

# THOMSON BALL SCREWS & BALL SPLINES



**THE COMPLETE SELECTION GUIDE  
FOR LINEAR ACTUATION COMPONENTS**

## First and Foremost in Linear Actuator Applications

Our ball screw assemblies, electromechanical linear actuators and ball spline assemblies provide trouble-free operation in more applications than any other ball screw manufacturer. Thomson Saginaw linear actuators have become the standard for precise, controlled linear motion in commercial and military aircraft, machine tools, automated assembly equipment, material and nuclear fuel handling systems, medical equipment, office machines and agricultural machinery. Our expertise begins with engineers who understand that your linear actuation needs may be unique.

We know how to design ball screw assemblies that meet your strict space and weight restrictions while providing years of superior performance. And, when a standard product will work, we can recommend stock assemblies that will fit your immediate needs.

### A time-proven operating principle

Each ball screw assembly consists of a screw with a precision ground or rolled helical groove, a nut (the outer race) with an internal groove, and a circuit of precision steel balls that recirculate in the grooves between the screw and nut. This anti-friction design converts torque to thrust as either the screw or nut turns and the other component moves in a linear direction.



Thomson Saginaw quality assurance gives you the most comprehensive examination of component materials and processes in the industry. We maintain all critical testing and inspection capabilities in house, along with our own heat-treating, plating and carburizing facilities to provide you with the most reliable linear actuator products from a single, cost-effective source.

Expert design and manufacturing is only part of our commitment to your linear actuator needs. Thomson Saginaw products are represented by a nationwide network of sales and service professionals. With district offices in major industrial areas of the U.S. and hundreds of authorized distributor locations, the leader in linear actuator technology is always nearby.

Our products can make your linear actuation applications more efficient, reliable and cost-effective. Let us put our years of experience to work for you. The solutions you need begin with this engineering guide. And you're only a phone call away from talking with our experts at (989) 776-4123.

Operating at over 90 percent efficiency, Thomson Saginaw ball screw assemblies achieve stepless control over the full stroke length and maintain high repeatability with precise, reliable positioning. Expensive support systems commonly needed for hydraulic and pneumatic actuators are eliminated, as is the need to maintain and repair their various accessories and components. The simple nut and screw mechanism eliminates sliding friction and stick-slip. Our ball screws require little or no maintenance beyond periodic lubrication. And, because of the anti-friction principle, service life is predictable, allowing the most reliable, economical designs.

Thomson Saginaw ball screw assemblies minimize your power requirements because of their high efficiency. Drive transmission size and weight can be reduced, along with actuator operating costs. Once you've chosen a Thomson Saginaw ball screw assembly to actuate your mechanism, you can select practically any option available to power, mount, and control its precise positioning in critical applications.

## Table of Contents

|                                                                                     |                                                                                                                            |    |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|----|
|    | Product Overview . . . . .                                                                                                 | 4  |
|                                                                                     | Product Selector . . . . .                                                                                                 | 8  |
|                                                                                     | Introduction to Ball Screw Technology . . . . .                                                                            | 10 |
|                                                                                     | Ball Screw Accuracy Classes . . . . .                                                                                      | 13 |
|    | Engineering Support . . . . .                                                                                              | 14 |
|                                                                                     | Glossary . . . . .                                                                                                         | 16 |
|                                                                                     | Bearing Support Reference Drawings . . . . .                                                                               | 17 |
|                                                                                     | Acceptable Travel Rate vs. Length for Screws . . . . .                                                                     | 18 |
|                                                                                     | Life Expectancy for Ball Screws . . . . .                                                                                  | 19 |
|                                                                                     | Compression Load vs. Length . . . . .                                                                                      | 22 |
|                                                                                     | Typical Ends . . . . .                                                                                                     | 23 |
|                                                                                     | Mounting Ball Screws Assemblies . . . . .                                                                                  | 24 |
|   | Precision Ball Screw Assemblies (Rolled Thread) . . . . .                                                                  | 25 |
|                                                                                     | Ball Screw Wiper Kits . . . . .                                                                                            | 53 |
|  | Precision Plus* Ball Screw Assemblies (.0005"/ft.) . . . . .                                                               | 54 |
|                                                                                     | Bridgeport Mill Assemblies . . . . .                                                                                       | 62 |
|  |  Metric Ball Screw Assemblies . . . . . | 63 |
|                                                                                     | Rotating Nut Ball Screw Assemblies . . . . .                                                                               | 76 |
|  | Precision Ball Spline Systems . . . . .                                                                                    | 77 |
|  | Quick Mount* Bearing Support Blocks, Inch . . . . .                                                                        | 84 |
|                                                                                     |                                                                                                                            |    |
|                                                                                     | Maintenance and Service . . . . .                                                                                          | 86 |

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## Select the Linear Actuation and Positioning Product You Need from Thomson Saginaw ... the Leader in Reliable, Precision Ball Screw Assemblies since 1941.

If your design calls for precise linear actuation, Thomson Saginaw has the answer to your needs. We offer a full range of ground thread and rolled thread ball screws, electromechanical actuators and ball splines plus engineering expertise and sales and service nationwide.

The next several pages give you a preview of the products and actuation solutions we can provide.

### 1. Precision Ground Thread Ball Screws

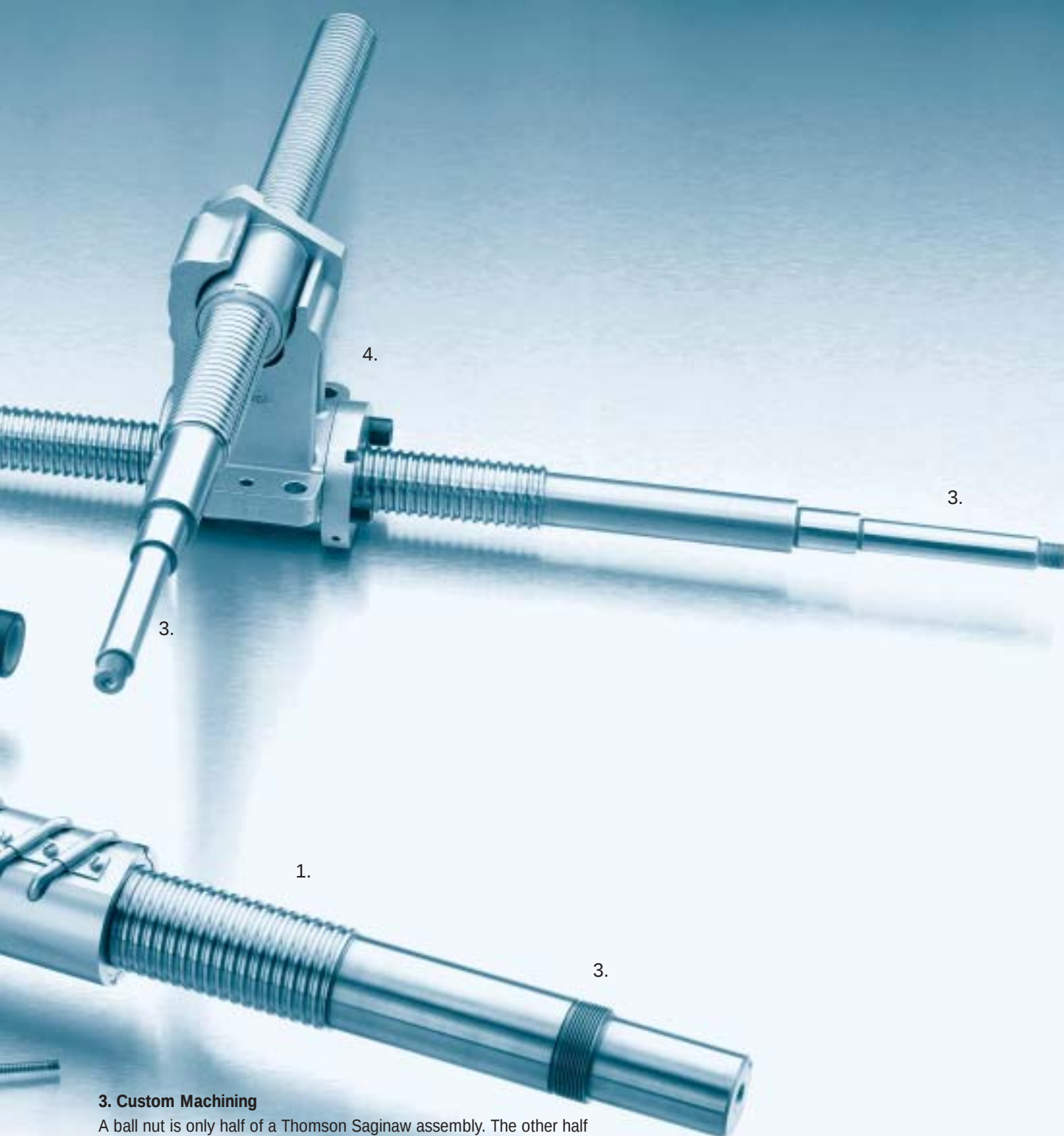
Thomson Saginaw custom and standard Precision Plus ball screw assemblies give you the most precise actuation because of ground thread lead accuracies of .0005 in./ft. travel. Efficiency ratings exceed 90%. Their anti-friction operation offers the most reliable performance and uniform feed under varying loads.

You can select from a full range of diameters up to 12 in. lengths to match your application.

### 2. Aviation Ball Screw Linear Actuators

Thomson Saginaw has been a leader in designing and producing custom, precision ground thread ball screw actuators for aerospace and aviation since 1941. Today tens of thousands of our actuators are operating in a variety of commercial and military aircraft.

Commercial aircraft applications include leading edge and trailing edge flaps, thrust reversers, and horizontal stabilizers while military aircraft use our actuators for flap and slat actuators, wing sweeps, main landing gear, and variable engine inlet and exhaust nozzle actuators.



### 3. Custom Machining

A ball nut is only half of a Thomson Saginaw assembly. The other half is our precision ground thread stock. It plays an important role in the dependable operation and minimal friction of Thomson Saginaw high performance Precision Plus assemblies. Custom machined screw ends allow for use of bearings, gears, and pulleys.

### 4. Precision Plus Bridgeport Mill Ball Screw Assemblies

Each Thomson Saginaw Precision Plus Bridgeport Mill assembly has two circuits of bearing balls (3-1/2 turns) and provides a life rating of 50-million in. travel at an operating load of 500 lb. Preloaded ball nuts, precision ground screws, a high strength housing, and plastic wipers all add up to a rugged retrofit package built to provide years of trouble-free service.

### 5. Miniature Ball Screws

Thomson Saginaw miniature ball screws are designed for instrumentation applications requiring minimal space. They are available in nominal shaft diameter size of .187 in. with a standard length of 12 in.

The epoxy ball nut has a rated load of 3 lb. and the stainless steel assembly has a rated load of 20 lb. Preloading can be achieved by using two ball nut assemblies.

### 6. Ball Splines

Thomson Saginaw ball splines are torque resistant linear motion assemblies. They provide high-speed, anti-friction, linear motion travel while subject to torsional loads ranging from 600 to 200,000 lb.-in., depending on size.

Unlimited rolling travel is achieved because the balls travel through a return circuit. Typical uses include robot and remote handling systems, helicopter rotor couplings, and nonswiveling telescoping struts.

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#### 1. Precision Non-preloaded Ball Nuts (SBN™)

Using rolled thread screws, assemblies using these ball nuts provide you with a low cost alternative to assemblies with more precise ground thread ball screws. They have a lead accuracy of .004 in./ft. travel and minimal backlash. Precision assemblies are widely used in conventional tables and slides, robotics, valve actuation and medical equipment. Nominal diameters range from .187 to 4.000 in. in lengths to match your application.

#### 2. Precision Preloaded I (SEL™)

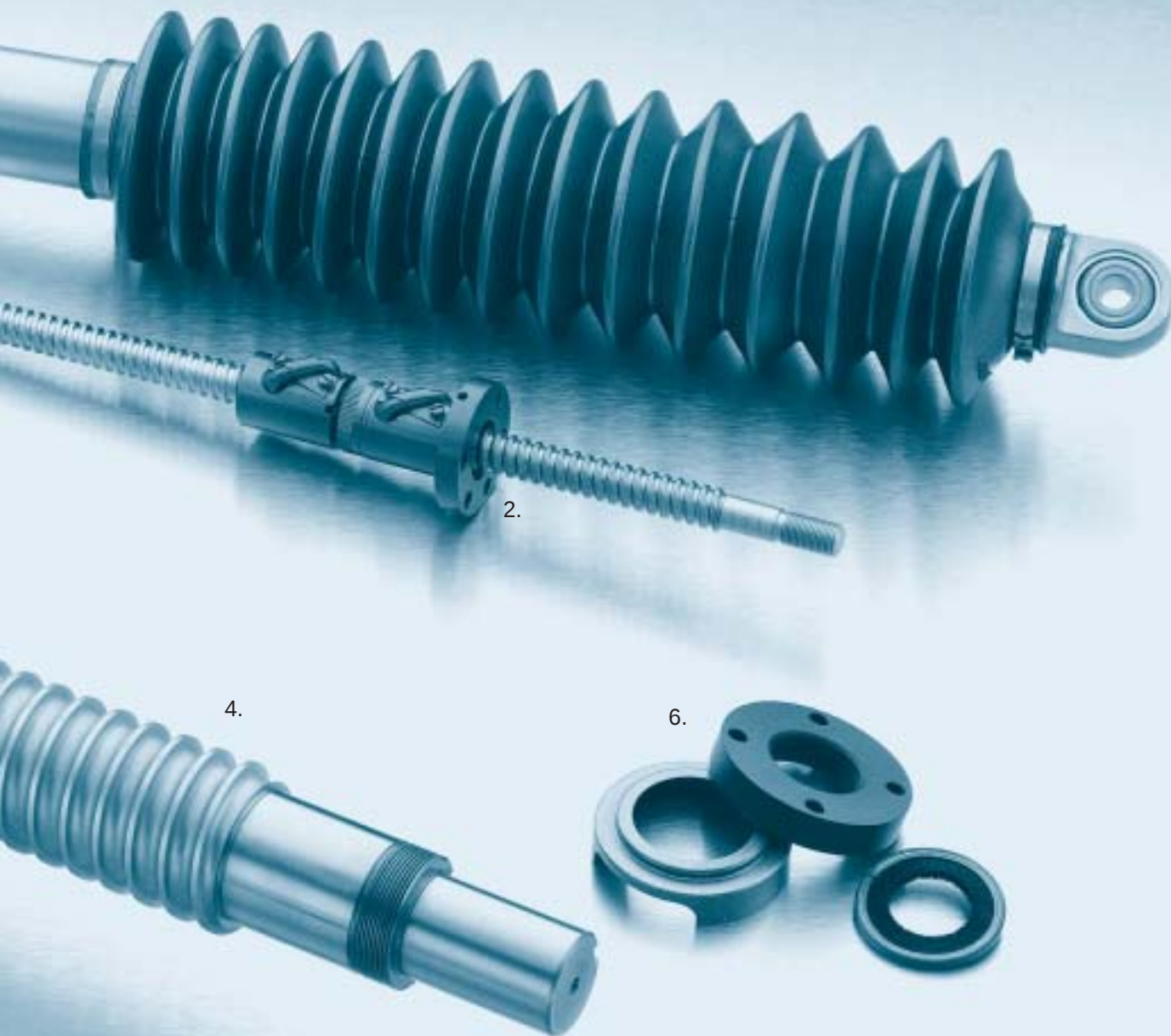
Precision Preloaded I standard rolled thread ball nuts are adjustable preloaded nuts on a rolled thread ball screw that provide zero backlash and increased system stiffness. They operate with a lead accuracy of .004 in./ft. travel and feature a serrated center nut for each preload after installation. These assemblies are available in nominal shaft diameter sizes .631 to 1.500 in. and give you the performance you need in non-critical actuation applications.

#### 3. Precision Preloaded II (SAR)

These rolled thread ball nuts also allow you to set the preload by simply rotating the serrated nut between the two ball nuts. This feature gives you a rolled thread assembly that can be used where zero backlash is required. The cost effectiveness of the Precision Preloaded II assembly permits major savings in N/C machine tool and other applications. They are available in nominal shaft diameter sizes from .631 to 3.00 in.

#### 4. Precision Rolled Thread Screws

Precision rolled thread screws can be produced in nominal diameters from .187 in. to 12 in. and standard lengths up to 20 ft. Screw threads are rolled for best performance at low cost. Ends are available machined for bearings, gears or pulleys.



### 5. PPA Performance Pak Actuators

PPA actuators combine an electric motor with a highly efficient Thomson Saginaw ball screw into a high performance, ready-to-install electromechanical positioning system. They are available with a choice of 12, 36, and 90 VDC or 110 and 220 VAC for either fixed or mobile applications.

Strokes from 4 to 36 in. give you design and application versatility for positioning loads up to 2500 lb. All PPA linear actuators feature a travel limiting clutch and a bi-directional brake.  
(separate catalog available)

### 6. Ball Screw Assembly Components

Thomson Saginaw has a complete line of components such as support blocks, wipers, and flanges to fit your particular application needs. In addition, shaft adapters and extensions, and shaft end machining is available for specific requirements.

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## Product Selector



### Precision Ball Screws

#### **Full range of diameters, leads, and ball nut configurations.**

Thomson Saginaw Precision ball screws come in a full range of diameters, leads, and ball nut configurations, in either preloaded or non-preloaded types, all in industry-standard envelopes. They provide dependable accuracy and repeatability at an economical price. Precision ball screws operate at over 90% efficiency with a constant low coefficient of friction. Precision ball nuts feature a Gothic arch ball groove geometry that extends service life, reduces lash, and optimizes stiffness in preloaded assemblies. This unique design also eliminates skidding, increases positioning accuracy, and maximizes travel life. Optional wiper kits and end support blocks are available, which increase system efficiency and service life. Available from over 1800 distributors worldwide.



### Precision Plus Ball Screw Assemblies

#### **High precision and accuracy for today's most stringent positioning requirements.**

Precision Plus\* ball screw assemblies give you at least eight times the lead accuracy of conventional rolled-thread units, for immediate improvement in machine performance. Standard sizes and leads with accuracies of .0005 in./ft. are available. A temperature-controlled grinding and laser inspection area ensures the highest quality and performance levels. Precision Plus ball screw assemblies offer zero-lash, high spring rate positioning and repeatability for machine tools, robots, material handling systems, electronic component insertion systems, and more. Available from over 1800 distributors worldwide.



### Precision Ball Spline Systems

#### **High reliability, speed and versatility for tough applications with torque loads.**

Thomson Saginaw precision ball spline systems feature high speed, anti-friction linear motion under high torsional loads. They have high reliability under varying operating conditions and predictable life expectancy. They resist radial displacement resulting from torque loads, and require smaller forces to achieve axial displacement of spline member while transmitting torque. Ball splines have application versatility such as helicopter rotor couplings; translating drive shaft couplings, nonswiveling telescoping struts; honing machine and drill press spindles, workhead and table ways, and remote and robot handling machines. Available from over 1800 distributors worldwide.



## Quick Mount\* Bearing Support Blocks

Versatile, space saving configuration that provides reliable mounting of ball screws and splines.

Quick Mount bearing blocks, from Thomson Saginaw, feature a rugged steel construction for application durability and a compact, low profile design for space savings in installations with limited space. They can be either foot or face mounted and complete as a package that includes locknuts and washers for faster installations. They are designed for use with Thomson Saginaw ball screws or ball splines with Type III shaft end machining. Available from over 1800 distributors worldwide.



## Repair and Reconditioning Services

When a ball screw assembly wears, replacement may not be the automatic solution to the problem. Reconditioning can save up to 90% of the cost of a new ball screw assembly. Worn or damaged ball screws of any design and from any manufacturer can normally be restored to their original performance specifications. Internal or external return systems are refurbished. Screws and nuts are remanufactured. If bearing journals are undersized, scored, or damaged, surface build-up and expert regrinding can bring the assembly back to original specification. When an evaluation identifies a problem with your application, a new ball screw assembly can be redesigned and manufactured, if desired. Available from over 1800 distributors worldwide.



## Capabilities

During our 50 plus years of servicing customers, our engineers have continuously developed new products required for industry's most unique and difficult applications. Thomson Saginaw is the pioneer in producing high speed ball screws — up to 120 in. per second; telescoping assemblies with up to five sections; hollow shafting; safety ball nuts with up to five redundant load paths; and ultimate accuracy assemblies. To find out more, contact Thomson Saginaw Application Engineering.

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# Introduction to Ball Screw Technology



Each Thomson Saginaw ball screw assembly consists of a screw (the inner race) with a precision helical groove, a nut (the outer race) with an internal groove, and precision steel balls that recirculate in the grooves between the screw and nut. This anti-friction design converts torque to thrust, or vice versa. As the screw or nut rotates, its mating component translates linearly.

## The Thomson Saginaw Advantages

Ball screws are not all alike. Differences in material, design, and manufacturing, coupled with extensive inspection and applications support, are all factors that affect the performance and extend the life of your ball screw. That's why it's important to select your ball screw — and ball screw supplier — very carefully.

### Design

The Thomson Saginaw thread form, "the Gothic Arch," (see Figures 1 and 2 on page 11) maintains tighter contact angle control than other thread forms. This rigid control of contact angle results in:

- Low contact stresses which provide high load capacity and maximum predictable life
- Improved stiffness
- Minimal backlash accumulation in non-preloaded assemblies
- Long-lasting preload and consistent stiffness

Thomson Saginaw ball screws also employ a durable external return ball recirculation system and a selection of specially designed replaceable seal/wiper designs that provide superior lubricant retention, while keeping out harmful contaminants.

### Performance

Ball screw assemblies from Thomson Saginaw provide performance advantages that other ball screws just can't match. These include:

- Higher Dynamic Load Ratings  
While other companies manufacture ball screws to conform to theoretically calculated standards, our products reflect empirically derived performance and use values which result in, size for size, the highest dynamic load rating in the industry.
- Longer Service Life  
Compared to competitive ball screws, our assemblies provide longer service life. This increased life is determined by the ratio of the Thomson Saginaw dynamic load rating versus competitive rating raised to the third power.

### Example:

$$\text{Life} = (C/F)^3 \times 10^6 \text{ in.}$$

|                                     | Competitor                | Thomson Saginaw                                                                                          |
|-------------------------------------|---------------------------|----------------------------------------------------------------------------------------------------------|
| Maximum Capacity                    | 4,141 lb.                 | 5,360 lb.                                                                                                |
| Relative Capacity                   | 1.0                       | 1.29 vs. Competitor                                                                                      |
| Relative Life At Capacity Full Load | 1.0 x 10 <sup>6</sup> in. | 2.1 x 10 <sup>6</sup> in. vs. Base Line for Competitor<br>(5,360 ÷ 4,141) <sup>3</sup> x 10 <sup>6</sup> |

The Thomson Saginaw ball screw assembly provides 210% life expectancy or twice the life of the competitor's assembly in this example.

## Manufacturing

Thomson Saginaw maintains the most modern and complete ball screw manufacturing facility in the industry. In-house manufacturing capabilities include our proprietary heat treating and plating processes. Expert manufacturing, using the most modern equipment available, provides ball screws that set the standards for performance, precision, and travel life. Our ball screws feature leads as accurate as .0002 in./ft. and fluctuation (wobble) resolution as low as .0001 in. Predictable travel life is made possible by maintaining tight quality and process control measures.

## Inspection

What some suppliers may consider to be complex or elaborate inspection methods are routine in-house procedures at Thomson Saginaw. Tests for structural and metallurgical integrity include magnetic particle, dye penetrant, and eddy current inspections. Laser interferometry is used for measuring lead accuracy and fluctuation. Our fully equipped engineering laboratory performs qualification testing for mechanical performance, environmental effects, and structural integrity. Your ball screw is inspected every step of the way to ensure top quality and performance. The result, Thomson Saginaw ball screws perform the way you expect them to perform — no surprises, no problems.

## Materials

The materials used to manufacture ball screws are critical to their performance. Our in-house metallurgists control and verify that the materials used are of the highest quality. They can also select and recommend materials best suited to your particular application.

## Applications Support

While manufacturing top quality ball screws is a key ingredient to customer satisfaction, the true measure of a ball screw supplier is gauged by the level of applications engineering, service, and support provided.

Working with us is like having your own staff of ball screw design engineers able to address application concerns and recommend solutions. The company's sales and engineering personnel have more ball screw expertise than any other group in the industry. They are skilled at evaluating your requirements and designing assemblies that fit your needs.

## Customer Service

Thomson Saginaw customer service is flexible in developing delivery schedules for your production requirements. District managers are linear motion experts always available for technical support and application proposals. Conveniently located in your area, they are an important interface between you and Thomson Saginaw.

We have the largest and most skilled network of industrial linear motion distributors, with over 1300 locations worldwide. Each person in this network is dedicated to supplying you with the right answers to your ball screw questions.

## Non-Preloaded

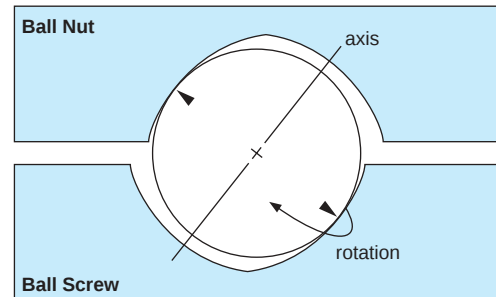


Figure 1

## Single Nut Preloaded

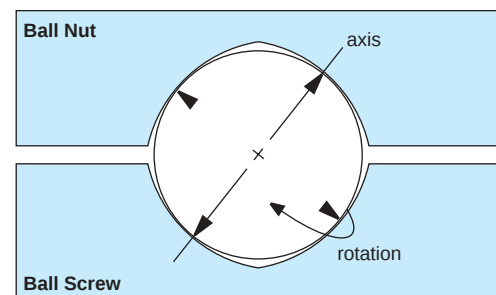


Figure 2

## Double Nut Preloaded

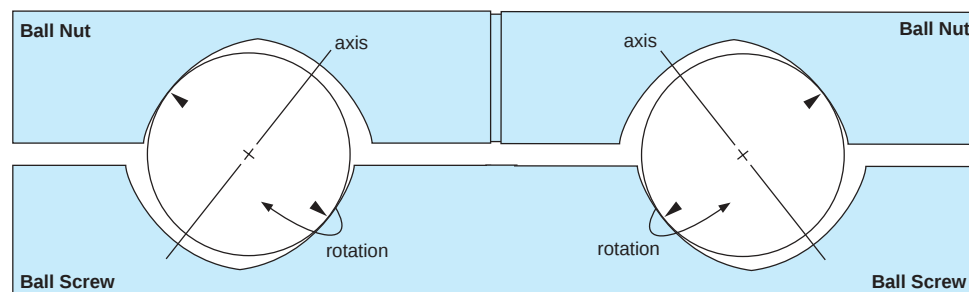


Figure 3

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## Why Thomson Saginaw Ball Screws Are Your Best Choice for Linear Actuation

Thomson Saginaw ball screws outperform other actuation methods. For example, they are up to three times more efficient than *Acme-type screws*. This lowers your power requirements, permitting the use of smaller, less expensive gears, clutches, and drive motors. Thomson Saginaw ball screws are also virtually friction-free. This eliminates stick-slip and reduces wear. The result is extremely smooth operation, high travel speed, predictable life, and lasting precision. And unlike Acme-type screws, they can be reconditioned, further increasing the return on your investment.

Compared to bulky, noisy, and expensive *hydraulic* or *pneumatic* actuator systems, Thomson Saginaw ball screws are compact, quiet, and very affordable. In addition, there's no need for pumps, hoses, fluids, or shop air. This eliminates fire, safety, and health hazards due to leaking fluid or other contaminants typically associated with these types of actuation methods.

*Belt, cable, and chain-drive mechanisms* are relatively inexpensive. However, they aren't as precise, repeatable, or as safe to use as ball screws. Their failure mode is either excessive wear or stretching, resulting in positioning inaccuracies during operation. These types of systems also have low load capacities.

*Rack and pinion* gear systems can be made to close tolerances, but lose precision as they wear and don't function as smoothly as ball screws, even when new. Because the force is supported by a few pinion teeth at any given time, the system also is limited in terms of load capacity.

*Offset cam rollers* rely on the tractive force between the rollers and the shaft to create linear motion, and therefore can handle only moderate loads. The higher the load, the more likely it is that the system will slip, reducing repeatability.

In summary, when compared to other types of mechanical actuation methods, Thomson Saginaw ball screws provide the most cost-effective combination of speed, accuracy, efficiency, repeatability, quiet operation, lubrication retention, load capacity, and compactness.

Thomson Saginaw Precision ball screw assemblies are the first choice in precise, reliable, cost-effective linear actuation.

## The Thomson Saginaw Ball Screw Advantages

|                       | Thomson Saginaw Ball Screws | Acme Screws | Fluid Power | Belt, Cable, and Chain-Drive Mechanisms | Rack & Pinion | Offset Cam Rollers | Pneumatic Cylinders |
|-----------------------|-----------------------------|-------------|-------------|-----------------------------------------|---------------|--------------------|---------------------|
| Inexpensive           | ●                           | ●           |             | ●                                       |               | ●                  |                     |
| Low Power Consumption | ●                           |             |             | ●                                       | ●             | ●                  |                     |
| Low Maintenance       | ●                           |             |             |                                         |               |                    | ●                   |
| High Accuracy         | ●                           |             |             |                                         |               |                    |                     |
| High Repeatability    | ●                           |             |             |                                         |               |                    |                     |
| High Efficiency       | ●                           |             |             |                                         |               |                    |                     |
| High Load Capacity    | ●                           |             | ●           |                                         |               |                    |                     |
| Compact Size          | ●                           | ●           |             |                                         | ●             |                    |                     |
| Speed                 | ●                           |             |             | ●                                       | ●             |                    | ●                   |

# Thomson Saginaw Ball Screw Accuracy Classes

Thomson Saginaw ball screws are available in accuracy classes to meet your positioning requirements. Within the Precision class, they can be specified in either preloaded or non-preloaded configurations to accommodate your lash requirements. Precision Plus ball screws are preloaded at the factory. Use the chart below to help guide you to the accuracy class and ball screw series best suited for your application.

| PERFORMANCE RANGES                             | Precision<br>.004 in./ft. lead accuracy standard<br>(.002 in./ft. available)<br>(.001 in./ft. available) |                                                                                   | Precision<br>.0005 in./ft. lead accuracy standard<br>(.0002 in./ft. available)     |                                                                                     |
|------------------------------------------------|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                                |                         |  |  |  |
| Series                                         | Precision<br>(non-preloaded) (SBN™)                                                                      | Precision<br>(preloaded) (SEL™)                                                   | Precision<br>(preloaded) (SAR™)                                                    | Precision Plus<br>(preloaded) (SSP™)                                                |
| Ball Circle Dia. x Lead                        | .187 x .050<br>to<br>6.000 x 1.000                                                                       | .631 x .200<br>to<br>1.500 x .250                                                 | .631 x .200<br>to<br>3.000 x .660                                                  | .500 x .200<br>to<br>2.500 x .500                                                   |
| Backlash                                       | .002-.013                                                                                                | zero                                                                              | zero                                                                               | zero                                                                                |
| Rated Load<br>(lb./10 <sup>6</sup> in. travel) | 5<br>to<br>160,000                                                                                       | 778<br>to<br>7,560                                                                | 778<br>to<br>44,316                                                                | 416<br>to<br>24,000                                                                 |
| Max. Static Load                               | 75<br>to<br>750,00                                                                                       | 6,384<br>to<br>34,662                                                             | 6,384<br>to<br>271,733                                                             | 1,500<br>to<br>140,000                                                              |
| Catalog Pages                                  | 27-52                                                                                                    | 29-52                                                                             | 32-51                                                                              | 54-61                                                                               |

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# Engineering Support

Thomson Saginaw products are engineered to world class performance standards, so that you can specify them worldwide. This Engineering Section provides charts, formulas and technical information for:

- Load considerations for horizontal and vertical mounted applications
- Ball screw life
- Operating speeds
- Column stiffness



## Design Formulas

These formulas allow you to calculate a number of important factors which govern the application of Thomson Saginaw ball screws.

### 1. Equivalent Operating Load

$$F = \sqrt[3]{q_1 (F_1)^3 + q_2 (F_2)^3 + q_3 (F_3)^3 + \dots q_n (F_n)^3}$$

$q_n$  = Proportion of Stroke or Cycle at  $F_n$   
 $F_n$  = Increment of Load (lb<sub>f</sub>)  
 $F$  = Equivalent Operating Load (lb<sub>f</sub>)

### 2. Ball Screw Life (L)

$$L = \left(\frac{C}{F}\right)^3 \times 10^6 \text{ inches or } L_h = \frac{L}{n_m \times 60}$$

$C$  = Rated Dynamic Load Capacity (lb<sub>f</sub>)  
 $F$  = Equivalent Operating Load (lb<sub>f</sub>)  
 $L$  = Life in Inches  
 $L_h$  = Life (hours)  
 $n_m$  = Average Speed (in.  $\times$  min.<sup>-1</sup>)

### 3. Rotational Speed Required for a Specific Linear Velocity

$$n = \frac{\text{Travel Rate (in.} \times \text{min.}^{-1}\text{)}}{\text{Lead (in.)}}$$

$n$  = rpm

### 4. Machine Service Life

After ball screw life (L) is calculated, apply it to the following formula to determine machine service life.

$$\text{Machine Service Life (in years)} = \frac{L_h}{(\text{machine operating hours}) \cdot (\text{days/year}) \cdot \left(\frac{\text{ball screw operating hours}}{\text{machine operating hours}}\right)}$$

### 5. Torque

a. Driving torque:  $T_d = \frac{F \times P}{2\pi e} = 0.177 \times F \times P \text{ (lb}_f \times \text{in.)}$

$F$  = Equivalent Operating Load (lb<sub>f</sub>)  
 $P$  = Lead (in.)  
 $e$  = Efficiency = 0.90  
 $T_d$  = Driving Torque  
 $T_b$  = Backdrive Torque

b. Backdrive torque:  $T_b = \frac{F \times P \times e}{2\pi} = 0.143 \times F \times P \text{ (lb}_f \times \text{in.)}$   
(conversion of linear to rotational motion)

### 6. Power

$$P_d = \frac{F \times P}{(2\pi) e} \times \frac{n}{6.302 \times 10^4} = \frac{F \times P \times n}{3.564 \times 10^5} \text{ (HP)}$$

$P_d$  = Power (HP)  
 $n$  = rpm

## 7. Critical Speed

$$n_c = C_s \times 4.8 \times 10^6 \times \frac{d_r}{l^2}$$

$$n_s = n_c \times S$$

$n_c$  = Critical Speed (RPM)

$n_s$  = Safe Drive Speed

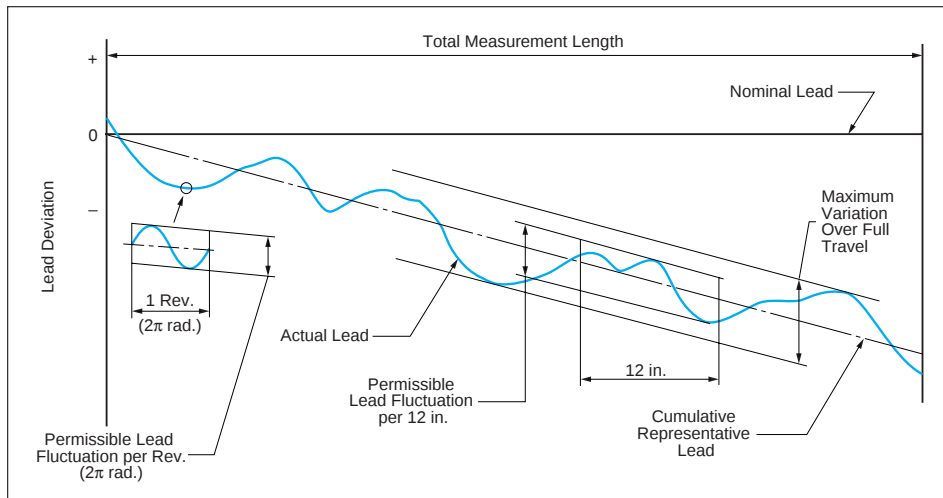
$d_r$  = Root Diameter (in.)

$l$  = Length between Bearing  
Supports (in.)

$S$  = Safety Factor (0.8 maximum)

$C_s$  = End Fixity Factor

| End Fixity Factor |                                  |       |
|-------------------|----------------------------------|-------|
| End Supports      |                                  | $C_s$ |
| A                 | One end fixed, one end free      | 0.36  |
| B                 | Both ends supported              | 1.00  |
| C                 | One end fixed, one end supported | 1.47  |
| D                 | Both ends fixed                  | 2.23  |



## Lead/Travel Accuracy Graph

The graph above shows the various criteria recognized by standards organizations worldwide as key in determining the accuracy of ball screw assemblies.

Specified travel of the ball nut relative to the ball screw shaft, assuming no compensation for elongation caused by temperature rise or external load, is indicated by the horizontal line, **Nominal Lead**.

**Actual Lead** is the axial movement of the ball nut relative to the ball screw shaft.

**Cumulative Representative Lead** is the straight line illustration of actual travel obtained by the least squares method. This line portrays the tendency of the Actual Lead.

Travel fluctuations are shown as a finite measure of distance between two lines drawn parallel to the Representative Lead at various points described by the following:

- **Maximum Fluctuation** – the extreme band width variation over full travel length.
- **Permissible Lead Fluctuation** – band width of variation over 12 in. defined by the accuracy class designation of the screw shaft under evaluation.
- **Permissible Lead Fluctuation per Revolution (Wobble)** – the actual magnitude of fluctuation for one revolution ( $2\pi$  radians).

## Cumulative Lead Accuracy $\Delta P$ (in.<sup>-3</sup>)

| Ball Screw Assembly | ISO Class | Accumulated lead deviation $\Delta P$ (in. <sup>-3</sup> ) over screw length L (in.): |     |     |     |      |      |     |
|---------------------|-----------|---------------------------------------------------------------------------------------|-----|-----|-----|------|------|-----|
|                     |           | 12                                                                                    | 24  | 36  | 48  | 60   | 80   | 120 |
| Precision           | 1         | .20                                                                                   | .31 | .43 | .51 | .59  | .71  | 1   |
| Plus                | 3         | .39                                                                                   | .63 | .83 | .95 | 1.14 | 1.38 | 2   |
|                     | 5         | 1                                                                                     | 2   | 3   | 4   | 5    | 6.67 | 10  |
| Precision           | 7         | 2                                                                                     | 4   | 6   | 8   | 10   | 13.3 | 20  |
|                     | 9         | 4                                                                                     | 8   | 12  | 16  | 20   | 26.7 | 40  |
|                     | 10        | 8                                                                                     | 16  | 24  | 32  | 40   | 53.3 | 80  |

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# Glossary

**Accuracy**

A measurement of precision. Perfect accuracy, for example, means advancing a ball nut 1 in. from any point on a screw will always require the exact same number of revolutions.

**Backdrive**

Application of a force on a ball nut to cause rotation of the screw shaft; in essence, converting linear to rotary motion.

**Backlash**

Free axial motion that is measured in a ball screw system. Preloaded Precision and Precision Plus assemblies have zero backlash. Non-preloaded Precision assemblies have .002 in. to .013 in. maximum backlash (depending on size).

**Ball Circle Diameter**

The distance between the centerlines of two exactly opposing recirculating balls when they are in contact with the screw. The basic point of reference used by Thomson Saginaw when dealing with ball screws.

**Compression Load**

A force that would tend to squeeze the screw in an axial direction.

**Critical Speed**

The condition where the rotary speed of the assembly sets up harmonic vibrations. These vibrations are the result of shaft diameter, unsupported length, type of bearing support, ball nut mounting method, or the shaft or ball nut rpm. Vibrations may also be caused by a bent screw or faulty installation alignment.

**Cycle**

The complete load-carrying extension and retraction of the screw or nut. Each cycle consists of two strokes (one forward and one back to the point of origin).

**Dynamic (Operating) Load**

The normal force in pounds which the ball screw will experience during operation.

**Efficiency**

Expressed as a percentage, the ability of a ball screw assembly to convert torque to thrust with minimal mechanical loss. Thomson Saginaw ball screws operate at over 90% efficiency.

**End Fixity**

The bearing configurations that are used to support the ends of a ball screw assembly. The common end fixity configurations are shown on page 17 of this guide.

**Lead**

The axial advance of the ball nut per revolution of the screw.

**Linear Expansion**

Ball screw and spline inner races have a coefficient of linear expansion of 0.0000065 for each degree of change (F) and for each inch of race length.

**Lubrication**

To provide the maximum useful life, ball splines and ball screws require lubrication. In general, standard ball bearing lubrication practices are acceptable.

**Off-Center Load**

A load that tends to create misalignment between the ball nut and screw shaft, which causes rotational binding and shortened operational life.

**Operating Loads**

The normal operating force in pounds (lb.) or Newtons (N) which the ball spline or ball screw will experience is considered the operating load. Contact Thomson Saginaw Application Engineering in applications subject to widely fluctuating loads or to optimize design.

**Preload**

A method of loading one set of bearing balls in opposition to each other to eliminate all axial freedom. Preloading increases system stiffness and eliminates backlash.

**Protective Coatings**

Standard outer races are supplied with a black oxide coating. Inner races are furnished with a phosphate coating. Contact Application Engineering for additional options.

**Repeatability**

A measurement of constancy. For example, a ball nut traveling between the same established points will always require the exact same number of turns.

**Root Diameter**

The diameter of the screw shaft as measured at the bottom of the ball track.

**Screw Diameter (land diameter)**

The outside diameter of the screw shaft.

**Screw Starts**

The number of individual threads on a screw shaft.

**Side Load**

A radial force that significantly reduces rated life and can potentially lead to premature failure.

**Spring Rate**

A ratio of load versus deflection of a component or of a total system. System stiffness will always be less than its most compliant member. Thus, in any system where a ball screw is used and where high system stiffness is a primary design requirement, Thomson Saginaw should be contacted for recommendations based on the specifics of the application.

**Static (Maximum) Load**

The maximum force that can be resisted without causing damage to the screw component.

**Straightness**

The linearity of a screw shaft. Precision screw stock is .010 in./ft. with .040 in. max. Precision Plus stock is typically .003 in. over the entire length of the screw.

**Stroke**

The maximum length of extension of a ball nut on the screw shaft.

**Temperature (operating)**

With suitable lubricants, ball splines and ball screws will operate with a minimum loss of efficiency between temperatures of -65° to +300°F (-53° to +149°C). Contact Thomson Saginaw for extreme temperatures.

**Tension Load**

A force in a direction that would tend to stretch the screw.

**Torque**

The force required to drive a ball screw in converting rotary to linear motion. Determined by multiplying the axial load by the screw lead and dividing by 5.65.

**Travel and Travel Rate**

The distance a ball nut moves relative to the screw shaft. Travel rate is the distance traveled in a specific time period.

# Bearing Support Reference Drawings (End Fixity)

**Critical Speed** — That condition where the rotary speed of the assembly sets up harmonic vibrations. (Refer to Figure 1.) These vibrations are the result of shaft diameter, unsupported length, type of bearing support, position of the ball nut in the stroke, how the ball nut is mounted, the shaft or ball nut rpm, etc. (Note: Shaft vibrations may also be caused by a bent screw or faulty installation alignment.) The four end fixity drawings (A, B, C, and D) show the bearing configurations for supporting a rotating shaft. The selection chart for Travel Rate vs. Length on page 18, shows these same configurations at the bottom of the chart and factors in their effect on critical shaft speed for the unsupported screw length.

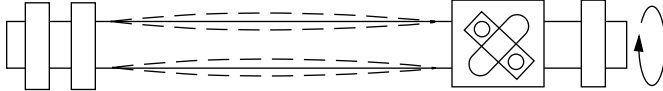
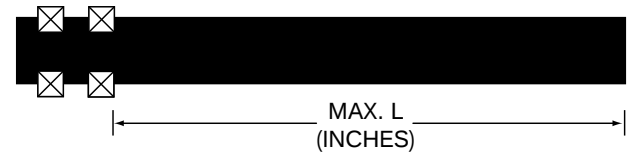


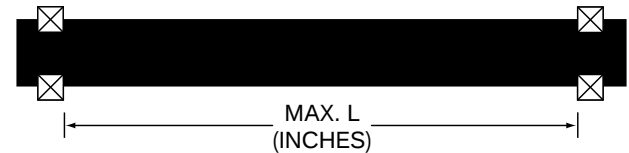
Figure 1

## Bearing Support vs. Speed (travel rate or rpm)

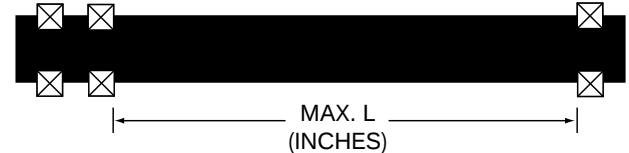
A – One end fixed, other end free



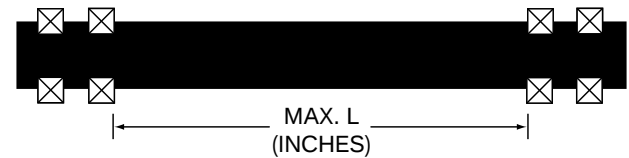
B – Both ends supported



C – One end fixed, other end supported



D – Both ends fixed



**Tension Loads** — Those loads where the force pulls on the bearing and its support. (Refer to Figure 2.) Where practical, applications should be designed to function with the load in tension to achieve the widest possible selection of screw sizes. Ball screws operating in both tension and compression may be preloaded between the support bearings or mounted per the guidelines under **Compression Loads**.

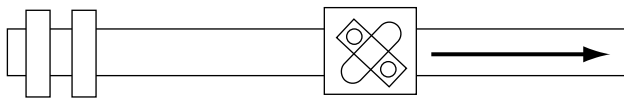


Figure 2

**Compression Loads** — Those loads where the force pushes on the bearing and its support. (Refer to Figure 3.) Compression loads tend to cause the screw shaft to bend. This normally requires a ball screw with a larger diameter than one for tension loading only. The four end fixity drawings (E, F, G, and H) show the bearing configurations for supporting a shaft subject to compression loads. The selection chart for Compression Load vs. Length, on page 22, shows these same configurations at the bottom of the chart and factors in their effect on the unsupported length of the screw for compression loads.

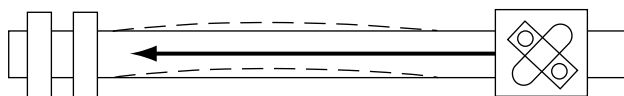


Figure 3

## Bearing Support vs. Compression Load on Screws

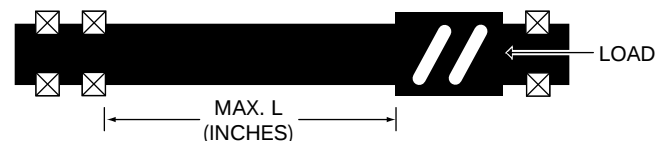
E – One end fixed, other end free



F – Both ends supported



G – One end fixed, other end supported



H – Both ends fixed



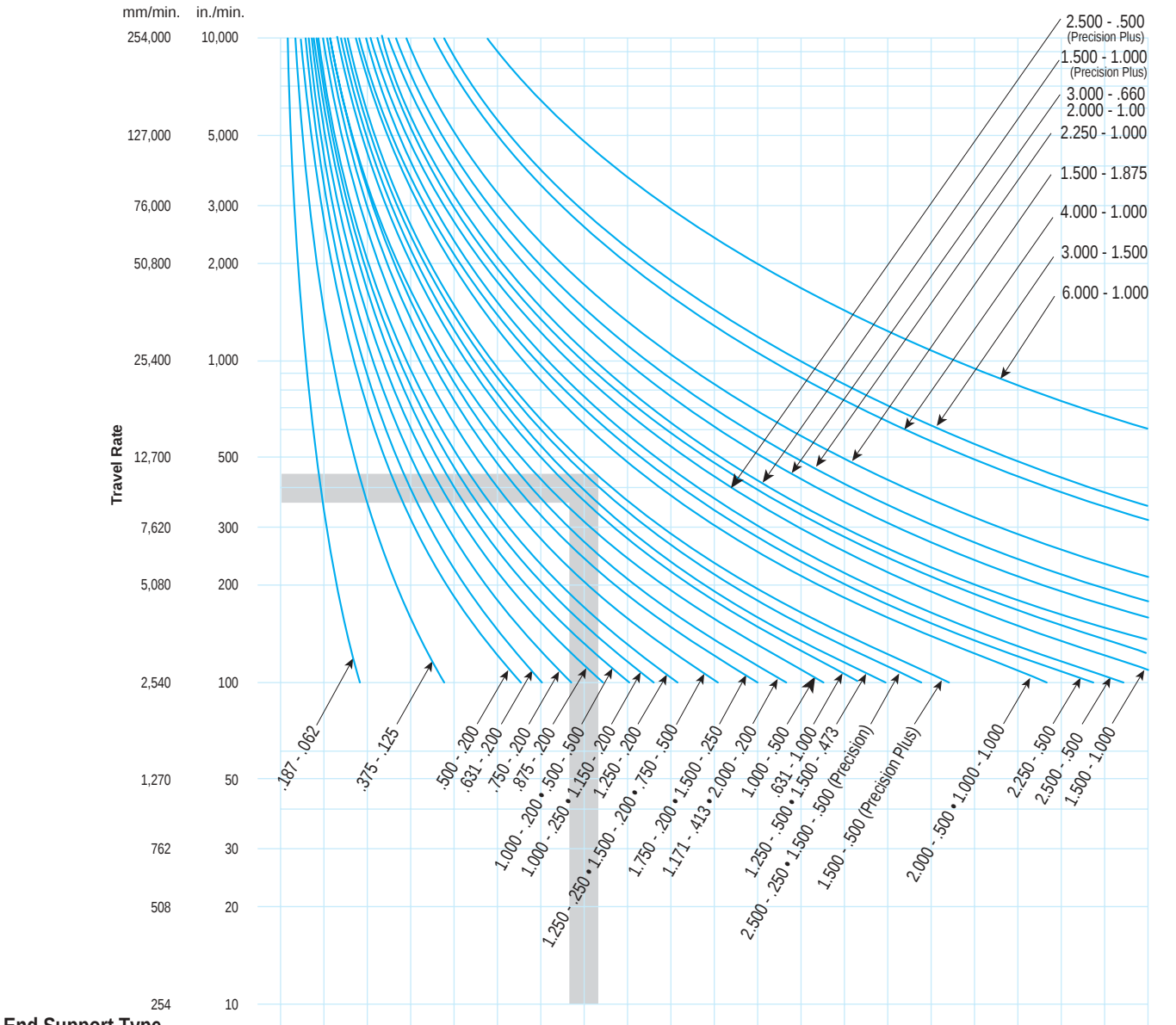
Note: The information in this guide for end fixity is based on the centers of the two bearings spaced apart by 1-1/2 times the root diameter of the screw.

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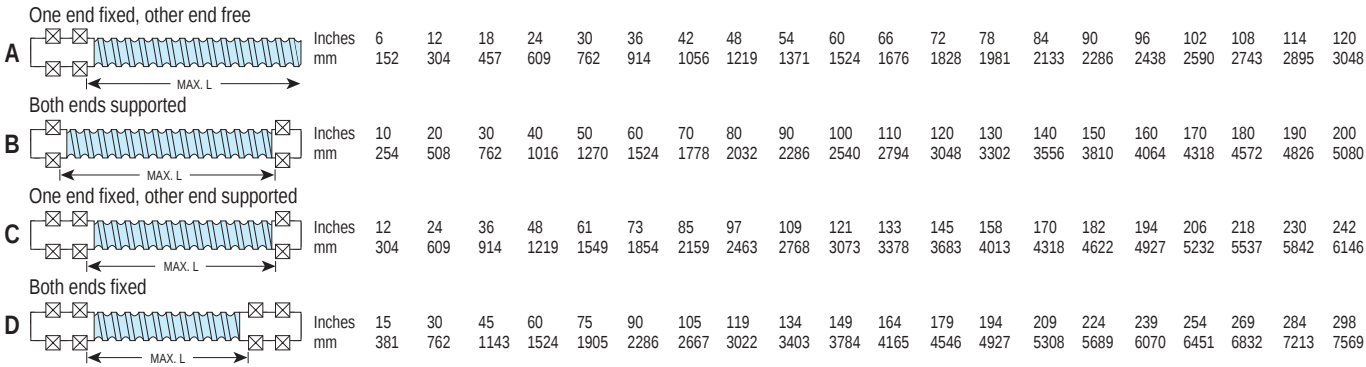
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# Acceptable Travel Rate<sup>†</sup> vs. Length for Screws



## End Support Type

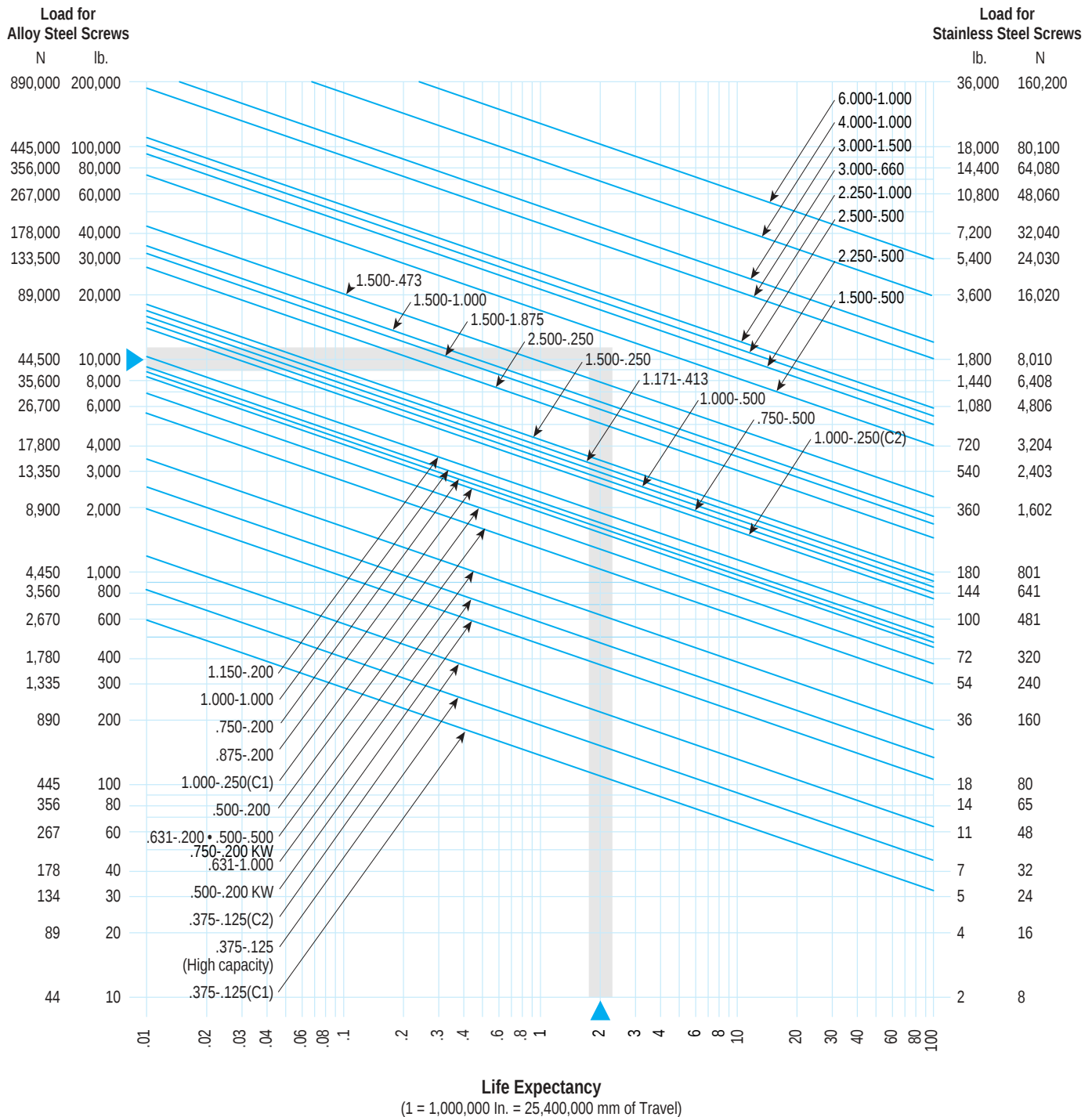


**Example:** Travel rate of 400 in./min. (10160 mm/min.).  
Unsupported length of 85 in. (2159 mm).  
End fixity of one end fixed, other end supported.

All screws with curves which pass through or above and to the right of the plotted point are suitable for the example. The acceptable velocities shown by this graph apply to the screw shaft selected and are not indicative of the velocities attainable of all of the associated ball nut assemblies. Consult factory in high speed applications.

<sup>†</sup> 80% of critical speed

# Life Expectancy for Precision *Non-Preloaded* Ball Screw Assemblies



**Example:** Application life expectancy (total travel) desired is 2 million in. (50.8 million mm).

Normal operating load is 10,000 lb. (44,500 N).

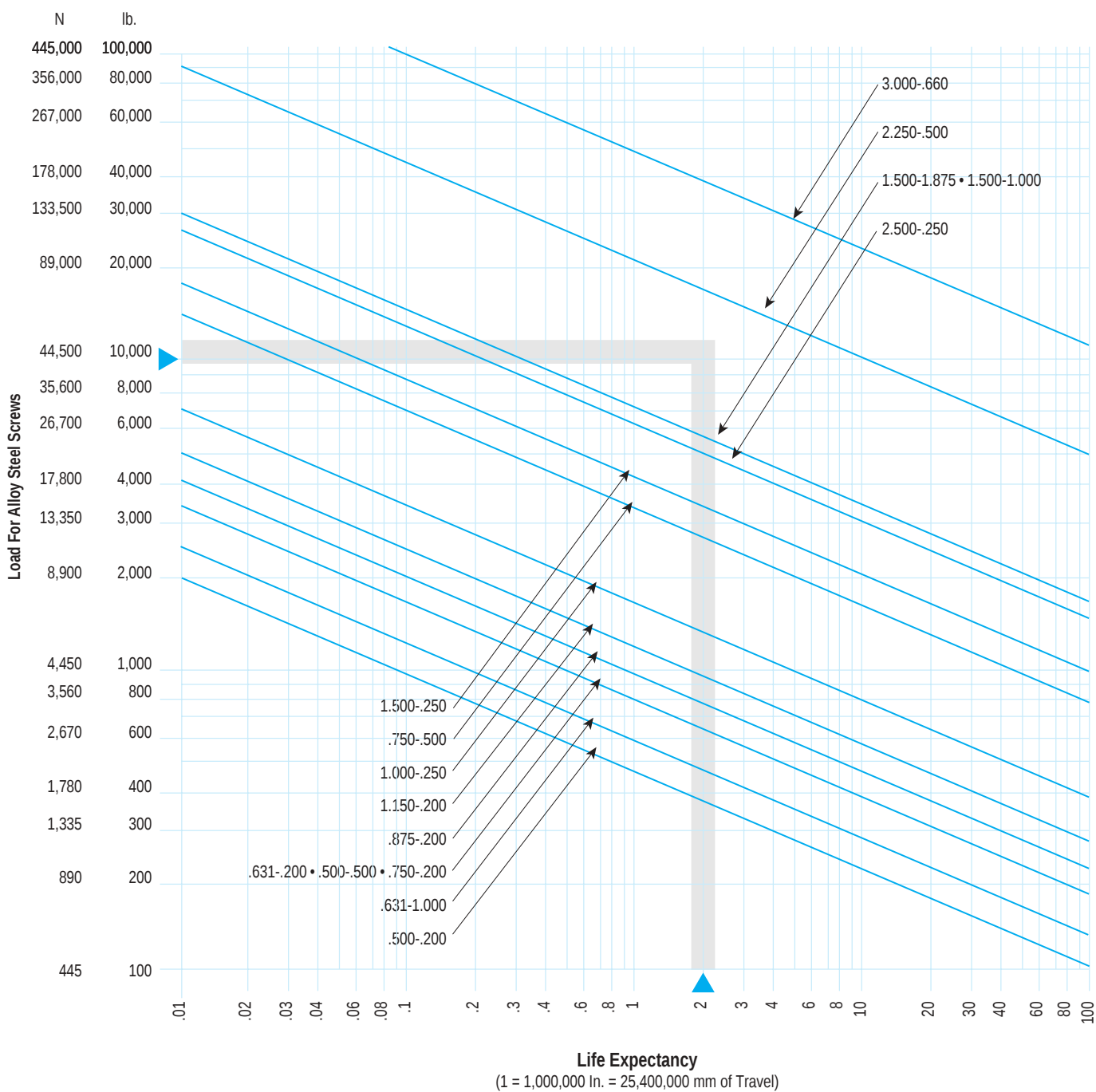
All screws with curves which pass through or are above and to the right of the plotted point are suitable for the example. The suitable dynamic life expectancies shown in this graph are not to exceed the maximum static load capacity as given in the rating table for the individual ball nut assembly.

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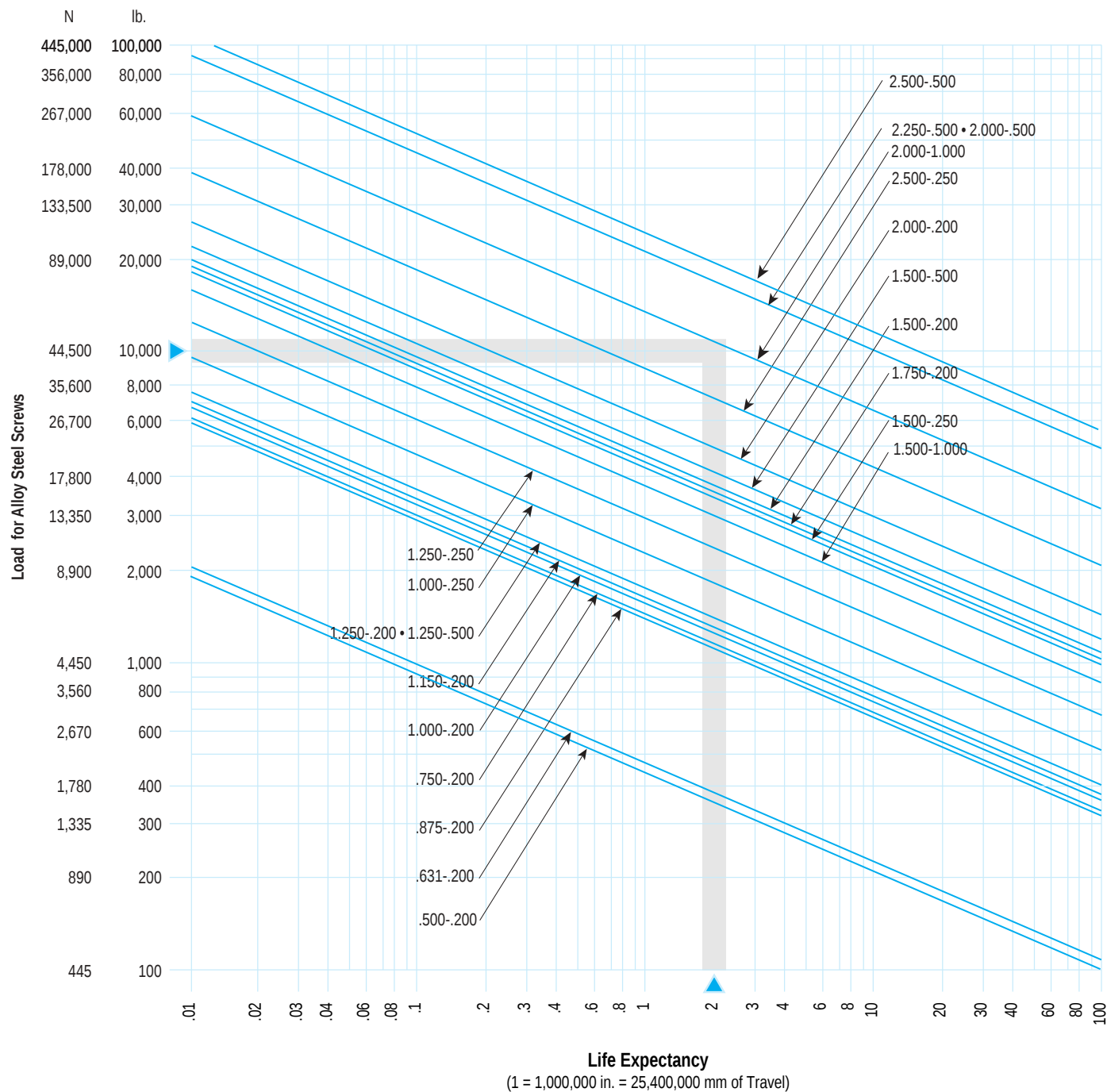
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# Life Expectancy for Precision *Preloaded* Ball Screw Assemblies



**Example:**Application life expectancy (total travel) desired is 2 million in. (50.8 million mm).  
Normal operating load is 10,000 lb. (44,500 N).  
All screws with curves which pass through or are above and to the right of the plotted point are suitable for the example. The suitable dynamic life expectancies shown in this graph are not to exceed the maximum static load capacity as given in the rating table for the individual ball nut assembly.

# Life Expectancy for Precision *Plus Preloaded* Ball Screw Assemblies



**Example:** Application life expectancy (total travel) desired is 2 million in.  
(50.8 million mm).

Normal operating load is 10,000 lb. (44,500 N).

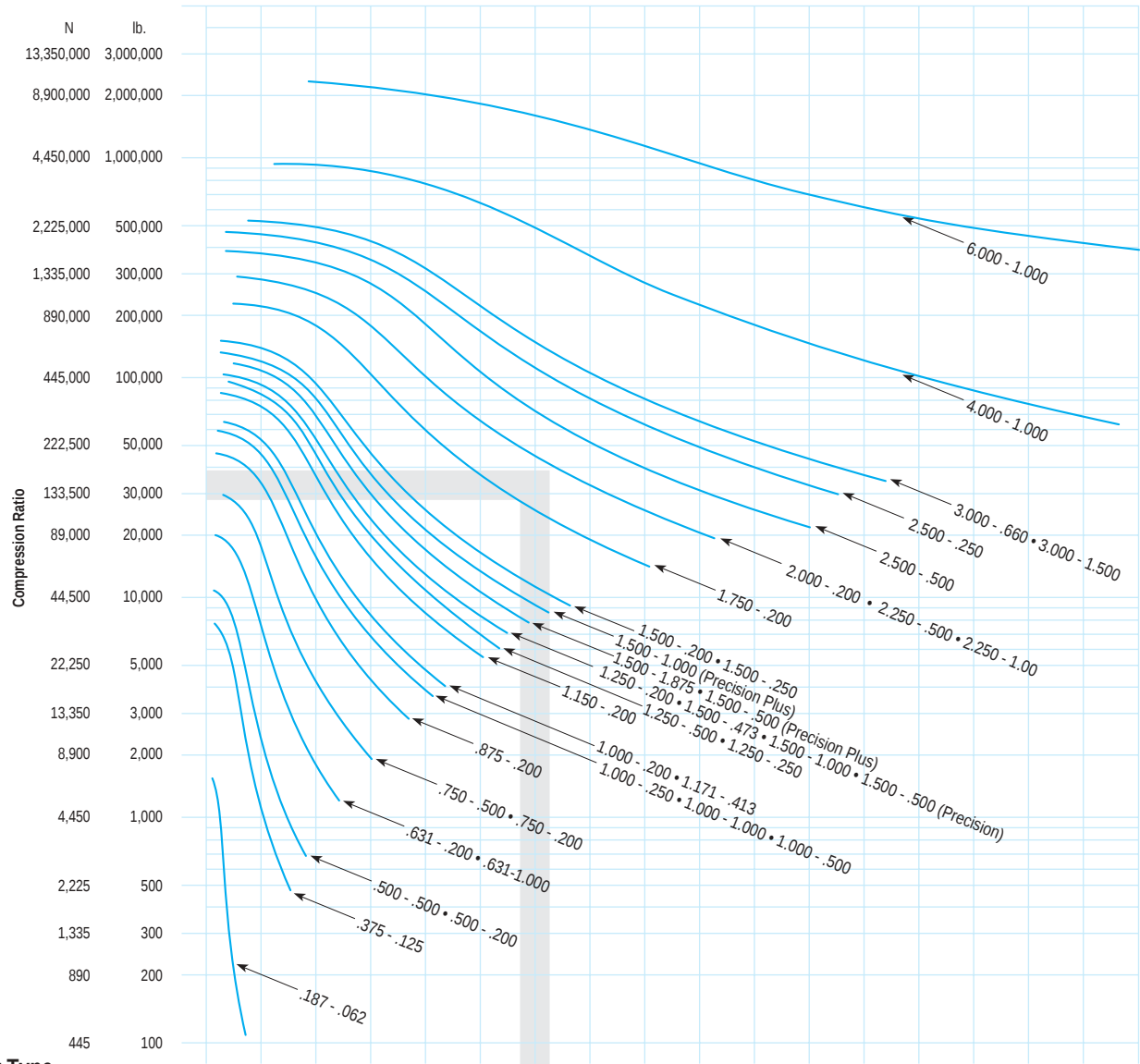
All screws with curves which pass through or are above and to the right of the plotted point are suitable for the example. The suitable dynamic life expectancies shown in this graph are not to exceed the maximum static load capacity as given in the rating table for the individual ball nut assembly.

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# Compression Load vs. Length for Designated Ball Screws



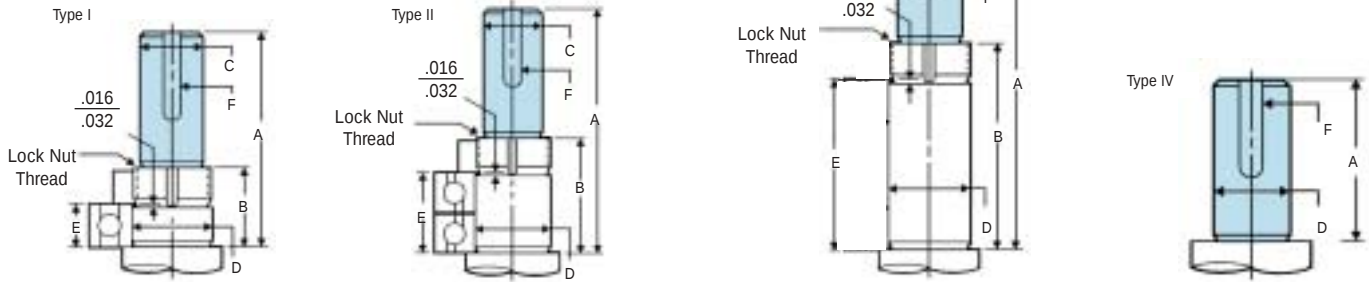
### End Support Type

|                                    |  |        |  |     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|------------------------------------|--|--------|--|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| One end fixed, other end free      |  | Inches |  | 5   | 10   | 15   | 20   | 25   | 30   | 35   | 40   | 45   | 50   | 55   | 60   | 65   | 70   | 75   | 80   | 85   |
|                                    |  | mm     |  | 127 | 254  | 381  | 508  | 635  | 762  | 889  | 1016 | 1143 | 1270 | 1397 | 1524 | 1651 | 1778 | 1905 | 2032 | 2159 |
| A                                  |  | LOAD   |  |     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Both ends supported                |  | Inches |  | 10  | 20   | 30   | 40   | 50   | 60   | 70   | 80   | 90   | 100  | 110  | 120  | 130  | 140  | 150  | 160  | 170  |
|                                    |  | mm     |  | 254 | 508  | 762  | 1016 | 1270 | 1524 | 1778 | 2032 | 2286 | 2540 | 2794 | 3048 | 3302 | 3556 | 3810 | 4064 | 4318 |
| B                                  |  | LOAD   |  |     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| One end fixed, other end supported |  | Inches |  | 14  | 28   | 42   | 57   | 71   | 85   | 99   | 113  | 127  | 141  | 156  | 170  | 184  | 198  | 212  | 226  | 240  |
|                                    |  | mm     |  | 356 | 711  | 1067 | 1448 | 1803 | 2159 | 2515 | 2870 | 3226 | 3581 | 3962 | 4318 | 4674 | 5029 | 5385 | 5740 | 6096 |
| C                                  |  | LOAD   |  |     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Both ends fixed                    |  | Inches |  | 20  | 40   | 60   | 80   | 100  | 120  | 140  | 160  | 180  | 200  | 220  | 240  | 260  | 280  | 300  | 320  | 340  |
|                                    |  | mm     |  | 508 | 1016 | 1524 | 2032 | 2540 | 3048 | 3556 | 4064 | 4572 | 5080 | 5588 | 6096 | 6604 | 7112 | 7620 | 8128 | 8636 |
| D                                  |  | LOAD   |  |     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |

**Example:** Maximum system load is 30,000 lb. (133,500 N)..  
Length of 85 in. (2159 mm).  
End fixity of one end fixed, other end supported.  
All screws with curves which pass through or above and to the right of the plotted point are suitable for the example.  
The suitable compression loads shown in this graph are not to exceed the maximum static load capacity as given in the rating table for the individual ball nut assembly..

# Typical Ends

The typical ends shown below can be machined on all ball screws<sup>†</sup> and ball splines<sup>‡</sup>. Specific dimensional data is provided in the chart. Shaded area represents the drive extension for a keyed drive coupling.



| SCREW<br>SIZE | ROOT<br>Min.<br>Dia.<br>(Ball<br>Screws) | Type I <sup>†</sup><br>Typical Journal for<br>Single Bearings |       |       | Type II <sup>†</sup><br>Typical Journal for<br>Duplexed Bearings |       |       | Type III <sup>†</sup><br>Typical Journal for<br>Multiple Sets of Duplexed<br>Bearings or Quick Mount<br>Bearing Blocks |        |       |          | Dimensions Common<br>to End Configurations<br>Types I, II, and III |                  |             |         |            |                | Type IV <sup>†</sup><br>Typical Journal for Pillow<br>Block |                  |                        |
|---------------|------------------------------------------|---------------------------------------------------------------|-------|-------|------------------------------------------------------------------|-------|-------|------------------------------------------------------------------------------------------------------------------------|--------|-------|----------|--------------------------------------------------------------------|------------------|-------------|---------|------------|----------------|-------------------------------------------------------------|------------------|------------------------|
|               |                                          |                                                               |       |       |                                                                  |       |       | Standard Hardware                                                                                                      |        |       |          |                                                                    |                  |             |         |            |                |                                                             |                  |                        |
|               |                                          | A                                                             | B     | E     | A                                                                | B     | E     | A                                                                                                                      | B      | E     | Part No. | C                                                                  | D                | F           | L'k Nut | L'k Was    | Ang<br>Con Brg | A                                                           | D                | F                      |
| .187 .062     | 0.1400                                   | 1.360                                                         | 0.360 | 0.156 | 1.516                                                            | 0.516 | 0.312 | 1.828                                                                                                                  | 0.828  | 0.624 |          | .093<br>.092                                                       | .1251<br>.1248   |             | 5-40    |            | R2 Radial      |                                                             |                  |                        |
| .375 .125     | 0.3000                                   | 1.900                                                         | 0.650 | 0.276 | 2.176                                                            | 0.926 | 0.552 | 2.728                                                                                                                  | 1.478  | 1.104 |          | .187<br>.186                                                       | .2757<br>.2754   | 1/16 x1 /32 | 1/4-20  | #37 Radial |                |                                                             |                  |                        |
| .500 .200     | 0.3600                                   | 1.970                                                         | 0.720 | 0.315 | 2.285                                                            | 1.035 | 0.630 | 2.915                                                                                                                  | 1.665  | 1.260 | 7828282  | .250<br>.249                                                       | .3544<br>.3541   | 3/32 x 3/64 | 5/16-24 | #39 Radial |                |                                                             |                  |                        |
| .500 .500     | 0.3600                                   | 1.970                                                         | 0.720 | 0.315 | 2.285                                                            | 1.035 | 0.630 | 2.915                                                                                                                  | 1.665  | 1.260 | 7828282  | .250<br>.249                                                       | .3544<br>.3541   | 3/32 x 3/64 | 5/16-24 | #39 Radial |                |                                                             |                  |                        |
| .631 .200     | 0.4800                                   | 2.110                                                         | 0.810 | 0.394 | 2.504                                                            | 1.204 | 0.788 | 3.292                                                                                                                  | 1.992  | 1.576 | 7824154  | .406<br>.405                                                       | .4726<br>.4723   | 1/8 x 1/16  | N-01    | W-01       | 201            | 2.625                                                       | .5000<br>.4995   | 1/8 x 1/16<br>x 1.500  |
| .631 1.000    | 0.4800                                   | 2.110                                                         | 0.810 | 0.394 | 2.504                                                            | 1.204 | 0.788 | 3.292                                                                                                                  | 1.992  | 1.576 | 7824154  | .406<br>.405                                                       | .4726<br>.4723   | 1/8 x 1/16  | N-01    | W-01       | 201            | 2.625                                                       | .5000<br>.4995   | 1/8 x 1/16<br>x 1.500  |
| .750 .200     | 0.5970                                   | 1.870                                                         | 0.870 | 0.433 | 2.310                                                            | 1.310 | 0.866 | 3.180                                                                                                                  | 2.180  | 1.732 | 7824155  | .500<br>.499                                                       | .5908<br>.5905   | 1/8 x 1/16  | N-02    | W-02       | 202            | 2.620                                                       | .5625<br>.5620   | 1/8 x 1/16<br>x 1.500  |
| .750 .500     | 0.5970                                   | 1.870                                                         | 0.870 | 0.433 | 2.310                                                            | 1.310 | 0.866 | 3.180                                                                                                                  | 2.180  | 1.732 | 7824155  | .500<br>.499                                                       | .5908<br>.5905   | 1/8 x 1/16  | N-02    | W-02       | 202            | 2.650                                                       | .5625<br>.5620   | 1/8 x 1/16<br>x 1.500  |
| .875 .200     | 0.7350                                   | 2.233                                                         | 0.918 | 0.472 | 2.705                                                            | 1.390 | 0.944 | 3.649                                                                                                                  | 2.334  | 1.888 | 7824156  | .562<br>.561                                                       | .6695<br>.6692   | 1/8 x 1/16  | N-03    | W-03       | 203            | 2.625                                                       | .6250<br>.6245   | 3/16 x 3/32<br>x 1.500 |
| 1.000 .200    | 0.8630                                   | 2.375                                                         | 1.060 | 0.551 | 2.926                                                            | 1.611 | 1.102 | 4.028                                                                                                                  | 2.713  | 2.204 | 7824157  | .625<br>.624                                                       | .7877<br>.7873   | 3/16 x 3/32 | N-04    | W-04       | 204            | 2.719                                                       | .7500<br>.7495   | 3/16 x 3/32<br>x 1.500 |
| 1.000 .250    | 0.8200                                   | 2.375                                                         | 1.060 | 0.551 | 2.926                                                            | 1.611 | 1.102 | 4.028                                                                                                                  | 2.713  | 2.204 | 7824157  | .625<br>.624                                                       | .7877<br>.7873   | 3/16 x 3/32 | N-05    | W-05       | 204            | 2.719                                                       | .7500<br>.7495   | 3/16 x 3/32<br>x 1.500 |
| 1.000 .500    | 0.820                                    | 2.375                                                         | 1.060 | 0.551 | 2.926                                                            | 1.611 | 1.102 | 4.028                                                                                                                  | 2.713  | 2.204 | 7824157  | .625<br>.624                                                       | .7877<br>.7873   | 3/16 x 3/32 | N-04    | W-04       | 204            | 2.719                                                       | .7500<br>.7495   | 3/16 x 3/32<br>x 1.500 |
| 1.000 1.000   | 0.8200                                   | 2.375                                                         | 1.060 | 0.551 | 2.926                                                            | 1.611 | 1.102 | 4.028                                                                                                                  | 2.713  | 2.204 | 7824157  | .625<br>.624                                                       | .7877<br>.7873   | 3/16 x 3/32 | N-04    | W-04       | 204            | 2.719                                                       | .7500<br>.7495   | 3/16 x 3/32<br>x 1.500 |
| 1.150 .200    | 1.0050                                   | 2.680                                                         | 1.120 | 0.591 | 3.271                                                            | 1.711 | 1.182 | 4.453                                                                                                                  | 2.893  | 2.364 | 7824158  | .750<br>.749                                                       | .9846<br>.9842   | 3/16 x 3/32 | N-05    | W-05       | 205            | 2.844                                                       | 1.0000<br>.9995  | 1/4 x 1/8<br>x 1.500   |
| 1.171 .413    | 0.8700                                   | 2.375                                                         | 1.060 | 0.551 | 2.926                                                            | 1.611 | 1.102 | 4.028                                                                                                                  | 2.713  | 2.204 | 7824157  | .625<br>.624                                                       | .7877<br>.7873   | 3/16 x 3/32 | N-04    | W-04       | 204            | 2.844                                                       | .8750<br>.8745   | 3/16 x 3/32<br>x 1.500 |
| 1.250 .200    | 1.1130                                   | 2.680                                                         | 1.120 | 0.591 | 3.280                                                            | 1.710 | 1.181 | 4.440                                                                                                                  | 2.880  | 2.362 | 7824158  | .750<br>.749                                                       | .9846<br>.9842   | 3/16 x 3/32 | N-05    | W-05       | 205            | 3.150                                                       | 1.0000<br>.9995  | 1/4 x 1/8<br>x 1.500   |
| 1.250 .500    | 1.0490                                   | 2.680                                                         | 1.120 | 0.591 | 3.280                                                            | 1.710 | 1.181 | 4.440                                                                                                                  | 2.880  | 2.362 | 7824158  | .750<br>.749                                                       | .9846<br>.9842   | 3/16 x 3/32 | N-05    | W-05       | 205            | 3.150                                                       | 1.0000<br>.9995  | 1/4 x 1/8<br>x 1.500   |
| 1.500 .200    | 1.3470                                   | 2.970                                                         | 1.160 | 0.630 | 3.600                                                            | 1.790 | 1.260 | 4.860                                                                                                                  | 3.050  | 2.520 | 7824159  | 1.000<br>.999                                                      | 1.1814<br>1.1810 | 1/4 x 1/8   | N-06    | W-06       | 206            | 3.438                                                       | 1.3125<br>1.3120 | 5/16 x 5/32<br>x 1.750 |
| 1.500 .250    | 1.3200                                   | 2.970                                                         | 1.160 | 0.630 | 3.600                                                            | 1.790 | 1.260 | 4.860                                                                                                                  | 3.050  | 2.520 | 7824159  | 1.000<br>.999                                                      | 1.1814<br>1.1810 | 1/4 x 1/8   | N-06    | W-06       | 206            | 3.438                                                       | 1.3125<br>1.3120 | 5/16 x 5/32<br>x 1.750 |
| 1.500 .500    | 1.2300                                   | 2.970                                                         | 1.160 | 0.630 | 3.600                                                            | 1.790 | 1.260 | 4.860                                                                                                                  | 3.050  | 2.520 | 7824159  | 1.000<br>.999                                                      | 1.1814<br>1.1810 | 1/4 x 1/8   | N-06    | W-06       | 206            | 3.250                                                       | 1.1875<br>1.1870 | 1/4 x 1/8<br>x 1.750   |
| 1.500 .473    | 1.1400                                   | 2.680                                                         | 1.120 | 0.591 | 3.271                                                            | 1.711 | 1.182 | 4.453                                                                                                                  | 2.893  | 2.364 | 7824158  | .750<br>.749                                                       | .9846<br>.9842   | 3/16 x 3/32 | N-05    | W-05       | 305            |                                                             | 1.1250<br>1.1245 | 1/4 x 1/8<br>x 1.750   |
| 1.500 1.000   | 1.1880                                   | 2.970                                                         | 1.160 | 0.630 | 3.600                                                            | 1.790 | 1.260 | 4.860                                                                                                                  | 3.050  | 2.520 | 7824159  | 1.000<br>.999                                                      | 1.1814<br>1.1810 | 1/4 x 1/8   | N-06    | W-06       | 206            | 3.250                                                       | 1.1875<br>1.1870 | 1/4 x 1/8<br>x 1.750   |
| 1.500 1.875   |                                          | 2.970                                                         | 1.160 | 0.630 | 3.600                                                            | 1.790 | 1.260 | 4.860                                                                                                                  | 3.050  | 2.520 | 7824159  | 1.000<br>.999                                                      | 1.1814<br>1.1810 | 1/4 x 1/8   | N-06    | W-06       | 206            | 3.250                                                       | 1.1875<br>1.1870 | 1/4 x 1/8<br>x 1.750   |
| 1.750 .200    | 1.6130                                   | 3.650                                                         | 1.460 | 0.906 | 4.556                                                            | 2.366 | 1.812 | 6.368                                                                                                                  | 4.178  | 3.624 | 7829554  | 1.375<br>1.374                                                     | 1.5752<br>1.5747 | 5/16 x 5/32 | N-08    | W-08       | 308            | 4.438                                                       | 1.5000<br>1.4995 | 3/8 x 3/16<br>x 2.500  |
| 2.000 .200    | 1.8500                                   | 3.730                                                         | 1.540 | 0.984 | 4.714                                                            | 2.524 | 1.968 | 6.682                                                                                                                  | 4.492  | 3.936 | 7824160  | 1.375                                                              | 1.7721           | 5/16 x 5/32 | N-09    | W-09       | 309            | 4.938                                                       | 1.7500           | 3/8 x 3/16             |
| 2.250 .500    |                                          |                                                               |       |       |                                                                  |       |       |                                                                                                                        |        |       |          | 1.374                                                              | 1.7716           |             |         |            |                | 1.7495                                                      | x 3.000          |                        |
| 2.250 1.000   | 2.3200                                   | 4.560                                                         | 1.680 | 1.063 | 5.623                                                            | 2.746 | 2.126 | 7.749                                                                                                                  | 4.872  | 4.252 | 7824161  | 1.750                                                              | 1.9689           | 3/8 x 3/16  | N-10    | W-10       | 310            | 5.188                                                       | 2.0000           | 1/2 x 1/4              |
| 2.500 .250    |                                          |                                                               |       |       |                                                                  |       |       |                                                                                                                        |        |       |          | 1.749                                                              | 1.9684           |             |         |            |                | 1.9995                                                      | x 3.000          |                        |
| 2.500 .500    | 2.3200                                   | 4.560                                                         | 1.680 | 1.063 | 5.623                                                            | 2.746 | 2.126 | 7.749                                                                                                                  | 4.872  | 4.252 | 7824161  | 1.750<br>1.749                                                     | 1.9689<br>1.9684 | 3/8 x 3/16  | N-10    | W-10       | 310            | 5.188                                                       | 2.0000<br>1.9995 | 1/2 x 1/4<br>x 3.000   |
| 3.000 .660    | 2.4800                                   | 5.560                                                         | 1.875 | 1.221 | 6.781                                                            | 3.096 | 2.442 | 9.223                                                                                                                  | 5.538  | 4.884 |          | 2.250                                                              | 2.3627           | 1/2 x 1/4   | N-12    | W-12       | 312            | 7.250                                                       | 2.4375           | 5/8 x 5/16             |
| 3.000 1.500   | 3.3380                                   | 6.950                                                         | 2.260 | 1.535 | 8.485                                                            | 3.795 | 3.070 | 11.555                                                                                                                 | 6.865  | 6.140 |          | 2.249                                                              | 2.3621           |             |         |            |                |                                                             | 2.4365           | x 4.688                |
| 4.000 1.000   |                                          |                                                               |       |       |                                                                  |       |       |                                                                                                                        |        |       | 3.000    | 3.1501                                                             | 3/4 x 3/8        | N-16        | W-16    | 316        | 7.563          | 2.9370                                                      | 3/4 x 3/8        |                        |
|               |                                          |                                                               |       |       |                                                                  |       |       |                                                                                                                        |        |       | 2.998    | 3.1495                                                             |                  |             |         |            | 2.9360         | x 4.688                                                     |                  |                        |
| 6.000 1.000   | 5.1430                                   | 8.596                                                         | 3.346 | 2.284 | 10.879                                                           | 5.629 | 4.567 | 15.446                                                                                                                 | 10.196 | 9.134 |          | 4.937<br>4.936                                                     | 5.1188<br>5.1179 | 1-1/2 x 3/4 |         |            | 326            | 15.500                                                      | 4.9207<br>4.9197 | 1-1/2 x 3/4<br>x7.430  |

<sup>†</sup>Screw Size refers to all standard ball screws. For ball splines, root diameter limitations apply.

<sup>‡</sup> To provide for bearings with larger capacity than those available for these typical ends, adapters can be used to increase the diameter.

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 Thomson Saginaw products for a specific application. While defective products will be replaced without charge if promptly returned, no liability is assumed beyond such replacement. Trademark of Thomson Industries, Inc. THOMSON is registered in the U.S. Patent and Trademark Office and in other countries.

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# Mounting Ball Screw Assemblies in Your Application

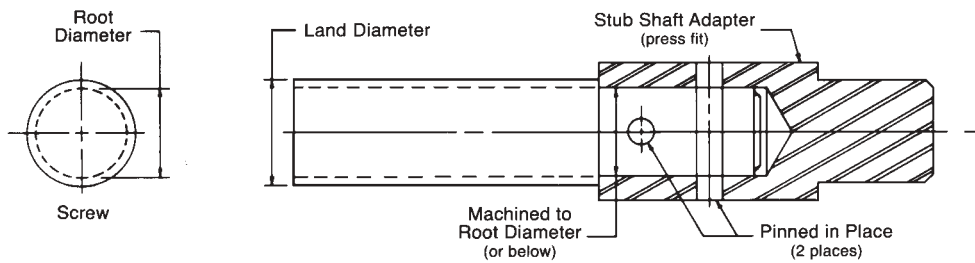


Figure 1

## Ball Screw Shaft End Machining

Thomson Saginaw Precision screws are purchased with either blank ends or completely machined to your engineering prints.

When you purchase Precision screws with blank shaft ends, the case hardened surface on the ends can be removed by OD grinding, or annealing before machining. To anneal the area to be machined, heat to a dark red color, (approximately 1200°F (650°C)), and allow to cool without quenching. Caution — annealing the working portion of the shaft will result in reduced load capacity or life expectancy.

Suitable end concentricity of solid shafts without centers can be obtained by locating on land diameters or ball grooves. (See Figure 1.) Shaft end diameters should be machined to a dimension less than the root diameter. This will remove ball groove traces from the machined end.

When you purchase Precision Plus preloaded assemblies with blank shaft ends, a portion of the end is soft.

## Ball Screw Shaft Adapters/Extensions

To achieve a larger shaft end diameter to accommodate compatible bearings or to provide for a longer shaft, the end of the ball screw shaft is machined as shown. The adapter/extension should be attached by suitable mechanical methods — such as threading, keying, or pinning. (See Figure 2.) Welding or brazing **should not** be used.

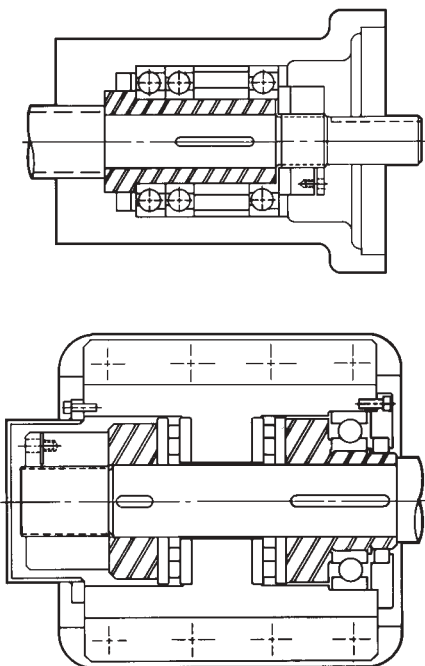


Figure 2

## Ball Nut Attachment

Most Precision and value priced preloaded Precision ball nuts are threaded for direct coupling or for attachment by means of available flanges. The remaining preloaded Precision and all Precision Plus ball nuts are flange mounted. Four typical mounting (customer supplied) brackets are shown in Figure 3.

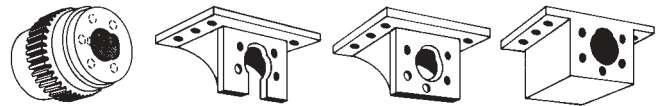


Figure 3

## Securing Threaded Connections

For light-load applications, lock washer/lock nuts and set screws may be adequate to secure ball nuts which are threaded into an integral mounting or into a flange. For heavy torque loads, it is recommended that the ball nut be seated into its threaded connection; then, drill a hole through both the ball nut and mounting threads; finally, drive a pin into the hole to securely lock the ball nut in place. (See Figure 4.) For complete instructions, request Spec. 7821104.

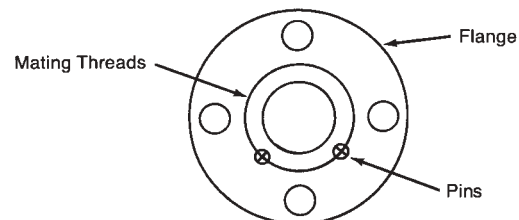


Figure 4

## Installation Sequence

Ball screws may be installed in the following manner:

- Place bearing(s) over screw shaft end(s) and finger tighten bearing(s) in place.
- Finger tighten the ball nut flange bolts in place. Preferred position is with the ball return guides up.
- Move the ball nut to the drive end next to the bearing and fully tighten the ball nut flange bolts.
- Position the bearing — shim if necessary — and fix in place. Be careful not to induce misalignment between the ball nut and the bearing.
- Move the ball nut to the other bearing end and fix the bearing in place.
- Move the ball nut to the original bearing end. Loosen the bearing, align and fix in place.
- Move the ball nut again to the other bearing end. Loosen the bearing, align and fix the bearing in place.
- Move the ball nut from end to end and check for free movement and proper alignment. Constant torque and/or constant motor amperage are signs of a properly aligned installation.

## Inch Precision Components



### Thomson Saginaw Precision Ball Screws offer:

- availability in a full range of diameters, leads, and nut configurations, in either preloaded or non-preloaded types, all in industry standard envelopes.
- over 90% efficiency with a constant low coefficient of friction. When replacing conventional actuation systems such as Acme screws, hydraulics, or pneumatics, they allow the use of smaller, less-expensive drive motors and reduce the need for auxiliary equipment.
- dependable accuracy and repeatability at an economical price.
- a Gothic arch ball groove geometry that extends service life, reduces lash, and optimizes stiffness in preloaded assemblies.
- optional wiper kits and end support blocks, which increase system efficiency and service life.
- availability through over 1800 authorized Thomson distributors worldwide.

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# Precision Thread Screws (SRT)

## Precision Screw Stock

### • Lead Accuracies

.004 in./ft. accuracy standard

.002 in./ft. accuracy available (selected sizes special order)

.001 in./ft. accuracy available (selected sizes special order)

| Ball Circle | Lead (in.)         | Direction | Part Number          | A Root Diameter (in.) | B Maximum Lengths Available (ft.) | Weight (lb./in.) | Use With These Ball Nuts                                                | w/Mounting Blocks |
|-------------|--------------------|-----------|----------------------|-----------------------|-----------------------------------|------------------|-------------------------------------------------------------------------|-------------------|
| .187        | .050 <sup>†</sup>  | RH        | 7821634              | .140                  | 1                                 | .006             | 7821632, 7821609                                                        |                   |
|             | .062 <sup>†</sup>  | RH        | 7821633              | .140                  | 1                                 | .006             | 7821579, 7831631                                                        |                   |
| .375        | .125               | RH        | 5707538              | .300                  | 4                                 | .026             | 5709574, 5707502                                                        |                   |
|             | .125               | LH        | 5708532              | .300                  | 4                                 | .026             | 5708282, 5709576                                                        |                   |
|             | .125 <sup>‡</sup>  | RH        | 5706540              | .300                  | 4                                 | .026             | 5709578, 5707643                                                        |                   |
|             | .125               | RH        | 7824974              | .285                  | 4                                 | .026             | 7824973                                                                 |                   |
| .500        | .200               | RH        | 7826721              | .360                  | 6                                 | .040             | 7826721, 7826763, 7823871                                               | 7828282           |
|             | .500 <sup>‡</sup>  | RH        | 5706740              | .360                  | 4                                 | .042             | 5707506, 5709582, 7826767                                               | 7828282           |
|             | .500 <sup>††</sup> | RH        | 5706846              | .360                  | 6                                 | .042             | 5707644, 5709584                                                        | 7828282           |
| .631        | .200               | RH        | 5707540 <sup>°</sup> | .480                  | 6                                 | .069             | 7820827 <sup>°</sup> , 7820955, 7823584                                 | 7824154           |
|             | .200               | LH        | 5707541 <sup>°</sup> | .480                  | 6                                 | .069             | 7820828 <sup>°</sup>                                                    | 7824154           |
|             | .200 <sup>‡</sup>  | RH        | 5705378              | .480                  | 6                                 | .069             | 5707645                                                                 | 7824154           |
|             | 1.000              | RH        | 7826712              | .505                  | 6                                 | .069             | 7826713, 7827531                                                        | 7824154           |
| .750        | .200               | RH        | 7824298              | .600                  | 6                                 | .121             | 7824297                                                                 | 7824155           |
|             | .200               | RH        | 7826770              | .625                  | 6                                 | .125             | 7826768, 7823870                                                        | 7824155           |
|             | .500 <sup>‡</sup>  | RH        | 7824361              | .580                  | 6                                 | .131             | 7824358, 7826991                                                        | 7824155           |
| .875        | .200               | RH        | 5708859              | .735                  | 12                                | .148             | 5708277, 7823585                                                        | 7824156           |
| 1.000       | .250               | RH        | 7820426 <sup>°</sup> | .820                  | 16                                | .183             | 5707508 <sup>°</sup> , 5700348 <sup>°</sup> , 5708278, 5704167, 7823586 | 7824157           |
|             | .250               | LH        | 7820428 <sup>°</sup> | .820                  | 16                                | .183             | 5707535 <sup>°</sup> , 5708284, 5704168                                 | 7824157           |
|             | .500 <sup>‡</sup>  | RH        | 7824290              | .830                  | 16                                | .183             | 7824286                                                                 | 7824157           |
|             | 1.000 <sup>‡</sup> | RH        | 7820429              | .820                  | 16                                | .183             | 5707509                                                                 | 7824157           |
| 1.150       | .200               | RH        | 7820430              | 1.005                 | 16                                | .265             | 5701566, 5704270, 7823587                                               | 7824158           |
|             | .200               | LH        | 7820431              | 1.005                 | 16                                | .265             | 7820207, 7820206                                                        | 7824158           |
| 1.171       | .413               | RH        | 7820432              | .870                  | 16                                | .231             | 5707511                                                                 | 7824157           |
| 1.500       | .250               | RH        | 7820595              | 1.320                 | 20                                | .432             | 5709587, 5704271, 7823588                                               | 7824159           |
|             | .250               | LH        | 7820596              | 1.320                 | 20                                | .432             | 5701990                                                                 | 7824159           |
|             | .473               | RH        | 7820597              | 1.140                 | 20                                | .373             | 5707513, 5708345 (KW)                                                   | 7824158           |
|             | .500               | RH        | 7824253              | 1.140                 | 20                                | .399             | 7824246                                                                 | 7824159           |
|             | 1.000 <sup>‡</sup> | RH        | 7820598              | 1.140                 | 20                                | .373             | 5708280, 5700698                                                        | 7824159           |
|             | 1.000 <sup>‡</sup> | LH        | 7825925              | 1.140                 | 20                                | .373             | 5701995                                                                 | 7824159           |
|             | 1.875 <sup>‡</sup> | RH        | 7820599              | 1.188                 | 20                                | .438             | 5707654, 5704272                                                        | 7824159           |
| 2.250       | .500               | RH        | 7820600              | 1.850                 | 20                                | .906             | 5707516, 5708346 (KW), 7823589                                          | 7824160           |
|             | .500               | LH        | 7820602              | 1.850                 | 20                                | .906             | 5704000                                                                 | 7824160           |
|             | 1.000 <sup>‡</sup> | RH        | 7820604              | 1.850                 | 20                                | .906             | 5704555                                                                 | 7824160           |
| 2.500       | .250               | RH        | 7820606              | 2.320                 | 20                                | 1.288            | 5703243, 7823590                                                        | 7824161           |
|             | .500               | RH        | 7824262              | 2.100                 | 20                                | 1.167            | 7824136                                                                 | 7824161           |
| 3.000       | .660               | RH        | 7820607              | 2.480                 | 20                                | 1.635            | 5707519, 5708347 (KW), 5703045                                          |                   |
|             | 1.500 <sup>‡</sup> | RH        | 7820609              | 2.480                 | 20                                | 1.610            | 5704986                                                                 |                   |
| 4.000       | 1.000              | RH        | 5703262              | 3.338                 | 20                                | 2.869            | 5703258                                                                 |                   |
| 6.000       | 1.000              | RH        | 5704762              | 5.220                 | 20                                | 6.830            | 5704738                                                                 |                   |

Longer lengths available on request. Contact factory.

<sup>†</sup> Stainless Steel

<sup>‡</sup> Multiple Start Thread

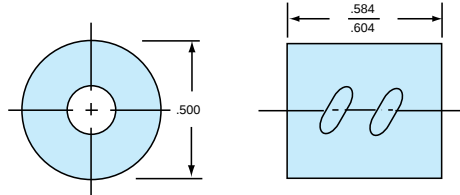
<sup>°</sup> Value Priced

(KW) Keyway

# Precision Ball Nuts

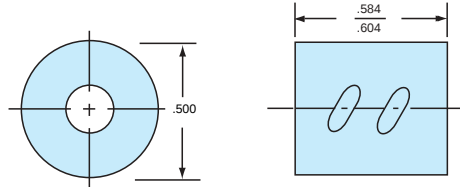
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.002 in to .013 in
- Preloaded  
Zero Backlash

## NON-PRELOADED BALL NUT



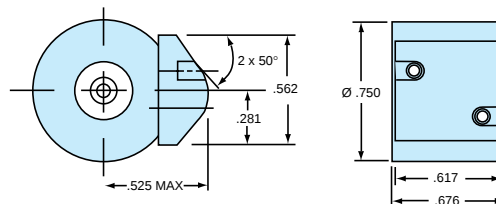
| Ball Circle Diameter (size) | Lead (in.) | General Description         | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|-----------------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| .187                        | .050       | RH, SS, NP<br>RH, Epoxy, NP | 7821609<br>7821632   | 7821634<br>7821634     | 20<br>3                                              | 75<br>5                            | .0046<br>.0046       | N/A<br>N/A         | N/A<br>N/A            | N/A<br>N/A            |

## NON-PRELOADED BALL NUT



| Ball Circle Diameter (size) | Lead (in.) | General Description         | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|-----------------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| .187                        | .062       | RH, SS, NP<br>RH, Epoxy, NP | 7821579<br>7821631   | 7821633<br>7821633     | 20<br>3                                              | 75<br>5                            | .0046<br>.0046       | N/A<br>N/A         | N/A<br>N/A            | N/A<br>N/A            |

## NON-PRELOADED BALL NUT



| Ball Circle Diameter (size) | Lead (in.) | General Description     | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|-------------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| .375                        | .125       | RH, NP<br>High Capacity | 7824973              | 7824974                | 170                                                  | 1600                               | .126                 | N/A                | N/A                   | N/A                   |

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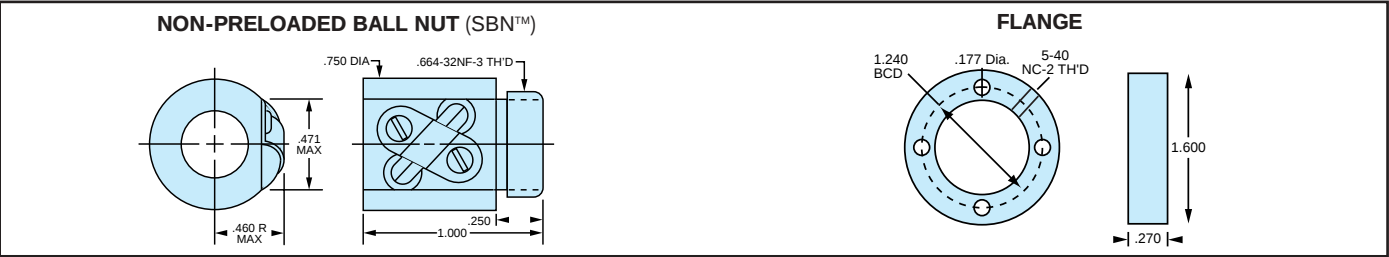
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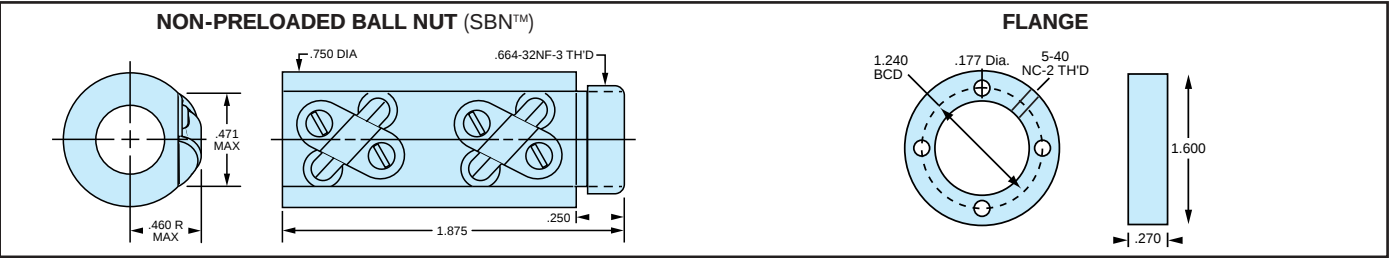
- Non-Preloaded Backlash

.002 in to .013 in
- Preloaded

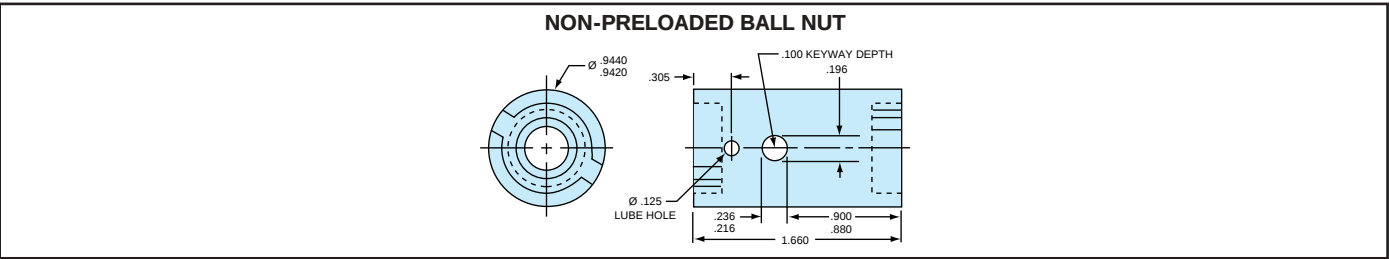
Zero Backlash



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| .375                        | .125       | RH, C1, NP          | 5707574              | 5707538                | 136                                                  | 1415                               | .126                 | 5706751            | N/A                   | N/A                   |
|                             |            | RH, C1, SS, NP      | 5707578              | 5706540                | 24                                                   | 255                                | .126                 | Consult factory    | N/A                   | N/A                   |
|                             |            | LH, C1, NP          | 5709576              | 5708532                | 136                                                  | 1415                               | .126                 | 5706751            | N/A                   | N/A                   |



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| .375                        | .125       | RH, C2, SS, NP      | 5707643              | 5706540                | 50                                                   | 509                                | .156                 | Consult factory    | N/A                   | N/A                   |
|                             |            | RH, C2, NP          | 5707502              | 5707538                | 272                                                  | 2,830                              | .156                 | 5706751            | N/A                   | N/A                   |
|                             |            | LH, C2, NP          | 5708282              | 5708532                | 272                                                  | 2,830                              | .156                 | 5706751            | N/A                   | N/A                   |



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| .500                        | .200       | RH, KW, NP          | 7826763              | 7826721                | 473                                                  | 2,850                              | .180                 | N/A                | Integral              | 7828282               |

- General Description Legend

C1

One Circuit

C2

Two Circuits

KW

Keyway

LH

Left Hand
- NP

Non-preloaded Ball Nut

OAL

Overall Length

Preload

Preloaded Ball Nut

RH

Right Hand
- Rnd

Round

Sq.

Square

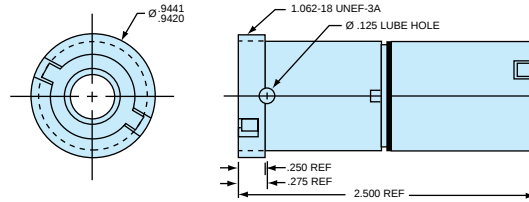
SS

Stainless Steel

v

Valued Priced

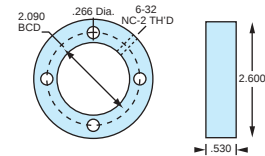
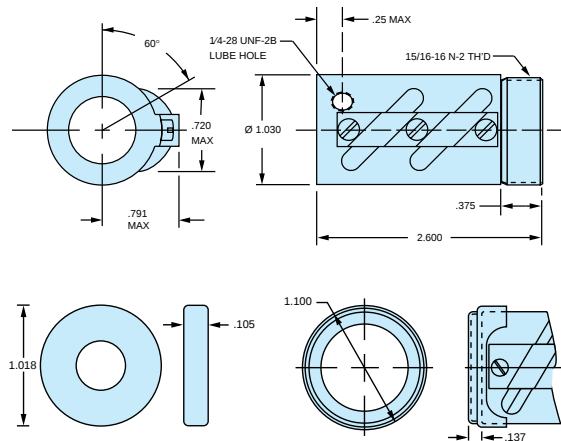
## PRELOADED BALL NUT



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| .500                        | .200       | RH, Preload         | 7823871              | 7826721                | 473                                                  | 2,850                              | .270                 | N/A                | Integral              | 7828282               |

## NON-PRELOADED BALL BUT (SBN™)

## FLANGE



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| .500                        | .200       | RH, NP              | 7826720              | 7826721                | 1357                                                 | 9430                               | .550                 | 5707570            | 7826759*              | 7828282               |

\* Customer to provide 1 wiper retainer. See pg. 53

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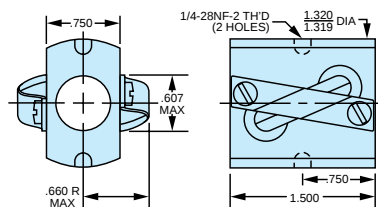
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## Precision Ball Nuts *(continued)*

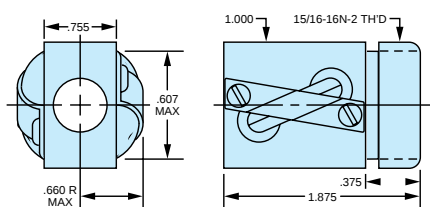
- Non-Preloaded Backlash  
.002 in to .013 in
- Preloaded  
Zero Backlash

### NON-PRELOADED BALL NUT

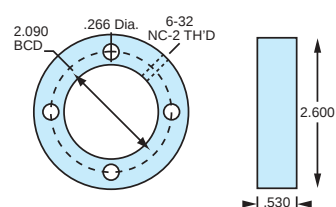


| Ball Circle Diameter (size) | Lead (in.) | General Description  | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|----------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| .500                        | .500       | RH, NP<br>RH, SS, NP | 5707506<br>5707644   | 5706740<br>5706846     | 786<br>121                                           | 4131<br>744                        | .267<br>.267         | N/A<br>N/A         | N/A<br>N/A            | 7828282<br>7828282    |

### NON-PRELOADED BALL NUT (SBN™)

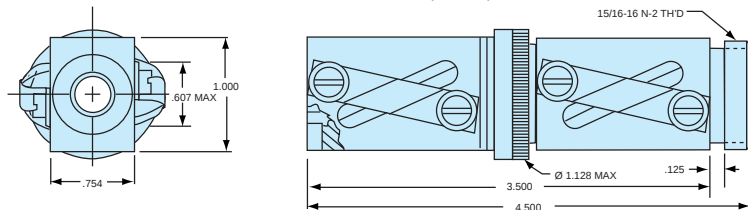


### FLANGE

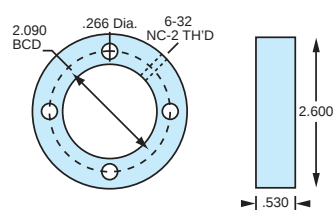


| Ball Circle Diameter (size) | Lead (in.) | General Description  | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number         | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|----------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|----------------------------|-----------------------|-----------------------|
| .500                        | .500       | RH, NP<br>RH, SS, NP | 5709582<br>5709584   | 5706740<br>5706846     | 786<br>121                                           | 4131<br>744                        | .273<br>.273         | 5707570<br>Consult factory | N/A<br>N/A            | 7828282<br>7828282    |

### PRELOADED BALL NUT (SEL™)



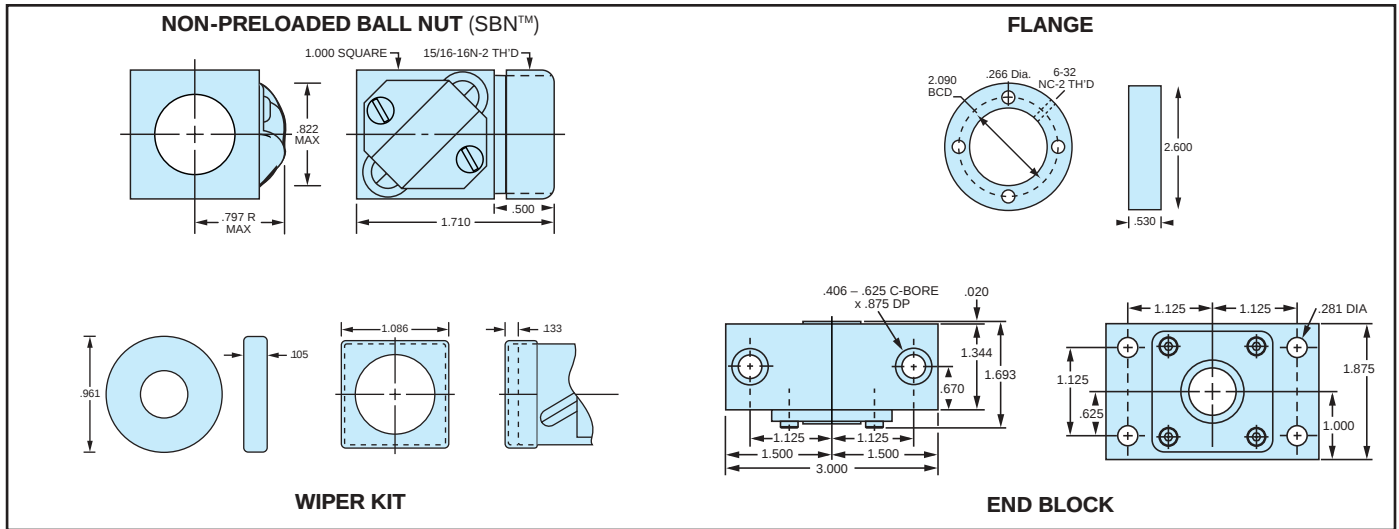
### FLANGE



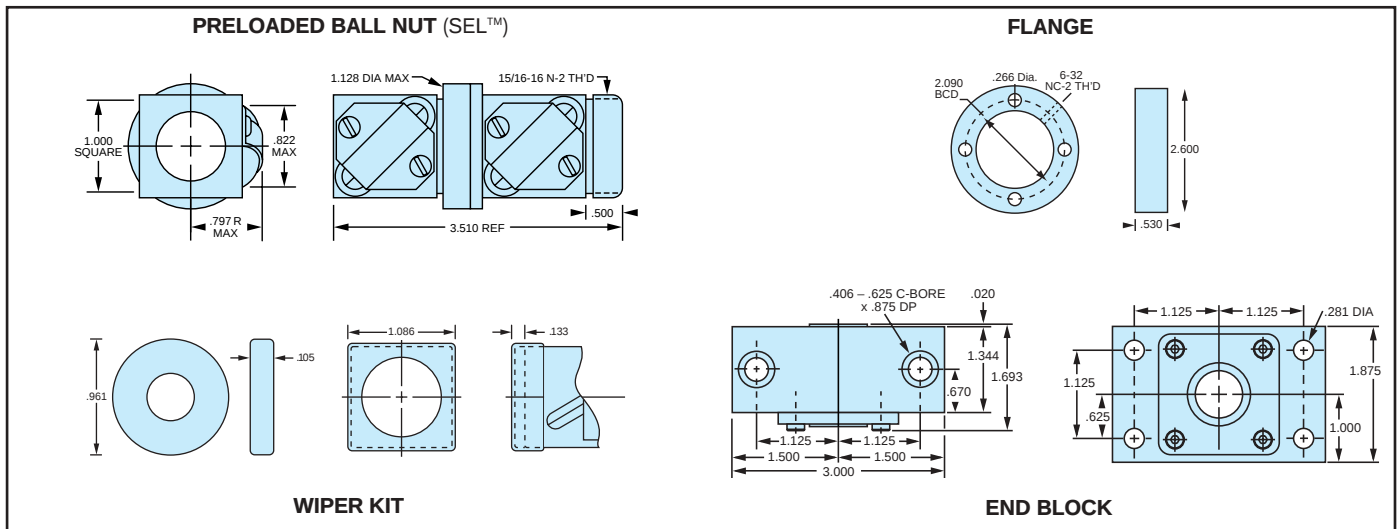
| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| .500                        | .500       | RH, Preload         | 7826767              | 5706740                | 786                                                  | 4,131                              | .650                 | 5707570            | N/A                   | 7828282               |

#### General Description Legend

|    |              |         |                        |     |                 |
|----|--------------|---------|------------------------|-----|-----------------|
| C1 | One Circuit  | NP      | Non-preloaded Ball Nut | Rnd | Round           |
| C2 | Two Circuits | OAL     | Overall Length         | Sq. | Square          |
| KW | Keyway       | Preload | Preloaded Ball Nut     | SS  | Stainless Steel |
| LH | Left Hand    | RH      | Right Hand             | v   | Valued Priced   |



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| .631                        | .200       | RH, NP <sup>v</sup> | 7820827              | 5707540                | 778                                                  | 6,384                              | .270                 | 5707570            | 5702647               | 7824154               |
|                             |            | LH, NP <sup>v</sup> | 7820828              | 5707541                | 778                                                  | 6,834                              | .270                 | 5707570            | 5702647               | 7824154               |
|                             |            | RH, SS, NP          | 5707645              | 5705378                | 140                                                  | 1,149                              | .270                 | Consult factory    | 5702647               | 7824154               |



| Ball Circle Diameter (size) | Lead (in.) | General Description      | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|--------------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| .631                        | .200       | RH, Preload <sup>v</sup> | 7820955              | 5707540                | 778                                                  | 6,384                              | .650                 | 5707570            | 5702647*              | 7824154               |
|                             |            | LH, Preload              | 7820956              | 5707541                | 778                                                  | 6,384                              | .650                 | 5707570            | 5702647*              | 7824154               |

\* Customer to provide 1 wiper retainer. See pg. 53

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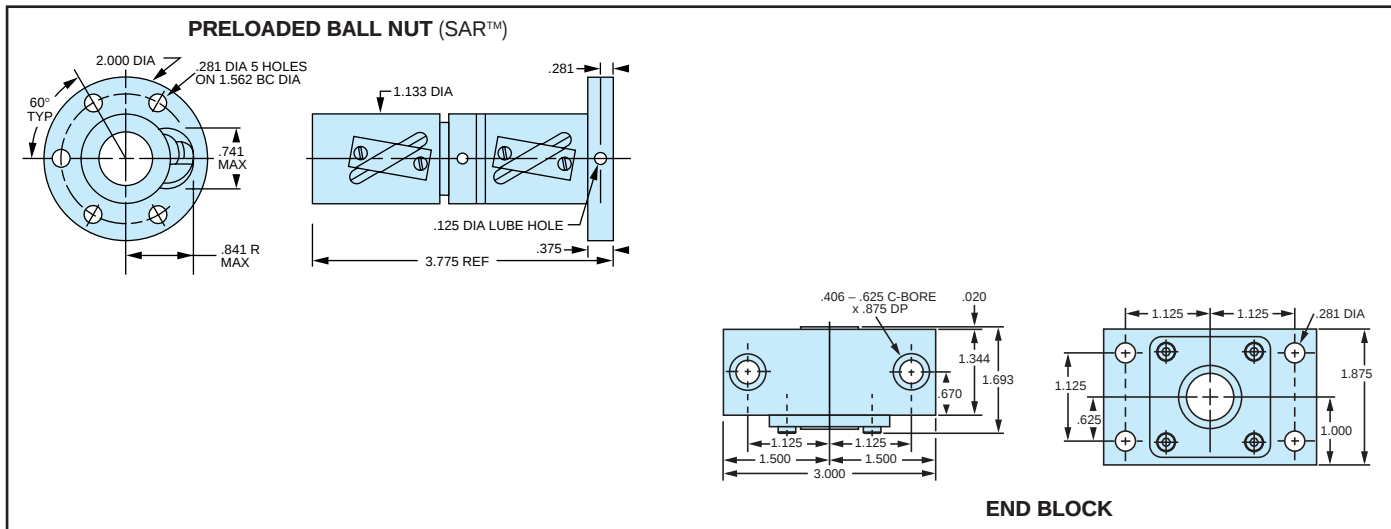
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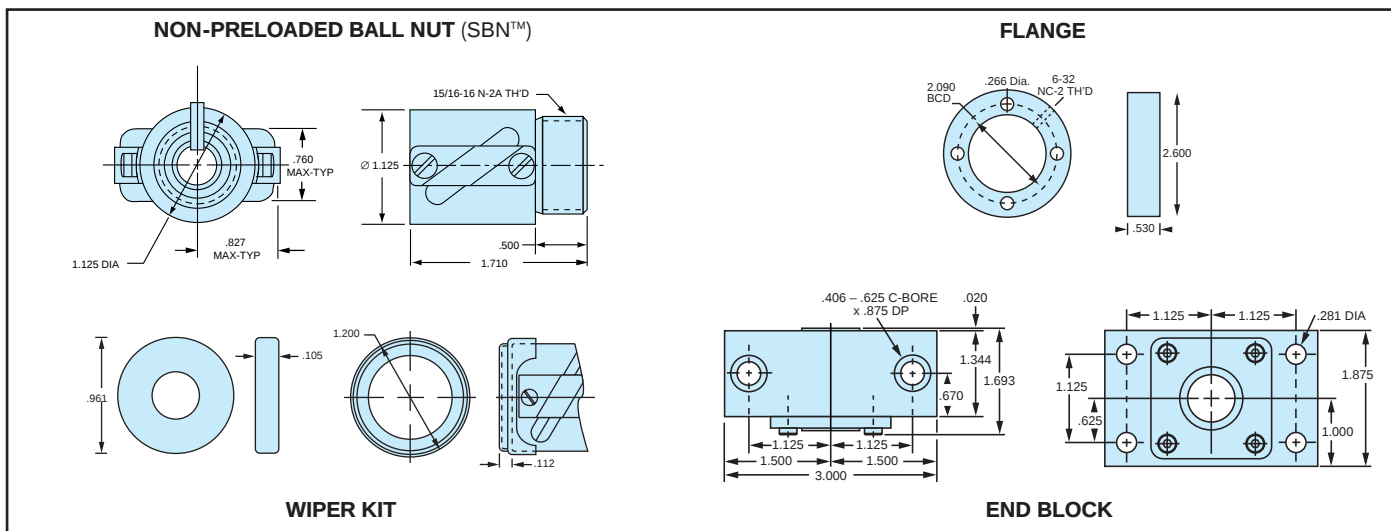
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## Precision Ball Nuts *(continued)*

- Non-Preloaded Backlash  
.002 in to .013 in
- Preloaded  
Zero Backlash



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| .631                        | .200       | RH, Preload         | 7823584              | 5707540                | 778                                                  | 6,384                              | 1.000                | Integral           | Integral              | 7824154               |

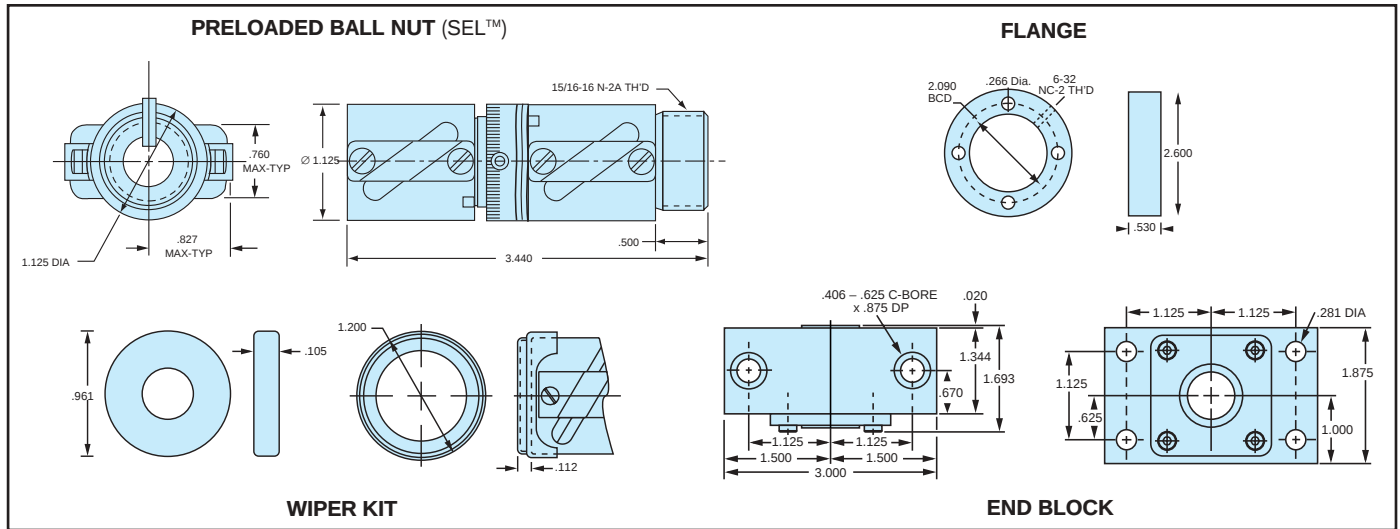


| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| .631                        | 1.000      | RH, NP              | 7826713              | 7826712                | 578                                                  | 2,425                              | .280                 | 5707570            | 7827527*              | 7824154               |

\* Customer to provide 1 wiper retainer. See pg. 53

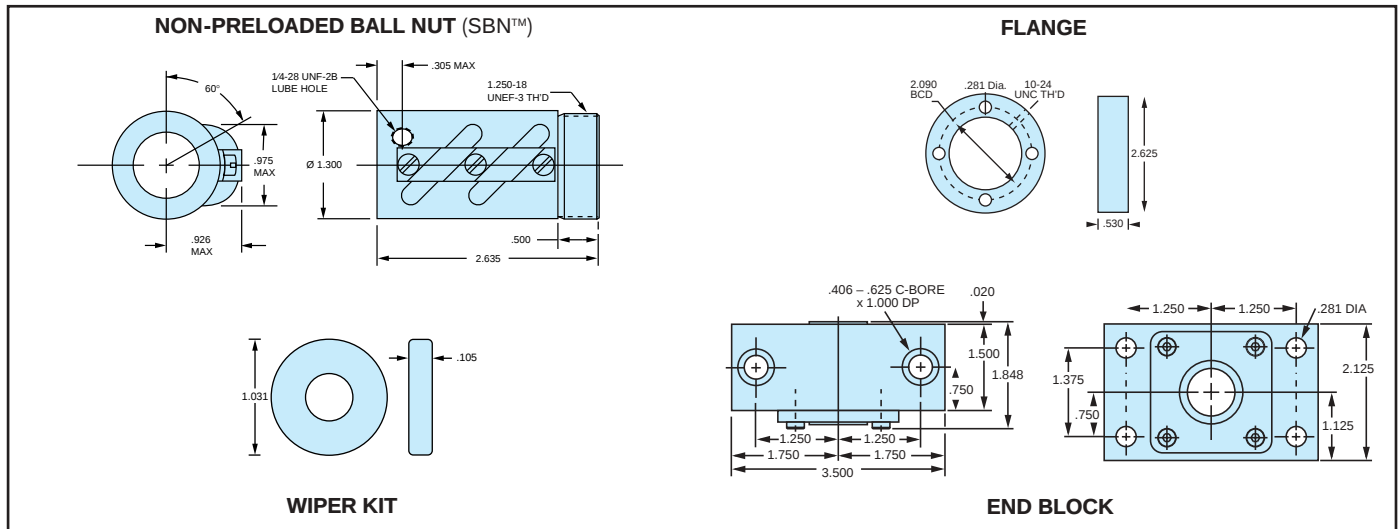
### General Description Legend

|    |              |         |                        |     |                 |
|----|--------------|---------|------------------------|-----|-----------------|
| C1 | One Circuit  | NP      | Non-preloaded Ball Nut | Rnd | Round           |
| C2 | Two Circuits | OAL     | Overall Length         | Sq. | Square          |
| KW | Keyway       | Preload | Preloaded Ball Nut     | SS  | Stainless Steel |
| LH | Left Hand    | RH      | Right Hand             | v   | Valued Priced   |



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| .631                        | 1.000      | RH, Preload         | 7827531              | 7826712                | 578                                                  | 2,425                              | .670                 | 5707570            | 7827527*              | 7824154               |

\* Customer to provide 1 wiper retainer. See pg. 53



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| .750                        | .200       | RH, NP              | 7824297              | 7824298                | 2,082                                                | 11,750                             | .679                 | 7823336            | 7824337               | 7824155               |

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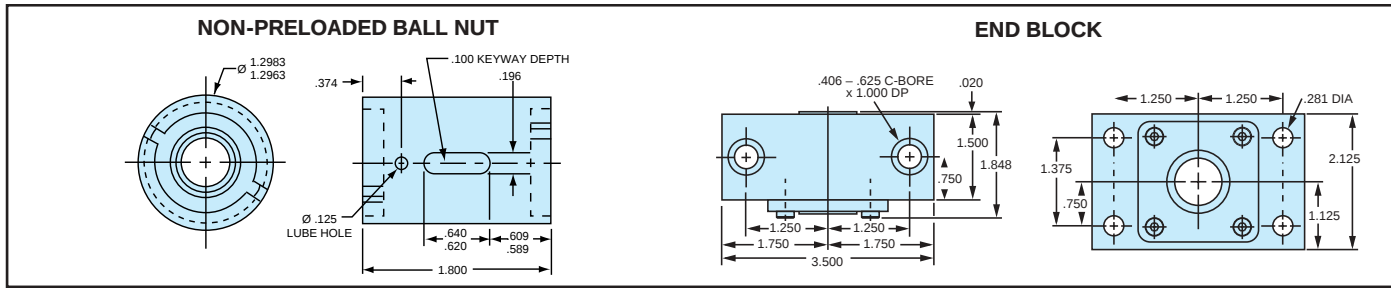
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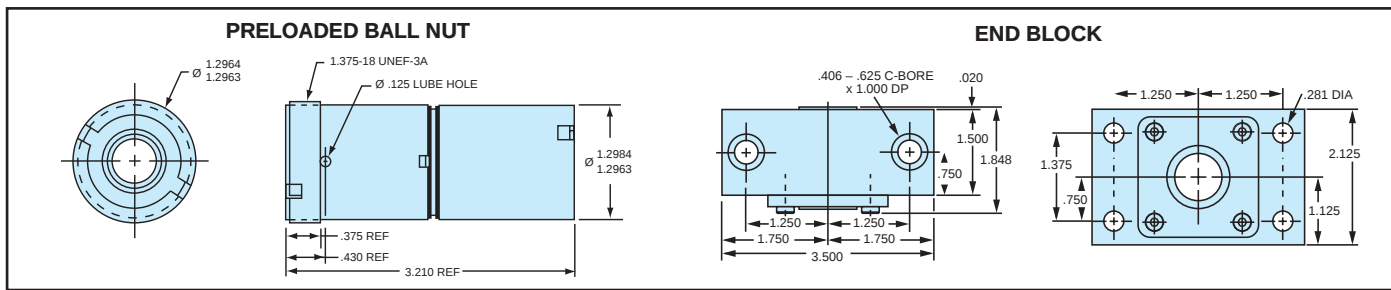
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## Precision Ball Nuts *(continued)*

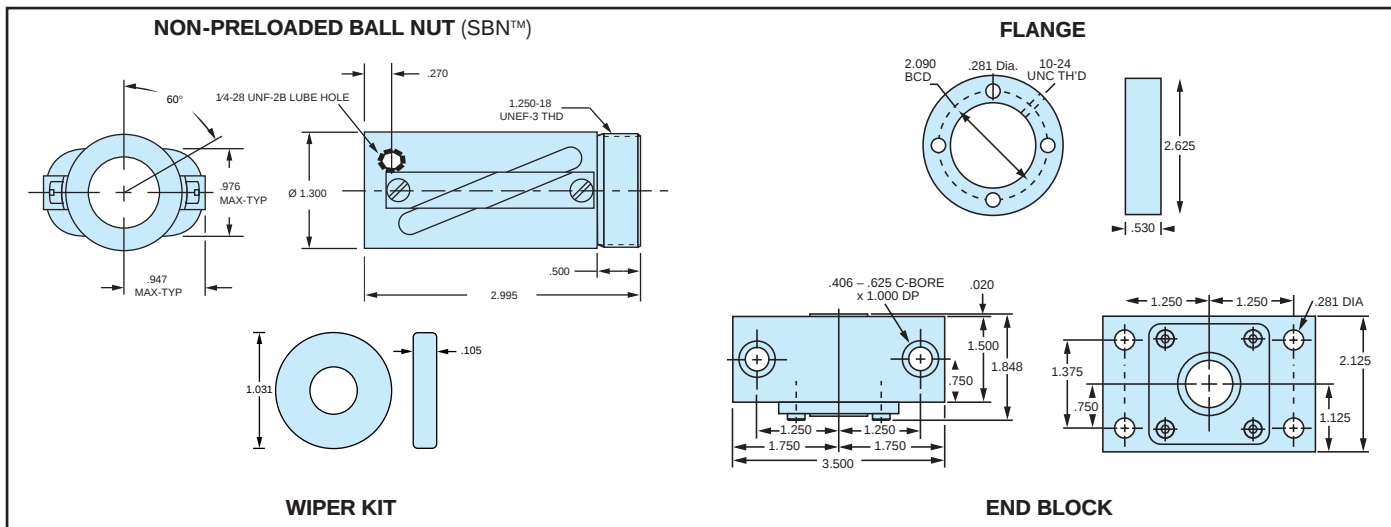
- Non-Preloaded Backlash  
.002 in to .013 in
- Preloaded  
Zero Backlash



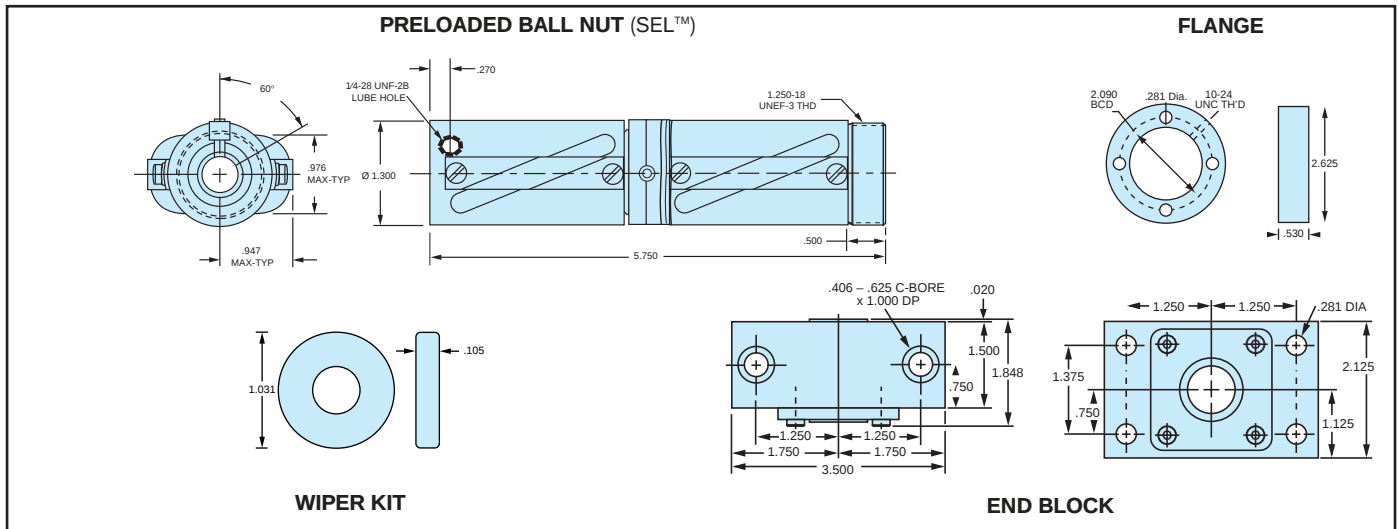
| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| .750                        | .200       | RH, KW, NP          | 7826768              | 7826770                | 815                                                  | 6,035                              | .370                 | N/A                | Integral              | 7824155               |



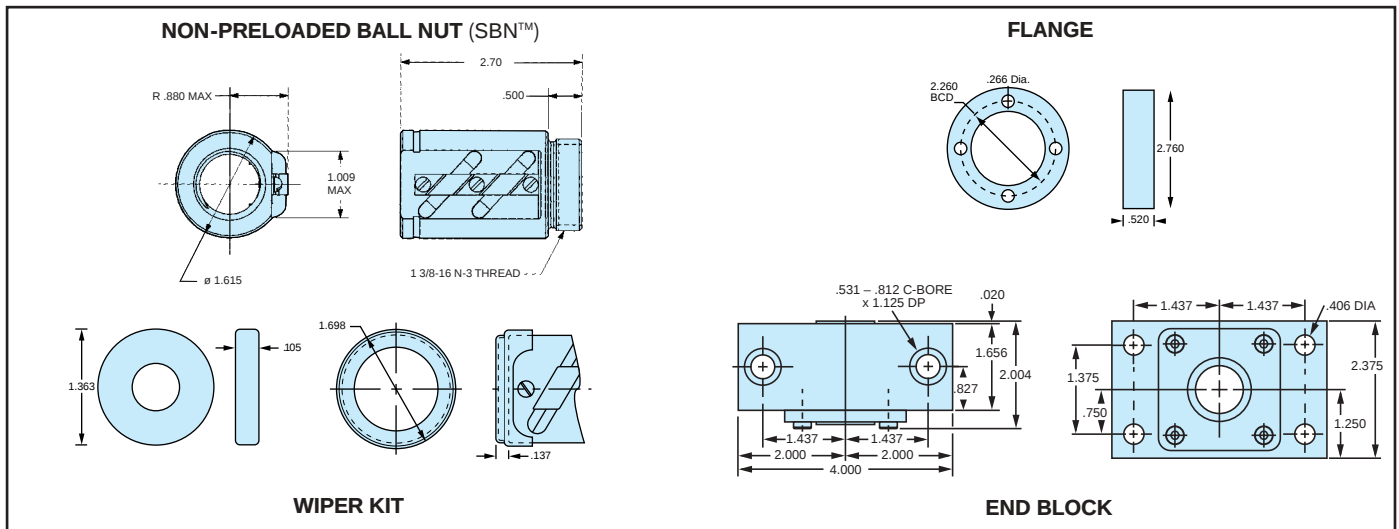
| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| .750                        | .200       | RH, Preload         | 7823870              | 7826770                | 815                                                  | 6,035                              | .590                 | N/A                | Integral              | 7824155               |



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| .750                        | .500       | RH, NP              | 7824358              | 7824361                | 3,263                                                | 13,260                             | .799                 | 7823336            | 7824337               | 7824155               |



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| .750                        | .500       | RH, Preload         | 7826991              | 7824361                | 3,263                                                | 13,260                             | 2.39                 | 7823336            | 7824337               | 7824155               |



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| .875                        | .200       | RH, NP              | 5708277              | 5708859                | 1,942                                                | 18,063                             | .687                 | 5708281            | 7831512               | 7824156               |

\* Customer to provide 1 wiper retainer. See pg. 53

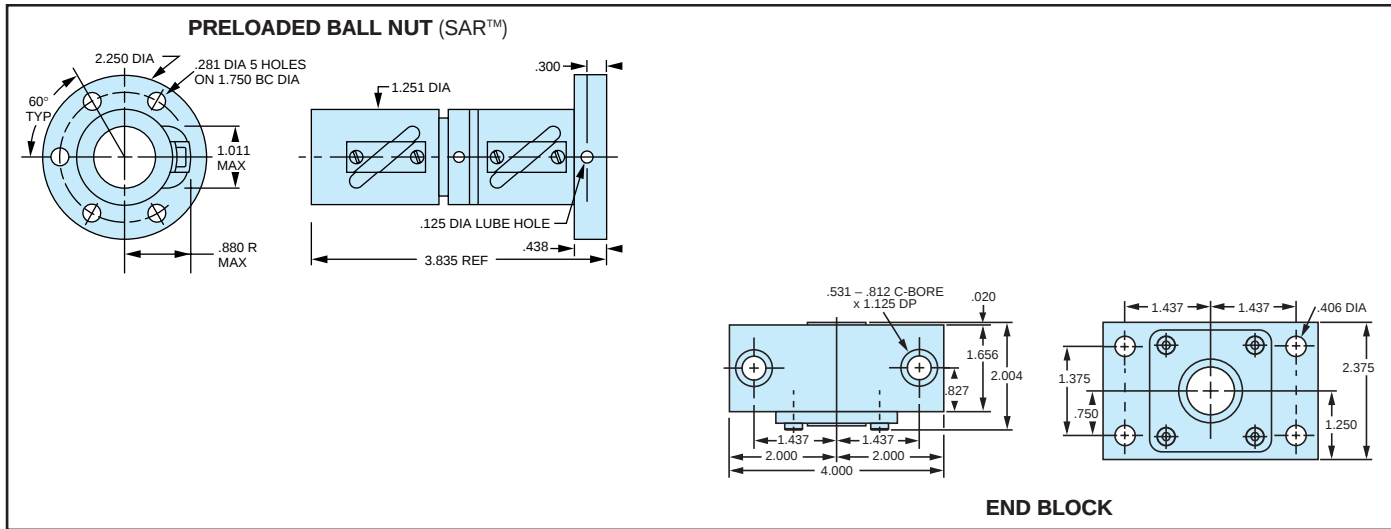
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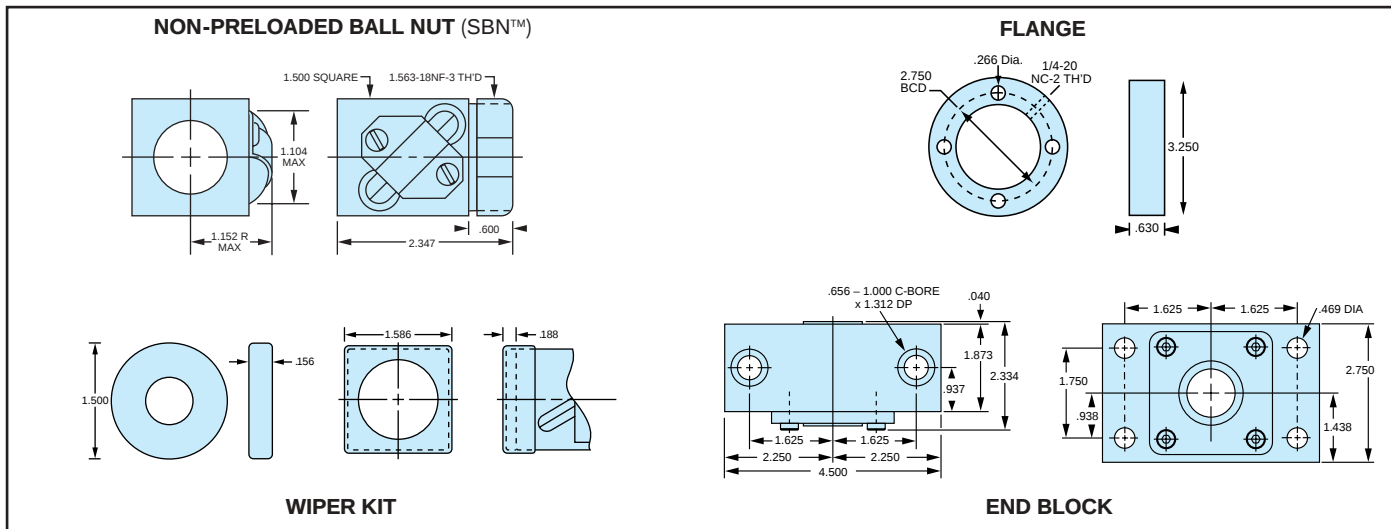
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## Precision Ball Nuts *(continued)*

- Non-Preloaded Backlash  
.002 in to .013 in
- Preloaded  
Zero Backlash



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10° rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| .875                        | .200       | RH, Preload         | 7823585              | 5708859                | 971                                      | 9,482                              | 1.810                | Integral           | Integral              | 7824156               |

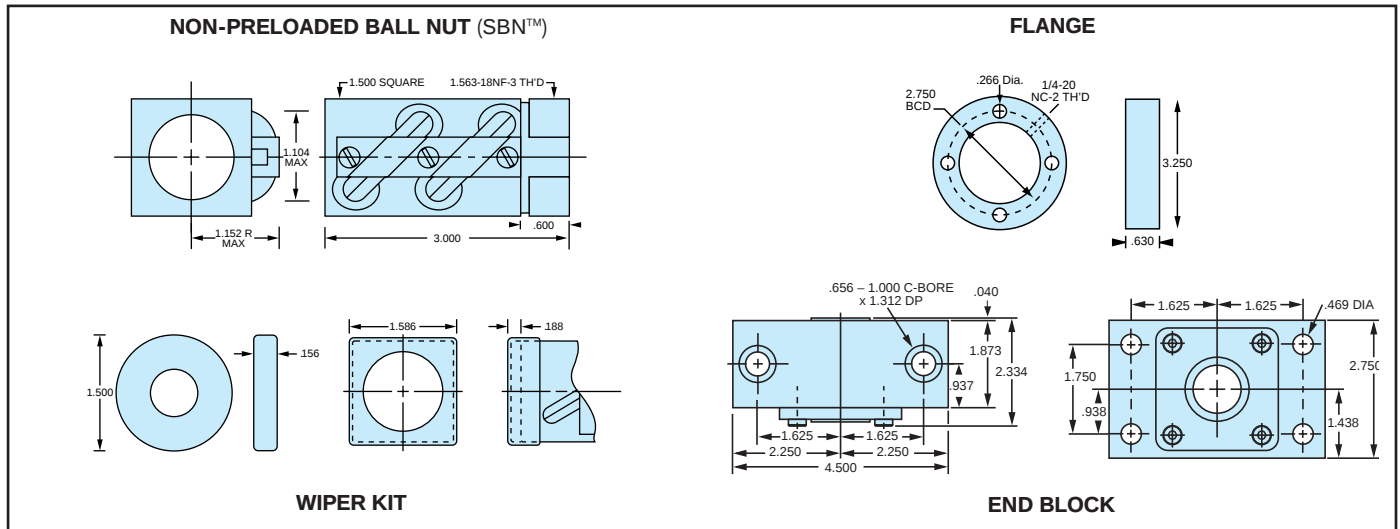


| Ball Circle Diameter (size) | Lead (in.) | General Description      | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10° rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|--------------------------|----------------------|------------------------|------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 1.000                       | .250       | RH, Sq., NP <sup>v</sup> | 5707508              | 7820426                | 1,612                                    | 13,913                             | .812                 | 5707571            | 5702649*              | 7824157               |
|                             |            | LH, Sq., NP <sup>v</sup> | 5707535              | 7820428                | 1,612                                    | 13,913                             | .812                 | 5707571            | 5702649*              | 7824157               |

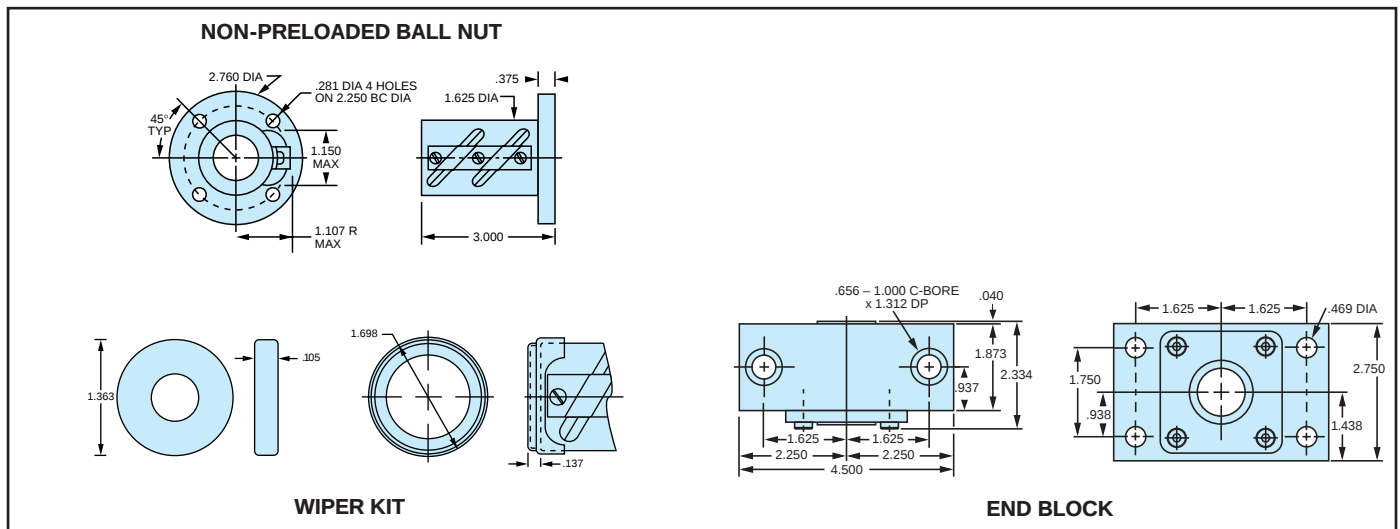
\* Customer to provide 1 wiper retainer. See pg. 53

### General Description Legend

|    |              |         |                        |     |                 |
|----|--------------|---------|------------------------|-----|-----------------|
| C1 | One Circuit  | NP      | Non-preloaded Ball Nut | Rnd | Round           |
| C2 | Two Circuits | OAL     | Overall Length         | Sq. | Square          |
| KW | Keyway       | Preload | Preloaded Ball Nut     | SS  | Stainless Steel |
| LH | Left Hand    | RH      | Right Hand             | v   | Valued Priced   |



| Ball Circle Diameter (size) | Lead (in.) | General Description      | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|--------------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 1.000                       | .250       | RH, Sq., NP <sup>v</sup> | 5700348              | 7820426                | 3,224                                                | 27,826                             | 1.250                | 5707571            | 5702649*              | 7824157               |



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 1.000                       | .250       | RH, Rnd, NP         | 5708278              | 7820426                | 3,224                                                | 27,826                             | 1.500                | Integral           | 5702651*              | 7824157               |
|                             |            | LH, Rnd, NP         | 5708284              | 7820428                | 3,224                                                | 27,826                             | 1.500                | Integral           | 5702651*              | 7824157               |

\* Customer to provide 1 wiper retainer. See pg. 53

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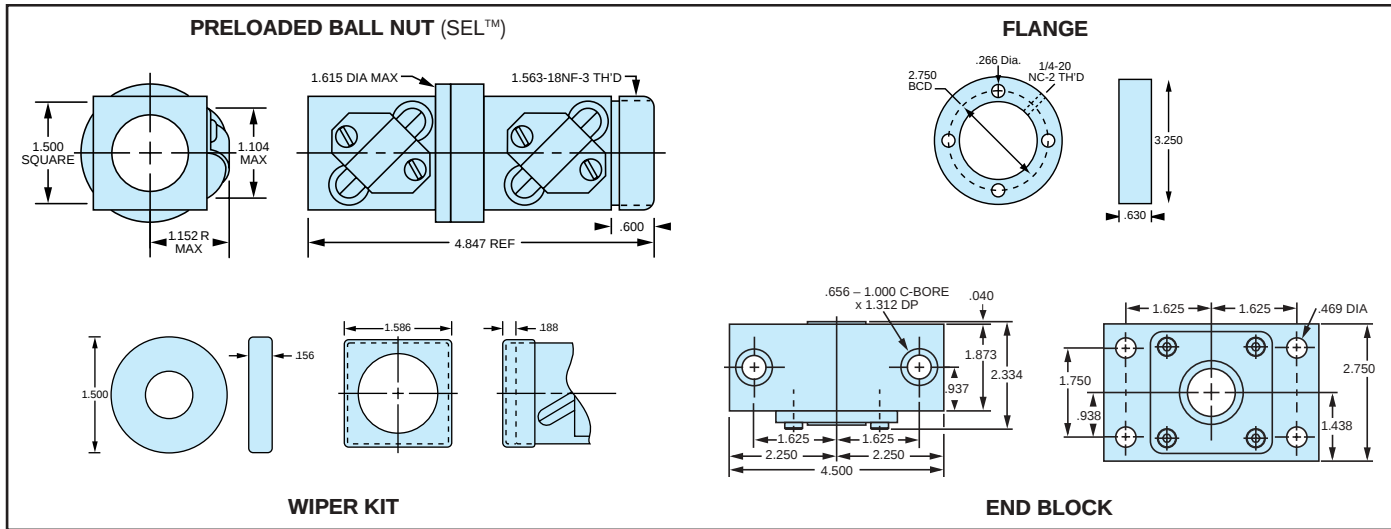
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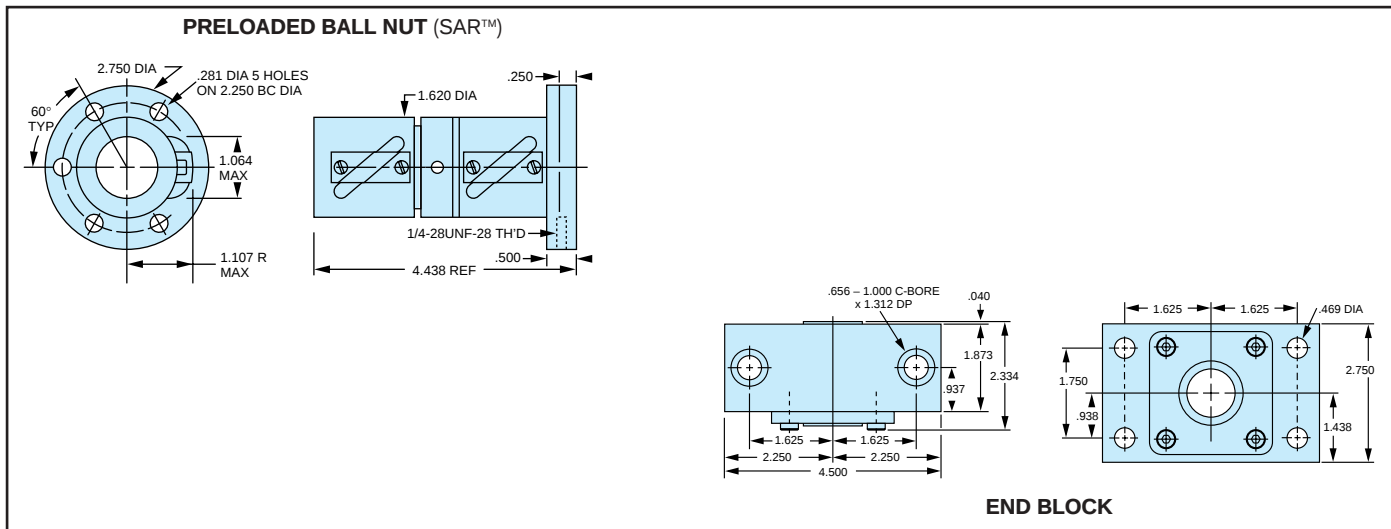
## Precision Ball Nuts *(continued)*

- Non-Preloaded Backlash  
.002 in to .013 in
- Preloaded  
Zero Backlash



| Ball Circle Diameter (size) | Lead (in.) | General Description                                            | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|----------------------------------------------------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 1.000                       | .250       | RH, Sq., Preload <sup>v</sup><br>LH, Sq., Preload <sup>v</sup> | 5704167<br>5704168   | 7820426<br>7820428     | 1612<br>1612                                         | 13,913<br>13,913                   | 1.900<br>1.900       | 5707571<br>5707571 | 5702649*<br>5702649*  | 7824157<br>7824157    |

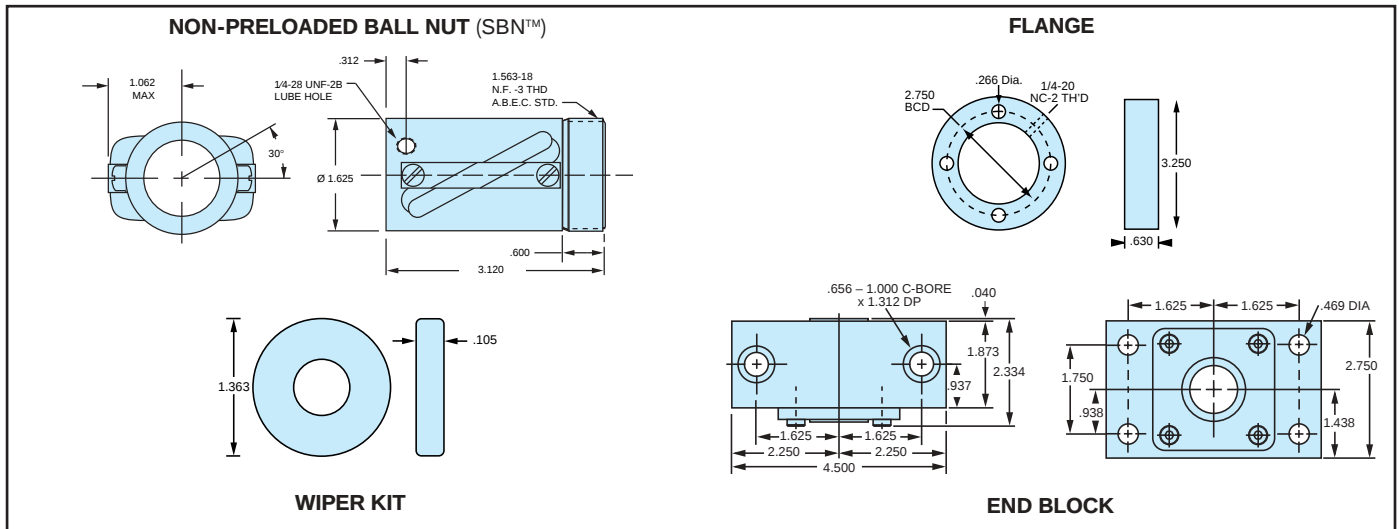
\* Customer to provide wiper retainer. See pg 53



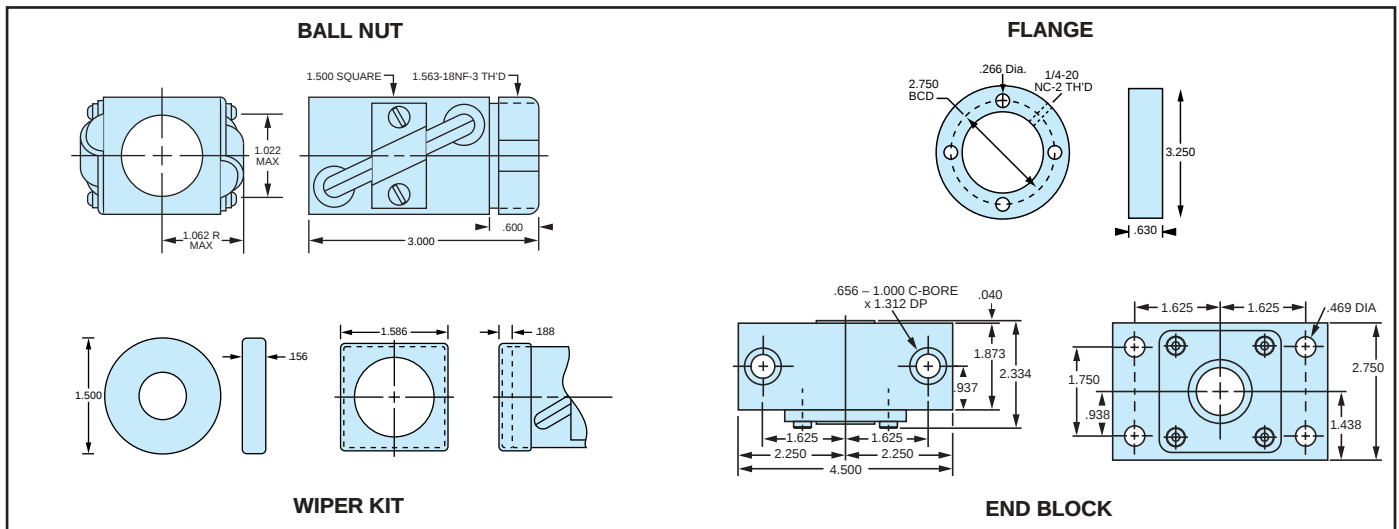
| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 1.000                       | .250       | RH, Preload         | 7823586              | 7820426                | 1,612                                                | 13,913                             | 2.00                 | Integral           | Integral              | 7824157               |

### General Description Legend

|    |              |         |                        |     |                 |
|----|--------------|---------|------------------------|-----|-----------------|
| C1 | One Circuit  | NP      | Non-preloaded Ball Nut | Rnd | Round           |
| C2 | Two Circuits | OAL     | Overall Length         | Sq. | Square          |
| KW | Keyway       | Preload | Preloaded Ball Nut     | SS  | Stainless Steel |
| LH | Left Hand    | RH      | Right Hand             | v   | Valued Priced   |



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 1.000                       | .500       | RH, NP              | 7824286              | 7824290                | 3,890                                                | 18,400                             | 1.200                | 5707571            | 7824292               | 7824157               |



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 1.000                       | 1.000      | RH, Sq., NP         | 5707509              | 7820429                | 2,142                                                | 11,925                             | 1.120                | 5707571            | 5702650*              | 7824157               |
|                             |            | RH, Sq., Preload**  | 7829720              | 7820429                | 2,142                                                | 11,925                             | 2.30                 | 5707571            | 5702650*              | 7824157               |

\* Customer to provide 1 wiper retainer. See pg. 53

\*\* Not shown, SEL™ Style 6.000 overall length

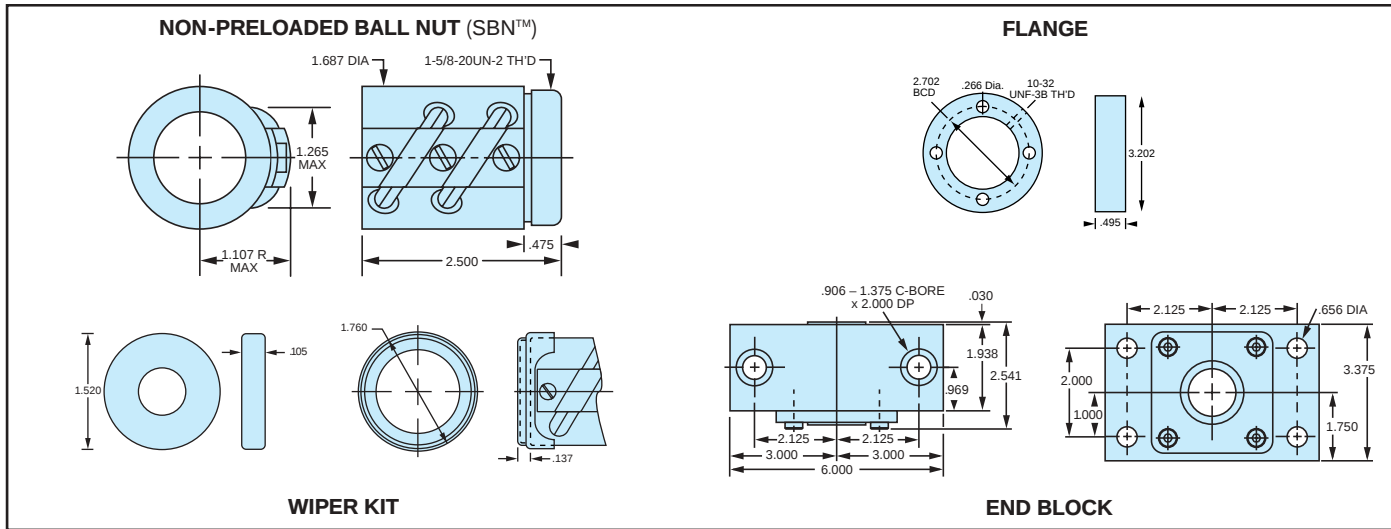
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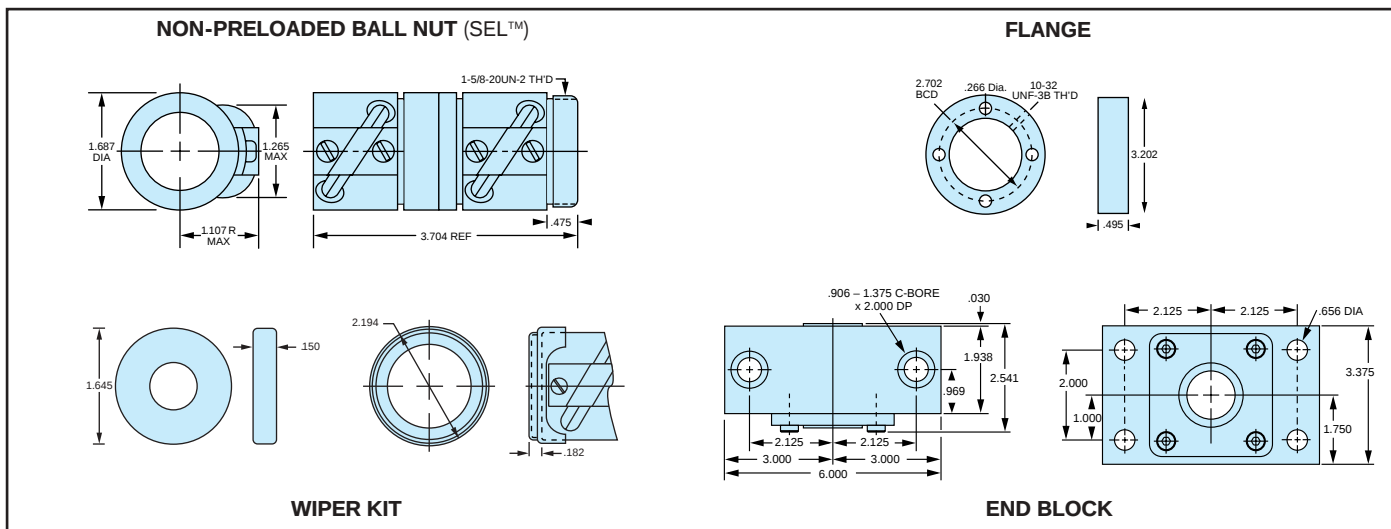
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## Precision Ball Nuts *(continued)*

- Non-Preloaded Backlash  
.002 in to .013 in
- Preloaded  
Zero Backlash



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 1.150                       | .200       | RH, NP<br>LH, NP    | 5701566<br>7820207   | 7820430<br>7820431     | 2,370<br>2,370                                       | 26,180<br>26,180                   | .875<br>.875         | 5708283<br>5708283 | 5702652*<br>5702652*  | 7824158<br>7824158    |

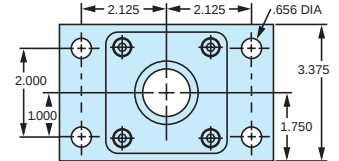
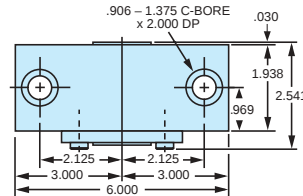
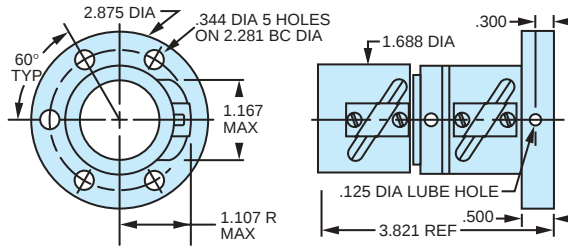


\* Customer to provide wiper retainer. See pg. 53

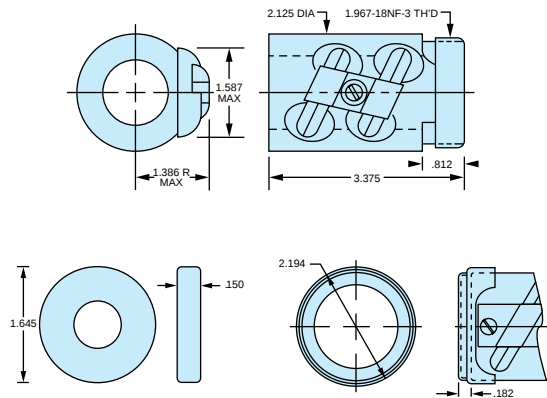
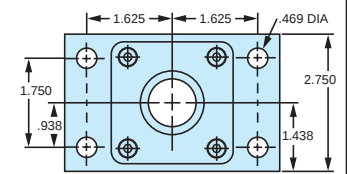
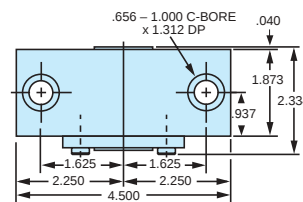
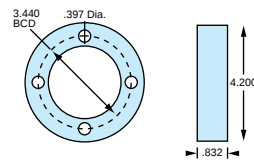
| Ball Circle Diameter (size) | Lead (in.) | General Description                                  | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|------------------------------------------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 1.150                       | .200       | RH, Preload <sup>v</sup><br>LH, Preload <sup>v</sup> | 5704270<br>7820206   | 7820430<br>7820431     | 1,185<br>1,185                                       | 13,090<br>13,090                   | 1.34<br>1.34         | 5708283<br>5708283 | 5702652*<br>5702652*  | 7824158<br>7824158    |

### General Description Legend

|    |              |         |                        |     |                 |
|----|--------------|---------|------------------------|-----|-----------------|
| C1 | One Circuit  | NP      | Non-preloaded Ball Nut | Rnd | Round           |
| C2 | Two Circuits | OAL     | Overall Length         | Sq. | Square          |
| KW | Keyway       | Preload | Preloaded Ball Nut     | SS  | Stainless Steel |
| LH | Left Hand    | RH      | Right Hand             | v   | Valued Priced   |

**PRELOADED BALL NUT (SAR™)****END BLOCK**

| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10° rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 1.150                       | .200       | RH, Preload         | 7823587              | 7820430                | 1,185                                    | 13,090                             | 1.75                 | Integral           | Integral              | 7824158               |

**NON-PRELOADED BALL NUT (SBN™)****WIPER KIT****FLANGE****END BLOCK**

| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10° rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 1.171                       | .413       | RH, NP              | 5707511              | 7820432                | 3,894                                    | 22,917                             | 1.94                 | 5707572            | 5702653*              | 7824157               |

\* Customer to provide 1 wiper retainer. See pg. 53

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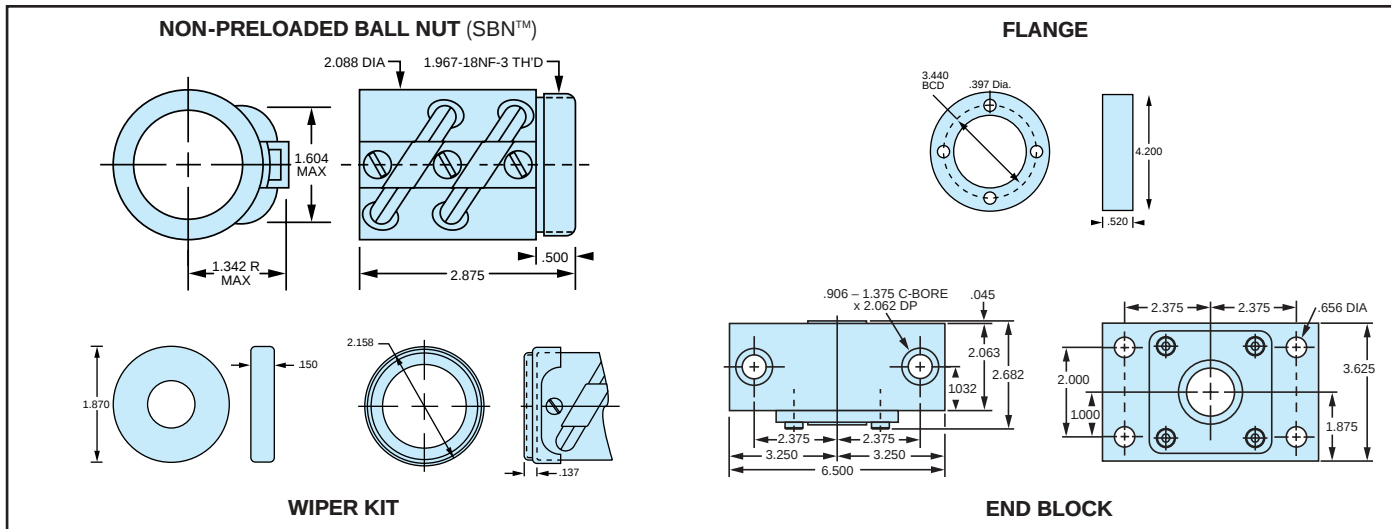
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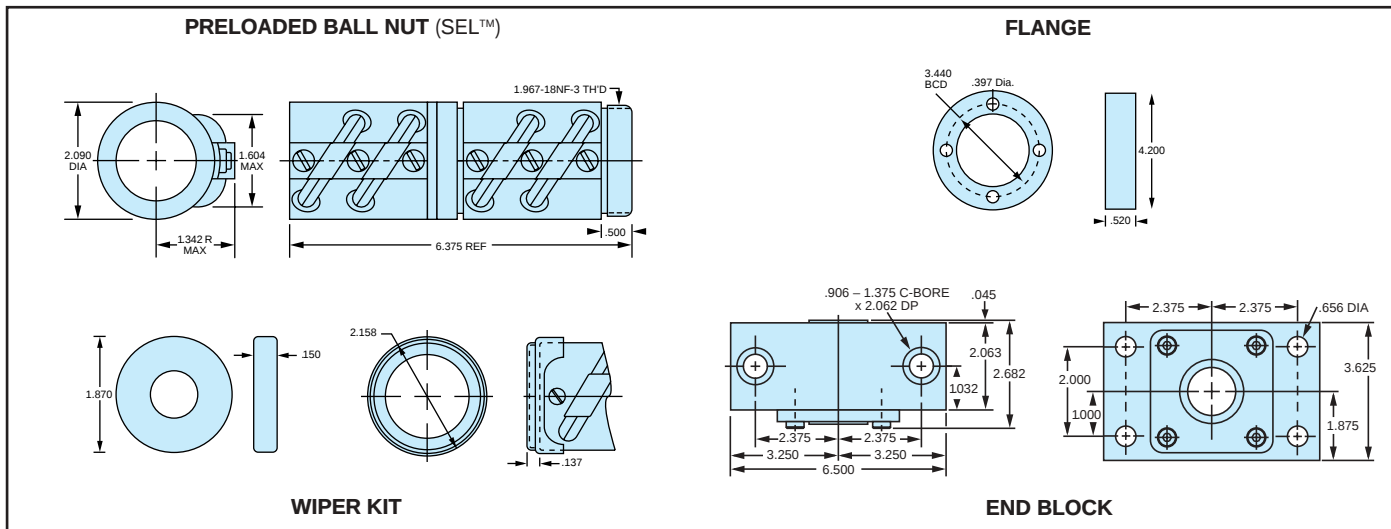
# Precision Ball Nuts *(continued)*

- Non-Preloaded Backlash .002 in to .013 in
- Preloaded Zero Backlash



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10° rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 1.500                       | .250       | RH, NP<br>LH, NP    | 5709587<br>5701990   | 7820595<br>7820596     | 4,198<br>4,198                           | 44,030<br>44,030                   | 1.65<br>1.65         | 5706754<br>5706754 | 5702654*<br>5702654*  | 7824159<br>7824159    |

\* Customer to provide wiper retainer. See pg. 53

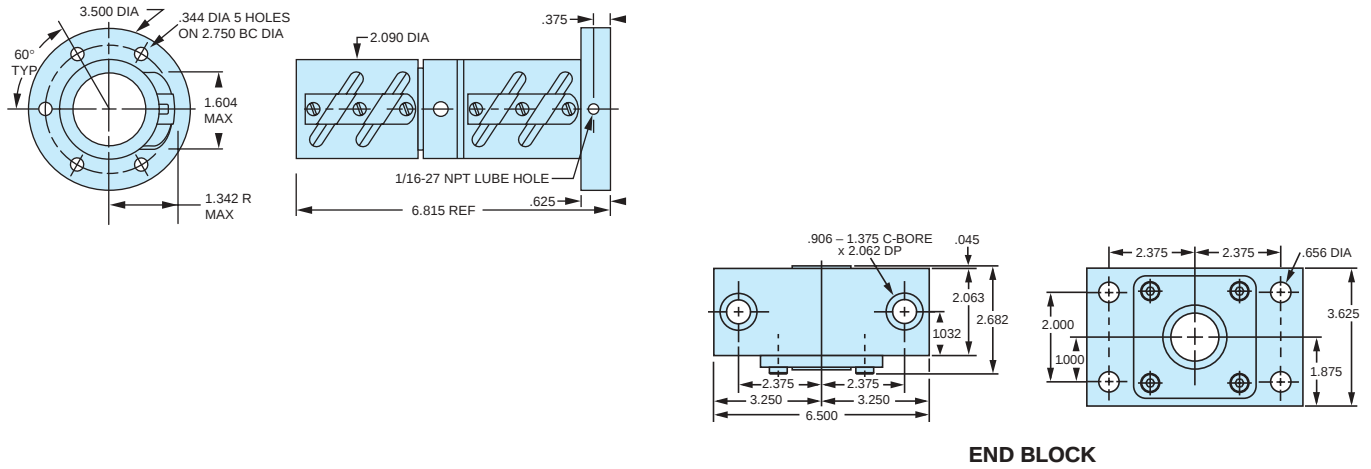


\* Customer to provide wiper retainer. See pg. 53

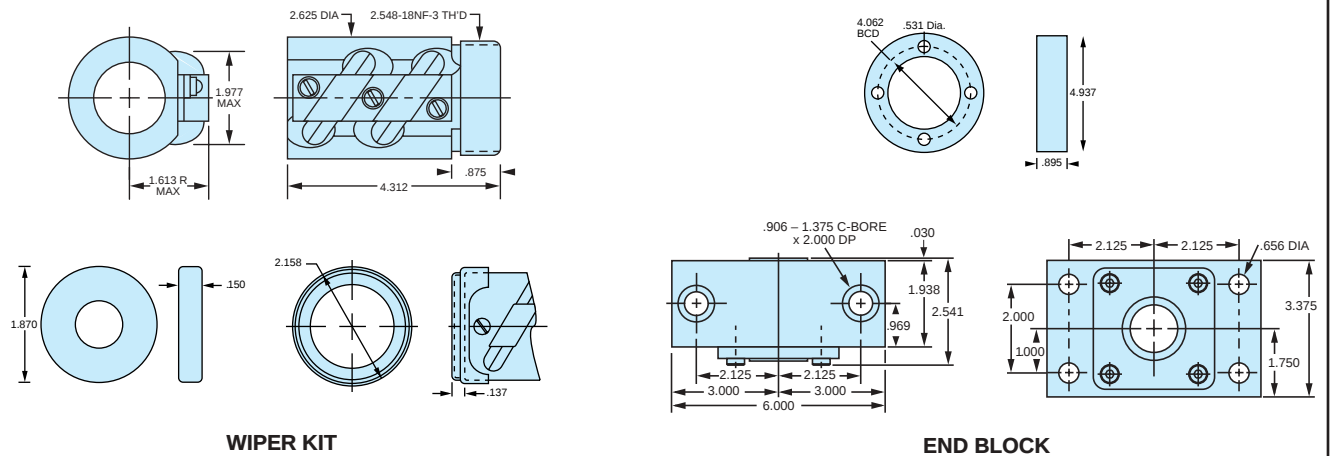
| Ball Circle Diameter (size) | Lead (in.) | General Description      | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10° rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|--------------------------|----------------------|------------------------|------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 1.500                       | .250       | RH, Preload <sup>v</sup> | 5704271              | 7820595                | 4,198                                    | 44,030                             | 3.02                 | 5706754            | 5702654*              | 7824159               |

## General Description Legend

|    |              |         |                        |     |                 |
|----|--------------|---------|------------------------|-----|-----------------|
| C1 | One Circuit  | NP      | Non-preloaded Ball Nut | Rnd | Round           |
| C2 | Two Circuits | OAL     | Overall Length         | Sq. | Square          |
| KW | Keyway       | Preload | Preloaded Ball Nut     | SS  | Stainless Steel |
| LH | Left Hand    | RH      | Right Hand             | v   | Valued Priced   |

**PRELOADED BALL NUT (SAR™)**

| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 1.500                       | .250       | RH, Preload         | 7823588              | 7820595                | 4,198                                                | 44,030                             | 4.80                 | Integral           | Integral              | 7824159               |

**NON-PRELOADED BALL NUT (SBN™)****FLANGE**

| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 1.500                       | .473       | RH, NP              | 5707513              | 7820597                | 10,050                                               | 57,770                             | 3.94                 | 5707573            | 5702655*              | 7824158               |

\* Customer to provide 1 wiper retainer. See pg. 53

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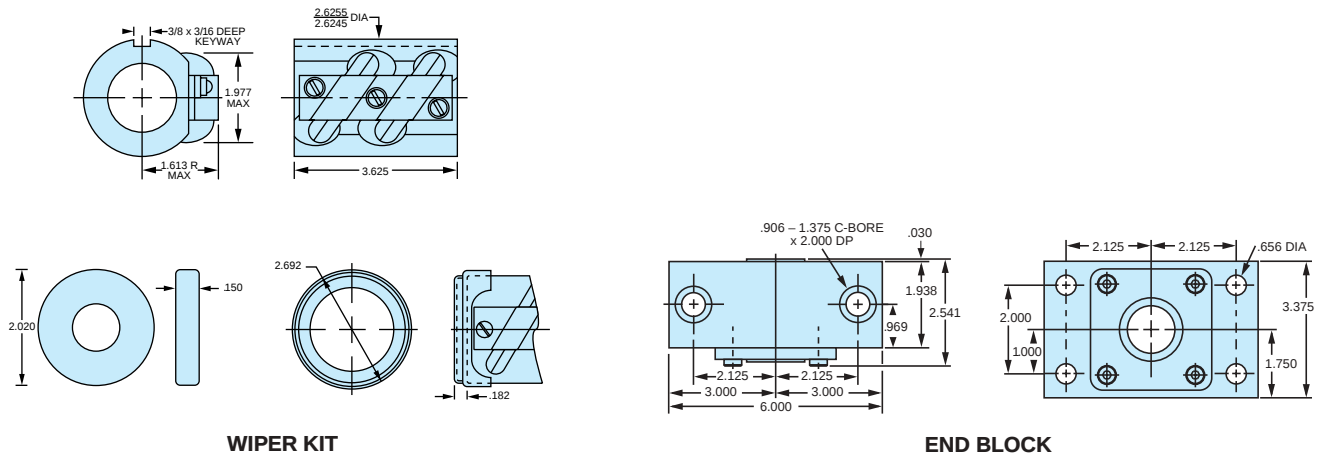
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## Precision Ball Nuts *(continued)*

- Non-Preloaded Backlash  
.002 in to .013 in
- Preloaded  
Zero Backlash

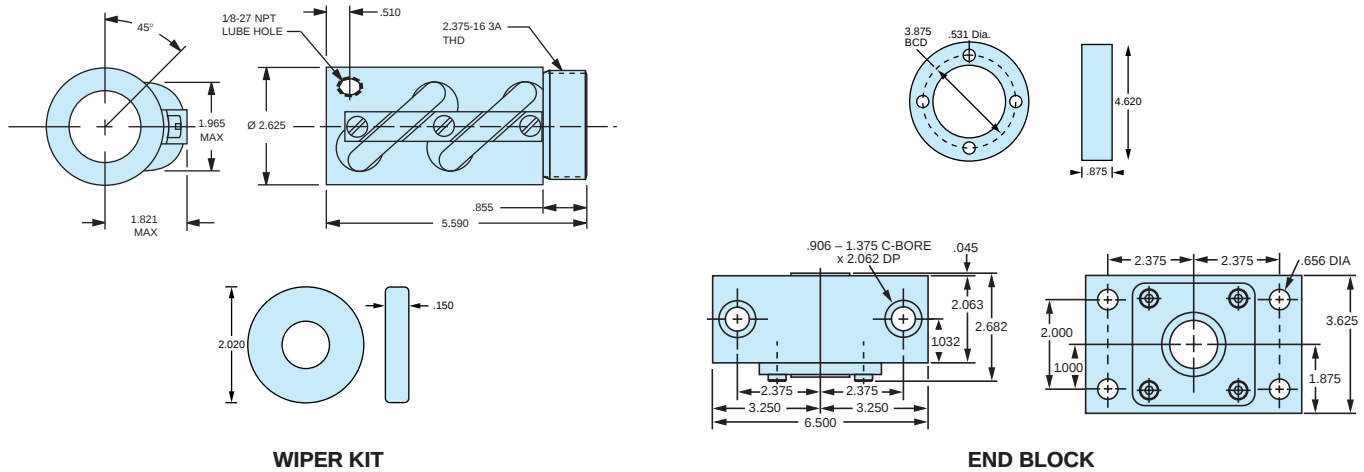
### NON-PRELOADED BALL NUT



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 1.500                       | .473       | RH, KW, NP          | 5708345              | 7820597                | 10,050                                               | 57,770                             | 3.94                 | N/A                | 5702656*              | 7824158               |

### NON-PRELOADED BALL NUT (SBN™)

### FLANGE

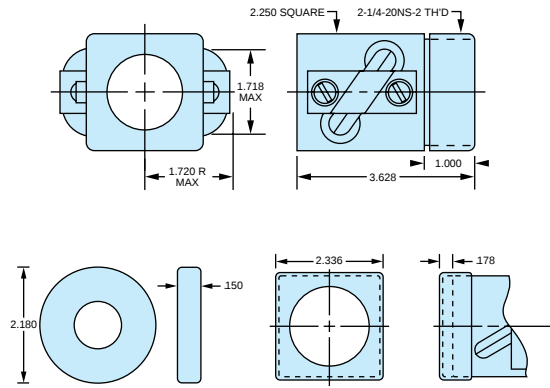
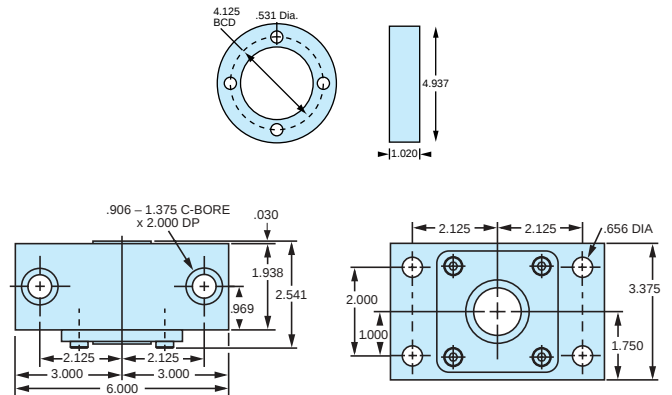


| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 1.500                       | .500       | RH, NP              | 7824246              | 7824253                | 14,513                                               | 81,600                             | 5.70                 | 7824250            | 7824251*              | 7824159               |

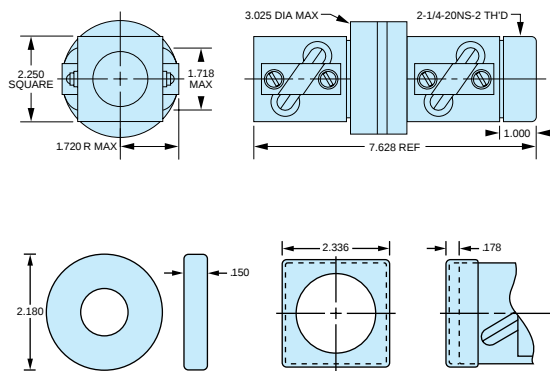
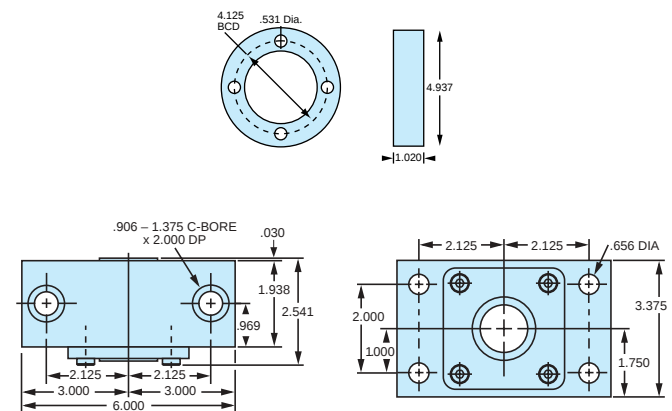
\* Customer to provide wiper retainer. See pg. 53

### General Description Legend

|    |              |         |                        |     |                 |
|----|--------------|---------|------------------------|-----|-----------------|
| C1 | One Circuit  | NP      | Non-preloaded Ball Nut | Rnd | Round           |
| C2 | Two Circuits | OAL     | Overall Length         | Sq. | Square          |
| KW | Keyway       | Preload | Preloaded Ball Nut     | SS  | Stainless Steel |
| LH | Left Hand    | RH      | Right Hand             | v   | Valued Priced   |

**NON-PRELOADED BALL NUT (SBN™)****WIPER KIT****FLANGE****END BLOCK**

| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 1.500                       | 1.000      | RH, NP<br>LH, NP    | 5708280<br>5701995   | 7820598<br>7825925     | 7,560<br>7,560                                       | 34,662<br>34,662                   | 3.88<br>3.88         | 5707777<br>5707777 | 5702657*<br>5702657*  | 7824158<br>7824158    |

**PRELOADED BALL NUT (SEL™)****WIPER KIT****FLANGE****END BLOCK**

| Ball Circle Diameter (size) | Lead (in.) | General Description      | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|--------------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 1.500                       | 1.000      | RH, Preload <sup>v</sup> | 5700698              | 7820598                | 7,560                                                | 34,662                             | 7.13                 | 5707777            | 5702657*              | 7824158               |

\* Customer to provide 1 wiper retainer. See pg. 53

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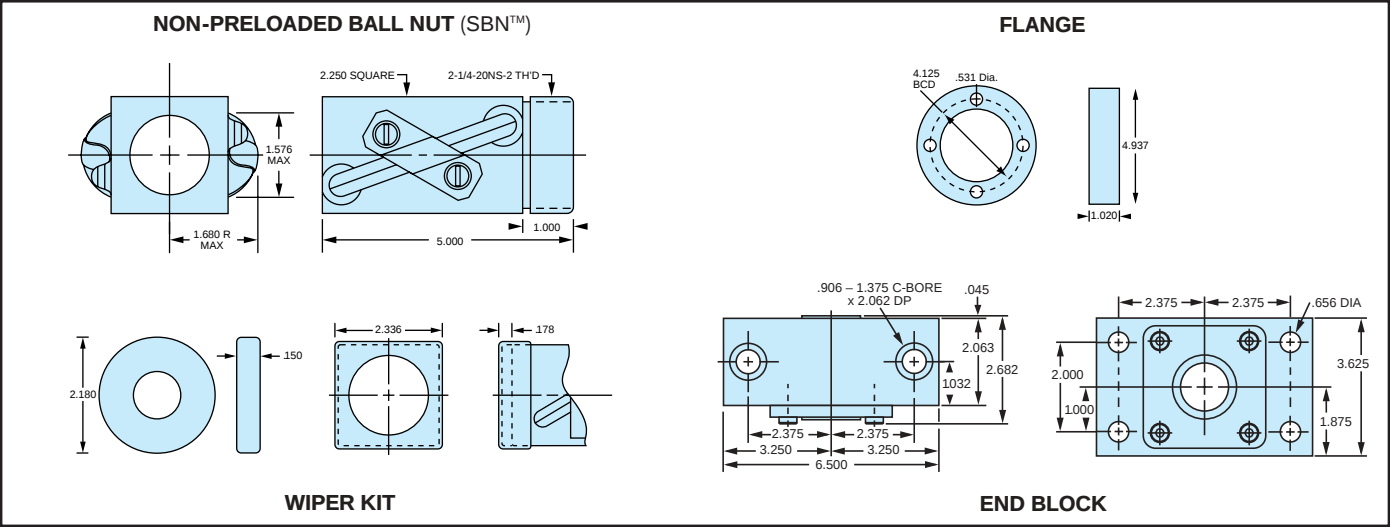
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Precision Ball Nuts (continued)

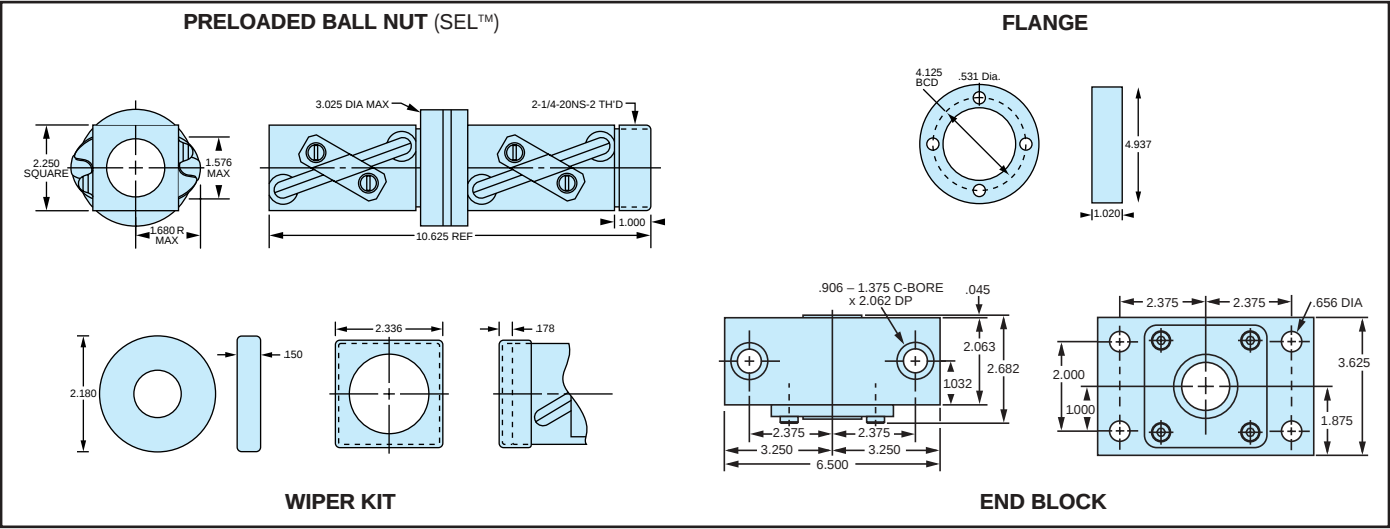
- Non-Preloaded Backlash

.002 in to .013 in
- Preloaded

Zero Backlash



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 1.500                       | 1.875      | RH, NP              | 5707654              | 7820599                | 7,242                                                | 29,895                             | 4.22                 | 5707777            | 5702658*              | 7824159               |



| Ball Circle Diameter (size) | Lead (in.) | General Description      | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|--------------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 1.500                       | 1.875      | RH, Preload <sup>v</sup> | 5704272              | 7820599                | 7,242                                                | 29,895                             | 9.93                 | 5707777            | 5702658*              | 7824159               |

\* Customer to provide 1 wiper retainer. See pg. 53

General Description Legend

- C1

One Circuit
- C2

Two Circuits
- KW

Keyway
- LH

Left Hand
- NP

Non-preloaded Ball Nut
- OAL

Overall Length
- Preload

Preloaded Ball Nut
- RH

Right Hand
- Rnd

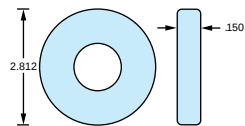
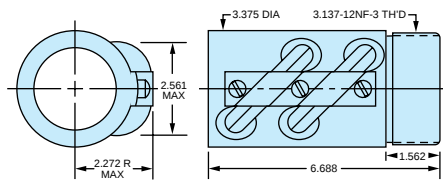
Round
- Sq.

Square
- SS

Stainless Steel
- v

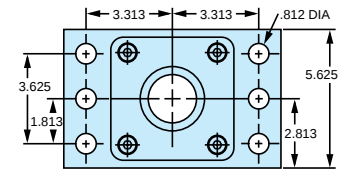
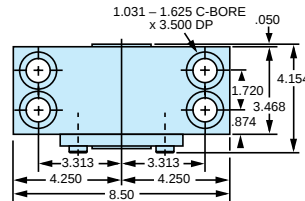
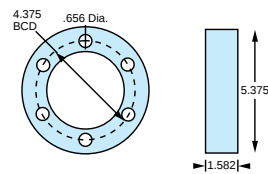
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## NON-PRELOADED BALL NUT (SBN™)



WIPER KIT

## FLANGE

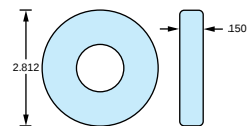
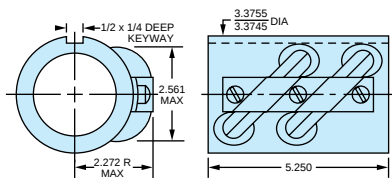


END BLOCK

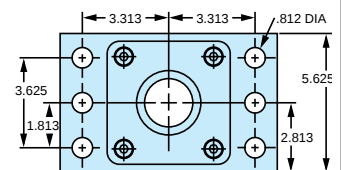
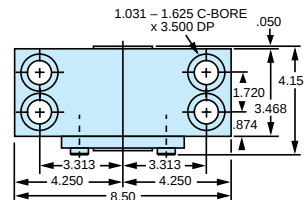
| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number                        | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|----------------------------------------------|-----------------------|
| 2.250                       | .500       | RH, NP<br>LH, NP    | 5707516<br>5704000   | 7820600<br>7820602     | 21,306<br>21,306                                     | 142.660<br>142.660                 | 8.25<br>8.25         | 5707574<br>5707574 | 5702659 <sup>†</sup><br>5702659 <sup>†</sup> | 7824160<br>7824160    |

<sup>†</sup>Brush-type wiper; formed felt available (5703890-RH; 5700456-LH); wiper dia. —2.718 in., width—.625 in.; retainer dia.—2.802 in. Increases length at each end by .300 in.

## NON-PRELOADED BALL NUT



WIPER KIT



END BLOCK

| Ball Circle Diameter (size) | Lead (in.) | General Description      | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number                        | End Block Part Number |
|-----------------------------|------------|--------------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|----------------------------------------------|-----------------------|
| 2.250                       | .500       | RH, KW, NP<br>LH, KW, NP | 5708346<br>7830722   | 7820600<br>7820602     | 21,306<br>21,306                                     | 142.660<br>142.660                 | 8.25<br>8.25         | N/A<br>N/A         | 5702659 <sup>†</sup><br>5702659 <sup>†</sup> | 7824160<br>7824160    |

<sup>†</sup>Snap ring retainers in ball nut C-bore.

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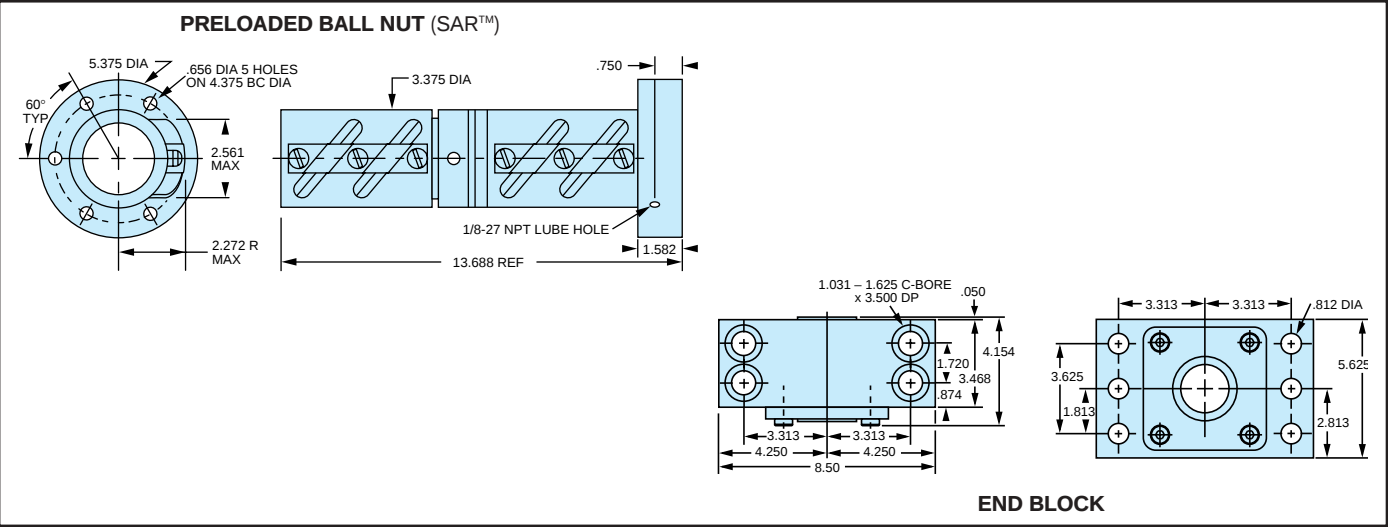
\*Trademark of Thomson Industries, Inc. THOMSON is registered in the U.S. Patent and Trademark Office and in other countries.

Precision Ball Nuts (continued)

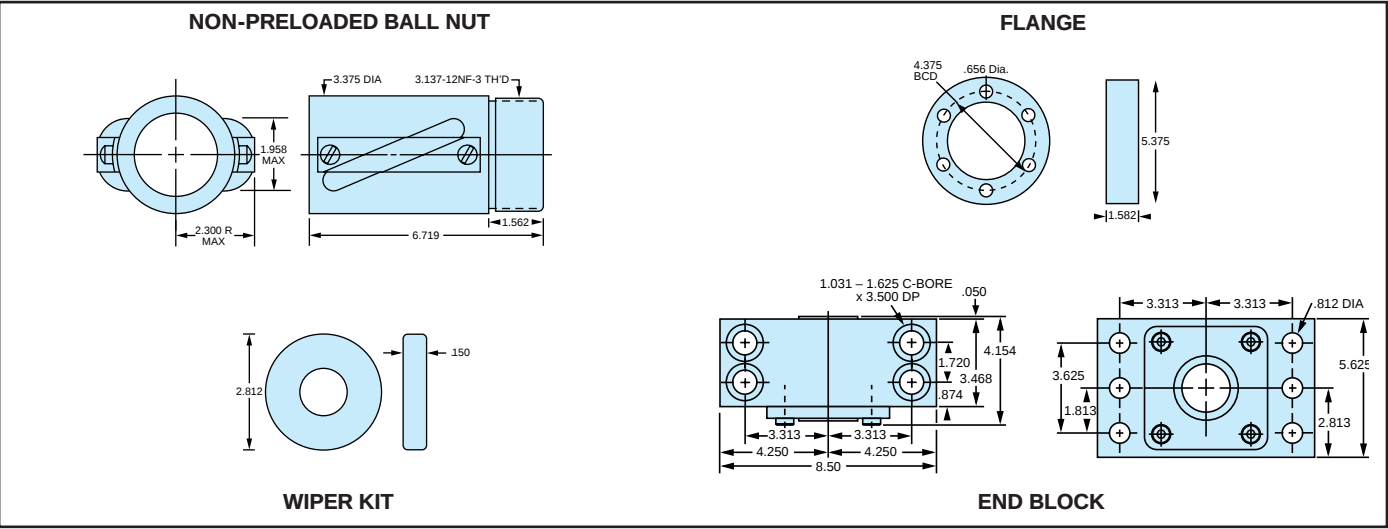
- Non-Preloaded Backlash

.002 in to .013 in
- Preloaded

Zero Backlash



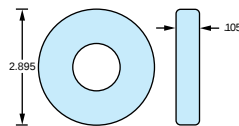
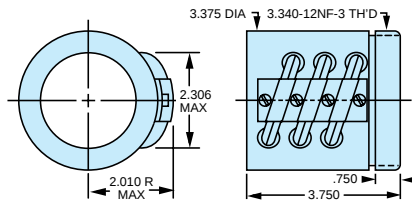
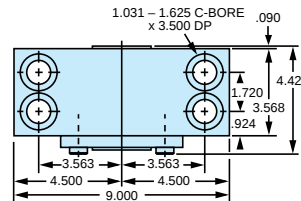
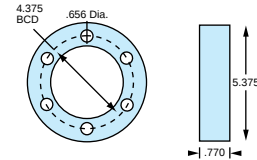
| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 2.250                       | .500       | RH, Preload         | 7823589              | 7820600                | 21,306                                               | 142,660                            | 24.25                | Integral           | Integral              | 7824160               |



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 2.250                       | 1.000      | RH, NP              | 5704555              | 7820604                | 26,538                                               | 142,660                            | 8.25                 | 5707574            | 5702659 <sup>†</sup>  | 7824160               |

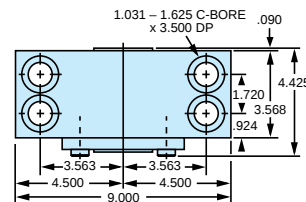
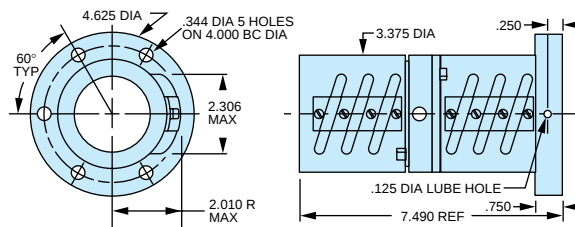
<sup>†</sup>Brush-type wiper; formed felt available (5700457-RH); wiper dia. —2.718 in., width—.625 in.; retainer dia.—2.802 in. Snap ring retainers in ball nut C-Bore. Increases length at each end by .300 in.

| General Description Legend |              |         |                        |     |                 |
|----------------------------|--------------|---------|------------------------|-----|-----------------|
| C1                         | One Circuit  | NP      | Non-preloaded Ball Nut | Rnd | Round           |
| C2                         | Two Circuits | OAL     | Overall Length         | Sq. | Square          |
| KW                         | Keyway       | Preload | Preloaded Ball Nut     | SS  | Stainless Steel |
| LH                         | Left Hand    | RH      | Right Hand             | v   | Valued Priced   |

**NON-PRELOADED BALL NUT (SBN™)****WIPER KIT****FLANGE****END BLOCK**

| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 2.500                       | .250       | RH, NP              | 5703243              | 7820606                | 6,315                                                | 81,938                             | 4.72                 | 5703263            | 5703324 <sup>†</sup>  | 7824161               |

<sup>†</sup> Snap ring retainers in ball nut C-bore.

**PRELOADED BALL NUT (SAR™)****END BLOCK**

| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 2.500                       | .250       | RH, Preload         | 7823590              | 7820606                | 6,315                                                | 81,938                             | 9.94                 | Integral           | Integral              | 7824161               |

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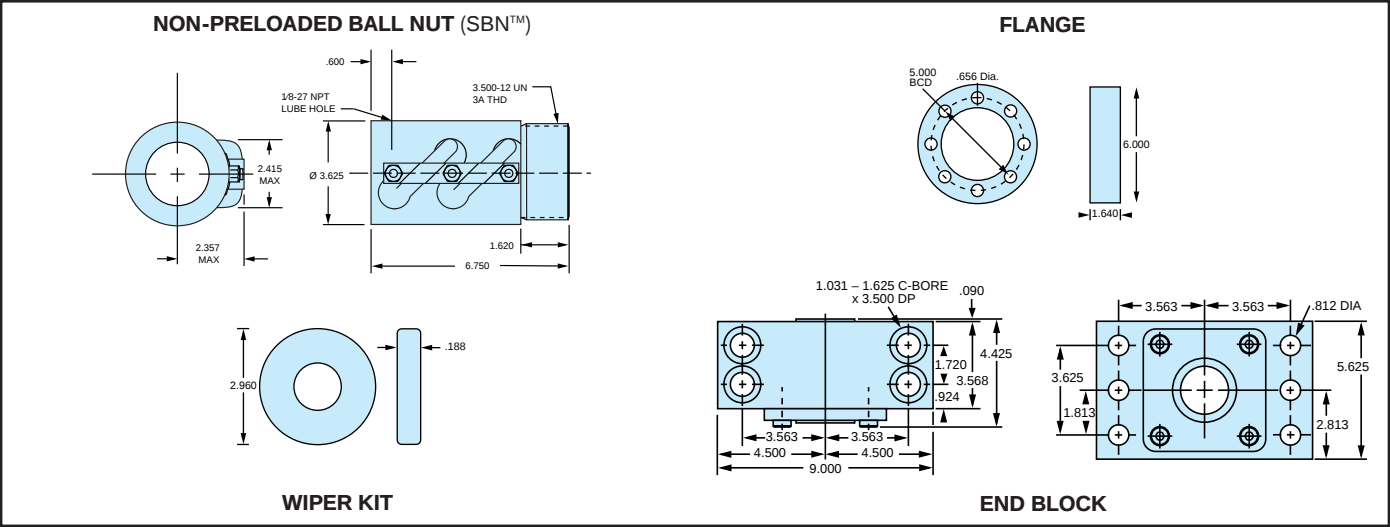
\* Trademark of Thomson Industries, Inc. THOMSON is registered in the U.S. Patent and Trademark Office and in other countries.

Precision Ball Nuts (continued)

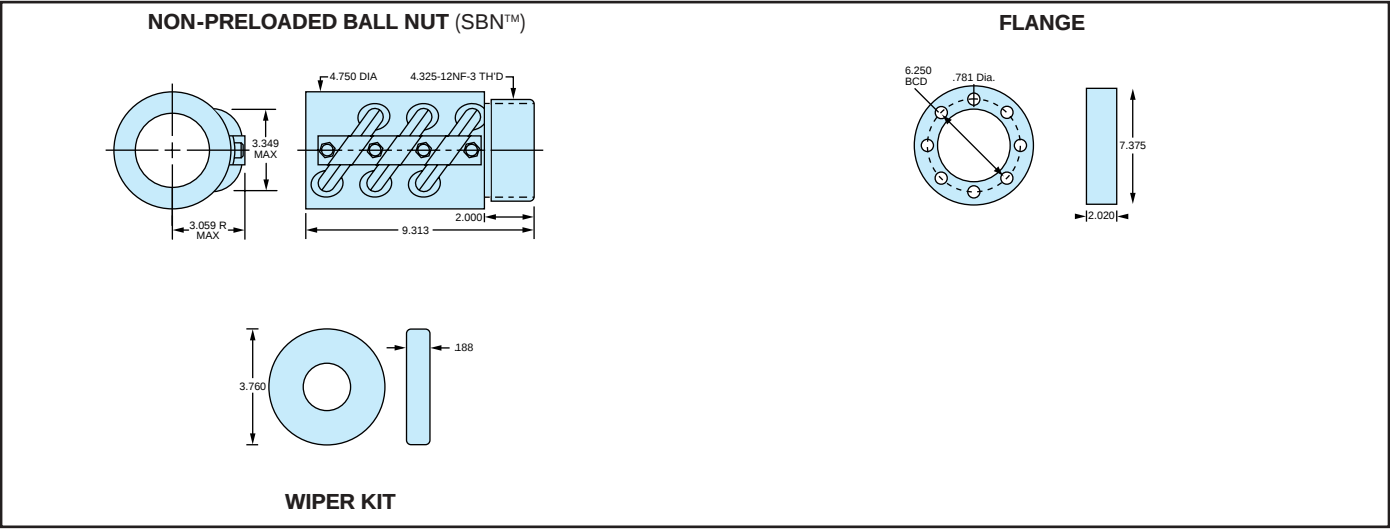
- Non-Preloaded Backlash

.002 in to .013 in
- Preloaded

Zero Backlash



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 2.500                       | .500       | RH, NP              | 7824136              | 7824262                | 22,981                                               | 166,062                            | 10.06                | 7824141            | 7824140               | 7824161               |



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 3.000                       | .660       | RH, NP              | 5707519              | 7820607                | 44,316                                               | 271,433                            | 26.0                 | 5707575            | 5702661 <sup>1</sup>  | N/A                   |

<sup>1</sup>Brush-type wiper; formed felt available (5703891-RH); wiper dia. —3.640 in., width—.7505 in.; retainer dia.—3.740 in. Increases length at each end by .375 in.

General Description Legend

- C1

One Circuit
- C2

Two Circuits
- KW

Keyway
- LH

Left Hand
- NP

Non-preloaded Ball Nut
- OAL

Overall Length
- Preload

Preloaded Ball Nut
- RH

Right Hand
- Rnd

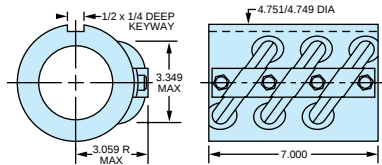
Round
- Sq.

Square
- SS

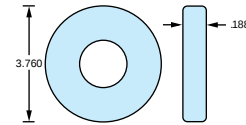
Stainless Steel
- v

Valued Priced

## NON-PRELOADED BALL NUT



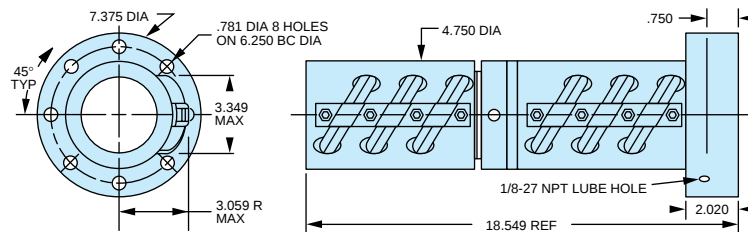
## WIPER KIT



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 3.000                       | .660       | RH, KW, NP          | 5708347              | 7820607                | 44,316                                               | 271,733                            | 26.00                | N/A                | 5702662*              | N/A                   |

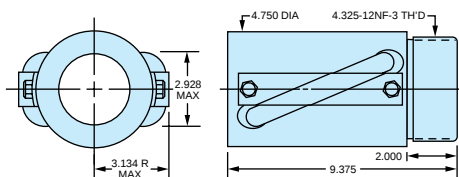
\* No retainers provided. See pg. 53

## PRELOADED BALL NUT (SAR™)

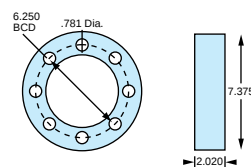


| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 3.000                       | .660       | RH, Preload         | 5703045              | 7820607                | 44,316                                               | 271,733                            | 67.50                | Integral           | Integral              | N/A                   |

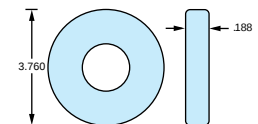
## NON-PRELOADED BALL NUT (SBN™)



## FLANGE



## WIPER KIT



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 3.000                       | 1.500      | RH, NP              | 5704986              | 7820609                | 53,646                                               | 253,617                            | 27.20                | 5707575            | 5702661 <sup>†</sup>  | N/A                   |

<sup>†</sup>Brush-type wiper; formed felt available (5700458-RH); wiper dia. —3.640 in.; width—.750 in.; retainer dia.—3.740 in. Increases length at each end by .375 in.

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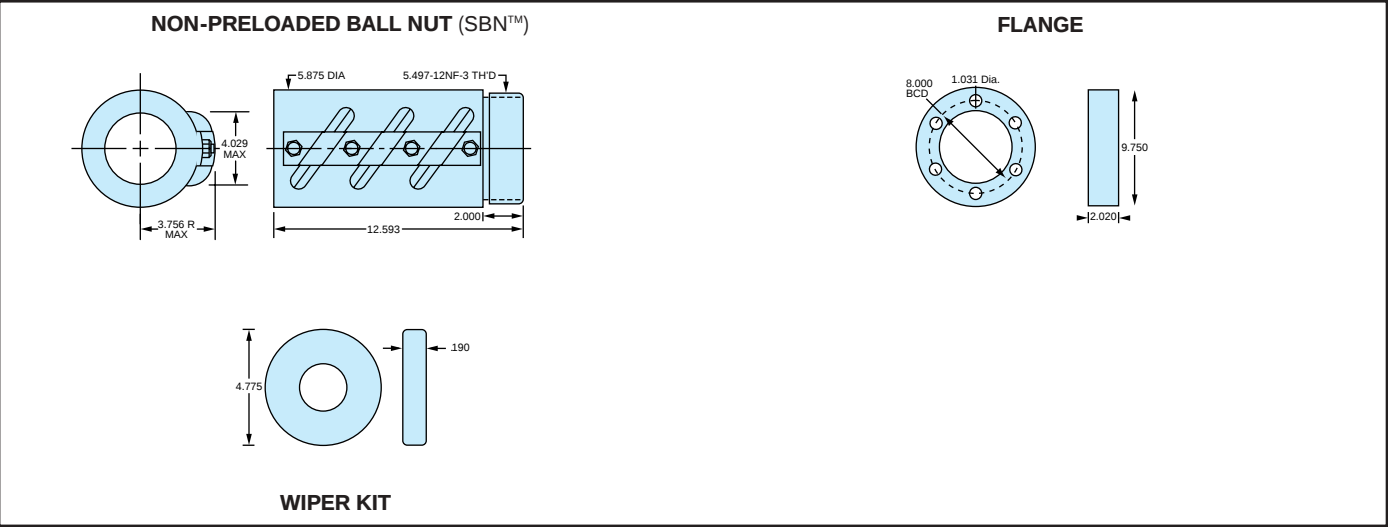
\* Trademark of Thomson Industries, Inc. THOMSON is registered in the U.S. Patent and Trademark Office and in other countries.

Precision Ball Nuts (continued)

- Non-Preloaded Backlash

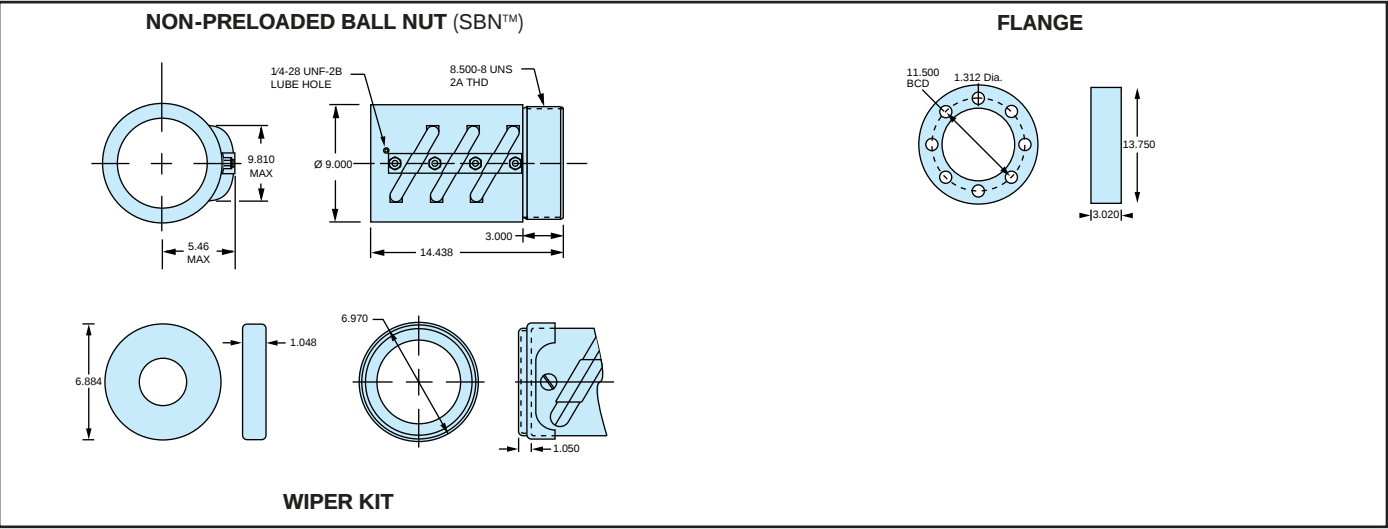
.002 in to .013 in
- Preloaded

Zero Backlash



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 4.000                       | 1.000      | RH, NP              | 5703258              | 5703262                | 85,758                                               | 476,970                            | 53.50                | 5703307            | 5703306 <sup>†</sup>  | N/A                   |

<sup>†</sup>Brush-type wiper; formed felt available (5704057-RH); wiper dia. —4.652 in., width—1.000 in.; retainer dia.—4.740 in. Increases length at each end by .600 in.



| Ball Circle Diameter (size) | Lead (in.) | General Description | Ball Nut Part Number | Ball Screw Part Number | Dynamic Load (lb <sub>f</sub> ) 10 <sup>6</sup> rev. | Max Static Load (lb <sub>f</sub> ) | Ball Nut Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------|----------------------|------------------------|------------------------------------------------------|------------------------------------|----------------------|--------------------|-----------------------|-----------------------|
| 6.000                       | 1.000      | RH, NP              | 5704738              | 5704762                | 160,000                                              | 750,000                            | 142.50               | 5704764            | 5704746*              | N/A                   |

\* Customer to provide wiper retainer. See pg. 53

| General Description Legend |              |         |                        |     |                 |
|----------------------------|--------------|---------|------------------------|-----|-----------------|
| C1                         | One Circuit  | NP      | Non-preloaded Ball Nut | Rnd | Round           |
| C2                         | Two Circuits | OAL     | Overall Length         | Sq. | Square          |
| KW                         | Keyway       | Preload | Preloaded Ball Nut     | SS  | Stainless Steel |
| LH                         | Left Hand    | RH      | Right Hand             | v   | Valued Priced   |

# Ball Screw Wiper Kits

Thomson Saginaw provides a complete selection of optional wiper kits to extend ball screw life and maintain efficiency.

## Kit Content Descriptions

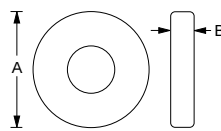
Type J: 2 wipers, 1 retainer; customer to supply 1 retainer. See typical methods below

Type K: 2 wipers, 2 retainers

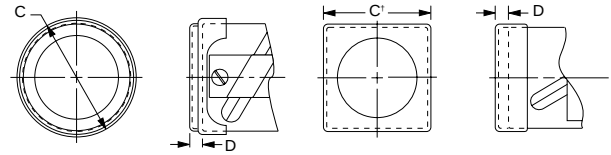
Type L: 2 wipers, 2 snap rings

Type M: 2 wipers only; customer's design to provide method of attaching wipers to ball nut

## Wipers



## Retainers

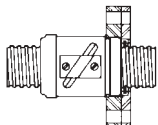


| Ball Nut Description<br>BCD x Lead | Wiper Kit Part Number | Kit Content | Dia. A | Dim. B | Dim. C Retainer    | Dim. D Retainer |
|------------------------------------|-----------------------|-------------|--------|--------|--------------------|-----------------|
| .187 .062                          | Not available         |             |        |        |                    |                 |
| .375 .125 B1                       | Not available         |             |        |        |                    |                 |
| .375 .125 B2                       | Not available         |             |        |        |                    |                 |
| .500 .200                          | 7826759               | J           | 1.018  | .105   | 1.100              | .137            |
| .500 .500                          | Not available         |             |        |        |                    |                 |
| .631 .200                          | 5702647               | J           | .961   | .105   | 1.086 <sup>†</sup> | .133            |
| .631 1.000                         | 7827527               | J           | .961   | .105   | 1.200              | .112            |
| .750 .200                          | 7824337               | L           | 1.031  | .105   |                    |                 |
| .750 .500                          | 7824337               | L           | 1.031  | .105   |                    |                 |
| .875 .200                          | 7831512               | J           | 1.363  | .105   | 1.698              | .137            |
| 1.000 .250 (Sq)                    | 5702649               | J           | 1.500  | .156   | 1.586 <sup>†</sup> | .188            |
| 1.000 .250 (Rnd)                   | 5702651               | J           | 1.363  | .105   | 1.698              | .137            |
| 1.000 .500                         | 7824292               | L           | 1.363  | .105   |                    |                 |
| 1.000 1.000                        | 5702650               | J           | 1.500  | .156   | 1.586 <sup>†</sup> | .188            |
| 1.150 .200                         | 5702652               | J           | 1.520  | .105   | 1.760              | .137            |
| 1.171 .413                         | 5702653               | J           | 1.645  | .150   | 2.194              | .182            |
| 1.500 .250                         | 5702654               | J           | 1.870  | .105   | 2.158              | .137            |
| 1.500 .473                         | 5702655               | J           | 2.020  | .150   | 2.692              | .182            |
| 1.500 .473 (KW)                    | 5702656               | K           | 2.020  | .150   | 2.692              | .182            |
| 1.500 .500                         | 7824251               | L           | 2.020  | .150   |                    |                 |
| 1.500 1.000                        | 5702657               | J           | 2.180  | .150   | 2.336 <sup>†</sup> | .178            |
| 1.500 1.875                        | 5702658               | J           | 2.180  | .150   | 2.336 <sup>†</sup> | .178            |
| 2.250 .500 (KW)                    | 5702659               | L           | 2.812  | .150   | ‡                  |                 |
| 2.250 .500 (R/LH)                  | 5702659               | L           | 2.812  | .150   | ‡                  |                 |
| 2.250 .500 (RH)                    | 5703890               | K           | 2.718  | .625   | 2.802              | .300            |
| 2.250 .500 (LH)                    | 5700456               | K           | 2.178  | .625   | 2.802              | .300            |
| 2.250 1.000                        | 5702659               | L           | 2.812  | .150   | ‡                  |                 |
| 2.250 1.000                        | 5700457               | K           | 2.718  | .625   | 2.802              | .300            |
| 2.500 .250                         | 5703324               | L           | 2.895  | .105   | ‡                  |                 |
| 2.500 .500                         | 7824140               | L           | 2.960  | .188   | ‡                  |                 |
| 3.000 .660                         | 5702661               | L           | 3.760  | .188   | ‡                  |                 |
| 3.000 .660 (KW)                    | 5702662               | M           | 3.760  | .188   | ‡                  |                 |
| 3.000 .660                         | 5703891               | K           | 3.640  | .750   | 3.740              | .375            |
| 3.000 1.500                        | 5702661               | L           | 3.760  | .188   | ‡                  |                 |
| 3.000 1.500                        | 5700458               | K           | 3.640  | .750   | 3.740              | .375            |
| 4.000 1.000                        | 5703306               | L           | 4.775  | .190   | ‡                  |                 |
| 4.000 1.000                        | 5704057               | K           | 4.652  | 1.000  | 4.720              | .600            |
| 6.000 1.000                        | 5704746               | K           | 6.884  | 1.048  | 6.970              | 1.050           |

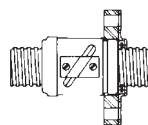
<sup>†</sup> Square configuration.

<sup>‡</sup> Snap ring retainers in ball nut counterbore.

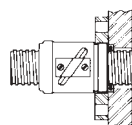
## Typical Methods of Attaching Wipers to V-thread End



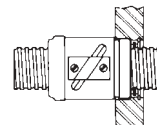
Counterbored flange  
adaptor plate



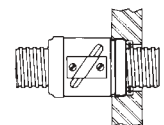
Stamped flange  
retainer plate



Counterbored  
work piece for flange  
attachment



Threaded work piece  
for ball nut attachment  
with snap ring retainer



Threaded work piece  
for ball nut attachment

## Precision Plus Ball Screw Assemblies



### Thomson Saginaw Precision Plus ball screw assemblies offer:

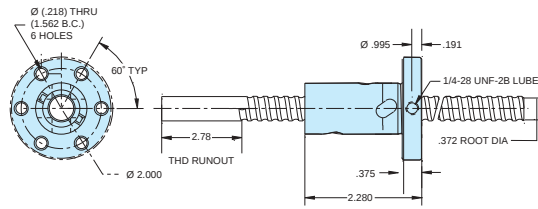
- eight times the lead accuracy of conventional ball screws for an immediate improvement in machine performance.
- zero-lash, high spring rate preloaded design which provides positioning accuracy and repeatability for machine tools, robots, material handling systems, electronic component insertion systems and more.
- a Gothic arch ball groove geometry that extends service life, reduces lash, and optimizes stiffness in preloaded assemblies.
- integral wipers and flanges for system cleanliness and mounting ease.
- optimum efficiency and cost-savings when replacing expensive hydraulic and pneumatic systems.
- predictable service life allowing for the most reliable, economical system designs.
- non-standard lengths available — consult factory.
- availability through over 1800 authorized Thomson distributors worldwide.

# Precision Plus Ball Screw Assemblies

## Product Specifications

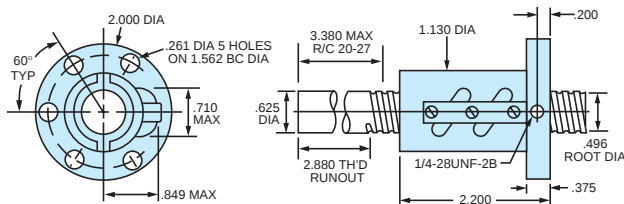
- Lead Accuracies
- Backlash zero
- .0005 in./ft. accuracy standard
- .0002 in./ft. accuracy available

### BALL SCREW ASSEMBLY (SSP™)

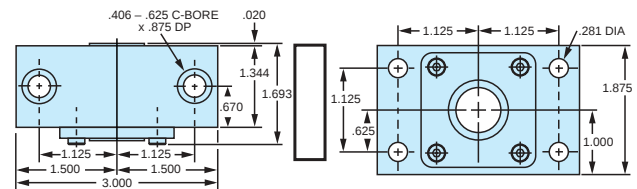


| Ball Circle Diameter (size) | Lead (in.) | General Description      | Assembly Part Number | Dynamic Load (lb <sub>f</sub> ) | Max. Static Load (lb <sub>f</sub> ) | Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|--------------------------|----------------------|---------------------------------|-------------------------------------|-------------|--------------------|-----------------------|-----------------------|
| .500                        | .200       | RH, Preload (42 in. OAL) | 7829724              | 416                             | 1500                                | 3.5         | Integral           | Integral              | 7828282               |

### BALL SCREW ASSEMBLY (SSP™)

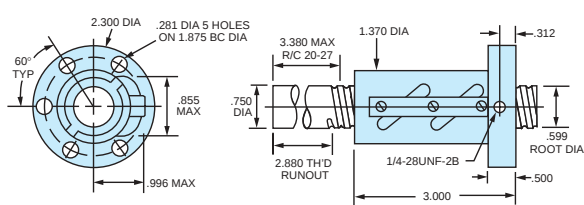


### END BLOCK

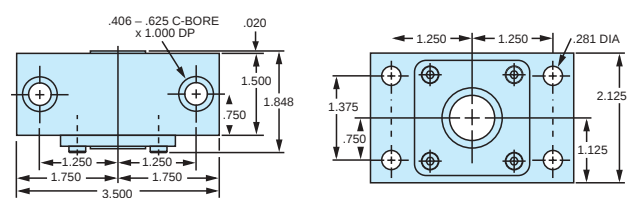


| Ball Circle Diameter (size) | Lead (in.) | General Description      | Assembly Part Number | Dynamic Load (lb <sub>f</sub> ) | Max. Static Load (lb <sub>f</sub> ) | Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|--------------------------|----------------------|---------------------------------|-------------------------------------|-------------|--------------------|-----------------------|-----------------------|
| .631                        | .200       | RH, Preload (42 in. OAL) | 7820396              | 440                             | 2,110                               | 3.61        | Integral           | Integral              | 7824154               |

### BALL SCREW ASSEMBLY (SSP™)



### END BLOCK



| Ball Circle Diameter (size) | Lead (in.) | General Description      | Assembly Part Number | Dynamic Load (lb <sub>f</sub> ) | Max. Static Load (lb <sub>f</sub> ) | Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|--------------------------|----------------------|---------------------------------|-------------------------------------|-------------|--------------------|-----------------------|-----------------------|
| .750                        | .200       | RH, Preload (42 in. OAL) | 5700974              | 1,473                           | 9,916                               | 5.37        | Integral           | Integral              | 7824155               |

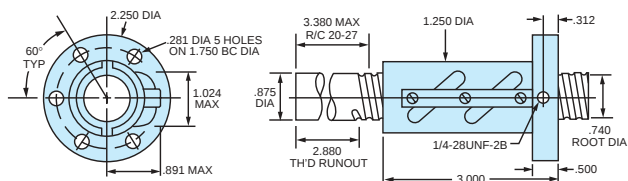
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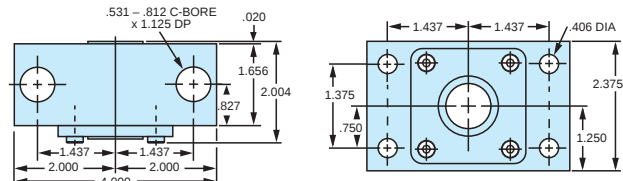
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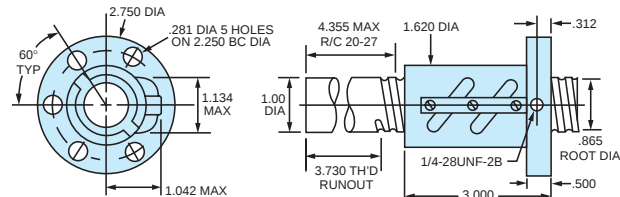


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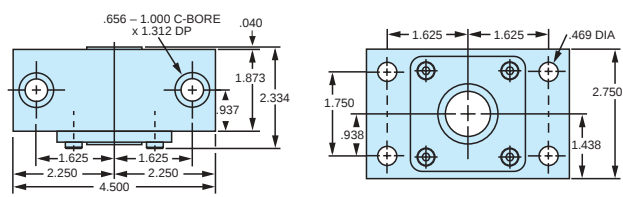


| Ball Circle Diameter (size) | Lead (in.) | General Description      | Assembly Part Number | Dynamic Load (lb <sub>f</sub> ) | Max. Static Load (lb <sub>f</sub> ) | Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|--------------------------|----------------------|---------------------------------|-------------------------------------|-------------|--------------------|-----------------------|-----------------------|
| .75                         | .200       | RH, Preload (60 in. OAL) | 7820397              | 1,375                           | 10,780                              | 9.61        | Integral           | Integral              | 7824156               |

BALL SCREW ASSEMBLY (SSP™)

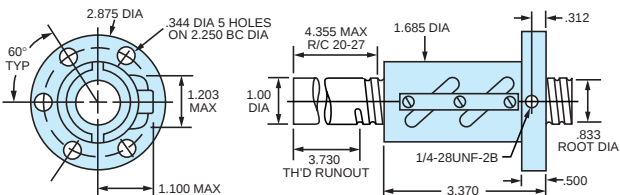


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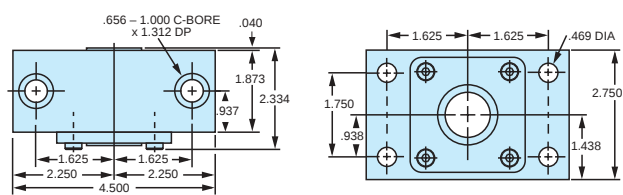


| Ball Circle Diameter (size) | Lead (in.) | General Description     | Assembly Part Number | Dynamic Load (lb <sub>f</sub> ) | Max. Static Load (lb <sub>f</sub> ) | Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|-------------------------|----------------------|---------------------------------|-------------------------------------|-------------|--------------------|-----------------------|-----------------------|
| 1.00                        | .200       | RH Preload (72 in. OAL) | 5700975              | 1,565                           | 13,073                              | 15.24       | Integral           | Integral              | 7824157               |

BALL SCREW ASSEMBLY (SSP™)



END BLOCK



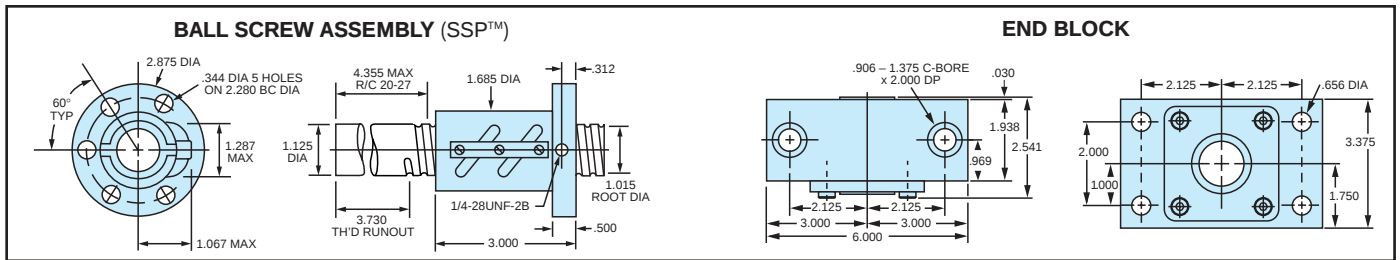
| Ball Circle Diameter (size) | Lead (in.) | General Description      | Assembly Part Number | Dynamic Load (lb <sub>f</sub> ) | Max. Static Load (lb <sub>f</sub> ) | Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|--------------------------|----------------------|---------------------------------|-------------------------------------|-------------|--------------------|-----------------------|-----------------------|
| 1.00                        | .250       | RH, Preload (72 in. OAL) | 7820477              | 2,285                           | 15,815                              | 15.36       | Integral           | Integral              | 7824157               |

## General Description Legend

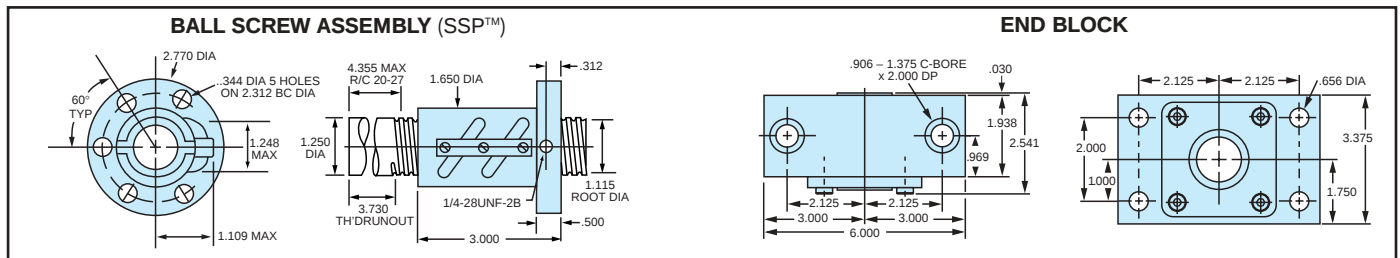
C1 One Circuit  
C2 Two Circuits  
KW Keyway  
LH Left Hand

NP Non-preloaded Ball Nut  
OAL Overall Length  
Preload Preloaded Ball Nut  
RH Right Hand

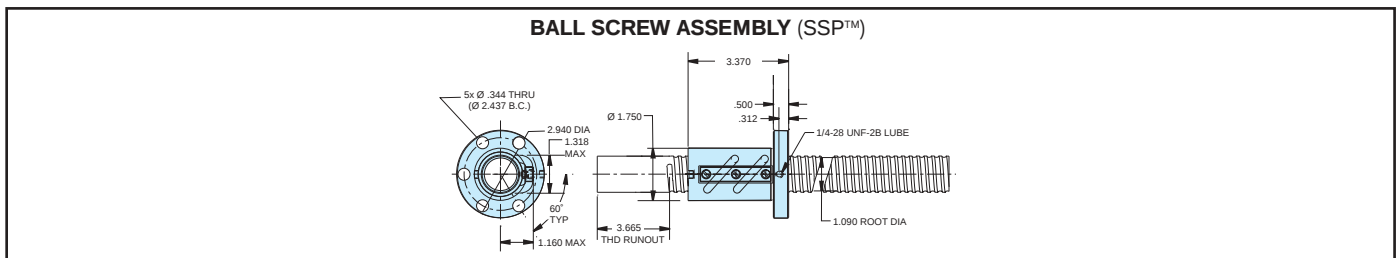
Rnd Round  
Sq. Square  
SS Stainless Steel  
v Valued Priced



| Ball Circle Diameter (size) | Lead (in.) | General Description      | Assembly Part Number | Dynamic Load (lb <sub>f</sub> ) | Max. Static Load (lb <sub>f</sub> ) | Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|--------------------------|----------------------|---------------------------------|-------------------------------------|-------------|--------------------|-----------------------|-----------------------|
| 1.150                       | .200       | RH, Preload (72 in. OAL) | 5700976              | 1,680                           | 14,886                              | 20.35       | Integral           | Integral              | 7824158               |



| Ball Circle Diameter (size) | Lead (in.) | General Description      | Assembly Part Number | Dynamic Load (lb <sub>f</sub> ) | Max. Static Load (lb <sub>f</sub> ) | Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|--------------------------|----------------------|---------------------------------|-------------------------------------|-------------|--------------------|-----------------------|-----------------------|
| 1.250                       | .200       | RH, Preload (72 in. OAL) | 5700977              | 1,800                           | 16,625                              | 23.68       | Integral           | Integral              | 7824158               |
|                             |            | LH, Preload (72 in. OAL) | 7820830              | 1,800                           | 16,625                              | 23.68       | Integral           | Integral              | 7824158               |



| Ball Circle Diameter (size) | Lead (in.) | General Description      | Assembly Part Number | Dynamic Load (lb <sub>f</sub> ) | Max. Static Load (lb <sub>f</sub> ) | Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|--------------------------|----------------------|---------------------------------|-------------------------------------|-------------|--------------------|-----------------------|-----------------------|
| 1.250                       | .250       | RH, Preload (72 in. OAL) | 7829725              | 2624                            | 13200                               | 23.68       | Integral           | Integral              | 7824158               |

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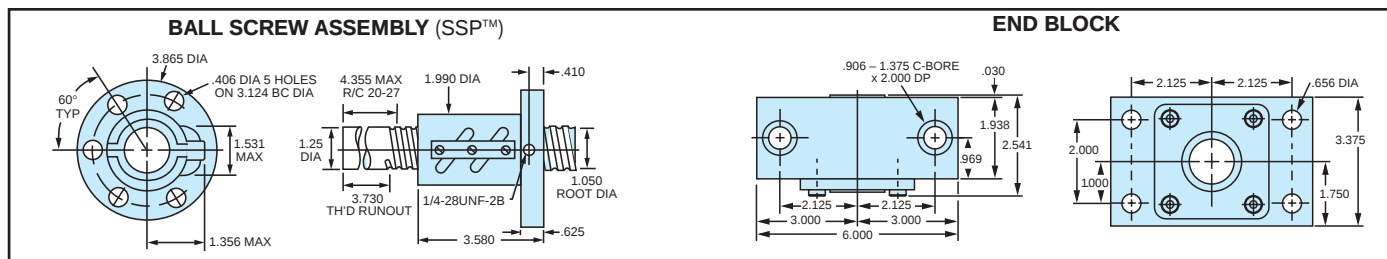
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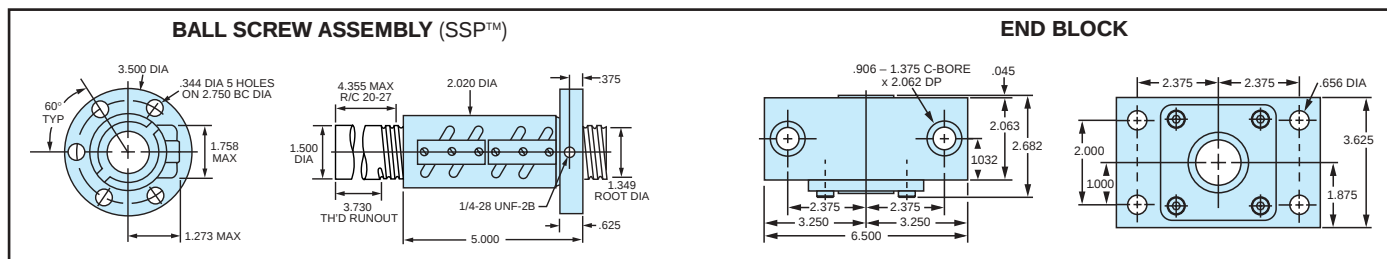
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# Precision Plus Ball Screw Assemblies

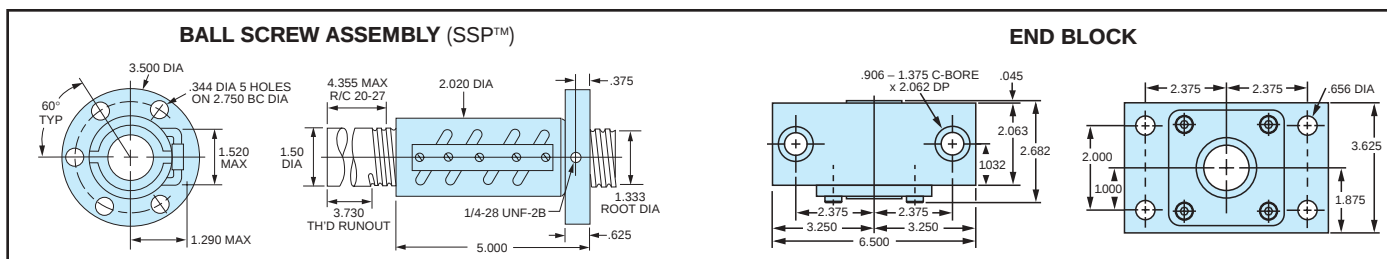
(continued)



| Ball Circle Diameter (size) | Lead (in.) | General Description      | Assembly Part Number | Dynamic Load (lb <sub>f</sub> ) | Max. Static Load (lb <sub>f</sub> ) | Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|--------------------------|----------------------|---------------------------------|-------------------------------------|-------------|--------------------|-----------------------|-----------------------|
| 1.250                       | .500       | RH, Preload (96 in. OAL) | 7820399              | 1,765                           | 11,080                              | 25.61       | Integral           | Integral              | 7824158               |



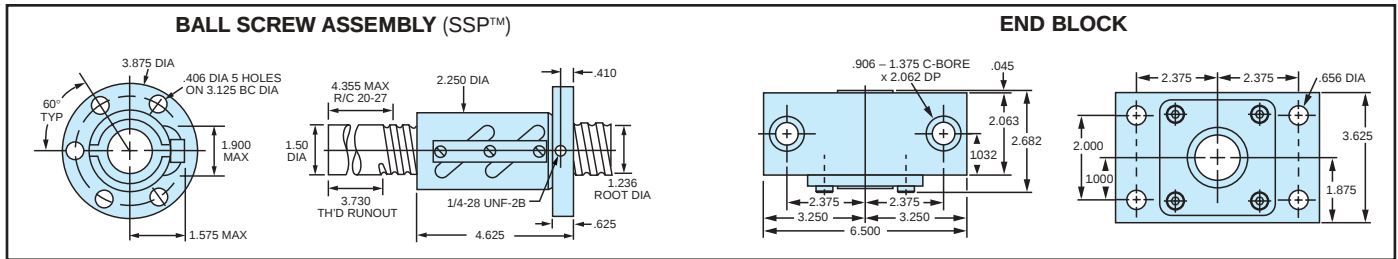
| Ball Circle Diameter (size) | Lead (in.) | General Description       | Assembly Part Number | Dynamic Load (lb <sub>f</sub> ) | Max. Static Load (lb <sub>f</sub> ) | Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------------|----------------------|---------------------------------|-------------------------------------|-------------|--------------------|-----------------------|-----------------------|
| 1.500                       | .200       | RH, Preload (120 in. OAL) | 7820375              | 4,745                           | 45,073                              | 45.84       | Integral           | Integral              | 7824159               |



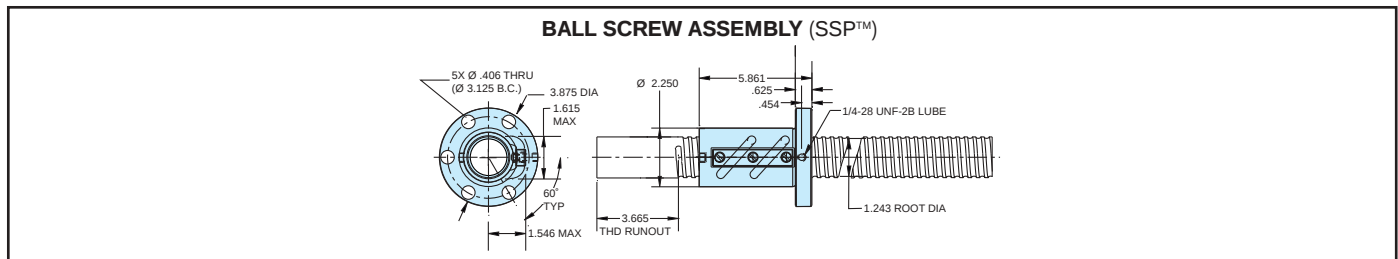
| Ball Circle Diameter (size) | Lead (in.) | General Description       | Assembly Part Number | Dynamic Load (lb <sub>f</sub> ) | Max. Static Load (lb <sub>f</sub> ) | Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------------|----------------------|---------------------------------|-------------------------------------|-------------|--------------------|-----------------------|-----------------------|
| 1.500                       | .250       | RH, Preload (120 in. OAL) | 7820965              | 4,250                           | 27,250                              | 45.83       | Integral           | Integral              | 7824159               |

## General Description Legend

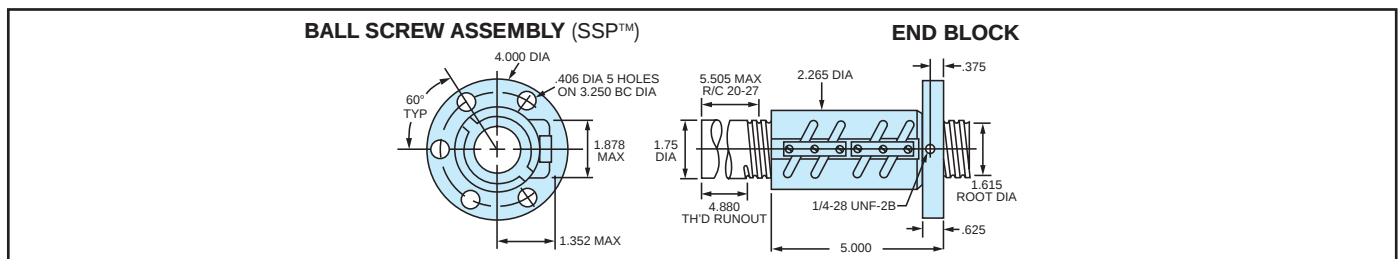
|    |              |         |                        |     |                 |
|----|--------------|---------|------------------------|-----|-----------------|
| C1 | One Circuit  | NP      | Non-preloaded Ball Nut | Rnd | Round           |
| C2 | Two Circuits | OAL     | Overall Length         | Sq. | Square          |
| KW | Keyway       | Preload | Preloaded Ball Nut     | SS  | Stainless Steel |
| LH | Left Hand    | RH      | Right Hand             | v   | Valued Priced   |



| Ball Circle Diameter (size) | Lead (in.) | General Description       | Assembly Part Number | Dynamic Load (lb <sub>f</sub> ) | Max. Static Load (lb <sub>f</sub> ) | Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------------|----------------------|---------------------------------|-------------------------------------|-------------|--------------------|-----------------------|-----------------------|
| 1.500                       | .500       | RH, Preload (120 in. OAL) | 7820401              | 5,075                           | 35,770                              | 46.05       | Integral           | Integral              | 7824159               |



| Ball Circle Diameter (size) | Lead (in.) | General Description     | Assembly Part Number | Dynamic Load (lb <sub>f</sub> ) | Max. Static Load (lb <sub>f</sub> ) | Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|-------------------------|----------------------|---------------------------------|-------------------------------------|-------------|--------------------|-----------------------|-----------------------|
| 1.500                       | 1.000      | RH, Preload (96 in OAL) | 7829726              | 3,712                           | 21,500                              | 46.05       | Integral           | Integral              | 7824159               |



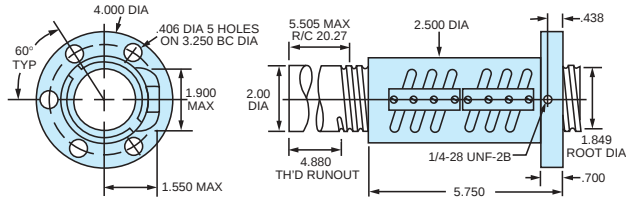
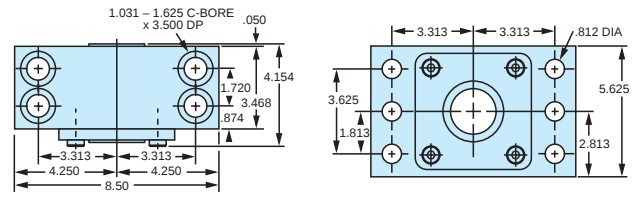
| Ball Circle Diameter (size) | Lead (in.) | General Description     | Assembly Part Number | Dynamic Load (lb <sub>f</sub> ) | Max. Static Load (lb <sub>f</sub> ) | Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|-------------------------|----------------------|---------------------------------|-------------------------------------|-------------|--------------------|-----------------------|-----------------------|
| 1.750                       | .200       | RH, Preload (96 in OAL) | 5700979              | 4,464                           | 47,446                              | 64.08       | Integral           | Integral              | 7829554               |

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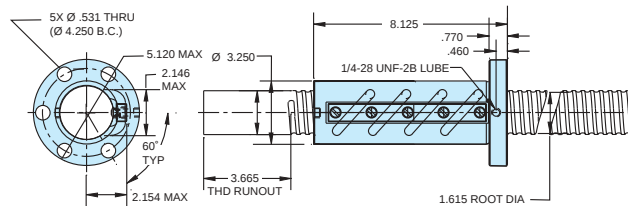
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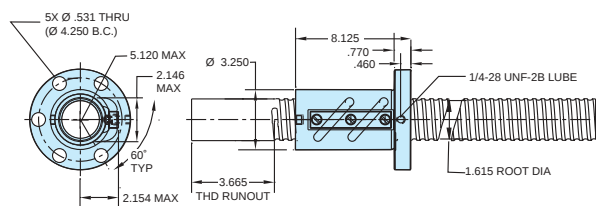
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**BALL SCREW ASSEMBLY (SSP™)**

**END BLOCK**


| Ball Circle Diameter (size) | Lead (in.) | General Description       | Assembly Part Number | Dynamic Load (lb <sub>f</sub> ) | Max. Static Load (lb <sub>f</sub> ) | Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------------|----------------------|---------------------------------|-------------------------------------|-------------|--------------------|-----------------------|-----------------------|
| 2.000                       | .200       | RH, Preload (120 in. OAL) | 7820402              | 6,181                           | 65,903                              | 82.44       | Integral           | Integral              | 7824160               |

**BALL SCREW ASSEMBLY (SSP™)**


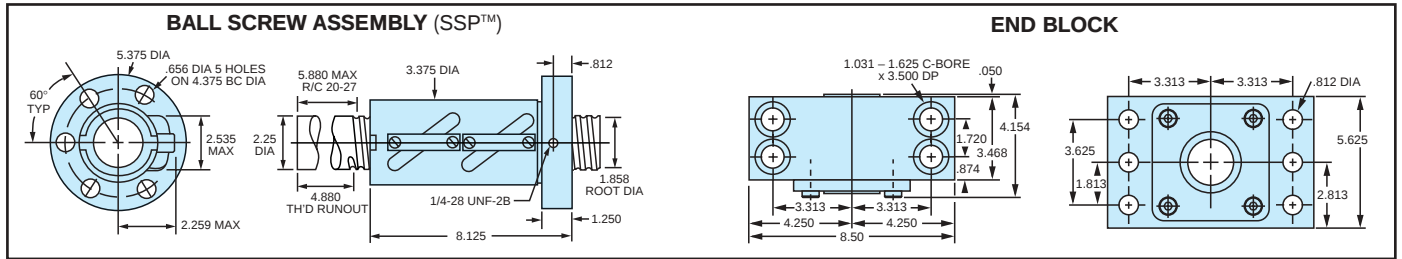
| Ball Circle Diameter (size) | Lead (in.) | General Description      | Assembly Part Number | Dynamic Load (lb <sub>f</sub> ) | Max. Static Load (lb <sub>f</sub> ) | Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|--------------------------|----------------------|---------------------------------|-------------------------------------|-------------|--------------------|-----------------------|-----------------------|
| 2.000                       | .500       | RH, Preload (96 in. OAL) | 7829727              | 20500                           | 10600                               | 82.44       | Integral           | Integral              | 7824160               |

**BALL SCREW ASSEMBLY (SSP™)**


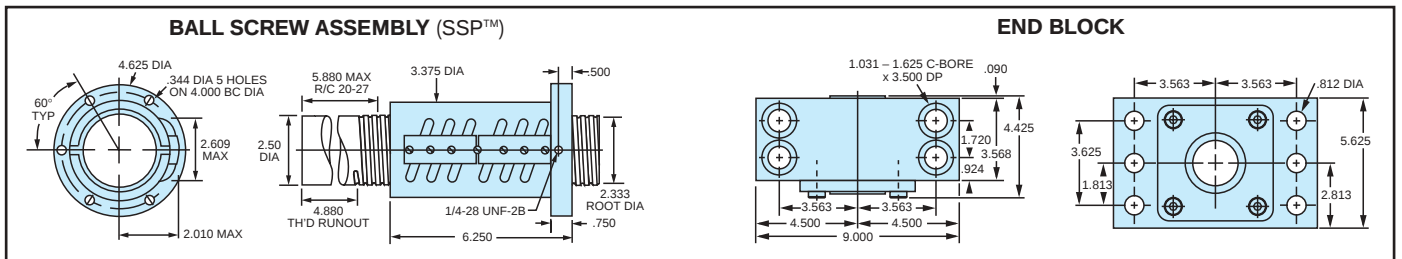
| Ball Circle Diameter (size) | Lead (in.) | General Description     | Assembly Part Number | Dynamic Load (lb <sub>f</sub> ) | Max. Static Load (lb <sub>f</sub> ) | Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|-------------------------|----------------------|---------------------------------|-------------------------------------|-------------|--------------------|-----------------------|-----------------------|
| 2.000                       | 1.000      | RH, Preload (96 in OAL) | 7829728              | 13075                           | 55,000                              | 82.44       | Integral           | Integral              | 7824160               |

**General Description Legend**

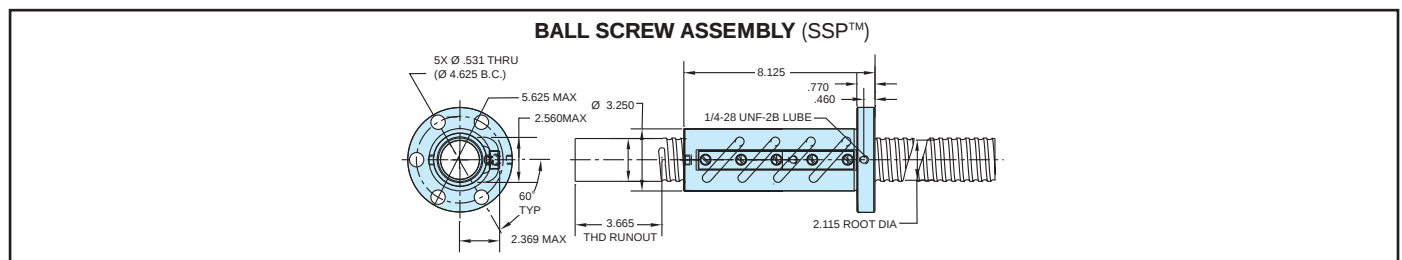
|    |              |         |                        |     |                 |
|----|--------------|---------|------------------------|-----|-----------------|
| C1 | One Circuit  | NP      | Non-preloaded Ball Nut | Rnd | Round           |
| C2 | Two Circuits | OAL     | Overall Length         | Sq. | Square          |
| KW | Keyway       | Preload | Preloaded Ball Nut     | SS  | Stainless Steel |
| LH | Left Hand    | RH      | Right Hand             | v   | Valued Priced   |



| Ball Circle Diameter (size) | Lead (in.) | General Description       | Assembly Part Number | Dynamic Load (lb <sub>f</sub> ) | Max. Static Load (lb <sub>f</sub> ) | Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------------|----------------------|---------------------------------|-------------------------------------|-------------|--------------------|-----------------------|-----------------------|
| 2.250                       | .500       | RH, Preload (120 in. OAL) | 7820484              | 20,160                          | 108,325                             | 100.87      | Integral           | Integral              | 7824160               |



| Ball Circle Diameter (size) | Lead (in.) | General Description       | Assembly Part Number | Dynamic Load (lb <sub>f</sub> ) | Max. Static Load (lb <sub>f</sub> ) | Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|---------------------------|----------------------|---------------------------------|-------------------------------------|-------------|--------------------|-----------------------|-----------------------|
| 2.500                       | .250       | RH, Preload (120 in. OAL) | 7820483              | 8,945                           | 93,165                              | 133.50      | Integral           | Integral              | 7824161               |



| Ball Circle Diameter (size) | Lead (in.) | General Description      | Assembly Part Number | Dynamic Load (lb <sub>f</sub> ) | Max. Static Load (lb <sub>f</sub> ) | Weight (lb) | Flange Part Number | Wiper Kit Part Number | End Block Part Number |
|-----------------------------|------------|--------------------------|----------------------|---------------------------------|-------------------------------------|-------------|--------------------|-----------------------|-----------------------|
| 2.500                       | .500       | RH, Preload (96 in. OAL) | 7829729              | 24000                           | 140000                              | 133.50      | Integral           | Integral              | 7824161               |

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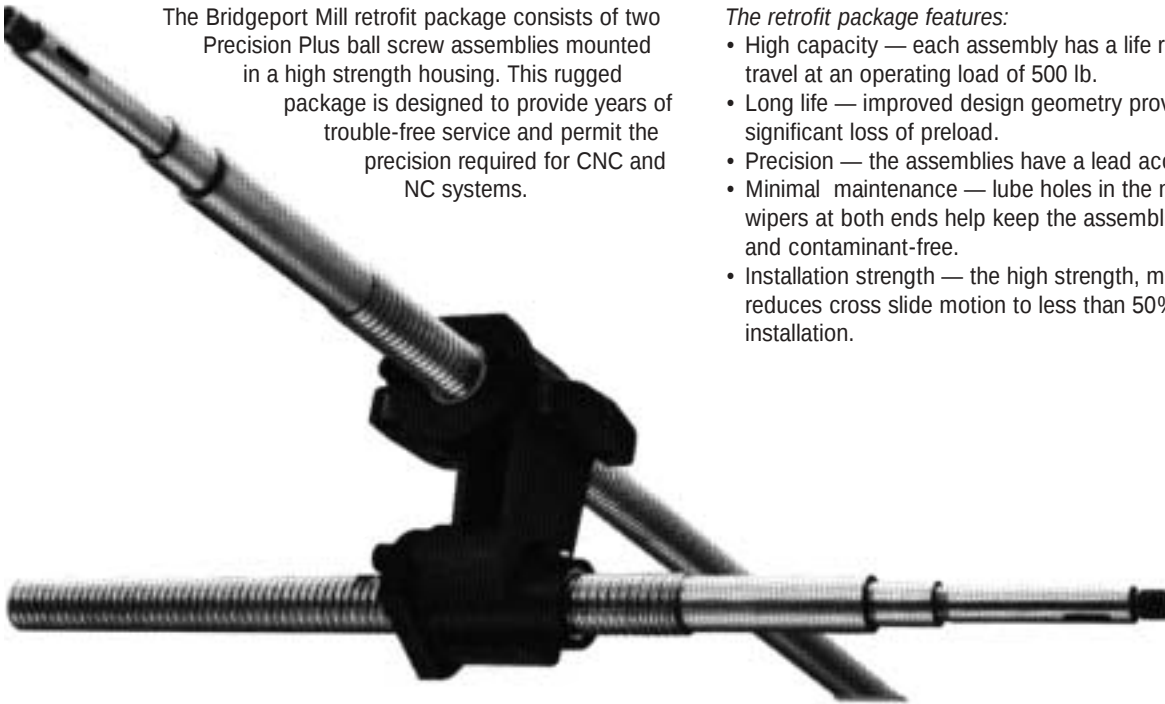
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# Precision Plus Ball Screw Assemblies for Bridgeport Mill Retrofit

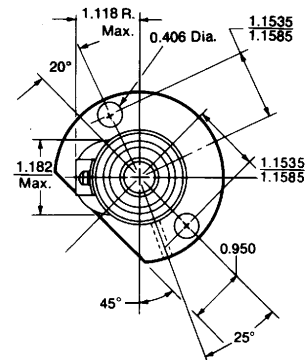
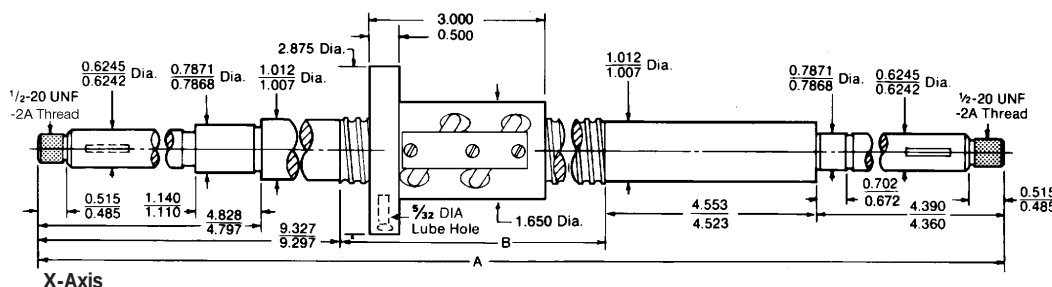
The Bridgeport Mill retrofit package consists of two Precision Plus ball screw assemblies mounted in a high strength housing. This rugged package is designed to provide years of trouble-free service and permit the precision required for CNC and NC systems.

The retrofit package features:

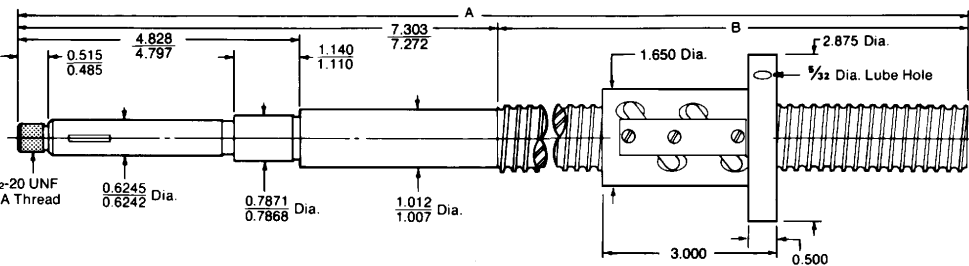
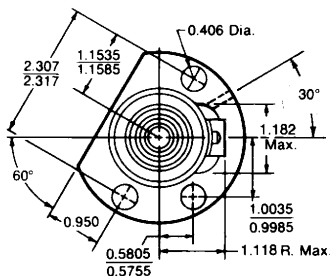
- High capacity — each assembly has a life rating of 50 million in. travel at an operating load of 500 lb.
- Long life — improved design geometry provides long life with no significant loss of preload.
- Precision — the assemblies have a lead accuracy of .0005 in./ft.
- Minimal maintenance — lube holes in the nuts and special plastic wipers at both ends help keep the assemblies running smoothly and contaminant-free.
- Installation strength — the high strength, machined housing reduces cross slide motion to less than 50% of the original installation.



## Precision Plus Standard Single-Nut Preloaded Traverse Screws



| Ball Circle Diameter | Lead | General Description | Part Number | Table Size | A      | B          |
|----------------------|------|---------------------|-------------|------------|--------|------------|
| 1.250                | .200 | RH                  | 7820413     | 32 in.     | 42 in. | 23.775 in. |
| 1.250                | .200 | RH                  | 7820414     | 36 in.     | 46 in. | 27.775 in. |
| 1.250                | .200 | RH                  | 7820413     | 32 in.     | 42 in. | 23.775 in. |
| 1.250                | .200 | RH                  | 7820414     | 36 in.     | 46 in. | 27.775 in. |



Y-Axis

| Ball Circle Diameter | Lead | General Description | Part Number | Table Size | A      | B          |
|----------------------|------|---------------------|-------------|------------|--------|------------|
| 1.250                | .200 | LH                  | 5700509     | 9 in.      | 21 in. | 13.212 in. |
| 1.250                | .200 | LH                  | 5700512     | 12 in.     | 24 in. | 16.712 in. |

# Metric Ball Screw Assemblies

ISO-Class 3, 5, 7, and 9



## Thomson Saginaw metric ball screw assemblies offer:

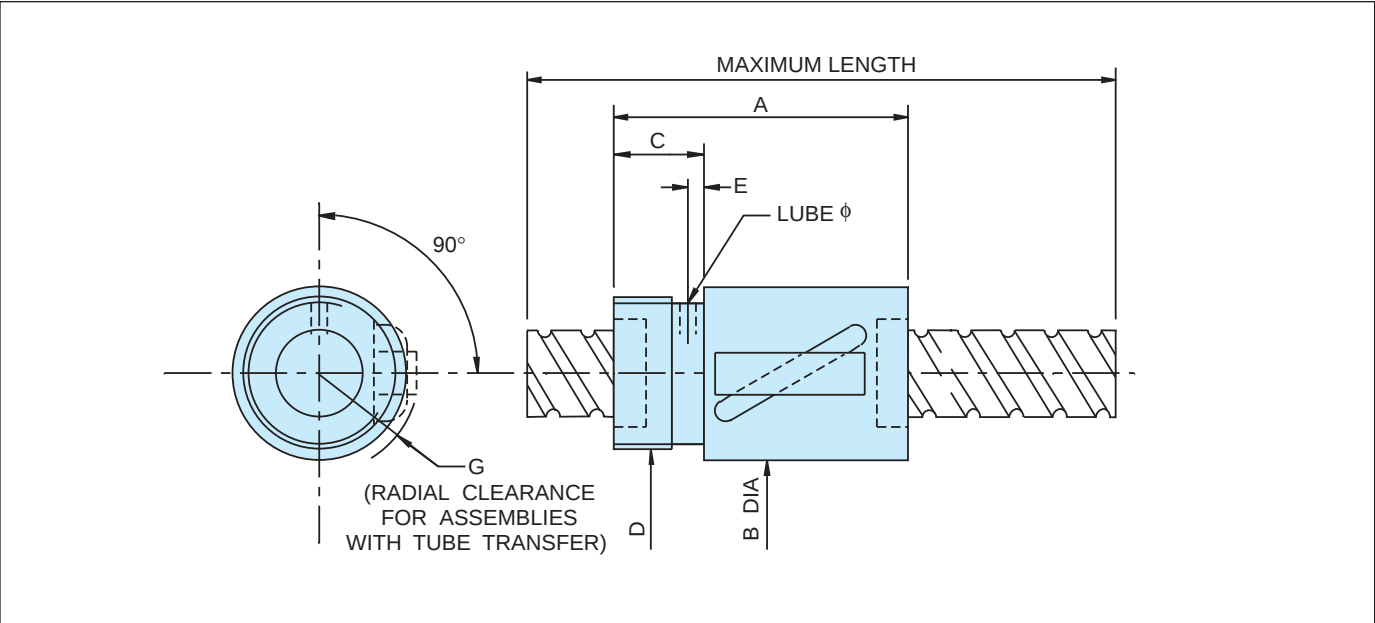
- lead accuracies up to eight times those of conventional ball screws for an immediate improvement in machine performance.
- zero-lash, preloaded designs available with a high spring rate that provides positioning accuracy and repeatability for machine tools, robots, material handling systems, electronic component insertion systems, and more.
- a gothic arch ball groove geometry to extend service life, and optimize stiffness in preloaded assemblies.
- Maximum lead error
  - Class 3 - 12 $\mu$ m / 300mm (.0005"/ft)
  - Class 5 - 23 $\mu$ m / 300mm (.001"/ft)
  - Class 7 - 52 $\mu$ m / 300mm (.002"/ft)
  - Class 9 - 100 $\mu$ m / 300mm (.004"/ft)
- integral wipers and flanges contributing to system cleanliness and mounting ease.
- optimum efficiency and cost savings when replacing expensive hydraulic and pneumatic systems.
- predictable service life for the most reliable, economical system designs.
- availability through more than 1,800 authorized Thomson distributors worldwide.

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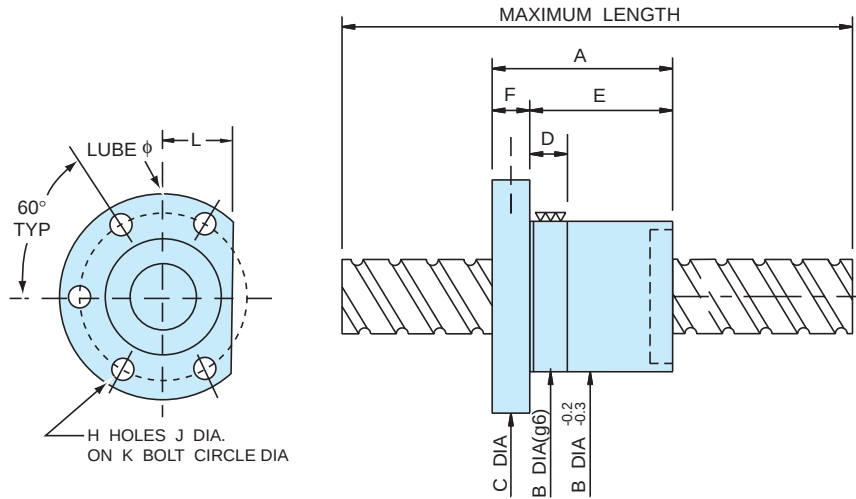
Class 5 (V-Thread) Metric Ball Screw Assemblies



| Dia. | Lead | Ball Nut*<br>Part Number | Screw<br>Part Number | Max.<br>Screw<br>Length | A    | B    | C    | D       | E   | Lube φ | G    | Dynamic<br>Load**<br>(KN) | Static<br>Load<br>(KN) |
|------|------|--------------------------|----------------------|-------------------------|------|------|------|---------|-----|--------|------|---------------------------|------------------------|
| 16   | 5    | 7827954                  | 7830028-5            | 3000                    | 55.5 | 32.0 | 16.5 | M30x1.5 | 3.0 | 3.0    | 16.0 | 13.0                      | 16.4                   |
| 16   | 10   | 7827955                  | 7830029-5            | 3000                    | 58.2 | 32.0 | 16.5 | M30x1.5 | 3.0 | 3.0    | 19.0 | 6.0                       | 6.6                    |
| 16   | 16   | 7827956                  | 7830030-5            | 3000                    | 62.5 | 32.0 | 16.5 | M30x1.5 | 3.0 | 3.0    | 19.5 | 5.0                       | 6.0                    |
| 20   | 5    | 7827957                  | 7830031-5            | 3000                    | 55.5 | 40.0 | 16.5 | M36x1.5 | 3.0 | 3.0    | 20.0 | 5.2                       | 22.3                   |
| 20   | 10   | 7827958                  | 7830032-5            | 3000                    | 58.5 | 40.0 | 16.5 | M36x1.5 | 3.0 | 3.0    | 22.0 | 7.0                       | 8.8                    |
| 20   | 20   | 7827959                  | 7830033-5            | 3000                    | 71.0 | 40.0 | 16.5 | M36x1.5 | 3.0 | 3.0    | 22.0 | 6.7                       | 8.5                    |
| 25   | 5    | 7827960                  | 7830034-5            | 4000                    | 58.5 | 44.0 | 19.0 | M40x1.5 | 3.0 | 3.0    | 22.0 | 18.3                      | 29.8                   |
| 25   | 10   | 7827961                  | 7830035-5            | 4000                    | 77.0 | 44.0 | 19.0 | M40x1.5 | 3.0 | 3.0    | 22.0 | 22.8                      | 30.1                   |
| 25   | 25   | 7827962                  | 7830036-5            | 4000                    | 84.0 | 44.0 | 19.0 | M40x1.5 | 3.0 | 3.0    | 25.0 | 10.0                      | 13.3                   |

All dimensions in mm.  
Nuts are only shipped assembled on Class 5 screw stock.  
\*Specify preloaded or non-preloaded on quote request.  
\*\*Dynamic load capacity is based on 10<sup>6</sup> revolutions per ISO-3408-5.

# Class 5 (Five-Hole Flanged) Metric Ball Screw Assemblies



| Dia. | Lead | Nut*<br>Part<br>Number | Screw<br>Part<br>Number | Max.<br>Screw<br>Length | A     | B    | C     | D    | E     | F    | H | J    | K    | L    | Lube φ | Dynamic**<br>Load<br>(KN) | Static<br>Load<br>(KN) |
|------|------|------------------------|-------------------------|-------------------------|-------|------|-------|------|-------|------|---|------|------|------|--------|---------------------------|------------------------|
| 12   | 5    | 7829045                | 7827808-5               | 1050                    | 45.0  | 24.0 | 40.0  | 11.0 | 33.0  | 12.0 | 5 | 4.6  | 32.0 | 14.0 | M6x1   | 5.6                       | 6.2                    |
| 12   | 10†  | 7829046                | 7827809-5               | 1050                    | 43.0  | 24.0 | 44.0  | 11.0 | 33.0  | 10.0 | 5 | 5.5  | 34.0 | 15.0 | M6x1   | 3.7                       | 3.9                    |
| 16   | 5    | 7829047                | 7827810-5               | 1500                    | 48.0  | 28.0 | 53.0  | 12.0 | 33.0  | 15.0 | 5 | 6.6  | 40.0 | 17.0 | M6x1   | 9.4                       | 11.1                   |
| 16   | 10†  | 7829048                | 7827811-5               | 1500                    | 51.0  | 40.0 | 63.0  | 10.0 | 40.0  | 11.0 | 5 | 6.6  | 51.0 | 24.0 | M6x1   | 6.0                       | 6.6                    |
| 16   | 16†  | 7829049                | 7827812-5               | 1500                    | 52.0  | 40.0 | 63.0  | 10.0 | 41.0  | 11.0 | 5 | 6.6  | 51.0 | 24.0 | M6x1   | 5.7                       | 6.4                    |
| 20   | 5    | 7829050                | 7827813-5               | 1500                    | 48.0  | 33.0 | 58.0  | 12.0 | 33.0  | 15.0 | 5 | 6.6  | 45.0 | 22.0 | M6x1   | 11.1                      | 15.1                   |
| 20   | 10†  | 7829051                | 7827814-5               | 1500                    | 58.0  | 44.0 | 58.0  | 11.0 | 43.0  | 15.0 | 5 | 6.6  | 55.0 | 25.0 | M6x1   | 7.0                       | 8.8                    |
| 20   | 20†  | 7829052                | 7827815-5               | 1500                    | 83.0  | 40.0 | 63.0  | 15.0 | 63.0  | 20.0 | 5 | 6.6  | 50.0 | 21.0 | M6x1   | 8.5                       | 11.3                   |
| 25   | 5    | 7829053                | 7827816-5               | 2000                    | 53.0  | 38.0 | 63.0  | 11.0 | 33.0  | 20.0 | 5 | 6.6  | 50.0 | 21.0 | M6x1   | 14.3                      | 22.3                   |
| 25   | 10   | 7829054                | 7827817-5               | 2000                    | 59.0  | 38.0 | 63.0  | 12.0 | 47.0  | 12.0 | 5 | 6.6  | 50.0 | 21.0 | M6x1   | 16.1                      | 20.1                   |
| 25   | 25†  | 7829055                | 7827818-5               | 2000                    | 100.0 | 48.0 | 73.0  | 15.0 | 75.0  | 25.0 | 5 | 6.6  | 60.0 | 26.0 | M6x1   | 12.8                      | 17.7                   |
| 32   | 5    | 7829056                | 7827819-5               | 2000                    | 51.0  | 48.0 | 73.0  | 12.0 | 32.5  | 18.5 | 5 | 6.6  | 60.0 | 26.0 | M6x1   | 16.4                      | 30.2                   |
| 32   | 10   | 7829057                | 7827820-5               | 2000                    | 72.0  | 50.0 | 80.0  | 12.0 | 60.0  | 12.0 | 5 | 9.0  | 65.0 | 28.5 | M6x1   | 27.4                      | 42.5                   |
| 32   | 32   | 7829058                | 7827821-5               | 2000                    | 96.0  | 55.0 | 93.0  | 15.0 | 84.0  | 12.0 | 5 | 9.0  | 78.0 | 35.0 | M6x1   | 18.9                      | 28.6                   |
| 40   | 5†   | 7829059                | 7827822-5               | 4000                    | 53.0  | 56.0 | 80.0  | 12.0 | 34.0  | 19.0 | 5 | 6.6  | 68.0 | 30.0 | M6x1   | 18.3                      | 39.1                   |
| 40   | 10†  | 7829060                | 7827823-5               | 4000                    | 85.0  | 63.0 | 95.0  | 15.0 | 60.0  | 25.0 | 5 | 9.0  | 78.0 | 34.0 | M6x1   | 43.1                      | 67.1                   |
| 40   | 20†  | 7829061                | 7827824-5               | 4000                    | 62.0  | 75.0 | 110.0 | 16.0 | 46.0  | 16.0 | 5 | 11.0 | 93.0 | 42.5 | M8x1   | 31.0                      | 47.0                   |
| 40   | 32†  | 7829062                | 7827825-5               | 4000                    | 88.0  | 67.0 | 105.0 | 16.0 | 76.0  | 12.0 | 5 | 9.0  | 85.0 | 37.0 | M6x1   | 23.0                      | 41.2                   |
| 40   | 40†  | 7829063                | 7827826-5               | 4000                    | 126.0 | 72.0 | 110.0 | 16.0 | 110.0 | 16.0 | 5 | 11.0 | 93.0 | 42.5 | M8x1   | 29.8                      | 45.4                   |
| 40   | 50†  | 7829064                | 7827827-5               | 4000                    | 150.0 | 72.0 | 110.0 | 16.0 | 130.0 | 20.0 | 5 | 11.0 | 90.0 | 42.5 | M8x1   | 32.0                      | 46.0                   |
| 50   | 50†  | 7829065                | 7827828-5               | 4000                    | 122.0 | 78.0 | 110.0 | 16.0 | 106.0 | 16.0 | 5 | 11.0 | 93.0 | 42.5 | M8x1   | 34.1                      | 59.6                   |

All dimensions in mm.

Nuts are only shipped assembled on Class 5 screw stock.

\*Specify preloaded or non-preloaded on quote request.

\*\*Dynamic load capacity is based on 10<sup>6</sup> revolutions per ISO-3408-5.

†These are external return or end return products. Consider in the DN evaluation.

To order, call 989-776-4123

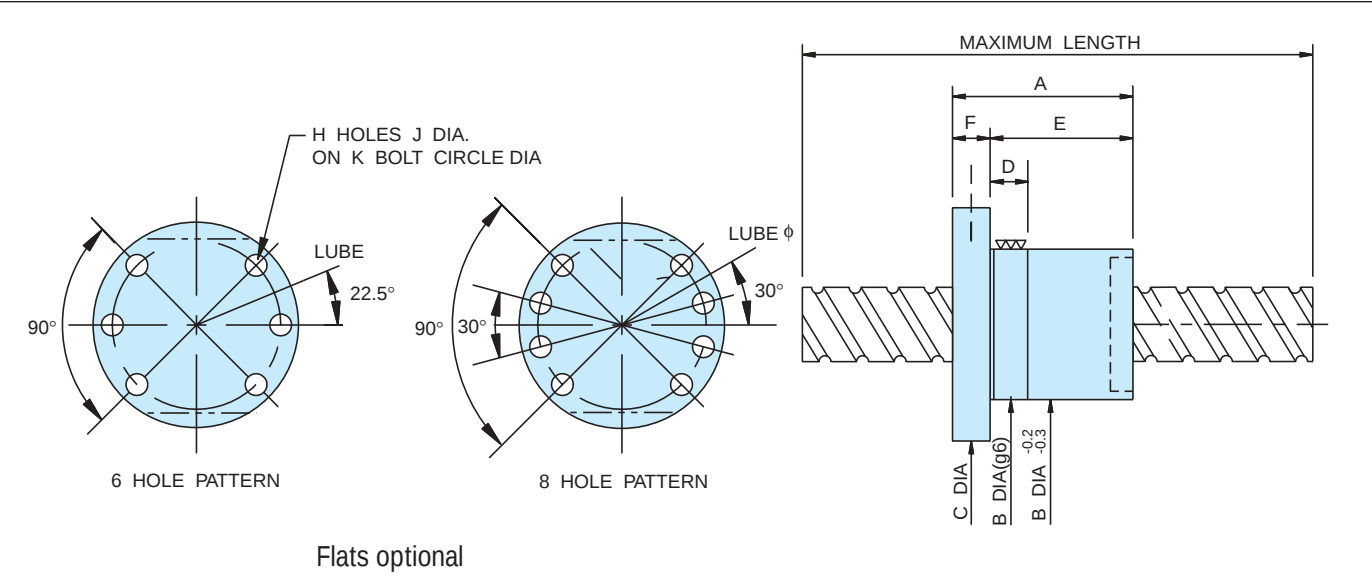
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# Class 5, 7, and 9 Metric Ball Screw Assemblies



## Nut and Screw Part Numbers

| Dia. | Lead | Class 5          |                   | Class 7         |                   | Class 9          |                   | Maximum Length |
|------|------|------------------|-------------------|-----------------|-------------------|------------------|-------------------|----------------|
|      |      | Nut* Part Number | Screw Part Number | Nut*Part Number | Screw Part Number | Nut* Part Number | Screw Part Number |                |
| 16   | 5    | 7831778          | 7827810-5         | 7831779         | 7827810-7         | 7831779          | 7827810-9         | 3000           |
| 20   | 5    | 7831781          | 7827813-5         | 7831782         | 7827813-7         | 7831782          | 7827813-9         | 3000           |
| 25   | 5    | 7831784          | 7827816-5         | 7831785         | 7827816-7         | 7831785          | 7827816-9         | 4000           |
| 25   | 10   | 7831787          | 7827817-5         | 7831788         | 7827817-7         | 7831788          | 7827817-9         | 4000           |
| 32   | 5    | 7831790          | 7827819-5         | 7831791         | 7827819-7         | 7831791          | 7827819-9         | 4000           |
| 32   | 10   | 7831793          | 7827820-5         | 7831794         | 7827820-7         | 7831794          | 7827820-9         | 4000           |
| 40   | 5    | 7831796          | 7827822-5         | 7831797         | 7827822-7         | 7831797          | 7827822-9         | 4000           |
| 40   | 10   | 7831799          | 7827823-5         | 7831800         | 7827823-7         | 7831800          | 7827823-9         | 4000           |
| 50   | 10   | 7831802          | 7827828-5         | 7831803         | 7827828-7         | 7831803          | 7827828-9         | 4000           |
| 50   | 20   | 7831805          | 7831815-5         | 7831806         | 7831815-7         | 7831806          | 7831815-9         | 4000           |

## Classes 5, 7, 9 Dimensions and Specifications

| Dia. | Lead | A     | B    | C     | D    | E     | F    | H | J    | K    | Lube $\phi$ |
|------|------|-------|------|-------|------|-------|------|---|------|------|-------------|
| 16   | 5    | 45.0  | 28.0 | 48.0  | 10.0 | 35.0  | 10.0 | 6 | 5.5  | 38.0 | M6x1        |
| 20   | 5    | 45.0  | 36.0 | 58.0  | 10.0 | 35.0  | 10.0 | 6 | 6.6  | 47.0 | M6x1        |
| 25   | 5    | 45.0  | 40.0 | 62.0  | 10.0 | 35.0  | 10.0 | 6 | 6.6  | 51.0 | M6x1        |
| 25   | 10   | 68.0  | 40.0 | 62.0  | 10.0 | 58.0  | 10.0 | 6 | 6.6  | 51.0 | M6x1        |
| 32   | 5    | 47.0  | 50.0 | 80.0  | 12.0 | 35.0  | 12.0 | 6 | 9.0  | 65.0 | M6x1        |
| 32   | 10   | 83.0  | 50.0 | 80.0  | 12.0 | 71.0  | 12.0 | 6 | 9.0  | 65.0 | M6x1        |
| 40   | 5    | 54.0  | 63.0 | 93.0  | 15.0 | 40.0  | 14.0 | 8 | 9.0  | 78.0 | M8x1        |
| 40   | 10   | 86.0  | 63.0 | 93.0  | 15.0 | 72.0  | 14.0 | 8 | 9.0  | 78.0 | M8x1        |
| 50   | 10   | 88.0  | 75.0 | 110.0 | 15.0 | 72.0  | 16.0 | 8 | 11.0 | 93.0 | M8x1        |
| 50   | 20   | 118.0 | 75.0 | 110.0 | 15.0 | 102.0 | 16.0 | 8 | 11.0 | 93.0 | M8x1        |

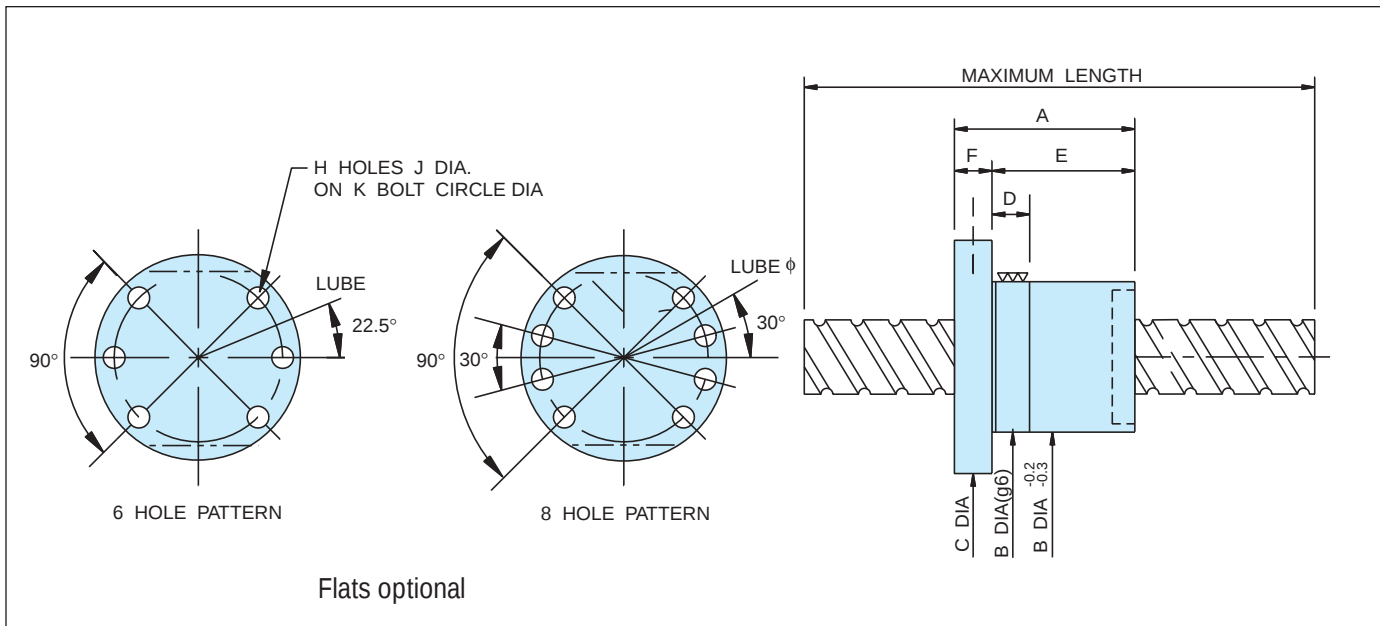
## Load Capacities (KN)

| Assembly Class                 | Diameter x Lead |              |              |              |              |              |              |              |               |               |
|--------------------------------|-----------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|---------------|
|                                | 16 x 5          | 20 x 5       | 25 x 5       | 25 x 10      | 32 x 5       | 32 x 10      | 40 x 5       | 40 x 10      | 50 x 10       | 50 x 20       |
| Class 5<br>Dynamic**<br>Static | 10.5<br>12.3    | 12.4<br>16.8 | 14.3<br>22.3 | 22.8<br>30.0 | 16.4<br>30.1 | 42.0<br>63.7 | 23.5<br>52.1 | 55.2<br>89.4 | 63.7<br>119.1 | 58.4<br>101.0 |
|                                |                 |              |              |              |              |              |              |              |               |               |
| Class 7<br>Dynamic**<br>Static | 9.5<br>11.1     | 11.2<br>15.1 | 12.9<br>20.1 | 20.5<br>27.0 | 14.8<br>27.1 | 37.8<br>57.3 | 21.1<br>46.9 | 49.7<br>80.5 | 57.3<br>107.2 | 51.9<br>90.7  |
|                                |                 |              |              |              |              |              |              |              |               |               |
| Class 9<br>Dynamic**<br>Static | 7.4<br>8.6      | 8.7<br>11.8  | 10.0<br>15.6 | 16.0<br>21.0 | 11.5<br>21.1 | 29.4<br>44.6 | 16.5<br>36.5 | 38.7<br>62.6 | 44.6<br>83.4  | 40.9<br>70.7  |
|                                |                 |              |              |              |              |              |              |              |               |               |

All dimensions in mm.  
Class 5 nuts are only shipped assembled on screw stock.

\*Specify preloaded or non-preloaded on quote request.  
\*\*Dynamic load capacity is based on 10<sup>6</sup> revolutions per ISO-3408-5.

# Class 3 Preloaded Metric Ball Screw Assemblies



| Dia. | Lead | Assembly Part Number | Max. Screw Length | A     | B    | C     | D    | E     | F    | H | J    | K     | Lube $\phi$ | Dynamic* Load (KN) | Static Load (KN) |
|------|------|----------------------|-------------------|-------|------|-------|------|-------|------|---|------|-------|-------------|--------------------|------------------|
| 12   | 5    | 7829259              | 600               | 50.0  | 24.0 | 44.0  | 10.0 | 40.0  | 10.0 | 6 | 5.5  | 34.0  | M6x1        | 4.7                | 5.1              |
| 16   | 5    | 7827231              | 800               | 50.0  | 28.0 | 48.0  | 10.0 | 40.0  | 10.0 | 6 | 5.5  | 38.0  | M6x1        | 7.9                | 9.1              |
| 20   | 5    | 7827232              | 900               | 61.0  | 36.0 | 58.0  | 10.0 | 51.0  | 10.0 | 6 | 6.6  | 47.0  | M6x1        | 13.2               | 18.5             |
| 25   | 5    | 7827233              | 1500              | 61.0  | 40.0 | 62.0  | 10.0 | 51.0  | 10.0 | 6 | 6.6  | 51.0  | M6x1        | 15.2               | 24.7             |
| 25   | 6    | 7829260              | 1500              | 70.0  | 40.0 | 62.0  | 10.0 | 60.0  | 10.0 | 6 | 6.6  | 51.0  | M6x1        | 19.8               | 29.0             |
| 25   | 10   | 7827234              | 1500              | 78.0  | 40.0 | 62.0  | 10.0 | 68.0  | 10.0 | 6 | 6.6  | 51.0  | M6x1        | 17.2               | 22.2             |
| 32   | 5    | 7827235              | 1500              | 63.0  | 50.0 | 80.0  | 12.0 | 51.0  | 12.0 | 6 | 9.0  | 65.0  | M6x1        | 17.4               | 33.3             |
| 32   | 10   | 7827236              | 2000              | 83.0  | 50.0 | 80.0  | 12.0 | 71.0  | 12.0 | 6 | 9.0  | 65.0  | M6x1        | 24.8               | 35.2             |
| 40   | 5    | 7827237              | 2000              | 77.0  | 63.0 | 93.0  | 15.0 | 63.0  | 14.0 | 8 | 9.0  | 78.0  | M8x1        | 24.8               | 57.5             |
| 40   | 6    | 7829261              | 2000              | 88.0  | 63.0 | 93.0  | 15.0 | 74.0  | 14.0 | 8 | 9.0  | 78.0  | M8x1        | 33.3               | 69.4             |
| 40   | 10   | 7827238              | 2000              | 133.0 | 63.0 | 93.0  | 15.0 | 119.0 | 14.0 | 8 | 9.0  | 78.0  | M8x1        | 58.9               | 98.9             |
| 40   | 20   | 7829262              | 2000              | 133.0 | 63.0 | 93.0  | 15.0 | 119.0 | 14.0 | 8 | 9.0  | 78.0  | M8x1        | 33.4               | 52.1             |
| 50   | 5    | 7827239              | 2500              | 91.0  | 75.0 | 110.0 | 15.0 | 75.0  | 16.0 | 8 | 11.0 | 93.0  | M8x1        | 33.4               | 92.4             |
| 50   | 10   | 7827240              | 2500              | 158.0 | 75.0 | 110.0 | 15.0 | 142.0 | 16.0 | 8 | 11.0 | 93.0  | M8x1        | 82.0               | 165.5            |
| 50   | 12   | 7829263              | 2500              | 128.0 | 75.0 | 110.0 | 15.0 | 112.0 | 16.0 | 8 | 11.0 | 93.0  | M8x1        | 62.6               | 112.2            |
| 50   | 20   | 7829264              | 2500              | 138.0 | 75.0 | 110.0 | 15.0 | 122.0 | 16.0 | 8 | 11.0 | 93.0  | M8x1        | 43.9               | 74.4             |
| 63   | 10   | 7827241              | 2750              | 160.0 | 90.0 | 125.0 | 15.0 | 142.0 | 18.0 | 8 | 11.0 | 108.0 | M8x1        | 94.3               | 221.7            |
| 63   | 20   | 7827963              | 2750              | 196.0 | 95.0 | 135.0 | 15.0 | 176.0 | 20.0 | 8 | 13.5 | 115.0 | M8x1        | 98.4               | 177.5            |

All dimensions in mm.

Nuts are only shipped assembled on Class 3 screw stock.

\*Dynamic load capacity is based on  $10^6$  revolutions per ISO-3408-5.

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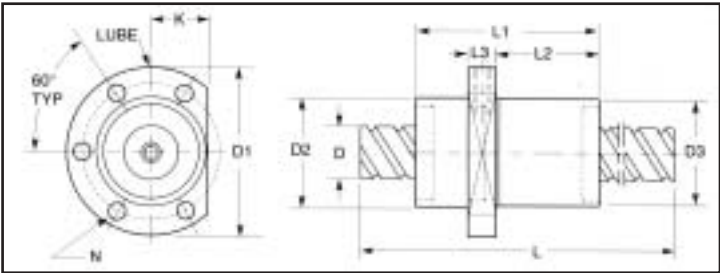
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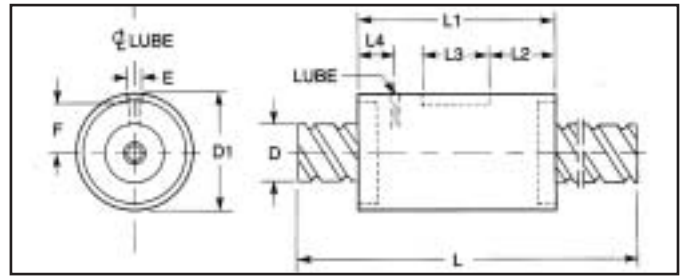
# Class 5 Center Flanged Assemblies



| Ball Circle Dia. (D) | Lead | Ball Nut Part Number |         | Dimensions (mm) |      |      |         |        |      |      |       |      |      |                     |       | Load Capacities (N) |            | Ball Screw Part Number | Max. Standard Length (L) |
|----------------------|------|----------------------|---------|-----------------|------|------|---------|--------|------|------|-------|------|------|---------------------|-------|---------------------|------------|------------------------|--------------------------|
|                      |      |                      |         | D1              | D2   | D3   | H       |        | K    | L1   | L2    | L3   | Lube | Preload Torque (Nm) |       |                     |            |                        |                          |
|                      |      | DIA.                 | BCD     |                 |      |      | dynamic | static |      |      |       |      |      |                     |       |                     |            |                        |                          |
| 12                   | 5    | 7829066              | 7829114 | 40,0            | 24,7 | 24,0 | 4,6     | 32,0   | 14,0 | 38,0 | 13,0  | 12,0 | M6   | 0,05-0,25           | 5600  | 6200                | 7827808 -5 | 1050                   |                          |
| 16                   | 5    | 7829067              | 7829115 | 53,0            | 28,7 | 28,0 | 6,6     | 40,0   | 17,0 | 45,0 | 15,0  | 15,0 | M6   | 0,05-0,25           | 9400  | 11100               | 7827810 -5 | 1500                   |                          |
| 20                   | 5    | 7829068              | 7829116 | 58,0            | 33,7 | 33,0 | 6,6     | 45,0   | 22,0 | 45,0 | 15,0  | 15,0 | M6   | 0,05-0,25           | 11100 | 15100               | 7827813 -5 | 1500                   |                          |
| 20                   | 20   | 7829069              | 7829117 | 63,0            | 40,0 | 40,0 | 6,6     | 50,0   | 21,0 | 68,0 | 24,0  | 20,0 | M6   | 0,05-0,25           | 8500  | 11300               | 7827815 -5 | 1500                   |                          |
| 25                   | 5    | 7829070              | 7829118 | 63,0            | 38,7 | 38,0 | 6,6     | 50,0   | 21,0 | 45,0 | 12,5  | 20,0 | M6   | 0,05-0,25           | 14300 | 22300               | 7827816 -5 | 2000                   |                          |
| 25                   | 10   | 7829071              | 7829119 | 63,0            | 38,7 | 38,0 | 6,6     | 50,0   | 21,0 | 64,0 | 22,0  | 12,0 | M6   | 0,05-0,25           | 16100 | 20100               | 7827817 -5 | 2000                   |                          |
| 25                   | 25   | 7829072              | 7829120 | 73,0            | 48,7 | 48,0 | 6,6     | 60,0   | 26,0 | 80,0 | 27,5  | 25,0 | M6   | 0,05-0,25           | 12800 | 17700               | 7827818 -5 | 2000                   |                          |
| 32                   | 5    | 7829073              | 7829121 | 73,0            | 48,7 | 48,0 | 6,6     | 60,0   | 26,0 | 45,0 | 13,25 | 18,5 | M6   | 0,05-0,25           | 16400 | 30200               | 7827819 -5 | 2000                   |                          |
| 32                   | 10   | 7829074              | 7829122 | 80,0            | 50,7 | 50,0 | 9,0     | 65,0   | 28,5 | 78,0 | 33,0  | 12,0 | M6   | 0,05-0,25           | 27400 | 42500               | 7827820 -5 | 2000                   |                          |
| 40                   | 5    | 7829075              | 7829123 | 80,0            | 56,7 | 56,0 | 6,6     | 68,0   | 30,0 | 51,0 | 16,0  | 19,0 | M6   | 0,05-0,45           | 18300 | 39100               | 7827822 -5 | 4000                   |                          |
| 40                   | 10   | 7829076              | 7829124 | 95,0            | 63,7 | 63,0 | 9,0     | 78,0   | 34,0 | 70,0 | 22,5  | 25,0 | M6   | 0,05-0,45           | 43100 | 67100               | 7827823 -5 | 4000                   |                          |
| 40                   | 20   | 7829077              | 7829125 | 110,0           | 75,7 | 75,0 | 11,0    | 93,0   | 42,5 | 62,0 | 23,0  | 16,0 | M8   | 0,05-0,45           | 31000 | 47000               | 7827824 -5 | 4000                   |                          |

Note:  
 Nuts are only shipped assembled on Class 5 screw stock.  
 Dynamic load capacity is based on 10<sup>6</sup> revolutions.

## Class 5 Cylindrical Nut Assemblies



| Ball Circle Dia. (D) | Lead | Ball Nut Part Number |             | Dimensions (mm) |     |      |       |       |      |      |      | Preload Torque (Nm) | Load Capacities (N) |        | Ball Screw Part Number | Max. Standard Length (L) |
|----------------------|------|----------------------|-------------|-----------------|-----|------|-------|-------|------|------|------|---------------------|---------------------|--------|------------------------|--------------------------|
|                      |      | Preload              | Non-Preload | D1              | E   | F    | L1    | L2    | L3   | L4   | Lube |                     | dynamic             | static |                        |                          |
| 12                   | 5    | 7829078              | 7829126     | 24,0            | 5,0 | 9,5  | 45,0  | 16,5  | 12,0 | 6,0  | 2,7  | 0,05-0,25           | 7700                | 9200   | 7827808 -5             | 1050                     |
| 16                   | 5    | 7829079              | 7829127     | 28,0            | 5,0 | 11,0 | 56,0  | 20,0  | 16,0 | 9,5  | 2,5  | 0,05-0,25           | 13000               | 16400  | 7827810 -5             | 1500                     |
| 20                   | 5    | 7829080              | 7829128     | 33,0            | 5,0 | 13,5 | 56,0  | 20,0  | 16,0 | 9,5  | 2,5  | 0,05-0,25           | 15200               | 22300  | 7827813 -5             | 1500                     |
| 20                   | 20   | 7829081              | 7829129     | 40,0            | 5,0 | 17,0 | 68,0  | 26,0  | 20,0 | 9,5  | 4,0  | 0,05-0,25           | 8500                | 11300  | 7827815 -5             | 1500                     |
| 25                   | 5    | 7829082              | 7829130     | 38,0            | 5,0 | 16,0 | 45,0  | 14,5  | 16,0 | 9,5  | 2,5  | 0,05-0,25           | 18300               | 29800  | 7827816 -5             | 2000                     |
| 25                   | 10   | 7829083              | 7829131     | 38,0            | 5,0 | 16,0 | 64,0  | 22,0  | 20,0 | 6,6  | 2,5  | 0,05-0,25           | 22800               | 30100  | 7827817 -5             | 2000                     |
| 25                   | 25   | 7829084              | 7829132     | 48,0            | 5,0 | 21,0 | 80,0  | 30,0  | 20,0 | 12,0 | 2,5  | 0,05-0,25           | 12800               | 17700  | 7827818 -5             | 2000                     |
| 32                   | 5    | 7829085              | 7829133     | 48,0            | 5,0 | 21,0 | 45,0  | 12,5  | 20,0 | 9,5  | 2,5  | 0,05-0,25           | 21000               | 40200  | 7827819 -5             | 2000                     |
| 32                   | 10   | 7829086              | 7829134     | 50,0            | 5,0 | 22,0 | 70,0  | 25,0  | 20,0 | 10,5 | 5,0  | 0,05-0,25           | 27400               | 42500  | 7827820 -5             | 2000                     |
| 40                   | 5    | 7829087              | 7829135     | 56,0            | 5,0 | 25,0 | 51,0  | 15,5  | 20,0 | 11,5 | 2,5  | 0,05-0,45           | 23500               | 52100  | 7827822 -5             | 4000                     |
| 40                   | 10   | 7829088              | 7829136     | 63,0            | 5,0 | 28,5 | 70,0  | 25,0  | 20,0 | 10,5 | 3,0  | 0,05-0,45           | 43100               | 67100  | 7827823 -5             | 4000                     |
| 40                   | 20   | 7829089              | 7829137     | 75,0            | 5,0 | 26,0 | 62,0  | 21,0  | 20,0 | 8,0  | 3,0  | 0,05-0,45           | 31000               | 47000  | 7827824 -5             | 4000                     |
| 40                   | 40   | 7829090              | 7829138     | 72,0            | 5,0 | 33,0 | 122,0 | 51,0  | 20,0 | 14,0 | 3,0  | 0,05-0,45           | 29800               | 45400  | 7827826 -5             | 4000                     |
| 40                   | 50   | 7829091              | 7829139     | 72,0            | 5,0 | 26,0 | 120,5 | 50,25 | 20,0 | 9,5  | 3,0  | 0,05-0,45           | 32000               | 46000  | 7827827 -5             | 4000                     |
| 50                   | 50   | 7829092              | 7829140     | 78,0            | 5,0 | 36,0 | 122,0 | 51,0  | 20,0 | 9,0  | 3,0  | 0,05-0,45           | 34100               | 59600  | 7827829 -5             | 4000                     |

Note:

Nuts are only shipped assembled on Class 5 screw stock.

Dynamic load capacity is based on 10<sup>6</sup> revolutions.

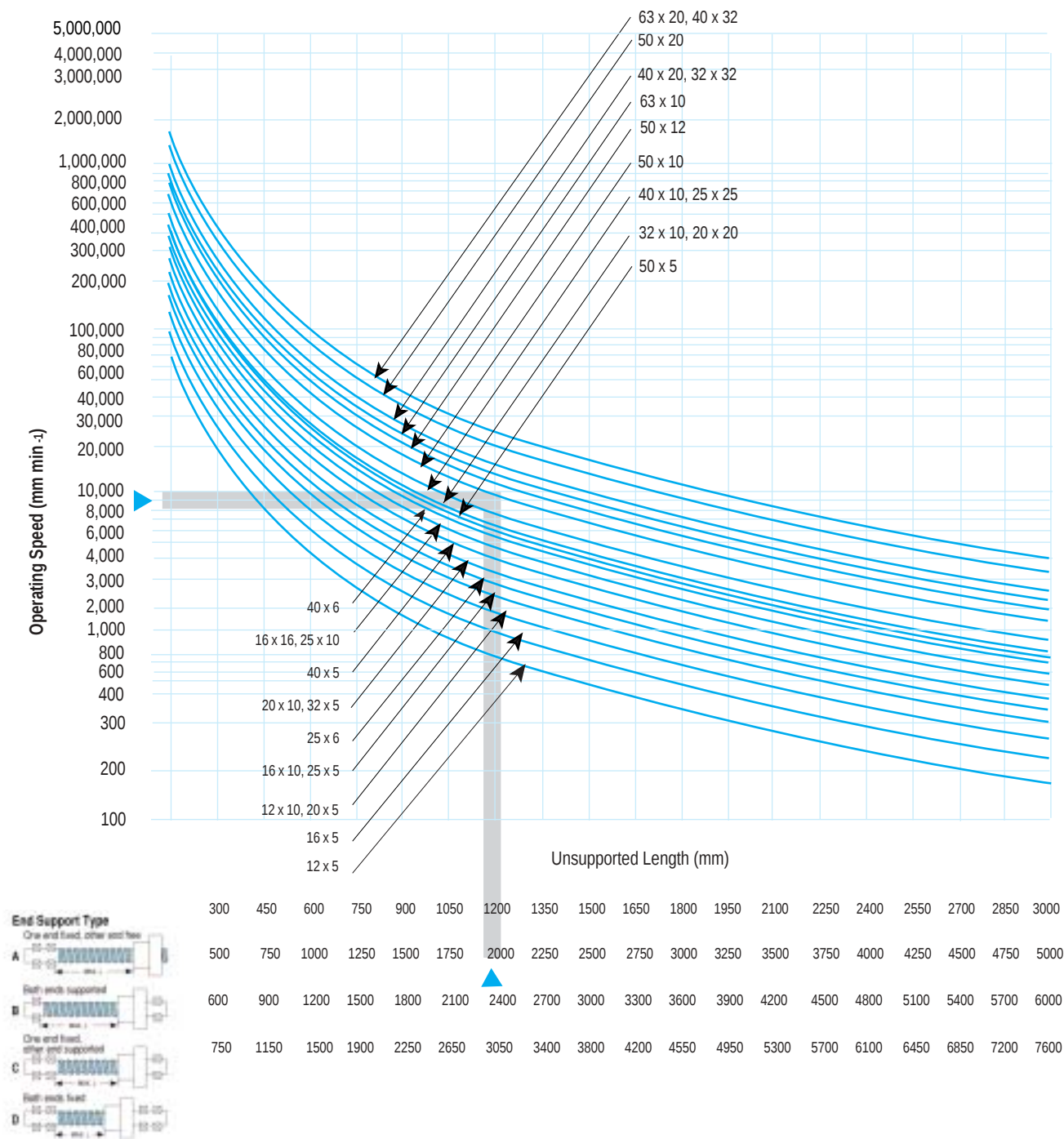
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# Ball Screw Operating Speed<sup>†</sup>

ISO-Class 3 and Class 5



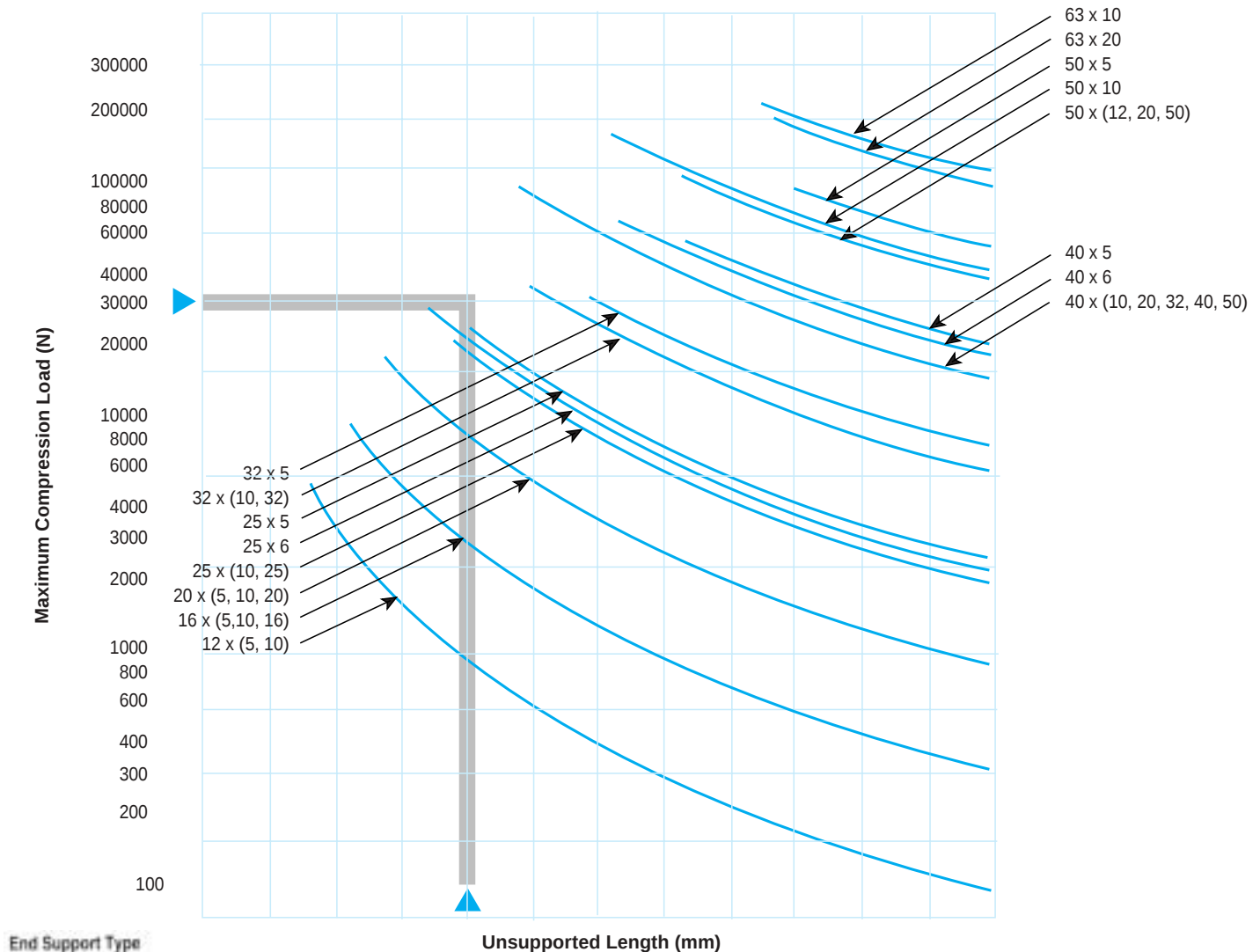
<sup>†</sup>Values are 80% of critical speed.

- Example:**
1. Unsupported length of 2000 mm for “both ends supported” application
  2. Operating speed of 8000 mm • min<sup>-1</sup>

- Solution:**
1. All assemblies with curves which pass through or are above and to the right of the plotted point are appropriate. Six sizes are suitable.
  2. Check life expectancy and column strength to confirm selection.

# Ball Screw Column Strength

## ISO-Class 3 and Class 5



### End Support Type

| End Support Type                     | 125 | 250  | 375  | 500  | 625  | 750  | 875  | 1000 | 1125 | 1375 | 1500 |
|--------------------------------------|-----|------|------|------|------|------|------|------|------|------|------|
| A One end fixed, other end free      |     |      |      |      |      |      |      |      |      |      |      |
| B Both ends supported                | 250 | 500  | 750  | 1000 | 1250 | 1500 | 1750 | 2000 | 2250 | 2500 | 3000 |
| C One end fixed, other end supported | 400 | 700  | 1100 | 1400 | 1800 | 2100 | 2500 | 2800 | 3200 | 3500 | 4200 |
| D Both ends fixed                    | 500 | 1000 | 1500 | 2000 | 2500 | 3000 | 3500 | 4000 | 4500 | 5000 | 6000 |

### Example:

1. Unsupported length of 2000 mm for "both ends fixed".
2. Compression load of 30000 N.

### Solution:

1. All assemblies with curves which pass through or are above and to the right of the plotted point are appropriate. Ten sizes are suitable.
2. Check life expectancy and operating speed to confirm selection.

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# Quick Mount\* Metric Bearing Support Blocks

Standard



V-Series



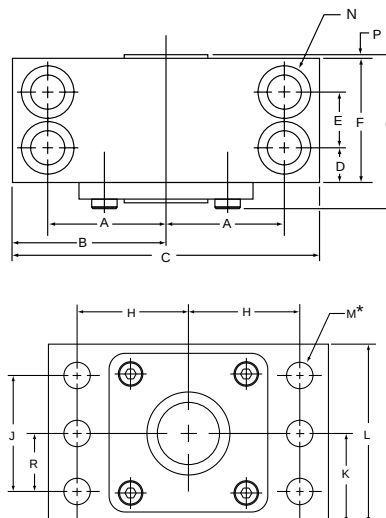
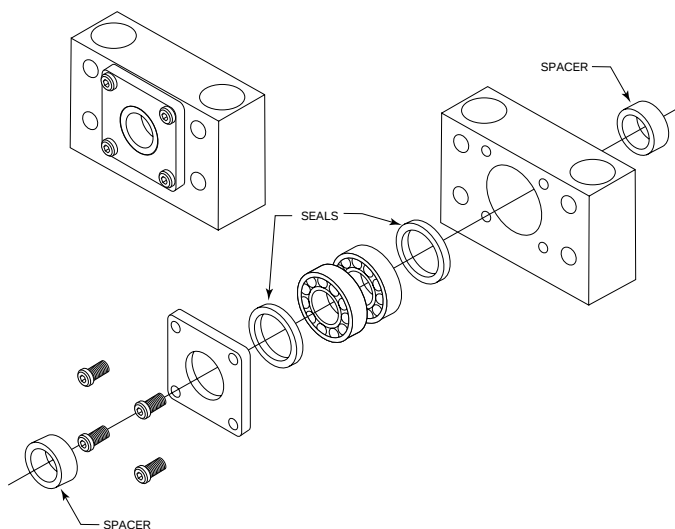
## A unitized package for simple mounting of Thomson Saginaw\* Precision ball screw assemblies.

- rugged steel construction
- low profile, compact design
- foot or face mounting Standard series
- foot mounting V-Series
- a pre-assembled package ready for installation
- high capacity angular contact bearings arranged in a back-to-back (DB) configuration for high stiffness
- installation accessories (locknut and washer) included for complete assembly
- design dimensions fit a standard Type III machined end for ball screws. See page 23.
- also available through Saginaw Express Machining as a "System" pre-mounted on your ball screw
- the Quick Mount will provide a "simple" bearing support for purposes of critical speed and column strength calculations
- available off the shelf for your machine building convenience

| 10 Pillow Block configurations have been designed to accommodate the following ball screw sizes. |          |          |
|--------------------------------------------------------------------------------------------------|----------|----------|
| Dia. x Lead (mm)                                                                                 | Standard | V-Series |
| 12 x 5                                                                                           | 7829546  |          |
| 12 x 10                                                                                          | 7829546  |          |
| 16 x 5                                                                                           | 7829547  | 7829539  |
| 16 x 10                                                                                          | 7829547  | 7829539  |
| 16 x 16                                                                                          | 7829547  | 7829539  |
| 20 x 5                                                                                           | 7829548  | 7829540  |
| 20 x 10                                                                                          | 7829548  | 7829540  |
| 20 x 20                                                                                          | 7829548  | 7829540  |
| 25 x 5                                                                                           | 7829549  | 7829541  |
| 25 x 10                                                                                          | 7829549  | 7829541  |
| 25 x 25                                                                                          | 7829549  | 7829541  |
| 32 x 5                                                                                           | 7829550  | 7829542  |
| 32 x 10                                                                                          | 7829550  | 7829542  |
| 32 x 32                                                                                          | 7829550  | 7829542  |
| 40 x 5                                                                                           | 7829551  | 7829543  |
| 40 x 10                                                                                          | 7829551  | 7829543  |
| 40 x 20                                                                                          | 7829551  | 7829543  |
| 40 x 32                                                                                          | 7829551  | 7829543  |
| 40 x 40                                                                                          | 7829551  | 7829543  |
| 40 x 50                                                                                          | 7829551  | 7829543  |
| 50 x 10                                                                                          | 7829552  | 7829544  |
| 50 x 50                                                                                          | 7829552  | 7829544  |
| 63 x 10                                                                                          | 7829553  | 7829545  |
| 63 x 20                                                                                          | 7829553  | 7829545  |

# Quick Mount\* Metric Bearing Support Blocks

## Product Dimensions and Specifications



| Standard | V-Series* | A     | B    | C   | D     | E     | F     | G   | J* | K     | L   | M*                    | N                                        | P   | R*    | Locknut   |
|----------|-----------|-------|------|-----|-------|-------|-------|-----|----|-------|-----|-----------------------|------------------------------------------|-----|-------|-----------|
| 7829546  | —         | 25.5  | 35   | 70  | 14.25 | —     | 31    | 35  | 35 | 25.4  | 51  | 5.08 Dia.<br>4 Holes  | Ø 8<br>Ø12.5 C-Bore x 14 DP<br>2 Holes   | —   | 17.53 | M8 x 1.25 |
| 7829547  | 7829539   | 28.5  | 38   | 76  | 17    | —     | 34    | 43  | 29 | 25.4  | 48  | 7.14 Dia.<br>4 Holes  | Ø 10.3<br>Ø 16 C-Bore x 22 DP<br>2 Holes | .5  | 15.88 | KM-01     |
| 7829548  | 7829540   | 31.75 | 44.5 | 89  | 19    | —     | 38    | 47  | 35 | 28.58 | 54  | 7.14 Dia.<br>4 Holes  | Ø 10.3<br>Ø 16 C-Bore x 25 DP<br>2 Holes | .5  | 19.05 | KM-02     |
| 7829549  | 7829541   | 41.25 | 57   | 114 | 24    | —     | 48    | 60  | 44 | 36.53 | 70  | 10.31 Dia.<br>4 Holes | Ø 16.6<br>Ø 25 C-Bore x 33 DP<br>2 Holes | 1.0 | 24    | KM-04     |
| 7829550  | 7829542   | 54.0  | 76   | 152 | 24.5  | —     | 49    | 65  | 51 | 44.45 | 86  | 11.91<br>4 Holes      | Ø 23<br>Ø 35 C-Bore x 50 DP<br>2 Holes   | .75 | 25.4  | KM-05     |
| 7829551  | 7829543   | 60.25 | 82.5 | 165 | 26    | —     | 52    | 68  | 51 | 47.63 | 92  | 16.66<br>4 Holes      | Ø 23<br>Ø 35 C-Bore x 50 DP<br>2 Holes   | 1.0 | 25.4  | KM-06     |
| 7829552  | 7829544   | 74.5  | 96   | 192 | 19.2  | 41.5  | 80    | 96  | 76 | 57.15 | 108 | 16.66<br>4 Holes      | Ø 23<br>Ø 35 C-Bore x 57 DP<br>4 Holes   | 1.2 | 38    | KM-08     |
| 7829553  | 7829545   | 90.5  | 115  | 230 | 23.5  | 43.75 | 90.75 | 113 | 92 | 71.45 | 143 | 15.24<br>4 Holes      | Ø 26<br>Ø 41 C-Bore x 9<br>4 Holes       | 2.5 | 46    | KM-10     |

\* V-Series does not have M holes

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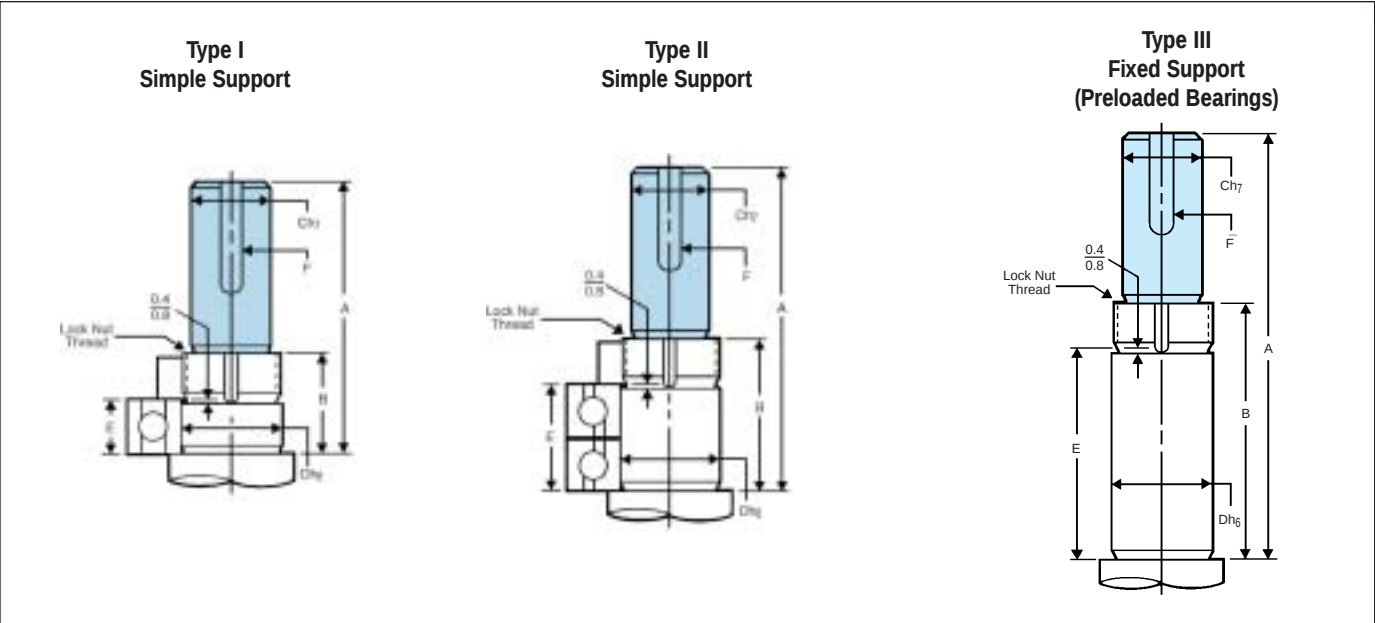
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The specifications and data in this publication are believed to be accurate and reliable. However, it is the responsibility of the product user to determine the suitability of Thomson Saginaw products for a specific application. While defective products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

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# Typical Ends

The typical ends shown below can be machined on Thomson Saginaw ball screws. The shaded area of the drawings represents the extension required for a keyed drive coupling. Specific dimensional data is provided in the chart.



| Screw Size | Type I <sup>(1)</sup>                      |    |    | Type II <sup>(1)</sup>                      |    |    | Type III <sup>(1)</sup>                                    |     |     | Type I, II, III                         |                 |         |                 |                                  |
|------------|--------------------------------------------|----|----|---------------------------------------------|----|----|------------------------------------------------------------|-----|-----|-----------------------------------------|-----------------|---------|-----------------|----------------------------------|
|            | Typical Journal for Single Mounted Bearing |    |    | Typical Journal for Duplex Mounted Bearings |    |    | Typical Journal for 1 or 2 Sets of Duplex Mounted Bearings |     |     | Dimensions Common to End Configurations |                 |         |                 |                                  |
|            | A                                          | B  | E  | A                                           | B  | E  | A                                                          | B   | E   | Ch <sub>7</sub>                         | Dh <sub>6</sub> | F       | Lock Nut Thread | Angular Contact Bearing Part No. |
| 12         | 46                                         | 19 | 7  | 53                                          | 26 | 14 | 73                                                         | 46  | 36  | 6                                       | 9               | N/A     | M8 x 1.25       | 708                              |
| 16         | 54                                         | 21 | 10 | 64                                          | 31 | 20 | 84                                                         | 51  | 40  | 10                                      | 12              | 3 x 1.8 | M12 x 1         | 201                              |
| 20         | 47                                         | 22 | 11 | 58                                          | 33 | 22 | 80                                                         | 55  | 44  | 12                                      | 15              | 4 x 2.5 | M15 x 1         | 202                              |
| 25         | 61                                         | 27 | 14 | 75                                          | 41 | 28 | 103                                                        | 69  | 56  | 16                                      | 20              | 5 x 3.0 | M20 x 1         | 204                              |
| 32         | 68                                         | 29 | 15 | 83                                          | 44 | 30 | 113                                                        | 74  | 60  | 20                                      | 25              | 5 x 3.0 | M25 x 1.5       | 205                              |
| 40         | 76                                         | 30 | 16 | 92                                          | 46 | 32 | 124                                                        | 78  | 64  | 25                                      | 30              | 8 x 4.0 | M30 x 1.5       | 206                              |
| 50         | 95                                         | 40 | 23 | 118                                         | 63 | 46 | 164                                                        | 109 | 92  | 32                                      | 40              | 8 x 4.0 | M40 x 1.5       | 308                              |
| 63         | 116                                        | 43 | 27 | 143                                         | 70 | 54 | 197                                                        | 124 | 108 | 40                                      | 50              | 10 x 5  | M50 x 1.5       | 310                              |
| 80         | 142                                        | 48 | 31 | 173                                         | 79 | 62 | 235                                                        | 141 | 124 | 50                                      | 60              | 12 x 6  | M60 x 2         | 312                              |

All dimensions in mm.

<sup>(1)</sup> To provide for bearings with higher load capacity than those available for these typical ends, adapters can be used to increase the diameter.

# Metric Ball Screw Assemblies Order Form

Date \_\_\_\_\_  
 Name \_\_\_\_\_  
 Company \_\_\_\_\_  
 Title \_\_\_\_\_  
 Address \_\_\_\_\_  
 City \_\_\_\_\_ State \_\_\_\_\_ Zip Code \_\_\_\_\_  
 Telephone \_\_\_\_\_ Fax \_\_\_\_\_  
 Email \_\_\_\_\_

## Ball Screw Assemblies

Quantity \_\_\_\_\_ Class (circle) 3 5 7 9  
 Ball Circle Diameter \_\_\_\_\_ Lead \_\_\_\_\_ Ball Nut or Assembly Part Number \_\_\_\_\_ Overall Length \_\_\_\_\_

## End Blocks (end blocks require Type III machined ends)

Quantity Per Assembly (1 or 2) \_\_\_\_\_ End Block Part Number \_\_\_\_\_

## End Machining

Right End – standard end machining

- ☐ Types (circle one) I II III\*  
☐ with drive  
☐ without drive

\*Type III end machining required for end blocks

Left End – standard end machining

- ☐ Types (circle one) I II III\*  
☐ with drive  
☐ without drive

\*Type III end machining required for end blocks

- ☐ Cut to length only  
☐ Other (see attached print)

## Ball nut flange or V-thread to face

- ☐ Left end machining  
☐ Right end machining  
☐ Other (see attached print)

## Flange Flats

- ☐ Yes (see attached print)  
☐ No

Purchase order number \_\_\_\_\_ Requested delivery date \_\_\_\_\_

Shipping instructions \_\_\_\_\_

Signature (required for orders) \_\_\_\_\_

**FAX THIS FORM TO: 989-776-3632**

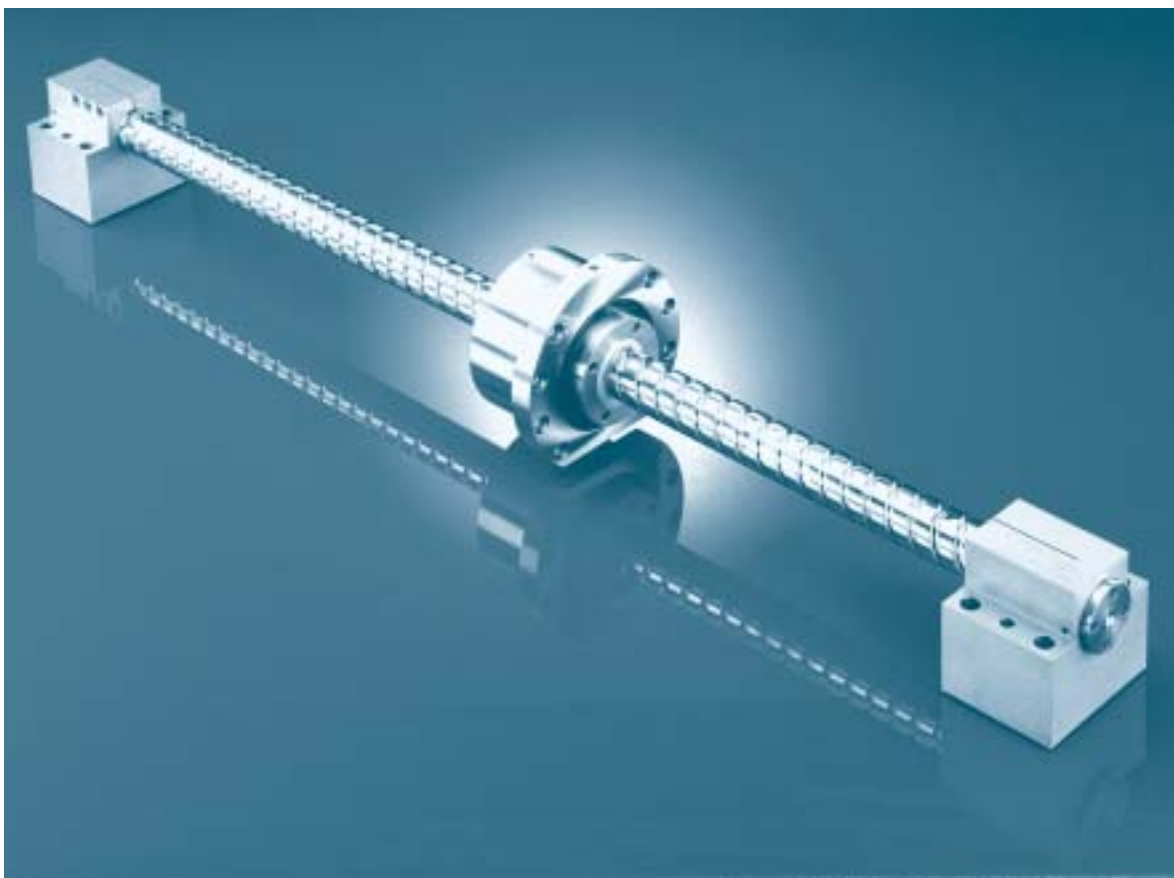
Thomson Saginaw Ball Screw Company, LLC  
 628 N. Hamilton  
 Saginaw, MI 48602  
 Telephone: 989-776-4123  
 Email: tsbsrfq@thomsonmail.com

To order, call 989-776-4123



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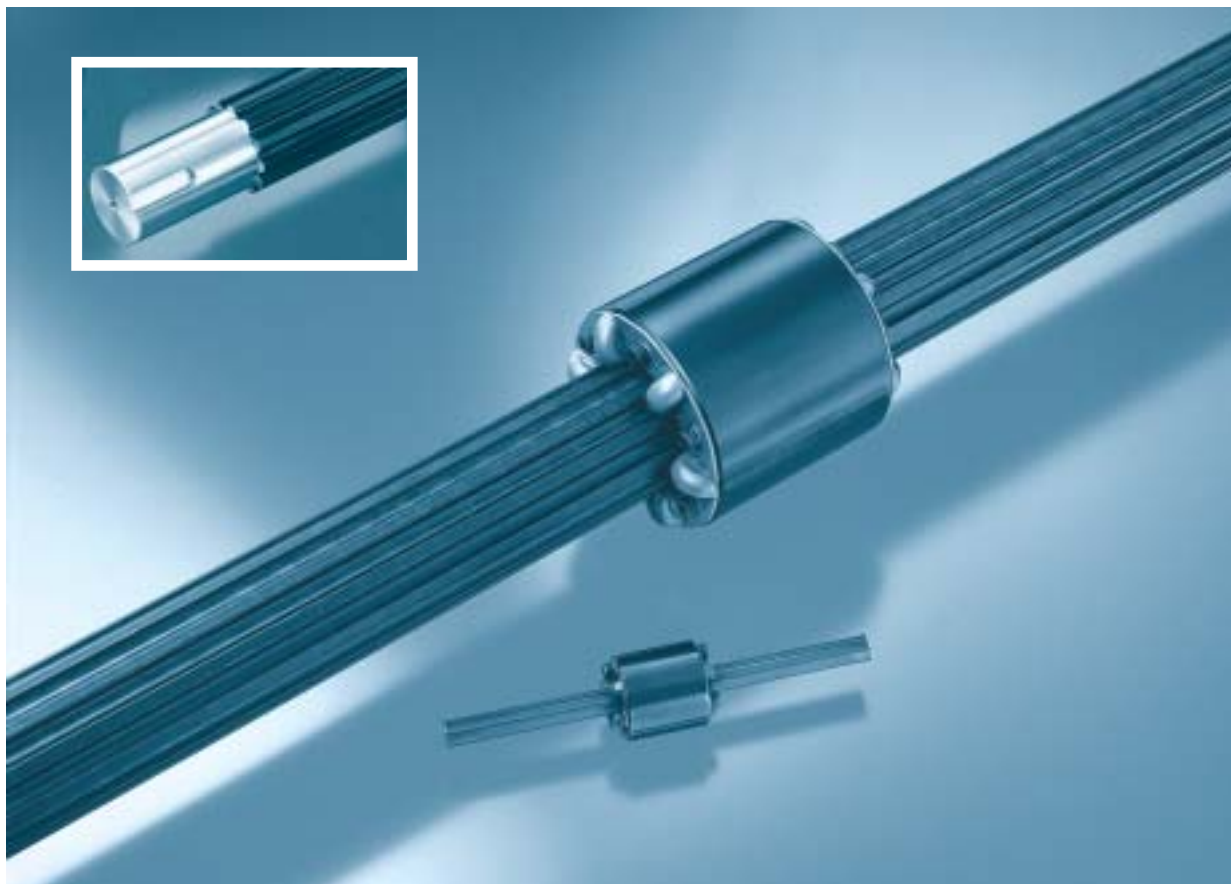
## RN (Rotating Nut) Series Belt Driven Ball Screws



### Rotating Nut Ball Screw for High Speed Applications:

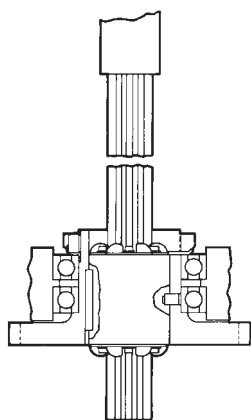
- linear speeds up to 100m/min.
- unique design eliminates critical speeds that limit traverse rates
- increase speed, reduce vibration and noise with Hollow Screw option
- 2 times the transfer rate of standard units
- increased rigidity with new end support units

# Precision Ball Spline Systems



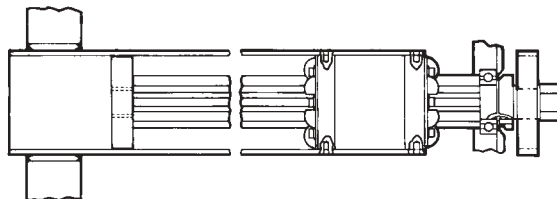
## Thomson Saginaw Precision spline systems offer:

- high speed, anti-friction linear motion under high torsional loads.
- anti-friction linear travel by ball recirculation.
- resistance to radial displacement resulting from torque loads.
- smaller force requirements to achieve axial displacement of spline members while transmitting torque.
- high reliability under varying operating conditions and predictable life expectancy.
- minimal lash resulting from wear and elimination of stick-slip.
- minimized friction reduces heat, thus preventing seizure.
- custom machined keyways are available on both inner and outer race.
- application versatility — helicopter rotor coupling; translating drive shaft coupling; non-swiveling telescoping struts; honing machine and drill press spindles; workhead and table ways; robot and remote handling machines.
- availability through over 1800 authorized Thomson distributors worldwide.



### Typical Applications

This translating coupling mounts the spline outer race in a keyed and pinned hub for maximum torque loads. The hub is mounted in spaced double bearings.  
(Hub and bearings not supplied)



Ball bearing splines are ideal for a translating coupling in high speed applications. Note the use of a follower bearing within the torque tube connected to the spline inner race to provide increased top speed range.

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## General Specifications

A Thomson Saginaw Precision ball spline system consists of mating inner (SRR) and outer (SOR) races containing concave axial races and a complement of bearing balls. The balls provide the only physical contact between the inner and outer races. Unlimited rolling travel is achieved by diverting the path of the balls at the extremes of the outer race into the end cap return circuit. This provides a closed loop through which the balls recirculate when the races are displaced axially relative to each other. The bearing balls resist radial displacement resulting from torque loads.

- Efficiency — coefficient of friction .007 maximum
- Hardness — minimum of RC 56 in ball race
- Lash — .005 in. maximum standard play perpendicular to rotational axis

## Selection Procedures

**Applications Analysis** — Follow this step-by-step procedure to determine the ball spline best suited for your application. It is suggested you analyze the requirements of your application using a work pad for easy reference.

**Maximum Static Load** — Determine the maximum static torque loads encountered in the application. This must include shock loads. Using the Maximum Static and Rated Loads table, note the ball spline sizes and race combinations which have capacities in excess of the application requirements.

### Maximum Static and Rated Loads

| Nominal Size | Number of Active Races | Maximum Static Torque Load (lb.-in.) | Rated Load in.-lb. for 1 million in. (25.4 million mm) |
|--------------|------------------------|--------------------------------------|--------------------------------------------------------|
| .375         | 3                      | 626                                  | 200                                                    |
| .625         | 3                      | 1,770                                | 585                                                    |
|              | 6                      | 3,540                                | 1,770                                                  |
| 1.000        | 3                      | 3,900                                | 1,300                                                  |
|              | 6                      | 7,800                                | 2,600                                                  |
| 1.500        | 3                      | 11,588                               | 4,200                                                  |
|              | 6                      | 23,176                               | 8,400                                                  |
| 2.000        | 3                      | 20,138                               | 8,000                                                  |
|              | 6                      | 40,276                               | 16,000                                                 |
| 2.500        | 3                      | 32,625                               | 13,500                                                 |
|              | 6                      | 65,250                               | 27,000                                                 |
| 4.062        | 6                      | 140,000                              | 57,000                                                 |
| 5.000        | 8                      | 345,000                              | 158,620                                                |
| 6.000        | 8                      | 584,000                              | 214,700                                                |

**Rated Load** — In many ball spline applications, freedom of axial movement is essential while actual travel is negligible. For example, a spline used on a jet engine accessory gear box drive moves less than 1/10 in. This axial freedom is essential to eliminate damaging stress forces to the engine and gear box housings, but total daily travel may be less than 2 in. Select the size and race combination with a rated load that will meet your application requirement from the chart.

**Life Expectancy** — On occasion, it is important to plan for a specific life expectancy. These applications usually are designed to use the smallest practical ball spline at the maximum possible torque or where considerable translation occurs. For these applications, use the Life Expectancy chart. Contact Thomson Saginaw if light weight and small size are considerations.

Determine the following:

- life expectancy — total inches of travel desired during the life of the application
- application load — the normal operating load for the application in inch-pounds (Newton-millimeters) of torque

Using the example at the bottom of the Life Expectancy chart, plot the point for your specific application.

Example: Desired life is 2 million in. (50.8 million mm); operating torque is 200 lb.-in. (22.6 N · mm). All ball splines with curves which pass through or are above and to the right of the plotted point are suitable for the example. See page 79.

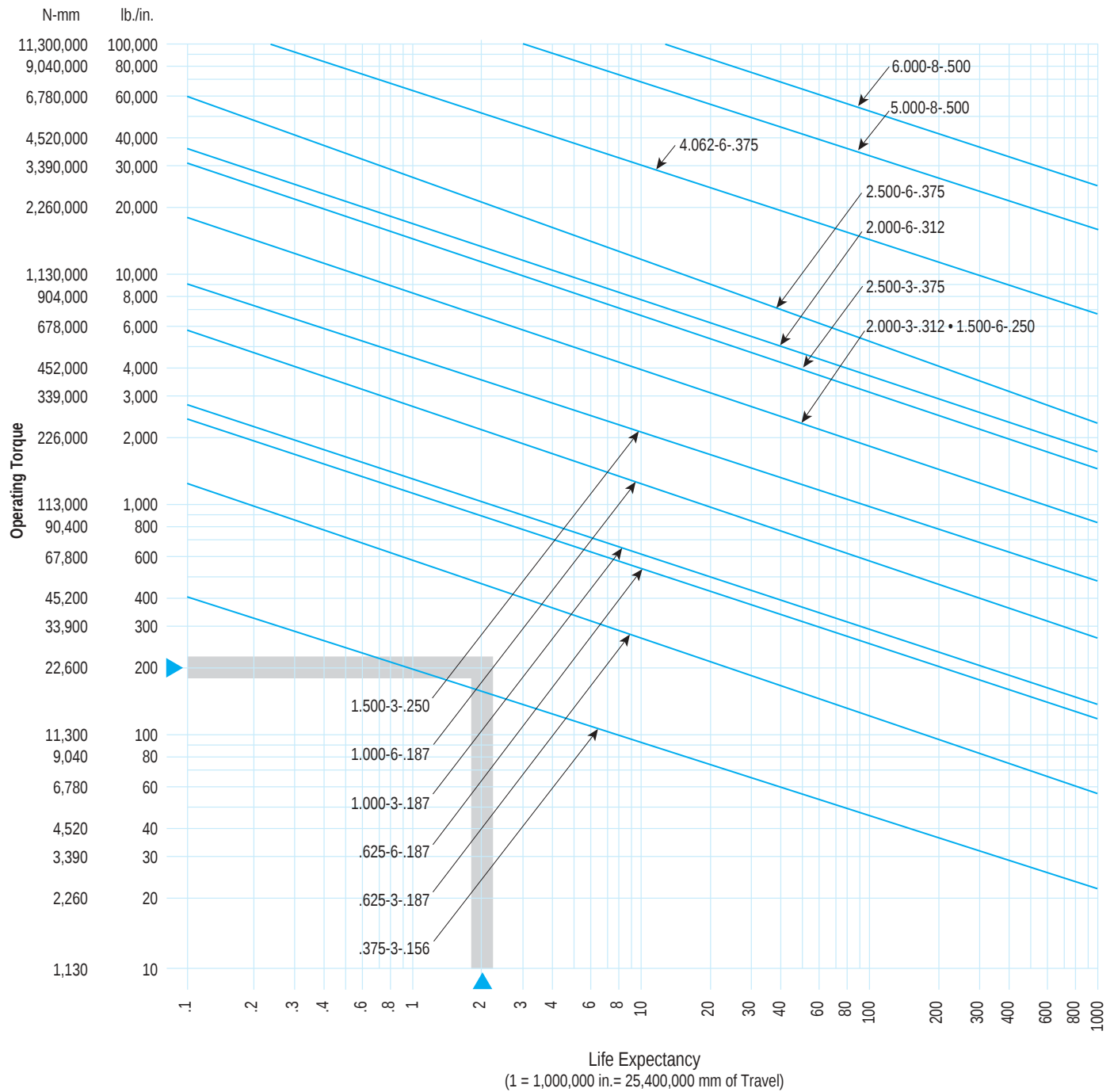
**Speed vs. Length** — Determine the following:

- speed — determine the maximum revolutions per minute (rpm) required
- maximum length — determine the maximum unsupported length
- end fixity — determine the type of configuration (refer to the Bearing Support reference drawings on page 17). Quick Mount bearing support blocks can be used on diameters 5/8 in. through 2-1/2 in.

Using the example at the bottom of the Speed vs. Length chart, plot the point for your specific application.

Example: Maximum shaft speed is 800 rpm; unsupported length is 60 in. (1524 mm); end fixity is both ends supported. All ball splines with curves which pass through or are above and to the right of the plotted point are suitable for the example. See page 80.

# Life Expectancy for Precision Ball Spline Systems



**Example:** Desired life of 2 million in.  
(50.8 million mm).  
Operating torque is 200 lb.-in.  
(22.6 N · mm)

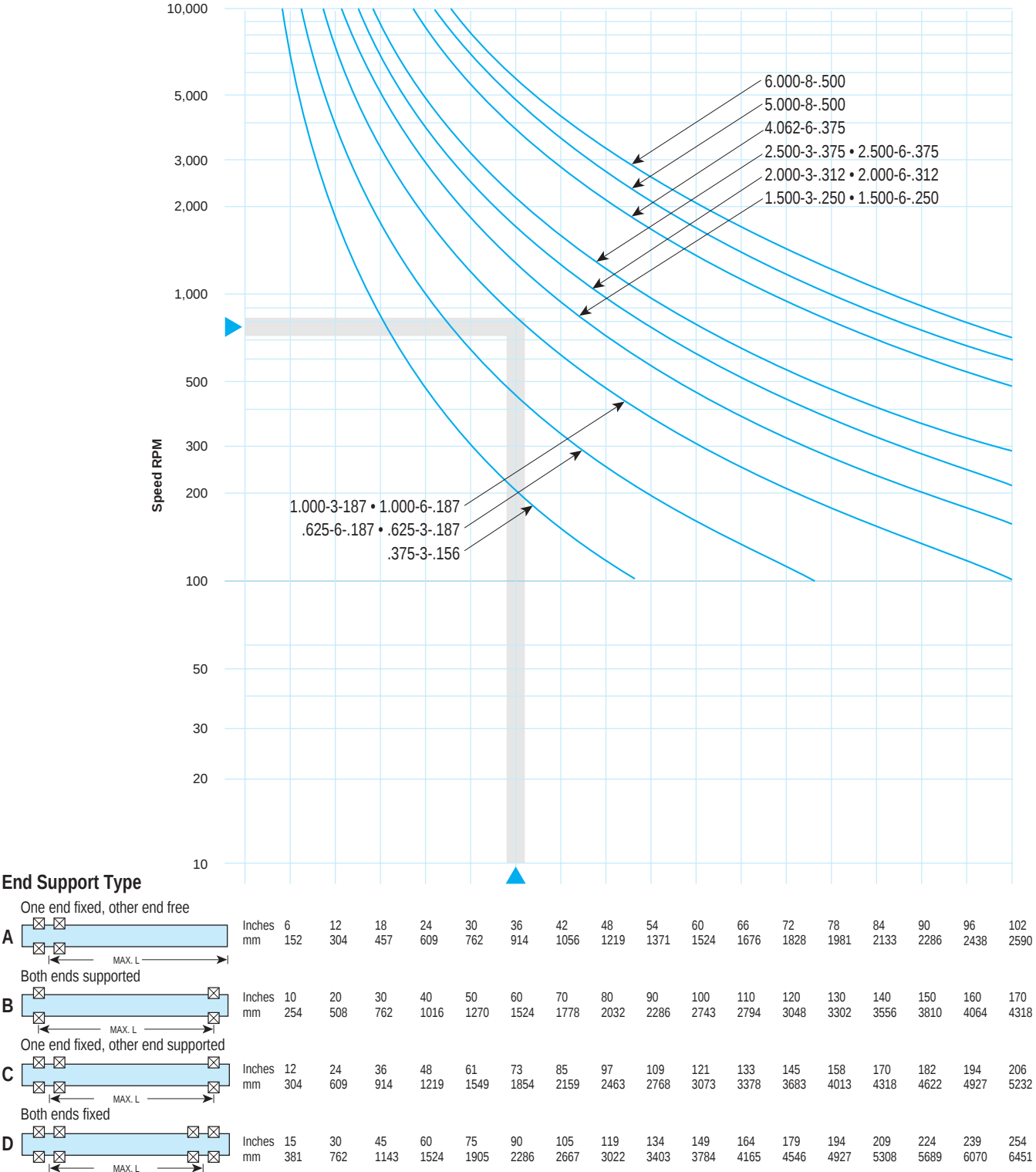
All splines with curves which pass through or are above and to the right of the plotted point are suitable for the example.

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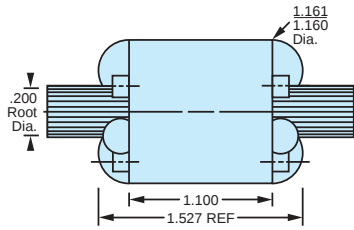
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# Speed vs. Length for Precision Ball Spline Systems

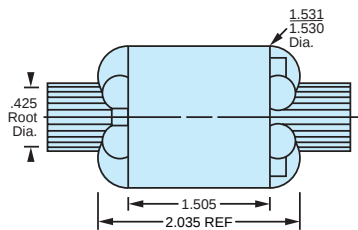


**Example:** Maximum shaft speed is 800 rpm.  
Unsupported length is 60 in. (1524 mm).  
End fixity is both ends supported.  
All splines with curves which pass through or are above and to the right of the plotted point are suitable for the example.

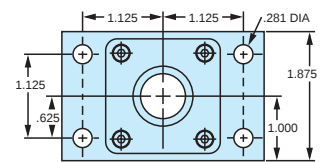
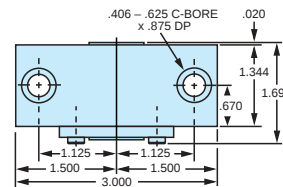
# Precision (Inner and Outer) Spline Races



| General Description |              | Inner Race  |                           | Outer Race  |               |                     | Load Ratings                                        |                                      |
|---------------------|--------------|-------------|---------------------------|-------------|---------------|---------------------|-----------------------------------------------------|--------------------------------------|
| Nominal Size        | Active Races | Part Number | Length <sup>†</sup> (ft.) | Part Number | Ball Diameter | Keyway Dimension    | Rated Load In in.-lb. for 1-mil. in. (25.4-mil. mm) | Maximum Static Torque Load (lb.-in.) |
| .375                | 3            | 5707547     | 2                         | 5706900     | .156          |                     | 200                                                 | 626                                  |
| .375                | 3            | 5707547     | 2                         | 7828127     | .156          | .187 x .093 x 1.000 | 200                                                 | 626                                  |

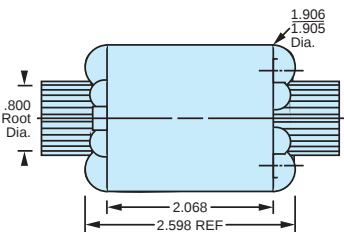


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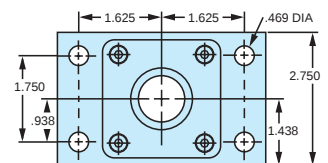
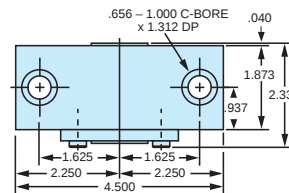


P/N 7824154

| General Description |              | Inner Race  |                           | Outer Race  |               |                     | Load Ratings                                        |                                      |
|---------------------|--------------|-------------|---------------------------|-------------|---------------|---------------------|-----------------------------------------------------|--------------------------------------|
| Nominal Size        | Active Races | Part Number | Length <sup>†</sup> (ft.) | Part Number | Ball Diameter | Keyway Dimension    | Rated Load In in.-lb. for 1-mil. in. (25.4-mil. mm) | Maximum Static Torque Load (lb.-in.) |
| .625                | 3            | 5707548     | 4                         | 5707445     | .187          |                     | 585                                                 | 1,770                                |
| .625                | 3            | 5707548     | 4                         | 7828128     | .187          | .250 x .125 x 1.125 | 585                                                 | 1,770                                |
| .625                | 6            | 5707548     | 4                         | 5708943     | .187          |                     | 1,170                                               | 3,540                                |
| .625                | 6            | 5707548     | 4                         | 7828129     | .187          | .250 x .125 x 1.125 | 1,170                                               | 3,540                                |



END BLOCK



P/N 7824157

| General Description |              | Inner Race  |                           | Outer Race  |               |                     | Load Ratings                                        |                                      |
|---------------------|--------------|-------------|---------------------------|-------------|---------------|---------------------|-----------------------------------------------------|--------------------------------------|
| Nominal Size        | Active Races | Part Number | Length <sup>†</sup> (ft.) | Part Number | Ball Diameter | Keyway Dimension    | Rated Load In in.-lb. for 1-mil. in. (25.4-mil. mm) | Maximum Static Torque Load (lb.-in.) |
| 1.000               | 3            | 5706084     | 12                        | 5707472     | .187          |                     | 1,300                                               | 3,900                                |
| 1.000               | 3            | 5706084     | 12                        | 7828130     | .187          | .250 x .125 x 1.625 | 1,300                                               | 3,900                                |
| 1.000               | 6            | 5706084     | 12                        | 5708944     | .187          |                     | 2,600                                               | 7,800                                |
| 1.000               | 6            | 5706084     | 12                        | 7828131     | .187          | .250 x .125 x 1.625 | 2,600                                               | 7,800                                |

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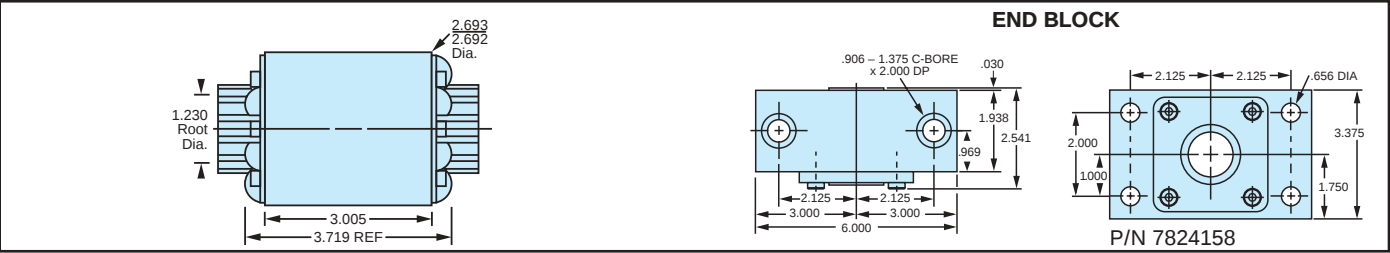
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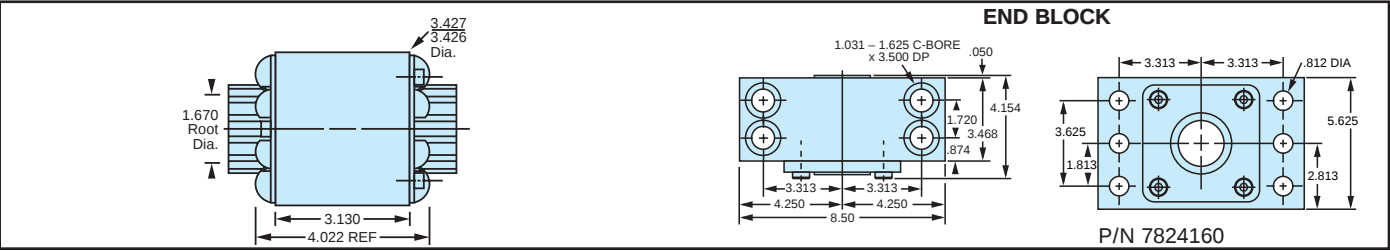
The specifications and data in this publication are believed to be accurate and reliable. However, it is the responsibility of the product user to determine the suitability of Thomson Saginaw products for a specific application. While defective products will be replaced without charge if promptly returned,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

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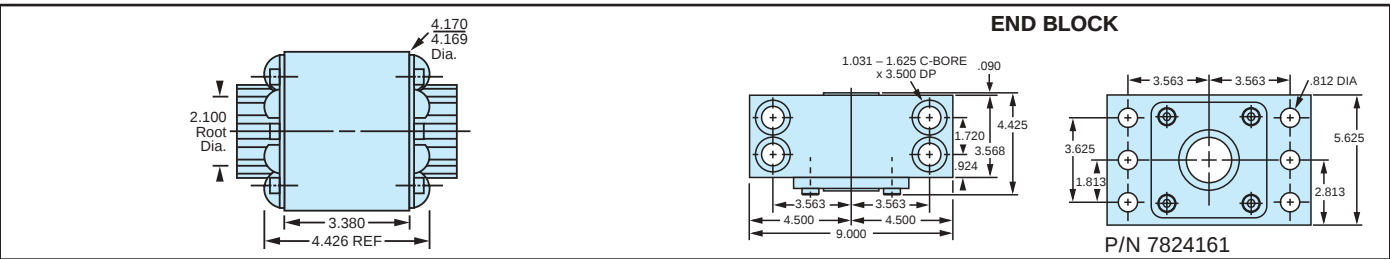
Precision (Inner and Outer) Spline Races (continued)



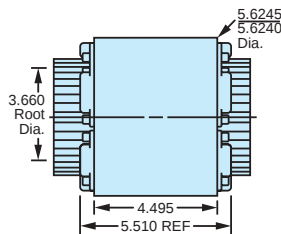
| General Description |              | Inner Race  |                           | Outer Race  |               |                     | Load Ratings                                        |                                      |
|---------------------|--------------|-------------|---------------------------|-------------|---------------|---------------------|-----------------------------------------------------|--------------------------------------|
| Nominal Size        | Active Races | Part Number | Length <sup>†</sup> (ft.) | Part Number | Ball Diameter | Keyway Dimension    | Rated Load In in.-lb. for 1-mil. in. (25.4-mil. mm) | Maximum Static Torque Load (lb.-in.) |
| 1.500               | 3            | 5706388     | 12                        | 5707528     | .250          |                     | 4,200                                               | 11,588                               |
| 1.500               | 3            | 5706388     | 12                        | 7828132     | .250          | .250 x .125 x 2.000 | 4,200                                               | 11,588                               |
| 1.500               | 6            | 5706388     | 12                        | 5708945     | .250          |                     | 8,400                                               | 23,176                               |
| 1.500               | 6            | 5706388     | 12                        | 7828133     | .250          | .375 x .187 x 2.000 | 8,400                                               | 23,176                               |



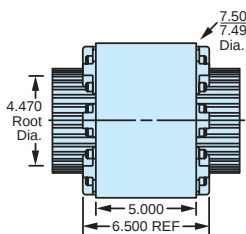
| General Description |              | Inner Race  |                           | Outer Race  |               |                     | Load Ratings                                        |                                      |
|---------------------|--------------|-------------|---------------------------|-------------|---------------|---------------------|-----------------------------------------------------|--------------------------------------|
| Nominal Size        | Active Races | Part Number | Length <sup>†</sup> (ft.) | Part Number | Ball Diameter | Keyway Dimension    | Rated Load In in.-lb. for 1-mil. in. (25.4-mil. mm) | Maximum Static Torque Load (lb.-in.) |
| 2.000               | 3            | 5706436     | 12                        | 5707530     | .312          |                     | 8,000                                               | 20,138                               |
| 2.000               | 3            | 5706436     | 12                        | 7828134     | .312          | .250 x .125 x 2.500 | 8,000                                               | 20,138                               |
| 2.000               | 6            | 5706436     | 12                        | 5708946     | .312          |                     | 16,000                                              | 40,276                               |
| 2.000               | 6            | 5706436     | 12                        | 7828135     | .312          | .500 x .219 x 2.500 | 16,000                                              | 40,276                               |



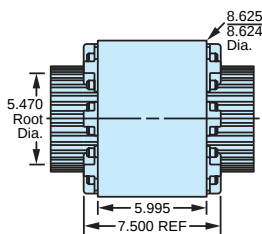
| General Description |              | Inner Race  |                           | Outer Race  |               |                     | Load Ratings                                        |                                      |
|---------------------|--------------|-------------|---------------------------|-------------|---------------|---------------------|-----------------------------------------------------|--------------------------------------|
| Nominal Size        | Active Races | Part Number | Length <sup>†</sup> (ft.) | Part Number | Ball Diameter | Keyway Dimension    | Rated Load In in.-lb. for 1-mil. in. (25.4-mil. mm) | Maximum Static Torque Load (lb.-in.) |
| 2.500               | 3            | 5706484     | 12                        | 5707532     | .375          |                     | 13,500                                              | 36,625                               |
| 2.500               | 3            | 5706484     | 12                        | 7828136     | .375          | .250 x .125 x 3.000 | 13,500                                              | 36,625                               |
| 2.500               | 6            | 5706484     | 12                        | 5708947     | .375          |                     | 27,000                                              | 62,250                               |
| 2.500               | 6            | 5706484     | 12                        | 7828137     | .375          | .500 x .250 x 3.000 | 27,000                                              | 62,250                               |



| General Description |              | Inner Race  |                           | Outer Race  |               |                      | Load Ratings                                        |                                      |
|---------------------|--------------|-------------|---------------------------|-------------|---------------|----------------------|-----------------------------------------------------|--------------------------------------|
| Nominal Size        | Active Races | Part Number | Length <sup>†</sup> (ft.) | Part Number | Ball Diameter | Keyway Dimension     | Rated Load In in.-lb. for 1-mil. in. (25.4-mil. mm) | Maximum Static Torque Load (lb.-in.) |
| 4.062               | 6            | 5702204     | 12                        | 5708330     | .375          | 1.000 x .500 x 3.500 | 57,000                                              | 140,000                              |
| 4.062               | 6            | 5702204     | 12                        | 7828138     | .375          |                      | 57,000                                              | 140,000                              |



| General Description |              | Inner Race  |                           | Outer Race  |               |                      | Load Ratings                                        |                                      |
|---------------------|--------------|-------------|---------------------------|-------------|---------------|----------------------|-----------------------------------------------------|--------------------------------------|
| Nominal Size        | Active Races | Part Number | Length <sup>†</sup> (ft.) | Part Number | Ball Diameter | Keyway Dimension     | Rated Load In in.-lb. for 1-mil. in. (25.4-mil. mm) | Maximum Static Torque Load (lb.-in.) |
| 5.000               | 8            | 7825268     | 8                         | 7825864     | .500          | 1.000 x .500 x 4.500 | 158,000                                             | 345,000                              |
| 5.000               | 8            | 7825268     | 8                         | 7828139     | .500          |                      | 158,000                                             | 345,000                              |



| General Description |              | Inner Race  |                           | Outer Race  |               |                      | Load Ratings                                        |                                      |
|---------------------|--------------|-------------|---------------------------|-------------|---------------|----------------------|-----------------------------------------------------|--------------------------------------|
| Nominal Size        | Active Races | Part Number | Length <sup>†</sup> (ft.) | Part Number | Ball Diameter | Keyway Dimension     | Rated Load In in.-lb. for 1-mil. in. (25.4-mil. mm) | Maximum Static Torque Load (lb.-in.) |
| 6.000               | 8            | 5704982     | 6                         | 5704798     | .500          | 1.000 x .500 x 5.500 | 214,700                                             | 584,000                              |
| 6.000               | 8            | 5704982     | 6                         | 7828140     | .500          |                      | 214,700                                             | 584,000                              |

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## Quick Mount\* Inch Bearing Support Blocks

**Standard**



**V-Series**



### A unitized package for simple mounting of Thomson Saginaw\* Precision ball screw assemblies.

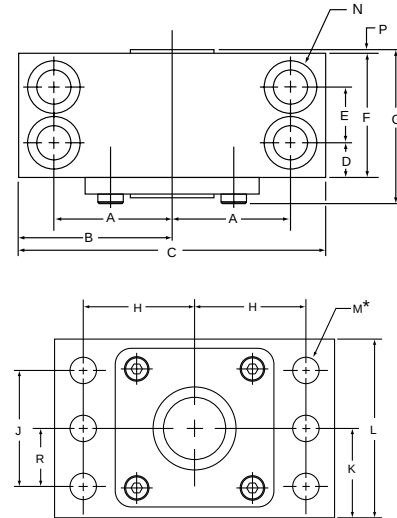
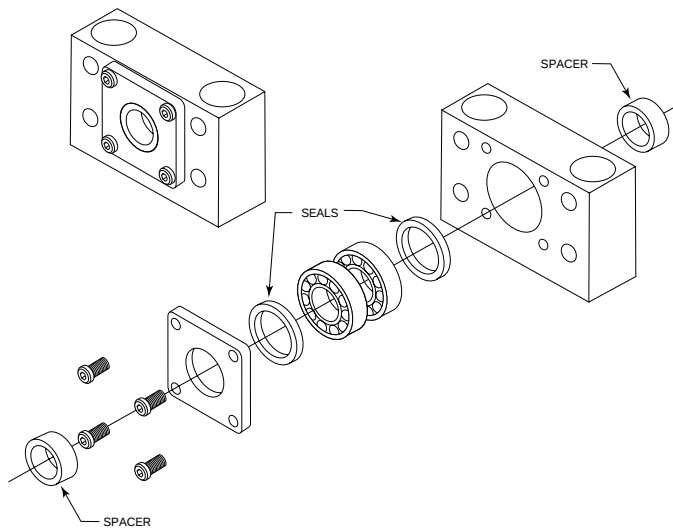
- rugged steel construction
- low profile, compact design
- foot or face mounting Standard series
- foot mounting V-Series
- a pre-assembled package ready for installation
- high capacity angular contact bearings arranged in a back-to-back (DB) configuration for high stiffness
- installation accessories (locknut and washer) included for complete assembly
- design dimensions fit a standard Type III machined end for ball screws. See page 23.
- the Quick Mount will provide a "simple" bearing support for purposes of critical speed and column strength calculations
- available off-the-shelf for your machine building convenience

10 Pillow Block configurations have been designed to accommodate the following ball screw sizes.

| Dia. x Lead (mm) | Standard | V-Series |
|------------------|----------|----------|
| .500 X .500      | 7828282  |          |
| .631 x .200      | 7824154  | 7827842  |
| .631 x 1.00      | 7824154  | 7827842  |
| .750 x .200      | 7824155  | 7827843  |
| .750 x .500      | 7824155  | 7827843  |
| .875 x .200      | 7824156  | 7827844  |
| 1.000 x .250     | 7824157  | 7827845  |
| 1.000 x .500     | 7824157  | 7827845  |
| 1.000 x 1.00     | 7824157  | 7827845  |
| 1.150 x .200     | 7824158  | 7827846  |
| 1.171 x .413     | 7824157  | 7827845  |
| 1.500 x .250     | 7824159  | 7827847  |
| 1.500 x .473     | 7824158  | 7827846  |
| 1.500 x .500     | 7824159  | 7827847  |
| 1.500 x 1.00     | 7824158  | 7827846  |
| 1.500 x 1.875    | 7824159  | 7827847  |
| 1.750 X .200     | 7829554  | 7829555  |
| 2.250 x .500     | 7824160  | 7827848  |
| 2.250 x 1.00     | 7824160  | 7827848  |
| 2.500 x .250     | 7824161  | 7827849  |
| 2.500 x .500     | 7824161  | 7827849  |

# Quick Mount\* Inch Bearing Support Blocks

## Product Dimensions and Specifications



| Standard | V-Series* | A     | B     | C     | D     | E     | F     | G     | H     | J*    | K     | L     | M*                | N                                                          | P    | R*    | Locknut |
|----------|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------------|------------------------------------------------------------|------|-------|---------|
| 7828282  | —         | 1.00  | 1.38  | 2.75  | 0.62  | —     | 1.18  | 1.37  | 1.00  | 1.38  | 1.00  | 2.00  | 4 Holes .28 Dia.  | Dia. .314 thru<br>Dia. .50 C-Bore x .56 DP<br>2 Holes      | —    | 0.69  | 5/16-24 |
| 7824154  | 7827842   | 1.125 | 1.500 | 3.000 | .670  | —     | 1.344 | 1.693 | 1.125 | 1.125 | 1.000 | 1.875 | 4 Holes .281 Dia. | Dia. .406 thru<br>Dia. .625 C-Bore x .875 DP<br>2 Holes    | .020 | .625  | N-01    |
| 7824155  | 7827843   | 1.250 | 1.750 | 3.500 | .750  | —     | 1.500 | 1.848 | 1.250 | 1.375 | 1.125 | 2.125 | 4 Holes .281 Dia. | Dia. .406 thru<br>Dia. .625 C-Bore x 1.000 DP<br>2 Holes   | .020 | .750  | N-02    |
| 7824156  | 7827844   | 1.437 | 2.000 | 4.000 | .828  | —     | 1.656 | 2.004 | 1.437 | 1.375 | 1.250 | 2.375 | 4 Holes .406 Dia. | Dia. .531 thru<br>Dia. .812 C-Bore x 1.125 DP<br>2 Holes   | .020 | .750  | N-03    |
| 7824157  | 7827845   | 1.625 | 2.250 | 4.500 | .937  | —     | 1.873 | 2.334 | 1.625 | 1.750 | 1.438 | 2.750 | 4 Holes .469 Dia. | Dia. .656 thru<br>Dia. 1.000 C-Bore x 1.312 DP<br>2 Holes  | .040 | .938  | N-04    |
| 7824158  | 7827846   | 2.125 | 3.000 | 6.000 | .969  | —     | 1.938 | 2.541 | 2.125 | 2.000 | 1.750 | 3.375 | 4 Holes .656 Dia. | Dia. .906 thru<br>Dia. 1.375 C-Bore x 2.000 DP<br>2 Holes  | .030 | 1.000 | N-05    |
| 7824159  | 7827847   | 2.375 | 3.250 | 6.500 | 1.032 | —     | 2.063 | 2.682 | 2.375 | 2.000 | 1.875 | 3.625 | 4 Holes .656 Dia. | Dia. .906 thru<br>Dia. 1.375 C-Bore x 2.062 DP<br>2 Holes  | .045 | 1.000 | N-06    |
| 7829554  | 7827855   | 2.937 | 3.750 | 7.500 | 0.758 | 1.634 | 3.150 | 3.785 | 2.937 | 3.000 | 2.250 | 4.250 | 4 Holes .6 Dia.   | Dia. .906 thru<br>Dia. 1.375 C-Bore x 2.25 DP<br>4 Holes   | .050 | 1.500 | N-08    |
| 7824160  | 7827848   | 3.313 | 4.250 | 8.500 | .874  | 1.720 | 3.468 | 4.154 | 3.313 | 3.625 | 2.813 | 5.625 | 6 Holes .812 Dia. | Dia. 1.031 thru<br>Dia. 1.625 C-Bore x 3.500 DP<br>4 Holes | .050 | 1.813 | N-09    |
| 7824161  | 7827849   | 3.563 | 4.500 | 9.000 | .924  | 1.720 | 3.568 | 4.425 | 3.563 | 3.625 | 2.813 | 5.625 | 6 Holes .812 Dia. | Dia. 1.031 thru<br>Dia. 1.625 C-Bore x 3.500 DP<br>4 Holes | .090 | 1.813 | N-10    |

\* V-Series does not have M holes

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## Maintenance and Service

All Thomson Saginaw ball screw assemblies are designed for maximum life and trouble-free operation when adequately serviced and maintained. Ball screw disassembly should be attempted only after complying with the general inspection and maintenance instructions outlined in this section. Be positive that the ball screw is at fault. Disassembly should be done only by persons familiar with ball screw assembly principles. In any unusual circumstances, contact Thomson Saginaw.

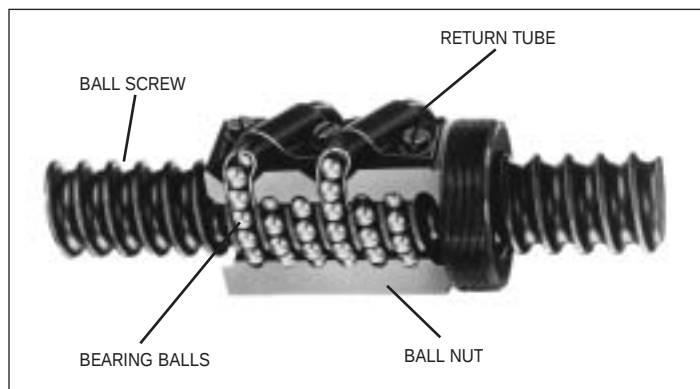


Figure 5

### General Description

A Thomson Saginaw ball screw is a force and motion transfer device belonging to the family of power transmission screws. It replaces the sliding friction of the conventional power screw with the rolling friction of bearing balls. The balls circulate in hardened steel races formed by concave helical grooves in the screw and nut. All reactive loads between the screw and nut are carried by the balls which provide the only physical contact between these members. (See Figure 5.)

As the screw and the nut rotate relative to each other, the balls are diverted from one end and carried by ball guides to the opposite end of the nut. This recirculation permits unrestricted travel of the nut in relation to the screw.

### Ball Deflectors (Method I)

Ball nuts using the deflector return system are identified by threaded deflector studs extending through holes in the nut and the guide clamp. Lock nuts of the deflector studs are used to secure the clamps that hold the guides in place. (Figure 6.)

### Pick-up Fingers (Method II)

Ball nuts using pick-up fingers are identified by the finger projections integral with the guide. In this method, cap screw fasteners are used to fasten the clamp that holds the guide in place. (Figure 6.)

### Wipers

Wipers are available for most units as optional items. They generally fall into two categories: one style is internally mounted inside the extreme ends of the ball nut and held in place with retaining rings; the other is a wiper and retainer kit combination mounted on the exterior end of the ball nut. In some applications, one or the other may be used or a combination of both. Visual inspection will reveal the style used.

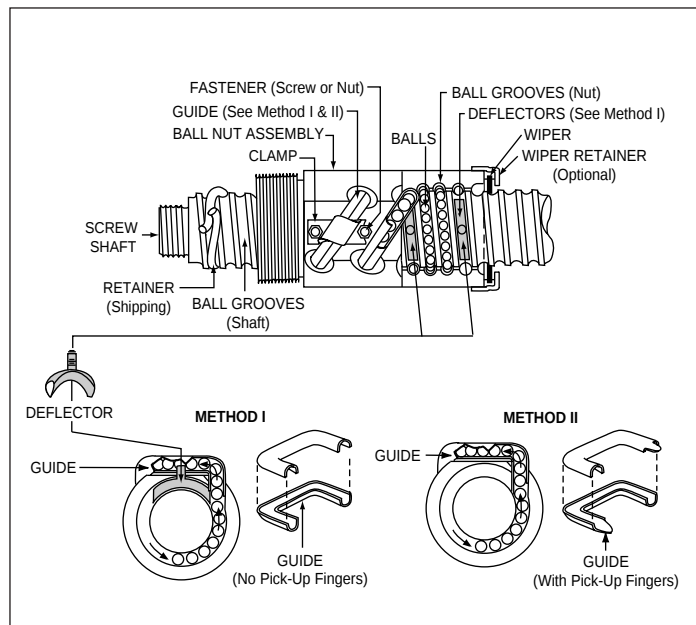


Figure 6

### Troubleshooting

Misalignment is one of the most common problems. Evidence of misalignment can generally be detected by one of the following situations:

- Squealing noise caused by the balls sliding in one or more of the circuits.
- Roughness in the form of vibrations or slightly erratic operation. This can normally be detected by "feel" when placing your hand on the return circuits.
- Excessive heat at the ball nut. Any appreciable temperature above the ambient of adjacent components should be considered excessive.

Gouging or scoring marks on the ball contact area of the screw may be caused by trapped balls between the circuits, broken balls, broken pick-up fingers or deflectors, or foreign objects which may have been digested by the ball nut.

When any of these conditions are encountered, examine the installation and, if necessary, immediately take corrective action to eliminate the cause and prevent further damage.

### General Inspection of the Screw Shaft

Inspect the shaft ball grooves for signs of excessive wear, pitting, gouges, corrosion, or brinelling. Normally, where any of these conditions exist on most Thomson Saginaw Precision units, it may be more economical and advisable to replace the screw shaft. Consult Thomson Saginaw for evaluation and possible repair of Precision Plus units.

### Backlash

Secure the screw shaft rigidly in a table clamp or similar device. Make sure it cannot rotate. Push firmly on the ball nut, first in one direction, then in the opposite direction. The axial movement of the ball nut is the backlash. This measurement can be taken with a dial indicator. Make sure that neither member rotates while the readings are taken.

## Maintenance and Service (continued)

Backlash with the following limits is considered acceptable:

| Ball Diameter  | Max. Permissible <sup>†</sup> Lash (used unit) | Max. Lash (new unit) |
|----------------|------------------------------------------------|----------------------|
| 0 - 1/8"       | .008                                           | .005                 |
| 5/32" - 1/4"   | .014                                           | .007                 |
| 9/32" - 15/32" | .025                                           | .010                 |
| 1/2" and up    | .050                                           | .015                 |

<sup>†</sup> Values based on wear resulting from foreign material contamination and/or lack of lubrication.

If, after inspection, the screw shaft appears to be usable but has excessive backlash, proceed with further disassembly and component inspection.

### Disassembly

**General Instructions:** Have a clean container, such as a tote tray or cardboard box, handy for each ball return circuit of the ball nut assembly. A piece of clean cloth should be placed on the work table and gathered around the edge to form a pocket to retain the balls. Place the ball nut assembly over the cloth and remove the clamp.

Where more than one guide is held in place by a single clamp, secure each remaining guide with a strip of tape around the diameter of the ball nut to prevent accidental guide removal before you are ready for that circuit.

Remove both halves of the guide simultaneously to prevent distortion to either half. Catch all the balls from this circuit on the cloth by rotating the screw or ball nut slowly. Place the removed components into a container. Identify the container, the guide, and the circuit of the ball nut so the components can be reassembled in the same circuit from which they were removed. Repeat for each circuit.

**Pick-up Finger Method:** Refer to the Component Inspection section.

**Deflector Method:** To remove the deflectors from the ball nut assembly, remove the ball nut from the screw shaft. The ball nut must be rotated since the deflectors engage loosely in the screw ball grooves and act as a thread. The deflectors now can be removed from the opposite ends of the ball nut so that you can use them for reference during component inspection.

### Component Inspection and Replacement

**Balls:** If there is more than one circuit in the ball nut, count the balls in each of the separate containers to be sure each has the same number (within a variation of three balls). Check random samples (about 1/4 of the balls for a circuit) for the following:

- True roundness, with a .0001 in. maximum variation.
- Signs of scuffing or fish scaling.
- More than .0001 in. diameter variation between balls of the same circuit.

Where the random sampling shows balls out of round, signs of scuffing or variation of diameter in excess of .0001 in., or short count in any circuit, all balls in the unit must be replaced with a complete set of new balls. Ball kits are available from Thomson Saginaw.

To ensure proper operation and long life of the serviced assembly, it is imperative that the diameters of all the replacement balls do not vary in excess of .00005 in. If Thomson Saginaw kits are not used for service, make sure the balls meet the above specification. (Note: Use only chrome alloy steel balls, Grade 25 or better. Carburized balls or carbon steel balls will not provide adequate life.)

**Deflectors:** Examine the ends of the deflectors for wear or brinelling. Wear can be determined by comparison with the unused ends of the

two outside deflectors. Since these ends have not been subjected to wear from balls, they are in a like-new condition. Where wear or brinelling is evident, it is best to replace the deflectors with new ones.

**Pick-up Fingers:** Inspect the pick-up fingers, which consist of short extensions at the end of the guides. Replace with new guides if a ball brinell impression appears on the tip. Remove any burrs on the fingers. If the guides were distorted during removal, replace with new guides.

**Ball Nut:** Inspect the internal threads of the ball nut for signs of excessive wear, pitting, gouges, corrosion, spalling, or brinelling in the ball groove area. On large ball nuts, running the tip of your finger along the groove which is accessible will enable you to detect a secondary ridge in the ball groove area when wear is excessive or brinelling has occurred. (The extended lead of a mechanical pencil can also be used as a groove probe.) If inspection indicates any of these flaws, the ball nut assembly should be replaced.

**Wipers:** Prolonged use and environmental conditions will generally determine the condition of wipers. After cleaning wipers, reassemble over the screw shaft to determine whether a snug fit is maintained over the complete contour of the screw shaft. Any loose fitting or worn wipers should be replaced. Wiper kits are available for Thomson Saginaw ball screws.

Note: If the assemblies have had extended use, it is recommended that all low cost items be replaced with new parts (i.e., balls, guides, deflectors, clamps). These can be ordered by simply referring to the assembly part number purchased.

### Reassembly

**Cleaning:** Clean all components with a commercial solvent and dry thoroughly before reassembly.

**Deflector Method:** Where the ball nut is equipped with deflectors, install these and secure temporarily by running the lock nuts down the studs and tightening.

**General Instructions:** Position the ball nut on the screw shaft. Ball nuts with deflectors have to be screwed on. Other ball nuts will slide on. Using dowels with an O.D. approximately equal to the diameter of the balls, center the ball nut grooves with the shaft grooves by inserting dowels into each of the ball nut return circuit holes.

Remove the second dowel from one end. With the ball return holes up, fill the circuit with balls from the container corresponding to that circuit. Turning the screw in the ball nut will help to feed the balls into the groove. When the circuit is full, the balls will begin to lift the end dowel from its position. To be sure there are no voids, lightly tap the top bearing ball and see if the end dowel moves.

The remaining ball in the container should fit into one of the halves of the return guide with space for about three to six left.

Note: There must be some free space in the ball circuit so the balls will roll and not skid. Do not try to add extra balls into the circuit.

Place a dab of bearing grease at each end of the half return guide to hold the balls in place. Now, take the other half of the return guide and place it over the half guide you have filled with balls and insert two ends of the ball guide into the respective hole in the ball nut. Seat by tapping gently with a rawhide or plastic mallet.

Note: Where more than one ball circuit must be filled in the ball nut, tape the ball return circuit to the ball nut to prevent accidental removal. Repeat the filling procedure for the remaining circuits.

With all ball circuits filled and all return guides in place, secure the return guides with the retaining clamp.

**Caution:** Care should be taken to ensure that balls are not accidentally trapped between circuits in units having pick-up fingers. In deflector

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## Maintenance and Service (continued)

**Inspection:** Wrap tape around the ball grooves at the ends of the screw shaft to prevent the ball nut from rolling off. Now inspect the assembly for free movement of the ball nut along the entire stroke. There should be no binding, squeal, or roughness at any point.

**Reducing Backlash:** Backlash can be reduced by replacing all the balls with a larger size. If the diameters of the bearing balls are increased by .001 in., backlash is decreased by .003 in. (Ball kits are available for these applications.)

### Lubrication:

**Inspection Prior to Lubrication:** All ball screw assemblies should run smoothly throughout the entire stroke. If the torque is not uniform over the entire stroke:

- Visually inspect the screw shaft for accumulations of foreign matter.
- Using cleaning fluid or solvent, remove dirt from the ball grooves. Be sure to flush the ball nut assembly thoroughly.
- Cycle the ball nut along the screw shaft several times. Wipe with a dry, lintless cloth and lubricate immediately.
- If the assembly continues to operate erratically after cleaning, contact Thomson Saginaw for further instructions.

**Lubrication:** The operating environment primarily determines the frequency and type of lubrication required by ball screws. The screw shaft should be inspected frequently and lubricated as required by the environmental conditions present. Lubricants can vary from instrument grade oil for dirty and heavy-dust environments to a good grade ball bearing grease for protected or clean environments. For most applications, a good 10W30 oil periodically wiped on the screw shaft with a damp cloth or applied by a drip or mist lubricator will suffice.

**CAUTION:** Where the screw is unprotected from airborne dirt, dust, etc., do not leave a heavy film of lubricant on the screw. Keep the screw shaft barely damp with lubricant. Inspect at regular intervals to be certain lubricating film is present. Where the application requires operation at temperatures below 0° F, an instrument grade oil is recommended. Operating environments from 0° F to 180° F will require a good grade 10W30 oil. For assemblies with balls larger than 3/8 in. diameter, MIL G 3278 grease is recommended. Bearing grease is recommended for operating environments at nominally higher temperatures. Again, in unprotected conditions, the lubricant is best applied with a lubricant-dampened cloth, taking care not to leave an excessive film thickness on the screw. Ball screws should never be run dry.

### Transferring a Ball Nut to or from an Arbor

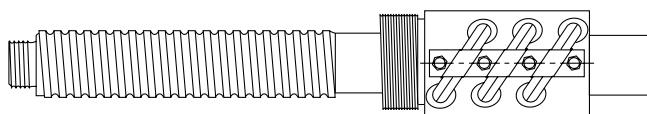


Figure 7

To transfer the ball nut to the screw, proceed as follows:

1. Remove any ball nut retainer from the arbor. Hold the arbor firmly end to end with the screw. Make certain the arbor end is centered on the screw shaft end. (See Figure 7.)

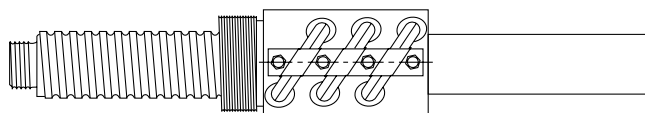


Figure 8

2. Slide the ball nut down to the screw shaft and rotate to the thread until you feel the balls drop into the screw thread. Then rotate with the screw thread until the ball nut completely clears the end of the screw shaft adjacent to the arbor. (Figure 8.)

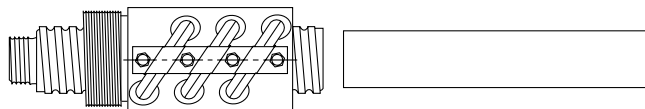


Figure 9

3. Remove the arbor. (Figure 9.)

To transfer the ball nut to the arbor, reverse these steps.

**CAUTION:** When end machining makes it impossible to bring the arbor adjacent to the shaft ball grooves, wrap the machined portion with tape to the nominal O.D. of the arbor. The tape will permit the ball nut to slide over the machined area without the balls dropping into machined irregularities in the shaft.

**CAUTION:** Extreme care must be taken to prevent the ball nut from sliding off the end of the screw shaft during installation and handling. Temporary stops can be made by wrapping tape around the shaft ball grooves at each end. Be sure to remove the tape and any residual adhesive after the ball screw assembly is properly installed.

**Warning:** If any balls are spilled during transfer and cannot be recovered and identified, replace all balls using the instructions previously provided in this section.

### Preloaded Ball Screws (Double Nut Design)

**General Description:** The two primary reasons for preloading ball screws are to: eliminate backlash and obtain maximum system stiffness.

Precision ball screws are generally preloaded in any one of the four configurations shown in Figure 10.

Precision ball screw preloading is limited to units having compensating features. However, preload configuration may also be encountered in certain applications approved by Thomson Saginaw Application Engineering.

Preload with the solid-type shim is normally established at one-third of the operating load. At this preload level, a nearly constant spring rate is achieved for the assembly up to the operating load. This provides a suitable compromise between stiffness and life expectancy.

Preload for units having a compensating spring feature should be established in excess of the normal operating load whenever possible. Further adjustment is not normally required during the life expectancy. Units of this type are used in many specific applications requiring special considerations. It is advisable to become familiar with the originally intended requirements of such a unit before disassembly. Note: Other styles such as preloading through a housing may be used in custom applications. The same basic instructions outlined in this section apply.

## Maintenance and Service (continued)

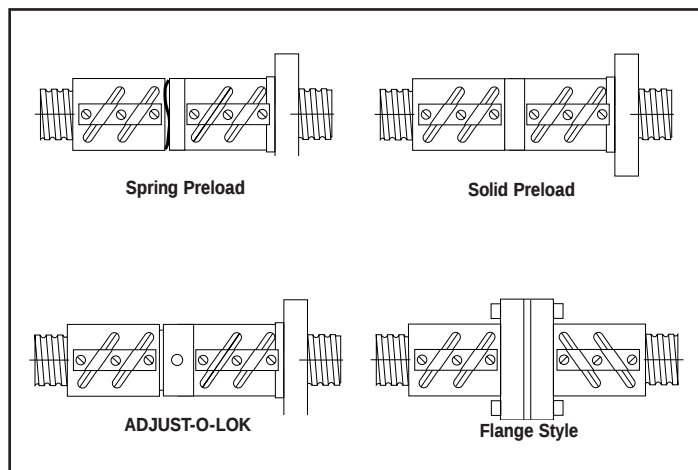


Figure 10

**Inspection and Existing Preload Check:** Whenever possible, the complete ball screw assembly should be removed from the machine prior to a thorough inspection. Preliminary screw inspection can be made while the unit is still in the machine. Preload can be determined by measuring movement of the nut in respect to the screw shaft. Clamp an indicator to the screw shaft with its probe resting on the face of the nut. Apply a load to the machine carriage in both directions. Be sure that the screw cannot rotate or move axially. Any measurable backlash between the ball nut and screw is an indication that preload does not exist. (See Figure 11.)

If no backlash exists, proceed further as outlined to determine whether proper preload remains in the unit. Existing preload,  $W_p$ , can be determined by measuring torque,  $T_p$ , using the following formula:

$$W_p = \frac{T_p}{.007}$$

where:  $W_p$  = Preload force, in lb.

$T_p$  = Torque, in lb.-in. (due to preload only)

**Note:** The above check is to determine preload only, and does not take into account torque due to seal drag or operating load.

Torque can be measured by means of a spring scale mounted to any projection on the ball nut or by means of a lever or rod secured to the ball nut. In taking this measurement, be sure the exact lever arm distance is measured. (See Figure 11.) This measurement (in.) multiplied by the scale reading (lb.) equals  $T_p$  (torque lb.-in.).

Existing preload can now be determined using the above formula.

Preload adjustment of a Precision ball screw (Figure 10) requires no disassembly. Possible removal of the ball nut from the machine housing may be necessary to expose the adjusting nut.

**Disassembly:** If in doubt about disassembly of preloaded ball nuts, contact Thomson Saginaw Application Engineering. If the unit is to be disassembled for general repair, follow the steps previously outlined in this section.

If being disassembled for preload adjustment, follow the guidelines except remove only one-half of the ball nut assembly to an arbor. If a standard arbor is not available, one can be made from a piece of

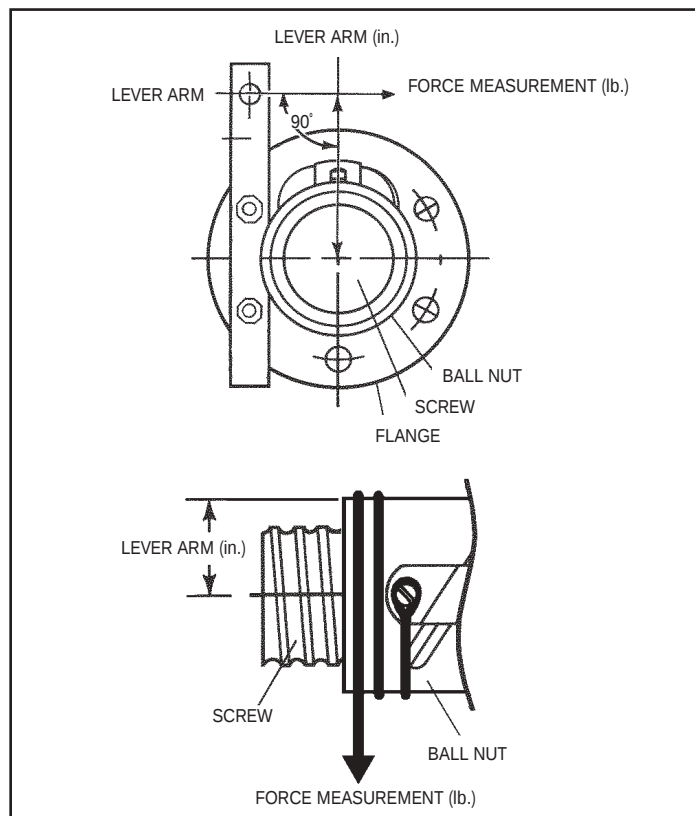


Figure 11

shafting or tubing with a diameter approximately .005 in. less than the root diameter of the ball grooves in the screw shaft. Both halves of the ball nut will come apart as soon as the last ball in the nut is free of the grooves in the screw shaft. It is not necessary to remove the other half from the screw.

**Preload Adjustment:** The adjusting nut unit in Figure 10 can be adjusted to the desired preload with the use of additional shims. To make further adjustment, loosen the set screw lock located on the periphery of the lock nut. Use a spanner wrench to rotate the adjusting nut to the desired setting. Recheck the preload.

For all other standard units in Figure 10, a shim increase of .001 in. will, as a general rule, increase preload by 500 to 1,000 lb. This varies depending upon screw size; therefore, some judgement and trial and error may be necessary before the desired preload is achieved.

Preload force,  $W_p$ , can be determined by measuring torque,  $T_p$ , after the desired preload has been established using the following formula:

$$T_p = .007 W_p$$

where:  $T_p$  = torque, lb.-in. (due to preload only)

$W_p$  = preload force, lb.

This section is intended to provide basic necessary information to properly service and maintain Thomson Saginaw ball screws. Other forms of preloaded units may be encountered which have been designed for particular applications. Please contact Thomson Saginaw Application Engineering for other specific information.

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## Transferring Ball Nuts from Arbor

**SBN, SEL** and **SAR** ball nuts are supplied on arbors. Care must be used not to lose any of the bearing balls, or trap balls between circuits when rotating the ball nut on to the screw.

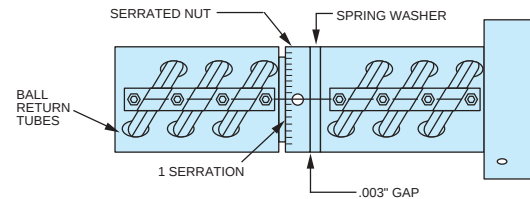
### Preloading SEL and SAR Ball Nuts

SEL and SAR ball nuts are transferred from arbor without a preload. Before preloading these ball nuts, oil the coupling threads, spring washers, ball nut bearing surfaces and the ball grooves of the screw shaft. Center the serrated nut on the coupling.

**Be sure to keep the ball return tubes of the two ball nuts aligned (see drawing). Also, make sure the coupling tangs line up with the slots in the ball nut if they have become disengaged.**

Position the ball nut midway on the screw shaft. Place retainers on screw to prevent the ball nut from accidentally running of the screw shaft. With the ball return tubes facing upwards, tighten the serrated nut against the spring washer "finger tight", plus 1/4 turn. Rotate the screw shaft through several turns in both directions while holding the ball nut with the ball return tubes on top. Continue to tighten the serrated nut with spanner or channel locks until the (.003") (075mm) average gap is obtained resulting in the preload as indicated by the chart. Rotate the screw in both directions several times and check for smoothness. Be sure the spring washer of the coupling is centralized (not protruding in any direction). Use a plastic or brass mallet, if necessary, to help seat the coupling system. Tap lightly. Recheck torque and re-average gap as necessary.

Check the torque by rotating screw shaft with a torque wrench. Secure the serrated nut with the set screw(s) provided.



| Ball Nut Nominal Size & Lead | Preload Lbs. (Newtons) at .003" Gap | Change per* Serration Lbs. (Newtons) | Torque In-lbs, (N-mm) at .003" Gap |
|------------------------------|-------------------------------------|--------------------------------------|------------------------------------|
| .500 .500                    | 150                                 | 20                                   | 1.0                                |
| .631 .200                    | (667.5)                             | (89)                                 | (110)                              |
| .750 x .500                  | 220                                 | 20                                   | 1.5                                |
| .875 .200                    | (979)                               | (89)                                 | (170)                              |
| 1.000 .250                   | 330                                 | 10                                   | 2.0                                |
| 1.000 1.00                   | (1468.5)                            | (44.5)                               | (230)                              |
| 1.150 .200                   | 240                                 | 10                                   | 1.5                                |
|                              | (1068)                              | (44.5)                               | (170)                              |
| 1.500 .250                   | 920                                 | 35                                   | 5.5                                |
|                              | (4094)                              | (155.75)                             | (620)                              |
| 1.500 1.000                  | 1550                                | 20                                   | 10.0                               |
|                              | (7342.5)                            | (89)                                 | (11.0)                             |
| 1.500 1.875                  | 1550                                | 20                                   | 10.0                               |
|                              | (7342.5)                            | (89)                                 | (11.0)                             |
| 2.250 .500                   | 5000                                | 150                                  | 30.0                               |
|                              | (2225)                              | (667.5)                              | (3400)                             |
| 2.500 .250                   | 1300                                | 25                                   | 10.0                               |
|                              | (5785)                              | (111.25)                             | (1100)                             |
| 3.000 .660                   | 12400                               | 55                                   | 75.0                               |
|                              | (56180)                             | (244.75)                             | (8500)                             |

## Ball Chart

Grade 25 Balls or better

| SIZE         | PART #                                   | NOMINAL DIAMETER        | APPROX.# OF BALLS** |
|--------------|------------------------------------------|-------------------------|---------------------|
| .187 x .050  | 7821609<br>7821632                       | 0.039                   | 30                  |
| .187 x .062  | 7821579<br>7821631                       | 0.039                   | 30                  |
| .375 x .125  | 7824973                                  | 0.078                   | 49                  |
| .375 x .125  | 5709574<br>5709578<br>5709576            | 0.062                   | 62                  |
|              | 5707643<br>5707502<br>5708282            | 0.062                   | 124                 |
| .500 x .200  | 7826763<br>7823871<br>7826720            | 0.125<br>0.125<br>0.125 | 72<br>48<br>96      |
| .500 x .500  | 5707506<br>5707644<br>5709582<br>5709584 | 0.125                   | 60                  |
|              | 7826767                                  | 0.125                   | 120                 |
| .631 x .200  | 7820827<br>7820828<br>5707645            | 0.125                   | 67                  |
|              | 7820955<br>7823584                       | 0.125<br>0.125          | 134<br>134          |
| .631 x 1.000 | 7826713<br>7827531                       | 0.125<br>0.125          | 46<br>92            |

| SIZE          | PART #                                              | NOMINAL DIAMETER                 | APPROX.# OF BALLS**      |
|---------------|-----------------------------------------------------|----------------------------------|--------------------------|
| .750 x .200   | 7824297<br>7826768<br>7823870                       | 0.141<br>0.125<br>0.125          | 134<br>72<br>108         |
| .750 x .500   | 7824358<br>7826991                                  | 0.141<br>0.156                   | 134<br>268               |
| .875 x .200   | 5708277<br>7823585                                  | 0.125<br>0.125                   | 184<br>184               |
| 1.000 x .250  | 5707508<br>5707535<br>5700348<br>5708278<br>5708284 | 0.156<br>0.156<br>0.156          | 85<br>170<br>170         |
|               | 5704167<br>5704168<br>7823586                       | 0.156<br>0.156<br>0.156          | 170<br>170<br>170        |
| 1.000 x .500  | 7824286                                             | 0.156                            | 168                      |
| 1.000 x 1.000 | 5707509                                             | 0.156                            | 98                       |
| 1.150 x .200  | 5701566<br>7820207<br>5704270<br>7820206<br>7823587 | 0.125<br>0.124<br>0.124<br>0.124 | 224<br>224<br>224<br>224 |
| 1.171 x .413  | 5707511                                             | 0.281                            | 60                       |

| SIZE          | PART #                        | NOMINAL DIAMETER        | APPROX.# OF BALLS** |
|---------------|-------------------------------|-------------------------|---------------------|
| 1.500 x .250  | 5709587<br>5701990<br>5704270 | 0.156<br>0.156<br>0.156 | 230<br>460<br>460   |
| 1.500 x .473  | 5707513<br>5708345            | 0.344                   | 86                  |
| 1.500 x .500  | 7824246                       | 0.344                   | 122                 |
| 1.500 x 1.000 | 5708280<br>5701995<br>5700698 | 0.344<br>0.344          | 64<br>128           |
| 1.500 x 1.875 | 5707654<br>5704272            | 0.281<br>0.281          | 84<br>168           |
| 2.250 x .500  | 5707516<br>5704000<br>5708346 | 0.375                   | 154                 |
|               | 7823589                       | 0.375                   | 308                 |
| 2.250 x 1.000 | 5704555                       | 0.375                   | 164                 |
| 2.500 x .250  | 5703243<br>7823590            | 0.156<br>0.156          | 468<br>936          |
| 2.500 x .500  | 7824136                       | 0.375                   | 170                 |
| 3.000 x .660  | 5707519<br>5708347<br>5703045 | 0.5<br>0.5              | 177<br>354          |
| 3.000 x 1.500 | 5704986                       | 0.5                     | 166                 |
| 4.000 x 1.000 | 5703258                       | 0.625                   | 186                 |
| 6.000 x 1.000 | 5704738                       | 0.75                    | 231                 |

\* Actual ball size is selected during assembly for optimal performance

\*\* Ball count can vary +/-5%.

# Typical Applications

## X-Y Inspection System

### Objective

Accurately position an inspection probe of an X-Y system over small electronic components.

### Solution

Design an X-Y system with Super Plus\* pillow blocks to provide accurate and repeatable movement of the test probe. Utilize Thomson Industries linear motion systems on the Y-axis to reduce cost and installation time.

### Products Specified

X-axis

- (A) 2 – S TWN-10-ADJ (Super Plus twin pillow blocks)
- (B) 4 – ASB M16 (aluminum support blocks)
- (C) 2 – 5/8" L 24" (60 Case\* LinearRace\* shafts)
- (D) 1 – .631 x .200 Thomson Saginaw Precision Plus ball screw assemblies

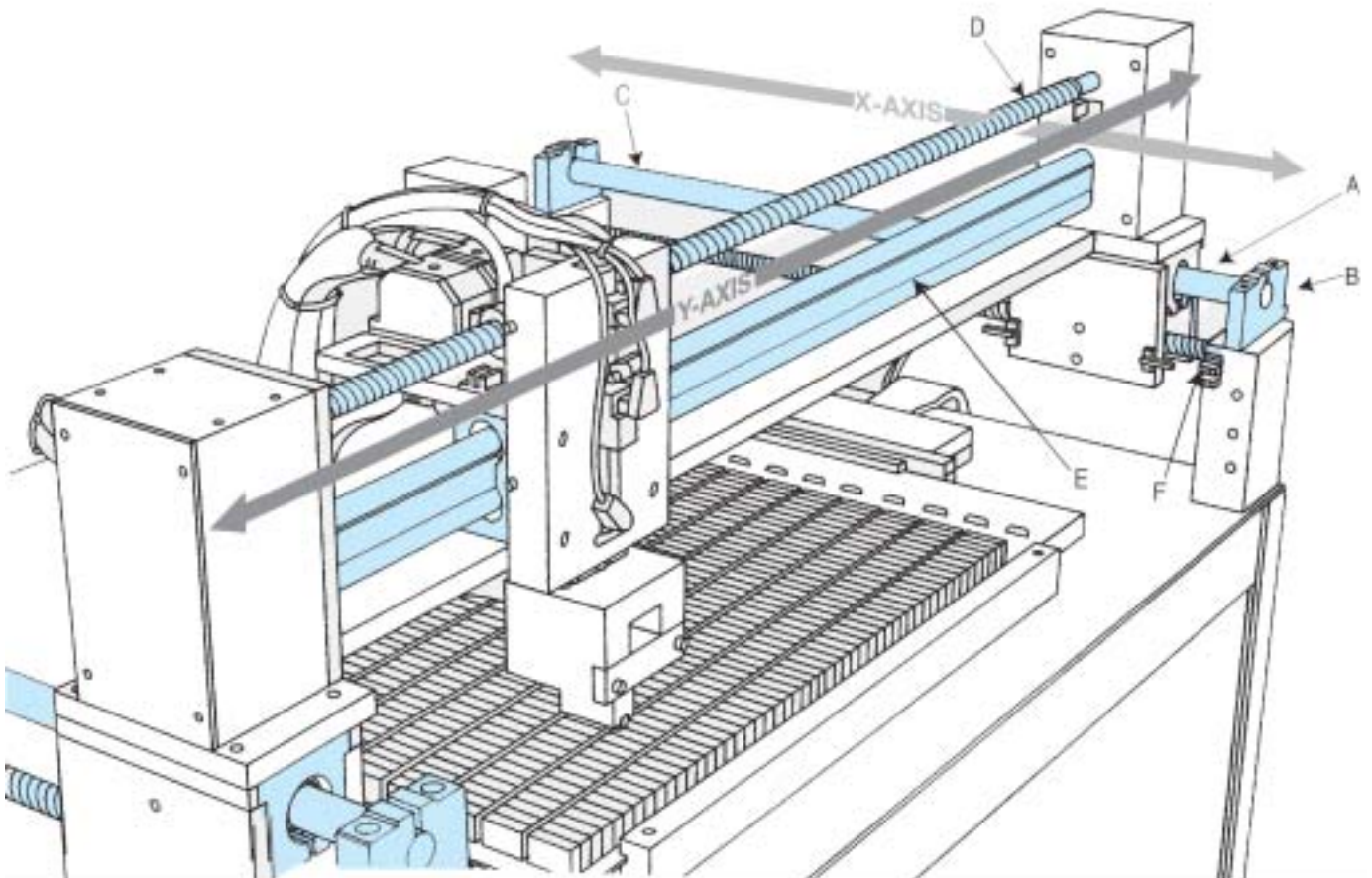
Y-axis

- (E) 1 – 2CA 08 (pre-assembled linear motion system with a Thomson Saginaw Precision Plus .631 x .200 ball screw assembly)

- 1 – .500 x .200 Thomson Saginaw\* Precision ball screw assembly

### Benefits

Outstanding positioning accuracy and repeatability was provided by the adjustable pillow blocks and ball screws. The use of a pre-engineered, pre-assembled linear motion system on the Y-axis saved valuable design and assembly time.



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# Typical Applications

## Microcomputer-Controlled X-Y Table

### Objective

Create a highly accurate, cost-effective system to position the workpiece for precise milling and drilling on a vertical machining center.

### Solution

Use Thomson Saginaw Precision ball screw assemblies, Super Ball Bushing\* bearing pillow blocks, and 60 Case\* LinearRace\* shafting on low-profile support rails.

### Products Specified

X-axis

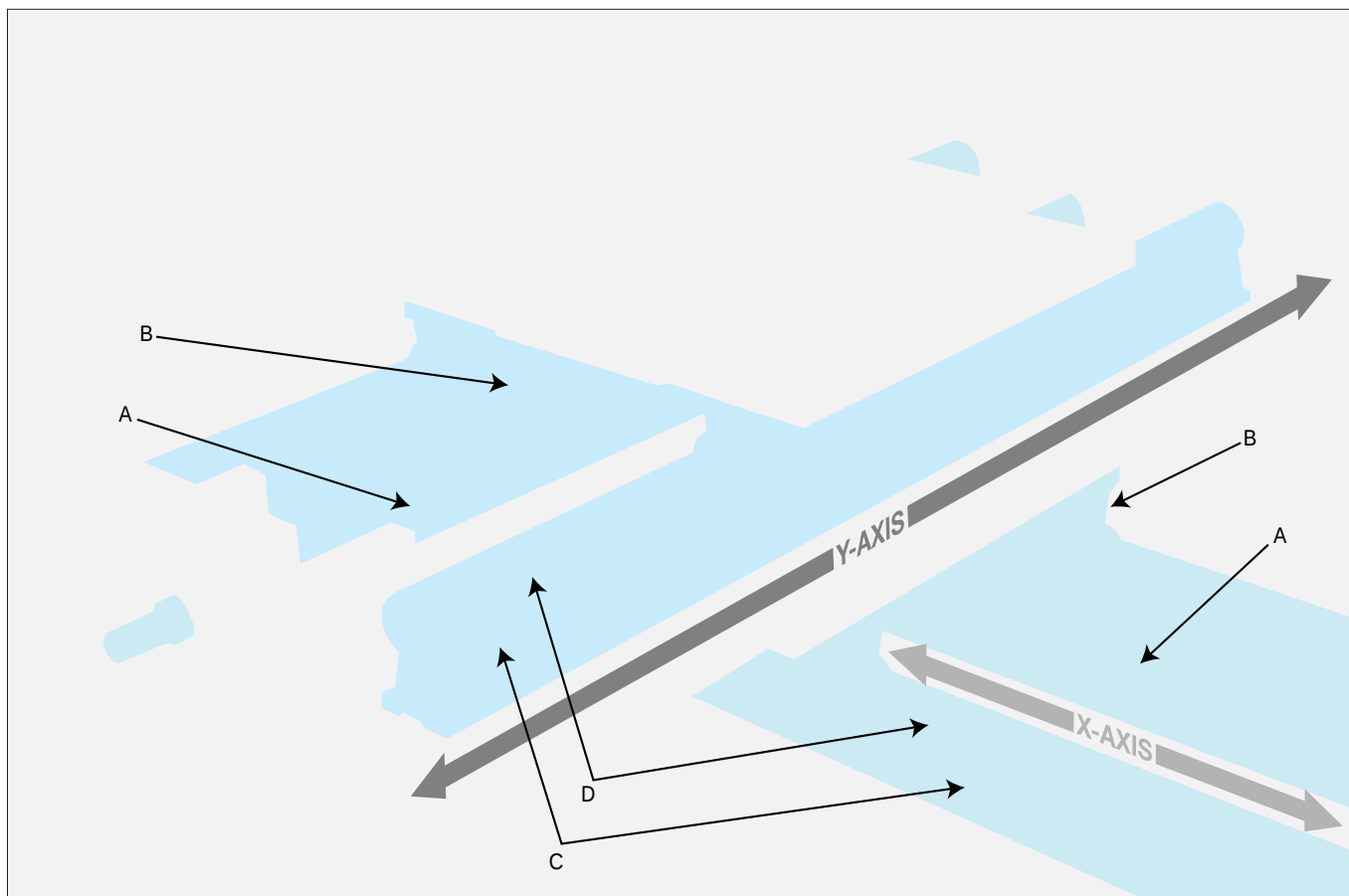
- (A) 1- 1.150 x .200 Thomson Saginaw\* Precision ball screw assembly
- (B) 4- SPB OPN 24 (pillow blocks)
- (C) 2- LSR-24-PD L24 (shaft support rails)
- (D) 2- 1 1/2-PD-24 (60 Case\* LinearRace\* shafts)

Y-axis

- (A) 1- .875 x .200 Thomson Saginaw Precision ball screw assembly
- (B) 4- SPB OPN 24 (pillow blocks)
- (C) 2- LSR-24-PD L24 (shaft support rails)
- (D) 2- 1 1/2-PD L24 (60 Case LinearRace shafts)

### Benefits

The ball screws provide controlled, repeatable movement of the workpiece for precise milling and drilling operations. All the actuators and linear motion components were ordered from one source, maximizing cost-effectiveness and minimizing paperwork.



# Inch Ball Screw Assemblies Order Form

Date \_\_\_\_\_  
Name \_\_\_\_\_  
Company \_\_\_\_\_  
Title \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ Zip Code \_\_\_\_\_  
Telephone \_\_\_\_\_ Fax \_\_\_\_\_  
Email \_\_\_\_\_

## Ball Screw Assemblies

Quantity \_\_\_\_\_ Lead Error – in./ft. (circle) 

|  | Standard   | Special         |
|--|------------|-----------------|
|  | .004 .0005 | .002 .001 .0002 |

  
Ball Circle Diameter \_\_\_\_\_ Lead \_\_\_\_\_ Ball Screw Part Number \_\_\_\_\_ Overall Length \_\_\_\_\_

## End Blocks (end blocks require Type III machined ends)

Quantity Per Assembly (1 or 2) \_\_\_\_\_ End Block Part Number \_\_\_\_\_

## End Machining

Right End – standard end machining

- ☐ Types (circle one)    I    II    III\*    IV  
☐ with drive  
☐ without drive

\*Type III end machining required for end blocks

Left End – standard end machining

- ☐ Types (circle one)    I    II    III\*    IV  
☐ with drive  
☐ without drive

\*Type III end machining required for end blocks

- ☐ Cut to length only  
☐ Other (see attached print)

Ball Nut Part Number \_\_\_\_\_ Flange Part Number \_\_\_\_\_ Wiper Part Number \_\_\_\_\_

## Ball nut flange or V-thread to face

- ☐ Left end machining  
☐ Right end machining  
☐ Other (see attached print)

## Flange Flats

- ☐ Yes (see attached print)  
☐ No

Purchase order number \_\_\_\_\_ Requested delivery date \_\_\_\_\_  
Shipping instructions \_\_\_\_\_  
Signature (required for orders) \_\_\_\_\_

**FAX THIS FORM TO: 989-776-3632**

Thomson Saginaw Ball Screw Company, LLC  
628 N. Hamilton  
Saginaw, MI 48602  
Telephone: 989-776-4123  
Email: tsbsrfq@thomsonmail.com

To order, call 989-776-4123



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## A Dedication To Quality

Exceptional quality and strict adherence to customer requirements are driving forces in the design and production of Thomson Saginaw ball screw actuators. The formal recognitions of quality assurance shown on this page are only a few of the many quality standards to which we comply. Quality assurance is one more reason Thomson Saginaw leads the industry.

"Thomson's quality and excellence goal is to provide quality products and services on time, first time, every time to meet the needs, wants and expectations of our customers, distributors and prospects."

*Dr. Alex N. Beavers, Jr.  
CEO*



"Winning this award means being able to consistently deliver top-quality on time. Quality, service, price — those are the criteria."

*GM Supplier of the Year*

"Thomson Saginaw has demonstrated, to HGSS Supplier Quality Assurance, a quality system capable of administering the controls required by MIL-I-45208A and is hereby approved."

*Harris Government Systems*

"Approved supplier of ball screw assemblies."

*Atomic Energy of Canada Ltd.  
25PN30000-624*

"As a result of this performance evaluation you are considered as an 'APPROVED' source for Martin Marietta Astronautics Group."

*Martin Marietta*

"The facilities and quality system of Thomson Saginaw Ball Screw have been evaluated by Vendor Quality Assurance and are approved for the following: Supplier of ball bearing screw and ball bearing spline assemblies."

*Speco Corporation*

"(Thomson Saginaw) has been reviewed and approved by the GDLS Supplier Assurance Group for the requirements for MIL-I-45208A."

*General Dynamics  
Land Systems Division*

"ISIR #85541-0 for part number A-6095 has been approved, per the attached paperwork. This letter is formal authorization to proceed with your production on this part number."

*Eaton Corporation  
Truck Components Operations*

"Your company has been approved for the capabilities indicated above."

*Bell Helicopter Textron, Inc.*

"Approval of manufacturing methods."

*Dowty Rotorol Limited*

"This certificate is issued to Thomson Saginaw Ball Screw upon finding that its organization complies in all respects with the requirements of the Federal Aviation Regulations and is empowered to operate an approved repair station."

*U.S. Department of Transportation  
Federal Aviation Administration*

"Thomson Saginaw Ball Screw Company, Inc., will be included in the FLS Aerospace Support approved list of stockists, suppliers and subcontractors."

*FLS Aerospace Support*

"A2LA has accredited the Thomson Saginaw Ball Screw Company, Inc., materials laboratory for the technical competence in the field of mechanical testing."

*The American Association for  
Laboratory Accreditation*

Thomson IBL, Ltd. meets the qualifications of British Standards.

*BS5750: Part 1*

Thomson IBL, Ltd. is registered with the British Standards Institute.

*BSI Registered Firm*

Thomson IBL, Ltd. is a member of the Machine Tool Technologies Association.

*MTTA*

Thomson IBL, Ltd. meets the requirements of the Quality Assurance System and is assigned quality number QAS3221/277 FM 1608.

*Quality Assurance System*

All Thomson ball screw facilities are certified ISO 9001.

*ISO 9001 Certified*

## Linear Bearings & Components (Inch)

### ADVANCED LINEAR MOTION TECHNOLOGY GUIDE



144-page guide includes specifications of all linear Ball Bushing\* bearings, pillow blocks and support rails. Also featured are the new Super Smart Ball Bushing\* bearings, Super Ball Bushing\* bearings and RoundWay\* linear roller bearings.

**Literature No. 01-00-000-6001-03**

## Linear Bearings & Components (Metric)

### ADVANCED LINEAR MOTION METRIC PRODUCTS



A 66-page comprehensive catalog provides information and specifications on advanced linear motion metric products. These include Super Smart Ball Bushing\* bearings, Smart MultiTrac Ball Bushing\* bearings and Smart Rail\* linear guides.

**Literature No. 01-50-000-6001-02**

## Thomson 60 Case

### THOMSON 60 CASE LINEARRACE SHAFTING CATALOG

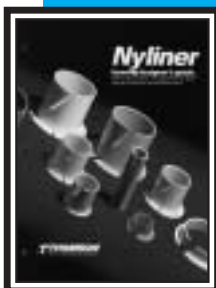


60-page catalog describing the features, benefits and technical specifications of the complete line of 60 Case\* LinearRace\* shafting. Engineering templates are provided for ease of ordering.

**Literature No. 02-00-000-6001**

## Molded Products

### NYLINER BEARING DESIGNER'S GUIDE



20-page design guide for Nyliner engineered polymer bearings includes easy-to-use technical and selection data, specification and application guidelines. Special section included on Nyliner Plus\* bearings. They are composed of advanced thermoplastics for increased PV ratings and operation at higher temperature and lower friction.

**Literature No. 04-00-000-6001-03**

## Thomson Saginaw

### PERFORMANCE PAK ACTUATORS—ENGINEERING AND SELECTION GUIDE



This 28-page catalog describes the Thomson Saginaw\* Performance Pak, PPA\*, actuators and accessories for commercial, institutional and industrial linear actuation. PPA's combine the efficiency of a ball screw with an electric motor for a ready-to-install positioning system. Includes complete engineering and selection data and application examples.

**Literature No. 09-00-000-6001-01**

## Thomson Saginaw

### EXPERT BALL SCREW RECONDITIONING FOR ANY DESIGN OR MAKE



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**Literature No. 06-16-000-6400-01**

## Thomson Micron\*

### TRUE PLANETARY GEARHEAD SELECTION GUIDE AND ENGINEERING CATALOG

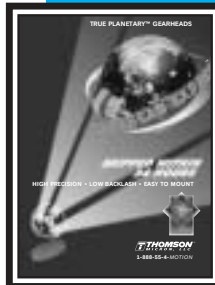


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