Thomson BSA Lead and Ball Screws

THOMSON BSA™

Linear Motion. **Optimized.**

www.thomsonbsa.com

THOMSON®

Linear Motion. **Optimized.**™

Thomson -
Linear Motion. *Optimized.*

Often the ideal design solution is not about finding the fastest, sturdiest, most accurate or even the least expensive option. Rather, the ideal solution is the optimal balance of performance, life and cost.

Thomson is best positioned to help you most quickly configure the optimal linear motion solution for your application.

- **Thomson invented anti-friction linear bearing technology. We own the broadest standard product offering of mechanical motion technologies in the industry.**
- **Modified versions of standard product are routine. White sheet design solutions available across our entire portfolio.**
- **Choose Thomson and gain access to over 70 years of global application experience in diverse industries including packaging, factory automation, material handling, medical, clean energy, printing, automotive, machine tool, aerospace and defense.**
- **As part of Danaher Motion, we are financially strong and unique in our ability to bring together control, drive, motor, power transmission and precision linear motion technologies.**

Thomson is the name you can trust for quality, innovation, on-time delivery, controlled costs, and reduced risk.

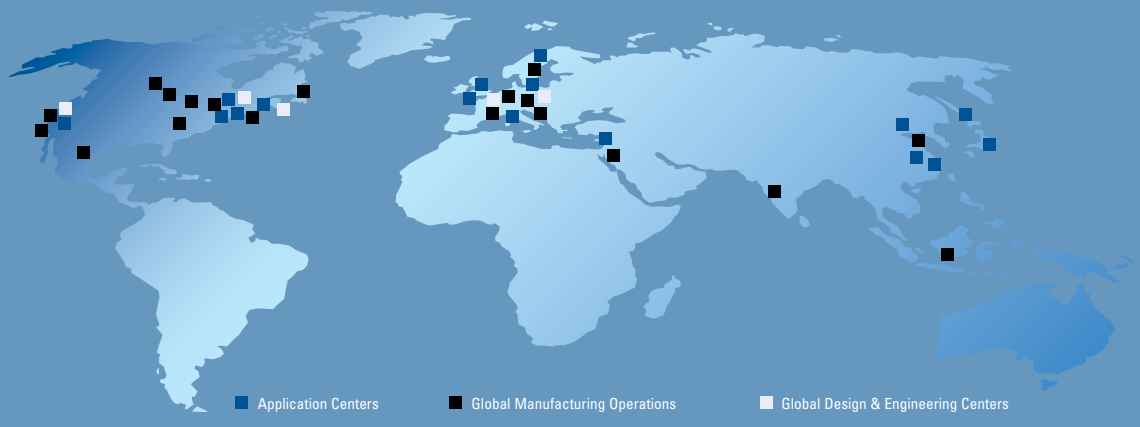
In addition to the information contained in this document, a wealth of product and application information is available online at www.thomsonlinear.com. Also online are downloadable 3D models, software tools, our distributor locator and global contact information for Thomson. For immediate assistance in North America contact us at 1-540-633-3549 or email us at thomson@thomsonlinear.com.

Talk to us early in the design process to see how Thomson can help identify the optimal balance of performance, life and cost for your next application. And, call us or any of our 2000+ distribution partners around the world for fast delivery of replacement parts.

The Danaher Business System -
Building sustainable competitive advantage into your business

The Danaher Business System (DBS) was established to increase the value we bring to customers. It is a mature and successful set of tools we use daily to continually improve manufacturing operations and product development processes. DBS is based on the principles of Kaizen which continuously and aggressively eliminate waste in every aspect of our business. DBS focuses the entire organization on achieving breakthrough results that create competitive advantages in quality, delivery and performance – advantages that are passed on to you. Through these advantages Thomson is able to provide you faster times to market as well as unsurpassed product selection, service, reliability and productivity.

Local Support Around the Globe
Application Centers Global Manufacturing Operations Global Design & Engineering Centers



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**Dimensions listed in catalog are for reference only and are subject to change without notice.*

Applications Data Information Sheet

Name: _____

Title/Dept. _____

Company Name: _____

Address: _____

_____

Phone: _____ Fax: _____

Rep? ☐ _____

1. What is your LOAD? ☐ Pounds ☐ Kilograms ☐ Newtons
   ☐ Other _____ (please describe)

2. Is your MOTION ☐ Horizontal or ☐ Vertical

3. What is the length of STROKE? _____ ☐ Inc ☐ Foot ☐ mm
   ☐ Other _____ (please describe)

4. What is the SPEED? ☐ Inch ☐ Foot ☐ mm per ☐ second ☐ minute
   ☐ Other _____ (please describe)

5. ACCURACY requirements: ☐ 0.005"/foot ☐ 0.0005"/foot
   ☐ 0.003"/foot ☐ Other _____ (please describe)

6. BACKLASH requirements: ☐ 0" ☐ .010"
   ☐ 0.002" ☐ Other _____ (please describe)

7. BEARING SUPPORT requirements: ☐ Fixed/Simple ☐ Fixed Free
   ☐ Fixed/Fixed ☐ Other _____ (please describe)

8. MOTOR CUBE requirements ☐ NEMA 17 ☐ NEMA 42
   ☐ NEMA 23 ☐ Other _____ (please describe)
   ☐ NEMA 34

9. Quantity required _____ per ☐ Month ☐ Year ☐ Other

Additional information/comments:

Applications

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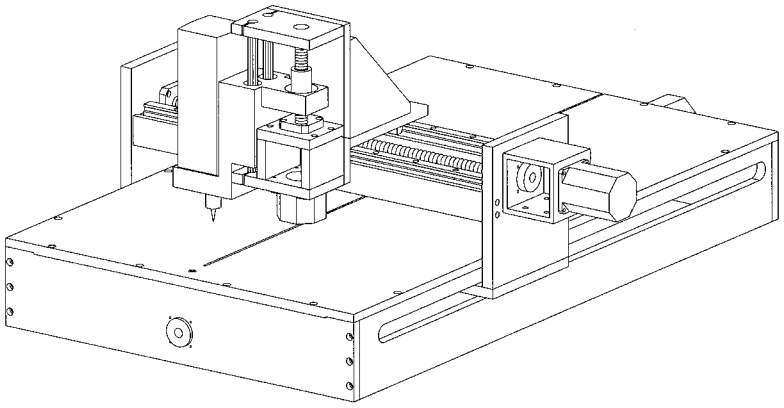
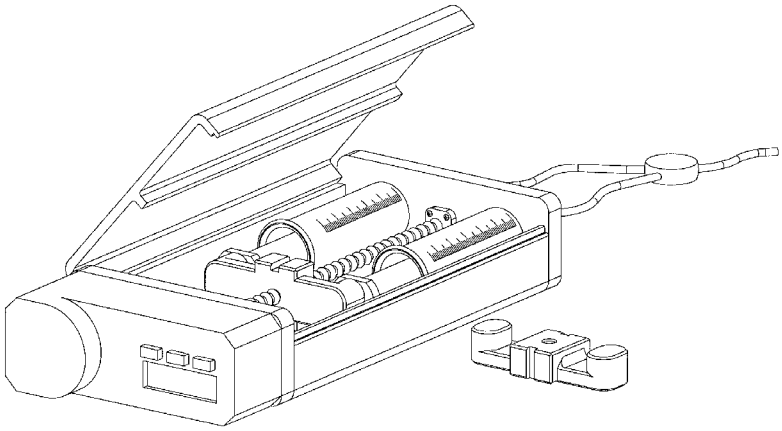
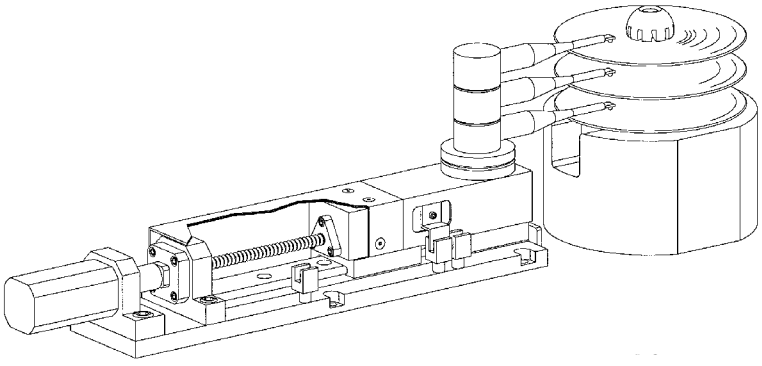
Lead Screw Applications



ENGRAVING EQUIPMENT

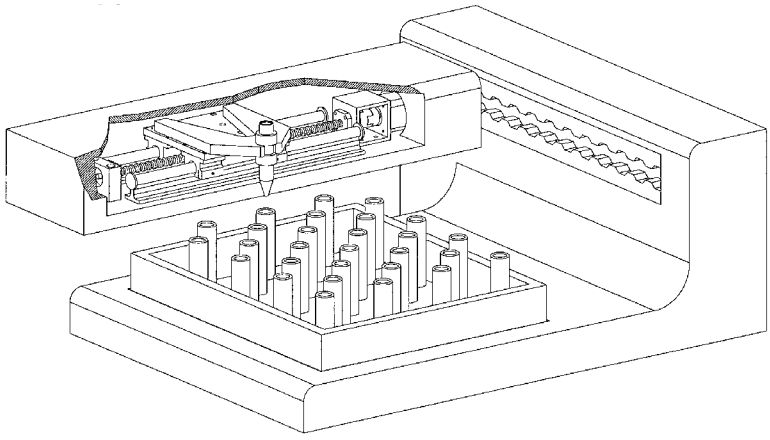
MEDICAL EQUIPMENT





SEMICONDUCTOR MANUFACTURING EQUIPMENT

LABORATORY EQUIPMENT



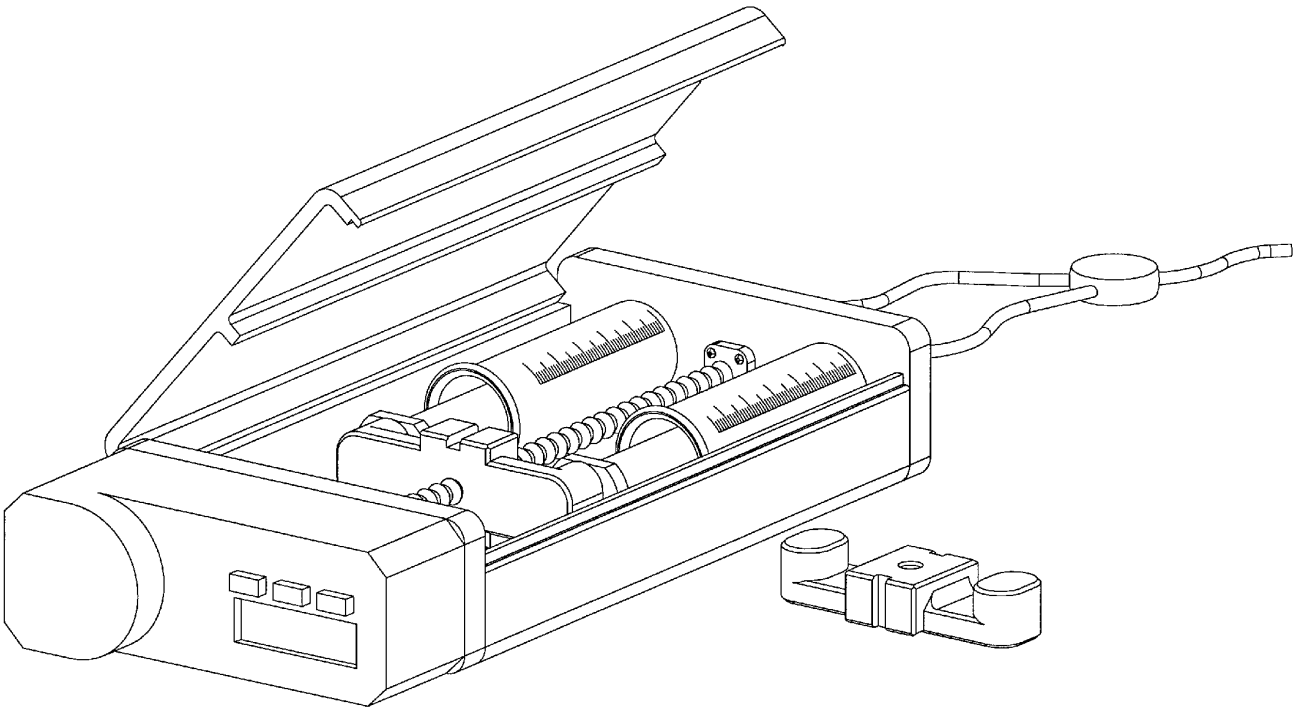
Application #1

Custom Plastic Nuts

If cost or design constraints dictate a more integrated package, let our engineering staff help you simplify your design. We offer a full range of manufacturing capabilities from injection molding to CNC machining with the largest selection of engineering plastics to suit your application and specifications.

- Our engineering staff will ensure your part is right the first time.
- Full range of engineering plastics including internally lubricated and high temperature thermoplastics.

Complete assembly selection shown on pages 61 – 68.



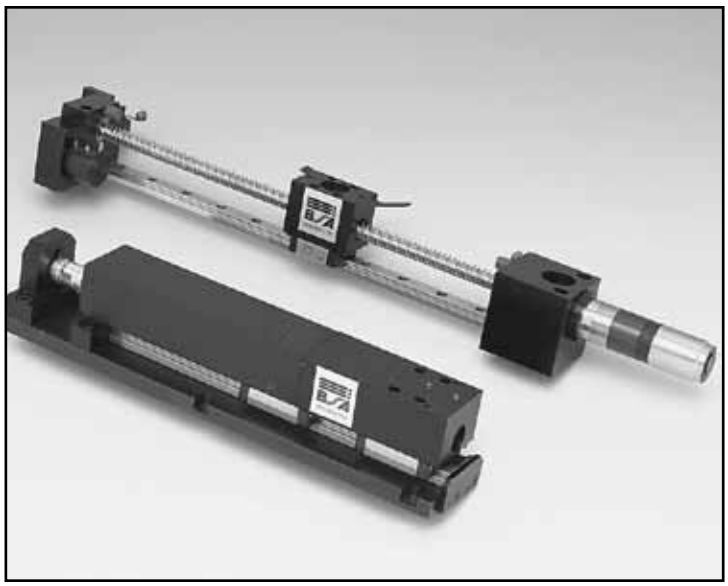
Application #2

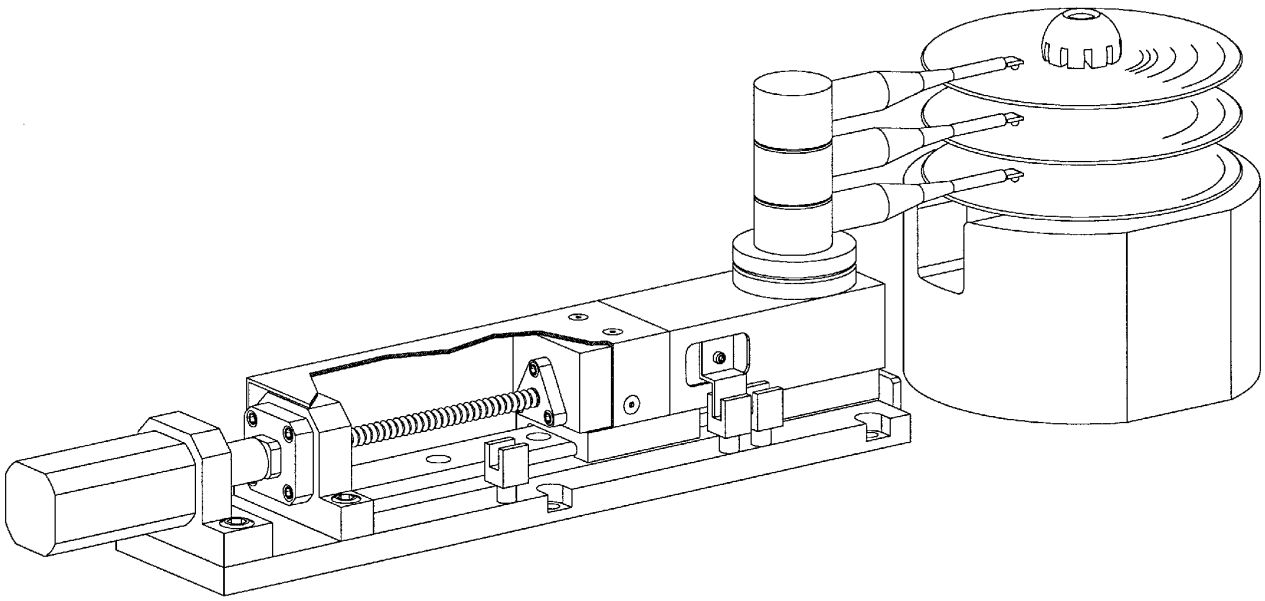
Custom Actuators

If your design criteria does not match our large selection of stock assemblies, let Thomson BSA's Design Engineering Staff discuss your require-ments. From simple custom adapters for our stock products to complete high precision tables, our engineering, manufacturing and qual-ity depart-ments offer a comprehensive solution to your custom linear motion needs.

- Design engineering staff
- World class machine shop
- Quality control for verifiable quality assurance

Complete assembly selection shown on pages 61 – 68.



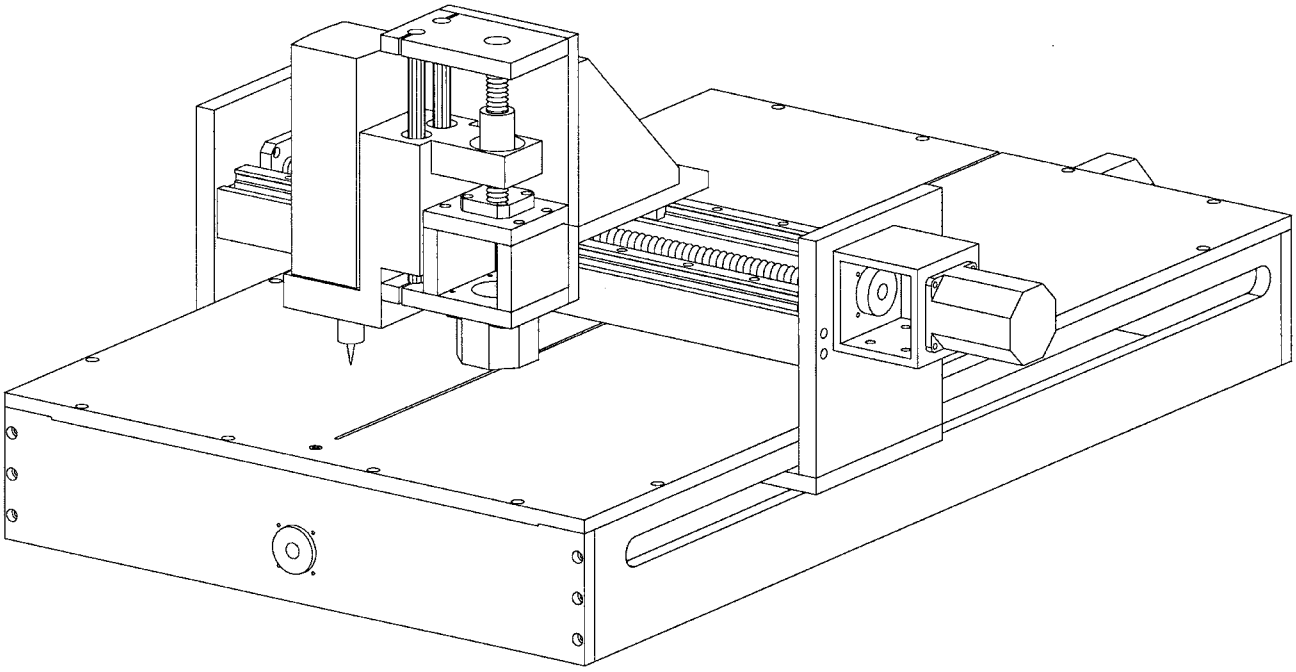


Application #3

Precision Screw Products

Thomson BSA's provides engineering support and quality assurance for all of it's components and assemblies allowing our customers to focus on the larger design picture. Our full range of designs and sizes for our linear motion components allow greater design flexibility, while our support staff ensures proper initial application and comprehensive support once installed.

Complete assembly selection shown on pages 61 – 68.



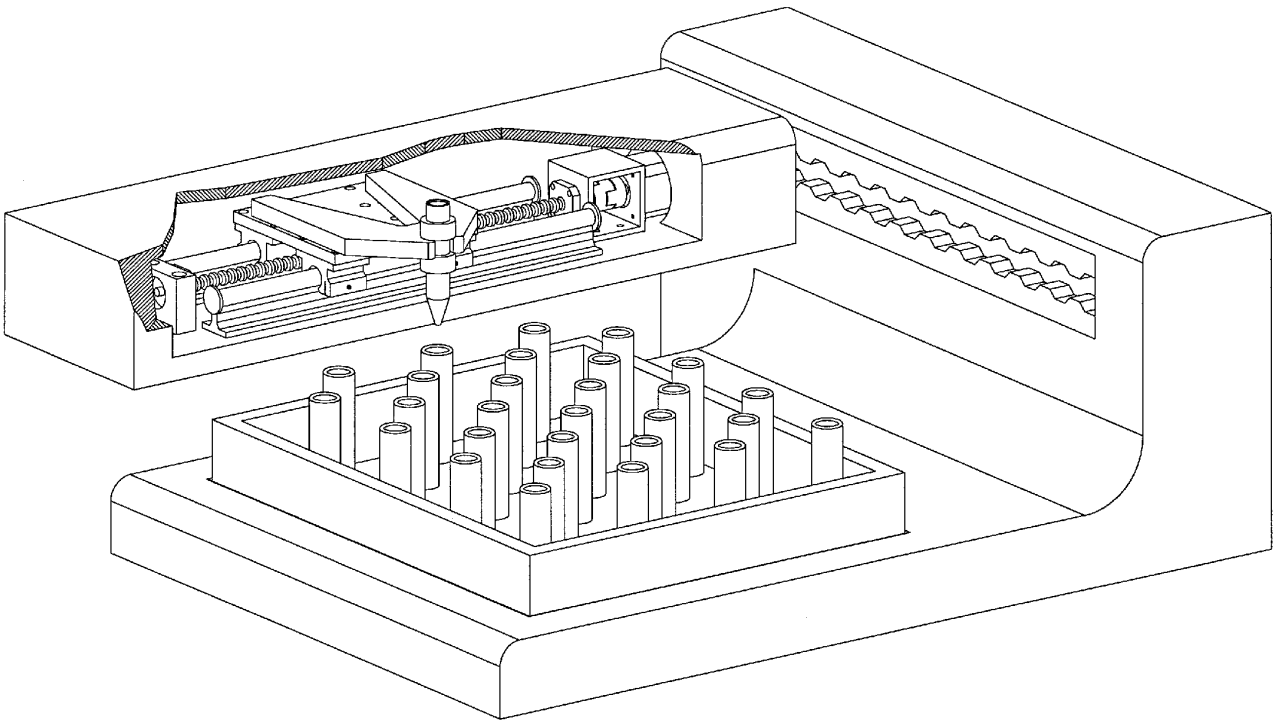
Application #4

Components and Assemblies

From components to complete assemblies, Thomson BSA's always provides the highest performance products for your applications. Let us assist in your design to ensure proper operation of our components, or let us provide you a complete solution.

- Complete solutions to your linear motion designs with our industry tested assemblies.
- Full complement of linear motion components: Rails (square and round), Motor Mounts, Bearing Mounts, Ball Nuts, Acme Plastic Nuts, Bronze Nuts, Anti-Backlash Nuts, Miniature Ball Nuts, Bearings, and more.

Complete assembly selection shown on pages 61 – 68.



Lead Screws

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Offering smooth, precise, cost effective positioning, lead screws are the ideal solution for your application.

Thomson BSA precision lead screws are an excellent economical solution for your linear motion requirements. For more than 25 years, Thomson BSA has designed and manufactured the highest quality lead screw assemblies in the industry. Our precision rolling process ensures accurate positioning to .003 in/ft and our PTFE coating process produces assemblies that have less drag torque and last longer.

Thomson BSA provides a large array of standard plastic nut assemblies in anti-backlash or standard Supernut® designs. All of our standard plastic nut assemblies use an internally lubricated Acetal providing excellent lubricity and wear resistance with or without additional lubrication. With the introduction of our new unique patented zero backlash designs, Thomson BSA provides assemblies with high axial stiffness, zero backlash and the absolute minimum drag torque to reduce motor requirements. These designs produce products that cost less, perform better and last longer. Both designs automatically adjust for wear ensuring zero backlash for the life of the nut.

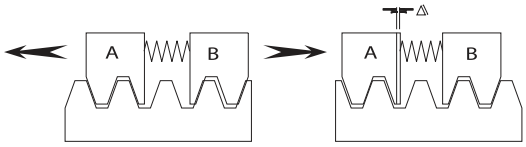
Thomson BSA also provides engineering design services to aid in your design requirements producing a lead screw assembly to your specifications. Call Thomson BSA today to discuss your application with one of our experienced application engineers.

Thomson BSA Products Deliver Performance

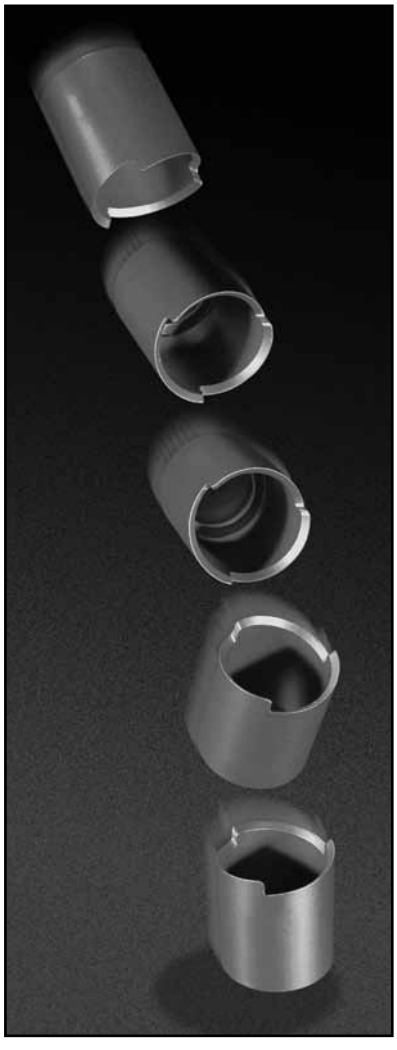
To ensure precise positioning, the elimination of backlash is of primary concern.

Several types of anti-backlash mechanisms are common in the market which utilise compliant preloads.

Because they are low in stiffness, a high preload is required to maintain position.



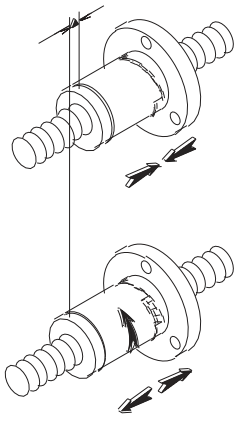
This results in high drag torque, shorter life and poor performance. System costs increase as a larger motor is required.



The Solutions is THOMSON BSA

With the introduction of the Patented XC series nut with ActiveCAM, the highest axial stiffness with the absolute minimum drag torque is achieved. Utilising an extremely rigid stainless steel cam for biasing, axial stiffness is unsurpassed.

Axial play is removed without the need for high preload, resulting in the lowest drag torque possible.



Self-Compensating

As wear occurs over time, the unique ActiveCAM mechanism automatically compensates without compromising stiffness, positional accuracy or affecting drag torque at any time.

US Patent #5839321 and one or more foreign counterparts

Lead Screws Engineering Overview

Precision Lead Screws & Supernuts®

Features/Advantages

Low Cost

Considerable savings when compared to ball screw assemblies.

Variety

Largest range of leads and diameters 3/16" to 3" to match your requirements.

Lubrication

Internally lubricated plastic nuts will operate without lubrication. However, additional lubrication or PTFE coating of the screw is recommended to optimize efficiency and life. See page 76.

Vibration and Noise

No ball recirculating vibration and often less audible noise compared to ball screws.

Design Considerations

Load

Supernuts provide a cost effective solution for moderate to light loads. For vertical applications, anti backlash supernuts should be mounted with thread/flange on the bottom.

Cantilevered Loads

Cantilevered loads that might cause a moment on the nut will cause premature failure.

Column Loading

Refer to column loading chart on page 86.

Critical Speed

Refer to critical speed chart on page 84.

Self-Locking

Lead screws can be self locking at low leads. Generally, the lead of the screw should be more than 1/3 of the diameter to satisfactorily backdrive.

Custom

Option of custom designs to fit into your design envelope.

Non-Corrosive*

Stainless Steel and internally lubricated acetal.

Environment

Less susceptible to particulate contamination compared to ball screws.

Lightweight

Less mass to move.

Temperature

Ambient and friction generated heat are the primary causes of premature plastic nut failure. Observe the temperature limits below and discuss your design with our application engineers for continuous duty, high load and high speed applications. Thomson BSA recommends bronze nuts for very high temperature environments or can aid in your selection of high temperature plastic for a custom assembly.

Efficiency

Except at very high leads, efficiency increases as lead increases. Although the internally lubricated acetal provides excellent lubricity, Ball Screw Assemblies remain significantly more efficient than any Acme design.

Length Limitations

3/16" to 1/4"	3'
5/16" to 10mm	4'
7/16" to 5/8"	6'
>5/8"	12'

Lead Accuracy

Standard Grade (SRA)	.010 in/ft
Precision Grade (SPR)	.003 in/ft

Assembly		Screws	Nuts**			
Maximum Temperature	Friction Coefficient	Material	Material	Tensile Strength	Water Absorption (24 HRS %)	Thermal Expansion Coefficient
180°F	0.08 – 0.14	Stainless Steel*	Acetal with PTFE	8,000 psi	0.15	5.4 x 10-5 in. /in. /°F

* Other materials available on a custom basis.

** Plastic nuts only. See bronze nut section for information on our bronze nut products, page 33.

Lead Screws Product Overview

Lead Screw Product Summary

Series	Thomson BSA Precision Lead Screw	
	Inch	Metric
Lead accuracy	.010"/ft. for standard .003"/ft. for precision	250 micron/300mm for standard 75 micron/300mm for precision
Diameter	.187" - 3.00"	6mm - 24mm
Lead	.013" - 2.00"	.5mm - 50.0mm
Backlash	.010" (max)	.25mm (max)
Dynamic Load	Up to 400 lbs*	Up to 1.3 kN*
Max. Static Load	Up to 2,000 lbs*	Up to 6.6 kN*
Catalog Pages	15 - 39	15 - 39

* Plastic nut ratings. Does not include bronze nut specifications.

Lead Screw Product Availability

	Inch	Lead (in.)																
		0.031	0.050	0.063	0.083	0.100	0.125	0.167	0.200	0.250	0.300	0.375	0.500	0.800	1.000	1.200	1.500	2.000
Dia. (in.)	3/16		●				●											
	1/4	●	●	●			●		●	●			●					
	5/16				●			●		●			●		●			
	3/8		●	●	●	●	●	●	●	●	●	●	●		●	●		
	7/16						●			●			●					
	1/2			●		●			●	●			●	●	●		●	
	5/8					●	●		●	●			●					
	3/4					●	●	●	●				●		●		●	●
	1					●	●		●	●			●		●			
	1-1/4								●	●								
	1-1/2								●	●		●	●					
	2									●								
	2-1/4									●								
	2-1/2									●								
	2-3/4									●								
	3									●								

	Metric	Lead (mm)															
		1	2	3	4	5	6	8	10	12	15	16	20	25	35	45	50
Dia. (mm)	6	●	●	●													
	10		●	●	●	●	●		●	●			●		●		
	12			●	●	●	●		●		●			●		●	
	16				●	●		●				●		●	●		
	20				●			●		●		●	●			●	●
	24					●											

Availability charts do not include V-thread screw leads.

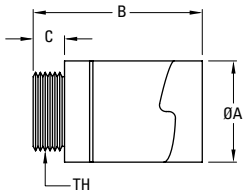
Advanced Anti-Backlash Supernuts®

XCM 1800

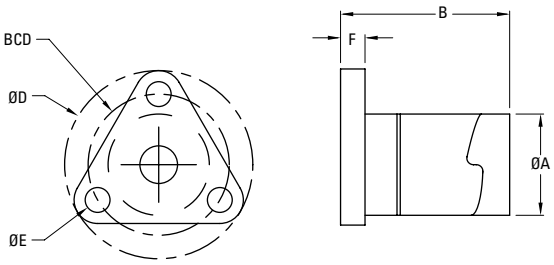
Our smallest anti-backlash nut design ever. The XCM 1800 uses the same patented† ActiveCAM™ mechanism as its larger siblings in a miniaturized package. This allows backlash free operation in space critical applications requiring high accuracy and low drag torque. This cost effective solution is available in either flanged or threaded versions. TriCoat® PTFE dry film lubricant is available as an option on most screws.

Note: See Screw Section on page 36. Specify XCMT or XCMF when ordering, see drawings at right.

XCMT 1800



XCMF 1800



Dia.	Lead	Part No.	Supernut® Dimensions								Design Load	Efficiency %	Drag Torque oz-in
			A	B	C	D	E	F	BCD	TH			
3/16"	0.050	XCM_1820	0.50	0.90 (max)	0.200	1.00	0.143	0.18	0.750	7/16"-20	5 lbs	49	< 1
	0.125	XCM_3-1824										70	
6mm*	1mm	XCM_6x1	0.50	0.90 (max)	0.200	1.00	0.143	0.18	0.750	7/16"-20	5 lbs	29	< 1
1/4"*	0.0125	XCM_2580	0.50	0.90 (max)	0.200	1.00	0.143	0.18	0.750	7/16"-20	5 lbs	13	< 1
	0.0208	XCM_2548										20	
	0.0250	XCM_2540										23	
	0.0278	XCM_2536										25	
	0.0313	XCM_2532										28	
	0.0357	XCM_2528										30	
	0.0417	XCM_2524										34	
1/4"	0.050	XCM_2520	0.50	0.90 (max)	0.200	1.00	0.143	0.18	0.750	7/16"-20	5 lbs	41	< 1
	0.063	XCM_2516										48	
	2mm	XCM_2-25x1M										53	
	3mm	XCM_3-25x1M										62	
	0.125	XCM_2-2516										64	
	0.200	XCM_4-2520										72	
	0.250	XCM_4-2516										76	
	0.500	XCM_7-2514										81	

* V-Thread screws, see page 39.
† Patent No. 5839321

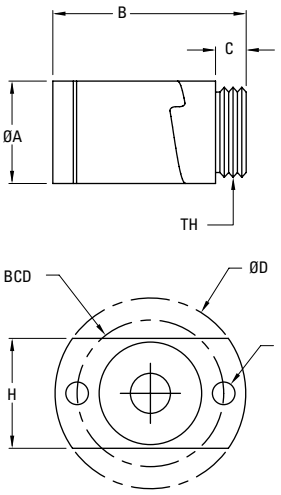
Advanced Anti-Backlash Supernuts®

XC 2500

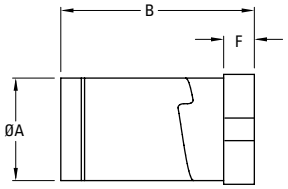
The XC Model Anti-Backlash assembly is the most advanced Anti-Backlash nut design. The unique patented† ActiveCAM™ accomplishes high axial stiffness, zero backlash and the absolute minimum drag torque. This advantage produces assemblies that cost less, perform better and last longer. The ActiveCAM™ automatically adjusts for wear insuring zero backlash for the life of the nut.

Note: See Screw Section on page 36. Specify XCT or XCF when ordering, see drawings at right.

XCT 2500



XCF 2500



Dia.	Lead	Part No.	Supernut® Dimensions									Design Load	Efficiency %	Drag Torque oz-in
			A	B	C	D	E	F	H	BCD	TH			
6mm*	1mm	XC_6x1	0.64	1.18 (max)	0.187	1.19	0.141	0.16	0.66	0.900	9/16" -18	10lbs	29	<1
1/4"*	0.0125	XC_2580	0.64	1.18 (max)	0.187	1.19	0.141	0.16	0.66	0.900	9/16" -18	10lbs	13	<1
	0.0208	XC_2548											20	
	0.0250	XC_2540											23	
	0.0278	XC_2536											25	
	0.0313	XC_2532											28	
	0.0357	XC_2528											30	
	0.0417	XC_2524											34	
1/4"	0.050	XC_2520	0.64	1.18 (max)	0.187	1.19	0.141	0.16	0.66	0.900	9/16" -18	10lbs	41	<1
	0.063	XC_2516											48	
	2mm	XC_2-25x1M											53	
	3mm	XC_3-25x1M											62	
	0.125	XC_2-2516											64	
	0.200	XC_4-2520											72	
	0.250	XC_4-2516											76	
	0.500	XC_7-2514											81	

* V-Thread screws, see page 39.
† Patent No. 5839321

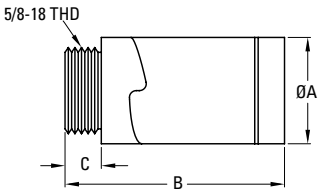
Advanced Anti-Backlash Supernuts®

XC 3700

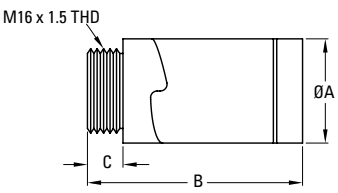
The XC Model Anti-Backlash assembly is the most advanced Anti-Backlash nut design. The unique patented† ActiveCAM™ accomplishes high axial stiffness, zero backlash and the absolute minimum drag torque. This advantage produces assemblies that cost less, perform better and last longer. The ActiveCAM™ automatically adjusts for wear insuring zero backlash for the life of the nut.

Note: See Screw Section on page 36. Specify XCT, XCB or XCF when ordering, see drawings at right.

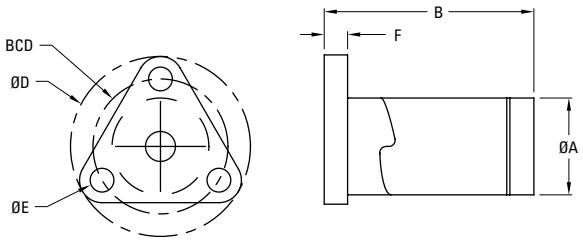
XCT 3700



XCB 3700



XCF 3700



Dia.	Lead	Part No.	Supernut® Dimensions							Design Load	Efficiency %	Drag Torque oz-in
			A	B	C	D	E	F	BCD			
5/16"	0.083	XC_3112	0.82	1.875 (max)	0.25	1.5	0.2	0.2	1.125	25 lbs	49	1 - 3
	0.167	XC_2-3112									65	
	0.250	XC_2-3108									72	
	0.500	XC_4-3108									80	
	1.000	XC_8-3108									81	
3/8"	0.050	XC_3720	0.82	1.875 (max)	0.25	1.5	0.2	0.2	1.125	25 lbs	32	1 - 3
	0.063	XC_3716									36	
	2mm	XC_37x2M									42	
	0.083	XC_3712									44	
	0.100	XC_3710									49	
	0.125	XC_3708									53	
	0.167	XC_2-3712									60	
	0.200	XC_2-3710									65	
	0.250	XC_2-3708									68	
	0.300	XC_3-3710									73	
	0.375	XC_4-3711									75	
	0.500	XC_4-3708									79	
10mm	2mm	XC_10x2M	0.82	1.875 (max)	0.25	1.5	0.2	0.2	1.125	25 lbs	41	1 - 3
	3mm	XC_10x3M									53	
	4mm	XC_2-10x2M									59	
	5mm	XC_2-10x2.5M									64	
	6mm	XC_4-10x1.5M									67	
	10mm	XC_5-10x2M									76	
	12mm	XC_5-10x2-4M									78	
	20mm	XC_6-10x3.3M									81	
	35mm	XC_10-10x3.5M									81	

† Patent No. 5839321

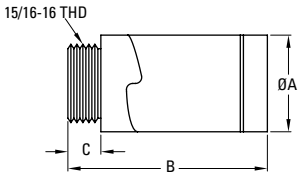
Advanced Anti-Backlash Supernuts®

XC 5000

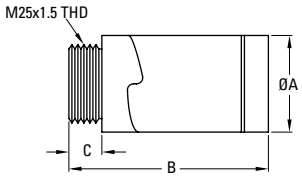
The XC 5000 utilizes the same patented† ActiveCAM™ as found in the XC 3700 model. Along with the very low drag torque and high axial stiffness advantages, the XC 5000 has greater load capacity.

Note: See Screw Section on page 36. Specify XCT, XCB or XCF when ordering, see drawings at right.

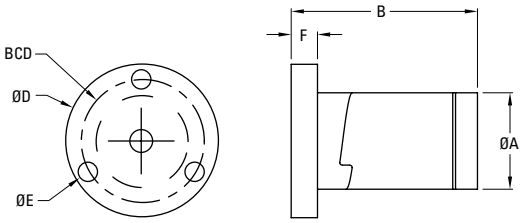
XCT 5000



XCB 5000



XCF 5000



Dia.	Lead	Part No.	Supernut® Dimensions							Design Load	Efficiency %	Drag Torque oz-in
			A	B	C	D	E	F	BCD			
7/16"	0.125	XC_2-4316	1.12	2.25 (max)	0.375	1.75	0.2	0.3	1.406	125 lbs	55	1 - 3
	0.250	XC_2-4308									65	
	0.500	XC_4-4308									76	
12mm	3mm	XC_12x3M	1.12	2.25 (max)	0.375	1.75	0.2	0.3	1.406	125 lbs	48	1 - 3
	4mm	XC_2-12x2M									54	
	5mm	XC_2-12x2.5M									59	
	6mm	XC_3-12x2M									63	
	10mm	XC_4-12x2.5M									73	
	15mm	XC_6-12x2.5M									78	
	25mm	XC_10-12x2.5M									82	
	45mm	XC_15-12x3M									81	
1/2"	.0625	XC_5016	1.12	2.25 (max)	0.375	1.75	0.2	0.3	1.406	125 lbs	30	1 - 3
	0.100	XC_5010									41	
	4mm	XC_2-50x2M									52	
	0.200	XC_2-5010									57	
	0.250	XC_2-5008									62	
	0.500	XC_4-5008									75	
	0.800	XC_8-5010									80	
	1.000	XC_8-5008									81	
	1.500	XC_12-5008									82	

† Patent No. 5839321

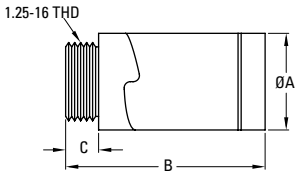
Advanced Anti-Backlash Supernuts®

XC 6200

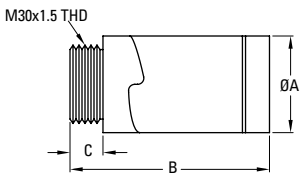
The XC 6200 utilizes the same patented† ActiveCAM™ as found in the XC 5000 model. Along with the very low drag torque and high axial stiffness advantages, the XC 6200 has greater load capacity.

Note: See Screw Section on page 36. Specify XCT, XCB or XCF when ordering, see drawings at right.

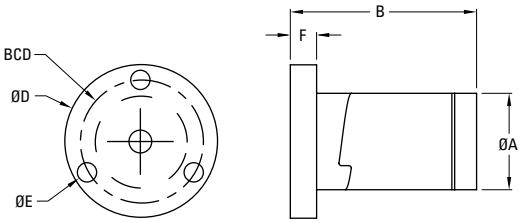
XCT 6200



XCB 6200



XCF 6200



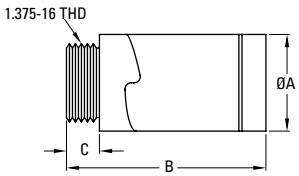
Dia.	Lead	Part No.	Supernut® Dimensions							Design Load	Efficiency %	Drag Torque oz-in
			A	B	C	D	E	F	BCD			
5/8"	0.100	XC_6210	1.40	2.60 (max)	0.5	2.13	0.22	0.5	1.688	175 lbs	35	2 - 6
	0.125	XC_6208									40	
	0.200	XC_2-6210									51	
	0.250	XC_2-6208									57	
	0.500	XC_4-6208									71	
16mm	4mm	XC_16x4M	1.40	2.60 (max)	0.5	2.13	0.22	0.5	1.688	175 lbs	47	2 - 6
	5mm	XC_2-16x2.5M									52	
	8mm	XC_4-16x2M									63	
	16mm	XC_7-16x2.3M									75	
	25mm	XC_5-16x5M									80	
	35mm	XC_7-16x5M									82	

† Patent No. 5839321

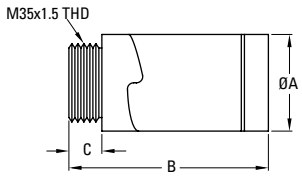
Advanced Anti-Backlash Supernuts®

XC 7500

XCT 7500



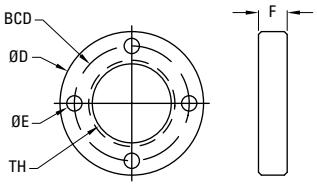
XCB 7500



The XC 7500 utilizes the same patented† ActiveCAM™ as found in the XC 5000 model. Along with the very low drag torque and high axial stiffness advantages, the XC 7500 has greater load capacity.

Note: See Screw Section on page 36. Specify XCT, XCB or XCF when ordering, see drawings at right.

Flange F75



Dia.	Lead	Part No.	Nut Dimensions			Flange Dimensions (Optional)				Design Load	Efficiency %	Drag Torque oz-in
			A	B	C	D	E	F	BCD			
3/4"	0.100	XC_7510	1.63	2.9 (max)	0.5	2.5	0.27	0.50	2.00	250 lbs	31	3 - 10
	0.125	XC_7508									36	
	0.167	XC_7506									44	
	0.200	XC_7505									49	
	0.500	XC_5-7510									69	
	1.000	XC_8-7508									79	
	1.500	XC_12-7508									81	
	2.000	XC_10-7505									82	
20mm	4mm	XC_20x4M	1.63	2.9 (max)	0.5	2.5	0.27	0.50	2.00	250 lbs	41	3 - 10
	8mm	XC_2-20x4M									59	
	12mm	XC_3-20x4M									67	
	16mm	XC_4-20x4M									72	
	20mm	XC_5-20x4M									76	
	45mm	XC_9-20x5M									82	
	50mm	XC_10-20x5M									82	

† Patent No. 5839321

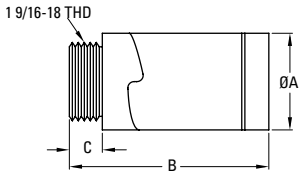
Advanced Anti-Backlash Supernuts®

XC 10000

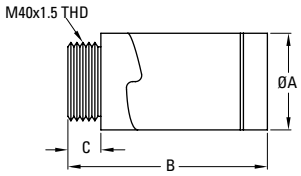
The XC 10000 utilizes Thomson BSA's patented† ActiveCAM™ technology to provide very low drag torque, high axial stiffness and maximum wear life. This self compensating design produces excellent positional repeatability while insuring consistent performance for the long run.

Note: See Screw Section on page 36. Specify XCT, XCB or XCF when ordering, see drawings at right.

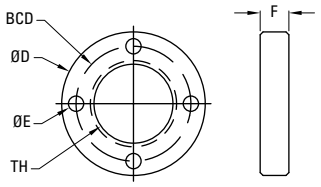
XCT 1000



XCB 1000



Flange F100

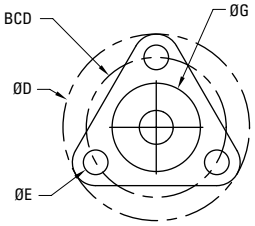


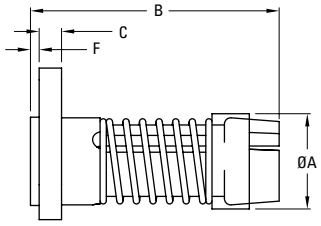
Dia.	Lead	Part No.	Nut Dimensions			Flange Dimensions (Optional)				Design Load	Efficiency %	Drag Torque oz-in
			A	B	C	D	E	F	BCD			
24mm	5mm	XC_24x5M	1.88	3.0 (max)	0.60	3.0	0.27	0.60	2.37	350 lbs	42	5-15
1"	0.100	XC_1010	1.88	3.0 (max)	0.60	3.0	0.27	0.60	2.37	350 lbs	25	5-15
	0.125	XC_1008									29	
	0.200	XC_1005									41	
	0.250	XC_2-1008									46	
	0.250	XC_1004									47	
	0.500	XC_5-1010									61	
	1.000	XC_10-1010									74	

† Patent No. 5839321

Advanced Anti-Backlash Supernuts®

AFT



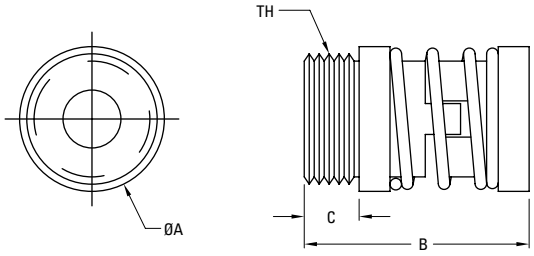


The low cost AFT Supernut is designed for light load OEM applications and offers smooth movement and low drag torque for axial loads up to 10 pounds. The AFT anti-backlash collar automatically adjusts for wear for the life of the nut.

Dia.	Lead	Part No.	Supernut® Dimensions								Design Load	Efficiency %	Drag Torque oz-in
			A	B	C	D	E	F	G	BCD			
3/8"	0.050	AFT3720	0.77	2.00	0.20	1.50	0.20	0.06	0.71	1.125	10 lbs	32	2 - 5
	0.063	AFT3716										36	
	2mm	AFT37x2M										42	
	0.083	AFT3712										44	
	0.100	AFT3710										49	
	0.125	AFT3708										53	
	0.167	AFT2-3712										60	
	0.200	AFT2-3710										65	
	0.250	AFT2-3708										68	
	0.300	AFT3-3710										73	
	0.375	AFT4-3711										75	
	0.500	AFT4-3708										79	
	1.000	AFT5-3705										82	
	1.200	AFT5-3704										82	
10mm	2mm	AFT10x2M	0.77	2.00	0.20	1.50	0.20	0.06	0.71	1.125	10 lbs	41	2 - 5
	3mm	AFT10x3M										53	
	4mm	AFT2-10x2M										59	
	5mm	AFT2-10x2.5M										64	
	6mm	AFT4-10x1.5M										67	
	10mm	AFT5-10x2M										76	
	12mm	AFT5-10x2.4M										78	
	20mm	AFT6-10x3.3M										81	
	35mm	AFT10-10x3.5M										81	
7/16"	0.125	AFT2-4316	0.77	2.00	0.20	1.50	0.20	0.06	0.71	1.125	10 lbs	55	2 - 5
	0.250	AFT2-4308										65	
	0.500	AFT4-4308										76	
1/2"	0.063	AFT5016	0.88	2.03	0.25	1.62	0.20	-	-	1.250	25 lbs	30	3 - 7
	0.100	AFT5010										41	
	4mm	AFT2-50x2M										52	
	0.200	AFT2-5010										57	
	0.250	AFT2-5008										62	
	0.500	AFT4-5008										75	
	0.800	AFT8-5010										80	
	1.000	AFT8-5008										81	

Anti-Backlash Supernuts®

SNAB Thread Mount Style



Our SNAB Model has the greatest design flexibility allowing anti-backlash assemblies through 1" diameters. All SNABs are made from our internally lubricated Acetal providing excellent lubricity and very low wear.

Flanges

3/16" to 1/4"	F25
5/16" to 3/8" (10mm)	F37

Dimensions available on page 35.

SNAB* - 3/16" to 3/8" (10mm) Diameter

Dia.	Lead	Part No.	Supernut® Dimensions					Preload Force (lbs)	Design Load	Max Static Load	Efficiency %	Drag Torque oz-in
			A	B (min)	B (max)	C	TH					
3/16"	0.050	SNAB1820X	0.625	1.125	1.250	0.187	9/16-18	1-3	10 lbs	150 lbs	49	2 - 4
	0.125	SNAB3-1824X									70	
6mm	1mm	SNAB6x1M	0.625	1.125	1.250	0.187	9/16-18	1-3	10 lbs	150 lbs	37	2 - 4
1/4"	0.031	SNAB2532X	0.625	1.125	1.250	0.187	9/16-18	1-3	25 lbs	225 lbs	30	2 - 4
	0.050	SNAB2520X									41	
	0.063	SNAB2516X									48	
	2mm	SNAB2-25x1M									53	
	3mm	SNAB3-25x1M									62	
	0.125	SNAB2-2516X									64	
	0.200	SNAB4-2520X									72	
	0.250	SNAB4-2516X									76	
	0.500	SNAB7-2514X									81	
5/16"	0.083	SNAB3112X	0.750	1.160	1.340	0.250	5/8-18	2-5	50 lbs	350 lbs	49	2 - 4
	0.167	SNAB2-3112X									65	
	0.250	SNAB2-3108X									72	
	0.500	SNAB4-3108X									80	
	1.000	SNAB8-3108X									81	
3/8"	0.050	SNAB3720X	0.750	1.160	1.340	0.250	5/8-18	2-5	70 lbs	350 lbs	32	2 - 4
	0.063	SNAB3716X									36	
	2mm	SNAB37x2M									42	
	0.083	SNAB3712X									44	
	0.100	SNAB710X									49	
	0.125	SNAB3708X									53	
	0.167	SNAB2-3712X									60	
	0.200	SNAB2-3710X									65	
	0.250	SNAB2-3708X									68	
	0.300	SNAB3-3710X									73	
	0.375	SNAB4-3711X									75	
	0.500	SNAB4-3708X									79	
	1.000	SNAB5-3705X	0.720	1.750	2.000						82	
	1.200	SNAB5-3704X									82	
10mm	2mm	SNAB10x2M	0.750	1.160	1.340	0.250	5/8-18	2-5	70 lbs	350 lbs	41	2 - 4
	3mm	SNAB10x3M									53	
	4mm	SNAB2-10x2M									59	
	5mm	SNAB2-10x2.5M									64	
	6mm	SNAB4-10x1.5M									67	
	10mm	SNAB5-10x2M									76	
	12mm	SNAB5-10x2.4M									78	
	20mm	SNAB6-10x3.3M									81	
	35mm	SNAB10-10x3.5M									81	

* SNAB nuts are only as axially stiff as the spring force in one direction.

Anti-Backlash Supernuts®

SNAB Thread Mount Style

Flanges

7/16" to 5/8" (16mm)	F50

Dimensions available on page 35.

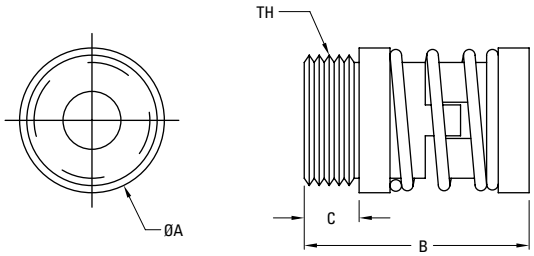
SNAB*
7/16" to 5/8" (16mm) Diameter

Dia.	Lead	Part No.	Supernut® Dimensions					Preload Force (lbs)	Design Load	Max Static Load	Efficiency %	Drag Torque oz-in
			A	B (min)	B (max)	C	TH					
7/16"	0.125	SNAB2-4316X	1.000	1.700	2.000	0.375	15/16-16	4-9	100 lbs	500 lbs	55	3 - 5
	0.250	SNAB2-4308X									65	
	0.500	SNAB4-4308X									76	
12mm	3mm	SNAB12x3M	1.000	1.700	2.000	0.375	15/16-16	4-9	100 lbs	500 lbs	48	3 - 5
	4mm	SNAB2-12x2M									54	
	5mm	SNAB2-12x2.5M									59	
	6mm	SNAB3-12x2M									63	
	10mm	SNAB4-12x2.5M									73	
	15mm	SNAB6-12x2.5M									78	
	25mm	SNAB10-12x2.5M									82	
	45mm	SNAB15-12x3M									81	
1/2"	0.0625	SNAB5016	1.000	1.700	2.000	0.375	15/16-16	4-9	150 lbs	750 lbs	30	5 - 8
	0.100	SNAB5010X									41	
	4mm	SNAB2-50x2M									52	
	0.200	SNAB2-5010X									57	
	0.250	SNAB2-5008X									62	
	0.500	SNAB4-5008X									75	
	0.800	SNAB8-5010X									80	
	1.000	SNAB8-5008X									81	
	1.500	SNAB12-5008X									82	
5/8"	0.100	SNAB6210X	1.000	1.700	2.000	0.375	15/16-16	4-9	160 lbs	800 lbs	35	7 - 10
	0.125	SNAB6208X									40	
	0.200	SNAB2-6210X									51	
	0.250	SNAB2-6208X									57	
	0.500	SNAB4-6208X									71	
16mm	4mm	SNAB16x4M	1.000	1.700	2.000	0.375	15/16-16	4-9	160 lbs	800 lbs	47	7 - 10
	5mm	SNAB2-16x2.5M									52	
	8mm	SNAB4-16x2M									63	
	16mm	SNAB7-16x2.3M									75	
	25mm	SNAB5-16x5M									80	
	35mm	SNAB7-16x5M									82	

* SNAB nuts are only as axially stiff as the spring force in one direction.

Anti-Backlash Supernuts®

SNAB Thread Mount Style



Flanges

3/4" to 1"	F100

Dimensions available on page 35.

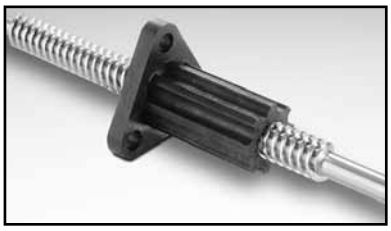
SNAB*
3/4" to 1" Diameter

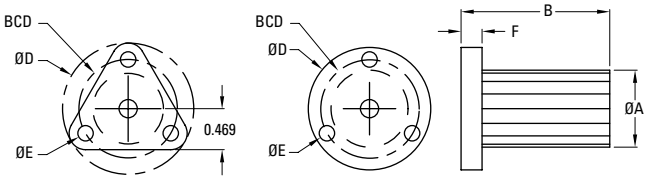
Dia.	Lead	Part No.	Supernut® Dimensions					Preload Force (lbs)	Design Load	Max Static Load	Efficiency %	Drag Torque oz-in
			A	B (min)	B (max)	C	TH					
3/4"	0.100	SNAB7510X	1.750	2.500	3.000	0.600	1-9/16 - 18	10-20	300 lbs	1500 lbs	31	15 - 20
	0.125	SNAB7508X									36	
	0.167	SNAB7506X									44	
	0.200	SNAB7505X									49	
	0.500	SNAB5-7510X									69	
	1.000	SNAB8-7508X									79	
	1.500	SNAB12-7508X									81	
	2.000	SNAB10-7505X									82	
20mm	4mm	SNAB20x4M	1.750	2.500	3.000	0.600	1-9/16 - 18	10-20	300 lbs	1500 lbs	41	15 - 20
	8mm	SNAB2-20x4M									59	
	12mm	SNAB3-20x4M									67	
	16mm	SNAB4-20x4M									72	
	20mm	SNAB5-20x4M									76	
	45mm	SNAB9-20x5M									82	
	50mm	SNAB10-20x5M									82	
24mm	5mm	SNAB24x5M	1.750	2.500	3.000	0.600	1-9/16 - 18	10-20	300 lbs	1500 lbs	42	15 - 20
1"	0.100	SNAB1010X	1.750	2.500	3.000	0.600	1-9/16 - 18	10-20	400 lbs	2000 lbs	25	15 - 20
	0.125	SNAB1008X									29	
	0.200	SNAB1005X									41	
	0.250	SNAB2-1008X									46	
	0.250	SNAB1004X									47	
	0.500	SNAB5-1010X									61	
	1.000	SNAB10-1010X									74	

* SNAB nuts are only as axially stiff as the spring force in one direction.

Flange Mount Supernuts®

MTS





MTS 3/8" (10mm) Only **MTS 3/16" to 5/16"**

Integral Flange Mount
The MTS models provide the excellent lubricity and dimensional stability of our proprietary Acetal with the convenience of an integral flange.

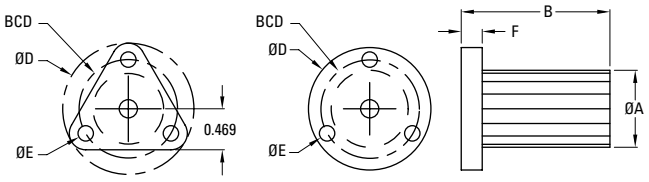
MTS - 3/16" to 3/8" (10mm) Diameter

Dia.	Lead	Part No.	Supernut® Dimensions						Design Load	Efficiency %	Drag Torque oz-in
			A	B	D	E	F	BCD			
3/16"	0.050	MTS1820	0.50	0.75	1.00	0.14	0.15	0.75	10 lbs	49	Free Wheeling
	0.125	MTS3-1824								70	
6mm	1mm	MTS6x1M	0.50	0.75	1.00	0.14	0.15	0.75	10 lbs	37	Free Wheeling
1/4"	0.031	MTS2532	0.50	0.75	1.00	0.14	0.15	0.75	25 lbs	30	Free Wheeling
	0.050	MTS2520								41	
	0.063	MTS2516								48	
	2mm	MTS2-25x1M								53	
	3mm	MTS3-25x1M								62	
	0.125	MTS2-2516								64	
	0.200	MTS4-2520								72	
	0.250	MTS4-2516								76	
	0.500	MTS7-2514								81	
5/16"	0.083	MTS3112	0.50	0.75	1.00	0.14	0.15	0.75	50 lbs	49	Free Wheeling
	0.167	MTS2-3112								65	
	0.250	MTS2-3108								72	
	0.500	MTS4-3108								80	
	1.000	MTS8-3108								81	
3/8"*	0.050	MTS3720	0.71	1.50	1.5	0.20	0.20	1.125	60 lbs	32	Free Wheeling
	0.063	MTS3716								36	
	2mm	MTS37x2M								42	
	0.083	MTS3712								44	
	0.100	MTS3710								49	
	0.125	MTS3708								53	
	0.167	MTS2-3712								60	
	0.200	MTS2-3710								65	
	0.250	MTS2-3708								68	
	0.300	MTS3-3710								73	
	0.375	MTS4-3711								75	
	0.500	MTS4-3708								79	
	1.000	MTS5-3705								82	
	1.200	MTS5-3704								82	
10mm*	2mm	MTS10x2M	0.71	1.50	1.5	0.2	0.200	1.125	75 lbs	41	Free Wheeling
	3mm	MTS10x3M								53	
	4mm	MTS2-10x2M								59	
	5mm	MTS2-10x2.5M								64	
	6mm	MTS4-10x1.5M								67	
	10mm	MTS5-10x2M								76	
	12mm	MTS5-10x2.4M								78	
	20mm	MTS6-10x3.3M								81	
	35mm	MTS10-10x3.5M								81	

* 3/8" and 10mm with tri-flange

Flange Mount Supernuts®

MTS



MTS 7/16" Only **MTS 12mm to 5/8" (16mm)**

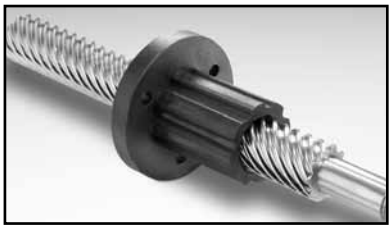
MTS
7/16" to 5/8" (16mm) Diameter

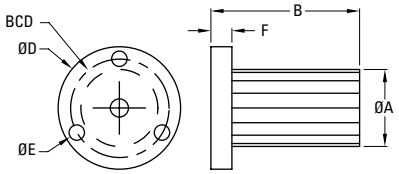
Dia.	Lead	Part No.	Supernut® Dimensions						Design Load	Efficiency %	Drag Torque oz-in
			A	B	D	E	F	BCD			
7/16"*	0.125	MTS2-4316	0.71	1.50	1.5	0.20	0.200	1.125	75 lbs	55	Free Wheeling
	0.250	MTS2-4308								65	
	0.500	MTS4-4308								76	
12mm	3mm	MTS12x3M	0.75	1.50	1.5	0.20	0.250	1.125	125 lbs	48	Free Wheeling
	4mm	MTS2-12x2M								54	
	5mm	MTS2-12x2.5M								59	
	6mm	MTS3-12x2M								63	
	10mm	MTS4-12x2.5M								73	
	15mm	MTS6-12x2.5M								78	
	25mm	MTS10-12x2.5M								82	
	45mm	MTS15-12x3M								81	
1/2"	0.0625	MTS5016	0.75	1.50	1.5	0.20	0.250	1.125	125 lbs	30	Free Wheeling
	0.100	MTS5010								41	
	4mm	MTS2-50x2M								52	
	0.200	MTS2-5010								57	
	0.250	MTS2-5008								62	
	0.500	MTS4-5008								75	
	0.800	MTS8-5010								80	
	1.000	MTS8-5008								81	
	1.500	MTS12-6008								82	
5/8"	0.100	MTS6210	0.88	1.63	1.5	0.20	0.300	1.188	175 lbs	35	Free Wheeling
	0.125	MTS6208								40	
	0.200	MTS2-6210								51	
	0.250	MTS2-6208								57	
	0.500	MTS4-6208								71	
16mm	4mm	MTS16x4M	0.88	1.63	1.5	0.20	0.300	1.188	175 lbs	47	Free Wheeling
	5mm	MTS2-16x2.5M								52	
	8mm	MTS4-16x2M								63	
	16mm	MTS7-16x2.3M								75	
	25mm	MTS5-16x5M								80	
	35mm	MTS7-16x5M								82	

* 7/16" with tri-flange

Flange Mount Supernuts®

MTS





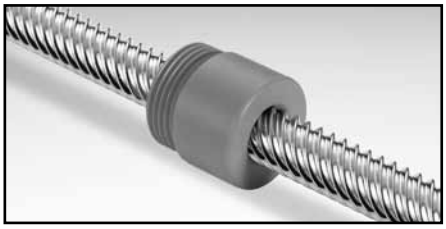
MTS 3/4" (20mm)

MTS
3/4" (20mm) Diameter

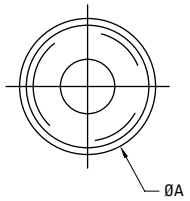
Dia.	Lead	Part No.	Supernut® Dimensions						Design Load	Efficiency %	Drag Torque oz-in
			A	B	D	E	F	BCD			
3/4"	0.100	MTS7510	1.125	1.75	2.0	0.20	0.300	1.438	275 lbs	31	Free Wheeling
	0.125	MTS7508								36	
	0.167	MTS7506								44	
	0.200	MTS7505								49	
	0.500	MTS5-7510								69	
	1.000	MTS8-7508								79	
	1.500	MTS12-7508								81	
	2.000	MTS10-7505								82	
20mm	4mm	MTS20x4M	1.125	1.75	2.0	0.20	0.300	1.438	275 lbs	42	Free Wheeling
	8mm	MTS2-20x4M								59	
	12mm	MTS3-20x4M								67	
	16mm	MTS4-20x4M								72	
	20mm	MTS5-20x4M								76	
	45mm	MTS9-20x5M								82	
	50mm	MTS10-20x5M								82	

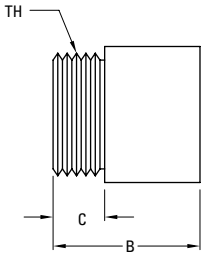
Thread Mount Supernuts®

SN



Our standard SN nuts have proven themselves for the past twenty years. Available in sizes from 3/16" to 1-1/2" with or without mounting flanges.





Flanges

3/16" to 1/4"	F25
5/16" to 10mm	F37
7/16" to 16mm	F50
3/4" to 1"	F75
1-1/4"	F100
1-1/2"	R54-3

Dimensions available on page 35 or online.

SN - 3/16" to 7/16" Diameter*

Dia.	Lead	Part No.	Supernut® Dimensions				Design Load	Max. Static Load	Efficiency %	Flange
			A	B	C	TH				
3/16"	0.050	SN1820X	0.625	0.500	0.187	9/16-18	30 lbs	150 lbs	49	F25
	0.125	SN3-1824X							70	
6mm	1mm	SN6x1M	0.625	0.500	0.187	9/16-18	30 lbs	150 lbs	37	F25
1/4"	0.031	SN2532X	0.625	0.500	0.187	9/16-18	45 lbs	225 lbs	30	F25
	0.050	SN2520X							41	
	0.063	SN2516X							48	
	2mm	SN2-25x1M							53	
	3mm	SN3-25x1M							62	
	0.125	SN2-2516X							64	
	0.200	SN4-2520X							72	
	0.250	SN4-2516X							76	
	0.500	SN7-2514X							81	
5/16"	0.083	SN3112X	0.750	0.750	0.250	5/8-18	70 lbs	350 lbs	49	F37
	0.167	SN2-3112X							65	
	0.250	SN2-3108X							72	
	0.500	SN4-3108X							80	
	1.000	SN8-3108X							81	
3/8"	0.050	SN3720X	0.750	0.750	0.250	5/8-18	70 lbs	350 lbs	32	F37
	0.063	SN3716X							36	
	2mm	SN37x2M							42	
	0.083	SN3712X							44	
	0.100	SN3710X							49	
	0.125	SN3708X							53	
	0.167	SN2-3712X							60	
	0.200	SN2-3710X							65	
	0.250	SN2-3708X							68	
	0.300	SN3-3710X							73	
	0.375	SN4-3711X							75	
	0.500	SN4-3708X							79	
	1.000	SN5-3705X							82	
	1.200	SN5-3704X							82	
10mm	2mm	SN10x2M	0.750	0.750	0.250	5/8-18	70 lbs	350 lbs	41	F37
	3mm	SN10x3M							53	
	4mm	SN2-10x2M							59	
	5mm	SN2-10x2.5M							64	
	6mm	SN4-10x1.5M							67	
	10mm	SN5-10x2M							76	
	12mm	SN5-10x2.4M							78	
	20mm	SN6-10x3.3M							67	
	35mm	SN10-10x3.5M							81	
7/16"	0.125	SN2-4316X	1.000	1.000	0.375	15/16-16	100 lbs	500 lbs	55	F50
	0.250	SN2-4308X							65	
	0.500	SN4-4308X							76	

* For all sizes shown on this page Drag Torque = Free Wheeling

Thread Mount Supernuts®

SN

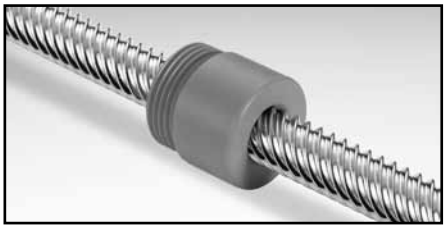
SN
1/2" (12mm) to 5/8" (16mm) Diameter*

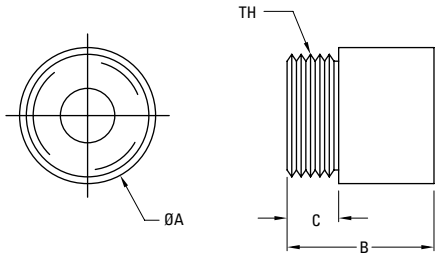
Dia.	Lead	Part No.	Supernut® Dimensions				Design Load	Max. Static Load	Efficiency %	Flange
			A	B	C	TH				
12mm	3mm	SN12x3M	1.000	1.000	0.375	15/16-16	100 lbs	500 lbs	48	F50
	4mm	SN2-12x2M							54	
	5mm	SN2-12x2.5M							59	
	6mm	SN3-12x2M							63	
	10mm	SN4-12x2.5M							73	
	15mm	SN6-12x2.5M							78	
	25mm	SN10-12x2.5M							82	
	45mm	SN15-12x3M							81	
1/2"	0.0625	SN5016X	1.000	1.000	0.375	15/16-16	150 lbs	750 lbs	30	F50
	0.100	SN5010X							41	
	4mm	SN2-50x2M							52	
	0.200	SN2-5010X							57	
	0.250	SN2-5008X							62	
	0.500	SN4-5008X							75	
	0.800	SN8-5010X							80	
	1.000	SN8-5008X							81	
	1.500	SN12-5008X							82	
5/8"	0.100	SN6210X	1.000	1.000	0.375	15/16-16	160 lbs	800 lbs	35	F50
	0.125	SN6208X							40	
	0.200	SN2-6210X							51	
	0.250	SN2-6208X							57	
	0.500	SN4-6208X							71	
16mm	4mm	SN16x4M	1.000	1.000	0.375	15/16-16	160 lbs	800 lbs	47	F50
	5mm	SN2-16x2.5M							52	
	8mm	SN4-16x2M							63	
	16mm	SN7-16x2.3M							75	
	25mm	SN5-16x5M							80	
	35mm	SN7-16x5M							82	

* For all sizes shown on this page Drag Torque = Free Wheeling

Thread Mount Supernuts®

SN





Flanges

3/16" to 1/4"	F25
5/16" to 10mm	F37
7/16" to 16mm	F50
3/4" to 1"	F75
1-1/4"	F100
1-1/2"	R54-3

Dimensions available on page 35 or online.

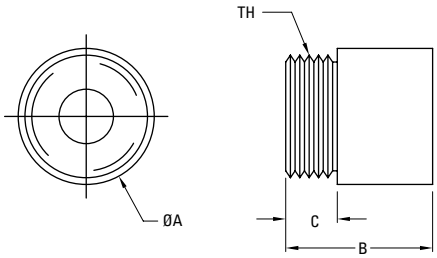
SN
3/4" to 1 1/2" Diameter*

Dia.	Lead	Part No.	Supernut® Dimensions				Design Load	Max. Static Load	Efficiency %	Flange
			A	B	C	TH				
3/4"	0.100	SN7510X	1.500	1.500	0.500	1 3/8-16	300 lbs	1500 lbs	31	F75
	0.125	SN7508X							36	
	0.167	SN7506X							44	
	0.200	SN7505X							49	
	0.500	SN5-7510X							69	
	1.000	SN8-7508X							79	
	1.500	SN12-7508X							81	
	2.000	SN10-7505X							82	
20mm	4mm	SN20x4M	1.500	1.500	0.500	1 3/8-16	300 lbs	1500 lbs	41	F75
	8mm	SN2-20x4M							59	
	12mm	SN3-20x4M							67	
	16mm	SN4-20x4M							72	
	20mm	SN5-20x4M							76	
	45mm	SN9-20x5M							82	
	50mm	SN10-20x5M							82	
24mm	5mm	SN24x5M	1.500	1.500	0.500	1 3/8-16	300 lbs	1500 lbs	42	F75
1"	0.100	SN1010X	1.500	1.500	0.500	1 3/8-16	400 lbs	2000 lbs	25	F75
	0.125	SN1008X							29	
	0.200	SN1005X							41	
	0.250	SN2-1008X							46	
	0.250	SN1004X							47	
	0.500	SN5-1010X							61	
	1.000	SN10-1010X							74	
1 1/4"	0.200	SN1205X	2.000	2.000	0.600	1 9/16-18	400 lbs	2000 lbs	35	F100
	0.200	SN2-1210X							35	
	0.250	SN1204X							41	
1 1/2"	0.200	SN1505X	2.000	2.500	0.530	1.967-18	400 lbs	2000 lbs	31	R54-3
	0.250	SN1504X							36	
	0.375	SN1503X							47	
	0.500	SN2-1504X							52	

* For all sizes shown on this page Drag Torque = Free Wheeling

Metric Thread Mount Supernuts®

SB



Our classic Supernut is now available with metric mounting thread. Offered with our metric screw line sizes 10mm through 24mm. The nut color is black to easily differentiate it from the SN nut (see p. 31)

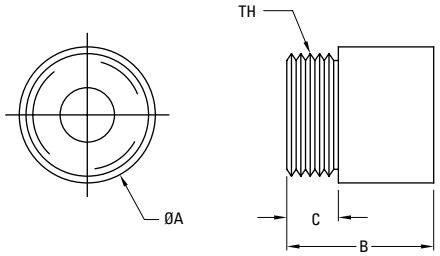
SB
10mm to 24mm) Diameter*

Dia.	Lead	Part No.	Supernut® Dimensions				Design Load lb (N)	Max. Static Load lb (N)	Efficiency %
			A in (mm)	B in (mm)	C in (mm)	TH			
10mm	2mm	SB10x2M	0.750 (19.1)	0.750 (19.1)	0.250 (6.5)	M16 x 1.5	70 (310)	350 (1550)	42
	3mm	SB10x3M							53
	4mm	SB2-10x2M							59
	5mm	SB2-10x2.5M							64
	6mm	SB4-10x1.5M							66
	10mm	SB5-10x2M							76
	12mm	SB5-10x2.4M							78
	20mm	SB6-10x3.3M							81
	35mm	SB10-10x3.5M							81
12mm	3mm	SB12x3M	1.000 (25.4)	1.000 (25.4)	0.375 (9.5)	M22 x 1.5	100 (445)	500 (2225)	48
	4mm	SB2-12x2M							54
	5mm	SB2-12x2.5M							59
	6mm	SB3-12x2M							63
	10mm	SB4-12x2.5M							73
	15mm	SB6-12x2.5M							78
	25mm	SB10-12x2.5M							82
	45mm	SB15-12x3M							81
16mm	4mm	SB16x4M	1.000 (25.4)	1.000 (25.4)	0.375 (9.5)	M22 x 1.5	160 (710)	800 (3560)	48
	5mm	SB2-16x2.5M							52
	8mm	SB4-16x2M							63
	16mm	SB7-16x2.3M							75
	25mm	SB5-16x5M							80
	35mm	SB7-16x5M							82
20mm	4mm	SB20x4M	1.500 (38.1)	1.500 (38.1)	0.500 (12.7)	M35 x 1.5	300 (1335)	1500 (6675)	42
	8mm	SB2-20x4M							59
	12mm	SB3-20x4M							67
	16mm	SB4-20x4M							72
	20mm	SB5-20x4M							76
	45mm	SB9-20x5M							82
	50mm	SB10-20x5M							82
24mm	5mm	SB24x5M	1.500 (38.1)	1.500 (38.1)	0.500 (12.7)	M35 x 1.5	300 (1335)	1500 (6675)	42

* For all sizes shown on this page Drag Torque = Free Wheeling

Thread Mount Bronze Nuts

For Acme Screws



For standard bronze nuts, Thomson BSA uses SAE 660 bearing bronze which provides excellent load carrying ability, good wear resistance and is less susceptible to damage from impact and shock loading. Custom bronzes can be selected if required.

Material Properties

Maximum Temperature	Friction Coefficient	Material*	Tensile Strength
max. 250°F	0.2 to 0.3	SAE 660	35,000 psi

* Other materials available on a custom basis.

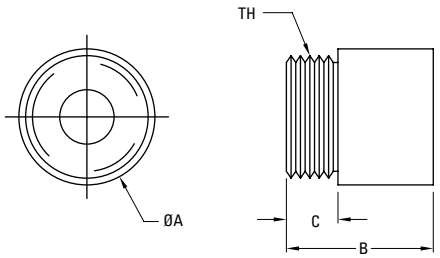
1/4" to 5/8" Diameter

Dia.	Lead	Nut Part No. for R.H. Screws	Nut Part No. for L.H. Screws	Bronze Nut Dimensions				Fits Flange No.	Design Load†	Maximum Static Load	Torque to Raise 1 Pound (in-oz)
				A	B	C	TH				
1/4"	.050	BN2520	BN2520L	0.625	0.625	0.187	9/16-18	F25	110 lbs	550 lbs	.41
	.0625	BN2516	—								.43
	.250	BN4-2516	—								1.00
3/8"	.0625	BN3716	—	0.750	0.750	0.250	5/8-18	F37	300 lbs	1,500 lbs	.61
	.083	BN3712	BN3712L								.64
	.100	BN3710	BN3710L								.67
	.125	BN3708S	—								.76
	.167	BN2-3712S	—								.86
1/2"	.100	BN5010	BN5010L	1.00	1.00	0.375	15/16-16	F50	620 lbs	3,100 lbs	.83
	.200	BN2-5010	—								1.10
5/8"	.100	BN6210	BN6210L	1.00	1.00	0.375	15/16-16	F50	860 lbs	4,300 lbs	.99
	.125	BN6208S	—								1.06
	.200	BN2-6210	—								1.26

† Load ratings based on using Thomson BSA grease. See page 78.

Thread Mount Bronze Nuts

For Acme Screws



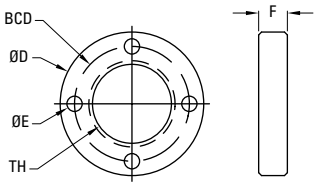
3/4" to 3" Diameter

Dia.	Lead	Nut Part No. for R.H. Screws	Nut Part No. for L.H. Screws	Bronze Nut Dimensions				Fits Flange No.	Design Load†	Maximum Static Load	Torque to Raise 1 Pound (in-oz)
				A	B	C	TH				
3/4"	.100	BN7510	BN7510L	1.50	1.50	0.500	1-3/8 - 16	F75	1,500 lbs	7,500 lbs	1.15
	.125	BN7508	—								1.21
	.167	BN7506	BN7506L								1.28
	.200	BN7505	BN7505L								1.35
1"	.100	BN1010	—	1.50	1.50	0.500	1-3/8 - 16	F75	1,900 lbs	9,500 lbs	1.47
	.125	BN1008	—								1.52
	.200	BN1005	—								1.67
	.250	BN1004	—								1.76
	.500	BN5-1010	—								2.55
	1.000	BN10-1010	—								3.91
1-1/4"	.200	BN1205*	—	1.75	1.75	0.625	1-9/16 - 18	R1004-3	3,000 lbs	15,000 lbs	1.99
	.250	BN1204*	—								2.09
1-1/2"	.200	BN1505*	—	2.25	2.25	0.530	1.967-18	R54-3	4,600 lbs	23,000 lbs	2.31
	.250	BN1504*	—								2.41
	.375	BN1503*	—								2.56
	.500	BN2-1504*	—								3.08
2"	.250	BN2004*	—	2.75	3.50	0.780	2.548-18	R50-3	8,000 lbs	40,000 lbs	3.04
2-1/4"	.250	BN2204*	—	3.37	3.00	1.56	3.137-12	R2202-3	12,800 lbs	64,000 lbs	3.70
2-1/2"	.250	BN2504*	—	3.37	3.00	1.56	3.137-12	R2202-3	16,000 lbs	80,000 lbs	3.90
2-3/4"	.250	BN2704*	—	4.00	4.00	1.75	3.625-12	R2501-3	20,000 lbs	100,000 lbs	4.20
3"	.250	BN3004*	—	4.00	4.00	1.75	3.625-12	R2501-3	23,000 lbs	115,000 lbs	4.50

† Load ratings based on using Thomson BSA grease. See page 78.
* Non-stock item

Standard Mounting Flanges

For Bronze Nuts and Supernuts®



These mounting flanges are designed for easy mounting when fixed to a bronze nut or Supernut®.

Aluminum (6061-T6) Flanges for Bronze Nuts and Supernuts®

Part No.	Flange Dimensions				
	D	E	F	BCD	TH
F25	1.25	0.140 (4X)	0.187	1.00	9/16 - 18
F37	1.60	0.177 (4X)	0.250	1.24	5/8 - 18
F50	2.00	0.266 (4X)	0.375	1.50	15/16 - 16
F75	2.50	0.266 (4X)	0.500	2.00	1-3/8 - 16
F100	3.00	0.266 (4X)	0.600	2.37	1-9/16 - 18

Aluminum flanges do not have a set screw which could deform the Supernut® and possibly cause binding. Aluminum flanges should be pinned or bonded to Supernuts® to prevent unwanted disassembly during operation.

Lead Screws

Lead Screws — 3/16" to 3/8" Diameter

Nominal Major Diameter	Lead	Precision Prefix	Standard Prefix	BSA Part No.	Avail in Left Hand	Material	Root Diameter	Recommended Bearing
3/16"	0.050	SPR	SRA	1820	L	Stainless Steel	0.12	N/A
	0.125			3-1824			0.13	
6mm	1mm	SPR	SRA	6x1M	L	Stainless Steel	0.18	4mm
1/4"	0.031	SPR	SRA	2532	L	Stainless Steel	0.21	4mm
	0.050			2520	L		0.19	
	0.063			2516	L		0.17	
	2mm			2-25x1M			0.19	
	3mm			3-25x1M			0.19	
	0.125			2-2516			0.17	
	0.200			4-2520			.018	
	0.250			4-2516			0.17	
	0.500	N/A		7-2514			0.16	
5/16"	0.083	SPR	SRA	3112	L	Stainless Steel	0.22	4mm
	0.167			2-3112			0.20	
	0.250			2-3108S			0.22	
	0.500			4-3108S			0.21	
	1.000			8-3108			0.23	
3/8"	0.0500	SPR	SRA	3720	L	Stainless Steel	0.30	4mm
	0.0625			3716	L		0.30	
	2mm			37x2M	L		0.28	
	0.083			3712	L		0.28	
	0.100			3710	L		0.26	
	0.125			3708S	L		0.29	
	0.167			2-3712S			0.31	
	0.200			2-3710			0.26	
	0.250			2-3708S	L		0.29	
	0.300			3-3710			0.25	
	0.375			4-3711	L		0.27	
	0.500			4-3708S	L		0.27	
	1.00	N/A		5-3705			0.24	
	1.20			5-3704			0.24	

Lead Screws

Lead Screws — 7/16" (10mm) to 5/8" (16mm) Diameter

Nominal Major Diameter	Lead	Precision Prefix	Standard Prefix	BSA Part No.	Avail in Left Hand	Material	Root Diameter	Recommended Bearing
10mm	2mm	SPT	SRT	10x2M	L	Stainless Steel	0.31	4mm
	3mm			10x3M	L		0.25	
	4mm			2-10x2M			0.29	
	5mm	SPR	SRA	2-10x2.5M			0.27	
	6mm			4-10x1.5M			0.31	
	10mm			5-10x2M			0.29	
	12mm			5-10x2.4M			.029	
	20mm			6-10x3.3M			0.30	
	35mm	N/A		10-10x3.5M			0.29	
7/16"	0.125	SPR	SRA	2-4316		Stainless Steel	0.35	6mm
	0.250			2-4308S			0.36	
	0.500			4-4308S			0.33	
12mm	3mm	SPT	SRT	12x3M		Stainless Steel	0.31	6mm
	4mm	SPR	SRA	2-12x2M			0.36	
	5mm	SPT	SRT	2-12x2.5M			0.35	
	6mm	SPR	SRA	3-12x2M			0.35	
	10mm	SPT	SRT	4-12x2.5M			0.35	
	15mm	SPR	SRA	6-12x2.5M			0.34	
	25mm	—	SRA	10-12x2.5M			0.36	
	45mm	—	SRA	15-12x3M			0.37	
1/2"	0.0625	SPR	SRA	5016		Stainless Steel	0.41	6mm
	0.100			5010	L		0.37	
	4mm			2-50x2M			0.39	
	0.200			2-5010			0.39	
	0.250			2-5008			0.38	
	0.500			4-5008			0.36	
	0.800	N/A		8-5010			0.37	
	1.000			8-5008			0.39	
	1.500			12-5008			0.39	
5/8"	0.100	SPR	SRA	6210	L	Stainless Steel	0.52	8 to 10mm
	0.125			6208S	L		0.52	
	0.200	SPR		2-6210	L		0.52	
	0.250			2-6208S			0.52	
	0.500			4-6208			0.48	
16mm	4mm	SPT	SRT	16x4M	L	Stainless Steel	0.45	8 to 10mm
	5mm	SPR	SRA	2-16x2.5M			0.48	
	8mm			4-16x2M			0.51	
	16mm			7-16x2.3M			0.49	
	25mm	N/A		5-16x5M			0.45	
	35mm			7-16x5M			0.48	

Lead Screws

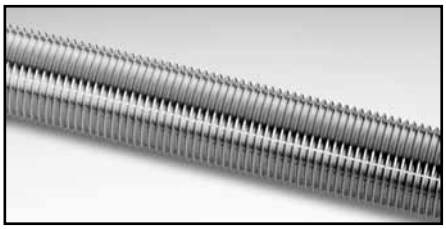
Lead Screws — 3/4" (24mm) to 3" Diameter

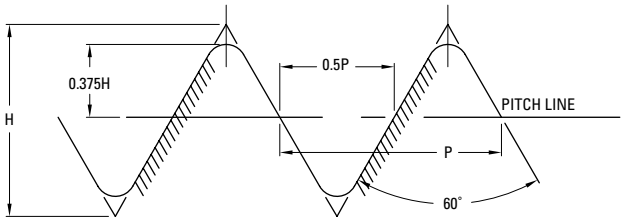
Nominal Major Diameter	Lead	Precision Prefix	Standard Prefix	BSA Part No.	Avail in Left Hand	Material	Root Diameter	Recommended Bearing
3/4"	0.100	SPR	SRA	7510	L	Stainless Steel	0.63	12mm
	0.125			7508	L		0.61	
	1.500	N/A		12-7508			0.62	
	0.167	SPR		7506	L		0.56	
	0.200			7505	L		0.53	
	0.500	N/A		5-7510			0.62	
	1.000			8-7508			0.61	
	2.000			10-7505†	L		0.59	
20mm	4mm	SPT	SRT	20x4M	L	Stainless Steel	0.61	12mm
	8mm	SPR	SRA	2-20x4M			0.58	
	12mm			3-20x4M			0.59	
	16mm			4-20x4M			0.59	
	20mm	–		5-20x4M			0.59	
	45mm	–		9-20x5M			0.62	
	50mm			10-20x5M			0.65	
24mm	5mm	SPT	SRT	24x5M	L	Stainless Steel	0.73	12 to 15mm
1"	0.100	SPR	SRA	1010	L	Stainless Steel	0.88	12 to 20mm
	0.125			1008	L		0.86	
	0.200			1005	L		0.78	12 to 15mm
	0.250	N/A	RA	1004	L	Carbon Steel	0.72	
	0.250	SPR	SRA	2-1008		Stainless Steel	0.84	12 to 20mm
	0.500	N/A		5-1010			0.88	
	1.000			10-1010			0.88	
1-1/4"	0.200	N/A	RA	1205	L	Low Carbon Steel	1.03	20mm
	0.200		SRA	1205	L	Stainless Steel	1.01	
	0.200			2-1210			1.11	
	0.250		RA	1204	L	Low Carbon Steel	0.98	
1-1/2"	0.200	N/A	RA	1505	L	Low Carbon Steel	1.28	25mm
	0.250			1504	L		1.23	
	0.375			1503			1.11	
	0.500			2-1504			1.23	
2"	0.250	N/A	RA	2004	L	Low Carbon Steel	1.73	*
2-1/4"	0.250	N/A	RA	2204	L	Low Carbon Steel	1.98	*
2-1/2"	0.250	N/A	RA	2504	L	Low Carbon Steel	2.23	*
2-3/4"	0.250	N/A	RA	2704	L	Low Carbon Steel	2.48	*
3"	0.250	N/A	RA	3004	L	Low Carbon Steel	2.73	*

† Nominal O.D. is .734"

V-Thread Screws

Burnished Finish 303 Stainless Steel





- Some sizes available in 1018 Steel
- Matching Supernuts and Left Hand Screws on special request
- Lead Accuracy is .015 in/ft

Diameter	Lead	Size	Part No.	Recommended Bearing
6mm	1mm	6 x 1	SV6x1	4mm
1/4"	0.0125	1/4-80	SV2580	4mm
	0.0208	1/4-48	SV2548	
	0.0250	1/4-40	SV2540	
	0.0278	1/4-36	SV2536	
	0.0313	1/4-32	SV2532	
	0.0357	1/4-28	SV2528	
	0.0417	1/4-24	SV2524	
	0.0500	1/4-20	SV2520	
5/16"	0.0130	5/16-80	SV3180	4mm
	0.0420	5/16-24	SV3124	
3/8"	0.013	3/8-80	SV3780	4 to 6mm
	0.0250	3/8-40	SV3740	
	0.0313	3/8-32	SV3732	
	0.0400	3/8-25	SV3725	
	0.0417	3/8-24	SV3724	
	0.0500	3/8-20	SV3720	
	0.0625	3/8-16	SV3716	
	0.0833	3/8-12	SV3712	
7/16"	0.0500	7/16-20	SV4320	6mm
1/2"	0.0130	1/2-80	SV5080	6 to 8mm
	0.0250	1/2-40	SV5040	
	0.0333	1/2-30	SV5030	
	0.0500	1/2-20	SV5020	
	0.0625	1/2-16	SV5016	
	0.0769	1/2-13	SV5013	

Ball Screws

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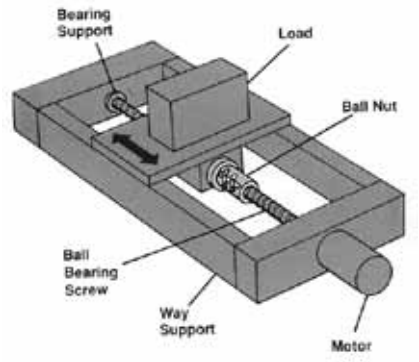
Ball Screw Selection Guide

Ball Bearing Screw Selection Process

For the selection of ball bearing screws, BSA has developed a simplified process. By applying the four steps which follow, the proper size ball bearing screw can readily be selected for most applications. This four step process includes:

- Determine the load
- Determine the design life objective
- Verify safe speed
- Verify safe compression load

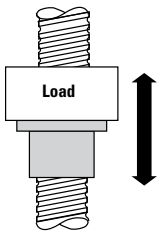


If unique design considerations are encountered in your applcation, consult the factory for indepth technical assistance.

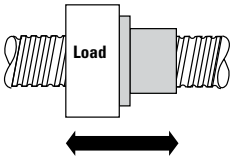
Step 1. Determine the load

The key step here is to determine the load "as seen by the screw." Essentially, the load applied in a vertical application, such as lifting or jacking, is the same as the weight of the load.

VERTICAL APPLICATION



HORIZONTAL APPLICATION



Lifting or pushing an automobile is a good analogy for explaining this relationship. It may be impossible to lift a 3,000 pound automobile, but it is possible to push it. The "load seen" in pushing the auto is the weight of the auto times the coefficient of friction of the wheels.

The load seen by a ball bearing screw is the weight of the load times the coefficient of friction of the bearing supports. For example, take a 3,000 pound load supported on way bearings with a coefficient of friction of .2. The force required to move the load would be 3,000 lb. x .2 = 600 lbs. This is the load as seen by the screw. Typical coefficient of friction for various bearing surfaces are:

SLIDES/WAYS

Bronze on steel (lubricated)	= .16
Steel on steel (lubricated)	= .18

BEARINGS

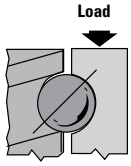
Ball bushings	= .001
Rollerway bushings	= .005
Ball bearing splines	= .005

Another practical way to determine the load in an actual application is to attach a spring scale to the load and pull it. Base the load on the moving force required, not on the higher starting (breakaway) force.

Step 2. Determine the design life objective

The design life objective is the number of inches that a ball bearing nut will travel during the desired life of the machine.

VERTICAL APPLICATION



Example of calculating life in a vertical application:

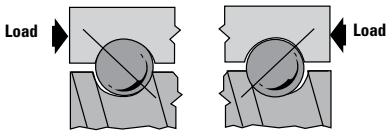
- Length of stroke: 8 inches
- Cycle rate of machine: 25 strokes/hr.
- Estimated machine operation/day: 16 hrs/day
- Number of working days/year: 225 days
- Number of years machine is designed for: 10 years

Counting one trip up (8 inches) and one trip down (8 inches) for each cycle the design life objective in this example is:

8 x 2 x 25 x 16 x 225 x 10 = 14,400,000 inches

It should be noted that the stroke length must be multiplied by 2 because the load is always on the same side of the ball groove during both extend and retract strokes.

HORIZONTAL APPLICATION



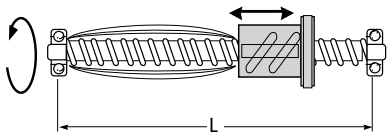
Using the vertical application example it would not be necessary to multiply the 8 inch stroke length by 2 in a hori-zontal application. The calculation is:

8 x 25 x 16 x 225 x 10 = 7,200,000 inches

Ball Screw Selection Guide

Once the load and design life objective have been determined, refer to the load/life relationship formula on page 85 to select the correct unit.

Step 3. Verify safe speed
The three factors that determine the safe speed of a ball bearing screw are:
- Screw diameter
- Screw length
- Rigidity of end mountings



A small diameter, long length screw operating at very high speed could develop severe vibrations. Normally, this is not a problem, but should always be checked.

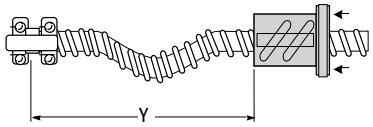
$$\text{RPM} = \frac{\text{travel rate (inches/minute)}}{\text{lead (inches/revolution)}}$$

If safe speed is a concern, first use the most rigid end mounting arrangement. Secondly, use a larger diameter screw.

Engineering curves for critical speed comparisons of all models can be found on page 84.

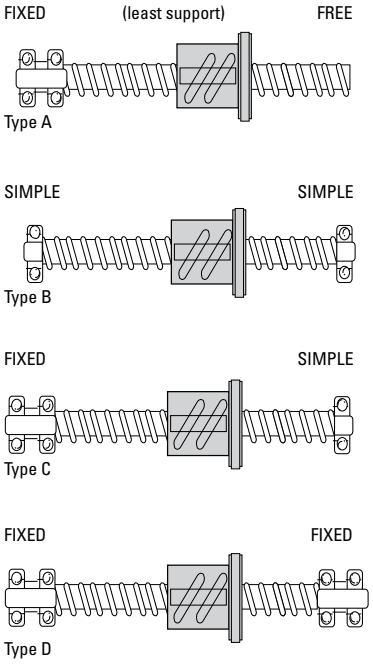
Step 4. Verify safe compression load
The three factors that determine the safe compression load of a given diameter ball bearing screw are:
- Length between load point and end bearing
- Load
- Rigidity of end mountings

If a sufficiently heavy load is applied to a long ball bearing screw it could buckle. The easiest solution to this problem is to use the most rigid end mounting. The next step is to select a larger diameter screw.



Engineering curves for compression load comparisons of all models can be found on page 84.

End Mounting
Bearing Supports
Four combinations of bearing supports are used throughout this catalog for selection purposes. They are:



See pages 61 – 68 for more information on end journals and bearing supports.

Other Considerations
In selecting a ball screw, many factors such as load, length, bearing supports, life, speed, etc., are interrelated.

Changing one factor often forces the designer to change another. The selection process consists largely of balancing these factors to arrive at the optimum design.

An example of the interrelationship of design factors is fine lead vs. coarse lead. A fine lead provides better positioning sensitivity and a lower drive torque, but it also results in higher rotary speed. A coarse lead results in lower rotary speed, but requires a higher drive torque which may require a larger motor and related drive components. The chart below presents the effect of change in parameters on common ball bearing screw characteristics.

Increase	Result
Screw Length	Critical Speed deceases
	Compression load decreases
Screw Diameter	Critical Speed inceases
	Inertia increases
	Compression load increases
Lead	Drive torque increases
	Angular velocity decreases
End Mounting Rigidity	Critical Speed inceases
	Compression load increases
Load	Life decreases
Preload	Positioning accuracy inceases
	System stiffness increases
	Drag torque increases

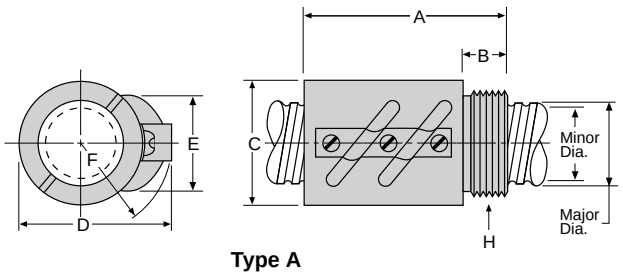
Precision Rolled Ball Screws

3/8" to 3/4" Diameter

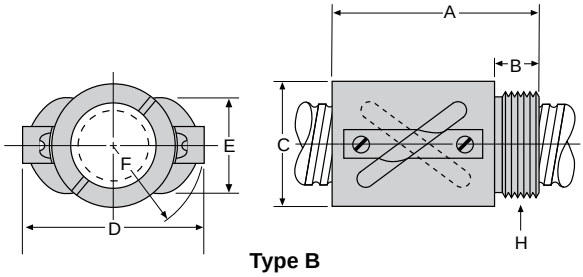
Product Specifications

Ball Screws							Standard Ball Nuts						Preloaded Ball Nuts		
Nom. Dia.	Lead (in/ rev)	RH LH	SST 17-4 PH	Support Bearing (See p 51)	Nom. Root Dia.	Screw P/N	Nut P/N	Nut type	No. of Circuits	Dynamic Load Rating (lbs)*	Static Load Rating (lbs)	Tourque to Raise 1lb	Nut P/N	Max. Preload (lbs)	Static Load Rating (lbs)
3/8"	.125	R		6mm	.300	R0308†	RB0308-2	A	2	500	4.250	.02 lb-in	–	–	–
	.125	R				PRX10†	RX10-2	D	1	136	1,415		–	–	–
	.125	R	x			PRB15	RB15-2	D	1	25	230		–	–	–
1/2"	.200	R		6mm or 8mm	.390	PR0505	R0505-2	A	2	1,200	9,400	.04 lb-in	RP0505-2	360	9,040
	.500	R				PR0502	RB20-2	B	2	850	4,150	.09 lb-in	–	–	–
	.500	R	x			PRB21	RB21-2	B	2	140	750		–	–	–
5/8"	.200	R		8mm	.480	PR0605	RC0605-2	D	1	800	6,150	.04 lb-in	RD0605-2	240	5,910
	.200	R				PR0605	RQ0605-2	F	1	800	6,150		–	–	–
	.200	L				PRL0605	RK0605-2	D	1	800	6,150		RE0605-2	240	5,910
	.200	L				PRL0605	RR0605-2	F	1	800	6,150		–	–	–
	.200	R	x			SPRB30	SRB30-2	D	1	170	1,250		–	–	–
	.200	L	x			SPRB 31	SRB31-2	D	1	170	1,250		–	–	–
3/4"	.200	R		12mm	.625	PR0705	RBC0705-2	D	1	950	7,750	.04 lb-in	–	–	–
	.200	R				PR0705	RB0705-2	A	2	1,900	18,800		–	–	–
	.200	R	x			PRB36	RB36-2	D	1	160	1,350		–	–	–
	.500	R				PR0702	R0702-2	B	2	3,450	24,200	.09 lb-in	RP0702-2	1,035	23,165
	.500	R	x			PRS0702	RS0702-2	B	2	600	3,460		–	–	–

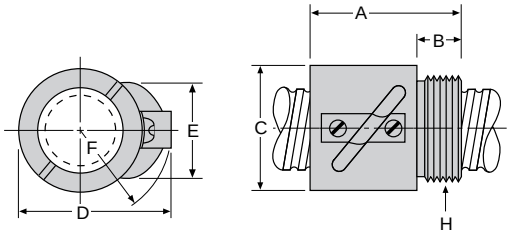
All screws come in precision grade (0.003 in/ft) except as noted. Delete the leading P in the screw P/N for standard grade (0.010 in/ft.)
Non-preloaded ball nuts come standard with no more than 0.007" backlash. Minimum backlash (0.002") is available for an additional charge. For zero backlash, select a preloaded assembly.
* Dynamic load ratings based on 1,000,000 inches of travel using BSA Grease—see page 78.
† Available only in 0.005" per foot lead accuracy.
Complete assembly selections shown pages 61 – 68.



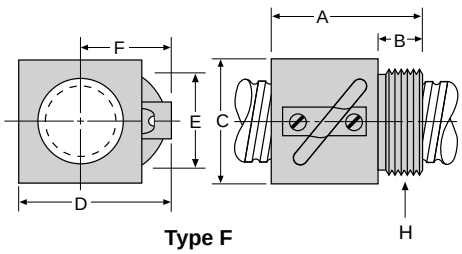
Type A



Type B



Type D



Type F

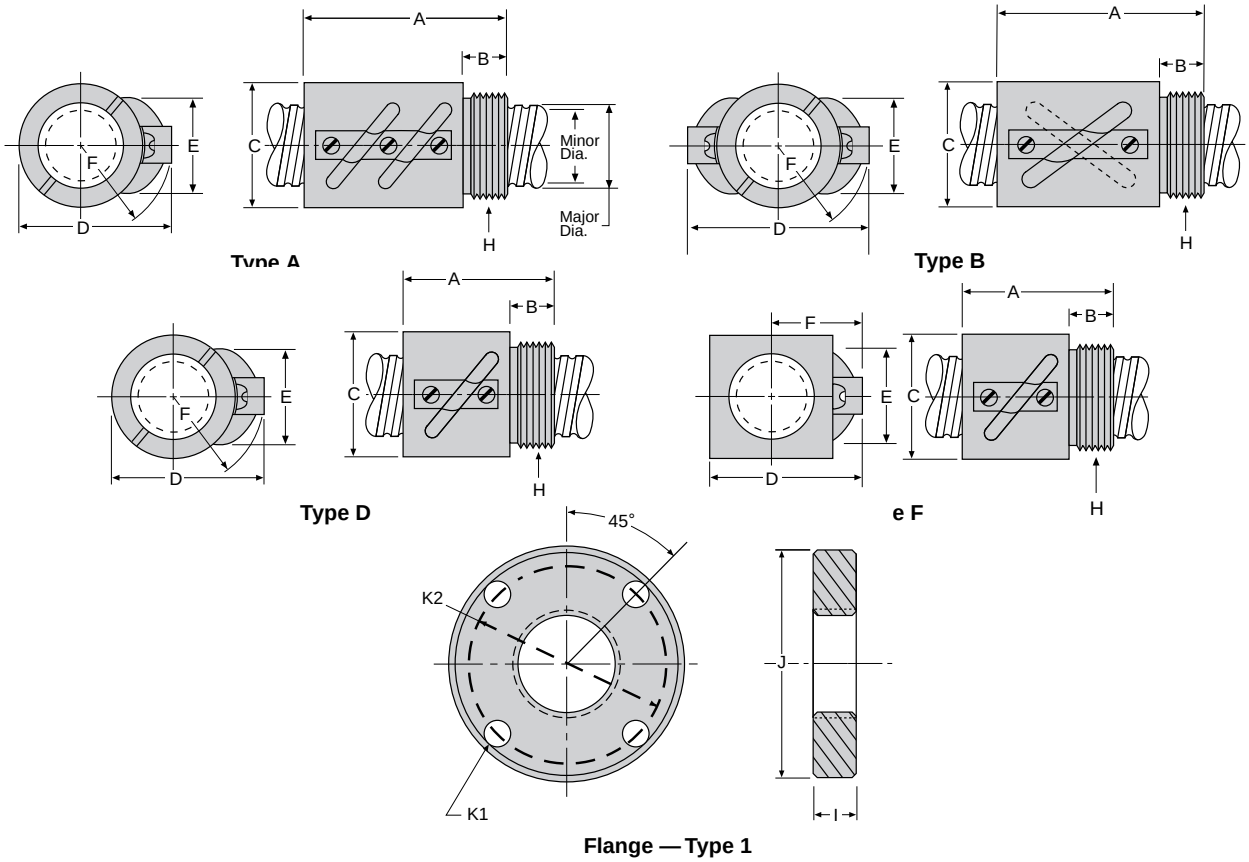
Precision Rolled Ball Screws

3/8" to 3/4" Diameter

Dimensions

Standard Ball Nuts									Optional Ball Nut Flanges			
Nut P/N	Nut Type	A Max	B Max	C Max	D Max	E Max	F Max	H "V" Threads	I Max	J Max	K1 Hole Dia.	K2 Bolt Circle Dia.
RB0308-2	A	1.83	0.255	0.786	0.915	0.468	0.55	.664-32 (N-03 Locknut)	0.275	1.61	0.177 (4x)	1.24
RX10-2	D	1.01	0.255	0.755	0.850	0.475	0.48	.664-32 (N-03 Locknut)	0.275	1.61	0.177 (4x)	1.24
RB15-2	D	1.01	0.255	0.736	0.850	0.475	0.48	.664-32 (N-03 Locknut)	0.275	1.61	0.177 (4x)	1.24
R0505-2	A	2.76	0.390	1.070	1.339	0.665	0.85	15/16-16 UN-2A	0.540	2.63	0.281 (4x)	2.09
RB20-2	B	1.76	0.390	1.063	1.390	0.625	0.70	15/16-16 UN-2A	0.540	2.63	0.281 (4x)	2.09
RB21-2	B	1.76	0.390	1.063	1.390	0.625	0.70	15/16-16 UN-2A	0.540	2.63	0.281 (4x)	2.09
RC0605-2	D	1.72	0.510	1.130	1.360	0.787	0.80	15/16-16 UN-2A	0.540	2.63	0.281 (4x)	2.09
RQ0605-2	F	1.72	0.510	1.005	1.300	0.797	0.80	15/16-16 UN-2A	0.540	2.63	0.281 (4x)	2.09
RK0605-2	D	1.72	0.510	1.130	1.360	0.787	0.80	15/16-16 UN-2A	0.540	2.63	0.281 (4x)	2.09
RR0605-2	F	1.72	0.510	1.005	1.300	0.797	0.80	15/16-16 UN-2A	0.540	2.63	0.281 (4x)	2.09
SRB30-2	D	1.72	0.510	1.361	1.500	0.900	0.80	15/16-16 UN-2A	0.540	2.63	0.281 (4x)	2.09
SRB31-2	D	1.72	0.510	1.361	1.500	0.900	0.80	15/16-16 UN-2A	0.540	2.63	0.281 (4x)	2.09
RBC0705-2	D	1.89	0.510	1.317	1.550	0.959	0.90	1 1/8-18 UNEF-2A	0.540	2.63	0.266 (4x)	2.09
RB0705-2	A	2.89	0.510	1.317	1.521	0.917	0.94	1 1/8-18 UNEF-2A	0.540	2.63	0.266 (4x)	2.09
RB36-2	D	1.88	0.510	1.361	1.580	0.770	0.90	1 1/8-18 UNEF-2A	0.540	2.63	0.266 (4x)	2.09
R0702-2	B	2.94	0.510	1.317	1.984	0.983	1.06	1 1/4-16 UN-2A	0.540	2.63	0.281 (4x)	2.09
RS0702-2	B	2.94	0.510	1.317	1.984	0.983	1.06	1 1/4-16 UN-2A	0.540	2.63	0.281 (4x)	2.09

Complete assembly selections shown on pages 61 – 68.



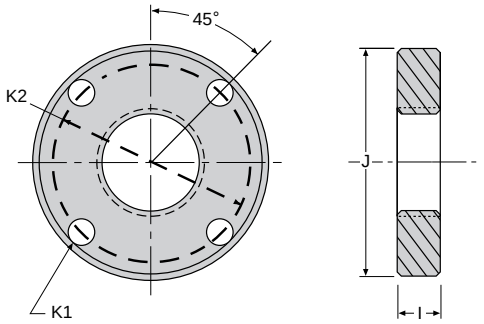
Precision Rolled Ball Screws

3/8" to 3/4" Diameter

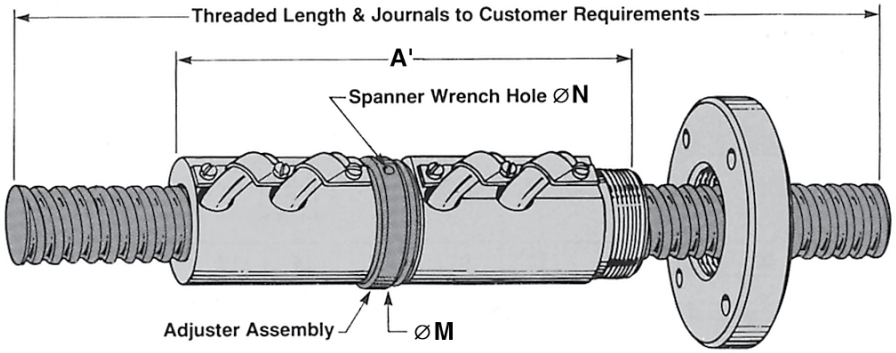
Dimensions - Preloaded Nuts

Preloaded Ball Nuts									Optional Ball Nut Flanges			
Nut P/N	Nut Type	A' Max	B* Max	C* Max	F* Max	M Max	N Max	H* "V" Threads	I Max	J Max	K1 Hole Dia.	K2 Bolt Circle Dia.
RP0505-2	A	5.95	0.390	1.067	0.85	1.420	0.203	15/16-16 UN-2A	0.540	2.63	0.281 (4x)	2.09
RD0605-2	D	3.72	0.510	1.130	0.80	1.420	0.203	15/16-16 UN-2A	0.540	2.63	0.281 (4x)	2.09
RE0605-2	D	3.75	0.510	1.130	0.80	1.420	0.203	15/16-16 UN-2A	0.540	2.63	0.281 (4x)	2.09
RP0702-2	B	6.18	0.510	1.317	1.06	1.670	0.266	1 1/4-16 UN-2A	0.540	2.63	0.281 (4x)	2.09

* See drawings on previous two pages.
Complete assembly selections shown on pages 61 – 68.



Flange — Type 1



Preloaded Ball Nut

Precision Rolled Ball Screws

1" to 1-1/2" Diameter

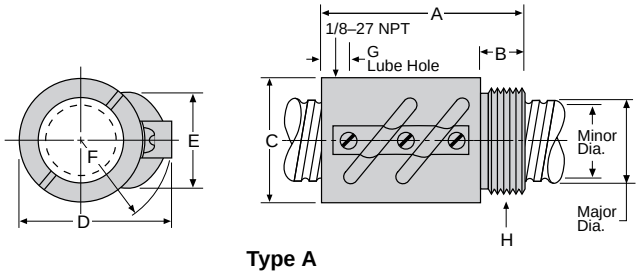
Product Specifications

Ball Screws							Standard Ball Nuts						Preloaded Ball Nuts		
Nom. Dia.	Lead (in/ rev)	RH LH	SST	Support Bearing (See p 51)	Nom. Root Dia.	Screw P/N	Nut P/N	Nut type	No. of Cir-cuits	Dynamic Load Rating (lbs)*	Static Load Rating (lbs)	Tourque to Raise 1lb	Nut P/N	Max. Preload (lbs)	Static Load Rating (lbs)
1	.250	R		15 or 20mm	.836	PR1004	R1004-2	A	2	3,350	30,750	.05 lb-in	–	–	–
	.250	R				PR1004	RC1004-2	D	1	1,600	12,700		–	–	–
	.250	L				PRL1004	RL1004-2	A	2	3,350	30,750		–	–	–
	.250	L				PRL1004	RK1004-2	D	1	1,600	12,700		–	–	–
	.500	R			.879	PR1002	R1002-2	B	2	3,950	32,300	.09 lb-in	RP1002-2	1,185	31,115
	1.000	R			.836	PR1001	R1001-2	B	2	2,250	13,750	.18 lb-in	–	–	–
	1.000	R	x			RS1001†	RS1001-2	B	2	430	2,000		–	–	–
1 1/8	0.200	R		20mm	1.020	PR1105	R1105-2	A	2	2,400	27,550	.04 lb-in	RP1105-2	720	26,830
1 1/2	0.250	R		25mm	1.320	PRX1504†	RX1504-2	A	2	4,198	44,030	.05 lb-in	–	–	–
	0.500	R			1.265	PR1502	R1502-2	A	2	12,900	102,300	.09 lb-in	RP1502-2	3,870	98,430
	0.500	L				PRL1502	RL1502-2	A	2	12,900	102,300		–	–	–
	1.000	R			1.143	PR1501	R1501-2	B	2	8,250	47,800	.18 lb-in	RP1501-2	2,475	45,325
	2.000	R			1.210	PR1520	R1520-2	B	2	7,600	29,000	.35 lb-in	–	–	–

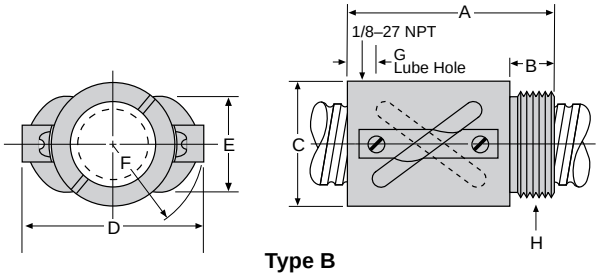
All screws come standard in precision grade (0.003 in/ft) except where noted. Delete the leading P in the screw P/N for standard grade (0.010 in/ft) One-inch nuts come with up to 0.009" backlash. Larger sizes come standard with up to 0.018" backlash. Custom loading is available. For zero backlash select a preloaded assembly.

* Dynamic load ratings based on 1,000,000 inches of travel using BSA grease—see page 78.

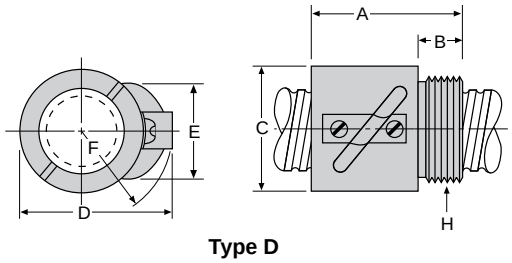
† Offered in 0.005" per foot lgrad only



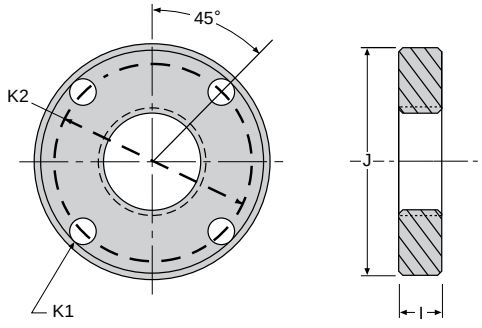
Type A



Type B



Type D



Flange — Type 1

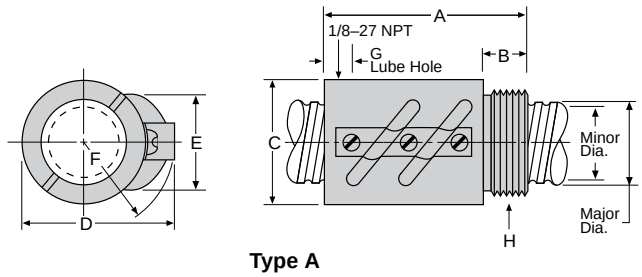
Precision Rolled Ball Screws

1" to 1-1/2" Diameter

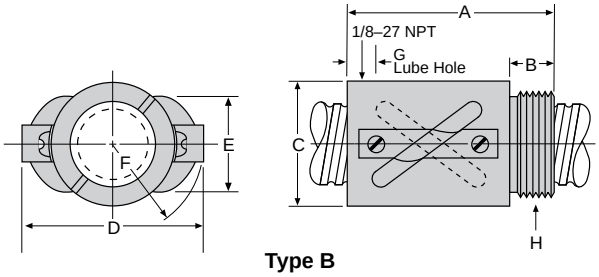
Dimensions

Standard Ball Nuts										Optional Ball Nut Flanges				
Nut P/N	Nut Type	A Max	B Max	C Max	D Max	E Max	F Max	G Max*	H "V" Threads	Flange Type	I Max	J Max	K1 Hole Dia.	K2 Bolt Circle Dia.
R1004-2	A	3.14	0.630	1.692	1.882	1.191	1.12	–	1 9/16-18 UNEF-2A	1	0.640	3.28	0.281	2.75
RC1004-2	D	2.36	0.630	1.692	1.913	1.185	1.09	–	1 9/16-18 UNEF-2A	1	0.640	3.28	0.281	2.75
RL1004-2	A	3.14	0.630	1.692	1.882	1.191	1.05	–	1 9/16-18 UNEF-2A	1	0.640	3.28	0.281	2.75
RK1004-2	D	2.36	0.630	1.692	1.913	1.185	1.08	–	1 9/16-18 UNEF-2A	1	0.640	3.28	0.281	2.75
R1002-2	B	3.13	0.630	1.692	2.172	1.191	1.12	–	1 9/16-18 UNEF-2A	1	0.640	3.28	0.281	2.75
R1001-2	B	3.10	0.605	1.692	2.172	1.200	1.17	–	1 9/16-18 UNEF-2A	1	0.640	3.28	0.281	2.75
RS1001-2	B	3.10	0.605	1.692	2.172	1.200	1.10	–	1 9/16-18 UNEF-2A	1	0.640	3.28	0.281	2.75
R1105-2	A	2.51	0.485	1.692	1.963	1.281	1.22	–	1 5/8-20 UN-2A	1	0.495	3.23	0.281	2.702
RX1504-2	A	2.88	0.505	2.098	2.400	1.604	1.53	–	1.967-18 UNS-2A	1	0.520	4.20	0.397	3.440
R1502-2	A	5.59	0.755	2.630	3.177	1.564	1.93	.46	2.360-18 UNS-2A	1	0.785	4.65	0.531	3.875
RL1502-2	A	5.59	0.755	2.630	3.154	1.566	1.88	.46	2.360-18 UNS-2A	1	0.785	4.65	0.531	3.875
R1501-2	B	3.65	1.010	2.630	3.696	1.737	1.96	–	2 ¼-20 UN-2A	1	1.030	4.97	0.531	4.125
R1520-2	B	5.26	1.005	2.621	3.400	1.576	1.68	.50	2 ¼-20 UN-2A	1	1.030	4.97	0.531	4.125

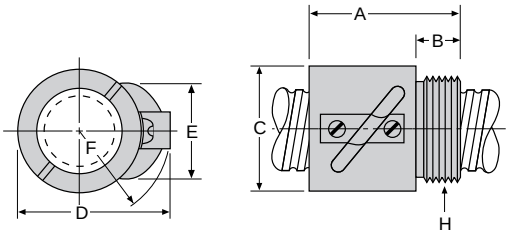
* Lube hole is 1/8 - 27 NPT tapped hole where offered.



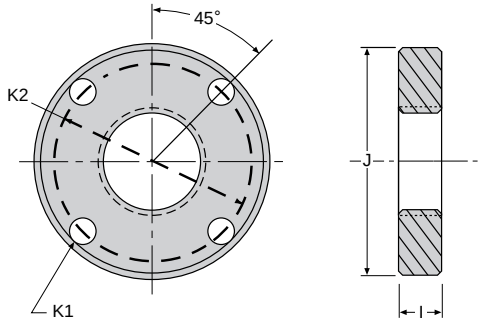
Type A



Type B



Type D



Flange — Type 1

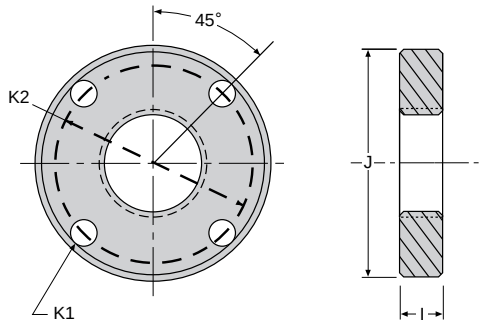
Precision Rolled Ball Screws

1" to 1-1/2" Diameter

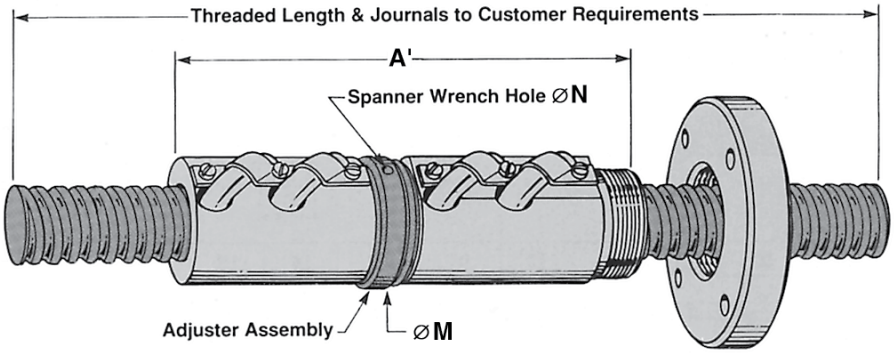
Dimensions - Preloaded Nuts

Preloaded Ball Nuts										Optional Ball Nut Flanges				
Nut P/N	Nut Type	A' Max	B* Max	C* Max	F* Max	G*† Max	M Max	N Max	H* "V" Threads	Flange Type	I Max	J Max	K1 Hole Dia.	K2 Bolt Circle Dia.
RP1002-2	B	6.64	0.630	1.692	1.12	–	2.070	.266	1 9/16-18 UNEF-2A	1	0.640	3.28	0.281	2.75
RP1105-2	A	5.50	0.485	1.692	1.22	–	2.070	.266	1 5/8-20 UN-2A	1	0.495	3.23	0.281	2.702
RP1502-2	A	12.10	0.755	2.630	1.93	.46	3.114	.437	2.360-18 UNS-2A	1	0.785	4.65	0.531	3.875
RP1501-2	B	8.16	1.010	2.630	1.96	–	3.114	.437	2 ¼-20 UN-2A	1	1.030	4.97	0.531	4.125

* See drawings on the two previous pages.
† Lube hole is 1/8 -27 NPT tapped hole where offered.



Flange — Type 1



Preloaded Ball Nut

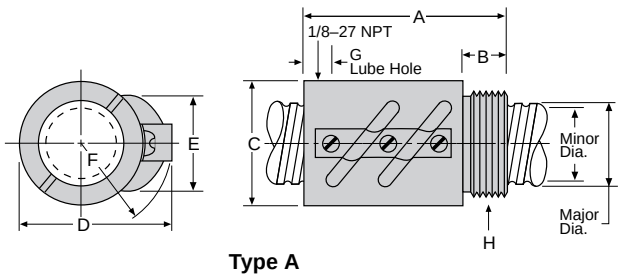
Precision Rolled Ball Screws

2" to 4" Diameter

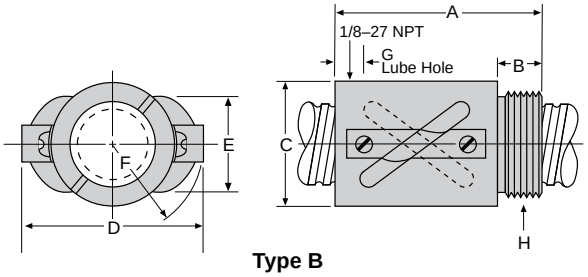
Product Specifications

Ball Screws							Standard Ball Nuts						Preloaded Ball Nuts		
Nom. Dia.	Lead (in/ rev)	RH LH	SST	Sug. Support Bearing (p 51)	Nom. Root Dia.	Screw P/N	Nut P/N	Nut type	No. of Cir-cuits	Dynamic Load Rating (lbs)*	Static Load Rating (lbs)	Tourque to Raise 1lb	Nut P/N	Max. Preload (lbs)	Static Load Rating (lbs)
2	0.500	R		35mm	1.723	PR2002	R2002-2	A	2	18,500	143,400	.09 lb-in	RP2002-2	5,245	150,805
	0.500	L				RL2002	RL2002-2	A	2	18,500	143,400		RT2002-2	5,245	150,805
	1.000	R				PR2001	R2001-2	B	2	21,200	134,500	.18 lb-in	RP2001-2	6,585	148,215
2 ¼	0.500	R		40mm	1.850	PRX2202†	RX2202-2	A	2	21,306	142,660	.09 lb-in	–	–	–
2 ½	0.250	R		–	2.320	PRX74†	RX74-2	C	3	6,315	81,938	.05 lb-in	–	–	–
	0.500	R			2.222	PR2502	R2502-2	A	2	21,200	186,000	.09 lb-in	–	–	–
	1.000	R				PR2501	R2501-2	B	2	27,000	174,000	.18 lb-in	–	–	–
3	0.660	R		–	2.483	PR3066	R3066-2	C	3	34,200	320,150	.12 lb-in	–	–	–

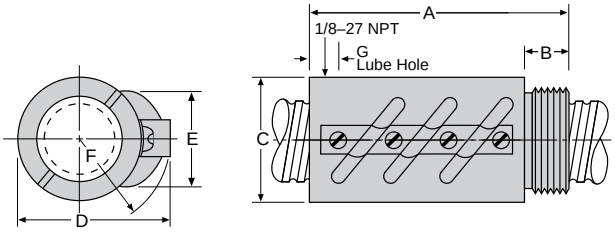
All screws come standard in precision grade (0.003 in/ft) Delete the leading P in the screw P/N for standard grade (0.010 in/ft)
One-inch nuts come with up to 0.009" backlash. Larger sizes come standard with up to 0.018" backlash. Custom loading is available. For zero backlash select a preloaded assembly.
* Dynamic load ratings based on 1,000,000 inches of travel using BSA grease—see page 78.
† Offered in 0.004" grade only.



Type A

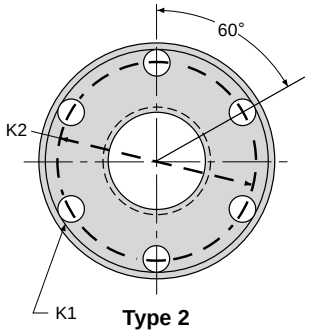


Type B

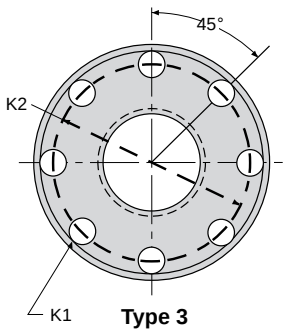


Type C

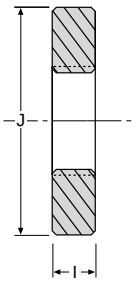
Flanges



Type 2



Type 3



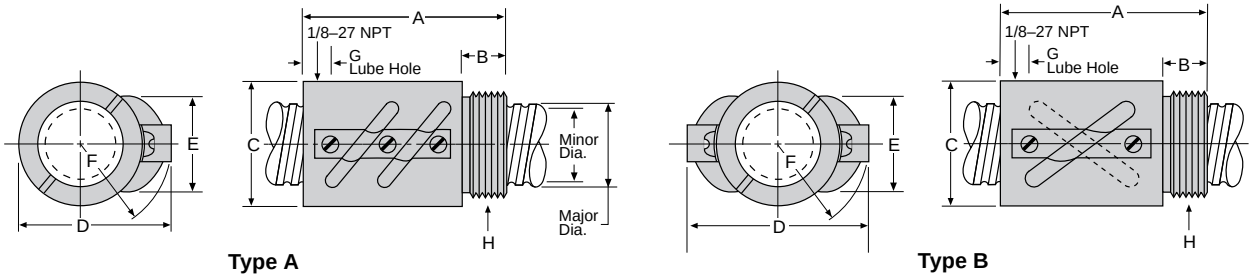
Precision Rolled Ball Screws

2" to 4" Diameter

Dimensions

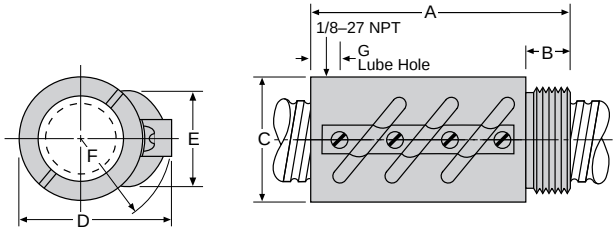
Standard Ball Nuts										Optional Ball Nut Flanges				
Nut P/N	Nut Type	A Max	B Max	C Max	D Max	E Max	F Max	G Max *	H "V" Threads	Flange Type	I Max	J Max	K1 Hole Dia.	K2 Bolt Circle Dia.
R2002-2	A	6.41	1.505	3.255	3.861	2.010	2.27	.50	3-12 UN-2A	3	1.536	5.41	0.656	4.25
RL2002-2	A	6.41	1.505	3.255	3.861	2.010	2.27	.50	3-12 UN-2A	3	1.536	5.41	0.656	4.25
R2001-2	B	6.41	1.505	3.255	4.460	2.330	2.29	.50	3-12 UN-2A	3	1.536	5.41	0.656	4.25
RX2202-2	A	6.70	1.570	3.380	3.960	2.561	2.48	–	3.137-12 UNS-2A	2	1.587	5.41	0.656	4.25
RX74-2	C	3.76	0.755	3.380	3.725	2.306	2.02	–	3.34-12	2	0.775	5.38	0.656	4.375
R2502-2	A	6.78	1.755	4.005	4.640	2.371	2.77	.50	3 5/8-12 UN-2A	3	1.785	6.03	0.656	5.00
R2501-2	B	6.78	1.755	4.005	5.274	2.381	2.66	.50	3 5/8-12 UN-2A	3	1.785	6.03	0.656	5.00
R3066-2	C	9.35	2.010	4.755	5.486	3.356	3.34	.50	4.325-12 UNS-2A	3	2.025	7.41	0.781	6.25

* Lube hole is 1/8 - 27 NPT tapped hole where offered.



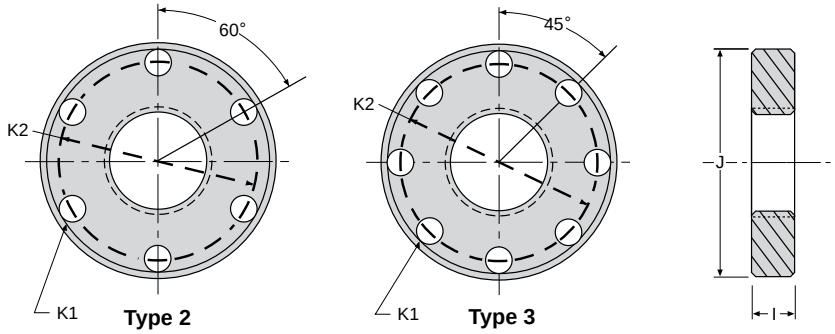
Type A

Type B



Type C

Flanges



Type 2 **Type 3**

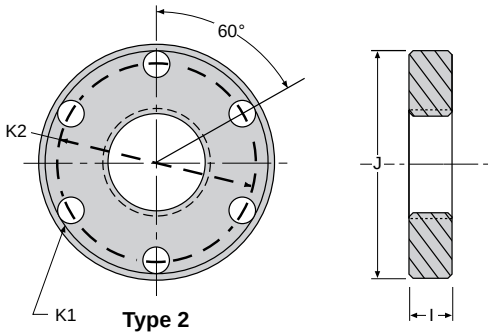
Precision Rolled Ball Screws

2" to 4" Diameter

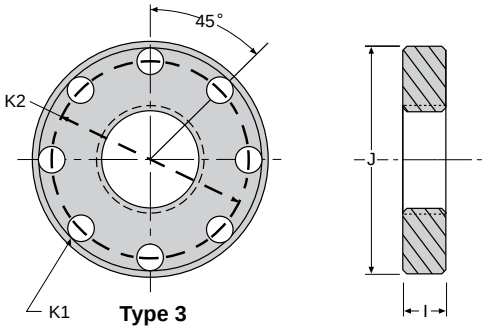
Dimensions - Preloaded Ball Nuts

Preloaded Ball Nuts										Optional Ball Nut Flanges				
Nut P/N	Nut Type	A' Max	B* Max	C* Max	F* Max	G*† Max	M Max	N Max	H* "V" Threads	Flange Type	I Max	J Max	K1 Hole Dia.	K2 Bolt Circle Dia.
RP2002-2	A	13.92	1.505	3.255	2.27	.50	3.710	.500	3-12 UN-2A	3	1.536	5.41	0.656	4.25
RT2002-2	A	13.92	1.505	3.255	2.27	.50	3.710	.500	3-12 UN-2A	3	1.536	5.41	0.656	4.25
RP2001-2	B	13.90	1.505	3.255	2.29	.50	3.710	.500	3-12 UN-2A	3	1.536	5.41	0.656	4.25

* See drawings on previous two pages.
† Lube hole is 1/8 -27 NPT tapped hole where offered.

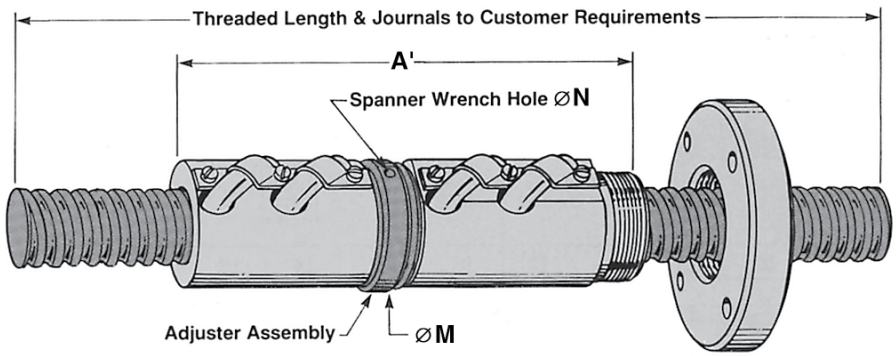


Type 2



Type 3

Flanges



Preloaded Ball NutFlanges

Miniature Rolled Ball

Screw Assemblies

Overview

- Smooth and efficient
- Wide selection of leads available
- Small envelope
- Designed for a cost effective solution

Material

Item	Material	Heat Processing	Hardness
Screw Shaft	4150 Steel	Induction Hardened	HRC 58-62
Nut	4150 Steel	Carbuerized	HRC 58-62

Screw Length Availability

Shaft Diameter	Maximum Length
4 mm	100 mm
5 mm	222 mm
6 mm	265 mm
8 mm	360 mm
10 mm	355 mm
12 mm	395 mm
13 mm	700 mm
14 mm	445 mm

Screw Precision and Axial Play

Screw Diameter	Accuracy	Axial Backlash
4 to 14 mm	C7	20 microns

C7 = less than .002"/foot, C10 = less than .009"/foot.

Miniature Rolled Ball Screws — Metric Series

4mm to 14mm Diameter, Lead Accuracy: ± 52µm/300mm

Type A

Type B

Non-Preloaded, Rolled Ball Screw Assemblies

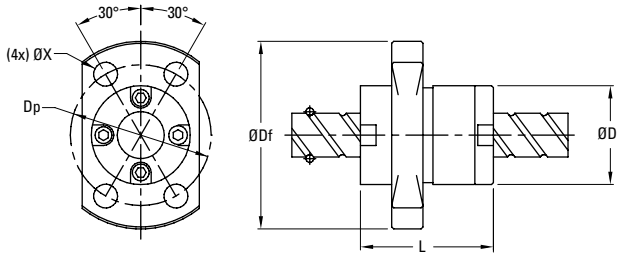
- Cost-effective solution in a small envelope, ideal for use in small spaces
- Clearance held to max .02mm
- Two nut styles (Type A & B) provide optimum performance in low and high lead assemblies

Nominal Diameter (size)	Lead	Nut Type	Ball Screw and Nut Assembly P/N[1]	Suggested Bearing Size	Performance Data						
					Dynamic Load Capacity		Static Load Capacity		Max. Axial Backlash	Minor Diameter	Max. Length
(mm)	(mm)			(mm)	(kN)	(lbf)	(kN)	(lbf)	(mm)	(mm)	(mm)
4	1	B	PRM0401	N/A	0.6	126	0.8	178	0.02	3.3	100
5	4	B	PRM0504	N/A	0.5	106	0.7	162	0.02	4.3	220
6	1	B	PRM0601	4	0.7	153	1.2	270	0.02	5.3	265
6	6	A	PRM0606	4	0.9	196	1.5	326	0.02	5.2	265
8	1	B	PRM0801	6	0.8	175	1.7	371	0.02	7.3	360
8	2	B	PRM0802	6	2.4	540	4.1	922	0.02	6.6	360
8	5	B	PRM0805	6	1.9	416	3.0	674	0.02	6.6	360
8	8	A	PRM0808	6	2.2	495	3.8	854	0.02	6.7	360
8	12	A	PRM0812	6	2.2	495	4.0	899	0.02	6.7	360
10	2	B	PRM1002	6	2.7	607	5.3	1,191	0.02	8.6	355
10	10	A	PRM1010	6	3.3	742	5.9	1,326	0.02	8.4	405
10	15	A	PRM1015	6	3.3	742	6.4	1,439	0.02	8.4	405
10	20	A	PRM1020	6	2.1	472	4.0	899	0.02	8.7	405
12	2	B	PRM1202	8	3.0	674	6.4	1,439	0.02	10.6	395
13	12	A	PRM1312	8	5.0	1,124	9.9	2,226	0.02	11.0	700
13	20	A	PRM1320	8	5.0	1,124	10.7	2,405	0.02	11.0	700
14	2	B	PRM1402	8	3.2	719	7.5	1,686	0.02	12.6	445
14	4	B	PRM1404	8	5.7	1,281	11.6	2,608	0.02	11.8	445

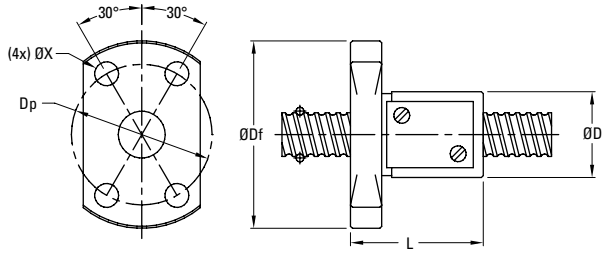
(1) All Miniature Rolled product is sold in matched sets as ball screw and nut assemblies. Please contact factory for sizes not listed.

Miniature Rolled Ball Screws — Metric Series

Type A — End Cap Design



Type B — Return Plate Design



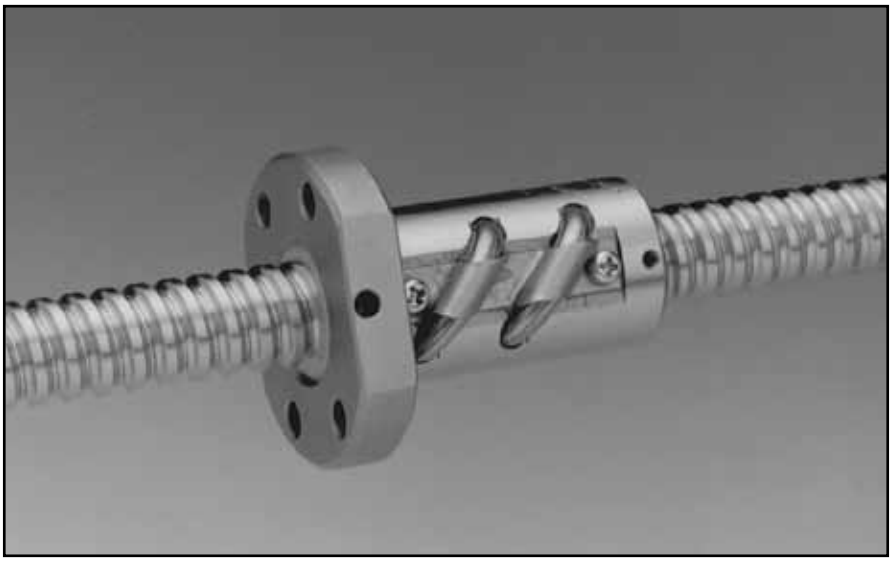
Nominal Diameter (size)	Lead	Nut Type	Nut Specifications								
			Outside Diameter D	Flange Outside Diameter Df	Overall Length L	Body Length L1	Flange Width F	Flange Flat Width V	Bolt Circle Diameter Dp	Mounting Hole Diameter X	Ball Diameter
(mm)	(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
4	1	B	11.0	24.0	17.0	13.0	4.0	15.0	18.0	3.4	0.80
5	4	B	12.0	24.0	22.0	18.0	4.0	16.0	18.0	3.4	0.80
6	1	B	13.0	26.0	17.0	13.0	4.0	16.0	20.0	3.4	0.80
6	6	A	14.0	27.0	17.0	8.0	4.0	16.0	21.0	3.4	1.00
8	1	B	16.0	29.0	17.0	13.0	4.0	18.0	23.0	3.4	0.80
8	2	B	20.0	37.0	24.0	19.0	5.0	22.0	29.0	4.5	1.59
8	5	B	18.0	31.0	28.0	24.0	4.0	20.0	25.0	3.4	1.59
8	8	A	18.0	31.0	20.0	10.0	4.0	20.0	25.0	3.4	1.59
8	12	A	18.0	31.0	27.0	17.0	4.0	20.0	25.0	3.4	1.59
10	2	B	23.0	40.0	24.0	19.0	5.0	25.0	32.0	4.5	1.59
10	10	A	23.0	40.0	24.0	13.0	5.0	25.0	32.0	4.5	2.00
10	15	A	23.0	40.0	33.0	22.0	5.0	25.0	32.0	4.5	2.00
10	20	A	20.0	37.0	23.0	13.0	5.0	22.0	29.0	4.5	1.59
12	2	B	25.0	42.0	24.0	19.0	5.0	27.0	34.0	4.5	1.59
13	12	A	28.0	45.0	30.0	17.0	5.0	30.0	37.0	4.5	2.38
13	20	A	28.0	45.0	43.0	29.0	5.0	30.0	37.0	4.5	2.38
14	2	B	26.0	45.0	25.0	19.0	6.0	28.0	36.0	5.5	1.59
14	4	B	30.0	49.0	33.0	27.0	6.0	32.0	40.0	5.5	2.38

Precision Ground Ball

Screw Assemblies

Overview

- Finest Ball Screw Assemblies Available
- Lead Accuracy of .0005”/ft. or better
- Zero Backlash Preloaded Ball Nuts
- Extremely Smooth Operation
- High Axial Stiffness
- Integral Wipers



Ground Ball Screw Assemblies are your answer to
the most rigorous positioning requirements.
With lead accuracies below 0.0005”/ft and repeatability
in the microns, our ground assemblies offer
a no compromise solution for your application. These units
come in a wide variety of diameters and leads (up to 50mm).

Precision Ground Ball

Screw Availability

Availability Table — Metric Leads

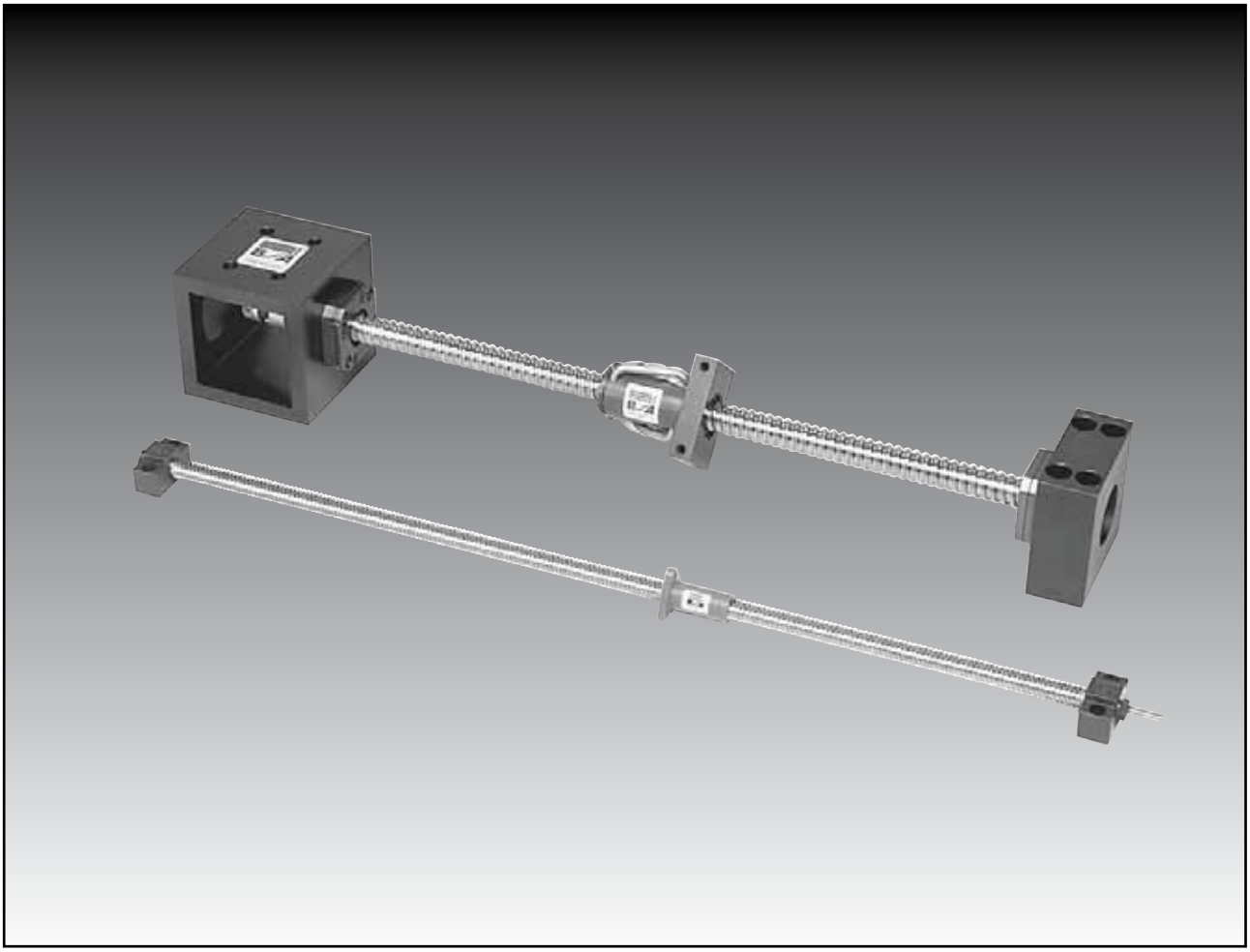
Screw Shaft Diameter (mm)	Lead (mm)															
	1	1.5	2	2.5	4	5	6	8	10	12	16	20	25	32	40	50
4	●															
6	●															
8	●	●	●													
10			●	●	●											
12			●	●		●			●							
14						●		●								
15									●			●				
16			●	●		●					●			●		
20					●	●			●			●			●	
25					●	●	●		●			●	●			●
28						●	●									
32						●	●	●	●				●	●		
36									●							
40						●		●	●	●						
45									●							
50									●							

Availability Table — Inch Leads

Shaft O.D. lead	.472″ (12mm)	.630″ (16mm)	.784″ (20mm)	.787″ (20mm)	.984″ (25mm)	1.260″ (25mm)	1.496″ (38mm)	1.732″ (44mm)	1.969″ (50mm)
.200	●	●		●	●	●	●	●	●
.250					●	●	●	●	●
.500		●	●	●	●	●	●	●	●
1.00					●	●	●		

For specific information on a ground ball screw product please call 1-800-882-8857 for product assistance.

Complete Screw Assemblies



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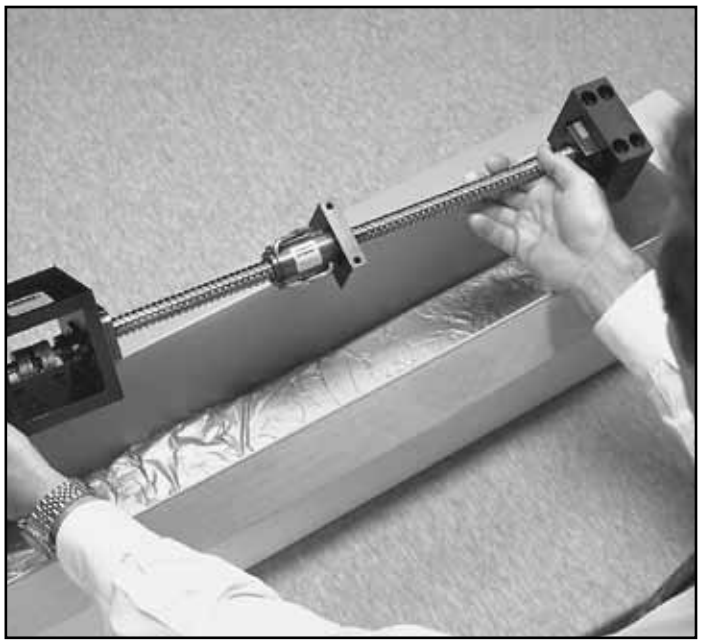
How to Pick Your Assembly



Our Drive Assembly units allow for a drop-in solution with Ball Screws and Actuators' quality components. Available in most screw sizes, both ACME and Ball threads, our Drive Assemblies free designers to concentrate on larger design issues. Our standard Drive Assemblies can be assembled and shipped quickly, providing the right solution when you need it.

Step 1. Select your screw-nut combination depending on load, cost, speed, stroke, backlash, accuracy and environmental constraints. Use critical speed and column loading charts as general guides (pages 84 to 86). Note allowable bearing sizes for your screw-nut selection before returning to this section.

Step 2. Determine end configuration due to load, length and rotational velocity. Refer to critical speed and column loading charts as required (pages 84 to 86). We offer fixed-fixed, fixed-simple and fixed free bearing arrangements.

Step 3. Noting allowable bearing size, turn to correct NEMA motor size page for assembly dimensions.

Step 4. Add Nut Part Number with Stroke to Drive Assembly Part Number

(EXAMPLE)

M23F6-SN3710-10

NEMA 23 Motor Mount
Fixed – Fixed, 6mm bearing

SN3700 Nut

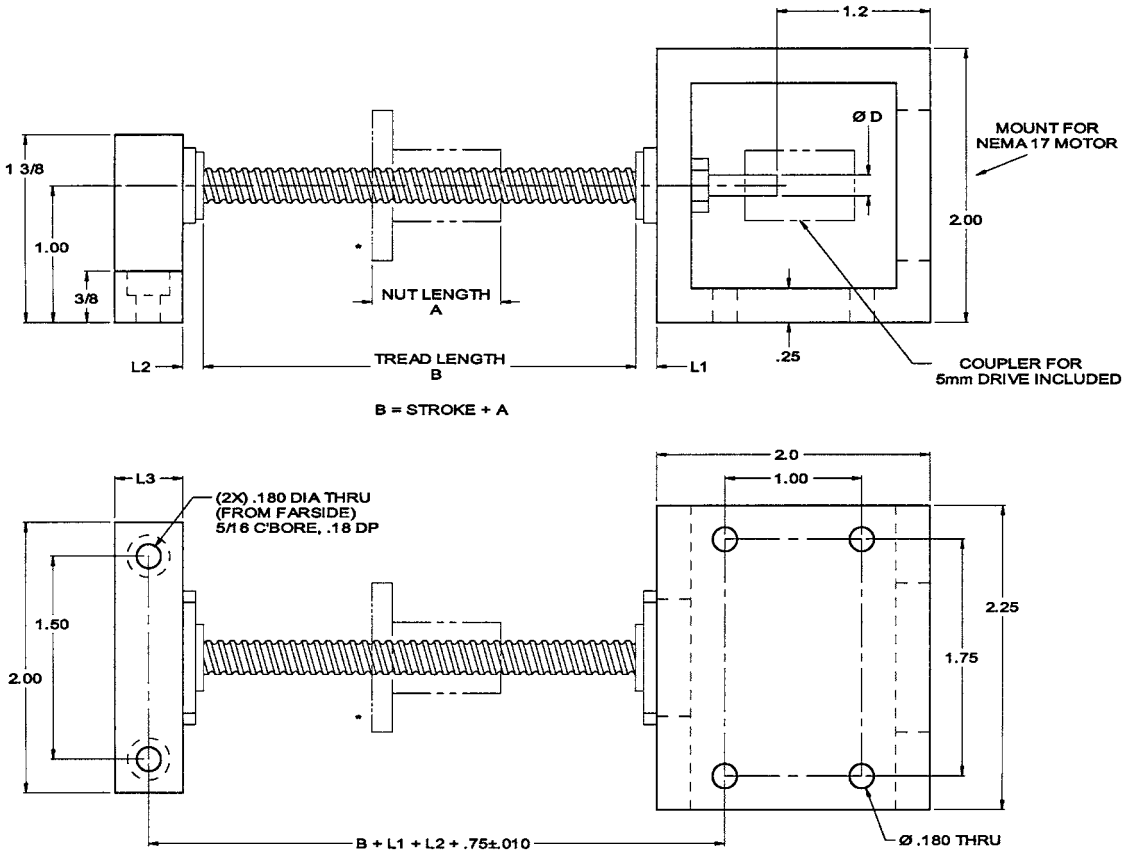
10" Stroke

Step 5. Give us a call at 1-800-882-8857.

Screw Assemblies w/

NEMA 17 Motor Mounts

For 1/4" to 3/8" Ball & Lead Screws and 6mm to 10mm Ball and Lead Screws



Part Number (See Example)	Axial* Load	Bearing Support	D	L1	L2	L3
M17F4	50 lbs	4mm	3mm	.155	.155	.50
M17S4			3mm	.155	–	.50
M17E4			3mm	.155	–	–

* Maximum assembly thrust load, Do Not Exceed. Do not exceed dynamic load rating of the lead nut.

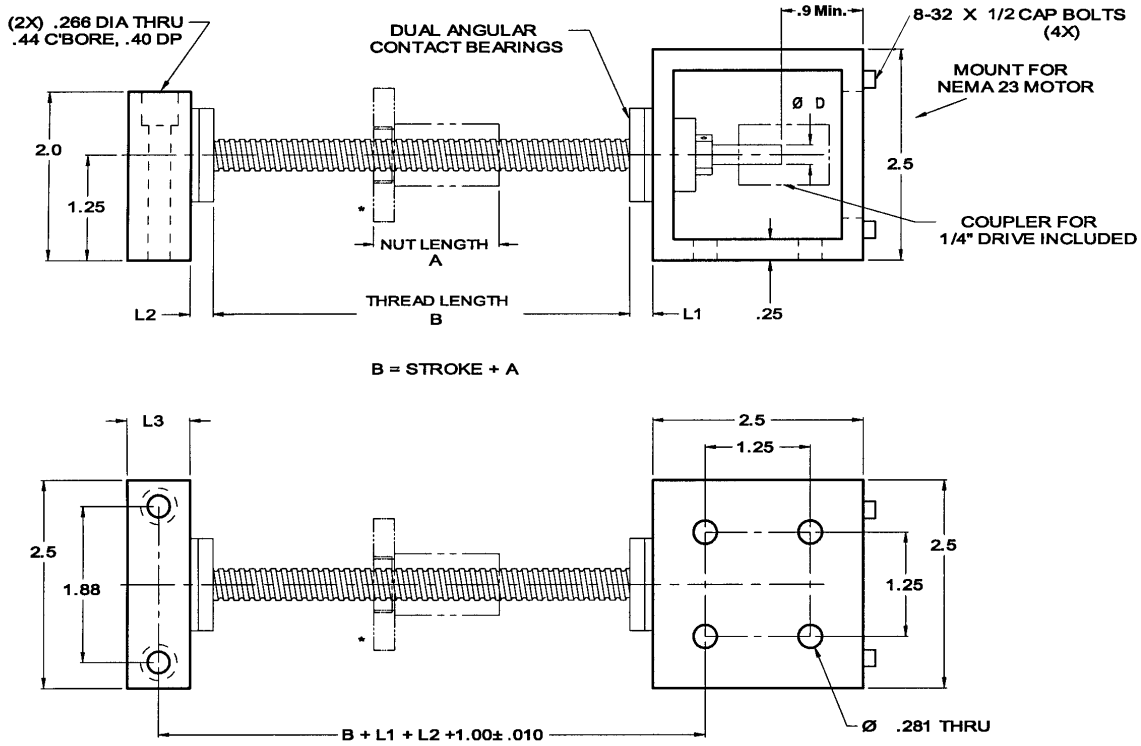
Example: M17F4
M-17-F-4

Motor Mount	NEMA Motor Size	Bearing Config.	Bearing Size
	17	**F = Fixed**	**4mm**
	23	S = Simple	6mm
	34	E = Free	8mm
	42		12mm
			20mm

Screw Assemblies w/

NEMA 23 Motor Mounts

For 3/8" to 5/8" Ball & Lead Screws and 6mm to 14mm Ball and Lead Screws



Part Number (See Example)	Axial* Load	Bearing Support	D	L1	L2	L3
M23F4	50 lbs	4mm	3mm	.155	.155	.75
M23S4			3mm	.155	–	.75
M23E4			3mm	.155	–	–
M23F6	230 lbs	6mm	.187	.275	.275	.75
M23S6			.187	.275	–	.75
M23E6			.187	.275	–	–
M23F8	326 lbs	8mm	.250	.354	.354	.75
M23S8			250	.354	–	.75
M23E8			250	.354	–	–

* Maximum assembly thrust load, Do Not Exceed. Do not exceed dynamic load rating of the lead nut.

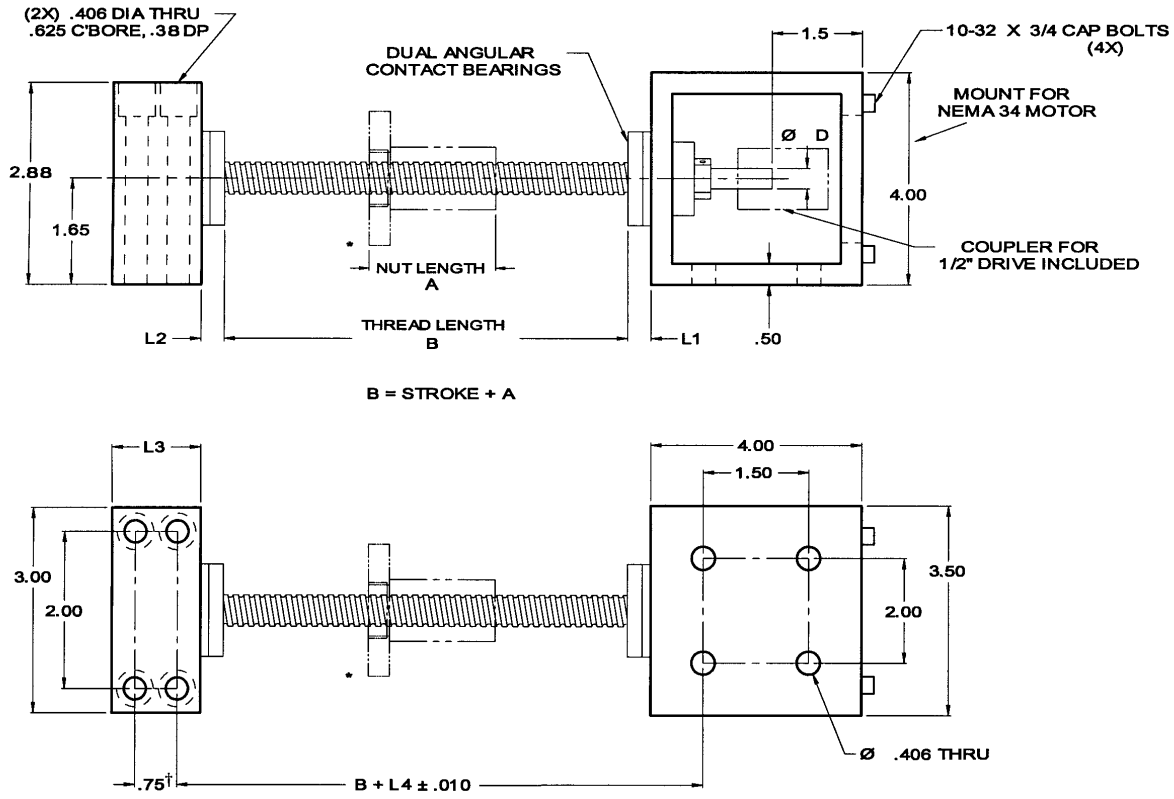
Example: M23F6
M-23-F-6

Motor Mount	NEMA Motor Size	Bearing Config.	Bearing Size
	17	**F = Fixed**	4mm
	23	S = Simple	**6mm**
	34	E = Free	8mm
	42		12mm
			20mm

Screw Assemblies w/

NEMA 34 Motor Mounts

For 3/4" to 1" Ball & Lead Screws
and 16mm to 24mm Ball and Lead Screws



Part Number (See Example)	Axial* Load	Bearing Support	D	L1	L2	L3	L4
M34F12	680 lbs	12mm	.375	.395	.395	1.50	2.42
M34S12			.375	.395	–	1.00	2.15
M34E12			.375	.395	–	–	–

* Maximum assembly thrust load, Do Not Exceed. Do not exceed dynamic load rating of the lead nut.
† M34F12 only. M34S12 has two mounting holes centered on L3.

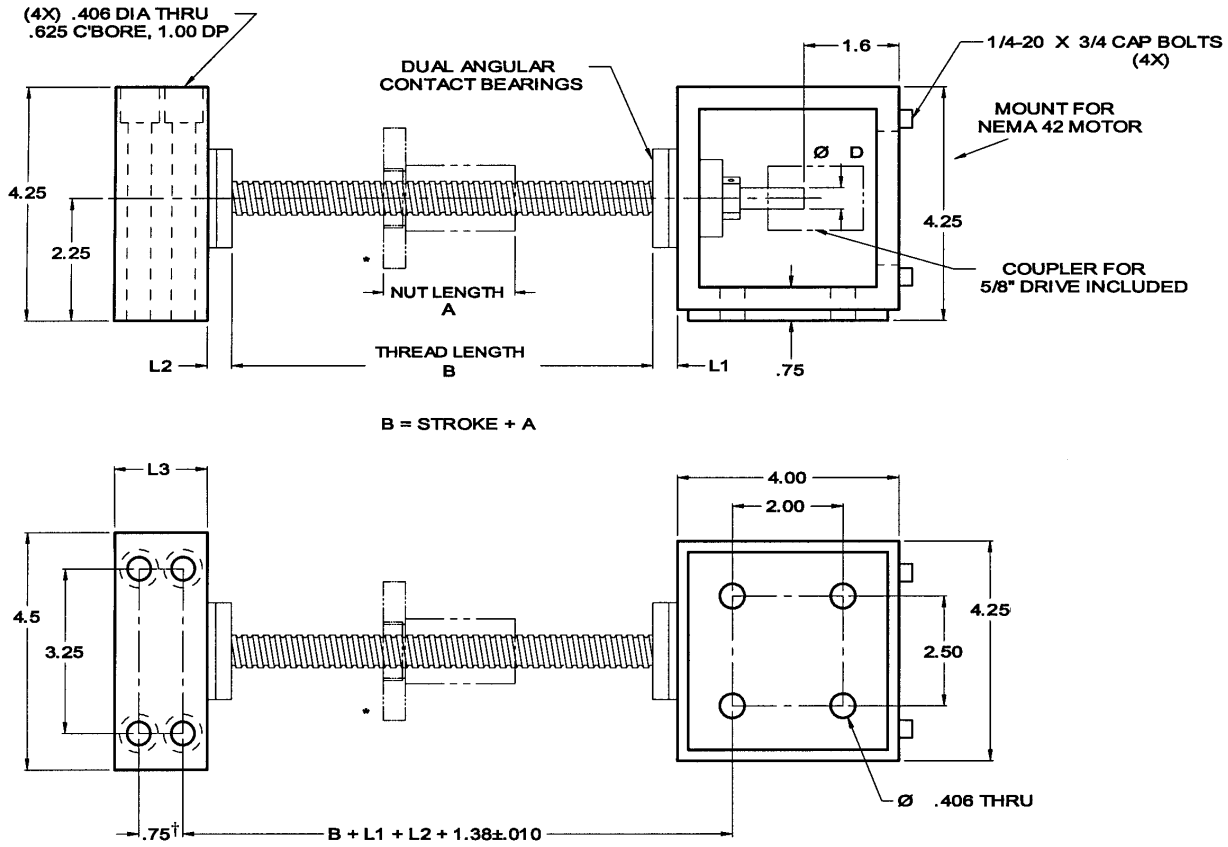
Example: M34F12
M-34-F-12

Motor Mount	NEMA Motor Size	Bearing Config.	Bearing Size
	17	**F = Fixed**	4mm
	23	S = Simple	6mm
	34	E = Free	8mm
	42		**12mm**
			20mm

Screw Assemblies w/

NEMA 42 Motor Mounts

For 1" to 1-1/2" Ball & Leadand Screws and 25mm to 38mm Ball and Lead Screws



Part Number (See Example)	Axial* Load	Bearing Support	D	L1	L2	L3
M42F20	1,850 lbs	20mm	.500	.869	.869	1.50
M42S20			.500	.869	–	.75
M42E20			.500	.869	–	–

* Maximum assembly thrust load, Do Not Exceed. Do Not Exceed.Do not exceed dynamic load rating of the lead nut.
† M42F20 only. M42S20 has two mounting holes centered on L3.

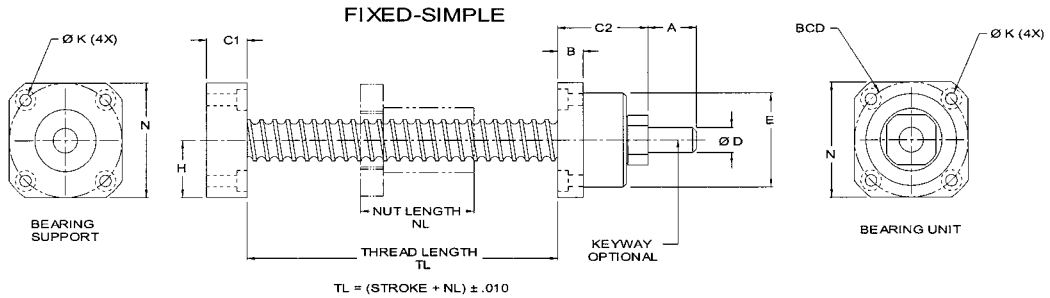
Example: M42F20
M-42-F-20

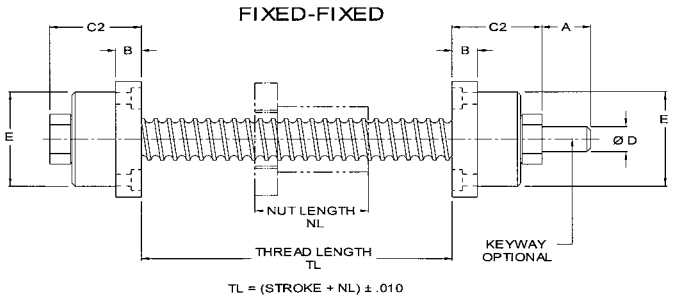
Motor Mount	NEMA Motor Size	Bearing Config.	Bearing Size
	17	**F = Fixed**	4mm
	23	S = Simple	6mm
	34	E = Free	8mm
	42		12mm
			20mm

Screw Assemblies w/

Bearing Mounts

Flange Mount





Assembly No.	Axial Load*	A	B	C1	C2	D ± .000 .001	E	BCD	K	H	N
B6EF	230 lbs	.63	.28	–	1.04	.187	.866	1.10	0.114 thru .22 cbore .14 deep	.55	1.10
B6ES				.37							
B6EE				–							
B8EF	326 lbs	.63	.35	–	1.22	.250	1.102	1.38	0.134 thru .26 cbore .16 deep	.69	1.38
B8ES				.50							
B8EE				–							
B12EF	680 lbs	.75	.40	–	1.40	.375	1.417	1.73	0.177 thru .32 cbore .16 deep	.67	1.73
B12ES				.62							
B12EE				–							
B15EF	760 lbs	.75	.59	–	1.82	.500	1.575	1.97	0.216 thru .37 cbore .24 deep	1.02	2.05
B15ES				.62							
B15EE				–							
B20EF	1,852 lbs	1.00	.87	–	2.61	.625	2.244	2.76	0.260 thru .43 cbore .39 deep	1.34	2.67
B20ES				1.00							
B20EE				–							

* Maximum assembly thrust load, Do Not Exceed. Do not exceed the dynamic load rating of the lead nut

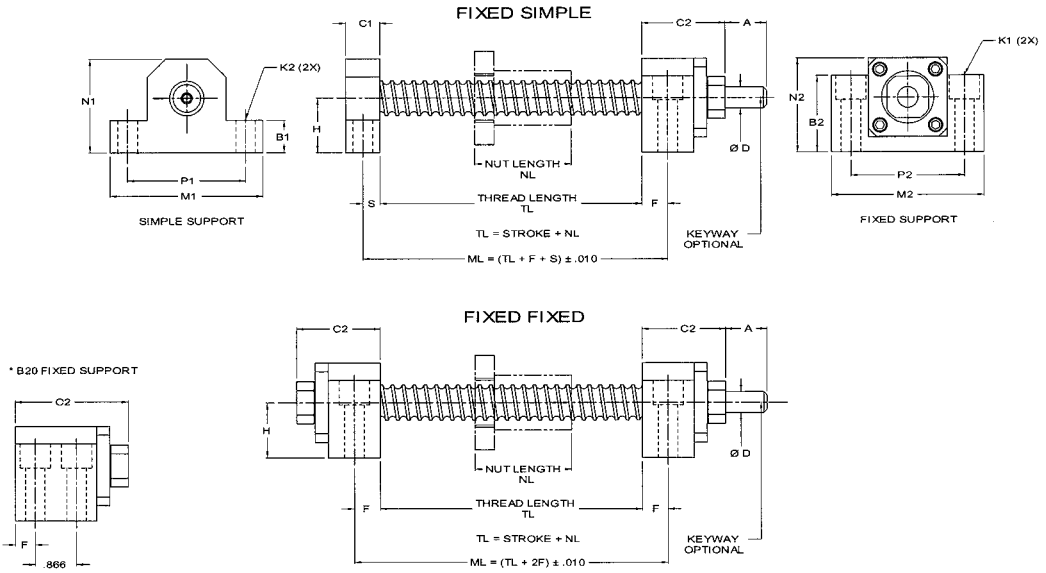
Example: B12FF
B-12-E-F

Bearing Drive	Bearing Size	Mounting	Bearing Config.
	6	**E = End/Flange**	**F = Fixed**
	8	B = Base	S = Simple
	12		E = Free
	15		
	20		

Screw Assemblies w/

Bearing Mounts

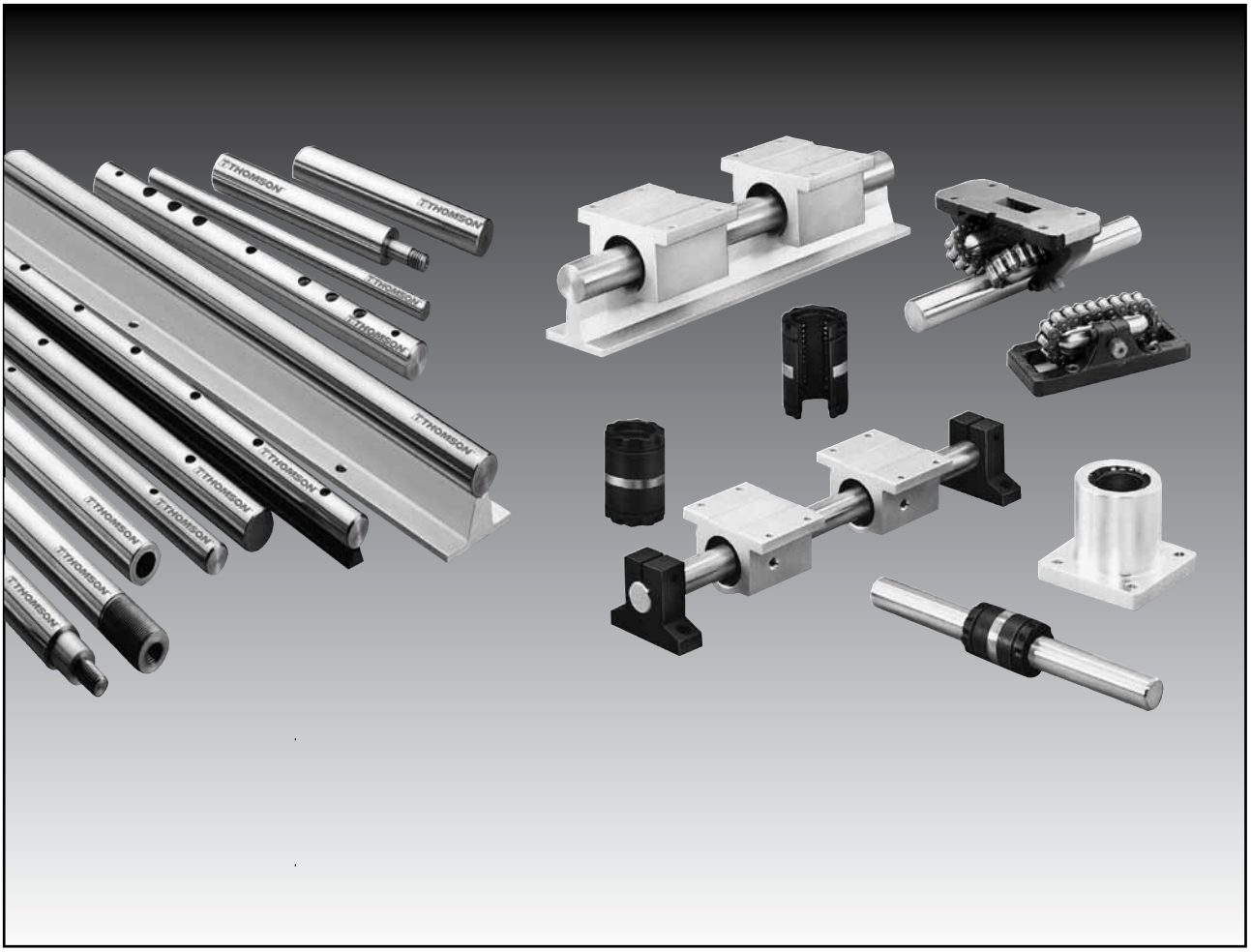
Base Mount †



Assembly No.	Axial Load*	F	S	A	C1	C2	D ± .000 .001	H	K1	K2	M1	M2	N1	N2	P1	P2	B1	B2
B6BF	230 lbs	.40	–	.63	–	1.00	.187	.512	0.216 thru .37 cbore .43 deep	–	–	1.66	–	.98	–	1.18	–	.78
B6BS			.19		.37					0.22 thru	1.66		.95		1.26		.39	
B6BE			–		–					–	–		–		–		–	
B8BF	326 lbs	.45	–	.63	–	1.18	.250	.669	0.260 thru .43 cbore .47 deep	–	–	2.05	–	1.26	–	1.50	–	1.02
B8BS			.25		.50					0.26 thru	2.01		1.18		1.50		.51	
B8BE			–		–					–	–		–		–		–	
B12BF	680 lbs	.47	–	.75	–	1.40	.375	.984	0.354 thru .55 cbore .43 deep	–	–	2.76	–	1.70	–	2.05	–	1.38
B12BS			.31		.62					0.35 thru	2.76		1.69		2.13		.60	
B12BE			–		–					–	–		–		–		–	
B15BF	760 lbs	.49	–	.75	–	1.67	.500	1.181	0.433 thru .67 cbore .59 deep	–	–	3.15	–	1.97	–	2.36	–	1.58
B15BS			.31		.62					0.35 thru	3.15		2.00		2.44		.71	
B15BE			–		–					–	–		–		–		–	
B20BF	1,852 lbs	.39	–	1.00	–	2.44	.625	1.181	0.433 thru .67 cbore .59 deep	–	–	3.74	–	2.28	–	2.95	–	1.77
B20BS			.50		1.00					0.43 thru	3.74		2.44		3.07		.79	
B20BE			–		–					–	–		–		–		–	

† Note flange radius. Some flanges may interfere with the mounting surface.
* Maximum assembly load. Do not exceed the dynamic load rating of the lead nut.

Rails & Bearings



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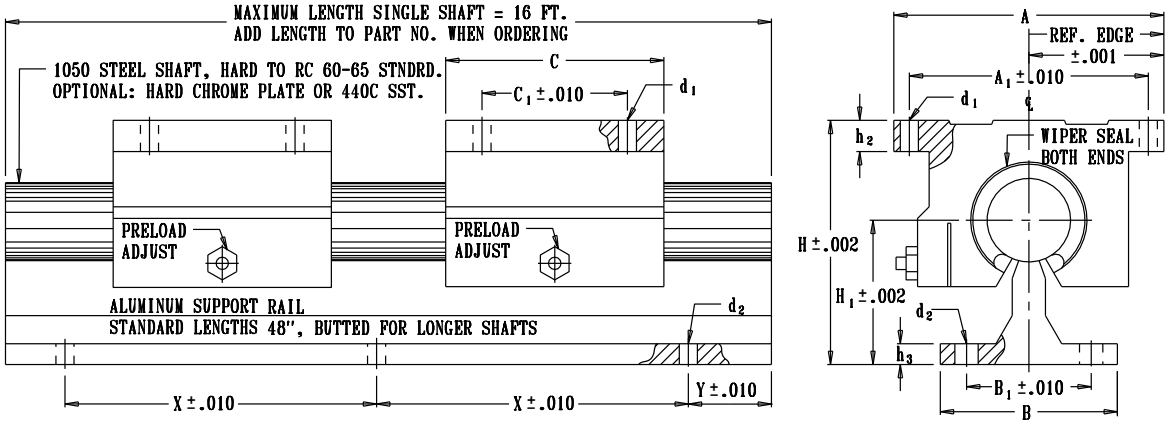
Round Rail — Full Support

Linear Bearing Assembly with 2 LSOH Series Bearing Units

- Will accept 1° misalignment
- Quiet running high load capacity
- Adjustable preload
- Assemblies come standard with seals at each end of bearing unit.
- Butted supports may have a gap of up to .2" between sections.



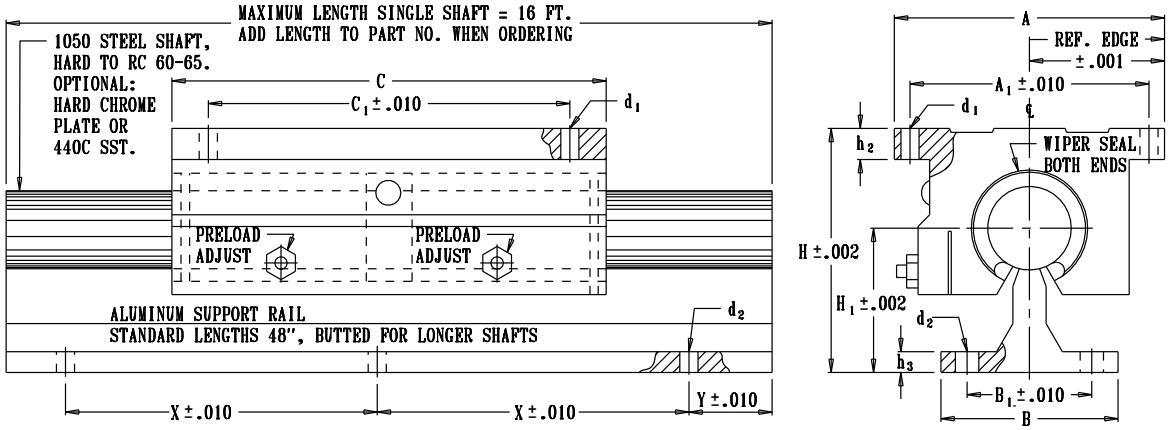
Ref. Shaft Dia.	Assembly Part No. Add Length in Inches	Dimensions in Inches														Dynamic Load Rating lbs. 1
		Height	Center	Width	Length	Bearing Mounts				Support Rail Mounting						
		H	H1	A	C	A1	C1	D1	H2	B	B1	D2	H3	X	Y	
½"	ADO50-	1.812	1.125	2.000	1.500	1.688	1.000	.156	.250	1.50	1.000	.169	.188	4.00	2.00	230
5/8"	ADO62-	2.000	1.125	2.500	1.750	2.125	1.130	.188	.281	1.63	1.125	.193	.250	4.00	2.00	320
¾"	ADO75-	2.437	1.500	2.750	1.875	2.375	1.250	.188	.315	1.75	1.250	.221	.250	6.00	3.00	470
1"	ADO100-	2.937	1.750	3.250	2.625	2.875	1.750	.218	.375	2.13	1.500	.281	.250	6.00	3.00	780
1-1/4"	ADO125-	3.625	2.125	4.000	3.375	3.500	2.000	.218	.437	2.50	1.875	.343	.313	6.00	3.00	1170
1-1/2"	ADO150-	4.250	2.500	4.750	3.750	4.125	2.500	.281	.500	3.00	2.250	.343	.375	8.00	4.00	1560

1. The dynamic load rating is based on a travel life expectancy of 2 million inches using a ground shaft with a minimum of RC 58 hardness. Load rating listed per bearing. Loads away from shaft support are derated 50%. Loads on single bearing unit are half of rate shown.

Round Rail — Full Support

Tandem Linear Bearing Assembly with LTO Series Tandem Bearing Units

- Will accept 1° misalignment
- Quiet running high load capacity
- Adjustable preload
- Assemblies come standard with seals at each end of bearing unit.
- Butted supports may have a gap of up to .2" between sections.

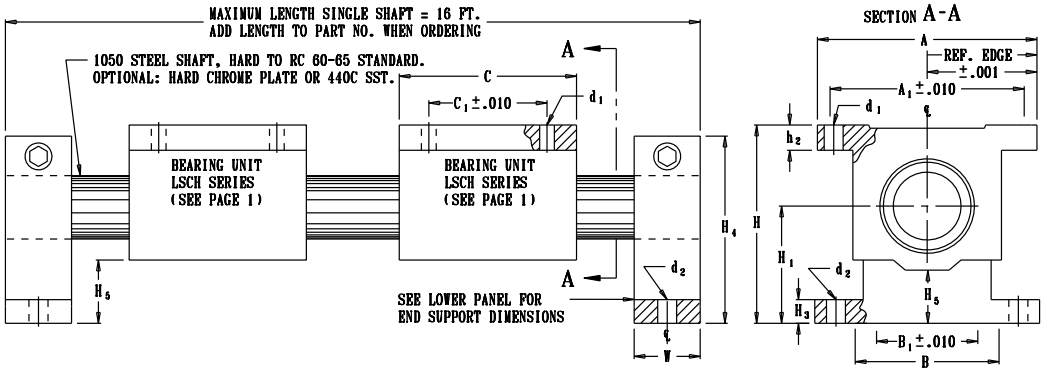


Ref. Shaft Dia.	Assembly Part No. Add Length in Inches	Dimensions in Inches														Dynamic Load Rating lbs. 1
		Height	Center	Width	Length	Bearing Mounts				Support Rail Mounting						
		H	H1	A	C	A1	C1	D1	H2	B	B1	D2	H3	X	Y	
1/2"	ATO50-	1.812	1.125	2.000	3.50	1.688	2.50	.156	.250	1.50	1.000	.169	.188	4.00	2.00	460
5/8"	ATO62-	2.000	1.125	2.500	4.00	2.125	3.00	.188	.281	1.63	1.125	.193	.250	4.00	2.00	640
3/4"	ATO75-	2.437	1.500	2.750	4.50	2.375	3.50	.188	.315	1.75	1.250	.221	.250	6.00	3.00	940
1"	ATO100-	2.937	1.750	3.250	6.00	2.875	4.50	.218	.375	2.13	1.500	.281	.250	6.00	3.00	1560
1-1/4"	ATO125-	3.625	2.125	4.000	7.50	3.500	5.50	.218	.437	2.50	1.875	.343	.313	6.00	3.00	2340
1-1/2"	ATO150-	4.250	2.500	4.750	9.00	4.125	6.50	.281	.500	3.00	2.250	.343	.375	8.00	4.00	3120

1. The dynamic load rating is based on a travel life expectancy of 2 million inches using a ground shaft with a minimum of RC 58 hardness. Loads away from shaft support are derated 50%. Loads on single bearing unit are half of rate shown.

Round Rail — End Support

Linear Bearing Assembly with 2 LSCH Series Bearing Units

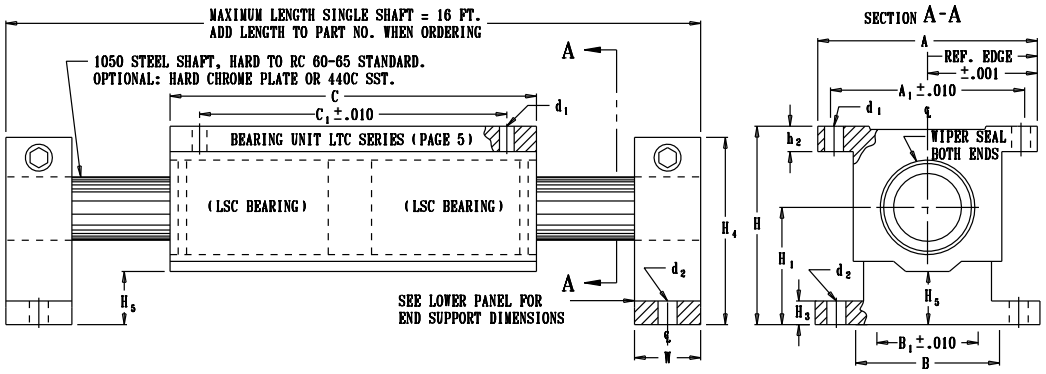


Ref. Shaft Dia.	Assembly Part No. Add Length in Inches	Dimensions in Inches									Ref. Shaft Supports Part No.	Dynamic Load Rating lbs.1
		Height	Center	Width	Length	Clearance	Bearing Unit Mount					
		H+-.001	H1	A	C	H5	A1+-.001	C1+-.001	d1	h2		
1/4"	AED025-	1.125	.6875	1.625	1.188	.312	1.312	0.750	.156	.188	ES025	60
3/8"	AED037-	1.250	.7500	1.750	1.313	.312	1.437	0.875	.156	.188	ES037	100
1/2"	AED050-	1.687	1.000	2.000	1.688	.437	1.688	1.000	.156	.250	ES050	255
5/8"	AED062-	1.875	1.000	2.500	1.938	.250	2.125	1.125	.188	.281	ES062	450
3/4"	AED075-	2.187	1.250	2.750	2.063	.437	2.375	1.250	.188	.313	ES075	600
1"	AED100-	2.687	1.500	3.250	2.813	.500	2.875	1.750	.219	.375	ES100	1050
1-1/4"	AED125-	3.250	1.750	4.000	3.625	.437	3.500	2.000	.219	.438	ES125	1500
1-1/2"	AED150-	3.750	2.000	4.750	4.000	.500	4.125	2.500	.281	.500	ES150	2000
2"	AED200-	4.625	2.500	6.000	5.000	.562	5.250	3.250	.406	.625	ES200	3000

1. The dynamic load rating is based on a travel life expectancy of 2 million inches using a ground shaft with a minimum of RC 58 hardness. Load rating listed per bearing. Loads on single bearing unit are half of rate shown.

Round Rail — End Support

Linear Bearing Assembly with LTC Series Tandem Bearing Unit



Ref. Shaft Dia.	Assembly Part No. Add Length in Inches	Dimensions in Inches									Ref. Shaft Supports Part No.	Dynamic Load Rating lbs.1
		Height	Center	Width	Length	Clearance	Bearing Unit Mount					
		H	H1	A	C	H5	A1	C1	d1	h2		
¼"	AET025-	1.125	.6875	1.625	2.50	.312	1.312	2.000	.156	.188	ES025	120
3/8"	AET037-	1.250	0.750	1.750	2.75	.312	1.437	2.250	.156	.188	ES037	200
½"	AET050-	1.687	1.000	2.000	3.50	.437	1.688	2.500	.156	.250	ES050	510
5/8"	AET062-	1.875	1.000	2.500	4.00	.250	2.125	3.000	.188	.281	ES062	900
¾"	AET075-	2.187	1.250	2.750	4.50	.437	2.375	3.500	.188	.313	ES075	1200
1"	AET100-	2.687	1.500	3.250	6.00	.500	2.875	4.500	.219	.375	ES100	2100
1-1/4"	AET125-	3.250	1.750	4.000	7.50	.437	3.500	5.500	.219	.438	ES125	3000
1-1/2"	AET150-	3.750	2.000	4.750	9.00	.500	4.125	6.500	.281	.500	ES150	4000

1. The dynamic load rating is based on a travel life expectancy of 2 million inches using a ground shaft with a minimum of RC 58 hardness.

Accessories

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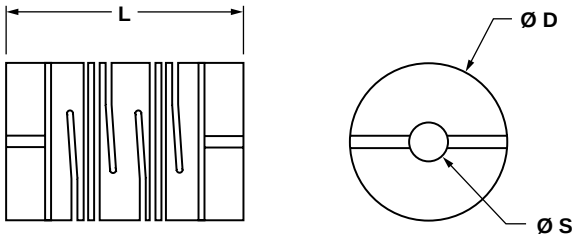
Couplings Flex Type

Flexible-Zero Backlash
Stainless Steel & Aluminum

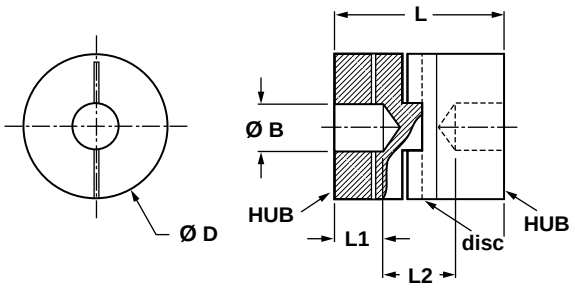
- Ideal for Lead Screw Applications
- Misalignment Capability
- Withstands Hostile Environments and Temperatures
- Zero Backlash
- Torsionally Rigid
- One Piece Construction
- Allows for Near Butting of Shafts
- Constant Velocity
- No Lubrication Required
- Aircraft Grade Stainless & Aluminum



Part Numbers	S Bore ± .002	L Length ± 1/64	D Diameter ± 1/64	Maximum Torque Inch lbs.
AC18	.188	1-1/4	3/4	3.5
SC18		.90		4.9
AC25	.250	1-1/2	1.0	7.8
SC25		1-1/4		13
AC31	.313	1-1/2	1.0	7.3
SC31		1-1/4		12
AC37	.375	1-3/4	1-1/4	14
SC37		2-3/8		27
AC50	.500	2-1/4	1-1/2	29
SC50		2-5/8		50
AC62	.625	2-1/2	2.0	54
SC62*		3.0		96
AC75	.750	2-1/2	2.0	48
SC75*		3.0		84

• AC Part No's. are made of 7075-T6 Aluminum, Anodized AC Parts will accept 3° angular and .010" parallel offset misalignment.
• SC Part No's. are made of 17-4 Cres Stainless Steel. SC parts will accept 5° angular and .010" parallel offset misalignment.

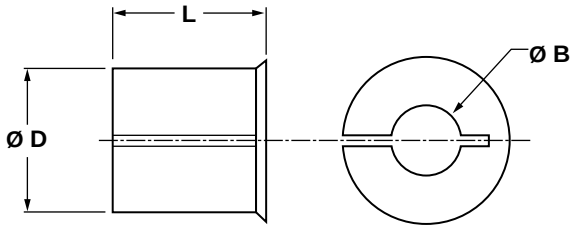
Three Piece Type Couplers



Part Number	Bore	O.D.	L	L1	L2	Use With Disk
HUB1875	0.188	0.75	1.02	0.37	0.28	DISK75
HUB2575	0.250	0.75	1.02	0.37	0.28	
HUB0575	0.197 (5mm)	0.75	1.02	0.37	0.28	
HUB25100	0.250	1.00	1.28	0.46	0.36	DISK100
HUB37100	0.375	1.00	1.28	0.46	0.36	
HUB37131	0.375	1.31	1.89	0.59	0.71	DISK131
HUB50131	0.500	1.31	1.89	0.59	0.71	
HUB37163	0.375	1.63	2.00	0.70	0.60	DISK163
HUB50163	0.500	1.63	2.00	0.70	0.60	
HUB62163	0.625	1.63	2.00	0.70	0.60	

Ordering Instructions: Specify any two “Hubs” with the same O.D. and one matching DISK.
For example: HUB25100, HUB37100, DISK100

Bore Adaptors



Part Number	Bore	O.D.	L
ADP0305	0.118 (3mm)	0.197 (5mm)	0.17
ADP1825	0.1875	0.250	0.26

Grease

Overview

We offer a full compliment of lubricants including our low vapor pressure greases for clean room and vacuum applications. The TriGel line is specifically formulated to offer a lubrication solution for a wide range of linear motion applications. Choose the appropriate gel for your requirements and get the utmost performance out of your BSA products.

Lubrication Selection Chart for Ball & Lead Screw Assemblies

BSA Gel Type	TriGel-300S	TriGel-450R	TriGel-600SM	TriGel-1200SC	TriGel-1800RC
Application	Acme Screws, Supernuts, Plastic Nuts	Ball Screws, Linear Bearings	Bronze Nuts	Acme Plastic Nuts, Clean Room, High Vacuum	Ball Screws, Linear Bearings, Bronze Nuts, Clean Room, Vacuum
Maximum Temperature	200ºC (392ºF)	125ºC (257ºF)	125ºC (257ºF)	250ºC (482ºF)	125ºC (257ºF)
Mechanism Materials	Plastic on Plastic or Metal	Metal on Metal	Metal on Metal Bronze on Steel	Plastics or Metals, any Combination	Metal on Metal
Mechanical Load	Light	Moderate	Moderate to Heavy	Light to Moderate	Moderate
Precision Positioning	Not recommended w/o OEM testing	Not recommended w/o OEM testing	Not recommended w/o OEM testing	Usually OK	Usually OK
Very Low Torque Variation Over Temperature	Yes	–	–	Yes	–
Very Low Starting Torque	Yes	Yes	–	Yes	Yes
Compatibility w/Reactive Chemicals	Not recommended w/o OEM testing	Not recommended w/o OEM testing	Not recommended w/o OEM testing	Usually OK	Not recommended w/o OEM testing
Compatibility w/Plastics and Elastomers	May cause silicone rubber seals to swell	May cause EPDM seals to swell	May cause EPDM seals to swell	Usually OK	May cause EPDM seals to swell
Clean Room Use	Not recommended	Not recommended	Not recommended	Usually OK	Usually OK
High Vacuum use	Not recommended	Not recommended	Not recommended	Usually OK	Usually OK
Vapor Pressuer (25ºC)	Varies with lot	Varies with lot	Varies with lot	8 x 10-9 torr	4 x 10-9 torr
Lubricant Price 10cc Syringe** 1 Pound Tube	 √ √	 √ √	4 oz tube	 √ NA	 √ NA

* Maximum temperature for continuous exposure. Higher surge temperatures may be permissible but should be validated in the actual end use by the OEM. Low temperature limits are -15°C or lower. Consult BSA for specifics.

Formulated for plastic on metal lead screw applications

PTFE coating is a dry film which creates a lubrication barrier between a metal substrate and a polymer bushing or lead nut. It can in some cases eliminate the need for an additional gel type lubricant which must be re-applied. It is well suited for use with our SuperNut line of plastic nuts and stainless steel lead screws. Lubrication maintenance intervals can be eliminated and the coating does not attract particulate like a gel lubricant. Gel lubricants can provide lower friction coefficients than dry film lubricants but must be maintained to prevent performance degradation. PTFE coating provides an attractive and clean* alternative to gels and oils.

Typical Properties

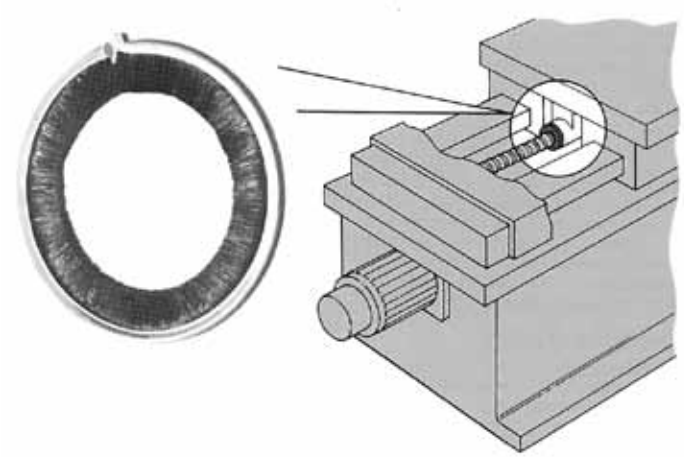
Type:	Bonded Solid Film Lubricant
Purpose:	Increased Lubricity, Decreased Friction & Wear
Appearance:	Black Coating
Thickness:	Approx. 13 – 25 micron
Active Lubricant:	Polytetrafluroethylene
Friction Coefficient:	0,06 to 0,12
Temperature Operating Range:	-250˚ to 290˚ C
Resistance to Acids:	Excellent
Resistance to Bases:	Very Good
Resistance to Solvents:	Excellent

*Some particulate will be generated as a result of wear between nut and screw. Screw may begin to show signs of "polishing" over time. This does not necessarily indicate failure.

Wiper Kits

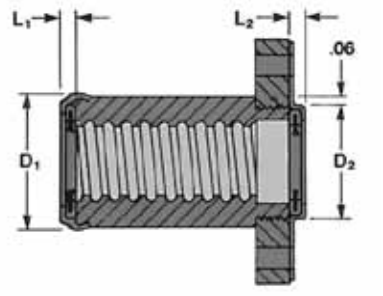
Overview

Brush type wiper kits maximize ball bearing screw performance by helping to spread lubricant over the length of the screw and preventing internal ball nut contamination from foreign materials. Wiper kits are optional on models R-0308 through R-1504, and standard on models R-1502 through R–3066. Optional and standard wiper kits are also available for comparable zero backlash/preload ball nut assemblies. For heavily contaminated environments, BSA recommends the use of metal shields, bellows type enclosures or extensions in conjunction with brush wipers for maximum protection.



Type A

For these ball bearing screw sizes, end caps attached to the ball nut and flange hold the wipers in position. The Type A wiper kit includes a flange end cap. If the application does not use a flange, discard the flange end cap and epoxy the wiper to the end of the ball nut.



Model†	D1 Max.	D2 Max.	L1 Max.	L2 Max.	Wiper Part Number
R-0308	.838	.880	.139	.148	8103-101-002
RC0308	.838	.880	.139	.148	8103-101-002
R-0505	1.122	1.138	.139	.148	8105-101-002
R-0502	1.122	1.138	.139	.148	8105-101-002
RS0502	1.122	1.138	.139	.148	8105-101-002
RC0605	1.177	1.060	.139	.148	8106-101-002
RK0605	1.177	1.060	.139	.148	8106-101-002
R-0705	1.382	1.230	.158	.148	8107-101-002
R-0702	1.382	1.230	.158	.148	8107-101-002
RC0705	1.382	1.230	.158	.148	8107-101-002
RS0702	1.382	1.230	.158	.148	8107-101-002
R-1001	1.763	1.610	.158	.148	8110-101-002
R-1004	1.763	1.610	.158	.148	8110-101-002
R-1002	1.763	1.610	.158	.148	8110-101-002
RC1004	1.763	1.610	.158	.148	8110-101-002
RK1004	1.763	1.610	.158	.148	8110-101-002
RL1004	1.763	1.610	.158	.148	8110-101-002
RS1001	1.763	1.610	.158	.148	8110-101-002
R-1105	1.763	1.610	.158	.148	8111-101-002
R-1504	2.163	2.050	.158	.148	8115-101-006

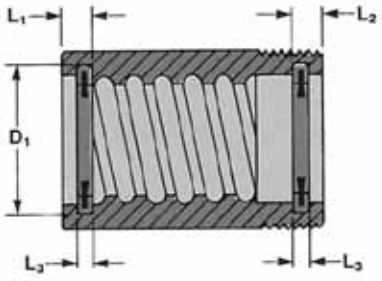
† Not for use with some ball nuts.

Wiper Kits

Bearing Mounts

Type B

For these models, easy-to-install snap-in wiper kits prevent internal ball nut contamination which decreases performance and dynamic life ratings.



Model	D1 Nom.	L1 Nom.	L2 Nom.	L3 Nom.	Wiper Part Number
R-1501*	2.096	.200	.190	.130	8115-101-004
RH1501*	2.096	.200	.190	.130	8115-101-004
R-1520*	2.096	.200	.190	.130	8115-101-004
RH1520*	2.096	.200	.190	.130	8115-101-004
R-1547*	2.096	.200	.190	.130	8115-101-004
R-1502*	2.096	.200	.190	.130	8115-101-004
RL1502*	2.096	.200	.190	.130	8115-101-004
R-2002*	2.600	.250	.190	.130	8120-101-002
RL2002*	2.600	.250	.190	.130	8120-101-002
R-2001*	2.600	.250	.190	.130	8120-101-002
R-2202*	2.793	.220	.190	.130	8122-101-002
R-2502*	3.126	.250	.190	.130	8125-101-002
R-2501*	3.126	.250	.190	.130	8125-101-002
R-3066	3.762	.250	.190	.130	8130-101-002

* wiper kit standard with ball nut

Glossary/ Technical Data

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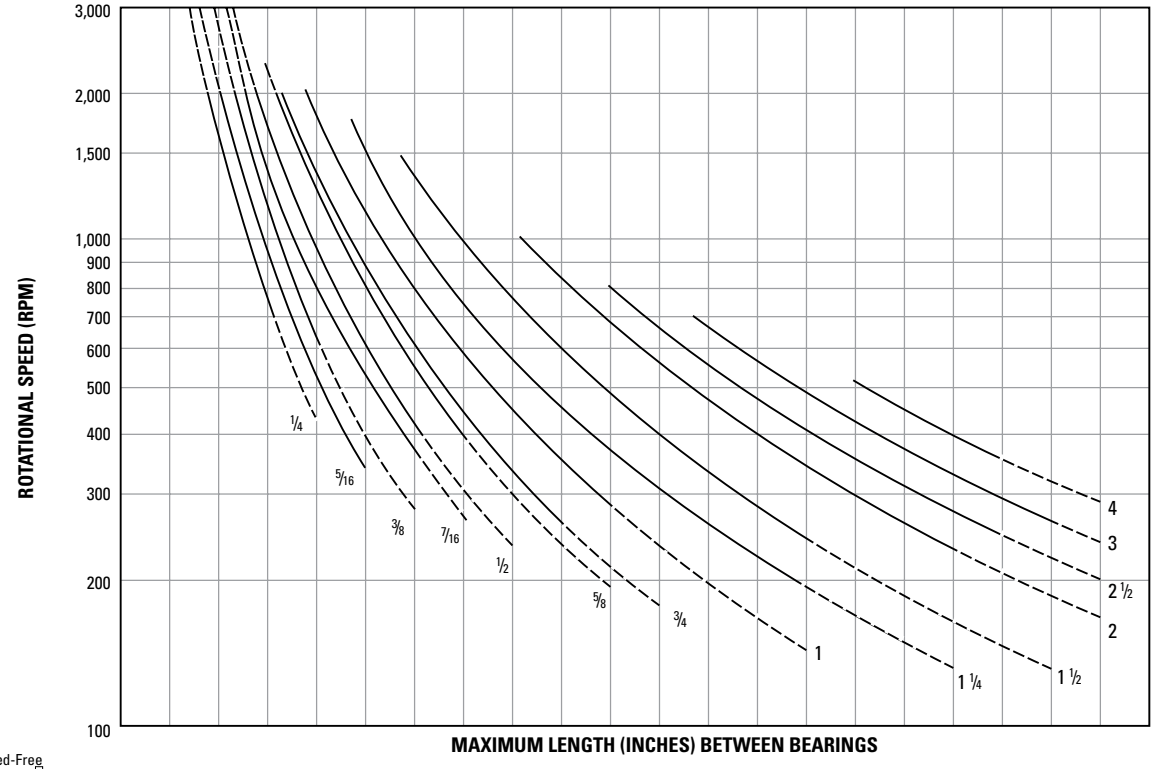
Engineering Guidelines for Ball and Lead Screws

Critical Speed Limits Chart for Lead Screws and Rolled Ball Screws

Every screw shaft has a rotational speed limit. That is the point at which the rotational speed sets up excessive vibration. This critical point is modified by the type of end bearing support used.

To use this chart, determine the required rpm and the maximum length between bearing supports. Next, select one of the four types of end support shown below. The critical speed limit can be found by locating the point at which rpm (horizontal lines) intersects with the unsupported screw length (vertical lines) as modified by the type of supports selected below. We recommend operating at no more than 80% of the critical speed limit to allow for misalignment and/or lack of screw straightness. If speed falls into dotted line, consult factory.

Warning: Curves for the screw diameters shown are based on the smallest root (minor) diameter of the standard screws within the nominal size range and truncated at the maximum ball nut rotational speed. DO NOT EXCEED this rpm regardless of screw length.



A Fixed-Free	Inches	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	120	126
	mm	152	304	457	609	762	914	1056	1219	1371	1524	1676	1828	1981	2133	2286	2438	2590	2743	3048	3200
B Simple-Simple	Inches	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
	mm	254	508	762	1016	1270	1524	1778	2032	2286	2540	2794	3048	3302	3556	3810	4064	4318	4572	4826	5080
C Fixed-Simple	Inches	12	24	36	48	61	73	85	97	109	121	133	145	158	170	182	194	206	218	230	242
	mm	304	609	914	1219	1549	1854	2159	2463	2768	3073	3378	3683	4013	4318	4622	4927	5232	5537	5842	6146
D Fixed-Fixed	Inches	15	30	45	60	75	90	105	119	134	149	164	179	194	209	224	239	254	269	284	298
	mm	381	762	1143	1524	1905	2286	2667	3022	3403	3784	4165	4546	4927	5308	5689	6070	6451	6832	7213	7569

Load Life Relationship

Column Loading Capacities

For Ball Screws

Ball screws are rated for 1,000,000 inches of travel at the rated dynamic load. This is the load at which 90% of a group of identical ball screws will run without flaking for their lifetime. However, they will travel farther than this at lower limits. These load-life relationships are analogous to the B10 rating common in the ball bearing industry. The relationship of load to life is an inverse cube relation. For example, reducing the load by 1/2 increases life eight times. Doubling the load decreases life by 1/8. Every attempt should be made to design for loads that do not exceed the dynamic load rating of the nut.† Never exceed twice the rated dynamic load rating of the nut while in motion.

To use the load/life equation, look up the rated dynamic load for the assembly you are interested in. Use a diagram load that covers your typical worst case loading and compute the predicted theoretical design life as follows:

$$L = \left(\frac{Fr}{D \bullet f_w}\right)^3 x\ 1\ x\ 10^6$$

L = life in inches
D = Design Load
Fr = Dynamic Load Rating
f_W = 1.2–1.5 Nominal Operation
1.5–3.0 Operation with impact or vibration

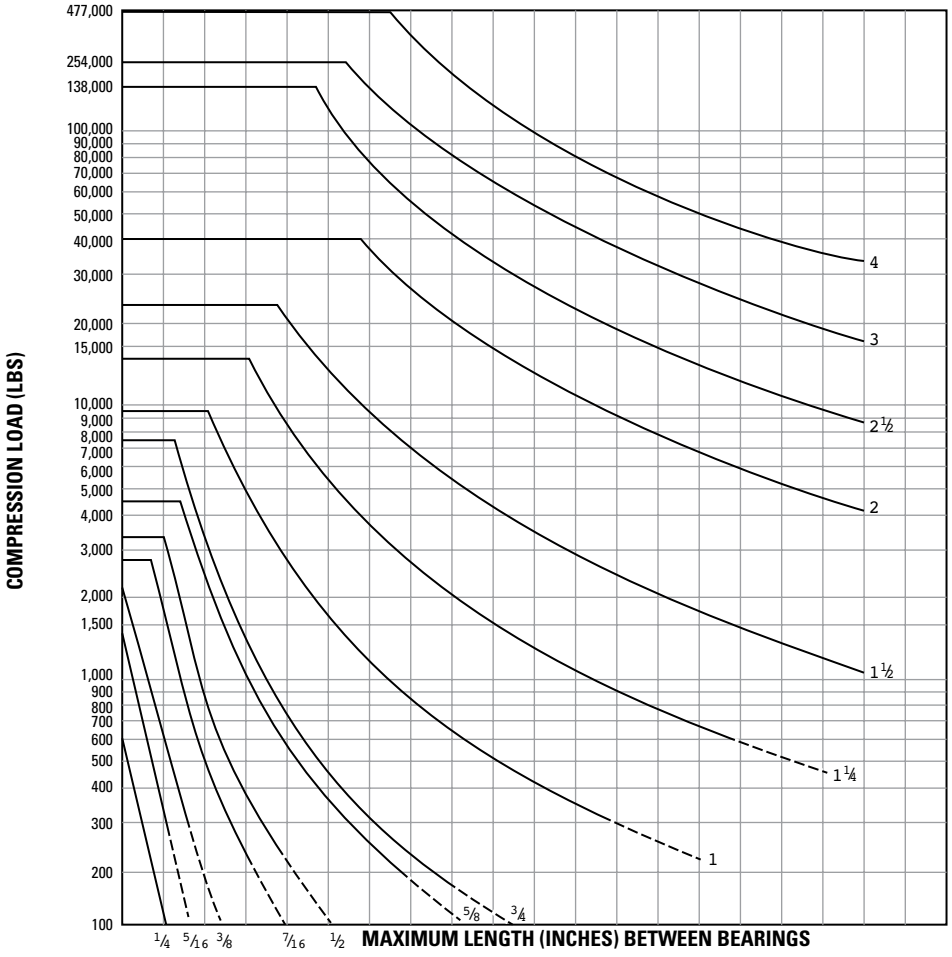
† BSA assumes no liability for assemblies used at above the dynamic load rating of the nut.

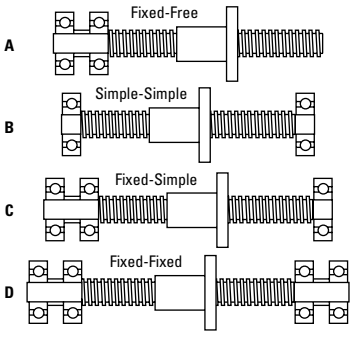
Engineering Guidelines for Lead Screws

Column Loading Capacities Chart for Lead Screws and Ball Screws

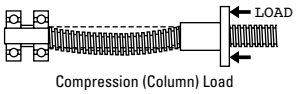
Use the chart below to determine the Maximum Compression Load for Screw Shaft. Usually, screw operated in tension can handle loads up to the rated capacity of the nut, providing the screw length is within standard lengths. End supports have an effect on the load capacity of screws. The four standard variations are shown below with corresponding rating adjustments. Find the point of intersecting lines of load (horizontal) and length (vertical) to determine the minimum safe diameter of screw. If loads fall into dotted lines, consult factory.

Warning: DO NOT EXCEED ball nut capacity. Curves for the screw diameters shown are based on the smallest root (minor) diameter of the standard screws within the nominal size range.

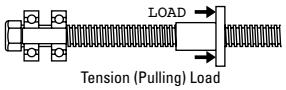




A	Inches	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95
	mm	127	254	381	508	635	762	889	1016	1143	1270	1397	1524	1651	1778	1905	2032	2159	2286	2413
B	Inches	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190
	mm	254	508	762	1016	1270	1524	1778	2032	2286	2540	2794	3048	3302	3556	3810	4064	4318	4572	4826
C	Inches	14	28	42	57	71	85	99	113	127	141	156	170	184	198	212	226	240	255	270
	mm	356	711	1067	1448	1803	2159	2515	2870	3226	3581	3962	4318	4674	5029	5385	5740	6096	6477	6858
D	Inches	20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380
	mm	508	1016	1524	2032	2540	3048	3556	4064	4572	5080	5588	6096	6604	7112	7620	8128	8636	9144	9652



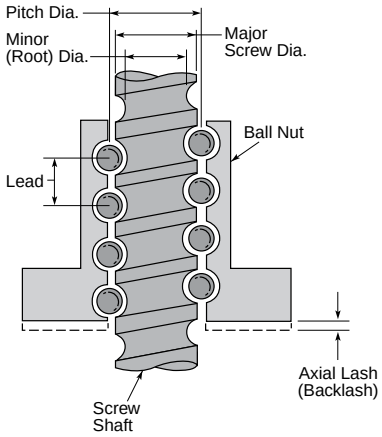
Compression (Column) Load



Tension (Pulling) Load

Glossary

General Definitions



AXIAL LASH/BACKLASH
The axial free motion between the ball nut and screw; a measure of system stiffness.

BEARING BALL CIRCUIT
The closed path of recirculating balls within the ball nut assembly. A multiple circuit nut with two or more individual circuits has a greater load carrying capability than a single circuit ball nut assembly of the same diameter.

CYCLE
The complete forward and reverse motion of the screw (or nut) when moving the load. One cycle is equivalent to two load carrying strokes (one forward and one backward).

DIAMETER—MAJOR
The outside diameter of the ball bearing screw shaft. In dealing with ball bearing screws, this is the basic measurement.

DIAMETER—MINOR (ROOT)
Diameter of the screw measured at the bottom of the ball track.

DIAMETER - PITCH
The nominal diameter of a theoretical cylinder passing through the centers of the balls when they are in contact with the ball bearing screw and ball nut tracks.

EFFECTIVE BALL TURNS
The number of ball groove revolutions within the ball nut body; a ball nut with seven effective ball turns will have a higher load carrying capability than one with five, all other characteristics being equal.

LEAD
The axial distance a screw travels during one revolution.

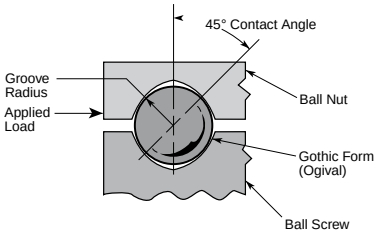
LEAD TOLERANCE
The maximum variation from nominal, measured in inches per foot, cumulative.

LOAD CARRYING BALLS
The balls in contact with the ball grooves of both the nut and the screw for load carrying purposes.

RIGHT HAND THREAD
The direction of the threads on the screw shaft causing the ball nut to travel away from the end viewed when rotated in a counter clockwise direction.

SCREW STARTS
The integral number of independent threads on the screw shaft; typically one, two or four.

Ball Contact



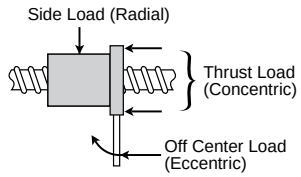
GOTHIC (OR OGIVAL) GROOVE
A ball track cross-section shaped like a Gothic arch.

CONFORMITY RATIO
Ratio of the ball track radius to the ball diameter.

CONTACT ANGLE
Nominal angle between a plane perpendicular to the screw and a line drawn between the theoretical points of tangency between a ball and the ball tracks and projected on a plane passing through the screw axis and the center of the ball. The angle at which the ball contacts the groove.

Glossary

Loading



DYNAMIC LOAD RATING
Dynamic load rating is the maximum load which a ball bearing screw assembly can maintain for a prescribed length of travel.

STATIC LOAD
Static load is the maximum non-operating load capacity above which brinelling of the ball track occurs.

THRUST LOAD
Thrust load is loading parallel to and concentric with the centerline of the screw shaft which acts continuously in one direction. Thrust loading is the proper method of attaching the load to the ball bearing screw assembly.

PRELOAD
The use of one group of bearing balls set in opposition to another to remove axial lash or backlash and increase ball bearing screw stiffness. All axial freedom is eliminated in preloading.

TENSION LOAD
Tension load is a load which would tend to stretch the ball screw shaft.

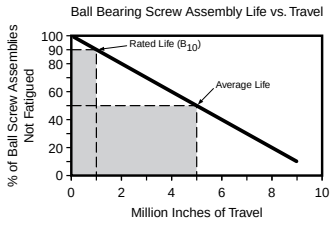
COMPRESSION LOAD
Compression load is a load which would tend to compress or buckle the ball screw shaft.

OFF CENTER LOAD (ECCENTRIC)
A load tending to cock the ball nut on the screw, reducing the rated life. This must be considered in the selection of the ball bearing screw assembly.

SIDE LOAD (RADIAL)
A load from the side that will reduce the rated life and must be considered in the selection of the ball bearing screw.

Load/Life

A rolling contact device such as a ball bearing screw is said to have reached the end of its usable life at the first sign of fatigue on the rolling surfaces. Fatigue results from the repeated flexing of metal as the balls pass over any given point under load.



LOAD/LIFE RATING
The usable life of a ball bearing screw assembly measured in inches of travel under a specific load. The length of travel that 90 percent of a group of ball bearing screws will complete, or exceed, before the first evidence of fatigue develops. (B10)

MOUNTING-ENDS

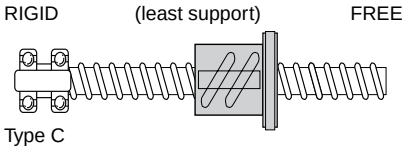
END BEARING SUPPORT (END FIXITY)
The three basic bearing configurations that are commonly used to support the ends of a ball screw are:

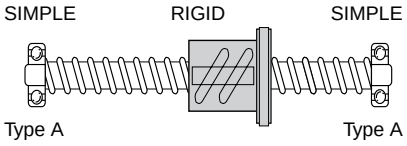
a) A single journal or ball type bearing (simple support).

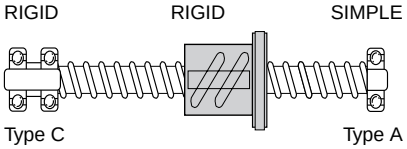
b) A pair of back-to-back, angular contact bearings to control end play (simple support).

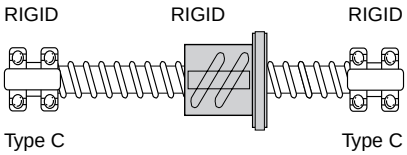
c) A pair of spaced bearings for added rigidity (rigid support).

Four combinations of bearing supports are used throughout this catalog for selection purposes. They are:







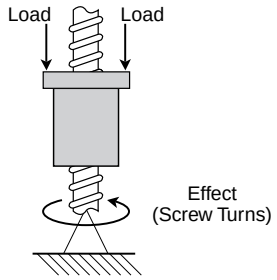


ANNEALED ENDS
A manufacturing process which removes brittleness while softening screw stock to allow for machining of end journals.

Glossary

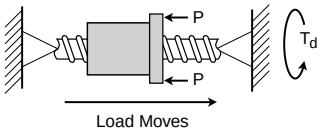
Backdriving

Ball bearing screws can be backdriven. A load on the nut will drive the screw because of the inherent high efficiency (90%).



If backdriving is required in a particular application, the lead of the screw should be at least one third the screw diameter. Ideally the lead should be equal to the screw diameter.

DRIVING TORQUE



The amount of effort, measured in pound-inches, required to turn the ball screw and move the load.

$T_d = \frac{P \times L}{2 \pi e} = .177\ P \times L$ (lb-inches)

T_d = Direct Torque (lb-inches)
P = Load
L = Screw Lead (inches/turn)
e = Ball Bearing Screw Efficiency (90%)

BACKDRIVING TORQUE
The backdriving torque (Tb) is the torque created by an applied load.
$T_b = .143\ (P)\ (L)$ = in-lbs

PRELOAD TORQUE

$$T_{PL} = \frac{P_{PL} \times L \times .2}{2\pi}$$

or

$$T_{PL} = .032 \times P_{PL} \times L$$

T_{PL} = Torque (lb-inches)
P_{PL} = Preload setting (pounds)
L = Lead

ANGULAR VELOCITY

$$RPM = \frac{\text{Velocity (inches/min.)}}{\text{Lead (inches/rev.)}}$$

HORSEPOWER

$$HP = \frac{RPM \times \text{Torque (in-lbs)}}{63{,}000}$$

ROTATIONAL TORQUE
To accelerate the screw

$$T_r = \frac{WR^2\ (RPM)}{3700\ (t)} = \text{lb-in}$$

T_r =Torque (lb-in)
WR^2 = Inertia (lb-in)
t = Time to accelerate (sec.)

ACCELERATION TORQUE
Under load

$$Ta = \frac{(p/g)\ (A)\ (L)}{2\pi e} = \text{lb-in}$$

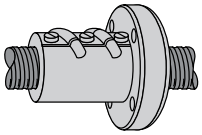
A = Acceleration (in/sec^2)
g = 386 in/sec2
p =Load (lb)
L = Screw lead (in/turn)

Thermal expansion of screw
= 6.25 x 10^{-6} in/in/°F

Design Considerations

Most Frequently Asked Questions About Ball Screws

Question How do you restrict the flange from turning off the nut in reversing load applications?



Answer The flange may be held to the nut by three alternative methods:

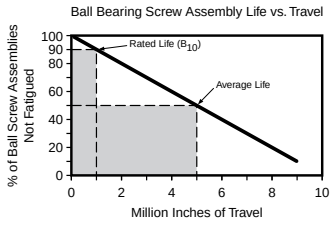
a) The most positive method of holding the flange to the nut is to order factory "drill and pin" prior to bearing loading. The flange and nut are drilled to accept a roll pin from the flange face.

b) The flange may be drilled and tapped from the O.D. into the nut threads. A carbide spade drill may be used to drill into the hardened nut threads. Avoid getting metal chips into the nut.

c) Commercially available adhesives such as Loctite may be used. Take care to avoid getting adhesive on the ball track. (Light loads only).

Question How do you calculate application life requirement in inches?

Answer Each ball bearing screw application will have an expected life given the stroke length, duty cycle, years of required service and load.



a) Life expectancy is the total inches of travel that an assembly will provide under a stated load. (Life is sensitive to load.) Use the Load Life Relationship on page 85 to calculate the expected life of a particular assembly in inches.

b) To determine the inches of required life: multiply inches of stroke x two (only on vertical applications) x cycles per hour x hours of operation per day x number of working days per year x years of expected service.

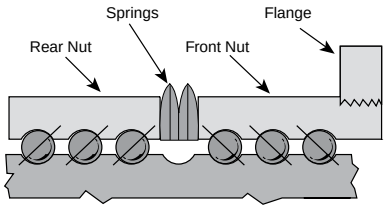
c) Compare the expected life to the required life. Expected life can be increased by choosing a ball screw with a larger load rating.

Question Is lubrication necessary?

Answer Proper and frequent lubrication must be provided for satisfactory service and life. A 90% reduction in ball bearing screw life should be allowed where dry operation is unavoidable. Lubricants reduce abrasive wear and dissipate heat caused by metal-to-metal contact between bearing surfaces. See page 78 for BSA lubricants.

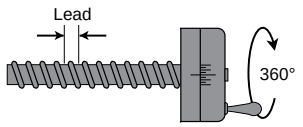
Question How are torque requirements for preload nuts calculated?

Answer Driving torque increases only slightly with preload since a preload unit continues to be highly efficient.



First, determine the driving torque for a single nut working at a given load. Second, determine the torque required for the preload load setting. Add the driving torque and preload torque together to determine total torque requirement.

Question What is meant by lead error?



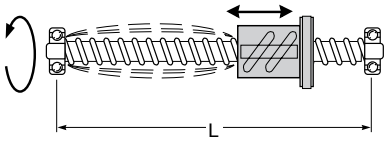
Answer Lead error is the average deviation from the nominal lead that occurs in one foot of nut displacement. Most screws are offered in standard and precision grades. (See pages 41 – 59 for more details.)

Design Considerations

Question How are ball bearing screws synchronized?

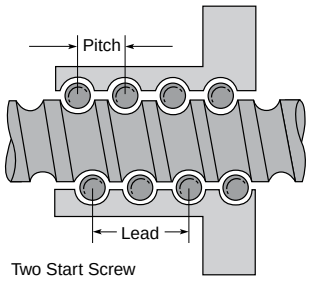
Answer Screw synchronizing is achieved by selecting screws with similar lead error and driven by a positive single source drive. "Matched sets required" should be specified when ordering screws that should be timed to run together without binding because of lead mismatch. (Special factory order).

Question What can be done to exceed calculated critical speed?



Answer The chart for critical speed is on page 84. Critical speed is a function of unsupported screw length, mean diameter of screw and bearing supports. Rigid/rigid screw mounting is the optimum support for high speeds. Consider a faster lead to reduce the RPM required. If higher speed is still necessary, go to a larger diameter screw.

Question What is the difference between pitch and lead?



Answer Pitch is the measurable distance between screw grooves. Lead is the linear travel the nut makes per screw revolution. The pitch and lead are equal with single start screws. The pitch is 1/2 the lead in two start screws, etc.

Question What is the standard straightness on machined screws with standard ends or screws machined to customer prints?

Answer The threaded portion is .005 T.I.R. per foot and not to exceed .010 T.I.R. total length of screw.

Question What is meant by tangential design nuts?

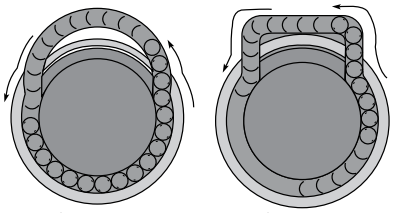


FIGURE 1 FIGURE 2

Answer The tangential circuit (Fig. 1) consists of a pickup finger (or yoke deflector) geometry which allows the circuit balls to enter and leave the load carrying portion of the ball screw circuit in a straight line path—along the tangent to the pitch diameter.

The standard ball nut design (Fig. 2) places the return tube holes closer together resulting in a circuit which requires a change in direction of the ball travel as the return tubes are entered and exited.

Question What is the backlash of single nuts?

Answer The backlash range in a single nut is as follows:

Model	Max. Backlash
R-0308 to R-0705	.007"
R-0702 to R-1105	.009"
R-1501 to R-1502	.013"
R-2202 to R-2502	.015"
R-3066	.018"

Question Can backlash be minimized?

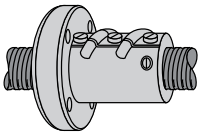
Answer Yes, backlash can be minimized or eliminated completely by using a preloaded ball bearing screw. See pages 44, 48, and 52.

Question What is a load locking spring and how does it work?

Answer The load locking spring is a coil that is turned into the inactive portion of the nut and conforms to the ball track. The spring does nothing in normal operation and does not touch the screw. In the event the ball bearings are lost from the nut, the load locking spring will not allow the load carrying nut to free-fall down the screw.

Design Considerations

Question Where is the lube hole in the large size nuts and what is the thread size?



Answer A 1/8-27 NPT pipe thread tapped hole is standard on most nuts from R-1502 through R-3066.

Question How do you size a ball bearing screw?

Answer Select the screw that will satisfy the most critical requirement of the application, such as high RPM, heavy load, duty cycle, column loading or zero backlash. Design for the worst case. See page 42.

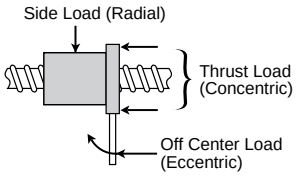
Question How is a hardened screw annealed?

Answer The ball bearing screws are case hardened to Rockwell C56 minimum. The screw ends are coil annealed after they are cut to length to reduce the case hardness to a machinable state. Screws may be annealed in the field by heating the ends to a cherry red with a torch, then putting the ends in sand to cool.

Question How should ball bearing screws be protected from dirt and contaminates?

Answer The brush wipers help prohibit contaminates from entering the nut as it translates along the screw. For heavily contaminated environments, metal shields, bellow type enclosures or extensions are recommended to be used with wipers.

Question What causes premature failure?



Answer Premature failure may be caused by any of the following:

a) Misalignment of ball nut to screw which results in side loading or eccentric loading will reduce life. This may cause the bearing balls to split or get flats on them. The bearings may even break out of the tubes.

b) Metal Chips or Dirt in the ball nut will not allow the bearings free circulation. The bearing balls may get flats on them because of skidding and spalling.

c) Lack of Lubrication Proper lubrication will help dissipate heat and reduce metal-to-metal wear of components.

d) High speed operation Shaft speeds resulting in screw surface speeds above 8,000 IPM will reduce rated life.

Question What is the normal operating temperature range for ball bearing screws?

Answer The normal operating temperature range is –65°F to 300°F (–55°C to 149°C) with suitable lubrication. Temperatures in excess of this may make the screw brittle, warped or annealed.

Warranties

Exclusions & Limitations

The specifications for Seller's products published in Seller's catalogs or other printed material are for reference only. The performance rating figures do not con-stitute a warranty. All ratings are based on use in a normal environment under normal conditions. Such things as temperature extremes, eccentric or side loading, dirty conditions, extreme travel speeds, inadequate or faulty support and/or mounting provisions, lack of lubrication and maintenance, can and will derate the catalog ratings.

Should any failure occur during the first sixty days or the first 100,000 inches of travel, whichever comes first, due to a defect in material or workmanship in any product, if written notice is received from the buyer for any such alleged defect and if the product is found not to be in conformity with this warranty (buyer having provided Seller a reasonable opportunity to perform any appropriate tests thereon), Seller will replace or repair the product(s) provided (i) misuse or misapplication has not caused the failure and (ii) a complete inspection of the product and application thereof have been made by Seller. Claims must be made within 90 days after the date of shipment.

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Modification or alteration of any product not specifically authorized by Seller will void any warranty whatsoever. Products used in conjunction with nuclear devices or their support systems are specifically excluded from any warranty.

SELLER'S LIABILITY UNDER THE FOREGOING WARRANTIES OR ANY OTHER WARRANTY, WHETHER EXPRESSED OR IMPLIED, IN LAW OR FACT, SHALL BE LIMITED TO THE REPAIR OR REPLACEMENT OF DEFECTIVE MATERIAL AND WORKMANSHIP AND IN NO EVENT SHALL SELLER BE LIABLE FOR CONSEQUENTIAL OR INDIRECT DAMAGES. THE ABOVE WARRANTY COMPRISES SELLER'S SOLE AND ENTIRE WARRANTY OBLIGATION AND LIABILITY IN CONNECTION WITH SELLER PRODUCTS SOLD HEREUNDER. ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSLY EXCLUDED.

SOME USEFUL FORMULAS FOR LEADSCREW ASSEMBLIES

Torque, Rotary to Linear

Driving the screw to translate the nut, or driving the nut to translate the screw.

Ball Screw Assemblies

$$\text{Torque (in lbs)} = .177 \times \text{Load (lbs)} \times \text{Lead (inches)}$$

Acme Screw Assemblies

$$\text{Torque (in lbs)} = \frac{\text{Load (lbs)} \times \text{Lead (inches)}}{2\pi \times \text{Efficiency*}}$$

*Acme screw efficiency is variable with the helix angle of the threads, the friction of the material and the finish. See the efficiency formula below.

Torque, Linear to Rotary

Translating the nut to force the screw to turn.

Ball Screw Assemblies

$$\text{Torque (in lbs)} = .143 \times \text{Load (lbs)} \times \text{Lead (inches)}$$

Acme Screw Assemblies

$$\text{Torque (in lbs)} = \frac{\text{Load} \times \text{Lead} \times \text{Efficiency}}{2\pi}$$

The higher the lead of the screw the less effort required to backdrive either the screw or the nut. As a rule, the lead of the screw should be more than 1/3 the diameter of the screw to satisfactorily backdrive.

Efficiency

Ball Screw Assemblies

Most ball screw assemblies are better than 90% efficient. A preload will cause a decrease in efficiency.

Acme Screw Assemblies

$$\%\ \text{Efficiency} = \frac{\tan(\text{helix angle})}{\tan(\text{helix angle} + \arctan f)} \times 100$$

f = coefficient of friction

Horsepower

Torque to Horsepower

$$HP = \frac{\text{Torque (in lbs)} \times RPM}{63{,}000}$$

Horsepower to Torque

$$\text{Torque} = \frac{63{,}000 \times HP}{RPM}$$

Column Load Strength

(Based on Eulers Formula)

$$P_{cr} = \frac{14.03 \times 10^6 F_c d^4}{L^2}$$

P_{cr} = maximum load (lbs)
F_c = end support factor (see page 31)
- .25 one end fixed, other free
- 1.00 both ends supported
- 2.00 one end fixed, other supported
- 4.00 both ends fixed

d = root diameter of screw (in)
L = distance between nut and load carrying bearing (in)

When possible, design for tension loads to eliminate the buckling factor and reduce the required screw size.

Critical Screw Shaft Speed

(Maximum rotational speed of a screw)

$$C_S = F \times 4.76 \times 10^6 \times \frac{d}{L^2}$$

C_S = Critical Speed (rpm)
d = root diameter of screw (in)
L = length between supports (in)
Fc = end support factor (see page 31)
- .36 one end fixed, other free
- 1.00 both ends supported
- 1.47 one end fixed, other supported
- 2.23 both ends fixed

Critical shaft speed should be reduced to 80% to allow for other factors such as alignment and straightness.

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