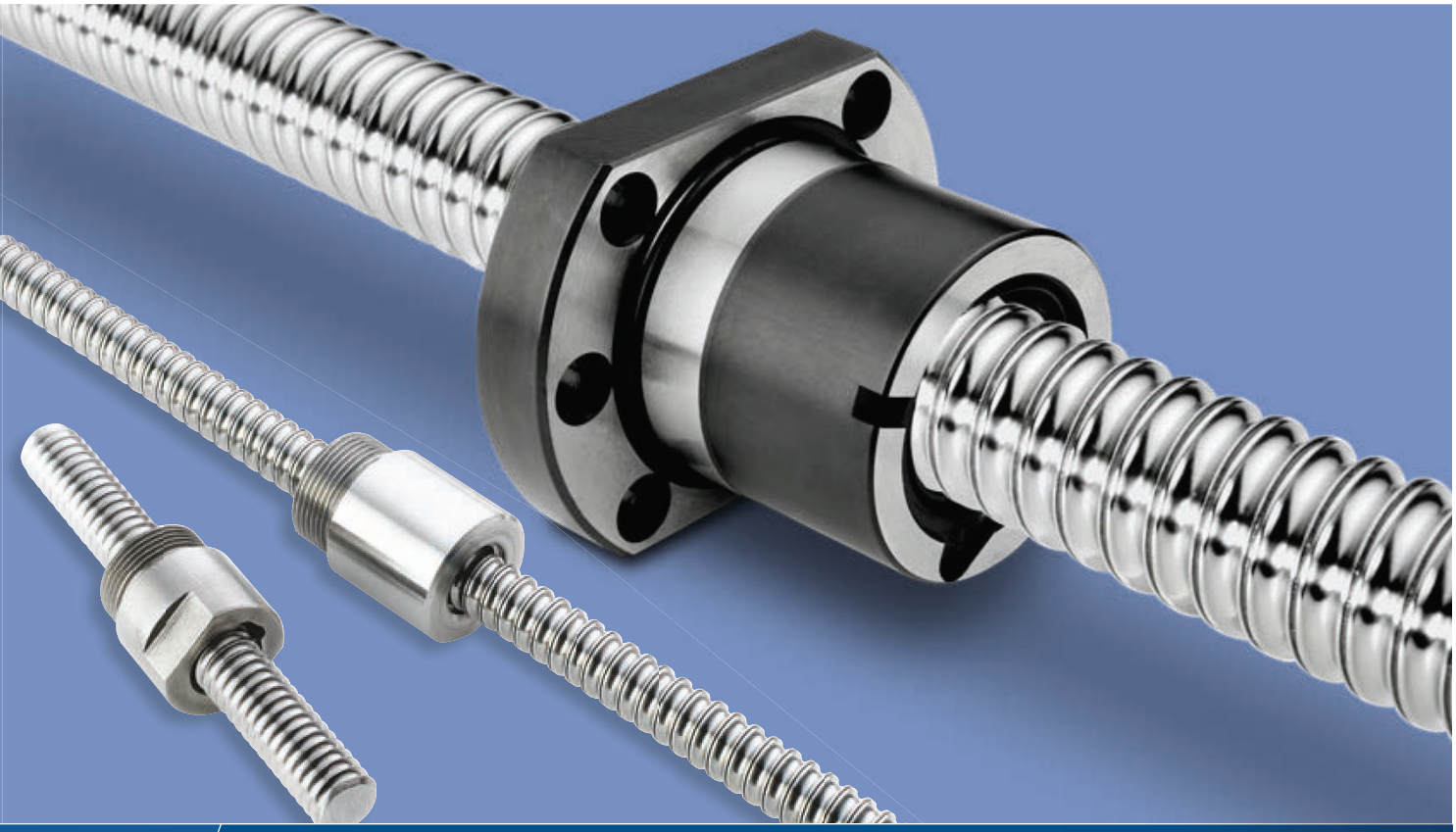

Metric Precision Ball Screws

High load capacity in a range of package sizes, providing precise, smooth and quiet performance

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Metric Precision Ball Screw Overview (10 - 12 mm)

The ideal solution for laboratory, medical and mechatronic applications, Thomson's miniature metric rolled ball screws deliver smooth and quiet operation and best-in-class load capacity.

Bigger Load Capacity

- Design maximizes load capacity by optimizing return system
- Quiet and smooth performance
- Enables flexible ball nut mounting configurations and rapid prototyping

Improved Value

- Screws are precision rolled to T7 accuracy class standard
- State-of-the-art manufacturing
- Higher load capacity equates to longer life

Genuine Thomson Quality and Innovation

- Proprietary thread form and processing equal quality and performance
- Expert technical and application support

Ball Nut Types

Styles	Nominal Diameter Size Range (mm)
Flanged Single Nut Internal Return System (FSI)	10 - 50
Threaded Single Nut Internal Return System (TSI)	10 - 12
Cylindrical Single Nut Internal Return System (RSI)	10 - 12

Materials

Part	Material		Strength		Heat treatment	Standard Surface Finish
	16 - 50 mm (FSI)	10 - 12 mm (FSI, TSI, RSI)	R_m [N/mm²]	R_e [N/mm²]		
Screw	Cf53	SAE1045	≥ 610	≥ 380	60 ± 2 HRC Inductive hardening	Polished & Oiled
Nut	16MnCr5	SAE8620	> 800	> 600	60 ± 2 HRC hardened	Polished & Oiled (optional black oxide)
Wiper	NBR 33					
Ball	100Cr6	SAE52100			64 ± 2 HRC	

Special materials and heat or surface treatment on request.
Permitted temperature in continuous operation -22°F (-30°C) to 212°F (100°C). Please inquire for other applications.
Nuts with plastic ball returns only to 176°F (80°C); briefly 230°F (110°C).

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Miniature Metric Styles Ball Screws – Product Availability							
Nominal Diameter	Screw Leads						
[mm]	2 mm	3 mm	5 mm	10 mm	20 mm	25 mm	40 mm
10	•	•		•			
12	•						
Standard Metric Ball Screws - Product Availability							
16			•	•			
20			•				
25			•	•	•	•	
32			•	•	•		
40			•	•	•		•
50				•			

Standard Flanged Style (16 - 50 mm)

Flanged style metric ball screw assemblies combine the engineering and performance of high-quality, German ball screws with North American manufacturing and logistics. Only 2% of all ball screws sold in North America are manufactured here, so you'll be able to take advantage of shorter lead times, reduced shipping costs, and enhanced communication with support and service. The flanged style provides the best in quality, performance and delivery at a competitive price.

- DIN 69051 compliant (flanged style 16 - 50 mm only)
- Patented Precision Screw Forming (PST) technology
- Smooth performance due to unique ball return systems

- Regionally stocked/machined/assembled product in Marengo, Illinios
- P5 accuracy screws standard
- Ground quality ball nuts

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Flanged Style Application Examples

Thomson's ball screw assemblies provide the smooth motion and positional accuracy typically found only in a ground product. These qualities, combined with the economical precision rolled solution, make them ideal for large 3-axis structures.

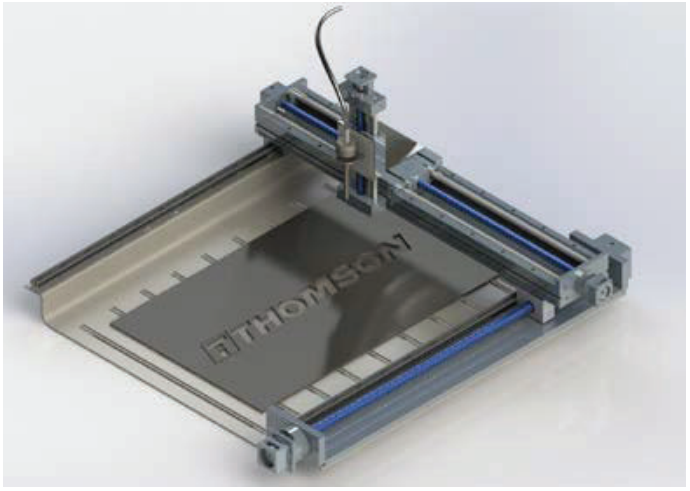
Gantry

Thomson's unique ball return systems and preload capabilities reduce the effect of critical screw speed on a long slender axis (see X-axis above). Combined with the Thomson profile rail, this solution provides stiffness and accuracy to the overall system.

Smooth motion is necessary to prevent reflected inertia from causing structural vibration in large structures. The illustrated Y-axis below combines a precision flanged ball screw assembly with the alignment compensation of Thomson linear rails.

Engraver / Laser / Waterjet Cutting

Machine tool applications have primarily been the domain of ground ball screw assemblies. The introduction of high-precision P3/P5 accuracy rolled ball screws has eliminated the need for ground product where a less expensive solution that still meets high performance standards is required.



These types of applications typically require P3/P5 accuracy, 75-100% duty cycle, harsh environments, and reversing loads or dithering issues. Flanged ball screw assemblies have molded rubber (NBR) seals as standard in sizes ø16 mm and above and are ideal for these demanding parameters.

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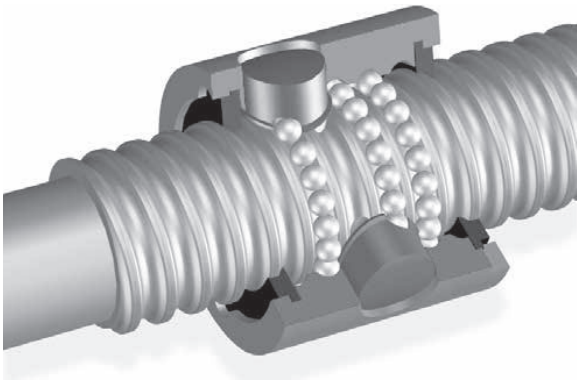
Metric Ball Nut Return System Overview

All ball screws require a recirculation system for the ball bearings. Thomson return systems are optimized for each diameter and lead combination to maximize load capacity, minimize footprint and guarantee smooth operation.

Single Return (E = Single Liner, M = Multi Liner)

For single-start ball screws

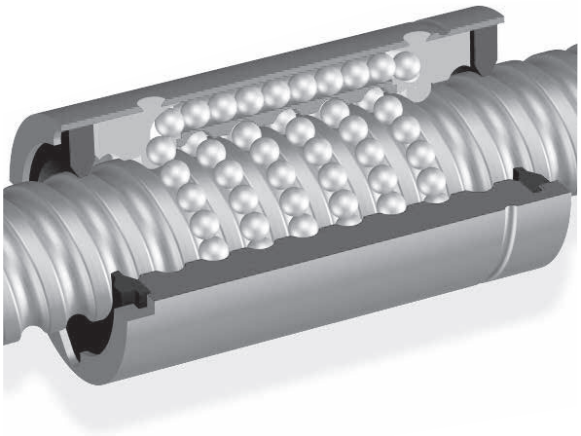
After each turn, the balls are lifted from the shaft raceway and set back by a single turn. Thomson NEFF return systems made from glass-fiber reinforced plastic or steel guarantee a faultless and gentle recirculation of the balls.



Internal Return (K = Channel)

For single-start and multiple-start ball screws.

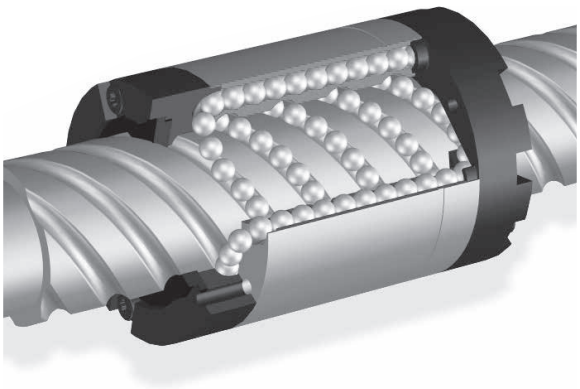
After several turns, the balls are returned either by a patented plastic recirculation system integrated into the nut or through recirculation channels also integrated into the nut using steel recirculation inserts.



External Return (D = End Cap)

For multiple-start ball screws.

The balls are recirculated via two special end caps and return channels integrated into the nut.



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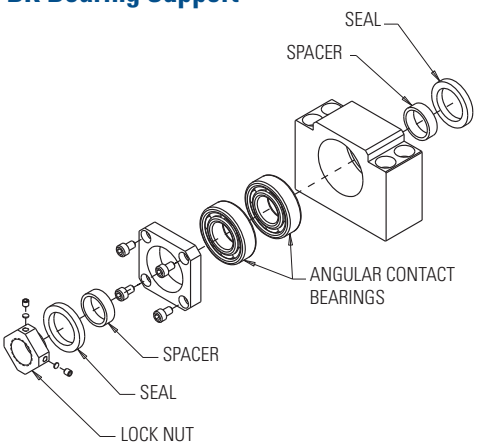
Bearing Supports Product Overview

Metric Ball Screws

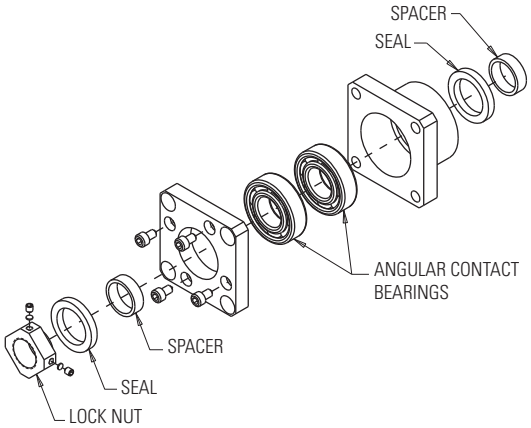
Diameter	BK	BF	FK	FF	MK	WK
12	7833391	7833398	7833405	7833411	7833700	-
16	7833392	7833399	7833406	7833412	7833701	-
20	7833393	7833400	7833407	7833413	7833702	-
25	7833394	7833401	7833408	7833414	7833703	7833614
32	7833395	7833402	7833409	7833415	-	7833615
40	7833396	7833403	7833410	7833416	-	7833617
50	7833397	7833404	-	-	-	7833621

BK Bearing Support [1], [2]



The base mounted BK Bearing Support contains an angular contact bearing pair for increased stiffness and axial load capacity. Design dimensions fit standard Type BK or BK1 end machining.

FK Bearing Support [1], [2]



The flange-mounted FK Bearing Support contains an angular contact bearing pair for increased stiffness and axial load capacity. Design dimensions fit standard Type FK or FK1 end machining.

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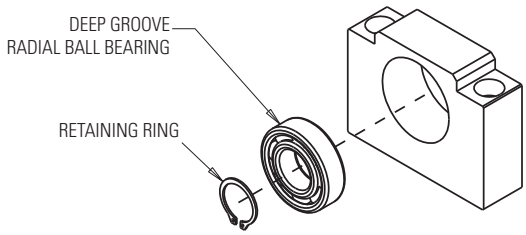
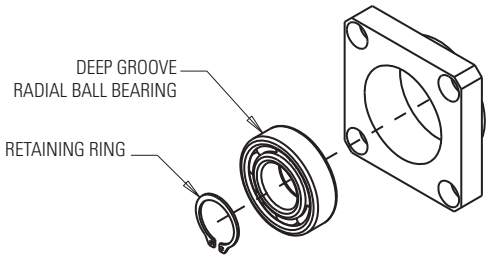
BF Bearing Support [1], [3]



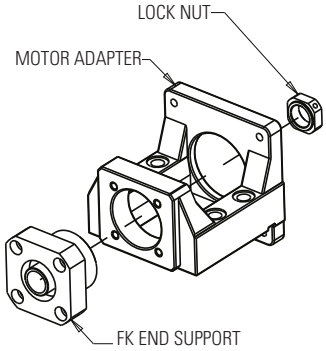
Base-mounted BF Bearing Support contains a floating radial bearing to allow axial shaft movement. Design dimensions fit standard Type BF or BF1 end machining.

FF Bearing Support [1], [3]



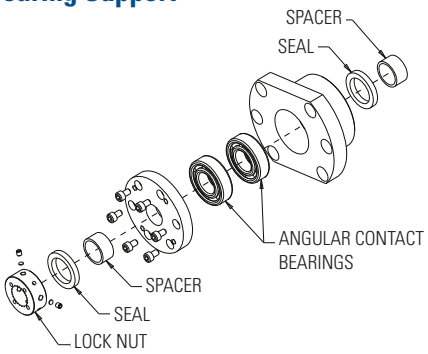
The flange-mounted FF Bearing Support contains a floating radial bearing to allow axial shaft movement. Design dimensions fit standard Type FF or FF1 end machining.

MK Bearing Support [2]



Base-mounted NEMA 23 or 34 motor mount. Design dimensions fit standard Type FK end machining.

WK Bearing Support [2]



Heavy duty, flange-mounted WK support contains higher load capacity bearings. Design dimensions fit standard WK or WK1 end machining.

(1) BK, FK, MK and WK supports are classified as "fixed," and BF and FF supports are classified as "simple" for purposes of critical speed and column strength calculations.
(2) Locknut included in assembly
(3) Retaining ring included in assembly

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Flanged Style Ball Nuts – Technical Specifications

Standard Lead Accuracy
10-12 mm: ± 52 µm / 300 mm
≥ 16 mm: ± 23 µm / 300 mm[1]

Note: Some sizes only available with round flange; check L8 dimension for flange style.

Internal Return Flanged Ball Nut and Screw

- Flexible solution for standard mounting
- Integral wiper (≥ 16 mm) and flange included as standard
- Available in three preload classes (Type Z1, Z2, Z3)
  - Z1 – light preload to 1-2% (16 - 50 mm only)
  - Z2 – no preload, clearance held to max indicated in table (standard unless specified)
  - Z3 – no preload, clearance held to max 0.05 mm (16 - 50 mm only)

Technical Specifications

Nom. Diameter	Lead	Nut Form	Return System	Ball Nut P/N	Ball Screw P/N	Performance Data					Screw Specifications				
						Dynamic Load Capacity		Static Load Capacity		Max Axial Backlash	Major Diameter	Minor Diameter	Std Length	Max Length	Screw Weight
[mm]	[mm]					[kN]	[lbs]	[kN]	[lbs]	[mm]	[mm]	[mm]	[mm]	[mm]	[kg/m]
10	2	M	M	**8103-448-039**	190-9680	2.0	440	3.4	769	0.05	9.8	8.3	1800	1800	0.59
10	3	M	M	**8103-448-040**	190-9681	4.8	1076	8.6	1941	0.05	9.7	8.0	1800	1800	0.58
10	10	M	K	**8103-448-042**	190-9689	2.9	659	5.2	1176	0.05	9.7	7.9	1900	1800	0.58
12	2	M	M	**8105-448-043**	190-9690	6.8	1550	13.1	2945	0.05	11.8	10.3	1800	1800	0.86
16	5	E	E	**7106-448-061**	195-9698	9.3	2091	13.1	2945	0.08	15.3	12.9	4000	6000	1.30
16	10	E	K	**7106-448-062**	195-9699	15.4	3462	26.5	5958	0.08	15.2	13.0	4000	6000	1.30
20	5	E	K	**7107-448-063**	195-9700	10.5	2361	16.6	3732	0.08	19.3	16.9	4000	6000	2.00
25	5	E	E	**7110-448-064**	195-9701	12.3	2765	22.5	5058	0.08	24.3	21.9	4000	6000	3.30
25	10	E	K	**7110-448-065**	195-9702	13.2	2968	25.3	5688	0.08	24.3	21.9	4000	6000	3.30
25	20	S	D	**7110-448-066**	195-9703	13.0	2923	23.3	5238	0.15	24.4	22.0	4000	6000	3.30
25	25	S	D	**7110-448-067**	195-9704	16.7	3754	32.2	7239	0.08	24.3	22.0	4000	6000	3.30
32	5	E	E	**7112-448-069**	195-9706	21.5	4834	49.3	11084	0.08	31.3	28.9	4000	6000	5.60
32	10	E	E	**7112-448-070**	195-9707	33.4	7509	54.5	12253	0.08	32.5	27.3	4000	6000	5.60
32	20	E	K	**7112-448-071**	195-9708	29.7	6677	59.8	13444	0.08	31.5	27.9	4000	6000	5.60
40	5	E	E	**7115-448-073**	195-9710	23.8	5351	63.1	14186	0.08	39.3	36.9	4000	6000	9.00
40	10	E	E	**7115-448-074**	195-9711	38.0	8543	69.1	15535	0.08	39.3	34.1	4000	6000	8.40
40	20	E	K	**7115-448-075**	195-9712	33.3	7487	76.1	17109	0.08	39.5	35.9	4000	6000	9.00
40	40	S	D	**7115-448-076**	195-9713	35.0	7869	101.9	22909	0.08	38.7	36.3	4000	6000	9.00
50	10	E	E	**7120-448-077**	195-9714	68.7	15445	155.8	35027	0.08	49.3	44.1	4000	6000	13.50

(1) P3 accuracy class is ± 12 µm / 300 mm for nut sizes 16 mm and greater and is available upon request.

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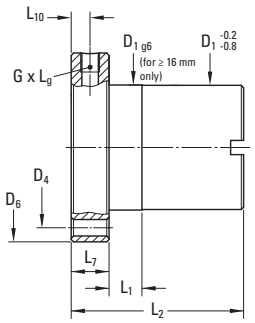
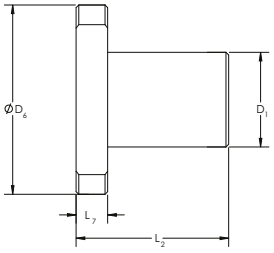
Flanged Style Ball Nuts – Technical Specifications

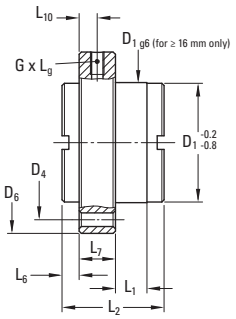
FORM E



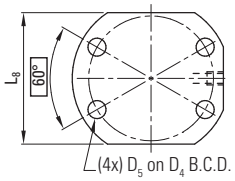
FORM M



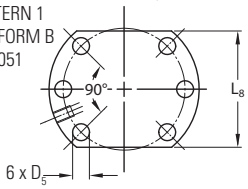
FORM S



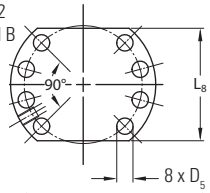
HOLE PATTERN 0 ≤ 12 mm ONLY



HOLE PATTERN 1
FLANGED FORM B
TO DIN 69051



HOLE PATTERN 2
FLANGED FORM B
TO DIN 69051



Technical Specifications

Nom. Diameter	Lead	Hole Pattern	Nut Specifications													
			D1 g6 [2]	D4	D5	D6	L1	L2	L6	L7	L8	L10	Lube Hole (G)	No.of Circuits	Ball Diameter
[mm]	[mm]		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]			[mm]
10	2	0	18	28	4.5	36	-	22	-	6	22	-	-	5	1.588
10	3	0	18	28	4.5	36	-	29	-	6	22	-	-	7	1.984
10	10	0	23	30.5	4.5	38	-	35	-	6	24	-	-	2 x 1.8	1.984
12	2	0	20	29	4.5	37	-	40	-	8	24	-	-	9	1.588
16	5	1	28	38	6	48	10	42	-	10	40	5	M6x1	3	3.500
16	10	1	28	38	6	48	10	55	-	10	40	5	M6x1	6	3.000
20	5	1	36	47	7	58	10	42	-	10	44	5	M6x1	3	3.500
25	5	1	40	51	7	62	10	42	-	10	48	5	M6x1	3	3.500
25	10	1	40	51	7	62	16	55	-	10	48	5	M6x1	3	3.500
25	20	1	40	51	7	62	4	35	10.5	10	48	5	M6x1	4	3.500
25	25	1	40	51	7	62	9	35	8	10	N/A[4]	5	M6x1	5	3.500
32	5	1	50	65	9	80	10	55	-	12	62	6	M6x1	5	3.500
32	10	1	53[3]	65	9	80	16	69	-	12	62	6	M8x1	3	7.140
32	20	1	53[3]	65	9	80	16	80	-	12	62	6	M6x1	4	5.000
40	5	2	63	78	9	93	10	57	-	14	70	7	M6x1	5	3.500
40	10	2	63	78	9	93	16	71	-	14	70	7	M8x1	3	7.140
40	20	2	63	78	9	93	16	80	-	14	70	7	M8x1	4	5.000
40	40	2	63	78	9	93	16	85	7.5	14	N/A[4]	7	M8x1	8	3.500
50	10	2	75	93	11	110	16	95	-	16	85	8	M8x1	5	7.140

(2) For ≥ 16 mm nominal diameter.
(3) Dimension does not comply with DIN 69051.
(4) Round flange.

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Threaded Style Ball Nuts – Technical Specifications

Standard Lead Accuracy: ± 52 µm / 300 mm

Internal Return Threaded Ball Nut and Screw

- Cost-effective solution in a small envelope, ideal for use in small spaces
- Flexible solution for non-standard mounting
- Available in standard preload classes (Type Z2)
  - Z2 – no preload, clearance held to max indicated in table

Technical Specifications

Nom. Diameter	Lead	Return System	Ball Nut P/N	Ball Screw P/N	Performance Data					
					Dynamic Load Capacity		Static Load Capacity		Max. Axial Backlash	
[mm]	[mm]				[kN]	[lbs]	[kN]	[lbs]	[mm]	
10	2	M	**8103-448-022**	190-9680	2.0	440	3.4	769	0.05	
10	3	M	**8103-448-023**	190-9681	4.8	1076	8.6	1941	0.05	
10	10	K	**8103-448-030**	190-9689	2.9	659	5.2	1176	0.05	
12	2	M	**8105-448-031**	190-9690	6.8	1550	13.1	2945	0.05	

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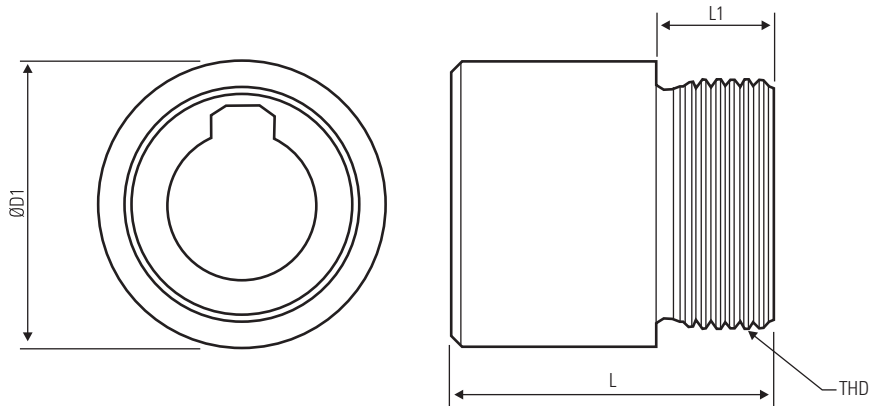
Threaded Style Ball Nuts – Technical Specifications



	Nom. Diameter	Lead	Screw Specifications				Nut Specifications					
			Major Diameter	Minor Diameter	Std Length	Screw Weight	L	D1 0/-.1	THD	L1	No. of Circuits	Ball Diameter
	[mm]	[mm]	[mm]	[mm]	[mm]	[kg/m]	[mm]	[mm]		[mm]		[mm]
	10	2	9.8	8.3	1800	0.59	22	19.5	M17 x 1	8	5	1.588
	10	3	9.7	8.0	1800	0.58	29	21	M18 x 1	9	7	1.984
	10	10	9.7	7.9	1800	0.58	35	23	M18 x 1	9	2x1.8	1.984
	12	2	11.8	10.3	1800	0.86	40	24	M20 x 1	10	9	1.588

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Cylindrical Style Ball Nuts – Technical Specifications

Standard Lead Accuracy: ± 52 µm / 300 mm

Internal Return Cylindrical Ball Nut and Screw

- Cost-effective solution in a small envelope, ideal for use in small spaces
- Flexible solution for non-standard mounting
- Available in standard preload classes (Type Z2)
  - Z2 – no preload, clearance held to max indicated in table

Technical Specifications

Nom. Diameter	Lead	Return System	Ball Nut P/N	Ball Screw P/N	Performance Data					
					Dynamic Load Capacity		Static Load Capacity		Max. Axial Backlash	
[mm]	[mm]				[kN]	[lbs]	[kN]	[lbs]	[mm]	
10	2	M	**8103-448-052**	190-9680	2.0	440	3.4	769	0.05	
10	3	M	**8103-448-053**	190-9681	4.8	1076	8.6	1941	0.05	
10	10	K	**8103-448-055**	190-9689	2.9	659	5.2	1176	0.05	
12	2	M	**8105-448-056**	190-9690	6.8	1550	13.1	2945	0.05	

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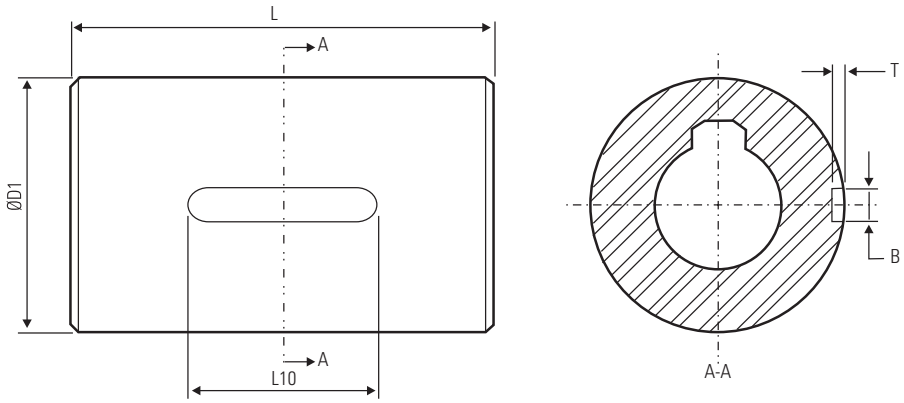
Cylindrical Style Ball Nuts – Technical Specifications



	Nom. Diameter	Lead	Screw Specifications				Nut Specifications					
			Major Diameter	Minor Diameter	Std Length	Screw Weight	L	D1 g6	B x T N9	L10	No. of Circuits	Ball Diameter
	[mm]	[mm]	[mm]	[mm]	[mm]	[kg/m]	[mm]	[mm]		[mm]		[mm]
	10	2	9.8	8.3	1800	0.59	22	19.5	3 x 1.8	13	5	1.588
	10	3	9.7	8.0	1800	0.58	29	21	3 x 1.8	13	7	1.984
	10	10	9.7	7.9	1800	0.58	35	23	3 x 1.8	13	2x1.8	1.984
	12	2	11.8	10.3	1800	0.86	40	24	3 x 1.8	18	9	1.588

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How to Order Metric Precision Rolled Ball Screws

This ordering key provides a quick overview of available precision rolled metric ball screws. To explore additional technical resources and options, contact Thomson customer support.

Ordering Key

1	2	3	4	5	6	7	8	9	10	11	12	13
RM	**25**	**10**	**FD**	**Z2-**	**271.5**	**L**	**W-**	**BK**	**S**	**K**	**X**	

1. Nut Configuration
RM = Metric

2. Nominal thread diameter
10 = 10 mm
12 = 12 mm
16 = 16 mm
20 = 20 mm
25 = 25 mm
32 = 32 mm
40 = 40 mm
50 = 50 mm
63 = 63 mm
80 = 80 mm

3. Thread lead
02 = 2 mm
03 = 3 mm
04 = 4 mm
05- = 5 mm
10 = 10 mm
20 = 20 mm
25 = 25 mm
40 = 40 mm

4. Nut style
T = Threaded internal ball return (TSI)
R = Cylindrical internal ball return (RSI)
FD = Flanged internal ball return (FSI)
FK = Flanged (DIN 69051), metal ball return
FN = Flanged, polymer ball return
MD = Flanged (DIN 69051), polymer ball return
MG = Threaded, metal ball return

5. Nut assembly condition
Z1- = Light preload (1-2%)
Z2- = Standard backlash
Z3- = Backlash reduced (0.05 mm max.)

6. Threaded length
xxx.x- = Lenght (mm)

7. Nut orientation
R = Nut faces right end
L = Nut faces left end
X = Nut ships on arbor

8. Wipers
X- = No wipers
W- = Polymer wipers (standard)

9. Left end configuration
X = Cut to length
K = Machine to print with drive
BK = Base mount with drive
BK1 = Base mount without drive
BF = Floating base mount with drive
BK1 = Floating base mount without drive
FK = Flange mount with drive
FK1 = Flange mount without drive
FF = Floating flange mount with drive
FF1 = Floating flange mount without drive
QK = Base mount with drive
QK1 = Base mount without drive
QF = Floating base mount with drive
QK1 = Floating base mount without drive
WK = Heavy duty flange with drive
WK1 = Heavy duty flange without drive
MK = Motor mount with drive

10. Left screw support configuration
X = No support (machined only)
S = Support installed on machined surface

11. Right end configuration
X = Cut to length
K = Machine to print with drive
BK = Base mount with drive
BK1 = Base mount without drive
BF = Floating base mount with drive
BK1 = Floating base mount without drive
FK = Flange mount with drive
FK1 = Flange mount without drive
FF = Floating flange mount with drive
FF1 = Floating flange mount without drive
QK = Base mount with drive
QK1 = Base mount without drive
QF = Floating base mount with drive
QK1 = Floating base mount without drive
WK = Heavy duty flange with drive
WK1 = Heavy duty flange without drive
MK = Motor mount with drive

12. Right screw support configuration
X = No support (machined only)
S = Support installed on machined surface

13. Custom Modifier
blank = Standard
M = Custom

Code Example: RM2510FDZ2-271.5LW-BKSKX
This describes a standard lashed Ø25 x 10 mm FSI ball screw assembly that is 271.5 mm in threaded length with a BK bearing support on the left side with drive extension, BK end bearing support without drive on the right side. The flange faces the left side (the side with the drive extension).
NOTE: Not all bearing supports are available in all sizes. See catalog or contact customer support for available combinations.

Express Prototypes, Less Lead Time

Prices and lead times are generally higher with other products as 98% of rolled metric ball screws are manufactured outside of North America.

Thomson provides expert application support and the ability to rapidly prototype designs by combining North American manufacturing of metric products with the engineering support of a trusted brand.

Don't pay extra to wait.
Order your Thomson prototype with delivery from our North American facility in Marengo:

	Standard Lead Time	Express Lead Time (Qualified Prototypes)
Components	2 - 3 days	1 day
Machined Assemblies	2 - 4 weeks	1 - 2 weeks

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Customized Products and Machining to Fit Your Applications

Standard (16 - 50 mm) Metric Ball Screws

- Custom coatings available (thin dense chrome)
- ± 12 µm/300 mm lead accuracy (P3)
- Reduced backlash (0.05 mm)

Miniature Metric Ball Screws

- Custom coatings available (thin dense chrome)

Standard and custom machining


KGF-D
Flanged


KGF-N
Flanged


KGF-D (FK)
Flanged

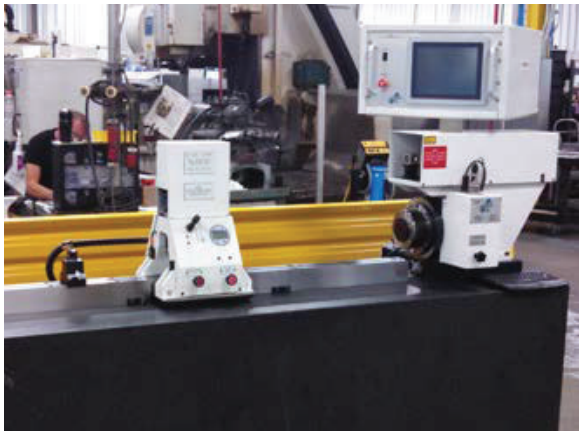

KGF-D (FH)
Flanged


KGM-D
Cylindrical


KGM-N
Cylindrical


KGM-G (ZG)
Threaded

Precision end journal machining to standard or customer specified requirements using CNC lathe and grinding.



State-of-the-art dynamic lead error verification to P5 accuracy.

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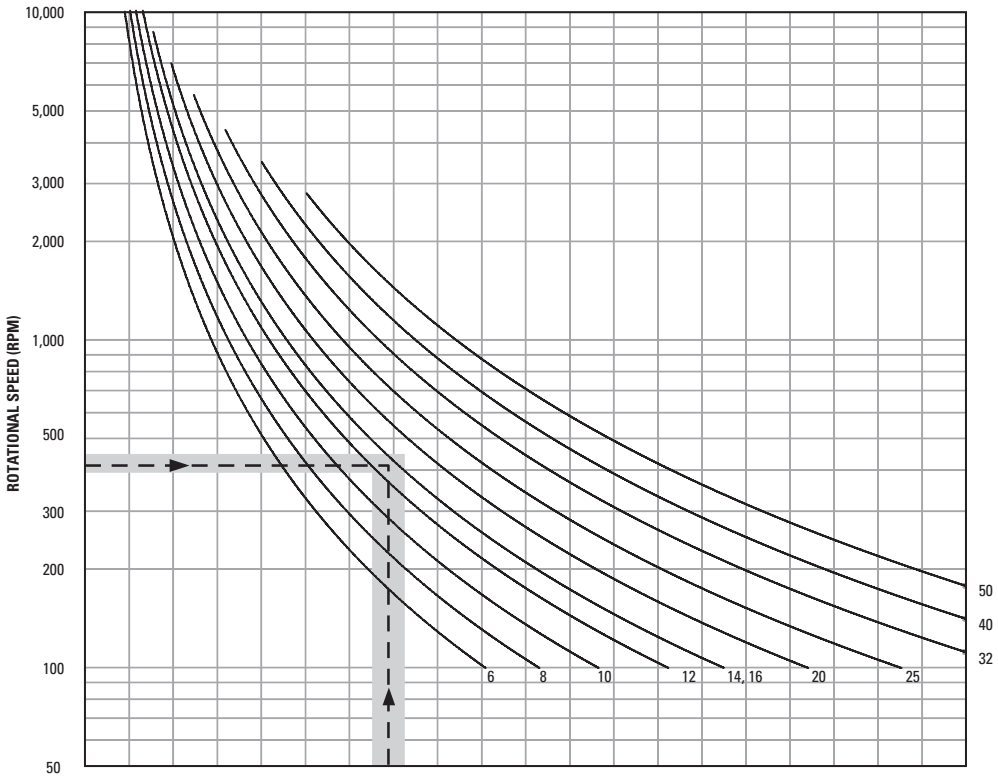
Ball Screw Engineering

Acceptable Speed vs. Length for Screws



END SUPPORT TYPE

A One end xed, other end free	Inches	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120
MAX. L	mm	152	304	457	609	762	914	1056	1219	1371	1524	1676	1828	1981	2133	2286	2438	2590	2743	2895	3048
B Both ends supported	Inches	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
MAX. L	mm	254	508	762	1016	1270	1524	1778	2032	2286	2540	2794	3048	3302	3556	3810	4064	4318	4572	4826	5080
C One end xed, other end supported	Inches	12	24	36	48	61	73	85	97	109	121	133	145	158	170	182	194	206	218	230	242
MAX. L	mm	304	609	914	1219	1549	1854	2159	2463	2768	3073	3378	3683	4013	4318	4622	4927	5232	5537	5842	6146
D Both ends xed	Inches	15	30	45	60	75	90	105	119	134	149	164	179	194	209	224	239	254	269	284	298
MAX. L	mm	381	762	1143	1524	1905	2286	2667	3022	3403	3784	4165	4546	4927	5308	5689	6070	6451	6832	7213	7569

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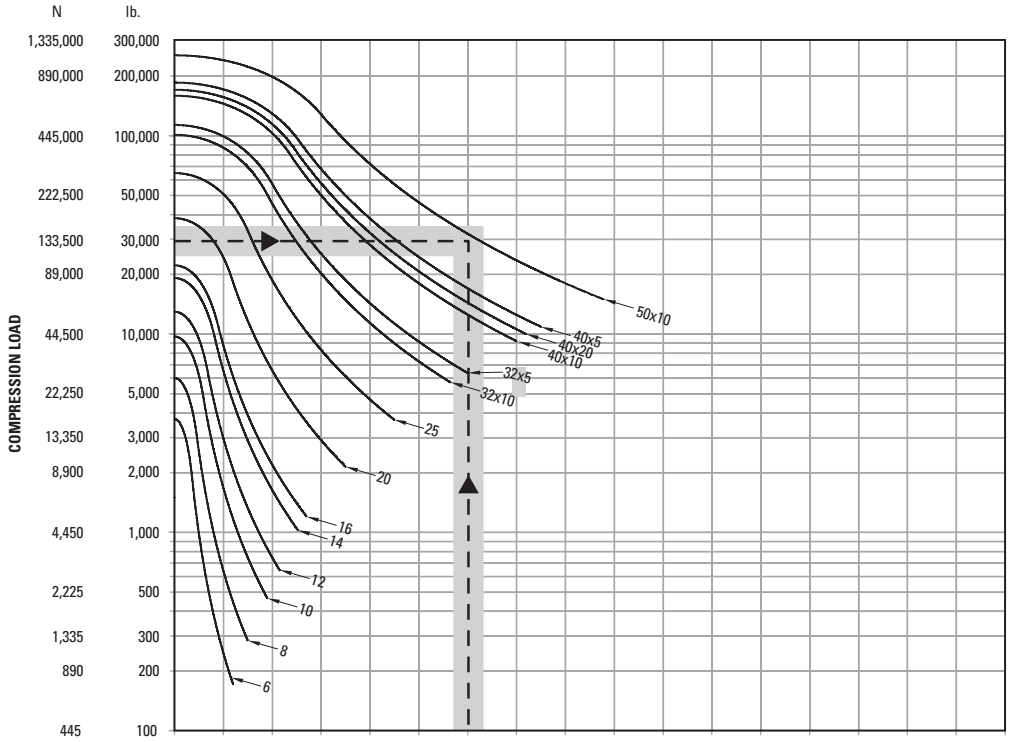
Ball Screw Engineering

Compression Load vs. Length for Designated Ball Screws



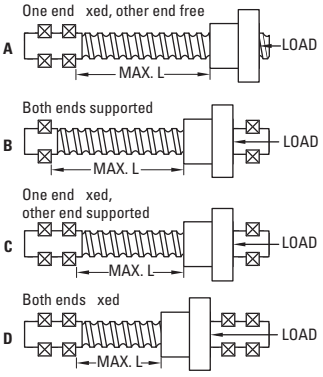
END SUPPORT TYPE

A — One end xed, other end free

B — Both ends supported

C — One end xed, other end supported

D — Both ends xed



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

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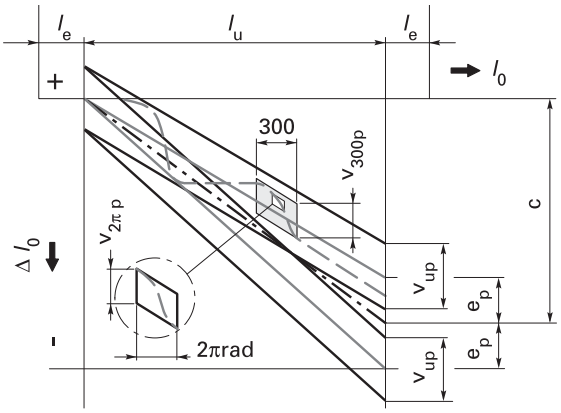
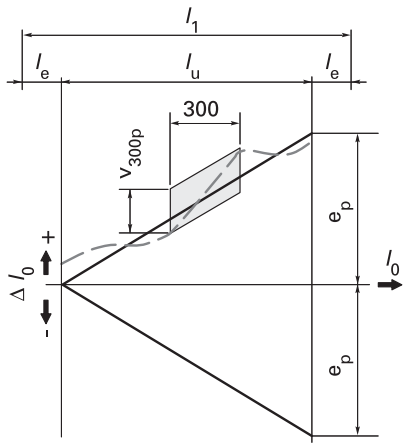
Screw Accuracy – Permissible Travel Variation

Type P – Positioning Ball Screws



Type T – Transport Ball Screws



l_1 = Axial thread length l_u = Useful travel l_e = Overrun = Table 2 l_0 = Nominal distance Δl_0 = Travel deviation

Lead Accuracy

		P3	P5	T7
v_{300p}	Permissible travel variance over 300 mm	Table 1	Table 1	Table 1
$v_{2\pi p}$	Permissible travel variance over 2 π travel	Table 1	Table 1	-
c	Travel compensation	-0.01/1000	0	0
e_p	Limit deviations for useful distance l_u	Table 3	Table 3	$\pm \frac{l_u}{300} \cdot v_{300p}$
v_{up}	Permissible travel variance over useful travel l_u	Table 3	Table 3	-

Table 1

	Tolerance Class				
	1	3	4	5	7
v300p [µm]	6	12	18	23	52
v2πp [µm]	4	6	7	8	-

Table 2

Nominal lead	Ph [mm]	≤ 2.5	≤ 5	≤ 10	≤ 20	> 20
Lead error	le [mm]	10	20	40	60	100

Table 3

		l_u [mm]	>	0	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	12500
			≤	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	12500	16000
Tolerance class	1	e_p	[µm]	6	7	8	9	10	11	13	15	18	22	26	32	39	48	60	76	94	115
		v_{up}		6	6	7	7	8	9	10	11	13	15	17	21	27	33	40	50	61	76
	3	e_p		12	13	15	16	18	21	24	29	35	41	50	62	76	92	115	140	175	220
		v_{up}		12	12	13	14	16	17	19	22	25	29	34	41	49	61	75	92	113	140
	4	e_p		18	18	20	22	25	28	33	39	46	55	68	84	102	125	159	199	240	290
		v_{up}		18	19	20	21	23	26	29	33	38	44	52	56	68	83	101	124	152	189
	5	e_p		23	25	27	32	36	40	47	55	65	78	96	115	140	170	210	270	330	410
		v_{up}		23	25	26	29	31	34	39	44	51	59	69	82	99	119	142	174	213	265

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Glossary and Formulas

Accuracy
A measurement of precision. Perfect accuracy, for example, means advancing a ball nut 25 mm from any point on a screw will always require the exact same number of revolutions.

Axial Lash / Backlash
The axial-free motion between the ball nut and ball screw; a measure of system stiffness and repeatability.

Column Load / Compression Load
Load that would tend to compress or buckle the ball screw shaft.

Dynamic Load Rating
Maximum load that a ball bearing screw assembly can maintain for 1 million revolutions (Metric Series).

Lead
The axial distance a screw travels during one revolution.

Lead Error
The amount of positional error per 300 mm (Metric Series) that is inherent in linear motion on ball screws.

Load/Life Rating
The usable life of a ball bearing screw assembly measured in revolutions under a specific load. The revolutions that 90% of a group of ball bearing screws will complete, or exceed, before the first evidence of fatigue develops.

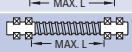
Repeatablity
A measure of constancy that is directly related to axial backlash. Higher backlash equates to lower repeatability and may be corrected by preloading the ball nut if required.

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

Formulas

Equivalent Load	$F_{eq}[N] = \left(\sum_{i=1}^{n} F_i^3 \times \frac{n_i}{n_{eq}} \times \frac{q_i}{100} \right)^{1/3}$	Power	$P_d[W] = \frac{F_{eq} \times P \times n}{5.398 \times 10^4}$
Equivalent Speed	$n_{eq}[rpm] = \sum_{i=1}^{n} n_i \times \frac{q_i}{100}$	Critical Screw Speed	$n_S[rpm] = S \times C_{S_1} \times 1.2 \times 10^8 \times \frac{d_r}{L^2}$
Life	$L_{10}[Rot] = \left(\frac{C_{am}}{F_{eq}} \right)^3 \times 10^6$	Critical Nut Speed	$DN = d_0 n < 140{,}000$
Torque	$T[Nm] = 1.77 \times 10^{-4} \times F_{eq} \times P$	Permissible Compression Load	$F_S[N] = S \times C_{S_2} \times \frac{9.687}{L^2} \times 10^4 \times \frac{d_r^4}{L^2}$

q = Duration [%]
C_{am} = Dynamic Load [N]
P = Lead [mm]
C_S = End Fixity Factor (see table on the right)
S = Safety Factor (0.8 recommended)
d_0 = Nominal Diameter [mm]
d_r = Root Diameter [mm]
L = Max. Unsupported Length [mm]
n = Rotational Speed of Screw [RPM]

End Support		C_{S_1}	C_{S_2}
A		0.36	0.25
B		1.00	1.00
C		1.47	2.00
D		2.23	4.00

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