



With over thirty years of experience manufacturing precision ball screws, Nook Industries has expanded the PowerTrac™ offering to include metric ball screws providing design engineers a globally accepted product. Metric ball screws are available in many diameters, leads, and pitches.

The metric ball screws are available with internal, low profile external or external return guide ball nuts in more than 25 sizes. Several Nook metric products are available with preloaded ball nut systems. See the metric ball screw product technical data pages 153-170 for additional detail.



MRT and PMT BALL SCREWS

These screw assemblies are similar in construction and materials to PowerTrac™ Inch Ball Screws and Nuts.

MRT Standard lead accuracy:

±100µm / 300mm

PMT Standard lead accuracy:

±25µm / 300mm

Temperature Range:

For standard applications: -20° to +80° C

Wipers: Plastic



CARRY™ BALL SCREWS

PowerTrac™ Carry™ Metric Rolled Ball Screws are hardworking and durable. Designed for applications which require predictable life while moving a load with high efficiency and duty cycle. These screws are economical and maintain lead accuracy that is appropriate for most industrial applications.

Made of hardened alloy or stainless steel PowerTrac™ Carry™ ball screws are matched with a range of durable ball nuts with either external low-profile returns or internal returns. Their compact shape enhances the inherent advantages of ball screw design.

Standard lead accuracy: is ±100µm / 300mm

±50µm / 300mm available on request.

Temperature Range:

For standard applications: -20° to +80° C

Wipers: Plastic or brush

CARRY™ BALL NUTS

TYPE Z:

Internal Return or Low-Profile
External Return



TYPE FG:

Internal Return or Low-Profile
External Return



TYPE FB:

Internal Return or Low-Profile
External Return



16x50:

Internal
Return



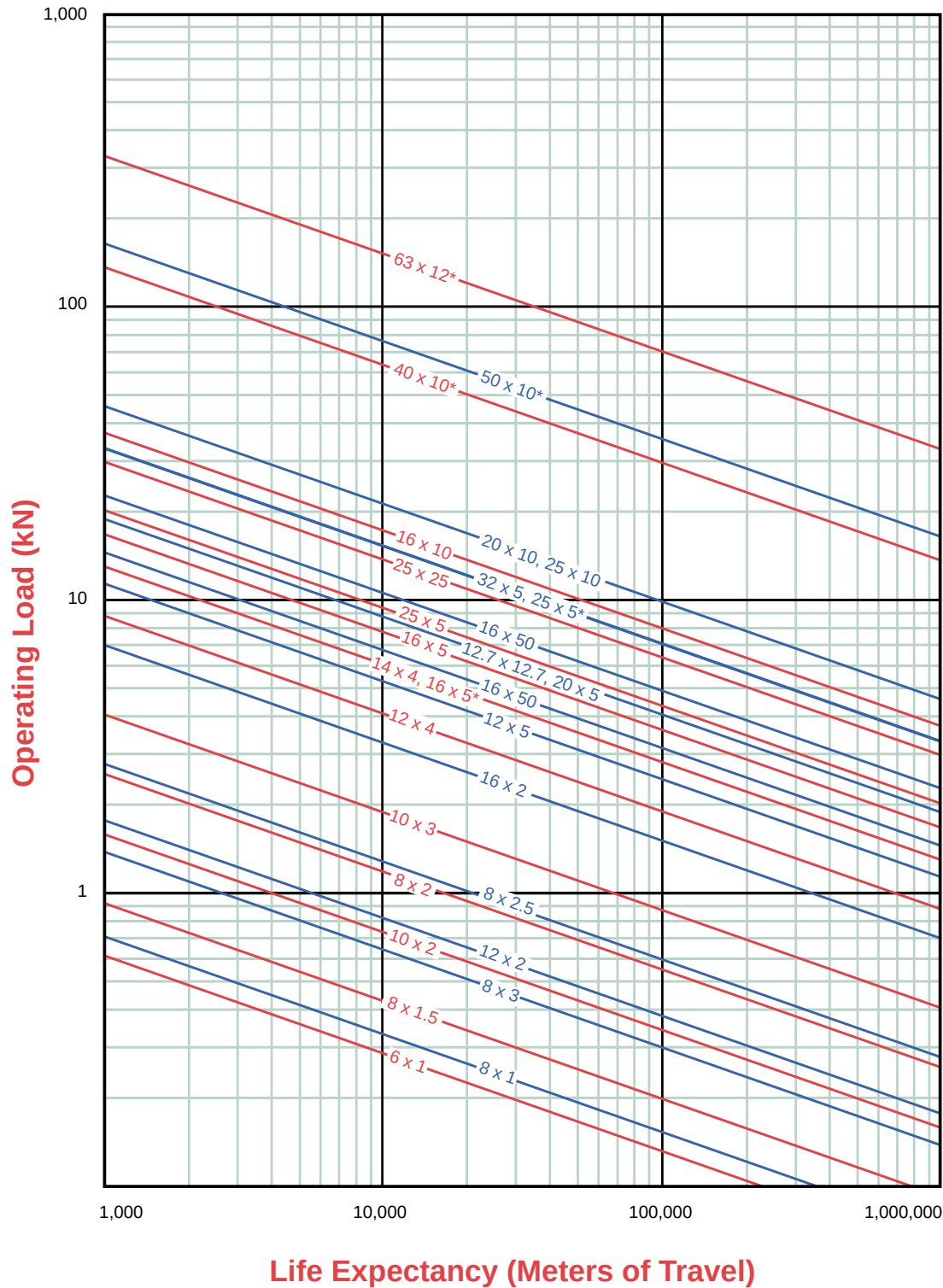
TO USE THIS CHART:

1) Determine required Life
(in meters of travel)
at equivalent operating load.

2) Find point at which load and life
requirement intersect.

3) Select ball nut to the right or above
the intersect point.

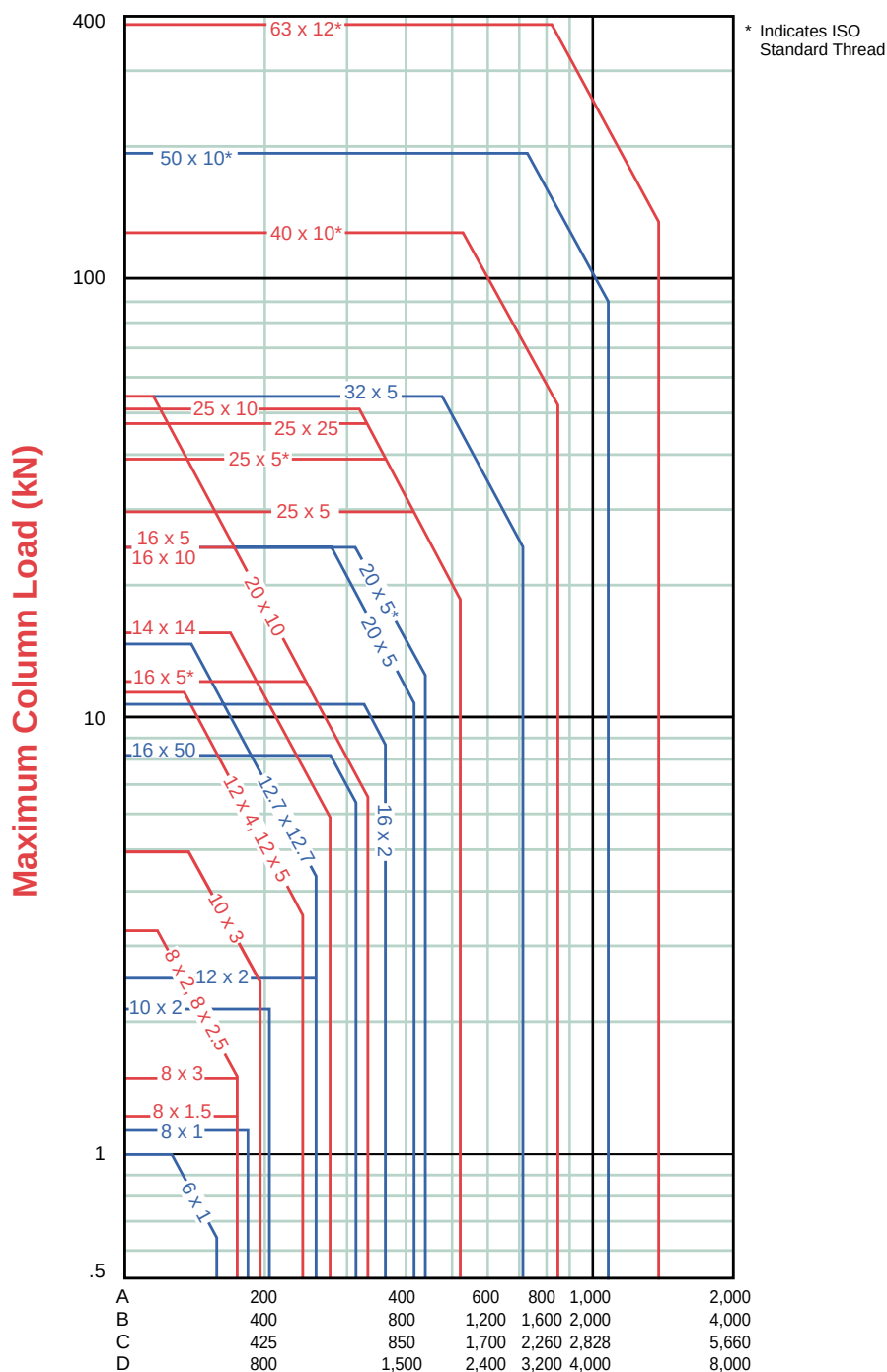
NOTE: IF USING A BALL SCREW
WITHOUT LUBRICANT
DE-RATE LIFE BY 90%



COLUMN STRENGTH: METRIC MRT, PMT AND CARRY™ SCREWS

Use this chart to verify the screw selected has sufficient column strength for your load.

TO USE THIS CHART: find a point at which the maximum length between bearing and load intersects the maximum load. Be sure the screw selected is above and to the right of that point.



Maximum Length Between Bearings (mm)

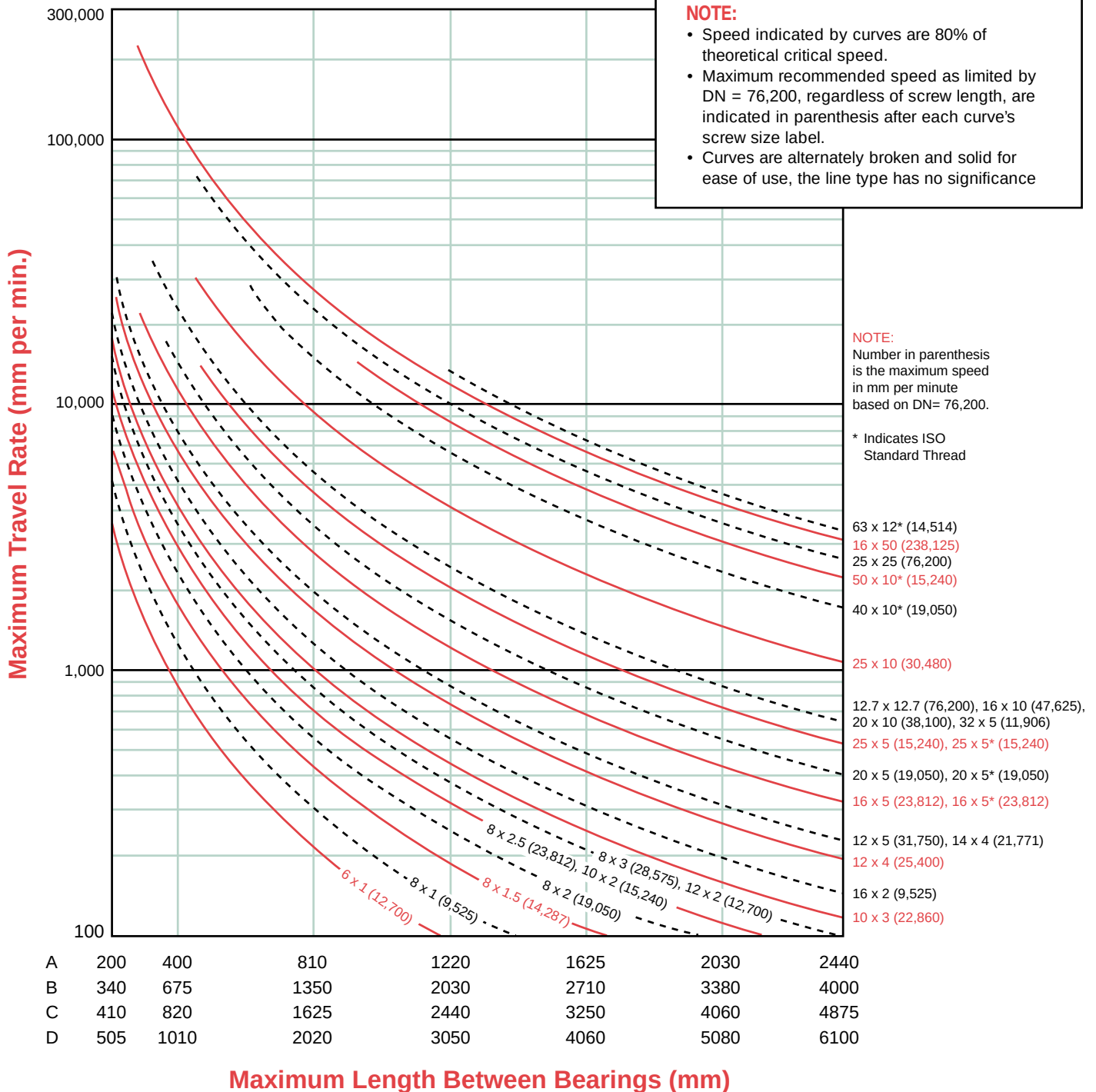
See Page 89 for Reference Description on "A-B-C-D" end fixity.

Metric to Inch Conversions:

1 Newton = .224 lbf 1mm = 0.039 in. 1 n.m = 8.85 in.-lb.

TO USE THIS CHART:

- 1) Determine maximum travel rate required.
- 2) Determine screw length "L".
- 3) Find point at which travel rate and screw length intersect.
Select a screw above and to the right of that point.



See Page 89 for Reference Description on "A-B-C-D" end fixity.

Metric to Inch Conversions:

1 Newton = .224 lbf 1mm = 0.039 in. 1 n.m = 8.85 in.-lb.

ECS-16020 - RA / EK / 4N / 1063 / ECN-16020-RBU / S

BALL SCREW

Thread Form Codes					
Carry Part#	Dia. x Lead	Carry Part#	Dia. x Lead	Part#	Dia. x Lead
ECS-06010	= 6 x 1	ECS-14040	= 14 x 4	MRT 16x5	= 16 x 5
ECS-08010	= 8 x 1	ECS-16020	= 16 x 2	MRT 20x5	= 20 x 5
ECS-08015	= 8 x 1.5	ECS-16050	= 16 x 5	MRT 25x5	= 25 x 5
ECS-08020	= 8 x 2	ECS-16100	= 16 x 10	MRT 40x10	= 40 x 10
ECS-08025	= 8 x 2.5	ECS-16500	= 16 x 50	MRT 50x10	= 50 x 10
ECS-08030	= 8 x 3	ECS-20050	= 20 x 5	MRT 63x12	= 63 x 12
ECS-10020	= 10 x 2	ECS-20010	= 20 x 10	PMT 16x5	= 16 x 5
ECS-10030	= 10 x 3	ECS-25050	= 25 x 5	PMT 20x5	= 20 x 5
ECS-12020	= 12 x 2	ECS-25100	= 25 x 10	PMT 25x5	= 25 x 5
ECS-12040	= 12 x 4	ECS-25250	= 25 x 25	PMT 40x10	= 40 x 10
ECS-12050	= 12 x 5	ECS-32050	= 32 x 5	PMT 50x10	= 50 x 10
ECS-12120	= 12.7 x 12.7			PMT 63x12	= 63 x 12

MATERIAL

THREAD	RA	MATERIAL
R = Right Hand		A = Alloy Steel - Rolled
L = Left Hand		B = Alloy Steel - Precision Rolled
		S = Stainless Steel - Rolled

NOTE: Not all materials/threads are available for all sizes.

FIRST END CONFIGURATION

ENZE-MOUNT™ / End Machining
(see page 190 & 188)

- 1 = Type 1
2 = Type 2
3 = Type 3
4 = Type 4

B = Universal Double Bearing Support
Endcap Facing Screw Thread

C = Universal Single Bearing Support

D = Flanged Single Bearing Support
Flange Facing Screw Thread

E = Universal Double Bearing Support
End Cap Facing Away From Screw Thread

F = Flanged Double Bearing Support
Flange Facing Screw Thread

G = Flanged Single Bearing Support
Flange Facing Away From Screw Thread

H = Flanged Single Bearing Support
Flange Facing Away From Screw Thread

00 = No End Machining (Screw will cut to desired length).

XX = Custom Machining (Print or specified data must be provided).

NOTE: Single Bearing Supports are used in conjunction with Type 1N end machining.
Double Bearing Supports are used in conjunction with Type 3K, 3L, or 3N end machining.

EK

EK = Universal Double Bearing
Support, with Keyway

Shaft Extension
(see page 188)

K = Shaft Extension
with Keyway

L = Shaft Extension
without Keyway

N = No Shaft
Extension

NOTE:
Both Ends must
be specified

SECOND END CONFIGURATION

Refer to the First End Configuration section above.

NOTE: Both Ends must be specified.

OVER - ALL - LENGTH (OAL)

Length in mm.

TRAVEL NUT

CARRY NUT

ECN - 16020 - R B U

Nut Thread Code

MATERIAL

R = Right Hand Alloy
L = Left Hand Alloy
S = Right Hand Stainless Steel
M = Left Hand Stainless Steel

N = No Wiper
U = With Wiper

NUT STYLE

Z = Type Z Nut
H = 16 x 50 Nut

A = Type FB
Round Flange
B = Type FB
Standard Flange
C = Type FB
"D" Flange

G = Type FG

K = Type FB Round
Flange High Load
J = Type FB Standard
Flange High Load
L = Type FB "D" Flange
High Load
D = Type FG High Load

MRT or PMT NUT

Use standard part number
found in the Technical Data
Section for Metric Ball Screws.

Example:
MBN 10206 = 16 x 5 MRT Nut

Nut will be installed with flange or threaded end toward first end designation. 00000 = No Nut

MODIFIER LIST

S or M Required

S = Standard, no additional description required

M = Modified, additional description required

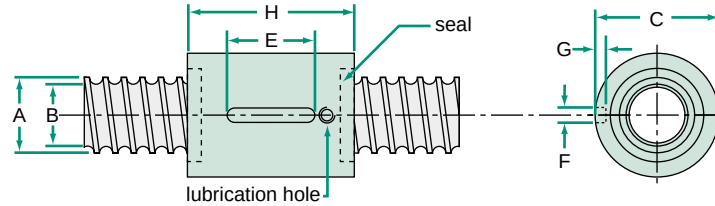
F (Optional for MRT and PMT Screws Only)

F = Round Flange

6mm Carry™ METRIC THREAD

LEAD ACCURACY: $\pm 100\mu\text{m}/300\text{mm}$

Carry Type Z Ball Nut



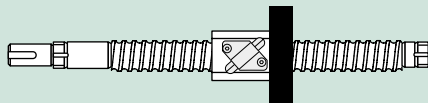
dimensions in mm

SCREW SPECIFICATIONS						NUT SPECIFICATIONS												load rating (N)	
dia x lead	helix	reference number*	A	B root dia	wgt. (g/m)	part number	C	H	E	F	G	lash	wiper **	ball return location	wgt. (g)	torque to raise 1 kN (N·m)		Dyn. (C _a)	Static (C _{0a})
6 x 1	RH	ECS-06010-R□	6.0	5.0	196	ECN-06010-□ZN	12	14	8	2	1.0	0.03	—	Internal	8	0.178		600	1000

*Lengths available up to 3,000 mm. See page 152 and 170 to complete reference number **All nuts with wiper feature an M5 lubrication hole.

END MACHINING

Machining for Nook standard ends or custom requirement available.



See page 188 for complete product details.

LUBRICANT

Prolong ball screw and nut performance with this special lubricant.



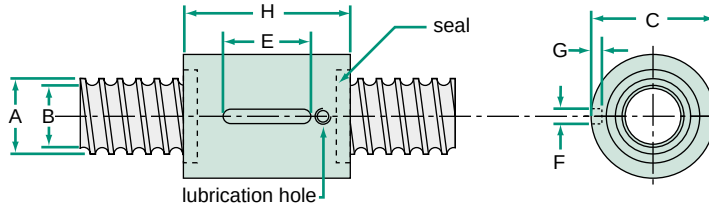
E-900 12oz. Spray or 32oz. Liquid
See page 95 for complete product details.



8mm Carry™ METRIC THREAD

LEAD ACCURACY: $\pm 100\mu\text{m}/300\text{mm}$

Carry Type Z Ball Nut

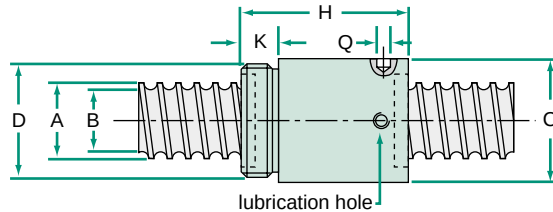


dimensions in mm

SCREW SPECIFICATIONS						NUT SPECIFICATIONS												
dia x lead	helix	reference number*	A	B root dia	wgt. (g/m)	part number	C	H	E	F	G	lash	wiper **	ball return location	wgt. (g)	torque to raise 1 kN (N·m)	load rating (N)	
																	Dyn. (C _a)	Static (C _{0a})
8 x 1	RH	ECS-08010-R□	8.0	7.0	357	ECN-08010-□ZN	14	14	8	2	1.2	0.03	—	Internal	9	0.178	700	1200
8 x 1.5	RH	ECS-08015-R□	8.0	6.7	322	ECN-08015-□ZN	14	14	8	2	1.2	0.04	—	Internal	17	0.254	800	1300
8 x 2	RH	ECS-08020-R□	8.0	6.5	295	ECN-08020-□ZN	16	14	8	2	1.2	0.06	—	External	18	0.356	2000	3200
8 x 2.5	RH	ECS-08025-R□	8.0	6.6	335	ECN-08025-□ZN	18	16	10	3	2.0	0.06	—	External	22	0.432	2000	3200
8 x 3	RH	ECS-08030-R□	8.0	6.7	352	ECN-08030-□ZN	14	12	8	2	1.2	0.05	—	Internal	16	0.533	950	1500

*Lengths available up to 3,000 mm. See page 152 and 170 to complete reference number **All nuts with wiper feature an M5 lubrication hole.

Carry Type FG Ball Nut

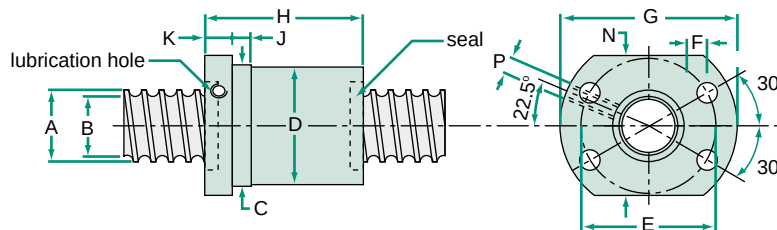


dimensions in mm

SCREW SPECIFICATIONS						NUT SPECIFICATIONS												
dia x lead	helix	reference number*	A	B root dia	wgt. (g/m)	part number	C	D	H	K	Q	lash	wiper **	ball return location	wgt. (g)	torque to raise 1 kN (N·m)	load rating (N)	
																	Dyn. (C _a)	Static (C _{0a})
8 x 1.5	RH	ECS-08015-R□	8.0	6.7	322	ECN-08015-□GN	16	M14x1	22	8	2.5	0.04	—	Internal	25	0.254	800	1300
8 x 2.5	RH	ECS-08025-R□	8.0	6.6	335	ECN-08025-□GN	17.5	M15x1	24	8	2.5	0.06	—	External	35	0.432	2000	3200
8 x 3	RH	ECS-08030-R□	8.0	6.7	352	ECN-08030-□GN	16	M14x1	22	8	2.5	0.05	—	Internal	25	0.533	950	150

*Lengths available up to 3,000 mm. See page 152 and 170 to complete reference number **All nuts with wiper feature an M5 lubrication hole.

Carry Type FB Ball Nut



dimensions in mm

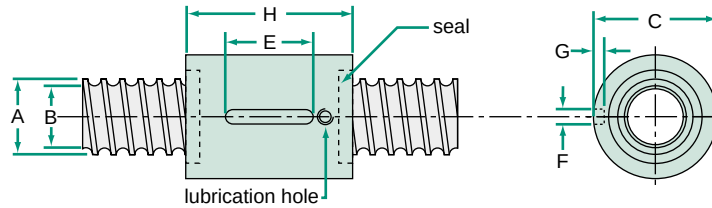
SCREW SPECIFICATIONS						NUT SPECIFICATIONS																	
dia x lead	helix	reference number*	A	B root dia	wgt. (g/m)	part number	C	D	E	F	G	H	J	K	N	P	lash	wiper **	ball return location	wgt. (g)	torque to raise 1 kN (N·m)	load rating (N)	
																						Dyn. (C _a)	Static (C _{0a})
8 x 2	RH	ECS-08020-R□	8.1	6.5	295	ECN-08020-□BU	16	15.5	22	3.4	28	25	4	6	19	Ø4	0.06	Plastic	External	33	0.356	2000	3200

*Lengths available up to 3,000 mm. See page 152 and 170 to complete reference number **All nuts with wiper feature an M5 lubrication hole.

10mm Carry™ METRIC THREAD

LEAD ACCURACY: $\pm 100\mu\text{m}/300\text{mm}$

Carry Type Z Ball Nut

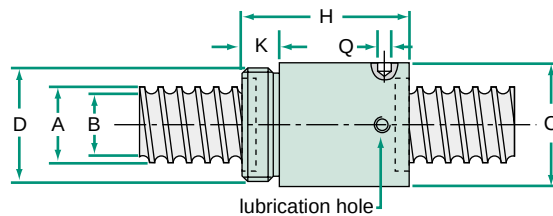


dimensions in mm

SCREW SPECIFICATIONS						NUT SPECIFICATIONS												load rating (N)	
dia x lead	helix	reference number*	A	B root dia	wgt. (g/m)	part number	C	H	E	F	G	lash	wiper **	ball return location	wgt. (g)	torque to raise 1 kN (N·m)		Dyn. (C _a)	Static (C _{0a})
10 x 2	RH	ECS-10020-R□	9.7	8.2	494	ECN-10020-□ZN	18	14	10	3	1.2	0.06	—	Internal	15	0.356		1250	2100
10 x 3	RH,LH	ECS-10030-□□	9.9	7.8	494	ECN-10030-□Z□	22	24	10	3	2.0	0.06	Plastic	External	46	0.541		2800	5000

*Lengths available up to 3,000 mm. See page 152 and 170 to complete reference number **All nuts with wiper feature an M5 lubrication hole.

Carry Type FG Ball Nut



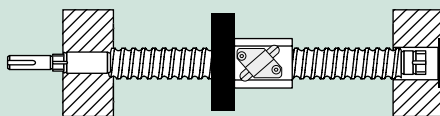
dimensions in mm

SCREW SPECIFICATIONS						NUT SPECIFICATIONS												load rating (N)	
dia x lead	helix	reference number*	A	B root dia	wgt. (g/m)	part number	C	D	H	K	Q	lash	wiper **	ball return location	wgt. (g)	torque to raise 1 kN (N·m)		Dyn. (C _a)	Static (C _{0a})
10 x 2	RH	ECS-10020-R□	9.7	8.2	494	ECN-10020-□GN	18	M16x1	22	8	2.5	0.06	—	Internal	23	0.356		1250	2100
10 x 2	RH	ECS-10020-R□	9.7	8.2	494	ECN-10020-□DN	19.5	M17x1	22	7	2.5	0.06	—	Internal	23	0.356		1700	2800
10 x 3	RH,LH	ECS-10030-□□	9.9	7.8	494	ECN-10030-□G□	21	M18x1	29	9	3	0.06	Plastic	External	44	0.533		2800	5000

*Lengths available up to 3,000 mm. See page 152 and 170 to complete reference number **All nuts with wiper feature an M5 lubrication hole.

BALL SCREW ASSEMBLIES

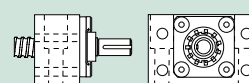
These assemblies are shipped with screw, nut, flange, and bearing supports.



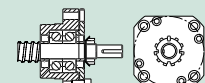
See page 145 for complete product details.

EZZE-MOUNT™ END BEARING SUPPORTS

A convenient solution for mounting ball screw assemblies.



Single or Double Bearing
Universal Mount



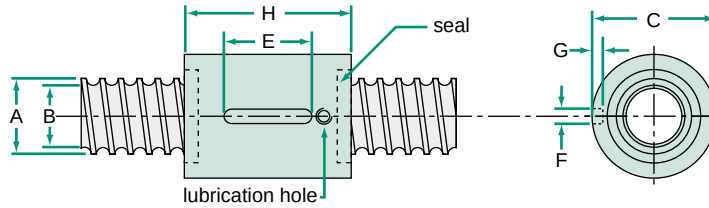
Single or Double Bearing
Flange Mount

See page 190 for complete product details.

12mm Carry™ METRIC THREAD

LEAD ACCURACY: $\pm 100\mu\text{m}/300\text{mm}$

Carry Type Z Ball Nut

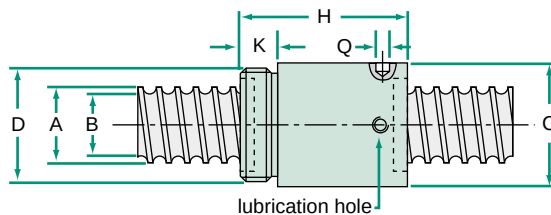


dimensions in mm

SCREW SPECIFICATIONS						NUT SPECIFICATIONS												
dia x lead	helix	reference number*	A	B root dia	wgt. (g/m)	part number	C	H	E	F	G	lash	wiper **	ball return location	wgt. (g)	torque to raise 1 kN (N·m)	load rating (N)	
																	Dyn. (C _a)	Static (C _{0a})
12 x 2	RH	ECS-12020-R□	12.0	10.6	750	ECN-12020-□ZN	20	15	10	3	1.2	0.06	—	Internal	19	0.356	1380	2500
12 x 4	RH	ECS-12040-R□	12.0	9.8	739	ECN-12040-□ZN	26	24	10	3	1.8	0.07	—	External	68	0.711	5500	11000
12 x 4	RH	ECS-12040-R□	12.0	9.8	739	ECN-12040-□ZU	26	32	10	3	1.8	0.07	Plastic	External	70	0.711	5500	11000

*Lengths available up to 3,000 mm. See page 152 and 170 to complete reference number **All nuts with wiper feature an M5 lubrication hole.

Carry Type FG Ball Nut

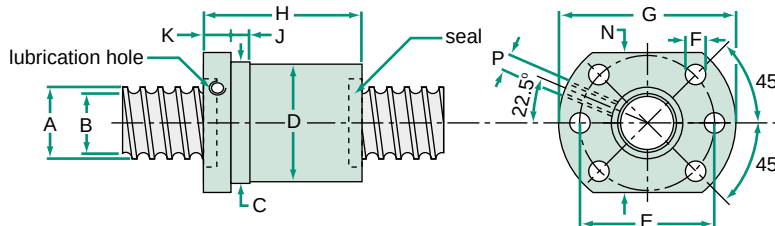


dimensions in mm

SCREW SPECIFICATIONS						NUT SPECIFICATIONS												
dia x lead	helix	reference number*	A	B root dia	wgt. (g/m)	part number	C	D	H	K	Q	lash	wiper **	ball return location	wgt. (g)	torque to raise 1 kN (N·m)	load rating (N)	
																	Dyn. (C _a)	Static (C _{0a})
12 x 2	RH	ECS-12020-R□	12.0	10.6	750	ECN-12020-□GN	20	M18x1	23	8	2.5	0.06	—	Internal	24	0.356	1380	2500
12 x 4	RH	ECS-12040-R□	12.0	9.8	739	ECN-12040-□GN	26	M20x1	32	8	2.5	0.07	—	External	83	0.711	5500	11000
12 x 4	RH	ECS-12040-R□	12.0	9.8	739	ECN-12040-□GU	26	M20x1	34	10	2.5	0.07	Plastic	External	84	0.711	5500	11000
12 x 5	RH	ECS-12050-R□	12.0	9.5	737	ECN-12050-□G□	26	M20x1	37	8	2.5	0.07	Plastic	External	87	0.889	6600	12000
12.7x 12.7	RH	ECS-12120-R□	13.1	10.3	880	ECN-12120-□G□	29.5	M25x1.5	50	12	3	0.07	Brush	External	134	2.235	8000	15500

*Lengths available up to 3,000 mm. See page 152 and 170 to complete reference number **All nuts with wiper feature an M5 lubrication hole.

Carry Type FB Ball Nut



dimensions in mm

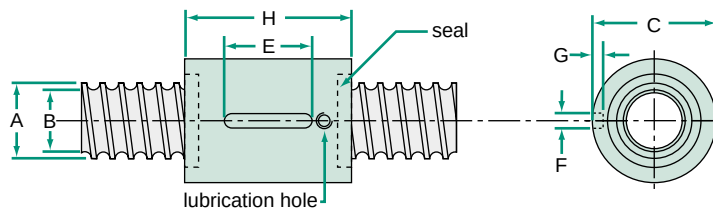
SCREW SPECIFICATIONS						NUT SPECIFICATIONS																	
dia x lead	helix	reference number*	A	B root dia	wgt. (g/m)	part number	C	D	E	F	G	H	J	K	N	P	lash	wiper **	ball return location	wgt. (g)	torque to raise 1 kN (N·m)	load rating (N)	
																						Dyn. (C _a)	Static (C _{0a})
12 x 4	RH	ECS-12040-R□	12.0	9.8	739	ECN-12040-□BU	26	25.5	32	4.5	39.5	36	5	8	FA	M5	0.07	Plastic	External	126	0.711	5500	11000
12 x 5	RH	ECS-12050-R□	12.0	9.5	737	ECN-12050-□BU	26	25.5	32	4.5	39.5	40	5	7	FA	M5	0.07	Plastic	External	126	0.889	6600	12000

*Lengths available up to 3,000 mm. See page 152 and 170 to complete reference number **All nuts with wiper feature an M5 lubrication hole.

14mm Carry™ METRIC THREAD

LEAD ACCURACY: $\pm 100\mu\text{m}/300\text{mm}$

Carry Type Z Ball Nut

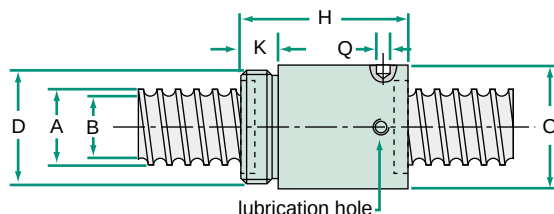


dimensions in mm

SCREW SPECIFICATIONS						NUT SPECIFICATIONS												
dia x lead	helix	reference number*	A	B root dia	wgt. (g/m)	part number	C	H	E	F	G	lash	wiper **	ball return location	wgt. (g)	torque to raise 1 kN (N·m)	load rating (N)	
																	Dyn. (C _a)	Static (C _{oa})
14 x 4	RH,LH	ECS-14040-□□	14.0	11.5	986	ECN-14040-□ZN	29	24	16	4	2.5	0.07	—	External	79	0.711	8100	16000
14 x 4	RH,LH	ECS-14040-□□	14.0	11.5	986	ECN-14040-□ZU	29	32	16	4	2.5	0.07	Plastic	External	82	0.711	8100	16000

*Lengths available up to 3,000 mm. See page 152 and 170 to complete reference number **All nuts with wiper feature an M5 lubrication hole.

Carry Type FG Ball Nut

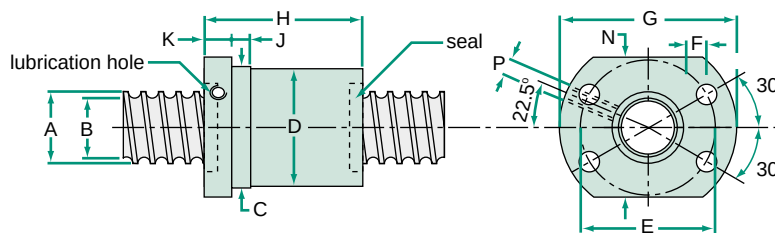


dimensions in mm

SCREW SPECIFICATIONS						NUT SPECIFICATIONS												
dia x lead	helix	reference number*	A	B root dia	wgt. (g/m)	part number	C	D	H	K	Q	lash	wiper **	ball return location	wgt. (g)	torque to raise 1 kN (N·m)	load rating (N)	
																	Dyn. (C _a)	Static (C _{oa})
14 x 4	RH,LH	ECS-14040-□□	14.0	11.5	986	ECN-14040-□GN	29	M22x1.5	32	8	3	0.07	—	External	97	0.711	8100	16000
14 x 4	RH,LH	ECS-14040-□□	14.0	11.5	986	ECN-14040-□GU	29	M22x1.5	38	8	3	0.07	Plastic	External	111	0.711	8100	16000

*Lengths available up to 3,000 mm. See page 152 and 170 to complete reference number **All nuts with wiper feature an M5 lubrication hole.

Carry Type FB Ball Nut



dimensions in mm

SCREW SPECIFICATIONS						NUT SPECIFICATIONS																	
dia x lead	helix	reference number*	A	B root dia	wgt. (g/m)	part number	C	D	E	F	G	H	J	K	N	P	lash	wiper **	ball return location	wgt. (g)	torque to raise 1 kN (N·m)	load rating (N)	
																						Dyn. (C _a)	Static (C _{oa})
14 x 4	RH,LH	ECS-14040-□□	14.0	11.5	986	ECN-14040-□BU	29	28.8	38	5.5	48	40	6	8	36	M5	0.07	Plastic	External	175	0.711	8100	16000

*Lengths available up to 3,000 mm. See page 152 and 170 to complete reference number **All nuts with wiper feature an M5 lubrication hole.

16x5 MRT

LEAD ACCURACY: $\pm 100\mu\text{m}/300\text{mm}$

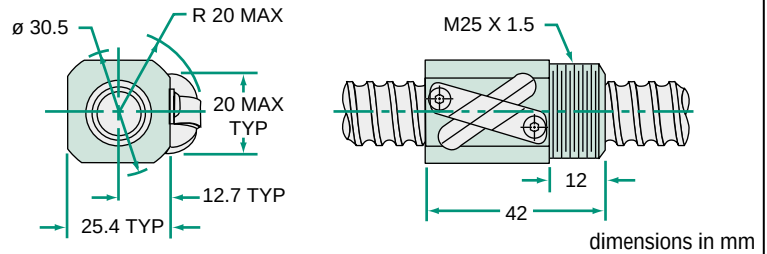
Single Start

16.0	Ball Circle Diameter
5.0	Lead
12.9	Root Diameter
3.175	Nominal Ball Diameter
1222	Screw Mass (g/m)

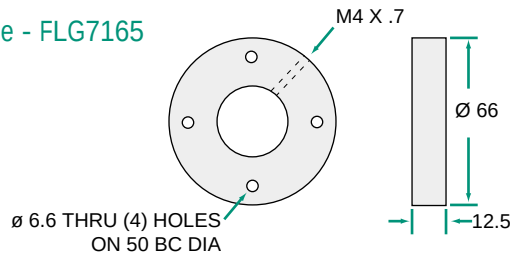
Available Screw Length	PART NUMBERS
	RH
up to 7 M	16x5MRT
Custom cut lengths available up to 7M. For longer lengths contact customer service.	

MBN Single Circuit Ball Nut

PRODUCT SPECIFICATIONS	RH
Dynamic Load C_a (kN)	7.6
Static Load C_{0a} (kN)	12.4
Torque to Raise 1 kN (N·m)	.88
Nut Weight (g)	123
Ball Nut Number	MBN10206
Flange Part Number	FLG7165
Wiper Kit Part Number	—



Flange - FLG7165



16x5 PMT

LEAD ACCURACY: $\pm 25\mu\text{m}/300\text{mm}$

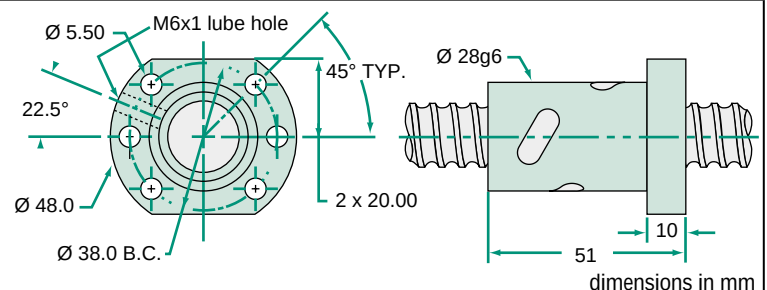
Single Start

16.0	Ball Circle Diameter
5.0	Lead
12.9	Root Diameter
3.175	Nominal Ball Diameter
1222	Screw Mass (g/m)

Available Screw Length	PART NUMBERS
	RH
up to 7 M	16x5PMT
Custom cut lengths available up to 7M. For longer lengths contact customer service.	

MPN Preloaded Flanged Internal Return Ball Nut

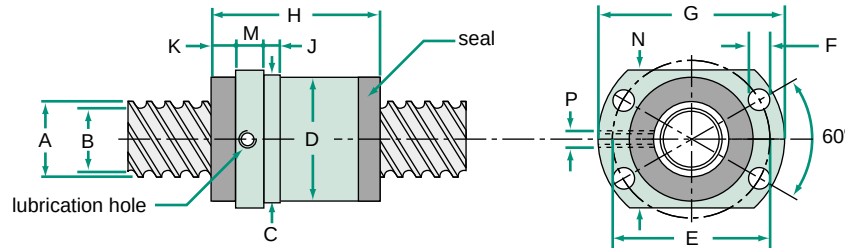
PRODUCT SPECIFICATIONS	RH
Dynamic Load C_a (kN)	5.7
Static Load C_{0a} (kN)	8.6
Torque to Raise 1 kN (N·m)	.88
Nut Weight (g)	190
Spring Rate (kN/ μm)	.22
Ball Nut Number	MPN10331
Flange	INTEGRAL
Wiper Type	ELASTOMER



16mm Carry™ METRIC THREAD

LEAD ACCURACY: $\pm 100\mu\text{m}/300\text{mm}$

Carry Type 16 x 50 Ball Nut



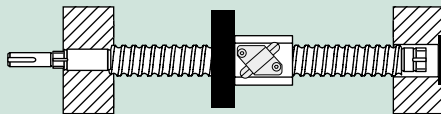
dimensions in mm

SCREW SPECIFICATIONS						NUT SPECIFICATIONS																	
dia x lead	helix	reference number*	A	B root dia	wgt. (g/m)	part number	C	D	E	F	G	H	J	K	M	N	P	wiper **	ball return location	wgt. (g)	torque to raise 1 kN (N·m)	load rating (N)	
																						Dyn. (C _a)	Static (C _{0a})
16 x 50	RH	ECS-16500-R□	15.8	10.6	1250	ECN-16500-□HU	34	33.5	45	5.4	54	46	5	10	10	36	M6	Plastic	Internal	236	8.839	4500	10000

*Lengths available up to 3,000 mm. See page 152 and 170 to complete reference number **All nuts with wiper feature an M5 lubrication hole.

BALL SCREW ASSEMBLIES

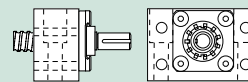
These assemblies are shipped with screw, nut, flange, and bearing supports.



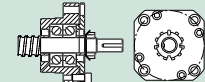
See page 145 for complete product details.

EZZE-MOUNT™ END BEARING SUPPORTS

A convenient solution for mounting ball screw assemblies.



Single or Double Bearing
Universal Mount

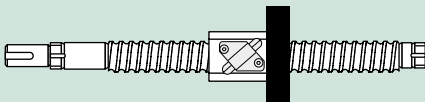


Single or Double Bearing
Flange Mount

See page 190 for complete product details.

END MACHINING

Machining for Nook standard ends or custom requirement available.



See page 188 for complete product details.

LUBRICANT

Prolong ball screw and nut performance with this special lubricant.

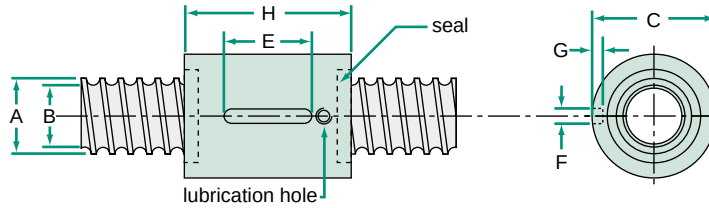


E-900 12oz. Spray or 32oz. Liquid
See page 95 for complete product details.



16mm Carry[™] METRIC THREADLEAD ACCURACY: $\pm 100\mu\text{m}/300\text{mm}$

Carry Type Z Ball Nut

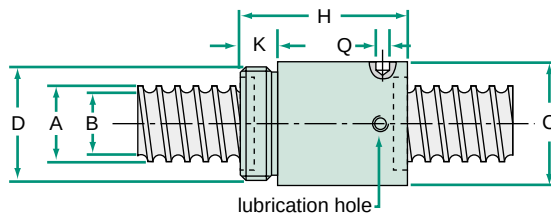


dimensions in mm

SCREW SPECIFICATIONS						NUT SPECIFICATIONS												load rating (N)	
dia x lead	helix	reference number*	A	B root dia	wgt. (g/m)	part number	C	H	E	F	G	lash	wiper **	ball return location	wgt. (g)	torque to raise 1 kN (N·m)		Dyn. (C _a)	Static (C _{0a})
16 x 5	RH	ECS-16050-R□	15.7	13.0	1251	ECN-16050-□ZU	30	43	16	4	2.5	0.07	Plastic	Internal	113	0.889		9700	22000

*Lengths available up to 3,000 mm. See page 152 and 170 to complete reference number **All nuts with wiper feature an M5 lubrication hole.

Carry Type FG Ball Nut

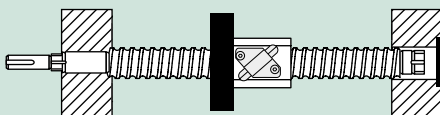


dimensions in mm

SCREW SPECIFICATIONS						NUT SPECIFICATIONS												load rating (N)	
dia x lead	helix	reference number*	A	B root dia	wgt. (g/m)	part number	C	D	H	K	Q	lash	wiper **	ball return location	wgt. (g)	torque to raise 1 kN (N·m)		Dyn. (C _a)	Static (C _{0a})
16 x 2	RH	ECS-16020-R□	16.0	14.5	1416	ECN-16020-□GU	30	M26x1.5	28	12	3.5	0.06	Plastic	External	76	0.356		2500	5500
16 x 5	RH	ECS-16050-R□	15.7	13.0	1251	ECN-16050-□GU	30.2	M26x1.5	50	12	3.5	0.07	Plastic	Internal	123	0.889		9700	22000
16 x 5	RH	ECS-16050-R□	15.7	13.0	1251	ECN-16050-□DN	32	M26x1.5	42	12	4	0.07	—	External	144	0.889		12000	25000
16 x 5	RH	ECS-16050-R□	15.7	13.0	1251	ECN-16020-□DU	32	M26x1.5	47	12	4	0.07	Plastic	External	164	0.889		12000	25000
16 x 10	RH	ECS-16100-R□	15.7	13.0	1251	ECN-16100-□GN	32	M26x1.5	47	12	4	0.07	—	External	165	1.778		17000	25000
16 x 10	RH	ECS-16100-R□	15.7	13.0	1251	ECN-16100-□GU	32	M26x1.5	52	12	4	0.07	Plastic	External	184	1.788		17000	25000

*Lengths available up to 3,000 mm. See page 152 and 170 to complete reference number **All nuts with wiper feature an M5 lubrication hole.

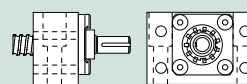
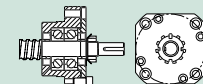
BALL SCREW ASSEMBLIES

These assemblies are shipped with
screw, nut, flange, and bearing supports.

See page 145 for complete product details.

EZZE-MOUNT[™]
END BEARING SUPPORTS

A convenient solution for mounting ball screw assemblies.

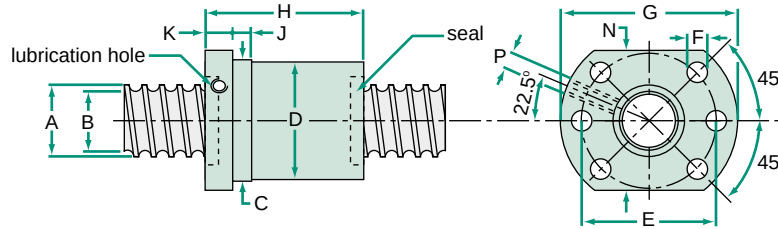
Single or Double Bearing
Universal MountSingle or Double Bearing
Flange Mount

See page 190 for complete product details.

16mm Carry™ METRIC THREAD

LEAD ACCURACY: $\pm 100\mu\text{m}/300\text{mm}$

Carry Type FB Ball Nut



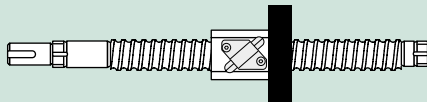
dimensions in mm

SCREW SPECIFICATIONS						NUT SPECIFICATIONS																	
dia x lead	helix	reference number*	A	B root dia	wgt. (g/m)	part number	C	D	E	F	G	H	J	K	N	P	lash	wiper **	ball return location	wgt. (g)	torque to raise 1 kN (N·m)	load rating (N)	
																						Dyn. (C _a)	Static (C _{0a})
16 x 2	RH	ECS-16020-R□	16.0	14.5	1416	ECN-16020-□BU	30	29.5	38	5.5	48	45	6	10	40	M6	0.06	Plastic	External	225	0.356	4500	11000
16 x 5	RH	ECS-16050-R□	15.7	13.0	1251	ECN-16050-□BU	28	27.8	38	5.5	48	45	6	10	40	M6	0.07	Plastic	Internal	160	0.889	9700	22000
16 x 10	RH	ECS-16100-R□	15.7	13.0	1251	ECN-16100-□BU	32	31.5	43	6.6	54	52	6	12	44	M6	0.07	Plastic	External	281	1.778	17000	25000

*Lengths available up to 3,000 mm. See page 152 and 170 to complete reference number **All nuts with wiper feature an M5 lubrication hole.

END MACHINING

Machining for Nook standard ends or custom requirement available.



See page 188 for complete product details.

LUBRICANT

Prolong ball screw and nut performance with this special lubricant.



E-900 12oz. Spray or 32oz. Liquid
See page 95 for complete product details.



20x5 MRT

LEAD ACCURACY: $\pm 100\mu\text{m}/300\text{mm}$

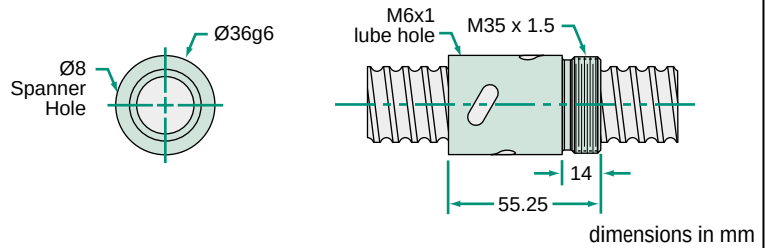
Single Start

20.71	Ball Circle Diameter
5	Lead
17.5	Root Diameter
3.175	Nominal Ball Diameter
2,170	Screw Mass (g/m)

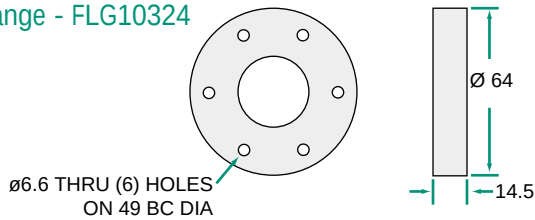
Available Screw Length	PART NUMBERS
	RH
up to 7 M	20x5MRT
Custom cut lengths available up to 7M. For longer lengths contact customer service.	

MBN Internal Return Ball Nut

PRODUCT SPECIFICATIONS	RH
Dynamic Load C_a (kN)	13
Static Load C_{0a} (kN)	24.4
Torque to Raise 1 kN (N·m)	.88
Nut Weight (g)	238
Ball Nut Number	MBN10295
Flange Part Number	FLG10324
Wiper Type	ELASTOMER



Flange - FLG10324



20x5 PMT

LEAD ACCURACY: $\pm 25\mu\text{m}/300\text{mm}$

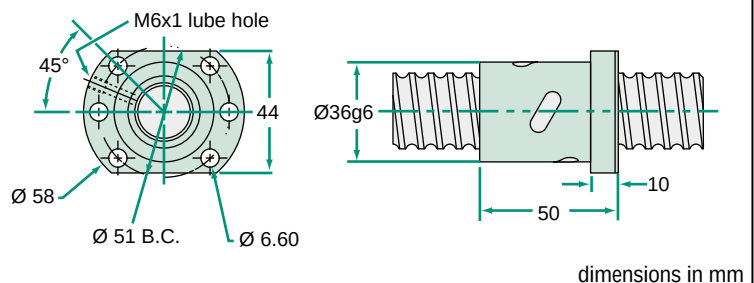
Single Start

20.71	Ball Circle Diameter
5	Lead
17.5	Root Diameter
3.175	Nominal Ball Diameter
2,170	Screw Mass (g/m)

Available Screw Length	PART NUMBERS
	RH
up to 7 M	20x5PMT
Custom cut lengths available up to 7M. For longer lengths contact customer service.	

MPN Preloaded Flanged Internal Return Ball Nut

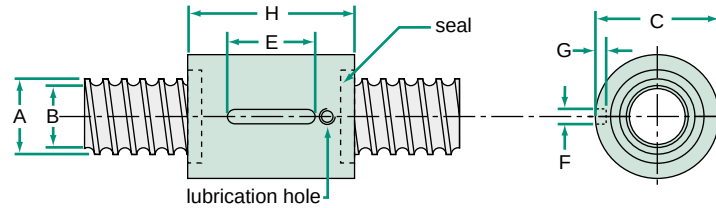
PRODUCT SPECIFICATIONS	RH
Dynamic Load C_a (kN)	7.2
Static Load C_{0a} (kN)	12.2
Torque to Raise 1 kN (N·m)	.88
Nut Weight (g)	307
Spring Rate (kN/ μm)	.28
Ball Nut Number	MPN10332
Flange	INTEGRAL
Wiper Type	ELASTOMER



20mm Carry™ METRIC THREAD

LEAD ACCURACY: $\pm 100\mu\text{m}/300\text{mm}$

Carry Type Z Ball Nut

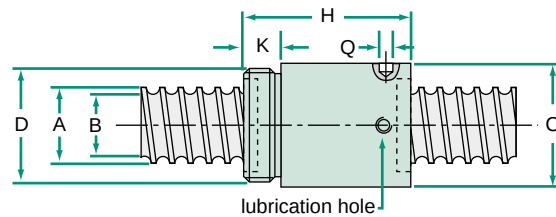


dimensions in mm

SCREW SPECIFICATIONS						NUT SPECIFICATIONS												
dia x lead	helix	reference number*	A	B root dia	wgt. (g/m)	part number	C	H	E	F	G	lash	wiper **	ball return location	wgt. (g)	torque to raise 1 kN (N·m)	load rating (N)	
																	Dyn. (C _d)	Static (C _{oa})
20 x 5	RH,LH	ECS-20050-□□	19.5	16.5	2014	ECN-20050-□ZU	33	45	20	4	2.5	0.07	Plastic	Internal	131	0.889	10800	25000

*Lengths available up to 3,000 mm. See page 152 and 170 to complete reference number **All nuts with wiper feature an M5 lubrication hole.

Carry Type FG Ball Nut

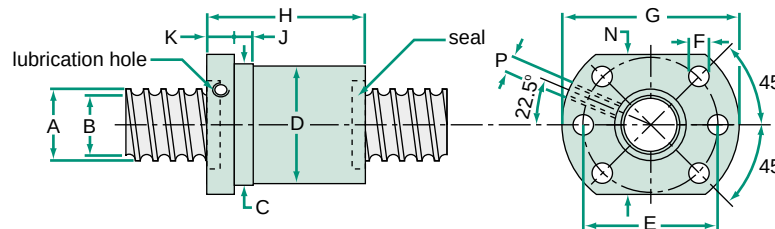


dimensions in mm

SCREW SPECIFICATIONS						NUT SPECIFICATIONS												
dia x lead	helix	reference number*	A	B root dia	wgt. (g/m)	part number	C	D	H	K	Q	lash	wiper **	ball return location	wgt. (g)	torque to raise 1 kN (N·m)	load rating (N)	
																	Dyn. (C _a)	Static (C _{oa})
20 x 5	RH,LH	ECS-20050-□□	19.5	16.5	2014	ECN-20050-□GU	32.2	M30x1.5	47	12	4	0.07	Plastic	Internal	120	0.889	10800	25000
20 x 10	RH	ECS-20010-□□	19.5	16.5	2014	ECN-20010-□G□	38	M35x1.5	58	19	4	0.07	Brush	External	250	1.778	21000	54000

*Lengths available up to 3,000 mm. See page 152 and 170 to complete reference number **All nuts with wiper feature an M5 lubrication hole.

Carry Type FB Ball Nut



dimensions in mm

SCREW SPECIFICATIONS						NUT SPECIFICATIONS																	
dia x lead	helix	reference number*	A	B root dia	wgt. (g/m)	part number	C	D	E	F	G	H	J	K	N	P	lash	wiper **	ball return location	wgt. (g)	torque to raise 1 kN (N·m)	load rating (N)	
																						Dyn. (C _a)	Static (C _{oa})
20 x 5	RH,LH	ECS-20050-□□	19.5	16.5	2014	ECN-20050-□BU	36	35.5	47	6.6	58	50	10	10	44	M6	0.07	Plastic	Internal	283	0.889	10800	25000
20 x 10	RH	ECS-20010-R□	19.5	16.5	2014	ECN-20010-□BU	38	37.5	50	6.6	62	55	7	10	48	M6	0.07	Brush	Internal	250	1.778	21000	51000

*Lengths available up to 3,000 mm. See page 152 and 170 to complete reference number **All nuts with wiper feature an M5 lubrication hole.

25x5 MRT

LEAD ACCURACY: $\pm 100\mu\text{m}/300\text{mm}$

Single Start

25.75 Ball Circle Diameter**5** Lead**22.6** Root Diameter**3.175** Nominal Ball Diameter**3,452** Screw Mass (g/m)**Available
Screw Length**

up to 7 M

PART NUMBERS

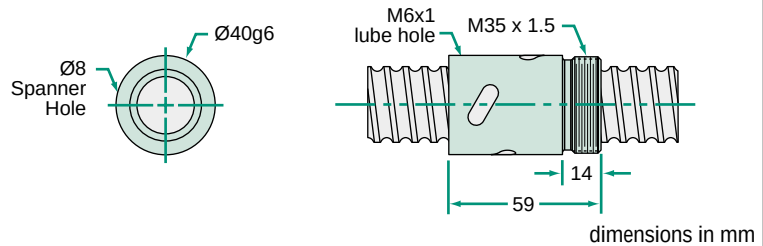
RH

25x5MRT

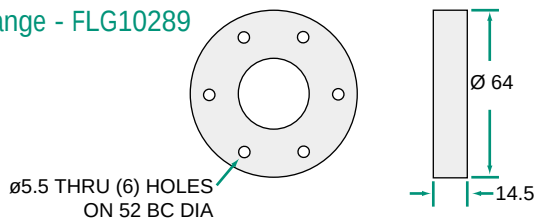
Custom cut lengths available up to 7M.
For longer lengths contact customer service.

MBN Internal Return Ball Nut

PRODUCT SPECIFICATIONS	RH
Dynamic Load C_a (kN)	18.5
Static Load C_{0a} (kN)	39.4
Torque to Raise 1 kN (N·m)	.88
Nut Weight (g)	280
Ball Nut Number	MBN10281
Flange Part Number	FLG10289
Wiper Type	ELASTOMER



Flange - FLG10289



25x5 PMT

LEAD ACCURACY: $\pm 25\mu\text{m}/300\text{mm}$

Single Start

25.75 Ball Circle Diameter**5** Lead**22.6** Root Diameter**3.175** Nominal Ball Diameter**3,452** Screw Mass (g/m)**Available
Screw Length**

up to 7 M

PART NUMBERS

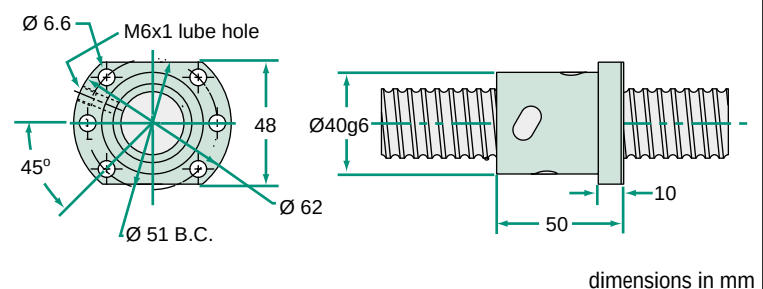
RH

25x5PMT

Custom cut lengths available up to 7M.
For longer lengths contact customer service.

MPN Preloaded Flanged Internal Return Ball Nut

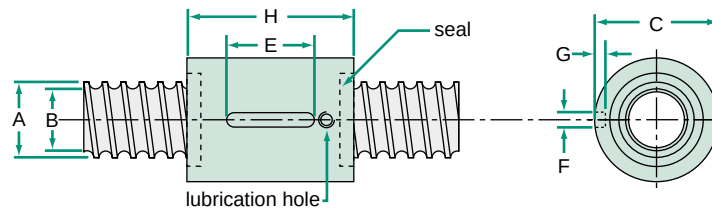
PRODUCT SPECIFICATIONS	RH
Dynamic Load C_a (kN)	8.4
Static Load C_{0a} (kN)	15.7
Torque to Raise kN (N·m)	.88
Spring Rate (kN/ μm)	.35
Nut Weight (g)	340
Ball Nut Number	MPN10333
Flange	INTEGRAL
Wiper Type	ELASTOMER



LEAD ACCURACY: $\pm 100\mu\text{m}/300\text{mm}$

25mm Carry™ METRIC THREAD

Carry Type Z Ball Nut

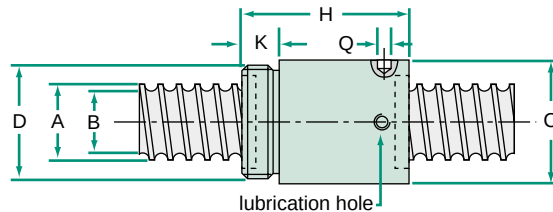


dimensions in mm

SCREW SPECIFICATIONS						NUT SPECIFICATIONS												
dia x lead	helix	reference number*	A	B root dia	wgt. (g/m)	part number	C	H	E	F	G	lash	wiper **	ball return location	wgt. (g)	torque to raise 1 kN (N·m)	load rating (N)	
																	Dyn. (C _a)	Static (C _{0a})
25 x 5	RH	ECS-25050-R□	24.6	21.5	2400	ECN-25050-□ZU	38	50	20	4	2.5	0.07	Plastic	Internal	165	0.889	11700	30000

*Lengths available up to 3,000 mm. See page 152 and 170 to complete reference number **All nuts with wiper feature an M5 lubrication hole.

Carry Type FG Ball Nut

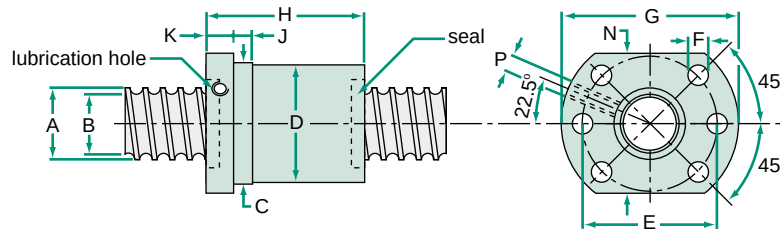


dimensions in mm

SCREW SPECIFICATIONS						NUT SPECIFICATIONS												
dia x lead	helix	reference number*	A	B root dia	wgt. (g/m)	part number	C	D	H	K	Q	lash	wiper **	ball return location	wgt. (g)	torque to raise 1 kN (N·m)	load rating (N)	
																	Dyn. (C _a)	Static (C _{0a})
25 x 5	RH	ECS-25050-R□	24.6	21.5	2400	ECN-25050-□GU	40	M38x1.5	57	12	4	0.07	Plastic	Internal	227	0.889	11700	30000
25 x 10	RH	ECS-25100-R□	24.8	21.8	2400	ECN-25100-□G□	43	M40x1.5	58	19	4	0.07	Brush	External	300	1.778	21000	51000
25 x 25	RH	ECS-25250-R□	24.5	21.2	3348	ECN-25250-□GU	44	M40x1.5	72	20	4	0.08	Brush	External	420	2.235	10000	24000
25 x 25	RH	ECS-25250-R□	24.5	21.2	3348	ECN-25250-□DU	44	M40x1.5	72	20	4	0.08	Brush	External	444	2.235	20000	48000

*Lengths available up to 3,000 mm. See page 152 and 170 to complete reference number **All nuts with wiper feature an M5 lubrication hole.

Carry Type FB Ball Nut



dimensions in mm

SCREW SPECIFICATIONS						NUT SPECIFICATIONS																	
dia x lead	helix	reference number*	A	B root dia	wgt. (g/m)	part number	C	D	E	F	G	H	J	K	N	P	lash	wiper **	ball return location	wgt. (g)	torque to raise 1 kN (N·m)	load rating (N)	
																						Dyn. (C _a)	Static (C _{0a})
25 x 5	[†] RH	ECS-25050-R□	24.6	21.5	2400	ECN-25050-□BU	40	39.5	51	6.6	62	50	10	10	48	M6	0.07	Plastic	Internal	292	0.889	11700	30000
25 x 5	[‡] RH	ECS-25050-R□	24.6	21.5	2400	ECN-25050-□JU	40	39.5	51	6.6	62	55	10	10	48	M6	0.07	Plastic	Internal	309	0.889	14000	35000
25 x 10	[†] RH	ECS-25100-R□	24.8	21.9	2400	ECN-25100-□BU	43	42.5	55	6.6	65	55	7	10	50	M6	0.07	Brush	External	440	1.778	21000	54000
25 x 25	[†] RH	ECS-25250-R□	24.5	21.2	3348	ECN-25250-□BU	44	43.5	56	6.6	70	67	10	12	52	M6	0.08	Brush	External	500	4.420	10000	24000

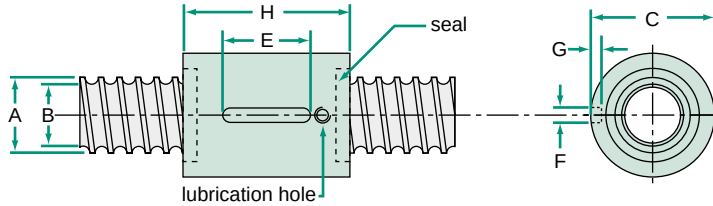
*Lengths available up to 3,000 mm. See page 152 and 170 to complete reference number **All nuts with wiper feature an M5 lubrication hole.

† This size only available with nut styles: B, A and C ‡ This size available with nut styles J, K, and L

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

32mm Carry[™] METRIC THREADLEAD ACCURACY: $\pm 100\mu\text{m}/300\text{mm}$

Carry Type Z Ball Nut

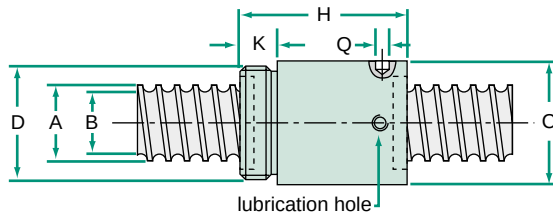


dimensions in mm

SCREW SPECIFICATIONS						NUT SPECIFICATIONS												load rating (N)	
dia x lead	helix	reference number*	A	B root dia	wgt. (g/m)	part number	C	H	E	F	G	lash	wiper **	ball return location	wgt. (g)	torque to raise 1 kN (N·m)		Dyn. (C _a)	Static (C _{0a})
32 x 5	RH	ECS-32050-R□	29.6	26.6	5660	ECN-32050-□ZU	48	48	20	5	3.0	0.07	Plastic	Internal	258	0.889		19000	54000

*Lengths available up to 3,000 mm. See page 152 and 170 to complete reference number **All nuts with wiper feature an M5 lubrication hole.

Carry Type FG Ball Nut

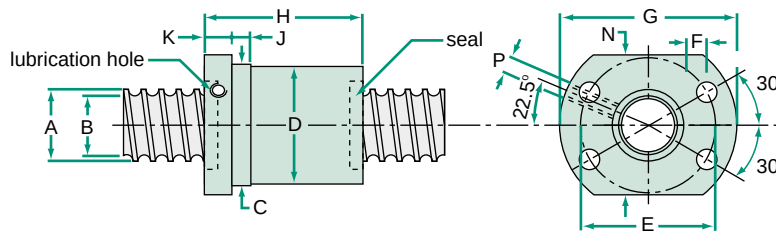


dimensions in mm

SCREW SPECIFICATIONS						NUT SPECIFICATIONS												load rating (N)	
dia x lead	helix	reference number*	A	B root dia	wgt. (g/m)	part number	C	D	H	K	Q	lash	wiper **	ball return location	wgt. (g)	torque to raise 1 kN (N·m)		Dyn. (C _a)	Static (C _{0a})
32 x 5	RH	ECS-32050-R□	29.6	26.6	5660	ECN-32050-□GU	52	M48x1.5	55	15	4	0.07	Plastic	Internal	381	0.889		19000	54000

*Lengths available up to 3,000 mm. See page 152 and 170 to complete reference number **All nuts with wiper feature an M5 lubrication hole.

Carry Type FB Ball Nut



dimensions in mm

SCREW SPECIFICATIONS						NUT SPECIFICATIONS																	
dia x lead	helix	reference number*	A	B root dia	wgt. (g/m)	part number	C	D	E	F	G	H	J	K	N	P	lash	wiper **	ball return location	wgt. (g)	torque to raise 1 kN (N·m)	load rating (N)	
																						Dyn. (C _a)	Static (C _{0a})
32 x 5	RH	ECS-32050-R□	29.6	26.6	5660	ECN-32050-□□U	50	49.5	65	9.0	80	57	10	12	62	M6	0.07	Plastic	Internal	560	0.889	19000	54000

*Lengths available up to 3,000 mm. See page 152 and 170 to complete reference number **All nuts with wiper feature an M5 lubrication hole.

Available Screw Length	PART NUMBERS
	RH
up to 7 M	40x10MRT
Custom cut lengths available up to 7M. For longer lengths contact customer service.	

40x10 MRT

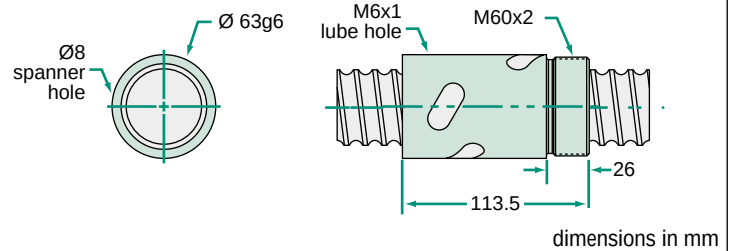
LEAD ACCURACY: $\pm 100\mu\text{m}/300\text{mm}$

Single Start

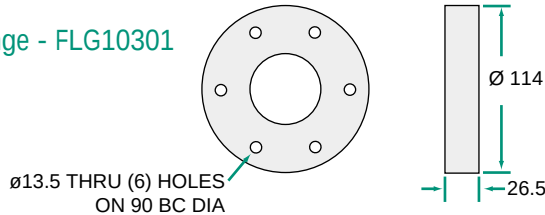
42.1	Ball Circle Diameter
10	Lead
34.79	Root Diameter
7.144	Nominal Ball Diameter
8,566	Screw Mass (g/m)

MBN Internal Return Ball Nut

PRODUCT SPECIFICATIONS	RH
Dynamic Load C_a (kN)	62.5
Static Load C_{0a} (kN)	136.2
Torque to Raise 1 kN (N·m)	1.77
Nut Weight (g)	1177
Ball Nut Number	MBN10291
Flange Part Number	FLG10301
Wiper Type	ELASTOMER



Flange - FLG10301



Available Screw Length	PART NUMBERS
	RH
up to 7 M	40x10PMT
Custom cut lengths available up to 7M. For longer lengths contact customer service.	

40x10 PMT

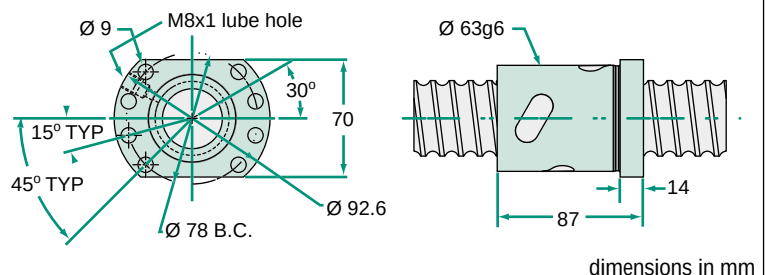
LEAD ACCURACY: $\pm 25\mu\text{m}/300\text{mm}$

Single Start

42.1	Ball Circle Diameter
10	Lead
34.79	Root Diameter
7.144	Nominal Ball Diameter
8,566	Screw Mass (g/m)

MPN Preloaded Flanged Internal Return Ball Nut

PRODUCT SPECIFICATIONS	RH
Dynamic Load C_a (kN)	28.4
Static Load C_{0a} (kN)	54.5
Torque to Raise 1 kN (N·m)	1.77
Nut Weight (g)	1182
Spring Rate (kN/ μm)	.55
Ball Nut Number	MPN10305
Flange	INTEGRAL
Wiper Type	ELASTOMER



50x10 MRT

LEAD ACCURACY: $\pm 100\mu\text{m}/300\text{mm}$

Single Start

51.7	Ball Circle Diameter
10	Lead
45.2	Root Diameter
6.35	Nominal Ball Diameter
13,880	Screw Mass (g/m)

**Available
Screw Length**

up to 7 M

PART NUMBERS

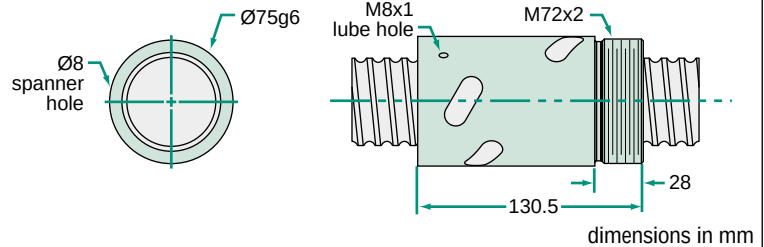
RH

50x10MRT

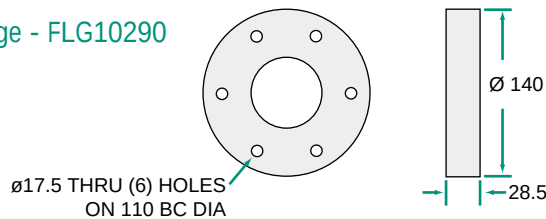
Custom cut lengths available up to 7M.
For longer lengths contact customer service.

MBN Internal Return Ball Nut

PRODUCT SPECIFICATIONS	RH
Dynamic Load C_a (kN)	75.5
Static Load C_{0a} (kN)	189.3
Torque to Raise 1 kN (N-m)	1.77
Nut Weight (g)	1952
Ball Nut Number	MBN10285
Flange Part Number	FLG10290
Wiper Type	ELASTOMER



Flange - FLG10290



50x10 PMT

LEAD ACCURACY: $\pm 25\mu\text{m}/300\text{mm}$

Single Start

51.7	Ball Circle Diameter
10	Lead
45.2	Root Diameter
6.35	Nominal Ball Diameter
13,880	Screw Mass (g/m)

**Available
Screw Length**

up to 7 M

PART NUMBERS

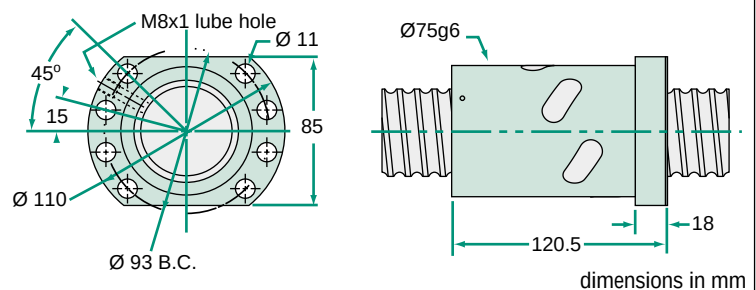
RH

50x10PMT

Custom cut lengths available up to 7M.
For longer lengths contact customer service.

MPN Preloaded Flanged Internal Return Ball Nut

PRODUCT SPECIFICATIONS	RH
Dynamic Load C_a (kN)	41.6
Static Load C_{0a} (kN)	94.6
Torque to Raise 1 kN (N-m)	1.77
Nut Weight (g)	2328
Spring Rate (kN/ μm)	.97
Ball Nut Number	MPN10334
Flange	INTEGRAL
Wiper Type	ELASTOMER



Available Screw Length	PART NUMBERS
	RH
up to 7 M	63x12MRT
Custom cut lengths available up to 7M. For longer lengths contact customer service.	

63x12 MRT

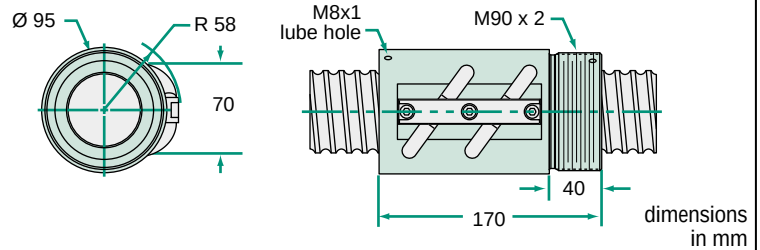
LEAD ACCURACY: $\pm 100\mu\text{m}/300\text{mm}$

Single Start

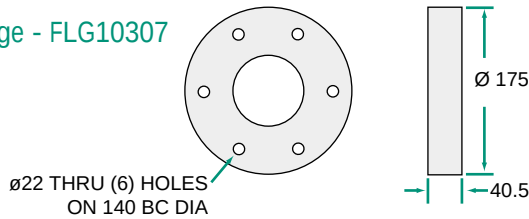
65.1	Ball Circle Diameter
12	Lead
56.98	Root Diameter
7.94	Nominal Ball Diameter
22,046	Screw Mass (g/m)

MBN Double Circuit Ball Nut

PRODUCT SPECIFICATIONS	RH
Dynamic Load C_a (kN)	140
Static Load C_{0a} (kN)	386
Torque to Raise kN (N·m)	2.13
Nut Weight (g)	4451
Ball Nut Number	MBN10297
Flange Part Number	FLG10307
Wiper Kit Part Number	—



Flange - FLG10307



METRIC BALL SCREW AND NUT TECHNICAL DATA

Available Screw Length	PART NUMBERS
	RH
up to 7 M	63x12PMT
Custom cut lengths available up to 7M. For longer lengths contact customer service.	

63x12 PMT

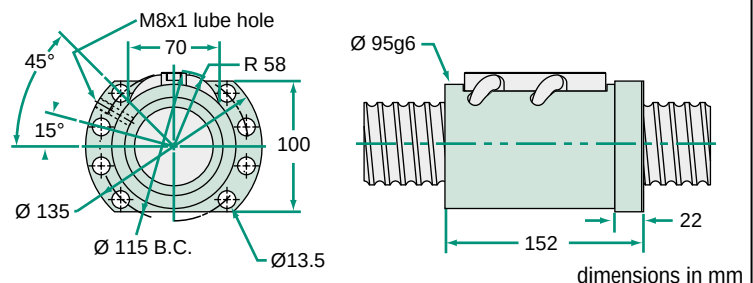
LEAD ACCURACY: $\pm 25\mu\text{m}/300\text{mm}$

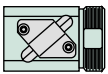
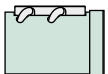
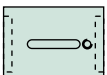
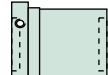
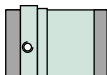
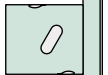
Single Start

65.1	Ball Circle Diameter
12	Lead
56.98	Root Diameter
7.94	Nominal Ball Diameter
22,046	Screw Mass (g/m)

MPN Preloaded Flanged Ball Nut

PRODUCT SPECIFICATIONS	RH
Dynamic Load C_a (kN)	76.91
Static Load C_{0a} (kN)	193
Torque to Raise kN (N·m)	2.13
Nut Weight (g)	4915
Spring Rate (kN/ μm)	1.52
Ball Nut Number	MPN10335
Flange	INTEGRAL
Wiper Type	—



MBN External Return 	MPN External Return 	TYPE Z External Return Internal Return 	TYPE FG External Return Internal Return 	TYPE FB External Return Internal Return 	16 x 50 Internal Return 
Internal Return 	Internal Return 				

SCREW SELECTION								NUT SELECTION																		Page Ref	
DIA x LEAD	Root Dia. (mm)	MRT RH	PMT RH	CARRY				LOAD RATING (N)		Torque To Raise 1kN(N·m)	MBN	MPN	Z				FG				FB				16 x 50		
				Alloy		SS		Static C ₀	Dynamic C _{0A}		Alloy		Alloy		SS		Alloy		SS		Alloy		SS				
				RH	LH	RH	LH				RH	RH	RH	LH	RH	LH	RH	LH	RH	LH	RH	LH	RH	LH			
6 x 1	5.0			●		●		600	1,000	0.178			●		●												153
8 x 1	7.0			●		●		700	1,200	0.178			●		●												154
8 x 1.5	6.7			●		●		800	1,300	1.254			●		●		●		●								154
8 x 2	6.5			●		●		2,000	3,200	0.356			●		●						●		●				154
8 x 2.5	6.6			●		●		2,000	3,200	0.432			●		●		●		●								154
8 x 3	6.7			●		●		950	1,500	0.533			●		●		●		●								154
10 x 2	8.2			●		●		1,250	2,100	0.356			●		●		●		●								155
10 x 3	7.8			●	●	●	●	2,800	5,000	0.541			●	●	●	●	●	●	●	●							155
12 x 2	10.6			●		●		1,380	2,500	0.356			●		●		●		●								156
12 x 4	9.8			●		●		5,500	11,000	0.711			●		●		●		●		●		●		●		156
12 x 5	9.5			●		●		6,600	12,000	0.889							●		●		●		●		●		156
12.7 x 12.7	10.3			●		●		8,000	15,500	2.235							●		●								156
14 x 4	11.5			●	●	●	●	8,100	16,000	0.711			●	●	●	●	●	●	●	●	●	●	●	●	●	●	157
16 x 2	14.5			●		●		2,500	5,500	0.356							●		●		●		●		●		160
16 x 5	12.9	●	●					7,600	12,400	0.880	●	●															158
16 x 5	13.0			●		●		9,700	22,000	0.889			●		●		●		●		●		●		●		160
16 x 10	13.0			●		●		17,000	25,000	1.778							●		●		●		●		●		160
16 x 50	10.6			●		●		4,500	10,000	8.839															●		159
20 x 5	17.5	●	●					13,000	24,400	0.880	●	●															162
20 x 5	16.5			●	●	●	●	10,800	25,000	0.889			●	●	●	●	●	●	●	●	●	●	●	●	●	●	163
20 x 10	16.5			●		●		21,000	51,000	1.778							●		●		●		●		●		163
25 x 5	22.6	●	●					18,500	39,400	0.880	●	●															164
25 x 5	21.5			●		●		11,700	30,000	0.889			●		●		●		●		●		●		●		165
25 x 10	21.8			●		●		21,000	51,000	1.778							●		●		●		●		●		165
25 x 25	21.2			●		●		10,000	24,000	4.420							●		●		●		●		●		165
32 x 5	26.6			●		●		19,000	54,000	0.889			●		●		●		●		●		●		●		166
40 x 10	34.79	●	●					62,500	136,200	1.77	●	●															167
50 x 10	45.2	●	●					75,500	189,300	1.77	●	●															168
63 x 12	56.98	●	●					140,000	386,000	2.13	●	●															169