



Nook/Thomson NRS™

PLANETARY ROLLER SCREW ASSEMBLIES



Nook/Thomson planetary roller screws have many uses in the aerospace industry



ROLLER SCREWS

Roller Screws 144

Planetary Roller Screw Engineering 146

Planetary Roller Screws & Nuts 154

High Capacity EZRF Bearing Supports..... 162



NRS™ PLANETARY ROLLER SCREW APPLICATION AND DESIGN

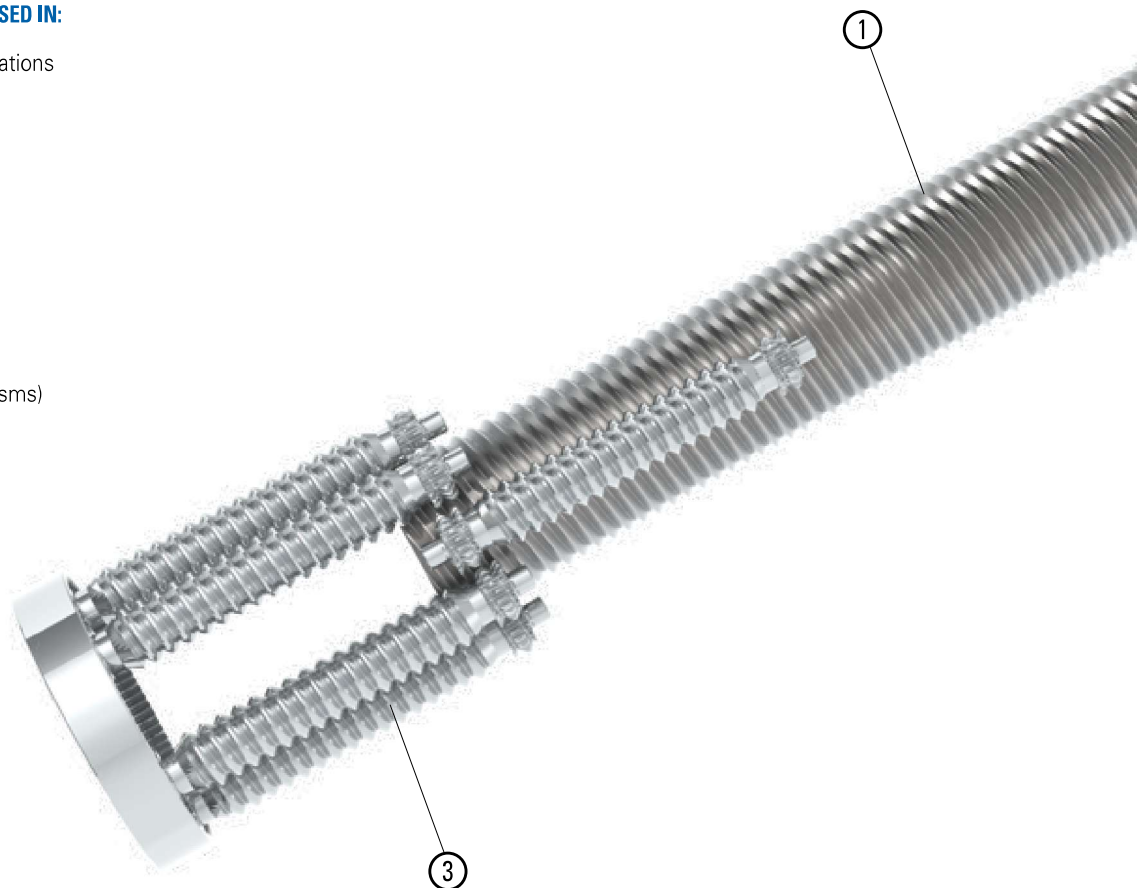
Nook/Thomson Planetary Roller Screws (NRS), a member of the lead screw family, are remarkable devices designed to convert rotary motion into axial force or vice versa.

The NRS design offers multiple advantages and reliability for the most demanding applications when compared with other lead screw types due to its rolling motion. NRS offers high efficiency even in relatively shallow lead designs. The multitude of contact points can carry large loads and provide very high resolution (small axial movement) when using very shallow leads. NRS produces high rotational speeds with faster acceleration without adverse effects.

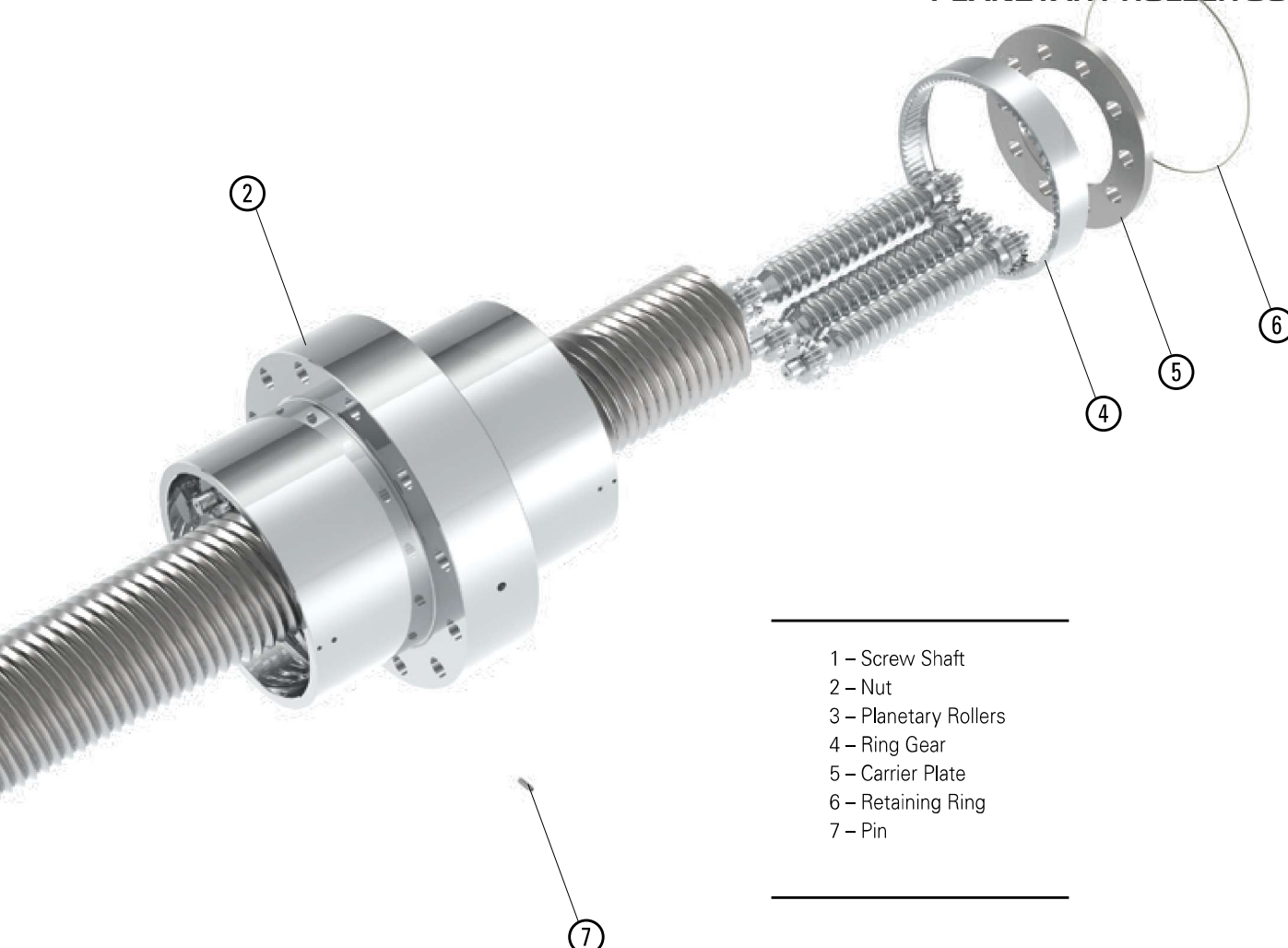
NRS planetary roller screws shown in the following pages cover a large spectrum of possibilities and application demands. Nook/Thomson engineers are at your disposal to suggest the suitable product for your application requirements.

NRS PLANETARY ROLLER SCREWS ARE USED IN:

- Aerospace & Outer Space Applications
- Machine Tools
- Measuring Equipment
- Positioning Systems
- Optical Equipment
- Photography Equipment
- Ordnance
- High Force Actuators
- Plastic Machinery
- Transportation (Train Tilt Mechanisms)



Nook/Thomson **NRS** PLANETARY ROLLER SCREWS



-
- 1 – Screw Shaft
 - 2 – Nut
 - 3 – Planetary Rollers
 - 4 – Ring Gear
 - 5 – Carrier Plate
 - 6 – Retaining Ring
 - 7 – Pin
-

PRELOADED NRS - Split nuts are installed with two halves pushed against each other and the clearance removed for preload. Due to the large number of contacts and great rigidity, a planetary roller screw does not require high preload amounts to perform backlash-free in most application conditions. Split nuts only carry load on a reduced length of thread (half-length minus the half-thickness of the calibrated spacer).

NON-PRELOADED NRS - One-piece solid nuts do not have a calibrated spacer to remove backlash. One-piece nuts have larger load ratings since all threads of the nut can carry load.

NRS MATERIALS - NRS planetary roller screws are made of high strength materials. The screw shaft is made of medium carbon induction hardenable alloy steel. The rollers and nut are manufactured from high grade bearing steel. All rolling surfaces are heat treated to a surface hardness not less than 56 HRC with a case depth suitably chosen to carry the load. Other materials, such as stainless steel, can be provided upon request.

Reduced load ratings should be considered when designing stainless steel roller screws.

ROLLER SCREW CALCULATION AND SELECTION



44 x 12 precision roller screw

HIGH STATIC AND DYNAMIC CAPACITY - Transmission of the load from the nut to the roller screw shaft is provided through the planetary rollers' engagement. The number of contact points is larger, therefore the load-carrying capacity of roller screws is much higher than that of ball screws.

WIDE VARIETY OF LEADS - Roller screws are also available with a wide variety of Lead x Pitch combinations, with leads as small as 2 mm.

OTHER ADVANTAGES - Roller screws can be used with high acceleration and deceleration rates as well as with a high rotational speed. Additionally, there is no problem with losing bearing balls - the nut can be easily removed from the screw shaft frequently.

CALCULATION AND SELECTION

Basic dynamic load ratings C and L_{10} life

Dynamic load rating is used to calculate the fatigue life of a NRS planetary roller screw. The dynamic load rating is defined as a load, constant in magnitude and direction under which 90% of a statistically significant number of apparently identical planetary roller screws reach an operating life of 10^6 revolutions (L_{10}).

Static load ratings (C_0) and safety factors (S_0)

Static load rating C_0 is a load that would cause a permanent deformation at the most heavily loaded contact equal to 0.0001 of the curvature diameter of the rolling element. In order to prevent deformations that could impair the proper function and the operating noise of the planetary roller screw, a safety factor S_0 should be used when selecting a roller screw on the basis of its static load rating.

The S_0 factor should not be less than 3. For operations with quasi-static load applications (i.e. presses) where the load occurs primarily on the same portion of the stroke, it is recommended to use higher S_0 . If size constraints prevent the use of larger screws and the operation of the device is such that the S_0 approaches 1, please contact our engineering department.

Theoretical life

Theoretical life L_{10} or L_n is the operating time reached by 90% of a group of apparently identical planetary roller screws operating under the same conditions. The theoretical life is calculated as follows:

$$L_{10} = \left(\frac{C}{P} \right)^3$$

If operation reliability higher than 90% is required, then the theoretical life must be corrected by using a reliability factor (a_n) according to the table.

$$L_n = L_{10} \times a_n$$

Reliability (%)	$-a_0$
90	1
95	0.62
96	0.53
97	0.44
98	0.33
99	0.21

Nook/Thomson **NRS** PLANETARY ROLLER SCREWS

Equivalent load

Operating loads can be defined by physical characteristics (i.e. masses, inertia, etc.) that operate on the screw. For systems with varying conditions, such as changes of load magnitude and duration as well as speed, the simple calculation cannot be employed and an equivalent load should be assessed. The equivalent load is a calculated mean operating load used for determining life and is dependent upon load pattern.

The equivalent load can be computed using the following formula:

$$P = \sqrt[3]{\frac{q_1 \times n_1 \times F_{ax1}^3 + q_2 \times n_2 \times F_{ax2}^3 + \dots + q_n \times n_n \times F_{axn}^3}{q_1 \times n_1 + q_2 \times n_2 + \dots + q_n \times n_n}}$$

The equivalent speed can be computed as follows:

$$n_{eq} = \frac{(q_1 \times n_1 + q_2 \times n_2 + \dots + q_n \times n_n)}{100}$$

Where:

- $F_{ax(1,2,n)}$ = applied load in the individual time step
- $n_{(1,2,n)}$ = screw rotational speed (RPM) in the individual load steps
- $q_{(1,2,n)}$ = time step in (%)

Preload

Preloaded nuts are used to eliminate axial lash and to increase system rigidity. Preload is detrimental to the operating life and should be selected carefully. The preload magnitude should be accounted for in the equivalent load calculation so its impact on the system life can be determined.

Preload magnitude should be selected as a function of the operating conditions. In case the varying steps cannot be easily identified, the preload magnitude can be assessed as follows:

$$F_p = \frac{F_{max}}{2.83}$$

The resulting load (inclusive of preload and operating load) can be calculated as follows:

Loaded nut (or half-nut)

$$P = F_p - 0.65 \times F_{ax} \text{ (for } F_{ax} < 2.83 \times F_p \text{)} \text{ (N)}$$

$$P = 0 \text{ (for } F_{ax} \geq 2.83 \times F_p \text{)} \text{ (N)}$$

Relieved nut (or half-nut)

$$P = F_p - 0.35 \times F_{ax} \text{ (for } F_{ax} < 2.83 \times F_p \text{)}$$

$$P = 0 \text{ (for } F_{ax} \geq 2.83 \times F_p \text{)}$$

Where:

- P = resulting equivalent load (N)
- F_p = preload magnitude (N)
- F_{ax} = applied load (N)

Rigidity of a roller screw

The rigidity of a roller screw assembly is a function of several parameters, such as: nut rigidity, bearing support rigidity, screw shaft rigidity, mounting housing rigidity as well as the mounting arrangement. If known, all of the parameters can be assembled in a formula as follows:

$$C_{\delta t} = \left(\frac{1}{C_{\delta s}} + \frac{1}{C_{\delta n}} + \frac{1}{C_{\delta b}} + \frac{1}{C_{\delta h}} \right)^{-1}$$

Where:

- $C_{\delta t}$ = total system rigidity (N/μm)
- $C_{\delta s}$ = screw shaft rigidity (N/μm)
- $C_{\delta n}$ = screw nut rigidity (N/μm)
- $C_{\delta b}$ = support bearing rigidity (N/μm)
- $C_{\delta h}$ = housing rigidity (N/μm)

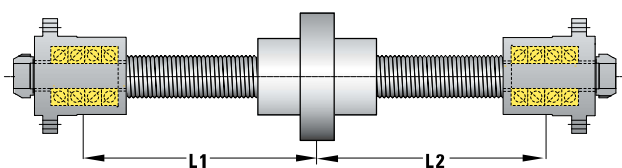
The screw rigidity can be calculated as follows:

$$C_{\delta s} = 165 \times d_0^2 \times f_e$$

Where:

- f_e = factor dependent on end-support configuration (see Fig. 1)

Fixed-fixed: $f_e = (1/L_1 + 1/L_2)$



Fixed-free: $f_e = 1/L$

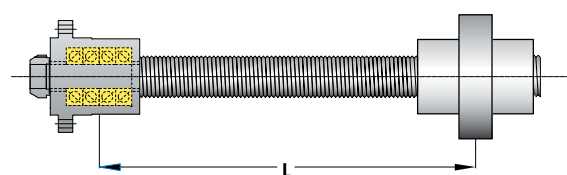


Fig. 1

ROLLER SCREW CALCULATIONS AND SELECTION continued

The nut rigidity can be calculated as follows:

$$C_{\delta n} = f_n \times \sqrt[3]{F_{ax}}$$

The factor f_n can be supplied upon request. The customer must determine the rigidity of the bearings and housing.

COLUMN STRENGTH

If the screw is subjected to compressive loads, then a verification of its suitability to the loading conditions can be performed as follows:

$$F_{ax \text{ allowed}} = \frac{f_{sc} \times d_o^4 \times 10^4}{L^2}$$

Where:

F_{ax} = compressed load (N)

f_{sc} = factor dependent on end-support configuration (SEE FIG. 2)

d_o = screw nominal diameter (mm)

L = free-length (mm)

CRITICAL SPEED

The maximum achievable rotational velocity of planetary roller screws is affected by the following parameters:

- Rotational speed capability of the nut (and planetary train)
- Diameter and free length of the screw (for rotating screw shafts)
- End support configuration (for rotating screws)
- Rotation member (nut or screw)

While the rotational capability of the nut can be easily assessed since it depends upon the maximum rotational factor DMn (mean diameter of the planetary train $\times$ rotational velocity n), the critical speed of the screw shaft must be calculated for each application. This value is normally considered the threshold at which the screw will start to resonate (1st order). The nut DMn factor equals 140,000.

The critical speed is calculated as follows:

$$n_{max} = \frac{f_{sn} \times d_o \times 10^7}{L^2} \text{ (RPM)}$$

Fig. 2 - Column Strength f_{sc} Factor

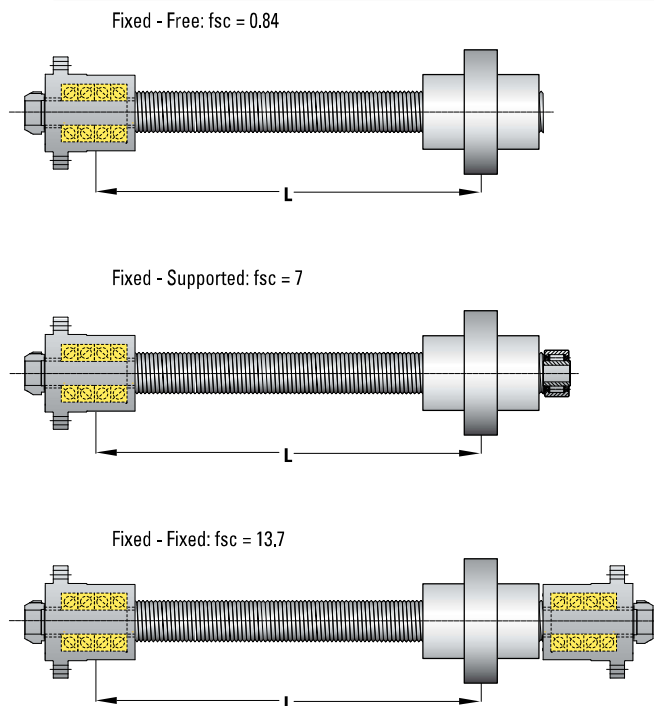
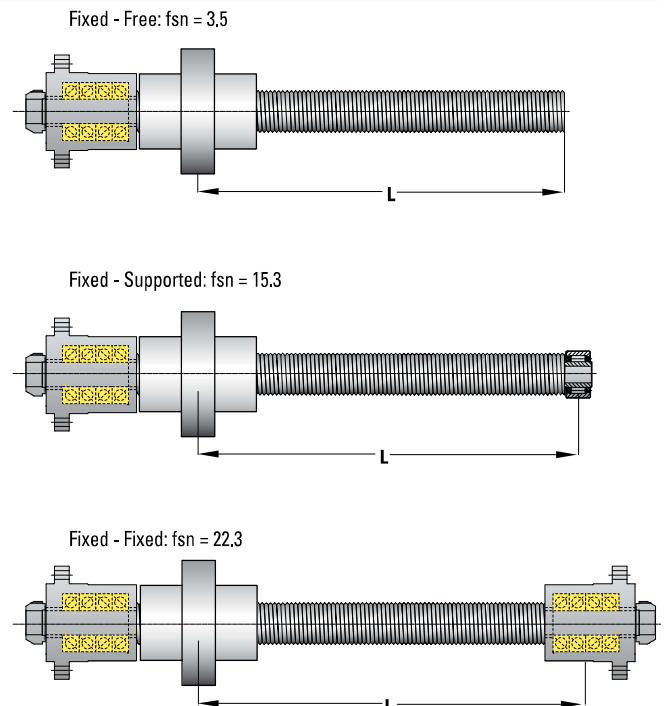


Fig. 3 - Critical Speed f_{sn} Factor



Nook/Thomson **NRS**[™] PLANETARY ROLLER SCREWS

Where:

- $\eta_{\max}$ = allowable screw rotational velocity (RPM)
- f_{sn} = factor dependent upon the end-support configuration (see FIG. 3)
- d_o = screw nominal diameter (mm)
- L = screw free-length (mm)

EFFICIENCY AND DRIVING TORQUE

Efficiency of the NRS planetary roller screw is dependent upon its operating parameters. The friction of the system is dependent upon varying factors that cannot be easily summarized here. To simplify the selection of the screw size, the following formulae can be used.

$$\eta_1 = \frac{1}{1 + \left(\frac{f_f \times d_o}{p_{ho}} \right)}$$

(for transforming rotary motion into axial motion)

$$\eta_2 = 1 - \left(\frac{f_f \times d_o}{p_{ho}} \right)$$

(for transforming axial motion into rotary motion)

Where:

- f_f = friction factor (mean value = 0.038)
- p_{ho} = screw lead

Torque required

To move an axial load at constant speed, the screw will require a motor torque and its magnitude can be calculated as follows:

$$M_t = \frac{F_{ax} \times p_{ho} \times 10^{-3}}{2 \times \pi \times \eta_1}$$

M_t = drive torque (N • m)

By contrast, to restrain an axial load, the screw must be equipped with a brake and the restraining torque is calculated as follows:

$$M_b = \frac{F_{ax} \times p_{ho} \times \eta_2 \times 10^{-3}}{2 \times \pi}$$

M_b = brake torque (N • m)

Note: The start-up torque required will be greater than the calculated value M_t above.

LUBRICATION & MAINTENANCE

NRS planetary roller screws, like all rolling element systems, must be lubricated in order to operate properly.

The screws can be lubricated with oil or grease. The application demands will dictate which media is more suited for the task.

Grease lubrication

Typically NLGI Grade 2 greases are used for roller screws. The grease used must not contain solid additives in any form. Greases suitable for lubricating screws must contain EP additives as well as anti-wear additives.

The lubricant characteristics, the amount to be used and its replenishment interval are a function of the application. Factors such as load, stroke length, operating temperature, environment cleanliness, and operating speed will impact the lubricant suitability and durability.

Nook/Thomson engineers will gladly provide guidance on the selection of suitable grease as well as the maintenance interval.

Oil lubrication

Nook/Thomson E-900L is available in a 32 oz. bottle for applications that require oil lubrication (see page 76). Applications that operate with high speeds and continuous motion may operate only with oil lubrication. The basic oil viscosity, the presence of additives and the lubricant flow should be assessed during the design phase.

Nook/Thomson engineers will gladly provide guidance on the selection of a suitable oil, as well as the proper flow, to insure the system operates as intended.

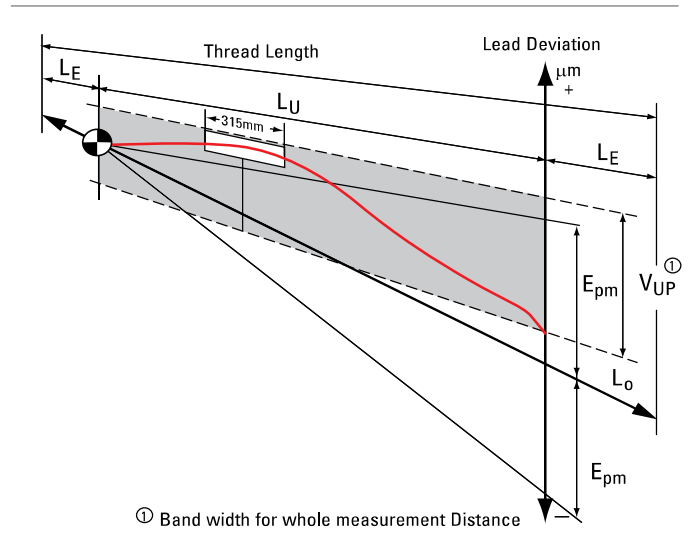
ROLLER SCREW **ACCURACY** AND **INSTALLATION**

ACCURACY

NRS planetary roller screws are produced in quality classes according to ISO 1, 3 and 5 standards. The summary of the characteristics and their allowable error are reported below

Accuracy Class	Tolerance* (μm)
G1	± 6
G3	± 12
G5	± 23

*Measured on a thread length of 315 mm



EFFECTIVE THREAD LENGTH L_U		ACCURACY CLASS					
from (mm)	to (mm)	G1		G3		G5	
		E_{pm} (μm)	V_{up} (μm)	E_{pm} (μm)	V_{up} (μm)	E_{pm} (μm)	V_{up} (μm)
0	315	6	6	12	12	23	23
315	400	7	6	13	12	25	25
400	500	8	7	15	13	27	26
500	630	9	7	16	14	30	29
630	800	10	8	18	16	35	31
800	1000	11	9	21	17	40	35
1000	1250	13	10	24	19	46	39
1250	1600	15	11	29	22	54	44
1600	1800	-	-	35	25	65	51

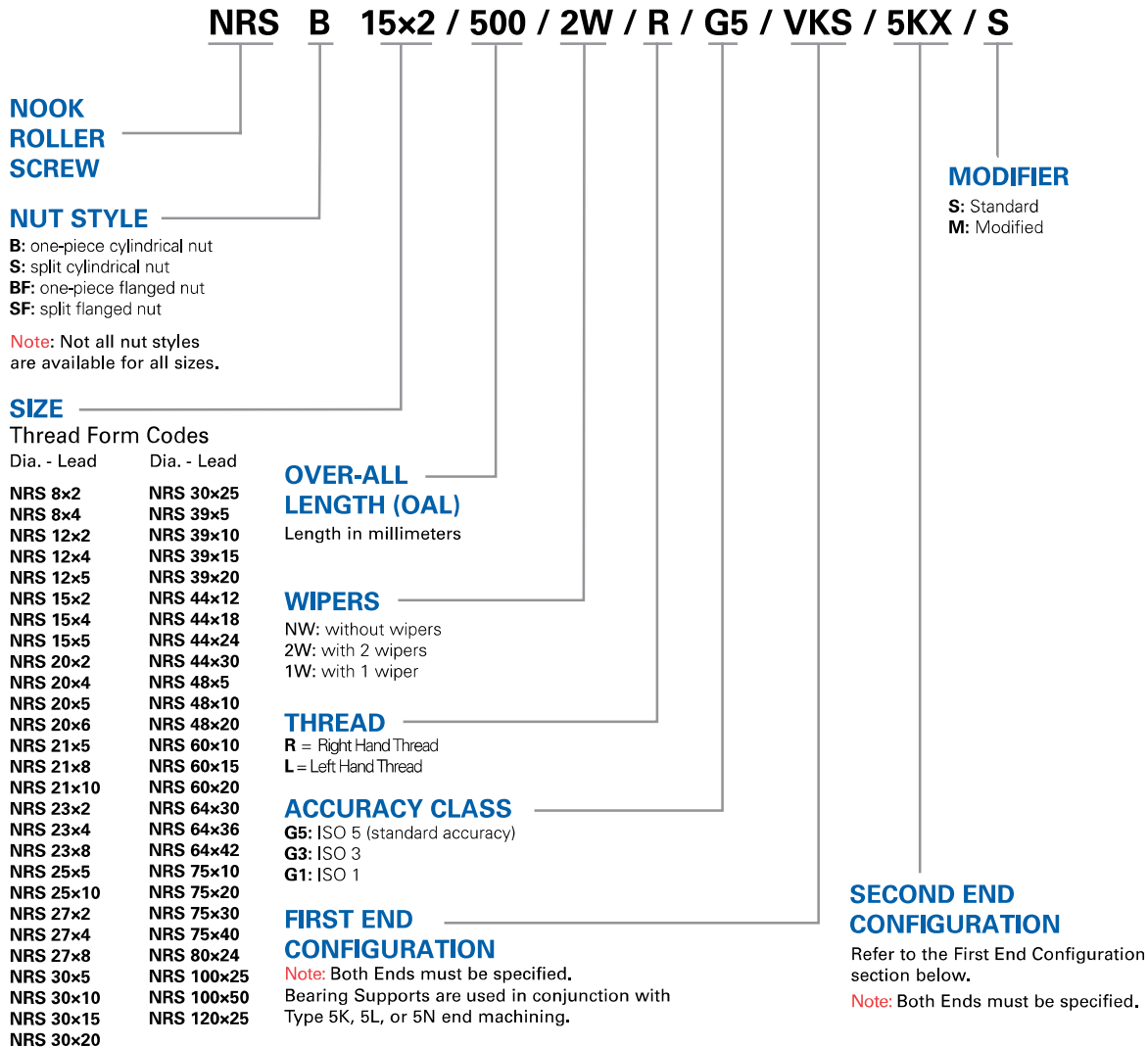
INSTALLATION

NRS planetary roller screws are precision components. They must be handled with care before and during installation to prevent the units from carrying radial loads or moments since either of these will impair the proper functioning and reduce the life of the system, or even cause the system to fail.

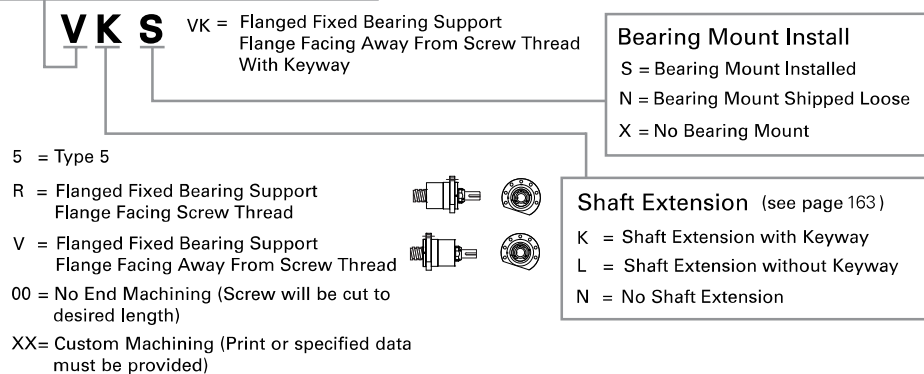
Nook/Thomson engineers are at your disposal to address any concerns for the design of the adjacent construction and the bearing arrangement to maximize the usefulness of the NRS planetary roller screws.

ROLLER SCREW REFERENCE NUMBER SYSTEM

Nook/Thomson NRS™
PLANETARY ROLLER SCREWS



EZZE-MOUNT™ / End Machining (see page 162 - 163)



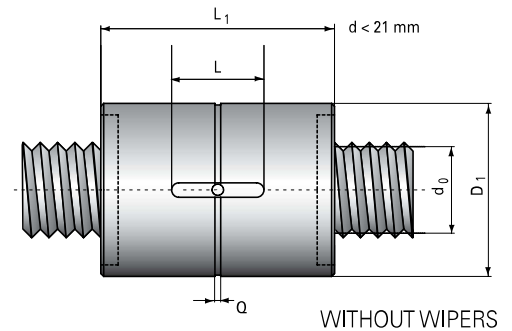


NRS 8mm > 27 mm Ø one-piece and split cylindrical nut

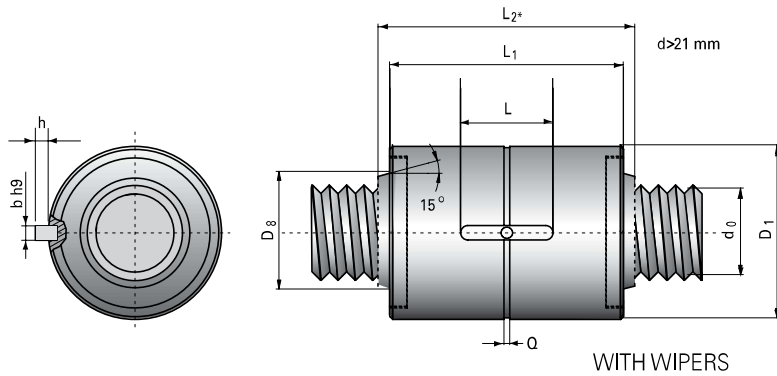


100 x 50 roller screw with cylindrical nut

Nook/Thomson NRS Planetary Roller Screws are used in the most demanding and precise linear motion applications. With a greater number of contact points, a roller screw provides stiffness and higher load ratings compared to a ball screw.



Nominal Screw Dia. d ₀	Dia. x Lead	Lead (mm)	D ₁ (g6) (mm)	Q (mm)	D ₈ (mm)
8	NRS 8x2	2	21	3	-
	NRS 8x4	4	21	3	-
12	NRS 12x2	2	26	3	-
	NRS 12x4	4	26	3	-
	NRS 12x5	5	26	3	-
15	NRS 15x2	2	34	3	-
	NRS 15x4	4	34	3	-
	NRS 15x5	5	34	3	-
20	NRS 20x2	2	42	5	-
	NRS 20x4	4	42	5	-
	NRS 20x5	5	42	5	-
	NRS 20x6	6	42	5	-
21	NRS 21x5	5	45	5	26
	NRS 21x8	8	45	5	26
	NRS 21x10	10	45	5	26
23	NRS 23x2	2	45	4	30
	NRS 23x4	4	45	5	30
	NRS 23x8	8	45	5	30
25	NRS 25x5	5	53	5	32
	NRS 25x10	10	53	5	32
27	NRS 27x2	2	53	4	35
	NRS 27x4	4	53	5	35
	NRS 27x8	8	53	5	35

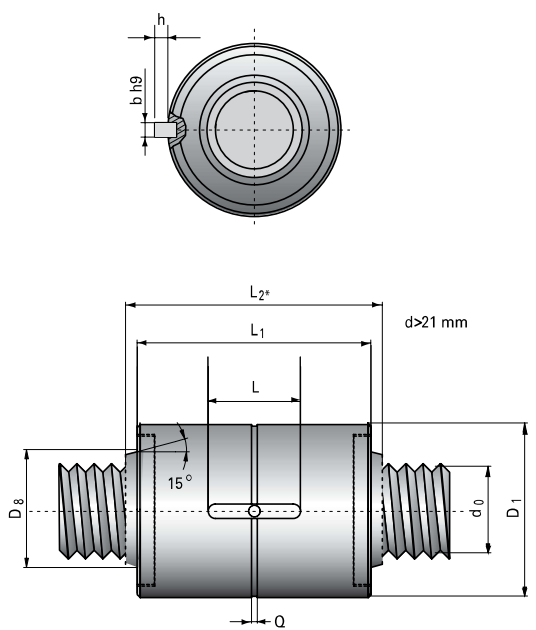


L ₁ (mm)	L ₂ (mm)	Keyway L × b × h (mm)	ONE-PIECE NUT Load Rating		backlash (mm)	SPLIT NUT Load Rating		Locknut	End Code Type 5	EZZE-Mount
			Dynamic C _a (kN)	Static C _{0a} (kN)		Dynamic C _a (kN)	Static C _{0a} (kN)			
31	-	10×3×1.2	6.98	17.91	0.02	4.19	8.90	-	-	-
31	-	10×3×1.2	5.43	18.63	0.02	3.26	9.31	-	-	-
31	-	14×4×1.5	10.24	26.72	0.02	6.14	13.36	-	-	-
31	-	14×4×1.5	8.92	27.74	0.02	5.35	13.87	-	-	-
31	-	14×4×1.5	8.31	31.00	0.02	4.88	15.50	-	-	-
35	-	14×4×1.5	13.47	31.74	0.02	8.08	15.87	SFZ 12×1	12	EZRF-3012
35	-	14×4×1.5	11.94	33.00	0.02	7.16	16.50	SFZ 12×1	12	EZRF-3012
35	-	14×4×1.5	11.20	36.90	0.02	6.72	18.45	SFZ 12×1	12	EZRF-3012
65	-	20×4×1.5	33.00	66.00	0.02	19.80	33.00	SFZ 15×1	15	EZRF-3015
65	-	20×4×1.5	29.54	68.63	0.02	17.72	34.31	SFZ 15×1	15	EZRF-3015
65	-	20×4×1.5	27.80	56.29	0.02	16.68	28.15	SFZ 15×1	15	EZRF-3015
65	-	20×4×1.5	26.42	65.17	0.02	15.91	39.13	SFZ 15×1	15	EZRF-3015
64	72	20×5×2	40.70	68.70	0.02	24.40	34.20	SFZ 17×1	17	EZRF-3017
64	72	20×5×2	44.20	69.00	0.02	26.50	34.50	SFZ 17×1	17	EZRF-3017
64	72	20×5×2	47.90	69.50	0.02	28.70	35.00	SFZ 17×1	17	EZRF-3017
55	65	20×5×2	40.89	66.80	0.02	24.63	33.40	SFZ 17×1	17	EZRF-3017
55	65	20×5×2	40.12	64.38	0.02	24.17	32.19	SFZ 17×1	17	EZRF-3017
55	65	20×5×2	38.41	69.02	0.04	23.14	34.51	SFZ 17×1	17	EZRF-3017
78	90	25×6×2.5	52.70	92.00	0.02	31.60	46.00	SFZ 20×1	20	EZRF-3020
78	90	25×6×2.5	60.50	88.51	0.04	36.30	44.20	SFZ 20×1	20	EZRF-3020
55	69	20×5×2	44.32	77.66	0.02	26.70	38.83	SFZ 25×1.5	20	EZRF-3025
55	69	20×5×2	40.34	80.76	0.02	24.30	40.38	SFZ 25×1.5	20	EZRF-3025
55	69	20×5×2	42.10	99.26	0.04	25.36	49.63	SFZ 25×1.5	20	EZRF-3025



NRS 30mm > 120 mm Ø

one-piece and split cylindrical nut

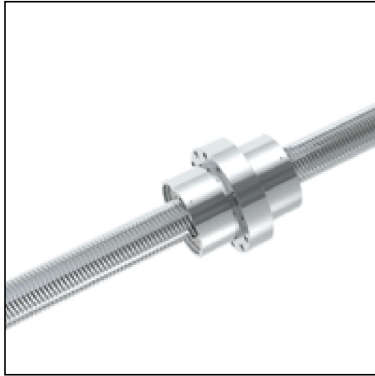


WITH WIPERS

Nominal Screw Dia. d ₀	Dia. x Lead	Lead (mm)	D ₁ (g6) (mm)	Q (mm)	D ₈ (mm)
30	NRS 30x2	2	64	5	45
	NRS 30x5	5	64	5	45
	NRS 30x10	10	64	5	45
	NRS 30x15	15	64	5	45
	NRS 30x20	20	64	5	45
	NRS 30x25	25	64	5	45
39	NRS 39x5	5	80	7	50
	NRS 39x10	10	80	7	50
	NRS 39x15	15	80	7	50
	NRS 39x20	20	80	7	50
44	NRS 44x12	12	80	7	56
	NRS 44x18	18	80	7	56
	NRS 44x24	24	80	7	56
	NRS 44x30	30	80	7	56
48	NRS 48x5	5	100	7	63
	NRS 48x10	10	100	7	63
	NRS 48x20	20	100	7	63
60	NRS 60x10	10	130	10.5	77
	NRS 60x15	15	130	10.5	77
	NRS 60x20	20	130	10.5	77
64	NRS 64x30	30	115	7	75
	NRS 64x36	36	115	7	75
	NRS 64x42	42	115	7	75
75	NRS 75x10	10	150	10.5	98
	NRS 75x20	20	150	10.5	98
	NRS 75x30	30	150	10.5	98
	NRS 75x40	40	160	10.5	98
	NRS 80x24	24	150	10.5	98
100	NRS 100x25	25	200	13	122.5
	NRS 100x50	50	200	13	122.5
120	NRS 120x25	25	240	15	176

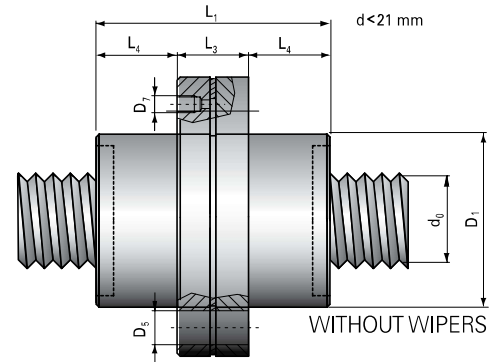
L ₁ (mm)	L ₂ (mm)	Keyway L x b x h (mm)	ONE-PIECE NUT Load Rating		backlash (mm)	SPLIT NUT Load Rating		Locknut	End Code Type 5	EZZE-Mount
			Dynamic C _a (kN)	Static C _{0a} (kN)		Dynamic C _a (kN)	Static C _{0a} (kN)			
85	99	32×6×2.5	58.70	133.00	0.02	35.20	66.50	-	25	EZRF-3025
85	99	32×6×2.5	76.70	122.30	0.02	46.00	61.15	-	25	EZRF-3025
85	99	32×6×2.5	88.60	122.30	0.04	53.20	61.15	-	25	EZRF-3025
85	99	32×6×2.5	96.40	119.40	0.07	57.80	59.70	-	25	EZRF-3025
85	99	32×6×2.5	99.80	128.80	0.07	59.80	64.40	-	25	EZRF-3025
85	99	32×6×2.5	102.40	143.20	0.07	61.40	71.60	-	25	EZRF-3025
110	126	40×8×3	107.70	228.50	0.02	64.60	114.30	-	35	EZRF-3035
110	126	40×8×3	127.30	230.30	0.04	76.30	115.10	-	35	EZRF-3035
110	126	40×8×3	138.30	228.10	0.04	82.80	114.00	-	35	EZRF-3035
110	126	40×8×3	144.70	214.60	0.04	86.70	107.30	-	35	EZRF-3035
90	106	32×6×2.5	115.90	217.20	0.04	69.50	108.60	-	40	EZRF-3040
90	106	32×6×2.5	127.40	215.00	0.07	76.40	107.50	-	40	EZRF-3040
90	106	32×6×2.5	136.50	221.40	0.07	81.90	110.70	-	40	EZRF-3040
90	106	32×6×2.5	133.80	206.30	0.07	80.20	103.10	-	40	EZRF-3040
127	142	45×8×3	165.10	334.30	0.02	99.00	167.15	-	45	EZRF-3045
127	142	45×8×3	193.00	403.80	0.04	115.80	201.90	-	45	EZRF-3045
127	142	45×8×3	215.10	369.00	0.07	129.00	184.50	-	45	EZRF-3045
162	180	45×10×3	282.30	662.60	0.04	169.40	331.30	SFZ 55×2	55	EZRF-3055
162	180	45×10×3	307.00	656.30	0.07	184.20	328.20	SFZ 55×2	55	EZRF-3055
162	180	45×10×3	325.00	558.90	0.07	195.00	279.45	SFZ 55×2	55	EZRF-3055
129	151	45×8×3	260.90	515.00	0.07	156.50	257.50	SFZ 60×2	60	EZRF-3060
129	151	45×8×3	260.00	493.10	0.07	156.00	246.50	SFZ 60×2	60	EZRF-3060
129	151	45×8×3	258.20	471.40	0.07	154.90	235.70	SFZ 60×2	60	EZRF-3060
191	211	63×10×3	411.10	969.40	0.04	246.00	484.70	SFZ 70×2	70	EZRF-3070
191	211	63×10×3	483.40	816.20	0.07	290.00	408.10	SFZ 70×2	70	EZRF-3070
206	224	63×10×3	461.40	866.90	0.07	276.80	433.45	SFZ 70×2	70	EZRF-3070
200	218	63×10×3	595.80	906.10	0.07	-	-	SFZ 70×2	70	EZRF-3070
200	224	63×10×3	650.90	1,078.00	0.07	-	-	SFZ 75×2	70	EZRF-3075
270	288	100×16×4	960.5	1412	0.07	-	-	-	-	-
270	288	100×16×4	822.1	1292	0.07	-	-	-	-	-
280	304	100×16×4	1510	2376	0.07	-	-	-	-	-

NRS 8mm > 27 mm Ø one-piece and split flanged nut

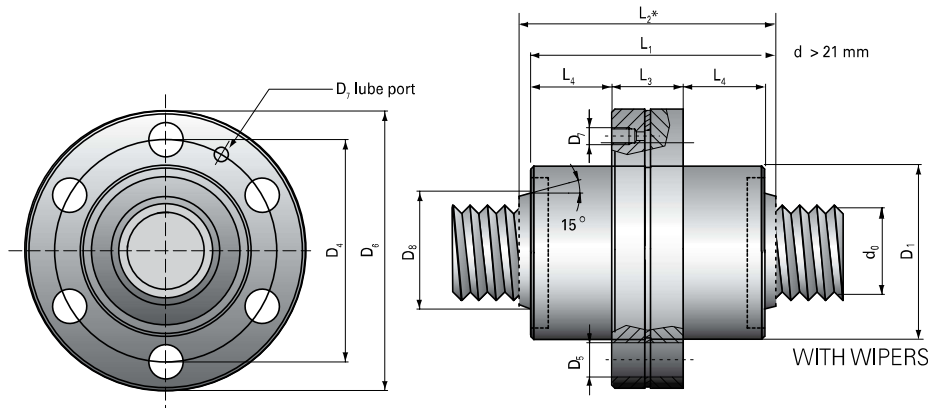


100 x 50 roller screw with flanged nut

Nook/Thomson NRS Planetary Roller Screws are used in the most demanding and precise linear motion applications. With a greater number of contact points, a roller screw provides stiffness and higher load ratings compared to a ball screw.



Nominal Screw Dia. d ₀	Dia. x Lead	Lead (mm)	D ₁ (g6) (mm)	D ₄ (mm)	nxD ₅ (mm)	D ₆ (mm)
8	NRS 8x2	2	21	31	6x4.5	41
	NRS 8x4	4	21	31	6x4.5	41
12	NRS 12x2	2	26	36	6x4.5	46
	NRS 12x4	4	26	36	6x4.5	46
	NRS 12x5	5	26	36	6x4.5	46
15	NRS 15x2	2	34	45	6x5	56
	NRS 15x4	4	34	45	6x5	56
	NRS 15x5	5	34	45	6x5	56
20	NRS 20x2	2	42	53	6x6	64
	NRS 20x4	4	42	53	6x6	64
	NRS 20x5	5	42	53	6x6	64
	NRS 20x6	6	42	53	6x6	64
21	NRS 21x5	5	45	56	6x6	68
	NRS 21x8	8	45	56	6x6	68
	NRS 21x10	10	45	56	6x6	68
23	NRS 23x2	2	45	56	6x7	67
	NRS 23x4	4	45	56	6x7	67
	NRS 23x8	8	45	56	6x7	67
25	NRS 25x5	5	53	70	6x7	84
	NRS 25x10	10	53	70	6x7	84
27	NRS 27x2	2	53	68	6x7	83
	NRS 27x4	4	53	68	6x7	83
	NRS 27x8	8	53	68	6x7	83

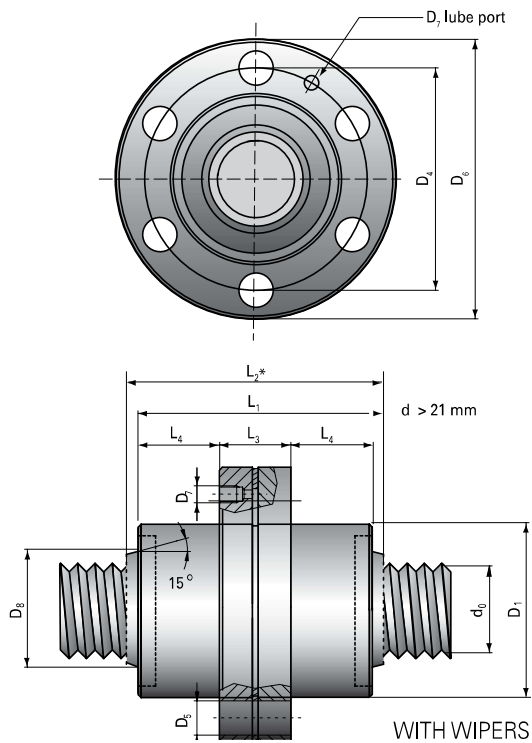


lube port D ₇ (mm)	D ₈ (mm)	L ₁ (mm)	L ₂ (mm)	L ₃ (mm)	L ₄ (mm)	ONE-PIECE NUT Load Rating		backlash (mm)	SPLIT NUT Load Rating		Locknut	End Code Type 5	EZZE-Mount
						Dynamic C _a (kN)	Static C _{0a} (kN)		Dynamic C _a (kN)	Static C _{0a} (kN)			
M4	-	31	41	13	14	6.98	17.91	0.02	4.19	8.90	-	-	-
M4	-	31	41	13	14	5.43	18.63	0.02	3.26	9.31	-	-	-
M4	-	31	41	13	14	10.24	26.72	0.02	6.14	13.36	-	-	-
M4	-	31	41	13	14	8.92	27.74	0.02	5.35	13.87	-	-	-
M4	-	31	41	13	14	8.31	31.00	0.02	4.88	15.50	-	-	-
M5	-	35	51	18	16.5	13.47	31.74	0.02	8.80	15.87	SFZ 12×1	12	EZRF-3012
M5	-	35	51	18	16.5	11.94	33.00	0.02	7.16	16.50	SFZ 12×1	12	EZRF-3012
M5	-	35	51	18	16.5	11.20	36.90	0.02	6.72	18.45	SFZ 12×1	12	EZRF-3012
M6	-	55	65	20	22.5	33.00	66.00	0.02	19.80	33.00	SFZ 15×1	15	EZRF-3015
M6	-	55	65	20	22.5	29.54	68.63	0.02	17.72	34.31	SFZ 15×1	15	EZRF-3015
M6	-	55	65	20	22.5	27.80	56.29	0.02	16.68	28.15	SFZ 15×1	15	EZRF-3015
M6	-	55	65	20	22.5	26.42	65.17	0.02	15.91	39.13	SFZ 15×1	15	EZRF-3015
M6	26	64	72	18	23	40.70	68.70	0.02	24.40	34.20	SFZ 17×1	17	EZRF-3017
M6	26	64	72	18	23	44.20	69.00	0.02	26.50	34.50	SFZ 17×1	17	EZRF-3017
M6	26	64	72	18	23	47.90	69.50	0.02	28.70	35.00	SFZ 17×1	17	EZRF-3017
M6	30	55	65	20	22.5	24.63	33.40	0.02	24.63	33.40	SFZ 17×1	17	EZRF-3017
M6	30	55	65	20	22.5	24.17	32.19	0.02	24.17	32.19	SFZ 17×1	17	EZRF-3017
M6	30	55	65	20	22.5	23.14	34.51	0.04	23.14	34.51	SFZ 17×1	17	EZRF-3017
M6	32	78	90	20	29	52.70	92.00	0.02	31.60	46.00	SFZ 20×1	20	EZRF-3020
M6	32	78	90	20	29	60.50	88.51	0.04	36.30	44.20	SFZ 20×1	20	EZRF-3020
M6	35	55	69	22	23.5	44.32	77.66	0.02	26.70	38.83	SFZ 25×1.5	25	EZRF-3025
M6	35	55	69	22	23.5	40.34	80.76	0.02	24.30	40.38	SFZ 25×1.5	25	EZRF-3025
M6	35	55	69	22	23.5	42.10	99.26	0.04	25.36	49.63	SFZ 25×1.5	25	EZRF-3025



NRS 30mm > 100 mm Ø

one-piece and split flanged nut



Nominal Screw Dia. d ₀	Dia. x Lead	Lead (mm)	D ₁ (g6) (mm)	D ₄ (mm)	nxD ₅ (mm)	D ₆ (mm)
30	NRS 30x2	2	64	81	6x9	98
	NRS 30x5	5	64	81	6x9	98
	NRS 30x10	10	64	81	6x9	98
	NRS 30x15	15	64	81	6x9	98
	NRS 30x20	20	64	81	6x9	98
	NRS 30x25	25	64	81	6x9	98
39	NRS 39x5	5	80	102	6x11	124
	NRS 39x10	10	80	102	6x11	124
	NRS 39x15	15	80	102	6x11	124
	NRS 39x20	20	80	102	6x11	124
44	NRS 44x12	12	80	102	6x11	124
	NRS 44x18	18	80	102	6x11	124
	NRS 44x24	24	80	102	6x11	124
	NRS 44x30	30	80	102	6x11	124
48	NRS 48x5	5	100	127	6x13.5	150
	NRS 48x10	10	100	127	6x13.5	150
	NRS 48x20	20	100	127	6x13.5	150
60	NRS 60x10	10	130	160	8x16.75	190
	NRS 60x15	15	130	160	8x16.75	190
	NRS 60x20	20	130	160	8x16.75	190
64	NRS 64x30	30	115	150	8x16.75	180
	NRS 64x36	36	115	150	8x16.75	180
	NRS 64x42	42	115	150	8x16.75	180
75	NRS 75x10	10	150	180	8x16.75	210
	NRS 75x20	20	150	180	8x16.75	210
	NRS 75x30	30	150	180	8x16.75	210
	NRS 75x40	40	160	180	8x16.75	210
80	NRS 80x24	24	150	180	8x16.75	210
100	NRS 100x25	25	200	245	12x17.5	275
	NRS 100x50	50	200	245	12x17.5	275

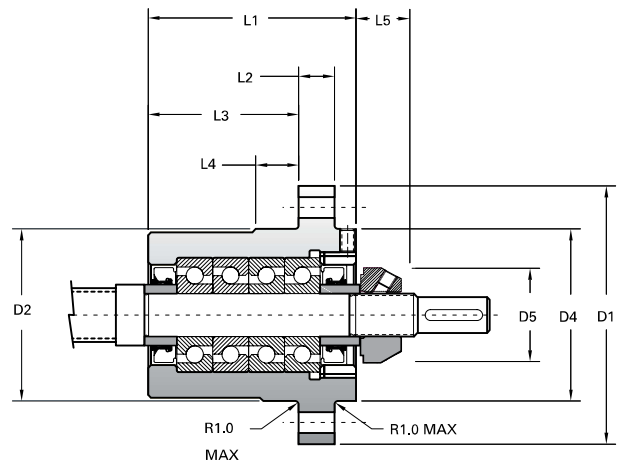
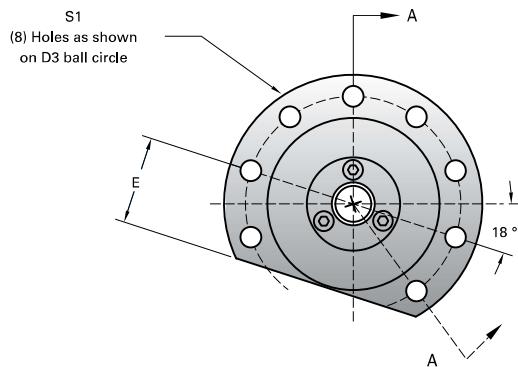
Lube port							ONE-PIECE NUT		backlash mm	SPLIT NUT		Locknut	End Code Type 5	EZZE-Mount
	D ₇ (mm)	D ₈ (mm)	L ₁ (mm)	L ₂ (mm)	L ₃ (mm)	L ₄ (mm)	Dynamic C _a (kN)	Load Rating Static C _{0a} (kN)		Dynamic C _a (kN)	Load Rating Static C _{0a} (kN)			
M6	45	85	99	27	29		58.70	133.00	0.02	35.20	66.50	SFZ 25×1.5	25	EZRF-3025
M6	45	85	99	27	29		76.70	122.30	0.02	46.00	61.15	SFZ 25×1.5	25	EZRF-3025
M6	45	85	99	27	29		88.60	122.30	0.04	53.20	61.15	SFZ 25×1.5	25	EZRF-3025
M6	45	85	99	27	29		96.40	119.40	0.07	57.80	59.70	SFZ 25×1.5	25	EZRF-3025
M6	45	85	99	27	29		99.80	128.80	0.07	59.80	64.40	SFZ 25×1.5	25	EZRF-3025
M6	45	85	99	27	29		102.40	143.20	0.07	61.40	71.60	SFZ 25×1.5	25	EZRF-3025
M6	54	110	126	33	38.5		107.70	228.50	0.02	64.60	114.30	SFZ 35×1.5	35	EZRF-3035
M6	54	110	126	33	38.5		127.30	230.30	0.04	76.30	115.10	SFZ 35×1.5	35	EZRF-3035
M6	54	110	126	33	38.5		138.30	228.10	0.04	82.80	114.00	SFZ 35×1.5	35	EZRF-3035
M6	54	110	126	33	38.5		144.70	214.60	0.04	86.70	107.30	SFZ 35×1.5	35	EZRF-3035
M8×1	56	90	106	33	28.5		115.90	217.20	0.04	69.50	108.60	SFZ 40×1.5	40	EZRF-3040
M8×1	56	90	106	33	28.5		127.40	215.00	0.07	76.40	107.50	SFZ 40×1.5	40	EZRF-3040
M8×1	56	90	106	33	33.5		136.50	221.40	0.07	81.90	110.70	SFZ 40×1.5	40	EZRF-3040
M8×1	56	90	106	33	33.5		133.80	206.30	0.07	80.20	103.10	SFZ 40×1.5	40	EZRF-3040
M8×1	63	127	142	37	45		165.10	334.30	0.02	99.00	167.15	SFZ 45×1.5	40	EZRF-3045
M8×1	63	127	142	37	45		193.00	403.80	0.04	115.80	201.90	SFZ 45×1.5	40	EZRF-3045
M8×1	63	127	142	37	45		215.10	369.00	0.07	129.00	184.50	SFZ 45×1.5	40	EZRF-3045
M8×1	79	162	180	45	58.5		282.30	662.60	0.04	169.40	331.30	SFZ 55×2	55	EZRF-3055
M8×1	79	162	180	45	58.5		307.00	656.30	0.07	184.20	328.20	SFZ 55×2	55	EZRF-3055
M8×1	79	162	180	45	58.5		325.00	558.90	0.07	195.00	279.45	SFZ 55×2	55	EZRF-3055
M8×1	75	129	151	45	42		260.90	515.00	0.07	156.50	257.50	SFZ 60×2	60	EZRF-3060
M8×1	75	129	151	45	42		260.00	493.10	0.07	156.00	246.50	SFZ 60×2	60	EZRF-3060
M8×1	75	129	151	45	42		258.20	471.40	0.07	154.90	235.70	SFZ 60×2	60	EZRF-3060
M8×1	98	191	211	45	73		411.10	969.40	0.04	246.00	484.70	SFZ 70×2	70	EZRF-3070
M8×1	98	191	211	45	73		483.40	816.20	0.07	290.00	408.10	SFZ 70×2	70	EZRF-3070
M8×1	98	206	224	45	80.5		461.40	866.90	0.07	276.80	433.45	SFZ 70×2	70	EZRF-3070
M8×1	98	200	218	45	77.5		820.00	980.00	0.07	-	-	SFZ 70×2	70	EZRF-3070
M8×1	98	200	224	45	77.5		840.00	1,260.00	0.07	-	-	SFZ 75×2	75	EZRF-3075
M8×1	122.5	270	288	65	102.5		960.5	1412	0.07	-	-	-	-	-
M8×1	122.5	270	288	65	102.5		822.1	1292	0.07	-	-	-	-	-



EZRF BEARING SUPPORTS FOR NRS 15×2 - NRS 80×24

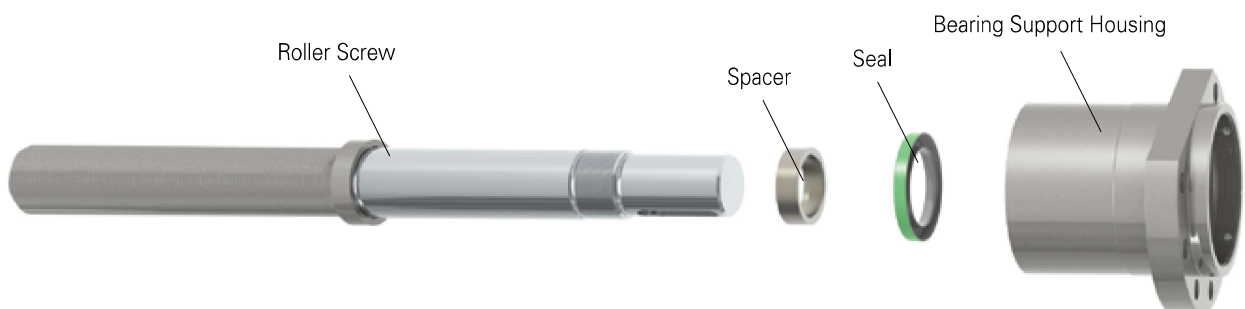
Roller screw high load ratings and extreme performance characteristics place large demands on end support units. Nook/Thomson has developed support units capable of handling these demands. Nook/Thomson series EZRF end support units are matched to the roller screw (see

dimension table below) and are designed to provide high load carrying capacity, precision, speed, rigidity, low friction, and ease of maintenance and installation. EZRF supports include a SFZ locknut.



Part No.	Roller Screw	L1	L2	L3	L4	L5	D1	D2 g6	D3	D4	D5	E	S
EZRF-3012	NRS 15	67	10	51	14	15	72	48	60	48	30	25	5.8
EZRF-3015	NRS 20	72	10	55.5	15	17	82	54	68	54	33	28	6.8
EZRF-3017	NRS 21	78	12	59	16	19	92	64	78	64	37	33	6.8
	NRS 23	78	12	59	16	19	92	64	78	64	37	33	6.8
EZRF-3020	NRS 25	82	12	62	17	19	100	64	82	64	40	33	8.8
EZRF-3025	NRS 27	93	15	69.5	19	21	116	80	98	80	44	41	8.8
	NRS 30	93	15	69.5	19	21	116	80	98	80	44	41	8.8
EZRF-3035	NRS 39	115	20	83.5	23	23	140	100	120	100	54	51	10.8
EZRF-3040	NRS 44	125	20	90.5	25	23	160	112	136	112	65	57	12.8
EZRF-3045	NRS 48	135	20	99.5	27	23	174	125	150	125	70	63.5	12.8
EZRF-3055	NRS 60	152	25	111.5	31	26	214	150	182	150	85	76	16.8
EZRF-3060	NRS 64	169	25	127.5	33	27	226	162	194	162	90	82	16.8
EZRF-3070	NRS 75	186	30	137.5	37	29	268	188	228	188	100	95	20.8
EZRF-3075	NRS 80	196	30	146.5	39	29	290	211	251	211	105	109	20.8

all dimensions in millimeters

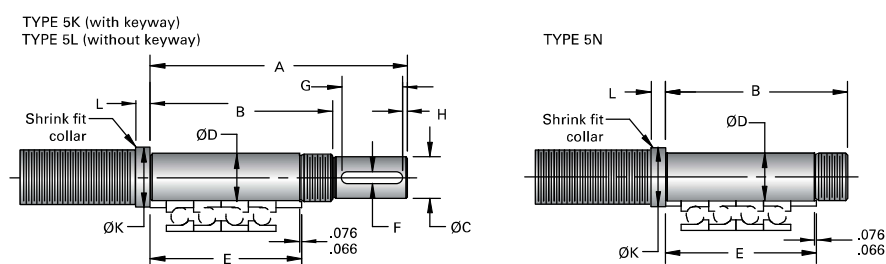


TYPE 5 END MACHINING USED WITH EZRF BEARING MOUNTS

Nook/Thomson NRS™
PLANETARY ROLLER SCREWS

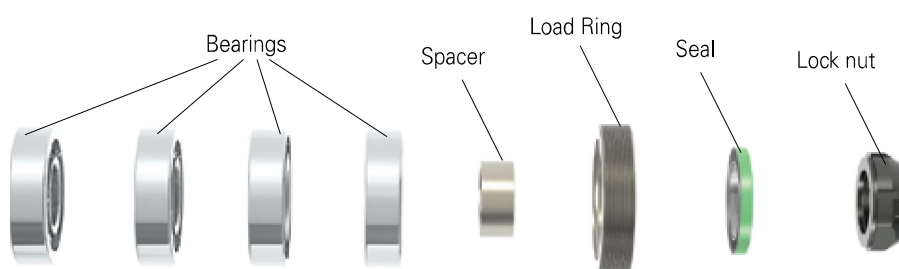
Specifying standard machined ends results in quicker deliveries. The machined ends shown below represent designs that are compatible with common application requirements for fixed bearing support.

Dimensional data for Type 5 ends is provided in the chart. Included in the chart are the locknut and lockwasher identification. These standard ends may be machined and ground to finish size.



Machine End Codes	COMMON DIMENSIONS FOR TYPE 5 (K,L,N) (mm)						TYPE 5 (K,L) (mm)				
	B	D	E	K	L	Locknut	A	C	F	G	H
12	85	12.008/11.997	69	18	8	SFZ 12 × 1	117	10.00/9.97	3	26	2
15	93	15.008/14.997	74	22	9	SFZ 15 × 1	133	12.00/11.97	4	33	3
17	101	17.008/16.997	80	24	9	SFZ 17 × 1	141	15.00/14.97	5	33	3
20	105	20.009/19.996	84	28	9	SFZ 20 × 1	151	17.00/16.97	5	37	4
25	119	25.009/24.996	95	32	10	SFZ 25 × 1.5	170	20.00/19.97	6	41	5
35	143	35.011/34.995	117	45	10	SFZ 35 × 1.5	205	30.00/29.97	8	51	4
40	153	40.011/39.995	127	50	12	SFZ 40 × 1.5	216	35.00/34.97	10	51	4
45	163	45.011/44.995	137	55	12	SFZ 45 × 1.5	228	40.00/39.97	12	51	5
55	184	55.012/54.993	154	65	14	SFZ 55 × 2	265	50.00/49.97	14	64	6
60	202	60.012/59.993	171	75	16	SFZ 60 × 2	291	55.00/54.97	16	71	6
70	222	70.012/69.993	188	85	18	SFZ 70 × 2	334	60.00/59.97	18	91	7
75	232	75.012/74.993	198	90	18	SFZ 75 × 2	346	65.00/64.97	18	91	8

all dimensions in millimeters

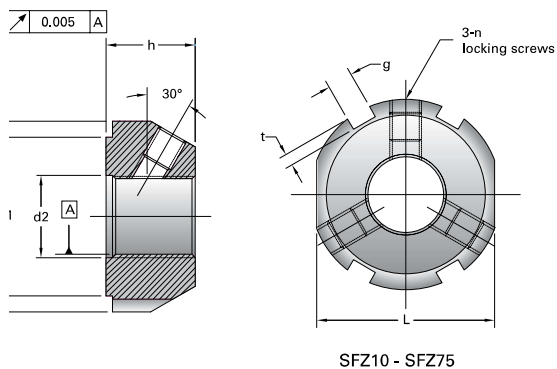




SFZ LOCKNUTS FOR NRS 15×2 TO NRS 80×24



Precision ground locknuts



Conventional locknuts may not be suitable in a typical roller screw application due to the high axial load generated. Nook/Thomson series SFZ locknuts are designed to carry high axial forces while minimizing the rotational inertia, an important benefit in high dynamic applications. SFZ locknuts are designed to carry high axial load, have high loosening torque and are manufactured with high accuracy to optimize the load on the thread interface.

Nook/Thomson **NRS** PLANETARY ROLLER SCREWS



SFZ Locknut on an EZRF bearing mount

Part No. Size × Pitch	Roller Screw	Dimensions in mm							Locking Screws		Allowable Axial Load (Ca) kN	Loosening Torque (T) (N•m)
		D	h	g	t	d1	d2	L	DIN	Max Tightening Torque (T) (N•m)		
SFZ 12×1	NRS 15	30	14	4	2	25	13	27	M5	4.7	40	18
SFZ 15×1	NRS 20	33	16	4	2	28	16	30	M5	4.7	60	20
SFZ 17×1	NRS 21	37	18	5	2	33	18	34	M6	8	80	25
SFZ 20×1	NRS 25	40	18	5	2	35	21	36	M6	8	90	35
SFZ 25×1.5	NRS 27	44	20	5	2	39	26	41	M6	8	130	45
SFZ 35×1.5	NRS 39	54	22	5	2	49	38	50	M6	8	190	65
SFZ 40×1.5	NRS 44	65	22	6	2.5	59	42	60	M8	18.6	210	80
SFZ 45×1.5	NRS 48	70	22	6	2.5	64	48	65	M8	18.6	240	95
SFZ 55×2	NRS 60	85	25	7	3	78	58	80	M8	18.6	340	225
SFZ 60×2	NRS 64	90	26	8	3.5	82	62	85	M8	18.6	380	245
SFZ 70×2	NRS 75	100	28	8	3.5	92	72	95	M8	18.6	490	285
SFZ 75×2	NRS 80	105	28	8	3.5	97	77	100	M8	18.6	520	305