

NSK Ball Screws for High-Load Drive

NSKTAC Series of Ball Screw Support Bearings for High-Load Applications NSK Roller Guide RA Series

We have developed easy-to-use ball screws for high-load applications and now offer a wide variety of products suited for high-load drives.

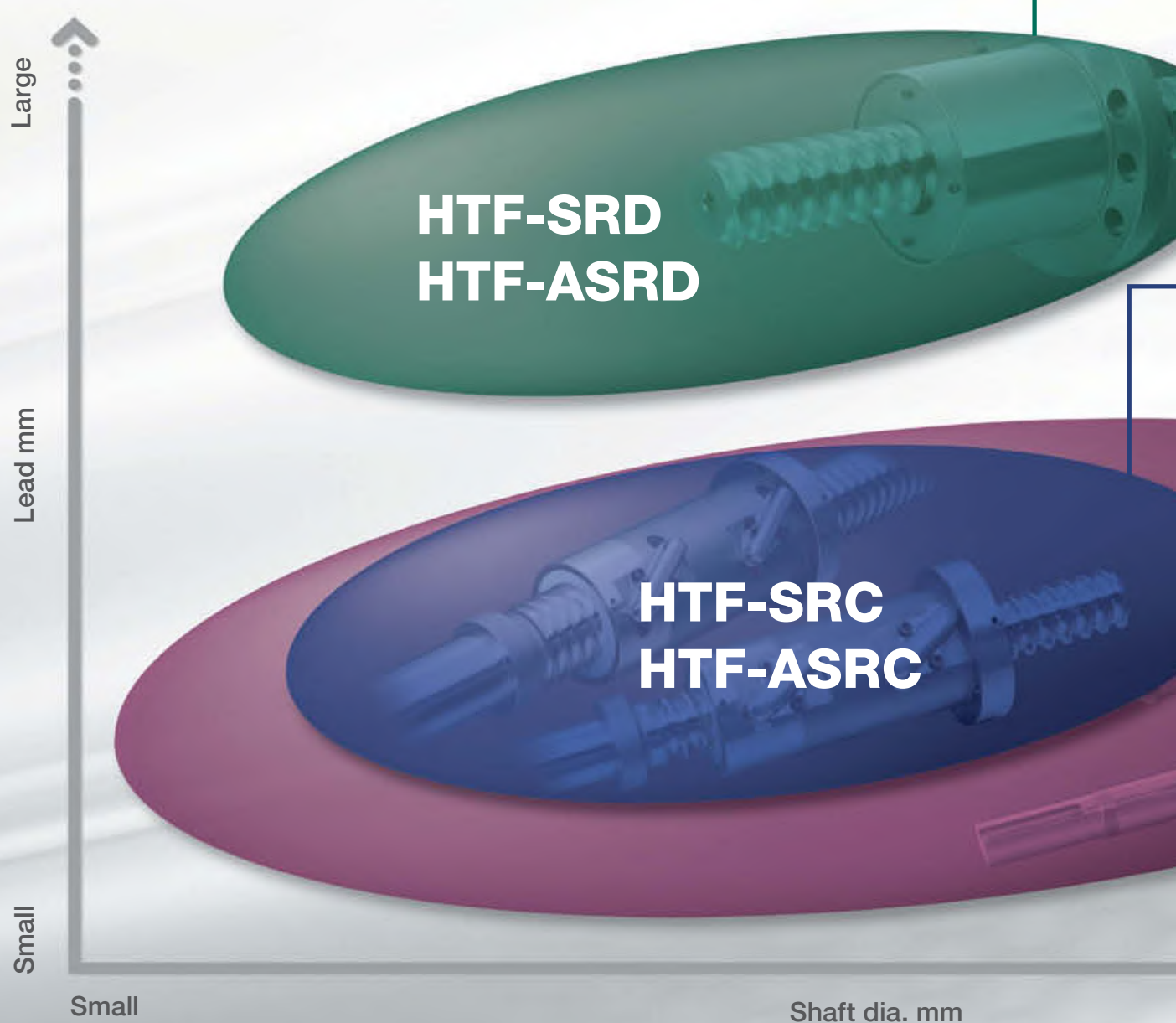
These ball screws enable the electric servo drive to operate under the most severe conditions.



Lineup of NSK Ball Screws for High-Load Drive

Best suited design for high-load applications

The best arrangement of the ball recirculation circuits and use of the largest possible ball have significantly contributed to the enhancement of high-load bearing characteristics. (Refer to pages 6 and 7 for details.)



As well as long shafts, a variety of shaft end configurations are available

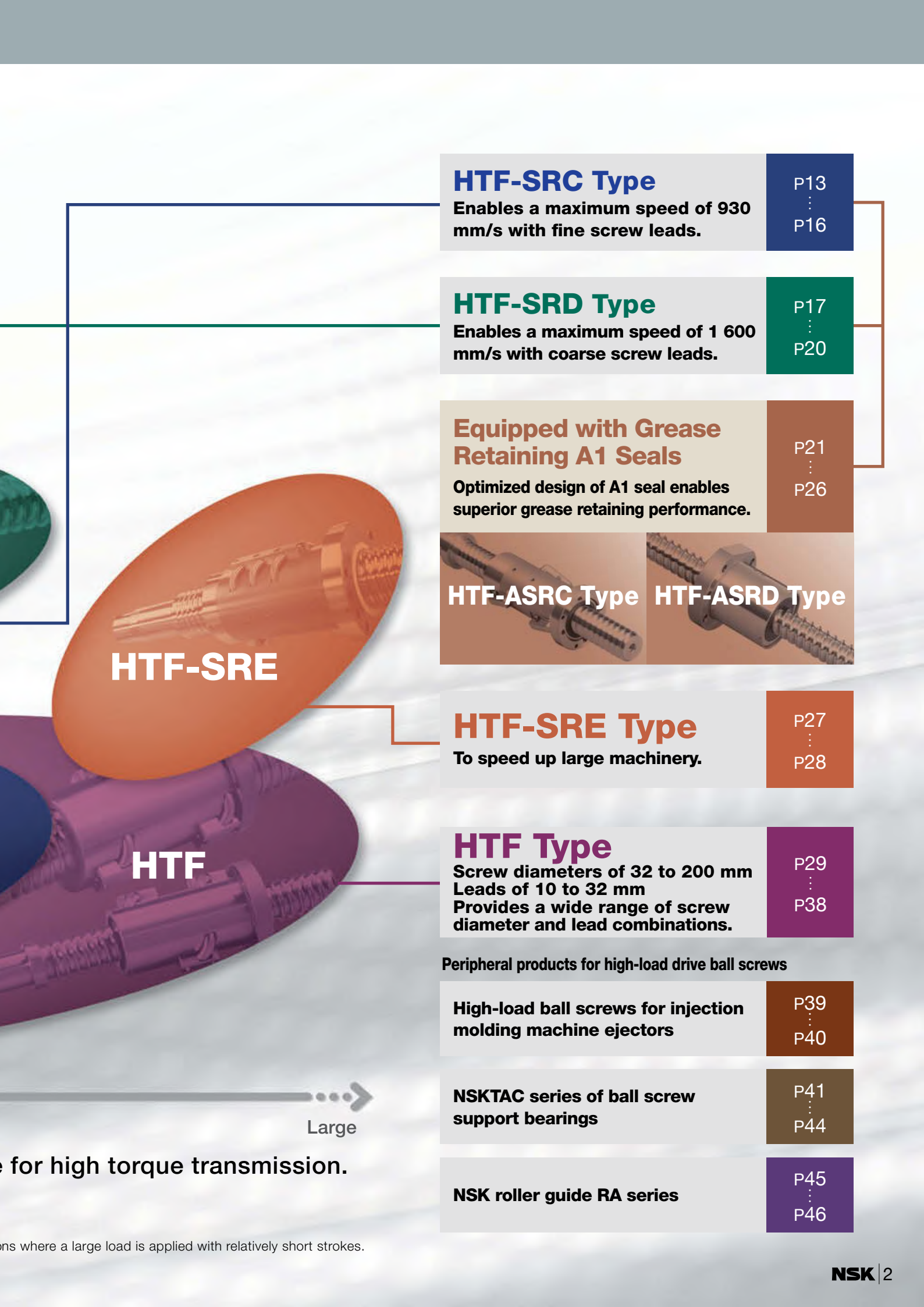
Examples:

■ Involute spline (JIS B 1603)

■ Straight-sided spline (JIS B 1601)

■ Keyways

※There are high load capacity options available for the above ball screws for application



HTF-SRC Type

Enables a maximum speed of 930 mm/s with fine screw leads.

P13
⋮
P16

HTF-SRD Type

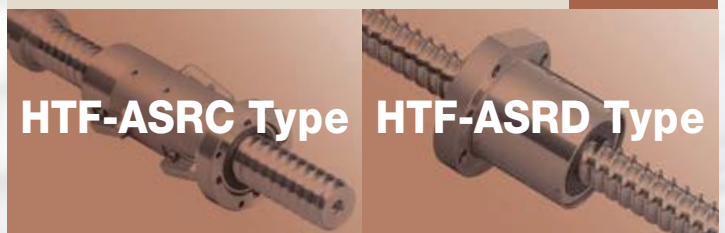
Enables a maximum speed of 1 600 mm/s with coarse screw leads.

P17
⋮
P20

Equipped with Grease Retaining A1 Seals

Optimized design of A1 seal enables superior grease retaining performance.

P21
⋮
P26



HTF-ASRC Type

HTF-ASRD Type

HTF-SRE Type

To speed up large machinery.

P27
⋮
P28

HTF Type

Screw diameters of 32 to 200 mm
Leads of 10 to 32 mm
Provides a wide range of screw diameter and lead combinations.

P29
⋮
P38

Peripheral products for high-load drive ball screws

High-load ball screws for injection molding machine ejectors

P39
⋮
P40

NSKTAC series of ball screw support bearings

P41
⋮
P44

NSK roller guide RA series

P45
⋮
P46

for high torque transmission.

ons where a large load is applied with relatively short strokes.

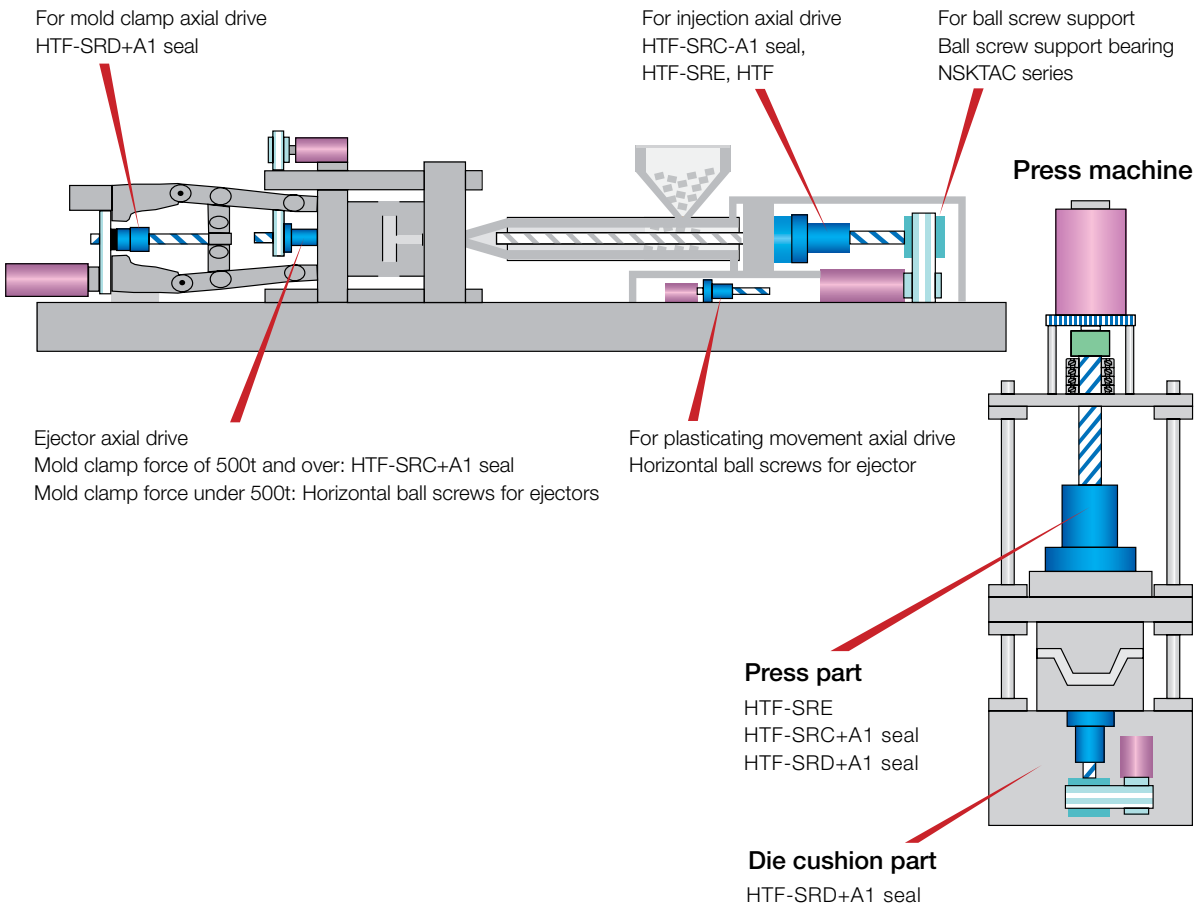
Technical Description

1 Examples of Application

Application	Injection molding machine	Die cast machine	Servo press	Press brake	Punch press	Powder press	Bending machine	Press fitting machine	Elevating machine
HTF Type	○	○	○	○	○	○	○	○	○
SRC Type	◎	○	◎	◎	○	◎	◎	◎	○
SRD Type	◎	◎			○				○
SRE Type	○	◎	◎	○	○	○	○		○

※There are high load capacity options available for applications with large loads with relatively short strokes, such as press fitting machine.
Please consult NSK.

Injection molding machine



2 Features

NSK high-load drive ball screws have maximized the ball diameter and increased the number of valid load balls for a design that can withstand a high load. They have achieved a high reliability through many different technologies including even load distribution. Technology for high-speed feeding and preserving the work environment have also been added to accommodate the needs of various devices requiring a large load and high reliability, such as hydraulic cylinder replacement.

High reliability

In addition to high load design, all series are equipped with ball retaining piece S1 for preventing ball competition and helping even nut load distribution, and other original NSK technology to meet a high load bearing requirements.

High-speed feeding

Feeding speed has been increased to improve efficiency of the machine and injection. Maximum speeds are 930 mm/s with a fine lead and 1,600 mm/s with a coarse lead.

High environmental properties

With sophisticated seal technology, grease splattering has been reduced and less topping up is needed in response to ever increasing concerns for environment.

The chart below shows technologies used for each series to achieve high reliability, high-speed feeding and environmental consideration.

Ball screws for high load drive		Line up					
Technology used		HTF·SRC	HTF·SRD	HTF·ASRC	HTF·ASRD	HTF·SRE	HTF
High reliability P5~	Design for high load	○	○	○	○	○	○
	Ball retaining piece S1	○	○	○	○	○	○
	Even load distribution [1] (radial load balance)	○	○	○	○	○	○
	Even load distribution [2] (in consideration of axial nut material expansion and contraction)	○	○	○	○	○	○
	High load capacity option (optional)	○	○	○	○	○	○
High-speed feeding P8~	High d/n circulation route design	○	○	○	○	○	
	Ball groove shape for high speed	○	○	○	○	○	○
	Coarse lead setting		○		○		
High environmental properties P9~	Grease retaining A1 seals			○	○		
	Low noise	○	○	○	○	○	

Technical Description

2-1 High reliability

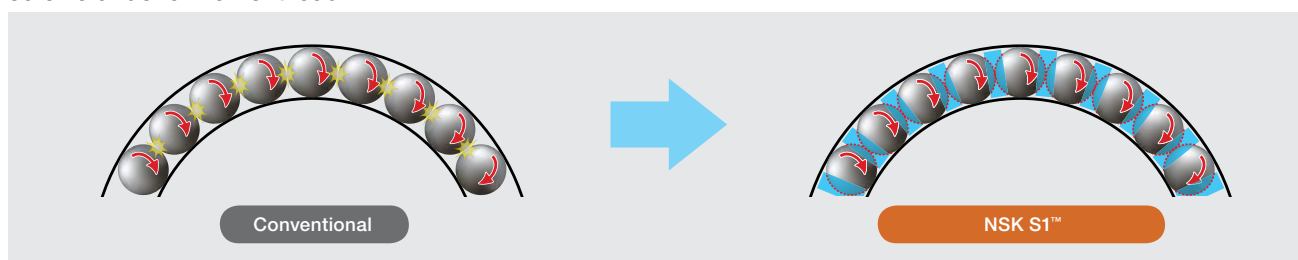
1 Design for high load

NSK ball screws for high load drive have increased load capacity by maximizing the diameter of balls in relation to the lead, increasing the number of valid load balls and optimizing the shape of ball groove for a design that can withstand high load.

2 Resin Retaining Piece NSK S1™

A moment load caused by misalignment of a ball screw can hinder smooth motion of the balls, thus causing ball jamming in the ball recirculation circuits and adversely affecting the durability of the ball screw.

By incorporating the resin retaining piece NSK S1™ between balls, NSK has greatly improved the durability of ball screws under a moment load.



Durability test with continuous high load

Test model: HTF10025-7.5

All load balls (without S1), and with S1

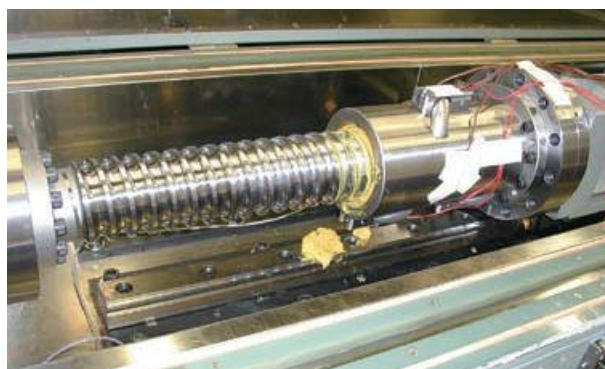
Test conditions:

Load condition: Forward 200 kN, Back 20 kN

Stroke: 70 mm, Cycle time: 9 sec

Lubrication: Grease

Temperature: Normal



Mounting error: Max. 0.03 mm

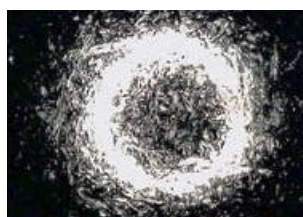
0.3 mm

0.3 mm

Outer
surface of
balls



All load balls: very good
(after 100 000 cycles)



All load balls: damaged
(after 10 000 cycles)



With S1: very good
(after 100 000 cycles)

3 Technology to evenly distribute nut load

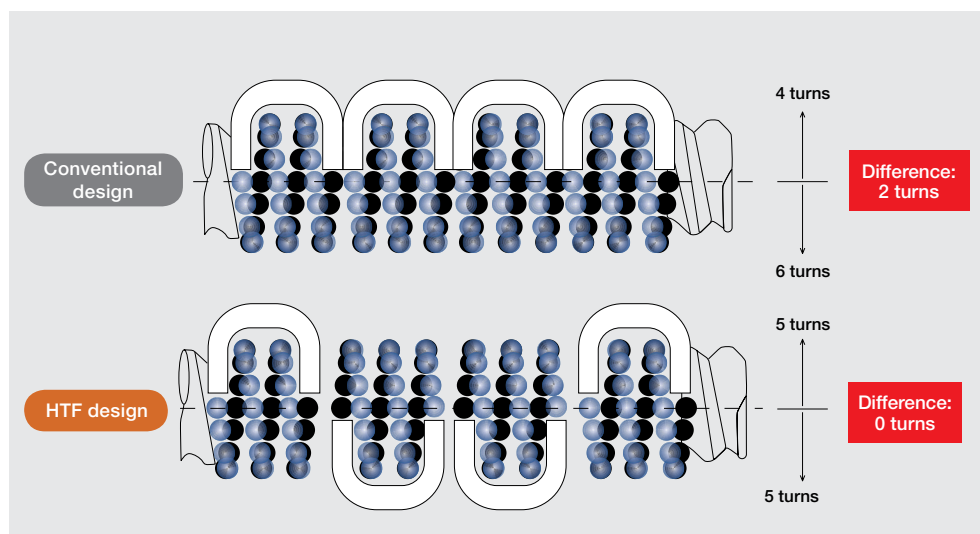
[Patent pending]

With ball screws that carry large loads, it is important to distribute the load evenly to each ball. NSK high-load drive ball screws have improved reliability with the load distribution technology described below.

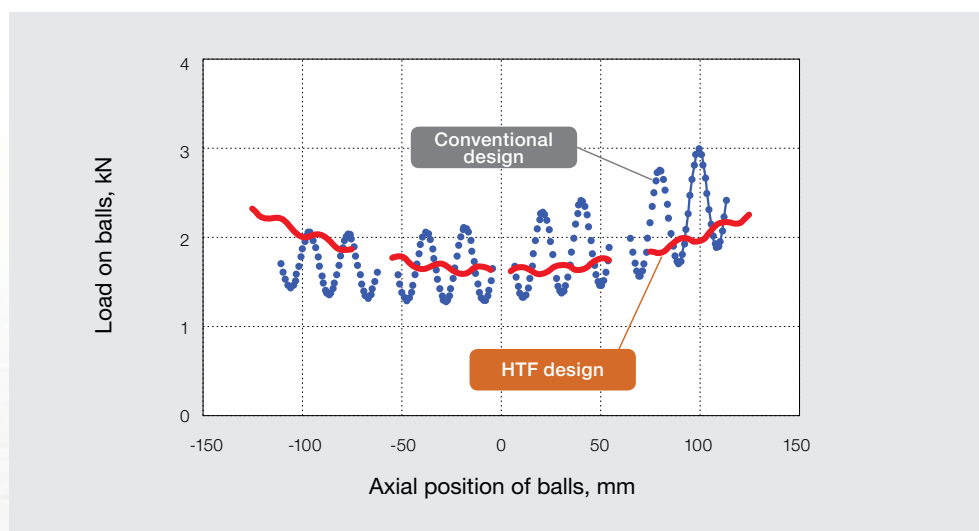
Theory of even load distribution 1 (applies to SRC and return tube types)

Ball return tubes are located 180 degrees apart for equal load distribution to the balls.

Minimum difference between upper and lower balls



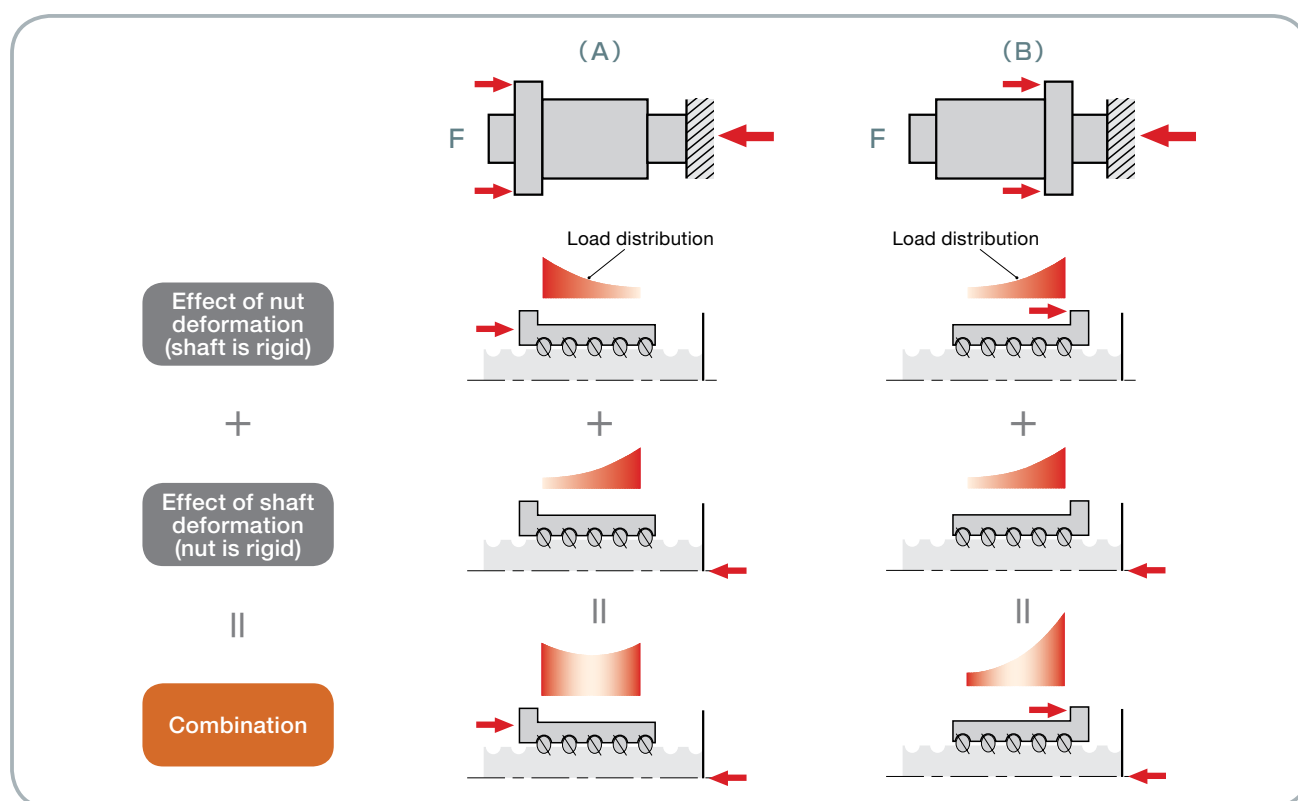
Load distribution to balls



Technical Description

Even load distribution [2]

With ball screws that carry a large load, the deformation of components (axis, nut) cannot be disregarded. Based on the load points adapted for screws and nuts in the illustration below (A) (recommended installation), the influence of contraction and expansion in the screw shaft and nut axial direction is offset and inner nut load is evenly distributed. To make these measures even more effective, axis and the cross section of nut are placed as close to each other as possible in HTF-SRC and HTF models.



4 Options for high load capacity

Improving load bearing performance considerably

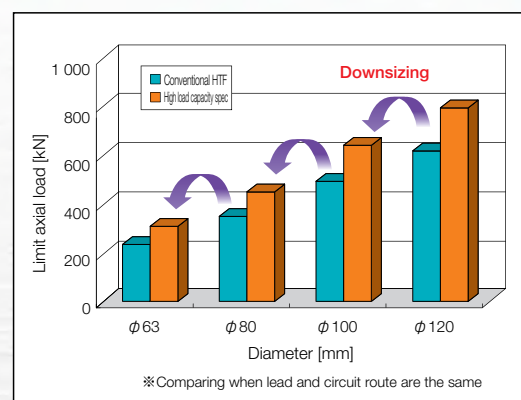
Load limits for high-load drive ball screws are

- (1) Allowable axial load (load limit beyond which stress on ball contact surface has extremely adverse effect on fatigue life)
- (2) Limit axial load (limit load of ball and axial groove contact surface reaching groove shoulder).

Through inner spec optimization, limit axial load can be up to 1.3 times greater than conventional high-load drive ball screws. These are suitable for applications where a large load is applied at relatively short strokes, such as sheet metal presses, press brakes, servo presses, mold presses, etc. Choices are made in consideration of balance between enhanced load bearing and service life. Please consult NSK.

A wide range of variations

Ball screws with this option are compatible with all types of high-load drive ball screws, such as HTF-SRC, HTF-SRD and grease-retaining A1 series in terms of size.

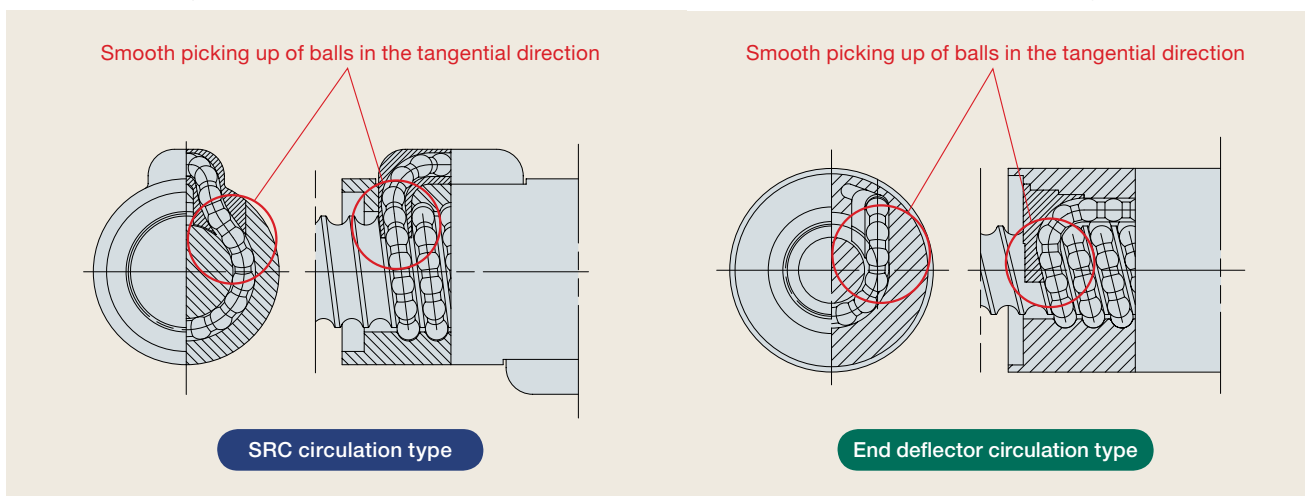


2-2 High-speed feeding

1 High d/n circulation route design

[Patent pending]

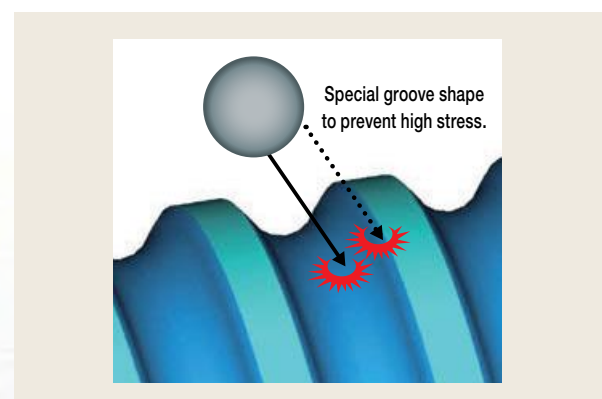
By smoothly picking up balls in the direction tangent to the screw groove, the impact of the balls colliding on other components will be reduced. d/n values (shaft diameter x number of rotations) for speed of circulation components is more than twice as fast as the conventional tube recirculation system.



2 Ball groove shape for high speed

[Patent pending]

While rotating at a high speed, the ball collides with the axis at a high speed. With optimal-design ball grooves, pressure on the ball groove surface is minimized during ball collision, preventing shaft damage.



3 Coarse lead setting

To achieve higher feeding, coarse lead setting is available. (for example, shaft diameter 50 mm for a lead of 40 mm). This, along with high d/n values, enables a high speed feeding.

Technical Description

2-3 High environmental properties

1 Grease retaining A1 seal

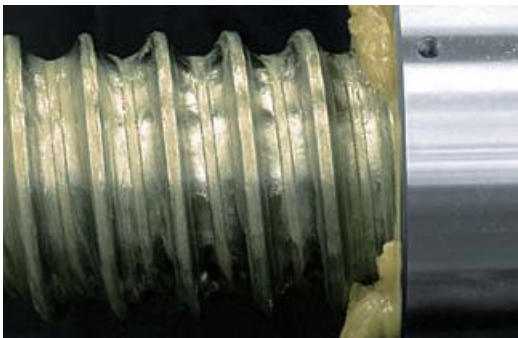
[Patent pending]

Greatly improved grease retaining performance

Thanks to the special ball groove profile of the screw shaft together with the grease retaining A1 seal, the grease retaining characteristics have greatly improved compared with those of existing plastic seals.

Grease leakage at initial cycle operation

(Test piece: HTF-ASRC6316-10.5 with high-load grease with an extreme pressure additive [worked penetration: 300])



With conventional labyrinth seals



With grease retaining A1 seals

Suppresses grease scattering and preserves a clean environment

Use of the A1 seal greatly suppresses grease scattering, showing a significant improvement over the use of existing plastic seals. The A1 seal simplifies the design of your cover, helping to preserve a clean and healthy environment.

Grease splash after 100-cycle operation

Test conditions	Test piece	Speed	Stroke	Lubrication
	HTF-ASRC6316-10.5	1 600 min ⁻¹	500 mm	High-load grease with an extreme pressure additive

After initial run of 100 cycles at 200 min⁻¹, grease was wiped off from shaft OD, then photos were taken at the speed of 1 600 min⁻¹.



With existing plastic seals
(stroke center area)

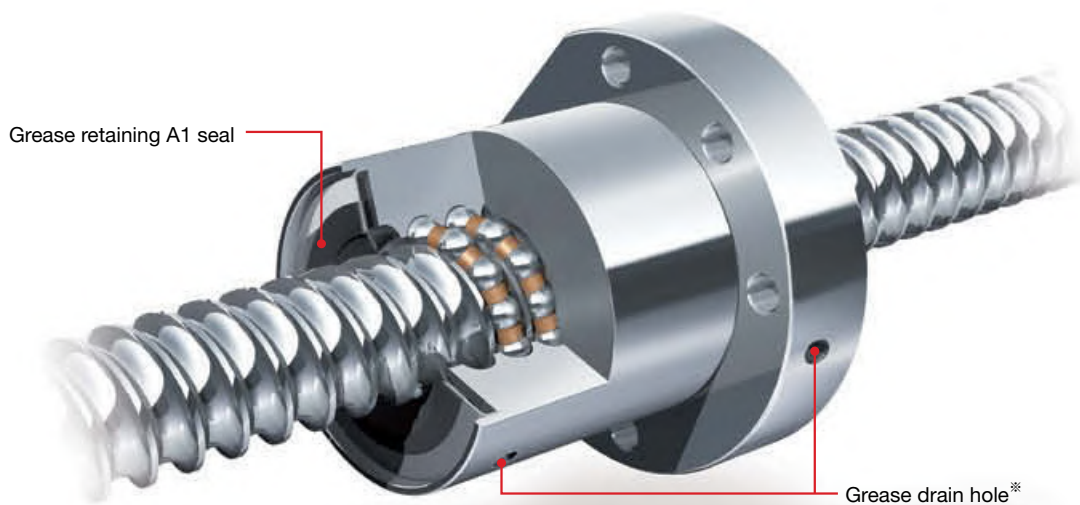


With grease retaining A1 seals
(stroke center area)

Low friction torque and low-heat generation

The increase of dynamic torque caused by the A1 seal is very small (30 to 50 Ncm in case of ball screw with 80-mm diameter). This level of increase has practically no impact on the driving torque.
The practical temperature rise caused by the A1 seal is merely 2 to 3 deg C higher than that of existing plastic seals.

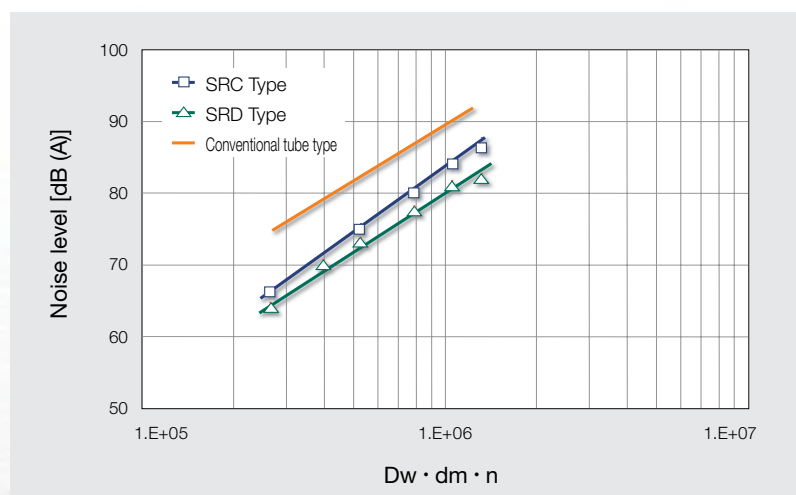
Construction of ball screw equipped with grease retaining A1 seal



※By opening the discharge holes for running-in after grease supplementation, etc., excess grease is discharged. By removing excess grease, grease splatter in high speed operation is reduced.

2 Low noise

By smoothly picking up balls in the screw shaft tangent direction, impact of ball collision on other components can be reduced. Compared to conventional tube type, the noise is reduced by over 6dB (A).



Technical Description

3 In use

1 Life of Ball Screw

Computational life, which is estimated by calculation, is the flaking life caused by rolling contact fatigue. The fatigue life of a ball screw can be estimated by basic dynamic load rating (Ca).

Basic dynamic load rating (Ca)

Basic dynamic load rating (Ca) is the axial load that allows 90% of a group of the same ball screws to rotate one million times (10^6 rev) under the same conditions without flaking occurring due to rolling contact fatigue. Basic dynamic load ratings (Ca) are shown in the dimension tables.

How to calculate fatigue life

The fatigue life of a ball screw is obtained by the following formula.

$$L = \left(\frac{Ca}{Fa \cdot fw} \right)^3 \cdot 10^6$$

$$Lt = \frac{L}{60n}$$

$$Ls = \frac{L \cdot l}{10^6}$$

L : Rated fatigue life (rev)

Lt : Life in hours (h)

Ls : Life by running distance (km)

Ca : Basic dynamic load rating (N)

Fa : Axial load (N)

n : Rotational speed (min^{-1})

l : Lead (mm)

fw : Load factor*

*The load factor is decided by operating conditions.
Consult NSK when impact and/or vibrations occur during the operation.

2 Conditions for attaching ball screws

With design aimed at high loads and even inner nut load distribution, NSK high-load drive ball screws have achieved high-load performance. (See page 7)

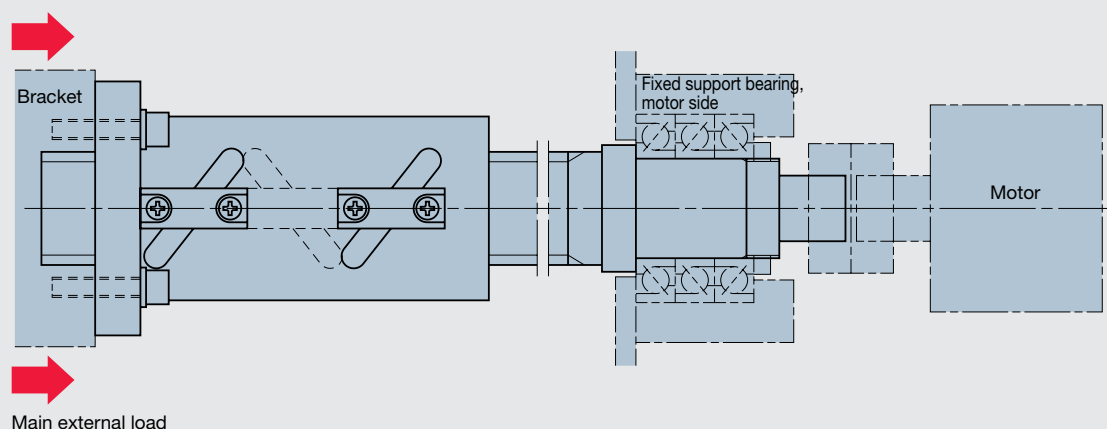
To make the most of these features, installation according to the illustration below is recommended.

The bolt holes of the installation surface in this catalog have been set on an assumption that load is received on the surface of the nut flange.

If there is drag load on the bolt for mounting ball screw, the strength of bolts should be carefully considered.

Also make sure to center the ball screw with guides.

HTF-SRC, HTF-ASRC, HTF type of recommended mounting direction



3 Cautions regarding lubrication

When using ball screws, lubricant needs to be replenished.

As time passes, lubricant and its functions deteriorate.

Lubricant inside of nuts is gradually discharged by stroke motions. Also, operating environments results in impurities in lubricant. Therefore, lubricant needs to be supplemented regularly.

[If high load is applied, use of load withstanding grease containing extreme pressure additives is recommended.]

4 Operating temperature

As the temperature of ball screws rises during use, the strength of the oil film of the lubricant decreases and there is a risk of inadequate lubrication. Be sure to use them at temperatures below 70 deg C (temperature at nut diameter). Contact NSK to ask about environments and use conditions that can easily become too hot.

Other

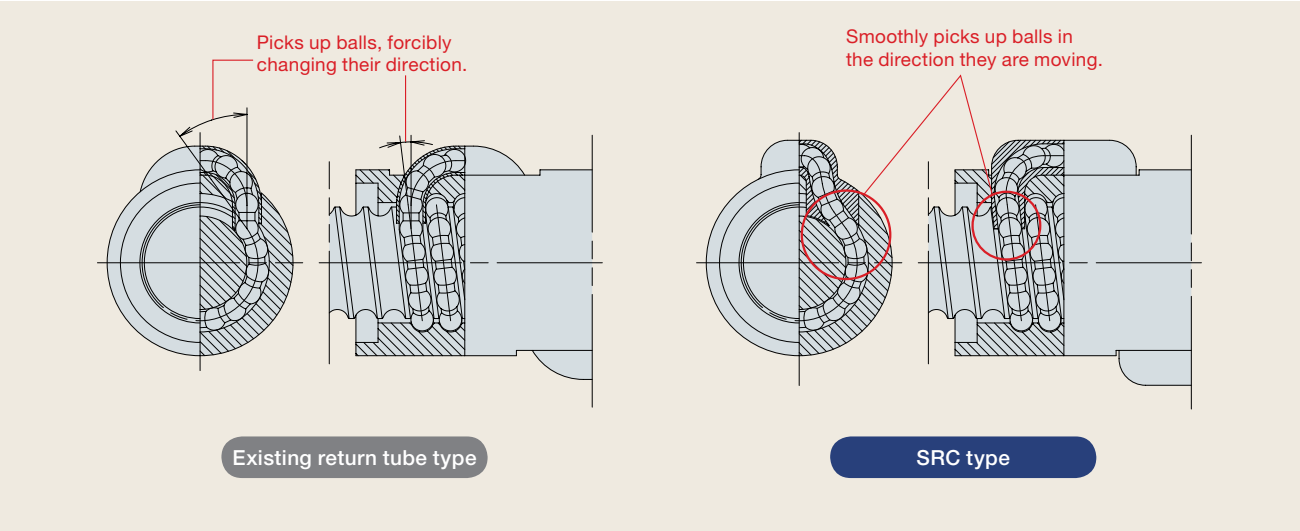
For other information on general technology of ball screws, see the section of ball screw technical explanations in the precision product catalog (CAT. No. 3162).

HTF-SRC Type

1 Specifications

Recirculation system: Equipped with SRC (Smooth Return Coupling)

By smoothly picking up balls in the direction tangent to the screw groove, feeding speed is twice as fast as the conventional tube recirculation system while the noise is half or less.



Allowable d·n value and feed speed

Lead 14 and 16 mm: 160 000 or less
Lead 20 and 25 mm: 140 000 or less
d·n: Shaft diameter d (mm) × Rotational speed n (min⁻¹)

Allowable feed speed of combinations of shaft diameter and lead					Unit [mm/s]	
Lead (mm)		14	16	20	25	
Shaft dia. (mm)	50	750	860	—	—	
	63	—	680	740	930	
	80	—	540	590	730	
	100	—	—	470	590	
	120	—	—	390	490	

High-speed performance
two times greater than
existing products

Noise reduced by 6 dB (A)
or more compared with
return tube type

Accuracy grade

Ct7 of JIS B 1192 (1997) is applicable as the standard accuracy grade.

Axial play

Standard axial play: 0.020 mm or less, or 0.050 mm or less

Optional specs

- High load capacity option to increase limit axial load.
See page 7 for details.
- Consult NSK if the number of circuits is to be changed for a higher load capacity or circulation routes are to be placed on a single side.

2 Design Precautions

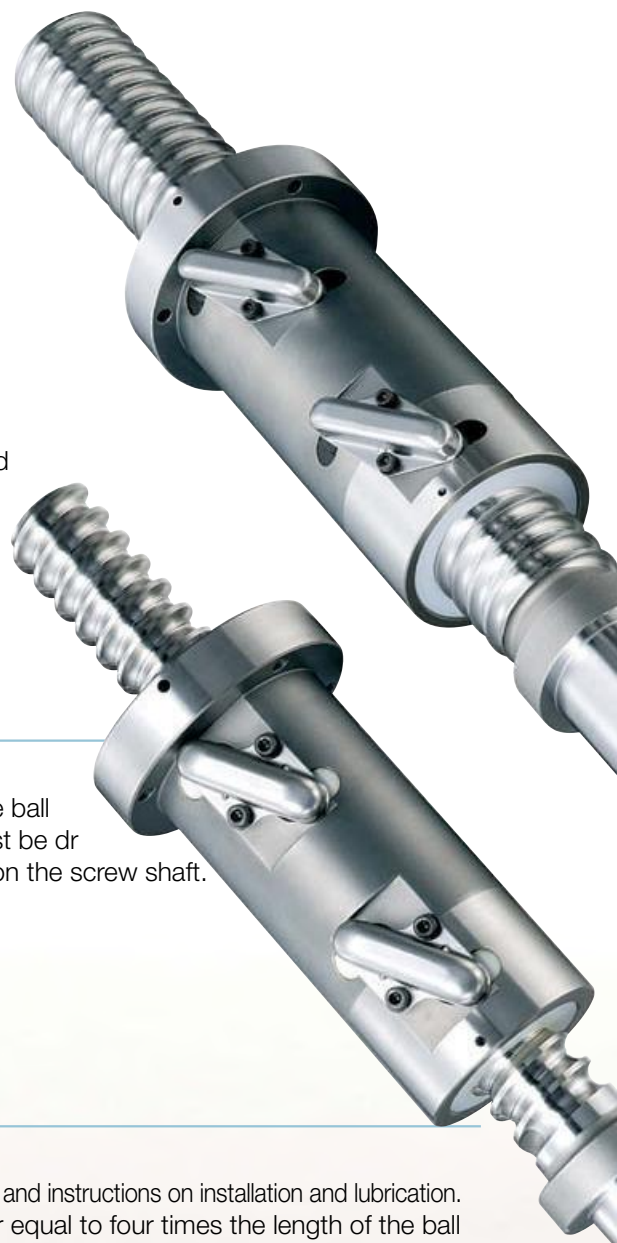
- 1) When designing the shaft ends, one end of the screw shaft must have ball groove cut through to the shaft end or the ball groove root diameter must be ϕ or less (see dimension chart), otherwise the ball nut cannot be installed on the screw shaft.
- 2) Please consult NSK with your special design requirements.

3 Selection of Ball Screw

- Please refer to pages 11 and 12 for details on the operating life of the ball screw and instructions on installation and lubrication.
- Please consult NSK in the case of a short stroke operation less than or equal to four times the length of the ball screw lead.capacity or circulation routes are to be placed on a single side.

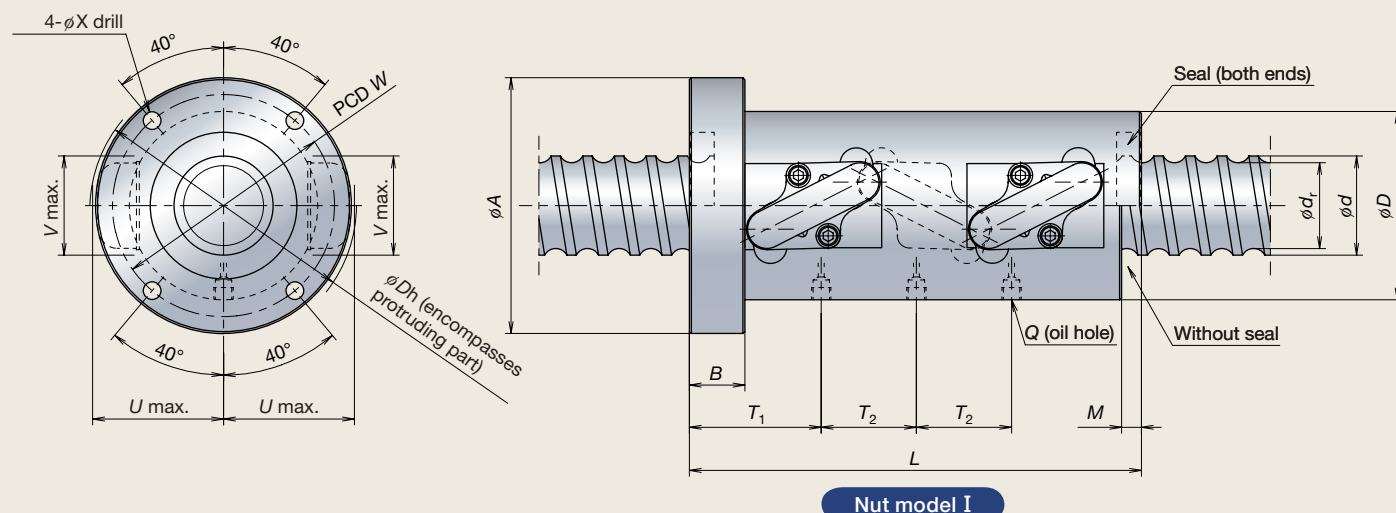
4 Operating Temperature

- Use temperature: 70 deg C maximum (temperature at nut diameter).
Use at or below 60 deg C is recommended.



HTF-SRC Type

Outline drawing



HTF-SRC Type Specifications

Model No.	Lead ℓ	Shaft dia. d	Root dia. d_r	Effective ball turns Turns $\times$ Circuits	Nut model	Basic load rating (kN)		D	A
						Dynamic C_a	Static C_{0a}		
HTF-SRC5014-7.5	14	50	41.6	2.5 $\times$ 3	I	264	623	80	114
HTF-SRC5016-7.5	16	50	39	2.5 $\times$ 3	I	383	818	95	129
HTF-SRC6316-7.5	16	63	52	2.5 $\times$ 3	I	429	1 050	105	139
HTF-SRC6316-10	16	63	52	2.5 $\times$ 4	II	549	1 410	105	139
HTF-SRC6316-10.5	16	63	52	3.5 $\times$ 3	I	562	1 450	105	139
HTF-SRC6316-14	16	63	52	3.5 $\times$ 4	II	720	1 930	105	139
HTF-SRC8016-10.5	16	80	69	3.5 $\times$ 3	I	627	1 870	120	154
HTF-SRC8016-14	16	80	69	3.5 $\times$ 4	II	802	2 490	120	154
HTF-SRC6320-7.5	20	63	49	2.5 $\times$ 3	I	572	1 280	117	157
HTF-SRC6320-10	20	63	49	2.5 $\times$ 4	II	732	1 710	117	157
HTF-SRC8020-10.5	20	80	66	3.5 $\times$ 3	I	838	2 300	130	170
HTF-SRC10020-10.5	20	100	86	3.5 $\times$ 3	I	936	2 910	145	185
HTF-SRC10020-14	20	100	86	3.5 $\times$ 4	II	1 200	3 890	145	185
HTF-SRC12020-7.5	20	120	106	2.5 $\times$ 3	I	776	2 550	173	213
HTF-SRC12020-10	20	120	106	2.5 $\times$ 4	II	994	3 400	173	213
HTF-SRC6325-10.5	25	63	49	3.5 $\times$ 3	I	750	1 770	117	157
HTF-SRC8025-7.5	25	80	63	2.5 $\times$ 3	I	790	1 960	145	185
HTF-SRC10025-10.5	25	100	83	3.5 $\times$ 3	I	1 200	3 430	159	199
HTF-SRC10025-14	25	100	83	3.5 $\times$ 4	II	1 540	4 580	159	199
HTF-SRC12025-10.5	25	120	103	3.5 $\times$ 3	I	1 300	4 200	173	213
HTF-SRC12025-14	25	120	103	3.5 $\times$ 4	II	1 660	5 600	173	213

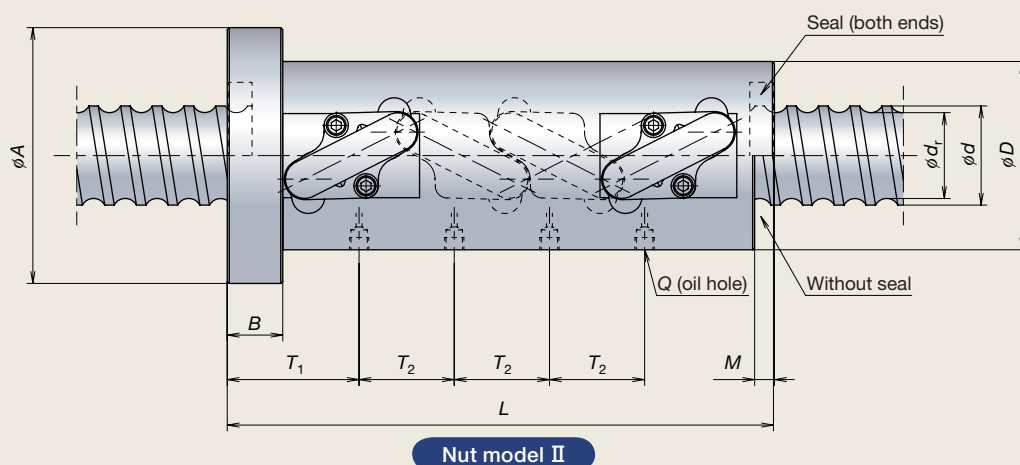
Remarks: 1. The ball nut length with no seals is shorter by M than that of a ball nut with seals.

2. Please consult NSK if load exceeds the allowable axial load (F_a max.).

3. The right hand screw is the standard. For specifications on left hand screws, contact NSK.

4. The allowable axial load (F_a max.) is determined in accordance with the mounting conditions of ball screws recommended by NSK.

Refer to page 12 for the mounting conditions. If your mounting conditions differ from those provided, please consult NSK.



Unit [mm]

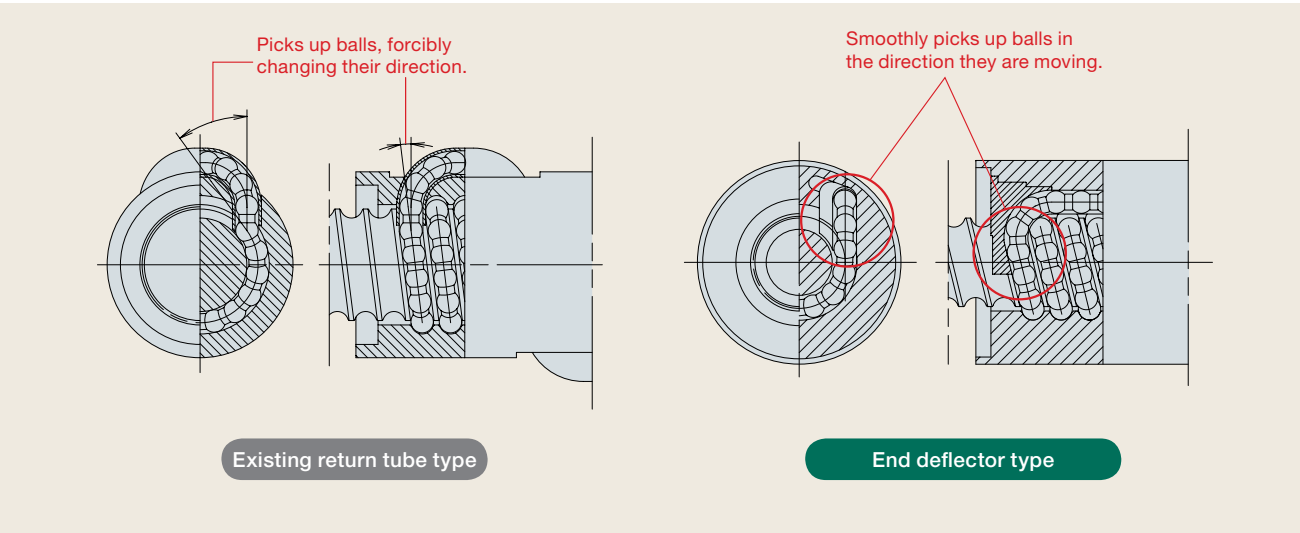
Ball nut dimensions												Allowable axial load Fa max. (kN)
	<i>B</i>	<i>L</i>	<i>M</i>	<i>W</i>	<i>X</i>	<i>U</i>	<i>V</i>	<i>Dh</i>	<i>Q</i>	<i>T</i> ₁	<i>T</i> ₂	
	28	202	10	97	9	54.5	46	111	M6×1	69	42	73.1
	28	228	10	112	9	66	50	134	Rc1/8	74.5	48	91.1
	28	228	10	122	9	72.5	50	148	Rc1/8	74.5	48	119.7
	28	276	10	122	9	72.5	50	148	Rc1/8	74.5	48	159.6
	28	276	10	122	9	72.5	50	148	Rc1/8	74.5	64	167.6
	28	340	10	122	9	72.5	50	148	Rc1/8	74.5	64	215.0
	32	278	10	137	9	80	60	165	Rc1/8	78.5	64	221.3
	32	342	10	137	9	80	60	165	Rc1/8	78.5	64	295.1
	32	279	12	137	11	80	62	163	Rc1/8	90	60	147.1
	32	339	12	137	11	80	62	163	Rc1/8	90	60	196.1
	32	339	12	150	11	88	64	180	Rc1/8	90	80	267.4
	32	339	12	165	11	97	78	199	Rc1/8	90	80	345.9
	32	419	12	165	11	97	78	199	Rc1/8	90	80	461.2
	40	287	12	193	11	109.5	88	229	Rc1/8	98	60	304.6
	40	347	12	193	11	109.5	88	229	Rc1/8	98	60	406.1
	32	405	12	137	11	81.5	61	167	Rc1/8	101.75	100	170.0
	40	347	17	165	11	99.5	73	202	Rc1/8	111.75	75	221.1
	40	422	17	179	11	108	79	220	Rc1/8	111.75	100	408.4
	40	522	17	179	11	108	79	220	Rc1/8	111.75	100	544.6
	40	421	17	193	11	116	92	238	Rc1/8	111.25	100	498.0
	40	521	17	193	11	116	92	238	Rc1/8	111.25	100	664.0

HTF-SRD Type

1 Specifications

Recirculation system: Equipped with end deflector

By smoothly picking up balls in the direction tangent to the screw groove, feeding speed is twice as fast as the conventional tube recirculation system while the noise is half or less.



Allowable d·n value and feed speed

d·n: 120 000 or less
d·n: Shaft diameter d (mm) × Rotational speed (min⁻¹)

Allowable feed speed of combinations of shaft diameter and lead						Unit [mm/s]
Lead (mm) / Shaft dia. (mm)	32	40	50	60	70	
50	—	1 600	—	—	—	
63	1 000	1 250	—	—	—	
80	—	—	1 250	—	—	
100	—	—	—	1 200	—	
120	—	—	—	—	1 160	

High-lead specification
optimal for high speed

Noise reduced by 6 dB (A) or
more compared with
return tube type

Accuracy grade

Ct7 of JIS B 1192 (1997) is applicable as the standard accuracy grade.

Axial play

Standard axial play: 0.020 mm or less, or 0.050 mm or less

Seal

The ball nut length is shortened by the use of thin seals.

Option

High load capacity option to increase limit axial load. See page 7 for details.
Please consult NSK if you are considering nut rotation.



2 Design Precautions

- 1) When designing the shaft ends, one end of the screw shaft must have ball groove cut through to the shaft end or the ball groove root diameter must be ϕr or less (see dimension chart), otherwise the ball nut cannot be installed on the screw shaft.
- 2) Please consult NSK with your special design requirements.

3 Selection of Ball Screw

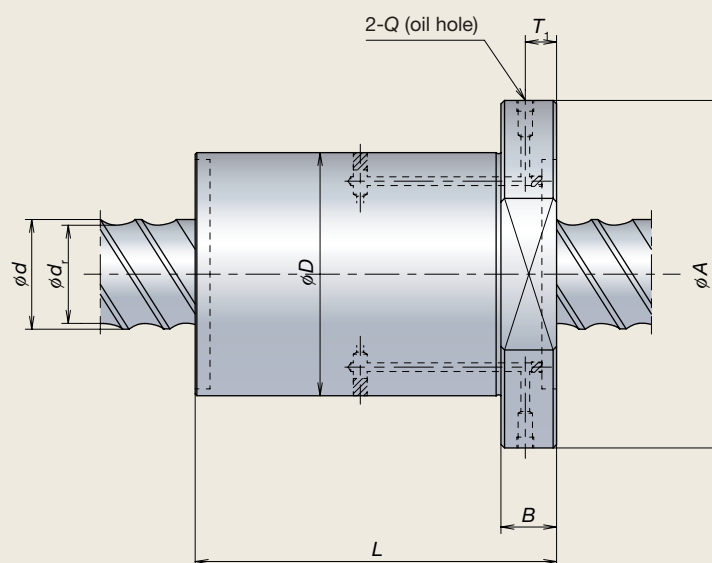
- Please refer to pages 11 and 12 for details on the operating life of the ball screw and instructions on installation and lubrication.
- Please consult NSK in the case of a short stroke operation less than or equal to four times the length of the ball screw lead.capacity or circulation routes are to be placed on a single side.

4 Operating Temperature

- Use temperature: 70 deg C maximum (temperature at nut diameter).
Use at or below 60 deg C is recommended.

HTF-SRD Type

Outline drawing



HTF-SRD Type Specifications

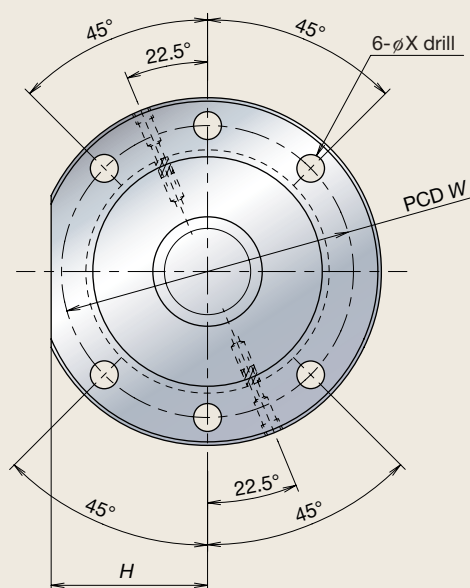
Model No.	Lead ℓ	Shaft dia. d	Root dia. d_r	Basic load rating (kN)		D	
				Dynamic C_a	Static C_{0a}		
HTF-SRD6332-4E	32	63	49	292	590	140	
HTF-SRD5040-6E	40	50	39	243	491	115	
HTF-SRD5040-8E	40	50	39	319	679	115	
HTF-SRD6340-6E	40	63	49	363	768	140	
HTF-SRD6340-8E	40	63	49	476	1 060	140	
HTF-SRD8050-6E	50	80	63	502	1 180	175	
HTF-SRD8050-8E	50	80	63	658	1 630	175	
HTF-SRD10060-6E	60	100	83	583	1 490	195	
HTF-SRD10060-8E	60	100	83	765	2 060	195	
HTF-SRD12070-6E	70	120	103	630	1 810	210	
HTF-SRD12070-8E	70	120	103	826	2 520	210	

Remarks: 1. Please consult NSK if load exceeds the allowable axial load (F_a max.).

2. The right hand screw is the standard. For specifications on left hand screws, contact NSK.

3. The allowable axial load (F_a max.) is determined in accordance with the mounting conditions of ball screws recommended by NSK.

Refer to page 12 for the mounting conditions. If your mounting conditions differ from those provided, please consult NSK.



Unit [mm]

Ball nut dimensions								Allowable axial load Fa max. (kN)
A	B	L	H	W	X	Q	T ₁	
190	32	176	85	165	14	Rc1/8	18	72.6
165	28	159	72.5	140	14	Rc1/8	16	67.6
165	28	199	72.5	140	14	Rc1/8	16	92
200	32	163	90	170	18	Rc1/8	18	106.3
200	32	203	90	170	18	Rc1/8	18	144.7
250	40	194	110	210	22	Rc1/8	18	163.7
250	40	244	110	210	22	Rc1/8	18	224.1
270	40	225	122	235	22	Rc1/8	20	211.5
270	40	285	122	235	22	Rc1/8	20	288
285	50	260	130	250	22	Rc1/8	25	259.4
285	50	330	130	250	22	Rc1/8	25	352

HTF-ASRC Type and HTF-ASRD Type Equipped with Grease Retaining A1 Seal

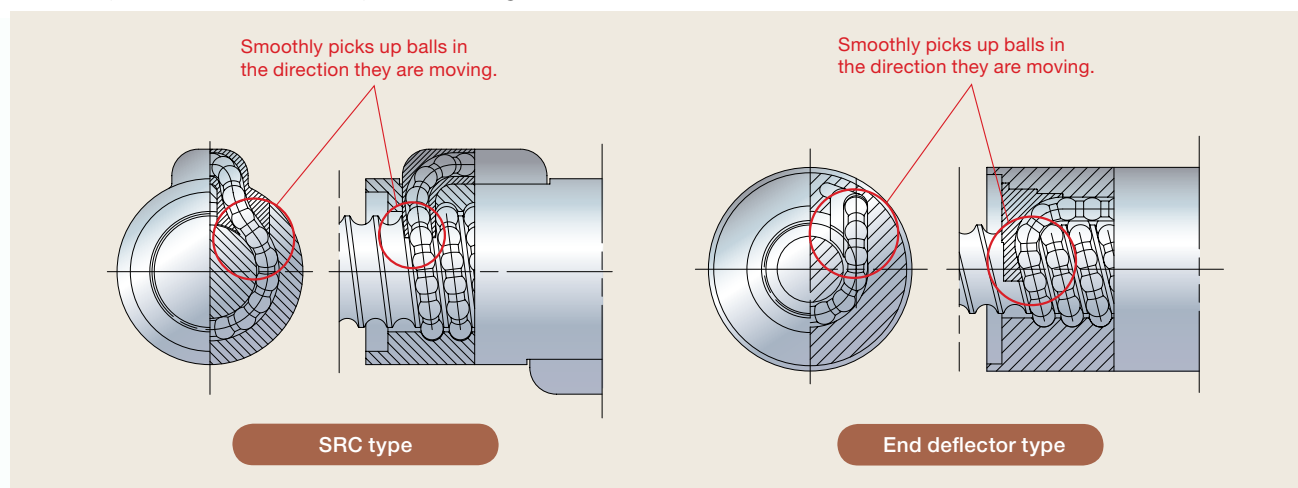
1 Specifications

Equipped with grease retaining A1 seal

The optimum design of the A1 seal (patent applied for and pending) allows superior grease retaining performance.

Recirculation system: Equipped with SRC or end deflector

These ball screws are used with the SRC or the end deflector recirculation system, which pick up balls smoothly in the direction they are moving.



Allowable d·n value and feed speed

Lead 16 mm: 160 000 or less

Lead 20 and 25 mm: 140 000 or less

Lead 32, 40 and 50 mm: 120 000 or less

d·n: Shaft diameter d (mm) × Rotational speed (min⁻¹)

Allowable feed speed of combinations of shaft diameter and lead

Unit [mm/s]

Lead (mm) Shaft dia. (mm)	HTF-ASRC Type			HTF-ASRD Type			
	16	20	25	32	40	50	60
50	860	—	—	—	1 600	—	—
63	680	740	930	1 000	1 250	—	—
80	540	590	730	—	—	1 250	—
100	—	470	590	—	—	—	1 200
120	—	390	490	—	—	—	—

Accuracy grade

Ct7 of JIS B 1192 (1997) is applicable as the standard accuracy grade.

Axial play

Standard axial play: 0.020 mm or less, 0.050 mm or less

Option

High load capacity option to increase limit axial load.
See page 7 for details.



2 Design Precautions

- 1) When designing the shaft ends, one end of the screw shaft must have ball groove cut through to the shaft end or the ball groove root diameter must be ϕr or less (see dimension chart), otherwise the ball nut cannot be installed on the screw shaft.
- 2) The table below shows the maximum length of screw shaft for the equipment of the A1 seal.
- 3) Please contact NSK with your special design requirements.

Unit [mm]

Shaft dia.	Max. shaft length
50	850
63	950
80	1 100
100, 120	1 300

3 Selection of Ball Screw

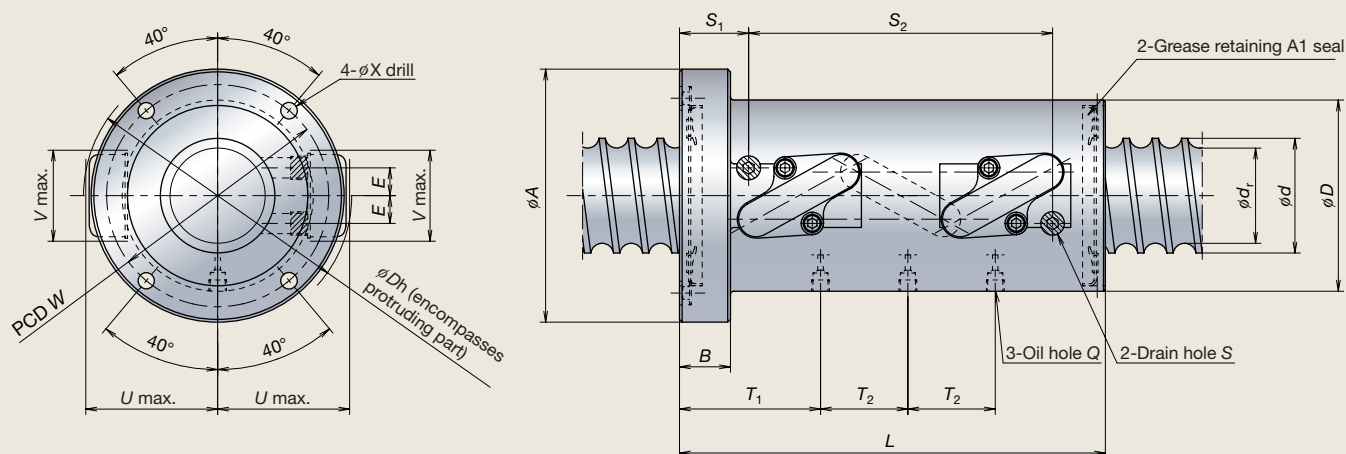
- Please refer to pages 11 and 12 for details on the operating life of the ball screw and instructions on installation and lubrication.
- Please consult NSK in the case of a short stroke operation less than or equal to four times the length of the ball screw lead.

4 Environmental Conditions

- Use temperature: 70 deg C maximum (temperature at nut diameter). Use at or below 60 deg C is recommended.
- Never use in an environment where degreasing solvents are present.
Examples: grease-removing organic solvent such as hexane or thinner, white kerosine, rust preventive oil (containing white kerosine)

HTF-ASRC Type

Outline drawing



Nut model I

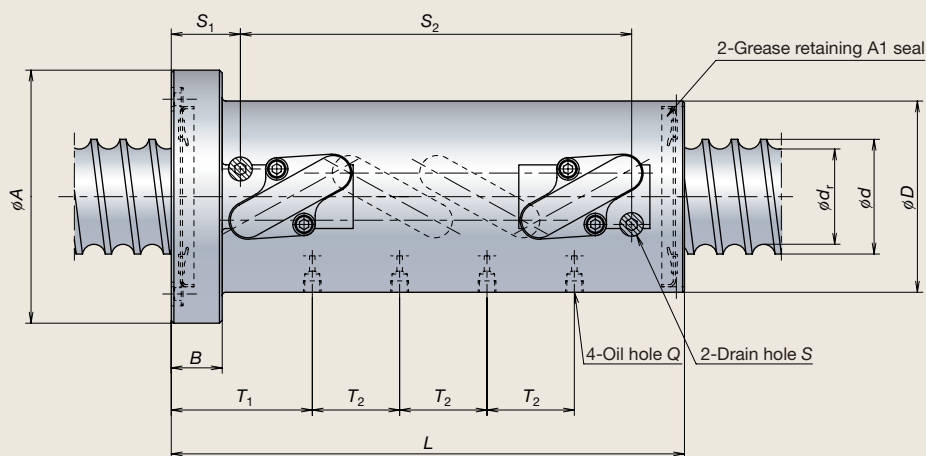
HTF-ASRC Type Specifications

Model No.	Lead ℓ	Shaft dia. d	Root dia. d_r	Effective ball turns Turns $\times$ Circuits	Nut model	Basic load rating (kN)		D	A	B
						Dynamic C_a	Static C_{0a}			
HTF-ASRC5016-7.5	16	50	39	2.5 $\times$ 3	I	383	818	95	129	28
HTF-ASRC6316-7.5	16	63	52	2.5 $\times$ 3	I	429	1 050	105	139	28
HTF-ASRC6316-10	16	63	52	2.5 $\times$ 4	II	549	1 410	105	139	28
HTF-ASRC6316-10.5	16	63	52	3.5 $\times$ 3	I	562	1 450	105	139	28
HTF-ASRC6316-14	16	63	52	3.5 $\times$ 4	II	720	1 930	105	139	28
HTF-ASRC8016-10.5	16	80	69	3.5 $\times$ 3	I	627	1 870	120	154	32
HTF-ASRC8016-14	16	80	69	3.5 $\times$ 4	II	802	2 490	120	154	32
HTF-ASRC6320-7.5	20	63	49	2.5 $\times$ 3	I	572	1 280	117	157	32
HTF-ASRC6320-10	20	63	49	2.5 $\times$ 4	II	732	1 710	117	157	32
HTF-ASRC8020-10.5	20	80	66	3.5 $\times$ 3	I	838	2 300	130	170	32
HTF-ASRC10020-10.5	20	100	86	3.5 $\times$ 3	I	936	2 910	145	185	32
HTF-ASRC10020-14	20	100	86	3.5 $\times$ 4	II	1 200	3 890	145	185	32
HTF-ASRC12020-7.5	20	120	106	2.5 $\times$ 3	I	776	2 550	173	213	40
HTF-ASRC12020-10	20	120	106	2.5 $\times$ 4	II	994	3 400	173	213	40
HTF-ASRC6325-10.5	25	63	49	3.5 $\times$ 3	I	750	1 770	117	157	32
HTF-ASRC8025-7.5	25	80	63	2.5 $\times$ 3	I	790	1 960	145	185	40
HTF-ASRC10025-10.5	25	100	83	3.5 $\times$ 3	I	1 200	3 430	159	199	40
HTF-ASRC10025-14	25	100	83	3.5 $\times$ 4	II	1 540	4 580	159	199	40
HTF-ASRC12025-10.5	25	120	103	3.5 $\times$ 3	I	1 300	4 200	173	213	40
HTF-ASRC12025-14	25	120	103	3.5 $\times$ 4	II	1 660	5 600	173	213	40

Remarks: 1. Drain holes shall be plugged for shipping.

2. The right hand screw is the standard. For specifications on left hand screws, contact NSK.

3. The allowable axial load (F_a max.) is determined in accordance with the mounting conditions of ball screws recommended by NSK.
Refer to page 12 for the mounting conditions. If your mounting conditions differ from those provided, please consult NSK.



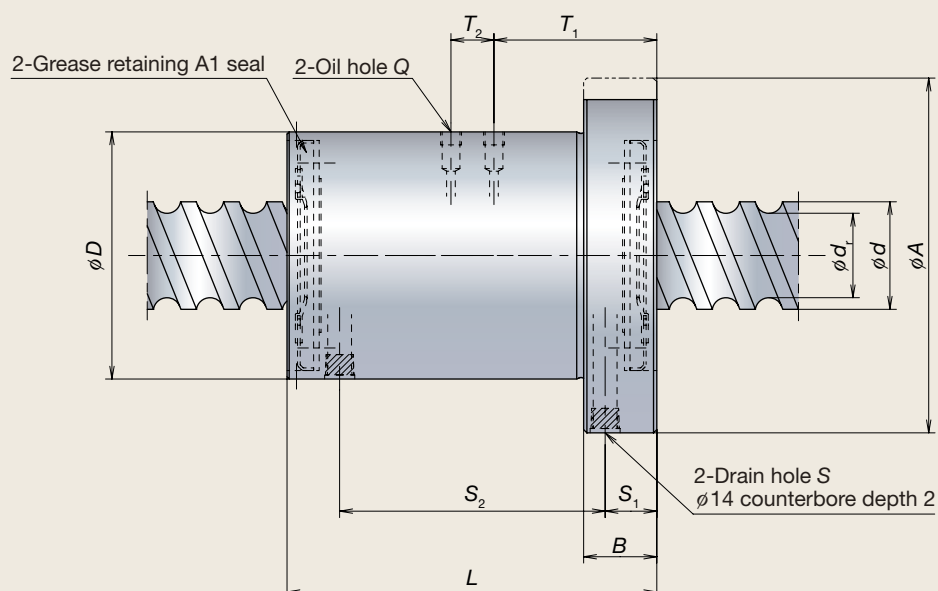
Nut model II

Unit [mm]

Ball nut dimensions													Allowable axial load Fa max. (kN)
L	W	X	U	V	Dh	Q	T ₁	T ₂	S	E	S ₁	S ₂	
234	112	9	66	50	134	Rc1/8	77.5	48	Rc1/4	15.3	38	167	91.1
234	122	9	72.5	50	148	Rc1/8	77.5	48	Rc1/4	15.3	38	167	119.7
282	122	9	72.5	50	148	Rc1/8	77.5	48	Rc1/4	15.3	38	215	159.6
282	122	9	72.5	50	148	Rc1/8	77.5	64	Rc1/4	11.8	38	215	167.6
346	122	9	72.5	50	148	Rc1/8	77.5	64	Rc1/4	11.8	38	279	215.0
284	137	9	80	60	165	Rc1/8	81.5	64	Rc1/4	11.3	42	215	221.3
348	137	9	80	60	165	Rc1/8	81.5	64	Rc1/4	11.3	42	279	295.1
279	137	11	80	62	163	Rc1/8	90	60	Rc1/4	18.5	43	204	147.1
339	137	11	80	62	163	Rc1/8	90	60	Rc1/4	18.5	43	264	196.1
339	150	11	88	64	180	Rc1/8	90	80	Rc1/4	15	43	264	267.4
339	165	11	97	78	199	Rc1/8	90	80	Rc1/4	13	43	264	345.9
419	165	11	97	78	199	Rc1/8	90	80	Rc1/4	13	43	344	461.2
287	193	11	109.5	88	229	Rc1/8	98	60	Rc1/4	20	51	204	304.6
347	193	11	109.5	88	229	Rc1/8	98	60	Rc1/4	20	51	264	406.1
405	137	11	81.5	61	167	Rc1/8	101.75	100	Rc1/4	13.5	47	323	170.0
347	165	11	99.5	73	202	Rc1/8	111.75	75	Rc1/4	19	55	251	221.1
422	179	11	108	79	220	Rc1/8	111.75	100	Rc1/4	14	55	326	408.4
522	179	11	108	79	220	Rc1/8	111.75	100	Rc1/4	14	55	426	544.6
421	193	11	116	92	238	Rc1/8	111.25	100	Rc1/4	11	55	325	498.0
521	193	11	116	92	238	Rc1/8	111.25	100	Rc1/4	11	55	425	664.0

HTF-ASRD Type

Outline drawing



HTF-ASRD Type Specifications

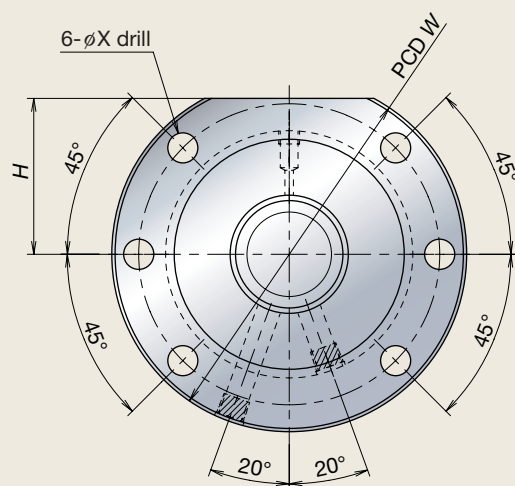
Model No.	Lead ℓ	Shaft dia. d	Root dia. d_r	Basic load rating (kN)					
				Dynamic C_a	Static C_{0a}	D	A	B	L
HTF-ASRD6332-4E	32	63	49	292	590	140	190	36	186
HTF-ASRD5040-6E	40	50	39	243	491	115	165	34	172
HTF-ASRD5040-8E	40	50	39	319	679	115	165	34	212
HTF-ASRD6340-6E	40	63	49	363	768	140	200	36	176
HTF-ASRD6340-8E	40	63	49	476	1 060	140	200	36	216
HTF-ASRD8050-6E	50	80	63	502	1 180	175	250	40	208
HTF-ASRD8050-8E	50	80	63	658	1 630	175	250	40	258
HTF-ASRD10060-6E	60	100	83	583	1 490	195	270	40	239
HTF-ASRD10060-8E	60	100	83	765	2 060	195	270	40	299

Remarks: 1. Drain holes shall be plugged for shipping.

2. The right hand screw is the standard. For specifications on left hand screws, contact NSK.

3. The allowable axial load (F_a max.) is determined in accordance with the mounting conditions of ball screws recommended by NSK.

Refer to page 12 for the mounting conditions. If your mounting conditions differ from those provided, please consult NSK.



Unit [mm]

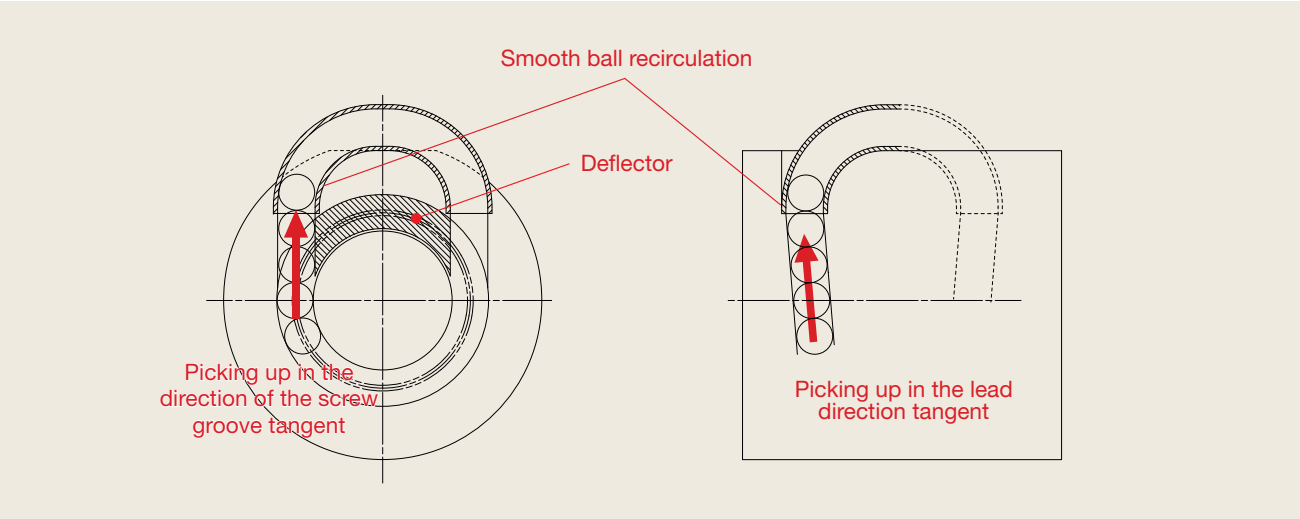
Ball nut dimensions										Allowable axial load Fa max. (kN)
<i>H</i>	<i>W</i>	<i>X</i>	<i>Q</i>	<i>T</i> ₁	<i>T</i> ₂	<i>S</i>	<i>S</i> ₁	<i>S</i> ₂		
85	165	14	Rc1/8	85.1	—	Rc1/4	23.5	138	72.6	
72.5	140	14	Rc1/8	75.7	20	Rc1/4	24	123.5	67.6	
72.5	140	14	Rc1/8	95.7	20	Rc1/4	24	163.5	92.0	
90	170	18	Rc1/8	77.6	20	Rc1/4	24	127.5	106.3	
90	170	18	Rc1/8	97.6	20	Rc1/4	24	167.5	144.7	
110	210	22	Rc1/8	91.1	25	Rc1/4	26	156	163.7	
110	210	22	Rc1/8	116.1	25	Rc1/4	26	206	224.1	
122	235	22	Rc1/8	104.5	30	Rc1/4	26	187	211.5	
122	235	22	Rc1/8	134.5	30	Rc1/4	26	247	288	

HTF-SRE Type

1 Specifications

Recirculation system: picking up balls in the direction tangent to deflector

By smoothly picking up balls in the direction of the screw groove tangent, feeding speed is 1.4 to 2 times as fast as the conventional tube recirculation system.



Allowable d-n value

Allowable d-n value 100,000
d-n value: shaft diameter d [mm] × rotations n [min⁻¹]

Allowable feed speed of combinations of shaft diameter and lead

Unit [mm]

Shaft dia. \ Lead	25	30	70	80	Allowable rotating speed [min ⁻¹]
140					714
160					625
200					500

- Please consult NSK about ball nut shape and dimensions.
- A double-spread screw can be used for leads of 50mm and more.

High-speed performance
two times greater than
existing products

Abundant variation

Accuracy grade

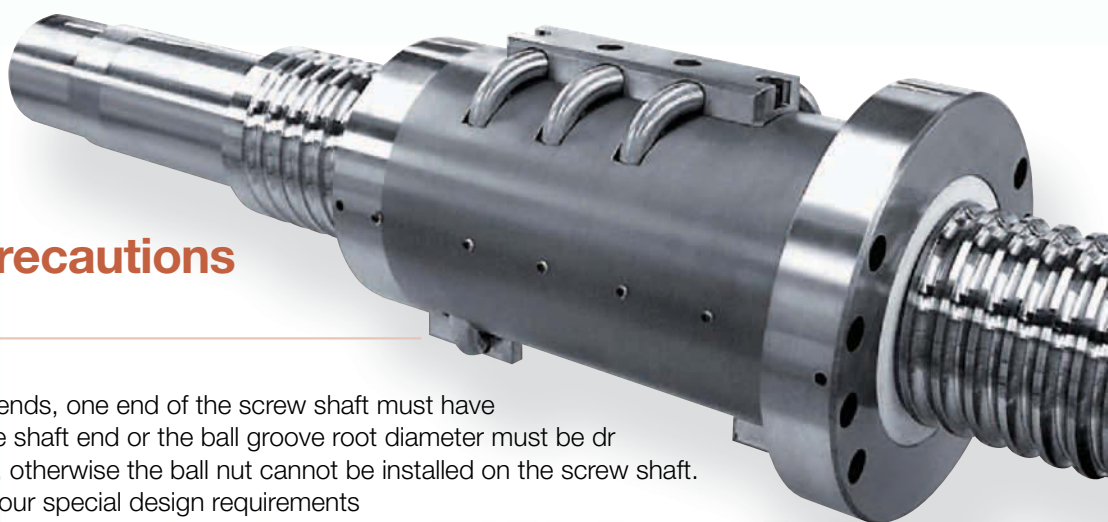
Ct7 of JIS B 1192 (1997) is applicable as the standard accuracy grade.

Axial play

Standard axial play: 0.050 mm or less

Option

- High load capacity option to increase limit axial load. See page 7 for details.
- Consult NSK if the number of circuits is to be changed for a higher load capacity or circulation routes are to be placed on a single side.



2

Design Precautions

- 1) When designing the shaft ends, one end of the screw shaft must have ball groove cut through to the shaft end or the ball groove root diameter must be ϕr or less (see dimension chart), otherwise the ball nut cannot be installed on the screw shaft.
- 2) Please consult NSK with your special design requirements

3

Selection of Ball Screw

- Please refer to pages 11 and 12 for details on the operating life of the ball screw and instructions on installation and lubrication.
- Please consult NSK in the case of a short stroke operation less than or equal to four times the length of the ball screw lead.capacity or circulation routes are to be placed on a single side.

4

Operating Temperature

- Use temperature: 70 deg C maximum (temperature at nut diameter).

HTF Type

1 Specifications

Allowable d·n value and feed speed

Lead	20 mm or less	25 mm	30 to 32 mm
Standard	≤70 000	≤70 000	≤50 000
High-speed	≤100 000	—	—

d·n: Shaft diameter d (mm) × Rotational speed (min⁻¹)

For even faster specs, HTF-SRC is recommended (See pages 13–16 for details).

Allowable feed speed of combinations of shaft diameter and lead

Unit [mm/s]

Shaft dia. [mm]	Lead [mm]							
	10	12	14	16	20	25	30	32
32	520							
36	460	550						
40	410	500						
45	370	440						
50	330	400						
55	300	360	420	480				
63		310	370		520			
80			290	330	410			
100				260	330	290		
120				220	270	240		
140					230	200	170	190
160						180	150	160
200							120	130

Leads with a diameter of 20 mm or less have high-speed feeding specs.

Accuracy grade

Ct7 of JIS B 1192 (1997) is applicable as the standard accuracy grade.

Axial play

Standard axial play: 0.020 mm or less, or 0.050 mm or less

Optional specs

- High load capacity option to increase limit axial load.
See page 7 for details.
- Consult NSK if the number of circuits is to be changed for a higher load capacity or circulation routes are to be placed on a single side.

2 Design Precautions

- 1) When designing the shaft ends, one end of the screw shaft must have a ball groove cut through to the shaft end or the ball groove root diameter must be ϕr or less (see dimension chart), otherwise the ball nut cannot be installed on the screw shaft.
- 2) Please consult NSK with your special design requirements.

3 Selection of Ball Screw

- Please refer to pages 11 and 12 for details on the operating life of the ball screw and instructions on installation and lubrication.
- Please consult NSK in the case of a short stroke operation less than or equal to four times the length of the ball screw lead.

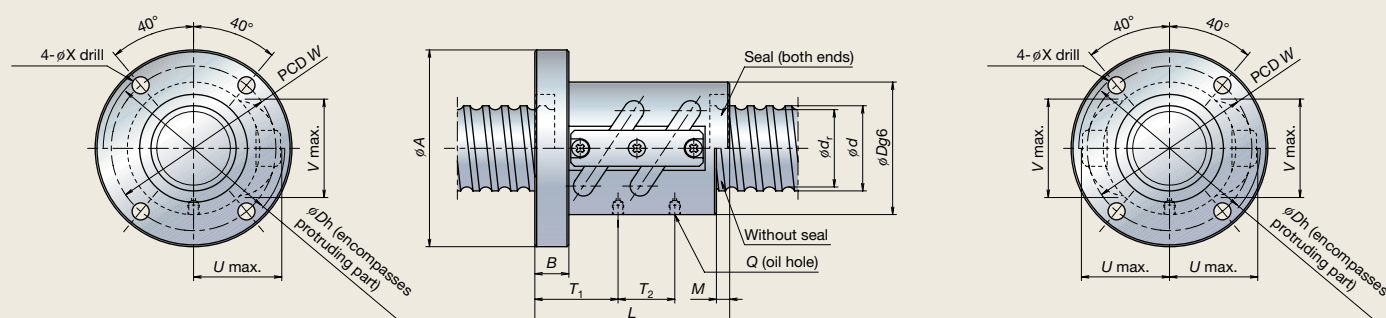
4 Operating Temperature

- Use temperature: 70 deg C maximum (temperature at nut diameter)



HTF Type

Outline drawing



Nut model I

HTF Type Specifications

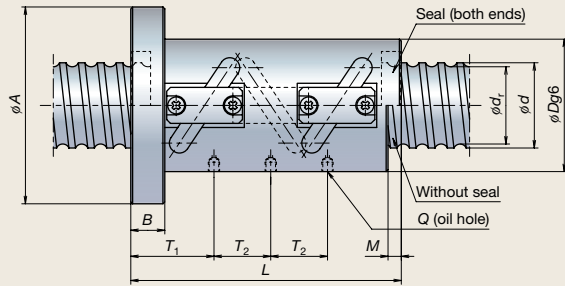
Model No.	Lead ℓ	Shaft dia. d	Root dia. d_r	Effective ball turns Turns $\times$ Circuits	Nut model	Basic load rating (kN)				
						Dynamic C_a	Static C_{0a}			
								D	A	B
HTF3210-5	10	32	25.6	2.5 $\times$ 2	I	88.7	169	58	92	18
HTF3610-5	10	36	29.6	2.5 $\times$ 2	I	96.1	191	62	96	18
HTF4010-7.5	10	40	33.6	2.5 $\times$ 3	II	149	344	66	100	18
HTF4510-7.5	10	45	38.6	2.5 $\times$ 3	II	158	386	70	104	18
HTF4510-10	10	45	38.6	2.5 $\times$ 4	III	203	514	70	104	18
HTF5010-7.5	10	50	43.6	2.5 $\times$ 3	II	166	435	75	109	18
HTF5010-10	10	50	43.6	2.5 $\times$ 4	III	213	580	75	109	18
HTF5510-7.5	10	55	48.6	2.5 $\times$ 3	II	173	477	80	114	18
HTF5510-10	10	55	48.6	2.5 $\times$ 4	III	222	636	80	114	18
HTF3612-5	12	36	29	2.5 $\times$ 2	I	112	228	66	100	22
HTF4012-7.5	12	40	33	2.5 $\times$ 3	II	184	422	70	104	22
HTF4512-7.5	12	45	38	2.5 $\times$ 3	II	195	473	72	106	22
HTF5012-7.5	12	50	43	2.5 $\times$ 3	II	205	525	77	111	22
HTF5012-10	12	50	43	2.5 $\times$ 4	III	263	700	77	111	22
HTF5512-7.5	12	55	48	2.5 $\times$ 3	II	214	586	82	116	22
HTF5512-10	12	55	48	2.5 $\times$ 4	III	274	781	82	116	22
HTF6312-7.5	12	63	56	2.5 $\times$ 3	II	227	668	92	126	22
HTF6312-10	12	63	56	2.5 $\times$ 4	III	290	891	92	126	22

Remarks: 1. The ball nut length with no seals is shorter by M than that of a ball nut with seals.

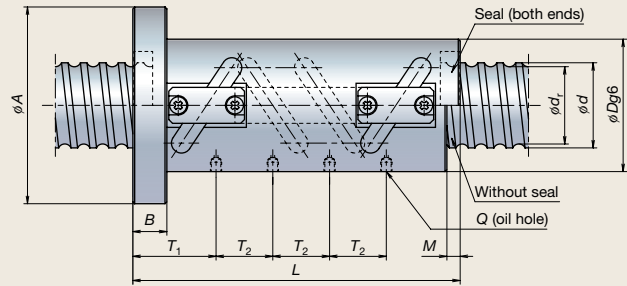
2. Please consult NSK if load exceeds the allowable axial load (F_a max.).

3. The allowable axial load (F_a max.) is determined in accordance with the mounting conditions of ball screws recommended by NSK.

Refer to page 12 for the mounting conditions. If your mounting conditions differ from those provided, please consult NSK.



Nut model II



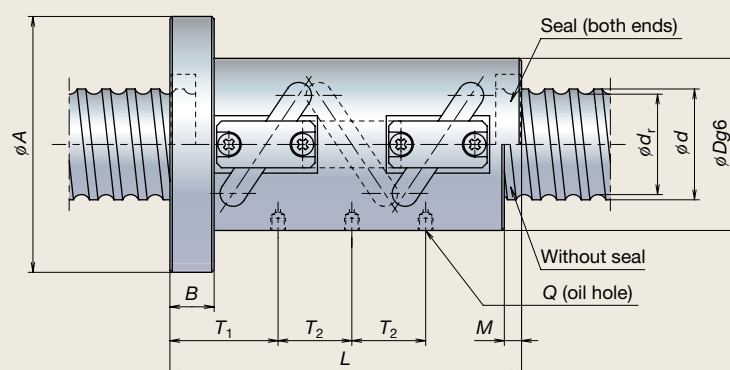
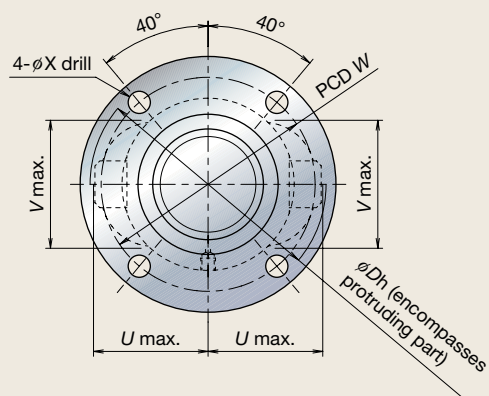
Nut model III

Unit [mm]

Ball nut dimensions										Allowable axial load Fa max. (kN)
L	M	W	X	U	V	Dh	Q	T ₁	T ₂	
103	7	75	9	40.5	42	82	M6×1	36.5	30	20.3
103	7	79	9	43	45	87	M6×1	36.5	30	23.4
143	7	83	9	45	48	91	M6×1	46.5	30	39.6
143	7	87	9	47	52	95	M6×1	46.5	30	45.3
173	7	87	9	47	52	95	M6×1	46.5	30	60.4
143	7	92	9	49	57	99	M6×1	46.5	30	51.0
173	7	92	9	49	57	99	M6×1	46.5	30	68.0
143	7	97	9	51.5	62	104	M6×1	46.5	30	55.7
173	7	97	9	51.5	62	104	M6×1	46.5	30	74.2
123	8	83	9	46.5	46	94	M6×1	44	36	28.3
171	8	87	9	47.5	50	96	M6×1	56	36	48.0
171	8	89	9	49.5	54	100	M6×1	56	36	55.0
171	8	94	9	52	59	105	M6×1	56	36	62.0
207	8	94	9	52	59	105	M6×1	56	36	82.7
171	8	99	9	54.5	63	110	M6×1	56	36	69.1
207	8	99	9	54.5	63	110	M6×1	56	36	92.1
171	8	109	9	58.5	70	118	M6×1	56	36	80.3
207	8	109	9	58.5	70	118	M6×1	56	36	107.1

HTF Type

Outline drawing



Nut model II

HTF Type Specifications

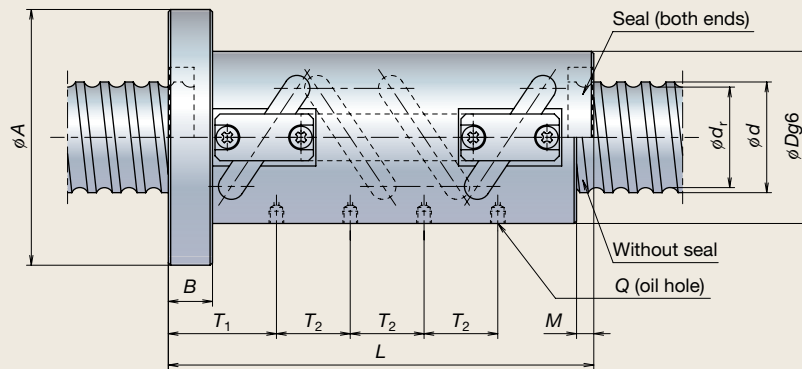
Model No.	Lead ℓ	Shaft dia. d	Root dia. d_r	Effective ball turns Turns $\times$ Circuits	Nut model	Basic load rating (kN)				
						Dynamic C_a	Static C_{0a}			
								D	A	B
HTF5514-7.5	14	55	46.7	2.5×3	Ⅱ	270	696	85	119	28
HTF6314-7.5	14	63	54.7	2.5×3	Ⅱ	291	800	94	128	28
HTF6314-10	14	63	54.7	2.5×4	Ⅲ	373	1 070	94	128	28
HTF8014-7.5	14	80	71.7	2.5×3	Ⅱ	327	1 020	116	150	28
HTF8014-10	14	80	71.7	2.5×4	Ⅲ	418	1 360	116	150	28
HTF5516-7.5	16	55	44	2.5×3	Ⅱ	399	922	99	133	28
HTF8016-7.5	16	80	69	2.5×3	Ⅱ	478	1 340	120	154	32
HTF8016-10	16	80	69	2.5×4	Ⅲ	612	1 790	120	154	32
HTF10016-7.5	16	100	89	2.5×3	Ⅱ	529	1 710	145	185	32
HTF10016-10	16	100	89	2.5×4	Ⅲ	677	2 280	145	185	32
HTF12016-7.5	16	120	109	2.5×3	Ⅱ	572	2 050	173	213	32
HTF12016-10	16	120	109	2.5×4	Ⅲ	732	2 730	173	213	32

Remarks: 1. The ball nut length with no seals is shorter by M than that of a ball nut with seals.

2. Please consult NSK if load exceeds the allowable axial load ($F_a \text{ max.}$).

3. The allowable axial load ($F_{a \max.}$) is determined in accordance with the mounting conditions of ball screws recommended by NSK.

Refer to page 12 for the mounting conditions. If your mounting conditions differ from those provided, please consult NSK.



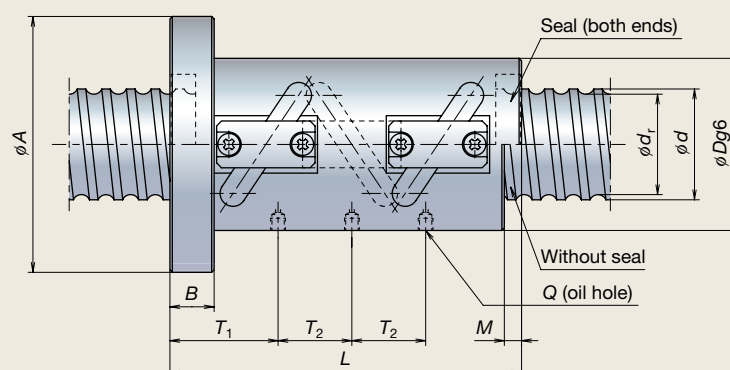
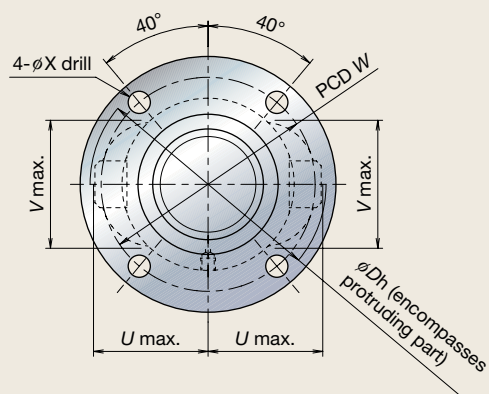
Nut model III

Unit [mm]

Ball nut dimensions											Allowable axial load Fa max. (kN)
L	M	W	X	U	V	Dh	Q	T ₁	T ₂		
200	10	102	9	57.5	65	116	M6×1	66.5	42		81.2
200	10	111	9	61.5	72	124	M6×1	66.5	42		93.5
242	10	111	9	61.5	72	124	M6×1	66.5	42		124.7
200	10	133	9	72	87	146	M6×1	66.5	42		121.9
242	10	133	9	72	87	146	M6×1	66.5	42		162.5
223	10	116	9	70	70	141	Rc1/8	73	48		101.9
227	10	137	9	80	92	161	Rc1/8	77	48		159.0
275	10	137	9	80	92	161	Rc1/8	77	48		212.0
227	10	165	11	91	109	184	Rc1/8	77	48		202.3
275	10	165	11	91	109	184	Rc1/8	77	48		269.8
227	10	193	11	104	126	210	Rc1/8	77	48		248.9
275	10	193	11	104	126	210	Rc1/8	77	48		331.9

HTF Type

Outline drawing



Nut model II

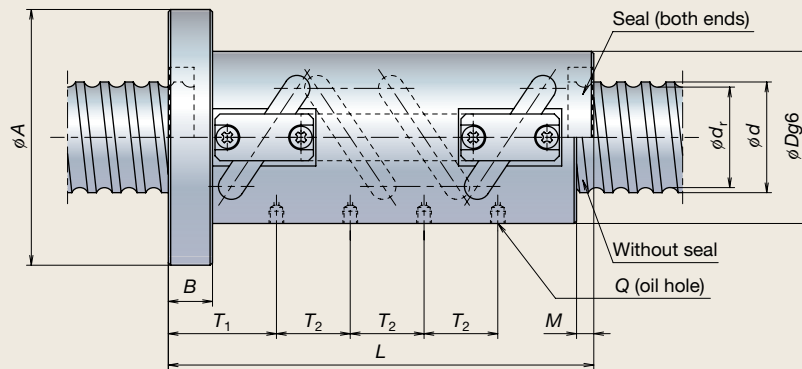
HTF Type Specifications

Model No.	Lead ℓ	Shaft dia. d	Root dia. d_r	Effective ball turns Turns $\times$ Circuits	Nut model	Basic load rating (kN)				
						Dynamic C_a	Static C_{0a}			
								D	A	B
HTF6320-10.5	20	63	49	3.5 $\times$ 3	II	749	1 810	117	157	32
HTF8020-7.5	20	80	66	2.5 $\times$ 3	II	639	1 690	130	170	32
HTF8020-10	20	80	66	2.5 $\times$ 4	III	818	2 250	130	170	32
HTF10020-7.5	20	100	86	2.5 $\times$ 3	II	713	2 140	145	185	32
HTF10020-10	20	100	86	2.5 $\times$ 4	III	914	2 850	145	185	32
HTF12020-10.5	20	120	106	3.5 $\times$ 3	II	1 020	3 530	173	213	40
HTF12020-14	20	120	106	3.5 $\times$ 4	III	1 300	4 710	173	213	40
HTF14020-7.5	20	140	126	2.5 $\times$ 3	II	829	3 000	204	250	40
HTF14020-10	20	140	126	2.5 $\times$ 4	III	1 060	4 000	204	250	40
HTF10025-7.5	25	100	84	2.5 $\times$ 3	II	917	2 550	159	199	40
HTF10025-10	25	100	84	2.5 $\times$ 4	III	1 170	3 400	159	199	40
HTF12025-7.5	25	120	104	2.5 $\times$ 3	II	990	3 080	173	213	40
HTF12025-10	25	120	104	2.5 $\times$ 4	III	1 270	4 110	173	213	40
HTF14025-7.5	25	140	124	2.5 $\times$ 3	II	1 050	3 610	204	250	40
HTF14025-10	25	140	124	2.5 $\times$ 4	III	1 350	4 810	204	250	40
HTF14025-10.5	25	140	124	3.5 $\times$ 3	II	1 380	4 910	204	250	40
HTF14025-14	25	140	124	3.5 $\times$ 4	III	1 770	6 540	204	250	40
HTF16025-7.5	25	160	144	2.5 $\times$ 3	II	1 140	4 140	234	280	40
HTF16025-10	25	160	144	2.5 $\times$ 4	III	1 450	5 520	234	280	40

Remarks: 1. The ball nut length with no seals is shorter by M than that of a ball nut with seals.

2. Please consult NSK if load exceeds the allowable axial load (F_a max.).

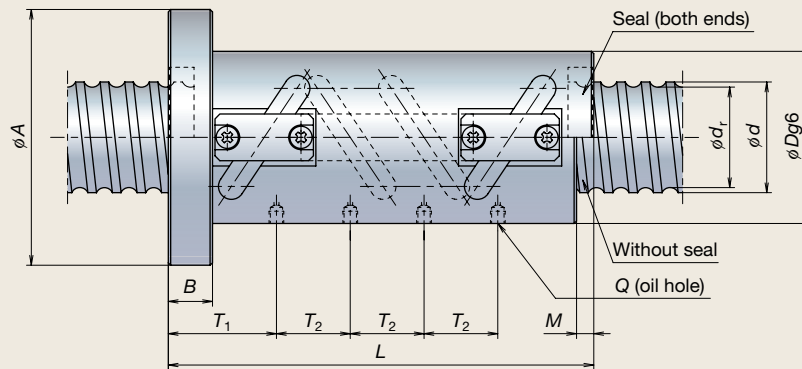
3. The allowable axial load (F_a max.) is determined in accordance with the mounting conditions of ball screws recommended by NSK.
Refer to page 12 for the mounting conditions. If your mounting conditions differ from those provided, please consult NSK.



Nut model III

Unit [mm]

Ball nut dimensions											Allowable axial load Fa max. (kN)
L	M	W	X	U	V	Dh	Q	T ₁	T ₂		
333	12	137	11	83.5	81	168	Rc1/8	88	80		205.4
273	12	150	11	89.5	96	181	Rc1/8	88	60		192.6
333	12	150	11	89.5	96	181	Rc1/8	88	60		256.8
273	12	165	11	97.5	114	196	Rc1/8	88	60		248.6
333	12	165	11	97.5	114	196	Rc1/8	88	60		331.5
341	12	193	11	111	131	223	Rc1/8	96	80		424.7
421	12	193	11	111	131	223	Rc1/8	96	80		566.2
281	12	226	14	122.5	148	248	Rc1/8	96	60		360.9
341	12	226	14	122.5	148	248	Rc1/8	96	60		481.2
338	17	179	11	108.5	118	219	Rc1/8	109.25	75		293.2
413	17	179	11	108.5	118	219	Rc1/8	109.25	75		391.0
338	17	193	11	116	135	233	Rc1/8	109.25	75		358.2
413	17	193	11	116	135	223	Rc1/8	109.25	75		477.6
338	17	226	14	127.5	153	258	Rc1/8	109.25	75		423.1
413	17	226	14	127.5	153	258	Rc1/8	109.25	75		564.1
413	17	226	14	127.5	153	258	Rc1/8	109.25	100		595.2
513	17	226	14	127.5	153	258	Rc1/8	109.25	100		793.6
338	17	256	14	138	173	279	Rc1/8	109.25	75		495.3
413	17	256	14	138	173	279	Rc1/8	109.25	75		660.4



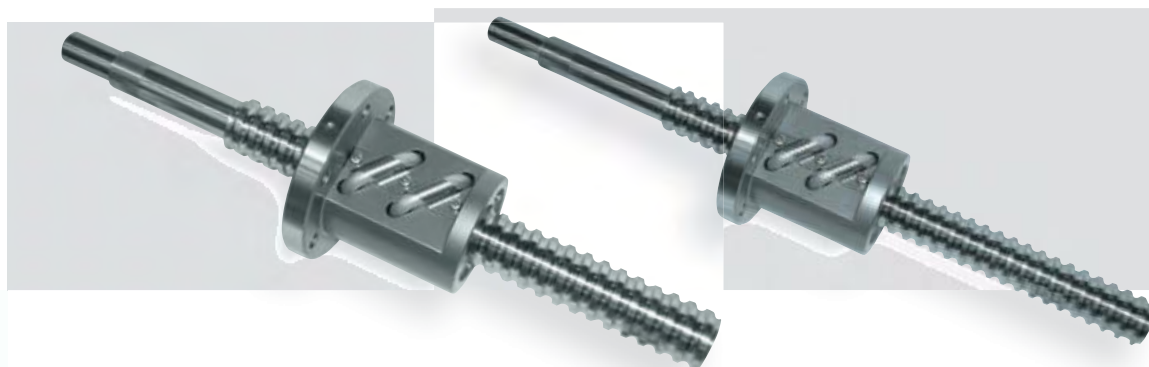
Nut model III

Unit [mm]

Ball nut dimensions											Allowable axial load Fa max. (kN)
L	M	W	X	U	V	Dh	Q	T ₁	T ₂		
411	22	252	18	139	160	281	Rc1/8	134.5	90		487.1
501	22	252	18	139	160	281	Rc1/8	134.5	90		649.5
501	22	252	18	139	160	281	Rc1/8	134.5	120		678.2
411	22	264	18	148	177	299	Rc1/8	134.5	90		564.3
501	22	264	18	148	177	299	Rc1/8	134.5	90		752.4
501	22	264	18	148	177	299	Rc1/8	134.5	120		788.1
411	22	320	18	178	212	359	Rc1/8	134.5	90		718.8
501	22	320	18	178	212	359	Rc1/8	134.5	90		958.4
465	22	259	22	148	163	299	Rc1/8	166.5	96		549.3
561	22	259	22	148	163	299	Rc1/8	166.5	96		732.5
561	22	259	22	148	163	299	Rc1/8	166.5	128		756.9
465	22	271	22	152	181	307	Rc1/8	166.5	96		636.0
561	22	271	22	152	181	307	Rc1/8	166.5	96		848.1
561	22	271	22	152	181	307	Rc1/8	166.5	128		885.5
465	22	327	22	182	215	367	Rc1/8	166.5	96		809.4
561	22	327	22	182	215	367	Rc1/8	166.5	96		1 079.2

High-load ball screws for injection molding machine ejectors

Ball screws exclusively designed for ejector mechanism contribute to the compact design of the device.



More compact, high-load volume

Compared with conventional ball screws (generally used with ejectors), these have achieved a higher load capacity. This means smaller ball screws, contributing to the compact design of the device.

Grease splatter reduction

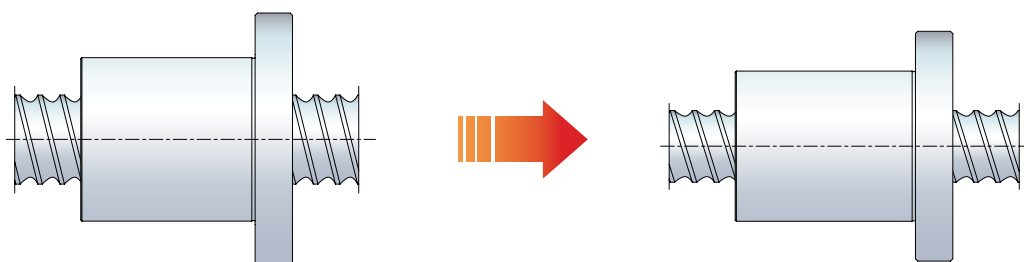
An exclusive design for seal and ball groove has reduced grease leakage and splattering.

Examples of down sizing

Rolled ball screws
Shaft diameter $\phi 40$
No. of circuits:
2.5 turns $\times$ 2 circuits
 $C_a=40.1$ [kN]

Shaft diameter downsized, but
 C_a : 23%UP

Ball screw in this spec
Shaft diameter $\phi 32$
No. of circuits: 2.5 turns $\times$ 2 circuits
 $C_a=49.6$ [kN]



Specifications

Accuracy grade

Ct7 of JIS B 1192 (1197) is applicable as the standard accuracy grade.

Axial play

Standard axial play: 0.050 mm or less

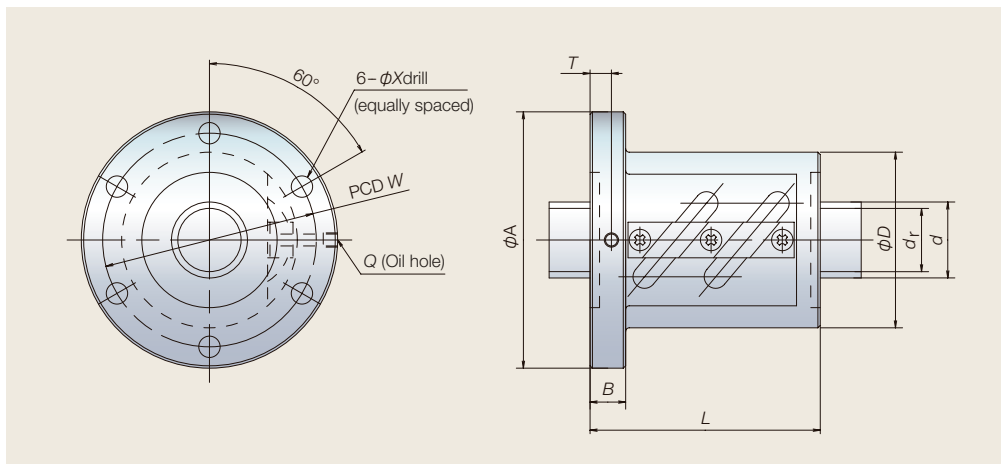
Optional specs

The nut shape can be adapted for tube push-out specs. Please consult NSK.

Design Precautions

When designing the shaft ends, one end of the screw shaft must have ball groove cut through to the shaft end or the ball groove root diameter must be d_r or less (see dimension chart), otherwise the ball nut cannot be installed on the screw shaft.

Outline view



Dimension chart

Unit [mm]

Model No.	Lead ℓ	Shaft dia. d	Root dia. d_r	Effective ball turns × Circuits	Basic load rating[kN]		Ball nut dimensions							
					Dynamic C_a	Static C_{0a}	D	A	B	L	W	X	Q	T
3210-5	10	32	26.4	2.5×2	49.6	118	74	108	15	98	90	9	M6X1	9
3610-5	10	36	30.4	2.5×2	52.7	134	75	120	18	100	98	11	M6X1	9
4010-5	10	40	34.4	2.5×2	55.4	149	82	124	18	100	102	11	M6X1	9
4012-5	12	40	34.1	2.5×2	65.2	169	86	128	18	115	106	11	M6X1	9

Note: All are right-hand screws.

NSKTAC Series of Ball Screw Support Bearings for High-Load Applications

Standard Series and Special Bore Diameter Series of Ball Screw Support Bearings for High-Load Applications

NSKHPS™ Angular Contact Thrust Ball Bearings of Ball Screw Support Bearings for High-Load Drive Applications

High-capacity bearings used for supporting ball screws operating under high loads typically adopt large-diameter steel balls in order to ensure sufficient high capacity and to reduce the number of rows of combinations. With the development and commercialization of the special bore diameter series, which has the same load rating as that of the standard series but with a smaller bore diameter, users can maintain equivalent high-capacity performance with a smaller diameter of screw shaft end without changing the number of rows. Please refer to pages 43 and 44 for applicable bearing tables.

Extended bearing life and higher axial-load capacity

- Limiting axial load has increased by 1.5 times compared with that of conventional bearings.
- Bearing life has increased by 1.3 times compared with that of conventional bearings.

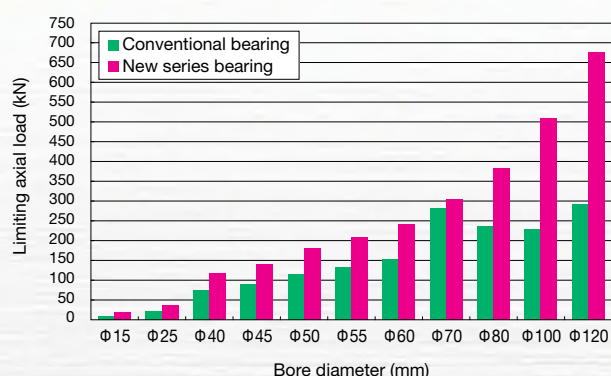
Special bore diameter series facilitates downscaling of screw shaft end

Easy handling by means of universal matching

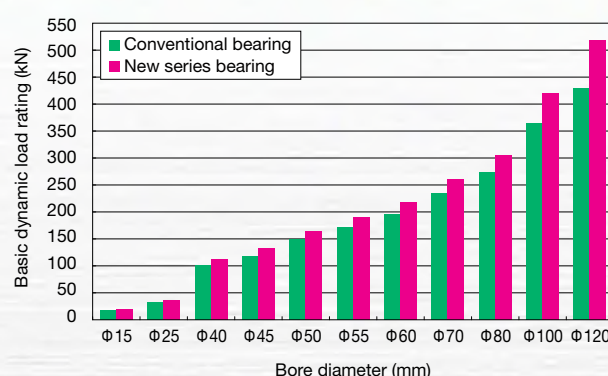


Extended bearing life and higher axial-load capacity

Longer bearing life and higher axial load capacity have been achieved by optimization of the bearing's internal design, thus enabling the reduction in number of combined rows.



Comparison of limiting axial load

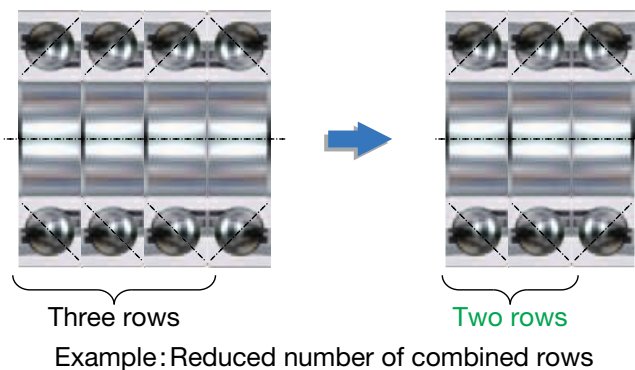


Comparison of basic dynamic load ratings

Axial load capacity has increased by 1.5 times compared with that of conventional bearings.

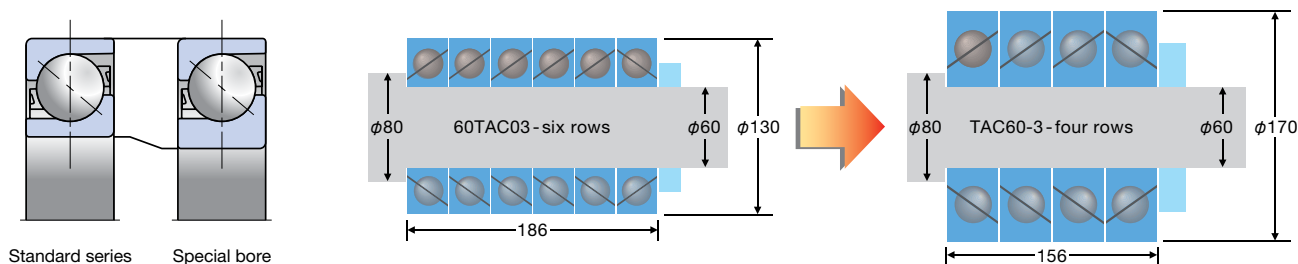


The **DBD arrangement** can be used instead of a DBT arrangement.



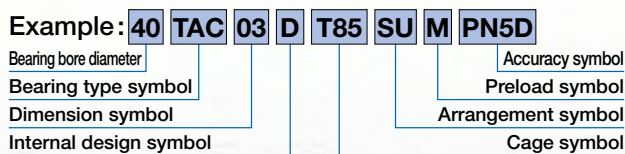
Special bore diameter series facilitates downscaling of screw shaft end

The special bore diameter series is designed with an outer ring outside diameter and width that are the same as those of the standard series, but with a bore diameter that is smaller. Therefore, the dimension of the shaft end of the screw can be shortened while maintaining the same basic load rating.



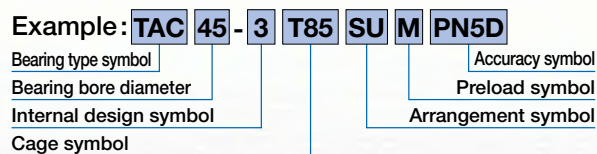
Formulation of Bearing Numbers

Standard series



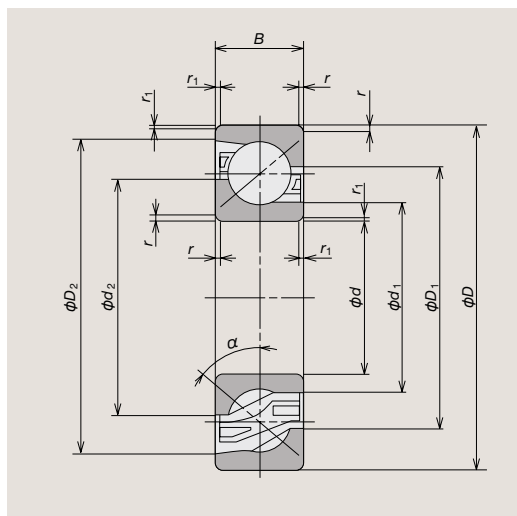
40	Bearing bore diameter	Bore diameter (mm)
TAC	Bearing type symbol	Angular contact thrust ball bearing
03	Dimension symbols	02:02 series; 03:03 series
D	Internal design symbol	Contact angle 55 °
T85	Cage symbol	T85: Polyamide resin cage
SU	Arrangement symbol	SU: Universal matching for single row
M	Preload symbol	M: Standard preload
PN5D	Accuracy symbol	PN5D: Standard accuracy (ISO class 5 equivalent)

Special bore diameter series



TAC	Bearing type symbol	Angular contact thrust ball bearing
45	Bearing bore diameter	Bore diameter (mm)
3	Internal design symbol	Contact angle 55 °
T85	Cage symbol	T85: Polyamide resin cage
SU	Arrangement symbol	SU: Universal matching for single row
M	Preload symbol	M: Standard preload
PN5D	Accuracy symbol	PN5D: Standard accuracy (ISO class 5 equivalent)

NSKTAC Series of Ball Screw Support Bearings for High-Load Applications



Dynamic equivalent load

Angular contact thrust ball bearings for equipment such as electric injection molding machines are subjected to extremely large axial loads (F_a) in comparison to radial loads (F_r).

Therefore, the dynamic equivalent load P of the support bearing is obtained by the following formula regardless of the number of rows:

$$P \text{ is } 0.81 F_r + F_a$$

Multi-row combination calculations

These have been calculated by multiplying the coefficients in the right table for preload coefficient, axial rigidity and starting torque.

Standard series

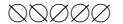
Bearing numbers	Boundary dimensions (mm)					Dimensions (mm)			
	d	D	B	r (min)	r_1 (min)	d_1	d_2	D_1	D_2
15TAC02D	15	35	11	0.6	0.3	19.1	24.5	26	31.9
20TAC03D	20	52	15	1.1	0.6	27.2	35.3	37.5	46.1
25TAC02D	25	52	15	1	0.6	30.8	38.1	39.6	47.3
40TAC03D	40	90	23	1.5	1	50.4	64.2	67.1	81.7
45TAC03D	45	100	25	1.5	1	56.5	71.7	74.7	90.8
50TAC03D	50	110	27	2	1	62	79.1	82.4	100.6
55TAC03D	55	120	29	2	1	68	86.4	90.2	109.7
60TAC03D	60	130	31	2.1	1.1	73.9	93.8	98	119
70TAC03D	70	150	35	2.1	1.1	86.3	108.6	113.4	137.8
75TAC03D	75	160	37	2.1	1.1	92.4	116.17	121	146.2
80TAC03D	80	170	39	2.1	1.1	98.5	123.6	128.7	157.5
100TAC03D	100	215	47	3	1.1	124	154.9	160.4	194.5
120TAC03D	120	260	55	3	1.1	150.5	186.9	193.4	231.7

Special bore diameter series

Bearing numbers	Boundary dimensions (mm)					Dimensions (mm)			
	d	D	B	r (min)	r_1 (min)	d_1	d_2	D_1	D_2
TAC35-3	35	90	23	1.5	1	50.4	64.2	67.1	81.7
TAC40-3	40	110	27	2	1	62	79.1	82.4	100.6
TAC45-3	45	110	27	2	1	62	79.1	82.4	100.6
TAC50-3	50	130	31	2.1	1.1	73.9	93.8	98	119
TAC60-3	60	170	39	2.1	1.1	98.5	123.6	128.7	157.5
TAC80-3	80	215	47	3	1.1	124	154.9	160.4	194.5
TAC100-3	100	260	55	3	1.1	150.5	186.9	193.4	231.7

Ball Screw Shaft Diameters and Recommended NSKTAC Series

Shaft diameter (mm)	Standard series	Special bore diameter series
40, 45	—	TAC35-3
50	40TAC03D	TAC40-3
63	50TAC03D	TAC50-3
80	60TAC03D	TAC60-3
100	80TAC03D	TAC80-3
120	100TAC03D	TAC100-3
140	120TAC03D	—

Bearing configuration	2 rows		3 rows			4 rows		5 rows
	DFD	DFF	DFT	DFFD	DFFF	DFTD	DFTT	DFFT
								
Preload coefficient	1.36	2.00	1.57	2.42	3.00	1.72	2.72	1.83
Axial rigidity	1.49	2.00	1.89	2.51	3.00	2.24	2.97	2.57
Starting torque	1.35	2.00	1.55	2.41	3.00	1.68	2.71	1.77

Recommended amount of prepacked grease (cc)	Contact angle	Limiting speed (min ⁻¹)	Mass (kg)	Preload ⁽²⁾ (DB and DF Arrangement (N))	Axial rigity ⁽²⁾ (DB and DF Arrangement (N/μm))	Starting torque ⁽³⁾ (DB and DF Arrangement (N·m))	Basic dynamic load rating C _a by number of rows sustaining F _a					Limiting axial load by number of rows sustaining F _a				
		Grease					1 row (kN)	2 rows (kN)	3 rows (kN)	4 rows (kN)	5 rows (kN)	1 row (kN)	2 rows (kN)	3 rows (kN)	4 rows (kN)	5 rows (kN)
1	55	12 000	0.047	400	290	0.017	21	34	45	55.5	64.5	18.6	37.5	56	74.5	93
2.7	55	8 300	0.155	830	430	0.026	42.5	69.5	92	113	132	38.5	77	116	154	193
3	55	7 700	0.137	690	430	0.036	37	60	79.5	97.5	114	36	72.5	109	145	181
14	55	4 600	0.659	2 500	780	0.26	113	184	244	299	350	118	235	355	470	590
18	55	4 100	0.877	2 800	830	0.31	133	216	287	350	410	142	283	425	565	710
25	55	3 700	1.14	3 900	970	0.5	166	270	360	440	515	181	360	540	720	905
32	55	3 400	1.44	4 800	1 060	0.68	190	310	410	500	585	210	420	630	840	1 050
40	55	3 100	1.8	5 200	1 120	0.78	218	355	470	575	670	242	485	725	965	1 210
59	55	2 700	2.67	6 400	1 250	1.1	262	425	565	690	810	305	615	920	1 230	1 530
67	55	2 500	3.2	7 230	1 330	1.3	283	460	610	750	875	345	690	1 040	1 380	1 730
85	55	2 400	3.8	8 050	1 400	1.5	305	495	660	805	940	390	775	1 170	1 550	1 940
156	55	1 900	7.54	1 240	880	0.15	420	685	910	1 110	1 300	510	1 020	1 530	2 040	2 550
254	55	1 500	13.3	1 620	1 050	0.21	520	850	1 130	1 380	1 610	680	1 360	2 040	2 720	3 400

Recommended amount of prepacked grease (cc)	Contact angle	Limiting speed (min ⁻¹)	Mass (kg)	Preload ⁽²⁾ (DB and DF Arrangement (N))	Axial rigity ⁽²⁾ (DB and DF Arrangement (N/μm))	Starting torque ⁽³⁾ (DB and DF Arrangement (N·m))	Basic dynamic load rating C _a by number of rows sustaining F _a					Limiting axial load by number of rows sustaining F _a				
		Grease					1 row (kN)	2 rows (kN)	3 rows (kN)	4 rows (kN)	5 rows (kN)	1 row (kN)	2 rows (kN)	3 rows (kN)	4 rows (kN)	5 rows (kN)
14	55	4 600	0.712	2 500	780	0.26	113	184	244	299	350	118	235	355	470	590
25	55	3 700	1.28	3 900	970	0.5	166	270	360	440	515	181	360	540	720	905
25	55	3 700	1.21	3 900	970	0.5	166	270	360	440	515	181	360	540	720	905
40	55	3 100	2	5 200	1 120	0.78	218	355	470	575	670	242	485	725	965	1 210
85	55	2 400	4.47	8 050	1 400	1.5	305	495	660	805	940	390	775	1 170	1 550	1 940
156	55	1 900	8.66	1 240	880	0.15	420	685	910	1 110	1 300	510	1 020	1 530	2 040	2 550
254	55	1 500	14.8	1 620	1 050	0.21	520	850	1 130	1 380	1 610	680	1 360	2 040	2 720	3 400

Remarks:

- Limiting speeds are based on the standard preload of each bearing.
Also, the figures are free of the influence arrangement type.
- Bearing bore of 100mm or more and TAC80-3 indicates a figures of EL preload.
- The starting torque figures indicate grease lubrication.
- Permissible axial load equals 0.7 times of limiting axial load.

NSK Roller Guides RA Series

The RA series' roller guides feature high-load capacity and high rigidity and help to preserve the working environment. This series is the culmination of NSK's analysis technology and tribology.

Demand for preloaded rolling linear guides for high-load drive is now increasing. The RA series with high rigidity and a function for preserving a clean environment is one of the most suitable linear guides for high-load applications.

High-load capacity

The world's highest-load capacity, taking full advantage of NSK's analysis technology, ensures a long operating life.

High rigidity

The optimum size of the roller ensures high rigidity and supports more compact machinery.

Highly dust-resistant design

The high performance seals as standard equipment completely block the entry of foreign matter and maintain primary performance over the long time.

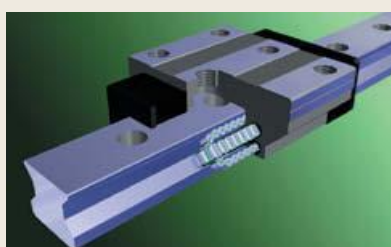
Interchangeable series

The interchangeable series of the guide rails and the roller slides are independently available in stock.

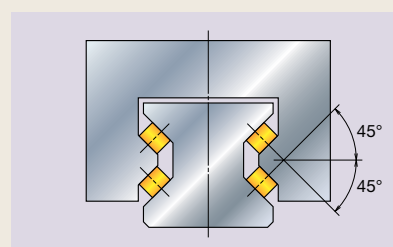


Optimal Design

NSK executed a comprehensive, detailed performance simulation of roller guides by integrating its analysis technology and the tribology technology that the company had been developing over many years. Down to the dimensions and shapes of component details, we have attained an optimal design completely.



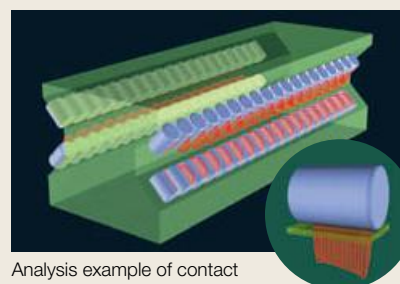
Smooth motion by use of retaining pieces



Balanced four-directional iso-load specifications



Example of roller slide deformation analysis



Analysis example of contact pressure distribution of rollers

Specifications

Roller Slide Types and Shapes

- Two types of roller slides are available in this series: a flange type and a square type.
- A compact, low-profile square type is now available.
- On the mounting hole of the flange type, the tapped part is used to fix the roller slide from the top surface, and the minor diameter can be used as a bolt hole from the bottom. This provides mounting from both directions, top and bottom.
- Roller slide length can be specified by the standard high-load type or special long, super-high load type.

Fig. 1 Square type (RA15, 20, 25, 30, 35, 45, 55, and 65)

Roller slide shape code

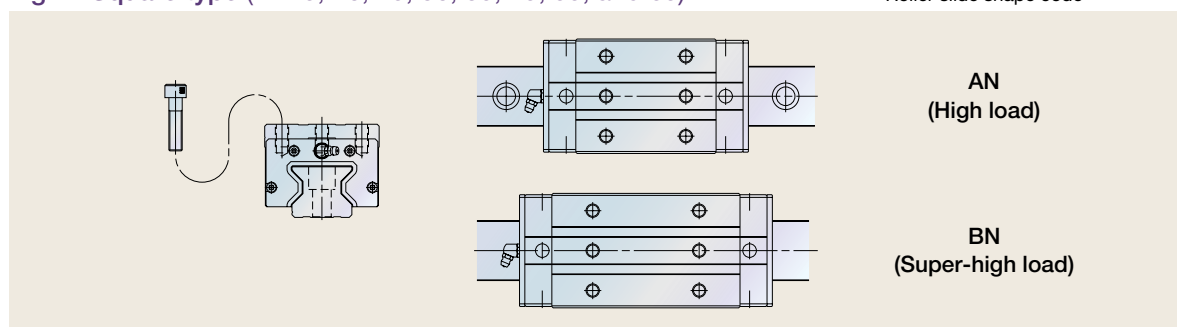


Fig. 2 Low-profile type (RA15, 25, 30, 35, 45, and 55)

Roller slide shape code

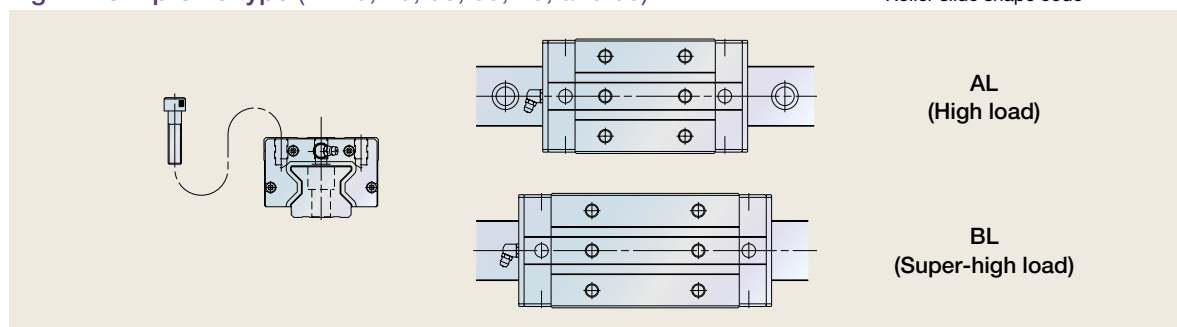
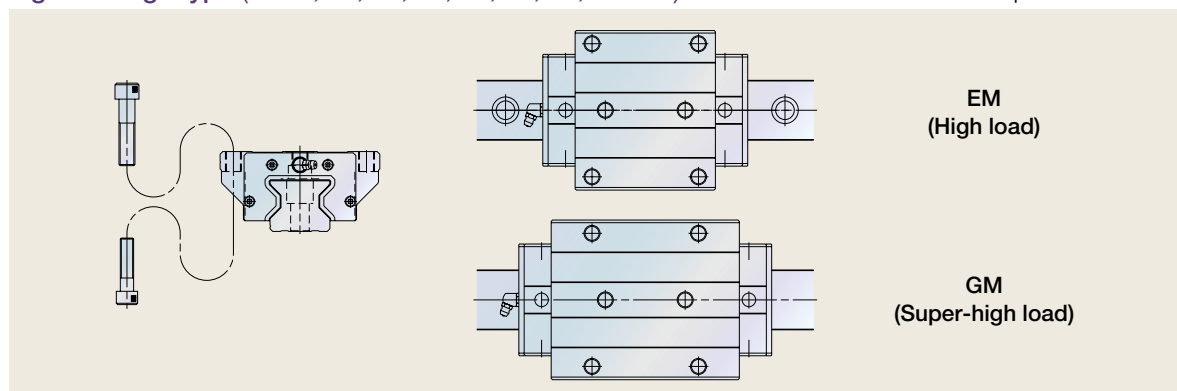


Fig. 3 Flange type (RA15, 20, 25, 30, 35, 45, 55, and 65)

Roller slide shape code



Please refer to Cat. No. E3328 for more details.

Technical Data sheet

NSK Technical Data Sheet for NSK High-Load Drive Ball Screw

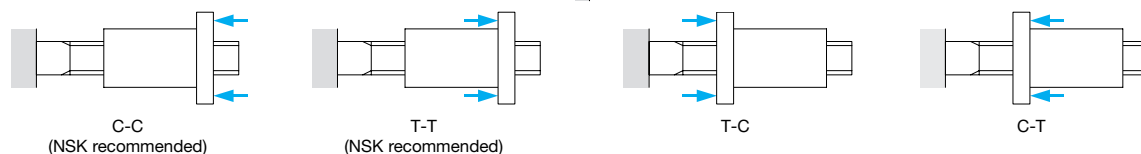
Custom-made ball screw

Company name:	Date:	NSK sales office
Section:	Person in charge:	
Address:		

Name of machine*¹: Electric injection molding machine; 30-ton capacity Application*²: Clamping axisDrawing/rough sketch attached?: ☒ Yes ☐ No*¹ Please specify capacity of the machine in case of injection molding machine or press.*² If the application is injection molding machine, please indicate the axis. (Examples: injection axis and clamping axis)

1. Use conditions

Operating conditions	☒ Shaft rotation–Moving nut ☐ Shaft rotation–Moving shaft ☐ Nut rotation–Moving nut ☐ Nut rotation–Moving shaft	☒ Normal operation ☐ Back drive operation ☐ Oscillation	Degree of vibration / impact	☐ Smooth operation without impact ☒ Normal operation ☐ Operation associated with impact or vibration	
Direction of load* ³	☐ C-C ☒ T-T ☐ T-C ☐ C-T ☐ other (Refer to figures below.)			Mounting orientation	☒ Horizontal ☐ Vertical (Indicate the direction of gravity.)
Lubricant	☒ Grease (Brand name: <u>High-load grease with an extreme pressure additive</u>) ☐ Oil (Maker:)			How to replenish lubricant	☒ Grease gun ☐ Automatic (cm ³ / cycles)
Request for oil hole	☒ NSK recommended ☐ Your request				
Necessity of seals	☒ Yes ☐ No			NSK S1 necessary?	☒ NSK recommended ☐ Not necessary
Environment	Temperature (<u>40</u> deg)	Particles / ☐ Yes (Size of particle: a) to 0.1, b) over 0.1 to 0.3, c) over 0.3, d) Ingredient:) ☒ No particle			
Surface treatment	☒ Not required ☐ Low-temperature chrome plating ☐ Fluoride low-temperature chrome plating ☐ Other				
Quantity in mass-production	/Month	/Year	/Lot	Quantity used per machine	<u>1</u> pcs./machine

*³ Please specify loading direction code on the figures below. (Shaft fixed: |, Main load: →)

2. Specifications

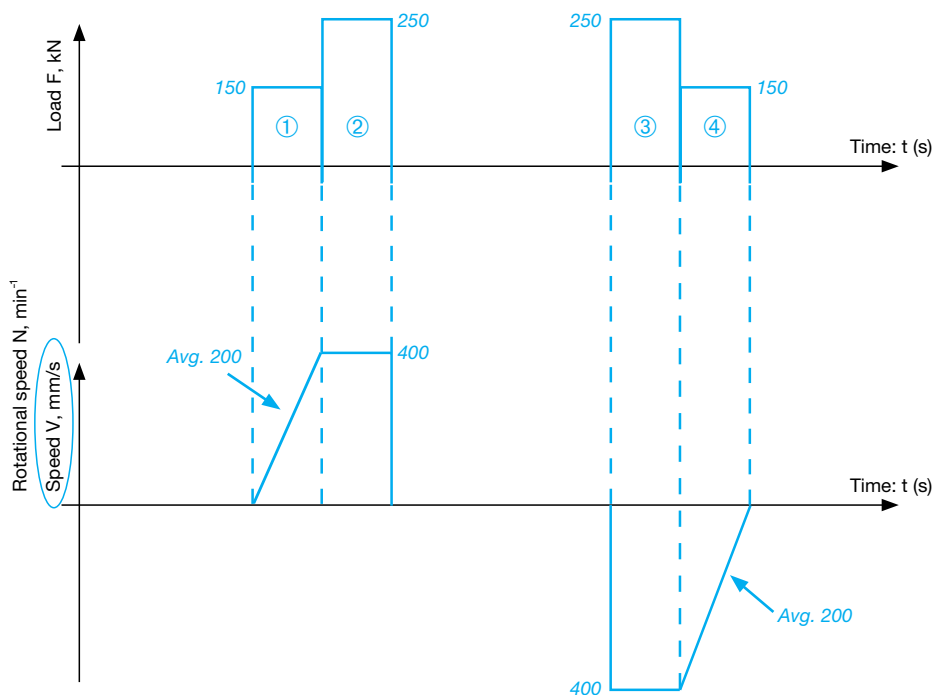
Shaft diameter	ø <u>140</u> mm	Lead	<u>32</u> mm	Accuracy grade	<u>Ct7</u>	Axial play	<u>0.050 or less</u> mm max.
Nut model No.	<u>HTF 14032-7.5-S1</u>	Effective turns of balls	<u>2.5 × 2</u>	Direction of turn	<u>right</u>	Thread length / Overall shaft length	<u>1000 / 1500</u>

Special note / Requests

Please calculate the life as a continuous operation based on "3. Load chart".

NSK Technical Data Sheet for NSK High-Load Drive Ball Screw

3. Load chart (If using multiple ball screws in an axis, fill out the axial load per ball screw.)



	Axial load* F (kN)	Rotational speed or Average speed N (min ⁻¹)	V (mm/s)	Time t (s)	Stroke St (mm)	Remarks
①	150		200	0.5	100	
②	250		400	0.5	200	
③	250		400	0.5	200	
④	150		200	0.5	100	
⑤				Total: 2.0	Total: 600	
⑥						
⑦						
⑧						
⑨						
⑩						

Dynamic axial load (max.): 250 (kN) Static axial load (max.)* (at 0 mm/s): (kN)

Stroke in normal use: 300 (mm) Maximum stroke: 500 (mm)

Cycle time: 2.0 (s) Required life: 2500 (☒ h or ☐ cycles)

*If using multiple ball screws in an axis, fill out the axial load per ball screw.

4. Plan to conduct the endurance test of the ball screw?

Actual data on the machine ☐ Yes
☒ N/A ☐ Planning to check endurance (Date: From the middle of March 2014)
☐ No (Reason:)

Endurance of the ball screw

- (1) Mounting accuracy, load conditions, and lubricating conditions are the main factors affecting the ball screw fatigue life. Therefore, we recommend evaluating the influence of those factors on actual use of your machines.
- (2) A temperature rise caused by operational and environmental conditions may reduce the effectiveness of lubricant.

Technical Data sheet

NSK Technical Data Sheet for NSK High-Load Drive Ball Screw

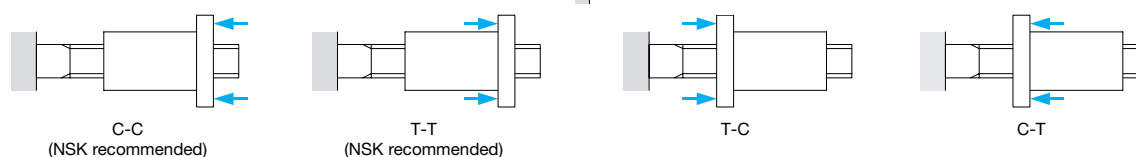
Custom-made ball screw

Company name:	Date:	NSK sales office
Section:	Person in charge:	
Address:		

Name of machine*¹: _____ Application*²: _____Drawing/rough sketch attached?: ☐ Yes ☐ No*¹ Please specify capacity of the machine in case of injection molding machine or press.*² If the application is injection molding machine, please indicate the axis. (Examples: injection axis and clamping axis)

1. Use conditions

Operating conditions	☐ Shaft rotation–Moving nut ☐ Shaft rotation–Moving shaft ☐ Nut rotation–Moving nut ☐ Nut rotation–Moving shaft	☐ Normal operation ☐ Back drive operation ☐ Oscillation	Degree of vibration / impact	☐ Smooth operation without impact ☐ Normal operation ☐ Operation associated with impact or vibration	
Direction of load* ³	☐ C-C ☐ T-T ☐ T-C ☐ C-T ☐ other (Refer to figures below.)		Mounting orientation	☐ Horizontal ☐ Vertical (Indicate the direction of gravity.)	
Lubricant	☐ Grease (Brand name: _____) ☐ Oil (Maker: _____)		How to replenish lubricant	☐ Grease gun ☐ Automatic (_____ cm ³ / _____ cycles)	
Request for oil hole	☐ NSK recommended ☐ Your request				
Necessity of seals	☐ Yes ☐ No		NSK S1 necessary?	☐ NSK recommended ☐ Not necessary	
Environment	Temperature (_____ deg)	Particles / ☐ Yes (Size of particle: a) to 0.1, b) over 0.1 to 0.3, c) over 0.3, d) Ingredient: _____) ☐ No particle			
Surface treatment	☐ Not required ☐ Low-temperature chrome plating ☐ Fluoride low-temperature chrome plating ☐ Other				
Quantity in mass-production	/Month	/Year	/Lot	Quantity used per machine	pcs./machine

*³ Please specify loading direction code on the figures below. (Shaft fixed: , Main load: )

2. Specifications

Shaft diameter	∅ mm	Lead	mm	Accuracy grade		Axial play	mm max.
Nut model No.		Effective turns of balls		Direction of turn		Thread length / Overall shaft length	/

Special note / Requests

NSK Technical Data Sheet for NSK High-Load Drive Ball Screw

3. Load chart (If using multiple ball screws in an axis, fill out the axial load per ball screw.)



	Axial load* F (kN)	Rotational speed or Average speed N (min ⁻¹)	V (mm/s)	Time t (s)	Stroke St (mm)	Remarks
①						
②						
③						
④						
⑤						
⑥						
⑦						
⑧						
⑨						
⑩						

Dynamic axial load (max.)*: (kN) Static axial load (max.)* (at 0 mm/s): (kN)

Stroke in normal use: (mm) Maximum stroke: (mm)

Cycle time: (s) Required life: (□ h or □ cycles)

*If using multiple ball screws in an axis, fill out the axial load per ball screw.

4. Plan to conduct the endurance test of the ball screw?

Actual data on the machine → ☐ Yes
 → ☐ N/A → Planning to check endurance (Date:)
 → No (Reason:)

Endurance of the ball screw

- (1) Mounting accuracy, load conditions, and lubricating conditions are the main factors affecting the ball screw fatigue life. Therefore, we recommend evaluating the influence of those factors on actual use of your machines.
- (2) A temperature rise caused by operational and environmental conditions may reduce the effectiveness of lubricant.

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