B-3-2.1 End Deflector Type Ball Screws

This product is being applied for a patent.

1. Features

●Low and less offensive noise

The average noise level is reduced by more than 6 dB compared with our existing products. At low-speed rotation, the ball screws are nearly silent, while their noise is unprecedentedly low at high-speed rotation.

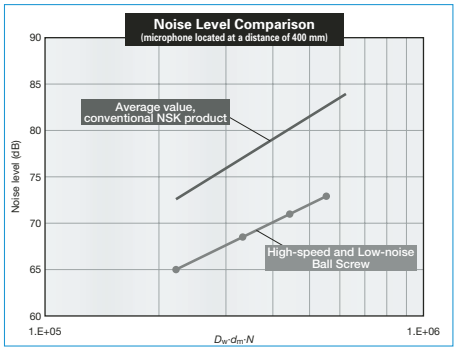


Fig. 1 Comparison of noise level

●High-speed operation

Realizes the d·n of 180 000, outstanding for ball screws and far surpassing the 100 000 d·n performance of existing return tube type products. For high-lead ball screws, high-speed operation at over 200 m/min is also possible.

●Compact

The external diameter of the ball nut is 30% smaller than our existing models. Compact configurations are possible for low-profile XY tables as well as for other devices and equipment.

●Grease fitting provided as standard equipment

The ball screws with shaft diameters equal to or less than ø25 are equipped with a grease fitting (M5 × 0.8) as a standard. Lubrication ports are provided in 2 places for ease of maintenance. The ball screws can be easily connected to an integrated lubrication system.

2. Specifications

(1) Ball recirculation system

Fig. 2 shows the structure of the end-deflector recirculation system.

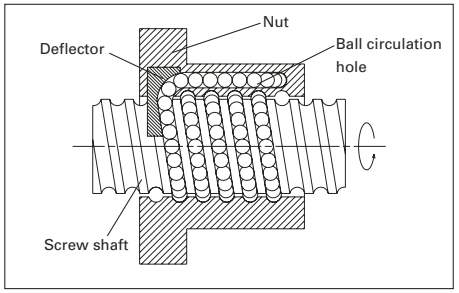


Fig. 2 Structure of end-deflector recirculation system

(2) Accuracy grade and axial play

The available standard accuracy grade and axial play are as follows. Please consult NSK for other grades.

Table 1 Accuracy grade and axial play

Accuracy grade	C0, C1, C2, C3, C5, Ct7
Axial play	Z, 0 mm (preloaded); T, 0.005 mm or less; S, 0.020 mm or less; N, 0.050 mm or less

(3) Allowable d·n value and the criterion of maximum rotational speed

Allowable d·n value and the criterion of maximum rotational speed are shown below. Please consult NSK if the rotational speed exceeds the permissible range below.

Allowable d·n value : 180 000 or less

Standard of rotational speed: 5 000 min^{-1}

Note: Please also review the critical speed. See "Technical Description: Permissible Rotational Speed" (page B47) for details.

(4) Seal

A compact and thin plastic seal is used. Nut outside diameter is compact compare with the return tube recirculation system.

(5) Option

Optional NSK K1 lubrication unit, molded from resin and impregnated with lubrication oil, supplies fresh oil onto ball rolling surfaces, ensuring long-term, maintenance-free operation. Please contact NSK when using NSK K1.

3. Design precautions

When designing the shaft end of a ball screw which diameter is 25 mm or less, or 32 mm or over, and the lead is the same as its shaft diameter, one end of the screw must meet either one of the following conditions. If not, we cannot install the ball nut on the screw shaft.

- Cut the ball groove through to the shaft end.
- The diameters of bearing journals and the gear or pulley seat must be less than the root diameter of ball groove "dr" specified on the dimension table.

For general precautions regarding ball screws, refer to "Design Precautions"(page B83) and "Handling Precautions"(page B103).

4. Product categories

End deflector type ball screws have the model as follows.

Table 2 End-deflector type ball screw product categories

Nut model	Shape	Flang shape	Nut shape	Preload system
BSS		Circular Ⅱ, Ⅲ	Circular	Non-preload, Slight axial play P-preload (light preload)

5. Structure of model number and reference number

The following describe the structure of "Model number" and "Reference number for ball screw".

◇Model number

BSS 10 10 - 2E

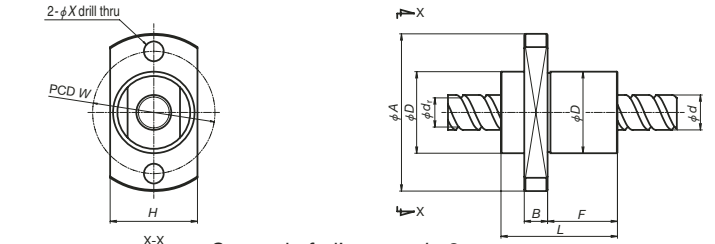
- BSS: Nut model: BSS
- 10: Screw shaft diameter (mm)
- 10: Lead (mm)
- 2E: Effective turns of balls

◇Reference number for ball screw

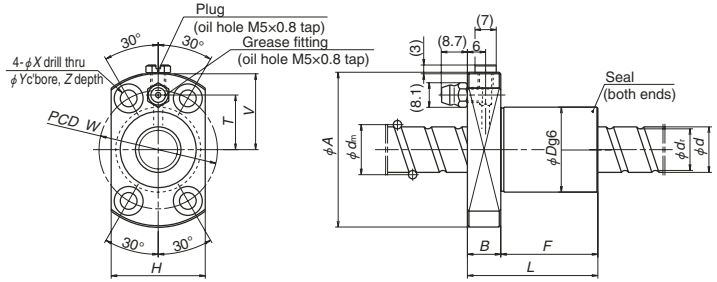
W 10 01 - ** P SS - C5 Z 10

- W: Product code
- 10: Screw shaft diameter (mm)
- 01: Effective threaded length (in the unit of 100 mm)
- **: NSK design serial number
- P: Preload code: No code, non-preload; P, P-preload (page B5)
- SS: End-deflector recirculation system
- C5: Accuracy grade: C0, C1, C2, C3, C5, C7 (Ct7) (page B37 to B42)
- Z: Axial play code: Z, T, S, N (page B20)
- 10: Lead (mm)

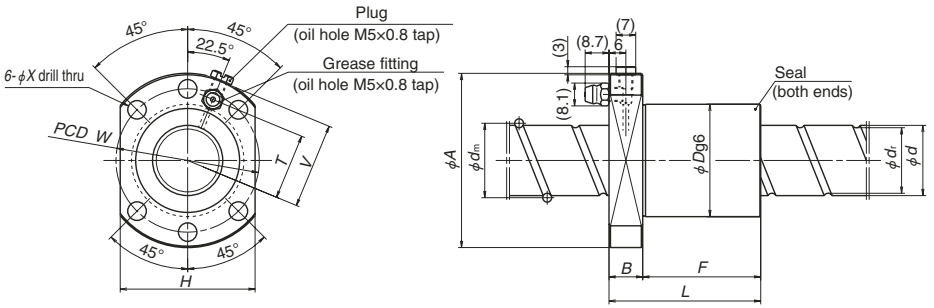
End deflector type



Screw shaft diameter $d \leq 8$ mm



Screw shaft diameter $d \leq 20$ mm



Screw shaft diameter $d = 25$ mm

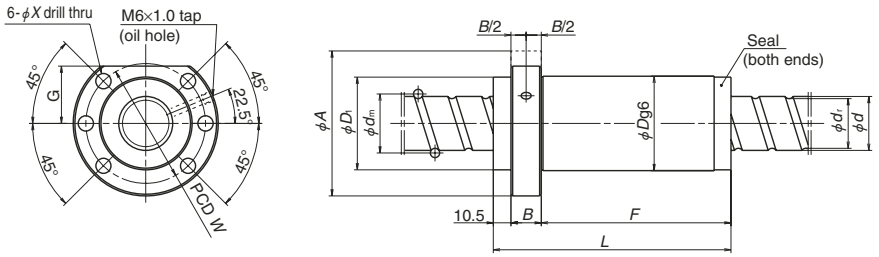
Unit: mm

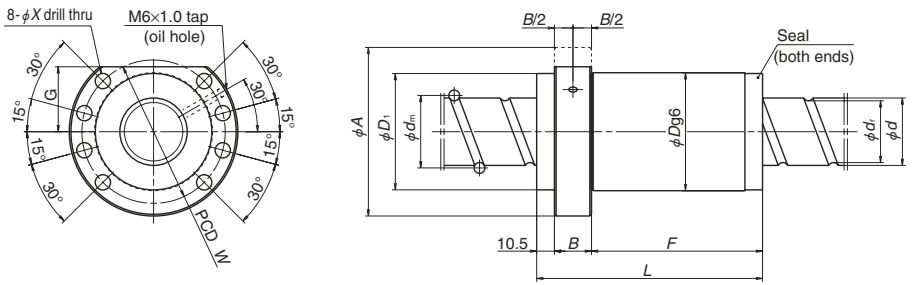
Model No.	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls	Basic load rating (N) Dynamic C_a	Basic load rating (N) Static C_{0a}	Axial rigidity K (N/μm)
BSS0608-2E	6	8	1.2	6.2	4.9	2	550	715	24
BSS0608-4E		8				4	1 180	1 760	55
BSS0612-2E		12				2	550	715	22
BSS0612-4E		12				4	1 180	1 760	51
BSS0810-2E	8	10	1.588	8.3	6.6	2	910	1 260	31
BSS0810-4E		10				4	1 950	3 080	72
BSS0815-2E		15				2	910	1 260	29
BSS0815-4E		15				4	1 950	3 080	68
BSS1005-3E	10	5	2.000	10.3	8.2	3	2 930	4 790	126
BSS1010-2E		10				2	1 970	3 010	77
BSS1205-3E	12	5	2.000	12.3	10.2	3	3 200	5 860	146
BSS1210-3E		10				3	3 200	5 860	142
BSS1220-2E		20				2	2 150	3 610	83
BSS1230-2E		30				2	2 150	3 610	75
BSS1505-3E	15	5	2.778	15.5	12.6	3	5 460	10 200	183
BSS1510-3E		10	2.778		12.6	3	5 460	10 200	181
BSS1520-2E		20	3.175		12.2	2	5 070	8 730	127
BSS1530-2E		30	3.175		12.2	2	5 070	8 730	116
BSS2005-3E	20	5	3.175	20.5	17.2	3	8 790	18 500	268
BSS2010-3E		10				3	8 790	18 500	268
BSS2020-2E		20				2	5 900	11 700	167
BSS2030-2E		30				2	5 900	11 700	159
BSS2040-2E		40				2	5 900	11 700	147
BSS2060-2E		60				2	5 900	11 700	128
BSS2505-3E	25	5	3.175	25.5	22.2	3	9 760	23 600	325
BSS2510-4E		10				4	12 800	32 300	437
BSS2520-2E		20				2	6 560	14 600	203
BSS2525-2E		25				2	6 560	14 600	197
BSS2530-2E		30				2	6 560	14 600	194
BSS2550-2E		50				2	6 560	14 600	177

Nut entire length L	Nut diameter D	Flange diameter A	Flange width B	Nut length F	Flange dimension H	Flange dimension V	Bolt hole PCD W	Bolt hole dimension X	Bolt hole dimension Y	Bolt hole dimension Z	Oil hole distance T
16	14	27	4	8	15 (10)	—	21	3.4	—	—	—
24				16							
20				12							
32				24							
18	18	31	4	10	19 (13)	—	25	3.4	—	—	—
28				20							
22				14							
37				29							
29	23	43	11	18	26	21	33	4.5	8	4.5	14
32				21							
30	24	44	11	19	27	21.5	34	4.5	8	4.5	14.5
43				32							
50				39							
70				59							
30	28	51	11	19	31	25	39	5.5	9.5	5.5	18
43	28	51		32	31	25	39				18
51	32	55		40	33	27	43				20
71	32	55		60	33	27	43				20
31	36	62	13	18	38	30.5	49	6.6	11	6.5	23.5
45				32							
54				41							
74				61							
92				79							
129				116							
32	40	62	12	20	48	30.5	51	6.6	—	—	23.5
56				44							
54				42							
63				51							
74				62							
114				102							

Note: 1) The axial rigidity K in the table above is a theoretical value derived from elastic displacement between screw grooves and balls when axial load is applied to a ball nut for which preload is set at 3% of the basic dynamic load rating (C_a).
For ball screws with shaft diameters less than ø25, the standard Compact FA PSS type can be available.

2) Dimensions in parentheses are for flat nut configurations.





Screw shaft diameter d = 32 mm

Model No.	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls	Basic load rating (N) Dynamic C_a	Basic load rating (N) Static C_{0a}	Axial rigidity K (N/μm)
BSS3205-4E	32	5	3.175	32.5	29.2	4	14 200	41 400	534
BSS3210-6E		10	5.556	33	27.2	6	43 300	111 000	865
BSS3212-5E		12	5.556	33	27.2	5	36 700	90 800	716
BSS3216-5E		16	5.556	33	27.2	5	36 700	90 800	716
BSS3220-5E		20	5.556	33	27.2	5	36 700	90 800	708
BSS3232-2E		32	5.556	33	27.2	2	15 300	32 400	261
BSS3264-2E		64	5.556	33	27.2	2	15 300	32 400	232
BSS3605-3E	36	5	3.175	36.5	33.2	3	11 400	34 100	433
BSS3610-6E		10	6.35	37	30.4	6	55 200	142 000	970
BSS3612-6E		12	6.35	37	30.4	6	55 200	142 000	967
BSS3616-6E		16	6.35	37	30.4	6	55 200	142 000	961
BSS3620-6E		20	6.35	37	30.4	6	55 200	142 000	959
BSS4010-5E	40	10	6.35	41	34.4	5	49 300	130 000	875
BSS4012-5E		12				5	49 300	130 000	873
BSS4016-5E		16				5	49 300	130 000	875
BSS4020-5E		20				5	49 300	130 000	868
BSS4025-4E		25				4	40 100	103 000	686
BSS4030-3E		30				3	30 600	74 000	505
BSS4040-2E		40				2	20 600	46 600	319
BSS4080-2E		80				2	20 600	46 600	286
BSS4510-5E	45	10	6.35	46	39.4	5	51 400	146 000	961
BSS4512-5E		12				5	51 400	146 000	959
BSS4516-5E		16				5	51 400	146 000	955
BSS4520-5E		20				5	51 400	146 000	950
BSS4525-5E		25				5	51 400	146 000	954
BSS4530-4E		30				4	41 800	116 000	752
BSS5010-4E	50	10	6.35	51	44.4	4	44 600	129 000	836
BSS5012-4E		12				4	44 600	129 000	944
BSS5016-4E		16				4	44 600	129 000	832
BSS5020-4E		20				4	44 600	129 000	837
BSS5025-4E		25				4	44 600	129 000	828
BSS5030-4E		30				4	44 600	129 000	821
BSS5050-2E		50				2	22 800	58 300	383
BSS50100-2E		100				2	22 800	58 300	342

Note: The axial rigidity K in the table above is a theoretical value derived from elastic displacement between screw grooves and balls when axial load is applied to a ball nut for which preload is set at 3% of the basic dynamic load rating (C_a).

Screw shaft diameter $d \geq 36$ mm

Unit: mm

Nut entire length L	Nut diameter D	Seal section diameter D_1	Flange diameter A	Flange width B	Nut length F	Notched flange G	Bolt hole PCD W	Bolt hole dimension X
55	56	55	86	12	32.5	34	71	9
104				18	75.5			
103				18	74.5			
122				18	93.5			
141				18	112.5			
94				18	65.5			
153				18	124.5			
50	65	64	95	12	27.5	36	80	9
109				22	76.5			
120				22	87.5			
143				22	110.5			
166				22	133.5			
99	70	69	100	22	66.5	38.5	85	9
108					75.5			
127					94.5			
146					113.5			
145					112.5			
134					101.5			
110					77.5			
184					151.5			
99	75	74	110	22	66.5	43	93	11
108					75.5			
127					94.5			
146					113.5			
170					137.5			
164					131.5			
89	82	81	118	22	56.5	46	100	11
96					63.5			
111					78.5			
126					93.5			
145					112.5			
164					131.5			
130					97.5			
224					191.5			

B-3-2.2 Return Tube Type Ball Screws

1. Features

Return tube type is a standard way of ball recirculation system for ball screws. It has various combinations of shaft diameter and lead.

2. Specifications

(1) Ball recirculation system

The structure of return tube recirculation system is shown below.

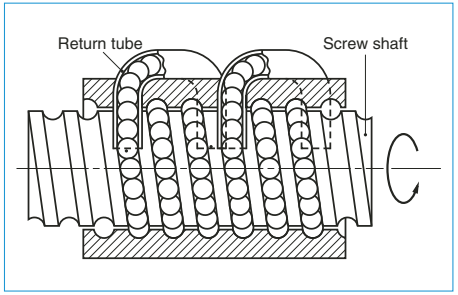


Fig.1 Structure of return tube recirculation system

Table 1 Accuracy grade and axial play

Accuracy grade	SFT, PFT, ZFT, DFT: C0, C1, C2, C3, C5, Ct7 LSFT, LPFT, LDFT: C1, C2, C3, C5, Ct7 (Ct7 is not included in DFT, LDFT)
Axial play	Z, 0 mm (preloaded); T, 0.005 mm or less; S, 0.020 mm or less; N, 0.050 mm or less

(2) Accuracy grade and axial play

The available standard accuracy grade and axial play are shown in **Table 1**. Please consult NSK for other grades.

(3) Allowable d·n value and the criterion of maximum rotational speed

Allowable d·n value and the criterion of maximum rotational speed are shown below. Please consult NSK if the rotational speed exceeds the permissible range below. Basic measures must be taken for the high-speed ball screws respectively.

Allowable d·n value :

Standard specification ; 70 000 or less

High-speed specification; 100 000 or less

Standard of rotational speed : 3 000 min^{-1}

Note: Please also review the critical speed. Refer to "Technical Description: Permissible Rotational Speed" (page B47) for details.

(4) Option

A type equipped with NSK K1 lubrication unit is also available.

(5) Other specifications

Please consult NSK for other specifications not listed in the dimension tables.

3. Product categories

There are four different preloaded systems with several models. Since the leads are in the range from 1/2 to the same length of the shaft diameter (medium-high helix lead), LSFT, LPFT, LDFT Type ball screws are suitable for high-speed operation.

Table 2 Return tube type ball screws product categories

Nut model	Shape	Flange shape	Nut shape	Preload system
SFT PFT		Flanged d=16mm or under Rectangle d=20mm or over Circular Ⅰ, Ⅱ	Circle dia.	Non-preload, Slight axial play P-preload (light preload) Spacer ball 1:1
ZFT		Flanged Circular Ⅰ, Ⅱ	Circle dia.	Z-preload (medium preload)
DFT		Flanged Circular Ⅰ, Ⅱ	Circular	D-preload (medium preload) (heavy preload)
LSFT LPFT		Flanged d=20mm or under Rectangle d=25mm or over Circular Ⅱ	d=20mm or under Circular d=25mm or over Tube- projecting type	Non-preload, Slight axial play P-preload (light preload) Spacer ball 1:1
LDFT		Flanged Circular Ⅱ	Circular	D-preload (medium preload) (heavy preload)

4. Structure of model number and reference number

The followings describe the structure of "Model number" and "Reference number for ball screw".

◇ Model number

SFT 14 05 - 2.5

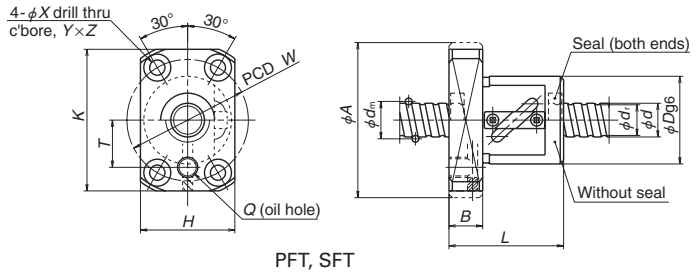
- SFT: Nut model: SFT, PFT, ZFT, DFT / LSFT, LPFT, LDFT
- 14: Screw shaft diameter (mm)
- 05: Lead (mm)
- 2.5: Effective turns of balls (Note)

Note: In case of Z-preload, the number here is twice as large as the effective turns of balls.

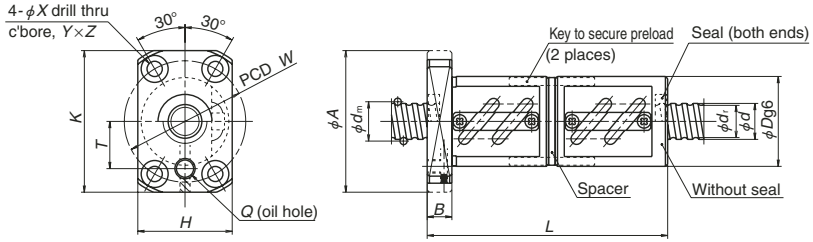
◇ Reference number for ball screw

W 14 01 - ** P - C3 Z 5

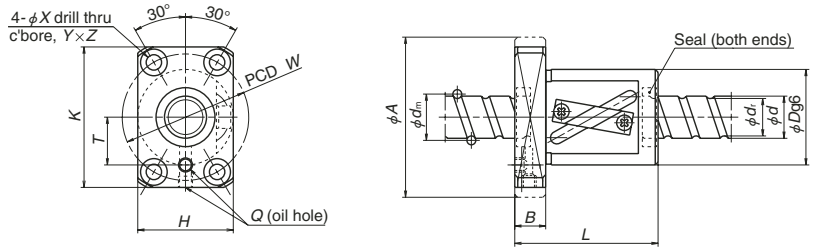
- W: Product code
- 14: Screw shaft diameter (mm)
- 01: Effective threaded length (in the unit of 100 mm)
- **: NSK design serial number
- P: Preload code: No code, non-preload; P, P-preload; Z, Z-preload; D, D-preload (page B5)
- C3: Accuracy grade code: C0, C1, C2, C3, C5, C7 (Ct7) (page B37 to B42)
- Z: Axial play code: Z, T, S, N (page B20)
- 5: Lead (mm)



PFT, SFT



DFT



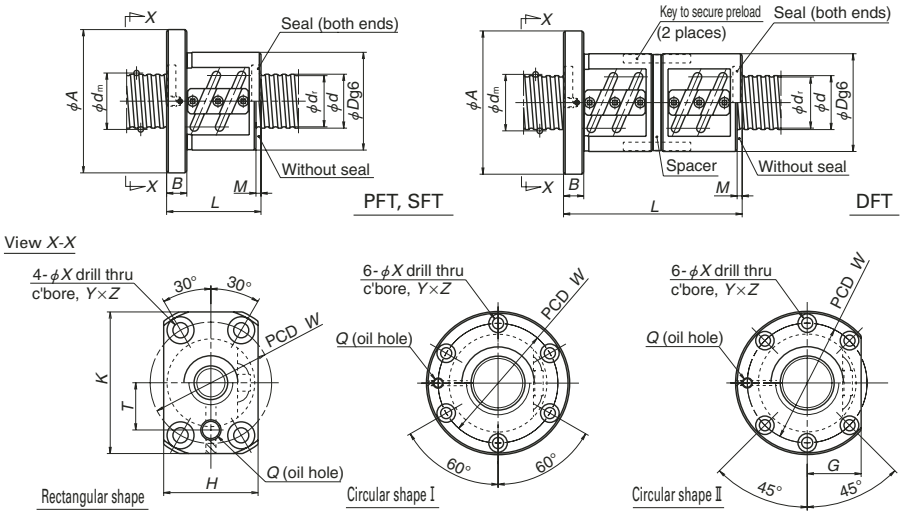
LPFT, LSFT

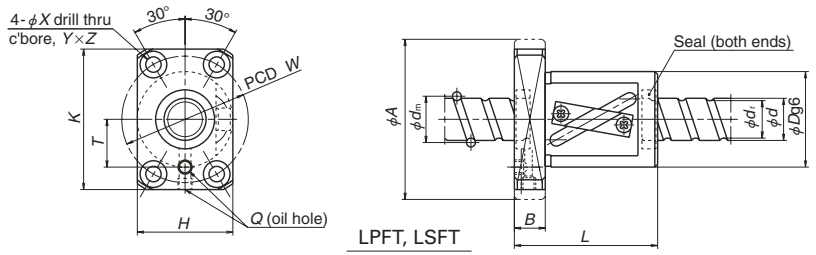
Unit: mm

	Model No.	Preload system	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls: Turns × Circuits	Basic load rating (N): Dynamic C_a	Basic load rating (N): Static C_{0a}	Axial rigidity K (N/μm)
*	**PFT 1004-2.5**	P	10	4	2.000	10.3	8.2	2.5×1	1 730	2 230	76
	SFT 1004-2.5	Clearance							2 740	4 450	90
	PFT 1204-2.5	P	12	4	2.381	12.3	9.8	2.5×1	2 370	3 160	89
	PFT 1204-3	P						1.5×2	2 770	3 790	106
	SFT 1204-2.5	Clearance						2.5×1	3 760	6 310	106
	SFT 1204-3	Clearance						1.5×2	4 390	7 580	126
*	**PFT 1205-2.5**	P		5	2.381	12.3	9.8	2.5×1	2 370	3 160	89
	PFT 1205-3	P						1.5×2	2 770	3 790	106
	SFT 1205-2.5	Clearance						2.5×1	3 760	6 310	106
	SFT 1205-3	Clearance						1.5×2	4 390	7 580	126
*	**LPFT 1210-2.5**	P		10	2.381	12.5	10.0	2.5×1	2 360	3 240	90
	LSFT 1210-2.5	Clearance							3 750	6 480	110
*	**PFT 1405-2.5**	P	14	5	3.175	14.5	11.2	2.5×1	4 280	5 840	116
	SFT 1405-2.5	Clearance						2.5×1	6 790	11 700	140
	PFT 1405-5	P						2.5×2	7 770	11 700	225
	SFT 1405-5	Clearance						2.5×2	12 300	23 400	274
*	**LPFT 1408-2.5**	P		8	3.175	14.5	11.2	2.5×1	4 280	5 840	120
	LSFT 1408-2.5	Clearance							6 790	11 700	140
*	**LPFT 1510-2.5**	P	15	10	3.175	15.5	12.2	2.5×1	4 450	6 380	127
	LSFT 1510-2.5	Clearance							7 070	12 800	150
	PFT 1604-3	P	16	4	2.381	16.3	13.8	1.5×2	3 170	5 150	135
	SFT 1604-2.5	Clearance						2.5×1	4 300	8 530	134
	DFT 1604-2.5	D						2.5×1	4 300	8 530	263
	PFT 1604-5	P						2.5×2	4 920	8 530	215
	SFT 1604-3	Clearance						1.5×2	5 040	10 300	160
	DFT 1604-3	D						1.5×2	5 040	10 300	315

Ball nut dimensions											
Nut entire length L	Nut diameter D	Flanged diameter A	Flanged width B	Rectangle flanged diameter H	Rectangle flanged diameter K	Bolt hole dimension X	Bolt hole dimension Y	Bolt hole dimension Z	Bolt hole PCD W	Oil hole length T	Oil hole Q
34	26	46	10	28	42	4.5	8	4.5	36	14	M6×1
38	30	50	10	32	45	4.5	8	4.5	40	15	M6×1
44											
38											
44											
40	30	50	10	32	45	4.5	8	4.5	40	15	M6×1
48											
40											
48											
50	30	50	10	32	45	4.5	8	4.5	40	15	M6×1
40	34	57	11	34	50	5.5	9.5	5.5	45	17	M6×1
40											
55											
55											
46	34	57	11	34	50	5.5	9.5	5.5	45	17	M6×1
51	34	57	11	34	50	5.5	9.5	5.5	45	17	M6×1
45	34	57	11	34	50	5.5	9.5	5.5	45	17	M6×1
38	34			34							
70	36			36							
50	34			34							
45	34			34							
85	36			36							

Notes: 1. Nut flange for shaft diameter 16 mm or smaller comes in rectangular shape.
2. Seals are equipped as a standard for LSFT and LPFT of shaft diameter 20 mm or smaller. The outside dimensions are the same as those of without seals.
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.
4. The axial rigidity K in the table above is a theoretical value obtained from the elastic deformation between screw groove and ball when the axial load is 30% of the basic dynamic load rating (C_a) with non-preload, 10% with D-preload, and 5% with P-preload. Refer to "Technical Description" (page B37) if the axial load and preload differ from the conditions above, or when the deformation of the ball nut body must be considered.
5. For PFT and LPFT, the basic load ratings differ from the other models as the spacer balls are installed.
6. The models marked with * (asterisk) are available in the FA type standard ball screws with finished shaft end.
7. Preload system: P, Oversize ball preload; D, Double nut preload (See page B5.)





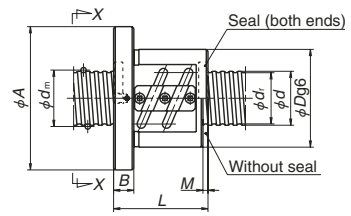
Unit: mm

Model No.	Preload system	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls: Turns × Circuits	Basic load rating (N): Dynamic C_a	Basic load rating (N): Static C_{0a}	Axial rigidity K (N/μm)
PFT 1605-3	P	16	5	3.175	16.5	13.2	1.5×2	5 400	8 100	158
SFT 1605-2.5	Clearance						2.5×1	7 330	13 500	158
DFT 1605-2.5	D						2.5×1	7 330	13 500	311
PFT 1605-5	P						2.5×2	8 380	13 500	258
SFT 1605-3	Clearance						1.5×2	8 570	16 200	188
DFT 1605-3	D						1.5×2	8 570	16 200	370
SFT 1605-5	Clearance						2.5×2	13 300	27 000	307
DFT 1605-5	D						2.5×2	13 300	27 000	603
PFT 1606-2.5	P		6	3.175	16.5	13.2	2.5×1	4 620	6 750	133
SFT 1606-2.5	Clearance						2.5×1	7 330	13 500	158
DFT 1606-2.5	D						2.5×1	7 330	13 500	311
SFT 1606-3	Clearance						1.5×2	8 570	16 200	188
DFT 1606-3	D						1.5×2	8 570	16 200	370
* **LPFT 1616-1.5**	P		16	3.175	16.75	13.4	1.5×1	3 600	5 410	110
LSFT 1616-1.5	Clearance							4 710	8 110	100
SFT 2004-2.5	Clearance	20	4	2.381	20.3	17.8	2.5×1	4 740	10 700	160
DFT 2004-2.5	D						2.5×1	4 740	10 700	315
* **PFT 2004-5**	P						2.5×2	5 420	10 700	260
SFT 2004-5	Clearance						2.5×2	8 600	21 500	309
DFT 2004-5	D						2.5×2	8 600	21 500	608
PFT 2005-3	P		5	3.175	20.5	17.2	1.5×2	6 060	10 300	191
SFT 2005-2.5	Clearance						2.5×1	8 230	17 100	190
DFT 2005-2.5	D						2.5×1	8 230	17 100	376
* **PFT 2005-5**	P						2.5×2	9 410	17 100	311
SFT 2005-3	Clearance						1.5×2	9 620	20 600	227
DFT 2005-3	D						1.5×2	9 620	20 600	446
SFT 2005-5	Clearance						2.5×2	14 900	34 300	370
DFT 2005-5	D						2.5×2	14 900	34 300	726

Notes: 1. Nut flange for shaft diameter 16 mm or smaller comes in rectangular shape. It comes in circular shape I and circular shape II for shaft diameter 20 mm or larger. Select a flange that is suitable for the space available for nut installation.
2. If there is no seal for PFT, SFT, and DFT, the nut length "L" is shortened by dimension "M".
3. Seals are equipped as a standard for LSFT and LPFT of shaft diameter 20 mm or smaller. The outside dimensions are the same as those of without seals.
4. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.

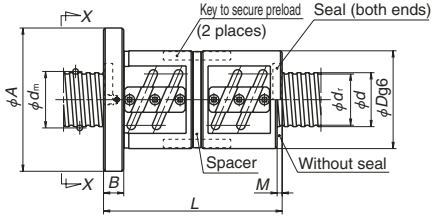
Ball nut dimensions													
Nut entire length L	Nut diameter D	Flanged diameter A	Flanged width B	Notched flange G	Rectangle flanged diameter H	Rectangle flanged diameter K	Seal dimension M	Bolt hole dimension X	Bolt hole dimension Y	Bolt hole dimension Z	Bolt hole PCD W	Oil hole length T	Oil hole Q
52	40	63	11	—	40	55	—	5.5	9.5	5.5	51	20	M6×1
42													
77													
57													
52													
97													
57													
107													
44	40	63	11	—	40	55	—	5.5	9.5	5.5	51	20	M6×1
44													
86													
56													
110													
56	40	63	12	—	40	55	—	5.5	9.5	5.5	51	17	M6×1
37	40	63	11	24	—	—	3	5.5	9.5	5.5	51	—	M6×1
69													
49													
49													
93													
52	44	67	11	26	—	—	3	5.5	9.5	5.5	55	—	M6×1
41													
76													
56													
52													
97													
56													
106													

5. The axial rigidity K in the table above is a theoretical value obtained from the elastic deformation between screw groove and ball when the axial load is 30% of the basic dynamic load rating (C_a) with non-preload, 10% with D-preload, and 5% with P-preload. Refer to "Technical Description" (page B37) if the axial load and preload differ from the conditions above, or when the deformation of the ball nut body must be considered.
6. For PFT and LPFT, the basic load ratings differ from the other models as the spacer balls are installed.
7. The models marked with * (asterisk) are available in the FA or SA type standard ball screws with finished shaft end.
8. Preload system: P, Oversize ball preload; D, Double nut preload (See page B5.)

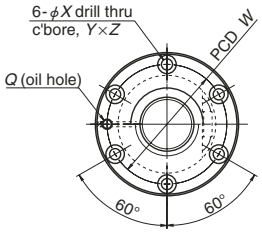


View X-X

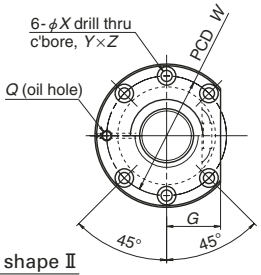
PFT, ZFT, SFT



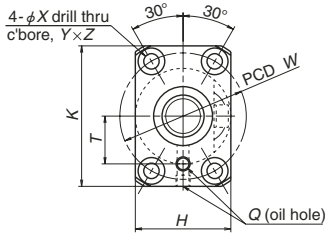
DFT

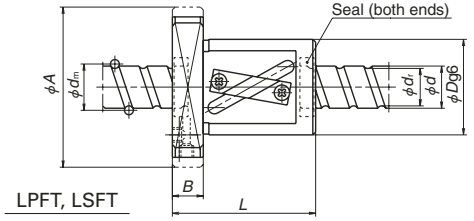


Circular shape Ⅰ



Circular shape Ⅱ





LPFT, LSFT

Unit: mm

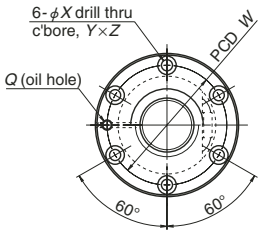
Model No.	Preload system	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls: Turns × Circuits	Basic load rating (N): Dynamic C_a	Basic load rating (N): Static C_{0a}	Axial rigidity K (N/μm)
PFT 2006-2.5	P	20	6	3.969	20.5	16.4	2.5×1	6 900	10 500	164
PFT 2006-3	P						1.5×2	8 080	12 700	195
SFT 2006-2.5	Clearance						2.5×1	11 000	21 100	195
DFT 2006-2.5	D						2.5×1	11 000	21 100	384
SFT 2006-3	Clearance						1.5×2	12 800	25 300	232
DFT 2006-3	D						1.5×2	12 800	25 300	456
PFT 2008-2.5	P		8	3.969	20.5	16.4	2.5×1	6 900	10 500	164
SFT 2008-2.5	Clearance						2.5×1	11 000	21 100	195
DFT 2008-2.5	D						2.5×1	11 000	21 100	384
SFT 2008-3	Clearance						1.5×2	12 800	25 300	232
DFT 2008-3	D						1.5×2	12 800	25 300	456
✻ **LPFT 2010-2.5**	P		10	3.969	21.0	16.9	2.5×1	6 800	10 800	169
LSFT 2010-2.5	Clearance							10 900	21 700	202
LPFT 2016-2.5	P		16	3.969	21.0	16.9	2.5×1	6 880	10 800	169
LSFT 2016-2.5	Clearance							10 900	21 700	202
✻ **LPFT 2020-1.5**	P		20	3.969	21.0	16.9	1.5×1	5 370	8 450	137
LSFT 2020-1.5	Clearance							7 040	12 700	127
SFT 2504-2.5	Clearance	25	4	2.381	25.3	22.8	2.5×1	5 270	13 600	193
ZFT 2504-5	Z						2.5×1	5 270	13 600	379
✻ **PFT 2504-5**	P						2.5×2	6 020	13 600	312
SFT 2504-5	Clearance						2.5×2	9 560	27 200	374
ZFT 2504-10	Z						2.5×2	9 560	27 200	735
PFT 2505-3	P		5	3.175	25.5	22.2	1.5×2	6 730	12 800	223
SFT 2505-2.5	Clearance						2.5×1	9 130	21 900	231
ZFT 2505-5	Z						2.5×1	9 130	21 900	454
✻ **PFT 2505-5**	P						2.5×2	10 400	21 900	372
SFT 2505-3	Clearance						1.5×2	10 700	25 700	271
DFT 2505-3	D						1.5×2	10 700	25 700	532
PFT 2505-7.5	P						2.5×3	14 800	32 800	544
SFT 2505-5	Clearance						2.5×2	16 600	43 700	447
ZFT 2505-10	Z						2.5×2	16 600	43 700	876
SFT 2505-7.5	Clearance						2.5×3	23 500	65 600	654

Notes: 1. Nut flange for shaft diameter 20 mm or larger comes in circular shape I and circular shape II. Select a flange that is suitable for the space available for nut installation.
2. If there is no seal for PFT, SFT, and DFT, the nut length "L" is shortened by dimension "M".
3. Seals are equipped as a standard for LSFT and LPFT of shaft diameter 20 mm or smaller. The outside dimensions are the same as those of without seals.
4. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.

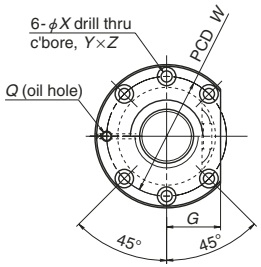
Ball nut dimensions													
Nut entire length L	Nut diameter D	Flanged diameter A	Flanged width B	Notched flange G	Rectangle flanged diameter H	Rectangle flanged diameter K	Seal dimension M	Bolt hole dimension X	Bolt hole dimension Y	Bolt hole dimension Z	Bolt hole PCD W	Oil hole length T	Oil hole Q
44	48	71	11	27	—	—	3	5.5	9.5	5.5	59	—	M6×1
56													
44													
86													
56													
110													
54	48	75	13	28	—	—	5	6.6	11	6.5	61	—	M6×1
54													
102													
64													
120													
54	46	74	13	—	46	66	—	6.6	11	6.5	59	24	M6×1
72	46	74	13	—	46	66	—	6.6	11	6.5	59	24	M6×1
63	46	74	13	—	46	66	—	6.6	11	6.5	59	24	M6×1
36	46	69	11	26	—	—	3	5.5	9.5	5.5	57	—	M6×1
48													
48													
48													
72													
52	50	73	11	28	—	—	3	5.5	9.5	5.5	61	—	M6×1
40							3						
55							3						
55							3						
52							3						
102							3						
70							—						
55							3						
85							3						
70							—						

5. The axial rigidity K in the table above is a theoretical value obtained from the elastic deformation between screw groove and ball when the axial load is 30% of the basic dynamic load rating (C_a) with non-preload, 10% with D-preload, and 5% with P-preload. Refer to "Technical Description" (page B37) if the axial load and preload differ from the conditions above, or when the deformation of the ball nut body must be considered.
6. For PFT and LPFT, the basic load ratings differ from the other models as the spacer balls are installed.
7. The models marked with ✻ (asterisk) are available in the FA or SA type standard ball screws with finished shaft end.
8. Preload system: P, Oversize ball preload; Z, Offset preload; D, Double nut preload (See page B5.)

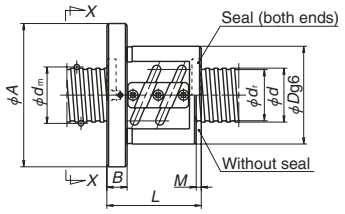
View *X-X*



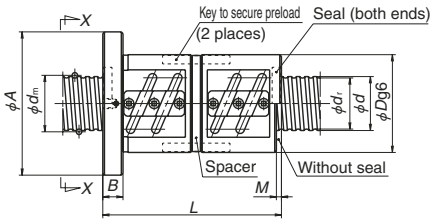
Circular shape Ⅰ



Circular shape Ⅱ



PFT, ZFT, SFT



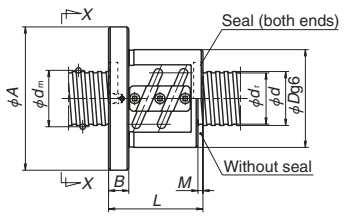
DFT

Unit: mm

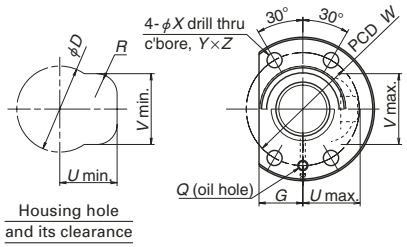
Model No.	Preload system	Shaft dia. *d*	Lead *l*	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls: Turns × Circuits	Basic load rating (N): Dynamic C_a	Basic load rating (N): Static C_{0a}	Axial rigidity *K* (N/μm)
PFT 2506-3	P	25	6	3.969	25.5	21.4	1.5×2	9 070	16 100	235
SFT 2506-2.5	Clearance						2.5×1	12 300	26 800	235
ZFT 2506-5	Z						2.5×1	12 300	26 800	462
* **PFT 2506-5**	P						2.5×2	14 100	26 800	383
SFT 2506-3	Clearance						1.5×2	14 400	32 100	280
DFT 2506-3	D						1.5×2	14 400	32 100	551
SFT 2506-5	Clearance						2.5×2	22 300	53 500	456
ZFT 2506-10	Z						2.5×2	22 300	53 500	896
PFT 2508-2.5	P		8	4.762	25.5	20.5	2.5×1	9 940	16 000	203
PFT 2508-3	P						1.5×2	11 600	19 000	234
SFT 2508-2.5	Clearance						2.5×1	15 800	32 000	242
ZFT 2508-5	Z						2.5×1	15 800	32 000	476
SFT 2508-3	Clearance						1.5×2	18 500	38 100	286
DFT 2508-3	D						1.5×2	18 500	38 100	562
PFT 2510-2.5	P		10	4.762	25.5	20.5	2.5×1	9 940	16 000	203
ZFT 2510-3	Z						1.5×1	10 200	19 000	291
PFT 2510-3	P						1.5×2	11 600	19 000	234
SFT 2510-2.5	Clearance						2.5×1	15 800	32 000	242
DFT 2510-2.5	D						2.5×1	15 800	32 000	475
SFT 2510-3	Clearance						1.5×2	18 500	38 100	286
DFT 2510-3	D						1.5×2	18 500	38 100	562
SFT 2510-3.5	Clearance						3.5×1	21 100	44 200	330
DFT 2510-3.5	D						3.5×1	21 100	44 200	649

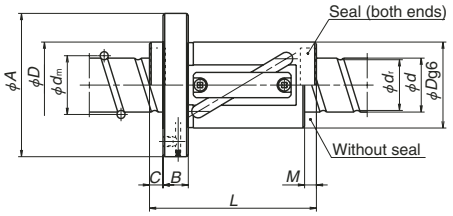
Ball nut dimensions										
Nut entire length *L*	Nut diameter *D*	Flanged diameter *A*	Flanged width *B*	Notched flange *G*	Seal dimension *M*	Bolt hole dimension *X*	Bolt hole dimension *Y*	Bolt hole dimension *Z*	Bolt hole PCD *W*	Oil hole *Q*
56	53	76	11	29	3	5.5	9.5	5.5	64	M6×1
44										
62										
62										
56										
110										
62										
98										
56	58	85	13	32	5	6.6	11	6.5	71	M6×1
69										
56										
80										
69										
133										
67	58	85	15	32	8	6.6	11	6.5	71	M6×1
81										
81										
67										
127										
81										
151										
77										
147										

Notes: 1. Nut flange for shaft diameter 20 mm or larger comes in circular shape I and circular shape II. Select a flange that is suitable for the space available for nut installation.
2. If there is no seal for PFT, ZFT, SFT, and DFT, the nut length "L" is shortened by dimension "M".
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.
4. The axial rigidity *K* in the table above is a theoretical value obtained from the elastic deformation between screw groove and ball when the axial load is 30% of the basic dynamic load rating (C_a) with non-preload, 10% with D-preload, and 5% with P-preload. Refer to "Technical Description" (page B37) if the axial load and preload differ from the conditions above, or when the deformation of the ball nut body must be considered.
5. For PFT, the basic load ratings differ from the other models as the spacer balls are installed.
6. The models marked with * (asterisk) are available in the SA type standard ball screws with finished shaft end.
7. Preload system: P, Oversize ball preload; Z, Offset preload; D, Double nut preload (See page B5.)



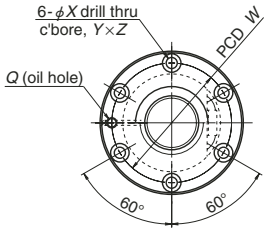
PFT, ZFT, SFT



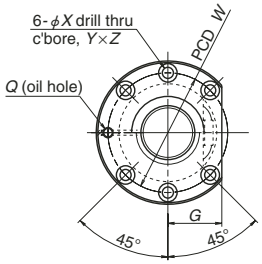


LPFT, LSFT

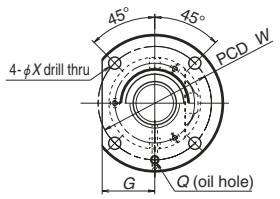
View *X-X*

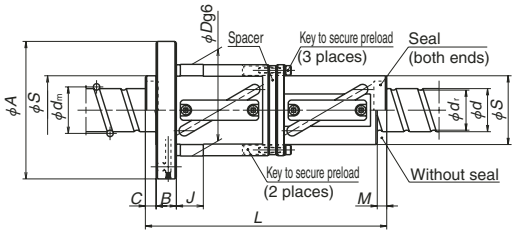


Circular shape I



Circular shape II





LDFT

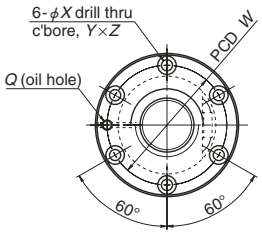
Unit: mm

	Model No.	Preload system	Shaft dia. *d*	Lead *l*	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls: Turns × Circuits	Basic load rating (N): Dynamic C_a	Basic load rating (N): Static C_{0a}	Axial rigidity *K* (N/μm)	Nut entire length *L*
	LPFT 2516-2.5	P	25	16	4.762	26.25	21.3	2.5×1	9 900	16 400	210	84
	LPFT 2516-3	P						1.5×2	11 600	19 100	247	100
	LSFT 2516-2.5	Clearance						2.5×1	15 700	32 800	250	84
	LDFT 2516-2.5	D						2.5×1	15 700	32 800	490	152
	LSFT 2516-3	Clearance						1.5×2	18 400	38 200	295	100
	LDFT 2516-3	D						1.5×2	18 400	38 200	577	181
*	**LPFT 2520-2.5**	P		20	4.762	26.25	21.3	2.5×1	9 900	16 400	210	96
	LPFT 2520-3	P						1.5×2	11 600	19 100	247	116
	LSFT 2520-2.5	Clearance						2.5×1	15 700	32 800	250	96
	LDFT 2520-2.5	D						2.5×1	15 700	32 800	490	177
	LSFT 2520-3	Clearance						1.5×2	18 400	38 200	295	116
	LDFT 2520-3	D						1.5×2	18 400	38 200	577	217
*	**LPFT 2525-1.5**	P		25	4.762	26.25	21.3	1.5×1	6 380	9 540	127	90
	LDFT 2525-1.5	D							10 100	19 100	308	166
	LSFT 2525-1.5	Clearance							10 100	19 100	157	90
	SFT 2805-2.5	Clearance	28	5	3.175	28.5	25.2	2.5×1	9 600	24 400	252	41
	ZFT 2805-5	Z						2.5×1	9 600	24 400	495	56
	PFT 2805-5	P						2.5×2	11 000	24 400	410	56
	SFT 2805-5	Clearance						2.5×2	17 400	48 800	487	56
*	**ZFT 2805-10**	Z						2.5×2	17 400	48 800	959	86

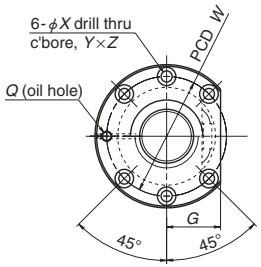
Ball nut dimensions															
Nut diameter *D*	*S*	Flanged diameter *A*	Flanged width *B*	Notched flange *G*	Tube projecting type *U*	*V*	*R*	Seal dimension *M*	*C*	Diameter g6 *J*	Bolt hole dimension *X*	*Y*	*Z*	Bolt hole PCD *W*	Oil hole *Q*
44	—	71	12	23	31	35	12	6	8	—	6.6	—	—	57	M6×1
44	—	71		23	31	35	12			—				57	
44	—	71		23	31	35	12			—				57	
62	44	89		34	—	—	—			18				75	
44	—	71		23	31	35	12			—				57	
62	44	89		34	—	—	—			18				75	
44	—	71	12	23	31	35	12	7	8	—	6.6	—	—	57	M6×1
44	—	71		23	31	35	12			—				57	
44	—	71		23	31	35	12			—				57	
62	44	89		34	—	—	—			18				75	
44	—	71		23	31	35	12			—				57	
62	44	89		34	—	—	—			18				75	
44	—	71	12	23	32	34	12	10	10	—	6.6	—	—	57	M6×1
62	44	89		34	—	—	—			18				75	
44	—	71		23	32	34	12			—				57	
55	—	85	12	31	—	—	—	3	—	—	6.6	11	6.5	69	M6×1

Notes: 1. Nut flange for shaft diameter 20 mm or larger comes in circular shape I and circular shape II. Select a flange that is suitable for the space available for nut installation.
2. If there is no seal for PFT, ZFT, and SFT, the nut length "L" is shortened by dimension "M".
3. If there is no seal for LSFT and LDFT of shaft diameter 25 mm or larger, the nut length "L" is shortened by dimension "M" and "C".
4. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.
5. The axial rigidity *K* in the table above is a theoretical value obtained from the elastic deformation between screw groove and ball when the axial load is 30% of the basic dynamic load rating (C_a) with non-preload, 10% with D-preload, and 5% with P-preload. Refer to "Technical Description" (page B37) if the axial load and preload differ from the conditions above, or when the deformation of the ball nut body must be considered.
6. For PFT and LPFT, the basic load ratings differ from the other models as the spacer balls are installed.
7. The models marked with * (asterisk) are available in the FA or SA type standard ball screws with finished shaft end.
8. Preload system: P, Oversize ball preload; Z, Offset preload; D, Double nut preload (See page B5.)

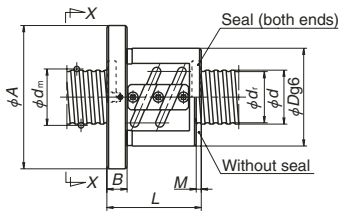
View *X-X*



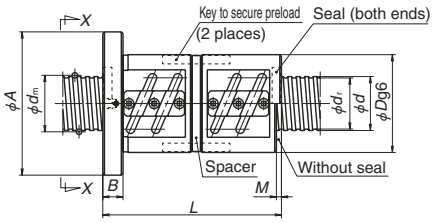
Circular shape I



Circular shape II



PFT, ZFT, SFT



DFT

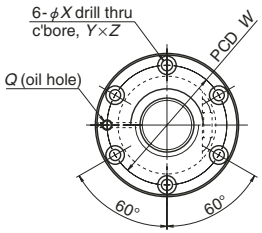
Unit: mm

Model No.	Preload system	Shaft dia. *d*	Lead *l*	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls: Turns × Circuits	Basic load rating (N): Dynamic C_a	Basic load rating (N): Static C_{0a}	Axial rigidity *K* (N/μm)
PFT 2806-3	P	28	6	3.175	28.5	25.2	1.5×2	7 080	14 600	252
SFT 2806-2.5	Clearance						2.5×1	9 600	24 400	252
ZFT 2806-5	Z						2.5×1	9 600	24 400	495
* **PFT 2806-5**	P						2.5×2	11 000	24 400	410
SFT 2806-3	Clearance						1.5×2	11 200	29 300	300
DFT 2806-3	D						1.5×2	11 200	29 300	590
SFT 2806-5	Clearance						2.5×2	17 400	48 800	487
* **ZFT 2806-10**	Z						2.5×2	17 400	48 800	959
PFT 2810-2.5	P		10	4.762	28.5	23.5	2.5×1	10 500	18 000	220
ZFT 2810-3	Z						1.5×1	10 800	21 500	320
PFT 2810-3	P						1.5×2	12 300	21 500	265
SFT 2810-2.5	Clearance						2.5×1	16 700	36 100	265
DFT 2810-2.5	D						2.5×1	16 700	36 100	522
SFT 2810-3	Clearance						1.5×2	19 500	43 000	314
DFT 2810-3	D						1.5×2	19 500	43 000	618
SFT 3204-2.5	Clearance	32	4	2.381	32.3	29.8	2.5×1	5 800	17 500	234
ZFT 3204-5	Z						2.5×1	5 800	17 500	461
PFT 3204-5	P						2.5×2	6 630	17 500	382
SFT 3204-5	Clearance						2.5×2	10 500	35 100	454
ZFT 3204-10	Z						2.5×2	10 500	35 100	892
PFT 3205-3	P		5	3.175	32.5	29.2	1.5×2	7 490	16 800	281
SFT 3205-2.5	Clearance						2.5×1	10 200	28 000	281
ZFT 3205-5	Z						2.5×1	10 200	28 000	552
* **PFT 3205-5**	P						2.5×2	11 600	28 000	455
SFT 3205-3	Clearance						1.5×2	11 900	33 600	333
DFT 3205-3	D						1.5×2	11 900	33 600	655
PFT 3205-7.5	P						2.5×3	16 500	42 100	672
SFT 3205-5	Clearance						2.5×2	18 500	56 100	543
* **ZFT 3205-10**	Z						2.5×2	18 500	56 100	1 070
SFT 3205-7.5	Clearance						2.5×3	26 200	84 100	799
DFT 3205-7.5	D						2.5×3	26 200	84 100	1 572

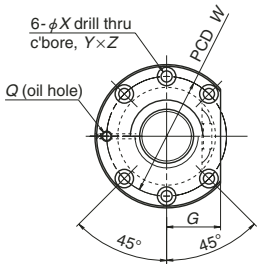
Ball nut dimensions											
Nut entire length *L*	Nut diameter *D*	Flanged diameter *A*	Flanged width *B*	Notched flange *G*	Seal dimension *M*	Bolt hole dimension *X*	Bolt hole dimension *Y*	Bolt hole dimension *Z*	Bolt hole PCD *W*	Oil hole *Q*
57	55	85	12	31	3	6.6	11	6.5	69	M6×1
45										
63										
63										
57										
111										
63										
99										
68	60	94	15	36	7	9	14	8.5	76	M6×1
82										
82										
68										
128										
82										
152										
37	54	81	12	31	3	6.6	11	6.5	67	M6×1
49										
49										
49										
73										
53	58	85	12	32	3	6.6	11	6.5	71	M6×1
41										
56										
56										
53										
103										
71										
56										
86										
71										
136										

Notes: 1. Nut flange for shaft diameter 20 mm or larger comes in circular shape I and circular shape II. Select a flange that is suitable for the space available for nut installation.
2. If there is no seal for PFT, ZFT, SFT, and DFT, the nut length "L" is shortened by dimension "M".
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.
4. The axial rigidity *K* in the table above is a theoretical value obtained from the elastic deformation between screw groove and ball when the axial load is 30% of the basic dynamic load rating (C_a) with non-preload, 10% with D-preload, and 5% with P-preload. Refer to "Technical Description" (page B37) if the axial load and preload differ from the conditions above, or when the deformation of the ball nut body must be considered.
5. For PFT, the basic load ratings differ from the other models as the spacer balls are installed.
6. The models marked with * (asterisk) are available in the SA type standard ball screws with finished shaft end.
7. Preload system: P, Oversize ball preload; Z, Offset preload; D, Double nut preload (See page B5.)

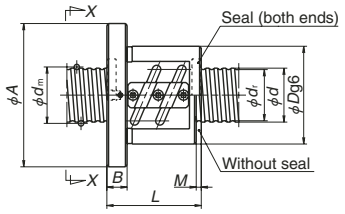
View *X-X*



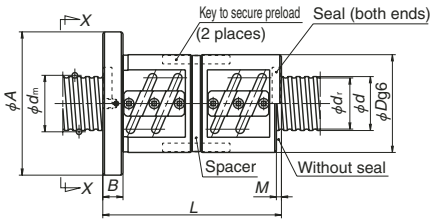
Circular shape Ⅰ



Circular shape Ⅱ



PFT, ZFT, SFT



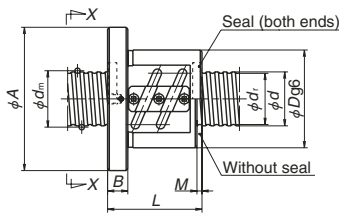
DFT

Unit: mm

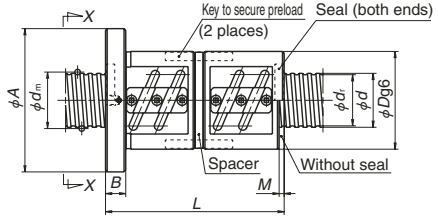
Model No.	Preload system	Shaft dia. *d*	Lead *l*	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls: Turns × Circuits	Basic load rating (N): Dynamic C_a	Basic load rating (N): Static C_{0a}	Axial rigidity *K* (N/μm)
PFT 3206-3	P	32	6	3.969	32.5	28.4	1.5×2	10 000	20 600	285
SFT 3206-2.5	Clearance						2.5×1	13 600	34 700	287
ZFT 3206-5	Z						2.5×1	13 600	34 700	563
PFT 3206-5	P						2.5×2	15 500	34 700	468
SFT 3206-3	Clearance						1.5×2	15 900	41 200	339
DFT 3206-3	D						1.5×2	15 900	41 200	666
SFT 3206-5	Clearance						2.5×2	24 700	69 400	555
* **ZFT 3206-10**	Z						2.5×2	24 700	69 400	1 090
PFT 3208-3	P		8	4.762	32.5	27.5	1.5×2	12 900	24 800	294
SFT 3208-2.5	Clearance						2.5×1	17 500	41 000	292
ZFT 3208-5	Z						2.5×1	17 500	41 000	573
PFT 3208-5	P						2.5×2	20 000	41 000	470
SFT 3208-3	Clearance						1.5×2	20 400	49 500	349
ZFT 3208-6	Z						1.5×2	20 400	49 500	686
SFT 3208-5	Clearance						2.5×2	31 700	82 000	565
DFT 3208-5	D						2.5×2	31 700	82 000	1 102
ZFT 3208-10	Z						2.5×2	31 700	82 000	1 102
PFT 3210-2.5	P		10	6.35	33.0	26.4	2.5×1	16 100	27 000	255
ZFT 3210-3	Z						1.5×1	16 400	32 400	365
PFT 3210-3	P						1.5×2	18 800	32 400	303
SFT 3210-2.5	Clearance						2.5×1	25 500	54 000	302
* **ZFT 3210-5**	Z						2.5×1	25 500	54 000	594
PFT 3210-5	P						2.5×2	29 200	54 000	494
SFT 3210-3	Clearance						1.5×2	29 900	64 800	360
DFT 3210-3	D						1.5×2	29 900	64 800	707
SFT 3210-3.5	Clearance						3.5×1	34 100	77 000	422
DFT 3210-3.5	D						3.5×1	34 100	77 000	829
SFT 3210-5	Clearance						2.5×2	46 300	108 000	585
* **DFT 3210-5**	D						2.5×2	46 300	108 000	1 156
ZFT 3210-10	Z						2.5×2	46 300	108 000	1 156
PFT 3212-2.5	P		12	6.35	33.0	26.4	2.5×1	16 100	27 000	255
ZFT 3212-3	Z						1.5×1	16 400	32 400	365
PFT 3212-3	P						1.5×2	18 800	32 400	303
SFT 3212-2.5	Clearance						2.5×1	25 500	54 000	302
DFT 3212-2.5	D						2.5×1	25 500	54 000	603
SFT 3212-3	Clearance						1.5×2	29 900	64 800	360
DFT 3212-3	D						1.5×2	29 900	64 800	707

Ball nut dimensions										
Nut entire length *L*	Nut diameter *D*	Flanged diameter *A*	Flanged width *B*	Notched flange *G*	Seal dimension *M*	Bolt hole dimension *X*	Bolt hole dimension *Y*	Bolt hole dimension *Z*	Bolt hole PCD *W*	Oil hole *Q*
57	62	89	12	34	3	6.6	11	6.5	75	M6×1
45										
63										
63										
57										
111										
63										
99										
71	66	100	15	38	5	9	14	8.5	82	M6×1
58					5					
82					5					
82					5					
71					5					
111					5					
82					5					
154					5					
130					—					
70	74	108	15	41	7	9	14	8.5	90	M6×1
87					7					
87					7					
70					7					
100					7					
100					7					
87					7					
167					7					
80					7					
150					7					
100					7					
190					7					
160					—					
81	74	108	18	41	9	9	14	8.5	90	M6×1
97										
97										
81										
153										
97										
181										

Notes: 1. Nut flange for shaft diameter 20 mm or larger comes in circular shape I and circular shape II. Select a flange that is suitable for the space available for nut installation.
2. If there is no seal for PFT, ZFT, SFT, and DFT, the nut length "L" is shortened by dimension "M".
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.
4. The axial rigidity *K* in the table above is a theoretical value obtained from the elastic deformation between screw groove and ball when the axial load is 30% of the basic dynamic load rating (C_a) with non-preload, 10% with D-preload, and 5% with P-preload. Refer to "Technical Description" (page B37) if the axial load and preload differ from the conditions above, or when the deformation of the ball nut body must be considered.
5. For PFT, the basic load ratings differ from the other models as the spacer balls are installed.
6. The models marked with * (asterisk) are available in the SA type standard ball screws with finished shaft end.
7. Preload system: P, Oversize ball preload; Z, Offset preload; D, Double nut preload (See page B5.)

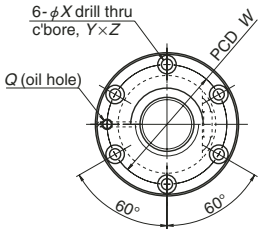


PFT, ZFT, SFT

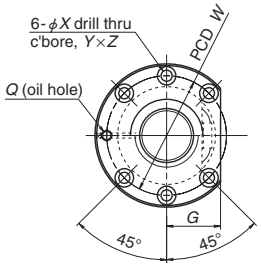


DFT

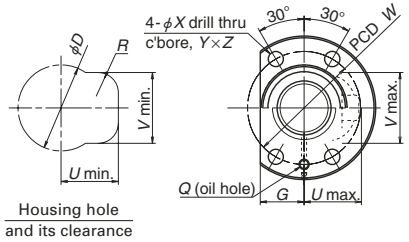
View *X*-*X*



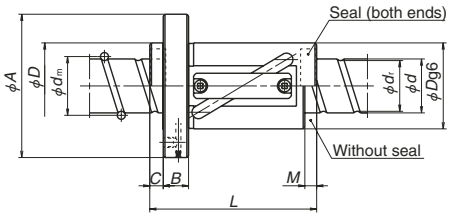
Circular shape Ⅰ



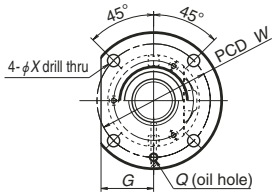
Circular shape Ⅱ

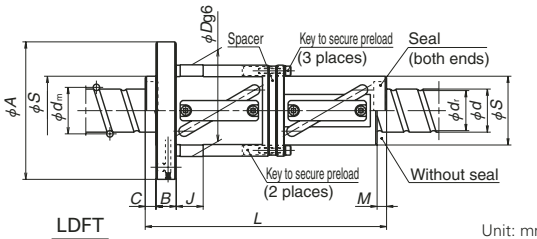


Housing hole
and its clearance



LPFT, LSFT





LDFT

Unit: mm

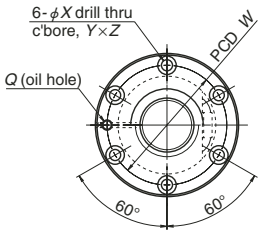
Model No.	Preload system	Shaft dia. *d*	Lead *l*	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls: Turns × Circuits	Basic load rating (N): Dynamic C_a	Basic load rating (N): Static C_{0a}	Axial rigidity *K* (N/μm)	Nut entire length *L*
LPFT 3220-2.5	P	32	20	4.762	33.25	28.3	2.5×1	11 300	20 900	251	99
LPFT 3220-3	P						1.5×2	13 200	24 800	297	119
LSFT 3220-2.5	Clearance						2.5×1	17 900	41 800	300	99
LDFT 3220-2.5	D						2.5×1	17 900	41 800	604	179
LSFT 3220-3	Clearance						1.5×2	21 000	49 600	360	119
LDFT 3220-3	D						1.5×2	21 000	49 600	708	219
* **LPFT 3225-2.5**	P		25				2.5×1	11 300	20 900	251	117
LPFT 3225-3	P						1.5×2	13 200	24 800	297	142
LSFT 3225-2.5	Clearance						2.5×1	17 900	41 800	300	117
LDFT 3225-2.5	D						2.5×1	17 900	41 800	604	218
LSFT 3225-3	Clearance						1.5×2	21 000	49 600	360	142
LDFT 3225-3	D						1.5×2	21 000	49 600	708	268
* **LPFT 3232-1.5**	P		32				1.5×1	7 280	12 400	161	109
LSFT 3232-1.5	Clearance							11 500	24 800	190	109
LDFT 3232-1.5	D							11 500	24 800	376	205
ZFT 3605-5	Z	36	5	3.175	36.5	33.2	2.5×1	10 700	31 700	607	59
PFT 3605-5	P						2.5×2	12 200	31 700	504	59
PFT 3605-7.5	P						2.5×3	17 300	47 500	740	74
SFT 3605-5	Clearance						2.5×2	19 400	63 300	597	59
ZFT 3605-10	Z						2.5×2	19 400	63 300	1 170	89
SFT 3605-7.5	Clearance						2.5×3	27 500	95 000	878	74
DFT 3605-7.5	D						2.5×3	27 500	95 000	1 730	139

Ball nut dimensions

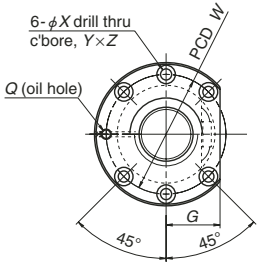
Nut diameter *D*	Nut diameter *S*	Flanged diameter *A*	Flanged width *B*	Notched flange *G*	Tube projecting type *U*	Tube projecting type *V*	Tube projecting type *R*	Seal dimension *M*	Seal dimension *C*	Diameter g6 *J*	Bolt hole dimension *X*	Bolt hole dimension *Y*	Bolt hole dimension *Z*	Bolt hole PCD *W*	Oil hole *Q*
51	—	85	15	26	34	42	12	7	8	—	9	—	—	67	M6×1
51	—	85		26	34	42	12			—				67	
51	—	85		26	34	42	12			—				67	
68	51	102		39	—	—	—			20				84	
51	—	85		26	34	42	12			—				67	
68	51	102		39	—	—	—			20				84	
51	—	85	15	26	34	42	12	10	10	—	9	—	—	67	M6×1
51	—	85		26	34	42	12			—				67	
51	—	85		26	34	42	12			—				67	
68	51	102		39	—	—	—			20				84	
51	—	85		26	34	42	12			—				67	
68	51	102		39	—	—	—			20				84	
51	—	85	15	26	34	42	12	13	12	—	9	—	—	67	M6×1
68	51	102		39	—	—	—			20				84	
65	—	100	15	38	—	—	—	3	—	—	9	14	8.5	82	M6×1

Notes: 1. Nut flange for shaft diameter 20 mm or larger comes in circular shape I and circular shape II. Select a flange that is suitable for the space available for nut installation.
2. If there is no seal for PFT, ZFT, SFT, and DFT the nut length "L" is shortened by dimension "M".
3. If there is no seal for LSFT and LDFT of shaft diameter 25 mm or larger, the nut length "L" is shortened by dimension "M" and "C".
4. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.
5. The axial rigidity *K* in the table above is a theoretical value obtained from the elastic deformation between screw groove and ball when the axial load is 30% of the basic dynamic load rating (C_a) with non-preload, 10% with D-preload, and 5% with P-preload. Refer to "Technical Description" (page B37) if the axial load and preload differ from the conditions above, or when the deformation of the ball nut body must be considered.
6. For PFT and LPFT, the basic load ratings differ from the other models as the spacer balls are installed.
7. The models marked with * (asterisk) are available in the FA type standard ball screws with finished shaft end.
8. Preload system: P, Oversize ball preload; Z, Offset preload; D, Double nut preload (See page B5.)

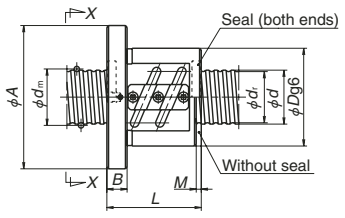
View *X-X*

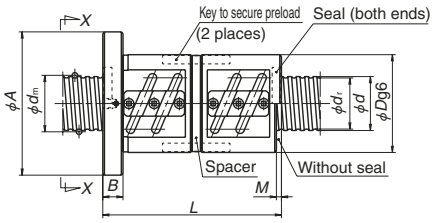


Circular shape I



Circular shape II





PFT, ZFT, SFT

DFT

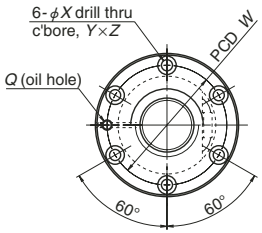
Unit: mm

Model No.	Preload system	Shaft dia. *d*	Lead *l*	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls: Turns × Circuits	Basic load rating (N): Dynamic C_a	Basic load rating (N): Static C_{0a}	Axial rigidity *K* (N/μm)
ZFT 3606-5	Z	36	6	3.969	36.5	32.4	2.5×1	14 600	39 300	625
PFT 3606-5	P						2.5×2	16 700	39 300	518
PFT 3606-7.5	P						2.5×3	23 700	58 900	763
SFT 3606-5	Clearance						2.5×2	26 500	78 500	615
ZFT 3606-10	Z						2.5×2	26 500	78 500	1 210
SFT 3606-7.5	Clearance						2.5×3	37 600	118 000	905
DFT 3606-7.5	D						2.5×3	37 600	118 000	1 780
PFT 3610-2.5	P		10	6.35	37.0	30.4	2.5×1	17 100	30 600	278
ZFT 3610-3	Z						1.5×1	17 500	36 800	404
PFT 3610-3	P						1.5×2	20 000	36 800	327
SFT 3610-2.5	Clearance						2.5×1	27 200	61 300	334
ZFT 3610-5	Z						2.5×1	27 200	61 300	657
PFT 3610-5	P						2.5×2	31 100	61 300	537
SFT 3610-3	Clearance						1.5×2	31 800	73 500	397
DFT 3610-3	D						1.5×2	31 800	73 500	781
PFT 3610-7.5	P						2.5×3	43 700	96 000	782
SFT 3610-5	Clearance						2.5×2	49 300	123 000	647
DFT 3610-5	D						2.5×2	49 300	123 000	1 259
ZFT 3610-10	Z						2.5×2	49 300	123 000	1 259
SFT 3610-7.5	Clearance						2.5×3	69 900	184 000	945
PFT 4005-3	P	40	5	3.175	40.5	37.2	1.5×2	8 210	21 200	337
SFT 4005-2.5	Clearance						2.5×1	11 100	35 300	336
ZFT 4005-5	Z						2.5×1	11 100	35 300	661
PFT 4005-5	P						2.5×2	12 700	35 300	548
SFT 4005-3	Clearance						1.5×2	13 000	42 400	399
DFT 4005-3	D						1.5×2	13 000	42 400	785
PFT 4005-7.5	P						2.5×3	18 100	53 000	806
SFT 4005-5	Clearance						2.5×2	20 200	70 600	649
* **ZFT 4005-10**	Z						2.5×2	20 200	70 600	1 280
SFT 4005-7.5	Clearance						2.5×3	28 700	106 000	956
DFT 4005-7.5	D						2.5×3	28 700	106 000	1 870
ZFT 4006-5	Z		6	3.969	40.5	36.4	2.5×1	15 200	43 800	679
PFT 4006-5	P						2.5×2	17 400	43 800	564
SFT 4006-3	Clearance						1.5×2	17 800	52 600	411
DFT 4006-3	D						1.5×2	17 800	52 600	807
PFT 4006-7.5	P						2.5×3	24 600	65 700	827
SFT 4006-5	Clearance						2.5×2	27 600	87 600	668
ZFT 4006-10	Z						2.5×2	27 600	87 600	1 320
SFT 4006-7.5	Clearance						2.5×3	39 100	131 000	984
DFT 4006-7.5	D						2.5×3	39 100	131 000	1 940

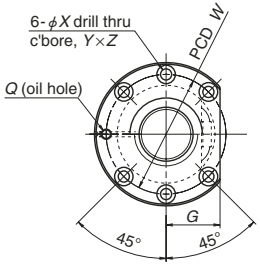
Ball nut dimensions											
Nut entire length *L*	Nut diameter *D*	Flanged diameter *A*	Flanged width *B*	Notched flange *G*	Seal dimension *M*	Bolt hole dimension *X*	Bolt hole dimension *Y*	Bolt hole dimension *Z*	Bolt hole PCD *W*	Oil hole *Q*
66	65	100	15	38	3	9	14	8.5	82	M6×1
66										
84										
102										
84										
162										
73	75	120	18	45	7	11	17.5	11	98	M6×1
90					7					
90					7					
73					7					
103					7					
103					7					
90					7					
170					7					
133					—					
103					7					
193					7					
163					—					
133					—					
56	67	101	15	39	3	9	14	8.5	83	Rc1/8
44										
59										
59										
56										
106										
74										
59										
89										
74										
139										
66	70	104	15	40	3	9	14	8.5	86	Rc1/8
66										
60										
114										
84										
66										
102										
84										
162										

Notes: 1. Nut flange for shaft diameter 20 mm or larger comes in circular shape I and circular shape II. Select a flange that is suitable for the space available for nut installation.
2. If there is no seal for PFT, ZFT, SFT, and DFT, the nut length "L" is shortened by dimension "M".
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.
4. The axial rigidity *K* in the table above is a theoretical value obtained from the elastic deformation between screw groove and ball when the axial load is 30% of the basic dynamic load rating (C_a) with non-preload, 10% with D-preload, and 5% with P-preload. Refer to "Technical Description" (page B37) if the axial load and preload differ from the conditions above, or when the deformation of the ball nut body must be considered.
5. For PFT, the basic load ratings differ from the other models as the spacer balls are installed.
6. The models marked with * (asterisk) are available in the SA type standard ball screws with finished shaft end.
7. Preload system: P, Oversize ball preload; Z, Offset preload; D, Double nut preload (See page B5.)

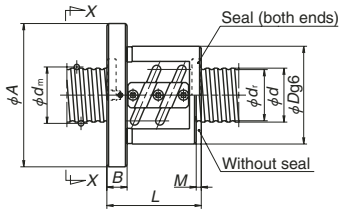
View *X-X*



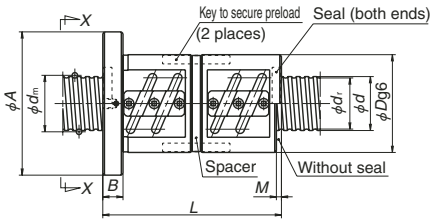
Circular shape Ⅰ



Circular shape Ⅱ



PFT, ZFT, SFT



DFT

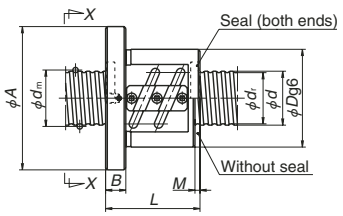
Unit: mm

Model No.	Preload system	Shaft dia. *d*	Lead *l*	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls: Turns × Circuits	Basic load rating (N): Dynamic C_a	Basic load rating (N): Static C_{0a}	Axial rigidity *K* (N/μm)
PFT 4008-3	P	40	8	4.762	40.5	35.5	1.5×2	14 200	31 300	352
SFT 4008-2.5	Clearance						2.5×1	19 200	51 600	349
ZFT 4008-5	Z						2.5×1	19 200	51 600	687
PFT 4008-5	P						2.5×2	22 000	51 600	570
SFT 4008-3	Clearance						1.5×2	22 500	62 600	418
DFT 4008-3	D						1.5×2	22 500	62 600	822
SFT 4008-5	Clearance						2.5×2	34 900	103 000	675
ZFT 4008-10	Z						2.5×2	34 900	103 000	1 330
PFT 4010-2.5	P		10	6.35	41	34.4	2.5×1	18 000	34 300	307
PFT 4010-3	P						1.5×2	21 100	41 100	366
SFT 4010-2.5	Clearance						2.5×1	28 600	68 600	365
ZFT 4010-5	Z						2.5×1	28 600	68 600	717
PFT 4010-5	P						2.5×2	32 800	68 600	595
SFT 4010-3	Clearance						1.5×2	33 500	82 300	434
ZFT 4010-6	Z						1.5×2	33 500	82 300	854
ZFT 4010-7	Z						3.5×1	38 300	96 000	988
SFT 4010-3.5	Clearance						3.5×1	38 300	96 000	503
PFT 4010-7	P						3.5×2	43 700	96 000	813
SFT 4010-5	Clearance						2.5×2	52 000	137 000	706
* **DFT 4010-5**	D						2.5×2	52 000	137 000	1 376
ZFT 4010-10	Z						2.5×2	52 000	137 000	1 376
SFT 4010-7	Clearance						3.5×2	69 400	192 000	976
PFT 4012-2.5	P		12	7.144	41.5	34.1	2.5×1	21 200	38 800	310
SFT 4012-2.5	Clearance						2.5×1	33 600	77 500	373
ZFT 4012-5	Z						2.5×1	33 600	77 500	733
PFT 4012-5	P						2.5×2	38 400	77 500	600
PFT 4012-7.5	P						2.5×3	54 400	116 000	872
SFT 4012-5	Clearance						2.5×2	61 000	155 000	722
* **DFT 4012-5**	D						2.5×2	61 000	155 000	1 404
ZFT 4012-10	Z						2.5×2	61 000	155 000	1 404
SFT 4012-7.5	Clearance						2.5×3	86 400	233 000	1 054
ZFT 4016-3	Z		16	7.144	41.5	34.1	1.5×1	21 700	46 500	451
SFT 4016-2.5	Clearance						2.5×1	33 600	77 500	373
DFT 4016-2.5	D						2.5×1	33 600	77 500	733
SFT 4016-3	Clearance						1.5×2	39 300	93 100	440
DFT 4016-3	D						1.5×2	39 300	93 100	872

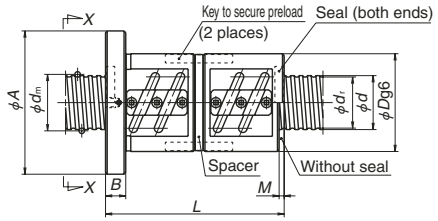
Ball nut dimensions

Nut entire length *L*	Nut diameter *D*	Flanged diameter *A*	Flanged width *B*	Notched flange *G*	Seal dimension *M*	Bolt hole dimension *X*	Bolt hole dimension *Y*	Bolt hole dimension *Z*	Bolt hole PCD *W*	Oil hole *Q*
71	74	108	15	41	5	9	14	8.5	90	Rc1/8
58										
82										
82										
71										
135										
82										
130										
73	82	124	18	47	7	11	17.5	11	102	Rc1/8
90					7					
73					7					
103					7					
103					7					
90					7					
140					7					
123					7					
83					7					
123					—					
103					7					
193					7					
163					—					
123					—					
81	86	128	18	48	9	11	17.5	11	106	Rc1/8
81					9					
117					9					
117					9					
153					—					
117					9					
225					9					
189					—					
153					—					
118	86	128	22	48	14	11	17.5	11	106	Rc1/8
102										
182										
118										
214										

Notes: 1. Nut flange for shaft diameter 20 mm or larger comes in circular shape I and circular shape II. Select a flange that is suitable for the space available for nut installation.
2. If there is no seal for PFT, ZFT, SFT, and DFT, the nut length "L" is shortened by dimension "M".
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.
4. The axial rigidity *K* in the table above is a theoretical value obtained from the elastic deformation between screw groove and ball when the axial load is 30% of the basic dynamic load rating (C_a) with non-preload, 10% with D-preload, and 5% with P-preload. Refer to "Technical Description" (page B37) if the axial load and preload differ from the conditions above, or when the deformation of the ball nut body must be considered.
5. For PFT, the basic load ratings differ from the other models as the spacer balls are installed.
6. The models marked with * (asterisk) are available in the SA type standard ball screws with finished shaft end.
7. Preload system: P, Oversize ball preload; Z, Offset preload; D, Double nut preload (See page B5.)

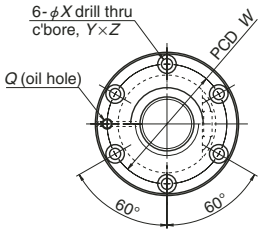


ZFT, SFT

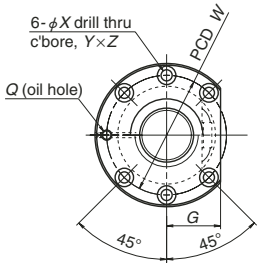


DFT

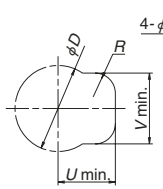
View *X*-*X*



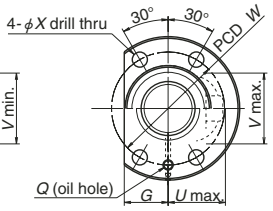
Circular shape Ⅰ

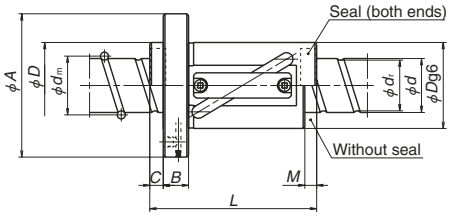


Circular shape Ⅱ

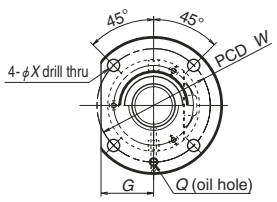


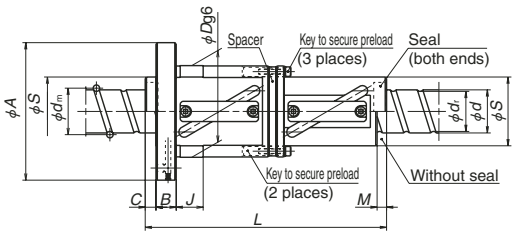
Housing hole
and its clearance





LPFT, LSFT





LDFT

Unit: mm

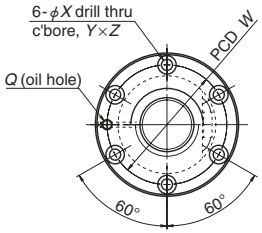
Model No.	Preload system	Shaft dia. *d*	Lead *l*	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls: Turns × Circuits	Basic load rating (N): Dynamic C_a	Basic load rating (N): Static C_{0a}	Axial rigidity *K* (N/μm)	Nut entire length *L*
LPFT 4025-2.5	P	40	25	6.35	41.75	35.1	2.5×1	18 000	35 000	315	123
LPFT 4025-3	P						1.5×2	21 000	41 200	347	148
LSFT 4025-2.5	Clearance						2.5×1	28 500	70 000	375	123
LDFT 4025-2.5	D						2.5×1	28 500	70 000	737	223
LSFT 4025-3	Clearance						1.5×2	33 400	82 400	444	148
LDFT 4025-3	D						1.5×2	33 400	82 400	873	273
LPFT 4032-2.5	P		32	6.35	41.75	35.1	2.5×1	18 000	35 000	315	146
LSFT 4032-2.5	Clearance							28 500	70 000	375	146
LDFT 4032-2.5	D							28 500	70 000	737	274
LPFT 4040-1.5	P		40	6.35	41.75	35.1	1.5×1	11 600	20 600	199	133
LSFT 4040-1.5	Clearance							18 400	41 200	237	133
LDFT 4040-1.5	D							18 400	41 200	465	253
ZFT 4510-5	Z	45	10	6.35	46.0	39.4	2.5×1	29 900	77 300	784	103
PFT 4510-7	P						3.5×2	45 600	109 000	887	123
PFT 4510-7.5	P						2.5×3	48 400	116 000	950	133
SFT 4510-5	Clearance						2.5×2	54 200	155 000	772	103
DFT 4510-5	D						2.5×2	54 200	155 000	1 520	193
SFT 4510-7	Clearance						3.5×2	72 400	218 000	1 064	123
SFT 4510-7.5	Clearance						2.5×3	76 800	232 000	1 140	133
DFT 4510-7.5	D						2.5×3	76 800	232 000	2 230	253
SFT 4512-2.5	Clearance		12	7.144	46.5	39.1	2.5×1	35 400	88 500	412	83
ZFT 4512-5	Z						2.5×1	35 400	88 500	811	119
SFT 4512-5	Clearance						2.5×2	64 200	177 000	798	119
DFT 4512-5	D						2.5×2	64 200	177 000	1 570	227

Notes: 1. Nut flange for shaft diameter 20 mm or larger comes in circular shape I and circular shape II. Select a flange that is suitable for the space available for nut installation.
2. If there is no seal for ZFT, SFT, and DFT the nut length "L" is shortened by dimension "M".
3. If there is no seal for LSFT and LDFT of shaft diameter 25 mm or larger, the nut length "L" is shortened by dimension "M" and "C".
4. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.

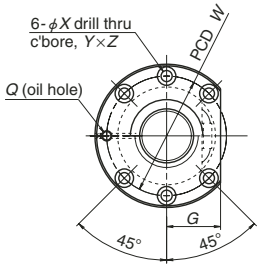
Ball nut dimensions															
Nut diameter *D*	Nut diameter *S*	Flanged diameter *A*	Flanged width *B*	Notched flange *G*	Tube projecting type *U*	Tube projecting type *V*	Tube projecting type *R*	Seal dimension *M*	Seal dimension *C*	Diameter g6 *J*	Bolt hole dimension *X*	Bolt hole dimension *Y*	Bolt hole dimension *Z*	Bolt hole PCD *W*	Oil hole *Q*
64	—	106	18	33	42	52	15	10	10	—	11	—	—	84	Rc1/8
64	—	106		33	42	52	15			—				84	
64	—	106		33	42	52	15			—				84	
84	64	126		48	—	—	—			22				104	
64	—	106		33	42	52	15			—				84	
84	64	126		48	—	—	—			22				104	
64	—	106	18	33	42	52	15	13	12	—	11	—	—	84	Rc1/8
64	—	106		33	42	52	15			—				84	
84	64	126		48	—	—	—			22				104	
64	—	106	18	33	42	52	15	16	14	—	11	—	—	84	Rc1/8
64	—	106		33	42	52	15			—				84	
84	64	126		48	—	—	—			22				104	
88	—	132	18	50	—	—	—	7	—	—	11	17.5	11	110	Rc1/8
								—							
								—							
								7							
								—							
								7							
								7							
90	—	132	18	50	—	—	—	8	—	—	11	17.5	11	110	Rc1/8

5. The axial rigidity *K* in the table above is a theoretical value obtained from the elastic deformation between screw groove and ball when the axial load is 30% of the basic dynamic load rating (C_a) with non-preload, 10% with D-preload, and 5% with P-preload. Refer to "Technical Description" (page B37) if the axial load and preload differ from the conditions above, or when the deformation of the ball nut body must be considered.
6. For LPFT, the basic load ratings differ from the other models as the spacer balls are installed.
7. Preload system: P, Oversize ball preload; Z, Offset preload; D, Double nut preload (See page B5.)

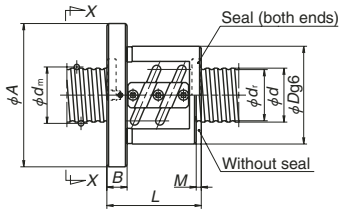
View *X*-*X*



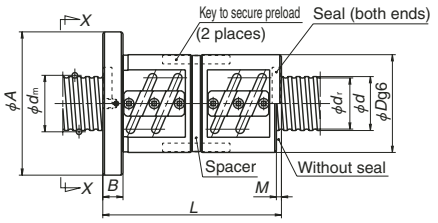
Circular shape Ⅰ



Circular shape Ⅱ



ZFT, SFT



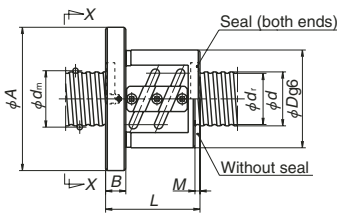
DFT

Unit: mm

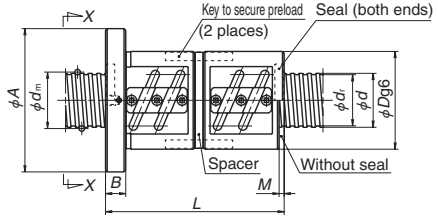
Model No.	Preload system	Shaft dia. *d*	Lead *l*	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls Turns × Circuits	Basic load rating (N) Dynamic C_a	Basic load rating (N) Static C_{0a}	Axial rigidity *K* (N/μm)
SFT 5005-3	Clearance	50	5	3.175	50.5	47.2	1.5×2	14 200	52 500	472
ZFT 5005-6	Z						1.5×2	14 200	52 500	930
SFT 5005-4.5	Clearance						1.5×3	20 200	78 800	696
ZFT 5005-9	Z						1.5×3	20 200	78 800	1 360
SFT 5006-3	Clearance		6	3.969	50.5	46.4	1.5×2	19 500	65 100	486
DFT 5006-3	D						1.5×2	19 500	65 100	956
PFT 5006-7.5	P						2.5×3	27 000	81 900	988
SFT 5006-5	Clearance						2.5×2	30 300	109 000	794
ZFT 5006-10	Z						2.5×2	30 300	109 000	1 562
SFT 5006-7.5	Clearance						2.5×3	42 900	164 000	1 170
DFT 5006-7.5	D						2.5×3	42 900	164 000	2 300
SFT 5008-3	Clearance		8	4.762	50.5	45.5	1.5×2	25 000	77 400	496
DFT 5008-3	D						1.5×2	25 000	77 400	975
SFT 5008-5	Clearance						2.5×2	38 700	131 000	815
ZFT 5008-10	Z						2.5×2	38 700	131 000	1 600
SFT 5008-7.5	Clearance						2.5×3	54 900	197 000	1 200
DFT 5008-7.5	D						2.5×3	54 900	197 000	2 350
SFT 5010-2.5	Clearance		10	6.35	51.0	44.4	2.5×1	31 800	87 400	440
ZFT 5010-5	Z						2.5×1	31 800	87 400	866
SFT 5010-3	Clearance						1.5×2	37 200	103 000	517
DFT 5010-3	D						1.5×2	37 200	103 000	1 010
ZFT 5010-7	Z						3.5×1	42 500	122 000	1 190
PFT 5010-7.5	P						2.5×3	51 500	131 000	1 039
SFT 5010-5	Clearance						2.5×2	57 700	175 000	853
* **ZFT 5010-10**	Z						2.5×2	57 700	175 000	1 677
SFT 5010-7.5	Clearance						2.5×3	81 800	262 000	1 250
DFT 5010-7.5	D						2.5×3	81 800	262 000	2 460
SFT 5012-2.5	Clearance		12	7.938	51.5	43.2	2.5×1	42 800	107 000	449
ZFT 5012-5	Z						2.5×1	42 800	107 000	883
SFT 5012-5	Clearance						2.5×2	77 600	214 000	869
DFT 5012-5	D						2.5×2	77 600	214 000	1 718
ZFT 5012-10	Z						2.5×2	77 600	214 000	1 718
SFT 5016-2.5	Clearance		16	7.938	51.5	43.2	2.5×1	42 800	107 000	449
ZFT 5016-5	Z					43.2	2.5×1	42 800	107 000	883
PFT 5016-7.5	P					44.4	2.5×3	69 300	161 000	1 066
SFT 5016-5	Clearance					43.2	2.5×2	77 600	214 000	869
DFT 5016-5	D					43.2	2.5×2	77 600	214 000	1 710
SFT 5016-7.5	Clearance					43.2	2.5×3	110 000	321 000	1 286
ZFT 5020-3	Z		20	7.938	51.5	43.2	1.5×1	27 600	64 300	542
SFT 5020-2.5	Clearance						2.5×1	42 800	107 000	449
DFT 5020-2.5	D						2.5×1	42 800	107 000	883
SFT 5020-3	Clearance						1.5×2	50 000	129 000	534
DFT 5020-3	D						1.5×2	50 000	129 000	1 050

Ball nut dimensions										
Nut entire length *L*	Nut diameter *D*	Flanged diameter *A*	Flanged width *B*	Notched flange *G*	Seal dimension *M*	Bolt hole dimension *X*	Bolt hole dimension *Y*	Bolt hole dimension *Z*	Bolt hole PCD *W*	Oil hole *Q*
58	80	114	15	43	3	9	14	8.5	96	Rc1/8
83										
68										
103										
62	84	118	15	45	3	9	14	8.5	100	Rc1/8
116					3					
86					—					
68					3					
104					3					
86					3					
164					3					
74	87	129	18	49	5	11	17.5	11	107	Rc1/8
138										
85										
133										
109										
205										
73	93	135	18	51	7	11	17.5	11	113	Rc1/8
103					7					
90					7					
170					7					
123					7					
133					—					
103					7					
163					7					
133					7					
253					7					
87	100	146	22	55	8	14	20	13	122	Rc1/8
123					8					
123					8					
231					8					
195					—					
104	100	146	22	55	14	14	20	13	122	Rc1/8
152					14		20	13		
200					—		17.5	11		
152					14		20	13		
280					14		20	13		
200					—		17.5	11		
147	100	146	28	55	17	14	20	13	122	Rc1/8
127										
227										
147										
267										

Notes: 1. Nut flange for shaft diameter 20 mm or larger comes in circular shape I and circular shape II. Select a flange that is suitable for the space available for nut installation.
2. If there is no seal for ZFT, SFT, and DFT, the nut length "L" is shortened by dimension "M".
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.
4. The axial rigidity *K* in the table above is a theoretical value obtained from the elastic deformation between screw groove and ball when the axial load is 30% of the basic dynamic load rating (C_a) with non-preload, 10% with D-preload, and 5% with P-preload. Refer to "Technical Description" (page B37) if the axial load and preload differ from the conditions above, or when the deformation of the ball nut body must be considered.
5. The models marked with * (asterisk) are available in the SA type standard ball screws with finished shaft end.
6. Preload system: Z, Offset preload; D, Double nut preload (See page B5.)

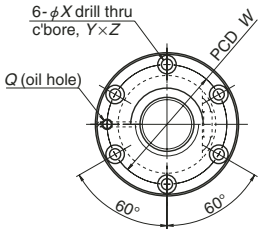


ZFT, SFT

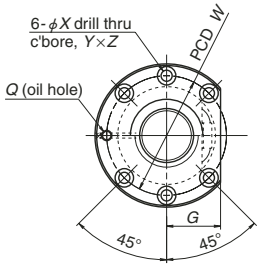


DFT

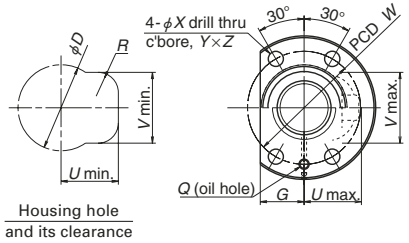
View *X*-*X*

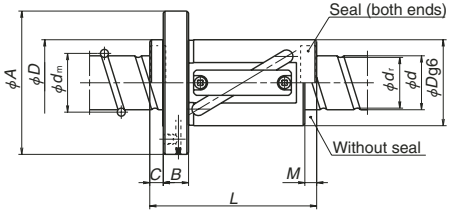


Circular shape Ⅰ

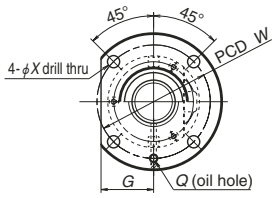


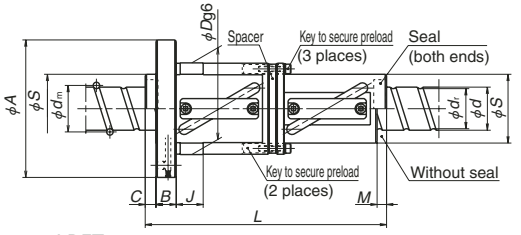
Circular shape Ⅱ





LPFT, LSFT





LDFT

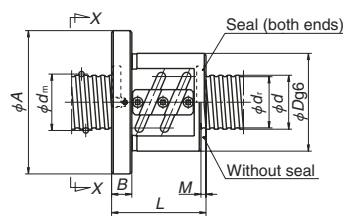
Unit: mm

Model No.	Preload system	Shaft dia. *d*	Lead *l*	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls: Turns × Circuits	Basic load rating (N): Dynamic C_a	Basic load rating (N): Static C_{0a}	Axial rigidity *K* (N/μm)	Nut entire length *L*
LPFT 5025-2.5	P	50	25	7.938	52.25	44	2.5×1	26 900	54 700	388	129
LPFT 5025-3	P						1.5×2	31 400	66 500	450	154
LSFT 5025-2.5	Clearance						2.5×1	42 700	109 000	462	129
LDFT 5025-2.5	D						2.5×1	42 700	109 000	905	229
LSFT 5025-3	Clearance						1.5×2	49 900	133 000	547	154
LDFT 5025-3	D						1.5×2	49 900	133 000	1 070	279
LPFT 5032-2.5	P		32	7.938	52.25	44	2.5×1	26 900	54 700	388	151
LPFT 5032-3	P						1.5×2	31 400	66 500	450	183
LSFT 5032-2.5	Clearance						2.5×1	42 700	109 000	462	151
LDFT 5032-2.5	D						2.5×1	42 700	109 000	905	279
LSFT 5032-3	Clearance						1.5×2	49 900	133 000	547	183
LDFT 5032-3	D						1.5×2	49 900	133 000	1 070	343
LPFT 5040-2.5	P		40	7.938	52.25	44	2.5×1	26 900	54 700	388	178
LSFT 5040-2.5	Clearance							42 700	109 000	462	178
LDFT 5040-2.5	D							42 700	109 000	922	338
LPFT 5050-1.5	P		50	7.938	52.25	44	1.5×1	17 300	33 200	245	161
LSFT 5050-1.5	Clearance							27 500	66 500	290	161
LDFT 5050-1.5	D							27 500	66 500	572	312
ZFT 5510-5	Z	55	10	6.35	56.0	49.4	2.5×1	32 800	96 100	929	103
SFT 5510-5	Clearance						2.5×2	59 500	192 000	916	103
ZFT 5510-10	Z						2.5×2	59 500	192 000	1 800	163
DFT 5510-5	D						2.5×2	59 500	192 000	1 800	193
SFT 5510-7.5	Clearance						2.5×3	84 300	288 000	1 350	133
DFT 5510-7.5	D						2.5×3	84 300	288 000	2 650	253

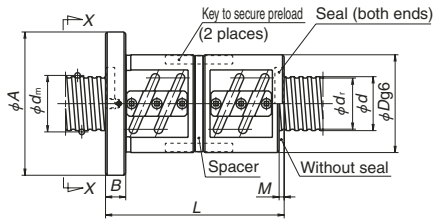
Notes: 1. Nut flange for shaft diameter 20 mm or larger comes in circular shape I and circular shape II. Select a flange that is suitable for the space available for nut installation.
2. If there is no seal for ZFT, SFT, and DFT, the nut length "L" is shortened by dimension "M".
3. If there is no seal for LSFT and LDFT of shaft diameter 25 mm or larger, the nut length "L" is shortened by dimension "M" and "C".
4. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.

Ball nut dimensions																
Nut diameter		Flanged diameter	Flanged width	Notched flange	Tube projecting type			Seal dimension		Diameter g6	Bolt hole dimension			Bolt hole PCD	Oil hole
D	*S*	*A*	*B*	*G*	*U*	*V*	*R*	*M*	*C*	*J*	*X*	*Y*	*Z*	*W*	*Q*
80	—	126	22	41	52	64	19	11	11	—	14	—	—	102	Rc1/8
80	—	126		41	52	64	19			—				102	
80	—	126		41	52	64	19			—				102	
106	80	152		56	—	—	—			25				128	
80	—	126		41	52	64	19			—				102	
106	80	152		56	—	—	—			25				128	
80	—	126	22	41	52	64	19	14	12	—	14	—	—	102	Rc1/8
80	—	126		41	52	64	19			—				102	
80	—	126		41	52	64	19			—				102	
106	80	152		56	—	—	—			25				128	
80	—	126		41	52	64	19			—				102	
106	80	152		56	—	—	—			25				128	
80	—	126	22	41	52	64	19	17	14	—	14	—	—	102	Rc1/8
80	—	126		41	52	64	19			—				102	
106	80	152		56	—	—	—			25				128	
80	—	126	22	41	52	64	19	21	16	—	14	—	—	102	Rc1/8
80	—	126		41	52	64	19			—				102	
106	80	152		56	—	—	—			25				128	
102	—	144	18	54	—	—	—	7	—	—	11	17.5	11	122	Rc1/8

5. The axial rigidity *K* in the table above is a theoretical value obtained from the elastic deformation between screw groove and ball when the axial load is 30% of the basic dynamic load rating (C_a) with non-preload, 10% with D-preload, and 5% with P-preload. Refer to "Technical Description" (page B37) if the axial load and preload differ from the conditions above, or when the deformation of the ball nut body must be considered.
6. For LPFT, the basic load ratings differ from the other models as the spacer balls are installed.
7. Preload system: P, Oversize ball preload; Z, Offset preload; D, Double nut preload (See page B5.)

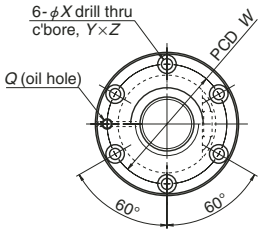


SFT, ZFT

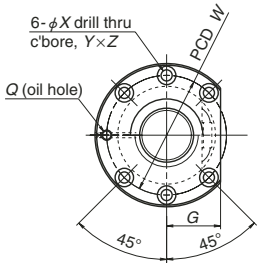


DFT

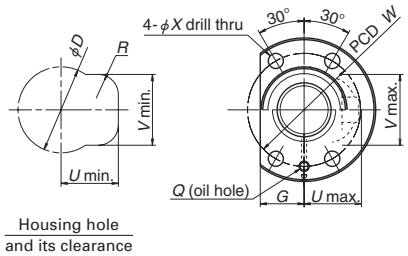
View *X*-*X*



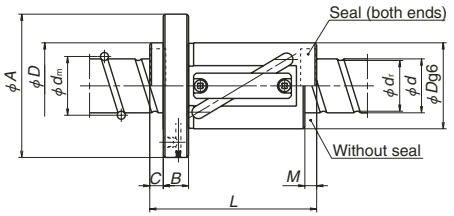
Circular shape Ⅰ



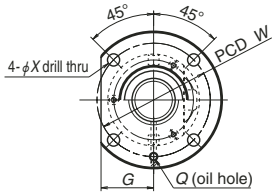
Circular shape Ⅱ

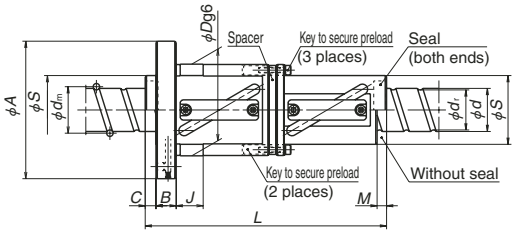


Housing hole
and its clearance



LPFT, LSFT





LDFT

Unit: mm

Model No.	Preload system	Shaft dia. *d*	Lead *l*	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls: Turns × Circuits	Basic load rating (N): Dynamic C_a	Basic load rating (N): Static C_{oa}	Axial rigidity *K* (N/μm)	Nut entire length *L*
SFT 6310-2.5	Clearance	63	10	6.35	64.0	57.4	2.5×1	34 800	111 000	528	77
ZFT 6310-5	Z						2.5×1	34 800	111 000	1 038	107
PFT 6310-7.5	P						2.5×3	56 400	166 000	1 250	137
SFT 6310-5	Clearance						2.5×2	63 200	221 000	1 020	107
ZFT 6310-10	Z						2.5×2	63 200	221 000	2 000	167
SFT 6310-7.5	Clearance						2.5×3	89 500	332 000	1 500	137
DFT 6310-7.5	D						2.5×3	89 500	332 000	2 950	257
ZFT 6312-5	Z		12	7.938	64.5	56.2	2.5×1	47 400	137 000	1 060	123
SFT 6312-2.5	Clearance						2.5×1	47 400	137 000	542	87
SFT 6312-5	Clearance						2.5×2	86 000	273 000	1 050	123
DFT 6312-5	D						2.5×2	86 000	273 000	2 060	231
SFT 6316-2.5	Clearance		16	9.525	65.0	55.2	2.5×1	79 500	228 000	713	110
DFT 6316-2.5	D						2.5×1	79 500	228 000	1 400	206
PFT 6316-5	P						2.5×2	90 900	228 000	1 136	158
SFT 6316-5	Clearance						2.5×2	144 000	455 000	1 380	158
DFT 6316-5	D						2.5×2	144 000	455 000	2 710	302
SFT 6320-2.5	Clearance		20	9.525	65.0	55.2	2.5×1	79 500	228 000	713	127
DFT 6320-2.5	D						2.5×1	79 500	228 000	1 400	227
PFT 6320-5	P						2.5×2	90 900	228 000	1 132	187
SFT 6320-5	Clearance						2.5×2	144 000	455 000	1 380	187
DFT 6320-5	D						2.5×2	144 000	455 000	2 710	347
LPFT 6340-2.5	P		40	7.938	65.25	57	2.5×1	30 600	69 500	466	178
LPFT 6340-3	P						1.5×2	35 800	82 500	551	218
LSFT 6340-2.5	Clearance						2.5×1	48 500	139 000	560	178
LDFT 6340-2.5	D						2.5×1	48 500	139 000	1 100	339
LSFT 6340-3	Clearance						1.5×2	56 800	165 000	667	218
LDFT 6340-3	D						1.5×2	56 800	165 000	1 310	419
LPFT 6350-1.5	P		50	7.938	65.25	57	1.5×1	19 700	41 200	285	161
LPFT 6350-2.5	P						2.5×1	30 600	69 500	478	211
LSFT 6350-1.5	Clearance						1.5×1	31 300	82 500	346	161
LDFT 6350-1.5	D						1.5×1	31 300	82 500	678	311
LSFT 6350-2.5	Clearance						2.5×1	48 500	139 000	560	211
LDFT 6350-2.5	D						2.5×1	48 500	139 000	1 120	411

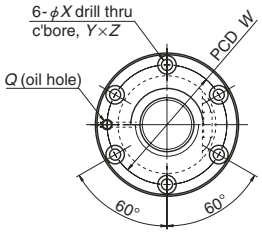
Notes: 1. Nut flange for shaft diameter 20 mm or larger comes in circular shape I and circular shape II. Select a flange that is suitable for the space available for nut installation.
2. If there is no seal for ZFT, SFT, and DFT the nut length "L" is shortened by dimension "M".
3. If there is no seal for LSFT and LDFT of shaft diameter 25 mm or larger, the nut length "L" is shortened by dimension "M" and "C".
4. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.

Ball nut dimensions

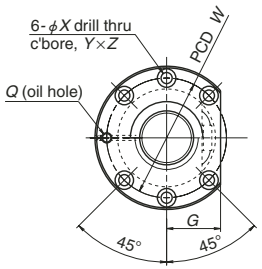
Nut diameter *D*	Nut diameter *S*	Flanged diameter *A*	Flanged width *B*	Notched flange *G*	Tube projecting type *U*	Tube projecting type *V*	Tube projecting type *R*	Seal dimension *M*	Seal dimension *C*	Diameter g6 *J*	Bolt hole dimension *X*	Bolt hole dimension *Y*	Bolt hole dimension *Z*	Bolt hole PCD *W*	Oil hole *Q*
108	—	154	22	58	—	—	—	7	—	—	14	20	13	130	Rc1/8
								7							
								—							
								7							
								7							
								7							
115	—	161	22	61	—	—	—	8	—	—	14	20	13	137	Rc1/8
122	—	180	28	69	—	—	—	—	—	—	18	26	17.5	150	Rc1/8
122	—	180	28	69	—	—	—	17	—	—	18	26	17.5	150	Rc1/8
								17							
								—							
								17							
								17							
97	—	144	22	49	58	77	19	15	14	—	14	—	—	120	Rc1/8
97	—	144		49	58	77	19			—				120	
97	—	144		49	58	77	19			—				120	
122	97	168		62	—	—	—			29				144	
97	—	144		49	58	77	19			—				120	
122	97	168		62	—	—	—			29				144	
97	—	144	22	49	58	77	19	19	16	—	14	—	—	120	Rc1/8
97	—	144		49	58	77	19			—				120	
97	—	144		49	58	77	19			—				120	
122	97	168		62	—	—	—			29				144	
97	—	144		49	58	77	19			—				120	
122	97	168		62	—	—	—			29				144	

5. The axial rigidity *K* in the table above is a theoretical value obtained from the elastic deformation between screw groove and ball when the axial load is 30% of the basic dynamic load rating (C_a) with non-preload, 10% with D-preload, and 5% with P-preload. Refer to "Technical Description" (page B37) if the axial load and preload differ from the conditions above, or when the deformation of the ball nut body must be considered.
6. For LPFT, the basic load ratings differ from the other models as the spacer balls are installed.
7. Preload system: P, Oversize ball preload; Z, Offset preload; D, Double nut preload (See page B5.)

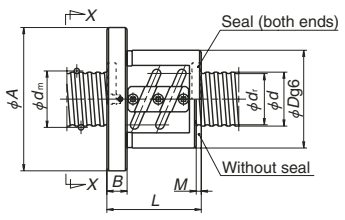
View *X*-*X*



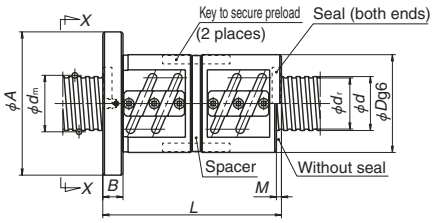
Circular shape Ⅰ



Circular shape Ⅱ



SFT



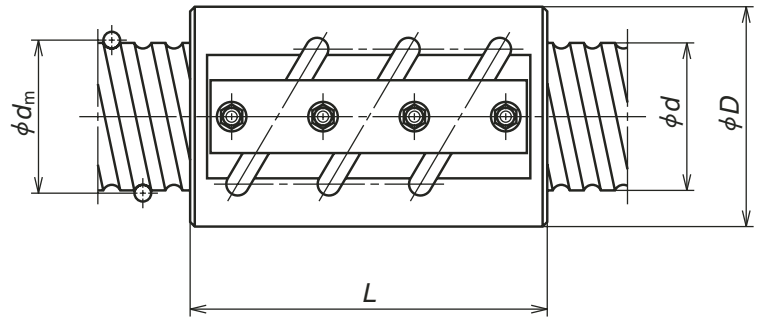
DFT

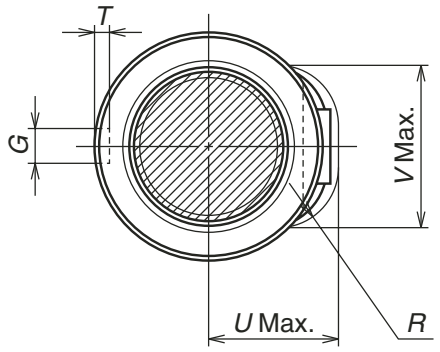
Unit: mm

Model No.	Preload system	Shaft dia. *d*	Lead *l*	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls Turns × Circuits	Basic load rating (N) Dynamic C_a	Basic load rating (N) Static C_{0a}	Axial rigidity *K* (N/μm)
SFT 8010-5	Clearance	80	10	6.35	81.0	74.4	2.5×2	70 500	282 000	1 240
DFT 8010-5	D						2.5×2	70 500	282 000	2 430
SFT 8010-7.5	Clearance						2.5×3	99 800	424 000	1 830
DFT 8010-7.5	D						2.5×3	99 800	424 000	3 590
SFT 8012-5	Clearance		12	7.938	81.5	73.2	2.5×2	96 000	350 000	1 280
DFT 8012-5	D						2.5×2	96 000	350 000	2 500
SFT 8012-7.5	Clearance						2.5×3	136 000	526 000	1 880
DFT 8012-7.5	D						2.5×3	136 000	526 000	3 690
SFT 8016-5	Clearance		16	9.525	82.0	72.2	2.5×2	162 000	582 000	1 680
DFT 8016-5	D						2.5×2	162 000	582 000	3 300
SFT 8016-7.5	Clearance						2.5×3	230 000	874 000	2 470
DFT 8016-7.5	D						2.5×3	230 000	874 000	4 850
SFT 8020-5	Clearance		20	9.525	82.0	72.2	2.5×2	162 000	582 000	1 680
DFT 8020-5	D						2.5×2	162 000	582 000	3 300
SFT 8020-7.5	Clearance						2.5×3	230 000	874 000	2 470
DFT 8020-7.5	D						2.5×3	230 000	874 000	4 850
SFT 10012-5	Clearance	100	12	7.938	101.5	93.2	2.5×2	105 000	441 000	1 530
DFT 10012-5	D						2.5×2	105 000	441 000	2 990
SFT 10012-7.5	Clearance						2.5×3	149 000	662 000	2 250
DFT 10012-7.5	D						2.5×3	149 000	662 000	4 400
SFT 10016-5	Clearance		16	9.525	102	92.2	2.5×2	176 000	737 000	2 010
DFT 10016-5	D						2.5×2	176 000	737 000	3 930
SFT 10016-7.5	Clearance						2.5×3	250 000	1 100 000	2 950
DFT 10016-7.5	D						2.5×3	250 000	1 100 000	5 790
SFT 10020-5	Clearance		20	9.525	102	92.2	2.5×2	176 000	737 000	2 010
DFT 10020-5	D						2.5×2	176 000	737 000	3 930
SFT 10020-7.5	Clearance						2.5×3	250 000	1 100 000	2 950
DFT 10020-7.5	D						2.5×3	250 000	1 100 000	5 780
SFT 12516-5	Clearance	125	16	9.525	127	117.2	2.5×2	195 000	918 000	2 390
DFT 12516-5	D						2.5×2	195 000	918 000	4 690
SFT 12516-7.5	Clearance						2.5×3	277 000	1 380 000	3 520
DFT 12516-7.5	D						2.5×3	277 000	1 380 000	6 890
SFT 12520-5	Clearance		20	9.525	127	117.2	2.5×2	195 000	918 000	2 390
DFT 12520-5	D						2.5×2	195 000	918 000	4 690
SFT 12520-7.5	Clearance						2.5×3	277 000	1 380 000	3 520
DFT 12520-7.5	D						2.5×3	277 000	1 380 000	6 890

Ball nut dimensions											
Nut entire length *L*	Nut diameter *D*	Flanged diameter *A*	Flanged width *B*	Notched flange *G*	Seal dimension *M*	Bolt hole dimension *X*	Bolt hole dimension *Y*	Bolt hole dimension *Z*	Bolt hole PCD *W*	Oil hole *Q*
107	130	176	22	66	7	14	20	13	152	Rc1/8
197										
137										
257										
123	136	182	22	68	8	14	20	13	158	Rc1/8
231										
159										
303										
158	143	204	28	77	10	18	26	17.5	172	Rc1/8
302										
206										
398										
187	143	204	28	77	17	18	26	17.5	172	Rc1/8
347										
247										
467										
129	160	220	28	82	8	18	26	17.5	188	Rc1/8
237										
165										
309										
162	170	243	32	91	10	22	32	21.5	205	Rc1/8
306										
210										
402										
191	170	243	32	91	17	22	32	21.5	205	Rc1/8
351										
251										
471										
170	200	290	36	109	10	26	39	25.5	243	Rc1/8
314										
218										
410										
199	200	290	36	109	12	26	39	25.5	243	Rc1/8
379										
259										
499										

Notes: 1. Nut flange for shaft diameter 20 mm or larger comes in circular shape I and circular shape II. Select a flange that is suitable for the space available for nut installation.
2. If there is no seal for SFT, and DFT, the nut length "L" is shortened by dimension "M".
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.
4. The axial rigidity *K* in the table above is a theoretical value obtained from the elastic deformation between screw groove and ball when the axial load is 30% of the basic dynamic load rating (C_a) with non-preload, 10% with D-preload, and 5% with P-preload. Refer to "Technical Description" (page B37) if the axial load and preload differ from the conditions above, or when the deformation of the ball nut body must be considered.
5. Preload system: D; Double nut preload (See page B5.)





Unit: mm

Model No.	Axial play (Max.)	Shaft dia. *d*	Lead *l*	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls Turns × Circuits	Basic load rating (N) Dynamic C_a	Basic load rating (N) Static C_{0a}
GSCT14025-5	0.25	140	25	15.875	143	126.0	2.5×2	272 000	1 400 000
GSCT14025-7.5							2.5×3	362 000	2 090 000
GSCT14032-5	0.35		32	22.225	144	121.0	2.5×2	428 000	1 920 000
GSCT14032-7.5							2.5×3	568 000	2 880 000
GSCT14040-5	0.35		40	22.225	144	121.0	2.5×2	428 000	1 920 000
GSCT14040-7.5							2.5×3	568 000	2 880 000
GSCT14050-5	0.40		50	25.4	145	119.0	2.5×2	518 000	2 190 000
GSCT14050-7.5							2.5×3	688 000	3 290 000
GSCT16032-5	0.35	160	32	22.225	164	141.0	2.5×2	458 000	2 210 000
GSCT16032-7.5							2.5×3	608 000	3 310 000
GSCT16040-5	0.35		40	22.225	164	141.0	2.5×2	458 000	2 210 000
GSCT16040-7.5							2.5×3	608 000	3 310 000
GSCT16050-5	0.40		50	25.4	165	139.0	2.5×2	544 000	2 560 000
GSCT16050-7.5							2.5×3	722 000	3 840 000
GSCT20032-5	0.35	200	32	22.225	204	181.0	2.5×2	509 000	2 820 000
GSCT20032-7.5							2.5×3	676 000	4 230 000
GSCT20040-5	0.35		40	22.225	204	181.0	2.5×2	509 000	2 820 000
GSCT20040-7.5							2.5×3	676 000	4 230 000
GSCT20050-5	0.40		50	25.4	205	179.0	2.5×2	604 000	3 200 000
GSCT20050-7.5							2.5×3	802 000	4 800 000
GSCT25040-5	0.40	250	40	25.4	255	229.0	2.5×2	662 000	4 000 000
GSCT25040-7.5							2.5×3	879 000	6 000 000
GSCT25050-5	0.51		50	31.75	256	223.0	2.5×2	825 000	5 000 000
GSCT25050-7.5							2.5×3	1 100 000	7 500 000

Nut dimensions							
Nut entire length	Nut diameter	Key dimension		Tube projecting dimension			Seal dimension
L	*D*	*G*	*T*	*U*	*V*	*R*	(*MS*)
200	210	32	11	115	154	50	40
275							
252	220			135	163	60	48
348							
306	220			135	163	60	58
426							
377	225			141	167	70	70
527							
252	245	36	12	141	180	60	48
348							
306	245			141	180	60	58
426							
377	250			147	185	70	70
527							
252	295	45	15	162	216	70	48
348							
306	295			162	216		58
426							
377	300			168	221		70
527							
312	355	50	17	194	266	70	58
432							
385	370			206	274	90	70
535							

Notes: 1. Precision grade is equivalent to Ct10 grade of JIS B1192 (see page B37).
2. The entire nut length (L) is the size without seal. The size with a seal is longer by the size of "MS."

B-3-2.3 Deflector(bridge) Type Ball Screws

1. Features

The deflector(bridge) type has the smallest ball nut compared to the other recirculation systems, and suitable for fine lead operation.

2. Specifications

(1) Ball recirculation system

It has a small ball nut outside diameter, and suits for small lead ball screws. **Fig.1** shows the structure of the deflector(bridge) recirculation system.

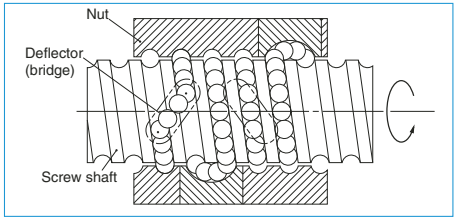


Fig. 1 Structure of deflector(bridge) recirculation system

Table 1 Accuracy grade and axial play

Accuracy grade	C0, C1, C2, C3, C5, Ct7 (Ct7 is not included in DFD)
Axial play	Z, 0 mm (preloaded); T, 0.005 mm or less S, 0.020 mm or less; N, 0.050 mm or less

(2) Accuracy grade and axial play

The available standard accuracy grade and axial play are shown in **Table 1**. Please consult NSK for other grades.

(3) Allowable d·n value and the criterion of maximum rotational speed

The allowable d·n value and criterion of maximum rotational speed are shown below. Please consult NSK if the rotational speed exceeds the permissible range below. Basic measure must be taken for the high speed ball screws respectively.

Allowable d·n value:

Standard specification ; 84 000 or less

High-speed specification; 100 000 or less

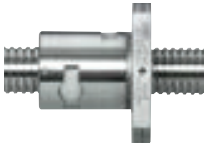
Standard of rotational speed : 3 000 min^{-1}

Note: Please also review the critical speed. Refer to "Technical Description: Permissible Rotational Speed" (page B47) for details.

(4) Other specifications

Please consult NSK for other specifications not listed in the dimension tables.

Table 2 Deflector(bridge) type ball screw product categories

Nut model	Shape	Flange shape	Preload system
MSFD		Flanged Circular Ⅲ	Non-preload, Slight axial play
MPFD			P-preload (light preload) no spacer ball
SFD		Screw shaft diameter of 16 mm or smaller: Flanged Screw shaft diameter of 20 mm or smaller: Rectangle CircularⅠ, Ⅱ	Non-preload, Slight axial play
ZFD		Flanged Circular Ⅰ, Ⅱ	Z-preload (medium preload)
DFD		Flanged Circular Ⅰ, Ⅱ	D-preload (medium preload) (heavy preload)

3. Product categories

There are four different preload systems (Table 2). Synthetic resin that shows superb characteristics against wear is used in the recirculation deflector (bridge) for MSFD, MPFD, and has enhanced the smooth recirculation of balls.

This product is being applied for a patent.

4. Design Precautions

When designing the screw shaft end, one end of the screw must meet either one of the following conditions. If not, we cannot install the ball nut on the screw shaft.

- Cut the ball groove through to the shaft end.
- The diameters of bearing journals and the gear or pulley seat must be less than the root diameter of ball groove "dr" specified on the dimension table.

For general precautions regarding ball screws, refer to "Design Precautions" (page B83) and "Handling Precautions" (page B103).

5. Structure of model number and reference number

The followings describe the structure of "Model number" and "Reference number for ball screw".

◇Model number

SFD 40 08 - 4

- SFD 40 → Nut model: SFD, ZFD, DFD / MSFD, MPFD; Screw shaft diameter (mm)
- 08 → Lead (mm)
- 4 → Effective turns of balls (Note)

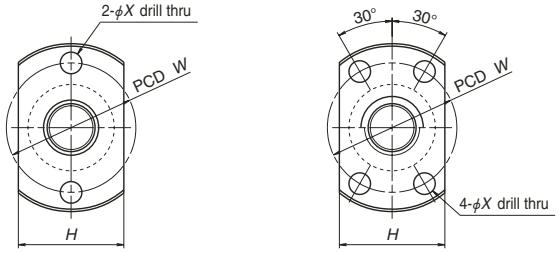
Note: In case of ZFD, the number here is twice as large as the effective turns of balls.

◇Reference number for ball screw

W 40 08 - ** D Y - C3 Z 5

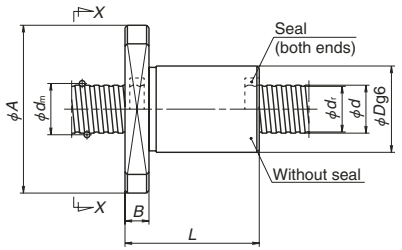
- W → Product code
- 40 → Screw shaft diameter (mm)
- 08 → Effective threaded length (in the unit of 100 mm)
- ** → NSK design serial number
- D → Preload code: No code, non-preload; Z, Z-preload; D, D-preload; P, P-preload (page B5)
- Y → Deflector(bridge) recirculation system
- C3 → Accuracy grade code: C0, C1, C2, C3, C5, C7(Ct7) (page B37 to B42)
- Z → Axial play code: Z, T, S, N (page B20)
- 5 → Lead (mm)

View *X-X*



Lead l = 0.5 mm

Lead l > 1 mm

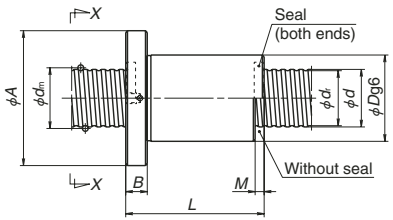


Unit: mm

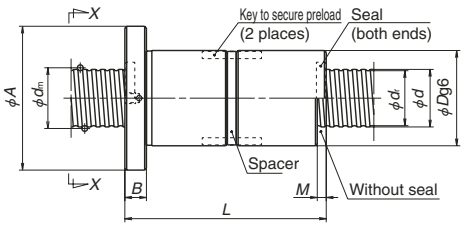
Model No.	Preload system	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls: Turns × Circuits	Basic load rating (N): Dynamic C_a	Basic load rating (N): Static C_{0a}
MSFD 0400.5-3	Clearance	4	0.5	0.400	4.1	3.6	1×3	170	280
MPFD 0400.5-3	P								
MSFD 0401-2	Clearance		1	0.800	4.2	3.2	1×2	315	370
✻ **MPFD 0401-2**	P								
MSFD 0600.5-3	Clearance	6	0.5	0.400	6.1	5.6	1×3	205	430
MPFD 0600.5-3	P								
MSFD 0601-3	Clearance		1	0.800	6.2	5.2	1×3	575	925
✻ **MPFD 0601-3**	P								
MSFD 0602-3	Clearance		2	0.800	6.2	5.2	1×3	575	925
MPFD 0602-3	P								
MSFD 0800.5-3	Clearance	8	0.5	0.400	8.1	7.6	1×3	230	595
MPFD 0800.5-3	P								
MSFD 0801-3	Clearance		1	0.800	8.2	7.2	1×3	670	1 290
✻ **MPFD 0801-3**	P								
MSFD 0801.5-3	Clearance		1.5	1.000	8.3	7.0	1×3	1 080	1 980
✻ **MPFD 0801.5-3**	P								
MSFD 0802-3	Clearance		2	1.200	8.3	6.9	1×3	1 320	2 210
✻ **MPFD 0802-3**	P								
MSFD 1001-3	Clearance	10	1	0.800	10.2	9.2	1×3	745	1 660
MPFD 1001-3	P								
MSFD 1002-3	Clearance		2	1.200	10.3	8.9	1×3	1 490	2 850
✻ **MPFD 1002-3**	P								
MSFD 1002.5-3	Clearance		2.5	1.588	10.4	8.6	1×3	2 130	3 640
✻ **MPFD 1002.5-3**	P								
MSFD 1201-3	Clearance	12	1	0.800	12.2	11.2	1×3	795	1 980
MPFD 1201-3	P								
MSFD 1202-3	Clearance		2	1.200	12.3	10.9	1×3	1 660	3 620
✻ **MPFD 1202-3**	P								
MSFD 1202.5-3	Clearance		2.5	1.588	12.4	10.6	1×3	2 360	4 540
✻ **MPFD 1202.5-3**	P								
MSFD 1203-3	Clearance		3	2.000	12.5	10.2	1×3	3 120	5 420
MPFD 1203-3	P								
MSFD 1402-3	Clearance	14	2	1.200	14.3	12.9	1×3	1 780	4 270
MPFD 1402-3	P								
MSFD 1403-3	Clearance		3	2.000	14.5	12.2	1×3	3 400	6 490
MPFD 1403-3	P								

Axial rigidity K (N/μm)	Ball nut dimensions: Nut entire length L	Nut diameter D	Flanged diameter A	Flanged width B	Flanged dimension H	Bolt hole dimension X	Bolt hole PCD W
30	13	10	22	3	11	3.4	16
47							
22	12	10	20	3	14	2.9	15
34							
42	13	12	24	3	13	3.4	18
66							
49	15	12	24	3.5	16	3.4	18
76							
49	17	13	25	4	17	3.4	19
76							
54	13	14	27	3	15	3.4	21
85							
64	16	14	27	4	18	3.4	21
99							
76	22	15	28	4	19	3.4	22
117							
73	26	16	29	4	20	3.4	23
113							
77	16	16	29	4	20	3.4	23
120							
91	28	18	35	5	22	4.5	27
138							
90	32	19	36	5	23	4.5	28
140							
88	16	18	31	4	22	3.4	25
137							
108	28	20	37	5	24	4.5	29
168							
107	32	21	38	5	25	4.5	30
167							
107	36	22	39	5	26	4.5	31
166							
122	29	22	41	6	26	5.5	32
191							
127	37	24	43	6	28	5.5	34
196							

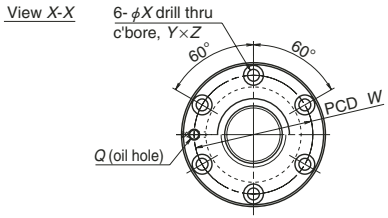
Notes: 1. If the shaft OD is less than 6 mm or the lead is less than 1 mm, a seal is not installed in the nut. (See page B68 for dust protection.)
2. Ball nuts with shaft diameters under 14 mm do not have oil holes.
3. Right turn screw is standard. Please consult NSK for left turn screw.
4. The axial rigidity K in the table above is a theoretical value obtained from the elastic deformation between screw groove and ball when the axial load is 30% of the basic dynamic load rating (C_a) with non-preload, 10% with D-preload, and 5% with P-preload. Refer to "Technical Description" (page B37) if the axial load and preload differ from the conditions above, or when the deformation of the ball nut body must be considered.
5. The models marked with ✻ (asterisk) are available in the MA type standard ball screw with finished shaft end.
6. Preload system: P; Oversize ball preload (See page B5.)



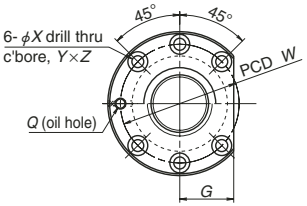
SFD, ZFD



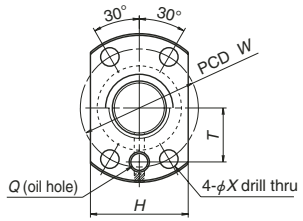
DFD

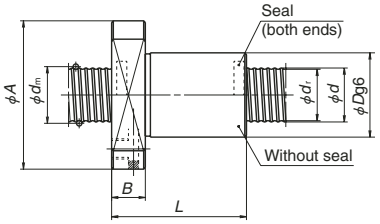


Circular shape Ⅰ



Circular shape Ⅱ





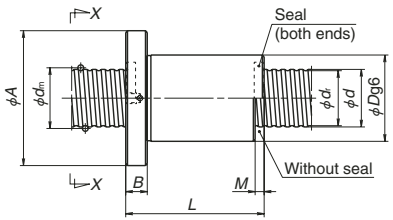
MSFD, MPFD

Unit: mm

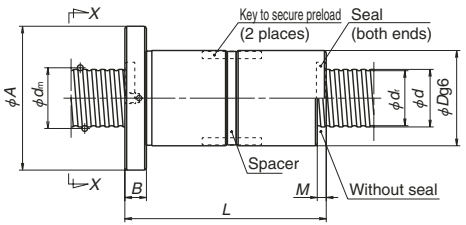
	Model No.	Preload system	Shaft dia. *d*	Lead *l*	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls: Turns × Circuits	Basic load rating (N): Dynamic C_a	Basic load rating (N): Static C_{0a}	Axial rigidity *K* (N/μm)
	MSFD 1602-4	Clearance	16	2	1.588	16.4	14.6	1×4	3 510	8 450	185
*	**MPFD 1602-4**	P									288
	MSFD 1602.5-4	Clearance		2.5	1.588	16.4	14.6	1×4	3 510	8 450	185
*	**MPFD 1602.5-4**	P									288
	MSFD 2002-4	Clearance	20	2	1.588	20.4	18.6	1×4	3 910	10 900	225
	MPFD 2002-4	P									351
	SFD 2005-3	Clearance		5	3.175	20.75	17.4	1×3	8 620	17 500	196
	ZFD 2005-6	Z						1×3	8 620	17 500	382
	SFD 2005-4	Clearance						1×4	11 000	23 300	255
	DFD 2005-4	D						1×4	11 000	23 300	509
	SFD 2006-3	Clearance		6	3.969	21	16.9	1×3	11 100	20 600	196
	ZFD 2006-6	Z						1×3	11 100	20 600	382
	SFD 2006-4	Clearance						1×4	14 300	27 500	255
	DFD 2006-4	D						1×4	14 300	27 500	498
	MSFD 2502-4	Clearance	25	2	1.588	25.4	23.6	1×4	4 310	13 900	273
	MPFD 2502-4	P									425
	SFD 2505-3	Clearance		5	3.175	25.75	22.4	1×3	9 790	22 900	245
*	**ZFD 2505-6**	Z						1×3	9 790	22 900	480
	SFD 2505-4	Clearance						1×4	12 500	30 500	323
	DFD 2505-4	D						1×4	12 500	30 500	630
	SFD 2506-3	Clearance		6	3.969	26	21.9	1×3	12 900	27 300	245
	ZFD 2506-6	Z						1×3	12 900	27 300	470
	SFD 2506-4	Clearance						1×4	16 500	36 500	323
	DFD 2506-4	D						1×4	16 500	36 500	626
	ZFD 2510-4	Z		10	4.762	26.25	21.3	1×2	11 400	21 400	323
	SFD 2510-3	Clearance						1×3	16 100	32 000	245
	DFD 2510-3	D						1×3	16 100	32 000	479

Ball nut dimensions												
Nut entire length *L*	Nut diameter *D*	Flanged diameter *A*	Flanged width *B*	Notched flange *G*	Notched flange *H*	Seal dimension *M*	Bolt hole dimension *X*	Bolt hole dimension *Y*	Bolt hole dimension *Z*	Bolt hole PCD *W*	Oil hole dimension *T*	Oil hole *Q*
40	25	44	10	—	29	—	5.5	—	—	35	16	M6×1
44	25	44	10	—	29	—	5.5	—	—	35	16	M6×1
40	30	49	10	—	34	—	5.5	—	—	40	18.5	M6×1
46	35	58	11	22.5	—	5	5.5	9.5	5.5	46	—	M6×1
66	35	58		22.5						46		
51	35	58		22.5						46		
91	41	64		25						52		
52	35	58	11	22.5	—	6	5.5	9.5	5.5	46	—	M6×1
76	35	58		22.5						46		
60	35	58		22.5						46		
108	42	65		25						53		
40	36	55	10	—	40	—	5.5	—	—	46	21.5	M6×1
46	40	63	11	24	—	5	5.5	9.5	5.5	51	—	M6×1
66	40	63		24						51		
51	40	63		24						51		
91	46	69		26						57		
52	40	63	11	24	—	6	5.5	9.5	5.5	51	—	M6×1
76	40	63		24						51		
60	40	63		24						51		
108	47	70		27						58		
88	42	69	15	26	—	10	6.6	11	6.5	55	—	M6×1
80	42	69		26						55		
140	47	74		28						60		

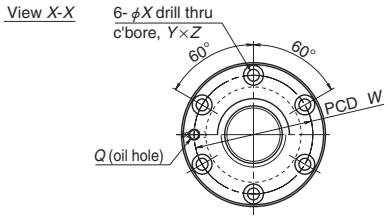
Notes: 1. Nut comes in circular shape I and circular shape II for shaft diameter 20 mm or larger. Select a flange that is suitable for the space available for nut installation.
2. If there is no seal for SFD, ZFD, and DFD, the nut length "L" is shortened by dimension "M". For MSFD and MPFD, the nut length is the same as those with seal.
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw. Please consult NSK for MSFD and MPFD.
4. The axial rigidity *K* in the table above is a theoretical value obtained from the elastic deformation between screw groove and ball when the axial load is 30% of the basic dynamic load rating (C_a) with non-preload, 10% with D-preload, and 5% with P-preload. Refer to "Technical Description" (page B37) if the axial load and preload differ from the conditions above, or when the deformation of the ball nut body must be considered.
5. It is recommended to use with seals when the shaft diameter is 16 mm or over and an oil hole is provided on the ball nut.
6. The models marked with * (asterisk) are available in the MA type standard ball screw with finished shaft end.
7. Preload system: Z, Offset preload; P, Oversize ball preload; D, Double nut preload (See page B5.)



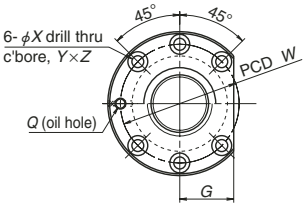
SFD, ZFD



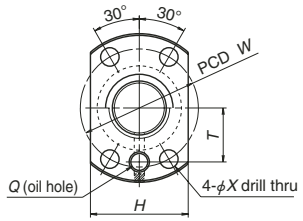
DFD

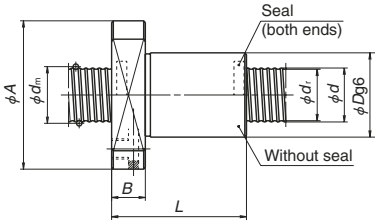


Circular shape Ⅰ



Circular shape Ⅱ





MSFD, MPFD

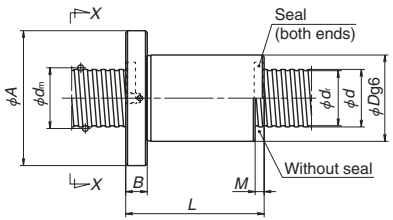
Unit: mm

Model No.	Preload system	Shaft dia. *d*	Lead *l*	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls: Turns × Circuits	Basic load rating (N): Dynamic C_a	Basic load rating (N): Static C_{0a}	Axial rigidity *K* (N/μm)
MSFD 3202-6	Clearance	32	2	1.588	32.4	30.6	1×6	6 790	27 200	494
MPFD 3202-6	P									769
SFD 3205-3	Clearance		5	3.175	32.75	29.4	1×3	11 100	30 500	304
ZFD 3205-6	Z						1×3	11 100	30 500	598
SFD 3205-4	Clearance						1×4	14 200	40 700	409
* **ZFD 3205-8**	Z						1×4	14 200	40 700	784
SFD 3205-6	Clearance						1×6	20 200	61 000	588
DFD 3205-6	D						1×6	20 200	61 000	1 160
SFD 3206-3	Clearance		6	3.969	33	28.9	1×3	15 000	37 500	314
ZFD 3206-6	Z						1×3	15 000	37 500	608
SFD 3206-4	Clearance						1×4	19 200	49 900	412
ZFD 3206-8	Z						1×4	19 200	49 900	804
SFD 3206-6	Clearance						1×6	27 200	74 900	598
DFD 3206-6	D						1×6	27 200	74 900	1 190
SFD 3208-3	Clearance		8	4.762	33.25	28.3	1×3	18 300	41 800	304
ZFD 3208-6	Z						1×3	18 300	41 800	588
SFD 3208-4	Clearance						1×4	23 500	55 800	392
ZFD 3208-8	Z						1×4	23 500	55 800	774
SFD 3210-3	Clearance		10	6.35	33.75	27.1	1×3	25 900	52 800	300
* **ZFD 3210-6**	Z						1×3	25 900	52 800	588
SFD 3210-4	Clearance						1×4	33 200	70 300	392
DFD 3210-4	D						1×4	33 200	70 300	773

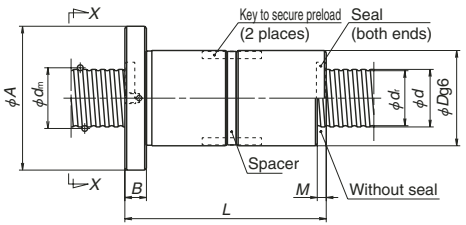
Notes: 1. Nut comes in circular shape I and circular shape II for shaft diameter 20 mm or larger. Select a flange that is suitable for the space available for nut installation.
2. If there is no seal for SFD, ZFD, and DFD, the nut length "L" is shortened by dimension "M". For MSFD and MPFD, the nut length is the same as those with seal.
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw. Please consult NSK for MSFD and MPFD.

Ball nut dimensions													
Nut entire length *L*	Nut diameter *D*	Flanged diameter *A*	Flanged width *B*	Notched flange: *G*	Notched flange: *H*	Seal dimension *M*	Bolt hole dimension: *X*	Bolt hole dimension: *Y*	Bolt hole dimension: *Z*	Bolt hole PCD *W*	Oil hole dimension *T*	Oil hole *Q*
50	42	65	10	—	46	—	6.6	—	—	54	26.5	M6×1
47	48	75	12	29	—	5	6.6	11	6.5	61	—	M6×1
67	48	75		29						61		
52	48	75		29						61		
77	48	75		29						61		
62	48	75		29						61		
112	53	80		30						66		
53	48	75	12	29	—	6	6.6	11	6.5	61	—	M6×1
77	48	75		29						61		
61	48	75		29						61		
90	48	75		29						61		
73	48	75		29						61		
133	54	81		31						67		
67 99 76 116	50	84	15	32	—	8	9	14	8.5	66	—	M6×1
80 120 90 160	54	88	15	34	—	10	9	14	8.5	70	—	M6×1

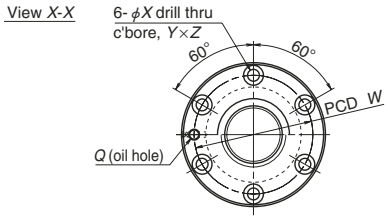
4. The axial rigidity *K* in the table above is a theoretical value obtained from the elastic deformation between screw groove and ball when the axial load is 30% of the basic dynamic load rating (C_a) with non-preload, 10% with D-preload, and 5% with P-preload. Refer to "Technical Description" (page B37) if the axial load and preload differ from the conditions above, or when the deformation of the ball nut body must be considered.
5. It is recommended to use with seals when the shaft diameter is 16 mm or over and an oil hole is provided on the ball nut.
6. The models marked with * (asterisk) are available in the SS type standard ball screw with finished shaft end.
7. Preload system: Z, Offset preload; P, Oversize ball preload; D, Double nut preload (See page B5.)



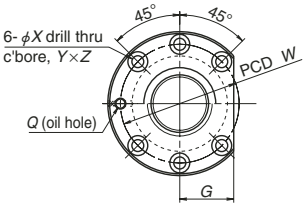
SFD, ZFD



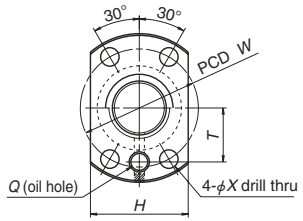
DFD

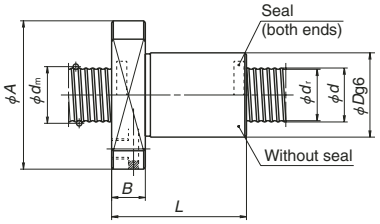


Circular shape Ⅰ



Circular shape Ⅱ





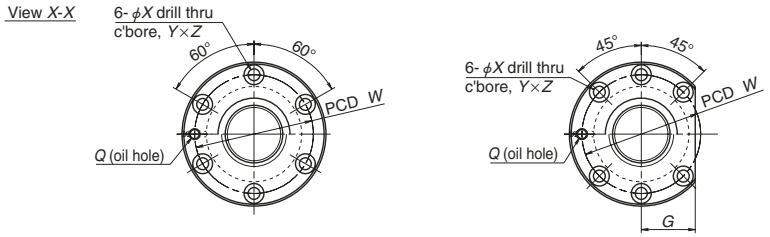
MSFD, MPFD

Unit: mm

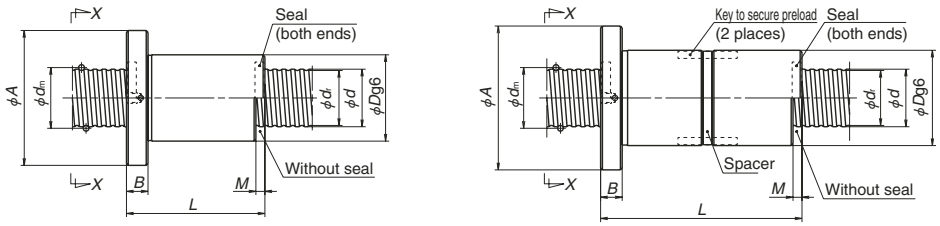
Model No.	Preload system	Shaft dia. *d*	Lead *l*	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls: Turns × Circuits	Basic load rating (N): Dynamic C_a	Basic load rating (N): Static C_{0a}	Axial rigidity *K* (N/μm)
MSFD 4002-6	Clearance	40	2	1.588	40.4	38.6	1×6	7 380	33 900	588
MPFD 4002-6	P									916
SFD 4005-4	Clearance		5	3.175	40.75	37.4	1×4	15 800	52 300	490
ZFD 4005-8	Z						1×4	15 800	52 300	960
SFD 4005-6	Clearance						1×6	22 400	78 400	725
ZFD 4005-12	Z						1×6	22 400	78 400	1 410
SFD 4006-4	Clearance		6	3.969	41.0	36.9	1×4	21 300	63 500	490
ZFD 4006-8	Z						1×4	21 300	63 500	970
SFD 4006-6	Clearance						1×6	30 100	95 300	725
ZFD 4006-12	Z						1×6	30 100	95 300	1 431
SFD 4008-4	Clearance		8	4.762	41.25	36.3	1×4	27 200	75 200	500
ZFD 4008-8	Z						1×4	27 200	75 200	990
SFD 4008-6	Clearance						1×6	38 500	113 000	735
DFD 4008-6	D						1×6	38 500	113 000	1 460
SFD 4010-3	Clearance		10	6.35	41.75	35.1	1×3	30 000	70 000	372
ZFD 4010-6	Z						1×3	30 000	70 000	735
SFD 4010-4	Clearance						1×4	38 400	93 300	490
ZFD 4010-8	Z						1×4	38 400	93 300	970
SFD 5005-4	Clearance	50	5	3.175	50.75	47.4	1×4	17 500	66 800	593
ZFD 5005-8	Z						1×4	17 500	66 800	1 170
SFD 5005-6	Clearance						1×6	24 800	100 000	872
ZFD 5005-12	Z						1×6	24 800	100 000	1 720
SFD 5006-4	Clearance		6	3.969	51.0	46.9	1×4	23 600	81 700	598
ZFD 5006-8	Z						1×4	23 600	81 700	1 190
SFD 5006-6	Clearance						1×6	33 500	122 000	892
ZFD 5006-12	Z						1×6	33 500	122 000	1 750

Ball nut dimensions													
Nut entire length *L*	Nut diameter *D*	Flanged diameter *A*	Flanged width *B*	Notched flange *G*	Notched flange *H*	Seal dimension *M*	Bolt hole dimension *X*	Bolt hole dimension *Y*	Bolt hole dimension *Z*	Bolt hole PCD *W*	Oil hole dimension *T*	Oil hole *Q*
50	51	74	10	—	55	—	6.6	—	—	63	31	M6×1
55	56	90	15	34	—	5	9	14	8.5	72	—	Rc1/8
80												
65												
101												
64	56	90	15	34	—	6	9	14	8.5	72	—	Rc1/8
93												
76												
118												
76	60	94	15	36	—	8	9	14	8.5	76	—	Rc1/8
116	60	94		36						76		
93	60	94		36						76		
168	62	96		37						78		
83	62	104	18	40	—	10	11	17.5	11	82	—	Rc1/8
123												
93												
143												
55	66	100	15	38	—	5	9	14	8.5	82	—	Rc1/8
80												
65												
101												
64	66	100	15	38	—	6	9	14	8.5	82	—	Rc1/8
93												
76												
118												

Notes: 1. Nut comes in circular shape I and circular shape II for shaft diameter 20 mm or larger. Select a flange that is suitable for the space available for nut installation.
2. If there is no seal for SFD, ZFD, and DFD, the nut length "L" is shortened by dimension "M". For MSFD and MPFD, the nut length is the same as those with seal.
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw. Please consult NSK for MSFD and MPFD.
4. The axial rigidity *K* in the table above is a theoretical value obtained from the elastic deformation between screw groove and ball when the axial load is 30% of the basic dynamic load rating (C_a) with non-preload, 10% with D-preload, and 5% with P-preload. Refer to "Technical Description" (page B37) if the axial load and preload differ from the conditions above, or when the deformation of the ball nut body must be considered.
5. It is recommended to use with seals when the shaft diameter is 16 mm or over and an oil hole is provided on the ball nut.
6. Preload system: Z, Offset preload; P, Oversize ball preload; D, Double nut preload (See page B5.)



Circular shape I　　Circular shape II



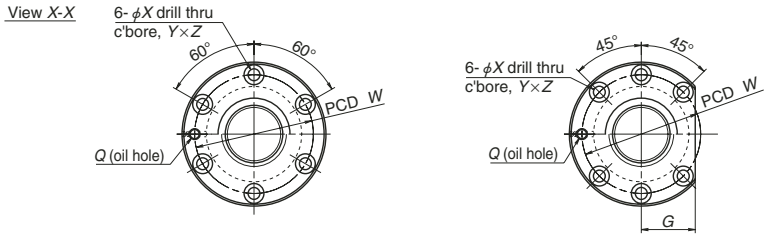
SFD, ZFD　　DFD

Unit: mm

Model No.	Preload system	Shaft dia. d	Lead l	Ball dia. Dw	Ball circle dia. dm	Root dia. dr	Effective turns of balls Turns × Circuits	Basic load rating (N) Dynamic Ca	Basic load rating (N) Static C0a	Axial rigidity K (N/μm)
SFD 5008-4	Clearance	50	8	4.762	51.25	46.3	1×4	29 900	94 800	598
ZFD 5008-8	Z						1×4	29 900	94 800	1 180
SFD 5008-6	Clearance						1×6	42 400	142 000	887
DFD 5008-6	D						1×6	42 400	142 000	1 740
SFD 5010-3	Clearance		10	6.35	51.75	45.1	1×3	34 100	91 600	461
ZFD 5010-6	Z						1×3	34 100	91 600	914
SFD 5010-4	Clearance						1×4	43 600	122 000	608
ZFD 5010-8	Z						1×4	43 600	122 000	1 200
SFD 5010-6	Clearance						1×6	61 800	183 000	902
DFD 5010-6	D						1×6	61 800	183 000	1 770
SFD 5012-3	Clearance		12	7.938	52.25	44	1×3	44 800	109 000	461
ZFD 5012-6	Z						1×3	44 800	109 000	906
SFD 5012-4	Clearance						1×4	57 300	146 000	608
DFD 5012-4	D						1×4	57 300	146 000	1 200
SFD 5020-3	Clearance		20	7.938	52.25	44	1×3	44 800	109 000	461
DFD 5020-3	D							44 800	109 000	908
SFD 6306-4	Clearance	63	6	3.969	64.0	59.9	1×4	26 100	104 000	735
ZFD 6306-8	Z						1×4	26 100	104 000	1 430
SFD 6306-6	Clearance						1×6	36 900	157 000	1 180
ZFD 6306-12	Z						1×6	36 900	157 000	2 110
SFD 6308-4	Clearance		8	4.762	64.25	59.3	1×4	33 600	124 000	745
ZFD 6308-8	Z						1×4	33 600	124 000	1 460
SFD 6308-6	Clearance						1×6	47 600	186 000	1 100
DFD 6308-6	D						1×6	47 600	186 000	2 150
SFD 6310-4	Clearance		10	6.35	64.75	58.1	1×4	49 700	163 000	764
ZFD 6310-8	Z						1×4	49 700	163 000	1 510
SFD 6310-6	Clearance						1×6	70 500	244 000	1 130
DFD 6310-6	D						1×6	70 500	244 000	2 210
ZFD 6312-6	Z		12	7.938	65.25	57	1×3	50 800	143 000	1 120
SFD 6312-4	Clearance						1×4	65 100	191 000	755
DFD 6312-4	D						1×4	65 100	191 000	1 480
SFD 6312-6	Clearance						1×6	92 200	286 000	1 110
DFD 6312-6	D						1×6	92 200	286 000	2 180
SFD 6320-3	Clearance		20	9.525	65.75	56	1×3	83 700	232 000	735
DFD 6320-3	D									1 440

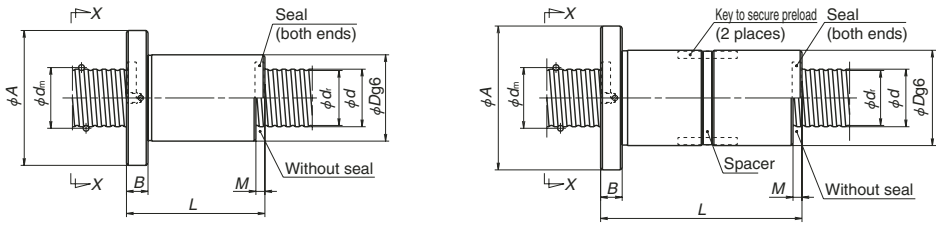
Ball nut dimensions											
Nut entire length L	Nut diameter D	Flanged diameter A	Flanged width B	Notched flange G	Seal dimension M	Bolt hole dimension X	Bolt hole dimension Y	Bolt hole dimension Z	Bolt hole PCD W	Oil hole Q
79	70	112	18	43	8	11	17.5	11	90	Rc1/8
119	70	112		43					90	
96	70	112		43					90	
171	72	114		44					92	
83	72	114	18	44	10	11	17.5	11	92	Rc1/8
123										
93										
143										
114										
205										
99	75	121	22	47	12	14	20	13	97	Rc1/8
147										
111										
195										
146	75	121	28	47	20	14	20	13	97	Rc1/8
253										
67	80	122	18	47	6	11	17.5	11	100	Rc1/8
96										
79										
121										
79	82	124	18	47	8	11	17.5	11	102	Rc1/8
119	82	124		47					102	
96	82	124		47					102	
175	85	127		48					105	
97	85	131	22	50	10	14	20	13	107	Rc1/8
147										
118										
214										
147	90	136	22	52	12	14	20	13	112	Rc1/8
111										
195										
136										
248										
146	95	153	28	59	20	18	26	17.5	123	Rc1/8
253										

Notes: 1. Nut comes in circular shape I and circular shape II for shaft diameter 20 mm or larger. Select a flange that is suitable for the space available for nut installation.
2. If there is no seal the nut length "L" is shortened by dimension "M".
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.
4. The axial rigidity *K* in the table above is a theoretical value obtained from the elastic deformation between screw groove and ball when the axial load is 30% of the basic dynamic load rating (C_a) with non-preload, 10% with D-preload, and 5% with P-preload. Refer to "Technical Description" (page B37) if the axial load and preload differ from the conditions above, or when the deformation of the ball nut body must be considered.
5. It is recommended to use with seals when the shaft diameter is 16 mm or over and an oil hole is provided on the ball nut.
6. Preload system: Z, Offset preload; D, Double nut preload (See page B5.)



Circular shape Ⅰ

Circular shape Ⅱ



SFD

DFD

Unit: mm

Model No.	Preload system	Shaft dia. *d*	Lead *l*	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls: Turns × Circuits	Basic load rating (N): Dynamic C_a	Basic load rating (N): Static C_{0a}	Axial rigidity *K* (N/μm)
SFD 8010-4	Clearance	80	10	6.35	81.75	75.1	1×4	55 100	209 000	931
DFD 8010-4	D						1×4	55 100	209 000	1 840
SFD 8010-6	Clearance						1×6	78 000	314 000	1 370
DFD 8010-6	D						1×6	78 000	314 000	2 710
SFD 8012-4	Clearance		12	7.938	82.25	74	1×4	74 000	254 000	941
DFD 8012-4	D						1×4	74 000	254 000	1 860
SFD 8012-6	Clearance						1×6	105 000	381 000	1 392
DFD 8012-6	D						1×6	105 000	381 000	2 730
SFD 8020-3	Clearance		20	9.525	82.75	73	1×3	96 600	313 000	931
DFD 8020-3	D						1×3	96 600	313 000	1 830
SFD 8020-4	Clearance						1×4	124 000	417 000	1 230
DFD 8020-4	D						1×4	124 000	417 000	2 410
SFD 10010-6	Clearance	100	10	6.35	101.75	95.1	1×6	86 200	401 000	1 670
DFD 10010-6	D									3 270
SFD 10012-6	Clearance		12	7.938	102.25	94	1×6	117 000	490 000	1 680
DFD 10012-6	D									3 320
SFD 10020-4	Clearance		20	9.525	102.75	93	1×4	136 000	526 000	1 470
DFD 10020-4	D									2 890

Ball nut dimensions										
Nut entire length *L*	Nut diameter *D*	Flanged diameter *A*	Flanged width *B*	Notched flange *G*	Seal dimension *M*	Bolt hole dimension *X*	Bolt hole dimension *Y*	Bolt hole dimension *Z*	Bolt hole PCD *W*	Oil hole *Q*
97	105	151	22	57	10	14	20	13	127	Rc1/8
172										
118										
214										
111	110	156	22	59	12	14	20	13	132	Rc1/8
195										
136										
248										
146	115	173	28	66	20	18	26	17.5	143	Rc1/8
253										
168										
297										
118	125	171	22	64	10	14	20	13	147	Rc1/8
214										
142	130	188	28	71	12	18	26	17.5	158	Rc1/8
254										
172	135	205	32	79	20	22	32	21.5	169	Rc1/8
301										

Notes 1. Nut comes in circular shape I and circular shape II for shaft diameter 20 mm or larger. Select a flange that is suitable for the space available for nut installation.
2. If there is no seal the nut length "L" is shortened by dimension "M".
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.
4. The axial rigidity *K* in the table above is a theoretical value obtained from the elastic deformation between screw groove and ball when the axial load is 30% of the basic dynamic load rating (C_a) with non-preload, 10% with D-preload, and 5% with P-preload. Refer to "Technical Description" (page B37) if the axial load and preload differ from the conditions above, or when the deformation of the ball nut body must be considered.
5. It is recommended to use with seals when the shaft diameter is 16 mm or over and an oil hole is provided on the ball nut.
6. Preload system: D; Double nut preload (See page B5.)

B-3-2.4 End Cap Type Ball Screws

1. Features

The end cap recirculation system is suitable for high-helix lead and multiple start threads.
Since the leads are 1 to 3 times larger than their screw shaft diameter, it makes them more suitable for high-speed operation.

2. Specifications

(1) Ball recirculation system

The structure of end cap recirculation system is shown in **Fig. 1**.

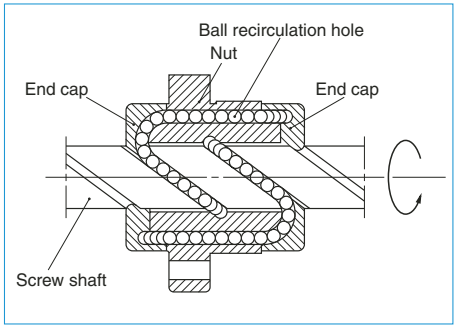


Fig. 1 Structure of end cap recirculation system

(2) Accuracy grade and axial play

The available standard accuracy grade and axial play are shown in **Table 1**. Please consult NSK for other grades.

Table 1 Accuracy grade and axial play

Accuracy grade	LSFC, LPFC: C1, C2, C3, C5, Ct7 USFC, UPFC: C3, C5, Ct7 (Three times lead or over are C5, Ct7)
Axial play	Z, 0 mm (preloaded); T, 0.005 mm or less; S, 0.020 mm or less; N, 0.050 mm or less

(3) Allowable d·n value and the criterion of maximum rotational speed.

The allowable d·n value and criterion of maximum rotational speed are shown below. Please consult NSK for high-speed specification. Basic measure must be taken for the high speed ball screws respectively.

Allowable d·n value:
Standard specification ; 80 000 or less
High-speed specification; 100 000 or less
Standard of rotational speed : 3 000 min^{-1}
※Please also review the critical speed. Refer to "Technical Description: Permissible Rotational Speed" (page B47) for details.

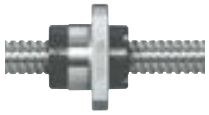
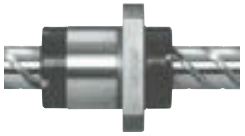
(4) Other specifications

Please consult NSK for other specifications not listed in the dimension tables.

3. Product categories

There are two different preload systems with several models (**Table 2**).

Table 2 End cap type ball screws product categories

Nut model	Shape	Flange shape	Nut shape	Preload system
LSFC		Flanged Circular Ⅲ	Circular	Non-preload, Slight axial play
LPFC			Circular	P-preload (light preload) no spacer ball
USFC		Flanged Rectangular	Circular	Non-preload, Slight axial play
UPFC			Circular	P-preload (light preload) no spacer ball

4. Design Precautions

When designing the screw shaft end, one end of the screw must meet either one of the following conditions. If not, we cannot install the ball nut on the screw shaft.

- Cut the ball groove through to the shaft end.
- The diameters of bearing journals and the gear or pulley seat must be less than the root diameter of ball groove "dr" specified on the dimension table.

Special bearings which have higher-load carrying capacity are available.
For general precautions regarding ball screws, refer to "Design Precautions" (page B83) and "Handling Precautions" (page B103).

5. Example of model number in dimension tables

The followings describe the structure of "Model number" and "Reference number for ball screw".

◇Model number

UPFC 25 25 - 3

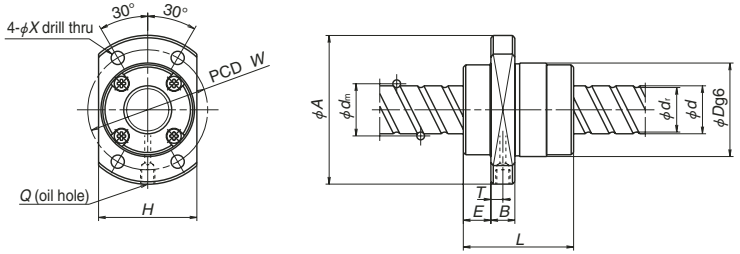
- UPFC: Nut model: LSFC, LPFC, USFC, UPFC
- 25: Screw shaft diameter (mm)
- 25: Lead (mm)
- 3: Effective turns of balls

◇Reference number for ball screw

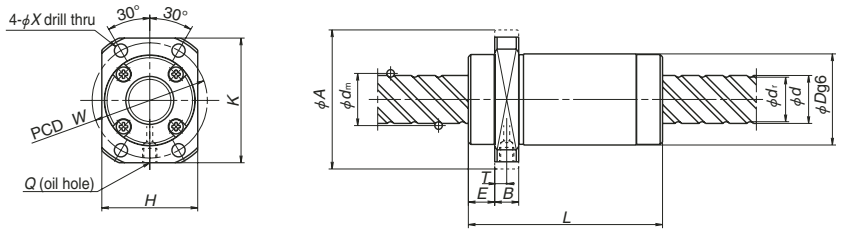
W 25 09 - ** P G X - C3 Z 25

- W: Product code
- 25: Screw shaft diameter (mm)
- 09: Effective threaded length (in the unit of 100 mm)
- **: NSK design serial number
- P: Preload code: No code, non-preload; P, P-preload (page B5)
- G: End cap recirculation system
- X: Appearance/specification code
- C3: Accuracy grade code: C1, C2, C3, C5, C7 (Ct7) (page B37 to B42)
- Z: Axial play code: Z, T, S, N (page B20)
- 25: Lead (mm)

End cap type



LSFC, LPFC



USFC, UPFC

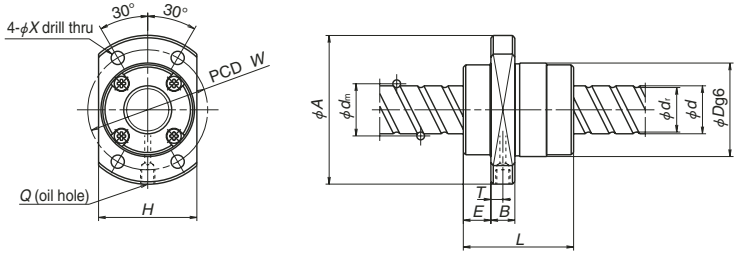
Unit: mm

Model No.	Preload system	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls Turns × Circuits	Basic load rating (N) Dynamic C_a	Basic load rating (N) Static C_{0a}	Axial rigidity K (N/μm)
USFC 1220-1.5	Clearance	12	20	2.381	12.5	9.9	1.7×1	2 690	4 420	66
UPFC 1220-1.5	P									103
USFC 1520-1.5	Clearance	15	20	3.175	15.5	12.2	1.7×1	5 070	8 730	97
* **UPFC 1520-1.5**	P									151
USFC 1540-1	Clearance		40	3.175	15.75	12.2	0.7×2	3 860	6 050	62
UPFC 1540-1	P						0.7×2	3 860	6 050	97
USFC 1540-2	Clearance						0.7×4	7 000	12 100	121
UPFC 1540-2	P						0.7×4	7 000	12 100	188
LSFC 1616-3	Clearance	16	16	2.778	16.65	13.7	1.7×2	6 380	12 500	172
LPFC 1616-3	P						1.7×2	6 380	12 500	268
LSFC 1616-6	Clearance						1.7×4	11 600	25 000	334
LPFC 1616-6	P						1.7×4	11 600	25 000	520
USFC 1632-1	Clearance		32	3.175	16.75	13.4	0.7×2	4 000	6 690	74
* **UPFC 1632-1**	P						0.7×2	4 000	6 690	116
USFC 1632-3	Clearance						1.7×2	8 580	17 000	176
UPFC 1632-3	P						1.7×2	8 580	17 000	273
USFC 1632-6	Clearance						1.7×4	15 600	34 100	340
UPFC 1632-6	P						1.7×4	15 600	34 100	530
USFC 1650-1	Clearance		50	3.175	16.75	13.4	0.7×2	4 000	6 690	65
UPFC 1650-1	P						0.7×2	4 000	6 690	102
USFC 1650-2	Clearance						0.7×4	7 260	13 400	126
UPFC 1650-2	P						0.7×4	7 260	13 400	197
LSFC 2020-3	Clearance	20	20	3.175	20.75	17.4	1.7×2	9 620	21 000	238
LPFC 2020-3	P						1.7×2	9 620	21 000	370
LSFC 2020-6	Clearance						1.7×4	17 500	42 000	462
LPFC 2020-6	P						1.7×4	17 500	42 000	718
USFC 2040-1	Clearance		40	3.175	20.75	17.4	0.7×2	4 490	8 640	89
* **UPFC 2040-1**	P						0.7×2	4 490	8 640	138
USFC 2040-3	Clearance						1.7×2	9 620	21 000	211
UPFC 2040-3	P						1.7×2	9 620	21 000	328
USFC 2040-6	Clearance						1.7×4	17 500	42 000	409
UPFC 2040-6	P						1.7×4	17 500	42 000	636
USFC 2060-1	Clearance		60	3.175	20.75	17.4	0.7×2	4 490	8 640	78
UPFC 2060-1	P						0.7×2	4 490	8 640	121
USFC 2060-2	Clearance						0.7×4	8 140	17 300	151
UPFC 2060-2	P						0.7×4	8 140	17 300	235

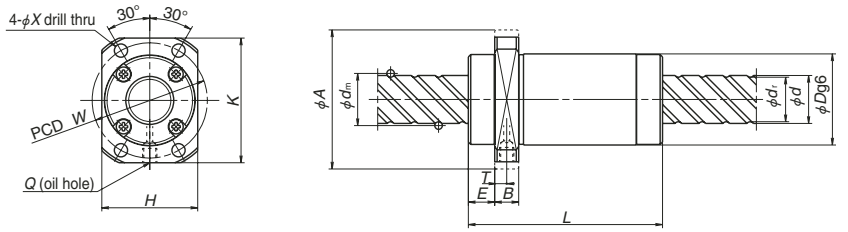
Ball nut dimensions										
Nut entire length L	Nut diameter D	Flanged diameter A	Flanged width B	Flanged dimension H	Flanged dimension K	End cap dimension E	Bolt hole dimension X	Bolt hole PCD W	Oil hole Q	Oil hole position T
44	26	44	10	28	40	9	4.5	35	M6×1	5
45	34	55	10	36	50	11	5.5	45	M6×1	5
40	32	53	10	33	48	12	5.5	43	M6×1	5
38	32	53	10	34	—	10	4.5	42	M6×1	5
34	34	55	10	36	50	10.5	5.5	45	M6×1	5
34										
66										
66										
66										
66										
50	34	55	10	36	50	12	5.5	45	M6×1	5
46	39	62	10	41	—	11.5	5.5	50	M6×1	5
41	38	58	10	40	52	11	5.5	48	M6×1	5.5
41										
81										
81										
81										
81										
58	38	58	10	40	52	12.3	5.5	48	M6×1	5

Notes: 1. For the LSFC and USFC type ball screws, the axial rigidity K in the table above is the theoretical values obtained from the elastic deformation between screw groove and ball when the axial load is 30% of the basic dynamic load rating (C_a). For the LPFC and UPFC type, the rigidity is the theoretical value when the preload is 10% of the basic dynamic load rating (C_a) and an axial load is applied to it. Refer to the "Technical Description" (page B37) if the rigidity and preload differ from the conditions above, or when the deformation of the ball nut body must be considered.

2. The right turn screw is the standard. Please consult NSK for the left turn screw.
3. The models marked with * (asterisk) are available in the FA type standard ball screws with finished shaft end.
4. Preload system: P; Oversize ball preload (See page B5.)



LSFC, LPFC



USFC, UPFC

Unit: mm

Model No.	Preload system	Shaft dia. *d*	Lead *l*	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls Turns × Circuits	Basic load rating (N) Dynamic C_a	Basic load rating (N) Static C_{0a}	Axial rigidity *K* (N/μm)
LSFC 2525-3	Clearance	25	25	3.969	26.0	21.9	1.7×2	14 400	32 800	293
LPFC 2525-3	P						1.7×2	14 400	32 800	456
LSFC 2525-6	Clearance						1.7×4	26 100	65 600	568
LPFC 2525-6	P						1.7×4	26 100	65 600	883
USFC 2550-1	Clearance		50				0.7×2	6 700	13 500	109
UPFC 2550-1	P						0.7×2	6 700	13 500	170
USFC 2550-3	Clearance						1.7×2	14 400	32 800	264
UPFC 2550-3	P						1.7×2	14 400	32 800	412
USFC 2550-6	Clearance						1.7×4	26 100	65 600	512
UPFC 2550-6	P						1.7×4	26 100	65 600	796
USFC 2580-1	Clearance		80				0.7×2	6 700	13 500	94
UPFC 2580-1	P						0.7×2	6 700	13 500	147
USFC 2580-2	Clearance						0.7×4	12 200	27 000	184
UPFC 2580-2	P						0.7×4	12 200	27 000	285
LSFC 3232-3	Clearance	32	32	4.762	33.25	28.3	1.7×2	21 000	51 600	366
LPFC 3232-3	P						1.7×2	21 000	51 600	570
LSFC 3232-6	Clearance						1.7×4	38 100	103 000	709
LPFC 3232-6	P						1.7×4	38 100	103 000	1 104
USFC 3264-1	Clearance		64				0.7×2	9 800	20 900	143
UPFC 3264-1	P						0.7×2	9 800	20 900	222
USFC 3264-3	Clearance						1.7×2	21 000	51 600	329
UPFC 3264-3	P						1.7×2	21 000	51 600	512
USFC 3264-6	Clearance						1.7×4	38 100	103 000	636
UPFC 3264-6	P						1.7×4	38 100	103 000	991
LSFC 4040-3	Clearance	40	40	6.350	41.75	35.2	1.7×2	33 500	86 500	455
LPFC 4040-3	P						1.7×2	33 500	86 500	708
LSFC 4040-6	Clearance						1.7×4	60 800	173 000	880
LPFC 4040-6	P						1.7×4	60 800	173 000	1 370
LSFC 5050-3	Clearance	50	50	7.938	52.25	44.1	1.7×2	50 000	135 000	560
LPFC 5050-3	P						1.7×2	50 000	135 000	871
LSFC 5050-6	Clearance						1.7×4	90 800	270 000	1 084
LPFC 5050-6	P						1.7×4	90 800	270 000	1 688

Ball nut dimensions										
Nut entire length *L*	Nut diameter *D*	Flanged diameter *A*	Flanged width *B*	Flanged dimension *H*	Flanged dimension *K*	End cap dimension *E*	Bolt hole dimension *X*	Bolt hole PCD *W*	Oil hole *Q*	Oil hole position *T*
55	47	74	12	49	—	13	6.6	60	M6×1	6
50	46	70	12	48	63	13	6.6	58	M6×1	7
50										
100										
100										
100										
100										
75	46	70	12	48	63	14.5	6.6	58	M6×1	6
70	58	92	12	60	—	16	9	74	M6×1	5.5
62	58	92	12	60	82	15.5	9	74	M6×1	7.5
62										
126										
126										
126										
126										
85	73	114	15	75	—	19.5	11	93	M6×1	6.5
107	90	135	20	92	—	21.5	14	112	M6×1	7

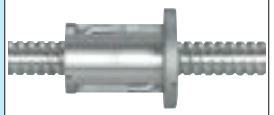
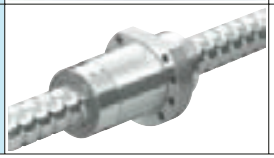
*

Notes: 1. For the LSFC and USFC type ball screws, the axial rigidity *K* in the table above is the theoretical values obtained from the elastic deformation between screw groove and ball when the axial load is 30% of the basic dynamic load rating (C_a). For the LPFC and UPFC type, the rigidity is the theoretical value when the preload is 10% of the basic dynamic load rating (C_a) and an axial load is applied to it. Refer to the "Technical Description" (page B37) if the rigidity and preload differ from the conditions above, or when the deformation of the ball nut body must be considered.

2. The right turn screw is the standard. Please consult NSK for the left turn screw.
3. The models marked with ✻ (asterisk) are available in the FA type standard ball screws with finished shaft end.
4. Preload system: P; Oversize ball preload (See page B5.)

B-3-3 Dimension Table and Reference Number of Application-Oriented Ball Screws

◇Features and application examples of application-oriented ball screws

Applications		Shape	Features	Applications	Page
High-Speed Machine Tools	HMD Type		High-speed operation: 64 to 120 m/min Rigidity: 5% greater than the HMC series. High-load carrying capacity: 7% greater than the HMC type New recirculation system reduces the noise level by 5 dB or more compared with the HMC type	High-speed machining centers High-speed combined machine tools Die mold processing machine	B493
	HMS Type		Fine lead: 5 to 12 mm High-speed operation: 25 to 50 m/min Easy replacement: Dimensional interchangeability with tube type ball screws New recirculation system reduces the noise level by 5 dB or more compared with the Tube type.	Machining centers Die mold processing machine NC lathes Combined machine tools	B497
	HMC Type		High-speed: 40 to 120 m/min Rigidity: 30% greater than existing tube type ball screws High-Load carrying capacity: 14% greater than existing tube type ball screws Noise reduced by small-diameter balls	High-speed machining centers High-speed combined machine tools Die mold processing machines	B501
Small Lathes	BSL Type		Compact nut: 50% less ball nut volume than NSK existing products. High-dust protection by thin plastic seal Special high-load capacity ball screw support bearings are available.	Small lathes Multi-axis lathes Small machining centers	B507
High-Load Drives	HTF-SRC Type		High-load capacity High-speed operation by high-speed rotation: 930 mm/sec Even load distribution to balls in the ball nut for high-load drive Improved durability by NSK S1	Injection axis of injection molding machines Servo press machines Press brake Bending machines	B511
	HTF-SRD Type		High-load capacity High-speed operation by large screw lead: 1 600 mm/sec Improved durability by NSK S1	Clamping axis of injection molding machines Die cast machines Punch presses Lifting and lowering devices	B515
	HTF Type		High-load capacity Even load distribution to the balls in a ball nut for high-load drive Improved durability by NSK S1 Provide a wide range of screw diameter and lead combinations.	Injection molding machines Press machines Press fitting machines Lifting and lowering machines	B519
Contaminated Environments	VSS Type		High dust-resistant performance: Reduces particle penetration rate to less than 1/15 (compared with standard seal). More than four times longer service life than standard seal under contaminated environments.	Woodworking machines Laser cutting machines Graphite milling machines Tire molding machines Transfer equipment	B531

Applications		Shape	Features	Applications	Page
Contaminated Environments and Grease Retention	Ball Screw with X1 Seals		Highly dustproof: Particle penetration ratio reduced to less than 1/30 of existing standard seals. Superior grease retention: Can reduce lubricant consumption, also effective at suppressing grease splattering.	Machining centers Combined machine tools NC lathes Woodworking machines Laser cutting machines Graphite milling machines Tire molding machines	B536
Twin-Drive Systems	TW Series		Controlled screw lead accuracy and variation of preload torque for twin drive. Improved axial rigidity, expected life and controllability by the paired up two ball-screw driving systems	Machining centers Combined machine tools Large-size machine tools	B539
High-Precision Machine Tools	Hollow Shaft Ball Screws		Suppress thermal deformation by cooling the shaft center Prevent the machine base from deforming due to thermal expansion. NSK special support units and seal units are available.	High-precision die processing machines High-precision combined machine tools High-precision machining centers High-precision lathes	B540
	Nut Cooling Ball Screws		Due to the simple nut cooling setup, cooling is achieved simply by attaching piping to the thermal displacement control nut. Cooling just as effective as core cooling Insulation to prevent heat from affecting the table.	High-precision die processing machines High-precision combined machine tools High-precision machining centers High-precision lathes Large machine tools	B545
Nut-Rotatable Ball Screws	NDT and NDD Type		Angular contact support bearings are integrated into the ball nut. Two or more ball nuts can be installed in a single ball screw shaft. The NDD type ball screws can surpass the critical speed. A special vibration damper enables long-stroke-high-speed operation.	Woodworking machines Laser cutting machines Electronic component mounting devices Liquid crystal display transfer equipment Transfer equipment	B549
Robots	Σ Series		A ball screw and a ball spline are made in one shaft, combining a drive and guide system. A ball screw nut, a ball spline nut and support bearings are combined to the unit. Hollow shaft has an effect for weight saving. The hollow can be used for wiring and piping.	SCALA type robots Electronic-component mounting systems	B557
Equipped with "NSK K1" Lubrication Unit			Long-term, maintenance-free operation Maintains lubrication efficiency for a prolonged time in contaminated environments Does not pollute the environment Made of compatible material with the FDA regulations is also available.	Automotive manufacturing machines Woodworking machines Laser cutting machines Semiconductor/Liquid crystal display manufacturing equipment Food processing/Medical equipment	B569

B-3-3.1 HMD Type for High-Speed Machine Tools

This product is being applied for a patent. The newly developed ball recirculation components, the end-deflector and middle-deflector, have greatly contributed for the substantial improvements in the maximum rotational speed and noise level compared to the HMC type.

1. Features

● High speed

The permissible rotational speed (d·n value) has greatly increased to 160 000 compared with 135 000 of the HMC type.

● Low noise

Noise reduced by 5 dB or more compared with the HMC type ball screws for high-speed machine tools.

● Nut mounting dimensions

The ball nut diameters are the same as those of the HMC type.

2. Specifications

(1) Recirculation system

Fig.1 shows the structure of the middle-deflector recirculation system of the HMD type.

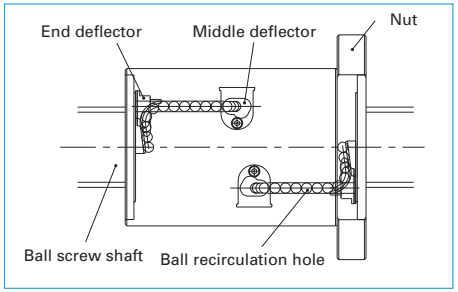


Fig. 1 Structure of middle-deflector recirculation system

(2) Accuracy grade and axial play

The available standard accuracy grade and axial play are as follows. Please consult NSK for other grades.

Table 1 Accuracy grade and axial play

Accuracy grade	C3, C5
Axial play	0 mm (preloaded)

(3) Allowable d·n value and the criterion of maximum rotational speed

Allowable d·n value and the criterion of maximum rotational speed are shown below. Please consult NSK if the rotational speed exceeds the permissible range below.

Allowable d·n value: 160 000 or less

Criterion of maximum rotational speed

: 4 000 min^{-1}

Note: Please also review the critical speed. See "Technical Description: Permissible Rotational Speed" (page B47) for details.

(4) Options

● For twin-drive systems (See page B539.)

Upon request, the variations in lead accuracy and preload torque between two ball screws of a pair of the TW series are controlled for the further improvement of the reliability.

● Hollow shaft ball screw (See page B540.)

● Nut cooling ball screw (See page B545.)

The temperature rise and measures against thermal expansion of ball screw driving mechanism are the most challenging for high-speed machine tools. We recommend using core forced cooling or nut cooling for the HMD type.

(5) Seal

Compact, thin plastic seal is available. Nut outside diameter is compact compare with the return tube recirculation system.

3. Design precautions

For general precautions regarding ball screws, refer to "Design Precautions" (page B83) and "Handling Precautions" (page B103).

4. Product categories

The HMD type has a model as follows.

Table 2 HMD type product categories

Nut model	Shape	Flange shape	Nut shape	Preload system
EM		Flanged Circular Ⅱ	Circular	Z-Preload (medium preload)

5. Structure of model number and reference number

The followings describe the structure of "Model number" and "Reference number for ball screw".

◇Model number

EM 40 20 - 6E

- EM — Nut model: EM
- 40 — Screw shaft diameter (mm)
- 20 — Lead (mm)
- 6E — Effective turns of balls

◇Reference number for ball screw

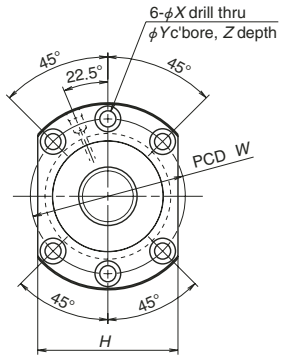
W 40 07 - ** Z M X T - C5 Z 20

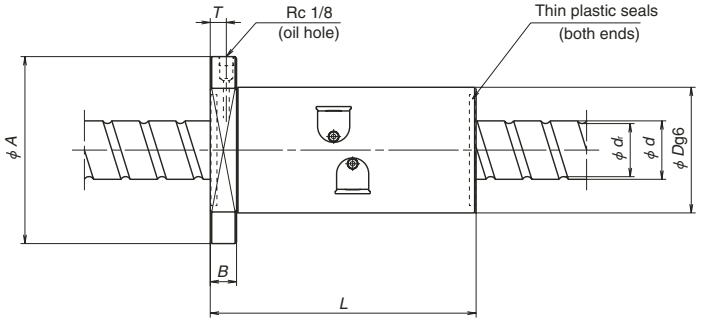
- W — Product code
- 40 — Screw shaft diameter (mm)
- 07 — Effective threaded length (in the unit of 100 mm)
- ** — NSK design serial number
- Z — Preload code: Z; Z-preload
- M — Middle-deflector recirculation system
- X — Ball screw specification/appearance
- T — Hollow shaft specification
- C5 — Accuracy grade: C3 or C5
- Z — Axial play code: Z
- 20 — Lead (mm)

6. Handling Precautions

Maximum operating temperature: 80°C

If using NSK K1, operating temperature should not exceed 50°C. Refer to "Designing Precautions" (page B83).





Unit: mm

Model No.	Shaft dia. d	Lead l	Root dia. d_r	Basic load rating (N) Dynamic C_a	Basic load rating (N) Static C_{0a}	Axial rigidity K (N/μm)
EM4016-4E	40	16	34.1	57 100	130 000	1 020
EM4020-6E		20	34.4	66 900	165 000	1 340
EM4025-6E		25	34.1	79 100	191 000	1 370
EM4030-6E		30	34.1	79 100	191 000	1 350
EM4516-4E	45	16	39.1	59 600	145 000	1 060
EM4520-6E		20	39.4	69 100	186 000	1 470
EM4525-6E		25	39.1	82 500	213 000	1 510
EM5016-4E	50	16	44.1	61 800	160 000	1 150
EM5020-6E		20	44.4	73 200	206 000	1 600
EM5025-6E		25	44.1	85 600	235 000	1 620
EM5030-6E		30	44.1	85 600	235 000	1 630
EM6316-4E	63	16	55.2	111 000	339 000	1 600

Ball nut dimensions: Nut length L	Nut dia. D	Flange dia. A	Flange width B	Flange size H	Bolt hole size X	Bolt hole size Y	Bolt hole size Z	Bolt hole PCD W	Oil hole position T	Max. feeding speed (m/min)
160	86	128	18	96	11	17.5	11	106	11	64
150										80
182										100
213										120
160	92	134	18	102	11	17.5	11	112	11	56
150										70
182										88
160	98	140	18	107	11	17.5	11	118	11	51
150										64
182										80
213										96
170	122	180	28	138	18	26	17.5	150	14	40

Notes: 1. The right turn screw is the standard. Please consult NSK for left turn screws.
2. Rigidity listed under the column K is the value when a 5% of basic dynamic load rating is applied as the preload.

B-3-3.2 HMS Type for High-Speed Machine Tools

1. Features

● High speed

The permissible rotational speed (d·n value) has greatly increased to 160 000 compared with 100 000 for tube type screws.

● Low noise

By adopting SRC recirculation system, noise reduced by 5 dB or more compared with tube type screws.

● Nut mounting dimensions

The ball nut diameters are the same as those of tube type screws.

2. Specifications

(1) Recirculation system

Fig.1 shows the structure of the SRC recirculation system of the HMS type.

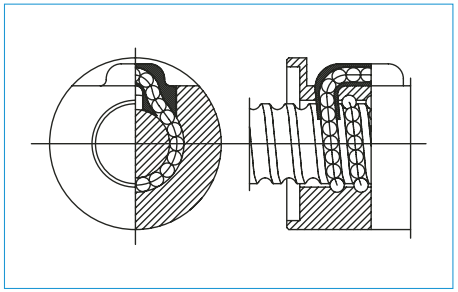


Fig. 1 Structure of SRC recirculation system

(2) Accuracy grade and axial play

The available standard accuracy grade and axial play are as follows. Please consult NSK for other grades.

Table 1 Accuracy grade and axial play

Accuracy grade	C3, C5
Axial play	0 mm (preloaded)

(3) Allowable d·n value and the criterion of maximum rotational speed

Allowable d·n value and the criterion of maximum rotational speed are shown below. Please consult NSK if the rotational speed exceeds the permissible range below.

Allowable d·n value: 160 000 or less

Criterion of maximum rotational speed

: 5 000 min^{-1}

Note: Please also review the critical speed. See "Technical Description: Permissible Rotational Speed" (page B47) for details.

(4) Options

● For twin-drive systems (See page B539.)

Upon request, the variations in lead accuracy and preload torque between two ball screws of a pair of the TW series are controlled for the further improvement of the reliability.

● Hollow shaft ball screw (See page B540.)

● Nut cooling ball screw (See page B545.)

The temperature rise and measures against thermal expansion of ball screw driving mechanism are the most challenging for high-speed machine tools. We recommend using core forced cooling or nut cooling for the HMS type.

3. Design precautions

For general precautions regarding ball screws, refer to "Design Precautions" (page B83) and "Handling Precautions" (page B103).

4. Product categories

The HMS type has a model as follows.

Table 2 HMS type product categories

Nut model	Shape	Flange shape	Nut shape	Preload system
ZFRC		Flanged Circular Ⅱ	Circular	Z-Preload (medium preload)

5. Structure of model number and reference number

The followings describe the structure of "Model number" and "Reference number for ball screw".

◇Model number

ZFRC 40 10 - 10

- ZFRC: Nut model: ZFRC
- 40: Screw shaft diameter (mm)
- 10: Lead (mm)
- 10: Effective turns of balls*

* In the case of Z-preload, the amount shown is twice the effective turn of balls.

◇Reference number for ball screw

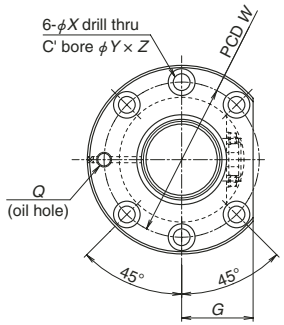
W 40 07 - ** Z RC T - C5 Z 10

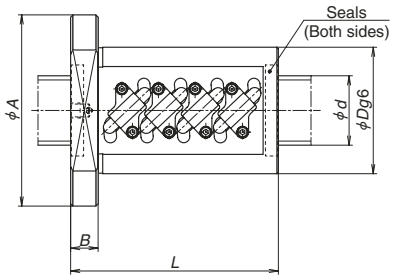
- W: Product code
- 40: Screw shaft diameter (mm)
- 07: Effective threaded length (in the unit of 100 mm)
- **: NSK design serial number
- Z: Preload code: Z; Z-preload
- RC: SRC recirculation system
- T: Hollow shaft specification
- C5: Accuracy grade: C3 or C5
- Z: Axial play code: Z
- 10: Lead (mm)

6. Handling Precautions

Maximum operating temperature: 60°C

If using NSK K1, operating temperature should not exceed 50°C. Refer to "Designing Precautions" (page B83).





Unit: mm

Model No.	Shaft dia. *d*	Lead *l*	Root dia. d_r	Effective turns Turns × rows	Basic load rating (N) Dynamic C_a	Basic load rating (N) Static C_{0a}	Axial rigidity *K* (N/μm)
ZFRC3205-10	32	5	29.2	2.5×2	18 500	56 100	840
ZFRC3210-10	32	10	26.4	2.5×2	46 300	108 000	920
ZFRC4010-10	40	10	34.4	2.5×2	52 000	137 000	1 090
ZFRC4012-10	40	12	34.1	2.5×2	61 000	155 000	1 110
ZFRC4508-10	45	8	40.5	2.5×2	37 300	118 000	1 160
ZFRC4510-10	45	10	39.4	2.5×2	54 200	155 000	1 210
ZFRC4512-10	45	12	39.1	2.5×2	64 200	177 000	1 230
ZFRC5010-10	50	10	44.4	2.5×2	57 700	175 000	1 320
ZFRC5012-10	50	12	43.2	2.5×2	77 600	214 000	1 360
ZFRC6312-14	63	12	56.2	3.5×2	115 000	386 000	2 250

Ball nut dimensions: Nut length *L*	Nut dia. *D*	Flange dia. *A*	Flange width *B*	Groove size *G*	Bolt hole size *X*	*Y*	*Z*	Bolt hole PCD *W*	Oil hole position *Q*	Max. feeding speed (m/min)
89	58	85	12	32	6.6	11	6.5	71	M6×1	25
163	74	108	15	41	9	14	8.5	90	M6×1	50
166	82	124	18	47	11	17.5	11	102	Rc1/8	40
192	86	128	18	48	11	17.5	11	106	Rc1/8	48
136	82	124	18	47	11	17.5	11	102	Rc1/8	28
166	88	132	18	50	11	17.5	11	110	Rc1/8	35
192	90	132	18	50	11	17.5	11	110	Rc1/8	42
166	93	135	18	51	11	17.5	11	113	Rc1/8	32
198	100	146	22	55	14	20	13	122	Rc1/8	38
244	115	161	22	61	14	20	13	137	Rc1/8	30

Notes: 1. The right turn screw is the standard. Please consult NSK for left turn screws.
2. Rigidity listed under the column K is the value when a 5% of basic dynamic load rating is applied as the preload.

B-3-3.3 HMC Type for High-Speed Machine Tools

This product is being applied for a patent.

1. Features

● High-speed traveling

High helix leads of 16 mm to 36 mm are used. Furthermore, the ball recirculation return tube is reinforced to make a high-speed traveling of 40 to 120 m/min. possible.

● High rigidity, high load carrying capacity

Double start thread increases the number of effective turns of balls, and a smaller ball size increases the number of the balls. Together they contribute to have high rigidity and high load carrying capacity, despite the high helix lead.

● Compact nut

The size of nut diameter and length were reduced.

2. Specifications

(1) Ball recirculation system

The ball recirculation circuits and grooves are suited for high-speed operation. Structure of recirculation system is shown in **Fig. 1**.

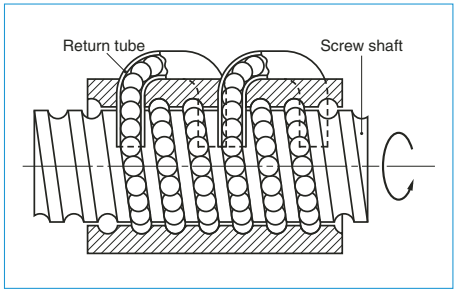


Fig. 1 Structure of return tube recirculation system

(2) Accuracy grades and axial play

Standard accuracy grades and axial play are shown in **Table 1**. Please consult NSK for other grade.

Table 1 Accuracy grades and axial play

Accuracy grade	C3, C5
Axial play	0 mm (preloaded)

(3) Options

● Equipped with NSK K1 lubrication unit

Optional NSK K1 lubrication unit, molded from resin and impregnated with lubrication oil, is available. Please consult NSK when using NSK K1.

● For twin-drive systems (See page B539.)

Upon request, the variations in lead accuracy and preload torque between two ball screws of a pair of the TW series are controlled for the further improvement of the reliability.

● Hollow shaft ball screw specifications (See page B540.)

The temperature rise and measures against thermal expansion of ball screw driving mechanism are the most challenging for high-speed machine tools. For the HMD type ball screws, we recommend to utilize the hollow for forced cooling system.

● For a vertical axis ball screw

For a vertical axis ball screw, which constantly supports the load of vertical axis system, a high load capacity ball screw is required. A high load capacity type with compact design is available for the nut models Ⅱ and Ⅲ in the dimension tables. For details, please consult NSK.

(4) Allowable d·n value and the criterion of maximum rotational speed

Allowable d·n value and the criterion of maximum rotational speed are shown below. Please consult NSK if the rotational speed exceeds the permissible range below.

Allowable d•n value: HZC, HDC; 100 000 or less
HZF, HDF; 135 000 or less

Criterion of maximum rotational speed: 3 750 min^{-1}

Note: Please also review the critical speed. See "Technical Description: Permissible Rotational Speed" (page B47) for details.

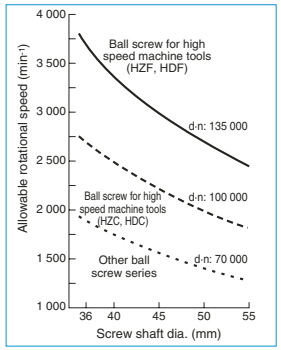


Fig. 2 Comparison of permissible rotational speed

(5) Other specifications

For other specifications not listed in the dimension tables such as high-speed, high-load capacity, and NSK K1 installed type, please consult NSK.

3. Design precautions

For general precautions regarding ball screws, refer to "Design Precautions" (page B83) and "Handling Precautions" (page B103).

4. Product categories

HMC type has two different preload systems with several models (**Table 2**).

Table 2 HMC type product categories

Nut model	Shape	Flange shape	Preload system
HZC HZF		Flanged Circular Ⅰ	Z-preload (medium preload)
HDC HDF		Flanged Circular Ⅰ	D-preload (medium preload)

5. Structure of model number and reference number

The followings describe the structure of "Model number" and "Reference number for ball screw".

◇Model number

HZF 36 16 - 5

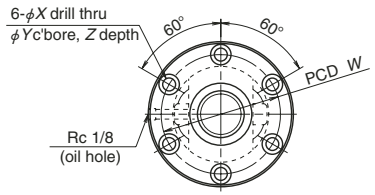
- HZF: Nut model: HZC, HZF, HDC, HDF
- 36: Screw shaft diameter (mm)
- 16: Lead (mm)
- 5: Effective turns of balls

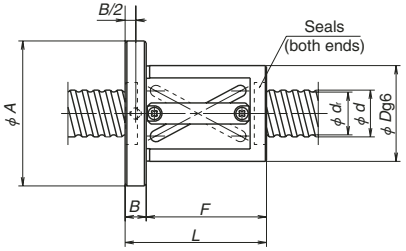
◇Reference number for ball screw

W 36 05 - ** Z X T - C5 Z 16

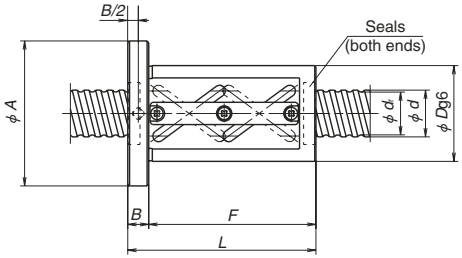
- W: Product code
- 36: Screw shaft diameter (mm)
- 05: Effective threaded length (in the unit of 100 mm)
- **: Design serial number
- Z: Preload code : Z, Z-prelord; D, D-preload (page B5)
- X: Appearance/specification code
- T: Hollow shaft ball screw
- C5: Accuracy grade: C3, C5 (page B37 to B42)
- Z: Axial play code: Z (page B20)
- 16: Lead (mm)

HMC





Nut model Ⅰ (offset preload)



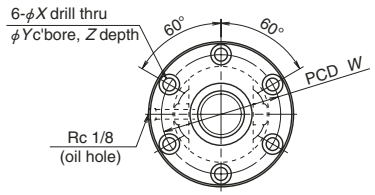
Nut model Ⅱ (offset preload)

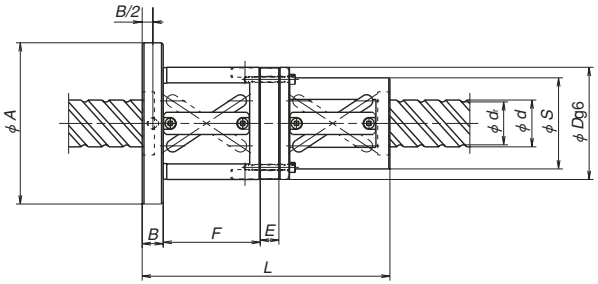
Unit: mm

Model No.	Shaft dia.	Lead	Root dia.	Effective turns of balls	Nut model	Basic load rating (N)		Axial rigidity K (N/μm)	
						Dynamic	Static		
	d	l	d_r			C_a	C_{0a}	5%C_a	10%C_a
HZF3616-5	36	16	31.7	5	Ⅱ	40 200	102 000	1 130	1 420
HZC3616-5									
HZF3620-3.5		20	30.6	3.5	Ⅰ	44 000	98 500	830	1 050
HZC3620-3.5									
HZF4016-5	40	16	35.7	5	Ⅱ	41 200	112 000	1 230	1 550
HZC4016-5									
HZF4020-3.5		20	34.6	3.5	Ⅰ	46 100	107 000	900	1 130
HZC4020-3.5									
HZF4020-5				5	Ⅱ	62 600	153 000	1 260	1 590
HZC4020-5									
HZF4516-5	45	16	40.7	5	Ⅱ	43 800	127 000	1 340	1 690
HZF4516-7.5				7.5		62 100	191 000	1 960	2 470
HZF4520-3.5		20	39.6	3.5	Ⅰ	47 600	120 000	990	1 240
HZC4520-3.5									
HZF4520-5				5	Ⅱ	64 700	170 000	1 380	1 740
HZC4520-5									
HZF4525-3.5		25	39.3	3.5	Ⅰ	56 800	137 000	1 010	1 280
HZC4525-3.5									
HZF5020-3.5	50	20	44.6	3.5	Ⅰ	50 400	133 000	1 080	1 360
HZC5020-3.5									
HZF5020-5				5	Ⅱ	68 500	191 000	1 520	1 910
HZC5020-5									
HZF5025-3.5		25	44.3	3.5	Ⅰ	58 900	152 000	1 100	1 390
HZC5025-3.5									
HZF5025-5				5	Ⅱ	80 100	216 000	1 540	1 940
HZC5025-5									
HZF5030-3.5		30	44.3	3.5	Ⅰ	58 900	152 000	1 100	1 390
HZC5030-3.5									
HZF5520-3.5	55	20	49.6	3.5	Ⅰ	51 600	145 000	1 150	1 450
HZF5520-5				5	Ⅱ	70 200	208 000	1 630	2 050
HZF5525-3.5		25	49.3	3.5	Ⅰ	62 600	165 000	1 190	1 560
HZF5525-5				5	Ⅱ	85 000	238 000	1 680	2 120
HZF5530-3.5		30	49.3	3.5	Ⅰ	62 600	165 000	1 190	1 560

Ball nut dimensions									Max. feeding speed (m/min)
Nut entire length	Nut dia.	Flange dia.	Flange width	Nut length	Bolt hole demensions			Bolt hole PCD	
L	D	A	B	F	X	Y	Z	W	
134	78	120	18	116	11	17.5	11	98	60
	71	113						91	44
121	94	136	18	103	11	17.5	11	114	75
	78	120						98	56
134	79	121	18	116	11	17.5	11	99	54
	76	118						96	40
121	96	138	18	103	11	17.5	11	116	67
	82	124						102	50
161	96	138		143				116	67
	82	124						102	50
134	82	124	18	116	11	17.5	11	102	48
187		128	22	165	14	20	13	104	
122	98	140	18	104	11	17.5	11	118	60
	88	130						108	44
162	98	140		144				118	60
	88	130						108	44
141	101	143	18	123	11	17.5	11	121	75
	92	134						112	56
122	101	143	18	104	11	17.5	11	121	54
	95	137						115	40
162	101	143		144				121	54
	95	137						115	40
141	103	145	18	123	11	17.5	11	123	67
	98	140						118	50
191	103	145		173				123	67
	98	140						118	50
159	103	145	18	141	11	17.5	11	123	81
	98	140						118	60
122	103	145	18	104	11	17.5	11	123	49
162				144					
141	105	147	18	123	11	17.5	11	125	61
191				173					
159	105	147	18	141	11	17.5	11	125	73

Notes: 1. Ball screws of 32 or 36 mm lead have triple start threads. Others have double start threads.
2. Rigidity listed under the column 5%Ca is the value when a 5% of basic dynamic load rating is applied as the preload. Similarly, those listed under the column 10%Ca means a 10% of basic dynamic load rating is applied.





Nut model Ⅲ (double nut spacer, preload)
(the figure indicates use of double start threads)

Unit: mm

Model No.	Shaft dia. *d*	Lead *l*	Root dia. d_r	Effective turns of balls	Nut model	Basic load rating (N) Dynamic C_a	Basic load rating (N) Static C_{0a}	Axial rigidity *K* (N/μm) 5% C_a	Axial rigidity *K* (N/μm) 10% C_a
HDF3620-5	36	20	30.6	5	Ⅲ	59 800	138 000	1 160	1 460
HDC3620-5									
HDF4025-5	40	25	34.3	5	Ⅲ	74 000	175 000	1 320	1 660
HDC4025-5									
HDF4030-5		30	34.3	5	Ⅲ	74 000	175 000	1 320	1 660
HDC4030-5									
HDF4032-7.5		32	34.6	7.5	Ⅲ	88 700	230 000	1 920	2 420
HDC4032-7.5									
HDF4036-4.5		36	34.6	4.5	Ⅲ	57 200	138 000	1 170	1 480
HDF4525-5	45	25	39.3	5	Ⅲ	77 200	197 000	1 430	1 800
HDC4525-5									
HDF4530-5		30	39.3	5	Ⅲ	77 200	197 000	1 430	1 800
HDC4530-5									
HDF4532-7.5		32	39.6	7.5	Ⅲ	91 700	256 000	2 090	2 630
HDC4532-7.5									
HDF4536-4.5		36	39.6	4.5	Ⅲ	59 100	155 000	1 280	1 620
HDF5030-5	50	30	44.3	5	Ⅲ	80 100	216 000	1 540	1 940
HDC5030-5									
HDF5032-7.5		32	44.6	7.5	Ⅲ	97 100	286 000	2 270	2 860
HDC5032-7.5									
HDF5530-5	55	30	49.3	5	Ⅲ	85 000	238 000	1 680	2 120
HDF5532-7.5		32	49.6	7.5	Ⅲ	99 500	313 000	2 420	3 050

Ball nut dimensions											Max. feeding speed (m/min)
Nut entire length *L*	Nut dia. *D*	Nut dia. *S*	Flange dia. *A*	Flange width *B*	Nut length *F*	Spacer dimensions *E*	Bolt hole size *X*	Bolt hole size *Y*	Bolt hole size *Z*	Bolt hele PCD *W*	
191	94	76	136	18	77	5	11	17.5	11	114	75
	78	60	120							98	56
228.5	98	80	140	18	91	13.5	11	17.5	11	118	84
	86	68	128							106	63
248	98	80	140	18	104	8	11	17.5	11	118	101
	86	68	128							106	75
265	96	78	142	22	109	11	14	20	13	118	108
	82	64	128							106	80
200	96	78	138	18	83	4	11	17.5	11	116	120
228.5	101	83	143	18	91	13.5	11	17.5	11	121	75
	92	74	134							112	56
248	101	83	143	18	104	8	11	17.5	11	121	90
	92	74	134							112	67
266	98	80	144	22	109	11	14	20	13	120	96
	88	70	134							110	71
200	98	80	140	18	83	4	11	17.5	11	118	108
249	103	85	145	18	104	8	11	17.5	11	123	81
	98	80	140							118	60
266	101	83	147	22	109	11	14	20	13	123	86
	95	77	141							117	64
249	105	87	147	18	104	8	11	17.5	11	125	73
266	103	85	149	22	109	11	14	20	13	125	78

Notes: 1. Ball screws of 32 or 36 mm lead have triple start threads. Others have double start threads.
2. Rigidity listed under the column 5%Ca is the value when a 5% of basic dynamic load rating is applied as the preload. Similarly, those listed under the column 10%Ca means a 10% of basic dynamic load rating is applied.

B-3-3.4 BSL™ Type for Miniature Lathes

1. Features

● Prompt delivery

Screw shaft configuration and ball nut shape are standardized for prompt delivery.

● High speed and low noise

Adoption of end-deflector recirculation system realized high-speed operation with low noise.

● Excellent dust resistance

Thin plastic seal and specially designed ball grooves prevent the entry of foreign matters.

2. Specifications

(1) Ball recirculation system

End-deflector recirculation system has features of high-speed, low-noise operation and compact ball nut. The structure of recirculation system is shown in **Fig.1**.

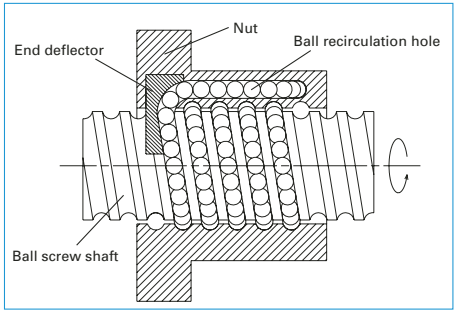


Fig. 1 Structure of end-deflector recirculation system

(2) Accuracy grade and axial play

The available standard accuracy grade and axial play are as follows. Please consult NSK for other grades.

Table 1 Accuracy grade and axial play

Accuracy grade	C5
Axial play	0 mm (preloaded)

(3) Allowable d·n value and the criterion of maximum rotational speed

Allowable d·n value and the criterion of maximum rotational speed are shown below. Please consult NSK if the rotational speed exceeds the permissible range below.

Allowable d·n value: 180 000 or less

Criterion of maximum rotational speed

: 4 000 min^{-1}

Note: Please also review the critical speed. See "Technical Description: Permissible Rotational Speed" (page B47) for details.

(4) Options

Optional NSK K1 lubrication unit, molded from resin and impregnated with lubrication oil, supplies fresh oil onto ball rolling surface, ensuring long-term, maintenance-free operation. Please consult NSK when using NSK K1.

3. Design Precautions

When designing the screw shaft end, one end of the shaft must meet either one of the following conditions. If not, we cannot install the ball nut on the screw shaft.

- Cut the ball groove through to the shaft end.
- The diameters of bearing journals and the gear or pulley seat must be less than the root diameter of ball groove "dr" specified on the dimension table.

Special bearings which have higher-load carrying capacity are available.

For general precautions regarding ball screws, refer to "Design Precautions" (page B83) and "Handling Precautions" (page B103).

4. Product categories

The BSL type has a model as follows.

Table 2 BSL type product categories

Nut model	Shape	Flange shape	Preload system
BSL		Circular Ⅲ	P-Preload (Slight preload)

5. Structure of model number and reference number

The followings describe the structure of "Model number" and "Reference number for ball screw".

◇Model number

BSL 20 05

- BSL — Nut model: BSL
- 20 — Screw shaft diameter (mm)
- 05 — Lead (mm)

◇Reference number for ball screw

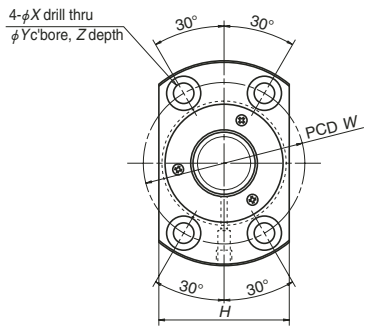
W 20 05 - ** P SS - C5 Z 5

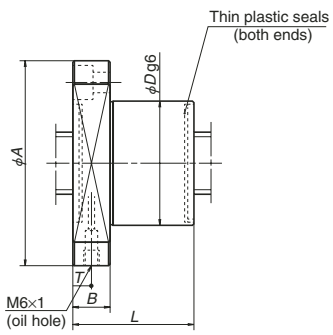
- W — Product code
- 20 — Screw shaft diameter (mm)
- 05 — Effective threaded length (in the unit of 100 mm)
- ** — NSK design serial number
- P — Preload code: P; P-preload (page B5)
- SS — End-deflector recirculation system
- C5 — Accuracy grade: C5 (page B37 to B42)
- Z — Axial play code: Z (page B20)
- 5 — Lead (mm)

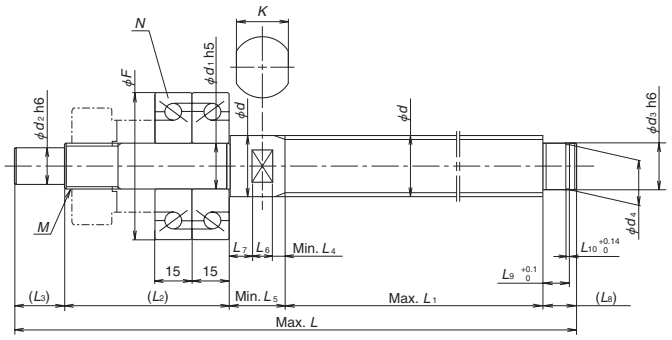
6. Handling Precautions

Maximum operating temperature: 80°C

If using NSK K1, operating temperature should not exceed 50°C. Refer to "Designing Precautions" (page B83).







Unit: mm

Model No.	Shaft dia.	Lead	Root dia.	Basic load rating (N)		Ball nut dimensions										
						External dimensions					Bolt hole dimensions				Oil hole	
	d	l	d_r	C_a	C_{0a}	D	A	H	B	L	W	X	Y	Z	T	d_1
BSL2005	20	5	17.2	8 920	16 300	36	63	38	12	37	49	6.6	11	6.5	6.5	15
BSL2006		6	16.4	11 900	20 000	40	65	42		45	51				6.7	
BSL2505	25	5	22.2	9 900	20 500	40	65	42	12	38	51	6.6	11	6.5	7.1	20
BSL2506		6	21.4	13 300	25 200	43	69	45		44	55				6.3	
BSL2508		8	20.5	17 100	30 100	46	72	48		55	58				6.5	
BSL2510		10	20.5	17 100	30 100	46	72	48		65	58				6	
BSL3210	32	10	26.4	27 700	51 300	61	93	63	18	68	76	9	14	8.5	10	25
BSL3212		12								77						

Shaft configuration and dimensions (reference)																							Exclusive bearing N		Basic dynamic load rating	Permissible axial load
Shaft dimension																							Bearing reference number			
d_2	d_3	d_4	L (max.)	L_1 (max.)	L_2	L_3	L_4 (min.)	L_5 (min.)	L_6	L_7	L_8	L_9	L_{10}	K	M		F	C_a	(N)
12	15	$14.3^{0}_{-0.11}$	500	500	66	20	3	20	8	9	14	10.15	1.15	17	M15×1.0	15TAC47B	47	21 900	26 600
							4	21											
15	20	$19^{0}_{-0.21}$	700	700	71	27	3	27	10	14	19	15.35	1.35	22	M20×1.0	20TAC62B	62	28 500	40 500
							4	28											
							5	29											
							5	29											
20	25	$23.9^{0}_{-0.21}$	1 000	800	71	33	6	33	12	15	20	16.35	1.35	27	M25×1.5	25TAC62B	62	28 500	40 500
							7	34											

Notes: 1. The right turn screw is the standard. Please consult NSK for left turn screw.
2. Shaft dimensions are for reference.
3. Shaft length L_1 and shaft entire length L are the maximum length.
When L becomes the same length as the L_1, the thread is all screw specification.

B-3-3.5.1 HTF-SRC Type for High-Load Drives

1. Features

● High-speed operation and low noise

The SRC recirculation system contributes to more than twice the feed speed (d·n value: 140 000 and 160 000) and the noise level of less than 8 to 10 dB (half to 1/3 of noise) compared with the HTF type.

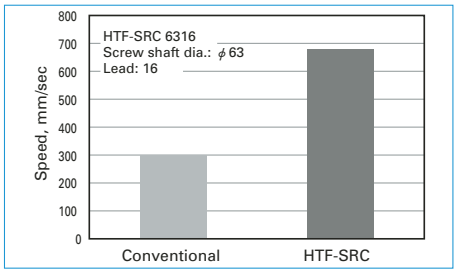


Fig. 1 Feed speed comparison

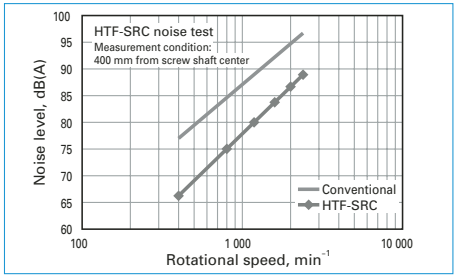


Fig. 2 Noise level comparison

2. Specifications

(1) Ball recirculation system

The SRC recirculation system picks up balls in the direction they are moving, and thus contributed to high-speed, low-noise operation. Structure of the recirculation system is as follows.

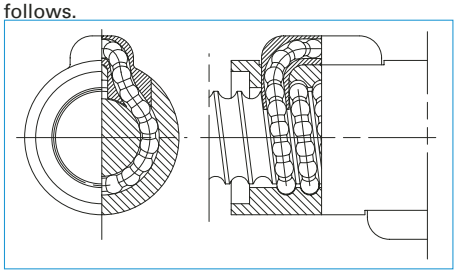


Fig. 3 Structure of SRC recirculation system

(2) Accuracy grade and axial play

The available standard accuracy grade and axial play are as follows. Please consult NSK for other grades.

Table 1 Accuracy grade and axial play

Accuracy grade	Ct7
Axial play	S,0.020 mm or less; N,0.050 mm or less

(3) Allowable d·n value and the criterion of maximum rotational speed

Allowable d·n value and the criterion of maximum rotational speed are shown below. Please consult NSK if the rotational speed exceeds the permissible range below.

Table 2 Allowable d·n value and the criterion of maximum rotational speed

Lead	14, 16 mm	20, 25 mm☆
Allowable d·n value	160 000 or less	140 000 or less
Criterion of maximum rotational speed	3 225 min^{-1}	

d·n value: shaft dia. d [mm] × rotational speed n [min^{-1}]
☆ Allowable d · n value for HTF-SRC5020: 160 000

Note: Please also review the critical speed. See "Technical Description: Permissible Rotational Speed" (page B47) for details.

(4) Ball retaining piece NSK S1™

The NSK S1, resin retainers between the balls, significantly extend ball screw durability to the moment load.

(5) Other

Please consult NSK for special requests, such as the addition of a recirculation circuit to increase the load capacity, or the arrangement of all recirculation circuits on the same phase of ball nut circumference.

3. Design Precautions

The HTF-SRC type is designed to distribute the load uniformly to the load balls for high-load drive mechanism. We recommend installing the ball screws in the way shown below for the full use of this characteristic.

In addition, we will make full analysis when you use the HTF-SRC type under extreme conditions such as application of extremely high load or operating in short stroke. Contact NSK about operating conditions (See page B529).

When designing the screw shaft end, one end of the screw shaft must meet either one of the following conditions. If not, we cannot install the ball nut on the screw shaft.

- Cut the ball groove through to the shaft end.
- The diameters of bearing journals and the gear or pulley seat must be less than the root diameter of ball groove "dr" specified on the dimension table.

For general precautions regarding ball screws, refer to "Design Precautions" (page B83) and "Handling Precautions" (page B103).

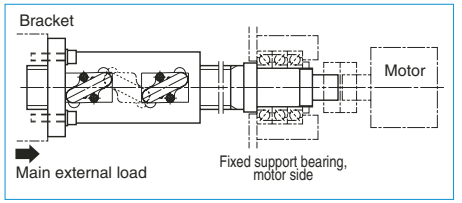


Fig. 4 Recommended installing direction of high-load drive ball screw

4. Product categories

The HTF-SRC type has a model as follows.

Table 3 HTF-SRC type product categories

Nut model	Shape	Flange shape	Preload system
HTF-SRC		Flanged Circular I	Non-preload Slight axial play

5. Structure of model number and reference number

The followings describe the structure of "Model number" and "Reference number for ball screw".

◇Model number

HTF-SRC 63 20 - 7.5

- HTF-SRC: Nut model: HTF-SRC
- 63: Screw shaft diameter (mm)
- 20: Lead (mm)
- 7.5: Effective turns of balls

◇Reference number for ball screw

W 63 04 - ** RC SP - C7 S 20

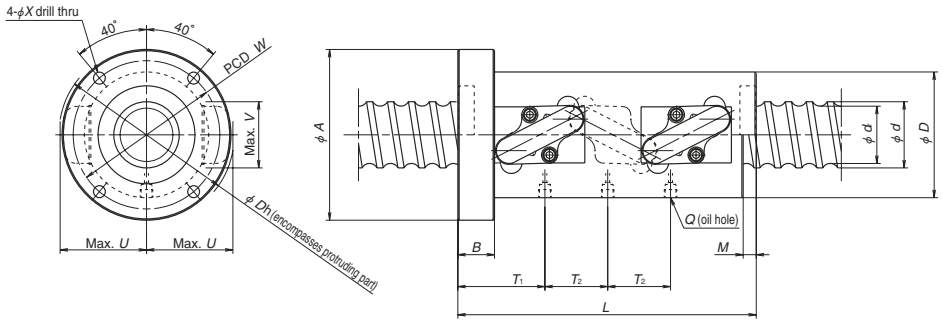
- W: Product code
- 63: Screw shaft diameter (mm)
- 04: Effective threaded length (in the unit of 100 mm)
- **: NSK design serial number
- RC: SRC recirculation system
- SP: Ball retaining pieces NSK S1 specification
- C7: Accuracy grade: C7 (Ct7) (page B37 to B42)
- S: Axial play code: S, N (page B20)
- 20: Lead (mm)

6. Handling Precautions

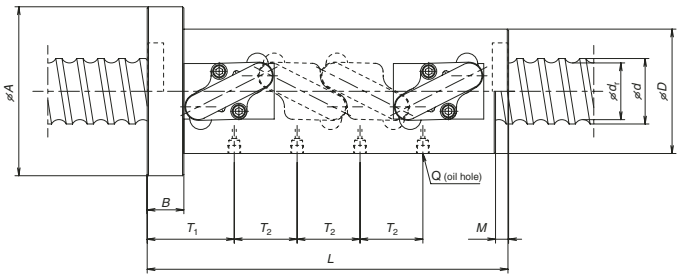
Maximum operating temperature: 70°C
(at outside diameter of ball nut)

The lubricant deteriorates, operating temperature is recommended 60°C and under.

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.



Nut model Ⅰ



Nut model Ⅱ

Unit: mm

Model No.	Shaft dia.	Lead	Root dia.	Effective turns of balls Turns × Circuits	Nut model	Basic load rating (kN) Dynamic	Basic load rating (kN) Static	Allowable axial load
	d	*l*	d_r			C_a	C_{0a}	(kN)
HTF-SRC5014-7.5	50	14	41.6	2.5×3	Ⅰ	211	623	73.1
HTF-SRC5016-7.5		16	39	2.5×3		306	818	91.1
HTF-SRC5020-7.5		20	39	2.5×3		306	818	91.0
HTF-SRC6316-7.5	63	16	52	2.5×3	Ⅰ	343	1 050	119
HTF-SRC6316-10				2.5×4	Ⅱ	439	1 410	159
HTF-SRC6316-10.5				3.5×3	Ⅰ	450	1 450	167
HTF-SRC6316-14				3.5×4	Ⅱ	576	1 930	215
HTF-SRC6320-7.5		20	49	2.5×3	Ⅰ	457	1 280	147
HTF-SRC6320-10				2.5×4	Ⅱ	586	1 710	196
HTF-SRC6325-10.5		25	49	3.5×3	Ⅰ	600	1 770	170
HTF-SRC8016-10.5	80	16	69	3.5×3	Ⅰ	501	1 870	221
HTF-SRC8016-14				3.5×4	Ⅱ	642	2 490	295
HTF-SRC8020-10.5		20	66	3.5×3	Ⅰ	671	2 300	267
HTF-SRC8025-7.5		25	63	2.5×3	Ⅰ	632	1 960	221
HTF-SRC10020-10.5	100	20	86	3.5×3	Ⅰ	749	2 910	346
HTF-SRC10020-14				3.5×4	Ⅱ	959	3 890	461
HTF-SRC10025-10.5		25	83	3.5×3	Ⅰ	964	3 430	408
HTF-SRC10025-14				3.5×4	Ⅱ	1 230	4 580	544
HTF-SRC12020-7.5	120	20	106	2.5×3	Ⅰ	621	2 550	304
HTF-SRC12020-10				2.5×4	Ⅱ	795	3 400	406
HTF-SRC12025-10.5		25	103	3.5×3	Ⅰ	1 040	4 200	498
HTF-SRC12025-14				3.5×4	Ⅱ	1 330	5 600	664

Ball nut dimensions													Max. feeding speed
Nut length	Nut dia.	Flange dia.	Flange width	Seal width	Bolt hole PCD	Bolt hole size	Protruding tube dimensions			Oil hole	Oil hole position		
L	*D*	*A*	*B*	*M*	*W*	*X*	*U*	*V*	*Dh*	*Q*	T_1	T_2	(mm/sec)
202	80	114	28	10	97	9	54.5	46	111	M6×1	69	42	750
228	95	129			112		66	50	134	Rc1/8	74.5	48	860
268	95	129			112		66	50	134	Rc1/8	83.5	60	1 070
228	105	139	28	10	122	9	72.5	50	148	Rc1/8	74.5	48	680
276												48	
276												64	
340												64	
279	117	157	32	12	137	11	80	62	163		90	60	740
339													
405	117	157	32	12	137	11	81.5	61	167		101.75	100	930
278	120	154	32	10	137	9	80	60	165	Rc1/8	78.5	64	540
342													
339	130	170	32	12	150	11	88	64	180		90	80	590
347	145	185	40	17	165	11	99.5	73	202		111.75	75	730
339	145	185	32	12	165	11	97	78	199	Rc1/8	90	80	470
419													
422	159	199	40	17	179		108	79	220		111.75	100	590
522													
287	173	213	40	12	193	11	109.5	88	229	Rc1/8	98	60	390
347													
421				17	193		116	92	238		111.25	100	490
521													

Notes: 1. The right hand screw is the standard. For specifications on left hand screws, contact NSK.
2. The ball nut length with no seals is shorter by M than that length of a ball nut with seals.
3. Please consult NSK if load exceeds the allowable axial load.
4. The allowable axial load is determined in accordance with the mounting conditions of ball screws recommended by NSK (See page B512). If your mounting conditions differ from those provided, please consult NSK.

B-3-3.5.2 HTF-SRD Type for High-Load Drives

This product is being applied for a patent.

1. Features

● High-speed operation and low noise

Used with end deflectors, HTF-SRD type ball screws achieve the maximum feed speed of 1 600 mm/s. The ball nut body surface is completely round, thus enabling well balanced ball nut rotation.

Double start thread structure which has more recirculation circuits, and large diameter balls contribute to have high load carrying capacity.

● Low noise and compact design

End deflector system using a ball scooping mechanism in the direction of screw spiral offers smoother ball recirculation system, thus contributing to less than half the noise level compared with existing ball screws equipped with a return tube.

Compact, high-performance seal is available. Nut outside diameter is compact compare with the return tube recirculation system.

Also, compact, thin plastic seal is available. Nut outside diameter is compact compare with the return tube recirculation system.

2. Specifications

(1) Ball recirculation system

End-deflector recirculation system has features of high-speed, low-noise operation, and compact ball nut. The structure of recirculation parts are as follows.

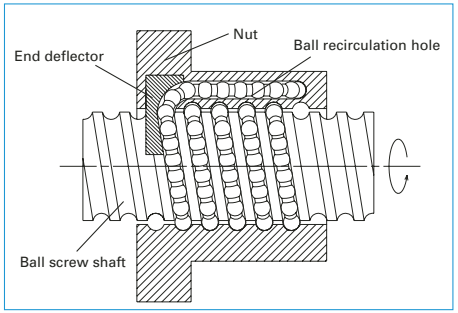


Fig. 1 Structure of End-deflector recirculation system

(2) Accuracy grade and axial play

The available standard accuracy grade and axial play are as follows. Please consult NSK for other grades.

Table 1 Accuracy grade and axial play

Accuracy grade	Ct7
Axial play	S, 0.020 mm or less; N, 0.050 mm or less

(3) Allowable d·n value and the criterion of maximum rotational speed

Allowable d·n value and the criterion of maximum rotational speed are shown below. Please consult NSK if the rotational speed exceeds the permissible range below.

Table 2 Allowable d·n value and the criterion of maximum rotational speed

Allowable d·n value	120 000 or less
Criterion of maximum rotational speed	2 400 min^{-1}

d·n value: shaft dia. d [mm] × rotational speed n [min^{-1}]

Note: Please also review the critical speed. See "Technical Description: Permissible Rotational Speed" (page B47) for details.

(4) Ball retaining piece NSK S1™

The NSK S1, resin retainers between the balls, significantly extend ball screw durability to the moment load.

3. Design Precautions

The HTF-SRD type is designed to distribute the load uniformly to the load balls for high-load drive mechanism. We recommend installing the ball screws in the way shown below for the full use of this characteristic.

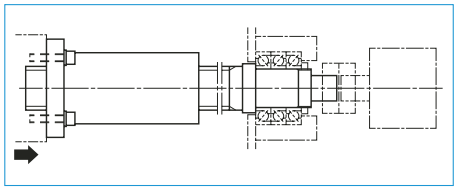


Fig. 2 Recommended installing direction of high-load drives ball screw

In addition, we will make full analysis when you use the HTF-SRD type under extreme conditions such as application of extremely high load or operating in short stroke. Contact NSK about operating conditions (see page B529).

When designing the screw shaft end, one end of the screw shaft must meet either one of the following conditions. If not, we cannot install the ball nut on the screw shaft.

- Cut the ball groove through to the shaft end.
- The diameters of bearing journals and the gear or pulley seat must be less than the root diameter of ball groove "dr" specified on the dimension table.

For general precautions regarding ball screws, refer to "Design Precautions" (page B83) and "Handling Precautions" (page B103).

4. Product categories

The HTF-SRD type has a model as follows.

Table 3 HTF-SRD type product categories

Nut model	Shape	Flange shape	Preload system
HTF-SRD		Circular Ⅲ	Non-preload Slight axial play

5. Structure of model number and reference number

The followings describe the structure of "Model number" and "Reference number for ball screw".

◇Model number

HTF-SRD 50 40 - 6E

- HTF-SRD: Nut model: HTF-SRD
- 50: Screw shaft diameter (mm)
- 40: Lead (mm)
- 6E: Effective turns of balls

◇Reference number for ball screw

W 50 18 - ** SS SP X - C7 N 40

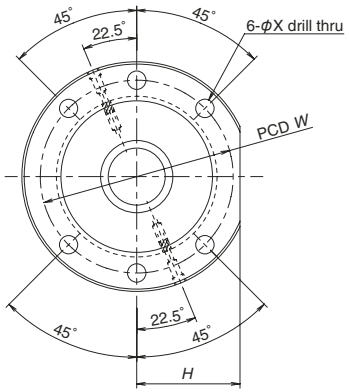
- W: Product code
- 50: Screw shaft diameter (mm)
- 18: Effective threaded length (in the unit of 100 mm)
- **: NSK design serial number
- SS: End-deflector recirculation system
- SP: Ball retaining pieces NSK S1 specification
- X: Ball screw specification/appearance
- C7: Accuracy grade: C7 (Ct7) (page B37 to B42)
- N: Axial play code: S, N (page B20)
- 40: Lead (mm)

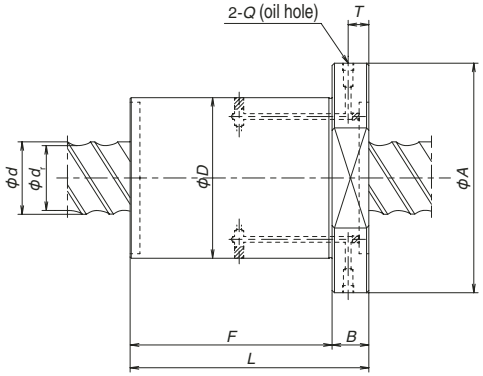
6. Handling Precautions

Maximum operating temperature: 70°C
(at outside diameter of ball nut)

The lubricant deteriorates, operating temperature is recommended 60°C and under.

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.





Unit: mm

Model No.	Shaft dia. d	Lead l	Root dia. d_r	Effective turns of balls	Basic load rating (kN) Dynamic C_a	Basic load rating (kN) Static C_{0a}	Allowable axial load (kN)
HTF-SRD5040-6E	50	40	39	6	195	491	67.6
HTF-SRD5040-8E				8	255	679	92
HTF-SRD6332-4E	63	32	49	4	233	590	72.6
HTF-SRD6340-6E		40		6	291	768	106
HTF-SRD6340-8E				8	381	1 060	144
HTF-SRD8050-6E	80	50	63	6	401	1 180	163
HTF-SRD8050-8E				8	526	1 630	224
HTF-SRD10060-6E	100	60	83	6	467	1 490	211
HTF-SRD10060-8E				8	612	2 060	288
HTF-SRD12070-6E	120	70	103	6	504	1 810	259
HTF-SRD12070-8E				8	660	2 520	352

Ball nut dimensions: Nut entire length L	Nut dia. D	Flange dia. A	Notch size H	Flange width B	Nut length F	Bolt hole PCD W	Bolt hole size X	Oil hole position T	Max. feeding speed (mm/sec)
159	115	165	72.5	28	131	140	14	16	1 600
199					171				
176	140	190	85	32	144	165	14	18	1 000
163		200	90		131	170	18		1 250
203					171				
194	175	250	110	40	154	210	22	18	1 250
244					204				
225	195	270	122	40	185	235	22	20	1 200
285					245				
260	210	285	130	50	210	250	22	25	1 160
330					280				

Notes: 1. The right hand screw is the standard. For specifications on left hand screws, contact NSK.
2. Please consult NSK if load exceeds the allowable axial load.
3. The allowable axial load is determined in accordance with the mounting conditions of ball screws recommended by NSK (See page B515). If your mounting conditions differ from those provided, please consult NSK.

B-3-3.5.3 HTF Type for High-Load Drives

This product is being applied for a patent.

1. Features

● High load carrying capacity

Has an ideal design to bear heavy load. It significantly enhances load rating as well as maximum permissible load.

● Abundant diameter / lead combinations

Twenty nine types of shaft diameter/lead combinations are available. Please consult NSK when you require other combination.

● Respond to various shaft end configuration

Additional ball screw shaft machining is not required. HTF type responds to various shaft ends that convey high torque.

HTF type can be used with: involute spline (JIS B 1603), straight sided spline (JIS B 1601), key seat, etc.

2. Specifications

(1) Ball recirculation system

Structure of recirculation system is shown in **Fig. 1**.

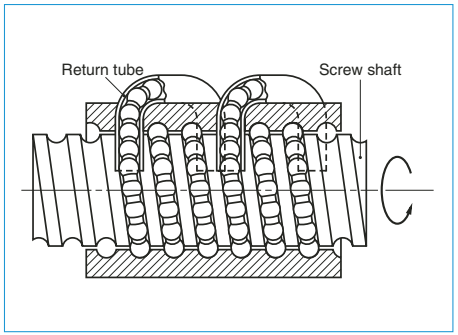


Fig. 1 Structure of return tube recirculation system

(2) Accuracy grade and axial play

The allowable standard accuracy grade and axial play are as follows. Please consult NSK for other grades.

Table 1 Accuracy grade and axial play

Accuracy grade	Ct7
Axial play	S, 0.020 mm or under; N, 0.050 mm or under

(3) Allowable d·n value and the criterion of maximum rotational speed

Allowable d·n value and the criterion of maximum rotational speed are shown below. Please consult NSK if the rotational speed exceeds the permissible range below. For higher-speed operation, HTF-SRC type is recommend (See page 511).

Table 2 Allowable d•n value and the criterion of maximum rotational speed

Lead		– 20 mm	25 mm	30 – 32 mm
Allowable d·n value	Standard specification	70 000 or less	70 000 or less	50 000 or less
	High-speed specification	10 0000 or less	–	–
Criterion of maximum rotational speed		3 125 min^{-1}		

d•n value: shaft dia. d [mm] × rotational speed n [min^{-1}]

Note: Please also review the critical speed. See "Technical Description: Permissible Rotational Speed" (page B47) for details.

(4) Ball retaining piece NSK S1™

The NSK S1, resin retainers between the balls, significantly extend ball screw durability to the moment load.

(5) Other

Please consult NSK for special requests, such as the addition of a recirculation circuit to increase the load capacity, or the arrangement of all recirculation circuits on the same phase of ball nut circumference.

3. Design precautions

For designing shaft end configuration, you should take into account that the HTF type ball screws are dedicated to high-load drives.

The HTF type is designed to distribute the load uniformly to the load balls for high load drive mechanism.

We recommend installing the ball screws in the way shown in **Fig. 2** for the full use of this characteristic. In addition, we will make full analysis when you use the HTF type under extreme conditions such as application of extremely high load or operating in short stroke. Contact NSK about operating conditions (See page B529).

For general precautions regarding ball screws, refer to "Design Precautions" (page B83) and "Handling Precautions" (page B103).

4. Product categories

The HTF type has a model as follows.

Table 3 HTF type product categories

Nut model	Shape	Flange shape	Preload system
HTF		Flanged Circular I	Non-preloaded Slight axial play

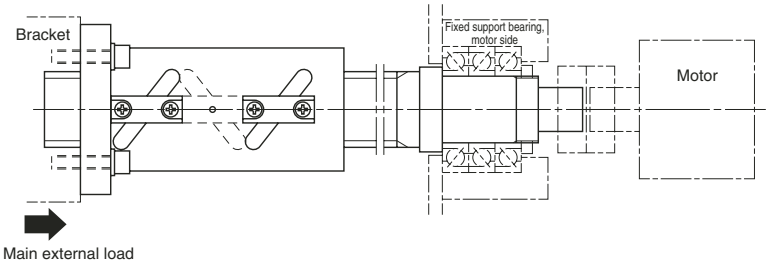
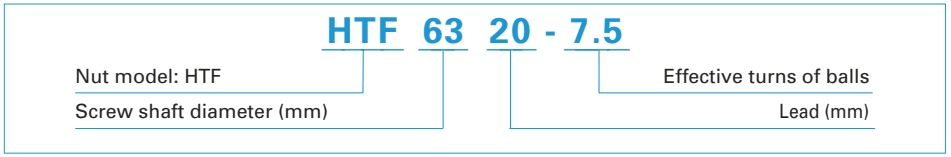


Fig. 2 Recommended installing direction of ball screws for high-load drives

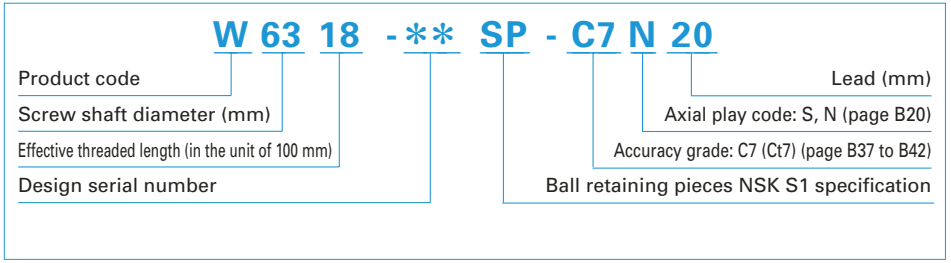
5. Structure of model number and reference number

A structure of "Model number" and "Reference number for ball screw" are as follows.

◇Model number

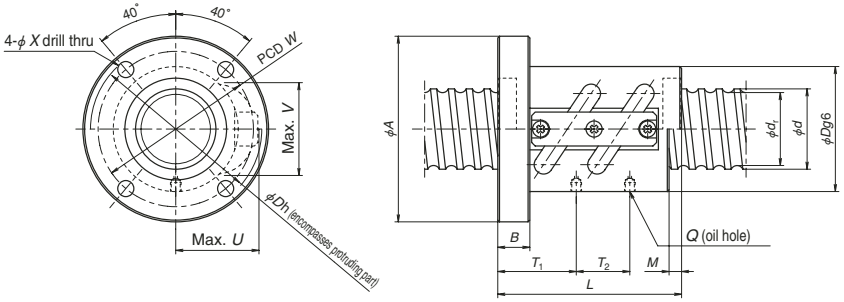


◇Reference number for ball screw

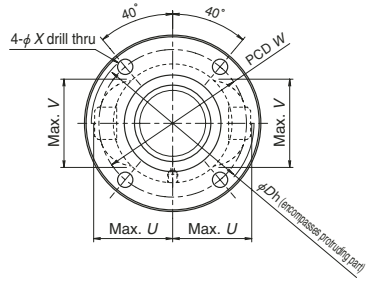


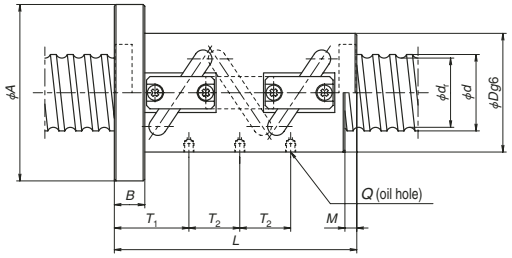
6. Handling precautions

Maximum operating temperature : 70°C
(at outside diameter of all nut)
The lubricant deteriorates, operating temperature is recommended 60°C and under.
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.

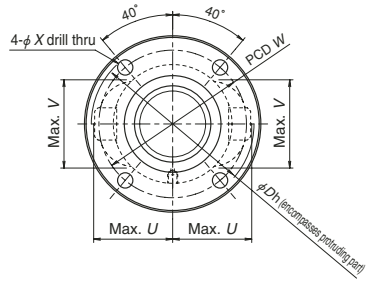


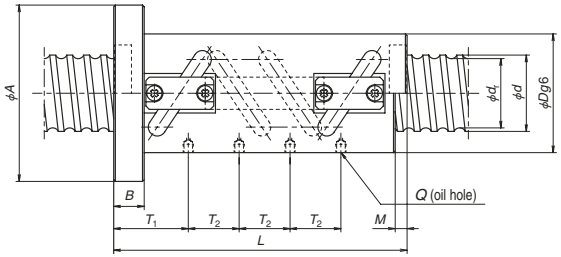
Nut model I





Nut model II





Nut model III

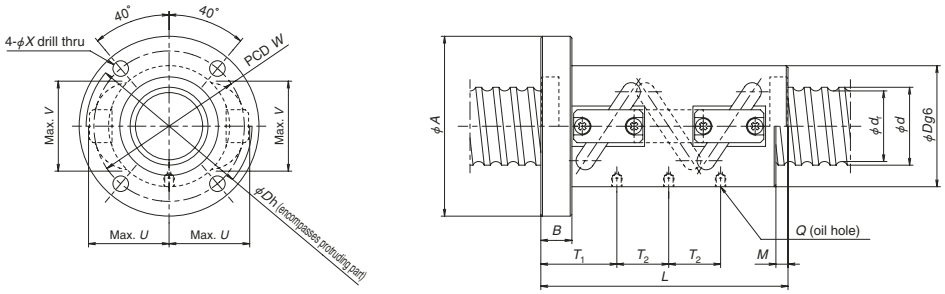
Unit: mm

Model No.	Shaft dia. d	Lead l	Root dia. d_r	Effective turns of balls Turns × Circuits	Nut model	Basic load rating (kN) Dynamic C_a	Basic load rating (kN) Static C_{0a}	Allowable axial load (kN)
HTF3210-5	32	10	25.6	2.5×2	Ⅰ	71	169	20.3
HTF3610-5	36	10	29.6	2.5×2	Ⅰ	76.9	191	23.4
HTF3612-5		12	29			90	228	28.3
HTF4010-7.5	40	10	33.6	2.5×3	Ⅱ	120	344	39.6
HTF4012-7.5		12	33	2.5×3	Ⅱ	147	422	48.0
HTF4510-7.5	45	10	38.6	2.5×3	Ⅱ	127	386	45.3
HTF4510-10				2.5×4	Ⅲ	162	514	60.4
HTF4512-7.5		12	38	2.5×3	Ⅱ	156	473	55.0
HTF14020-7.5	140	20	126	2.5×3	Ⅱ	663	3 000	361
HTF14020-10				2.5×4	Ⅲ	849	4 000	481
HTF14025-7.5		25	124	2.5×3	Ⅱ	842	3 610	423
HTF14025-10				2.5×4	Ⅲ	1 080	4 810	564
HTF14025-10.5				3.5×3	Ⅱ	1 100	4 910	595
HTF14025-14				3.5×4	Ⅲ	1 410	6 540	793

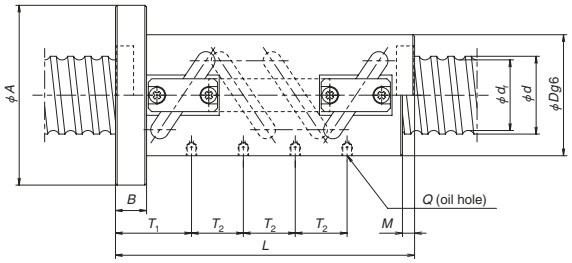
See HTF-SRC type (page B511) regarding shaft diameter 50 - 120 mm. Consult NSK for shaft diameter and lead except HTF-SRC type.

Ball nut dimensions: Nut length L	Nut dia. D	Flange dia. A	Flange width B	Seal width M	Bolt hole PCD W	Bolt hole size X	Protruding tube dimensions U	Protruding tube dimensions V	Protruding tube dimensions Dh	Oil hole Q	Oil hole positions T_1	Oil hole positions T_2	Max. feeding speed (mm/sec)
103	58	92	18	7	75	9	40.5	42	82	M6×1	36.5	30	520
103	62	96	18	7	79	9	43	45	87	M6×1	36.5	30	460
123	66	100	22	8	83		46.5	46	94		44	36	550
143	66	100	18	7	83	9	45	48	91	M6×1	46.5	30	410
171	70	104	22	8	87	9	47.5	50	96	M6×1	56	36	500
143	70	104	18	7	87	9	47	52	95	M6×1	46.5	30	370
173													
171	72	106	22	8	89		49.5	54	100		56	36	440
281	204	250	40	12	226	14	122.5	148	248	Rc1/8	96	60	230
341													
338	204	250	40	17	226	14	127.5	153	258	Rc1/8	109.25	75	200
413												75	
413												100	
513												100	

Notes: 1. The right hand screw is the standard. "L" is added to the end of the model code for the left turn screw.
2. If there is no seal, the nut length is shorter by the lengths of "M" than those with a seal.
3. Please consult NSK if load exceeds the allowable axial load.
4. The allowable axial load is determined in accordance with the mounting conditions of ball screws recommended by NSK (see page B520). If your mounting conditions differ from those provided, please consult NSK.



Nut model Ⅱ



Nut model Ⅲ

Unit: mm

Model No.	Shaft dia. d	Lead l	Root dia. d_1	Effective turns of balls Turns × Circuits	Nut model	Basic load rating (kN) Dynamic C_a	Basic load rating (kN) Static C_{0a}	Allowable axial load (kN)
HTF14030-7.5	140	30	121	2.5×3	Ⅱ	1 050	4 110	487
HTF14030-10				2.5×4	Ⅲ	1 340	5 490	649
HTF14030-10.5				3.5×3	Ⅱ	1 370	5 710	678
HTF14032-7.5		32	118	2.5×3	Ⅱ	1 270	4 740	549
HTF14032-10				2.5×4	Ⅲ	1 630	6 320	732
HTF14032-10.5				3.5×3	Ⅱ	1 670	6 420	757
HTF16025-7.5	160	25	144	2.5×3	Ⅱ	909	4 140	495
HTF16025-10				2.5×4	Ⅲ	1 160	5 520	660
HTF16030-7.5		30	141	2.5×3	Ⅱ	1 120	4 760	564
HTF16030-10				2.5×4	Ⅲ	1 430	6 340	752
HTF16030-10.5				3.5×3	Ⅱ	1 460	6 520	788
HTF16032-7.5		32	138	2.5×3	Ⅱ	1 330	5 370	636
HTF16032-10				2.5×4	Ⅲ	1 700	7 160	848
HTF16032-10.5				3.5×3	Ⅱ	1 750	7 460	885
HTF20030-7.5	200	30	181	2.5×3	Ⅱ	1 240	5 960	718
HTF20030-10				2.5×4	Ⅲ	1 590	7 950	958
HTF20032-7.5		32	178	2.5×3	Ⅱ	1 470	6 840	809
HTF20032-10				2.5×4	Ⅲ	1 890	9 120	1 080

Notes: 1. The right hand screw is the standard. "L" is added to the end of the model code for the left turn screw.
2. If there is no seal, the nut length is shorter by the lengths of "M" than those with a seal.

Ball nut dimensions													Max. feeding speed (mm/sec)
Nut length L	Nut dia. D	Flange dia. A	Flange width B	Seal width M	Bolt hole PCD W	Bolt hole size X	Protruding tube dimensions U	Protruding tube dimensions V	Protruding tube dimensions Dh	Oil hole Q	Oil hole positions T_1	Oil hole positions T_2	
411	222	282	50	22	252	18	139	160	281	Rc1/8	134.5	90	170
501												90	
501												120	
465	222	296	70	22	259	22	148	163	299		166.5	96	190
561												96	
561												128	
338	234	280	40	17	256	14	138	173	279	Rc1/8	109.25	75	180
413													
411		294	50	22	264	18	148	177	299		134.5	90	150
501												90	
501												120	
465		308	70	22	271	22	152	181	307		166.5	96	160
561												96	
561												128	
411	290	350	50	22	320	18	178	212	359	Rc1/8	134.5	90	120
501													
465		364	70		327	22	182	215	367		166.5	96	130
561													

3. Please consult NSK if load exceeds the allowable axial load.
4. The allowable axial load is determined in accordance with the mounting conditions of ball screws recommended by NSK (see page B520). If your mounting conditions differ from those provided, please consult NSK.

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

Made-to-order ball screw

Company name:	Date:
Section:	Person in charge:
Address:	

NSK sales office

Name of machine*1 : *Electric injection molding machine; 30-ton capacity* Application*2 : *Clamping axis*

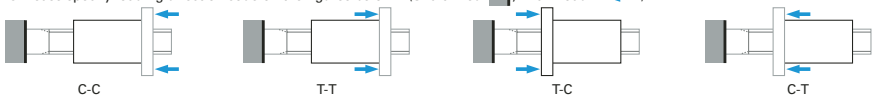
Drawing/rough sketch attached?: ☐ Yes ☑ No

*1 Please specify capacity of the machine in case of injection molding machine or press.
*2 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: *High-load grease with an extreme pressure additive*) ☐ Oil (Maker:)	How to replenish lubricant	☑ Grease gun ☐ Automatic (cm³/ cycles)
Request for oil hole	☑ NSK recommended ☐ Your request		
Necessity of seals	☑ Yes ☐ No	NSK S1 necessary?	☑ NSK recommended ☐ Not necessary
Environment	Temperature (*40* deg)	Particles / ☐ Yes (Size of particle : a) -0.1, b) over 0.1-0.3, 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	*1* pcs./machine

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

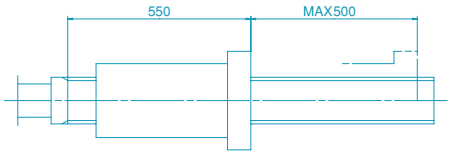


2. Specifications

Shaft diameter	*ϕ140* mm	Lead	*32* mm	Accuracy grade	*Ct7*	Axial play	*0.050 or less* mm max.
Nut model No.	*HTF 14032-7.5-S1*	Effective turns of balls	*2.5 × 3*	Direction of turn	*right*	Thread length /Overall shaft length	*1000* / *1500*

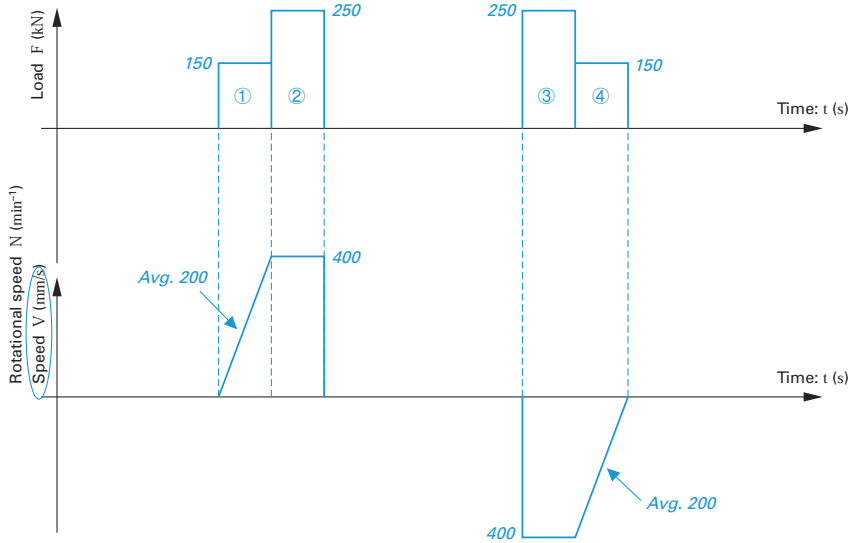
Special note / Requests

See nut stroke on the drawing



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

3. Load chart



	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: *2500h*

*If you use 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 December 2013*)
- 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.

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

Made-to-order ball screw

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

Name of machine*1 : _____ Application*2 : _____

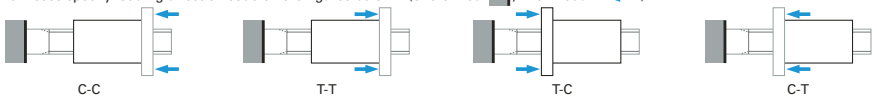
Drawing/rough sketch attached?: ☐ Yes ☐ No

*1 Please specify capacity of the machine in case of injection molding machine or press.
*2 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 (cm³/ 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) -0.1, b) over 0.1-0.3, 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: ←)



C-C (NSK recommended) T-T T-C C-T

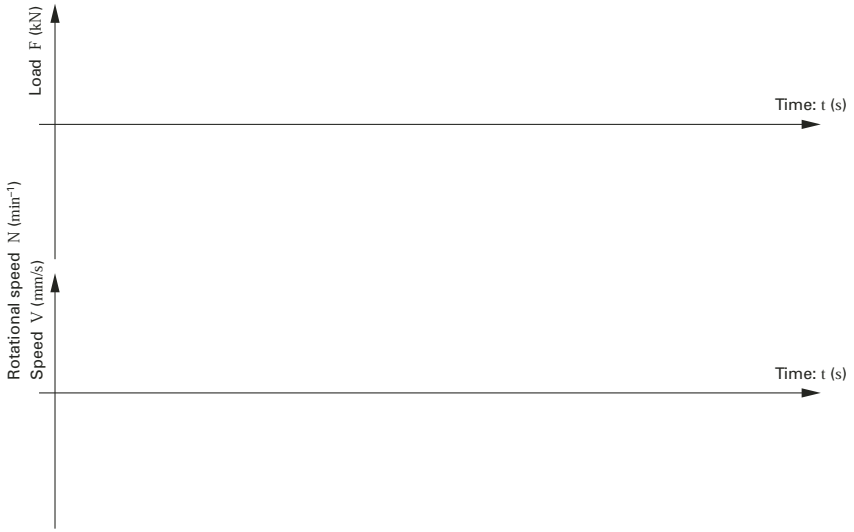
2. Specifications

Shaft diameter	ϕ 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 Screws

3. Load chart



	Axial load* F (kN)	Rotational speed or Average speed N (min⁻¹)	Rotational speed or Average speed 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:

*If you use 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.

B-3-3.6.1 VSS Type for Contaminated Environments

1. Features

● High dust-resistance

Specially profiled screw shaft grooves and high performance seals prevent the entry of fine contaminants. Reduces particle penetration rate to less than 1/15 of existing standard products.

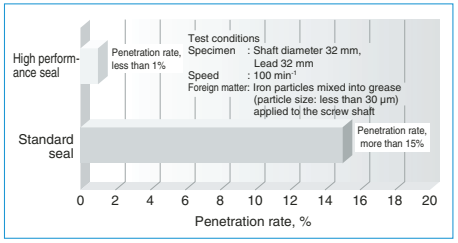


Fig. 1 Particle penetration rate

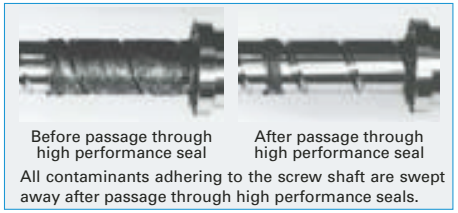


Fig. 2 Contamination before and after particle penetration test

● Long life

High performance seals extend ball screw durability under severely contaminated environments with iron powder.

Extreme durability tests under contaminated environments show the durability of the VSS type extends more than four times longer than our existing type with a standard seal.

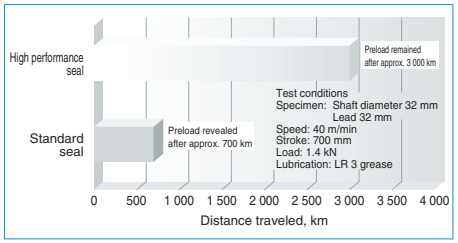


Fig. 3 Extreme durability test results using iron particles

● High speed

For ultimate smoothness of ball recirculation, the internal ball recirculation system enables high-speed operation at a maximum of d·n 150 000. Large lead specifications allow high-speeds of 150 m/min.

● Low-noise

Reduces noise level by more than 6 dB compared with our conventional tube-type ball screws, thereby providing low-noise and good noise tone features.

● Compact size

Ball nut external diameter is up to 25% smaller than our conventional models.

2. Specifications

(1) Ball recirculation system

End-deflector recirculation system has features of high-speed operation with low-noise, and compact ball nut. The structure of recirculation system is shown in **Fig. 4**.

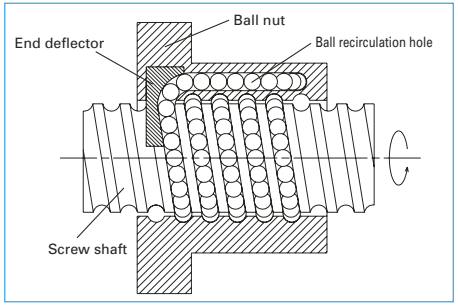


Fig. 4 Structure of end deflector recirculation system

(2) Accuracy grade and axial play

The available standard accuracy grade and axial play are as follows. Please consult NSK for other grades.

Table 1 Accuracy grade and axial play

Accuracy grade	C5
Axial play	Z, 0 mm (preloaded)
	T, 0.005 mm or less; S, 0.020 mm or less

(3) Allowable d·n value and the criterion of maximum rotational speed

Allowable d·n value and the criterion of maximum rotational speed are shown below. Please consult NSK if the rotational speed exceeds the permissible range below.

Allowable d·n value: 150 000 or less

Criterion of maximum rotational speed: 3 000 min^{-1}

Note: Please also review critical speed. See "Technical Description: Permissible Rotational Speed" (page B47) for details.

(4) High performance seal

High performance seal (Japanese patents: 3646452, 3692203) with special lip that contacts screw shaft cross-section and prevents entry of fine contaminants.

(5) Lubrication unit

Incorporates NSK K1 lubrication unit to sufficiently lubricate the high performance seal lip, reduce friction, and improve durability.

(6) optional

Non-contact metal protector that traces the ball screw grooves and safeguards the seal against high-temperature foreign matter.

3. Design precaution

When designing the screw shaft end, one end of the screw must meet either one of the following conditions. If not, we cannot install the ball nut on the screw shaft.

- Cut the ball groove through to the shaft end.
- The diameters of bearing journals and the gear or pulley seat must be less than the root diameter of ball groove "dr" specified on the dimension table.

High performance seals may increase torque, which may in turn increase temperature. Please consult with NSK prior to usage under severe service conditions.

For general precautions regarding ball screws, refer to "Design Precautions" (page B83) and "Handling Precautions" (page B103).

4. Structure of model number and reference number

The followings describe the structure of "Model number" and "Reference number for ball screw".

◇Model number

VSS 32 10 - 6E

- VSS — Nut model: VSS
- 32 — Screw shaft diameter (mm)
- 10 — Lead (mm)
- 6E — Effective turns of balls

◇Reference number for ball screw

W 36 12 - ** P SS V1 - C5 Z 10

- W — Product code
- 36 — Screw shaft diameter (mm)
- 12 — Effective threaded length (in the unit of 100 mm)
- ** — Design serial number
- P — Preload code: P; P-Preload (page B5)
- SS — End-deflector recirculation system
- V1 — High performance seal V1
- C5 — Accuracy grade: C5 (page B37 to B42)
- Z — Axial play: Z, T, S (page B20)
- 10 — Lead (mm)

5. Handling Precautions

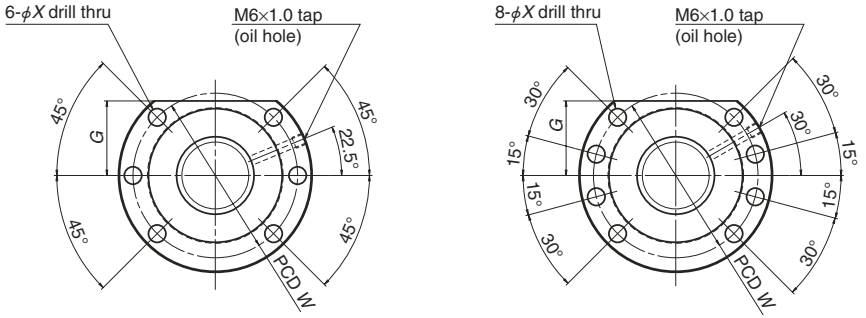
Maximum operating temperature: 50˚C

Maximum momentary operating temperature: 80˚C

Chemical precautions: Never expose the ball screw to grease-removing organic solvents such as hexane or thinner. Never immerse the ball screw in kerosene or rust preventive oils which contain kerosene.

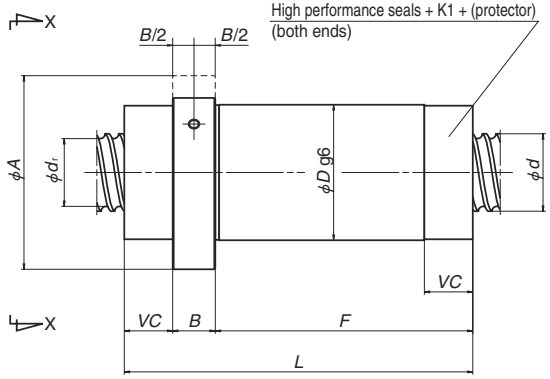
The data shown in the catalog are the results of our tests, and no warranty is given to sealing performance on actual usage on machinery. Sealing performance is affected by usage environment and lubrication conditions. Dust covers and other measures to keep machinery free of dust are recommended.

View *X-X*



Screw shaft diameter $d = 32$ mm

Screw shaft diameter $d \geq 40$ mm



Unit: mm

Model No.	Shaft dia. *d*	Lead *l*	Root dia. d_r	Effective turns of balls	Basic load rating (N) Dynamic C_a	Basic load rating (N) Static C_{0a}	Axial rigidity *K* (N/μm)
VSS3210-6E	32	10	27.2	6	43 300	111 000	682
VSS3216-5E		16		5	36 700	90 800	563
VSS3220-5E		20		5	36 700	90 800	561
VSS3232-4E		32		4	25 000	58 300	387
VSS4040-4E	40	40	34.4	4	33 600	83 900	472
VSS5050-4E	50	50	44.4	4	37 300	105 000	559

Notes: 1. The right hand screw is the standard. For specifications on left hand screws, contact NSK.
2. Rigidity in the table is theoretical value obtained from the elastic deformation between screw groove and ball when the preload is 1.5% of the basic dynamic load rating, and axial load is applied to it. Refer to "Technical Description" (page B37) if axial load and preload differs from the conditions above, or when considering change in the deformation of the ball nut itself.
3. Products with axial play may have a partially negative play (preloaded condition) depending on screw length. Refer to "Manufacturing range of effective screw length in combination of accuracy grade and axial play" (page B20).

Ball nut dimensions									Maximum shaft length
Nut entire length *L*	Nut outside diameter *D*	Flange outside diameter *A*	Flange width *B*	Nut length *F*	Notch size *G*	Seal installation dimensions *VC*	Bolt hole PCD *W*	Bolt hole dimensions *X*	
132	56	86	18	89.5	34	24.5	71	9	2 800
150				107.5					
169				126.5					
122				79.5					
144	70	100	22	94	38.5	27.5	85	9	3 800
164	82	118	22	114.5	46.0	27.5	100	11	5 000

B-3-3.6.2 Ball Screw with X1 Seals for Contaminated Environments and Grease Retention

1. Features

● Highly dustproof

Particle penetration ratio reduced to less than 1/30 of existing standard seals, thus contributing to longer service life for machine tools.

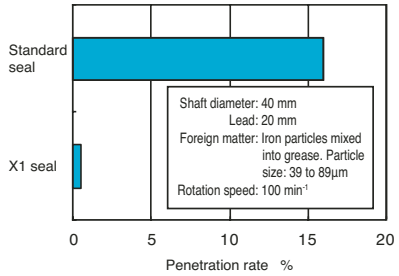


Fig. 1 Results of particle penetration rate test

● Superior grease retention

Automatically adding grease makes it possible to reduce the amount used and keep it from spattering.

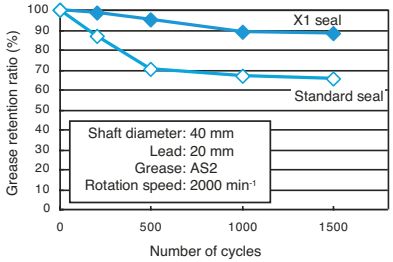


Fig. 2 Results of grease leakage test

● Contact seal with low torque

Optimizing the seal shape reduces torque and enhances seal performance.

2. Specifications

(1) Structure

The ball screw with X1 seals has a double seal structure combining a dustproof seal and a grease-retaining seal.

Fig. 3 Seal structure

(2) Scope of application in NSK Ball Screw series

This series is standard for the following two types.

Ball screws for high-speed machine tools	HMS type Nut model: ZFRC
	HMD type Nut model: EM

For specifications other than the above, please consult NSK. Table 1 shows the minimum nut outer diameter on which X1 seals can be mounted.

Table 1 The minimum nut outer diameter on which X1 seals can be mounted

Shaft diameter: 40 mm	70 mm
Shaft diameter: 45 mm	75 mm
Shaft diameter: 50 mm	82 mm

(3) Accuracy grade / axial play

Table 2 shows standard tolerance classes and axial clearances. Please consult NSK for tolerance classes other than those in the table.

Table 2 Accuracy grade and axial play

Accuracy grade	C3, C5
Axial play	0 mm (preloaded)

(4) Design-related precautions

When designing the screw shaft end, assume that the end of the screw shaft is cut.

The temperature will increase somewhat when torque is applied if an X1 seal is attached. Please consult NSK if it is to be used under strict operating conditions.

Maximum overall shaft length is 2900 mm.

For general precautions regarding ball screws, refer to "Design Precautions" (page B83) and "Handling Precautions" (page B103).

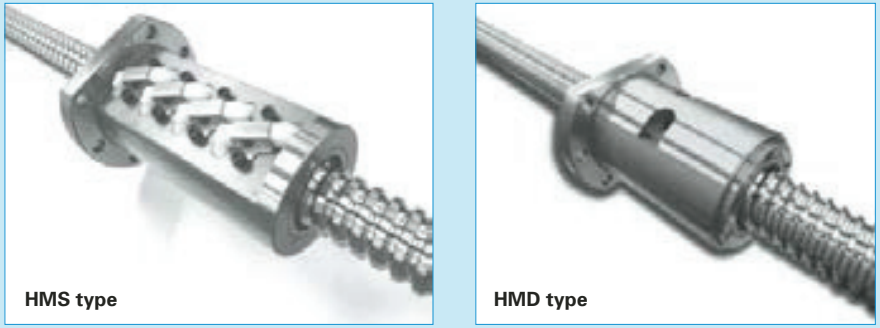


Fig. 4 External appearance

3. Example of reference number

A structure of "Reference number for ball screw" is as follows.

Note: "X1" is added at the end of "nut model code" and "Specifications number".

◇Reference number for ball screw

W4010-＊＊ZMX1-C5Z16

X1 seal equipped type ball screw code

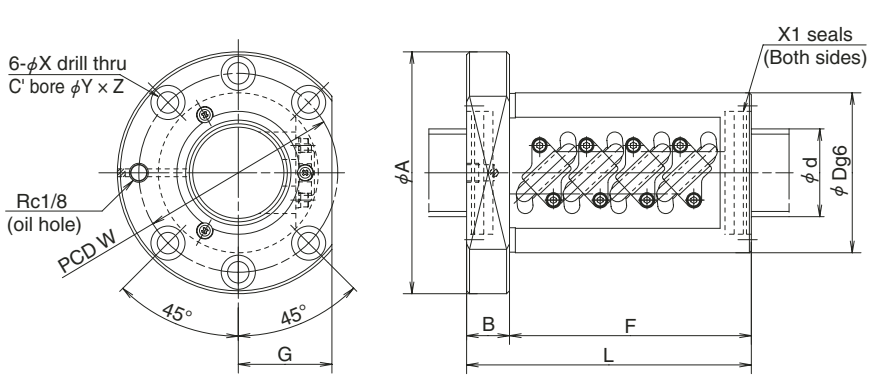
4. Precautions for use

Temperature range for use: Maximum temperature: 60°C (at outside diameter of ball nut)

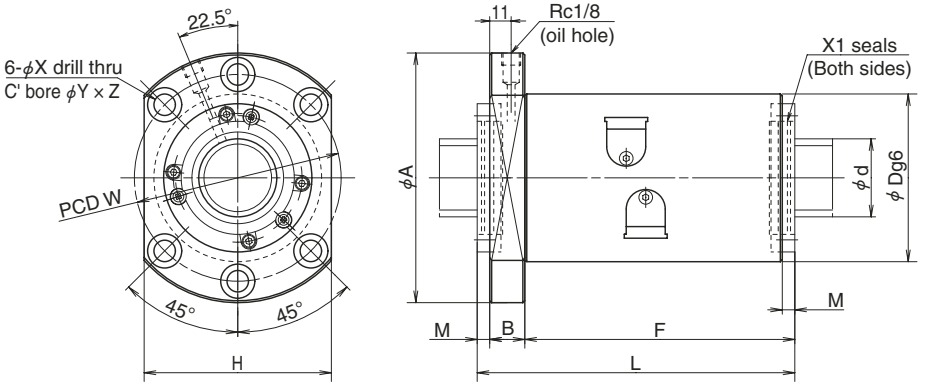
Chemicals that should not come to contact:

Do not leave ball screw in organic solvent, white kerosene such as hexane, thinner which removes oil, and rust preventive oil which contains white kerosene.

The data shown in the catalog are the results of our tests, and no warranty is given to sealing performance on actual usage on machinery. Sealing performance is affected by usage environment and lubrication conditions. Dust covers and other measures to keep machinery free of dust are recommended.



HMS type (Nut model : ZFRC)



HMD type (Nut model: EM)

Applicable dimensions for HMS type

Unit: mm

Model No.	Shaft dia.	Lead	Basic load rating (N)		Nut dimensions									
			Dynamic	Static							Bolt holes			
	d	*l*	C_a	C_{0a}	*L*	*F*	*B*	*D*	*A*	*G*	*X*	*Y*	*Z*	*W*
ZFRC4010-10	40	10	52 000	137 000	173	151	22	82	124	47	11	17.5	11	102
ZFRC4012-10		12	61 000	155 000	197	175		86	128	48				106
ZFRC4508-10	45	8	37 300	118 000	146	124	22	82	124	47	11	17.5	11	102
ZFRC5010-10	50	10	57 700	175 000	174	151	23	93	135	51	11	17.5	11	113
ZFRC5012-10		12	77 600	214 000	200	177		100	146	55	14	20	13	122

Note: 1.The right hand screw is the standard. For specifications on left hand screws, contact NSK.

Applicable dimensions for HMD type

Unit: mm

Model No.	Shaft dia.	Lead	Basic load rating (N)		Nut dimensions												
			Dynamic	Static								Bolt holes					
	d	*l*	C_a	C_{0a}	*L*	*F*	*M*	*B*	*D*	*A*	*H*	*X*	*Y*	*Z*	*W*		
EM4016-4E	40	16	57 100	130 000	172	148	6	18	86	128	96	11	17.5	11	106		
EM4020-6E		20	66 900	165 000	164	139	7										
EM4516-4E	45	16	59 600	145 000	173	148.5	6.5	18	92	134	102	11	17.5	11	112		
EM4520-6E		20	69 100	186 000	164	139	7										
EM5016-4E	50	16	61 800	160 000	173	148.5	6.5	18	98	140	107	11	17.5	11	118		
EM5020-6E		20	73 200	206 000	164	139	7										

Note: 1.The right hand screw is the standard. For specifications on left hand screws, contact NSK.

B-3-3.7 TW Series for Twin-Drive Systems

(1) Features

Variations in the lead accuracy and preload torque between two ball screws, which consist of a unit of TW Series, are controlled, resulting improved travel accuracy and ball screw operating lifetime.

Fig. 1 shows measured variation in lead accuracy while **Fig. 2** displays an example of variation in thermal expansion between the two ball screws. **Fig. 3** is a schematic diagram comparing the travel accuracy between the TW Series and conventional model.

● High rigidity and long lifetime

Twin-drive systems are superior to single-drive systems in system rigidity, supporting the design of long-life feeding mechanism even if they make the shaft diameter one size smaller.

● High responsiveness to positioning commands

Twin-drive systems permit the use of screw shaft diameters that are one size smaller, thereby reducing screw shaft inertia by up to 50%, offering high responsiveness to positioning commands.

● Improved high-speed capability and noise level

Twin-drive systems allow the use of smaller screw diameters, resulting in no increase in the level of noise. The end-deflector recirculation system significantly improves high-speed capability and noise level compared with the existing return tube recirculation system, offering high-speed feeding of up to 1 200 mm/min (shaft dia. 40 mm, lead 30 mm, rotational speed 4 000 min^{-1}).

(2) Specifications

Table 1 Specifications of twin-drive systems

Recirculation systems	End-deflector recirculation system, Return tube system, Deflector(bridge type) system
Shaft dia.	ϕ32 – 63 mm
Lead	10 – 30 mm
Accuracy grade	C5
Screw shaft length	3 m or less

(3) Optional specifications

- Hollow shaft ball screw and nut cooling ball screw
- Provides high accuracy through the use of forced cooling. Please refer to ball screws for high precision machine tools (page B540 to B548) for more details.

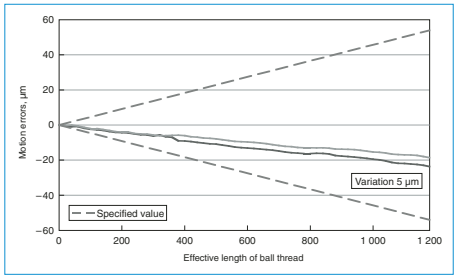


Fig. 1 Example of measured variation in lead accuracy

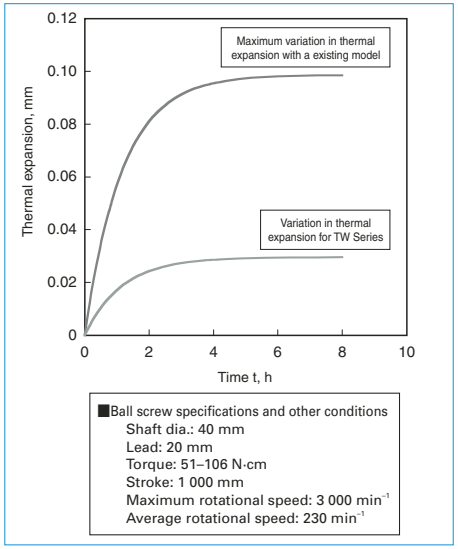


Fig. 2 Calculation example of the variation of thermal expansion

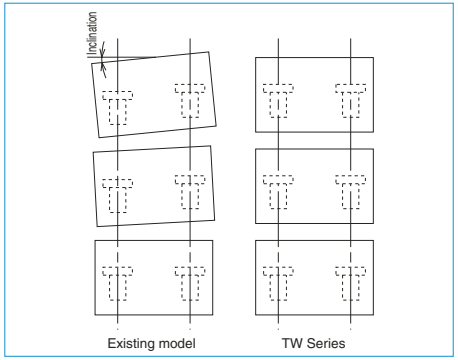


Fig. 3 Schematic diagram of travel accuracy

B-3-3.8.1 Hollow Shaft Ball Screw for High Precision Machine Tools

The increase in speed of the feeding mechanism for highly accurate positioning may require some measures against thermal expansion of the ball screw (forced cooling using hollow ball screw). NSK standardized hollowed screw shafts and shaft ends configuration (sealing section and support bearing seat). NSK recommends this as the most effective measure against thermal expansion.

1. Features

●Stable positioning accuracy

Suppresses expansion of the ball screw shaft by rising temperature, and provides stable, precise positioning.

● Prevents displacement of various sections

Minimizes deformation of the ball screw support bearings as well as of the machine base which is caused by thermal expansion of ball screw. Forced cooling keeps the heat from spreading to other sections, and prevents the processing table from deforming due to heat.

● Reduces warm-up time

Temperature does not rise high, therefore cuts machine warm-up period.

● Maintains lubricant's effect

Removes heat from the ball screw, deterring lubricant deterioration.

● Easy designing for installation

Use support bearing unit exclusive for NSK ball screws (high speed and high load capacity for machine tools, see page B405) and seal unit (page B543) to standardized shaft end. This makes designing of mounting ball screw easy.

NSK also provides nut cooling ball screws. The level of temperature rise for nut cooling ball screw is equal to the hollow shaft ball screw thanks to the optimized nut internal design for cooling. Please refer to nut cooling ball screws (page B545) for more details.

3. Model example of dimension table

A model number that indicates specification factors is structured as shown below.

◇Example of model

H 32 - 10

- H: Screw shaft model H
- 32: Screw shaft diameter (mm)
- 10: Hollow bore (mm)

2. Design precautions

Refer to HMC type, end-deflector recirculation system, return tube recirculation system, and deflector(bridge type) recirculation system for ball screw specifications. If the overall ball screw length exceeds 3 000 mm, contact NSK. For general precautions regarding ball screw, refer to "Design Precautions" (page B83) and "Handling precautions" (page B103).

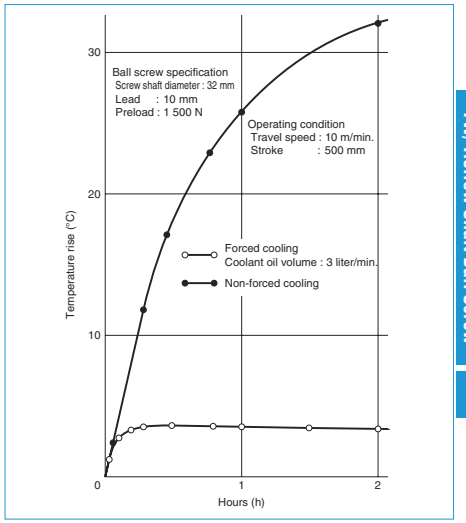
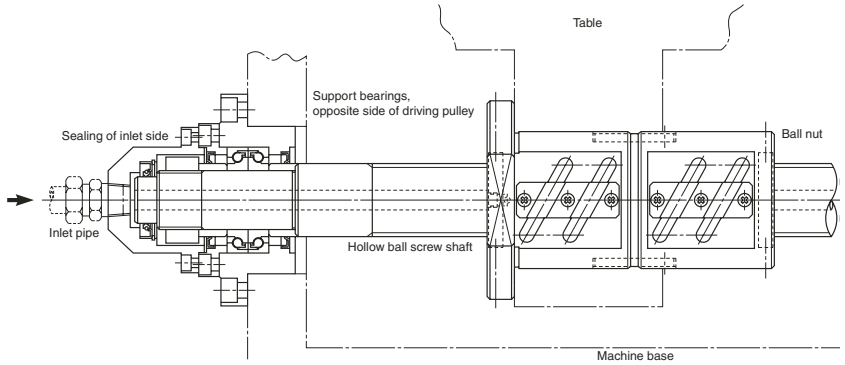
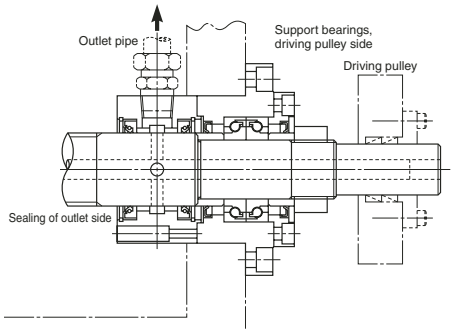
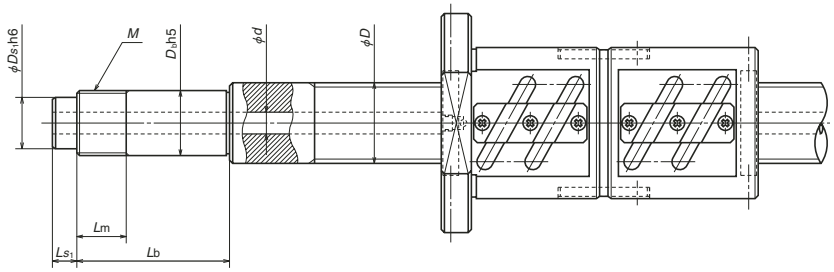


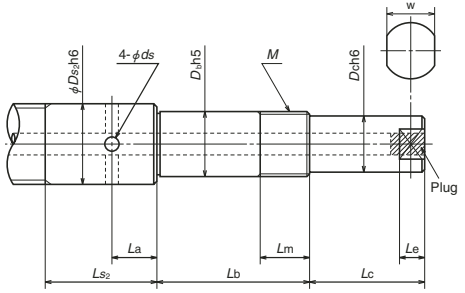
Fig. 1 Effect of forced cooling by hollow shaft ball screw

4. Installation example and standard dimensions









Unit: mm

Model No.	Screw shaft		Bearing seat				Sealing					
	Diameter	Hollow	Diameter	Lock nut			Inlet		Outlet			
	D	*d*	*D*b	*M*	*L*m	*L*b	Ds_1	Ls_1	Ds_2	Ls_2	*L*a	*d*s
H32-10	32	10	25	M25×1.5	26	89 104 119	20	15	32	60	25	6
H40-12	40	12	30	M30×1.5	26	89 104 119	25	15	40	60	25	7
H50-15	50	15	40	M40×1.5	30	92 107 122	32	15	50	65	27	8

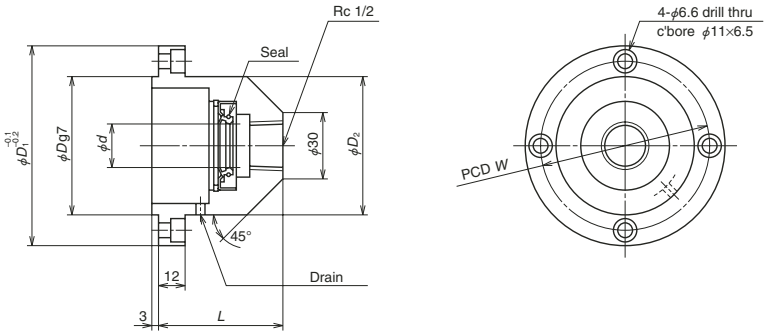
Notes: Please consult NSK for other models.

Drive side		Spanner flats		Applicable support unit	Used bearing	Equipped seal unit	
						Shaft end	Shaft outer surface
*D*c	*L*c	*w*	*L*e				
20	40	17	8	WBK25DF-31H WBK25DFD-31H	25TAC62BDFC10PN7A 25TAC62BDFDC10PN7A (25TAC62BDFFC10PN7A)	WSK20A-01	WSK32B-01
25	50	22	10	WBK30DF-31H WBK30DFD-31H	30TAC62BDFC10PN7A 30TAC62BDFDC10PN7A (30TAC62BDFFC10PN7A)	WSK25A-01	WSK40B-01
35	70	30	13	WBK40DF-31H WBK40DFD-31H WBK40DFF-31H	40TAC72BDFC10PN7A 40TAC72BDFDC10PN7A 40TAC72BDFFC10PN7A	WSK32A-01	WSK50B-01

5. Seal units for hollow ball screw shaft (available by order)

This is an exclusive joint for coolant of the hollow ball screw shaft.

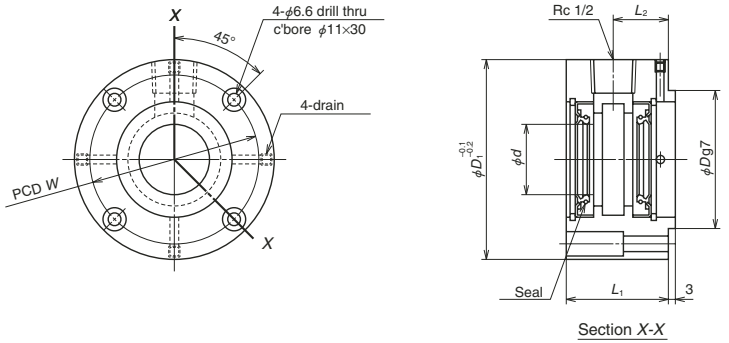
A Type
(for shaft end)



Unit: mm

Reference No.	*d*	*D*	D_1	D_2	*L*	*W*	Fixing bolt
WSK20A-01	20	57	85	57	56	70	M6
WSK25A-01	25	57	85	57	56	70	M6
WSK32A-01	32	69	95	67	61	80	M6

B Type
(for shaft outer surface)



Unit: mm

Reference No.	*d*	*D*	D_1	L_1	L_2	*W*	Fixing bolt
WSK32B-01	32	57	85	46	25	70	M6
WSK40B-01	40	57	85	46	25	70	M6
WSK50B-01	50	69	95	49	27	80	M6

◇ **Handling precautions**

- Use NSK support unit (high speed and high load capacity for machine tools on page B405) for installation in order to maintain the eccentricity between screw shaft and seal unit.
- Apply grease to the lip section for protection at the time of installation to the ball screw.
- Make certain that the drain holes (one for A Type, four for B Type) of the seal unit directly face downward when the unit is installed.

B-3-3.8.2 Nut Cooling Ball Screws for High Precision Machine Tools

Nut cooling ball screws are easily cooled with a ball nut cooling system and are ideal for use in high-speed and high-precision machine tools that have nut cooling systems.

Using nut cooling ball screws makes it possible to cool long ball screws that are difficult to cool with hollow-core cooling, and they accommodate the broad high-precision needs of machine tools both small and large.

1. Features

● Cooling effects

By optimizing the cooling structure inside the nut, cooling capacity equivalent to hollow shaft cooling has been achieved. The nut in contact with the table is cooled, so that heat conduction from the table to the ball screw is blocked. Moreover, by cooling hollow shaft in parallel, the screw shaft and ball nut can be cooled at the same time for even more precise temperature control.

● Internal design in consideration of preload torque change

The nut cooling ball screw has double contact-point preload in the tensile direction. This prevents an increase in preload torque when the nut is cooled, enabling effective cooling of the ball screw.

● Cooling structure

The cooling fluid goes in a balanced way through the nut. Double nuts have separate coolant routes for each nut for efficient cooling. Cooling fluid does not go through the inside of spacers, so coolant fluid does not leak even when preload drops and airtightness is maintained.

● Improved handling

Ball screws can be cooled by simply attaching piping to the exterior flange part.* Sliding seals and rotary joints that are required for hollow shaft cooling are not needed. Dimensions for mounting area (without nut cooling) are the same as conventional products, so the nut cooling can be implemented without changing machine designs.

*When cooling double nuts, piping is required on the nut end face on the other side of the flange.

● Long ball screws can be cooled at a low cost

Since these products are suitable for long ball screws for which hollow hole processing is difficult, improved precision of large machine tools can be achieved at a low cost.

2. Cautions regarding design

If heat impact from the bearing is too great, separate cooling for bearing and surrounding areas is recommended. For details, please contact NSK.

◇Reference number for nut cooling ball screw

W4012-＊＊ZMNC-C5Z20

Nut cooling ball screw code

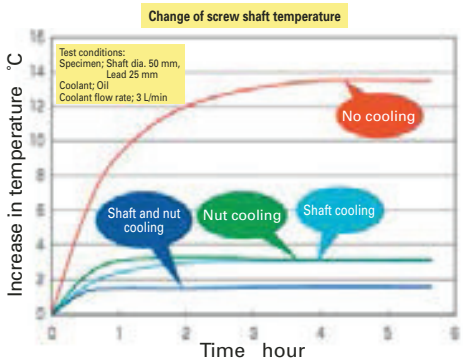
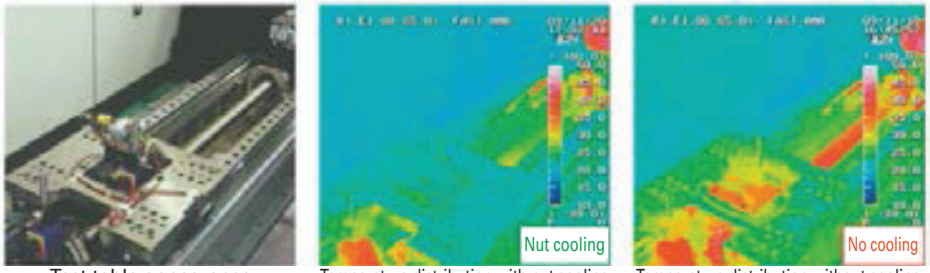


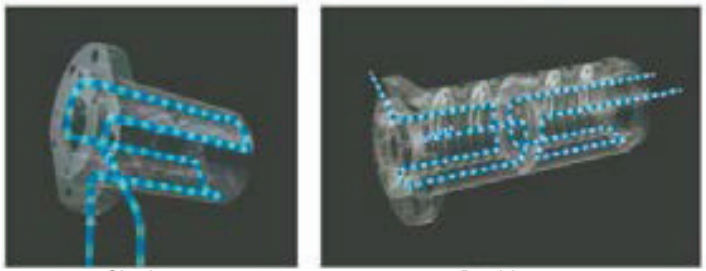
Fig. 1 Effect of forced cooling by nut cooling ball screw



Test table appearance | Temperature distribution with nut cooling | Temperature distribution without cooling

Fig. 2 Effect of forced cooling by nut cooling ball screw

Cooling structure

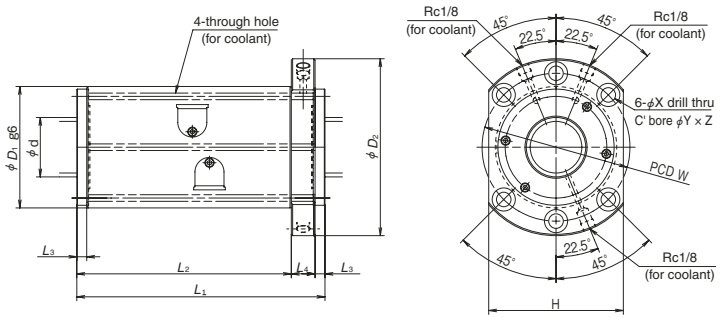


Single nut | Double nut

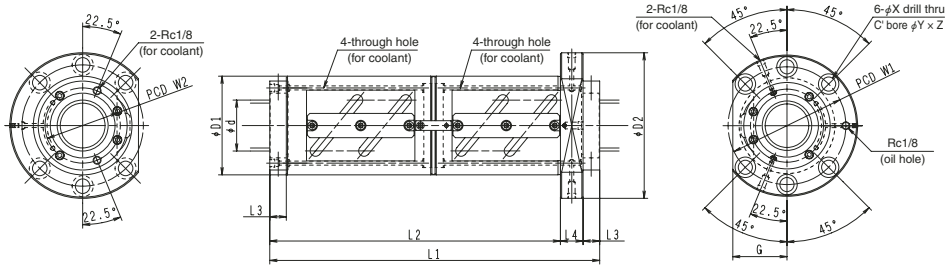
Fig. 3 Cooling structure of a nut cooling ball screw

Nut cooling ball screws: dimension chart

● Single nut cooling ball screws (for HMD type, nut type: EM)



● Double nut cooling ball screws (tube-type, nut type: DFT)



Applicable dimensions for HMD type

Unit: mm

Model No.	Shaft dia. d	Lead l	Nut dimensions D_1	D_2	H	L_1	L_2	L_3	L_4	W	X	Y	Z
EM4016-4E	40	16	86	128	96	166	140.5	7.5	18	106	11	17.5	11
EM4020-6E		20				156	130.5						
EM4025-6E		25				188	162.5						
EM4030-6E		30				219	193.5						
EM4516-4E	45	16	92	134	102	166	140.5	7.5	18	112	11	17.5	11
EM4520-6E		20				156	130.5						
EM4525-6E		25				188	162.5						
EM5016-4E	50	16	98	140	107	166	140.5	7.5	18	118	11	17.5	11
EM5020-6E		20				156	130.5						
EM5025-6E		25				188	162.5						
EM5030-6E		30				219	193.5						
EM6316-4E	63	16	122	180	138	176	139	9	28	150	18	26	17.5

Dimensions for tube type

Unit: mm

Model No.	Shaft dia. d	Lead l	Nut dimensions D_1	D_2	L_1	L_2	L_3	L_4	G	W_1	X	Y	Z	W_2
DFT5010-7.5	50	10	93	135	303	275	10	18	51	113	11	17.5	11	73
DFT5012-5		12	100	146	279	245	12	22	55	122	14	20	13	78
DFT5016-5		16	100	146	344	306	16	22						
DFT5020-3		20	100	146	327	279	20	28						
DFT5510-5	55	10	102	144	243	215	10	18	54	122	11	17.5	11	80
DFT6310-7.5	63	10	108	154	307	275	10	22	58	130	14	20	13	88
DFT6312-5		12	115	161	279	245	12	22	61	137	14	20	13	91
DFT6316-5		16	122	180	350	306	16	28	69	150	18	26	17.5	93
DFT6320-5		20	122	180	407	359	20	28						
DFT8010-5	80	10	130	176	247	215	10	22	66	152	14	20	13	108
DFT8012-5		12	136	182	279	245	12	22	68	158	14	20	13	110
DFT8016-5		16	143	204	350	306	16	28	77	172	18	26	17.5	112
DFT8020-5		20	143	204	407	359	20	28						
DFT10012-5	100	12	160	220	285	245	12	28	82	188	18	26	17.5	134
DFT10016-5		16	170	243	354	306	16	32	91	205	22	32	21.5	136
DFT10020-5		20	170	243	411	359	20	32						

B-3-3.9 ND Series for Nut-Rotatable Drives

• This product is patented by NSK.

A nut rotatable ball screw is developed as a unit into which angular contact support ball bearings are integrated. It is best suited for an application that requires rotation of the ball nut while the screw shaft is fixed.

NDT model

1. Structure

Balls are installed between the assembly housing and the ball nut. The outer bearing rings are integrated into the assembly housing and thus, compact design are attained.
A timing pulley (prepared by the user) is directly secured to the end face of the nut.

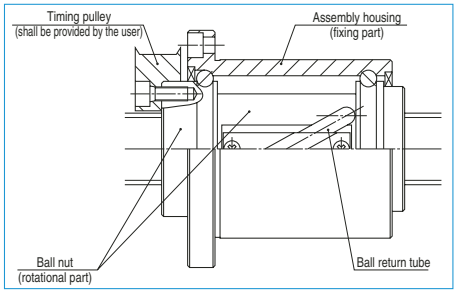


Fig. 1 Ball nut structure

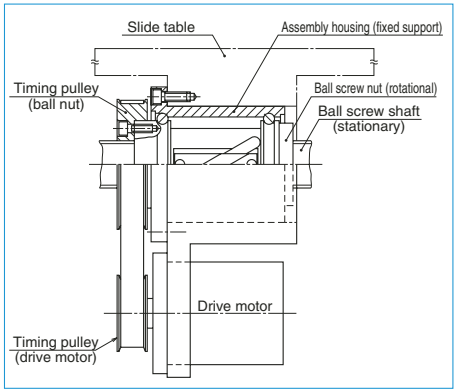


Fig. 2 Example of installation to the table

2. Features

● Multi-nut drive
Two or more nut units can be installed in a single ball screw shaft. They can be operated by respective motors.

● High operation speed
High feeding speed operation, but yet low rotational speed, is feasible by means of medium to high-helix lead ball screws.

● Easy installation
Merely install a mount housing to the table of the machine to take advantage of this multi-nut rotation system.

● Simple shaft end configuration
Shaft end configuration is simple because this unit does not need support bearings.

● Shaft diameter/lead combination
There are 10 types of "shaft diameter/lead" combinations.
Selections are: Shaft diameters -- 32, 40, 50 mm; Leads -- 20, 25, 32, 40, 50 mm.

● Low inertia
Compared to the NSK current product (end cap ball recirculation system), rotational inertia was reduced by 16% at most.

3. Specifications

(1) Ball recirculation system
The structure of return tube recirculation system is shown below.

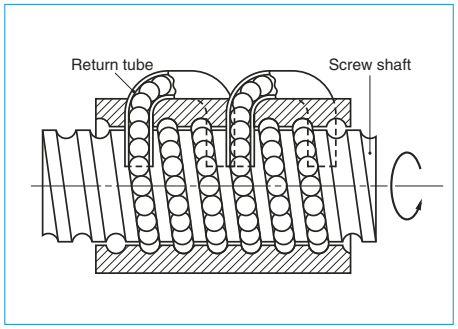


Fig. 3 Structure of ball return tube recirculation system

(2) Accuracy grade and axial play
The available standard accuracy grade and axial play are as follows. Please consult NSK for other grades.

Table 1 Axial play

Axial play code	Z	T	S
Axial play	0	0.005 mm or less	0.020 mm or less

Table 2 Combination of accuracy grades and axial play

Accuracy grade	C3	C5	Ct7
Axial play code	Z, T, S	Z, T, S	S

4. Allowable d•n value and the criterion of maximum rotational speed

Allowable d·n value and the criterion of maximum rotational speed are shown below. Please consult NSK if the rotational speed exceeds the permissible range below.
Note: The basic concept is the same as that of general ball screws. Refer to "Technical Description: Permissible Rotational Speed" (page B47).

Table 3 Allowable d·n value and the criterion of maximum rotational speed

Allowable d·n value	Standard specification	70 000 or less
	High-speed specification	100 000 or less
Criterion of maximum rotational speed	3 000 min^{-1}	

d·n value: shaft dia. d [mm] × rotational speed n [min^{-1}]

● Critical speed n_c
As shown **Fig. 4**, calculate unsupported length (mm) of L_1, L_2, and L_3 (assumed that the nut section is a fixed support.) **Table 4** shows the coefficients "*f*" of each shaft end mounting condition.

$$n_c = f \bullet \frac{d_r}{L_i^2} \times 10^7 \ (min^{-1}) \qquad (Ⅲ\text{-}1)$$

d_r: Screw shaft root diameter (See the dimension table.)
L_i: Unsupported length (mm) (See **Fig. 4**)
f : Factor determined by the ball screw shaft end mounting condition

Table 4

Shaft end mounting condition	*f*
Fixed – Fixed support	21.9
Fixed – Simple support	15.1
Fixed – Free support	3.4

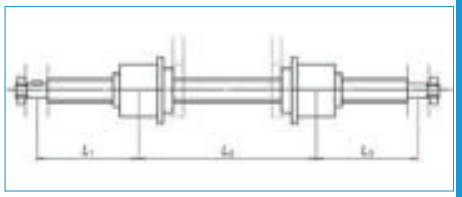


Fig. 4 Installation example

5. Design precautions

One end of the screw thread should be cut-through to the end. Also, if the nut must be removed from the screw shaft, the user should have an arbor to prevent the balls from falling out during this process. (NSK manufactures arbors on request.)
For general precautions regarding ball screws, refer to "Design Precautions" (page B83) and "Handling Precautions" (page B103).

NDD Type: (Incorporating vibration damper)

An increase in stroke length may restrict required rotational speed of a ball screw due to the issue of critical speed even if there is no problem on d·n limitation.

In such a case, we recommend using NDD Type nut rotatable ball screws equipped with vibration damper.

It will make it possible to operate a ball screw exceeding the critical speed, which is conventionally considered being impossible.

Notes: 1) However, NDD Type cannot be used exceeding the d·n limitation. Please consult with NSK in such a case.

2) You cannot rotate the screw shaft of NDD Series.

1. Structure

Hollow ball screw shaft has a mechanism to absorb vibration energy (vibration damper). This increases dynamic rigidity of the screw shaft and lowers vibration when exceeding the critical speed.

Construction of the ball nuts are the same as those of NDT Type.

2. Features

● No need for measures against critical speed.

Conventionally, an increase in screw shaft diameter or use of intermediate support is the measure against the issue of critical speed. NDD Type ball screw will make these measures needless.

● Dimensional interchageability with NDT Type ball screws

The vibration damper is set inside a ball screw shaft, and therefore, there is no difference with existing series in regards to external dimensions. The ball nuts of NDD Type are interchangeable with those of NDT Type.

● Others

Benefits in multiple ball nut on a screw shaft, high feeding speed for long stroke, easy in installation, and low inertia of the ball nuts are the same as NDT Type.

3. Specification

Recirculation system, accuracy grade, axial play and preload system are the same as NDT Type.

4. Design precautions

They are the same as NDT Type.

5. Permissible rotational speed

The d•n value is the same as NDT Type.

You don't need to consider the critical speed.

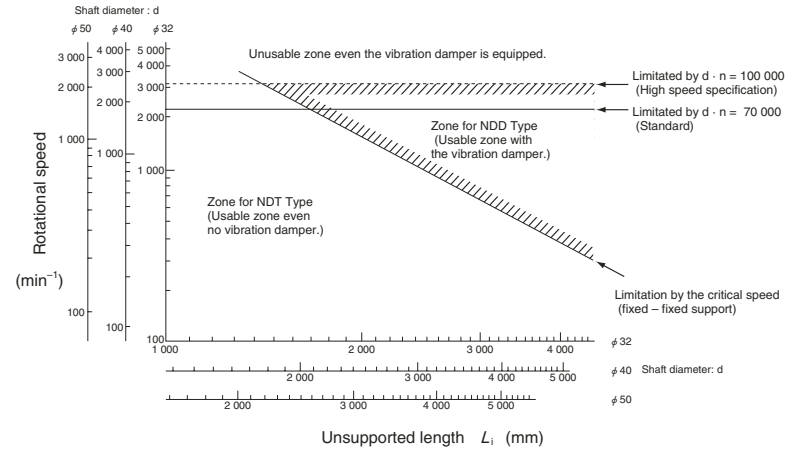


Fig. 5 Compartmentalization between NDT and NDD types to rotational speed and unsupported length

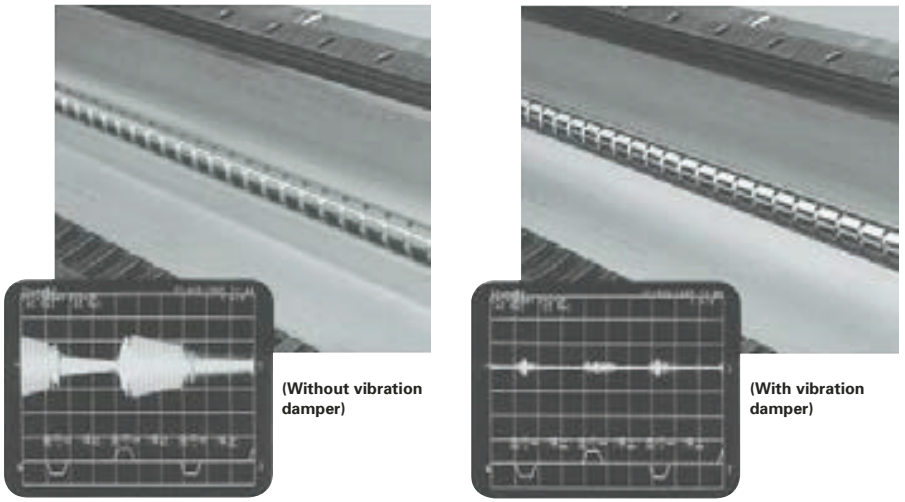


Fig. 6 Vibration of screw shaft when nut is rotating

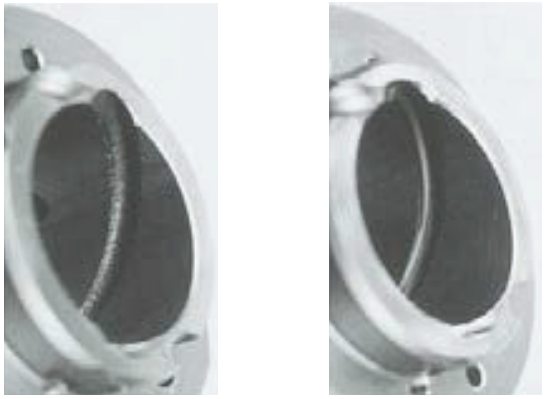


Fig. 7 Effect of vibration damper (results of endurance test)

Calculation example of permissible rotational speed

[Calculation example]
Assume a system which moves two nuts on a shaft as shown below.
Does this system operate appropriately if: both ends of the ball screw (shaft diameter 40 mm/ lead 40 mm) are fixed, and the travel speed is at 60 m/min?

[Answer]
The rotational speed n (min^{-1}) when the lead of the ball screw is 40 mm, and the travel speed is at 60 m/min is:

$$n = \frac{60 \times 10^3}{40} = 1\,500\ (min^{-1})$$

● Calculate d • n value
As the d • n value of standard specification is 7 000, therefore, the permissible rotational speed is;

$$n \leq \frac{70\,000}{40} = 1\,750\ (min^{-1})$$

● Calculate critical speed
The maximum unsupported length comes between Nut A and B.

$L_2 = 3\,300$ (mm)
$f = 21.9$ (Fixed-Fixed)
Root diameter: $d_r = 35.1$ (mm)

Therefore, the permissible rotational speed is;

$$n \leq \frac{21.9 \times 35.1}{3\,300^2} \times 10^7 = 706\ (min^{-1})$$

The calculation indicates that the d • n value is at the safe level. But the critical speed exceeds the limitation. However, with a vibration damper, the system can be operated at 1 500 min^{-1}.

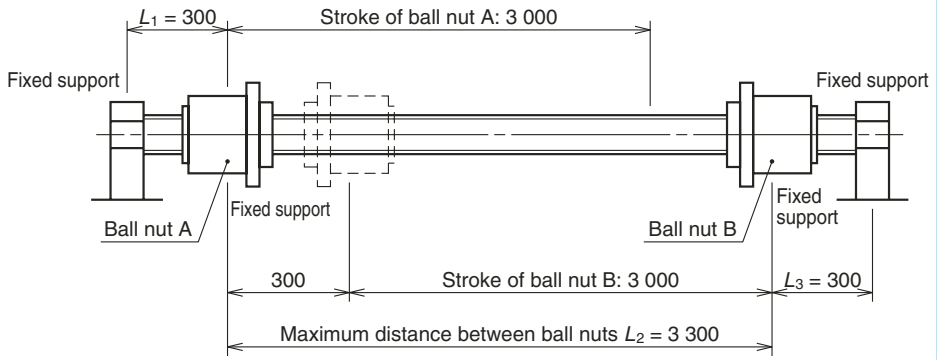


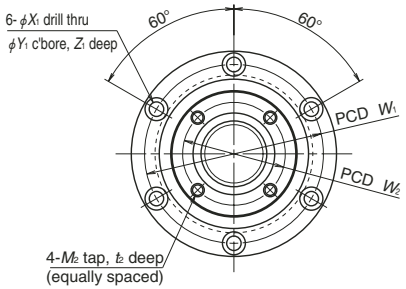
Fig. 8 Calculation example of permissible rotational speed

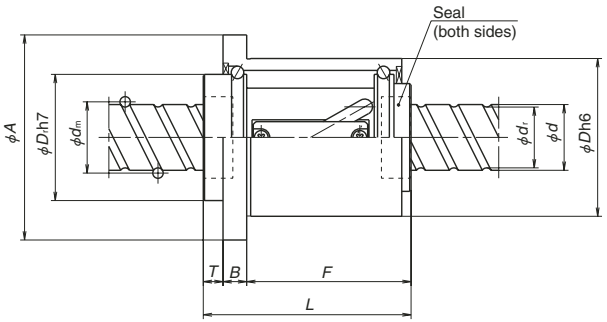
Structure of reference number
The followings describe the structure of "Reference number for ball screw".

◇Reference number for ball screw

W 40 15 - ** P XU - C5 Z 40

- W 40 — Product code
- 15 — Screw shaft diameter (mm)
- 15 — Effective threaded length (in the unit of 100 mm)
- ** — Design serial number
- P — Preload code: No code, Non-preload; P, P-preload (page B5)
- XU — Appearance/specification code ("T" is added for NDD Type.)
- C5 — Accuracy grade: C3, C5, C7 (Ct7) (page B37 to B42)
- Z — Axial play code: Z, T, S (page B20)
- 40 — Lead (mm)





Unit: mm

Model No.	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls Turns × Circuits	Basic load rating (N) Dynamic C_a	Basic load rating (N) Static C_{0a}	Moment of inertia, ball nut J (kg·cm²)	Ball nut mass W (kg)
NDT 3220-2.5 **NDD 3220-2.5**	32	20	4.762	33.25	28.3	2.5×1	17 900	41 800	6.2	2.9
NDT 3225-2.5 **NDD 3225-2.5**		25	4.762	33.25	28.3	2.5×1	17 900	41 800	6.7	3.2
NDT 3232-1.5 **NDD 3232-1.5**		32	4.762	33.25	28.3	1.5×1	11 500	24 800	6.2	2.9
NDT 3232-3 **NDD 3232-3**						1.5×2	18 900	44 600		
NDT 4025-2.5 **NDD 4025-2.5**	40	25	6.35	41.75	35.1	2.5×1	28 500	70 000	19.3	6.0
NDT 4032-1.5 **NDD 4032-1.5**		32	6.35	41.75	35.1	1.5×1	18 400	41 200	18.0	5.5
NDT 4032-3 **NDD 4032-3**						1.5×2	30 100	74 100		
NDT 4040-1.5 **NDD 4040-1.5**		40	6.35	41.75	35.1	1.5×1	18 400	41 200	19.2	6.0
NDT 4040-3 **NDD 4040-3**						1.5×2	30 100	74 100		
NDT 5025-2.5 **NDD 5025-2.5**	50	25	7.938	52.25	44.0	2.5×1	42 700	109 000	45.7	8.5
NDT 5032-2.5 **NDD 5032-2.5**		32	7.938	52.25	40.0	2.5×1	42 700	109 000	48.9	9.4
NDT 5040-1.5 **NDD 5040-1.5**		40	7.938	52.25	44.0	1.5×1	27 500	66 500	45.5	8.5
NDT 5040-3 **NDD 5040-3**						1.5×2	44 900	120 000		
NDT 5050-1.5 **NDD 5050-1.5**		50	7.938	52.25	44.0	1.5×1	27 500	66 500	48.7	9.4
NDT 5050-3 **NDD 5050-3**						1.5×2	44 900	120 000		

Ball nut dimensions													Tap hole PCD
Nut entire length L	Nut outside diameter D	Flange outside diameter A	Flange width B	Nut length F	Projection tube dimensions D_1	Projection tube dimensions T	Bolt hole dimensions X_1	Bolt hole dimensions Y_1	Bolt hole dimensions Z_1	Bolt hole PCD W_1	Tap hole dimensions M_2	Tap hole dimensions t_2	W_2
107	78	105	12	83	60	12	6.6	11	6.5	91	M6	12	50
120	78	105	12	96	60	12	6.6	11	6.5	91	M6	12	50
107	78	105	12	83	60	12	6.6	11	6.5	91	M6	12	50
136	100	133	15	106	76	15	9	14	8.5	116	M8	16	62
122	100	133	15	92	76	15	9	14	8.5	116	M8	16	62
136	100	133	15	106	76	15	9	14	8.5	116	M8	16	62
140	120	156	18	107	96	15	11	17.5	11	136	M10	18	78
158	120	156	18	125	96	15	11	17.5	11	136	M10	18	78
140	120	156	18	107	96	15	11	17.5	11	136	M10	18	78
158	120	156	18	125	96	15	11	17.5	11	136	M10	18	78

Notes: 1. The right hand screw is the standard. Consult NSK for the left hand screws.
2. Seals are standard equipment.

B-3-3.10 ∑ Series for Robots

1. Features

∑ Series (NSK's Robotte) is a ball screw with a high-performance spline. It is ideal for various actuators such as the vertical axis of SCALA type robot.

A ball screw groove and a ball spline groove are made in one shaft, combining the ball screw and the ball spline.

Mount housing, nuts, and support bearings are combined into a single unit.

Timing pulley (prepared by the user) is directly secured at the end face of the nut.

● High functions

A single shaft has both feeding mechanism and guide functions. This allows the shaft ends to move back and forth (linear motion), as well as to rotate.

● Compact and lightweight

A ball screw nut and a spline nut are placed on one shaft, and a support bearings are also combined to the unit. This allows compact and high-precision design. Hollow shaft is standard to reduce weight. The hollow can be used for wiring and piping. Other components are also designed to be light in weight.

● Low inertia

Because of return tube type ball nut of which outside diameter is decreased, low inertia design is enabled.

It reduces the inertia by 19% of conventional products.

2. Functions

As shown in **Fig. 1**, the ball screw nut and a spline nut are rotated independently to control rotation value. Thereby the shaft can move in any direction -- linear and rotational. **Table 1** shows the relationship between power input and output.

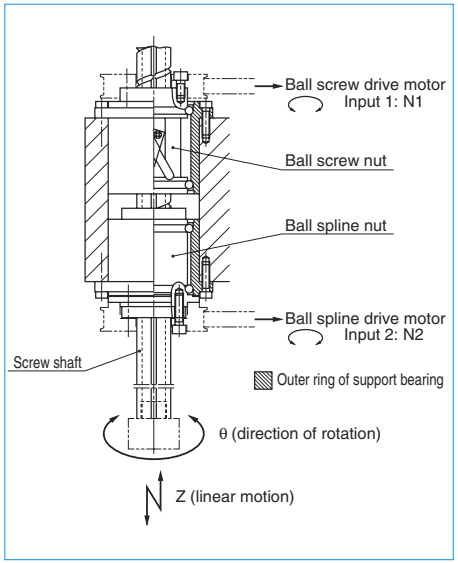


Fig. 1 Example structure of Z axis plus θ axis actuator

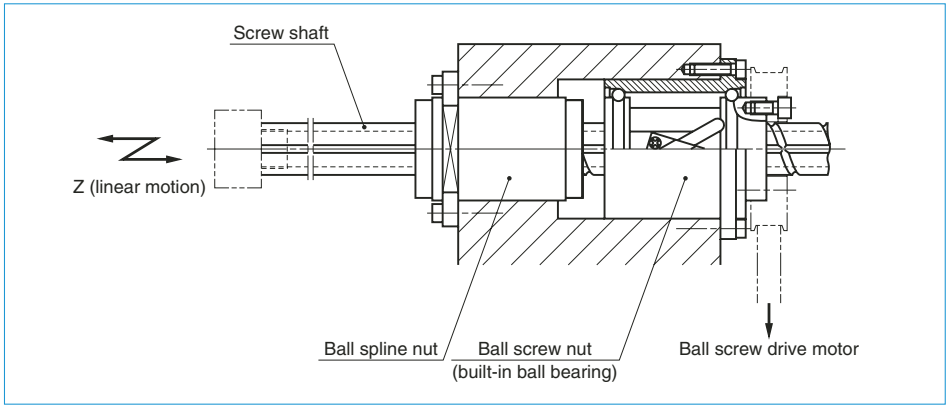


Fig. 2 Example structure of single Z axis unit

Table 1 Power input and output of Σ Series

Shaft movement (output)		Input		
Z (up-down movement) (mm/min)	θ (rotational movement) (min^{-1})	① Ball screw (min^{-1})	② Spline (min^{-1})	Notes
Up, down N1×l	Stop 0	Rotate N1	Stop 0	–
Stop 0	Rotate N2	Rotate N1	Rotate N2	N1 = N2
Up, down N2×l	Rotate N2	Stop 0	Rotate N2	–
Up, down |N1–N2|×l	Rotate N2	Rotate N1	Rotate N2	N1≠N2

3. Specifications

(1) Ball recirculation system

A structure of return tube recirculation system is shown below.

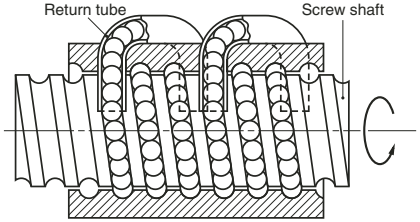


Fig. 3 Structure of return tube recirculation system

(2) Accuracy grade and axial play

The available standard accuracy grade and axial play for ball screw are as follows. The axial play for spline is 0 mm (preloaded product). Please consult NSK for other grades.

Table 2 Accuracy grade and axial play

Accuracy grade	C3, C5, Ct7
Axial play	Z, 0 mm (preloaded)
	T, 0.005 mm or less; S, 0.020 mm or less

(3) Allowable d•n value and the criterion of maximum rotational speed

Allowable d·n value and the criterion of maximum rotational speed are shown below. Please consult NSK if the rotational speed exceeds the permissible range below.

Permissible d•n value: 70 000 or less

Criterion of maximum rotational speed: 3 000 min^{-1}

Note: Please also review the critical speed.

For details, see "Technical Description: Permissible Rotational Speed" (page B47).

(4) Application

SCALA type and Cartesian type industrial robots, semiconductor manufacturing machines, machines for automobile production facilities, material handling systems, other Z (vertical) axis and Z axis plus θ (rotation) axis actuators.

4. Design precautions

The overall length L can be extended to 25 times of the shaft diameter.

To remove the spline nut from the shaft for assembling, use an arbor as shown in **Fig. 4**. (page B545). Avoid removing ball screw nut as much as possible. Refer to root diameter in the dimension table for arbor diameter. (NSK manufactures the arbors on request.)

For general precautions regarding ball screws, refer to "Precautions in Designing" (page B83) and "Precautions in Handling" (page B103).

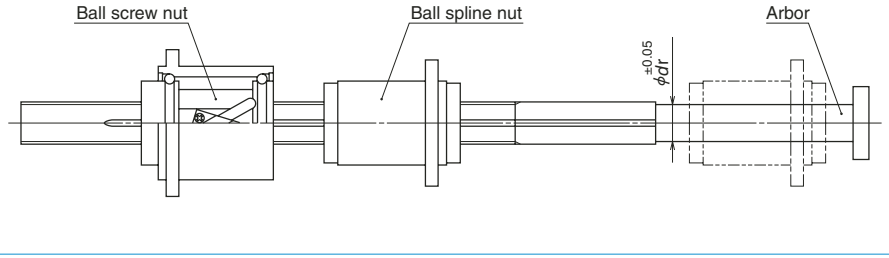
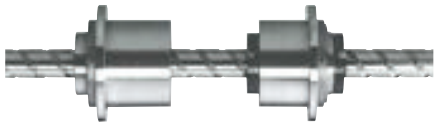
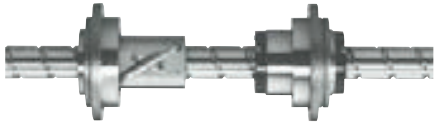
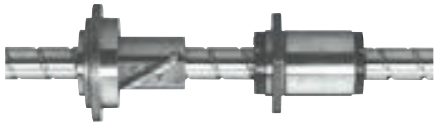


Fig. 4 Removing spline nut

5. Product categories

Σ Series (NSK's Robotte) is four models with different moving functions and performances are available. Select a standard model if rigidity is important. A compact system is recommended for reducing the weight of machine.

Table 3 Σ Series product categories

Model	Appearance	Size	Structure (Movement)
Σ		Standard	Z+θ Unit
ΣZ		Standard	Z Unit
ΣC		Compact	Z+θ Unit
ΣCZ		Compact	Z Unit

6. Load rating and life

The relationship between load rating of the ball spline section and life is the same as in other NSK liner motion products. However, various loads that apply to Robotte must be taken into account. For example, the following factors must be considered in calculating life when the product is used as shown in **Fig. 5**.

Fa : Load that is generated when the shaft moves in up-down direction. (Load is applied to the ball screw nut.)

T : Torque that is generated to the shaft by Fa.

Fr : Load that is generated by moment of inertia of the shaft and the work attached to Robotte as well as by centrifugal force when the arm rotates.

θ : Direction of Fr load that changes by shaft rotation.

NSK has life calculation programs which take these factors into account. Please ask NSK for more details.

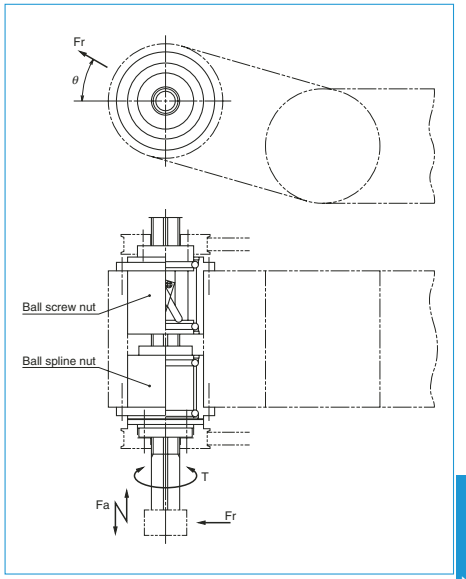


Fig. 5 Example structure of Z axis plus θ axis actuator

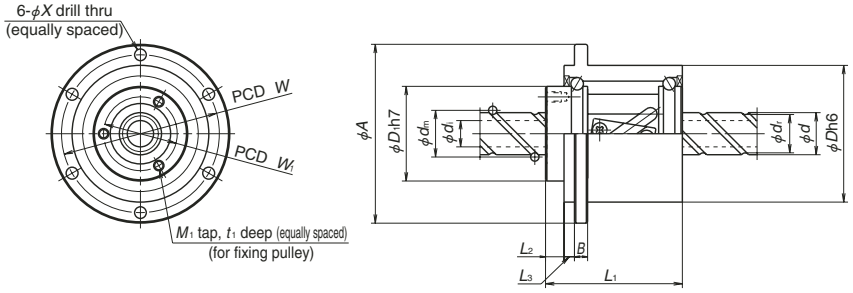
7. Structure of reference number

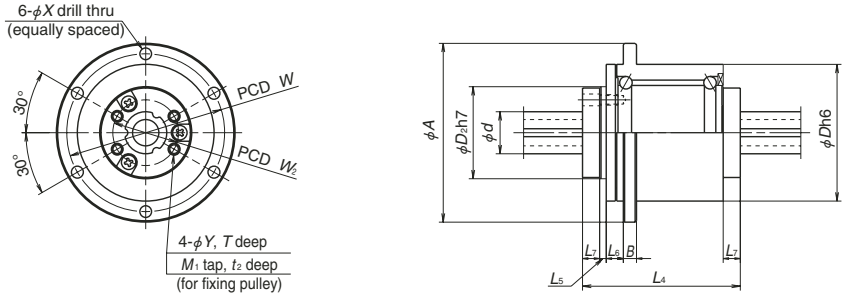
The following describes the structure of "Reference number for ball screw".

◇Reference number for ball screw

PW 25 02 - ** P T U - C5 Z 20

- Product code
- Screw shaft diameter (mm)
- Effective threaded length (in the unit of 100 mm)
- Design serial number
- Preload code: No code, Non-preload; P, P-preload (page B5)
- Hollow shaft ball screw specification
- Use support unit
- Accuracy grade: C3, C5, C7 (Ct7) (page B37 to B42)
- Axial play code: Z, T, S (page B20)
- Lead (mm)

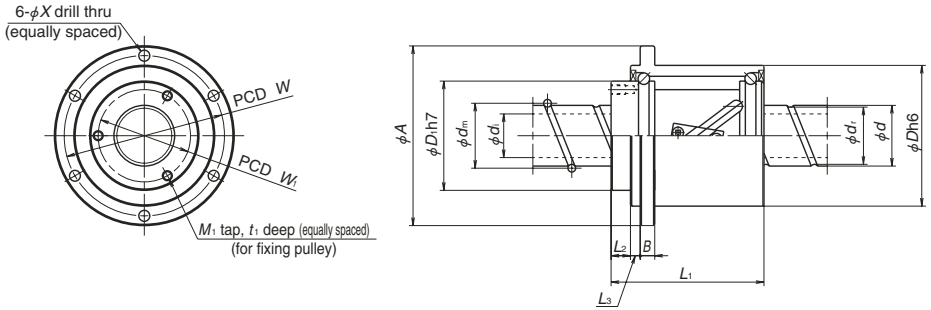


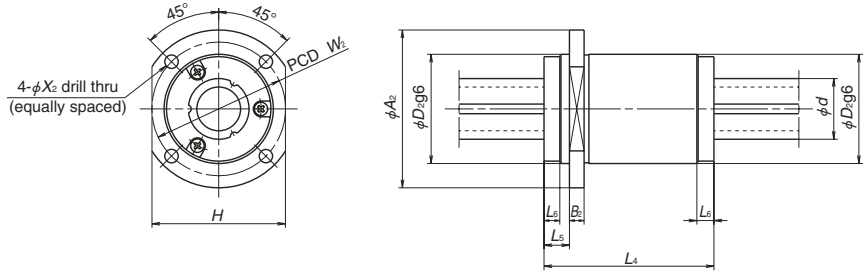


Unit: mm

Model No.	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Screw shaft hollow d_i	Ball screw nut: Basic load rating (N) Dynamic C_a	Static C_{0a}	D	A	B	L_1	L_2	L_3	M_1	t_1	W_1	D_1	W	X	Moment of inertia (kg·cm²)
∑1610	16	10	3.175	16.75	13.4	(8)	4 710	8 110	48	64	5	47	7	4	3-M4	6	28	35	56	4.5	0.41
∑1632		32					2 990	4 870				52									0.44
∑2010	20	10	3.175	20.75	17.4	(14)	8 210	17 500	54	70	6	57	8	4	3-M4	6	32	40	62	4.5	0.64
∑2020		20					5 290	10 300				63									0.65
∑2040		40					3 360	6 170				57									0.64
∑2510	25	10	3.175	25.75	22.4	(18)	9 110	21 900	58	74	6	57	8	4	3-M4	6	38	45	66	4.5	1.10
∑2520		20					5 870	13 200				63									1.18
∑2525		25					5 870	13 200				72									1.30
∑2550		50					3 730	7 500				64									1.20
∑3220	32	20	3.175	32.75	29.4	(25)	6 540	16 800	70	95	8	70	10	6	3-M5	10	44	53	82	6.6	2.60
∑3232		32					6 540	16 800				91									3.15
∑4020	40	20	3.969	41.0	36.9	(30)	9 770	26 300	85	110	8	73	10	6	4-M5	10	58	67	96	6.6	5.96
∑4040		40					9 770	26 300				107									7.85
∑4520	45	20	3.969	46.0	41.9	(35)	10 300	29 700	90	115	8	73	10	6	4-M5	10	63	72	101	6.6	7.73
∑4540		40					10 300	29 700				107									10.3

Mass (kg)	Ball spline nut: Basic load rating (N) Dynamic C_r	Static C_{0r}	Basic torque (N·m) Dynamic C_t	Static C_{0t}	D	A	B	L_4	L_5	L_6	L_7	Y	T	M_2	t_2	W_2	D_2	W	X	Moment of inertia (kg·cm²)	Mass (kg)
0.50	5 530	7 270	61.5	91.3	48	64	5	60	2.5	6.5	6.5	4.5	6.5	M4	7	25	35	56	4.5	0.71	0.63
0.55	5 890	8 000	65.5	100																	
0.74	6 260	8 720	86.3	135	54	70	6	65	2.5	6.5	6.5	5.5	6.5	M5	8	30.5	40	62	4.5	1.15	0.87
0.81	6 610	9 450	91.1	145																	
0.74	6 610	9 450	91.1	145																	
0.81	6 630	9 450	115	185	58	74	6	70	2.5	6.5	6.5	5.5	6.5	M5	8	35.5	45	66	4.5	1.88	1.03
0.88	7 290	10 900	125	210																	
1.00	7 290	10 900	125	210																	
0.91	7 290	10 900	125	210																	
1.46	7 630	11 600	165	285	70	95	8	75	2.5	7.5	6.5	5.5	6.5	M5	8	42	50	82	6.6	3.80	1.62
1.83	7 950	12 400	175	305																	
2.02	10 600	14 800	290	455	85	110	8	80	4	7.5	8	5.5	8	M5	8	55	65	96	6.6	9.74	2.38
2.85	11 200	15 900	305	490																	
2.17	11 200	15 900	340	550	90	115	8	85	4	7.5	8	5.5	8	M5	8	60	70	101	6.6	12.5	2.56
3.06	11 700	17 000	360	590																	

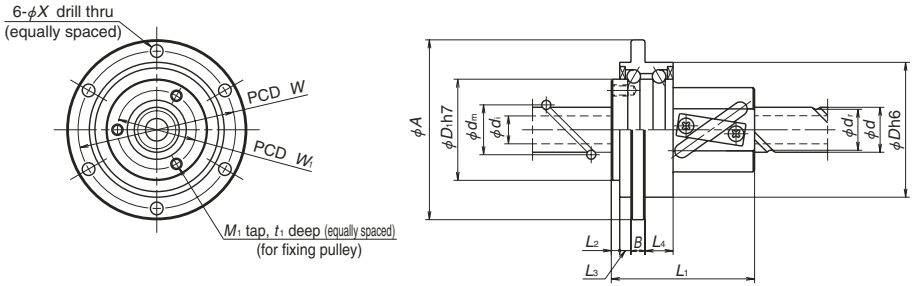


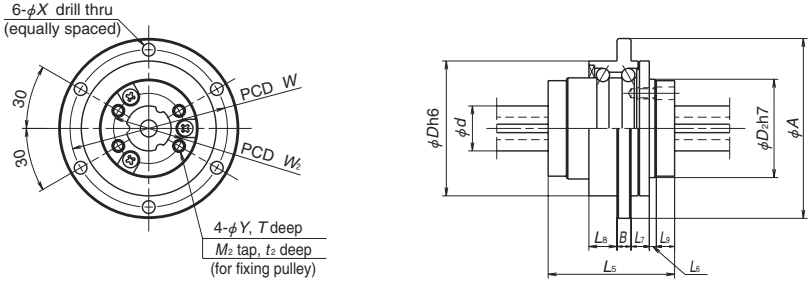


Unit: mm

Model No.	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Screw shaft hollow d_1	Ball screw nut: Basic load rating (N) Dynamic C_a	Static C_{0a}	Dimensions D	A	B	L_1	L_2	L_3	M_1	t_1	W_1	D_1	W	X
∑Z1610	16	10	3.175	16.75	13.4	(8)	4 710	8 110	48	64	5	47	7	4	3-M4	6	28	35	56	4.5
∑Z1632		32					2 990	4 870				52								
∑Z2010	20	10	3.175	20.75	17.4	(14)	8 210	17 500	54	70	6	57	8	4	3-M4	6	32	40	62	4.5
∑Z2020		20					5 290	10 300				63								
∑Z2040		40					3 360	6 170				57								
∑Z2510	25	10	3.175	25.75	22.4	(18)	9 110	21 900	58	74	6	57	8	4	3-M4	6	38	45	66	4.5
∑Z2520		20					5 870	13 200				63								
∑Z2525		25					5 870	13 200				72								
∑Z2550		50					3 730	7 500				64								
∑Z3220	32	20	3.175	32.75	29.4	(25)	6 540	16 800	70	95	8	70	10	6	3-M5	10	44	53	82	6.6
∑Z3232		32					6 540	16 800				91								
∑Z4020	40	20	3.969	41.0	36.9	(30)	9 770	26 300	85	110	8	73	10	6	4-M5	10	58	67	96	6.6
∑Z4040		40					9 770	26 300				107								
∑Z4520	45	20	3.969	46.0	41.9	(35)	10 300	29 700	90	115	8	73	10	6	4-M5	10	63	72	101	6.6
∑Z4540		40					10 300	29 700				107								

Moment of inertia (kg·cm²)	Mass (kg)	Ball spline nut: Basic load rating (N) Dynamic C_r	Static C_{0r}	Basic torque (N·m) Dynamic C_t	Static C_{0t}	Dimensions D_2	A_2	B_2	L_4	L_5	L_6	H	W_2	X	Mass (kg)
0.41	0.50	5 530	7 270	61.5	91.3	35	55	6	60	10.5	6.5	45	4.5	4.5	0.35
0.44	0.55	5 890	8 000	65.5	100										
0.64	0.74	6 260	8 720	86.5	135	40	60	6	65	10.5	6.5	50	50	5.5	0.46
0.65	0.81	6 610	9 450	91.1	145										
0.64	0.74	6 610	9 450	91.1	145										
1.10	0.81	6 630	9 450	115	185	45	65	6	70	10.5	6.5	55	55	5.5	0.57
1.18	0.88	7 290	10 900	125	210										
1.30	1.00	7 290	10 900	125	210										
1.20	0.91	7 290	10 900	125	210										
2.60	1.46	7 630	11 600	165	285	50	70	6	75	10.5	6.5	60	60	5.5	0.64
3.15	1.83	7 950	12 400	175	305										
5.96	2.02	10 600	14 800	290	455	65	88	8	80	12	8	76	76	6.6	1.20
7.85	2.85	11 200	15 900	305	490										
7.73	2.17	11 200	15 900	340	550	70	93	8	85	12	8	81	81	6.6	1.39
10.3	3.06	11 700	17 000	360	590										

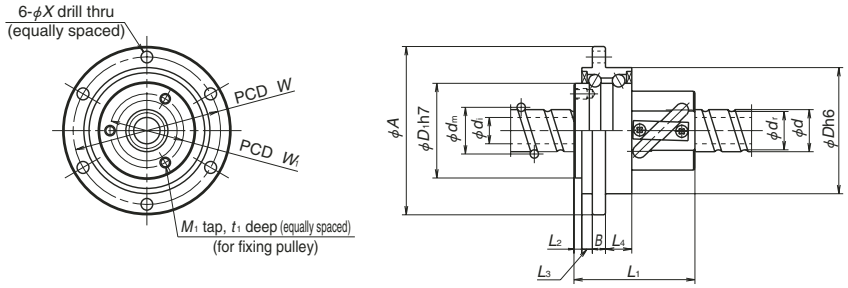


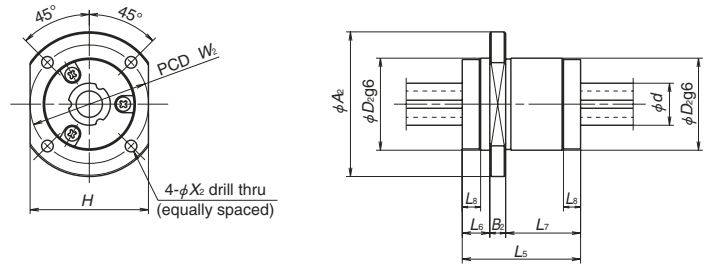


Unit: mm

Model No.	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Screw shaft hollow d_i	Ball screw nut: Basic load rating(N) Dynamic C_a	Static C_{0a}	Dimensions D	A	B	L_1	L_2	L_3	L_4	M_1	t_1	W_1	D_1	W	X	Moment of inertia (kg·cm²)
∑C1610	16	10	3.175	16.75	13.4	(8)	4 710	8 110	48	64	5	46	3	4	10	3-M4	6	28	35	56	4.5	0.40
∑C1632		32					2 990	4 870				51										0.43
∑C2010	20	10	3.175	20.75	17.4	(14)	8 210	17 500	54	70	6	56	4	4	10	3-M4	6	32	40	62	4.5	0.63
∑C2020		20					5 290	10 300				63										0.65
∑C2040		40					3 360	6 170				56										0.63
∑C2510	25	10	3.175	25.75	22.4	(18)	9 110	21 900	58	74	6	56	4	4	10	3-M4	6	38	45	66	4.5	1.04
∑C2520		20					5 870	13 200				63										1.13
∑C2525		25					5 870	13 200				71										1.24
∑C2550		50					3 730	7 500				63										1.13

Mass (kg)	Ball spline nut: Basic load rating(N) Dynamic C_r	Static C_{0r}	Basic torque(N·m) Dynamic C_t	Static C_{0t}	Dimensions D	A	B	L_5	L_6	L_7	L_8	L_9	Y	T	M_2	t_3	W_2	D_2	W	X	Moment of inertia (kg·cm²)	Mass (kg)
0.41	4 300	5 090	47.9	63.9	48	64	5	45	2.5	6.5	10	6.5	4.5	6.5	M4	7	25	35	56	4.5	0.52	0.42
0.43																						
0.53	4 730	5 820	65.1	90.5	54	70	6	50	2.5	6.5	10	6.5	5.5	6.5	M5	8	30.5	40	62	4.5	0.86	0.56
0.56	5 110	6 540	70.5	100																		
0.53	5 110	6 540	70.5	100																		
0.60	5 130	6 540	87.8	125	58	74	6	55	2.5	6.5	10	6.5	5.5	6.5	M5	8	35.5	45	66	4.5	1.44	0.67
0.64	5 870	8 000	100	155																		
0.69	5 870	8 000	100	155																		
0.64	5 870	8 000	100	155																		





Unit: mm

Model No.	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Screw shaft hollow d_1	Ball screw nut: Basic load rating(N) Dynamic C_a	Static C_{0a}	Dimensions D	A	B	L_1	L_2	L_3	L_4	M_1	t_1	W_1	D_1	W	X
∑CZ1610	16	10	3.175	16.75	13.4	(8)	4 710	8 110	48	64	5	46	3	4	10	3-M4	6	28	35	56	4.5
∑CZ1632		32					2 990	4 870				51									
∑CZ2010	20	10	3.175	20.75	17.4	(14)	8 210	17 500	54	70	6	56	4	4	10	3-M4	6	32	40	62	4.5
∑CZ2020		20					5 290	10 300				63									
∑CZ2040		40					3 360	6 170				56									
∑CZ2510	25	10	3.175	25.75	22.4	(18)	9 110	21 900	58	74	6	56	4	4	10	3-M4	6	38	45	66	4.5
∑CZ2520		20					5 870	13 200				63									
∑CZ2525		25					5 870	13 200				71									
∑CZ2550		50					3 730	7 500				63									

Moment of inertia (kg·cm²)	Mass (kg)	Ball spline nut: Basic load rating(N) Dynamic C_r	Static C_{0r}	Basic torque(N·m) Dynamic C_t	Static C_{0t}	Dimensions D_2	A_2	B_2	L_5	L_6	L_7	L_8	H	W_2	X_2	Mass (kg)
0.40	0.41	4 300	5 090	47.9	63.9	35	55	6	45	10.5	28.5	6.5	45	45	4.5	0.26
0.43	0.43															
0.63	0.53	4 730	5 820	65.1	90.5	40	60	6	50	10.5	33.5	6.5	50	50	5.5	0.35
0.65	0.56	5 110	6 540	70.5	100											
0.63	0.53	5 110	6 540	70.5	100											
1.04	0.60	5 130	6 540	87.8	125	45	65	6	55	10.5	38.5	6.5	55	55	5.5	0.44
1.13	0.64	5 870	8 000	100	155											
1.24	0.69	5 870	8 000	100	155											
1.13	0.64	5 870	8 000	100	155											