

### B-3-3.4 End Cap Type Ball Screw

#### 1. Features

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) Recirculation system

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

##### (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.

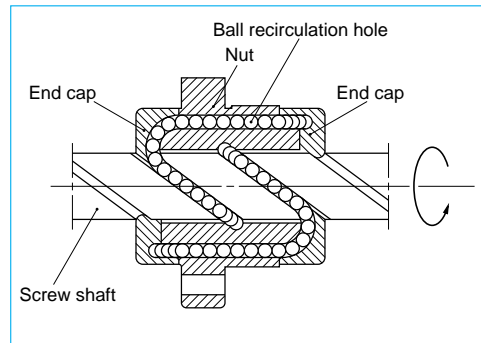


Fig. 1 Structure of end cap recirculation system

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 (Preload); 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 for high-speed specification. Basic measure must be taken for the high speed ball screws respectively.

Allowable d·n value:

Standard specification : 80000 or less

High-speed specification; 100000 or less

Standard of rotational speed : 3000 min<sup>-1</sup>

※Please also review the critical speed. Refer to "Technical Description: Permissible rotational speed" (Page B51) 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.

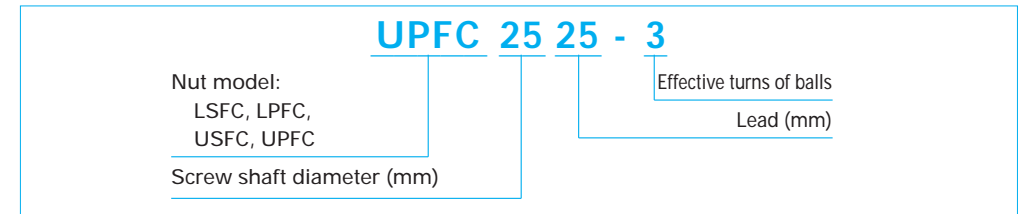
Special bearings which have higher-load carrying capacity are available.

For general precautions regarding ball screws, refer to "Design Precautions" (Page B84) and "Handling Precautions" (Page B103).

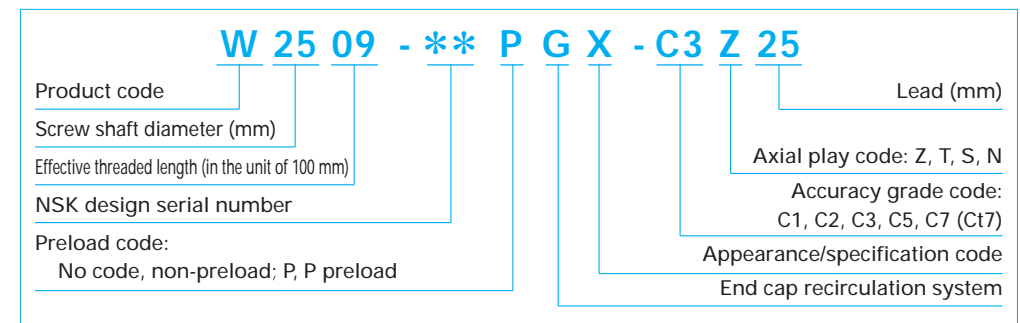
#### 5. Example of model number in dimension tables

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

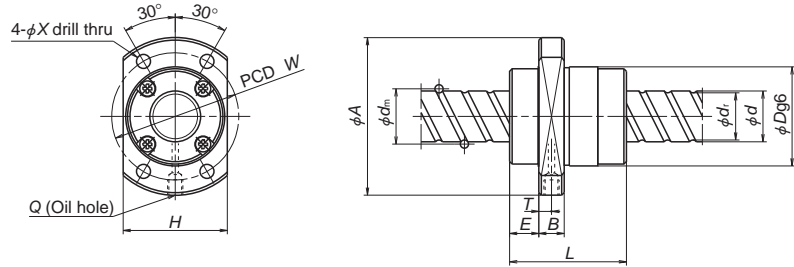
##### ◇Model number



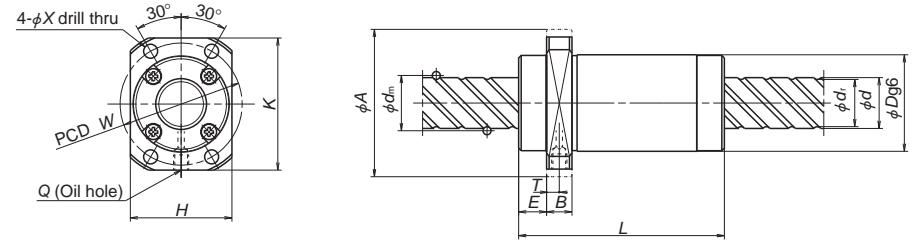
##### ◇Reference number for ball screw



# End cap type



LSFC, LPFC



USFC, UPFC

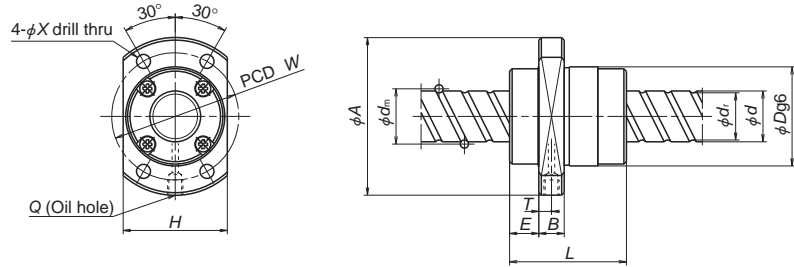
Unit: mm

Model No.	Preload system	Shaft dia. <i>d</i>	Lead <i>I</i>	Ball dia. <i>D<sub>v</sub></i>	Ball circle dia. <i>d<sub>m</sub></i>	Root dia. <i>d<sub>r</sub></i>	Effective turns of balls Turns × Circuits	Basic load rating (N)		Axial rigidity <i>K</i> (N/μm)
								Dynamic <i>C<sub>a</sub></i>	Static <i>C<sub>0a</sub></i>	
USFC 1220-1.5 UPFC 1220-1.5	Clearance P	12	20	2.381	12.5	9.9	1.7×1	2690	4420	66 103
* USFC 1520-1.5 UPFC 1520-1.5	Clearance P	15	20	3.175	15.5	12.2	1.7×1	5070	8730	97 151
USFC 1540-1 UPFC 1540-1	Clearance P		40	3.175	15.75	12.2	0.7×2 0.7×2	3860 3860	6050 6050	62 97
USFC 1540-2 UPFC 1540-2	Clearance P	16	16	2.778	16.65	13.7	0.7×4	7000	12100	121
USFC 1616-3 LPFC 1616-3	Clearance P						0.7×4	7000	12100	188
USFC 1616-6 LPFC 1616-6	Clearance P	16	32	3.175	16.75	13.4	1.7×2	6380	12500	172
USFC 1632-1 UPFC 1632-1	Clearance P						1.7×2	4000	6690	74
USFC 1632-3 UPFC 1632-3	Clearance P	16	50	3.175	16.75	13.4	0.7×2	4000	6690	102
USFC 1632-6 UPFC 1632-6	Clearance P						0.7×2	4000	6690	102
USFC 1650-1 UPFC 1650-1	Clearance P	20	20	3.175	20.75	17.4	0.7×4	7260	13400	126
USFC 1650-2 UPFC 1650-2	Clearance P						0.7×4	7260	13400	197
USFC 2020-3 LPFC 2020-3	Clearance P	20	40	3.175	20.75	17.4	1.7×2	9620	21000	238
USFC 2020-6 LPFC 2020-6	Clearance P						1.7×2	9620	21000	370
* USFC 2040-1 UPFC 2040-1	Clearance P	20	60	3.175	20.75	17.4	1.7×4	17500	42000	462
USFC 2040-3 UPFC 2040-3	Clearance P						1.7×4	17500	42000	718
USFC 2040-6 UPFC 2040-6	Clearance P	20	40	3.175	20.75	17.4	0.7×2	4490	8640	89
USFC 2060-1 UPFC 2060-1	Clearance P						0.7×2	4490	8640	138
USFC 2060-2 UPFC 2060-2	Clearance P	20	60	3.175	20.75	17.4	1.7×2	9620	21000	211
USFC 2060-3 UPFC 2060-3	Clearance P						1.7×2	9620	21000	328
USFC 2060-6 UPFC 2060-6	Clearance P	20	40	3.175	20.75	17.4	1.7×4	17500	42000	409
USFC 2060-1 UPFC 2060-1	Clearance P						1.7×4	17500	42000	636
USFC 2060-2 UPFC 2060-2	Clearance P	20	60	3.175	20.75	17.4	0.7×2	4490	8640	78
USFC 2060-3 UPFC 2060-3	Clearance P						0.7×2	4490	8640	121
USFC 2060-6 UPFC 2060-6	Clearance P	20	60	3.175	20.75	17.4	0.7×4	8140	17300	151
USFC 2060-1 UPFC 2060-1	Clearance P						0.7×4	8140	17300	235

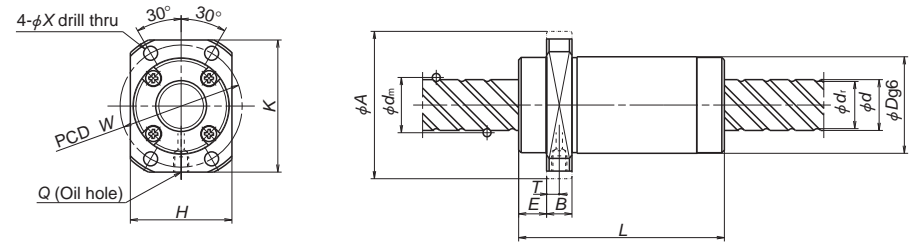
Remarks 1. For LSFC and USFC type ball screws, rigidities in the table are theoretical values obtained from the elastic deformation between the screw groove and the ball when the axial load is 30% of the basic dynamic load rating (*C<sub>a</sub>*). For LPFC and UPFC type, rigidities are theoretical values when the preload is 10% of the basic dynamic load rating (*C<sub>a</sub>*) and an axial load is applied to it. Refer to the "Technical Description" (Page B41) if the preload differs from the conditions above, or when considering a change in the deformation of the ball nut itself.

Nut entire length <i>L</i>	Nut diameter <i>D</i>	Flanged diameter <i>A</i>	Flanged width <i>B</i>	Ball nut dimensions		End cap dimension <i>E</i>	Bolt hole dimension <i>X</i>	Bolt hole PCD <i>W</i>	Oil hole <i>Q</i>	Oil hole position <i>T</i>
				Flanged dimension <i>H</i>	Flanged dimension <i>K</i>					
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 66 66 66 66	34	55	10	36	50	10.5	5.5	45	M6×1	5
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 41 81 81 81 81	38	58	10	40	52	11	5.5	48	M6×1	5.5
58	38	58	10	40	52	12.3	5.5	48	M6×1	5

Remarks 2. The right turn screw is standard. Please consult NSK for left turn screw.  
3. The models marked with \* are in FA type of standard ball screw with finished shaft end.  
4. Preload system: P; Oversize ball preload (Refer to Page B5)



LSFC, LPFC



USFC, UPFC

Unit: mm

Model No.	Preload system	Shaft dia. <i>d</i>	Lead <i>I</i>	Ball dia. <i>D<sub>v</sub></i>	Ball circle dia. <i>d<sub>m</sub></i>	Root dia. <i>d<sub>r</sub></i>	Effective turns of balls Turns × Circuits	Basic load rating (N)		Axial rigidity <i>K</i> (N/μm)			
								Dynamic <i>C<sub>a</sub></i>	Static <i>C<sub>0a</sub></i>				
LSFC 2525-3	Clearance P	25	25	3.969	26.0	21.9	1.7×2	14400	32800	293			
LPFC 2525-3							1.7×2	14400	32800	456			
LSFC 2525-6	1.7×4						26100	65600	568				
LPFC 2525-6	1.7×4						26100	65600	883				
USFC 2550-1	Clearance P						0.7×2	6700	13500	109			
UPFC 2550-1							0.7×2	6700	13500	170			
USFC 2550-3	Clearance P		1.7×2	14400	32800	264							
UPFC 2550-3			1.7×2	14400	32800	412							
USFC 2550-6	Clearance P		1.7×4	26100	65600	512							
UPFC 2550-6			1.7×4	26100	65600	796							
USFC 2580-1	Clearance P		80	3.969	26.0	21.9	0.7×2	6700	13500	94			
UPFC 2580-1							0.7×2	6700	13500	147			
USFC 2580-2	0.7×4	12200					27000	184					
UPFC 2580-2	0.7×4	12200					27000	285					
LSFC 3232-3	Clearance P	32					4.762	33.25	28.3	1.7×2	21000	51600	366
LPFC 3232-3										1.7×2	21000	51600	570
LSFC 3232-6	1.7×4		38100	103000	709								
LPFC 3232-6	1.7×4		38100	103000	1104								
USFC 3264-1	Clearance P		64	4.762	33.25	28.3				0.7×2	9800	20900	143
UPFC 3264-1										0.7×2	9800	20900	222
USFC 3264-3	1.7×2						21000	51600	329				
UPFC 3264-3	1.7×2						21000	51600	512				
USFC 3264-6	1.7×4						38100	103000	636				
UPFC 3264-6	1.7×4						38100	103000	991				
LSFC 4040-3	Clearance P		40	6.350	41.75	35.2	1.7×2	33500	86500	455			
LPFC 4040-3							1.7×2	33500	86500	708			
LSFC 4040-6	1.7×4	60800					173000	880					
LPFC 4040-6	1.7×4	60800					173000	1370					
LSFC 5050-3	Clearance P	50					7.938	52.25	44.1	1.7×2	50000	135000	560
LPFC 5050-3										1.7×2	50000	135000	871
LSFC 5050-6	1.7×4		90800	270000	1084								
LPFC 5050-6	1.7×4		90800	270000	1688								

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Nut entire length <i>L</i>	Nut diameter <i>D</i>	Flanged diameter <i>A</i>	Flanged width <i>B</i>	Ball nut dimensions		End cap dimension <i>E</i>	Bolt hole dimension <i>X</i>	Bolt hole PCD <i>W</i>	Oil hole <i>Q</i>	Oil hole position <i>T</i>
				Flanged dimension						
				<i>H</i>	<i>K</i>					
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	75	70	12	48	63	14.5	6.6	58	M6×1	6
75										
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

Remarks 2. The right turn screw is standard. Please consult NSK for left turn screw.  
3. The models marked with \* are in FA type of standard ball screw with finished shaft end.  
4. Preload system: P; Oversize ball preload (Refer to Page B5)