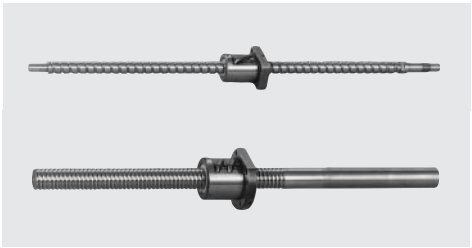
BALL SCREWS

Ⅰ Selection Guide to NSK Ball Screw



Ⅱ Technical Description of Ball Screws

B-Ⅰ Selection Guide to NSK Ball Screw

B-Ⅰ-1 Features of NSK Ball Screws

① Quick delivery

Standardized items are in stock for short lead time.

- Precision ball screws:‥ A Series, KA Series, S Series, V Series,
- Rolled ball screws:···· R Series

② Competitive prices

NSK reduces cost by well-planned mass production of standardized items. We rank the best in the world production of ordered items. We are able to offer our products at competitive prices by producing similar items in the same production group.

③ Unparalleled accuracy

When the accuracy is required, NSK utilizes its unique grinding technique and measuring equipment for the product in the topnotch precision.

④ Superb durability

NSK uses thoroughly purified alloy steel, and applies special case hardening heat treatment to it for superb durability.

⑤ No backlash, and unparalleled rigidity

NSK ball screws use gothic-arch groove as shown in Fig. I-1.1. Providing controlled preload is easy, thanks to this gothic-arch groove, and appropriate rigidity with no backlash can be obtained. As the Gothic-arch also minimizes the clearance between the balls and the groove, the back lash is controlled to minimal without applying preload.

Groove Shape of NSK Precision Ball Screw

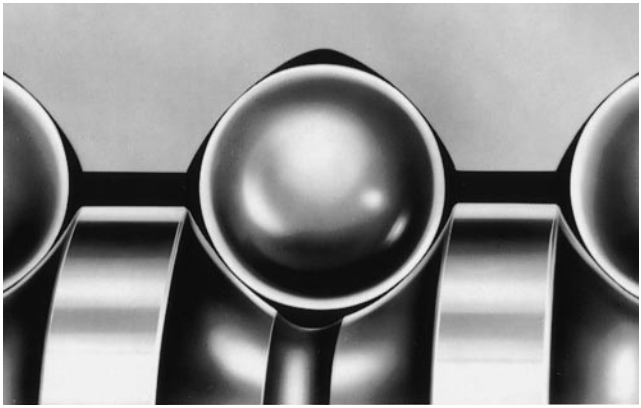


Fig. Ⅰ-1•1 Ball groove profile of NSK ball screw

⑥ Smooth movement assures high efficiency

Balls are slightly wedging into grooves of the nut and screw, as they enter to load zone at their recirculation, causing minute vibration, when the circular-arc groove is used. But this phenomenon does not happen in the gothic-arch groove. This, along with the low friction that is the inherent nature of the ball screw, is accountable for the smooth and highly efficient conversion of motion as shown in Fig. I-1•2.

⑦ Abundant accessory units available

Utilizing bearing technology, NSK produces high quality support units (for light load type to be used for small equipment and heavy load type to be used for machine tools) which are exclusive for ball screws. These units are standardized and always in stock.

NSK also offers quality-assured accessories such as lock nuts to tighten bearings, travel stoppers to prevent overrun, and sealing units to cool hollow shaft ball screws.

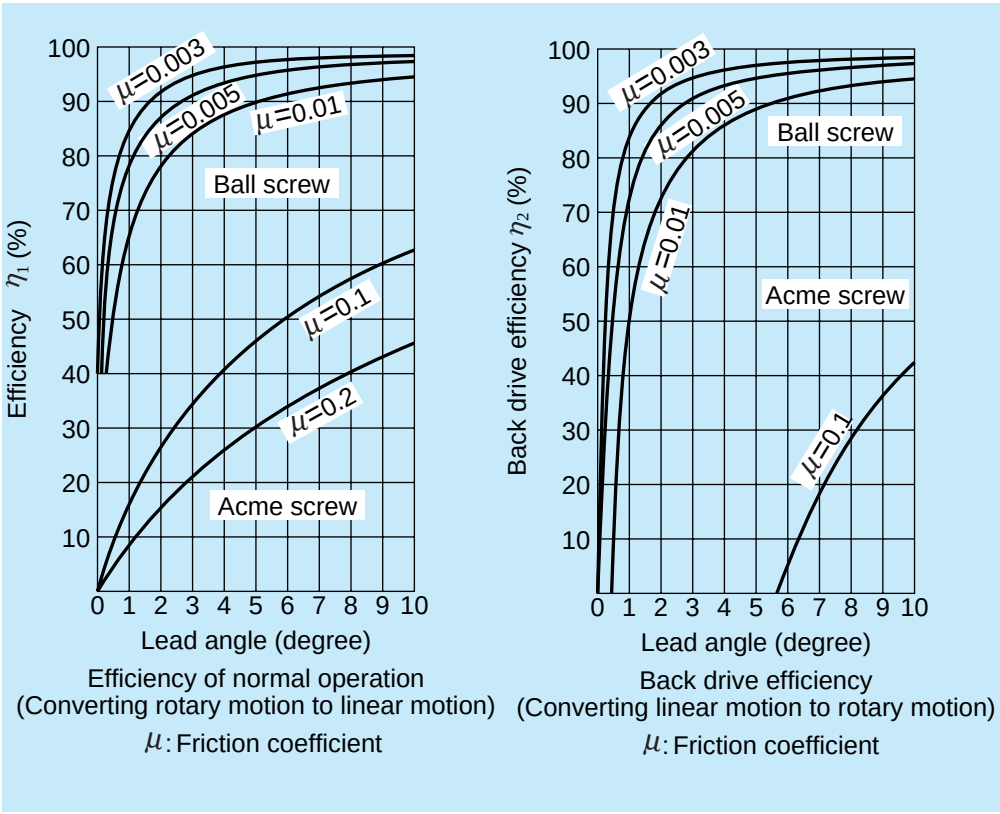


Fig. I-1•2 Mechanical efficiency of ball screws

B-I-2 Structure of a Ball Screw

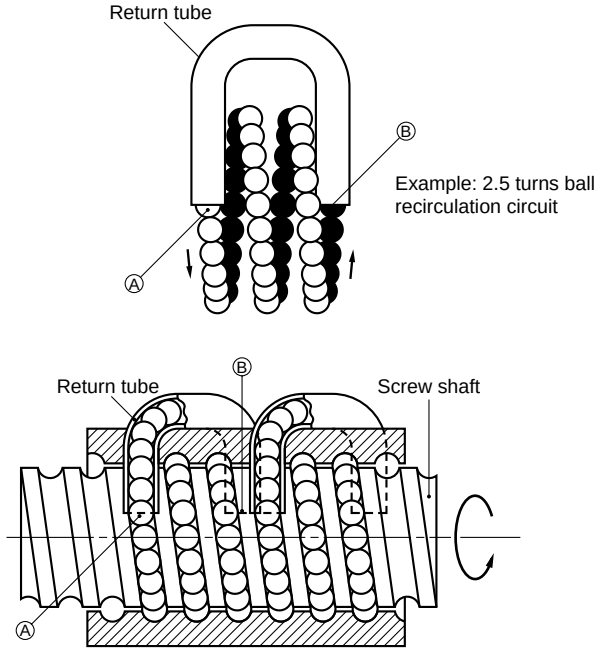
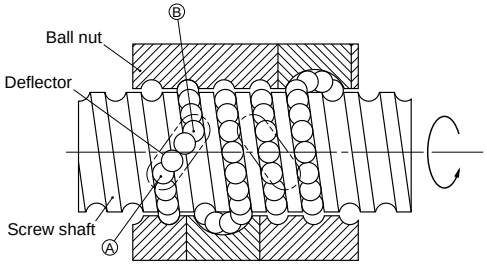
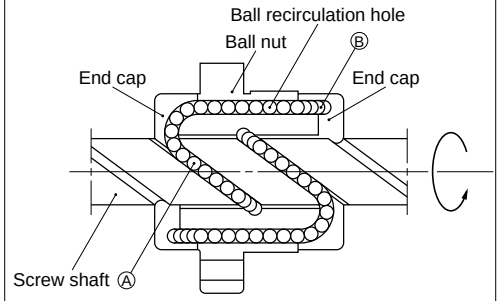
Balls are placed between the screw shaft and nut, and roll. This system is called a "ball screw." To keep the balls recirculating continually, this system requires a screw shaft, a nut, balls, and recirculation components as basic items. A ball screw has the following functions.

① Converting motion: Changing rotary motion to linear motion (normal operation); Changing linear motion to rotary motion efficiently (back-drive operation).

② Increasing power: A small torque is converted to a large thrust force.

③ Positioning: Sets accurate position in linear motion.

Table I-2•1 Ball screw recirculation system

Recirculation method	Ball return tube type	Deflector type	End cap type
Structure	 Number of turns of balls i_1: Number of turns between (A) to (B) Number of circuit i_2: Number of the tube Effective turns of balls i_0 : $i_0 = i_1 \times i_2$ In the above Figure, $i_2 = 2.5$; $i_2 = 2$. Therefore $i_0 = 5$	 Number of turns of balls i_1: 1(one) for deflector type, the number of turns is between (A) to (B). Number of circuit i_2: number of deflector Effective turns i_0 : $i_0 = 1 \times i_2$	 Number of turns of balls i_1: Number of turns of balls is (A) to (B) Number of circuit i_2: Number of start i_1, which is the number of independent threads of the screw Effective turns i_0 : $i_0 = i_1 \times i_2 = i_1 \times i_3$
Characteristics	Suitable for mass production which cuts costs	Compact nut outside diameter For small lead	For screws with high helix lead and multiple start threads
Number of turns of balls	Several types	Only one turn	Several types
Circuit (number of rows)	Several types	Several types	Several types
Nut outside diameter	Large	Small	Medium size
Output	High	Low	Somewhat suitable

B-I-2.1 Ball Recirculation System

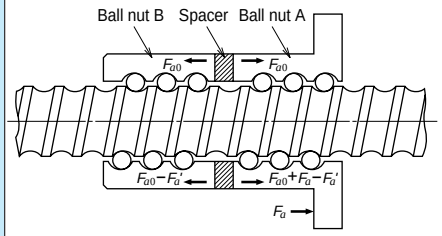
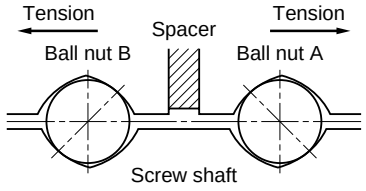
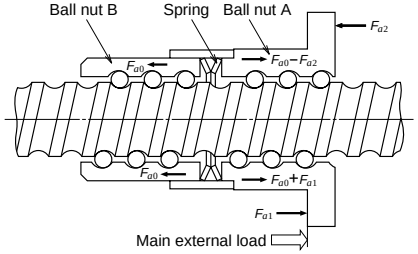
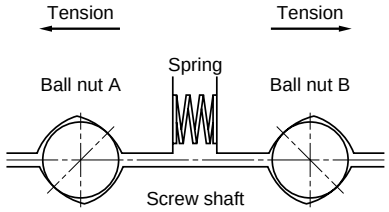
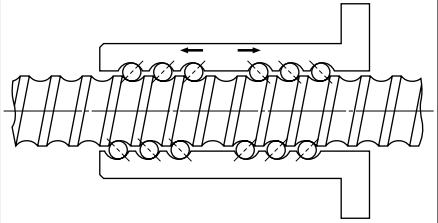
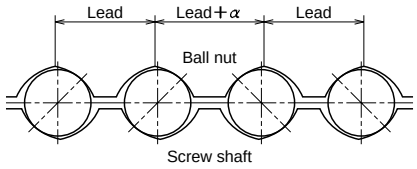
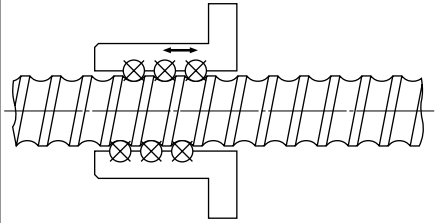
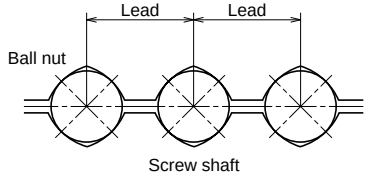
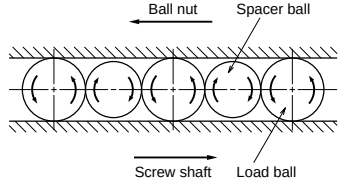
Ball recirculation system is categorically most important system, same as the preload system, to classify the structure of ball screw.

As shown in Table I-2.1, three types of ball recirculation system are used for NSK ball screw.

B-I-2.2 Preload system

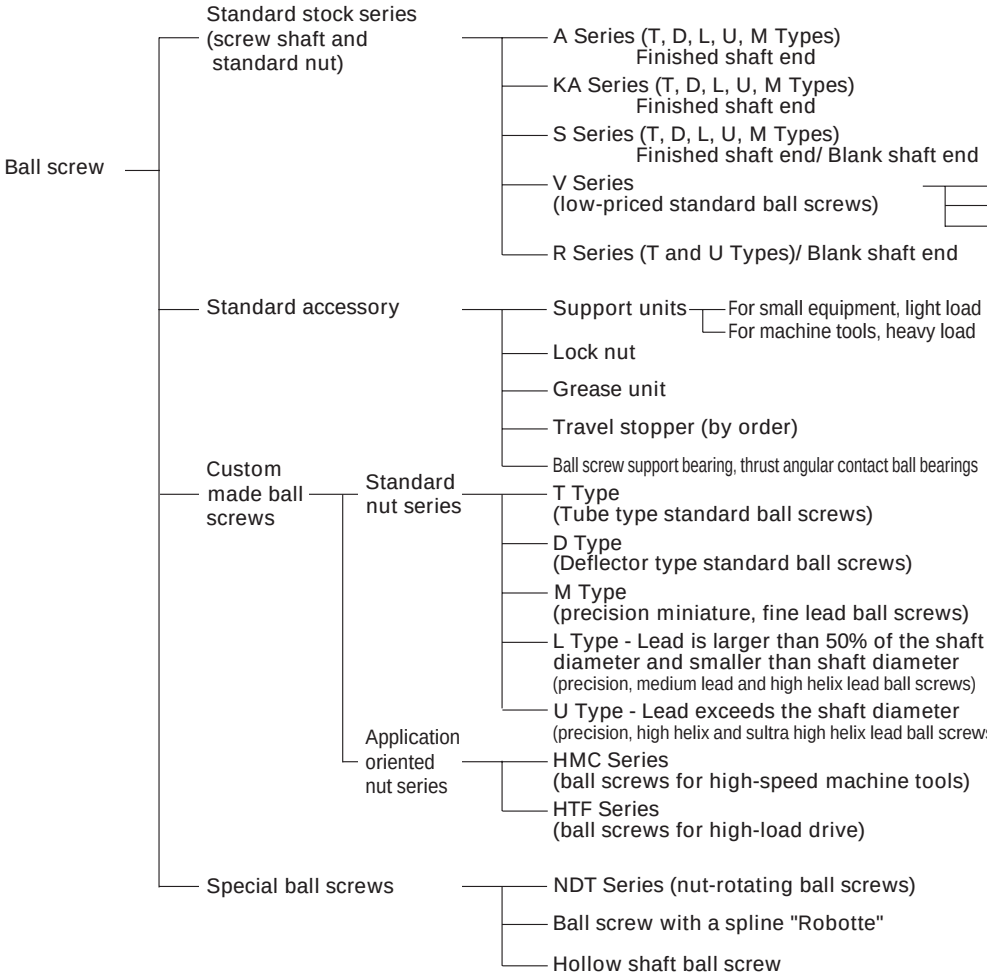
There are four types of the way to apply preload for the NSK ball screw depending on the application.

Table I-2•2 Preload system for ball screw

Preload system	Double nut preload (D Preload)	Spring preloaded double nut (J Preload)	Offset preload (Z Preload)	Oversize ball preload (P Preload)
Structure	 Double nut preload (D Preload)  Ball contact under double nut D Preload	 Spring preloaded double nut (J Preload)  Ball contact under the spring preloaded double nut (J Preload)	 Offset preload (Z Preload)  Ball contact under offset Z Preload	 Oversize ball preload (P Preload)  Ball contact under oversize ball P Preload Spacer ball (1:1) is standard to improve smoothness in operation, excepting for those with short turns of balls. 
Description	Uses two nuts, and insert a spacer between them to apply preload. In general, a spacer is thicker (by the deformation equivalent to the preload) than the actual space between two nuts. On the contrary, a thin spacer is inserted in some cases.	A spring is used as a spacer of D Preload. (Must be used with discretion in its varied rigidity by load direction.)	To apply preload, the lead near the center of the nut is enlarged by the volume equivalent to preload (α). (Uses a single nut to create a preload similar to D preload.)	Balls slightly larger than the space of the ball groove (over-size balls) are inserted to apply preload by balls' four-point contact.
Nut length	Long	Long	Medium	Short
Torque characteristics	Fair	Excellent	Fair	Fair
Rigidity	Excellent	Poor	Excellent	Fair

B-I-3 Ball Screw Series

B-I-3.1 Ball Screw Classification



Accuracy grade: C5 grade or better Can be combined with support units.	Page B39
Uses stainless steel, highly effective in rust-prevention.	Page B155
Accuracy grade: C5 grade or better Custom-ordered shaft end processing is available	Page B181
RMA (precision rolled miniature ball screw, finished shaft end) RMS (precision rolled miniature ball screw, blank shaft end) VFA (finished shaft end) Low-price, accuracy grade Ct7	Page B232
Low-price	Page B255
Support bearing units for ball screw	Page B273
	Page B299
Lubricant grease for ball screws	Page B300
Safety measure against overrun	Page B300
Support bearing for ball screws	Page B301
This ball recirculation type is ideal for large volume production for cost reduction	Page B309
Compact nut outside diameter	Page B353
Accurate positioning for small equipment	Page B375
	Page B383
Ideal for high-speed feed	
	Page B399
High-speed, low vibration, low noise High rigidity, high load carrying capacity, compact nut	Page B405
Exclusively developed for high loads: Electric drive became possible for the use under high load.	Page B411
Long stroke, for high-speed operation	Page B417
For various actuators	Page B423
Prevents thermal expansion of the ball screw to achieve highly precise positioning.	Page B435

Table I-3.1 shows basic types of NSK ball screws.

Table I-3•1 Basic NSK ball screws

Type	Lead size	Recirculation component	Preload method
T Type	Fine, Medium	Tube	D, P, Z
D Type	Fine, Medium	Deflector	D, P, Z
L Type	Medium, High helix	Tube	D, P
U Type	High helix, Ultra high helix	Tube, end cap	P
M Type	Fine	Deflector	P

Remarks

Table I-3•2 Lead classification

Classification	Lead ratio K=lead *l* / shaft diameterd
Fine	K<0.5
Medium	0.5 ≦ K<1
High helix	1 ≦ K<2
Ultra high helix	2 ≦ K

B-I-3.2 Ball Screw Series

(1) Standard stock series (immediate delivery, low-price)

Ball screws

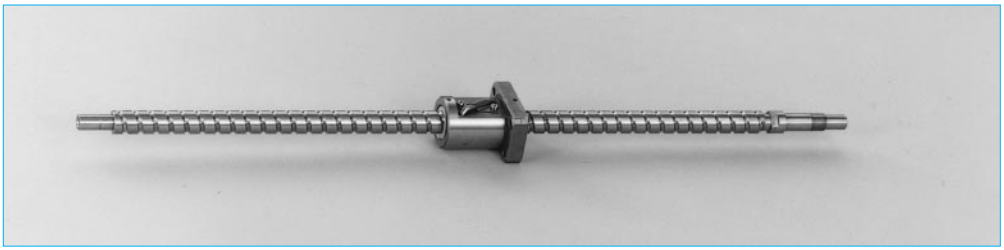


Fig. I-3•1 A Series Finished shaft end Page B39

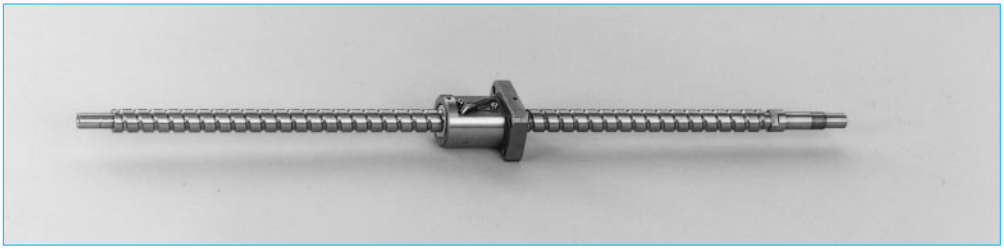


Fig. I-3•2 KA Series Finished shaft end Page B155

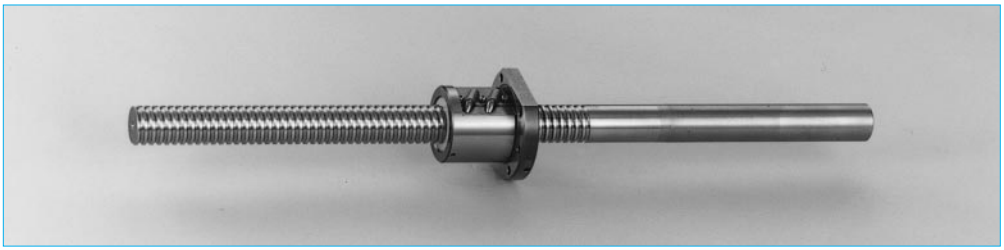


Fig. I-3•3 S Series Blank shaft end Page B181

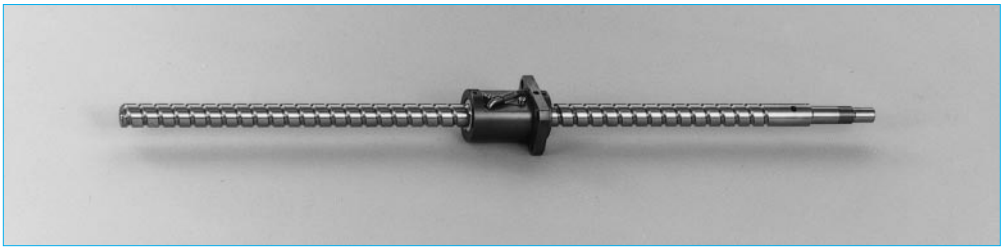


Fig. I-3•4 V Series VFA finished shaft end Page B232

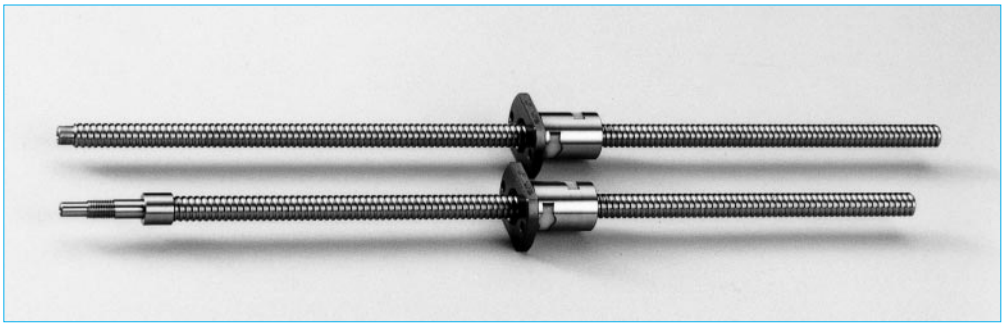


Fig. I-3•5 V Series RMA finished shaft end RMS blank shaft end Page B240

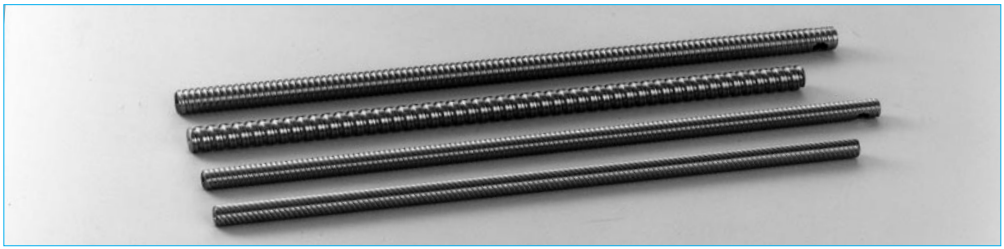


Fig. I-3•6 R Series Blank shaft end Page B255

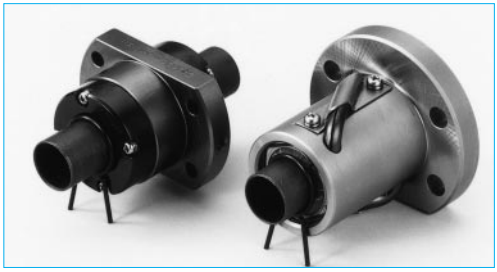


Fig. I-3•7 R Series Nut assembly

Standard accessory

Fig. I-3•8 Support unit, for small equipment (light load) Page B276

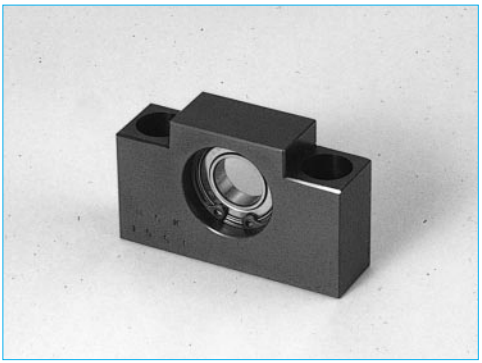


Fig. I-3•9 Support unit for VFA (simple support side) Page B291

Fig. I-3•10 Support bearing kit for RMA Page B293

Fig. I-3•11 Support unit, for machine tolls (heavy load) Page B296

Components for ball screw support bearing are available.

Fig. I-3•12 Lock nuts A Type Page B299

Fig. I-3•13 Lock nuts S Type Page B299

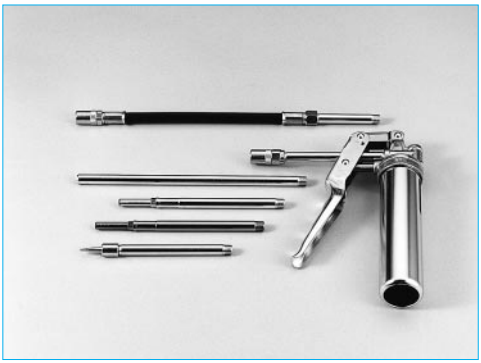


Fig. I-3•14 Grease unit Page D19

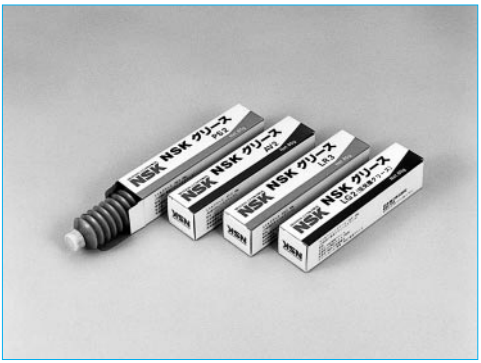


Fig. I-3•15 NSK grease Page B300, D19

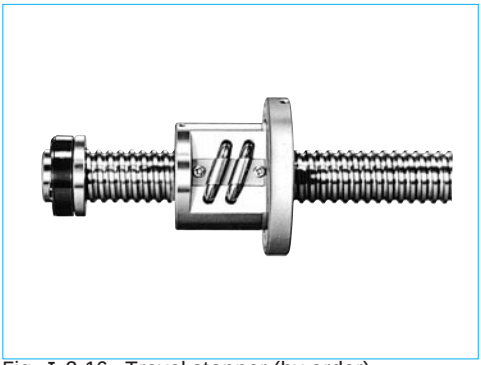


Fig. I-3•16 Travel stopper (by order) Page B300

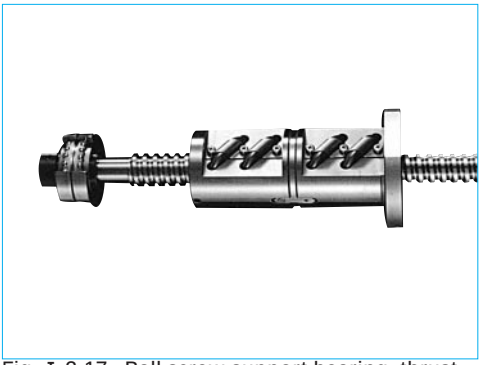


Fig. I-3•17 Ball screw support bearing, thrust angular contact ball bearings Page B301

(2) Custom made ball screws: Standard ball nut series

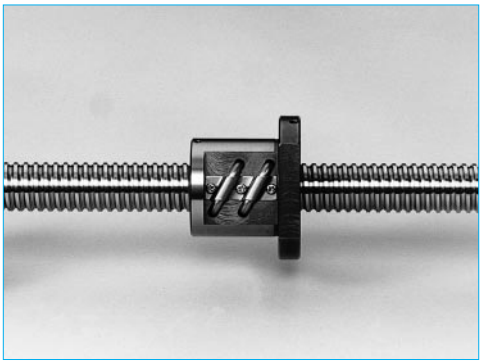


Fig. I-3•18 T Type
(Tube type, standard ball screw) Page B309

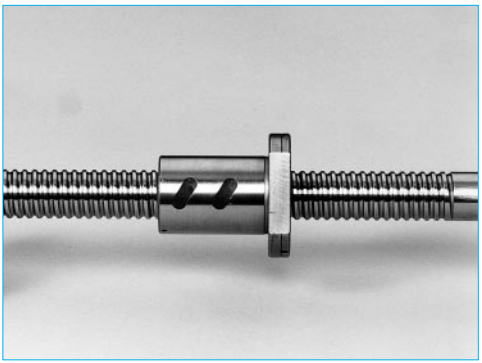


Fig. I-3•19 D Type
(Deflector type, standard ball screw) Page B353

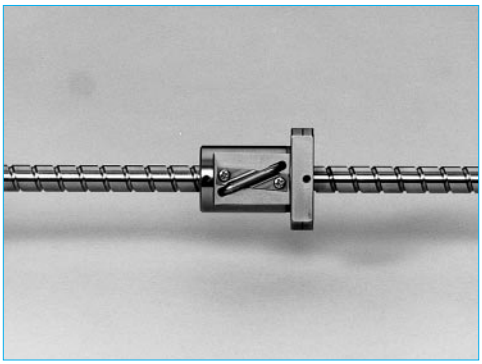


Fig. I-3•20 L Type (precision, medium and high helix lead ball screws) Page B383

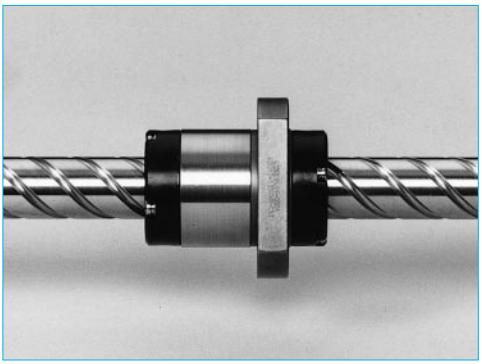


Fig. I-3•21 U Type (precision, high helix and ultra high helix lead ball screws) Page B399

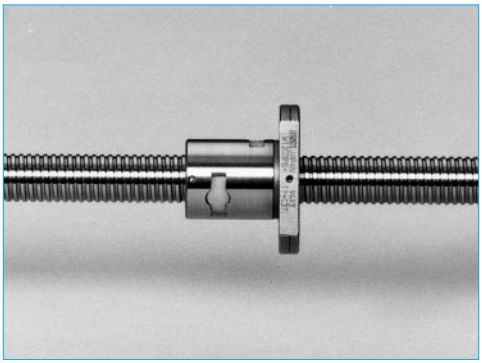


Fig. I-3•22 M Type
(precision miniature, fine lead ball screws)
Page B375

(3) Custom made ball screws: Application oriented nut series

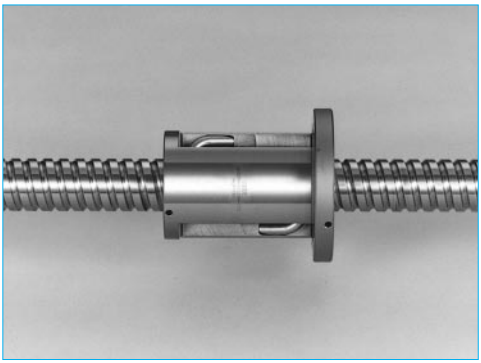


Fig. I-3•23 Ball screw for high-speed machine tools (HMC Series) Page B405

Fig. I-3•24 Ball screw for high load drive (HTF Series) Page B411

(4) Special ball screws

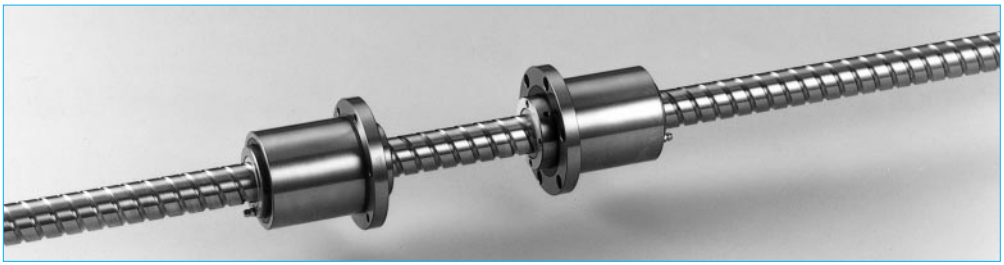


Fig. I-3•25 NDT Series (rotatable nut ball screws) Page B417

Fig. I-3•26 Ball screw with spline "Robotte" Page B423

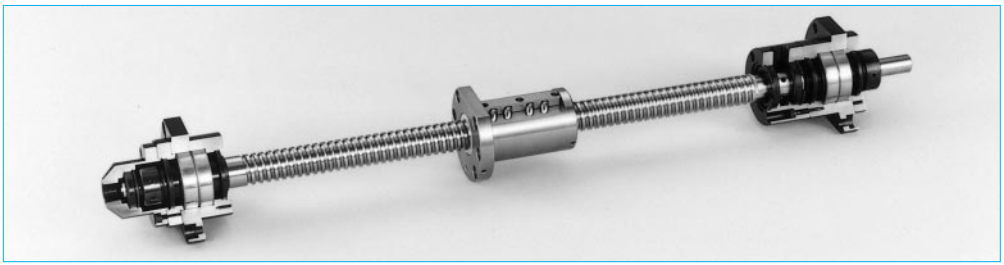
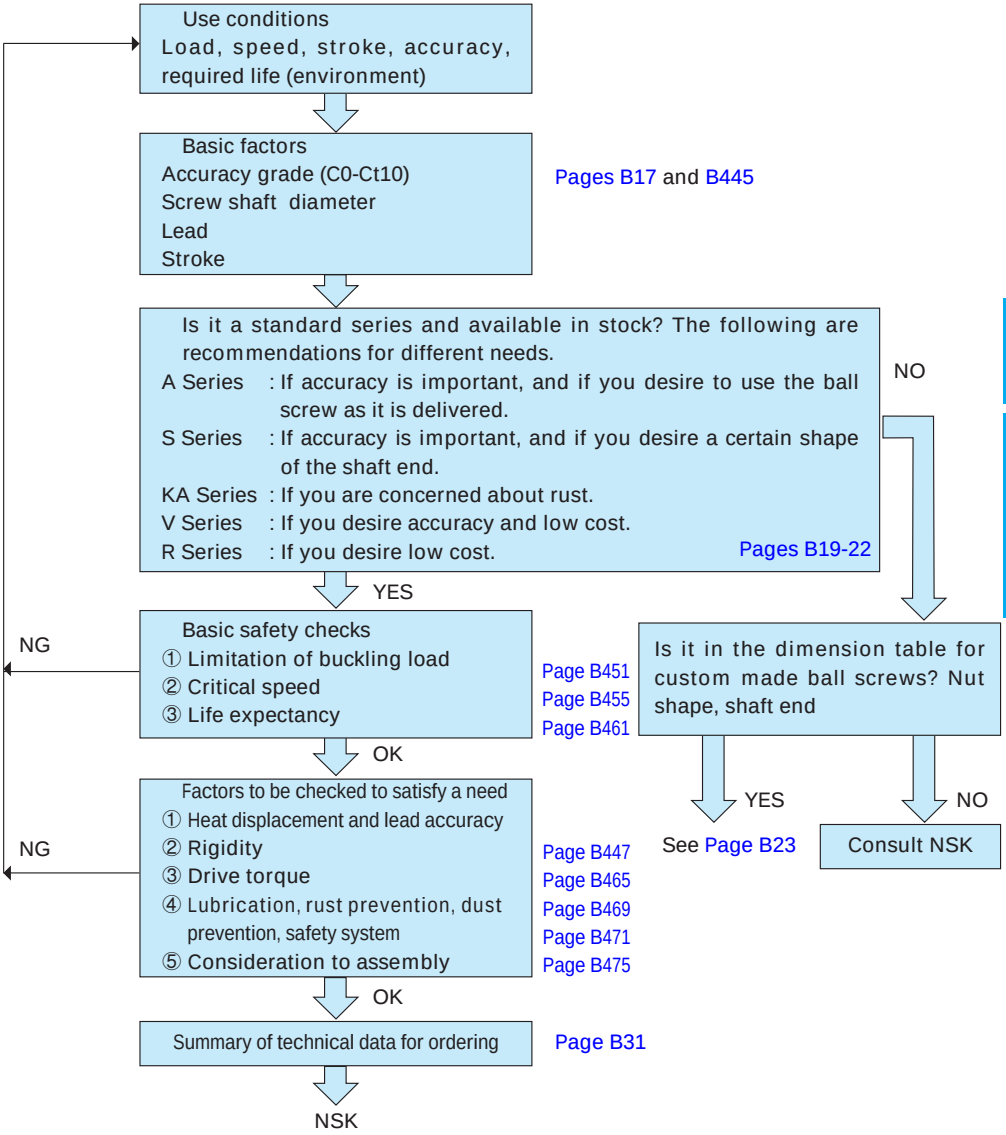


Fig. I-3•27 Hollow shaft ball screw Page B437

B-I-4 Procedures to Select Ball Screw

B-I-4.1 Flow Chart for Selection

There are several methods to select a ball screw which is most suitable both in type and size for a specific use. The chart below is one of the selection methods. To take advantage of prompt delivery and reasonable prices, this method focuses on the standardized series that are available in stock.
NSK offers a ball screw selection program, and also has a service to select appropriate items using data file compiled by our knowledge and experience.



B-I-4.2 Accuracy Grades

Table I-4•1 shows examples of how to select accuracy grade for a specific use. These practical cases are based on NSK's experience. Circle indicates the range of the accuracy grade in actual use. Double circle indicates accuracy grades most frequently used among cases marked with a single circle. These symbols help to identify general information on the accuracy grade of ball screws. To confirm whether a specific ball screw accuracy grade satisfies requirements in positioning accuracy in actual use, refer to "Technical Description" and "Mean travel deviation and travel variation." (Page B445)

Table I-4•1 Accuracy grades of ball screw and their application

Application		NC machine tools																				
		Lathe		Milling machine Boring machine		Machining center		Drilling machine		Jig boring machine		Grinder		Electric discharge machine		Wire cutting machine Electric discharge machine		Punch press	Laser cutting machine		Woodworking machine
Name of axis		X	Z	XY	Z	XY	Z	XY	Z	XY	Z	XY	Z	XY	Z	XY	Z	XY	XY	Z	
Accuracy grade	C0	○								○	○	○									
	C1	○		○		○				◎	◎	○	○	○		○	○				
	C2	○		○	○	○	○					◎	○	○	○	◎	○				
	C3	◎	○	◎	○	○	○	○					◎	◎	◎	◎	◎	○	○	○	
	C5	◎	◎	◎	◎	◎	◎	◎	◎						◎		○	◎	◎	◎	◎
	Ct7								○												◎
	Ct10																				○

Application		General industrial machines , Machines for specific use	Semiconductor/associated industry						Industrial robots						Steel mills equipment	Plastic injection molding machine	Three-dimensional coordinate measuring machine	Office machine	Image processing equipment	Nuclear power		Aircraft
			Lithographic machine	Chemical processing equipment	Wire bonder	Prober	Electronic component inserting machine	Printed circuit board drilling machine	Cartesian type		Articulate type		SCARA type								Fuel rod control	Mechanical snubber	
									Assembly	other purposes	Assembly	other purposes											
Accuracy grade	C0		○			○											○		○				
	C1		◎		○	○		○									◎		◎				
	C2				○	◎	○	○	○								○						
	C3	○		○			○	◎	○		○		○								○		○
	C5	◎		○			◎	○	◎	○	◎	○	○			○		○			◎		◎
	Ct7	◎		◎					○	◎	○	◎	◎		○	◎		○			○	◎	
	Ct10	○		○						○					◎	○		○				○	

B-I-4.3 Axial Play

Table I-4•2 indicates combinations of NSK ball screw accuracy grades and axial play. Select an axial play which satisfies the required accuracy in backlash, positioning and repeatability. Ranges of available ball thread effective length in relation to accuracy grade and axial play are shown in Table I-4•3. Please note that if the effective length exceeds the range, the axial play may become partially negative (preloaded condition).

Table I-4•2 Combinations of accuracy grades and axial play

Unit: mm

Axial play / Accuracy grade	*Z*	*T*	*S*	*N*	*L*
	0 (Preload)	0.005 or under	0.020 or under	0.050 or under	0.3 or under
C0	C0Z	C0T	—	—	—
C1	C1Z	C1T	—	—	—
C2	C2Z	C2T	—	—	—
C3	C3Z	C3T	C3S	—	—
C5	C5Z	C5T	C5S	C5N	—
Ct7	—	—	C7S	C7N	C7L

Table I-4•3 Maximum effective thread length in combination of accuracy grade and axial play

Unit: mm

Screw shaft diameter	Effective length of the screw thread (maximum)				
	Axial play *T*		Axial play *S*		
	C0~C3	**C5**	**C3**	**C5**	**Ct7**
4~6	80	100	80	100	—
8~10	250	200	250	300	—
12~16	500	400	500	600	700
20~25	800	700	1000	1000	1000
32~40	1000	800	2000	1500	1500
50~63	1200	1000	2500	2000	2000
80~125	—	—	4000	3000	3000

Remarks: Refer to Table I-4.12 (Page B25) for the available length of screw shaft (maximum length). Also, axial play of code N does not become partial negative play if it is within the available range of effective ball thread length.

B-I-4.4 Screw Shaft Diameter, Lead, and Stroke

First, temporarily choose a screw shaft diameter and stroke based on the allowable space for ball screw installation. Lead should be set based on the required running speed, and should give some allowance to the maximum rotational speed of the motor.

Table I-4•4 shows classification of lead.

(1) Standard stock series

Table I-4•5 and 6 show "combinations of ball screw diameter and leads" and "range of stroke." From these tables, select closest values to the shaft diameter, lead, and stroke which temporarily had been selected previously. Also, confirm detailed specifications and sizes in "Dimensional table of standard items" (Page B39).

Table I-4•4 Lead classification

Classification	Lead ratio K= lead l / shaft diameter d
Fine lead	$K<0.5$
Medium lead	$0.5 \leqq K<1$
High helix lead	$1 \leqq K<2$
Ultra high helix lead	$2 \leqq K$

Table I-4•5 Standard stock ball screws: Combinations of screw shaft diameter and leads

Unit: mm

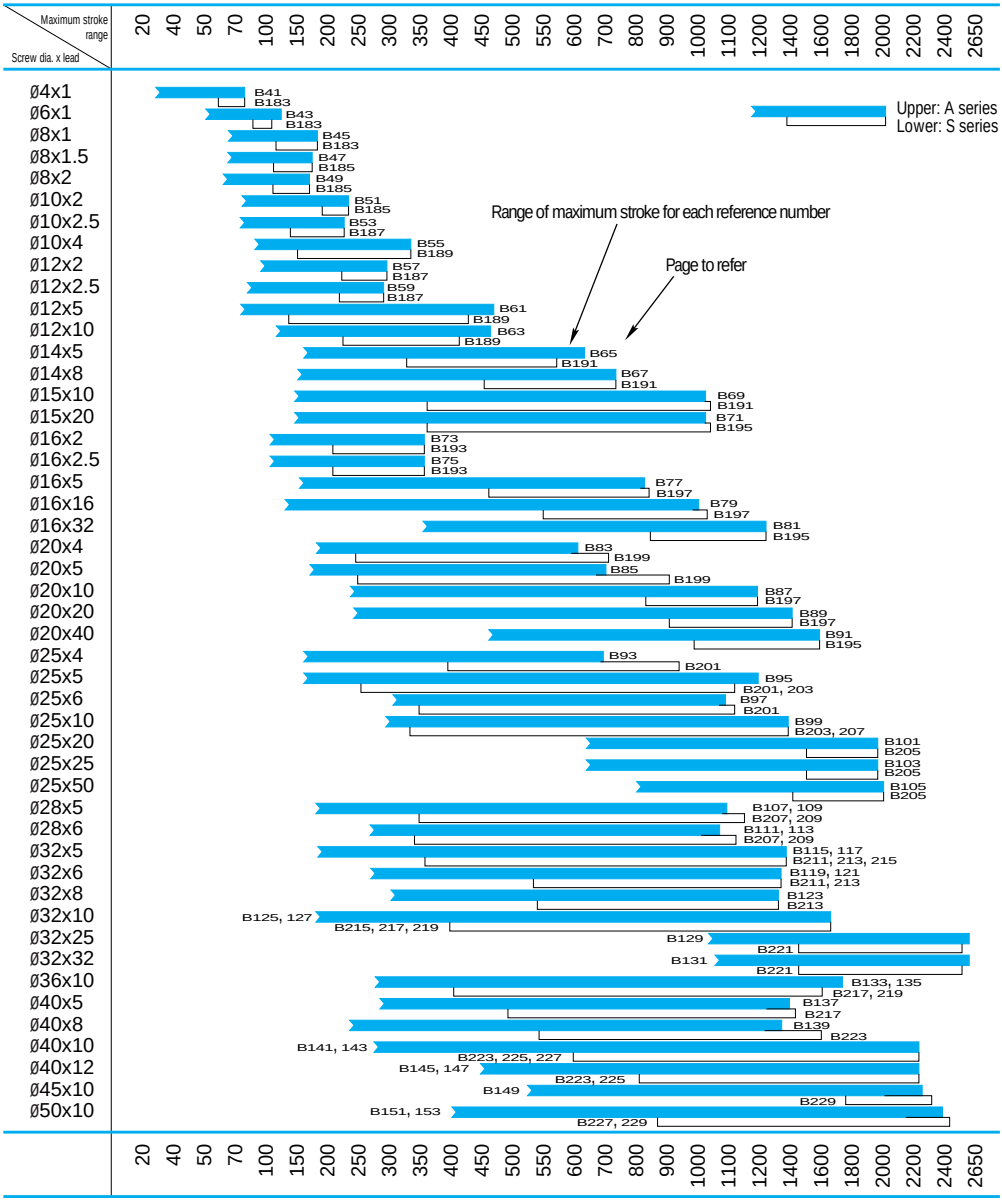
Shaft diameter \ Lead	1	1.5	2	2.5	4	5	6	8	10	12	16	20	25	32	40	50
4	●															
6	●															
8	●	●	●													
10			●	●	●											
12			●	●		●			●							
14						●		●								
15									●			●				
16			●	●		●					●			●		
20					●	●			●			●			●	
25					●	●			●			●	●			●
28						●	●									
32						●	●	●	●				●	●		
36									●							
40						●		●	●	●						
45									●							
50									●							

Remark: See Table I-4•7 for KA (stainless) Series.

Strips in the Tables indicate a range of maximum stroke of each series and each model number. Page numbers are shown at the end of the strips.

Table I-4•6 Maximum stroke of standard stock ball screws (A and S series)

Unit: mm



Refer to Table I-4•9 for KA series.

Table I-4•7 KA Series: Combinations of shaft diameter and leads

Unit: mm

Shaft diameter \ Lead	1	2	4	5	10	20
6	●					
8	●	●				
10		●	●			
12		●		●	●	
15					●	●
16		●				
20						●

Table I-4•8 Rolled ball screw: Combinations of shaft diameter and leads

Unit: mm

Shaft diameter \ Lead	3	4	5	6	8	10	12	16	20	25	32	40	50	64	80
10	●			●											
12					●		●								
14		●	●												
15									●						
16						●		●			●				
18					●										
20			●			●			●			●			
25			●			●				●			●		
28				●											
32						●					●			●	
36						●									
40						●						●			●
45							●								
50						●		●					●		

Table I-4•9 Range of maximum stroke of the stainless A series (KA series)

Unit: mm

Shaft dia. X lead \ Range of maximum stroke	100	200	300	400	500	600	700	800	900	1000	1100
Ø 6 x 1	B157										
Ø 8 x 1	B159										
Ø 8 x 2	B161										
Ø10 x 2	B163										
Ø10 x 4	B165										
Ø12 x 2	B167										
Ø12 x 5	B169										
Ø12 x 10	B171										
Ø15 x 10	B173										
Ø15 x 20	B175										
Ø16 x 2	B177										
Ø20 x 20	B179										

Maximum stroke range for S series is shown in the next page.

Table I-4•10 Maximum stroke range of standard stock rolled ball screw

Unit: mm

Shaft dia. X lead \ Shaft length	500	1000	1500	2000	2500	3000	3500	4000	5000
Ø10 x 3	B257, 265								
Ø10 x 6	B257, 263								
Ø12 x 8	B257, 263								
Ø12 x 12	B261, 269								
Ø14 x 4	B257, 263, 265, 267								
Ø14 x 5	B257, 263, 265, 267								
Ø15 x 20	B269								
Ø16 x 10	B257								
Ø16 x 16	B261, 269								
Ø16 x 32	B271								
Ø18 x 8	B257								
Ø20 x 5	B257, 263, 265, 267								
Ø20 x 10	B216, 263, 267								
Ø20 x 20	B261, 269								
Ø20 x 40	B271								
Ø25 x 5	B257, 263, 265, 267								
Ø25 x 10	B257, 263, 265, 267								
Ø25 x 25	B261, 269								
Ø25 x 50	B271								
Ø28 x 6	B259, 263, 265, 267								
Ø32 x 10	B259, 263, 265, 267								
Ø32 x 32	B261, 269								
Ø32 x 64	B271								
Ø36 x 10	B259, 263, 265, 267								
Ø40 x 10	B259, 263, 265								
Ø40 x 40	B261, 269								
Ø40 x 80	B271								
Ø45 x 12	B259, 265, 267								
Ø50 x 10	B259, 265								
Ø50 x 16	B259, 265								
Ø50 x 50	B269								

Page to refer

Medium shaft length

Maximum shaft length

Minimum shaft length

(2) Custom made standard series

If the item you need is not in the standard series, you are required to set each specification for the ball screw.
Follow the selection procedures shown below.
Refer to Page B483 for drills to practice selection.

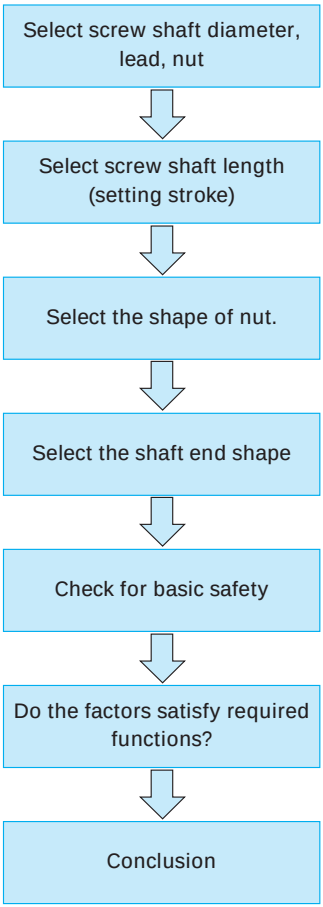


Table I-4•11 "Combinations of screw shaft diameter of basic type ball screws and leads"·····See Page B24
"Dimension of nut"·····See Page B307

Table I-4•12 "Range of available screw shaft dimensions"
·····See Page B25

"Exterior shapes of nut"····· See Page B26
"Dimension table of nut"·····See Page B307

Table I-4•13, 14 "Shapes of standard shaft ends"····See Page B27
Table I-4•15, 16 "Configuration of rolled ball screw shaft end" (reference)·····See Page B29

(1) Permissible axial load See Page B451
(2) Critical speed See Page B455
(3) Life See Page B461

(1) Thermal displacement and lead accuracy See Page B447
(2) Rigidity See Page B465
(3) Drive torque See Page B469
(4) Lubrication, rust prevention, dust prevention, safety system See Page B471
(5) Consideration to assembly See Page B475

"When placing orders"····· See Page B31

Table I-4•11 is "Combinations of screw shaft diameter and leads for basic type ball screw." Please consult NSK if you require the types that are not listed in the Table.

Table I-4•11 "Combinations of screw shaft diameter and leads for typical ball screw"

Shaft diameter \ Lead	0.5	1	1.5	2	2.5	3	4	5	6	8	10	12	16	20	25	30	32	40	50	60	64	80
4	M	M																				
6	M	M		M																		
8	M	M	M	M																		
10		M		M	M	T	T		T													
12		M		M	M	M	T	T		T	L	L		U								
14				M		M	T	T		L												
15											L			U								
16				M	M		T	T	T		T		L				U		U			
18										T												
20				M			T	TD	TD	T	L		L	L				U		U		
25				M			T	TD	TD	T	TD		L	L	L				U			U
28								T	T		T											
32				M			T	TD	TD	TD	TD	T		LN	LN		LN				U	
36								T	T		T											
40				M				TD	TD	TD	TD	T	T	H	LN		LN	LN				U
45											T	T		H	H							
50								TD	TD	TD	TD	TD	TF	TD	LH N	H	LN	LN	LN			
55											T		F									
63									D	D	TD	TD	TF	TD F				L	L			
80											TD	TD	T	TD F								
100											D	TD	T	TD F	F							
125													T	T	T		T					
140															T		T	T	T			
160																	T	T	T			
200																	T	T	T			
250																		T	T			

T : T Type (Tube type ball screws)

D : D Type (Deflector type ball screws)

L : L Type (High helix lead ball screws)

U : U Type (Ultra high helix lead ball screws)

M : M Type (Deflector type miniature ball screws)

H : HMC Series (Ball screws for high-speed machine tools)

F : HTF Series (Ball screws for high load)

N : NDT Series (Nut rotatable ball screws)

B-I-4.5 Manufacturing Capability for Screw Shaft

Table I-4•12 shows the manufacturing capability for the screw shaft overall length for each accuracy grade.

The capability of large ball screw whose shaft diameter exceeds 100 mm is limited due to the weight. Please consult NSK in such case. Also consult NSK if the screw shaft size you desire to use exceeds the size listed in Table I-4•12.

Table I-4•12 Manufacturing capability of screw shaft

Unit: mm

Screw shaft diameter \ Accuracy grade	C0	C1	C2	C3	C5	Ct7	rolled ball screw (Ct10)
4	90	110	120	140	140	140	—
6	150	180	200	250	250	250	—
8	240	280	340	340	340	340	—
10	350	400	500	500	500	550	800
12	450	500	650	700	750	800	800
14	600	650	750	800	1000	1000	1000
15	600	700	800	900	1250	1250	1500
16	600	750	900	1000	1500	1500	1500
18	—	—	—	—	—	—	1500
20	850	1000	1200	1400	1900	1900	2000
25	1100	1400	1600	1900	2500	2500	2500
28	1100	1400	1600	1900	2500	2500	2500
32	1500	1750	2250	2500	3200	3200	3000(4000)
36	1500	1750	2250	2500	3200	3500	3000
40	2000	2400	3000	3400	3800	4300	4000 (5000)
45	2000	2400	3000	3400	4000	4500	4000
50	2000	3200	4000	4500	5000	5750	4000
63	2000	4000	5000	6000	6800	7700	
80		4000	6300	8200	9200	10000	
100		4000	6300	10000	12500	14000	
125				10000	14000	14000	

Remarks: Values in parentheses of rolled ball screw are applicable to the ultra high helix lead (l/d ≧ 2). Refer to dimension tables in B255 and following pages for details. Please note that the range for small leads (3 mm or under) are also limited by the screw length.

B-I-4.6 Outside Shapes of Ball Nut

(1) Flange shape (Fig. I-4•1)
Following types are available. For detailed dimensions, refer to "Dimension table of nut" in Page B311 and following pages.

① **Circular shape I**
Applicable to shaft diameter of 20 mm and larger

② **Circular shape II**
A flatted round flange. Applicable to the screw shaft diameter of 20 mm and larger

③ **Circular shape III**
A circle with two sides flatted. Applicable to M (miniature) Type

④ **Rectangular shape**
Applicable to shaft diameter of 16 mm and smaller

(2) Shapes of nut cross section (Fig. I-4•2)
Following types are available. For detailed dimensions, refer to "Dimension table of nut.."

① **Circular (round)**
The ball recirculation components are contained inside the circumference of the nut. It can be inserted in a round hole.

② **Tube-projecting type**
This shape is peculiar for the tube recirculation type. The nut outside diameter is small. But some recess must be given for housing because the ball recirculation tube protrudes from the circumference of the nut.

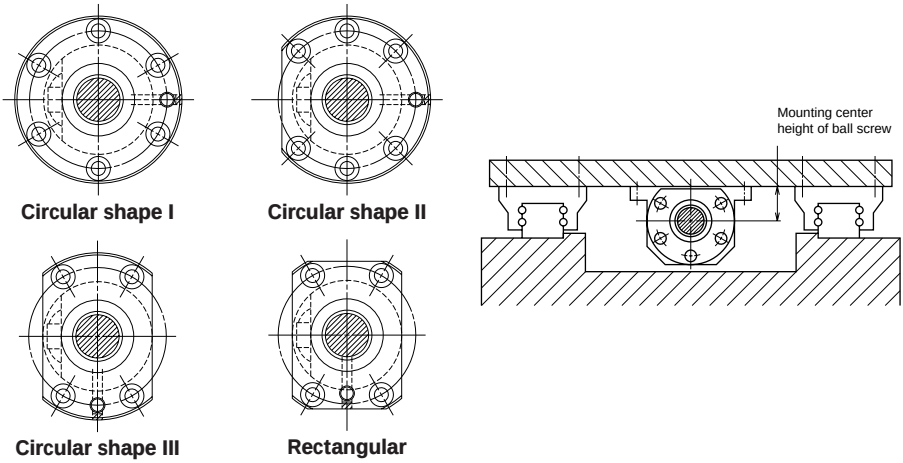


Fig. I-4.1 Flange shape and an installation example

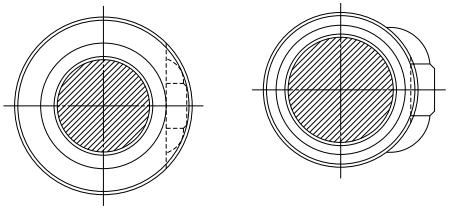


Fig. I-4.2 Shape of the cross section of nut

B-I-4.7 Shaft End Configuration

Table I-4•13 and 14 show shaft end types for NSK standard support units. Table I-4•15 and 16 shows rolled screw shaft ends for the same occasion. Refer to the dimension tables below also in designing shaft ends of standardized S Series.

(1) Standard shaft end dimensions

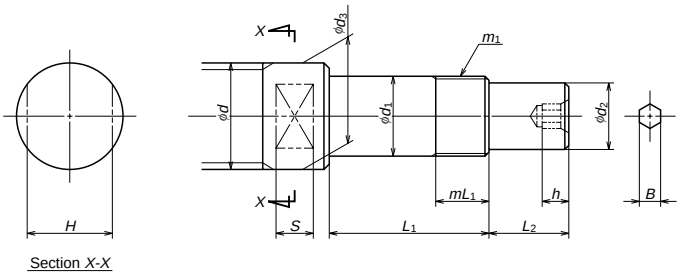


Fig. I-4•3 Configuration of standard shaft end (drive side)

Table I-4•13 Dimension of shaft end (drive side)

Unit: mm

Screw shaft diameter	Bearing journal		Thread		Drive section		Seal section	Hexagon hole		Wrench flats		Support unit	
	Outside diameter	Length	Nominal spec.	Length	Outside diameter	Length	Outside diameter	Width across flats	Depth	Width across flats	Length	Reference No.	
d	d_1	L_1	m_1	mL_1	d_2	L_2	d_3	B	h	H	S		
4	6	22.5	M6 x 0.75	7	4.5	7.5	9.5			8	4.5	WBK06-01A	WBK06-11
6	6	22.5	M6 x 0.75	7	4.5	7.5	9.5			8	4.5	WBK06-01A	WBK06-11
8	8	27	M8 x 1.0	9	6	10	11.5			10	5.5	WBK08-01A	WBK08-11
10	8	27	M8 x 1.0	9	6	10	11.5			10	5.5	WBK08-01A	WBK08-11
12	10	30	M10 x 1.0	10	8	15	14			12	6.5	WBK10-01A	WBK10-11
14	12	30	M12 x 1.0	10	10	15	15	4	6	12	6.5	WBK12-01A	WBK12-11
15	12	30	M12 x 1.0	10	10	15	15	4	6	12	6.5	WBK12-01A	WBK12-11
16	12	30	M12 x 1.0	10	10	15	15	4	6	12	6.5	WBK12-01A	WBK12-11
20	15	40	M15 x 1.0	15	12	20	19.5	5	7	17	8.5	WBK15-01A	WBK15-11
	17	81	M17 x 1.0	23	12	29	20	5	7	22	10	WBK17DF-31	
25	20	53	M20 x 1.0	16	15	27	25	6	8	22	10	WBK20-01	WBK20-11
	20	81	M20 x 1.0	23	15	39	25	6	8	22	10	WBK20DF-31	
28	20	53	M20 x 1.0	16	15	27	25	6	8	22	10	WBK20-01	WBK20-11
	20	81	M20 x 1.0	23	15	39	28	6	8	24	12	WBK20DF-31	
32	25	62	M25 x 1.5	20	20	33	32	8	10	27	12	WBK25-01	WBK25-11
	25	89	M25 x 1.5	26	20	51	32	8	10	27	12	WBK25DF-31	
	25	104	M25 x 1.5	26	20	51	32	8	10	27	12	WBK25DFD-31	
36	30	89	M30 x 1.5	26	25	61	36	10	12	30	13	WBK30DF-31	
	30	104	M30 x 1.5	26	25	61	36	10	12	30	13	WBK30DFD-31	
40	30	89	M30 x 1.5	26	25	61	40	10	12			WBK30DF-31	
	30	104	M30 x 1.5	26	25	61	40	10	12			WBK30DFD-31	
45	35	92	M35 x 1.5	30	30	63	45	12	14			WBK35DF-31	
	35	107	M35 x 1.5	30	30	63	45	12	14			WBK35DFD-31	
50	40	92	M40 x 1.5	30	35	78	50	14	18			WBK40DF-31	
	40	107	M40 x 1.5	30	35	78	50	14	18			WBK40DFD-31	

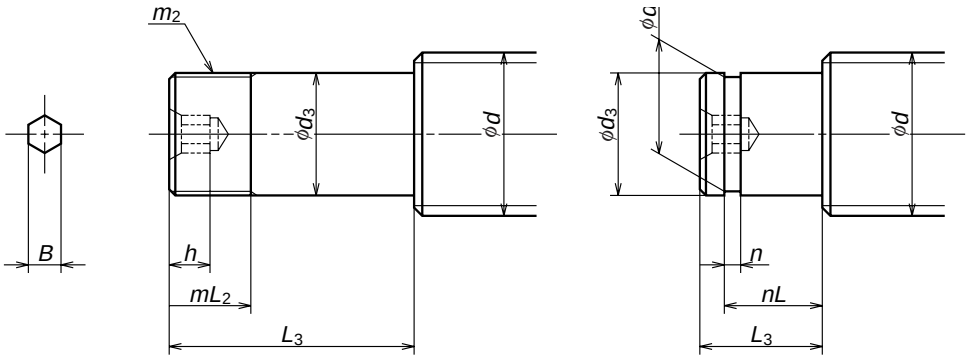


Fig. I-4•4 Standard shaft end configuration (opposite to the drive side)

Table I-4•14 Dimensions of shaft ends (opposite to the drive side)

Unit: mm

Screw shaft diameter d	Bearing journal		Thread for lock nut		Retainer ring groove			Hexagonal hole		Support unit Reference No. Numbers in parentheses are bearing reference number.
	Outside diameter d_3	Length L_3	Nominal spec. m_2	Length mL_2	Width n	Groove diameter dn	Groove position nL	Width across flats B	Depth h	
8	6	9	—	—	0.8	5.7	6.8	—	—	WBK08S-01
10	6	9	—	—	0.8	5.7	6.8	—	—	WBK08S-01
12	8	10	—	—	0.9	7.6	7.9	—	—	WBK10S-01
14	10	22(12)	—	—	1.15	9.6	9.15	4	6	WBK12S-01
15	10	22(12)	—	—	1.15	9.6	9.15	4	6	WBK12S-01
16	10	22(12)	—	—	1.15	9.6	9.15	4	6	WBK12S-01
20	15	25(13)	—	—	1.15	14.3	10.15	5	7	WBK15S-01
25	20	19	—	—	1.35	19	15.35	6	8	WBK20S-01
	20	53	M20×1.0	16	—	—	—	6	8	WBK20-01 | WBK20-11
	20	81	M20×1.0	23	—	—	—	6	8	WBK20DF-31
28	20	19	—	—	1.35	19	15.35	6	8	WBK20S-01
	20	53	M20×1.0	16	—	—	—	6	8	WBK20-01 | WBK20-11
	20	81	M20×1.0	23	—	—	—	6	8	WBK20DF-31
32	25	20	—	—	1.35	23.9	16.35	8	10	WBK25S-01
	25	62	M25×1.5	20	—	—	—	8	10	WBK25-01 | WBK25-11
	25	89	M25×1.5	26	—	—	—	8	10	WBK25DF-31
36	25	20	—	—	1.35	23.9	16.35	10	12	(6205)
	25	89	M25×1.5	26	—	—	—	10	12	WBK30DF-31
40	30	22	—	—	1.75	28.6	17.75	10	12	(6206)
	30	89	M30×1.5	26	—	—	—	10	12	WBK30DF-31
45	35	25	—	—	1.75	33	18.75	12	14	(6207)
	35	92	M35×1.5	30	—	—	—	12	14	WBK35DF-31
50	40	25	—	—	1.95	38	19.95	14	18	(6208)
	40	92	M40×1.5	30	—	—	—	14	18	WBK40DF-31

(2) Shaft end configuration of rolled ball screw

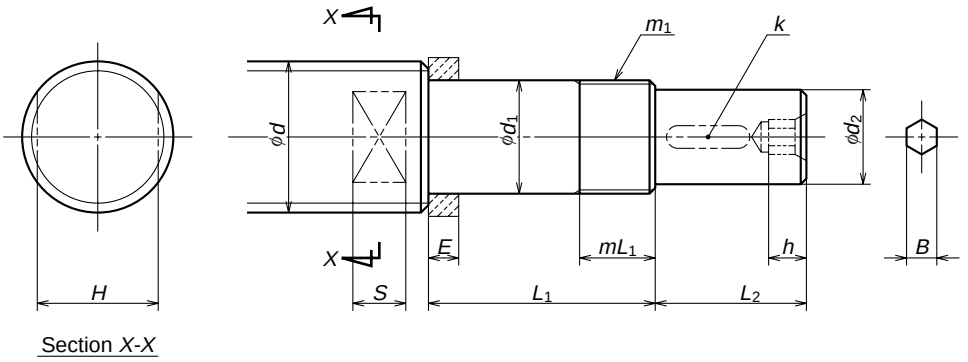


Fig. I-4•5 Rolled ball screw shaft end (drive side)

Table I-4•15 Dimensions of rolled screw shaft ends (drive side)

Unit: mm

Screw shaft diameter	Bearing journal		Thread for lock nut		Spacer	Drive section			Hexagonal hole		Wrench flat		Support unit	
	Outside diameter	Length	Nominal spec	Length	Width	Outside diameter	Length	Key width	Width across flats	Depth	Width across flats	Length		
d	d_1	L_1	m_1	mL_1	*E*	d_2	L_2	*k*	*B*	*h*	*H*	*S*	Reference No.	
10	6	27	M6×0.75	7	5.0	4.5	7.5	—	—	—	8	4.5	WBK06-01A	WBK06-11
	8	32	M8×1.0	9	5.5	6	10	—	—	—	10	5.5	WBK08-01A	WBK08-11
12	8	32	M8×1.0	9	5.5	6	10	—	—	—	10	5.5	WBK08-01A	WBK08-11
	10	35	M10×1.0	10	5.5	8	15	—	—	—	12	6.5	WBK10-01A	WBK10-11
14	10	35	M10×1.0	10	5.5	8	15	—	—	—	12	6.5	WBK10-01A	WBK10-11
15	10	35	M10×1.0	10	5.5	8	15	—	—	—	12	6.5	WBK10-01A	WBK10-11
	12	35	M12×1.0	10	5.5	10	15	3	4	6	12	6.5	WBK12-01A	WBK12-11
16	12	35	M12×1.0	10	5.5	10	15	3	4	6	12	6.5	WBK12-01A	WBK12-11
18	12	35	M12×1.0	10	5.5	10	15	3	4	6	12	6.5	WBK12-01A	WBK12-11
20	15	50	M15×1.0	15	10	12	20	4	5	7	17	8.5	WBK15-01A	WBK15-11
25	20	64	M20×1.0	16	11	15	27	5	6	8	22	10	WBK20-01	WBK20-11
28	20	64	M20×1.0	16	11	15	27	5	6	8	22	10	WBK20-01	WBK20-11
32	25	76	M25×1.5	20	14	20	33	6	8	10	27	12	WBK25-01	WBK25-11
36	25	76	M25×1.5	20	14	20	33	6	8	10	27	12	WBK25-01	WBK25-11
40	30	89	M30×1.5	26	—	25	61	8	10	12	—	—	WBK30DF-31	
45	35	92	M35×1.5	30	—	30	63	8	12	14	—	—	WBK35DF-31	
50	35	92	M35×1.5	30	—	30	63	8	12	14	—	—	WBK35DF-31	

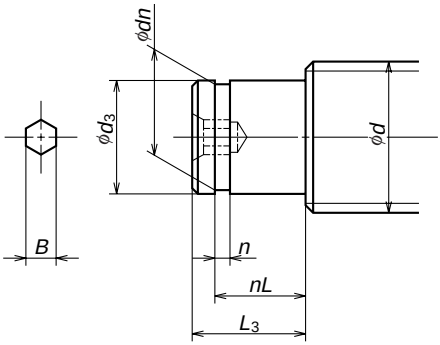


Fig. I-4•6 Shaft end configuration of rolled ball screw (opposite to the drive side)

Table I-4•16 Dimensions of rolled ball screw shaft end (opposite to the drive side)

Unit: mm

Screw shaft diameter	Bearing journal		Retaining ring groove			Hexagonal hole		Support unit Numbers in parentheses are bearing reference numbers.
	Outside diameter	Length	Width	Groove diameter	Groove position	Width across flats	Depth	
d	d_3	L_3	*n*	*dn*	*nL*	*B*	*h*	
10	6	9	0.8	5.7	6.8	—	—	WBK08S-01(606)
12	8	10	0.9	7.6	7.9	—	—	WBK10S-01(608)
14	10	12	1.15	9.6	9.15	4	6	WBK12S-01(6000)
15	10	12	1.15	9.6	9.15	4	6	WBK12S-01(6000)
16	10	12	1.15	9.6	9.15	4	6	WBK12S-01(6000)
18	10	12	1.15	9.6	9.15	4	6	WBK12S-01(6000)
20	15	13	1.15	14.3	10.15	5	7	WBK15S-01(6002)
25	20	19	1.35	19	15.35	6	8	WBK20S-01(6204)
28	20	19	1.35	19	15.35	6	8	WBK20S-01(6204)
32	25	20	1.35	23.9	16.35	8	10	WBK25S-01(6205)
36	25	20	1.35	23.9	16.35	8	10	WBK25S-01(6205)
40	30	22	1.75	28.6	17.75	10	12	(6206)
45	35	92	1.75	33	18.75	12	14	(6207)
50	35	92	1.75	33	18.75	12	14	(6207)

B-I-5 When Placing Orders

In order to avoid confusion, please use "reference number" or "specification number" when inquiring of NSK the factors of the desired ball screw specifications.

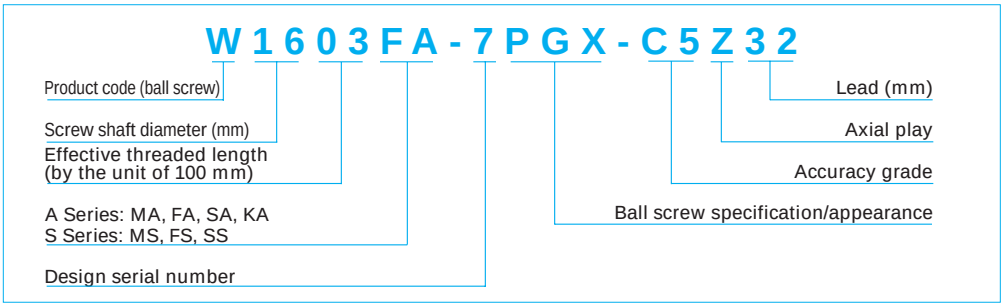
Reference number : Alpha-numeric codes are assigned to each ball screw.

Specification number : Specification factors are identified by alpha-numeric codes. Codes are for easy explanation of your requirements.
(If you do not use these numbers, please itemize your requirements)

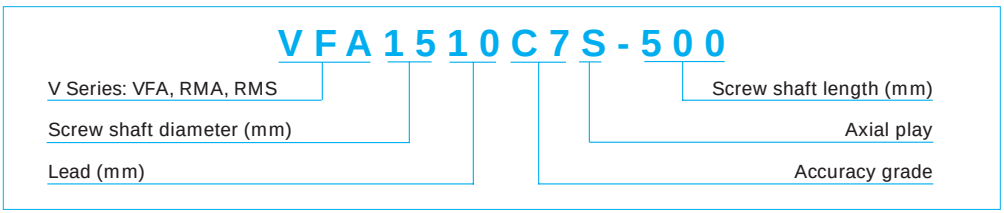
B-I-5.1 When Ordering Standard Series

Find the reference number from the dimension table. Enter the reference number in the "Order Form by Fax" (Page B33). Send the fax to a NSK agency (branch office, sales office, or your local representative.)

(1) Example of reference number of A/S Series ball screw

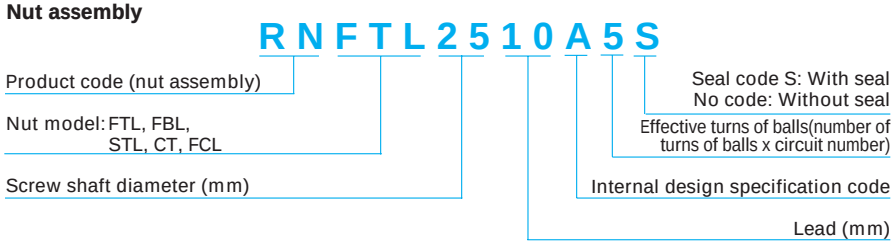


(2) Example of reference number of V Series ball screw

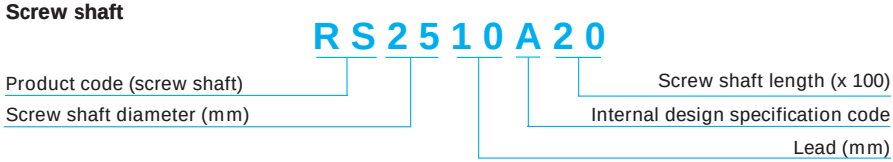


(3) Example of reference number for a rolled ball screw

Nut assembly



Screw shaft



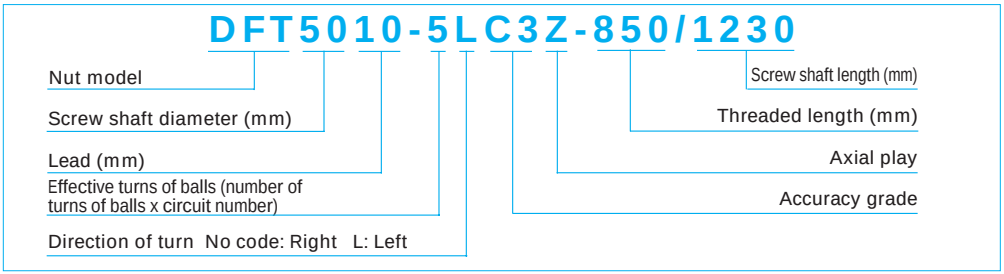
Please identify the nut assembly and screw shaft reference number when ordering.

B-I-5.2 When Ordering Custom Made Ball Screws

(1) Specification number

Use a specification number for inquiry prior to determining your specifications. A specification number reveals general information on the specification. This is useful for communication with NSK such as for obtaining a price estimate. If you desire to discuss with NSK technical points regarding specifications, use the NSK ball screw technical data sheet as an aid (Page B35).

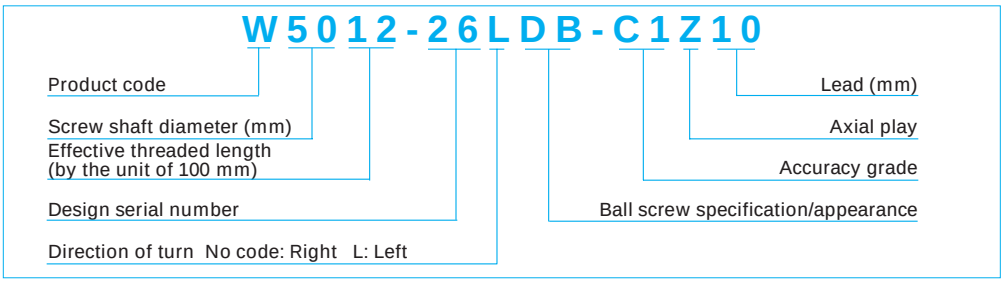
An example of specification number



(2) Reference number

After specifications are determined, a reference number such as below is assigned to each ball screw.
For detailed specifications, check the specification drawing, which NSK will issue for individual ball screw to confirm your requirements.
When placing order, please use this reference number.

An example of reference number



Fax Order Form

(Make copies for future orders)

(1) Standard series

Company name : Date: Day Month Year

Address : Telephone :

Name of person in charge : Section :

Product name	Specification number	Quantity	Desired delivery date
Precision ball screw			
Rolled ball screw Nut			
Rolled ball screw Screw shaft			
Support unit			
Lock nut			
Grease pack			

Describe the shaft end configuration if processing is required (S Series, R Series). In this case, specify for what ball screw in the above list the shaft end shall be processed.
Refer to Page 27-30 for shaft end configuration. These pages also show reference number of support units.

Drive side

Opposite of drive side

NSK Ball Screw Technical Data Sheet (example)

(2) Custom made ball screw

Company name _____ Date: Day Month Year

Address _____ Telephone _____

Person in charge _____ Section _____

Machine which uses the ball screw *Machining center Model MC-* Application *Table left/right movement (X axis)*

Drawing/rough sketch attached? Yes (No)

Note: Either unit system can be used.

Use conditions

	Axial load	Rotational speed	Operating hours		
Maximum load	*9000* N (kgf)	*20* rpm	*15*	Operating conditions	(Shaft rotation - Moving nut) (Normal operation) Shaft rotation - Moving shaft Back drive operation Nut rotation - Moving nut Nut rotation - Moving shaft Oscillation
Load in normal use	*4000* N (kgf)	*360* rpm	*60*		
Minimum load	*2000* N (kgf)	*1000* rpm	*25*	Degree of vibration shock	*Normal*
Maximum rotational speed	*1000* rpm			Required life	*20000h*
Lubricant	Grease/oil (*Brand name: Alvania No. 2*)			Motor in use	*Company A, Model 1*
Seal	Yes No			Control system	*Company B, Model 2* (resolution: *1μm*)
Support bearing	Drive side *35TAC62DF*			Opposite to drive side *35TAC62DF*	
Guide way	(Rolling) Sliding (*LY451500HL2-P4Z3-U*)				
Environment	Temperature (Normal temperature in degrees Celsius)	Dust	Humidity	Gas	Liquid (where?) Clean room In vacuum
Schedule for prototype	Day Month Year (approx.)			Quantity used per machine	Piece
Date, going in production/Quantity	/Month /Year /Lot				

Specification factors of the ball screw

Shaft diameter	*50mm*	Direction of turn	*right*	Accuracy grade	*C2*	Screw shaft length	*880mm*	Preload	*300kgf*
Lead	*10mm*	Effective turns of balls		Axial play	*0mm*	Overall shaft length	*1335mm*	Required torque	
Nut model	*DFT5010-5*		Flange type	*Circular I*	Nut orientation	Same as shown in the dimension table			Opposite

Supplemental explanation/requests

NSK Ball Screw Technical Data Sheet (example)

(2) Custom made ball screw

Company name _____ Date: Day Month Year

Address _____ Telephone _____

Person in charge _____ Section _____

Machine which uses the ball screw _____ Application _____

Drawing/rough sketch attached? Yes No

Note: Either unit system can be used.

Use conditions

	Axial load	Rotational speed	Operating hours		
Maximum load	N (kgf)	rpm		Operating conditions	Shaft rotation - Moving nut Normal operation Shaft rotation - Moving shaft Back drive operation Nut rotation - Moving nut Nut rotation - Moving shaft Oscillation
Load in normal use	N (kgf)	rpm			
Minimum load	N (kgf)	rpm		Degree of vibration shock	
Maximum rotational speed	rpm			Required life	
Lubricant	Grease/oil ( )			Motor in use	
Seal	Yes No			Control system	( )
Support bearing	Drive side			Opposite to drive side	
Guide way	Rolling Sliding ( )				
Environment	Temperature (Normal temperature in degrees Celsius)	Dust	Humidity	Gas	Liquid (where?) Clean room In vacuum
Schedule for prototype	Day Month Year (approx.)			Quantity used per machine	Piece
Date, going in production/Quantity	/Month /Year /Lot				

Specification factors of the ball screw

Shaft diameter		Direction of turn		Accuracy grade		Screw shaft length		Preload	
Lead		Effective turns of balls		Axial play		Overall shaft length		Required torque	
Nut model		Flange type		Nut orientation	Same as shown in the dimension table				Opposite

Supplemental explanation/requests

B-Ⅰ-6 Dimension Table and Reference Number of Standard Stock Ball Screws

Ball Screws

B-I-6.1 A Series

◇Ball screw sizes are in order of the page number.
Table begins with the smallest shaft diameter ball screw, and proceeds to the larger sizes. If ball screws have the same shaft diameter, those with smaller leads appear first. Page numbers of shaft diameter and lead combinations are shown in Table I-6•1.

◇Dimension tables
Dimension tables show shapes/sizes as well as specification factors of each shaft diameter/lead combination. Tables also contain data as follows:

•Stroke
Nominal stroke: A reference for your use.
Maximum stroke: The limit stroke that the nut can move. The figure is obtained by subtracting the nut length from the effective threaded length (L_1).

•Lead accuracy
Lead accuracy is C3 and C5 grades
T : Travel compensation;
e_p : Tolerance on specified travel;
v_u : Travel variation
See "Technical Description: Lead accuracy" (Page B445) for the details of the codes.

•Permissible rotational speed
dm • n: Limited by the relative peripheral speed between the screw shaft and the nut.
Critical speed: Limited by the critical speed of the screw shaft. Critical speed varies depending on mounting conditions of support bearing.

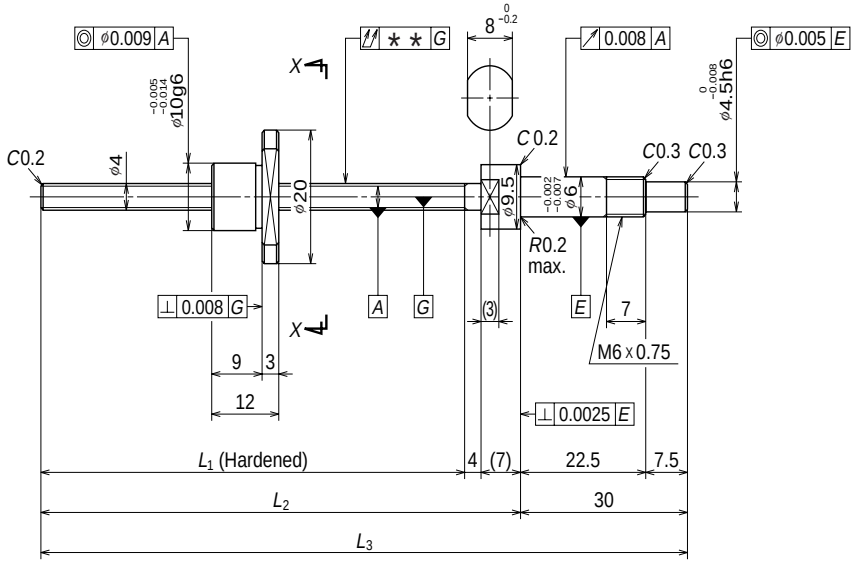
Use under either, but the smaller permissible rotational speed. For details, see "Technical description: Permissible rotational speed" (Page B455).

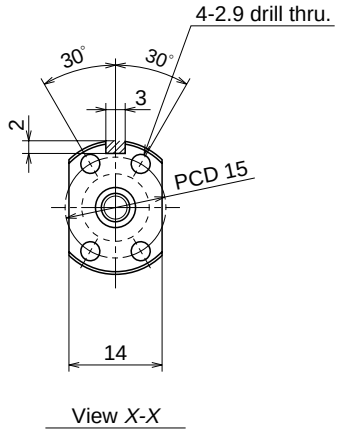
◇Other
Seal of the ball screw, ball recirculating deflector, and end cap are made of synthetic resin. Consult NSK when using our ball screws under extreme environment or in special environment, or if using special lubricant or oil.
For special environments, refer to Pages B473 and D2.
For lubricants, refer to Pages B471 and D13.

Table I-6-1 Combinations of shaft diameter and lead

Shaft diameter \ Lead	1	1.5	2	2.5	4	5	6	8	10	12	16	20	25	32	40	50
4	B41															
6	B43															
8	B45	B47	B49													
10			B51	B53	B55											
12			B57	B59		B61			B63							
14						B65		B67								
15									B69			B71				
16			B73	B75		B77					B79			B81		
20					B83	B85			B87			B89			B91	
25					B93	B95	B97		B99			B101	B103			B105
28						B107 B109	B111 B113									
32						B115 B117	B119 B121	B123	B125 B127				B129	B131		
36									B133 B135							
40						B137		B139	B141 B143	B145 B147						
45									B149							
50									B151 B153							

B
40





Unit: mm

Standard stock

Ball screw specifications			
Shaft dia. x Lead / Direction of turn		4 x 1 / Right	
Preload / Ball recirculation		P preload / Deflector	
Ball dia. / Ball circle dia.		0.800 / 4.2	
Effective turns of balls		1 x 2	
Accuracy grade / Axial play		C3 / Z	C3 / T
Basic load rating N { Kgf }	Dynamic C_a	315 {32}	
	Static C_{0a}	370 {38}	
Axial play		0	0.005 or less
Dynamic friction torque, N·cm {kgf·cm}		~1.0 {~0.1}	~0.3 {~0.03}
Spacer ball		None	
Factory packed grease		NSK grease PS2	

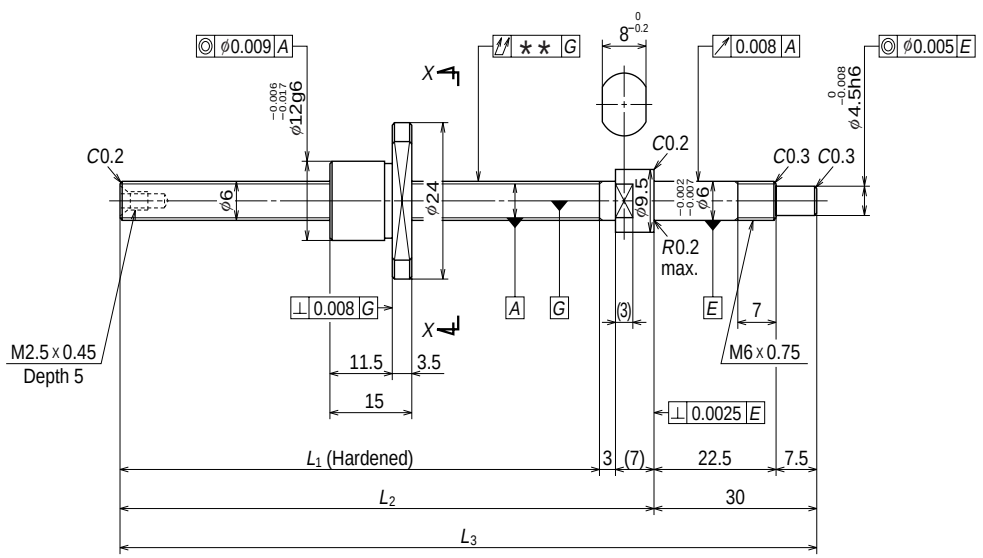
B 42

Unit: mm

Ball screw No.		Stroke	
Preloaded (MPFD)	Precise clearance (MSFD)	Nominal	Maximum (L_1–Nut length)
W0400MA-1PY-C3Z1	**W0400MA-2Y-C3T1**	20	32
W0400MA-3PY-C3Z1	**W0400MA-4Y-C3T1**	40	52
W0401MA-1PY-C3Z1	**W0401MA-2Y-C3T1**	70	82

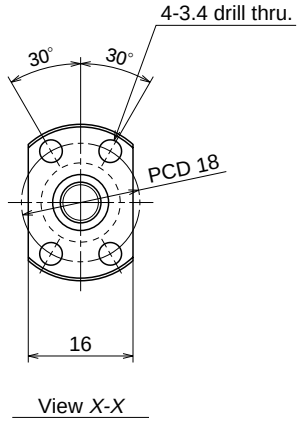
Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)	
								Critical speed
L_1	L_2	L_3	T	e_p	υ_u			Fixed - Free
44	55	85	0	0.008	0.008	0.015	3000	—
64	75	105	0	0.008	0.008	0.020		—
94	105	135	0	0.008	0.008	0.025		—

Remarks: 1. NSK support units WBK06-01A, (square type, fixed side), or WBK06-11 (round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. Apply to the screw shaft surface when replenishing.
3. Nut does not have a seal.
4. The hatched groove on the nut flange outside surface is made for production purpose only.



NSK

φ 6 x 1



View *X-X*

Unit: mm

Ball screw specifications			
Shaft dia x Lead / Direction of turn		6 x 1/Right	
Preload / Ball recirculation		P preload / Deflector	
Ball dia. / Ball circle dia.		0.800/6.2	
Effective turns of balls		1 x 3	
Accuracy grade / Axial play		C3 / Z	C3 / T
Basic load rating N { Kgf }	Dynamic C_a	575 {60}	
	Static C_{0a}	925 {95}	
Axial play		0	0.005 or less
Dynamic friction torque, N·cm {kgf·cm}		~1.3 {~0.13}	~0.3 {~0.03}
Spacer ball		None	
Factory packed grease		NSK grease PS2	

Standard stock

B 44

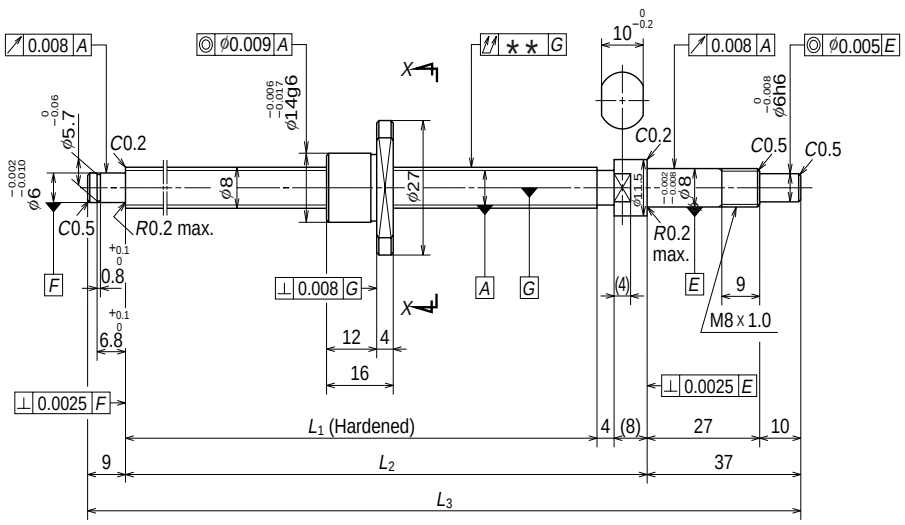
Unit: mm

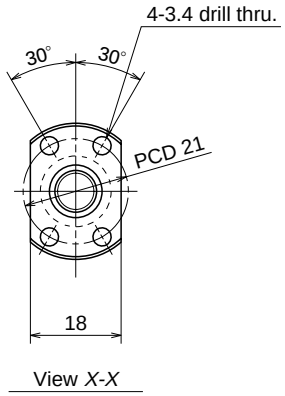
Ball screw No.		Stroke		Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)	
		Nominal	Maximum (L_1–Nut length)									Critical speed
Preloaded (MPFD)	Precise clearance (MSFD)			L_1	L_2	L_3	T	e_p	υ_u			Fixed - Free
W0600MA-1PY-C3Z1	**W0600MA-2Y-C3T1**	40	50	65	75	105	0	0.008	0.008	0.015	3000	—
W0601MA-1PY-C3Z1	**W0601MA-2Y-C3T1**	70	80	95	105	135	0	0.008	0.008	0.020		—
W0601MA-3PY-C3Z1	**W0601MA-4Y-C3T1**	100	110	125	135	165	0	0.010	0.008	0.025		—

Remarks 1. NSK support unit WBK06-01A (square type, fixed side), and WBK06-11 (round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. Apply to the screw shaft surface when replenishing.
3. Nut does not have a seal.

NSK

ϕ8 x 1





Unit: mm

Ball screw specifications			
Shaft dia. x Lead / Direction of turn		8 x 1/Right	
Preload / Ball recirculation		P preload / Deflector	
Ball dia. / Ball circle dia.		0.800/8.2	
Effective turns of balls		1 x 3	
Accuracy grade / Axial play		C3/Z	C3/T
Basic load rating N { Kgf }	Dynamic C_a	670 {70}	
	Static C_{0a}	1290 {130}	
Axial play		0	0.005 or less
Dynamic friction torque, N·cm {kgf·cm}		~1.8 {~0.18}	~0.5 {~0.05}
Spacer ball		None	
Factory packed grease		NSK grease PS2	

Standard stock

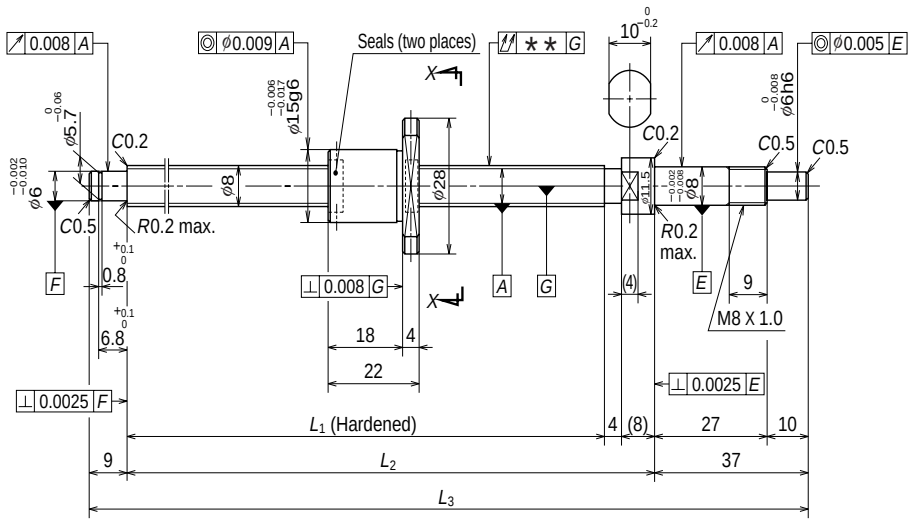
B 46

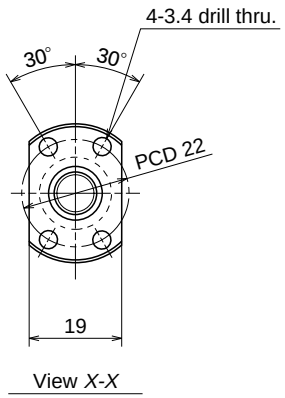
Unit: mm

Ball screw No.		Stroke	
		Nominal	Maximum (L_1–Nut length)
Preloaded (MPFD)	Precise clearance (MSFD)		
W0800MA-1PY-C3Z1	**W0800MA-2Y-C3T1**	40	64
W0801MA-1PY-C3Z1	**W0801MA-2Y-C3T1**	70	94
W0801MA-3PY-C3Z1	**W0801MA-4Y-C3T1**	100	124
W0802MA-1PY-C3Z1	**W0802MA-2Y-C3T1**	150	174

Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)	
								Critical speed
L_1	L_2	L_3	T	e_p	υ_u			Fixed - Simple support
80	92	138	0	0.008	0.008	0.025	3000	—
110	122	168	0	0.010	0.008	0.030		—
140	152	198	0	0.010	0.008	0.030		—
190	202	248	0	0.010	0.008	0.035		—

Remarks
1. NSK support unit WBK08-01A (square type, fixed side), WBK08S-01 (square type, simple support side), and WBK08-11 (round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. Apply to the screw shaft surface when replenishing.
3. Nut does not have a seal.





Unit: mm

Ball screw specifications			
Shaft dia. x Lead / Direction of turn		8 x 1.5/Right	
Preload / Ball recirculation		P preload / Deflector	
Ball dia. / Ball circle dia.		1.000/8.3	
Effective turns of balls		1 x 3	
Accuracy grade / Axial play		C3/Z	C3/T
Basic load rating N { Kgf }	Dynamic C_a	1080 {110}	
	Static C_{0a}	1980 {200}	
Axial play		0	0.005 or less
Dynamic friction torque, N·cm {kgf·cm}		~2.0 {~0.2}	~0.5 {~0.05}
Spacer ball		None	
Factory packed grease		NSK grease PS2	

Standard stock

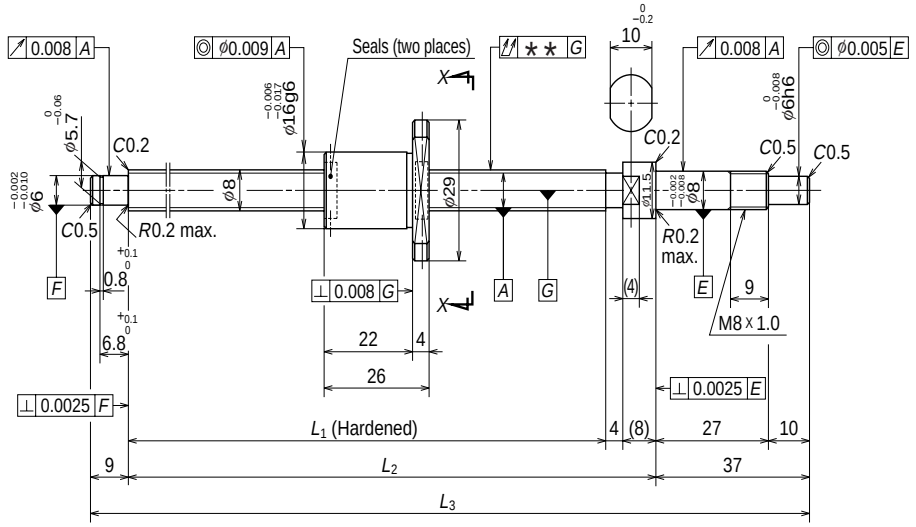
B 48

Unit: mm

Ball screw No.		Stroke	
		Nominal	Maximum (L_1–Nut length)
Preloaded (MPFD)	Precise clearance (MSFD)		
W0800MA-3PY-C3Z1.5	**W0800MA-4Y-C3T1.5**	40	58
W0801MA-5PY-C3Z1.5	**W0801MA-6Y-C3T1.5**	70	88
W0801MA-7PY-C3Z1.5	**W0801MA-8Y-C3T1.5**	100	118
W0802MA-3PY-C3Z1.5	**W0802MA-4Y-C3T1.5**	150	168

Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)	
								Critical speed
L_1	L_2	L_3	T	e_p	υ_u			Fixed - Simple support
80	92	138	0	0.008	0.008	0.025	3000	—
110	122	168	0	0.010	0.008	0.030		—
140	152	198	0	0.010	0.008	0.030		—
190	202	248	0	0.010	0.008	0.035		—

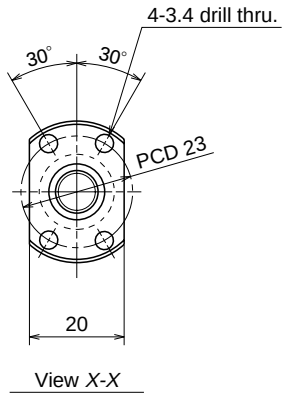
Remarks 1. NSK support unit WBK08-01A (square type, fixed side), WBK08S-01 (square type, simple support side), and WBK08-11 (round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. Apply to the screw shaft surface when replenishing.



NSK

ϕ8 x 2

Unit: mm



Ball screw specifications			
Shaft dia. x Lead / Direction of turn		8 x 2/Right	
Preload / Ball recirculation		P preload / Deflector	
Ball dia. / Ball circle dia.		1.200/8.3	
Effective turns of balls		1 x 3	
Accuracy grade / Axial play		C3/Z	C3/T
Basic load rating N { Kgf }	Dynamic C_a	1320 {135}	
	Static C_{0a}	2210 {225}	
Axial play		0	0.005 or less
Dynamic friction torque, N·cm {kgf·cm}		~2.0 {~0.2}	~0.5 {~0.05}
Spacer ball		None	
Factory packed grease		NSK grease PS2	

Standard stock

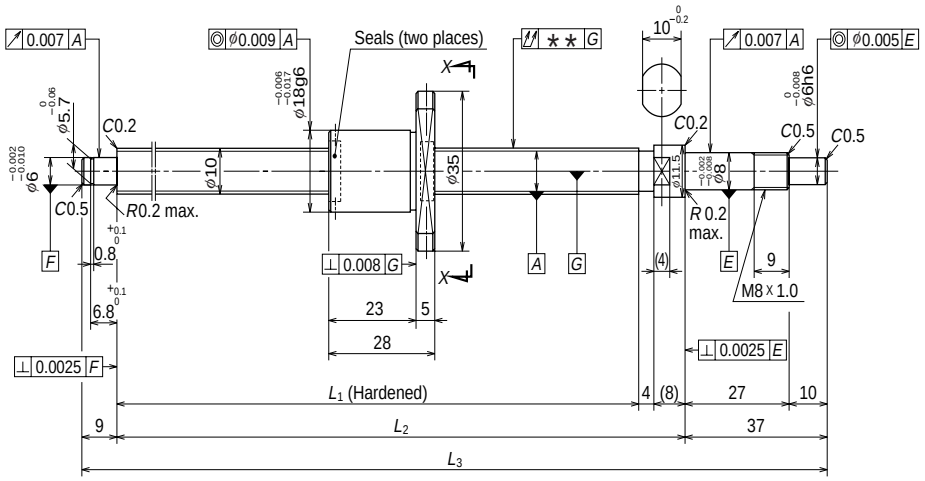
B 50

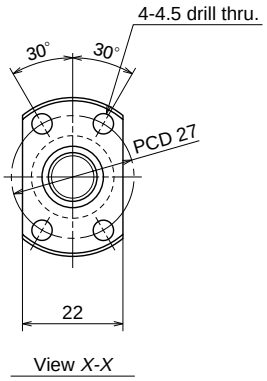
Unit: mm

Ball screw No.		Stroke	
		Nominal	Maximum (L_1–Nut length)
Preloaded (MPFD)	Precise clearance (MSFD)		
W0800MA-5PY-C3Z2	**W0800MA-6Y-C3T2**	40	54
W0801MA-9PY-C3Z2	**W0801MA-10Y-C3T2**	70	84
W0801MA-11PY-C3Z2	**W0801MA-12Y-C3T2**	100	114
W0802MA-5PY-C3Z2	**W0802MA-6Y-C3T2**	150	164

Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)	
								Critical speed
L_1	L_2	L_3	T	e_p	υ_u	↗↗		Fixed - Simple support
80	92	138	0	0.008	0.008	0.025	3000	—
110	122	168	0	0.010	0.008	0.030		—
140	152	198	0	0.010	0.008	0.030		—
190	202	248	0	0.010	0.008	0.035		—

Remarks 1. NSK support unit WBK08-01A (square type, fixed side), WBK08S-01 (square type, simple support side), and WBK08-11 (round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. Apply to the screw shaft surface when replenishing.





View *X-X*

Unit: mm

Standard stock

Ball screw specifications			
Shaft dia. x Lead / Direction of turn		10 x 2/Right	
Preload / Ball recirculation		P preload / Deflector	
Ball dia. / Ball circle dia.		1.200/10.3	
Effective turns of balls		1 x 3	
Accuracy grade / Axial play		C3/Z	C3/T
Basic load rating N { Kgf }	Dynamic C_a	1490 {150}	
	Static C_{0a}	2850 {290}	
Axial play		0	0.005 or less
Dynamic friction torque, N·cm {kgf·cm}		0.1~2.4 {0.01~0.25}	~0.5 {~0.05}
Spacer ball		None	
Factory packed grease		NSK grease PS2	

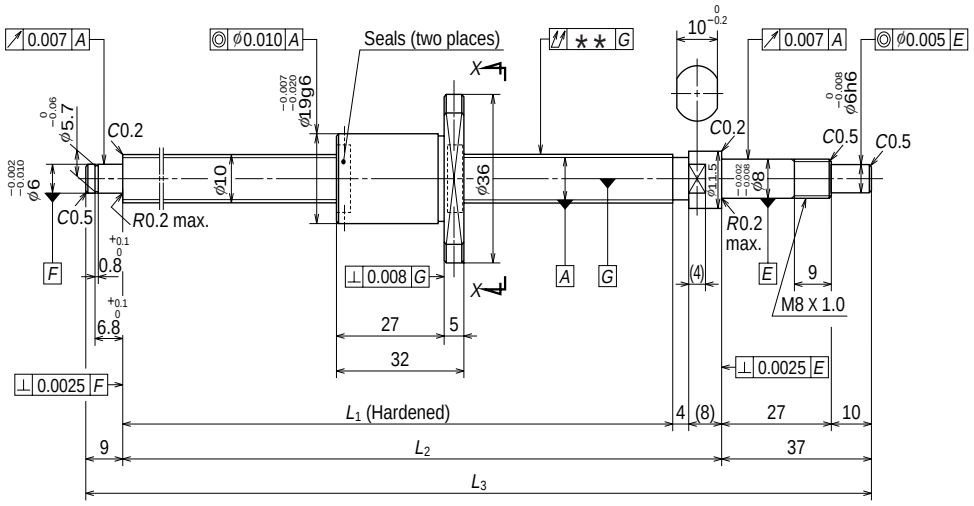
B 52

Unit: mm

Ball screw No.		Stroke	
Preloaded (MPFD)	Precise clearance (MSFD)	Nominal	Maximum (L_1–Nut length)
W1001MA-1PY-C3Z2	**W1001MA-2Y-C3T2**	50	72
W1001MA-3PY-C3Z2	**W1001MA-4Y-C3T2**	100	122
W1002MA-1PY-C3Z2	**W1002MA-2Y-C3T2**	150	172
W1002MA-3PY-C3Z2	**W1002MA-4Y-C3T2**	200	222

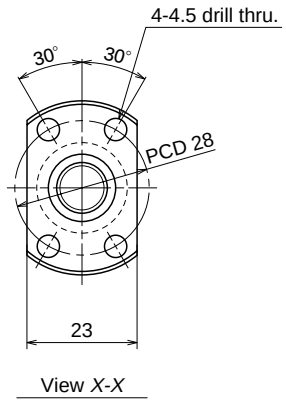
Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)	
								Critical speed
L_1	L_2	L_3	T	e_p	υ_u	↗↗		Fixed - Simple support
100	112	158	0	0.008	0.008	0.020	3000	—
150	162	208	0	0.010	0.008	0.030		—
200	212	258	0	0.010	0.008	0.030		—
250	262	308	0	0.012	0.008	0.030		—

Remarks 1. NSK support unit WBK08-01A (square type, fixed side), WBK08S-01 (square type, simple support side), and WBK08-11 (round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. Apply to the screw shaft surface when replenishing.



NSK

ϕ10 x 2.5



Unit: mm

Ball screw specifications			
Shaft dia. x Lead / Direction of turn		10 x 2.5/Right	
Preload / Ball recirculation		P preload / Deflector	
Ball dia. / Ball circle dia.		1.588/10.4	
Effective turns of balls		1 x 3	
Accuracy grade / Axial play		C3/Z	C3/T
Basic load rating N { Kgf }	Dynamic C_a	2130 {215}	
	Static C_{0a}	3640 {370}	
Axial play		0	0.005 or less
Dynamic friction torque, N·cm {kgf·cm}		0.2~2.9 {0.02~0.3}	~0.5 {~0.05}
Spacer ball		None	
Factory packed grease		NSK grease PS2	

Standard stock

B 54

Unit: mm

Ball screw No.		Stroke	
		Nominal	Maximum (L_1–Nut length)
Preloaded (MPFD)	Precise clearance (MSFD)		
W1001MA-5PY-C3Z2.5	**W1001MA-6Y-C3T2.5**	50	68
W1001MA-7PY-C3Z2.5	**W1001MA-8Y-C3T2.5**	100	118
W1002MA-5PY-C3Z2.5	**W1002MA-6Y-C3T2.5**	150	168
W1002MA-7PY-C3Z2.5	**W1002MA-8Y-C3T2.5**	200	218

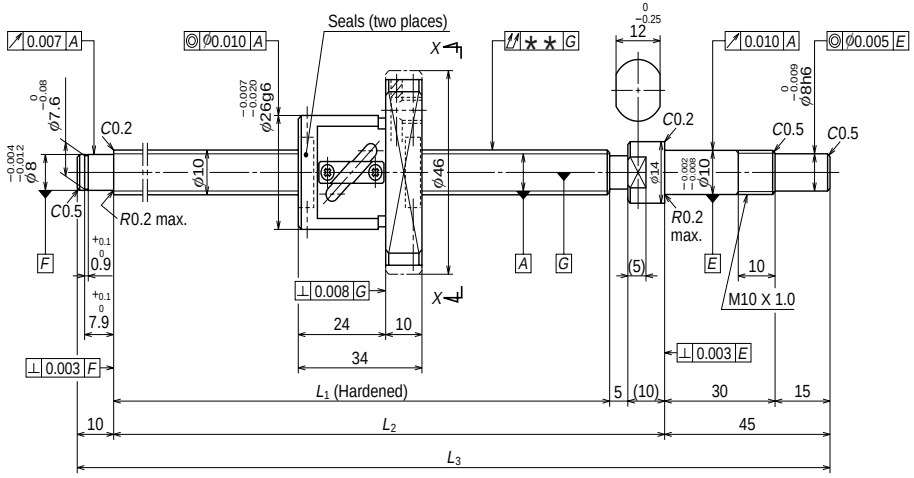
Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)	
								Critical speed
L_1	L_2	L_3	T	e_p	υ_u			Fixed - Simple support
100	112	158	0	0.008	0.008	0.020	3000	—
150	162	208	0	0.010	0.008	0.030		—
200	212	258	0	0.010	0.008	0.030		—
250	262	308	0	0.012	0.008	0.030		—

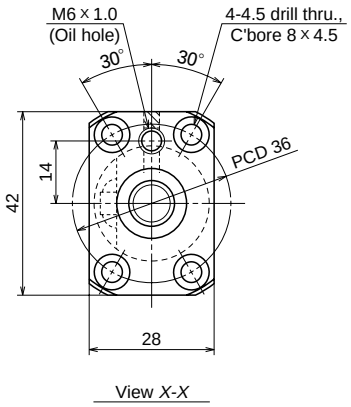
Remarks 1. NSK support unit WBK08-01A (square type, fixed side), WBK08S-01 (square type, simple support side), and WBK08-11 (round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. Apply to the screw shaft surface when replenishing.

NSK

ϕ10 x 4

Standard stock





Unit: mm

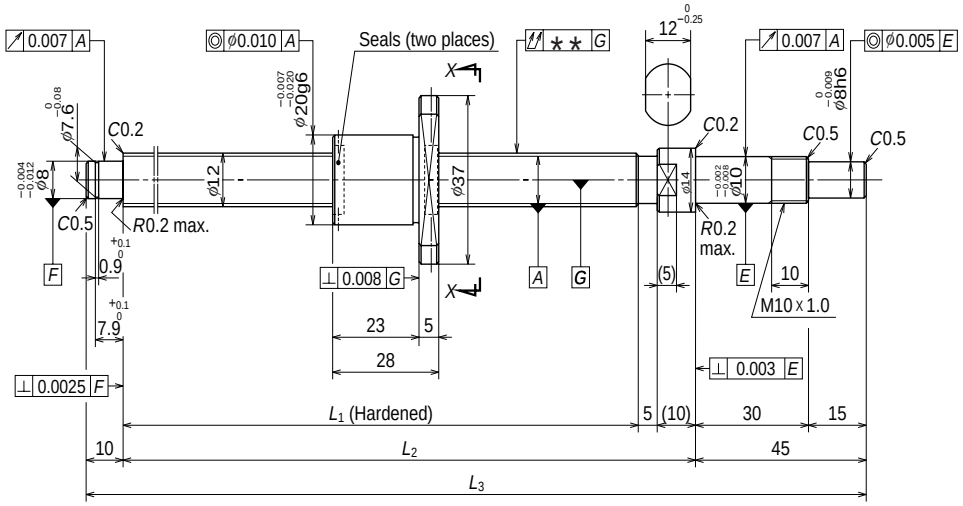
Ball screw specifications			
Shaft dia. x Lead / Direction of turn		10 x 4/Right	
Preload / Ball recirculation		P preload / Return tube	
Ball dia. / Ball circle dia.		2.000/10.3	
Effective turns of balls		2.5 x 1	
Accuracy grade / Axial play		C3/Z	C3/T
Basic load rating N { Kgf }	Dynamic C_a	1730 {175}	2470 {280}
	Static C_{0a}	2230 {225}	4450 {455}
Axial play		0	0.005 or less
Dynamic friction torque, N·cm {kgf·cm}		0.5~3.9 {0.05~0.4}	~1.0 {~0.1}
Spacer ball		Yes	None
Factory packed grease		NSK grease PS2	
Internal spatial volume of nut (cm^3)		0.8	

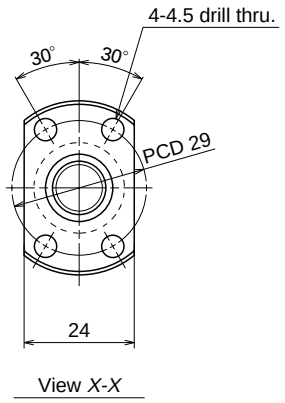
Unit: mm

Ball screw No.		Stroke	
Preloaded (PFT)	Precise clearance (SFT)	Nominal	Maximum (L_1–Nut length)
W1001FA-1P-C3Z4	**W1001FA-2-C3T4**	50	76
W1001FA-3P-C3Z4	**W1001FA-4-C3T4**	100	126
W1002FA-1P-C3Z4	**W1002FA-2-C3T4**	150	176
W1002FA-3P-C3Z4	**W1002FA-4-C3T4**	200	226
W1003FA-1P-C3Z4	**W1003FA-2-C3T4**	250	276
W1003FA-3P-C3Z4	**W1003FA-4-C3T4**	300	326

Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)	
								Critical speed
L_1	L_2	L_3	T	e_p	υ_u			Fixed - Simple support
110	125	180	0	0.010	0.008	0.020	3000	—
160	175	230	0	0.010	0.008	0.030		—
210	225	280	0	0.012	0.008	0.030		—
260	275	330	0	0.012	0.008	0.040		—
310	325	380	0	0.012	0.008	0.040		—
360	375	430	0	0.013	0.010	0.050		—

Remarks 1. NSK support unit WBK10-01A (square type, fixed side), WBK10S-01 (square type, simple support side), and WBK10-11 (round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. The amount for replenishing should be about 50% of nut internal space capacity.





Unit: mm

Ball screw specifications			
Shaft dia. x Lead / Direction of turn		12 x 2/Right	
Preload / Ball recirculation		P preload / Deflector	
Ball dia. / Ball circle dia.		1.200/12.3	
Effective turns of balls		1 x 3	
Accuracy grade / Axial play		C3/Z	C3/T
Basic load rating N { Kgf }	Dynamic C_a	1660 {170}	
	Static C_{0a}	3620 {370}	
Axial play		0	0.005 or less
Dynamic friction torque, N·cm {kgf·cm}		0.4~3.4 {0.04~0.35}	~1.0 {~0.1}
Spacer ball		None	
Factory packed grease		NSK grease PS2	

Standard stock

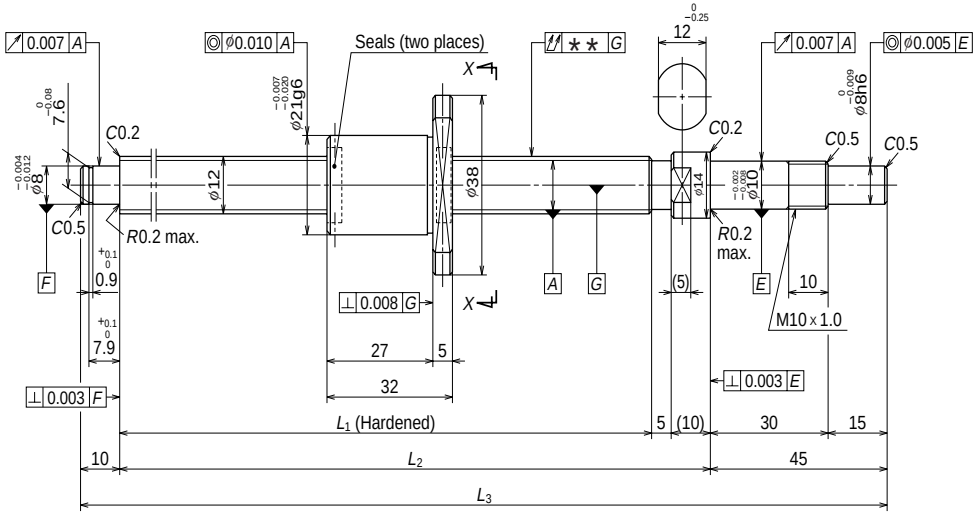
B 58

Unit: mm

Ball screw No.		Stroke	
Preloaded (MPFD)	Precise clearance (MSFD)	Nominal	Maximum (L_1–Nut length)
W1201MA-1PY-C3Z2	**W1201MA-2Y-C3T2**	50	82
W1201MA-3PY-C3Z2	**W1201MA-4Y-C3T2**	100	132
W1202MA-1PY-C3Z2	**W1202MA-2Y-C3T2**	150	182
W1202MA-3PY-C3Z2	**W1202MA-4Y-C3T2**	200	232
W1203MA-1PY-C3Z2	**W1203MA-2Y-C3T2**	250	282

Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)	
								Critical speed
L_1	L_2	L_3	T	e_p	υ_u	↗↗		Fixed - Simple support
110	125	180	0	0.010	0.008	0.020	3000	—
160	175	230	0	0.010	0.008	0.030		—
210	225	280	0	0.012	0.008	0.030		—
260	275	330	0	0.012	0.008	0.040		—
310	325	380	0	0.012	0.008	0.040		—

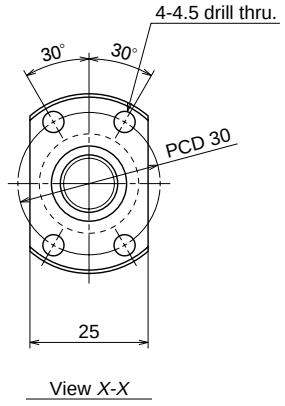
Remarks 1. NSK support unit WBK10-01A (square type, fixed side), WBK10S-01 (square type, simple support side), and WBK10-11 (round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. Apply to the screw shaft surface when replenishing.



NSK

ϕ12 x 2.5

Unit: mm



Ball screw specifications			
Shaft dia. x Lead / Direction of turn		12 x 2.5/Right	
Preload / Ball recirculation		P preload / Deflector	
Ball dia. / Ball circle dia.		1.588/12.4	
Effective turns of balls		1 x 3	
Accuracy grade / Axial play		C3/Z	C3/T
Basic load rating N { Kgf }	Dynamic C_a	2360 {240}	
	Static C_{0a}	4540 {465}	
Axial play		0	0.005 or less
Dynamic friction torque, N·cm {kgf·cm}		0.4~3.4 {0.04~0.35}	~1.0 {~0.1}
Spacer ball		None	
Factory packed grease		NSK grease PS2	

Standard stock

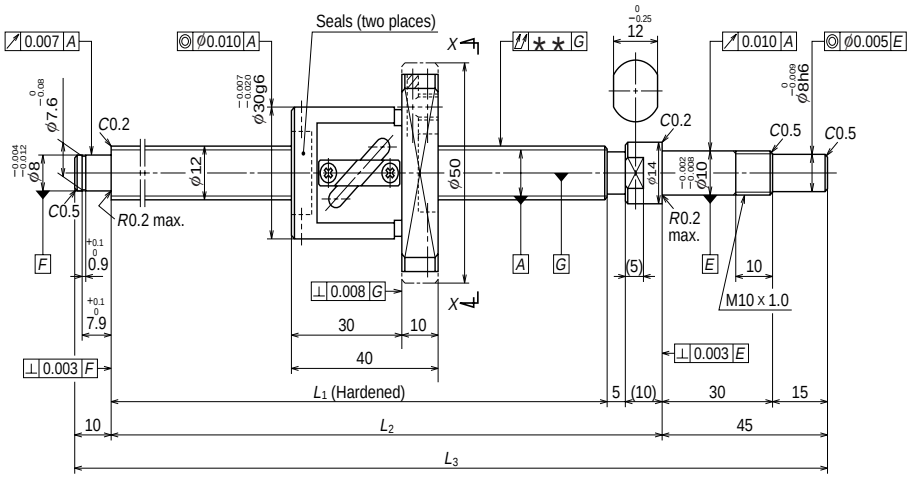
B 60

Unit: mm

Ball screw No.		Stroke	
		Nominal	Maximum (L_1–Nut length)
Preloaded (MPFD)	Precise clearance (MSFD)		
W1201MA-5PY-C3Z2.5	**W1201MA-6Y-C3T2.5**	50	78
W1201MA-7PY-C3Z2.5	**W1201MA-8Y-C3T2.5**	100	128
W1202MA-5PY-C3Z2.5	**W1202MA-6Y-C3T2.5**	150	178
W1202MA-7PY-C3Z2.5	**W1202MA-8Y-C3T2.5**	200	228
W1203MA-3PY-C3Z2.5	**W1203MA-4Y-C3T2.5**	250	278

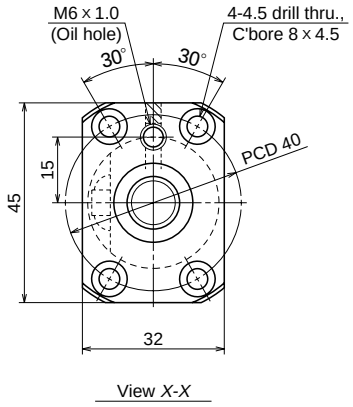
Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)	
								Critical speed
L_1	L_2	L_3	T	e_p	υ_u			Fixed - Simple support
110	125	180	0	0.010	0.008	0.020	3000	—
160	175	230	0	0.010	0.008	0.030		—
210	225	280	0	0.012	0.008	0.030		—
260	275	330	0	0.012	0.008	0.040		—
310	325	380	0	0.012	0.008	0.040		—

Remarks 1. NSK support unit WBK10-01A (square type, fixed side), WBK10S-01 (square type, simple support side), and WBK10-11 (round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. Apply to the screw shaft surface when replenishing.



NSK

ϕ12 x 5



View *X-X*

Unit: mm

Ball screw specifications			
Shaft dia. x Lead / Direction of turn		12 x 5/Right	
Preload / Ball recirculation		P preload / Return tube	
Ball dia. / Ball circle dia.		2.381/12.3	
Effective turns of balls		2.5 x 1	
Accuracy grade / Axial play		C3/Z	C3/T
Basic load rating N { Kgf }	Dynamic C_a	2370 {240}	3760 {385}
	Static C_{0a}	3160 {320}	6310 {645}
Axial play		0	0.005 or less
Dynamic friction torque,N·cm {kgf·cm}		1.0~4.4 {0.1~0.45}	~1.0 {~0.1}
Spacer ball		Yes	None
Factory packed grease		NSK grease PS2	
Internal spatial volume of nut (cm³)		1.2	

Standard stock

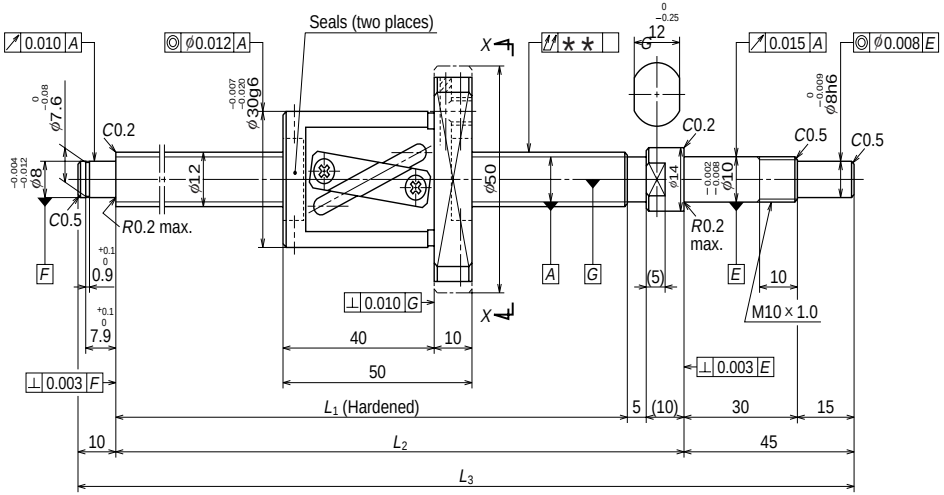
B 62

Unit: mm

Ball screw No.		Stroke	
		Nominal	Maximum (L_1–Nut length)
Preloaded (PFT)	Precise clearance (SFT)		
W1201FA-1P-C3Z5	**W1201FA-2-C3T5**	50	70
W1201FA-3P-C3Z5	**W1201FA-4-C3T5**	100	120
W1202FA-1P-C3Z5	**W1202FA-2-C3T5**	150	170
W1202FA-3P-C3Z5	**W1202FA-4-C3T5**	200	220
W1203FA-1P-C3Z5	**W1203FA-2-C3T5**	250	270
W1204FA-1P-C3Z5	**W1204FA-2-C3T5**	350	370
W1205FA-1P-C3Z5	**W1205FA-2-C3T5**	450	470

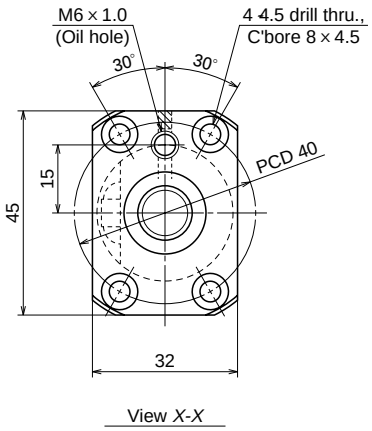
Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)	
								Critical speed
L_1	L_2	L_3	T	e_p	υ_u			Fixed - Simple support
110	125	180	0	0.010	0.008	0.020	3000	—
160	175	230	0	0.010	0.008	0.030		—
210	225	280	0	0.012	0.008	0.030		—
260	275	330	0	0.012	0.008	0.040		—
310	325	380	0	0.012	0.008	0.040		—
410	425	480	0	0.015	0.010	0.050		—
510	525	580	0	0.016	0.012	0.065		—

Remarks 1. NSK support unit WBK10-01A (square type, fixed side), WBK10S-01 (square type, simple support side), and WBK10-11 (round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. The amount for replenishing should be about 50% of nut internal space capacity.



NSK

ϕ 12 x 10



View *X-X*

Unit: mm

Ball screw specifications			
Shaft dia. x Lead / Direction of turn		12 x 10/Right	
Preload / Ball recirculation		P preload / Return tube	
Ball dia. / Ball circle dia.		2.381/12.5	
Effective turns of balls		2.5 x 1	
Accuracy grade / Axial play		C5/Z	C5/T
Basic load rating N { Kgf }	Dynamic C_a	2360 {240}	3750 {380}
	Static C_{0a}	3240 {330}	6480 {660}
Axial play		0	0.005 or less
Dynamic friction torque, N·cm {kgf·cm}		1.0~4.9 {0.1~0.5}	~1.5 {~0.15}
Spacer ball		Yes	None
Factory packed grease		NSK grease LR3	
Internal spatial volume of nut (cm^3)		1.4	

Standard stock

B 64

Unit: mm

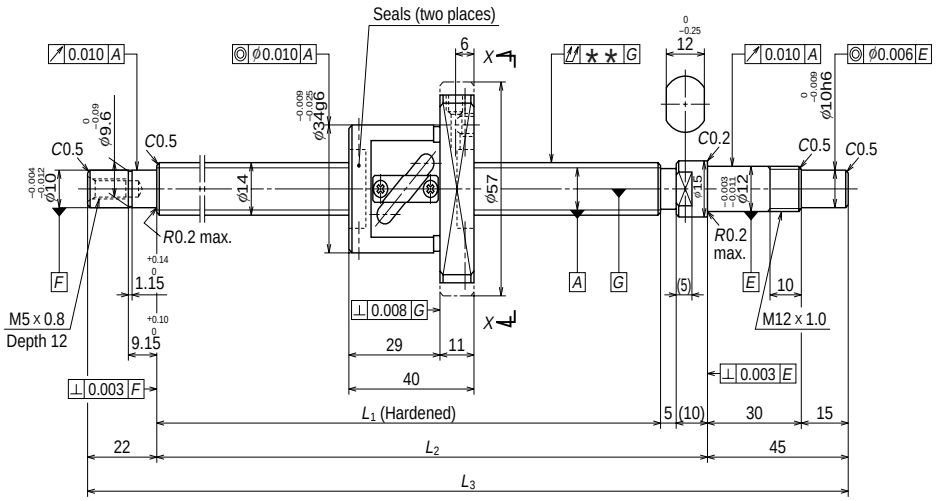
Ball screw No.		Stroke	
		Nominal	Maximum (L_1–Nut length)
Preloaded (LPFT)	Precise clearance (LSFT)		
W1201FA-5P-C5Z10	**W1201FA-6-C5T10**	100	110
W1202FA-5P-C5Z10	**W1202FA-6-C5T10**	150	160
W1203FA-3P-C5Z10	**W1203FA-4-C5T10**	250	260
W1204FA-3P-C5Z10	**W1204FA-4-C5T10**	350	360
W1205FA-3P-C5Z10	**W1205FA-4-C5T10**	450	460

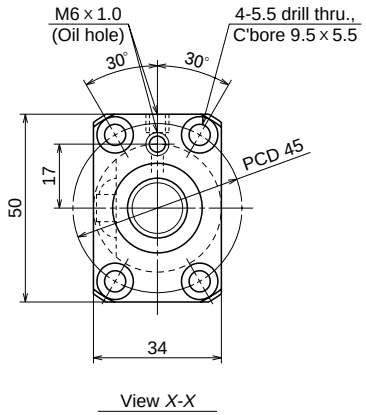
Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)	
								Critical speed
L_1	L_2	L_3	T	e_p	υ_u			Fixed - Simple support
160	175	230	0	0.020	0.018	0.035	3000	—
210	225	280	0	0.023	0.018	0.035		—
310	325	380	0	0.023	0.018	0.050		—
410	425	480	0	0.027	0.020	0.060		—
510	525	580	0	0.030	0.023	0.075		—

Remarks 1. NSK support unit WBK10-01A (square type, fixed side), WBK10S-01 (square type, simple support side), and WBK10-11 (round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. The amount for replenishing should be about 50% of nut internal space capacity.

NSK

ϕ14 x 5





Unit: mm

Ball screw specifications			
Shaft dia. x Lead / Direction of turn		14 x 5/Right	
Preload / Ball recirculation		P preload / Return tube	
Ball dia. / Ball circle dia.		3.175/14.5	
Effective turns of balls		2.5 x 1	
Accuracy grade / Axial play		C3/Z	C3/T
Basic load rating N { Kgf }	Dynamic C_a	4280 {435}	6790 {695}
	Static C_{0a}	5840 {595}	11700 {1190}
Axial play		0	0.005 or less
Dynamic friction torque,N·cm {kgf·cm}		1.5~6.9 {0.15~0.7}	~2.0 {~0.2}
Spacer ball		Yes	None
Factory packed grease		NSK grease LR3	
Internal spatial volume of nut (cm³)		2.2	

Standard stock

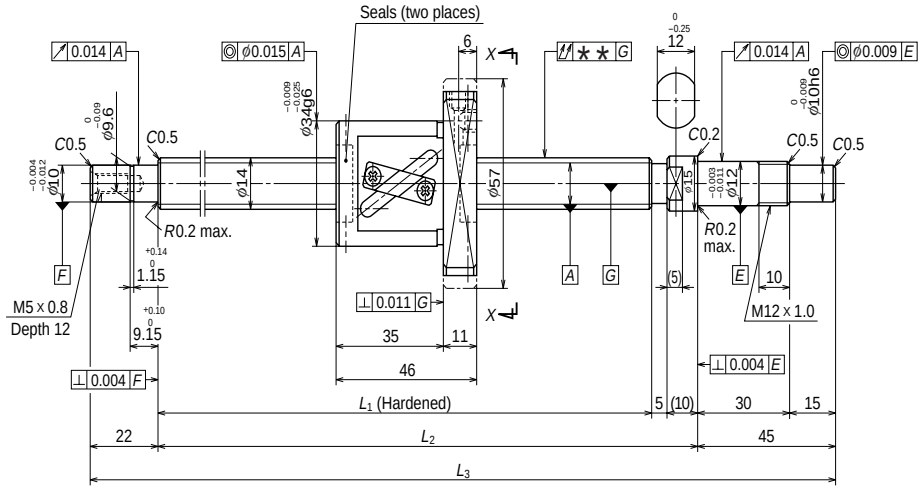
B 66

Unit: mm

Ball screw No.		Stroke	
Preloaded (PFT)	Precise clearance (SFT)	Nominal	Maximum (L_1–Nut length)
W1401FA-1P-C3Z5	**W1401FA-2-C3T5**	100	149
W1402FA-1P-C3Z5	**W1402FA-2-C3T5**	150	199
W1403FA-1P-C3Z5	**W1403FA-2-C3T5**	250	299
W1404FA-1P-C3Z5	**W1404FA-2-C3T5**	350	399
W1405FA-1P-C3Z5	**W1405FA-2-C3T5**	450	499
W1406FA-1P-C3Z5	**W1406FA-2-C3T5**	600	649

Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)	
								Critical speed
L_1	L_2	L_3	T	e_p	υ_u			Fixed - Simple support / Fixed - Fixed
189	204	271	0	0.010	0.008	0.020	3000	— / —
239	254	321	0	0.012	0.008	0.030		— / —
339	354	421	0	0.013	0.010	0.035		— / —
439	454	521	0	0.015	0.010	0.045		— / —
539	554	621	0	0.016	0.012	0.045		— / —
689	704	771	0	0.018	0.013	0.055		— / —

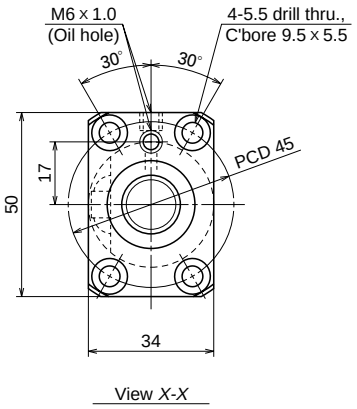
Remarks 1. NSK support unit WBK12-01A (square type, fixed side), WBK12S-01 (square type, simple support side), and WBK12-11 (round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. The amount for replenishing should be about 50% of nut internal space capacity.



NSK

ϕ14 x 8

Unit: mm



Ball screw specifications			
Shaft dia. x Lead / Direction of turn		14 x 8/Right	
Preload / Ball recirculation		P preload / Return tube	
Ball dia. / Ball circle dia.		3.175/14.5	
Effective turns of balls		2.5 x 1	
Accuracy grade / Axial play		C5/Z	C5/T
Basic load rating N { Kgf }	Dynamic C_a	4280 {435}	6790 {695}
	Static C_{0a}	5840 {595}	11700 {1190}
Axial play		0	0.005 or less
Dynamic friction torque, N·cm {kgf·cm}		1.5~7.8 {0.15~0.8}	~2.4 {~0.25}
Spacer ball		Yes	None
Factory packed grease		NSK grease LR3	
Internal spatial volume of nut (cm³)		2.1	

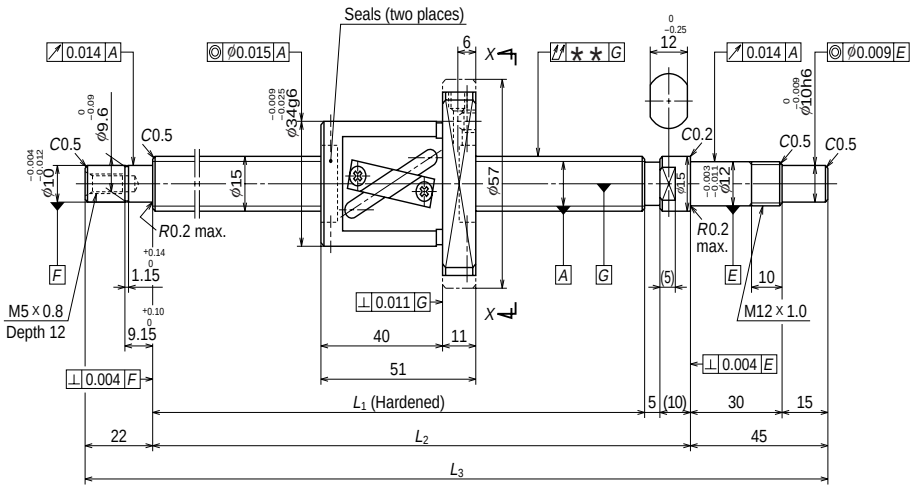
Standard stock

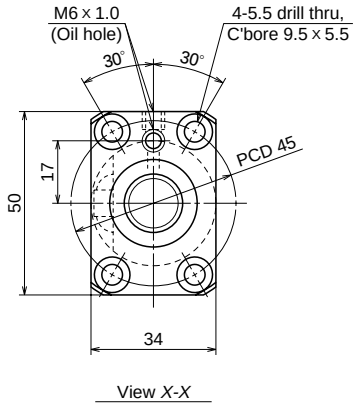
B 68

Unit: mm

Ball screw No.		Stroke		Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)	
		Nominal	Maximum (L_1–Nut length)								Critical speed	
Preloaded (LPFT)	Precise clearance (LSFT)			L_1	L_2	L_3	T	e_p	υ_u			Fixed - Simple support / Fixed - Fixed
W1401FA-3P-C5Z8	**W1401FA-4-C5T8**	100	143	189	204	271	0	0.020	0.018	0.025	3000	— / —
W1402FA-3P-C5Z8	**W1402FA-4-C5T8**	150	193	239	254	321	0	0.023	0.018	0.035		— / —
W1402FA-5P-C5Z8	**W1402FA-6-C5T8**	200	243	289	304	371	0	0.023	0.018	0.035		— / —
W1403FA-3P-C5Z8	**W1403FA-4-C5T8**	250	293	339	354	421	0	0.025	0.020	0.040		— / —
W1403FA-5P-C5Z8	**W1403FA-6-C5T8**	300	343	389	404	471	0	0.025	0.020	0.040		— / —
W1404FA-3P-C5Z8	**W1404FA-4-C5T8**	350	393	439	454	521	0	0.027	0.020	0.050		— / —
W1404FA-5P-C5Z8	**W1404FA-6-C5T8**	400	443	489	504	571	0	0.027	0.020	0.050		— / —
W1405FA-3P-C5Z8	**W1405FA-4-C5T8**	450	493	539	554	621	0	0.030	0.023	0.050		— / —
W1405FA-5P-C5Z8	**W1405FA-6-C5T8**	500	543	589	604	671	0	0.030	0.023	0.065		— / —
W1406FA-3P-C5Z8	**W1406FA-4-C5T8**	550	593	639	654	721	0	0.035	0.025	0.065		— / —
W1406FA-5P-C5Z8	**W1406FA-6-C5T8**	600	643	689	704	771	0	0.035	0.025	0.065		— / —
W1407FA-1P-C5Z8	**W1407FA-2-C5T8**	700	743	789	804	871	0	0.035	0.025	0.085		2800 / —

Remarks 1. NSK support unit WBK12-01A (square type, fixed side), WBK12S-01 (square type, simple support side), and WBK12-11 (round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. The amount for replenishing should be about 50% of nut internal space capacity.





Unit: mm

Standard stock

Ball screw specifications			
Shaft dia. x Lead / Direction of turn		15 x 10/Right	
Preload / Ball recirculation		P preload / Return tube	
Ball dia. / Ball circle dia.		3.175/15.5	
Effective turns of balls		2.5 x 1	
Accuracy grade / Axial play		C5/Z	C5/T
Basic load rating N { Kgf }	Dynamic C_a	4450 {455}	7070 {720}
	Static C_{0a}	6380 {650}	12800 {1300}
Axial play		0	0.005 or less
Dynamic friction torque,N·cm {kgf·cm}		1.5~7.8 {0.15~0.8}	~2.4 {~0.25}
Spacer ball		Yes	None
Factory packed grease		NSK grease LR3	
Internal spatial volume of nut (cm^3)		2.3	

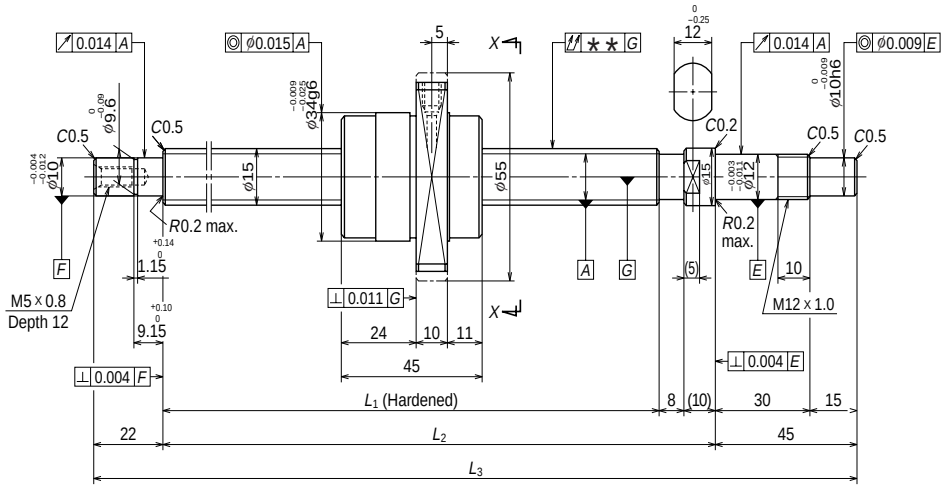
Ball screw No.		Stroke	
Preloaded (LPFT)	Precise clearance (LSFT)	Nominal	Maximum (L_1–Nut length)
W1501FA-1P-C5Z10	**W1501FA-2-C5T10**	100	138
W1502FA-1P-C5Z10	**W1502FA-2-C5T10**	150	188
W1502FA-3P-C5Z10	**W1502FA-4-C5T10**	200	238
W1503FA-1P-C5Z10	**W1503FA-2-C5T10**	250	288
W1503FA-3P-C5Z10	**W1503FA-4-C5T10**	300	338
W1504FA-1P-C5Z10	**W1504FA-2-C5T10**	350	388
W1504FA-3P-C5Z10	**W1504FA-4-C5T10**	400	438
W1505FA-1P-C5Z10	**W1505FA-2-C5T10**	450	488
W1505FA-3P-C5Z10	**W1505FA-4-C5T10**	500	538
W1506FA-1P-C5Z10	**W1506FA-2-C5T10**	550	588
W1506FA-3P-C5Z10	**W1506FA-4-C5T10**	600	638
W1507FA-1P-C5Z10	**W1507FA-2-C5T10**	700	738
W1508FA-1P-C5Z10	**W1508FA-2-C5T10**	800	838
W1510FA-1P-C5Z10	**W1510FA-2-C5T10**	1000	1038

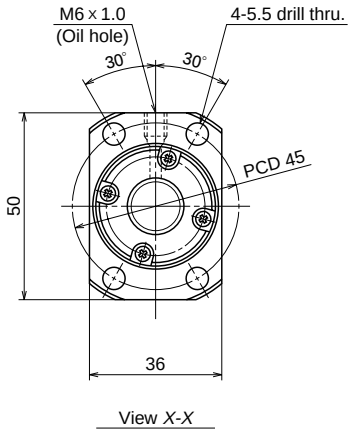
Remarks 1. NSK support unit WBK12-01A (square type, fixed side), WBK12S-01 (square type, simple support side), and WBK12-11 (round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. The amount for replenishing should be about 50% of nut internal space capacity.

Unit: mm

Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)	
							Critical speed	
L_1	L_2	L_3	T	e_p	υ_u		Fixed - Simple support	Fixed - Fixed
189	204	271	0	0.020	0.018	0.025	—	—
239	254	321	0	0.023	0.018	0.035	—	—
289	304	371	0	0.023	0.018	0.035	—	—
339	354	421	0	0.025	0.020	0.040	—	—
389	404	471	0	0.025	0.020	0.040	—	—
439	454	521	0	0.027	0.020	0.050	—	—
489	504	571	0	0.027	0.020	0.050	—	—
539	554	621	0	0.030	0.023	0.050	—	—
589	604	671	0	0.030	0.023	0.065	—	—
639	654	721	0	0.035	0.025	0.065	—	—
689	704	771	0	0.035	0.025	0.065	—	—
789	804	871	0	0.035	0.025	0.085	—	—
889	904	971	0	0.040	0.027	0.085	2400	—
1089	1104	1171	0	0.046	0.030	0.110	1590	2250

3000





Nut models: UPFC, USFC

NSK

ϕ 15 x 20

Unit: mm

Standard stock

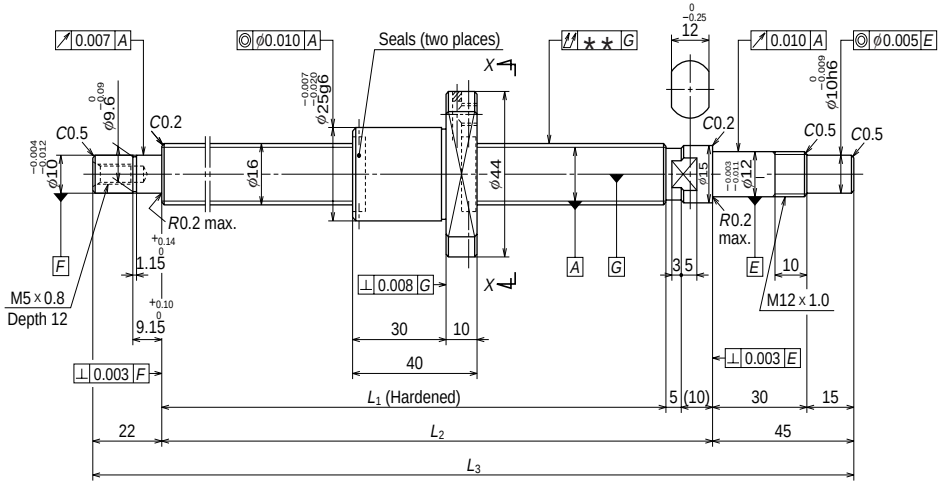
Ball screw specifications			
Shaft dia. x Lead / Direction of turn		15 x 20/Right	
Preload / Ball recirculation		P preload / End cap	
Ball dia. / Ball circle dia.		3.175/15.5	
Effective turns of balls		1.7 x 1	
Accuracy grade / Axial play		C5/Z	C5/T
Basic load rating N { Kgf }	Dynamic C_a	3870 {395}	5070 {515}
	Static C_{0a}	5820 {595}	8730 {890}
Axial play		0	0.005 or less
Dynamic friction torque, N·cm {kgf·cm}		1.5~7.8 {0.15~0.8}	~2.4 {~0.25}
Spacer ball		Yes	None
Factory packed grease		NSK grease LR3	
Internal spatial volume of nut (cm³)		1.9	

Ball screw No.		Stroke	
		Nominal	Maximum (L_1–Nut length)
Preloaded (UPFC)	Precise clearance (USFC)		
W1501FA-3PG-C5Z20	**W1501FA-4G-C5T20**	100	141
W1502FA-5PG-C5Z20	**W1502FA-6G-C5T20**	150	191
W1502FA-7PG-C5Z20	**W1502FA-8G-C5T20**	200	241
W1503FA-5PG-C5Z20	**W1503FA-6G-C5T20**	250	291
W1503FA-7PG-C5Z20	**W1503FA-8G-C5T20**	300	341
W1504FA-5PG-C5Z20	**W1504FA-6G-C5T20**	350	391
W1504FA-7PG-C5Z20	**W1504FA-8G-C5T20**	400	441
W1505FA-5PG-C5Z20	**W1505FA-6G-C5T20**	450	491
W1505FA-7PG-C5Z20	**W1505FA-8G-C5T20**	500	541
W1506FA-5PG-C5Z20	**W1506FA-6G-C5T20**	550	591
W1506FA-7PG-C5Z20	**W1506FA-8G-C5T20**	600	641
W1507FA-3PG-C5Z20	**W1507FA-4G-C5T20**	700	741
W1508FA-3PG-C5Z20	**W1508FA-4G-C5T20**	800	841
W1510FA-3PG-C5Z20	**W1510FA-4G-C5T20**	1000	1041

Unit: mm

Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)	
								Critical speed
L_1	L_2	L_3	T	e_p	υ_u	↑		Fixed - Simple support / Fixed - Fixed
186	204	271	0	0.020	0.018	0.025	3000	— / —
236	254	321	0	0.023	0.018	0.035		— / —
286	304	371	0	0.023	0.018	0.035		— / —
336	354	421	0	0.025	0.020	0.040		— / —
386	404	471	0	0.025	0.020	0.040		— / —
436	454	521	0	0.027	0.020	0.050		— / —
486	504	571	0	0.027	0.020	0.050		— / —
536	554	621	0	0.030	0.023	0.050		— / —
586	604	671	0	0.030	0.023	0.065		— / —
636	654	721	0	0.035	0.025	0.065		— / —
686	704	771	0	0.035	0.025	0.065		— / —
786	804	871	0	0.035	0.025	0.085		— / —
886	904	971	0	0.040	0.027	0.085		2400 / —
1086	1104	1171	0	0.046	0.030	0.110		1590 / 2240

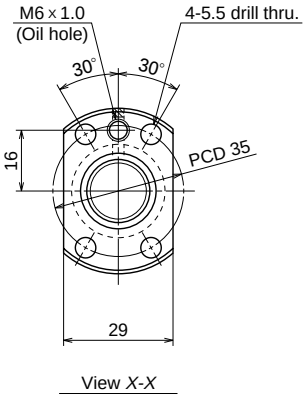
Remarks 1. NSK support unit WBK12-01A (square type, fixed side), WBK12S-01 (square type, simple support side), and WBK12-11 (round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. The amount for replenishing should be about 50% of nut internal space capacity.



NSK

ϕ16 x 2

Unit: mm



Ball screw specifications			
Shaft dia. x Lead / Direction of turn		16 x 2/Right	
Preload / Ball recirculation		P preload / Deflector	
Ball dia. / Ball circle dia.		1.588/16.4	
Effective turns of balls		1 x 4	
Accuracy grade / Axial play		C3/Z	C3/T
Basic load rating N { Kgf }	Dynamic C_a	3510 {360}	
	Static C_{0a}	8450 {860}	
Axial play		0	0.005 or less
Dynamic friction torque, N·cm {kgf·cm}		0.5~4.9 {0.05~0.5}	~1.5 {~0.15}
Spacer ball		None	
Factory packed grease		NSK grease PS2	
Internal spatial volume of nut (cm^3)		1.6	

Standard stock

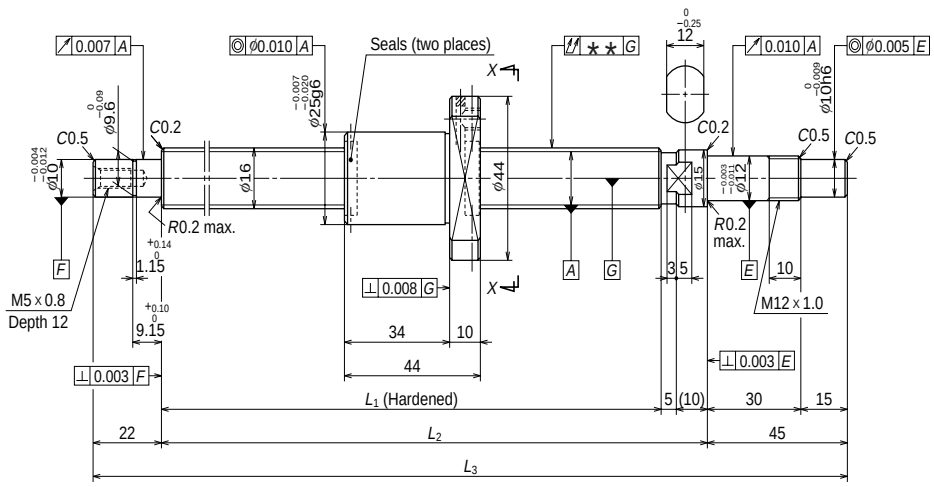
B 74

Unit: mm

Ball screw No.		Stroke	
Preloaded (MPFD)	Precise clearance (MSFD)	Nominal	Maximum (L_1–Nut length)
W1601MA-1PY-C3Z2	**W1601MA-2Y-C3T2**	50	99
W1601MA-3PY-C3Z2	**W1601MA-4Y-C3T2**	100	149
W1602MA-1PY-C3Z2	**W1602MA-2Y-C3T2**	150	199
W1602MA-3PY-C3Z2	**W1602MA-4Y-C3T2**	200	249
W1603MA-1PY-C3Z2	**W1603MA-2Y-C3T2**	300	349

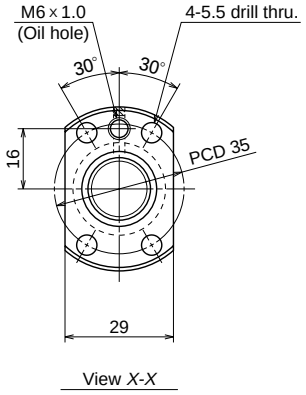
Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)	
								Critical speed
L_1	L_2	L_3	T	e_p	υ_u			Fixed - Simple support	Fixed - Fixed
139	154	221	0	0.010	0.008	0.020	3000	—	—
189	204	271	0	0.010	0.008	0.020		—	—
239	254	321	0	0.012	0.008	0.030		—	—
289	304	371	0	0.012	0.008	0.030		—	—
389	404	471	0	0.013	0.010	0.035		—	—

Remarks 1. NSK support unit WBK12-01A (square type, fixed side), WBK12S-01 (square type, simple support side), and WBK12-11(round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. The amount for replenishing should be about 50% of the nut internal space capacity.



NSK

ϕ 16 x 2.5



Unit: mm

Ball screw specifications			
Shaft dia. x Lead / Direction of turn		16 x 2.5/Right	
Preload / Ball recirculation		P preload / Deflector	
Ball dia. / Ball circle dia.		1.588/16.4	
Effective turns of balls		1 x 4	
Accuracy grade / Axial play		C3/Z	C3/T
Basic load rating N { Kgf }	Dynamic C_a	3510 {360}	
	Static C_{0a}	8450 {860}	
Axial play		0	0.005 or less
Dynamic friction torque, N·cm {kgf·cm}		0.5~4.9 {0.05~0.5}	~1.5 {~0.15}
Spacer ball		None	
Factory packed grease		NSK grease PS2	
Internal spatial volume of nut (cm^3)		1.6	

Standard stock

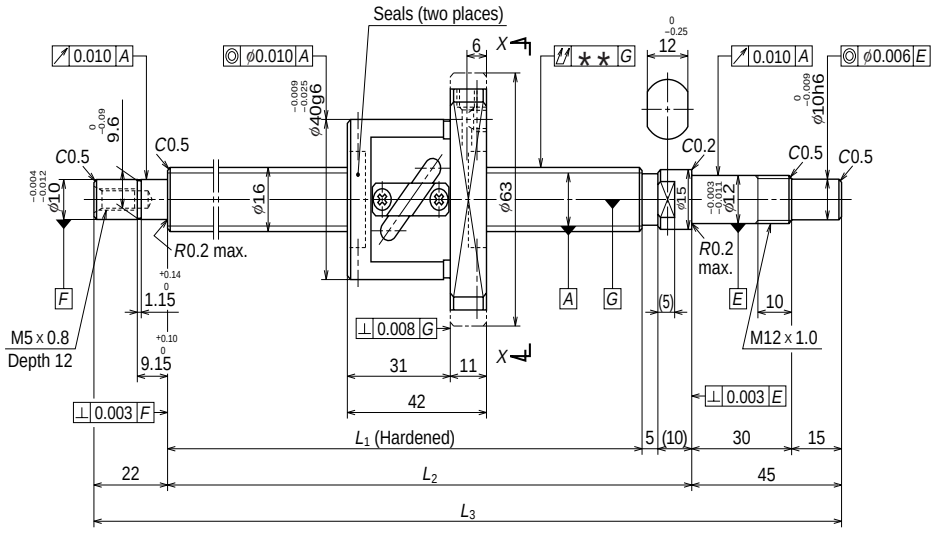
B 76

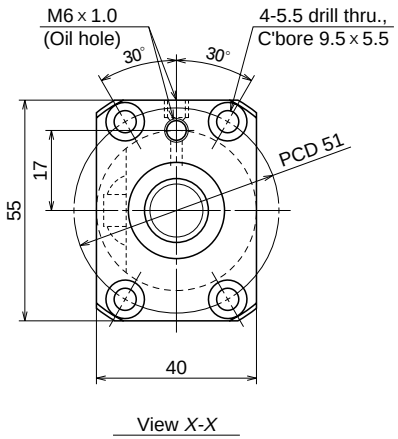
Unit: mm

Ball screw No.		Stroke	
Preloaded (MPFD)	Precise clearance (MSFD)	Nominal	Maximum (L_1–Nut length)
W1601MA-5PY-C3Z2.5	**W1601MA-6Y-C3T2.5**	50	95
W1601MA-7PY-C3Z2.5	**W1601MA-8Y-C3T2.5**	100	145
W1602MA-5PY-C3Z2.5	**W1602MA-6Y-C3T2.5**	150	195
W1602MA-7PY-C3Z2.5	**W1602MA-8Y-C3T2.5**	200	245
W1603MA-3PY-C3Z2.5	**W1603MA-4Y-C3T2.5**	300	345

Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)	
								Critical speed
L_1	L_2	L_3	T	e_p	υ_u			Fixed - Simple support / Fixed - Fixed
139	154	221	0	0.010	0.008	0.020	3000	— / —
189	204	271	0	0.010	0.008	0.020		— / —
239	254	321	0	0.012	0.008	0.030		— / —
289	304	371	0	0.012	0.008	0.030		— / —
389	404	471	0	0.013	0.010	0.035		— / —

Remarks 1. NSK support unit WBK12-01A (square type, fixed side), WBK12S-01 (square type, simple support side), and WBK12-11(round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. The amount for replenishing should be about 50% of the nut internal space capacity.





Unit: mm

Standard stock

Ball screw specifications			
Shaft dia. x Lead / Direction of turn		16 x 5/Right	
Preload / Ball recirculation		P preload / Return tube	
Ball dia. / Ball circle dia.		3.175/16.5	
Effective turns of balls		2.5 x 1	
Accuracy grade / Axial play		C3/Z	C3/T
Basic load rating N { Kgf }	Dynamic C_a	4620 {470}	7330 {745}
	Static C_{0a}	6750 {690}	13500 {1380}
Axial play		0	0.005 or less
Dynamic friction torque,N·cm {kgf·cm}		1.5~7.8 {0.15~0.8}	~2.0 {~0.2}
Spacer ball		Yes	None
Factory packed grease		NSK grease LR3	
Internal spatial volume of nut (cm³)		2.6	

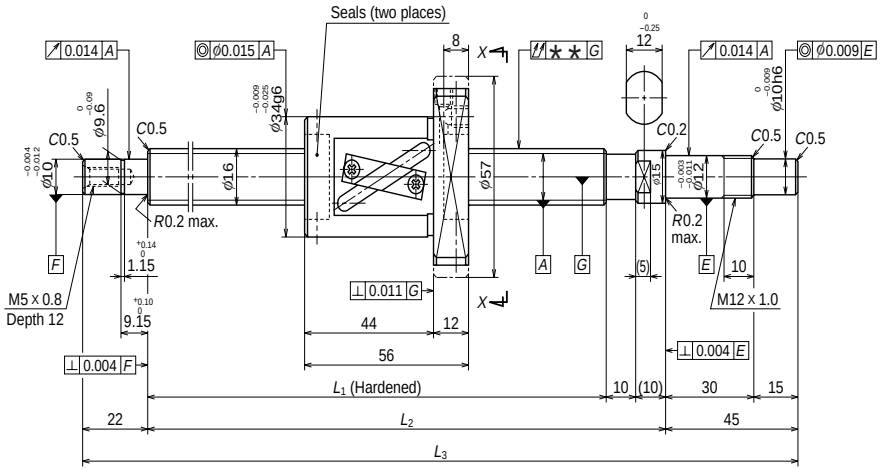
B 78

Unit: mm

Ball screw No.		Stroke	
Preloaded (PFT)	Precise clearance (SFT)	Nominal	Maximum (L_1–Nut length)
W1601FA-1P-C3Z5	**W1601FA-2-C3T5**	100	147
W1602FA-1P-C3Z5	**W1602FA-2-C3T5**	200	247
W1603FA-1P-C3Z5	**W1603FA-2-C3T5**	300	347
W1604FA-1P-C3Z5	**W1604FA-2-C3T5**	400	447
W1606FA-1P-C3Z5	**W1606FA-2-C3T5**	600	647
W1608FA-1P-C3Z5	**W1608FA-2-C3T5**	800	847

Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)	
								Critical speed
L_1	L_2	L_3	T	e_p	υ_u			Fixed - Simple support / Fixed - Fixed
189	204	271	0	0.010	0.008	0.020	3000	— / —
289	304	371	0	0.012	0.008	0.030		— / —
389	404	471	0	0.013	0.010	0.035		— / —
489	504	571	0	0.015	0.010	0.045		— / —
689	704	771	0	0.018	0.013	0.055		— / —
889	904	971	0	0.021	0.015	0.075		2570 / —

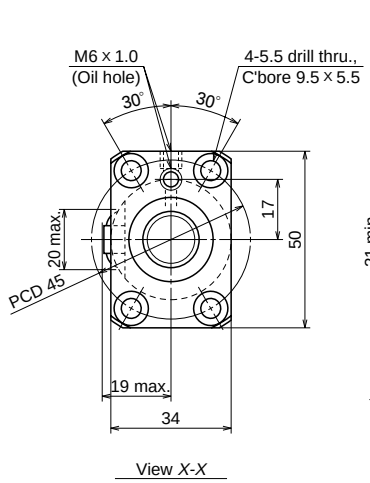
Remarks 1. NSK support unit WBK12-01A (square type, fixed side), WBK12S-01 (square type, simple support side), and WBK12-11 (round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. The amount for replenishing should be about 50% of nut internal space capacity.



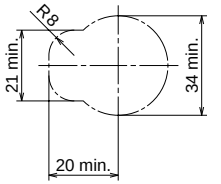
NSK

ϕ16 x 16

Unit: mm



Standard stock



Housing hole and its clearance

Ball screw specifications			
Shaft dia. x Lead / Direction of turn		16 x 16/Right	
Preload / Ball recirculation		P preload / Return tube	
Ball dia. / Ball circle dia.		3.175/16.75	
Effective turns of balls		1.5 x 1	
Accuracy grade / Axial play		C5/Z	C5/T
Basic load rating N { Kgf }	Dynamic C_a	3600 {365}	4710 {480}
	Static C_{0a}	5410 {550}	8110 {825}
Axial play		0	0.005 or less
Dynamic friction torque,N·cm {kgf·cm}		1.5~7.8 {0.15~0.8}	~2.4 {~0.25}
Spacer ball		Yes	None
Factory packed grease		NSK grease LR3	
Internal spatial volume of nut (cm³)		2.1	

B 80

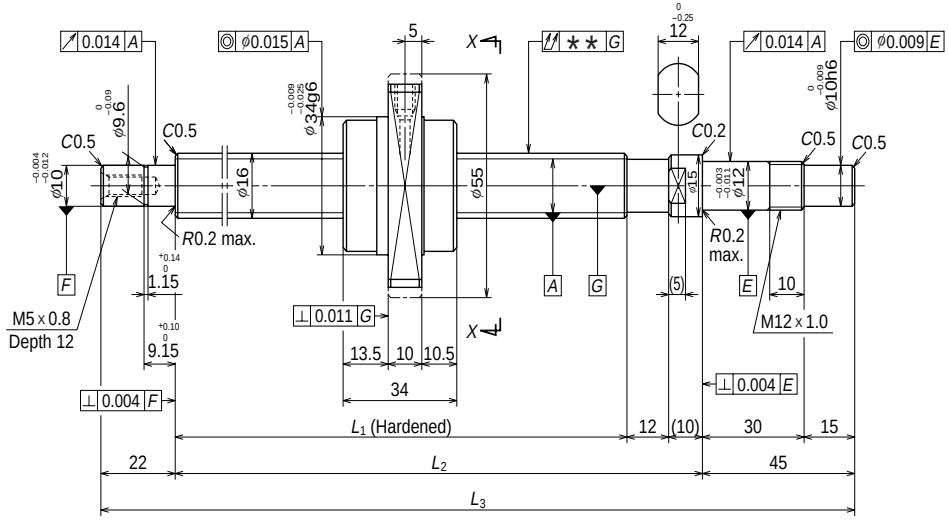
Unit: mm

Ball screw No.		Stroke	
Preloaded (LPFT)	Precise clearance (LSFT)	Nominal	Maximum (L_1–Nut length)
W1601FA-3P-C5Z16	**W1601FA-4-C5T16**	100	128
W1602FA-3P-C5Z16	**W1602FA-4-C5T16**	150	178
W1602FA-5P-C5Z16	**W1602FA-6-C5T16**	200	228
W1603FA-3P-C5Z16	**W1603FA-4-C5T16**	250	278
W1603FA-5P-C5Z16	**W1603FA-6-C5T16**	300	328
W1604FA-3P-C5Z16	**W1604FA-4-C5T16**	350	378
W1604FA-5P-C5Z16	**W1604FA-6-C5T16**	400	428
W1605FA-1P-C5Z16	**W1605FA-2-C5T16**	450	478
W1605FA-3P-C5Z16	**W1605FA-4-C5T16**	500	528
W1606FA-3P-C5Z16	**W1606FA-4-C5T16**	550	578
W1606FA-5P-C5Z16	**W1606FA-6-C5T16**	600	628
W1607FA-1P-C5Z16	**W1607FA-2-C5T16**	700	728
W1608FA-3P-C5Z16	**W1608FA-4-C5T16**	800	828
W1610FA-1P-C5Z16	**W1610FA-2-C5T16**	1000	1028

Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)	
								Critical speed
L_1	L_2	L_3	T	e_p	υ_u	↗↙		Fixed - Simple support / Fixed - Fixed
184	204	271	0	0.020	0.018	0.025	3000	— / —
234	254	321	0	0.023	0.018	0.035		— / —
284	304	371	0	0.023	0.018	0.035		— / —
334	354	421	0	0.025	0.020	0.040		— / —
384	404	471	0	0.025	0.020	0.040		— / —
434	454	521	0	0.027	0.020	0.050		— / —
484	504	571	0	0.027	0.020	0.050		— / —
534	554	621	0	0.030	0.023	0.050		— / —
584	604	671	0	0.030	0.023	0.065		— / —
634	654	721	0	0.035	0.025	0.065		— / —
684	704	771	0	0.035	0.025	0.065		— / —
784	804	871	0	0.035	0.025	0.085		— / —
884	904	971	0	0.040	0.027	0.085		2690 / —
1084	1104	1171	0	0.046	0.030	0.110		1770 / 2480

Remarks 1. NSK support unit WBK12-01A (square type, fixed side), WBK12S-01 (square type, simple support side), and WBK12-11 (round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. The amount for replenishing should be about 50% of nut internal space capacity.

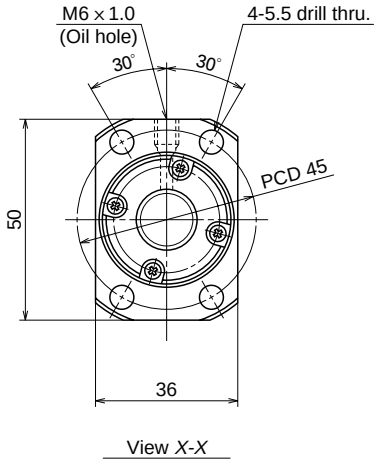
A Series: Finished shaft end (Ultra high helix lead) Dia. 16, Lead 32



Nut models: UPFC, USFC

NSK

ϕ 16 x 32



View *X-X*

Unit: mm

Ball screw specifications			
Shaft dia. x Lead / Direction of turn		16 x 32/Right	
Preload / Ball recirculation		P preload / End cap	
Ball dia. / Ball circle dia.		3.175/16.75	
Effective turns of balls		0.7 x 2	
Accuracy grade / Axial play		C5/Z	C5/T
Basic load rating N { Kgf }	Dynamic C_a	4000 {410}	
	Static C_{0a}	6690 {680}	
Axial play		0	0.005 or less
Dynamic friction torque, N·cm {kgf·cm}		1.5~9.8 {0.15~1.0}	~2.4 {~0.25}
Spacer ball		None	
Factory packed grease		NSK grease LR3	
Internal spatial volume of nut (cm^3)		2.0	

Standard stock

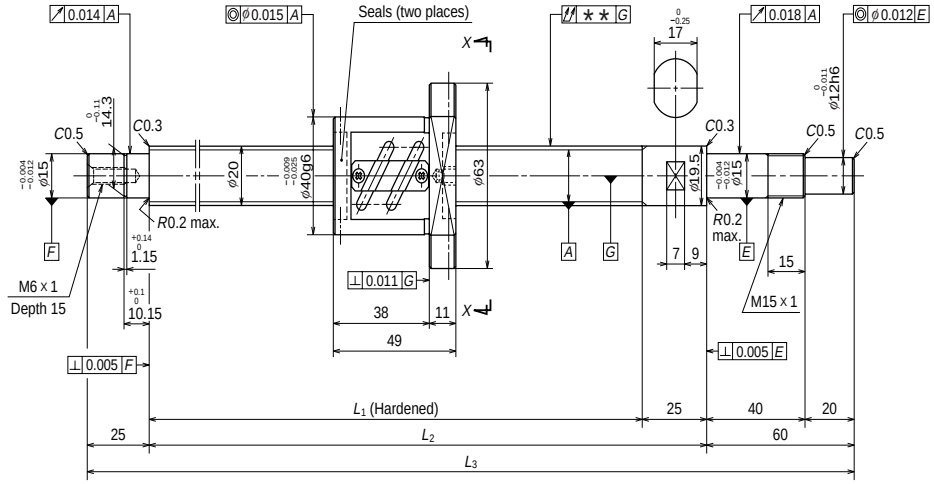
B 82

Unit: mm

Ball screw No.		Stroke	
		Nominal	Maximum (L_1–Nut length)
Preloaded (UPFC)	Precise clearance (USFC)		
W1603FA-7PGX-C5Z32	**W1603FA-8GX-C5T32**	300	348
W1605FA-5PGX-C5Z32	**W1605FA-6GX-C5T32**	500	548
W1608FA-5PGX-C5Z32	**W1608FA-6GX-C5T32**	800	848
W1612FA-1PGX-C5Z32	**W1612FA-2GX-C5T32**	1200	1248

Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)	
								Critical speed
L_1	L_2	L_3	T	e_p	υ_u			Fixed - Simple support	Fixed - Fixed
382	404	471	0	0.025	0.020	0.040	3000	—	—
582	604	671	0	0.030	0.023	0.065		—	—
882	904	971	0	0.040	0.027	0.085		2630	—
1282	1304	1371	0	0.054	0.035	0.150		1240	1740

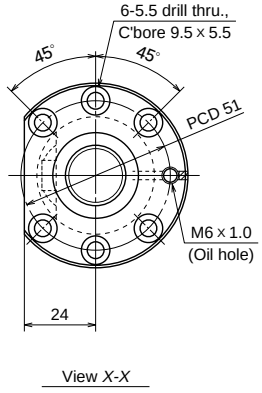
Remarks
1. NSK support unit WBK12-01A (square type, fixed side), WBK12S-01 (square type, simple support side), and WBK12-11 (round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. The amount for replenishing should be about 50% of nut internal space capacity.
3. Nut does not have a seal.



NSK

ϕ 20 x 4

Unit: mm



View *X-X*

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		20 x 4/Right
Preload / Ball recirculation		P preload / Return tube
Ball dia. / Ball circle dia.		2.381/20.3
Effective turns of balls		2.5 x 2
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	5420 {550}
	Static C_{0a}	10700 {1090}
Preload N{Kgf}		294 {30}
Dynamic friction torque,median, N·cm {kgf·cm}		3.9 {0.4}
Spacer ball		Yes
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm^3)		2.7

Standard stock

B 84

Unit: mm

Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W2002SA-1P-C5Z4	150	176	225	250	335
W2002SA-2P-C5Z4	200	226	275	300	385
W2003SA-1P-C5Z4	300	326	375	400	485
W2004SA-1P-C5Z4	400	426	475	500	585
W2005SA-1P-C5Z4	500	526	575	600	685
W2006SA-1P-C5Z4	600	626	675	700	785

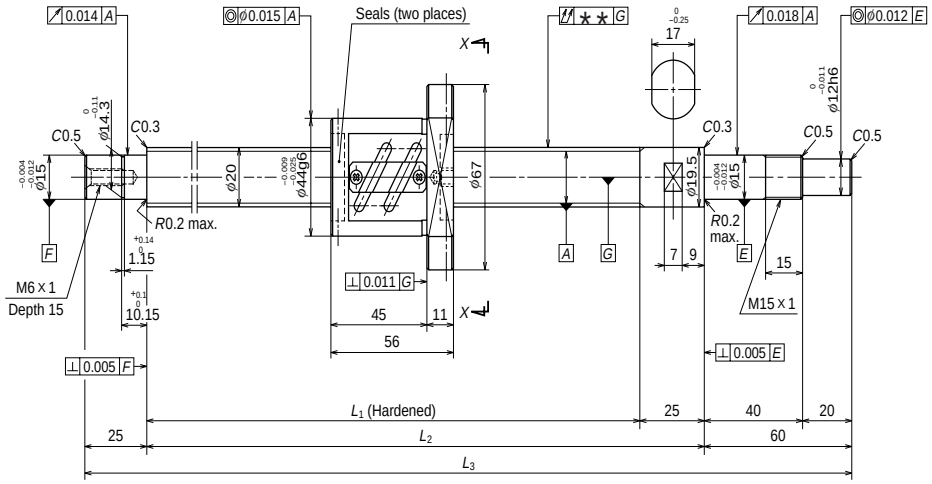
Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)	
				Critical speed	
T	e_p	υ_u		Fixed - Simple support	Fixed - Fixed
–0.005	0.023	0.018	0.045	—	—
–0.007	0.023	0.018	0.045	—	—
–0.009	0.025	0.020	0.055	—	—
–0.011	0.027	0.020	0.070	—	—
–0.014	0.030	0.023	0.085	—	—
–0.016	0.035	0.025	0.085	—	—

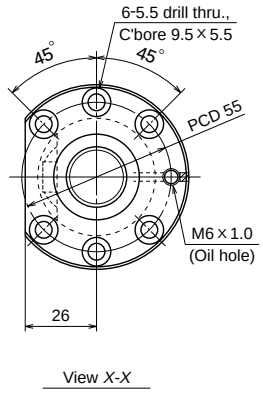
3000

Remarks 1. NSK support unit WBK15-01A (square type, fixed side), WBK15S-01 (square type, simple support side), and WBK15-11 (round type, fixed side) are recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

NSK

ϕ 20 x 5





View *X-X*

Unit: mm

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		20 x 5/Right
Preload / Ball recirculation		P preload / Return tube
Ball dia. / Ball circle dia.		3.175/20.5
Effective turns of balls		2.5 x 2
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	9410 {960}
	Static C_{0a}	17100 {1750}
Preload N{Kgf}		490 {50}
Dynamic friction torque, median,N·cm {Kgf·cm}		7.8 {0.8}
Spacer ball		Yes
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm^3)		4.3

Standard stock

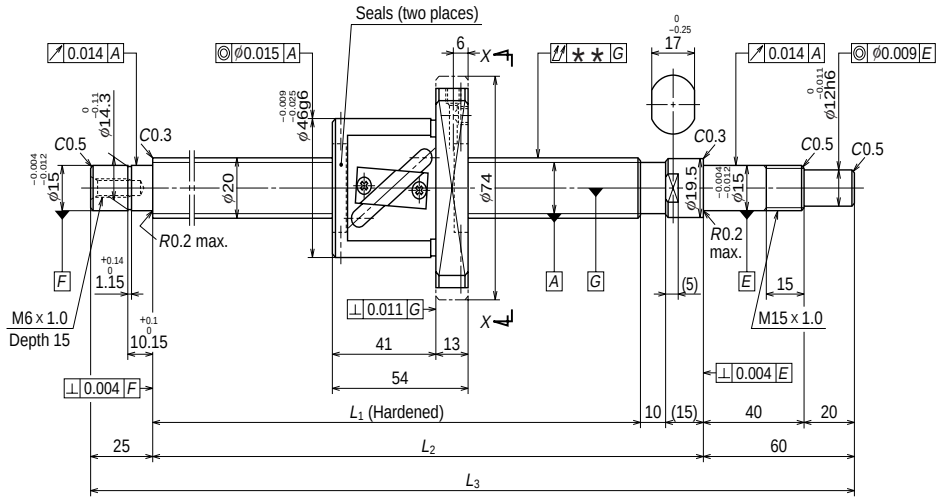
B 86

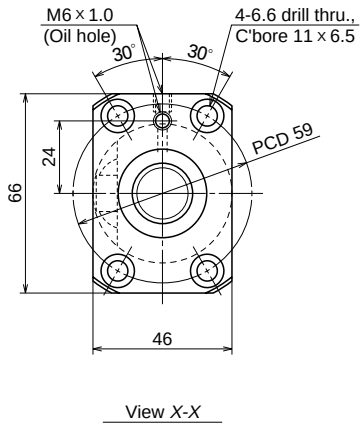
Unit: mm

Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W2002SA-3P-C5Z5	150	169	225	250	335
W2002SA-4P-C5Z5	200	219	275	300	385
W2003SA-2P-C5Z5	300	319	375	400	485
W2004SA-2P-C5Z5	400	419	475	500	585
W2005SA-2P-C5Z5	500	519	575	600	685
W2007SA-1P-C5Z5	700	719	775	800	885

Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)	
					Critical speed
T	e_p	υ_u			Fixed - Simple support / Fixed - Fixed
-0.005	0.023	0.018	0.045	3000	– / –
-0.007	0.023	0.018	0.045		– / –
-0.009	0.025	0.020	0.055		– / –
-0.011	0.027	0.020	0.070		– / –
-0.014	0.030	0.023	0.085		– / –
-0.019	0.035	0.025	0.110		– / –

Remarks 1. NSK support unit WBK12-01A (square type, fixed side), WBK12S-01 (square type, simple support side), and WBK12-11 (round type, fixed side) are recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.





NSK

ϕ 20 x 10

Unit: mm

Standard stock

Ball screw specifications			
Shaft dia. x Lead / Direction of turn		20 x 10/Right	
Preload / Ball recirculation		P preload / Return tube	
Ball dia. / Ball circle dia.		3.969/21	
Effective turns of balls		2.5 x 1	
Accuracy grade / Axial play		C5/Z	C5/T
Basic load rating N { Kgf }	Dynamic C_a	6880 {700}	10900 {1110}
	Static C_{0a}	10800 {1100}	21700 {2210}
Axial play		0	0.005 or less
Dynamic friction torque, N·cm {kgf·cm}		2.0~11.8 {0.2~1.2}	~2.9 {~0.3}
Spacer ball		Yes	None
Factory packed grease		NSK grease LR3	
Internal spatial volume of nut (cm³)		4.7	

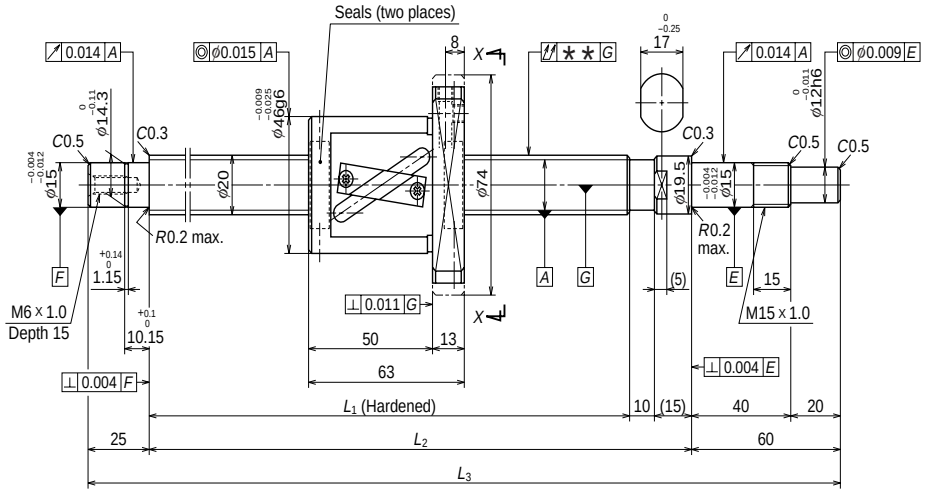
B 88

Unit: mm

Ball screw No.		Stroke	
		Nominal	Maximum (L_1–Nut length)
Preloaded (LPFT)	Precise clearance (LSFT)		
W2002FA-1P-C5Z10	**W2002FA-2-C5T10**	200	235
W2003FA-1P-C5Z10	**W2003FA-2-C5T10**	300	335
W2004FA-1P-C5Z10	**W2004FA-2-C5T10**	400	435
W2005FA-1P-C5Z10	**W2005FA-2-C5T10**	500	535
W2006FA-1P-C5Z10	**W2006FA-2-C5T10**	600	635
W2007FA-1P-C5Z10	**W2007FA-2-C5T10**	700	735
W2008FA-1P-C5Z10	**W2008FA-2-C5T10**	800	835
W2009FA-1P-C5Z10	**W2009FA-2-C5T10**	900	935
W2010FA-1P-C5Z10	**W2010FA-2-C5T10**	1000	1035
W2011FA-1P-C5Z10	**W2011FA-2-C5T10**	1100	1135
W2012FA-1P-C5Z10	**W2012FA-2-C5T10**	1200	1235

Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)	
								Critical speed
L_1	L_2	L_3	T	e_p	υ_u			Fixed - Simple support	Fixed - Fixed
289	314	399	0	0.023	0.018	0.035	3000	—	—
389	414	499	0	0.025	0.020	0.040		—	—
489	514	599	0	0.027	0.020	0.050		—	—
589	614	699	0	0.030	0.023	0.065		—	—
689	714	799	0	0.035	0.025	0.065		—	—
789	814	899	0	0.035	0.025	0.085		—	—
889	914	999	0	0.040	0.027	0.085		—	—
989	1014	1099	0	0.040	0.027	0.110		2680	—
1089	1114	1199	0	0.046	0.030	0.110		2210	—
1189	1214	1299	0	0.046	0.030	0.150		1840	2570
1289	1314	1399	0	0.054	0.035	0.150		1570	2190

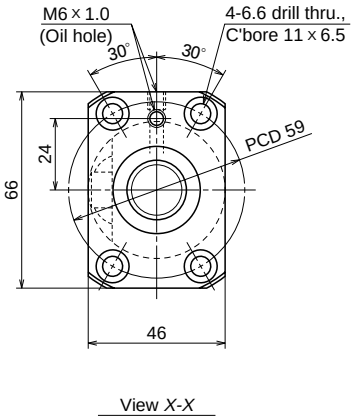
Remarks 1. NSK support unit WBK15-01A (square type, fixed side), WBK15S-01 (square type, simple support side), and WBK15-11 (round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. The amount for replenishing should be about 50% of nut internal space capacity.



NSK

ϕ20 x 20

Unit: mm



View *X-X*

Ball screw specifications			
Shaft dia. x Lead / Direction of turn		20 x 20/Right	
Preload / Ball recirculation		P preload / Return tube	
Ball dia. / Ball circle dia.		3.969/21	
Effective turns of balls		1.5 x 1	
Accuracy grade / Axial play		C5/Z	C5/T
Basic load rating N { Kgf }	Dynamic C_a	5370 {550}	7040 {720}
	Static C_{0a}	8450 {860}	12700 {1290}
Axial play		0	0.005 or less
Dynamic friction torque, N·cm {kgf·cm}		2.0~11.8 {0.2~1.2}	~2.9 {~0.3}
Spacer ball		Yes	None
Factory packed grease		NSK grease LR3	
Internal spatial volume of nut (cm³)		4.2	

Standard stock

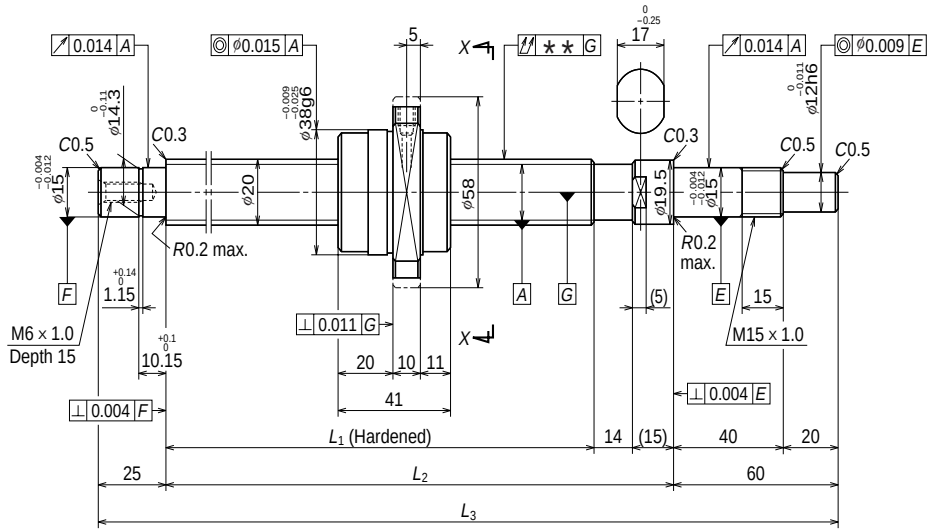
B 90

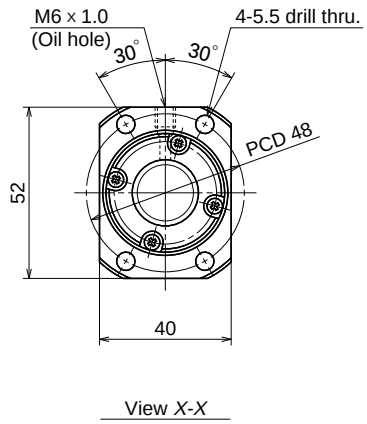
Unit: mm

Ball screw No.		Stroke	
		Nominal	Maximum (L_1–Nut length)
Preloaded (LPFT)	Precise clearance (LSFT)		
W2003FA-3P-C5Z20	**W2003FA-4-C5T20**	200	247
W2004FA-3P-C5Z20	**W2004FA-4-C5T20**	300	347
W2005FA-3P-C5Z20	**W2005FA-4-C5T20**	400	447
W2006FA-3P-C5Z20	**W2006FA-4-C5T20**	500	547
W2007FA-3P-C5Z20	**W2007FA-4-C5T20**	600	647
W2008FA-3P-C5Z20	**W2008FA-4-C5T20**	700	747
W2009FA-3P-C5Z20	**W2009FA-4-C5T20**	800	847
W2010FA-3P-C5Z20	**W2010FA-4-C5T20**	900	947
W2011FA-3P-C5Z20	**W2011FA-4-C5T20**	1000	1047
W2012FA-3P-C5Z20	**W2012FA-4-C5T20**	1100	1147
W2015FA-1P-C5Z20	**W2015FA-2-C5T20**	1400	1447

Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)	
								Critical speed
L_1	L_2	L_3	T	e_p	υ_u			Fixed - Simple support / Fixed - Fixed
310	335	420	0	0.023	0.018	0.040	3000	— / —
410	435	520	0	0.027	0.020	0.050		— / —
510	535	620	0	0.030	0.023	0.050		— / —
610	635	720	0	0.030	0.023	0.065		— / —
710	735	820	0	0.035	0.025	0.085		— / —
810	835	920	0	0.040	0.027	0.085		— / —
910	935	1020	0	0.040	0.027	0.110		— / —
1010	1035	1120	0	0.046	0.030	0.110		2590 / —
1110	1135	1220	0	0.046	0.030	0.110		2140 / 2970
1210	1235	1320	0	0.046	0.030	0.150		1790 / 2500
1510	1535	1620	0	0.054	0.035	0.180		1140 / 1610

Remarks 1. NSK support unit WBK15-01A (square type, fixed side), WBK15S-01 (square type, simple support side), and WBK15-11 (round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. The amount for replenishing should be about 50% of nut internal space capacity.





View *X-X*

Nut models: UPFC, USFC

NSK

ϕ 20 x 40

Unit: mm

Standard stock

Ball screw specifications			
Shaft dia. x Lead / Direction of turn		20 x 40/Right	
Preload / Ball recirculation		P preload / End cap	
Ball dia. / Ball circle dia.		3.175/20.75	
Effective turns of balls		0.7 x 2	
Accuracy grade / Axial play		C5/Z	C5/T
Basic load rating N { Kgf }	Dynamic C_a	4480 {455}	
	Static C_{0a}	8650 {880}	
Axial play		0	0.005 or less
Dynamic friction torque, N·cm {kgf·cm}		2.0~11.8 {0.2~1.2}	~2.9 {~0.3}
Spacer ball		None	
Factory packed grease		NSK grease LR3	
Internal spatial volume of nut (cm^3)		2.8	

B 92

Unit: mm

Ball screw No.		Stroke	
Preloaded (UPFC)	Precise clearance (USFC)	Nominal	Maximum (L_1–Nut length)
W2005FA-5PGX-C5Z40	**W2005FA-6GX-C5T40**	400	465
W2007FA-5PGX-C5Z40	**W2007FA-6GX-C5T40**	600	665
W2009FA-5PGX-C5Z40	**W2009FA-6GX-C5T40**	800	865
W2011FA-5PGX-C5Z40	**W2011FA-6GX-C5T40**	1000	1065
W2013FA-1PGX-C5Z40	**W2013FA-2GX-C5T40**	1200	1265
W2017FA-1PGX-C5Z40	**W2017FA-2GX-C5T40**	1600	1665

Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)	
							Critical speed	
L_1	L_2	L_3	T	e_p	υ_u		Fixed - Simple support	Fixed - Fixed
506	535	620	0	0.030	0.023	0.050	—	—
706	735	820	0	0.035	0.025	0.085	—	—
906	935	1020	0	0.040	0.027	0.110	—	—
1106	1135	1220	0	0.046	0.030	0.110	2170	3000
1306	1335	1420	0	0.054	0.035	0.150	1550	2160
1706	1735	1820	0	0.065	0.040	0.230	910	1270

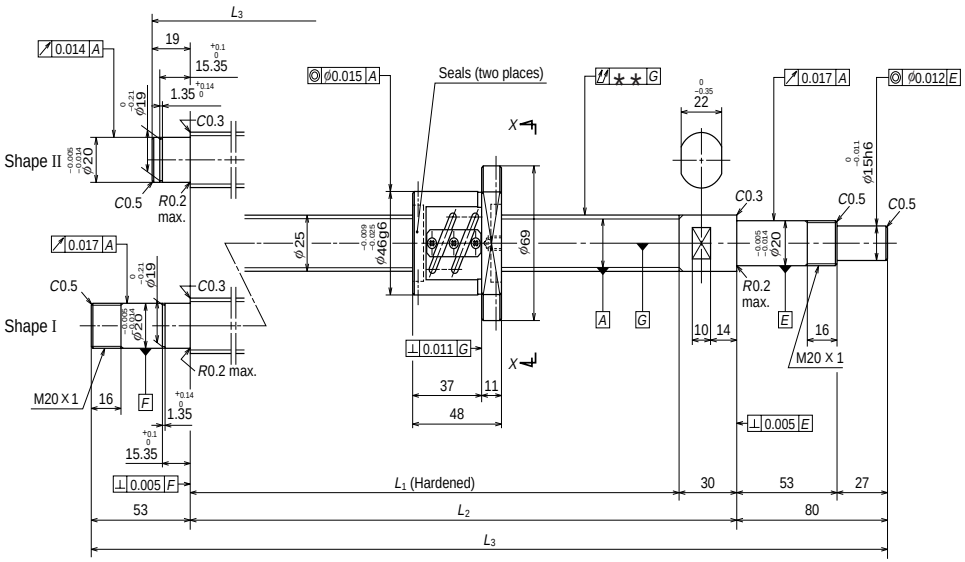
3000

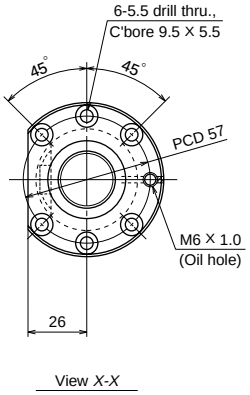
Remarks 1. NSK support unit WBK15-01A (square type, fixed side), WBK15S-01 (square type, simple support side), and WBK15-11 (round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. The amount for replenishing should be about 50% of nut internal space capacity.
3. Nut does not have a seal.

NSK

ϕ 25 x 4

Unit: mm





View *X-X*

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		25 x 4/Right
Preload / Ball recirculation		P preload / Return tube
Ball dia. / Ball circle dia.		2.381/25.3
Effective turns of balls		2.5 x 2
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	6020 {615}
	Static C_{0a}	13600 {1390}
Preload N{Kgf}		290 {30}
Dynamic friction torque, median,N·cm {Kgf·cm}		4.9 {0.5}
Spacer ball		Yes
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm^3)		3.2

Standard stock

B 94

Unit: mm

Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W2502SA-1P-C5Z4	150	172	220	250	349
W2502SA-2P-C5Z4	200	222	270	300	399
W2503SA-1P-C5Z4	300	322	370	400	499
W2504SA-1P-C5Z4	400	422	470	500	599
W2505SA-1P-C5Z4	500	522	570	600	733
W2507SA-1P-C5Z4	700	722	770	800	933

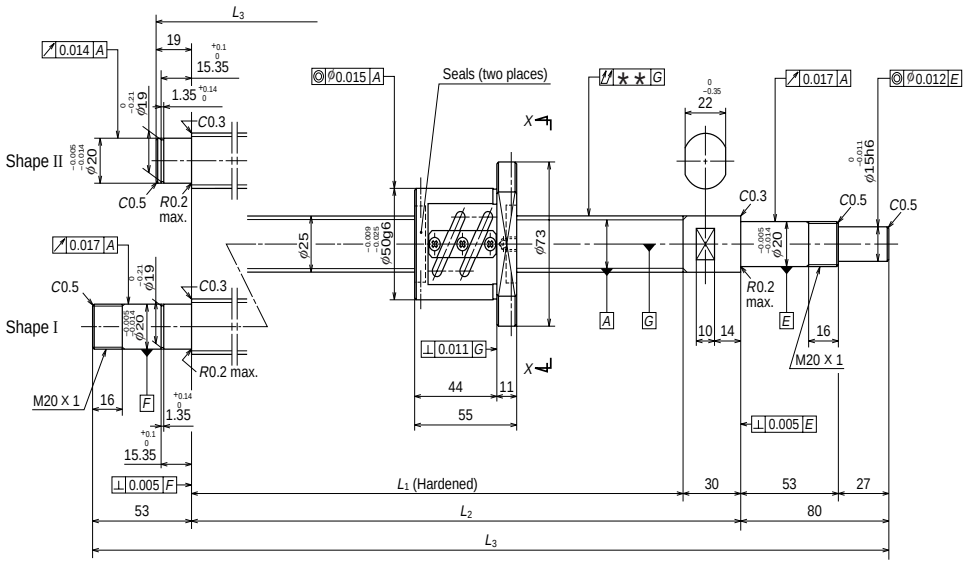
Left side shaft end	Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
					dm·n	Critical speed	
	T	e_p	v_u			Fixed - Simple support	Fixed - Fixed
II	–0.005	0.023	0.018	0.035	2760	—	—
II	–0.006	0.023	0.018	0.035		—	—
II	–0.009	0.025	0.020	0.040		—	—
II	–0.011	0.027	0.020	0.050		—	—
I	–0.014	0.030	0.023	0.060		—	—
I	–0.018	0.035	0.025	0.075		—	—

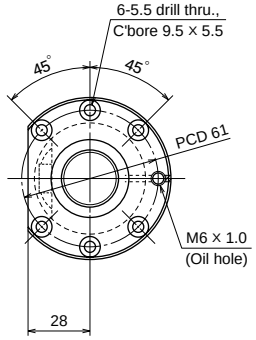
Remarks 1. NSK support unit WBK20-01A (square type, fixed side), WBK20S-01 (square type, simple support side), and WBK20-11 (round type, fixed side) are recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

NSK

ϕ 25 x 5

Unit: mm





View X-X

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		25 x 5/Right
Preload / Ball recirculation		P preload / Return tube
Ball dia. / Ball circle dia.		3.175/25.5
Effective turns of balls		2.5 x 2
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	10400 {1070}
	Static C_{0a}	21900 {2230}
Preload N{Kgf}		540 {55}
Dynamic friction torque, median,N·cm {Kgf·cm}		8.8 {0.9}
Spacer ball		Yes
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm^3)		5.0

Standard stock

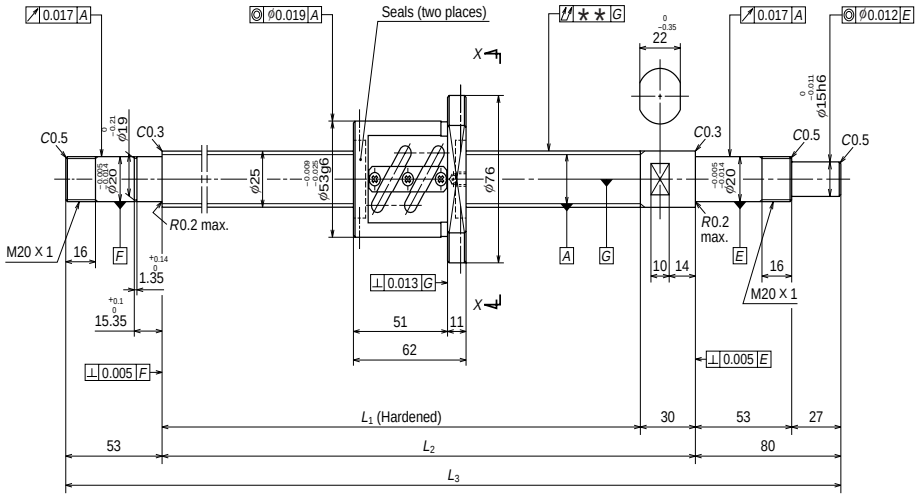
B 96

Unit: mm

Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W2502SA-3P-C5Z5	150	165	220	250	349
W2502SA-4P-C5Z5	200	215	270	300	399
W2503SA-2P-C5Z5	300	315	370	400	499
W2504SA-2P-C5Z5	400	415	470	500	599
W2505SA-2P-C5Z5	500	515	570	600	733
W2506SA-1P-C5Z5	600	615	670	700	833
W2507SA-2P-C5Z5	700	715	770	800	933
W2509SA-1P-C5Z5	900	915	970	1000	1133
W2511SA-1P-C5Z5	1000	1115	1170	1200	1333

Left side shaft end	Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
					dm·n	Critical speed	
	T	e_p	v_u			Fixed - Simple support	Fixed - Fixed
II	–0.005	0.023	0.018	0.035	2740	—	—
II	–0.006	0.023	0.018	0.035		—	—
II	–0.009	0.025	0.020	0.040		—	—
II	–0.011	0.027	0.020	0.050		—	—
I	–0.014	0.030	0.023	0.060		—	—
I	–0.016	0.035	0.025	0.075		—	—
I	–0.018	0.035	0.025	0.075		—	—
I	–0.023	0.040	0.027	0.090		—	—
I	–0.028	0.046	0.030	0.120		2480	—

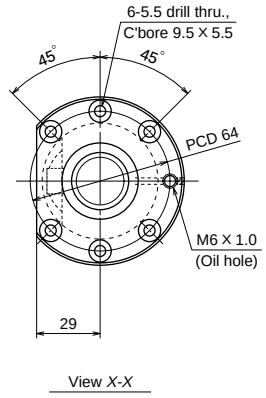
Remarks 1. NSK support unit WBK20-01A (square type, fixed side), WBK20S-01 (square type, simple support side), and WBK20-11 (round type, fixed side) are recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.



NSK

ϕ 25 x 6

Unit: mm



View *X-X*

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		25 x 6/Right
Preload / Ball recirculation		P preload / Return tube
Ball dia. / Ball circle dia.		3.969/25.5
Effective turns of balls		2.5 x 2
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	14100 {1430}
	Static C_{0a}	26800 {2730}
Preload N{Kgf}		685 {70}
Dynamic friction torque, median,N·cm {Kgf·cm}		13.8 {1.4}
Spacer ball		Yes
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm^3)		7.0

Standard stock

B 98

Unit: mm

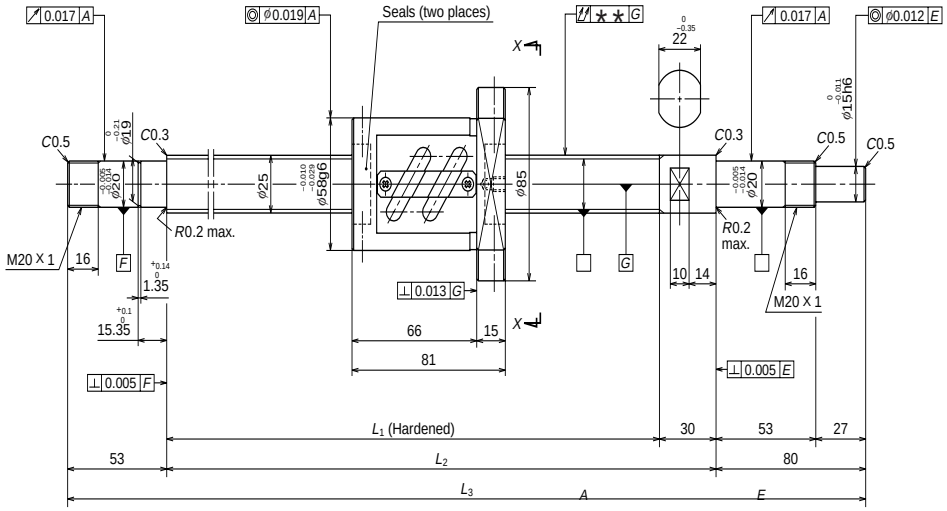
Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W2503SA-3P-C5Z6	250	308	370	400	533
W2505SA-3P-C5Z6	450	508	570	600	733
W2507SA-3P-C5Z6	650	708	770	800	933
W2511SA-2P-C5Z6	1050	1108	1170	1200	1333

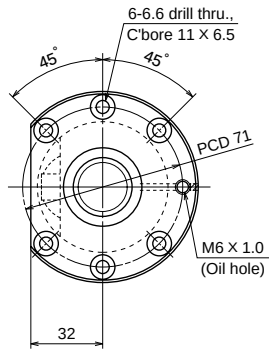
Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
				dm·n	Critical speed	
T	e_p	υ_u			Fixed - Simple support	Fixed - Fixed
–0.009	0.025	0.020	0.050	2740	—	—
–0.014	0.030	0.023	0.060		—	—
–0.018	0.035	0.025	0.075		—	—
–0.028	0.046	0.030	0.120		2410	—

Remarks 1. NSK support unit WBK20-01A (square type, fixed side), WBK20S-01 (square type, simple support side), and WBK20-11 (round type, fixed side) are recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

NSK

ϕ 25 x 10





View *X-X*

Unit: mm

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		25 x 10/Right
Preload / Ball recirculation		P preload / Return tube
Ball dia. / Ball circle dia.		4.762/25.5
Effective turns of balls		1.5 x 2
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	11600 {1190}
	Static C_{0a}	19000 {1940}
Preload N{Kgf}		585 {60}
Dynamic friction torque, median,N·cm {Kgf·cm}		13.8 {1.4}
Spacer ball		Yes
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm³)		9.5

Standard stock

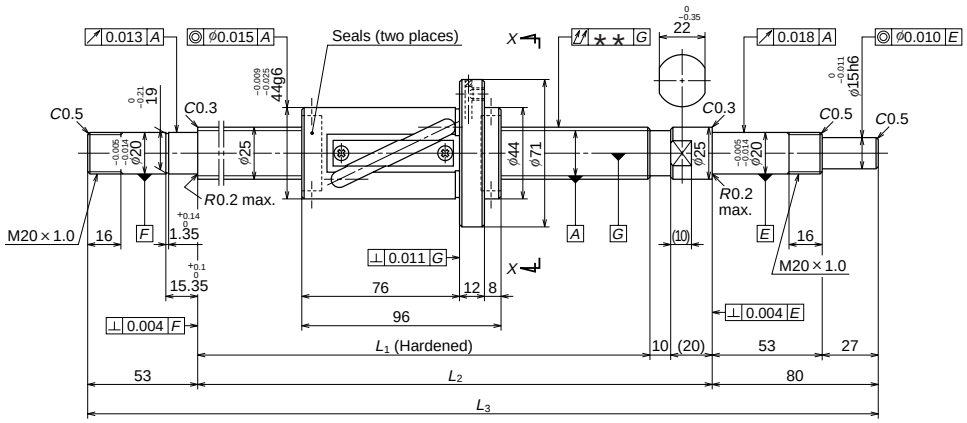
B 100

Unit: mm

Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W2503SA-4P-C5Z10	250	289	370	400	533
W2505SA-4P-C5Z10	450	489	570	600	733
W2507SA-4P-C5Z10	650	689	770	800	933
W2509SA-2P-C5Z10	850	889	970	1000	1133
W2511SA-3P-C5Z10	1050	1089	1170	1200	1333
W2514SA-1P-C5Z10	1350	1389	1470	1500	1633

Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
				dm·n	Critical speed	
T	e_p	υ_u	↗↗		Fixed - Simple support	Fixed - Fixed
–0.009	0.025	0.020	0.050	2740	—	—
–0.014	0.030	0.023	0.060		—	—
–0.018	0.035	0.025	0.075		—	—
–0.023	0.040	0.027	0.090		—	—
–0.028	0.046	0.030	0.120		2340	—
–0.035	0.054	0.035	0.150		1470	2050

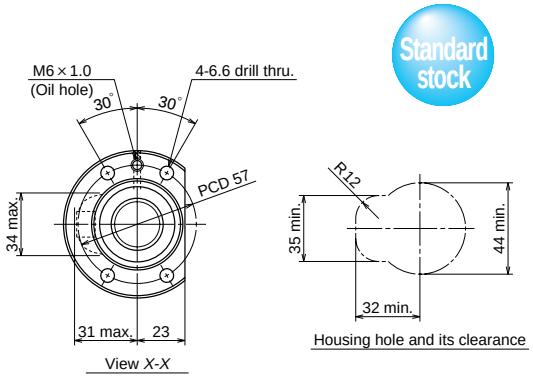
Remarks 1. NSK support unit WBK12-01A (square type, fixed side), WBK12S-01 (square type, simple support side), and WBK12-11 (round type, fixed side) are recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.



NSK

⌀25 x 20

Unit: mm



Standard stock

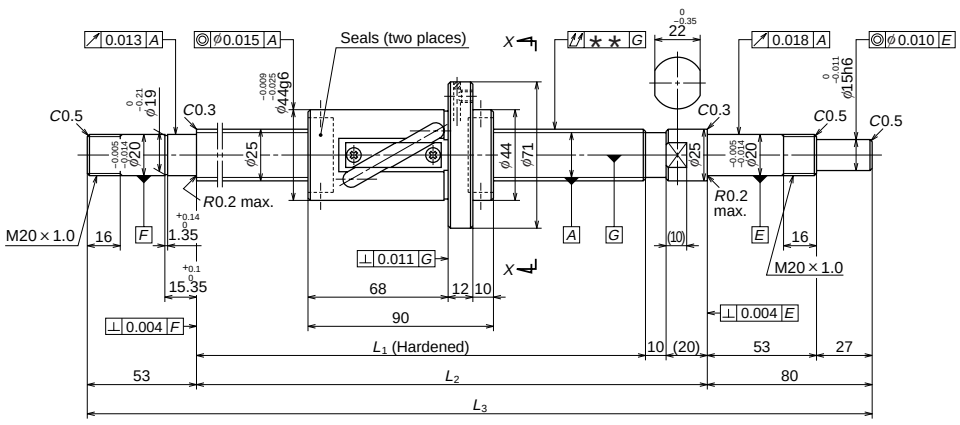
Ball screw specifications			
Shaft dia. x Lead / Direction of turn		25 x 20/Right	
Preload / Ball recirculation		P preload / Return tube	
Ball dia. / Ball circle dia.		4.762/26.25	
Effective turns of balls		2.5 x 1	
Accuracy grade / Axial play		C5/Z	C5/T
Basic load rating N { Kgf }	Dynamic C_a	9900 {1010}	15700 {1600}
	Static C_{0a}	16400 {1670}	32800 {3350}
Axial play		0	0.005 or less
Dynamic friction torque,N·cm {kgf·cm}		3.9~24.5 {0.4~2.5}	4.9 {~0.5}
Spacer ball		Yes	None
Factory packed grease		NSK grease LR3	
Internal spatial volume of nut (cm³)		12	

B 102

Unit: mm

Ball screw No.		Stroke		Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
											dm·n	Critical speed	
Preloaded (LPFT)	Precise clearance (LSFT)	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3	T	e_p	υ_u			Fixed - Simple support	Fixed - Fixed
W2507FA-1P-C5Z20	**W2507FA-2-C5T20**	600	654	750	780	913	0	0.035	0.025	0.055	2660	—	—
W2509FA-1P-C5Z20	**W2509FA-2-C5T20**	800	854	950	980	1113	0	0.040	0.027	0.070		—	—
W2511FA-1P-C5Z20	**W2511FA-2-C5T20**	1000	1054	1150	1180	1313	0	0.046	0.030	0.090		2560	—
W2513FA-1P-C5Z20	**W2513FA-2-C5T20**	1200	1254	1350	1380	1513	0	0.054	0.035	0.090		1840	2550
W2515FA-1P-C5Z20	**W2515FA-2-C5T20**	1400	1454	1550	1580	1713	0	0.054	0.035	0.120		1390	1940
W2517FA-1P-C5Z20	**W2517FA-2-C5T20**	1600	1654	1750	1780	1913	0	0.065	0.040	0.120		1080	1520
W2521FA-1P-C5Z20	**W2521FA-2-C5T20**	2000	2054	2150	2180	2313	0	0.077	0.046	0.160		710	1000

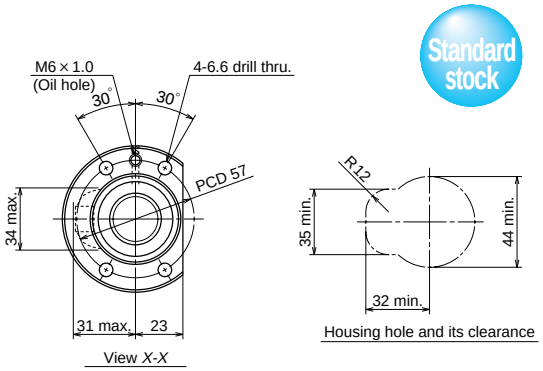
Remarks 1. NSK support unit WBK20-01A (square type, fixed side), WBK20S-01 (square type, simple support side), and WBK20-11 (round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. The amount for replenishing should be about 50% of nut internal space capacity.



NSK

ϕ 25 x 25

Unit: mm



Standard stock

Ball screw specifications			
Shaft dia. x Lead / Direction of turn		25 x 25/Right	
Preload / Ball recirculation		P preload / Return tube	
Ball dia. / Ball circle dia.		4.762/26.25	
Effective turns of balls		1.5 x 1	
Accuracy grade / Axial play		C5/Z	C5/T
Basic load rating N { Kgf }	Dynamic C_a	7730 {790}	10100 {1030}
	Static C_{0a}	12700 {1300}	19100 {1950}
Axial play		0	0.005 or less
Dynamic friction torque,N·cm {kgf·cm}		3.9~24.5 {0.4~2.5}	4.9 {~0.5}
Spacer ball		Yes	None
Factory packed grease		NSK grease LR3	
Internal spatial volume of nut (cm³)		7.5	

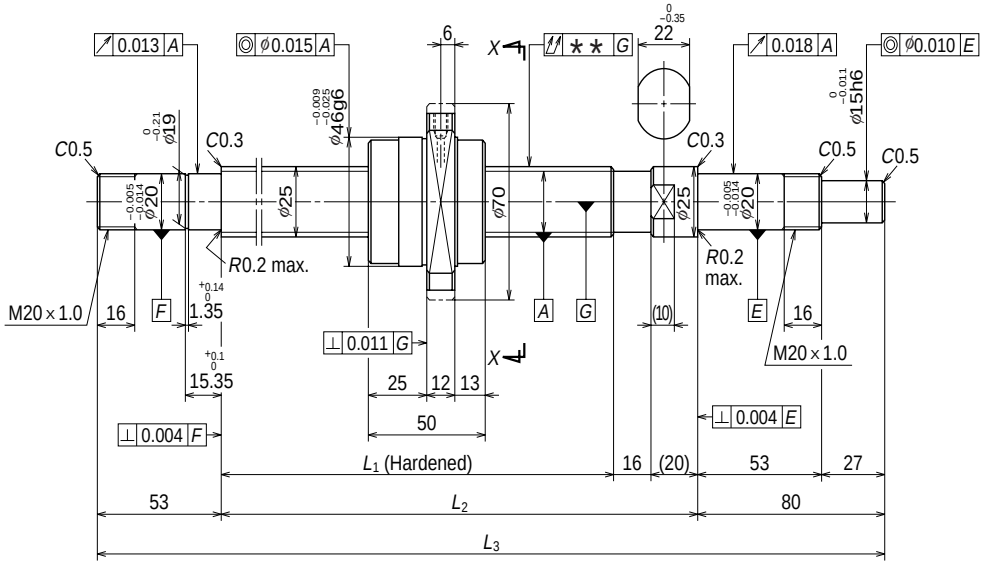
Unit: mm

Ball screw No.		Stroke	
Preloaded (LPFT)	Precise clearance (LSFT)	Nominal	Maximum (L_1–Nut length)
W2507FA-3P-C5Z25	**W2507FA-4-C5T25**	600	660
W2509FA-3P-C5Z25	**W2509FA-4-C5T25**	800	860
W2511FA-3P-C5Z25	**W2511FA-4-C5T25**	1000	1060
W2513FA-3P-C5Z25	**W2513FA-4-C5T25**	1200	1260
W2515FA-3P-C5Z25	**W2515FA-4-C5T25**	1400	1460
W2517FA-3P-C5Z25	**W2517FA-4-C5T25**	1600	1660
W2521FA-3P-C5Z25	**W2521FA-4-C5T25**	2000	2060

Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
							dm·n	Critical speed	
L_1	L_2	L_3	T	e_p	υ_u			Fixed - Simple support	Fixed - Fixed
750	780	913	0	0.035	0.025	0.055	2660	—	—
950	980	1113	0	0.040	0.027	0.070		—	—
1150	1180	1313	0	0.046	0.030	0.090		2540	—
1350	1380	1513	0	0.054	0.035	0.090		1830	2540
1550	1580	1713	0	0.054	0.035	0.120		1380	1930
1750	1780	1913	0	0.065	0.040	0.120		1080	1510
2150	2180	2313	0	0.077	0.046	0.160		710	1000

Remarks 1. NSK support unit WBK20-01A (square type, fixed side), WBK20S-01 (square type, simple support side), and WBK20-11 (round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. The amount for replenishing should be about 50% of nut internal space capacity.

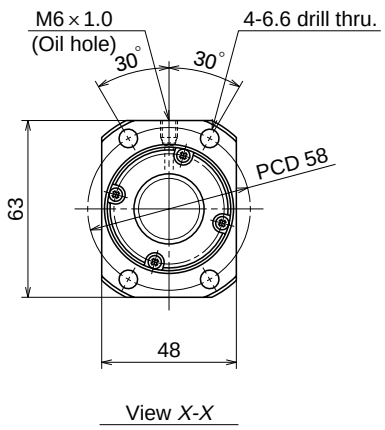
A Series: Finished shaft end (Ultra high helix lead) Dia. 25, Lead 50



Nut models: UPFC, USFC

NSK

ϕ 25 x 50



Unit: mm

Ball screw specifications			
Shaft dia. x Lead / Direction of turn		25 x 50/Right	
Preload / Ball recirculation		P preload / End cap	
Ball dia. / Ball circle dia.		3.969/26	
Effective turns of balls		0.7 x 2	
Accuracy grade / Axial play		C5/Z	C5/T
Basic load rating N { Kgf }	Dynamic C_a	6690 {680}	
	Static C_{0a}	13500 {1380}	
Axial play		0	0.005 or less
Dynamic friction torque, N·cm {kgf·cm}		2.9~21.5 {0.3~2.2}	~4.9 {~0.5}
Spacer ball		None	
Factory packed grease		NSK grease LR3	
Internal spatial volume of nut (cm^3)		4.2	

Standard stock

B 106

Unit: mm

Ball screw No.		Stroke	
Preloaded (UPFC)	Precise clearance (USGC)	Nominal	Maximum (L_1–Nut length)
W2508FA-1PGX-C5Z50	**W2508FA-2GX-C5T50**	700	794
W2511FA-5PGX-C5Z50	**W2511FA-6GX-C5T50**	1000	1094
W2516FA-1PGX-C5Z50	**W2516FA-2GX-C5T50**	1500	1594
W2521FA-5PGX-C5Z50	**W2521FA-6GX-C5T50**	2000	2094

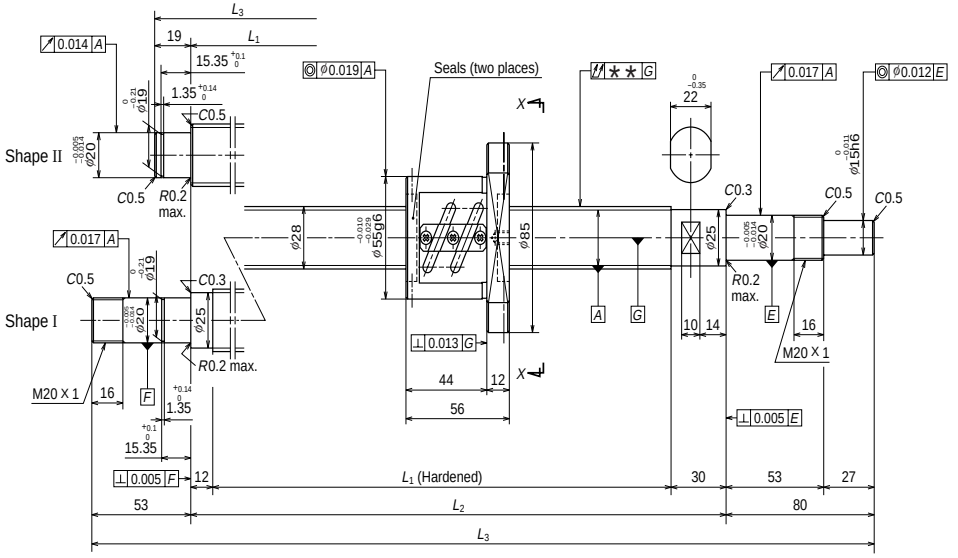
Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
							dm·n	Critical speed	
L_1	L_2	L_3	T	e_p	υ_u			Fixed - Simple support	Fixed - Fixed
844	880	1013	0	0.040	0.027	0.070	2690	—	—
1144	1180	1313	0	0.046	0.030	0.090		2550	—
1644	1680	1813	0	0.065	0.040	0.120		1230	1710
2144	2180	2313	0	0.077	0.046	0.160		720	1010

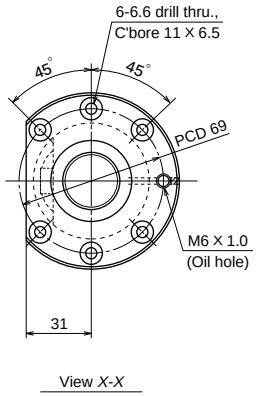
Remarks
1. NSK support unit WBK20-01A (square type, fixed side), WBK20S-01 (square type, simple support side), and WBK20-11 (round type, fixed side) are recommended.
2. NSK grease PS2 is recommended. The amount for replenishing should be about 50% of nut internal space capacity.
3. Nut does not have a seal.

NSK

ϕ 28 x5

Unit: mm





View *X-X*

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		28 x 5/Right
Preload / Ball recirculation		P preload / Return tube
Ball dia. / Ball circle dia.		3.175/28.5
Effective turns of balls		2.5 x 2
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	11000 {1120}
	Static C_{0a}	24400 {2490}
Preload N{Kgf}		540{55}
Dynamic friction torque, median,N·cm {Kgf·cm}		9.8 {1.0}
Spacer ball		Yes
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm^3)		6.0

Standard stock

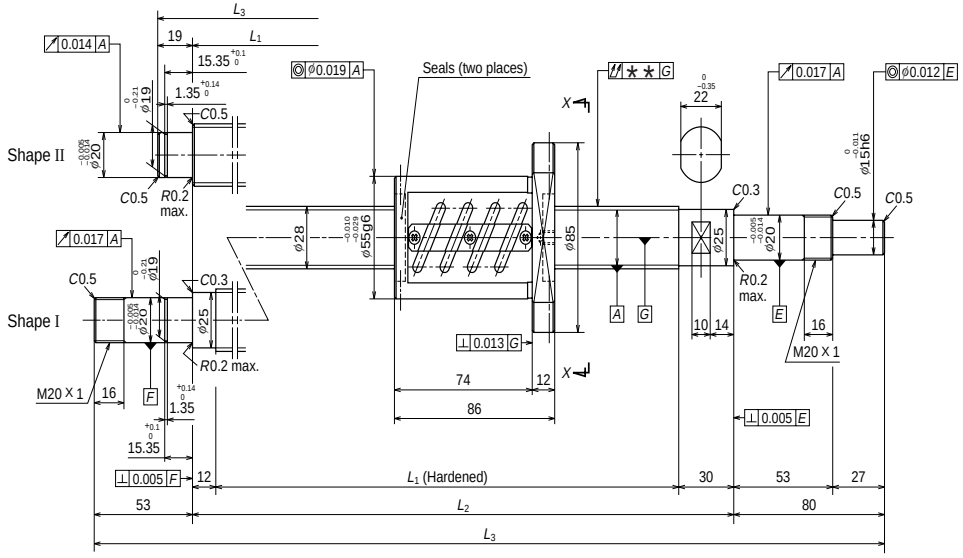
B 108

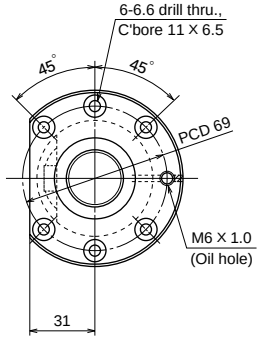
Unit: mm

Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W2802SA-1P-C5Z5	200	214	270	300	399
W2803SA-1P-C5Z5	300	314	370	400	499
W2804SA-1P-C5Z5	400	414	470	500	599
W2805SA-1P-C5Z5	450	502	558	600	733
W2807SA-1P-C5Z5	650	702	758	800	933
W2809SA-1P-C5Z5	850	902	958	1000	1133
W2811SA-1P-C5Z5	1050	1102	1158	1200	1333

Left side shaft end	Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
					dm·n	Critical speed	
	T	e_p	υ_u	↗↗		Fixed - Simple support	Fixed - Fixed
II	–0.006	0.023	0.018	0.035	2450	—	—
II	–0.009	0.025	0.020	0.040		—	—
II	–0.011	0.027	0.020	0.050		—	—
I	–0.014	0.030	0.023	0.060		—	—
I	–0.018	0.035	0.025	0.075		—	—
I	–0.024	0.040	0.027	0.090		—	—
I	–0.028	0.046	0.030	0.120			

Remarks 1. NSK support unit WBK20-01A (square type, fixed side), WBK20S-01 (square type, simple support side), and WBK20-11 (round type, fixed side) are recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.





View *X-X*

Unit: mm

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		28 x 5/Right
Preload / Ball recirculation		P preload / Return tube
Ball dia. / Ball circle dia.		3.175/28.5
Effective turns of balls		2.5 x 2
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	17400 {1780}
	Static C_{0a}	48800 {4980}
Preload N{Kgf}		1220 {125}
Dynamic friction torque, median,N·cm {Kgf·cm}		21.5 {2.2}
Spacer ball		Yes
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm^3)		9.0

Standard stock

B 110

Unit: mm

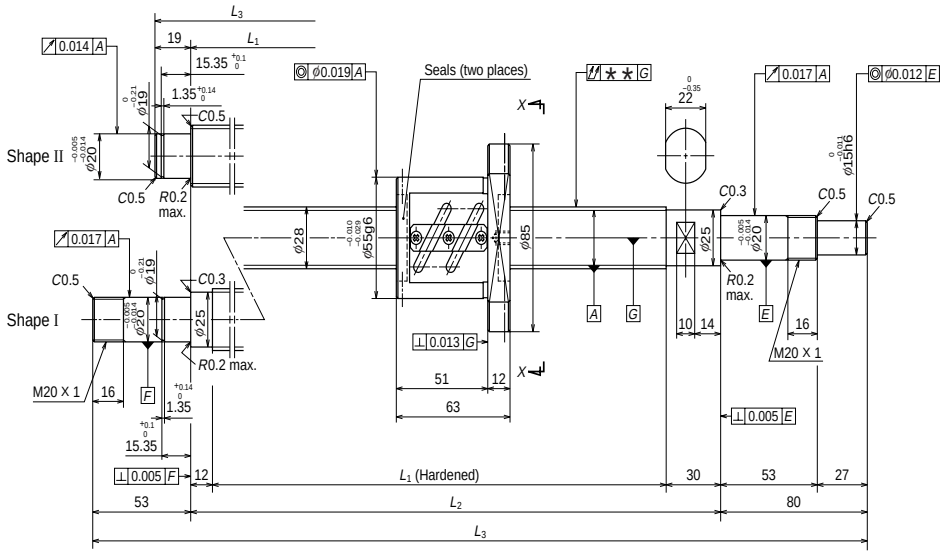
Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W2802SA-2Z-C5Z5	150	184	270	300	399
W2803SA-2Z-C5Z5	250	284	370	400	499
W2804SA-2Z-C5Z5	350	384	470	500	599
W2805SA-2Z-C5Z5	450	472	558	600	733
W2807SA-2Z-C5Z5	650	672	758	800	933
W2809SA-2Z-C5Z5	850	872	958	1000	1133
W2811SA-2Z-C5Z5	1050	1072	1158	1200	1333

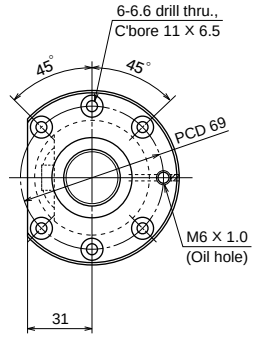
Left side shaft end	Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
					dm·n	Critical speed	
	T	e_p	υ_u	↗↙		Fixed - Simple support	Fixed - Fixed
II	–0.006	0.023	0.018	0.035	2450	—	—
II	–0.009	0.025	0.020	0.040		—	—
II	–0.011	0.027	0.020	0.050		—	—
I	–0.013	0.030	0.023	0.060		—	—
I	–0.018	0.035	0.025	0.075		—	—
I	–0.023	0.040	0.027	0.090		—	—
I	–0.028	0.046	0.030	0.120		—	—

Remarks 1. NSK support unit WBK20-01A (square type, fixed side), WBK20S-01 (square type, simple support side), and WBK20-11 (round type, fixed side) are recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

NSK

ϕ 28 x6





View *X-X*

Unit: mm

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		28 x 6/Right
Preload / Ball recirculation		P preload / Return tube
Ball dia. / Ball circle dia.		3.175/28.5
Effective turns of balls		2.5 x 2
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	11000 {1120}
	Static C_{0a}	24400 {2490}
Preload N{Kgf}		540 {55}
Dynamic friction torque, median,N·cm {Kgf·cm}		11.8 {1.2}
Spacer ball		Yes
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm³)		6.0

Standard stock

B 112

Unit: mm

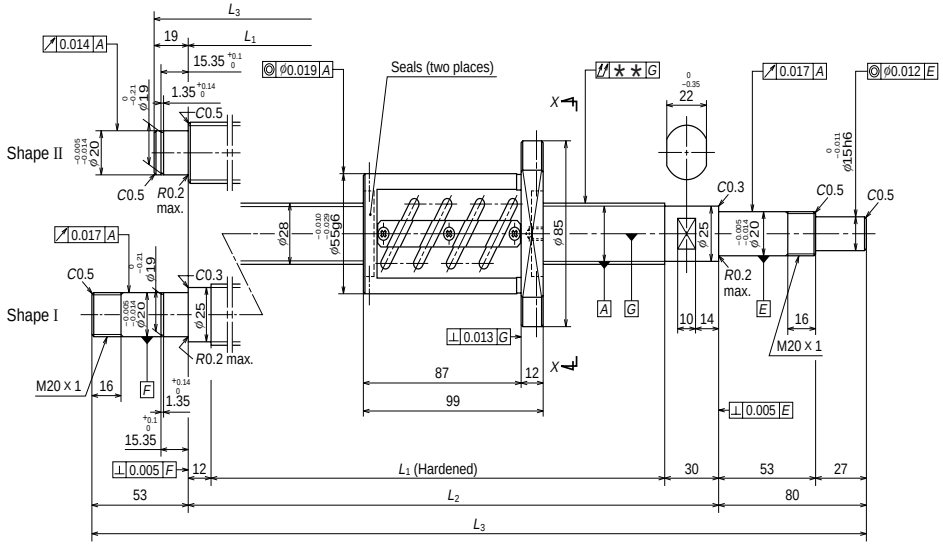
Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W2803SA-3P-C5Z6	250	307	370	400	499
W2805SA-3P-C5Z6	450	507	570	600	699
W2807SA-3P-C5Z6	650	695	758	800	933
W2809SA-3P-C5Z6	850	895	958	1000	1133
W2811SA-3P-C5Z6	1050	1095	1158	1200	1333

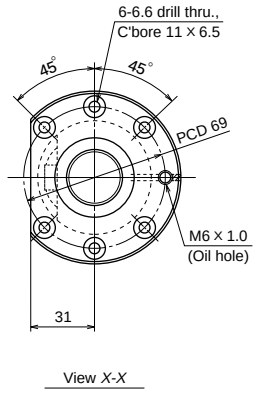
Left side shaft end	Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
					dm•n	Critical speed	
	T	e_p	υ_u	↗↗		Fixed - Simple support	Fixed - Fixed
II	–0.009	0.025	0.020	0.040	2450	—	—
II	–0.014	0.030	0.023	0.060		—	—
I	–0.018	0.035	0.025	0.075		—	—
I	–0.023	0.040	0.027	0.090		—	—
I	–0.028	0.046	0.030	0.120		—	—

Remarks 1. NSK support unit WBK20-01A (square type, fixed side), WBK20S-01 (square type, simple support side), and WBK20-11 (round type, fixed side) are recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

NSK

ϕ 28 x 6





View *X-X*

Unit: mm

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		28 x 6/Right
Preload / Ball recirculation		Z preload / Return tube
Ball dia. / Ball circle dia.		3.175/28.5
Effective turns of balls		2.5 x 2
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	17400 {1780}
	Static C_{0a}	48800 {4980}
Preload N{Kgf}		1220 {125}
Dynamic friction torque, median,N·cm {Kgf·cm}		23.5 {2.4}
Spacer ball		No
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm^3)		9.5

Standard stock

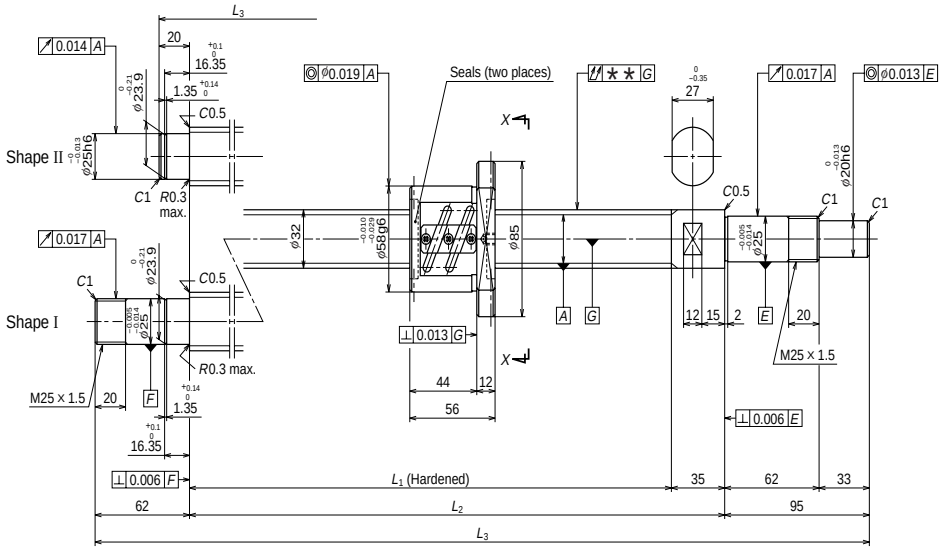
B 114

Unit: mm

Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W2803SA-4Z-C5Z6	250	271	370	400	499
W2805SA-4Z-C5Z6	450	471	570	600	699
W2807SA-4Z-C5Z6	650	659	758	800	933
W2809SA-4Z-C5Z6	850	859	958	1000	1133
W2811SA-4Z-C5Z6	1050	1059	1158	1200	1333

Left side shaft end	Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
					dm·n	Critical speed	
	T	e_p	υ_u			Fixed - Simple support	Fixed - Fixed
II	–0.009	0.025	0.020	0.040	2450	—	—
II	–0.014	0.030	0.023	0.060		—	—
I	–0.018	0.035	0.025	0.075		—	—
I	–0.023	0.040	0.027	0.090		—	—
I	–0.028	0.046	0.030	0.120		—	—

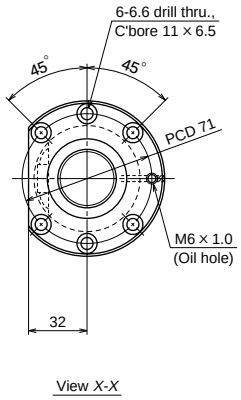
Remarks 1. NSK support unit WBK20-01A (square type, fixed side), WBK20S-01 (square type, simple support side), and WBK20-11 (round type, fixed side) are recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.



NSK

ϕ 32 x5

Unit: mm



View X-X

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		32 x 5/Right
Preload / Ball recirculation		P preload / Return tube
Ball dia. / Ball circle dia.		3.175/32.5
Effective turns of balls		2.5 x 2
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	11600 {1190}
	Static C_{0a}	28000 {2860}
Preload N{Kgf}		590 {60}
Dynamic friction torque, median,N·cm {Kgf·cm}		11.8 {1.2}
Spacer ball		Yes
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm³)		7.0

Standard stock

B 116

Unit: mm

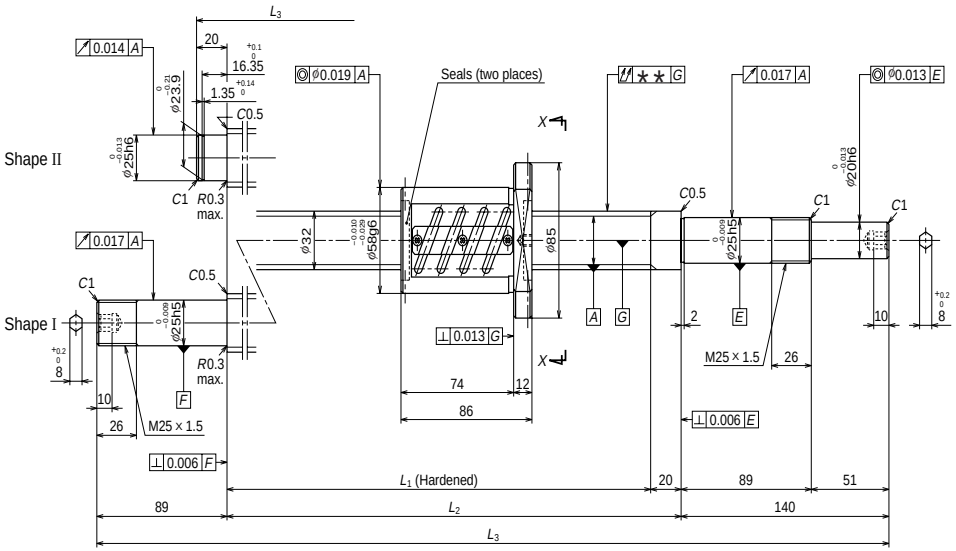
Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W3202SA-1P-C5Z5	150	209	265	300	415
W3203SA-1P-C5Z5	250	309	365	400	515
W3204SA-1P-C5Z5	350	409	465	500	615
W3205SA-1P-C5Z5	450	509	565	600	715
W3206SA-1P-C5Z5	550	609	665	700	857
W3207SA-1P-C5Z5	650	709	765	800	957
W3209SA-1P-C5Z5	850	909	965	1000	1157
W3211SA-1P-C5Z5	1050	1109	1165	1200	1357
W3214SA-1P-C5Z5	1350	1409	1465	1500	1657

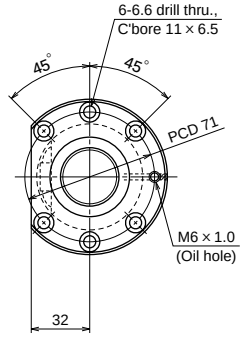
Left side shaft end	Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
	T	e_p	v_u		dm·n	Critical speed	
						Fixed - Simple support	Fixed - Fixed
II	–0.006	0.023	0.018	0.040	2150	—	—
II	–0.009	0.025	0.020	0.050		—	—
II	–0.011	0.027	0.020	0.050		—	—
II	–0.014	0.030	0.023	0.060		—	—
I	–0.016	0.035	0.025	0.075		—	—
I	–0.018	0.035	0.025	0.075		—	—
I	–0.023	0.040	0.027	0.090		—	—
I	–0.028	0.046	0.030	0.120		—	—
I	–0.035	0.054	0.035	0.150		2070	—

Remarks 1. NSK support unit WBK25-01 (square type, fixed side), WBK25S-01 (square type, simple support side), and WBK25-11(round type, fixed side) are recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

NSK

ϕ 32 x 5





View X-X

Unit: mm

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		32 x 5/Right
Preload / Ball recirculation		Z preload / Return tube
Ball dia. / Ball circle dia.		3.175/32.5
Effective turns of balls		2.5 x 2
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	18500 {1880}
	Static C_{0a}	56100 {5720}
Preload N{Kgf}		1270 {130}
Dynamic friction torque, median,N·cm {Kgf·cm}		23.5 {2.4}
Spacer ball		None
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm³)		10

Standard stock

B 118

Unit: mm

Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W3202SA-2Z-C5Z5	150	194	280	300	460
W3203SA-2Z-C5Z5	250	294	380	400	560
W3204SA-2Z-C5Z5	350	394	480	500	660
W3205SA-2Z-C5Z5	450	494	580	600	760
W3206SA-2Z-C5Z5	550	594	680	700	929
W3207SA-2Z-C5Z5	650	694	780	800	1029
W3209SA-2Z-C5Z5	850	894	980	1000	1229
W3211SA-2Z-C5Z5	1050	1094	1180	1200	1429
W3214SA-2Z-C5Z5	1350	1394	1480	1500	1729

Unit: mm

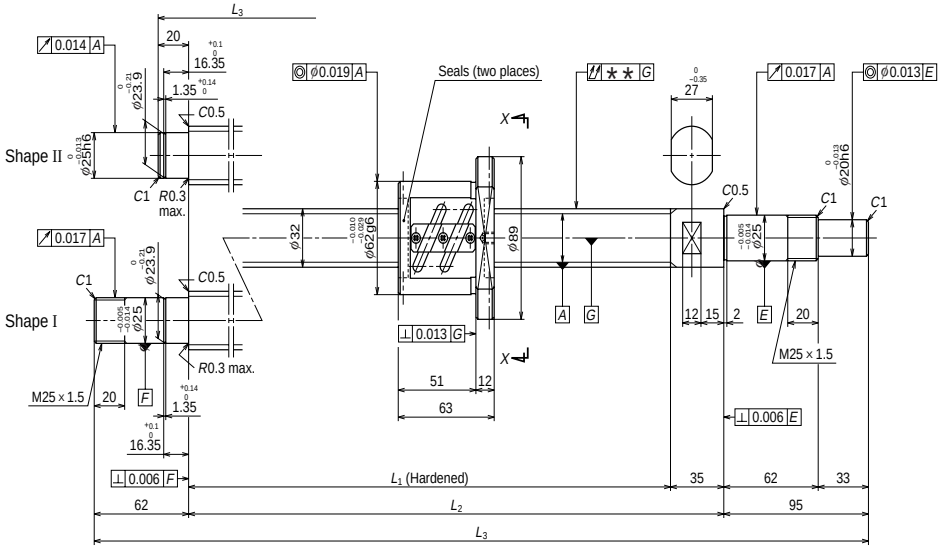
Left side shaft end	Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
					dm·n	Critical speed	
	T	e_p	υ_u			Fixed - Simple support	Fixed - Fixed
II	–0.007	0.023	0.018	0.040	2150	—	—
II	–0.009	0.025	0.020	0.050		—	—
II	–0.012	0.027	0.020	0.060		—	—
II	–0.014	0.030	0.023	0.060		—	—
I	–0.016	0.035	0.025	0.075		—	—
I	–0.019	0.035	0.025	0.090		—	—
I	–0.024	0.040	0.027	0.090		—	—
I	–0.028	0.046	0.030	0.120		—	—
I	–0.036	0.054	0.035	0.150		2040	—

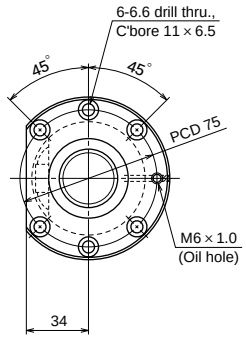
Remarks 1. NSK support unit WBK25DF-31 (round type) is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

NSK

ϕ32 x 6

Standard stock





View X-X

Unit: mm

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		32 x 6/Right
Preload / Ball recirculation		P preload / Return tube
Ball dia. / Ball circle dia.		3.969/32.5
Effective turns of balls		2.5 x 2
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	15500 {1580}
	Static C_{0a}	34700 {3540}
Preload N{Kgf}		780 {80}
Dynamic friction torque, median,N·cm {Kgf·cm}		15.7 {1.6}
Spacer ball		Yes
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm³)		9.5

B 120

Unit: mm

Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W3203SA-3P-C5Z6	250	302	365	400	515
W3205SA-3P-C5Z6	450	502	565	600	715
W3207SA-3P-C5Z6	650	702	765	800	957
W3209SA-3P-C5Z6	850	902	965	1000	1157
W3211SA-3P-C5Z6	1050	1102	1165	1200	1357
W3214SA-3P-C5Z6	1350	1402	1465	1500	1657

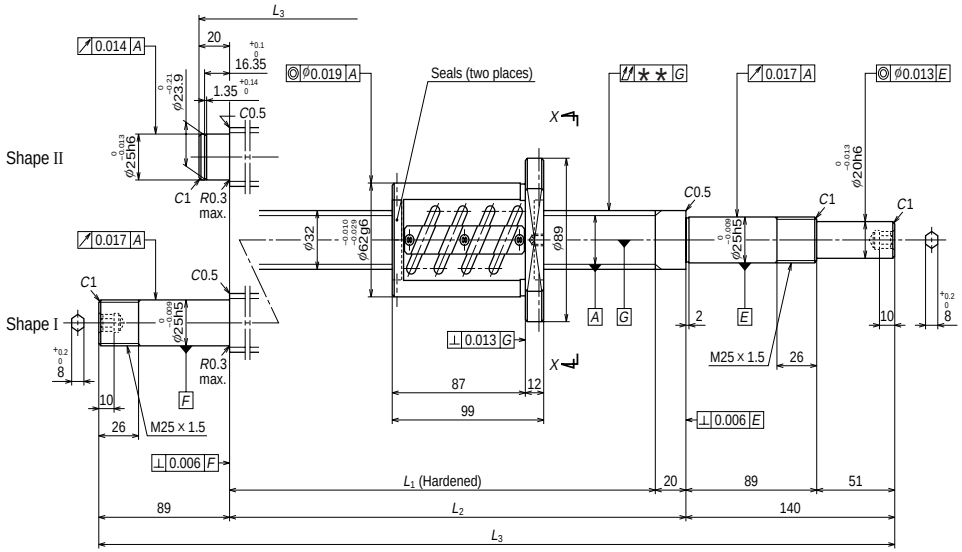
Left side shaft end	Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
					dm·n	Critical speed	
	T	e_p	υ_u			Fixed - Simple support	Fixed - Fixed
II	–0.009	0.025	0.020	0.050	2150	—	—
II	–0.014	0.030	0.023	0.060		—	—
I	–0.018	0.035	0.025	0.075		—	—
I	–0.023	0.040	0.027	0.090		—	—
I	–0.028	0.046	0.030	0.120		—	—
I	–0.035	0.054	0.035	0.150		2020	—

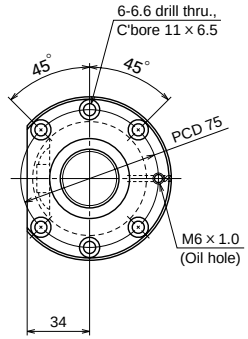
Remarks 1. NSK support unit WBK25-01 (square type, fixed side), WBK25S-01 (square type, simple support side), and WBK25-11(round type, fixed side) are recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

NSK

ϕ32 x 6

Standard stock





View X-X

Unit: mm

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		32 x 6/Right
Preload / Ball recirculation		Z preload / Return tube
Ball dia. / Ball circle dia.		3.969/32.5
Effective turns of balls		2.5 x 2
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	24700 {2520}
	Static C_{0a}	69400 {7080}
Preload N{Kgf}		1710 {175}
Dynamic friction torque, median,N·cm {Kgf·cm}		35.0 {3.6}
Spacer ball		None
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm^3)		14

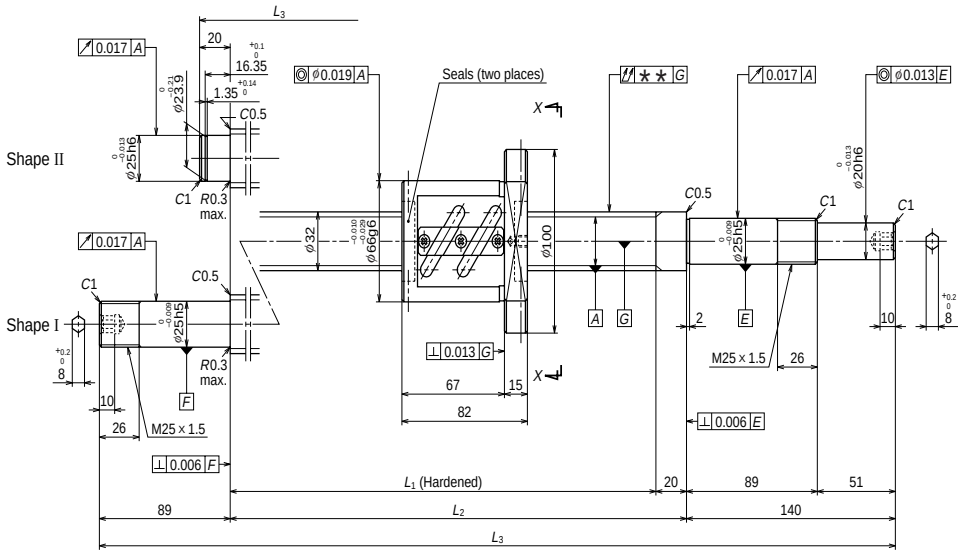
B 122

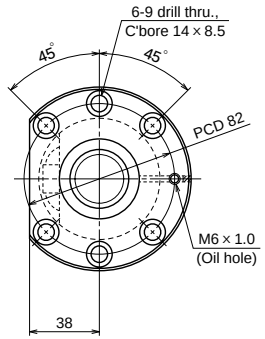
Unit: mm

Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W3203SA-4Z-C5Z6	250	281	380	400	560
W3205SA-4Z-C5Z6	450	481	580	600	760
W3207SA-4Z-C5Z6	650	681	780	800	1029
W3209SA-4Z-C5Z6	850	881	980	1000	1229
W3211SA-4Z-C5Z6	1050	1081	1180	1200	1429
W3214SA-4Z-C5Z6	1350	1381	1480	1500	1729

Left side shaft end	Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
	T	e_p	υ_u		dm·n	Critical speed	
						Fixed - Simple support	Fixed - Fixed
II	–0.009	0.025	0.020	0.050	2150	—	—
II	–0.014	0.030	0.023	0.060		—	—
I	–0.019	0.035	0.025	0.090		—	—
I	–0.024	0.040	0.027	0.090		—	—
I	–0.028	0.046	0.030	0.120		—	—
I	–0.036	0.054	0.035	0.150		2000	—

Remarks 1. NSK support unit WBK25DF-31 (round type) is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.





View X-X

Unit: mm

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		32 x 8/Right
Preload / Ball recirculation		Z preload / Return tube
Ball dia. / Ball circle dia.		4.762/32.5
Effective turns of balls		2.5 x 1
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	17500 {1780}
	Static C_{0a}	41000 {4180}
Preload N{Kgf}		1320 {135}
Dynamic friction torque, median,N·cm {Kgf·cm}		31.0 {3.2}
Spacer ball		None
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm^3)		13

Standard stock

B 124

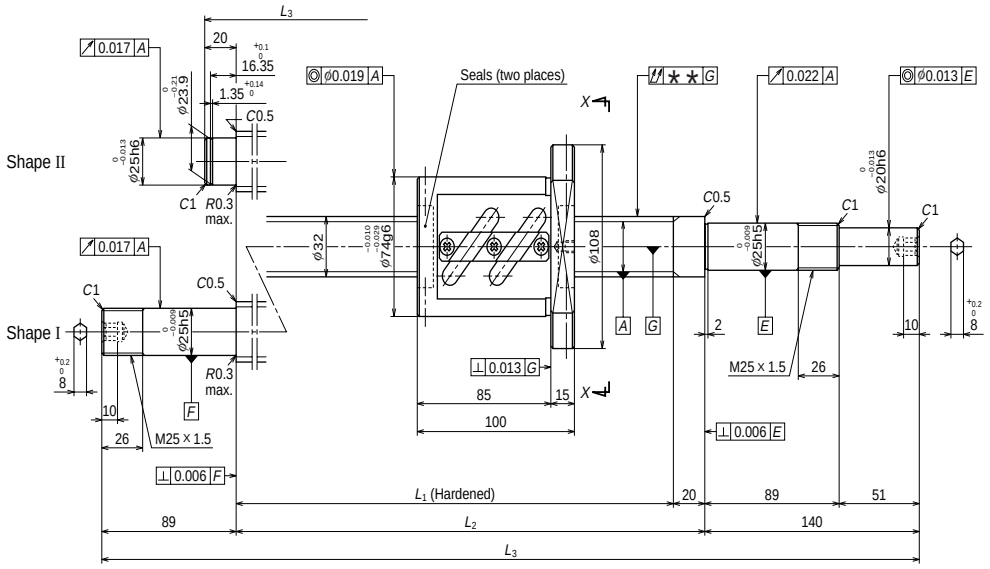
Unit: mm

Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W3203SA-5Z-C5Z8	250	298	380	400	560
W3205SA-5Z-C5Z8	450	498	580	600	760
W3207SA-5Z-C5Z8	650	698	780	800	1029
W3209SA-5Z-C5Z8	850	898	980	1000	1229
W3214SA-5Z-C5Z8	1350	1398	1480	1500	1729

Left side shaft end	Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
					dm·n	Critical speed	
	T	e_p	υ_u			Fixed - Simple support	Fixed - Fixed
II	–0.009	0.025	0.020	0.050	2150	—	—
II	–0.014	0.030	0.023	0.060		—	—
I	–0.019	0.035	0.025	0.090		—	—
I	–0.024	0.040	0.027	0.090		—	—
I	–0.036	0.054	0.035	0.150		1920	—

Remarks 1. NSK support unit WBK25DF-31 (round type) is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

A Series: Finished shaft end (Fine lead) Dia. 32, Lead 10



Nut models: ZFT

NSK

ϕ 32 x 10

Unit: mm

Standard stock

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		32 x 10/Right
Preload / Ball recirculation		Z preload / Return tube
Ball dia. / Ball circle dia.		6.35/33
Effective turns of balls		2.5 x 1
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	25500 {2600}
	Static C_{0a}	54000 {5510}
Preload N{Kgf}		1960 {200}
Dynamic friction torque, median,N·cm {Kgf·cm}		54.0 {5.5}
Spacer ball		None
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm^3)		22

B 126

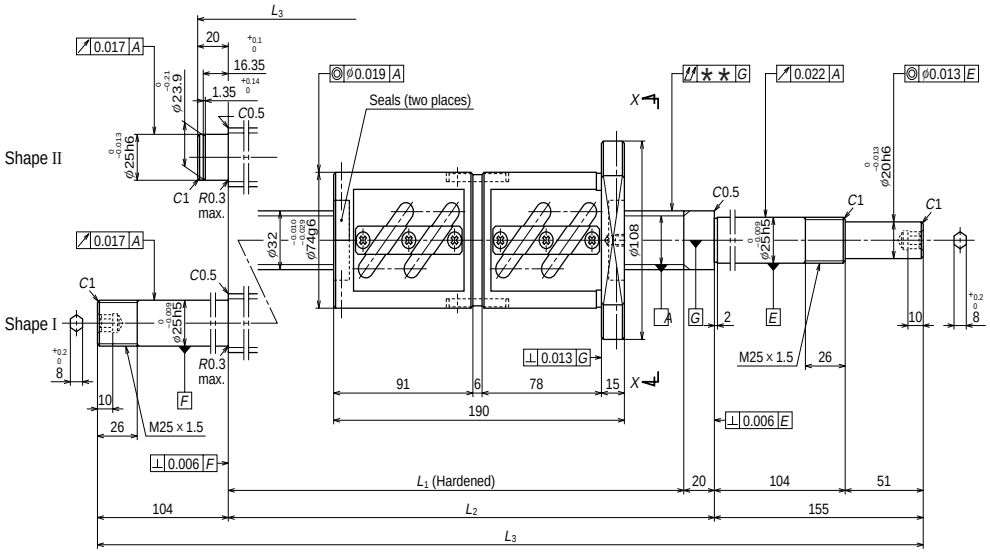
Unit: mm

Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W3203SA-6Z-C5Z10	250	280	380	400	560
W3204SA-3Z-C5Z10	350	380	480	500	660
W3205SA-6Z-C5Z10	450	480	580	600	760
W3206SA-3Z-C5Z10	550	580	680	700	929
W3207SA-6Z-C5Z10	650	680	780	800	1029
W3209SA-6Z-C5Z10	850	880	980	1000	1229
W3211SA-5Z-C5Z10	1050	1080	1180	1200	1429
W3214SA-6Z-C5Z10	1350	1380	1480	1500	1729
W3217SA-1Z-C5Z10	1650	1680	1780	1800	2029

Left side shaft end	Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
					dm·n	Critical speed	
	T	e_p	υ_u			Fixed - Simple support	Fixed - Fixed
II	–0.009	0.025	0.020	0.050	2120	—	—
II	–0.012	0.027	0.020	0.060		—	—
II	–0.014	0.030	0.023	0.060		—	—
I	–0.016	0.035	0.025	0.075		—	—
I	–0.019	0.035	0.025	0.090		—	—
I	–0.024	0.040	0.027	0.090		—	—
I	–0.028	0.046	0.030	0.120		—	—
I	–0.036	0.054	0.035	0.150		1860	—
I	–0.043	0.065	0.040	0.200		1280	1820

Remarks 1. NSK support unit WBK25DF-31 (round type) is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

A Series: Finished shaft end (Fine lead) Dia. 32, Lead 10

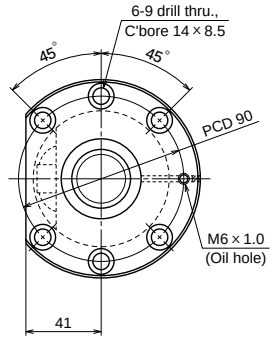


Nut models: DFT

NSK

ϕ32 x 10

Unit: mm



View *X-X*

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		32 x 10/Right
Preload / Ball recirculation		D preload / Return tube
Ball dia. / Ball circle dia.		6.35/33
Effective turns of balls		2.5 x 2
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	46300 {4720}
	Static C_{0a}	108000 {11000}
Preload N{Kgf}		3230 {330}
Dynamic friction torque, median,N-cm {Kgf-cm}		83.0 {8.5}
Spacer ball		None
Factory packed grease		Refer to Note 2.
Internal spatial volume of nut (cm^3)		44

Standard stock

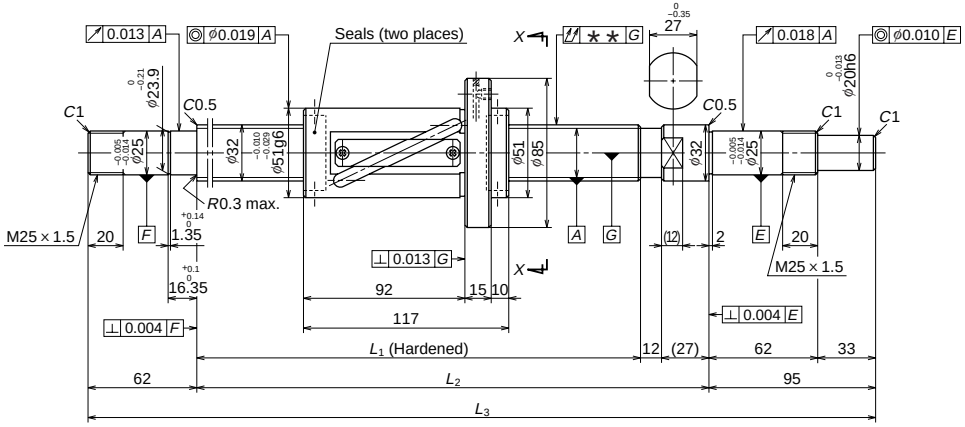
B 128

Unit: mm

Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W3203SA-7D-C5Z10	150	190	380	400	575
W3204SA-4D-C5Z10	250	290	480	500	675
W3205SA-7D-C5Z10	350	390	580	600	775
W3206SA-4D-C5Z10	450	490	680	700	959
W3207SA-7D-C5Z10	550	590	780	800	1059
W3209SA-7D-C5Z10	750	790	980	1000	1259
W3211SA-6D-C5Z10	950	990	1180	1200	1459
W3214SA-7D-C5Z10	1250	1290	1480	1500	1759
W3217SA-2D-C5Z10	1550	1590	1780	1800	2059

Left side shaft end	Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
	T	e_p	υ_u		dm·n	Critical speed	
						Fixed - Simple support	Fixed - Fixed
II	–0.009	0.025	0.020	0.050	2120	—	—
II	–0.012	0.027	0.020	0.060		—	—
II	–0.014	0.030	0.023	0.060		—	—
I	–0.016	0.035	0.025	0.075		—	—
I	–0.019	0.035	0.025	0.090		—	—
I	–0.024	0.040	0.027	0.120		—	—
I	–0.028	0.046	0.030	0.120		—	—
I	–0.036	0.054	0.035	0.150		1980	—
I	–0.043	0.065	0.040	0.200		1350	1910

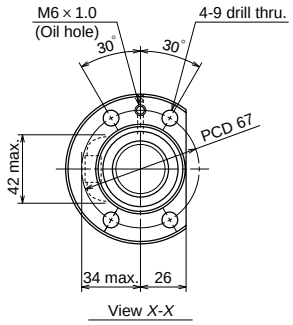
Remarks 1. NSK support unit WBK25DF-31 (round type) is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

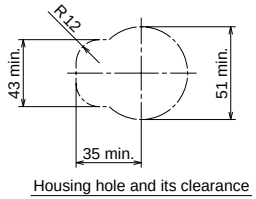


NSK

ϕ 32 x 25

Standard stock





Housing hole and its clearance

Unit: mm

Ball screw specifications			
Shaft dia. x Lead / Direction of turn		32 x 25/Right	
Preload / Ball recirculation		P preload / Return tube	
Ball dia. / Ball circle dia.		4.762/33.25	
Effective turns of balls		2.5 x 1	
Accuracy grade / Axial play		C5/Z	C5/T
Basic load rating N { Kgf }	Dynamic C_a	11300 {1150}	17900 {1830}
	Static C_{0a}	20900 {2130}	41800 {4270}
Axial play		0	0.005 or less
Dynamic friction torque, N·cm {kgf·cm}		6.8~31.5 {0.7~3.2}	~7.8 {~0.8}
Spacer ball		Yes	None
Factory packed grease		NSK grease LR3	
Internal spatial volume of nut (cm^3)		17.5	

B 130

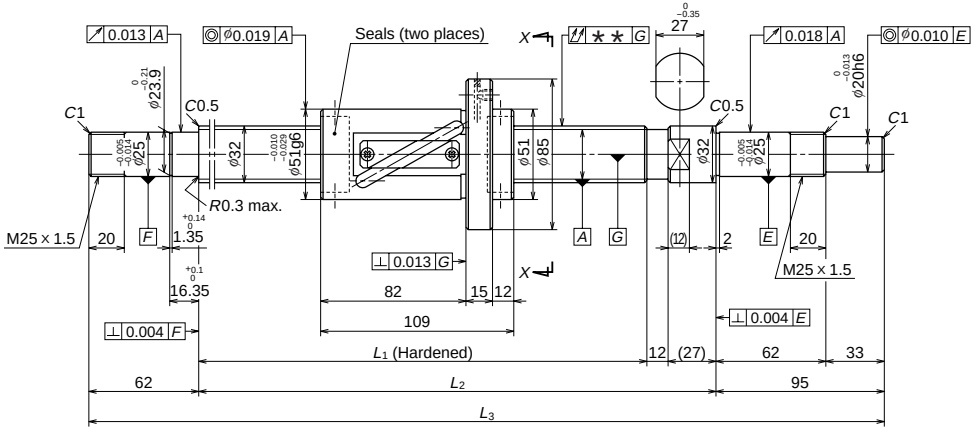
Unit: mm

Ball screw No.		Stroke	
Preloaded (LPFT)	Precise clearance (LSFT)	Nominal	Maximum (L_1–Nut length)
W3211FA-1P-C5Z25	**W3211FA-2-C5T25**	1000	1063
W3216FA-1P-C5Z25	**W3216FA-2-C5T25**	1500	1563
W3221FA-1P-C5Z25	**W3221FA-2-C5T25**	2000	2063
W3227FA-1P-C5Z25	**W3227FA-2-C5T25**	2600	2663

Remarks 1. NSK support unit WBK25-01 (square type, fixed side), and WBK25S-01 (square type, simple support side), and WBK25-11 (round type, fixed side) are recommended.
2. NSK grease LR3 is recommended. The amount for replenishing should be about 50% of the nut internal space capacity.

Unit: mm

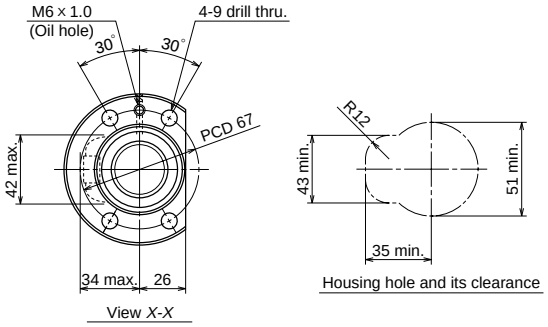
Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
							dm·n	Critical speed	
L_1	L_2	L_3	T	e_p	υ_u			Fixed - Simple support	Fixed - Fixed
1180	1219	1376	0	0.046	0.030	0.090	2100	—	—
1680	1719	1876	0	0.065	0.040	0.120		1580	—
2180	2219	2376	0	0.077	0.046	0.160		930	1300
2780	2819	2976	0	0.093	0.054	0.200		560	800



NSK

ϕ32 x 32

Standard stock



Unit: mm

Ball screw specifications			
Shaft dia. x Lead / Direction of turn		32 x 32/Right	
Preload / Ball recirculation		P preload / Return tube	
Ball dia. / Ball circle dia.		4.762/33.25	
Effective turns of balls		1.5 x 1	
Accuracy grade / Axial play		C5/Z	C5/T
Basic load rating N { Kgf }	Dynamic C_a	8800 {900}	11500 {1180}
	Static C_{0a}	16600 {1690}	24800 {2530}
Axial play		0	0.005 or less
Dynamic friction torque,N·cm {kgf·cm}		6.9~31.5 {0.7~3.2}	~7.8 {~0.8}
Spacer ball		Yes	None
Factory packed grease		NSK grease LR3	
Internal spatial volume of nut (cm^3)		14	

B 132

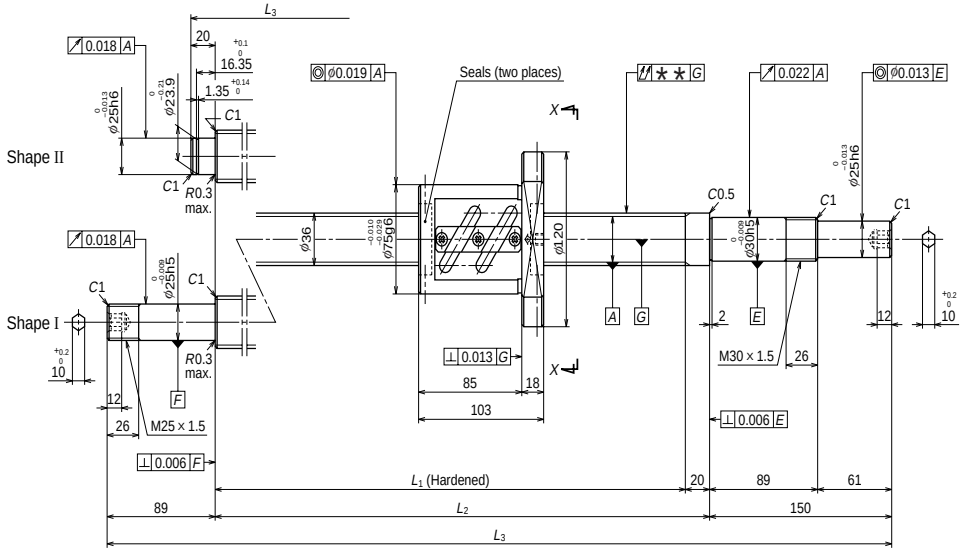
Unit: mm

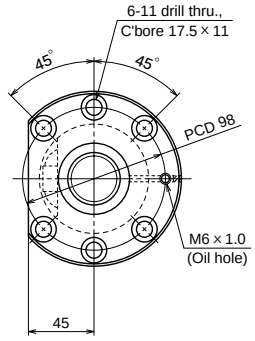
Ball screw No.		Stroke		Screw shaft length			Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
											dm·n	Critical speed	
Preloaded (LPFT)	Precise clearance (LSFT)	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3	T	e_p	υ_u			Fixed - Simple support	Fixed - Fixed
W3211FA-3P-C5Z32	**W3211FA-4-C5T32**	1000	1071	1180	1219	1376	0	0.046	0.030	0.090	2100	—	—
W3216FA-3P-C5Z32	**W3216FA-4-C5T32**	1500	1571	1680	1719	1876	0	0.065	0.040	0.120		1570	—
W3221FA-3P-C5Z32	**W3221FA-4-C5T32**	2000	2071	2180	2219	2376	0	0.077	0.046	0.160		920	1290
W3227FA-3P-C5Z32	**W3227FA-4-C5T32**	2600	2671	2780	2819	2976	0	0.093	0.054	0.200		560	790

Remarks 1. NSK support unit WBK25-01 (square type, fixed side), and WBK25S-01 (square type, simple support side), and WBK25-11 (round type, fixed side) are recommended.
2. NSK grease LR3 is recommended. The amount for replenishing should be about 50% of the nut internal space capacity.

NSK

ϕ36 x 10





View X-X

Unit: mm

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		36 x 10/Right
Preload / Ball recirculation		Z preload / Return tube
Ball dia. / Ball circle dia.		6.35/37
Effective turns of balls		2.5 x 1
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	27200 {2770}
	Static C_{0a}	61300 {6250}
Preload N{Kgf}		2060 {210}
Dynamic friction torque, median,N·cm {Kgf·cm}		59.0 {6.0}
Spacer ball		None
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm³)		32

Standard stock

B 134

Unit: mm

Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W3604SA-1Z-C5Z10	350	377	480	500	670
W3606SA-1Z-C5Z10	550	577	680	700	870
W3609SA-1Z-C5Z10	850	877	980	1000	1239
W3613SA-1Z-C5Z10	1250	1277	1380	1400	1639
W3617SA-1Z-C5Z10	1650	1677	1780	1800	2039

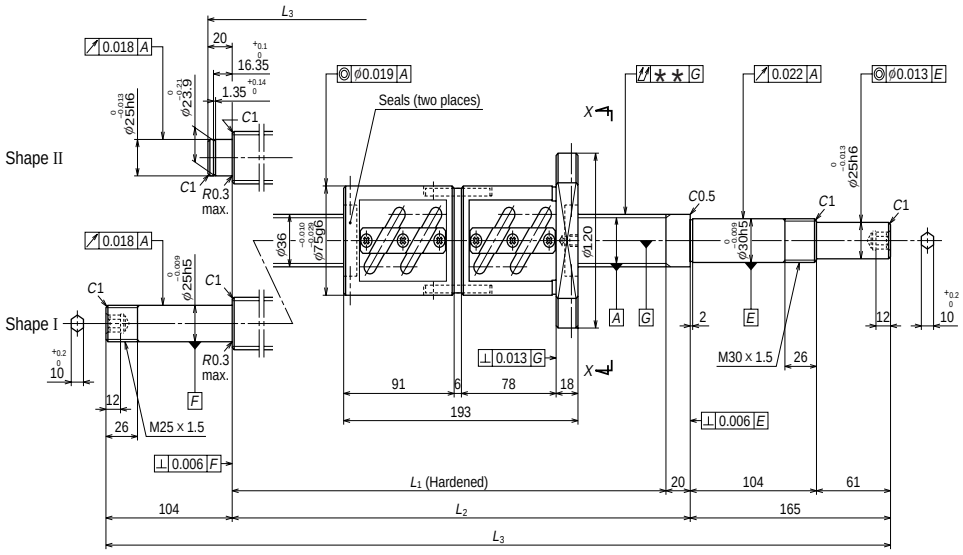
Left side shaft end	Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
					dm•n	Critical speed	
	T	e_p	v_u			Fixed - Simple support	Fixed - Fixed
II	–0.012	0.027	0.020	0.040	1890	—	—
II	–0.016	0.035	0.025	0.050		—	—
I	–0.024	0.040	0.027	0.065		—	—
I	–0.033	0.054	0.035	0.100		—	—
I	–0.043	0.065	0.040	0.130		1480	—

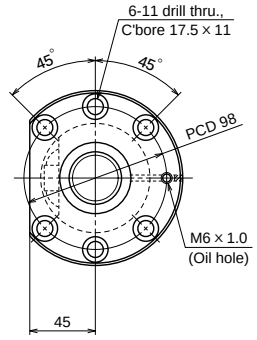
Remarks 1. NSK support unit round type WBK30DF-31 and WBK25DF-31 are recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

NSK

ϕ 36 x 10

Unit: mm





View X-X

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		36 x 10/Right
Preload / Ball recirculation		D preload / Return tube
Ball dia. / Ball circle dia.		6.35/37
Effective turns of balls		2.5 x 2
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	49300 {5030}
	Static C_{0a}	123000 {12500}
Preload N{Kgf}		3430 {350}
Dynamic friction torque, median,N·cm {Kgf·cm}		93.0 {9.5}
Spacer ball		None
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm³)		54

Standard stock

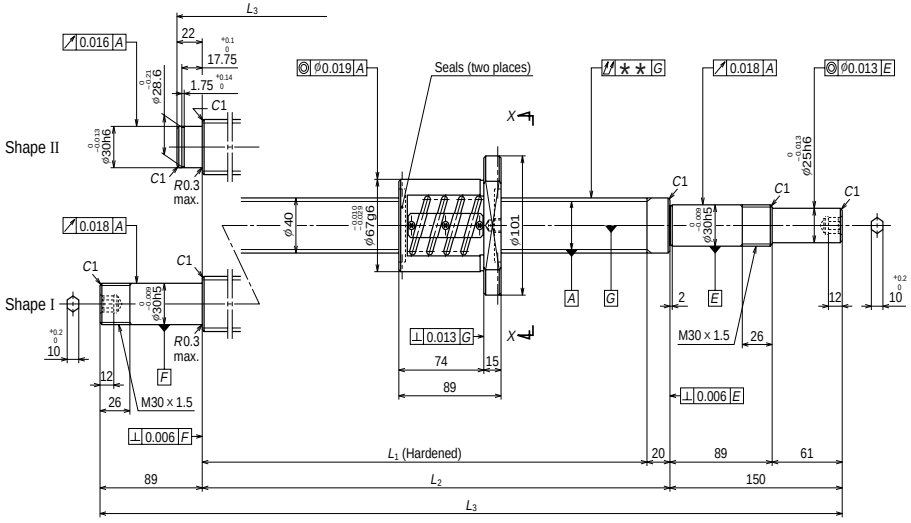
B 136

Unit: mm

Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W3604SA-2D-C5Z10	250	287	480	500	685
W3606SA-2D-C5Z10	450	487	680	700	885
W3609SA-2D-C5Z10	750	787	980	1000	1269
W3613SA-2D-C5Z10	1150	1187	1380	1400	1669
W3617SA-2D-C5Z10	1550	1587	1780	1800	2069

Left side shaft end	Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
					dm·n	Critical speed	
	T	e_p	v_u			Fixed - Simple support	Fixed - Fixed
II	–0.012	0.027	0.020	0.040	1890	—	—
II	–0.016	0.035	0.025	0.050		—	—
I	–0.024	0.040	0.027	0.080		—	—
I	–0.033	0.054	0.035	0.100		—	—
I	–0.043	0.065	0.040	0.130		1540	—

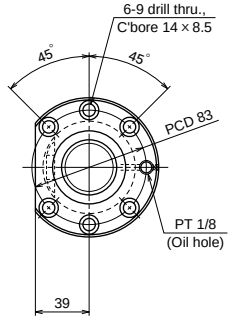
Remarks 1. NSK support unit round type WBK30DF-31 and WBK25DF-31 are recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.



NSK

ϕ 40 x 5

Standard stock



View X-X

Unit: mm

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		40 x 5/Right
Preload / Ball recirculation		Z preload / Return tube
Ball dia. / Ball circle dia.		3.175/40.5
Effective turns of balls		2.5 x 2
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	20200 {2060}
	Static C_{0a}	70600 {7200}
Preload N{Kgf}		1420 {145}
Dynamic friction torque, median,N·cm {Kgf·cm}		29.5 {3.0}
Spacer ball		None
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm³)		14

B 138

Unit: mm

Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W4003SA-1Z-C5Z5	250	291	380	400	572
W4005SA-1Z-C5Z5	450	491	580	600	772
W4007SA-1Z-C5Z5	650	691	780	800	1039
W4009SA-1Z-C5Z5	850	891	980	1000	1239
W4011SA-1Z-C5Z5	1050	1091	1180	1200	1439
W4015SA-1Z-C5Z5	1450	1491	1580	1600	1839

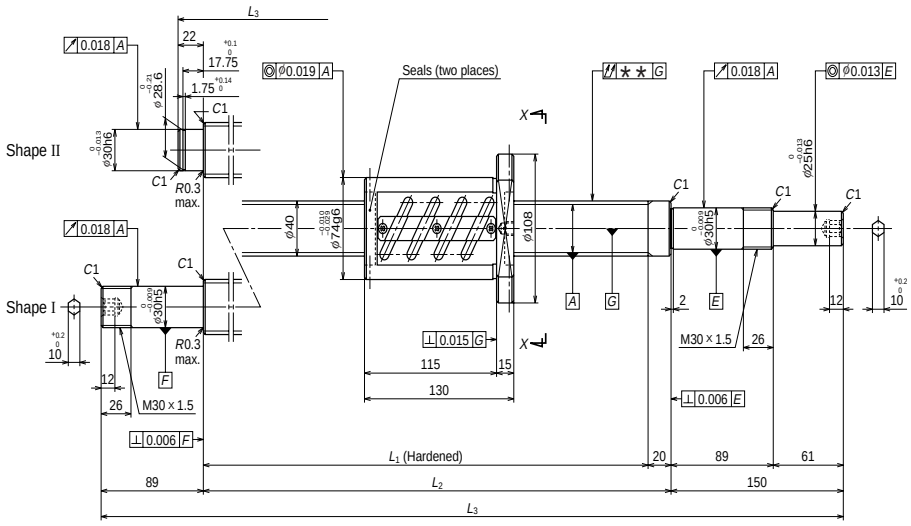
Left side shaft end	Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
					dm·n	Critical speed	
	T	e_p	υ_u			Fixed - Simple support	Fixed - Fixed
II	–0.009	0.025	0.020	0.035	1720	—	—
II	–0.014	0.030	0.023	0.040		—	—
I	–0.019	0.035	0.025	0.065		—	—
I	–0.024	0.040	0.027	0.065		—	—
I	–0.028	0.046	0.030	0.080		—	—
I	–0.038	0.054	0.035	0.100		—	—

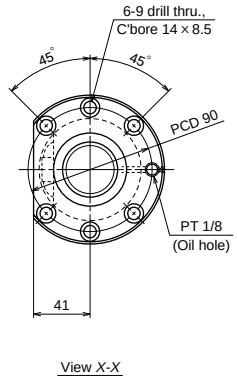
Remarks 1. NSK support unit round type WBK30DF-31 is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

NSK

ϕ 40 x 8

Standard stock





View *X-X*

Unit: mm

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		40 x 8/Right
Preload / Ball recirculation		Z preload / Return tube
Ball dia. / Ball circle dia.		4.762/40.5
Effective turns of balls		2.5 x 2
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	34900 {3550}
	Static C_{0a}	103000 {10500}
Preload N{Kgf}		2450 {250}
Dynamic friction torque, median,N·cm {Kgf·cm}		64.0 {6.5}
Spacer ball		None
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm³)		27

B 140

Unit: mm

Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W4003SA-2Z-C5Z8	200	250	380	400	572
W4005SA-2Z-C5Z8	400	450	580	600	772
W4007SA-2Z-C5Z8	600	650	780	800	1039
W4009SA-2Z-C5Z8	800	850	980	1000	1239
W4011SA-2Z-C5Z8	1000	1050	1180	1200	1439
W4015SA-2Z-C5Z8	1400	1450	1580	1600	1839

Left side shaft end	Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
					dm·n	Critical speed	
	T	e_p	υ_u			Fixed - Simple support	Fixed - Fixed
II	–0.009	0.025	0.020	0.035	1720	—	—
II	–0.014	0.030	0.023	0.040		—	—
I	–0.019	0.035	0.025	0.065		—	—
I	–0.024	0.040	0.027	0.065		—	—
I	–0.028	0.046	0.030	0.080		—	—
I	–0.038	0.054	0.035	0.100		—	—

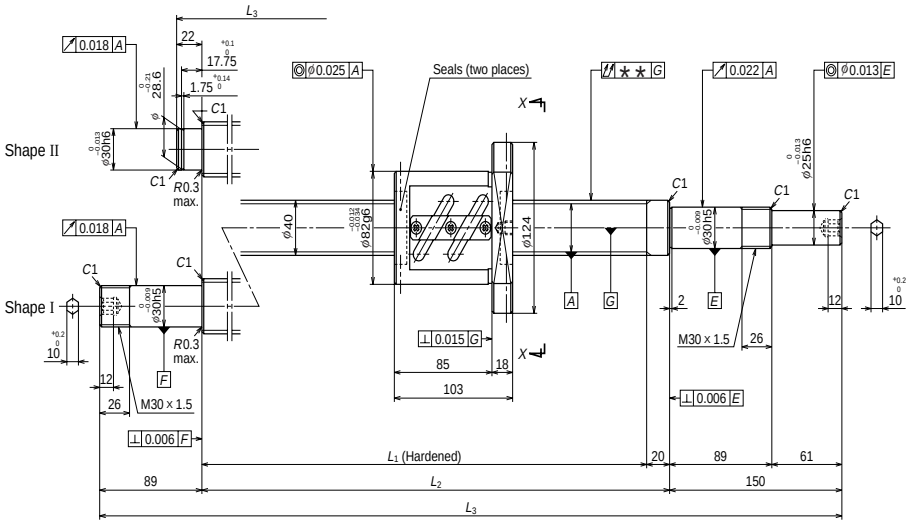
Remarks 1. NSK support unit round type WBK30DF-31 is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

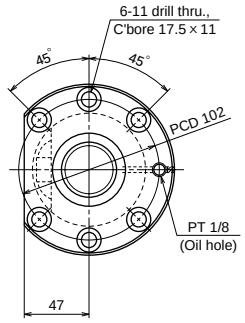
NSK

ϕ 40 x 10

Unit: mm

Standard stock





View X-X

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		40 x 10/Right
Preload / Ball recirculation		Z preload / Return tube
Ball dia. / Ball circle dia.		6.35/41
Effective turns of balls		2.5 x 1
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	28600 {2920}
	Static C_{0a}	68600 {6990}
Preload N{Kgf}		2160 {220}
Dynamic friction torque, median,N·cm {Kgf·cm}		64.0 {6.5}
Spacer ball		None
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm³)		30

B 142

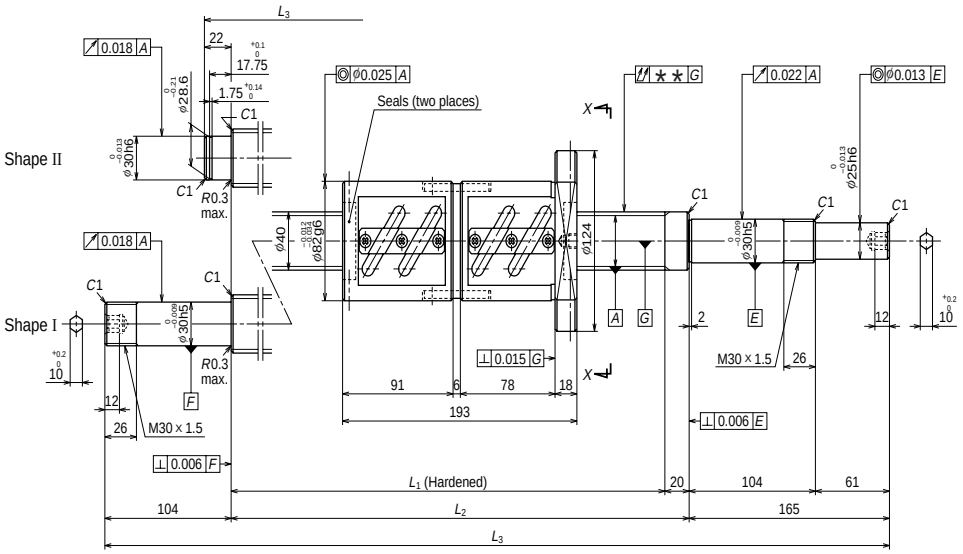
Unit: mm

Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W4004SA-1Z-C5Z10	350	377	480	500	672
W4005SA-3Z-C5Z10	450	477	580	600	772
W4006SA-1Z-C5Z10	550	577	680	700	872
W4007SA-3Z-C5Z10	650	677	780	800	1039
W4009SA-3Z-C5Z10	850	877	980	1000	1239
W4011SA-3Z-C5Z10	1050	1077	1180	1200	1439
W4013SA-1Z-C5Z10	1250	1277	1380	1400	1639
W4015SA-3Z-C5Z10	1450	1477	1580	1600	1839
W4017SA-1Z-C5Z10	1650	1677	1780	1800	2039
W4023SA-1Z-C5Z10	2250	2277	2380	2400	2639

Left side shaft end	Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
					dm•n	Critical speed	
	T	e_p	υ_u			Fixed - Simple support	Fixed - Fixed
II	–0.012	0.027	0.020	0.040	1700	—	—
II	–0.014	0.030	0.023	0.040		—	—
II	–0.016	0.035	0.025	0.050		—	—
I	–0.019	0.035	0.025	0.065		—	—
I	–0.024	0.040	0.027	0.065		—	—
I	–0.028	0.046	0.030	0.080		—	—
I	–0.033	0.054	0.035	0.100		—	—
I	–0.038	0.054	0.035	0.100		—	—
I	–0.043	0.065	0.040	0.130		1670	—
I	–0.057	0.077	0.046	0.170		930	1320

Remarks 1. NSK support unit round type WBK30DF-31 is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

A Series: Finished shaft end (Fine lead) Dia. 40, Lead 10

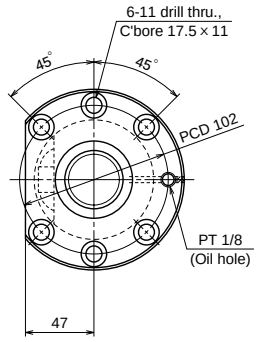


Nut models: DFT

NSK

ϕ 40 x 10

Unit: mm



Ball screw specifications		
Shaft dia. x Lead / Direction of turn		40 x 10/Right
Preload / Ball recirculation		D preload / Return tube
Ball dia. / Ball circle dia.		6.35/41
Effective turns of balls		2.5 x 2
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	52000 {5300}
	Static C_{0a}	137000 {14000}
Preload N{Kgf}		3630 {370}
Dynamic friction torque, median,N·cm {Kgf·cm}		108 {11.0}
Spacer ball		None
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm^3)		59

Standard stock

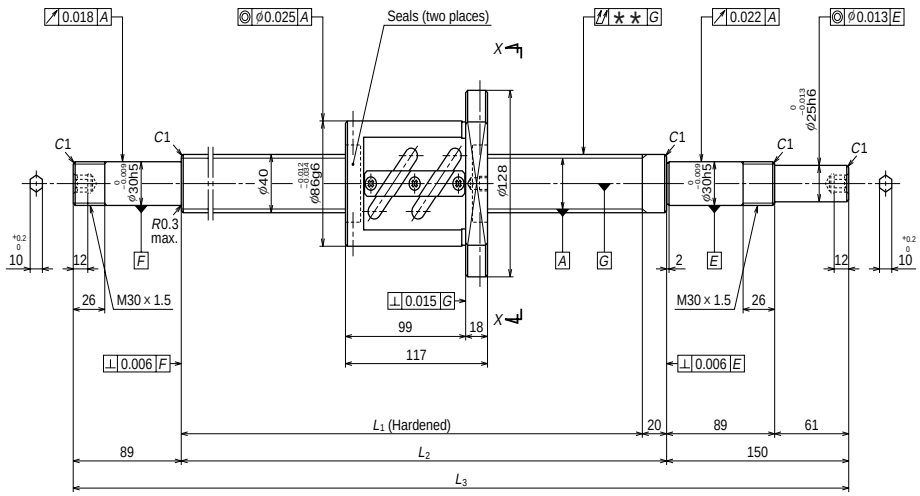
B 144

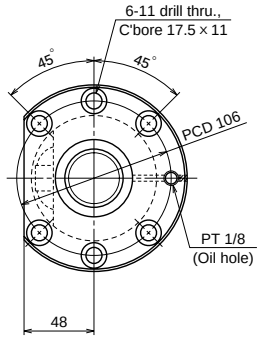
Unit: mm

Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W4004SA-2D-C5Z10	250	287	480	500	687
W4005SA-4D-C5Z10	350	387	580	600	787
W4006SA-2D-C5Z10	450	487	680	700	887
W4007SA-4D-C5Z10	550	587	780	800	1069
W4009SA-4D-C5Z10	750	787	980	1000	1269
W4011SA-4D-C5Z10	950	987	1180	1200	1469
W4013SA-2D-C5Z10	1150	1187	1380	1400	1669
W4015SA-4D-C5Z10	1350	1387	1580	1600	1869
W4017SA-2D-C5Z10	1550	1587	1780	1800	2069
W4023SA-2D-C5Z10	2150	2187	2380	2400	2669

Left side shaft end	Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
	T	e_p	υ_u		dm·n	Critical speed	
						Fixed - Simple support	Fixed - Fixed
II	–0.012	0.027	0.020	0.040	1700	—	—
II	–0.014	0.030	0.023	0.040		—	—
II	–0.016	0.035	0.025	0.050		—	—
I	–0.019	0.035	0.025	0.065		—	—
I	–0.024	0.040	0.027	0.080		—	—
I	–0.028	0.046	0.030	0.080		—	—
I	–0.033	0.054	0.035	0.100		—	—
I	–0.038	0.054	0.035	0.100		—	—
I	–0.043	0.065	0.040	0.130		—	—
I	–0.057	0.077	0.046	0.170		960	1370

Remarks 1. NSK support unit round type WBK30DF-31 is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.





View *X-X*

Unit: mm

Standard stock

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		40 x 12/Right
Preload / Ball recirculation		Z preload / Return tube
Ball dia. / Ball circle dia.		7.144/41.5
Effective turns of balls		2.5 x 1
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	33600 {3430}
	Static C_{0a}	77500 {7910}
Preload N{Kgf}		2550 {260}
Dynamic friction torque, median,N·cm {Kgf·cm}		83.0 {8.5}
Spacer ball		None
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm^3)		33

Unit: mm

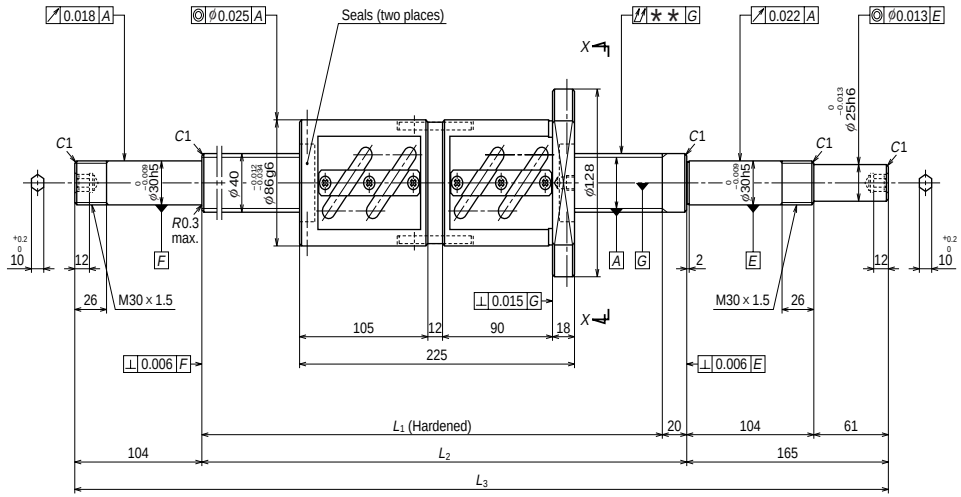
Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W4006SA-3Z-C5Z12	500	563	680	700	939
W4009SA-5Z-C5Z12	800	863	980	1000	1239
W4013SA-3Z-C5Z12	1200	1263	1380	1400	1639
W4017SA-3Z-C5Z12	1600	1663	1780	1800	2039
W4024SA-1Z-C5Z12	2300	2363	2480	2500	2739

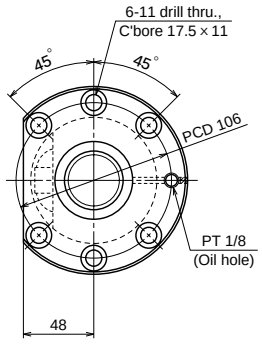
Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
				dm·n	Critical speed	
T	e_p	υ_u	↗		Fixed - Simple support	Fixed - Fixed
–0.016	0.035	0.025	0.050	1680	—	—
–0.024	0.040	0.027	0.065		—	—
–0.033	0.054	0.035	0.100		—	—
–0.043	0.065	0.040	0.130		1670	—
–0.060	0.077	0.046	0.170		850	1220

Remarks 1. NSK support unit round type WBK30DF-31 is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

NSK

φ40 x 12





View *X-X*

Unit: mm

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		40 x 12/Right
Preload / Ball recirculation		D preload / Return tube
Ball dia. / Ball circle dia.		7.144/41.5
Effective turns of balls		2.5 x 2
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	61000 {6220}
	Static C_{0a}	155000 {15800}
Preload N{Kgf}		4310 {440}
Dynamic friction torque, median,N·cm {Kgf·cm}		137 {14.0}
Spacer ball		None
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm³)		76

Standard stock

B 148

Unit: mm

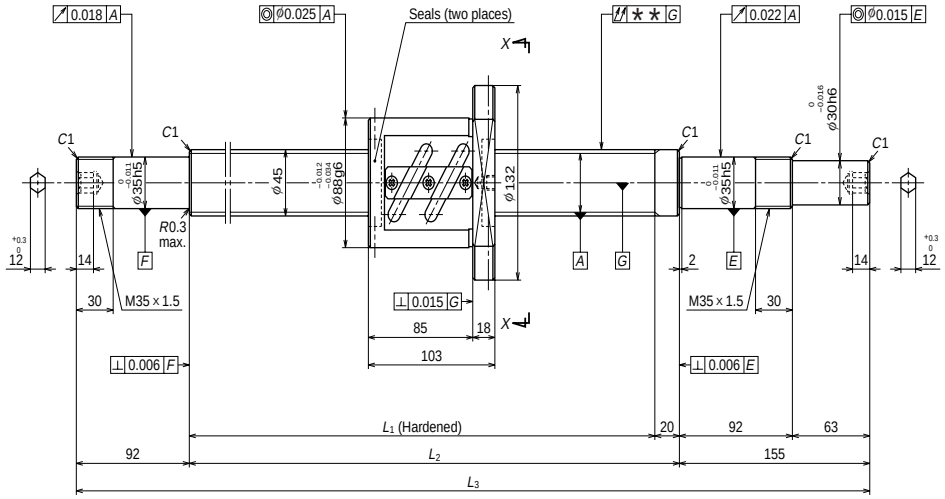
Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W4006SA-4D-C5Z12	400	455	680	700	969
W4009SA-6D-C5Z12	700	755	980	1000	1269
W4013SA-4D-C5Z12	1100	1155	1380	1400	1669
W4017SA-4D-C5Z12	1500	1555	1780	1800	2069
W4024SA-2D-C5Z12	2200	2255	2480	2500	2769

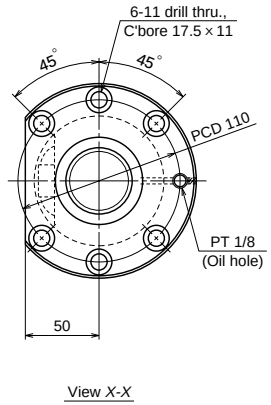
Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
				dm·n	Critical speed	
T	e_p	υ_u			Fixed - Simple support	Fixed - Fixed
–0.016	0.035	0.025	0.050	1680	—	—
–0.024	0.040	0.027	0.080		—	—
–0.033	0.054	0.035	0.100		—	—
–0.043	0.065	0.040	0.130		—	—
–0.060	0.077	0.046	0.170		880	1260

Remarks 1. NSK support unit round type WBK30DF-31 is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

NSK

ϕ 45 x 10





Unit: mm

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		45 x 10/Right
Preload / Ball recirculation		Z preload / Return tube
Ball dia. / Ball circle dia.		6.35/46
Effective turns of balls		2.5 x 1
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	29900 {3040}
	Static C_{0a}	77300 {7880}
Preload N{Kgf}		2260 {230}
Dynamic friction torque, median,N·cm {Kgf·cm}		69.0 {7.0}
Spacer ball		None
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm³)		33

Standard stock

B 150

Unit: mm

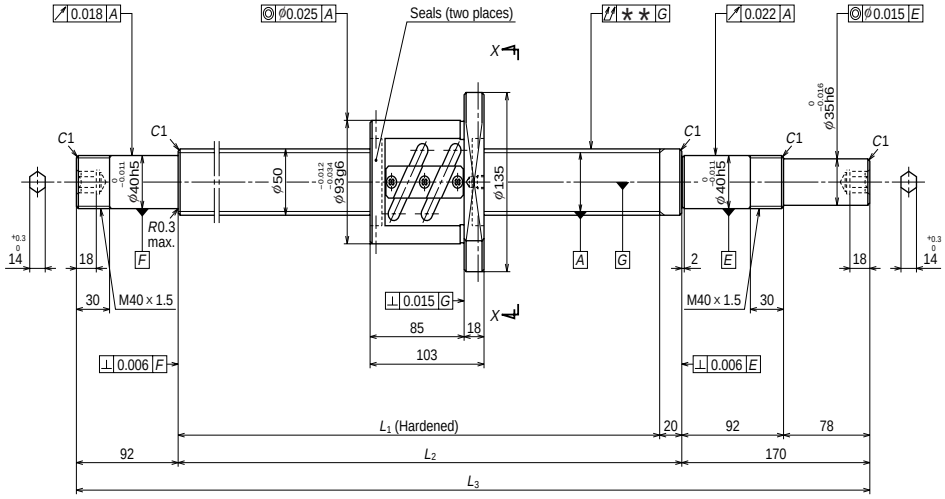
Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W4506SA-1Z-C5Z10	550	577	680	700	947
W4509SA-1Z-C5Z10	850	877	980	1000	1247
W4513SA-1Z-C5Z10	1250	1277	1380	1400	1647
W4517SA-1Z-C5Z10	1650	1677	1780	1800	2047
W4524SA-1Z-C5Z10	2350	2377	2480	2500	2747

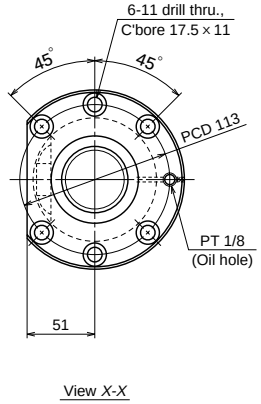
Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
				dm·n	Critical speed	
T	e_p	v_u	↗↗		Fixed - Simple support	Fixed - Fixed
–0.016	0.035	0.025	0.050	1520	—	—
–0.024	0.040	0.027	0.065		—	—
–0.033	0.054	0.035	0.100		—	—
–0.043	0.065	0.040	0.130		—	—
–0.060	0.077	0.046	0.170		980	1400

Remarks 1. NSK support unit round type WBK35DF-31 is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

NSK

φ50 x 10





View *X-X*

Unit: mm

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		50 x 10/Right
Preload / Ball recirculation		Z preload / Return tube
Ball dia. / Ball circle dia.		6.35/51
Effective turns of balls		2.5 x 1
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	31800 {3240}
	Static C_{0a}	87400 {8910}
Preload N{Kgf}		2450 {250}
Dynamic friction torque, median,N·cm {Kgf·cm}		79.0 {8.0}
Spacer ball		None
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm³)		37

Standard stock

B 152

Unit: mm

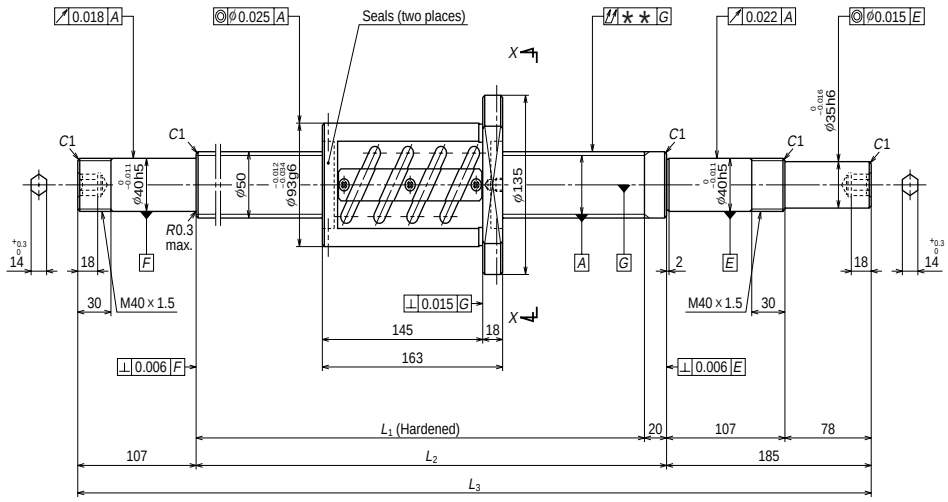
Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W5005SA-1Z-C5Z10	450	477	580	600	862
W5007SA-1Z-C5Z10	650	677	780	800	1062
W5009SA-1Z-C5Z10	850	877	980	1000	1262
W5011SA-1Z-C5Z10	1050	1077	1180	1200	1462
W5014SA-1Z-C5Z10	1350	1377	1480	1500	1762
W5019SA-1Z-C5Z10	1850	1877	1980	2000	2262
W5025SA-1Z-C5Z10	2450	2477	2580	2600	2862

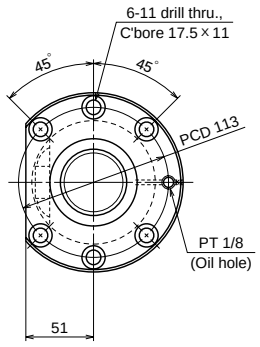
Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
				dm·n	Critical speed	
T	e_p	v_u	↗↗		Fixed - Simple support	Fixed - Fixed
–0.014	0.030	0.023	0.050	1370	—	—
–0.019	0.035	0.025	0.065		—	—
–0.024	0.040	0.027	0.080		—	—
–0.028	0.046	0.030	0.080		—	—
–0.036	0.054	0.035	0.100		—	—
–0.048	0.065	0.040	0.130		—	—
–0.062	0.093	0.054	0.170		1020	—

Remarks 1. NSK support unit round type WBK35DF-31 is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

NSK

ϕ50 x 10





View *X-X*

Unit: mm

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		50 x 10/Right
Preload / Ball recirculation		Z preload / Return tube
Ball dia. / Ball circle dia.		6.35/51
Effective turns of balls		2.5 x 2
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	57700 {5890}
	Static C_{0a}	175000 {17800}
Preload N{Kgf}		4020 {410}
Dynamic friction torque, median,N·cm {Kgf·cm}		137 {14.0}
Spacer ball		None
Factory packed grease		Refer to Remarks 2.
Internal spatial volume of nut (cm³)		59

Standard stock

B 154

Unit: mm

Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1–Nut length)	L_1	L_2	L_3
W5005SA-2Z-C5Z10	350	417	580	600	892
W5007SA-2Z-C5Z10	550	617	780	800	1092
W5009SA-2Z-C5Z10	750	817	980	1000	1292
W5011SA-2Z-C5Z10	950	1017	1180	1200	1492
W5014SA-2Z-C5Z10	1250	1317	1480	1500	1792
W5019SA-2Z-C5Z10	1750	1817	1980	2000	2292
W5025SA-2Z-C5Z10	2350	2417	2580	2600	2892

Lead accuracy			Shaft run-out **	Permissible rotational speed N (rpm)		
				dm·n	Critical speed	
T	e_p	υ_u			Fixed - Simple support	Fixed - Fixed
–0.014	0.030	0.023	0.050	1370	—	—
–0.019	0.035	0.025	0.065		—	—
–0.024	0.040	0.027	0.080		—	—
–0.028	0.046	0.030	0.080		—	—
–0.036	0.054	0.035	0.100		—	—
–0.048	0.065	0.040	0.130		—	—
–0.062	0.093	0.054	0.170		1040	—

Remarks 1. NSK support unit round type WBK40DFD-31 is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

B-I-6.2 KA Series: Ball Screws Made of Stainless Steel

◇Ball screw sizes are in order of the pages.

Table begins with the smallest shaft diameter ball screw, and proceeds to larger sizes. If ball screws have the same shaft diameter, those with smaller leads appear first. Page numbers of shaft diameter and lead combinations are shown in Table I-6•2.

◇ Dimension tables

Dimension tables show shapes/sizes as well as specification factors of each shaft diameter/lead combination. Tables also contain data as follows:

●Stroke

Nominal stroke : A reference for your use.

Maximum stroke : The stroke limit that the nut can move. The figure is obtained by subtracting the nut length (plus some allowance) from the screw threaded length (L1).

●Lead accuracy

Lead accuracy is C3 and C5 grades.

T : Travel compensation;

e_p : Tolerance on specified travel;

v_u : Travel variation

See "Technical Description: Lead error" (Page B445) for details of the codes.

●Permissible rotational speed

dm • n : Limited by the relative peripheral speed between screw shaft and nut.

Critical speed : Limited by the critical speed of screw shaft. Critical speed varies depending on mounting conditions of support bearings.

Use under either, but the smaller permissible rotational speed. For details, see "Technical Description: Permissible rotational speed" (Page B455).

◇ Material

A martensitic stainless steel is used. A special heat treatment technology provides the ball groove section with sufficient hardness which produces high load carrying capacity and durability.

◇ Other

Seal of the ball screw, ball recirculating deflector, and end cap are made of synthetic resin. Consult NSK when using the ball screws under extreme environment or special environment, or using special lubricant or oil.

For special environment, refer to Pages B473 and D1.

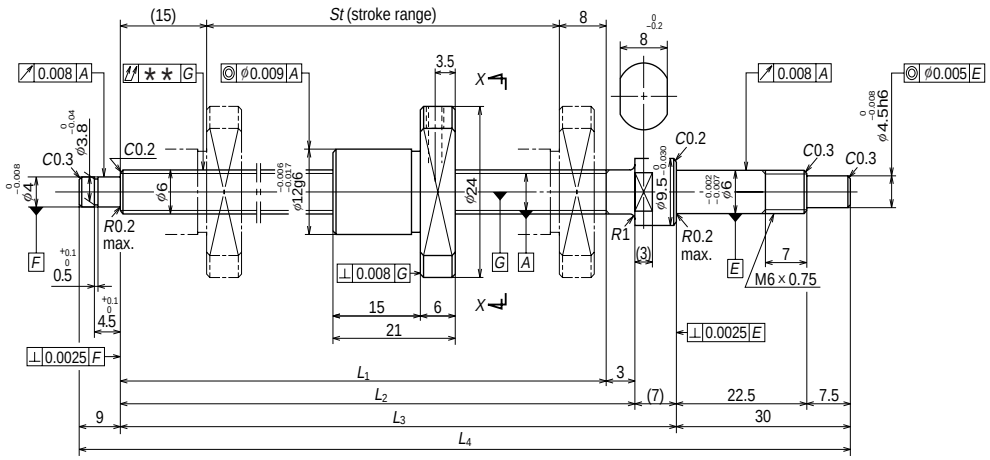
Refer to Pages B471 and D13 for lubricants.

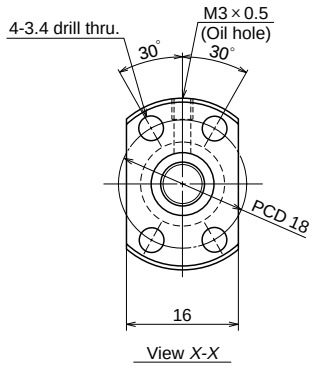
Table I-6•2

Shaft diameter \ Lead	1	2	4	5	10	20
6	B157					
8	B159	B161				
10		B163	B165			
12		B167		B169	B171	
15					B173	B175
16		B177				
20						B179

NSK

Stainless: ϕ6 x 1





Unit: mm

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		6 x 1/Right
Preload / Ball recirculation		P preload / Deflector
Ball dia. / Ball circle dia.		0.800/6.2
Effective turns of balls		1 x 3
Accuracy grade / Axial play		C3/Z
Basic load rating N { Kgf }	Dynamic C_a	470 {48}
	Static C_{0a}	680 {70}
Axial play		0
Dynamic friction torque, N·cm {kgf·cm}		~1.3 {~0.13}
Spacer ball		None
Factory packed grease		Refer to the remarks bellow.

Standard stock

B 158

Unit: mm

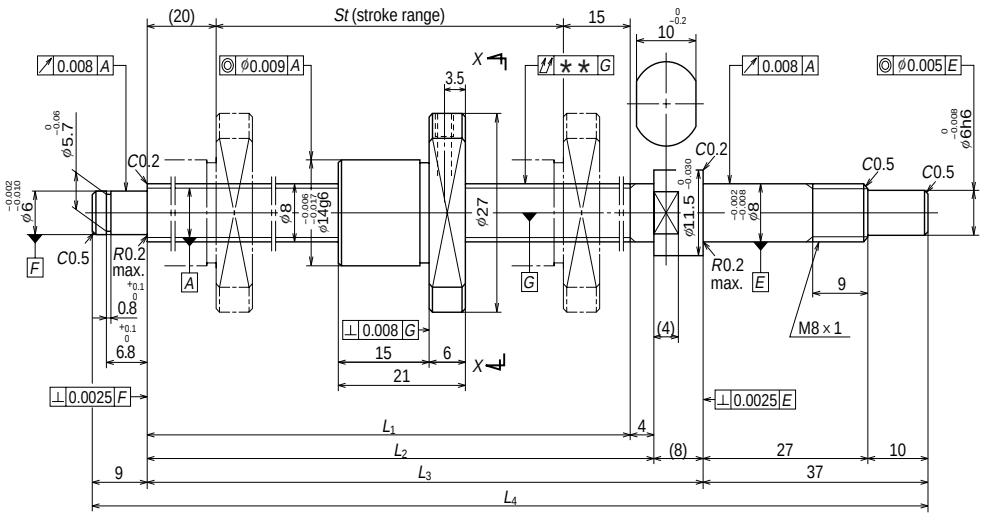
Ball screw No.	Stroke		Thread length			
	Nominal	Maximum	L_1	L_2	L_3	L_4
W0601KA-3PY-C3Z1	100	102	125	128	135	174

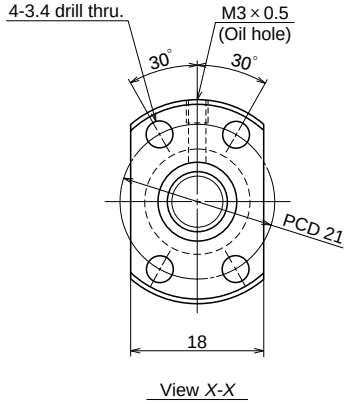
Lead accuracy			Shaft run-out **	Permissible rotational speed N(rpm)	
					Critical speed
T	e_p	v_u			Fixed - Simple support
0	0.010	0.008	0.025	3000	—

Remarks 1. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use. NSK Clean Grease LG2 is recommended.
2. Nut does not have a seal.

NSK

Stainless: φ8 x 1





Ball screw specifications		
Shaft dia. x Lead / Direction of turn		8 x 1/Right
Preload / Ball recirculation		P preload / Deflector
Ball dia. / Ball circle dia.		0.800/8.2
Effective turns of balls		1 x 3
Accuracy grade / Axial play		C3/Z
Basic load rating N { Kgf }	Dynamic C_a	545 {55}
	Static C_{0a}	955 {95}
Axial play		0
Dynamic friction torque, N·cm {kgf·cm}		~1.8 {~0.18}
Spacer ball		None
Factory packed grease		Refer to the remarks bellow.

Unit: mm

Ball screw No.	Stroke		Thread length			
	Nominal	Maximum	L_1	L_2	L_3	L_4
W0802KA-1PY-C3Z1	150	155	190	194	202	248

Unit: mm

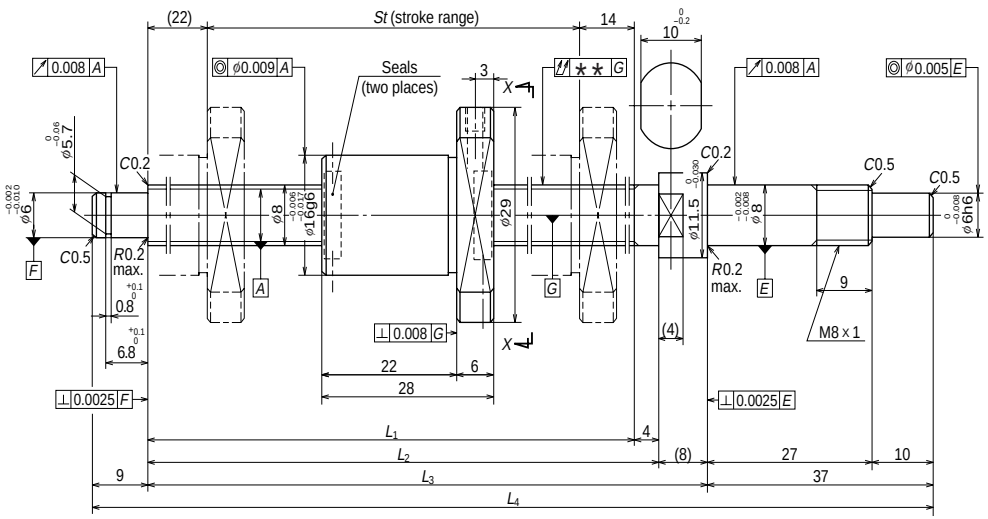
Lead accuracy			Shaft run-out **	Permissible rotational speed N(rpm)	
					Critical speed
T	e_p	υ_u			Fixed - Simple support
0	0.010	0.008	0.035	3000	—

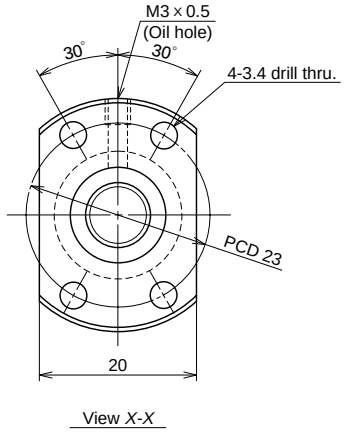
Remarks 1. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use. NSK Clean Grease LG2 is recommended.
2. Nut does not have a seal.

NSK

Stainless: ϕ8 x 2

Unit: mm





View *X-X*

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		8 x 2/Right
Preload / Ball recirculation		P preload / Deflector
Ball dia. / Ball circle dia.		1.200/8.3
Effective turns of balls		1 x 3
Accuracy grade / Axial play		C3/Z
Basic load rating N { Kgf }	Dynamic C_a	1080 {110}
	Static C_{0a}	1630 {165}
Axial play		0
Dynamic friction torque, N·cm {kgf·cm}		~2.0 {~0.2}
Spacer ball		None
Factory packed grease		Refer to the remarks bellow.

Standard stock

B 162

Unit: mm

Ball screw No.	Stroke		Thread length			
	Nominal	Maximum	L_1	L_2	L_3	L_4
W0802KA-5PY-C3Z2	150	154	190	194	202	248

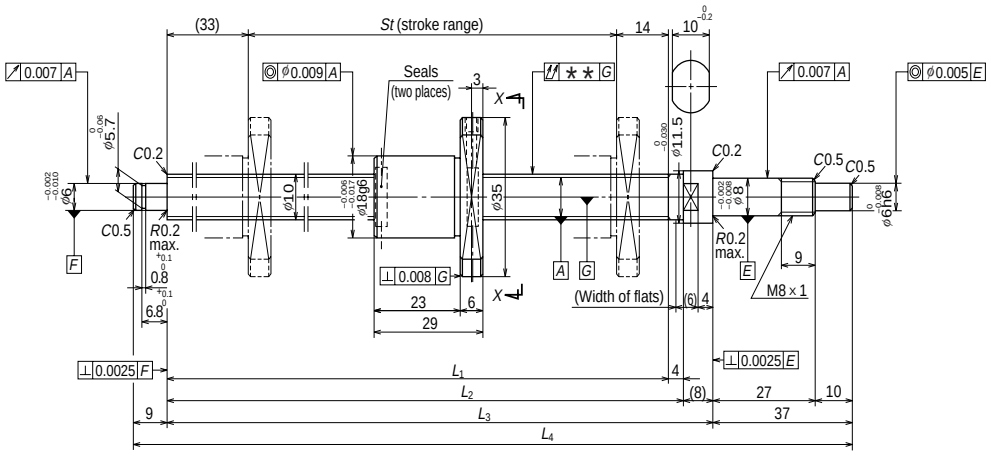
Lead accuracy			Shaft run-out **	Permissible rotational speed N(rpm)	
					Critical speed
T	e_p	v_u			Fixed - Simple support
0	0.010	0.008	0.035	3000	—

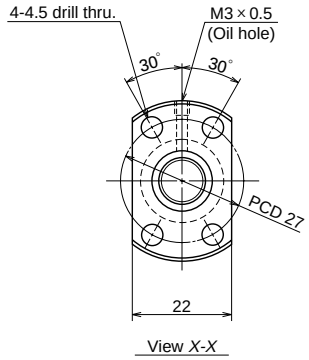
Remarks 1. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use. NSK Clean Grease LG2 is recommended.

NSK

Stainless: ϕ 10 x 2

Unit: mm





Ball screw specifications		
Shaft dia. x Lead / Direction of turn		10 x 2/Right
Preload / Ball recirculation		P preload / Deflector
Ball dia. / Ball circle dia.		1.200/10.3
Effective turns of balls		1 x 3
Accuracy grade / Axial play		C3/Z
Basic load rating N { Kgf }	Dynamic C_a	1210 {125}
	Static C_{0a}	2110 {215}
Axial play		0
Dynamic friction torque, N·cm {kgf·cm}		0.10~2.5 {0.01~0.25}
Spacer ball		None
Factory packed grease		Refer to the remarks bellow.

Standard stock

B 164

Unit: mm

Ball screw No.	Stroke		Thread length			
	Nominal	Maximum	L_1	L_2	L_3	L_4
W1002KA-3PY-C3Z2	200	203	250	254	262	308

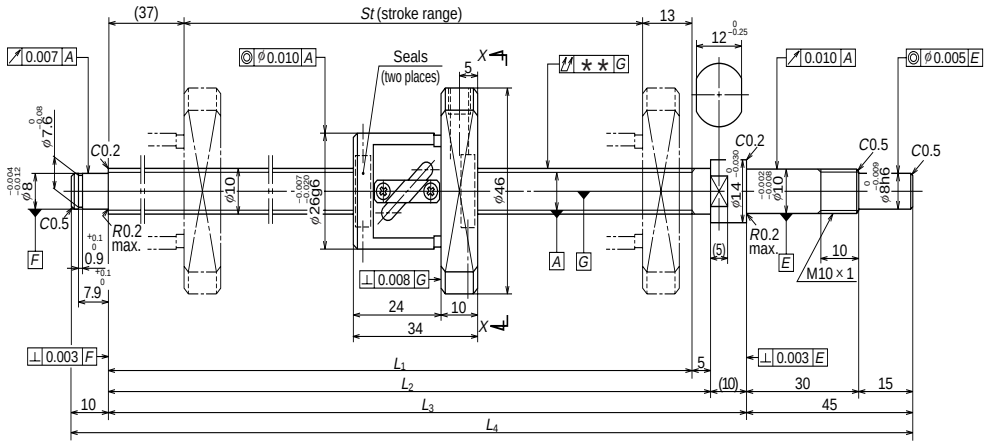
Lead accuracy			Shaft run-out **	Permissible rotational speed N(rpm)	
					Critical speed
T	e_p	v_u			Fixed - Simple support
0	0.012	0.008	0.030	3000	—

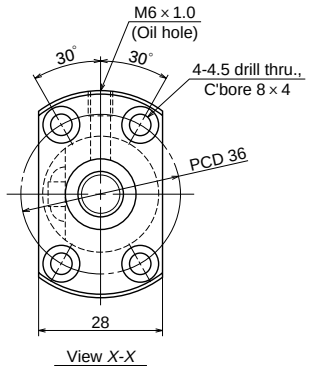
Remarks 1. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use. NSK Clean Grease LG2 is recommended.

NSK

Stainless: ϕ 10 x 4

Unit: mm





Ball screw specifications		
Shaft dia. x Lead / Direction of turn		10 x 4/Right
Preload / Ball recirculation		P preload / Return tube
Ball dia. / Ball circle dia.		2.000/10.3
Effective turns of balls		2.5 x 1
Accuracy grade / Axial play		C3/Z
Basic load rating N { Kgf }	Dynamic C_a	2250 {230}
	Static C_{0a}	3290 {335}
Axial play		0
Dynamic friction torque, N·cm {kgf·cm}		0.5~3.9 {0.05~0.4}
Spacer ball		None
Factory packed grease		Refer to the remarks bellow.
Internal spatial volume of nut (cm^3)		0.8

Standard stock

B 166

Unit: mm

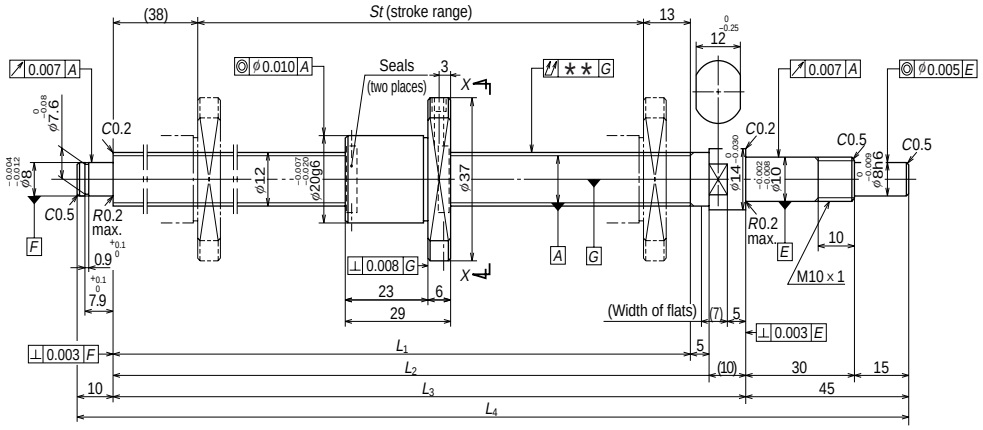
Ball screw No.	Stroke		Thread length			
	Nominal	Maximum	L_1	L_2	L_3	L_4
W1001KA-3P-C3Z4	100	110	160	165	175	230
W1003KA-3P-C3Z4	300	310	360	365	375	430

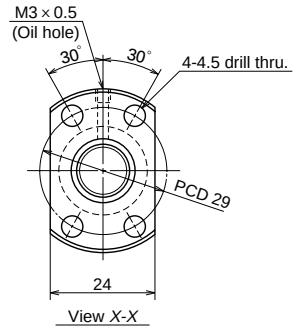
Lead accuracy			Shaft run-out **	Permissible rotational speed N(rpm)	
					Critical speed
T	e_p	v_u			Fixed - Simple support
0	0.010	0.008	0.030	3000	—
0	0.013	0.008	0.050		—

Remarks 1. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use. NSK Clean Grease LG2 is recommended.

NSK

Stainless: ϕ 12 x 2





Unit: mm

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		12 x 2/Right
Preload / Ball recirculation		P preload / Deflector
Ball dia. / Ball circle dia.		1.200/12.3
Effective turns of balls		1 x 3
Accuracy grade / Axial play		C3/Z
Basic load rating N { Kgf }	Dynamic C_a	1360 {140}
	Static C_{0a}	2680 {275}
Axial play		0
Dynamic friction torque, N·cm {kgf·cm}		0.4~3.4 {0.04~0.35}
Spacer ball		None
Factory packed grease		Refer to the remarks bellow.

Standard stock

B 168

Unit: mm

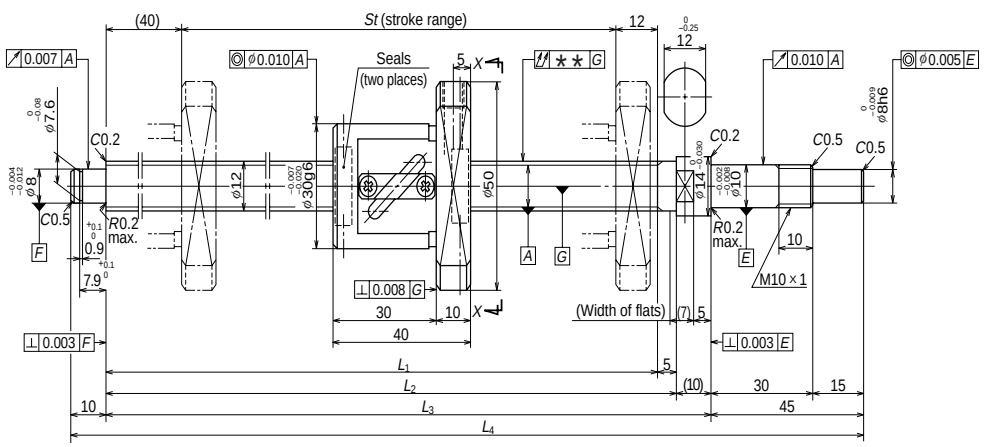
Ball screw No.	Stroke		Thread length			
	Nominal	Maximum	L_1	L_2	L_3	L_4
W1201KA-3PY-C3Z2	100	109	160	165	175	230
W1203KA-1PY-C3Z2	250	259	310	315	325	380

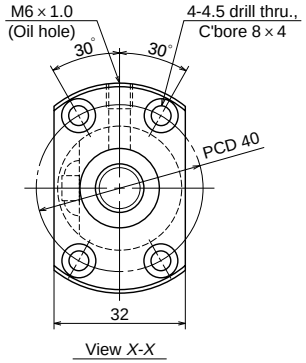
Lead accuracy			Shaft run-out **	Permissible rotational speed N(rpm)	
					Critical speed
T	e_p	v_u			Fixed - Simple support
0	0.010	0.008	0.030	3000	—
0	0.012	0.008	0.040		—

Remarks 1. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use. NSK Clean Grease LG2 is recommended.

NSK

Stainless: ϕ 12 x 5





Unit: mm

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		12 x 5/Right
Preload / Ball recirculation		P preload / Return tube
Ball dia. / Ball circle dia.		2.381/12.3
Effective turns of balls		2.5 x 1
Accuracy grade / Axial play		C3/Z
Basic load rating N { Kgf }	Dynamic C_a	3070 {315}
	Static C_{0a}	4670 {475}
Axial play		0
Dynamic friction torque,N·cm {kgf·cm}		1.0~4.4 {0.1~0.45}
Spacer ball		None
Factory packed grease		Refer to the remarks bellow.
Internal spatial volume of nut (cm^3)		1.2

Standard stock

B 170

Unit: mm

Ball screw No.	Stroke		Thread length			
	Nominal	Maximum	L_1	L_2	L_3	L_4
W1202KA-3P-C3Z5	200	208	260	265	275	330
W1205KA-1P-C3Z5	450	458	510	515	525	580

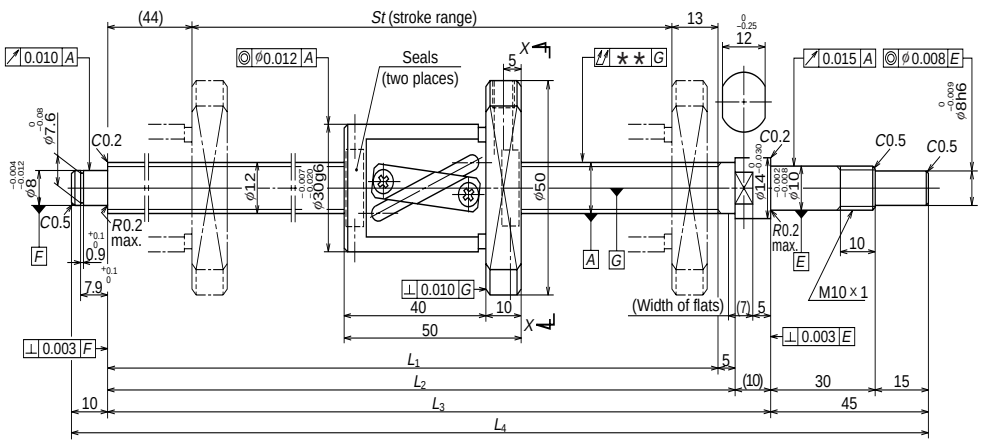
Lead accuracy			Shaft run-out **	Permissible rotational speedN(rpm)	
					Critical speed
T	e_p	v_u			Fixed - Simple support
0	0.012	0.008	0.040	3000	—
0	0.016	0.012	0.065		—

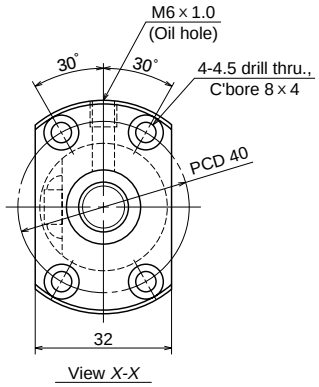
Remarks 1. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use. NSK Clean Grease LG2 is recommended.

NSK

Stainless: ϕ12 x 10

Unit: mm





Ball screw specifications		
Shaft dia. x Lead / Direction of turn		12 x 10/Right
Preload / Ball recirculation		P preload / Return tube
Ball dia. / Ball circle dia.		2.381/12.5
Effective turns of balls		2.5 x 1
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	3070 {315}
	Static C_{0a}	4790 {490}
Axial play		0
Dynamic friction torque, N·cm {kgf·cm}		1.0~4.9 {0.1~0.5}
Spacer ball		None
Factory packed grease		Refer to the remarks bellow.
Internal spatial volume of nut (cm^3)		1.4

Standard stock

B 172

Unit: mm

Ball screw No.	Stroke		Thread length			
	Nominal	Maximum	L_1	L_2	L_3	L_4
W1203KA-3P-C5Z10	250	253	310	315	325	380
W1205KA-3P-C5Z10	450	453	510	515	525	580

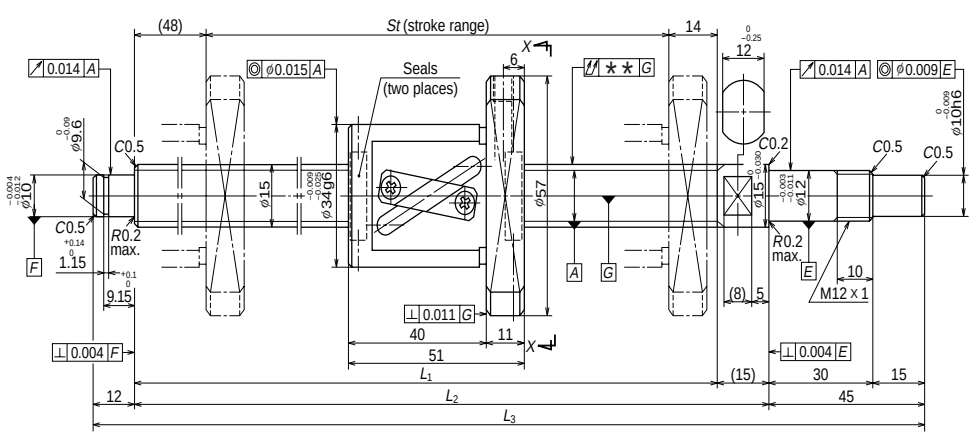
Lead accuracy			Shaft run-out **	Permissible rotational speed N(rpm)	
					Critical speed
T	e_p	v_u			Fixed - Simple support
0	0.023	0.018	0.050	3000	—
0	0.030	0.023	0.075		—

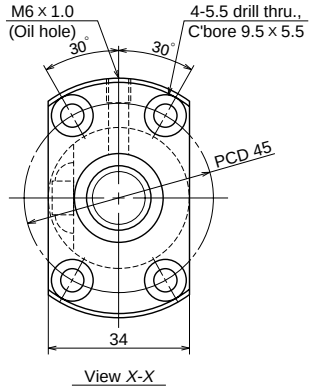
Remarks 1. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use. NSK Clean Grease LG2 is recommended.

NSK

Stainless: ϕ15 x 10

Unit: mm





Ball screw specifications		
Shaft dia. x Lead / Direction of turn		15 x 10/Right
Preload / Ball recirculation		P preload / Return tube
Ball dia. / Ball circle dia.		3.175/15.5
Effective turns of balls		2.5 x 1
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	5780 {590}
	Static C_{0a}	9430 {960}
Axial play		0
Dynamic friction torque, N·cm {kgf·cm}		1.5~7.9 {0.15~0.8}
Spacer ball		None
Factory packed grease		Refer to the remarks bellow.
Internal spatial volume of nut (cm^3)		2.3

Standard stock

B 174

Unit: mm

Ball screw No.	Stroke		Thread length		
	Nominal	Maximum	L_1	L_2	L_3
W1504KA-3P-C5Z10	400	427	489	504	561
W1506KA-3P-C5Z10	600	627	689	704	761
W1510KA-1P-C5Z10	1000	1027	1089	1104	1161

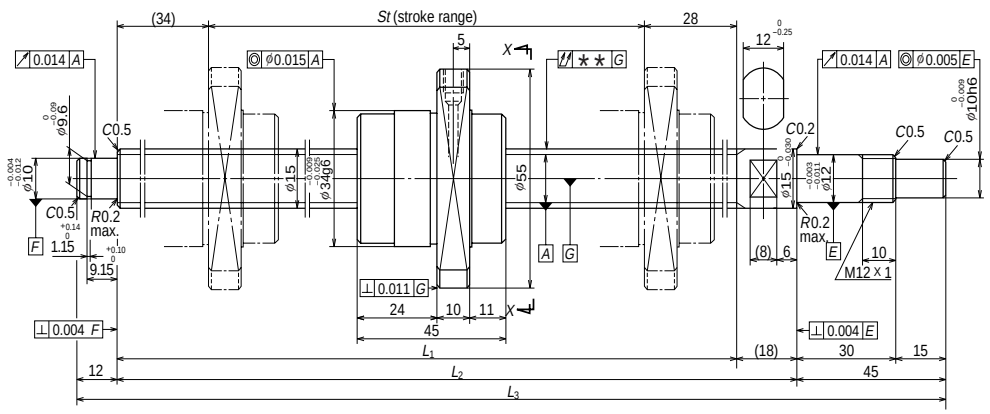
Lead accuracy			Shaft run-out **	Permissible rotational speed N(rpm)	
					Critical speed
T	e_p	υ_u			Fixed - Simple support
0	0.027	0.020	0.050	3000	—
0	0.035	0.025	0.065		—
0	0.046	0.030	0.110		1610

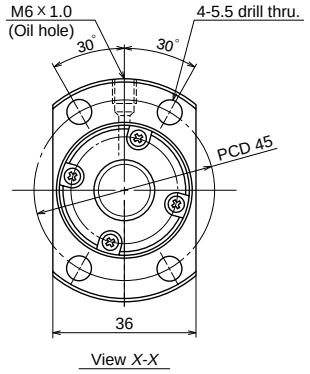
Remarks 1. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use. NSK Clean Grease LG2 is recommended.

NSK

Stainless: ϕ15 x 20

Unit: mm





Ball screw specifications		
Shaft dia. x Lead / Direction of turn		15 x 20/Right
Preload / Ball recirculation		P preload / End cap
Ball dia. / Ball circle dia.		3.175/15.5
Effective turns of balls		1.7 x 1
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	4150 {425}
	Static C_{0a}	6450 {660}
Axial play		0
Dynamic friction torque, N·cm {kgf·cm}		1.5~7.9 {0.15~0.8}
Spacer ball		None
Factory packed grease		Refer to the remarks bellow.
Internal spatial volume of nut (cm^3)		1.9

Standard stock

B 176

Unit: mm

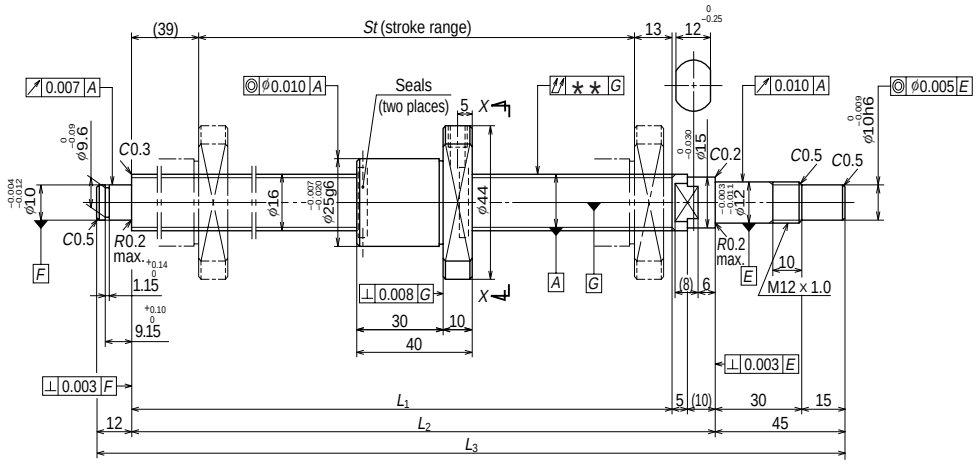
Ball screw No.	Stroke		Thread length		
	Nominal	Maximum	L_1	L_2	L_3
W1504KA-7PG-C5Z20	400	424	486	504	561
W1506KA-7PG-C5Z20	600	624	686	704	761
W1510KA-3PG-C5Z20	1000	1024	1086	1104	1161

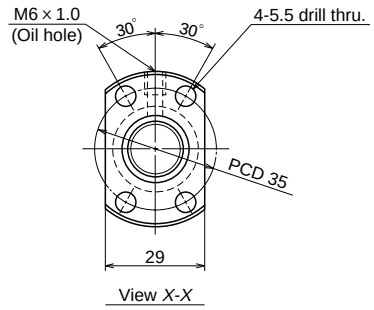
Lead accuracy			Shaft run-out **	Permissible rotational speed N(rpm)	
					Critical speed
T	e_p	v_u			Fixed - Simple support
0	0.027	0.020	0.050	3000	—
0	0.035	0.025	0.065		—
0	0.046	0.030	0.110		1610

Remarks 1. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use. NSK Clean Grease LG2 is recommended.

NSK

Stainless: ϕ16 x 2





Unit: mm

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		16 x 2/Right
Preload / Ball recirculation		P preload / Deflector
Ball dia. / Ball circle dia.		1.588/16.4
Effective turns of balls		1 x 4
Accuracy grade / Axial play		C3/Z
Basic load rating N { Kgf }	Dynamic C_a	2870 {295}
	Static C_{0a}	6250 {635}
Axial play		0
Dynamic friction torque, N·cm {kgf·cm}		0.5~4.9 {0.05~0.5}
Spacer ball		None
Factory packed grease		Refer to the remarks bellow.
Internal spatial volume of nut (cm^3)		1.6

Standard stock

B 178

Unit: mm

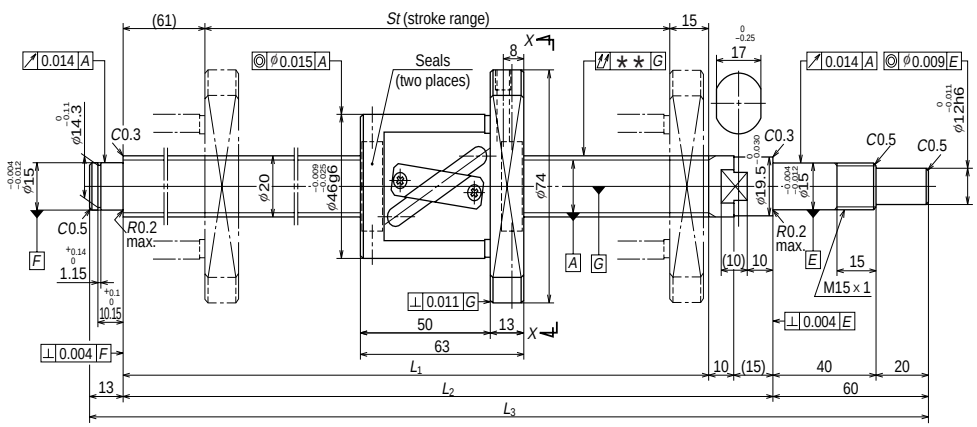
Ball screw No.	Stroke		Thread length		
	Nominal	Maximum	L_1	L_2	L_3
W1601KA-3PY-C3Z2	100	137	189	204	261
W1603KA-1PY-C3Z2	300	337	389	404	461

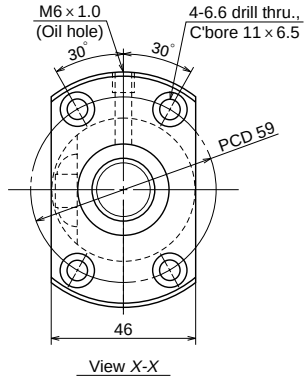
Lead accuracy			Shaft run-out **	Permissible rotational speed N(rpm)	
					Critical speed
T	e_p	υ_u			Fixed - Simple support
0	0.010	0.008	0.020	3000	—
0	0.013	0.010	0.035		—

Remarks 1. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use. NSK Clean Grease LG2 is recommended.

NSK

Stainless: ϕ20 x 20





Unit: mm

Ball screw specifications		
Shaft dia. x Lead / Direction of turn		20 x 20/Right
Preload / Ball recirculation		P preload / Return tube
Ball dia. / Ball circle dia.		3.969/21
Effective turns of balls		1.5 x 1
Accuracy grade / Axial play		C5/Z
Basic load rating N { Kgf }	Dynamic C_a	5760 {585}
	Static C_{0a}	9370 {955}
Axial play		0
Dynamic friction torque,N·cm {kgf·cm}		2.0~11.8 {0.2~1.2}
Spacer ball		None
Factory packed grease		Refer to the remarks bellow.
Internal spatial volume of nut (cm^3)		4.2

Standard stock

B 180

Unit: mm

Ball screw No.	Stroke		Thread length		
	Nominal	Maximum	L_1	L_2	L_3
W2005KA-3P-C5Z20	400	434	510	535	608
W2007KA-3P-C5Z20	600	634	710	735	808
W2011KA-3P-C5Z20	1000	1034	1110	1135	1208

Lead accuracy			Shaft run-out **	Permissible rotational speedN(rpm)	
					Critical speed
T	e_p	υ_u			Fixed - Simple support
0	0.030	0.023	0.050	3000	—
0	0.035	0.025	0.085		—
0	0.046	0.030	0.110		2160

Remarks 1. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use. NSK Clean Grease LG2 is recommended.

B-I-6.3 S Series

◇ Ball screw sizes are in order of pages.
Dimension table begins with the smallest shaft diameter ball screw, and proceed to larger sizes. If ball screws have the same shaft diameter, those with smaller leads appear first. Page numbers of shaft diameter and lead combinations are shown in the Table I-6•3.

◇Dimension tables
Dimension tables show shapes/sizes as well as specification factors of each shaft diameter/lead combination. Tables also contain data as follows:

●Lead accuracy
Lead accuracy is C3 and C5 grades.
T : Travel compensation;
e_p : Tolerance of specified travel;
v_u : Travel variation
See "Technical description: Lead accuracy" (Page B445) for details of the codes.

●Permissible rotational speed
dm • n: Limited by the relative peripheral speed between the screw shaft and the nut.
Always operate under the permissible rotational speed. Consider critical speed after deciding on the screw shaft design. For details, see "Technical description: Permissible rotational speed" (Page B455).

◇Shaft end processing
S Series requires shaft end processing to your specification. Exclusive support unit (Page B273) is available to design the shaft end support section. See "Configuration of shaft end" (Page B27 and following pages) when using a support unit. See "Technical Description: Shaft end processing" (Page B478) for procedures of shaft end processing and precautions.

◇Other
Seal of the ball screw, ball recirculating deflector and end cap are made of synthetic resin. Consult NSK when using the ball screws under extreme environment or special environment, or using special lubricant or oil.
For special environment, refer to Pages B473 and D1. Refer to Pages B471 and D13 for lubricants.

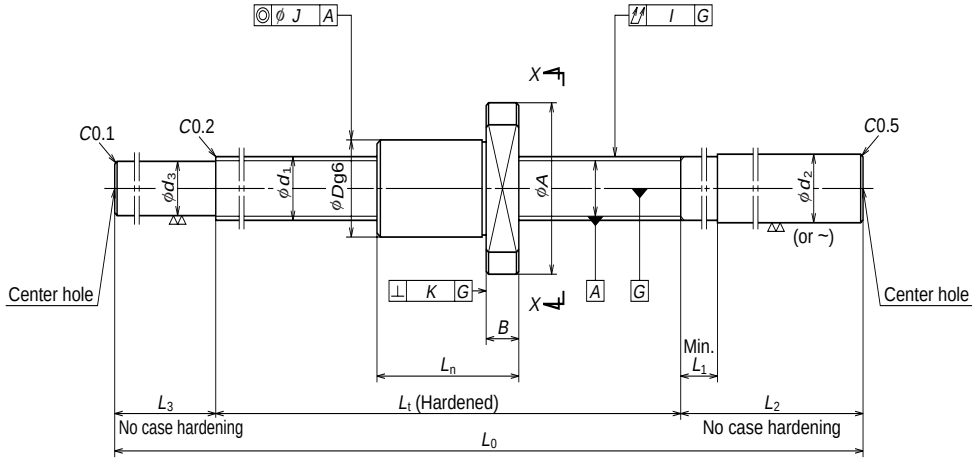
Table I-6•3

Shaft diameter \ Lead	1	1.5	2	2.5	4	5	6	8	10	12	16	20	25	32	40	50
4	B183															
6	B183															
8	B183	B185	B185													
10			B185	B187	B189											
12			B187	B187		B189			B189							
14						B191		B191								
15									B191			B195				
16			B193	B193		B197					B197			B195		
20					B199	B199			B197			B197			B195	
25					B201	B201 B203	B201		B203 B207			B205	B205			B205
28						B207 B209	B207 B209									
32						B211 B213 B215	B211 B213	B213	B215 B217 B219				B221	B221		
36									B217 B219							
40						B217		B223	B223 B225 B227	B223 B225						
45									B229							
50									B227 B229							

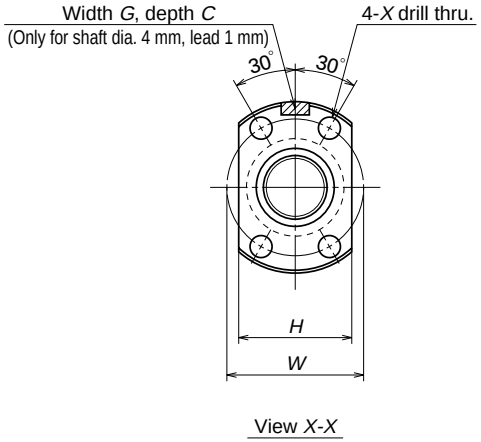
NSK

φ4 x 1, φ6 x 1, φ8 x 1

Standard stock



Nut type code: MSFD



View X-X

B 184

Unit: mm

Ball screw No.	Stroke Max. L_t-L_n	Screw shaft dia. d_1	Lead l	Ball dia. D_w	Ball circle dia. d_m	Effective ball turns	Basic load rating N {kgf} Dynamic C_a	Basic load rating N {kgf} Static C_{0a}	Axial play Max.	Nut Outside dia. D	Nut Flange A	Nut Flange H	Nut Flange B
W0400MS-1Y-C3T1	68	4	1	0.8	4.2	2	315 {32}	370 {38}	0.005	10	20	14	3
W0601MS-1Y-C3T1	110	6	1	0.8	6.2	3	575 {60}	925 {95}	0.005	12	24	16	3.5
W0801MS-1Y-C3T1	94	8	1	0.8	8.2	3	670 {70}	1290 {130}	0.005	14	27	18	4
W0802MS-1Y-C3T1	174												

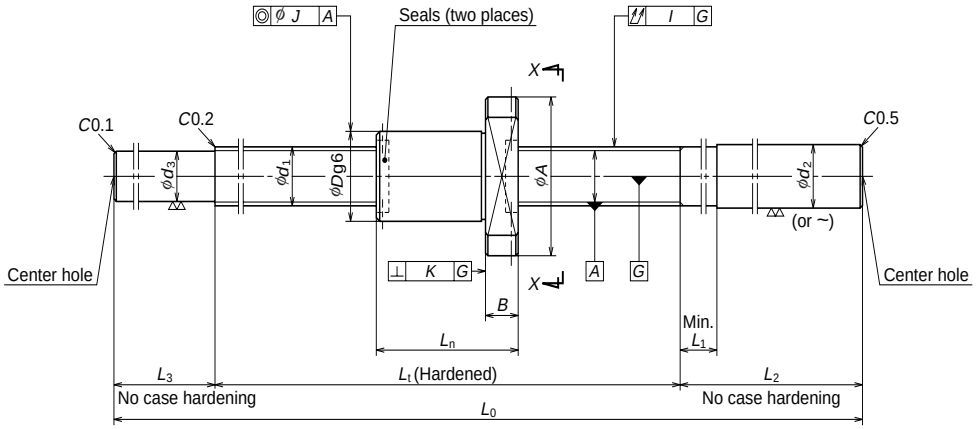
dimensions Overall length L_n	Bolt hole W	Bolt hole X	Slot G	Slot C	Screw shaft dimensions Threaded length L_t	Shaft end, right d_2	Shaft end, right L_1	Shaft end, right L_2	Shaft end, left d_3	Shaft end, left L_3	Overall length L_0	Lead accuracy T	Deviation e_p	Variation v_u	Run out Shaft straightness I	Run out Nut O.D. eccentricity J	Run out Flange perpendicularity K	Permissible rotational speed N(rpm)
12	15	2.9	3	2	80	6.0	4	40	3.3	10	130	0	0.008	0.008	0.030	0.009	0.008	
15	18	3.4	—	—	125	8.0	4	50	5.3	15	190	0	0.010	0.008	0.030	0.009	0.008	3000
16	21	3.4	—	—	110	10.2	4	60	7.3	25	195	0	0.010	0.008	0.030	0.009	0.008	
					190						275				0.050			

Remarks: 1. NSK support unit is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.
3. Nut does not have a seal.
4. The hatched groove on the nut flange outside surface is for production purpose only.

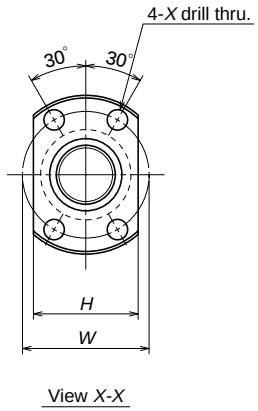
NSK

ϕ8 x 1.5, ϕ8 x 2, ϕ10 x 2

Standard stock



Nut type code: MSFD



View X-X

Unit: mm

Ball screw No.	Stroke Max. L_t-L_n	Screw shaft dia. d_1	Lead l	Ball dia. D_w	Ball circle dia. d_m	Effective ball turns	Basic load rating N {kgf} Dynamic C_a	Basic load rating N {kgf} Static C_{0a}	Axial play Max.	Nut Outside dia. D	Nut Flange A	Nut Flange H	Nut Flange B
W0801MS-2Y-C3T1.5	88	8	1.5	1.0	8.3	3	1080 {110}	1980 {200}	0.005	15	28	19	4
W0802MS-2Y-C3T1.5	168												
W0801MS-3Y-C3T2	84	8	2	1.2	8.3	3	1320 {135}	2210 {225}	0.005	16	29	20	4
W0802MS-3Y-C3T2	164												
W1001MS-1Y-C3T2	122	10	2	1.2	10.3	3	1490 {150}	2850 {290}	0.005	18	35	22	5
W1002MS-1Y-C3T2	222												

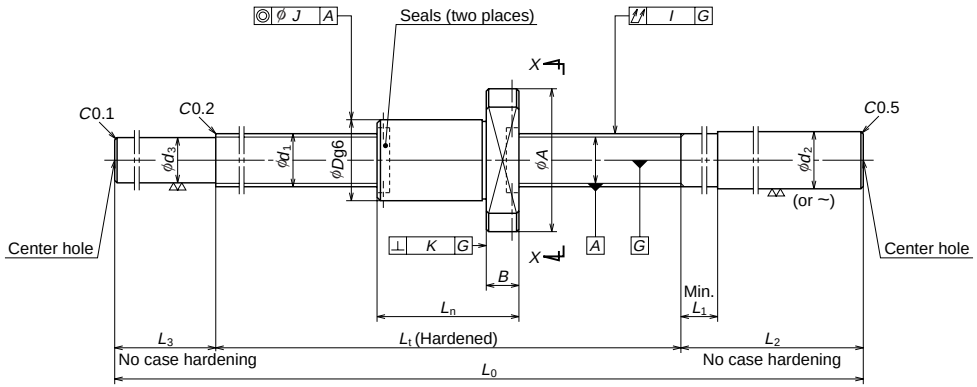
dimensions Overall length L_n	Bolt hole W	Bolt hole X	Screw shaft dimensions Threaded length L_t	Shaft end, right d_2	Shaft end, right L_1	Shaft end, right L_2	Shaft end, left d_3	Shaft end, left L_3	Overall length L_0	Lead accuracy T	Deviation e_p	Variation v_u	Run out Shaft straightness I	Run out Nut O.D. eccentricity J	Run out Flange perpendicularity K	Permissible rotational speed N(rpm)
22	22	3.4	110	10.2	4	60	7.2	25	195	0	0.010	0.008	0.030	0.009	0.008	3000
			190						275				0.050			
26	23	3.4	110	10.2	4	60	7.0	25	195	0	0.010	0.008	0.030	0.009	0.008	
			190						275				0.050			
28	27	4.5	150	12.2	4	70	9.0	30	250	0	0.010	0.008	0.035	0.009	0.008	
			250						350		0.012		0.050			

Remarks: 1. NSK support unit is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

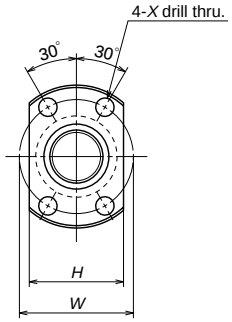
NSK

ϕ10 x 2.5, ϕ12 x 2, ϕ12 x 2.5

Standard stock



Nut type code: MSFD



View X-X

Unit: mm

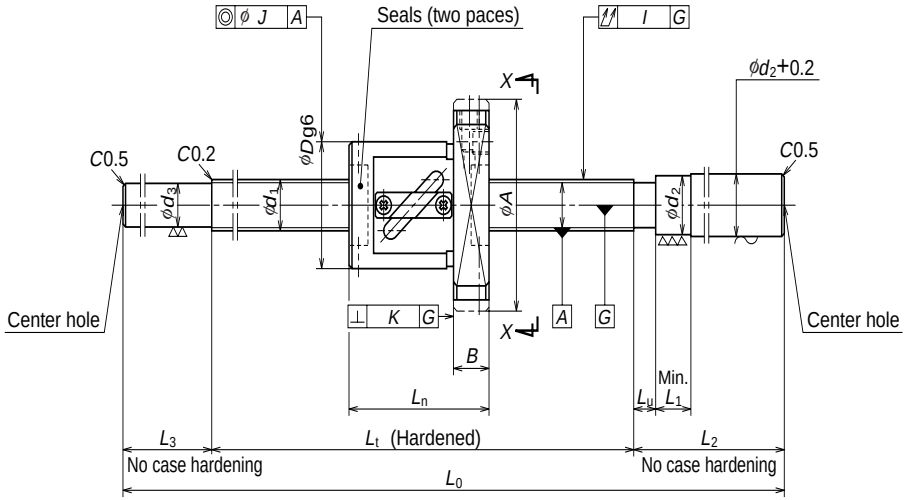
Ball screw No.	Stroke Max. L_t-L_n	Screw shaft dia. d_1	Lead l	Ball dia. D_w	Ball circle dia. d_m	Effective ball turns	Basic load rating N {kgf} Dynamic C_a	Basic load rating N {kgf} Static C_{0a}	Axial play Max.	Nut Outside dia. D	Nut Flange A	Nut Flange H	Nut Flange B
W1001MS-2Y-C3T2.5	118	10	2.5	1.588	10.4	3	2130 {215}	3640 {370}	0.005	19	36	23	5
W1002MS-2Y-C3T2.5	218												
W1202MS-1Y-C3T2	182	12	2	1.200	12.3	3	1660 {170}	3620 {370}	0.005	20	37	24	5
W1203MS-1Y-C3T2	282												
W1202MS-2Y-C3Z2.5	178	12	2.5	1.588	12.4	3	2360 {240}	4540 {465}	0.005	21	38	25	5
W1203MS-2Y-C3Z2.5	278												

dimensions Overall length L_n	Bolt hole W	Bolt hole X	Screw shaft dimensions Threaded length L_t	Shaft end, right d_2	Shaft end, right L_1	Shaft end, right L_2	Shaft end, left d_3	Shaft end, left L_3	Overall length L_0	Lead accuracy T	Deviation e_p	Variation v_u	Run out Shaft straightness I	Run out Nut O.D. eccentricity J	Run out Flange perpendicularity K	Permissible rotational speed N(rpm)
32	28	4.5	150	12.2	4	70	8.7	30	250	0	0.010	0.008	0.035	0.010	0.008	3000
			250						350		0.012		0.050			
28	29	4.5	210	14.2	5	80	11.0	35	325	0	0.012	0.008	0.050	0.010	0.008	
			310						425				0.060			
32	30	4.5	210	14.2	5	80	10.7	35	325	0	0.012	0.008	0.050	0.010	0.008	
			310						425				0.060			

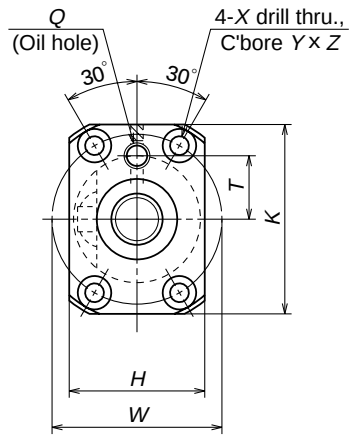
Remarks: 1. NSK support unit is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

ϕ10 x 4, ϕ12 x 5, ϕ12 x 10

Standard stock



Nut type code: SFT, LSFT



View X-X

B 190

Unit: mm

Ball screw No.	Stroke Max. L_t-L_n	Screw shaft dia. d_1	Lead l	Ball dia. D_w	Ball circle dia. d_m	Effective ball turns Turns × Circuits	Basic load rating N {kgf} Dynamic C_a	Basic load rating N {kgf} Static C_{0a}	Axial play Max.	Nut Outside dia. D	Nut Flange A	Nut Flange H	Nut Flange K	Nut Flange B	Nut Overall length L_n
W1001FS-1-C3T4	126	10	4	2.000	10.3	2.5×1	2470 {280}	4450 {455}	0.005	26	46	28	42	10	34
W1002FS-1-C3T4	226														
W1003FS-1-C3T4	326														
W1201FS-1-C3T5	110	12	5	2.381	12.3	2.5×1	3760 {385}	6310 {645}	0.005	30	50	32	45	10	40
W1202FS-1-C3T5	210														
W1204FS-1-C3T5	410														
W1202FS-2-C5T10	200	12	10	2.381	12.5	2.5×1	3750 {380}	6480 {660}	0.005	30	50	32	45	10	50
W1204FS-2-C5T10	400														

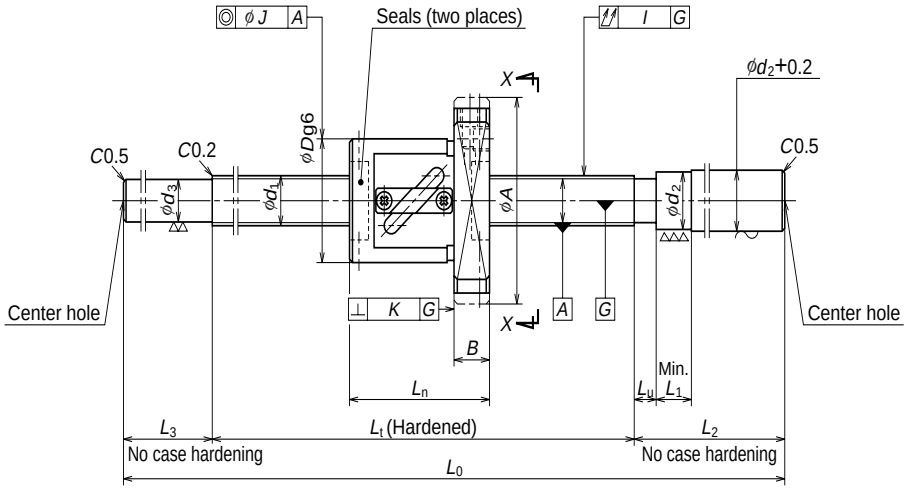
dimensions: Bolt hole W	X	Y	Z	Oil hole Q	T	Screw shaft dimensions: Threaded length L_t	Shaft end, right d_2	L_u	L_1	Shaft end, left L_2	d_3	L_3	Overall length L_0	Lead accuracy T	Deviation e_p	Variation v_u	Run out Shaft straightness I	Nut O.D. eccentricity J	Flange perpendicularity K	Permissible rotational speed N(rpm)
36	4.5	8	4.5	M6×1	14	160	14	5	40	70	8.2	35	265	0	0.010	0.008	0.030	0.010	0.008	3000
						260							365		0.012	0.008	0.040			
						360							465		0.013	0.010	0.050			
40	4.5	8	4.5	M6×1	15	150	14	5	40	70	9.8	35	255	0	0.010	0.008	0.030	0.010	0.008	
						250							355		0.012	0.008	0.040			
						450							555		0.015	0.010	0.065			
40	4.5	8	4.5	M6×1	15	250	14	8	40	70	10.0	35	355	0	0.023	0.018	0.050	0.012	0.010	
						450							555		0.027	0.020	0.075			

Remarks: 1. NSK support unit is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

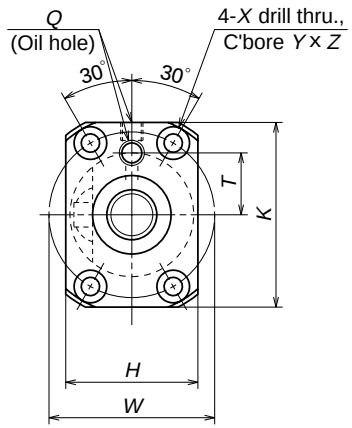
NSK

ϕ14 x 5, ϕ14 x 8, ϕ15 x 10

Standard stock



Nut type code: SFT, LSFT



View X-X

B 192

Unit: mm

Ball screw No.	Stroke Max. L_t-L_n	Screw shaft dia. d_1	Lead l	Ball dia. D_w	Ball circle dia. d_m	Effective ball turns: Turns × Circuits	Basic load rating N {kgf}: Dynamic C_a	Basic load rating N {kgf}: Static C_{0a}	Axial play Max.	Nut: Outside dia. D	Nut: Flange A	Nut: Flange H	Nut: Flange K	Nut: Flange B	Nut: Overall length L_n
W1403FS-1-C3T5	310	14	5	3.175	14.5	2.5×1	6790 {695}	11700 {1190}	0.005	34	57	34	50	11	40
W1406FS-1-C3T5	560														
W1405FS-1-C5T8	454	14	8	3.175	14.5	2.5×1	6790 {695}	11700 {1190}	0.005	34	57	34	50	11	46
W1408FS-1-C5T8	754														
W1504FS-1-C5T10	349	15	10	3.175	15.5	2.5×1	7070 o720	12800 o{1300}	0.005	34	57	34	50	11	51
W1506FS-1-C5T10	549														
W1509FS-1-C5T10	849														
W1511FS-1-C5T10	1049														

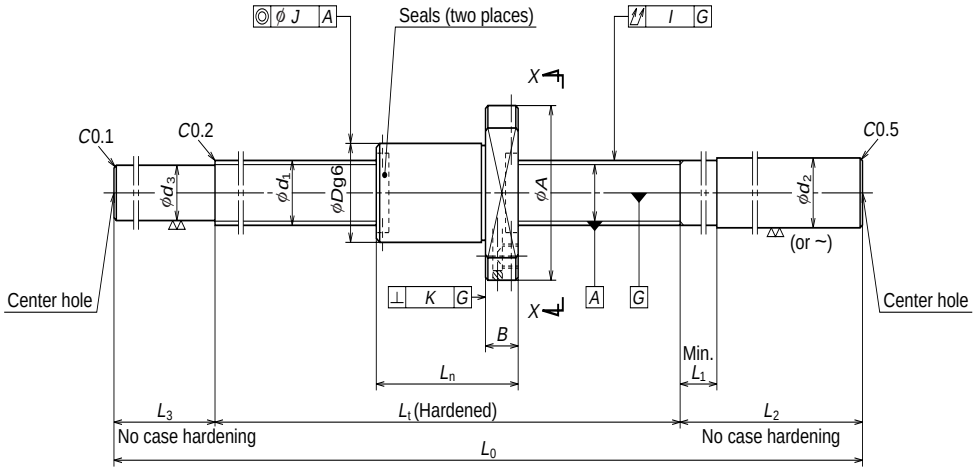
dimensions: Bolt hole W	Bolt hole X	Bolt hole Y	Bolt hole Z	Oil hole Q	Oil hole T	Screw shaft dimensions: Threaded length L_t	Shaft end, right d_2	Shaft end, right L_u	Shaft end, right L_1	Shaft end, left L_2	Shaft end, left d_3	Shaft end, left L_3	Overall length L_0	Lead accuracy T	Deviation e_p	Variation v_u	Run out: Shaft straightness I	Run out: Nut O.D. eccentricity J	Run out: Flange perpendicularity K	Permissible rotational speed N(rpm)
45	5.5	9.5	5.5	M6×1	17	350	15	5	40	100	11.2	40	490	0	0.013	0.010	0.035	0.012	0.008	3000
						600							740		0.016	0.012	0.055			
45	5.5	9.5	5.5	M6×1	17	500	15	8	40	100	11.2	40	640	0	0.027	0.020	0.065	0.015	0.011	
						800							940		0.035	0.025	0.085			
45	5.5	9.5	5.5	M6×1	17	400	15	8	40	120	12.2	50	570	0	0.025	0.020	0.050	0.015	0.011	
						600							770		0.030	0.023	0.065			
						900							1070		0.040	0.027	0.110			
						1100							1270		0.046	0.030	0.150			

Remarks: 1. NSK support unit is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

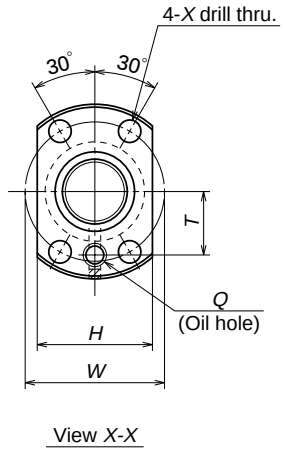
NSK

ϕ16 x 2, ϕ16 x 2.5

Standard stock



Nut type code: MSFD



View X-X

Unit: mm

Ball screw No.	Stroke Max. L_t-L_n	Screw shaft dia. d_1	Lead l	Ball dia. D_w	Ball circle dia. d_m	Effective ball turns	Basic load rating N {kgf} Dynamic C_a	Basic load rating N {kgf} Static C_{0a}	Axial play Max.	Nut Outside dia. D	Nut Flange A	Nut Flange H	Nut Flange B	Nut Overall length L_n
W1602MS-1Y-C3T2	210	16	2	1.588	16.4	4	3510 {360}	8450 {860}	0.005	25	44	29	10	40
W1604MS-1Y-C3T2	360													
W1602MS-2Y-C3T2.5	206	16	2.5	1.588	16.4	4	3510 {360}	8450 {860}	0.005	25	44	29	10	44
W1604MS-2Y-C3T2.5	356													

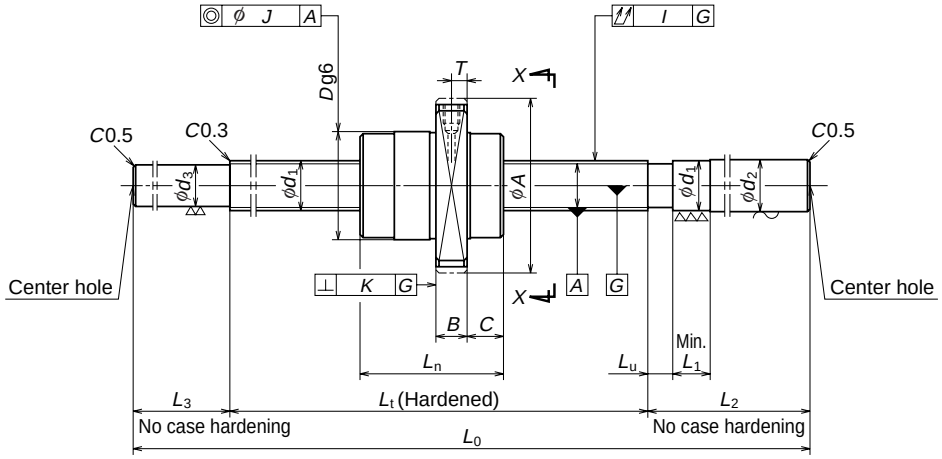
dimensions Bolt hole W	Bolt hole X	Oil hole Q	Oil hole T	Screw shaft dimensions Threaded length L_t	Shaft end, right d_2	Shaft end, right L_1	Shaft end, right L_2	Shaft end, left d_3	Shaft end, left L_3	Overall length L_0	Lead accuracy T	Deviation e_p	Variation v_u	Run out Shaft straightness I	Run out Nut O.D. eccentricity J	Run out Flange perpendicularity K	Permissible rotational speed N(rpm)
35	5.5	M6×1	16	250	16.2	30	100	14.7	40	390	0	0.012	0.008	0.035	0.010	0.008	3000
				400						540		0.013	0.010	0.050			
35	5.5	M6×1	16	250	16.2	30	100	14.7	40	390	0	0.012	0.008	0.035	0.010	0.008	
				400						540		0.013	0.010	0.050			

Remarks: 1. NSK support unit is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

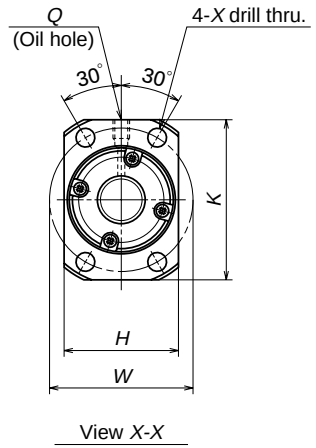
NSK

ϕ15 x 20, ϕ16 x 32, ϕ20 x 40

Standard stock



Nut type code: USFC



View X-X

Unit: mm

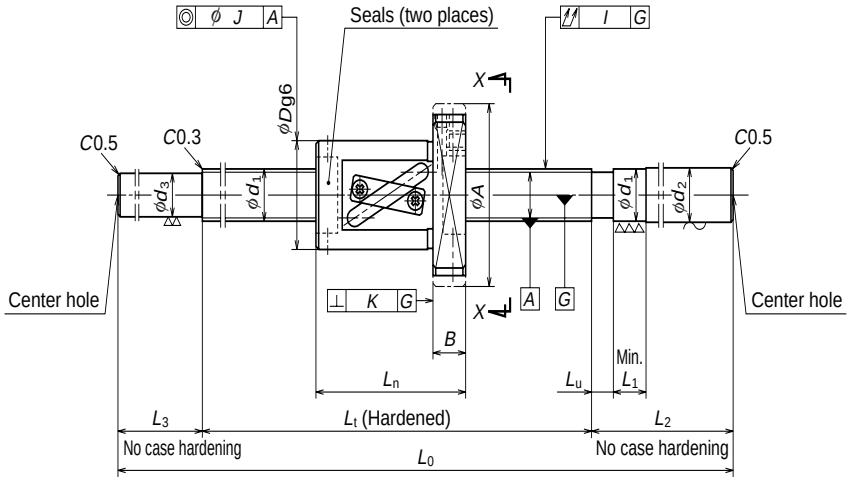
Ball screw No.	Stroke Max. L_t-L_n	Screw shaft dia. d_1	Lead l	Ball dia. D_w	Ball circle dia. d_m	Effective ball turns: Turns × Circuits	Basic load rating N {kgf}: Dynamic C_a	Basic load rating N {kgf}: Static C_{0a}	Axial play Max.	Nut: Outside dia. D	Nut: Flange A	Nut: Flange H	Nut: Flange K	Nut: Flange B	Nut: Flange C
W1504FS-2G-C5T20	355	15	20	3.175	15.5	1.7×1	5070 {515}	8730 {890}	0.005	34	55	36	50	10	11
W1506FS-2G-C5T20	555														
W1509FS-2G-C5T20	855														
W1511FS-2G-C5T20	1055														
W1609FS-2GX-C5T32	866	16	32	3.175	16.75	0.7×2	4000 {410}	6690 {680}	0.005	34	55	36	50	10	10.5
W1613FS-1GX-C5T32	1266														
W2011FS-1GX-C5T40	1059	20	40	3.175	20.75	0.7×2	4490 {460}	8640 {880}	0.005	38	58	40	52	10	11
W2017FS-1GX-C5T40	1659														

dimensions: Overall length L_n	Bolt hole W	Bolt hole X	Oil hole Q	Oil hole T	Screw shaft dimensions: Threaded length L_t	Shaft end, right d_2	Shaft end, right L_u	Shaft end, right L_1	Shaft end, right L_2	Shaft end, left d_3	Shaft end, left L_3	Overall length L_0	Lead accuracy: Travel compensation T	Lead accuracy: Deviation e_p	Lead accuracy: Variation v_u	Run out: Shaft straightness I	Run out: Nut O.D. eccentricity J	Run out: Flange perpendicularity K	Permissible rotational speed N(rpm)
45	45	5.5	M6×1	5	400	15.2	13	40	120	12.2	50	570	0	0.025	0.020	0.050	0.015	0.011	3000
					600							770		0.030	0.023	0.065			
					900							1070		0.040	0.027	0.110			
					1100							1270		0.046	0.030	0.150			
34	45	5.5	M6×1	5	900	16.2	19	40	150	13.4	60	1110	0	0.040	0.027	0.110	0.015	0.011	3000
					1300							1510		0.054	0.035	0.150			
41	48	5.5	M6×1	5	1100	20.2	22	60	150	17.4	80	1330	0	0.046	0.030	0.150	0.015	0.011	3000
					1700							1930		0.065	0.040	0.200			

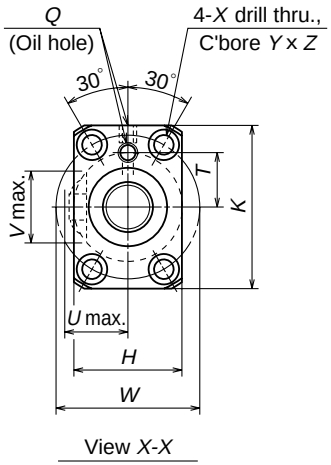
Remarks: 1. NSK support unit is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

ϕ16 x 5, ϕ16 x 16, ϕ20 x 10, ϕ20 x 20

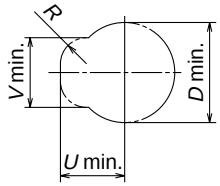
Standard stock



Nut type code: SFT, LSFT



View X-X



Housing hole and its clearance
(Only applicable to shaft dia. 16 × lead 16)

B
198

Unit: mm

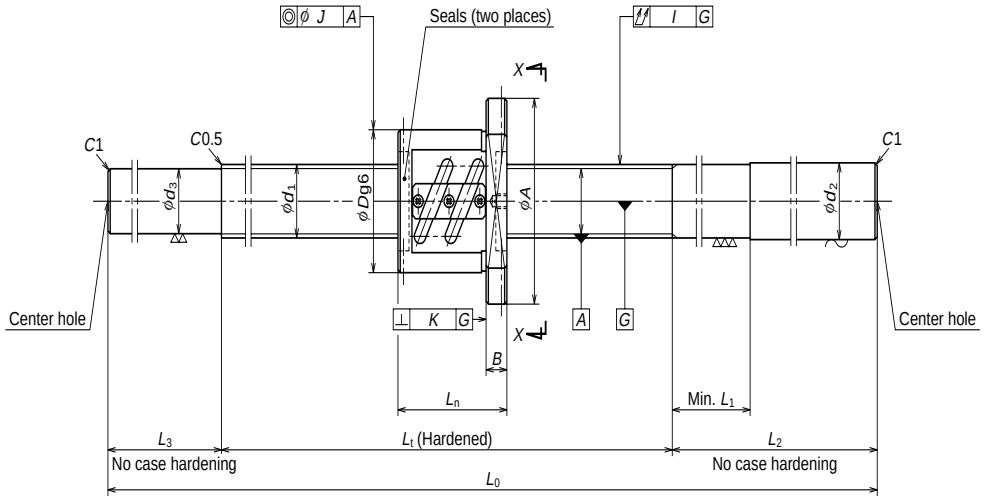
Ball screw No.	Stroke Max. L_t-L_n	Screw shaft dia. d_1	Lead l	Ball dia. D_w	Ball circle dia. d_m	Effective ball turns: Turns × Circuits	Basic load rating N {kgf}: Dynamic C_a	Basic load rating N {kgf}: Static C_{oa}	Axial play Max.	Nut: Outside dia. D	Nut: Flange A	Nut: Flange H	Nut: Flange K	Nut: Flange B	Nut: Overall length L_n	Nut: Bolt W	Nut: Bolt X
W1605FS-1-C3T5	458	16	5	3.175	16.5	2.5×1	7330 {745}	13500 {1380}	0.005	40	63	40	55	11	42	51	5.5
W1609FS-1-C3T5	858																
W1606FS-1-C5T16	544	16	16	3.175	16.75	1.5×1	4710 {480}	8110 {825}	0.005	34	57	34	50	12	56	45	5.5
W1611FS-1-C5T16	1044																
W2009FS-1-C5T10	846	20	10	3.969	21	2.5×1	10900 {1110}	21700 {2210}	0.005	46	74	46	66	13	54	59	6.6
W2013FS-1-C5T10	1246																
W2010FS-1-C5T20	937	20	20	3.969	21	1.5×1	7040 {720}	12700 {1290}	0.005	46	74	46	66	13	63	59	6.6
W2015FS-1-C5T20	1437																

dimensions: hole Y	hole Z	Projecting tube U	Projecting tube V	Projecting tube R	Oil hole Q	Oil hole T	Screw shaft dimensions: Threaded length L_t	Shaft end, right d_2	Shaft end, right L_u	Shaft end, right L_1	Shaft end, right L_2	Shaft end, left d_3	Shaft end, left L_3	Overall length L_0	Lead accuracy T	Run out: Deviation e_p	Run out: Variation v_u	Run out: Shaft straightness I	Run out: Nut O.D. eccentricity J	Run out: Flange perpendicularity K	Permissible rotational speed N(rpm)
9.5	5.5	—	—	—	M6×1	17	500	16.2	5	40	150	13.2	60	710	0	0.015	0.010	0.055	0.012	0.008	3000
							900							1110		0.021	0.015	0.095			
9.5	5.5	19	20	8	M6×1	17	600	16.2	10	40	150	13.4	60	810	0	0.030	0.023	0.085	0.015	0.011	3000
							1100							1310		0.046	0.030	0.150			
11	6.5	—	—	—	M6×1	24	900	20.2	10	60	150	16.9	80	1130	0	0.040	0.027	0.110	0.015	0.011	3000
							1300							1530		0.054	0.035	0.150			
11	6.5	—	—	—	M6×1	24	1000	20.2	13	60	150	16.9	80	1230	0	0.040	0.027	0.110	0.015	0.011	3000
							1500							1730		0.054	0.035	0.200			

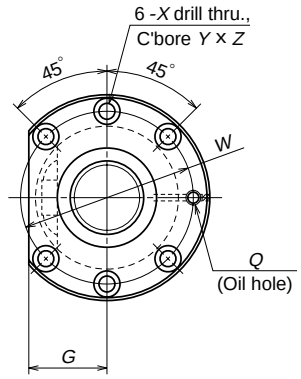
Remarks: 1. NSK support unit is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

ϕ20 x 4, ϕ20 x 5

Standard stock



Nut type code: PFT



View X-X

B 200

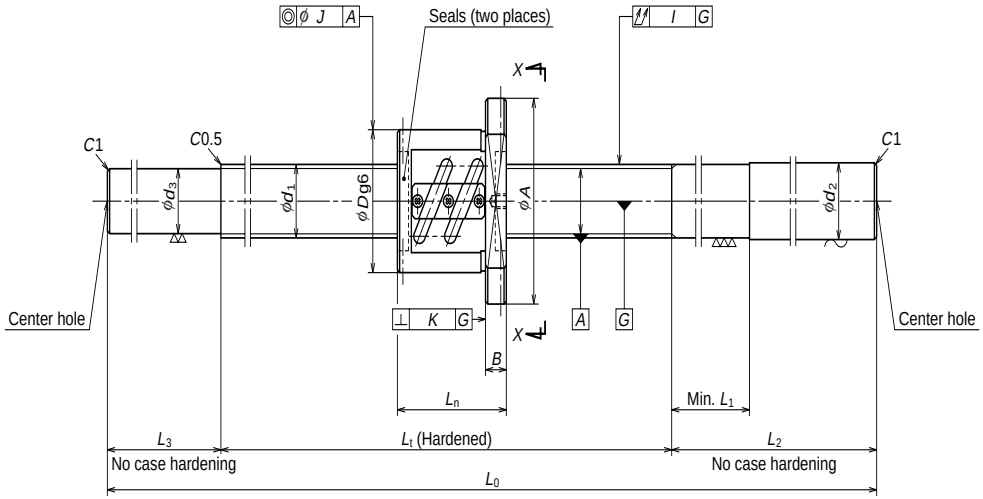
Unit: mm

Ball screw No.	Stroke Max. L_t-L_n	Screw shaft dia. d_1	Lead l	Ball dia. D_w	Ball circle dia. d_m	Effective ball turns Turns × Circuits	Basic load rating N {kgf} Dynamic C_a	Basic load rating N {kgf} Dynamic C_a	Preload N {kgf}	Friction torque, median N·cm {kgf·cm}	Nut Outside dia. D	Nut Flange A	Nut Flange G	Nut Flange B	Nut Overall length L_n
W2003SS-1P-C5Z4	251	20	4	2.381	20.3	2.5×2	5420 {550}	10700 {1090}	290 {30}	3.9 {0.4}	40	63	24	11	49
W2005SS-1P-C5Z4	451														
W2008SS-1P-C5Z4	751														
W2003SS-2P-C5Z5	244	20	5	3.175	20.5	2.5×2	9410 {960}	17100 {1750}	490 {50}	7.8 {0.8}	44	67	26	11	56
W2005SS-2P-C5Z5	444														
W2007SS-1P-C5Z5	644														
W2010SS-1P-C5Z5	944														

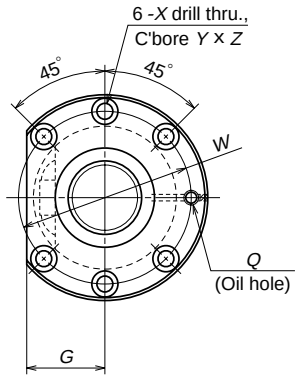
dimensions: Bolt hole W	X	Y	Z	Oil hole Q	Screw shaft dimensions: Threaded length L_t	Shaft end, right d_2	L_1	L_2	Shaft end, left d_3	L_3	Overall length L_0	Lead accuracy: Travel compensation T	Deviation e_p	Variation v_u	Run out: Shaft straightness I	Nut O.D. eccentricity J	Flange perpendicularity K	Permissible rotational speed N(rpm)
51	5.5	9.5	5.5	M6×1	300	20.2	40	150	17.8	—	450	-0.007	0.023	0.018	0.055	0.015	0.011	3000
					500			150		50	700	-0.012	0.027	0.020	0.085			
					800			200		100	1100	-0.019	0.035	0.025	0.140			
55	5.5	9.5	5.5	M6×1	300	20.2	40	150	17.2	—	450	-0.007	0.023	0.018	0.055	0.015	0.011	3000
					500			150		50	700	-0.012	0.027	0.020	0.085			
					700			200		100	1000	-0.017	0.035	0.025	0.110			
					1000			200		100	1300	-0.024	0.040	0.027	0.180			

Remarks: 1. NSK support unit is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

ϕ25x4, ϕ25x5, ϕ25x6



Nut type code: PFT



View X-X

Unit: mm

Ball screw No.	Stroke Max. L_t-L_n	Screw shaft dia. d_1	Lead l	Ball dia. D_w	Ball circle dia. d_m	Effective ball turns: Turns × Circuits	Basic load rating N {kgf}: Dynamic C_a	Basic load rating N {kgf}: Static C_{0a}	Preload N {kgf}	Friction torque, median N·cm {kgf·cm}	Nut: Outside dia. D	Nut: Flange A	Nut: Flange G	Nut: Flange B	Nut: Overall length L_n
W2503SS-1P-C5Z4	252	25	4	2.381	25.3	2.5×2	6020 {615}	13600 {1390}	290 {30}	4.9 {0.5}	46	69	26	11	48
W2506SS-1P-C5Z4	552														
W2510SS-1P-C5Z4	952														
W2503SS-2P-C5Z5	245	25	5	3.175	25.5	2.5×2	10400 {1070}	21900 {2230}	540 {55}	8.8 {0.9}	50	73	28	11	55
W2505SS-1P-C5Z5	445														
W2508SS-1P-C5Z5	745														
W2512SS-1P-C5Z5	1145														
W2504SS-1P-C5Z6	338	25	6	3.969	25.5	2.5×2	14100 {1430}	26800 {2730}	690 {70}	13.8 {1.4}	53	76	29	11	62
W2508SS-2P-C5Z6	738														
W2512SS-2P-C5Z6	1138														

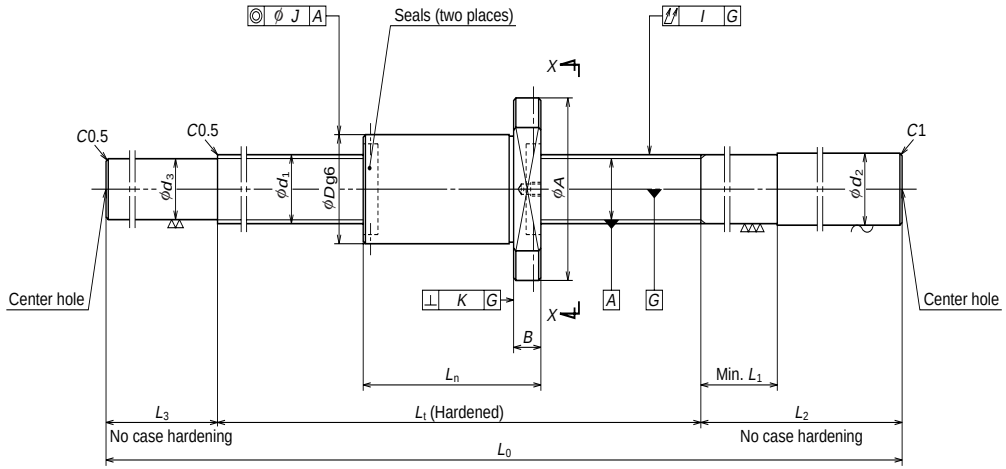
Bolt hole: W	Bolt hole: X	Bolt hole: Y	Bolt hole: Z	Oil hole Q	Screw shaft dimensions: Threaded length L_t	Shaft end, right: d_2	Shaft end, right: L_1	Shaft end, right: L_2	Shaft end, left: d_3	Shaft end, left: L_3	Overall length L_0	Lead accuracy: Travel compensation T	Lead accuracy: Deviation e_p	Lead accuracy: Variation v_u	Run out: Shaft straightness I	Run out: Nut O.D. eccentricity J	Run out: Flange perpendicularity K	Permissible rotational speed N(rpm)
57	5.5	9.5	5.5	M6×1	300	25.2	40	150	22.8	—	450	-0.007	0.023	0.018	0.040	0.015	0.011	2760
					600			200		100	900	-0.014	0.030	0.023	0.075			
					1000			200		100	1300	-0.024	0.040	0.027	0.120			
61	5.5	9.5	5.5	M6×1	300	25.2	40	200	22.2	—	500	-0.007	0.023	0.018	0.040	0.015	0.011	2740
					500			200		50	750	-0.012	0.027	0.020	0.060			
					800			250		100	1150	-0.019	0.035	0.025	0.090			
					1200			300		100	1600	-0.029	0.046	0.030	0.120			
64	5.5	9.5	5.5	M6×1	400	25.2	40	200	21.4	—	600	-0.010	0.025	0.020	0.050	0.019	0.013	2740
					800			250		100	1150	-0.019	0.035	0.025	0.090			
					1200			300		100	1600	-0.029	0.046	0.030	0.120			

Remarks: 1. NSK support unit is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

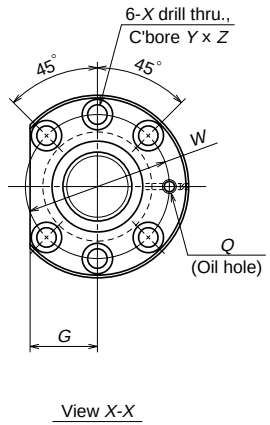
NSK

ϕ25 x 5, ϕ25 x 10

Standard stock



Nut type code: ZFD



View X-X

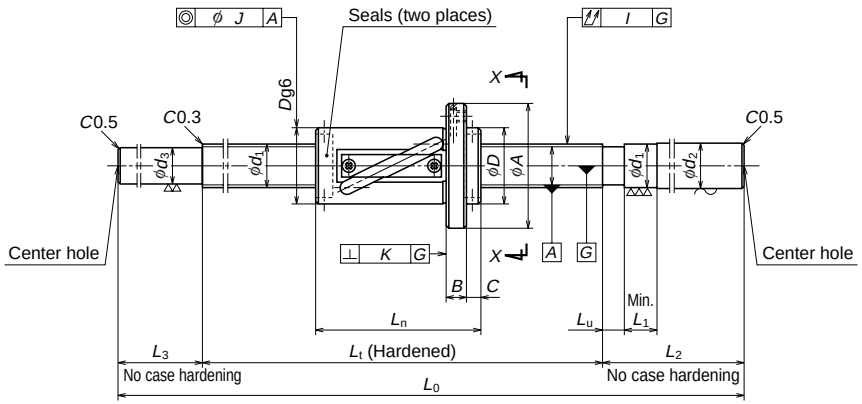
Unit: mm

Ball screw No.	Stroke Max. L_t-L_n	Screw shaft dia. d_1	Lead l	Ball dia. D_w	Ball circle dia. d_m	Effective ball turns: Turns × Circuits	Basic load rating N {kgf}: Dynamic C_a	Basic load rating N {kgf}: Static C_{0a}	Preload N {kgf}	Friction torque, median N·cm {kgf·cm}	Nut: Outside dia. D	Nut: Flange A	Nut: Flange G	Nut: Flange B	Nut: Overall length L_n
W2502SS-1ZY-C5Z5	184	25	5	3.175	25.75	1×3	9790 {1000}	22900 {2340}	740 {75}	13.8 {1.4}	40	63	24	11	66
W2504SS-3ZY-C5Z5	334														
W2506SS-2ZY-C5Z5	534														
W2509SS-1ZY-C5Z5	834														
W2512SS-3ZY-C5Z5	1134														
W2504SS-4ZY-C5Z10	312	25	10	4.762	26.25	1×2	11400 {1160}	21400 {2180}	880 {90}	21.5 {2.2}	42	69	26	15	88
W2506SS-3ZY-C5Z10	512														
W2508SS-3ZY-C5Z10	712														
W2511SS-1ZY-C5Z10	1012														
W2515SS-2ZY-C5Z10	1412														

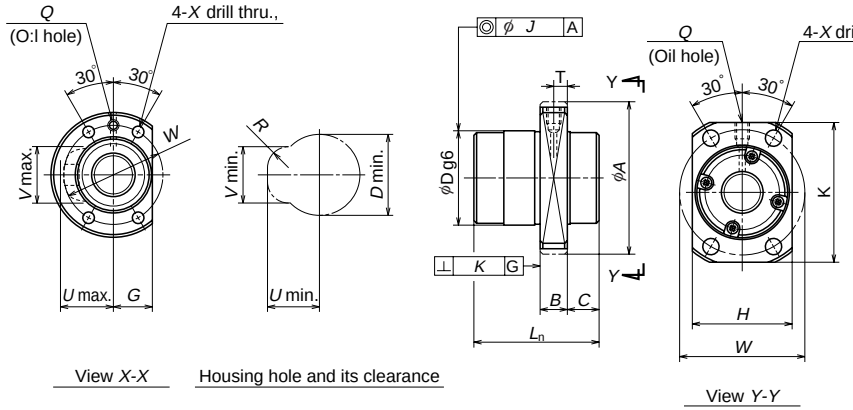
dimensions: Bolt hole W	X	Y	Z	Oil hole Q	Screw shaft dimensions: Threaded length L_t	Shaft end, right d_2	L_1	L_2	Shaft end, left d_3	L_3	Overall length L_0	Lead accuracy: Travel compensation T	Deviation e_p	Variation v_u	Run out: Shaft straightness I	Nut O.D. eccentricity J	Flange perpendicularity K	Permissible rotational speed N(rpm)
51	5.5	9.5	5.5	M6×1	250	25.2	40	200	22.4	—	450	-0.005	0.023	0.018	0.040	0.015	0.011	2710
					400			200		50	650	-0.009	0.025	0.020	0.060			
					600			250		100	950	-0.013	0.030	0.023	0.075			
					900			250		100	1250	-0.021	0.040	0.027	0.090			
					1200			300		100	1600	-0.028	0.046	0.030	0.120			
55	6.6	11	6.5	M6×1	400	25.2	60	200	21.3	50	650	-0.008	0.025	0.020	0.060	0.015	0.011	2660
					600			250		100	950	-0.012	0.030	0.023	0.075			
					800			250		100	1150	-0.017	0.035	0.025	0.090			
					1100			300		100	1500	-0.024	0.046	0.030	0.120			
					1500			300		100	1900	-0.034	0.054	0.035	0.150			

Remarks: 1. NSK support unit is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

ϕ25 x 20, ϕ25 x 25, ϕ25 x 50



Nut type code: LSFT



Nut type code: USFC

Unit: mm

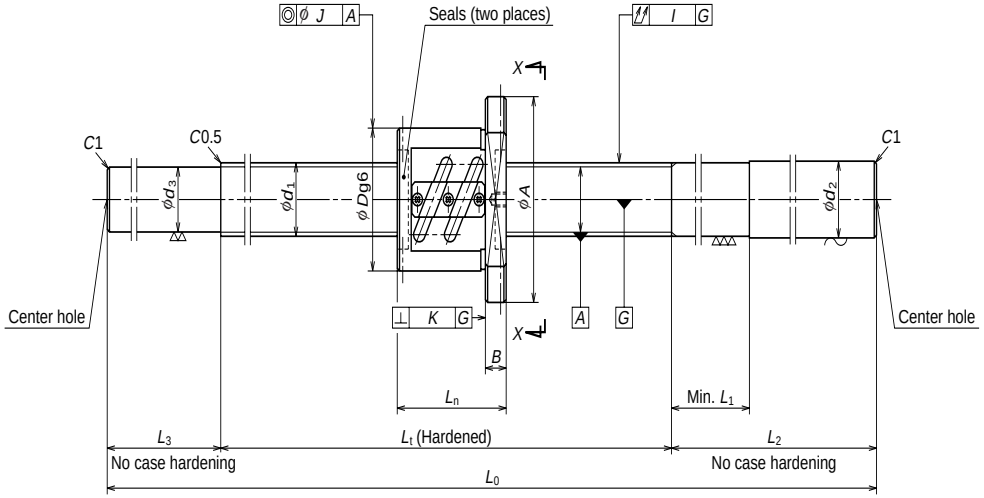
Ball screw No.	Stroke Max. L_t-L_n	Screw shaft dia. d_1	Lead l	Ball dia. D_w	Ball circle dia. d_m	Effective ball turns: Turns × Circuits	Basic load rating N {kgf}: Dynamic C_a	Basic load rating N {kgf}: Static C_{0a}	Axial play Max.	Nut: Nut type code	Nut: Outside dia. D	Nut: Flange A	Nut: Flange G	Nut: Flange H	Nut: Flange K	Nut: Flange B	Nut: Flange C	Nut: Overall length L_n
W2513FS-1-C5T20	1254	25	20	4.762	26.25	2.5×1	15700 {1600}	32800 {3350}	0.005	LSFT	44	71	23	—	—	12	8	96
W2521FS-1-C5T20	2054																	
W2513FS-2-C5T25	1260	25	25	4.762	26.25	1.5×1	10100 {1030}	19100 {1950}	0.005	LSFT	44	71	23	—	—	12	10	90
W2521FS-2-C5T25	2060																	
W2515FS-1GX-C5T50	1450	25	50	3.969	26	0.7×2	6700 {685}	13500 {1380}	0.005	USFC	46	70	—	48	63	12	13	50
W2521FS-3GX-C5T50	2100																	

dimensions: Bolt hole W	X	Projecting tube U	V	R	Oil hole Q	T	Screw shaft dimensions: Threaded length L_t	Shaft end, right d_2	L_u	L_1	L_2	Shaft end, left d_3	L_3	Overall length L_0	Lead accuracy: T	Deviation e_p	Variation v_u	Run out: Shaft straightness I	Nut O.D. eccentricity J	Flange perpendicularity K	Permissible rotational speed dm·n N(rpm)
57	6.6	31	35	12	M6×1	—	1350	25.2	13	70	200	21.3	100	1650	0	0.054	0.035	0.120	0.015	0.011	2660
							2150							2450		0.077	0.046	0.160			
57	6.6	32	34	12	M6×1	—	1350	25.2	15	70	200	21.3	100	1650	0	0.054	0.035	0.120	0.015	0.011	2660
							2150							2450		0.077	0.046	0.160			
58	6.6	—	—	—	M6×1	6	1500	25.2	26	70	200	21.9	100	1800	0	0.054	0.035	0.120	0.015	0.011	2690
							2150							2450		0.077	0.046	0.160			

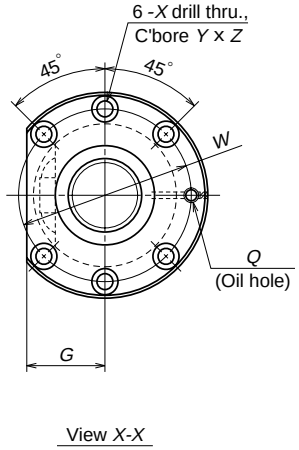
Remarks: 1. NSK support unit is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

ϕ25 x 10, ϕ28 x 5, ϕ28 x 6

Standard stock



Nut type code: PFT



View X-X

Unit: mm

Ball screw No.	Stroke Max. L_t-L_n	Screw shaft dia. d_1	Lead l	Ball dia. D_w	Ball circle dia. d_m	Effective ball turns: Turns × Circuits	Basic load rating N {kgf}: Dynamic C_a	Basic load rating N {kgf}: Static C_{0a}	Preload N {kgf}	Friction torque, median N·cm {kgf·cm}	Nut: Outside dia. D	Nut: Flange A	Nut: Flange G	Nut: Flange B	Nut: Overall length L_n
W2504SS-2P-C5Z10	319	25	10	4.762	25.5	1.5×2	11600 {1190}	19000 {1940}	590 {60}	13.8 {1.4}	58	85	32	15	81
W2507SS-1P-C5Z10	619														
W2510SS-2P-C5Z10	919														
W2515SS-1P-C5Z10	1419														
W2804SS-1P-C5Z5	344	28	5	3.175	28.5	2.5×2	11000 {1120}	24400 {2490}	540 {55}	9.8 {1.0}	55	85	31	12	56
W2806SS-1P-C5Z5	544														
W2808SS-1P-C5Z5	744														
W2812SS-1P-C5Z5	1144														
W2804SS-3P-C5Z6	337	28	6	3.175	28.5	2.5×2	11000 {1120}	24400 {2490}	540 {55}	10.8 {1.1}	55	85	31	12	63
W2806SS-3P-C5Z6	537														
W2808SS-3P-C5Z6	737														
W2812SS-3P-C5Z6	1137														

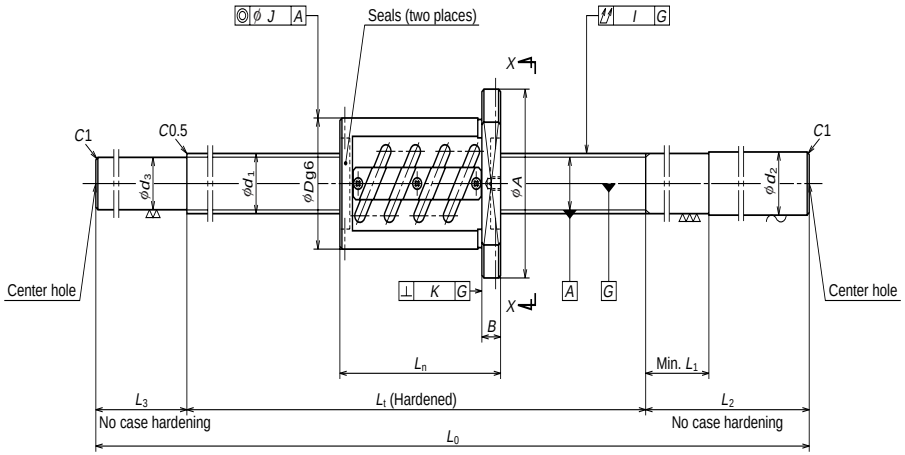
dimensions: Bolt hole W	X	Y	Z	Oil hole Q	Screw shaft dimensions: Threaded length L_t	Shaft end, right d_2	L_1	L_2	Shaft end, left d_3	L_3	Overall length L_0	Lead accuracy: Travel compensation T	Deviation e_p	Variation v_u	Run out: Shaft straightness I	Nut O.D. eccentricity J	Flange perpendicularity K	Permissible rotational speed dm·n N(rpm)
71	6.6	11	6.5	M6×1	400	25.2	60	200	20.5	50	650	–0.010	0.025	0.020	0.060	0.019	0.013	2740
					700			250		100	1050	–0.017	0.035	0.025	0.090			
					1000			250		100	1350	–0.024	0.040	0.027	0.120			
					1500			300		100	1900	–0.036	0.054	0.035	0.150			
69	6.6	11	6.5	M6×1	400	28.2	40	200	25.2		600	–0.010	0.025	0.020	0.050	0.019	0.013	2450
					600			250		100	950	–0.014	0.030	0.023	0.075			
					800			250		100	1150	–0.019	0.035	0.025	0.090			
					1200			300		100	1600	–0.029	0.046	0.030	0.120			
69	6.6	11	6.5	M6×1	400	28.2	40	200	25.2		600	–0.010	0.025	0.020	0.050	0.019	0.013	2450
					600			250		100	950	–0.014	0.030	0.023	0.075			
					800			250		100	1150	–0.019	0.035	0.025	0.090			
					1200			300		100	1600	–0.029	0.046	0.030	0.120			

Remarks: 1. NSK support unit is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

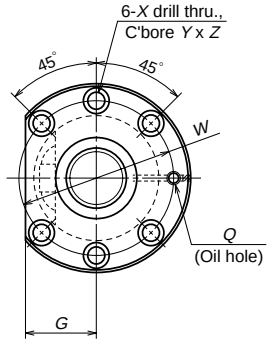
NSK

ϕ28 x 5, ϕ28 x 6

Standard stock



Nut type code: ZFT



View X-X

B 210

Unit: mm

Ball screw No.	Stroke Max. L_t-L_n	Screw shaft dia. d_1	Lead l	Ball dia. D_w	Ball circle dia. d_m	Effective ball turns Turns × Circuits	Basic load rating N {kgf} Dynamic C_a	Basic load rating N {kgf} Static C_{0a}	Preload N {kgf}	Friction torque, median N·cm {kgf·cm}	Nut Outside dia. D	Nut Flange A	Nut Flange G	Nut Flange B	Nut Overall length L_n
W2804SS-2Z-C5Z5	314	28	5	3.175	28.5	2.5×2	17400 {1780}	48800 {4980}	1225 {125}	21.5 {2.2}	55	85	31	12	86
W2806SS-2Z-C5Z5	514														
W2808SS-2Z-C5Z5	714														
W2812SS-2Z-C5Z5	1114														
W2804SS-4Z-C5Z6	301	28	6	3.175	28.5	2.5×2	17400 {1780}	48800 {4980}	1225 {125}	22.5 {2.3}	55	85	31	12	99
W2806SS-4Z-C5Z6	501														
W2808SS-4Z-C5Z6	701														
W2812SS-4Z-C5Z6	1101														

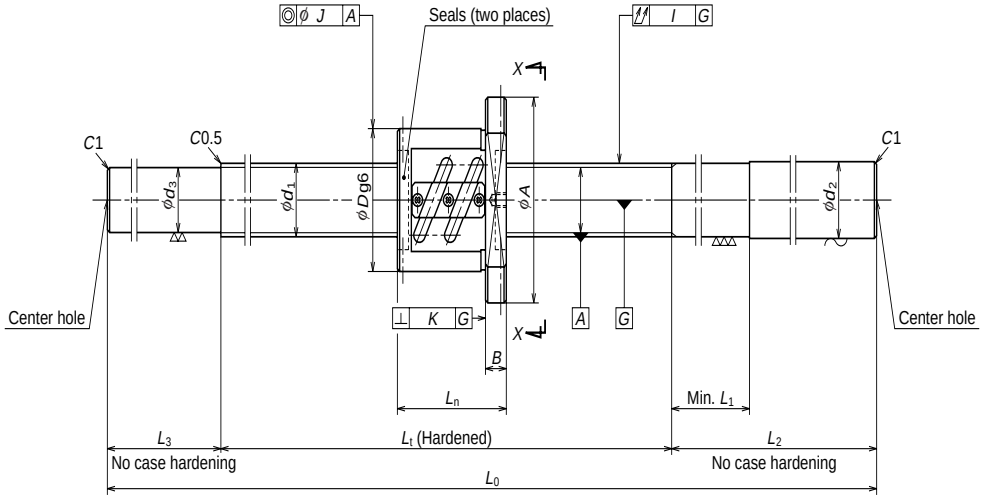
Remarks: 1. NSK support unit is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

dimensions Bolt hole W	X	Y	Z	Oil hole Q	Screw shaft dimensions Threaded length L_t	Shaft end, right d_2	L_1	L_2	Shaft end, left d_3	L_3	Overall length L_0	Lead accuracy Travel compensation T	Deviation e_p	Variation v_u	Run out Shaft straightness I	Nut O.D. eccentricity J	Flange perpendicularity K	Permissible rotational speed dm·n N(rpm)
69	6.6	11	6.5	M6×1	400	28.2	40	200	25.2	—	600	–0.010	0.025	0.020	0.050	0.019	0.013	2450
					600			250		100	950	–0.014	0.030	0.023	0.075			
					800			250		100	1150	–0.019	0.035	0.025	0.090			
					1200			300		100	1600	–0.029	0.046	0.030	0.120			
69	6.6	11	6.5	M6×1	400	28.2	40	200	25.2	—	600	–0.010	0.025	0.020	0.050	0.019	0.013	2450
					600			250		100	950	–0.014	0.030	0.023	0.075			
					800			250		100	1150	–0.019	0.035	0.025	0.090			
					1200			300		100	1600	–0.029	0.046	0.030	0.120			

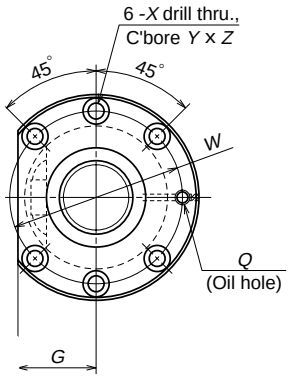
NSK

ϕ32 x 5, ϕ32 x 6

Standard stock



Nut type code: PFT



View X-X

Unit: mm

Ball screw No.	Stroke Max. L_t-L_n	Screw shaft dia. d_1	Lead l	Ball dia. D_w	Ball circle dia. d_m	Effective ball turns Turns × Circuits	Basic load rating N {kgf} Dynamic C_a	Basic load rating N {kgf} Static C_{0a}	Preload N {kgf}	Friction torque, median N·cm {kgf·cm}	Nut Outside dia. D	Nut Flange A	Nut Flange G	Nut Flange B	Nut Overall length L_n
W3204SS-1P-C5Z5	344	32	5	3.175	32.5	2.5×2	11600 {1190}	28000 {2860}	590 {60}	10.8 {1.1}	58	85	32	12	56
W3206SS-1P-C5Z5	544														
W3208SS-1P-C5Z5	744														
W3212SS-1P-C5Z5	1144														
W3215SS-1P-C5Z5	1444														
W3206SS-3P-C5Z6	537	32	6	3.969	32.5	2.5×2	15500 {1580}	34700 {3540}	780 {80}	15.6 {1.6}	62	89	34	12	63
W3210SS-1P-C5Z6	937														
W3215SS-3P-C5Z6	1437														

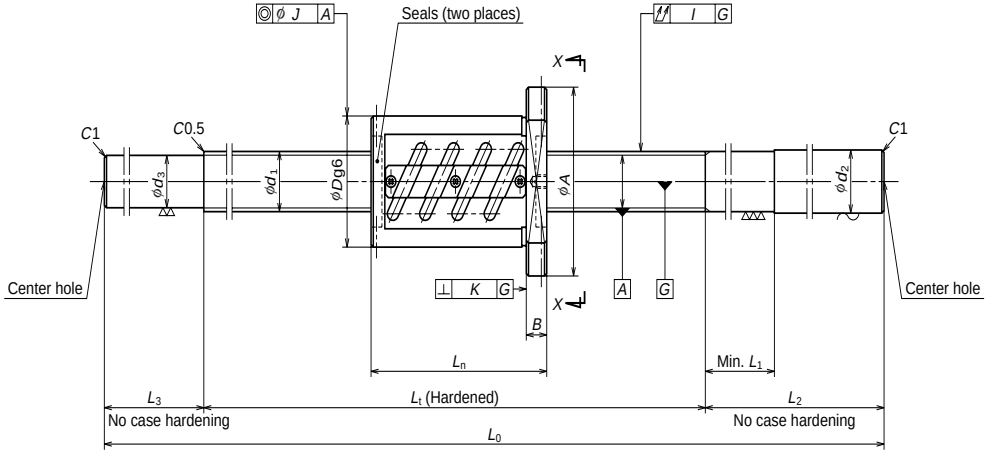
dimensions Bolt hole W	X	Y	Z	Oil hole Q	Screw shaft dimensions Threaded length L_t	Shaft end, right d_2	L_1	L_2	Shaft end, left d_3	L_3	Overall length L_0	Lead accuracy Travel compensation T	Deviation e_p	Variation v_u	Run out Shaft straightness I	Nut O.D. eccentricity J	Flange perpendicularity K	Permissible rotational speed dm·n N(rpm)
71	6.6	11	6.5	M6×1	400	32.3	40	200	29.2	50	650	-0.010	0.025	0.020	0.060	0.019	0.013	2150
					600			250		100	950	-0.014	0.030	0.023	0.075			
					800			250		100	1150	-0.019	0.035	0.025	0.090			
					1200			300		100	1600	-0.029	0.046	0.030	0.120			
					1500			300		100	1900	-0.036	0.054	0.035	0.150			
75	6.6	11	6.5	M6×1	600	32.3	40	250	28.4	100	950	-0.014	0.030	0.023	0.075	0.019	0.013	2150
					1000			300			1400	-0.024	0.040	0.027	0.120			
					1500			300			1900	-0.036	0.054	0.035	0.150			

Remarks: 1. NSK support unit is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

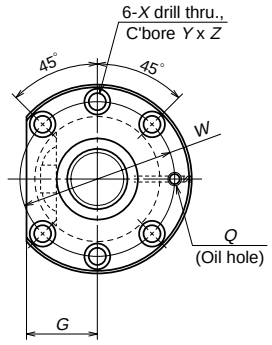
NSK

ϕ32 x 5, ϕ32 x 6, ϕ32 x 8

Standard stock



Nut type code: ZFT



View X-X

Unit: mm

Ball screw No.	Stroke Max. L_t-L_n	Screw shaft dia. d_1	Lead l	Ball dia. D_w	Ball circle dia. d_m	Effective ball turns: Turns × Circuits	Basic load rating N {kgf}: Dynamic C_a	Basic load rating N {kgf}: Static C_{0a}	Preload N {kgf}	Friction torque, median N·cm {kgf·cm}	Nut: Outside dia. D	Nut: Flange A	Nut: Flange G	Nut: Flange B	Nut: Overall length L_n
W3204SS-2Z-C5Z5	314	32	5	3.175	32.5	2.5×2	18500 {1880}	56100 {5720}	1270 {130}	22.5 {2.3}	58	85	32	12	86
W3206SS-2Z-C5Z5	514														
W3208SS-2Z-C5Z5	714														
W3212SS-2Z-C5Z5	1114														
W3215SS-2Z-C5Z5	1414														
W3206SS-4Z-C5Z6	501	32	6	3.969	32.5	2.5×2	24700 {2520}	69400 {7080}	1720 {175}	34.5 {3.5}	62	89	34	12	99
W3210SS-2Z-C5Z6	901														
W3215SS-4Z-C5Z6	1401														
W3206SS-5Z-C5Z8	518	32	8	4.762	32.5	2.5×1	7500 {1780}	41000 {4180}	1320 {135}	30.5 {3.1}	66	100	38	15	82
W3210SS-3Z-C5Z8	918														
W3215SS-5Z-C5Z8	1418														

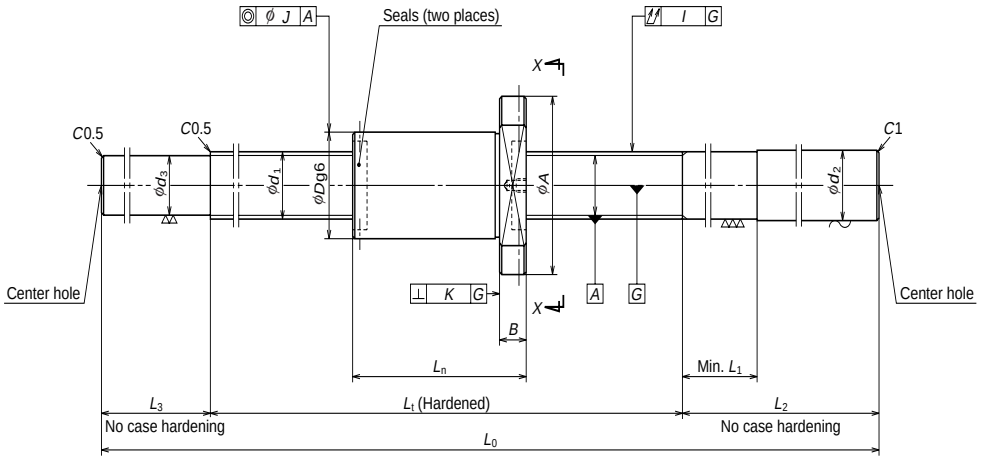
dimensions: Bolt hole W	X	Y	Z	Oil hole Q	Screw shaft dimensions: Threaded length L_t	Shaft end, right d_2	L_1	L_2	Shaft end, left d_3	L_3	Overall length L_0	Lead accuracy: Travel compensation T	Deviation e_p	Variation v_u	Run out: Shaft straightness I	Nut O.D. eccentricity J	Flange perpendicularity K	Permissible rotational speed dm·n N(rpm)
71	6.6	11	6.5	M6×1	400	32.3	40	200	29.2	50	650	-0.010	0.025	0.020	0.060	0.019	0.013	2150
					600			250		100	950	-0.014	0.030	0.023	0.075			
					800			250		100	1150	-0.019	0.035	0.025	0.090			
					1200			300		100	1600	-0.029	0.046	0.030	0.120			
					1500			300		100	1900	-0.036	0.054	0.035	0.150			
75	6.6	11	6.5	M6×1	600	32.3	40	250	28.4	100	950	-0.014	0.030	0.023	0.075	0.019	0.013	2150
					1000			300			1400	-0.024	0.040	0.027	0.120			
					1500			300			1900	-0.036	0.054	0.035	0.150			
82	9	14	8.5	M6×1	600	32.3	50	250	27.5	100	950	-0.014	0.030	0.023	0.075	0.019	0.013	2150
					1000			300			1400	-0.024	0.040	0.027	0.120			
					1500			300			1900	-0.036	0.054	0.035	0.150			

Remarks: 1. NSK support unit is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

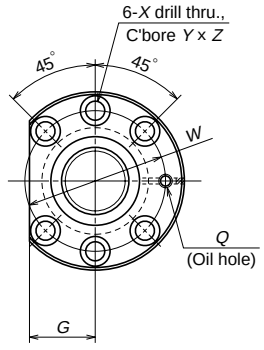
NSK

ϕ32 x 5, ϕ32 x 10

Standard stock



Nut type code: ZFD



View X-X

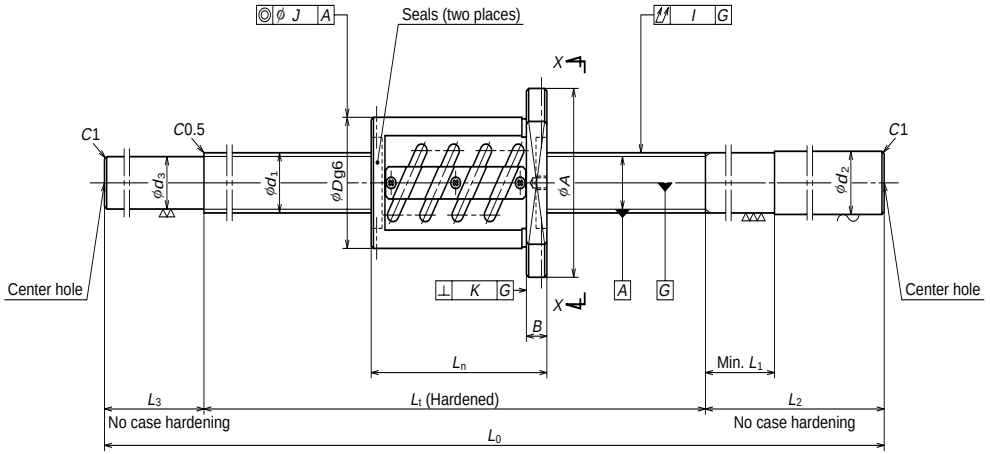
Unit: mm

Ball screw No.	Stroke Max. L_t-L_n	Screw shaft dia. d_1	Lead l	Ball dia. D_w	Ball circle dia. d_m	Effective ball turns: Turns × Circuits	Basic load rating N {kgf}: Dynamic C_a	Basic load rating N {kgf}: Static C_{0a}	Preload N {kgf}	Friction torque, median N·cm {kgf·cm}	Nut: Outside dia. D	Nut: Flange A	Nut: Flange G	Nut: Flange B	Nut: Overall length L_n
W3204SS-3ZY-C5Z5	323	32	5	3.175	32.75	4	14200 {1450}	40700 {4150}	1080 {110}	19.6 {2.0}	48	75	29	12	77
W3206SS-6ZY-C5Z5	523														
W3209SS-1ZY-C5Z5	823														
W3212SS-3ZY-C5Z5	1123														
W3216SS-1ZY-C5Z5	1523														
W3205SS-3ZY-C5Z10	380	32	10	6.35	33.75	3	25900 {2640}	52800 {5380}	1860 {190}	49.0 {5.0}	54	88	34	15	120
W3207SS-3ZY-C5Z10	580														
W3210SS-6ZY-C5Z10	880														
W3214SS-3ZY-C5Z10	1280														
W3218SS-3ZY-C5Z10	1680														

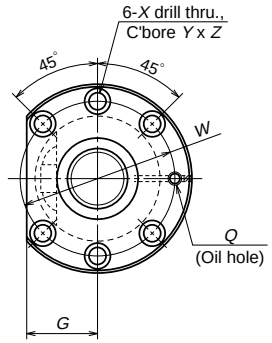
dimensions: Bolt hole W	X	Y	Z	Oil hole Q	Screw shaft dimensions: Threaded length L_t	Shaft end, right d_2	Shaft end, right L_1	Shaft end, right L_2	Shaft end, left d_3	Shaft end, left L_z	Overall length L_0	Lead accuracy: Travel compensation T	Lead accuracy: Deviation e_p	Lead accuracy: Variation v_u	Run out: Shaft straightness I	Run out: Nut O.D. eccentricity J	Run out: Flange perpendicularity K	Permissible rotational speed dm·n N(rpm)
61	6.6	11	6.5	M6×1	400	32.3	40	200	29.4	50	650	-0.009	0.025	0.020	0.060	0.015	0.011	2130
					600			250		100	950	-0.013	0.030	0.023	0.075			
					900			250		100	1250	-0.021	0.040	0.027	0.090			
					1200			300		100	1600	-0.028	0.046	0.030	0.120			
					1600			300		100	2000	-0.037	0.054	0.035	0.150			
70	9	14	8.5	M6×1	500	32.3	60	250	27.1	100	850	-0.010	0.027	0.020	0.075	0.019	0.013	2070
					700			250		100	1050	-0.015	0.035	0.025	0.090			
					1000			300		100	1400	-0.022	0.040	0.027	0.120			
					1400			350		120	1870	-0.032	0.054	0.035	0.150			
					1800			350		120	2270	-0.041	0.065	0.040	0.200			

Remarks: 1. NSK support unit is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

ϕ32 x 10, ϕ36 x 10, ϕ40 x 5



Nut type code: ZFT



View X-X

Standard stock

Unit: mm

Ball screw No.	Stroke Max. L_t-L_n	Screw shaft dia. d_1	Lead l	Ball dia. D_w	Ball circle dia. d_m	Effective ball turns Turns × Circuits	Basic load rating N {kgf} Dynamic C_a	Basic load rating N {kgf} Static C_{0a}	Preload N {kgf}	Friction torque, median N·cm {kgf·cm}	Nut Outside dia. D	Nut Flange A	Nut Flange G	Nut Flange B	Nut Overall length L_n
W3205SS-1Z-C5Z10	400	32	10	6.350	33	2.5×1	25500 {2600}	54000 {5510}	1960 {200}	50 {5.1}	74	108	41	15	100
W3207SS-1Z-C5Z10	600														
W3210SS-4Z-C5Z10	900														
W3214SS-1Z-C5Z10	1300														
W3218SS-1Z-C5Z10	1700														
W3607SS-1Z-C5Z10	597	36	10	6.350	37	2.5×1	27200 {2770}	61300 {6250}	2060 {210}	56 {5.7}	75	120	45	18	103
W3612SS-1Z-C5Z10	1097														
W3620SS-1Z-C5Z10	1897														
W4006SS-1Z-C5Z5	511	40	5	3.175	40.5	2.5×2	20200 {2060}	70600 {7200}	1420 {145}	28.5 {2.9}	67	101	39	15	89
W4010SS-1Z-C5Z5	911														
W4016SS-1Z-C5Z5	1511														

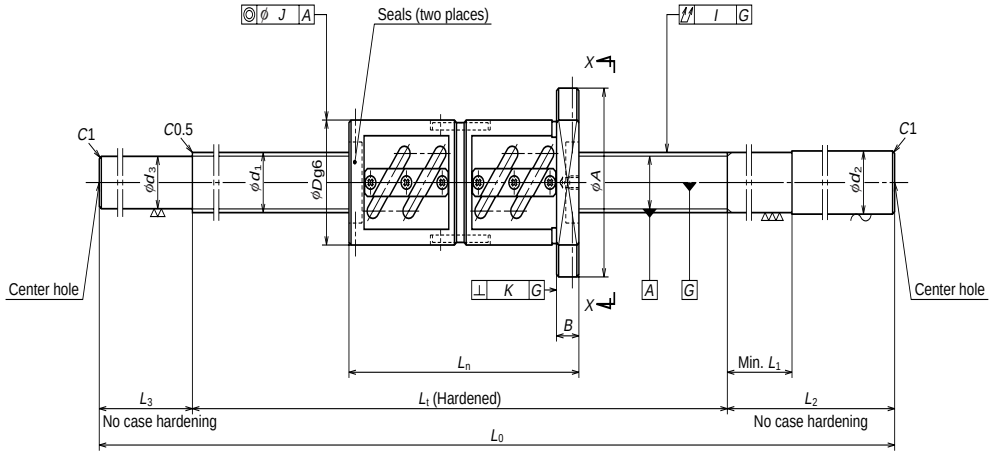
dimensions Bolt hole W	X	Y	Z	Oil hole Q	Screw shaft dimensions Threaded length L_t	Shaft end, right d_2	L_1	L_2	Shaft end, left d_3	L_3	Overall length L_0	Lead accuracy Travel compensation T	Deviation e_p	Variation v_u	Run out Shaft straightness I	Nut O.D. eccentricity J	Flange perpendicularity K	Permissible rotational speed dm·n N(rpm)
90	9	14	8.5	M6×1	500	32.3	60	250	26.4	100	850	-0.012	0.027	0.020	0.075	0.019	0.013	2120
					700			250		100	1050	-0.017	0.035	0.025	0.090			
					1000			300		100	1400	-0.024	0.040	0.027	0.120			
					1400			350		120	1870	-0.034	0.054	0.035	0.150			
					1800			350		120	2270	-0.043	0.065	0.040	0.200			
98	11	17.5	11	M6×1	700	36.3	60	300	30.4	100	1100	-0.017	0.035	0.025	0.065	0.019	0.013	1890
					1200			350		120	1670	-0.029	0.046	0.030	0.100			
					2000			350		120	2470	-0.048	0.065	0.040	0.130			
83	9	14	8.5	PT1/8	600	40.3	50	300	37.2	100	1000	-0.014	0.030	0.023	0.050	0.019	0.013	1720
					1000			300			1400	-0.024	0.040	0.027	0.080			
					1600			350			2050	-0.038	0.054	0.035	0.130			

Remarks: 1. NSK support unit is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

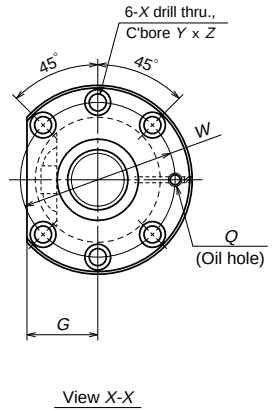
NSK

ϕ32 x 10, ϕ36 x 10

Standard stock



Nut type code: DFT



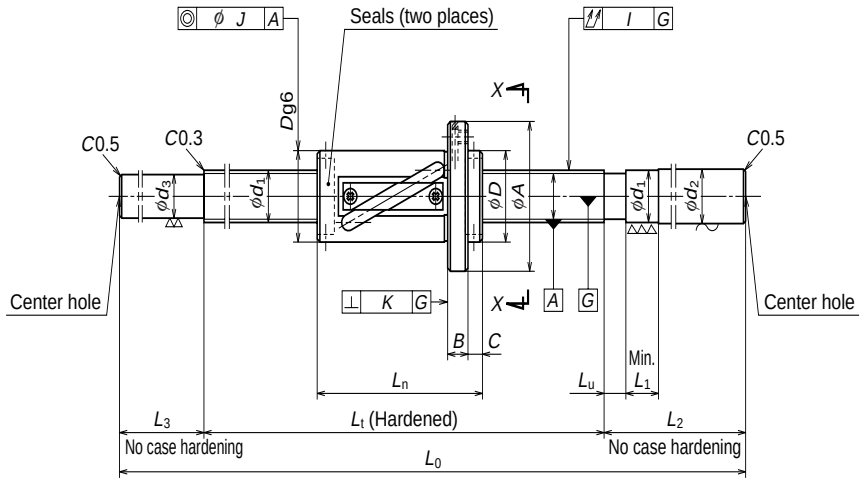
View X-X

Unit: mm

Ball screw No.	Stroke Max. L_t-L_n	Screw shaft dia. d_1	Lead l	Ball dia. D_w	Ball circle dia. d_m	Effective ball turns: Turns × Circuits	Basic load rating N {kgf}: Dynamic C_a	Basic load rating N {kgf}: Static C_{0a}	Preload N {kgf}	Friction torque, median N·cm {kgf·cm}	Nut: Outside dia. D	Nut: Flange A	Nut: Flange G	Nut: Flange B	Nut: Overall length L_n
W3205SS-2D-C5Z10	310	32	10	6.350	33	2.5×2	46300 {4720}	108000 {11000}	3240 {330}	83 {8.5}	74	108	41	15	190
W3207SS-2D-C5Z10	510														
W3210SS-5D-C5Z10	810														
W3214SS-2D-C5Z10	1210														
W3218SS-2D-C5Z10	1610														
W3607SS-2D-C5Z10	507	36	10	6.350	37	2.5×2	49300 {5030}	123000 {12500}	3430 {350}	93 {9.5}	75	120	45	18	193
W3620SS-2D-C5Z10	1807														

Remarks: 1. NSK support unit is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

dimensions: Bolt hole W	X	Y	Z	Oil hole Q	Screw shaft dimensions: Threaded length L_t	Shaft end, right d_2	L_1	L_2	Shaft end, left d_3	L_3	Overall length L_0	Lead accuracy: Travel compensation T	Deviation e_p	Variation v_u	Run out: Shaft straightness I	Nut O.D. eccentricity J	Flange perpendicularity K	Permissible rotational speed dm·n N(rpm)
90	9	14	8.5	M6×1	500	32.3	60	250	26.4	100	850	-0.012	0.027	0.020	0.075	0.019	0.013	2120
					700			250		100	1050	-0.017	0.035	0.025	0.090			
					1000			300		100	1400	-0.024	0.040	0.027	0.120			
					1400			350		120	1870	-0.034	0.054	0.035	0.150			
					1800			350		120	2270	-0.043	0.065	0.040	0.200			
98	11	17.5	11	M6×1	700	36.3	60	300	30.4	100	1100	-0.017	0.035	0.025	0.065	0.019	0.013	1890
					1200			350		120	1670	-0.029	0.046	0.030	0.100			
					2000			350		120	2470	-0.048	0.065	0.040	0.130			

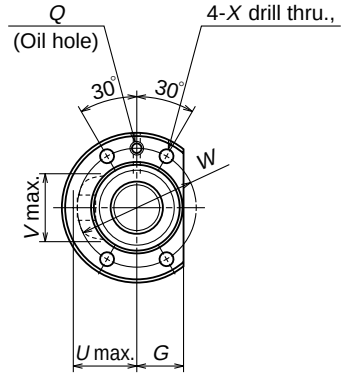


Nut type code: LSFT

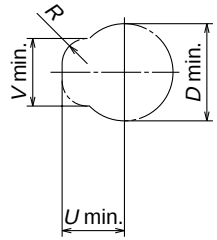
NSK

ϕ32 x 25, ϕ32 x 32

Standard stock



View X-X



Housing hole and its clearance

Unit: mm

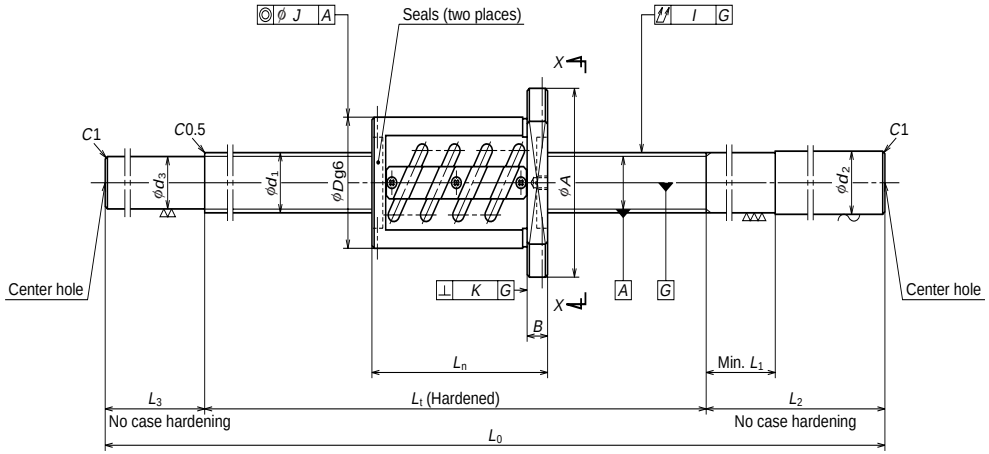
Ball screw No.	Stroke Max. L_t-L_n	Screw shaft dia. d_1	Lead l	Ball dia. D_w	Ball circle dia. d_m	Effective ball turns Turns × Circuits	Basic load rating N {kgf} Dynamic C_a	Basic load rating N {kgf} Static C_{0a}	Axial play Max.	Nut Outside dia. D	Nut Flange A	Nut Flange G	Nut Flange B	Nut Flange C	Nut Overall length L_n
W3217FS-1-C5T25	1583	32	25	4.762	33.25	2.5×1	17900 {1830}	41800 {4270}	0.005	51	85	26	15	10	117
W3227FS-1-C5T25	2583														
W3217FS-2-C5T32	1591	32	32	4.762	33.25	1.5×1	11500 {1180}	24800 {2530}	0.005	51	85	26	15	12	109
W3227FS-2-C5T32	2591														

Remarks: 1. NSK support unit is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

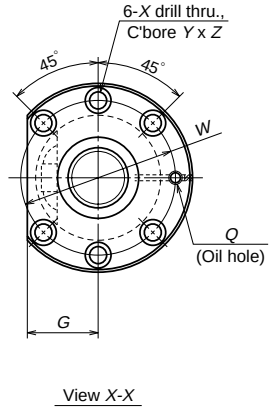
dimensions Bolt hole W	dimensions Bolt hole X	dimensions Projecting tube U	dimensions Projecting tube V	dimensions Projecting tube R	dimensions Oil hole Q	Screw shaft dimensions Threaded length L_t	Screw shaft dimensions Shaft end, right d_2	Screw shaft dimensions Shaft end, right L_u	Screw shaft dimensions Shaft end, right L_1	Screw shaft dimensions Shaft end, right L_2	Screw shaft dimensions Shaft end, left d_3	Screw shaft dimensions Shaft end, left L_3	Screw shaft dimensions Overall length L_0	Lead accuracy Travel compensation T	Lead accuracy Deviation e_p	Lead accuracy Variation v_u	Run out Shaft straightness I	Run out Nut O.D. eccentricity J	Run out Flange perpendicularity K	Permissible rotational speed dm·n N(rpm)
67	9	34	42	12	M6×1	1700	32.3	15	70	250	28.3	120	2070	0	0.065	0.040	0.160	0.019	0.013	2100
						2700							3070		0.093	0.054	0.210			
67	9	34	42	12	M6×1	1700	32.3	19	70	250	28.3	120	2070	0	0.065	0.040	0.160	0.019	0.013	2100
						2700							3070		0.093	0.054	0.210			

ϕ40 x 8, ϕ40 x 10, ϕ40 x 12

Standard stock



Nut type code: ZFT



View X-X

Unit: mm

Ball screw No.	Stroke Max. L_t-L_n	Screw shaft dia. d_1	Lead l	Ball dia. D_w	Ball circle dia. d_m	Effective ball turns: Turns × Circuits	Basic load rating N {kgf}: Dynamic C_a	Basic load rating N {kgf}: Static C_{0a}	Preload N {kgf}	Friction torque, median N·cm {kgf·cm}	Nut: Outside dia. D	Nut: Flange A	Nut: Flange G	Nut: Flange B	Nut: Overall length L_n
W4007SS-1Z-C5Z8	570	40	8	4.762	40.5	2.5×2	34900 {3550}	103000 {10500}	2450 {250}	64 {6.5}	74	108	41	15	130
W4012SS-1Z-C5Z8	1070														
W4018SS-1Z-C5Z8	1670														
W4007SS-2Z-C5Z10	597	40	10	6.350	41	2.5×1	28600 {2920}	68600 {6990}	2160 {220}	64 {6.5}	82	124	47	18	103
W4010SS-2Z-C5Z10	897														
W4014SS-1Z-C5Z10	1297														
W4018SS-2Z-C5Z10	1697														
W4024SS-1Z-C5Z10	2297														
W4010SS-4Z-C5Z12	883	40	12	7.144	41.5	2.5×1	33600 {3430}	77500 {7910}	2550 {260}	83 {8.5}	86	128	48	18	117
W4016SS-2Z-C5Z12	1483														
W4025SS-1Z-C5Z12	2383														

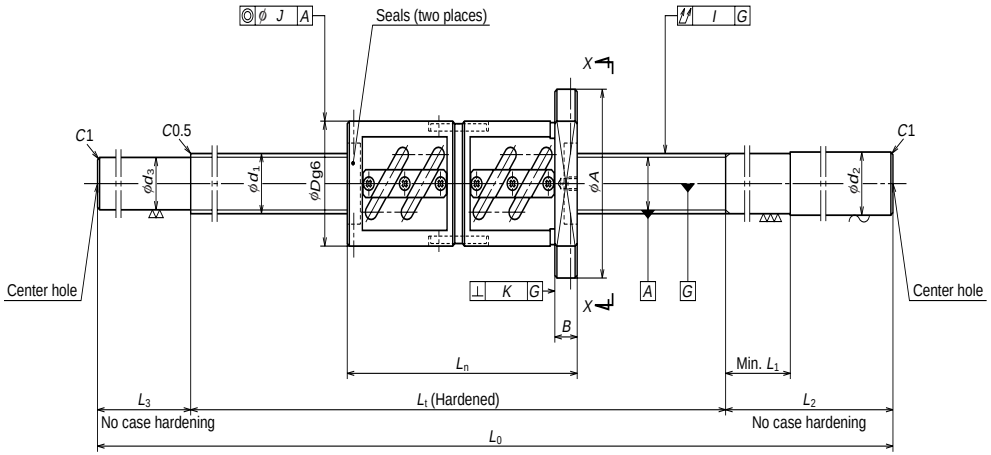
dimensions: Bolt hole W	X	Y	Z	Oil hole Q	Screw shaft dimensions: Threaded length L_t	Shaft end, right d_2	L_1	L_2	Shaft end, left d_3	L_3	Overall length L_0	Lead accuracy: Travel compensation T	Deviation e_p	Variation v_u	Run out: Shaft straightness I	Nut O.D. eccentricity J	Flange perpendicularity K	Permissible rotational speed dm·n N(rpm)
90	9	14	8.5	PT1/8	700	40.3	50	300	35.5	100	1100	–0.017	0.035	0.025	0.065	0.019	0.013	1720
					1200			350		100	1650	–0.029	0.046	0.030	0.100			
					1800			350		120	2270	–0.043	0.065	0.040	0.130			
102	11	17.5	11	PT1/8	700	40.3	60	300	34.4	100	1100	–0.017	0.035	0.025	0.065	0.025	0.015	1700
					1000			300		100	1400	–0.024	0.040	0.027	0.080			
					1400			350		120	1870	–0.034	0.054	0.035	0.100			
					1800			350		120	2270	–0.043	0.065	0.040	0.130			
					2400			400		150	2950	–0.058	0.077	0.046	0.170			
106	11	17.5	11	PT1/8	1000	40.3	70	300	34.1	100	1400	–0.024	0.040	0.027	0.080	0.025	0.015	1680
					1600			350		150	2100	–0.038	0.054	0.035	0.130			
					2500			400		150	3050	–0.060	0.077	0.046	0.170			

Remarks: 1. NSK support unit is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

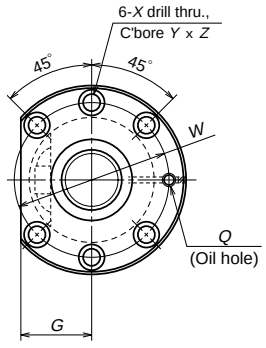
NSK

ϕ40 x 10, ϕ40 x 12

Standard stock



Nut type code: DFT



View X-X

Unit: mm

Ball screw No.	Stroke Max. L_t-L_n	Screw shaft dia. d_1	Lead l	Ball dia. D_w	Ball circle dia. d_m	Effective ball turns Turns × Circuits	Basic load rating N {kgf} Dynamic C_a	Basic load rating N {kgf} Static C_{0a}	Preload N {kgf}	Friction torque, median N·cm {kgf·cm}	Nut Outside dia. D	Nut Flange A	Nut Flange G	Nut Flange B	Nut Overall length L_n
W4007SS-3D-C5Z10	507	40	10	6.350	41	2.5×2	52000 {5300}	137000 {14000}	3630 {370}	108 {11}	82	124	47	18	193
W4010SS-3D-C5Z10	807														
W4014SS-2D-C5Z10	1207														
W4018SS-3D-C5Z10	1607														
W4024SS-2D-C5Z10	2207														
W4010SS-5D-C5Z12	775	40	12	7.144	41.5	2.5×2	61000 {6220}	155000 {15800}	4310 {440}	138 {14}	86	128	48	18	225
W4016SS-3D-C5Z12	1375														
W4025SS-2D-C5Z12	2275														

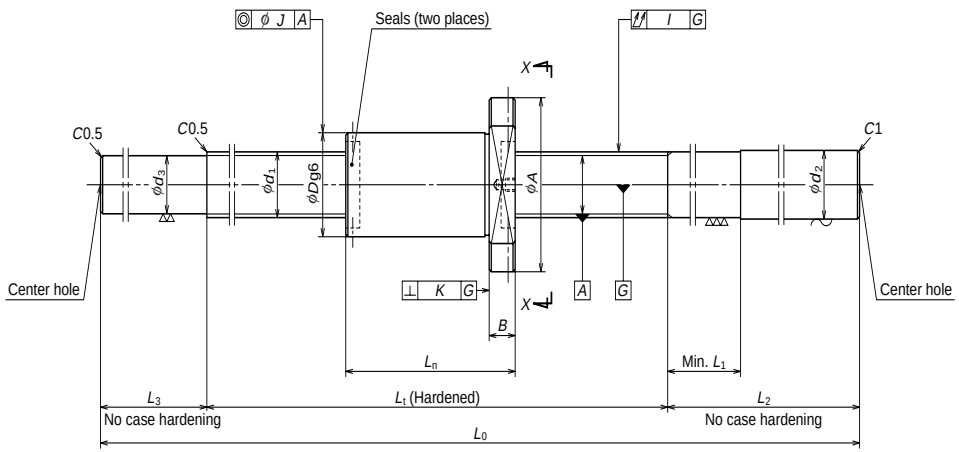
dimensions: Bolt hole W	X	Y	Z	Oil hole Q	Screw shaft dimensions: Threaded length L_t	Shaft end, right d_2	L_1	L_2	Shaft end, left d_3	L_3	Overall length L_0	Lead accuracy: Travel compensation T	Deviation e_p	Variation v_u	Run out: Shaft straightness I	Nut O.D. eccentricity J	Flange perpendicularity K	Permissible rotational speed dm·n N(rpm)
102	11	17.5	11	PT1/8	700	40.3	60	300	34.4	100	1100	–0.017	0.035	0.025	0.065	0.025	0.015	1700
					1000			300		100	1400	–0.024	0.040	0.027	0.080			
					1400			350		120	1870	–0.034	0.054	0.035	0.100			
					1800			350		120	2270	–0.043	0.065	0.040	0.130			
					2400			400		150	2950	–0.058	0.077	0.046	0.170			
106	11	17.5	11	PT1/8	1000	40.3	70	300	34.1	100	1400	–0.024	0.040	0.027	0.080	0.025	0.015	1680
					1600			350		150	2100	–0.038	0.054	0.035	0.130			
					2500			400		150	3050	–0.060	0.077	0.046	0.170			

Remarks: 1. NSK support unit is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

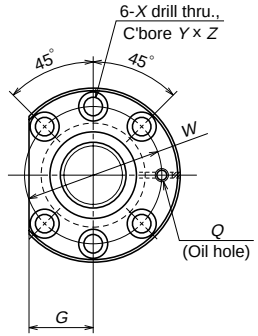
NSK

ϕ40 x 10, ϕ50 x 10

Standard stock



Nut type code: ZFD



View X-X

Unit: mm

Ball screw No.	Stroke Max. L_t-L_n	Screw shaft dia. d_1	Lead l	Ball dia. D_w	Ball circle dia. d_m	Effective ball turns	Basic load rating N {kgf} Dynamic C_a	Basic load rating N {kgf} Static C_{0a}	Preload N {kgf}	Friction torque, median N·cm {kgf·cm}	Nut Outside dia. D	Nut Flange A	Nut Flange G	Nut Flange B	Nut Overall length L_n
W4007SS-4ZY-C5Z10	557	40	10	6.350	41.75	4	38400 {3910}	93300 {9520}	2840 {290}	83 {8.5}	62	104	40	18	143
W4010SS-6ZY-C5Z10	857														
W4014SS-3ZY-C5Z10	1257														
W4018SS-4ZY-C5Z10	1657														
W4024SS-3ZY-C5Z10	2257														
W5007SS-1ZY-C5Z10	557	50	10	6.350	51.75	4	43600 {4450}	122000 {12500}	3240 {330}	108 {11}	72	114	44	18	143
W5010SS-3ZY-C5Z10	857														
W5015SS-3ZY-C5Z10	1357														
W5020SS-3ZY-C5Z10	1857														
W5026SS-3ZY-C5Z10	2457														

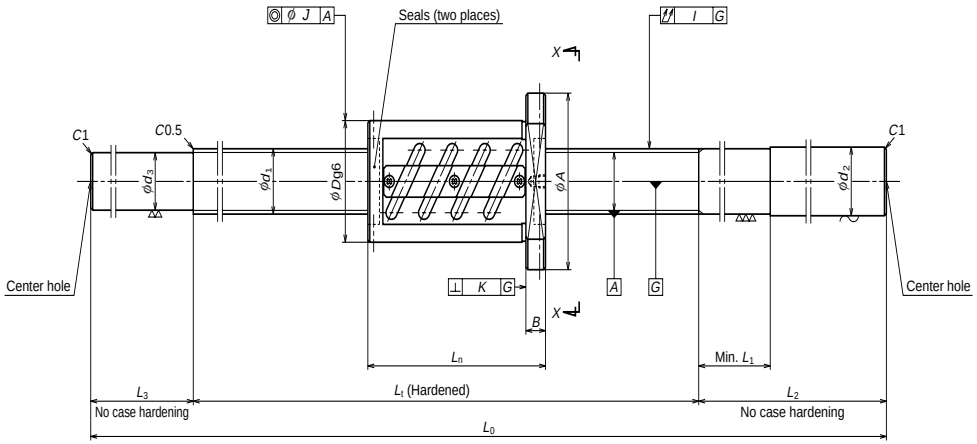
dimensions Bolt hole W	X	Y	Z	Oil hole Q	Screw shaft dimensions Threaded length L_t	Shaft end, right d_2	L_1	L_2	Shaft end, left d_3	L_3	Overall length L_0	Lead accuracy Travel compensation T	Deviation e_p	Variation v_u	Run out Shaft straightness I	Nut O.D. eccentricity J	Flange perpendicularity K	Permissible rotational speed dm·n N(rpm)
82	11	17.5	11	PT1/8	700	40.3	60	300	35.1	100	1100	–0.015	0.035	0.025	0.065	0.019	0.013	1670
					1000			300		100	1400	–0.022	0.040	0.027	0.080			
					1400			350		120	1870	–0.032	0.054	0.035	0.100			
					1800			350		120	2270	–0.041	0.065	0.040	0.130			
					2400			400		150	2950	–0.056	0.077	0.046	0.170			
92	11	17.5	11	PT1/8	700	50.3	60	300	45.1	100	1100	–0.015	0.035	0.025	0.065	0.019	0.013	1350
					1000			300		100	1400	–0.022	0.040	0.027	0.080			
					1500			400		150	2050	–0.034	0.054	0.035	0.130			
					2000			400		150	2550	–0.046	0.065	0.040	0.170			
					2600			500		200	3300	–0.060	0.093	0.054	0.220			

Remarks: 1. NSK support unit is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

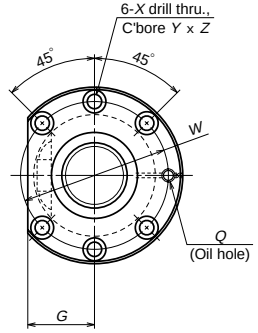
NSK

ϕ45 x 10, ϕ50 x 10

Standard stock



Nut type code: ZFT



View X-X

Unit: mm

Ball screw No.	Stroke Max. L_t-L_n	Screw shaft dia. d_1	Lead l	Ball dia. D_w	Ball circle dia. d_m	Effective ball turns: Turns × Circuits	Basic load rating N {kgf}: Dynamic C_a	Basic load rating N {kgf}: Static C_{0a}	Preload N {kgf}	Friction torque, median N·cm {kgf·cm}	Nut: Outside dia. D	Nut: Flange A	Nut: Flange G	Nut: Flange B	Nut: Overall length L_n
W4510SS-1Z-C5Z10	897	45	10	6.350	46	2.5 × 1	29900 {3040}	77300 {7880}	2260 {230}	69 {7}	88	132	50	18	103
W4516SS-1Z-C5Z10	1497														
W4525SS-1Z-C5Z10	2397														
W5010SS-1Z-C5Z10	897	50	10	6.350	51	2.5 × 1	31800 {3240}	87400 {8910}	2450 {250}	78 {8}	93	135	51	18	103
W5015SS-1Z-C5Z10	1397														
W5020SS-1Z-C5Z10	1897														
W5026SS-1Z-C5Z10	2497														
W5010SS-2Z-C5Z10	837	50	10	6.350	51	2.5 × 2	57700 {5890}	175000 {17800}	4020 {410}	138 {14}	93	135	51	18	163
W5015SS-2Z-C5Z10	1337														
W5020SS-2Z-C5Z10	1837														
W5026SS-2Z-C5Z10	2437														

dimensions: Bolt hole W	Bolt hole X	Bolt hole Y	Bolt hole Z	Oil hole Q	Screw shaft dimensions: Threaded length L_t	Shaft end, right d_2	Shaft end, right L_1	Shaft end, right L_2	Shaft end, left d_3	Shaft end, left L_3	Overall length L_0	Lead accuracy: Travel compensation T	Lead accuracy: Deviation e_p	Lead accuracy: Variation v_u	Run out: Shaft straightness I	Run out: Nut O.D. eccentricity J	Run out: Flange perpendicularity K	Permissible rotational speed dm·n N(rpm)
110	11	17.5	11	PT1/8	1000	45.3	60	300	39.4	100	1400	-0.024	0.040	0.027	0.080	0.025	0.015	1520
					1600			400		150	2150	-0.038	0.054	0.035	0.130			
					2500			450		150	3100	-0.060	0.077	0.046	0.170			
113	11	17.5	11	PT1/8	1000	50.3	60	300	44.4	100	1400	-0.024	0.040	0.027	0.080	0.025	0.015	1370
					1500			400		150	2050	-0.036	0.054	0.035	0.130			
					2000			400		150	2550	-0.048	0.065	0.040	0.170			
					2600			450		150	3200	-0.062	0.093	0.054	0.220			
113	11	17.5	11	PT1/8	1000	50.3	60	300	44.4	100	1400	-0.024	0.040	0.027	0.080	0.025	0.015	1370
					1500			400		150	2050	-0.036	0.054	0.035	0.130			
					2000			400		150	2550	-0.048	0.065	0.040	0.170			
					2600			450		150	3200	-0.062	0.093	0.054	0.220			

Remarks: 1. NSK support unit is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.

B-I-6.4 V Series

(1) VFA ball screws: Standard, low-priced FA ball screws

◇**Features**

●**Accuracy: Ct7 grade**

Ct7 grade series demonstrates high ball screw performance for transporting mechanism of Cartesian type robots and single axis actuators.

●**High speed traveling**

The high helix, 10 mm and 20 mm leads make high speed feed possible.

●**Functional shaft end configuration**

Screw shaft outside surface is used for the support bearing seat. Thus, the exclusive support unit installed on the simple support side allows flexible stroke. (Current support units can be used on the fixed support side.)

Refer to Page B273 for details of support units.

●**Low price**

Prices are 40% lower than other existing A series.

◇**Dimension tables**

Dimension tables show shapes/sizes as well as specification factors of shaft diameter/lead combinations. Tables also contain data as shown below:

● **Lead accuracy**

Lead accuracy is Ct7 Grade.

T : Travel compensation

e_p : Tolerance on specified travel

v_{300} : Travel variation

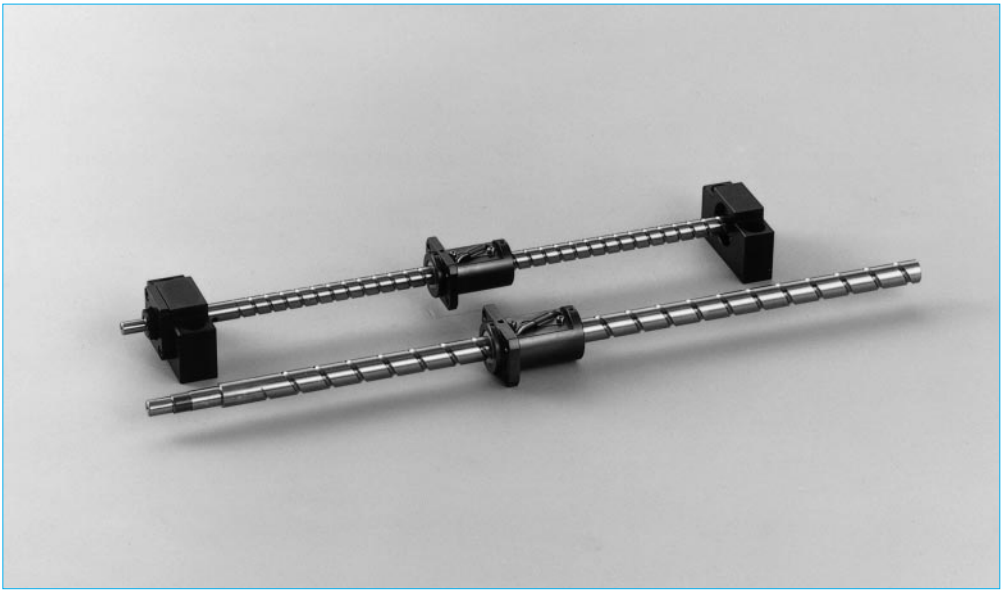
Refer to "Technical Description: Lead accuracy" (Page B445) for details of codes.

● **Permissible rotational speed**

dm·n : Limited by the relative peripheral speed between the screw shaft and the nut.

Critical speed : Limited by the critical speed of the screw shaft. Critical speed varies with the installation conditions. Use under the lower permissible rotational speed. For details, see "Technical description: Permissible rotational speed" (Page B455).

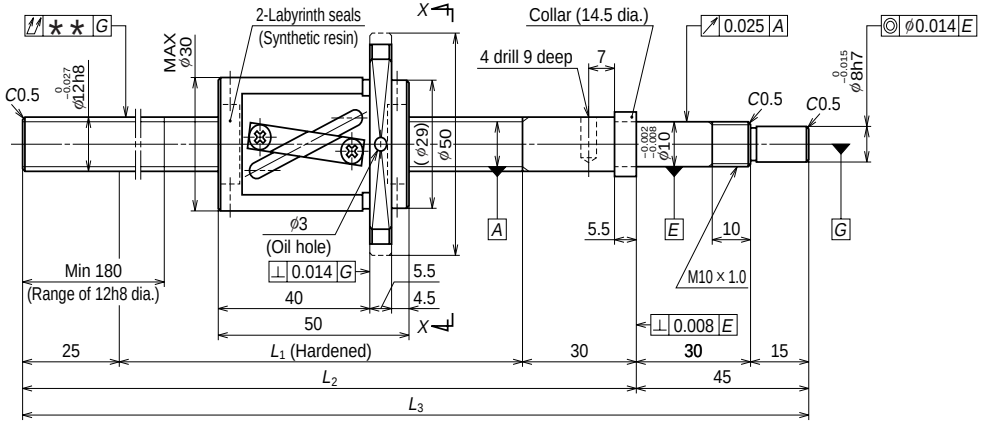
Always operate below the permissible rotational speed.

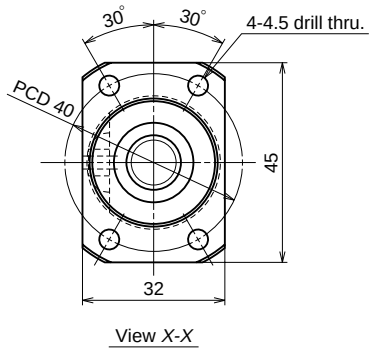


NSK

VFA ϕ12 x 10

Standard stock





View *X-X*

Unit: mm

Ball screw specification		
Shaft dia. × Lead / Direction of turn		12 × 10/Right
Ball recirculation		Return tube
Ball dia. / Ball circle dia.		2.381/12.5
Root dia.		10.0
Effective turns of balls		2.5 × 1
Accuracy grade / Axial play code		Ct7/S
Basic load rating N { kgf }	Dynamic C_a	3750 {380}
	Static C_{0a}	6480 {660}
Axial play		0.010 or less
Dynamic friction torque N·cm {kgf·cm}		~1.5 {~0.15}
Spacer ball		None
Factory pre-packed grease		NSK grease LR3
Internal spatial volume of nut (cm³)		1.4

B 234

Unit: mm

Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1-Nut length)	L_1	L_2	L_3
VFA1210C7S-410	250	260	310	365	410
VFA1210C7S-610	450	460	510	565	610

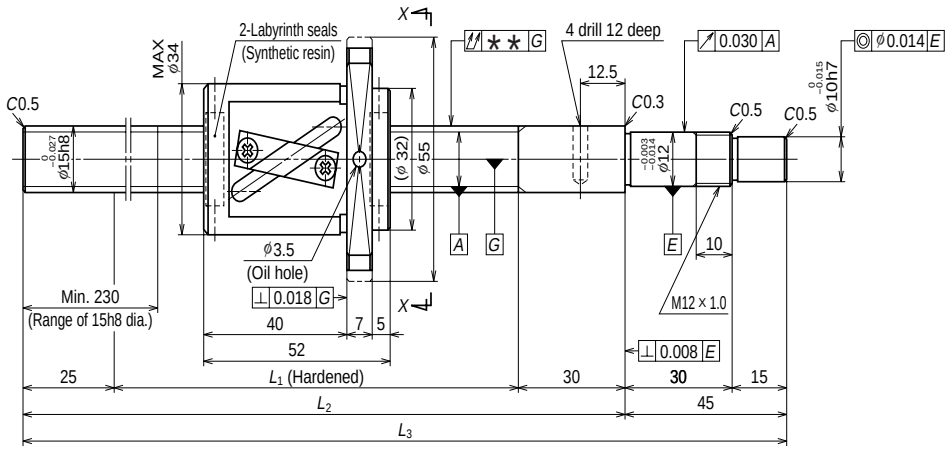
Lead accuracy			Run out**	Permissible rotational speedN(rpm)		
					Critical speed	
T	e_p	v_{300}			Fixed - Simple support	Fixed - Free
0	0.085	0.052	0.100	3000	—	—
0	0.155	0.052	0.160		—	1300

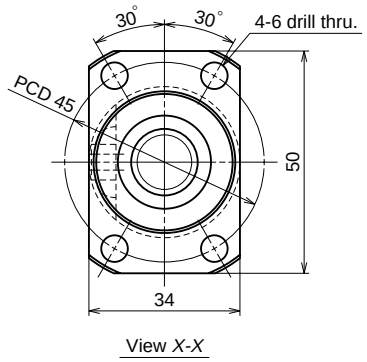
Remarks 1. NSK support units WBK10-01A (square type, fixed support side), WBK12SF-01(simple support side), and WBK10-11 (round type, fixed support side) are recommended. WBK12SF-01 (on the simple support side) is a unit that supports the shaft outside surface by the bearing.
2. NSK grease LR3 is recommended.

NSK

VFA ϕ15 x 10

Standard stock





View *X-X*

Unit: mm

Ball screw specification		
Shaft dia. ×Lead / Direction of turn		15×10/Right
Ball recirculation		Return tube
Ball dia. / Ball circle dia.		3.175/15.5
Root dia.		12.2
Effective turns of balls		2.5×1
Accuracy grade / Axial play code		Ct7/S
Basic load rating N { kgf }	Dynamic C_a	7070 {720}
	Static C_{0a}	12800 {1300}
Axial play		0.010 or less
Dynamic friction torque N·cm {kgf·cm}		~2.5 {~0.25}
Spacer ball		None
Factory pre-packed grease		NSK grease LR3
Internal spatial volume of nut (cm³)		2.3

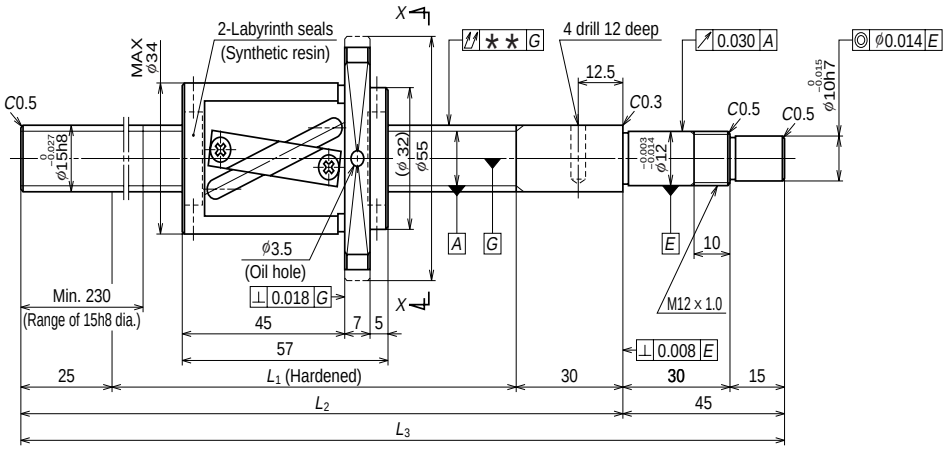
B 236

Unit: mm

Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1-Nut length)	L_1	L_2	L_3
VFA1510C7S-500	300	348	400	455	500
VFA1510C7S-700	500	548	600	655	700
VFA1510C7S-1000	800	848	900	955	1000

Lead accuracy			Run out** ↗	Permissible rotational speedN(rpm)		
					Critical speed	
T	e_p	v_{300}			Fixed - Simple support	Fixed - Free
0	0.120	0.052	0.075	3000	—	2600
0	0.195	0.052	0.110		—	1150
0	0.310	0.052	0.180		2340	510

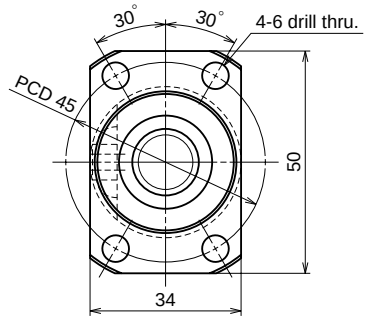
Remarks 1. NSK support units WBK12-01A (square type, fixed support side), WBK15SF-01(simple support side), and WBK12-11 (round type, fixed support side) are recommended. WBK12SF-01 (on the simple support side) is a unit that supports the shaft outside surface by the bearing.
2. NSK grease LR3 is recommended.



NSK

VFA φ15 x 20

Standard stock



View X-X

Unit: mm

Ball screw specification		
Shaft dia. ×Lead / Direction of turn		15×20/Right
Ball recirculation		Return tube
Ball dia. / Ball circle dia.		3.175/15.5
Root dia.		12.2
Effective turns of balls		1.5×1
Accuracy grade / Axial play code		Ct7/S
Basic load rating N { kgf }	Dynamic C_a	4560 {465}
	Static C_{0a}	7730 {790}
Axial play		0.010 or less
Dynamic friction torque N·cm {kgf·cm}		~2.5 {~0.25}
Spacer ball		None
Factory pre-packed grease		NSK grease LR3
Internal spatial volume of nut (cm³)		2.3

B 238

Unit: mm

Ball screw No.	Stroke		Screw shaft length		
	Nominal	Maximum (L_1-Nut length)	L_1	L_2	L_3
VFA1520C7S-500	300	343	400	455	500
VFA1520C7S-700	500	543	600	655	700
VFA1520C7S-1000	800	843	900	955	1000

Lead accuracy			Run out**	Permissible rotational speedN(rpm)		
					Critical speed	
T	e_p	v_{300}			Fixed - Simple support	Fixed - Free
0	0.120	0.052	0.075	3000	—	2630
0	0.195	0.052	0.110		—	1160
0	0.310	0.052	0.180		2350	510

Remarks 1. NSK support units WBK12-01A (square type, fixed support side), WBK15SF-01(simple support side), and WBK12-11 (round type, fixed support side) are recommended. WBK12SF-01 (on the simple support side) is a unit that supports the shaft outside surface by the bearing.
2. NSK grease LR3 is recommended.

(2) RMA, RMS precision rolled miniature ball screws

◇Features

●Low prices

The screw shaft is processed by precision rolling, and has come up to the accuracy grade of Ct7.

●Compact

Uses deflector ball recirculation for the compact ball nut.

●Easy to handle

RMA series has a finished shaft end. They can be used without further processing. It can be combined with the exclusive support kit (Page B291) and support units (current items are in Page B273).

Shaft ends of the RMS Series are unprocessed blank. It is necessary to design and machine prior to use.

◇Dimension tables

Dimension tables show shapes/sizes as well as specification factors of shaft diameter/lead combinations. Tables also contain the following data:

●Lead precision

Lead precision is Ct7 Grade.

T : Travel compensation;

e_p : Tolerance in specified travel;

υ_{300} : Travel variation

Refer to "Technical Description: Lead precision" (Page B445) for details of codes.

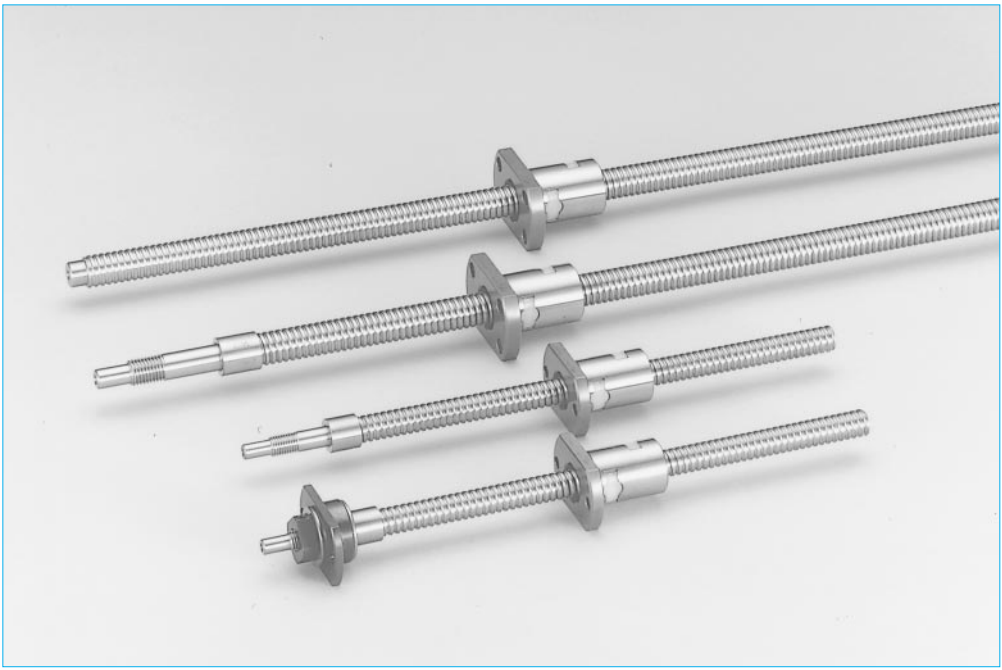
●Permissible rotational speed

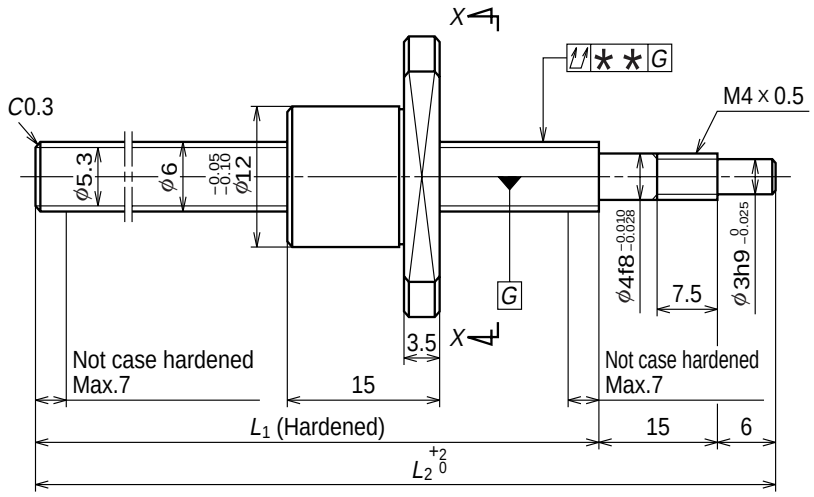
dm·n : Limited by the relative peripheral speed between the screw shaft and the nut.

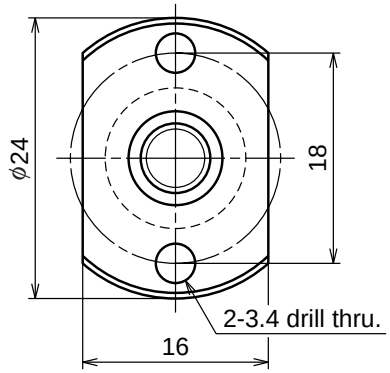
Critical speed : Limited by the critical speed of the screw shaft. Critical speed varies with the installation conditions.

Use under either, but the lower permissible rotational speed. For details, see "Technical Description: Permissible rotational speed" (Page B455).

Always operate below permissible rotational speed.







View *X-X*

Unit: mm

Ball screw specification		
Shaft dia. ×Lead / Direction of turn		6×1/Right
Ball recirculation		Deflector
Ball dia. / Ball circle dia.		0.800/6.2
Root dia.		5.3
Effective turns of balls		1×3
Accuracy grade / Axial play code		Ct7/S
Basic load rating N { kgf }	Dynamic C_a	520 {55}
	Static C_{0a}	925 {95}
Axial play		0.020 or less
Dynamic friction torque N·cm {kgf·cm}		~1.0 {~0.1}
Spacer ball		None
Factory pre-packed grease		Refer to the remarks.

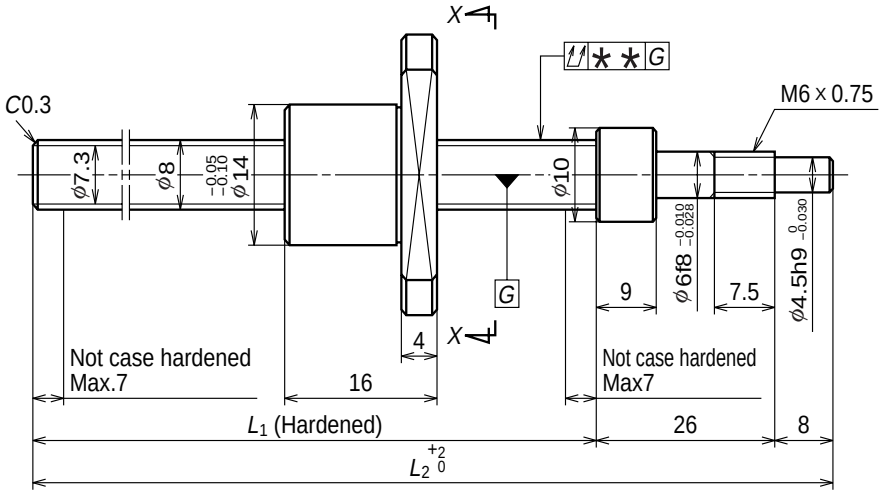
B 242

Unit: mm

Ball screw No.	Stroke		Screw shaft length	
	Nominal	Maximum (L_1-Nut length)	L_1	L_2
RMA0601C7S-160	100	124	139	160
RMA0601C7S-260	200	224	239	260

Lead accuracy			Run out**	Permissible rotational speed
Target compensation T	Deviation e_p	Variation v_{300}		N(rpm)
0	0.052	0.052	0.060	3000
0	0.085	0.052	0.090	3000

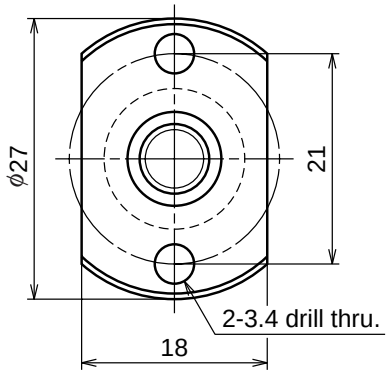
Remarks 1. NSK support bearing kit WBK04R-11 (round type, fixed support side) is recommended.
2. Only rust preventive oil is applied at time of delivery. Please apply lubricant (oil or grease) before use.



NSK

RMA φ8 x 1

Standard stock



View X-X

Unit: mm

Ball screw specification		
Shaft dia. ×Lead / Direction of turn		8×1/Right
Ball recirculation		Deflector
Ball dia. / Ball circle dia.		0.800/8.2
Root dia.		7.3
Effective turns of balls		1×3
Accuracy grade / Axial play code		Ct7/S
Basic load rating N { kgf }	Dynamic C_a	600 {60}
	Static C_{0a}	1290 {130}
Axial play		0.020 or less
Dynamic friction torque N·cm {kgf·cm}		~1.0 {~0.1}
Spacer ball		None
Factory pre-packed grease		Refer to the remarks.

B 244

Unit: mm

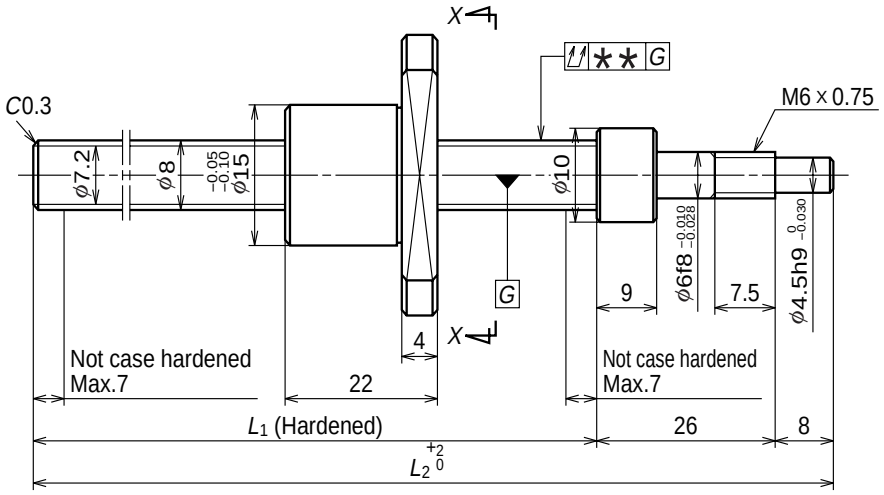
Ball screw No.	Stroke		Screw shaft length	
	Nominal	Maximum (L_1-Nut length)	L_1	L_2
RMA0801C7S-180	100	130	146	180
RMA0801C7S-280	200	230	246	280

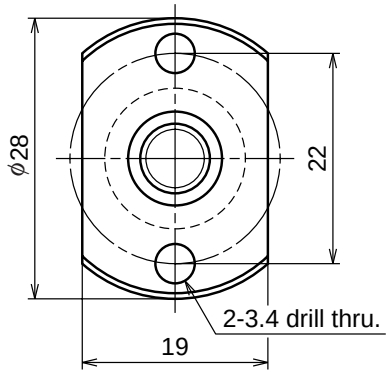
Unit: mm

Lead accuracy			Run out**	Permissible rotational speed
Target compensation T	Deviation e_p	Variation v_{300}	⏥	N(rpm)
0	0.052	0.052	0.060	3000
0	0.085	0.052	0.090	3000

Remarks 1. The NSK round support kit WBK06R-11 (fixed support side) is recommended.
2. Only rust preventive oil is applied at time of delivery. Please apply lubricant (oil or grease) before use.

Standard stock





View *X-X*

Unit: mm

Ball screw specification		
Shaft dia. xLead / Direction of turn		8x1.5/Right
Ball recirculation		Deflector
Ball dia. / Ball circle dia.		1.000/8.3
Root dia.		7.2
Effective turns of balls		1x3
Accuracy grade / Axial play code		Ct7/S
Basic load rating N { kgf }	Dynamic C_a	810 {85}
	Static C_{0a}	1590 {160}
Axial play		0.020 or less
Dynamic friction torque N·cm {kgf·cm}		~1.0 {~0.1}
Spacer ball		None
Factory pre-packed grease		Refer to the remarks.

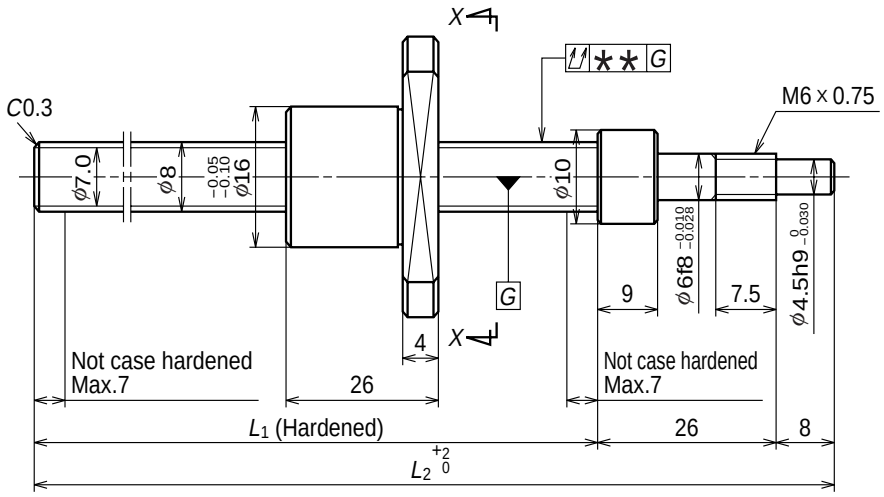
B 246

Ball screw No.	Stroke		Screw shaft length	
	Nominal	Maximum (L_1-Nut length)	L_1	L_2
RMA0801.5C7S-180	100	124	146	180
RMA0801.5C7S-280	200	224	246	280

Unit: mm

Lead accuracy			Run out**	Permissible rotational speed
Target compensation T	Deviation e_p	Variation v_{300}	⟂	N(rpm)
0	0.052	0.052	0.060	3000
0	0.085	0.052	0.090	3000

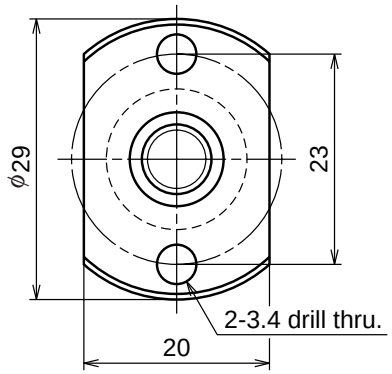
Remarks 1. The NSK round support kit WBK06R-11 (fixed support side) is recommended.
2. Only rust preventive oil is applied at time of delivery. Please apply lubricant (oil or grease) before use.



NSK

RMA φ8 x 2

Standard stock



View *X-X*

Unit: mm

Ball screw specification		
Shaft dia. xLead / Direction of turn		8x2/Right
Ball recirculation		Deflector
Ball dia. / Ball circle dia.		1.200/8.3
Root dia.		7.0
Effective turns of balls		1x3
Accuracy grade / Axial play code		Ct7/S
Basic load rating N { kgf }	Dynamic C_a	1070 {100}
	Static C_{0a}	1950 {180}
Axial play		0.020 or less
Dynamic friction torque N·cm {kgf·cm}		~1.0 {~0.1}
Spacer ball		None
Factory pre-packed grease		Refer to the remarks.

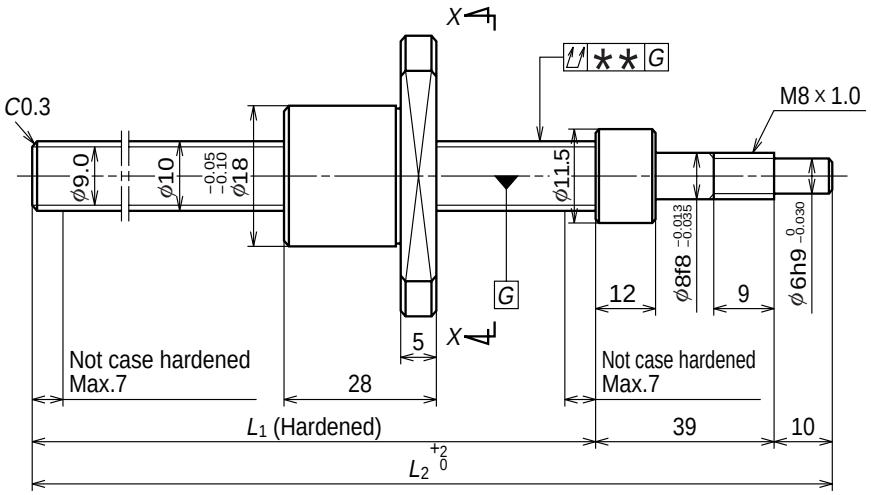
B 248

Unit: mm

Ball screw No.	Stroke		Screw shaft length	
	Nominal	Maximum (L_1-Nut length)	L_1	L_2
RMA0802C7S-180	100	120	146	180
RMA0802C7S-280	200	220	246	280

Lead accuracy			Run out**	Permissible rotational speed
Target compensation T	Deviation e_p	Variation v_{300}	↥	N(rpm)
0	0.052	0.052	0.060	3000
0	0.085	0.052	0.090	3000

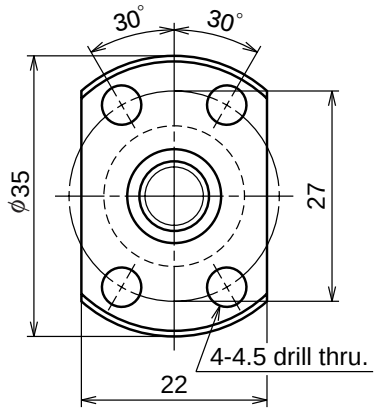
Remarks 1. The NSK round support kit WBK06R-11 (fixed support side) is recommended.
2. Only rust preventive oil is applied at time of delivery. Please apply lubricant (oil or grease) before use.



NSK

RMA ϕ10 x 2

Standard stock



View *X-X*

Unit: mm

Ball screw specification		
Shaft dia. xLead / Direction of turn		10x2/Right
Ball recirculation		Deflector
Ball dia. / Ball circle dia.		1.200/10.3
Root dia.		9.0
Effective turns of balls		1x3
Accuracy grade / Axial play code		Ct7/S
Basic load rating N { kgf }	Dynamic C_a	1210 {125}
	Static C_{0a}	2510 {255}
Axial play		0.020 or less
Dynamic friction torque N·cm {kgf·cm}		~1.0 {~0.1}
Spacer ball		None
Factory pre-packed grease		Refer to the remarks.

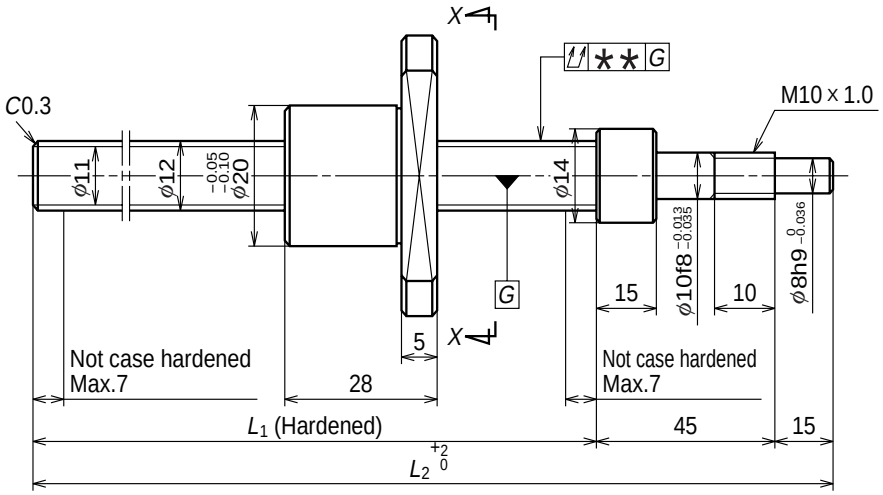
B 250

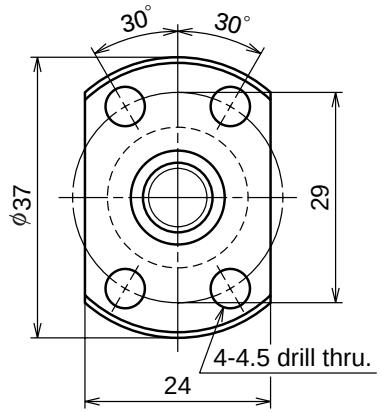
Unit: mm

Ball screw No.	Stroke		Screw shaft length	
	Nominal	Maximum (L_1-Nut length)	L_1	L_2
RMA1002C7S-250	150	173	201	250
RMA1002C7S-350	250	273	301	350

Lead accuracy			Run out**	Permissible rotational speed N(rpm)
Target compensation T	Deviation e_p	Variation v_{300}		
0	0.085	0.052	0.070	3000
0	0.085	0.052	0.100	3000

Remarks 1. NSK support kit WBK08-01 (round type, fixed support side) and WBK08-11 (round type, fixed support side) are recommended.
2. Only rust preventive oil is applied at time of delivery. Please apply lubricant (oil or grease) before use.





View *X-X*

Standard stock

Unit: mm

Ball screw specification		
Shaft dia. xLead / Direction of turn		12x2/Right
Ball recirculation		Deflector
Ball dia. / Ball circle dia.		1.200/12.3
Root dia.		11.0
Effective turns of balls		1x3
Accuracy grade / Axial play code		Ct7/S
Basic load rating N { kgf }	Dynamic C_a	1350 {135}
	Static C_{0a}	3190 {325}
Axial play		0.020 or less
Dynamic friction torque N·cm {kgf·cm}		~1.0 {~0.1}
Spacer ball		None
Factory pre-packed grease		Refer to the remarks.

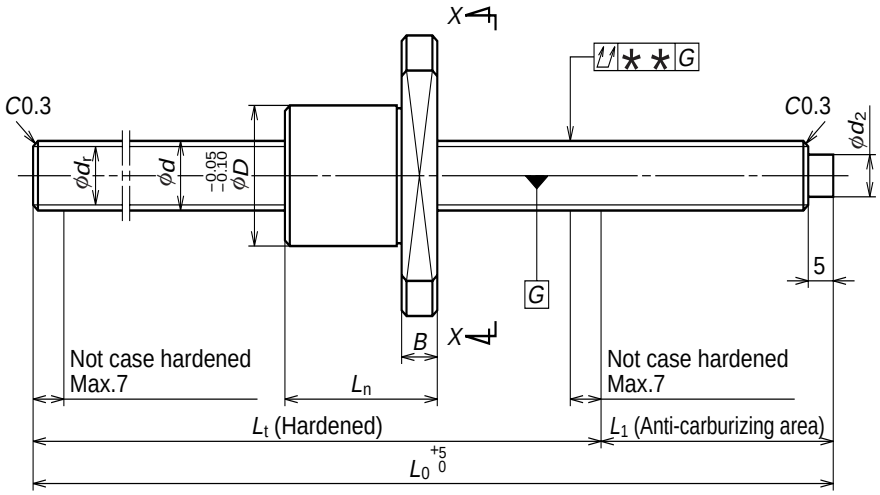
B 252

Ball screw No.	Stroke		Screw shaft length	
	Nominal	Maximum (L_1-Nut length)	L_1	L_2
RMA1202C7S-250	150	162	190	250
RMA1202C7S-350	250	262	290	350

Unit: mm

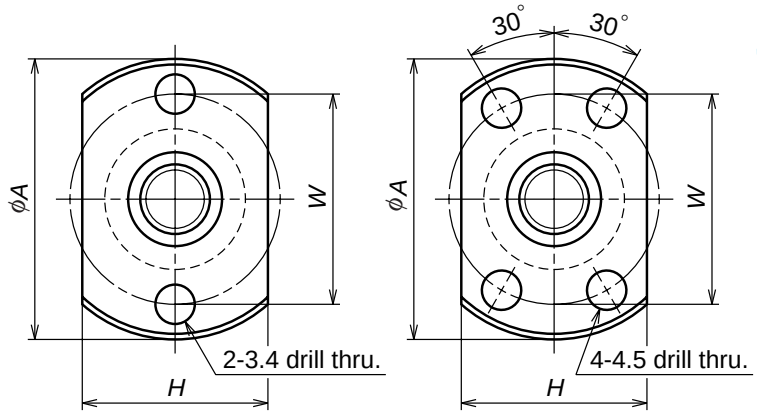
Lead accuracy			Run out**	Permissible rotational speed
Target compensation T	Deviation e_p	Variation v_{300}	⊥	N(rpm)
0	0.060	0.052	0.070	3000
0	0.085	0.052	0.100	3000

Remarks 1. NSK support unit WBK10-01A (square type, fixed support side) and WBK10-11 (round type, fixed support side) are recommended.
2. Only rust preventive oil is applied at time of delivery. Please apply lubricant (oil or grease) before use.



φ6 x 1, φ8 x 1, φ8 x 1.5
φ8 x 2, φ10 x 2, φ12 x 2

Standard stock



View *X-X*
(For screw shaft of 6 and 8 dia.)

View *X-X*
(For screw shaft of 10 and 12 dia.)

B 254

Unit: mm

Ball screw No.	Stroke Max. L_t-L_n	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}	Basic load rating {kgf} Dynamic C_a	Basic load rating {kgf} Static C_{0a}	Axial play Max.
RMS0601C7S-300	235	6	1	0.800	6.2	5.3	3	520	925	55	95	0.02
RMS0801C7S-300	234	8	1	0.800	8.2	7.3	3	600	1290	60	130	0.02
RMS0801.5C7S-300	228		1.5	1.000	8.3	7.2		810	1590	85	160	
RMS0802C7S-300	224		2	1.200	8.3	7.0		1070	1950	110	200	
RMS1002C7S-350	262	10	2	1.200	10.3	9.0	3	1210	2510	125	255	0.02
RMS1202C7S-350	262	12	2	1.200	12.3	11.0	3	1350	3190	135	325	0.02

Nut dimensions D	A	H	B	L_n	W	Screw shaft dimensions Effective thread length L_t	Shaft end L_1	Shaft end d_2	Overall length L_0	Lead accuracy Target compensation T	Deviation e_p	Variation v_{300}	Run out**	Permissible rotational speed N (rpm)
12	24	16	3.5	15	18	250	50	4	300	0	0.085	0.052	0.09	3000
14	27	18	4	16	21	250	50	6	300	0	0.085	0.052	0.09	
15	28	19		22	22									
16	29	20		26	23									
18	35	22	5	28	27	290	60	8	350	0	0.085	0.052	0.10	
20	37	24	5	28	29	290	60	10	350	0	0.085	0.052	0.10	

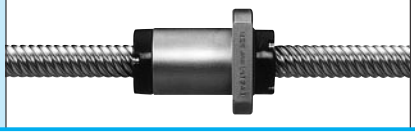
Remarks 1. NSK support unit or support kit is recommended.
2. Only rust preventive agent is applied at time of delivery. Please apply lubricant (oil or grease) before use.
3. Seal is not installed.

B-I-6.4 Rolled Ball Screw R Series

(1) Product classification

NSK rolled ball screws are classified by nut model as shown in Table I-6.4.

Table I-6•4 Classification of rolled ball screws

Nut model	Nut shape		Recirculation system	Lead classification	Page
RNFTL		Flanged, Tube projecting type	Return tube type	Fine, medium lead High helix lead	B257 B261
RNFBL		Flanged Circular	Return tube type	Fine, medium lead	B263
RNCT		V-thread (no flange) Projecting tube type	Return tube type	Fine lead	B265
RNSTL		Square type	Return tube type	Small, medium leads	B267
RNFCL		Flanged Circular	End cap type	High helix lead Ultra high helix lead	B269 B271

(2) Features

- Short delivery time: R Series is standardized, and available in stock.
- Interchangeable screw shaft and ball nut: Screw shaft and nut assembly components are sold separately, and randomly-matched. The maximum axial play after assembly is shown in the dimension tables (from Page B257 ~ B272).
- Low prices: Screw shaft is processed by rolling. This is why prices are lower than those of precision types.
- Abundant series: There are 128 types of nut assembly combinations in the series. Each combination has two to three different lengths in screw shaft.

(3) Accuracy

◇Lead accuracy: Ct10 grade (v_{300}=0.210).
Refer to "Technical Description: Accuracy" (Page B445) for details.

◇Axial play: Varies with internal specification. Refer to the dimension tables (Page B257).

◇Run out of screw shaft center: Ct10 grade

(4) Nut installation

Refer to "Technical Description: Installation" (Page B477).

(5) Shaft end machining

It is necessary to machine screw shaft end of the rolled ball screw.
Refer to "Configuration of rolled ball screw shaft end" (Page B29) if you use standard support unit. Refer to "Technical Description: Shaft end machining" (Page B480) for procedures and precautions.

(6) Rust prevention

Rust prevention agent is applied at time of delivery. But special surface treatment is not given to these ball screws.

NSK furnishes treatment such as phosphate coating or electrolysis low temperature chrome plating on request.

Reference number of rolled ball screw is described below. Please use reference number to order, or for a price inquiry.

(7) Reference number

Nut assembly (example)

RNFTL 25 10 A5 S

- RNFTL: Product code (rolled nut)
- 25: Screw shaft diameter (mm)
- 10: Lead (mm)
- A5: Internal design code
- A5: Effective turns of balls (turns of balls x circuit number)
- S: Seal code S: With seal; No code: Without seal

Nut model: FTL, FBL, STL, CT, FCL

Screw shaft (example)

RS 25 10 A 20

- RS: Product code (Rolled screw shaft)
- 25: Screw shaft diameter (mm)
- 10: Lead (mm)
- A: Internal design code
- 20: Screw shaft length (x 100 mm)

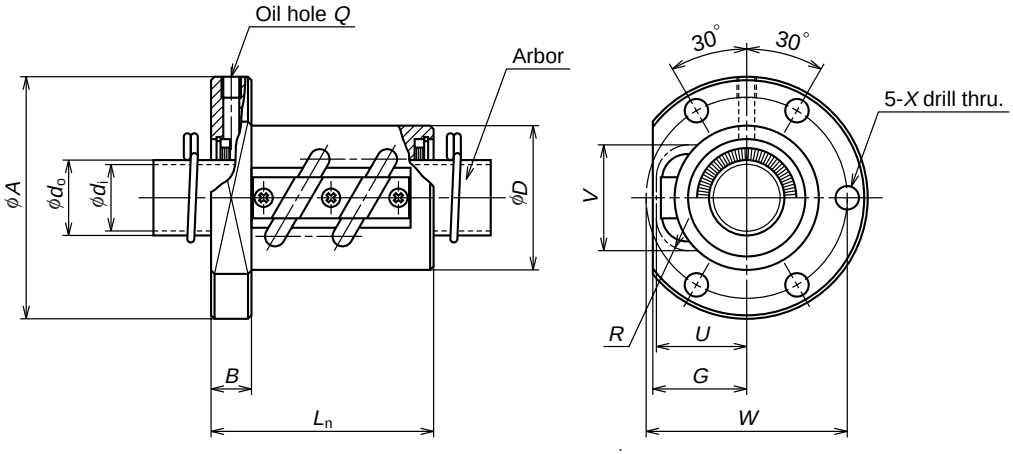
(8) Combinations of shaft diameter/lead

Combinations are shown below in Table I-6.5. The table also indicates nut model codes and page numbers to be referred.

Table I-6.5 Combinations of shaft diameter/lead

Shaft diameter	Lead														
	3	4	5	6	8	10	12	16	20	25	32	40	50	64	80
10	O B257 △B265			O B257 ● B263											
12					O B257 ● B263		O B261 ◎B269								
14		O B257 ● B263 △B265 □B267	O B257 ● B263 △B265 □B267												
15									◎B269						
16						O B257		O B261 ◎B269			◎B271				
18					O B265 ● B263 △B265 □B267										
20			O B257 ● B263 △B265 □B267			O B257 ● B263 □B267			O B261 ◎B269			◎B271			
25			O B257 ● B263 △B265 □B267			O B257 ● B263 △B265 □B267				O B261 ◎B269			◎B271		
28				O B257 ● B263 △B265 □B267											
32						O B259 ● B263 △B265 □B267					O B261 ◎B269			◎B271	
36						O B259 ● B263 △B265 □B267									
40						O B259 △B265						O B261 ◎B269			◎B271
45							O B259 △B265 □B267								
50						O B259		O B259 △B265					◎B269		

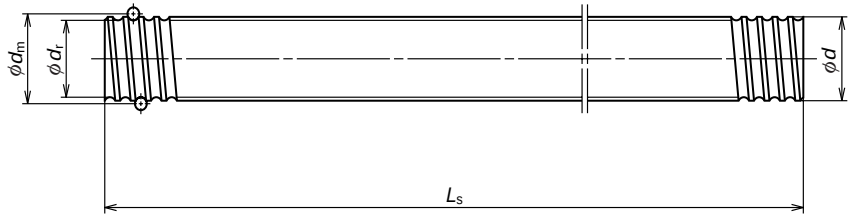
O : RNFTL ● : RNFBL △ : RNCT □ : RNSTL ◎ : RNFCL



Ball nut No.	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls × Circuits	Basic load rating N Dynamic C_a	Basic load rating N Static C_{0a}	Basic load rating {kgf} Dynamic C_a	Basic load rating {kgf} Static C_{0a}	Axial play Max.
RNFTL 1003A3.5	10	3	2.381	10.65	8.1	3.5×1	3780	6730	385	685	0.10
RNFTL 1006A2.5S	10	6	2.381	10.65	8.1	2.5×1	2830	4810	290	490	0.10
RNFTL 1208A2.5S	12	8	2.778	12.65	9.6	2.5×1	3730	6560	380	670	0.10
RNFTL 1404A3.5S	14	4	2.778	14.5	11.5	3.5×1	5370	10800	545	1100	0.10
RNFTL 1405A2.5S	14	5	3.175	14.5	11.0	2.5×1	5260	9720	535	990	0.10
RNFTL 1610A2.5 **RNFTL 1610A2.5S**	16	10	3.175	16.75	13.3	2.5×1	5660	11500	575	1180	0.10
RNFTL 1808A3.5 **RNFTL 1808A3.5S**	18	8	4.762	18.5	13.6	3.5×1	13200	25800	1350	2630	0.15
RNFTL 2005A2.5 **RNFTL 2005A2.5S**	20	5	3.175	20.5	17.0	2.5×1	6360	14200	650	1450	0.10
RNFTL 2010A2.5 **RNFTL 2010A2.5S**	20	10	4.762	21.25	16.2	2.5×1	10900	21800	1110	2220	0.15
RNFTL 2505A5 **RNFTL 2505A5S**	25	5	3.175	25.5	22.0	2.5×2	12800	36300	1310	3710	0.10
RNFTL 2510A2.5 **RNFTL 2510A2.5S**	25	10	6.35	26	19.0	2.5×1	17500	35200	1790	3590	0.20
RNFTL 2510A5 **RNFTL 2510A5S**						2.5×2	31800	70300	3240	7170	

Remarks
1. Protruding portion of the tube does not have any interference with the ball nut housing if its dimensions corresponding to U and V are large enough.
2. The actual entire screw shaft length may become slightly longer than nominal length Ls due to manufacturing tolerance.
3. Seal is contained in the nut. Therefore, the external dimensions of those with a seal are the same as those without. In the side view drawing of ball nut, the above of the center line is with seal, and beneath is without seal. Seal for those with the shaft diameter of 14 mm or less is made of synthetic resin. Seal for those of 16 mm or over is a "Brush-seal."

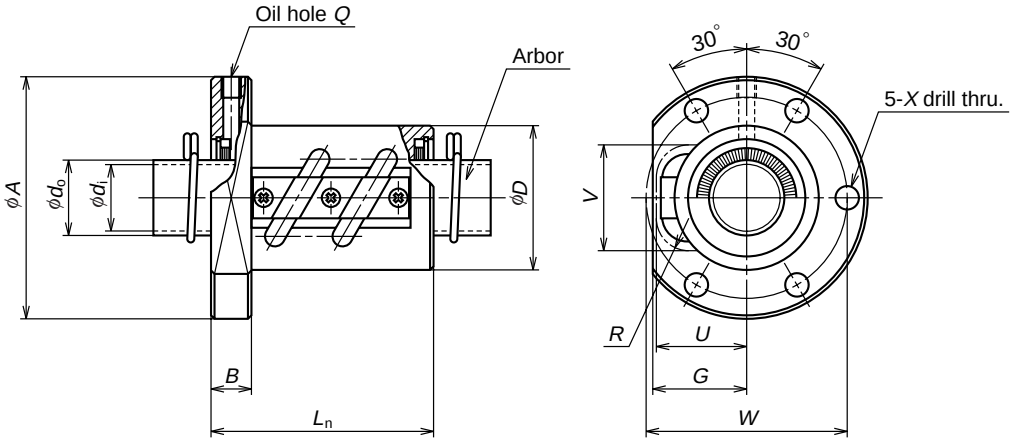
Standard stock

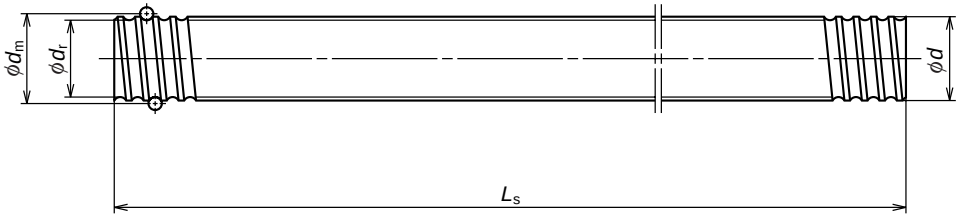


Unit: mm

Ball nut dimensions: Outside dia. D	Flange A	Flange G	Flange B	Length L_n	Bolt hole W	Bolt hole X	Oil hole Q	Projecting tube U	Projecting tube V	Projecting tube R	Arbor: Outside dia. d_0	Arbor: Bore d_i	Screw shaft: Standard length L_s			Screw shaft No.
20	40	15	6	34	30	4.5	M3×0.5	15	15	7	8.1	6.1	400	800		RS1003A**
20	40	15	6	36	30	4.5	M3×0.5	15	15	5	8.1	6.1	400	800		RS1006A**
25	45	19	8	46	35	4.5	M3×0.5	19	18	7	9.6	7.6	400	800		RS1208A**
25	50	19	10	43	40	4.5	M6×1	19	20	7	11.5	9.5	500	1000		RS1404A**
30	50	22	10	45	40	4.5	M6×1	22	21	8	11.0	9.0	500	1000		RS1405A**
30	53	23	10	54	41	5.5	M6×1	23	22.5	8	13.3	11.3	500	1000	1500	RS1610A**
34	63	27	12	58	49	6.6	M6×1	27	27	14	13.6	11.6	500	1000	1500	RS1808A**
40	60	28	10	46	50	4.5	M6×1	28	27	10	17.0	14.6	500	1000	2000	RS2005A**
40	67	30	12	59	53	6.6	M6×1	30	29	12	16.2	13.8	500	1000	2000	RS2010A**
42	71	28	12	66	57	6.6	M6×1	28	31	10	22.0	19.6	1000	2000	2500	RS2505A**
44	80	34	15	62	62	9	M6×1	34	37	17	19.0	16.6	1000	2000	2500	RS2510A**
44	80	34	15	92	62	9	M6×1	34	37	17						

Remarks
4. Nut assembly with arbor and the screw shaft are separated at time of delivery.
5. At the end of the screw shaft reference number where marked with "**", fill with the value obtained by dividing the standard screw shaft length by 100 mm.
6. Items in stock are not applied surface treatment. NSK provides treatment such as phosphate coating on request.





Standard stock

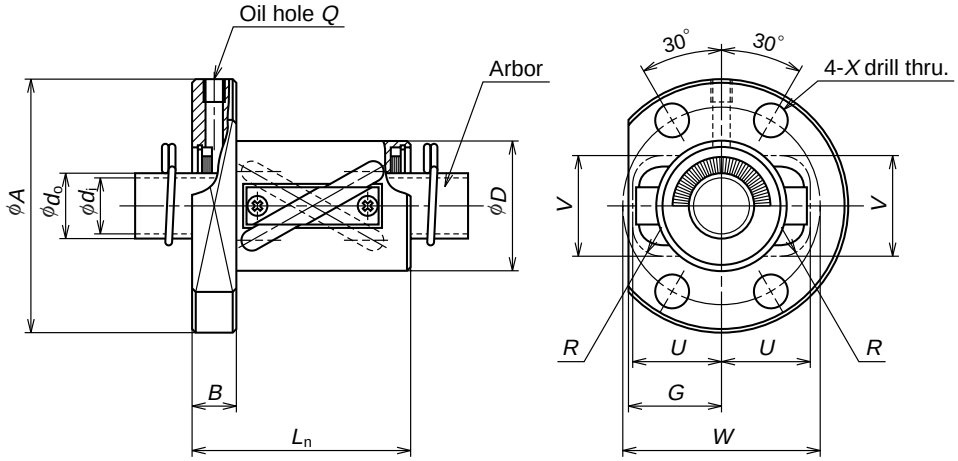
Unit: mm

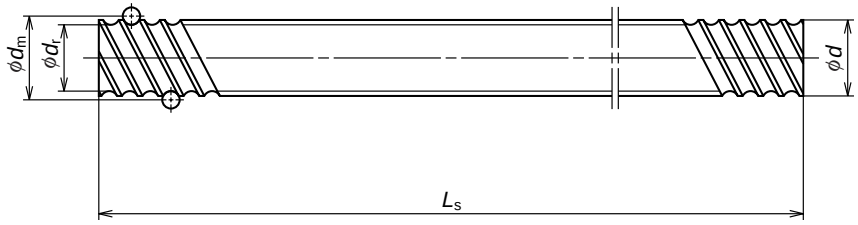
Ball nut No.	Shaft dia. *d*	Lead *l*	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls: Turns × Circuits	Basic load rating N: Dynamic C_a	Basic load rating N: Static C_{0a}	Basic load rating {kgf}: Dynamic C_a	Basic load rating {kgf}: Static C_{0a}	Axial play Max.
RNFTL 2806A2.5	28	6	3.175	28.5	25.0	2.5×1	7430	20300	760	2070	0.10
RNFTL 2806A2.5S											
RNFTL 2806A5						2.5×2	13500	40600	1380	4140	
RNFTL 2806A5S											
RNFTL 3210A5	32	10	6.35	33.75	27.0	2.5×2	35700	92200	3640	9410	0.20
RNFTL 3210A5S											
RNFTL 3610A2.5	36	10	6.35	37	30.0	2.5×1	21000	51000	2140	5200	0.20
RNFTL 3610A2.5S											
RNFTL 3610A5						2.5×2	38100	102000	3890	10400	
RNFTL 3610A5S											
RNFTL 4010A7	40	10	6.35	41.75	35.0	3.5×2	53500	164000	5460	16800	0.20
RNFTL 4010A7S											
RNFTL 4512A5	45	12	7.144	46.5	39.0	2.5×2	49600	147000	5060	15000	0.23
RNFTL 4512A5S											
RNFTL 5010A7	50	10	6.35	51.75	45.0	3.5×2	59500	205000	6060	21000	0.20
RNFTL 5010A7S											
RNFTL 5016A5	50	16	9.525	52	42.0	2.5×2	99900	293000	10200	29900	0.23
RNFTL 5016A5S											

Remarks
1. The protruding portion of the tube does not interfere with nut housing if its corresponding dimensions to U and V are large enough.
2. The actual screw shaft length may become slightly longer than nominal length of Ls due to manufacturing tolerance.
3. The seal is contained in the nut. Therefore, the external dimensions of those with a seal are the same as those without.
In the side view drawing of the nut, the above of the center line is with seal, and beneath is without seal.
Seal is "BBrush-seal".

Ball nut dimensions: Outside dia. *D*	Flange *A*	Flange *G*	Flange *B*	Length L_n	Bolt hole *W*	Bolt hole *X*	Oil hole *Q*	Projecting tube *U*	Projecting tube *V*	Projecting tube *R*	Arbor: Outside dia. d_0	Arbor: Bore d_i	Screw shaft: Standard length L_s			Screw shaft No.
50	*79*	*33*	*15*	*55*	*65*	*6.6*	*M6×1*	*33*	*34*	*10*	*25.0*	*22.6*	*1000*	*2000*	*2500*	*RS2806A***
50	*79*	*33*	*15*	*79*	*65*	*6.6*	*M6×1*	*33*	*34*	*10*						
55	*97*	*39*	*18*	*97*	*75*	*11*	*M6×1*	*39*	*42*	*17*	*27.0*	*24.6*	*1000*	*2000*	*3000*	*RS3210A***
60	*102*	*42*	*18*	*68*	*80*	*11*	*M6×1*	*42*	*46*	*17*	*30.0*	*27.6*	*1000*	*2000*	*3000*	*RS3610A***
60	*102*	*42*	*18*	*98*	*80*	*11*	*M6×1*	*42*	*46*	*17*						
65	*114*	*44*	*20*	*120*	*90*	*14*	*M6×1*	*44*	*50*	*20*	*35.0*	*31.8*	*2000*	*3000*	*4000*	*RS4010A***
70	*130*	*47*	*22*	*116*	*100*	*18*	*M6×1*	*47*	*55*	*20*	*39.0*	*35.8*	*2000*	*3000*	*4000*	*RS4512A***
80	*140*	*52*	*22*	*122*	*110*	*18*	*M6×1*	*52*	*59*	*20*	*45.0*	*41.8*	*2000*	*3000*	*4000*	*RS5010A***
85	*163*	*57*	*28*	*146*	*125*	*22*	*M6×1*	*57*	*63*	*25*	*42.0*	*38.8*	*2000*	*3000*	*4000*	*RS5016A***

Remarks
4. Nut assembly with arbor and the screw shaft are separated at time of delivery.
*5. At the end of the screw shaft reference number where marked with "**", fill with the value obtained by dividing the standard screw shaft length by 100 mm.*
6. Items in stock are not applied surface treatment. NSK provides treatment such as phosphate coating on request.





Standard stock

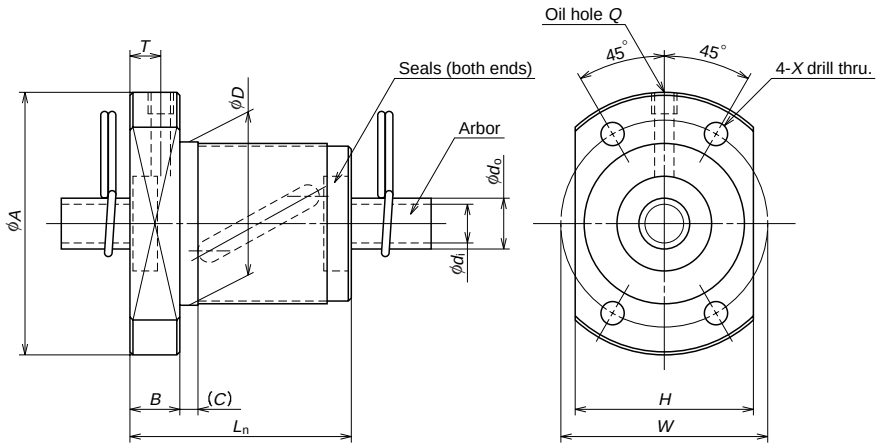
Unit: mm

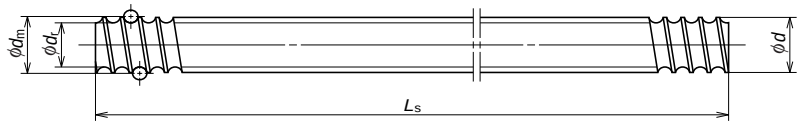
Ball nut No.	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls: Turns × Circuits	Basic load rating (N) Dynamic C_a	Basic load rating (N) Static C_{0a}	Basic load rating {kgf} Dynamic C_a	Basic load rating {kgf} Static C_{0a}	Axial play Max.
RNFTL 1212A3	12	12	2.381	12.65	10.1	1.5 × 2	3360	6270	340	640	0.10
RNFTL 1616A3 **RNFTL 1616A3S**	16	16	2.778	16.65	13.6	1.5 × 2	4880	9650	500	985	0.10
RNFTL 2020A3 **RNFTL 2020A3S**	20	20	3.175	20.75	17.3	1.5 × 2	7010	15400	715	1570	0.10
RNFTL 2525A3 **RNFTL 2525A3S**	25	25	3.969	26	22.0	1.5 × 2	10500	24100	1070	2450	0.12
RNFTL 3232A3 **RNFTL 3232A3S**	32	32	4.762	33.25	28.0	1.5 × 2	15300	37100	1560	3780	0.15
RNFTL 4040A3 **RNFTL 4040A3S**	40	40	6.35	41.75	35.0	1.5 × 2	24400	61600	2490	6280	0.20

Remarks 1. Protruding portion of the tube does not have any interference with the ball nut housing if its dimensions corresponding to U and V are large enough.
2. The actual entire screw shaft length may become slightly longer than nominal length Ls due to manufacturing tolerance.
3. Seal is contained in the nut. Therefore, the external dimensions of those with a seal are the same as those without.
In the side view drawing of ball nut, the above of the center line is with seal, and beneath is without seal.
Seal for those with the shaft diameter of 14 mm or less is made of synthetic resin. Seal for those of 16 mm or over is a "Brush-seal."

Ball nut dimensions: Outside dia. D	Flange A	Flange G	Flange B	Length L_n	Bolt hole W	Bolt hole X	Oil hole Q	Projecting tube U	Projecting tube V	Projecting tube R	Arbor: Outside dia. d_0	Arbor: Bore d_i	Screw shaft: Standard length L_s	Screw shaft No.
24	44	17	8	44	34	4.5	M3 × 0.5	17	16	5	10.1	8.1	400 800	RS1212A**
30	55	22	10	50	43	6.6	M6 × 1	22	22	7	13.6	11.6	500 1000 1500	RS1616A**
35	68	25	12	59	52	9	M6 × 1	25	27	8	17.3	14.9	500 1000 2000	RS2020A**
45	80	31	12	69	63	9	M6 × 1	31	32	10	22.0	19.6	1000 2000 2500	RS2525A**
55	100	37	15	84	80	11	M6 × 1	37	40	12	28.0	25.6	1000 2000 3000	RS3232A**
70	120	46	18	103	95	14	M6 × 1	46	49	15	35.0	31.8	2000 3000 4000	RS4040A**

Remarks 4. Nut assembly with arbor and the screw shaft are separated at time of delivery.
5. At the end of the screw shaft reference number where marked with "**", fill with the value obtained by dividing the standard screw shaft length by 100 mm.
6. Items in stock are not applied surface treatment. NSK provides treatment such as phosphate coating on request.





Standard stock

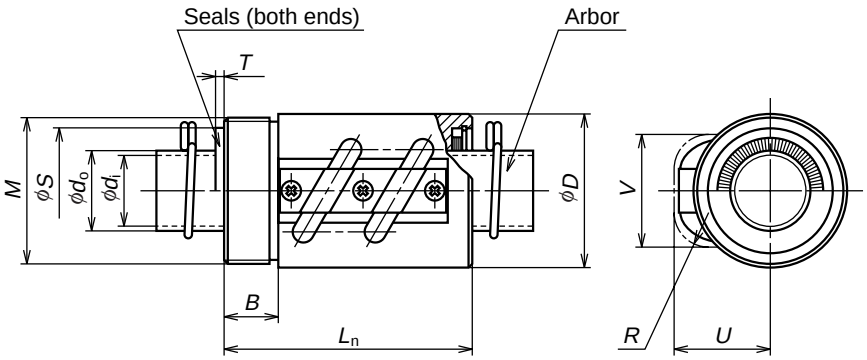
Unit: mm

Ball nut 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}	Basic load rating {kgf}: Dynamic C_a	Basic load rating {kgf}: Static C_{0a}	Axial play Max.
RNFBL 1006A2.5S	10	6	2.381	10.65	8.1	2.5×1	2830	4810	290	490	0.10
RNFBL 1208A2.5S	12	8	2.778	12.65	9.6	2.5×1	3730	6560	380	670	0.10
RNFBL 1404A3.5S	14	4	2.778	14.5	11.5	3.5×1	5370	10800	545	1100	0.10
RNFBL 1405A2.5S	14	5	3.175	14.5	11.0	2.5×1	5260	9720	535	990	0.10
RNFBL 1808A3.5S	18	8	4.762	18.5	13.6	3.5×1	13200	25800	1350	2630	0.15
RNFBL 2005A2.5S	20	5	3.175	20.5	17.0	2.5×1	6360	14200	650	1450	0.10
RNFBL 2010A2.5S	20	10	4.762	21.25	16.2	2.5×1	10900	21800	1110	2220	0.15
RNFBL 2505A2.5S	25	5	3.175	25.5	22.0	2.5×1	7070	18200	720	1850	0.10
RNFBL 2505A5S						2.5×2	12800	36300	1310	3710	
RNFBL 2510A2.5S	25	10	6.35	26	19.0	2.5×1	17500	35200	1790	3590	0.20
RNFBL 2510A5S						2.5×2	31800	70300	3240	7170	
RNFBL 2806A2.5S	28	6	3.175	28.5	25.0	2.5×1	7430	20300	760	2070	0.10
RNFBL 2806A5S						2.5×2	13500	40600	1380	4140	
RNFBL 3210A2.5S	32	10	6.35	33.75	27.0	2.5×1	19700	46100	2010	4700	0.20
RNFBL 3210A5S						2.5×2	35700	92200	3640	9410	
RNFBL 3610A2.5S	36	10	6.35	37	30.0	2.5×1	21000	51000	2140	5200	0.20
RNFBL 3610A5S						2.5×2	38100	102000	3890	10400	
RNFBL 4010A5S	40	10	6.35	41.75	35.0	2.5×2	40100	116000	4090	1190	0.20

Ball nut dimensions: Outside dia. D	Flange A	Flange H	Flange B	Length: Overall length L	Length (C)	Bolt hole W	Bolt hole X	Oil hole Q	Oil hole T	Arbor: Outside dia. d_0	Arbor: Bore d_1	Screw shaft: Standard length L_s	Screw shaft No.
26	42	29	8	36	3	34	4.5	M3×0.5	5.0	8.1	6.1	400 800	RS1006A**
29	45	32	8	44	3	37	4.5	M3×0.5	5.5	9.6	7.6	400 800	RS1208A**
31	50	37	10	40	4	40	4.5	M6×1	5.0	11.5	9.5	500 1000	RS1404A**
32	50	38	10	40	4	40	4.5	M6×1	5.0	11.0	9.0	500 1000	RS1405A**
50	80	60	12	61	4	65	6.6	M6×1	6.0	13.6	11.6	500 1000 1500	RS1808A**
40	60	46	10	40	4	50	4.5	M6×1	5.0	17.0	14.6	500 1000 2000	RS2005A**
52	82	64	12	61	5	67	6.6	M6×1	6.0	16.2	13.8	500 1000 2000	RS2010A**
43	67	50	10	40	4	55	5.5	M6×1	5.0	22.0	19.6	1000 2000 2500	RS2505A**
				55									
60	96	72	15	66	5	78	9.0	M6×1	7.5	19.0	16.6	1000 2000 2500	RS2510A**
				96									
50	80	60	12	47	5	65	6.6	M6×1	6.0	25.0	22.6	1000 2000 2500	RS2806A**
				65									
67	103	78	15	67	5	85	9.0	M6×1	7.5	27.0	24.6	1000 2000 3000	RS3210A**
				97									
70	110	82	17	69	5	90	11.0	M6×1	8.5	30.0	27.6	1000 2000 3000	RS3610A**
				99									
76	116	88	17	99	5	96	11.0	M6×1	8.5	35.0	31.8	2000 3000 4000	RS4010A**

Remarks 1. The actual screw shaft length may be slightly longer than nominal length Ls due to manufacturing tolerance.
2. Nut assembly with arbor and screw shaft are separated at time of delivery.
3. The value obtained by dividing the standard screw length by 100 mm will be entered at the end of the reference number where marked with "* *."

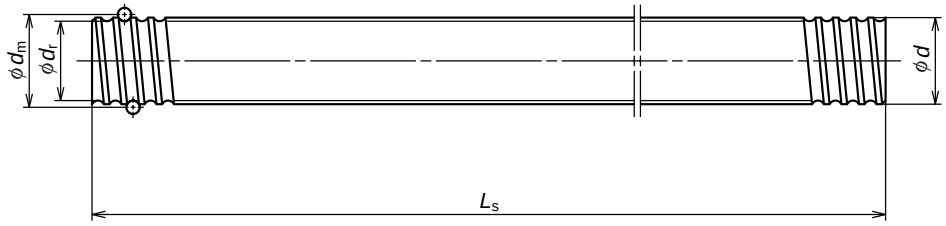
Remarks 4. Items in stock are not applied surface treatment. NSK provides treatment such as phosphate coating on request.
5. Seal for those with the shaft diameter of 14 mm or less is made of synthetic resin. Seal for those with 16 mm or larger is "Brush-seal."



Ball nut 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}	Basic load rating {kgf}: Dynamic C_a	Basic load rating {kgf}: Static C_{0a}	Axial play Max.
RNCT 1003A3.5	10	3	2.381	10.65	8.1	3.5 × 1	3780	6730	385	685	0.10
RNCT 1404A3.5S	14	4	2.778	14.5	11.5	3.5 × 1	5370	10800	545	1100	0.10
RNCT 1405A2.5S	14	5	3.175	14.5	11.0	2.5 × 1	5260	9720	535	990	0.10
RNCT 1808A3.5 **RNCT 1808A3.5S**	18	8	4.762	18.5	13.6	3.5 × 1	13200	25800	1350	2630	0.15
RNCT 2005A2.5 **RNCT 2005A2.5S**	20	5	3.175	20.5	17.0	2.5 × 1	6360	14200	650	1450	0.10
RNCT 2505A5 **RNCT 2505A5S**	25	5	3.175	25.5	22.0	2.5 × 2	12800	36300	1310	3710	0.10
RNCT 2510A5 **RNCT 2510A5S**	25	10	6.35	26	19.0	2.5 × 2	31800	70300	3240	7170	0.20
RNCT 2806A5 **RNCT 2806A5S**	28	6	3.175	28.5	25.0	2.5 × 2	13500	40600	1380	4140	0.10
RNCT 3210A5 **RNCT 3210A5S**	32	10	6.35	33.75	27.0	2.5 × 2	35700	92200	3640	9410	0.20
RNCT 3610A5 **RNCT 3610A5S**	36	10	6.35	37	30.0	2.5 × 2	38100	102000	3890	10400	0.20
RNCT 4010A7 **RNCT 4010A7S**	40	10	6.35	41.75	35.0	3.5 × 2	53500	164000	5460	16800	0.20
RNCT 4512A5 **RNCT 4512A5S**	45	12	7.144	46.5	39.0	2.5 × 2	49600	147000	5060	15000	0.23
RNCT 5010A7 **RNCT 5010A7S**	50	10	6.35	51.75	45.0	3.5 × 2	59500	205000	6060	21000	0.20
RNCT 5016A5 **RNCT 5016A5S**	50	16	9.525	52	42.0	2.5 × 2	99900	293000	10200	29900	0.23

Remarks
1. Protruding portion of the tube does not have any interference with the ball nut housing if its dimensions corresponding to U and V are large enough.
2. The actual entire screw shaft length may become slightly longer than nominal length Ls due to manufacturing tolerance.
3. A seal cannot be installed in the V thread side. It may be installed in the opposite side.
Seal is contained in the nut. Therefore, the external dimensions of those with a seal are the same as those without. In the side view drawing of ball nut, the above of the center line is with seal, and beneath is without seal.

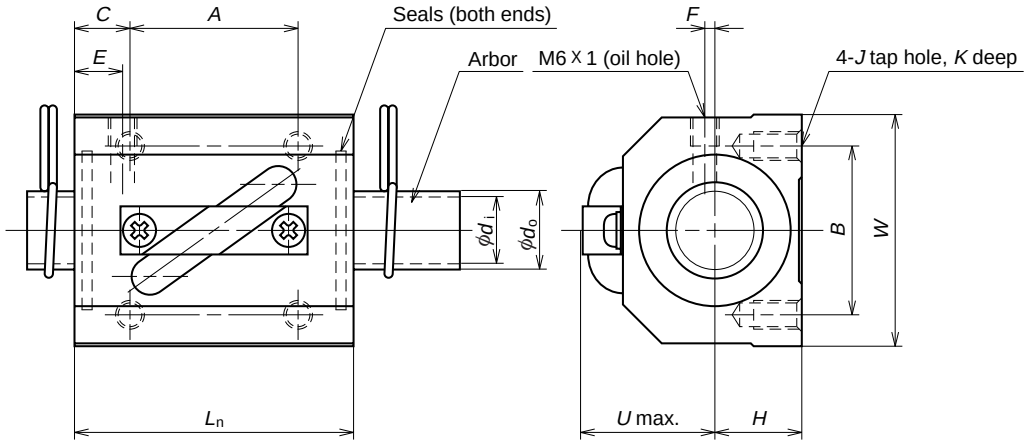
Standard stock

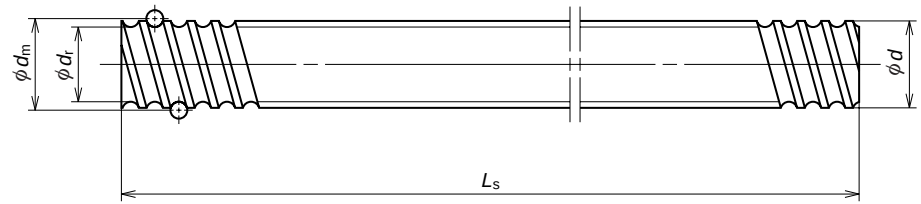


Unit: mm

Ball nut dimensions: Outside dia. D	Flange: M	Flange: B	Length L_n	Projecting tube: U	Projecting tube: V	Projecting tube: R	Seal dimensions: Diameter S	Seal dimensions: Thickness T	Arbor: Outside dia. d_0	Arbor: Bore d_i	Screw shaft: Standard length L_s			Screw shaft No.
20	M18 × 1	10	38	15	15	7			8.1	6.1	400	800		RS1003A**
25	M24 × 1	10	43	19	20	7			11.5	9.5	500	1000		RS1404A**
30	M26 × 1.5	10	45	22	21	8			11.0	9.0	500	1000		RS1405A**
34	M32 × 1.5	12	58	27	27	14	28.5	2.5	13.6	11.6	500	1000	1500	RS1808A**
40	M36 × 1.5	12	48	28	27	10	29.5	2.5	17.0	14.6	500	1000	2000	RS2005A**
42	M40 × 1.5	15	69	28	31	10	34.5	2.5	22.0	19.6	1000	2000	2500	RS2505A**
44	M42 × 1.5	15	92	34	37	17	38.5	2.5	19.0	16.6	1000	2000	2500	RS2510A**
50	M45 × 1.5	15	79	33	34	10	37.5	2.5	25.0	22.6	1000	2000	2500	RS2806A**
55	M50 × 1.5	18	97	39	42	17	45.5	2.5	27.0	24.6	1000	2000	3000	RS3210A**
60	M55 × 2	18	98	42	46	17	50.5	3.0	30.0	27.6	1000	2000	3000	RS3610A**
65	M60 × 2	25	125	44	50	20	54.5	3.0	35.0	31.8	2000	3000	4000	RS4010A**
70	M65 × 2	30	124	47	55	20	60.5	3.0	39.0	35.8	2000	3000	4000	RS4512A**
80	M75 × 2	40	140	52	59	20	64.5	3.0	45.0	41.8	2000	3000	4000	RS5010A**
85	M80 × 2	40	158	57	63	25	68.5	3.0	42.0	38.8	2000	3000	4000	RS5016A**

Seal for those with the shaft diameter of 14 mm or less is made of synthetic resin. Seal for those of 16 mm or over is a "Brush-seal."
There is no seal on the V-thread side for RNCT1404A3.5S and RNCT1405A2.5S
4. *Nut assembly with arbor and the screw shaft are separated at time of delivery.*
5. *At the end of the screw shaft reference number where marked with "**", fill with the value obtained by dividing the standard screw shaft length by 100 mm.*
6. *Items in stock are not applied surface treatment. NSK provides treatment such as phosphate coating on request.*





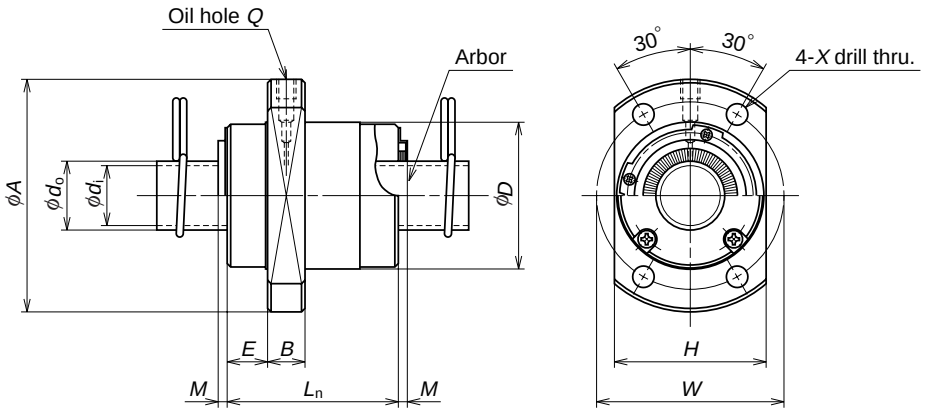
Unit: mm

Ball nut 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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}	Axial play Max.
RNSTL 1404A3.5S	14	4	2.778	14.5	11.5	3.5 × 1	5370	10800	545	1100	0.10
RNSTL 1405A2.5S	14	5	3.175	14.5	11.0	2.5 × 1	5260	9720	535	990	0.10
RNSTL 1808A3.5S	18	8	4.762	18.5	13.6	3.5 × 1	13200	25800	1350	2630	0.15
RNSTL 2005A2.5S	20	5	3.175	20.5	17.0	2.5 × 1	6360	14200	650	1450	0.10
RNSTL 2010A2.5S	20	10	4.762	21.25	16.2	2.5 × 1	10900	21800	1110	2220	0.15
RNSTL 2505A2.5S	25	5	3.175	25.5	22.0	2.5 × 1	7070	18200	720	1850	0.10
RNSTL 2510A5S	25	10	6.35	26	19.0	2.5 × 2	31800	70300	3240	7170	0.20
RNSTL 2806A2.5S	28	6	3.175	28.5	25.0	2.5 × 1	7430	20300	760	2070	0.10
RNSTL 2806A5S						2.5 × 2	13500	40600	1380	4140	
RNSTL 3210A2.5S	32	10	6.35	33.75	27.0	2.5 × 1	19700	46100	2010	4700	0.20
RNSTL 3210A5S						2.5 × 2	35700	92200	3640	9410	
RNSTL 3610A2.5S	36	10	6.35	37	30.0	2.5 × 1	21000	51000	2140	5200	0.20
RNSTL 3610A5S						2.5 × 2	38100	102000	3890	10400	
RNSTL 4512A5S	45	12	7.144	46.5	39.0	2.5 × 2	49600	147000	5060	15000	0.23

Ball nut dimensions: Length L_n	Width W	Center height H	Bolt hole A	B	C	J	K	Oil hole E	F	U	Arbor: Outside dia. d_0	Bore d_i	Screw shaft: Standard length L_s			Screw shaft No.
38	34	13	22	26	8	M4	7	7	3	20	11.5	9.5	500	1000		RS1404A**
38	34	13	22	26	8	M4	7	7	3	21	11.0	9.0	500	1000		RS1405A**
56	48	17	35	35	10.5	M6	10	8	3	26	13.6	11.6	500	1000	1500	RS1808A**
38	48	17	22	35	8	M6	9	6	2	27	17.0	14.6	500	1000	2000	RS2005A**
58	48	18	35	35	11.5	M6	10	10	2	28	16.2	13.8	500	1000	2000	RS2010A**
35	60	20	22	40	6.5	M8	10	6	0	27	22.0	19.6	1000	2000	2500	RS2505A**
94	60	23	60	40	17	M8	12	10	0	32	19.0	16.6	1000	2000	2500	RS2510A**
42	60	22	18	40	12	M8	12	8	0	32	25.0	22.6	1000	2000	2500	RS2806A**
67	60	22	40	40	13.5											
64	70	26	45	50	9.5	M8	12	10	0	38	27.0	24.6	1000	2000	3000	RS3210A**
94	70	26	60	50	17											
64	86	29	45	60	9.5	M10	16	11	0	41	30.0	27.6	1000	2000	3000	RS3610A**
96	86	29	60	60	18											
115	100	36	75	75	20	M12	20	13	0	46	39.0	35.8	2000	3000	4000	RS4512A**

Remarks 1. The actual screw shaft length may be slightly longer than nominal length Ls due to manufacturing tolerance.
2. Nut assembly with arbor and screw shaft are separated at time of delivery.
3. The value obtained by dividing the standard screw length by 100 mm will be entered at the end of the reference number where marked with "* *."

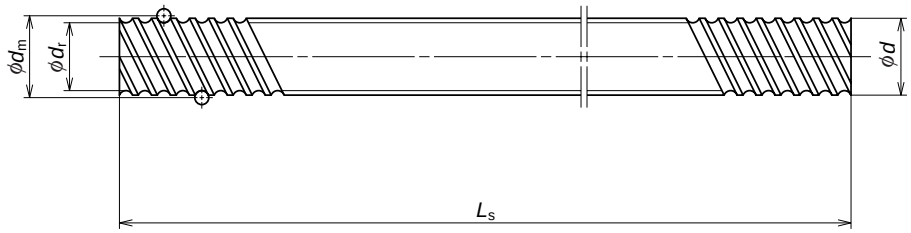
Remarks 4. Items in stock are not applied surface treatment. NSK provides treatment such as phosphate coating on request.
5. Seal for those with the shaft diameter of 14 mm or less is made of synthetic resin. Seal for those with 18 mm or larger is "Brush-seal."



Ball nut No.	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	(N) Static C0a	{kgf} Dynamic Ca	{kgf} Static C0a	Axial play Max.
RNFCL 1212A3	12	12	2.381	12.65	10.1	1.7 × 2	3740	6640	380	675	0.10
RNFCL 1212A6						1.7 × 4	6780	13300	690	1350	
RNFCL 1520A3 **RNFCL 1520A3S**	15	20	3.175	15.5	12.2	1.7 × 2	6730	12300	685	1260	0.10
RNFCL 1616A3 **RNFCL 1616A3S**	16	16	2.778	16.65	13.5	1.7 × 2	5430	10400	555	1060	0.10
RNFCL 1616A6 **RNFCL 1616A6S**						1.7 × 4	9860	20800	1010	2120	
RNFCL 2020A3 **RNFCL 2020A3S**	20	20	3.175	20.75	17.3	1.7 × 2	7810	16500	795	1680	0.10
RNFCL 2020A6 **RNFCL 2020A6S**						1.7 × 4	14200	33000	1450	3360	
RNFCL 2525A3 **RNFCL 2525A3S**	25	25	3.969	26	22.0	1.7 × 2	11700	25800	1190	2630	0.12
RNFCL 2525A6 **RNFCL 2525A6S**						1.7 × 4	21200	51500	2160	5250	
RNFCL 3232A3 **RNFCL 3232A3S**	32	32	4.762	33.25	28.0	1.7 × 2	17100	40500	1740	4130	0.15
RNFCL 3232A6 **RNFCL 3232A6S**						1.7 × 4	31000	81000	3160	8260	
RNFCL 4040A3 **RNFCL 4040A3S**	40	40	6.35	41.75	35.0	1.7 × 2	27200	67900	2770	6920	0.20
RNFCL 4040A6 **RNFCL 4040A6S**						1.7 × 4	49300	136000	5030	13800	
RNFCL 5050A3 **RNFCL 5050A3S**	50	50	7.938	52.25	44.0	1.7 × 2	40600	106000	4140	10800	0.25
RNFCL 5050A6 **RNFCL 5050A6S**						1.7 × 4	73700	212000	7510	21600	

Remarks 1. The actual screw shaft length may be slightly longer than nominal length Ls due to manufacturing tolerance.
2. Nut assembly with arbor and screw shaft are separated at time of delivery.
3. The value obtained by dividing the standard screw length by 100 mm will be entered at the end of the reference number where marked with "* *."

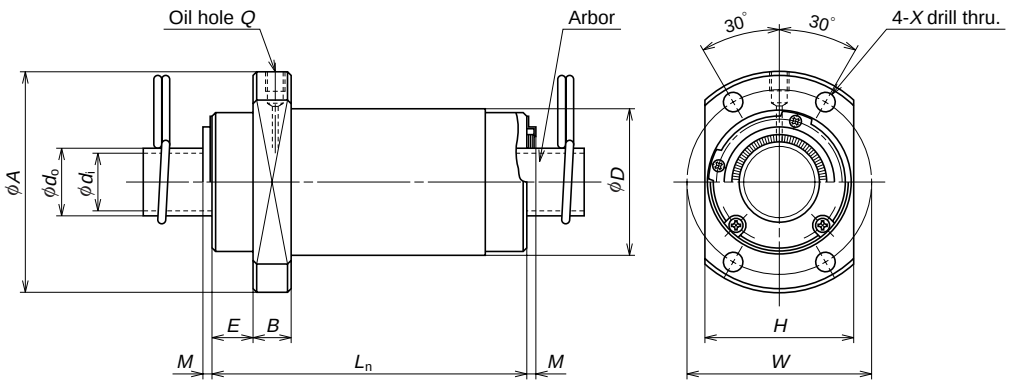
Standard stock



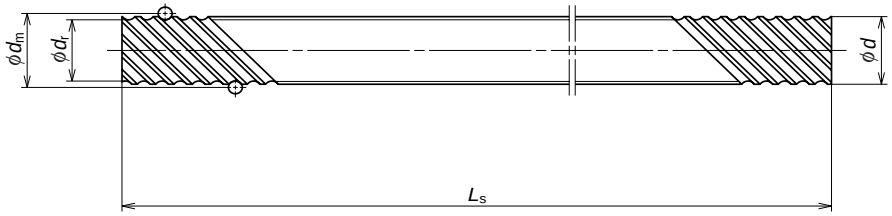
Unit: mm

Ball nut dimensions: Outside dia. D	Flange A	Flange H	Flange B	Length E	Length Ln	Length M	Bolt hole W	Bolt hole X	Oil hole Q	Arbor: Outside dia. d0	Arbor: Bore di	Screw shaft: Standard length Ls	Screw shaft No.
26	44	28	6	9	30	—	35	4.5	M3 × 0.5	10.1	8.1	400 800	RS1212A**
33	51	35	10	11	45	— 3	42	4.5	M6 × 1	12.2	10.2	500 1000 1500	RS1520A**
32	53	34	10	10	38	— 3 — 3	42	4.5	M6 × 1	13.5	11.5	500 1000 1500	RS1616A**
39	62	41	10	11.5	46	— 3 — 3	50	5.5	M6 × 1	17.3	14.9	500 1000 2000	RS2020A**
47	74	49	12	13	55	— 3 — 3	60	6.6	M6 × 1	22.0	19.6	1000 2000 2500	RS2525A**
58	92	60	12	16	70	— 3 — 3	74	9	M6 × 1	28.0	25.6	1000 2000 3000	RS3232A**
73	114	75	15	19.5	85	— 3.5 — 3.5	93	11	M6 × 1	35.0	31.8	2000 3000 4000	RS4040A**
90	135	92	20	21.5	107	— 3.5 — 3.5	112	14	M6 × 1	44.0	40.8	2000 3000 4000	RS5050A**

Remarks 4. Items in stock are not applied surface treatment. NSK provides treatment such as phosphate coating on request.
5. The entire length of the nut becomes longer by "2 x M " for those with a seal. The seal is "Brush-seal."



Standard stock



Unit: mm

Ball nut 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}	Basic load rating {kgf}: Dynamic C_a	Basic load rating {kgf}: Static C_{0a}	Axial play Max.
RNFCL 1632A2	16	32	2.778	16.65	13.5	0.7 × 4	4600	8460	470	865	0.10
RNFCL 1632A2S											
RNFCL 1632A3						1.7 × 2	5430	10400	555	1060	
RNFCL 1632A3S											
RNFCL 1632A6						1.7 × 4	9860	20800	1010	2120	
RNFCL 1632A6S											
RNFCL 2040A2	20	40	3.175	20.75	17.3	0.7 × 4	6610	13600	675	1380	0.10
RNFCL 2040A2S											
RNFCL 2040A3						1.7 × 2	7810	16500	795	1680	
RNFCL 2040A3S											
RNFCL 2040A6						1.7 × 4	14200	33000	1450	3360	
RNFCL 2040A6S											
RNFCL 2550A2	25	50	3.969	26	22.0	0.7 × 4	9870	21200	1010	2160	0.12
RNFCL 2550A2S											
RNFCL 2550A3						1.7 × 2	11700	25800	1190	2630	
RNFCL 2550A3S											
RNFCL 2550A6						1.7 × 4	21200	51500	2160	5250	
RNFCL 2550A6S											
RNFCL 3264A3	32	64	4.762	33.25	28.0	1.7 × 2	17100	40500	1740	4130	0.15
RNFCL 3264A3S											
RNFCL 3264A6						1.7 × 4	31000	81000	3160	8260	
RNFCL 3264A6S											
RNFCL 4080A3	40	80	6.350	41.75	35.0	1.7 × 2	27200	67900	2770	6920	0.20
RNFCL 4080A3S											
RNFCL 4080A6						1.7 × 4	49300	136000	5030	13800	
RNFCL 4080A6S											

Ball nut dimensions: Outside dia. D	Flange: A	Flange: H	Flange: B	Length: E	Length: L_n	Length: M	Bolt hole: W	Bolt hole: X	Oil hole Q	Arbor: Outside dia. d_0	Arbor: Bore d_1	Screw shaft: Standard length L_s	Screw shaft No.
32	50	34	10	10	34	—	41	4.5	M6 × 1	13.5	11.5	500 1000 1500	RS1632A**
						3							
					66	—							
						3							
					66	—							
						3							
38	58	40	10	11	41	—	48	5.5	M6 × 1	17.3	14.9	500 1000 1500 2000	RS2040A**
						3							
					81	—							
						3							
					81	—							
						3							
46	70	48	12	13	50	—	58	6.6	M6 × 1	22.0	19.6	1000 2000 2500	RS2550A**
						3							
					100	—							
						3							
					100	—							
						3							
58	92	60	12	15.5	126	—	74	9	M6 × 1	28.0	25.6	1000 2000 3000 4000	RS3264A**
						3							
						—							
						3							
73	114	75	15	19	158	—	93	11	M6 × 1	35.0	31.8	2000 3000 4000 5000	RS4080A**
						3.5							
						—							
						3.5							

Remarks 1. The actual screw shaft length may be slightly longer than nominal length Ls due to manufacturing tolerance.
2. Nut assembly with arbor and screw shaft are separated at time of delivery.
3. The value obtained by dividing the standard screw length by 100 mm will be entered at the end of the reference number where marked with "* *."

Remarks 4. Items in stock are not applied surface treatment. NSK provides treatment such as phosphate coating on request.
5. The entire length of the nut becomes longer by "2 x M " for those with a seal. The seal is "Brush-seal."

B-I-6.6 Accessories

Accessories to use with ball screw are available in stock.

Table I-6•6 Support unit categories

Application		Shape	Support side	Bearing in use	Bearing boreBearing seat diameter	Page
Small equipment, light load	Square	WBK**-01 	Fixed support side	Angular contact ball bearing	ϕ 6～ϕ 25	B277～
		WBK**S-01 	Simple support side	Deep groove ball bearing	ϕ 6～ϕ 25	B279～
		WBK**SF-01 		Deep groove ball bearing	ϕ 12, ϕ 15 (Exclusive for VFA Series)	B291
	Round	WBK**R-01 (Support kit) 	Fixed support side	Deep groove ball bearing (arranged to have angular contact)	ϕ 4, ϕ 6 (Exclusive for RMA and RMS Series)	B293
		WBK**-11 		Angular contact ball bearing	ϕ 6～ϕ 25	B277～
Machine tools, heavy load	Round	WBK**DF*-31 	Fixed support side	Thrust angular contact ball bearing	ϕ 17～ϕ 40	B296～

(1) Support units

① Classification

Ball screw support units are classified into categories by their shape (Table I-6.6). Select the type that is appropriate for you to use.

② Features

- Short delivery time: Standardized items in stock
- Use most suitable bearings

  On the fixed support side, the angular contact ball bearing is used. It has great rigidity and low friction torque which match the rigidity of the ball screw. The thrust angular contact ball bearing with high precision and great rigidity is another choice for the fixed support side.
- High dust prevention, and low friction torque

  Oil seal is installed in small clearance on the fixed support side. A deep-groove ball bearing with a shield on both sides is used on the simple support side. This minimizes friction torque.
- Lock nut is provided.

  A lock nut of fine grade finish is provided to fix the bearing with high precision.

③ Reference number and applicable ball screw

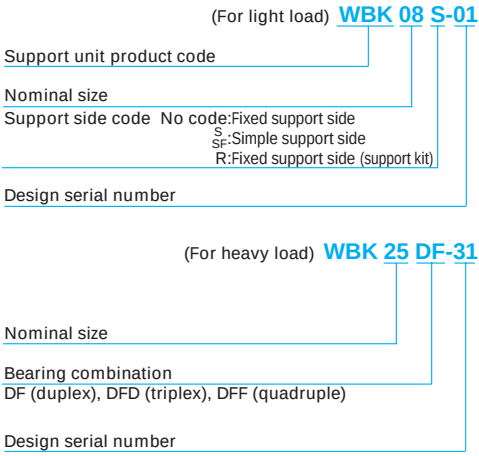


Table I-6•7 and 8 show "shaft diameter/lead combinations" of standard ball screws that are applicable to support units.

Table I-6•7 Support units for light load and applicable "shaft diameter/lead combinations"

	Support unit / reference number			"Shaft diameter/lead combinations" of standard ball screws that are applicable to support unit
	Square		Round	
	Fixed support side (driving motor side)	Simple support side (opposite to driving motor)	Fixed support side	
Light load / small equipment	WBK06-01A	—	WBK06-11	$\phi 4 \times 1$, $\phi 6 \times 1$
	WBK08-01A	WBK08S-01	WBK08-11	$\phi 8 \times 1$, $\phi 8 \times 1.5$, $\phi 8 \times 2$, $\phi 10 \times 2$, $\phi 10 \times 2.5$
	WBK10-01A	WBK10S-01	WBK10-11	$\phi 10 \times 4$, $\phi 12 \times 2$, $\phi 12 \times 2.5$, $\phi 12 \times 5$, $\phi 12 \times 10$
	WBK12-01A	WBK12S-01	WBK12-11	$\phi 14 \times 5$, $\phi 14 \times 8$, $\phi 15 \times 10$, $\phi 15 \times 20$, $\phi 16 \times 2$ $\phi 16 \times 2.5$, $\phi 16 \times 5$, $\phi 16 \times 16$, $\phi 16 \times 32$
	WBK15-01A	WBK15S-01	WBK15-11	$\phi 20 \times 4$, $\phi 20 \times 5$, $\phi 20 \times 10$, $\phi 20 \times 20$, $\phi 20 \times 40$
	WBK20-01	WBK20S-01	WBK20-11	$\phi 20 \times 4$, $\phi 20 \times 5$, $\phi 20 \times 6$, $\phi 20 \times 10$, $\phi 20 \times 20$ $\phi 25 \times 25$, $\phi 25 \times 50$, $\phi 28 \times 5$, $\phi 28 \times 6$
	WBK25-01	WBK25S-01	WBK25-11	$\phi 32 \times 5$, $\phi 32 \times 6$, $\phi 32 \times 8$, $\phi 32 \times 10$ $\phi 32 \times 25$, $\phi 32 \times 32$,

Remarks 1. Reference number is based on the bearing bore on the fixed support side.
2. Please note that the reference numbers 12 or below on the simple-support side do not match the bore of the deep-groove ball bearing in use.

Table I-6•8 Support units for heavy load and applicable "shaft diameter/lead combinations"

	Support unit / reference number		"Shaft diameter/lead combinations" of standard ball screws that are applicable to the support unit
	Fixed support side (drive motor side)	Fixed support side (opposite to drive motor)	
Heavy load / machine tools	WBK30DF-31	WBK25DF-31	$\phi 36 \times 10$
	WBK30DFD-31	WBK25DFD-31	$\phi 36 \times 10$, $\phi 40 \times 10$
	WBK30DF-31	WBK30DF-31	$\phi 40 \times 5$, $\phi 40 \times 8$, $\phi 40 \times 10$, $\phi 40 \times 12$
	WBK30DFD-31	WBK30DFD-31	$\phi 40 \times 12$
	WBK35DF-31	WBK35DF-31	$\phi 45 \times 10$
	WBK40DF-31	WBK40DF-31	$\phi 50 \times 10$
	WBK40DFD-31	WBK40DFD-31	$\phi 50 \times 10$

✻Refer to Page B27 for shaft end configuration to use support units.

4. Dimensions of support unit for light load / small equipment

Table I-6•9 shows characteristic value of the support units for light load / small equipment.

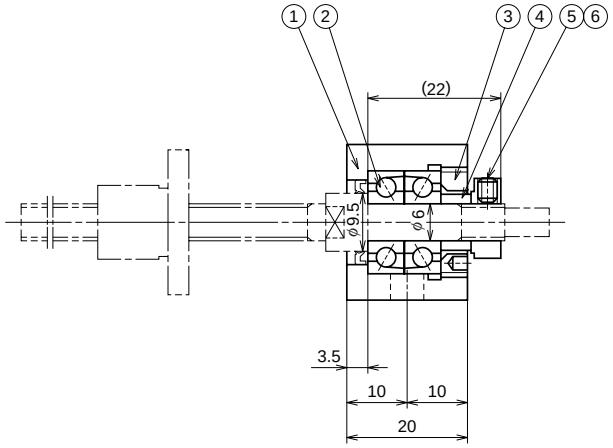
Table I-6•9 Characteristic values of support units for light load

Fixed side support unit							Support unit on simple support side		
Support unit reference number	Bearing in use (angular contact ball bearing)						Bearing in use (deep-groove ball bearing)		Support unit reference number
	Bearing reference number	Axial direction				Maximum starting torque N·cm {kgf·cm}	Bearing reference number	Radial direction	
		Basic dynamic load rating C_a N {kgf}	Load limit N {kgf}	Preload N {kgf}	Rigidity N/μm {kgf/μm}			Basic dynamic load rating C N {kgf}	
WBK06-01A (Square)	706ATYDFC7P5	2670	1040	20	28	0.49	—	—	—
WBK06-11 (Round)		{273}	{106}	{2.0}	{2.9}	{0.05}			
WBK08-01A (Square)	708ATYDFC8P5	4400	1450	59	53	0.88	606ZZ	2260	WBK08S-01
WBK08-11 (Round)		{450}	{148}	{6.0}	{5.4}	{0.09}		{231}	(Square type)
WBK10-01A (Square)	7000ATYDFC8P5	6600	2730	205	94	1.9	608ZZ	3300	WBK10S-01
WBK10-11 (Round)		{670}	{278}	{21}	{9.6}	{0.19}		{335}	(Square type)
WBK12-01A (Square)	7001ATYDFC8P5	7100	3040	215	104	2.1	6000ZZ	4550	WBK12S-01
WBK12-11 (Round)		{725}	{310}	{22}	{10.6}	{0.21}		{465}	(Square type)
WBK15-01A (Square)	7002ATYDFC8P5	7600	3380	235	113	2.3	6002ZZ	5600	WBK15S-01
WBK15-11 (Round)		{775}	{345}	{24}	{11.5}	{0.23}		{570}	(Square type)
WBK20-01 (Square)	7204ATYDFC8P5	17900	8240	440	155	5.4	6204ZZ	12800	WBK20S-01
WBK20-11 (Round)		{1820}	{840}	{45}	{15.8}	{0.55}		{1300}	(Square type)
WBK25-01 (Square)	7205ATYDFC8P5	20200	10000	580	192	7.2	6205ZZ	14000	WBK25S-01
WBK25-11 (Round)		{2060}	{1020}	{59 p	{19.6}	{0.73}		{1430}	(Square type)

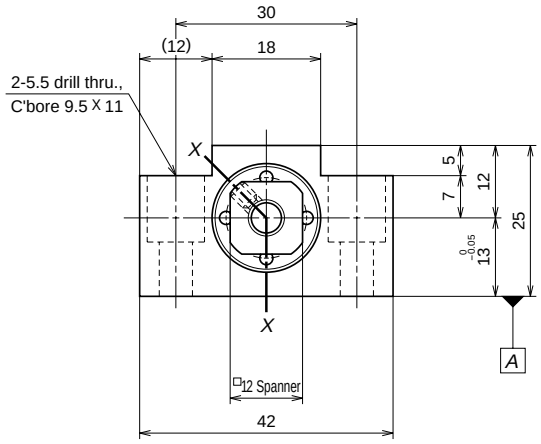
Square type Reference number: WBK06-01A

Unit: mm

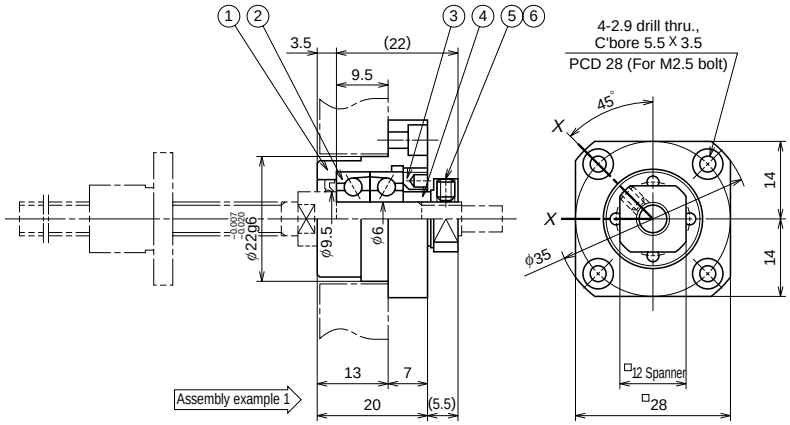
Standard stock



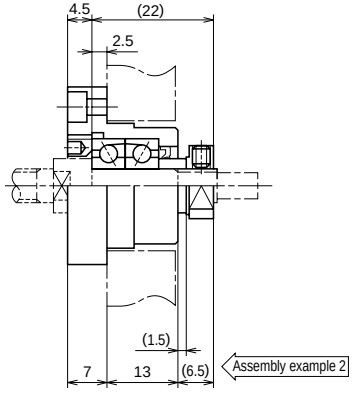
Section *X-X*



Round type Reference number: WBK06-11



Section *X-X*



Parts list

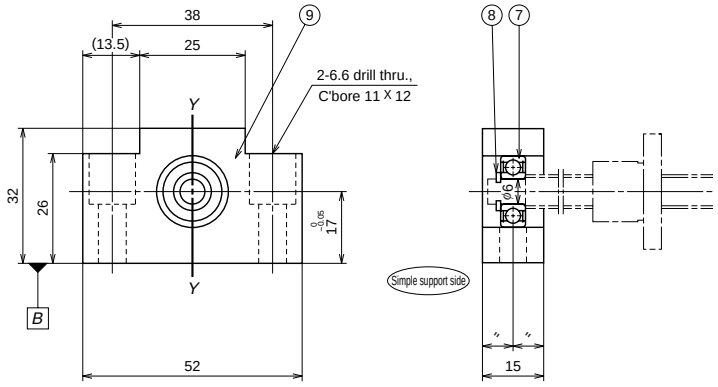
Number	Name of part	Quantity	Remarks
①	Bearing housing	1	With oil seal
②	Bearing	One set	706ATYDFC7P5
③	Retaining cover	1	
④	Spacer	1	
⑤	Lock nut	1	For M6, tightening torque245N·cm {25kgf·cm}
⑥	Set screw	1	M3, with a set piece (pad)

Remarks
1. When installing a square support unit, place A side to the base. Use a spacer if necessary to adjust height.
2. Components ①, ②, ③ are assembled into a unit. Do not disassemble.
3. An appropriate volume of grease is packed in the support unit.
4. Tighten the set screw ⑥ after adjustment.

Unit: mm

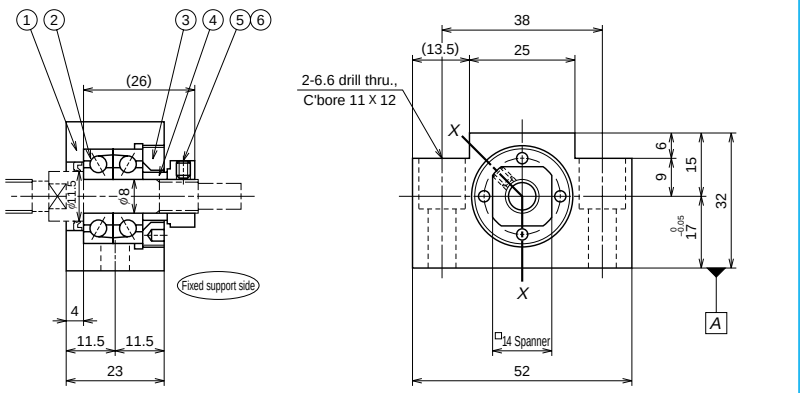
Standard stock

Square type Reference number: WBK08-01A (fixed support side); WBK08S-01 (simple support side)



WBK08S-01

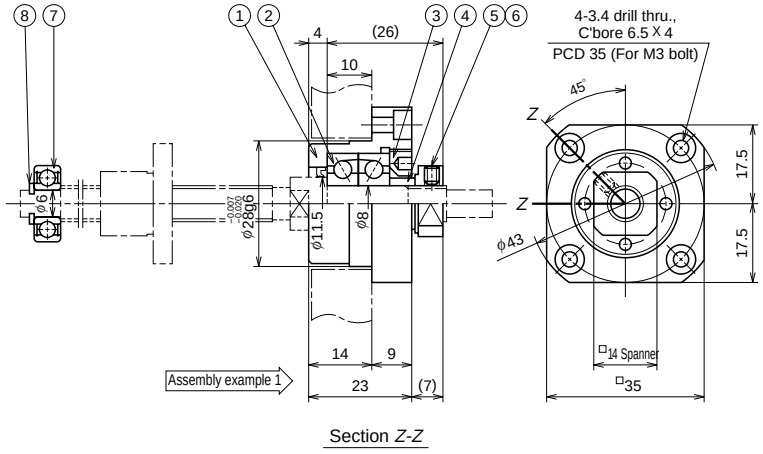
Section *Y-Y*



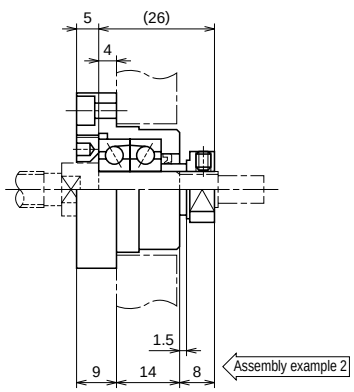
Section *X-X*

WBK08-01A

Round type Reference number: WBK08-11



Section *Z-Z*



Parts list

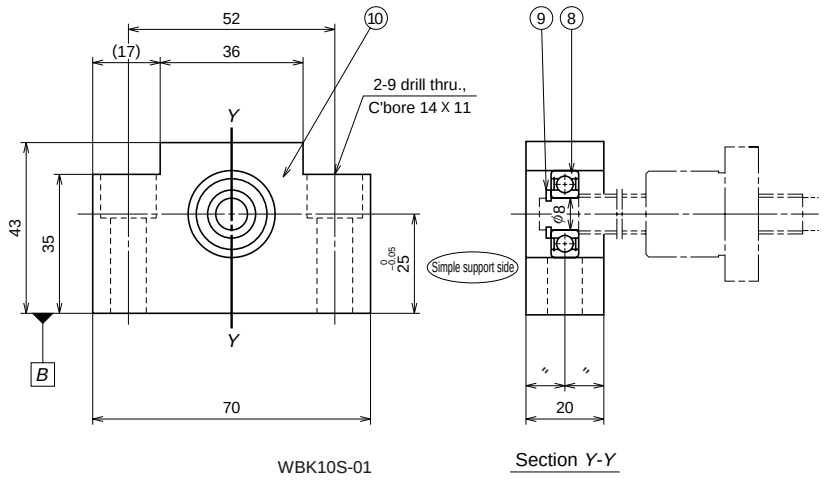
Number	Name of part	Quantity	Remarks
①	Bearing housing	1	With oil seal on fixed support side
②	Bearing	One set	708ATYDFC8P5
③	Retaining cover	1	
④	Spacer	1	
⑤	Lock nut	1	For M8, tightening torque 490N·cm {50 kgf·cm}
⑥	Set screw	1	M3, with a set piece (pad)
⑦	Bearing	1	606ZZ
⑧	Retaining ring	1	
⑨	Bearing housing	1	Simple support side (only square type)

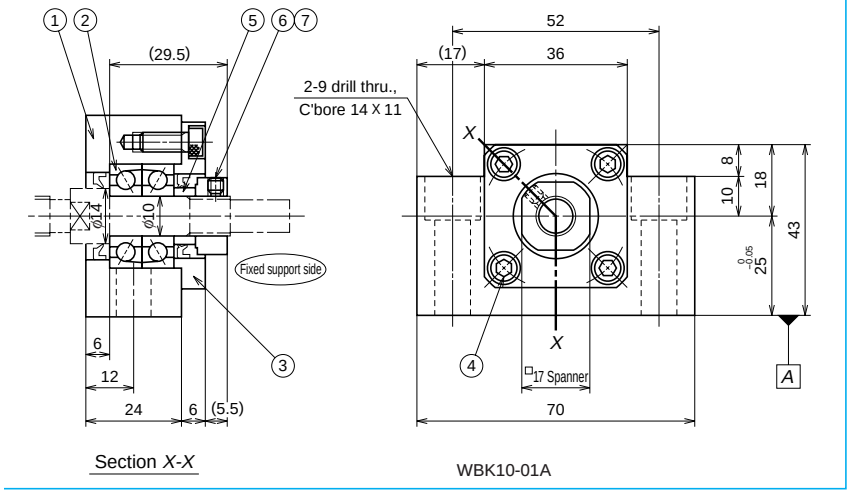
Remarks
1. When installing a square support unit, place A and B sides to the base. Use a spacer if necessary to adjust height.
2. Components ①, ②, ③ are assembled into a unit. Do not disassemble.
3. An appropriate volume of grease is packed in the support unit.
4. Tighten the set screw ⑥ after adjustment.

Square type Reference number: WBK10-01A (fixed support side); WBK10S-01 (simple support side)

Unit: mm

Standard stock





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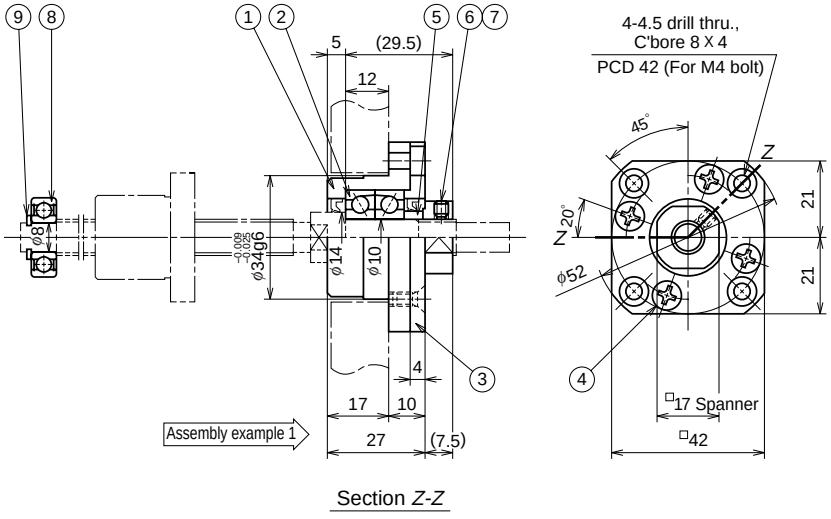
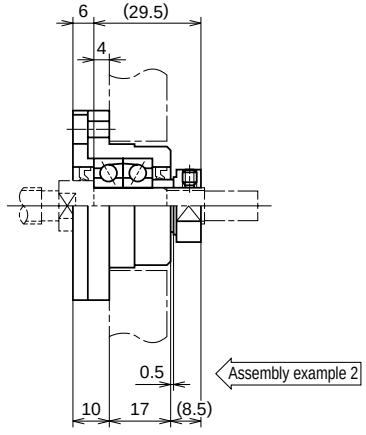




Parts list

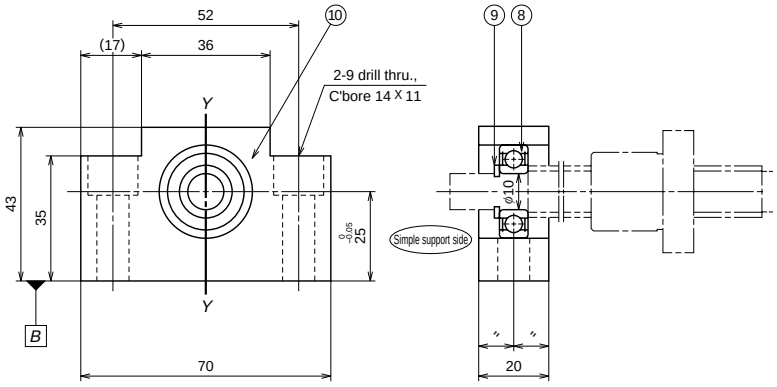
Number	Name of part	Quantity	Remarks
①	Bearing housing	1	With oil seal on fixed support side
②	Bearing	One set	7000ATYDFC8P5
③	Retaining cover	1	
④	Hexagon socket head cap screw or cross recessed pan head screw	4	M4
⑤	Spacer	1	
⑥	Lock nut	1	For M10, tightening torque 930N·cm {95 kgf·cm}
⑦	Set screw	1	M4 with a set piece (pad)
⑧	Bearing	1	608ZZ
⑨	Retaining ring	1	
⑩	Bearing housing	1	Simple support side (only square type)

Remarks
1. When installing a square support unit, place A and B sides to the base. Use a spacer if necessary to adjust height.
2. Components ①, ②, ③ are assembled into a unit. Do not disassemble.
3. An appropriate volume of grease is packed in the support unit.
4. Tighten the set screw ⑦ after adjustment.

Square type Reference number: WBK12-01A (fixed support side); WBK12S-01 (simple support side)

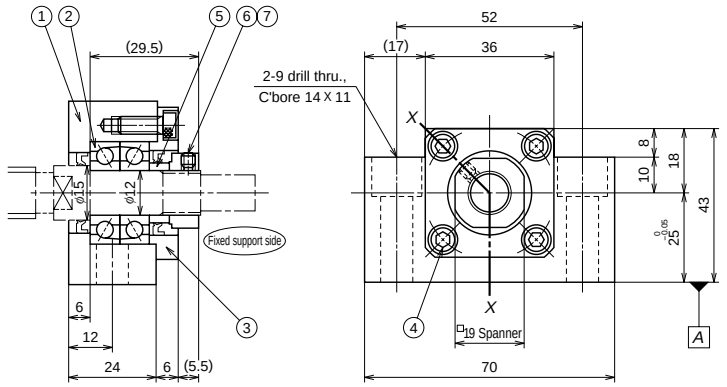
Unit: mm

Standard stock



WBK12S-01

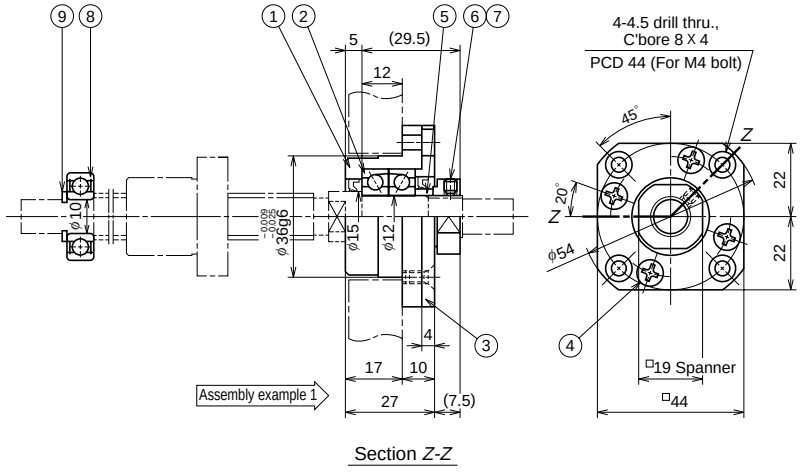
Section *Y-Y*



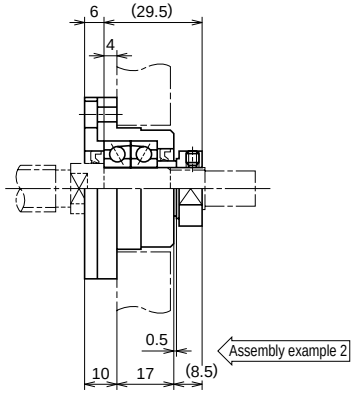
Section *X-X*

WBK12-01A

Round type Reference number: WBK12-11



Section *Z-Z*



Parts list

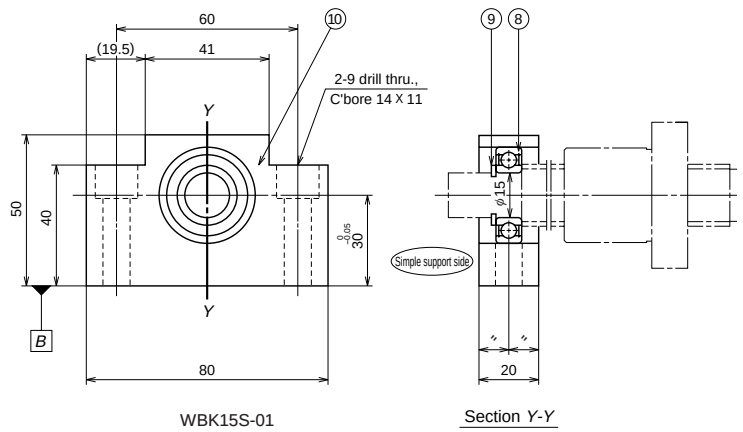
Number	Name of part	Quantity	Remarks
①	Bearing housing	1	With oil seal on fixed support side
②	Bearing	One set	7001ATYDFC8P5
③	Retaining cover	1	
④	Hexagon socket head cap screw or cross recessed pan head screw	4	M4
⑤	Spacer	1	
⑥	Lock nut	1	For M12, tightening torque 1370N·cm {140 kgf·cm}
⑦	Set screw	1	M4 with a set piece (pad)
⑧	Bearing	1	6000ZZ
⑨	Retaining ring	1	
⑩	Bearing housing	1	Simple support side (only square type)

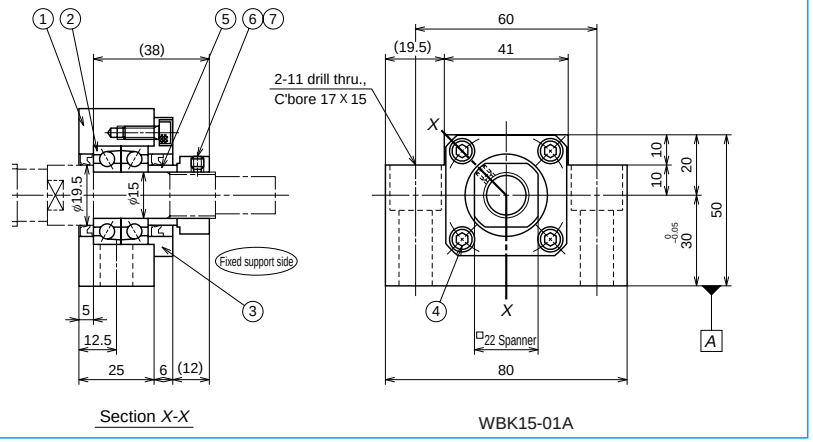
Remarks
1. When installing a square support unit, place A and B sides to the base. Use a spacer if necessary to adjust height.
2. Components ①, ②, ③ are assembled into a unit. Do not disassemble.
3. An appropriate volume of grease is packed in the support unit.
4. Tighten the set screw ⑦ after adjustment.

Square type Reference number: WBK15-01A (fixed support side); WBK15S-01 (simple support side)

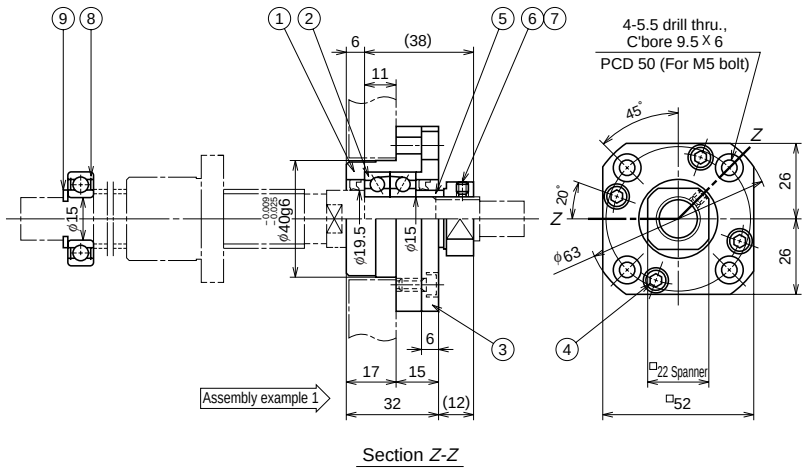
Unit: mm

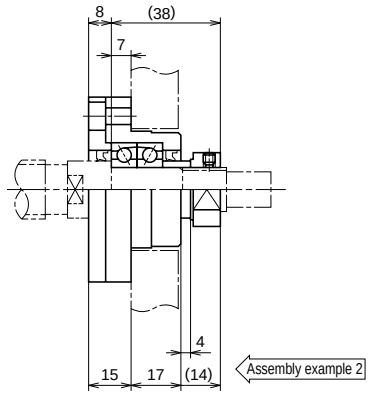
Standard stock





Round type Reference number: WBK15-11





Parts list

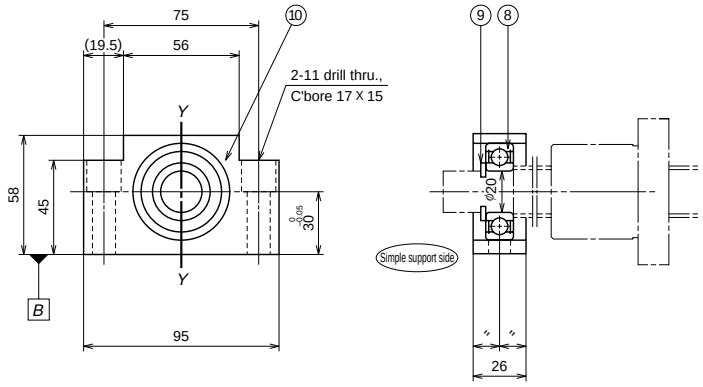
Number	Name of part	Quantity	Remarks
①	Bearing housing	1	With oil seal on fixed support side
②	Bearing	One set	7002ATYDFC8P5
③	Retaining cover	1	
④	Hexagon socket head cap screw	4	M4
⑤	Spacer	1	
⑥	Lock nut	1	For M15, tightening torque 2350N·cm {240 kgf·cm}
⑦	Set screw	1	M4 with a set piece (pad)
⑧	Bearing	1	6002ZZ
⑨	Retaining ring	1	
⑩	Bearing housing	1	Simple support side (only square type)

Remarks
1. When installing a square support unit, place A and B sides to the base. Use a spacer if necessary to adjust height.
2. Components ①, ②, ③ are assembled into a unit. Do not disassemble.
3. An appropriate volume of grease is packed in the support unit.
4. Tighten the set screw ⑦ after adjustment.

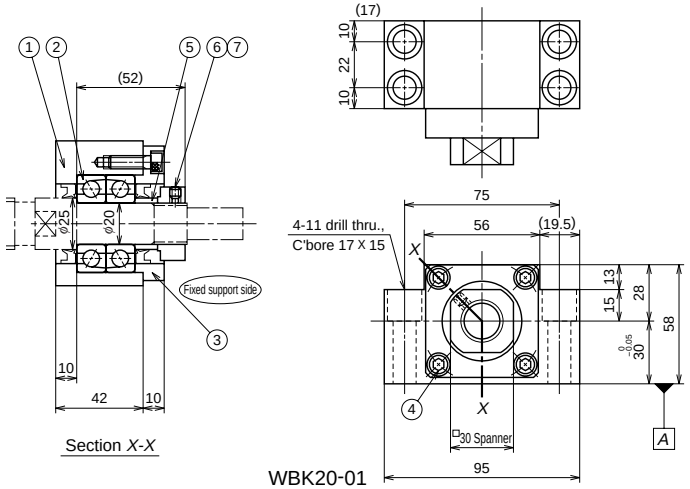
Square type Reference number: WBK20-01 (fixed support side); WBK20S-01 (simple support side)

Unit: mm

Standard stock

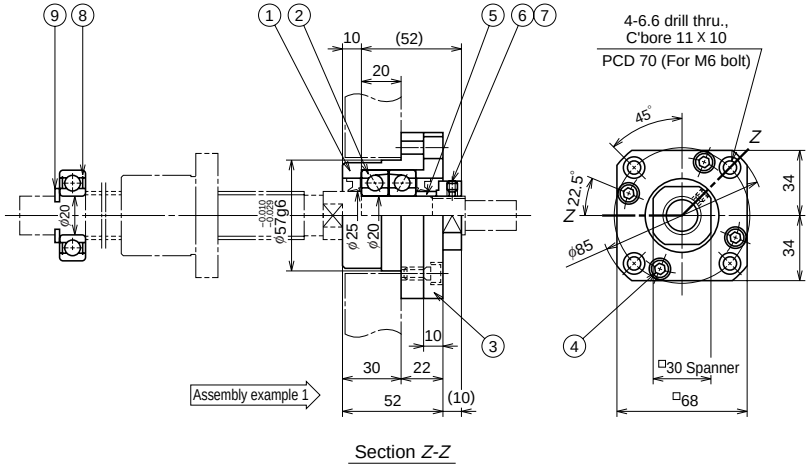


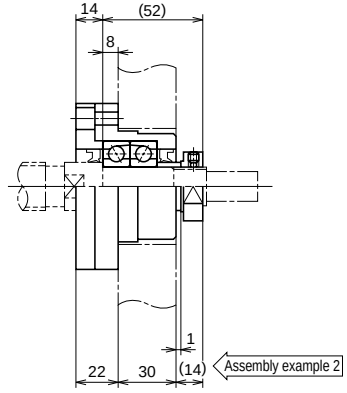
WBK20S-01



WBK20-01

Round type Reference number: WBK20-11





Parts list

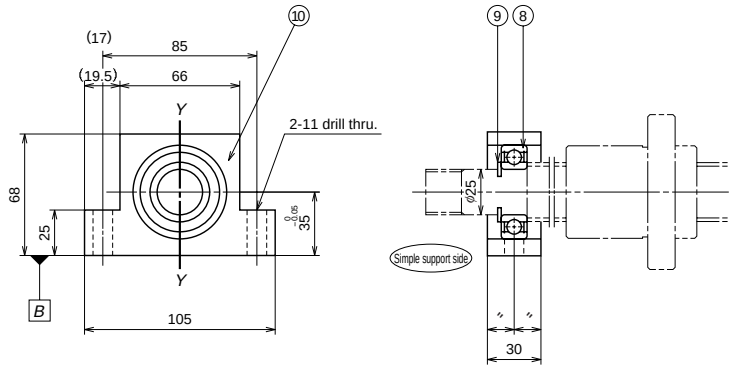
Number	Name of part	Quantity	Remarks
①	Bearing housing	1	With oil seal on fixed support side
②	Bearing	One set	7204ATYDFC8P5
③	Retaining cover	1	
④	Hexagon socket head cap screw	4	M6
⑤	Spacer	1	
⑥	Lock nut	1	For M20, tightening torque 4700N·cm {480 kgf·cm}
⑦	Set screw	1	M4 with a set piece (pad)
⑧	Bearing	1	6204ZZ
⑨	Retaining ring	1	
⑩	Bearing housing	1	Simple support side (only square type)

Remarks
1. When installing a square support unit, place A and B sides to the base. Use a spacer if necessary to adjust height.
2. Components ①, ②, ③ are assembled into a unit. Do not disassemble.
3. An appropriate volume of grease is packed in the support unit.
4. Tighten the set screw ⑦ after adjustment.

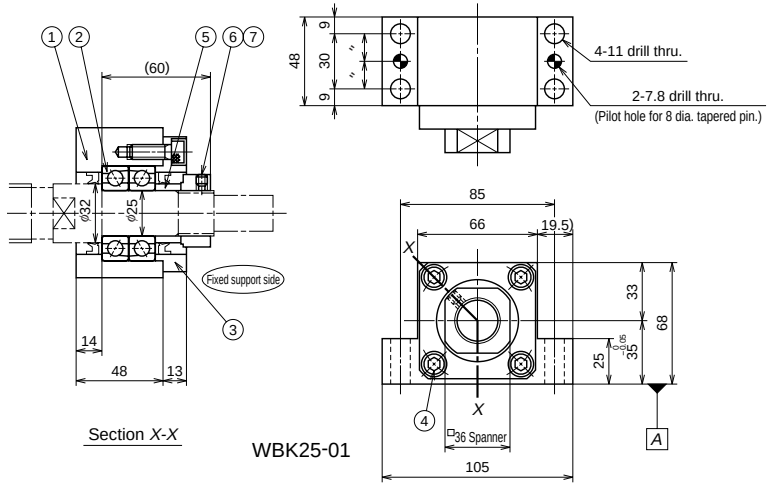
Square type Reference number: WBK25-01 (fixed support side); WBK25S-01 (simple support side)

Unit: mm

Standard stock

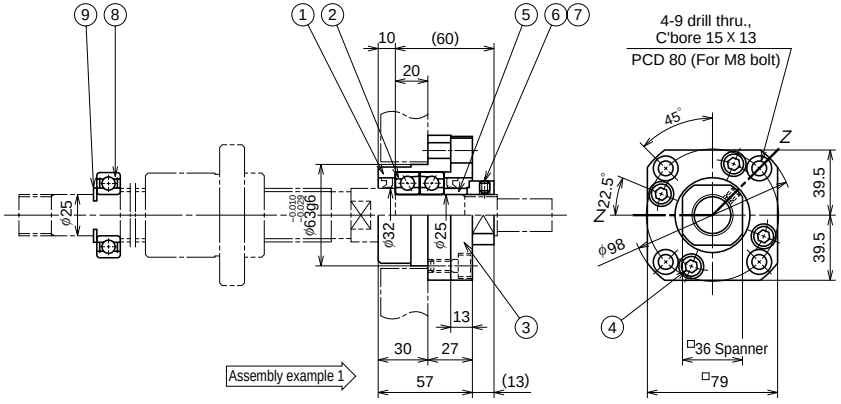


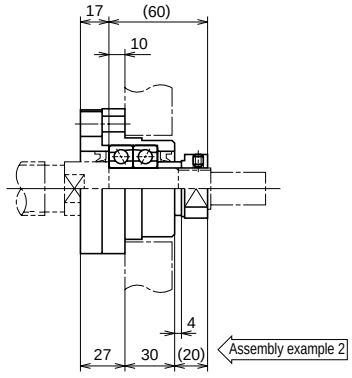
WBK25S-01



WBK25-01

Round type Reference number: WBK25-11





Parts list

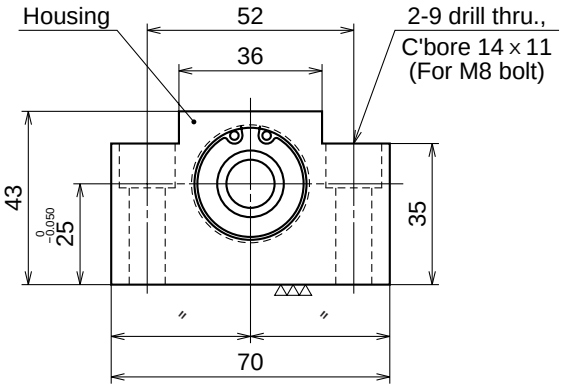
Number	Name of part	Quantity	Remarks
①	Bearing housing	1	With oil seal on fixed support side
②	Bearing	One set	7205ATYDFC8P5
③	Retaining cover	1	
④	Hexagon socket head cap screw	4	M8
⑤	Spacer	1	
⑥	Lock nut	1	For M25, tightening torque 8400N·cm {860 kgf·cm}
⑦	Set screw	1	M6 with a set piece (pad)
⑧	Bearing	1	6205ZZ
⑨	Retaining ring	1	
⑩	Bearing housing	1	Simple support side (only square type)

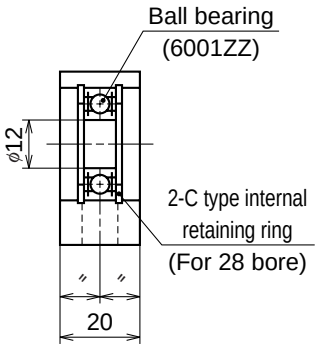
Remarks
1. When installing a square support unit, place A and B sides to the base. Use a spacer if necessary to adjust height.
2. Components ①, ②, ③ are assembled into a unit. Do not disassemble.
3. An appropriate volume of grease is packed in the support unit.
4. Tighten the set screw ⑦ after adjustment.

Standard stock

Square type Reference number: WBK12SF-01 (Simple support side: For VFA1210)

Unit: mm





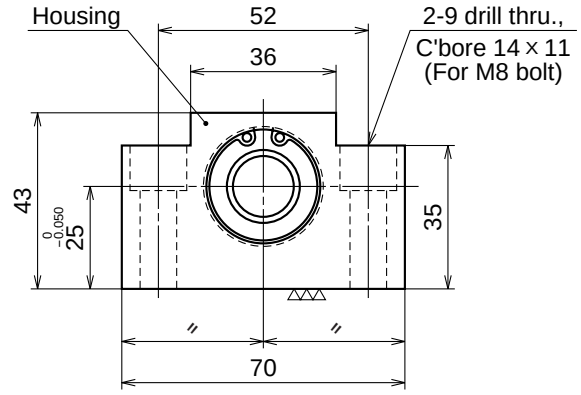
Parts list (WBK12SF-01)

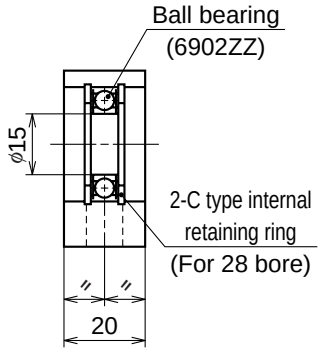
Number	Name of part	Quantity	Remarks
①	Bearing housing	1	Simple support side
②	Bearing	1	6001ZZ
③	Retaining ring	2	

Remarks 1. When installing the square support unit, place side A to the base and install the unit in the vertical direction. Use a spacer if necessary to adjust height.
2. Do not disassemble the support unit.
3. An appropriate volume of grease is packed in the bearing.

Applicable ball screw : **VFA1210**

Square type Reference number: WBK15SF-01 (Simple support side: For VFA1510)





Parts list (WBK15SF-01)

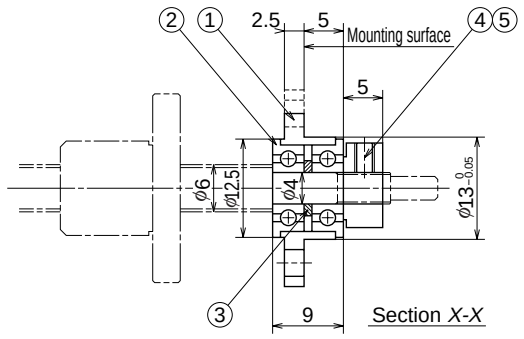
Number	Name of part	Quantity	Remarks
①	Bearing housing	1	Simple support side
②	Bearing	1	6902ZZ
③	Retaining ring	2	

Remarks 1. When installing the square support unit, place side A to the base and install the unit in the vertical direction. Use a spacer if necessary to adjust height.
2. Do not disassemble the support unit.
3. An appropriate volume of grease is packed in the bearing.

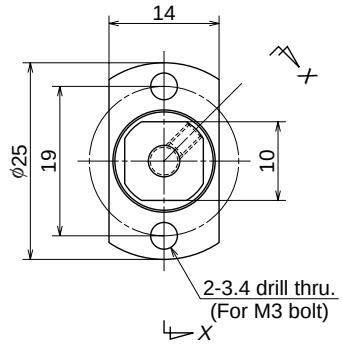
Applicable ball screw : **VFA1510, VFA1520**

Standard stock

Round type Reference number: WBK04R-11



Unit: mm



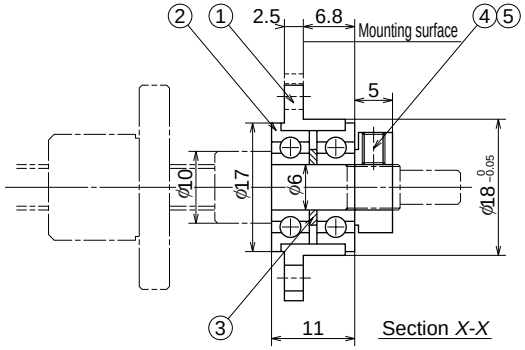
Parts list (WBK04R-11)

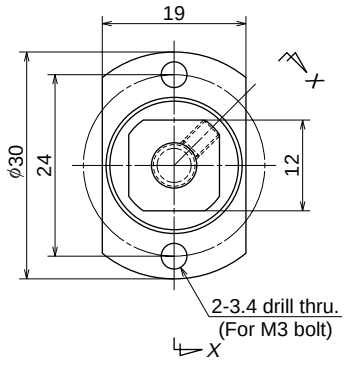
Number	Name of part	Quantity	Remarks
①	Bearing housing	1	
②	Bearing	One set	F694ZZ
③	Spacer	1	
④	Lock nut	1	For M4, tightening torque 98N·cm {10 kgf·cm}
⑤	Set screw to secure the lock nut	1	M3 with a set piece (pad)

Remarks
1. Adjust phases of the bearing and the lock nut at time of assembly, and secure them in the state when the run out of the flange mounting surface is minimal.
2. Assembled to an arbor (M4 bolt, nut) at time of delivery. Remove it from the arbor and move to the ball screw shaft end before use.
3. An appropriate volume of grease is packed into the bearing.
4. Slightly tighten the set screw ⑤ after adjustment.

Applicable ball screw : **RMA0601**

Round type Reference number: WBK06R-11





Parts list (WBK06R-11)

Number	Name of part	Quantity	Remarks
①	Bearing housing	1	
②	Bearing	One set	F696ZZ
③	Spacer	1	
④	Lock nut	1	For M6, tightening torque118N·cm {12 kgf·cm}
⑤	Set screw to secure the lock nut	1	M3 with a set piece (pad)

Remarks
1. Adjust phases of the bearing and the lock nut at time of assembly, and secure them in the state when the run out of the flange mounting surface is minimal.
2. Assembled to an arbor (M6 bolt, nut) at time of delivery. Remove it from the arbor and move to the ball screw shaft end before use.
3. An appropriate volume of grease is packed into the bearing.
4. Slightly tighten the set screw ⑤ after adjustment.

Applicable ball screw : **RMA0801, RMA0801.5, RMA0802**

When using with a rolled ball screw

When using a support unit (for small equipment) for a rolled ball screw, install a spacer for holding a seal in the ball screw side of the shaft end.

Table I-6.10 shows the dimensions of spacer. NSK will provide the spacers on request. Use the reference number in Table I-6•10, and place an order separately.

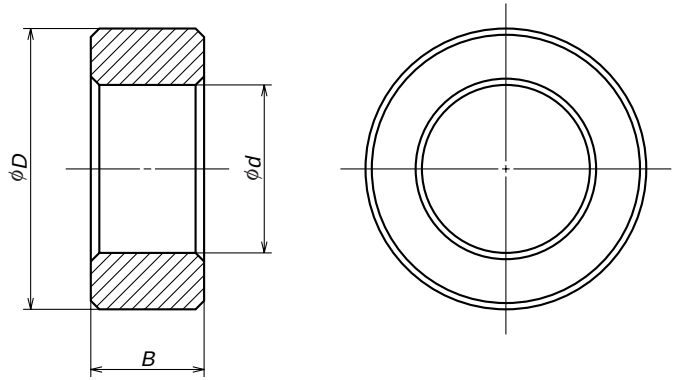


Fig. I-6.1 Drawing of support unit spacer

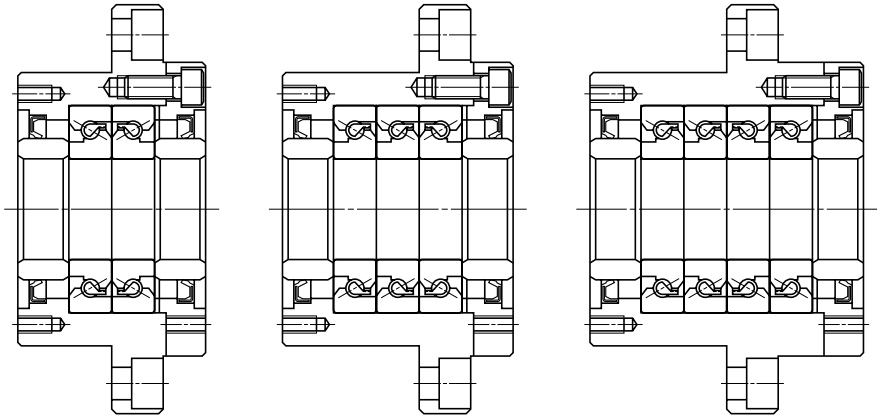
Table I-6.10 Dimensions of support unit spacer

Unit: mm

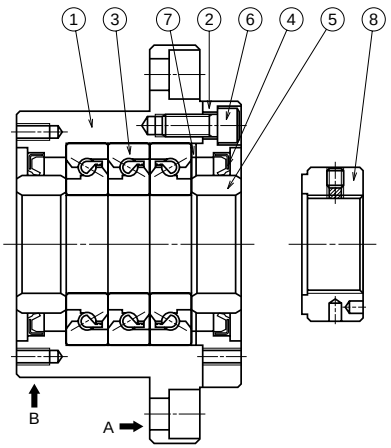
Support unit reference number	Dimensions			Spacer reference number
	Internal diameter *d*	Outside diameter *D*	Width *B*	
WBK06-**	6	9.5	5.0	B86006050-301
WBK08-**	8	11.5	5.5	B86008050-301
WBK10-**	10	14.5	5.5	B86010051-301
WBK12-**	12	15.0	5.6	B86012061-301
WBK15-**	15	19.5	10.0	B86015101-301
WBK20-**	20	25.5	11.0	B86020110-301
WBK25-**	25	32.0	14.0	B86025140-301

(2) Dimensions of support unit: heavy-load / for machine tools

Support units for heavy-load / machine tools use a thrust angular contact ball bearing (TAC Series) with high rigidity and accuracy. The thrust angular contact ball bearing has very suitable functions and structure as a ball screw support bearing. There are three combinations as shown below.



DF combination DFD combination DFF combination

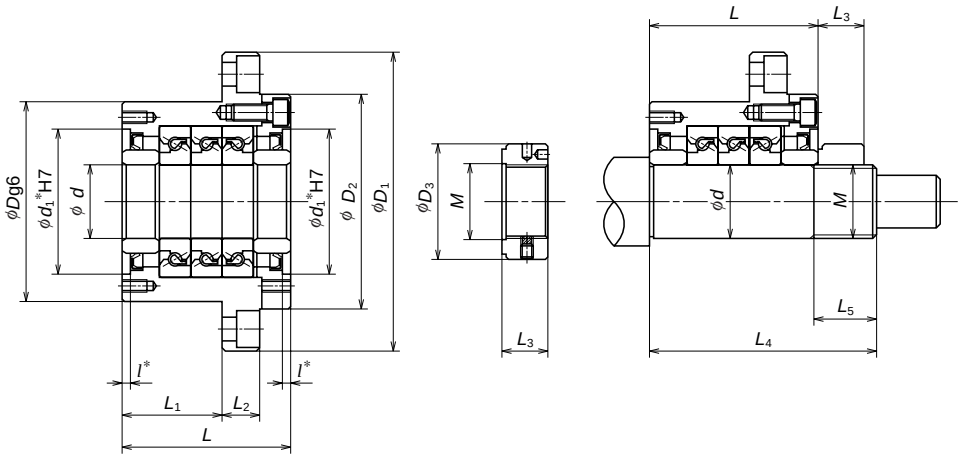


Parts list

Part number	Part name	Quantity
①	Housing	1
②	Retaining cover	1
③	High accuracy thrust angular contact ball bearing	One set
④	Dust seal	2
⑤	Collar	2
⑥	Preload bolt	6 or 8
⑦	Shim	One set
⑧	Lock nut	1

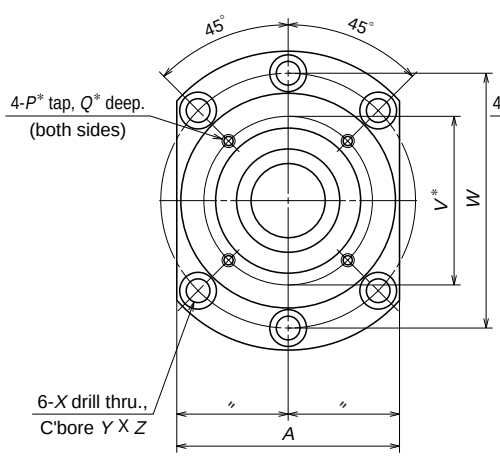
Remarks

1. Mount sections A and B to the machine base.
2. NSK support units are precisely preloaded and adjusted. Components ①, ②, ③, ④, ⑥, ⑦ are assembled into a unit. Do not disassemble.
3. Grease is packed into support units.
4. Lock nut ⑧ is exclusively prepared for ball screw. The end face of the nut is in strict control being precisely perpendicular to the V thread. Secure the lock nut using the set screw.
   Lock nut is also available as an accessory (See page B299). Refer to Page B301 as well for high-precision thrust angular contact ball bearing (TAC Series).

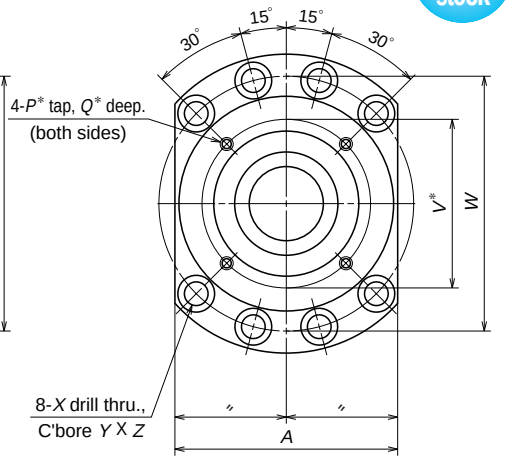


Lock nut

Dimensions of bearing seat



Bearing bore $d \leqq 30$



Bearing bore $d \geqq 35$

Standard stock

B
298

Unit: mm

Support unit No.	Support unit																	Basic dynamic load rating C_a	
	d	D	D_1	D_2	L	L_1	L_2	A	W	X	Y	Z	d_1*	l*	V*	P*	Q*	N	{kgf}
WBK 17DF-31	17	70	106	72	60	32	15	80	88	9	14	8.5	45	3	58	M5	10	21900	2240
WBK 20DF-31	20	70	106	72	60	32	15	80	88	9	14	8.5	45	3	58	M5	10	21900	2240
WBK 25DF-31	25	85	130	90	66	33	18	100	110	11	17.5	11	57	4	70	M6	12	28500	2910
WBK 25DFD-31					81	48												46500	4700
WBK 30DF-31	30	85	130	90	66	33	18	100	110	11	17.5	11	57	4	70	M6	12	29200	2980
WBK 30DFD-31					81	48												47500	4850
WBK 35DF-31	35	95	142	102	66	33	18	106	121	11	17.5	11	69	4	80	M6	12	31000	3150
WBK 35DFD-31					81	48												50500	5150
WBK 35DFF-31					96	48												50500	5150
WBK 40DF-31	40	95	142	102	66	33	18	106	121	11	17.5	11	69	4	80	M6	12	31500	3250
WBK 40DFD-31					81	48												51500	5250
WBK 40DFF-31					96	48												51500	5250

Permissible axial load		Preload		Axial rigidity		Starting torque		Lock nut			Bearing seat for unit		
N	{kgf}	N	{kgf}	N/μm	{kgf/μm}	N·m	{kgf·m}	M	D_3	L_3	d	L_4	L_5
26600	2710	2150	220	750	75	14.0	1.5	M17×1.0	37	18	17	81	23
26600	2710	2150	220	750	75	14.0	1.5	M20×1.0	40	18	20	81	23
40500	4150	3150	320	1000	100	23.0	2	M25×1.5	45	20	25	89	26
81500	8300	4300	440	1470	150	31.0	3					104	
43000	4400	3350	340	1030	105	24.0	2.5	M30×1.5	50	20	30	89	26
86000	8800	4500	460	1520	155	33.0	3					104	
50000	5100	3800	390	1180	120	28.0	3	M35×1.5	55	22	35	92	30
100000	10200	5200	530	1710	175	37.0	4					107	
100000	10200	7650	780	2350	240	55.0	5.5					122	
52000	5300	3900	400	1230	125	28.0	3	M40×1.5	60	22	40	92	30
104000	10600	5300	540	1810	185	38.0	4					107	
104000	10600	7850	800	2400	245	57.0	5.5					122	

Remarks 1. Rigidity
Values in the Table are theoretical values obtained from the elastic deformation between the groove and the balls.
2. Starting torque
Starting torque indicates torque due to the preload of the bearing. It does not include seal torque.
3. The tolerance of the shaft bearing seat
We recommend "h5 grade of the fits tolerance.

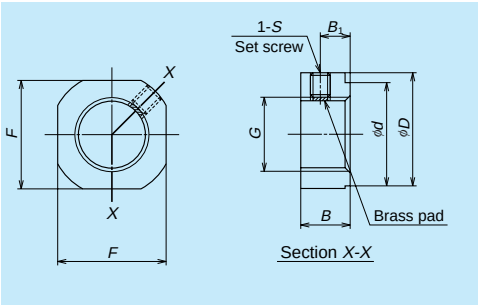
Remarks 4. Dimensions with * (asterisk) mark
*Pilot diameter and tapped screws marked with "asterisk *" are used for seal unit installation for NSK standard hollow shaft ball screws. They also can be used for dust cover and damper installation.
5. Grease is packed into the bearing. It is not necessary to apply grease before use. We recommend "h5 grade of the fits tolerance.

Lock nut, grease unit, and travel stopper

In addition to the support units, NSK has other components for the ball screw as shown below.

(3) Lock nuts

Ball screw support bearing must be installed with minimum inclination. NSK lock nuts exclusive for ball screw help to reduce this inclination.



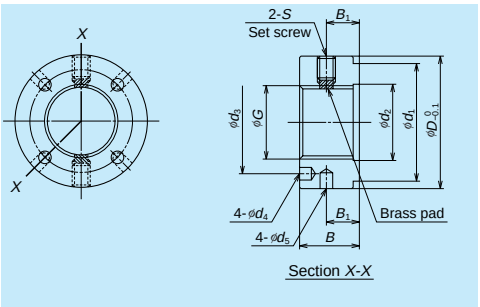
A Type Shapes and dimensions

A Type lock nuts

Unit: mm

Lock nut reference number	G	D	F	B	d	B_1	S	Tightening torque N·m {kgf·m} (for reference)
WBK06L-01	M6 × 0.75	14.5	12	5	10	2.7	M3, with brass made set piece	245 {25}
WBK08L-01	M8 × 1.0	17	14	6.5	13	4	M3, with brass made set piece	490 {50}
WBK10L-01	M10 × 1.0	20	17	8	16	5	M4, with brass made set piece	930 {95}
WBK12L-01	M12 × 1.0	22	19	8	17	5	M4, with brass made set piece	1370 {140}
WBK15L-01	M15 × 1.0	25	22	10	21	6	M4, with brass made set piece	2350 {240}
WBK20L-01	M20 × 1.0	35	30	13	26	8	M4, with brass made set piece	4700 {480}
WBK25L-01	M25 × 1.5	42	36	16	34	10	M6, with brass made set piece	8400 {860}

Remarks: Insert a set piece (brass pad) and tighten the securing set screw.



S Type Shapes and dimensions

S Type lock nuts

Unit: mm

Lock nut reference number	G	$D^{0}_{0.1}$	B	d_1	d_2	d_3	d_4	d_5	B_1	S	Tightening torque N·m {kgf·m} (for reference)
WBK17L-31	M17 × 1.0	37	18	30	18	27	4.3	4	10	M6	5400 {550}
WBK20L-31	M20 × 1.0	40	18	30	21	30	4.3	4	10	M6	7350 {750}
WBK25L-31	M25 × 1.5	45	20	40	26	35	4.3	4	11	M6	13200 {1350}
WBK30L-31	M30 × 1.5	50	20	40	31	40	4.3	5	11	M6	19600 {2000}
WBK35L-31	M35 × 1.5	55	22	50	36	45	4.3	5	12	M6	29400 {3000}
WBK40L-31	M40 × 1.5	60	22	50	41	50	4.3	5	12	M6	39200 {4000}

(4) Grease unit

NSK has various grease units exclusive for ball screw lubricant. They come in a bellows-shaped container which can be attached to the grease gun instantly. The other is a compact grease pump. For details, refer to Page D19.

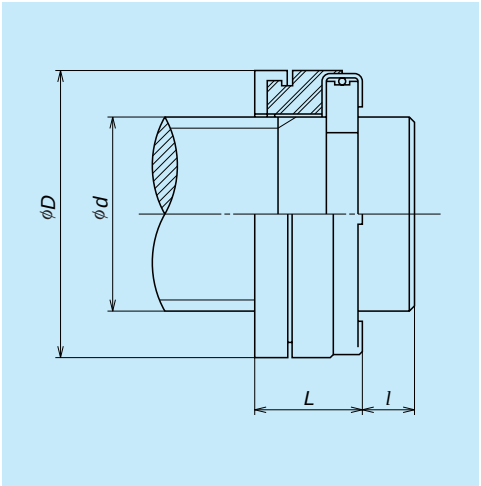
Table I-6•11 Lubricant greases

Name	Use	Base oil viscosity mm²/S (40°C)
NSK Grease AV2	For heavy load	130
NSK Grease PS2	High-speed, light load	15
NSK Grease LR3	High-speed, medium load	30
NSK Grease LG2	Clean environment	30

NSK greases

(5) Travel stopper (by order)

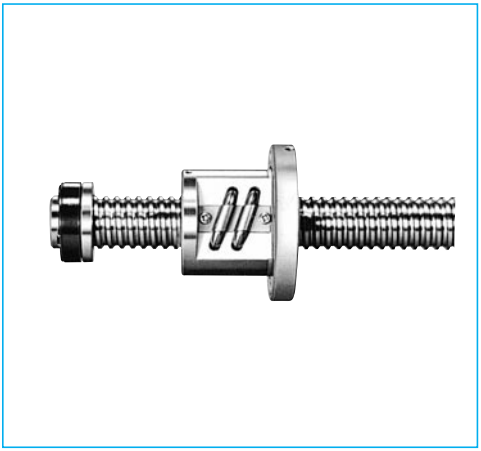
Travel stopper is installed in some cases to prevent the nut from overrunning due to the malfunction of the safety system of the equipment or by human error. NSK has several types of series of shock-absorbing travel stoppers. Please request NSK for installation. The travel stopper is not sold as a single item since it does not have a general use. Also, a travel stopper cannot be used for end cap type recirculation system, because the stopper would come directly into contact with the ball recirculating portion.



Travel stopper dimensions

stopper No.	Applicable shaft dia.	Outer dia.	Length	Shaft end width (Min.)
BSR 20	20	32	16	5
BSR 25	25	38	16	5
BSR 32	32	46	20	6
BSR 40	40	60	22	6
BSR 50	50	72	24	7
BSR 63	63	85	25	7

Remarks: This stopper is patented by NSK Ltd.



Shock-absorbing travel stopper

B-I-6.7 Thrust Angular Contact Ball Bearing for Ball Screw

(1) Features

This is highly rigid and accurate ball screw support bearing often used for the machine tool driving mechanism.

① High axial rigidity
Uses many balls, and set high contact angle at 60 degrees.

② Small friction torque
Friction torque is smaller than that of tapered and cylindrical roller bearings. This contributes to accurate rotation by a small driving power.

③ Axial play is pre-adjusted
Combination bearings are already adjusted to a suitable preload. Universal combination bearing (SU) furnish certain preload for all combinations (DB, DF, DT, and other).

④ Simple mounting structure
A duplex combination of bearings can receive axial and radial loads. Therefore, the installation structure is simpler than when both a thrust bearing and a radial bearing are used.

⑤ Easy handling
Inner and outer rings are inseparable, and are easy to handle.

⑥ Superb polyamide resin retainer
Uses polyamide resin retainer which is superb to friction and furnishes high precision rotations.

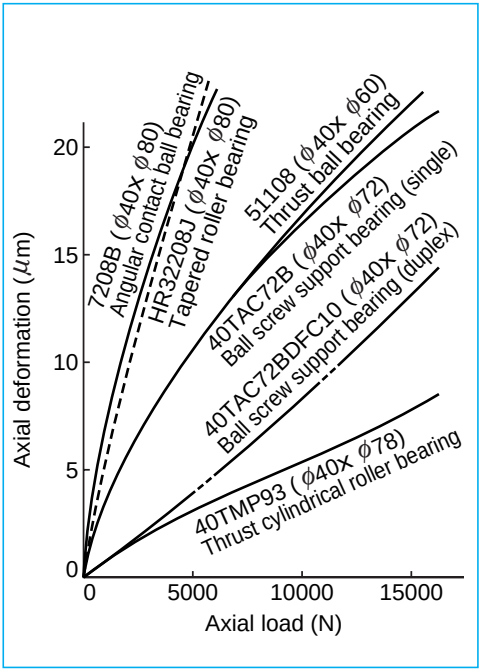


Fig. I-6•1 Axial rigidity of various bearings

Table I-6•12 Comparison with other types of bearings

Bearing type	Bearing rigidity (See Fig. 1.1)	Starting torque	Preload adjustment	Installation structure
Thrust angular contact ball bearing for NSK precision ball screw support unit	High	Low	Not required	Simple
Combined angular contact ball bearing	Low	Low	Not required	Simple
Combination of tapered roller bearings	Low	High	Complicated	Simple
Thrust ball bearing and radial bearing	High	Low	Complicated	Complicated
Thrust cylindrical roller bearing and radial bearing	Extremely high	Extremely high	Complicated	Complicated

Note : Consult NSK when you use these bearings other than the purpose of ball screw support.

(2) Composition of reference number

30 TAC 62 B DF C10 PN7A

- 30 — Bearing bore (mm)
- TAC — Bearing model code
- 62 — Bearing outside diameter (mm)
- B — Internal design code
- DF — Combination code
- C10 — Axial play code
- PN7A — Accuracy

Remark : As "30 TAC 62 B," any part of the former half of the reference number is referred to as "nominal size" in this catalogue.

(3) Bearing combinations

Generally, a set uses more than two pieces (referred to as 'two rows') of bearings and, thus the preload is applied.

There are two types of combination:

1. Bearing combination -- Bearings are adjusted as a single combined set. Since the bearing alignment is pre-set, there is no interchangeability;

2. Universal combination bearing (SU) – A combination of independent bearings, which is manufactured as a single bearing. Bearings are randomly-matched to obtain required preload by more than one of randomly picked up bearings.

1. Bearing combination

- Figure I-6•2 shows examples of combinations. There is "V" mark on the outside surface of the bearing to avoid misarrangement. A complete letter "V" should be formed when all bearings align correctly to form a set.
- DF combination which easily absorbs misalignment with the ball screw nut is used in general.
- DT combination may be used if pre-tension is required to the ball screw shaft.

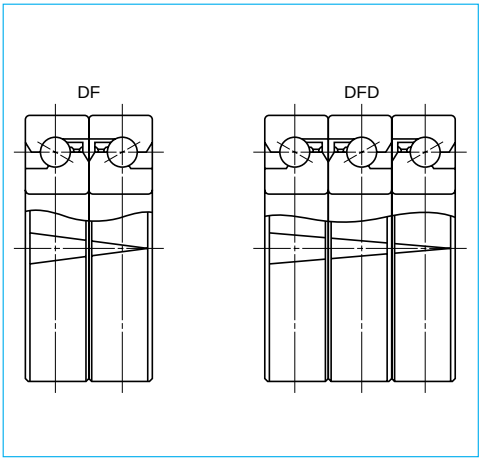


Fig. I-6•2 Examples of combination and "V" mark

2. Universal combination bearing (SU)

- Unlike the above case, marks on the bearing outside surface do not form a letter "V." The tip of the "V" on each bearing simply indicates the direction to which axial load can be applied.

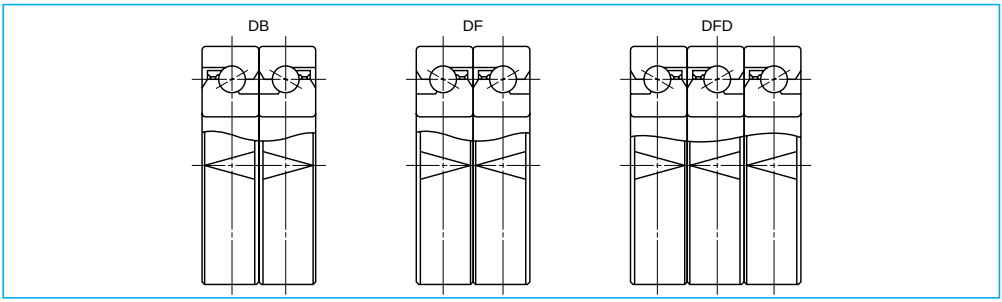


Fig. I-6•3 Example of universal combination (SU) and "V" mark

(4) Preload, rigidity, and starting torque

The table below shows preload, rigidity (spring modulus), and starting torque with grease lubrication. (The starting torque should be 1.4 times higher when oil is used as a lubricant.)
Consult NSK for the bearing combinations not included in the Table.

Table I-6•13 Preload, rigidity, and starting torque

Reference number	Duplex combination DF				Triplex combination DFD		Quadruplet combination DFF					
	Axial play code	Preload N{kgf}	Rigidity N/μm {kgf/μm}	Starting torque N·m {kgf·cm}	Axial play code	Preload N {kgf}	Rigidity N/μm {kgf/μm}	Starting torque N·m {kgf·cm}	Axial play code	Preload N{kgf}	Rigidity N/μm {kgf/μm}	Starting torque N·m {kgf·cm}
17TAC 47B	C10	2150 {220}	750 {75}	0.14 {1.5}	C10	2950 {300}	1080 {110}	0.20 {2}	C10	4300 {440}	1470 {150}	0.29 {3}
20TAC 47B	C10	2150 {220}	750 {75}	0.14 {1.5}	C10	2950 {300}	1080 {110}	0.20 {2}	C10	4300 {440}	1470 {150}	0.29 {3}
25TAC 62B	C10	3150 {320}	1000 {100}	0.23 {2}	C10	4300 {440}	1470 {150}	0.31 {3}	C10	6250 {640}	1960 {200}	0.46 {4.5}
30TAC 62B	C10	3350 {340}	1030 {105}	0.24 {2.5}	C10	4500 {460}	1520 {155}	0.33 {3}	C10	6650 {680}	2010 {205}	0.49 {5}
35TAC 72B	C10	3800 {390}	1180 {120}	0.28 {3}	C10	5200 {530}	1710 {175}	0.37 {4}	C10	7650 {780}	2350 {240}	0.55 {5.5}
40TAC 72B	C10	3900 {400}	1230 {125}	0.28 {3}	C10	5300 {540}	1810 {185}	0.38 {4}	C10	7850 {800}	2400 {245}	0.57 {5.5}
40TAC 90B	C10	5000 {510}	1320 {135}	0.48 {5}	C10	6750 {690}	1960 {200}	0.65 {6.5}	C10	10300 {1050}	2650 {270}	0.96 {9.5}
45TAC 75B	C10	4100 {420}	1270 {130}	0.29 {3}	C10	5600 {570}	1910 {195}	0.40 {4}	C10	8250 {840}	2550 {260}	0.59 {5.5}
45TAC 100B	C10	5900 {600}	1520 {155}	0.58 {6}	C10	8050 {820}	2210 {225}	0.78 {8}	C10	11800 {1200}	3000 {305}	1.16 {12}
50TAC 100B	C10	6100 {620}	1570 {160}	0.60 {6}	C10	8250 {840}	2300 {235}	0.80 {8}	C10	12300 {1250}	3100 {315}	1.18 {12}
55TAC 100B	C10	6100 {620}	1570 {160}	0.60 {6}	C10	8250 {840}	2300 {235}	0.80 {8}	C10	12300 {1250}	3100 {315}	1.18 {12}
55TAC 120B	C10	6650 {680}	1760 {185}	0.64 {6.5}	C10	9100 {930}	2650 {270}	0.86 {9}	C10	13200 {1350}	3550 {360}	1.27 {13}
60TAC 120B	C10	6650 {680}	1760 {185}	0.64 {6.5}	C10	9100 {930}	2650 {270}	0.86 {9}	C10	13200 {1350}	3550 {360}	1.27 {13}

(5) Accuracy

① **Accuracy grades**

Uses NSK standard PN7A and PN7B which are equivalent to JIS4 grade of the radial ball bearing.
Combined bearing——————— PN7A
Universal combination bearing———PN7B
However, PN7A is stricter than JIS4 grade regarding axial run out of inner and outer rings. PN7B is stricter regarding the tolerance of the bore and outside diameter (Table I-6•14).

② **Fits**

Table I-6•15 shows recommended values of the tolerance of shaft and housing bore.

Table I-6•14 Tolerance: thrust angular contact ball bearing for ball screw support

Unit: μm

Nominal size of bearing bore or outside diameter (mm)		Tolerance of bore				Tolerance of outside diameter				Tolerance of inner ring width		Axial run out of inner or outer ring
		Accuracy grade				Accuracy grade				Accuracy grade		Accuracy grade
		PN7A		PN7B		PN7A		PN7B		PN7A PN7B		PN7A PN7B
over	or less	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	Maximum
10	18	0	–4	0	–4	–	–	–	–	0	–80	2.5
18	30	0	–5	0	–4	–	–	–	–	0	–120	2.5
30	50	0	–6	0	–4	0	–6	0	–4	0	–120	2.5
50	80	0	–7	0	–5	0	–7	0	–5	0	–150	2.5
80	120	0	–8	0	–6	0	–8	0	–6	0	–200	2.5

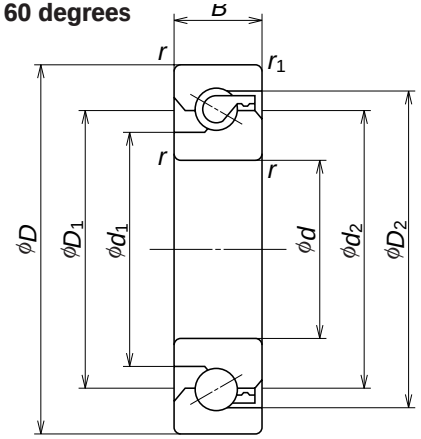
Remarks : The tolerance of the outer ring width is the same as that of the inner ring width of the same bearing.

Table I-6•15 Tolerance of shaft bearing seat and housing bore

Unit: μm

Size of shaft or housing bore (mm)		Tolerance of shaft bearing seat h5		Tolerance of housing hole H6	
over	or less	upper	lower	upper	lower
10	18	0	–8	–	–
18	30	0	–9	–	–
30	50	0	–11	+16	0
50	80	0	–13	+19	0
80	120	0	–15	+22	0

**TAC*B
Nominal contact angle 60 degrees



Dynamic equivalent load $P_a = XF_r \times F_a$

Bearing configuration / Combination code / Number of the row that receives axial load		Duplex		Triplex			Quadruplet		
		DF	DT	DFD		DTD	DFT	DFF	DFT
e=2.17		One row	Two rows	One row	Two rows	Three rows	One row	Two rows	Three rows
$F_a/F_r \leqq e$	X	1.9	–	1.43	2.33	–	1.17	2.33	2.53
	Y	0.54	–	0.77	0.35	–	0.89	0.35	0.26
$F_a/F_r > e$	X	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
	Y	1	1	1	1	1	1	1	1

External dimensions (mm)					Dimensions (mm)				Permissible rotational speed (rpm)		Bearing No.
d	D	B	r Min.	r_1 Min.	d_1	d_2	D_1	D_2	Grease lubrication	Oil lubrication	
17	47	15	1	0.6	27.2	34	34	39.6	6000	8000	17TAC 47B
20	47	15	1	0.6	27.2	34	34	39.6	6000	8000	20TAC 47B
25	62	15	1	0.6	37	45	45	50.7	4500	6000	25TAC 62B
30	62	15	1	0.6	39.5	47	47	53.2	4300	5600	30TAC 62B
35	72	15	1	0.6	47	55	55	60.7	3600	5000	35TAC 72B
40	72	15	1	0.6	49	57	57	62.7	3600	4800	40TAC 72B
	90	20	1	0.6	57	68	68	77.2	3000	4000	40TAC 90B
45	75	15	1	0.6	54	62	62	67.7	3200	4300	45TAC 75B
	100	20	1	0.6	64	75	75	84.2	2600	3600	45TAC 100B
50	100	20	1	0.6	67.5	79	79	87.7	2600	3400	50TAC 100B
55	100	20	1	0.6	67.5	79	79	87.7	2600	3400	55TAC 100B
	120	20	1	0.6	82	93	93	102.2	2200	3000	55TAC 120B
60	120	20	1	0.6	82	93	93	102.2	2200	3000	60TAC 120B

Basic dynamic load rating C_a						Permissible axial load						Mass (kg)
One row sustaining load DF		Two rows sustaining load DT, DFD, DFF		Three rows sustaining load DTD, DFT		One row sustains load DF		Two rows sustain load DT, DFD, DFF		Three rows sustain load DTD, DFT		
(N)	{kgf}	(N)	{kgf}	(N)	{kgf}	(N)	{kgf}	(N)	{kgf}	(N)	{kgf}	(Reference)
21900	2240	35500	3650	47500	4850	26600	2710	53000	5400	79500	8150	0.144
21900	2240	35500	3650	47500	4850	26600	2710	53000	5400	79500	8150	0.135
28500	2910	46500	4700	61500	6250	40500	4150	81500	8300	122000	12500	0.252
29200	2980	47500	4850	63000	6400	43000	4400	86000	8800	129000	13200	0.224
31000	3150	50500	5150	67000	6850	50000	5100	100000	10200	150000	15300	0.310
31500	3250	51500	5250	68500	7000	52000	5300	104000	10600	157000	16000	0.275
59000	6000	95500	9750	127000	13000	89500	9150	179000	18300	269000	27400	0.674
33000	3350	53500	5450	71000	7250	57000	5800	114000	11600	170000	17400	0.270
61500	6300	100000	10200	133000	13600	99000	10100	198000	20200	298000	30500	0.842
63000	6400	102000	10400	136000	13800	104000	10600	208000	21200	310000	32000	0.778
63000	6400	102000	10400	136000	13800	104000	10600	208000	21200	310000	32000	0.714
67500	6850	109000	11200	145000	14800	123000	12600	246000	25100	370000	37500	1.23
67500	6850	109000	11200	145000	14800	123000	12600	246000	25100	370000	37500	1.16

Note : (1) Values are based on a standard preload (C10).

* "Row" means the quantity of bearings that receive axial load. "Two rows" means two bearings are receiving axial load.

B-I-7 Custom Made Ball Screw Series: Dimension Table and Model Number

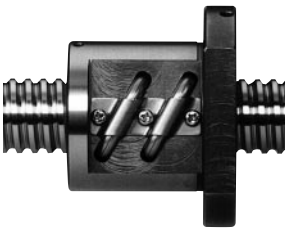
BALL SCREWS

B-I-7.1 T Type (Return tube type, fine lead) Ball Screws

(1) Product categories

T Type ball screws uses return tube recirculation system which is price competitive and suitable for large volume production. There are several models by difference in the preload system (Table I-7•1).

Table I-7•1 Classification of T Type ball screws

Nut models	Shape	Flange shape	Preload system	Nut length	Page
SFT		Flanged d=16 or under Rectangle d=20 or over Circular I Circular II	Non-preload, Slight axial play	Short	B311
PFT		Flanged d=16 or under Rectangle d=20 or over Circular I Circular II	P preload (light preload) Spacer ball 1:1	Short	B323
ZFT		Flanged d=20 or over Circular I Circular II	Z preload (medium preload)	Medium	B329
DFT		Flanged d=20 or over Circular I Circular II	D preload (medium preload) (heavy preload)	Long	B335
DFFT		Flanged to flanged Circular I	D preload (medium preload) (heavy preload)	Long	B345
GSCT (General industrial use, extra-large)		No flange	Non-preload, Slight axial play	Projecting-tube type	B351

(2) Special ball screw specifications

Other than specified in "Screw shaft diameter/lead combinations" of JIS B1192, the combinations of medium size screw shaft diameter are added to T type series as the standard specifications.

◇Appearance of ball nut

In the standard specification, the recirculation return tube is contained within the outer circumference of the ball nut. On request, NSK also makes "projecting-tube" type for smaller outside diameter.

◇Shaft diameter/lead combinations

NSK makes non-standard shaft diameter/lead combinations as well as leads of special specifications such as "inch" leads and "π"- leads on request.

◇Flange shape/size

NSK makes nut flanges of special shapes and sizes. Please consult NSK.

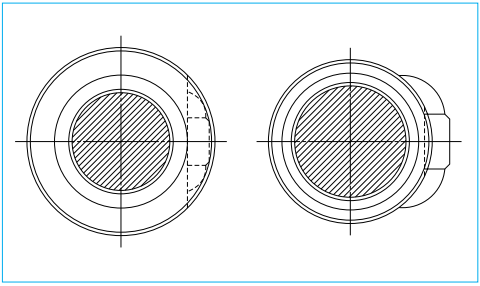


Fig. I-7•1 Nut appearance

(3) Ball nut model number

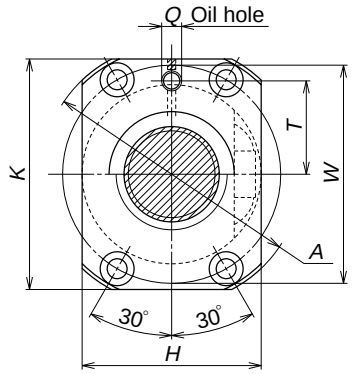
A model number that indicates specification factors is structured as shown below.

(Example) Nut model SFT; shaft diameter 10 mm; lead 4 mm; effective turns of balls 2.5* (Note)

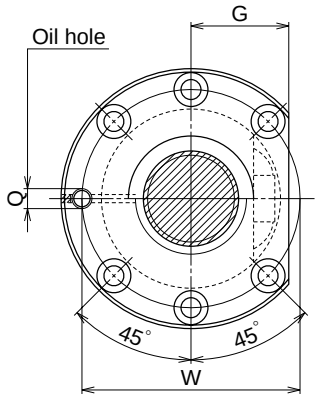
SFT 10 04 – 2.5

- SFT: Nut model
- 10: Shaft diameter
- 04: Lead
- 2.5: Effective turns of balls

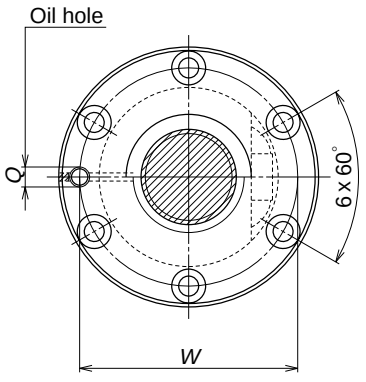
* Note: In case of Z preload, the number here is twice as large as the effective turns of balls.



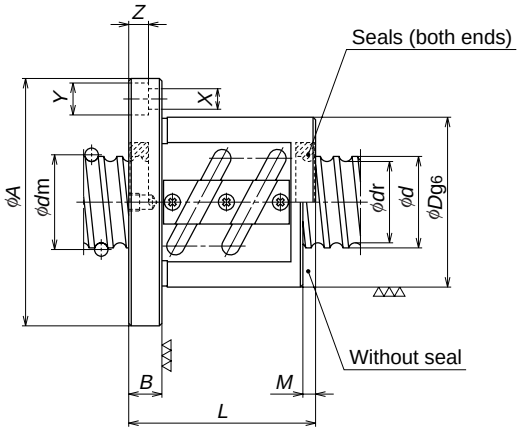
Rectangular shape
Screw shaft dia. $d \leqq 16$mm



Circular shape II (semi-circular)



Circular shape I



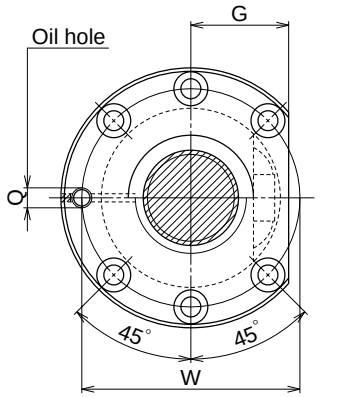
Unit: mm

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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
SFT 1004-2.5	10	4	2.000	10.3	8.2	2.5×1	2740	4450	280	455
SFT 1204-2.5	12	4	2.381	12.3	9.8	2.5×1	3760	6310	385	645
SFT 1204-3						1.5×2	4390	7580	450	770
SFT 1205-2.5		5	2.381	12.3	9.8	2.5×1	3760	6310	385	645
SFT 1205-3						1.5×2	4390	7580	450	770
SFT 1405-2.5	14	5	3.175	14.5	11.2	2.5×1	6790	11700	695	1190
SFT 1405-5						2.5×2	12300	23400	1260	2380
SFT 1604-2.5	16	4	2.381	16.3	13.8	2.5×1	4300	8530	440	870
SFT 1604-3						1.5×2	5040	10300	515	1050
SFT 1605-2.5		5	3.175	16.5	13.2	2.5×1	7330	13500	745	1380
SFT 1605-3						1.5×2	8570	16200	875	1650
SFT 1605-5						2.5×2	13300	27000	1360	2750
SFT 1606-2.5		6	3.175	16.5	13.2	2.5×1	7330	13500	745	1380
SFT 1606-3						1.5×2	8570	16200	875	1650
SFT 2004-2.5	20	4	2.381	20.3	17.8	2.5×1	4740	10700	485	1090
SFT 2004-5						2.5×2	8600	21500	875	2190
SFT 2005-2.5		5	3.175	20.5	17.2	2.5×1	8230	17100	840	1750
SFT 2005-3						1.5×2	9620	20600	980	2100
SFT 2005-5						2.5×2	14900	34300	1520	3500
SFT 2006-2.5		6	3.969	20.5	16.4	2.5×1	11000	21100	1120	2150
SFT 2006-3						1.5×2	12800	25300	1310	2580
SFT 2008-2.5		8	3.969	20.5	16.4	2.5×1	11000	21100	1120	2150
SFT 2008-3						1.5×2	12800	25300	1310	2580

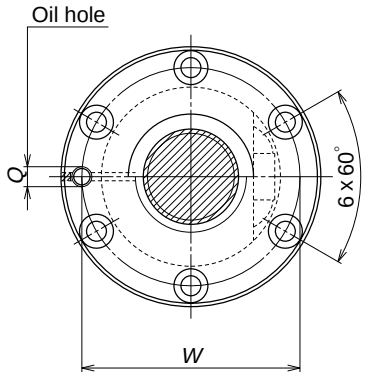
Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	G	H	K	B	L	M	W	X	Y	Z	Q	T
90	9	26	46	—	28	42	10	34	—	36	4.5	8	4.5	M6×1	14
106	11	30	50	—	32	45	10	38	—	40	4.5	8	4.5	M6×1	15
126	13							44							
106	11	30	50	—	32	45	10	40	—	40	4.5	8	4.5	M6×1	15
126	13							48							
140	14	34	57	—	34	50	11	40	—	45	5.5	9.5	5.5	M6×1	17
274	28							55							
134	14	34	57	—	34	50	11	38	—	45	5.5	9.5	5.5	M6×1	17
160	16							45							
158	16	40	63	—	40	55	11	42	—	51	5.5	9.5	5.5	M6×1	20
188	19							52							
307	31							57							
158	16	40	63	—	40	55	11	44	—	51	5.5	9.5	5.5	M6×1	20
188	19							56							
160	16	40	63	24	—	—	11	37	3	51	5.5	9.5	5.5	M6×1	—
309	32							49							
190	19	44	67	26	—	—	11	41	3	55	5.5	9.5	5.5	M6×1	—
227	23							52							
370	38							56							
195	20	48	71	27	—	—	11	44	3	59	5.5	9.5	5.5	M6×1	—
232	24							56							
195	20	48	75	28	—	—	13	54	5	61	6.6	11	6.5	M6×1	—
232	24							64							

Remarks 1. Flanges for the shaft diameter of 16 mm and smaller are rectangular. There are Circular I and Circular II for those with 20 mm and larger.
Select a flange shape which is suitable for the nut installation space.
2. If there is no seal, the nut length is shorter by the size of "M" than those with a seal.
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.

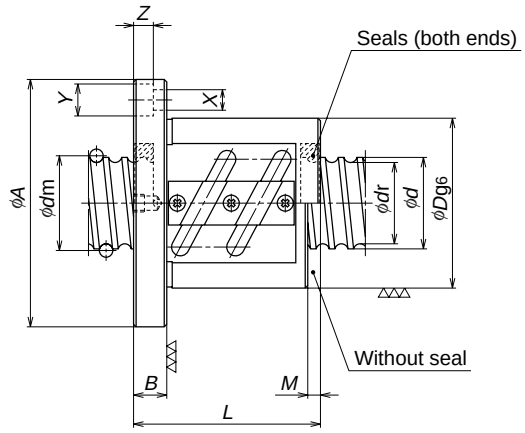
4. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the axial load is 30% of the basic dynamic load rating (C_a). Refer to "Technical Description" (Page B467) if axial load differs from the conditions above, or when considering change in the deformation of the ball nut itself.



Circular shape II (semi-circular)



Circular shape I



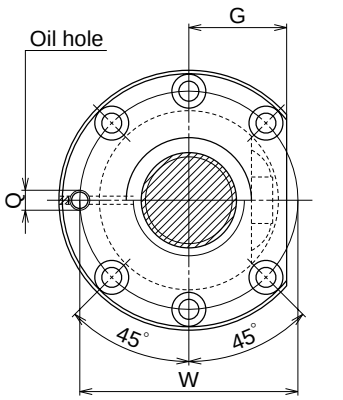
Unit: mm

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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
SFT 2504-2.5	25	4	2.381	25.3	22.8	2.5×1	5270	13600	535	1390
SFT 2504-5						2.5×2	9560	27200	975	2780
SFT 2505-2.5		5	3.175	25.5	22.2	2.5×1	9130	21900	930	2230
SFT 2505-3						1.5×2	10700	25700	1090	2620
SFT 2505-5						2.5×2	16600	43700	1690	4460
SFT 2506-2.5		6	3.969	25.5	21.4	2.5×1	12300	26800	1250	2730
SFT 2506-3						1.5×2	14400	32100	1470	3280
SFT 2506-5						2.5×2	22300	53500	2280	5460
SFT 2508-2.5		8	4.762	25.5	20.5	2.5×1	15800	32000	1610	3260
SFT 2508-3						1.5×2	18500	38100	1880	3880
SFT 2510-2.5		10	4.762	25.5	20.5	2.5×1	15800	32000	1610	3260
SFT 2510-3						1.5×2	18500	38100	1880	3880
SFT 2510-3.5						3.5×1	21100	44200	2150	4500
SFT 2805-2.5	28	5	3.175	28.5	25.2	2.5×1	9600	24400	980	2490
SFT 2805-5						2.5×2	17400	48800	1780	4980
SFT 2806-2.5		6	3.175	28.5	25.2	2.5×1	9600	24400	980	2490
SFT 2806-3						1.5×2	11200	29300	1150	2990
SFT 2806-5						2.5×2	17400	48800	1780	4980
SFT 2810-2.5		10	4.762	28.5	23.5	2.5×1	16700	36100	1700	3680
SFT 2810-3						1.5×2	19500	43000	1990	4380

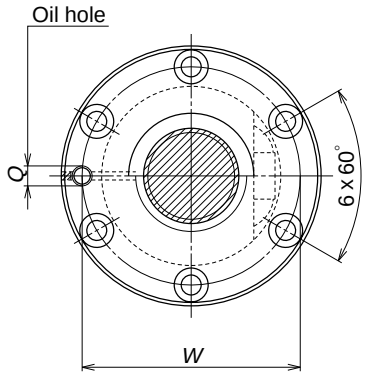
Axial rigidity *K* (N/μm)	Axial rigidity *K* {kgf/μm}	Ball nut dimensions *D*	*A*	*G*	*B*	*L*	*M*	*W*	*X*	*Y*	*Z*	*Q*
193	20	46	69	26	11	36	3	57	5.5	9.5	5.5	M6×1
374	38					48						
231	24	50	73	28	11	40	3	61	5.5	9.5	5.5	M6×1
271	28					52						
447	46					55						
235	24	53	76	29	11	44	3	64	5.5	9.5	5.5	M6×1
280	29					56						
456	46					62						
242	25	58	85	32	13	56	5	71	6.6	11	6.5	M6×1
286	29					69						
242	25	58	85	32	15	67	8	71	6.6	11	6.5	M6×1
286	29					81						
330	34					77						
252	26	55	85	31	12	41	3	69	6.6	11	6.5	M6×1
487	50					56						
252	26	55	85	31	12	45	3	69	6.6	11	6.5	M6×1
300	31					57						
487	50					63						
265	27	60	94	36	15	68	7	76	9	14	8.5	M6×1
314	32					82						

Remarks 1. Flange comes in Circular I and Circular II shape. Select a flange that is suitable for the nut installation space.
2. If there is no seal, the nut length is shorter by the length of "M" than those with a seal.
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.

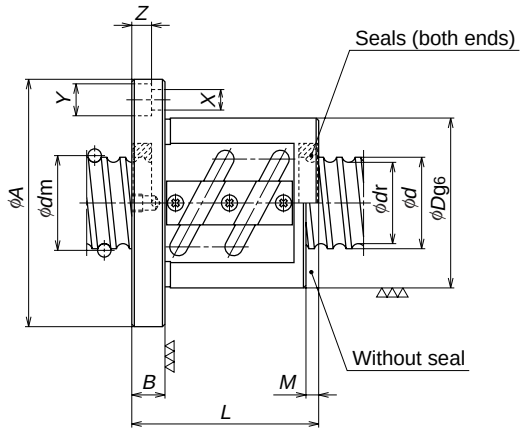
4. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the axial load is 30% of the basic dynamic load rating (C_a). Refer to "Technical Description" (Page B467) if axial load differs from the conditions above, or when considering change in the deformation of the ball nut itself.



Circular shape II (semi-circular)



Circular shape I



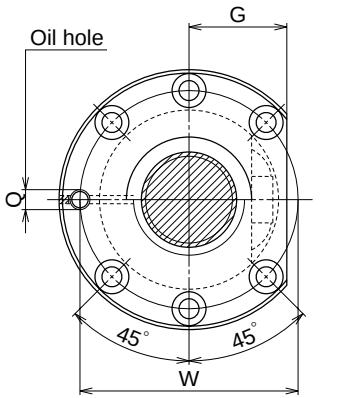
Unit: mm

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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
SFT 3204-2.5	32	4	2.381	32.3	29.8	2.5×1	5800	17500	590	1790
SFT 3204-5						2.5×2	10500	35100	1070	3580
SFT 3205-2.5		5	3.175	32.5	29.2	2.5×1	10200	28000	1040	2860
SFT 3205-3						1.5×2	11900	33600	1210	3430
SFT 3205-5						2.5×2	18500	56100	1880	5720
SFT 3205-7.5						2.5×3	26200	84100	2670	8580
SFT 3206-2.5		6	3.969	32.5	28.4	2.5×1	13600	34700	1390	3540
SFT 3206-3						1.5×2	15900	41200	1620	4200
SFT 3206-5						2.5×2	24700	69400	2520	7080
SFT 3208-2.5		8	4.762	32.5	27.5	2.5×1	17500	41000	1780	4180
SFT 3208-3						1.5×2	20400	49500	2080	5050
SFT 3208-5						2.5×2	31700	82000	3230	8360
SFT 3210-2.5		10	6.35	33	26.4	2.5×1	25500	54000	2600	5510
SFT 3210-3						1.5×2	29900	64800	3040	6610
SFT 3210-3.5						3.5×1	34100	77000	3480	7850
SFT 3210-5						2.5×2	46300	108000	4720	11000
SFT 3212-2.5		12	6.35	33	26.4	2.5×1	25500	54000	2600	5510
SFT 3212-3						1.5×2	29900	64800	3040	6610
SFT 3605-5	36	5	3.175	36.5	33.2	2.5×2	19400	63300	1980	6460
SFT 3605-7.5						2.5×3	27500	95000	2800	9690
SFT 3606-5		6	3.969	36.5	32.4	2.5×2	26500	78500	2700	8010
SFT 3606-7.5						2.5×3	37600	118000	3830	12000
SFT 3610-2.5		10	6.35	37.0	30.4	2.5×1	27200	61300	2770	6250
SFT 3610-3						1.5×2	31800	73500	3240	7500
SFT 3610-5						2.5×2	49300	123000	5030	12500

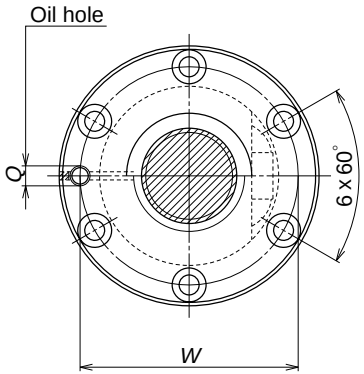
Axial rigidity *K* (N/μm)	Axial rigidity *K* {kgf/μm}	Ball nut dimensions *D*	*A*	*G*	*B*	*L*	*M*	*W*	*X*	*Y*	*Z*	*Q*
234	24	54	81	31	12	37	3	67	6.6	11	6.5	M6×1
454	46					49						
281	28	58	85	32	12	41	3	71	6.6	11	6.5	M6×1
333	34					53						
543	55					56						
799	81					71						
287	29	62	89	34	12	45	3	75	6.6	11	6.5	M6×1
339	35					57						
555	57					63						
292	30	66	100	38	15	58	5	82	9	14	8.5	M6×1
349	36					71						
565	58					82						
302	31	74	108	41	15	70	7	90	9	14	8.5	M6×1
360	37					87						
422	43					80						
585	60					100						
302	31	74	108	41	18	81	9	90	9	14	8.5	M6×1
360	37					97						
597	61	65	100	38	15	59	3	82	9	14	8.5	M6×1
878	90					74						
615	63	65	100	38	15	66	3	82	9	14	8.5	M6×1
905	92					84						
334	34	75	120	45	18	73	7	98	11	17.5	11	M6×1
397	41					90						
647	66					103						

Remarks 1. Flange comes in Circular I and Circular II shape. Select a flange that is suitable for the nut installation space.
2. If there is no seal, the nut length is shorter by the length of "M" than those with a seal.
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.

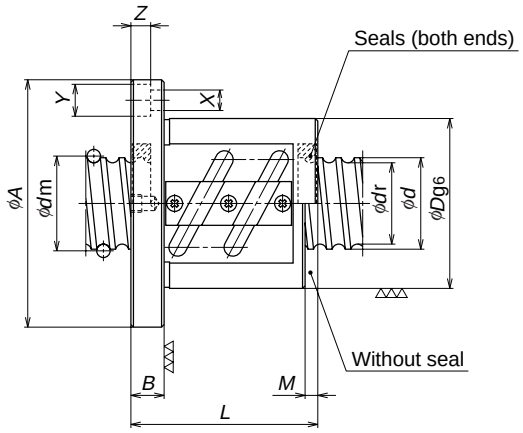
4. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the axial load is 30% of the basic dynamic load rating (C_a). Refer to "Technical Description" (Page B467) if axial load differs from the conditions above, or when considering change in the deformation of the ball nut itself.



Circular shape II (semi-circular)



Circular shape I



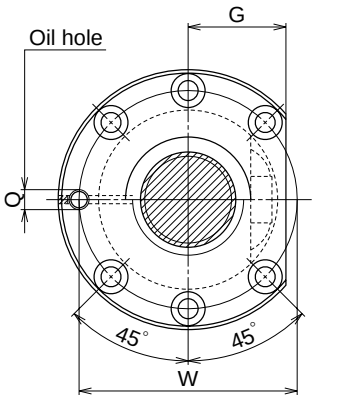
Unit: mm

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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
SFT 4005-2.5	40	5	3.175	40.5	37.2	2.5×1	11100	35300	1140	3600
SFT 4005-3						1.5×2	13000	42400	1330	4320
SFT 4005-5						2.5×2	20200	70600	2060	7200
SFT 4005-7.5						2.5×3	28700	106000	2920	10800
SFT 4006-3		6	3.969	40.5	36.4	1.5×2	17800	52600	1810	5360
SFT 4006-5						2.5×2	27600	87600	2810	8930
SFT 4006-7.5						2.5×3	39100	131000	3990	13400
SFT 4008-2.5		8	4.762	40.5	35.5	2.5×1	19200	51600	1960	5270
SFT 4008-3						1.5×2	22500	62600	2290	6380
SFT 4008-5						2.5×2	34900	103000	3550	10500
SFT 4010-2.5		10	6.35	41.0	34.4	2.5×1	28600	68600	2920	6990
SFT 4010-3						1.5×2	33500	82300	3420	8390
SFT 4010-3.5						3.5×1	38300	96000	3900	9790
SFT 4010-5						2.5×2	52000	137000	5300	14000
SFT 4012-2.5		12	7.144	41.5	34.1	2.5×1	33600	77500	3430	7910
SFT 4012-5						2.5×2	61000	155000	6220	15800
SFT 4016-2.5		16	7.144	41.5	34.1	2.5×1	33600	77500	3430	7910
SFT 4016-3						1.5×2	39300	93100	4010	9490
SFT 4510-5	45	10	6.35	46.0	39.4	2.5×2	54200	155000	5530	15800
SFT 4510-7.5						2.5×3	76800	232000	7830	23600
SFT 4512-2.5		12	7.144	46.5	39.1	2.5×1	35400	88500	3610	9030
SFT 4512-5						2.5×2	64200	177000	6540	18100

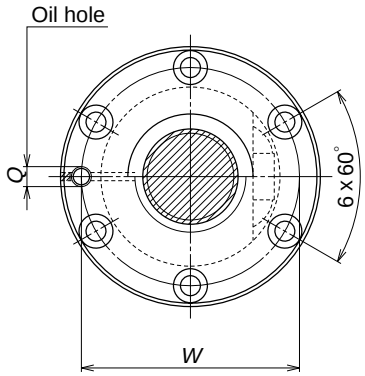
Axial rigidity *K* (N/μm)	Axial rigidity *K* {kgf/μm}	Ball nut dimensions *D*	*A*	*G*	*B*	*L*	*M*	*W*	*X*	*Y*	*Z*	*Q*
336	34	67	101	39	15	44	3	83	9	14	8.5	PT1/8
399	41					56						
649	66					59						
956	97					74						
411	42	70	104	40	15	60	3	86	9	14	8.5	PT1/8
668	68					66						
984	100					84						
349	36	74	108	41	15	58	5	90	9	14	8.5	PT1/8
418	43					71						
675	69					82						
365	37	82	124	47	18	73	7	102	11	17.5	11	PT1/8
434	44					90						
503	51					83						
706	72					103						
373	38	86	128	48	18	81	9	106	11	17.5	11	PT1/8
722	74					117						
373	38	86	128	48	22	102	14	106	11	17.5	11	PT1/8
440	45					118						
772	78	88	132	50	18	103	7	110	11	17.5	11	PT1/8
1140	116					133						
412	42	90	132	50	18	83	8	110	11	17.5	11	PT1/8
798	81					119						

Remarks 1. Flange comes in Circular I and Circular II shape. Select a flange that is suitable for the nut installation space.
2. If there is no seal, the nut length is shorter by the length of "M" than those with a seal.
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.

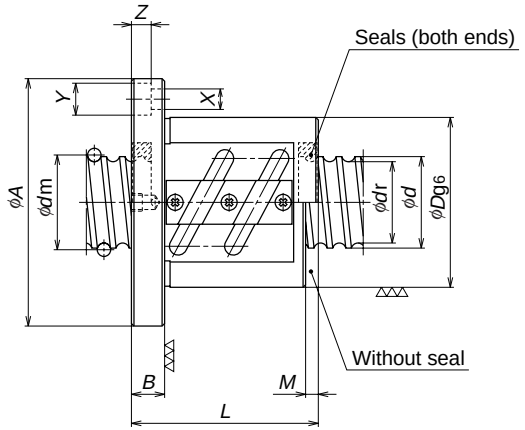
4. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the axial load is 30% of the basic dynamic load rating (C_a). Refer to "Technical Description" (Page B467) if axial load differs from the conditions above, or when considering change in the deformation of the ball nut itself.



Circular shape II (semi-circular)



Circular shape I



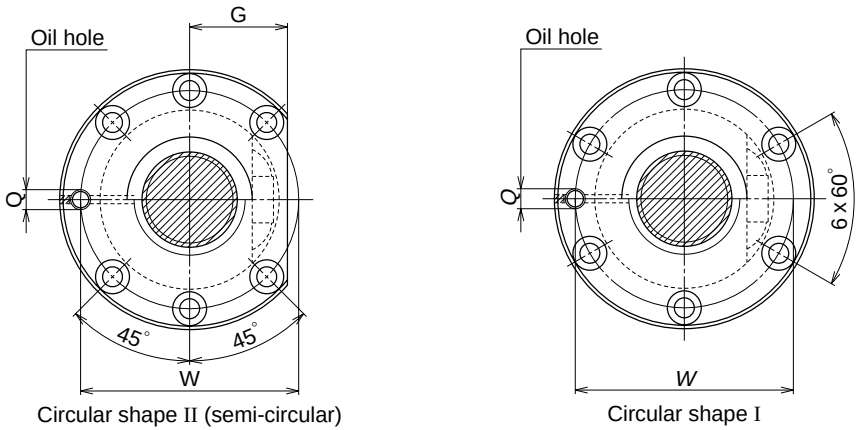
Unit: mm

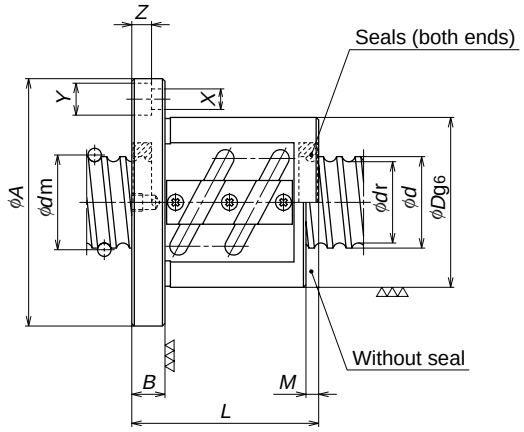
Model No.	Shaft dia. *d*	Lead *l*	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls Turns × Circuits	Basic load rating (N) Dynamic C_a	Basic load rating (N) Static C_{0a}	Basic load rating {kgf} Dynamic C_a	Basic load rating {kgf} Static C_{0a}
SFT 5005-3	50	5	3.175	50.5	47.2	1.5×2	14200	52500	1450	5360
SFT 5005-4.5						1.5×3	20200	78800	2060	8040
SFT 5006-3		6	3.969	50.5	46.4	1.5×2	19500	65100	1990	6640
SFT 5006-5						2.5×2	30300	109000	3080	11100
SFT 5006-7.5						2.5×3	42900	164000	4370	16700
SFT 5008-3		8	4.762	50.5	45.5	1.5×2	25000	77400	2550	7890
SFT 5008-5						2.5×2	38700	131000	3950	13400
SFT 5008-7.5						2.5×3	54900	197000	5600	20000
SFT 5010-2.5		10	6.35	51	44.4	2.5×1	31800	87400	3240	8910
SFT 5010-3						1.5×2	37200	103000	3790	10500
SFT 5010-5						2.5×2	57700	175000	5890	17800
SFT 5010-7.5						2.5×3	81800	262000	8340	26700
SFT 5012-2.5		12	7.938	51.5	43.2	2.5×1	42800	107000	4360	10900
SFT 5012-5						2.5×2	77600	214000	7920	21900
SFT 5016-2.5		16	7.938	51.5	43.2	2.5×1	42800	107000	4360	10900
SFT 5016-5						2.5×2	77600	214000	7920	21900
SFT 5020-2.5		20	7.938	51.5	43.2	2.5×1	42800	107000	4360	10900
SFT 5020-3						1.5×2	50000	129000	5100	13100
SFT 5510-5	55	10	6.35	56.0	49.4	2.5×2	59500	192000	6070	19600
SFT 5510-7.5						2.5×3	84300	288000	8600	29400

Axial rigidity *K* (N/μm)	Axial rigidity *K* {kgf/μm}	Ball nut dimensions *D*	*A*	*G*	*B*	*L*	*M*	*W*	*X*	*Y*	*Z*	*Q*
472	48	80	114	43	15	58	3	96	9	14	8.5	PT1/8
696	71					68						
486	50	84	118	45	15	62	3	100	9	14	8.5	PT1/8
794	81					68						
1170	119					86						
496	51	87	129	49	18	74	5	107	11	17.5	11	PT1/8
815	83					85						
1200	122					109						
440	45	93	135	51	18	73	7	113	11	17.5	11	PT1/8
517	53					90						
853	87					103						
1250	128					133						
449	46	100	146	55	22	87	8	122	14	20	13	PT1/8
869	89					123						
449	46	100	146	55	22	104	14	122	14	20	13	PT1/8
869	89					152						
449	46	100	146	55	28	127	17	122	14	20	13	PT1/8
534	54					147						
916	93	102	144	54	18	103	7	122	11	17.5	11	PT1/8
1350	137					133						

Remarks 1. Flange comes in Circular I and Circular II shape. Select a flange that is suitable for the nut installation space.
2. If there is no seal, the nut length is shorter by the length of "M" than those with a seal.
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.

4. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the axial load is 30% of the basic dynamic load rating (C_a). Refer to "Technical Description" (Page B467) if axial load differs from the conditions above, or when considering change in the deformation of the ball nut itself.





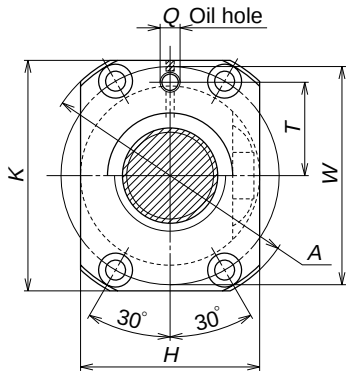
Unit: mm

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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
SFT 6310-2.5	63	10	6.35	64.0	57.4	2.5×1	34800	111000	3550	11300
SFT 6310-5						2.5×2	63200	221000	6440	22600
SFT 6310-7.5						2.5×3	89500	332000	9130	33900
SFT 6312-2.5		12	7.938	64.5	56.2	2.5×1	47400	137000	4830	13900
SFT 6312-5						2.5×2	86000	273000	8770	27900
SFT 6316-2.5		16	9.525	65.0	55.2	2.5×1	79500	228000	8110	23200
SFT 6316-5						2.5×2	144000	455000	14700	46400
SFT 6320-2.5		20	9.525	65.0	55.2	2.5×1	79500	228000	8110	23200
SFT 6320-5						2.5×2	144000	455000	14700	46400
SFT 8010-5	80	10	6.35	81.0	74.4	2.5×2	70500	282000	7180	28800
SFT 8010-7.5						2.5×3	99800	424000	10200	43200
SFT 8012-5		12	7.938	81.5	73.2	2.5×2	96000	350000	9790	35700
SFT 8012-7.5						2.5×3	136000	526000	13900	53600
SFT 8016-5		16	9.525	82.0	72.2	2.5×2	162000	582000	16600	59400
SFT 8016-7.5						2.5×3	230000	874000	23500	89100
SFT 8020-5		20	9.525	82.0	72.2	2.5×2	162000	582000	16600	59400
SFT 8020-7.5						2.5×3	230000	874000	23500	89100
SFT 10012-5	100	12	7.938	101.5	93.2	2.5×2	105000	441000	10700	45000
SFT 10012-7.5						2.5×3	149000	662000	15200	67500
SFT 10016-5		16	9.525	102	92.2	2.5×2	176000	737000	18000	75100
SFT 10016-7.5						2.5×3	250000	1100000	25400	113000
SFT 10020-5		20	9.525	102	92.2	2.5×2	176000	737000	18000	75100
SFT 10020-7.5						2.5×3	250000	1100000	25400	113000
SFT 12516-5	125	16	9.525	127	117.2	2.5×2	195000	918000	19900	93600
SFT 12516-7.5						2.5×3	277000	1380000	28200	140000
SFT 12520-5		20	9.525	127	117.2	2.5×2	195000	918000	19900	93600
SFT 12520-7.5						2.5×3	277000	1380000	28200	140000

Axial rigidity K (N/µm)	Axial rigidity K {kgf/µm}	Ball nut dimensions D	A	G	B	L	M	W	X	Y	Z	Q
528	54	108	154	58	22	77	7	130	14	20	13	PT1/8
1020	104					107						
1500	153					137						
542	55	115	161	61	22	87	8	137	14	20	13	PT1/8
1050	107					123						
713	73	122	180	69	28	110	10	150	18	26	17.5	PT1/8
1380	141					158						
713	73	122	180	69	28	127	17	150	18	26	17.5	PT1/8
1380	141					187						
1240	126	130	176	66	22	107	7	152	14	20	13	PT1/8
1830	186					137						
1280	130	136	182	68	22	123	8	158	14	20	13	PT1/8
1880	192					159						
1680	171	143	204	77	28	158	10	172	18	26	17.5	PT1/8
2470	252					206						
1680	171	143	204	77	28	187	17	172	18	26	17.5	PT1/8
2470	252					247						
1530	156	160	220	82	28	129	8	188	18	26	17.5	PT1/8
2250	229					165						
2010	205	170	243	91	32	162	10	205	22	32	21.5	PT1/8
2950	301					210						
2010	205	170	243	91	32	191	17	205	22	32	21.5	PT1/8
2950	301					251						
2390	244	200	290	109	36	170	10	243	26	39	25.5	PT1/8
3520	359					218						
2390	244	200	290	109	36	199	12	243	26	39	25.5	PT1/8
3520	359					259						

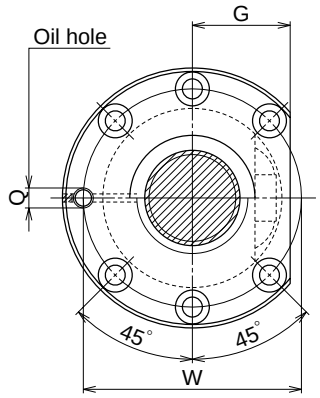
Remarks 1. Flange comes in Circular I and Circular II shape. Select a flange that is suitable for the nut installation space.
2. If there is no seal, the nut length is shorter by the length of "M" than those with a seal.
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.

4. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the axial load is 30% of the basic dynamic load rating (C_a). Refer to "Technical Description" (Page B467) if axial load differs from the conditions above, or when considering change in the deformation of the ball nut itself.

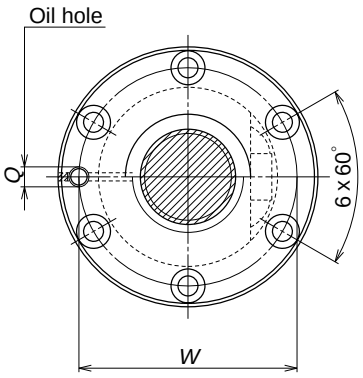


Rectangular shape

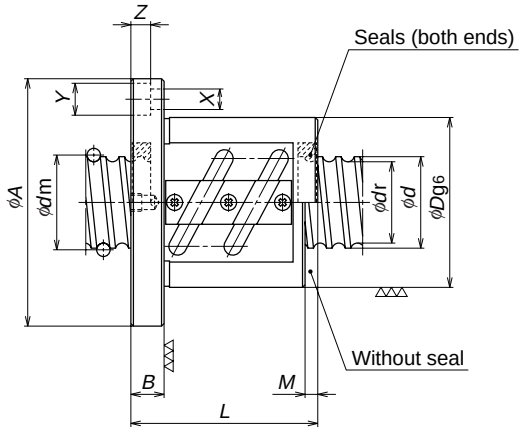
Screw shaft dia. $d \leqq 16$mm



Circular shape II (semi-circular)



Circular shape I

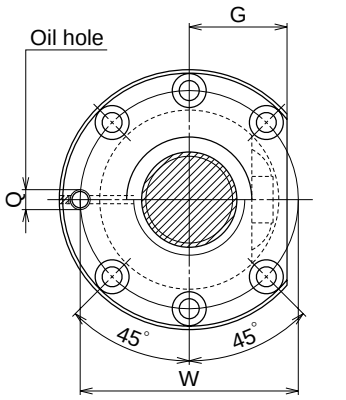


Unit: mm

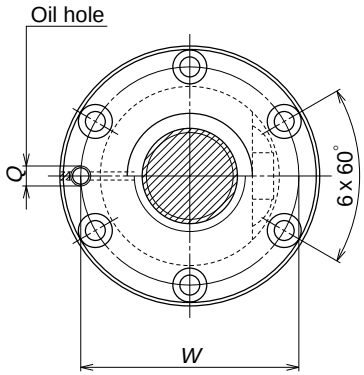
Model No.	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls Turns × Circuits	Basic load rating (N) Dynamic C_a	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
PFT 1004-2.5	10	4	2.000	10.3	8.2	2.5×1	1730	2230	175	225
PFT 1204-2.5	12	4	2.381	12.3	9.8	2.5×1	2370	3160	240	320
PFT 1204-3						1.5×2	2770	3790	280	385
PFT 1205-2.5		5	2.381	12.3	9.8	2.5×1	2370	3160	240	320
PFT 1205-3						1.5×2	2770	3790	280	385
PFT 1405-2.5	14	5	3.175	14.5	11.2	2.5×1	4280	5840	435	595
PFT 1405-5						2.5×2	7770	11700	790	1190
PFT 1604-3	16	4	2.381	16.3	13.8	1.5×2	3170	5150	325	525
PFT 1604-5						2.5×2	4920	8530	500	870
PFT 1605-3		5	3.175	16.5	13.2	1.5×2	5400	8100	550	825
PFT 1605-5						2.5×2	8380	13500	855	1380
PFT 1606-2.5		6	3.175	16.5	13.2	2.5×1	4620	6750	470	690
PFT 2004-5	20	4	2.381	20.3	17.8	2.5×2	5420	10700	550	1090
PFT 2005-3		5	3.175	20.5	17.2	1.5×2	6060	10300	620	1050
PFT 2005-5						2.5×2	9410	17100	960	1750
PFT 2006-2.5		6	3.969	20.5	16.4	2.5×1	6900	10500	705	1080
PFT 2006-3						1.5×2	8080	12700	825	1290
PFT 2008-2.5		8	3.969	20.5	16.4	2.5×1	6900	10500	705	1080
PFT 2504-5	25	4	2.381	25.3	22.8	2.5×2	6020	13600	615	1390
PFT 2505-3		5	3.175	25.5	22.2	1.5×2	6730	12800	685	1310
PFT 2505-5						2.5×2	10400	21900	1070	2230
PFT 2506-3		6	3.969	25.5	21.4	1.5×2	9070	16100	925	1640
PFT 2506-5						2.5×2	14100	26800	1430	2730

Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	G	H	K	B	L	M	W	X	Y	Z	Q	T
76	8	26	46	—	28	42	10	34	—	36	4.5	8	4.5	M6×1	14
89	9	30	50	—	32	45	10	38	—	40	4.5	8	4.5	M6×1	15
106	11							44							
89	9	30	50	—	32	45	10	40	—	40	4.5	8	4.5	M6×1	15
106	11							48							
116	12	34	57	—	34	50	11	40	—	45	5.5	9.5	5.5	M6×1	17
225	23							55							
135	14	34	57	—	34	50	11	45	—	45	5.5	9.5	5.5	M6×1	17
215	22							50							
158	16	40	63	—	40	55	11	52	—	51	5.5	9.5	5.5	M6×1	20
258	26							57							
133	14	40	63	—	40	55	11	44	—	51	5.5	9.5	5.5	M6×1	20
260	27	40	63	24	—	—	11	49	3	51	5.5	9.5	5.5	M6×1	—
191	20	44	67	26	—	—	11	52	3	55	5.5	9.5	5.5	M6×1	—
311	32							56							
164	17	48	71	27	—	—	11	44	3	59	5.5	9.5	5.5	M6×1	—
195	20							56							
164	17	48	75	28	—	—	13	54	5	61	6.6	11	6.5	M6×1	—
312	32	46	69	26	—	—	11	48	3	57	5.5	9.5	5.5	M6×1	—
223	23	50	73	28	—	—	11	52	3	61	5.5	9.5	5.5	M6×1	—
372	38							55							
235	24	53	76	29	—	—	11	56	3	64	5.5	9.5	5.5	M6×1	—
383	39							62							

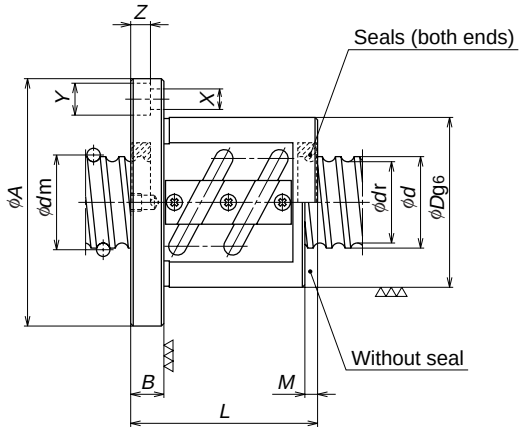
Remarks 1. Flanges for shaft diameter of 16 mm and smaller are rectangle. There are Circular I and Circular II for those with 20 mm and larger. Select a flange shape which is suitable for the nut installation space.
2. If there is no seal, the nut length is shorter by the length of "M" than those with a seal.
3. Right turn screw is standard. "L" is added to the end of the model for left turn screw.
4. Load balls and spacer balls are installed at a ratio of 1:1. Therefore, the basic load rating differs from those of other models.
5. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the preload is 5% of the basic dynamic load rating (C_a), and the axial load is applied to it. Refer to "Technical description" (Page B467) if preload differs from the conditions above, or when considering change in the deformation of the ball nut itself.



Circular shape II (semi-circular)



Circular shape I



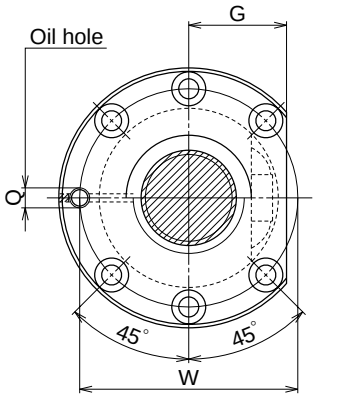
Unit: mm

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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
PFT 2508-2.5	25	8	4.762	25.5	20.5	2.5×1	9940	16000	1010	1630
PFT 2508-3						1.5×2	11600	19000	1190	1940
PFT 2510-2.5		10	4.762	25.5	20.5	2.5×1	9940	16000	1010	1630
PFT 2510-3						1.5×2	11600	19000	1190	1940
PFT 2805-5	28	5	3.175	28.5	25.2	2.5×2	11000	24400	1120	2490
PFT 2806-3		6	3.175	28.5	25.2	1.5×2	7080	14600	720	1490
PFT 2806-5						2.5×2	11000	24400	1120	2490
PFT 2810-2.5		10	4.762	28.5	23.5	2.5×1	10500	18000	1070	1840
PFT 2810-3						1.5×2	12300	21500	1260	2190
PFT 3204-5	32	4	2.381	32.3	29.8	2.5×2	6630	17500	675	1790
PFT 3205-3		5	3.175	32.5	29.2	1.5×2	7490	16800	765	1720
PFT 3205-5						2.5×2	11600	28000	1190	2860
PFT 3205-7.5						2.5×3	16500	42100	1680	4290
PFT 3206-3		6	3.969	32.5	28.4	1.5×2	10000	20600	1020	2100
PFT 3206-5						2.5×2	15500	34700	1580	3540
PFT 3208-3		8	4.762	32.5	27.5	1.5×2	12900	24800	1310	2520
PFT 3208-5						2.5×2	20000	41000	2030	4180
PFT 3210-2.5		10	6.35	33.0	26.4	2.5×1	16100	27000	1640	2750
PFT 3210-3						1.5×2	18800	32400	1920	3300
PFT 3210-5						2.5×2	29200	54000	2980	5510
PFT 3212-2.5		12	6.35	33.0	26.4	2.5×1	16100	27000	1640	2750
PFT 3212-3						1.5×2	18800	32400	1920	3300

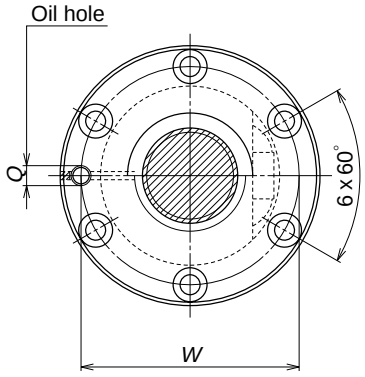
Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	G	B	L	M	W	X	Y	Z	Q
203	21	58	85	32	13	56	5	71	6.6	11	6.5	M6×1
234	24					69						
203	21	58	85	32	15	67	8	71	6.6	11	6.5	M6×1
234	24					81						
410	42	55	85	31	12	56	3	69	6.6	11	6.5	M6×1
252	26	55	85	31	12	57	3	69	6.6	11	6.5	M6×1
410	42					63						
220	22	60	94	36	15	68	7	76	9	14	8.5	M6×1
265	27					82						
382	39	54	81	31	12	49	3	67	6.6	11	6.5	M6×1
281	29	58	85	32	12	53	3	71	6.6	11	6.5	M6×1
455	47					56						
672	69					71						
285	29	62	89	34	12	57	3	75	6.6	11	6.5	M6×1
468	48					63						
294	30	66	100	38	15	71	5	82	9	14	8.5	M6×1
470	48					82						
255	26	74	108	41	15	70	7	90	9	14	8.5	M6×1
303	31					87						
494	50					100						
255	26	74	108	41	18	81	9	90	9	14	8.5	M6×1
303	31					97						

Remarks 1. Flange comes in Circular I and Circular II shape. Select a flange that is suitable for the nut installation space.
2. If there is no seal, the nut length is shorter by the length of "M" than those with a seal.
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.

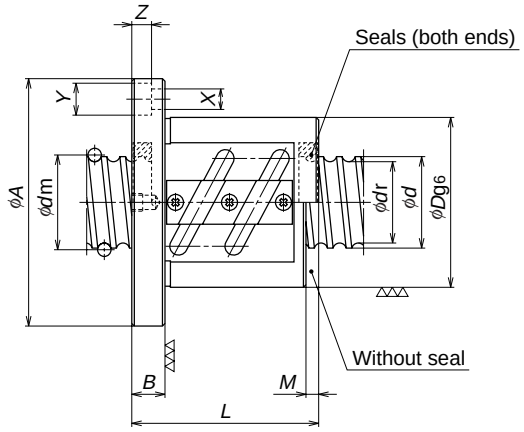
4. Load balls and spacer balls are installed at a ratio of 1:1. Therefore, the basic load rating differs from those of other models.
5. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the preload is 5% of the basic dynamic load rating (C_a), and the axial load is applied to it. Refer to "Technical description" (Page B467) if preload differs from the conditions above, or when considering change in the deformation of the ball nut itself.



Circular shape II (semi-circular)



Circular shape I



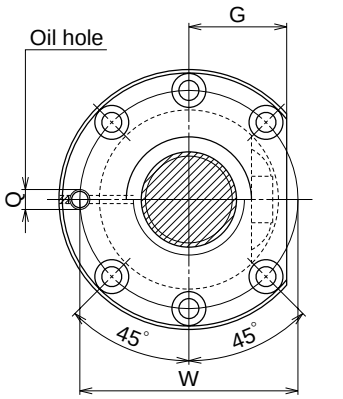
Unit: mm

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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
PFT 3605-5	36	5	3.175	36.5	33.2	2.5×2	12200	31700	1250	3230
PFT 3605-7.5						2.5×3	17300	47500	1760	4840
PFT 3606-5		6	3.969	36.5	32.4	2.5×2	16700	39300	1700	4000
PFT 3606-7.5						2.5×3	23700	58900	2410	6010
PFT 3610-2.5		10	6.35	37.0	30.4	2.5×1	17100	30600	1750	3120
PFT 3610-3						1.5×2	20000	36800	2040	3750
PFT 3610-5						2.5×2	31100	61300	3170	6250
PFT 4005-3	40	5	3.175	40.5	37.2	1.5×2	8210	21200	840	2160
PFT 4005-5						2.5×2	12700	35300	1300	3600
PFT 4005-7.5						2.5×3	18100	53000	1840	5400
PFT 4006-5		6	3.969	40.5	36.4	2.5×2	17400	43800	1770	4470
PFT 4006-7.5						2.5×3	24600	65700	2510	6700
PFT 4008-3		8	4.762	40.5	35.5	1.5×2	14200	31300	1440	3190
PFT 4008-5						2.5×2	22000	51600	2240	5270
PFT 4010-2.5		10	6.35	41.0	34.4	2.5×1	18000	34300	1840	3500
PFT 4010-3						1.5×2	21100	41100	2150	4190
PFT 4010-5						2.5×2	32800	68600	3340	6990
PFT 4012-2.5		12	7.144	41.5	34.1	2.5×1	21200	38800	2160	3950
PFT 4012-5						2.5×2	38400	77500	3920	7910

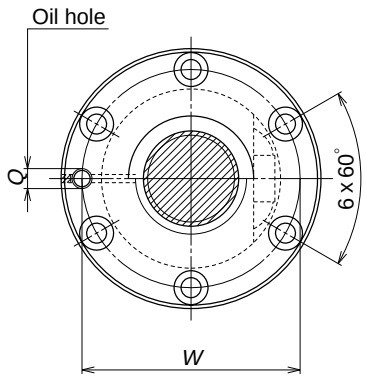
Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	G	B	L	M	W	X	Y	Z	Q
504	51	65	100	38	15	59	3	82	9	14	8.5	M6×1
740	75					74						
518	53	65	100	38	15	66	3	82	9	14	8.5	M6×1
763	78					84						
278	28	75	120	45	18	73	7	98	11	17.5	11	M6×1
327	33					90						
537	55					103						
337	34	67	101	39	15	56	3	83	9	14	8.5	PT1/8
548	56					59						
806	82					74						
564	57	70	104	40	15	66	3	86	9	14	8.5	PT1/8
827	84					84						
352	36	74	108	41	15	71	5	90	9	14	8.5	PT1/8
570	58					82						
307	31	82	124	47	18	73	7	102	11	17.5	11	PT1/8
366	37					90						
595	61					103						
310	32	86	128	48	18	81	9	106	11	17.5	11	PT1/8
600	61					117						

Remarks 1. Flange comes in Circular I and Circular II shape. Select a flange that is suitable for the nut installation space.
2. If there is no seal, the nut length is shorter by the length of "M" than those with a seal.
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.

4. Load balls and spacer balls are installed at a ratio of 1:1. Therefore, the basic load rating differs from those of other models.
5. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the preload is 5% of the basic dynamic load rating (C_a), and the axial load is applied to it. Refer to "Technical description" (Page B467) if preload differs from the conditions above, or when considering change in the deformation of the ball nut itself.



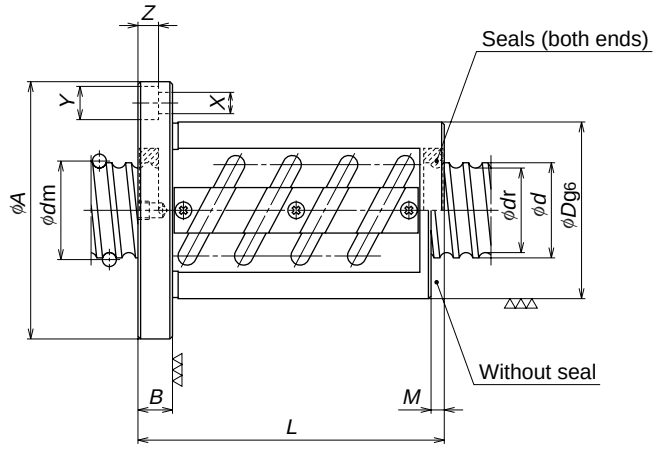
Circular shape II (semi-circular)



Circular shape I

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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
ZFT 2504-5	25	4	2.381	25.3	22.8	2.5×1	5270	13600	535	1390
ZFT 2504-10						2.5×2	9560	27200	975	2780
ZFT 2505-5		5	3.175	25.5	22.2	2.5×1	9130	21900	930	2230
ZFT 2505-10						2.5×2	16600	43700	1690	4460
ZFT 2506-5		6	3.969	25.5	21.4	2.5×1	12300	26800	1250	2730
ZFT 2506-10						2.5×2	22300	53500	2280	5460
ZFT 2508-5		8	4.762	25.5	20.5	2.5×1	15800	32000	1610	3260
ZFT 2510-3		10	4.762	25.5	20.5	1.5×1	10200	19000	1040	1940
ZFT 2805-5	28	5	3.175	28.5	25.2	2.5×1	9600	24400	980	2490
ZFT 2805-10						2.5×2	17400	48800	1780	4980
ZFT 2806-5		6	3.175	28.5	25.2	2.5×1	9600	24400	980	2490
ZFT 2806-10						2.5×2	17400	48800	1780	4980
ZFT 2810-3		10	4.762	28.5	23.5	1.5×1	10800	21500	1100	2190
ZFT 3204-5	32	4	2.381	32.3	29.8	2.5×1	5800	17500	590	1790
ZFT 3204-10						2.5×2	10500	35100	1070	3580
ZFT 3205-5		5	3.175	32.5	29.2	2.5×1	10200	28000	1040	2860
ZFT 3205-10						2.5×2	18500	56100	1880	5720
ZFT 3206-5		6	3.969	32.5	28.4	2.5×1	13600	34700	1390	3540
ZFT 3206-10						2.5×2	24700	69400	2520	7080
ZFT 3208-5		8	4.762	32.5	27.5	2.5×1	17500	41000	1780	4180
ZFT 3208-6						1.5×2	20400	49500	2080	5050
ZFT 3210-3		10	6.35	33.0	26.4	1.5×1	16400	32400	1680	3300
ZFT 3210-5						2.5×1	25500	54000	2600	5510
ZFT 3212-3		12	6.35	33.0	26.4	1.5×1	16400	32400	1680	3300

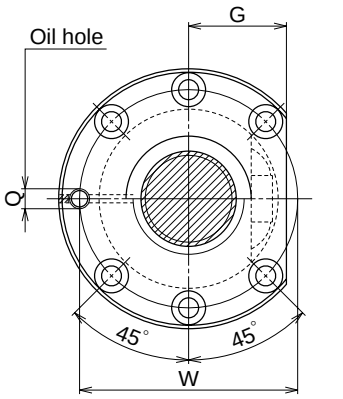
Remarks 1. Flange comes in Circular I and Circular II shape. Select a flange that is suitable for the nut installation space.
2. If there is no seal, the nut length is shorter by the length of "M" than those with a seal.
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.



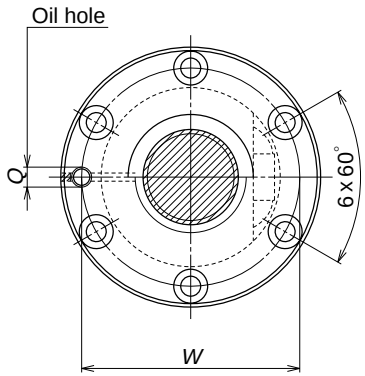
Unit: mm

Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	G	B	L	M	W	X	Y	Z	Q
379	39	46	69	26	11	48	3	57	5.5	9.5	5.5	M6×1
735	75					72						
454	46	50	73	28	11	55	3	61	5.5	9.5	5.5	M6×1
876	89					85						
462	47	53	76	29	11	62	3	64	5.5	9.5	5.5	M6×1
896	91					98						
476	48	58	85	32	13	80	5	71	6.6	11	6.5	M6×1
291	30	58	85	32	15	81	8	71	6.6	11	6.5	M6×1
495	50	55	85	31	12	56	3	69	6.6	11	6.5	M6×1
959	98					86						
495	50	55	85	31	12	63	3	69	6.6	11	6.5	M6×1
959	98					99						
320	33	60	94	36	15	82	7	76	9	14	8.5	M6×1
461	47	54	81	31	12	49	3	67	6.6	11	6.5	M6×1
892	91					73						
552	56	58	85	32	12	56	3	71	6.6	11	6.5	M6×1
1070	109					86						
563	57	62	89	34	12	63	3	75	6.6	11	6.5	M6×1
1090	111					99						
573	58	66	100	38	15	82	5	82	9	14	8.5	M6×1
686	70					111						
365	37	74	108	41	15	87	7	90	9	14	8.5	M6×1
594	61					100						
365	37	74	108	41	18	97	9	90	9	14	8.5	M6×1

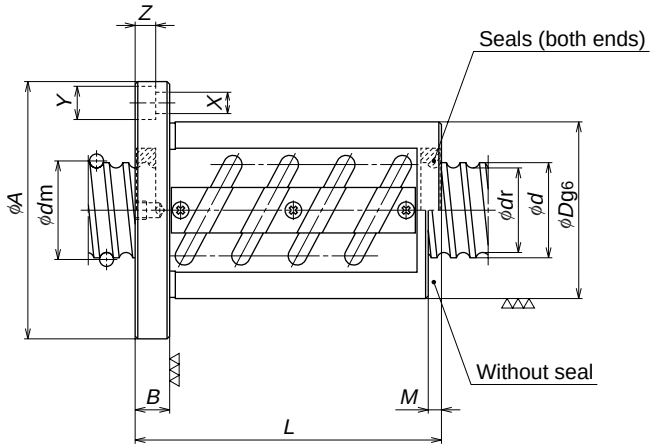
4. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the preload is 10% of the basic dynamic load rating (C_a), and axial load is applied to it. Refer to "Technical Description" (Page B467) if preload differ from the conditions above, or when considering change in the deformation of the ball nut itself.



Circular shape II (semi-circular)



Circular shape I



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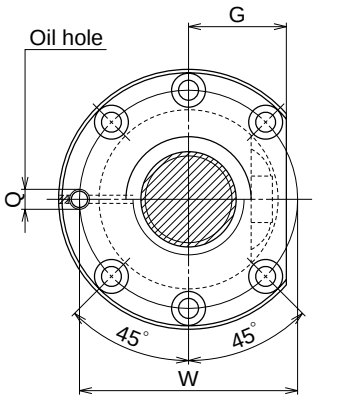
Unit: mm

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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
ZFT 3605-5	36	5	3.175	36.5	33.2	2.5×1	10700	31700	1090	3230
ZFT 3605-10						2.5×2	19400	63300	1980	6460
ZFT 3606-5		6	3.969	36.5	32.4	2.5×1	14600	39300	1490	4000
ZFT 3606-10						2.5×2	26500	78500	2700	8010
ZFT 3610-3		10	6.35	37.0	30.4	1.5×1	17500	36800	1790	3750
ZFT 3610-5						2.5×1	27200	61300	2770	6250
ZFT 4005-5	40	5	3.175	40.5	37.2	2.5×1	11100	35300	1140	3600
ZFT 4005-10						2.5×2	20200	70600	2060	7200
ZFT 4006-5		6	3.969	40.5	36.4	2.5×1	15200	43800	1550	4470
ZFT 4006-10						2.5×2	27600	87600	2810	8930
ZFT 4008-5		8	4.762	40.5	35.5	2.5×1	19200	51600	1960	5270
ZFT 4008-10						2.5×2	34900	103000	3550	10500
ZFT 4010-5		10	6.35	41.0	34.4	2.5×1	28600	68600	2920	6990
ZFT 4010-6						1.5×2	33500	82300	3420	8390
ZFT 4010-7						3.5×1	38300	96000	3900	9790
ZFT 4012-5		12	7.144	41.5	34.1	2.5×1	33600	77500	3430	7910
ZFT 4016-3		16	7.144	41.5	34.1	1.5×1	21700	46500	2210	4740
ZFT 4510-5	45	10	6.35	46	39.4	2.5×1	29900	77300	3040	7880
ZFT 4512-5		12	7.144	46.5	39.1	2.5×1	35400	88500	3610	9030

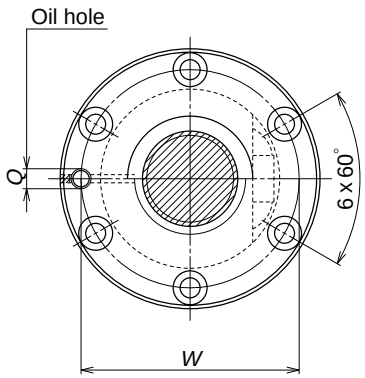
Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	G	B	L	M	W	X	Y	Z	Q
607	62	65	100	38	15	59	3	82	9	14	8.5	M6×1
1170	119					89						
625	64	65	100	38	15	66	3	82	9	14	8.5	M6×1
1210	123					102						
404	41	75	120	45	18	90	7	98	11	17.5	11	M6×1
657	67					103						
661	67	67	101	39	15	59	3	83	9	14	8.5	PT1/8
1280	130					89						
679	69	70	104	40	15	66	3	86	9	14	8.5	PT1/8
1320	134					102						
687	70	74	108	41	15	82	5	90	9	14	8.5	PT1/8
1330	135					130						
717	73	82	124	47	18	103	7	102	11	17.5	11	PT1/8
854	87					140						
988	101					123						
733	75	86	128	48	18	117	9	106	11	17.5	11	PT1/8
451	46	86	128	48	22	118	14	106	11	17.5	11	PT1/8
784	80	88	132	50	18	103	7	110	11	17.5	11	PT1/8
811	83	90	132	50	18	119	8	110	11	17.5	11	PT1/8

Remarks 1. Flange comes in Circular I and Circular II shape. Select a flange that is suitable for the nut installation space.
2. If there is no seal, the nut length is shorter by the length of "M" than those with a seal.
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.

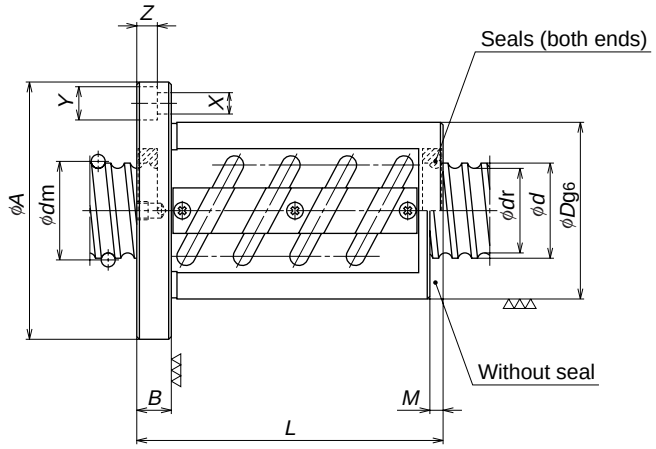
4. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the preload is 10% of the basic dynamic load rating (C_a), and axial load is applied to it. Refer to "Technical Description" (Page B467) if preload differ from the conditions above, or when considering change in the deformation of the ball nut itself.



Circular shape II (semi-circular)



Circular shape I



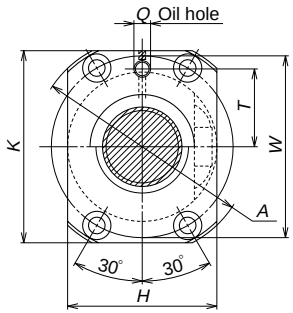
Unit: mm

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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
ZFT 5005-6	50	5	3.175	50.5	47.2	1.5×2	14200	52500	1450	5360
ZFT 5005-9						1.5×3	20200	78800	2060	8040
ZFT 5006-10		6	3.969	50.5	46.4	2.5×2	30300	109000	3080	11100
ZFT 5008-10		8	4.762	50.5	45.5	2.5×2	38700	131000	3950	13400
ZFT 5010-5		10	6.35	51.0	44.4	2.5×1	31800	87400	3240	8910
ZFT 5010-7						3.5×1	42500	122000	4330	12500
ZFT 5010-10						2.5×2	57700	175000	5890	17800
ZFT 5012-5		12	7.938	51.5	43.2	2.5×1	42800	107000	4360	10900
ZFT 5016-5		16	7.938	51.5	43.2	2.5×1	42800	107000	4360	10900
ZFT 5020-3		20	7.938	51.5	43.2	1.5×1	27600	64300	2810	6560
ZFT 5510-5	55	10	6.35	56.0	49.4	2.5×1	32800	96100	3340	9800
ZFT 5510-10						2.5×2	59500	192000	6070	19600
ZFT 6310-5	63	10	6.35	64.0	57.4	2.5×1	34800	111000	3550	11300
ZFT 6310-10						2.5×2	63200	221000	6440	22600
ZFT 6312-5		12	7.938	64.5	56.2	2.5×1	47400	137000	4830	13900

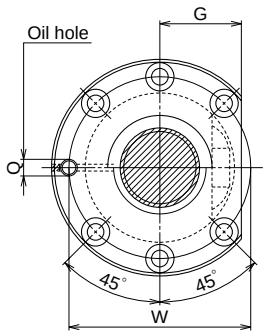
Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	G	B	L	M	W	X	Y	Z	Q
930	95	80	114	43	15	83	3	96	9	14	8.5	PT1/8
1360	139					103						
1562	159	84	118	45	15	104	3	100	9	14	8.5	PT1/8
1600	163	87	129	49	18	133	5	107	11	17.5	11	PT1/8
866	88	93	135	51	18	103	7	113	11	17.5	11	PT1/8
1190	121					123						
1677	171					163						
883	90	100	146	55	22	123	8	122	14	20	13	PT1/8
883	90	100	146	55	22	152	14	122	14	20	13	PT1/8
542	55	100	146	55	28	147	17	122	14	20	13	PT1/8
929	95	102	144	54	18	103	7	122	11	17.5	11	PT1/8
1800	180					163						
1038	106	108	154	58	22	107	7	130	14	20	13	PT1/8
2000	204					167						
1060	108	115	161	61	22	123	8	137	14	20	13	PT1/8

Remarks 1. Flange comes in Circular I and Circular II shape. Select a flange that is suitable for the nut installation space.
2. If there is no seal, the nut length is shorter by the length of "M" than those with a seal.
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.

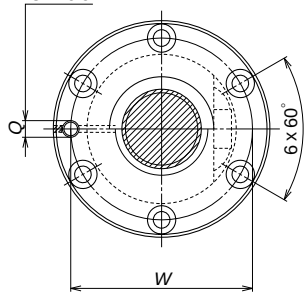
4. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the preload is 10% of the basic dynamic load rating (C_a), and axial load is applied to it. Refer to "Technical Description" (Page B467) if preload differ from the conditions above, or when considering change in the deformation of the ball nut itself.



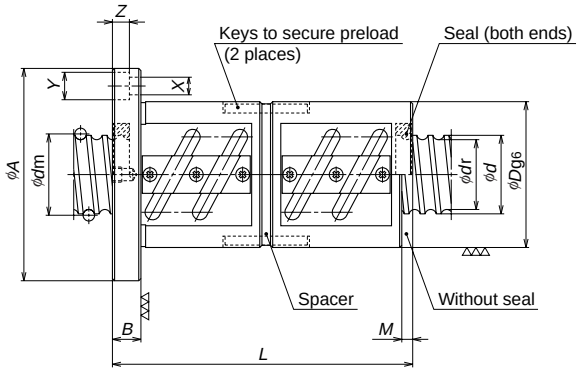
Rectangular shape
Screw shaft dia. $d \leqq 16$mm



Circular shape II (semi-circular)
Screw shaft dia. $d \geqq 20$mm



Circular shape I



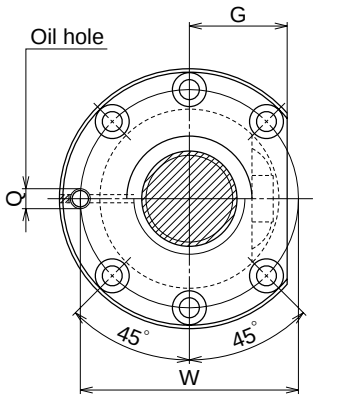
Unit: mm

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}	Basic load rating {kgf} Dynamic C_a	Basic load rating {kgf} Static C_{0a}
DFT 1604-2.5	16	4	2.381	16.3	13.8	2.5×1	4300	8530	440	870
DFT 1604-3						1.5×2	5040	10300	515	1050
DFT 1605-2.5		5	3.175	16.5	13.2	2.5×1	7330	13500	745	1380
DFT 1605-3						1.5×2	8570	16200	875	1650
DFT 1605-5						2.5×2	13300	27000	1360	2750
DFT 1606-2.5		6	3.175	16.5	13.2	2.5×1	7330	13500	745	1380
DFT 1606-3						1.5×2	8570	16200	875	1650
DFT 2004-2.5	20	4	2.381	20.3	17.8	2.5×1	4740	10700	485	1090
DFT 2004-5						2.5×2	8600	21500	875	2190
DFT 2005-2.5		5	3.175	20.5	17.2	2.5×1	8230	17100	840	1750
DFT 2005-3						1.5×2	9620	20600	980	2100
DFT 2005-5						2.5×2	14900	34300	1520	3500
DFT 2006-2.5		6	3.969	20.5	16.4	2.5×1	11000	21100	1120	2150
DFT 2006-3						1.5×2	12800	25300	1310	2580
DFT 2008-2.5		8	3.969	20.5	16.4	2.5×1	11000	21100	1120	2150
DFT 2008-3						1.5×2	12800	25300	1310	2580
DFT 2504-2.5	25	4	2.381	25.3	22.8	2.5×1	5270	13600	535	1390
DFT 2504-5						2.5×2	9560	27200	975	2780
DFT 2505-2.5		5	3.175	25.5	22.2	2.5×1	9130	21900	930	2230
DFT 2505-3						1.5×2	10700	25700	1090	2620
DFT 2505-5						2.5×2	16600	43700	1690	4460
DFT 2506-2.5		6	3.969	25.5	21.4	2.5×1	12300	26800	1250	2730
DFT 2506-3						1.5×2	14400	32100	1470	3280
DFT 2506-5						2.5×2	22300	53500	2280	5460

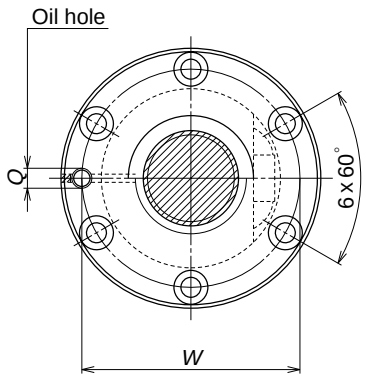
Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	G	H	K	B	L	M	W	X	Y	Z	Q	T
263	27	34	57	—	34	50	11	70	—	45	5.5	9.5	5.5	M6×1	17
315	32							85							
311	32	40	63	—	40	55	11	77	—	51	5.5	9.5	5.5	M6×1	20
370	38							97							
603	61							107							
311	32	40	63	—	40	55	11	86	—	51	5.5	9.5	5.5	M6×1	20
370	38							110							
315	32	40	63	24	—	—	11	69	3	51	5.5	9.5	5.5	M6×1	—
608	62							93							
376	38	44	67	26	—	—	11	76	3	55	5.5	9.5	5.5	M6×1	—
446	45							97							
726	74							106							
384	39	48	71	27	—	—	11	86	3	59	5.5	9.5	5.5	M6×1	—
456	46							110							
384	39	48	75	28	—	—	13	102	5	61	6.6	11	6.5	M6×1	—
456	47							120							
379	39	46	69	26	—	—	11	68	3	57	5.5	9.5	5.5	M6×1	—
735	75							92							
453	46	50	73	28	—	—	11	75	3	61	5.5	9.5	5.5	M6×1	—
532	54							102							
876	89							105							
462	47	53	76	29	—	—	11	86	3	64	5.5	9.5	5.5	M6×1	—
551	56							110							
896	91							122							

Remarks 1. Flanges come in Circular I and Circular II. Select a flange which is suitable for the nut installation space. Those with shaft diameter of 16 mm and smaller are rectangle.
2. If there is no seal, the nut length is shorter by the length of "M" than those with a seal.
3. Right turn screw is standard. "L" is added to the end of the model for left turn screw.

4. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the preload is 10% of the basic dynamic load rating (C_a), and axial load is applied to it. Refer to "Technical Description" (Page B467) if preload differ from the conditions above, or when considering change in the deformation of the ball nut itself.



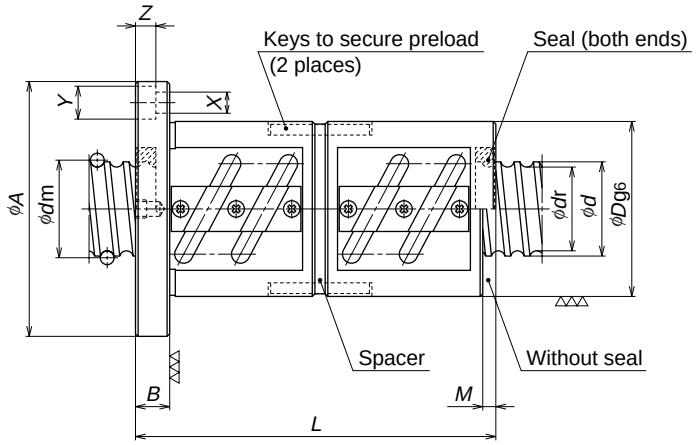
Circular shape II (semi-circular)



Circular shape I

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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
DFT 2508-2.5	25	8	4.762	25.5	20.5	2.5×1	15800	32000	1610	3260
DFT 2508-3						1.5×2	18500	38100	1880	3880
DFT 2510-2.5		10	4.762	25.5	20.5	2.5×1	15800	32000	1610	3260
DFT 2510-3						1.5×2	18500	38100	1880	3880
DFT 2510-3.5						3.5×1	21100	44200	2150	4500
DFT 2805-2.5	28	5	3.175	28.5	25.2	2.5×1	9600	24400	980	2490
DFT 2805-5						2.5×2	17400	48800	1780	4980
DFT 2806-2.5		6	3.175	28.5	25.2	2.5×1	9600	24400	980	2490
DFT 2806-3						1.5×2	11200	29300	1150	2990
DFT 2806-5						2.5×2	17400	48800	1780	4980
DFT 2810-2.5		10	4.762	28.5	23.5	2.5×1	16700	36100	1700	3680
DFT 2810-3						1.5×2	19500	43000	1990	4380
DFT 3204-2.5	32	4	2.381	32.3	29.8	2.5×1	5800	17500	590	1790
DFT 3204-5						2.5×2	10500	35100	1070	3580
DFT 3205-2.5		5	3.175	32.5	29.2	2.5×1	10200	28000	1040	2860
DFT 3205-3						1.5×2	11900	33600	1210	3430
DFT 3205-5						2.5×2	18500	56100	1880	5720
DFT 3205-7.5						2.5×3	26200	84100	2670	8580
DFT 3206-2.5		6	3.969	32.5	28.4	2.5×1	13600	34700	1390	3540
DFT 3206-3						1.5×2	15900	41200	1620	4200
DFT 3206-5						2.5×2	24700	69400	2520	7080
DFT 3208-2.5		8	4.762	32.5	27.5	2.5×1	17500	41000	1780	4180
DFT 3208-3						1.5×2	20400	49500	2080	5050
DFT 3208-5						2.5×2	31700	82000	3230	8360
DFT 3210-2.5		10	6.35	33.0	26.4	2.5×1	25500	54000	2600	5510
DFT 3210-3						1.5×2	29900	64800	3040	6610
DFT 3210-3.5						3.5×1	34100	77000	3480	7850
DFT 3210-5						2.5×2	46300	108000	4720	11000
DFT 3212-2.5		12	6.35	33.0	26.4	2.5×1	25500	54000	2600	5510
DFT 3212-3						1.5×2	29900	64800	3040	6610

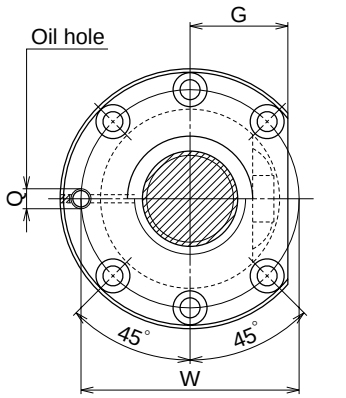
Remarks 1. Flange comes in Circular I and Circular II shape. Select a flange that is suitable for the nut installation space.
2. If there is no seal, the nut length is shorter by the length of "M" than those with a seal.
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.



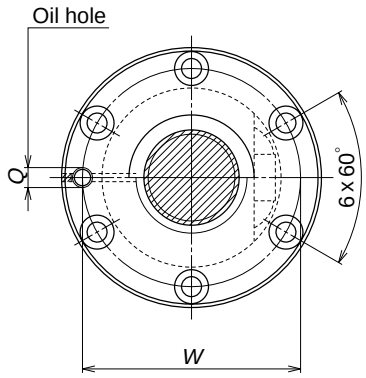
Unit: mm

Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	G	B	L	M	W	X	Y	Z	Q
475	48	58	85	32	13	104	5	71	6.6	11	6.5	M6×1
562	57					133						
475	48	58	85	32	15	127	8	71	6.6	11	6.5	M6×1
562	57					151						
649	66					147						
495	50	55	85	31	12	76	3	69	6.6	11	6.5	M6×1
959	98					106						
495	50	55	85	31	12	87	3	69	6.6	11	6.5	M6×1
590	60					111						
959	98					123						
522	53	60	94	36	15	128	7	76	9	14	8.5	M6×1
618	63					152						
461	47	54	81	31	12	69	3	67	6.6	11	6.5	M6×1
892	91					93						
552	56	58	85	32	12	76	3	71	6.6	11	6.5	M6×1
655	67					103						
1067	109					106						
1572	160					136						
563	57	62	89	34	12	87	3	75	6.6	11	6.5	M6×1
666	68					111						
1092	111					123						
573	58	66	100	38	15	106	5	82	9	14	8.5	M6×1
686	70					135						
1110	113					154						
594	61	74	108	41	15	130	7	90	9	14	8.5	M6×1
707	72					167						
829	84					150						
1150	117					190						
603	62	74	108	41	18	153	9	90	9	14	8.5	M6×1
707	72					181						

4. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the preload is 10% of the basic dynamic load rating (C_a), and axial load is applied to it. Refer to "Technical Description" (Page B467) if preload differ from the conditions above, or when considering change in the deformation of the ball nut itself.



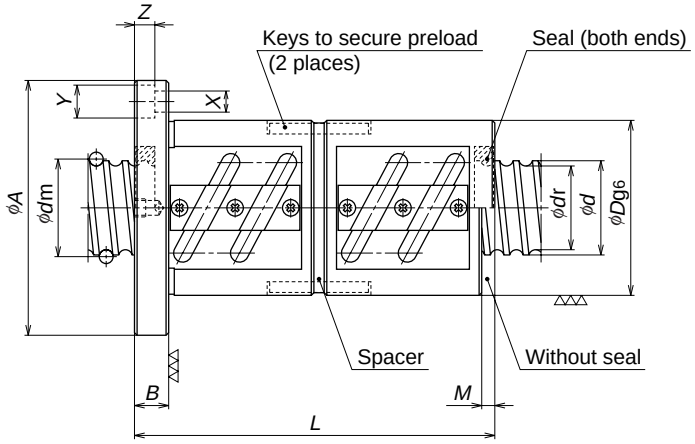
Circular shape II (semi-circular)



Circular shape I

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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
DFT 3605-5	36	5	3.175	36.5	33.2	2.5×2	19400	63300	1980	6460
DFT 3605-7.5						2.5×3	27500	95000	2800	9690
DFT 3606-5		6	3.969	36.5	32.4	2.5×2	26500	78500	2700	8010
DFT 3606-7.5						2.5×3	37600	118000	3830	12000
DFT 3610-2.5		10	6.35	37.0	30.4	2.5×1	27200	61300	2770	6250
DFT 3610-3						1.5×2	31800	73500	3240	7500
DFT 3610-5						2.5×2	49300	123000	5030	12500
DFT 4005-2.5	40	5	3.175	40.5	37.2	2.5×1	11100	35300	1140	3600
DFT 4005-3						1.5×2	13000	42400	1330	4320
DFT 4005-5						2.5×2	20200	70600	2060	7200
DFT 4005-7.5						2.5×3	28700	106000	2920	10800
DFT 4006-3		6	3.969	40.5	36.4	1.5×2	17800	52600	1810	5360
DFT 4006-5						2.5×2	27600	87600	2810	8930
DFT 4006-7.5						2.5×3	39100	131000	3990	13400
DFT 4008-2.5		8	4.762	40.5	35.5	2.5×1	19200	51600	1960	5270
DFT 4008-3						1.5×2	22500	62600	2290	6380
DFT 4008-5						2.5×2	34900	103000	3550	10500
DFT 4010-2.5		10	6.35	41.0	34.4	2.5×1	28600	68600	2920	6990
DFT 4010-3						1.5×2	33500	82300	3420	8390
DFT 4010-3.5						3.5×1	38300	96000	3900	9790
DFT 4010-5						2.5×2	52000	137000	5300	14000
DFT 4012-2.5		12	7.144	41.5	34.1	2.5×1	33600	77500	3430	7910
DFT 4012-5						2.5×2	61000	155000	6220	15800
DFT 4016-2.5		16	7.144	41.5	34.1	2.5×1	33600	77500	3430	7910
DFT 4016-3						1.5×2	39300	93100	4010	9490
DFT 4510-5	45	10	6.35	46.0	39.4	2.5×2	54200	155000	5530	15800
DFT 4510-7.5						2.5×3	76800	232000	7830	23600
DFT 4512-2.5		12	7.144	46.5	39.1	2.5×1	35400	88500	3610	9030
DFT 4512-5						2.5×2	64200	177000	6540	18100

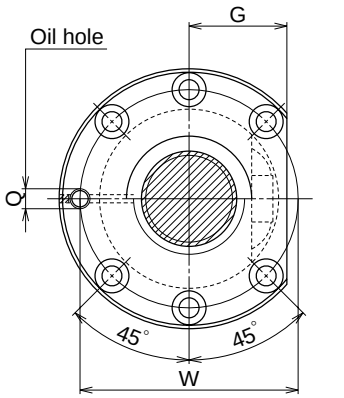
Remarks 1. Flange comes in Circular I and Circular II shape. Select a flange that is suitable for the nut installation space.
2. If there is no seal, the nut length is shorter by the length of "M" than those with a seal.
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.



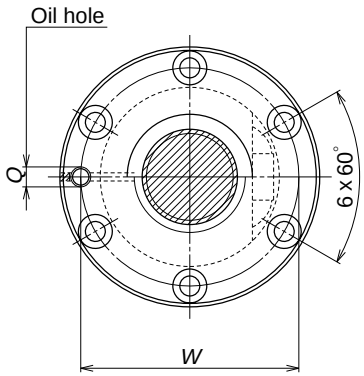
Unit: mm

Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	G	B	L	M	W	X	Y	Z	Q
1170	119	65	100	38	15	109	3	82	9	14	8.5	M6×1
1730	176					139						
1210	123	65	100	38	15	126	3	82	9	14	8.5	M6×1
1780	181					162						
656	67	75	120	45	18	133	7	98	11	17.5	11	M6×1
781	80					170						
1270	129					193						
660	67	67	101	39	15	79	3	83	9	14	8.5	PT1/8
785	80					106						
1280	130					109						
1870	191					139						
807	82	70	104	40	15	114	3	86	9	14	8.5	PT1/8
1310	134					126						
1940	197					162						
686	70	74	108	41	15	106	5	90	9	14	8.5	PT1/8
822	84					135						
1330	135					154						
717	73	82	124	47	18	133	7	102	11	17.5	11	PT1/8
853	87					170						
988	101					153						
1390	142					193						
733	75	86	128	48	18	153	9	106	11	17.5	11	PT1/8
1420	144					225						
733	75	86	128	48	22	182	14	106	11	17.5	11	PT1/8
872	89					214						
1520	155	88	132	50	18	193	7	110	11	17.5	11	PT1/8
2230	230					253						
811	83	90	132	50	18	155	8	110	11	17.5	11	PT1/8
1570	160					227						

4. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the preload is 10% of the basic dynamic load rating (C_a), and axial load is applied to it. Refer to "Technical Description" (Page B467) if preload differ from the conditions above, or when considering change in the deformation of the ball nut itself.

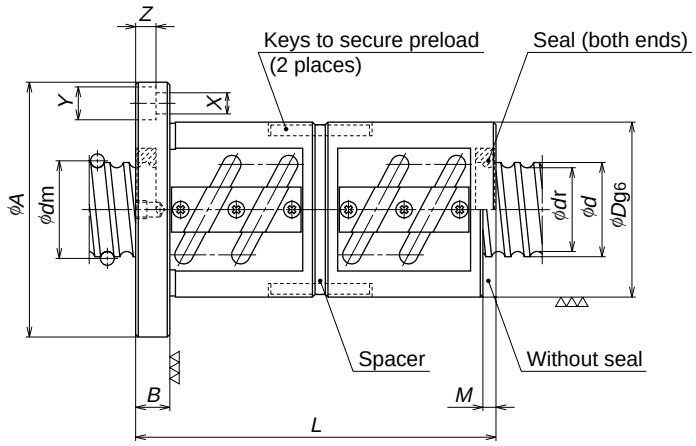


Circular shape II (semi-circular)



Circular shape I

Nut model: DFT (Spacer, D pre-load)



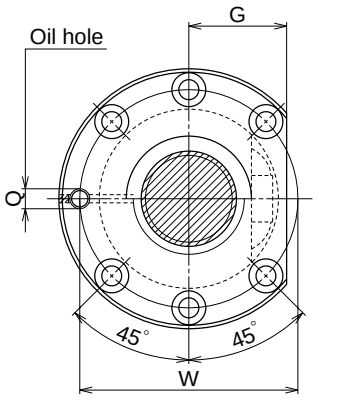
Unit: mm

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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
DFT 5005-3	50	5	3.175	50.5	47.2	1.5×2	14200	52500	1450	5360
DFT 5005-4.5						1.5×3	20200	78800	2060	8040
DFT 5006-3		6	3.969	50.5	46.4	1.5×2	19500	65100	1990	6640
DFT 5006-5						2.5×2	30300	109000	3080	11100
DFT 5006-7.5						2.5×3	42900	164000	4370	16700
DFT 5008-3		8	4.762	50.5	45.5	1.5×2	25000	77400	2550	7890
DFT 5008-5						2.5×2	38700	131000	3950	13400
DFT 5008-7.5						2.5×3	54900	197000	5600	20000
DFT 5010-2.5		10	6.35	51.0	44.4	2.5×1	31800	87400	3240	8910
DFT 5010-3						1.5×2	37200	103000	3790	10500
DFT 5010-5						2.5×2	57700	175000	5890	17800
DFT 5010-7.5						2.5×3	81800	262000	8340	26700
DFT 5012-2.5		12	7.938	51.5	43.2	2.5×1	42800	107000	4360	10900
DFT 5012-5						2.5×2	77600	214000	7920	21900
DFT 5016-2.5		16	7.938	51.5	43.2	2.5×1	42800	107000	4360	10900
DFT 5016-5						2.5×2	77600	214000	7920	21900
DFT 5020-2.5		20	7.938	51.5	43.2	2.5×1	42800	107000	4360	10900
DFT 5020-3						1.5×2	50000	129000	5100	13100
DFT 5510-5	55	10	6.35	56.0	49.4	2.5×2	59500	192000	6070	19600
DFT 5510-7.5						2.5×3	84300	288000	8600	29400
DFT 6310-2.5	63	10	6.35	64.0	57.4	2.5×1	34800	111000	3550	11300
DFT 6310-5						2.5×2	63200	221000	6440	22600
DFT 6310-7.5						2.5×3	89500	332000	9130	33900
DFT 6312-2.5		12	7.938	64.5	56.2	2.5×1	47400	137000	4830	13900
DFT 6312-5						2.5×2	86000	273000	8770	27900

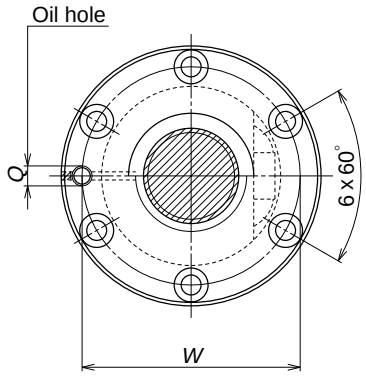
Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	G	B	L	M	W	X	Y	Z	Q
929	95	80	114	43	15	108	3	96	9	14	8.5	PT1/8
1370	139					128						
956	98	84	118	45	15	116	3	100	9	14	8.5	PT1/8
1560	159					128						
2300	235					164						
975	99	87	129	49	18	138	5	107	11	17.5	11	PT1/8
1600	163					157						
2350	240					205						
866	88	93	135	51	18	133	7	113	11	17.5	11	PT1/8
1010	103					170						
1680	171					193						
2460	251					253						
883	90	100	146	55	22	159	8	122	14	20	13	PT1/8
1710	174					231						
883	90	100	146	55	22	184	14	122	14	20	13	PT1/8
1710	174					280						
883	90	100	146	55	28	227	17	122	14	20	13	PT1/8
1050	107					267						
1800	183	102	144	54	18	193	7	122	11	17.5	11	PT1/8
2650	270					253						
1040	106	108	154	58	22	137	7	130	14	20	13	PT1/8
2000	204					197						
2950	301					257						
1060	108	115	161	61	22	159	8	137	14	20	13	PT1/8
2060	210					231						

Remarks 1. Flange comes in Circular I and Circular II shape. Select a flange that is suitable for the nut installation space.
2. If there is no seal, the nut length is shorter by the length of "M" than those with a seal.
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.

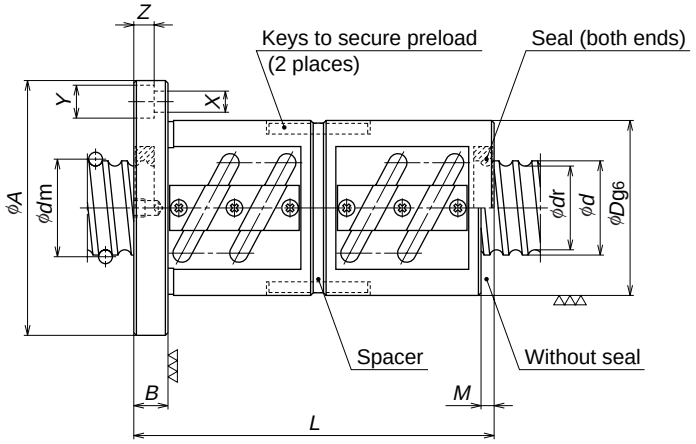
4. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the preload is 10% of the basic dynamic load rating (C_a), and axial load is applied to it. Refer to "Technical Description" (Page B467) if preload differ from the conditions above, or when considering change in the deformation of the ball nut itself.



Circular shape II (semi-circular)



Circular shape I



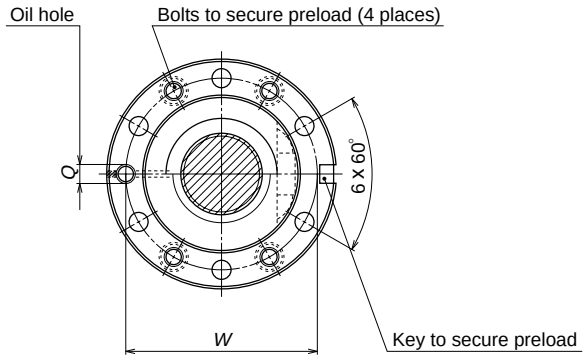
Unit: mm

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}	Basic load rating {kgf} Dynamic C_a	Basic load rating {kgf} Static C_{0a}
DFT 6316-2.5	63	16	9.525	65.0	55.2	2.5×1	79500	228000	8110	23200
DFT 6316-5						2.5×2	144000	455000	14700	46400
DFT 6320-2.5		20	9.525	65.0	55.2	2.5×1	79500	228000	8110	23200
DFT 6320-5						2.5×2	144000	455000	14700	46400
DFT 8010-5	80	10	6.35	81.0	74.4	2.5×2	70500	282000	7180	28800
DFT 8010-7.5						2.5×3	99800	424000	10200	43200
DFT 8012-5		12	7.938	81.5	73.2	2.5×2	96000	350000	9790	35700
DFT 8012-7.5						2.5×3	136000	526000	13900	53600
DFT 8016-5		16	9.525	82.0	72.2	2.5×2	162000	582000	16600	59400
DFT 8016-7.5						2.5×3	230000	874000	23500	89100
DFT 8020-5		20	9.525	82.0	72.2	2.5×2	162000	582000	16600	59400
DFT 8020-7.5						2.5×3	230000	874000	23500	89100
DFT 10012-5	100	12	7.938	101.5	93.2	2.5×2	105000	441000	10700	45000
DFT 10012-7.5						2.5×3	149000	662000	15200	67500
DFT 10016-5		16	9.525	102.0	92.2	2.5×2	176000	737000	18000	75100
DFT 10016-7.5						2.5×3	250000	1100000	25400	113000
DFT 10020-5		20	9.525	102.0	92.2	2.5×2	176000	737000	18000	75100
DFT 10020-7.5						2.5×3	250000	1100000	25400	113000
DFT 12516-5	125	16	9.525	127.0	117.2	2.5×2	195000	918000	19900	93600
DFT 12516-7.5						2.5×3	277000	1380000	28200	140000
DFT 12520-5		20	9.525	127.0	117.2	2.5×2	195000	918000	19900	93600
DFT 12520-7.5						2.5×3	277000	1380000	28200	140000

Axial rigidity *K* (N/μm)	Axial rigidity *K* {kgf/μm}	Ball nut dimensions *D*	*A*	*G*	*B*	*L*	*M*	*W*	*X*	*Y*	*Z*	*Q*
1400	143	122	180	69	28	206	10	150	18	26	17.5	PT1/8
2710	276					302						
1400	143	122	180	69	28	227	17	150	18	26	17.5	PT1/8
2710	276					347						
2430	248	130	176	66	22	197	7	152	14	20	13	PT1/8
3590	366					257						
2500	255	136	182	68	22	231	8	158	14	20	13	PT1/8
3690	376					303						
3300	336	143	204	77	28	302	10	172	18	26	17.5	PT1/8
4850	494					398						
3300	336	143	204	77	28	347	17	172	18	26	17.5	PT1/8
4850	494					467						
2990	305	160	220	82	28	237	8	188	18	26	17.5	PT1/8
4400	449					309						
3930	400	170	243	91	32	306	10	205	22	32	21.5	PT1/8
5790	590					402						
3930	400	170	243	91	32	351	17	205	22	32	21.5	PT1/8
5780	590					471						
4690	479	200	290	109	36	314	10	243	26	39	25.5	PT1/8
6890	702					410						
4690	479	200	290	109	36	379	12	243	26	39	25.5	PT1/8
6890	702					499						

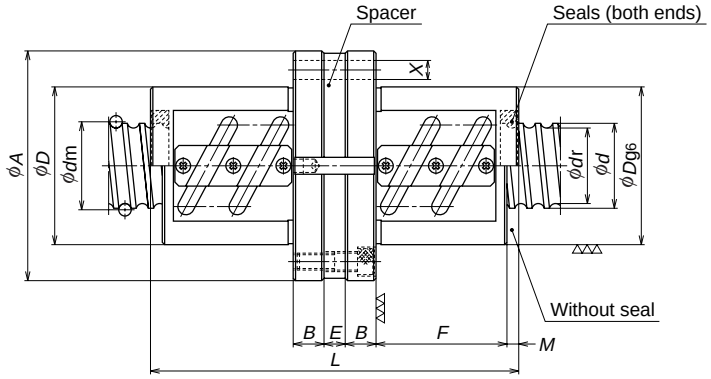
Remarks 1. Flange comes in Circular I and Circular II shape. Select a flange that is suitable for the nut installation space.
2. If there is no seal, the nut length is shorter by the length of "M" than those with a seal.
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.

4. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the preload is 10% of the basic dynamic load rating (C_a), and axial load is applied to it. Refer to "Technical Description" (Page B467) if preload differ from the conditions above, or when considering change in the deformation of the ball nut itself.



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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
DFFT2004-2.5	20	4	2.381	20.3	17.8	2.5×1	4740	10700	485	1090
DFFT2004-5						2.5×2	8600	21500	875	2190
DFFT2005-2.5		5	3.175	20.5	17.2	2.5×1	8230	17100	840	1750
DFFT2005-3						1.5×2	9620	20600	980	2100
DFFT2005-5						2.5×2	14900	34300	1520	3500
DFFT2006-2.5		6	3.969	20.5	16.4	2.5×1	11000	21100	1120	2150
DFFT2006-3						1.5×2	12800	25300	1310	2580
DFFT2504-2.5	25	4	2.381	25.3	22.8	2.5×1	5270	13600	535	1390
DFFT2504-5						2.5×2	9560	27200	975	2780
DFFT2505-2.5		5	3.175	25.5	22.2	2.5×1	9130	21900	930	2230
DFFT2505-3						1.5×2	10700	25700	1090	2620
DFFT2505-5						2.5×2	16600	43700	1690	4460
DFFT2506-2.5		6	3.969	25.5	21.4	2.5×1	12300	26800	1250	2730
DFFT2506-3						1.5×2	14400	32100	1470	3280
DFFT2506-5						2.5×2	22300	53500	2280	5460
DFFT2508-2.5		8	4.762	25.5	20.5	2.5×1	15800	32000	1610	3260
DFFT2508-3						1.5×2	18500	38100	1880	3880
DFFT2510-2.5		10	4.762	25.5	20.5	2.5×1	15800	32000	1610	3260
DFFT2510-3						1.5×2	18500	38100	1880	3880
DFFT3204-2.5	32	4	2.381	32.3	29.8	2.5×1	5800	17500	590	1790
DFFT3204-5						2.5×2	10500	35100	1070	3580
DFFT3205-2.5		5	3.175	32.5	29.2	2.5×1	10200	28000	1040	2860
DFFT3205-3						1.5×2	11900	33600	1210	3430
DFFT3205-5						2.5×2	18500	56100	1880	5720
DFFT3205-7.5						2.5×3	26200	84100	2670	8580
DFFT3206-2.5		6	3.969	32.5	28.4	2.5×1	13600	34700	1390	3540
DFFT3206-3						1.5×2	15900	41200	1620	4200
DFFT3206-5						2.5×2	24700	69400	2520	7080
DFFT3208-2.5		8	4.762	32.5	27.5	2.5×1	17500	41000	1780	4180
DFFT3208-3						1.5×2	20400	49500	2080	5050
DFFT3208-5						2.5×2	31700	82000	3230	8360
DFFT3210-2.5		10	6.35	33.0	26.4	2.5×1	25500	54000	2600	5510
DFFT3210-3						1.5×2	29900	64800	3040	6610
DFFT3210-5						2.5×2	46300	108000	4720	11000

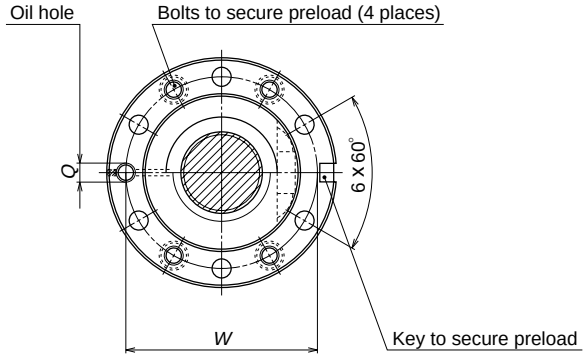
Remarks 1. If there is no seal, the nut length is shorter by the length of "2M" than those with a seal.
2. Right turn screw is standard. "L" is added to the end of the model for left turn screw.



Unit: mm

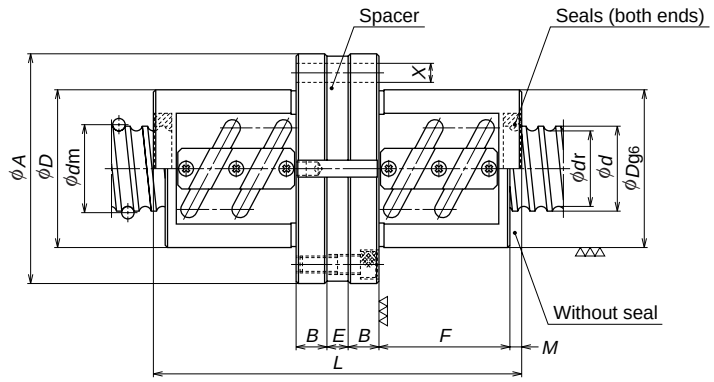
Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	D	A	B	F	E	L	M	W	X	Q
315	32	40	63	11	23	3	77	3	51	5.5	M6×1
608	62				35	3	101				
376	38	44	67	11	27	5	87	3	55	5.5	M6×1
446	45				38	4	108				
726	74				42	5	117				
384	39	48	71	11	30	7	95	3	59	5.5	M6×1
456	46				42	7	119				
379	39	46	69	11	22	4	76	3	57	5.5	M6×1
735	75				34	4	100				
453	46	50	73	11	26	6	86	3	61	5.5	M6×1
532	54				38	4	108				
876	89				41	6	116				
462	47	53	76	11	30	7	95	3	64	5.5	M6×1
551	56				42	7	119				
896	91				48	7	131				
475	48	58	85	13	38	5	117	5	71	6.6	M6×1
562	57				51	8	146				
475	48	58	85	15	44	11	145	8	71	6.6	M6×1
562	57				58	7	169				
461	47	54	81	12	22	6	80	3	67	6.6	M6×1
892	91				34	6	104				
552	56	58	85	12	26	4	86	3	71	6.6	M6×1
655	67				38	7	113				
1070	109				41	4	116				
1570	160				56	4	146				
563	57	62	89	12	30	5	95	3	75	6.6	M6×1
666	68				42	5	119				
1090	111				48	5	131				
573	58	66	100	15	38	9	125	5	82	9	M6×1
686	70				51	12	154				
1110	113				62	9	173				
594	61	74	108	15	48	8	148	7	90	9	M6×1
707	72				65	11	185				
1150	117				78	8	208				

3. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the preload is 10% of the basic dynamic load rating (C_a), and axial load is applied to it. Refer to "Technical Description" (Page B467) if preload differ from the conditions above, or when considering change in the deformation of the ball nut itself.



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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
DFFT4005-2.5	40	5	3.175	40.5	37.2	2.5×1	11100	35300	1140	3600
DFFT4005-3						1.5×2	13000	42400	1330	4320
DFFT4005-5						2.5×2	20200	70600	2060	7200
DFFT4005-7.5						2.5×3	28700	106000	2920	10800
DFFT4006-3		6	3.969	40.5	36.4	1.5×2	17800	52600	1810	5360
DFFT4006-5						2.5×2	27600	87600	2810	8930
DFFT4006-7.5						2.5×3	39100	131000	3990	13400
DFFT4008-2.5		8	4.762	40.5	35.5	2.5×1	19200	51600	1960	5270
DFFT4008-3						1.5×2	22500	62600	2290	6380
DFFT4008-5						2.5×2	34900	103000	3550	10500
DFFT4010-2.5		10	6.35	41.0	34.4	2.5×1	28600	68600	2920	6990
DFFT4010-3						1.5×2	33500	82300	3420	8390
DFFT4010-5						2.5×2	52000	137000	5300	14000
DFFT4012-2.5		12	7.144	41.5	34.1	2.5×1	33600	77500	3430	7910
DFFT4012-5						2.5×2	61000	155000	6220	15800
DFFT5005-3	50	5	3.175	50.5	47.2	1.5×2	14200	52500	1450	5360
DFFT5005-4.5						1.5×3	20200	78800	2060	8040
DFFT5006-3		6	3.969	50.5	46.4	1.5×2	19500	65100	1990	6640
DFFT5006-5						2.5×2	30300	109000	3080	11100
DFFT5006-7.5						2.5×3	42900	164000	4370	16700
DFFT5008-3		8	4.762	50.5	45.5	1.5×2	25000	77400	2550	7890
DFFT5008-5						2.5×2	38700	131000	3950	13400
DFFT5008-7.5						2.5×3	54900	197000	5600	20000
DFFT5010-2.5		10	6.35	51.0	44.4	2.5×1	31800	87400	3240	8910
DFFT5010-3						1.5×2	37200	103000	3790	10500
DFFT5010-5						2.5×2	57700	175000	5890	17800
DFFT5010-7.5						2.5×3	81800	262000	8340	26700
DFFT5012-2.5		12	7.938	51.5	43.2	2.5×1	42800	107000	4360	10900
DFFT5012-5						2.5×2	77600	214000	7920	21900
DFFT5016-2.5		16	7.938	51.5	43.2	2.5×1	42800	107000	4360	10900
DFFT5016-5						2.5×2	77600	214000	7920	21900

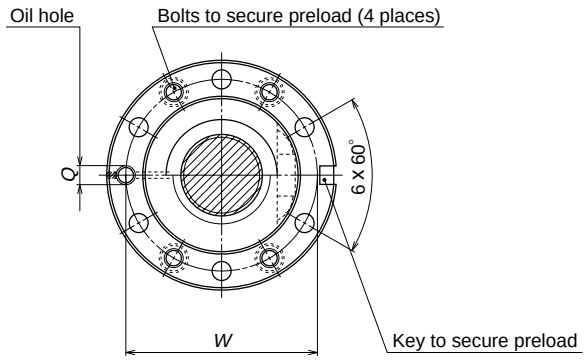
Remarks 1. If there is no seal, the nut length is shorter by the length of "2M" than those with a seal.
2. Right turn screw is standard. "L" is added to the end of the model for left turn screw.

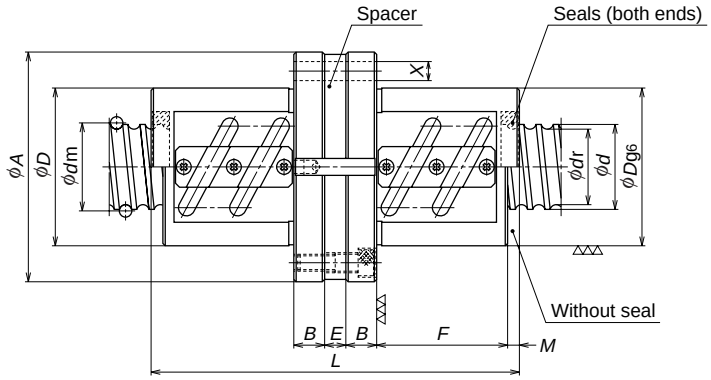


Unit: mm

Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	B	F	E	L	M	W	X	Q
660	67	67	101	15	26	8	96	3	83	9	PT1/8
785	80				38	6	118				
1280	130				41	8	126				
1870	191				56	8	156				
807	82	70	104	15	42	5	125	3	86	9	PT1/8
1310	134				48	5	137				
1940	197				66	5	173				
686	70	74	108	15	38	9	125	5	90	9	PT1/8
822	84				51	12	154				
1330	135				62	9	173				
717	73	82	124	18	48	12	158	7	102	11	PT1/8
853	87				65	5	185				
1390	141				78	12	218				
733	75	86	128	18	54	12	174	9	106	11	PT1/8
1420	144				90	12	246				
929	95	80	114	15	40	9	125	3	96	9	PT1/8
1370	139				50	9	145				
956	97	84	118	15	44	9	133	3	100	9	PT1/8
1560	159				50	9	145				
2300	234				68	9	181				
975	99	87	129	18	51	6	154	5	107	11	PT1/8
1600	163				62	11	181				
2350	240				86	11	229				
866	88	93	135	18	48	12	158	7	113	11	PT1/8
1010	103				65	5	185				
1680	171				78	12	218				
2460	251				108	12	278				
883	90	100	146	22	57	14	188	8	122	14	PT1/8
1710	174				93	14	260				
883	90	100	146	22	68	6	214	14	122	14	PT1/8
1710	174				116	6	310				

3. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the preload is 10% of the basic dynamic load rating (C_a), and axial load is applied to it. Refer to "Technical Description" (Page B467) if preload differ from the conditions above, or when considering change in the deformation of the ball nut itself.





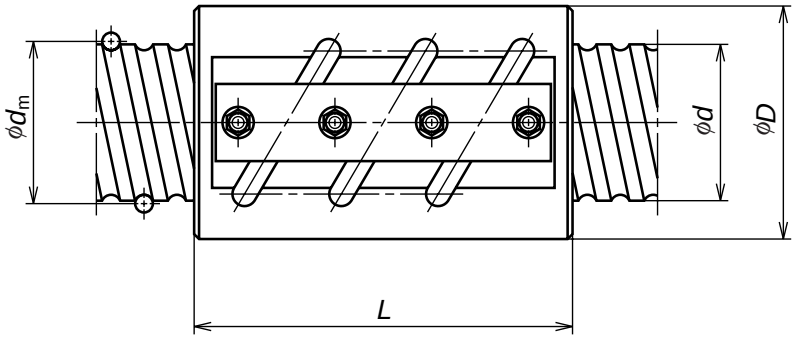
Unit: mm

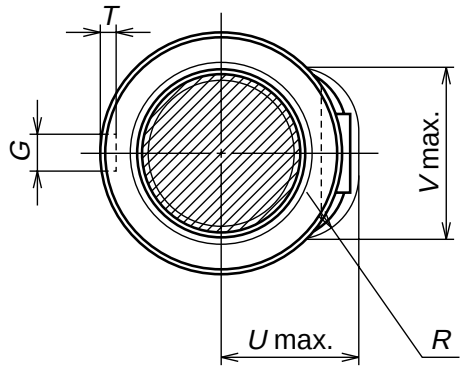
Model No.	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls Turns × Circuits	Basic load rating (N) Dynamic C_a	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
DFFT6310-2.5	63	10	6.35	64.0	57.4	2.5×1	34800	111000	3550	11300
DFFT6310-5						2.5×2	63200	221000	6440	22600
DFFT6310-7.5						2.5×3	89500	332000	9130	33900
DFFT6312-2.5		12	7.938	64.5	56.2	2.5×1	47400	137000	4830	13900
DFFT6312-5						2.5×2	86000	273000	8770	27900
DFFT6316-2.5		16	9.525	65.0	55.2	2.5×1	79500	228000	8110	23200
DFFT6316-5						2.5×2	144000	455000	14700	46400
DFFT6320-2.5		20	9.525	65.0	55.2	2.5×1	79500	228000	8110	23200
DFFT6320-5						2.5×2	144000	455000	14700	46400
DFFT8010-5	80	10	6.35	81.0	74.4	2.5×2	70500	282000	7180	28800
DFFT8010-7.5						2.5×3	99800	424000	10200	43200
DFFT8012-5		12	7.938	81.5	73.2	2.5×2	96000	350000	9790	35700
DFFT8012-7.5						2.5×3	136000	526000	13900	53600
DFFT8016-5		16	9.525	82.0	72.2	2.5×2	162000	582000	16600	59400
DFFT8016-7.5						2.5×3	230000	874000	23500	89100
DFFT8020-5		20	9.525	82.0	72.2	2.5×2	162000	582000	16600	59400
DFFT8020-7.5						2.5×3	230000	874000	23500	89100
DFFT10012-5	100	12	7.938	101.5	93.2	2.5×2	105000	441000	10700	45000
DFFT10012-7.5						2.5×3	149000	662000	15200	67500
DFFT10016-5		16	9.525	102.0	92.2	2.5×2	176000	737000	18000	75100
DFFT10016-7.5						2.5×3	250000	1100000	25400	113000
DFFT10020-5		20	9.525	102.0	92.2	2.5×2	176000	737000	18000	75100
DFFT10020-7.5						2.5×3	250000	1100000	25400	113000
DFFT12516-5	125	16	9.525	127.0	117.2	2.5×2	195000	918000	19900	93600
DFFT12516-7.5						2.5×3	277000	1380000	28200	140000
DFFT12520-5		20	9.525	127.0	117.2	2.5×2	195000	918000	19900	93600
DFFT12520-7.5						2.5×3	277000	1380000	28200	140000

Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	B	F	E	L	M	W	X	Q
1040	106	108	154	22	48	14	168	7	130	14	PT1/8
2000	204				78	14	228				
2950	301				108	14	288				
1060	108	115	161	22	57	14	188	8	137	14	PT1/8
2060	210				93	14	260				
1400	143	122	180	28	72	10	230	10	150	18	PT1/8
2710	276				120	10	326				
1400	143	122	180	28	82	10	264	17	150	18	PT1/8
2710	276				142	10	384				
2430	248	130	176	22	78	14	228	7	152	14	PT1/8
3590	366				108	14	288				
2500	255	136	182	22	93	14	260	8	158	14	PT1/8
3700	376				129	14	332				
3300	336	143	204	28	120	10	326	10	172	18	PT1/8
4850	494				168	10	422				
3300	336	143	204	28	142	10	384	17	172	18	PT1/8
4850	494				202	10	504				
2990	305	160	220	28	93	14	272	8	188	18	PT1/8
4400	449				129	14	344				
3930	400	170	243	32	120	18	342	10	205	22	PT1/8
5790	590				168	18	438				
3930	400	170	243	32	142	22	404	17	205	22	PT1/8
5790	590				202	22	524				
4690	479	200	290	36	124	22	362	10	243	26	PT1/8
6890	704				172	22	458				
4690	479	200	290	36	151	10	408	12	243	26	PT1/8
6890	704				211	10	528				

Remarks 1. If there is no seal, the nut length is shorter by the length of "2M" than those with a seal.
2. Right turn screw is standard. "L" is added to the end of the model for left turn screw.

3. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the preload is 10% of the basic dynamic load rating (C_a), and axial load is applied to it. Refer to "Technical Description" (Page B467) if preload differ from the conditions above, or when considering change in the deformation of the ball nut itself.





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	Axial play (Max.)	Basic load rating (N) Dynamic C_a	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
GSCT12525-5	125	25	12.7	128	115.0	2.5×2	0.20	190000	1010000	19400	103000
GSCT12525-7.5						2.5×3		252000	1520000	25700	155000
GSCT12532-5		32	15.875	128	111.0	2.5×2	0.25	259000	1250000	26400	127000
GSCT12532-7.5						2.5×3		344000	1880000	35100	191000
GSCT14025-5	140	25	15.875	143	126.0	2.5×2	0.25	272000	1400000	27800	142000
GSCT14025-7.5						2.5×3		362000	2090000	36900	214000
GSCT14032-5		32	22.225	144	121.0	2.5×2	0.35	428000	1920000	43600	196000
GSCT14032-7.5						2.5×3		568000	2880000	57900	294000
GSCT14040-5		40	22.225	144	121.0	2.5×2	0.35	428000	1920000	43600	196000
GSCT14040-7.5						2.5×3		568000	2880000	57900	294000
GSCT14050-5		50	25.4	145	119.0	2.5×2	0.40	518000	2190000	52800	223000
GSCT14050-7.5						2.5×3		688000	3290000	70100	335000
GSCT16032-5	160	32	22.225	164	141.0	2.5×2	0.35	458000	2210000	46700	225000
GSCT16032-7.5						2.5×3		608000	3310000	62000	338000
GSCT16040-5		40	22.225	164	141.0	2.5×2	0.35	458000	2210000	46700	225000
GSCT16040-7.5						2.5×3		608000	3310000	62000	338000
GSCT16050-5		50	25.4	165	139.0	2.5×2	0.40	544000	2560000	55400	261000
GSCT16050-7.5						2.5×3		722000	3840000	73600	392000
GSCT20032-5	200	32	22.225	204	181.0	2.5×2	0.35	509000	2820000	51900	287000
GSCT20032-7.5						2.5×3		676000	4230000	68900	431000
GSCT20040-5		40	22.225	204	181.0	2.5×2	0.35	509000	2820000	51900	287000
GSCT20040-7.5						2.5×3		676000	4230000	68900	431000
GSCT20050-5		50	25.4	205	179.0	2.5×2	0.40	604000	3200000	61500	326000
GSCT20050-7.5						2.5×3		802000	4800000	81700	490000
GSCT25040-5	250	40	25.4	255	229.0	2.5×2	0.40	662000	4000000	67500	408000
GSCT25040-7.5						2.5×3		879000	6000000	89600	612000
GSCT25050-5		50	31.75	256	223.0	2.5×2	0.51	825000	5000000	84100	510000
GSCT25050-7.5						2.5×3		1100000	7500000	112000	765000

Ball nut dimensions							
D	L	G	T	U	V	R	(MS)
180	197 272	32	11	100	136	40	40
185	248 344	32	11	107	140	45	48
210	200 275	32	11	115	154	50	40
220	252 348	32	11	135	163	60	48
220	306 426	32	11	135	163	60	58
225	377 527	32	11	141	167	70	70
245	252 348	36	12	141	180	60	48
245	306 426	36	12	141	180	60	58
250	377 527	36	12	147	185	70	70
295	252 348	45	15	162	216	70	48
295	306 426	45	15	162	216	70	58
300	377 527	45	15	168	221	70	70
355	312 432	50	17	194	266	70	58
370	385 535	50	17	206	274	90	70

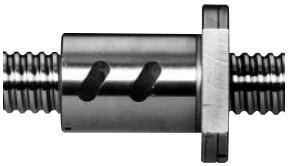
Remarks 1. Precision grade is equivalent to Ct10 grade of JIS B1192 (Refer to Page B445)
2. The entire nut length (L) is the size without seal. The size with a seal is longer by the size of "MS."

B-I-7.2 D Type (Deflector type, fine lead) Ball Screws

(1) Product categories

D Type ball screws use the deflector recirculation system. This can make the ball nut outside diameter smaller than the other recirculation systems. There are several models by difference in the preload system as shown below (Table I-7•2).

Table I-7•2 Classification of D Type ball screws

Nut models	Shape	Flange shape	Preload system	Nut length	Page
SFD		Flanged d=16 or under Rectangle d=20 or over Circular I Circular II	Non-preload, Slight axial play	Short	B355
ZFD		Flanged Circular I Circular II	Z preload (medium preload)	Medium	B359
DFD		Flanged Circular I Circular II	D preload (medium preload) (heavy preload)	Long	B363
DFFD		Flanged to flanged Circular I	D preload (medium preload) (heavy preload)	Long	B367
DCD	 → ← Preload direction	No flange	D preload (medium preload) (heavy preload)	Long	B371

(2) Benefit of design and precautions

Internal recirculation contributes to the compact design. Please note that it is impossible to assemble the nut unless one end of ball thread on the screw shaft is cut through, and, unless the shaft end of this side is smaller than the ball groove root diameter.

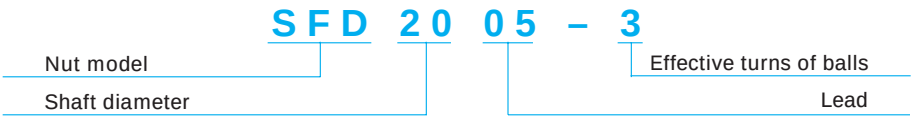
(3) Special ball screw specifications

D Series is based on the JIS B1192 combinations (shat diameter/lead). However, NSK manufactures combinations other than shown in the Dimension Tables, as well as flanges of special shape. Please consult NSK.

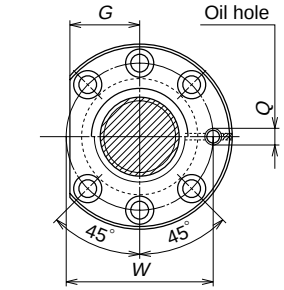
(3) Model number

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

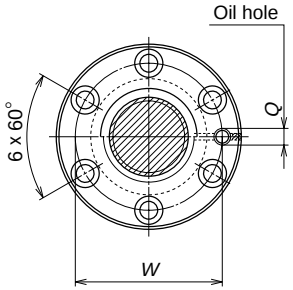
(Example) Nut model SFD shaft diameter 20 mm; lead 5 mm; effective turns of balls 3* (Note)



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



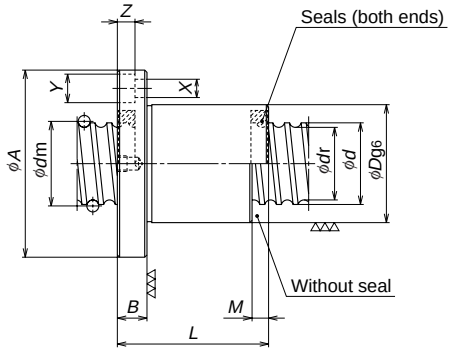
Circular shape II (semi-circular)



Circular shape I

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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
SFD 2005-3	20	5	3.175	20.75	17.4	1 × 3	8620	17500	880	1780
SFD 2005-4						1 × 4	11000	23300	1130	2380
SFD 2006-3		6	3.969	21.0	16.9	1 × 3	11100	20600	1130	2100
SFD 2006-4						1 × 4	14300	27500	1450	2800
SFD 2505-3	25	5	3.175	25.75	22.4	1 × 3	9790	22900	1000	2340
SFD 2505-4						1 × 4	12500	30500	1280	3110
SFD 2506-3		6	3.969	26.0	21.9	1 × 3	12900	27300	1310	2790
SFD 2506-4						1 × 4	16500	36500	1680	3720
SFD 2510-3		10	4.762	26.25	21.3	1 × 3	16100	32000	1650	3270
SFD 3205-3	32	5	3.175	32.75	29.4	1 × 3	11100	30500	1130	3110
SFD 3205-4						1 × 4	14200	40700	1450	4150
SFD 3205-6						1 × 6	20200	61000	2060	6220
SFD 3206-3		6	3.969	33.0	28.9	1 × 3	15000	37500	1530	3820
SFD 3206-4						1 × 4	19200	49900	1960	5090
SFD 3206-6						1 × 6	27200	74900	2770	7640
SFD 3208-3		8	4.762	33.25	28.3	1 × 3	18300	41800	1870	4270
SFD 3208-4						1 × 4	23500	55800	2390	5690
SFD 3210-3		10	6.35	33.75	27.1	1 × 3	25900	52800	2640	5380
SFD 3210-4						1 × 4	33200	70300	3390	7170
SFD 4005-4	40	5	3.175	40.75	37.4	1 × 4	15800	52300	1610	5330
SFD 4005-6						1 × 6	22400	78400	2290	7990
SFD 4006-4		6	3.969	41.0	36.9	1 × 4	21300	63500	2170	6480
SFD 4006-6						1 × 6	30100	95300	3070	9720
SFD 4008-4		8	4.762	41.25	36.3	1 × 4	27200	75200	2770	7670
SFD 4008-6						1 × 6	38500	113000	3930	11500
SFD 4010-3		10	6.35	41.75	35.1	1 × 3	30000	70000	3060	7140
SFD 4010-4						1 × 4	38400	93300	3910	9520

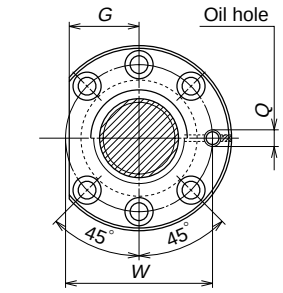
Remarks 1. Flange comes in Circular I and Circular II shape. Select a flange that is suitable for the nut installation space.
2. If there is no seal, the nut length is shorter by the length of "M" than those with a seal.
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.



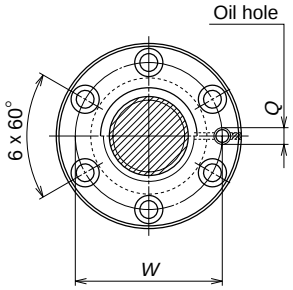
Unit: mm

Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	G	B	L	M	W	X	Y	Z	Q
196	20	35	58	22.5	11	46	5	46	5.5	9.5	5.5	M6 × 1
255	26					51						
196	20	35	58	22.5	11	52	6	46	5.5	9.5	5.5	M6 × 1
255	26					60						
245	25	40	63	24	11	46	5	51	5.5	9.5	5.5	M6 × 1
323	33					51						
245	25	40	63	24	11	52	6	51	5.5	9.5	5.5	M6 × 1
323	33					60						
245	25	42	69	26	15	80	10	55	6.6	11	6.5	M6 × 1
304	31	48	75	29	12	47	5	61	6.6	11	6.5	M6 × 1
409	41					52						
588	60					62						
314	32	48	75	29	12	53	6	61	6.6	11	6.5	M6 × 1
412	42					61						
598	61					73						
304	31	50	84	32	15	67	8	66	9	14	8.5	M6 × 1
392	40					76						
300	30	54	88	34	15	80	10	70	9	14	8.5	M6 × 1
392	40					90						
490	50	56	90	34	15	55	5	72	9	14	8.5	PT1/8
725	74					65						
490	50	56	90	34	15	64	6	72	9	14	8.5	PT1/8
725	74					76						
500	51	60	94	36	15	76	8	76	9	14	8.5	PT1/8
735	75					93						
372	38	62	104	40	18	83	10	82	11	17.5	11	PT1/8
490	50					93						

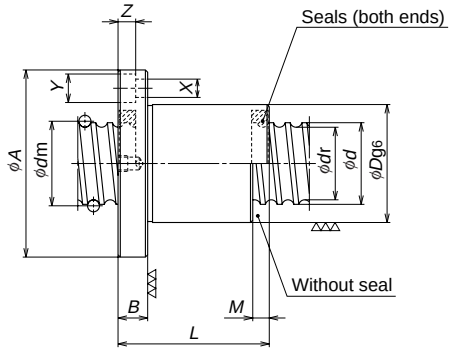
4. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the axial load is 30% of the basic dynamic load rating (C_a). Refer to "Technical Description" (Page B467) if axial load differs from the conditions above, or when considering change in the deformation of the ball nut itself.



Circular shape II (semi-circular)



Circular shape I



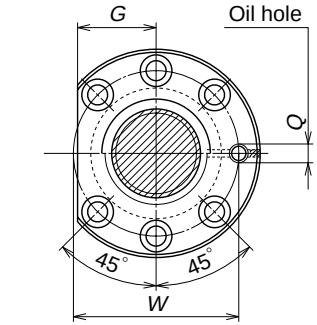
Unit: mm

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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
SFD 5005-4	50	5	3.175	50.75	47.4	1 × 4	17500	66800	1780	6810
SFD 5005-6						1 × 6	24800	100000	2530	10200
SFD 5006-4		6	3.969	51.0	46.9	1 × 4	23600	81700	2410	8330
SFD 5006-6						1 × 6	33500	122000	3420	12500
SFD 5008-4		8	4.762	51.25	46.3	1 × 4	29900	94800	3050	9670
SFD 5008-6						1 × 6	42400	142000	4320	14500
SFD 5010-3		10	6.35	51.75	45.1	1 × 3	34100	91600	3470	9340
SFD 5010-4						1 × 4	43600	122000	4450	12500
SFD 5010-6						1 × 6	61800	183000	6300	18700
SFD 5012-3		12	7.938	52.25	44.0	1 × 3	44800	109000	4570	11200
SFD 5012-4						1 × 4	57300	146000	5850	14900
SFD 5020-3		20	7.938	52.25	44.0	1 × 3	44800	109000	4570	11200
SFD 6306-4	63	6	3.969	64.0	59.9	1 × 4	26100	104000	2660	10600
SFD 6306-6						1 × 6	36900	157000	3770	16000
SFD 6308-4		8	4.762	64.25	59.3	1 × 4	33600	124000	3420	12700
SFD 6308-6						1 × 6	47600	186000	4850	19000
SFD 6310-4		10	6.35	64.75	58.1	1 × 4	49700	163000	5070	16600
SFD 6310-6						1 × 6	70500	244000	7190	24900
SFD 6312-4		12	7.938	65.25	57.0	1 × 4	65100	191000	6630	19500
SFD 6312-6						1 × 6	92200	286000	9400	29200
SFD 6320-3		20	9.525	65.75	56.0	1 × 3	83700	232000	8540	23700
SFD 8010-4	80	10	6.35	81.75	75.1	1 × 4	55100	209000	5620	21300
SFD 8010-6						1 × 6	78000	314000	7960	32000
SFD 8012-4		12	7.938	82.25	74.0	1 × 4	74000	254000	7550	25900
SFD 8012-6						1 × 6	105000	381000	10700	38900
SFD 8020-3		20	9.525	82.75	73.0	1 × 3	96600	313000	9850	31900
SFD 8020-4						1 × 4	124000	417000	12600	42600
SFD 10010-6	100	10	6.35	101.75	95.1	1 × 6	86200	401000	8790	40800
SFD 10012-6		12	7.938	102.25	94.0	1 × 6	117000	490000	11900	50000
SFD 10020-4		20	9.525	102.75	93.0	1 × 4	136000	526000	13900	53700

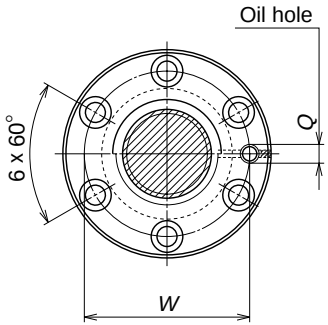
Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	G	B	L	M	W	X	Y	Z	Q
593	60	66	100	38	15	55	5	82	9	14	8.5	PT1/8
872	89					65						
598	61	66	100	38	15	64	6	82	9	14	8.5	PT1/8
892	91					76						
598	61	70	112	43	18	79	8	90	11	17.5	11	PT1/8
887	90					96						
461	47	72	114	44	18	83	10	92	11	17.5	11	PT1/8
608	62					93						
902	92					114						
461	47	75	121	47	22	99	12	97	14	20	13	PT1/8
608	62					111						
461	47	75	121	47	28	146	20	97	14	20	13	PT1/8
735	75	80	122	47	18	67	6	100	11	17.5	11	PT1/8
1180	110					79						
745	76	82	124	47	18	79	8	102	11	17.5	11	PT1/8
1100	112					96						
764	78	85	131	50	22	97	10	107	14	20	13	PT1/8
1130	115					118						
755	77	90	136	52	22	111	12	112	14	20	13	PT1/8
1110	113					136						
735	75	95	153	59	28	146	20	123	18	26	17.5	PT1/8
931	95	105	151	57	22	97	10	127	14	20	13	PT1/8
1370	140					118						
941	96	110	156	59	22	111	12	132	14	20	13	PT1/8
1392	142					136						
931	95	115	173	66	28	146	20	143	18	26	17.5	PT1/8
1230	125					168						
1670	170	125	171	64	22	118	10	147	14	20	13	PT1/8
1680	173	130	188	71	28	142	12	158	18	26	17.5	PT1/8
1470	150	135	205	79	32	172	20	169	22	32	21.5	PT1/8

Remarks 1. Flange comes in Circular I and Circular II shape. Select a flange that is suitable for the nut installation space.
2. If there is no seal, the nut length is shorter by the length of "M" than those with a seal.
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.

4. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the axial load is 30% of the basic dynamic load rating (C_a). Refer to "Technical Description" (Page B467) if axial load differs from the conditions above, or when considering change in the deformation of the ball nut itself.



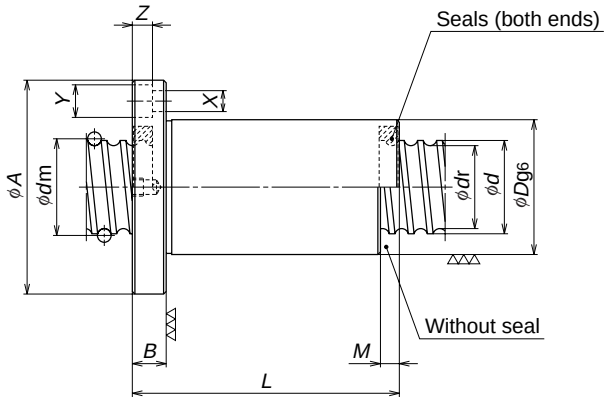
Circular shape II (semi-circular)



Circular shape I

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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
ZFD 2005-6	20	5	3.175	20.75	17.4	1 × 3	8620	17500	880	1780
ZFD 2006-6		6	3.969	21.0	16.9	1 × 3	11100	20600	1130	2100
ZFD 2505-6	25	5	3.175	25.75	22.4	1 × 3	9790	22900	1000	2340
ZFD 2506-6		6	3.969	26.0	21.9	1 × 3	12900	27300	1310	2790
ZFD 2510-4		10	4.762	26.25	21.3	1 × 2	11400	21400	1160	2180
ZFD 3205-6	32	5	3.175	32.75	29.4	1 × 3	11100	30500	1130	3110
ZFD 3205-8						1 × 4	14200	40700	1450	4150
ZFD 3206-6		6	3.969	33.0	28.9	1 × 3	15000	37500	1530	3820
ZFD 3206-8						1 × 4	19200	49900	1960	5090
ZFD 3208-6		8	4.762	33.25	28.3	1 × 3	18300	41800	1870	4270
ZFD 3208-8						1 × 4	23500	55800	2390	5690
ZFD 3210-6		10	6.35	33.75	27.1	1 × 3	25900	52800	2640	5380
ZFD 4005-8	40	5	3.175	40.75	37.4	1 × 4	15800	52300	1610	5330
ZFD 4005-12						1 × 6	22400	78400	2290	7990
ZFD 4006-8		6	3.969	41.0	36.9	1 × 4	21300	63500	2170	6480
ZFD 4006-12						1 × 6	30100	95300	3070	9720
ZFD 4008-8		8	4.762	41.25	36.3	1 × 4	27200	75200	2770	7670
ZFD 4010-6		10	6.35	41.75	35.1	1 × 3	30000	70000	3060	7140
ZFD 4010-8						1 × 4	38400	93300	3910	9520

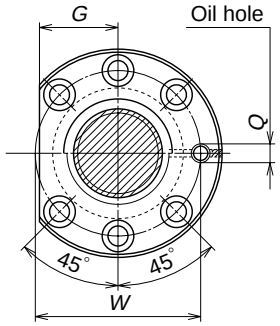
Remarks 1. Flange comes in Circular I and Circular II shape. Select a flange that is suitable for the nut installation space.
2. If there is no seal, the nut length is shorter by the length of "M" than those with a seal.
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.



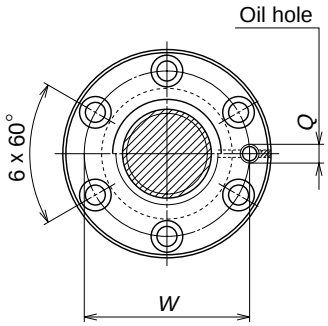
Unit: mm

Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	G	B	L	M	W	X	Y	Z	Q
382	39	35	58	22.5	11	66	5	46	5.5	9.5	5.5	M6×1
382	39	35	58	22.5	11	76	6	46	5.5	9.5	5.5	M6×1
480	49	40	63	24	11	66	5	51	5.5	9.5	5.5	M6×1
470	48	40	63	24	11	76	6	51	5.5	9.5	5.5	M6×1
323	33	42	69	26	15	88	10	55	6.6	11	6.5	M6×1
598	61	48	75	29	12	67	5	61	6.6	11	6.5	M6×1
784	80					77						
608	62	48	75	29	12	77	6	61	6.6	11	6.5	M6×1
804	82					90						
588	60	50	84	32	15	99	8	66	9	14	8.5	M6×1
774	79					116						
588	60	54	88	34	15	120	10	70	9	14	8.5	M6×1
960	98	56	90	34	15	80	5	72	9	14	8.5	PT1/8
1410	144					101						
970	99	56	90	34	15	93	6	72	9	14	8.5	PT1/8
1431	146					118						
990	101	60	94	36	15	116	8	76	9	14	8.5	PT1/8
735	75	62	104	40	18	123	10	82	11	17.5	11	PT1/8
970	99					143						

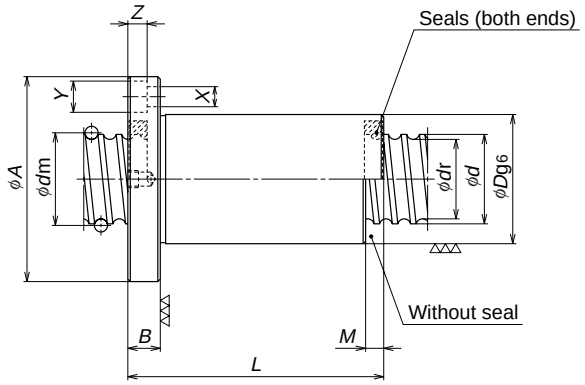
4. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the preload is 10% of the basic dynamic load rating (C_a), and axial load is applied to it. Refer to "Technical Description" (Page B467) if preload differ from the conditions above, or when considering change in the deformation of the ball nut itself.



Circular shape II (semi-circular)



Circular shape I



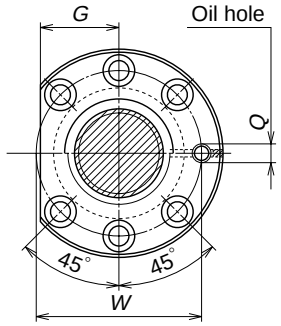
Unit: mm

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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
ZFD 5005-8	50	5	3.175	50.75	47.4	1 × 4	17500	66800	1780	6810
ZFD 5005-12						1 × 6	24800	100000	2530	10200
ZFD 5006-8		6	3.969	51.0	46.9	1 × 4	23600	81700	2410	8330
ZFD 5006-12						1 × 6	33500	122000	3420	12500
ZFD 5008-8		8	4.762	51.25	46.3	1 × 4	29900	94800	3050	9670
ZFD 5010-6		10	6.35	51.75	45.1	1 × 3	34100	91600	3470	9340
ZFD 5010-8						1 × 4	43600	120000	4450	12500
ZFD 5012-6		12	7.938	52.25	44.0	1 × 3	44800	109000	4570	11200
ZFD 6306-8	63	6	3.969	64.0	59.9	1 × 4	26100	104000	2660	10600
ZFD 6306-12						1 × 6	36900	157000	3770	16000
ZFD 6308-8		8	4.762	64.25	59.3	1 × 4	33600	124000	3420	12700
ZFD 6310-8		10	6.35	64.75	58.1	1 × 4	49700	163000	5070	16600
ZFD 6312-6		12	7.938	65.25	57.0	1 × 3	50800	143000	5180	14600

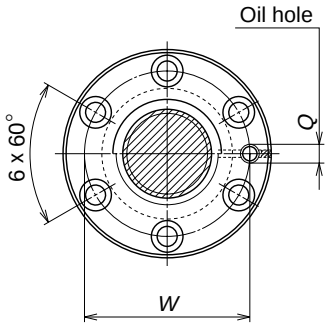
Axial rigidity *K* (N/µm)	Axial rigidity *K* {kgf/µm}	Ball nut dimensions *D*	*A*	*G*	*B*	*L*	*M*	*W*	*X*	*Y*	*Z*	*Q*
1170	119	66	100	38	15	80	5	82	9	14	8.5	PT1/8
1720	175					101						
1190	121	66	100	38	15	93	6	82	9	14	8.5	PT1/8
1750	178					118						
1180	120	70	112	43	18	119	8	90	11	17.5	11	PT1/8
914	93	72	114	44	18	123	10	92	11	17.5	11	PT1/8
1200	122					143						
906	92	75	121	47	22	147	12	97	14	20	13	PT1/8
1430	146	80	122	47	18	96	6	100	11	17.5	11	PT1/8
2110	215					121						
1460	149	82	124	47	18	119	8	102	11	17.5	11	PT1/8
1510	154	85	131	50	22	147	10	107	14	20	13	PT1/8
1120	114	90	136	52	22	147	12	112	14	20	13	PT1/8

Remarks 1. Flange comes in Circular I and Circular II shape. Select a flange that is suitable for the nut installation space.
2. If there is no seal, the nut length is shorter by the length of "M" than those with a seal.
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.

4. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the preload is 10% of the basic dynamic load rating (C_a), and axial load is applied to it. Refer to "Technical Description" (Page B467) if preload differ from the conditions above, or when considering change in the deformation of the ball nut itself.



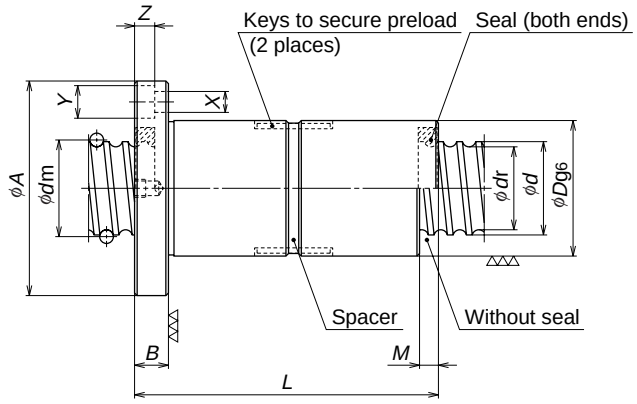
Circular shape II (semi-circular)



Circular shape I

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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
DFD 2005-3	20	5	3.175	20.75	17.4	1×3	8620	17500	880	1780
DFD 2005-4						1×4	11000	23300	1130	2380
DFD 2006-3		6	3.969	21.0	16.9	1×3	11100	20600	1130	2100
DFD 2006-4						1×4	14300	27500	1450	2800
DFD 2505-3	25	5	3.175	25.75	22.4	1×3	9790	22900	1000	2340
DFD 2505-4						1×4	12500	30500	1280	3110
DFD 2506-3		6	3.969	26.0	21.9	1×3	12900	27300	1310	2790
DFD 2506-4						1×4	16500	36500	1680	3720
DFD 2510-3		10	4.762	26.25	21.3	1×3	16100	32000	1650	3270
DFD 3205-3	32	5	3.175	32.75	29.4	1×3	11100	30500	1130	3110
DFD 3205-4						1×4	14200	40700	1450	4150
DFD 3205-6						1×6	20200	61000	2060	6220
DFD 3206-3		6	3.969	33.0	28.9	1×3	15000	37500	1530	3820
DFD 3206-4						1×4	19200	49900	1960	5090
DFD 3206-6						1×6	27200	74900	2770	7640
DFD 3208-3		8	4.762	33.25	28.3	1×3	18300	41800	1870	4270
DFD 3208-4						1×4	23500	55800	2390	5690
DFD 3210-3		10	6.35	33.75	27.1	1×3	25900	52800	2640	5380
DFD 3210-4						1×4	33200	70300	3390	7170
DFD 4005-4	40	5	3.175	40.75	37.4	1×4	15800	52300	1610	5330
DFD 4005-6						1×6	22400	78400	2290	7990
DFD 4006-4		6	3.969	41.0	36.9	1×4	21300	63500	2170	6480
DFD 4006-6						1×6	30100	95300	3070	9720
DFD 4008-4		8	4.762	41.25	36.3	1×4	27200	75200	2770	7670
DFD 4008-6						1×6	38500	113000	3930	11500
DFD 4010-3		10	6.35	41.75	35.1	1×3	30000	70000	3060	7140
DFD 4010-4						1×4	38400	93300	3910	9520

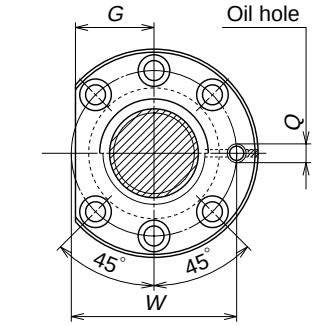
Remarks
1. Flanges for the shaft diameter of 16 mm and smaller are rectangular. There are Circular I and Circular II for those with 20 mm and larger.
   Select a flange shape which is suitable for the nut installation space.
2. If there is no seal, the nut length is shorter by the size of "M" than those with a seal.
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.



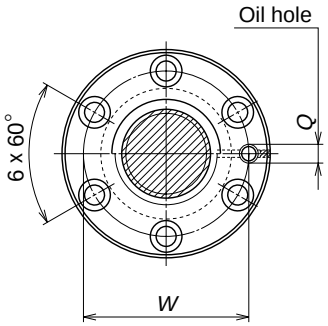
Unit: mm

Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	G	B	L	M	W	X	Y	Z	Q
386	39	41	64	25	11	81	5	52	5.5	9.5	5.5	M6×1
509	52					91						
378	39	42	65	25	11	92	6	53	5.5	9.5	5.5	M6×1
498	51					108						
479	49	46	69	26	11	81	5	57	5.5	9.5	5.5	M6×1
630	64					91						
475	48	47	70	27	11	92	6	58	5.5	9.5	5.5	M6×1
626	64					108						
479	49	47	74	28	15	140	10	60	6.6	11	6.5	M6×1
600	61	53	80	30	12	82	5	66	6.6	11	6.5	M6×1
784	80					92						
1160	118					112						
613	62	54	81	31	12	93	6	67	6.6	11	6.5	M6×1
806	82					109						
1190	121					133						
591	60	54	88	34	15	116	8	70	9	14	8.5	M6×1
777	79					134						
587	60	54	88	34	15	140	10	70	9	14	8.5	M6×1
773	79					160						
962	98	62	96	37	15	95	5	78	9	14	8.5	PT1/8
1410	144					115						
973	99	62	96	37	15	112	6	78	9	14	8.5	PT1/8
1430	146					136						
989	101	62	96	37	15	134	8	78	9	14	8.5	PT1/8
1460	148					168						
738	75	62	104	40	18	143	10	82	11	17.5	11	PT1/8
970	99					163						

4. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the preload is 10% of the basic dynamic load rating (C_a), and axial load is applied to it. Refer to "Technical Description" (Page B467) if preload differ from the conditions above, or when considering change in the deformation of the ball nut itself.



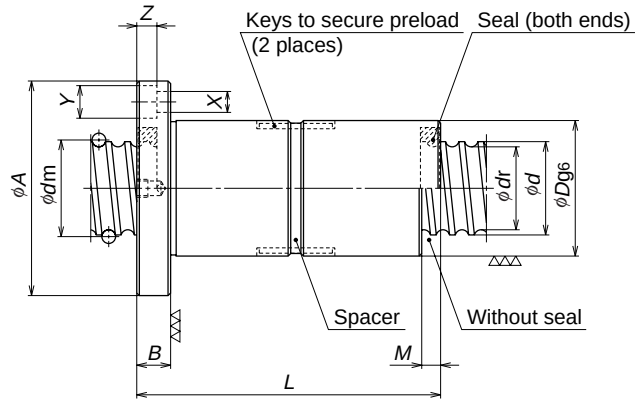
Circular shape II (semi-circular)



Circular shape I

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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
DFD 5005-4	50	5	3.175	50.75	47.4	1 × 4	17500	66800	1780	6810
DFD 5005-6						1 × 6	24800	100000	2530	10200
DFD 5006-4		6	3.969	51.0	46.9	1 × 4	23600	81700	2410	8330
DFD 5006-6						1 × 6	33500	122000	3420	12500
DFD 5008-4		8	4.762	51.25	46.3	1 × 4	29900	94800	3050	9670
DFD 5008-6						1 × 6	42400	142000	4320	14500
DFD 5010-3		10	6.35	51.75	45.1	1 × 3	34100	91600	3470	9340
DFD 5010-4						1 × 4	43600	122000	4450	12500
DFD 5010-6						1 × 6	61800	183000	6300	18700
DFD 5012-3		12	7.938	52.25	44.0	1 × 3	44800	109000	4570	11200
DFD 5012-4						1 × 4	57300	146000	5850	14900
DFD 5020-3		20	7.938	52.25	44.0	1 × 3	44800	109000	4570	11200
DFD 6306-4	63	6	3.969	64.0	59.9	1 × 4	26100	104000	2660	10600
DFD 6306-6						1 × 6	36900	157000	3770	16000
DFD 6308-4		8	4.762	64.25	59.3	1 × 4	33600	124000	3420	12700
DFD 6308-6						1 × 6	47600	186000	4850	19000
DFD 6310-4		10	6.35	64.75	58.1	1 × 4	49700	163000	5070	16600
DFD 6310-6						1 × 6	70500	244000	7190	24900
DFD 6312-4		12	7.938	65.25	57.0	1 × 4	65100	191000	6630	19500
DFD 6312-6						1 × 6	92200	286000	9400	29200
DFD 6320-3		20	9.525	65.75	56.0	1 × 3	83700	232000	8540	23700
DFD 8010-4	80	10	6.35	81.75	75.1	1 × 4	55100	209000	5620	21300
DFD 8010-6						1 × 6	78000	314000	7960	32000
DFD 8012-4		12	7.938	82.25	74.0	1 × 4	74000	254000	7550	25900
DFD 8012-6						1 × 6	105000	381000	10700	38900
DFD 8020-3		20	9.525	82.75	73.0	1 × 3	96600	313000	9850	31900
DFD 8020-4						1 × 4	124000	417000	12600	42600
DFD 10010-6	100	10	6.35	101.75	95.1	1 × 6	86200	401000	8790	40800
DFD 10012-6		12	7.938	102.25	94.0	1 × 6	117000	490000	11900	50000
DFD 10020-4		20	9.525	102.75	93.0	1 × 4	136000	526000	13900	53700

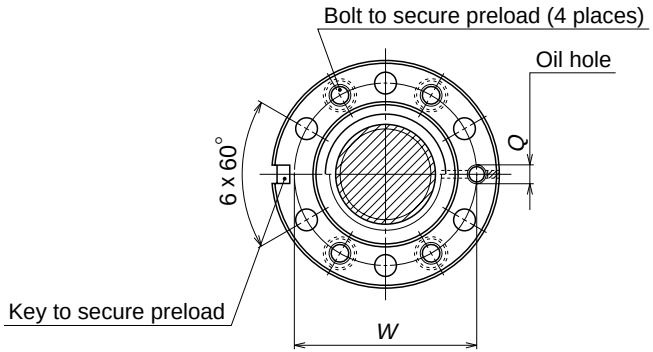
Remarks 1. Flange comes in Circular I and Circular II shape. Select a flange that is suitable for the nut installation space.
2. If there is no seal, the nut length is shorter by the length of "M" than those with a seal.
3. The right turn screw is standard. "L" is added to the end of the model code for the left turn screw.

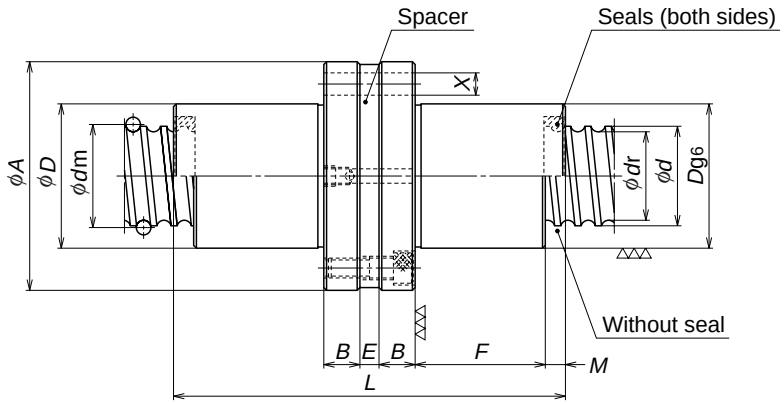


Unit: mm

Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	G	B	L	M	W	X	Y	Z	Q
1170	119	72	106	40	15	95	5	88	9	14	8.5	PT1/8
1720	175					115						
1190	121	72	106	40	15	112	6	88	9	14	8.5	PT1/8
1750	178					136						
1180	120	72	114	44	18	137	8	92	11	17.5	11	PT1/8
1740	177					171						
914	93	72	114	44	18	143	10	92	11	17.5	11	PT1/8
1200	122					163						
1770	180					205						
906	92	75	121	47	22	171	12	97	14	20	13	PT1/8
1200	122					195						
908	93	75	121	47	28	253	20	97	14	20	13	PT1/8
1430	146	85	127	48	18	118	6	105	11	17.5	11	PT1/8
2110	215					142						
1460	149	85	127	48	18	141	8	105	11	17.5	11	PT1/8
2150	219					175						
1510	154	85	131	50	22	172	10	107	14	20	13	PT1/8
2210	226					214						
1480	150	90	136	52	22	195	12	112	14	20	13	PT1/8
2180	222					248						
1440	147	95	153	59	28	253	20	123	18	26	17.5	PT1/8
1840	187	105	151	57	22	172	10	127	14	20	13	PT1/8
2710	275					214						
1860	189	110	156	59	22	195	12	132	14	20	13	PT1/8
2730	278					248						
1830	186	115	173	66	28	253	20	143	18	26	17.5	PT1/8
2410	245					297						
3270	334	125	171	64	22	214	10	147	14	20	13	PT1/8
3320	339	130	188	71	28	254	12	158	18	26	17.5	PT1/8
2890	294	135	205	79	32	301	20	169	22	32	21.5	PT1/8

4. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the preload is 10% of the basic dynamic load rating (C_a), and axial load is applied to it. Refer to "Technical Description" (Page B467) if preload differ from the conditions above, or when considering change in the deformation of the ball nut itself.





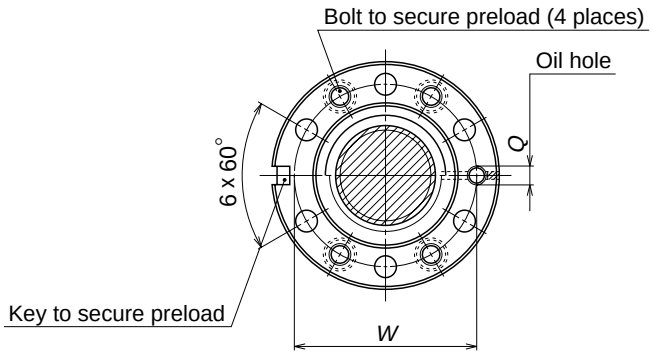
Unit: mm

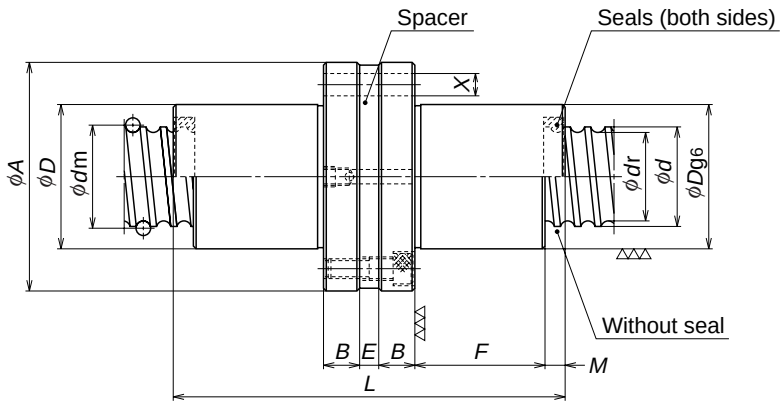
Model No.	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls Turns × Circuits	Basic load rating (N) Dynamic C_a	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
DFFD 2005-3	20	5	3.175	20.75	17.4	1×3	8620	17500	880	1780
DFFD 2005-4						1×4	11000	23300	1130	2380
DFFD 2006-3		6	3.969	21.0	16.9	1×3	11100	20600	1130	2100
DFFD 2006-4						1×4	14300	27500	1450	2800
DFFD 2505-3	25	5	3.175	25.75	22.4	1×3	9790	22900	1000	2340
DFFD 2505-4						1×4	12500	30500	1280	3110
DFFD 2506-3		6	3.969	26.0	21.9	1×3	12900	27300	1310	2790
DFFD 2506-4						1×4	16500	36500	1680	3720
DFFD 3205-3	32	5	3.175	32.75	29.4	1×3	11100	30500	1130	3110
DFFD 3205-4						1×4	14200	40700	1450	4150
DFFD 3205-6						1×6	20200	61000	2060	6220
DFFD 3206-3		6	3.969	33.0	28.9	1×3	15000	37500	1530	3820
DFFD 3206-4						1×4	19200	49900	1960	5090
DFFD 3206-6						1×6	27200	74900	2770	7640
DFFD 3208-3		8	4.762	33.25	28.3	1×3	18300	41800	1870	4270
DFFD 3208-4						1×4	23500	55800	2390	5690
DFFD 3210-3		10	6.35	33.75	27.1	1×3	25900	52800	2640	5380
DFFD 3210-4						1×4	33200	70300	3390	7170
DFFD 4005-4	40	5	3.175	40.75	37.4	1×4	15800	52300	1610	5330
DFFD 4005-6						1×6	22400	78400	2290	7990
DFFD 4006-4		6	3.969	41.0	36.9	1×4	21300	63500	2170	6480
DFFD 4006-6						1×6	30100	95300	3070	9720
DFFD 4008-4		8	4.762	41.25	36.3	1×4	27200	75200	2770	7670
DFFD 4008-6						1×6	38500	113000	3930	11500
DFFD 4010-3		10	6.35	41.75	35.1	1×3	30000	70000	3060	7140
DFFD 4010-4						1×4	38400	93300	3910	9520

Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	B	F	E	L	M	W	X	Q
386	39	35	58	11	30	8	100	5	46	5.5	M6×1
509	52				35		110				
378	39	35	58	11	35	7	111	6	46	5.5	M6×1
498	51				43		127				
479	49	40	63	11	30	8	100	5	51	5.5	M6×1
630	64				35		110				
475	48	40	63	11	35	7	111	6	51	5.5	M6×1
626	64				43		127				
600	61	48	75	12	30	6	100	5	61	6.6	M6×1
784	80				35		110				
1160	118				45		130				
613	62	48	75	12	35	5	111	6	61	6.6	M6×1
806	82				43		127				
1190	121				55		151				
591	60	50	84	15	44	5	139	8	66	9	M6×1
777	79				53		157				
587	60	54	88	15	55	5	165	10	70	9	M6×1
773	79				65		185				
962	98	56	90	15	35	5	115	5	72	9	PT1/8
1410	144				45	5	135				
973	99	56	90	15	43	5	133	6	72	9	PT1/8
1430	146				55	5	157				
989	101	60	94	15	53	5	157	8	76	9	PT1/8
1460	148				70	5	191				
738	75	62	104	18	55	9	175	10	82	11	PT1/8
972	99				65	9	195				

Remarks 1. If there is no seal, the nut length is shorter by the length of "2M" than those with a seal.
2. Right turn screw is standard. "L" is added to the end of the model for left turn screw.

4. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the preload is 10% of the basic dynamic load rating (C_a), and axial load is applied to it. Refer to "Technical Description" (Page B467) if preload differ from the conditions above, or when considering change in the deformation of the ball nut itself.





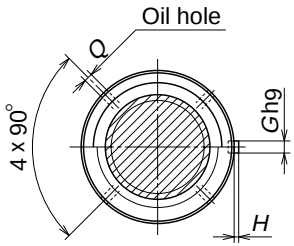
Unit: mm

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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
DFFD 5005-4	50	5	3.175	50.75	47.4	1×4	17500	66800	1780	6810
DFFD 5005-6						1×6	24800	100000	2530	10200
DFFD 5006-4		6	3.969	51.0	46.9	1×4	23600	81700	2410	8330
DFFD 5006-6						1×6	33500	122000	3420	12500
DFFD 5008-4		8	4.762	51.25	46.3	1×4	29900	94800	3050	9670
DFFD 5008-6						1×6	42400	142000	4320	14500
DFFD 5010-3		10	6.35	51.75	45.1	1×3	34100	91600	3470	9340
DFFD 5010-4						1×4	43600	122000	4450	12500
DFFD 5010-6						1×6	61800	183000	6300	18700
DFFD 5012-3		12	7.938	52.25	44.0	1×3	44800	109000	4570	11200
DFFD 5012-4						1×4	57300	146000	5850	14900
DFFD 6306-4	63	6	3.969	64.0	59.9	1×4	26100	104000	2660	10600
DFFD 6306-6						1×6	36900	157000	3770	16000
DFFD 6308-4		8	4.762	64.25	59.3	1×4	33600	124000	3420	12700
DFFD 6308-6						1×6	47600	186000	4850	19000
DFFD 6310-4		10	6.35	64.75	58.1	1×4	49700	163000	5070	16600
DFFD 6310-6						1×6	70500	244000	7190	24900
DFFD 6312-4		12	7.938	65.25	57.0	1×4	65100	191000	6630	19500
DFFD 6312-6						1×6	92200	286000	9400	29200
DFFD 8010-4	80	10	6.35	81.75	75.1	1×4	55100	209000	5620	21300
DFFD 8010-6						1×6	78000	314000	7960	32000
DFFD 8012-4		12	7.938	82.25	74.0	1×4	74000	254000	7550	25900
DFFD 8012-6						1×6	105000	381000	10700	38900
DFFD 8020-3		20	9.525	82.75	73.0	1×3	96600	313000	9850	31900
DFFD 8020-4						1×4	124000	417000	12600	42600
DFFD 10010-6	100	10	6.35	101.75	95.1	1×6	86200	401000	8790	40800
DFFD 10012-6		12	7.938	102.25	94.0	1×6	117000	490000	11900	50000
DFFD 10020-4		20	9.525	102.75	93.0	1×4	136000	526000	13900	53700

Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	B	F	E	L	M	W	X	Q
1170	119	66	100	15	35	5	115	5	82	9	PT1/8
1720	175				45	5	135				
1190	121	66	100	15	43	8	136	6	82	9	PT1/8
1750	178				55	8	160				
1180	120	70	112	18	53	7	165	8	90	11	PT1/8
1740	177				70	7	199				
914	93	72	114	18	55	9	175	10	92	11	PT1/8
1200	122				65	9	195				
1770	180				86	7	235				
906	92	75	121	22	65	5	203	12	97	14	PT1/8
1200	122				77	5	227				
1430	146	80	122	18	43	8	142	6	100	11	PT1/8
2110	215				55	8	166				
1460	149	82	124	18	53	7	165	8	102	11	PT1/8
2150	219				70	7	199				
1510	154	85	131	22	65	11	205	10	107	14	PT1/8
2210	226				86	9	245				
1480	150	90	136	22	77	8	230	12	112	14	PT1/8
2180	222				102	8	280				
1840	187	105	151	22	65	11	205	10	127	14	PT1/8
2710	275				86	9	245				
1860	189	110	156	22	77	8	230	12	132	14	PT1/8
2730	278				102	8	280				
1830	186	115	173	28	98	9	301	20	143	18	PT1/8
2410	246				120	10	346				
3270	334	125	171	22	86	9	245	10	147	14	PT1/8
3320	339	130	188	28	102	8	292	12	158	18	PT1/8
2890	294	135	205	32	120	12	356	20	169	22	PT1/8

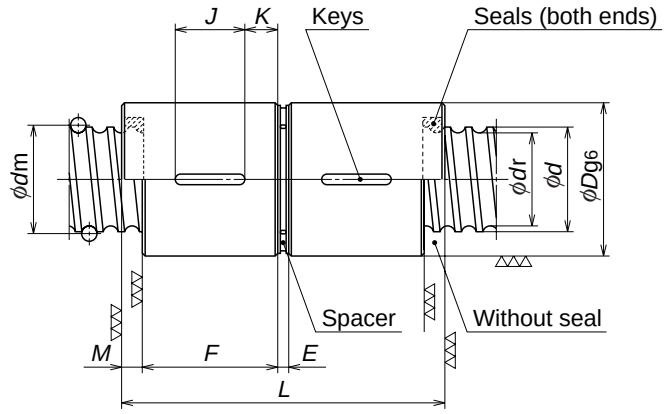
Remarks 1. If there is no seal, the nut length is shorter by the length of "2M" than those with a seal.
2. Right turn screw is standard. "L" is added to the end of the model for left turn screw.

4. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the preload is 10% of the basic dynamic load rating (C_a), and axial load is applied to it. Refer to "Technical Description" (Page B467) if preload differ from the conditions above, or when considering change in the deformation of the ball nut itself.



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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
DCD 2005-3	20	5	3.175	20.75	17.4	1×3	8620	17500	880	1780
DCD 2005-4						1×4	11000	23300	1130	2380
DCD 2006-3		6	3.969	21.0	16.9	1×3	11100	20600	1130	2100
DCD 2006-4						1×4	14300	27500	1450	2800
DCD 2505-3	25	5	3.175	25.75	22.4	1×3	9790	22900	1000	2340
DCD 2505-4						1×4	12500	30500	1280	3110
DCD 2506-3		6	3.969	26.0	21.9	1×3	12900	27300	1310	2790
DCD 2506-4						1×4	16500	36500	1680	3720
DCD 3205-3	32	5	3.175	32.75	29.4	1×3	11100	30500	1130	3110
DCD 3205-4						1×4	14200	40700	1450	4150
DCD 3205-6						1×6	20200	61000	2060	6220
DCD 3206-3		6	3.969	33.0	28.9	1×3	15000	37500	1530	3820
DCD 3206-4						1×4	19200	49900	1960	5090
DCD 3206-6						1×6	27200	74900	2770	7640
DCD 3208-3		8	4.762	33.25	28.3	1×3	18300	41800	1870	4270
DCD 3208-4						1×4	23500	55800	2390	5690
DCD 3210-3		10	6.35	33.75	27.1	1×3	25900	52800	2640	5380
DCD 3210-4						1×4	33200	70300	3390	7170
DCD 4005-4	40	5	3.175	40.75	37.4	1×4	15800	52300	1610	5330
DCD 4005-6						1×6	22400	78400	2290	7990
DCD 4006-4		6	3.969	41.0	36.9	1×4	21300	63500	2170	6480
DCD 4006-6						1×6	30100	95300	3070	9720
DCD 4008-4		8	4.762	41.25	36.3	1×4	27200	75200	2770	7670
DCD 4008-6						1×6	38500	113000	3930	11500
DCD 4010-3		10	6.35	41.75	35.1	1×3	30000	70000	3060	7140
DCD 4010-4						1×4	38400	93300	3910	9520

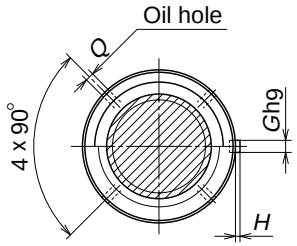
Remarks 1. If there is no seal, the nut length is shorter by the length of "2M" than those with a seal.
2. Right turn screw is standard. "L" is added to the end of the model for left turn screw.
3. Preload direction differs from that of other D preloaded items. The ball nuts are adjusted to a compressing preload. Apply a compressive load to the ball nuts when installing in the housing.



Unit: mm

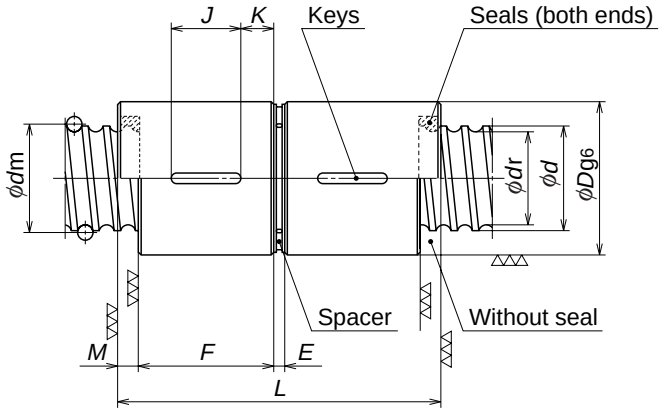
Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	F	E	L	M	J	K	G	H	Q
386	39	35	30	5	75	5	20	5	4	1.5	3
509	52		35		85		20	7.5			
378	39	35	35	5	87	6	20	7.5	4	1.5	3
498	51		43		103		25	9			
479	49	40	30	5	75	5	20	5	4	1.5	3
630	64		35		85		20	7.5			
475	48	40	35	5	87	6	20	7.5	4	1.5	3
626	64		43		103		25	9			
600	61	48	30	5	75	5	20	5	4	1.5	3
784	80		35		85		20	7.5			
1160	118		45		105		25	10			
613	62	48	35	5	87	6	20	7.5	4	1.5	3
806	82		43		103		25	9			
1190	121		55		127		25	13			
591	60	50	44	5	109	8	25	9.5	5	2	3
777	79		53		127		25	14			
587	60	54	55	5	135	10	25	15	5	2	3
773	79		65		155		32	16.5			
962	98	56	35	5	85	5	20	7.5	5	2	3
1410	144		45		105		25	10			
973	99	56	43	5	103	6	25	9	5	2	3
1430	146		55		127		25	13			
989	101	60	53	5	127	8	25	14	5	2	3
1460	148		70		161		32	19			
738	75	62	55	5	135	10	25	15	5	2	3
972	99		65		155		32	16.5			

4. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the preload is 10% of the basic dynamic load rating (C_a), and axial load is applied to it. Refer to "Technical Description" (Page B467) if preload differ from the conditions above, or when considering change in the deformation of the ball nut itself.



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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
DCD 5005-4	50	5	3.175	50.75	47.4	1×4	17500	66800	1780	6810
DCD 5005-6						1×6	24800	100000	2530	10200
DCD 5006-4		6	3.969	51.0	46.9	1×4	23600	81700	2410	8330
DCD 5006-6						1×6	33500	122000	3420	12500
DCD 5008-4		8	4.762	51.25	46.3	1×4	29900	94800	3050	9670
DCD 5008-6						1×6	42400	142000	4320	14500
DCD 5010-3		10	6.35	51.75	45.1	1×3	34100	91600	3470	9340
DCD 5010-4						1×4	43600	122000	4450	12500
DCD 5010-6						1×6	61800	183000	6300	18700
DCD 5012-3		12	7.938	52.25	44.0	1×3	44800	109000	4570	11200
DCD 5012-4						1×4	57300	146000	5850	14900
DCD 6306-4	63	6	3.969	64.0	59.9	1×4	26100	104000	2660	10600
DCD 6306-6						1×6	36900	157000	3770	16000
DCD 6308-4		8	4.762	64.25	59.3	1×4	33600	124000	3420	12700
DCD 6308-6						1×6	47600	186000	4850	19000
DCD 6310-4		10	6.35	64.75	58.1	1×4	49700	163000	5070	16600
DCD 6310-6						1×6	70500	244000	7190	24900
DCD 6312-4		12	7.938	65.25	57.0	1×4	65100	191000	6630	19500
DCD 6312-6						1×6	92200	286000	9400	29200
DCD 8010-4	80	10	6.35	81.75	75.1	1×4	55100	209000	5620	21300
DCD 8010-6						1×6	78000	314000	7960	32000
DCD 8012-4		12	7.938	82.25	74.0	1×4	74000	254000	7550	25900
DCD 8012-6						1×6	105000	381000	10700	38900
DCD 8020-3		20	9.525	82.75	73.0	1×3	96600	313000	9850	31900
DCD 8020-4						1×4	124000	417000	12600	42600
DCD 10010-6	100	10	6.35	101.75	95.1	1×6	86200	401000	8790	40800
DCD 10012-6		12	7.938	102.25	94.0	1×6	117000	490000	11900	50000
DCD 10020-4		20	9.525	102.75	93.0	1×4	136000	526000	13900	53700

Remarks 1. If there is no seal, the nut length is shorter by the length of "2M" than those with a seal.
2. Right turn screw is standard. "L" is added to the end of the model for left turn screw.
3. Preload direction differs from that of other D preloaded items. The ball nuts are adjusted to a compressing preload. Apply a compressive load to the ball nuts when installing in the housing.



Unit: mm

Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	D	F	E	L	M	J	K	G	H	Q
1170	119	66	35	5	85	5	20	7.5	5	2	3
1720	175		45		105	5	25	10			
1190	121	66	43	5	103	6	25	9	5	2	3
1750	178		55		127	6	25	13			
1180	120	70	53	5	127	8	25	14	5	2	3
1740	177		70		161	8	32	19			
914	93	72	55	5	135	10	25	15	5	2	3
1200	122		65		155	10	32	16.5			
1770	180		86		197	10	40	23			
906	92	75	65	7	161	12	32	16.5	5	2	4
1200	122		77		185	12	40	18.5			
1430	146	80	43	8	106	6	25	9	6	2.5	4
2110	215		55		130	6	25	15			
1460	149	82	53	9	131	8	25	14	6	2.5	4
2150	219		70		165	8	32	19			
1510	154	85	65	10	160	10	32	16.5	6	2.5	4
2210	226		86		202	10	40	23			
1480	150	90	77	7	185	12	40	18.5	6	2.5	4
2180	222		102	10	238	12	40	31			
1840	187	105	65	10	160	10	32	16.5	8	3	4
2710	275		86		202	10	40	23			
1860	189	110	77	7	185	12	40	18.5	8	3	4
2730	278		102	10	238	12	40	31			
1830	186	115	98	9	245	20	50	24	8	3	4
2410	245		120		289	20	50	35			
3270	334	125	86	10	202	10	40	23	8	3	4
3320	339	130	102	10	238	12	40	31	10	3	4
2890	294	135	120	9	289	20	50	35	10	3	4

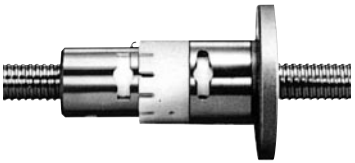
4. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the preload is 10% of the basic dynamic load rating (C_a), and axial load is applied to it. Refer to "Technical Description" (Page B467) if preload differ from the conditions above, or when considering change in the deformation of the ball nut itself.

B-I-7.3 M Type (Miniature • fine lead) Ball Screws

(1) Product categories

Like D Type, M Type ball screws use internal recirculation deflector type. There are several models by the difference in the preload system (Table I-7•3).

Table I-7•3 Product categories of M Type ball screws

Nut models	Shape	Flange shape	Preload system	Nut length	Page
MSFD		Flanged Circular III	Non-preload, Slight axial play	Short	B377
MPFD		Flanged Circular III	P preload (light preload), no spacer ball	Short	B377
MJFD		Flanged Circular III	J preload (spring preload) (medium preload)	Long	B381

(2) Features

Internal recirculation system contributes to the compact nut outside diameter.

Synthetic resin that shows superb characteristics against wear is used in the recirculation deflector, and has enhanced the smooth recirculation of balls. NSK has a patent for this product.

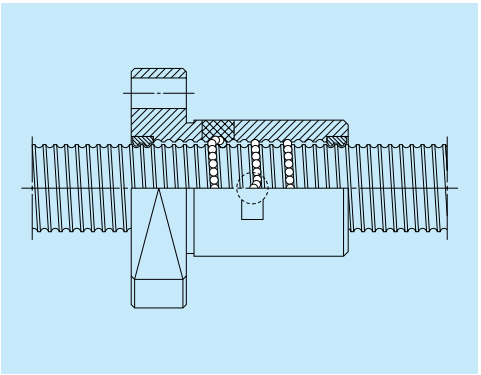


Fig. I-7•2 M type recirculation system

(3) Precaution in designing

When designing the screw shaft end, please note that it is impossible to assemble the nut unless one end of the ball thread is cut through, and, unless this side of shaft end is smaller than the ball groove root diameter.

When using nut model MJFD, it is recommended to apply major external load to the direction as shown in Fig. I-7•3 in order to effectively use the characteristic of the constant pressure pre-load.

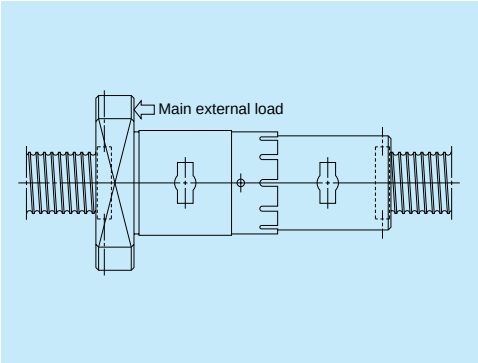


Fig. I-7•3 Constant pressure pre-load and major external load direction

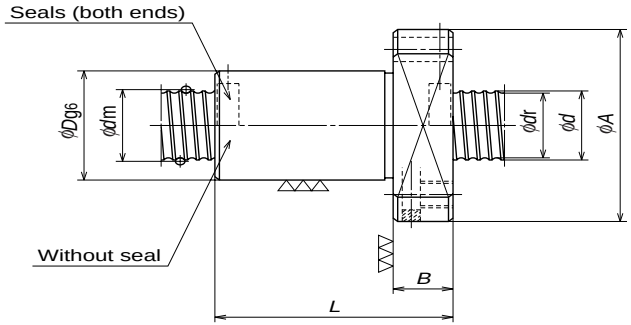
(4) Model number

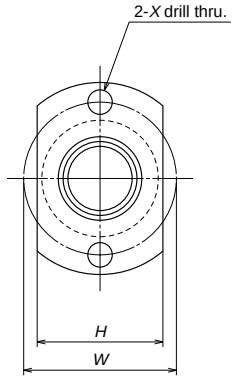
A model number that indicates specification factors is structured as shown below.

(example) Nut model MSFD; shaft diameter 4 mm; lead 1 mm; effective turns of balls 3

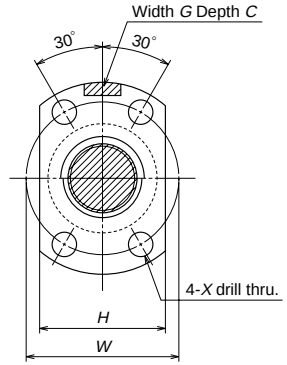
MSFD 04 01 – 3

- MSFD: Nut model
- 04: Shaft diameter
- 01: Lead
- 3: Effective turns of balls





For 0.5mm lead



For 1mm lead or higher

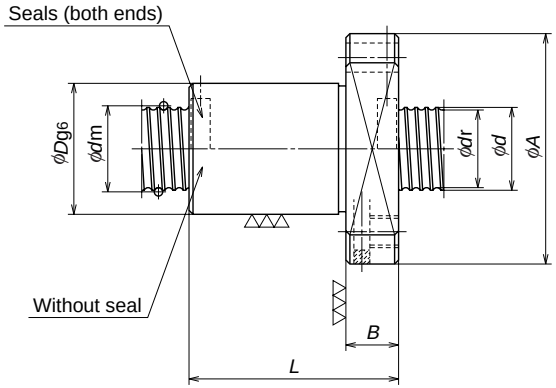
Unit: mm

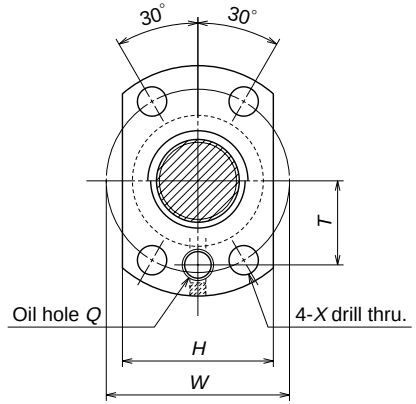
Model No.	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls Turns × Circuits	Basic load rating (N) Dynamic C_a	Static C_{0a}	{kgf} Dynamic C_a	Static C_{0a}
MSFD 0400.5-3 MPFD 0400.5-3	4	0.5	0.400	4.1	3.6	1×3	170	280	17	29
MSFD 0401-2 MPFD 0401-2		1	0.800	4.2	3.2	1×2	315	370	32	38
MSFD 0600.5-3 MPFD 0600.5-3	6	0.5	0.400	6.1	5.6	1×3	205	430	21	44
MSFD 0601-3 MPFD 0601-3		1	0.800	6.2	5.2	1×3	575	925	60	95
MSFD 0602-3 MPFD 0602-3		2	0.800	6.2	5.2	1×3	575	925	60	95
MSFD 0800.5-3 MPFD 0800.5-3	8	0.5	0.400	8.1	7.6	1×3	230	595	24	61
MSFD 0801-3 MPFD 0801-3		1	0.800	8.2	7.2	1×3	670	1290	70	130
MSFD 0801.5-3 MPFD 0801.5-3		1.5	1.000	8.3	7.0	1×3	1080	1980	110	200
MSFD 0802-3 MPFD 0802-3		2	1.200	8.3	6.9	1×3	1320	2210	135	225
MSFD 1001-3 MPFD 1001-3	10	1	0.800	10.2	9.2	1×3	745	1660	75	170
MSFD 1002-3 MPFD 1002-3		2	1.200	10.3	8.9	1×3	1490	2850	150	290
MSFD 1002.5-3 MPFD 1002.5-3		2.5	1.588	10.4	8.6	1×3	2130	3640	215	370

Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	H	B	L	W	X	G	C
30 47	3.0 4.7	10	22	11	3	13	16	3.4	—	—
22 34	2.2 3.5	10	20	14	3	12	15	2.9	3	2
42 66	4.3 6.7	12	24	13	3	13	18	3.4	—	—
49 76	5.0 7.8	12	24	16	3.5	15	18	3.4	—	—
49 76	5.0 7.8	13	25	17	4	17	19	3.4	—	—
54 85	5.5 8.6	14	27	15	3	13	21	3.4	—	—
64 99	6.5 10	14	27	18	4	16	21	3.4	—	—
76 117	7.7 12	15	28	19	4	22	22	3.4	—	—
73 113	7.4 12	16	29	20	4	26	23	3.4	—	—
77 120	7.8 12	16	29	20	4	16	23	3.4	—	—
91 138	9.3 14	18	35	22	5	28	27	4.5	—	—
90 140	9.2 14	19	36	23	5	32	28	4.5	—	—

Remarks 1. Seal cannot be installed if the lead is 1 mm or smaller, or if the shaft outer diameter is 6 mm or smaller. (Refer to Page B472 for dust protection.)
2. Right turn screw is standard. Please consult NSK for left turn screw.

3. For MSFD, rigidities in the Table are theoretical values when an axial load equivalent to 30% of the dynamic load rating (C_a) is applied. For MPFD, the rigidities are theoretical values when the axial load is applied and the preload is 0.05C_a. Refer to "Technical Explanation" (Page B467) if axial load differs from the conditions above, or when considering change in the deformation of the ball nut itself.
4. The hatched groove (shaded portion, width *G*, depth *C*) to the outside of nut flange is made for production purpose only.





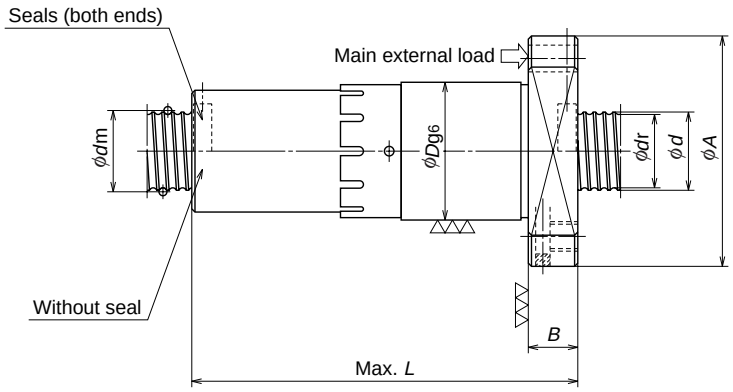
Unit: mm

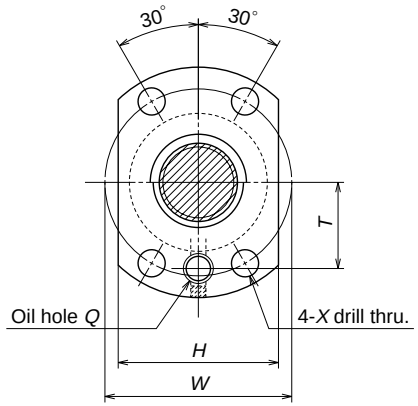
Model No.	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls Turns × Circuits	Basic load rating (N) Dynamic C_a	Static C_{0a}	{kgf} Dynamic C_a	Static C_{0a}
MSFD 1201-3 MPFD 1201-3	12	1	0.800	12.2	11.2	1×3	795	1980	80	200
MSFD 1202-3 MPFD 1202-3		2	1.200	12.3	10.9	1×3	1660	3620	170	370
MSFD 1202.5-3 MPFD 1202.5-3		2.5	1.588	12.4	10.6	1×3	2360	4540	240	465
MSFD 1203-3 MPFD 1203-3		3	2.000	12.5	10.2	1×3	3120	5420	320	550
MSFD 1402-3 MPFD 1402-3	14	2	1.200	14.3	12.9	1×3	1780	4270	180	435
MSFD 1403-3 MPFD 1403-3		3	2.000	14.5	12.2	1×3	3400	6490	345	660
MSFD 1602-4 MPFD 1602-4	16	2	1.588	16.4	14.6	1×4	3510	8450	360	860
MSFD 1602.5-4 MPFD 1602.5-4		2.5	1.588	16.4	14.6	1×4	3510	8450	360	860
MSFD 2002-4 MPFD 2002-4	20	2	1.588	20.4	18.6	1×4	3910	10900	400	1110
MSFD 2502-4 MPFD 2502-4	25	2	1.588	25.4	23.6	1×4	4310	13900	440	1420
MSFD 3202-6 MPFD 3202-6	32	2	1.588	32.4	30.6	1×6	6790	27200	690	2770
MSFD 4002-6 MPFD 4002-6	40	2	1.588	40.4	38.6	1×6	7380	33900	750	3460

Axial rigidity K (N/μm)	{kgf/μm}	Ball nut dimensions D	A	H	B	L	W	X	Q	T
88	9	18	31	22	4	16	25	3.4	—	—
137	14									
108	11	20	37	24	5	28	29	4.5	—	—
168	17									
107	11	21	38	25	5	32	30	4.5	—	—
167	17									
107	11	22	39	26	5	36	31	4.5	—	—
166	17									
122	12	22	41	26	6	29	32	5.5	—	—
191	19									
122	12	24	43	28	6	37	34	5.5	—	—
191	19									
185	19	25	44	29	10	40	35	5.5	M6×1	16
288	29									
185	19	25	44	29	10	44	35	5.5	M6×1	16
288	29									
225	23	30	49	34	10	40	40	5.5	M6×1	18.5
351	36									
273	28	36	55	40	10	40	46	5.5	M6×1	21.5
425	43									
494	50	42	65	46	10	50	54	6.6	M6×1	26.5
769	78									
588	60	51	74	55	10	50	63	6.6	M6×1	31
916	93									

Remarks 1. Seal cannot be installed if the lead is 1 mm or smaller. (Refer to Page B472 for dust protection.)
2. Those with shaft diameter of 14 mm or smaller do not have lubrication oil hole. It is recommended to use those with seal when shaft diameter is 16 mm or larger and have lubrication oil hole.
3. The right turn screw is standard. Please consult NSK for left turn screw.

4. For MSFD, rigidities in the Table are theoretical values when an axial load equivalent to 30% of the dynamic rating load (C_a) is applied. For MPFD, rigidities are theoretical values when an axial load is applied and the preload is 0.05C_a. Refer to "Technical Description" (Page B467) if axial load differs from the conditions above, or when considering change in the deformation of the ball nut itself.





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}	Basic load rating {kgf} Dynamic C_a	Basic load rating {kgf} Static C_{0a}
MJFD 0801.5-3	8	1.5	1.000	8.3	7	1×3	1080	1980	110	200
MJFD 1002-3	10	2	1.200	10.3	8.9	1×3	1490	2850	150	290
MJFD 1202-3	12	2	1.200	12.3	10.9	1×3	1660	3620	170	370
MJFD 1202.5-3		2.5	1.588	12.4	10.6	1×3	2360	4540	240	465
MJFD 1203-3		3	2.000	12.5	10.2	1×3	3120	5420	320	550
MJFD 1402-3	14	2	1.200	14.3	12.9	1×3	1780	4270	180	435
MJFD 1403-3		3	2.000	14.5	12.2	1×3	3400	6490	345	660
MJFD 1602-4	16	2	1.588	16.4	14.6	1×4	3510	8450	360	860
MJFD 1602.5-4		2.5	1.588	16.4	14.6	1×4	3510	8450	360	860
MJFD 2002-4	20	2	1.588	20.4	18.6	1×4	3910	10900	400	1110
MJFD 2502-4	25	2	1.588	25.4	23.6	1×4	4310	13900	440	1420
MJFD 3202-6	32	2	1.588	32.4	30.6	1×6	6790	27200	690	2770
MJFD 4002-6	40	2	1.588	40.4	38.6	1×6	7380	33900	750	3460

Axial rigidity *K* (N/μm)	Axial rigidity *K* {kgf/μm}	Ball nut dimensions *D*	*A*	*H*	*B*	*L*	*W*	*X*	*Q*	*T*
103	11	18	31	22	4	47	25	3.4	—	—
125	13	21	38	25	5	58	30	4.5	—	—
148	15	23	40	27	5	58	32	4.5	—	—
147	15	24	41	28	5	68	33	4.5	—	—
146	15	25	42	29	5	75	34	4.5	—	—
168	17	25	44	29	6	59	35	5.5	—	—
168	17	27	46	31	6	76	37	5.5	—	—
257	26	28	47	32	10	79	38	5.5	M6×1	17.5
257	26	28	47	32	10	87	38	5.5	M6×1	17.5
308	31	34	53	38	10	79	44	5.5	M6×1	20.5
373	38	40	59	44	10	80	50	5.5	M6×1	23.5
676	69	46	69	50	10	98	58	6.6	M6×1	28.5
805	82	56	79	60	10	98	68	6.6	M6×1	33.5

Remarks 1. Those under the shaft diameter of 14 mm do not have an oil hole. It is recommended to use those with seal when shaft diameter is 16 mm or larger and have the oil hole.
2. Right turn thread screw is standard. Please consult NSK for left turn screw.

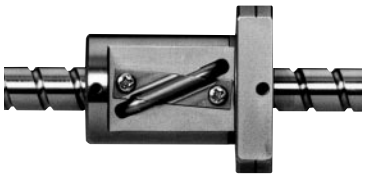
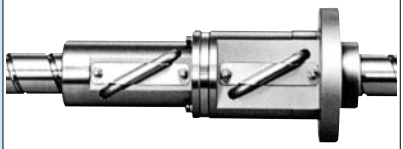
3. Rigidities in the Table are theoretical values when the axial load of $0.30C_a$ is applied to the major external load (above figure), and the preload is $0.10C_a$. Consult NSK if preload differs from above condition.

B-I-7.4 L Type (Medium • high helix lead) Ball Screws

(1) Product categories

There are several L Type models by difference in the preload system (Table I-7•4). Since the leads are in the range from 1/2 to the same length of the shaft diameter (medium • high helix lead), L Type ball screws are suitable for high-speed operation.

Table I-7•4 Classification of L Type ball screws

Nut models	Shape	Flange shape	Nut shape	Recirculation system Preload system	Page
LSFT		Flanged d=20 or under Rectangle d=25 or over Circular II	d=20 or under Circular d=25 or over Projecting-tube type	Return tube Non preloaded, slight axial play	B385
LPFT		Flanged d=20 or under Rectangle d=25 or over Circular II	d=20 or under Circular d=25 or over Projecting-tube type	Tube P preload (light preload) Spacer ball 1:1	B389
LDFT		Flanged Circular II	Circular	Return tube D preload (medium preload) (heavy preload)	B393
LFFT		Flanged to flanged Circular I	Projecting-tube type	Return tube D preload (medium preload) (heavy preload)	B395

Nut models	Shape	Flange shape	Nut shape	Recirculation system Preload system	Page
LSFC		Flanged Circular III	Circular	End cap Non preloaded, slight axial play	B397
LPFC		Flanged Circular III	Circular	End cap P preload (light loaded) No Spacer ball	B397

(2) Accuracy
Grades of C1, C2, C3, C5, Ct7 are available.
* Please consult NSK for C0 grade.

(3) Precaution in designing
For end cap system, please note that it is impossible to assemble the nut unless one end of ball thread of screw shaft is cut through, and unless the shaft end of this side is smaller than the ball groove root diameter.

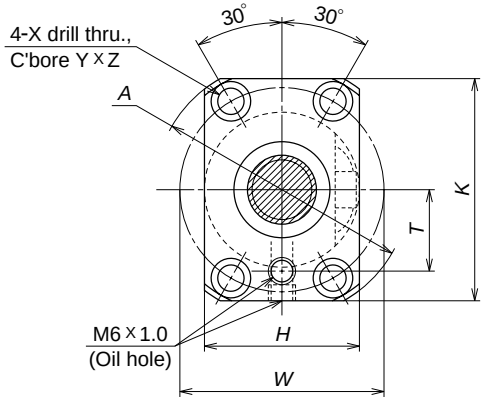
(4) Special ball screw specifications
L Series is based on the combinations of dimensional factors in the table. However, NSK manufactures other combinations, as well as flanges in special shapes. Please consult NSK.

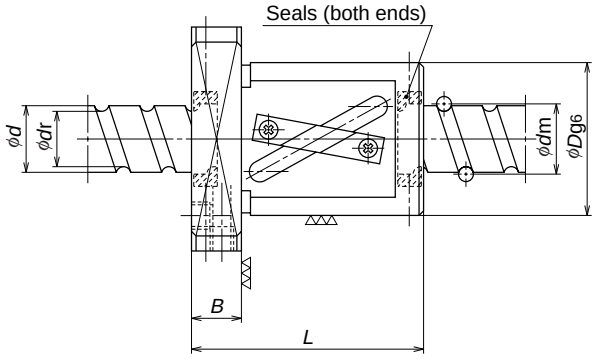
(5) Model number
A model number that indicates specification factors is

(Example) Nut model LSFT; shaft diameter 12 mm; lead 10 mm; effective turns of balls 2.5

LSFT 12 10 – 2.5

- LSFT: Nut model
- 12: Shaft diameter
- 10: Lead
- 2.5: Effective turns of balls





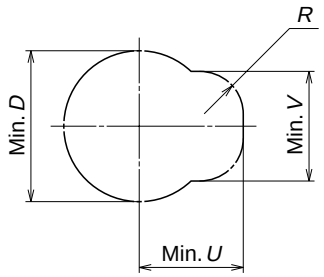
Unit: mm

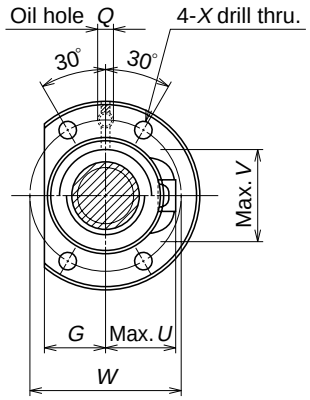
Model No.	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls Turns × Circuits	Basic load rating (N) Dynamic C_a	Static C_{0a}	{kgf} Dynamic C_a	Static C_{0a}
LSFT 1210-2.5	12	10	2.381	12.5	10.0	2.5×1	3750	6480	380	660
LSFT 1408-2.5	14	8	3.175	14.5	11.2	2.5×1	6790	11700	695	1190
LSFT 1510-2.5	15	10	3.175	15.5	12.2	2.5×1	7070	12800	720	1300
LSFT 1616-1.5	16	16	3.175	16.75	13.4	1.5×1	4710	8110	480	825
LSFT 2010-2.5	20	10	3.969	21.0	16.9	2.5×1	10900	21700	1110	2210
LSFT 2016-2.5		16	3.969	21.0	16.9	2.5×1	10900	21700	1110	2210
LSFT 2020-1.5		20	3.969	21.0	16.9	1.5×1	7040	12700	720	1290

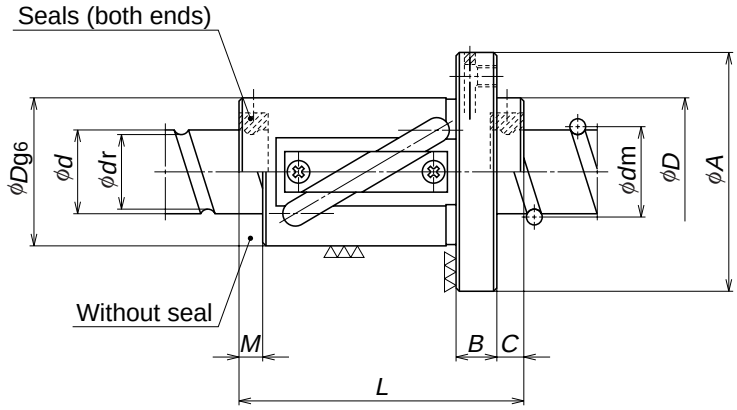
Axial rigidity K (N/μm)	{kgf/μm}	Ball nut dimensions D	A	H	K	B	L	W	X	Y	Z	T
110	11	30	50	32	45	10	50	40	4.5	8	4	15
140	14	34	57	34	50	11	46	45	5.5	9.5	5.5	17
150	15	34	57	34	50	11	51	45	5.5	9.5	5.5	17
100	10	40	63	40	55	12	56	51	5.5	9.5	5.5	17
202	21	46	74	46	66	13	54	59	6.6	11	6.5	24
202	21	46	74	46	66	13	72	59	6.6	11	6.5	24
127	13	46	74	46	66	13	63	59	6.6	11	6.5	24

Remarks 1. Ball screw with a shaft diameter of 12 mm has one lubrication oil hole on the flange surface.(position T).
2. Seal is standard. Outside dimensions does not change when the seal is removed.
3. Right turn screw is standard. "L" is added to the end of the model for left turn screw.

4. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the axial load is 30% of the basic dynamic load rating (C_a). Refer to "Technical Description" (Page B467) if axial load differs from the conditions above, or when considering change in the deformation of the ball nut itself.







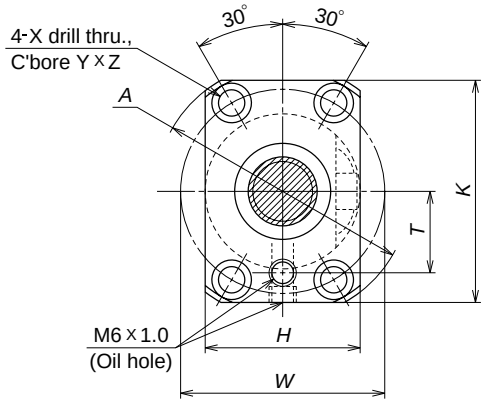
Unit: mm

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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
LSFT 2516-2.5	25	16	4.762	26.25	21.3	2.5×1	15700	32800	1600	3350
LSFT 2516-3						1.5×2	18400	38200	1870	3890
LSFT 2520-2.5		20	4.762	26.25	21.3	2.5×1	15700	32800	1600	3350
LSFT 2520-3						1.5×2	18400	38200	1870	3890
LSFT 2525-1.5		25	4.762	26.25	21.3	1.5×1	10100	19100	1030	1950
LSFT 3220-2.5	32	20	4.762	33.25	28.3	2.5×1	17900	41800	1830	4270
LSFT 3220-3						1.5×2	21000	49600	2140	5060
LSFT 3225-2.5		25	4.762	33.25	28.3	2.5×1	17900	41800	1830	4270
LSFT 3225-3						1.5×2	21000	49600	2140	5060
LSFT 3232-1.5		32	4.762	33.25	28.3	1.5×1	11500	24800	1180	2530
LSFT 4025-2.5	40	25	6.35	41.75	35.1	2.5×1	28500	70000	2910	7140
LSFT 4025-3						1.5×2	33400	82400	3410	8400
LSFT 4032-2.5		32	6.35	41.75	35.1	2.5×1	28500	70000	2910	7140
LSFT 4040-1.5		40	6.35	41.75	35.1	1.5×1	18400	41200	1880	4200
LSFT 5025-2.5	50	25	7.938	52.25	44.0	2.5×1	42700	109000	4350	11200
LSFT 5025-3						1.5×2	49900	133000	5090	13600
LSFT 5032-2.5		32	7.938	52.25	44.0	2.5×1	42700	109000	4350	11200
LSFT 5032-3						1.5×2	49900	133000	5090	13600
LSFT 5040-2.5		40	7.938	52.25	44.0	2.5×1	42700	109000	4350	11200
LSFT 5050-1.5		50	7.938	52.25	44.0	1.5×1	27500	66500	2800	6780
LSFT 6340-2.5	63	40	7.938	65.25	57.0	2.5×1	48500	139000	4950	14200
LSFT 6340-3						1.5×2	56800	165000	5790	16800
LSFT 6350-1.5		50	7.938	65.25	57.0	1.5×1	31300	82500	3190	8410
LSFT 6350-2.5						2.5×1	48500	139000	4950	14200

Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	G	B	C	L	M	W	X	U	V	R	Q
250	25	44	71	23	12	8	84	6	57	6.6	31	35	12	M6×1
295	30						100							
250	25	44	71	23	12	8	96	7	57	6.6	31	35	12	M6×1
295	30						116							
157	16	44	71	23	12	10	90	10	57	6.6	32	34	12	M6×1
300	30	51	85	26	15	8	99	7	67	9	34	42	12	M6×1
360	36						119							
300	30	51	85	26	15	10	117	10	67	9	34	42	12	M6×1
360	36						142							
190	19	51	85	26	15	12	109	13	67	9	34	42	12	M6×1
375	38	64	106	33	18	10	123	10	84	11	42	52	15	PT1/8
444	45						148							
375	38	64	106	33	18	12	146	13	84	11	42	52	15	PT1/8
237	24	64	106	33	18	14	133	16	84	11	42	52	15	PT1/8
462	47	80	126	41	22	11	129	11	102	14	52	64	19	PT1/8
547	55						154							
462	47	80	126	41	22	12	151	14	102	14	52	64	19	PT1/8
547	55						183							
462	47	80	126	41	22	14	178	17	102	14	52	64	19	PT1/8
290	29	80	126	41	22	16	161	21	102	14	52	64	19	PT1/8
560	57	97	144	49	22	14	178	15	120	14	58	77	19	PT1/8
667	68						218							
346	35	97	144	49	22	16	161	19	120	14	58	77	19	PT1/8
560	57						211							

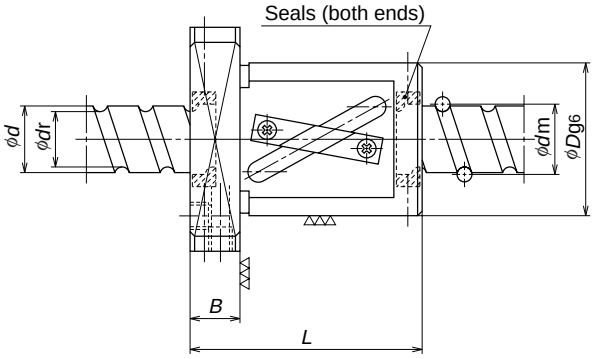
Remarks 1. If there is no seal, the nut length is shorter by the lengths of "M" and "C" than those with a seal.
2. Right start screw is standard. "L" is added to the end of the model number for left turn screw.

3. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the axial load is 30% of the basic dynamic load rating (C_a). Refer to "Technical Description" (Page B467) if axial load differs from the conditions above, or when considering change in the deformation of the ball nut itself.



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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
LPFT 1210-2.5	12	10	2.381	12.5	10.0	2.5×1	2360	3240	240	330
LPFT 1408-2.5	14	8	3.175	14.5	11.2	2.5×1	4280	5840	435	595
LPFT 1510-2.5	15	10	3.175	15.5	12.2	2.5×1	4450	6380	455	650
LPFT 1616-1.5	16	16	3.175	16.75	13.4	1.5×1	3600	5410	365	550
LPFT 2010-2.5	20	10	3.969	21.0	16.9	2.5×1	6880	10800	700	1100
LPFT 2016-2.5		16	3.969	21.0	16.9	2.5×1	6880	10800	700	1100
LPFT 2020-1.5		20	3.969	21.0	16.9	1.5×1	5370	8450	550	860

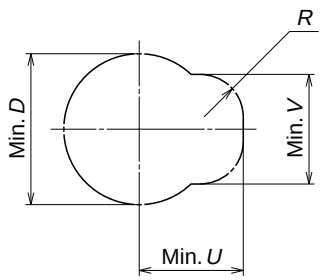
Remarks 1. Ball screw with a shaft diameter of 12 mm has one lubrication oil hole on the flange surface.(position T).
2. Seal is standard. Outside dimensions does not change when the seal is removed.
3. Right turn screw is standard. "L" is added to the end of the model for left turn screw.

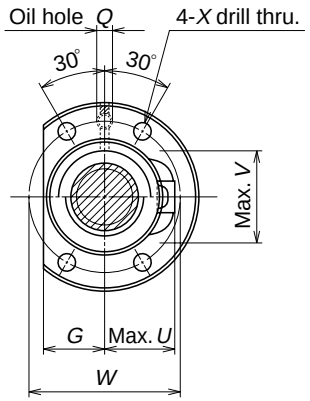


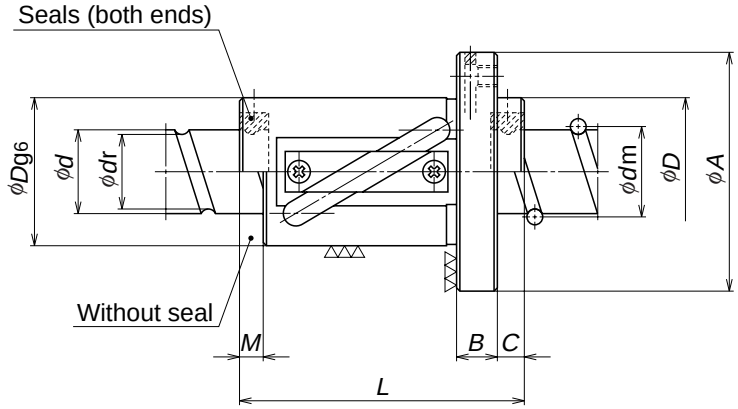
Unit: mm

Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	H	K	B	L	W	X	Y	Z	T
90	9	30	50	32	45	10	50	40	4.5	8	4	15
120	12	34	57	34	50	11	46	45	5.5	9.5	5.5	17
127	13	34	57	34	50	11	51	45	5.5	9.5	5.5	17
110	11	40	63	40	55	12	56	51	5.5	9.5	5.5	17
169	17	46	74	46	66	13	54	59	6.6	11	6.5	24
169	17	46	74	46	66	13	72	59	6.6	11	6.5	24
137	14	46	74	46	66	13	63	59	6.6	11	6.5	24

4. Load balls and spacer balls are installed at a ratio of 1:1. Therefore, the basic load rating differs from those of other models.
5. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the preload is 5% of the basic dynamic load rating (C_a), and the axial load is applied to it. Refer to "Technical description" (Page B467) if preload differs from the conditions above, or when considering change in the deformation of the ball nut itself.







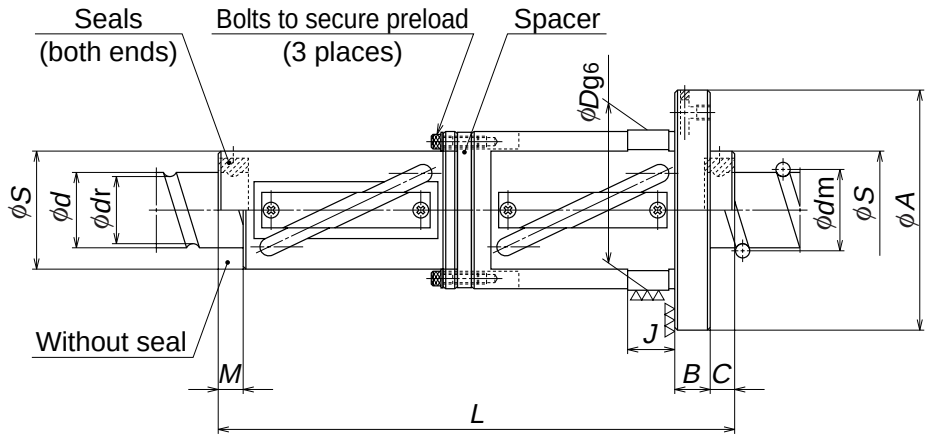
Unit: mm

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}	Basic load rating {kgf} Dynamic C_a	Basic load rating {kgf} Static C_{0a}
LPFT 2516-2.5	25	16	4.762	26.25	21.3	2.5×1	9900	16400	1010	1670
LPFT 2516-3						1.5×2	11600	19100	1180	1950
LPFT 2520-2.5		20	4.762	26.25	21.3	2.5×1	9900	16400	1010	1670
LPFT 2520-3						1.5×2	11600	19100	1180	1950
LPFT 2525-1.5		25	4.762	26.25	21.3	1.5×1	6380	9540	650	975
LPFT 3220-2.5	32	20	4.762	33.25	28.3	2.5×1	11300	20900	1150	2130
LPFT 3220-3						1.5×2	13200	24800	1350	2530
LPFT 3225-2.5		25	4.762	33.25	28.3	2.5×1	11300	20900	1150	2130
LPFT 3225-3						1.5×2	13200	24800	1350	2530
LPFT 3232-1.5		32	4.762	33.25	28.3	1.5×1	7280	12400	740	1260
LPFT 4025-2.5	40	25	6.35	41.75	35.1	2.5×1	18000	35000	1830	3570
LPFT 4025-3						1.5×2	21000	41200	2150	4200
LPFT 4032-2.5		32	6.35	41.75	35.1	2.5×1	18000	35000	1830	3570
LPFT 4040-1.5		40	6.35	41.75	35.1	1.5×1	11600	20600	1180	2100
LPFT 5025-2.5	50	25	7.938	52.25	44.0	2.5×1	26900	54700	2740	5580
LPFT 5025-3						1.5×2	31400	66500	3210	6780
LPFT 5032-2.5		32	7.938	52.25	44.0	2.5×1	26900	54700	2740	5580
LPFT 5032-3						1.5×2	31400	66500	3210	6780
LPFT 5040-2.5		40	7.938	52.25	44.0	2.5×1	26900	54700	2740	5580
LPFT 5050-1.5		50	7.938	52.25	44.0	1.5×1	17300	33200	1770	3390
LPFT 6340-2.5	63	40	7.938	65.25	57.0	2.5×1	30600	69500	3120	7080
LPFT 6340-3						1.5×2	35800	82500	3650	8410
LPFT 6350-1.5		50	7.938	65.25	57.0	1.5×1	19700	41200	2010	4200
LPFT 6350-2.5						2.5×1	30600	69500	3120	7080

Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	D	A	G	B	C	L	M	W	X	U	V	R	Q
210	21	44	71	23	12	8	84	6	57	6.6	31	35	12	M6×1
247	25						100							
210	21	44	71	23	12	8	96	7	57	6.6	31	35	12	M6×1
247	25						116							
127	13	44	71	23	12	10	90	10	57	6.6	32	34	12	M6×1
251	25	51	85	26	15	8	99	7	67	9	34	42	12	M6×1
297	30						119							
251	25	51	85	26	15	10	117	10	67	9	34	42	12	M6×1
297	30						142							
161	16	51	85	26	15	12	109	13	67	9	34	42	12	M6×1
315	32	64	106	33	18	10	123	10	84	11	42	52	15	PT1/8
347	35						148							
315	32	64	106	33	18	12	146	13	84	11	42	52	15	PT1/8
199	20	64	106	33	18	14	133	16	84	11	42	52	15	PT1/8
388	39	80	126	41	22	11	129	11	102	14	52	64	19	PT1/8
450	45						154							
388	39	80	126	41	22	12	151	14	102	14	52	64	19	PT1/8
450	45						183							
388	39	80	126	41	22	14	178	17	102	14	52	64	19	PT1/8
245	25	80	126	41	22	16	161	21	102	14	52	64	19	PT1/8
466	48	97	144	49	22	14	178	15	120	14	58	77	19	PT1/8
551	56						218							
285	29	97	144	49	22	16	161	19	120	14	58	77	19	PT1/8
478	48						211							

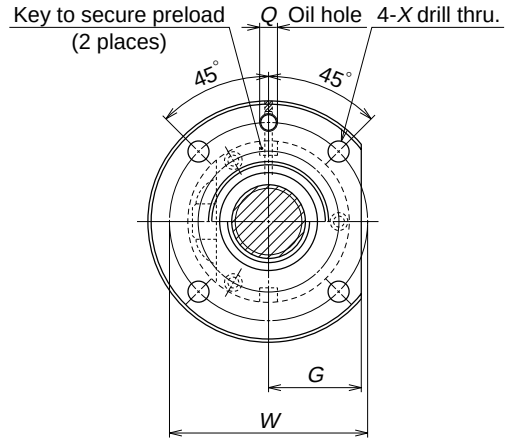
Remarks 1. If there is no seal, the nut length is shorter by the lengths of "M" and "C" than those with a seal.
2. Right start screw is standard. "L" is added to the end of the model number for left turn screw.

3. Load balls and spacer balls are installed at a ratio of 1:1. Therefore, the basic load rating differs from those of other models.
4. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the preload is 5% of the basic dynamic load rating (C_a), and the axial load is applied to it. Refer to "Technical description" (Page B467) if preload differs from the conditions above, or when considering change in the deformation of the ball nut itself.



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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
LDFT 2516-2.5	25	16	4.762	26.25	21.3	2.5×1	15700	32800	1600	3350
LDFT 2516-3						1.5×2	18400	38200	1870	3890
LDFT 2520-2.5		20	4.762	26.25	21.3	2.5×1	15700	32800	1600	3350
LDFT 2520-3						1.5×2	18400	38200	1870	3890
LDFT 2525-1.5		25	4.762	26.25	21.3	1.5×1	10100	19100	1030	1950
LDFT 3220-2.5	32	20	4.762	33.25	28.3	2.5×1	17900	41800	1830	4270
LDFT 3220-3						1.5×2	21000	49600	2140	5060
LDFT 3225-2.5		25	4.762	33.25	28.3	2.5×1	17900	41800	1830	4270
LDFT 3225-3						1.5×2	21000	49600	2140	5060
LDFT 3232-1.5		32	4.762	33.25	28.3	1.5×1	11500	24800	1180	2530
LDFT 4025-2.5	40	25	6.35	41.75	35.1	2.5×1	28500	70000	2910	7140
LDFT 4025-3						1.5×2	33400	82400	3410	8400
LDFT 4032-2.5		32	6.35	41.75	35.1	2.5×1	28500	70000	2910	7140
LDFT 4040-1.5		40	6.35	41.75	35.1	1.5×1	18400	41200	1880	4200
LDFT 5025-2.5	50	25	7.938	52.25	44.0	2.5×1	42700	109000	4350	11200
LDFT 5025-3						1.5×2	49900	133000	5090	13600
LDFT 5032-2.5		32	7.938	52.25	44.0	2.5×1	42700	109000	4350	11200
LDFT 5032-3						1.5×2	49900	133000	5090	13600
LDFT 5040-2.5		40	7.938	52.25	44.0	2.5×1	42700	109000	4350	11200
LDFT 5050-1.5		50	7.938	52.25	44.0	1.5×1	27500	66500	2800	6780
LDFT 6340-2.5	63	40	7.938	65.25	57.0	2.5×1	48500	139000	4950	14200
LDFT 6340-3						1.5×2	56800	165000	5790	16800
LDFT 6350-1.5		50	7.938	65.25	57.0	1.5×1	31300	82500	3190	8410
LDFT 6350-2.5						2.5×1	48500	139000	4950	14200

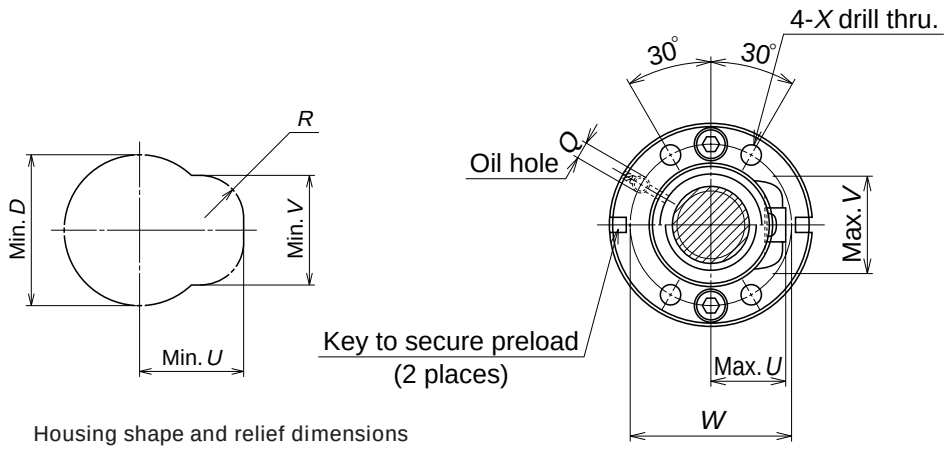
Remarks 1. If there is no seal, the nut length is shorter by the lengths of "M" and "C" than those with a seal.
2. Right start screw is standard. "L" is added to the end of the model number for left turn screw.



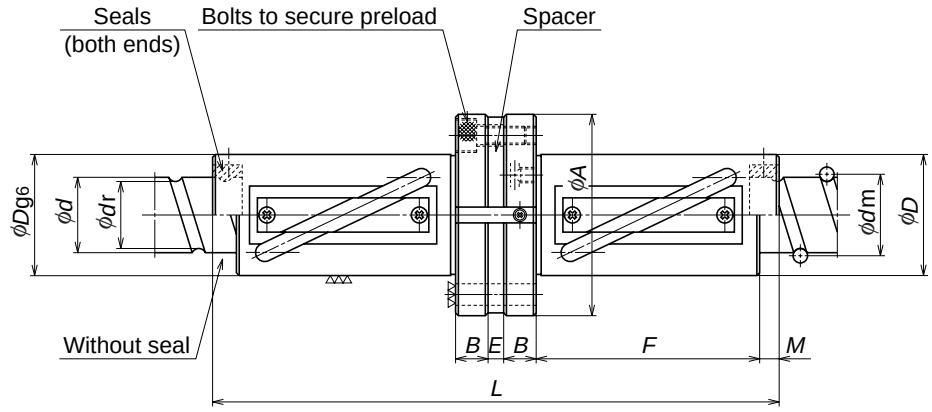
Unit: mm

Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	S	G	B	J	L	C	M	W	X	Q
490	50	62	89	44	34	12	18	152	8	6	75	6.6	M6×1
577	58							181					
490	50	62	89	44	34	12	18	177	8	7	75	6.6	M6×1
577	58							217					
308	31	62	89	44	34	12	18	166	10	10	75	6.6	M6×1
604	61	68	102	51	39	15	20	179	8	7	84	9	M6×1
708	72							219					
604	61	68	102	51	39	15	20	218	10	10	84	9	M6×1
708	72							268					
376	38	68	102	51	39	15	20	205	12	13	84	9	M6×1
737	75	84	126	64	48	18	22	223	10	10	104	11	PT1/8
873	89							273					
737	75	84	126	64	48	18	22	274	12	13	104	11	PT1/8
465	47	84	126	64	48	18	22	253	14	16	104	11	PT1/8
905	92	106	152	80	56	22	25	229	11	11	128	14	PT1/8
1070	109							279					
905	92	106	152	80	56	22	25	279	12	14	128	14	PT1/8
1070	109							343					
922	94	106	152	80	56	22	25	338	14	17	128	14	PT1/8
572	58	106	152	80	56	22	25	312	16	21	128	14	PT1/8
1100	112	122	168	97	62	22	29	339	14	15	144	14	PT1/8
1310	133							419					
678	69	122	168	97	62	22	29	311	16	19	144	14	PT1/8
1120	113							411					

3. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the preload is 10% of the basic dynamic load rating (C_a), and the axial load is applied to it. Refer to "Technical description" (Page B467) if preload differs from the conditions above, or when considering change in the deformation of the ball nut itself.



Housing shape and relief dimensions



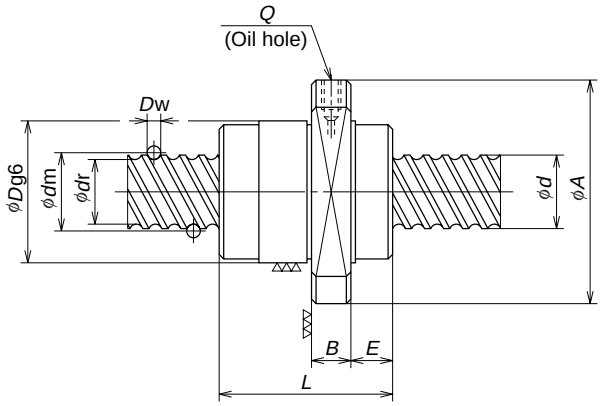
Unit: mm

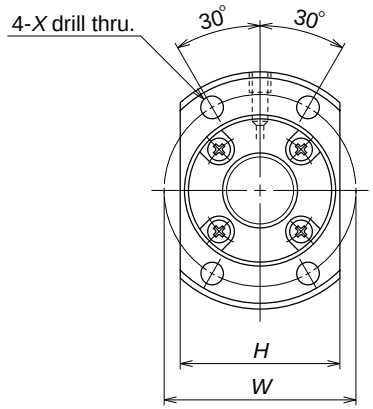
Model No.	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls Turns × Circuits	Basic load rating (N) Dynamic C_a	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
LFFT 2516-2.5	25	16	4.762	26.25	21.3	2.5×1	15700	32800	1600	3350
LFFT 2516-3						1.5×2	18400	38200	1870	3890
LFFT 2520-2.5		20	4.762	26.25	21.3	2.5×1	15700	32800	1600	3350
LFFT 2520-3						1.5×2	18400	38200	1870	3890
LFFT 2525-1.5		25	4.762	26.25	21.3	1.5×1	10100	19100	1030	1950
LFFT 3220-2.5	32	20	4.762	33.25	28.3	2.5×1	17900	41800	1830	4270
LFFT 3220-3						1.5×2	21000	49600	2140	5060
LFFT 3225-2.5		25	4.762	33.25	28.3	2.5×1	17900	41800	1830	4270
LFFT 3225-3						1.5×2	21000	49600	2140	5060
LFFT 3232-1.5		32	4.762	33.25	28.3	1.5×1	11500	24800	1180	2530
LFFT 4025-2.5	40	25	6.35	41.75	35.1	2.5×1	28500	70000	2910	7140
LFFT 4025-3						1.5×2	33400	82400	3410	8400
LFFT 4032-2.5		32	6.35	41.75	35.1	2.5×1	28500	70000	2910	7140
LFFT 4040-1.5		40	6.35	41.75	35.1	1.5×1	18400	41200	1880	4200
LFFT 5025-2.5	50	25	7.938	52.25	44.0	2.5×1	42700	109000	4350	11200
LFFT 5025-3						1.5×2	49900	133000	5090	13600
LFFT 5032-2.5		32	7.938	52.25	44.0	2.5×1	42700	109000	4350	11200
LFFT 5032-3						1.5×2	49900	133000	5090	13600
LFFT 5040-2.5		40	7.938	52.25	44.0	2.5×1	42700	109000	4350	11200
LFFT 5050-1.5		50	7.938	52.25	44.0	1.5×1	27500	66500	2800	6780
LFFT 6340-2.5	63	40	7.938	65.25	57.0	2.5×1	48500	139000	4950	14200
LFFT 6340-3						1.5×2	56800	165000	5790	16800
LFFT 6350-1.5		50	7.938	65.25	57.0	1.5×1	31300	82500	3190	8410
LFFT 6350-2.5						2.5×1	48500	139000	4950	14200

Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	B	F	E	L	M	W	X	U	V	R	Q
490	50	44	71	11	58	5	155	6	57	6.6	31	35	12	M6×1
577	58				74		187							
490	50	44	71	11	74	5	189	7	57	6.6	31	35	12	M6×1
577	58				94		229							
308	31	44	71	11	68	5	183	10	57	6.6	32	34	12	M6×1
604	61	51	85	13	71	7	189	7	67	9	34	42	12	M6×1
708	72				91		229							
604	61	51	85	13	90	7	233	10	67	9	34	42	12	M6×1
708	72				115		283							
376	38	51	85	13	69	6	196	13	67	9	34	42	12	M6×1
737	75	64	106	17	87	8	236	10	84	11	42	52	15	PT1/8
873	89				112		286							
737	75	64	106	17	114	8	296	13	84	11	42	52	15	PT1/8
465	47	64	106	17	85	7	243	16	84	11	42	52	15	PT1/8
905	92	80	126	20	85	6	238	11	102	14	52	64	19	PT1/8
1070	109				110		288							
905	92	80	126	20	110	10	298	14	102	14	52	64	19	PT1/8
1070	109				142		362							
922	94	80	126	18	125	6	326	17	102	14	52	64	19	PT1/8
572	58	80	126	20	104	10	300	21	102	14	52	64	19	PT1/8
1100	112	97	144	18	127	6	326	15	120	14	58	77	19	PT1/8
1310	133				167		406							
678	69	97	144	20	105	12	300	19	120	14	58	77	19	PT1/8
1120	113				155		400							

Remarks 1. If there is no seal, the nut length is shorter by the length of "2 x M" than those with a seal.
2. Right turn screw is standard. "L" is added to the end of the model number for left turn screw.

3. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the preload is 10% of the basic dynamic load rating (C_a), and the axial load is applied to it. Refer to "Technical description" (Page B467) if preload differs from the conditions above, or when considering change in the deformation of the ball nut itself.





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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
LSFC 1616-3 LPFC 1616-3	16	16	2.778	16.65	13.7	1.7×2	6380	12500	650	1280
LSFC 1616-6 LPFC 1616-6						1.7×4	11600	25000	1180	2550
LSFC 2020-3 LPFC 2020-3	20	20	3.175	20.75	17.4	1.7×2	9620	21000	980	2140
LSFC 2020-6 LPFC 2020-6						1.7×4	17500	42000	1780	4280
LSFC 2525-3 LPFC 2525-3	25	25	3.969	26.0	21.9	1.7×2	14400	32800	1470	3350
LSFC 2525-6 LPFC 2525-6						1.7×4	26100	65600	2660	6690
LSFC 3232-3 LPFC 3232-3	32	32	4.762	33.25	28.3	1.7×2	21000	51600	2140	5260
LSFC 3232-6 LPFC 3232-6						1.7×4	38100	103000	3890	10500
LSFC 4040-3 LPFC 4040-3	40	40	6.35	41.75	35.2	1.7×2	33500	86500	3410	8820
LSFC 4040-6 LPFC 4040-6						1.7×4	60800	173000	6200	17600
LSFC 5050-3 LPFC 5050-3	50	50	7.938	52.25	44.1	1.7×2	50000	135000	5100	13800
LSFC 5050-6 LPFC 5050-6						1.7×4	90800	270000	9260	27600

Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	H	B	E	F	L	W	X	Q
188 293	19 29	32	53	34	10	10	18	38	42	4.5	M6×1
365 567	37 57										
260 404	26 41	39	62	41	10	11.5	24.5	46	50	5.5	M6×1
505 784	51 79										
320 499	32 50	47	74	49	12	13	30	55	60	6.6	M6×1
620 965	63 98										
400 623	40 63	58	92	60	12	16	42	70	74	9	M6×1
775 1210	79 123										
497 773	50 78	73	114	75	15	19.5	50.5	85	93	11	M6×1
962 1500	98 152										
611 952	62 97	90	135	92	20	21.5	65.5	107	112	14	M6×1
1180 1840	120 188										

Remarks For LSFC, rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when the axial load is 30% of the dynamic load rating (Ca). For LPFC, rigidities are theoretical values when a preload is 5% of the dynamic load rating, and axial load is applied to it. Refer to "Technical Description" (Page B467) if axial load and pre-load differ from the conditions above, or when considering change in the deformation of the ball nut itself.

B-I-7.5 U Type (High helix • ultra high helix lead) Ball Screws

(1) Product categories

U Type ball screws use end cap recirculation system. There are several models by difference in the preload system (Table I-7•5). Since the leads are in the range of larger than 1.3 times of the screw shaft diameter, U Type is even more suitable than L Type for high-speed operation.

Table I-7•5 Classification of U Type ball screws

Nut models	Shape	Flange shape	Nut shape	Recirculation system Preload system	Page
USFC		Flanged Rectangle	Circular	End cap Non-pre-loaded, slight axial play	B401
UPFC		Flanged Rectangle	Circular	End cap (light load) No spacer ball	B401

(2) Features

● High-speed operation

The ratio of lead to screw shaft diameter is larger than 1. This is a quite suitable specification for high-speed feed. The lead with the ratio of three times or larger than screw shaft diameter (three-times lead) is particularly ideal for high-speed operation.

(Example) High-speed feed at 180 m/min.
Lead 50 mm → 3600 rpm
60 mm → 3000 rpm
80 mm → 2250 rpm

● Low noise

The three-times lead significantly reduces noise more than the 2-times lead under the same traveling speed.

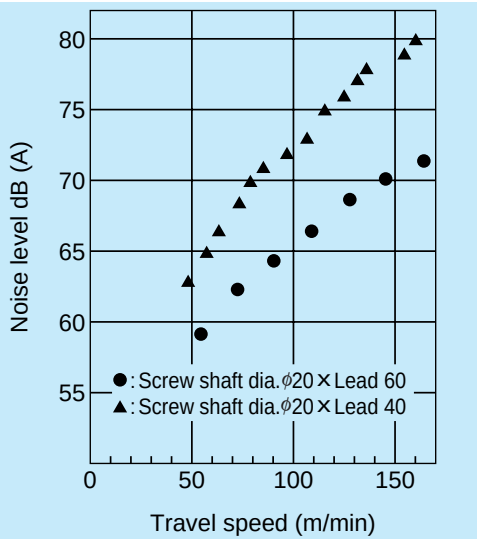


Fig. I-7.4 Noise levels by ultra high helix lead

(3) Accuracy grades

Three-times lead·····C5, Ct7 grades are available.
Other····· C3, C5, Ct7 grades are available.
※Please consult NSK for C2 or higher grades.

(4) Precaution in designing shaft end

Please note that it is impossible to assemble nut unless one end of ball thread of screw shaft is cut through, and unless the shaft end of this side is smaller than the ball groove root diameter.

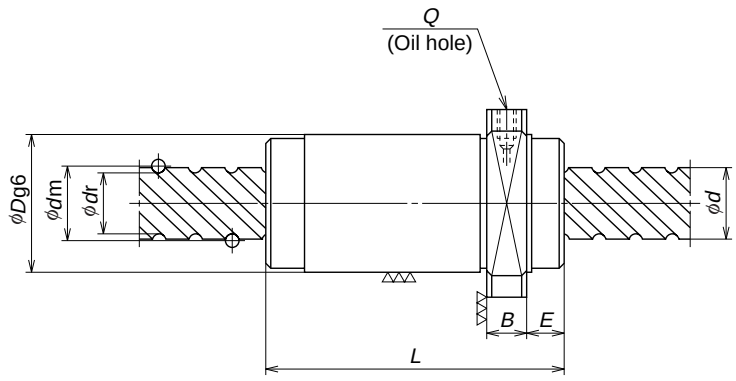
(5) Models number

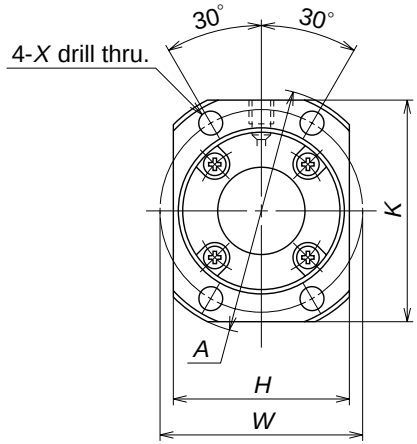
A model number that indicates specification factors is structured as shown below.

(Example) Nut model USFC; shaft diameter 12 mm; lead 20 mm; effective turns of balls 1.5

USFC 12 20 – 1.5

- USFC: Nut model
- 12: Shaft diameter
- 20: Lead
- 1.5: Effective turns of balls



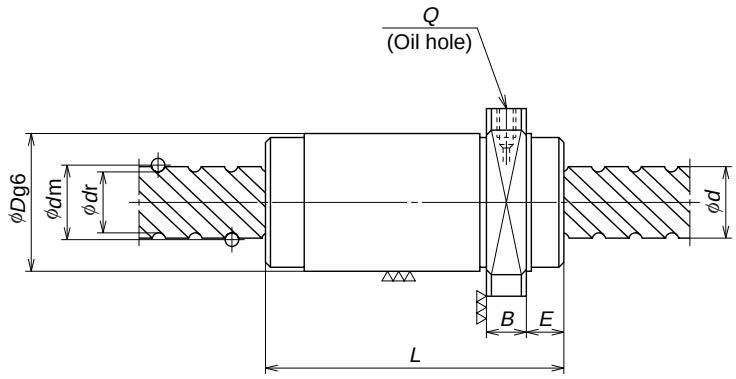


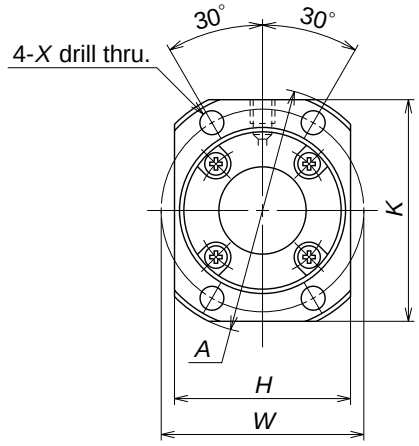
Unit: mm

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	Static C_{0a}	{kgf} Dynamic C_a	Static C_{0a}
USFC 1220-1.5 UPFC 1220-1.5	12	20	2.381	12.5	9.9	1.7×1	2690	4420	275	450
USFC 1520-1.5 UPFC 1520-1.5	15	20	3.175	15.5	12.2	1.7×1	5070	8730	515	890
USFC 1540-1 UPFC 1540-1		40	3.175	15.5	12.2	0.7×2	3860	6050	395	615
USFC 1540-2 UPFC 1540-2				15.5	12.2	0.7×4	7000	12100	715	1230
USFC 1632-1 UPFC 1632-1	16	32	3.175	16.75	13.4	0.7×2	4000	6690	410	680
USFC 1632-3 UPFC 1632-3				16.75	13.4	1.7×2	8580	17000	875	1740
USFC 1632-6 UPFC 1632-6				16.75	13.4	1.7×4	15600	34100	1590	3470
USFC 1650-1 UPFC 1650-1		50	3.175	16.75	13.4	0.7×2	4000	6690	410	680
USFC 1650-2 UPFC 1650-2				16.75	13.4	0.7×4	7260	13400	740	1360
USFC 2040-1 UPFC 2040-1	20	40	3.175	20.75	17.4	0.7×2	4490	8640	460	880
USFC 2040-3 UPFC 2040-3				20.75	17.4	1.7×2	9620	21000	980	2140
USFC 2040-6 UPFC 2040-6				20.75	17.4	1.7×4	17500	42000	1780	4280

Axial rigidity K (N/μm)	{kgf/μm}	Ball nut dimensions D	A	H	K	B	E	L	W	X	Q
83	8	26	44	28	40	10	9	44	35	4.5	M6×1
129	13										
113	12	34	55	36	50	10	11	45	45	5.5	M6×1
176	18										
105	11	32	53	33	48	10	12	40	43	5.5	M6×1
163	17										
203	21	32	53	33	48	10	12	40	43	5.5	M6×1
315	32										
102	10	34	55	36	50	10	10.5	34	45	5.5	M6×1
159	16										
240	25	34	55	36	50	10	10.5	66	45	5.5	M6×1
374	38										
466	48	34	55	36	50	10	10.5	66	45	5.5	M6×1
725	74										
124	13	34	55	36	50	10	12	50	45	5.5	M6×1
194	20										
240	25	34	55	36	50	10	12	50	45	5.5	M6×1
374	38										
122	12	38	58	40	52	10	11	41	48	5.5	M6×1
191	19										
290	30	38	58	40	52	10	11	81	48	5.5	M6×1
451	46										
562	57	38	58	40	52	10	11	81	48	5.5	M6×1
875	89										

Remarks For USFC, rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when axial load is 30% of the dynamic load rating (C_a).
For UPFC, rigidities are theoretical values when preload is 5% of the dynamic load rating, and axial load is applied to it. Refer to "Technical Description" (Page B467) if axial load and preload differ from the conditions above, or when considering change in the deformation of the ball nut itself.





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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
USFC 2060-1 UPFC 2060-1	20	60	3.175	20.75	17.4	0.7×2	4490	8640	460	880
USFC 2060-2 UPFC 2060-2				20.75	17.4	0.7×4	8140	17300	830	1760
USFC 2550-1 UPFC 2550-1	25	50	3.969	26	21.9	0.7×2	6700	13500	685	1380
USFC 2550-3 UPFC 2550-3				26	21.9	1.7×2	14400	32800	1470	3350
USFC 2550-6 UPFC 2550-6				26	21.9	1.7×4	26100	65600	2660	6690
USFC 2580-1 UPFC 2580-1		80	3.969	26	21.9	0.7×2	6700	13500	685	1380
USFC 2580-2 UPFC 2580-2				26	21.9	0.7×4	12200	27000	1240	2750
USFC 3264-1 UPFC 3264-1	32	64	4.762	33.25	28.3	0.7×2	9800	20900	1000	2130
USFC 3264-3 UPFC 3264-3				33.25	28.3	1.7×2	21000	51600	2140	5260
USFC 3264-6 UPFC 3264-6				33.25	28.3	1.7×4	38100	103000	3890	10500

Axial rigidity K (N/μm)	Axial rigidity K {kgf/μm}	Ball nut dimensions D	A	H	K	B	E	L	W	X	Q
143 224	14 22	38	58	40	52	10	12.3	58	48	5.5	M6×1
278 433	28 44	38	58	40	52	10	12.3	58	48	5.5	M6×1
150 234	15 23	46	70	48	63	12	13	50	58	6.6	M6×1
363 565	37 57	46	70	48	63	12	13	100	58	6.6	M6×1
703 1090	71 111	46	70	48	63	12	13	100	58	6.6	M6×1
184 288	18 29	46	70	48	63	12	14.5	75	58	6.6	M6×1
359 558	36 56	46	70	48	63	12	14.5	75	58	6.6	M6×1
196 305	20 31	58	92	60	82	12	15.5	62	74	9	M6×1
452 703	46 71	58	92	60	82	12	15.5	126	74	9	M6×1
879 1360	89 139	58	92	60	82	12	15.5	126	74	9	M6×1

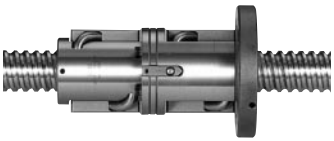
Remarks For USFC, rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when axial load is 30% of the dynamic load rating (C_a).
For UPFC, rigidities are theoretical values when preload is 5% of the dynamic load rating, and axial load is applied to it. Refer to "Technical Description" (Page B467) if axial load and preload differ from the conditions above, or when considering change in the deformation of the ball nut itself.

B-I-7.6 HMC Series (Ball screws for high-speed machine tools)

(1) Product categories

HMC Series ball screws use return tube recirculation system. There are several models by difference in the preload system (Table I-7•6).

Table I-7•6 Classification of HMC Series

Nut models	Shape	Flange shape	Preload system	Nut length	Page
HZC HZF		Flanged Circular I	Z preload (medium preload)	Medium	B407
HDC HDF		Flanged Circular I	Z preload (medium preload)	Long	B409

(2) Features

- High-speed traveling

High helix leads of 20 mm to 30 mm are used. Furthermore, the ball recirculation return tube is reinforced to make a high-speed traveling of 40 m ~ 72 m/min. possible.

- Low vibration, low noise

Vibration and noise are reduced by NSK's accumulated know-how (See the figure on right).

- 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.
Comparison with current products -- about 80% increase in rigidity, 60% increase in load rating.

- Compact nut

The size of nut diameter and length were reduced.
Comparison with current products -- about 50% reduction in volume.

- Measures against thermal expansion

As measures against thermal error, a hollow shaft ball screw for forced cooling is optional. Please consult NSK.

(3) Accuracy grades

C3 and C5 are available.

※Please consult NSK for C2 grade and higher accuracy grades.

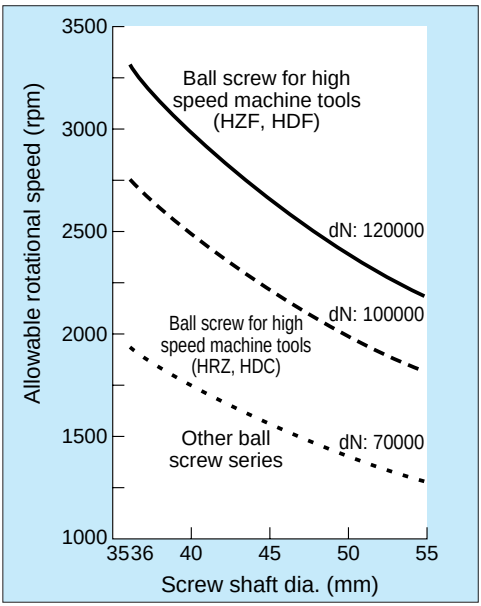


Fig. I-7•5 Comparison of permissible rotational speed

(4) Permissible rotational speed

HMC ball screws are made to high-speed specifications.

Use under the conditions below (Refer to Fig. I-7•5).

HZC, HDC ····· $dm \cdot N \leqq 100\,000$

HZF, HDF ····· $dm \cdot N \leqq 120\,000$

※Consider critical speed after deciding on the travel and screw shaft support conditions.

For details, see "Technical Description: Permissible rotational speed" (Page B455).

(5) Model number

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

(Example) Nut model HZF; shaft diameter 40 mm; lead 20 mm; effective turns of balls 2.5

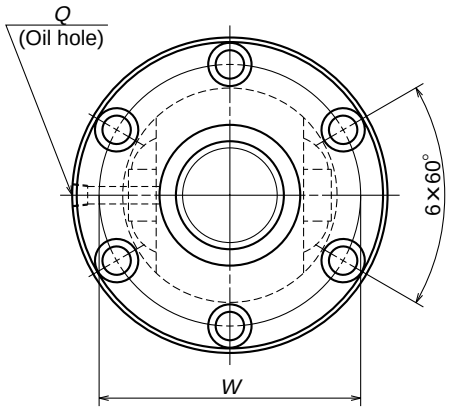
HZFT 40 20 – 2.5

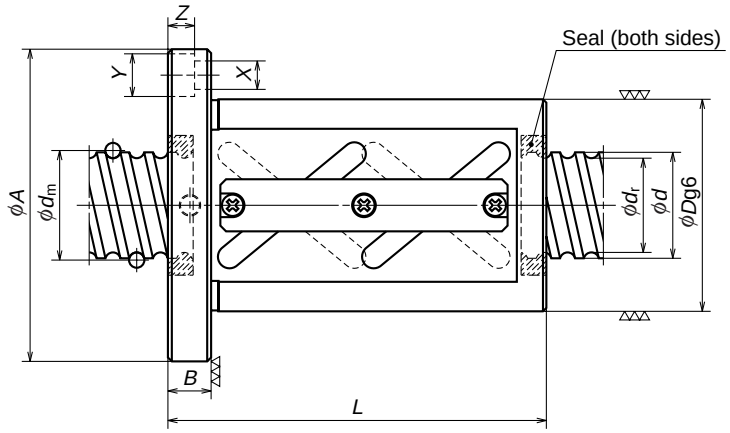
Nut model

Shaft diameter

Lead

Effective turns of balls





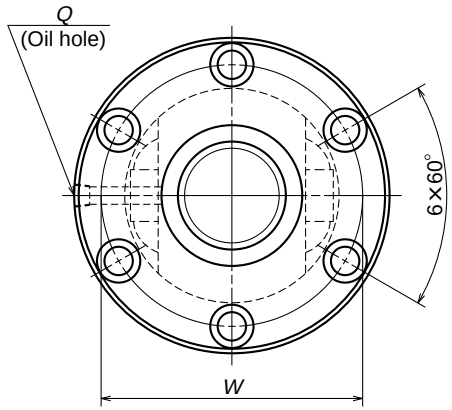
Unit: mm

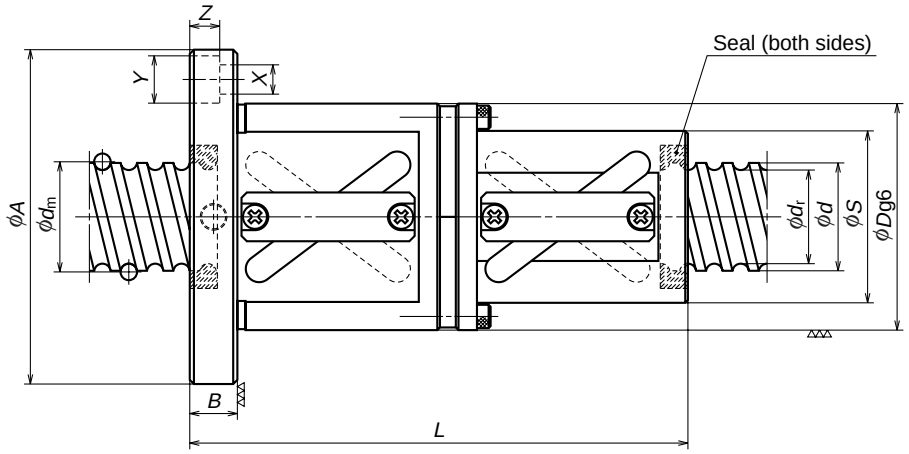
Model No.	Shaft dia. *d*	Lead *l*	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls Turns × Circuits	Basic load rating (N) Dynamic C_a	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
HZC 3620-3.5 **HZF 3620-3.5**	36	20	6.35	37	30.4	3.5×1	44000	98500	4490	10000
HZC 4020-3.5 **HZF 4020-3.5**	40	20	6.35	41	34.4	3.5×1	46100	107000	4700	10900
HZC 4020-5 **HZF 4020-5**						2.5×2	62600	153000	6380	15600
HZC 4520-3.5 **HZF 4520-3.5**	45	20	6.35	46	39.4	3.5×1	47600	120000	4860	12300
HZC 4520-5 **HZF 4520-5**						2.5×2	64700	170000	6600	17400
HZC 4525-3.5 **HZF 4525-3.5**		25	7.144	46.5	39.1	3.5×1	56800	137000	5790	14000
HZF 5020-3.5	50	20	6.35	51	44.4	3.5×1	50400	133000	5140	13600
HZF 5020-5						2.5×2	68500	191000	6980	19500
HZF 5025-3.5		25	7.144	51.5	44.1	3.5×1	58900	152000	6010	15500
HZF 5025-5						2.5×2	80100	216000	8170	22000
HZF 5030-3.5		30	7.144	51.5	44.1	3.5×1	58900	152000	6010	15500
HZF 5520-3.5	55	20	6.35	56	49.4	3.5×1	51600	145000	5270	14800
HZF 5520-5						2.5×2	70200	208000	7160	21200
HZF 5530-3.5		30	7.144	56	49.4	3.5×1	62600	165000	6380	16800

Axial rigidity *K* (N/μm)	Axial rigidity *K* {kgf/μm}	Ball nut dimensions *D*	*A*	*B*	*L*	*W*	*X*	*Y*	*Z*	*Q*
1060	108	78 94	120 136	18	121	98 114	11	17.5	11	PT1/8
1150	116	82 96	124 138	18	121	102 116	11	17.5	11	PT1/8
1610	164	82 96	124 138	18	161	102 116	11	17.5	11	PT1/8
1250	127	88 98	130 140	18	122	108 118	11	17.5	11	PT1/8
1760	179	88 98	130 140	18	162	108 118	11	17.5	11	PT1/8
1280	131	92 101	134 143	18	141	112 121	11	17.5	11	PT1/8
1360 1910	138 194	101	143	18	122 162	121	11	17.5	11	PT1/8
1400 1960	142 200	103	145	18	141 191	123	11	17.5	11	PT1/8
1400	141	103	145	18	159	123	11	17.5	11	PT1/8
1460 2050	149 208	103	145	18	122 162	123	11	17.5	11	PT1/8
1520	155	105	147	18	159	125	11	17.5	11	PT1/8

Remarks 1. Right turn screw is standard. Consult NSK for left turn screws.
2. Seal is standard.

3. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when an axial load is applied, and the preload is 0.1Ca. Refer to "Technical Description" (Page B467) if preload differs from the conditions above, or when considering change in the deformation of the ball nut itself.





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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
HDC 3620-5 **HDF 3620-5**	36	20	6.35	37	30.4	2.5×2	59800	138000	6100	14100
HDC 4525-5 **HDF 4525-5**	45	25	7.144	46.5	39.1	2.5×2	77200	197000	7870	20100
HDF 5030-5	50	30	7.144	51.5	44.1	2.5×2	80100	216000	8100	22000
HDF 5530-5	55	30	7.144	56.5	49.1	2.5×2	85000	238000	8670	24300

Axial rigidity *K* (N/μm)	Axial rigidity *K* {kgf/μm}	Ball nut dimensions *D*	*A*	*B*	*L*	*S*	*W*	*X*	*Y*	*Z*	*Q*
1480	151	78 94	120 136	18	191	60 76	98 114	11	17.5	11	PT1/8
1800	183	92 101	134 143	18	228.5	74 83	112 121	11	17.5	11	PT1/8
1960	200	103	145	18	249	85	123	11	17.5	11	PT1/8
2120	216	105	147	18	249	87	125	11	17.5	11	PT1/8

Remarks 1. Right turn screw is standard. Consult NSK for left turn screws.
2. Seal is standard.

3. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when an axial load is applied, and the preload is 0.1Ca. Refer to "Technical Description" (Page B467) if preload differs from the conditions above, or when considering change in the deformation of the ball nut itself.

B-I-7.7 HTF Series (Ball screws for high load drive)

(1) Product categories

HTF Series ball screws use return tube recirculation system. Their structure and features are as follows.

Table I-7•7 HTF Series

Nut models	Shape	Flange shape	Preload system	Page
HTF		Flanged Circular I	Non-preloaded	B413

(2) 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 types

Nine types of shaft diameter/lead combinations are available.

- Respond to various shaft end configuration

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

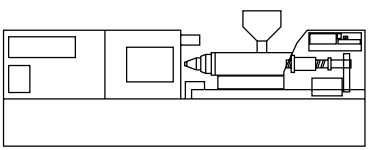
HTH Series can be used with: Key seat, involute spline (JIS B 1603), straight sided spline (JIS B 1601), spur gear, etc.

(3) Application

HTF ball screws have made electric drive under high load possible that had previously been unattainable. Therefore, they are capable of highly precise positioning without relying on a hydraulic cylinder. They also reduce equipment sizes, and increase maintenance efficiency.

Major applications: Injection molding machine, press machine, IC molding press, die cast machine, power cylinder, friction welding machine, etc.

Example



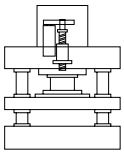


Fig. I-7•6

(4) Accuracy grades

C5 and Ct7 are available.

※Please consult NSK for accuracy grade C3 and higher.

(5) Precaution in designing

HTF ball screws are for high load drive. Design of shaft end should take this into account. Please request NSK for assistance in designing.
Refer to the figure below for the direction of nut installation.

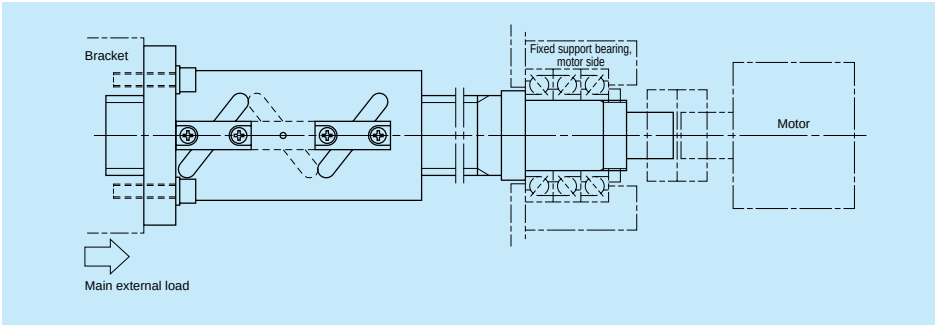


Fig. I-7•7 Example of ball screw installation

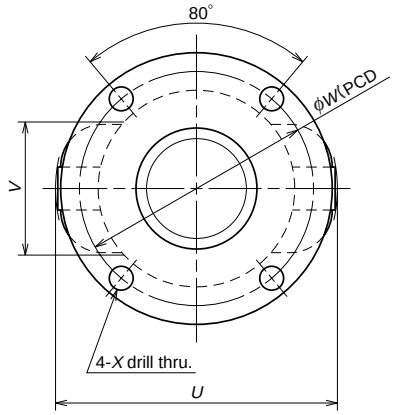
(6) Model number

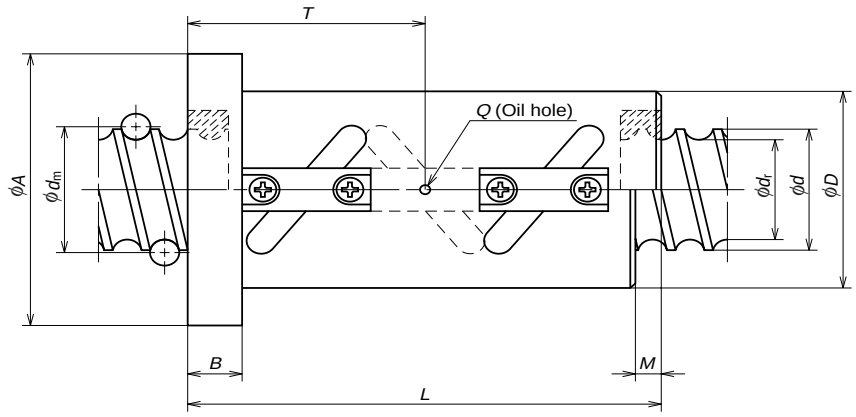
A model number that indicates specification factors is structured as shown below.

Nut model HTF; shaft diameter 63 mm; lead 20 mm; effective turns of balls 7.5

HTF6320-7.5

- HTF: Nut model
- 63: Shaft diameter
- 20: Lead
- 7.5: Effective turns of balls





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	(N) Static C_{0a}	{kgf} Dynamic C_a	{kgf} Static C_{0a}
HTF 5016-7.5	50	16	12.700	53	39.6	2.5×3	306000	844000	31200	86000
HTF 5516-7.5	55	16	12.700	58	44.6	2.5×3	319000	923000	32500	94200
HTF 6316-7.5	63	16	12.700	66	52.6	2.5×3	342000	1080000	34900	110000
HTF 6320-7.5	63	20	15.875	66	49.2	2.5×3	457000	1320000	46600	134000
HTF 8020-7.5	80	20	15.875	83	66.2	2.5×3	511000	1690000	52100	172000
HTF 8025-7.5	80	25	19.050	84	64.0	2.5×3	663000	2020000	67700	206000
HTF 10020-7.5	100	20	15.875	103	86.2	2.5×3	571000	2140000	59800	218000
HTF 10025-7.5	100	25	19.050	104	84.0	2.5×3	734000	2550000	74800	260000
HTF 12025-7.5	120	25	19.050	124	104.0	2.5×3	792000	3080000	80700	314000

Axial rigidity K (N/μm)	{kgf/μm}	Ball nut dimensions D	A	B	L	M	W	X	U	V	Q	T
2210	225	95	129	28	223	10	112	9	136	66	PT1/8	117
2370	241	99	133	28	223	10	116	9	140	70	PT1/8	117
2670	272	105	139	28	223	10	122	9	145	77	PT1/8	117
2720	277	117	157	32	273	17	137	11	167	81	PT1/8	143
3290	335	130	170	32	273	17	150	11	179	95	PT1/8	143
3400	346	145	185	40	316	17	165	11	204	99	PT1/8	170
3960	404	145	187	32	273	17	167	11	202	111	PT1/8	143
4060	414	159	199	40	316	17	179	11	217	115	PT1/8	170
4700	478	173	213	40	316	17	193	11	232	131	PT1/8	170

Remarks 1. Right turn screw is standard. Consult NSK for left turn screws.
2. If there is no seal, the nut length is shorter by the lengths of "M" than those with a seal.
3. Rigidities in the Table are theoretical values obtained from the elastic deformation between screw groove and balls when preload is 30% of the dynamic load rating (Ca), and axial load is applied. Refer to "Technical Description" (Page B467) if axial load differs from the conditions above, or when considering change in the deformation of the ball nut itself.

B-I-8 Special Ball Screws: Dimension Table and Model Numbers

BALL SCREWS

B-I-8.1 NDT Series (Ball screws with rotatable nut)

Nut- rotatable ball screws were developed as they are beneficial for machines, such as electronic components mounting machines, punching presses, laser processing machines, woodworking machines, industrial robots, and various other material handling systems, for which the long travel yet high speed operation is crucial factor.

(1) Structure

◇ Screw shaft is secured to the base of the machine to allow more than one nut being driven on the shaft. (Nuts rotate and move along the screw shaft.)

◇ Bearing balls were placed between the mount housing and the nut.

◇ A timing pulley (prepared by the user) is directly secured to the end face of the nut.

◇ Due to the vibration energy absorbing system - a vibration damper (optional) - a rotational speed can be set more higher than the current system. See next page for more details. (Patent pending.)

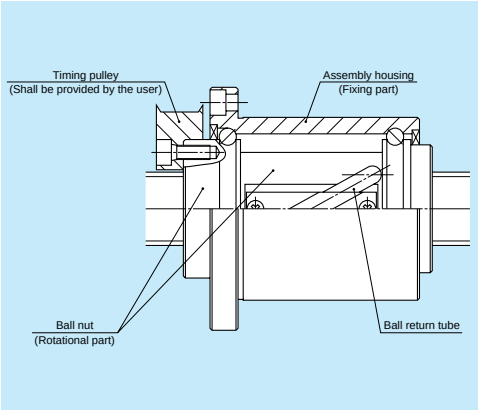


Fig. I-8•1 Ball nut structure

(2) Features

● Multi-nut drive

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

● Long stroke, high-speed travel

Medium and high helix lead ball screws allow faster traveling with lower rotations. The vibration damper (optional) allows operation beyond the critical speed limit, further increasing speed.

● Easy installation

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

● Abundant series

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) Accuracy grade and axial play

◇ Accuracy grades

C3, C5, Ct7 are available.

* Please consult NSK for grades higher than the above, and for rolled screw shaft specification (Ct10).

◇Axial play

Unit: mm

Code	Z	T	S
Axial play	0	0.005	0.020

Combination of accuracy grades and axial play

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

(4) Permissible rotational speed

Either the dm・n value or the critical speed, which is smaller, should be the permissible rotational speed of the ball screw.

* The basic concept is the same as that of general ball screws. Refer to "Technical Description: Permissible rotational speed" (Page B455).

◇ dm・n value

Use lower dm・n value (dm: ball pitch diameter, mm; n: rotational speed per minute, rpm) than those shown in the table below.

Standard specification	dm・n	≦	70000
High-speed specification	dm・n	≦	100000

* Please consult NSK for high-speed specifications. Basic measures must be taken for the high speed ball screws respectively.

◇ Critical speed n_c

$$n_c = f\frac{d_r}{L^2}\times 10^7 \text{ (rpm)} \cdots\cdots (\text{I}-1)$$

d_r: Screw shaft root diameter [See the dimension table]

L: Unsupported length (mm) [See Fig. I-8•2 Unsupported length]

f: Factor determined by the ball screw shaft end mounting method

As shown in Fig. I-8•2, calculate unsupported length (mm) of L1, L2, and L3. (Assumed that the nut section is secured.)

Shaft end mounting method	f
Simple -- Simple support	9.7
Fixed -- Simple support	15.1
Fixed - Fixed support	21.9
Fixed -- Free support	3.4

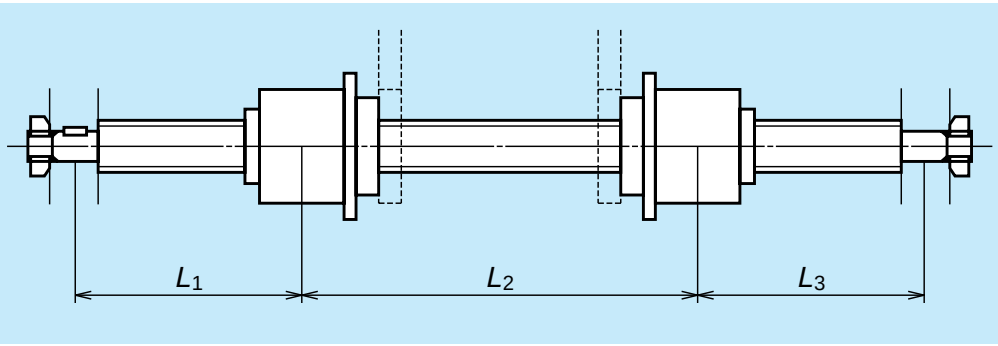


Fig. I-8•2 Unsupported length

◇ Vibration damper to negate critical speed

Use a vibration damper (optional) where a desired rotational speed cannot be obtained because the critical speed of the screw is low, whereas there is no problem with the dm・n value. A vibration damper (patent pending) is installed in the hollow of the screw shaft. This reduces vibration, allowing operation which exceeds the critical speed limit.

* Operation exceeding dm・n value is impossible even though a vibration damper is installed. Please consult NSK regarding this case.

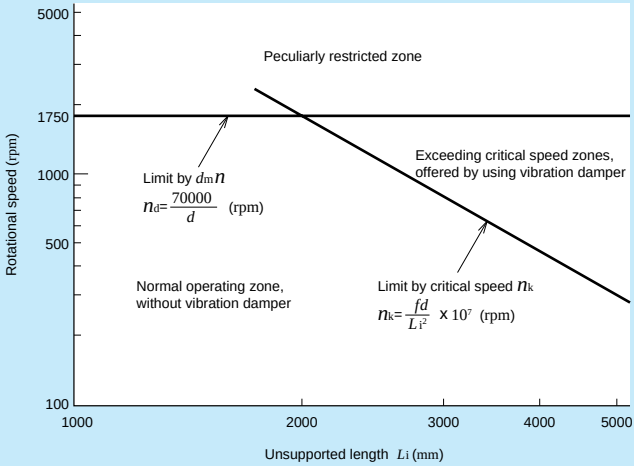


Fig. I-8•3 Effect of a vibration damper (with shaft diameter 40 mm)

[Calculation example]

Assume a system which moves two nuts on a shaft as shown at right.

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?

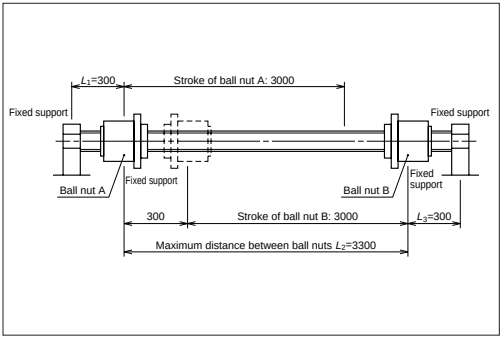


Fig. I-8.4 Drill in case of two nuts

[Answer]

The rotational speed n (rpm) when the lead of the ball screw is 40 mm, and the travel speed is at 60 m/min is:

$$n = \frac{60 \times 10^3}{40} = 1500(\text{rpm})$$

• Calculate dm • n value $n \leq \frac{70000}{41.75} = 1676(\text{rpm})$

• Calculate critical speed

The maximum unsupported length comes between Nut A and B.

Therefore, L_2 = 3300 (mm), f = 21.9 (Fixed – Fixed)

Root diameter: dr = 35.1 (mm)

$$n \leq \frac{21.9 \times 35.1}{3300^2} \times 10^7 = 804(\text{rpm})$$

The calculation indicates that the dm • 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 1500 rpm.

(5) Specification number

Example **NDT4040–3C5Z1500/1800–2**

- Nut model
- Screw shaft diameter (mm)
- Lead (mm)
- Effective turns of balls (turns x circuit number)
- Accuracy grade code (C3, C5, C7)
- Axial play code (Z, T, S)
- Length of the threaded section (mm)
- Overall screw shaft length (mm)
- Number of nut on a screw shaft

This is an inquiring number used by the user and NSK before reference number is assigned for the item.

(6) Reference number

Example **W4015–123PXU–C5Z40**

- Product code
- Screw shaft diameter (mm)
- Effective threaded length (x100 mm)
- Design serial number
- Accuracy grade code (C3, C5, C7)
- Axial play code (Z, T, S)
- Lead (mm)

This is the number used at the time of ordering. The all codes are determined when specifications are finalized, and the reference number is indicated on the specification drawings and the identification of the item.

(7) Installation example

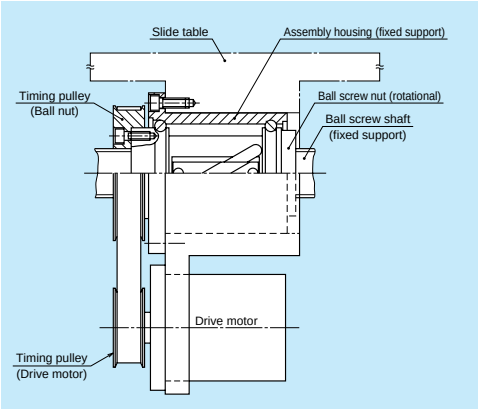
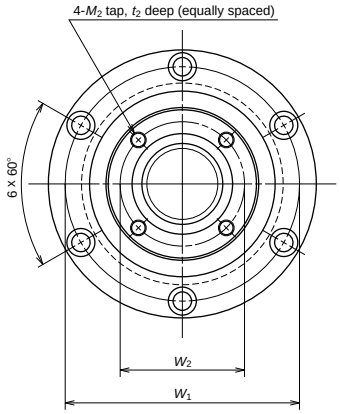


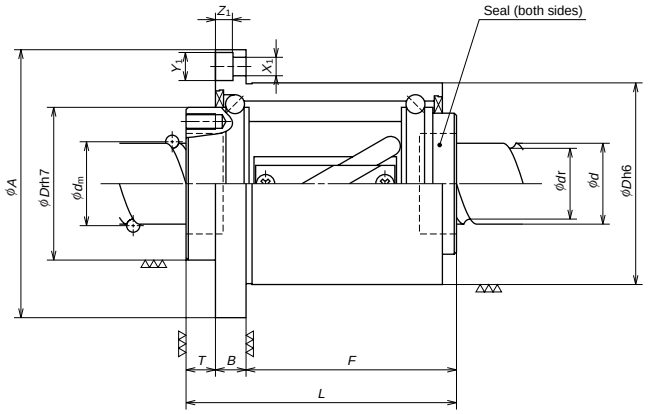
Fig. I-8•5 Example of installation to the table

(8) Precautions in designing

◇One end of the screw thread should be cut-through. 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 "Precautions in Designing" (Page B487) and "Precautions in Handling" (Page B443).





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}	Basic load rating {kgf} Dynamic C_a	Basic load rating {kgf} Static C_{0a}
NDT 3220-2.5	32	20	4.762	33.25	28.3	2.5×1	17900	41800	1830	4270
NDT 3225-2.5		25	4.762	33.25	28.3	2.5×1	17900	41800	1830	4270
NDT 3232-1.5		32	4.762	33.25	28.3	1.5×1	11500	24800	1180	2530
NDT 3232-3						1.5×2	18900	44600	1920	4550
NDT 4025-2.5	40	25	6.35	41.75	35.1	2.5×1	28500	70000	2910	7140
NDT 4032-1.5		32	6.35	41.75	35.1	1.5×1	18400	41200	1880	4200
NDT 4032-3						1.5×2	30100	74100	3060	7560
NDT 4040-1.5		40	6.35	41.75	35.1	1.5×1	18400	41200	1880	7140
NDT 4040-3						1.5×2	30100	74100	3060	7560
NDT 5025-2.5	50	25	7.938	52.25	44.0	2.5×1	42700	109000	4350	11200
NDT 5032-2.5		32	7.938	52.25	44.0	2.5×1	42700	109000	4350	11200
NDT 5040-1.5		40	7.938	52.25	44.0	1.5×1	27500	66500	2800	6780
NDT 5040-3						1.5×2	44900	120000	4580	12200
NDT 5050-1.5		50	7.938	52.25	44.0	1.5×1	27500	66500	2800	6780
NDT 5050-3						1.5×2	44900	120000	4580	12200

Moment of inertia, ball nut J (kg·cm^2) {kgf·m·s^2}		Ball nut mass W (kg)	Ball nut dimensions D	A	D_r	T	B	F	L	W_1	X_1	Y_1	Z_1	W_2	M_2	t_2
6.2	0.632	2.9	78	105	60	12	12	83	107	91	6.6	11	6.5	50	M6	12
6.7	0.683	3.2	78	105	60	12	12	96	120	91	6.6	11	6.5	50	M6	12
6.2	0.632	2.9	78	105	60	12	12	83	107	91	6.6	11	6.5	50	M6	12
19.3	1.97	6.0	100	133	76	15	15	106	136	116	9	14	8.5	62	M8	16
18.0	1.84	5.5	100	133	76	15	15	92	122	116	9	14	8.5	62	M8	16
19.2	1.96	6.0	100	133	76	15	15	106	136	116	9	14	8.5	62	M8	16
45.7	4.66	8.5	120	156	96	15	18	107	140	136	11	17.5	11	78	M10	18
48.9	4.99	9.4	120	156	96	15	18	125	158	136	11	17.5	11	78	M10	18
45.5	4.64	8.5	120	156	96	15	18	107	140	136	11	17.5	11	78	M10	18
48.7	4.97	9.4	120	156	96	15	18	125	158	136	11	17.5	11	78	M10	18

Remarks 1. Right turn screw is standard. Consult NSK for left turn screws.
2. Seal is standard.

B-I-8.2 Ball Screw with Spline: "Robotte"

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.

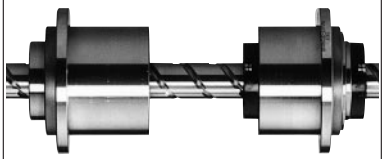
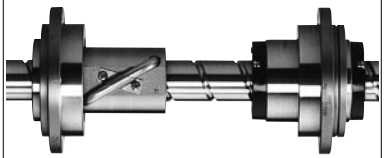
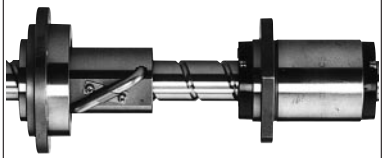
◇Mount housing, nuts, and support bearings are combined into a single unit.
◇Timing pulley (prepared by the user) is directly secured at the end face of the nut.

(1) Structure and series models

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

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 I-8•1 Robotte product categories

Model	Appearance	Size	Structure(Movement)	Page
Σ		Standard	Z+θ Unit	B427
Σz		Standard	Z Unit	B429
Σc		Compact	Z+θ Unit	B431
Σcz		Compact	Z Unit	B433

(2) Features

● 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

Thanks to the ball return tube recirculation system, inertia is low at the ball screw nut section. The inertia was reduced by 19% at most from the NSK current product by end cap system.

(3) Functions

As shown in Fig. I-8•6, the ball screw nut and a spline nut are rotated independently to control rotation value. Thereby the shaft can move in any direction -- up, down, or rotate. Table I-8•2 shows the relationship between power input and output.

● Major applications

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

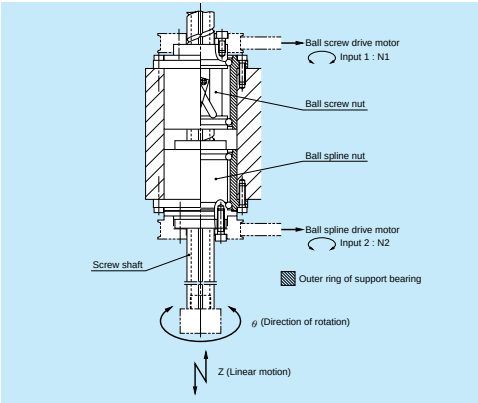


Fig. I-8•6 Example structure of Z axis plus θ axis actuator

Table I-8•2 Power input and output of Robotte

Shaft movement (output)		Input		
Z(mm/min) (Up-down movement)	θ(rpm) (Rotational movement)	①(rpm) Ball screw	②(rpm) Spline	
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±N1	Rotate N1	Rotate N2	N1 ≠ N2

※ l : Lead

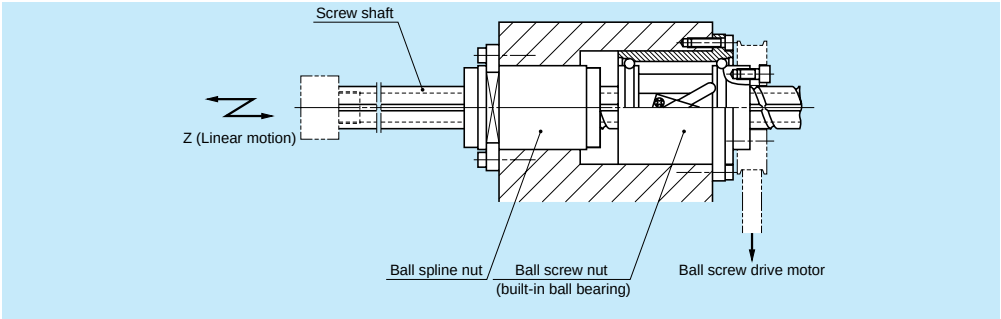


Fig. I-8.7 Example structure of single Z axis unit

(4) 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 are generated 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. I-8•8.

F_a: 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 F_a.

F_r: 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.

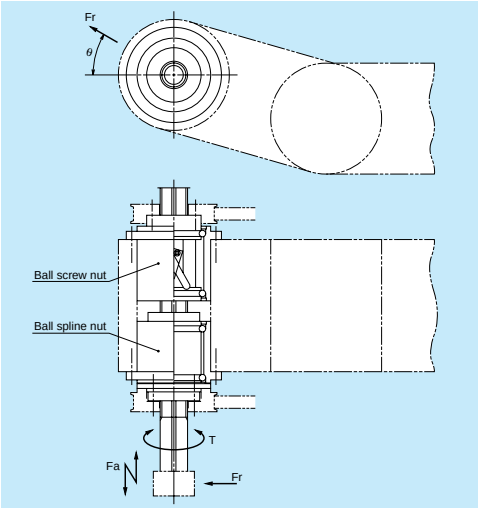


Fig. I-8•8 Load and torque applied to Robotte

(5) Accuracy grades and axial play

◇Accuracy grades (ball screw section)

C3, C5, Ct7 are available.

◇ Axial play (ball screw section)

Unit: mm

Code	Z	T	S
Axial play	0	0.005	0.020

There is no play in spline section.

Combination of accuracy grades of ball screw section and axial play

Unit: mm

Accuracy grade \ Axial play	**Z** **0** (preload)	**T** **0.005** or less	**S** **0.02** or less
C3	C3Z	C3T	C3S
C5	C5Z	C5T	C5S
Ct7	—	—	Ct7S

(6) Specification number and reference number

◇ Specification number

Major specifications are expressed by alphanumeric codes. Specification number is used between the client and NSK for an inquiry until specifications are finalized.

Example of specification number : ∑CZ 2520 – C5 Z–B200 S200 /300

- Model
  - ∑ : Standard type Z +θ unit
  - ∑Z : Standard type Z unit
  - ∑C : Compact type Z +θ unit
  - ∑CZ : Compact type Z unit
- Shaft diameter/ lead
- Accuracy grade C3, C5, C7
- Axial play code (Z, T, S)
- Effective length of ball screw (mm)
- Effective length of spline (mm)
- Overall length of shaft (mm)

◇Reference number

Reference number is entered in the specification drawing as well as in the quotation, and submitted to the client. Please use reference number when ordering.

Reference number is also shown on the wrapping/packing of the product as the identification.

Example of specification number : PW 25 02 – 123 PTU–C5 Z 20

- Nut model
- Shaft diameter
- Effective length of thread (unit in 100 mm)
- Design serial number
- Appearance/specification code
- Accuracy grade
- Axial play code
- Lead (mm)

(7) Precautions in designing

◇ The shaft (overall length L) can be extended to 24 times of the shaft diameter.

◇ To remove the spline nut from the shaft for assembling, use an arbor as shown in Fig. I-8•9. Avoid removing ball screw nut as much as possible. (NSK manufactures the arbors on request.)

◇ For general precautions regarding ball screws, refer to "Precautions in Designing" (Page B481) and "Precautions in Handling" (Page B443).

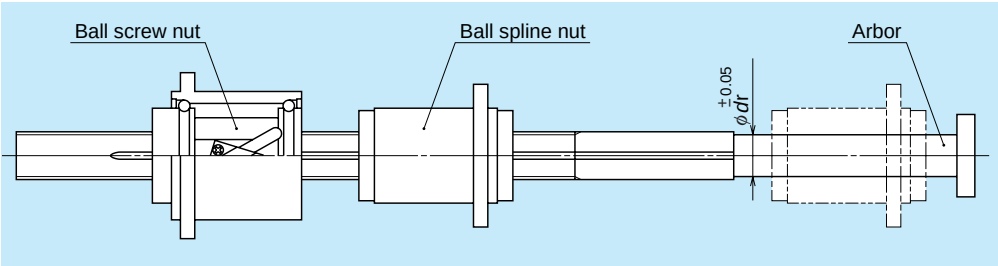
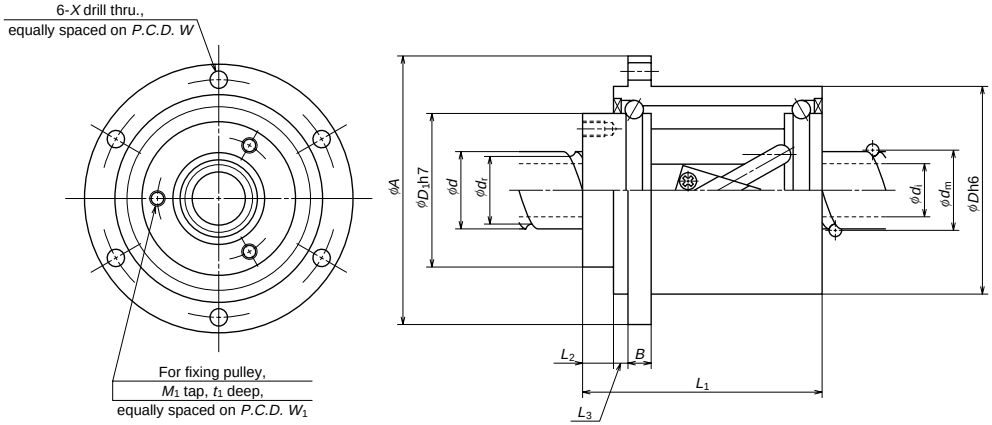
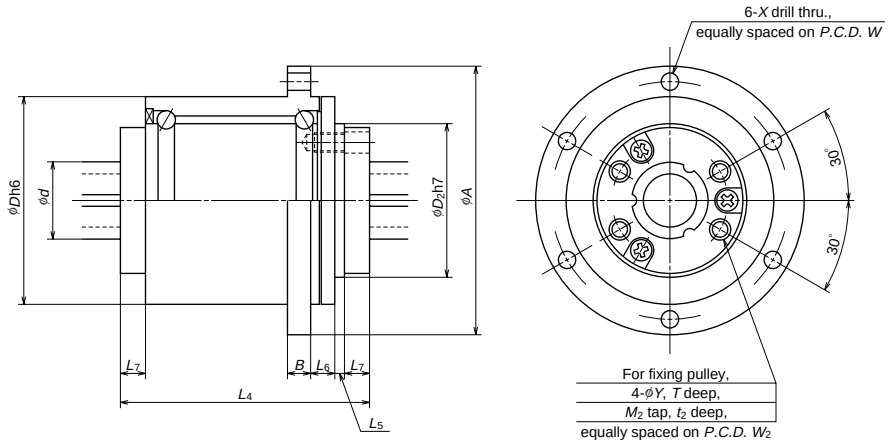


Fig. I-8•9 Removing spline nut



Ball screw nut dimensions

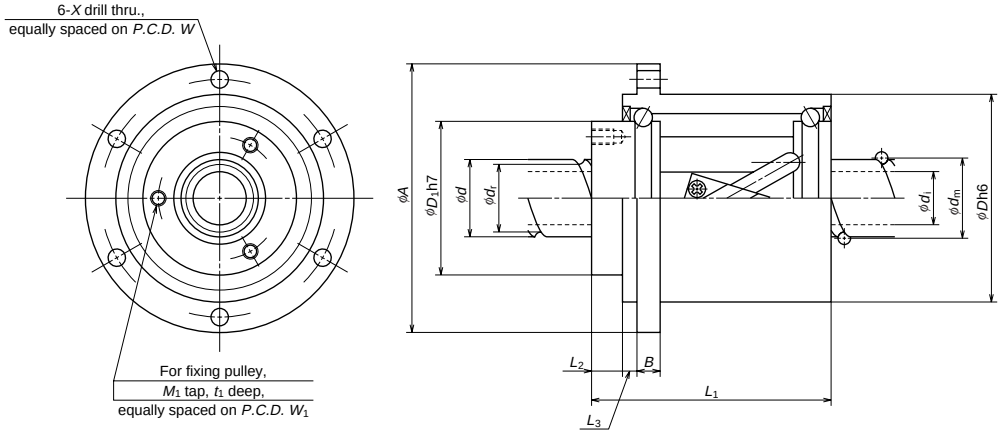
Model No.	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Screw shaft bore d_i	Ball screw nut: Basic load rating N {kgf} C_a	C_{0a}	D	A	B	L_1	L_2	L_3	M_1	t_1	W_1	D_1	W	X	Moment of inertia kg·cm² {x10⁻³kgf·cm·s²}	Mass kg
∑1610	16	10	3.175	16.75	13.4	8	4710 {480}	8110 {825}	48	64	5	47	7	4	3-M4	6	28	35	56	4.5	0.41 {0.42}	0.50
∑1632		32					2990 {305}	4870 {495}				52									0.44 {0.45}	0.55
∑2010	20	10	3.175	20.75	17.4	14	8210 {835}	17500 {1780}	54	70	6	57	8	4	3-M4	6	32	40	62	4.5	0.64 {0.65}	0.74
∑2020		20					5290 {540}	10300 {1050}				63									0.65 {0.66}	0.81
∑2040		40					3360 {345}	6170 {630}				57									0.64 {0.65}	0.74
∑2510	25	10	3.175	25.75	22.4	18	9110 {930}	21900 {2230}	58	74	6	57	8	4	3-M4	6	38	45	66	4.5	1.10 {1.13}	0.81
∑2520		20					5870 {600}	13200 {1340}				63									1.18 {1.20}	0.88
∑2525		25					5870 {600}	13200 {1340}				72									1.30 {1.32}	1.00
∑3220	32	20	3.175	32.75	29.4	25	6540 {665}	16800 {1720}	70	95	8	70	10	6	3-M5	10	44	53	82	6.6	2.60 {2.65}	1.46
∑3232		32					6540 {665}	16800 {1720}				91									3.15 {3.21}	1.83
∑4020	40	20	3.969	41.0	36.9	30	9770 {995}	26300 {2680}	85	110	8	73	10	6	4-M5	10	58	67	96	6.6	5.96 {6.08}	2.02
∑4040		40					9770 {995}	26300 {2680}				107									7.85 {8.01}	2.85
∑4520	45	20	3.969	46.0	41.9	35	10300 {1050}	29700 {3030}	90	115	8	73	10	6	4-M5	10	63	72	101	6.6	7.73 {7.88}	2.17
∑4540		40					10300 {1050}	29700 {3030}				107									10.3 {10.5}	3.06

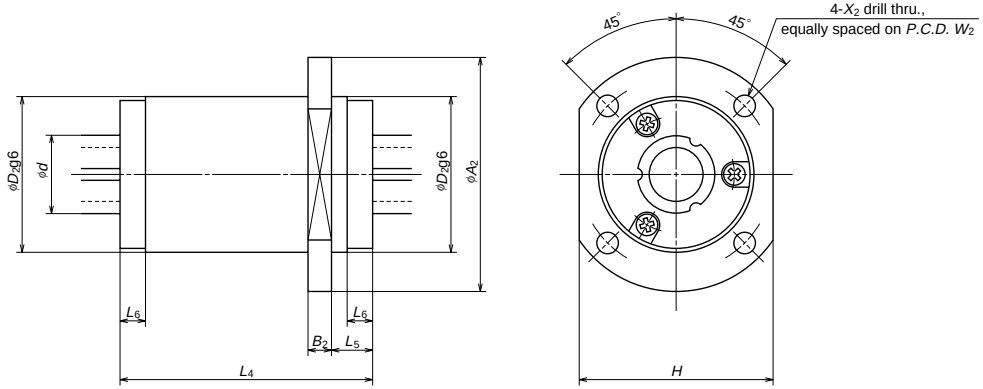


Ball spline nut dimensions

Unit: mm

Ball spline nut: Basic load rating N {kgf} C_r	C_{or}	Basic torque N-m{kgf-m} C_t	C_{ot}	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 {x10⁻³kgf·cm·s²}	Mass kg	Screw shaft dia. d	Model No.
5530 {560}	7270 {740}	61.5 {6.3}	91.3 {9.3}	48	64	5	60	2.5	6.5	6.5	4.5	6.5	M4	7	25	35	56	4.5	0.71 {0.72}	0.63	16	**∑1610**
5890 {600}	7990 {815}	65.5 {6.7}	100 {10.2}																			**∑1632**
6260 {635}	8720 {890}	86.3 {8.8}	135 {13.8}	54	70	6	65	2.5	6.5	6.5	5.5	6.5	M5	8	30.5	40	62	4.5	1.15 {1.17}	0.87	20	**∑2010**
6610 {675}	9450 {965}	91.1 {9.3}	147 {15.0}																			**∑2020**
6610 {675}	9450 {965}	91.1 {9.3}	147 {15.0}																			**∑2040**
6620 {675}	9450 {965}	113 {11.6}	182 {18.6}	58	74	6	70	2.5	6.5	6.5	5.5	6.5	M5	8	35.5	45	66	4.5	1.88 {1.92}	1.03	25	**∑2510**
7290 {745}	9450 {1110}	125 {12.7}	210 {21.5}																			**∑2520**
7290 {745}	9450 {1110}	125 {12.7}	210 {21.5}																			**∑2525**
7630 {775}	11600 {1190}	166 {16.9}	285 {29.1}	70	95	8	75	2.5	7.5	6.5	5.5	6.5	M5	8	42	50	82	6.6	3.80 {3.87}	1.62	32	**∑3220**
7940 {810}	12300 {1260}	173 {17.6}	303 {30.9}																			**∑3232**
10600 {1080}	14700 {1500}	289 {29.5}	454 {46.3}	85	110	8	80	4	7.5	8	5.5	8	M5	8	55	65	96	6.6	9.74 {9.93}	2.38	40	**∑4020**
11100 {1130}	15900 {1620}	304 {31.0}	489 {49.9}																			**∑4040**
11200 {1140}	15900 {1620}	342 {34.9}	548 {55.9}	90	115	8	85	4	7.5	8	5.5	8	M5	8	60	70	101	6.6	12.5 {12.7}	2.56	45	**∑4520**
11700 {1200}	17000 {1730}	358 {36.5}	587 {59.9}																			**∑4540**





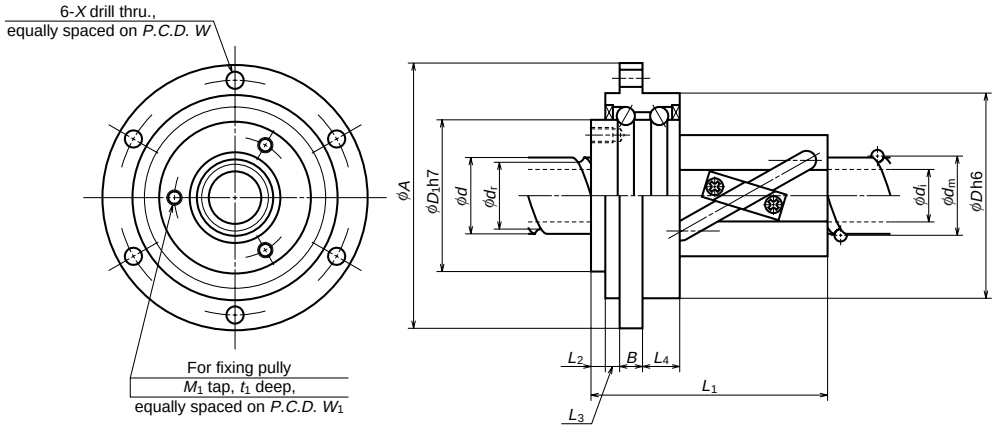
Ball screw nut dimensions

Model No.	Shaft dia. d	Lead l	Ball dia. Dw	Ball circle dia. dm	Root dia. dr	Screw shaft bore di	Ball screw nut: Basic load rating N {kgf} Ca	Ca0a	D	A	B	L1	L2	L3	M1	t1	W1	D1	W	X	Moment of inertia kg·cm² {x10⁻³kgf·cm·s²}	Mass kg
∑Z1610	16	10	3.175	16.75	13.4	8	4710 {480}	8110 {825}	48	64	5	47	7	4	3-M4	6	28	35	56	4.5	0.41 {0.42}	0.50
∑Z1632		32					2990 {305}	4870 {495}				52									0.44 {0.45}	0.55
∑Z2010	20	10	3.175	20.75	17.4	14	8210 {835}	17500 {1780}	54	70	6	57	8	4	3-M4	6	32	40	62	4.5	0.64 {0.65}	0.74
∑Z2020		20					5290 {540}	10300 {1050}				63									0.65 {0.66}	0.81
∑Z2040		40					3360 {345}	6170 {630}				57									0.64 {0.65}	0.74
∑Z2510	25	10	3.175	25.75	22.4	18	9110 {930}	21900 {2230}	58	74	6	57	8	4	3-M4	6	38	45	66	4.5	1.10 {1.13}	0.81
∑Z2520		20					5870 {600}	13200 {1340}				63									1.18 {1.20}	0.88
∑Z2525		25					5870 {600}	13200 {1340}				72									1.30 {1.32}	1.00
∑Z3220	32	20	3.175	32.75	29.4	25	6540 {665}	16800 {1720}	70	95	8	70	10	6	3-M5	10	44	53	82	6.6	2.60 {2.65}	1.46
∑Z3232		32					6540 {665}	16800 {1720}				91									3.15 {3.21}	1.83
∑Z4020	40	20	3.969	41.0	36.9	30	9770 {995}	26300 {2680}	85	110	8	73	10	6	4-M5	10	58	67	96	6.6	5.96 {6.08}	2.02
∑Z4040		40					9770 {995}	26300 {2680}				107									7.85 {8.01}	2.85
∑Z4520	45	20	3.969	46.0	41.9	35	10300 {1050}	29700 {3030}	90	115	8	73	10	6	4-M5	10	63	72	101	6.6	7.73 {7.88}	2.17
∑Z4540		40					10300 {1050}	29700 {3030}				107									10.3 {10.5}	3.06

Ball spline nut dimensions

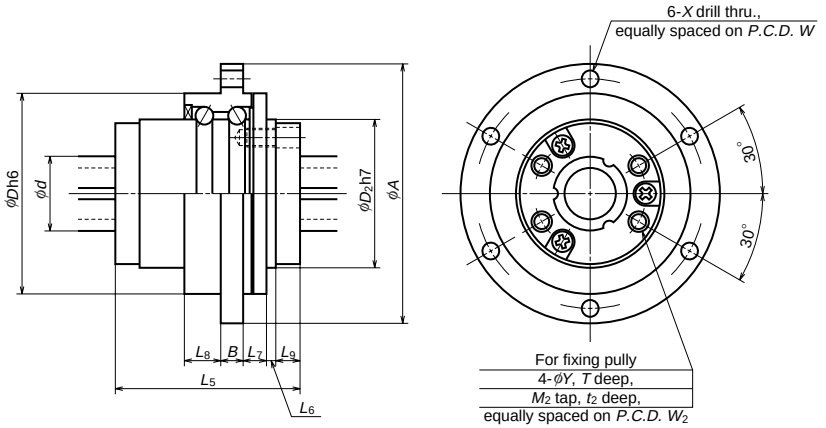
Unit: mm

Ball spline nut: Basic load rating N{kgf} Cr	Cor	Basic torque N-m{kgf-m} Ct	Cot	Dimensions D2	A2	B2	L4	L5	L6	H	W2	X2	Mass kg	Screw shaft dia. d	Model No.
5530 {560}	7270 {740}	61.5 {6.3}	91.3 {9.3}	35	55	6	60	10.5	6.5	45	45	4.5	0.35	16	∑Z1610
5890 {600}	7990 {815}	65.5 {6.7}	100 {10.2}												∑Z1632
6260 {635}	8720 {890}	86.3 {8.8}	135 {13.8}	40	60	6	65	10.5	6.5	50	50	5.5	0.46	20	∑Z2010
6610 {675}	9450 {965}	91.1 {9.3}	147 {15.0}												∑Z2020
6610 {675}	9450 {965}	91.1 {9.3}	147 {15.0}												∑Z2040
6620 {675}	9450 {965}	113 {11.6}	182 {18.6}	45	65	6	70	10.5	6.5	55	55	5.5	0.57	25	∑Z2510
7290 {745}	9450 {1110}	125 {12.7}	210 {21.5}												∑Z2520
7290 {745}	9450 {1110}	125 {12.7}	210 {21.5}												∑Z2525
7630 {775}	11600 {1190}	166 {16.9}	285 {29.1}	50	70	6	75	10.5	6.5	60	60	5.5	0.64	32	∑Z3220
7940 {810}	12300 {1260}	173 {17.6}	303 {30.9}												∑Z3232
10600 {1080}	14700 {1500}	289 {29.5}	454 {46.3}	65	88	8	80	12	8	76	76	6.6	1.20	40	∑Z4020
11100 {1130}	15900 {1620}	304 {31.0}	489 {49.9}												∑Z4040
11200 {1140}	15900 {1620}	342 {34.9}	548 {55.9}	70	93	8	85	12	8	81	81	6.6	1.39	45	∑Z4520
11700 {1200}	17000 {1730}	358 {36.5}	587 {59.9}												∑Z4540



Ball screw nut dimensions

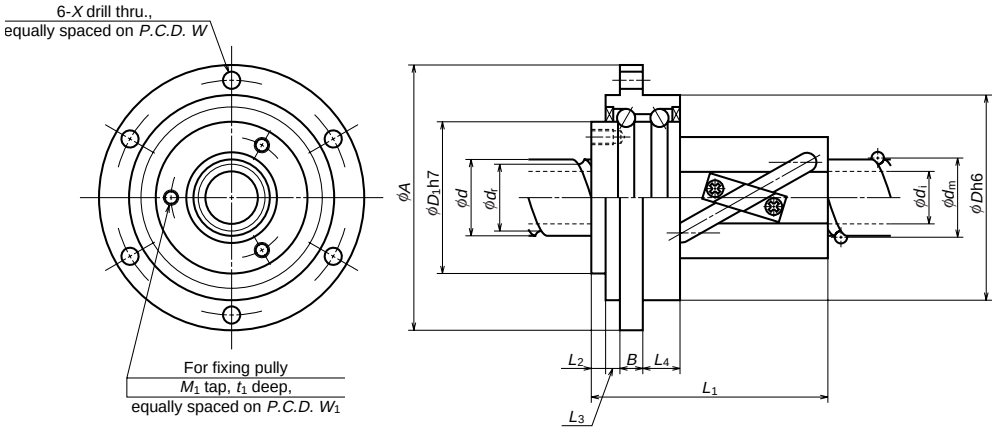
Model No.	Shaft dia. d	Lead l	Ball dia. Dw	Ball circle dia. dm	Root dia. dr	Screw shaft bore dl	Ball screw nut: Basic load rating N {kgf} Ca	Ca0a	D	A	B	L1	L2	L3	L4	M1	t1	W1	D1	W	X	Moment of inertia kg·cm² {x10⁻³kgf·cm·s²}	Mass kg
∑C1610	16	10	3.175	16.75	13.4	8	4710 {480}	8110 {825}	48	64	5	46	3	4	10	3-M4	6	28	35	56	4.5	0.40 {0.41}	0.41
∑C1632		32					2990 {305}	4870 {495}				51			10							0.43 {0.44}	0.43
∑C2010	20	10	3.175	20.75	17.4	14	8210 {835}	17500 {1780}	54	70	6	56	4	4	10	3-M4	6	32	40	62	4.5	0.63 {0.64}	0.53
∑C2020		20					5290 {540}	10300 {1050}				63			10							0.65 {0.66}	0.56
∑C2040		40					3360 {345}	6170 {630}				56			10							0.63 {0.64}	0.53
∑C2510	25	10	3.175	25.75	22.4	18	9110 {930}	21900 {2230}	58	74	6	56	4	4	10	3-M4	6	38	45	66	4.5	1.04 {1.06}	0.60
∑C2520		20					5870 {600}	13200 {1340}				63			10							1.13 {1.06}	0.64
∑C2525		25					5870 {600}	13200 {1340}				71			10							1.24 {1.26}	0.69



Ball spline nut dimensions

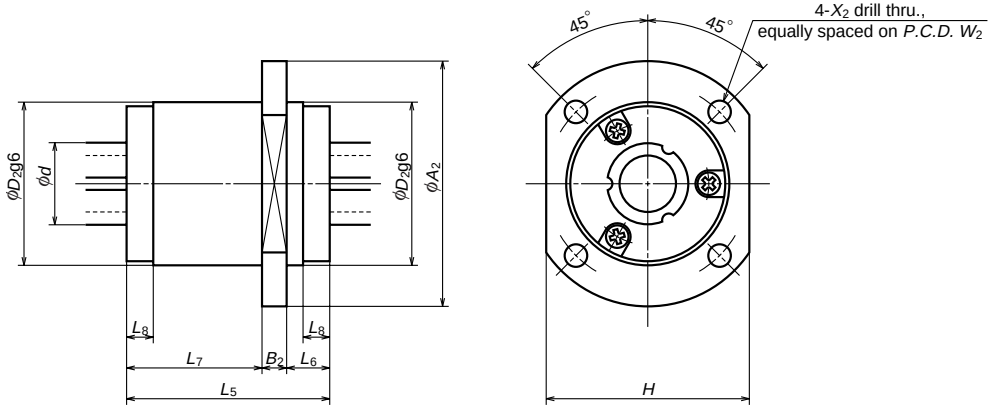
Unit: mm

Ball spline nut: Basic load rating N {kgf} Cr	Cor	Basic torque N-m{kgf-m} Ct	Cot	D	A	B	L5	L6	L7	L8	L9	Y	T	M2	t2	W2	D2	W	X	Moment of inertia kg·cm² {x10⁻³kgf·cm·s²}	Mass kg	Screw shaft dia. d	Model No.
4300 {435}	5090 {520}	47.9 {4.9}	63.9 {6.5}	48	64	5	45	2.5	6.5	10	6.5	4.5	6.5	M4	7	25	35	56	4.5	0.52 {0.53}	0.42	16	∑C1610
4300 {435}	5090 {520}	47.9 {4.9}	63.9 {6.5}																				∑C1632
4720 {480}	5820 {595}	65.1 {6.6}	90.5 {9.2}	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 {0.88}	0.56	20	∑C2010
5110 {520}	6540 {665}	70.5 {7.2}	90.5 {10.4}																				∑C2020
5110 {520}	6540 {665}	70.5 {7.2}	102 {10.4}																				∑C2040
5130 {525}	6540 {665}	87.8 {8.9}	126 {12.9}	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 {1.47}	0.67	25	∑C2510
5870 {600}	8000 {815}	100 {10.2}	154 {15.7}																				∑C2520
5870 {600}	8000 {815}	100 {10.2}	154 {15.7}																				∑C2525



Ball screw nut dimensions

Model No.	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Screw shaft bore d_i	Ball screw nut: Basic load rating N {kgf} C_a	C_{0a}	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 {x10⁻³kgf·cm·s²}	Mass kg
∑CZ1610	16	10	3.175	16.75	13.4	8	4710 {480}	8110 {825}	48	64	5	46	3	4	10	3-M4	6	28	35	56	4.5	0.40 {0.41}	0.41
∑CZ1632		32					2990 {305}	4870 {495}				51										0.43 {0.44}	0.43
∑CZ2010	20	10	3.175	20.75	17.4	14	8210 {835}	17500 {1780}	54	70	6	56	4	4	10	3-M4	6	32	40	62	4.5	0.63 {0.64}	0.53
∑CZ2020		20					5290 {540}	10300 {1050}				63										0.65 {0.66}	0.56
∑CZ2040		40					3360 {345}	6170 {630}				56										0.63 {0.64}	0.53
∑CZ2510	25	10	3.175	25.75	22.4	18	9110 {930}	21900 {2230}	58	74	6	56	4	4	10	3-M4	6	38	45	66	4.5	1.04 {1.06}	0.60
∑CZ2520		20					5870 {600}	13200 {1340}				63										1.13 {1.06}	0.64
∑CZ2525		25					5870 {600}	13200 {1340}				71										1.24 {1.26}	0.69



Ball spline nut dimensions

Unit: mm

Ball spline nut: Basic load rating N{kgf} C_r	C_{or}	Basic torque N-m{kgf-m} C_t	C_{ot}	Dimensions D_2	A_2	B_2	L_5	L_6	L_7	L_8	H	W_2	X_2	Mass kg	Screw shaft dia. d	Model No.
4300 {435}	5090 {520}	47.9 {4.9}	63.9 {6.5}	35	55	6	45	10.5	28.5	6.5	45	45	4.5	0.26	16	∑CZ1610
4300 {435}	5090 {520}	47.9 {4.9}	63.9 {6.5}													∑CZ1632
4720 {480}	5820 {595}	65.1 {6.6}	90.5 {9.2}	40	60	6	50	10.5	33.5	6.5	50	50	5.5	0.35	20	∑CZ2010
5110 {520}	6540 {665}	70.5 {7.2}	102 {10.4}													∑CZ2020
5110 {520}	6540 {665}	70.5 {7.2}	102 {10.4}													∑CZ2040
5130 {525}	6540 {665}	87.8 {8.9}	126 {12.9}	45	65	6	55	10.5	38.5	6.5	55	55	5.5	0.44	25	∑CZ2510
5870 {600}	8000 {815}	100 {10.2}	154 {15.7}													∑CZ2520
5870 {600}	8000 {815}	100 {10.2}	154 {15.7}													∑CZ2525

B-I-8.3 Hollow Shaft Ball Screw

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 recommend 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 load capacity for machine tools, see Page B296) and seal unit (Page B439) to standardized shaft end. This makes designing for mounting ball screw easy.

(2) Precautions in designing

◇ Refer to T Type and D Type for ball screw specifications.

◇ The overall ball screw length can be extended up to 3000 mm.

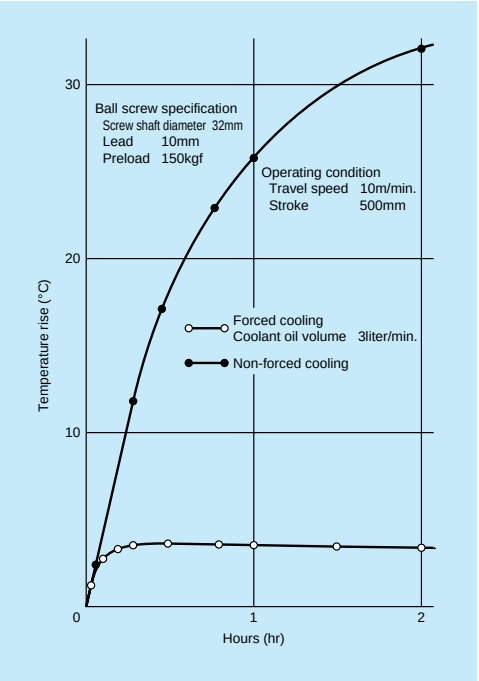
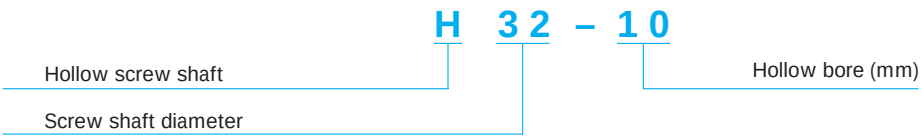
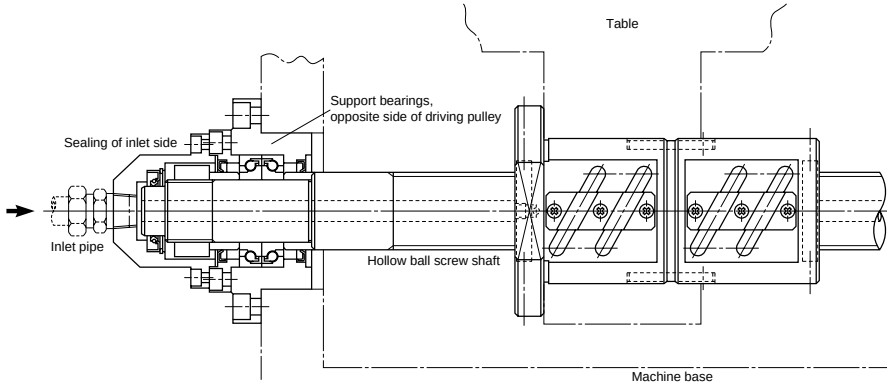


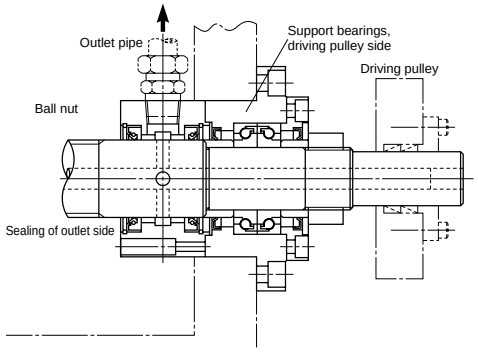
Fig. I-8•10 Effect of forced cooling by hollow ball screw

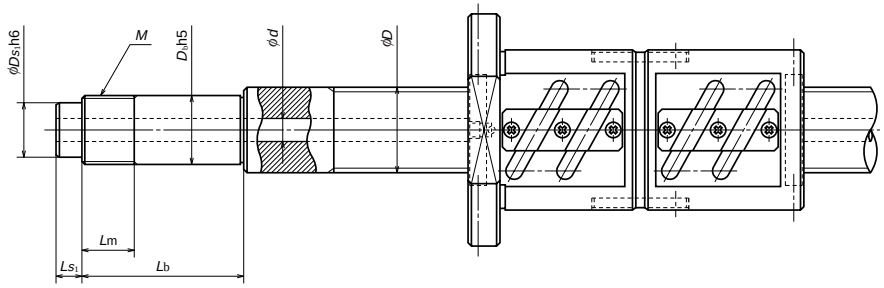
(3) Model code

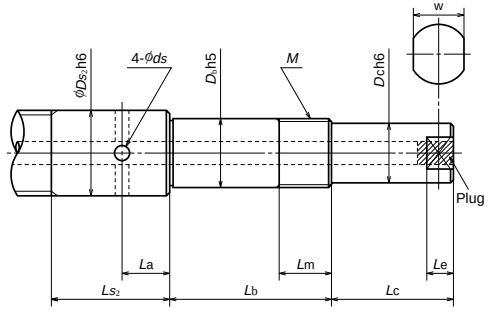

H 32 – 10
Hollow screw shaft
Screw shaft diameter
Hollow bore (mm)

(4) Example installation and standard dimensions









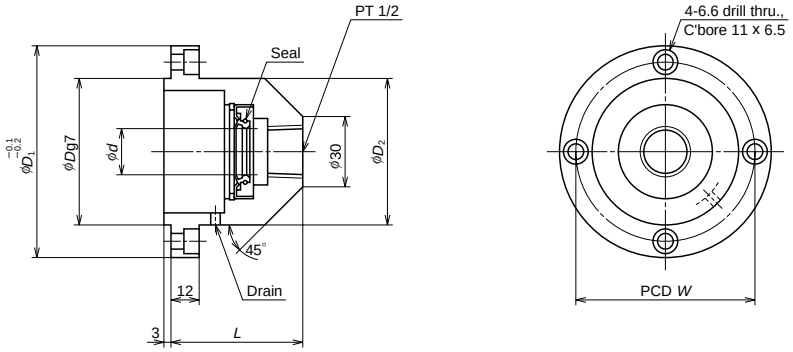
Unit: mm

Hollow shaft ball screw Model No.	Screw shaft		Bearing seat				Sealing					
	Diameter	Bore	Diameter	Lock nut			Inlet		Outlet			
	D	*d*	*Db*	*M*	*Lm*	*Lb*	Ds_1	Ls_1	Ds_2	Ls_2	*La*	*ds*
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

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

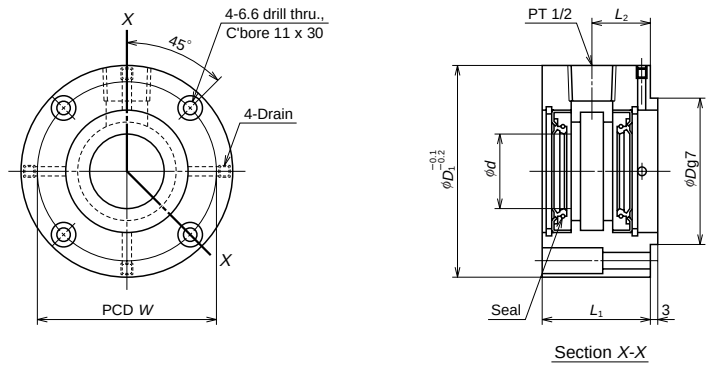
(5) Seal units for hollow ball screw shaft (Available by order)
This is an exclusive joint for coolant of the hollow ball screw shaft.

A Type
(for shaft end)



Reference number	*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)



Reference number	*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

◇ **Precautions in handling**

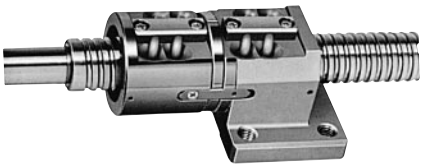
- Use NSK support unit (high load capacity for machine tools in Page B296) for installation in order to maintain the eccentricity between screw shaft and seal unit.
- Apply grease to the lip section for protection at the time of installation to the ball screw.
- Make certain that the drain holes (one for A Type, four for B Type) of the seal unit directly face downward when the unit is installed.

B-I-8.4 Special Ball Screws

In addition to the standard ball screws, NSK manufactures various types of ball screws in special shapes as shown below.

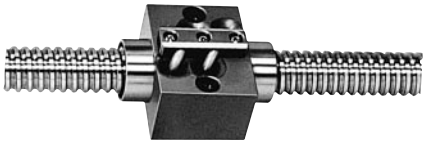
Thoroughly discuss with NSK for specifications before determining specifications and ordering ball screws in special shape.

Nut with gear



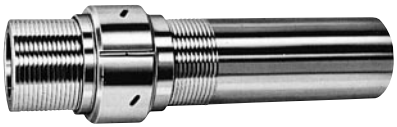
Double nut with flat mounting face

Lightly preloaded single nut with bearing seat



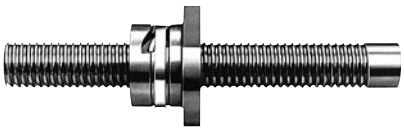
Lightly preloaded single nut with flat mounting face

Nut with trunion



Hollow shaft, lightly preloaded single nut, with large shaft diameter and fine lead

Double nut with right and left turn thread on each side of screw shaft



Ceramic ball screw

B-I-9 Guide to Technical Services

(1) CAD data

CAD data are available at branch offices and agencies. Data are available in the forms of magnetic tape, floppy disk, and CD-ROM.

CAD DRAWING DATA

■ Magnetic tape (CADAM, IGES)

Standard ball screws in stock

- A Series ··· Finished shaft end, precision ball screws
- S Series ··· Blank shaft end, precision ball screws
- R Series ··· Blank shaft end, rolled ball screws

Custom made ball screws (nut dimensions)

- T Type ··· Fine leads, return tube type
- D Type ··· Fine leads, deflector type
- M Type ··· Fine leads
- L Type ··· Medium and high helix leads
- U Type ··· Ultra high helix leads

Support units

- Support unit for light load, small equipment
- Support unit for heavy load machine tools

■ Floppy disks 5.25", 3.5"

(MICRO CADAM, AUTO CAD DXF)

Standard ball screws in stock

- A Series ··· Finished shaft end, precision ball screws
- S Series ··· Blank shaft end, precision ball screws

■ CD-ROM

(AUTO CAD DXF)

Standard ball screws in stock

- A Series ··· Finished shaft end, precision ball screws
- S Series ··· Blank shaft ends

* The same CD-ROM contains linear guides, rolling bearings, etc.

(2) Telephone consultation with NSK engineers

This catalogue contains technical explanation for each section. However, some descriptions and explanations may be insufficient due to page limitation, etc. To amend this shortcoming, NSK offers telephone assistance. NSK engineers are pleased to help you. Our local offices are listed in the last part of this catalogue. Call local NSK office or representative in your area.

(3) Additional machining (processing) some part of standard ball screws in stock

NSK processes half-finished series in stock (e.g. ball screws of S Series and R Series). NSK also cuts linear guide rails to required length for you. Service is available at NSK processing factories throughout the world. Requests are taken by branch offices and agencies.

B-Ⅰ-10 Precautions When Handling Ball Screws

Ball screws are precision products. They require careful handling as described below.

Confirm lubrication

Lubrication

(1) Confirm the state of lubrication before use. Insufficient lubrication causes loss of ball screw functions in a short period.

(2) Use without lubrication if grease is already applied to the ball screws. Remove dust or swarf if they stuck to the greased surface during handling. Wipe with clean white kerosene, then apply the same type of new lubricant before use. Avoid using different types of grease at the same time.

Consult NSK for special oil lubricant if it is required to your application.

(3) Check lubricant after two to three months of operation. Wipe off grease if it is excessively soiled, and apply sufficient volume of a fresh coat of grease. After the initial check, check and replenish lubricant approximately every year. Check more often if environment requires.

* Refer to Pages B471 and D18 for lubrication.

Do not disassemble

Do not reassemble

Watch out for falling objects

Handle with care

Do not impose shock

Handling

(1) Never disassemble ball screw. It invites dust to enter, and lowers precision, or may cause an accident.

(2) User should never reassemble ball screw by himself. Loss of ball screw function is apt to occur if a mistake is made. Please send ball screw to NSK for repair or re-assembly. It will be reworked at the minimum service charge.

(3) Ball screw shaft or nut may fall due to its own weight. Watch out for such falling object. If it falls, the ball groove or ball recirculation component may be damaged and the function might have been lost. Make certain to return such item to NSK for check. There will be the minimum charge for this service.

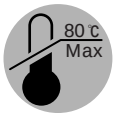
(4) If recirculation component, shaft outside, or ball groove is scratched or damaged by impact, recirculation operation becomes deficient, and may cause loss of function.

* Refer to Page B477 for assembling components.

Prevent dust

Rotational speed limitation

Do not overrun



Temperature limitation

Precautions in use

(1) Ball screws should be used in a clean environment. Use a dust cover to keep dust and swarf from entering into the system. Insufficient dust protection causes not only the ball screw function to deteriorate but also brings about damage to the recirculation components if dust plugs the system. This may result in more serious accident such as a fall of the table.

(2) For rotational speed in operation, refer to the applicable section in this catalogue which describes permissible rotational speeds, or to specification drawing furnished by NSK. Exceeding permissible rotational speed damages recirculation components, and may cause the table to fall. A precaution system such as a safety nut is recommended in vertical use of ball screw. Please consult NSK for safety system.

(3) Overrunning ball nut (removed from the ball thread) causes the balls to fall out, damages recirculation components, and dent ball groove, resulting in insufficient operation. Continued use under such conditions may cause premature wear, and damages recirculation components. For these reasons, avoid overrun by all means. If overrun occurs, please request NSK to check. There will be a minimum charge for this service.

(4) Ball screws are designed to be used at a temperature of less than 80 ℃. Do not operate at temperatures higher than this limit. Use at a higher temperature may damage recirculation and seal components. Please consult NSK if it is necessary to use at a temperature higher than the limit.

* Please read Page B481 before designing.

Store in the correct position

Storage

(1) Store in the original NSK package. Do not unwrap or tear the inner wrapping if it is not necessary. This allows dust to enter and rust to set in, and may deteriorate functions.

(2) The following position is recommended when storing ball screws.

① Keep in the NSK original package, and place it flat.

② Place flatly on supports; store in a clean area.

③ Hang vertically in a clean place.

B-Ⅱ Technical Description of Ball Screws

B-Ⅱ-1 Accuracy

B-Ⅱ-1.1 Lead Accuracy

The lead accuracy of NSK precision ball screws (C0-C5 grades) conforms to the four characteristics specified in JIS Standards. These characteristics are expressed by codes *ep*, v_u, v_{300}, and $v_{2\pi}$.

Fig. Ⅱ-1•1 explains the definition of each characteristic, and shows allowable value of each. Leads are classified into two categories: C system for positioning; Ct system for transportation. Table Ⅱ-1•2, 3 and 4 show tolerance of each characteristic.

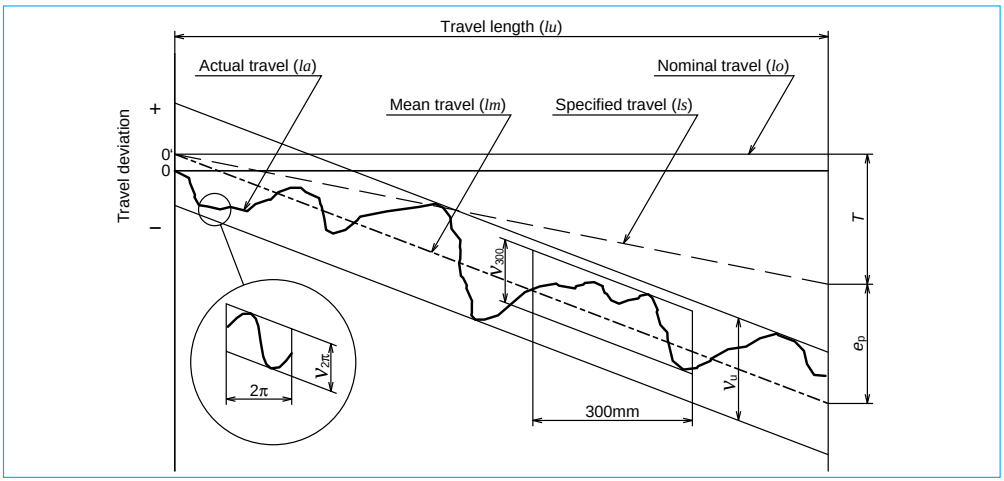


Fig. Ⅱ-1•1 Definition of lead accuracy

Table Ⅱ-1•1 Terminology in lead accuracy

Term	Code	Description	Tolerance
Specified travel	*ls*	Travel after the adjustment of thermal expansion and deformation by the load have been made relative to the nominal travel.	
Travel compensation	*T*	Value obtained by subtracting the specified travel from the nominal travel based on the effective length of thread. The value is to compensate the errors caused by thermal error and deformation by load.This value is determined by tests and experience (See Page B447).	
Actual travel	*la*	Actually measured travel	
Actual mean travel	*lm*	A straight line that demonstrates the direction of actual travel. This straight line is obtained from the curve that shows actual travel volume by least-squares method or by resembling approximation.	
Tolerance on specified travel	*ep*	Obtained by subtracting the specified travel from the actual mean travel.	Table Ⅱ-1•2
Travel variation	v_u v_{300} $v_{2\pi}$	Maximum range of the actual travel which is between the two straight lines drawn parallel to the actual mean travel. There are three categories as shown below. • Maximum range relative to the effective length of thread. • Maximum range relative to the length of 300 mm anywhere within the effective length of thread. • Maximum range which corresponds to any single rotation ($2\pi rad.$) within the effective length of thread.	Table Ⅱ-1•2 Table Ⅱ-1•3, 4 Table Ⅱ-1•3

Table Ⅱ-1•2 Tolerance on specified travel (±*ep*) and travel variation (υ_u) of the positioning (*C* type) ball screws

Unit: μm

Accuracy grade			C0		C1		C2		C3		C5	
	over	or less	±*ep*	υ_u	±*ep*	υ_u	±*ep*	υ_u	±*ep*	υ_u	±*ep*	υ_u
Effective thread length mm	—	100	3	3	3.5	5	5	7	8	8	18	18
	100	200	5.5	3	4.5	5	7	7	10	8	20	18
	200	315	4	3.5	6	5	8	7	12	8	23	18
	315	400	5	3.5	7	5	9	7	13	10	25	20
	400	500	6	4	8	5	10	7	15	10	27	20
	500	630	6	4	9	6	11	8	16	12	30	23
	630	800	7	5	10	7	13	9	18	13	35	25
	800	1000	8	6	11	8	15	10	21	15	40	27
	1000	1250	9	6	13	9	18	11	24	16	46	30
	1250	1600	11	7	15	10	21	13	29	18	54	35
	1600	2000			18	11	25	15	35	21	65	40
	2000	2500			22	13	30	18	41	24	77	46
	2500	3150			26	15	36	21	50	29	93	54
	3150	4000			30	18	44	25	60	35	115	65
	4000	5000					52	30	72	41	140	77
	5000	6300					65	36	90	50	170	93
	6300	8000							110	60	210	115
	8000	10000									260	140
	10000	12500									320	170

Table Ⅱ-1•3 Tolerance of travel variation relative to 300 mm (υ_{300}) and one revolution ($\upsilon_{2\pi}$) of the positioning (*C* type) ball screws

Unit: μm

Accuracy grade	C0	C1	C2	C3	C5
υ_{300}	3.5	5	7	8	18
$\upsilon_{2\pi}$	2.5	4	5	6	8

Remarks 1. JIS B1192 sets C type and Cp type standards for positioning ball screws. NSK uses the specification of C type only.
2. Colored sections conform to JIS B1192 standards. Values in other areas are NSK standards.

Table Ⅱ-1•4 Travel variation (υ_{300}) relative to 300 mm of transportation (*C*t type) ball screws

Unit:μm

Accuracy grade	Ct7	Ct10
υ_{300}	52	210

Remarks 1. Tolerance on specified travel (*ep*) of the transportation (*C*t type) ball screws is calculated as follows.

$$ep = \frac{2 \cdot l_u}{300} \cdot \upsilon_{300}$$

2. JIS B1192 sets Ct1, 3, and 5 grade standards. NSK standards are integrated by C type only. Refer to Table Ⅱ-1•2 for C type standard tolerance.

[Example of specifying lead accuracy]
Conditions
Nut model: DFT 4010-5;
Stroke: 1000 mm; Positioning accuracy: ±0.035 mm / 1000 mm
Obtain required lead accuracy of a ball screw under these conditions.
① Calculate the length of the thread of the screw shaft
Stroke + nut length + margin = 1000 +193+100 = 1293 (mm) – – – – →1300 mm
② Calculate lead precision
From Table II-1.2, obtain the tolerance on specified travel relative to the length of thread (1300 mm).
C5– – – – – →±0.054/1250 ~ 1600
C3– – – – – →±0.029/1250 ~ 1600
③ Determine lead accuracy
Required lead accuracy is:
From $\pm ep <$ ±0.035/1000mm stroke

Accuracy grade: C3 grade ±ep = 0.029/length of thread (1300 mm)
v_u300 = 0.018

B-Ⅱ-1.2 Thermal Expansion and Target Value of Specified Travel

(1) Thermal expansion

Thermal expansion of screw shaft induces the degradation of positioning accuracy of the ball screws. Thermal expansion of a screw shaft is calculated as follows.

$$\Delta L_\theta = \rho \cdot \theta \cdot L \text{(mm)} \quad \text{-- (Ⅱ-1)}$$

In this formula:

ΔL_θ : Thermal expansion (mm)
ρ : Thermal expansion coefficient (12.0×10^{-6})
θ : Average temperature rise of screw shaft (Celsius)
L : Length of screw shaft (mm)

The above formula indicates that when the temperature rises one degree Celsius, the screw shaft stretches 12 μm per meter. Ball screw generates more heat when it is used at high speed. This causes elongation of the screw shaft. Although the ball screw lead is ground into high precision, an elongated screw shaft due to high temperature rise may not satisfy required highly accurate positioning.

Countermeasures against temperature rise of the ball screw are:

① Suppress heat generation
- Do not apply excessive preload to the ball screw and support bearing.
- Select correct lubricant and use it appropriately.
- Use higher helix ball screw lead to lower rotational speed.
- Use preload switching ball screw - Consult NSK.

② Use forced cooling.
- Use hollow screw shaft, and flow liquid coolant through it. - Refer to hollow ball screws in the section for special ball screws (B-Ⅰ-8)
- Cool screw shaft surface with lubricant oil or air.

③ Avoid effects of temperature rise on positioning
- Warm up the machine by high speed until temperature rise saturate, then maintain a stable temperature of ball screw shaft.
- Pull screw shaft in the axial direction at time of installation (Fig. Ⅱ-1•2).
- Set the negative (minus) target value of specified travel.
- Employ the closed loop system.

NSK strongly recommends forced cooling by the use of a hollow ball screw as it is the most effective thermal error countermeasure for high-speed and high-precision ball screw performance.

(2) How to determine specified travel In general, the specified travel of ball screw is the same as the nominal travel . However, the specified lead of ball screw is sometimes set to negative (minus) or positive (plus) to adjust expansion by temperature rise during operation, or the elongation/contraction of the screw shaft by external load. For such occasion, specify travel compensation (T) when ordering the ball screw.
As an example, Table Ⅱ-1•5 shows the travel compensation (T) for typical NC machine tools.

Table Ⅱ-1•5 Travel compensation (T) of specified travel for typical NC machine tools

Unit: mm

Type of machine	Axis	Travel compensation (per 1m)
NC lathe	X	– 0.02 ~ – 0.05
	Z	– 0.02 ~ – 0.03
Machining center	X, Y	– 0.03 ~ – 0.04
	Z	Differs by structure

In order to absorb thermal expansion, pre-tension can be provided to the screw shaft at the time of installation. In this case, the pre-tension is usually equivalent to the expansion brought about by the temperature rise of 2 to 3°c.
Fig. Ⅱ-1•2 shows the bearing support structure in such occasion.

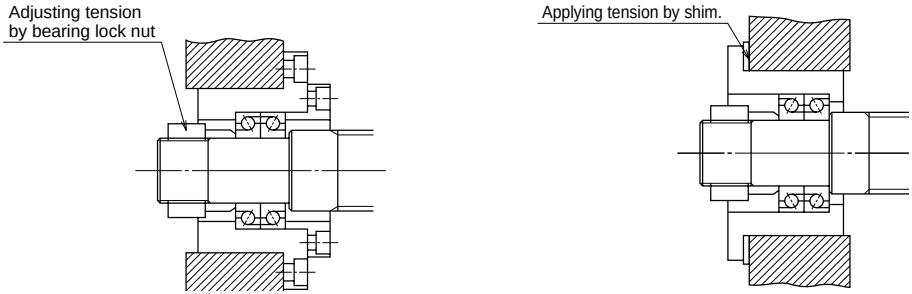


Fig. Ⅱ-1•2 Bearing structure to provide pre-tension

B-Ⅱ-1.3 Mounting Accuracy and Tolerance of Ball Screws

The accuracy related to mount the ball screws is specified in the following seven characteristics (Fig-Ⅱ-1.3). Accuracy grade is also entered in specifications.

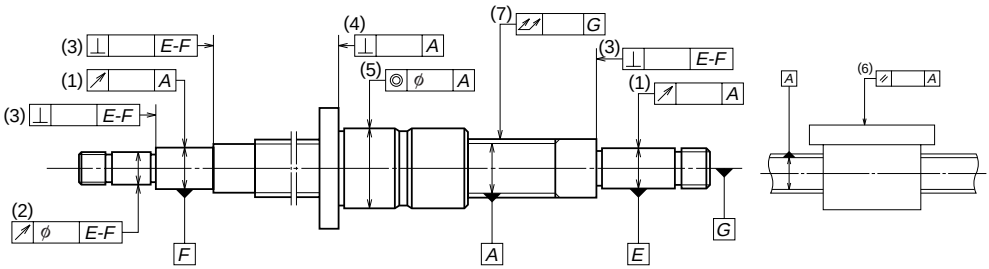


Fig. Ⅱ-1•3 Mounting accuracy of ball screw

(1) Radial run-out of the support bearing seat relative to the axis of the ball thread of screw shaft.
(2) Radial run-out of the other shaft ends section relative to the axis of the support bearing seat.
(3) Perpendicularity of the shoulder of support bearing seat relative to the axis of support bearing seat.
(4) Perpendicularity of the nut flange face, or of the nut end datum face, relative to the axis of screw shaft.
(5) Eccentricity of the nut outside surface (cylindrical shape) to the axis of screw shaft.
(6) Parallelism of the nut mounting surface to the screw shaft axis. (in case of flat mounting surface)
(7) Total run-out of the screw shaft axis.

Detailed tolerances are specified by JIS B1192. For reference, Table Ⅱ-1•6 shows standard values of "(7) Total run-out of the screw shaft axis (straightness of the screw shaft)". NSK sets stricter tolerance standards than JIS standards. For accuracy of the ball screw installation, refer to "Technical Description: Recommended Mounting Error" (Page B477).

Table Ⅱ-1•6 Total run-out of the screw shaft axis

Unit: μm

Accuracy grade			C0						C1						
Nominal diameter		over		8	12	20	32	50		8	12	20	32	50	80
(mm)		or less	8	12	20	32	50	80	8	12	20	32	50	80	125
Overall length of screw shaft (mm)	over	or less													
		125	15	15	15				20	20	15				
	125	200	25	20	20	15			30	25	20				
	200	315	35	25	20	20			40	30	25	20			
	315	400		35	25	20	15		45	40	30	25	20		
	400	500		45	35	25	20			50	40	30	25		
	500	630		50	40	30	20	15		60	45	35	25	20	
	630	800			50	35	25	20			60	40	30	25	
	800	1000			65	45	30	25			75	55	40	30	25
	1000	1250			85	55	40	30			95	65	45	35	30
	1250	1600			110	70	50	40			130	85	60	45	35
	1600	2000				95	65	45				120	80	55	40
	2000	2500											100	70	50
	2500	3150												130	90
	3150	4000													120
	4000	5000													

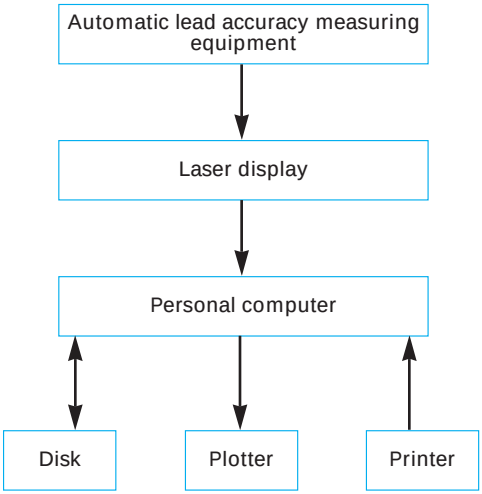
Unit: μm

Accuracy grade			C3							C5						
Nominal diameter		over		8	12	20	32	50	80		8	12	20	32	50	80
(mm)		or less	8	12	20	32	50	80	125	8	12	20	32	50	80	125
Overall length of screw shaft (mm)																
	over	or less														
		125	25	25	20					35	35	35				
	125	200	35	35	25	20				50	40	40	35			
	200	315	50	40	30	30				65	55	45	40			
	315	400	60	50	40	35	25			75	65	55	45	35		
	400	500		65	50	40	30				80	60	50	45		
	500	630		70	55	45	35	30			90	75	60	50	40	
	630	800			70	55	40	35				90	70	55	45	
	800	1000			95	65	50	40	30			120	85	65	50	45
	1000	1250			120	85	60	45	35			150	100	75	60	50
	1250	1600			160	110	75	55	40			190	130	95	70	55
	1600	2000				140	95	70	50				170	120	85	65
	2000	2500					120	85	60					150	110	80
	2500	3150	60				160	110	75					200	140	95
	3150	4000	80				220	150	100					260	180	120
	4000	5000						200	130						240	160
	5000	6300													310	210
	6300	8000														280
	8000	10000														370

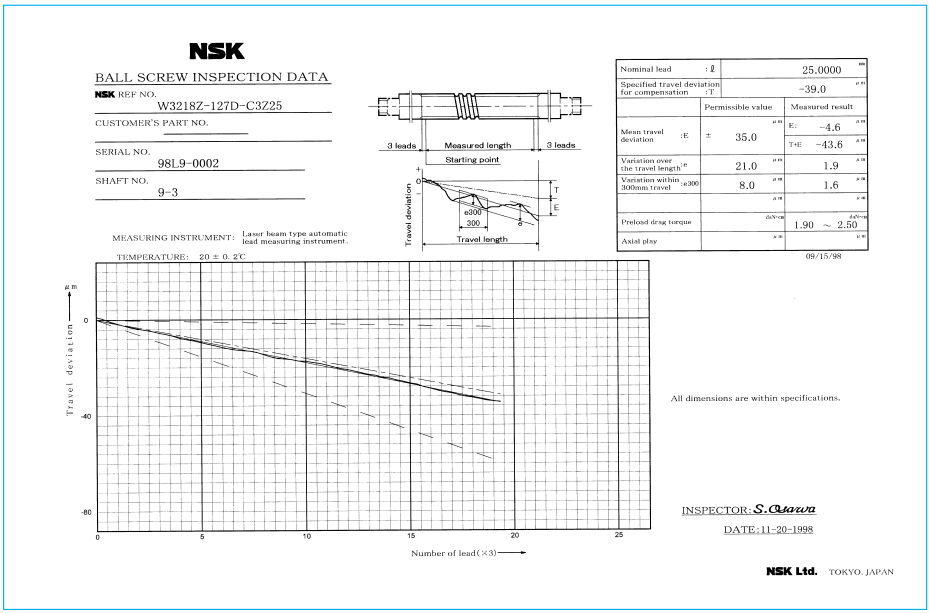
Automatic lead accuracy measuring system

In response to the demand for high precision in production technology, NSK is the first in the world that developed and uses "Lead Accuracy Measuring System (LAMS)." Lead accuracy is measured by the system that employs a laser interferometer measuring instrument and a personal computer.

The figure right shows the basic composition of this system. The laser interferometer measures either ball nut travel accuracy or lead accuracy of the ball thread . The data which are input into a computer are processed into four characteristics readings regarding lead accuracy. (See Page B445.)



Lead Accuracy Measuring System



NSK

BALL SCREW INSPECTION DATA

NSK REF NO. W3218Z-127D-C3Z25

CUSTOMER'S PART NO.

SERIAL NO. 98L9-0002

SHAFT NO. 9-3

MEASURING INSTRUMENT: Laser beam type automatic lead measuring instrument.

TEMPERATURE: 20 ± 0. 2℃

3 leads | Measured length | 3 leads

Starting point

Travel deviation

Travel length

Nominal lead : l		25.0000	mm
Specified travel deviation for compensation : T		-39.0	μm
	Permissible value	Measured result	
Mean travel deviation : E	± 35.0 μm	E: -4.6 μm	
		T+E: -43.6 μm	
Variation over the travel length : e	21.0 μm	1.9 μm	
Variation within 300mm travel : e300	8.0 μm	1.6 μm	
	μm	μm	
Preload drag torque	daN·cm	1.90 ~ 2.50	daN·cm
Axial play	μm		μm

09/15/98

Travel deviation (μm): 0, -40, -80

Number of lead(×3): 0, 5, 10, 15, 20, 25

All dimensions are within specifications.

INSPECTOR: S. Ogawa

DATE: 11-20-1998

NSK Ltd. TOKYO, JAPAN

B-Ⅱ-2 Static Load Limitation

Prior to estimating life by repeated fatigue described in the following section 5, it is necessary to calculate damage by static load. Static load limit is determined by the three following factors.

- Buckling of the ball screw shaft
- Yielding of the ball screw shaft by tensional and compressive stress
- Permanent deformation of the ball contact point

B-Ⅱ-2.1 Buckling Load

It is necessary to calculate whether the ball screw shaft is safe from buckling.
Buckling load, i.e. permissible compressive load "P" to axial direction, is calculated as follows.

$$P \quad \alpha \times \frac{N \cdot \pi^2 \cdot E \cdot I}{L^2} = m \frac{d_r^4}{L^2} \times 10^4 \qquad (N) \cdots\cdots (Ⅱ\text{-}2)$$

In this formula:

α : Safety factor ($\alpha = 0.5$)
E : Elastic modulus ($E = 2.06 \times 10^5$ MPa)
I : Moment of inertia

$$I \quad \frac{\pi}{64} d_r^4 \qquad (mm^4) \cdots\cdots (II\text{-}3)$$

d_r : Screw shaft root diameter (mm) [See the dimension table.]
L : Unsupported length (mm) [See Fig Ⅱ-4•1, 2 'Supporting conditions of screw shaft and nut' in Page B459 and B460.)
m, N : Factors determined by the supporting method of the ball screw shaft

Supporting method	m	N
Fixed - Fixed support	19.9	4
Fixed - Simple support	10.0	2
Fixed support - Free	1.2	0.25
Simple - Simple support	5.0	1

Fig Ⅱ-2•1, 2 are the graphs of buckling load limitation for each nominal diameter of screw shaft. (Use the above formula if nominal diameter of screw shaft exceeds 125 mm.)

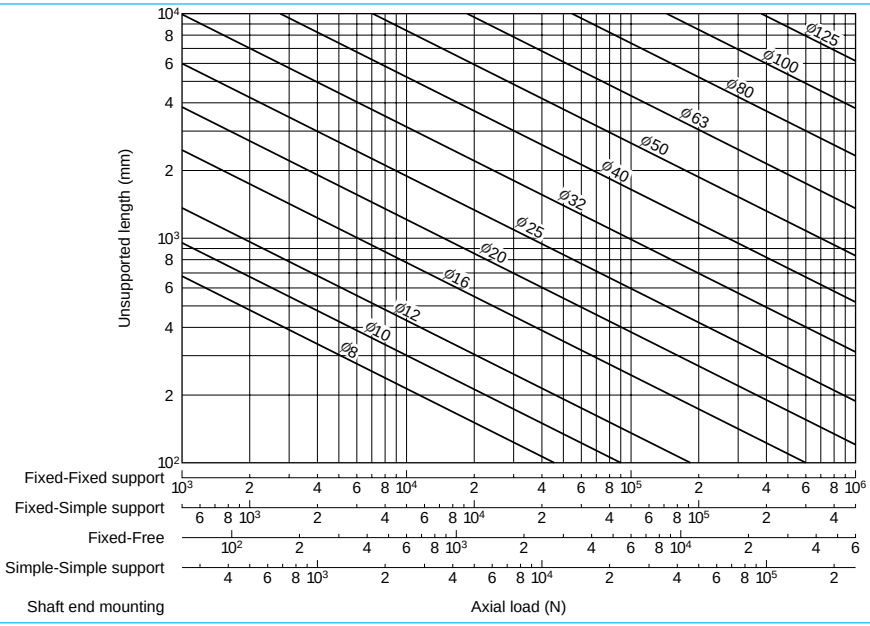


Fig. Ⅱ-2•1 Buckling load (SI unit system)

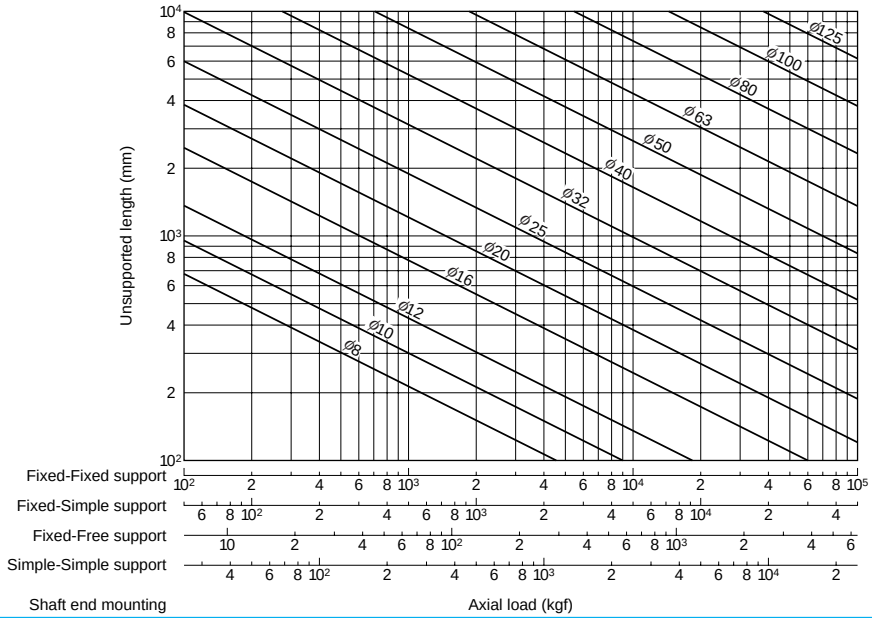


Fig. Ⅱ-2•2 Buckling load (gravitational unit system)

Example of calculation

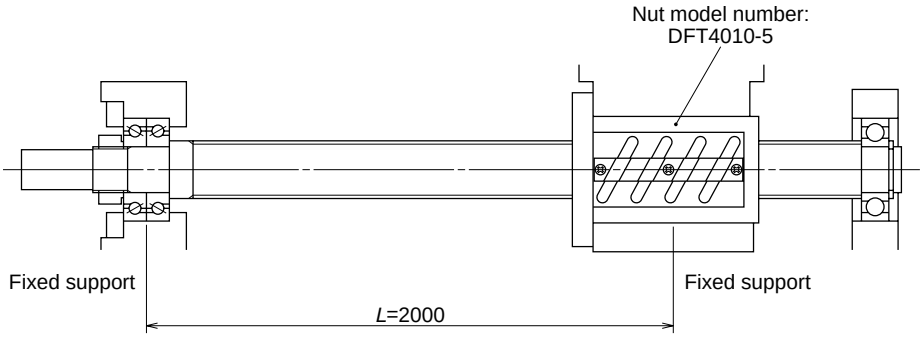


Fig. Ⅱ-2•3 Calculation example of buckling load

Calculate buckling load under the conditions in Fig. Ⅱ-2•3.

* Use conditions

Nut model: DFT4010-5

From Fig.Ⅱ-2•3 - support condition is Fixed - Fixed support

$\longrightarrow N = 4$; $m = 19.9$

(Same as the supporting condition (ii) in Fig. Ⅱ-4.1 'Supporting conditions of screw shaft and nut' in Page B459.)

Unsupported length L = 2000 mm

From the dimension table - Screw shaft root diameter

d_r = 34.4 mm

* Calculation

By Formula (Ⅱ-2)

$$P = m \frac{d_r^4}{L^2} \times 10^4 = 19.9 \times \frac{34.4^4}{2000^2} \times 10^4 = 69667(\mathrm{N})$$

Converted to the gravitational unit system:

69667/9.80665 = 7104 (kgf)

* Result

Permissible buckling load P = 69600 N

(= 7100 kgf)

B-Ⅱ-2.2 Yield by Tensional/Compressive load

Buckling does not occur to the screw shaft if unsupported length is short. However, it is necessary to calculate tensional or compressive stress by the axial direction load (Formula Ⅱ-4).

Formula to obtain permissible load "P" by tensional or compressive stress to screw shaft.

$P = \sigma \cdot A = 1.15 d_r^2 \times 10^2$ (N) -- (Ⅱ-4)

In this formula:

σ: Allowable stress (=147 MPa)

A: Cross section area of a screw shaft using root diameter

$A = \frac{\pi}{4} d_r^2$ ····· (Ⅱ-5)

d_r: Screw shaft root diameter (mm)

Example of calculation

Obtain load in respect to the allowable stress under the conditions in Fig. Ⅱ-2•3.

* Use conditions

Nut model: DFT4010-5

From the dimension table - Screw shaft root diameter

d_r = 34.4 mm

* Calculation

By Formula Ⅱ-4

$P = 1.15\ d_r^2 \times 10^2 = 1.15 \times 34.4^2 \times 10^2 = 136086$(N)

Converted to the gravitational unit system:

136086/9.80665 = 13877(kgf)

* Result

Load with respect to allowable stress P =136000 N

(= 13800 kgf)

B-Ⅱ-2.3 Permanent Deformation of the Ball Contact Point

Exposed to an excessively heavy load in axial direction, the balls are squashed, and the ball rolling surface is dented. The deformations on these points do not perfectly restore to original shape after the load is removed. They are permanently disfigured. It is necessary to determine the limitation of this disfigurement to containing it within a certain range.

(1) Basic static load rating C_{0a}

Basic static load rating is a load to axial direction which results in the combined permanent deformations at the contact point of balls and ball grooves of the screw and nut equal to 0.01% of the ball diameter.

(2) Calculation of permissible load by C_{0a}

P_o (allowable axial direction load to limit the permanent deformation) is calculated using *Coa*.

$P_0 = C_{0a} / f_s$ (N) ···· (Ⅱ-6)

In this formula:

f_s: Static permissible load factor	
At time of normal operation	1—2
With vibration impact	1.5—3

Calculation example

Obtain maximum allowable load to the ball groove section under conditions in Fig. Ⅱ-2•3

* Use conditions

Nut model: DFT4010-5

From the dimension table C_{0a} = 137000 (N)

f_s=2 (normal operation, no vibration impact)

* Calculation

By Formula Ⅱ-6:

$P_0 = C_{0a}/f_s$ = 137000/2 = 68500 (N)

Convert to the gravity unit system:

68500/9.80665 = 6985(kgf)

* Result

Maximum allowable load of the ball groove section

P_0 = 68500 N

(= 6980 kgf)

B-Ⅱ-3 Permissible Rotational Speed

Permissible rotational speed is determined by the following two factors:

- Critical speed which is the resonance vibration of the shaft.
- dm•n value which is involved in damaging the ball recirculation components.

B-Ⅱ-3.1 Critical Speed of the Screw Shaft

Calculate the critical speed which is the matching value of the ball screw rotational speed and the natural frequency of the screw shaft. The permissible rotational speed is up to the 80% range of the critical speed. Refer to Page B459 "Supporting conditions of screw shaft and ball nut" and use the formula below to calculate critical speed. Fig. Ⅱ-3•1 shows permissible rotational speeds to critical speed for each screw shaft diameter.

(Use the formula below if screw shaft nominal diameter exceeds 125 mm.)

Formula to calculate permissible rotational speed to the critical speed

$$n_c = \alpha \times \frac{60\lambda^2}{2\pi L^2} \sqrt{\frac{E \cdot I \cdot g}{\gamma \cdot A}} = f \frac{d_r}{L^2} \times 10^7 \text{ (rpm)} \cdots\cdots (\text{Ⅱ-7})$$

In this formula:

α: Safely factor (α = 0.8)

E: Elastic modulus (E = 2.06 x 10^5 MPa)

I: Moment of inertia of the screw shaft cross section

$$I = \frac{\pi}{64} d_r^4 \quad (\text{mm}^4) \cdots\cdots (\text{Ⅱ-3})$$

d_r: Screw shaft root diameter (mm) [See the dimension table.]

g: Acceleration of gravity (= 9.8 x10^3mm/s^2)

γ: Specific weight (γ = 7.65 x 10^{-5}N/mm^3)

A: Cross section area of the screw shaft root diameter (mm^2)

$$A = \frac{\pi}{4} d_r^2 \quad (\text{mm}^2) \cdots\cdots (\text{Ⅱ-5})$$

L: Unsupported length (mm) [See Fig. Ⅱ-4•1, 2 'Supporting conditions of screw shaft and ball nut' on Page B459]

f, λ: Factors determined by the supporting condition

Supporting condition	f	λ
Fixed - Simple support	15.1	3.927
Fixed - Fixed support	21.9	4.730
Fixed support - Free	3.4	1.875
Simple - Simple support	9.7	π

Calculate the resonance of the screw shaft whether you use shaft rotation or nut rotation. Critical speed varies by the nut traveling position. Please consult NSK for detailed calculation.

If using exceeding the critical speed, it is necessary to increase the natural frequency by using an intermediate support, etc. If using with nut rotation, it is possible to operate exceeding critical speed by installing a vibration energy absorbing system (optional, vibration control damper: patent pending) to the screw shaft. (Refer to "Nut rotatable ball screws" in Page B417.)

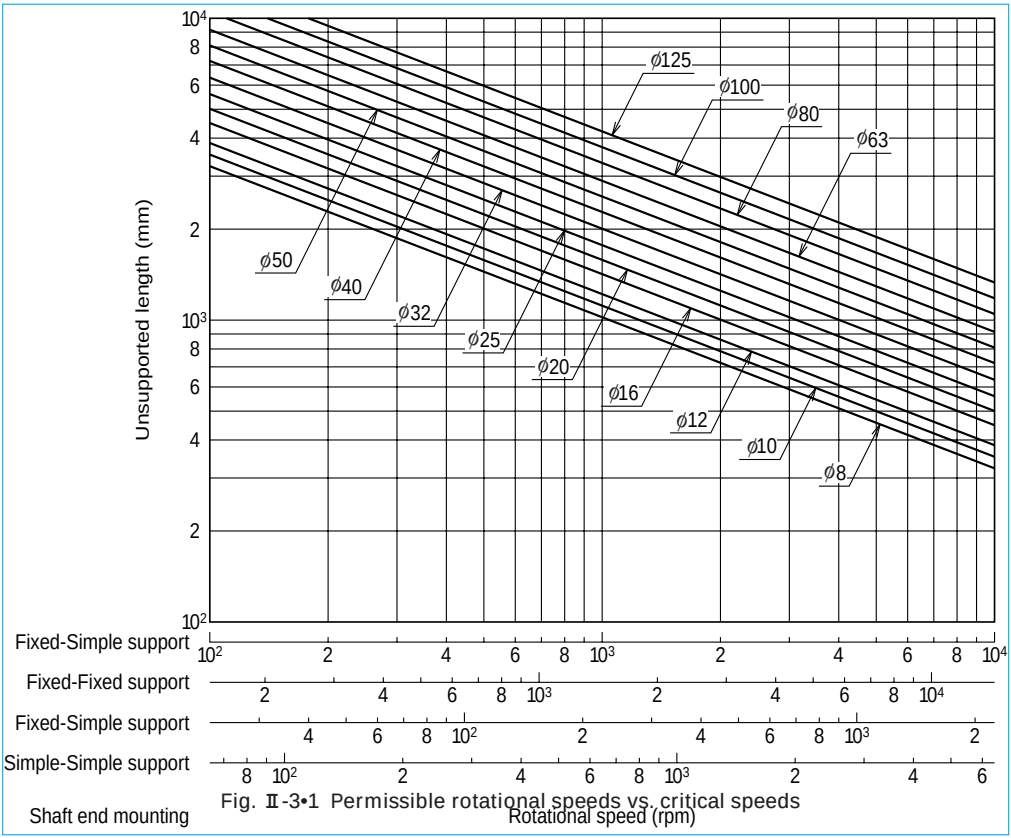


Fig. Ⅱ-3•1 Permissible rotational speeds vs. critical speeds

Calculation example

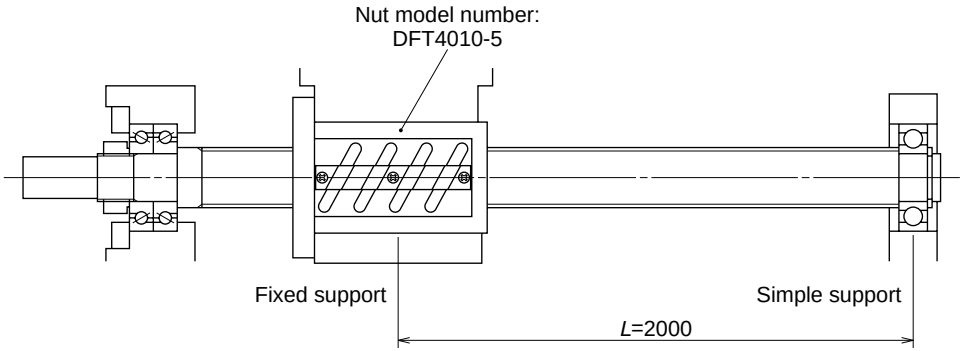


Fig. Ⅱ-3•2 Calculation example of ball screw permissible rotational speed

Calculate the permissible rotational speed to the critical speed under conditions in Fig. Ⅱ-3•2.

* Use conditions

Nut model: DFT4010-5

From Fig. Ⅱ-3•2 - Supporting condition is Fixed - Simple support $-\!\!\rightarrow\lambda = 3.927$, $f = 15.1$

(Same as the supporting condition (ii) in Fig. Ⅱ-4•1 'Supporting conditions of screw shaft and ball nut.')

Unsupported length L = 2000 mm

From the dimension table: Screw shaft root diameter

d_r = 34.4 mm

* Calculation

By Formula Ⅱ-7

$$n_c = f\frac{d_r}{L^2} \times 10^7 = 15.1 \times \frac{34.4}{2000^2} \times 10^7 = 1298.6(\text{rpm})$$

* Result

Permissible rotational speed to critical speed

n_c = 1290 rpm or under

B-Ⅱ-3.2 dm • n Value

Permissible rotational speed is also limited by $d_m \cdot n$ value (d_m: ball pitch circle diameter mm; n: rotational speed per minute rpm). Dm・n value indicates peripheral speed (revolution speed of balls).

Table Ⅱ-3•1

For positioning type (C5 grade or higher),	Standard specification	dm・n ≦ 70000
For transporting type (Ct7 grade)	High-speed specification	dm・n ≦ 100000
For transportation type (Ct10 Grade)		dm・n ≦ 50000

Special measure is taken for high-speed specification products. Operating exceeding the limitation is possible under certain conditions. Please consult NSK.

* Please consult NSK if the maximum rotational speed exceeds 30000 rpm, even both the critical speed of the screw shaft rotation and the $d_m \cdot n$ value are in ranges of the allowable limit.

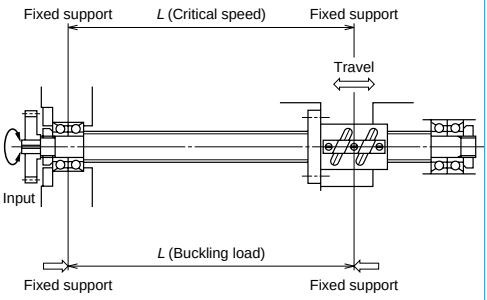
B-Ⅱ-4 Supporting Conditions for Calculation of Buckling Load and Critical Speed

B-Ⅱ-4•1 and 2 are typical conditions in supporting ball screw. Use them as reference to calculate buckling load and critical speed.
Please consult NSK if it is necessary to scrutinize calculation due to use conditions, or if boundary conditions are not clear due to special installation.

[How to read the tables]
Example ii: Buckling load generates between the nut and the left bearings, indicating that the critical speed appears between the nut and the right bearing. Therefore, set L at maximum stroke for each side. Calculate by applying support bearing conditions.

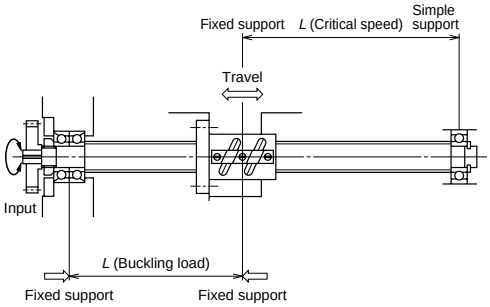
i

Buckling load: Fixed - Fixed support (code C)
Critical speed: Fixed - Fixed support (code G)



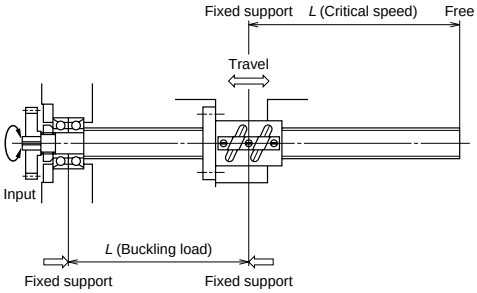
ii

Buckling load: Fixed - Fixed support (code C)
Critical speed: Fixed - Simple support (code F)



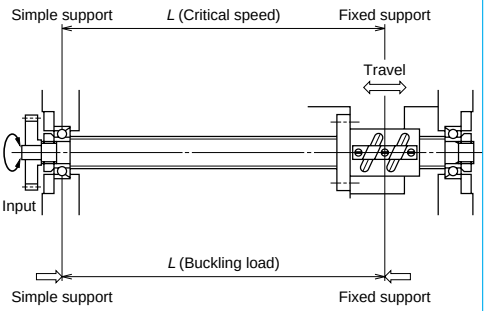
iii

Buckling load: Fixed - Fixed support (code C)
Critical speed: Fixed - Free support (code H)



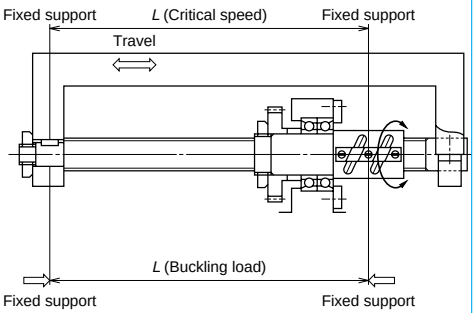
iv

Buckling load: Fixed - Simple support (code B)
Critical speed: Fixed - Simple support (code F)



v

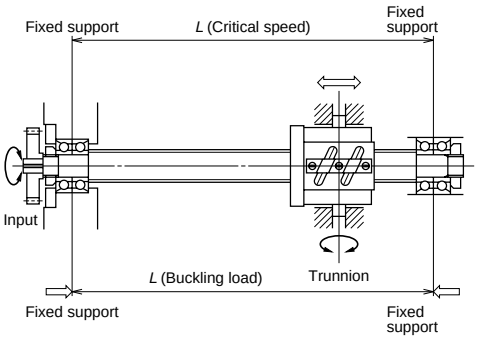
Buckling load: Fixed - Fixed support (code C)
Critical speed: Fixed - Fixed (code G)



B-II-4.1 Supporting conditions for screw shaft and ball nut

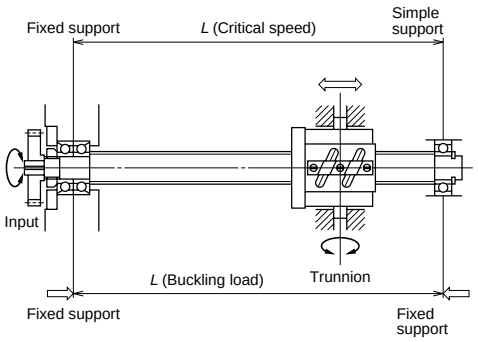
vi

Buckling load: Fixed - Fixed support (code C)
Critical speed: Fixed - Fixed support (code G)
} Minimum value (estimate) is obtained in the state as shown in the figure.



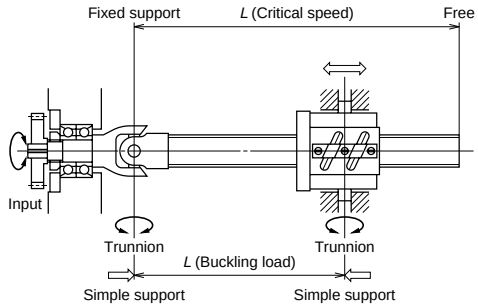
vii

Buckling load: Fixed - Fixed support (code C)
Critical speed: Fixed - Simple support (code F)
} Minimum value (estimate) is obtained in the state as shown in the figure.



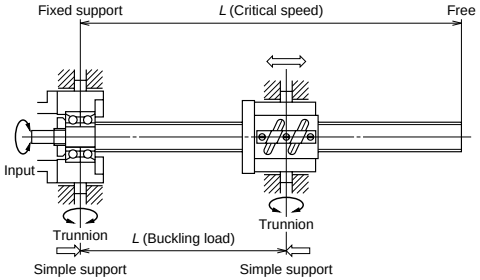
viii

Buckling load: Simple support - Simple support (code A)
Critical speed: Fixed - Free Support (code H)→Minimum value (estimate) is obtained in the state as shown in the figure.



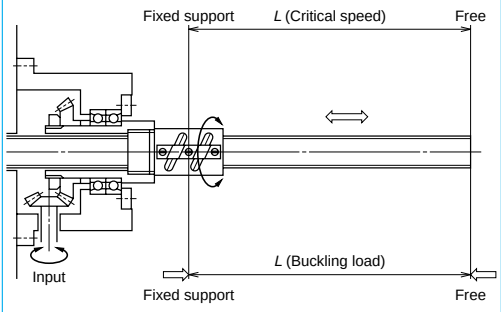
ix

Buckling load: Simple support - Simple support (code A)
Critical speed: Fixed - Free support (code H)→Minimum value (estimate) is obtained in the state as shown in the figure.



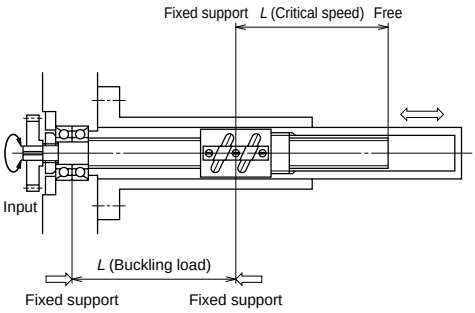
x

Buckling load: Fixed - Free Support (code D)
Critical speed: Fixed - Free support (code H)



xi

Buckling load: Fixed - Fixed support (code C)
Critical speed: Fixed - Free support (code H)



B-II-4.2 Supporting conditions of screw shaft and ball nut w

B-Ⅱ-5 Life (dynamic load limitation)

B-Ⅱ-5.1 Life of Ball Screw

Although used in appropriate conditions and is ideally designed, the ball screw deteriorates after a certain operation period, and eventually becomes useless. The period in this situation is the life of the ball screw. There is "fatigue life" caused by flaking and "life of accuracy" caused by deterioration of precision because of wear.

B-Ⅱ-5.2 Fatigue Life

Fatigue life of the ball screw can be estimated by basic dynamic load rating (C_a) as is for the rolling bearing.

(1) Basic dynamic load rating C_a

Basic dynamic load rating is the axial load which allows a 90% of the group of the same ball screws to rotate 1 million times (10^6rev) under the same condition without causing flaking by rolling contact fatigue. Basic dynamic load ratings are shown in the dimension tables.

(2) How to calculate fatigue life

1. Life calculation

Fatigue life is defined as a total rotation number in general. It is sometimes indicated by total rolling hours or total running distance. Fatigue life is obtained by the following formula.

$$L = \left(\frac{C_a}{F_a \cdot f_w}\right)^3 \cdot 10^6 \cdots (\text{Ⅱ-8})$$

$$L_t = \frac{L}{60n} \cdots (\text{Ⅱ-9})$$

$$L_s = \frac{L \cdot l}{10^6} \cdots (\text{Ⅱ-10})$$

In this formula:

L : Rating fatigue life (rev)
L_t : Life in hours (h)
L_s : Life by running distance (km)
C_a : Basic dynamic load rating (N)
F_a : Axial load (N)
n : Rotational speed (rpm)
l : Lead (mm)
f_w : Load factor (Coefficient by operating condition)

Smooth operation without impact	1.0～1.2
Normal operation	1.2～1.5
Operation associated with impact or vibration	1.5～3.0

Setting too long fatigue life requires larger ball screw, and is not economical. Below are the general target values of operating life for machines. (reference)

Machine tools	20,000 hours
Industrial machines	10,000 hours
Automatic control system	15,000 hours
Measuring equipment	15,000 hours

(3) Mean load

If the axial load varies often, to calculate a life, obtain an mean load which gives equivalent fatigue life under this varying load conditions.

1. When load and rotational speed shift by phase (Fig. Ⅱ-5.1)

Axial load (N)	Rotational speed (rpm)	Hours of use, or ratio of hours of use
F_1	n_1	t_1
F_2	n_2	t_2
:	:	:
F_n	n_n	t_n

Obtain the mean load Fm by the formula below.

$$F_m = \left(\frac{F_1^3 \cdot n_1 \cdot t_1 + F_2^3 \cdot n_2 \cdot t_2 + \cdots + F_n^3 \cdot n_n \cdot t_n}{n_1 \cdot t_1 + n_2 \cdot t_2 + \cdots + n_n \cdot t_n}\right)^{\frac{1}{3}} \cdots (\text{Ⅱ-11})$$

Obtain mean rotational speed Nm by the formula below.

$$Nm = \frac{n_1 \cdot t_1 + n_2 \cdot t_2 + \cdots + n_n \cdot t_n}{t_1 + t_2 + \cdots + t_n} \cdots (\text{Ⅱ-12})$$

2. When the rotational speed is constant, and the load changes linearly (Fig. II-5.2)

Obtain approximate value of the mean load Fm by the formula below.

$$F_m = \frac{1}{3}(F_{min} + 2F_{max}) \cdots (\text{Ⅱ-13})$$

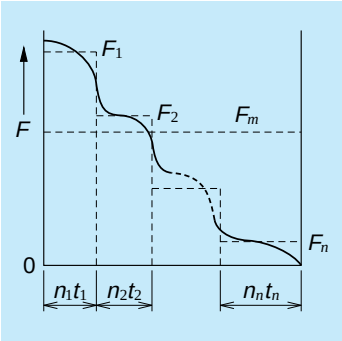


Fig. Ⅱ-5•1 Load varies by phase

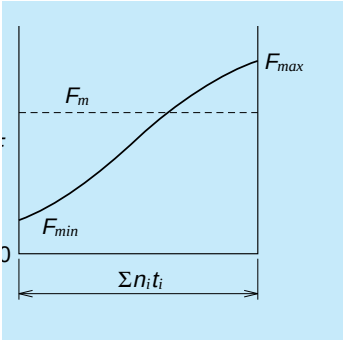


Fig. Ⅱ-5•2 Simply varying load

3. When rotational speed is constant, and the load changes in sinusoidal (Fig. Ⅱ-5•3)

Obtain approximate value of the mean load Fm by the formula below.

When the sine curve is Fig. (a)

$$F_m \fallingdotseq 0.65F_{max}$$

When the sine curve is Fig. (b)

$$F_m \fallingdotseq 0.75F_{max} \cdots \text{(Ⅱ-14)}$$

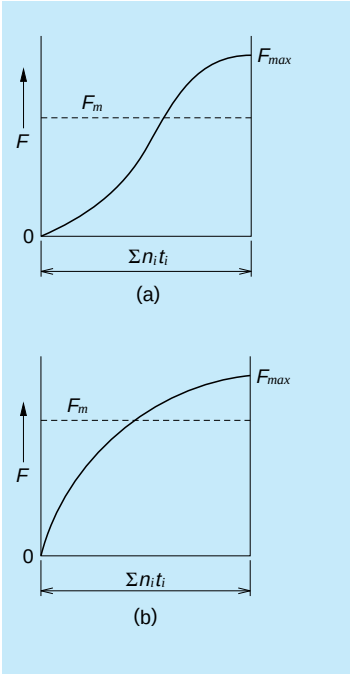


Fig. Ⅱ-5•3 Load changes in sinusoidal (Fig. Ⅱ-5•3)

(4) Affect of mounting misalignment

If moment load or radial load is applied to the ball screw, it adversely affects ball screw function, and shortens life. Watch for eccentric load that induces moment or radial load.

Fig. Ⅱ-5.4 shows a calculation example of fatigue life when moment load is applied to the ball screw. In this figure, the value of the rigidity of mounting ball screw sections (screw shaft, support bearing, guide, etc.) is set at infinity. In actual use, deformation is absorbing the moment load in various areas, and the moment load that generates between the screw shaft and nut is abated.

In general, the following values are recommenced as control values for precision class.

Misalignment in inclination ····1/2000 or under
Eccentricity ····· 20μm or under

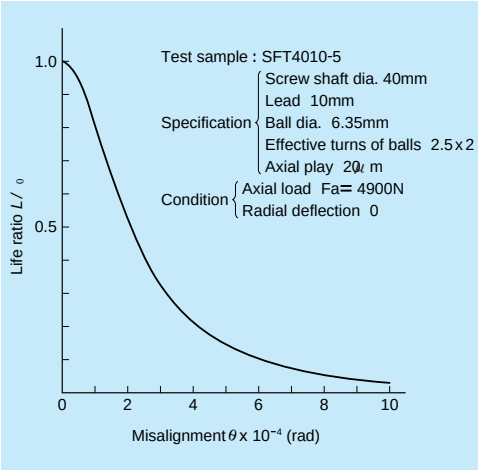


Fig. Ⅱ-5•4 Affects of misalignment

① Effects of heavy load and short stroke

If the ball screw is used under heavy load and short strokes, such as for drive of plastic injection molding machine and of press machines, the fatigue life may become significantly shorter than the rated fatigue life which is calculated in Ⅱ-5.2. This decreased life occurs because the heavy load generates large stress (surface pressure) in the contact point of balls and ball grooves of the screw shaft and the nut, adversely affecting the life. In such case, the life calculation should take into account the size of the surface pressure as well as the size of the stroke.

* Criterion for axial load during operation, that affects fatigue life

The axial load during operation and the size of stroke, which affect fatigue life , can be obtained by the following formula.

Please consult NSK if the load exceeds this value or if the stroke is shorter. NSK calculates fatigue life for drives under heavy load and short stroke.

* Axial load : The load is applied to the axial direction when screw shaft of and the nut of ball screw are rotating relatively each other. The rotational speed is irrelevant.

$$F_{amax} \geqq 0.10C_{0a} \cdots \text{(Ⅱ-15)}$$
$$S \leqq 4$$

In this formula:

F_{amax} : Maximum load to axial direction during drive (N)

C_{0a} : Basic dynamic load rating (N)

S : Stroke (rev) $S = L_s / l$

L_s : Stroke distance (mm)

l : Lead (mm)

B-Ⅱ-5.3 Materials and Hardness

NSK standard materials

Table Ⅱ-5.1 indicates NSK standard materials and their hardness.

Table Ⅱ-5.1 Ball screw materials and their hardness

Component	Material	Heat treatment method	Hardness (HRC)
Screw shaft	SCM415H SCM420H	Carburizing	58～62
	SAE4150	Induction hardening	58～62
Nut	SCM415H SCM420H	Carburizing	58～62

* NSK manufactures special material ball screws for special environments (stainless steel: SUS440C, SUS630). NSK also furnishes surface treatment (Refer to Page D5). Please consult NSK for such request.

B-Ⅱ-5.4 Wear Life

Wear of materials, as is the case for other mechanical components, is significantly affected by use conditions, lubrication conditions and other factors. It is difficult to estimate its volume, and measuring requires various tests and field data.

NSK has data of wear accumulated through abundant experience. Please contact NSK for inquiry pertaining to the wear.

B-Ⅱ-6. Preload and Rigidity

B-Ⅱ-6.1 Elastic Deformation of the Preloaded Ball Screw

(1) Position preload (D, Z, P preloads)

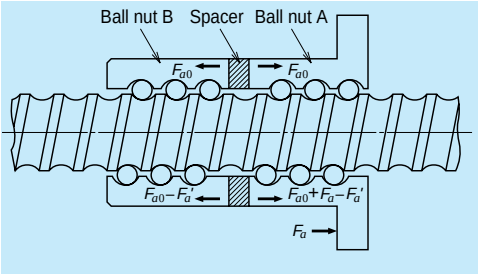


Fig. Ⅱ-6•1 Position preload (double-nut)

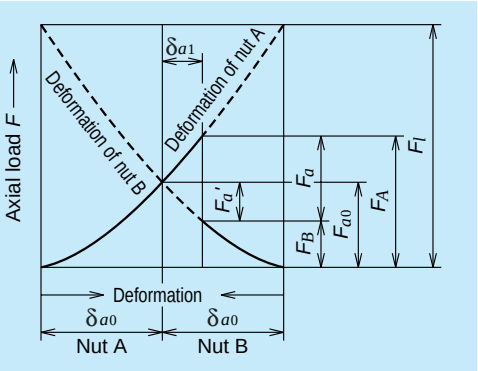


Fig. Ⅱ-6•2 Deformation of A and B nut (position preload)

In Fig. Ⅱ-6•1, elastic deformation of Nut A and B is already given at time of assembly by the amount of $\delta a0$ by preload $Fa0$. When the external load Fa is added to Nut A, the elastic deformation δa and δb of each Nut A and B change as shown in Fig. Ⅱ-6•2,

$$\delta a = \delta a0 + \delta a1 \qquad \delta b = \delta a0 - \delta a1$$

At this time, the load to each Nut A and B are:

$$F_A = Fa0 + Fa - Fa'$$

$$F_B = Fa0 - Fa'$$

It shows that the load applied to Nut A is affected by Nut B and reduced by the amount of Fa'. Thereby, the elastic deformation of Nut A becomes smaller. This effect continues until the elastic deformation by the external load becomes $\delta a0$, and the preload by Nut B disappears.

Assuming that the load when the preload is absorbed is F_l, the relationship between the axial load and the elastic deformation is as follows.

$$\delta a0 = K \cdot Fa0^{2/3} \qquad 2\delta a0 = K \cdot F_l^{\frac{2}{3}}$$

(K: Invariable number)

$$\left[\frac{F_l}{Fa0}\right]^{2/3} = \frac{2\delta a0}{\delta a0} = 2$$

$$F_l = 2^{\frac{3}{2}} \times Fa0 \fallingdotseq 3Fa0$$

For this reason, the preload should be about 1/3 of the maximum axial load. Please note that the preload of about 1/3 of the maximum axial load increases heat, and shortens life if it exceeds 10% of C_a. The criterion for the maximum preload is $0.1C_a$.

Fig. Ⅱ-6•3 shows two types of elastic deformation curves: one is by the ball screw with preload, the other without preload. When an axial load which is about three times as large as the preload is applied, the deformation of the preloaded ball screw is 1/2 of the deformation of the ball screw without preload.

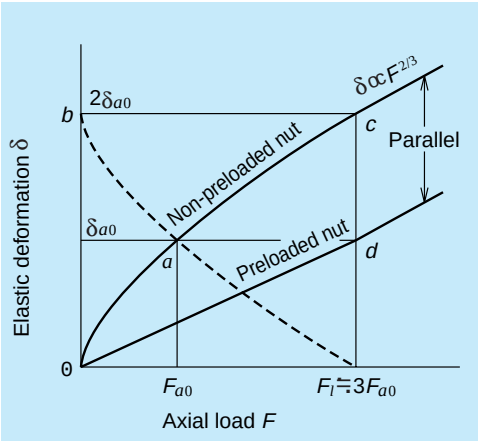


Fig. Ⅱ-6•3 Deformation of preloaded ball nut (position preload)

(2) Constant pressure preload (J preload: preloaded by spring)

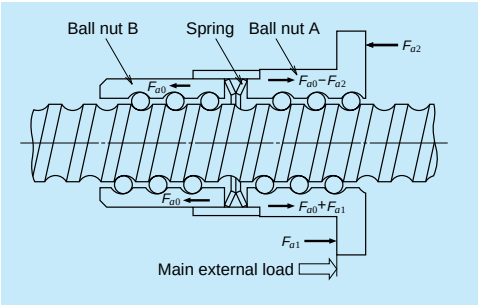


Fig. Ⅱ-6•4 Constant pressure preload (double nut)

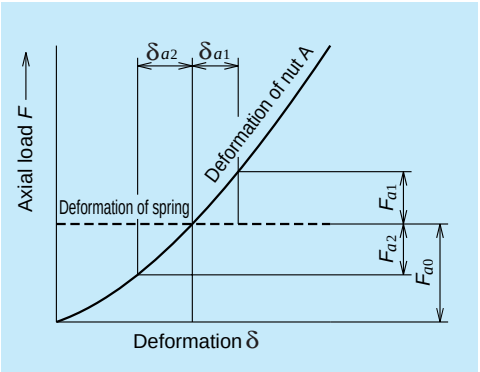


Fig. Ⅱ-6•5 Deformation curve of constant pressure preloaded nut

Fig. Ⅱ-6•5 shows an elastic deformation of the ball screw which is preloade with "constant pressure." The rigidity of the preload spring is sufficiently smaller than the nut rigidity. Therefore, the deformation of the spring becomes nearly parallel to the axis of abscissa. For this reason, the elastic deformation by the preload with constant pressure changes along the deformation curve by Nut A. In order to take advantage of the characteristics of the preload with constant pressure, the major external load should be applied in the directions shown by arrows (Fig. Ⅱ-6•4.).

B-Ⅱ-6.2 Rigidity of the Feed Screw System

A low rigidity around the feed screw mounting area causes lost motion. To improve the positioning accuracy of precision machines such as NC machine tools, it requires a good balance in axial rigidities of composing parts of the feed screw system.
Also check torsional rigidities of the feed screw system.

(1) Axial rigidity of the feed screw system

① Axial elastic deformation and rigidity of the feed screw system: K_T

Elastic deformation and rigidity of the feed screw system can be obtained by the following formula.

$$\delta = \frac{F_a}{K_T} \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots \text{(Ⅱ-16)}$$

$$\frac{1}{K_T} = \frac{1}{K_S} + \frac{1}{K_N} + \frac{1}{K_B} + \frac{1}{K_H} \cdots\cdots \text{(Ⅱ-17)}$$

In this formula:

δ : Volume of axial elastic deformation of the feed screw system (μm)
F_a : Axial load to the feed screw system (N)
K_T : Axial rigidity of the feed system (N/μm)
K_S : Axial rigidity of the screw shaft (N/μm)
K_N : Axial rigidity of the nut (N/μm)
K_B : Axial rigidity of the support bearing (N/μm)
K_H : Axial rigidity of the nut and bearing mounting section (N/μm)

② Axial rigidity of the screw shaft: K_S

(a) In case of: Fixed support - Free (axial direction)

In this formula:

$$K_S = \frac{A \cdot E}{x} \times 10^{-3} \cdots\cdots\cdots\cdots\cdots\cdots \text{(Ⅱ-18)}$$

K_S : Axial rigidity of the screw shaft (N/μm)
A : Cross section area of the screw shaft (mm^2)

$$A = \frac{\pi}{4} dr^2$$

dr : Screw shaft root diameter (mm)
E : Elastic modulus (E = 2.06 x 10^{5}MP)
x : Distance between points of load application (mm)

(b) In case of: Fixed – Fixed support (axial direction)

In this formula:

$$K_S = \frac{A \cdot E \cdot L}{x\,(L-x)} \times 10^{-3} \cdots\cdots\cdots\cdots\cdots\cdots \text{(Ⅱ-19)}$$

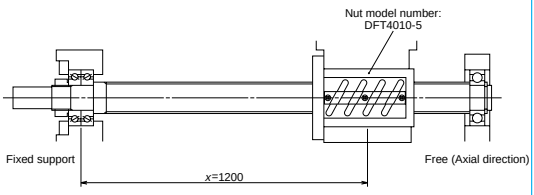
K_S : Axial rigidity of the screw shaft (N/μm)
L : Unsupported length (mm)
x : Axial deformation is maximum at position x = L/2.

Axial rigidity of the screw shaft can be obtained by the following formula.

$$K_S = \frac{4A \cdot E}{L} \times 10^{-3} \cdots\cdots\cdots\cdots\cdots\cdots \text{(Ⅱ-20)}$$

[Example of calculation-1]

Obtain axial rigidity of the screw shaft under the condition in Fig. Ⅱ-6•6.



Fixed support -- Free (axial direction)

Fig. Ⅱ-6.6 Supporting conditions"(a)"to calculate axial rigidity of the screw shaft

* Use conditions

Nut model: DFT 4010-5

From Fig. Ⅱ-6.6: Supporting condition -

Fixed support --Free (axial direction)

Distance between points of load application

x = 1200 mm

From the dimension table: Screw shaft root diameter

dr = 34.4 mm

* Calculation

By Formula Ⅱ-18

$$A = \frac{\pi}{4} dr^2 = \frac{3.14}{4} \times 34.4^2 = 929.4\ (mm^2)$$

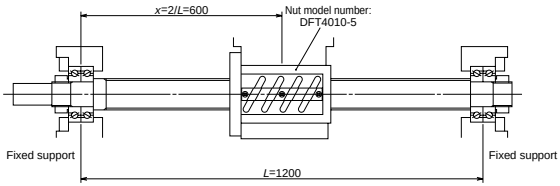
$$K_S = \frac{A \cdot E}{x} \times 10^{-3} = \frac{929.4 \times 2.06 \times 10^5}{1200} \times 10^{-3} = 159\ (N/\mu m)$$

Result

Axial rigidity of the screw shaft K_S = 159 N/μm

[Example of calculation-2]

Obtain axial rigidity of the screw shaft under the conditions in Fig. Ⅱ-6•7.



Fixed - Fixed support

Fig. Ⅱ-6.7 Supporting conditions"(b)" to calculate axial rigidity of the screw shaft

* Use conditions: Nut model: DFT 4010-5

From Fig. Ⅱ-6•7: Supporting condition:

Fixed - Fixed support (axial direction)

L = 1200 mm

Distance between points of load application:

From the dimension table: Screw shaft root diameter

dr = 34.4 mm

* Calculation

By Formula Ⅱ-19

$$A = \frac{\pi}{4} dr^2 = \frac{3.14}{4} \times 34.4^2 = 929.4\ (mm^2)$$

$$K_S = \frac{4A \cdot E}{x} \times 10^{-3} = \frac{4 \times 929.4 \times 2.06 \times 10^5}{1500} \times 10^{-3} = 510\ (N/\mu m)$$

* Result

Axial rigidity of the screw shaft K_S = 510 N/μm

③ Axial rigidity of the ball nut : K_N

(a) Rigidity of the nut with axial play

The following formula shows the relationship between axial load "Fa" and the volume of elastic deformation "δa."

$$\delta a = \frac{0.22C}{\sin\alpha}\left[\frac{Q^2}{D_W}\right]^{1/3} \times \xi\,(\mu m) \cdots\cdots\cdots\cdots \text{(II-21)}$$

In this formula:

δa : Axial deformation of the ball nut

C : Invariable number determined by material, shape and size (ref: medium size precision ball screw C ≒ 2.4)

α : Contact angle (degree) of balls and groove

D_W : Ball diameter (mm)

Q : Load per ball (N)

$Q = F_a/Z \cdot \sin\alpha$

Z : Number of balls

ζ : Factor determined by accuracy and internal structure

Theoretical rigidity value K is shown in the dimension table. K is obtained from the elastic deformation between screw groove and balls when an axial load which is equivalent to 30% of the basic dynamic load rating C_a is applied. The criterion for calculation of ball nut rigidity is 80% of the value listed in the table taking into consideration disfigurement of the ball nut, etc.

Rigidity value K_N is obtained by the following formula when the axial load "F_a" is not 30% of "C_a."

$$K_N = 0.8 \times K\left[\frac{F_a}{0.3C_a}\right]^{1/3} (N/\mu m) \cdots\cdots\cdots \text{(II-22)}$$

In this formula:

K : Rigidity value in dimension tables (N/μm)

F_a : Axial load (N)

C_a : Basic dynamic load rating (N)

[Example of calculation-1]

Obtain axial rigidity of the nut under the following conditions.

* Use conditions

Nut model: SFT 4010-5

Axial load: F_a = 6000 N

From the dimension table: F_a = Rigidity at $0.3C_a$ K = 706 N/μm

* Calculation

By Formula II-22

$$K_N = 0.8 \times K\left[\frac{F_a}{0.3 \cdot C_a}\right]^{1/3} = 0.8 \times 706 \times \left[\frac{6000}{0.3 \times 53000}\right]^{1/3} = 408\ (N/\mu m)$$

* Result

Axial rigidity of the nut : K_N = 408 N/μm

④ Rigidity of preloaded ball nut

Theoretical rigidity K is shown in each dimension table. K is obtained from the elastic deformation of the ball rolling surface and the balls when: a preload which is equivalent to 10% of the basic dynamic load rating C_a (P Preload. Five percent for single-nut oversize ball pre-load system) is applied, followed by an axial load. The criterion for calculation of nut rigidity is 80% of the value listed in the table taking into consideration disfigurement of the ball nut, etc.

Rigidity K_N is obtained by the following formula when preload "F_{ao}" is not 10% (or 5%) of "C_a".

$$K_N = 0.8 \times K\left[\frac{F_{ao}}{\varepsilon \cdot C_a}\right]^{1/3} (N/\mu m) \cdots\cdots\cdots \text{(II-23)}$$

In this formula:

K: Rigidity in the dimension tables (N/μm)

Fao: Preload (N)

ε: Basic factor to calculate rigidity (ε = 0.1. Use 0.05 for P Preload)

Example of calculation-1]
Obtain axial rigidity of the nut under the following conditions.
* Use conditions
Nut model : DFT 4010-5
Preload : F_{ao}= 4000 N
From the dimension table: F_{ao} = Rigidity when $\mathcal{E}C_a$: K = 1388 N/μm
When D Preload:$\mathcal{E}$ = 0.1

* Calculation
By Formula Ⅱ-23

$$K_N = 0.8 \times K\left[\frac{F_{ao}}{\mathcal{E}\cdot C_a}\right]^{1/3} = 0.8 \times 1388 \times \left[\frac{4000}{0.1\times 53000}\right]^{1/3} = 1010\ (N/\mu m)$$

* Result
Axial rigidity of the nut : K_N 1010 N/μm

(a) The criterion of the pre-load to ball screw
Nut rigidity increases by a larger preload volume. But excessive preload shortens life, and generates heat. Set the maximum pr-load about at 0.1*C*a (0.05 for *P* Pre-load). Table Ⅱ-6.1 shows the criteria for preload for different application.

④ Axial rigidity of support bearing: K_B
Rigidity of the combined thrust angular contact ball bearing which is widely used as a support bearing of the ball screw for high-precision equipment can be obtained by the following formula.

$$K_B \fallingdotseq \frac{3F_{ao}}{\delta_{ao}}(N/\mu m) \quad \cdots\cdots\cdots\cdots (Ⅱ\text{-}24)$$

In this formula:

K_B : Rigidity of the combined thrust angular contact ball screw (N/μm)
F_{ao} : Preload of the bearing (N)
δ_{ao} : Axial elastic deformation by preload (μm)

$$\delta_{ao} = \frac{0.44}{\sin\alpha}\left[\frac{Q}{D_W}\right]^{2/3}(\mu m) \cdots\cdots (Ⅱ\text{-}25)$$

$$Q = F_{ao}/Z \cdot \sin\alpha$$

α : Contact angle
D_W : Ball diameter (mm)
Z : Number of balls

Refer to Page B305 for data regarding thrust angular contact ball bearings which support high-precision ball screws (TAC Series).
⑤ Axial rigidity of the ball nut and bearing mounting section : K_H
High rigidity should be given to the mounting section from the design phase of the machine.
ⓐ **Torsional rigidity of the feed screw system**
Major torsion factors in the rotating system which bring about error in positioning accuracy are.
* Torsional deformation of the screw shaft
* Torsional deformation of the joint section
* Torsional deformation of the motor
The value of the effect of torsional strain to positioning accuracy is smaller than axial deformation. However, check the effect when designing equipment which requires high positioning accuracy.
ⓑ **Suppress thermal error**
It is necessary to minimize the thermal error for ever increasing demand for positioning accuracy.
* Suppress heat
* Forced cooling
* Avoid effect of temperature rise
Refer to "Measures against thermal expansion" on Page B447.

Table Ⅱ-6•1 Criteria of preload

Ball screw application	Preload (relative to dynamic load rating Ca)
Robots,material handling systems, etc.	Axial play or ~ 0.01Ca
Semiconductor manufacturing systems, etc. which require highly accurate positioning	0.01Ca ~ 0.04Ca
Medium- high-speed machine tools for cutting	0.035Ca ~ 0.075Ca
Low to medium-speed systems that require especially high rigidity	0.07Ca ~ 0.1Ca

B-Ⅱ-7 Friction Torque and Drive Torque

Operations that use ball screw drives require a motor torque which is equivalent to the total of:

* Friction torque, i.e. the friction of the ball screw itself
* Drive torque which is required for operation

B-Ⅱ-7.1 Friction Torque

(1) Starting friction torque (Break away torque)

A large torque is necessary to start ball screw. This is called "starting friction torque" or "break away torque." This torque is 2 to 2.5 times larger than preloaded dynamic (friction) torque which is described below. Starting friction torque quickly diminishes once the ball screw begins to move.

(2) Dynamic preloaded drag torque (preloaded dynamic friction torque)

When the ball screw is moving, two types of torque generate: 1. Dynamic friction torque by preload; 2. Friction torque associated with ball recirculation. JIS B1192 sets standard of dynamic preloaded torque, which is the total of these two torque types. They are defined in Fig. Ⅱ-7•1.

(3) Calculation of basic torque

Basic torque of preloaded ball screw (T_{po}) can be obtained by the following formula.

$$T_{p0} = K\frac{F_{ao} \cdot l}{2\pi} \fallingdotseq 0.014F_{ao}\sqrt{dm \cdot l}\,(N \cdot cm) \cdots (Ⅱ\text{-}26)$$

In this formula:

F_{ao} : Preload (N)

l : Lead (cm)

K : Torque coefficient of ball screw

$$K = \frac{0.05}{\sqrt{tan\beta}}$$

β : Lead angle (deg.)

dm: Ball pitch circle diameter (cm)

Allowable values of torque variation rate relative to basic torque are regulated as shown in Table Ⅱ-7.1.

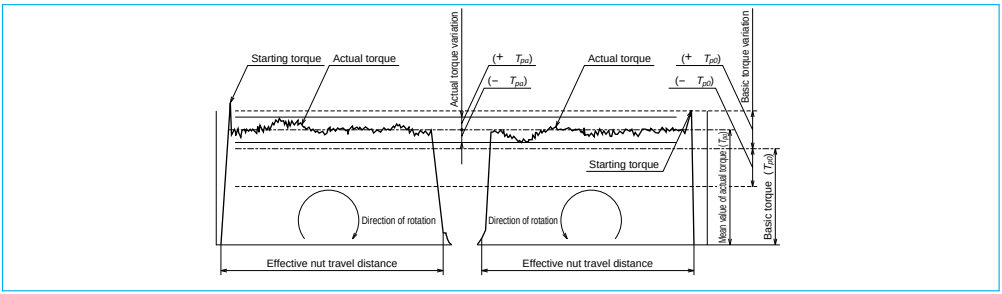


Fig. Ⅱ-7•1 Definitions of dynamic preloaded drag torque

Table Ⅱ-7•1 Range of allowable values of torque variation rates (Source: JIS B 1192)

Basic torque (N·cm)		Effective length of the screw thread (mm)										
		4000 or under								Over 4000 and 10000 or under		
		Slenderness ratio[1]: 40 or less				Slenderness ratio[1]: More than 40 and 60 or less				—		
		Accuracy grade				Accuracy grade				Accuracy grade		
Over	Incl.	C0	C1	C2, 3	C5	C0	C1	C2, 3	C5	C1	C2, 3	C5
20	40	±30%	±35%	±40%	±50%	±40%	±40%	±50%	±60%	—	—	—
40	60	±25%	±30%	±35%	±40%	±35%	±35%	±40%	±45%	—	—	—
60	100	±20%	±25%	±30%	±35%	±30%	±30%	±35%	±40%	—	±40%	±45%
100	250	±15%	±20%	±25%	±30%	±25%	±25%	±30%	±35%	—	±35%	±40%
250	630	±10%	±15%	±20%	±25%	±20%	±20%	±25%	±30%	—	±30%	±35%
630	1000	—	±15%	±15%	±20%	—	—	±20%	±25%	—	±25%	±30%

Remarks 1. Slenderness ratio: The value obtained by dividing the length of the screw thread section of screw shaft (mm) by diameter of the screw shaft (mm).

2. NSK independently sets torque standards which are under 20N·cm.

B-Ⅱ-7.2 Drive Torque

(1) Operating torque of the ball screw

① Normal drive

The torque when converting rotational motion to linear motion (normal operation) is obtained by the following formula.

$$T_a = \frac{F_a \cdot l}{2\pi \cdot \eta_1} \quad (N \cdot cm) \cdots\cdots\cdots\cdots (Ⅱ\text{-}27)$$

In this formula:

T_a : Normal operation torque (N・cm)
F_a : Axial load (N)
l : Lead (cm)
η_1 : Normal efficiency (η_1=0.9-0.95)

② Back-drive operation

The torque when converting linear motion to rotational motion (back-drive operation) is obtained by the following formula.

$$T_b = \frac{F_a \cdot l \cdot \eta_2}{2\pi} \quad (N \cdot cm) \cdots\cdots\cdots\cdots (Ⅱ\text{-}28)$$

In this formula:

T_b : Normal operation torque (N・cm)
η_2 : Normal efficiency (η_1 = 0.9 - 0.95)

③ Dynamic drag torque of the preloaded ball screw

Operation torque of preloaded ball screw can be obtained by Formula Ⅱ-26 (Page B469).

(2) Drive torque of the motor

① Drive torque at constant speed

Torque which is necessary to drive a ball screw at constant speed resisting to external loads can be obtained by the following formula.

$$T_1 = (T_a + T_{pmax} + T_u) \times \frac{N_1}{N_2} \cdots\cdots\cdots\cdots\cdots\cdots (Ⅱ\text{-}29)$$

In this formula:

T_a : Drive torque at constant speed

$$T_a = \frac{F_a \cdot l}{2\pi \cdot \eta_1} \cdots\cdots\cdots\cdots\cdots\cdots (Ⅱ\text{-}27)$$

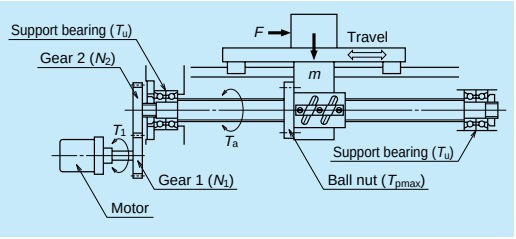


Fig. II-7.2 Driving mechanism of ball screw

F_a : Axial load (N)

The value of F_a in Fig. Ⅱ-7•2 is:

$F_a = F + \mu \cdot m \cdot g$

F : Such as cutting force to axial direction (N)
μ : Friction coefficient of the guide way
m : Volume of the traveling section (table mass plus work mass kg)
g : Gravitational acceleration (9.80665m/s^2)
T_{pmax} : Upper limit of the dynamic friction torque of ball screw (N・cm)
T_u : Friction torque of the support bearing (N・cm)
N_1 : Number of teeth in Gear 1
N_2 : Number of teeth in Gear 2

Though it depends on the type of motor, using when T_1 is lower than 30% of the motor rating torque is common.

② Drive torque at acceleration

Accelerating the ball screw resisting axial load requires maximum torque. Drive torque necessary for this occasion can be obtained by the following formula.

$$T_2 = T_1 + J \cdot \dot{\omega} \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (Ⅱ\text{-}30)$$

$$J = J_M + J_{G1} + \left[\frac{N_1}{N_2}\right]^2 \left[J_{G2} + J_S + m\left[\frac{l}{2\pi}\right]^2\right] (kg \cdot m^2) \cdots\cdots (Ⅱ\text{-}31)$$

In this formula:

T_2 : Maximum drive torque at time of acceleration (N・m)
$\dot{\omega}$: Motor's angular acceleration (rad/s2)
J : Moment of inertia applied to the motor (kg・m^2)
J_M : Moment of inertia of the motor (kg・m^2)
J_{G1} : Moment of inertia of Gear 1 (kg・m^2)
J_{G2} : Moment of inertia of Gear 2 (kg・m^2)
J_S : Moment of inertia of the screw shaft (kg・m^2)

Check maximum torque of the motor relative to T_2.

※Formula for the moment of inertia of a cylindrical object (ball screw, gear, etc.)

$$J = \frac{\pi \cdot y}{32} D^4 \cdot L \ (kg \cdot cm^2) \cdots\cdots\cdots (Ⅱ\text{-}32)$$

In this formula:

Y : Material density (kg/cm^3)
D : Diameter of the cylindrical object (cm)
L : Length of the cylindrical object (cm)

B-Ⅱ-8 Lubrication of Ball Screw

Lithium soap-based grease at viscosity 30~140cSt℃ is used for grease lubrication. Oil with ISO grade 32~100 is used for oil lubrication.

In general, lubricants with low base oil viscosity are recommended when the ball screw is used for high speed, and it is important to reduce thermal elongation of the screw shaft. On the other hand, lubricants with high base oil viscosity are recommended when the ball screw is used for low speed, high temperature, with vibration, or under high load.

NSK Grease Unit for ball screw lubrication includes:

1) Various types of grease in the bellows-tube which can be instantly attached to the grease pump;

2) Hand grease pump which is compact and easy to use;

3) Nozzles.

Table Ⅱ-8•1 shows NSK greases, and names of other ball screw greases.

Table Ⅱ-8•2 explains checking points in lubrication and standard intervals between replenishments. It is important to wipe off old grease from the screw shaft prior to applying new grease. Page D15 also explains in detail concerning the replenishing methods.

Table Ⅱ-8•1 Grease for ball screw

Product name	Thickener	Base oil	Base oil viscosity cSt/40℃	Range of temperature for use (deg.℃)	Application
NSK Grease AV2	Lithium base	Mineral oil	130	–10～110	General heavy load
NSK Grease PS2	Lithium base	Synthetic oil combined with mineral oil	15	–50～110	Light load
NSK Grease LR3	Lithium base	Synthetic oil	30	–30～130	High-speed medium load
Adlex	Lithium base	Mineral oil	197	～100	Heavy load
NSK (NF2)	Urea composite type	Synthetic oil combined with mineral oil	27	–40～100	Fretting resistant
NSK (EA2)	Diurea	Synthetic oil	47	–40～150	For wide-range temperature

※Refer to Page D14 for the nature of NSK greases.

Table Ⅱ-8•2 Checking lubricant and intervals of replenishment

Lubricating method	Checking intervals	Check points	Replenish/replacing interval
Intermittent automatic oil supply	Once a week	Remaining volume, contamination	Supply oil when checking (depending on the tank volume)
Grease	2 ～ 3 months after start of use	Clean, foreign matters	Generally once a year (replenish when necessary)
Oil bath	Every day, when start to work	Oil level	Specify according to oil consumption

B-Ⅱ-9 Dust Prevention for Ball Screw

Use bellows and telescopic pipe (Fig. Ⅱ-9•1) to keep foreign matters from entering into the feed screw system. Install these items so as to shut foreign matters completely from the ball screw.

A seal installed on the nut reinforces the prevention effect. As a rule, a plastic seal (Fig. Ⅱ-9•2) comes with A Series and S Series which are standard series in stock. Small ball screws (diameter of 14 mm and smaller) of R Series (rolled ball screws) come with a plastic seal. The seal for other sizes is "Brush-seal." (Fig. Ⅱ-9•3).

In case of end cap recirculation system for rolled screws (high helix and ultra high helix leads), recirculation components on both ends also serve as a seal. However, the clearance is very large. To provide further dust protection, use the brush-seal which can be installed to the exterior side. Please consult NSK for detail.

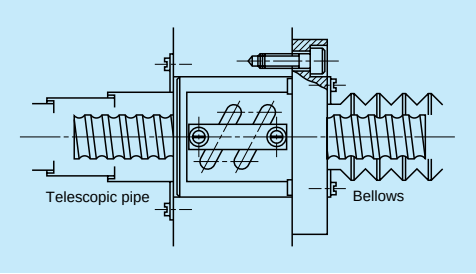


Fig. Ⅱ-9•1 Dust prevention by telescopic pipe and bellows

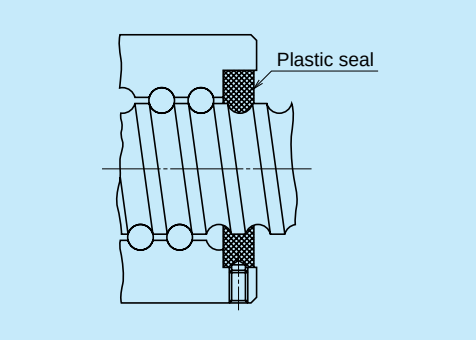


Fig. Ⅱ-9•2 Standard plastic seal

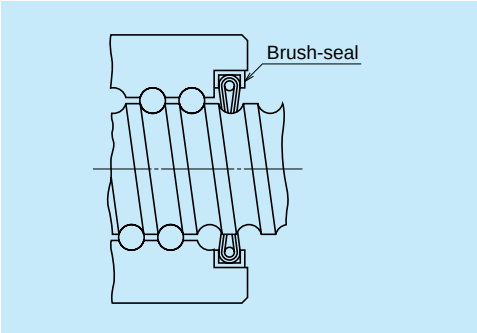


Fig. Ⅱ-9•3 Brush-seal for rolled ball screws

B-Ⅱ-10 Rust Prevention and Surface Treatment of Ball Screws

(1) Stainless steel ball screw

Stainless series KA is standard and available in stock. Please consult NSK if you require custom made stainless steel ball screw.)

(2) Surface treatment

Various types of surface treatments for different purpose are available. Please consult NSK.

[Some of the recommended surface treatments]

* Electrolytic low temperature chrome plating (black chrome plating)
* Fluoride low temperature chrome plating

Among seueral surface treatments, black chrome plating is superior because it is easy to furnish and it is effective.

Applicable length -- 5 m (4 m in case of the fluoride low temperature chrome plating)

* Refer to D-1.3 "Rust Prevention and Surface Treatment" (Page D5).

B-Ⅱ-11 Ball Screw Specifications for Special Environments

B-Ⅱ-11.1 Clean Environment

NSK manufactures NSK Clean Grease "LG2" for NSK linear guides, ball screws, and Monocarriers which are used under normal temperature and pressure in a clean room.
LG2 is a lithium base oil grease, and is far more superior in stable torque characteristics than the vacuum grease which has been used as a countermeasure against dust generation. "LG2" also has a sufficient durability and dust prevention capacity.

(1) Features of "LG2"

① Generates less dust than vacuum grease and other general greases. Cleanliness is enhanced by simply switching the grease to"LG2".
② Has extremely low and stable torque characteristics. It is ideal for high speeds.
③ Unlike vacuum grease,"LG2" has a nature similar to general grease. Its effect is long-lasting, and sufficiently durable. It greatly contributes to minimize the frequency of maintenance.
④ It has an equal capability in rust prevention as general grease, and also is reliable.

When using NSK linear guides, ball screws, or Monocarriers in a clean environment, request "LG2"as a packed lubricant prior to delivery. NSK also makes bellows-tubes which contains 80 grams of "LG2". The tube is easy to use, and is ideal for maintenance. (Refer to Pages B300 and D19). Wash to remove adipose substances prior to use.
Refer to Page D8 for detailed nature, functions and characteristics of "LG2".

B-Ⅱ-11.2 Measures for Use under Vacuum

NSK developed MoS2 / WS2 spattering and dry-filmed ball screws for equipment to be used in space. NSK also makes soft-metal film (gold, silver) ball screws to be used in a vacuum environment for semiconductor and liquid crystal display processing equipment.

Lubricants widely used for ball screws in a high vacuum are:

* Vacuum grease which uses base oil of low vapor pressure.
* Solid lubricants such as MoS_2, WS2 used mainly for equipment in space.
* Solid lubricants by soft-metal such as gold, silver, or lead film.

Used for semiconductor and liquid crystal display making equipment, the oil of the vacuum grease evaporates and causes environmental contamination. Also, it is difficult to create a super high vacuum. MoS2 in the state of solid lubricant generates a large volume of dust, and Mo is unsuitable for semiconductors and reformed surface. Therefore, it is not suitable for the processing machines for semiconductor and liquid crystal display.

NSK recommends solid lubricant ball screws with a long life. These ball screws are treated with special silver film by NSK's unique processing technology, and can be used in a super-high vacuum. However, being a sold lubricant, the film may detach and attach repeatedly, causing the torque to rise momentarily on some occasions. The drive motor should be of large capacity to handle this drastic variation of torque.

Refer to Page D7 for test data of ball screws for vacuum.

For ball screw specifications for special environments, refer to Page D2.

B-Ⅱ-12 Noise and Vibration

B-Ⅱ-12.1 Consideration to Lowering Noise

As the machine operates at higher speeds, noise levels tend to increase. Covering the nut section is insufficient to lower noise. NSK has abundant data (NSK Motion & Control Technical Journal No.1, etc.), and offers advice to users regarding selecting ball screw.

To lower noise level in general, the following points should be taken into consideration.

① If the travel speed is the same, use as large a lead as possible to reduce rotational speed.

② Use a ball screw with as small outer diameter as possible.

It often requires designing for critical dimensions, mandating special specification. Please consult NSK.

For reference, noise levels by ball screws alone are plotted below. Formula for calculation is also shown below.

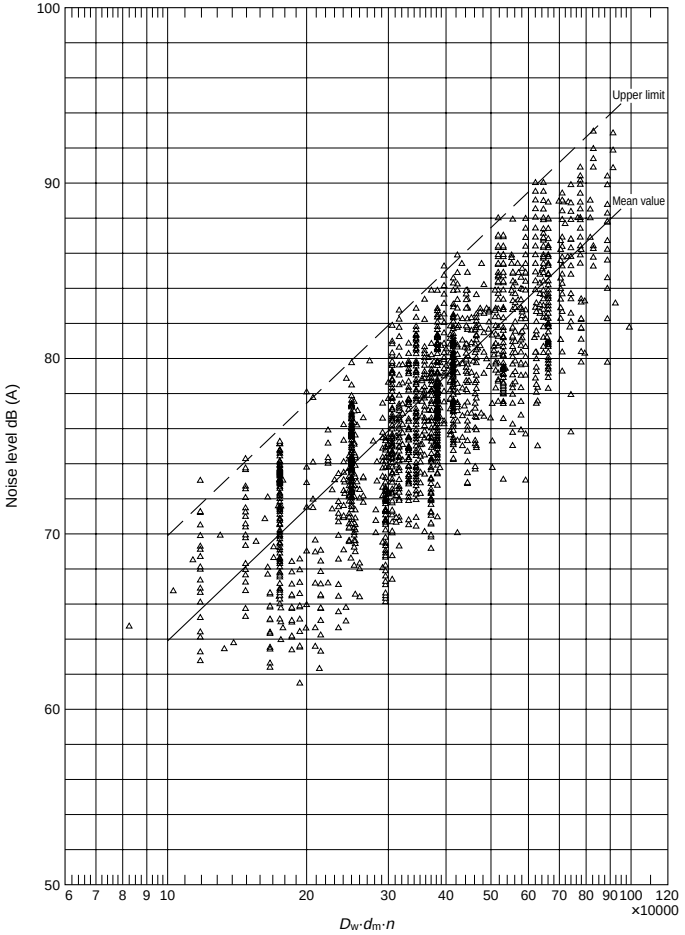


Fig. Ⅱ-12•1 Noise levels of ball screws

Average value at measuring distance of 400 mm ···· dB(A) = $25.2\{\log_{10}(D_w \cdot d_m \cdot n \times 10^{-5})\} + 63.9$ ····· (Ⅱ-33)

Upper limit ···· Average value + 6dB(A)

D_w : Ball diameter (mm)

d_m : Ball pitch circle dia. (mm)

n : Rotational speed (rpm)

If measuring distance is 1 m, the average noise level is: Various noise levels minus 8dB(A).

Example of calculation

* Use conditions

Nut model: DFT4010-5

From the dimension table: $D_w = 6.350$

$d_m = 41$

Maximum rotational speed: 2000 rpm

* Calculation

By Formula Ⅱ-33:

$dB(A) = 25.2\{\log_{10}(D_w \cdot d_m \cdot n \times 10^{-5})\} + 63.9 = 25.2\{\log_{10}(6.350 \times 41 \times 2000 \times 10^{-5})\} + 63.9 = 82dB\ (A)$

* Result

The average value of noise level by ball screws alone at maximum rotational speed (measuring distance 400 mm) is 82dB(A). Upper limit is: 82dB(A) + 6dB(A) = 88dB(A)

* If the measuring distance is 1 m, the average value is 74dB(A), and upper limit is 80dB(A).

When installed, the noise of ball screw becomes higher by the noise of the machine and characteristics of machine vibration.

B-Ⅱ-12.2 Consideration to Ball Screw Support System

Ball screw has low radial rigidity because its support span is longer compare to its shaft diameter. It has only small damping capacity, requiring as much support rigidity as possible through design.

Simplify support bearing system to cut costs invites noise and vibration problems. The necessity to support both shaft ends is increasingly becoming important as the machine is operated at higher speeds.

If one shaft end must be left unfixed without support bearing due to structural reasons, noise and vibration problems may occur. These problems are related to the natural vibration frequency of the screw shaft on the unsecured end. This problem can be averted by installing an impact damper to the shaft end (Fig. Ⅱ-12•2). Please consult NSK.

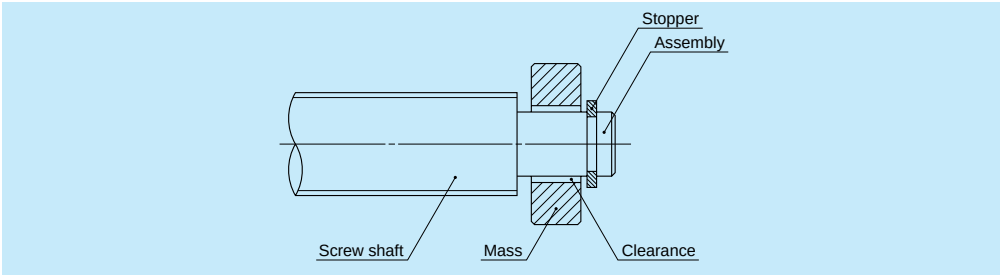


Fig. Ⅱ-12•2 Impact damper (NSK patent)

B-Ⅱ-13 Installation of Ball Screw

B-Ⅱ-13.1 Recommendation of Installation Accuracy

The following values are generally recommended for precision classes.

* Parallelism ·····Under 1/2000 (in inclination)
* Eccentricity ·····Under 20μm

B-Ⅱ-13.2 Adjustment and Test Operation

When installing a ball screw, give heed that it is parallel with the support bearing and the guide way bearing. Confirm the ball screw movement before securing it finally. Begin the test run starting from a low speed and gradually increasing speed in order to check abnormal noise and vibration. Then proceed to continuous operation.

B-Ⅱ-13.3 Inserting Ball Nut into Rolled Screw Shaft

When delivered, the nut of rolled ball screw is separated from the screw shaft, and inserted into an arbor shaft.

(1) Watch out for the shaft end shape

The balls may fall out during moving the assembled nut components from the arbor to the screw shaft if the sizes and shapes of the arbor and the screw shaft are not suitable.

If the end of the ball groove can touch the end of the arbor, connect both ends and move the assembled nut from the arbor to the screw shaft (Fig. Ⅱ-13•1).

If both ends of the screw shaft are machine-processed, it is impossible for the arbor to contact the ball groove end. In this case, wrap tape around the machined- end. Wrap layers of tape until the diameter of the machined end is equal to the outer diameter of the arbor (Fig. Ⅱ-13•2).

If there is a groove or a nick along the way, fill such gaps prior to moving the ball nut.

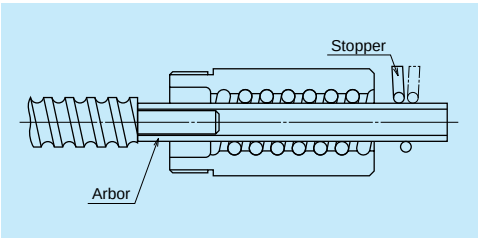


Fig. Ⅱ-13•1 Inserting nut into the screw shaft

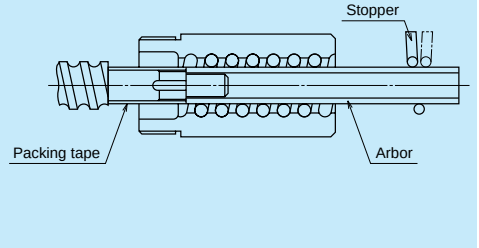


Fig. Ⅱ-13•2 Arbor and the shape of shaft end

(2) Installation of arbor t

Confirm the correct nut orientation for installation. Remove the stop ring on the side from which the assembled nut is to be removed. Match the centers of the screw shaft and the arbor while pressing hard the screw shaft end against the arbor.

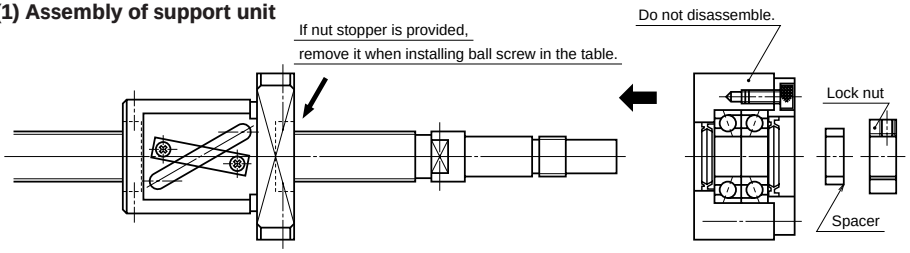
(3) Moving the nut

Slide the nut until it lightly touches the shoulder of the screw shaft ball groove section. Stop sliding. Keep the arbor pressed. Lightly press the assembled nut to the direction it should go. Turn to the direction of thread turn. The assembled nut moves to the screw shaft. Do not separate the arbor from the screw shaft end until the ball groove end of the screw shaft completely appears.

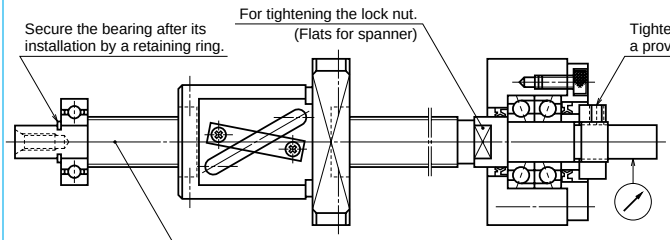
B-Ⅱ-13.4 Installation of Standard Ball Screw and Support Unit

The illustration below shows typical installation procedures of standard A Series ball screw and support unit of the support bearing.

(1) Assembly of support unit



- Pay attention to turnup of oil seal.
- Apply grease to the oil seal, then install in the screw shaft.

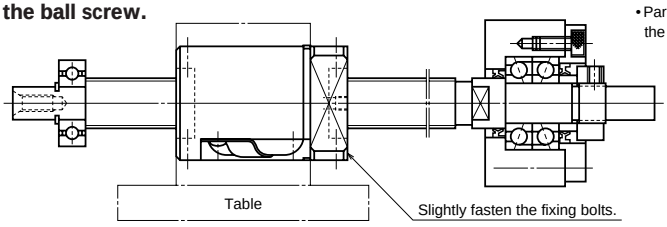


Lubrication grease is applied to the ball screw and ball nut.
(The ball screws which has the letters SA in its reference number is simply applied the rust preventive grease. Apply lubricant to it.)

Run out of the screw shaft ends shall be minimal.

(2) Installation of ball screw nut to the table

Installation example: Turn the table upside down, and install the ball screw.

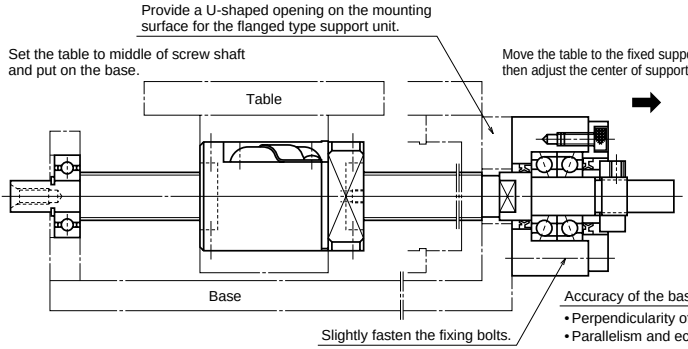


Install the ball screw so that the return tube is on the table side.

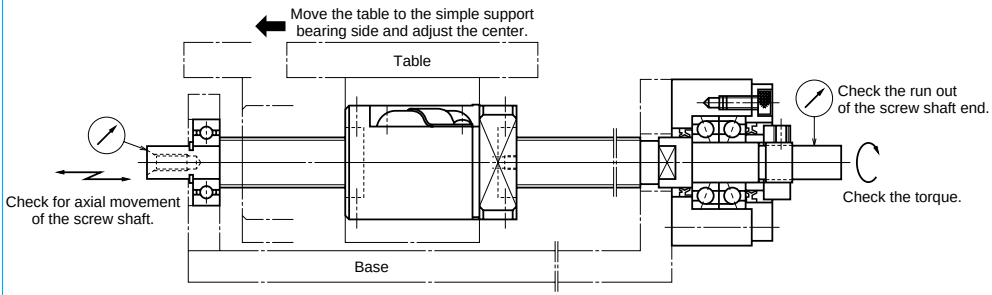
Accuracy of table

- Perpendicularity of nut housing
- Parallelism and center height deviation between the table center and the guide way bearings.

(3) Base, and the support unit installation on the fixed support side



(4) Base and bearing installation on simple support side, and confirming assembling accuracy.

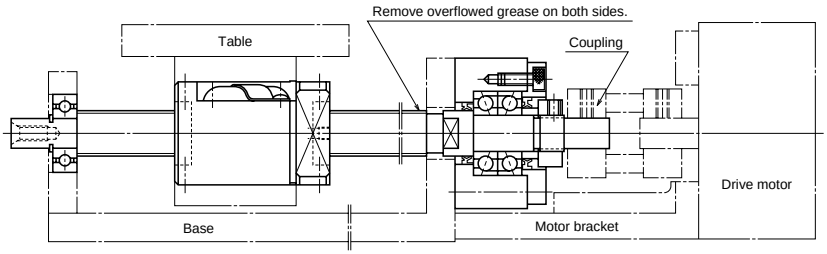


Adjust the center line by moving the table back and forth. Check for smooth operation of the table.
Repeat the same procedures described above if the table is not moving smoothly.
Tighten the fixing bolts checking the assembly accuracy.

(5) Assembly completed.

• Motor bracket / Motor / Coupling

• After the assembly, execute the running-in test entirely.



Assembling accuracy of the motor bracket and coupling affects the positioning accuracy of the table.
Pay great attention to it in the same manner as assembling ball screw.

B-Ⅱ-13.5 Shaft End Machining

Shaft end is machined in the following three occasions.

* Precision ball screws in S Series with blank shaft end.
* Rolled ball screws in R Series with blank shaft end.
* Additional machining of the completed ball screw

The following are summaries of machining of these shaft ends. For details, please contact NSK.

(1) Additional machining of S Series ball screw

① Cutting screw shaft

Use a cutting whetstone, etc. to cut the shaft, leaving stock for turning. Keep the nut in the assembled state to the screw shaft, and open only one side of the plastic wrapping bag, expose only the shaft end section to be machined, then cut the screw shaft. This prevents foreign matters from entering to the ball screw section. Do the same for other machining.

② Precautions in cutting shaft end

Outside of the screw shaft is ground with precision. There is a center hole in the ends. Use them for centering. Do not rotate the shaft quickly or stop it suddenly, or the nut might move along the shaft. Securing the nut with tape is a good idea. To machine a very long shaft, apply work rests to the screw shaft surface to suppress vibration (especially caused by critical speed).

③ Turning by lathe

Cut to the length, turn shaft end steps, turn thread screw, and provide the center hole. Refer to JIS B1192 which sets standards for shaft end accuracy.

④ Processing by grinding

Apply the same precautions as for cutting for centering, securing nut, and work rest. Grind sections where the bearings and a "Spann ring" are installed.

⑤ Milling processing

Process key groove and tooth lock washer groove.

⑥ Deburring, washing, rust prevention

Wash with clean white kerosene after processing. Apply lubricant for immediate use. For later use, apply rust preventive agent.

[Note]

Contact NSK if nut is accidentally removed.

(2) Additional machining of R Series rolled ball screw shaft end

① Cutting screw shaft

Carry out the same process as for S Series above.

② Annealing the shaft end (Heat the section of the shaft end to be machined with an acetylene torch. Then gradually cool it in ambient atmosphere.)

* The area not machined loses hardness if exposed to heat. This shortens ball screw life. Cool with water the areas where should not be heated to avoid heat conduction.

③ The following process is the same as S Series above.

B-Ⅱ-14 Precautions for Designing Ball Screw

B-Ⅱ-14.1 Safety System

As shown in the illustration on Page B300, a stopper is installed in some cases to prevent the nut from overrunning due to malfunction of the safety system of the machine itself, or human error during operation.

The travel stopper should be installed at a place where it will not come into contact with the nut when the nut reaches the designed stroke end.

An impact absorbing travel stopper (NSK patent, refer to Page B300) is available from NSK.

B-Ⅱ-14.2 Design Cautious to Assembling Ball Screw

(1) Cutting through the thread screw

For the deflector and end cap ball recirculation system ball screws, one end of the thread screw should be cut through. This is for convenience of assembly for ball nut to the screw shaft (Fig. Ⅱ-14•1). In this case, the shaft end diameter, where this thread cut through is made, should be 0.2 mm or smaller than the ball groove root diameter "d_r" (See the dimension table). A similar precaution is required when it is absolutely necessary to remove the nut from the screw shaft in order to install the ball screw to the machine. Also, in case using the cut-through end as the shoulder of the support bearing, make certain that a sufficient amount of the effective flat surface is left from the root diameter. If not sufficient, the bearing cannot be installed in perpendicular to the bearing seat. (Fig. Ⅱ-14•2)

(2) Designing screw shaft end and the nut area

When installing a ball screw to the machine, avoid a design which makes it necessary to separate the nut from the screw shaft as shown in Fig. Ⅱ-14•3. If separated, the balls may fall out. Separation may also deteriorate the ball screw accuracy, or may damage the ball screw. If separating them is unavoidable, please furnish NSK with the component which is to be installed between the nut and screw shaft. NSK will install the component prior to delivery.

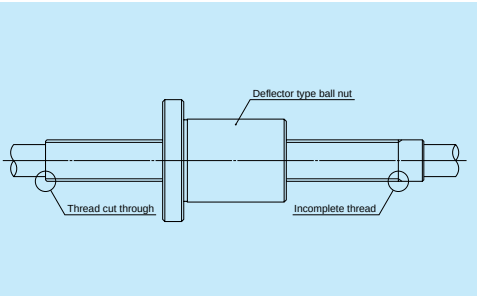


Fig. Ⅱ-14•1 Shaft end of a deflector recirculation system ball screw

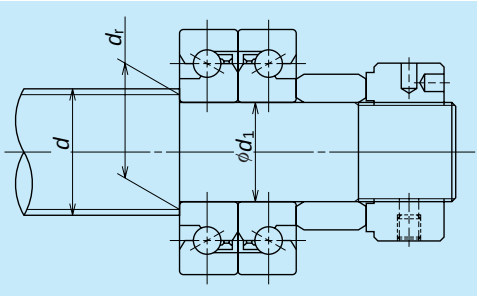


Fig. Ⅱ-14•2 Support bearing and end face (shoulder) for installation

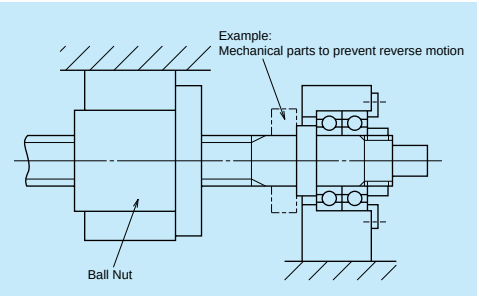


Fig. Ⅱ-14•3 Nut and ball screw are required to be separated when installing in this structure.

(3) Removing nut from the shaft at time of assembly

If it is unavoidable, use an arbor (Fig.Ⅱ-14•4), keeping the balls in the nut. In this case, the outside diameter of the arbor should be approximately 0.2 ~ 0.4 mm smaller than the ball groove root diameter "dr."

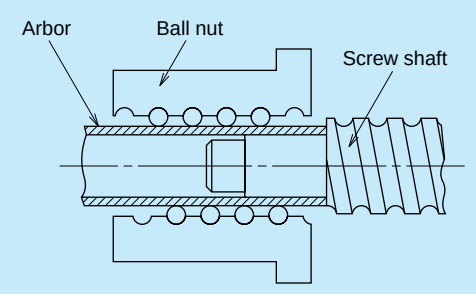
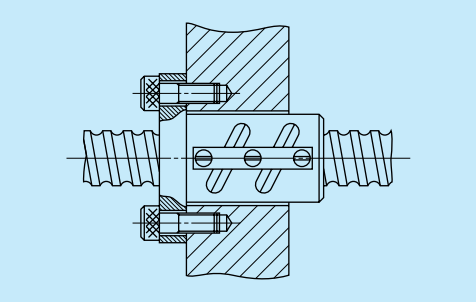


Fig. Ⅱ-14•4 Arbor to install and remove nut

(4) Centering of the ball nut when installing

When installing the nut as shown in Fig. Ⅱ-14•5, provide a space between the housing and the nut body diameter section, allowing the centering to be performed.



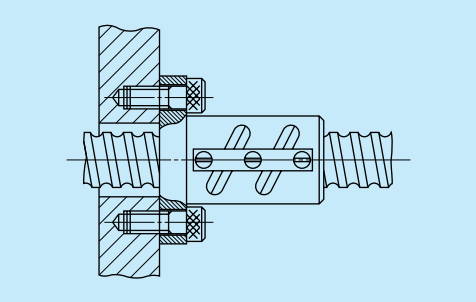


Fig. Ⅱ-14•5 Fixing a ball nut by flange

(5) Preventing the thread screw of nut from loosening

When installing and securing the nut to the housing at the thread screw section, as in the case for RNCT Series rolled ball screw, apply an agent which prevents the nut from loosening.

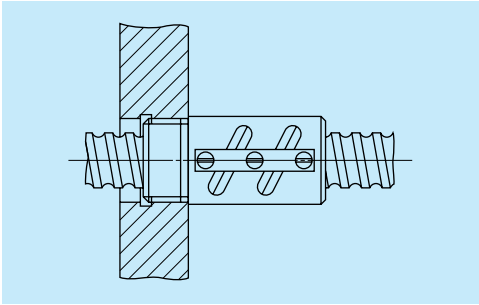


Fig. Ⅱ-14•6 Fixing a ball nut with thread screw

(6) Installation of brush-seal to the nut

If the brush-seal is installed at the thread screw side of the nut which comes with a thread screw, the brush-seal should be designed to be secured as shown in Fig. Ⅱ-14•7.

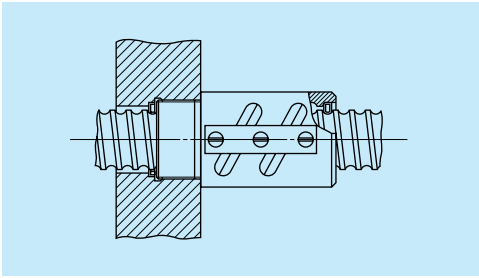


Fig. Ⅱ-14•7 Installation of brush-seal to a ball nut with thread screw

B-Ⅱ-14.3 Effective Stroke of Long, Very Large Ball Screw

Rigidity of a long and very large ball screw which is hardened by the induction hardening may be slightly low at both ends of the screw section. Consider this low hardness prior to determining the length of effective stroke. Please consult NSK for details.

B-Ⅱ-14.4 Matching after Delivery

Please inform NSK on the position and size if it is necessary to machine the screw shaft end, or if a knock pin at the nut installation section is needed after delivery.

NSK takes a measure and protects designated spots from heat treatment prior to delivery to make subsequent machining easy.

B-Ⅱ-15 Ball Screw Selection Exercise

[Drill 1] High-speed transporting system

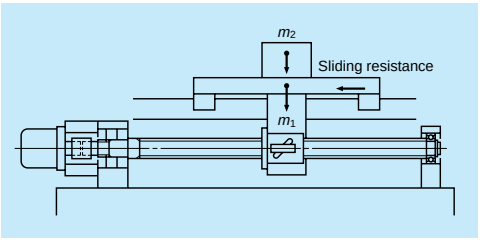


Fig. Ⅱ-15•1

* Design conditions

① Table design specifications

Table mass :	m_1 = 40kg
Mass of the transporting item :	m_2 = 20kg
Maximum stroke :	S_{max} = 700mm
Rapid traverse speed :	Vmax=1000mm/sec(60m/min)
Positioning accuracy :	±0.10/700mm(0.01 mm/pulse)
Repeatability :	±0.010mm
Required life :	Lt = 25000 h(5 years)
Guide way (rolling) :	μ = 0.01(friction coefficient)
Drive motor :	AC servo motor (N max = 3000rpm)

② Operating conditions

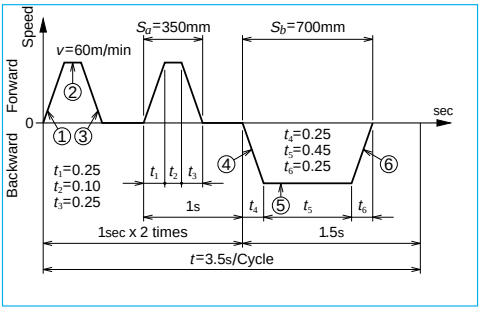


Fig. Ⅱ-15•2

① Selection of basic factors

(1) Selection of accuracy grade

Accuracy grade should be in the range of C5 to Ct10 according to "Table Ⅰ-4•1 Accuracy grades of ball screw and their application" on Page B17.

From the following conditions in design, the axial play should be T code (0.005 mm or less).

Repeatability : ±0.010 (mm)

Resolution : 0.01 mm/pulse

From "Table Ⅰ-4•2 Combinations of accuracy grades and axial play" on Page B18, select C5 accuracy grade, and axial play T code (0.005 mm or less).

(2) Selection of lead

From the maximum rotational speed of AC servo motor:

$$l \geqq \frac{V_{max}}{N_{max}} = \frac{1000 \times 60}{3000} = 20(\text{mm})$$

Select a lead which is 20 mm or larger.

(3) Selection of screw shaft diameter

According to "Table Ⅰ-4•5 Standard in stock ball screw: Combinations of screw shaft diameter and leads" on Page B19, the diameter of the shaft which has a lead larger than 20 mm should be in the range of 15 mm to 32 mm. Select the smallest 15 mm.

(4) Selection of stroke

From "Table Ⅰ-4•6 Maximum stroke of standard ball screw (A&S Series)" on Page B20, the shaft diameter 15 mm and lead 22 mm satisfy maximum stroke 700 mm.

Primary selection:

Shaft diameter :	15 mm
Lead :	22 mm
Stroke :	700 mm
Accuracy grade :	C5
Axial play :	T code

2 Find out if the required item is in standard stock
In consideration of delivery time and price, select from the standard A Series (finished shaft end)

Primary candidate: W1507FA-4G-C5T20

3 Checking basic safety
(1) Checking allowable axial load
① Calculation of allowable axial load (See Fig. Ⅱ-15•2.)
Acceleration at accelerating/decelerating is:

$$\alpha_1 = \frac{V_{max}}{t_1} = \frac{1000}{0.25} = 4000\,(mm/s^2) = 4\,(m/s^2)$$

(At time of acceleration ①, ④)

$$F_1 = \mu(m_1 + m_2) \times g + (m_1 + m_2) \times \alpha 1$$
$$= 0.01 \times (40 + 20) \times 9.80665 + (40 + 20) \times 4$$
$$= 246(N)$$

(At time of constant speed ②, ⑤)

$$F_2 = \mu(m_1 + m_2) \times g = 0.01 \times (40 + 20) \times 9.80665 = 6(N)$$

(At time of deceleration ③, ⑥)

$$F_3 = -\mu(m_1 + m_2) \times g + (m_1 + m_2) \times \alpha_1 = 234(N)$$

② Buckling load
Calculate using the dimension table on Page B71. Bearing structure is a common Fixed -- Simple support type.
From Formula (Ⅱ-2) on Page B451:

$$dr \geqq \left[\frac{P \cdot L^2}{m} \times 10^{-4}\right]^{1/4} = \left[\frac{246 \times 804^2}{19.9} \times 10^{-4}\right]^{1/4}$$
$$= 5.3(mm)$$

Dimension table does not list dr. But "Dimensions and Model Numbers of Ball Nut" on Page B401 has a listing of those with the same nut models. According to this table, *d*r is 12.2 mm, and satisfies the requirement.
Result: Acceptable

(2) Checking allowable value of rotational speed
$P = 246$ (N), $L = 804$ (mm)
The permissible rotational speed listed in the dimension table is 3000 rpm. Since the motor maximum rotational speed is 3000 rpm, the operation is in the range of permissible rotational speed.
Result: Acceptable

(3) Checking life expectation (See Fig. Ⅱ-15•2.)
(At time of acceleration ①, ④)
From calculation of axial load:

$F_1 = 246(N)$

$$N_1 = \frac{n}{2} = \frac{3000}{2} = 1500\,(rpm)$$

$t_a = 2 \times t_1 + t_4 = 0.75(s)$

(At time of constant speed ②, ⑤)

$F_2 = 6(N)$

$N_2 = 3000(rpm)$

$t_b = 2 \times t_2 + t_5 = 0.65(s)$

(At time of deceleration ③, ⑥)

$F_3 = 234(N)$

$N_3 = 1500(rpm)$

$t_c = 2 \times t_3 + t_6 = 0.75(s)$

Table Ⅱ-15•1

Operating condition	Axial load (N)	Rotational speed (mean)(rpm)	Operating time (s)
①, ④	$F_1 = 246$	$N_1 = 1500$	$t_a = 0.75$
②, ⑤	$F_2 = 6$	$N_2 = 3000$	$t_b = 0.65$
③, ⑥	$F_3 = 234$	$N_3 = 1500$	$t_{cv} = 0.75$

① Mean load F_m, mean rotational speed N_m
From Formulas (Ⅱ-11) and (Ⅱ-12) on Page B461:

$$F_m = \left[\frac{F_1^3 \cdot N_1 \cdot t_a + F_2^3 \cdot N_2 \cdot t_b + F_3^3 \cdot N_3 \cdot t_c}{N_1 \cdot t_a + N_2 \cdot t_b + N_a \cdot t_c}\right]^{1/3}$$
$$= 195(N)$$

$$N_m = \frac{N_1 \cdot t_a + N_2 \cdot t_b + N_3 \cdot t_c}{t}$$
$$= 1200(rpm)$$

② Calculation of life expectation
From Formulas (Ⅱ-8) and (Ⅱ-9) on Page B461:
(T axial play $C_a = 5070$N)

$$L_t = \left[\frac{C_a}{F_m \cdot f_w}\right]^3 \times \frac{1}{60 N_m} \times 10^6$$
$$= \left[\frac{5070}{195 \times 1.2}\right]^3 \times \frac{1}{60 \times 1200} \times 10^6$$
$$\fallingdotseq 141200 \geqq 25000\ (h)$$

Result: Acceptable

④ Check whether the following figures meet requirements

(1) Checking accuracy and axial play

Positioning accuracy

From the dimension table and the permissible value of lead accuracy on Page B446:

According to Table Ⅱ-1•2:

Accuracy grade: C5

$E = \pm 0.035/800(mm)$

$e = 0.025(mm)$

This grade satisfies the required function.

Checking axial play is omitted here since it is explained in "①Selection of basic factors."

(2) Checking drive torque

Required specifications

Motor rotational sped : 3000 rpm

Time to reach maximum speed : Under 0.25 sec

① Load (converted to motor axis)

From Formulas (Ⅱ-31) and (Ⅱ-32) on Page B470:

Screw shaft

$$J_B = \frac{\pi \cdot \gamma}{32} D^4 \cdot L \quad \frac{\pi \times 7.8 \times 10^{-3}}{32} \times 1.5^4 \times 80$$

Moving part

$$J_w = m \times \left[\frac{l}{2\pi}\right]^2 = 60 \times \left[\frac{2}{2\pi}\right]^2$$

$= 6.1(kg \cdot cm^2)$

Coupling

$J_c = 0.25\ (kg.\ cm^2)$ -- Temporary

Total

$J_L = 6.7(kg \cdot cm^2) \longrightarrow 6.7 \times 10^{-4}(kg \cdot m^2)$

② Driving torque

From Formulas (Ⅱ-27) and (Ⅱ-29) on Page B470:

At time of constant speed

$$T_1 = \frac{F_2 \cdot l}{2\pi \cdot \eta 1} + T_U = \frac{6 \times 2}{2\pi \times 0.9} + 2.1$$

$= 4.2(N \cdot cm) \rightarrow 4.2 \times 10^{-2}(N \cdot m)$

Use WBK12-01, a light load support unit for small equipment from Page B275.

At time of acceleration:

$$T_2 = T_1 + J \cdot \frac{2\pi \cdot n}{60 t_1} = T_1 + \frac{(J_L + J_M) \cdot \pi \cdot n}{30 t_1}$$

$$= 4.2 \times 10^{-2} + \frac{(6.7 \times 10^{-4} + 3.1 \times 10^{-4}) \times \pi \times 3000}{30 \times 0.25}$$

$= 1.27(N \cdot m)$

* Assuming that J_M of the motor is: $J_M = 3.1(kg \cdot cm^2) = 3.1 \times 10^{-4}\ (kg \cdot m^2)$.

At time of deceleration

$$T_2 = T_1 - J \cdot \frac{2\pi \cdot n}{60 t_3} = T_1 + \frac{(J_L + J_M) \cdot \pi \cdot n}{30 t_3}$$

$$= 4.2 \times 10^{-2} - \frac{(6.7 \times 10^{-4} + 3.1 \times 10^{-4}) \times \pi \times 3000}{30 \times 0.25}$$

$= -1.19(N \cdot m)$

③ Selection of motor

[Selection conditions]

Maximum rotational speed: $N_M \geqq 3000(rpm)$

Motor rating torque: $T_M \geqq T_{rms}(N \cdot m)$

(T_{rms}: Effective torque)

Motor's rotor inertia -- $J_M > J_L / 3$ or more, select an AC servo motor with the following specifications.

Motor specifications:

Rating power output: $W_M = 300(W)$

Maximum rotational speed: $N_M = 3000(rpm)$

Rating torque: $T_M = 1(N \cdot m) = 1 \times 10^2(N \cdot cm)$

Rotor inertia: $J_M = 3.1 \times 10^{-4}(kg \cdot m^2) = 3.1(kg \cdot cm^2)$

(4) Checking effective torque

$$Trms = \sqrt{\frac{T_2^2 \times t_a + T_1^2 \times t_b + T_3^2 \times t_c}{t}}$$

$$= \sqrt{\frac{1.27^2 \times 0.75 + 0.042^2 \times 0.55 + 1.19^2 \times 0.75}{3.5}}$$

$= 0.81 \leqq 1(N \cdot m)$

(5) Checking time to reach maximum speed:

$$t_a = \frac{(J_L + J_M) \times 2\pi \times n}{(T_M - T_1)} \times 1.4$$

$$= \frac{(6.7 \times 10^{-4} + 3.1 \times 10^{-4}) \times 2\pi \times 3000}{(2 \times 1 - 4.2 \times 10^{-2}) \times 60} \times 1.4$$

$= 0.16 \leqq 0.25(sec)$

In this formula: $T_M = 2 \times T_M$

From above: Use W1507FA-4G-C5T20

[Drill 2] Processing table for special machines

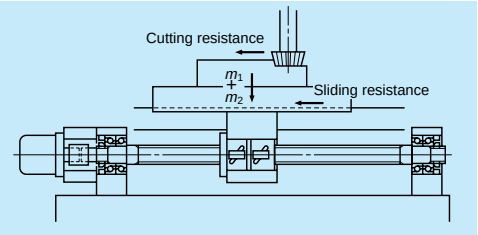


Fig. Ⅱ-15•3

* Design conditions

① Table design specifications

Table mass: m_2 = 1000kg
Mass of the moving item: m_1 = 600kg
Maximum stroke: S_{max} = 1000mm
Maximum speed: V_{max} = 15000mm/min
Positioning accuracy: ±0.035/1000 mm (no load)

※ Attitude accuracy of the table and thermal displacement are not included in the accuracy requirement of the ball screw.

Repeatability: ±0.005 mm (no load)
Lost motion: 0.020mm (no load)
Required life expectancy: L_t = 20000 h
($16^{h} \times 250^{days} \times 10^{years} \times 0.5^{rate\ of\ operation}$)
Guide way (sliding): : μ = 0.15
(friction coefficient)
Processing: Milling and drilling
Drive motor: AC servo motor
(N max = 2000rpm)

(2) Operating conditions

Table II-15.2

Operation	Axial load (N)		Feed speed (mm/min)	Use time ratio (%)
	Cutting resistance	Sliding resistance		
Rapid traverse	0	2354	15000	30
Light/medium cutting	4000	2354	500	50
Heavy cutting	8000	2354	100	20

※ Sliding resistance: F_r = (1000 +600) x0.15 x 9.80665
= 2354(N)

※ Ignore inertia at time of acceleration/deceleration because their time ratios are small.

① Selection of basic factors

(1) Selection of accuracy grade

Accuracy grade should be in the range from C1 to Ct5 according to "Table Ⅰ-4•1 Precision grades of ball screw and their applications" on Page B17.

Assuming that the screw length Ls is:

L_s = Maximum stroke + nut length + margin
= 1000 = (200) + (100) = 1300

From "Table Ⅱ-1•2 Permissible lead accuracy" on Page B446, the accuracy which satisfies required function is possibly:

Accuracy C3 grade
e_p = ±0.029/1600(mm)
v_u = 0.018(mm) Therefore select C3 Grade.

Considering importance on the volume of lost motion, select Z code (axial play 0 and less) for axial play.

(2) Selection of lead

From the maximum rotational speed of AC servo motor:

$$l \geqq \frac{V_{max}}{N_{max}} = \frac{15000}{2000} = 7.5(mm)$$

Larger lead would be beneficial for feed speed. But from the view of the control system (resolution), limit the lead to 8 mm or 10 mm.

(3) Selection of screw shaft diameter

According to "Table Ⅰ-4•5 Standard stock ball screws: Combinations of shaft diameter and lead" on Page B19, shafts whose lead is 8 mm or 10 mm are in the range of 12 mm to 50 mm. Placing more importance on rigidity than to the volume of lost motion, select a relatively large size in the range of 32 mm to 50 mm.

(4) Selection of stroke

Select 1000 mm, the maximum stroke in request.

Primary selection:
Standard ball screw in stock
Shaft diameter: 32, 36, 40, 45, 50 mm
Lead: 8, 10 mm
Stroke: 1000 mm
grade: C3
Axial play code: Z

2 Determining if the required item is in standard stock

Giving consideration to delivery time and price, select from the standard series.

C3 grade chosen in the Primary selection was not found in the standard series. Let us check whether there is a C3 grade among ball screws to order.

3 Finding out whether C3 grade is among the custom made ball screws.

Since C3 grade was the only missing item in step 2, select a custom made ball screw with accuracy grade C3.

Second selection:

Custom made ball screw	
Shaft diameter :	32, 36, 40, 45, 50 mm
Lead :	8, 10 mm
Stroke :	1000 mm
Accuracy grade :	C3
Axial play :	Z

4 Selection of screw shaft diameter, lead, and nut

(1) Checking dynamic load rating

Obtain required load carrying capacity of each lead through load conditions.

Table Ⅱ-15•3

Operating condition	Axial load (N)	Rotations per minute (rpm)		Use time ratio (%)
		l = 8	l = 10	
Rapid traverse	F_1=2354	N_1=1875	N_1=1500	t_1=30
Light/medium cutting	F_2=6354	N_2=62.5	N_2=50	t_2=50
Heavy cutting	F_3=10354	N_3=12.5	N_3=10	t_3=20

Obtain mean load F_m, and mean rotational speed N_m from Formulas (Ⅱ-11) and (Ⅱ-12) on Page B461:

Table Ⅱ-15•4

Lead (mm)	8	10
Mean load F_m (N)	3122	3122
Mean rotational speed N_m (rpm)	596	477

Required load carrying capacity is:

From Formulas (Ⅱ-8) and (Ⅱ-9) on Page B461:

$$C_a \geqq (60N_m \bullet L_t)^{1/3} \bullet F_m \bullet f_w \times 10^{-2} (N)$$

Therefore: L_t = 20000(h)

f_w = 1.2

Therefore:

l = 8(mm) ····· $C_a \geqq$ 33500(N)

l = 10(mm) ····· $C_a \geqq$ 31100(N)

(2) Selection of the nut

Assuming that the design requires more importance on rigidity than on lost motion :

* T Type (Tube recirculation system standard ball screw)

* Model: DFT (Pages B337-B342)

* Number of turns of balls : Select from 2.5 turns 2 circuits or 2.5 turns 3 circuits

Table Ⅱ-15.5 *Ca*:(N)

Shaft diameter	Lead 8 mm		Lead 10 mm	
	2.5 turns 2 circuits	2.5 turns 3 circuits	2.5 turns 2 circuits	2.5 turns 3 circuits
32	31700		46300	
36			49300	
40	34900		52000	
45			54200	76800
50	38700	54900	57700	81800

Third selection: In the range surrounded by the dotted line in Table Ⅱ-15•5

(3) Checking permissible rotational speed

① Critical speed

Calculate based on rapid traverse speed. Ball screw rotational speed at each lead is:

l = 8(mm) ····· 1875(rpm)

l = 10(mm) ···· 1500(rpm)

From Formula (Ⅱ-7) on Page B455:

$$dr \geqq \frac{n \bullet L^2}{f} \times 10^{-7} (mm)$$

In this formula:

L = Maximum stroke + nut length/2 + shaft end extra length

= 1000 + 100 + 200 = 1300(mm)

f = 21.9 (Fixed -- Fixed)

Therefore:

l = 8(mm) ····· $d_r \geqq$ 14.5(mm)

l = 10(mm) ···· $d_r \geqq$ 11.6(mm)

② $d_m \bullet n$ value

From Formula Table Ⅱ-3.1 on Page B458:

$$d_m \bullet n \geqq \frac{70000}{n}$$

Therefore: l = 8(mm) • • • • • $d_m \leqq$ 37.8(mm)

l = 10(mm) • • • • • $d_m \leqq$ 46.7(mm)

※ Please consult NSK if it is necessary to use at d_m • n >70000.

Fourth selection: In the range surrounded by the solid-line in Table Ⅱ-15•5

(4) Checking rigidity of the ball screw system

Set the lost motion of the ball screw system (screw shaft, nut and support bearing) at 80% of the specified value. Then calculate the system rigidity.

20(μm) x 0.8 = 16(μm)

At this time, the single-direction elastic deformation of the major factors of ball screw system becomes half.

$\Delta L \leqq 8(\mu m)$

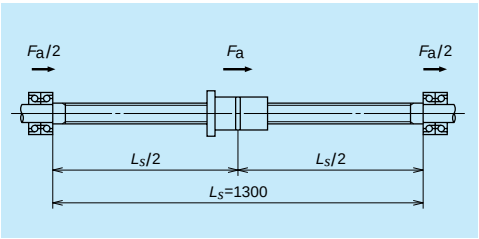


Fig. Ⅱ-15•4

① Rigidity of the screw shaft: Ks (Elastic deformation: ΔLs)

Calculate at the screw shaft center where axial deformation becomes the largest.

From Formula (Ⅱ-20) on Page B465:

$$Ks = \frac{\pi \cdot dr^2 \cdot E}{Ls} \times 10^{-3} \ (N/\mu m) \quad \text{(Fixed -- Fixed)}$$

$$\Delta Ls = \frac{Fa}{Ks} = \frac{Fa \cdot Ls}{\pi \cdot dr^2 \cdot E} \times 103(\mu m)$$

In this formula:

Fa: Sliding resistance (Fa = 2354N)

Calculation result is shown in Table Ⅱ-15.7

(2) Rigidity of the nut: Kv (Elastic deformation: ΔL_N)

Set about 1/3 of the maximum axial load as the preload value.

$$F_{a0} = \frac{F_{max}}{3} = \frac{10354}{3} \fallingdotseq 3452 \rightarrow 3500(N)$$

From Formula (Ⅱ-23) on Page B467:

Rigidity at this time:

$$K_N = 0.8 \times K \frac{F_{a0}}{\mathcal{E} \cdot C_a} = 0.8 \times K \frac{3500}{0.1 C_a} \quad (N/\mu m)$$

$$\Delta L_N = \frac{F_a}{K_N}$$

In this formula:

C_a, K: Values listed in the dimension table

F_a: Sliding resistance (Fa = 2354N)

Calculation result is shown in Table Ⅱ-15•7.

(3) Rigidity of the support bearing: K_B (Elastic deformation: ΔL_B)

The bearing is thrust angular contact ball bearing for ball screw support (TAC Series). Assume each shaft diameter is as shown in Table Ⅱ-15•6 (Refer to Page B301).

Table Ⅱ-15•6

Shaft diameter	Bearing code
32	25TAC62BDF
36	25TAC62BDF
40	30TAC62BDF
45	35TAC72BDF

Refer to Page B303 for rigidity K_B of each bearing (axial spring modulus).

$$\Delta L_B = \frac{Fa}{2K_B}$$

Calculation result is shown in Table Ⅱ-15•7.

Table Ⅱ-15•7

Unit : N/μm, μm

Nut model number	Screw shaft		Nut		Support bearing		Total
	K_S	ΔL_S	K_N	ΔL_N	K_B	ΔL_B	ΔL
DFT3210-5	347	6.8	839	2.8	1000	1.2	10.8
DFT3610-5	460	5.1	907	2.6			8.9
DFT4010-5	589	4.0	973	2.4	1030	1.1	7.5
DFT4510-5	772	3.0	1050	2.2	1180	1.0	6.2
DFT4510-7.5			1375	1.7			5.7

In consideration of expense, the following is selected.

Nut model code of the selected ball screw:

DFT4010-5

Shaft diameter : 40 mm

Lead : 10 mm

4 Selection of screw shaft length

Screw shaft length

L_s = Maximum stroke + nut length + margin

=1000 + 193 + 100 = 1293 → 1300mm

5 Checking basic safety

(1) Permissible axial load

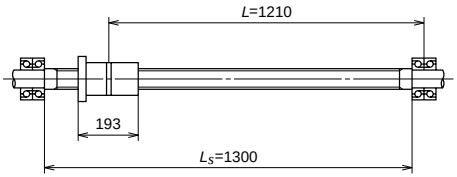


Fig. Ⅱ-15.5

Bucking load

Calculate at: P = 10354(N), L = 1210 (N)

Bearing supporting condition: Fixed - Fixed support

$$dr \geqq \left[\frac{P \cdot L^2}{m} \times 10^{-4}\right]^{1/4} = \left[\frac{10354 \times 1210^2}{19.9} \times 10^{-4}\right]^{1/4}$$

= 16.6(mm)

Result: Acceptable

(2) Checking permissible rotational speed

a) Critical speed

$$n = f \cdot \frac{dr}{L^2} \times 10^7 = 21.9 \times \frac{34.4}{1210^2} \times 10^7$$

≒ 5140 ≧ 1500(rpm)

b) dm • n value

dm • n = 41 x 1500 = 61500 ≦ 70000

Result: Acceptable

(3) Checking life

$$L_t = \left[\frac{C_a}{f_w \cdot F_m}\right]^3 \times 10^6 \times \frac{1}{60 \cdot N_m}$$

≒ 95000 ≧ 20000(h)

Result: Acceptable

6 Check whether the following factors satisfy requirements

(1) Checking accuracy

• Positioning accuracy ±0.035/1000 mm stroke

From "Table Ⅱ-1•2 Tolerance of specified travel and travel variation" on Page B446:

Accuracy grade : C3e

e_p = ±0.0351/1600(mm)

v_u = 0.018(mm)

• Measures against thermal expansion

Provide pre-tension force equivalent to the elongation of 3°C temperature rise, taking in consideration of the load carrying capacity of bearing. Also, adjust the travel compensation of the specified travel by a volume equivalent to 3°C temperature rise.

① Thermal elongation : ΔL_θ

From Formula (Ⅱ-1) on Page B447:

$\Delta L_\theta = \rho \cdot \theta \cdot L$ = 12.0 x 10^{-6} x 3 x 1300 = 0.047(mm)

② Pre-tension force : F_θ

$$F_\theta = \Delta L_\theta \cdot Ks = \frac{\Delta L_\theta \cdot E \cdot \pi \cdot dr^2}{4L}$$

$$= \frac{0.047 \times 2.06 \times 10^5 \times \pi \times 34.4^2}{4 \times 1300}$$

≒ 6922 → 6900(N)

Travel compensation :	–0.047/1300(mm)
Pre-tension force :	6900(N)
Tension (elongation) volume :	0.047(mm)

• Selection of support bearing

Assuming that the ratio of basic dynamic load rating of support bearing (Ca) and pre-tension force (F_θ) is ε:

Select a bearing which generally satisfies:

$\varepsilon = F_\theta / C_B < 0.20$

Design the bearing supporting configuration to which pre-tension force is applied in such way that the axial load is received by the duplex combination or more. Please consult to NSK when one bearing must sustain the pre-tension load.

Table II-15.7

Bearing reference number	C_B(N)	ε
30TAC62BDF	29200	0.23
30TAC62BDFD	47500	0.14

Selected support bearing: 30TAC62BDFD

(2) Checking drive torque
Selection of driving motor
〈Required specifications〉
Motor rotational speed : 1500rpm
Time to reach maximum speed : Under 0.16 sec
(At time of rapid traverse)
① Load (converted to the motor load)
From Formula (Ⅱ-31) and (Ⅱ-32) on Page B470:
Screw shaft

$$J_B = \frac{\pi \cdot \gamma}{32} D^4 \cdot L = \frac{\pi \times 7.8 \times 10^{-3}}{32} \times 4^4 \times 155$$

$$= 30(\text{kg} \cdot \text{cm}2)$$

Moving part

$$J_w = m \times \left[\frac{l}{2\pi}\right]^2 = 1600 \times \left[\frac{1}{2\pi}\right]^2$$

$$= 40(\text{kg} \cdot \text{cm}^2)$$

Coupling

$$J_c = 10(\text{kg} \cdot \text{cm}^2) \quad \cdots \text{assumed}$$

Total

$$J_L = 80(\text{kg} \cdot \text{cm}^2) \rightarrow 80 \times 10^{-4}(\text{kg} \cdot \text{m}^2)$$

② Driving torque
From Formula (Ⅱ-29) on Page B470:
Driving torque at time of constant speed is:
From Formula (Ⅱ-29) on Page 470:

$$T_1 = T_A + T_P + T_U$$

In this formula:

$$T_A = \frac{Fa \cdot l}{2\pi\eta_1}$$

$$T_P = 0.014 F_{a0} \sqrt{\text{dm} \cdot l}$$

$$\eta_1 = 0.9$$

Refer to the starting torque value on Page B303:

$$T_U = 33 + 33 = 66 \ (\text{N} \cdot \text{cm})$$

At time of rapid traverse

$$T_{11} = \frac{2354 \times 1}{2\pi \times 0.9} + 0.014 \times 3500\sqrt{4.1 \times 1} + 66$$

$$= 580(\text{N} \cdot \text{cm}) \rightarrow 580 \times 10^{-2}(\text{N} \cdot \text{cm})$$

At time of heavy cutting

$$T_{12} = \frac{10354 \times 1}{2\pi \times 0.9} + 0.014 \times 3500\sqrt{4.1 \times 1} + 66$$

$$= 1995(\text{N} \cdot \text{cm}) \rightarrow 1995 \times 10^{-2}(\text{N} \cdot \text{cm})$$

③ Selection of the motor
〈Selection conditions〉
Maximum rotational speed : $N_M \geqq 1500(\text{rpm})$
Motor rating torque : $T_M > T_L(\text{N} \cdot \text{m})$
Motor's rotor inertia : $J_M > J_L / 3(\text{kg} \cdot \text{m}^2)$
Based on this, select AC servo motor as below.

Motor specifications
Rating power output: $W_M = 1.8(\text{kW})$
Maximum rotational speed:
$N_M = 1500(\text{rpm})$
Rating torque: $T_M = 22.5(\text{N} \cdot \text{m})$
$= 22.5 \times 10^2(\text{N} \cdot \text{cm})$
Rotor inertia: $J_M = 190 \times 10^{-4}(\text{kg} \cdot \text{m}^2)$
$= 190(\text{kg} \cdot \text{cm}^2)$

④ Checking time to reach maximum speed:

$$t_a = \frac{(J_L + J_M) \times 2\pi \times N}{(T_M - T_1) \times 60} \times 1.4$$

$$= \frac{(80 \times 10^{-4} + 190 \times 10^{-4}) \times 2\pi \times 1500}{(2 \times 22.5 - 572 \times 10^{-2}) \times 60} \times 1.4$$

$$= 0.15 \leqq 0.16(\text{sec})$$

In the above, $T_M = 2 \times T_M$

[Drill 3] Cartesian coordinates type robot Z axis (vertical axis)

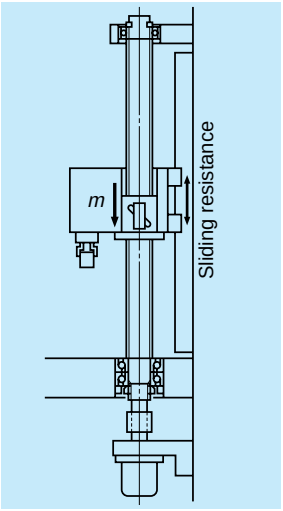


Fig. II-15.6

Design conditions

① Design specifications

Mass of the traveling item : m = 300kg

Maximum travel : S_{max} = 1500mm

Rapid traverse speed : V_{max} = 10000mm/min

Repeatability : 0.3mm

Required life : L_t = 24000h

(16 hours x 300 days x 5 years)

Screw shaft supporting condition :

Fixed -- Simple support

Nut: Flanged single nut

Guide way (rolling) : μ = 0.01 (friction coefficient)

Drive motor : AC servo motor (Nmax = 1000rpm)

Environment : Slightly dusty

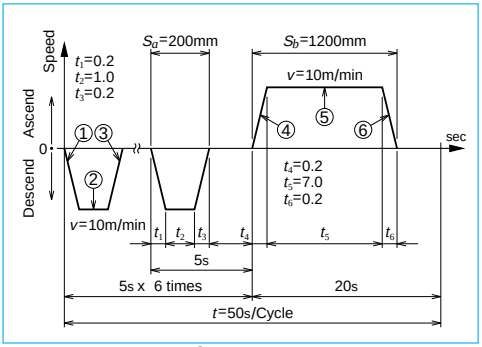


Fig. Ⅱ-15•7

① Selection of basic factors

(1) Selection of accuracy grade

There is no listing concerning this system in "Table I-4•1 Precision grades of ball screw and their applications" on Page B17.

A rolled ball screws in R Series, which is standard in stock, can be a candidate according to repeatability 0.3 mm" and "Mass of the traveling item 2940 (N)."

(2) Selection of lead

From the maximum rotational speed of AC motor:

$$l \geqq \frac{V_{max}}{N_{max}} = \frac{10000}{1000} = 10(mm)$$

Select a lead which is larger than 10 mm.

(3) Selection of screw shaft diameter

According to "Table I-4•8 Rolled ball screw: Combinations of screw shaft diameter and leads" on Page B21, the shaft diameters whose lead is more than 10 mm are in the range of 12 mm to 50 mm.

(4) Selection of stroke

According to "Table I-4•10 Maximum stroke range of standard stock rolled ball screws" on Page B22, the shaft diameter which satisfies maximum stroke is between 15 mm and 50 mm.

Primary selection: Rolled ball screw, standard in stock

Shaft diameter : 15 ~ 50(mm)

Lead : 10(mm)

Stroke : 1500(mm)

2 Find out if the required item is standard stock.
In consideration of delivery time and price, select from the standard R Series (rolled ball screws). Select from Flanged single nuts.

Second selection :	Rolled ball screw, standard in stock
Shaft diameter :	15, 16, 20, 25, 32 36, 40, 45, 50(mm)
Lead :	10(mm)
Stroke :	1500(mm)

3 Checking basic safety
(1) Checking allowable axial load
① Calculation of allowable axial load (see Fig. Ⅱ-15•7.)
Acceleration at accelerating/decelerating time is:

$$\alpha_1 = \frac{V}{60t_1} = \frac{10 \times 10^3}{60 \times 0.2} = 833(mm/s^2) = 0.833(m/s^2)$$

①, ⑥ ····· $F_1 = mg - m\alpha = 2690(N)$

②, ⑤ ····· $F_2 = mg = 2940(N)$

③, ④ ····· $F_1 = mg + m\alpha = 3190(N)$

(2) Bucking load
Use values below.

$P = 3190(N)$, $L = 1600$ (mm)
Bearing supporting condition is common Fixed -- Simple support.
From Formula (Ⅱ-2) on Page B451:

$$d_r \geqq \left[\frac{P \cdot L^2}{m} \times 10^{-4}\right]^{1/4} = \left[\frac{3190 \times 1600^2}{10.0} \times 10^{-4}\right]^{1/4}$$
$$= 16.8(mm)$$

(2) Checking permissible rotational speed
① Critical speed
Use values below.

$n = 1000$ rpm, $L = 1600$ mm.
From Formula (Ⅱ-7) on Page B455:

$$d_r \geqq \frac{n \cdot L^2}{f} \times 10^{-7} = \frac{1000 \times 1600^2}{15.1} \times 10^{-7}$$
$$= 17(mm)$$

② dm • n value
From Table Ⅱ-3.1 on Page B458:

$$d_m \leqq \frac{50000}{n} = \frac{50000}{1000}$$
$$= 50(mm)$$

* Please consult NSK if $d_m \cdot n > 50000$ is required.
(3) Selection of screw length

$$L_s = \underbrace{\text{Stroke} + \text{nut length} + \text{margin} + \text{shaft end length}}_{\text{Screw section length}}$$
$$= 1500 + 100 + 100 + 200 = 1900 \leqq 2000(mm)$$

Normally, Ls/d (screw length/shaft diameter) ≦ 70 is recommended.

$$d \geqq \frac{L_s}{70} = \frac{1900}{70} = 27.1$$

Third selection:	Rolled ball screw, standard in stock
Shaft diameter:	32, 36, 40, 45, 50 (mm)
Lead:	10 (mm)
Stroke:	1500 (mm)

(4) Checking life (dynamic load rating)
Determine required load carrying capacity from load conditions.

Table Ⅱ-15•8

Operating condition	Axial load (N)	Rotational speed (mean)(rpm)	Use time (s)
①, ⑥	F_1=2690	N_1=500	t_a=1.4
②, ⑤	F_2=2940	N_2=1000	t_b=13.0
③, ④	F_3=3190	N_3=500	t_c=1.4

Calculate mean load F_m and mean rotational speed N_m from Formulas (Ⅱ-11) and (Ⅱ-12) on Page B461:
Required load carrying capacity is:

$$F_m = \left[\frac{F_1^3 \cdot N_1 \cdot t_a + F_2^3 \cdot N_2 \cdot t_b + F_3^3 \cdot N_3 \cdot t_c}{N_1 \cdot t_a + N_2 \cdot t_b +}\right]^{1/3}$$
$$= 2940(N)$$

$$N_m = \frac{N_1 \cdot t_a + N_2 \cdot t_b + N_3 \cdot t_c}{t}$$
$$= 288(rpm)$$

From Formulas (Ⅱ-8) and (Ⅱ-9) on Page B461:

$$C_a \geqq (60N_m \cdot L_t)^{1/3} \cdot F_m \cdot f_w \times 10^{-2}(N)$$
$$= (60 \times 288 \times 24000)^{1/3} \times 2940 \times 1.2 \times 10^{-2}$$
$$= 26300(N)$$

Checking static load rating

C_{0a} = Fmax x f_s = 3190 x 2

= 6380(N)

In consideration of expense:

Fourth selection :

Rolled ball screw, standard in stock

Shaft diameter :	32(mm)
Lead :	10(mm)
Stroke :	
Turns of balls and circuit number :	2.5x2
Screw length :	2000(mm)
Basic dynamic load rating :	35700(N)

4 Selection of nut

Select a "standard nut with a flange and a seal (Brush-seals contained inside)" based on the necessity as well as on the environmental conditions.

Selected ball screw:Nut assembly RNFTL3210A5S
Screw shaft RS3210A20

B-Ⅱ-16 Reference

"NSK Motion & Control (technical journal)" was compiled to introduce NSK products and its technologies. You will find data summaries which are imperative in selecting ball screws in this catalogue. If you need detailed technical data, other than described in this catalogue, please refer to "NSK Motion & Control" technical journal.

For inquiries and orders, please contact NSK branch offices, sales offices, and representatives assigned at various locations.

Table Ⅱ-16•1 NSK Motion & Control (technical journal) : Issues relating to ball screws (1980-)

No.	Issued Date	Content
No.1	Sep.1996	Noise Level of Precision Ball Screws
No.2	Dec.1997	Ball Screw for High Speed Machine Tool (Product introduction)
No.4	May.1998	Recent Technical Trend in Ball Screws