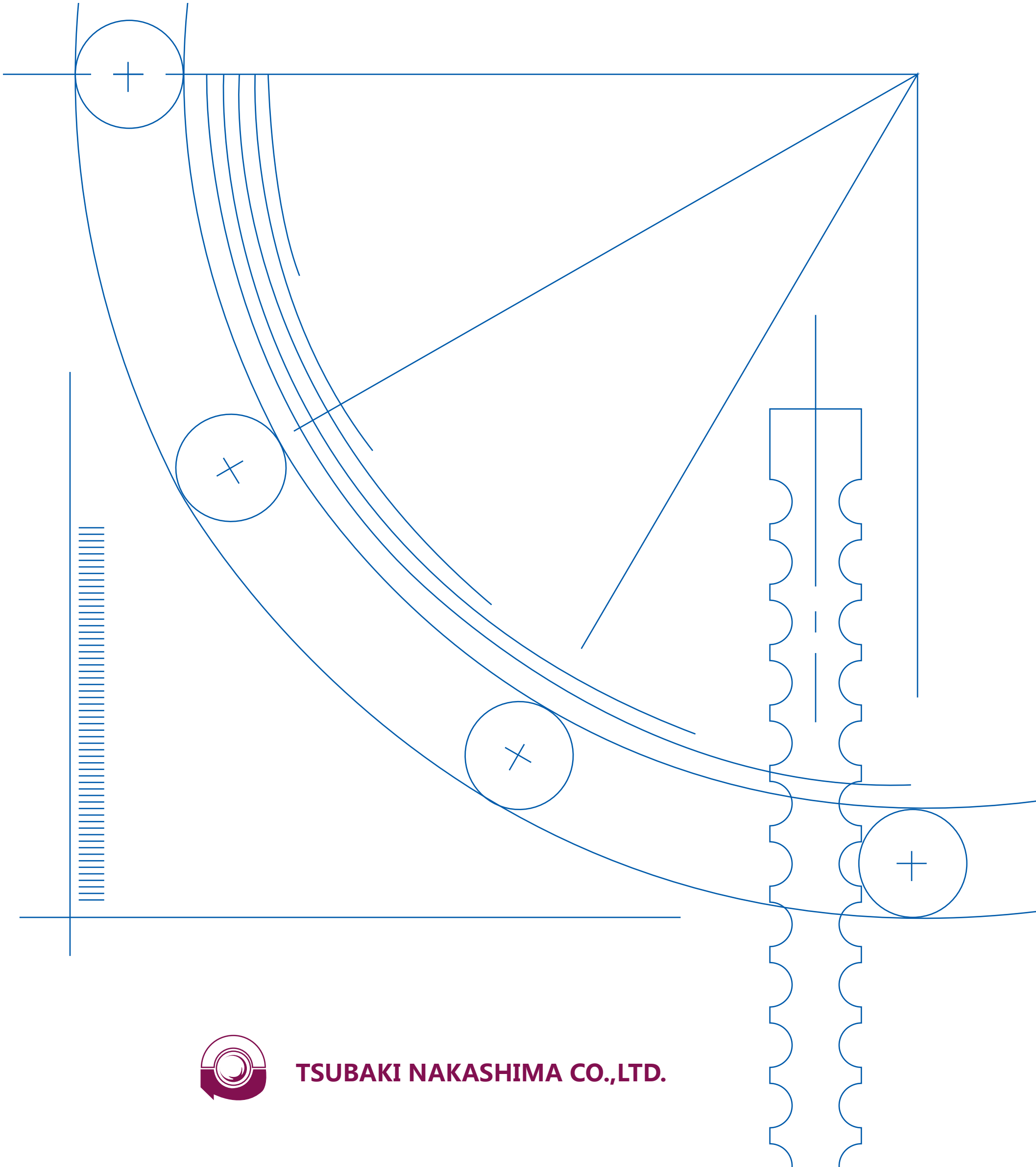
TSUBAKI NAKASHIMA

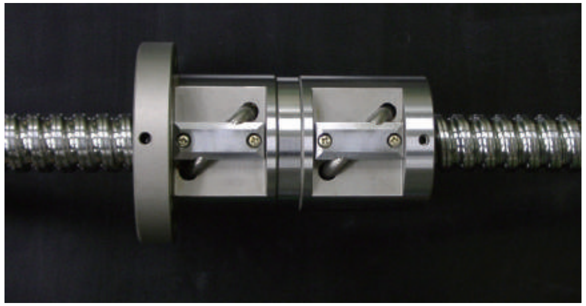
LINEAR MOTION CATALOG



TSUBAKI NAKASHIMA CO.,LTD.

TSUBAKI NAKASHIMA
Linear Motion Products

Contents



1.Design manual

1.1 Feature

（1） Feature of ball screw

1) High transmission efficiency and low friction loss

Power transmission is by rolling of very high surface finish steel ball along with round internal and external profiles, that is different from the sliding screw surfaces, resulting in high mechanical efficiency of 90%. Further more, coefficient of friction is extremely low as 0.003-0.010. (refer Fig.1)

2) No stick slip

As the high surface finish steel ball is rolling along the lapping finished ball track on screw even the difference between the coefficient of static friction and dynamic friction is small, it does not cause the stick slip motion as in case of the sliding screw at low speed.

3) Reversibility

Because the friction resistance is very low, basic system lends it self for complete reversibility and by this reversibility the movement can be easily convert the linear motion to the rotary motion and the rotary motion to the linear motion.

4) No backlash

By providing the preload to the nut system, backlash is eliminated and that increases the stiffness of ball nut.

5) Less wear and long life

Because of the steel balls are rolling on the screw grooves so the wear is extremely low, if the good lubrication is provided and the elimination of intrusion of foreign matters are done, it can be used for a long term without any decrease in initial accuracy.

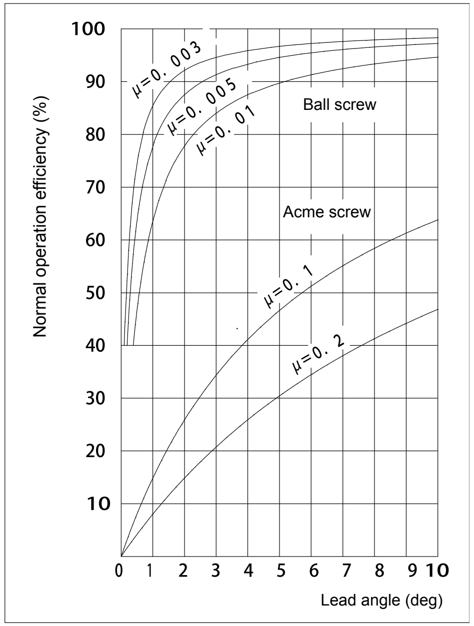


Fig. 1 Normal operation efficiency of ball screw

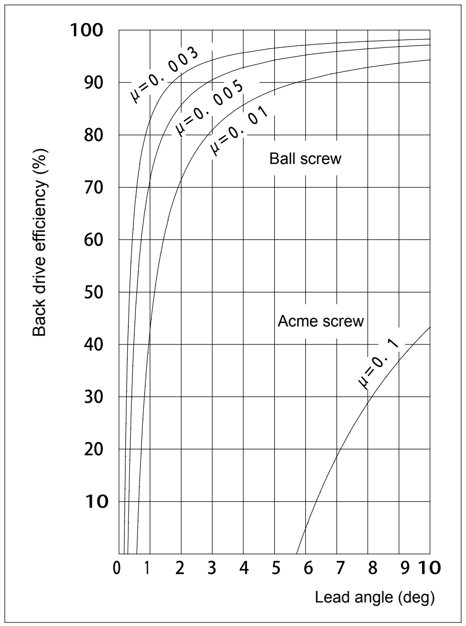


Fig. 2 Back drive efficiency of ball screw

(2) Feature of TSUBAKI NAKASHIMA ball screws

Tsubaki Nakashima Co., Ltd.（former Tsubakimoto Precision Products Co., Ltd.）was the first manufacturer that manufactured and sold the ball screw for general industrial use in Japan. TSUBAKI NAKASHIMA ball screws have the following special feature besides the general feature

1) Excellent accuracy

Different from the other companies, TSUBAKI NAKASHIMA consistently produces all components of ball screws including the balls with the high accuracy facility. Moreover, grinding, assembly and inspection are operated under critically controlled temperature in the factory, and a furthermore thorough quality control and a proper production process are developed. These activities ensure accuracy with excellent life of TSUBAKI NAKASHIMA ball screw.

2) Excellent durability

Excellent durability is obtained by proper selection of material, and applying proper heat treatment (quenching, tempering, and subzero treatment) from the long experience of the material.

3) Proper groove shape

The Gothic arc shown in Figure 3 is adopted for the groove shape, and groove geometry is made by thorough working. The axial clearance can be eliminated by providing the preload. As a result, there is no backlash and a proper nut stiffness value can be obtained.

4) Approach on short delivery

Short lead times are obtained by promoting steps such as consolidating the production process , and arrangement are done to deliver it as early as possible.

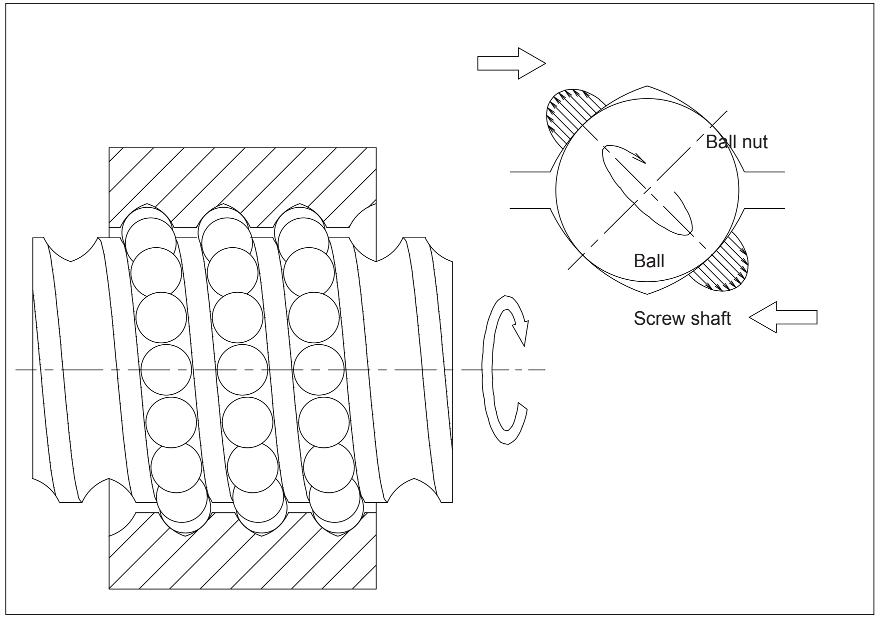


Fig. 3 Ball screw groove profile

(3) Structure

The ball screw has a recirculation system in which, the ball is rolling between the screw shaft and the ball nut, therefore the balls are be continuously recirculated. The ball screw is composed of the screw shaft, the ball nut, the ball, and the ball recirculation system.

In addition, to provide the high accuracy of the ball screw for long time, it uses one of, no contact labyrinth seals, high dustproof effect seals. Retainers that have no friction of between balls are also offered. Ceramic ball for high speed and low noise, low lubrication needs can be selected for special applications of the TSUBAKI NAKASHIMA ball screw.

(4) Recirculation system

Standards types of the TSUBAKI NAKASHIMA ball screw have three kinds of recirculation systems.
Type ① - ④ explain the structure and the feature of such system.

1) Tube type

① In this system rolling ball circulates back in the return tube fixed above the ball nut body over ball filled circuits in the ball nut.
② It is suitable for the lead up to same size of nominal diameter of the ball screw shaft.
③ The multiple rows can be easily covered, circuit from 1.5 circuits, 2.5 circuits, 3.5 circuits so on.
④ In T type tube is installed within the diameter of ball nut and in N type that the tube is located over the diameter of the ball nut, and ball nut outside diameter is smaller than that of ball nut of T type.

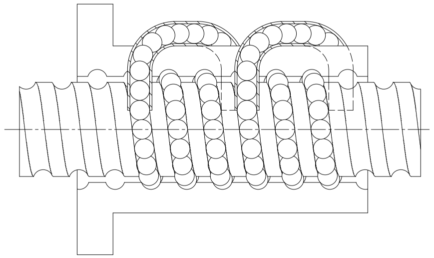


Fig. 4 Tube type ball recirculation method

2) Return cap type

① In this system the rolling ball is returned within outside diameter of nut body, via a return cap by one lead and circulates.
② It is suitable for the lead up to about 1/3 times of nominal diameter of the ball screw.
③ The necessary circuits can be separated in the every circuit.
④ The outside diameter of the ball nut is designed to smaller size than other recirculation systems.

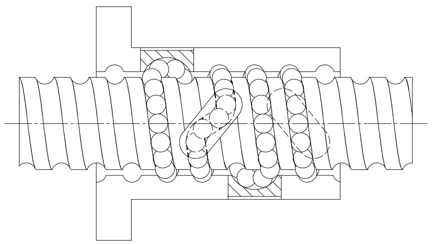


Fig. 5 Return cap type ball recirculation method

3) End cap type

① In this type of system, the recirculation is done by ball rolling to the end side in the nut and through the path made inside the nut body from the return groove of the end cap.
② It is suitable for the lead up to 1-3 times of nominal diameter of the ball screw.
③ The corresponding circuits can be separated to the ball nut length depending on the number of starts for multi start threads.
④ The outside diameter of the ball nut is smaller than T type of nut.

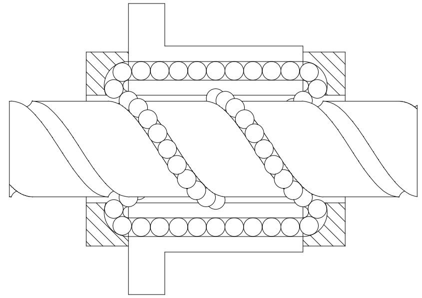
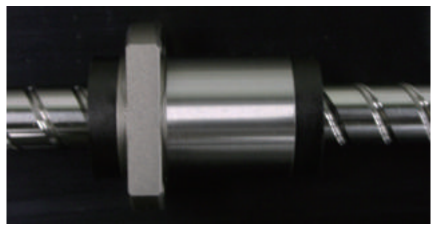


Fig. 6 End cap type ball recirculation method

Tube type ball nut

Return cap type ball nut



End cap type ball nut

(5) Preload system

For zero backlash and high nut stiffness, four kinds of preload systems can be selected in the application for the TSUBAKI NAKASHIMA ball screws.

- ○ Constant position preload
  - Double nuts preload
  - Integral preload
  - Oversize ball preload
- ○ Constant pressure preload
  - Spring type double nut preload

1) Double nuts preload

In this system a suitable shim plate is inserted between two ball nuts and provide preload either by tension or compression. Insertion of a shim plate that is thicker than the exact spacing for the ball nut creates a tension preload and thinner shim plate creates a compression preload.

A high stiffness is easily obtained, though the total length of the ball nut becomes long.

It is suitable for a medium and high preload.

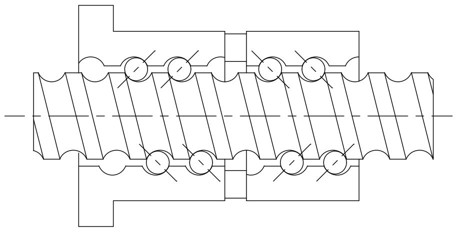


Fig. 7 Double nuts preload by shim plate (Constant position preload)

2) Integral preload

In this system the preload provided by shifting two parts of nut threads in the center part of the single ball nut. The amount of shift in the nut threads provide different amount of preload.

The total length of the ball nut is smaller than that of tension preload type, and the structure becomes simple.

It is suitable for a low and medium preload

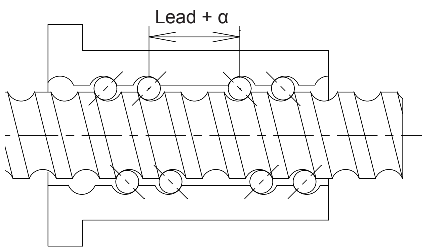


Fig. 8 Integral preload (Constant position preload)

3) Oversize ball preload

In this system preload is provided by inserting slightly over sized balls in the space of standard sized ball space in ball nut.

By four point ball contacts, there is no backlash but the number of points of contact of balls increases and the operating friction condition of the ball screw increases. In such cases the ball spacers may have to be used for smooth rotation.

It is suitable for a low preload.

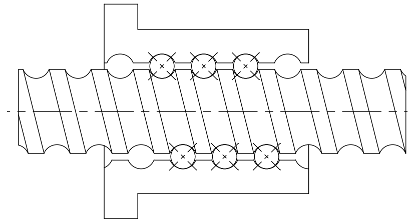


Fig. 9 Oversize ball preload (Constant position preload)

4) Spring type double nuts preload

In this system a spring is inserted between two ball nuts to provide the preload.

The change of the preload due to the wear out of the ball screw groove is compensated. It is necessary to consider differential stiffness in two direction of load.

Only RR series of a general industrial ball screw uses this of preload.

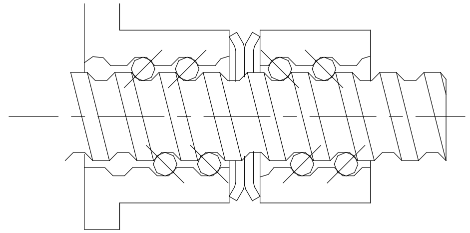


Fig. 10 Spring type double nuts preload (Constant pressure preload)

Ball screw

1.2 TSUBAKI NAKASHIMA ball screw classification and series

TSUBAKI NAKASHIMA ball screw series

- Precision ball screw (C0 ~ C5)
  - Precision ball screw
    FB series (P. A9)
  - Precision ball screw (P. A63)
    Made to order (Standard, special type of nut)
  - Hollow shaft ball screw (Ball screw cooling)
    TH series (P. A198)
  - → Ball screw with ceramic ball
    CB series is available. (PA12)
  - → Ball screw with retainer
    VB series is available. (PA13)

- Standard precision Ball screw (C0 ~ C5)
  - Standard precision ball screw for machine tool
    STS series (P. A151)
    STD series (P. 155A)
    SZD series (P. A157)
  - Standard precision ball screw for low load
    STS series (P. A167)
    SNS series (P. A178)
  - Standard precision miniature ball screw
    SMS series (P. A181)

- Heavy load capacity Precision ball screw (C3 ~ C7)
  - Heavy load capacity ball screw
    HN·FB series (P. A11)
  - Heavy load capacity ball screw
    HN series (P. A57)
  - Ultra heavy load capacity Ball screw
    UHD series (P. A14)
  - → Ball screw with ceramic ball
    CB series is available(A12)
  - → Ball screw with retainer
    VB series is available. (A13)

- Standard stock Ball screw (C5 ~ C10)
  - Precision rolled ball screw
    SD series (P. A201)
    TN series (P. A201)
    RT series (P. A205)
    RGF series (P. A205)
    SL series (P. A203)
    TL series (P. A203)
  - Ball screw for general industry
    R (mm) series (P. A211)
    R (inch) series (P. A225)
    RS series (P. A219)
    RZ series (P. A227)
    RR series (P. A223)
    R2 series (P. A215)
    RE series (P. A217)
    Right & left hands series (P. A229)
    G series (P. A233)
    TF series (P. A235)
    EF series (P. A239)
    MF series (P. A239)
    TM series (P. A241)

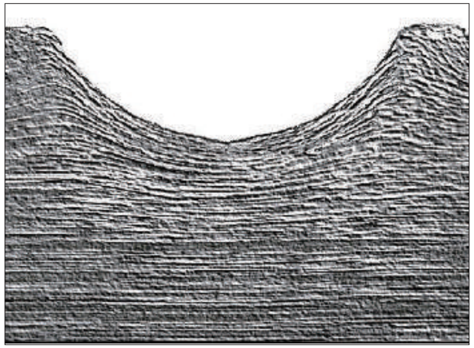
- Accessory for Ball screw
  - Support unit (P. A249)
    Lock nut (P. A253)

Ball screw

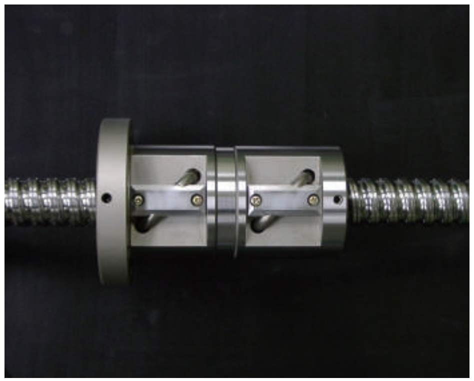
(1) FB series

The precision ball screw (ground ball screw) has evolved!

The FB series ball screw with high strength is made from deformation working that doesn't cut the metal structure.



The FB series has higher strength on ball rolling surface than the ground ball screws; the screw shaft is superior in wear and abrasion resistance. The ground ball screw shaft is usually formed by cutting and the grinding work, which improves form accuracy and reduces defective surface roughness of the ball rolling contact surface. In FB series the groove of the screw shaft is formed by thread rolling which is cold deformation working . The metallographic structure of the surface of the groove is transformed by plastic deformation along the shape of the ball rolling contact surface, and work hardening by a high stress makes the metallographic structure exact, strength is high, and defective surface roughness more smooth than the ground ball screws.



TSUBAKI NAKASHIMA offers a short delivery time and the low price for FB series ball screw.

Due to the above manufacturing process of the FB series it is possible to reduce cost of the working of screw shaft. For the ground ball screw, production cost of threaded portion of the screw shaft is large and it is proportional to the length. However in case of the FB series, due to high efficiency production is possible because deformation working by the single pass of the screw shaft.

It is a high efficiency, an energy saving process, because the groove is formed by deformation working in this respect it is a favorable for the environment concern compared with other working methods, and a working method does not to put out the chip and to contribute to the saving resource and the reduction of waste.

The production of the ball screw of a higher slenderness ratio (total length/shaft diameter) enabled by the continuous deformation working.

Earlier when a high slenderness ratio of ground ball screw with the small diameter was produced, the machining time of the ball screw thread was long and production was difficult and expensive due to the deflection of the screw shaft by the grinding force. However, a higher slenderness ratio in FB series has enabled a low-priced ball screw production by adopting the groove forming method by the continuous deformation working. Moreover, the lead linearity that is the feature of the deformation working can be produced and the any part of ball screw can supplied as the same quality production.

FB series can be used same high-quality as the ground ball screw.

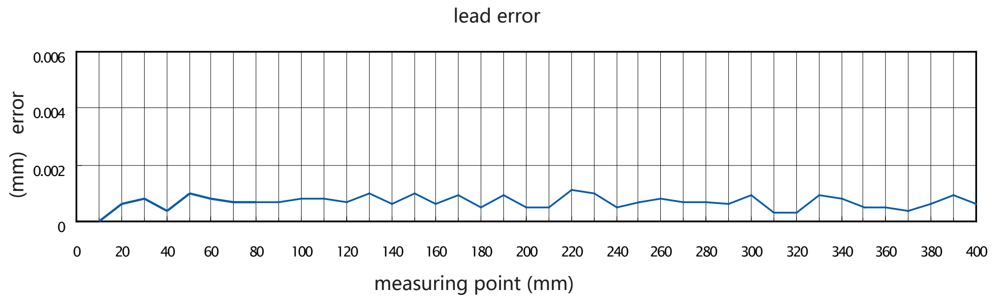


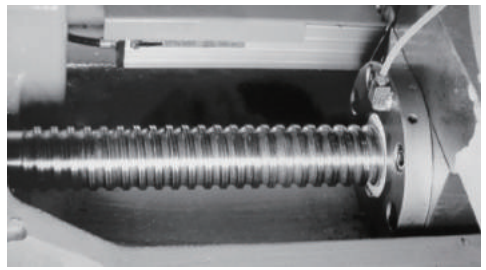
Fig. 11 Lead accuracy of FB series

The FB series conforms to the standard in accordance with the same JIS standard as the ground ball screw. Lead accuracy, torque deviation, and run-out accuracy so on, it can be supplied in stable quality. Moreover, groove surface roughness is better than the ground ball screw and wear and abrasion resistance is improved. The precision ball screw FB series can accommodate proper amount of the preload or axial clearance as equal to that possible in ground ball screw.

Lead accuracy of FB series

Type	40TTFC12-1000C3F
Shaft diameter	40mm
Lead	12mm
The total length	1000mm
Accuracy	C3

FB series dimension table (P.A51)

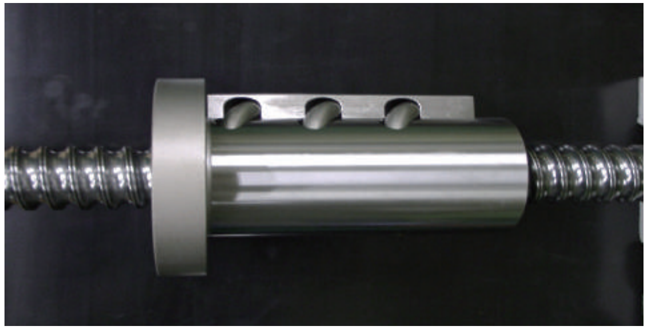


Using for the facility for the ball screw working

(2) HN FB series

The precision ball screw (ground ball screw) has evolved!

The production technology that had been improved in the development of the FB series applied for a heavy duty electric cylinder technology.



HN- FB series offers a short delivery and the low price of the ball screw

The HN·FB series have the feature of FB series that have high strength of the ball rolling surface of the screw shaft, excellent in wear and abrasion resistance. So that the heavy duty ball screw user may also use it to change the hydraulic cylinder to an electric cylinder

The HN · FB series forms the groove of the screw shaft by cold deformation working, and shape on the ball rolling surface is completed by forming. The metallographic structure is modified by plastic deformation during rolling, the surface of the groove is transformed along the shape of the ball rolling contact surface, and work hardening by a high stress makes the metallographic structure exact, strength is high, and defective surface roughness smooth more than the ground ball screws.

Feature

1) The load capacity achieved 2-3 times by a special design for heavy load application.
2) All parts of the ball screw are configured for heavy load.
3) It can be used to obtain same higher –quality of the ground ball screw.
4) When combined with the retainer option, the jamming up effects by the oscillation is reduced and the lubricant retention is improved.
5) Select the HN series and the UHD series when there is no suitable with the HN·FB series.

HN FB series dimension table (A51)
HN series dimension table (A63)

(3) CB series (with ceramic ball)

The CB series is a hybrid type ball screws with the ceramic balls.

The ball screw uses steel ball (the material: SUJ2) used for the ball bearing usually, except when it is required by the specific environment. However, need of costly cooling system and the soundproofing measures so on is needed to decrease heat generation and noise of the ball screw during high-speed condition when using steel balls.

To solve these problems, CB series ball screws uses the ceramic balls. (Silicon nitride ball) The shape of the ball nut can be same without changing the design of the nut because it is same as with using the steel ball.

Feature of ball screw with ceramic ball

1) Possible to run at high speed rotation.

Mass of ceramic is less compared with the steel ball, and is lower by about 1.5 times, higher speeds are possible than with steel balls .

2) Low noise.

The ball and the collision noise in the recirculation part decrease, the acoustic pressure decreases by 5-10dB (A) compared with the steel ball.

3) Heat generation value can be reduced.

Coefficient of linear expansion and thermal conductivity are lower than the steel ball, and temperature-rise at the high-speed rotation is controlled.

4) Main application

Semiconductor inserting machine, Fabrication equipment, Inspection device, Machine tool, and Injection molding machine so on.

Noise measurement of ball screw

Ball screw specification		Measuring condition	
Screw diameter	: 36mm	Feeding speed	: 25m/min
Lead	: 20mm	Measuring position	: 200mm from center of screw shaft
Ball diameter	: 6.35mm	Lubrication	: Oil (ISO VG68)

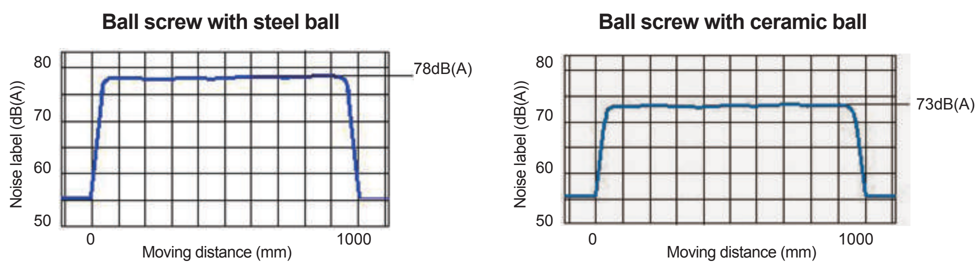


Fig. 12 Comparison of noise of ball screw

(4) VB series (with retainer)

Resolve the problems by far ! Standardization is first in the world !

A lot of problems were solved by using the retainer to the ball screw.

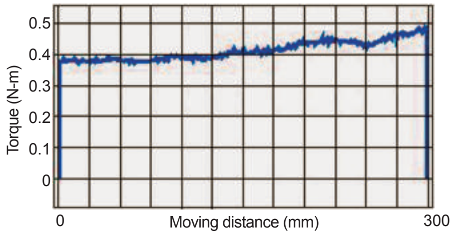


Fig. 13 Dynamic torque of ball screw with retainer

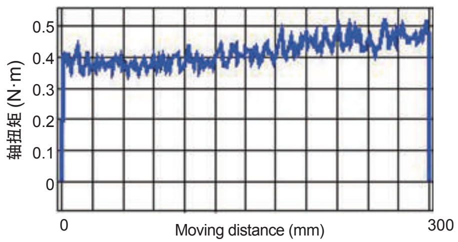
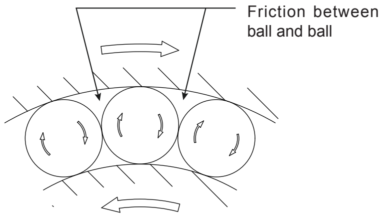


Fig. 14 Dynamic torque of ball screw with full ball

Feature of precision ball screw with retainer

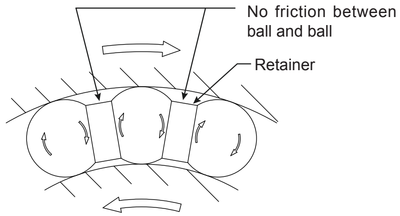
1) Smooth movement without jerky motion of balls in the ball nut.
2) Deviation of the dynamic preload torque is small and results in smooth motion.
3) Retention of the lubricant improves, and results in long-term maintenance-free condition.
4) Achieving long lifetime of the ball screw due to decrease in the friction loss.
5) No collision noise of the balls and runs at low noise, and results in good sound quality.
6) Application
Machine tool, Measuring instrument, Medical equipment, Injection molding machine, Semiconductor fabrication equipment, and Controller so on.

The VB series can be produced in the same designs as given earlier, however, in case that is not available, please contact us.



There is a mutual friction of the balls, and the balls are easily jammed up when running at low speeds and oscillation.

Fig. 15 Full ball specification



There is no mutual friction of the balls, the ball may not jammed up when running at low speeds and oscillation.

Fig. 16 Retainer specification

(5) UHD series

The load capacity of the ball screw has increased dramatically.

Feature of ball screw UHD series for ultra-heavy duty

If you want to increase the load carrying capacity of the ball screw (life), one method is to increase the number of effective balls, but it was necessary to limit the number of balls in one row due to the friction of balls rubbing each other by the contact, UHD series which have super-high load capacity is made by increasing the number of rows.and with retainers. it possible to increase the number of balls in one row by use of the retainer which eliminates the mutual friction of the ball. In addition, the ball nut shape was made compact by use of the new ball recirculation method.

1）Possible to offer super-heavy duty load rating.
2）Load capacity is maximum twice higher compared to the conventional heavy load ball screw.
3）Stiffness is maximum 1.5 times higher compared to a conventional ball screw.
4）Additional retainer can be used for oscillating movement
5）Outside diameter of the ball nut is a compact and even shape.
6）Application is an injection molding machine, a press, a push bench, and a damping device, etc.

Any type of special design is available. Please contact us.

1.3 Combination of outside diameter of screw shaft and lead

(1) Sizes commonly used for semiconductor equipment

Table 1 Combination of outside diameter of screw shaft and lead of FB series (excerpt)

Lead; Unit: mm

Screw Dia.	2	5	6	10	12	15	16	20	25	30	32	40	50	60
8	○		○		○									
10	○													
12		○		○										
15		○		○		○		○		○				
16											○			
20		○		○				○				○		○
25		○		○					○					

Please select the precision ball screw FB series for short delivery time and the low price. The accuracy classes are C3.C5, and C7. The specification corresponds to different applications. Select details from dimension table (P. A51). Please select the precision ground ball screw when the required size is not available in the FB series. Select details from dimension table (P. A63).

Table 2 Combination of outside diameter of screw shaft and lead of ground ball screw (excerpt)

Lead; Unit: mm

Screw Dia.	1	1.5	2	2.5	3	4	5	6	8	10	12	15	16	20	25	30	32	40	50
4	○																		
5	○	○	○																
6	○	○	○																
8	○	○	○					○			○								
10	○	○	○	○															
12			○	○	○	○	○			○									
14			○	○	○	○	○												
15							○			○		○		○		○			
16			○	○		○	○										○		
20						○	○	○	○	○	○		○	○	○	○		○	
25						○	○	○	○	○			○	○	○				○

Table 3 Combination of outside diameter of screw shaft and lead of precision rolled ball screw (excerpt)

Lead; Unit: mm

Screw Dia.	2	2.5	3	4	5	6	10	20	24	25	30	32	40	50
6	○													
8		○												
10	○		○											
12				○										
14				○	○									
16	○				○							○		
20					○	○		○					○	
25					○		○	○		○				○

The accuracy classes are C5, and C7. The specification corresponds to different uses.

Please select details from size table (P. A57).

(2) Sizes commonly used for injection molding machine

Table 4 Combination of outside diameter of screw shaft and lead of FB series (excerpt)

Lead; Unit: mm

○ FB
◎ HN•FB

Screw Dia.	10	12	16	20	25	50
25	○				○	
28	○	○				
32	○	○	○			
36				○		
40	○	○		○		
50			◎			○
55			◎			
63			◎			
100			◎			

Please select ○precision ball screw FB series and ◎ HN·FB series ball screw for heavy load use for short delivery time and the low price. The specification corresponds to an electric cylinder application like the nozzle, the clamp, the ejector, and the injection and so on; the accuracy grades are C3.C5, and C7.

Select details from dimension table (P. A51).

Please select the precision ground ball screw when the required dimensions are not in the FB series. Please select details from dimension table (P.A63).

Table 5 Combination of outside diameter of screw and lead of precision ball screw (excerpt)

Lead; ◎ HN; Unit: mm

Screw Dia.	4	5	6	8	10	12	16	20	24	25	32	40	50
25	○	○	○	○	○		○	○		○			○
28		○	○		○	○							
32	○	○	○	○	○	○	○	○		○	○		
36		○	○		○			○					
38									○				
40		○	○	○	○	○	○	○		○	○	○	
45					○	○							
50		○	○	○	○	○	◎	◎		◎	○	○	○
55					○	○	◎						
63			○	○	○	○	◎	◎		◎			
80					○	○	◎	◎		◎			
100						○	◎	◎		◎			
125							◎	◎		◎			
140										◎			
160										◎			
200										◎			

◎ ball screw HN series for heavy load. The specification corresponds to an electric cylinder application like the nozzle, the clamp, the ejector, and the injection and so on; the accuracy grades are C3.C5, and C7.

Please select details from dimension table (P.A63).

(3) Sizes commonly used for machine tool

Table 6 Combination of outside diameter of screw shaft and lead for FB series (excerpt)

Lead / Unit: mm

Screw Dia.	2	5	6	8	10	12	15	16	20	25	30	32	40	50	60
8	○		○			○									
10	○														
12		○			○										
15		○			○		○		○		○				
16												○			
20		○			○				○				○		○
25		○			○					○					
28					○	○									
32			○	○	○	○		○				○			
36									○						
40					○	○			○						
50														○	

Please select the precision ball screw FB series for short delivery time and the low price. The accuracy grades are C3.C5. The specification corresponds to different applications.

Please select details from dimension table (P. A51).

Please select the precision ground ball screw when the required dimensions are not in the FB series. Please select details from dimension table (P. A63).

Table 7 Combination of outside diameter of screw shaft and lead of precision ball screw (excerpt)

Lead / Unit: mm

Screw Dia.	1	1.5	2	2.5	3	4	5	6	8	10	12	15	16	20	24	25	30	32	40	50
10	○	○	○	○																
12			○	○	○	○	○			○										
14			○	○	○	○	○													
15							○			○		○		○			○			
16			○	○		○	○											○		
20						○	○	○	○	○	○		○	○		○	○		○	
25						○	○	○	○	○			○	○		○				○
28							○	○		○	○									
32						○	○	○	○	○	○		○	○		○		○		
36							○	○		○				○						
38															○					
40							○	○	○	○	○		○	○		○		○	○	
45										○	○									
50							○	○	○	○	○		○	○				○	○	○
55										○	○		○							
63								○	○	○	○		○	○						
80										○	○		○	○		○				
100											○		○	○		○				
125													○	○		○				
140														○		○				
160																○				
200																○				

(4) Sizes commonly used for general industrial machinery and transportation equipment

Table 9 Combination of outside diameter of screw shaft and lead of general industrial ball screw series (excerpt)

Lead / ◎ Left hand also available / Unit: mm

Screw Dia.	2	3	4	5	6	8	10	12	15	16	20	24	25	30	32	36	40	50	60
8	○				○			○											
10	○	◎			○														
12				○		○	○	○											
14			○	○															
15				○			○		○		○								
16				○			○			○					○				
18						○													
20				◎	○		○				○						○		○
22						○													
25				○		○	○						○					○	
28					○		○	○											
32					○	○	○	○		○					○				
36							○	○			○	○				○			
40							○	○			○						○		
45							○	◎											
50							○			○								○	
60										○									
63							○			○									
80										○	○								
100											○	○							
125											○		○		○				
140													○		○		○		
160													○		○		○		
200															○		○		
250															○		○		
315																	○		

1.4 Lead accuracy

(1) Higher than C5 grade

The lead accuracy of TSUBAKI NAKASHIMA precision ball screw (C0-C5 grade) are based on JIS standard (JIS B 1192-1997).

The definition concerning the lead accuracy is shown in figure 17 and the tolerance is shown in Table 11 and Table 10.

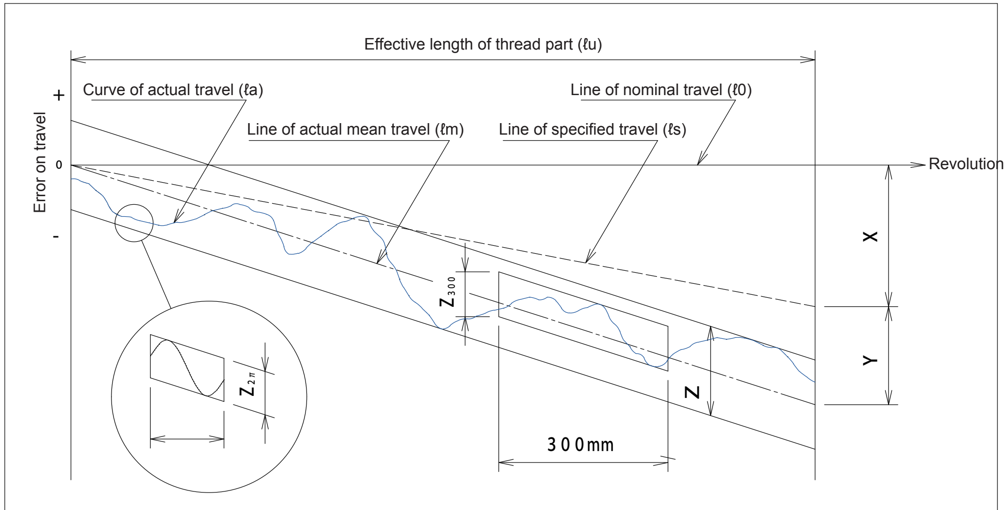


Fig. 17 Explanation of lead accuracy

Table 10 Definition terms of lead accuracy

Term	Symbol	Definition
Nominal travel	ℓ	Axial directional travel when rotated arbitrary number of revolutions in accordance with the nominal lead.
Specified travel	ℓ_s	Axial directional travel when rotated arbitrary number of revolutions in accordance with the specified lead.
Target of specified travel	X	Value in which nominal travel is decreased from specified travel to effective length of threaded part.
Actual travel	ℓ_a	Axial directional travel obtained by continuous measuring when ball screw is used.
Actual mean travel error	Y	Difference between the actual mean travel which is obtained by the method of least square or a simple and appropriate approximation and specified travel.
Travel variation	Z	Distance of two straight lines of the parallel in the line of the actual travel in the whole area of the effective length of threaded part and specified travel.
	Z_{300}	Distance of two straight lines of the parallel in the line of the actual travel at any 300mm and actual mean travel.
	$Z_{2\pi}$	Distance of two straight lines of the parallel in the line of the actual travel at any 1 revolution (2πrad) and actual mean trave.

Table 11 Permissible value of actual mean travel errors and travel variations in respect to positioning ball screw (C series)

Unit: μm

Accuracy grade			C0		C1		C2		C3		C5	
	Over	Under	Y	Z	Y	Z	Y	Z	Y	Z	Y	Z
Effective thread length L(mm)	-	100	3	3	3.5	5	5	7	8	8	18	18
	100	200	3.5	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

Note: 1. The standard in the part enclosed with the heavy line is within the range with JIS B 1192, others are as per TSUBAKI NAKASHIMA standard value.

Note: 2. Though 2 varieties of the C series and the Cp series are defined as a standard of the positioning ball screw in JIS B 1192 and TSUBAKI NAKASHIMA adopts the C series.

Table 12 Permissible value of travel variation at any 300 mm of thread length (Z300) and for one revolution (Z2π)

Unit: μm

Accuracy grade	C0	C1	C2	C3	C5
Z_{300}	3.5	5	7	8	18
$Z_{2\pi}$	2.5	4	5	6	8

Ball screw

(2) Lower than C7 grade

The lead accuracy of a part of FB series, less than C7 such as used in general industrial application are as shown in Table 13.

Table 13 Permissible value of actual mean travel error (Y) and travel variation at any 300 mm of thread length (Z300) for transport ball screw.

Unit: μm

Accuracy grade	C7	C10
Y	$Y=Z_{300}$ ・2・ (Effective lengthL)/300	
Z_{300}	52	210

(3) Recommendable lead accuracy according to application

Table 14 Lead accuracy grade of ball screw according to application

○ General specification ◎ Major Specification

Application	Lead accuracy grade (C series)					
	C0	C1	C3	C5	C7	C10
Lathe	○	○	◎	◎		
Machining center		○	◎	◎		
Milling machine		○	◎	◎		
Drilling machine			○	◎	○	
Jig bola	○	◎				
Grinding machine	○	◎	◎			
Electrical discharge machine		○	◎			
Injection molding machine				○	◎	
Steel facility machine				○	◎	
Punching press			○	◎		
Laser beam machine			○	◎		
"General-purpose machine and special purpose machine"			○	◎	◎	○
Wood working machine				○	◎	○
Photolithography machine	○	◎			○	
Chemical processing unit			○	◎		
Electronic packing machine		○	◎	○		
Wire bonder		○	◎	○		
Blow bar	○	◎				
Printed board punching machine		○	◎	○		
Crtogonal coordinates type robot			○	◎		
Vertical revolute			○	◎		
Three-dimensional measurement machine	○	◎	○			
Image processor	○	◎	○			
Atomic energy controller			○	◎	○	
Aircraft			○	◎	○	

1.5 Mounting accuracy

The accuracy of respective parts of TSUBAKI NAKASHIMA ball screw must have the following seven items of accuracy in accordance with JIS B 1192 and our permissible tolerances are maintained more accurately than the values in the standard.

① Radial run-out of the circumference of thread root and part mounting surface in respect to the to the screw shaft supporting part axis.

② Radial run-out of the circumference of the part mounting surface in respect to the screw-shaft supported-portion axis.

③ Perpendicularity of screw-shaft supported portion end face to shaft axis.

④ Perpendicularity of flange mounting surface to the screw shaft axis.

⑤ Radial run-out of the nut circumference in respect to screw shaft axis.

⑥ Parallelism between the nut circumference (flat mounting surface) and screw shaft axis.

⑦ Total radial run-out of threaded part outside in respect to screw shaft. (C0-C10)

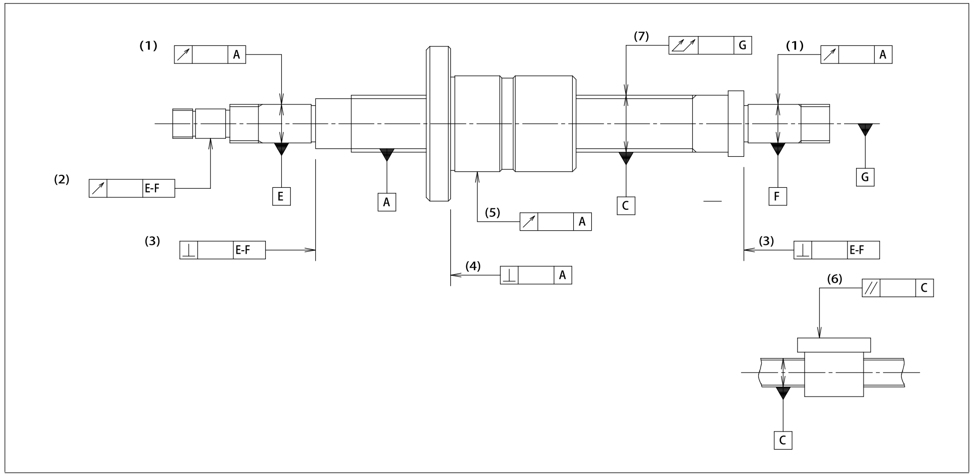


Fig. 18 Accuracy on respective parts

Table 15 Radial run-out of the circumference of thread root and part mounting surface in respect to the to the screw shaft supporting part axis.

Unit: μm

O.D of screw (mm)		Tolerance of run-out (max.)					
Over	Under	C0	C1	C3	C5	C7	C10
–	8	3	5	8	10	14	40
8	12	4	5	8	11	14	40
12	20	4	6	9	12	14	40
20	32	5	7	10	13	20	60
32	50	6	8	12	15	20	60
50	80	7	9	13	17	20	60
80	125	–	10	15	20	30	80
125	200	–	–	–	–	30	80

Since the influence of the runout on screw shaft axis is included in the measurements of P. A22 ①~③ item, its correction is required the correcting method is obtain a corrected value from the total run-out of screw shaft axis based on a ratio of the overall shaft length to the distances between the supporting point and measuring point, and apply by adding it to the tolerance of Table 15. The formula is shown as follows.

$A = a + \Delta a = a + L'/L \times B$

A: Allowable value (μm)

a: Standard value in above table 15 (μm)

Δa: Correction value

B: Total runouts in radial direction of axis line of screw shaft (60 μm for 500 mm shaft)

L: Total length of screw shaft (mm)

L': Distance from supporting point to measuring point (mm)

Table 16 Perpendicularity of screw-shaft supported portion end face to shaft axis. Unit: μm

O.D of screw (mm)		Tolerance of run-out (max.)					
Over	Under	C0	C1	C3	C5	C7	C10
-x	8	2	3	4	5	7	10
8	12	2	3	4	5	7	10
12	20	2	3	4	5	7	10
20	32	2	3	4	5	7	10
32	50	2	3	4	5	8	12
50	80	3	4	5	7	10	14
80	125	-	4	6	8	11	16
125	200	-	—	—	—	13	18

Table 17 Perpendicularity of flange mounting surface to the screw shaft axis. Unit: μm

O.D of screw (mm)		Tolerance of run-out (max.)					
Over	Under	C0	C1	C3	C5	C7	C10
-	20	5	6	8	10	14	20
20	32	5	6	8	10	14	20
32	50	6	7	8	11	18	30
50	80	7	8	10	13	18	30
80	125	7	9	12	15	20	40
125	160	8	10	13	17	20	40
160	200	-	11	14	18	25	50
200	250	-	12	15	20	25	50
250	300	-	-	-	-	25	50

Table 18 Radial run-out of the nut circumference in respect to screw shaft axis. Unit: μm

O.D of screw (mm)		Tolerance of run-out (max.)					
Over	Under	C0	C1	C3	C5	C7	C10
-	20	5	6	9	12	20	40
20	32	6	7	10	12	20	40
32	50	7	8	12	15	30	60
50	80	8	10	15	19	30	60
80	125	9	12	20	27	40	80
125	160	10	13	22	30	40	80
160	200	-	16	25	34	50	100
200	250	-	18	28	38	50	100
250	300	-	-	-	-	50	100

Table 19 Perpendicularity of flange mounting surface to the screw shaft axis.

Unit: μm

Standard length of mounting part (mm)		Tolerance of parallelism (max)					
Over	Under	C0	C1	C3	C5	C7	C10
-	50	5	6	8	10	17	30
50	100	7	8	10	13	17	30
100	200	-	10	13	17	30	50
200	400	-	-	-	-	30	50

Table 20 Total radial run-out of threaded part outside in respect to screw shaft. (C0)

Unit: μm

Nominal Dia. / Length		Over	-	8	12	20	32	50	80	125
		Under	8	12	20	32	50	80	125	200
Over	Under									
–	125		15	15	15					
125	200		25	20	20	15				
200	315		35	25	20	20				
315	400			35	25	20	15			
400	500			45	35	25	20			
500	630			50	40	30	20	15		
630	800				50	35	25	20		
800	1000				65	45	30	25		
1000	1250				85	55	40	30		
1250	1600				110	70	50	40		
1600	2000					95	65	45		

Table 21 Total radial run-out of threaded part outside in respect to screw shaft. (C1)

Unit: μm

Nominal Dia. / Length		Over	-	8	12	20	32	50	80	125
		Under	8	12	20	32	50	80	125	200
Over	Under									
–	125		20	20	15					
125	200		30	25	20	15				
200	315		40	30	25	20				
315	400		45	40	30	25	20			
400	500			50	40	30	25			
500	630			60	45	35	25	20		
630	800				60	40	30	25		
800	1000				75	55	40	30	25	
1000	1250				95	65	45	35	30	
1250	1600				130	85	60	45	35	
1600	2000					120	80	55	40	
2000	2500						100	70	50	
2500	3150						130	90	60	
3150	4000							120	80	

Ball screw

Table 22 Total radial run-out of threaded part outside in respect to screw shaft. (C3)

Unit: μm

Nominal Dia.		Over	-	8	12	20	32	50	80	125
Length		Under	8	12	20	32	50	80	125	200
Over	Under									
–	125		25	25	20					
125	200		35	35	25	20				
200	315		50	40	30	25				
315	400		60	50	40	35	25			
400	500			65	50	40	30			
500	630			70	55	45	35	30		
630	800				70	55	40	35		
800	1000				95	65	50	40	30	
1000	1250				120	85	60	45	35	
1250	1600				160	110	75	55	40	
1600	2000					140	95	70	50	
2000	2500						120	85	60	
2500	3150						160	110	75	
3150	4000						220	150	100	
4000	5000							200	130	

able 23 Total radial run-out of threaded part outside in respect to screw shaft. (C5)

Unit: μm

Nominal Dia.		Over	-	8	12	20	32	50	80	125
Length		Under	8	12	20	32	50	80	125	200
Over	Under									
–	125		35	35	35					
125	200		50	40	40	35				
200	315		65	55	45	40				
315	400		75	65	55	45	35			
400	500			80	60	50	45			
500	630			90	75	60	50	40		
630	800				90	70	55	45		
800	1000				120	85	65	50	45	
1000	1250				150	100	75	60	50	
1250	1600				190	130	95	70	55	
1600	2000					170	120	85	65	
2000	2500						150	110	80	
2500	3150						200	140	95	
3150	4000						260	180	120	
4000	5000							240	160	
5000	6300							310	210	
6300	8000								280	
8000	10000								370	

1.6 Preload torque

The preload torque of the TSUBAKI NAKASHIMA ball screws conforms to the standard in accordance with JIS B 1192, and the permissible value of the basic torque deviation ratio is defined by the accuracy class of the ball screw, and defined as shown in Figure 19. Table 25 shows the permissible value of the basic torque deviation ratio.

Table 24 Definition of preload torque

Term	Symbole	Definition
Preload	F_{PR}	In order to decrease or elliminate the backlash and to increase rigidity of the ball nut, a preloading force is added to the ball nut by assmbling a group of over size balls or using a pair of nuts being displaced in axial direction to each other.
Dynamic drag torque	T_P	Torque required to rotate the preloaded ball nut relative to the ball screw shaft, or vice versa, in the absence of an external load and any friction torque of the end seals.
Total dynamic drag torque	T_t	Dynamic drag torque including the friction torque of the end seals.
Basic torque	T_{PO}	Dynamic drag torque which has been established as the target.
Fluctuation value of basic torque	$\triangle T_{PO}$	Fluctuation value of dynamic drag torque which has been established as target. This is taken as the positive and negative in respect to the basick torque.
Fluctuation rate of basic torque	—	Rate of fluctuation value of basic torque $\triangle T_{PO}$to the basic torque T_{PO}.
Actual torque curve	—	Dynamic torque curve measured and recorded on the actual preloaded ball screws.
Mean acutual torque	T_{pa}	Arithmetic mean values of the maximum value and the minimum valueo f a the actual torque curve exccluded starting torque, when measured allowing the nut to behave reciprocating motion on the effective length of threaded part.
Fluctuation value of actual torque	$\triangle T_{pa}$	maxmum flucuation value of actual torque curve excluded the starting torque, when measured allowing the nut to behave reciprocating motion on the effective length of threaded part.
fluctuation rate of actual torque	—	Rate of fluctuation value of actual torque ΔT_{pa} to the mean actual torque T_{pa}

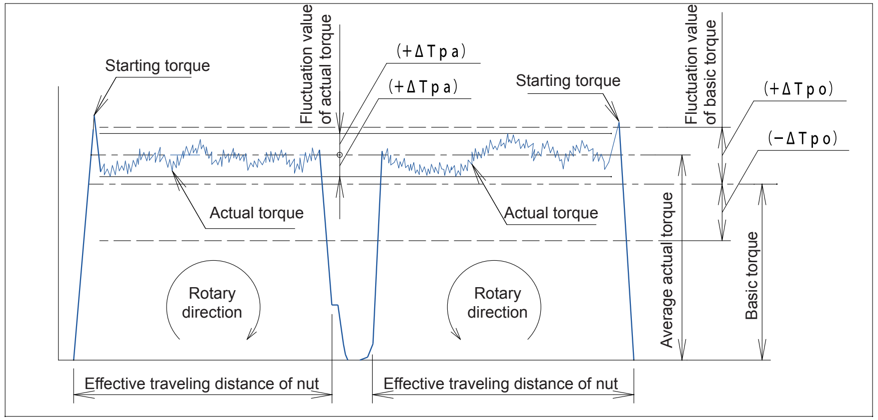


Figure 19 Explanatory diagrams of definitions

Table 25 Permissible fluctuation rate of basic torque

Unit: % Preload torque

Basic torque Tpo (N · m)		Effective thread length L(mm)												
		Under 4000										Over 4000 & Under 10000		
		Slenderness (Note:1): Under 40					Slenderness (Note:1): Over 40 & Under 60					-		
Over	Under	C0	C1	C3	C5	C7	C0	C1	C3	C5	C7	C3	C5	C7
0.2	0.4	±30	±35	±40	±50	–	±40	±40	±50	±60	–	–	–	–
0.4	0.6	±25	±30	±35	±40	–	±35	±35	±40	±45	–	–	–	–
0.6	1.0	±20	±25	±30	±35	±40	±30	±30	±35	±40	±45	±40	±45	±50
1.0	2.5	±15	±20	±25	±30	±35	±25	±25	±30	±35	±40	±35	±40	±45
2.5	6.3	±10	±15	±20	±25	±30	±20	±20	±25	±30	±35	±30	±35	±40
6.3	10.0	–	±15	±15	±20	±30	–	–	±20	±20	±35	±25	±30	±35

Note: 1. "Slenderness ratio" is a value in which thread length (mm) of the screw shaft is divided in screw shaft nominal outside diameter (mm).

Note: 2. 0.2N·m or less of basic torque of ball screw is as per to our own standard.

1.7 Axial clearance

A combination of the axial clearance and the accuracy class of the ball screw is shown in Table 26. Please select it for necessary positioning accuracy.

Table 26 Accuracy grade and axial clearance

Unit: mm

Axial clearance	0 (preload)	Under 0.005	Under 0.02	Under 0.05	Under 0.3
Clearance symbol	**Q0**	**QS**	**Q2**	**Q5**	**QL**
Applicable accuracy grade	C0	C0	C3	C5	C7
	C1	C1	C5	C7	–
	C3	C3	C7	–	–
	C5	C5	–	–	–

It may be a partial preload condition when the length of the ball screw with QS or Q2 clearance exceeds Table 27.

If it is a range of screw shaft production, Q5 and QL axial Clearance is provided.

Table 27 Production range of effective thread length for QS Q2 clearance.

Unit: mm

O.D of screw shaft	Effective thread length of screw shaft				
	C0•C1•C3	C5	C3	C5	C7
	QS (under 0.005 clearance)		Q2 (under 0.02 clearance)		
ø4 ~ 6	80	100	80	100	100
ø8 ~ 10	250	200	250	300	300
ø12 ~ 16	500	400	500	600	600
ø20 ~ 28	800	700	1000	1000	1000
ø32 ~ 40	1000	800	2000	1500	1500
ø50 ~ 63	1200	1000	2500	2000	2000
ø80 ~ 125	-	-	4000	3000	3000

Refer to each dimension table for the axial clearance of a precision rolled ball screw and a general industrial use ball screw as per pages shown.

Precision rolled ball screw P.A199~
General industrial use ball screw P.A207~

1.8 Permissible axial load

(1) Basic rated static load Co

The basic rated static load Co (N) is the axial load which the sum of the contact area of the ball and screw groove, and a permanent deformation is identical with 1/10,000 times of the ball diameter.
The Co value is shown in each dimension table.

Permissible axial load Pmax is shown by following formula. Pmax=Co/fd' (N)
fd': 1 to 2 （in case of the normal operation）
fd': 2 to 3 （in case of the impact and the vibration operation）

(2) Buckling load

It is necessary to examine axial load condition so as not to cause the buckling in the screw shaft when the compressive load acts on the screw shaft.

In general, use and calculate the following Euler formula. Fig. 20 shows the buckling load of each outside diameter of the screw shaft.

$$Pcr = m \times \left(\frac{dr^2}{Lo}\right)^2 \times \alpha \ (N)$$

P_{cr}	Column load (N)
d_r	Screw shaft root diameter (mm)
L_o	Unsup ported length(mm)
α	Safety factor (α=0.5)
m	Supporting factor

Support method	Support factor:m
F-O support	$2.5x10^4$
S-S support	$10x10^4$
F-S support	$20x10^4$
F-F support	$40x10^4$

F:Fix S:Support O:Open

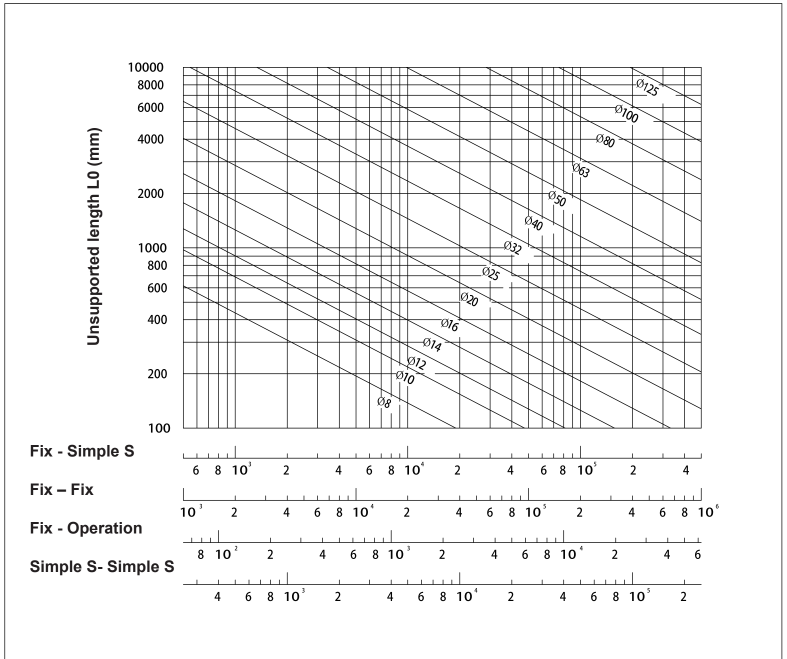


Fig. 20 Relation between buckling load – Out diameter of screw shaft

1.9 Permissible stress in screw shaft section

Because the buckling will not happen in the screw shaft when the mounting distance of the ball screw is short, the axial load that stress the screw in axial plane becomes permissible stress σ0 is assumed to be a permissible tension and compression load, and it is calculated by the following formula. Select it so that the axial load may become less than permissible tension and compression load P0.

$P_0=\sigma_0\times\pi\times dr^2/4=1.15dr^2\times10^2$

P_0 : Permissible tension compressive load (N)

σ_0 : Permissible stress(147MPa)

d_r : Screw shaft root diameter (mm)

1.10 Permissible rotational speed

(1) Critical speed

When Ball screw rotates at high speeds it and it is corresponding to critical speed of ball screw it resonates and it causes a hazardous situation due to self -excited vibration. occurrence value of the screw axis. We regard permissible rotational speed of the ball screw as 80% less than the self-excited vibration occurrence value of the screw axis.

Permissible rotating speed is calculated by the following formula.

Fig. 21 is a chart of a permissible rotating speed of each shaft diameter. If required axis diameter is not available in the chart, please calculate it using the following formula.

$$Nc = n \times \frac{d_r}{L_0^2} \times \alpha \ (min^{-1})$$

N_c	Critical speed (min^{-1})
d_r	Screw shaft root diameter (mm)
L_o	Supported length(mm)
α	Safety factor (α=0.5)
n	Support factor(refer right table)

Support method	Support factor:n
F-O support	$40x10^6$
S-S support	$120x10^6$
F-S support	$180x10^6$
F-F support	$270x10^6$

F:Fix S:Support O:Open

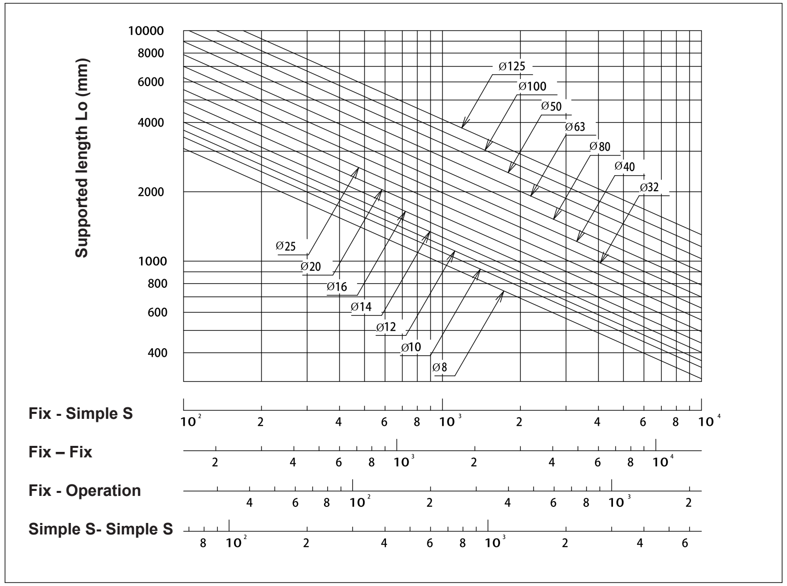


Fig.21 Relation between self-excited vibration occurrence value and outer diameter of screw shaft.

(2) Dn value

The peripheral velocity of the outside diameter of the screw shaft when the ball screw rotates is shown by the Dn value, and a permissible rotational speed of the ball screw is limited based on manufacturing process.

$Dn = D \cdot n$

D: Outside diameter of screw shaft (mm)

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

Table 28 Definition of Dn value

Precision ball screw	Standard spec	DN≤70000
Precision ball screw	High speed spec	DN≤120000
Industial use ball screw		DN≤50000

Note: 1. A permissible value for both rotational speeds and the Dn values, please consult us when the rotational speed exceeds 3000 rpm.

Note: 2. It is possible to produce ball screw with the Dn value to exceeding 120000, please consult us.

1.11 Supporting condition of ball screw

The example of a general supporting condition of the ball screw is as shown.

Please decide the supporting condition and distance referring to the example, and calculate a permissible axial load and a permissible rotational speed.

Note. L(P_{cr}) : Buckling load. L(N_c) : Critical speed. F: Fix S: Support O: Open

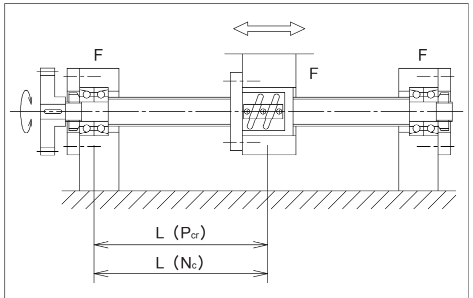


Fig. 22 Supporting condition (1)

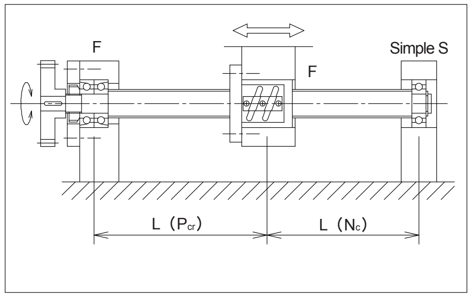


Fig.23 Supporting condition (2)

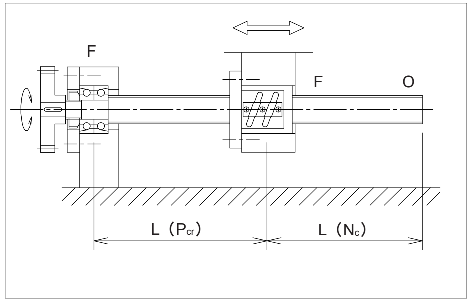


Fig.24 Supporting condition (3)

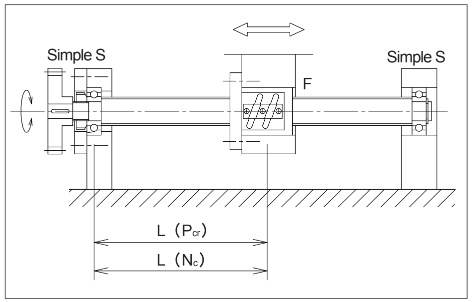


Fig. 25 Supporting condition (4)

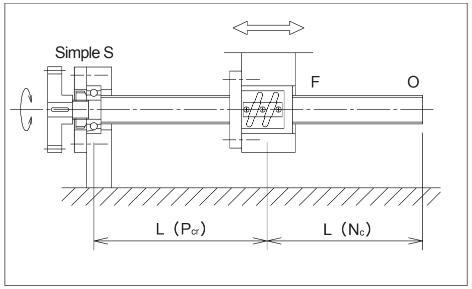


Fig. 26 Supporting condition (5)

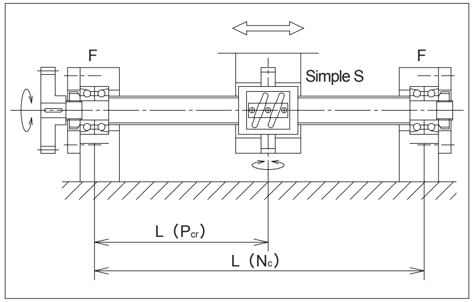


Fig. 27 Supporting condition (6)

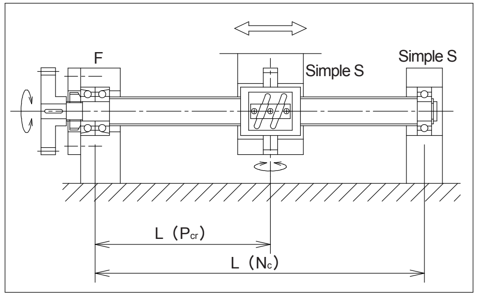


Fig. 28 Supporting condition (7)

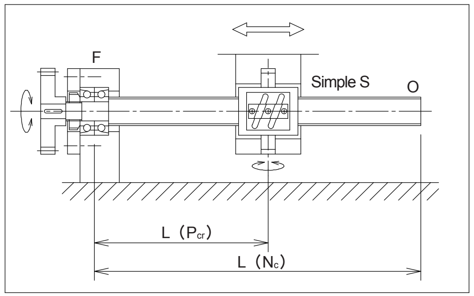


Fig. 29 Supporting condition (8)

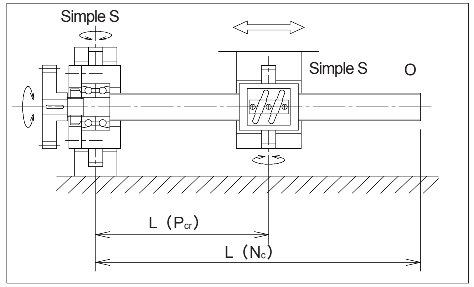


Fig. 30 Supporting condition (9)

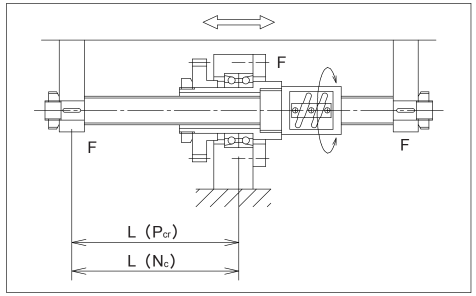


Fig. 31 Supporting condition (10)

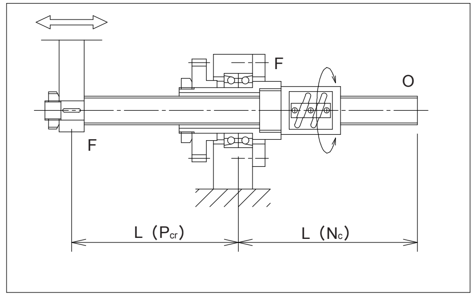


Fig. 32 Supporting condition (11)

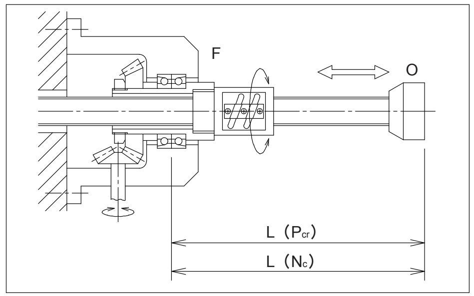


Fig. 33 Supporting condition (12)

1.12 Life of ball screw

The ball screw receives the axial load when it is rotating and the repeated stress always works on both the ball rolling race and the ball. When the number of rotations exceeds certain numbers, flaking off takes place both on ball surface and raceways of screw.

When flaking off is generated, the ball screw cannot maintain an original performance, and has unsatisfactory performance.

The life of ball screw is consider ended when it has the fatigue failure by the flaking off and the wear, the accuracy decreases by the wear-out. The fatigue life is described as follows.

(1) Basic rated dynamic load Ca

Basic rated dynamic load is at load which Flaking off of the ball screw starts, Basic rated dynamic load (Ca) at which it is able rotate 10^6 revolutions without causing flaking off on 90% of the ball screws tested when two or more same ball screws are rotated under same condition. The basic rated load has been described in each dimension table.

(2) Life calculation

The fatigue life of ball screw is calculated from the basic rated load; the axial load and the operating factor so on by the following formula. The fatigue life can be shown even the operating hour and travel at another of a total numbers of revolution.

(1) Rated fatigue life (total numbers of revolution)

$$L = \left(\frac{C_a \cdot f_s}{P_e \cdot f_d}\right)^3 \times 10^6 \text{(rev)}$$

L : Rated fatigue life (rev)
C_a : Basic rated load (N)
P_e : Axial load (N)
f_d : Driving factor
f_s : Stroke factor

In case of a smooth driving without the impact
fd = 1.0 ～ 1.2
In case of a driving with the slight impulse
fd = 1.2 ～ 1.5
In case of a driving with a large impact and the vibration
fd = 1.5 ～ 3.0

(2) Life time

$$L_n = \frac{L}{60 \times n} \text{ (hr)}$$

L_n : Life time (hr)
n : Rotational speed (min^{-1})

(3) Life travel

$$L_s = \frac{L \cdot \ell}{10^6} \text{ (km)}$$

L_s : Life travel (km)
ℓ : Lead of ball screw (mm)

Large ball screw having higher load rating than the necessary will be selected when the high fatigue life of the ball screw is expected and it is not economical.

Guidance of life time for each application

Machine tool	: 18,000 hours
General industrial machinery	: 10,000 hours
Automatic controller	: 15,000 hours
Measuring instrument	: 15,000 hours

Stroke length of nut	1.0 Under	1.2 Under	1.4 Under	1.6 Under	1.8 Under	2.0 Under	2.1 Under
f_s	0.77	0.82	0.86	0.90	0.94	0.97	1.00

(4) Average load in case of the load varies

Please calculate life from the average load that becomes life equal to the fatigue life in the changing loading condition when the axial load of the ball screw changes.

① When the axial load and the number of revolution are gradually changed

When the load and the rotational speed change gradually as shown in Fig.34, it is summarized in the following tables.

Axial load (N)	Number of revolution (min^{-1})	Time ratio (%)
P_1	n_1	t_1
P_2	n_2	t_2
P_3	n_3	t_3
.	.	.
.	.	.
P_n	n_n	t_n

Note : $t_1+t_2+t_3+\ldots+t_n = 100$

The average load is calculated by the following formula.

$$P_e = \left(\frac{P_1^3 n_1 t_1 + P_2^3 n_2 t_2 + \ldots + P_n^3 n_n t_n}{n_1 t_1 + n_2 t_2 + \ldots + n_n t_n}\right)^{\frac{1}{3}} \text{(N)}$$

The average number of revolution is calculated by the following formula.

$$n_e = \frac{n_1 t_1 + n_2 t_2 + \ldots + n_n t_n}{t_1 + t_2 + \ldots + t_n} \text{ } (min^{-1})$$

② When the number of revolution is constant and the change of the axial load is simple.

When the axial load changes in the straight line as shown in Fig.35, the average load is approximately obtained by the following formula.

$$P_e = \frac{2P_{max} + P_{min}}{3} \text{ (N)}$$

P_{max} : The maximum axial load (N)
P_{min} : The minimum axial load (N)

② When the number of revolution is constant and the axial load varies in sine curve.

When the number of revolution is constant and the axial load is obtained in the sine curve as shown in Fig.36 and 37, the average load is obtained by the following approximate formula.

$P_e ≒ 0.65 \times P_{max}$ (at diagrammatic chart A)
$P_e ≒ 0.75 \times P_{max}$ (at diagrammatic chart B)

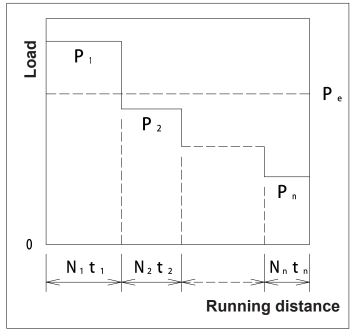


Fig. 34 Fluctuating load of stepwise

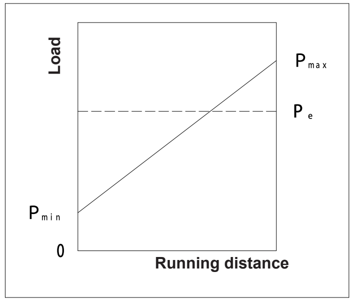


Fig. 35 Fluctuating load of monotonous

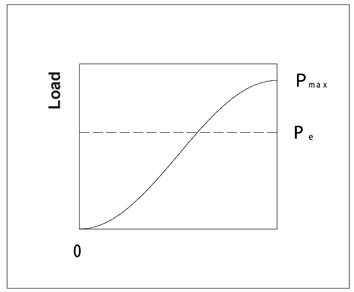


Fig. 36 Fluctuating load sine curve (A)

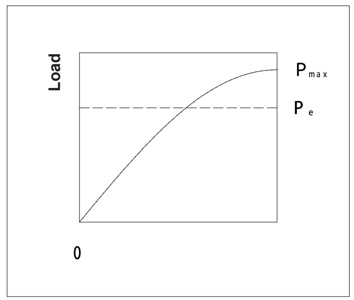


Fig. 37 Fluctuating load sine curve (B)

1.13 Ball screw for oscillation

When the ball screw is used repeatedly in an extremely short stroke or the oscillating movement with a short stroke it is possible to have a short life. In such a use of a ball screw, the life of the screw axis might be shorter than that of the ball nut, and it is necessary to account it into the rated fatigue life of the screw axis. Moreover, it is possible to have a phenomenon of the increase in rotating torque's by jerky motion of the ball by the oscillating movement with a short stroke.

Please examine ball screw VB series (P.A 13) with the spacer ball specification or the retainer as a counter measures.

1.14 Stiffness

(1) Stiffness of the feed screw system

Deflections due axial load causes the lost motion in the feed drive system. For a machine tool, requiring a highly accurate positioning, and a high speed response. When the stiffness of the feed screw system is low, and the required accuracy might not be able to be achieved.

The stiffness of the feed screw system includes following stiffness.

① Axial stiffness of screw shaft
② Torsion stiffness of screw shaft
③ Axial stiffness of ball nut
④ Axial stiffness of support bearing
⑤ Stiffness of ball nut and support bearing part

The stiffness of a feed screw system is required with the following formula.

$$K = \frac{P}{\delta}\,(\mathrm{N/\mu m})$$

$$\frac{1}{K} = \frac{1}{K_S} + \frac{1}{K_N} + \frac{1}{K_B} + \frac{1}{K_H}\,(\mathrm{\mu m/N})$$

P : Axial load applied to feed screw system (N)
δ: Elastic deformation amount of feed screw system (μm)
K : Axial stiffness of feed screw system (N/μm)
K_S : Axial stiffness of screw shaft (N/μm)
K_N : Axial stiffness of nut (N/μm)
K_B : Axial stiffness of support bearing (N/μm)
K_H : Stiffness of nut and support bearing part (N/μm)

(2) Axial stiffness of ball screw

The axial stiffness of the screw shaft and the axial stiffness of the ball nut are as described.

① Axial stiffness of screw shaft

It is calculated by equations considering screw shaft mounting configuration such as Fix-Fix and Fix-Open supporting method of the ball screw.

In case of Fix – Fix

$$K_{SF} = \frac{4A \cdot E}{L} \times 10^{-3}\,(\mathrm{N/\mu m})$$

A : the root diameter sectional area. (mm^2): $A = \pi dr^2/4$
dr : Screw shaft root diameter (mm)
E : Longitudinal elastic modulus. ($E = 2.06 \times 10^5$ MPa)
K_{SF}: Axial stiffness of screw shaft (N/μm)
L: Supporting distance (mm)

In case of Fix- Open

$$K_{SS} = \frac{A \cdot E}{L_0} \times 10^{-3}\,(\mathrm{N/\mu m})$$

K_{SS} : Axial stiffness of screw shaft (N/μm)
L_o : Distance between the fixed end and load position (mm)

Supplementation: The maximum axial deformation for Fix-Fix is at the position of 1/2 of the supporting distance. The above expression is an expression that considers the amount of the maximum axial deformation for the supporting distance.

② Axial stiffness of ball nut

(a) Stiffness of single nut (no preload)

$$\delta_{NS} = \frac{K}{\sin\beta}\left(\frac{Q^2}{d}\right)^{\frac{1}{3}} \times \frac{1}{\zeta}\,(\mathrm{\mu m})$$

$$Q = \frac{P}{n \cdot \sin\beta}$$

$$n = \frac{D_o \cdot \pi \cdot m}{d}$$

$$D_o = \frac{\ell}{\tan\alpha \cdot \pi}$$

K_N: Axial stiffness of nut (N/μm)
δ_{NS}: Axial elastic deformation amount of nut (μm)
k: Factor by the shape of groove.
β: Contact angle of a ball and a groove
P: Axial load (N)
d: Ball diameter (mm)
ζ: Coefficient by the accuracy and internal structure
m: Numbers of effective turns
Q: Load per 1 piece of ball (N)
n: Number of balls
D_0: Ball pitch circle diameter (mm)
ℓ: Nominal lead (mm)
α: Lead angle

The stiffness of a single nut is calculated by the following formula.

$$K_N = \frac{P}{\delta_{NS}}\,(\mathrm{N/\mu m})$$

The theoretical axial stiffness value KN is described in each dimension table when the axial load of 30% of the basic rated dynamic load Ca is applied. This value does not consider the stiffness of parts related to the mounting of the ball nut, and please apply 80% of the stiffness value that is described in the dimension table. Please calculate the stiffness value by the following formula when the axial load P is different from 30% of Ca.

$$K_{NS} = 0.8 \times K \times \left(\frac{P}{0.3Ca}\right)^{\frac{1}{3}}\,(\mathrm{N/\mu m})$$

K: Stiffness value in dimension table (N/μm)
P: Axial load (N)
Ca: Basic rated dynamic load (N)

(b) The stiffness of double nuts and integral nut (with preload)

The theoretical stiffness value is described in each dimension table when preload load (PPL) of 10% of basic rated dynamic load Ca is applied. This value does not consider the stiffness of parts related to the mounting of the ball nut, and please apply 80% of the stiffness value that is described in the dimension table. Please calculate the stiffness value by the following formula when the axial load P is different from 10% of Ca.

$$K_{NW} = 0.8 \times K \times \left(\frac{P_{PL}}{0.1 \times Ca}\right)^{\frac{1}{3}}\,(\mathrm{N/\mu m})$$

K : Stiffness value of dimension table (N/μm)
P : Preload load (N)

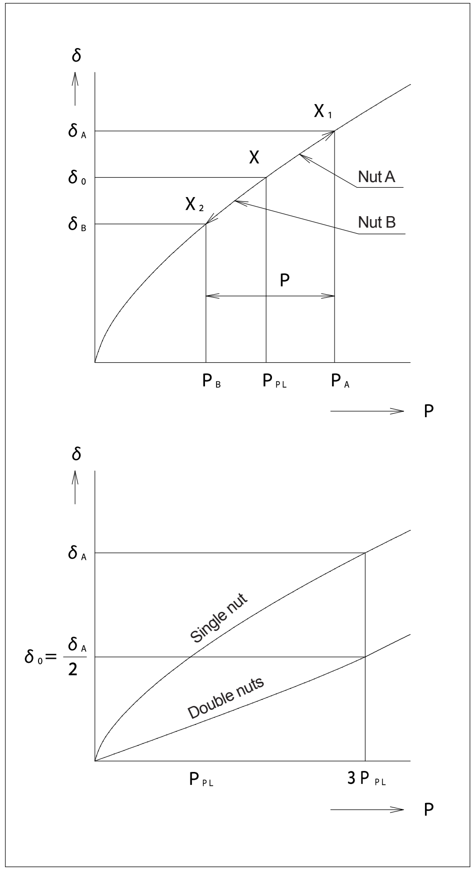


Fig. 38 Axial deformation of position preloaded ball nut

The explanation of preload (double nuts and integral nut)

If the preload of PPL is obtained to nut A and B, both nut A and B elasticity is deformed into X point as shown in Fig. 38. When external force P is obtained, nut A moves from X point to the X1 point and nut B moves from X point to the X2 point.

The deformation amount of nut A and B is

$\delta_0 = aP_{PL}^{2/3}$

$\delta_A = aP_A^{2/3}$

$\delta_B = aP_B^{2/3}$

The deformation amount of nut A and B by external force P is equal.

$\delta_A - \delta_0 = \delta_0 - \delta_B$

Because the external force that acts on nut A and B is P

$P_A - P_B = P$

When PA increases, external force on nut B is absorbed and becomes small by nut A until becoming $\delta_B = 0$

Therefore,

$\delta_B = 0$

$aP_A^{2/3} - aP_{PL}^{2/3} = aP_{PL}^{2/3}$

$P_A^{2/3} = 2P_{PL}^{2/3}$

$P_A = \sqrt{8}P_{PL} ≒ 3P_{PL}$

Moreover, because of $\delta_A - \delta_0 = \delta_0$

It becomes

$$\delta_o = \frac{\delta_A}{2}$$

In Figure 38, the deformation amount becomes 1/2 for a single nut when the axial load is obtained 3 times of preload, and the stiffness becomes doubles.

③ Torsion stiffness of screw shaft

The influence on the positioning accuracy by the torsion of driving system becomes small compared with the axial deformation, and when using it for a highly accurate positioning device, should confirm the deformation value. The amount of torsion deformation of the screw shaft and coupling is obtained by following formula.

Torsion deformation of screw shaft

$$\theta = \frac{320T}{\pi \cdot d_r^4 \cdot G} \times 10^2 \text{(rad/mm)}$$

$$\delta_T = a \cdot \theta \cdot \frac{\ell}{2\pi} \text{(mm)}$$

δ_T :Torsion deformation amount of ball screw (mm)

a: Distance between a load effect (mm)

ℓ: Nominal lead (mm)

T: Driving torque (N·m)

d_r: Root diameter of screw shaft (mm)

G: Modulus of transverse elasticity (83000N/mm^2)

Torsion deformation amount of coupling

$$\delta_C = \frac{\ell}{2\pi} \cdot \theta \text{(mm)}$$

δ_C: Torsion deformation amount of coupling (mm)

θ: Torsion angle (rad) (refer manufacturer catalog)

ℓ: Nominal lead (mm)

④ Axial stiffness of support bearing

As for the axial stiffness of the support bearing, the value is different depending on the kind of the bearing used. It is calculated by following formula.

$$K_B = \frac{P}{\delta_B} \text{(N/μm)}$$

For the angular contact ball bearing

$$\delta_B = \frac{0.00044}{\sin\beta}\left(\frac{Q^2}{d}\right)^{\frac{1}{3}} \text{(mm)}$$

For the thrust ball bearing

$$\delta_B = 0.00052\left(\frac{Q^2}{d}\right)^{\frac{1}{3}} \text{(mm)}$$

⑤ Stiffness of mounting part of ball nut and support bearing

Please design the mounting part of support bearing that secures a necessary and enough high stiffness.

$$K_H = \frac{P}{\delta_H} \text{(mm)}$$

1.15 Thermal expansion

The ball screw generates heat because of the friction load , the temperature ,preload change, The screw axis expands and it changes the positioning accuracy of the ball screw. When a high accuracy positioning is required, the consideration of heating is necessary.

The thermal expansion is calculated by the following formula.

$\triangle L = \rho \cdot \triangle t \cdot L$ (mm)

ΔL: Thermal expansion (mm)

ρ: Thermal expansion coefficient (11.7×10^{-6}/℃)

Δt: Temperature rise of screw shaft (℃)

L: Effective thread length (mm)

If the temperature of the ball screw rises by 1℃ , it causes the expansion of screw by 11.7 microns per 1 m . When the feeding speed becomes high, suppression of the heat generation of the ball screw is necessary.

For tapered roller bearing

$$\delta_B = \frac{0.000077}{\sin\beta} \cdot \frac{Q^{0.9}}{\ell_a^{0.8}} \text{(mm)}$$

$$Q = \frac{P}{n \cdot \sin\beta} \text{(N)}$$

Q : Load that acts to rolling element (N)

β: Angle of rolling element

d : Diameter of rolling element (mm)

ℓ_a : Effective length of roller (mm)

P: Axial load (N)

n: Number of rolling elements

To suppress the heat generation amount

- Do not increase the preload of the ball screw and the support bearing more than the necessary.
- Select the ball screw with a large lead, and lower the rotational speed as much as possible.
- Select the suitable lubricant and the method of lubrication.
- Suppress the heat generation of the feed screw system as much as possible, and design so that heat dissipation easily.
- By adopting the hollow screw shaft, cool the ball screw by forced cooling fluids.
- Cool the outside of screw shaft by the lubrication and or air so on.

To suppress the heat generation influence

- The installation that gives pretension to the screw shaft is done.
- Go through a warm-up cycle by the high speed driving in a short period, and use it after stable temperature.
- The target value of specified travel is set to the minus beforehand by compensation.
- Generally, make the value in which temperature-rise of the ball screw is at 2 to 5℃ for the target. (Target value: -0.02--0.06mm per 1000mm)

1.16 Driving torque of feed screw system

The torque of the motor should be necessarily higher than total of the torques needed by the ball screw and also that required for driving load.

Driving torque of feed screw system

$T_S = T_P + T_D + T_F$ (cruising)

$T_S = T_G + T_P + T_D + T_F$ (acceleration)

T_S: Driving torque of feed screw system (N·m)

T_G: Torque necessary for acceleration (N·m)

T_P: Load torque (N·m)

T_D: Preload torque of ball screw (N·m)

T_F: Friction torque (N·m)

Acceleration torque

$T_G = J \cdot a$ (N·m)

$$a = \frac{2\pi n}{60 \triangle t}$$

TG: Torque necessary for acceleration (N·m)

J: The moment of inertia of motor shaft conversion (kg·m²)

α: Angular acceleration (rad/S²)

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

Δt: Rise time (sec)

Load torque

$$T_P = \frac{P \cdot \ell}{2\pi \eta^1} \times 10^{-3} (N \cdot m)$$

P:Axial load(N)

ℓ: Nominal lead (mm)

η^1: Positive efficiency: Efficiency of converting rotary motion to linear motion

F: Cutting force (N)

μ: Coeffiacient of friction

M: Mass of transfer material (kg)

g: Gravity acceleration (9.8m/s²)

Reverse operation torque T_P

$$T_P = \frac{P \cdot \ell \cdot \eta^2}{2\pi}$$

η^2 : reverse efficiency: Efficiency of converting linear motion to rotary motion

Preload torque

$$T_D = \frac{K \cdot P_{PL} \cdot \ell}{\sqrt{\tan\alpha} \cdot 2\pi} \times 10^{-3} (N \cdot m)$$

k: Internal coefficient efficiency(0.05 is used usually).

P_{PL}: Preload amount (N)

ℓ: Nominal lead (mm)

α: Lead angle

Friction torque

$T_F = T_{B+} T_{O+} T_J$ (N·m)

T_B: Friction torque of support bearing

T_O: Torque of oil seal

T_J: Other friction torque that comes on to motor shaft

1.17 Lubrication of ball screws

Lubrication is an important element that maintains accuracy of ball screw that helps to form the oil slick in the rolling part of the ball screw, prevents wear out, and influences the life.

The role of lubrication is (1) protection on ball and rolling surface (wear resistance, relief of stress, and rust prevention), (2) dustproof (3) cooling and proper lubrication

In case of the grease lubrication

When the grease lubrication is used for the ball screw, it is general to use the lithium soap base grease of JIS consistency 2-3. The viscosity of the base oil of grease is recommended to consider and to be selected according to usage conditions of the ball screw.

Product name	Manufacturer	Category	"JIS consistancy"
Albania grease2	Showa shell	Flexible grease	2
Albania EP grease1		Ultra-pressure grease	1
multenpLRL3	Kyodo Yushi	Low flush grease	3
Mobil grease22	Mobil oil	For low temperature grease	2

The lubrication interval depends on the operating condition.

Please check once every 2-3 months in the first stage of operation, though the lubrication interval depends on the operating condition. Please re-lubricate during maintenance according to operating conditions, to maintain accuracy.

Please apply the grease amount of grease for about 1/3-1/2 of space of inside nut enclosure.

Capacity of the space inside the nut is calculated by the following formula.

$$V = L \cdot \pi \cdot D_{PW} \cdot (D_{PW} - d) \cdot \left[1 - \frac{D_W \cdot S}{\ell}\right] + \pi^2 \cdot D_W{}^2 \cdot D_{PW} \cdot S \cdot \left[\frac{L}{4 \cdot \ell} - \frac{n}{6}\right]$$

V: Capacity of space in nut (cm^3)

L: Total length of nut except the width of the wiper (cm).

D_{PW}: Ball circle diameter (cm)

d: Screw shaft outside diameter (cm)

D_W: Ball diameter (cm)

ℓ: Nominal lead (cm)

n: Effective number of circuits (twice at double nuts)

S: Number of starts

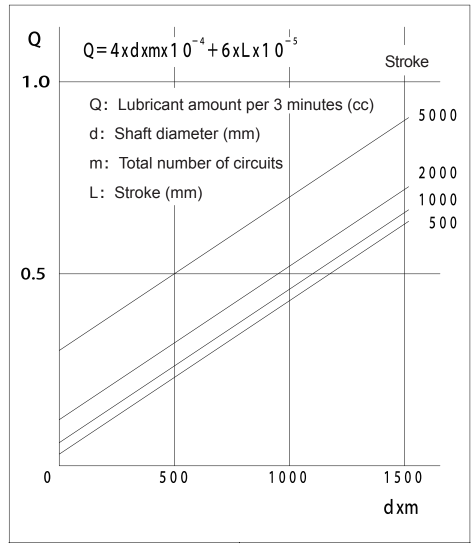
In case of the oil lubrication

When the oil lubrication is used for the ball screw, it is general to use the oil of the viscosity of ISO VG 32-100m²/s (40℃).

The oil recommended to the TSUBAKI NAKASHIMA ball screw is shown as follows.

Product name	Manufacturer	ISOVG m²/s(40℃)
Mobil vactraNo.2	Mobil oil	68
Mobil vactraNo.4		100
Daphne multway68	Idemitsu Kosan	68

The method of lubricating oil is generally intermittent lubrication. The chart below shows re-lubrication quantity.



Standard of re-lubrication

1.18 Dust prevention for ball screws

The ball screw is the same precision part as an antifriction bearing that operates by the rolling of the ball. When the foreign matter enters in the ball nut, it decreases the life and increases noise, increases rotating torque, and damages the re-circulation part etc.

In the environment where it is not possible to avoid the foreign matter entering the nut inside, dust prevention measures of the ball screw are required.

Please prevent the foreign matter from adhering to the screw axis by installing of bellows and installing the telescopic type cover. There is a dust proofing effect when a dustproof cover cannot be installed and the wiper seal is installed in both ends of the ball nut.

○ Wiper seal

The following wiper seal can be installed in the TSUBAKI NAKASHIMA ball screw.a

There is no contact in labyrinth a seal with rotating parts ,in which is no heat generation due to no seal torque but the labyrinth is effective.Contact type wiper seal which has higher dust proof ability with low friction.

Please select the suitable wiper seal according to the application.

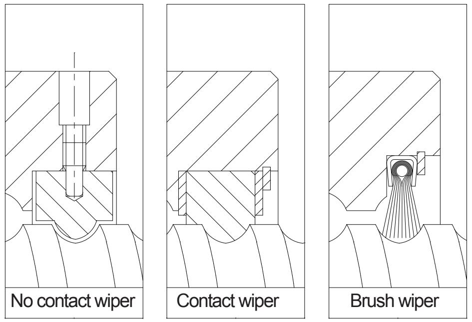
Material	Stracture	Features
PE	Labyrinth	Low price
PTFE	Labyrinth	Heat resistant chemical resiatant
Felt	Sealed contact	High dustproof

Note: The size of the ball nut might change for different felt wiper installation.

The detailed dimensions are published in each series dimension table.

○ Brush wiper seal

The brush wiper seal can be installed to the general industrial ball screw series. Please select it according to the application.



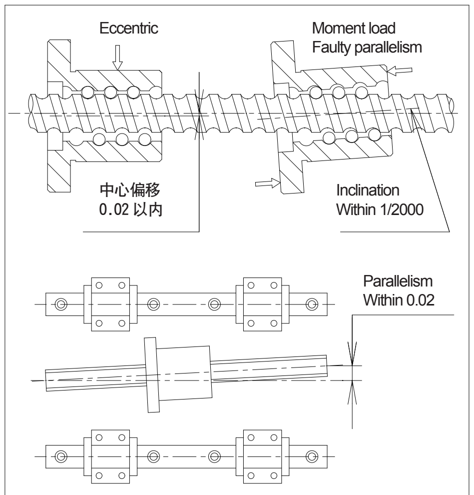
1.19 Notes of ball screw installation

When installing the ball screw, please check the parallelism of the support bearings blocks and linear motion guides.also the installation accuracy of the ball nut so that the offset load should not act on the ball screw. Temporarily tighten and check the mounting accuracy, and check the shaft torque of the ball screw. After the final tightening, revolve up gradually from the low revolution and pay attention to the noise, oscillation, and check the each parts of the operation with the max revolution of the use.

Note1: Please eliminate eccentricity between the ball nut support part and screw shaft axis within 0.02mm.

Note 2: Please eliminate the inclination of the ball nut within 1/2000.

Note 3: Please ensure the installation parallelism with the linear motion guide within 0.02mm.



Installation accuracy

1.20 Procedure of selection of ball screw

It is necessary to examine it from various angles according to the application for the best selection of the ball screw. The best selection greatly contributes to the safety of the device, the life of the ball screw, and the cost.

Please design the ball screw examining the following items.

< Selection and confirmation item >

1.Setting of life
2.Selection of accuracy class
3.Selection of lead
4.Calculation of average load
5.Calculation of required life travel
6.Calculation of required rated dynamic load
7.Selection of ball nut type
8.Selection of screw diameter
9.Selection of thread length
10.Examination of permissible axial load
11.Examination of permissible rotating speed and Dn value
12.Examination of stiffness of feed screw system
13.Examination of heat deformation measures
14.Selection of support bearing
15.Confirmation of ball screw life
16.Confirmation of driving torque

1. Setting of expecting life

Lifetime Ln (hr)

Ln = hours × days× years × utilization rate

2. Selection of accuracy grade

Select the accuracy class that satisfies the required function referring to the lead accuracy on P.A19. Moreover, put the amount of the lost motion in consideration and select the axial clearance referring to the axial clearance of the ball screw on P. A28.

3. Selection of lead

Put the required feed speed, the maximum speed of the servo motor, the resolution, and the decelerator in consideration and select it.

Lead: ℓ (mm)
Feed speed: V(mm/min)
Rotating speed: N(min1)

4. Calculation of average load

Calculate referring to the life of the ball screw on P.A33

Operating ondition	Axial load	Rotating speed	Operating ratio
1	P1	n1	t1
2	P2	n2	t2
:	:	:	:

Average load Pe (N) becomes as follows.
(example: Load that changes in stages)

$$Pe = \left[\frac{P_1^3 n_1 t_1 + P_2^3 n_2 t_2 + \ldots + P_n^3 n_n t_n}{n_1 t_1 + n_2 t_2 + \ldots + n_n t_n} \right]^{\frac{1}{3}} (N)$$

Please give the axial load as a total value of the slide load of weight of the movement and the external load.
Slide load = weight of moving objects × friction coefficient

5. Calculation of required life travel

Average rotating speed ne (min^{-1})

$$n_e = \frac{n_1 t_1 + n_2 t_2 + \ldots + n_n t_n}{t_1 + t_2 + \ldots + t_n} (min^{-1})$$

The required life travel: L(km) :.

$L = 60 \times n_e \times Ln \times \ell \times 10^{-6} (km)$

6. Calculation of required rated dynamic load

Requied rated dynamic load Ca (N)

$$Ca = \left(\frac{L}{\ell} \right)^{\frac{1}{3}} \times \frac{Pe \times fd}{fs} (N)$$

Please refer fd·f s value on section 15.

7. Selection of ball nut type

Please compare the required rated dynamic load that is calculated in section 6 with rated dynamic load Ca described in the dimension table of each series, and select the model that satisfies it.

8. Selection of screw shaft diameter

Please select the screw shaft diameter from the combination (P.A15) of the external diameter of the screw shaft and the lead in A15 based on the lead selected in selection 3 and the ball nut type selected in section 7.

9. Selection of thread length

Please calculate thread length as the maximum stroke + length of nut + length of allowance.
Please select the length of allowance so that the nut doesn't exceed the length of the screw when it is overrun. Please decide the supporting distance of the bearing at the same time.

10. Examination of permissible axial load

Axial load F (N)

F=μ×m×g×α(N)

Coefficient of friction of slide μ
Weight of moving objects m(kg)
Gravitational acceleration $g=9.8m/s^2$
Acceleration $\alpha(m/s^2)$

Please calculate the maximum axial load of the operating condition.

Buckling load of screw shaft: Pcr (N)

$$Pcr = m \times \left(\frac{dr^2}{Lo}\right)^2 \times 10^4 (N)$$

Support factor: m (Refer P. A29).
Root diameter of screw shaft: dr (mm)
Supporting distance: Lo (mm)

Please confirm F < Pcr is satisfied with the above-mentioned calculation.

11. Examination of permissible rotating speed and Dn value

A permissible rotating speed is limited by self-excited vibration generation value Nc (min^{-1}).

$$Nc = \frac{n \times dr}{L^2} \times \alpha (min^{-1})$$

Root diameter of screw shaft: dr (mm)
Supporting distance: L (mm)
Safety factor: α (0.8)
Support factor: n (Refer P. A30).

Please examine it by the maximum speed of the operation condition.

Please confirm the examination of the Dn value is less permissible value, referring to A31.

Dn value= screw diameter (mm) × rotating speed (min^{-1})

12. Examination of stiffness of feed screw system

The machine that needs the highly accurate positioning and high response, the amount of required lost motion cannot be satisfied when stiffness of the system is low. Please examine the following items referring to P. A35–A38.

1) Axis stiffness of screw shaft.
2) Axial stiffness of ball nut
3) Axial stiffness of support bearing

13. Examination of heat displacement measures

When measures to prevent the deterioration of positioning accuracy because of the heat generation of the ball screw are necessary, it is assumed that the method of support of the ball screw is Fix – Fix, and gives pretension to expect the heat generation value to the screw axis.
Moreover, the target of specified travel is set according to this.

Pretension F_P (N)

$$Fp = \frac{\triangle L \times E \times \pi \times dr^2}{4 \times L} (N)$$

Amount of heat displacement: ΔL (mm)

$\triangle L = \rho \times \triangle t \times L$

Modulus of longitudinal elasticity
$E = 2.06 \times 10^5$(MPa)

Coefficient of thermal expansion
$\rho = 11.7 \times 10^{-6}$(1/℃)

Screw shaft temperature-rise
Δt (℃)

Effective threaded length
L (mm)

Root diameter of screw shaft
dr (mm)

14. Selection of support bearing

Please select the support bearing that corresponded to the maximum axis load and pretension.

15. Confirmation of ball screw life

Required life travel: L (km)

$L = 60 \times n_e \times L_n \times \ell \times 10^{-6}$(km)

Selection life travel: Ls (km)

$$L_s = \left(\frac{Ca \times fs}{Pe \times fd}\right)^3 \times \ell \,(km)$$

Average rotating speed: ne (min^{-1}) Refer to section 5.
Lifetime: Ln (hr) Refer to section 1.
Lead: ℓ (mm) Refer to section 3.
Rated dynamic load: Ca (N) Refer each dimension table description value
Average load: Pe (N)
Stroke factor: fs

Stroke / Nut length	1.0 under	1.2 under	1.4 under	1.6 under	1.8 under	2.0 under	2.1 under
f_s	0.77	0.82	0.86	0.90	0.94	0.97	1.00

Driving factor: fd

In case of a smooth driving without the impact:
fd =1.0 ～ 1.2.

In case of driving with the slight impact:
fd =1.2 ～ 1.5.

In case of driving with a large impact and the vibration:
fd=1.5 ～ 3.0.

Please confirm L < LS by the above-mentioned calculation result.

16. Confirmation of driving torque

As for the torque of the motor, higher torque than totals of the frictional torque of the ball screw and required torque for the feed-shaft system is necessary.

Driving torque of feed-shaft system

$T_S=T_P+T_D+T_F$ (Cruising)
$T_S=T_G+T_P+T_D+T_F$ (Acceleration)

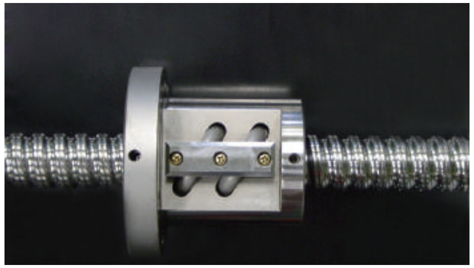
Driving torque of feed-shaft system: T_S(N·m)
Torque necessary for acceleration: T_G(N·m)
Load torque: T_P(N·m)
Preload torque of ball screw: T_D (N·m)
Friction torque: T_F (N·m)

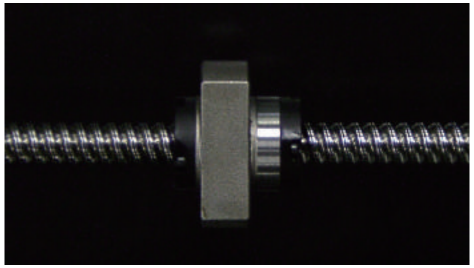
Please check the driving torque referring to P. A39.

Please change and recalculate the relating item again when the calculation result does not meet the specification. That needs to be calculated for each section. Moreover, if the required specification is not mentioned in each dimension table, please contact us. It is possible to manufacture by special specification.

2. TSUBAKI NAKASHIMA precision ball screw designing and standard dimension

(1) Precision ball screw FB series





Please refer to P.A. 51 – P. A63 for the series size table.

Please refer the shape of the standard ball nut of each model.

The ball nuts can be produced in other configuration than given in this catalogue.

Please instruct us the shape of supporting part of screw axis according to the usage.

When the contact area on the fixed bearing side is not enough, the collar can be installed by shrinkage fit, therefore please instruct it according to the usage.

FB series designing

For inquires and order, please use this ordering code.

V 20 TFA 10 – 1000 C5 F

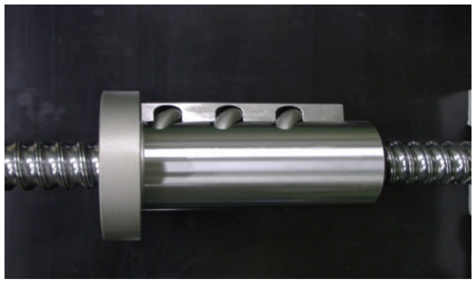
- V: Retainer *1
- 20: Nominal shaft diameter (mm)
- TFA: Ball nut type
- 10: Nominal lead (mm)
- 1000: Total length (mm)
- C5: Accuracy grade C3 or C5 *2
- F: FB series

*1 V: with retainers C: with ceramic balls

*2 C7 and C10 accuracy grade is also available.

Please also inform the symbol of axial clearance with the above-mentioned ordering code (Refer to the axial clearance of the ball screw on P.A28.)

(2) Precision ball screw HN FB series



Please refer to P. A55 – P. A56 for the series size table.

Please refer to the shape of the standard ball nut of each model.

The ball nuts can be produced in other configuration than given in this catalogue.

Please instruct us the shape of supporting part of screw axis according to the usage.

When the contact area on the fixed bearing side is not enough, the collar can be installed by shrinkage fit, therefore please instruct it according to the usage.

HN · FB series designing

Use this ordering code when inquiring and ordering.

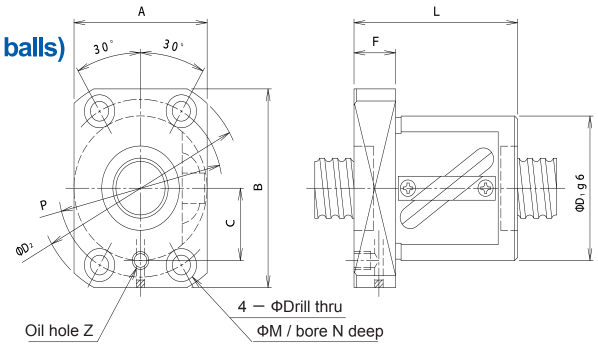
V 50 HNFL 16 – 600 C7 F

- V: Retainer *1
- 50: Nominal shaft diameter (mm)
- HNFL: Ball nut type
- 16: Nominal lead (mm)
- 600: Total length (mm)
- C7: Accuracy grade C7
- F: FB series

The standard axial clearance Q5 is 0.05mm or less.

FB series standard dimension
TXF type (Preloaded by over-size balls)

4 faces notched flange



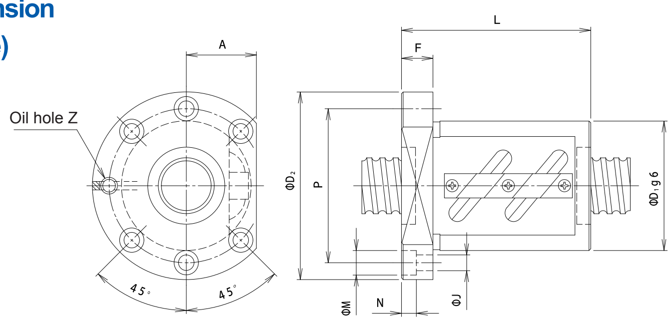
Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
5	12TXFA5	12	9.5	3.175	12.8	2.5×1	3880	4890	90
	15TXFA5	15	12.5	3.175	15.8	2.5×1	4250	5820	110
	20TXFA5	20	17.5	3.175	20.8	2.5×1	5190	8490	150
10	12TXFA10	12	10.1	2.381	12.6	2.5×1	2440	3390	90
	15TXFA10	15	12.5	3.175	15.8	2.5×1	4170	5820	110
	20TXFA10	20	16.4	4.763	21.3	2.5×1	8840	12900	160
15	15TXFU15	15	12.5	3.175	15.8	1.5×1	2850	3990	70
20	15TXFU20	15	12.5	3.175	15.8	1.5×1	2730	3990	70
	20TXFUS20	20	17.5	3.175	20.8	1.5×2	5440	8740	150

NOTE 1 : Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 5% amount of rated dynamic load Ca.
Stiffness of ball nut comes to be about 80% of applied stiffness

Nut dimension												Model No.
D_1	D_2	L	F	P	J	M	N	A	B	C	Z	
32	52	42	12	42	4.5	8.0	4.5	32	43	15	M6×1	12TXFA5
34	58	46	11	45	6.0	9.5	5.5	34	49	17	M6×1	15TXFA5
46	74	51	15	59	6.6	11	6.5	46	66	24	M6×1	20TXFA5
30	50	49	12	40	4.5	8.0	5.5	30	42	15	M6×1	12TXFA10
34	58	51	11	45	6.0	9.5	5.5	34	49	17	M6×1	15TXFA10
48	74	59	15	59	6.6	11	6.5	48	66	24	M6×1	20TXFA10
34	58	53	11	45	6.0	9.5	5.5	34	49	17	M6×1	15TXFU15
34	58	66	11	45	6.0	9.5	5.5	34	49	17	M6×1	15TXFU20
46	74	70	15	59	6.6	11	6.5	46	66	24	M6×1	20TXFUS20

FB series standard dimension
TIF type (Integral nut type)

1 face notched flange



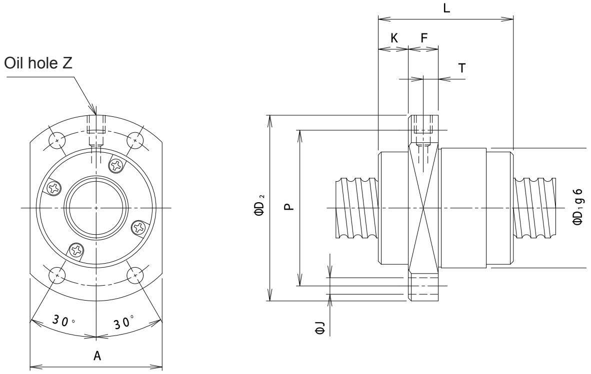
Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
5	25TIFC5	25	22.5	3.175	25.8	2.5×1	9170	21400	440
6	32TIFC6	32	28.9	3.969	33.0	2.5×1	13900	34900	570
8	32TIFC8	32	28.4	4.763	33.3	2.5×1	18000	42100	590
10	25TIFJ10	25	21.4	4.763	26.3	1.5×1	10100	19200	270
	28TIFC10	28	24.4	4.763	29.3	2.5×1	16600	36100	510
	32TIFC10	32	27.1	6.35	33.8	2.5×1	25500	53500	580
	40TIFC10	40	35.1	6.35	41.8	2.5×1	28600	67900	710
12	28TIFJ12	28	24.4	3.969	29.0	1.5×1	8470	18400	300
	32TIFC12	32	27.1	6.35	33.8	2.5×1	25400	53500	580
	40TIFC12	40	35.1	6.35	41.8	2.5×1	28600	67900	710
16	32TIFJ16	32	27.1	6.35	33.8	1.5×1	16300	32100	340
20	36TIFJ20	36	31.1	6.35	37.8	1.5×1	17200	36400	380
	40TIFC20	40	35.1	6.35	41.8	2.5×1	28300	67900	700

NOTE 1 : Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 10% amount of rated dynamic load Ca. Stiffness of ball nut comes to be about 80% of applied stiffness

Nut dimension										Model No.
D_1	D_2	L	F	P	J	M	N	A	Z	
50	73	55	11	61	5.5	9.5	5.5	28	M6×1	25TIFC5
62	89	63	12	75	6.6	11	6.5	34	M6×1	32TIFC6
66	100	82	15	82	9	14	8.5	38	M6×1	32TIFC8
58	85	79	15	71	6.6	11	6.5	32	M6×1	25TIFJ10
60	94	97	15	76	9	14	8.5	36	M6×1	28TIFC10
74	108	100	15	90	9	14	8.5	41	M6×1	32TIFC10
82	124	103	18	102	11	17.5	11	47	PT1/8	40TIFC10
58	92	83	15	74	9	14	8.5	36	M6×1	28TIFJ12
74	108	117	18	90	9	14	8.5	41	M6×1	32TIFC12
82	124	117	18	102	11	17.5	11	47	PT1/8	40TIFC12
74	108	108	18	90	9	14	8.5	41	M6×1	32TIFJ16
78	123	121	18	101	11	17.5	11	47	M6×1	36TIFJ20
82	124	161	18	102	11	17.5	11	47	PT1/8	40TIFC20

FB series standard dimension
EF type (Over-size ball preload)

2 faces notched flange



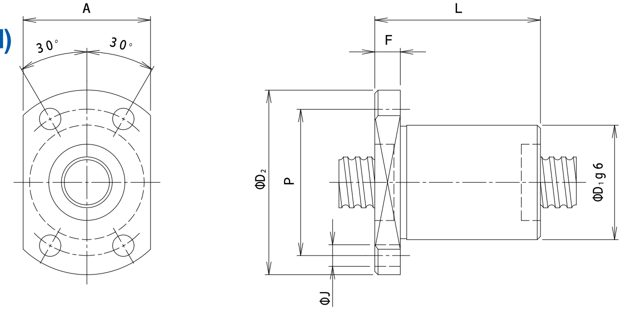
Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
6	8EF3D6	8	6.6	1.588	8.3	2.7×2	3200	5390	160
12	8EF2D12	8	6.6	1.588	8.3	1.7×2	2200	3300	100
25	25EF2D25	25	21.9	3.969	26.0	1.7×2	14500	32900	500
30	15EF1D30	15	12.5	3.175	15.8	0.7×2	3900	6360	140
32	16EF1Q32	16	13.7	2.778	16.6	0.7×4	5800	10800	280
32	32EF2D32	32	28.4	4.763	33.3	1.7×2	20500	49900	620
40	20EF1Q40	20	17.5	3.175	20.8	0.7×4	8370	17300	360
50	50EF2D50	50	44.0	7.938	52.2	1.7×2	50600	131000	950
60	20EF1Q60	20	17.5	3.175	20.8	0.7×4	7480	19400	370

NOTE 1 : Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 5% amount of rated dynamic load Ca.
Stiffness of ball nut comes to be about 80% of applied stiffness

Nut dimension									Model No.
D_1	D_2	L	K	F	P	J	A	Z	
18	31	24	5	9	25	3.4	18	–	8EF3D6
18	31	27	5	9	25	3.4	18	–	8EF2D12
47	74	81	11	12	60	6.6	49	M6×1	25EF2D25
32	53	34	6	10	43	5.5	33	M6×1	15EF1D30
35	56	37	9	10	44	4.5	38	M6×1	16EF1Q32
58	92	76	16	15	74	9	68	M6×1	32EF2D32
40	62	45	10	10	50	5.5	44	M6×1	20EF1Q40
90	135	118	25	22	112	14	100	PT1/8	50EF2D50
37	57	54	8	10	47	5.5	38	M6×1	20EF1Q60

FB series standard dimension
MF type (Over-size ball preload)

2 faces notched flange



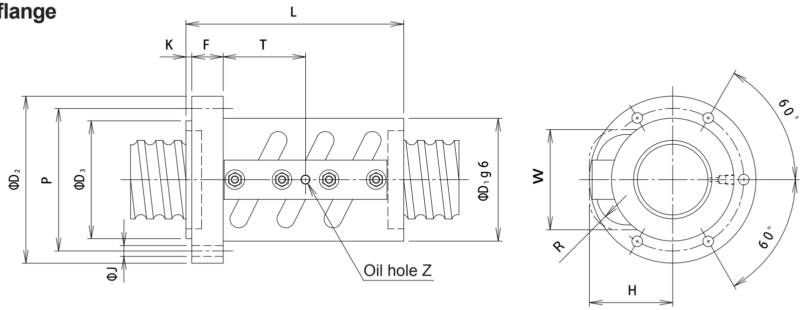
Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
2	8MF3S2	8	6.6	1.588	8.3	1×3	1700	2300	70
	10MF3S2	10	8.6	1.588	10.3	1×3	1900	3100	90

NOTE 1 : Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 5% amount of rated dynamic load Ca.
Stiffness of ball nut comes to be about 80% of applied stiffness

Nut dimension							Model No.
D_1	D_2	L	F	P	J	A	
18	29	26	4	23	3.4	20	8MF3S2
20	36	28	5	28	4.5	22	10MF3S2

FB series standard dimension
TXF type (Preloaded by over-size balls)

4 faces notched flange



Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(kN) C_a	Basic rated static load(kN) C_o
16	50HNFL16	50	40.5	12.7	53.6	2.5×3	273	737
	55HNFL16	55	45.5	12.7	58.6	2.5×3	285	800
	63HNFL16	63	53.5	12.7	66.6	2.5×3	307	924
	63HNFO16					2.5×4	393	1230
	100HNFL16	100	90.5	12.7	103.6	2.5×3	381	1480
	100HNFP16					3.5×3	509	2070

NOTE 1 : Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 5% amount of rated dynamic load Ca.
Stiffness of ball nut comes to be about 80% of applied stiffness

Nut dimension													Model No.
D_1	D_2	D_3	L	K	F	T	P	J	W	H	R	Z	
95	129	85	218	6	28	84	112	9	72	70	30	PT1/8	50HNFL16
98	132	92	218	6	28	84	115	9	77	72	30	PT1/8	55HNFL16
105	139	100	218	6	28	84	122	9	85	75	30	PT1/8	63HNFL16
			266			100							63HNFO16
146	190	140	226	10	32	84	168	13.5	122	95	30	PT1/8	100HNFL16
			274			100							100HNFP16

(3) Ball screw HN series for heavy load

Feature of ball screw HN series for heavy load

2-3 times of the rated load was achieved by a special design for a heavy load. → Long life.

Complete parts in the ball circulation part are the designed for a heavy load. → High-speed durability improvement（Allowance Dn value improvement）

Jamming up measures by the oscillation and the lubricant maintenance is improved, if it combines with the retainer of the option.→ Long life under a severe condition.

Abundant kinds were standardized size for 50-200mm of the screw shaft diameter.

The HN series was made in a series so that the ball screw user of the heavy load type can aim at substitution to use it in place of the hydraulic cylinder to an electric cylinder conversion. The customized ball screws other than the standard dimensioning or the need for dynamic balancing in the ball nut rotation are also available. Please contact us.

Application

Electric injection molding machine
(injection axle Clamping axle Ejection axle）
Electric press
Electric forging press
Electric power cylinder
Electric jack
Other electric device for areas of heavy load

Accuracy

The standard of the accuracy class is C5 and C7.
The standard of the axial clearance is 0.05mm or less.

HN series designing

For inquires and order, please use this designing.

V 125 HNFW 25 – 1300 C7

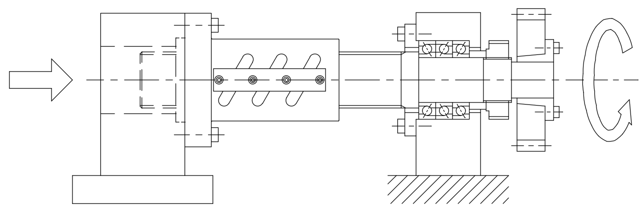
V: Retainer *1
Nominal shaft diameter (mm)
Ball nut type
Nominal lead (mm)
Accuracy grade C5 or C7
Total length (mm)

※*1 V: with retainers　C: with ceramic balls

Please also inform the symbol of axial clearance with the above-mentioned designing. (Refer to the axial clearance of the ball screw on P.A28.)

Example of ball screw recommendation installation (screw shaft rotation)

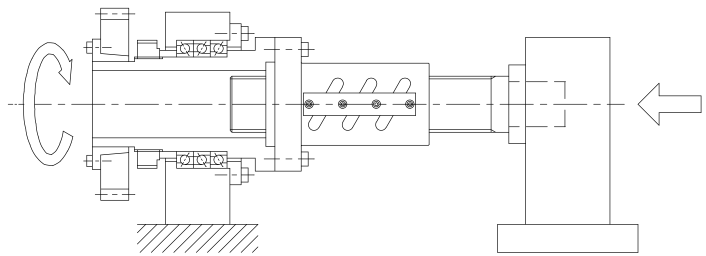
The structure that both screw shaft and ball nut receive compressive load is recommended.



Example of ball screw recommendation installation (screw shaft rotation)

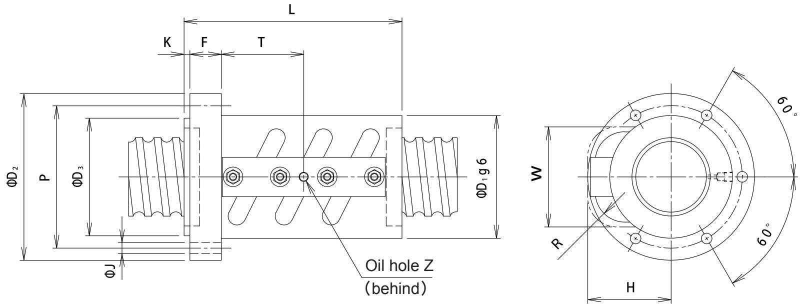
Example of ball screw recommendation installation (ball nut rotation)

The structure that both screw shaft and ball nut receive compressive load is recommended.



Example of ball screw recommendation installation (ball nut rotation)

HN series standard dimension
HNF type

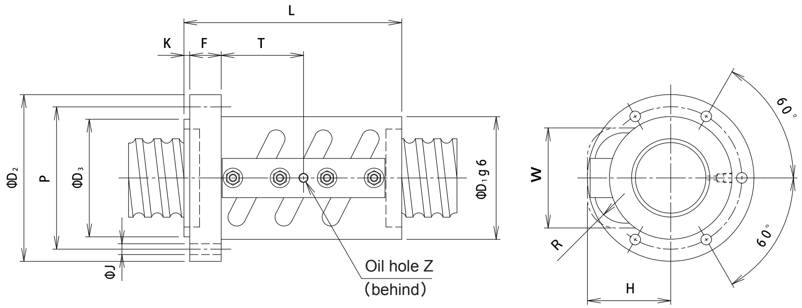


Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(kN) C_a	Basic rated static load(kN) C_o
16	50HNFL16	50	40.5	12.7	53.6	2.5×3	305	847
	55HNFL16	55	45.5	12.7	58.6	2.5×3	319	919
	63HNFL16	63	53.5	12.7	66.6	2.5×3	344	1060
	63HNFO16					2.5×4	441	1410
	80HNFL16	80	70.5	12.7	83.6	2.5×3	385	1340
	80HNFP16					3.5×3	514	1880
	100HNFL16	100	90.5	12.7	103.6	2.5×3	427	1700
	100HNFP16					3.5×3	571	2380
	125HNFL16	125	115.5	12.7	128.6	2.5×3	469	2130
	125HNFW16					3.5×4	802	3970
20	50HNFC20	50	40.5	12.7	53.6	2.5×2	215	564
	63HNFC20	63	51.2	15.875	67.6	2.5×2	322	883
	63HNFL20					2.5×3	457	1320
	80HNFL20	80	68.2	15.875	84.6	2.5×3	513	1660
	80HNFO20					2.5×4	657	2210
	100HNFL20	100	88.2	15.875	104.6	2.5×3	575	2100
	100HNFO20					2.5×4	737	2800
	125HNFL20	125	113.2	15.875	129.6	2.5×3	639	2660
	125HNFO20					2.5×4	818	3540
	140HNFO20	140	128.2	15.875	144.6	2.5×4	860	3990

Nut dimension													Model No.
D_1	D_2	D_3	L	K	F	T	P	J	W	H	R	Z	
95	129	85	218	6	28	84	112	9	72	70	30	PT1/8	50HNFL16
98	132	92	218	6	28	84	115	9	77	72	30	PT1/8	55HNFL16
105	139	100	218	6	28	84	122	9	85	75	30	PT1/8	63HNFL16
			266			100							63HNFO16
125	164	120	224	8	32	84	145	11	102	85	30	PT1/8	80HNFL16
			272			100							80HNFP16
146	190	140	226	10	32	84	168	13.5	122	95	30	PT1/8	100HNFL16
			274			100							100HNFP16
168	226	165	226	10	32	84	198	17.5	147	107	30	PT1/8	125HNFL16
			338			132							125HNFW16
95	129	85	194	6	28	62	112	9	72	70	30	PT1/8	50HNFC20
116	155	105	210	8	32	65	136	11	90	85	40	PT1/8	63HNFC20
			270			105							63HNFL20
130	169	125	270	8	32	105	150	11	106	92	40	PT1/8	80HNFL20
			330			125							80HNFO20
150	194	145	272	10	32	105	172	13.5	126	102	40	PT1/8	100HNFL20
			332			125							100HNFO20
178	236	170	280	10	40	105	208	17.5	152	116	40	PT1/8	125HNFL20
			340			125							125HNFO20
193	251	180	340	10	40	125	223	17.5	167	124	40	PT1/8	140HNFO20

Ball screw

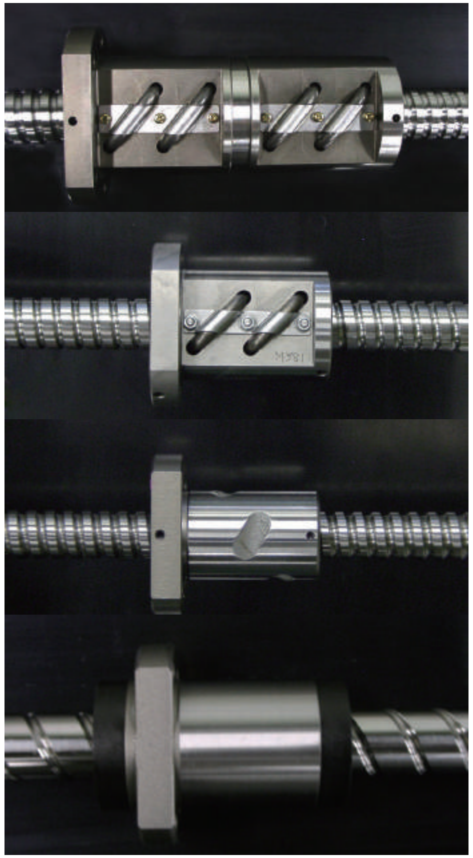
HN series standard dimension
HNF type



Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(kN) C_a	Basic rated static load(kN) C_o
25	50HNFB25	50	40.5	12.7	53.6	3.5×1	157	395
	63HNFC25	63	51.2	15.875	67.6	2.5×2	321	883
	80HNFL25	80	66.4	19.05	86.0	2.5×3	663	2060
	80HNFO25					2.5×4	850	2750
	100HNFL25	100	86.4	19.05	106.0	2.5×3	737	2550
	100HNFO25					2.5×4	945	3400
	125HNFL25	125	111.4	19.05	131.0	2.5×3	819	3190
	125HNFO25					2.5×4	1040	4250
	140HNFO25	140	126.4	19.05	146.0	2.5×4	1120	4890
	160HNFO25	160	146.4	19.05	166.0	2.5×4	1170	5530
	200HNFO25	200	186.4	19.05	206.0	2.5×4	1270	6820

Nut dimension													Model No.
D_1	D_2	D_3	L	K	F	T	P	J	W	H	R	Z	
95	129	85	175	8	28	50	112	9	72	70	30	PT1/8	50HNFB25
116	155	105	239	8	32	77	136	11	90	85	40	PT1/8	63HNFC25
146	190	130	322	8	32	129	168	13.5	112	104	40	PT1/8	80HNFL25
			397			154							80HNFO25
165	223	150	324	10	32	129	195	17.5	132	114	40	PT1/8	100HNFL25
			399			154							100HNFO25
192	250	180	332	10	40	129	222	17.5	157	127	40	PT1/8	125HNFL25
			407			154							125HNFO25
207	265	195	407	10	40	154	237	17.5	172	135	40	PT1/8	140HNFO25
227	295	215	407	10	40	154	260	22	192	145	40	PT1/8	160HNFO25
267	335	255	407	10	40	154	300	22	232	165	40	PT1/8	200HNFO25

(4) Precision ball screw



Please send us the dimension and the specification of the ball screw, when the required ball screw is not in the standard precision ball screw referring to system (P. A7) of the TSUBAKI NAKASHIMA ball screw series.

1. The main shape of the ball screw and the required performance are to be sent referring to selection points (P. A42) of the ball screw.
2. The shape and the mounting dimension of the ball nut are examined, and it compares with a standard dimension. Nonstandard shape is also available.
3. Support forming of screw shaft and design of ball nut dimension.
4. Please inform the examination of the performance and the result of review of the dimension.
5. Specification drawing of the ball screw is made by us.

Reference material

System of TSUBAKI NAKASHIMA ball screw series (P. A7)
Combination of screw shaft outer diameter and lead of TSUBAKI NAKASHIMA ball screw series (P. A5)
Recirculation system for ball (P. A3)
Preload method of ball screw (P. A5)
Lead accuracy (P. A19)
Axial clearance of ball screw (P. A28)
Support method of ball screw (P. A31)
Ball screw life (P. A33)

Precision ball screw order goods nominal form

For inquires and order, please use this designing.

V 32 TTFC 8 – 1300 C3

V: Retainer *1
Nominal shaft diameter (mm)
Ball nut type
Nominal lead (mm)
Accuracy grade C3 - C5
Total length (mm)

*1 V: with retainers C: with ceramic balls

Please select the axial clearance from the following tables based on a necessary positioning accuracy in case of no preload type of ball nut

Ball nut type and method of preload

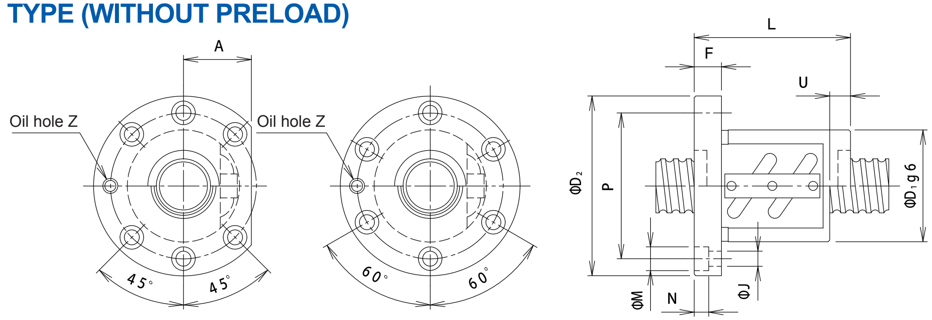
No preload	Integral preload	Double nuts preload	Over size preload
MF	TIF	TTF	TXF
TF	ZIF	ZZF	ZXF
ZF	NIF	NNF·NFN	
EF			
NF			

Accuracy grade and axial clearance

Unit: mm

Axial clearance	0 (preload)	0.005 under	0.02 under	0.05 under	0.3 under
Clearance symbol	Q0	QS	Q2	Q5	QL
Applied accuracy grade	C0	C0	C3	C5	C7
	C1	C1	C5	C7	–
	C3	C3	C7	–	–
	C5	C5	–	–	–

PRECISION BALL SCREW STANDARD DIMENSION
TF TYPE (WITHOUT PRELOAD)



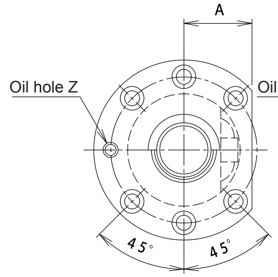
Notched flange   Circle flange

NOTE 1. Wiper is installed as our standard specification and total nut length shows L mm.
In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of 30% of rated dynamic load is operated.
Stiffness of ball nut comes to be about 80% of applied stiffness.

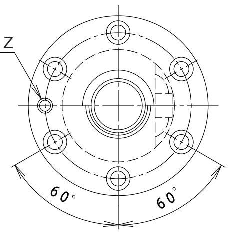
Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_0	Axial stiffness (N/μm) K
4	10TFA4	10	8.3	2	10.4	2.5×1	2930	4790	90
	12TFA4	12	10.1	2.381	12.6	2.5×1	4010	6790	100
	12TFJ4					1.5×2	4690	8150	120
	14TFA4	14	12.1	2.381	14.6	2.5×1	4410	8150	120
	16TFA4	16	14.1	2.381	16.6	2.5×1	4610	9080	130
	16TFJ4					1.5×2	5390	10900	160
	20TFA4	20	18.1	2.381	20.6	2.5×1	5210	11800	170
	20TFC4					2.5×2	9460	23600	330
	25TFA4	25	23.1	2.381	25.6	2.5×1	5650	14500	200
	25TFC4					2.5×2	10200	29100	390
	32TFA4	32	30.1	2.381	32.6	2.5×1	6330	19100	250
	32TFC4					2.5×2	11400	38200	490
5	12TFA5	12	10.1	2.381	12.6	2.5×1	3900	6790	100
	12TFJ5					1.5×2	4680	8150	120
	14TFA5	14	11.5	3.175	14.8	2.5×1	6790	11500	130
	14TFC5					2.5×2	12300	23100	260
	16TFA5	16	13.5	3.175	16.8	2.5×1	7330	13300	150
	16TFJ5					1.5×2	8580	16000	170
	16TFC5					2.5×2	13300	26700	300
	20TFA5	20	17.5	3.175	20.8	2.5×1	8240	16900	180
	20TFJ5					1.5×2	9640	20300	210
	20TFC5					2.5×2	14900	33900	360
	25TFA5	25	22.5	3.175	25.8	2.5×1	9170	21400	220
	25TFJ5					1.5×2	10700	25700	260
	25TFC5					2.5×2	16600	42900	440
	28TFA5	28	25.5	3.175	28.8	2.5×1	9650	24100	250
	28TFC5					2.5×2	17500	48300	490
	32TFA5	32	29.5	3.175	32.8	2.5×1	10200	27700	280
	32TFJ5					1.5×2	11900	33300	330
	32TFC5					2.5×2	18500	55500	540
	32TFL5					2.5×3	26200	83200	800

Nut dimension											Model No.
D_1	D_2	L	F	U	P	J	M	N	A	Z	
26	46	34	10	–	36	4.5	8	4.5	–	M6×1	10TFA4
30	50	38	10	–	40	4.5	8	4.5	–	M6×1	12TFA4
		44									12TFJ4
36	59	39	11	3	47	5.5	9.5	5.5	–	M6×1	14TFA4
34	57	38	11	–	45	5.5	9.5	5.5	–	M6×1	16TFA4
		45									16TFJ4
40	63	37	11	3	51	5.5	9.5	5.5	24	M6×1	20TFA4
		49									20TFC4
46	69	36	11	3	57	5.5	9.5	5.5	26	M6×1	25TFA4
		48									25TFC4
54	81	37	12	3	67	6.6	11	6.5	31	M6×1	32TFA4
		49									32TFC4
30	50	40	10	–	40	4.5	8	4.5	–	M6×1	12TFA5
		48									12TFJ5
34	57	40	11	–	45	5.5	9.5	5.5	–	M6×1	14TFA5
		55									14TFC5
40	63	42	11	–	51	5.5	9.5	5.5	–	M6×1	16TFA5
		52									16TFJ5
		57									16TFC5
44	67	41	11	3	55	5.5	9.5	5.5	26	M6×1	20TFA5
		52									20TFJ5
		56									20TFC5
50	73	40	11	3	61	5.5	9.5	5.5	28	M6×1	25TFA5
		52									25TFJ5
		55									25TFC5
55	85	41	12	3	69	6.6	11	6.5	31	M6×1	28TFA5
		56									28TFC5
58	85	41	12	3	71	6.6	11	6.5	32	M6×1	32TFA5
		53									32TFJ5
		56									32TFC5
		71									32TFL5

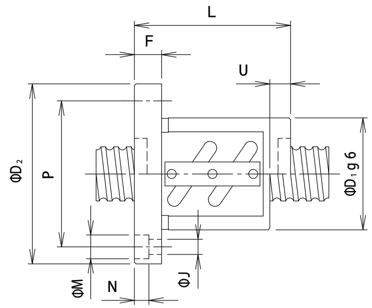
PRECISION BALL SCREW STANDARD DIMENSION
TF TYPE (WITHOUT PRELOAD)



Notched flange



Circle flange

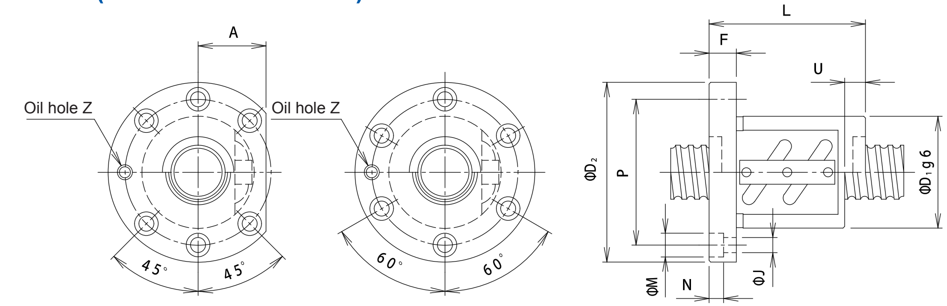


NOTE 1. Wiper is installed as our standard specification and total nut length shows L mm.
In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of 30% of rated dynamic load is operated.
Stiffness of ball nut comes to be about 80% of applied stiffness.

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
5	36TFC5	36	33.5	3.175	36.8	2.5×2	19400	62700	600
	36TFL5					2.5×3	27600	94000	890
	40TFA5	40	37.5	3.175	40.8	2.5×1	11200	34900	340
	40TFJ5					1.5×2	13100	41900	400
	40TFK5					1.5×3	18500	62900	580
	40TFC5					2.5×2	20300	69900	660
	40TFM5					1.5×4	23800	83800	770
	40TFL5					2.5×3	28800	104000	970
	50TFJ5	50	47.5	3.175	50.8	1.5×2	14300	52700	480
	50TFK5					1.5×3	20300	79100	700
	50TFM5					1.5×4	26000	105000	930
6	16TFA6	16	13.5	3.175	16.8	2.5×1	7310	13300	150
	16TFJ6					1.5×2	8560	16000	170
	20TFA6	20	16.9	3.969	21.0	2.5×1	10900	20900	190
	20TFJ6					1.5×2	12800	25100	220
	20TFC6					2.5×2	19900	41800	370
	25TFA6	25	21.9	3.969	26.0	2.5×1	12300	26500	230
	25TFJ6					1.5×2	14400	31800	270
	25TFC6					2.5×2	22300	53000	450
	28TFA6	28	25.5	3.175	28.8	2.5×1	9640	24100	250
	28TFJ6					1.5×2	11200	29000	290
	28TFC6					2.5×2	17400	48300	490
	32TFA6	32	28.9	3.969	33.0	2.5×1	13900	34900	290
	32TFJ6					1.5×2	16300	41900	340
	32TFC6					2.5×2	25400	69800	560
	36TFC6	36	32.9	3.969	37.0	2.5×2	26600	78300	620
	36TFL6					2.5×3	37700	117000	910
	40TFA6	40	36.9	3.969	41.0	2.5×1	15200	43300	340
	40TFJ6					1.5×2	17800	52000	400
	40TFC6					2.5×2	27700	86700	670
	40TFM6					1.5×4	32400	104000	790
	40TFL6					2.5×3	39200	130000	990

Nut dimension											Model No.
D_1	D_2	L	F	U	P	J	M	N	A	Z	
65	100	59	15	3	82	9	14	8.5	38	M6×1	36TFC5
		74									36TFL5
67	101	44	15	3	83	9	14	8.5	39	PT1/8	40TFA5
		56									40TFJ5
		66									40TFK5
		59									40TFC5
		81									40TFM5
		74									40TFL5
80	114	58	15	–	96	9	14	8.5	43	PT1/8	50TFJ5
		68									50TFK5
		81									50TFM5
40	63	44	11	–	51	5.5	9.5	5.5	–	M6×1	16TFA6
		56									16TFJ6
48	71	44	11	3	59	5.5	9.5	5.5	27	M6×1	20TFA6
		56									20TFJ6
		62									20TFC6
53	76	44	11	3	64	5.5	9.5	5.5	29	M6×1	25TFA6
		56									25TFJ6
		62									25TFC6
55	85	45	12	3	69	6.6	11	6.5	31	M6×1	28TFA6
		57									28TFJ6
		63									28TFC6
62	89	45	12	3	75	6.6	11	6.5	34	M6×1	32TFA6
		57									32TFJ6
		63									32TFC6
65	100	66	15	3	82	9	14	8.5	38	M6×1	36TFC6
		84									36TFL6
70	104	48	15	3	86	9	14	8.5	40	PT1/8	40TFA6
		60									40TFJ6
		66									40TFC6
		90									40TFM6
		84									40TFL6

PRECISION BALL SCREW STANDARD DIMENSION
TF TYPE (WITHOUT PRELOAD)



Notched flange

Circle flange

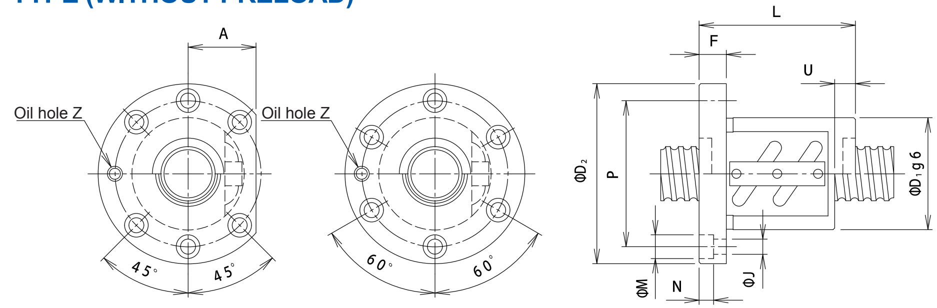
NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm.
In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of 30% of rated dynamic load is operated.
Stiffness of ball nut comes to be about 80% of applied stiffness.

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
6	50TFJ6	50	46.9	3.969	51.0	1.5×2	19600	65500	490
	50TFK6					1.5×3	27700	98300	720
	50TFC6					2.5×2	30400	109000	810
	50TFM6					1.5×4	35500	131000	950
	50TFL6					2.5×3	43100	163000	1190
	63TFJ6	63	59.9	3.969	64.0	1.5×2	21300	82400	590
	63TFK6					1.5×3	30300	123000	870
	63TFM6					1.5×4	38800	164000	1150
8	20TFA8	20	16.9	3.969	21.0	2.5×1	10900	20900	190
	20TFJ8					1.5×2	12700	25100	210
	25TFA8	25	21.4	4.763	26.3	2.5×1	15700	32100	230
	25TFJ8					1.5×2	18400	38500	270
	25TFC8					2.5×2	28500	64200	460
	32TFA8	32	28.4	4.763	33.3	2.5×1	18000	42100	300
	32TFJ8					1.5×2	21000	50600	340
	32TFC8					2.5×2	32600	84300	580
	40TFA8	40	36.4	4.763	41.3	2.5×1	19700	52300	350
	40TFJ8					1.5×2	23000	62800	410
	40TFC8					2.5×2	35800	104000	690
	50TFA8	50	46.4	4.763	51.3	2.5×1	21400	64500	420
	50TFJ8					1.5×2	25000	77400	490
	50TFC8					2.5×2	38800	129000	810
	50TFL8					2.5×3	55100	193000	1200
	63TFJ8	63	59.4	4.763	64.3	1.5×2	27700	99200	600
	63TFK8					1.5×3	39300	148000	890
	63TFM8					1.5×4	50300	198000	1170

Nut dimension											Model No.
D_1	D_2	L	F	U	P	J	M	N	A	Z	
84	118	62	15	3	100	9	14	8.5	45	PT1/8	50TFJ6
		74									50TFK6
		68									50TFC6
		90									50TFM6
		86									50TFL6
100	139	63	18	3	118	11	17.5	11	55	PT1/8	63TFJ6
		75									63TFK6
		93									63TFM6
48	75	54	13	5	61	6.6	11	6.5	28	M6×1	20TFA8
		64									20TFJ8
58	85	56	13	5	71	6.6	11	6.5	32	M6×1	25TFA8
		69									25TFJ8
		80									25TFC8
66	100	58	15	5	82	9	14	8.5	38	M6×1	32TFA8
		71									32TFJ8
		82									32TFC8
74	108	58	15	5	90	9	14	8.5	41	PT1/8	40TFA8
		71									40TFJ8
		82									40TFC8
87	129	61	18	5	107	11	17.5	11	49	PT1/8	50TFA8
		74									50TFJ8
		85									50TFC8
		109									50TFL8
103	145	74	18	5	123	11	17.5	11	57	PT1/8	63TFJ8
		90									63TFK8
		114									63TFM8

Ball screw

PRECISION BALL SCREW STANDARD DIMENSION
TF TYPE (WITHOUT PRELOAD)



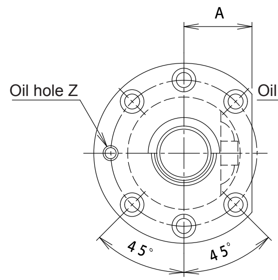
Notched flange　　Circle flange

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
10	20TFA10	20	16.9	3.969	21.0	2.5×1	10800	20900	190
	25TFA10	25	21.4	4.763	26.3	2.5×1	15600	32100	230
	25TFJ10					1.5×2	18300	38500	270
	25TFB10					3.5×1	20900	44900	330
	28TFA10	28	24.4	4.763	29.3	2.5×1	16600	36100	260
	28TFJ10					1.5×2	19400	43300	300
	32TFA10	32	27.2	6.35	33.8	2.5×1	25500	53500	290
	32TFJ10					1.5×2	29800	64200	340
	32TFC10					2.5×2	46300	107000	570
	36TFA10	36	31.2	6.35	37.8	2.5×1	27100	60700	330
	36TFJ10					1.5×2	31800	72900	380
	36TFC10					2.5×2	49300	121000	640
	40TFA10	40	35.2	6.35	41.8	2.5×1	28600	67900	360
	40TFJ10					1.5×2	33500	81500	410
	40TFB10					3.5×1	38300	95100	500
	40TFC10					2.5×2	52000	135000	700
	45TFC10	45	40.2	6.35	46.8	2.5×2	55900	157000	780
	45TFL10					2.5×3	79200	235000	1160
	50TFA10	50	45.2	6.35	51.8	2.5×1	31900	85900	430
	50TFJ10					1.5×2	37300	103000	500
	50TFC10					2.5×2	57900	171000	840
	50TFL10					2.5×3	82000	257000	1240
	55TFC10	55	50.2	6.35	56.8	2.5×2	61100	193000	930
	55TFL10					2.5×3	86700	289000	1380
	63TFA10	63	58.2	6.35	64.8	2.5×1	35600	111000	540
	63TFJ10					1.5×2	41700	133000	630
	63TFC10					2.5×2	64700	222000	1050
	63TFL10					2.5×3	91800	333000	1540
	80TFA10	80	75.2	6.35	81.8	2.5×1	39000	139000	650
	80TFJ10					1.5×2	45600	167000	760
	80TFC10					2.5×2	70800	279000	1260
	80TFL10					2.5×3	100000	419000	1850

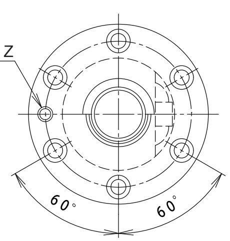
NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm.
In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of 30% of rated dynamic load is operated.
Stiffness of ball nut comes to be about 80% of applied stiffness.

Nut dimension											Model No.
D_1	D_2	L	F	U	P	J	M	N	A	Z	
48	71	64	13	5	59	5.5	9.5	5.5	27	M6×1	20TFA10
58	85	67	15	8	71	6.6	11	6.5	32	M6×1	25TFA10
		81									25TFJ10
		77									25TFB10
60	94	68	15	7	76	9	14	8.5	36	M6×1	28TFA10
		82									28TFJ10
74	108	70	15	7	90	9	14	8.5	41	M6×1	32TFA10
		87									32TFJ10
		100									32TFC10
75	120	73	18	7	98	11	17.5	11	45	M6×1	36TFA10
		85									36TFJ10
		103									36TFC10
82	124	73	18	7	102	11	17.5	11	47	PT1/8	40TFA10
		85									40TFJ10
		83									40TFB10
		103									40TFC10
88	132	103	18	7	110	11	17.5	11	50	PT1/8	45TFC10
		133									45TFL10
93	135	73	18	7	113	11	17.5	11	51	PT1/8	50TFA10
		85									50TFJ10
		103									50TFC10
		133									50TFL10
102	144	103	18	7	122	11	17.5	11	54	PT1/8	55TFC10
		133									55TFL10
108	154	77	22	7	130	14	20	13	58	PT1/8	63TFA10
		89									63TFJ10
		107									63TFC10
		137									63TFL10
130	176	79	22	7	152	14	20	13	66	PT1/8	80TFA10
		89									80TFJ10
		107									80TFC10
		137									80TFL10

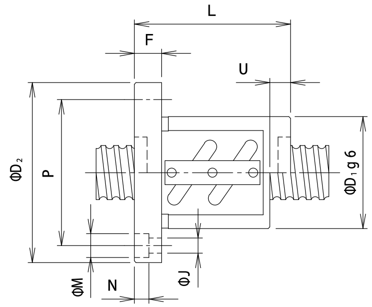
PRECISION BALL SCREW STANDARD DIMENSION
TF TYPE (WITHOUT PRELOAD)



Notched flange



Circle flange

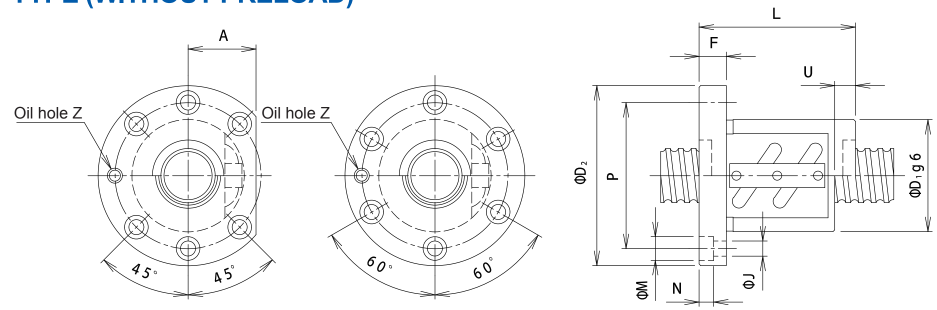


Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
12	32TFA12	32	27.2	6.35	33.8	2.5×1	25400	53500	290
	32TFJ12					1.5×2	29700	64200	340
	40TFA12	40	34.6	7.144	42.0	2.5×1	33600	76800	360
	40TFJ12					1.5×2	39300	92200	420
	40TFC12					2.5×2	61100	153000	710
	45TFA12	45	39.6	7.144	47.0	2.5×1	35400	85900	400
	45TFC12					2.5×2	64300	171000	780
	45TFL12					2.5×3	91100	257000	1150
	50TFA12	50	44.0	7.938	52.2	2.5×1	42800	106000	440
	50TFJ12					1.5×2	50100	127000	510
	50TFC12					2.5×2	77800	212000	860
	55TFC12	55	49.6	7.144	57.0	2.5×2	71900	217000	940
	55TFL12					2.5×3	101000	325000	1390
	63TFA12	63	57.0	7.938	65.2	2.5×1	47600	134000	530
	63TFJ12					1.5×2	55600	161000	620
	63TFC12					2.5×2	86400	268000	1040
	80TFA12	80	74.0	7.938	82.2	2.5×1	53100	173000	660
	80TFJ12					1.5×2	62100	208000	780
	80TFC12					2.5×2	96400	347000	1290
	80TFL12					2.5×3	136000	520000	1890
	100TFA12	100	94.0	7.938	102.2	2.5×1	58300	218000	800
	100TFC12					2.5×2	105000	437000	1550
	100TFL12					2.5×3	150000	655000	2280
16	40TFA16	40	34.6	7.144	42.0	2.5×1	33500	76800	360
	40TFJ16					1.5×2	39200	92200	420
	50TFA16	50	44.0	7.938	52.2	2.5×1	42700	106000	440
	50TFJ16					1.5×2	50000	127000	510
	50TFC16					2.5×2	77600	212000	860
	63TFA16	63	56.0	9.525	65.8	2.5×1	79700	223000	690
	63TFJ16					1.5×2	93200	268000	800
	63TFC16					2.5×2	144000	446000	1380

NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm.
In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of 30% of rated dynamic load is operated.
Stiffness of ball nut comes to be about 80% of applied stiffness.

Nut dimension											Model No.
D_1	D_2	L	F	U	P	J	M	N	A	Z	
74	108	81	18	9	90	9	14	8.5	41	M6×1	32TFA12
		97									32TFJ12
86	128	81	18	9	106	11	17.5	11	48	PT1/8	40TFA12
		98									40TFJ12
		117									40TFC12
90	132	83	18	8	110	11	17.5	11	50	PT1/8	45TFA12
		119									45TFC12
		155									45TFL12
100	146	87	22	8	122	14	20	13	55	PT1/8	50TFA12
		102									50TFJ12
		123									50TFC12
105	151	123	22	8	127	14	20	13	58	PT1/8	55TFC12
		159									55TFL12
115	161	87	22	8	137	14	20	13	61	PT1/8	63TFA12
		102									63TFJ12
		123									63TFC12
136	182	90	22	8	158	14	20	13	68	PT1/8	80TFA12
		102									80TFJ12
		123									80TFC12
		159									80TFL12
160	220	96	28	8	188	18	26	17.5	82	PT1/8	100TFA12
		129									100TFC12
		165									100TFL12
86	128	97	18	11	106	11	17.5	11	48	PT1/8	40TFA16
		113									40TFJ16
100	146	101	22	11	122	14	20	13	55	PT1/8	50TFA16
		117									50TFJ16
		149									50TFC16
122	180	110	28	10	150	18	26	17.5	69	PT1/8	63TFA16
		126									63TFJ16
		158									63TFC16

PRECISION BALL SCREW STANDARD DIMENSION
TF TYPE (WITHOUT PRELOAD)



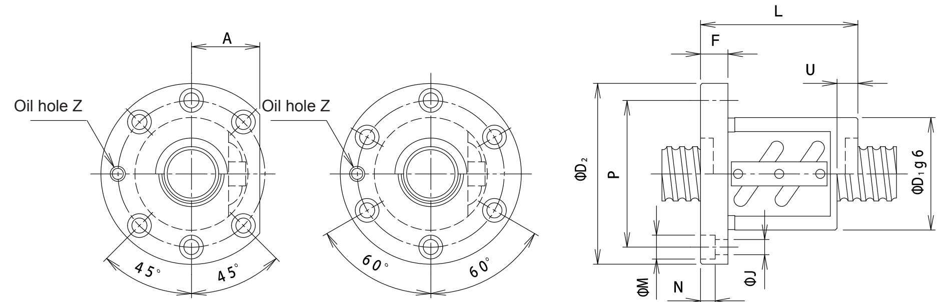
Notched flange　　Circle flange

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
16	80TFA16	80	73.0	9.525	82.8	2.5×1	89800	290000	860
	80TFJ16					1.5×2	105000	348000	1000
	80TFC16					2.5×2	163000	581000	1680
	80TFL16					2.5×3	231000	871000	2470
	100TFA16	100	93.0	9.525	102.8	2.5×1	97500	358000	1020
	100TFC16					2.5×2	176000	716000	1980
	100TFL16					2.5×3	250000	1070000	2920
	125TFC16	125	118.0	9.525	127.8	2.5×2	196000	917000	2430
	125TFL16					2.5×3	278000	1370000	3590
20	50TFA20	50	44.0	7.938	52.2	2.5×1	42600	106000	440
	50TFJ20					1.5×2	49800	127000	510
	63TFA20	63	56.0	9.525	65.8	2.5×1	79500	223000	690
	63TFJ20					1.5×2	93000	268000	800
	63TFC20					2.5×2	144000	446000	1350
	80TFA20	80	73.0	9.525	82.8	2.5×1	89700	290000	860
	80TFJ20					1.5×2	104000	348000	1000
	80TFC20					2.5×2	162000	581000	1670
	80TFL20					2.5×3	230000	871000	2470
	100TFA20	100	93.0	9.525	102.8	2.5×1	97400	358000	1020
	100TFC20					2.5×2	176000	716000	1980
	100TFL20					2.5×3	250000	1070000	2920
	125TFC20	125	118.0	9.525	127.8	2.5×2	196000	917000	2430
	125TFL20					2.5×3	278000	1370000	3590

NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm.
In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of 30% of rated dynamic load is operated.
Stiffness of ball nut comes to be about 80% of applied stiffness.

Nut dimension											Model No.
D_1	D_2	L	F	U	P	J	M	N	A	Z	
143	204	110	28	10	172	18	26	17.5	77	PT1/8	80TFA16
		126									80TFJ16
		158									80TFC16
		206									80TFL16
170	243	114	32	10	205	22	32	21.5	91	PT1/8	100TFA16
		162									100TFC16
		210									100TFL16
200	290	170	36	10	243	26	39	25.5	109	PT1/8	125TFC16
		218									125TFL16
100	146	127	28	17	122	14	20	13	55	PT1/8	50TFA20
		147									50TFJ20
122	180	127	28	17	150	18	26	17.5	69	PT1/8	63TFA20
		142									63TFJ20
		187									63TFC20
143	204	127	28	17	172	18	26	17.5	77	PT1/8	80TFA20
		147									80TFJ20
		187									80TFC20
		247									80TFL20
170	243	131	32	17	205	22	32	21.5	91	PT1/8	100TFA20
		191									100TFC20
		251									100TFL20
200	290	199	36	12	243	26	39	25.5	109	PT1/8	125TFC20
		259									125TFL20

PRECISION BALL SCREW STANDARD DIMENSION
TXF TYPE (OVER-SIZE BALL PRELOAD)



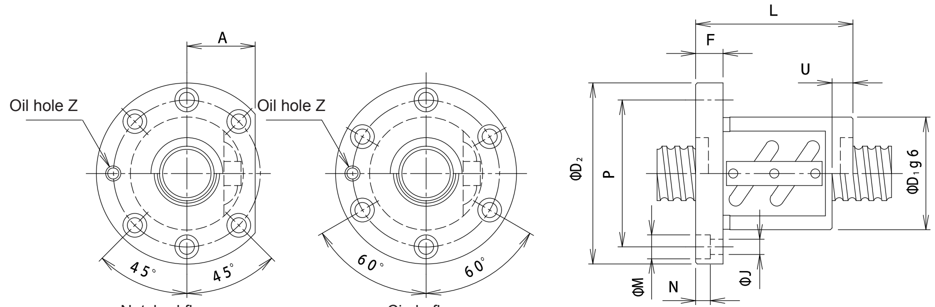
Notched flange   Circle flange

NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm.
In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 5% amount of rated dynamic load Ca.
Stiffness of ball nut comes to be about 80% of applied stiffness.

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
4	10TXFA4	10	8.3	2	10.4	2.5×1	1840	2390	70
	12TXFA4	12	10.1	2.381	12.6	2.5×1	2520	3390	80
	12TXFJ4					1.5×2	2950	4070	90
	14TXFA4	14	12.1	2.381	14.6	2.5×1	2680	3860	90
	16TXFA4	16	14.1	2.381	16.6	2.5×1	2810	4320	100
	16TXFJ4					1.5×2	3280	5190	110
	20TXFA4	20	18.1	2.381	20.6	2.5×1	3200	5680	130
	20TXFC4					2.5×2	5810	11300	260
	25TXFA4	25	23.1	2.381	25.6	2.5×1	3490	7050	160
	25TXFC4					2.5×2	6330	14100	310
	32TXFA4	32	30.1	2.381	32.6	2.5×1	3920	9330	200
	32TXFC4					2.5×2	7130	18600	390
5	12TXFA5	12	10.1	2.381	12.6	2.5×1	2510	3390	80
	12TXFJ5					1.5×2	2940	4070	90
	14TXFA5	14	11.5	3.175	14.8	2.5×1	4270	5790	100
	14TXFC5					2.5×2	7760	11500	200
	16TXFA5	16	13.5	3.175	16.8	2.5×1	4620	6690	120
	16TXFJ5					1.5×2	5400	8030	130
	16TXFC5					2.5×2	8380	13300	230
	20TXFA5	20	17.5	3.175	20.8	2.5×1	5190	8490	150
	20TXFJ5					1.5×2	6070	10100	170
	20TXFC5					2.5×2	9420	16900	290
	25TXFA5	25	22.5	3.175	25.8	2.5×1	5620	10300	170
	25TXFJ5					1.5×2	6570	12300	200
	25TXFC5					2.5×2	10200	20600	340
	28TXFA5	28	25.5	3.175	28.8	2.5×1	6070	12000	200
	28TXFC5					2.5×2	11000	24100	400
	32TXFA5	32	29.5	3.175	32.8	2.5×1	6430	13800	230
	32TXFJ5					1.5×2	7530	16600	260
	32TXFC5					2.5×2	11600	27700	440
	32TXFL5					2.5×3	16500	41600	660

Nut dimension											Model No.
D_1	D_2	L	F	U	P	J	M	N	A	Z	
26	46	34	10	–	36	4.5	8	4.5	–	M6×1	10TXFA4
30	50	38	10	–	40	4.5	8	4.5	–	M6×1	12TXFA4
		44									12TXFJ4
34	57	39	11	–	45	5.5	9.5	5.5	–	M6×1	14TXFA4
34	57	38	11	–	45	5.5	9.5	5.5	–	M6×1	16TXFA4
		45									16TXFJ4
40	63	37	11	3	51	5.5	9.5	5.5	24	M6×1	20TXFA4
		49									20TXFC4
46	69	36	11	3	57	5.5	9.5	5.5	26	M6×1	25TXFA4
		48									25TXFC4
54	81	37	12	3	67	6.6	11	6.5	31	M6×1	32TXFA4
		49									32TXFC4
30	50	40	10	–	40	4.5	8	4.5	–	M6×1	12TXFA5
		48									12TXFJ5
34	57	40	11	–	45	5.5	9.5	5.5	–	M6×1	14TXFA5
		55									14TXFC5
40	63	42	11	–	51	5.5	9.5	5.5	–	M6×1	16TXFA5
		52									16TXFJ5
		57									16TXFC5
44	67	41	11	3	55	5.5	9.5	5.5	26	M6×1	20TXFA5
		52									20TXFJ5
		56									20TXFC5
50	73	40	11	3	61	5.5	9.5	5.5	28	M6×1	25TXFA5
		52									25TXFJ5
		55									25TXFC5
55	85	41	12	3	69	6.6	11	6.5	31	M6×1	28TXFA5
		56									28TXFC5
58	85	41	12	3	71	6.6	11	6.5	32	M6×1	32TXFA5
		53									32TXFJ5
		56									32TXFC5
		71									32TXFL5

PRECISION BALL SCREW STANDARD DIMENSION
TXF TYPE (OVER-SIZE BALL PRELOAD)



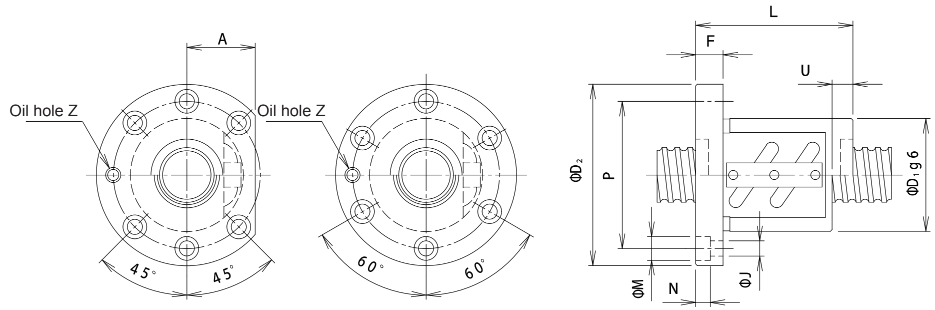
Notched flange Circle flange

NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm.
In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 5% amount of rated dynamic load Ca.
Stiffness of ball nut comes to be about 80% of applied stiffness.

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
5	36TXFC5	36	33.5	3.175	36.8	2.5×2	12200	31300	490
	36TXFL5					2.5×3	17400	47000	730
	40TXFA5	40	37.5	3.175	40.8	2.5×1	7060	17400	280
	40TXFJ5					1.5×2	8260	20900	320
	40TXFK5					1.5×3	11700	31400	470
	40TXFC5					2.5×2	12800	34900	540
	40TXFM5					1.5×4	14900	41900	620
	40TXFL5					2.5×3	18100	52400	790
6	16TXFA6	16	13.5	3.175	16.8	2.5×1	4600	6690	120
	16TXFJ6					1.5×2	5390	8030	130
	20TXFA6	20	16.9	3.969	21.0	2.5×1	6900	10400	150
	20TXFJ6					1.5×2	8080	12500	160
	20TXFC6					2.5×2	12500	20900	290
	25TXFA6	25	21.9	3.969	26.0	2.5×1	7760	13200	180
	25TXFJ6					1.5×2	9080	15900	200
	25TXFC6					2.5×2	14000	26500	360
	28TXFA6	28	25.5	3.175	28.8	2.5×1	6070	12000	200
	28TXFJ6					1.5×2	7100	14500	230
	28TXFC6					2.5×2	11000	24100	400
	32TXFA6	32	28.9	3.969	33.0	2.5×1	8810	17400	230
	32TXFJ6					1.5×2	10300	20900	260
	32TXFC6					2.5×2	16000	34900	450
	36TXFC6	36	32.9	3.969	37.0	2.5×2	16300	37800	490
	36TXFL6					2.5×3	23200	56700	720
	40TXFA6	40	36.9	3.969	41.0	2.5×1	9620	21700	280
	40TXFJ6					1.5×2	11200	26000	320
	40TXFC6					2.5×2	17400	43300	550
	40TXFM6					1.5×4	20400	52000	630
	40TXFL6					2.5×3	24700	65100	810

Nut dimension											Model No.
D_1	D_2	L	F	U	P	J	M	N	A	Z	
65	100	59	15	3	82	9	14	8.5	38	M6×1	36TXFC5
		74									36TXFL5
67	101	44	15	3	83	9	14	8.5	39	PT1/8	40TXFA5
		56									40TXFJ5
		66									40TXFK5
		59									40TXFC5
		81									40TXFM5
		74									40TXFL5
40	63	44	11	–	51	5.5	9.5	5.5	–	M6×1	16TXFA6
		56									16TXFJ6
48	71	44	11	3	59	5.5	9.5	5.5	27	M6×1	20TXFA6
		56									20TXFJ6
		62									20TXFC6
53	76	44	11	3	64	5.5	9.5	5.5	29	M6×1	25TXFA6
		56									25TXFJ6
		62									25TXFC6
55	85	45	12	3	69	6.6	11	6.5	31	M6×1	28TXFA6
		57									28TXFJ6
		63									28TXFC6
62	89	45	12	3	75	6.6	11	6.5	34	M6×1	32TXFA6
		57									32TXFJ6
		63									32TXFC6
65	100	66	15	3	82	9	14	8.5	38	M6×1	36TXFC6
		84									36TXFL6
70	104	48	15	3	86	9	14	8.5	40	PT1/8	40TXFA6
		60									40TXFJ6
		66									40TXFC6
		90									40TXFM6
		84									40TXFL6

PRECISION BALL SCREW STANDARD DIMENSION
TXF TYPE (OVER-SIZE BALL PRELOAD)



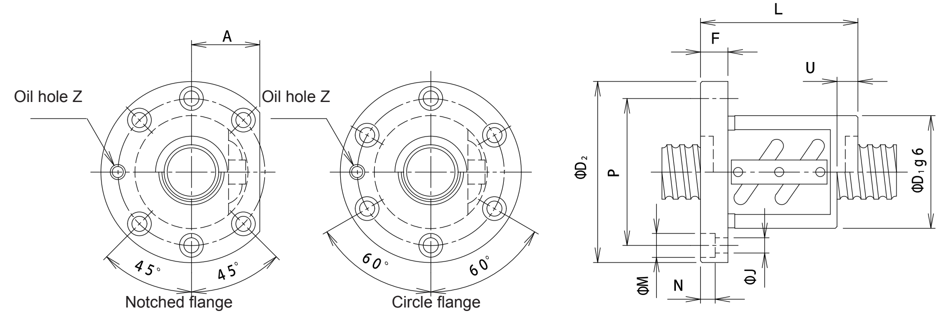
Notched flange   Circle flange

NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm.
In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 5% amount of rated dynamic load Ca.
Stiffness of ball nut comes to be about 80% of applied stiffness.

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
	20TXFA8	20	16.9	3.969	21.0	2.5×1	6880	10400	150
	20TXFJ8					1.5×2	8040	12500	160
	25TXFA8	25	21.4	4.763	26.3	2.5×1	9530	15100	170
	25TXFJ8					1.5×2	11100	18100	190
	25TXFC8					2.5×2	17200	30200	340
8	32TXFA8	32	28.4	4.763	33.3	2.5×1	11300	21100	230
	32TXFJ8					1.5×2	13200	25300	260
	32TXFC8					2.5×2	20500	42100	460
	40TXFA8	40	36.4	4.763	41.3	2.5×1	12100	25200	270
	40TXFJ8					1.5×2	14100	30200	310
	40TXFC8					2.5×2	22000	50400	540
	20TXFA10	20	16.9	3.969	21.0	2.5×1	6840	10400	150
	25TXFA10	25	21.4	4.763	26.3	2.5×1	9490	15100	170
	25TXFJ10					1.5×2	11100	18100	190
	25TXFB10					3.5×1	12600	21100	250
	28TXFA10	28	24.4	4.763	29.3	2.5×1	10100	17100	190
	28TXFJ10					1.5×2	11800	20500	210
	32TXFA10	32	27.2	6.35	33.8	2.5×1	16000	26700	230
	32TXFJ10					1.5×2	18800	32100	250
	32TXFB10					3.5×1	21400	37500	330
10	32TXFC10					2.5×2	29100	53500	450
	36TXFA10	36	31.2	6.35	37.8	2.5×1	17100	30300	260
	36TXFJ10					1.5×2	20000	36400	280
	36TXFC10					2.5×2	31000	60700	500
	40TXFA10	40	35.2	6.35	41.8	2.5×1	18000	33900	290
	40TXFJ10					1.5×2	21100	40700	320
	40TXFB10					3.5×1	24100	47500	410
	40TXFC10					2.5×2	32800	67900	560
	45TXFC10	45	40.2	6.35	46.8	2.5×2	34200	75200	600
	45TXFL10					2.5×3	48400	112000	890

Nut dimension											Model No.
D_1	D_2	L	F	U	P	J	M	N	A	Z	
48	75	54	13	5	61	6.6	11	6.5	28	M6X1	20TXFA8
		64									20TXFJ8
58	85	56	13	5	71	6.6	11	6.5	32	M6X1	25TXFA8
		69									25TXFJ8
		80									25TXFC8
66	100	58	15	5	82	9	14	8.5	38	M6X1	32TXFA8
		71									32TXFJ8
		82									32TXFC8
74	108	58	15	5	90	9	14	8.5	41	PT1/8	40TXFA8
		71									40TXFJ8
		82									40TXFC8
48	71	64	13	7	59	5.5	9.5	5.5	27	M6X1	20TXFA10
58	85	67	15	8	71	6.6	11	6.5	32	M6X1	25TXFA10
		81									25TXFJ10
		77									25TXFB10
60	94	68	15	7	76	9	14	8.5	36	M6X1	28TXFA10
		82									28TXFJ10
74	108	70	15	7	90	9	14	8.5	41	M6X1	32TXFA10
		83									32TXFJ10
		80									32TXFB10
		100									32TXFC10
75	120	73	18	7	98	11	17.5	11	45	M6X1	36TXFA10
		86									36TXFJ10
		103									36TXFC10
82	124	73	18	7	102	11	17.5	11	47	PT1/8	40TXFA10
		86									40TXFJ10
		83									40TXFB10
		103									40TXFC10
88	132	103	18	7	110	11	17.5	11	50	PT1/8	45TXFC10
		133									45TXFL10

PRECISION BALL SCREW STANDARD DIMENSION
TXF TYPE (OVER-SIZE BALL PRELOAD)



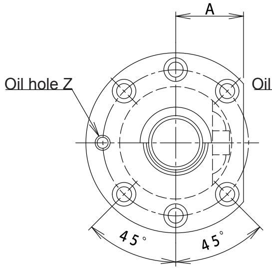
Notched flange　Circle flange

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
12	32TXFA12	32	27.2	6.35	33.8	2.5x1	16000	26700	230
	32TXFJ12					1.5x2	18700	32100	250
	40TXFA12	40	34.6	7.144	42.0	2.5x1	21200	38400	290
	40TXFJ12					1.5x2	24800	46100	310
	40TXFC12					2.5x2	38400	76800	560
	45TXFA12	45	39.6	7.144	47.0	2.5x1	22300	42900	320
	45TXFC12					2.5x2	40500	85900	630
	45TXFL12					2.5x3	57400	128000	920
16	40TXFA16	40	34.6	7.144	42.0	2.5x1	21100	38400	280
	40TXFJ16					1.5x2	24600	46100	310

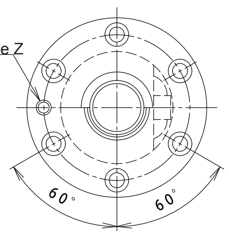
NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm.
In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 5% amount of rated dynamic load Ca.
Stiffness of ball nut comes to be about 80% of applied stiffness.

Nut dimension											Model No.
D_1	D_2	L	F	U	P	J	M	N	A	Z	
74	108	81	18	9	90	9	14	8.5	41	M6x1	32TXFA12
		97									32TXFJ12
86	128	81	18	9	106	11	17.5	11	48	PT1/8	40TXFA12
		97									40TXFJ12
		117									40TXFC12
90	132	83	18	9	110	11	17.5	11	50	PT1/8	45TXFA12
		119									45TXFC12
		155									45TXFL12
86	128	97	18	11	106	11	17.5	11	48	PT1/8	40TXFA16
		113									40TXFJ16

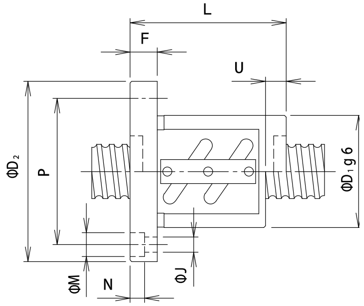
PRECISION BALL SCREW STANDARD DIMENSION
TIF TYPE (INTEGREL NUT PRELOAD)



Notched flange



Circle flange

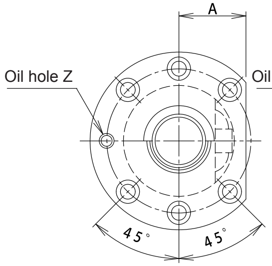


Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
4	25TIFC4	25	23.1	2.381	25.6	2.5x1	5650	14500	400
	25TIFO4					2.5x2	10200	29100	770
	32TIFC4	32	30.1	2.381	32.6	2.5x1	6330	19100	500
	32TIFO4					2.5x2	11500	38200	970
5	20TIFC5	20	17.5	3.175	20.8	2.5x1	8240	16900	370
	25TIFC5	25	22.5	3.175	25.8	2.5x1	9170	21400	440
	25TIFO5					2.5x2	16600	42900	870
	28TIFC5	28	22.5	3.175	28.8	2.5x1	9650	24100	490
	28TIFO5					2.5x2	17500	48300	960
	32TIFC5	32	29.5	3.175	32.8	2.5x1	10200	27700	550
	32TIFO5					2.5x2	18500	55500	1070
	36TIFC5	36	33.5	3.175	36.8	2.5x1	10700	31300	610
	36TIFO5					2.5x2	19400	62700	1180
	40TIFC5	40	37.5	3.175	40.8	2.5x1	11200	34900	660
	40TIFM5					1.5x2	13100	41900	780
	40TIFO5					2.5x2	20300	69900	1290
	50TIFM5	50	47.5	3.175	50.8	1.5x2	14300	52700	940
6	20TIFC6	20	16.9	3.969	21.0	2.5x1	10900	20900	370
	25TIFC6	25	21.9	3.969	26.0	2.5x1	12300	26500	450
	25TIFO6					2.5x2	22300	53000	880
	28TIFC6	28	25.5	3.175	28.8	2.5x1	9640	24100	490
	28TIFO6					2.5x2	17400	48300	960
	32TIFC6	32	28.9	3.969	33.0	2.5x1	13900	34900	570
	32TIFO6					2.5x2	25400	69800	1110
	36TIFC6	36	32.9	3.969	37.0	2.5x1	14600	39100	620
	36TIFO6					2.5x2	26600	78300	1210
	40TIFC6	40	36.9	3.969	41.0	2.5x1	15200	43300	680
	40TIFO6					2.5x2	27700	86700	1320
	50TIFM6	50	46.9	3.969	51.0	1.5x2	19600	65500	960
8	25TIFC8	25	21.4	4.763	26.3	2.5x1	15700	32100	460
	32TIFC8	32	28.4	4.763	33.3	2.5x1	18000	42100	590
	32TIFM8					1.5x2	21000	50600	680

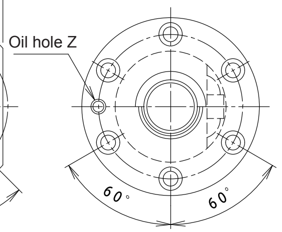
NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm.
In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 10% amount of rated dynamic load Ca.
Stiffness of ball nut comes to be about 80% of applied stiffness.

Nut dimension											Model No.
D_1	D_2	L	F	U	P	J	M	N	A	Z	
46	69	48	11	3	57	5.5	9.5	5.5	26	M6x1	25TIFC4
		72									25TIFO4
54	81	49	12	3	67	6.6	11	6.5	31	M6x1	32TIFC4
		73									32TIFO4
44	67	55	11	3	55	5.5	9.5	5.5	26	M6x1	20TIFC5
50	73	55	11	3	61	5.5	9.5	5.5	28	M6x1	25TIFC5
		85									25TIFO5
55	85	56	12	3	69	6.6	11	6.5	31	M6x1	28TIFC5
		86									28TIFO5
58	85	56	12	3	71	6.6	11	6.5	32	M6x1	32TIFC5
		86									32TIFO5
65	100	59	15	3	82	9	14	8.5	38	M6x1	36TIFC5
		89									36TIFO5
67	101	59	15	3	83	9	14	8.5	39	PT1/8	40TIFC5
		82									40TIFM5
		89									40TIFO5
80	114	82	15	3	96	9	14	8.5	43	PT1/8	50TIFM5
48	71	63	11	3	59	5.5	9.5	5.5	27	M6x1	20TIFC6
53	76	62	11	3	64	5.5	9.5	5.5	29	M6x1	25TIFC6
		98									25TIFO6
55	85	63	12	3	69	6.6	11	6.5	31	M6x1	28TIFC6
		99									28TIFO6
62	89	63	12	3	75	6.6	11	6.5	34	M6x1	32TIFC6
		99									32TIFO6
65	100	66	15	3	82	9	14	8.5	38	M6x1	36TIFC6
		102									36TIFO6
70	104	66	15	3	86	9	14	8.5	40	PT1/8	40TIFC6
		102									40TIFO6
84	118	90	15	3	100	9	14	8.5	45	PT1/8	50TIFM6
58	85	80	13	5	71	6.6	11	6.5	32	M6x1	25TIFC8
66	100	82	15	5	82	9	14	8.5	38	M6x1	32TIFC8
		111									32TIFM8

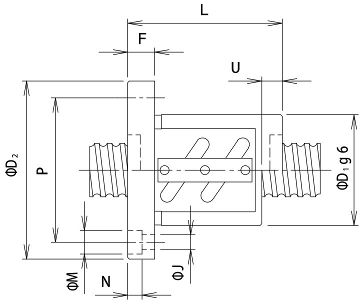
PRECISION BALL SCREW STANDARD DIMENSION
TIF TYPE (INTEGREL NUT PRELOAD)



Notched flange



Circle flange

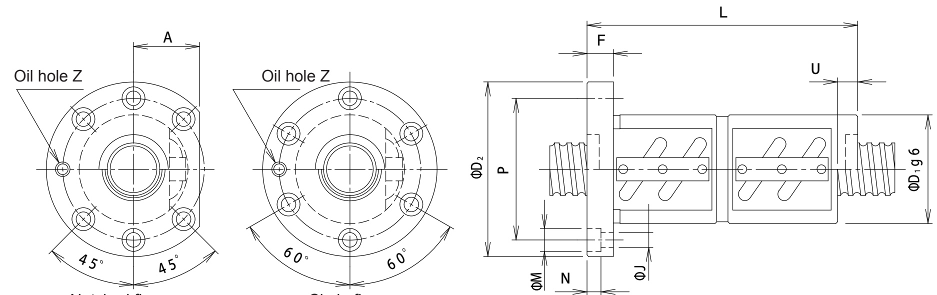


Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_0	Axial stiffness (N/μm) K
8	40TIFC8	40	36.4	4.763	41.3	2.5x1	19700	52300	700
	40TIFO8					2.5x2	35800	104000	1350
	50TIFC8	50	46.4	4.763	51.3	2.5x1	21400	64500	820
	50TIFO8					2.5x2	38800	129000	1600
10	25TIFJ10	25	21.4	4.763	26.3	1.5x1	10100	19200	270
	28TIFJ10	28	24.4	4.763	29.3	1.5x1	10700	21600	300
	28TIFC10					2.5x1	16600	36100	510
	32TIFJ10	32	27.2	6.35	33.8	1.5x1	16400	32100	340
	32TIFC10					2.5x1	25500	53500	580
	36TIFJ10	36	31.2	6.35	37.8	1.5x1	17500	36400	380
	36TIFC10					2.5x1	27100	60700	640
	40TIFC10	40	35.2	6.35	41.8	2.5x1	28600	67900	710
	40TIFM10					1.5x2	33500	81500	820
	40TIFD10					3.5x1	38300	95100	990
	40TIFO10					2.5x2	52000	135000	1370
	45TIFO10	45	40.2	6.35	46.8	2.5x2	55900	157000	1540
	50TIFC10	50	45.2	6.35	51.8	2.5x1	31900	85900	850
	50TIFD10					3.5x1	42600	120000	1190
	50TIFO10					2.5x2	57900	171000	1660
	55TIFC10	55	50.2	6.35	56.8	2.5x1	33700	96600	950
	55TIFO10					2.5x2	61100	193000	1840
	63TIFC10	63	58.2	6.35	64.8	2.5x1	35600	111000	1060
	63TIFO10					2.5x2	64700	222000	2050
12	32TIFJ12	32	27.2	6.35	33.8	1.5x1	16400	32100	340
	40TIFC12	40	34.6	7.144	42.0	2.5x1	33600	76800	720
	45TIFC12	45	39.6	7.144	47.0	2.5x1	35400	85900	790
	50TIFC12	50	44.0	7.938	52.2	2.5x1	42800	106000	870
	50TIFM12					1.5x2	50100	127000	1010
	63TIFC12	63	57.0	7.938	65.2	2.5x1	47600	134000	1050
16	40TIFJ16	40	34.6	7.144	42.0	1.5x1	21600	46100	430
	50TIFC16	50	44.0	7.938	52.2	2.5x1	42700	106000	870
20	50TIFJ20	50	44.0	7.938	52.2	1.5x1	27400	63700	520

NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm.
In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 10% amount of rated dynamic load Ca.
Stiffness of ball nut comes to be about 80% of applied stiffness.

Nut dimension											Model No.
D_1	D_2	L	F	U	P	J	M	N	A	Z	
74	108	82	15	5	90	9	14	8.5	41	PT1/8	40TIFC8
		130									40TIFO8
87	129	85	18	5	107	11	17.5	11	49	PT1/8	50TIFC8
		133									50TIFO8
58	85	81	15	8	71	6.6	11	6.5	32	M6x1	25TIFJ10
60	94	82	15	7	76	9	14	8.5	36	M6x1	28TIFJ10
		100									28TIFC10
74	108	84	18	7	90	9	14	8.5	41	M6x1	32TIFJ10
		100									32TIFC10
75	120	87	18	7	98	11	17.5	11	45	M6x1	36TIFJ10
		103									36TIFC10
82	124	103	18	7	102	11	17.5	11	47	PT1/8	40TIFC10
		135									40TIFM10
		123									40TIFD10
		163									40TIFO10
88	132	163	18	7	110	11	17.5	11	50	PT1/8	45TIFC10
93	135	103	18	7	113	11	17.5	11	51	PT1/8	50TIFC10
		123									50TIFD10
		163									50TIFO10
102	144	103	18	7	122	11	17.5	11	54	PT1/8	55TIFC10
		163									55TIFO10
108	154	107	22	7	130	14	20	13	58	PT1/8	63TIFC10
		167									63TIFO10
74	108	97	18	9	90	9	14	8.5	41	M6x1	32TIFJ12
86	128	117	18	9	106	11	17.5	11	48	PT1/8	40TIFC12
90	132	119	18	8	110	11	17.5	11	50	PT1/8	45TIFC12
100	146	123	22	8	122	14	20	13	55	PT1/8	50TIFC12
		162									50TIFM12
115	161	123	22	8	137	14	20	13	61	PT1/8	63TIFC12
86	128	118	22	14	106	11	17.5	11	48	PT1/8	40TIFJ16
100	146	152	22	14	122	14	20	13	55	PT1/8	50TIFC16
100	146	147	28	17	122	14	20	13	55	PT1/8	50TIFJ20

PRECISION BALL SCREW STANDARD DIMENSION
TTF TYPE (DOUBLE-NUT PRELOAD)



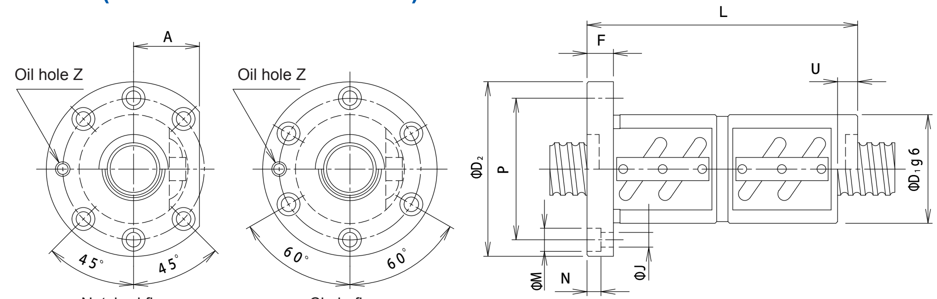
Notched flange   Circle flange

NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm.
In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 10% amount of rated dynamic load Ca.
Stiffness of ball nut comes to be about 80% of applied stiffness.

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
4	12TTFA4	12	10.1	2.381	12.6	2.5x1	4010	6790	210
	14TTFA4	14	12.1	2.381	14.6	2.5x1	4410	8150	250
	16TTFA4	16	14.1	2.381	16.6	2.5x1	4610	9080	270
	16TTFJ4					1.5x2	5390	10900	310
	20TTFA4	20	18.1	2.381	20.6	2.5x1	5210	11800	340
	20TTFC4					2.5x2	9460	23600	650
	25TTFA4	25	23.1	2.381	25.6	2.5x1	5650	14500	400
	25TTFC4					2.5x2	10200	29100	770
	32TTFA4	32	30.1	2.381	32.6	2.5x1	6330	19100	500
	32TTFC4					2.5x2	11500	38200	970
5	12TTFA5	12	10.1	2.381	12.6	2.5x1	3900	6790	210
	14TTFA5	14	11.5	3.175	14.8	2.5x1	6790	11500	260
	16TTFA5	16	13.5	3.175	16.8	2.5x1	7330	13300	300
	16TTFJ5					1.5x2	8580	16000	340
	16TTFC5					2.5x2	13300	26700	590
	20TTFA5	20	17.5	3.175	20.8	2.5x1	8240	16900	370
	20TTFJ5					1.5x2	9640	20300	430
	20TTFC5					2.5x2	14900	33900	720
	25TTFA5	25	22.5	3.175	25.8	2.5x1	9170	21400	440
	25TTFJ5					1.5x2	10700	25700	520
	25TTFC5					2.5x2	16600	42900	870
	28TTFA5	28	25.5	3.175	28.8	2.5x1	9650	24100	490
	28TTFC5					2.5x2	17500	48300	960
	32TTFA5	32	29.5	3.175	32.8	2.5x1	10200	27700	550
	32TTFJ5					1.5x2	11900	33300	640
	32TTFC5					2.5x2	18500	55500	1070
	32TTFL5					2.5x3	26200	83300	1580
	36TTFC5	36	33.5	3.175	36.8	2.5x2	19400	62700	1180
	36TTFL5					2.5x3	27600	94100	1740

Nut dimension											Model No.
D_1	D_2	L	F	U	P	J	M	N	A	Z	
30	50	70	10	—	40	4.5	8	4.5	—	M6x1	12TTFA4
34	57	71	11	—	45	5.5	9.5	5.5	—	M6x1	14TTFA4
34	57	70	11	—	45	5.5	9.5	5.5	—	M6x1	16TTFA4
		85									16TTFJ4
40	63	69	11	3	51	5.5	9.5	5.5	24	M6x1	20TTFA4
		93									20TTFC4
46	69	68	11	3	57	5.5	9.5	5.5	26	M6x1	25TTFA4
		92									25TTFC4
54	81	69	12	3	67	6.6	11	6.5	31	M6x1	32TTFA4
		93									32TTFC4
30	50	76	10	—	40	4.5	8	4.5	—	M6x1	12TTFA5
34	57	77	11	—	45	5.5	9.5	5.5	—	M6x1	14TTFA5
40	63	77	11	—	51	5.5	9.5	5.5	—	M6x1	16TTFA5
		97									16TTFJ5
		107									16TTFC5
44	67	76	11	3	55	5.5	9.5	5.5	26	M6x1	20TTFA5
		97									20TTFJ5
		106									20TTFC5
50	73	75	11	3	61	5.5	9.5	5.5	28	M6x1	25TTFA5
		102									25TTFJ5
		105									25TTFC5
55	85	76	12	3	69	6.6	11	6.5	31	M6x1	28TTFA5
		106									28TTFC5
58	85	76	12	3	71	6.6	11	6.5	32	M6x1	32TTFA5
		103									32TTFJ5
		106									32TTFC5
		136									32TTFL5
65	100	109	15	3	82	9	14	8.5	38	M6x1	36TTFC5
		139									36TTFL5

PRECISION BALL SCREW STANDARD DIMENSION
TTF TYPE (DOUBLE-NUT PRELOAD)



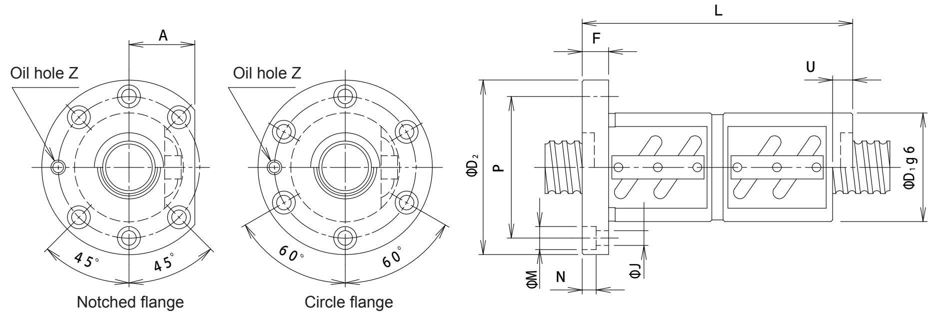
Notched flange   Circle flange

NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm.
In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 10% amount of rated dynamic load Ca.
Stiffness of ball nut comes to be about 80% of applied stiffness.

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
5	40TTFA5	40	37.5	3.175	40.8	2.5x1	11200	34900	660
	40TTFJ5					1.5x2	13100	41900	780
	40TTFK5					1.5x3	18500	62900	1150
	40TTFC5					2.5x2	20300	69900	1290
	40TTFM5					1.5x4	23800	83800	1520
	40TTFL5					2.5x3	28800	104000	1900
	50TTFJ5	50	47.5	3.175	50.8	1.5x2	14300	52700	940
	50TTFK5					1.5x3	20300	79100	1390
	50TTFM5					1.5x4	26000	105000	1830
6	16TTFA6	16	13.5	3.175	16.8	2.5x1	7310	13300	300
	16TTFJ6					1.5x2	8560	16000	340
	20TTFA6	20	16.9	3.969	21.0	2.5x1	10900	20900	370
	20TTFJ6					1.5x2	12800	25100	430
	20TTFC6					2.5x2	19900	41800	720
	25TTFA6	25	21.9	3.969	26.0	2.5x1	12300	26500	450
	25TTFJ6					1.5x2	14400	31800	530
	25TTFC6					2.5x2	22300	53000	880
	28TTFA6	28	25.5	3.175	28.8	2.5x1	9640	24100	490
	28TTFJ6					1.5x2	11200	29000	570
	28TTFC6					2.5x2	17400	48300	960
	32TTFA6	32	28.9	3.969	33.0	2.5x1	13900	34900	570
	32TTFJ6					1.5x2	16300	41900	670
	32TTFC6					2.5x2	25400	69800	1110
	36TTFC6	36	32.9	3.969	37.0	2.5x2	26600	78300	1210
	36TTFL6					2.5x3	37700	117000	1790
	40TTFA6	40	36.9	3.969	41.0	2.5x1	15200	43300	680
	40TTFJ6					1.5x2	17800	52000	800
	40TTFC6					2.5x2	27700	86700	1320
	40TTFM6					1.5x4	32400	104000	1550
	40TTFL6					2.5x3	39200	130000	1950

Nut dimension											Model No.
D_1	D_2	L	F	U	P	J	M	N	A	Z	
67	101	79	15	3	83	9	14	8.5	39	PT1/8	40TTFA5
		106									40TTFJ5
		119									40TTFK5
		109									40TTFC5
		149									40TTFM5
		139									40TTFL5
80	114	108	15	3	96	9	14	8.5	43	PT1/8	50TTFJ5
		128									50TTFK5
		149									50TTFM5
40	63	86	11	—	51	5.5	9.5	5.5	—	M6x1	16TTFA6
		101									16TTFJ6
48	71	86	11	3	59	5.5	9.5	5.5	27	M6x1	20TTFA6
		103									20TTFJ6
		122									20TTFC6
53	76	86	11	3	64	5.5	9.5	5.5	29	M6x1	25TTFA6
		103									25TTFJ6
		122									25TTFC6
55	85	87	12	3	69	6.6	11	6.5	31	M6x1	28TTFA6
		104									28TTFJ6
		123									28TTFC6
62	89	87	12	3	75	6.6	11	6.5	34	M6x1	32TTFA6
		104									32TTFJ6
		123									32TTFC6
65	100	126	15	3	82	9	14	8.5	38	M6x1	36TTFC6
		162									36TTFL6
70	104	90	15	3	86	9	14	8.5	40	PT1/8	40TTFA6
		113									40TTFJ6
		126									40TTFC6
		165									40TTFM6
		162									40TTFL6

PRECISION BALL SCREW STANDARD DIMENSION
TTF TYPE (DOUBLE-NUT PRELOAD)



Notched flange　　Circle flange

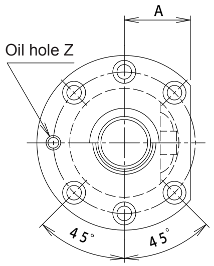
Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
6	50TTFJ6	50	46.9	3.969	51.0	1.5x2	19600	65500	960
	50TTFK6					1.5x3	27700	98300	1420
	50TTFC6					2.5x2	30400	109000	1590
	50TTFM6					1.5x4	35500	131000	1870
	50TTFL6					2.5x3	43100	163000	2350
	63TTFJ6	63	59.9	3.969	64.0	1.5x2	21300	82400	1160
	63TTFK6					1.5x3	30300	123000	1710
	63TTFM6					1.5x4	38800	164000	2250
8	20TTFA8	20	16.9	3.969	21.0	2.5x1	10900	20900	370
	20TTFJ8					1.5x2	12700	25100	430
	25TTFA8	25	21.4	4.763	26.3	2.5x1	15700	32100	460
	25TTFJ8					1.5x2	18400	38500	530
	25TTFC8					2.5x2	28500	64200	900
	32TTFA8	32	28.4	4.763	33.3	2.5x1	18000	42100	590
	32TTFJ8					1.5x2	21000	50600	680
	32TTFC8					2.5x2	32600	84300	1140
	40TTFA8	40	36.4	4.763	41.3	2.5x1	19700	52300	700
	40TTFJ8					1.5x2	23000	62800	810
	40TTFC8					2.5x2	35800	104000	1350
	50TTFA8	50	46.4	4.763	51.3	2.5x1	21400	64500	820
	50TTFJ8					1.5x2	25000	77400	960
	50TTFC8					2.5x2	38800	129000	1600
	50TTFL8					2.5x3	55100	193000	2360
	63TTFJ8	63	59.4	4.763	64.3	1.5x2	27700	99200	1190
	63TTFK8					1.5x3	39300	148000	1750
	63TTFM8					1.5x4	50300	198000	2310

NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm.
In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 10% amount of rated dynamic load Ca.
Stiffness of ball nut comes to be about 80% of applied stiffness.

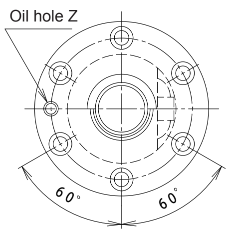
Nut dimension											Model No.
D_1	D_2	L	F	U	P	J	M	N	A	Z	
84	118	113	15	3	100	9	14	8.5	45	PT1/8	50TTFJ6
		137									50TTFK6
		128									50TTFC6
		165									50TTFM6
		164									50TTFL6
100	139	116	18	3	118	11	17.5	11	55	PT1/8	63TTFJ6
		140									63TTFK6
		168									63TTFM6
48	75	102	13	5	61	6.6	11	6.5	28	M6x1	20TTFA8
		120									20TTFJ8
58	85	104	13	5	71	6.6	11	6.5	32	M6x1	25TTFA8
		121									25TTFJ8
		152									25TTFC8
66	100	106	15	5	82	9	14	8.5	38	M6x1	32TTFA8
		135									32TTFJ8
		154									32TTFC8
74	108	106	15	5	90	9	14	8.5	41	PT1/8	40TTFA8
		135									40TTFJ8
		154									40TTFC8
87	129	109	18	5	107	11	17.5	11	49	PT1/8	50TTFA8
		138									50TTFJ8
		157									50TTFC8
		205									50TTFL8
103	145	138	18	5	123	11	17.5	11	57	PT1/8	63TTFJ8
		170									63TTFK8
		218									63TTFM8

Ball screw

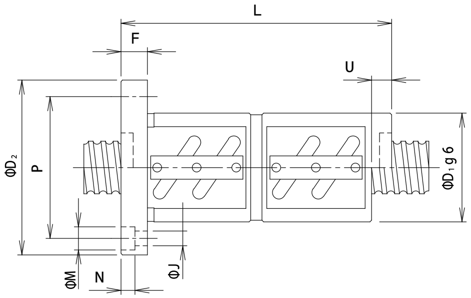
PRECISION BALL SCREW STANDARD DIMENSION
TTF TYPE (DOUBLE-NUT PRELOAD)



Notched flange



Circle flange

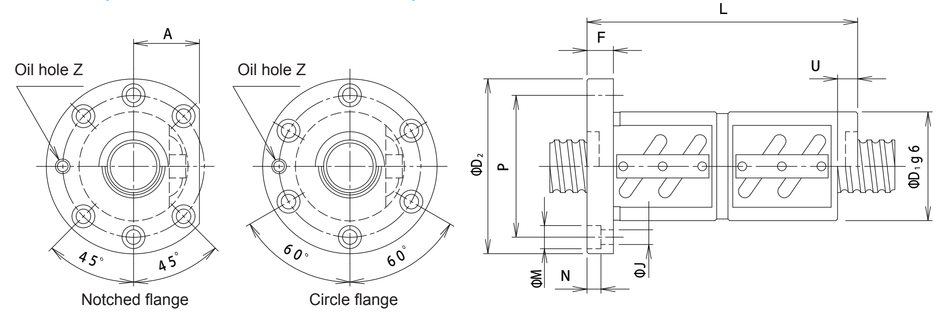


Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
10	20TTFA10	20	16.9	3.969	21.0	2.5x1	10800	20900	370
	25TTFA10	25	21.4	4.763	26.3	2.5x1	15600	32100	460
	25TTFJ10					1.5x2	18300	38500	530
	25TTFB10					3.5x1	20900	44900	650
	28TTFA10	28	24.4	4.763	29.3	2.5x1	16600	36100	510
	28TTFJ10					1.5x2	19400	43300	590
	32TTFA10	32	27.2	6.35	33.8	2.5x1	25500	53500	580
	32TTFJ10					1.5x2	29800	64200	660
	32TTFC10					2.5x2	46300	107000	1130
	36TTFA10	36	31.2	6.35	37.8	2.5x1	27100	60700	640
	36TTFJ10					1.5x2	31800	72900	740
	36TTFC10					2.5x2	49300	121000	1250
	40TTFA10	40	35.2	6.35	41.8	2.5x1	28600	67900	710
	40TTFJ10					1.5x2	33500	81500	820
	40TTFB10					3.5x1	38300	95100	990
	40TTFC10					2.5x2	52000	135000	1370
	45TTFC10	45	40.2	6.35	46.8	2.5x2	55900	157000	1540
	45TTFL10					2.5x3	79200	235000	2270
	50TTFA10	50	45.2	6.35	51.8	2.5x1	31900	85900	850
	50TTFJ10					1.5x2	37300	103000	990
	50TTFC10					2.5x2	57900	171000	1660
	50TTFL10					2.5x3	82000	257000	2440
	55TTFC10	55	50.2	6.35	56.8	2.5x2	61100	193000	1840
	55TTFL10					2.5x3	86600	289000	2710
	63TTFA10	63	58.2	6.35	64.8	2.5x1	35600	111000	1060
	63TTFJ10					1.5x2	41700	133000	1240
	63TTFC10					2.5x2	64700	222000	2050
	63TTFL10					2.5x3	91800	333000	3030
	80TTFA10	80	75.2	6.35	81.8	2.5x1	39000	139000	1270
	80TTFJ10					1.5x2	45600	167000	1490
	80TTFC10					2.5x2	70800	279000	2470
	80TTFL10					2.5x3	100000	419000	3640

NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm.
In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 10% amount of rated dynamic load Ca.
Stiffness of ball nut comes to be about 80% of applied stiffness.

Nut dimension											Model No.
D_1	D_2	L	F	U	P	J	M	N	A	Z	
48	71	124	13	5	59	5.5	9.5	5.5	27	M6x1	20TTFA10
58	85	127	15	8	71	6.6	11	6.5	32	M6x1	25TTFA10
		151									25TTFJ10
		147									25TTFB10
60	94	128	15	7	76	9	14	8.5	36	M6x1	28TTFA10
		152									28TTFJ10
74	108	130	15	7	90	9	14	8.5	41	M6x1	32TTFA10
		152									32TTFJ10
		190									32TTFC10
75	120	133	18	7	98	11	17.5	11	45	M6x1	36TTFA10
		155									36TTFJ10
		193									36TTFC10
82	124	133	18	7	102	11	17.5	11	47	PT1/8	40TTFA10
		155									40TTFJ10
		153									40TTFB10
		193									40TTFC10
88	132	193	18	7	110	11	17.5	11	50	PT1/8	45TTFC10
		253									45TTFL10
93	135	133	18	7	113	11	17.5	11	51	PT1/8	50TTFA10
		155									50TTFJ10
		193									50TTFC10
		253									50TTFL10
102	144	193	18	7	122	11	17.5	11	54	PT1/8	55TTFC10
		253									55TTFL10
108	154	137	22	7	130	14	20	13	58	PT1/8	63TTFA10
		159									63TTFJ10
		197									63TTFC10
		257									63TTFL10
130	176	137	22	7	152	14	20	13	66	PT1/8	80TTFA10
		159									80TTFJ10
		197									80TTFC10
		257									80TTFL10

PRECISION BALL SCREW STANDARD DIMENSION
TTF TYPE (DOUBLE-NUT PRELOAD)

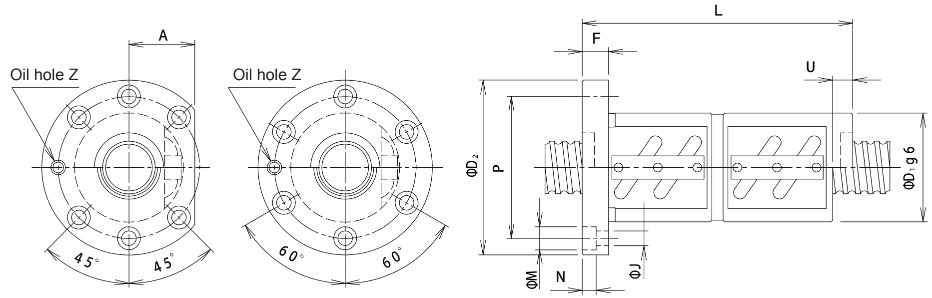


Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_0	Axial stiffness (N/μm) K
12	32TTFA12	32	27.2	6.35	33.8	2.5x1	25400	53500	580
	32TTFJ12					1.5x2	29700	64200	660
	40TTFA12	40	34.6	7.144	42.0	2.5x1	33600	76800	720
	40TTFJ12					1.5x2	39300	92200	830
	40TTFC12					2.5x2	61100	153000	1400
	45TTFA12	45	39.6	7.144	47.0	2.5x1	35400	85900	790
	45TTFC12					2.5x2	64300	171000	1530
	45TTFL12					2.5x3	91100	257000	2260
	50TTFA12	50	44.0	7.938	52.2	2.5x1	42800	106000	870
	50TTFJ12					1.5x2	50100	127000	1010
	50TTFC12					2.5x2	77800	212000	1690
	55TTFC12	55	49.6	7.144	57.0	2.5x2	71900	217000	1850
	55TTFL12					2.5x3	101000	325000	2720
	63TTFA12	63	57.0	7.938	65.2	2.5x1	47600	134000	1050
	63TTFJ12					1.5x2	55600	161000	1220
	63TTFC12					2.5x2	86400	268000	2040
	80TTFA12	80	74.0	7.938	82.2	2.5x1	53100	173000	1300
	80TTFJ12					1.5x2	62100	208000	1520
	80TTFC12					2.5x2	96400	347000	2530
	80TTFL12					2.5x3	136000	520000	3720
	100TTFA12	100	94.0	7.938	102.2	2.5x1	58300	218000	1570
	100TTFC12					2.5x2	105000	437000	3040
	100TTFL12					2.5x3	150000	655000	4480
16	40TTFA16	40	34.6	7.144	42.0	2.5x1	33500	76800	720
	40TTFJ16					1.5x2	39200	92200	830
	50TTFA16	50	44.0	7.938	52.2	2.5x1	42700	106000	870
	50TTFJ16					1.5x2	50000	127000	1010
	50TTFC16					2.5x2	77600	212000	1690
	63TTFA16	63	56.0	9.525	65.8	2.5x1	79700	223000	1360
	63TTFJ16					1.5x2	93200	268000	1570
	63TTFC16					2.5x2	144000	446000	2640

NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm.
In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 10% amount of rated dynamic load Ca.
Stiffness of ball nut comes to be about 80% of applied stiffness.

Nut dimension											Model No.
D_1	D_2	L	F	U	P	J	M	N	A	Z	
74	108	153	18	9	90	9	14	8.5	41	M6x1	32TTFA12
		181									32TTFJ12
86	128	153	18	9	106	11	17.5	11	48	PT1/8	40TTFA12
		182									40TTFJ12
		225									40TTFC12
90	132	155	18	8	110	11	17.5	11	50	PT1/8	45TTFA12
		227									45TTFC12
		299									45TTFL12
100	146	159	22	8	122	14	20	13	55	PT1/8	50TTFA12
		186									50TTFJ12
		231									50TTFC12
105	151	231	22	8	127	14	20	13	58	PT1/8	55TTFC12
		303									55TTFL12
115	161	159	22	8	137	14	20	13	61	PT1/8	63TTFA12
		186									63TTFJ12
		231									63TTFC12
136	182	176	22	8	158	14	20	13	68	PT1/8	80TTFA12
		200									80TTFJ12
		231									80TTFC12
		303									80TTFL12
160	220	182	28	8	188	18	26	17.5	82	PT1/8	100TTFA12
		237									100TTFC12
		309									100TTFL12
86	128	176	18	11	106	11	17.5	11	48	PT1/8	40TTFA16
		209									40TTFJ16
100	146	181	22	11	122	14	20	13	55	PT1/8	50TTFA16
		213									50TTFJ16
		277									50TTFC16
122	180	206	28	10	150	18	26	17.5	69	PT1/8	63TTFA16
		238									63TTFJ16
		302									63TTFC16

PRECISION BALL SCREW STANDARD DIMENSION
TTF TYPE (DOUBLE-NUT PRELOAD)



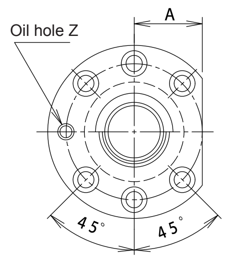
Notched flange　　Circle flange

NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm.
In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 10% amount of rated dynamic load Ca.
Stiffness of ball nut comes to be about 80% of applied stiffness.

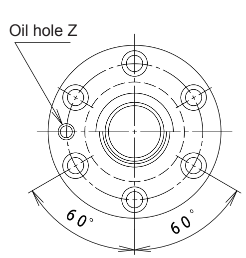
Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
16	80TTFA16	80	73.0	9.525	82.8	2.5x1	89800	290000	1700
	80TTFJ16					1.5x2	105000	348000	1970
	80TTFC16					2.5x2	163000	581000	3290
	80TTFL16					2.5x3	231000	871000	4850
	100TTFA16	100	93.0	9.525	102.8	2.5x1	97500	358000	2010
	100TTFC16					2.5x2	176000	716000	3980
	100TTFL16					2.5x3	250000	1070000	5730
	125TTFC16	125	118.0	9.525	127.8	2.5x2	196000	918000	4780
	125TTFL16					2.5x3	278000	1370000	7040
20	50TTFA20	50	44.0	7.938	52.2	2.5x1	42600	106000	870
	50TTFJ20					1.5x2	49800	127000	1010
	63TTFA20	63	56.0	9.525	65.8	2.5x1	79500	223000	1360
	63TTFJ20					1.5x2	93000	268000	1570
	63TTFC20					2.5x2	144000	446000	2640
	80TTFA20	80	73.0	9.525	82.8	2.5x1	89700	290000	1700
	80TTFJ20					1.5x2	104000	348000	1970
	80TTFC20					2.5x2	162000	581000	3290
	80TTFL20					2.5x3	230000	871000	4840
	100TTFA20	100	93.0	9.525	102.8	2.5x1	97400	358000	2010
	100TTFC20					2.5x2	176000	716000	3890
	100TTFL20					2.5x3	250000	1070000	5730
	125TTFC20	125	118.0	9.525	127.8	2.5x2	196000	917000	4780
	125TTFL20					2.5x3	278000	1370000	7040

Nut dimension											Model No.
D_1	D_2	L	F	U	P	J	M	N	A	Z	
143	204	206	28	10	172	18	26	17.5	77	PT1/8	80TTFA16
		238									80TTFJ16
		302									80TTFC16
		398									80TTFL16
170	243	210	32	10	205	22	32	21.5	91	PT1/8	100TTFA16
		306									100TTFC16
		402									100TTFL16
200	290	314	36	10	243	26	39	25.5	109	PT1/8	125TTFC16
		410									125TTFL16
100	146	227	28	17	122	14	20	13	55	PT1/8	50TTFA20
		267									50TTFJ20
122	180	227	28	17	150	18	26	17.5	69	PT1/8	63TTFA20
		267									63TTFJ20
		347									63TTFC20
143	204	227	28	17	172	18	26	17.5	77	PT1/8	80TTFA20
		267									80TTFJ20
		347									80TTFC20
		467									80TTFL20
170	243	231	32	17	205	22	32	21.5	91	PT1/8	100TTFA20
		351									100TTFC20
		471									100TTFL20
200	290	379	36	12	243	26	39	25.5	109	PT1/8	125TTFC20
		499									125TTFL20

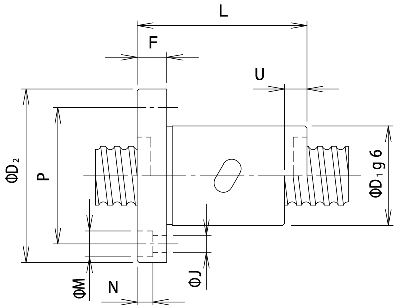
PRECISION BALL SCREW STANDARD DIMENSION
ZF TYPE (WITHOUT PRELOAD)



Notched flange



Circle flange

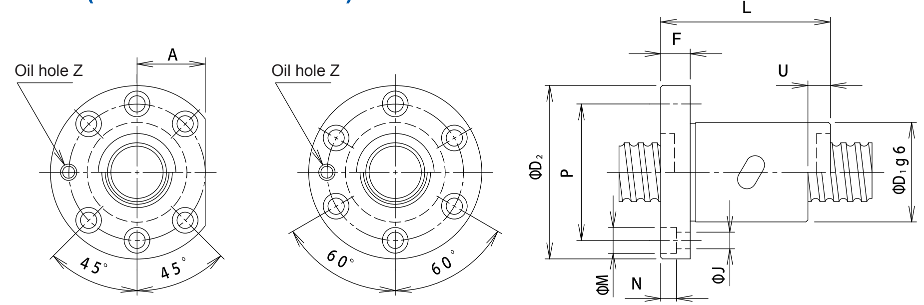


NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm.
In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial of 30% amount of rated dynamic load Ca is operated. Stiffness of ball nut comes to be about 80% of applied stiffness.

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
5	16ZF2S5	16	13.5	3.175	16.8	1x2	5270	8700	100
	16ZF3S5					1x3	7470	13000	150
	20ZF3S5	20	17.5	3.175	20.8	1x3	8650	17300	190
	20ZF4S5					1x4	11000	23000	250
	25ZF3S8	25	22.5	3.175	25.8	1x3	9850	22600	240
	25ZF4S5					1x4	12600	30200	320
	32ZF3S5	32	29.5	3.175	32.8	1x3	11100	30100	300
	32ZF4S5					1x4	14300	40200	400
	32ZF6S5					1x6	20300	60300	600
	40ZF4S5	40	37.5	3.175	40.8	1x4	15900	51700	490
	40ZF6S5					1x6	22600	77600	730
	50ZF4S5	50	47.5	3.175	50.8	1x4	17600	66000	600
	50ZF6S5					1x6	24900	99100	890
6	20ZF3S6	20	16.9	3.969	21.0	1x3	11100	20300	180
	20ZF4S6					1x4	14300	27100	240
	25ZF3S6	25	21.9	3.969	26.0	1x3	12900	27000	240
	25ZF4S6					1x4	16500	36000	310
	32ZF3S6	32	28.9	3.969	33.0	1x3	15000	37000	310
	32ZF4S6					1x4	19300	49400	410
	32ZF6S6					1x6	27300	74100	600
	40ZF4S6	40	36.9	3.969	41.0	1x4	21400	62900	500
	40ZF6S6					1x6	30300	94300	730
	50ZF4S6	50	46.9	3.969	51.0	1x4	23800	80800	610
	50ZF6S6					1x6	33700	121000	900
	63ZF4S6	63	59.9	3.969	64.0	1x4	26200	103000	740
	63ZF6S6					1x6	37200	154000	1100

Nut dimension											Model No.
D_1	D_2	L	F	U	P	J	M	N	A	Z	
30	49	37	10	5	39	4.5	8	4.5	-	M6x1	16ZF2S5
		44									16ZF3S5
35	58	46	11	5	46	5.5	9.5	5.5	23	M6x1	20ZF3S5
		51									20ZF4S5
40	63	46	11	5	51	5.5	9.5	5.5	24	M6x1	25ZF3S5
		51									25ZF4S5
48	75	47	12	5	61	6.6	11	6.5	29	M6x1	32ZF3S5
		52									32ZF4S5
		62									32ZF6S5
56	90	55	15	5	72	9	14	8.5	34	PT1/8	40ZF4S5
		65									40ZF6S5
66	100	55	15	5	82	9	14	8.5	38	PT1/8	50ZF4S5
		65									50ZF6S5
35	58	52	11	6	46	5.5	9.5	5.5	23	M6x1	20ZF3S6
		60									20ZF4S6
40	63	52	11	6	51	5.5	9.5	5.5	24	M6x1	25ZF3S6
		60									25ZF4S6
48	75	53	12	6	61	6.6	11	6.5	29	M6x1	32ZF3S6
		61									32ZF4S6
		73									32ZF6S6
56	90	64	15	6	72	9	14	8.5	34	PT1/8	40ZF4S6
		76									40ZF6S6
66	100	64	15	6	82	9	14	8.5	38	PT1/8	50ZF4S6
		76									50ZF6S6
80	122	67	18	6	100	11	17.5	11	47	PT1/8	63ZF4S6
		79									63ZF6S6

PRECISION BALL SCREW STANDARD DIMENSION
ZF TYPE (WITHOUT PRELOAD)



Notched flange

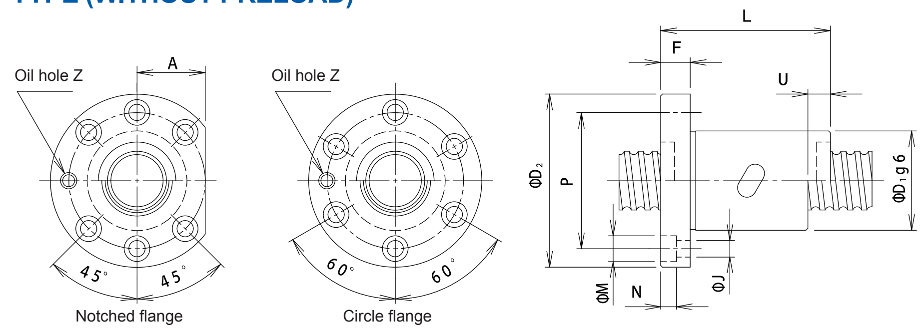
Circle flange

NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm.
In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial of 30% amount of rated dynamic load Ca is operated. Stiffness of ball nut comes to be about 80% of applied stiffness.

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
8	32ZF3S8	32	28.4	4.763	33.3	1x3	19100	43700	310
	32ZF4S8					1x4	24400	58300	410
	40ZF4S8	40	36.4	4.763	41.3	1x4	27300	74400	500
	40ZF6S8					1x6	38700	111000	740
	50ZF4S8	50	46.4	4.763	51.3	1x4	30100	93800	610
	50ZF6S8					1x6	42600	140000	900
	63ZF4S8	63	59.4	4.763	64.3	1x4	33800	122000	760
	63ZF6S8					1x6	47900	184000	1120
10	25ZF3S10	25	21.4	4.763	26.3	1x3	16100	31700	240
	32ZF3S10	32	27.2	6.35	33.8	1x3	25900	52200	290
	32ZF4S10					1x4	33200	69600	380
	40ZF3S10	40	35.2	6.35	41.8	1x3	30100	69300	370
	40ZF4S10					1x4	38500	92400	490
	50ZF3S10	50	45.2	6.35	51.8	1x3	34200	90700	460
	50ZF4S10					1x4	43800	120000	610
	50ZF6S10					1x6	62200	181000	900
	63ZF4S10	63	58.2	6.35	64.8	1x4	50000	160000	770
	63ZF6S10					1x6	70900	241000	1140
	80ZF4S10	80	75.2	6.35	81.8	1x4	55400	206000	950
	80ZF6S10					1x6	78600	310000	1400
	100ZF6S10	100	95.2	6.35	101.8	1x6	86900	396000	1700
12	40ZF3S12	40	34.6	7.144	42.0	1x3	34800	76800	370
	40ZF4S12					1x4	44600	102000	490
	50ZF3S12	50	44.0	7.938	52.2	1x3	45000	108000	460
	50ZF4S12					1x4	57600	144000	600
	63ZF4S12	63	57.0	7.938	65.2	1x4	65500	189000	750
	63ZF6S12					1x6	92800	283000	1110
	80ZF4S12	80	74.0	7.938	82.2	1x4	74500	251000	950
	80ZF6S12					1x6	105000	377000	1400
	100ZF4S12	100	94.0	7.938	102.2	1x4	82900	323000	1170
	100ZF6S12					1x6	117000	485000	1720

Nut dimension											Model No.
D_1	D_2	L	F	U	P	J	M	N	A	Z	
50	84	67	15	8	66	9	14	8.5	32	M6x1	32ZF3S8
		76									32ZF4S8
60	94	76	15	8	76	9	14	8.5	36	PT1/8	40ZF4S8
		93									40ZF6S8
70	112	79	18	8	90	11	17.5	11	43	PT1/8	50ZF4S8
		96									50ZF6S8
82	124	79	18	8	102	11	17.5	11	47	PT1/8	63ZF4S8
		96									63ZF6S8
42	69	80	15	10	55	6.6	11	6.5	26	M6x1	25ZF3S10
54	88	80	15	10	70	9	14	8.5	34	M6x1	32ZF3S10
		90									32ZF4S10
62	104	83	18	10	82	11	17.5	11	40	PT1/8	40ZF3S10
		93									40ZF4S10
72	114	83	18	10	92	11	17.5	11	44	PT1/8	50ZF3S10
		93									50ZF4S10
		114									50ZF6S10
85	131	97	22	10	107	14	20	13	50	PT1/8	63ZF4S10
		118									63ZF6S10
105	151	97	22	10	127	14	20	13	57	PT1/8	80ZF4S10
		118									80ZF6S10
125	171	118	22	10	147	14	20	13	64	PT1/8	100ZF6S10
70	112	90	18	12	90	11	17.5	11	44	PT1/8	40ZF3S12
		103									40ZF4S12
75	121	99	22	12	97	14	20	13	47	PT1/8	50ZF3S12
		111									50ZF4S12
90	136	111	22	12	112	14	20	13	52	PT1/8	63ZF4S12
		136									63ZF6S12
110	156	111	22	12	132	14	20	13	59	PT1/8	80ZF4S12
		136									80ZF6S12
130	188	114	28	12	158	18	26	17.5	71	PT1/8	100ZF4S12
		142									100ZF6S12

PRECISION BALL SCREW STANDARD DIMENSION
ZF TYPE (WITHOUT PRELOAD)

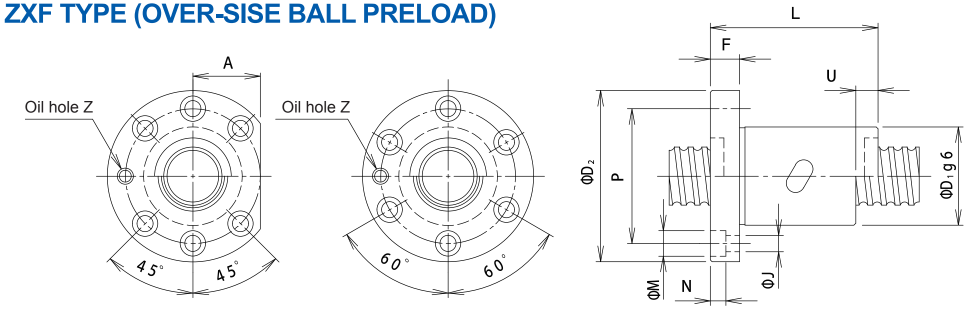


NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm.
In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial of 30% amount of rated dynamic load Ca is operated. Stiffness of ball nut comes to be about 80% of applied stiffness.

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
16	80ZF3S16	80	73.0	9.525	82.8	1x3	97100	309000	930
	80ZF4S16					1x4	124000	413000	1230
	100ZF4S16	100	93.0	9.525	102.8	1x4	137000	521000	1480
	100ZF6S16					1x6	194000	781000	2180
	125ZF6S16	125	118.0	9.525	127.8	1x6	218000	1020000	2720
20	50ZF3S20	50	44.0	7.938	52.2	1x3	44700	108000	450
	63ZF3S20	63	56.0	9.525	65.8	1x3	83900	229000	720
	80ZF3S20	80	73.0	9.525	82.8	1x3	97000	309000	930
	80ZF4S20					1x4	124000	413000	1230
	100ZF4S20	100	93.0	9.525	102.8	1x4	136000	521000	1480
	125ZF6S20	125	118.0	9.525	127.8	1x6	218000	1020000	2720

Nut dimension											Model No.
D_1	D_2	L	F	U	P	J	M	N	A	Z	
115	174	126	28	16	143	18	26	17.5	66	PT1/8	80ZF3S16
		146									80ZF4S16
135	205	150	32	16	169	22	32	21.5	79	PT1/8	100ZF4S16
		190									100ZF6S16
160	250	194	36	16	203	26	39	25.5	97	PT1/8	125ZF6S16
75	121	146	28	20	97	14	20	13	47	PT1/8	50ZF3S20
95	153	146	28	20	123	18	26	17.5	59	PT1/8	63ZF3S20
115	173	146	28	20	143	18	26	17.5	66	PT1/8	80ZF3S20
		168									80ZF4S20
135	205	172	32	20	169	22	32	21.5	79	PT1/8	100ZF4S20
160	250	220	36	20	203	26	39	25.5	97	PT1/8	125ZF6S20

PRECISION BALL SCREW STANDARD DIMENSION
ZXF TYPE (OVER-SISE BALL PRELOAD)



Notched flange

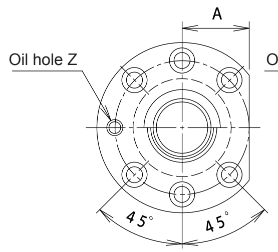
Circle flange

NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm.
In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 5% amount of rated dynamic load Ca.
Stiffness of ball nut comes to be about 80% of applied stiffness.

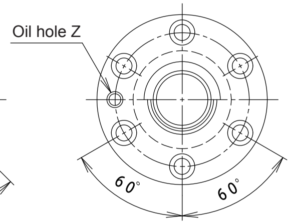
Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
5	16ZXF2S5	16	13.5	3.175	16.8	1x2	5270	8700	160
	16ZXF3S5					1x3	7470	13000	230
	20ZXF3S5	20	17.5	3.175	20.8	1x3	8650	17300	300
	20ZXF4S5					1x4	11000	23000	400
	25ZXF3S5	25	22.5	3.175	25.8	1x3	9850	22600	380
	25ZXF4S5					1x4	12600	30200	500
	32ZXF3S5	32	29.5	3.175	32.8	1x3	11100	30100	470
	32ZXF4S5					1x4	14300	40200	630
	32ZXF6S5					1x6	20300	60300	930
	40ZXF4S5	40	37.5	3.175	40.8	1x4	15900	51700	770
	40ZXF6S5					1x6	22600	77600	1140
6	20ZXF3S6	20	16.9	3.969	21.0	1x3	11100	20300	290
	20ZXF4S6					1x4	14300	27100	380
	25ZXF3S6	25	21.9	3.969	26.0	1x3	12900	27000	370
	25ZXF4S6					1x4	16500	36000	490
	32ZXF3S6	32	28.9	3.969	33.0	1x3	15000	37000	480
	32ZXF4S6					1x4	19300	49400	640
	32ZXF6S6					1x6	27300	74100	940
	40ZXF4S6	40	36.9	3.969	41.0	1x4	21400	62900	780
	40ZXF6S6					1x6	30300	94300	1140
8	32ZXF3S8	32	28.4	4.763	33.3	1x3	19100	43700	490
	32ZXF4S8					1x4	24400	58300	640
	40ZXF4S8	40	36.4	4.763	41.3	1x4	27300	74400	780
	40ZXF6S8					1x6	38700	111000	1160
10	25ZXF3S10	25	21.4	4.763	26.3	1x3	16100	31700	370
	32ZXF3S10	32	27.2	6.35	33.8	1x3	25900	52200	450
	32ZXF4S10					1x4	33200	69600	600
	40ZXF3S10	40	35.2	6.35	41.8	1x3	30100	69300	580
	40ZXF4S10					1x4	38500	92400	760
12	40ZXF3S12	40	34.6	7.144	42.0	1x3	34800	76800	580
	40ZXF4S12					1x4	44600	102000	760

Nut dimension											Model No.
D_1	D_2	L	F	U	P	J	M	N	A	Z	
30	49	37	10	5	39	4.5	8	4.5	-	M6x1	16ZXF2S5
		44									16ZXF3S5
35	58	46	11	5	46	5.5	9.5	5.5	23	M6x1	20ZXF3S5
		51									20ZXF4S5
40	63	46	11	5	51	5.5	9.5	5.5	24	M6x1	25ZXF3S5
		51									25ZXF4S5
48	75	47	12	5	61	6.6	11	6.5	29	M6x1	32ZXF3S5
		52									32ZXF4S5
		62									32ZXF6S5
56	90	55	15	5	72	9	14	8.5	34	PT1/8	40ZXF4S5
		65									40ZXF6S5
35	58	52	11	6	46	5.5	9.5	5.5	23	M6x1	20ZXF3S6
		60									20ZXF4S6
40	63	52	11	6	51	5.5	9.5	5.5	24	M6x1	25ZXF3S6
		60									25ZXF4S6
48	75	53	12	6	61	6.6	11	6.5	29	M6x1	32ZXF3S6
		61									32ZXF4S6
		73									32ZXF6S6
56	90	64	15	6	72	9	14	8.5	34	PT1/8	40ZXF4S6
		76									40ZXF6S6
50	84	67	15	8	66	9	14	8.5	32	M6x1	32ZXF3S8
		76									32ZXF4S8
60	94	76	15	8	76	9	14	8.5	36	PT1/8	40ZXF4S8
		93									40ZXF6S8
42	69	80	15	10	55	6.6	11	6.5	26	M6x1	25ZXF3S10
54	88	80	15	10	70	9	14	8.5	34	M6x1	32ZXF3S10
		90									32ZXF4S10
62	104	83	18	10	82	11	17.5	11	40	PT1/8	40ZXF3S10
		93									40ZXF4S10
70	112	90	18	12	85	9	14	8.5	44	PT1/8	40ZXF3S12
		103									40ZXF4S12

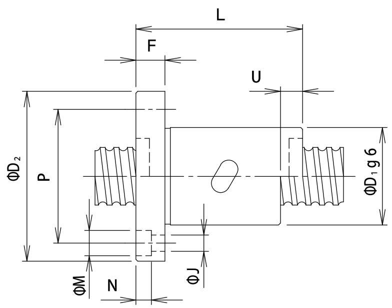
PRECISION BALL SCREW STANDARD DIMENSION
ZIF TYPE (INTRGRAL NUT PRELOAD)



Notched flange



Circle flange

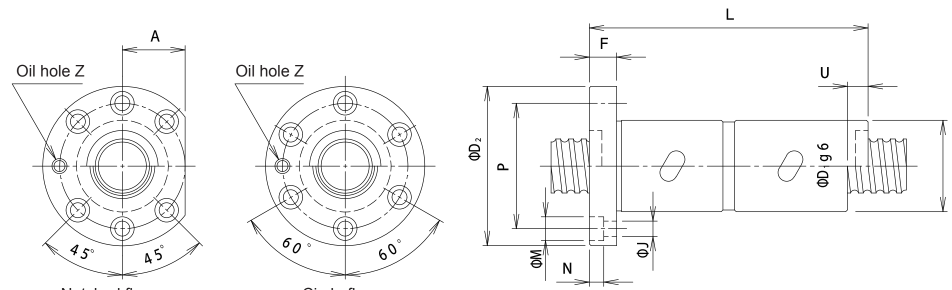


NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm.
In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 10% amount of rated dynamic load Ca.
Stiffness of ball nut comes to be about 80% of applied stiffness.

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
5	20ZIF6S5	20	17.5	3.175	20.8	1x3	8650	17300	380
	25ZIF6S5	25	22.5	3.175	25.8	1x3	9850	22600	480
	32ZIF6S5	32	29.5	3.175	32.8	1x3	11100	30100	600
	32ZIF8S5					1x4	14300	40200	790
	40ZIF8S5	40	37.5	3.175	40.8	1x4	15900	51700	970
	40ZIF12S5					1x6	22600	77600	1440
	50ZIF8S5	50	47.5	3.175	50.8	1x4	17600	66000	1190
	50ZIF12S5					1x6	24900	99100	1750
6	20ZIF6S6	20	16.9	3.969	21.0	1x3	11100	20300	370
	25ZIF6S6	25	21.9	3.969	26.0	1x3	12900	27000	470
	32ZIF6S6	32	28.9	3.969	33.0	1x3	15000	37000	610
	32ZIF8S6					1x4	19300	49400	810
	40ZIF8S6	40	36.9	3.969	41.0	1x4	21400	62900	980
	40ZIF12S6					1x6	30300	94300	1440
	50ZIF8S6	50	46.9	3.969	51.0	1x4	23800	80800	1200
	50ZIF12S6					1x6	33700	121000	1770
	63ZIF8S6	63	59.9	3.969	64.0	1x4	26200	103000	1460
	63ZIF12S6					1x6	37200	154000	2160
8	32ZIF6S8	32	28.4	4.763	33.3	1x3	19100	43700	610
	32ZIF8S8					1x4	24400	58300	810
	40ZIF8S8	40	36.4	4.763	41.3	1x4	27300	74400	990
	50ZIF8S8	50	46.4	4.763	51.3	1x4	30100	93800	1200
	63ZIF8S8	63	59.4	4.763	64.3	1x4	33800	122000	1490
10	25ZIF4S10	25	21.4	4.763	26.3	1x2	11300	21100	310
	32ZIF6S10	32	27.2	6.35	33.8	1x3	25900	52200	570
	40ZIF6S10	40	35.2	6.35	41.8	1x3	30100	69300	730
	40ZIF8S10					1x4	38500	92400	960
	50ZIF6S10	50	45.2	6.35	51.8	1x3	34200	90700	910
	50ZIF8S10					1x4	43800	120000	1200
	63ZIF8S10	63	58.2	6.35	64.8	1x4	50000	160000	1520
12	40ZIF6S12	40	34.6	7.144	42.0	1x3	34800	76800	730
	50ZIF6S12	50	44.0	7.938	52.2	1x3	45000	108000	900
	63ZIF6S12	63	57.0	7.938	65.2	1x3	51100	141000	1130

Nut dimension											Model No.
D_1	D_2	L	F	U	P	J	M	N	A	Z	
35	58	66	11	5	46	5.5	9.5	5.5	23	M6x1	20ZIF6S5
40	63	66	11	5	51	5.5	9.5	5.5	24	M6x1	25ZIF6S5
46	75	67	12	5	61	6.6	11	6.5	29	M6x1	32ZIF6S5
		77									32ZIF8S5
56	90	80	15	5	72	9	14	8.5	34	PT1/8	40ZIF8S5
		101									40ZIF12S5
66	100	80	15	5	82	9	14	8.5	38	PT1/8	50ZIF8S5
		101									50ZIF12S5
35	58	76	11	6	46	5.5	9.5	5.5	23	M6x1	20ZIF6S6
40	63	76	11	6	51	5.5	9.5	5.5	24	M6x1	25ZIF6S6
48	75	77	12	6	61	6.6	11	6.5	29	M6x1	32ZIF6S6
		90									32ZIF8S6
56	90	93	15	6	72	9	14	8.5	34	PT1/8	40ZIF8S6
		118									40ZIF12S6
66	100	93	15	6	82	9	14	8.5	38	PT1/8	50ZIF8S6
		118									50ZIF12S6
80	122	96	18	6	100	11	17.5	11	47	PT1/8	63ZIF8S6
		121									63ZIF12S6
50	84	99	15	8	66	9	14	8.5	32	M6x1	32ZIF6S8
		116									32ZIF8S8
60	94	116	15	8	76	9	14	8.5	36	PT1/8	40ZIF8S8
70	112	119	18	8	90	11	17.5	11	43	PT1/8	50ZIF8S8
82	124	119	18	8	102	11	17.5	11	47	PT1/8	63ZIF8S8
42	69	88	15	10	55	6.6	11	6.5	26	M6x1	25ZIF4S10
54	88	120	15	10	70	9	14	8.5	34	M6x1	32ZIF6S10
62	104	123	18	10	82	11	17.5	11	40	PT1/8	40ZIF6S10
		143									40ZIF8S10
72	114	123	18	10	92	11	17.5	11	44	PT1/8	50ZIF6S10
		143									50ZIF8S10
85	131	147	22	10	107	14	20	13	50	PT1/8	63ZIF8S10
70	112	136	18	12	90	11	17.5	11	44	M6x1	40ZIF6S12
75	121	147	22	12	97	14	20	13	47	PT1/8	50ZIF6S12
90	136	147	22	12	112	14	20	13	52	PT1/8	63ZIF6S12

PRECISION BALL SCREW STANDARD DIMENSION
ZZF TYPE (DOUBLE NUT PRELOAD)



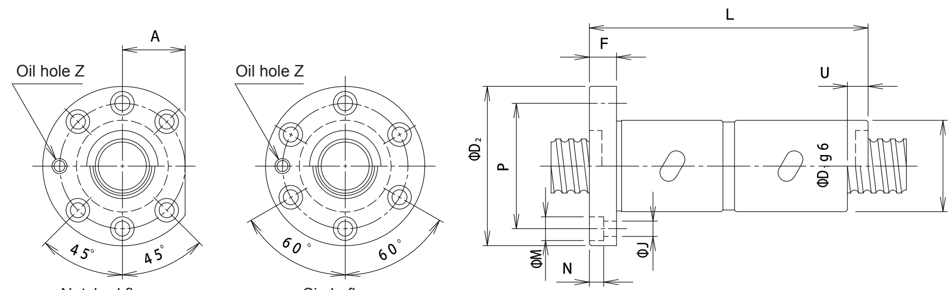
Notched flange   Circle flange

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
5	16ZZF2S5	16	13.5	3.175	16.8	1x2	5270	8700	200
	16ZZF3S5					1x3	7470	13000	300
	20ZZF3S5	20	17.5	3.175	20.8	1x3	8650	17300	380
	20ZZF4S5					1x4	11000	23100	500
	25ZZF3S5	25	22.5	3.175	25.8	1x3	9850	22600	480
	25ZZF4S5					1x4	12600	30200	630
	32ZZF3S5	32	29.5	3.175	32.8	1x3	11100	30100	600
	32ZZF4S5					1x4	14300	40200	790
	32ZZF6S5					1x6	20300	60300	1170
	40ZZF4S5	40	37.5	3.175	40.8	1x4	15900	51700	970
	40ZZF6S5					1x6	22600	77600	1440
	50ZZF4S5	50	47.5	3.175	50.8	1x4	17600	66000	1190
	50ZZF6S5					1x6	24900	99100	1750
6	20ZZF3S6	20	16.9	3.969	21.0	1x3	11100	20300	370
	20ZZF4S6					1x4	14300	27200	480
	25ZZF3S6	25	21.9	3.969	26.0	1x3	12900	27000	470
	25ZZF4S6					1x4	16500	36100	620
	32ZZF3S6	32	28.9	3.969	33.0	1x3	15000	37000	610
	32ZZF4S6					1x4	19300	49400	810
	32ZZF6S6					1x6	27300	74100	1190
	40ZZF4S6	40	36.9	3.969	41.0	1x4	21400	62900	980
	40ZZF6S6					1x6	30300	94300	1440
	50ZZF4S6	50	46.9	3.969	51.0	1x4	23800	80800	1200
	50ZZF6S6					1x6	33700	121000	1770
	63ZZF4S6	63	59.9	3.969	64.0	1x4	26200	103000	1460
	63ZZF6S6					1x6	37200	154000	2160

NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm.
In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 10% amount of rated dynamic load Ca.
Stiffness of ball nut comes to be about 80% of applied stiffness.

Nut dimension											Model No.
D_1	D_2	L	F	U	P	J	M	N	A	Z	
33	52	62	10	7	42	4.5	8	4.5	-	M6x1	16ZZF2S6
		76									16ZZF3S6
41	64	81	11	5	52	5.5	9.5	5.5	25	M6x1	20ZZF3S5
		91									20ZZF4S5
46	69	81	11	5	57	5.5	9.5	5.5	26	M6x1	25ZZF3S5
		91									25ZZF4S5
53	80	82	12	5	66	6.6	11	6.5	30	M6x1	32ZZF3S5
		92									32ZZF4S5
		112									32ZZF6S5
62	96	95	15	5	78	9	14	8.5	37	PT1/8	40ZZF4S5
		115									40ZZF6S5
72	106	96	15	5	88	9	14	8.5	40	PT1/8	50ZZF4S5
		115									50ZZF6S5
42	65	92	11	6	53	5.5	9.5	5.5	25	M6x1	20ZZF3S6
		108									20ZZF4S6
47	70	92	11	6	58	5.5	9.5	5.5	27	M6x1	25ZZF3S6
		108									25ZZF4S6
54	81	93	12	6	67	6.6	11	6.5	31	M6x1	32ZZF3S6
		109									32ZZF4S6
		133									32ZZF6S6
62	96	112	15	6	78	9	14	8.5	37	PT1/8	40ZZF4S6
		136									40ZZF6S6
72	106	112	15	6	88	9	14	8.5	40	PT1/8	50ZZF4S6
		136									50ZZF6S6
85	127	118	18	6	105	11	17.5	11	48	PT1/8	63ZZF4S6
		142									63ZZF6S6

PRECISION BALL SCREW STANDARD DIMENSION
ZZF TYPE (DOUBLE NUT PRELOAD)



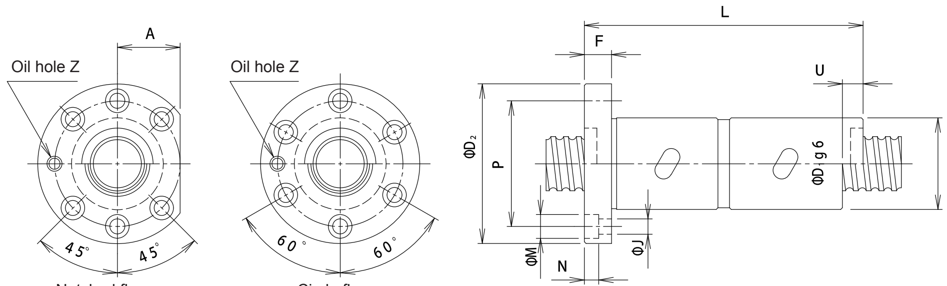
Notched flange   Circle flange

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
8	32ZZF3S8	32	28.4	4.763	33.3	1x3	19100	43700	610
	32ZZF4S8					1x4	24400	58300	810
	40ZZF4S8	40	36.4	4.763	41.3	1x4	27300	74400	990
	40ZZF6S8					1x6	38700	111000	1460
	50ZZF4S8	50	46.4	4.763	51.3	1x4	30100	93800	1200
	50ZZF6S8					1x6	42600	140000	1760
	60ZZF4S8	63	59.4	4.763	64.3	1x4	33800	122000	1490
	63ZZF6S8					1x6	47900	184000	2190
10	25ZZF3S10	25	21.4	4.763	26.3	1x3	16100	31700	470
	32ZZF3S10	32	27.2	6.35	33.8	1x3	25900	52200	570
	32ZZF4S10					1x4	33200	69600	750
	40ZZF3S10	40	35.2	6.35	41.8	1x3	30100	69300	730
	40ZZF4S10					1x4	38500	92400	960
	50ZZF3S10	50	45.2	6.35	51.8	1x3	34200	90700	910
	50ZZF4S10					1x4	43800	120000	1200
	50ZZF6S10					1x6	62200	181000	1770
	63ZZF4S10	63	58.2	6.35	64.8	1x4	50000	160000	1520
	63ZZF6S10					1x6	70900	241000	2250
	80ZZF4S10	80	75.2	6.35	81.8	1x4	55400	206000	1860
	80ZZF6S10					1x6	78600	310000	2750
	100ZZF6S10	100	95.2	6.35	101.8	1x6	86900	396000	3350
12	40ZZF3S12	40	34.6	7.144	42.0	1x3	34800	76800	730
	40ZZF4S12					1x4	44600	102000	960
	50ZZF3S12	50	44.0	7.938	52.2	1x3	45000	108000	900
	50ZZF4S12					1x4	57600	144000	1180
	63ZZF4S12	63	57.0	7.938	65.2	1x4	65500	189000	1480
	63ZZF6S12					1x6	92800	283000	2180
	80ZZF4S10	80	74.0	7.938	82.2	1x4	74500	251000	1880
	80ZZF6S10					1x6	105000	377000	2760
	100ZZF4S10	100	94.0	7.938	102.2	1x4	82900	323000	2300
	100ZZF6S10					1x6	117000	485000	3380

NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm.
In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 10% amount of rated dynamic load Ca.
Stiffness of ball nut comes to be about 80% of applied stiffness.

Nut dimension											Model No.
D_1	D_2	L	F	U	P	J	M	N	A	Z	
54	88	116	15	8	70	9	14	8.5	34	M6x1	32ZZF3S8
		134									32ZZF4S8
62	96	134	15	8	78	9	14	8.5	37	PT1/8	40ZZF4S8
		168									40ZZF6S8
72	114	137	18	8	92	11	17.5	11	44	PT1/8	50ZZF4S8
		171									50ZZF6S8
85	127	141	18	8	105	11	17.5	11	48	PT1/8	63ZZF4S8
		175									63ZZF6S8
47	74	140	15	10	60	6.6	11	6.5	28	M6x1	25ZZF3S10
54	88	140	15	10	70	9	14	8.5	34	M6x1	32ZZF3S10
		160									32ZZF4S10
62	104	143	18	10	82	11	17.5	11	40	PT1/8	40ZZF3S10
		163									40ZZF4S10
72	114	143	18	10	92	11	17.5	11	44	PT1/8	50ZZF3S10
		163									50ZZF4S10
		205									50ZZF6S10
85	131	172	22	10	107	14	20	13	50	PT1/8	63ZZF4S10
		214									63ZZF6S10
105	151	172	22	10	127	14	20	13	57	PT1/8	80ZZF4S10
		214									80ZZF6S10
125	171	214	22	10	147	14	20	13	64	PT1/8	100ZZF6S10
70	112	158	18	12	90	11	17.5	11	44	PT1/8	40ZZF3S12
		186									40ZZF4S12
75	121	171	22	12	97	14	20	13	47	PT1/8	50ZZF3S12
		195									50ZZF4S12
90	136	195	22	12	112	14	20	13	52	PT1/8	63ZZF4S12
		248									63ZZF6S12
110	156	195	22	12	132	14	20	13	59	PT1/8	80ZZF4S12
		248									80ZZF6S12
130	188	201	28	12	158	18	26	17.5	71	PT1/8	100ZZF4S12
		254									100ZZF6S12

PRECISION BALL SCREW STANDARD DIMENSION
ZZF TYPE (DOUBLE NUT PRELOAD)



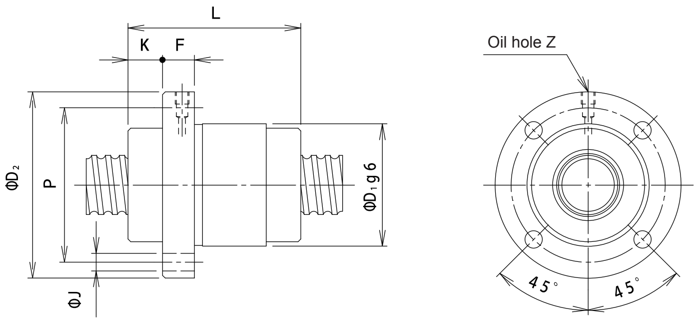
Notched flange　Circle flange

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
16	80ZZF3S16	80	73.0	9.525	82.8	1x3	97100	309000	1830
	80ZZF4S16					1x4	124000	413000	2410
	100ZZF4S16	100	93.0	9.525	102.8	1x4	137000	521000	2910
	100ZZF6S16					1x6	194000	781000	4280
	125ZZF6S16	125	118.0	9.525	127.8	1x6	218000	1020000	5340
20	50ZZF3S20	50	44.0	7.938	52.2	1x3	44700	108000	900
	63ZZF3S20	63	56.0	9.525	65.8	1x3	83900	229000	1430
	80ZZF3S20	80	73.0	9.525	82.8	1x3	97000	310000	1830
	80ZZF4S20					1x4	124000	413000	2410
	100ZZF4S20	100	93.0	9.525	102.8	1x4	136000	521000	2900
	125ZZF6S20	125	118.0	9.525	127.8	1x6	218000	1020000	5340

NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm.
In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 10% amount of rated dynamic load Ca.
Stiffness of ball nut comes to be about 80% of applied stiffness.

Nut dimension											Model No.
D_1	D_2	L	F	U	P	J	M	N	A	Z	
115	174	216	28	16	143	18	26	17.5	66	PT1/8	80ZZF3S16
		256									80ZZF4S16
135	205	260	32	16	169	22	32	21.5	79	PT1/8	100ZZF4S16
		340									100ZZF6S16
160	250	344	36	16	203	26	39	25.5	97	PT1/8	125ZZF6S16
75	121	253	28	20	97	14	20	13	47	PT1/8	50ZZF3S20
95	153	253	28	20	123	18	26	17.5	59	PT1/8	63ZZF3S20
115	173	253	28	20	143	18	26	17.5	66	PT1/8	80ZZF3S20
		297									80ZZF4S20
135	205	301	32	20	169	22	32	21.5	79	PT1/8	100ZZF4S20
160	250	406	36	20	203	26	39	25.5	97	PT1/8	125ZZF6S20

PRECISION BALL SCREW STANDARD DIMENSION
EF TYPE (NO PRELOAD)



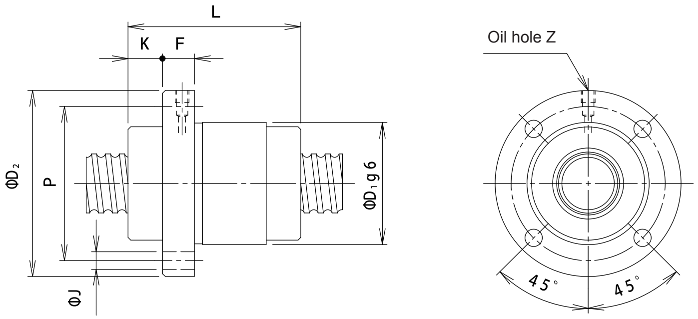
NOTE 1. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of 30% amount of rated dynamic load Ca is operated.
Stiffness of ball nut comes to be about 80% of applied stiffness.

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
6	8EF3D6	8	6.6	1.588	8.3	2.7x2	3200	5390	150
12	8EF2D12	8	6.6	1.588	8.3	1.7x2	2200	3320	100
20	15EF2S20	15	12.5	3.175	15.8	1.7x1	4860	9050	100
	15EF2D20					1.7x2	8100	15700	200
	20EF2D20	20	17.5	3.175	20.8	1.7x2	9700	21100	260
	20EF2Q20					1.7x4	17500	42200	500
	36EF3S20	36	31.2	6.35	37.8	2.7x1	28600	65600	360
	36EF3D20					2.7x2	48100	114000	690
24	38EF3S24	38	33.2	6.35	39.8	2.7x1	30300	73100	400
	38EF3D24					2.7x2	50900	127000	760
25	25EF2D25	25	21.9	3.969	26.0	1.7x2	14500	32900	320
	25EF2Q25					1.7x4	26200	65900	620
	25EF3S25					2.7x1	12800	30000	260
	32EF2S25	32	28.4	4.763	33.3	1.7x1	12500	28600	210
	32EF2D25					1.7x2	21000	49900	400
30	15EF1D30	15	12.5	3.175	15.8	0.7x2	3900	6360	90
	20EF2D30	20	17.5	3.175	20.8	1.7x2	9900	19200	270
	38EF2S30	38	33.2	6.35	39.8	1.7x1	20100	46000	250
	38EF3S30					2.7x1	29900	73100	400
	38EF3D30					2.7x2	50300	127000	760

Nut dimension								Model No.
D_1	D_2	L	K	F	P	J	Z	
18	31	24	5	9	25	3.4	-	8EF3D6
18	31	27	5	9	25	3.4	-	8EF2D12
34	55	45	7	10	45	5.5	M6x1	15EF2S20
								15EF2D20
39	62	47	10	10	50	5.5	M6x1	20EF2D20
								20EF2Q20
70	110	76	20	18	90	11	M6x1	36EF3S20
								36EF3D20
72	108	108	30	18	90	9	PT1/8	38EF3S24
								38EF3D24
47	74	56	11	12	60	6.6	M6x1	25EF2D25
								25EF2Q25
		81			61			25EF3S25
72	108	64	16	18	90	9	PT1/8	32EF2S25
								32EF2S25
32	53	34	6	10	43	5.5	M6x1	15EF1D30
39	59	71	12	10	49	5.5	M6x1	20EF2D30
72	108	96	30	18	90	9	PT1/8	38EF2S30
		126						38EF3S30
								38EF3D30

Ball screw

PRECISION BALL SCREW STANDARD DIMENSION
EF TYPE (NO PRELOAD)



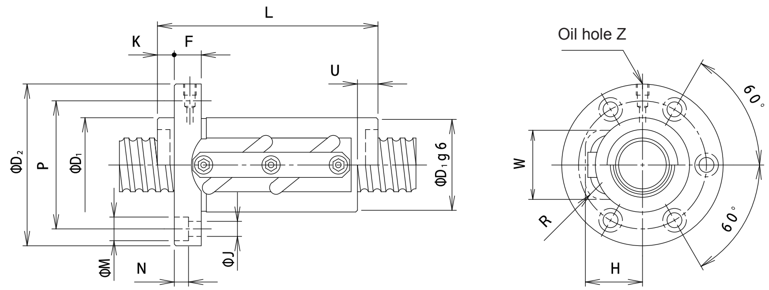
Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
32	16EF1D32	16	13.7	2.778	16.6	0.7x2	3100	5440	90
	16EF1Q32					0.7x4	5800	10800	180
	16EF2D32	16	13.7	2.778	16.6	1.7x2	6700	13200	210
	16EF2Q32					1.7x4	12400	26400	420
36	38EF2S36	38	33.2	6.35	39.8	1.7x1	19700	46000	250
	38EF2D36					1.7x2	33200	80100	480
40	20EF1D40	20	17.5	3.175	20.8	0.7x2	4500	8650	120
	20EF1Q40					0.7x4	8300	17300	230
	20EF2D40	20	17.5	3.175	20.8	1.7x2	9600	21000	280
	20EF2Q40					1.7x4	17900	42000	550
	38EF2S40	38	33.2	6.35	39.8	1.7x1	19500	46000	250
	38EF2D40					1.7x2	32800	80100	480
50	25EF1D50	25	21.9	3.969	26.0	0.7x2	6700	13500	140
	25EF1Q50					0.7x4	12500	27000	280
	25EF2Q50	25	21.9	3.969	26.0	1.7x4	26800	65600	680
	50EF2S50	50	44.0	7.938	52.2	1.7x1	30100	75800	320
	50EF2D50					1.7x2	50600	131000	610
60	20EF1D60	20	17.5	3.175	20.8	0.7x2	4500	8650	130
	20EF1Q60					0.7x4	8300	17300	260

NOTE 1. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of 30% amount of rated dynamic load Ca is operated.
Stiffness of ball nut comes to be about 80% of applied stiffness.

Nut dimension								Model No.
D_1	D_2	L	K	F	P	J	Z	
34	55	37	9	10	45	5.5	M6x1	16EF1D32
								16EF1Q32
34	55	69	9	10	45	5.5	M6x1	16EF2D32
								16EF2Q32
72	108	80	16	18	90	9	PT1/8	38EF2S36
								38EF2D36
38	58	45	10	10	48	5.5	M6x1	20EF1D40
								20EF1Q40
38	58	85	10	10	48	5.5	M6x1	20EF2D40
								20EF2Q40
72	108	88	16	18	90	9	PT1/8	38EF2S40
								38EF2D40
46	70	55	12	12	58	6.6	M6x1	25EF1D50
								25EF1Q50
		105						25EF2Q50
90	135	118	25	22	112	14	PT1/8	50EF2S50
								50EF2D50
37	57	54	6	10	47	5.5	M6x1	20EF1D60
								20EF1Q60

PRECISION BALL SCREW STANDARD DIMENSION
NF TYPE(NO PRELOAD)

HIGH LEAD



NOTE 1. Wiper is installed as standard specification and total nut length shows L mm.In case wiper is not required, it is (L-K-U) mm.

2.. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about 30% amount of rated dynamic load Ca is operated.

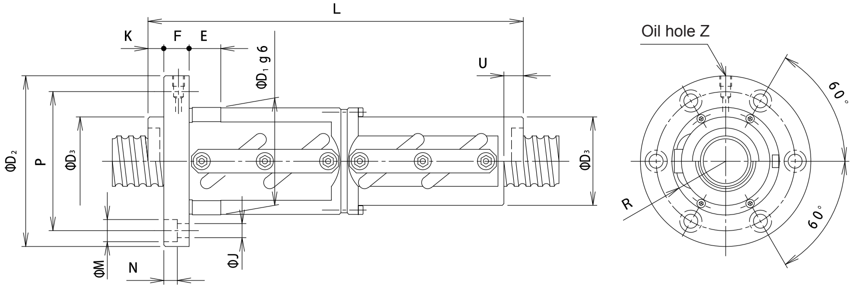
Stiffness of ball nut comes to be about 80% of applied stiffness.

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
12	20NFA12	20	17.5	3.175	20.8	2.5×1	8100	16900	180
	20NFJ12					1.5×2	9470	20300	210
16	16NFU16	16	13.5	3.175	16.8	1.5×1	4670	8530	90
	20NFU16	20	17.5	3.175	20.8	1.5×1	5300	10600	110
	25NFA16	25	21.4	4.763	26.3	2.5×1	15400	32100	230
	25NFJ16					1.5×2	18100	38500	270
20	25NFA20	25	21.4	4.763	26.3	2.5×1	15200	32100	230
	25NFJ20					1.5×2	17800	38500	260
	32NFA20	32	28.4	4.763	33.3	2.5×1	17600	42100	290
	32NFJ20					1.5×2	20600	50600	340
24	38NFA24	38	33.2	6.35	39.8	2.5×1	28300	67700	360
25	25NFU25	25	21.4	4.763	26.3	1.5×1	10000	20400	140
	32NFA25	32	28.4	4.763	33.3	2.5×1	17400	42100	290
	32NFJ25					1.5×2	20300	50600	340
	40NFA25	40	35.2	6.35	41.8	2.5×1	29000	71300	370
	40NFJ25					1.5×2	34000	85600	430
32	32NFU32	32	28.4	4.763	33.3	1.5×1	10900	25300	170
	40NFA32	40	35.2	6.35	41.8	2.5×1	28600	71300	370
	50NFA32	50	44.0	7.938	52.2	2.5×1	43400	111000	460
	50NFJ32					1.5×2	50700	133000	530
40	40NFU40	40	35.2	6.35	41.8	1.5×1	18000	42800	220
	50NFA40	50	44.0	7.938	52.2	2.5×1	42800	111000	450
50	50NFU50	50	44.0	7.938	52.2	1.5×1	27000	66800	270

Nut dimension														Model No.
D_1	D_2	L	K	F	U	P	J	M	N	W	H	R	Z	
34	60	72	8	10	6	47	5.5	9.5	5.5	26	23	8	M6×1	20NFA12
		84												20NFJ12
34	57	72	8	12	6	45	5.5	9.5	5.5	26	19	8	M6×1	16NFU16
34	60	70	8	10	8	47	5.5	9.5	5.5	26	23	8	M6×1	20NFU16
44	71	90	10	12	8	57	6.6	11	6.5	34	30	10	M6×1	25NFA16
		106												25NFJ16
44	71	107	10	12	10	57	6.6	11	6.5	34	30	10	M6×1	25NFA20
		127												25NFJ20
56	90	107	10	15	10	72	9	14	8.5	41	34	12	M6×1	32NFA20
		127												32NFJ20
60	102	126	12	18	12	80	11	17.5	11	48	42	15	M6×1	38NFA24
44	71	107	12	12	12	57	6.6	11	6.5	34	30	10	M6×1	25NFU25
56	90	132	12	15	12	72	9	14	8.5	41	34	12	M6×1	32NFA25
		157												32NFJ25
65	107	131	12	18	12	85	11	17.5	11	51	41	15	PT1/8	40NFA25
		156												40NFJ25
56	90	119	15	15	15	72	9	14	8.5	41	34	12	M6×1	32NFU32
65	107	167	15	18	15	85	11	17.5	11	51	41	15	PT1/8	40NFA32
80	126	168	15	20	15	102	14	20	13	64	52	16	PT1/8	50NFA32
		200												50NFJ32
65	107	146	17	18	21	85	11	17.5	11	51	41	15	PT1/8	40NFU40
80	126	199	17	20	20	102	14	20	13	64	52	16	PT1/8	50NFA40
80	126	188	20	20	26	102	14	20	13	64	52	16	PT1/8	50NFU50

PRECISION BALL SCREW STANDARD DIMENSION
NNF TYPE (DOUBLE NUT PERLOAD)

HIGH LEAD



Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
12	20NNFA12	20	17.5	3.175	20.8	2.5×1	8100	16900	370
	20NNFJ12					1.5×2	9470	20300	420
16	20NNFU16	25	17.5	3.175	20.8	1.5×1	5300	10600	220
	25NNFA16	25	21.4	4.763	26.3	2.5×1	15400	32100	460
	25NNFJ16					1.5×2	18100	38500	530
20	25NNFA20	25	21.4	4.763	26.3	2.5×1	15200	32100	460
	25NNFJ20					1.5×2	17800	38500	520
	32NNFA20	32	28.4	4.763	33.3	2.5×1	17600	42100	580
	32NNFJ20					1.5×2	20600	50600	680
25	25NNFU25	25	21.4	4.763	26.3	1.5×1	10000	20400	290
	32NNFA25	32	28.4	4.763	33.3	2.5×1	17400	42100	580
	32NNFJ25					1.5×2	20300	50600	670
	40NNFA25	40	35.2	6.35	41.8	2.5×1	29000	71300	730
	40NNFJ25					1.5×2	34000	85600	840
32	32NNFU32	32	28.4	4.763	33.3	1.5×1	10900	25300	340
	40NNFA32	40	35.2	6.35	41.8	2.5×1	28600	71300	730
	50NNFA32	50	44.0	7.938	52.2	2.5×1	43400	111000	900
	50NNFJ32					1.5×2	50700	133000	1040
40	40NNFU40	40	35.2	6.35	41.8	1.5×1	18000	42800	430
	50NNFA40	50	44.0	7.938	52.2	2.5×1	42800	111000	900
50	50NNFU50	50	44.0	7.938	52.2	1.5×1	27000	66800	530

NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm. In case wiper is not required, total nut length turns out (L-K-U) mm.

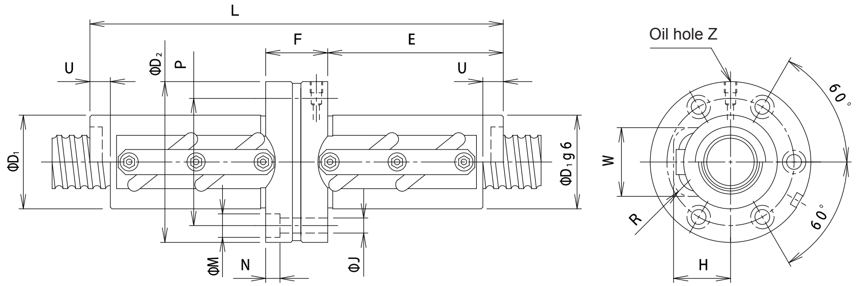
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 10% amount of rated dynamic load Ca.

Stiffness of ball nut comes to be about 80% of applied stiffness.

Nut dimension														Model No.
D_1	D_2	D_3	L	K	F	E	U	P	J	M	N	R	Z	
52	78	34	131	8	10	16	6	64	5.5	9.5	5.5	26	M6×1	20NNFA12
			155											20NNFJ12
52	78	34	121	8	10	16	8	64	5.5	9.5	5.5	26	M6×1	20NNFU16
62	89	44	161	10	12	18	8	75	6.6	11	6.5	31	M6×1	25NNFA16
			193											25NNFJ16
62	89	44	185	10	12	18	10	75	6.6	11	6.5	31	M6×1	25NNFA20
			225											25NNFJ20
68	102	56	194	10	15	20	10	84	9	14	8.5	34	M6×1	32NNFA20
			234											32NNFJ20
62	89	44	176	12	12	18	12	75	6.6	11	6.5	31	M6×1	25NNFU25
68	102	56	235	12	15	20	12	84	9	14	8.5	34	M6×1	32NNFA25
			285											32NNFJ25
84	126	65	238	12	18	22	12	104	11	17.5	11	42	PT1/8	40NNFA25
			288											40NNFJ25
68	102	56	220	15	15	20	15	84	9	14	8.5	34	M6×1	32NNFU32
84	126	65	297	15	18	22	15	104	11	17.5	11	42	PT1/8	40NNFA32
106	152	80	296	15	20	25	15	128	14	20	13	53	PT1/8	50NNFA32
			360											50NNFJ32
84	126	65	274	17	18	22	21	104	11	17.5	11	42	PT1/8	40NNFU40
106	152	80	359	17	20	25	20	128	14	20	13	53	PT1/8	50NNFA40
106	152	80	338	20	20	25	26	128	14	20	13	53	PT1/8	50NNFU50

PRECISION BALL SCREW STANDARD DIMENSION
NFN TYPE (DOUBLE NUT PERLOAD)

HIGH LEAD



NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm. In case wiper is not required, total nut length turns out (L-2×U) mm.

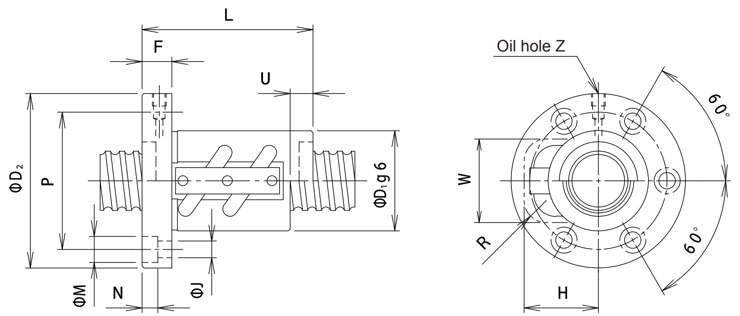
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 10% amount of rated dynamic load Ca.
Stiffness of ball nut comes to be about 80% of applied stiffness.

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
12	20NFNA12	20	17.5	3.175	20.8	2.5×1	8100	16900	370
	20NFNJ12					1.5×2	9470	20300	420
16	20NFNU16	20	17.5	3.175	20.8	1.5×1	5300	10600	220
	25NFNA16	25	21.4	4.763	26.3	2.5×1	15400	32100	460
	25NFNJ16					1.5×2	18100	38500	530
20	25NFNA20	25	21.4	4.763	26.3	2.5×1	15200	32100	460
	25NFNJ20					1.5×2	17800	38500	520
	32NFNA20	32	28.4	4.763	33.3	2.5×1	17600	42100	580
	32NFNJ20					1.5×2	20600	50600	680
25	25NFNU25	25	21.4	4.763	26.3	1.5×1	10000	20400	290
	32NFNA25	32	28.4	4.763	33.3	2.5×1	17400	42100	580
	32NFNJ25					1.5×2	20400	50600	670
	40NFNA25	40	35.2	6.35	41.8	2.5×1	29000	71300	730
	40NFNJ25					1.5×2	34000	85600	840
32	32NFNU32	32	28.4	4.763	33.3	1.5×1	10900	25300	340
	40NFNA32	40	35.2	6.35	41.8	2.5×1	28600	71300	730
	50NFNA32	50	44	7.938	52.2	2.5×1	43400	111000	900
	50NFNJ32					1.5×2	50700	133000	1040
40	40NFNU40	40	35.2	6.35	41.8	1.5×1	18000	42800	430
	50NFNA40	50	44.0	7.938	52.2	2.5×1	42800	111000	900
50	50NFNU50	50	44.0	7.938	52.2	1.5×1	27000	66800	530

Nut dimension														Model No.
D_1	D_2	L	F	E	U	P	J	M	N	W	H	R	Z	
34	60	131	23	54	6	47	5.5	9.5	5.5	26	23	8	M6×1	20NFNA12
		155		66										20NFNJ12
34	60	127	23	52	8	47	5.5	9.5	5.5	26	23	8	M6×1	20NFNU16
44	71	163	27	68	8	57	6.6	11	6.5	34	30	10	M6×1	25NFNA16
		195		84										25NFNJ16
44	71	199	29	85	10	57	6.6	11	6.5	34	30	10	M6×1	25NFNA20
		239		105										25NFNJ20
56	90	199	35	82	10	72	9	14	8.5	41	34	12	M6×1	32NFNA20
		239		102										32NFNJ20
44	71	195	29	83	12	57	6.6	11	6.5	34	30	10	M6×1	25NFNU25
56	90	245	35	105	12	72	9	14	8.5	41	34	12	M6×1	32NFNA25
		295		130										32NFNJ25
65	107	245	43	101	12	85	11	17.5	11	51	41	15	PT1/8	40NFNA25
		295		126										40NFNJ25
56	90	213	35	89	15	72	9	14	8.5	41	34	12	M6×1	32NFNU32
65	107	311	43	134	15	85	11	17.5	11	51	41	15	PT1/8	40NFNA32
80	126	315	49	133	15	102	14	20	13	64	52	16	PT1/8	50NFNA32
		379		165										50NFNJ32
65	107	265	43	111	21	85	11	17.5	11	51	41	15	PT1/8	40NFNU40
80	126	349	49	148	20	102	14	20	13	64	52	16	PT1/8	50NFNA40
80	126	331	49	141	26	102	14	20	13	64	52	16	PT1/8	50NFNU50

Ball screw

PRECISION BALL SCREW STANDARD DIMENSION
NF TYPE (WITHOUT PRELOAD)

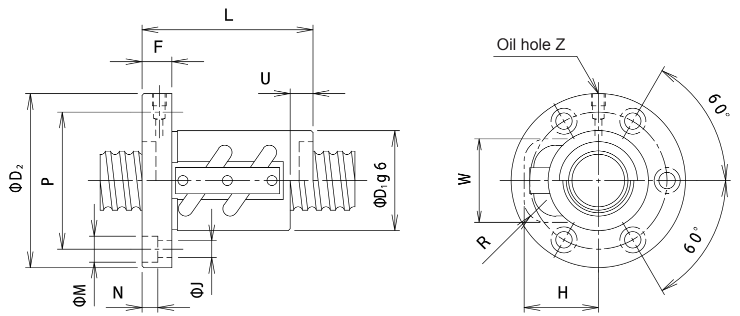


Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
5	16NFA5	16	13.5	3.175	16.8	2.5×1	7330	13300	150
	16NFJ5					1.5×2	8580	16000	170
	16NFC5					2.5×2	13300	26700	300
	20NFA5	20	17.5	3.175	20.8	2.5×1	8240	16900	180
	20NFJ5					1.5×2	9640	20300	210
	20NFC5					2.5×2	14900	33900	360
	25NFA5	25	22.5	3.175	25.8	2.5×1	9170	21400	220
	25NFJ5					1.5×2	10700	25700	260
	25NFC5					2.5×2	16600	42900	440
	32NFA5	32	29.5	3.175	32.8	2.5×1	10200	27700	280
	32NFJ5					1.5×2	11900	33300	330
	32NFC5					2.5×2	18500	55500	540
	40NFJ5	40	37.5	3.175	40.8	1.5×2	13100	41900	400
	40NFK5					1.5×3	18500	62900	580
	40NFM5					1.5×4	23800	83800	770
	50NFJ5	50	47.5	3.175	50.8	1.5×2	14300	52700	480
	50NFK5					1.5×3	20300	79100	700
	50NFM5					1.5×4	26000	105000	930
6	20NFA6	20	16.9	3.969	21.0	2.5×1	10900	20900	190
	20NFJ6					1.5×2	12800	25100	220
	20NFC6					2.5×2	19900	41800	370
	25NFA6	25	21.9	3.969	26.0	2.5×1	12300	26500	230
	25NFJ6					1.5×2	14400	31800	270
	25NFC6					2.5×2	22300	53000	450
	32NFA6	32	28.9	3.969	33.0	2.5×1	13900	34900	290
	32NFJ6					1.5×2	16300	41900	340
	32NFC6					2.5×2	25400	69800	560
	40NFA6	40	36.9	3.969	41.0	2.5×1	15200	43300	340
	40NFJ6					1.5×2	17800	52000	400
	40NFC6					2.5×2	27700	86700	670
	40NFM6					1.5×4	32400	104000	790
	40NFL6					2.5×3	39200	130000	990

NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm. In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of 30% of rated dynamic load is operated. Stiffness of ball nut comes to be about 80% of applied stiffness.

Nut dimension													Model No.
D_1	D_2	L	F	U	P	J	M	N	W	H	R	Z	
30	60	45	11	7	48	5.5	9.5	5.5	26	25	8	M6×1	16NFA5
		51											16NFJ5
		60											16NFC5
34	63	45	11	7	51	5.5	9.5	5.5	29	26	8	M6×1	20NFA5
		51											20NFJ5
		60											20NFC5
40	70	45	11	7	58	5.5	9.5	5.5	34	29	8	M6×1	25NFA5
		51											25NFJ5
		60											25NFC5
50	82	44	12	7	68	6.6	11	6.5	40	34	8	M6×1	32NFA5
		49											32NFJ5
		59											32NFC5
60	94	52	15	7	78	9	14	8.5	47	39	8	M6×1	40NFJ5
		62											40NFK5
		77											40NFM5
74	107	52	15	7	91	9	14	8.5	56	44	8	M6×1	50NFJ5
		62											50NFK5
		77											50NFM5
36	67	49	11	8	55	5.5	9.5	5.5	31	28	8	M6×1	20NFA6
		55											20NFJ6
		67											20NFC6
42	74	50	12	8	60	6.6	11	6.5	35	31	8	M6×1	25NFA6
		56											25NFJ6
		68											25NFC6
52	86	53	15	8	70	9	14	8.5	42	36	8	M6×1	32NFA6
		59											32NFJ6
		71											32NFC6
62	101	56	18	8	80	11	17.5	11	49	41	8	PT1/8	40NFA6
		62											40NFJ6
		74											40NFC6
		92											40NFM6
		92											40NFL6

PRECISION BALL SCREW STANDARD DIMENSION
NF TYPE (WITHOUT PRELOAD)



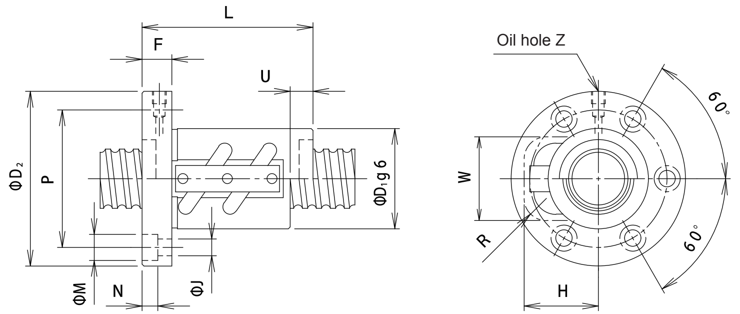
NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm. In case wiper is not required, total nut length turns out (L-U) mm.

2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of 30% of rated dynamic load is operated. Stiffness of ball nut comes to be about 80% of applied stiffness.

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
6	50NFJ6	50	46.9	3.969	51.0	1.5×2	19600	65500	490
	50NFK6					1.5×3	27700	98300	720
	50NFM6					1.5×4	35500	131000	950
	63NFJ6	63	59.9	3.969	64.0	1.5×2	21300	82400	590
	63NFK6					1.5×3	30300	123000	870
	63NFM6					1.5×4	38800	164000	1150
8	32NFA8	32	28.4	4.763	33.3	2.5×1	18000	42100	300
	32NFJ8					1.5×2	21000	50600	340
	32NFC8					2.5×2	32600	84300	580
	40NFA8	40	36.4	4.763	41.3	2.5×1	19700	52300	350
	40NFJ8					1.5×2	23000	62800	410
	40NFC8					2.5×2	35800	104000	690
	50NFA8	50	46.4	4.763	51.3	2.5×1	21400	64500	420
	50NFJ8					1.5×2	25000	77400	490
	50NFC8					2.5×2	38800	129000	810
	50NFL8					2.5×3	55100	193000	1200
	63NFJ8	63	59.4	4.763	64.3	1.5×2	27700	99200	600
	63NFK8					1.5×3	39300	148000	890
	63NFM8					1.5×4	50300	198000	1170
10	32NFA10	32	27.2	6.35	33.8	2.5×1	25500	53500	290
	32NFJ10					1.5×2	29800	64200	340
	32NFC10					2.5×2	46300	107000	570
	36NFA10	36	31.2	6.35	37.8	2.5×1	27100	60700	330
	36NFJ10					1.5×2	31800	72900	380
	36NFC10					2.5×2	49300	121000	640

Nut dimension													Model No.
D_1	D_2	L	F	U	P	J	M	N	W	H	R	Z	
76	115	62	18	8	94	11	17.5	11	58	47	8	PT1/8	50NFJ6
		74											50NFK6
		92											50NFM6
93	132	62	18	8	111	11	17.5	11	70	53	8	PT1/8	63NFJ6
		74											63NFK6
		92											63NFM6
54	96	61	15	10	80	9	14	8.5	45	40	12	M6×1	32NFA8
		69											32NFJ8
		85											32NFC8
64	108	64	18	10	87	11	17.5	11	52	45	12	PT1/8	40NFA8
		72											40NFJ8
		88											40NFC8
78	125	66	20	10	101	14	20	13	61	52	12	PT1/8	50NFA8
		74											50NFJ8
		90											50NFC8
		114											50NFL8
95	141	74	20	10	117	14	20	13	73	58	12	PT1/8	63NFJ8
		90											63NFK8
		114											63NFM8
57	99	71	15	11	82	9	14	8.5	47	43	15	M6×1	32NFA10
		81											32NFJ10
		101											32NFC10
60	107	74	18	11	86	11	17.5	11	51	45	15	M6×1	36NFA10
		84											36NFJ10
		104											36NFC10

PRECISION BALL SCREW STANDARD DIMENSION
NF TYPE (WITHOUT PRELOAD)

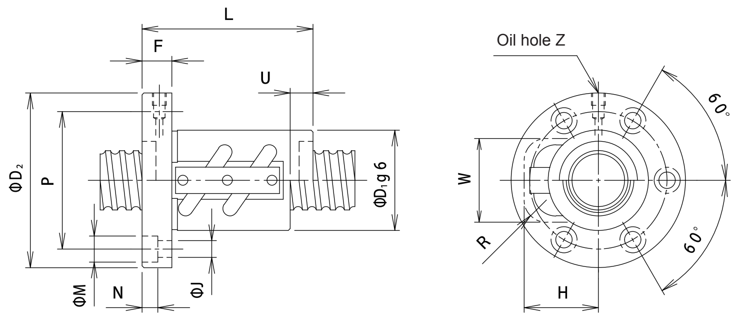


NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm. In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of 30% of rated dynamic load is operated. Stiffness of ball nut comes to be about 80% of applied stiffness.

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
10	40NFA10	40	35.2	6.35	41.8	2.5×1	28600	67900	360
	40NFJ10					1.5×2	33500	81500	410
	40NFC10					2.5×2	52000	135000	700
	45NFC10	45	40.2	6.35	46.8	2.5×2	55900	157000	780
	45NFL10					2.5×3	79200	235000	1160
	50NFA10	50	45.2	6.35	51.8	2.5×1	31900	85900	430
	50NFJ10					1.5×2	37300	103000	500
	50NFC10					2.5×2	57900	171000	840
	50NFL10					2.5×3	82000	257000	1240
	55NFC10	55	50.2	6.35	56.8	2.5×2	61100	193000	930
	55NFL10					2.5×3	86700	289000	1380
	63NFA10	63	58.2	6.35	64.8	2.5×1	35600	111000	540
	63NFJ10					1.5×2	41700	133000	630
	63NFC10					2.5×2	64700	222000	1050
	63NFL10					2.5×3	91800	333000	1540
	80NFA10	80	75.2	6.35	81.8	2.5×1	39000	139000	650
	80NFJ10					1.5×2	45600	167000	760
	80NFC10					2.5×2	70800	279000	1260
	80NFL10					2.5×3	100000	419000	1850
12	40NFA12	40	34.6	7.144	42.0	2.5×1	33600	76800	360
	40NFJ12					1.5×2	39300	92200	420
	40NFC12					2.5×2	61100	153000	710
	45NFC12	45	39.6	7.144	47.0	2.5×2	64300	171000	780
	45NFL12					2.5×3	91100	257000	1150
	50NFA12	50	44.0	7.938	52.2	2.5×1	42800	106000	440
	50NFJ12					1.5×2	50100	127000	510
	50NFC12					2.5×2	77800	212000	860

Nut dimension													Model No.
D_1	D_2	L	F	U	P	J	M	N	W	H	R	Z	
68	113	74	18	11	92	11	17.5	11	54	48	15	PT1/8	40NFA10
		84											40NFJ10
		104											40NFC10
73	118	104	18	11	97	11	17.5	11	59	50	15	PT1/8	45NFC10
		134											45NFL10
82	129	78	22	11	105	14	20	13	63	55	15	PT1/8	50NFA10
		88											50NFJ10
		108											50NFC10
		138											50NFL10
87	134	108	22	11	110	14	20	13	68	57	15	PT1/8	55NFC10
		138											55NFL10
100	159	78	22	11	128	18	26	17.5	75	63	15	PT1/8	63NFA10
		88											63NFJ10
		108											63NFC10
		138											63NFL10
122	181	78	22	11	150	18	26	17.5	91	71	15	PT1/8	80NFA10
		88											80NFJ10
		108											80NFC10
		138											80NFL10
72	129	85	18	13	108	11	17.5	11	58	54	15	PT1/8	40NFA12
		97											40NFJ12
		121											40NFC12
77	134	121	18	13	113	11	17.5	11	63	56	15	PT1/8	45NFC12
		157											45NFL12
86	144	89	22	13	120	14	20	13	67	60	15	PT1/8	50NFA12
		101											50NFJ12
		125											50NFC12

PRECISION BALL SCREW STANDARD DIMENSION
NF TYPE (WITHOUT PRELOAD)

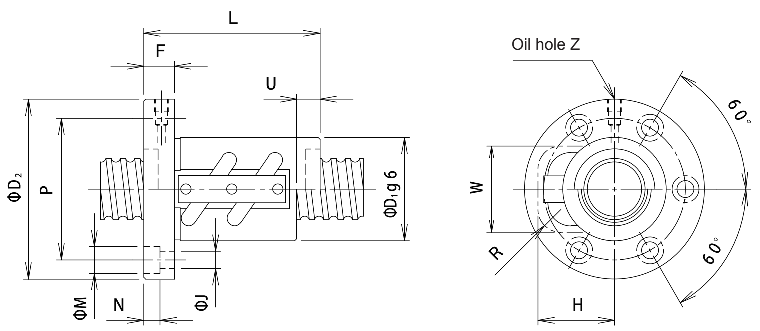


NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm. In case wiper is not required, total nut length turns out (L-U) mm.
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of 30% of rated dynamic load is operated. Stiffness of ball nut comes to be about 80% of applied stiffness.

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_0	Axial stiffness (N/μm) K
12	55NFC12	55	49.6	7.144	57.0	2.5×2	71900	217000	940
	55NFL12					2.5×3	101000	325000	1390
	63NFA12	63	57.0	7.938	65.2	2.5×1	47600	134000	530
	63NFJ12					1.5×2	55600	161000	620
	63NFC12					2.5×2	86400	268000	1040
	80NFA12	80	74.0	7.938	82.2	2.5×1	53100	173000	660
	80NFJ12					1.5×2	62100	208000	780
	80NFC12					2.5×2	96400	347000	1290
	80NFL12					2.5×3	136000	520000	1890
	100NFA12	100	94.0	7.938	102.2	2.5×1	58300	218000	800
	100NFC12					2.5×2	105000	437000	1550
	100NFL12					2.5×3	150000	655000	2280
16	40NFA16	40	34.6	7.144	42.0	2.5×1	33500	76800	360
	40NFJ16					1.5×2	39200	92200	420
	80NFA16	80	73.0	9.525	82.8	2.5×1	89800	290000	860
	80NFJ16					1.5×2	105000	348000	1000
	80NFC16					2.5×2	163000	581000	1680
	100NFA16	100	93.0	9.525	102.8	2.5×1	97500	358000	1020
	100NFC16					2.5×2	176000	716000	1980
	100NFL16					2.5×3	250000	1070000	2920
	125NFC16	125	118.0	9.525	127.8	2.5×2	196000	917000	2430
	125NFL16					2.5×3	278000	1370000	3590
20	80NFA20	80	730	9.525	82.8	2.5×1	89700	290000	860
	80NFJ20					1.5×2	104000	348000	1000
	80NFC20					2.5×2	162000	581000	1670
	100NFA20	100	93.0	9.525	102.8	2.5×1	97400	358000	1020
	100NFC20					2.5×2	176000	716000	1980
	125NFC20	125	118.0	9.525	127.8	2.5×2	196000	917000	2430
	125NFL20					2.5×3	278000	1370000	3590

Nut dimension													Model No.
D_1	D_2	L	F	U	P	J	M	N	W	H	R	Z	
91	149	125	22	13	125	14	20	13	72	62	15	PT1/8	55NFC12
		161											55NFL12
103	165	89	22	13	134	18	26	17.5	79	69	15	PT1/8	63NFA12
		101											63NFJ12
		125											63NFC12
125	197	89	22	13	159	18	26	17.5	94	78	15	PT1/8	80NFA12
		101											80NFJ12
		125											80NFC12
		161											80NFL12
152	224	95	28	13	186	22	32	21.5	113	92	15	PT1/8	100NFA12
		131											100NFC12
		167											100NFL12
72	129	106	18	16	108	11	17.5	11	58	54	15	PT1/8	40NFA16
		122											40NFJ16
130	199	116	28	16	168	18	26	17.5	97	83	20	PT1/8	80NFA16
		132											80NFJ16
		164											80NFC16
156	228	120	32	16	190	22	32	21.5	115	95	20	PT1/8	100NFA16
		168											100NFC16
		216											100NFL16
185	271	172	36	16	225	26	39	25.5	138	109	20	PT1/8	125NFC16
		220											125NFL16
130	199	138	28	20	168	18	26	17.5	97	83	20	PT1/8	80NFA20
		158											80NFJ20
		198											80NFC20
156	228	142	32	20	190	22	32	21.5	115	95	20	PT1/8	100NFA20
		202											100NFC20
185	271	206	36	20	225	26	39	25.5	138	109	20	PT1/8	125NFC20
		266											125NFL20

PRECISION BALL SCREW STANDARD DIMENSION
NIF TYPE (INTEGRAL NUT PRELOAD)



NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm. In case wiper is not required, total nut length turns out (L-U) mm.

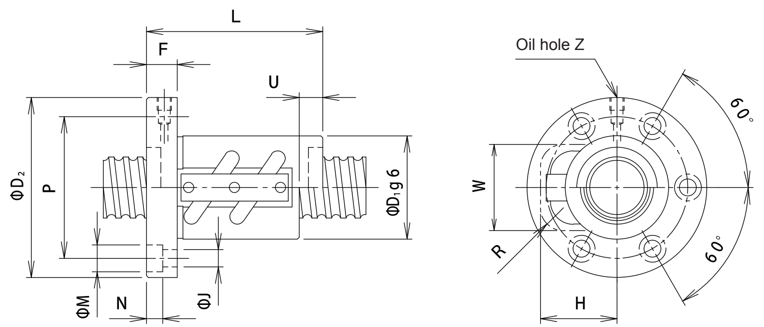
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 10% amount of rated dynamic load Ca.

Stiffness of ball nut comes to be about 80% of applied stiffness.

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
5	20NIFC5	20	17.5	3.175	20.8	2.5×1	8240	16900	370
	25NIFC5	25	22.5	3.175	25.8	2.5×1	9170	21400	440
	25NIFO5					2.5×2	16600	42900	870
	32NIFC5	32	29.5	3.175	32.8	2.5×1	10200	27700	550
	32NIFO5					2.5×2	18500	555500	1070
	40NIFM5	40	37.5	3.175	40.8	1.5×2	13100	41900	780
	50NIFM5	50	47.5	3.175	50.8	1.5×2	14300	52700	940
6	20NIFC6	20	16.9	3.969	21.0	2.5×1	10900	20900	370
	25NIFC6	25	21.9	3.969	26.0	2.5×1	12300	26500	450
	25NIFO6					2.5×2	22300	53000	880
	32NIFC6	32	28.9	3.969	33.0	2.5×1	13900	34900	570
	32NIFO6					2.5×2	25400	69800	1110
	40NIFC6	40	36.9	3.969	41.0	2.5×1	15200	43300	680
	40NIFO6					2.5×2	27700	86700	1320
	50NIFM6	50	46.9	3.969	51.0	1.5×2	19600	65500	960
8	32NIFC8	32	28.4	4.763	33.3	2.5×1	18000	42100	590
	32NIFM8					1.5×2	21000	50600	680
	40NIFC8	40	36.4	4.763	41.3	2.5×1	19700	52300	700
	40NIFO8					2.5×2	35800	104000	1350
	50NIFC8	50	46.4	4.763	51.3	2.5×1	21400	64500	820
	50NIFO8					2.5×2	38800	129000	1600

Nut dimension													Model No.
D_1	D_2	L	F	U	P	J	M	N	W	H	R	Z	
34	63	58	11	7	51	5.5	9.5	5.5	29	26	8	M6×1	20NIFC5
40	70	58	11	7	58	5.5	9.5	5.5	34	29	8	M6×1	25NIFC5
		88											25NIFO5
50	82	59	12	7	68	6.6	11	6.5	40	34	8	M6×1	32NIFC5
		89											32NIFO5
60	94	77	15	7	78	9	14	8.5	47	39	8	M6×1	40NIFM5
74	107	77	15	7	91	9	14	8.5	56	44	8	M6×1	50NIFM5
36	67	67	11	8	55	5.5	9.5	5.5	31	28	8	M6×1	20NIFC6
42	74	68	12	8	60	6.6	11	6.5	35	31	8	M6×1	25NIFC6
		104											25NIFO6
52	86	71	15	8	70	9	14	8.5	42	36	8	M6×1	32NIFC6
		107											32NIFO6
62	101	74	18	8	80	11	17.5	11	49	41	8	PT1/8	40NIFC6
		110											40NIFO6
76	115	92	18	8	94	11	17.5	11	58	47	8	PT1/8	50NIFM6
54	96	85	15	10	80	9	14	8.5	45	40	12	M6×1	32NIFC8
		101											32NIFM8
64	108	88	18	10	87	11	17.5	11	52	45	12	PT1/8	40NIFC8
		136											40NIFO8
78	125	90	20	10	101	14	20	13	61	52	12	PT1/8	50NIFC8
		138											50NIFO8

PRECISION BALL SCREW STANDARD DIMENSION
NIF TYPE (INTEGRAL NUT PRELOAD)



NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm. In case wiper is not required, total nut length turns out (L-U) mm.

2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 10% amount of rated dynamic load Ca.

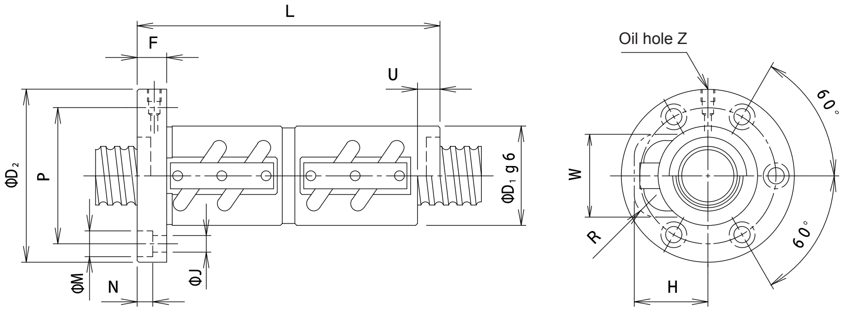
Stiffness of ball nut comes to be about 80% of applied stiffness.

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
10	32NIFJ10	32	27.2	6.35	33.8	1.5×1	16400	32100	340
	32NIFC10					2.5×1	25500	53500	580
	36NIFJ10	36	31.2	6.35	37.8	1.5×1	17500	36400	380
	36NIFC10					2.5×1	27100	60700	640
	40NIFC10	40	35.2	6.35	41.8	2.5×1	28600	67900	710
	40NIFO10					2.5×2	52000	135000	1370
	45NIFC10	45	40.2	6.35	46.8	2.5×1	30800	78600	790
	50NIFC10	50	45.2	6.35	51.8	2.5×1	31900	85900	850
	50NIFO10					2.5×2	57900	171000	1660
	63NIFC10	63	58.2	6.35	64.8	2.5×1	35600	111000	1060
	63NIFO10					2.5×2	64700	222000	2050
12	40NIFC12	40	34.6	7.144	42.0	2.5×1	33600	76800	720
	45NIFC12	45	39.6	7.144	47.0	2.5×1	35400	85900	790
	50NIFC12	50	44.0	7.938	52.2	2.5×1	42800	106000	870
	63NIFC12	63	57.0	7.938	65.2	2.5×1	47600	134000	1050

Nut dimension													Model No.
D_1	D_2	L	F	U	P	J	M	N	W	H	R	Z	
57	99	81	15	11	82	9	14	8.5	47	43	15	M6×1	32NIFJ10
		101											32NIFC10
60	107	84	18	11	86	11	17.5	11	51	45	15	M6×1	36NIFJ10
		104											36NIFC10
68	113	104	18	11	92	11	17.5	11	54	48	15	PT1/8	40NIFC10
		164											40NIFO10
73	118	104	18	11	97	11	17.5	11	59	50	15	PT1/8	45NIFC10
82	129	108	22	11	105	14	20	13	63	55	15	PT1/8	50NIFC10
		168											50NIFO10
100	159	108	22	11	128	18	26	17.5	75	63	15	PT1/8	63NIFC10
		168											63NIFO10
72	129	121	18	13	108	11	17.5	11	58	54	15	PT1/8	40NIFC12
77	134	121	18	13	113	11	17.5	11	63	56	15	PT1/8	45NIFC12
86	144	125	22	13	120	14	20	13	67	60	15	PT1/8	50NIFC12
103	165	125	22	13	134	18	26	17.5	79	69	15	PT1/8	63NIFC12

Ball screw

PRECISION BALL SCREW STANDARD DIMENSION
NNF TYPE (DOUBLE NUT PRELOAD)



Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
5	16NNFA5	16	13.5	3.175	16.8	2.5×1	7330	13300	300
	16NNFJ5					1.5×2	8580	16000	350
	16NNFC5					2.5×2	13300	26700	590
	20NNFA5	20	17.5	3.175	20.8	2.5×1	8240	16900	370
	20NNFJ5					1.5×2	9640	20300	430
	20NNFC5					2.5×2	14900	33900	720
	25NNFA5	25	22.5	3.175	25.8	2.5×1	9170	21400	440
	25NNFJ5					1.5×2	10700	25700	520
	25NNFC5					2.5×2	16600	42900	860
	32NNFA5	32	29.5	3.175	32.8	2.5×1	10200	27700	550
	32NNFJ5					1.5×2	11900	33300	640
	32NNFC5					2.5×2	18500	55500	1070
	40NNFJ5	40	37.5	3.175	40.8	1.5×2	13100	41900	780
	40NNFK5					1.5×3	18500	62900	1150
	40NNFM5					1.5×4	23800	83800	1520
	50NNFJ5	50	47.5	3.175	50.8	1.5×2	14300	52700	940
	50NNFK5					1.5×3	20300	79100	1390
	50NNFM5					1.5×4	26000	105000	1830
6	20NNFA6	20	16.9	3.969	21.0	2.5×1	10900	20900	370
	20NNFJ6					1.5×2	12800	25100	430
	20NNFC6					2.5×2	19900	41800	720
	25NNFA6	25	21.9	3.969	26.0	2.5×1	12300	26500	450
	25NNFJ6					1.5×2	14400	31800	530
	25NNFC6					2.5×2	22300	53000	880
	32NNFA6	32	28.9	3.969	33.0	2.5×1	13900	34900	570
	32NNFJ6					1.5×2	16300	41900	670
	32NNFC6					2.5×2	25400	69800	1110
	40NNFA6	40	36.9	3.969	41.0	2.5×1	15200	43300	680
	40NNFJ6					1.5×2	17800	52000	800
	40NNFC6					2.5×2	27700	86700	1320
	40NNFM6					1.5×4	32400	104000	1550
	40NNFL6					2.5×3	39200	130000	1950

NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm. In case wiper is not required, total nut length turns out (L-U) mm.

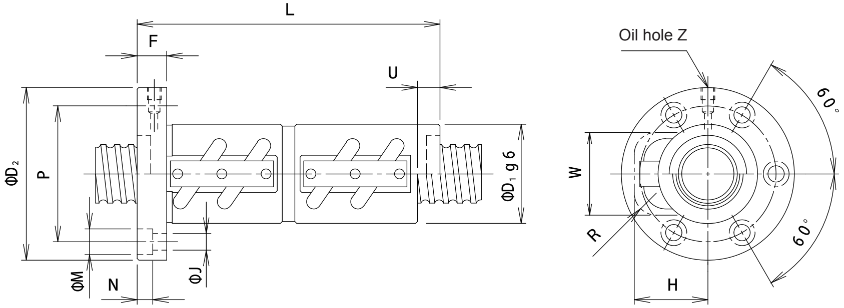
2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 10% amount of rated dynamic load Ca.

Stiffness of ball nut comes to be about 80% of applied stiffness.

Nut dimension													Model No.
D_1	D_2	L	F	U	P	J	M	N	W	H	R	Z	
30	60	80	11	7	48	5.5	9.5	5.5	26	25	8	M6×1	16NNFA5
		91											16NNFJ5
		110											16NNFC5
34	63	73	11	7	51	5.5	9.5	5.5	29	26	8	M6×1	20NNFA5
		83											20NNFJ5
		103											20NNFC5
40	70	73	11	7	58	5.5	9.5	5.5	34	29	8	M6×1	25NNFA5
		83											25NNFJ5
		103											25NNFC5
50	82	74	12	7	68	6.6	11	6.5	40	34	8	M6×1	32NNFA5
		84											32NNFJ5
		104											32NNFC5
60	94	87	15	7	78	9	14	8.5	47	39	8	M6×1	40NNFJ5
		107											40NNFK5
		137											40NNFM5
74	107	87	15	7	91	9	14	8.5	56	44	8	M6×1	50NNFJ5
		107											50NNFK5
		137											50NNFM5
36	67	85	11	8	55	5.5	9.5	5.5	31	28	8	M6×1	20NNFA6
		97											20NNFJ6
		121											20NNFC6
42	74	85	11	8	60	6.6	11	6.5	35	31	8	M6×1	25NNFA6
		97											25NNFJ6
		121											25NNFC6
52	86	89	15	8	70	9	14	8.5	42	36	8	M6×1	32NNFA6
		101											32NNFJ6
		125											32NNFC6
62	101	92	18	8	80	11	17.5	11	49	41	8	PT1/8	40NNFA6
		104											40NNFJ6
		128											40NNFC6
		164											40NNFM6
		164											40NNFL6

Ball screw

PRECISION BALL SCREW STANDARD DIMENSION
NNF TYPE (DOUBLE NUT PRELOAD)



Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_0	Axial stiffness (N/μm) K
6	50NNFJ6	50	46.9	3.969	51.0	1.5x2	19600	65500	960
	50NNFK6					1.5x3	27700	98300	1420
	50NNFM6					1.5x4	35500	131000	1870
	63NNFJ6	63	59.9	3.969	64.0	1.5x2	21300	82400	1160
	63NNFK6					1.5x3	30300	123000	1710
	63NNFM6					1.5x4	38800	164000	2250
8	32NNFA8	32	28.4	4.763	33.3	2.5x1	18000	42100	590
	32NNFJ8					1.5x2	21000	50600	680
	32NNFC8					2.5x2	32600	84300	1140
	40NNFA8	40	36.4	4.763	41.3	2.5x1	19700	52300	700
	40NNFJ8					1.5x2	23000	62800	810
	40NNFC8					2.5x2	35800	104000	1350
	50NNFA8	50	46.4	4.763	51.3	2.5x1	21400	64500	820
	50NNFJ8					1.5x2	25000	77400	960
	50NNFC8					2.5x2	38800	129000	1600
	50NNFL8					2.5x3	55100	193000	2360
	63NNFJ8	63	59.4	4.763	64.3	1.5x2	27700	99200	1190
	63NNFK8					1.5x3	39300	148000	1750
	63NNFM8					1.5x4	50300	198000	2310
10	32NNFA10	32	27.2	6.35	33.8	2.5x1	25500	53500	580
	32NNFJ10					1.5x2	29800	64200	660
	32NNFC10					2.5x2	46300	107000	1130
	36NNFA10	36	31.2	6.35	37.8	2.5x1	27100	60700	640
	36NNFJ10					1.5x2	31800	72900	740
	36NNFC10					2.5x2	49300	121000	1250
	40NNFA10	40	35.2	6.35	41.8	2.5x1	28600	67900	710
	40NNFJ10					1.5x2	33500	81500	820
	40NNFC10					2.5x2	52000	135000	1370
	45NNFC10	45	40.2	6.35	46.8	2.5x2	55900	157000	1540
	45NNFL10					2.5x3	79200	235000	2270

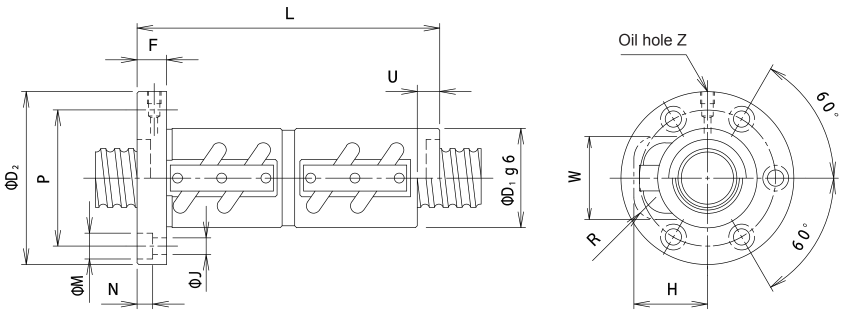
NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm. In case wiper is not required, total nut length turns out (L-U) mm.

2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 10% amount of rated dynamic load Ca.

Stiffness of ball nut comes to be about 80% of applied stiffness.

Nut dimension													Model No.
D_1	D_2	L	F	U	P	J	M	N	W	H	R	Z	
76	115	104	18	8	94	11	17.5	11	58	47	8	PT1/8	50NNFJ6
		128											50NNFK6
		164											50NNFM6
93	132	104	18	8	111	11	17.5	11	70	53	8	PT1/8	63NNFJ6
		128											63NNFK6
		164											63NNFM6
54	96	101	15	10	80	9	14	8.5	45	40	12	M6x1	32NNFA8
		117											32NNFJ8
		150											32NNFC8
64	108	104	18	10	87	11	17.5	11	52	45	12	PT1/8	40NNFA8
		120											40NNFJ8
		152											40NNFC8
78	125	106	20	10	101	14	20	13	61	52	12	PT1/8	50NNFA8
		122											50NNFJ8
		154											50NNFC8
		202											50NNFL8
95	141	123	20	10	117	14	20	13	73	58	12	PT1/8	63NNFJ8
		155											63NNFK8
		203											63NNFM8
57	99	121	15	11	82	9	14	8.5	47	43	15	M6x1	32NNFA10
		141											32NNFJ10
		181											32NNFC10
60	107	124	18	11	86	11	17.5	11	51	45	15	M6x1	36NNFA10
		144											36NNFJ10
		184											36NNFC10
68	113	124	18	11	92	11	17.5	11	54	48	15	PT1/8	40NNFA10
		144											40NNFJ10
		184											40NNFC10
73	118	184	18	11	97	11	17.5	11	59	50	15	PT1/8	45NNFC10
		244											45NNFL10

PRECISION BALL SCREW STANDARD DIMENSION
NNF TYPE (DOUBLE NUT PRELOAD)



NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm. In case wiper is not required, total nut length turns out (L-U) mm.

2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 10% amount of rated dynamic load Ca.

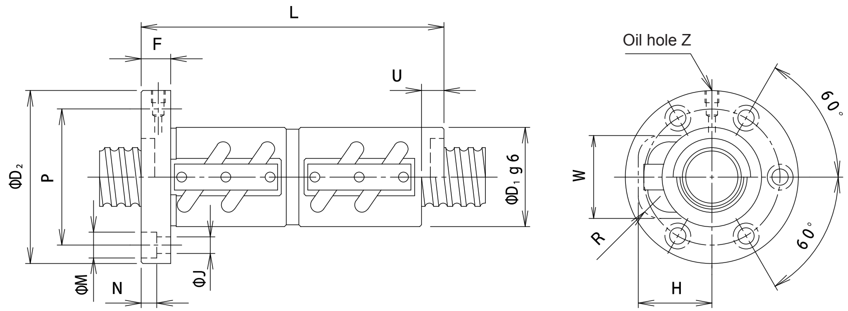
Stiffness of ball nut comes to be about 80% of applied stiffness.

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
10	50NNFA10	50	45.2	6.35	51.8	2.5×1	31900	85900	850
	50NNFJ10					1.5×2	37300	103000	990
	50NNFC10					2.5×2	57900	171000	1660
	50NNFL10					2.5×3	82000	257000	2440
	55NNFC10	55	50.2	6.35	56.8	2.5×2	61100	193000	1840
	55NNFL10					2.5×3	86600	289000	2710
	63NNFA10	63	58.2	6.35	64.8	2.5×1	35600	111000	1060
	63NNFJ10					1.5×2	41700	133000	1240
	63NNFC10					2.5×2	64700	222000	2050
	63NNFL10					2.5×3	91800	333000	3030
	80NNFA10	80	75.2	6.35	81.8	2.5×1	39000	139000	1270
	80NNFJ10					1.5×2	45600	167000	1490
	80NNFC10					2.5×2	70800	279000	2470
	80NNFL10					2.5×3	100000	419000	3640
12	40NNFA12	40	34.6	7.144	42.0	2.5×1	33600	76800	720
	40NNFJ12					1.5×2	39300	92200	830
	40NNFC12					2.5×2	61100	153000	1400
	45NNFC12	45	39.6	7.144	47.0	2.5×2	64300	171000	1530
	45NNFL12					2.5×3	91100	257000	2260
	50NNFA12	50	44.0	7.938	52.2	2.5×1	42800	106000	870
	50NNFJ12					1.5×2	50100	127000	1010
	50NNFC12					2.5×2	77800	212000	1690
	55NNFC12	55	49.6	7.144	57.0	2.5×2	71900	217000	1850
	55NNFL12					2.5×3	101000	325000	2720
	63NNFA12	63	57.0	7.938	65.2	2.5×1	47600	134000	1050
	63NNFJ12					1.5×2	55600	161000	1220
	63NNFC12					2.5×2	86400	268000	2040

Nut dimension													Model No.
D_1	D_2	L	F	U	P	J	M	N	W	H	R	Z	
82	129	128	22	11	105	14	20	13	63	55	15	PT1/8	50NNFA10
		148											50NNFJ10
		188											50NNFC10
		248											50NNFL10
87	134	188	22	11	110	14	20	13	68	57	15	PT1/8	55NNFC10
		248											55NNFL10
100	159	128	22	11	128	18	26	17.5	75	63	15	PT1/8	63NNFA10
		148											63NNFJ10
		188											63NNFC10
		248											63NNFL10
122	181	134	28	11	150	18	26	17.5	91	71	15	PT1/8	80NNFA10
		154											80NNFJ10
		194											80NNFC10
		254											80NNFL10
72	129	145	18	13	108	11	17.5	11	58	54	15	PT1/8	40NNFA12
		169											40NNFJ12
		217											40NNFC12
77	134	217	18	13	113	11	17.5	11	63	56	15	PT1/8	45NNFC12
		289											45NNFL12
86	144	149	22	13	120	14	20	13	67	60	15	PT1/8	50NNFA12
		173											50NNFJ12
		221											50NNFC12
91	149	221	22	13	125	14	20	13	72	62	15	PT1/8	55NNFC12
		293											55NNFL12
103	165	149	22	13	134	18	26	17.5	79	69	15	PT1/8	63NNFA12
		173											63NNFJ12
		221											63NNFC12

Ball screw

PRECISION BALL SCREW STANDARD DIMENSION
NNF TYPE (DOUBLE NUT PRELOAD)



Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
12	80NNFA12	80	74.0	7.938	82.2	2.5×1	53100	173000	1300
	80NNFJ12					1.5×2	62100	208000	1520
	80NNFC12					2.5×2	96400	347000	2530
	80NNFL12					2.5×3	136000	520000	3720
	100NNFA12	100	94.0	7.938	102.2	2.5×1	58300	218000	1570
	100NNFC12					2.5×2	105000	437000	3040
	100NNFL12					2.5×3	150000	655000	4480
16	40NNFA16	40	34.6	7.144	42.0	2.5×1	33500	76800	720
	40NNFJ16					1.5×2	39200	92200	830
	80NNFA16	80	73.0	9.525	82.8	2.5×1	89800	290000	1700
	80NNFJ16					1.5×2	105000	348000	1970
	80NNFC16					2.5×2	163000	581000	3290
	100NNFA16	100	93.0	9.525	102.8	2.5×1	97500	358000	2010
	100NNFC16					2.5×2	176000	716000	3890
	100NNFL16					2.5×3	250000	1070000	5730
	125NNFC16	125	118.0	9.525	127.8	2.5×2	196000	918000	4780
	125NNFL16					2.5×3	278000	1370000	7040
20	80NNFA20	80	73.0	9.525	82.8	2.5×1	89700	290000	1700
	80NNFJ20					1.5×2	104000	348000	1970
	80NNFC20					2.5×2	162000	581000	3290
	100NNFA20	100	93.0	9.525	102.8	2.5×1	97400	358000	2010
	100NNFC20					2.5×2	176000	716000	3890
	125NNFC20	125	118.0	9.525	127.8	2.5×2	196000	917000	4780
	125NNFL20					2.5×3	278000	1370000	7040

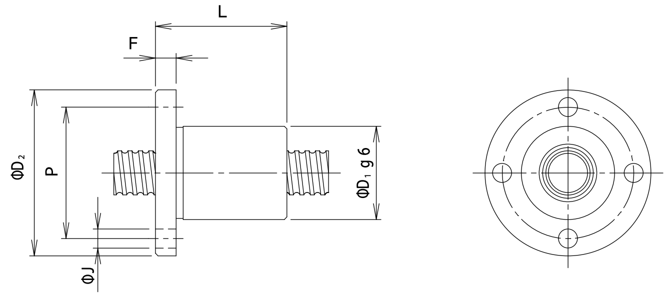
NOTE 1. Wiper is furnished as our standard specification and total nut length shows L mm. In case wiper is not required, total nut length turns out (L-U) mm.

2. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of about three times of preload amount is operated under condition of preloaded with 10% amount of rated dynamic load Ca.

Stiffness of ball nut comes to be about 80% of applied stiffness.

Nut dimension													Model No.
D_1	D_2	L	F	U	P	J	M	N	W	H	R	Z	
125	197	149	22	13	159	18	26	17.5	94	78	15	PT1/8	80NNFA12
		173											80NNFJ12
		221											80NNFC12
		293											80NNFL12
152	224	155	28	13	186	22	32	21.5	113	92	15	PT1/8	100NNFA12
		227											100NNFC12
		299											100NNFL12
72	129	186	18	16	108	11	17.5	11	58	54	15	PT1/8	40NNFA16
		218											40NNFJ16
130	199	196	28	16	168	18	26	17.5	97	83	20	PT1/8	80NNFA16
		228											80NNFJ16
		292											80NNFC16
156	228	200	32	16	190	22	32	21.5	115	95	20	PT1/8	100NNFA16
		296											100NNFC16
		392											100NNFL16
185	271	300	36	16	225	26	39	25.5	138	109	20	PT1/8	125NNFC16
		396											125NNFL16
130	199	238	28	20	168	18	26	17.5	97	83	20	PT1/8	80NNFA20
		278											80NNFJ20
		358											80NNFC20
156	228	242	32	20	190	22	32	21.5	115	95	20	PT1/8	100NNFA20
		362											100NNFC20
185	271	366	36	20	225	26	39	25.5	138	109	20	PT1/8	125NNFC20
		486											125NNFL20

PRECISION BALL SCREW STANDARD DIMENSION
MF TYPE (NO PRELOAD)



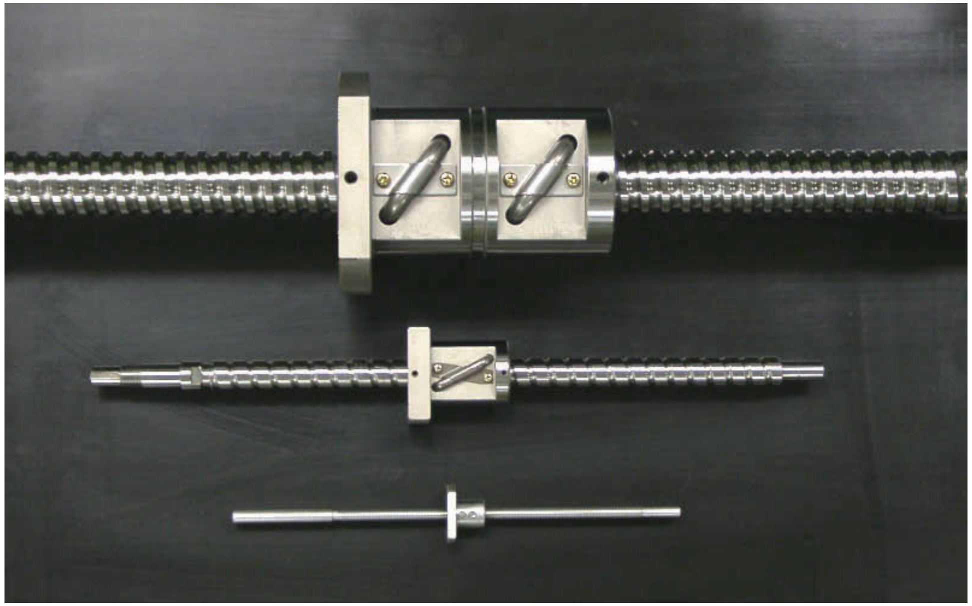
Note: 1. Stiffness shown in the table indicates theoretical elastic deformation at ball contact area when axial load of 30% of rated dynamic load is operated. Stiffness of ball nut comes to be about 80% of applied stiffness.

Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic road(N) C_a	Basic rated static load(N) C_o	Axial stiffness (N/μm) K
1	4MF2S1	4	3.3	0.8	4.15	1×2	350	350	30
	5MF2S1	5	4.3		5.15		400	500	40
	6MF3S1	6	5.3		6.15	1×3	640	950	50
	8MF3S1	8	7.3		8.15		750	1300	70
1.5	5MF3S1.5	5	4.1	1.0	5.2	1×3	740	900	40
	6MF3S1.5	6	5.1		6.2		830	1100	50
	8MF3S1.5	8	7.1		8.2		980	1600	70
2	5MF3S2	5	3.6	1.588	5.3	1×3	1100	1200	30
	6MF3S2	6	4.6		6.3		1300	1500	40
	8MF3S2	8	6.6		8.3		1700	2300	60
	10MF3S2	10	8.6		10.3		1900	3100	80
	12MF3S2	12	10.6		12.3		2200	3900	100
	14MF3S2	14	12.6		14.3		2400	4600	120
2.5	10MF3S2.5	10	8.3	2.0	10.4	1×3	2600	3700	80
	12MF3S2.5	12	10.3		12.4		2900	4600	100
	14MF3S2.5	14	12.3		14.4		3100	5500	110
3	12MF3S3	12	10.1	2.381	12.6	1×3	3500	5300	90
	14MF3S3	14	12.1		14.6		3900	6500	120

Nut dimension						Model No.
D_1	D_2	L	F	P	J	
11	26	19	4	19	2.9	4MF2S1
13						5MF2S1
15	30			23	3.4	6MF3S1
17	32	21		25		8MF3S1
15	28	24	4	21	2.9	5MF3S1.5
16	31			24	3.4	6MF3S1.5
18	33			26		8MF3S1.5
16	32	28	4	25	3.4	5MF3S2
17						6MF3S2
19	34			27		8MF3S2
21	40	29	5	31	4.5	10MF3S2
23	42			33		12MF3S2
25	46	30	6	36	5.5	14MF3S2
22	41	35	5	32	4.5	10MF3S2.5
24	43			34		12MF3S2.5
26	47		6	37	5.5	14MF3S2.5
25	44	37	5	35	4.5	12MF3S3
27	48	38	6	38	5.5	14MF3S3

Ball screw

3. TSUBAKI NAKASHIMA precision standard ball series



Feature of series

Short delivery

TSUBAKI NAKASHIMA precision standard ball screw is taken enough needs from the machine tool customers, and made as the precision ball screw for machine tool. It is possible to deliver a short time by standardize the length of the screw shaft and the mass production.

Standardize the support bearing part

By the long and amount of experience, standardize the support bearing part and support part of the support mechanics.

Easy working of shaft end

By standardizing the shape of shaft end, it made the design easy. Moreover, because of the shaft end cylinder part is not hardened and the center hole is provided both shaft ends, they enable the precision shaft end working easily.

Abundant standard series and flexibility

TSUBAKI NAKASHIMA precision standard ball screw has 16 kinds for the machine tool, applies the every usage. Moreover, the ball screw for the mechatronics and mechatronics kit ball screw which fixed the support bearing are also available.

High reliability

Reasonable design, selected material, excellent technology, strict management, they maintain the high reliability.

Excellent precision

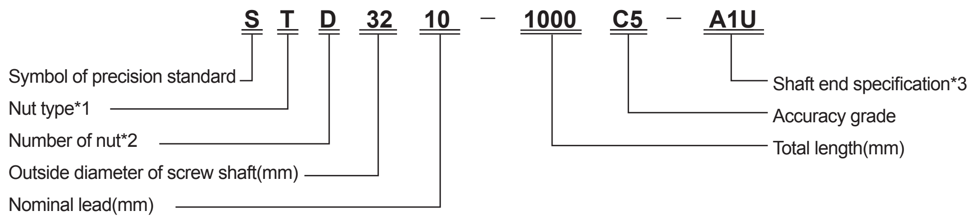
Grinding, assembling, inspection are done in the strictly temperature managed factory and using the top-level machines.

Zero axial clearance

Give a suitable preload by using the two nuts or arrange the steel ball, it makes the zero axial clearance. Axial clearance is also available.

Dustproof

TSUBAKI NAKASHIMA precision standard ball screw is installed the wiper in both ends of the nut as standard specification.



*1 Nut type	T: Ball recirculation part is settled in the nut diameter
	N: Ball recirculation part is out of the nut diameter
*2 Number of nut	S: Number of nut is one, preload is given by the adjustment of ball
	D: Number of nuts is twice, preload is given by the tension
*3 Shaft end spec	A: For the mechatronics equipment,, shaft end not worked
	B: For the machine tool, shaft end not worked
	C: Shaft end is worked by user's design
	A1U: Mechatronics kit with support bearing

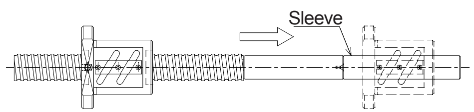
Notes on use

Lubrication

The enough lubrication is necessary when using the TSUBAKI NAKASHIMA precision standard ball screw. If the lubrication is not enough, it will cause the trouble or reduction of life. When use the ball screw, provide oil (ISO adhesive grade 46-100) or grease (Li soap group NLGI#2-3, mechatronics equipment ball screw is #1) well and do a trial running before the use.

Dustproof

A wiper seal (labyrinth) for the dust prevention is installed in the TSUBAKI NAKASHIMA precision standard ball screw, please use a telescopic type cover or the equipment like the bellows in case ensure the dustproof.



Note on additional working at the shaft end

Because of a short delivery, the shaft end of TSUBAKI NAKASHIMA precision standard ball screw is worked straight so an additional working on the shaft end is necessary depends on the use. We work it so please instruct us the detail by the standard shaft end shape. In the case of work the shaft end by the user, please obey the following notes.

① Work the nut as it's fixed to the screw shaft.

② Pay attention to invading a machining dust or a cutting fluid.

③ In case of operate a sudden rotation or a sudden stop when working, or stripping a nut from the screw shaft is necessary, please use the sleeve as below.

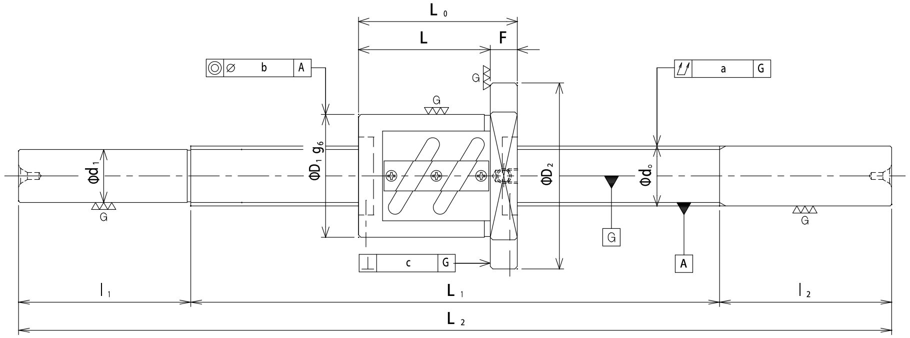
④ Use a run out stopper on the diameter part and centering well by using the center hole, and especially avoid working near the dangerous speed.

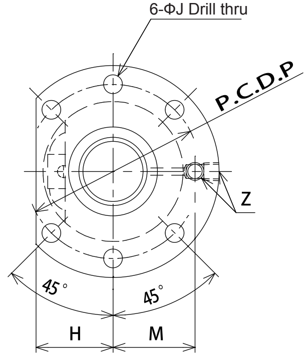
⑤ In case of come out the nut from the screw shaft, please contact us.

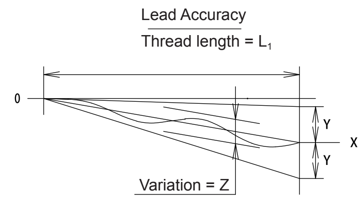
（1）STS SERIES（SHAFT DIA. Φ20～32）

REWORKABLE SHAFT END BALL SCREW FOR MACHINE TOOL

NUT : TF TYPE (Over-size Preload)







Nominal Number	Ball screw specification: Screw dia. d_0	Root dia. d_r	Lead l	Ball dia. D_w	Effective turns m	Shaft dimension: Thread length L_1	Overall length L_2	Screw dia. d_1	Journal length l_1	Journal length l_2	Lead accuracy: Target X	Torelance Y	Variation Z
STS2004- 400C5-B	20	18.1	4	2.381	2.5×2	250	400	–	–	150	－0.005	0.023	0.018
STS2004- 600C5-B	20	18.1	4	2.381	2.5×2	400	600	18.1	50	150	－0.008	0.025	0.020
STS2004-1000C5-B	20	18.1	4	2.381	2.5×2	800	1000	18.1	50	150	－0.016	0.035	0.025
STS2005- 400C5-B	20	17.5	5	3.175	2.5×2	250	400	–	–	150	－0.005	0.023	0.018
STS2005- 600C5-B	20	17.5	5	3.175	2.5×2	400	600	17.4	50	150	－0.008	0.025	0.020
STS2005-1000C5-B	20	17.5	5	3.175	2.5×2	800	1000	17.4	50	150	－0.016	0.035	0.025
STS2504- 500C5-B	25	23.1	4	2.381	2.5×2	300	500	–	–	200	－0.006	0.023	0.018
STS2504- 800C5-B	25	23.1	4	2.381	2.5×2	500	800	23.1	100	200	－0.010	0.027	0.020
STS2504-1000C5-B	25	23.1	4	2.381	2.5×2	700	1000	23.1	100	200	－0.014	0.035	0.025
STS2504-1400C5-B	25	23.1	4	2.381	2.5×2	1100	1400	23.1	100	200	－0.022	0.046	0.030
STS2505- 500C5-B	25	22.5	5	3.175	2.5×2	300	500	–	–	200	－0.006	0.023	0.018
STS2505- 800C5-B	25	22.5	5	3.175	2.5×2	500	800	22.4	100	200	－0.010	0.027	0.020
STS2505-1000C5-B	25	22.5	5	3.175	2.5×2	700	1000	22.4	100	200	－0.014	0.035	0.025
STS2505-1400C5-B	25	22.5	5	3.175	2.5×2	1100	1400	22.4	100	200	－0.022	0.046	0.030
STS2510- 600C5-B	25	21.4	10	4.763	1.5×2	400	600	–	–	200	－0.080	0.025	0.020
STS2510-1000C5-B	25	21.4	10	4.763	1.5×2	600	1000	21.4	100	300	－0.012	0.030	0.023
STS2510-1200C5-B	25	21.4	10	4.763	1.5×2	800	1200	21.4	100	300	－0.016	0.035	0.025
STS2510-1600C5-B	25	21.4	10	4.763	1.5×2	1200	1600	21.4	100	300	－0.024	0.046	0.030

Nominal Number	Accuracy of run-out: Runout a	Concentricity b	Squareness c	Nut dimension: Nut dia. D_1	Nut Length L	L_0	Flange: Flange dia. D_2	P.C.D P	Thickness F	Notch heigh H	Mount hole J	Oil hole: Position M	Size Z	Basic rated load: Dynamic C_a	Static C_o	Preload Amount N P_{PL}
STS2004- 400C5-B	0.045	0.015	0.011	40	38	49	63	51	11	23	5.5	22.5	M6	5800	11300	200
STS2004- 600C5-B	0.055	0.015	0.011	40	38	49	63	51	11	23	5.5	22.5	M6	5800	11300	200
STS2004-1000C5-B	0.085	0.015	0.011	40	38	49	63	51	11	23	5.5	22.5	M6	5800	11300	200
STS2005- 400C5-B	0.045	0.015	0.011	44	45	56	67	55	11	24.5	5.5	24.5	M6	9400	16900	350
STS2005- 600C5-B	0.055	0.015	0.011	44	45	56	67	55	11	24.5	5.5	24.5	M6	9400	16900	350
STS2005-1000C5-B	0.085	0.015	0.011	44	45	56	67	55	11	24.5	5.5	24.5	M6	9400	16900	350
STS2504- 500C5-B	0.040	0.015	0.011	46	37	48	69	57	11	25	5.5	25.5	M6	6300	14100	250
STS2504- 800C5-B	0.050	0.015	0.011	46	37	48	69	57	11	25	5.5	25.5	M6	6300	14100	250
STS2504-1000C5-B	0.070	0.015	0.011	46	37	48	69	57	11	25	5.5	25.5	M6	6300	14100	250
STS2504-1400C5-B	0.090	0.015	0.011	46	37	48	69	57	11	25	5.5	25.5	M6	6300	14100	250
STS2505- 500C5-B	0.040	0.015	0.011	50	44	55	73	61	11	26.5	5.5	27.5	M6	10200	20600	400
STS2505- 800C5-B	0.050	0.015	0.011	50	44	55	73	61	11	26.5	5.5	27.5	M6	10200	20600	400
STS2505-1000C5-B	0.070	0.015	0.011	50	44	55	73	61	11	26.5	5.5	27.5	M6	10200	20600	400
STS2505-1400C5-B	0.090	0.015	0.011	50	44	55	73	61	11	26.5	5.5	27.5	M6	10200	20600	400
STS2510- 600C5-B	0.045	0.019	0.013	58	66	81	85	71	15	31	6.6	33	M6	11100	18100	500
STS2510-1000C5-B	0.060	0.019	0.013	58	66	81	85	71	15	31	6.6	33	M6	11100	18100	500
STS2510-1200C5-B	0.070	0.019	0.013	58	66	81	85	71	15	31	6.6	33	M6	11100	18100	500
STS2510-1600C5-B	0.095	0.019	0.013	58	66	81	85	71	15	31	6.6	33	M6	11100	18100	500

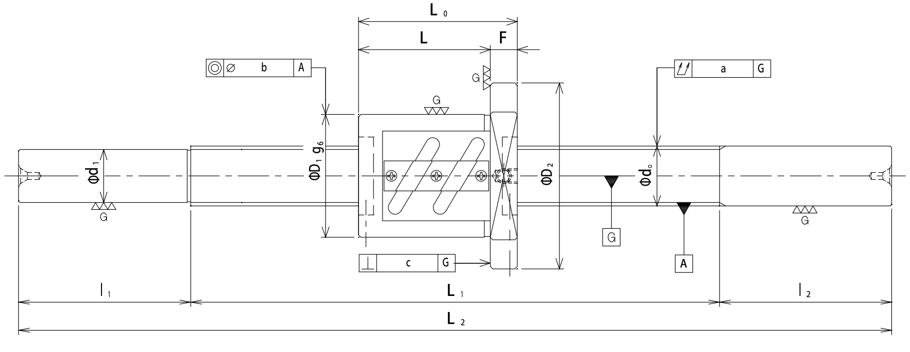
Note 1. Hardening length on shaft is L_1.

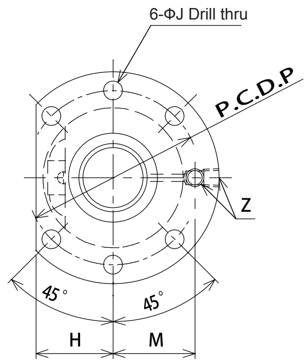
2. Shaft ends (l_1, l_2) can be machining work (under HRC 35.)

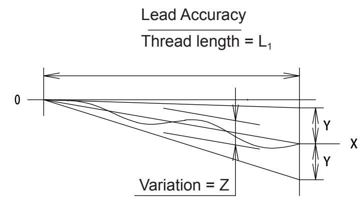
Ball screw

Reworkable Shaft End Ball Screw for Machine Tool

NUT : TF TYPE (Over-size Ball Preload)







Nominal Number	Ball screw specification					Shaft dimension					Lead accuracy		
	Screw dia.	Root dia.	Lead	Ball dia.	Effective turns	Thread length	Overall length	Screw dia.	Journal length		Target	Torelance	Variation
	d_0	d_r	l	D_w	m	L_1	L_2	d_1	l_1	l_2	X	Y	Z
STS2806- 600C5-B	28	25.5	6	3.175	2.5×2	400	600	–	–	200	-0.008	0.025	0.020
STS2806-1000C5-B	28	25.5	6	3.175	2.5×2	600	1000	25.4	100	300	-0.012	0.030	0.023
STS2806-1200C5-B	28	25.5	6	3.175	2.5×2	800	1200	25.4	100	300	-0.016	0.035	0.025
STS2806-1600C5-B	28	25.5	6	3.175	2.5×2	1200	1600	25.4	100	300	-0.024	0.046	0.030
STS3205- 600C5-B	32	29.5	5	3.175	2.5×2	400	600	–	–	200	-0.008	0.025	0.020
STS3205-1000C5-B	32	29.5	5	3.175	2.5×2	600	1000	29.4	100	300	-0.012	0.030	0.023
STS3205-1200C5-B	32	29.5	5	3.175	2.5×2	800	1200	29.4	100	300	-0.016	0.035	0.025
STS3205-1600C5-B	32	29.5	5	3.175	2.5×2	1200	1600	29.4	100	300	-0.024	0.046	0.030
STS3206- 600C5-B	32	28.9	6	3.969	2.5×2	400	600	–	–	200	-0.008	0.025	0.020
STS3206-1000C5-B	32	28.9	6	3.969	2.5×2	600	1000	28.4	100	300	-0.012	0.030	0.023
STS3206-1200C5-B	32	28.9	6	3.969	2.5×2	800	1200	28.4	100	300	-0.016	0.035	0.025
STS3206-1600C5-B	32	28.9	6	3.969	2.5×2	1200	1600	28.4	100	300	-0.024	0.046	0.030

Accuracy of run-out			Nut dimension									Oil hole		Basic rated load		Preload Amount
							Flange									
Runout	Concentricity	Squareness	Nut dia.	Nut Length		Flange dia.	P.C.D	Thickness	Notch heigh	Mount hole	Position	Size	Dynamic	Static	N
a	b	c	D_1	L	L_0	D_2	P	F	H	J	M	Z	C_a	C_0	P_{PL}
0.045	0.019	0.013	55	51	63	85	69	12	30	6.6	33	M6	11100	24100	450
0.060	0.019	0.013	55	51	63	85	69	12	30	6.6	33	M6	11100	24100	450
0.070	0.019	0.013	55	51	63	85	69	12	30	6.6	33	M6	11100	24100	450
0.095	0.019	0.013	55	51	63	85	69	12	30	6.6	33	M6	11100	24100	450
0.045	0.019	0.013	58	44	56	85	71	12	31	6.6	33	M6	11600	27700	500
0.060	0.019	0.013	58	44	56	85	71	12	31	6.6	33	M6	11600	27700	500
0.070	0.019	0.013	58	44	56	85	71	12	31	6.6	33	M6	11600	27700	500
0.095	0.019	0.013	58	44	56	85	71	12	31	6.6	33	M6	11600	27700	500
0.045	0.019	0.013	62	51	63	89	75	12	33	6.6	35	M6	16000	34900	600
0.060	0.019	0.013	62	51	63	89	75	12	33	6.6	35	M6	16000	34900	600
0.070	0.019	0.013	62	51	63	89	75	12	33	6.6	35	M6	16000	34900	600
0.095	0.019	0.013	62	51	63	89	75	12	33	6.6	35	M6	16000	34900	600

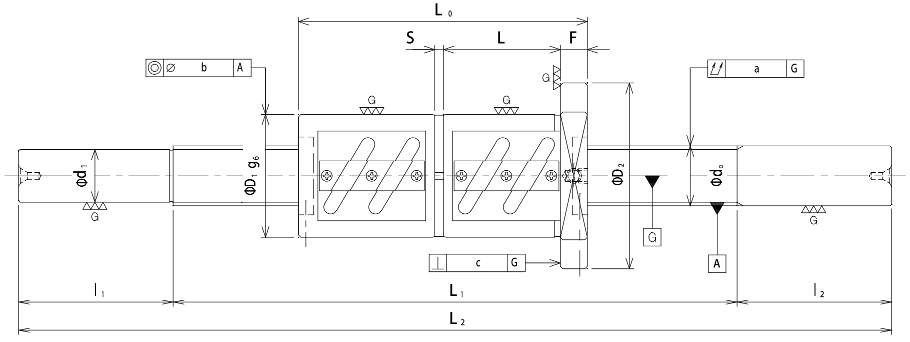
Note 1. Hardening length on shaft is L_1.

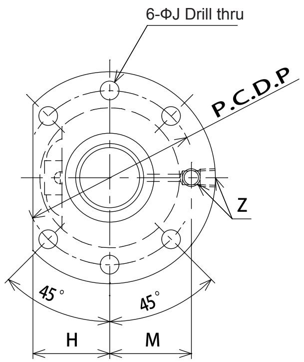
2. Shaft ends (l_1, l_2) can be machining work (under HRC 35.)

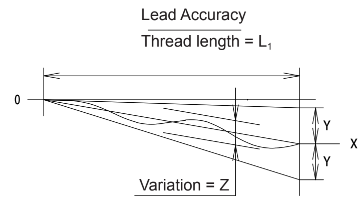
2) STD SERIES (Shaft Dia. Φ32 ～ 50)

Reworkable Shaft End Ball Screw for Machine Tool

NUT : TTF TYPE (Double Nut Preload)







Nominal Number	Ball screw specification: Screw dia. d_0	Root dia. d_r	Lead l	Ball dia. D_w	Effective turns m	Shaft dimension: Thread length L_1	Overall length L_2	Screw dia. d_1	Journal length l_1	l_2	Lead accuracy: Target X	Torelance Y	Variation Z
STD3210-1200C5-B	32	27.2	10	6.35	2.5×1	700	1200	27.2	120	380	-0.014	0.035	0.025
STD3210-1500C5-B	32	27.2	10	6.35	2.5×1	1000	1500	27.2	120	380	-0.020	0.040	0.027
STD3210-1800C5-B	32	27.2	10	6.35	2.5×1	1300	1800	27.2	120	380	-0.026	0.054	0.035
STD3210-2100C5-B	32	27.2	10	6.35	2.5×1	1600	2100	27.2	120	380	-0.032	0.054	0.035
STD3610-1200C5-B	36	31.2	10	6.35	2.5×2	700	1200	31.2	120	380	-0.014	0.035	0.025
STD3610-1500C5-B	36	31.2	10	6.35	2.5×2	1000	1500	31.2	120	380	-0.020	0.040	0.027
STD3610-1800C5-B	36	31.2	10	6.35	2.5×2	1300	1800	31.2	120	380	-0.026	0.054	0.035
STD3610-2100C5-B	36	31.2	10	6.35	2.5×2	1600	2100	31.2	120	380	-0.032	0.054	0.035
STD4010-1300C5-B	40	35.2	10	6.35	2.5×2	700	1300	35.2	150	450	-0.014	0.035	0.025
STD4010-1600C5-B	40	35.2	10	6.35	2.5×2	1000	1600	35.2	150	450	-0.020	0.040	0.027
STD4010-2000C5-B	40	35.2	10	6.35	2.5×2	1400	2000	35.2	150	450	-0.028	0.054	0.035
STD4010-2400C5-B	40	35.2	10	6.35	2.5×2	1800	2400	35.2	150	450	-0.036	0.065	0.040
STD4012-1300C5-B	40	34.6	12	7.144	2.5×2	700	1300	34.4	150	450	-0.014	0.035	0.025
STD4012-1600C5-B	40	34.6	12	7.144	2.5×2	1000	1600	34.4	150	450	-0.020	0.040	0.027
STD4012-2000C5-B	40	34.6	12	7.144	2.5×2	1400	2000	34.4	150	450	-0.028	0.054	0.035
STD4012-1400C5-B	40	34.6	12	7.144	2.5×2	1800	2400	34.4	150	450	-0.036	0.065	0.040
STD5010-1700C5-B	50	45.2	10	6.35	2.5×2	1000	1700	45.2	200	500	-0.020	0.040	0.027
STD5010-2200C5-B	50	45.2	10	6.35	2.5×2	1500	2200	45.2	200	500	-0.030	0.054	0.035
STD5010-2700C5-B	50	45.2	10	6.35	2.5×2	2000	2700	45.2	200	500	-0.040	0.065	0.040
STD5010-3200C5-B	50	45.2	10	6.35	2.5×2	2500	3200	45.2	200	500	-0.050	0.077	0.046

Accuracy of run-out: Runout a	Concentricity b	Squareness c	Nut dimension: Nut dia. D_1	Nut Length L	L_0		Flange: Flange dia. D_2	P.C.D P	Thickness F	Notch heigh H	Mount hole J	Oil hole: Position M	Size Z	Basic rated load: Dynamic C_a	Static C_0	Preload Amount N P_{PL}
0.070	0.019	0.013	74	48	130	6	108	90	15	39	9	44	M6	25500	53500	1500
0.085	0.019	0.013	74	48	130	6	108	90	15	39	9	44	M6	25500	53500	1500
0.130	0.019	0.013	74	48	130	6	108	90	15	39	9	44	M6	25500	53500	1500
0.180	0.019	0.013	74	48	130	6	108	90	15	39	9	44	M6	25500	53500	1500
0.055	0.019	0.013	75	78	193	6	120	98	18	44	11	44	PT1/8	49300	121000	2500
0.065	0.019	0.013	75	78	193	6	120	98	18	44	11	44	PT1/8	49300	121000	2500
0.095	0.019	0.013	75	78	193	6	120	98	18	44	11	44	PT1/8	49300	121000	2500
0.120	0.019	0.013	75	78	193	6	120	98	18	44	11	44	PT1/8	49300	121000	2500
0.055	0.025	0.015	82	78	193	6	124	102	18	45	11	46	PT1/8	52000	135000	2500
0.065	0.025	0.015	82	78	193	6	124	102	18	45	11	46	PT1/8	52000	135000	2500
0.095	0.025	0.015	82	78	193	6	124	102	18	45	11	46	PT1/8	52000	135000	2500
0.120	0.025	0.015	82	78	193	6	124	102	18	45	11	46	PT1/8	52000	135000	2500
0.055	0.025	0.015	86	90	225	12	128	106	18	47	11	49	PT1/8	61100	153000	3500
0.065	0.025	0.015	86	90	225	12	128	106	18	47	11	49	PT1/8	61100	153000	3500
0.095	0.025	0.015	86	90	225	12	128	106	18	47	11	49	PT1/8	61100	153000	3500
0.120	0.025	0.015	86	90	225	12	128	106	18	47	11	49	PT1/8	61100	153000	3500
0.065	0.025	0.015	93	78	193	6	135	113	18	49	11	52	PT1/8	57900	171000	3000
0.095	0.025	0.015	93	78	193	6	135	113	18	49	11	52	PT1/8	57900	171000	3000
0.120	0.025	0.015	93	78	193	6	135	113	18	49	11	52	PT1/8	57900	171000	3000
0.150	0.025	0.015	93	78	193	6	135	113	18	49	11	52	PT1/8	57900	171000	3000

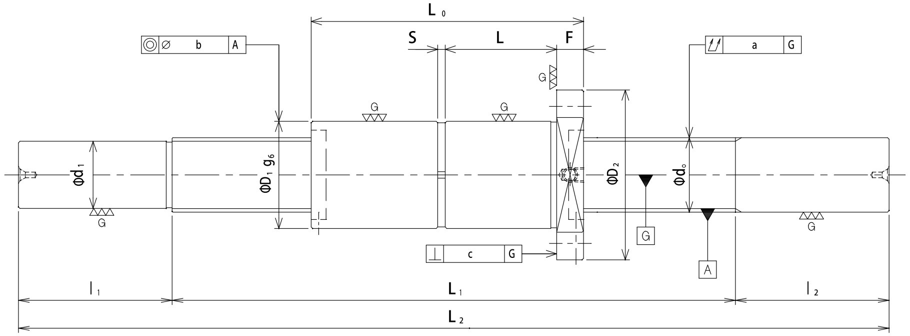
Note 1. Hardening length on shaft is L_1.

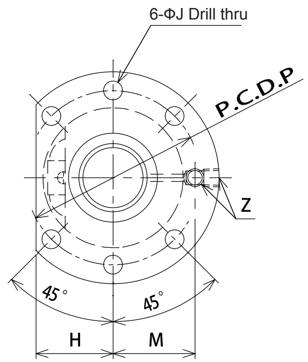
2. Shaft ends (l_1, l_2) can be machining work (under HRC 35.)

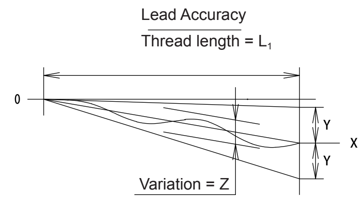
(3) SZD SERIES (Shaft Dia. Φ32～50)

Reworkable Shaft End Ball Screw for Machine Tool

NUT : ZZF TYPE (Double Nut Preload)







Nominal Number	Ball screw specification					Shaft dimension					Lead accuracy		
	Screw dia.	Root dia.	Lead	Ball dia.	Effective turns	Thread length	Overall length	Screw dia.	Journal length		Target	Torelance	Variation
	d_0	d_r	l	D_w	m	L_1	L_2	d_1	l_1	l_2	X	Y	Z
SZD3210-1200C5-B	32	27.2	10	6.35	1×3	700	1200	27.2	120	380	-0.014	0.035	0.025
SZD3210-1500C5-B	32	27.2	10	6.35	1×3	1000	1500	27.2	120	380	-0.020	0.040	0.027
SZD3210-1800C5-B	32	27.2	10	6.35	1×3	1300	1800	27.2	120	380	-0.026	0.054	0.035
SZD4010-1300C5-B	40	35.2	10	6.35	1×5	700	1300	35.2	150	450	-0.014	0.035	0.025
SZD4010-1600C5-B	40	35.2	10	6.35	1×5	1000	1600	35.2	150	450	-0.020	0.040	0.027
SZD4010-2000C5-B	40	35.2	10	6.35	1×5	1400	2000	35.2	150	450	-0.028	0.054	0.035
SZD4010-2400C5-B	40	35.2	10	6.35	1×5	1800	2400	35.2	150	450	-0.036	0.065	0.040
SZD5010-1700C5-B	50	45.2	10	6.35	1×5	1000	1700	45.2	200	500	-0.020	0.040	0.027
SZD5010-2200C5-B	50	45.2	10	6.35	1×5	1500	2200	45.2	200	500	-0.030	0.054	0.035
SZD5010-2700C5-B	50	45.2	10	6.35	1×5	2000	2700	45.2	200	500	-0.040	0.065	0.040
SZD5010-3200C5-B	50	45.2	10	6.35	1×5	2500	3200	45.2	200	500	-0.050	0.077	0.046

Accuracy of run-out			Nut dimension				Flange					Oil hole		Basic rated load		Preload Amount
Runout	Concentricity	Squareness	Nut dia.	Nut Length			Flange dia.	P.C.D	Thickness	Notch heigh	Mount hole	Position	Size	Dynamic	Static	N
a	b	c	D_1	L	L_0		D_2	P	F	H	J	M	Z	C_a	C_0	P_{PL}
0.070	0.019	0.013	54	55	140	5	88	70	15	32	9	35	M6	26000	52200	1500
0.085	0.019	0.013	54	55	140	5	88	70	15	32	9	35	M6	26000	52200	1500
0.130	0.019	0.013	54	55	140	5	88	70	15	32	9	35	M6	26000	52200	1500
0.055	0.019	0.013	62	75	183	5	104	82	18	38	11	37	PT1/8	46700	115000	2500
0.065	0.019	0.013	62	75	183	5	104	82	18	38	11	37	PT1/8	46700	115000	2500
0.095	0.019	0.013	62	75	183	5	104	82	18	38	11	37	PT1/8	46700	115000	2500
0.120	0.019	0.013	62	75	183	5	104	82	18	38	11	37	PT1/8	46700	115000	2500
0.065	0.019	0.013	72	75	183	5	114	92	18	42	11	42	PT1/8	53100	151000	3000
0.095	0.019	0.013	72	75	183	5	114	92	18	42	11	42	PT1/8	53100	151000	3000
0.120	0.019	0.013	72	75	183	5	114	92	18	42	11	42	PT1/8	53100	151000	3000
0.150	0.019	0.013	72	75	183	5	114	92	18	42	11	42	PT1/8	53100	151000	3000

Note 1. Hardening length on shaft is L_1.

2. Shaft ends (l_1, l_2) can be machining work (under HRC 35.)

Ball screw

(4) Standard shaft ends shape of precision standard ball screw

TSUBAKI NAKASHIMA precision standard ball screws for machine tool are prepared the standard shaft ends shape for each series. We work the shaft ends so please order us by the standard shaft ends number as below table.

Standard ball screw Model No.	Suitable bearing		Standard shaft ends number *3				Fix-side Support unit
	Bore	Bore No.	Fix-Fix (adjustable)	Fix-Fix	Fix-Support	Fix-Open	
STS 2004 STS 2005	15	02	-	21	22	23	-
	17※	03	-	-	32	33	S 1706 DF
STS 2504 STS 2505 STS 2510	17	03	-	31			
	20※	04	-	-	42	43	S 2007 DF
STS 2806 STS 3205 STS 3206 STD 3210 SZD 3210	20	04	-	41			
	25※	05	-	-	52	53	S 2508 DF S 2508 TFT
STD 3610	25	05	50	51			
	30※	06	-	-	62	63	S 3009 DF S 3009 TFT
STD 4010 SZD 4010 STD 4012	30	06	60	61			
STD 5010 SZD 5010	40	08	80	81	82	83	S 4011 DF S 4011 TFT S 4011 QFC

Note:

① Some dimension of shaft ends are different from the conventional standard precision ball screw.

② Special shaft ends working is available depend on the order.

③ Standard shaft ends number is specified by a combination of last digit of bore number of suitable bearing and number of supporting method. Please pay attention that the supported shaft ends of No. 82 is used different dimension of suitable bearing.Please refer a dimension drawing as detail.

④ In case of using shaft ends marked ※, please let the supported shaft ends cutting raised part due to the bearing contacting face is not enough.

⑥ Designing of TSUBAKI NAKASHIMA precision ball screw with shaft ends worked is below.

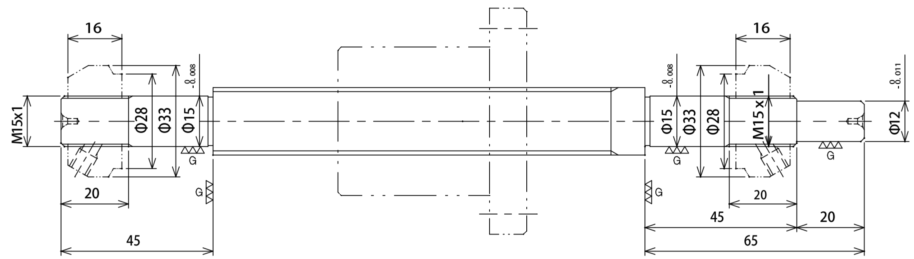
STD3210 — 827 — C5 — 42 U

- U: With support unit
- 42: Standard shaft ends number
- C5: Accuracy class
- 827: Overall length after shaft ends working (mm)
- STD3210: Nominal model no.

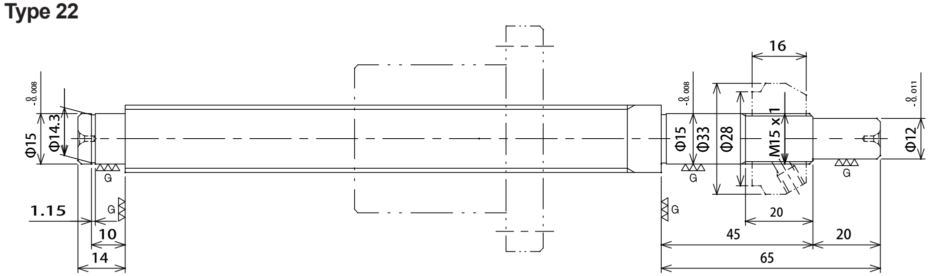
Standard bearing journal Type 21 ～ 23 (Bore Dia. 15 mm)

STS 2004
STS 2005

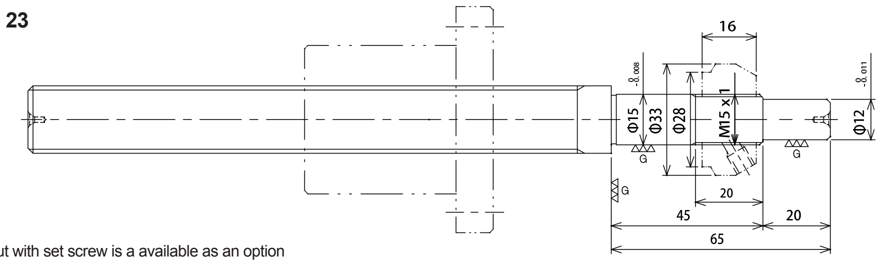
Type 21



Type 22



Type 23

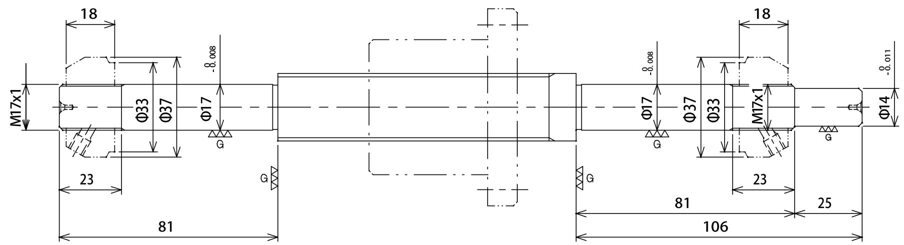


Note: Lock nut with set screw is a available as an option

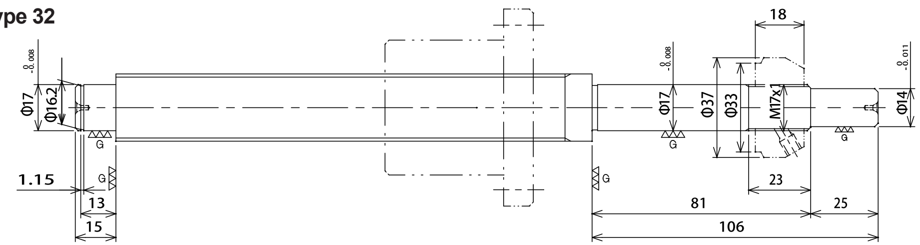
Standard bearing journal Type 31 ～ 33 (Bore Dia. 17 mm)

STS 2004※
STS 2005※
STS 2504
STS 2505
STS 2510

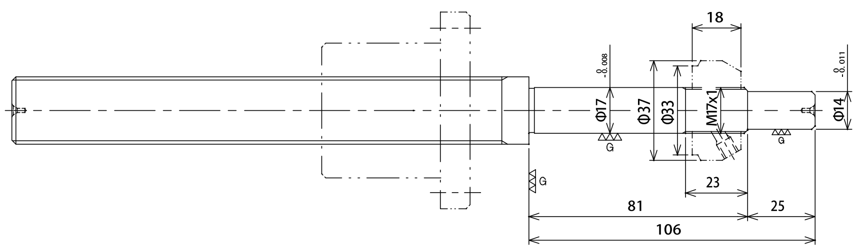
Type 31



Type 32



Type 33

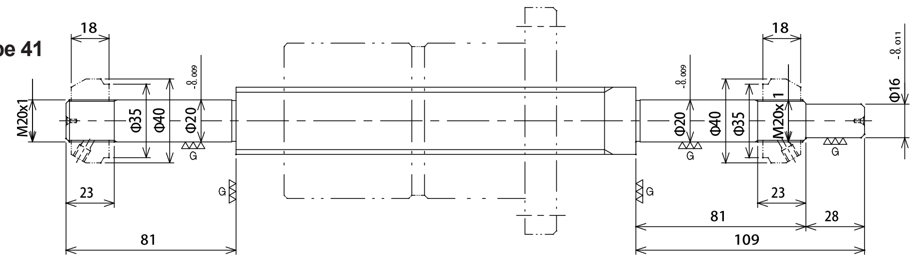


Note : 1. In case of marked ※ball screw (normal dia. 20),
please select type 32 or type 33.
Moreover leave unthreaded part at fixed side.
2. Lock nut with set screw is available as an option

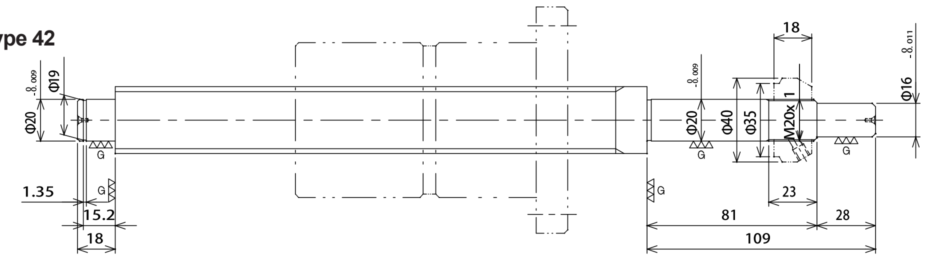
Standard bearing journal Type 41 ～ 43 (Bore Dia. 20 mm)

STS 2504※
STS 2505※
STS 2510※
STS 2806
STS 3205
STS 3206
STD 3210
SZD 3210

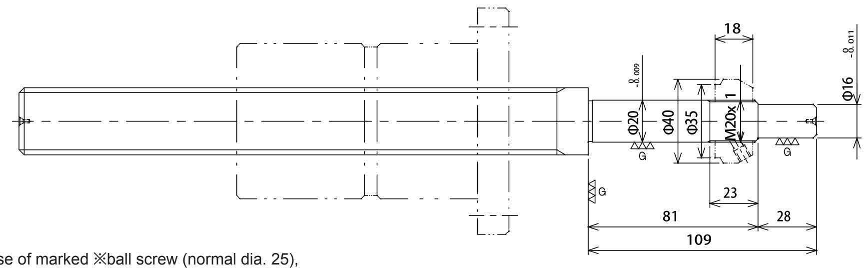
Type 41



Type 42



Type 43

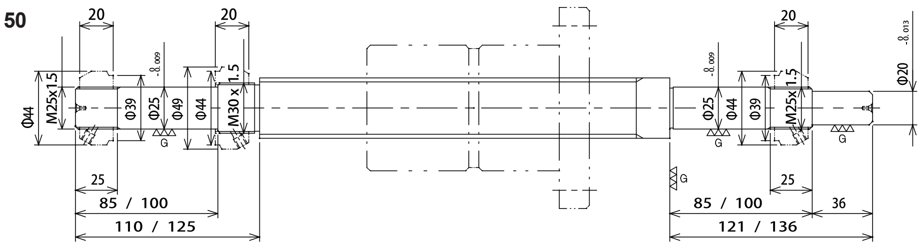


Note : 1. In case of marked ※ball screw (normal dia. 25),
please select type 42 or type 43.
Moreover leave unthreaded part at fixed side.
2. Lock nut with set screw is available as an option

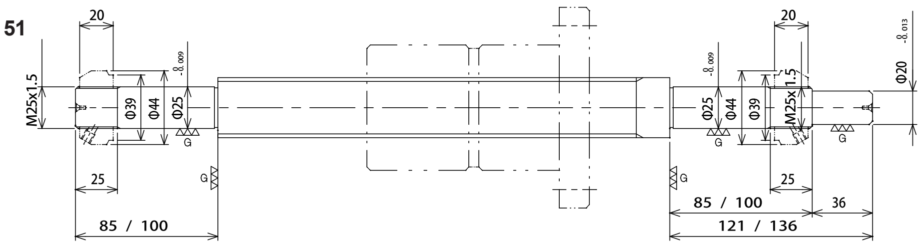
Standard bearing journal Type 50 ～ 53 (Bore Dia. 25 mm)

STS 2806※
STS 3205※
STS 3206※
STD 3210※
STD 3610
SZD 3210

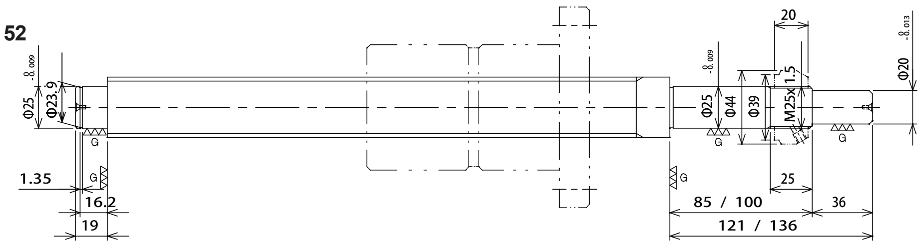
Type 50



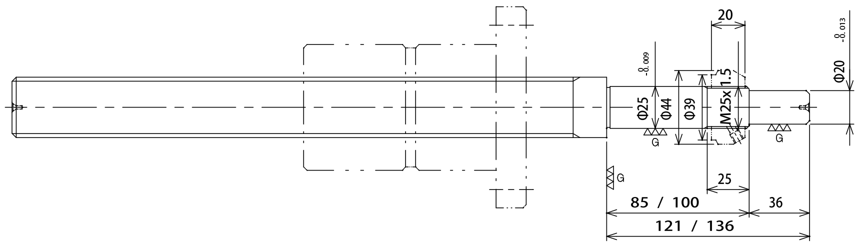
Type 51



Type 52



Type 53

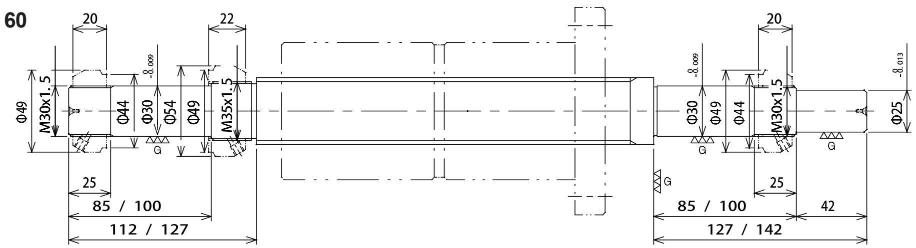


Note : 1. In case of marked ※ball screw (normal dia. 28, 32), please select type 52 or type 53.
Moreover leave unthreaded part at fixed side.
2. Lock nut with set screw is available as an option

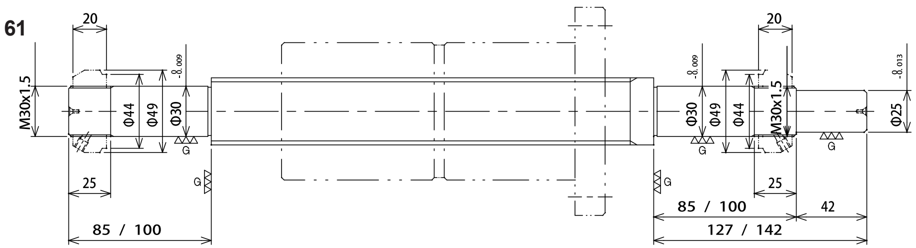
Standard bearing journal Type 60 ～ 63 (Bore Dia. 30 mm)

STD 3610※
STD 4010
STD 4012
SZD 4010

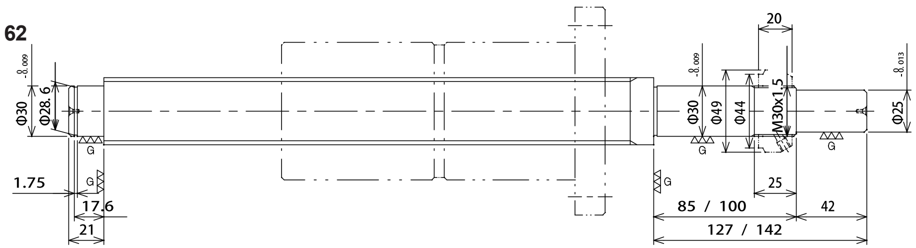
Type 60



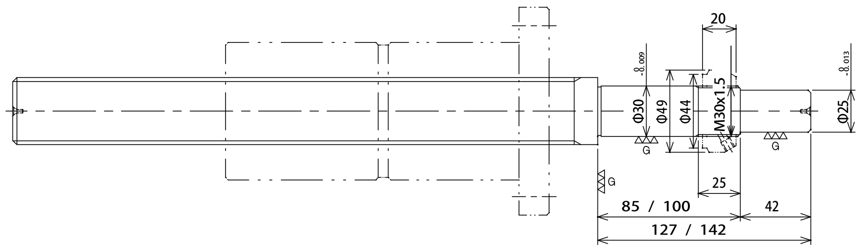
Type 61



Type 62



Type 63

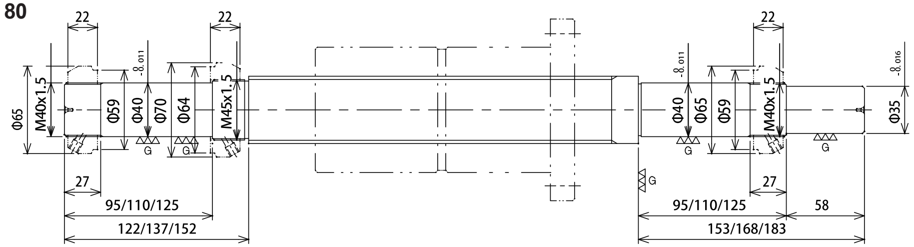


Note : 1. In case of marked ※ball screw (normal dia. 36), please select type 62 or type 63.
Moreover leave unthreaded part at fixed side.
2. Lock nut with set screw is available as an option

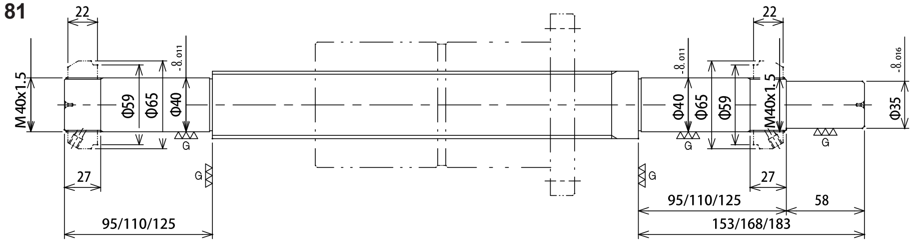
Standard bearing journal Type 80 ～ 83 (Bore Dia. 40 mm)

STD 5010
SZD 5010

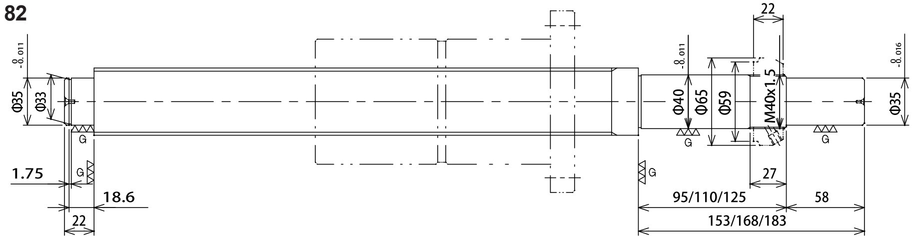
Type 80



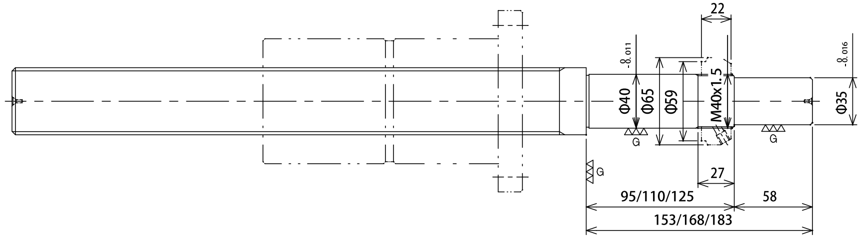
Type 81



Type 82



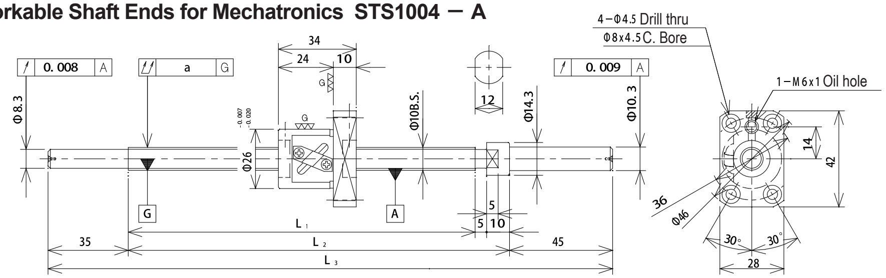
Type 83



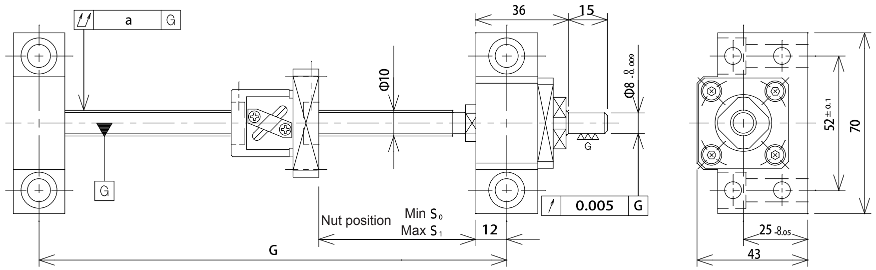
Note : Lock nut with set screw is available as an option.

(5) STS SERIES (Shaft dia. １０～２５ mm)

Reworkable Shaft Ends for Mechatronics STS1004－A



Kits for Mechatronics STS1004-A1U



Ball screw dimension

Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque ×10^{-1} N.m
STS1004	10	8.3	4	2.0	2.5×1	1840	2390	0.1～0.4

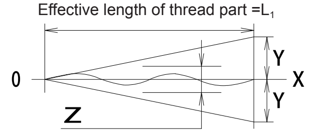
Screw shaft dimension

Unit:mm

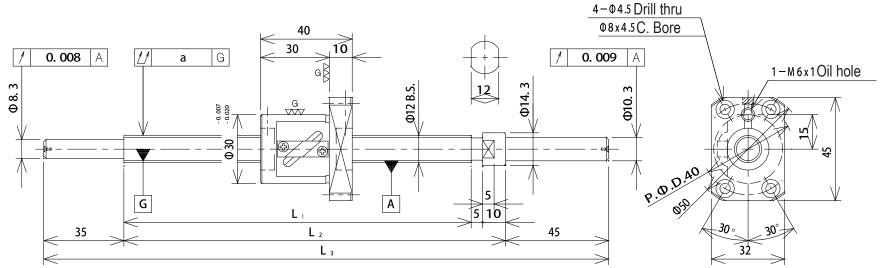
Stroke	Reworkable for mechatronics Model No.	L₁	L₂	L₃	Kits for mechatronics Model No.	G	S0	S1	Lead accuracy μm X	Y	Z	Run - out a
50	STS1004-205C3-A	110	125	205	STS1004-180C3-A1U	140	22	72	0	10	8	0.020
100	STS1004-255C3-A	160	175	255	STS1004-230C3-A1U	190	22	122	0	10	8	0.030
150	STS1004-305C3-A	210	225	305	STS1004-280C3-A1U	240	22	172	0	12	8	0.030
200	STS1004-355C3-A	260	275	355	STS1004-330C3-A1U	290	22	222	0	12	8	0.040
250	STS1004-405C3-A	310	325	405	STS1004-380C3-A1U	340	22	272	0	12	8	0.040
300	STS1004-455C3-A	360	375	455	STS1004-430C3-A1U	390	22	322	0	13	10	0.050

Note 1. Shaft ends shape of kit for mechatronics is accords with Type A1 on page A180.
2.The support unit of kit for mechatronics uses F1000ACDF at fix side, and S08082Z at supported side. Please refer A249 as detail.

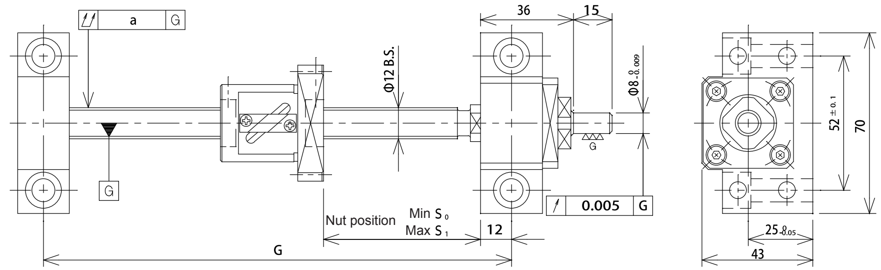
Lead Accuracy
Effective length of thread part =L₁



Reworkable Shaft Ends for Mechatronics STS1205-A



Kits for Mechatronics STS1205-A1U



Ball screw dimension

Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque ×10^{-1} N.m
STS1205	12	10.1	5	2.381	2.5x1	2510	3390	0.1～0.4

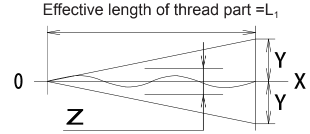
Screw shaft dimension

Unit:mm

Stroke	Reworkable for mechatronics Model No.	L₁	L₂	L₃	Kits for mechatronics Model No.	G	S0	S1	Lead accuracy μm X	Y	Z	Run - out a
50	STS1205-205C5-A	110	125	205	STS1205-180C5-A1U	140	22	72	0	20	18	0.020
100	STS1205-255C5-A	160	175	255	STS1205-230C5-A1U	190	22	122	0	20	18	0.030
150	STS1205-305C5-A	210	225	305	STS1205-280C5-A1U	240	22	172	0	23	18	0.030
200	STS1205-355C5-A	260	275	355	STS1205-330C5-A1U	290	22	222	0	23	18	0.040
250	STS1205-405C5-A	310	325	405	STS1205-380C5-A1U	340	22	272	0	23	18	0.040
300	STS1205-505C5-A	410	425	505	STS1205-440C5-A1U	440	22	322	0	27	20	0.050

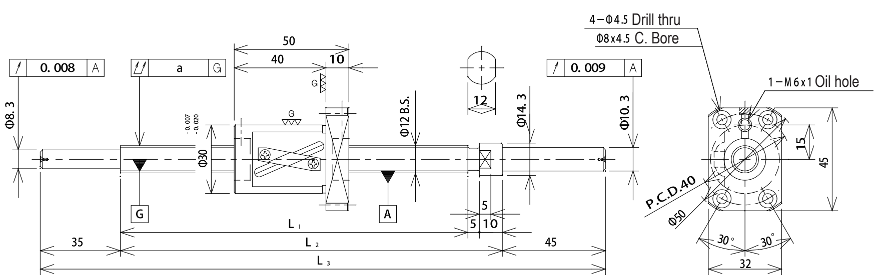
Note 1. Shaft ends shape of kit for mechatronics is accords with Type A1 on page A180.
2.The support unit of kit for mechatronics uses F1000ACDF at fix side, and S08082Z at supported side. Please refer A249 as detail.

Lead Accuracy
Effective length of thread part =L₁

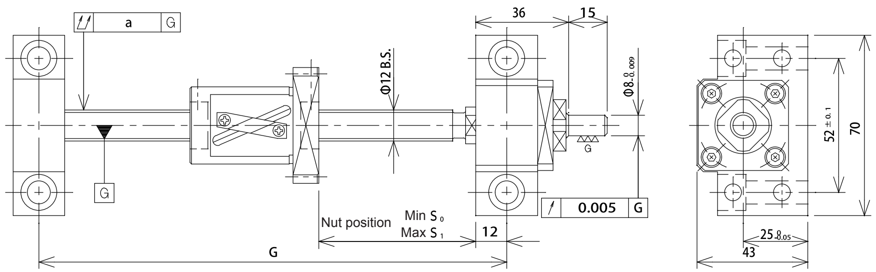


Ball screw

Reworkable Shaft Ends for Mechatronics STS1210-A



Kits for Mechatronics STS1210-A1U



Ball screw dimension

Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque ×10^{-1} N.m
STA1210	12	9.8	10	2.381	2.5x1	2440	3390	0.1 ～ 0.5

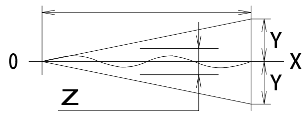
Screw shaft dimension

Unit:mm

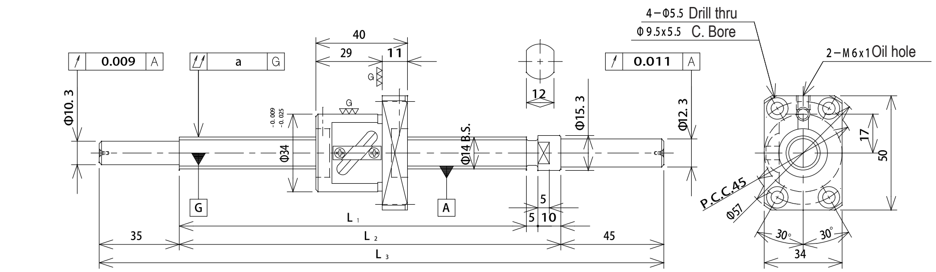
Stroke	Reworkable for mechatronics Model No.	L_1	L_2	L_3	Kits for mechatronics Model No.	G	S0	S1	Lead accuracy μm X	Y	Z	Run - out a
100	STS1210-255C5-A	160	175	255	STS1210-230C5-A1U	190	14	114	0	20	18	0.030
150	STS1210-305C5-A	210	225	305	STS1210-280C5-A1U	240	14	164	0	23	18	0.030
250	STS1210-405C5-A	310	325	405	STS1210-380C5-A1U	340	14	264	0	23	18	0.040
350	ATS1210-505C5-A	410	425	505	STS1210-480C5-A1U	440	14	364	0	27	20	0.050

Note 1. Shaft ends shape of kit for mechatronics is accords with Type A1 on page A180.
2.The support unit of kit for mechatronics uses F1000ACDF at fix side, and S08082Z at supported side. Please refer A249 as detail.

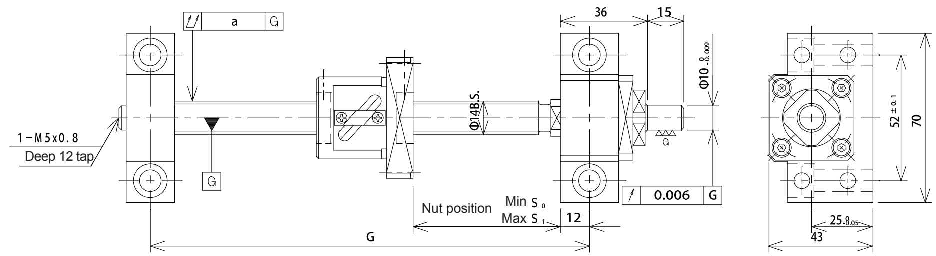
Lead Accuracy
Effective length of thread part =L_1



Reworkable Shaft Ends for Mechatronics STS1405-A



Kits for Mechatronics STS1405-A1U



Ball screw dimension

Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque ×10^{-1} N.m
STS1405	14	11.2	5	3.175	2.5x1	4270	5790	0.1 ～ 0.6

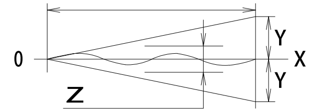
Screw shaft dimension

Unit:mm

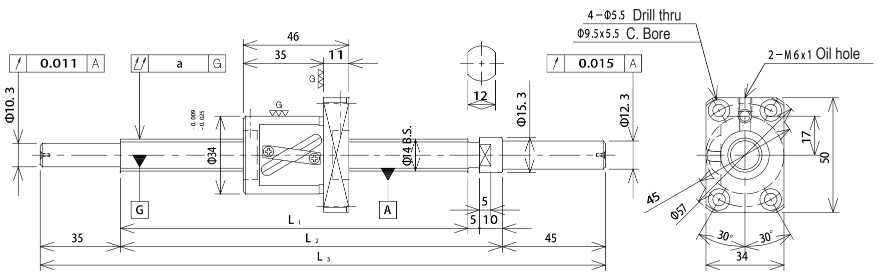
Stroke	Reworkable for mechatronics Model No.	L_1	L_2	L_3	Kits for mechatronics Model No.	G	S0	S1	Lead accuracy μm X	Y	Z	Run - out a
100	STS1405-284C3-A	189	204	284	STS1405-271C3-A1U	219	28	128	0	10	8	0.020
150	STS1405-334C3-A	239	254	334	STS1405-321C3-A1U	269	28	178	0	12	8	0.030
250	STS1405-434C3-A	339	354	434	STS1405-421C3-A1U	369	28	278	0	13	10	0.035
350	STS1405-534C3-A	439	454	534	STS1405-521C3-A1U	469	28	378	0	15	10	0.045
450	STS1405-634C3-A	539	554	634	STS1405-621C3-A1U	569	28	478	0	16	12	0.045
600	STS1405-784C3-A	689	704	784	STS1405-771C3-A1U	719	28	628	0	18	13	0.055

Note 1. Shaft ends shape of kit for mechatronics is accords with Type A1 on page A180.
2.The support unit of kit for mechatronics uses F1201ACDF at fix side, and S10002Z at supported side. Please refer A249 as detail.

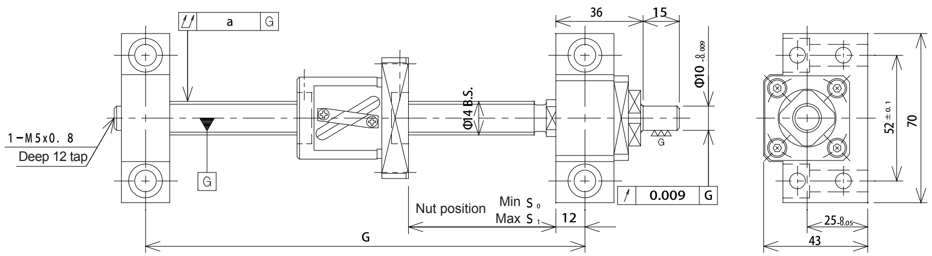
Lead Accuracy
Effective length of thread part =L_1



Reworkable Shaft Ends for Mechatronics STS1408-A



Kits for Mechatronics STS1405-A1U



Ball screw dimension

Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque ×10⁻¹ N.m
STS1408	14	11.2	8	3.175	2.5x1	4220	5790	0.2～0.8

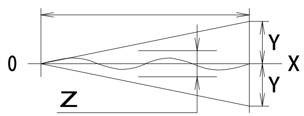
Screw shaft dimension

Unit:mm

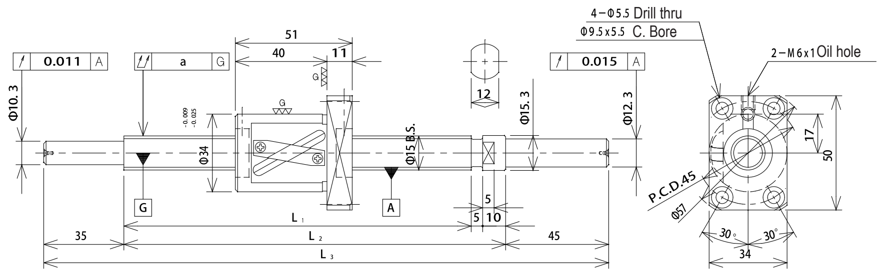
Stroke	Reworkable for mechatronics Model No.	L_1	L_2	L_3	Kits for mechatronics Model No.	G	S0	S1	Lead accuracy μm X	Y	Z	Run - out a
100	STS1408-284C5-A	189	204	284	STS1408-271C5-A1U	219	28	128	0	20	18	0.030
150	STS1408-334C5-A	239	254	334	STS1408-321C5-A1U	269	28	178	0	23	18	0.035
200	STS1408-384C5-A	289	304	384	STS1408-371C5-A1U	319	28	228	0	23	18	0.035
250	STS1408-434C5-A	339	354	434	STS1408-421C5-A1U	369	28	278	0	25	20	0.040
300	STS1408-484C5-A	389	404	484	STS1408-471C5-A1U	419	28	328	0	25	20	0.040
350	STS1408-534C5-A	439	454	534	STS1408-521C5-A1U	469	28	378	0	27	20	0.050
400	STS1408-584C5-A	489	504	584	STS1408-571C5-A1U	519	28	428	0	27	20	0.050
450	STS1408-634C5-A	539	554	634	STS1408-621C5-A1U	569	28	478	0	30	23	0.050
500	STS1408-684C5-A	589	604	684	STS1408-671C5-A1U	619	28	528	0	30	23	0.065
550	STS1408-734C5-A	639	654	734	STS1408-721C5-A1U	669	28	578	0	35	25	0.065
600	STS1408-784C5-A	389	704	784	STS1408-771C5-A1U	719	28	628	0	35	25	0.065
700	STS1408-884C5-A	789	804	884	STS1408-871C5-A1U	819	28	728	0	35	25	0.085

Note 1. Shaft ends shape of kit for mechatronics is accords with Type A1 on page A180.
2.The support unit of kit for mechatronics uses F1201ACDF at fix side, and S10002Z at supported side. Please refer A249 as detail.

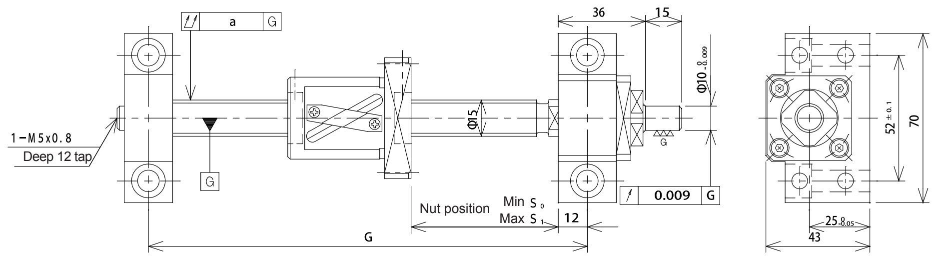
Lead Accuracy
Effective length of thread part =L_1



Reworkable Shaft Ends for Mechatronics STS1510-A



Kits for Mechatronics STS1510-A1U



Ball screw dimension

Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque ×10⁻¹ N.m
STS1510	15	12.2	10	3.175	2.5x1	4170	5820	0.2～0.8

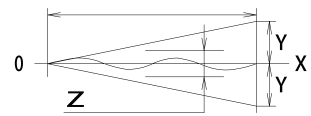
Screw shaft dimension

Unit:mm

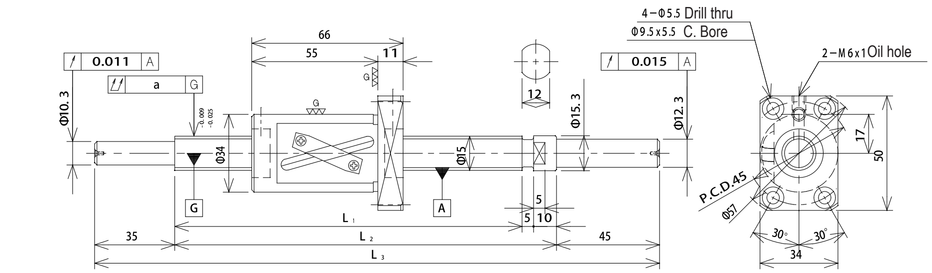
Stroke	Reworkable for mechatronics Model No.	L_1	L_2	L_3	Kits for mechatronics Model No.	G	S0	S1	Lead accuracy μm X	Y	Z	Run - out a
100	STS1510-284C5-A	189	204	284	STS1510-271C5-A1U	219	28	128	0	20	18	0.030
150	STS1510-334C5-A	239	254	334	STS1510-321C5-A1U	269	28	178	0	23	18	0.035
200	STS1510-384C5-A	289	304	384	STS1510-371C5-A1U	319	28	228	0	23	18	0.035
250	STS1510-434C5-A	339	354	434	STS1510-421C5-A1U	369	28	278	0	25	20	0.040
300	STS1510-484C5-A	389	404	484	STS1510-471C5-A1U	419	28	328	0	25	20	0.040
350	STS1510-534C5-A	439	454	534	STS1510-521C5-A1U	469	28	378	0	27	20	0.050
400	STS1510-584C5-A	489	504	584	STS1510-571C5-A1U	519	28	428	0	27	20	0.050
450	STS1510-634C5-A	539	554	634	STS1510-621C5-A1U	569	28	478	0	30	23	0.050
500	STS1510-684C5-A	589	604	684	STS1510-671C5-A1U	619	28	528	0	30	23	0.065
550	STS1510-734C5-A	639	654	734	STS1510-721C5-A1U	669	28	578	0	35	25	0.065
600	STS1510-784C5-A	689	704	784	STS1510-771C5-A1U	719	28	628	0	35	25	0.065
700	STS1510-884C5-A	789	804	884	STS1510-871C5-A1U	819	28	728	0	35	25	0.085
800	STS1510-984C5-A	889	904	984	STS1510-971C5-A1U	919	28	828	0	40	27	0.085
1000	STS1510-1184C5-A	1089	1104	1184	STS1510-1171C5-A1U	1119	28	1028	0	46	30	0.110

Note 1. Shaft ends shape of kit for mechatronics is accords with Type A1 on page A180.
2.The support unit of kit for mechatronics uses F1201ACDF at fix side, and S10002Z at supported side. Please refer A249 as detail.

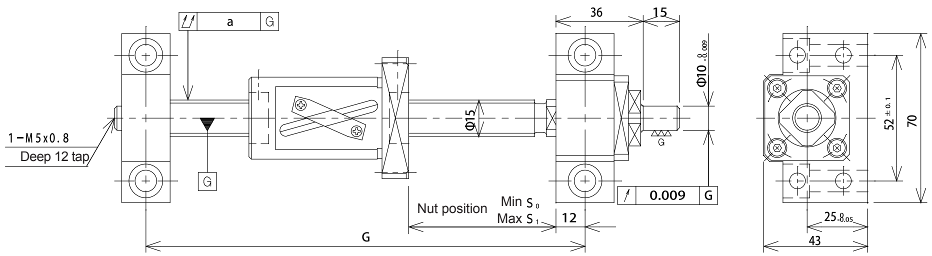
Lead Accuracy
Effective length of thread part =L_1



Reworkable Shaft Ends for Mechatronics STS1520-A



Kits for Mechatronics STS1520-A1U



Ball screw dimension

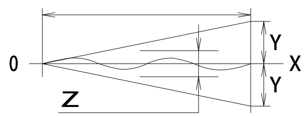
Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque ×10⁻¹ N.m
STS1520	15	12.5	20	3.175	1.5x1	2730	3990	0.2～0.8

Screw shaft dimension

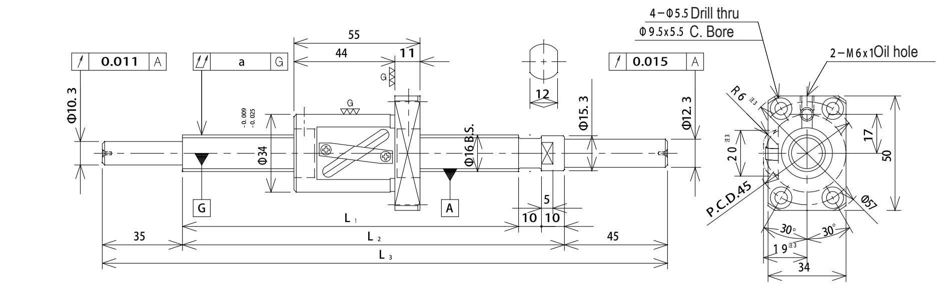
Stroke	Reworkable for mechatronics Model No.	L₁	L₂	L₃	Kits for mechatronics Model No.	G	S0	S1	Lead accuracy μm X	Y	Z	Run - out a
100	STS1520-284C5-A	189	204	284	STS1520-271C5-A1U	219	25	125	0	20	18	0.030
150	STS1520-334C5-A	239	254	334	STS1520-321C5-A1U	269	25	175	0	23	18	0.035
200	STS1520-384C5-A	289	304	384	STS1520-371C5-A1U	319	25	225	0	23	18	0.035
250	STS1520-434C5-A	339	354	434	STS1520-421C5-A1U	369	25	275	0	25	20	0.040
300	STS1520-484C5-A	389	404	484	STS1520-471C5-A1U	419	25	325	0	25	20	0.040
350	STS1520-534C5-A	439	454	534	STS1520-521C5-A1U	469	25	375	0	27	20	0.050
400	STS1520-584C5-A	489	504	584	STS1520-571C5-A1U	519	25	425	0	27	20	0.050
450	STS1520-634C5-A	539	554	634	STS1520-621C5-A1U	569	25	475	0	30	23	0.050
500	STS1520-684C5-A	589	604	684	STS1520-671C5-A1U	619	25	525	0	30	23	0.065
550	STS1520-734C5-A	639	654	734	STS1520-721C5-A1U	669	25	575	0	35	25	0.065
600	STS1520-784C5-A	689	704	784	STS1520-771C5-A1U	719	25	625	0	35	25	0.065
700	STS1520-884C5-A	789	804	884	STS1520-871C5-A1U	819	25	725	0	35	25	0.085
800	STS1520-984C5-A	889	904	984	STS1520-971C5-A1U	919	25	825	0	40	27	0.085
1000	STS1520-1184C5-A	1089	1104	1184	STS1520-1171C5-A1U	1119	25	1025	0	46	30	0.110

Note 1. Shaft ends shape of kit for mechatronics is accords with Type A1 on page A180.
2. The support unit of kit for mechatronics uses F1201ACDF at fix side, and S10002Z at supported side. Please refer A249 as detail.

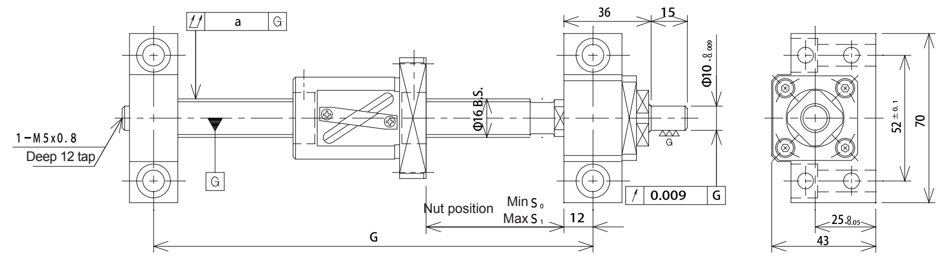
Lead Accuracy
Effective length of thread part =L₁



Reworkable Shaft Ends for Mechatronics SNS1616-A



Kits for Mechatronics SNS1616-A1U



Ball screw dimension

Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque ×10⁻¹ N.m
STS1616	16	13.5	16	3.175	1.5x1	2820	4010	0.2～0.8

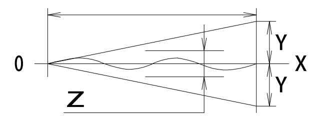
Screw shaft dimension

Unit:mm

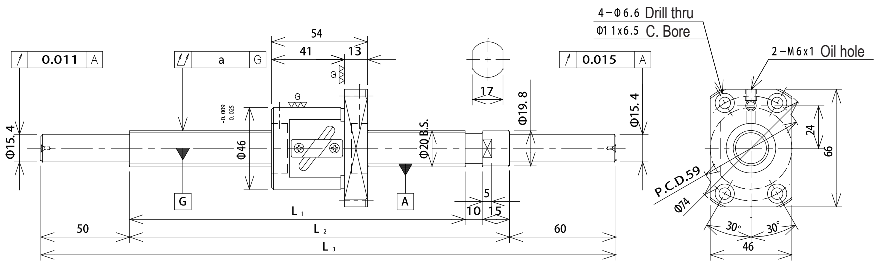
Stroke	Reworkable for mechatronics Model No.	L₁	L₂	L₃	Kits for mechatronics Model No.	G	S0	S1	Lead accuracy μm X	Y	Z	Run - out a
100	SNS1616-284C5-A	184	204	284	SNS1616-271C5-A1U	219	28	128	0	20	18	0.030
150	SNS1616-334C5-A	234	254	334	SNS1616-321C5-A1U	269	28	178	0	23	18	0.035
200	SNS1616-384C5-A	284	304	384	SNS1616-371C5-A1U	319	28	228	0	23	18	0.035
250	SNS1616-434C5-A	334	354	434	SNS1616-421C5-A1U	369	28	278	0	25	20	0.040
300	SNS1616-484C5-A	384	404	484	SNS1616-471C5-A1U	419	28	328	0	25	20	0.040
350	SNS1616-534C5-A	434	454	534	SNS1616-521C5-A1U	469	28	378	0	27	20	0.050
400	SNS1616-584C5-A	484	504	584	SNS1616-571C5-A1U	519	28	428	0	27	20	0.050
450	SNS1616-634C5-A	534	554	634	SNS1616-621C5-A1U	569	28	478	0	30	23	0.050
500	SNS1616-684C5-A	584	604	684	SNS1616-671C5-A1U	619	28	528	0	30	23	0.065
550	SNS1616-734C5-A	634	654	734	SNS1616-721C5-A1U	669	28	578	0	35	25	0.065
600	SNS1616-784C5-A	684	704	784	SNS1616-771C5-A1U	719	28	628	0	35	25	0.065
700	SNS1616-884C5-A	784	804	884	SNS1616-871C5-A1U	819	28	728	0	35	25	0.085
800	SNS1616-984C5-A	884	904	984	SNS1616-971C5-A1U	919	28	828	0	40	27	0.085
1000	SNS1616-1184C5-A	1084	1104	1184	SNS1616-1171C5-A1U	1119	28	1028	0	46	30	0.110

Note 1. Shaft ends shape of kit for mechatronics is accords with Type A1 on page A180.
2. The support unit of kit for mechatronics uses F1201ACDF at fix side, and S10002Z at supported side. Please refer A249 as detail.
3. The value shows the relief of housing.

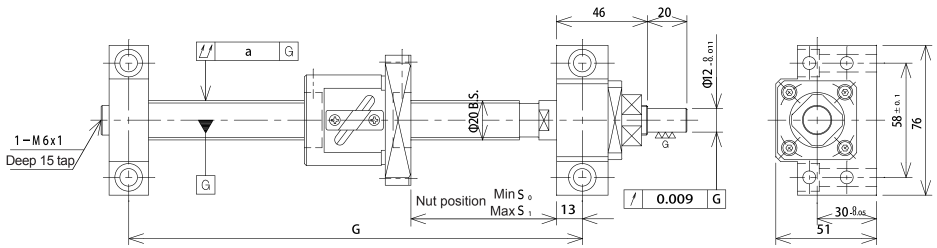
Lead Accuracy
Effective length of thread part =L₁



Reworkable Shaft Ends for Mechatronics STS2010-A



Kits for Mechatronics STS2010-A1U



Ball screw dimension

Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque $\times10^{-1}$ N.m
STS2010	20	16.9	10	3.969	2.5x1	6840	10400	0.2～1.0

Screw shaft dimension

Unit:mm

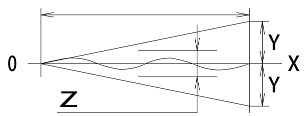
Stroke	Reworkable for mechatronics Model No.	L_1	L_2	L_3	Kits for mechatronics Model No.	G	S0	S1	Lead accuracy μm X	Y	Z	Run - out a
200	STS2010-424C5-A	289	314	424	STS2010-399C5-A1U	330	32	232	0	23	18	0.035
300	STS2010-524C5-A	389	414	524	STS2010-499C5-A1U	430	32	332	0	25	20	0.040
400	STS2010-624C5-A	489	514	624	STS2010-599C5-A1U	530	32	432	0	27	20	0.050
500	STS2010-724C5-A	589	614	724	STS2010-699C5-A1U	630	32	532	0	30	23	0.065
600	STS2010-824C5-A	689	714	824	STS2010-799C5-A1U	730	32	632	0	35	25	0.065
700	STS2010-924C5-A	789	814	924	STS2010-899C5-A1U	830	32	732	0	35	25	0.085
800	STS2010-1024C5-A	889	914	1024	STS2010-999C5-A1U	930	32	832	0	40	27	0.085
900	STS2010-1124C5-A	989	1014	1124	STS2010-1099C5-A1U	1030	32	932	0	40	27	0.110
1000	STS2010-1224C5-A	1089	1114	1224	STS2010-1199C5-A1U	1130	32	1032	0	46	30	0.110
1100	STS2010-1324C5-A	1189	1214	1324	STS2010-1299C5-A1U	1230	32	1132	0	46	30	0.150
1200	STS2010-1424C5-A	1289	1314	1424	STS2010-1399C5-A1U	1330	32	1232	0	54	35	0.150

Note 1. Shaft ends shape of kit for mechatronics is accords with Type A1 on page A180.

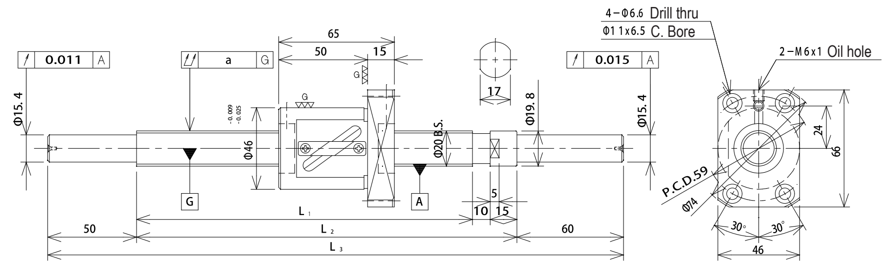
2. The support unit of kit for mechatronics uses F1502ACDF at fix side, and S15022Z at supported side. Please refer A249 as detail.

Lead Accuracy

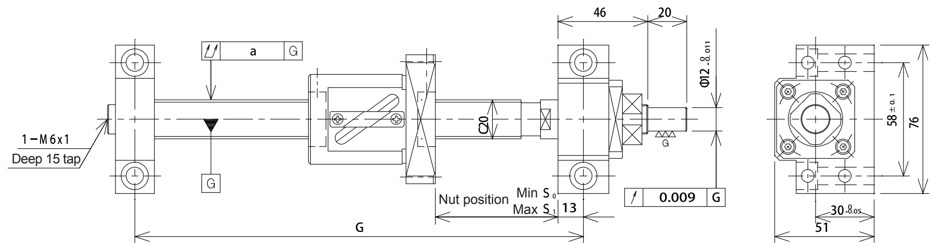
Effective length of thread part $=L_1$



Reworkable Shaft Ends for Mechatronics STS2016-A



Kits for Mechatronics STS2016-A1U



Ball screw dimension

Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque $\times10^{-1}$ N.m
STS2016	20	16.9	16	3.969	1.5x1	4310	6270	0.2～1.0

Screw shaft dimension

Unit:mm

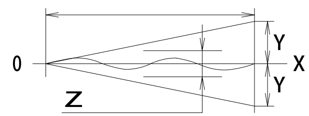
Stroke	Reworkable for mechatronics Model No.	L_1	L_2	L_3	Kits for mechatronics Model No.	G	S0	S1	Lead accuracy μm X	Y	Z	Run - out a
200	STS2016-431C5-A	296	321	431	STS2016-406C5-A1U	337	32	232	0	23	18	0.035
300	STS2016-531C5-A	396	421	531	STS2016-506C5-A1U	437	32	332	0	25	20	0.040
400	STS2016-631C5-A	496	521	631	STS2016-606C5-A1U	537	32	432	0	27	20	0.050
500	STS2016-731C5-A	596	621	731	STS2016-706C5-A1U	637	32	532	0	30	23	0.065
600	STS2016-831C5-A	696	721	831	STS2016-806C5-A1U	737	32	632	0	35	25	0.065
700	STS2016-931C5-A	796	821	931	STS2016-906C5-A1U	837	32	732	0	35	25	0.085
800	STS2016-1031C5-A	896	921	1031	STS2016-1006C5-A1U	937	32	832	0	40	27	0.085
900	STS2016-1131C5-A	996	1021	1131	STS2016-1106C5-A1U	1037	32	932	0	40	27	0.110
1000	STS2016-1231C5-A	1096	1121	1231	STS2016-1206C5-A1U	1137	32	1032	0	46	30	0.110
1100	STS2016-1331C5-A	1196	1221	1331	STS2016-1306C5-A1U	1237	32	1132	0	46	30	0.150
1200	STS2016-1431C5-A	1296	1321	1431	STS2016-1406C5-A1U	1337	32	1232	0	54	35	0.150

Note 1. Shaft ends shape of kit for mechatronics is accords with Type A1 on page A180.

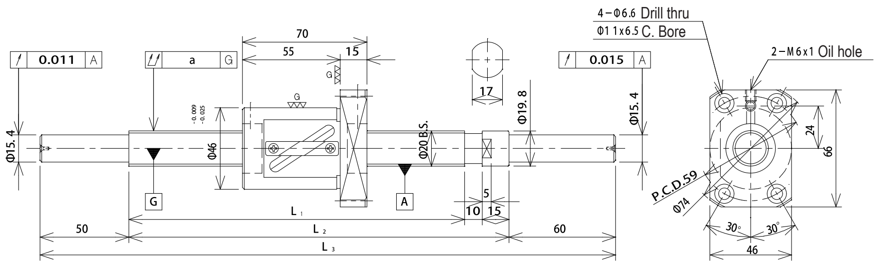
2. The support unit of kit for mechatronics uses F1502ACDF at fix side, and S15022Z at supported side. Please refer A249 as detail.

Lead Accuracy

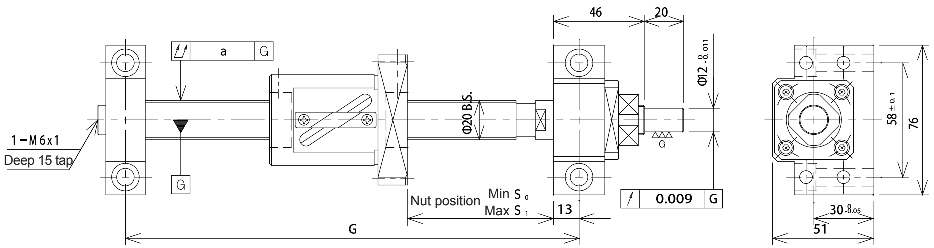
Effective length of thread part $=L_1$



Reworkable Shaft Ends for Mechatronics STS2020-A



Kits for Mechatronics STS2020-A1U



Ball screw dimension

Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque ×10^{-1} N.m
STS2020	20	16.9	20	3.969	1.5x1	4220	6270	0.2 ～ 1.0

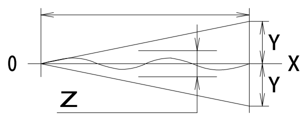
Screw shaft dimension

Unit:mm

Stroke	Reworkable for mechatronics Model No.	L1	L2	L3	Kits for mechatronics Model No.	G	S0	S1	Lead accuracy μm X	Y	Z	Run - out a
200	STS2020-445C5-A	310	335	445	STS2020-420C5-A1U	351	32	232	0	23	18	0.040
300	STS2020-545C5-A	410	435	545	STS2020-520C5-A1U	451	32	332	0	27	20	0.050
400	STS2020-645C5-A	510	535	645	STS2020-620C5-A1U	551	32	432	0	30	23	0.050
500	STS2020-745C5-A	610	635	745	STS2020-720C5-A1U	651	32	532	0	30	23	0.065
600	STS2020-845C5-A	710	735	845	STS2020-820C5-A1U	751	32	632	0	35	25	0.085
700	STS2020-945C5-A	810	835	945	STS2020-920C5-A1U	851	32	732	0	40	27	0.085
800	STS2020-1045C5-A	910	935	1045	STS2020-1020C5-A1U	951	32	832	0	40	27	0.110
900	STS2020-1145C5-A	1010	1035	1145	STS2020-1120C5-A1U	1051	32	932	0	46	30	0.110
1000	STS2020-1245C5-A	1110	1135	1245	STS2020-1220C5-A1U	1151	32	1032	0	46	30	0.110
1100	STS2020-1345C5-A	1210	1235	1345	STS2020-1320C5-A1U	1251	32	1132	0	46	30	0.150
1400	STS2020-1645C5-A	1510	1535	1645	STS2020-1620C5-A1U	1551	32	1432	0	54	35	0.180

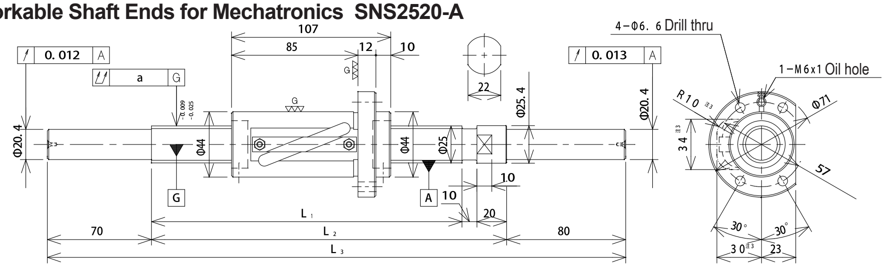
Note 1. Shaft ends shape of kit for mechatronics is accords with Type A1 on page A180.
2. The support unit of kit for mechatronics uses F1502ACDF at fix side, and S15022Z at supported side. Please refer A249 as detail.

Lead Accuracy
Effective length of thread part =L_1

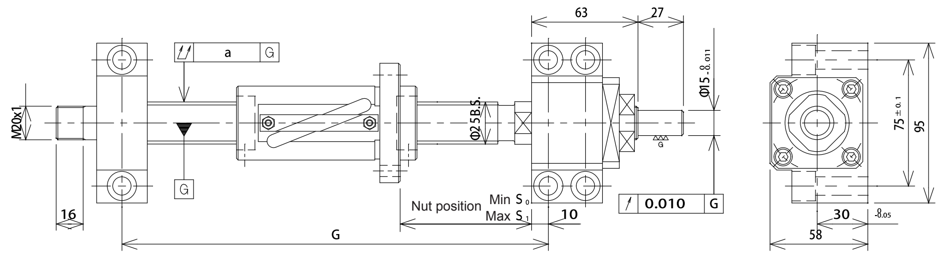


(6) SNS Series (Φ25)

Reworkable Shaft Ends for Mechatronics SNS2520-A



Kits for Mechatronics SNS2520-A1U



Ball screw dimension

Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque ×10^{-1} N.m
SNS2520	25	21.4	20	4.763	2.5x1	9240	15100	0.4 ～ 2.0

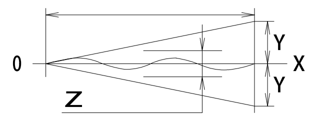
Screw shaft dimension

Unit:mm

Stroke	Reworkable for mechatronics Model No.	L1	L2	L3	Kits for mechatronics Model No.	G	S0	S1	Lead accuracy μm X	Y	Z	Run - out a
600	SNS2520-930C5-A	750	780	930	SNS2520-913C5-A1U	794	50	650	0	35	25	0.055
800	SNS2520-1130C5-A	950	980	1130	SNS2520-1113C5-A1U	994	50	850	0	40	27	0.070
1000	SNS2520-1330C5-A	1150	1180	1330	SNS2520-1313C5-A1U	1194	50	1050	0	46	30	0.090
1200	SNS2520-1530C5-A	1350	1380	1530	SNS2520-1513C5-A1U	1394	50	1250	0	54	35	0.090
1400	SNS2520-1730C5-A	1550	1580	1730	SNS2520-1713C5-A1U	1594	50	1450	0	54	35	0.120
1600	SNS2520-1930C5-A	1750	1780	1930	SNS2520-1913C5-A1U	1794	50	1650	0	65	40	0.120
2000	SNS2520-2330C5-A	2150	2180	2330	SNS2520-2313C5-A1U	2194	50	2050	0	77	46	0.160

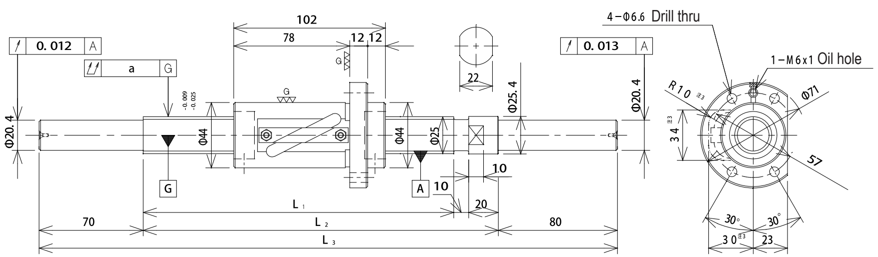
Note 1. Shaft ends shape of kit for mechatronics is accords with Type A1 on page A180.
2. The support unit of kit for mechatronics uses F2004ACDF at fix side, and S20042Z at supported side. Please refer A249 as detail.
3. The value shows the relief dimension of housing.

Lead Accuracy
Effective length of thread part =L_1

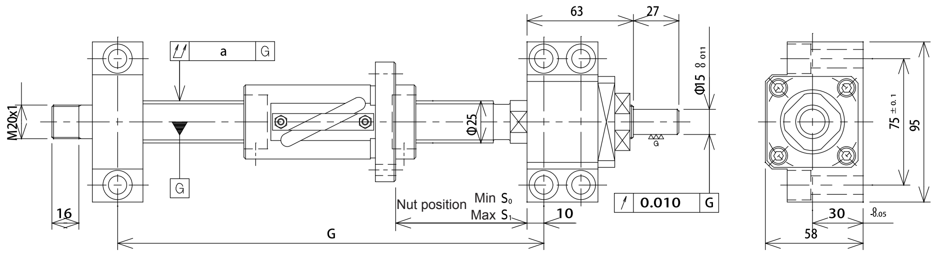


Ball screw

Reworkable Shaft Ends for Mechatronics SNS2525-A



Kits for Mechatronics SNS2525-A1U



Ball screw dimension

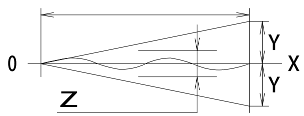
Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque ×10^{-1} N.m
SNS2525	25	21.4	25	4.763	1.5x1	6310	10200	0.4～2.0

Screw shaft dimension

	Reworkable for mechatronics				Kits for mechatronics				Lead accuracy μm			Run - out
Stroke	Model No.	L_1	L_2	L_3	Model No.	G	S0	S1	X	Y	Z	a
600	SNS2525-930C5-A	750	780	930	SNS2525-913C5-A1U	794	50	650	0	35	25	0.055
800	SNS2525-1130C5-A	950	980	1130	SNS2525-1113C5-A1U	994	50	850	0	40	27	0.070
1000	SNS2525-1330C5-A	1150	1180	1330	SNS2525-1313C5-A1U	1194	50	1050	0	46	30	0.090
1200	SNS2525-1530C5-A	1350	1380	1530	SNS2525-1513C5-A1U	1394	50	1250	0	54	35	0.090
1400	SNS2525-1730C5-A	1550	1580	1730	SNS2525-1713C5-A1U	1594	50	1450	0	54	35	0.120
1600	SNS2525-1930C5-A	1750	1780	1930	SNS2525-1913C5-A1U	1794	50	1650	0	65	40	0.120
2000	SNS2525-2330C5-A	2150	2180	2330	SNS2525-2313C5-A1U	2194	50	2050	0	77	46	0.160

Note 1. Shaft ends shape of kit for mechatronics is accords with Type A1 on page A180.
2. The support unit of kit for mechatronics uses F2004ACDF at fix side, and S20042Z at supported side. Please refer A249 as detail.

Lead Accuracy
Effective length of thread part =L_1



(7) Standard shaft ends shape of ball screw for mechatronics (A1 model)

Precision standard ball screw for mechatronics are prepared the standard shaft ends shape and we take the shaft ends working depends on the order. The designing of ball screw for mechatronics with standard shaft ends worked is shown as below example.

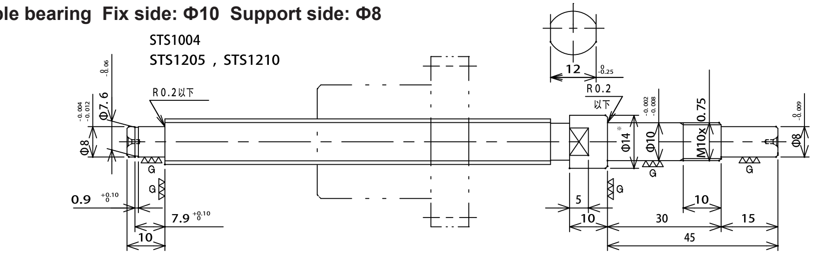
① Modify the dimension of total length of screw shaft after the shaft ends working

② End –A is shown as –A1.

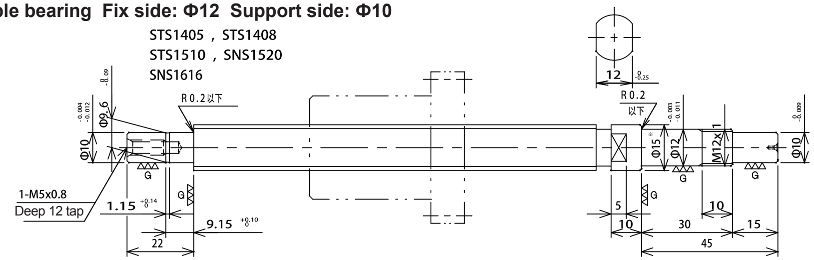
ex. Reworkable shaft ends → Shaft ends worked
STS1510-534C5-A → STS1510-521C5-A1

Note: Shaft ends shape of kits for mechatronics are same as this page's standard shaft ends but the dimension of marked ※ is different due to the matching seal.

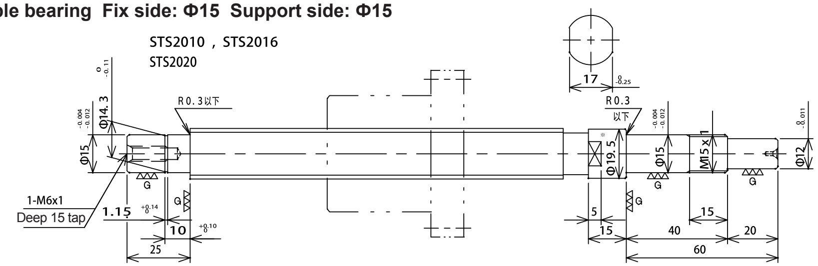
Suitable bearing Fix side: Φ10 Support side: Φ8



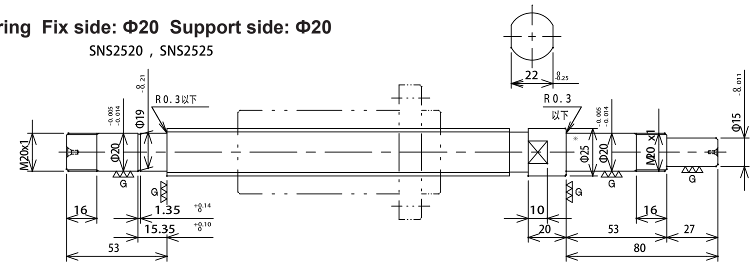
Suitable bearing Fix side: Φ12 Support side: Φ10



Suitable bearing Fix side: Φ15 Support side: Φ15

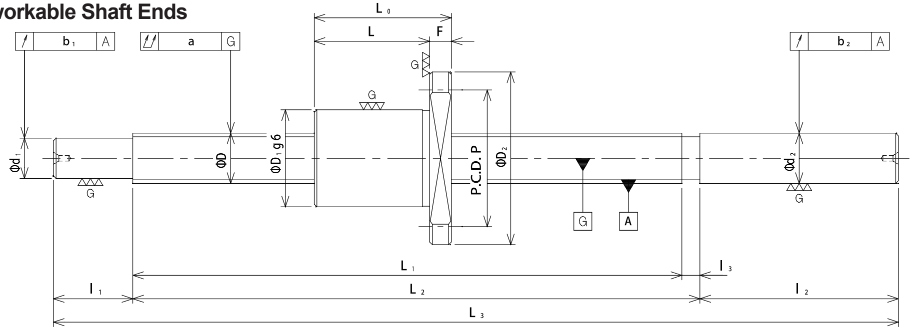


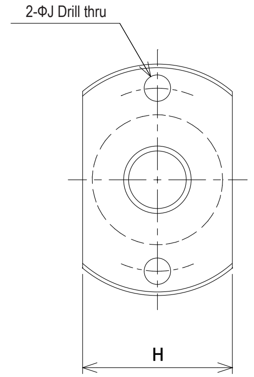
Suitable bearing Fix side: Φ20 Support side: Φ20



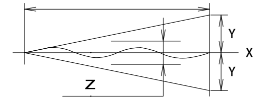
(8) SMS Series (shaft dia.φ6 ～ 14)
(Standardized Precision Miniature Ball Screw)

Reworkable Shaft Ends





Lead Accuracy
Effective length of thread part =L_1



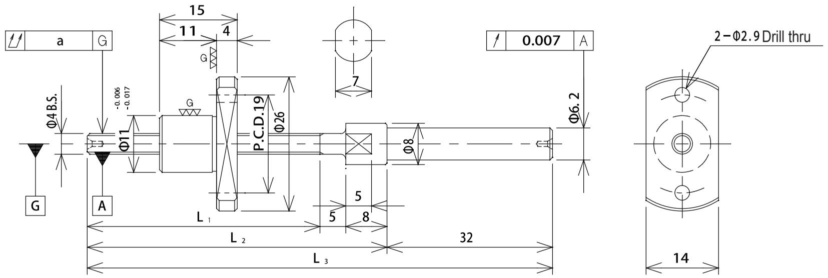
Nominal type	Screw dia.	Lead	Stroke	Shaft length			Shaft ends part					Lead accuracy		
	d_0	ℓ		L_1	L_2	L_3	l_3	d_1	d_2	l_1	l_2	X	Y	Z
SMS0610-158C3-B	6	1.0	30	84	88	158	4	5.2	6.2	20	50	0	0.008	0.008
SMS0610-178C3-B	6	1.0	50	104	108	178	4	5.2	6.2	20	50	0	0.010	0.008
SMS0610-228C3-B	6	1.0	100	154	158	228	4	5.2	6.2	20	50	0	0.010	0.008
SMS0810-191C3-B	8	1.0	50	107	111	191	4	6.2	8.2	25	55	0	0.010	0.008
SMS0810-241C3-B	8	1.0	100	157	161	241	4	6.2	8.2	25	55	0	0.010	0.008
SMS0810-291C3-B	8	1.0	150	207	211	291	4	6.2	8.2	25	55	0	0.012	0.008
SMS1010-207C3-B	10	1.0	50	107	112	207	5	8.2	10.2	35	60	0	0.010	0.008
SMS1010-257C3-B	10	1.0	100	157	162	257	5	8.2	10.2	35	60	0	0.010	0.008
SMS1010-307C3-B	10	1.0	150	207	212	307	5	8.2	10.2	35	60	0	0.012	0.008
SMS1010-357C3-B	10	1.0	200	257	262	357	5	8.2	10.2	35	60	0	0.012	0.008
SMS1015-210C3-B	10	1.5	50	110	115	210	5	8.2	10.2	35	60	0	0.010	0.008
SMS1015-260C3-B	10	1.5	100	160	165	260	5	8.2	10.2	35	60	0	0.010	0.008
SMS1015-310C3-B	10	1.5	150	210	215	310	5	8.2	10.2	35	60	0	0.012	0.008
SMS1015-360C3-B	10	1.5	200	260	265	360	5	8.2	10.2	35	60	0	0.012	0.008
SMS1220-225C3-B	12	2.0	50	115	120	225	5	10.2	12.2	45	60	0	0.010	0.008
SMS1220-275C3-B	12	2.0	100	165	170	275	5	10.2	12.2	45	60	0	0.010	0.008
SMS1220-325C3-B	12	2.0	150	215	220	325	5	10.2	12.2	45	60	0	0.012	0.008
SMS1220-375C3-B	12	2.0	200	265	270	375	5	10.2	12.2	45	60	0	0.012	0.008
SMS1220-425C3-B	12	2.0	250	315	320	425	5	10.2	12.2	45	60	0	0.012	0.008
SMS1420-230C3-B	14	2.0	50	115	120	230	5	12.2	14.2	50	60	0	0.010	0.008
SMS1420-280C3-B	14	2.0	100	165	170	280	5	12.2	14.2	50	60	0	0.010	0.008
SMS1420-330C3-B	14	2.0	150	215	220	330	5	12.2	14.2	50	60	0	0.012	0.008
SMS1420-380C3-B	14	2.0	200	265	270	380	5	12.2	14.2	50	60	0	0.012	0.008
SMS1420-430C3-B	14	2.0	250	315	320	430	5	12.2	14.2	50	60	0	0.012	0.008
SMS1430-240C3-B	14	3.0	50	125	130	240	5	11.2	14.2	50	60	0	0.010	0.008
SMS1430-290C3-B	14	3.0	100	175	180	290	5	11.2	14.2	50	60	0	0.010	0.008
SMS1430-340C3-B	14	3.0	150	225	230	340	5	11.2	14.2	50	60	0	0.012	0.008
SMS1430-390C3-B	14	3.0	200	275	280	390	5	11.2	14.2	50	60	0	0.012	0.008
SMS1430-440C3-B	14	3.0	250	325	330	440	5	11.2	14.2	50	60	0	0.013	0.010

Run - out accuracy			Nut dia.	Nut Length		Flange dia.	P.C.D	Thickness	Notch heigh	Mount bolt	Basic rated load(N)	
Shaft center	Radial	Radial									Dynamic	Static
a	b_1	b_2	D_1	L	L_0	D_2	P	F	H	J	Ca	Co
0.040	0.006	0.007	15	15	19	30	23	4	19	3.4	640	980
0.040	0.006	0.007	15	15	19	30	23	4	19	3.4	640	980
0.040	0.006	0.007	15	15	19	30	23	4	19	3.4	640	980
0.035	0.006	0.007	17	17	21	32	25	4	21	3.4	750	1300
0.040	0.006	0.007	17	17	21	32	25	4	21	3.4	750	1300
0.040	0.006	0.007	17	17	21	32	25	4	21	3.4	750	1300
0.035	0.008	0.008	20	17	22	39	30	5	24	4.5	810	1700
0.040	0.008	0.008	20	17	22	39	30	5	24	4.5	810	1700
0.040	0.008	0.008	20	17	22	39	30	5	24	4.5	810	1700
0.050	0.008	0.008	20	17	22	39	30	5	24	4.5	810	1700
0.035	0.008	0.008	20	20	25	39	30	5	24	4.5	1100	2100
0.040	0.008	0.008	20	20	25	39	30	5	24	4.5	1100	2100
0.040	0.008	0.008	20	20	25	39	30	5	24	4.5	1100	2100
0.050	0.008	0.008	20	20	25	39	30	5	24	4.5	1100	2100
0.035	0.008	0.008	23	24	29	42	33	5	27	4.5	2200	3900
0.040	0.008	0.008	23	24	29	42	33	5	27	4.5	2200	3900
0.040	0.008	0.008	23	24	29	42	33	5	27	4.5	2200	3900
0.050	0.008	0.008	23	24	29	42	33	5	27	4.5	2200	3900
0.065	0.008	0.008	23	24	29	42	33	5	27	4.5	2200	3900
0.025	0.009	0.008	25	24	30	46	36	6	29	5.5	2400	4600
0.030	0.009	0.008	25	24	30	46	36	6	29	5.5	2400	4600
0.030	0.009	0.008	25	24	30	46	36	6	29	5.5	2400	4600
0.040	0.009	0.008	25	24	30	46	36	6	29	5.5	2400	4600
0.050	0.009	0.008	25	24	30	46	36	6	29	5.5	2400	4600
0.030	0.009	0.008	27	32	38	48	38	6	31	5.5	3900	6500
0.030	0.009	0.008	27	32	38	48	38	6	31	5.5	3900	6500
0.030	0.009	0.008	27	32	38	48	38	6	31	5.5	3900	6500
0.040	0.009	0.008	27	32	38	48	38	6	31	5.5	3900	6500
0.050	0.009	0.008	27	32	38	48	38	6	31	5.5	3900	6500

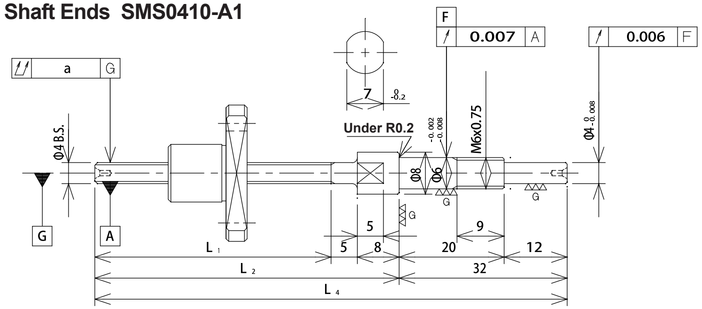
Note 1. Hardened length on shaft is shown as L1.
2. Shaft ends (l1, l2) are kept under reworkable hardness (under HRC35).

Standard Miniature Ball Screw for Mechatronics

Reworkable Shaft Ends SMS0410-A



Standardized Shaft Ends SMS0410-A1



Ball screw dimension

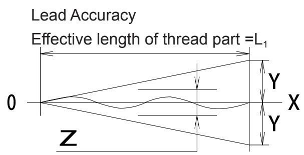
Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque $\times 10^{-1}$ N.m
SMS0410	4	3.3	1.0	0.8	1×2	350	390	0.04 less

Screw shaft dimension

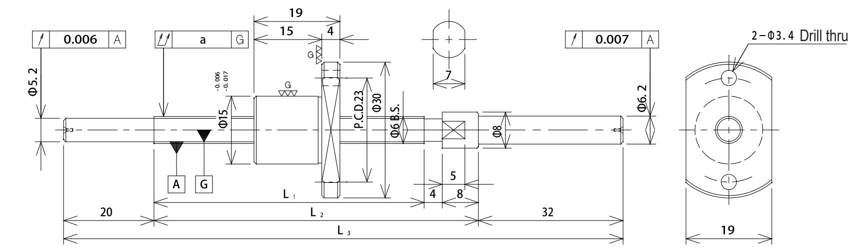
Unit:mm

Stroke	Reworkable shaft ends	L_1	L_2	L_3	Standarzized shaft ends	L_1	L_2	L_4	Lead accuracy μm X	Y	Z	Run - out a
20	SMS0410-93C3-A	48	61	93	SMS0410-93C3-A1	48	61	93	0	8	8	0.015
40	SMS0410-113C3-A	68	81	113	SMS0410-113C3-A1	68	81	113	0	8	8	0.020
70	SMS0410-143C3-A	98	111	143	SMS0410-143C3-A1	98	111	143	0	8	8	0.025

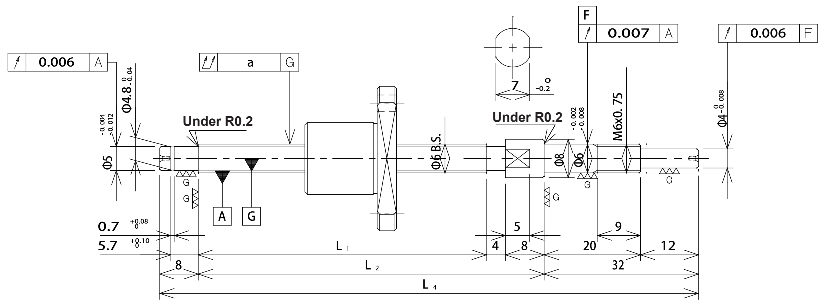
Note 1. Hardened length on shaft is shown as L_1.



Reworkable Shaft Ends SMS0610-A



Standardized Shaft Ends SMS0610-A1



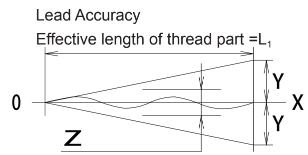
Ball screw dimension

Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque $\times 10^{-1}$ N.m
SMS0610	6	5.3	1.0	0.8	1×3	640	980	0.04 less

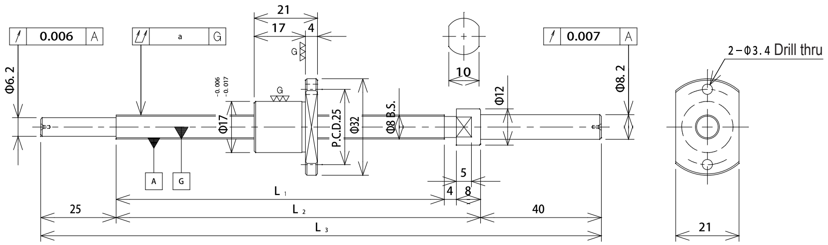
Screw shaft dimension

Stroke	Reworkable shaft ends	L_1	L_2	L_3	Standarzized shaft ends	L_1	L_2	L_4	Lead accuracy μm X	Y	Z	Run - out a
30	SMS0610-148C3-A	84	96	148	SMS0610-136C3-A1	84	96	136	0	8	8	0.040
50	SMS0610-168C3-A	104	116	168	SMS0610-156C3-A1	104	116	156	0	10	8	0.040
100	SMS0610-218C3-A	154	166	218	SMS0610-206C3-A1	154	166	206	0	10	8	0.040

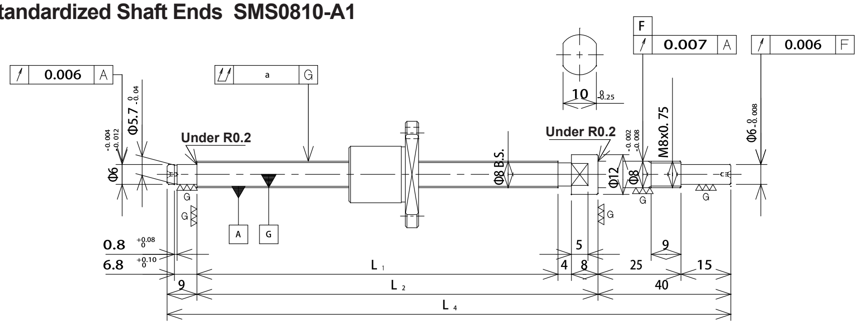
Note 1. Hardened length on shaft is shown as L_1.



Reworkable Shaft Ends SMS0810-A



Standardized Shaft Ends SMS0810-A1



Ball screw dimension

Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque $\times10^{-1}$ N.m
SMS0810	8	7.3	1.0	0.8	1×3	750	1300	0.01 ～ 0.05

Screw shaft dimension

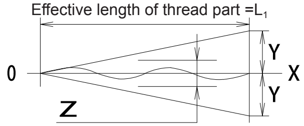
Unit:mm

Stroke	Reworkable shaft ends	L_1	L_2	L_3	Standarzized shaft ends	L_1	L_2	L_4	Lead accuracy μm X	Y	Z	Run - out a
50	SMS0810-184C3-A	107	119	184	SMS0810-168C3-A1	107	119	168	0	10	8	0.035
100	SMS0810-234C3-A	157	169	234	SMS0810-218C3-A1	157	169	218	0	10	8	0.040
150	SMS0810-284C3-A	207	219	284	SMS0810-268C3-A1	207	219	268	0	12	8	0.040

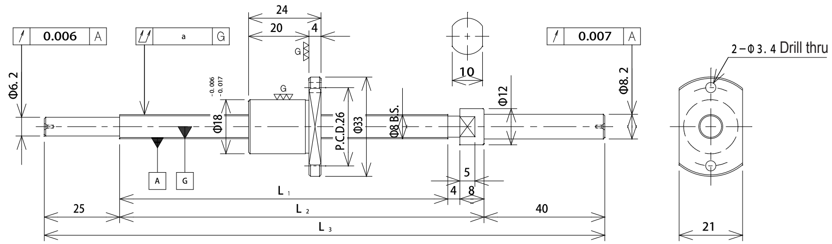
Note 1. Hardened length on shaft is shown as L_1.

Lead Accuracy

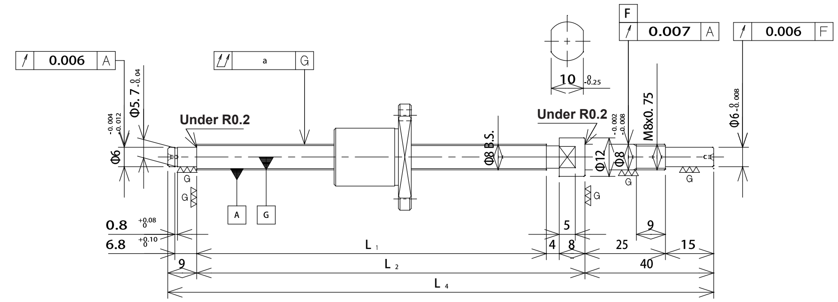
Effective length of thread part =L_1



Reworkable Shaft Ends SMS0815-A



Standardized Shaft Ends SMS0815-A1



Ball screw dimension

Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque $\times10^{-1}$ N.m
SMS0815	8	7.1	1.5	1.0	1×3	980	1600	0.02 ～ 0.08

Screw shaft dimension

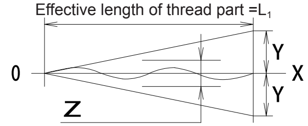
Unit:mm

Stroke	Reworkable shaft ends	L_1	L_2	L_3	Standarzized shaft ends	L_1	L_2	L_4	Lead accuracy μm X	Y	Z	Run - out a
50	SMS0815-184C3-A	107	119	184	SMS0815-168C3-A1	107	119	168	0	10	8	0.035
100	SMS0815-234C3-A	157	169	234	SMS0815-218C3-A1	157	169	218	0	10	8	0.040
150	SMS0815-284C3-A	207	219	284	SMS0815-268C3-A1	207	219	268	0	12	8	0.040

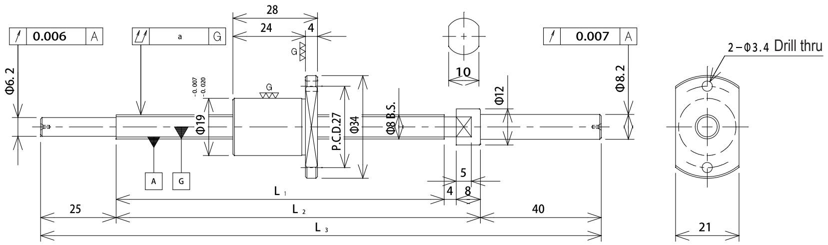
Note 1. Hardened length on shaft is shown as L_1.

Lead Accuracy

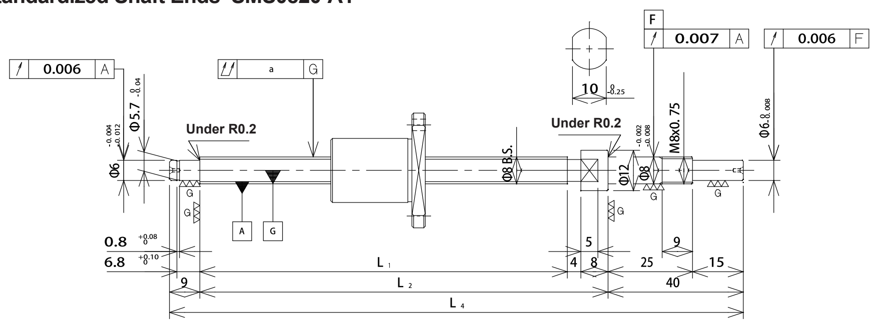
Effective length of thread part =L_1



Reworkable Shaft Ends SMS0820-A



Standardized Shaft Ends SMS0820-A1



Ball screw dimension

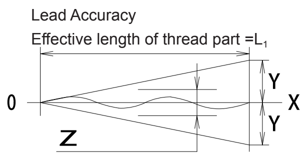
Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque ×10⁻¹ N.m
SMS0820	8	6.6	2.0	1.588	1×3	1700	2300	0.04 ～ 0.16

Screw shaft dimension

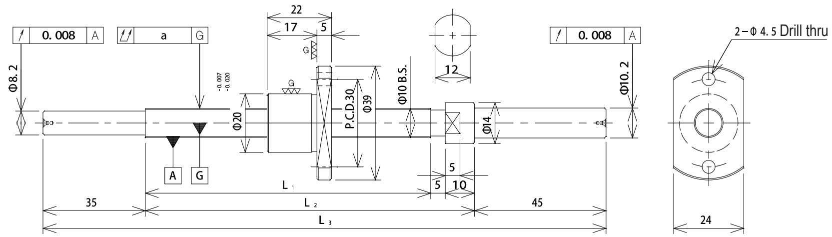
Unit:mm

Stroke	Reworkable shaft ends	L_1	L_2	L_3	Standarzized shaft ends	L_1	L_2	L_4	Lead accuracy μm X	Y	Z	Run - out a
50	SMS0820-184C3-A	107	119	184	SMS0820-168C3-A1	107	119	168	0	10	8	0.035
100	SMS0820-234C3-A	157	169	234	SMS0820-218C3-A1	157	169	218	0	10	8	0.040
150	SMS0820-284C3-A	207	219	284	SMS0820-268C3-A1	207	219	268	0	12	8	0.040

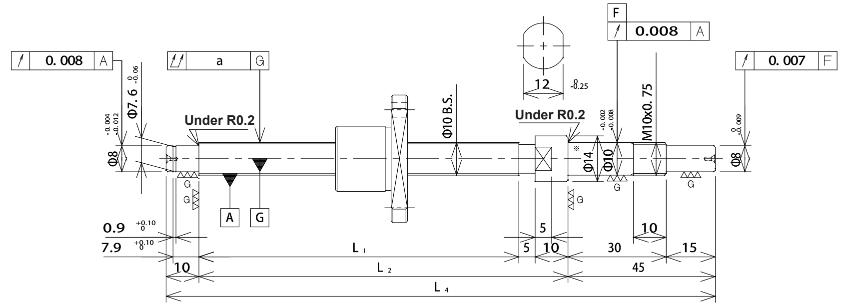
Note 1. Hardened length on shaft is shown as L_1.



Reworkable Shaft Ends SMS1010-A



Standardized Shaft Ends SMS1010-A1



Ball screw dimension

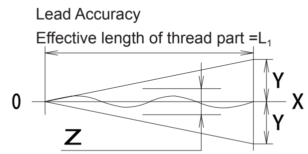
Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque ×10⁻¹ N.m
SMS1010	10	9.3	1.0	0.8	1×3	810	1700	0.01 ～ 0.06

Screw shaft dimension

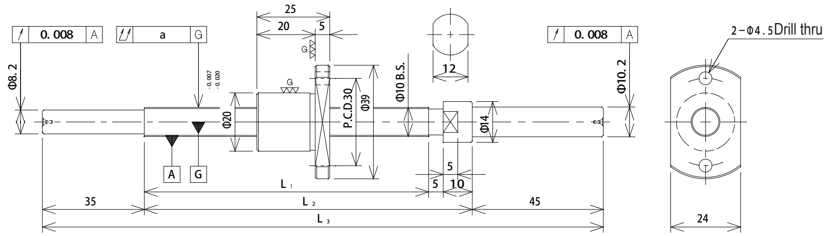
Unit:mm

Stroke	Reworkable shaft ends	L_1	L_2	L_3	Standarzized shaft ends	L_1	L_2	L_4	Lead accuracy μm X	Y	Z	Run - out a
50	SMS1010-202C3-A	107	122	202	SMS1010-177C3-A1	107	122	177	0	10	8	0.035
100	SMS1010-252C3-A	157	172	252	SMS1010-227C3-A1	157	172	227	0	10	8	0.040
150	SMS1010-302C3-A	207	222	302	SMS1010-277C3-A1	207	222	277	0	12	8	0.040
200	SMS1010-352C3-A	257	272	352	SMS1010-327C3-A1	257	272	327	0	12	8	0.050

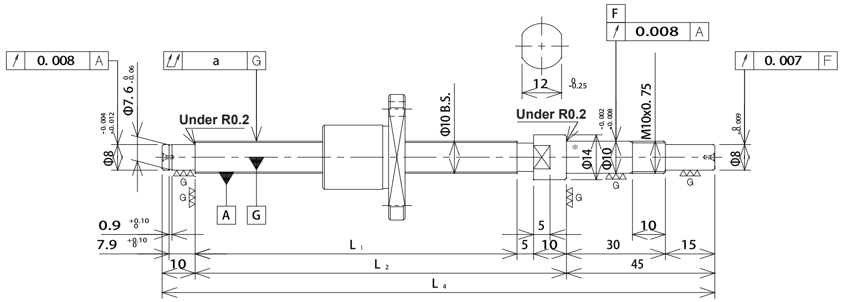
Note 1. Hardened length on shaft is shown as L_1.
2. Standardized shaft ends can be used supporting unit(fixed side F1000ACDF. supported side S08082Z) for mechatronics. but please indicate when you order in advance due to different dimension of marked *
Please refer to page A249 for detailed dimension of support unit.



Reworkable Shaft Ends SMS1015-A



Standardized Shaft Ends SMS1015-A1



Ball screw dimension

Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque $\times10^{-1}$ N.m
SMS1015	10	9.1	1.5	1.0	1×3	1100	2100	0.02 ～ 0.10

Screw shaft dimension

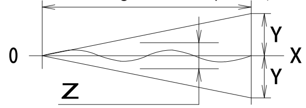
Unit:mm

Stroke	Reworkable shaft ends	L_1	L_2	L_3	Standarzized shaft ends	L_1	L_2	L_4	Lead accuracy μm X	Lead accuracy μm Y	Lead accuracy μm Z	Run - out a
50	SMS1015-205C3-A	110	125	205	SMS1015-180C3-A1	110	125	180	0	10	8	0.035
100	SMS1015-255C3-A	160	175	255	SMS1015-230C3-A1	160	175	230	0	10	8	0.040
150	SMS1015-305C3-A	210	225	305	SMS1015-280C3-A1	210	225	280	0	12	8	0.040
200	SMS1015-355C3-A	260	275	355	SMS1015-330C3-A1	260	275	330	0	12	8	0.050

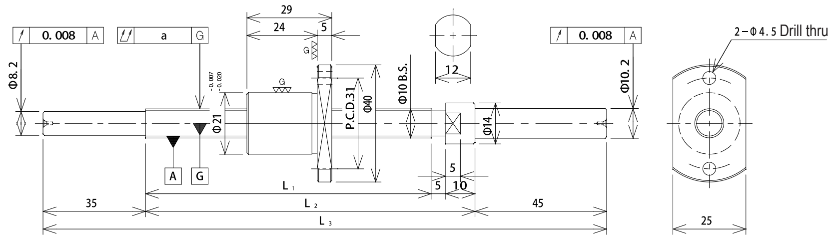
Note 1. Hardened length on shaft is shown as L_1.
2. Standardized shaft ends can be used supporting unit(fixed side F1000ACDF. supported side S08082Z) for mechatronics. but please indicate when you order in advance due to different dimension of marked *
Please refer to page A249 for detailed dimension of support unit.

Lead Accuracy

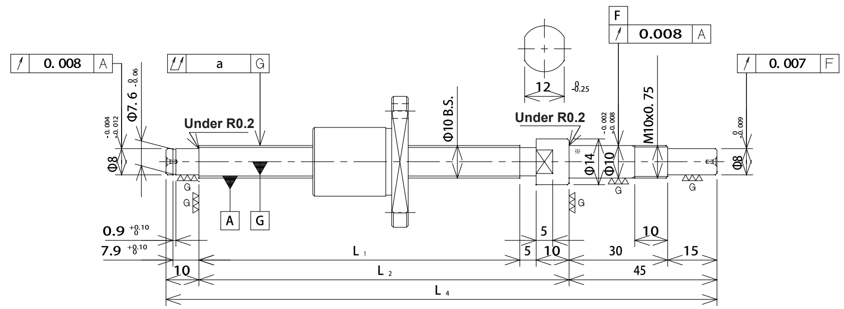
Effective length of thread part $=L_1$



Reworkable Shaft Ends SMS1020-A



Standardized Shaft Ends SMS1020-A1



Ball screw dimension

Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque $\times10^{-1}$ N.m
SMS1020	10	8.6	2.0	1.588	1×3	1900	3100	0.05 ～ 0.20

Screw shaft dimension

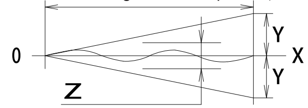
Unit:mm

Stroke	Reworkable shaft ends	L_1	L_2	L_3	Standarzized shaft ends	L_1	L_2	L_4	Lead accuracy μm X	Lead accuracy μm Y	Lead accuracy μm Z	Run - out a
50	SMS1020-205C3-A	110	125	205	SMS1020-180C3-A1	110	125	180	0	10	8	0.035
100	SMS1020-255C3-A	160	175	255	SMS1020-230C3-A1	160	175	230	0	10	8	0.040
150	SMS1020-305C3-A	210	225	305	SMS1020-280C3-A1	210	225	280	0	12	8	0.040
200	SMS1020-355C3-A	260	275	355	SMS1020-330C3-A1	260	275	330	0	12	8	0.050

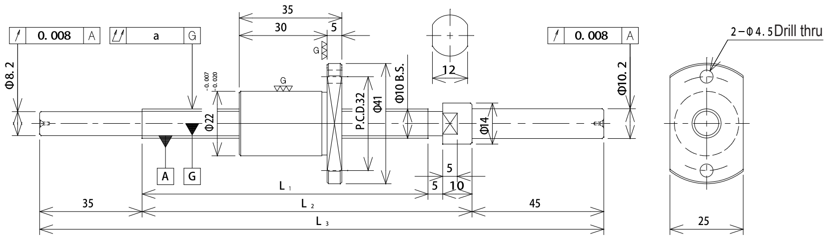
Note 1. Hardened length on shaft is shown as L_1.
2. Standardized shaft ends can be used supporting unit(fixed side F1000ACDF. supported side S08082Z) for mechatronics. but please indicate when you order in advance due to different dimension of marked *
Please refer to page A249 for detailed dimension of support unit.

Lead Accuracy

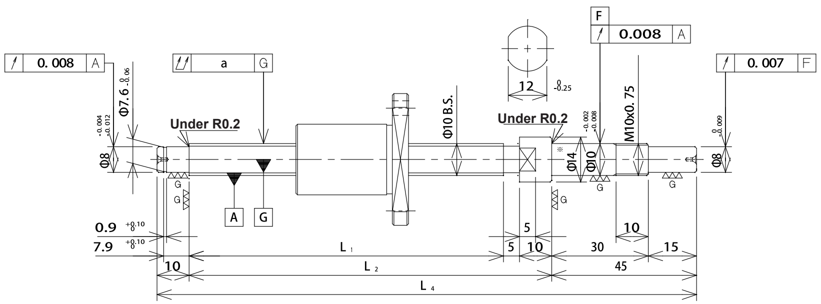
Effective length of thread part $=L_1$



Reworkable Shaft Ends SMS1025-A



Standardized Shaft Ends SMS1025-A1



Ball screw dimension

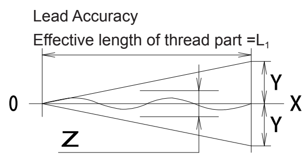
Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque ×10^{-1} N.m
SMS1025	10	8.3	2.5	2.0	1×3	2600	3700	0.08 ～ 0.29

Screw shaft dimension

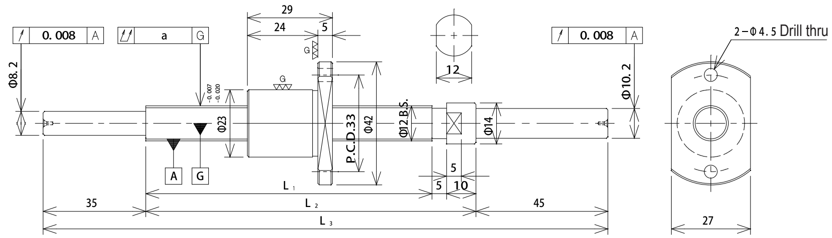
Unit:mm

Stroke	Reworkable shaft ends	L_1	L_2	L_3	Standarzized shaft ends	L_1	L_2	L_4	Lead accuracy μm X	Y	Z	Run - out a
50	SMS1025-205C3-A	110	125	205	SMS1025-180C3-A1	110	125	180	0	10	8	0.035
100	SMS1025-255C3-A	160	175	255	SMS1025-230C3-A1	160	175	230	0	10	8	0.040
150	SMS1025-305C3-A	210	225	305	SMS1025-280C3-A1	210	225	280	0	12	8	0.040
200	SMS1025-355C3-A	260	275	355	SMS1025-330C3-A1	260	275	330	0	12	8	0.050

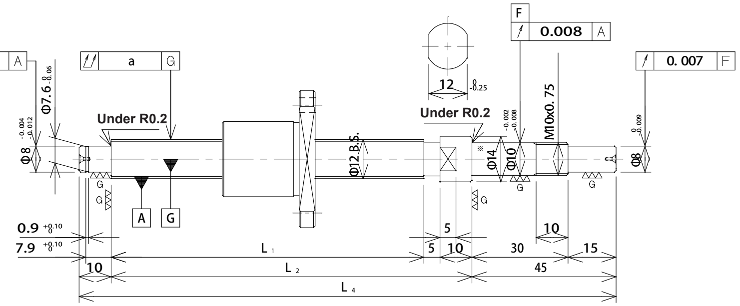
Note 1. Hardened length on shaft is shown as L_1.
2. Standardized shaft ends can be used supporting unit(fixed side F1000ACDF. supported side S08082Z) for mechatronics. but please indicate when you order in advance due to different dimension of marked *
Please refer to page A249 for detailed dimension of support unit.



Reworkable Shaft Ends SMS1220-A



Standardized Shaft Ends SMS1220-A1



Ball screw dimension

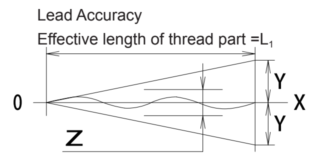
Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque ×10^{-1} N.m
SMS1220	12	10.6	2.0	1.588	1×3	2200	3900	0.06 ～ 0.24

Screw shaft dimension

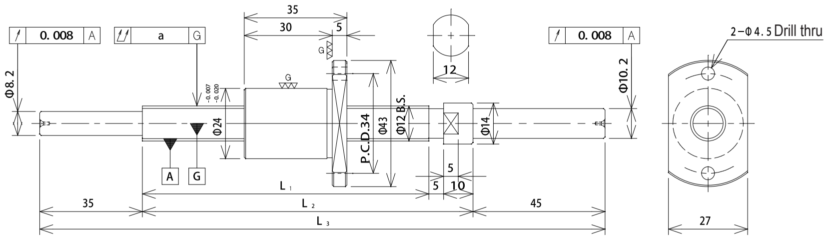
Unit:mm

Stroke	Reworkable shaft ends	L_1	L_2	L_3	Standarzized shaft ends	L_1	L_2	L_4	Lead accuracy μm X	Y	Z	Run - out a
50	SMS1220-210C3-A	115	130	210	SMS1220-185C3-A1	115	130	185	0	10	8	0.035
100	SMS1220-260C3-A	165	180	260	SMS1220-235C3-A1	165	180	235	0	10	8	0.040
150	SMS1220-310C3-A	215	230	310	SMS1220-285C3-A1	215	230	285	0	12	8	0.040
200	SMS1220-360C3-A	265	280	360	SMS1220-335C3-A1	265	280	335	0	12	8	0.050
250	SMS1220-410C3-A	315	330	410	SMS1220-385C3-A1	315	330	385	0	12	8	0.065

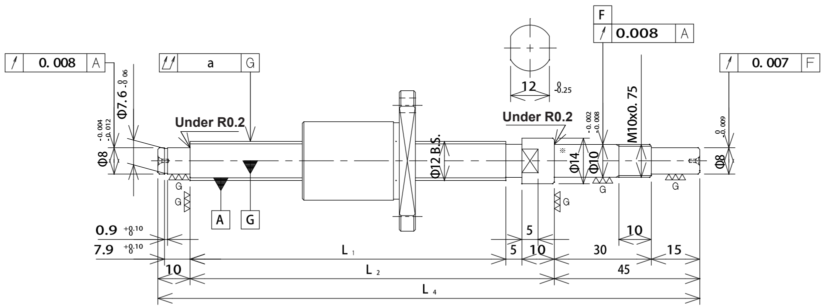
Note 1. Hardened length on shaft is shown as L_1.
2. Standardized shaft ends can be used supporting unit(fixed side F1000ACDF. supported side S08082Z) for mechatronics. but please indicate when you order in advance due to different dimension of marked *
Please refer to page A249 for detailed dimension of support unit.



Reworkable Shaft Ends SMS1225-A



Standardized Shaft Ends SMS1225-A1



Ball screw dimension

Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque ×10^{-1} N.m
SMS1225	12	10.3	2.5	2.0	1×3	2900	4600	0.1 ～ 0.36

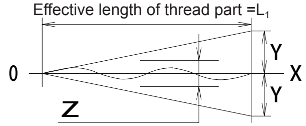
Screw shaft dimension

Unit:mm

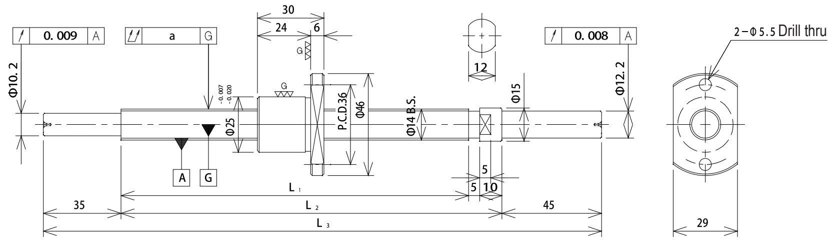
Stroke	Reworkable shaft ends	L_1	L_2	L_3	Standarzized shaft ends	L_1	L_2	L_4	Lead accuracy μm X	Y	Z	Run - out a
50	SMS1225-210C3-A	115	130	210	SMS1225-185C3-A1	115	130	185	0	10	8	0.035
100	SMS1225-260C3-A	165	180	260	SMS1225-235C3-A1	165	180	235	0	10	8	0.040
150	SMS1225-310C3-A	215	230	310	SMS1225-285C3-A1	215	230	285	0	12	8	0.040
200	SMS1225-360C3-A	265	280	360	SMS1225-335C3-A1	265	280	335	0	12	8	0.050
250	SMS1225-410C3-A	315	330	410	SMS1225-385C3-A1	315	330	385	0	12	8	0.065

Note 1. Hardened length on shaft is shown as L_1.
2. Standardized shaft ends can be used supporting unit(fixed side F1000ACDF. supported side S08082Z) for mechatronics. but please indicate when you order in advance due to different dimension of marked *
Please refer to page A249 for detailed dimension of support unit.

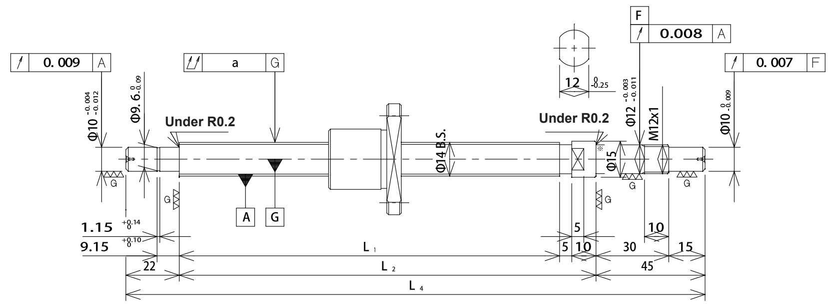
Lead Accuracy
Effective length of thread part =L_1



Reworkable Shaft Ends SMS1420-A



Standardized Shaft Ends SMS1420-A1



Ball screw dimension

Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque ×10^{-1} N.m
SMS1420	14	12.6	2.0	1.588	1×3	2400	4600	0.08 ～ 0.29

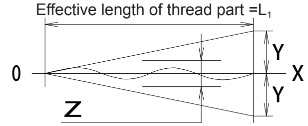
Screw shaft dimension

Unit:mm

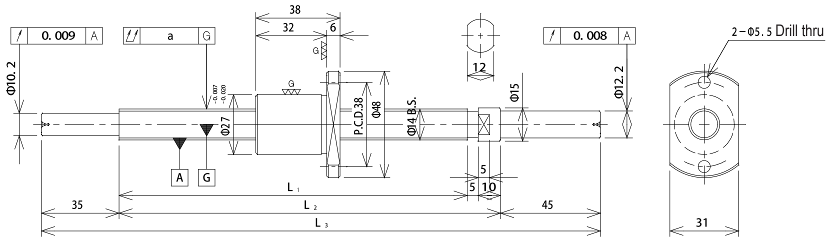
Stroke	Reworkable shaft ends	L_1	L_2	L_3	Standarzized shaft ends	L_1	L_2	L_4	Lead accuracy μm X	Y	Z	Run - out a
50	SMS1420-210C3-A	115	130	210	SMS1420-197C3-A1	115	130	197	0	10	8	0.025
100	SMS1420-260C3-A	165	180	260	SMS1420-247C3-A1	165	180	247	0	10	8	0.030
150	SMS1420-310C3-A	215	230	310	SMS1420-297C3-A1	215	230	297	0	12	8	0.030
200	SMS1420-360C3-A	265	280	360	SMS1420-347C3-A1	265	280	347	0	12	8	0.040
250	SMS1420-410C3-A	315	330	410	SMS1420-397C3-A1	315	330	397	0	12	8	0.050

Note 1. Hardened length on shaft is shown as L_1.
2. Standardized shaft ends can be used supporting unit(fixed side F1201ACDF. supported side S10002Z) for mechatronics. but please indicate when you order in advance due to different dimension of marked *
Please refer to page A249 for detailed dimension of support unit.

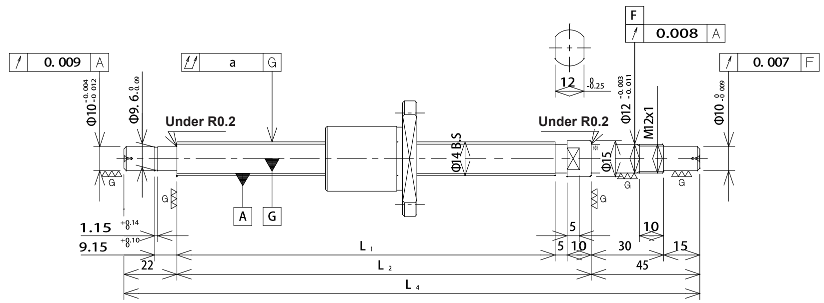
Lead Accuracy
Effective length of thread part =L_1



Reworkable Shaft Ends SMS1430-A



Standardized Shaft Ends SMS1430-A1



Ball screw dimension

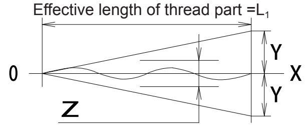
Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque ×10^{-1} N.m
SMS1430	14	12.1	3.0	2.381	1×3	3900	6500	0.16 ～ 0.58

Screw shaft dimension

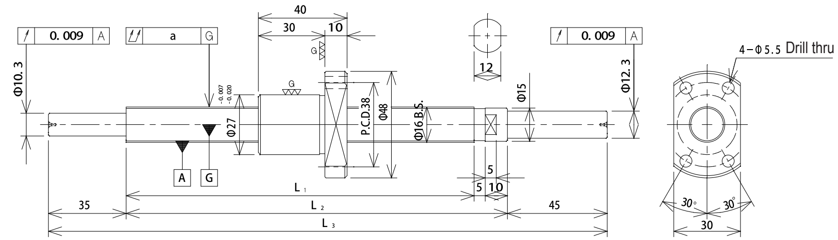
Unit:mm

Stroke	Reworkable shaft ends	L_1	L_2	L_3	Standarzized shaft ends	L_1	L_2	L_4	Lead accuracy μm X	Y	Z	Run - out a
50	SMS1430-220C3-A	125	140	220	SMS1430-207C3-A1	125	140	207	0	10	8	0.030
100	SMS1430-270C3-A	175	190	270	SMS1430-257C3-A1	175	190	257	0	10	8	0.030
150	SMS1430-320C3-A	225	240	320	SMS1430-307C3-A1	225	240	307	0	12	8	0.030
200	SMS1430-370C3-A	275	290	370	SMS1430-357C3-A1	275	290	357	0	12	8	0.040
250	SMS1430-420C3-A	325	340	420	SMS1430-407C3-A1	325	340	407	0	13	10	0.050

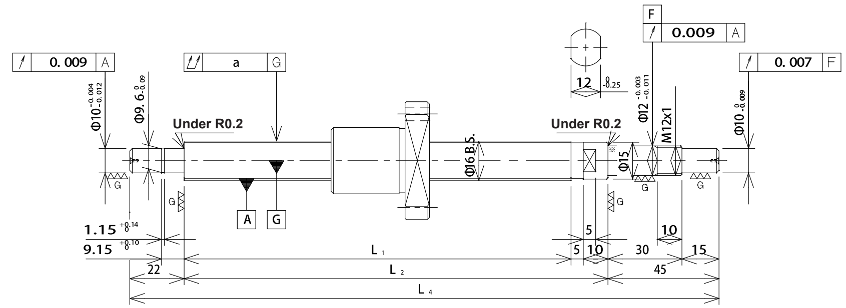
Note 1. Hardened length on shaft is shown as L_1.
2. Standardized shaft ends can be used supporting unit(fixed side F1201ACDF. supported side S10002Z) for mechatronics. but please indicate when you order in advance due to different dimension of marked *
Please refer to page A249 for detailed dimension of support unit.



Reworkable Shaft Ends SMS1620-A



Standardized Shaft Ends SMS1620-A1



Ball screw dimension

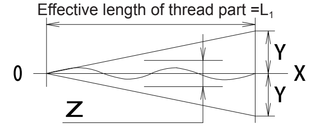
Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Basic rated load N Static Co	Preload torque ×10^{-1} N.m
SMS1620	16	14.6	2.0	1.588	1×4	3200	7200	0.11 ～ 0.42

Screw shaft dimension

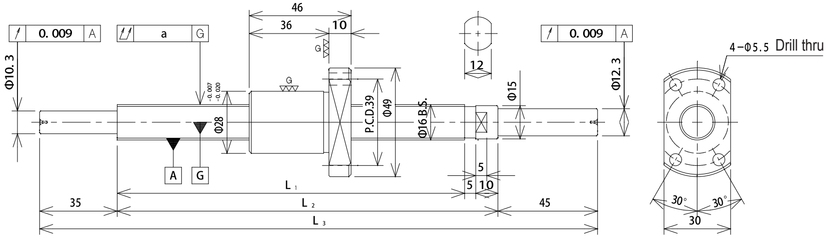
Unit:mm

Stroke	Reworkable shaft ends	L_1	L_2	L_3	Standarzized shaft ends	L_1	L_2	L_4	Lead accuracy μm X	Y	Z	Run - out a
50	SMS1620-234C3-A	139	154	234	SMS1620-221C3-A1	139	154	221	0	10	8	0.020
100	SMS1620-284C3-A	189	204	284	SMS1620-271C3-A1	189	204	271	0	10	8	0.020
150	SMS1620-334C3-A	239	254	334	SMS1620-321C3-A1	239	254	321	0	12	8	0.030
200	SMS1620-384C3-A	289	304	384	SMS1620-371C3-A1	289	304	371	0	12	8	0.030
300	SMS1620-484C3-A	389	404	484	SMS1620-471C3-A1	389	404	471	0	13	10	0.035

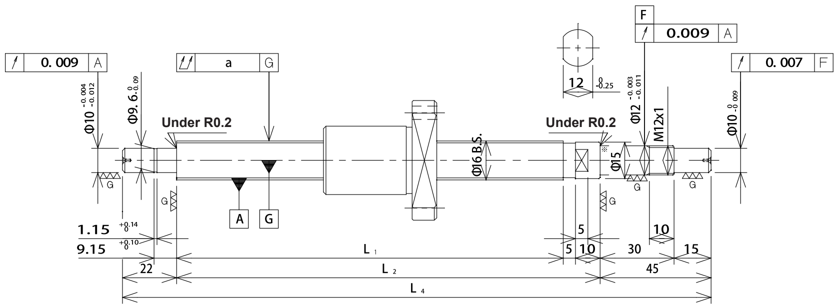
Note 1. Hardened length on shaft is shown as L_1.
2. Standardized shaft ends can be used supporting unit(fixed side F1201ACDF. supported side S10002Z) for mechatronics. but please indicate when you order in advance due to different dimension of marked *
Please refer to page A249 for detailed dimension of support unit.



Re-workable Shaft Ends SMS1625-A



Standardized Shaft Ends SMS1625-A1



Ball screw dimension

Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Basic rated load N Dynamic Ca	Static Co	Preload torque $\times10^{-1}$ N.m
SMS1625	16	14.3	2.5	2.0	1×4	4300	8600	0.17～0.62

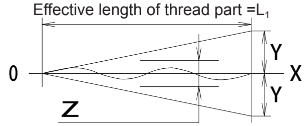
Screw shaft dimension

Unit:mm

Stroke	Reworkable shaft ends	L_1	L_2	L_3	Standarzized shaft ends	L_1	L_2	L_4	Lead accuracy μm X	Y	Z	Run - out a
50	SMS1625-234C3-A	139	154	234	SMS1625-221C3-A1	139	154	221	0	10	8	0.020
100	SMS1625-284C3-A	189	204	284	SMS1625-271C3-A1	189	204	271	0	10	8	0.020
150	SMS1625-334C3-A	239	254	334	SMS1625-321C3-A1	239	254	321	0	12	8	0.030
200	SMS1625-384C3-A	289	304	384	SMS1625-371C3-A1	289	304	371	0	12	8	0.030
300	SMS1625-484C3-A	389	404	484	SMS1625-471C3-A1	389	404	471	0	13	10	0.035

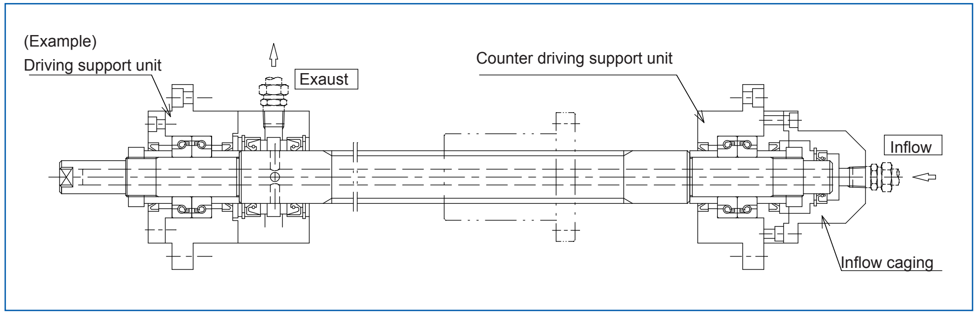
Note 1. Hardened length on shaft is shown as L_1.
2. Standardized shaft ends can be used supporting unit(fixed side F1201ACDF. supported side S10002Z) for mechatronics. but please indicate when you order in advance due to different dimension of marked *
Please refer to page A249 for detailed dimension of support unit.

Lead Accuracy
Effective length of thread part =L_1



4.TH series

Hollow shaft ball screw series



Our hollow shaft ball screws TH series are used in high speed precision machine tools,these ball screws can give good positioning accuracy by reducing error caused by thermal expansion of ball screw. Ball screw heating occurs when they are run high speeds. At high-speed operation we can better accuracy if we remove the heat effects from screw shaft drive.

Features

Highly accurate positioning with high-speed operation is possible

By the cooling ball screw shaft in the center, the temperature rise is reduced ,helps in stable high accurate positioning of ball screw shaft under high-speed operation

Decrease thermal error influences on other machine tool elements

It can also decrease influences of heat displacement of the support bearing, and reduce the thermal expansion effect to the servo-motor, by suppressing the thermal expansion caused by heating of the ball screw.

Shortening warming-up time

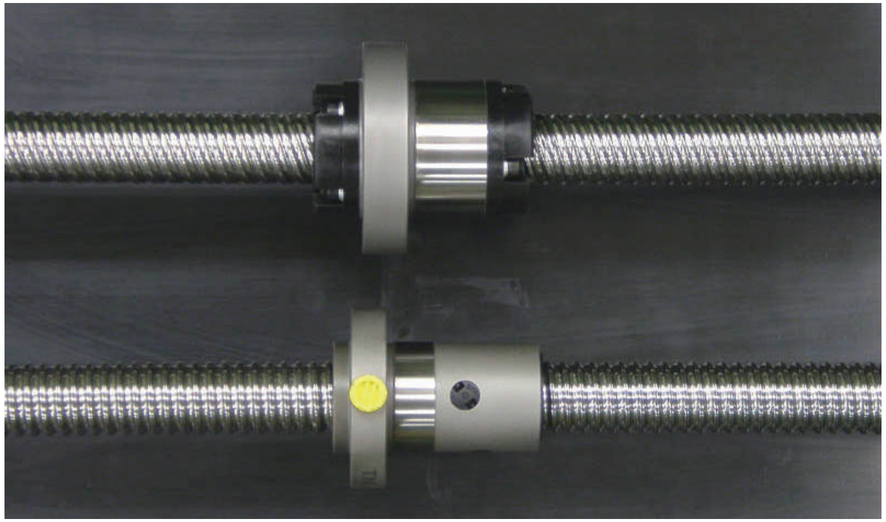
Short warming-up time is possible due to smaller temperature rise in ball screw shaft.

Restraining degradation of lubricant

The degradation of lubrication oil/grease caused by heating –up of ball screw is reduced and life of lubricant can be increased

When you design hollow type ball screw applications, please contact us for better specification, as our production range in total length or shaft end shape etc. might be limited.

5. TSUBAKI NAKASHIMA Precision Rolled Ball Screw Series



Features of the Series

Short Delivery, Low Price

We can give you short delivery due to mass production by rolled forming and abundant stocks. The price is greatly lower compared with precision ball screws.

High Accuracy

Lead accuracy maintains the C6 class.
RT and RGF series have the lead accuracy C5-C7 equivalent.

High Stiffness

Axial clearance "ZERO" type is available

High Reliability

You can always use the series based on our rational designing, advanced working technique and consistent controlled management from selected materials to delivery

Large ratio on slenderness

The SD/SH, TN, SL, TL series have large slenderness ratio, and we can make it slender as 150-230 times of shaft diameter.

Features and nut shape of each series

SD/SH series

The ball circulation parts are installed inside nut diameter.

TN series

The nut diameter is quite compact by means of the ball internal circulation type.

This is the integral pre-load type and axial clearance is zero.

RT series

The ball circulation parts are installed inside nut diameter

Notched part of flange to lower installation height.

A199-1

RGF series

The outside diameter of the nut is designed as small as possible, and the ball circulation parts are set over nut diameter.

SL series

The high lead specification design, high speed and low noise type.

Low torque specified with an axial play.

TL series

The high lead specified design, high speed and low noise type.

Axial clearance "zero"

Combinations of screw shaft diameter and lead for each series

Unit:mm

Screw dia	Lead										
	2	2.5	3	4	5	6	10	20	25	40	50
6	SD										
8											
10	SD		SD								
12				SD							
14				RT·RGF	RT·RGF						
16	SD				TN RT·RGF						
20					TN RT·RGF	RT·RGF					
25					TN RT·RGF		TN	SL·TL	SL·TL		
28						RT·RGF					
32							TN	SL·TL			
40								SL·TL		SL·TL	
50											SL·TL

Effective length of screw shaft and accuracy class

Accuracy class / Effective length mm	C5R		C6R		C7R	
	Y	Z	Y	Z	Y	Z
315	23	18	32	25	Less 0.05 mm for any 300 mm	
(315) ~ 400	25	20	36	27		
(400) ~ 500	27	20	40	29		
(500) ~ 630	30	23	44	32		
(630) ~ 800	35	25	50	36		
(800) ~ 1000	40	27	56	40		
(1000) ~ 1250			66	44		
(1250) ~ 1600			78	50		
(1600) ~ 2000			92	56		
(2000) ~ 2500			110	66		
(2500) ~ 3150			135	78		
(3150) ~ 4000			160	92		
(4000) ~ 5000			200	110		
(5000) ~ 6000			240	135		

Dust prevention measure

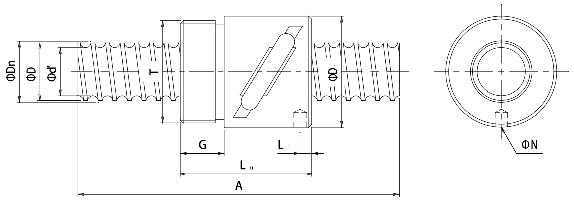
TN,SL,TL,RT and RGF series have built-in brush wiper in our standard models(except for 14RGFB4 and 14RGFB5 type), but the brush wiper is not attached to the SD series. Please contact us, when necessary.

Model No.

Nut type	Max length	Accuracy class
SD1002	500	C6R
TH1605	600	C6R
14RTB4	800	C6R
14RGFB4	800	C6R

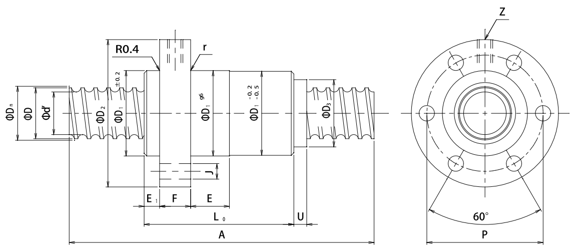
SH , SD,TN, SL, TL series are C6R
RT, RGF series are C5R, C7R as standard

SD/SH series (No preload)



Nut type	Screw dia.		Root dia.	Lead	Ball dia.	Turns	Nut dia.
	D_n	D	d'	ℓ	d	m	D_1
SD0602	6	6.2	4.6	2	1.588	2.5	16.5
SD1002	10	9.7	8.3	2	1.588	2.5	19.5
SD1003	10	9.9	7.8	3	2.0	2.5	21.0
SD1204	12	11.8	9.3	4	2.5	2.5	25.5
SD1602	16	15.6	14.3	2	1.588	2.5	29.5

PN series (with preload)



Nut type	Screw dia.		Root dia.	Lead	Ball dia.	Turns	Nut dia.	Nut dimension			Flange dia.
	D_n	D	d'	ℓ	d	m	D_1	L_0	E	E_1	D_2
TN1605	16	15.8	12.6	5	3.175	2	28	54	12	6	48
TN2005	20	19.7	16.5	5	3.5	2	33	58	15	6	57
TN2505	25	24.7	21.5	5	3.5	3	38	70	15	6	62
TN2510	25	24.6	20.5	10	5.0	2	43	85	15	6	67
TN3210	32	32.0	27.8	10	6.35	3	54	113	20	6	87

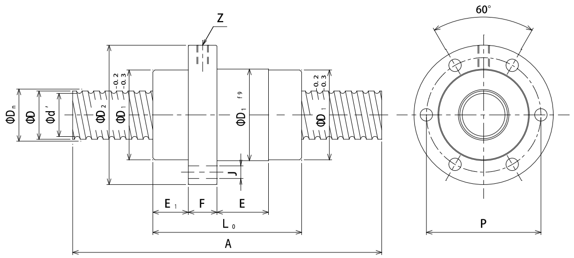
Note : 1. Accuracy C6R
2. Nut is provided with a sleeve
3. Brush wiper is not installed.

Nut dimension			Axial clearance	Hook hole		Shaft Max length	Basic rated load N Dynamic	Static
T	G	L_o		N	L_1	A	C_a	C_o
M14x1	7.5	20	0.05	3.2	3	500	1200	1500
M17x1	7.5	22	0.07	3.2	3	800	1600	2600
M18x1	9.0	29	0.07	3.2	3	1000	2300	3500
M20x1	10.0	34	0.07	3.2	3	1000	3400	5400
M25x1.5	12.0	27	0.07	3.2	3	1500	2000	4400

Note : 1. Accuracy C6R
2. Brush wiper is installed in the nut.

P.C.D	Corner	Thick	Mount hole	Wiper	Width	Oil hole	Preload torque	Shaft Max length	Basic rated load N Dynamic	Static
P	r	F	J	U	D_3	Z	$\times10^{-1}N{\cdot}m$	A	C_a	C_o
38	0.8	10	5.5	0	21	M6x1	0~1.5	1500	4800	8300
45	0.8	12	6.6	0	26	M6x1	0~2.0	2000	6400	12200
50	0.8	12	6.6	0	31	M6x1	0~3.0	2500	10100	22600
55	0.8	12	6.6	0	34	M6x1	0~4.0	2500	10400	19500
70	0.8	16	9.0	5	41	M8x1	0~10.0	3500	31300	64400

SL series (No preload)

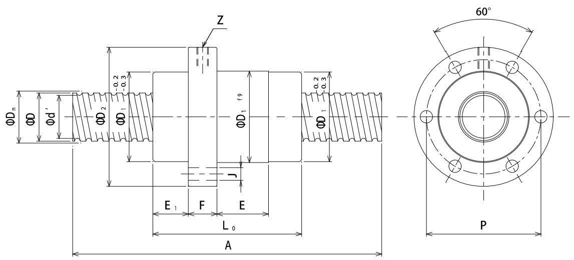


Note : 1. Accuracy C6R
2. Brush wiper is installed in the nut.

Nominal Nut	Screw dia.		Root dia.	Lead	Ball dia.	Turns	Nut dia.	Nut dimension		
	D_n	D	d'	ℓ	d	m	D_1	L_0	E	E_1
SL2520	25	24.4	21.7	20	3.175	6.8	48	66.4	18	17.4
SL2525	25	24.2	21.5	25	3.175	6.8	48	77.9	27	18.6
SL3220	32	30.1	27.5	20	3.175	6.8	56	66.4	18	17.4
SL4020	40	37.9	35.3	20	3.175	10.8	63	86.8	38	17.8
SL4040	40	38.4	34.3	40	5.0	6.8	72	110.3	44	21.3
SL5050	50	49.4	43.5	50	7.144	6.8	85	134.0	60	25.5

Flange dia.	P.C.D	Thickness	Mount hole	Oil hole	Axial clearance	Shaft Max length	Basic rated load N Dynamic	Static
D_2	P	F	J	Z		A	C_a	C_o
73	60	15	6.6	M6×1	0.04	2500	19400	54300
73	60	15	6.6	M6×1	0.04	2500	19100	54600
80	68	15	6.6	M6×1	0.04	3500	21700	68000
95	78	15	9.0	M6×1	0.04	4000	35300	133800
110	90	25	11.0	M8×1	0.05	4000	43800	137800
125	105	25	11.0	M8×1	0.08	4000	80000	254600

TL series（with preload）



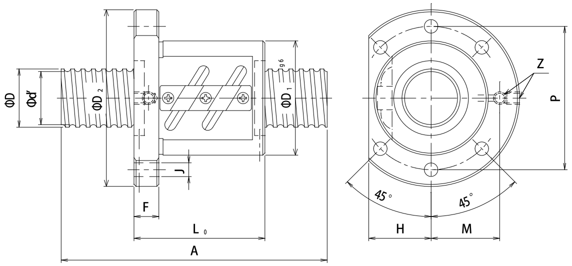
Note : 1. Accuracy C6R
2. Brush wiper is installed in the nut.

Nominal Nut	Screw dia.		Root dia.	Lead	Ball dia.	Turns	Nut dia.	Nut dimension		
	D_n	D	d'	ℓ	d	m	D_1	L_0	E	E_1
TL2520	25	24.4	21.7	20	3.175	3.4	48	66.4	18	17.4
TL2525	25	24.2	21.5	25	3.175	3.4	48	77.9	27	18.6
TL3220	32	30.1	27.5	20	3.175	3.4	56	66.4	18	17.4
TL4020	40	37.9	35.3	20	3.175	5.4	63	86.8	38	17.8
TL4040	40	38.4	34.3	40	5.0	3.4	72	110.3	44	21.3
TL5050	50	49.4	43.5	50	7.144	3.4	85	134.0	60	25.5

Flange dia.	P.C.D	Thickness	Mount hole	Oil hole	Preload torque	Shaft Max length	Basic rated load N Dynamic	Static
D_2	P	F	J	Z	$\times 10^{-1}$ N.m	A	C_a	C_o
73	60	15	6.6	M6×1	0~ 4.0	2500	10700	27100
73	60	15	6.6	M6×1	0~ 4.0	2500	10500	27300
80	68	15	6.6	M6×1	0~ 5.0	3500	11900	34000
95	78	15	9.0	M6×1	0~ 6.0	4000	19400	66900
110	90	25	11.0	M8×1	0~ 6.0	4000	24100	68900
125	105	25	11.0	M8×1	0~ 10.0	4000	44100	127300

Ball screw

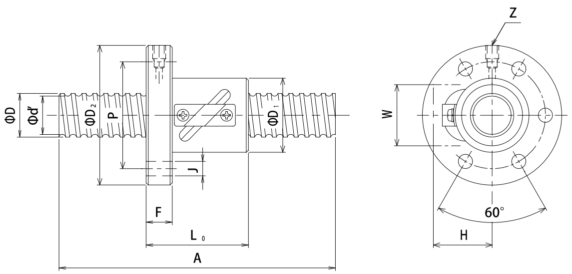
RT series (No preload)



Note : Wiper seal is installed in the nut

Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Nut dia.	Nut length	Flange dia.	P.C.D	Thickness	Mount hole	Notch	Oil hole position	Oil hole	Axial claerance	Possible shaft length A		Basic rated load N Dynamic	Static
	D	d'	ℓ	d	m	D_1	L_0	D_2	P	F	J	H	M	Z		C5R	C7R	C_a	C_o
14RTB4	14	11.7	4	2.778	3.5	36	44	59	47	11	5.5	22.0	20.5	M6×1	0.05	1000	1000	5300	8900
14RTA5	14	11.5	5	3.175	2.5	38	42	61	49	11	5.5	22.5	21.5	M6×1	0.05	1000	1000	4800	6900
16RTA5	16	13.5	5	3.175	2.5	40	42	63	51	11	5.5	23.5	22.5	M6×1	0.05	1000	1000	5100	8400
20RTC5	20	17.5	5	3.175	5	44	56	67	55	11	5.5	24.5	24.5	M6×1	0.05	1000	1500	10400	20600
20RTC6	20	17.5	6	3.175	5	44	62	67	55	11	5.5	24.5	24.5	M6×1	0.05	1000	1500	10400	20600
25RTC5	25	22.5	5	3.175	5	50	55	73	61	11	5.5	26.5	27.5	M6×1	0.05	1000	1500	11600	26500
28RTC6	28	25.5	6	3.175	5	55	63	85	69	12	6.6	30.0	33.0	M6×1	0.05	1000	2000	12200	30400

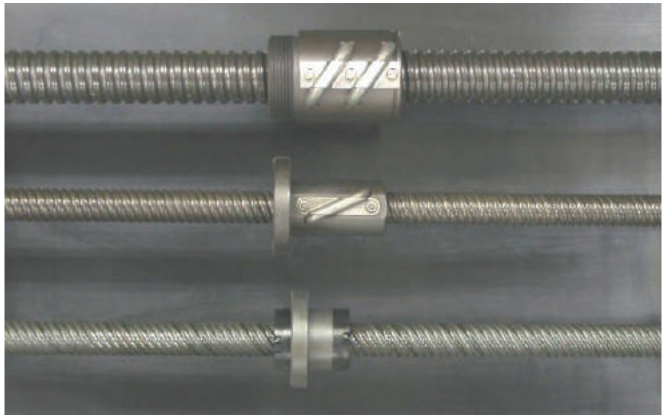
RGF series (No preload)



Note : Wiper seal is installed except for 14RGFB4 and 14RGFB5

Nominal Nut	Screw dia.	Root dia.	Lead	Ball dia.	Turns	Nut dia.	Nut length	Flange dia.	P.C.D	Thickness	Mount hole	Return tube relief Width	Highness	Oil hole	Axial claerance	Possible shaft length A		Basic rated load N Dynamic	Static
	D	d'	ℓ	d	m	D_1	L_0	D_2	P	F	J	W	H	Z		C5R	C7R	C_a	C_o
14RGFB4	14	11.7	4	2.778	3.5	25	44	55	40	10	6.6	21	21	M6×1	0.05	1000	1000	5300	8900
14RGFB5	14	11.5	5	3.175	3.5	25	47	55	40	10	6.6	21	21	M6×1	0.05	1000	1000	6300	9800
16RGFB5	16	13.5	5	3.175	3.5	30	47	58	45	10	6.6	23	24	M6×1	0.05	1000	1000	6800	11800
20RGFB5	20	17.5	5	3.175	3.5	34	47	64	49	12	6.6	28	27	M6×1	0.05	1000	1500	7700	14700
20RGFC6	20	17.5	6	3.175	5	34	62	64	49	12	6.6	28	27	M6×1	0.05	1000	1500	10400	20600
25RGFA5	25	22.5	5	3.175	2.5	40	42	64	52	10	5.5	31	27	M6×1	0.05	1000	1500	6400	12300
28RGFC6	28	25.5	6	3.175	5	50	75	80	65	15	6.6	34	33	M6×1	0.05	1000	2000	12200	30400

6. TSUBAKI NAKASHIMA Ball screw series for general industry



Features of the series

Short delivery, low price

Short delivery due to mass production by rolled forming and abundant stocks. The prices are greatly lower compared with precision ball screws.

High accuracy

Lead accuracy is equivalent to JIS B1192 C10 class.

Please refer to lead accuracy chart of below C7 class (Page A 21)

High stiffness

RR series have the axial clearance "ZERO" type.

Anti-rust & lubricating effect

R, RS, R2, RR, RZ and RE series nuts are phosphating treated which gives anti-rust and lubricating effect. (RZ series is not treated).

High reliability

You can always use in relief this series based on our rational designing, advanced working technique and consistent controlled management from selected materials to delivery.

Enhanced Parts

Fully variety of the standard parts, such as flange for nut installation, brush wiper and wiper cap for R, RS and RR series, are available.

Abundant standard series and high generalities

R series　millimeter size	36 types
R series　inch size	4 types
RS series	28 types
RZ series	3 types
RR series	19 types
R2 series	8 types
RE series	7 types
Right and left series	6 types
G series	14 types

Abundant line-up of 166 types in total and wide range shaft dia. 8-315mm.

Dust proof measures (option)

The ball screw is quite precise parts as same as the bearing which works by rolling of the balls. When the foreign substance invades into the ball nut, it may cause the lifetime decrease, noise generation, increase of the rotating torque and destruction of the ball circulating parts etc. In the environment which the invasion of the foreign articles into the ball nut is not avoidable, some dustproof measures for ball screw are definitely necessary. Please take consideration of prevention the foreign articles from adhering on the screw shaft, by attaching bellows or the telescopic type cover. In case dustproof cover cannot be attached, you may have dustproof effect by using the brush wiper installed in both ends of the ball nut. Please consult us.

Combinations of shaft dia. and lead (Mark ◎ has both of right-hand and the left-hand screw).

Unit:mm

Shaft dia. \ Lead	3	4	5	5.08	6	6.35	8	10	12	12.7	16	20	24	25	32	36	40	50
10	◎				○													
12							○		○									
12.7										○								
14		○	○															
15								○				○						
16			○	○				○			○				○			
18							○											
20			◎		○			○				○					○	
22							○											
25			○				○	○						○				○
25.4						○												
28					○													
32							○	○										
36								○	○			○	○			○		
38.1						○												
40								○									○	
45								○	◎									
50								○			○							○
60											○							
63								○			○							
80											○	○						
100												○	○					
125												○		○	○			
140														○	○		○	
160														○	○		○	
200															○		○	
250															○		○	
315																	○	

Specification

Lead accuracy

Lead accuracy is JIS B1192 C10 class equivalent.
Please refer to page A21 about Under C7 Class.

Axial clearance

Please refer to dimension tables of each series.

Nominal No.

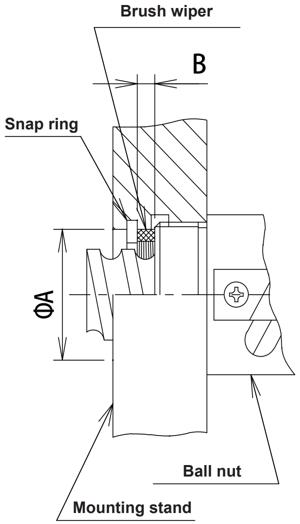
Nut type		Shaft length	Class symbol	Flange symbol	Brush seal symbol
25RC10	———	500	HR	F	W
36RSC10	———	1500	HR		W
16R2U16	———	1000	HR		
45RRD12	———	1000	HR		

Dimension table of Brush wiper

Some types of brush wipers are not furnished in both ends of the nut due to the constructional problem. Please confirm the applied type, referring to this page and next page.

Mark	Nut type	Wiper	A	B
◎	12RA8	W01201	22	2.8
	12RSA8			
	12R2U12			
◎	14RB4	W01401		
	14RSB4			
◎	14RRB4			
◎	14RB5			
	14RSB5			
◎	14RRB5			
●	15R2A10	W01501	24	2.8
○	15RE2D20			
◎	16RB5	W01601	25	2.8
	16RSB5			
◎	16RRB5			
	16RZ3S5			
◎	16RA10			
	16RSA10			
	16R2U16			
○	16RE1Q32			
◎	18RB8	W01801	30	2.8
	18RSB8			
◎	18RRB8			
◎	20RB5	W02001		
	20RSB5			
◎	20RRB5			
◎	20RB5L			
	20RSB5L			
◎	20RC6			
	20RSC6			
◎	20RRC6			
	20R2U20			
○	20RE1Q40			
◎	20RA10	W02002	33	2.8
	20RSA10			
◎	22RC8	W02201		
	22RSC8			
◎	22RRC8			
◎	25RA5	W02500	36	2.8
	25RSA5			
◎	25RB8	W02501	40	3.6
	25RSB8			
◎	25RRB8			
◎	25RC10			
	25RSC10			
◎	25RRC10			
	25R2U25			
○	25RE1Q50			
◎	28RC6	W02801	43	3.6
	28RSC6			
◎	28RRC6			

Mark	Nut type	Wiper	A	B
◎	32RC8	W03201	49	3.6
	32RSC8			
◎	32RRC8			
◎	32RC10			
	32RSC10			
	32R2U32			
◎	36RC10	W03601	52	3.6
	36RSC10			
◎	36RRC10			
◎	36RC12			
	36RSC12			
◎	36RRC12			
	36R2U36			
○	35RE3D20			
○	36RE3D24			
◎	40RD10	W04001	57	3.6
	40RSD10			
◎	40RRD10			
	40R2U40			
●	40RZ4S10			
◎	45RD10	W04501	62	3.6
	45RSD10			
◎	45RRD10			
◎	45RD12			
	45RSD12			
◎	45RRD12			
◎	45RD12L			
	45RSD12L			
	50RD10	W05000	64.5	3.6
	50RSD10			
○	50RE2D50			
	50RC16	W05001	68	3.6
	50RSC16			
	50RRC16			
	60RD16	W06001	80	3.6
	63RL10	W06301		
	63RRL10			
●	63RZ6S10			
	63RD16			
	80RL16	W08001	100	5.0
	80RL20			
	80RRL20			
	80RD20			
	100RL20	W10001	125	5.0
	100RD24	W10002		
◎	12.7R2B12.7	W10121	21	2.8
◎	16RB5.08	W10161	25	2.8
◎	25.4RB6.35	W10251	36	2.8
◎	38.1RD6.35	W10381	47.5	2.8



Note 1 : No mark : With built-in brush wiper at nut installation side and with wiper cap or built-in brush wiper at opposite side.

Mark ◎ : For attaching brush wiper at nut-installation side, you are requested to design the structure to maintain brush wiper, referring to the nut dimension table.

Mark ○ : For attaching brush wipers at both side of nut, please design the structure to maintain brush wiper, referring to the nut dimension table

Mark ● : For attaching brush wiper at anti-nut-installation side, please design the structure to maintain brush wiper, referring to the nut dimension table.

2.For the ball screws not entioned in the column of nut model of the table, we don't have brush wipers to be applied in our standard parts, but we may produce applied wiper as a special specification. Please consult us.

Wiper cap dimension table

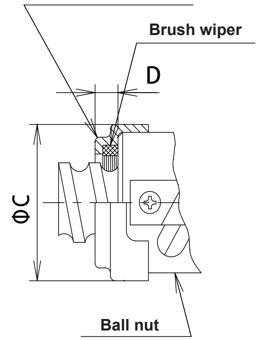
Please note that brush-wiper cap can be attached at anti-nut-installation side only.

Mark	Nut type	Wiper	C	D
	12RA8	S01201	26.6	3.5
○	12RSA8			
○	12R2U12	S01202		
	14RB4	S01401		
○	14RSB4			
	14RRB4			
	14RB5			
○	14RSB5			
	14RRB5			
	16RB5	S01601	31.6	3.5
○	16RSB5			
	16RRB5			
○	16RZ3S5			
	16RA10			
○	16RSA10			
○	16R2U16	S01602		
	18RB8	S01801	35.6	3.5
○	18RSB8			
	18RRB8			
	20RB5	S02001		
○	20RSB5			
	20RRB5			
	20RB5L			
○	20RSB5L			
	20RC6			
○	20RSC6			
	20RRC6			
○	20R2U20	S02003		
	20RA10	S02002	39.6	3.5
○	20RSA10			
	22RC8	S02201		
○	22RSC8			
	22RRC8			
	25RA5	S02500	41.6	3.5
○	25RSA5			
	25RB8	S02501	49	4.5
○	25RSB8			
	25RRB8			
	25RC10	S02502	46	4.5
○	25RSC10			
	25RRC10			
○	25R2U25	S02503		
	28RC6	S02801	52	4.5
○	28RSC6			
	28RRC6			
	32RC8	S03201	58	4.5
○	32RSC8			
	32RRC8			
	32RC10			
○	32RSC10			

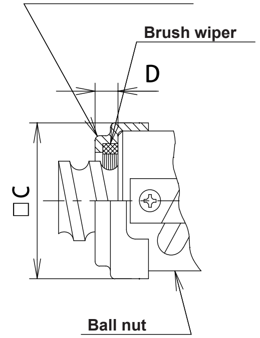
Mark	Nut type	Wiper	C	D
○	32R2U32	S03202	58	4.5
	36RC10	S03601	62	4.5
○	36RSC10			
	36RRC10			
	36RC12			
○	36RSC12			
	36RRC12			
○	36R2U36	S03602		
	40RD10	S04001	67	4.5
○	40RSD10			
	40RRD10			
○	40R2U40	S04002		
	45RD10	S04501	72	4.5
○	45RSD10			
	45RRD10			
	45RD12			
○	45RSD12			
	45RRD12			
	45RD12L			
○	45RSD12L			
	12.7R2B12.7	S10121	28.6	3.5
	16RB5.08	S10161	□27	3.5
	25.4RB6.35	S20251	□39.7	3.5
	38.1RD6.35	S10381	54.8	3.5

Mark	Nut type	
○	50RD10	Built-in brush wiper at both ends of nut is available
○	50RSD10	
○	50RC16	
○	50RSC16	
○	50RRC16	
○	60RD16	
○	63RL10	
○	63RRL10	
○	63RD16	
○	80RL16	
○	80RL20	
○	80RRL20	
○	80RD20	
○	100RL20	
○	100RD24	

Seal cap (round type)



Seal cap (square type)

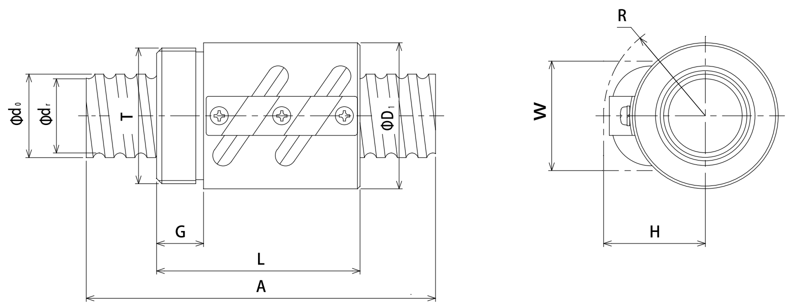


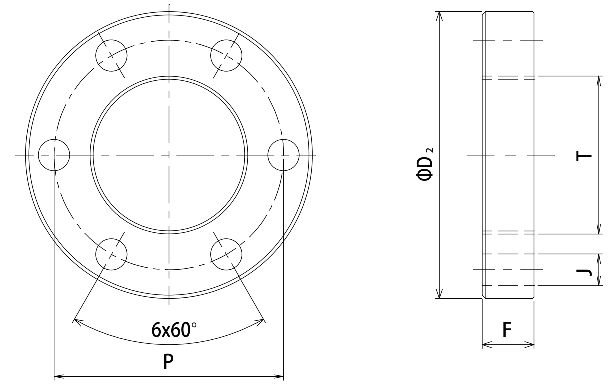
Note 1 . No Mark : For attaching brush wiper at installation side of the nut, please design at your side the structure to maintain brush wiper, referring to the brush wiper dimension table.

Mark ○ : Brush wiper is built in at nut-installation side.

2. We don't have any applied optional brush wipers for ball screw not mentioned in the column of nut model of the table

R series (mm size) Lead 3～8





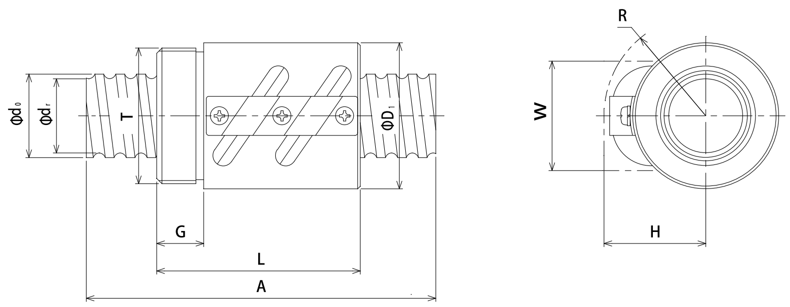
Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective tums m	Basic rated dynamic load C_a	Basic rated static load C_o	Axial clearance (mm)
3	10RB3L	10	8.1	2.381	10.6	3.5×1	3700	5700	0.10
	10RB3								
4	14RB4	14	11.7	2.778	14.6	3.5×1	5300	9000	0.10
5	14RB5	14	11.5	3.175	14.8	3.5×1	6300	10200	0.10
	16RB5	16	13.5	3.175	16.8	3.5×1	6800	11800	0.10
	20RB5L	20	17.5	3.175	20.8	3.5×1	7600	15000	0.10
	20RB5								
	25RA5	25	22.5	3.175	25.8	2.5×1	6400	13500	0.10
6	10RA6	10	8.1	2.381	10.6	2.5×1	2700	4000	0.10
	20RC6	20	17.5	3.175	20.8	2.5×2	10400	21400	0.10
	28RC6	28	25.5	3.175	28.8	2.5×2	12200	30500	0.10
8	12RA8	12	9.7	2.778	12.6	2.5×1	3600	5500	0.10
	18RB8	18	14.4	4.763	19.3	3.5×1	11900	19500	0.14
	22RC8	22	18.4	4.763	23.3	2.5×2	18600	35400	0.14
	25RB8	25	21.4	4.763	26.3	3.5×1	14600	28400	0.14
	32RC8	32	28.4	4.763	33.3	2.5×2	22800	53300	0.14

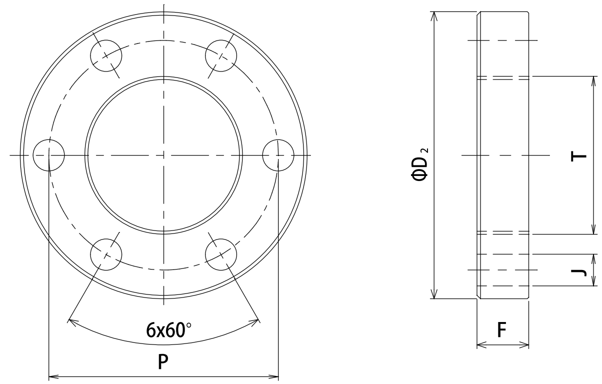
Nut dimension									Shaft max length	Flange			Model No.
D_1	L	T	G	P	J	W	H	R	A	D_2	F	Nominal	
20	32	M18×1	10	32	5.5	17	17	16.5	800	42	10	F01001	10RB3L
													10RB3
25	44	M24×1	10	40	6.6	21	21	20	1500	55	10	F01401	14RB4
25	44	M24×1	10	40	6.6	21	21	20.5	1500	55	10	F01401	14RB5
30	44	M28×1.5	10	45	6.6	23	24	24	1500	58	10	F01601	16RB5
34	42	M32×1.5	12	49	6.6	28	27	25	2000	64	12	F02001	20RB5L
													20RB5
40	41	M38×1.5	12	52	5.5	31	27	25	2500	64	12	F02500	25RA5
20	38	M18×1	10	32	5.5	16	16	16	800	42	10	F01001	10RA6
34	57	M32×1.5	12	49	6.6	28	27	25	2000	64	12	F02001	20RC6
50	75	M45×1.5	15	65	6.6	34	33	32.5	3000	80	15	F02801	28RC6
25	46	M24×1	10	35	4.5	18	20	19.5	1000	45	10	F01201	12RA8
34	56	M32×1.5	12	49	6.6	28	27	27	1500	64	12	F01801	18RB8
38	75	M35×1.5	15	56	9.0	32	30	30	2000	74	15	F02201	22RC8
47	66	M42×1.5	16	65	9.0	35	30	30	2500	83	16	F02501	25RB8
56	78	M52×2	18	75	9.0	42	39	39	3500	92	18	F03201	32RC8

Note 1. Rated dynamic load Ca is specified with life expectancy based on 10^6 revolution.
2. Mark of "L" shown at end of the ball screw type means left hand thread.
3. Upon your request, the oil hole in the flange can be drilled.
4. Please refer to the page A209 for the applied brush wiper.

Ball screw

R series (mm size) Lead 10 ～ 24



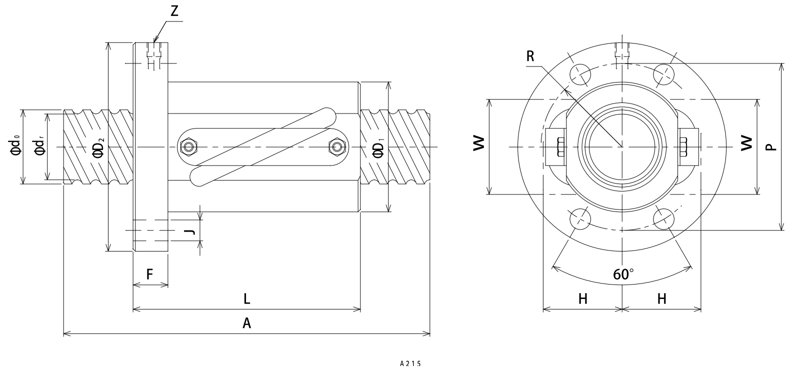


Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective tums m	Basic rated dynamic load C_a	Basic rated static load C_o	Axial clearance (mm)
10	16RA10	16	13.5	3.175	16.8	2.5×1	5000	8400	0.10
	20RA10	20	16.4	4.763	21.3	2.5×1	9800	16400	0.14
	25RC10	25	20.2	6.35	26.8	2.5×2	28600	53800	0.19
	32RC10	32	27.2	6.35	33.8	2.5×2	32300	67600	0.19
	36RC10	36	31.2	6.35	37.8	2.5×2	34400	76700	0.19
	40RD10	40	35.2	6.35	41.8	3.5×2	48500	120000	0.19
	45RD10	45	40.2	6.35	46.8	3.5×2	52100	139000	0.19
	50RD10	50	45.2	6.35	51.8	3.5×2	61600	173000	0.19
	63RL10	63	58.2	6.35	64.8	2.5×3	73200	240000	0.19
12	36RC12	36	30.6	7.144	38.0	2.5×2	39900	85600	0.22
	45RD12L	45	39.6	7.144	47.0	3.5×2	60000	152000	0.22
	45RD12								
16	50RC16	50	43.0	9.525	52.8	2.5×2	79300	185000	0.30
	60RD16	60	53.0	9.525	62.8	3.5×2	115000	309000	0.30
	63RD16	63	56.0	9.525	65.8	3.5×2	117000	325000	0.30
	80RL16	80	70.5	12.7	83.6	2.5×3	205000	588000	0.38
20	80RD20	80	70.5	12.7	83.6	3.5×2	193000	549000	0.38
	80RL20	80	73.0	9.525	82.8	2.5×3	140000	453000	0.30
	100RL20	100	90.5	12.7	103.6	2.5×3	228000	744000	0.38
24	100RD24	100	88.2	15.875	104.6	3.5×2	288000	858000	0.50

Nut dimension									Shaft max length	Flange			Model No.
D_1	L	T	G	P	J	W	H	R	A	D_2	F	Nominal	
30	52	M28×1.5	10	45	6.6	23	24	23	1500	58	10	F01601	16RA10
38	58	M35×1.5	15	53	6.6	30	30	29.5	1500	68	15	F02002	20RA10
44	90	M42×1.5	15	62	9	37	35	34.5	2500	80	15	F02502	25RC10
56	96	M52×2	18	75	9	42	39	36.5	3500	92	18	F03201	32RC10
60	98	M55×2	18	80	11	48	39	39	3500	100	18	F03601	36RC10
65	120	M60×2	25	90	14	52	45	45.5	4000	114	25	F04001	40RD10
70	125	M65×2	30	94	14	57	51	48	5500	118	30	F04501	45RD10
80	143	M75×2	40	110	18	59	52	53	5500	140	40	F05000	50RD10
95	150	M90×2	40	135	22	73	60	62	5500	175	40	F06301	63RL10
60	108	M55×2	18	80	11	48	43	42.5	3500	100	18	F03601	36RC12
70	150	M65×2	30	94	14	57	51	47	5500	118	30	F04501	45RD12L
													45RD12
85	160	M80×2	40	125	22	65	59	60	5500	165	40	F05001	50RC16
96	186	M90×2	30	138	22	74	58	61	5500	178	30	F06001	60RD16
100	195	M95×2	40	140	22	77	67	67	5500	180	40	F06302	63RD16
125	224	M120×2	50	168	22	97	84	87	5500	208	50	F08001	80RL16
125	260	M120×2	50	168	22	97	84	82	5500	208	50	F08001	80RD20
	258							83					80RL20
145	265	M140×2	50	194	26	116	94	98	5500	240	50	F10001	100RL20
158	278	M140×3	50	208	26	122	104	105	5500	254	50	F10002	100RD24

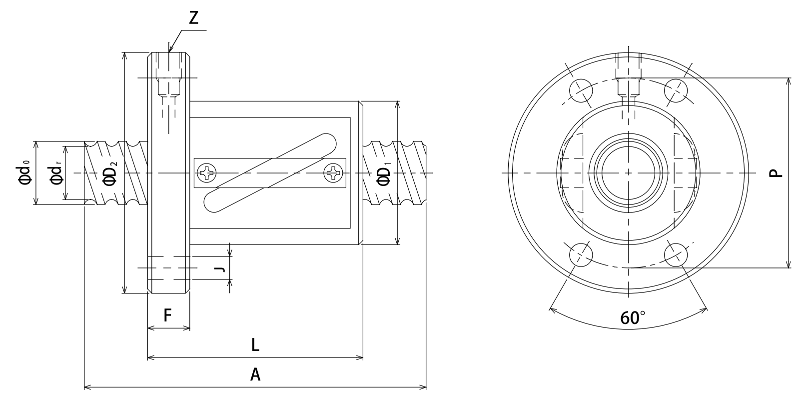
Note
1. Rated dynamic load Ca is specified with life expectancy based on 10^6 revolution.
2. Mark of “L” shown at end of the ball screw type means left hand thread.
3. Upon your request, the oil hole in the flange can be drilled.
4. For ball screw bigger than Φ80mm dia., a notch on the nut for a spanner is available.
5. As the nut of 60RD16, 80RD20 and 100RD24 are semi-standard types, please consult us in advance, when you require.
6. Please refer to the page A209 for the applied brush wiper.

R2 series (mm size) Lead 10 ～ 40



Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective tums m	Basic rated dynamic load C_a	Basic rated static load C_o	Axial clearance (mm)
10	15R2A10	15	12.2	3.175	15.8	2.5×2	8300	13500	0.10
12	12R2U12	12	10.1	2.381	12.6	1.5×2	3300	5200	0.10
16	16R2U16	16	13.7	2.778	16.6	1.5×2	4600	8000	0.10
20	20R2U20	20	17.5	3.175	20.8	1.5×2	6200	11600	0.10
25	25R2U25	25	21.9	3.969	26.0	1.5×2	9300	18100	0.12
32	32R2U32	32	28.4	4.763	33.3	1.5×2	13200	27500	0.14
36	36R2U36	36	31.7	5.556	37.5	1.5×2	17500	37300	0.17
40	40R2U40	40	35.2	6.35	41.8	1.5×2	21700	46400	0.19

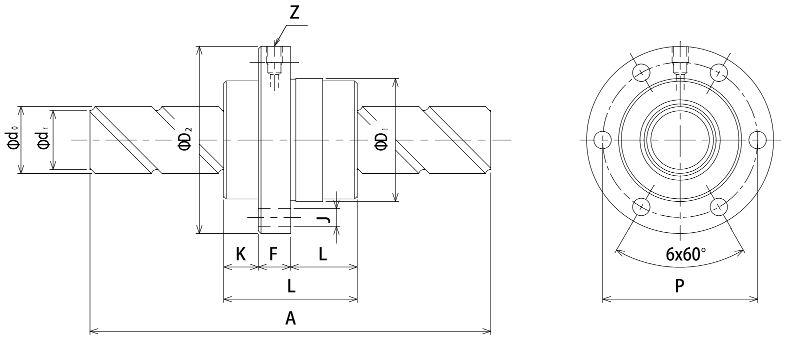
15R2A10 Model



Nut dimension										Shaft max length	Model No.
D_1	D_2	L	F	P	J	W	H	R	Z	A	
34	57	51	10	45	5.5	-	-	-	M6×0.75	1500	15R2A10
25	44	44	10	34	4.5	16	17	18	M6×0.75	1000	12R2U12
30	57	57	10	44	5.5	23	23	23	M6×0.75	1500	16R2U16
34	60	67	10	47	5.5	26	23	24	M6×0.75	2000	20R2U20
44	71	81	12	57	6.6	34	30	31	M6×0.75	2500	25R2U25
56	90	98	15	72	9	41	34	36	M6×0.75	3500	32R2U32
60	100	110	18	80	11	45	38	39	PT1/8	3500	36R2U36
65	107	123	18	85	11	51	41	43	M6×0.75	4000	40R2U40

Note 1. Rated dynamic load Ca is specified with life expectancy based on 10^6 revolution.
2. It is possible to install the wiper, if required.
3. Please refer to the page A209 for the applied brush wiper.

RE series (High lead, high speed type) Lead 20 ～ 50

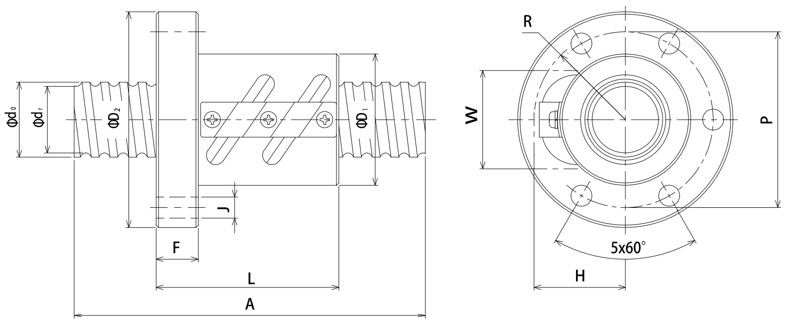


Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective tums m	Basic rated dynamic load C_a	Basic rated static load C_o	Axial clearance (mm)
20	15RE2D20	15	12.5	3.175	15.8	1.5×2	5200	8600	0.10
	36RE3D20	36	31.2	6.35	37.8	2.5×2	32100	65900	0.19
24	36RE3D24	36	30.6	7.144	38.0	2.5×2	38600	78300	0.22
32	16RE1Q32	16	13.7	2.778	16.6	0.5×4	2500	4500	0.10
40	20RE1Q40	20	17.5	3.175	20.8	0.5×4	3300	6500	0.10
50	25RE1Q50	25	21.9	3.969	26.0	0.5×4	5000	10200	0.12
	50RE2D50	50	44.0	7.938	52.2	1.5×2	32400	72600	0.24

Nut dimension								Shaft max length	Model No.
D_1	D_2	L	K	F	P	J	Z	A	
34	55	47	10	10	45	5.5	M6×0.75	1500	15RE2D20
70	110	76	20	18	90	11	-	3500	36RE3D20
75	115	90	22	18	94	11	-	3500	36RE3D24
34	55	37	9	10	45	5.5	M6×0.75	1500	16RE1Q32
38	58	45	10	10	48	5.5	M6×0.75	2000	20RE1Q40
46	70	55	12	12	58	6.6	M6×0.75	2500	25RE1Q50
90	135	118	24.5	22	112	14	PT1/8	5500	50RE2D50

Note 1. Rated dynamic load Ca is specified with life expectancy based on 10^6 revolution.

RS series Lead 3 ～ 8



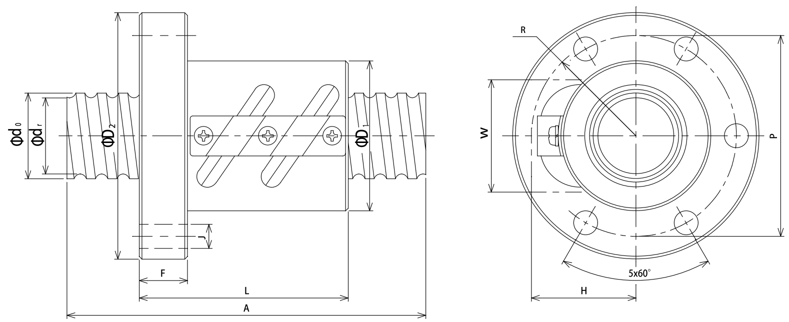
Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective tums m	Basic rated dynamic load C_a	Basic rated static load C_o	Axial clearance (mm)
3	10RSB3L	10	8.1	2.381	10.6	3.5×1	3700	5700	0.10
	10RSB3								
4	14RSB4	14	11.7	2.778	14.6	3.5×1	5300	9000	0.10
5	14RSB5	14	11.5	3.175	14.8	3.5×1	6300	10200	0.10
	16RSB5	16	13.5	3.175	16.8	3.5×1	6800	11800	0.10
	20RSB5L	20	17.5	3.175	20.8	3.5×1	7600	15000	0.10
	20RSB5								
	25RSA5	25	22.5	3.175	25.8	2.5×1	6400	13500	0.10
6	10RSA6	10	8.1	2.381	10.6	2.5×1	2700	4000	0.10
	20RSC6	20	17.5	3.175	20.8	2.5×2	10400	21400	0.10
	28RSC6	28	25.5	3.175	28.8	2.5×2	12200	30500	0.10
8	12RSA8	12	9.7	2.778	12.6	2.5×1	3600	5500	0.10
	18RSB8	18	14.4	4.763	19.3	3.5×1	11900	19500	0.14
	22RSC8	22	18.4	4.763	23.3	2.5×2	18600	35400	0.14
	25RSB8	25	21.4	4.763	26.3	3.5×1	14600	28400	0.14
	32RSC8	32	28.4	4.763	33.3	2.5×2	22800	53300	0.14

Nut dimension									Shaft max length	Model No.
D_1	D_2	L	F	P	J	W	H	R	A	
20	42	28	6	32	5.5	17	17	17	800	10RSB3L
										10RSB3
25	55	44	10	40	6.6	21	21	20	1500	14RSB4
25	55	44	10	40	6.6	21	21	21	1500	14RSB5
30	58	44	10	45	6.6	23	24	24	1500	16RSB5
34	64	42	12	49	6.6	28	27	25	2000	20RSB5L
										20RSB5
40	64	36	10	52	5.5	31	27	25	2500	25RSA5
20	42	34	6	32	5.5	16	16	16	800	10RSA6
34	64	57	12	49	6.6	28	27	25	2000	20RSC6
50	80	75	15	65	6.6	34	33	33	3000	28RSC6
25	45	44	8	35	4.5	18	20	20	1000	12RSA8
34	64	56	12	49	6.6	28	27	27	1500	18RSB8
38	74	75	15	56	9	32	30	30	2000	22RSC8
47	83	66	16	65	9	35	30	30	2500	25RSB8
56	92	78	18	75	9	42	39	39	3500	32RSC8

Note
1. Rated dynamic load Ca is specified with life expectancy based on 10^6 revolution.
2. Mark of "L" shown at end of the ball screw type means left hand thread.
3. Upon your request, the oil hole in the flange can be drilled.
4. Please refer to the page A209 for the applied brush wiper.

Ball screw

RS series Lead 10 ～ 16

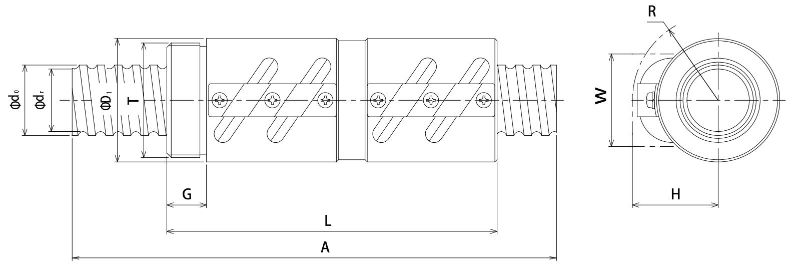


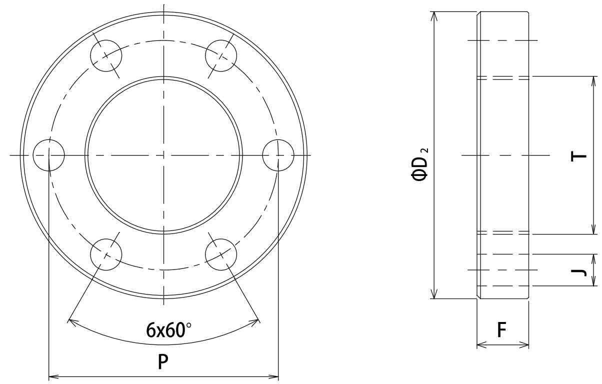
Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective tums m	Basic rated dynamic load C_a	Basic rated static load C_o	Axial clearance (mm)
10	16RSA10	16	13.5	3.175	16.8	2.5×1	5000	8400	0.10
	20RSA10	20	16.4	4.763	21.3	2.5×1	9800	16400	0.14
	25RSC10	25	20.2	6.35	26.8	2.5×2	28600	53800	0.19
	32RSC10	32	27.2	6.35	33.8	2.5×2	32300	67600	0.19
	36RSC10	36	31.2	6.35	37.8	2.5×2	34400	76700	0.19
	40RSD10	40	35.2	6.35	41.8	3.5×2	48500	120000	0.19
	45RSD10	45	40.2	6.35	46.8	3.5×2	52100	139000	01.9
	50RSD10	50	45.2	6.35	51.8	3.5×2	61600	173000	0.19
12	36RSC12	36	30.6	7.144	38.0	2.5×2	39900	85600	0.22
	45RSD12L 45RSD12	45	39.6	7.144	47.0	3.5×2	60000	152000	0.22
16	50RSC16	50	43.0	9.525	52.8	2.5×2	79300	185000	0.30

Nut dimension									Shaft max length	Model No.
D_1	D_2	L	F	P	J	W	H	R	A	
30	58	52	10	45	6.6	23	24	23	1500	16RSA10
38	68	55	12	53	6.6	30	30	30	1500	20RSA10
44	80	90	15	62	9	37	35	35	2500	25RSC10
56	92	93	18	75	9	42	39	37	3500	32RSC10
60	100	98	18	80	11	48	39	39	3500	36RSC10
65	114	115	20	90	14	52	45	46	4000	40RSD10
70	118	115	20	94	14	57	51	48	5500	45RSD10
80	140	125	22	110	18	59	52	53	5500	50RSD10
60	100	108	18	80	11	48	43	43	3500	36RSC12
70	118	140	20	94	14	57	51	47	5500	45RSD12L 45RSD12
85	165	144	24	125	22	65	59	60	5500	50RSC16

Note
1. Rated dynamic load Ca is specified with life expectancy based on 10^6 revolution.
2. Mark of “L” shown at end of the ball screw type means left hand thread.
3. Upon your request, the oil hole in the flange can be drilled.
4. Please refer to the page A209 for the applied brush wiper.

RR series (Constant-pressure preload) Lead 4 ~ 20



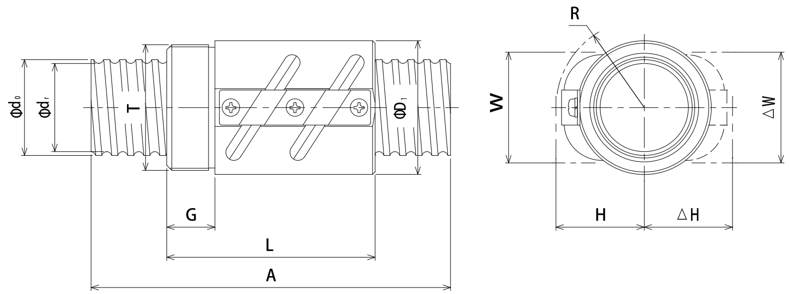


Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective tums m	Basic rated dynamic load C_a	Basic rated static load C_o
4	14RRB4	14	11.7	2.778	14.6	3.5×1	5300	9000
5	14RRB5	14	11.5	3.175	14.8	3.5×1	6300	10200
	16RRB5	16	13.5	3.175	16.8	3.5×1	6800	11800
	20RRB5	20	17.5	3.175	20.8	3.5×1	7600	15000
6	20RRC6	20	17.5	3.175	20.8	2.5×2	10400	21400
	28RRC6	28	25.5	3.175	28.8	2.5×2	12200	30500
8	18RRB8	18	14.4	4.763	19.3	3.5×1	11900	19500
	22RRC8	22	18.4	4.763	23.3	2.5×2	18600	35400
	25RRB8	25	21.4	4.763	26.3	3.5×1	14600	28400
	32RRC8	32	28.4	4.763	33.3	2.5×2	22800	53300
10	25RRC10	25	20.2	6.35	26.8	2.5×2	28600	53800
	36RRC10	36	31.2	6.35	37.8	2.5×2	34400	76700
	40RRD10	40	35.2	6.35	41.8	3.5×2	48500	120000
	45RRD10	45	40.2	6.35	46.8	3.5×2	52100	139000
	63RRL10	63	58.2	6.35	64.8	2.5×3	73200	240000
12	36RRC12	36	30.6	7.144	38.0	2.5×2	39900	85600
	45RRD12	45	39.6	7.144	47.0	3.5×2	60000	152000
16	50RRC16	50	43.0	9.525	52.8	2.5×2	79300	185000
20	80RRL20	80	73.0	9.525	82.8	2.5×3	140000	453000

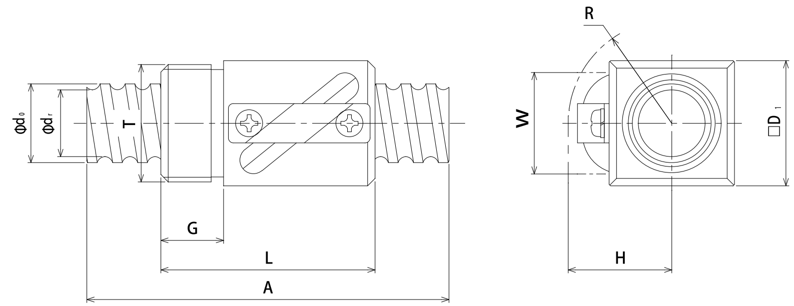
Nut dimension									Flange			Shaft max length	Model No.
D_1	L	T	G	P	J	W	H	R	D_2	F	Nominal	A	
25	88	M24×1	10	40	6.6	21	21	20	55	10	F01401	1500	14RRB4
25	89	M24×1	10	40	6.6	21	21	21	55	10	F01401	1500	14RRB5
30	89	M28×1.5	10	45	6.6	23	24	24	58	10	F01601	1500	16RRB5
34	82	M32×1.5	12	49	6.6	28	27	25	64	12	F02001	2000	20RRB5
34	111	M32×1.5	12	49	6.6	28	27	25	64	12	F02001	2000	20RRC6
50	147	M45×1.5	15	65	6.6	34	33	33	80	15	F02801	3000	28RRC6
34	112	M32×1.5	12	49	6.6	28	27	27	64	12	F01801	1500	18RRB8
38	147	M35×1.5	15	56	9	32	30	30	74	15	F02201	2000	22RRC8
47	122	M42×1.5	16	65	9	35	30	30	83	16	F02501	2500	25RRB8
56	150	M52×2	18	75	9	42	39	39	92	18	F03201	3500	32RRC8
44	180	M42×1.5	15	62	9	37	35	35	80	15	F02502	2500	25RRC10
60	188	M52×2	18	80	11	48	39	39	100	18	F03601	3500	36RRC10
65	230	M60×2	25	90	14	52	45	46	114	25	F04001	4000	40RRD10
70	235	M65×2	30	94	14	57	51	48	118	30	F04501	5500	45RRD10
95	280	M90×2	40	135	22	73	60	62	175	40	F06301	5500	63RRL10
60	216	M52×2	18	80	11	48	43	43	100	18	F03601	3500	36RRC12
70	282	M65×2	30	94	14	57	51	47	118	30	F04501	5500	45RRD12
85	304	M80×2	40	125	22	65	59	60	165	40	F05001	5500	50RRC16
125	498	M120×2	50	168	22	97	84	83	208	50	F08001	5500	80RRL20

Note
1. Rated dynamic load Ca is specified with life expectancy based on 10^6 revolution.
2. Total nut length may be slightly changed by pre-load adjustment.
3. Upon your request, the oil hole in the flange can be drilled.
4. For 80RRL20, a notch on the nut for a spanner is available.
5. Please refer to the page A209 for the applied brush wiper.

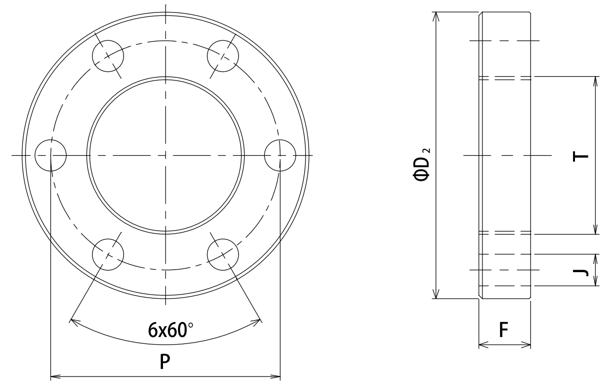
R series (Inch series) Lead 5.08 ～ 12.7 mm



Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective tums m	Basic rated dynamic load C_a	Basic rated static load C_o	Axial clearance (mm)
12.7	12.7R2B12.7	12.7	10.2	3.175	13.5	3.5×2	9900	16200	0.10
5.08	16RB5.08	16	13.5	3.175	16.8	3.5×1	6800	11800	0.10
6.35	25.4RB6.35	25.4	22.3	3.969	26.4	3.5×1	11400	23400	0.12
	38.1RB6.35	38.1	35.0	3.969	39.1	3.5×2	25000	71200	0.12

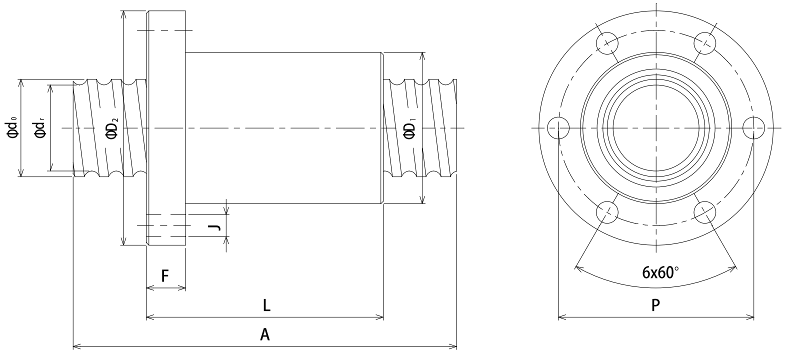


Nut dimension									Flange			Shaft max length	Model No.
D_1	L	T	G	P	J	W	H	R	D_2	F	Nominal	A	
27	70	15/16-16UN	9.5	53.1	6.8	18.5	21	22	66	10.2	F10121	1000	12.7R2B12.7
□25.4	43.6	15/16-16UN	12.7	53.1	6.8	21	21	21	66	13.5	F10161	1500	16RB5.08
□38.1	59.4	1.563-18UNS	15.2	69.9	6.8	32	28	29	82.6	16	F10251	2000	25.4RB6.35
53.2	82.6	1.967-18UNS	19.1	88.9	10	44	35	36	111	20.6	F10381	3000	38.1RB6.35



Note 1. Rated dynamic load Ca is specified with life expectancy based on 10^6 revolution.
2. Upon your request, the oil hole in the flange can be drilled.
3. For 12.7R2B12.7, relief of △ H is requested.
4. Please refer to the page A209 for the applied brush wiper.

RZ series (Return cap type) Lead 5～10 mm

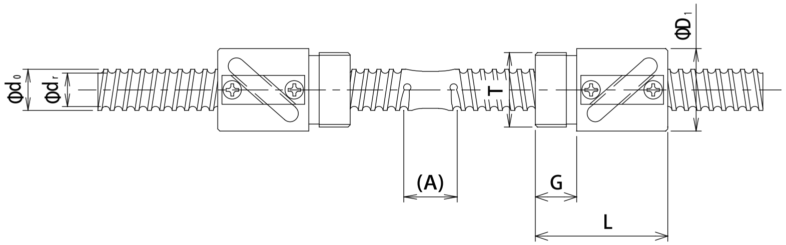


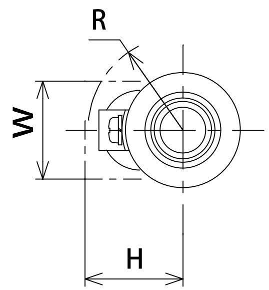
Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective turns m	Basic rated dynamic load C_a	Basic rated static load C_o	Axial clearance (mm)
5	16RZ3S5	16	13.5	3.175	16.8	1×3	4600	6900	0.10
10	40RZ4S10	40	35.2	6.35	41.8	1×4	24700	51400	0.19
	63RZ6S10	63	58.2	6.35	64.8	1×6	53900	162200	0.19

Nut dimension						Shaft max length	Model No.
D_1	D_2	L	F	P	J	A	
30	49	40	10	39	4.5	1500	16RZ3S5
62	96	81	16	80	9	4000	40RZ4S10
85	134	106	20	110	14	5500	63RZ6S10

Note
1. Rated dynamic load Ca is specified with life expectancy based on 10^6 revolution.
2. Total nut length may be slightly changed by pre-load adjustment.
3. Upon your request, the oil hole in the flange can be drilled.

Right + left one shaft series (Lead 3 ～ 12)



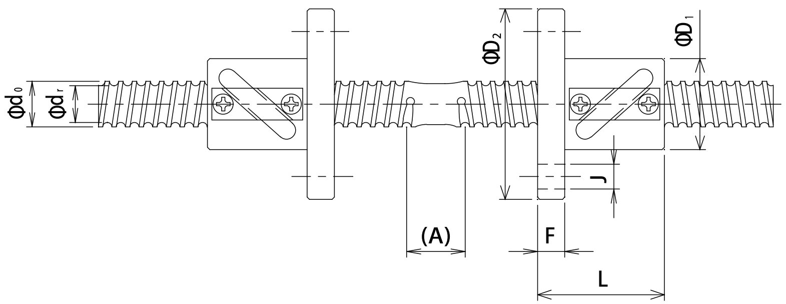


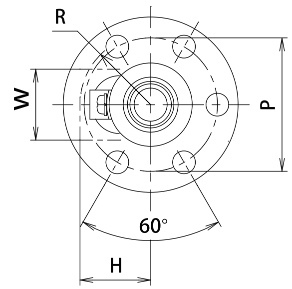
Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective tums m	Basic rated dynamic load C_a	Basic rated static load C_o	Axial clearance (mm)
3	10RB3RL	10	8.1	2.381	10.6	3.5×1	3700	5700	0.10
5	20RB5RL	20	17.5	3.175	20.8	3.5×1	7600	15000	0.10
12	45RD12RL	45	39.6	7.144	47.0	3.5×2	60000	152000	0.22

Nut dimension							Incomplete thread	Shaft max length	Model No.
D_1	L	T	G	W	H	R	B	A	
20	32	M18×1	10	17	17	17	30	800	10RB3RL
34	42	M32×1.5	13	28	27	25	45	2000	20RB5RL
70	150	M65×2	30	57	51	47	60	5500	45RD12RL

Note 1. Rated dynamic load Ca is specified with life expectancy based on 10^6 revolution.

Right + left one shaft series



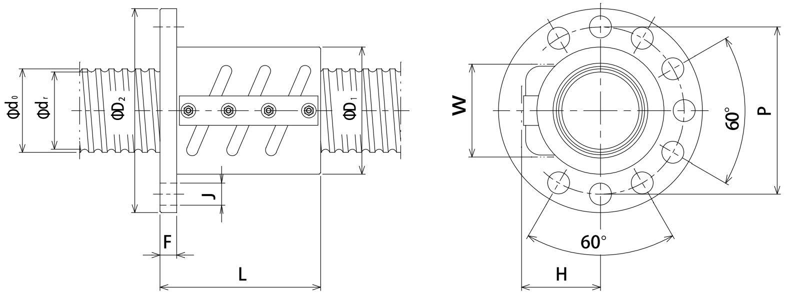


Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective tums m	Basic rated dynamic load C_a	Basic rated static load C_o	Axial clearance (mm)
3	10RSB3RL	10	8.1	2.381	10.6	3.5×1	3700	5700	0.10
5	20RSB5RL	20	17.5	3.175	20.8	3.5×1	7600	15000	0.10
12	45RSD12RL	45	39.6	7.144	47.0	3.5×2	60000	152000	0.22

Nut dimension									Incomplete thread	Shaft max length	Model No.
D_1	D_2	L	F	P	J	W	H	R	B	A	
20	42	28	6	32	5.5	17	17	17	30	800	10RSB3RL
34	64	42	12	49	6.6	28	27	25	45	2000	20RSB5RL
70	118	140	20	94	14	57	51	47	60	4500	45RSD12RL

Note 1. Rated dynamic load Ca is specified with life expectancy based on 10^6 revolution.

G series Lead 20 ～ 40 mm



Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective tums m	Basic rated dynamic load C_a	Basic rated static load C_o	Axial clearance (mm)
20	125GFL20	125	115.5	12.7	128.6	2.5×3	250000	931000	0.20
	125GFL25	125	115.5	12.7	128.6	2.5×3	249000	931000	0.20
25	140GFL25	140	128.2	15.875	144.6	2.5×3	358000	1308000	0.25
	160GFO25	160	148.2	15.875	164.6	2.5×4	486000	2004000	0.25
	125GFL32	125	113.2	15.875	129.6	2.5×3	340000	1163000	0.25
	140GFL32	140	123.7	22.225	146.6	2.5×3	561000	1802000	0.35
32	160GFL32	160	143.7	22.225	166.6	2.5×3	601000	2087000	0.35
	200GFO32	200	183.7	22.225	206.6	2.5×4	856000	3545000	0.35
	250GFO32	250	233.7	22.225	256.6	2.5×4	938000	4435000	0.35
	140GFL40	140	123.7	22.225	146.6	2.5×3	560000	1802000	0.35
	160GFL40	160	143.7	22.225	166.6	2.5×3	600000	2087000	0.35
40	200GFL40	200	183.7	22.225	206.6	2.5×3	668000	2658000	0.35
	250GFL40	250	233.7	22.225	256.6	2.5×3	732000	3326000	0.35
	315GFO40	315	296.3	25.4	322.4	2.5×4	1227000	6295000	0.40

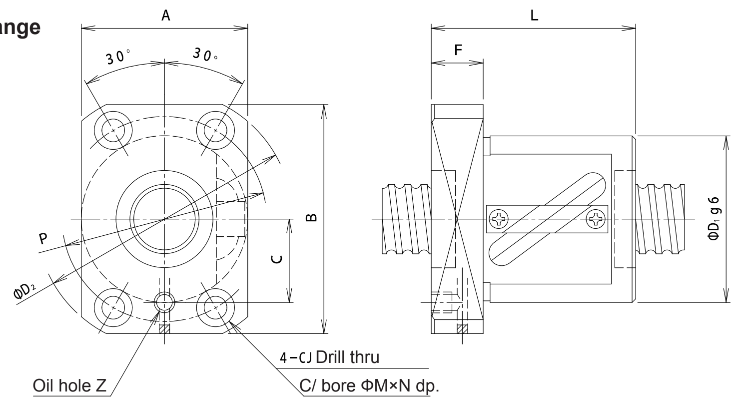
Nut dimension								Shaft max length	Model No.
D_1	D_2	L	F	P	J	W	H	A	
190	305	240	25	250	33	139	118	10000	125GFL20
190	305	285	25	250	33	139	118	10000	125GFL25
215	337	292	32	283	33	160	136	12000	140GFL25
236	358	367	32	304	33	177	146	14000	160GFO25
195	337	355	32	263	33	146	126	10000	125GFL32
230	352	368	40	298	33	174	153	12000	140GFL32
250	372	368	40	318	33	193	163	14000	160GFL32
300	422	464	40	368	33	229	188	16000	200GFO32
355	510	464	40	440	42	276	216	17000	250GFO32
230	352	440	40	298	33	147	153	12000	140GFL40
250	372	440	40	318	33	193	163	14000	160GFL40
300	422	440	40	368	33	229	188	16000	200GFL40
355	510	440	40	440	42	276	216	17000	250GFL40
450	604	574	50	534	42	335	268	17000	315GFO40

Note 1. Rated dynamic load Ca is specified with life expectancy based on 10^6 revolution.
2. Upon your request, the oil hole in the flange can be drilled.

Ball screw

TF series

4 faces notched flange

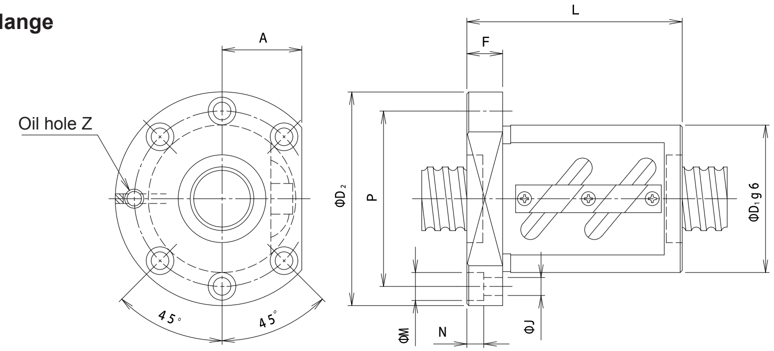


Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective tums m	Basic rated dynamic load C_a	Basic rated static load C_o	Axial clearance (mm)
5	12TFA5	12	9.5	3.175	12.8	2.5×1	4920	7070	0.10
	15TFA5	15	12.5	3.175	15.8	2.5×1	5640	9020	0.10
	20TFA5	20	17.5	3.175	20.8	2.5×1	6580	12200	0.10
10	12TFA10	12	10.1	2.381	12.6	2.5×1	3500	5770	0.10
	15TFA10	15	12.5	3.175	15.8	2.5×1	5530	9020	0.10
	20TFA10	20	16.4	4.763	21.3	2.5×1	11200	18700	0.10
15	15TFU15	15	12.5	3.175	15.8	1.5×1	3600	5770	0.10
20	15TFU20	15	12.5	3.175	15.8	1.5×1	3460	5770	0.10
	20TFUS20	20	17.5	3.175	20.8	1.5×2	7140	14600	0.10

Nut dimension												Model No.
D_1	D_2	L	F	P	J	M	N	A	B	C	Z	
32	52	42	12	42	4.5	8.0	4.5	32	43	15	M6×1	12TFA5
34	58	46	11	45	6.0	9.5	5.5	34	49	17	M6×1	15TFA5
46	74	51	15	59	6.6	11	6.5	46	66	24	M6×1	20TFA5
30	50	49	12	40	4.5	8.0	5.5	30	42	15	M6×1	12TFA10
34	58	51	11	45	6.0	9.5	5.5	34	49	17	M6×1	15TFA10
48	74	59	15	59	6.6	11	6.5	48	66	24	M6×1	20TFA10
34	58	53	11	45	6.0	9.5	5.5	34	49	17	M6×1	15TFU15
34	58	66	11	45	6.0	9.5	5.5	34	49	17	M6×1	15TFU20
46	74	70	15	59	6.6	11	6.5	46	66	24	M6×1	20TFUS20

TF series

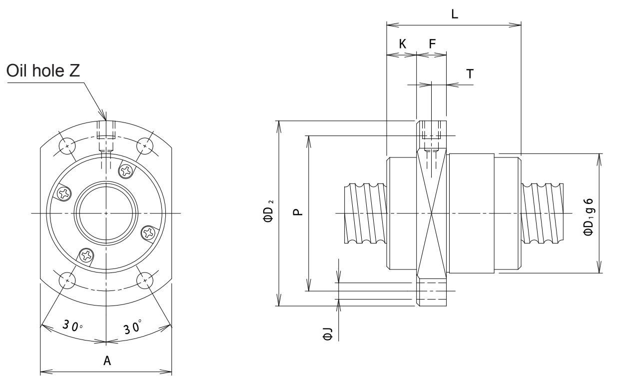
1 face notched flange



Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective tums m	Basic rated dynamic load C_a	Basic rated static load C_o	Axial clearance (mm)
5	25TFC5	25	22.5	3.175	25.8	2.5×2	13200	31000	0.10
6	32TFC6	32	28.9	3.969	33.0	2.5×2	20200	50400	0.12
8	32TFC8	32	28.4	4.763	33.3	2.5×2	26000	60900	0.14
10	25TFJ10	25	21.4	4.763	26.3	1.5×2	14600	27800	0.14
	28TFC10	28	24.4	4.763	29.3	2.5×2	24100	52200	0.14
	32TFC10	32	27.1	6.35	33.8	2.5×2	36900	77400	0.19
	40TFC10	40	35.1	6.35	41.8	2.5×2	41500	98100	0.19
12	28TFJ12	28	24.4	3.969	29.0	1.5×2	12200	26600	0.12
	32TFC12	32	27.1	6.35	33.8	2.5×2	36800	77400	0.19
	40TFC12	40	35.1	6.35	41.8	2.5×2	41400	98100	0.19
16	32TFJ16	32	27.1	6.35	33.8	1.5×2	23600	46400	0.19
20	36TFJ20	36	31.1	6.35	37.8	1.5×2	25000	52600	0.19
	40TFC20	40	35.1	6.35	41.8	2.5×2	41100	98100	0.19

Nut dimension										Model No.
D_1	D_2	L	F	P	J	M	N	A	Z	
50	73	55	11	61	5.5	9.5	5.5	28	M6×1	25TFC5
62	89	63	12	75	6.6	11	6.5	34	M6×1	32TFC6
66	100	82	15	82	9	14	8.5	38	M6×1	32TFC8
58	85	79	15	71	6.6	11	6.5	32	M6×1	25TFJ10
60	94	97	15	76	9	14	8.5	36	M6×1	28TFC10
74	108	100	15	90	9	14	8.5	41	M6×1	32TFC10
82	124	103	18	102	11	17.5	11	47	PT1/8	40TFC10
58	92	83	15	74	9	14	8.5	36	M6×1	28TFJ12
74	108	117	18	90	9	14	8.5	41	M6×1	32TFC12
82	124	117	18	102	11	17.5	11	47	PT1/8	40TFC12
74	108	108	18	90	9	14	8.5	41	M6×1	32TFJ16
78	123	121	18	101	11	17.5	11	47	M6×1	36TFJ20
82	124	161	18	102	11	17.5	11	47	PT1/8	40TFC20

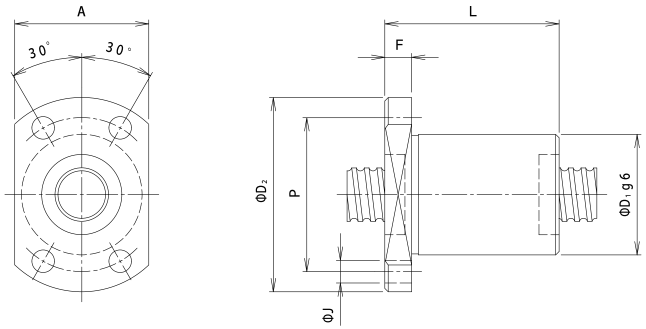
EF series



Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective tums m	Basic rated dynamic load C_a	Basic rated static load C_o	Axial clearance (mm)
6	8EF3D6	8	6.6	1.588	8.3	2.7×2	2390	3690	0.07
12	8EF2D12	8	6.6	1.588	8.3	1.7×2	1670	2280	0.07
25	25EF2D25	25	21.9	3.969	26.0	1.7×2	11600	26300	0.12
30	15EF1D30	15	12.5	3.175	15.8	0.7×2	3100	4590	0.10
32	16EF1Q32	16	13.7	2.778	16.6	0.7×4	5030	8710	0.10
32	32EF2D32	32	28.4	4.763	33.3	1.7×2	16400	36000	0.14
40	20EF1Q40	20	17.5	3.175	20.8	0.7×4	6680	12400	0.10
50	50EF2D50	50	44.0	7.938	52.2	1.7×2	40400	95300	0.24
60	20EF1Q60	20	17.5	3.175	20.8	0.7×4	5970	14000	0.10

Nut dimension									Model No.
D_1	D_2	L	K	F	P	J	A	Z	
18	31	23.5	5	9	25	3.4	18	-	8EF3D6
18	31	27	5	9	25	3.4	18	-	8EF2D12
47	74	81	11	12	60	6.6	49	M6×1	25EF2D25
32	53	34	6	10	43	5.5	33	M6×1	15EF1D30
35	56	37	9	10	44	4.5	38	M6×1	16EF1Q32
58	92	76	16	15	74	9	68	M6×1	32EF2D32
40	62	45	10	10	50	5.5	44	M6×1	20EF1Q40
90	135	118	22	22	112	14	100	PT1/8	50EF2D50
37	57	54	10	10	47	5.5	38	M6×1	20EF1Q60

MF series

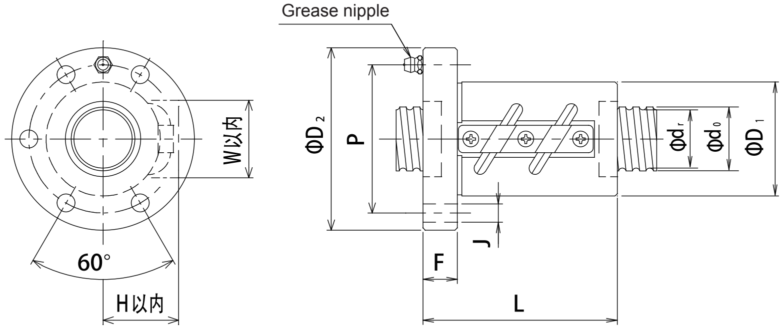


Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective tums m	Basic rated dynamic load C_a	Basic rated static load C_o	Axial clearance (mm)
2	8MF3S2	8	6.6	1.588	8.3	1×3	1300	1900	0.07
	10MF3S2	10	8.6	1.588	10.3	1×3	1600	2500	0.07

Nut dimension							Model No.
D_1	D_2	L	F	P	J	A	
18	29	26	4	23	3.4	20	8MF3S2
20	36	28	5	28	2.5	22	10MF3S2

TM series Lead 6～20

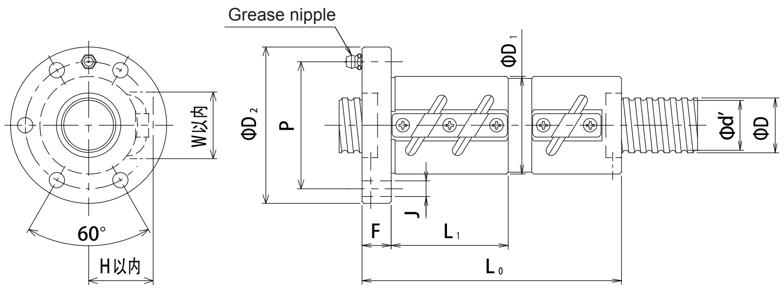
TM series ball screws are specially developed for the direct mecha-feeding such as transfer machines. TM series ball screws have many features which arose from combination of our rich experiences in manufacturing precision ball screws and long time research on thread shaft rolling.



Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective tums m	Basic rated dynamic load C_a	Basic rated static load C_o
6	28PFC6	28	25.0	3.175	28.8	2.5×2	15700	39200
8	32PFC8	32	27.9	4.763	33.3	2.5×2	28500	65400
10	36PFC10	36	30.5	6.35	37.8	2.5×2	44200	89600
	45PFD10	45	39.5	6.35	46.8	2.5×2	65200	170000
	63PFL10	63	57.0	6.35	64.8	2.5×3	80800	261000
20	80PFL20	80	72.0	9.525	82.8	2.5×3	158000	510000

Nut dimension									Shaft max length	Model No.
D_1	D_2	L	F	P	J	W	H	Z	A	
50	80	85	15	65	6.6	34	33	A-M6F	1200	28PFC6
56	92	90	18	75	9	42	39	A-M6F	1200	32PFC8
62	100	107	18	80	11	47	40	A-PT1/8	1500	36PFC10
72	118	139	30	94	13	55	46	A-PT1/8	1500	45PFD10
95	143	149	30	119	13	76	62	A-PT1/8	2500	63PFL10
124	186	249	30	155	18	96	77	A-PT1/8	2500	80PFL20

TM series Lead 6 ～ 20



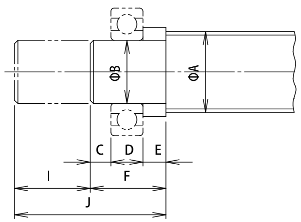
Lead ℓ	Model No.	Screw dia. d_0	Root dia. d_r	Ball dia. D_w	Ball circle dia. D_{pw}	Effective tums m	Basic rated dynamic load C_a	Basic rated static load C_o
6	28PPFAC6	28	25.0	3.175	28.8	2.5×2	15700	39200
8	32PPFAC8	32	27.9	4.763	33.3	2.5×2	28500	65400
10	36PPFAC10	36	30.5	6.35	37.8	2.5×2	44200	89600
	45PPFBD10	45	39.5	6.35	46.8	3.5×2	65200	170000
	63PPFAL10	63	57.0	6.35	64.8	2.5×3	80800	261000
20	80PPFAL20	80	72.0	9.525	82.8	2.5×3	158000	510000

Nut dimension									Shaft max length	Model No.
D_1	D_2	L	F	P	J	W	H	Z	A	
50	80	133	15	65	6.6	34	33	A-M6F	1200	28PPFAC6
56	92	138	18	75	9	42	39	A-M6F	1200	32PPFAC8
62	100	167	18	80	11	47	40	A-PT1/8	1500	36PPFAC10
72	118	209	30	94	13	55	46	A-PT1/8	1500	45PPFBD10
95	143	209	30	119	13	76	62	A-PT1/8	2500	63PPFAL10
124	186	349	30	155	18	96	77	A-PT1/8	2500	80PPFAL20

7. Shaft ends shapes of general industrial purpose ball screw

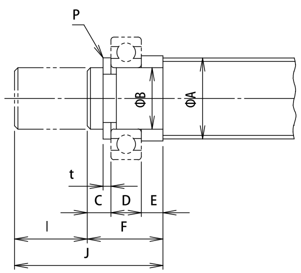
Please refer to our standardized examples of shaft end shapes and dimension which we have arranged as per each supporting way for TSUBAKI NAKASHIMA industrial ball screw series.

Type 1



Shaft Nominal dia. A	B	C	D	E	F	I	J	Applied bearing
10	8	3	8	6	17	16	33	628
14	10	3	9	7	19	–	19	6200
16	12	3	10	8	21	–	21	6201
18	12	3	10	8	21	–	21	6201
20	15	3	11	–	14	–	14	6202
22	17	3	12	–	15	–	15	6203
25	17	3	12	–	15	–	15	6203
28	20	4	14	–	18	–	18	6204
32	20	4	14	–	18	–	18	6204
36	25	4	15	–	19	–	19	6205
40	30	5	16	–	21	–	21	6206
45	35	5	21	–	26	–	26	6307
50	35	5	21	–	26	–	26	6307
63	45	5	25	–	30	–	30	6309
80	60	5	31	–	36	–	36	6312
100	75	6	37	–	43	–	43	6315

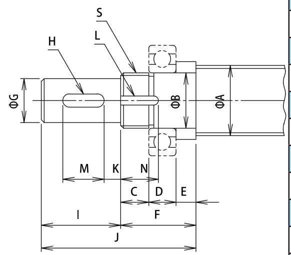
Type 2



Shaft Nominal dia. A	B	C	D	E	F	Stop ring P		Groove for stop ring		I	J	Applied bearing
						Type	t	Dia.	Width			
10	8	3	8	6	17	8	-	-	-	16	33	628
14	10	3	9	7	19	10	-	-	-	-	19	6200
16	12	3	10	8	21	12	-	-	-	-	21	6201
18	12	3	10	8	21	12	-	-	-	-	21	6201
20	15	3	11	-	14	15	-	-	-	-	14	6202
22	17	3	12	-	15	17	-	-	-	-	15	6203
25	17	3	12	-	15	17	-	-	-	-	15	6203
28	20	4	14	-	18	20	1.2	19	1.35	-	18	6204
32	20	4	14	-	18	20	1.2	19	1.35	-	18	6204
36	25	4	15	-	19	25	1.2	23.9	1.35	-	19	6205
40	30	5	16	-	21	30	1.6	28.6	1.75	-	21	6206
45	35	5	21	-	26	35	1.6	33	1.75	-	26	6307
50	35	5	21	-	26	35	1.6	33	1.75	-	26	6307
63	45	5	25	-	30	45	1.75	42.5	1.9	-	30	6309
80	60	5	31	-	36	60	2.0	57	2.2	-	36	6312
100	75	6	37	-	43	75	2.5	72	2.7	-	43	6315

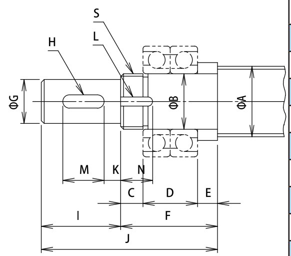
Ball screw

Type 3



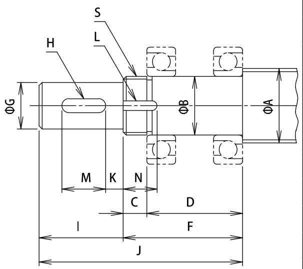
Shaft Nominal dia. A	B	Acme screw S	C	D	E	F	G	I	J	H			K	L			Applied bearing
										Wid.	Dep.	M		Wid.	Dep.	N	
14	10	M10×0.75	9	9	7	25	8	16	41	-	-	-	-	3	1.5	11	6200
16	12	M12×1	9	10	8	27	10	20	47	3	1.8	14	3	3	1.5	11	6201
18	12	M12×1	9	10	8	27	10	20	47	3	1.8	14	3	3	1.5	11	6201
20	15	M15×1	11	11	-	22	12	25	47	4	2.5	16	4	4	1.5	14	6202
22	17	M17×1	11	12	-	23	14	25	48	5	3.0	18	4	4	1.5	14	6203
25	17	M17×1	11	12	-	23	14	25	48	5	3.0	18	4	4	1.5	14	6203
28	20	M20×1	13	14	-	27	16	28	55	5	3.0	20	4	4	1.5	16	6204
32	20	M20×1	13	14	-	27	16	28	55	5	3.0	20	4	4	1.5	16	6204
36	25	M25×1.5	18	15	-	33	20	36	69	6	3.5	28	4	5	2.0	22	6205
40	30	M30×1.5	18	16	-	34	25	42	76	8	4.0	32	5	5	2.5	22	6206
45	35	M35×1.5	21	21	-	42	30	58	100	8	4.0	40	5	6	2.5	25	6307
50	35	M35×1.5	21	21	-	42	30	58	100	8	4.0	40	5	6	2.5	25	6307
63	45	M45×1.5	27	25	-	52	40	82	134	12	5.0	56	6	6	2.5	32	6309
80	60	M60×2	36	31	-	67	55	82	149	16	6.0	71	6	8	2.5	42	6312
100	75	M75×2	45	37	-	82	70	105	187	20	7.5	90	8	8	3.5	50	6315

Type 4



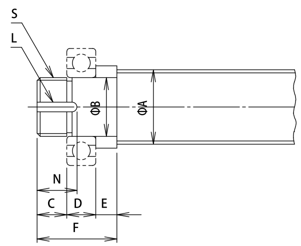
Shaft Nominal dia. A	B	Acme screw S	C	D	E	F	G	I	J	H			K	L			Applied bearing
										Wid.	Dep.	M		Wid.	Dep.	N	
14	10	M10×0.75	9	18	7	34	8	16	50	-	-	-	-	3	1.5	11	7200
16	12	M12×1	9	20	8	37	10	20	57	3	1.8	14	3	3	1.5	11	7201
18	12	M12×1	9	20	8	37	10	20	57	3	1.8	14	3	3	1.5	11	7201
20	15	M15×1	11	22	-	33	12	25	58	4	2.5	16	4	4	1.5	14	7202
22	17	M17×1	11	24	-	35	14	25	60	5	3.0	18	4	4	1.5	14	7203
25	17	M17×1	11	24	-	35	14	25	60	5	3.0	18	4	4	1.5	14	7203
28	20	M20×1	13	28	-	41	16	28	69	5	3.0	20	4	4	1.5	16	7204
32	20	M20×1	13	28	-	41	16	28	69	5	3.0	20	4	4	1.5	16	7204
36	25	M25×1.5	18	30	-	48	20	36	84	6	3.5	28	4	5	2.0	22	7205
40	30	M30×1.5	18	32	-	50	25	42	92	8	4.0	32	5	5	2.5	22	7206
45	35	M35×1.5	21	42	-	63	30	58	121	8	4.0	40	5	6	2.5	25	7307
50	35	M35×1.5	21	42	-	63	30	58	121	8	4.0	40	5	6	2.5	25	7307
63	45	M45×1.5	27	50	-	77	40	82	159	12	5.0	56	6	6	2.5	32	7309
80	60	M60×2	36	62	-	98	55	82	180	16	6.0	71	6	8	2.5	42	7312
100	75	M75×2	45	74	-	119	70	105	224	20	7.5	90	8	8	3.5	50	7315

Type 5



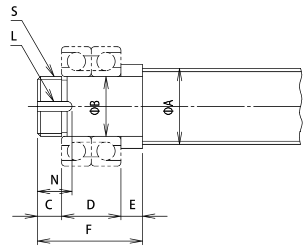
Shaft Nominal dia. A	B	Acme screw S	C	D	F	G	I	J	H			K	L			Applied bearing
									Wid.	Dep.	M	K	Wid.	Dep.	N	
14	10	M10×0.75	9	38	47	8	16	63	-	-	-	-	3	1.5	11	7200
16	12	M12×1	9	42	51	10	20	71	3	1.8	14	3	3	1.5	11	7201
18	12	M12×1	9	42	51	10	20	71	3	1.8	14	3	3	1.5	11	7201
20	15	M15×1	11	44	55	12	25	80	4	2.5	16	4	4	1.5	14	7202
22	17	M17×1	11	48	59	14	25	84	5	3.0	18	4	4	1.5	14	7203
25	17	M17×1	11	48	59	14	25	84	5	3.0	18	4	4	1.5	14	7203
28	20	M20×1	13	56	69	16	28	97	5	3.0	20	4	4	1.5	16	7204
32	20	M20×1	13	56	69	16	28	97	5	3.0	20	4	4	1.5	16	7204
36	25	M25×1.5	18	63	81	20	36	117	6	3.5	28	4	5	2.0	22	7205
40	30	M30×1.5	18	70	88	25	42	130	8	4.0	32	5	5	2.5	22	7206
45	35	M35×1.5	21	84	105	30	58	163	8	4.0	40	5	6	2.5	25	7307
50	35	M35×1.5	21	84	105	30	58	163	8	4.0	40	5	6	2.5	25	7307
63	45	M45×1.5	27	106	133	40	82	215	12	5.0	56	6	6	2.5	32	7309
80	60	M60×2	36	127	163	55	82	245	16	6.0	71	6	8	2.5	42	7312
100	75	M75×2	45	157	202	70	105	307	20	7.5	90	8	8	3.5	50	7315

Type 6



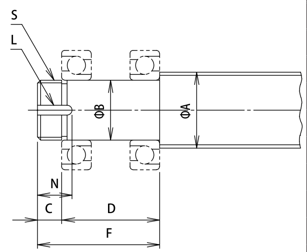
Shaft Nominal dia. A	B	Acme screw S	C	D	E	F	L			Applied bearing
							Wid.	Dep.	N	
14	10	M10×0.75	9	9	7	25	3	1.5	11	6200
16	12	M12×1	9	10	8	27	3	1.5	11	6201
18	12	M12×1	9	10	8	27	3	1.5	11	6201
20	15	M15×1	11	11	-	22	4	1.5	14	6202
22	17	M17×1	11	12	-	23	4	1.5	14	6203
25	17	M17×1	11	12	-	23	4	1.5	14	6203
28	20	M20×1	13	14	-	27	4	1.5	16	6204
32	20	M20×1	13	14	-	27	4	1.5	16	6204
36	25	M25×1.5	18	15	-	33	5	2.0	22	6205
40	30	M30×1.5	18	16	-	34	5	2.5	22	6206
45	35	M35×1.5	21	21	-	42	6	2.5	25	6307
50	35	M35×1.5	21	21	-	42	6	2.5	25	6307
63	45	M45×1.5	27	25	-	52	6	2.5	32	6309
80	60	M60×2	36	31	-	67	8	2.5	42	6312
100	75	M75×2	45	37	-	82	8	3.5	50	6315

Type 7



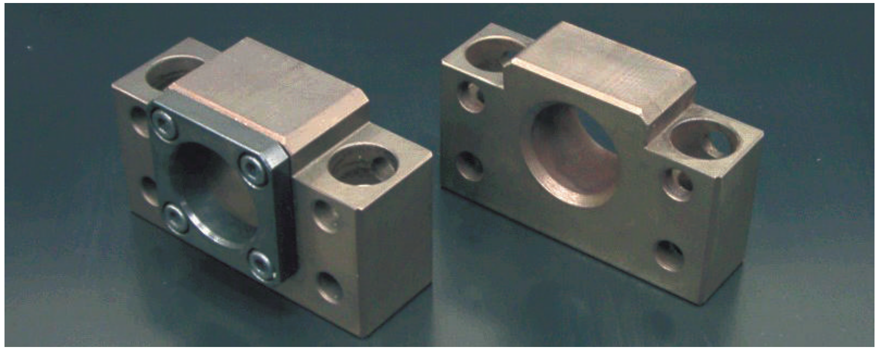
Shaft Nominal dia. A	B	Acme screw S	C	D	E	F	L			Applied bearing
							Wid.	Dep.	N	
14	10	M10×0.75	9	18	7	34	3	1.5	11	7200
16	12	M12×1	9	20	8	37	3	1.5	11	7201
18	12	M12×1	9	20	8	37	3	1.5	11	7201
20	15	M15×1	11	22	-	33	4	1.5	14	7202
22	17	M17×1	11	24	-	35	4	1.5	14	7203
25	17	M17×1	11	24	-	35	4	1.5	14	7203
28	20	M20×1	13	28	-	41	4	1.5	16	7204
32	20	M20×1	13	28	-	41	4	1.5	16	7204
36	25	M25×1.5	18	30	-	48	5	2.0	22	7205
40	30	M30×1.5	18	32	-	50	5	2.5	22	7206
45	35	M35×1.5	21	42	-	63	6	2.5	25	7307
50	35	M35×1.5	21	42	-	63	6	2.5	25	7307
63	45	M45×1.5	27	50	-	77	6	2.5	32	7309
80	60	M60×2	36	62	-	98	8	2.5	42	7312
100	75	M75×2	45	74	-	119	8	3.5	50	7315

Type 8

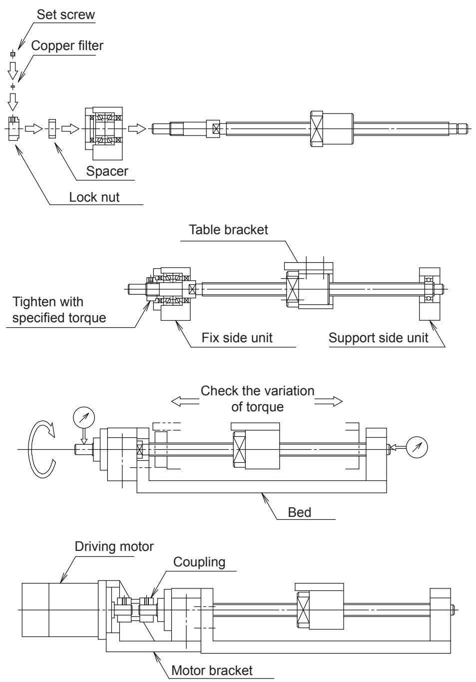


Shaft Nominal dia. A	B	Acme screw S	C	D	F	L			Applied bearing
						Wid.	Dep.	N	
14	10	M10×0.75	9	38	47	3	1.5	11	7200
16	12	M12×1	9	42	51	3	1.5	11	7201
18	12	M12×1	9	42	51	3	1.5	11	7201
20	15	M15×1	11	44	55	4	1.5	14	7202
22	17	M17×1	11	48	59	4	1.5	14	7203
25	17	M17×1	11	48	59	4	1.5	14	7203
28	20	M20×1	13	56	69	4	1.5	16	7204
32	20	M20×1	13	56	69	4	1.5	16	7204
36	25	M25×1.5	18	63	81	5	2.0	22	7205
40	30	M30×1.5	18	70	88	5	2.5	22	7206
45	35	M35×1.5	21	84	105	6	2.5	25	7307
50	35	M35×1.5	21	84	105	6	2.5	25	7307
63	45	M45×1.5	27	106	133	6	2.5	32	7309
80	60	M60×2	36	127	163	8	2.5	42	7312
100	75	M75×2	45	157	202	8	3.5	50	7315

8. Support unit for TSUBAKI NAKASHIMA ball screws



Support units are prepared for TSUBAKI NAKASHIMA precision ball screws and standardized ball screws.



Features

Short delivery, low price with standardized stock
Compact design and easy installation.
Adopted suitable bearings for required stiffness of ball screws

1)Mount the supporting unit on the fixed side of ball screw and assemble in turn, spacer, locknut and copper filter without disassembling the unit.

2)Mount the ball screw with the supported side unit on the table/bed bracket. Tighten lightly the fixed side unit on the bed, then fit lightly the other unit (support side). Please work carefully watching critically for miss-alignment and ensure parallelism between base center and linear guides. Tighten lightly on supported side unit on the bed and then the ball nut on the table bracket as well.

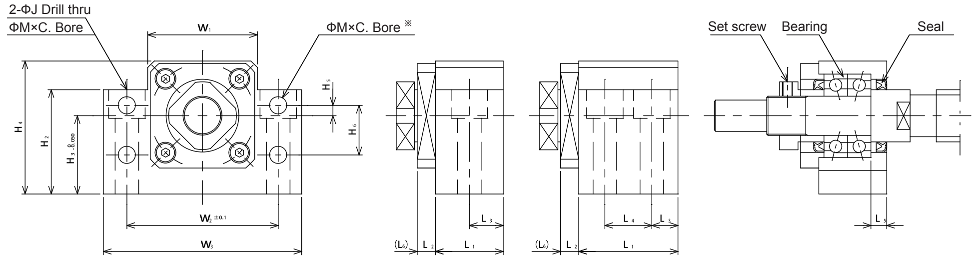
3)Move the table close to the fixed side unit and support side unit alternately. Tighten lightly the units, while checking carefully for axial deviation at the shaft end and axial clearance measured by dial gauge. And then fix the both units on the bed. Tighten securely fixing bolt of the ball nut. Please check carefully the smoothness of the ball screw in moving through all strokes and variation of torque to be within the specifications.

4)Mount the motor on the bed without any off-set, as accurately as possible, and fix the motor shaft and ball screw with a coupling.

5)Please execute fully trial operation and then only run at higher speeds.

Support unit for mechatronics

Support unit at fixed side



F2004ACDF only

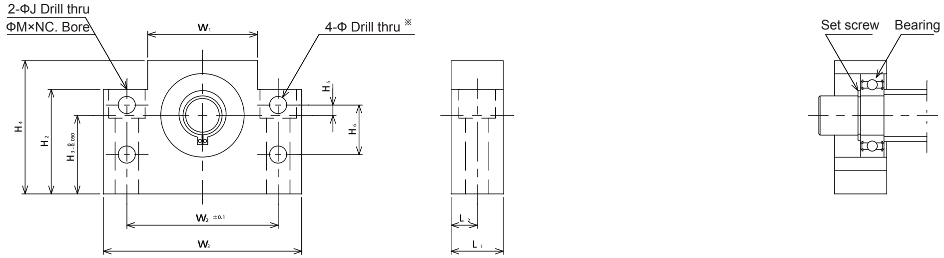
Unit dimension

Unit:mm

Nominal No.	W_1	W_2	W_3	H_2	H_3	H_4	H_5	H_6	L_1	L_2	L_3	L_4	L_5	J	M	N	D_1	L_6	Bearing type	Lock nut mount torque $\times 10^{-1}$N•m
F1000ACDF	36	52	70	35	25	43	4	19	24	6	12	-	6	9	14	11	20	5	7000ADFP4	70
F1201ACDF	36	52	70	35	25	43	4	19	24	6	12	-	6	9	14	11	23	5	7001ADFP4	120
F1502ACDF	42	58	76	40	30	51	4	19	26	7	13	-	6	9	14	11	26	7	7002ADFP4	200
F2004ACDF	55	75	95	45	30	58	-	-	42	10	10	22	10	11	17.5	14	37	10	7204ADFP4	400

Note : ※No drilled holes for A2004ACDF

Support unit at supported side



Unit dimension

Unit:mm

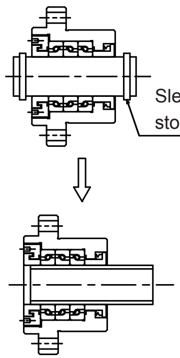
Nominal No.	W_1	W_2	W_3	H_2	H_3	H_4	H_5	H_6	L_1	L_2	J	M	N	Bearing type	Snap ring
S08082Z	36	52	70	35	25	43	4	19	20	10	9	14	11	608ZZ	Φ8
S10002Z	36	52	70	35	25	43	4	19	20	10	9	14	11	6000ZZ	Φ10
S15022Z	42	58	76	40	30	51	4	19	20	10	9	14	11	6002ZZ	Φ15
S20042Z	56	75	95	45	30	58	-	-	30	15	11	17.5	14	6204ZZ	Φ20

Note: ※No drilled holes for S20042Z

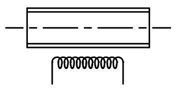
Support unit for machine tools

Installation procedures for support unit

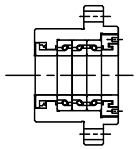
1.Installation procedures for support unit



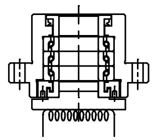
2. Heat the sleeve to indoor temperature plus 20℃ .



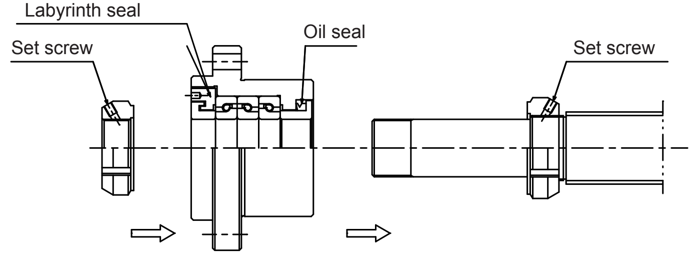
3. Inset a sleeve into a inner ring again.
4A. After 5-6 minutes, pull put a sleeve as the heat shifted to a inner ring. (or 4B)



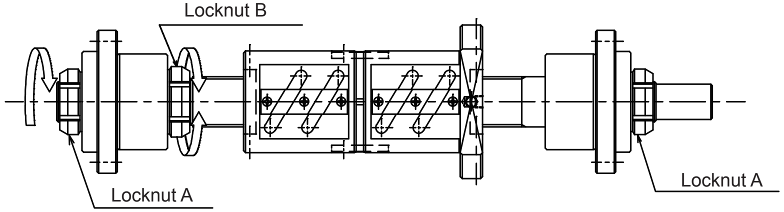
4B. It's available heating the unit inner diameter directly. (Indoor temp +20℃)

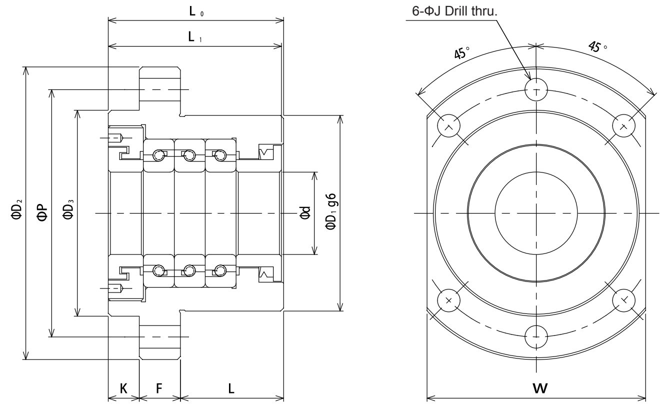


5. Bring the oil seas side of unit in front and then insert to the ball screw axis.



6. After tightening a lock nut when temp of inner ring drops, tighten a set screw for a lock pin.
7. In case of giving a pretension to the screw shaft, adjust with locknut A, B.



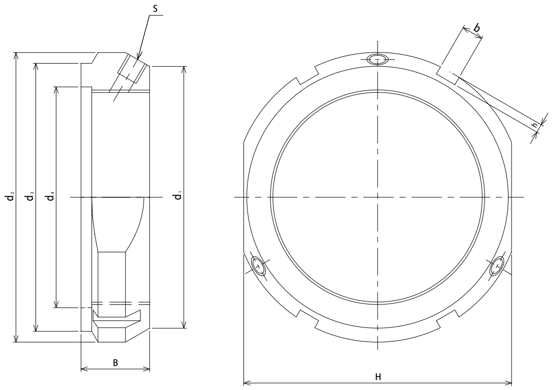


Type No.	Unit dimension												Basic rated load	Max load	Preld	Axial stiff.	Breaking torque ×10⁻¹N•m
	d	D_1	D_3	L_0	K	L	L_1	D_2	P	F	W	J	(N)	(N)	(N)	(N/μm)	
S1706DF	17	65	70	60	15	30	59	104	86	15	79	9	25900	30500	2160	735	1.5
S2007DF	20	65	70	60	15	30	59	104	86	15	79	9	25900	30500	2160	735	1.5
S2508DF	25	80	85	62	15	30	61	120	102	17	89	9	29900	43000	3330	981	2.5
S2508TFT	25	80	85	77	15	45	76	120	102	17	89	9	49000	86000	4510	1470	3.5
S3009DF	30	80	85	62	15	30	61	120	102	17	89	9	29900	43000	3330	981	2.5
S3009TFT	30	80	85	77	15	45	76	120	102	17	89	9	49000	86000	4510	1470	3.5
S3510DF	35	90	95	62	15	30	61	137	115	17	103	11	32500	52000	3920	1230	3.0
S3510TFT	35	90	95	77	15	45	76	137	115	17	103	11	53300	104000	5300	1770	4.0
S4011DF	40	95	100	70	15	35	69	142	120	20	106	11	32500	52000	3920	1230	3.0
S4011TFT	40	95	100	85	15	50	84	142	120	20	106	11	53300	104000	5300	1770	4.0
S4011QFC	40	95	100	100	15	65	99	142	120	20	106	11	53300	104000	7840	2350	6.0

Note : Value of stiffness of axial way is theoretical value.

9. Lock nut

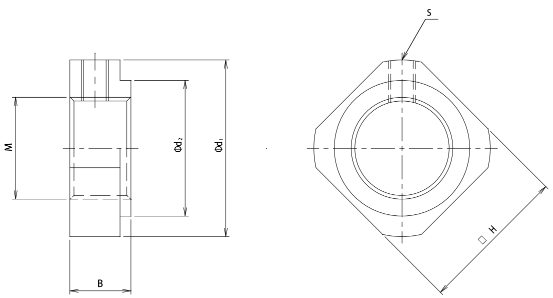
For machine tool



Unit:mm

Type No.	Acme screw	d_1	d_2	d_3	d_4	B	H	b	h	s
KMT2	M15x1	26	33	28	16	16	30	4	2	M5
KMT3	M17x1	29	37	33	18	18	34	5	2	M6
KMT4	M20x1	32	40	35	21	18	36	5	2	M6
KMT5	M25x1.5	36	44	39	26	20	41	5	2	M6
KMT6	M30x1.5	41	49	44	32	20	46	5	2	M6
KMT7	M35x1.5	46	54	49	38	22	50	5	2	M6
KMT8	M40x1.5	56	65	59	42	22	60	6	2.5	M6
KMT9	M45x1.5	61	70	64	48	22	65	6	2.5	M6

For mechatronics



Unit:mm

Type No.	Acme screw	d_1	d_2	B	H	S
LNT10	M10x0.75	20	15	8	17	M4
LNT12	M12x1	23	17	8	19	M4
LNT15	M15x1	26	20	9	22	M4
LNT20	M20x1	37	28	11	30	M4

10. Cautions in handling TSUBAKI NAKASHIMA ball screws

Lubrication

1.Please confirm the condition of the lubricant before using a ball screw.

In case of bad lubricant, it causes damage to functions of the ball screw in a short time.

2. When grease is correctly spread on the ball screw, please use it as it is. However, in case garbage, contaminations or chips is found on the adhered grease when handling , please wash the ball screw fully with fresh white-kerosene oil and make it clean perfectly, and then put new grease on it as same as used one.

3. We recommend that the first check for the lubricant would be done in 2-3 months after an actual operation, and in case quite high level of dirt is found, you should wipe dirty and old grease off and adhere new grease sufficiently.

Checking and replenishing of the lubricant must be usually made once a year, but please set the interval properly according to surrounding and operational condition.

Cautions in handling

1 . Please never disassemble a ball screw. It may cause major problems, decrease in accuracy or become cause of accidents.

2 . Please do not re-assemble ball screw by user, because miss-assembling may cause functional damage for ball screws.

3. The screw shaft or the nut can be rotated easily and might fall down by its own-weight. Please contact us when the screw shaft or the nut is dropped down, because the functional damage for the ball circulating parts might be effect the functioning totally.

4. In case that a ball screw is dropped on the ground by accident, or dents and/or scratches etc on the screw shaft or on the thread groove are found, please consult us, because it may cause damages to ball screw function.

Cautions in use

1. Please use the ball screw in clean environments. Prevent from invasion of dirt, metal chips, by applying dustproof cover or bellows etc.. Bad dustproof cover might invite lowering in the function of the ball screw and might cause damage for ball circulating parts and then cause an accident.

2. When you decide on operational rotating speed, please refer to the chapter and figures of permissible rational speed mentioned in this catalog.

To operate ball screw beyond permissible rational speed may cause damage on ball circulation parts etc and then cause dangerous accident such as locking or table dropping. For vertical axis, we recommend to furnish the preventive mechanism from table dropping such as a safety nut etc.

3. Please note that over-run of the nut of ball screw might cause scratches or dents etc. on the ball grooves and then cause defective operation.

In worst case, it may be easily connected with too early wear-out on the screw shaft and the nut, and damage of ball circulation part, so never let it over-run. Please contact us, when over-run happened.

4. The temperature limits during operation is generally designed as max. 80 ℃ or less. Please refrain from working over 80 ℃ in operation, otherwise, the ball circulation parts and the wiper parts might be damaged.

Keeping

1. In case storing for long time, please keep it as it is originally packed.

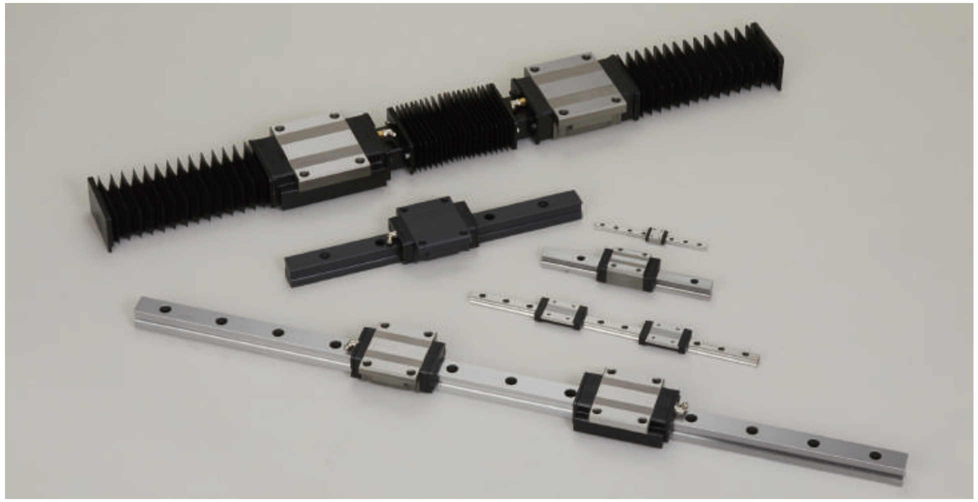
Please do not open the package and not to tear up wrapping plastic bag inside when ball screw is not required.

2. We recommend maintaining the posture in keeping as follows

a) Put it in horizontally and keep it as it is originally packed

b) Or, keep it horizontally on the ties.

TSUBAKI NAKASHIMA Ball Ways



Contents

1.System of Ball Ways

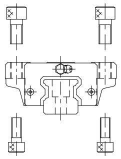
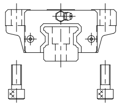
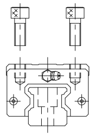
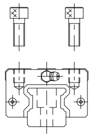
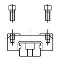
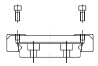
Table 1 shows a comparison of the basic static load rating of each Type No.

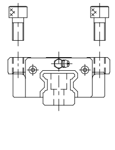
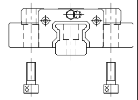
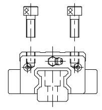
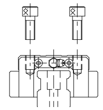
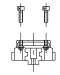
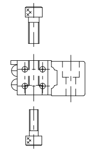
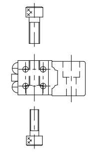
The tube type has an excellent ball circulation system for superior speed.

The slide unit of H-EA, H-LEA, M-TW, and M-TC can be mounted from both top and bottom.

The basic static load rating of M-TW and M-TC in this table is the values when the pair is used as for two slide units.

Table 1 Comparison of basic static load rating of each model

	End cap type					
Shape						
Small					MB7ER	
						MB7WER
					MB9ER	
						MB9WER
					MB12ER	
						MB12WER
					MB15ER	
				U15SER		MB15WER
					MB20ER	
				U20SER		
	H15EA	H15EB	H15ER	U15ER		
				U25SER		
Basic rated static load C_0	H20EA	H20EB	H20ER	U20ER		
				U30SER		
	H25EA	H25EB	H25ER	U25ER		
				U35SER		
	H30EA	H30EB	H30ER	U30ER		
	H25LEA	H25LEB	H25LER			
	H35EA	H35EB	H35ER	U35ER		
	H30LEA	H30LEB	H30LER			
	H35LEA	H35LEB	H35LER			
	H45EA	H45EB	H45ER	U45ER		
	H45LEA	H45LEB	H45LER			
	H55EA	H55EB	H55ER	U55ER		
	H55LEA	H55LEB	H55LER			
	H65EA	H65EB	H65ER			
Large	H65LEA	H65LEB	H65LER			
Page	**C35**	**C37**	**C39**	**C47**	**C51**	**C53**

Tube type						
						
				K7TR		
				K9TR		
					M10TW	
				K12TR		
			N15TR		M15TW	
H15TA	H15TB	H15TR				M15TC
			N20TR			
H20TA	H20TB		N25TR			
H25TA	H25TB	H25TR			M25TW	M25TC
		H30TR	N30TR			
H30TA	H30TB					
H35TA	H35TB	H35TR				
			N40TR		M35TW	M35TC
					M40TW	M40TC
H45TA	H45TB	H45TR	N50TR		M45TW	M45TC
H55TA	H55TB	H55TR			M55TW	M55TC
H65TA	H65TB	H65TR			M65TW	M65TC
C41	**C43**	**C45**	**C49**	**C55**	**C57**	**C59**

2. Features

① Six surfaces simultaneous NC grinding

Four ball grooves and datum and anti-datum six surfaces of rails are ground by NC special grinding machine at the same time as the rail fixed on the base with bolts at specified torque. This leads to the parallelism of ball grooves and datum surface, the enhanced running parallelism and uniform value.

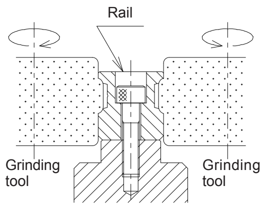


Fig. 1 Grinding method of rail

② Equal load capacity in four directions

The re-circulating balls moving between the rail and the slide unit support the four-direction load at a 45° contact angle.

Therefore, the rated load against load from the upward, downward and lateral directions onto the slide unit becomes equal and is excellent in vibration damping.

③ High moment load

Because its position of ball contact in upper and lower, right and left ball is made as back-to-back installation, the load arm to the rolling moment load becomes large, and long life and high rigidity is achieved.

The life time is seven times longer and the rigidity is three times stronger than the one of the face-to-face installation of the same width the rail.

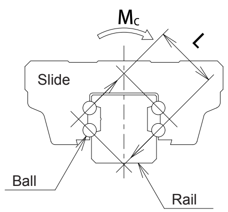


Fig. 2 Layout of balls

④ The ideal arc of ball grooves

When radius of curvature of the ball groove is closer to the ball radius, the slippage amount due to the ball rolling is increased. And the life time becomes shorter while the rigidity is higher.

Radius of curvature of an ideal circular arc groove provides long life and high rigidity and is adopted in our Ball Ways.

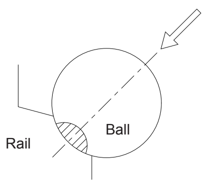


Fig. 3 The ideal design of contact part

Moreover, it has been designed so that where excessive unbalanced load will not disturb the stable contact condition. It is kept by the ball contact angle changes slightly even if there is a slight swivel misalignment vertically or horizontally.

⑤ Ball return radius

In the end cap type Ball Ways, by minimizing the radius of the ball return passage from the load groove, the slide unit has been made compact.

On the other hand, in the tube type Ball Ways, the high speed operation has been improved further by optimal value of the ratio of the return radius and the ball diameter.

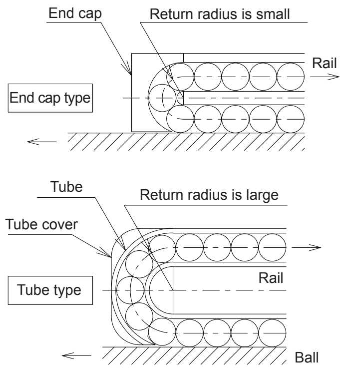


Fig. 4 Ball return radius

⑥ Easy to adopt into the design

Based on the need for various applications, different shapes of slide units are made as series.

Moreover, even if the slide unit is pulled out from the rail, the ball do not fall at all because of a steady type ball retainer.

In the interchangeable products, only rail or the slide unit can be supplied and can be easily replaced by the customer.

⑦ Easy lubrication management

It is possible to refill directly from the grease nipple fitted with standard equipment in the slide unit so that all the row of each ball evenly lubricated.

Moreover, a seal on the both ends and a under seal of the slide unit are standard equipment for better sealing, prevents dust from invasion into the slide unit, and can maintain the lubricant for a long period.

⑧ High reliability

Because by proper heat treatment the hardness quality of the system have been improved and by using the steel material of high cleanliness. This steel is made by vacuum degassing process which gives the excellent durability for a long term operation.

A through testing involving life test, a rigidity test, and a vibration damping test, etc. are conducted taking all possible quality assurance methods.

3. Model Number

The model number of the Ball Way is indicated in the following way.

For the two rails two slide assembly

H 25 EA B2 T1 – 3000 C5 W2 – 1 2 3 / A F B

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭

When a special symbol and a supplementary symbol are unnecessary, content of box is not shown.

For a single rail unit designing

H 25 – 3000 C5 1 3 / A F RAIL

① ② ⑥ ⑦ ⑨ ⑪ ⑫ ⑬ ⑮

When a special symbol and a supplementary symbol are unnecessary, content of box is not shown.

For a single slide unit designing

H 25 EA T1 – C5 – 2 3 SLIDE

① ② ③ ⑤ ⑦ ⑩ ⑪ ⑯

When a special symbol and a supplementary symbol are unnecessary, content of box is not shown.

① Series symbol
② Size number
③ Slide unit symbol
} Refer to Table 1

④ Number of slide units assembled in a row of rail (B1=1 piece, B2=2 pieces, and ...)

⑤ Preload symbol (non-indicated in case of M series)

The amount of the preload and the rigidity value of each preloads are indicated in Table 17 to 18.

Please refer to the applications shown in Table 2.

Table 2 Selection of preload by needed working condition

Preload Symbol	Operating condition	Main applications
T3、T2	Heavy cutting with vibration impact	Machining center, milling machine and Vertical axis of machine tools.
T2、T1	Medium cutting with slight vibration	"Electrical discharge machine, grinding machine, laser beam machine, and punching press machine"
T1、T0	Light operation with low vibration.	Positioning table, optical instrument, ATC, and welding machine
T0、T	Operation that doesn't required precision.	Various material feeders and fusing cutting machines

⑥ The total length of the rail (mm).

⑦ Accuracy grade symbol

Grade from C001 to C7

Table 4 to 9 shows the accuracy level of each grade

⑧ Number of rows of rails used on parallel in the same plane. (W1=1 row, W2=2 rows, and ...)

⑨ Special symbol 1: Indicates the special machine work is necessary for the rail.

⑩ Special symbol 2: Indicates the special machine work is necessary for the slide unit.

⑪ Special symbol 3: Indicates the special specifications other than the special machine work of the rail and the slide unit.

⑫ Optional symbol A: Indicates the total length of the rail is a jointed specification with multiple rails.

⑬ Optional symbol F: Indicates the plug for the rail mounting hole is supplied.

⑭ Optional symbol B: Indicates the bellows is supplied.

⑮ Indicates the rail delivered as a single unit.

⑯ Indicates the slide unit delivered as a single unit.

4. Accuracy

Table 3 shows the definition of the term concerning accuracy.

The specification of each accuracy item according to the tolerance grade is provided as shown in Table 4 to 9.

Table 3 Terms concerning the accuracy

Term	Definition
Dimensional difference in height H	The dimension from A respect to the center of the C face in the mid of the rail length is assumed to be height H, and the difference with the basic dimension is assumed to be a dimensional difference in height H.
Pair variation of height H	The difference between the maximum value and the minimum value of the height H of the slide unit used on the same plane is assumed to be a pair variation of height H.
Dimensional difference in width N	The dimension from the B respect to the center of the D face in the mid of the rail length is assumed to be a width N, and the difference with the basic dimension is assumed to be a dimensional difference in width N
Pair variation in width N	The difference between the maximum value and minimum value of the width N of the slide unit used for one rail is assumed to be a pair variation of the width N.
Running parallelism of face C to A	The difference between the maximum value and minimum value of the height H while the slide unit is traveling throughout the total length of the rail is assumed to be a running parallelism of the face C to A.
Running parallelism of face D to B	The difference between the maximum value and minimum value of the width N while the slide unit is traveling throughout the total length of the rail is assumed to be a running parallelism of the face D to B.

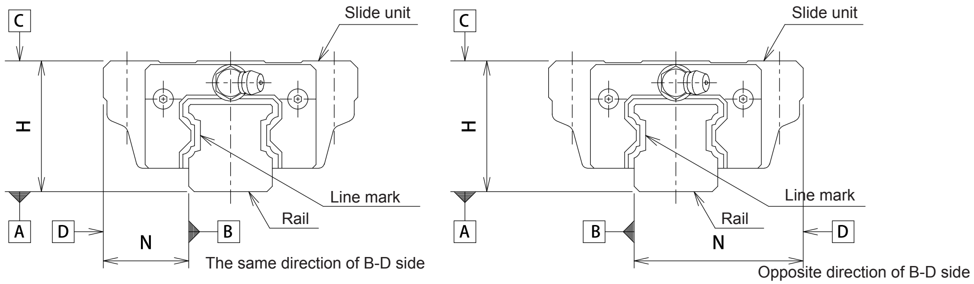


Fig. 5 H, U, and N type

Table 4 Accuracy standard (1) Unit:μm

H, U, and N type assembly		Accuracy grade					
		C001	C01	C1	C3	C5	C7
Height H	Dimensional difference	±5	±10	±20	±40	±80	±200
	Pair variation	3	5	7	15	25	100
Width N	Dimensional difference	±8	±15	±25	±50	±100	±200
	Pair variation	3	7	10	20	30	150

Table 5 Accuracy standard (2) Unit:μm

H, U, and N type rail single		Accuracy grade		
		C3	C5	C7
Height H	Dimensional difference	±10	±30	±35
	Pair variation	10	10	10
Width N	Dimensional difference	±10	±30	±35
	Pair variation	10	10	10

Table 6 Accuracy standard (3) Unit:μm

H, U, and N type slide unit single		Accuracy grade		
		C3	C5	C7
Height H	Dimensional difference	±20	±30	±35
	Pair variation	5	15	70
Width N	Dimensional difference	±20	±30	±60
	Pair variation	20	30	120

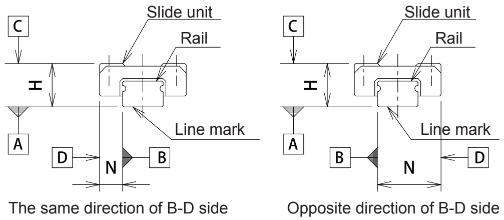


Fig. 6 MB-ER type

Table 7 Accuracy standard (4) Unit:μm

MB, and K type assembly		Accuracy grade		
		C1	C3	C5
Height H	Dimensional difference	±10	±20	±40
	Pair variation	5	20	40
Width N	Dimensional difference	±10	±30	±50
	Pair variation	10	30	40

Note: M B type is assumed to be only C5.

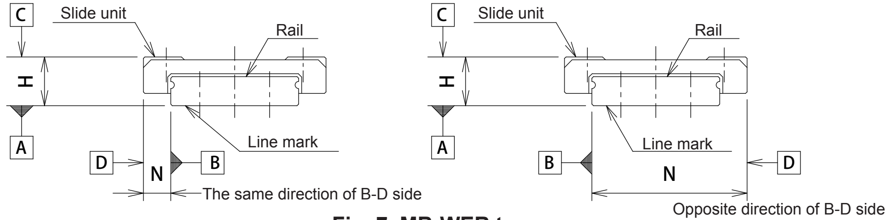


Fig. 7 MB-WER type

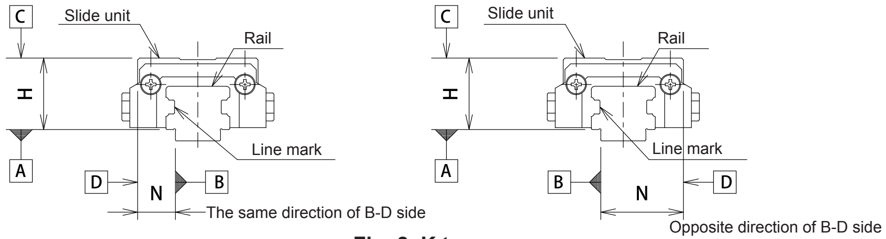


Fig. 8 K type

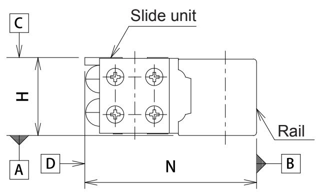


Fig. 9 M type

Table 8 Accuracy standard (5) Unit:μm

M type assembly		Accuracy grade				
		C001	C01	C1	C3	C5
Height H	Dimensional difference	±10	±15	±20	±50	±100
	Pair variation	3	5	10	20	50
Width N	Dimensional difference	±20	±30	±50	±100	±200
	Pair variation	3	5	10	20	50

Please mount the rails on the basis of the line marked face of the rail as shown in Fig.5 ~ 8.

The standard direction of the face D of the slide unit and the face B of the rail are same. In the other case, please specify the desired direction.

When more than two Ball Ways are used on same plane in parallel, the dimensional difference and the pair variation in width N are applied to only one datum Ball way, and has marked "P" to the end of the manufacturer's serial number for this rail.

It is also possible to purchase not only the assembly of the rail and the slide unit but also a single rail or a single slide unit as the Ball Ways of H, U, and N type.

In this case, various grades of accuracy are inspected by the master slide unit or the master rail and is inspected as per various accuracies in this case, and the accuracy is guaranteed by each production lot when the rails and slide units of the specified production lot are assembled.

Table 9 Running parallelism

Unit:μm

Total length of rail		Accuracy grade					
Over	Under	C001	C01	C1	C3	C5	C7
-	125	1.5	1.5	1.5	4	11	40
125	160	1.5	2	2	5	12	42
160	200	1.5	2	2	6	13	45
200	250	1.5	2	2	7	15	48
250	315	1.5	2	2.5	8	16	52
315	400	2	2.5	3.5	10	18	57
400	500	2	3	4.5	11	19	63
500	630	2	3.5	6	13	21	70
630	800	2.5	4	8	15	22	80
800	1000	3	4.5	9	16	24	90
1000	1250	3	6	11	18	26	105
1250	1600	4	7	14	19	28	125
1600	2000	4.5	8	16	21	30	150
2000	2500	6	9	18	23	32	170
2500	3150	6	10	18	25	34	210
3150	4000	7	11	20	28	37	250

Measuring method of running parallelism

By moving the measuring instrument mounted on the slide unit along the rail, the running parallelism is measured.

As an example, Fig.10 shows the measuring method of the running parallelism of the face C to A.

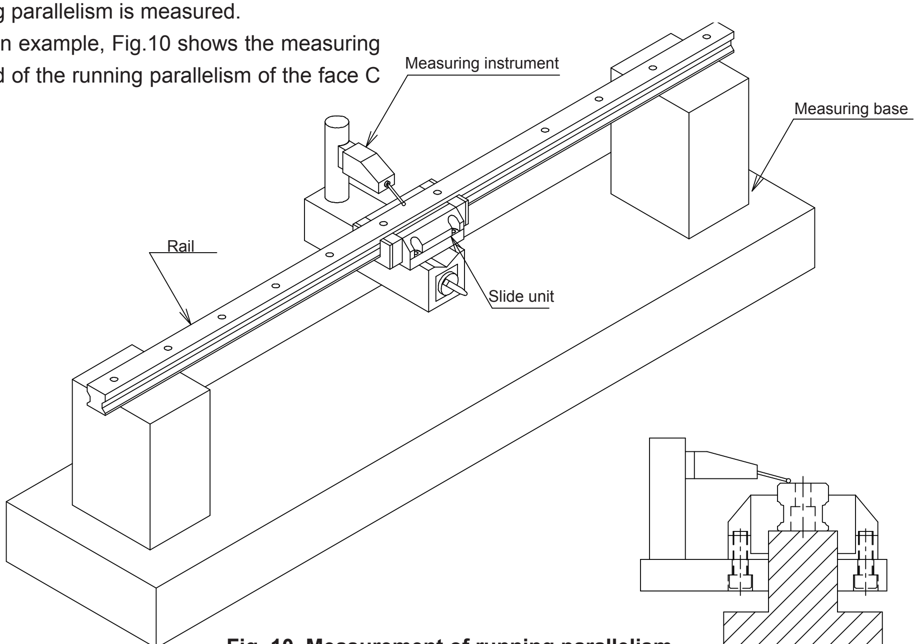


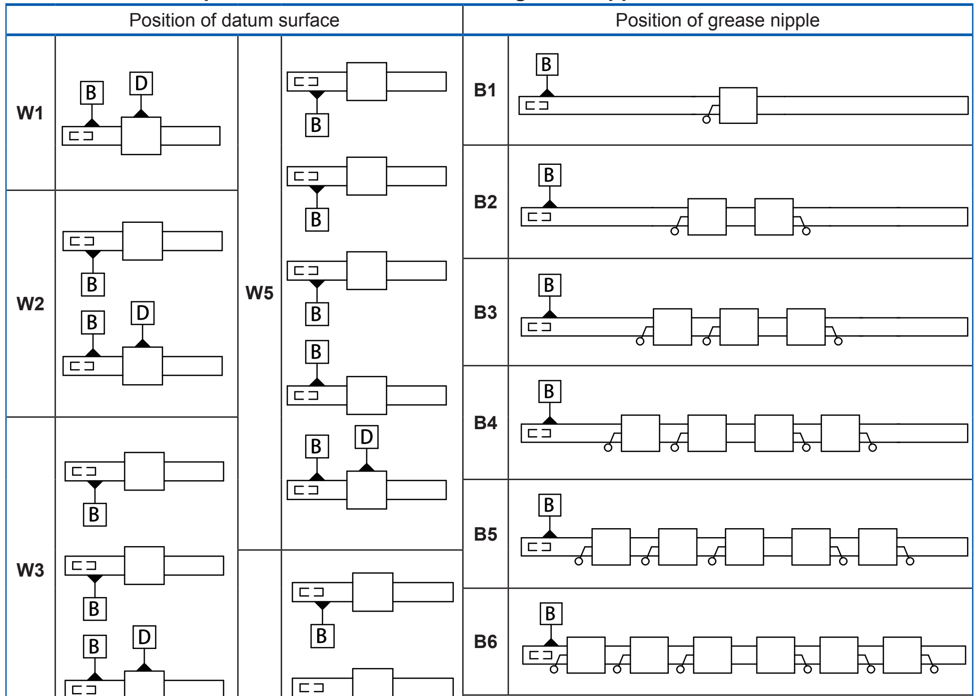
Fig. 10 Measurement of running parallelism

5. Direction of datum surface

The position of the datum surface and the grease nipple is adjusted to a standard position shown in Table 10, if no special arrangement is required.

If the position of the datum surface or the grease nipple is not standard and the mouting holes on rail and surface are not equal, please specify it in your sketch.

Table 10 Standard position of datum surface and grease nipple



Indication symbol	
B	Shows the datum surface B for mounting the rail. On the side of face B, there is a line mark in the center of a top bottom of the ball groove is side to be a B datum surface
D	Shows the datum surface D for mounting the rail. The rail that has P mark in the end of the serial number is a master rail, and only this rail has a surface D.
⊏⊐	Shows the serial number. If the Ball ways are placed in serial number, datum surface and grease nipple are placed to the standard the standard position or a specified position.
ᔑ	Shows the position and the direction of the elbow type grease nipple. Straight grease nipple is shown o–.

6.Load rating

The balls recirculate rolling on the ball groove when the slide unit moves on the rail. And every passing of the steel balls let the ball groove be alternately loaded and unloaded.

The long the travel distance is, the more number of repetitions of load and unload increases. This will increase the possibility of fatigue failure.

Moreover, if over an elastic deformation loads are encountered even for a very short time, the indentation is made due to plastic deformation caused on the balls or the ball grooves. This leads to early failure of ball ways.

It is important to examine the loading condition enough to prevent such damage beforehand, and to select the Ball Ways of an appropriate rated load.

(1) Basic dynamic load rating

The basic dynamic load rating is a load required to estimate the life distance. And, it is the static load that 90% Ball Ways of a group of the same type and the same travel condition can reach the rating life distance without flaking.

Two kinds of rating life distance are standardized now, and the basic dynamic load rating when the rating life distance is assumed to be 50km is shown with C_{50}, and the distance assumed to be 100km is shown with C_{100}.

The relation between C_{50} and C_{100} is shown by the following equation.

$$C_{100} = C_{50} \times \sqrt[3]{\frac{50}{100}}$$

The value of the basic dynamic load rating of each Ball Way is described in the dimension table.

The Ball Ways have an equal load capacity in four directions, so this value can be applied to both the vertical direction and horizontal direction.

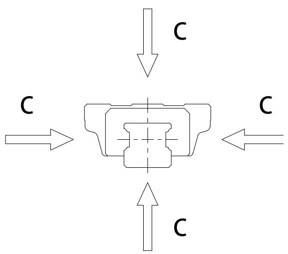


Fig. 11 Basic rated dynamic load

(2) Basic rated static load

The basic rated static load is a load required to select the maximum allowable load of the Ball Ways, it is defined as a load at which the maximum contact stress in the ball contacted area becomes 4200MPa, and it is shown as C_0.

This is the load, that will disturb the smooth rolling motion of the ball, and to cause the early failure. A load exceeding the basic static load rating will make an amount of deformation larger than allowable permanent deformation of balls and ball grooves.

The value of the basic rated static load of each Ball Ways is described in the dimension table.

The Ball Ways have an equal load capacity in four directions, so this value can be applied to both the vertical direction and horizontal direction.

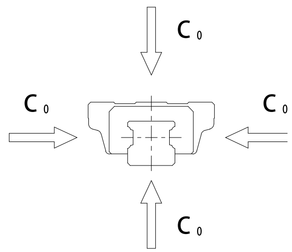


Fig. 12 Basic rated static load

(3) Basic rated static torque

The basic rated static torque is used for converting the moment load acting on single slide unit to an equivalent radial load.

The stress of heaviest loaded ball by the basic static torque rating is equal to the stress of the ball when the basic rated static load has acted. The symbol is shown in Figure 13 to 15 according to the direction of the moment.

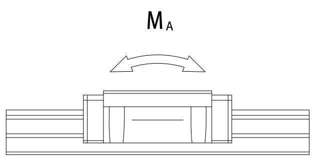


Fig. 13 Basic rated static torque in a of pitching direction

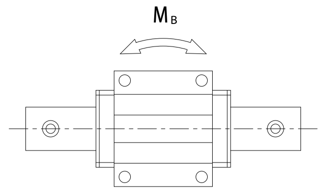


Fig. 14 Basic rated static torque in a yawing direction

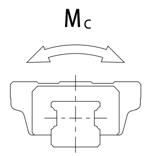


Fig. 15 Basic rated static torque in a rolling direction

7. Life time

The actual load acting on the Ball Ways tends to be larger than the simply calculated value due to vibration and the impact while running.

Moreover, the estimated values of loads are simple calculation results by assuming that the mounting base and the moving table are rigid, and actual load may be larger than this.

Then to forecast a more accurate fatigue life, the fatigue travel life of the Ball Ways is done by using the following equation and it is also corrected by the driving coefficient f_d, it has empirical formula as below.

$$L = 50 \times \left(\frac{C_{50}}{P_c f_d}\right)^3$$

or

$$L = 100 \times \left(\frac{C_{100}}{P_c f_d}\right)^3$$

here, L: The fatigue life travel (km)
C_{50}: Basic dynamic rated load of which 50km is rated life (N)
C_{100}: Basic dynamic rated load of which 100km is rated life (N)
P_e: The maximum average equivalent load (N)
f_d: Driving coefficient (Refer to Table 11)

Even if C_{50} is used or C_{100} is used, the calculation result of the fatigue life travel becomes the same.

The fatigue life time is given by the following equation.

$$L_h = \frac{50 \times 10^6}{120 \times S_t \times n} \times \left(\frac{C_{50}}{P_c f_d}\right)^3$$

or

$$L_h = \frac{100 \times 10^6}{120 \times S_t \times n} \times \left(\frac{C_{100}}{P_c f_d}\right)^3$$

here, L_h: The fatigue life time (h).
S_t: Stroke (mm)
n: Number of frequency travel per minute

Please consult us when hardness encountered is low because the special material, or if environment temperature may reach 100℃ or more.

Table 11 Driving coefficient f_d

Operating condition	f_d
Smooth driving without the vibration impact Speed 15m/min or less.	1.0～1.2
Usual driving. Speed 15~60m/min.	1.2～1.5
Driving with the vibration impact Speed 60m/min or over.	1.5～3.0

8. Permissible static load

For the basic static rated load, the permissible static load safety load coefficient corresponding to the working condition is given by the following equation

$$P_S = \frac{C_0}{f_S}$$

here, f_s: Permissible static load coefficient (Refer to Table 12).

Please select the Ball Ways so that the permissible static load P_s is larger than maximum working load P_{max}.

Table 12 Permissible static load coefficient f_s

Working condition	f_s
Smooth driving without the vibration impact	1～2
Usual driving	2～4
D with the vibration impact	3～5

9. Slide unit load

(1) Procedure of calculating a slide unit load

① About the external forces that act at the same time, calculate the load P_V,P_H,P_{MA},P_{MB},P_{MC} that acts on each slide unit by using the formula in Table 14 to 15.
② Calculate the sum of the absolute value P_V,P_H,P_{MA},P_{MB},P_{MC} of each slide, and this is assumed to be the slide unit load P.
③ In the same way, calculate the slide unit load P under all the loading conditions during the running cycle
④ In the case of the preloaded Ball Ways, calculate the internal load PA of the slide unit load P which calculated above.
⑤ Calculate the average equivalent load of each slide unit based on the running cycle.
⑥ The maximum value of all the average equivalent loads is a maximum average equivalent load.
⑦ The maximum value of all the slide unit load is a maximum load P_{max}.

(2) Calculation formula of the slide unit load

If the external force acts on the Ball Ways eccentrically, it acts not only as pure radial load but also as moment load. If multiple slide units are assembled, the load acting on each slide unit will be both vertical direction and horizontal direction, because the moment load can be supported by the distance of the slide units.

However, the moment load acts on the slide unit when there is only one slide unit for the moment direction. It is necessary to convert such a moment load into the equivalent radial load to calculate the total load of various loads that act on that slide unit.

The calculation formula of the radial load and the equivalent radial load in general layouts of the Ball Ways is shown in Table 14 to 15.Please contact us to obtain the calculation formula for the other layout.

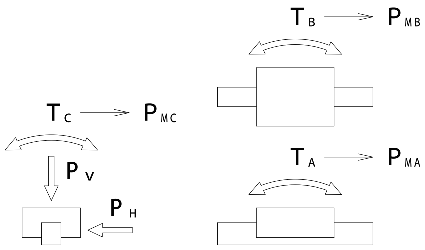


Fig. 16 Load acts to slide init

$$P = |P_V| + |P_H| + |P_{MA}| + |P_{MB}| + |P_{MC}|$$

P: Slide unit load (N)
P_V: Vertical direction load that acts on slide unit (N)
P_H: Horizontal direction load that acts on slide unit (N)
P_{MA}: Equivalent radial load in direction of pitching (N)
P_{MB}: Equivalent radial load in direction of yawing (N)
P_{MC}: Equivalent radial load in direction of rolling (N)
C_o: Basic static rated load (N)
M_A: Basic static rated torque in direction of pitching (N・m)
M_B: Basic static rated torque in direction of yawing (N・m)
M_C: Basic static rated torque in direction of rolling (N・m)
F: Load (N)
a: Acting location of load (mm)
b: Acting location of load (mm)
c: Span in rail (mm)
d: Span of slide unit (mm)
j: Load distribution coefficient
Table 13 shows J the coefficient to correct the load distribution of the ball in the slide unit.

Table 13 Load distribution coefficient j

Slide span d/Slide length		j
Over	Under	
1.0	1.5	1.4
1.5	2.0	1.3
2.0	2.5	1.2
2.5	3.0	1.1
3.0	—	1.0

Table 14 The load equation (one slide unit/rail)

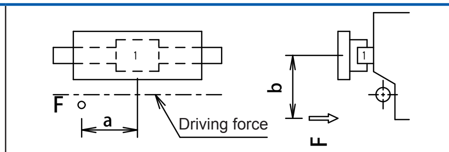
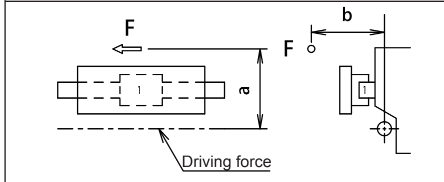
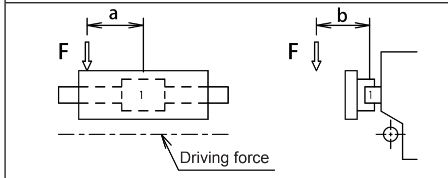
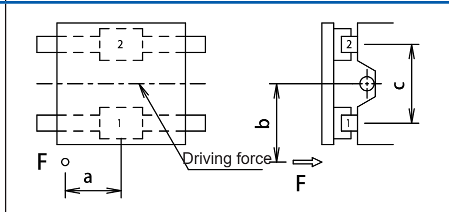
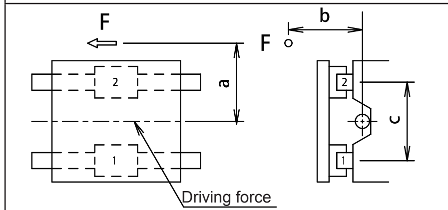
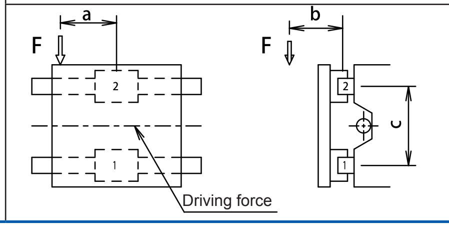
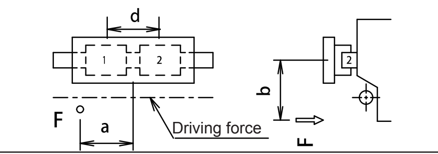
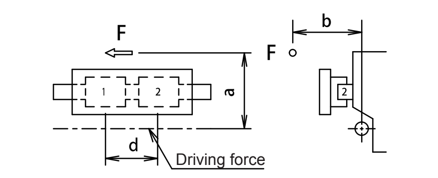
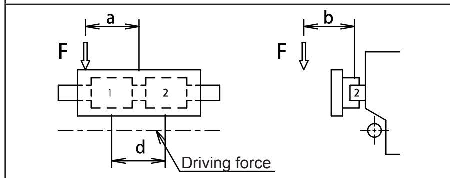
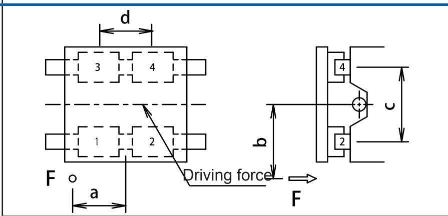
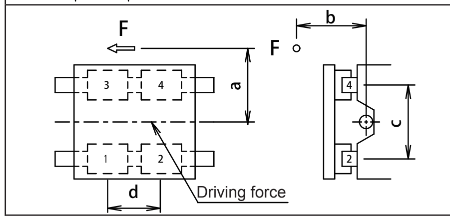
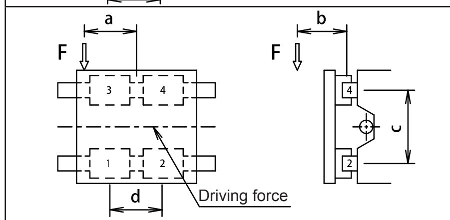
One rail		$P_{1V} = F$ $P_{1H} = 0$ $P_{1MA} = \frac{F \times a \times C_0}{M_A \times 10^3}$ $P_{1MC} = \frac{F \times b \times C_0}{M_C \times 10^3}$
		$P_{1V} = 0$ $P_{1H} = 0$ $P_{1MA} = \frac{F \times b \times C_0}{M_A \times 10^3}$ $P_{1MB} = \frac{F \times a \times C_0}{M_B \times 10^3}$
		$P_{1V} = 0$ $P_{1H} = F$ $P_{1MB} = \frac{F \times a \times C_0}{M_B \times 10^3}$ $P_{1MC} = \frac{F \times b \times C_0}{M_C \times 10^3}$
Two rails		$P_{1V} = \frac{F}{2} + \frac{F \times b}{c}$ $P_{1H} = 0$ $P_{1MA} = \frac{F \times a \times C_0}{2 \times M_A \times 10^3}$ $P_{2V} = \frac{F}{2} - \frac{F \times b}{c}$ $P_{2H} = 0$ $P_{2MA} = \frac{F \times a \times C_0}{2 \times M_A \times 10^3}$
		$P_{1V} = 0$ $P_{1H} = 0$ $P_{1MA} = \frac{F \times b \times C_0}{2 \times M_A \times 10^3}$ $P_{1MB} = \frac{F \times a \times C_0}{2 \times M_B \times 10^3}$ $P_{2V} = 0$ $P_{2H} = 0$ $P_{2MA} = \frac{F \times b \times C_0}{2 \times M_A \times 10^3}$ $P_{2MB} = \frac{F \times a \times C_0}{2 \times M_B \times 10^3}$
		$P_{1V} = \frac{F \times b}{c}$ $P_{1H} = \frac{F}{2}$ $P_{1MB} = \frac{F \times a \times C_0}{2 \times M_B \times 10^3}$ $P_{2V} = -\frac{F \times b}{c}$ $P_{2H} = \frac{F}{2}$ $P_{2MB} = \frac{F \times a \times C_0}{2 \times M_B \times 10^3}$

Table 15 The load equation (two slide units/rail)

One rail		$P_{1V} = \frac{F}{2} + \frac{F \times a \times j}{d}$ $P_{1H} = 0$ $P_{2V} = \frac{F}{2} - \frac{F \times a \times j}{d}$ $P_{2H} = 0$ $P_{1Mc} = \frac{F \times b \times C_0}{2 \times M_c \times 10^3}$ $P_{2Mc} = \frac{F \times b \times C_0}{2 \times M_c \times 10^3}$
		$P_{1V} = \frac{F \times b \times j}{d}$ $P_{2V} = -\frac{F \times b \times j}{d}$ $P_{1H} = \frac{F \times a \times j}{d}$ $P_{2H} = -\frac{F \times a \times j}{d}$
		$P_{1V} = 0$ $P_{1H} = \frac{F}{2} + \frac{F \times a \times j}{d}$ $P_{2V} = 0$ $P_{2H} = \frac{F}{2} - \frac{F \times a \times j}{d}$ $P_{1Mc} = \frac{F \times b \times C_0}{2 \times M_c \times 10^3}$ $P_{2Mc} = \frac{F \times b \times C_0}{2 \times M_c \times 10^3}$
Two rails		$P_{1V} = \frac{F}{4} + \frac{F \times a \times j}{2 \times d} + \frac{F \times b}{2 \times c}$ $P_{2V} = \frac{F}{4} - \frac{F \times a \times j}{2 \times d} + \frac{F \times b}{2 \times c}$ $P_{3V} = \frac{F}{4} + \frac{F \times a \times j}{2 \times d} - \frac{F \times b}{2 \times c}$ $P_{4V} = \frac{F}{4} - \frac{F \times a \times j}{2 \times d} - \frac{F \times b}{2 \times c}$ $P_{1H} = 0$ $P_{2H} = 0$ $P_{3H} = 0$ $P_{4H} = 0$
		$P_{1V} = \frac{F \times b \times j}{2 \times d}$ $P_{2V} = -\frac{F \times b \times j}{2 \times d}$ $P_{3V} = \frac{F \times b \times j}{2 \times d}$ $P_{4V} = -\frac{F \times b \times j}{2 \times d}$ $P_{1H} = \frac{F \times a \times j}{2 \times d}$ $P_{2H} = -\frac{F \times a \times j}{2 \times d}$ $P_{3H} = \frac{F \times a \times j}{2 \times d}$ $P_{4H} = -\frac{F \times a \times j}{2 \times d}$
		$P_{1V} = \frac{F \times b}{2 \times c}$ $P_{2V} = \frac{F \times b}{2 \times c}$ $P_{3V} = -\frac{F \times b}{2 \times c}$ $P_{4V} = -\frac{F \times b}{2 \times c}$ $P_{1H} = \frac{F}{4} + \frac{F \times a \times j}{2 \times d}$ $P_{2H} = \frac{F}{4} - \frac{F \times a \times j}{2 \times d}$ $P_{3H} = \frac{F}{4} + \frac{F \times a \times j}{2 \times d}$ $P_{4H} = \frac{F}{4} - \frac{F \times a \times j}{2 \times d}$

The above formulas for slide unit load assume the precondition that all main bodies including the table are rigid. The moment load acts on each slide unit when the table itself cannot be considered to be rigid. The example of calculating the moment load and the equivalent radial load is shown in the following.

Equivalent radial load P_{MA}(N) in a pitching direction

$$T_A = \frac{K_A M\theta}{K_A\theta + M}$$

$$P_{MA} = \frac{T_A \times C_0}{M_A \times 10^3}$$

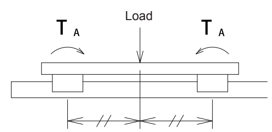


Fig. 17 Moment load T_A

Equivalent radial load PMC(N) in a rolling direction

$$T_C = \frac{K_C M\theta}{K_C\theta + M}$$

$$P_{MC} = \frac{T_C \times C_0}{M_C \times 10^3}$$

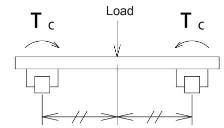


Fig. 18 Moment load T_c

here,

K_A: Slide unit moment rigidity in a pitching direction (N · mm/rad) Table 17 to 18

K_C: Slide unit moment rigidity in a rolling direction (N · mm/rad) Table 17 to 18

θ: Tilt angle at the support position when applying the load to the table which is simply supported at the position of the slide unit.(rad)

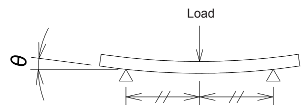


Fig. 19 Tilt angle of the table

M: The moment load at the support position when applying the load to the table which is fixed at the position of the slide unit. (N · mm).

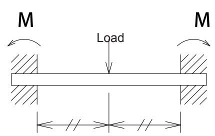


Fig. 20 Moment load of the table

(3)Average equivalent load of the slide unit

The average equivalent load is a constant load that is used to calculate life from the fluctuating load that gives the equal life and it is calculated by the following formula.

① When the load and the running distance change in a stepwise shape.

$$P_e = \sqrt[3]{\frac{P_1^3 \times L_1 + P_2^3 \times L_2 + \dots + P_n^3 \times L_n}{L_1 + L_2 + \dots + L_n}}$$

here, P_e: Average equivalent load (N).

P_n: Fluctuating load (N)

L_n: Running distance under the load Pn (mm)

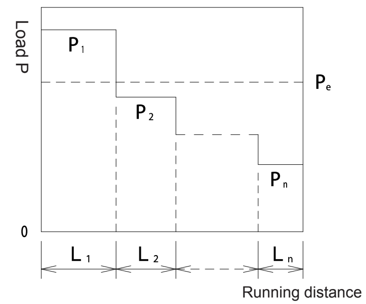


Fig. 21 Stepwise changing load

② When the load changes linearly

$$P_e = \frac{2 \times P_{max} + P_{min}}{3}$$

here, P_{max}: Maximum load (N).

P_{min}: Minimum load (N)

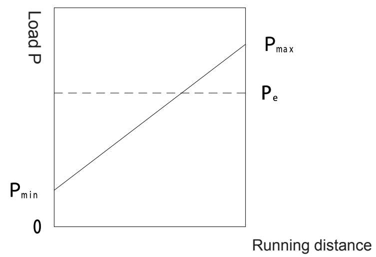


Fig. 22 Linearly changing load

③ When the load changes almost sinusoidally

$$P = \frac{1}{2} P_{max}(1 + \sin(\theta - \frac{\pi}{2}))$$

$$P_e = 0.65P_{max}$$

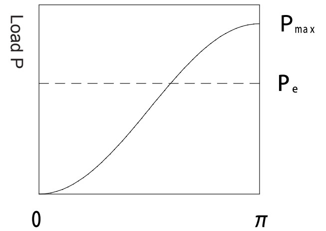


Fig. 23 Sinusoidally changing load(1)

$$P = P_{max}\sin\theta$$

$$P_e = 0.75P_{max}$$

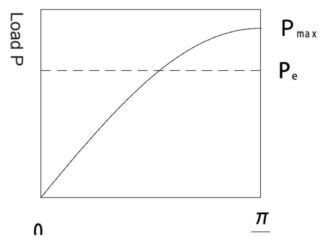


Fig. 24 Sinusoidally changing load(2)

(4) Internal load of slide unit

When the preload is given to the Ball Ways, if the external force acts on the slide unit from above, the load of the balls in the bottom groove becomes large and the load of the balls of the top groove becomes small. The loads of bottom and top groove in this case can be obtained by following formula.

Fig. 25 shows the stiffness y curve of preloaded Ball Ways. When the external force F is acting on the slide unit, the slide unit is displaced by δ for the rail, and also the bottom and top groove and displaced by δ for the rail. The force P_A is acting on the bottom groove and the force P_B is acting on the top groove of the rail.

At this time, the relation $F = P_A - P_B$ is consisted by the condition of the force balance, and P_A and P_B are calculated by the following equation respectively.

When $F \leq 2.83P_{PR}$

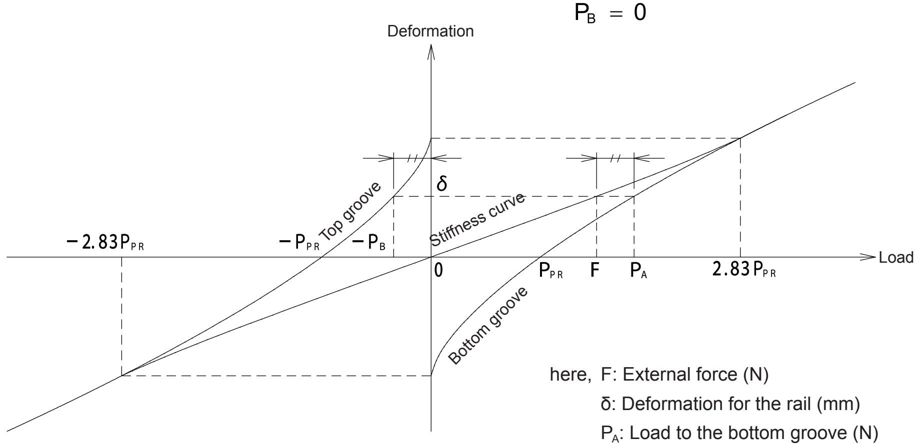
$$P_A = \left(\frac{F}{2.83P_{PR}} + 1\right)^{1.5} \times P_{PR}$$

$$P_B = P_A - F$$

When $F > 2.83P_{PR}$

$$P_A = F$$

$$P_B = 0$$



here, F: External force (N)
δ: Deformation for the rail (mm)
P_A: Load to the bottom groove (N)
P_B: Load to the top groove (N)
P_{PR}: Preload (N)

Fig. 25 Stiffness curve of the preloaded Ball Ways with the preload

10. Stiffness of the Ball Ways

If the external load acts on the Ball Ways, the ball that is the rolling element and the ball groove are elastically deformed. The slide unit is deformed to the rail like the no preload curve shown in Fig. 26.

However, reducing this deformation is very important in the applications required a precise positioning.

Then, the preload is given beforehand by fine-adjustment of the ball diameter put into the slide unit, and then the deformation is reduced like the with preload curve shown in Fig. 26.

When the preload P_{PR} is given, the amount of deformation due to the load equal to 2.83 times PPR acts becomes 1/2 of that of without preload.

Until the load is $2.83P_{PR}$, the with preloaded curve becomes almost straight line, and load÷deformation can be considered constant value, and is called as a stiffness value.

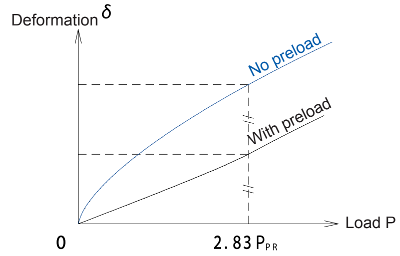


Fig. 26 Amount of deformation to load

These effects are similar to the tilt angle of the slide unit by the moment load.

The stiffness of the every preloaded Ball Ways is shown in Table 17 to 18.

By this stiffness, the amount of deformation and the tilt angle of the Ball Ways can be calculated by each equation in Table 16.

Table 16 Calculation formula of a deformation and a tilt angle of the Ball Ways

No preload	With preload	
Vertical, horizontal deformation		
$\delta = \frac{2.83P_{PR}^{1/3}}{K} \times P^{2/3}$	When $P \leq 2.83P_{PR}$ $\delta = \frac{P}{K}$	When $P > 2.83P_{PR}$ $\delta = \frac{2.83P_{PR}^{1/3}}{K} \times P^{2/3} - \frac{2.83P_{PR}}{K}$
Tilt angle in a pitching and a yawing direction		
$\theta = \frac{2.35 \times P_{PR}^{1/3}}{K^{1/6} \times K_A^{5/6}} \times M^{2/3}$	When $M \leq \frac{1.63P_{PR}K_A^{1/2}}{K^{1/2}}$ $\theta = \frac{M}{K_A}$	When $M > \frac{1.63P_{PR}K_A^{1/2}}{K^{1/2}}$ $\theta = \frac{2.35P_{PR}^{1/3}}{K^{1/6}K_A^{5/6}} \times M^{2/3} - \frac{1.63P_{PR}}{K^{1/2}K_A^{1/2}}$
Tilt angle in a rolling direction		
$\theta = \frac{2.83P_{PR}^{1/3}}{K^{1/6}K_C^{5/6}} \times M^{2/3}$	When $M \leq \frac{2.83P_{PR}K_C^{1/2}}{K^{1/2}}$ $\theta = \frac{M}{K_C}$	When $M > \frac{2.83P_{PR}K_C^{1/2}}{K^{1/2}}$ $\theta = \frac{2.83P_{PR}^{1/3}}{K^{1/6}K_C^{5/6}} \times M^{2/3} - \frac{2.83P_{PR}}{K^{1/2}K_C^{1/2}}$

Note 1. The value of P_{PR}, K, K_A, and K_C is indicated in Table 17-18.
Please apply amount value of T1 preload when there is no preload.

Note 2. Term and unit of each symbol

P: Load (N)
δ: Deformation (mm)
M: Moment load (N · mm)
θ: Tilt angle (rad)
P_{PR}: Preload (N)
K: Stiffness in a vertical and a horizontal direction (N/mm)
K_A: Stiffness in a pitching and a yawing direction (N · mm/rad)
K_C: Stiffness in a rolling direction (N · mm/rad)

Table 17 Stiffness of Ball Ways (1)

Type No.	Preload symbol	Preload P_{PR} (N)	Stiffness: Vertical and Horizontal direction K (N/ mm)	Stiffness: Pitching and Yawing direction K_A (N · mm/rad)	Stiffness: Rolling direction K_C (N · mm/rad)
H15 U15	T1	250	2.70×10^5	3.25×10^7	3.00×10^7
	T2	500	3.40×10^5	4.08×10^7	3.78×10^7
	T3	750	3.89×10^5	4.67×10^7	4.33×10^7
H20 U20	T1	400	3.40×10^5	6.38×10^7	6.47×10^7
	T2	800	4.28×10^5	8.04×10^7	8.16×10^7
	T3	1200	4.90×10^5	9.20×10^7	9.34×10^7
H25 U25	T1	550	4.02×10^5	1.09×10^8	1.03×10^8
	T2	1100	5.06×10^5	1.37×10^8	1.30×10^8
	T3	1650	5.79×10^5	1.57×10^8	1.49×10^8
H25L	T1	700	5.49×10^5	2.99×10^8	1.41×10^8
	T2	1400	6.92×10^5	3.77×10^8	1.78×10^8
	T3	2100	7.92×10^5	4.31×10^8	2.04×10^8
H30 U30	T1	800	4.79×10^5	1.76×10^8	1.78×10^8
	T2	1600	6.04×10^5	2.22×10^8	2.24×10^8
	T3	2400	6.91×10^5	2.54×10^8	2.56×10^8
H30L	T1	950	6.15×10^5	4.03×10^8	2.28×10^8
	T2	1900	7.74×10^5	5.08×10^8	2.87×10^8
	T3	2850	8.86×10^5	5.82×10^8	3.28×10^8
H35 U35	T1	1100	5.57×10^5	2.68×10^8	2.99×10^8
	T2	2200	7.02×10^5	3.37×10^8	3.76×10^8
	T3	3300	8.03×10^5	3.86×10^8	4.31×10^8
H35L	T1	1350	7.52×10^5	7.28×10^8	4.03×10^8
	T2	2700	9.48×10^5	9.17×10^8	5.08×10^8
	T3	4050	1.08×10^6	1.05×10^9	5.81×10^8
H45 U45	T1	1800	7.07×10^5	5.31×10^8	6.41×10^8
	T2	3600	8.91×10^5	6.69×10^8	8.07×10^8
	T3	5400	1.02×10^6	7.66×10^8	9.24×10^8
H45L	T1	2100	9.02×10^5	1.21×10^9	8.17×10^8
	T2	4200	1.14×10^6	1.52×10^9	1.03×10^9
	T3	6300	1.30×10^6	1.74×10^9	1.18×10^9
H55 U55	T1	2700	9.07×10^5	1.15×10^9	1.14×10^9
	T2	5400	1.14×10^5	1.45×10^9	1.43×10^9
	T3	8100	1.31×10^6	1.66×10^9	1.64×10^9
H55L	T1	3100	1.09×10^6	2.10×10^9	1.37×10^9
	T2	6200	1.37×10^6	2.65×10^9	1.72×10^9
	T3	9300	1.57×10^6	3.03×10^9	1.97×10^9
H65	T1	4200	1.07×10^6	1.81×10^9	1.98×10^9
	T2	8400	1.35×10^6	2.29×10^9	2.50×10^9
	T3	12600	1.55×10^6	2.62×10^9	2.86×10^9
H65L	T1	5200	1.45×10^6	4.95×10^9	2.68×10^9
	T2	10400	1.83×10^6	6.23×10^9	3.38×10^9
	T3	15600	2.10×10^6	7.14×10^9	3.87×10^9

Table 18 Stiffness of Ball Ways (2)

Type No.	Preload symbol	Preload P_{PR} (N)	Stiffness: Vertical and Horizontal direction K (N/ mm)	Stiffness: Pitching and Yawing direction K_A (N · mm/rad)	Stiffness: Rolling direction K_C (N · mm/rad)
U15S	T1	150	1.59×10^5	6.41×10^6	1.77×10^7
	T2	300	2.00×10^5	8.07×10^6	2.23×10^7
	T3	450	2.29×10^5	9.24×10^6	2.55×10^7
U20S	T1	250	2.03×10^5	1.28×10^7	3.86×10^7
	T2	500	2.56×10^5	1.61×10^7	4.87×10^7
	T3	750	2.93×10^5	1.84×10^7	5.57×10^7
U25S	T1	400	2.52×10^5	2.29×10^7	6.50×10^7
	T2	800	3.18×10^5	2.88×10^7	8.18×10^7
	T3	1200	3.64×10^5	3.30×10^7	9.37×10^7
U30S	T1	550	2.95×10^5	3.65×10^7	1.09×10^8
	T2	1100	3.72×10^5	4.59×10^7	1.38×10^8
	T3	1650	4.26×10^5	5.26×10^7	1.58×10^8
U35S	T1	800	3.82×10^5	8.09×10^7	2.05×10^8
	T2	1600	4.82×10^5	1.02×10^8	2.58×10^8
	T3	2400	5.51×10^5	1.17×10^8	2.95×10^8
N15	T1	150	2.40×10^5	2.54×10^7	2.67×10^7
	T2	300	3.02×10^5	3.20×10^7	3.36×10^7
	T3	450	3.46×10^5	3.66×10^7	3.85×10^7
N20	T1	300	3.62×10^5	8.75×10^7	8.86×10^7
	T2	600	4.56×10^5	1.10×10^8	1.12×10^8
	T3	900	5.22×10^5	1.26×10^8	1.28×10^8
N25	T1	500	4.25×10^5	1.25×10^8	1.53×10^8
	T2	1000	5.35×10^5	1.57×10^8	1.93×10^8
	T3	1500	6.13×10^5	1.80×10^8	2.21×10^8
N30	T1	700	4.82×10^5	1.78×10^8	2.47×10^8
	T2	1400	6.08×10^5	2.24×10^8	3.12×10^8
	T3	2100	6.96×10^5	2.56×10^8	3.57×10^8
N40	T1	1200	6.05×10^5	3.41×10^8	5.41×10^8
	T2	2400	7.62×10^5	4.30×10^8	6.81×10^8
	T3	3600	8.72×10^5	4.92×10^8	7.80×10^8
N50	T1	1800	7.07×10^5	5.31×10^8	7.40×10^8
	T2	3600	8.91×10^5	6.69×10^8	9.32×10^8
	T3	5400	1.02×10^6	7.66×10^8	1.07×10^9
K7	T1	50	1.66×10^5	1.88×10^7	8.59×10^8
K9	T1	50	1.64×10^5	2.40×10^7	1.20×10^7
K12	T1	100	2.15×10^5	4.45×10^7	2.28×10^7

11. Sliding resistance

As the rolling guide the friction coefficient of the Ball Ways is very smaller than the slide guide.

However, it is necessary to consider the preload and the seal resistance in the calculation of a required driving force besides the frictional resistance by the weight of moving element.

As shown in the Fig. 27, required sliding resistance F (N) to run the Ball Ways by the constant speed which loaded the object mass of m(kg) is calculated by the following equations.

When $mg \leq 2.83P_{PR}$

$$F = \mu(P_A + P_B) + f$$

When $mg > 2.83P_{PR}$

$$F = \mu mg + f$$

here, m: The mass of moving element (kg)

g: Gravity acceleration = 9.8m/s2

P_{PR}: Preload (N)

P_A: Load of bottom groove (N)

$$= \left(\frac{mg}{2.83P_{PR}} + 1\right)^{1.5} \times P_{PR}$$

PB: Load of top groove (N)

$$= P_A - mg$$

μ: Coefficient of rolling friction =0.002

F: Sliding resistance (N)

f: Seal resistance (N) shown in the Table 19

The seal resistance by the double seals becomes f×2

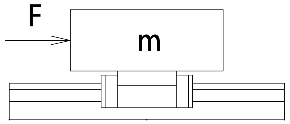


Fig. 27 Sliding resistance

As an example, when 500kg is loaded into the T2 preloaded H45EA slide unit, slide resistance is calculated from Table 17.

$$2.83P_{PR} = 2.83 \times 3600 = 10182(N)$$

$$mg = 500 \times 9.8 = 4900(N)$$

Therefore, because it is $mg \leq 2.83P_{PR}$

$$P_A = \left(\frac{4900}{10182} + 1\right)^{1.5} \times 3600$$

$$= 6400(N)$$

$$P_B = 6490 - 4900 = 1590(N)$$

f=14.5(N) from Table 19

Therefore, the sliding resistance in this case becomes

$$F = 0.002 \times (6490 + 12590) + 14.5 = 31(N)$$

Though a rolling friction coefficient itself is $\mu = 0.002$

Apparent friction coefficient μ_0, considering the preload and the seal resistance, becomes a result in which

$$\mu_0 = \frac{F}{mg} = \frac{31}{4900} = 0.006$$

Table 19 Seal resistance

Unit:N

Type No.	Max seal resistance f
H15E	
H15T	7.5
U15E	
H20E	
H20T	9.5
U20E	
H25E	
H25T	11.0
U25E	
H30E	
H30T	13.0
U30E	

Type No.	Max seal resistance f
H35E	
H35T	14.5
U35E	
H45E	
H45T	14.5
U45E	
H55E	
H55T	17.5
U55E	
H65E	20.5
H65T	

Type No.	Max seal resistance f
N15T	4.5
N20T	9.5
N25T	9.5
N30T	11.0
N40T	14.5
N50T	15.5
K7T	2.0
K9T	3.0
K12T	3.0

12. Rail length

The rails are produced to standard lengths as shown in Fig. 28 and Table 20 to 21 and this is cut in required length. Therefore, in case of the required length is longer than standard length L_o, the jointed rails are necessary. Please note that if E is longer than E_o, jointed rails are necessary, even if L is shorter than $_{Lo}$.

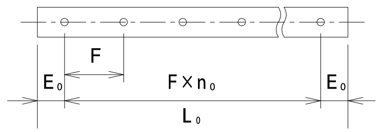


Fig. 28 Standard rail length

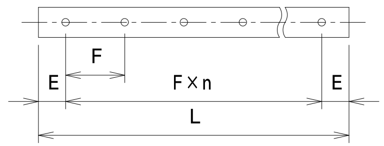


Fig. 29 Product rail

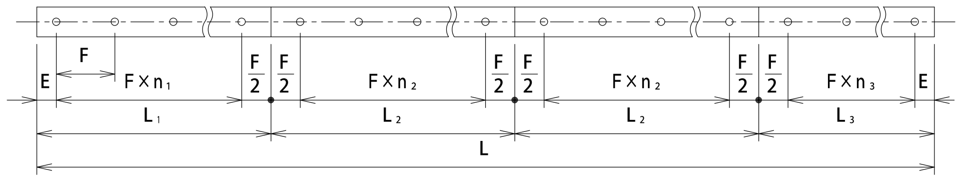


Fig. 30 Jointed rail

Table 20 Dimension of standard rail length

Rail Type No.	Dimension of standard rail length			Recommendation value of E of rail
	Total length L_0 mm	Pitch Numbers F × n_0 mm 个	E_0 mm	mm
H15	1500	60×24	30	6～35
H20	3000	60×49	30	7～36
H25	3000	60×49	30	8～37
H30,H35	3000	80×37	20	10～49
H45	3000	105×28	30	14～65.5
H55	3000	120×24	60	16～75
H65	3000	150×19	75	18～92
U15	1500	60×24	30	5～34
U20,U25	3000	60×49	30	7～36
U30	3000	80×37	20	8～47
U35	3000	80×37	20	10～49
U45	3000	105×28	30	13～64.5
U55	3000	120×24	60	14～73
N15	1500	60×24	30	5～34
N20	3000	60×49	30	7～36
N25,N30	3000	80×37	20	8～47
N40	3000	105×28	30	10～61.5
N50	3000	120×24	60	13～72

Ball way

When making the jointed rails, it is normal to make the length of the joint part F/2 as shown in Fig. 30.

In case of the W2 specification that uses the two rails in parallel, a right and left slide unit should pass over the joint part in rail alternately as shown in Fig. 31.

When the slide unit passes over the joint part of the rail, the slide unit receives a bad influence even if there is a slight bump in the joint part. Matching mark is put as shown in Fig. 31 please follow the match marks after confirming the accuracy of the joint part is enough. when assembling the rail.

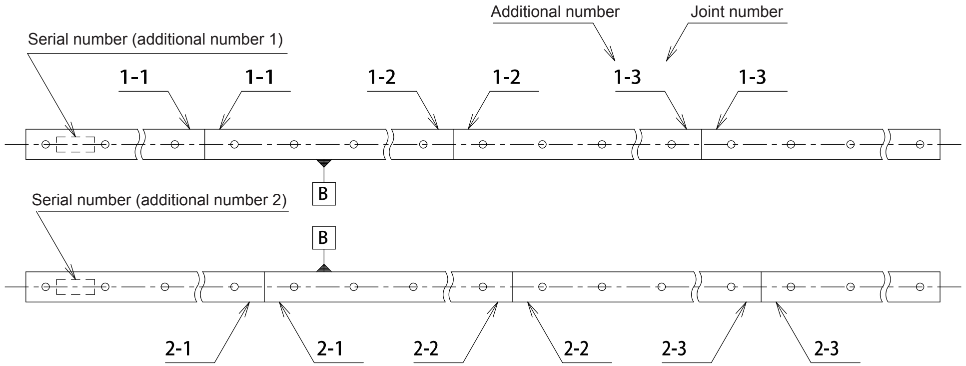


Fig. 21 Matching mark

Table 21 Dimension of standard rail length

Rail Type No.	Dimension of standard rail length: Total length L_0 mm	Pitch Numbers F × n_0 mm 个	E_0 mm	Recommendation value of E of rail mm
MB7	130	15×8	5	4～10.5
MB7W	290	30×9	10	5～19
MB9	275	20×13	7.5	5～14
MB9W	290	30×9	10	5～19
MB12	470	25×18	10	5～16.5
MB12W	470	40×11	15	6～25
MB15	670	40×16	15	5～24
MB15W	670	40×16	15	6～25
MB20	880	60×14	20	7～36
K7,K9	500	32×15	10	4～19
K12	500	50×9	25	5～29
M10	500	40×12	10	5～24
M15	1000	60×16	20	5～34
M25	1500	60×24	30	7～36
M35,M40	3000	80×37	20	10～49
M45	3000	105×28	30	13～64.5
M55	3000	120×24	60	14～73
M65	3000	150×19	75	18～92

13.Mounting method of M series Ball Ways

M series Ball Ways is always used in pairs though the normal Ball Ways can be used with one rail, that is, W1.

The Ball Ways of the equal load capacity in four directions, with wide width, low height and high moment load capacity in a rolling direction can be configured by installing as the rail spacing is free.

Because the tube type has an ideal turning radius as a ball circulation method, it is possible to use for a higher-speed operation than the end cap type could.

There are two kinds of Ball Ways of M series, and the M-TW type is an upper push type, the M-TC type is a middle push type as shown in Fig. 32, and the middle push type is suitable for the applications for which a high preload is necessary to increase the stiffness.

The M-TW type is effectively used for the applications when the lateral load is small, the stiffness requirement is not high, and the processing cost of the table is reduced.

Please provide relief to prevent the interference of the slide unit and the rail in the corner of the mounting surface.

One O-ring is appended to all slide units. Please use this one to prevent the leakage of the slide unit to the oil hole connected from the grease nipple etc. in the table when adjust the oil hole.

The preload can be adjusted by tightening the side push bolt evenly, while measuring the sliding resistance by the push scale etc. as shown in Fig. 33.

The value of the preload can be calculated by the following formula.

$$P_{PR} = \frac{F_2 - F_1}{0.004}$$

here, P_{PR}: Preload (N).

F_1: Sliding resistance before preload is applied (N) Ball circulation sliding resistance due to the viscous resistance of the lubricant, and the seal resistance.

F_2: Sliding resistance after preload is applied (N)

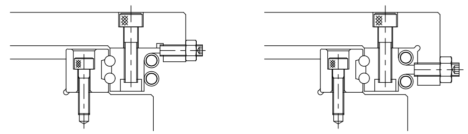


Fig. 32 Position of preload adjustment bolt

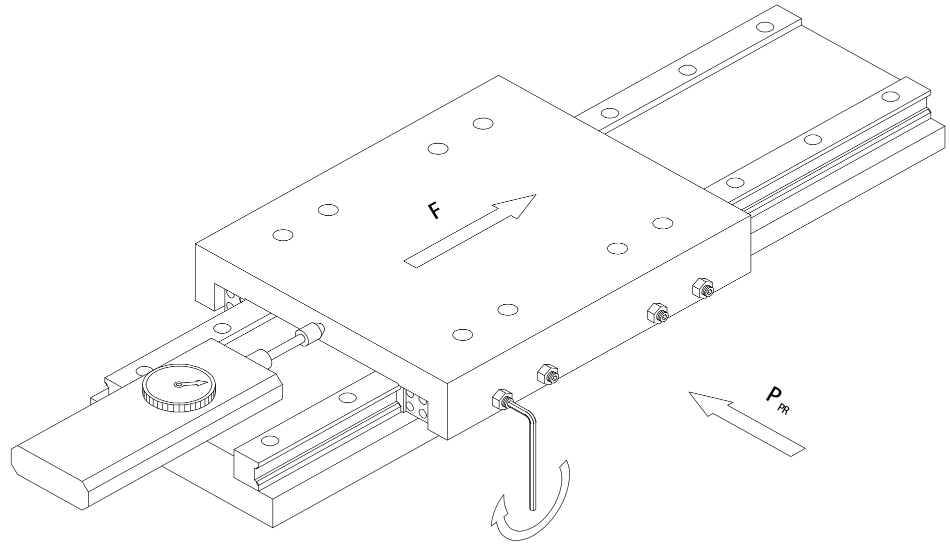


Fig. 33 Adjusting method of preload

14.Method of pressing the rails and the slide units

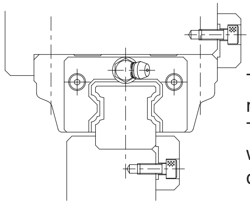
It is shown in Fig. 34 to 37 the method of pressing to datum side surface of the rail and the slide unit to mounting base or the table.

Please match the position of the set screw etc. for pressing the rail from the side to the position of the mounting bolt.

To attach the Ball Ways securely, it is necessary to form the shoulder of the mounting surface sufficiently high and to form the radius of the corner appropriate size.

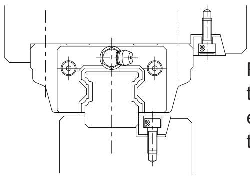
The recommendable value of shoulder and the largest corner radius is indicated in Table 22.

The width of the shoulder should be thick enough so as not to deform by a horizontal load.



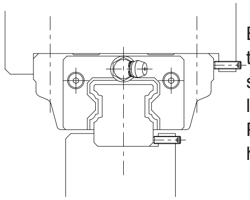
This is the most general method.
The clamp plate is provided with relief to push horizontal direction correctly.

Fig. 34 Clamps method



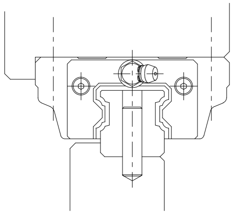
Please match the angle of the taper gib and the base exactly and do not over tighten the bolt.

Fig. 35 Taper gib method



Because height is limited, the size of a horizontal set screw cannot be made larger.
Please use only when the horizontal load is small.

Fig. 36 Set screw method



The knock pin hole is made in the rail beforehand. By drilling and reaming the knock pin hole is transferred to the base, after the mounting bolts are fixed while pressing railed against the datum surface with the clamps etc. And the knock pin is driven in the hole to prevent a lateral movement.

Fig. 37 Knock pin method

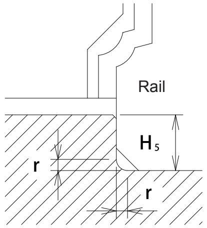


Fig. 38 Rail side contact

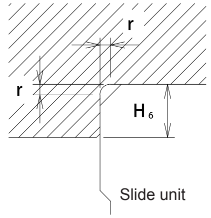


Fig. 39 Slide unit side contact

Table 22 Mount face height and rounded corner radius

Unit:mm

Type No.	H_5	H_6 (*1)	r max
H15	4	4	0.5
H20	4	4	0.5
H25	5	5	0.5
H30	5	5	0.5
H35	6	6	1.0
H45	8	8	1.0
H55	10	10	1.0
H65	10	10	1.0
U15	4	4	0.5
U20	3	4	0.5
U25	3	5	0.5
U30	5	5	0.5
U35	6	6	1.0
U45	8	8	1.0
U55	9	10	1.0
N15	4	4	0.3
N20	5	5	0.5
N25	6	6	1.0
N30	7	6	1.0
N40	7	8	1.0
N50	7	8	1.0
MB7	1	2	0.2
MB7W	1.5	2	0.2
MB9	1.5	3	0.2
MB9W	3	3	0.2
MB12	2	3	0.2
MB12W	3	3	0.2
MB15	3	3	0.2
MB15W	3	3	0.2
MB20	6	4	0.3

*1: In case of tube type TB and TR, please make this value less than H_3 of the dimension table.

15. Mounting method

(1)The mounting surface of the rail, the slide unit, the bed, and the table is wiped well, and the burrs are removed by the oilstone, and the machine oil spread thinly.

(2)Installation of the datum rail

① When there is a horizontal datum surface for the datum rail in the bed

Temporarily tightened all mounting bolts with the datum surface of Ball Way lightly pressed to a horizontal datum surface of the bed.

After tightened the side press bolt firmly, finally tighten the rail mounting bolt.

Repeat the sequence indicated by along a horizontal datum surface of the bed.

(Refer to Fig. 40.)

② When there is no horizontal datum surface for the datum rail in the bed

Put a datum Ball Ways on the bed, and temporarily tighten all mounting bolt.

Fix a dial indicator to the slide unit, and apply a probe to the straight edge.

Drive the slide unit, and finally tighten the mounting bolt as adjusting the datum rail parallel with the straight edge.(Refer to Fig. 41.)

(3)Installation of reference rail

① When there is a horizontal datum surface for the reference rail in the bed,

It is installed in the same way as datum rail. (Refer to Fig. 40)

② When there is no horizontal datum surface for the reference rail in the bed

Put a reference Ball Way on the bed, and temporarily tighten all mounting bolts.

Fix a dial indicator to the slide unit, and apply a probe to the horizontal datum surface

of the reference rail. Drive the datum slide unit, and finally tighten the all rail mounting bolts as adjusting the reference rail parallel with the datum rail. (Refer to Fig. 42)

(4)Installation of table

① When there is a horizontal datum surface for the slide unit in the table

Temporarily tighten all mounting bolts for the slide unit with the table lightly pressed to a horizontal datum surface of the slide unit.

After tightened the side press bolt firmly, finally tighten the bolt. (Refer to Fig.43)

② When there is no horizontal datum surface for the slide unit in the table

Put the table on the slide unit, and after temporarily tighten the all mounting bolt, finally tighten it.

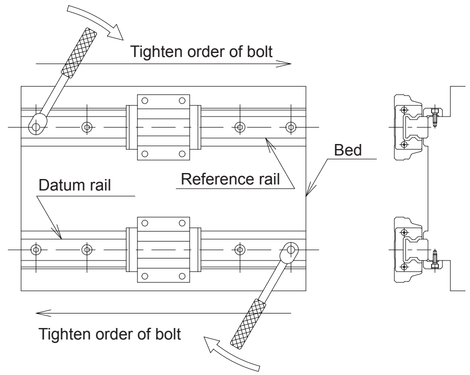


Fig. 40 Mounting method (1)

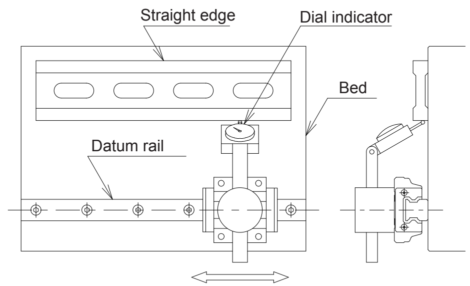


Fig. 41 Mounting method (2)

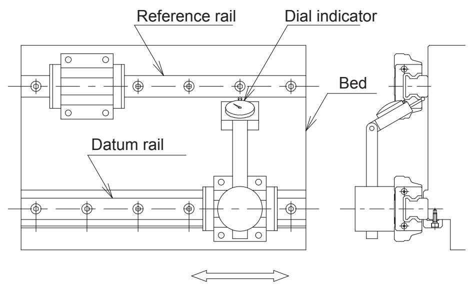


Fig. 42 Mounting method (3)

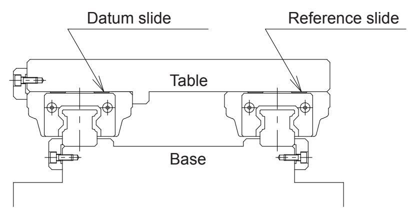


Fig. 43 Mounting method (4)

16. Rail mounting bolt

Please use hexagon socket head bolt made of steel as per JIS B 1176 (strength division 10.9 or more) of size shown in Table 23 or equivalent bolt when the rail is installed on the iron-based material.

Table 24 shows the proper torque value when tightening the rail mounting bolt.

In cases of following, it's necessary to enlarge the size of bolt or increase the number

of bolts by making the mounting pitch half, so please contact us.

- A large upward load is applied.
- The total length of the rail is short.
- Internal thread strength of the mounting base is not enough.

Table 23 Rail mounting bolt

Type No.	Mounting bolt	Type No.	Mounting bolt	Type No.	Mounting bolt	Type No.	Mounting bolt
H15	M4×16	U25	M6×20	N50	M10×40	K9	M2.5×10
H20	M5×20	U30	M6×25	MB7	M2×6	K12	M3×10
H25	M6×25	U35	M8×30	MB7W	M3×8	M10	M3×12
H30	M8×30	U45	M10×40	MB9.9W	M3×8	M15	M3×14
H35	M8×30	U55	M12×40	MB12	M3×8	M25	M5×20
H45	M12×40	N15	M3×14	MB12W	M4×12	M35	M8×25
H55	M14×45	N20	M5×20	MB15	M3×10	M40	M8×30
H65	M16×60	N25	M6×25	MB15W	M4×12	M45	M10×35
U15	M3×14	N30	M6×30	MB20	M5×16	M55	M12×40
U20	M5×16	N40	M8×40	K7	M2×8	M65	M16×50

Table 24 Tightening torque of rail mounting bolt Unit: N.m

Nominal bolt	Steel	Casting	Aluminum	Nominal bolt	Steel	Casting	Aluminum	Nominal bolt	Steel	Casting	Aluminum
M2	0.45	0.34	0.23	M5	6.76	5.07	3.38	M12	96	72	48
M2.5	0.83	0.62	0.42	M6	10.8	8.1	5.4	M14	153	115	77
M3	1.37	1.03	0.69	M8	27.4	20.6	13.7	M16	239	179	120
M4	3.33	2.50	1.67	M10	54.9	41.2	27.5				

17. Plug for rail mounting hole

The plugs to enhance the sealing performance are prepared which are driven in the mounting hole and make the upper surface smooth. Hammer the plug as pressing by flat plate after the plug is fitted into the mounting hole a little as shown in Fig. 44.

Table25 Plug for rail mounting hole

Plug No.	Bolt hole	Plug No.	Bolt hole
ø4.4	M2	ø11	M6
ø5.2	M2.5	ø14	M8
ø6	M3	ø17.5	M10
ø6.5	M3	ø20	M12
ø7.5	M4	ø23	M14
ø9.5	M5	ø26	M16

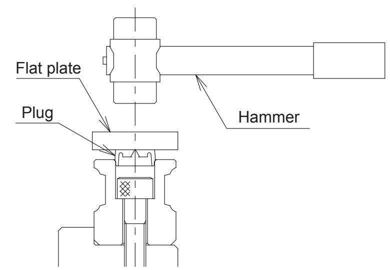


Fig. 44 Method of driving plug

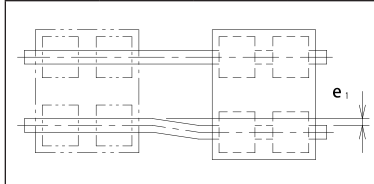
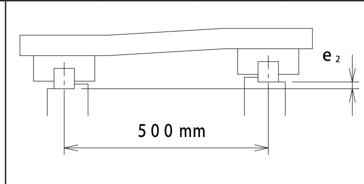
18. Recommendation value of mounting accuracy of rail

The misalignment of the rail influences not only the running accuracy of the table but also the life of the Ball Ways.

A general example of the rail mounting accuracy tolerance is shown in Table 26.

Please decide the appropriate allowance of mounting accuracy after considering the value of the safety f actors for the rated load of the Ball Ways to the load condition.

Table 26 Rail misalignment Unit: μ.m

Type No.	e_1: Parallelism error of two rails				e_2: Height error of two rails			
								
	Preload				Preload			
	T0	T1	T2	T3	T0	T1	T2	T3
H15,U15	19	13	10	9				
U15S	21	16	13	10				
H20,U20	23	17	14	11				
U20S	27	20	16	13				
H25,U25	29	21	17	14				
H25L	27	20	16	13				
U25S	33	24	19	16				
H30,U30	35	25	20	16				
H30L	32	24	19	15				
U30S	40	29	23	19	450	330	260	200
H35,U35	40	29	23	19				
H35L	37	27	21	18				
U35S	45	33	26	21				
H45,U45	52	38	29	24				
H45L	49	36	28	23				
H55,U55	62	46	36	30				
H55L	60	44	34	28				
H65	81	59	46	38				
H65L	75	55	43	35				
N15	13	10	8	6				
N20	18	13	11	9				
N25	24	17	13	11				
N30	29	21	16	14	330	240	190	150
N40	41	30	23	19				
N50	52	38	30	25				
K7	5	3	–	–				
K9	9	7	–	–	230	170	–	–
K12	11	8	–	–				

19. Lubrication

(1)Piping joint

In case of centralized lubrication, the piping joint is installed instead of the grease nipple.Table 27 shows the piping joint that can be installed.

Please contact us when the oil hole on the top or the side face of the slide unit is necessary.

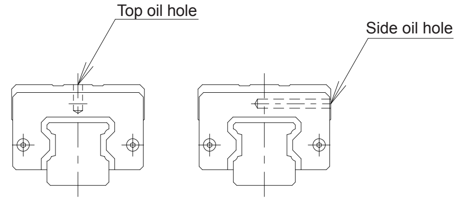


Table 27 Standard grease nipple and piping joint

Type No.			Standard grease nipple	Applicable piping joint
H15EA	H15EB	H15ER	NAS516-1A	-
H20EA	H20EB	H20ER	NAS516-1A	
H25EA	H25EB	H25ER	B-M6F	No.11 No.19 No.13 No.37
H25LEA	H25LEB	H25LER	B-M6F	
H30EA	H30EB	H30ER	B-M6F	No.11 No.19 No.15 No.2
H30LEA	H30LEB	H30LER	B-M6F	
H35EA	H35EB	H35ER	B-M6F	
H35LEA	H35LEB	H35LER	B-M6F	
H45EA	H45EB	H45ER	B-PT1/8	No.106141 No.106142 No.106102 No.106103
H45LEA	H45LEB	H45LER	B-PT1/8	
H55EA	H55EB	H55ER	B-PT1/8	
H55LEA	H55LEB	H55LER	B-PT1/8	
H65EA	H65EB	H65ER	B-PT1/8	
H65LEA	H65LEB	H65LER	B-PT1/8	
H15TA	H15TB		NAS516-1A	-
H15TR			PB1021B	No.16 No.14
H20TA	H20TB		NAS516-1A	No.26(*1)
H25TA	H25TB	H25TR	B-M6F	No.11 No.19 No.5 No.6
H30TA	H30TB	H30TR	B-M6F	
H35TA	H35TB	H35TR	B-M6F	
H45TA	H45TB	H45TR	B-M6F	
H55TA	H55TB	H55TR	B-PT1/8	No.106141 No.106142 No.106102 No.106103
H65TA	H65TB	H65TR	B-PT1/8	
U15ER	U15SER		NAS516-1A	-
U20ER	U20SER		NAS516-1A	No.26(*1)
U25ER	U25SER		B-M6F	No.11 No.19 No.13 No.37
U30ER	U30SER		B-M6F	No.11 No.19 No.5 No.2
U35ER	U35SER		B-M6F	
U45ER			B-PT1/8	No.106141 No.106142 No.106102 No.106103
U55ER			B-PT1/8	
N15TR			NAS516-1A	No.26(*1)
N20TR			PB1021B	No.16 No.14
N25TR	N30TR	N40TR	B-M6F	No.11 No.19 No.5 No.6
N50TR			B-PT1/8	No.106141 No.106142 No.106102 No.106103

*1: M4 taping in the end cap is necessary, please contact us.

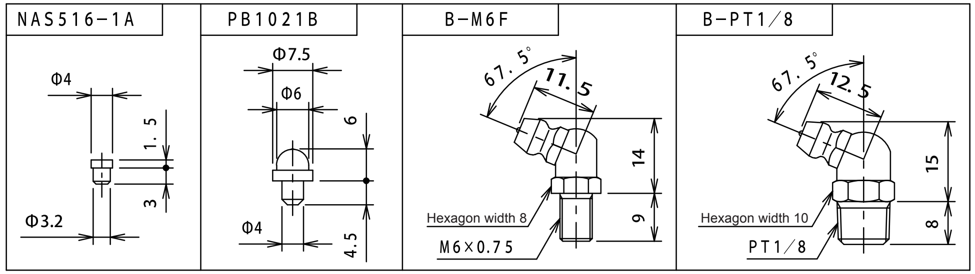


Fig. 45 Standard grease nipple

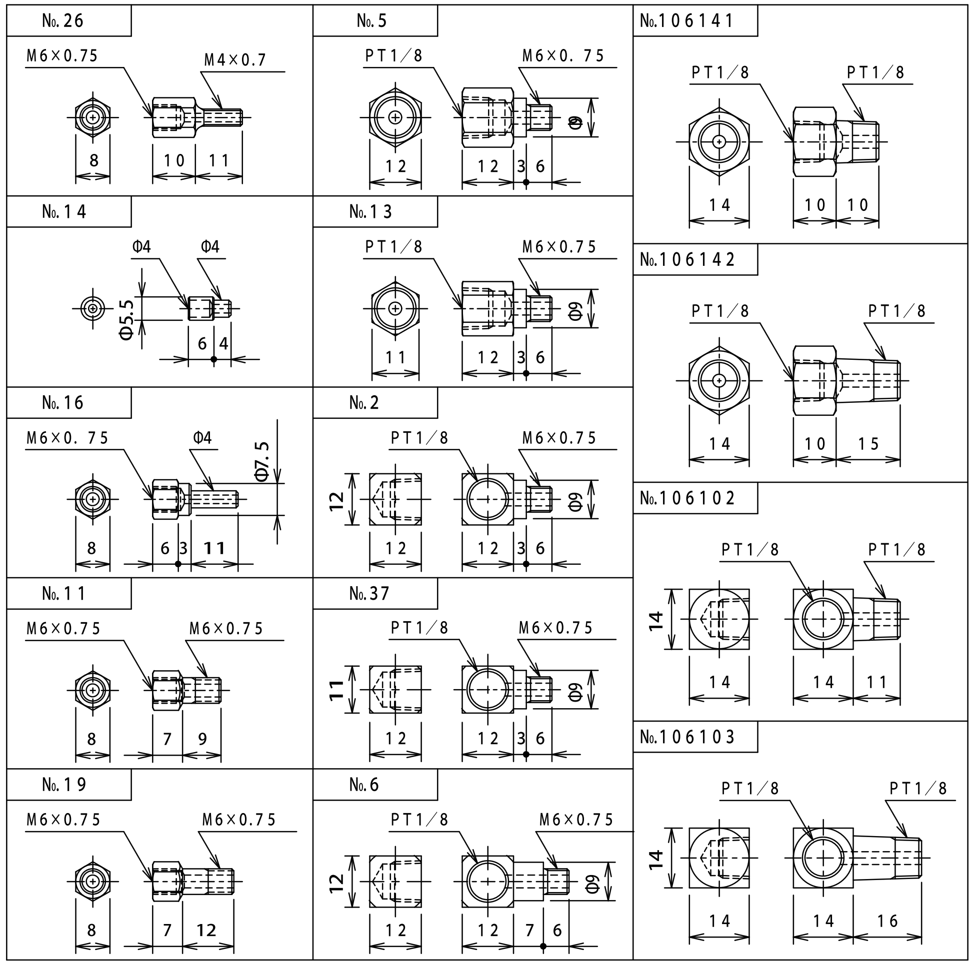


Fig. 46 Piping joint

(2) Supply amount of grease

The lithium soap base grease is recommended to general applications.

Please use grease with the EP additive when the particularly heavy load is applied.

The replenishment interval is every six months or every 100km of travel.

Please replenish the volume shown in Table 28 as a standard amount when the grease is started to be drained from slide unit.

Table 28 Volume of grease replenishment

Unit: cm^3

Type No.	Volume
H15EA	
H15EB	0.55 ~ 0.8
H15ER	
H15TA	
H15TB	0.7 ~ 1.0
H15TR	
U15ER	0.55 ~ 0.8
U15SER	0.55 ~ 0.55
H20EA	
H20EB	1.1 ~ 1.7
H20ER	
H20TA	1.5 ~ 2.2
H20TB	
U20ER	1.1 ~ 1.7
U20SER	0.7 ~ 1.1
H25EA	
H25EB	1.9 ~ 2.8
H25ER	
H25LEA	
H25LEB	2.6 ~ 3.9
H25LER	
H25TA	
H25TB	2.2 ~ 3.2
H25TR	
U25ER	1.9 ~ 2.8
U25SER	1.2 ~ 1.8
H30EA	
H30EB	3.0 ~ 4.4
H30ER	
H30LEA	
H30LEB	4.0 ~ 6.0
H30LER	
H30TA	
H30TB	3.2 ~ 4.7
H30TR	

Type No.	Volume
U30ER	3.0 ~ 4.4
U30SER	2.0 ~ 3.0
H55EA	
H55EB	4.5 ~ 6.8
H55ER	
H55LEA	
H55LEB	6.0 ~ 9.0
H55LER	
H55TA	
H55TB	5.1 ~ 7.7
H55TR	
U55ER	4.5 ~ 6.8
U55SER	3.1 ~ 4.6
H55EA	
H55EB	9.0 ~ 14.0
H55ER	
H55LEA	
H55LEB	11.0 ~ 17.0
H55LER	
H55TA	
H55TB	10.0 ~ 15.0
H55TR	
U55ER	9.0 ~ 14.0
H55EA	
H55EB	15.0 ~ 23.0
H55ER	
H55LEA	
H55LEB	19.0 ~ 29.0
H55LER	
H55TA	
H55TB	17.0 ~ 27.0
H55TR	
U55ER	15.0 ~ 23.0

Type No.	Volume
H65EA	
H65EB	29.0 ~ 44.0
H65ER	
H65LEA	
H65LEB	40.0 ~ 60.0
H65LER	
H65TA	
H65TB	33.0 ~ 50.0
H65TR	
N15TR	0.35 ~ 0.5
N20TR	0.85 ~ 1.3
N25TR	1.6 ~ 2.4
N30TR	2.6 ~ 3.8
N40TR	5.6 ~ 8.4
N50TR	9.6 ~ 14.0
K7TR	0.05 ~ 0.1
K9TR	0.15 ~ 0.2
K12TR	0.2 ~ 0.35
M10TW	0.15 ~ 0.25
M15TW	0.35 ~ 0.5
M15TC	
M25TW	1.1 ~ 1.7
M25TC	
M35TW	2.5 ~ 3.7
M35TC	
M40TW	3.6 ~ 5.3
M40TC	
M45TW	5.3 ~ 7.9
M45TC	
M55TW	8.6 ~ 13.0
M55TC	
M65TW	16.0 ~ 24.0
M65TC	

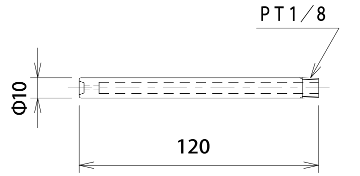
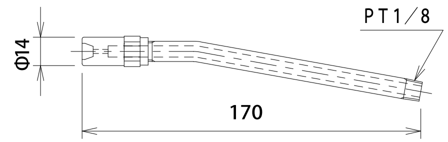
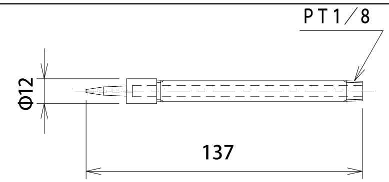
(3) Nozzle for grease nipple

Table 29 shows the typical nozzle used when replenish the grease to the standard grease nipple attached on the slide unit end surface.

Please use the HSP-1 type nozzle when the CNP-2 type nozzle interferes top of the rail or bottom of the table.

Please spread the lubricating grease directly on the rail for the K-TR type that has no grease nipple.

Table 29 Nozzle for refueling

Type No.	Outline dimensions	Applicable grease nipple
HSP-1		B-M6F B-PT1/8 PB1021B
CNP-2		B-M6F B-PT1/8
HSP-3		NAS516-1A

In case of M series, the oil hole from the grease nipple installed in the table as shown in Fig. 47 is connected with the oil hole at the center of the top face of the slide unit.

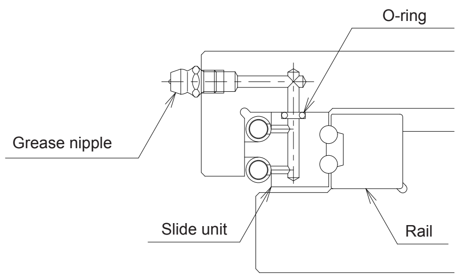


Fig. 47 Greasing method of M series

Please insert O-ring, attached to the slide unit, to this counter bored hole, and prevent oil leakage. The counter bored hole for O-ring is provided in a mouth of an oil hole of the slide unit.

The type of attached O-ring is shown in Table 30.

Table 30 O-ring No.

Type No.	O-ring No.
M10TW	C00500A
M15TW,M15TC	
M25TW,M25TC	C00501A
M35TW,M35TC	C00401A
M40TW,M40TC	C00404A
M45TW,M45TC	
M55TW,M55TC	C00406A
M65TW,M65TC	

20. Dustproof

(1) Double seals

As the easiest method of dustproof of the slide unit, the application of double seals is available shown in Figure 48. Table 31 shows the total length of the double seals type slide unit.

(2) Scraper

In the same manner as double seals, the scraper is mounted outside of a standard seal to remove relatively big chip or the welding sputtering etc.

The scraper is a steel plate that has shape with a little clearance for the rail, and works well for the foreign matter that cannot be removed with a standard rubber seal.

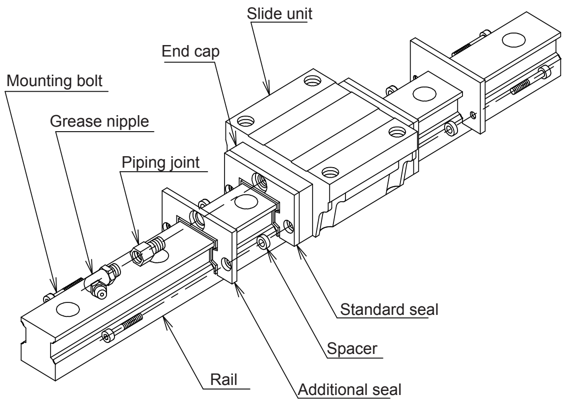


Fig. 48 Double seals assembly drawing

Table 31 The total length of slide with double seal

Unit: mm

Type No.	Total Length
H15EA	
H15EB	67
H15ER	
H20EA	
H20EB	81
H20ER	
H25EA	
H25EB	92
H25ER	
H25LEA	
H25LEB	116
H25LER	
H30EA	
H30EB	105
H30ER	
H30LEA	
H30LEB	131
H30LER	
H35EA	
H35EB	123
H35ER	

Type No.	Total Length
H35LEA	
H35LEB	152
H35LER	
H45EA	
H45EB	151
H45ER	
H45LEA	
H45LEB	179
H45LER	
H55EA	
H55EB	172
H55ER	
H55LEA	
H55LEB	204
H55LER	
H65EA	
H65EB	200
H65ER	
H65LEA	
H65LEB	259
H65LER	

Type No.	Total Length
H15TA	79
H15TB	
H15TR	78
H20TA	99
H20TB	
H25TA	
H25TB	105
H25TR	
H30TA	119
H30TB	
H30TR	110
H35TA	
H35TB	136
H35TR	
H45TA	
H45TB	167
H45TR	
H55TA	
H55TB	199
H55TR	
H65TA	
H65TB	235
H65TR	

Type No.	Total Length
U15ER	67
U15SER	53
U20ER	81
U20SER	61
U25ER	92
U25SER	69
U30ER	105
U30SER	81
U35ER	123
U35SER	95
U45ER	151
U55ER	172
N15TR	72
N20TR	96
N25TR	109
N30TR	125
N40TR	149
N50TR	170

(3) Bellows

When the Ball Ways are used in atmosphere with a large amount of foreign matter and powder dust, these dusts are piled up in the slide unit. So it may cause the damage of the Ball Ways by defective lubrication.

The bellows are recommended to prevent these problem easily.

The bellows are available for H, U, and N series Ball Ways, and the dimension tables are shown in Table 32 to 33.

The special bellows are the end bellows and the middle bellows, and the extension attachments are installed in the position in which the grease nipple is fixed.

Because the bellows are made of the polyurethane rubber as a standard material, these have a

property with high expansion/contraction ratio and a property of excellent toughness.

Available designs are only eight bellow models of nominal number JS15 to JS65 for the bellows body, and uses it in combination to various slide units. The rail mounting plate, the slide unit mounting plate, and the extension metal fittings use different size for an individual slide unit type.

Therefore, please contact us with the slide unit type No..

It is possible to manage by using the material and the middle plate, etc. for the inverted hanging or for high temperature application. Please contact us with details of special condition.

According to the type No. of the slide unit, the top of the bellows may be higher than the top surface of the slide unit. Please consult us for any inconvenience.

Minimum required length of the bellows and rails of the Ball Ways with the bellows can be calculated by the following equation based on necessary stroke, slide unit type No., and the center-to-center distance of the multiple slide units .

$$L_{min} = \frac{S_t}{L_{max}/L_{min} - 1}$$

$$L_{max} = L_{min} + S_t$$

$$L = A + B_L + L_{min} \times 2 + S_t$$

Here,

A : The center-to-center distance of the slide units (mm).

B_L: The total length of slide unit with mounting plate (mm) Refer to Table 32 to 33.

L_{min}: The minimum length of the bellows (mm)

L_{max}: The maximum length of the bellows (mm)

S_t: Stroke (mm)

L_{max}/L_{min}: Maximum stretch ratio of bellows

Refer to Table 32 to 33

In case of the middle bellows used in non-expansion, please set the length of the bellows equal to L_{max} or little shorter.

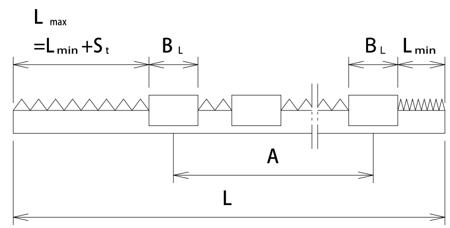


Fig. 49 Bellows length and the rail length

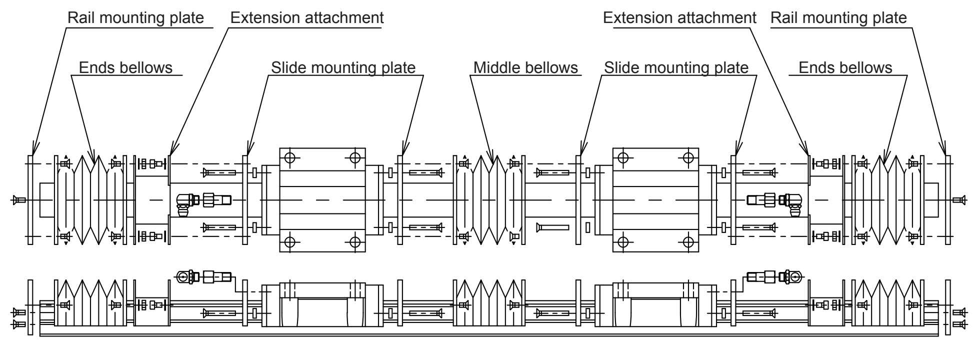


Fig. 50 Bellows assembly

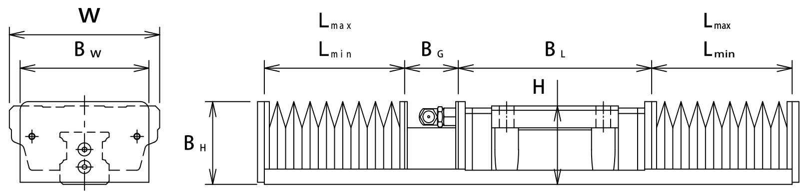


Fig. 51 Bellows assembly dimensions

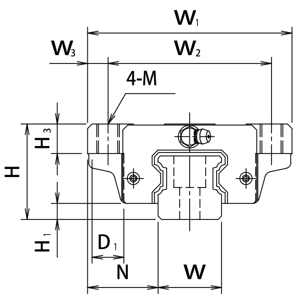
Table 32 Bellows dimensions

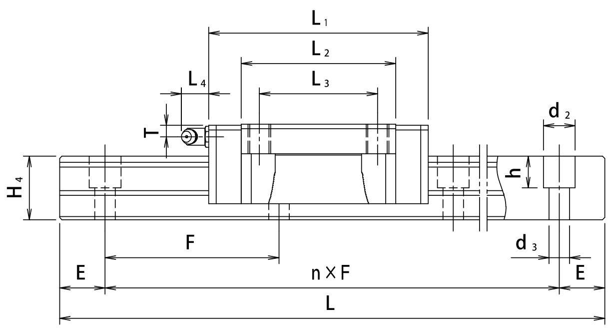
Nominal No.	Applicable Ball Ways	B_W mm	B_H mm	B_G mm	B_L mm	L_{max} /L_{min} Max stretch ratio	W mm	H mm
JS15	H15EA，H15EB	47	29	–	66	7.0	47	24
	H15ER	47	29	–	66	7.0	34	28
	H15TA	47	29	–	79	7.0	47	24
	H15TB	47	29	–	79	7.0	60	24
	H15TR	47	29	25	75	7.0	48	28
	U15ER	47	29	–	66	7.0	34	24
	U15SER	47	29	–	52	7.0	34	24
	N15TR	47	30	–	69	7.0	46	27
JS20	H20EA，H20EB	60	35	–	79	8.7	63	30
	H20ER	60	35	–	79	8.7	44	30
	H20TA	60	35	–	97	8.7	63	30
	U20ER	60	35	–	97	8.7	79	30
	U20ER	60	33.5	–	79	8.7	42	28
	U20SER	60	33.5	–	59	8.7	42	28
JS25	H25EA，H25EB	60	38	25	90	8.7	70	36
	H25ER	60	38	25	90	8.7	48	40
	H25LEA，H25LEB	60	38	25	114	8.7	70	36
	H25LER	60	38	25	114	8.7	48	40
	H25TA	60	38	25	102	8.7	70	36
	H25TB	60	38	25	102	8.7	89	36
	H25TR	60	38	25	100	8.7	66	40
	U25ER	60	35.5	25	90	8.7	48	33
	U25SER	60	35.5	25	67	8.7	48	33
	N20TR	60	39	25	93	8.7	62	37
JS30	H30EA，H30EB	67	43	25	103	9.7	90	42
	H30ER	67	43	25	103	9.7	60	45
	H30LEA，H39LEB	67	43	25	129	9.7	90	42
	H30LER	67	43	25	129	9.7	60	45
	H30TA	67	43	25	115	9.7	90	42
	H30TB	67	43	25	115	9.7	112	42
	H30TR	67	43	25	104	9.7	81	45
	U30ER	67	43	25	103	9.7	60	42
	U30SER	67	43	25	79	9.7	60	42
	N25TR	67	47	25	104	9.7	75	45

Table 33 Bellows dimensions

Nominal No.	Applicable Ball Ways	B_W mm	B_H mm	B_G mm	B_L mm	L_{max} /L_{min} Max stretch ratio	W mm	H mm
JS35	H35EA，H35EB	75	48	25	119	10.5	100	48
	H35ER	75	48	25	119	10.5	70	55
	H35LEA，H35LEB	75	48	25	148	10.5	100	48
	H35LER	75	48	25	148	10.5	70	55
	H35TA	75	48	25	131	10.5	100	48
	H35TB	75	48	25	131	10.5	123	48
	H35TR	75	48	25	131	10.5	92	55
	U35ER	75	48	25	119	10.5	70	48
	U35SER	75	48	25	91	10.5	70	48
	N30TR	75	53	25	116	10.5	88	55
JS45	H45EA，H45EB	90	60	40	141	12.2	120	60
	H45ER	90	60	40	141	12.2	86	70
	H45LEA，H45LEB	90	60	40	169	12.2	120	60
	H45LER	90	60	40	169	12.2	86	70
	H45TA	90	60	25	156	12.2	120	60
	H45TB	90	60	25	156	12.2	147	60
	H45TR	90	60	25	156	12.2	112	70
	U45ER	90	60	40	141	12.2	86	60
	N40TR	90	66	25	138	12.2	109	70
JS55	H55EA，H55EB	105	70	40	162	14.0	140	70
	H55ER	105	70	40	162	14.0	100	80
	H55LEA，H55LEB	105	70	40	193	14.0	140	70
	H55LER	105	70	40	193	14.0	100	80
	H55TA	105	70	40	186	14.0	140	70
	H55TB	105	70	40	186	14.0	171	70
	H55TR	105	70	40	186	14.0	130	80
	U55ER	105	68	40	161	14.0	100	68
	N50TR	105	71	40	157	16.8	127	80
JS65	H65EA，H65EB	125	83	40	189	16.8	170	85
	H65ER	125	83	40	189	16.8	126	90
	H65LEA，H65LEB	125	83	40	248	16.8	170	85
	H65LER	125	83	40	248	16.8	126	90
	H65TA	125	83	40	222	16.8	170	85
	H65TB	125	83	40	222	16.8	207	85
	H65TR	125	83	40	222	16.8	162	90

H-EA/H-LEA type





Type No.	Assembly dimensions (mm)			Slide unit dimensions (mm)											
	Height		Width	Width	Pitch		Length		Pitch		Mounting hole		Grease nipple		
	H	H_1	N	W_1	W_2	W_3	L_1	L_2	L_3	H_3	M×Depth	D_1	Type	T	L_4
H15EA	24	4.6	16	47	38	4.5	59	38.5	30	7	M5×7	7.5	NAS516-1A	3.5	0
H20EA	30	5	21.5	63	53	5	73	50	40	8	M6×9	10	NAS516-1A	5	0
H25EA H25LEA	36	6.5	23.5	70	57	6.5	84 108	59 83	45	10	M8×10	11	B-M6F	6	12
H30EA H30LEA	42	7	31	90	72	9	97 123	68 94	52	13	M10×13	14	B-M6F	5.5	12
H35EA H35LEA	48	8	33	100	82	9	113 142	80 109	62	13	M10×13	14	B-M6F	7.5	12
H45EA H45LEA	60	11	37.5	120	100	10	140 168	102 130	80	15	M12×15	18	B-PT1/8	8.5	16
H55EA H55LEA	70	14	43.5	140	116	12	160 192	124 156	95	17	M14×17	20	B-PT1/8	10	16
H65EA H65LEA	85	14	53.5	170	142	14	189 248	143 207	110	20	M16×20	23	B-PT1/8	13	16

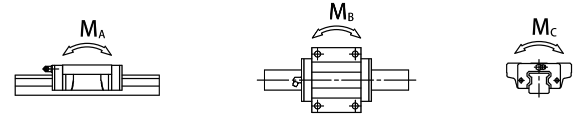
Note: Slide unit can be mounted by the one size smaller bolt from the bottom by using the preload hole of the tapped hole.

Type H30EA B2 T1 – 2000 C5 W2 –123 /AFB

- Nominal Type No
- Numbers of slide units used on the same rail B1= 1 slide, B2= 2 slides ...
- Preload symbol Select from T ~ T3
- Total length of rail
- Accuracy symbol Select from C001 ~ C7
- Numbers of rails used on the same plane W1= 1 rail, W2= 2 rails ...
- Special symbol
  1. Special work is needed for the rail
  2. Special work is needed for the slide unit
  3. Special specification except from above 1and 2
- Supplymentary symbol
  A. Joint specification with the multiple rails
  F. Plug for the rail mounting hole
  B. Attaching the bellows

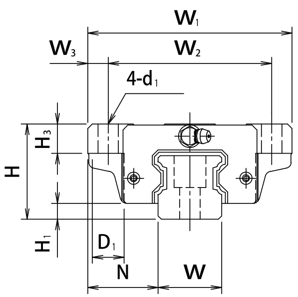
In case of special and supplymentary symbol is not necessary, it's not expressed in [ ],
Please refer to page C4 for the designation of a single rail or a single slide unit

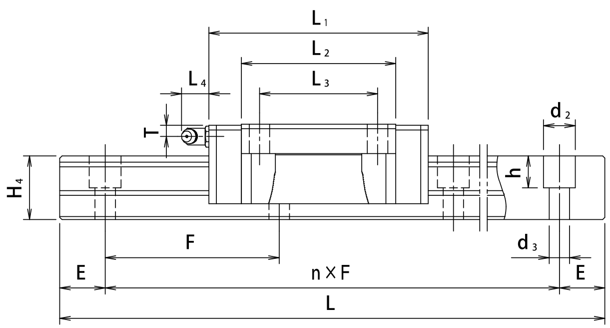
Rail dimensions (mm)							Basic rated dynamic load		Static load	Static moment		Mass	
Width	Height	Mounting hole			Recommendation	Pitch	C_{50}	C_{100}	C_0	$M_A.M_B$	M_C	Slide unit	Rail
W	H_4	d_2	d_3	h	E	F	(N)	(N)	(N)	(N · m)	(N · m)	(kg)	(kg/m)
15	17	7.5	4.5	7	20	60	8816	6997	17020	117	180	0.19	1.7
20	21	9.5	6	11	20	60	14210	11280	26590	229	367	0.36	2.8
23	24	11	7	11	20	60	20950 26730	16630 21220	38290 54240	395 775	614 871	0.64 0.9	3.6
28	28	14	9	14	20	80	29100 36530	23100 28280	52110 69480	627 1094	1003 1337	1.1 1.5	5.1
34	32	14	9	14	20	80	38730 49350	30740 39170	68060 96420	936 1837	1576 2232	1.6 2.4	7.3
45	42	20	14	21	22.5	105	62380 76180	49510 60460	106300 141800	1829 3189	3201 4268	2.7 3.7	12.6
53	48	23	16	24	30	120	97120 112400	77090 89210	165900 204200	3687 5510	5873 7228	5.0 6.7	17.1
63	58	26	18	25	35	150	148000 188800	117500 149800	239300 339000	6173 12110	10280 14560	10.0 15.0	24.6



Ball way

H-EB / H-LEB type





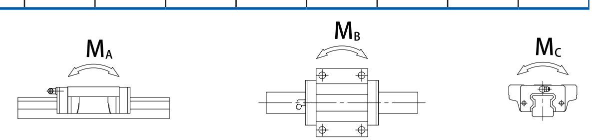
Type H30EB B2 T1 – 2000 C5 W2 –123 /AFB

- Nominal Type No
- Numbers of slide units used on the same rail B1= 1 slide, B2= 2 slides ...
- Preload symbol Select from T ~ T3
- Total length of rail
- Accuracy symbol Select from C001 ~ C7
- Numbers of rails used on the same plane W1= 1 rail, W2= 2 rails ...
- Special symbol
  1. Special work is needed for the rail
  2. Special work is needed for the slide unit
  3. Special specification except from above 1and 2
- Supplymentary symbol
  - A. Joint specification with the multiple rails
  - F. Plug for the rail mounting hole
  - B. Attaching the bellows

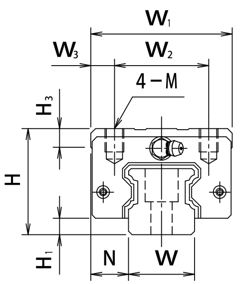
In case of special and supplymentary symbol is not necessary, it's not expressed in [dotted box],
Please refer to page C4 for the designation of a single rail or a single slide unit

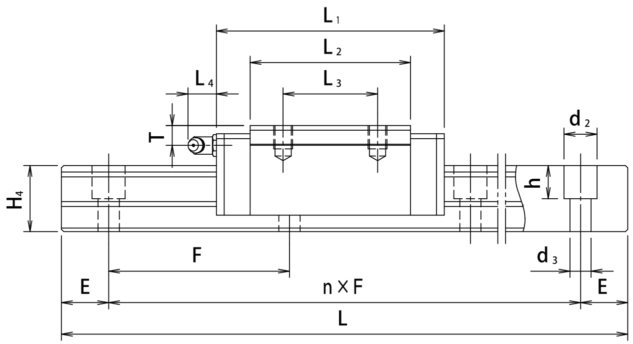
Type No.	Assembly dimensions (mm)			Slide unit dimensions (mm)											
	Height		Width	Width	Pitch		Length		Pitch		Mounting hole		Grease nipple		
	H	H_1	N	W_1	W_2	W_3	L_1	L_2	L_3	H_3	d_1×Depth	D_1	Type	T	L_4
H15EB	24	4.6	16	47	38	4.5	59	38.5	30	7	4.5×7	7.5	NAS516-1A	3.5	0
H20EB	30	5	21.5	63	53	5	73	50	40	8	6×9	10	NAS516-1A	5	0
H25EB H25LEB	36	6.5	23.5	70	57	6.5	84 108	59 83	45	10	7×10	11	B-M6F	6	12
H30EB H30LEB	42	7	31	90	72	9	97 123	68 94	52	13	9×13	14	B-M6F	5.5	12
H35EB H35LEB	48	8	33	100	82	9	113 142	80 109	62	13	9×13	14	B-M6F	7.5	12
H45EB H45LEB	60	11	37.5	120	100	10	140 168	102 130	80	15	11×15	18	B-PT1/8	8.5	16
H55EB H55LEB	70	14	43.5	140	116	12	160 192	124 156	95	17	14×17	20	B-PT1/8	10	16
H65EB H65LEB	85	14	53.5	170	142	14	189 248	148 207	110	20	16×20	23	B-PT1/8	13	16

Rail dimensions (mm)							Basic rated dynamic load		Static load	Static moment		Mass	
Width	Height	Mounting hole			Recommendation	Pitch	C_{50}	C_{100}	C_0	M_A.M_B	M_C	Slide unit	Rail
W	H_4	d_2	d_3	h	E	F	(N)	(N)	(N)	(N · m)	(N · m)	(kg)	(kg/m)
15	17	7.5	4.5	7	20	60	8816	6997	17020	117	180	0.19	1.7
20	21	9.5	6	11	20	60	14210	11280	26590	229	367	0.36	2.8
23	24	11	7	11	20	60	20950 26730	16630 21220	38290 54240	395 775	614 871	0.64 0.90	3.6
28	28	14	9	14	20	80	29100 35630	23100 28280	52110 69480	627 1094	1003 1337	1.1 1.5	5.1
34	32	14	9	15	20	80	38730 49350	30740 39170	68060 96420	936 1837	1576 2232	1.6 2.4	7.3
45	42	20	14	21	22.5	105	62380 76180	49510 60460	106300 141800	1829 3189	3201 4268	2.7 3.7	12.6
53	48	23	16	24	30	120	97120 112400	77090 89210	165900 204200	3687 5510	5873 7228	5.0 6.7	17.1
63	58	26	18	25	35	150	148000 188800	117500 149800	239300 339000	6173 12110	10280 14560	10.0 15.0	24.6



H-ER / H-LER type





Type No.	Assembly dimensions (mm)			Slide unit dimensions (mm)										
	Height		Width	Width	Pitch		Length		Pitch		Mounting hole	Grease nipple		
	H	H_1	N	W_1	W_2	W_3	L_1	L_2	L_3	H_3	M×Depth	Type	T	L_4
H15ER	28	4.6	9.5	34	26	4	59	38.5	26	6	M4×5	NAS516-1A	7.5	0
H20ER	30	5	12	44	32	6	73	50	36	8	M5×6	NAS516-1A	5	0
H25ER	40	6.5	12.5	48	35	6.5	84	59	35	8	M6×8	B-M6F	10	12
H25LER							108	83	50					
H30ER	45	7	16	60	40	10	97	68	40	8	M8×10	B-M6F	8.5	12
H30LER							123	94	60					
H35ER	55	8	18	70	50	10	113	80	50	10	M8×12	B-M6F	14.5	12
H35LER							142	109	72					
H45ER	70	11	20.5	86	60	13	140	102	60	15	M10×17	B-PT1/8	18.5	16
H45LER							168	130	80					
H55ER	80	14	23.5	100	75	12.5	160	124	75	18	M12×18	B-PT1/8	20	16
H55LER							192	156	95					
H65ER	90	14	31.5	126	90	18	189	148	70	23	M16×20	B-PT1/8	18	16
H65LER							248	207	120					

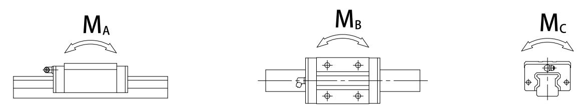
Type H30ER B2 T1 − 2000 C5 W2 −123 /AFB

- **H30ER** — Nominal Type No
- **B2** — Numbers of slide units used on the same rail; B1= 1 slide, B2= 2 slides ...
- **T1** — Preload symbol: Select from T ~ T3
- **2000** — Total length of rail
- **C5** — Accuracy symbol: Select from C001 ~ C7
- **W2** — Numbers of rails used on the same plane: W1= 1 rail, W2= 2 rails ...
- **−123** — Special symbol:
  1. Special work is needed for the rail
  2. Special work is needed for the slide unit
  3. Special specification except from above 1and 2
- **/AFB** — Supplymentary symbol:
  - A. Joint specification with the multiple rails
  - F. Plug for the rail mounting hole
  - B. Attaching the bellows

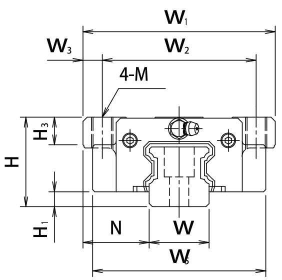
In case of special and supplymentary symbol is not necessary, it's not expressed in [dotted box],

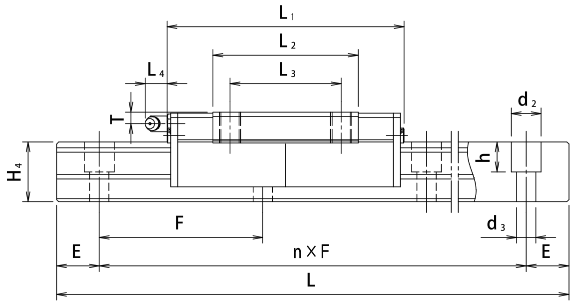
Please refer to page C4 for the designation of a single rail or a single slide unit

Rail dimensions (mm)							Basic rated dynamic load		Static load	Static moment		Mass	
Width	Height	Mounting hole			Recommendation	Pitch	C_{50}	C_{100}	C_0	M_A.M_B	M_C	Slide unit	Rail
W	H_4	d_2	d_3	h	E	F	(N)	(N)	(N)	(N · m)	(N · m)	(kg)	(kg/m)
15	17	7.5	4.5	7	20	60	8816	6997	17020	117	180	0.20	1.7
20	21	9.5	6	11	20	60	14210	11280	26590	229	367	0.29	2.8
23	24	11	7	11	20	60	20950	16630	38290	395	614	0.52	3.6
							26730	21220	54240	775	871	0.77	
28	28	14	9	14	20	80	29100	23100	52110	627	1003	0.85	5.1
							35630	28280	69480	1094	1337	1.2	
34	32	14	9	14	20	80	38730	30740	68060	936	1576	1.5	7.3
							49350	39170	96420	1837	2232	2.0	
45	42	20	14	21	22.5	105	62380	49510	106300	1829	3201	2.8	12.6
							76180	60460	141800	3189	4268	3.6	
53	48	23	16	24	30	120	97120	77090	165900	3687	5873	4.4	17.1
							112400	89210	204200	5510	7228	6.0	
63	58	26	18	25	35	150	148000	117500	239300	6173	10280	7.9	24.6
							188800	149800	339000	12110	14560	12.0	



H-TA type





Type **H30TA** **B2** **T1** − **2000** **C5** **W2** −**123** **/AFB**

Nominal Type No

Numbers of slide units used on the same rail
B1= 1 slide, B2= 2 slides ...

Preload symbol Select from T ～ T3

Total length of rail

Accuracy symbol Select from C001 ～ C7

Numbers of rails used on the same plane W1= 1 rail, W2= 2 rails ...

Special symbol 1. Special work is needed for the rail
2. Special work is needed for the slide unit
3. Special specification except from above 1and 2

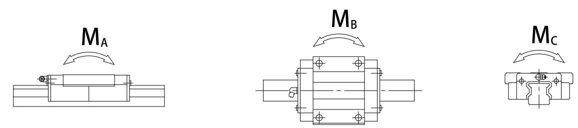
Supplymentary symbol A. Joint specification with the multiple rails
F. Plug for the rail mounting hole
B. Attaching the bellows

In case of special and supplymentary symbol is not necessary, it's not expressed in ⬚,
Please refer to page C4 for the designation of a single rail or a single slide unit

Type No.	Assembly dimensions (mm)			Slide unit dimensions (mm)											
	Height		Width	Width	Pitch			Length		Pitch		Mounting hole	Grease nipple		
	H	H_1	N	W_1	W_2	W_3	W_5	L_1	L_2	L_3	H_3	M×Depth	Type	T	L_4
H15TA	24	4.6	16	47	38	4.5	46.5	72	41	30	7	M5×7	NAS516-1A	3	0
H20TA	30	5	21.5	63	53	5	60	92	58	40	8	M6×10	NAS516-1A	4.5	0
H25TA	36	6.5	23.5	70	57	6.5	66	98	59	45	10	M8×12	B-M6F	5.5	10
H30TA	42	7	31	90	72	9	81	112	68	52	13	M10×14	B-M6F	5.5	10
H35TA	48	8	33	100	82	9	92	129	80	62	13	M10×16	B-M6F	6	10
H45TA	60	11	37.5	120	100	10	112	159	102	80	15	M12×19	B-M6F	7	12
H55TA	70	14	43.5	140	116	12	130	191	124	95	17	M14×23	B-PT1/8	10	12
H65TA	85	14	53.5	170	142	14	162	227	148	110	20	M16×29	B-PT1/8	13	12
H65TAH	90										25	M16×34			

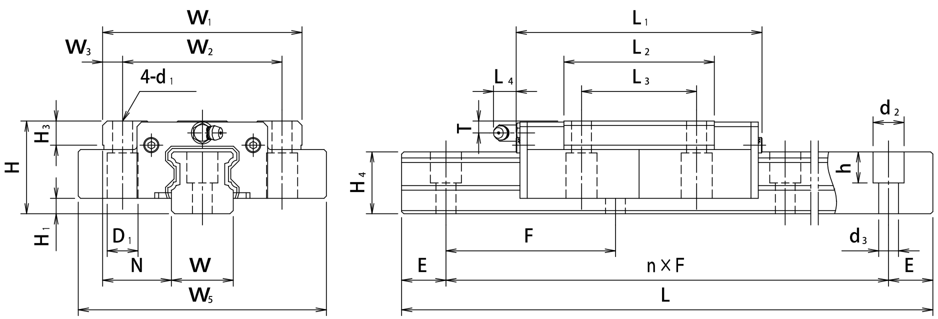
Note: Please do not exceed the screw depth of the mounting hole when the mounting bolt is screwed into the slide unit.

Rail dimensions (mm)							Basic rated dynamic load		Static load	Static moment		Mass	
Width	Height	Mounting hole			Recommendation	Pitch	C_{50}	C_{100}	C_0	$M_A.M_B$	M_C	Slide unit	Rail
W	H_4	d_2	d_3	h	E	F	(N)	(N)	(N)	(N · m)	(N · m)	(kg)	(kg/m)
15	17	7.5	4.5	7	20	60	8834	7012	17020	117	180	0.22	1.7
20	21	9.5	6	11	20	60	15820	12560	31020	308	428	0.48	2.8
23	24	11	7	11	20	60	20950	16630	38290	395	614	0.68	3.6
28	28	14	9	14	20	80	29100	23100	52110	627	1003	1.2	5.1
34	32	14	9	14	20	80	38730	30740	68060	936	1576	1.8	7.3
45	42	20	14	21	22.5	105	62380	49510	106300	1829	3201	3.2	12.6
53	48	23	16	24	30	120	97120	77090	165900	3687	5873	5.1	17.1
63	58	26	18	25	35	150	148000	117500	239300	6173	10280	9.6 10.6	24.6



Ball way

H-TB type



Type **H30TB** **B2** **T1** – **2000** **C5** **W2** **–123** **/AFB**

- Nominal Type No (H30TB)
- Numbers of slide units used on the same rail: B1= 1 slide, B2= 2 slides ... (B2)
- Preload symbol: Select from T ~ T3 (T1)
- Total length of rail (2000)
- Accuracy symbol: Select from C001 ~ C7 (C5)
- Numbers of rails used on the same plane: W1= 1 rail, W2= 2 rails ... (W2)
- Special symbol (–123)
  1. Special work is needed for the rail
  2. Special work is needed for the slide unit
  3. Special specification except from above 1and 2
- Supplymentary symbol (/AFB)
  - A. Joint specification with the multiple rails
  - F. Plug for the rail mounting hole
  - B. Attaching the bellows

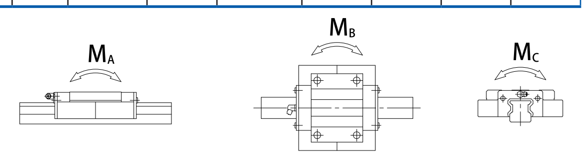
In case of special and supplymentary symbol is not necessary, it's not expressed in [ ],

Please refer to page C4 for the designation of a single rail or a single slide unit

Type No.	Assembly dimensions (mm)			Slide unit dimensions (mm)												
	Height		Width	Width	Pitch			Length		Pitch		Mounting hole		Grease nipple		
	H	H_1	N	W_1	W_2	W_3	W_5	L_1	L_2	L_3	H_3	d_1×Depth	D_1	Type	T	L_4
H15TB	24	4.6	16	47	38	4.5	60	72	41	30	5	4.5×7.5	8	NAS516-1A	3	0
H20TB	30	5	21.5	63	53	5	79	92	58	40	8	6×10	10	NAS516-1A	4.5	0
H25TB	36	6.5	23.5	70	57	6.5	89	98	59	45	10	7×12.5	11	B-M6F	5.5	10
H30TB	42	7	31	90	72	9	112	112	68	52	11	9×14.5	14	B-M6F	5.5	10
H35TB	48	8	33	100	82	9	123	129	80	62	13	9×16.5	14	B-M6F	6	10
H45TB	60	11	37.5	120	100	10	147	159	102	80	15	11×20	18	B-M6F	7	12
H55TB	70	14	43.5	140	116	12	171	191	124	95	17	14×23.5	20	B-PT1/8	10	12
H65TB	85	14	53.5	170	142	14	207	227	148	110	20	16×29.5	24	B-PT1/8	13	12

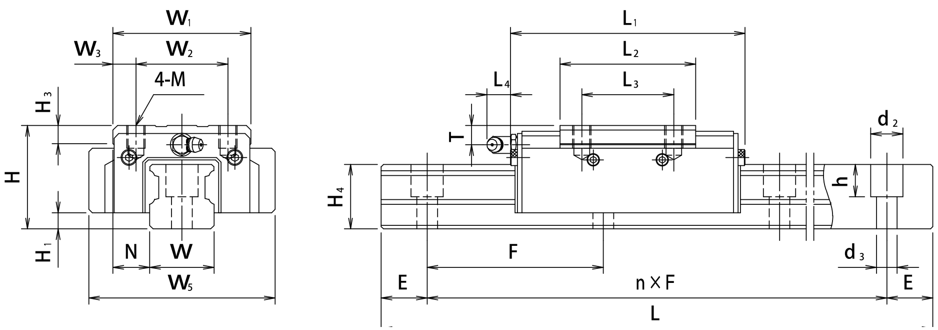
Note: Please pay attention that the width of the tube cover (W_5) is wider than the width of the slide unit W_1.

Rail dimensions (mm)							Basic rated dynamic load		Static load	Static moment		Mass	
Width	Height	Mounting hole			Recommendation	Pitch	C_{50}	C_{100}	C_0	$M_A.M_B$	M_C	Slide unit	Rail
W	H_4	d_2	d_3	h	E	F	(N)	(N)	(N)	(N · m)	(N · m)	(kg)	(kg/m)
15	17	7.5	4.5	7	20	60	8834	7012	17020	117	180	0.26	1.7
20	21	9.5	6	11	20	60	15820	12560	31020	308	428	0.60	2.8
23	24	11	7	11	20	60	20950	16630	38290	395	614	0.82	3.6
28	28	14	9	14	20	80	29100	23100	52110	627	1003	1.5	5.1
34	32	14	9	15	20	80	38730	30740	68060	936	1576	2.2	7.3
45	42	20	14	21	22.5	105	62380	49510	106300	1829	3201	3.9	12.6
53	48	23	16	24	30	120	97120	77090	165900	3687	5873	6.1	17.1
63	58	26	18	25	35	150	148000	117500	239300	6173	10280	11.3	24.6



Ball way

H-TR type



Type **H30TR B2 T1 – 2000 C5 W2 –123 /AFB**

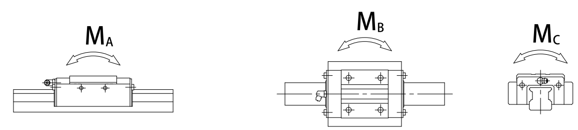
- Nominal Type No
- Numbers of slide units used on the same rail
  B1= 1 slide, B2= 2 slides ...
- Preload symbol Select from T ～ T3
- Total length of rail
- Accuracy symbol Select from C001 ～ C7
- Numbers of rails used on the same plane W1= 1 rail, W2= 2 rails ...
- Special symbol 1. Special work is needed for the rail
  2. Special work is needed for the slide unit
  3. Special specification except from above 1and 2
- Supplymentary symbol A. Joint specification with the multiple rails
  F. Plug for the rail mounting hole
  B. Attaching the bellows

In case of special and supplymentary symbol is not necessary, it's not expressed in [dotted box],
Please refer to page C4 for the designation of a single rail or a single slide unit

Type No.	Assembly dimensions (mm)			Slide unit dimensions (mm)											
	Height		Width	Width	Pitch			Length		Pitch		Mounting hole	Grease nipple		
	H	H_1	N	W_1	W_2	W_3	W_5	L_1	L_2	L_3	H_3	M×Depth	Type	T	L_4
H15TR	28	4.6	9.5	34	26	4	48	71	41	26	6	M4×5	PB1021B	5	3
H25TR	40	6.5	12.5	48	35	6.5	66	98	59	35	8	M6×8	B-M6F	9.5	10
H30TR	45	7	16	60	40	10	81	103	59	40	8	M8×10	B-M6F	8.5	10
H35TR	55	8	18	70	50	10	92	129	80	50	10	M8×12	B-M6F	13	10
H45TR	70	11	20.5	86	60	13	112	159	102	60	15	M10×17	B-M6F	17	12
H55TR	80	14	23.5	100	75	12.5	130	191	124	75	18	M12×18	B-PT1/8	20	12
H65TR	90	14	31.5	126	90	18	162	227	148	70	23	M16×20	B-PT1/8	18	12

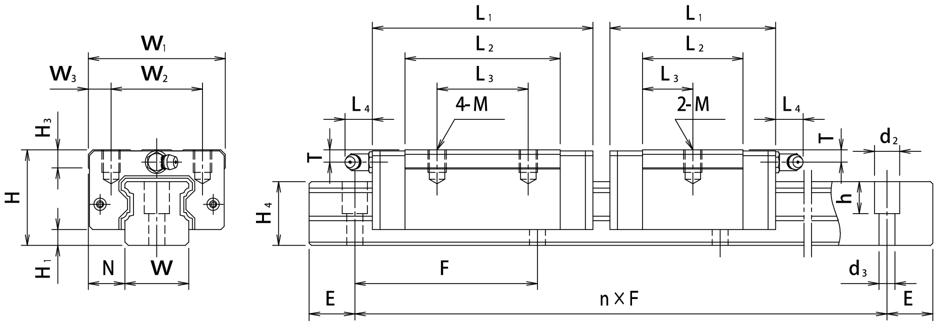
Rail dimensions (mm)							Basic rated dynamic load		Static load	Static moment		Mass	
Width	Height	Mounting hole			Recommendation	Pitch	C_{50}	C_{100}	C_0	$M_A.M_B$	M_C	Slide unit	Rail
W	H_4	d_2	d_3	h	E	F	(N)	(N)	(N)	(N · m)	(N · m)	(kg)	(kg/m)
15	17	7.5	4.5	7	20	60	8834	7012	17020	117	180	0.22	1.7
23	24	11	7	11	20	60	20950	16630	38290	395	614	0.67	3.6
28	28	14	9	14	20	80	25650	20360	43430	442	836	0.98	5.1
34	32	14	9	14	20	80	38730	30740	68060	936	1576	1.9	7.3
45	42	20	14	21	22.5	105	62380	49510	106300	1829	3201	3.4	12.6
53	48	23	16	24	30	120	97120	77090	165900	3687	5873	5.0	17.1
63	58	26	18	25	35	150	148000	117500	239300	6173	10280	8.9	24.6

Note: Please pay attention that the width of the tube cover W_5 is wider than the width of the slide unit (W_1).



Ball way

U-ER / U-SER type



Type **U30ER** **B2** **T1** − **2000** **C5** **W2** −**123** **/AFB**

Nominal Type No

Numbers of slide units used on the same rail
B1= 1 slide, B2= 2 slides ...

Preload symbol Select from T ～ T3

Total length of rail

Accuracy symbol Select from C001 ～ C7

Numbers of rails used on the same plane W1= 1 rail, W2= 2 rails ...

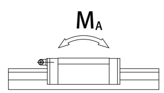
Special symbol
1. Special work is needed for the rail
2. Special work is needed for the slide unit
3. Special specification except from above 1and 2

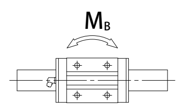
Supplymentary symbol
A. Joint specification with the multiple rails
F. Plug for the rail mounting hole
B. Attaching the bellows

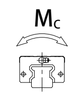
In case of special and supplymentary symbol is not necessary, it's not expressed in ⬚,
Please refer to page C4 for the designation of a single rail or a single slide unit

Type No.	Assembly dimensions (mm)			Slide unit dimensions (mm)										
	Height		Width	Width	Pitch		Length		Pitch		Mounting hole	Grease nipple		
	H	H_1	N	W_1	W_2	W_3	L_1	L_2	L_3	H_3	M×Depth	Type	T	L_4
U15ER U(H)15ER	24	4.6	9.5	34	26	4	59	38.5	26	6	M4×5	NAS516-1A	3.5	0
U15SER U(H)15SER	24	4.6	9.5	34	26	4	46	25	-	6	M4×5	NAS516-1A	3.5	0
U20ER U20SER	28	4	11	42	32	5	73 53	50 30	32 -	7.5	M5×7	NAS516-1A	4	0
U25ER U25SER	33	4	12.5	48	35	6.5	84 61	59 36	35 -	8	M6×8	B-M6F	5.5	12
U30ER U30SER	42	7	16	60	40	10	97 73	68 44	40 -	8	M8×10	B-M6F	5.5	12
U35ER U35SER	48	8	18	70	50	10	113 85	80 52	50 -	10	M8×12	B-M6F	7.5	12
U45ER	60	11	20.5	86	60	13	140	102	60	15	M10×16	B-PT1/8	8.5	14
U55ER	68	12	26	100	75	12.5	160	124	75	18	M12×18	B-PT1/8	10	14

Rail dimensions (mm)							Basic rated dynamic load		Static load	Static moment		Mass	
Width	Height	Mounting hole			Recommendation	Pitch	C_{50}	C_{100}	C_0	$M_A.M_B$	M_C	Slide unit	Rail
W	H_4	d_2	d_3	h	E	F	(N)	(N)	(N)	(N · m)	(N · m)	(kg)	(kg/m)
15	17	6 7.5	3.5 4.5	9 7	20	60	8816	6997	17020	117	180	0.16	1.7
15	17	6 7.5	3.5 4.5	9 7	20	60	6067	4815	9926	42	105	0.11	1.7
20	19.5	9.5	6	11	20	60	14210 9752	11280 7740	26590 15510	229 82	367 214	0.26 0.18	2.5
23	21.5	11	7	11	20	60	20950 14390	16630 11420	38290 22330	395 142	614 358	0.47 0.29	3.2
28	28	11	7	14	20	80	29100 20020	23100 15890	52110 30400	627 225	1003 585	0.78 0.53	5.2
34	32	14	9	14	20	80	38730 29130	30740 23120	68060 45380	936 432	1576 1050	1.2 0.84	7.3
45	42	17.5	11	20.5	22.5	105	62380	49510	106300	1829	3201	2.2	12.8
48	46	20	14	25	30	120	97120	77090	165900	3687	5873	4.3	14.7

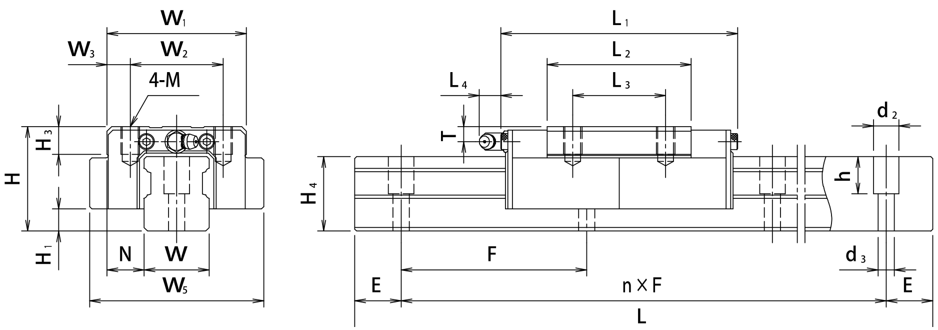






Ball way

N-TR type



Type No.	Assembly dimensions (mm)			Slide unit dimensions (mm)											
	Height		Width	Width	Pitch			Length		Pitch		Mounting hole	Grease nipple		
	H	H_1	N	W_1	W_2	W_3	W_5	L_1	L_2	L_3	H_3	M×Depth	Type	T	L_4
N15TR	27	5	9.5	34	26	4	46	65	36	26	8	M4×7	NAS516-1A	4	0
N20TR	37	8	12.5	48	35	6.5	62	89	54	35	12	M6×10	PB1021B	6	3
N25TR	45	9.5	16	60	40	10	75	103	62	40	12	M8×12	B-M6F	6.5	10
N30TR	55	13	18	70	50	10	88	117	71	50	16	M8×12	B-M6F	10	10
N40TR	70	17	20.5	86	60	13	109	141	88	60	18	M10×14	B-M6F	13	10
N50TR	80	13	26	100	75	12.5	127	162	97	75	21.5	M12×17	B-PT1/8	19	10

Note: Please pay attention that the width of the tube cover (W_5) is wider than the width of the slide unit (W_1).

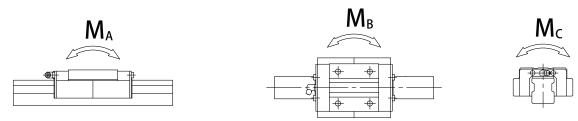
Type N25TR B2 T1 – 2000 C5 W2 –123 /AFB

- Nominal Type No
- Numbers of slide units used on the same rail B1= 1 slide, B2= 2 slides ...
- Preload symbol Select from T ~ T3
- Total length of rail
- Accuracy symbol Select from C001 ~ C7
- Numbers of rails used on the same plane W1= 1 rail, W2= 2 rails ...
- Special symbol
  1. Special work is needed for the rail
  2. Special work is needed for the slide unit
  3. Special specification except from above 1and 2
- Supplymentary symbol
  - A. Joint specification with the multiple rails
  - F. Plug for the rail mounting hole
  - B. Attaching the bellows

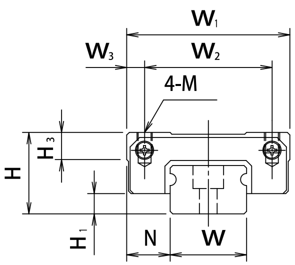
In case of special and supplymentary symbol is not necessary, it's not expressed in [dotted box],

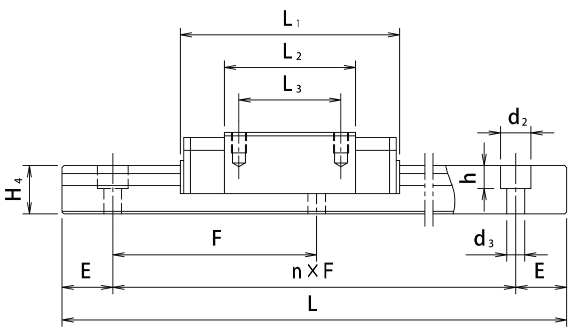
Please refer to page C4 for the designation of a single rail or a single slide unit

Rail dimensions (mm)							Basic rated dynamic load		Static load	Static moment		Mass	
Width	Height	Mounting hole			Recommendation	Pitch	C_{50}	C_{100}	C_0	$M_A.M_B$	M_C	Slide unit	Rail
W	H_4	d_2	d_3	h	E	F	(N)	(N)	(N)	(N · m)	(N · m)	(kg)	(kg/m)
15	18	6	3.5	9	20	60	5578	4428	11960	76	126	0.19	1.8
23	25	9.5	6	13	20	60	11250	8926	24110	230	377	0.48	3.9
28	32	11	7	16	20	80	16610	13180	33230	352	631	0.82	6.3
34	37	11	7	16	20	80	23360	18540	44670	532	1012	1.3	8.9
45	48	14	9	23	22.5	105	40980	32530	73730	1092	2205	3.0	15.3
48	49	17.5	11	24	30	120	62270	49430	106300	1829	3440	4.3	16.2



MB-ER type





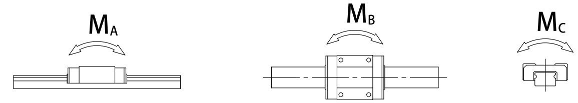
Type MB15ER B2 T0 – 430 C5 W2 –123 /A

- Nominal Type No
- Numbers of slide units used on the same rail: B1= 1 slide, B2= 2 slides ...
- Preload symbol: T0 only
- Total length of rail
- Accuracy symbol: C5 only
- Numbers of rails used on the same plane: W1= 1 rail, W2= 2 rails ...
- Special symbol:
  1. Special work is needed for the rail
  2. Special work is needed for the slide unit
  3. Special specification except from above 1and 2
- Supplymentary symbol: A. Joint specification with the multiple rails

In case of special and supplymentary symbol is not necessary, it's not expressed in [dotted box]

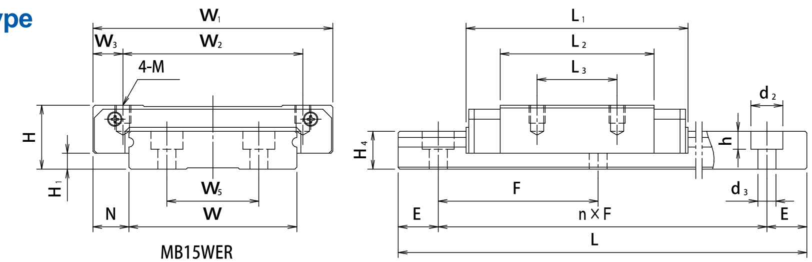
Type No.	Assembly dimensions (mm)			Slide unit dimensions (mm)							
	Height H	H_1	Width N	Width W_1	Pitch W_2	W_3	Length L_1	L_2	Pitch L_3	H_3	Mounting hole M×Depth
MB7ER	8	1.5	5	17	12	2.5	23.5	13.5	8	-	M2×2.5
MB9ER	10	2.2	5.5	20	15	2.5	31	20.0	10	-	M3×3
MB12ER	13	3	7.5	27	20	3.5	35	20.8	15	-	M3×3.5
MB15ER	16	4	8.5	32	25	3.5	43	25.7	20	-	M3×4
MB20ER	25	7.5	13	46	38	4	66.5	45.0	38	6	M4×6

Rail dimensions (mm)							Basic rated dynamic load		Static load	Static moment			Mass	
Width W	Height H_4	Mounting hole d_2	Mounting hole d_3	Mounting hole h	Recommendation E	Pitch F	C_{50} (N)	C_{100} (N)	C_0 (N)	M_A (N·m)	M_B (N·m)	M_C (N·m)	Slide unit (kg)	Rail (kg/m)
7	4.7	4.2	2.4	2.3	5	15	880	698	1370	2.55	2.55	5.10	0.02	0.23
9	5.5	6	3.5	3.3	7.5	20	1470	1170	2250	5.10	5.10	10.4	0.02	0.32
12	7.5	6	3.5	4.5	10	25	2650	2100	4020	8.04	8.72	14.7	0.04	0.58
15	9.5	6	3.5	4.5	15	40	4410	3500	6570	16.5	17.9	30.2	0.07	0.93
20	15	9.5	6	8.5	20	60	8820	7000	12700	48.8	52.7	75.7	0.25	1.95

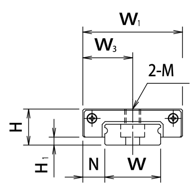


Ball way

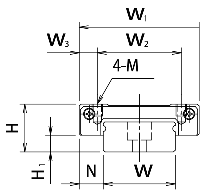
MB-WER type



MB15WER



MB7WER



MB9WER/MB12WER

Type No.	Assembly dimensions (mm)			Slide unit dimensions (mm)						
	Height H	H_1	Width N	Width W_1	Pitch W_2	W_3	Length L_1	L_2	Pitch L_3	Mounting hole M×Depth
MB7WER	9	2	5.5	25	-	12.5	31	21.5	12	M4×3.5
MB9WER	12	4.2	6	30	21	4.5	39	28	12	M2.6×3
MB12WER	14	4	8	40	28	6	44.5	30.5	15	M3×3.5
MB15WER	16	4	9	60	45	7.5	55.5	38.5	20	M4×4.5

Type MB15WER B2 T0 − 430 C5 W2 −123 /A

Nominal Type No

Numbers of slide units used on the same rail
B1= 1 slide, B2= 2 slides ...

Preload symbol T0 only

Total length of rail

Accuracy symbol C5 only

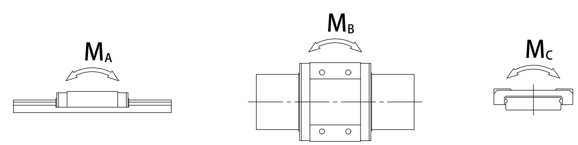
Numbers of rails used on the same plane W1= 1 rail, W2= 2 rails ...

Special symbol
1. Special work is needed for the rail
2. Special work is needed for the slide unit
3. Special specification except from above 1and 2

Supplymentary symbol A. Joint specification with the multiple rails

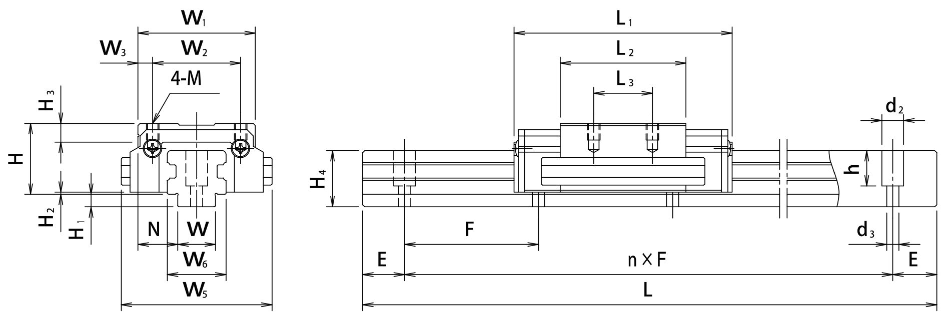
In case of special and supplymentary symbol is not necessary, it's not expressed in

Rail dimensions (mm)								Basic rated dynamic load		Static load	Static moment			Mass	
Width		Height	Mounting hole			Recommendation	Pitch	C_{50}	C_{100}	C_0	M_A	M_B	M_C	Slide unit	Rail
W	W_5	H_4	d_2	d_3	h	E	F	(N)	(N)	(N)	(N·m)	(N·m)	(N·m)	(kg)	(kg/m)
14	-	5.2	6	3.5	3.2	10	30	1370	1090	2160	5.39	5.39	15.2	0.03	0.51
18	-	7.5	6	3.5	4.5	10	30	2450	1940	3920	16.3	16.3	36.0	0.04	1.08
24	-	8.5	8	4.5	4.5	15	40	4020	3190	6080	17.2	18.6	47.6	0.08	1.50
42	23	9.5	8	4.5	4.5	15	40	6660	5290	9800	35.2	38.2	137	0.17	3.00



Ball way

K-TR type



Type K9TR B2 T1 − 340 C5 W2 −123 /AF

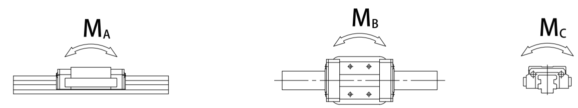
- Nominal Type No
- Numbers of slide units used on the same rail
  B1= 1 slide, B2= 2 slides ...
- Preload symbol   Select fromT-T3
- Total length of rail
- Accuracy symbol   Slect from C001-C7
- Numbers of rails used on the same plane W1= 1 rail, W2= 2 rails ...
- Special symbol   1. Special work is needed for the rail
  2. Special work is needed for the slide unit
  3. Special specification except from above 1and 2
- Supplymentary symbol   A. Joint specification with the multiple rails
  F. Plug for the rail mounting hole

In case of special and supplymentary symbol is not necessary, it's not expressed in [dotted box]

Type No.	Assembly dimensions (mm)				Slide unit dimensions (mm)								
	Height H	H_1	H_2	Width N	Width W_1	Pitch W_2	W_3	W_5	Length L_1	L_2	Pitch L_3	H_3	Mounting hole M×Depth
K7TR	15	3	0.5	9	25	18	3.5	32	46	26	10	4	M3×4
K9TR	17	3	0.5	9.5	28	21	3.5	36	52	30	14	4.5	M3×4
K12TR	19	3	0.5	10	32	25	3.5	41	58	34	16	5	M3×4

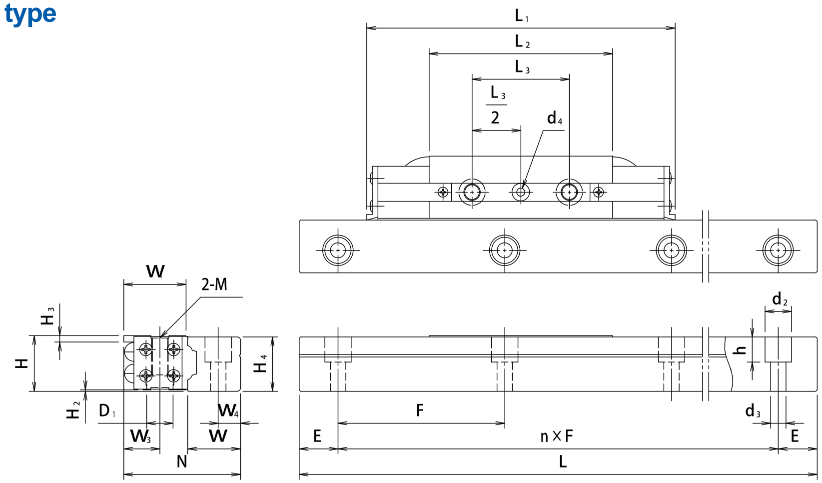
Note: Please pay attention that the width of the tube cover (W_5) is wider than the width of the slide unit (W_1).

Rail dimensions (mm)								Basic rated dynamic load		Static load	Static moment		Mass	
Width		Height	Mounting hole			Recommendation	Pitch	C_{50}	C_{100}	C_0	$M_A.M_B$	M_C	Slide unit	Rail
Wh8	W_6	H_4	d_2	d_3	h	E	F	(N)	(N)	(N)	(N · m)	(N · m)	(kg)	(kg/m)
7	12	12.5	4.4	2.4	7.5	8	32	1638	1300	4254	19	31	0.06	0.95
9	14	13.5	5.2	2.9	8.5	8	32	2672	2121	6381	32	55	0.08	1.2
12	17	14.5	6.5	3.4	9.5	12.5	50	4196	3330	9565	57	99	0.11	1.6



Ball way

M-TW type



Type No.	Assembly dimensions (mm)			Slide unit dimensions (mm)								
	Height		Width	Width		Length		Pitch		Mounting hole	Pitch	Oil hole
	H	H_2	N	W_1	W_3	L_1	L_2	L_3	H_3	M×Depth	D_1	d_4
M10TW	11	0.2	23	11.7	7	69	37	15	1.8	M3×8	5	2
M15TW	15	0.5	30	16.6	10	81	44	20	2.2	M4×11	6.5	2
M25TW	20	0.5	42	22.4	13	111	66	35	2.3	M6×14	9.5	3
M35TW	25	0.5	55	29.1	16	141	83	45	2.4	M8×18	11	3
M40TW	30	0.5	65	35	19	156	92	50	4.0	M10×21	14	4
M45TW	35	0.5	75	39.9	21.5	180	110	60	5.1	M12×24	17.5	4
M55TW	40	0.5	85	45.6	24	207	126	70	5.8	M14×26	20	4
M65TW	50	0.5	105	55.3	30	240	148	85	7.2	M16×34	23	5

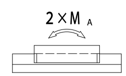
Note: Slide unit can be mounted by one size smaller bolt from the bottom by using the prepared hole of the tapped hole.

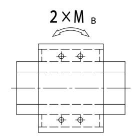
Type M25TW B2 − 900 C5 W2 −123 /AF

- Nominal Type No — M25TW
- Numbers of slide units used on the same rail B1= 1 slide, B2= 2 slides ... — B2
- Total length of rail — 900
- Accuracy symbol Slect from C001-C7 — C5
- Numbers of rails used on the same plane W2 only — W2
- Special symbol — −123
  1. Special work is needed for the rail
  2. Special work is needed for the slide unit
  3. Special specification except from above 1and 2
- Supplymentary symbol — /AF
  - A. Joint specification with the multiple rails
  - F. Plug for the rail mounting hole

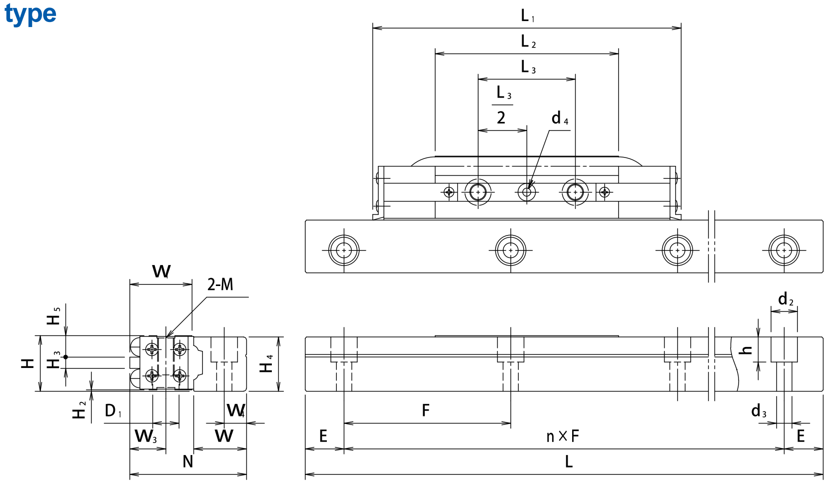
In case of special and supplymentary symbol is not necessary, it's not expressed in [dotted box]

Rail dimensions (mm)								Basic rated dynamic load		Static load	Static moment	Mass	
Width		Height	Mounting hole			Recommendation	Pitch	C_{50}	C_{100}	C_0	$M_A.M_B$	Slide unit	Rail
W	W_4	H_4	d_2	d_3	h	E	F	(N)	(N)	(N)	(N · m)	(kg)	(kg/m)
11	5	10.8	6	3.4	5	15	40	2792	2216	5982	38	0.04	0.82
13	6	14.5	6	3.4	5	20	60	4670	3707	9217	68	0.07	1.3
19	8	19.5	9.5	5.5	9	20	60	11090	8803	20740	230	0.23	2.5
25	10	24.5	14	9	12	20	80	20450	16230	36870	546	0.46	4.1
29	12	29.5	14	9	12	20	80	24910	19770	43070	667	0.76	5.9
34	14.5	34.5	17.5	11	16	22.5	105	32980	26180	57610	1067	1.1	8.1
38	16	39.5	20	14	19	30	120	48590	38560	82950	1844	1.8	10.3
48	20	49.5	26	18	24	35	150	73990	58730	119600	3086	2.9	16.2





M-TC type



Type No.	Assembly dimensions (mm)			Slide unit dimensions (mm)									
	Height H	H_2	Width N	Width W_1	W_3	Length L_1	L_2	Pitch L_3	H_3	H_5	Mounting hole M×Depth	D_1	Oil hole d_4
M15TC	15	0.5	30	16.6	10	81	44	20	3	5.8	M4×11	6.5	2
M25TC	20	0.5	42	22.4	13	111	66	35	4	7.8	M6×14	9.5	3
M35TC	25	0.5	55	29.1	16	141	83	45	5	9.8	M8×18	11	3
M40TC	30	0.5	65	35	19	156	92	50	8	10.8	M10×21	14	4
M45TC	35	0.5	75	39.9	21.5	180	110	60	9	12.8	M12×24	17.5	4
M55TC	40	0.5	85	45.6	24	207	126	70	11	14.3	M14×26	20	4
M65TC	50	0.5	105	55.3	30	240	148	85	13	18.3	M16×34	23	5

Note: Slide unit can be mounted by one size smaller bolt from the bottom by using the prepared hole of the tapped hole.

Type M25TC B2 — 900 C5 W2 —123 /AF

Nominal Type No

Numbers of slide units used on the same rail
B1= 1 slide, B2= 2 slides ...

Total length of rail

Accuracy symbol Slect from C001-C7

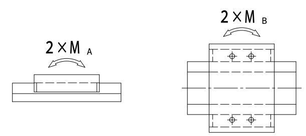
Numbers of rails used on the same plane W2 only

Special symbol 1. Special work is needed for the rail
2. Special work is needed for the slide unit
3. Special specification except from above 1and 2

Supplymentary symbol A. Joint specification with the multiple rails
F. Plug for the rail mounting hole

In case of special and supplymentary symbol is not necessary, it's not expressed in [dotted box]

Rail dimensions (mm)								Basic rated dynamic load		Static load	Static moment	Mass	
Width W	W_4	Height H_4	Mounting hole d_2	d_3	h	Recommendation E	Pitch F	C_{50} (N)	C_{100} (N)	C_0 (N)	$M_A.M_B$ (N · m)	Slide unit (kg)	Rail (kg/m)
13	6	14.5	6	3.4	5	20	60	4670	3707	9217	68	0.07	1.3
19	8	19.5	9.5	5.5	9	20	60	11090	8803	20740	230	0.23	2.5
25	10	24.5	14	9	12	20	80	20450	16230	36870	546	0.46	4.1
29	12	29.5	14	9	12	20	80	24910	19770	43070	667	0.76	5.9
34	14.5	34.5	17.5	11	16	22.5	105	32980	26180	57610	1067	1.1	8.1
38	16	39.5	20	14	19	30	120	48590	38560	82950	1844	1.8	10.3
48	20	49.5	26	18	24	35	150	73990	58730	119600	3086	2.9	16.2



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