YIGONG CHINA

National industrialization base of rolling function machine parts

Customer satisfied company

Customer satisfied products

China Famous Trademark

High performance Hign rigidity Qualitative flight

"Roller" as the rolling part

CHINA NANJING TECHNICAL EQUIPMENT MANUFACTURE CO., LTD.

Edition of 2014

Innovation-driven Scientific-development

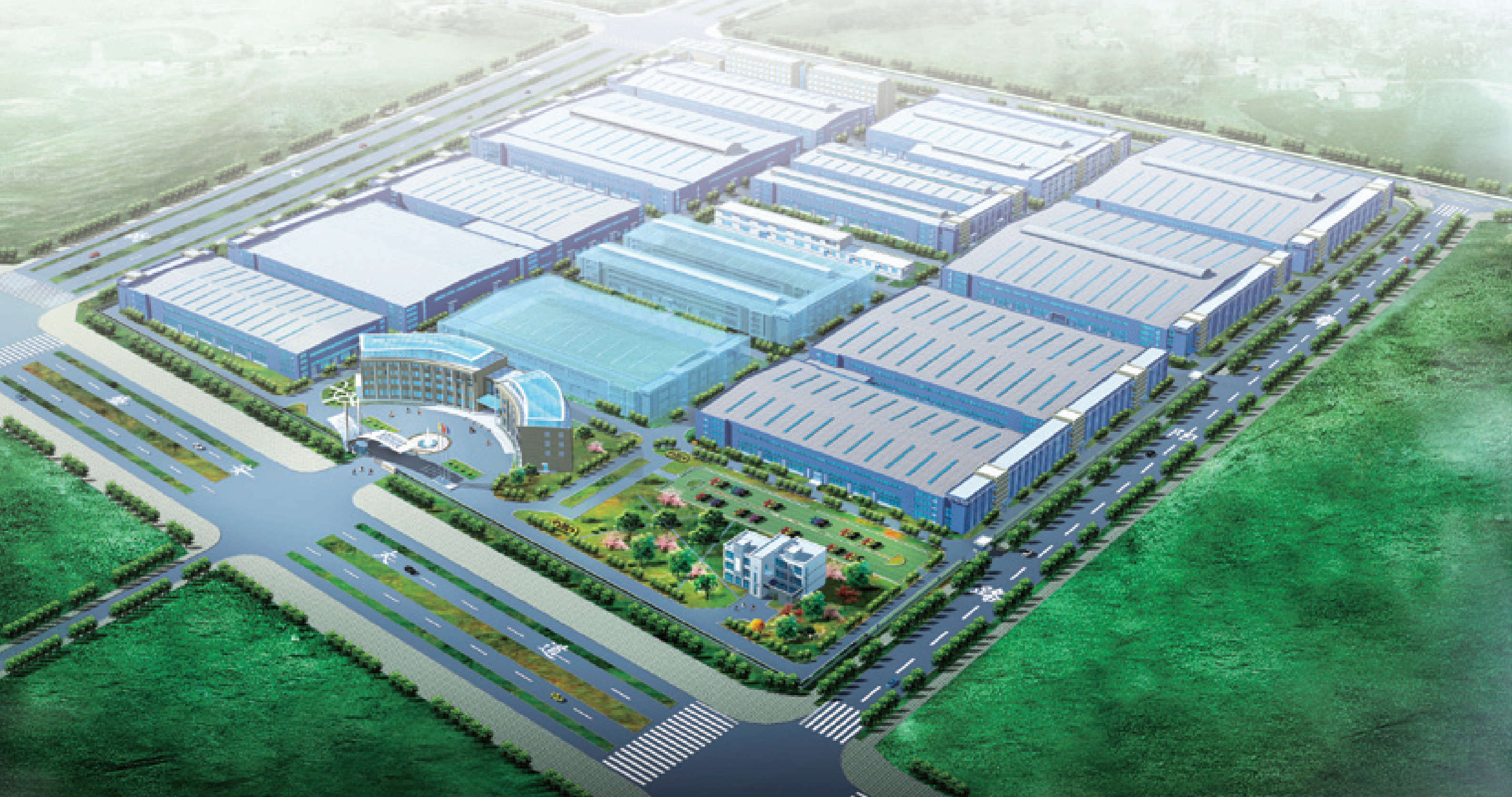
Take the tenet of scientific development, after decades of hard struggle, Nanjing Technical Equipment Manufacture Co., Ltd. exploits the development ways with innovative ideas, constantly enhances the core competitiveness and the capability of market service. It has the unique features in "large, high-precision, substitution of imports" with kinds of superiority of technology, equipment, scale, brand, team and etc., It builds the solid foundation of rapid development, adapt to and meet the market. It keeps the domestic leading position and international well-known of rolling function machine parts.

It is guided with "Continuous improvement, Superior management" ideas, manage with GB/T19580 "Criteria for performance excellence". It has passed the ISO9001 quality management system, ISO14001 environmental management system and OHSAS18001 occupational health and safety management system certification, and promotes enterprise basic management to a more scientific and normative direction. It achieved the honors of "Customer Satisfied Product", "Customer Satisfied Company", "Jiangsu Famous Brand", "Jiangsu Quality Award" and etc.; It has also been the China "Research Center of Rolling function machine parts", "Cognizance Technology Center in Jiangsu "," High-tech Enterprises in Jiangsu".

It takes the continuously discovery foresight, tracking and holds the international advanced technology. Research and develop from the roller guide series new products, it achieved from the "Ball" to "roller" high-rigidity, high-performance qualitative leap, greatly improved the load and rigidity, decreased the noise and prolonged the service life with manufacture, application and development of roller products, which upgrade the quality and grade of rolling parts rapidly and meet the huge demand of domestic large numerical control equipments. A number of products gain the national patent products, China Machinery Industry Science and Technology Award and National key new product certificates.

It has a set of international advanced and domestic leading excellent equipments. Imports have 8m, 10m hard whirling CNC machine tools, 2m, 3m, 4m, 5m high precision CNC thread grinding machines, 10m lathe, 10m shaft End Milling Machine, 10m straightening machine, 10m out grinding machine, 10m middle frequency quenching machine, 4m, 10m integrated lead dual-frequency laser measuring instruments, a full set of CNC equipments ensure the entire 10m ball screw and joint with 15m ball screw within 30 days production to deliver. It has 4m, 6m CNC rail grinding machine, 6m CNC plane grinding machine, a number of CNC block/slider precision grinding machine from Germany, 6m middle frequency quenching machine from Germany, integrated measuring instruments for linear guideway. It can offer the 6m, size from 35 to 125 linear guideway within 10-15 days.

The company's core values are "creating value for customers, creating opportunities for staff, creating wealth for society." It will fully implement the development strategy "show characteristics, enter on top, ascend scope, internationalization", adhere to innovation and development, to create the China Top Brand of rolling function parts, dedicated to equip the large, high precision national numerical control equipments and vitalizing the Manufacture Industry of China.



Customer satisfied company

Customer satisfied product

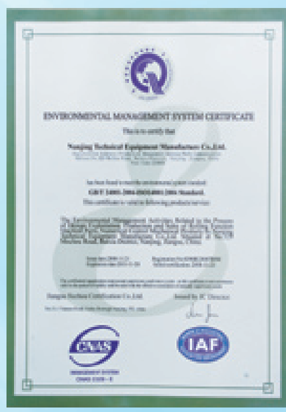
Jiangsu Famous Brand

Certificate of Jiangsu Quality Awards

Jiangsu Famous Trademark

ISO9001:2000

GB/T28001:2001



ISO14001:2004

Excellent Equipment
Quality Guarantee

CNC high-speed hard whirling machine, 10m, Germany

CNC out grinding machine, 10m

Laser measuring instrument,10m

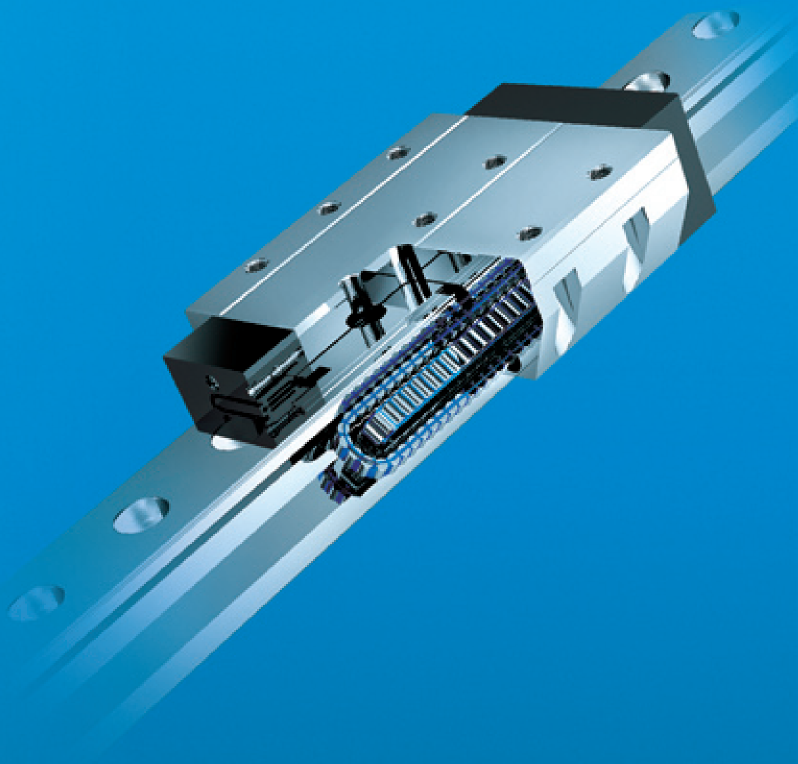
CNC middle frequency quenching machine, 10m

Turning and milling complex machining center for nuts

CNC precision thread grinding machine,2m, Switzerland

CNC nut grinding machine, England

CNC thread grinding machine, 5m



CNC drilling machine, 6m

CNC middle frequency quenching machine, 6m, Germany

CNC rail grinding machine, 4m, Germany

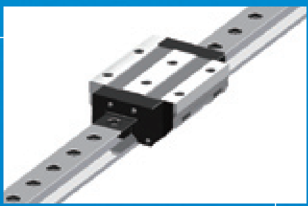
CNC precision plane grinding machine, 6m

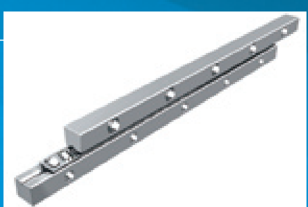
CNC block grinding machine, Germany

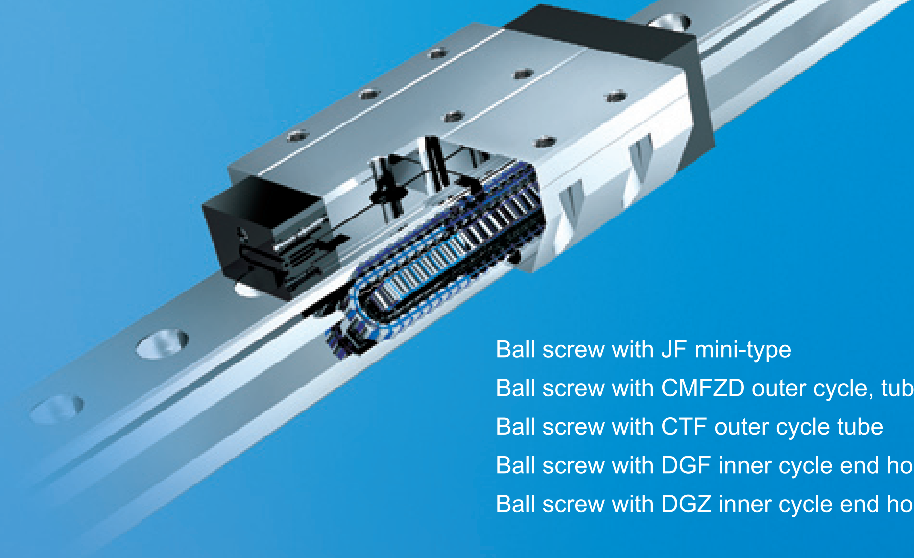
CNC rail grinding machine, 6m

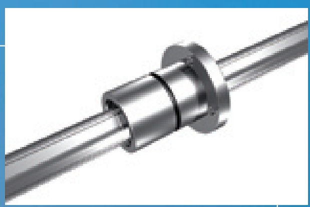
Integrated measuring instrument of LM guide

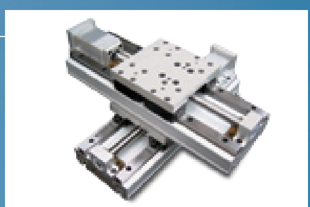
Content

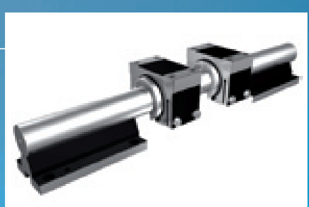












Precision linear guideway

Introduction

Linear guideway is as a kind of precision linear guiding parts, it has been more and more widely used in CNC machinery, automatic production line and etc. because of its heavy-load, high-accuracy, high-speed, low-abrasion, reliability and standardization characteristics.

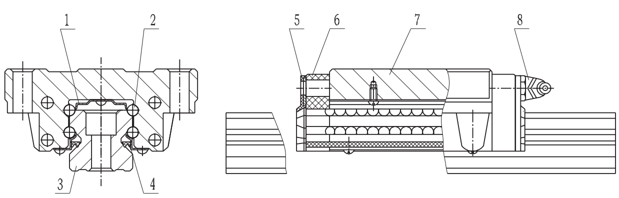
Linear guideway is one of our Yigong main products. After over 20 years production and development, it has GZB, GGB, GGC, GGD, GZD, GZV etc. about hundreds of specs and models products presently. We take self-innovation constantly, improve the technology, upgrade the international market competition, and get patent for roller guide (patent no.ZL200520073585.6) etc. total 14 items. We get five technology improvement awards from Nanjing city, Jiang province and Machinery Association early or late. Roller guide, R-guide, mini guide etc. are as high-tech product of Jiangsu Province and national emphasis new product. After many years' efforts, We have:

- **Large:** Max. rail size 125, max. single length: 6m
- **Heavy load:** mass production of roller guide size 35, 45, 55, 65, 85, 100 and 125, max. single block load capacity is 192 tons
- **High accuracy:** High accuracy, good quality and performance based on many years' advanced production and test technology
- **Short delivery:** within 10-15 days

1. Configuration and feature

● Structure (GGB type)

Linear guideway consists of rail, block, balls, return mechanism, retainer, sealing gasket etc.(see Fig-1). When the block moves in a linear direction relative to the rail, balls run along four raceway grooves which have been quenched and precisely finished. In the top of the block, balls again pass through the return mechanism into reciprocating hole then into raceway repeatedly. The return mechanism has rubber-sealing gasket on both sides to eliminate dust and keep foreign material away.



1. ball retainer	2. ball	3. rail	4. side seal gasket
5. end seal	6. return mechanism	7. block	8. oil cup

Fig-1

2. Advantages

- By placing appropriate balls between rail and block, friction between the block and the rail changes from sliding friction to rolling friction, which greatly reduced the motion friction resistance. Thereby:

a. The difference between dynamic and static friction is small. It benefits to raise response speed and sensibility of CNC system.
b. The driving power is greatly reduced,which is only 1/10 of the general machinery.
c. The friction resistance reduce 40 times compared to V-shape cross roller guide.
d. Suitable for high-speed linear motion, the instantaneous speed is 10 times of than sliding guide.
e. High positioning accuracy and high repetitive positioning accuracy.

- It can achieve no clearance motion, raising the running rigidity of the mechanical system.
- It has error homogenization effect when using in double guideways, which lower the processing accuracy requirements of rail fixing surface and save the cost of manufacture.
- Suitable ratio of radius groove of raceway sectional plane assured that contact force turns small and carrying capacity and rigidity could be also raised greatly. Value of rolling friction is less than that of double-arc raceway.
- Surface hardness process makes guideway good calibration and core part keep good mechanical characters.
- Simplify the design and manufacture of mechanical structure.

3. Accuracy

Because of the error homogenization effect of the linear guideways, when two or more sets of linear guideways are used on the same surface, higher moving accuracy can be attained even using lower mounting accuracy. Normally products quality can be improved by 20%~50%. Accuracy grades are recommended for kinds of machine tools and machinery equipment, see Tab-1

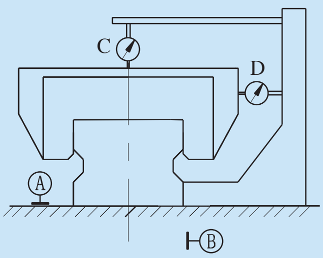
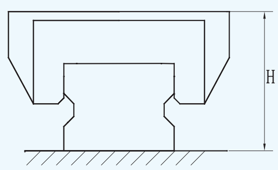
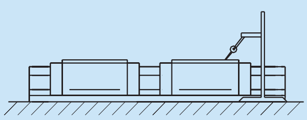
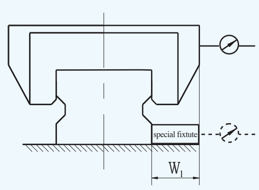
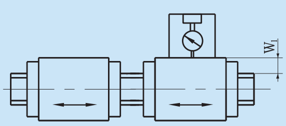
Tab-1

Machine tool and machinery type		Coordinate	Accuracy grade			
			2	3	4	5
NC machine	Lathe machine	x	√	√	√	
		z		√	√	√
	Milling machine, machining center	x, y	√	√	√	
		z		√	√	√
	Coordinate boring machine And grinding machine	x, y	√	√		
		z		√	√	
	Grinding machine	x, y	√	√		
		z	√		√	
	Electrical process machine	x, y	√	√		
		z			√	√
	Precision cutting machine	x, z			√	√
	Graph plotter	x, y		√	√	
	Precision worktable	x, y		√		
General machine		x, y		√		
		z		√	√	
General mechanism					√	√

The accuracy and inspection method of Yigong China is according to machinery industry standard of People's Republic of China JB/T715.4-2006«Rolling linear guide: Acceptance Specification», it's equal to the foreign competitor's standard.

Accuracy grade is classified as six grades: i.e.1, 2, 3, 4, 5 and 6. Grade 1 is the highest accuracy and accuracy grades go down step by step. Testing items and permission tolerance see tab. 2(those shown in the table below indicate GGB type, others refer to GGB)

Tab-2

No.	Testing items	Testing items	Permission Tolerance
1		a Running parallelism of block surface C to surface A; b Running parallelism of block surface D to surface B.	see item 1 tolerance table
2		Dimension tolerance of height H	see item 2 tolerance table
3		Variation of height H	see item 3 tolerance table
4		Dimension tolerance of width W_1 (only apply for ref. rail)	see item 4 tolerance table
5		Variation of width W_1 (only apply for ref.rail)	see item 5 tolerance table

Item 1 – Permission Tolerance

Rail length mm	Accuracy grade µm 1	2	3	4	5	6
≤500	2	4	8	14	20	28
>500-1000	3	6	10	17	25	34
>1000-1500	4	8	13	20	30	40
>1500-2000	5	9	15	22	32	46
>2000-2500	6	11	17	24	34	54
>2500-3000	7	12	18	26	36	62
>3000-3500	8	13	20	28	38	70
>3500-4000	9	15	22	30	40	80
>4000-4500	10	16	23	32	42	85
>4500-5000	11	17	24	33	43	87
>5000-5500	12	18	25	34	44	89
>5500-6000	13	19	26	35	45	92
>6000-6500	14	20	27	36	46	94
>6500-7000	15	21	28	37	47	96
>7000-8000	16	22	29	38	48	98
>8000-9000	17	23	31	39	49	102
>9000-10000	20	26	34	42	52	107

Item 2 – Accuracy grade µm

1	2	3	4	5	6
±5	±12	±25	±50	±100	±200

Item 3 – Accuracy grade µm

1	2	3	4	5	6
3	5	7	20	40	60

Item 4 – Accuracy grade µm

1	2	3	4	5	6
±8	±15	±30	±60	±150	±240

Item 5 – Accuracy grade µm

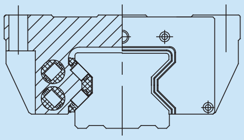
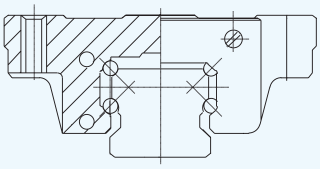
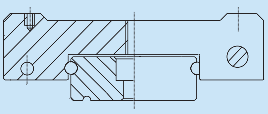
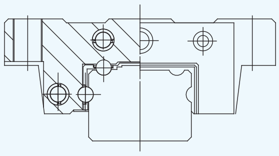
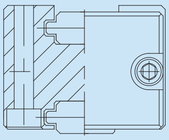
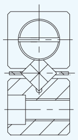
1	2	3	4	5	6
5	7	10	25	70	100

Notes:

1. Because raceway of rail is finished by fixing rail with bolts on a special fixture during the grinding process. Curve will possibly occur in free state. So the rail should be fixed on special table to measure and inspect.
2. When number of blocks exceeds two, testing items of both No.4 and No.5 are unnecessary for middle blocks, but value W1 of middle blocks should be less than that of the both ends.

4. Classification of linear guideway

Tab-3

Sketch	Type	Description	Use	Page
	GZB	Roller guide, four direction equal load	Machining center, NC lathe machine, grinding machine, heavy machine tool	P16~P21
	GGB	Ball guide four direction equal load	Machining center, NC lathe machine, wire spark machine, portage device, wood machinery, laser machine, precision test instrument, packing machine, food machinery, medical machinery, tool grinding machine, plane grinding machine	P22~P29
	GGC	miniature linear guide	Semiconductor industry, medical machinery, optical table, wire spark cutting machine	P30~P31
	GGD	super-load, high-rigidity	Machining center, NC lathe machine, grinding machine	P32~P37
	GZD	precision roller block	Heavy machine, heavy portage device	P38~P40
	GZV	precision cross roller guide	Precision table, test instrument, test device, assembling machine	P41~P45

5. Rated service life of linear guideway

● Calculation of rated service life

Rated service life of linear guideway is defined as the total distance travel for a number of the same linear guideways under the same condition in each motion, which 90% without surface peeling.

The linear guideway is classified into ball and roller type from the rolling element, the rated service life (L) is calculated according to basic rating dynamic load (C) and calculated load (P_C) as following:

● Formula under the application of ball guide

$$L = 50\left(\frac{f_h f_t f_c f_a}{f_w}\cdot\frac{C}{P_c}\right)^3 \quad (km)$$

● Formula under the application of roller guide

$$L = 100\left(\frac{f_h f_t f_c f_a}{f_w}\cdot\frac{C}{P_c}\right)^{\frac{10}{3}} \quad (km)$$

In formula:

L—rated service life
C—dynamic load rating
P_c—calculated load
f_t—temperature coefficient (see Tab-4)
f_c—contact coefficient (see Tab-5)
f_a—accuracy coefficient (see Tab-6)
f_w—loading coefficient (see Tab-7)
f_h—hardness coefficient
f_h—(actual hardness of raceway HRC/58)$^{3.6}$

According to technical regulations, hardness of raceway should not be lower than HRC58, usuallyf_h=1.

Tab-4 Temperature coefficient f_t

Working temperature (°C)	<100	>100~150	>150~200	200~250
f_t	1.00	0.90	0.73	0.60

Tab-5 Contact coefficient f_c

number of blocks per rail	1	2	3	4	5
f_c	1.00	0.81	0.72	0.66	0.61

Tab-6 Accuracy coefficient f_a

Accuracy grade	2	3	4	5
f_a	1.0	1.0	0.9	0.9

Tab-7 Loading coefficient f_w

Working conditions	No outer impact or low running speed which is less than 15m/min	No obvious impact or working in medium speed which is 1.5~60m/min	With foreign impact vibration, high speed which is more than 60m/min
f_w	1~1.5	1.5~2.0	2.0~3.5

● Calculation of life time

When value of travel distance is certain, the rated life (unit: hour) can be calculated from:

$$L_h = \frac{L\times 10^3}{2\times l\times n\times 60} \approx \frac{8.3L}{l\times n} \quad (h)$$

In formula:

l —travel distance
n—reciprocating times per minute
L—rated life

6. Calculation of load and demonstration

● Load characters

Special structure enable linear motion guideway (LMG) handle equal load in vertical upside ,vertical downside, horizontal left and horizontal right four orientations.(See Fig-2)with many merits, such as heavy load, good rigidity, anti-vibration torque in three directions, linear guideway is widely used in kinds of loading machine tools etc.

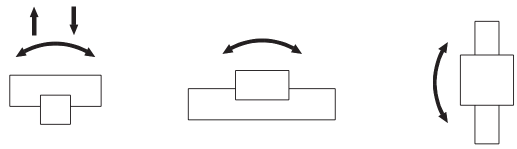


Fig-2

● Calculation of load acting on LMG

Several factors affect the calculation of loads acting on a linear guideway, such as structure forms (horizontal ,vertical, parallelism …and so on), position of object's center of gravity, the thrust position, and the inertia force at the times of start and stop, moving friction etc.

Load of each block could be calculated in terms of engineering mechanics. After that, suitable rail and amounts of blocks are selected. For example: see Tab-8, the moving blocks on horizontal guide assembly ,VV is the total load acting on these guides which are used on the same surface.

The calculation load P_c required to be worked as for the variable load over the total travel distance.

◆ Calculation load of subsection load:

$$P_c = \sqrt[3]{(P_1^3 L_1 + P_2^3 L_2 + \cdots + P_n^3 L_n)/L}$$

P_n—load within relative travel L_n (KN)
L_n—subsection travel distance (Km)
L—total travel, equal to $\sum L_n$ (Km)

◆ Calculation load of linear variation:

$$P_c = (P_{min} + 2P_{max})/3 \quad (KN)$$

◆ Calculation load of sinusoidal loading in whole wave:

$$P_c = 0.65P_{max} \quad (KN)$$

◆ Calculation load of sinusoidal loading in half wave

$$P_c = 0.75P_{max} \quad (KN)$$

◆ Calculation load of operating on vertical P_v and horizontal load P_h at the same time:

$$\vec{P_c} = \vec{P_V} + \vec{P_h} \quad (KN)$$

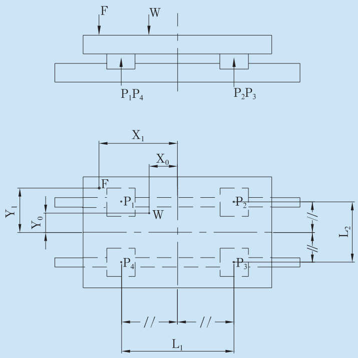
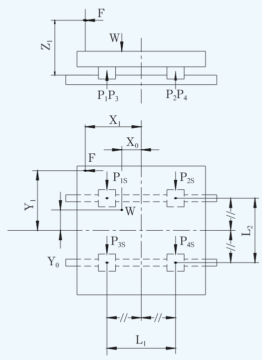
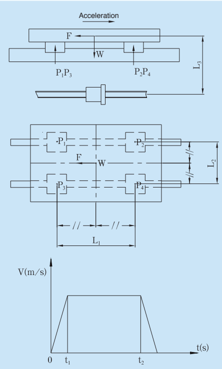
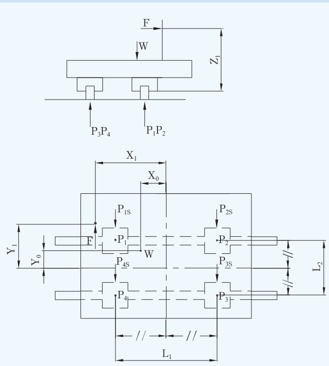
◆ Calculation load with torque M and exterior load P_0 at the same time:

$$P_c = P_0 + C_0 \cdot \frac{M}{M_t} \quad (KN)$$

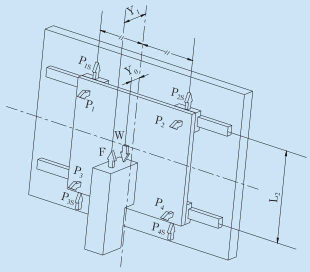
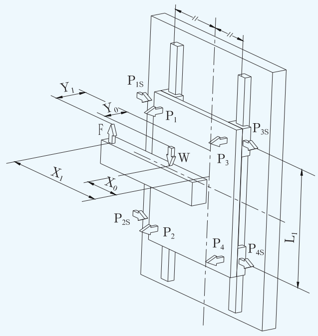
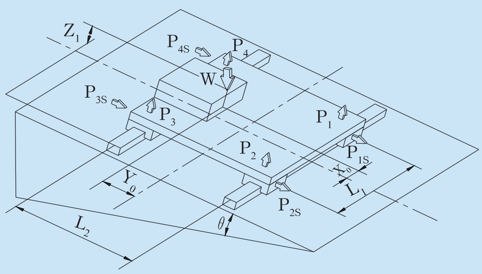
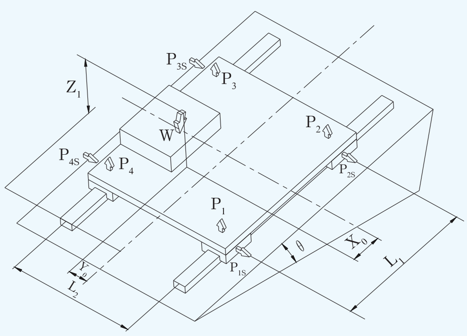
P_0—exterior load C_0—static load rating M—exterior torque M_t—rated torque, respectively indicates M_A, M_B and M_C.

● Normal calculation formula of calculated loads on four blocks

Tab-8

Item	Layout	Calculated formula
1		$P_1=\frac{W+F}{4}+\frac{W\cdot Y_0+F\cdot Y_1}{2L_2}+\frac{W\cdot X_0+F\cdot X_1}{2L_1}$ $P_2=\frac{W+F}{4}+\frac{W\cdot Y_0+F\cdot Y_1}{2L_2}-\frac{W\cdot X_0+F\cdot X_1}{2L_1}$ $P_3=\frac{W+F}{4}-\frac{W\cdot Y_0+F\cdot Y_1}{2L_2}+\frac{W\cdot X_0+F\cdot X_1}{2L_1}$ $P_4=\frac{W+F}{4}-\frac{W\cdot Y_0+F\cdot Y_1}{2L_2}-\frac{W\cdot X_0+F\cdot X_1}{2L_1}$
2		$P_1=\frac{W}{4}+\frac{W\cdot X_0+F\cdot Z_1}{2L_1}+\frac{W\cdot Y_0}{2L_2}$ $P_2=\frac{W}{4}-\frac{W\cdot X_0+F\cdot Z_1}{2L_1}+\frac{W\cdot Y_0}{2L_2}$ $P_3=\frac{W}{4}+\frac{W\cdot X_0+F\cdot Z_1}{2L_1}-\frac{W\cdot Y_0}{2L_2}$ $P_4=\frac{W}{4}-\frac{W\cdot X_0+F\cdot Z_1}{2L_1}-\frac{W\cdot Y_0}{2L_2}$ $P_{1S}=P_{3S}=\frac{F\cdot Y_1}{2L_1}$ $P_{2S}=P_{4S}=-\frac{FY_1}{2L_1}$
3		Uniform acceleration ($0\sim t_1$): $P_1=P_3=\frac{W}{4}-\frac{L_3}{2L_1}\cdot\frac{V}{g\cdot t_1}\cdot W$ $P_2=P_4=\frac{W}{4}+\frac{L_3}{2L_1}\cdot\frac{V}{g\cdot t_1}\cdot W$ Thereinto: g: gravitational acceleration V: velocity L_3: The distance between ball screw axes and F Under uniform motion ($t_1\sim t_2$): $P_1=P_2=P_3=P_4=\frac{W}{4}$
4		$P_1=\frac{W}{4}+\frac{W\cdot X_0}{2L_1}+\frac{W\cdot Y_0+F\cdot Z_1}{2L_2}$ $P_2=\frac{W}{4}-\frac{W\cdot X_0}{2L_1}+\frac{W\cdot Y_0-F\cdot Z_1}{2L_2}$ $P_3=\frac{W}{4}+\frac{W\cdot X_0}{2L_1}-\frac{W\cdot Y_0-F\cdot Z_1}{2L_2}$ $P_4=\frac{W}{4}-\frac{W\cdot X_0}{2L_1}-\frac{W\cdot Y_0+F\cdot Z_1}{2L_2}$ $P_{1S}=P_{3S}=\frac{F}{4}+\frac{F\cdot X_1}{2L_1}$ $P_{2S}=P_{4S}=\frac{F}{4}-\frac{F\cdot X_1}{2L_1}$

Tab-8 continued

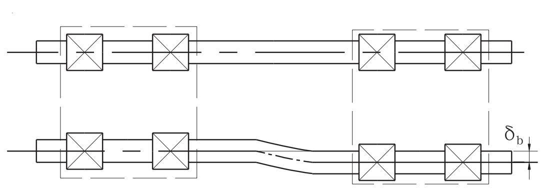
Item	Layout	Calculated formula
5		$P_1=P_2=\frac{F\cdot Y_1-W\cdot Y_0}{2L_2}$ $P_3=P_4=-\frac{F\cdot Y_1-W\cdot Y_0}{2L_2}$ $P_{1S}=P_{2S}=P_{3S}=P_{4S}=\frac{W-F}{4}$
6		$P_1=P_3=\frac{F\cdot Y_1-W\cdot Y_0}{2L_1}$ $P_2=P_4=-\frac{F\cdot Y_1-W\cdot Y_0}{2L_1}$ $P_{1S}=P_{3S}=\frac{FX_1-WX_0}{2L_1}$ $P_{2S}=P_{4S}=-\frac{FX_1-WX_0}{2L_1}$
7		$P_1=\frac{W\cdot\cos\theta}{4}+\frac{W\cdot\cos\theta\cdot X_0}{2L_1}-\frac{W\cdot\cos\theta\cdot Y_0}{2L_2}+\frac{W\cdot\sin\theta\cdot Z_1}{2L_2}$ $P_2=\frac{W\cdot\cos\theta}{4}-\frac{W\cdot\cos\theta\cdot X_0}{2L_1}-\frac{W\cdot\cos\theta\cdot Y_0}{2L_2}+\frac{W\cdot\sin\theta\cdot Z_1}{2L_2}$ $P_3=\frac{W\cdot\cos\theta}{4}-\frac{W\cdot\cos\theta\cdot X_0}{2L_1}+\frac{W\cdot\cos\theta\cdot Y_0}{2L_2}-\frac{W\cdot\sin\theta\cdot Z_1}{2L_2}$ $P_4=\frac{W\cdot\cos\theta}{4}+\frac{W\cdot\cos\theta\cdot X_0}{2L_1}+\frac{W\cdot\cos\theta\cdot Y_0}{2L_2}-\frac{W\cdot\sin\theta\cdot Z_1}{2L_2}$ $P_{1S}=P_{4S}=\frac{W\cdot\sin\theta}{4}+\frac{W\cdot X_0\cdot\sin\theta}{2L_1}$ $P_{2S}=P_{3S}=\frac{W\cdot\sin\theta}{4}-\frac{W\cdot X_0\cdot\sin\theta}{2L_1}$
8		$P_1=\frac{W\cdot\cos\theta}{4}+\frac{W\cdot\cos\theta\cdot X_0}{2L_1}-\frac{W\cdot\cos\theta\cdot Y_0}{2L_2}+\frac{W\cdot\sin\theta\cdot Z_1}{2L_1}$ $P_2=\frac{W\cdot\cos\theta}{4}-\frac{W\cdot\cos\theta\cdot X_0}{2L_1}-\frac{W\cdot\cos\theta\cdot Y_0}{2L_2}-\frac{W\cdot\sin\theta\cdot Z_1}{2L_1}$ $P_3=\frac{W\cdot\cos\theta}{4}-\frac{W\cdot\cos\theta\cdot X_0}{2L_1}+\frac{W\cdot\cos\theta\cdot Y_0}{2L_2}-\frac{W\cdot\sin\theta\cdot Z_1}{2L_1}$ $P_4=\frac{W\cdot\cos\theta}{4}+\frac{W\cdot\cos\theta\cdot X_0}{2L_1}+\frac{W\cdot\cos\theta\cdot Y_0}{2L_2}+\frac{W\cdot\sin\theta\cdot Z_1}{2L_1}$ $P_{1S}=P_{4S}=\frac{W\cdot Y_0\cdot\sin\theta}{2L_1}$ $P_{2S}=P_{3S}=-\frac{W\,Y_0\,\sin\theta}{2L_1}$

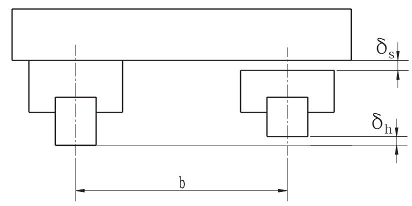
(We developed the special calculation software of load for linear guideway, we can recommend you the right specs, according to your force condition, design etc.)

7. Operating Instructions of linear guideway

- Accuracy requirements for mounting surface of basic parts of linear guideway

- The plane accuracy of mounting surface for single linear guideway can be a little less than operation accuracy.
- The accuracy of mounting surface for two sets or over two sets of linear guideway on the same surface can be lower than operation accuracy, the recommended accuracy shown in the table below.

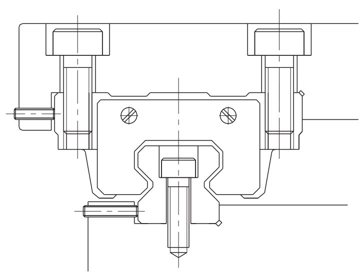




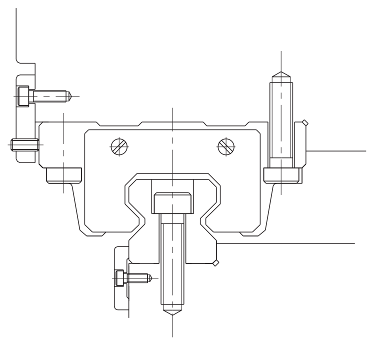
Tab-9 — *Unit:mm*

Parallelism tolerance of mounting side ref. surface δ_b				Height tolerance of mounting ref. surface δ_h=k·b				
Preload type				Preload type				
P_0	P_1	P	P_3	Calculated factor	P_0	P_1	P	P_3
0.010	0.015	0.020	0.030	k	0.00004	0.00006	0.00008	0.00012
Height tolerance of block mounting surface δ_s=0.00004b								

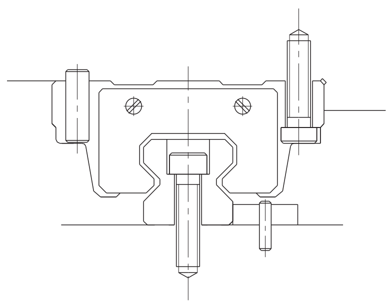
- Configuration of connecting datum plane of linear guideway (See fig-3)



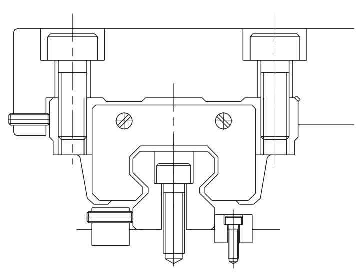
Fixed with tighten screw



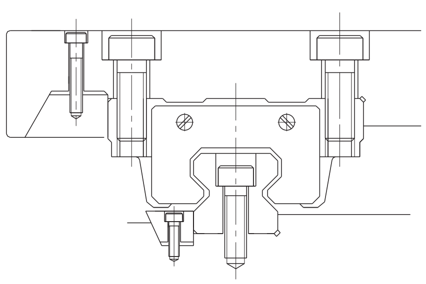
Fixed with push plate



Fixed with position pin



Fixed with tighten screw and position key

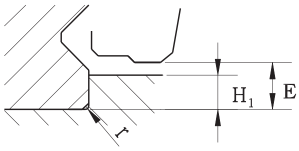


Fixed with tapper gib

Fig-3

● Shoulder height and chamfer type for mounting datum plane (See fig-4)

◆ Rail datum plane mounting



◆ Block datum plane mounting

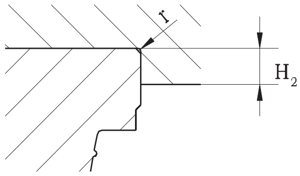


Fig-4

◆ When fixing block and rail on the machine body and worktable, the chamfer of block and rail should be machined as value r which is shown in Tab.10 respectively or machine to be grooved so as to keep the chamfers of rails and block not to contact basic parts.

Tab-10 *Unit:mm*

Spec	Chamfer(r)	shoulder height(H_1)	shoulder height(H_2)	E
GGB16	≤0.3	3.5	4	4.5
GGB20	≤0.5	4	4.5	5
GGB25	≤0.5	5	6	6.5
GGB30	≤0.5	5	6	6
GGB35	≤0.5	7	6	8.5
GGB45	≤0.7	8	8	9
GGB55	≤0.7	11	8	12
GGB65	≤1.0	11	10	12
GGB85	≤1.0	13	12	14

(Note: The shoulder height of specs. GZB and GGD shown as page 16-21, page 32-37)

Mounting and adjustment of linear guideway

◆ Mounting methods and operating instruction

Be careful to move the LMG gently enough so as not to damage its linear accuracy. No permission separating blocks from rail or push blocks back when it exceeds limit travel distance. When it is difficult to assemble, block should be taken down, guiding guide should be used, which you can order from our company (Guiding–guide is a kind of subsidiary tool, its size is smaller than guide's. When necessary, joint guide with the guiding-guide together, then push block from rail to guiding-guide. After fixing the rail, push block back to rail from the guiding-one again. Pay attention to ref. direction.)

◆ Mounting attentions

First distinguish the master linear guideway and subsidiary linear guideway correctly, arrow directs to the ref. side of the rail, the ref. side of the block is polishded. (see Fig-5)

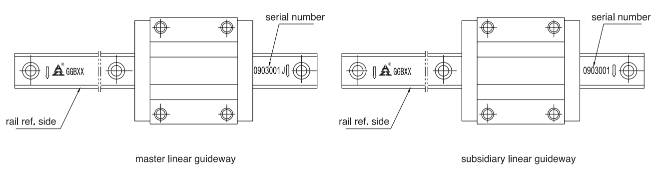
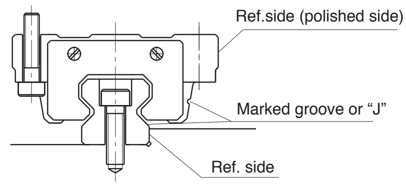
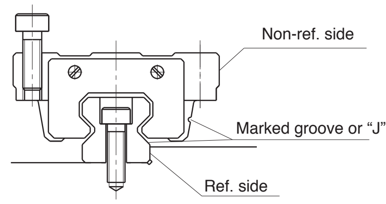


Fig-5

Then make certain the ref.side when fixing LMG



Master rail

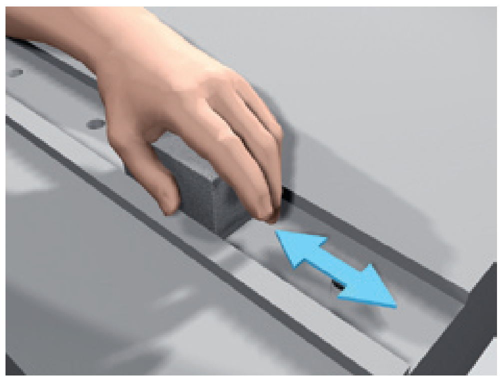


Subsidiary rail

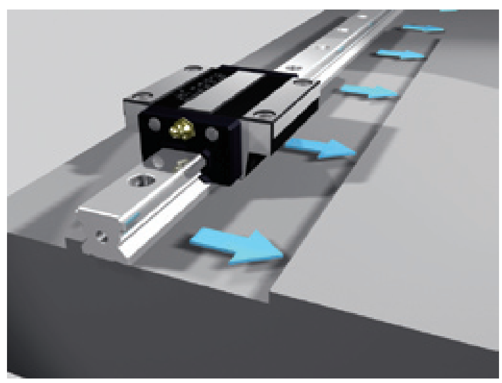
Fig-6

◆ Procedure of rail installation (see Fig-7)

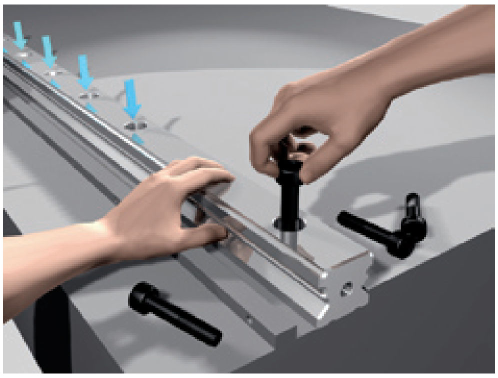
(a) Check and remove all dirt from the mounting surface of the machine;



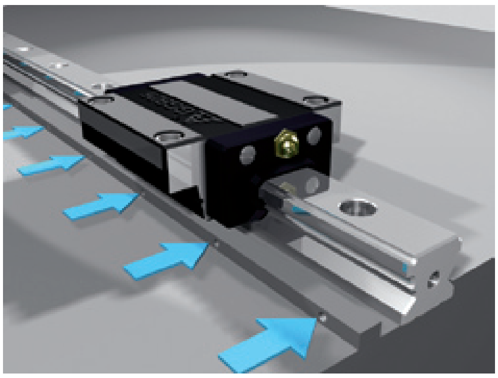
(b) Bring the guideway into close contact with the datum plane of bed;



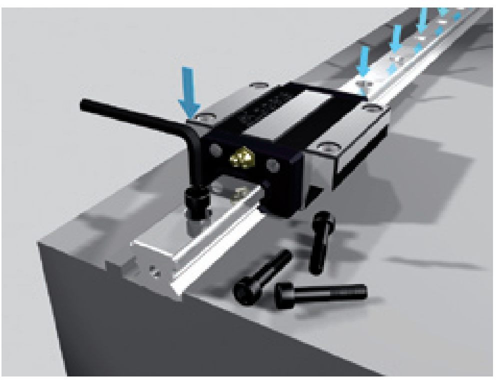
(c) Check position of screw correctly;



(d) Tighten the push screws sequentially to ensure close contact between the rail and the side datum plane;



(e) Tighten the mounting bolts.



(f) Tighten the push screws of the blocks one by one

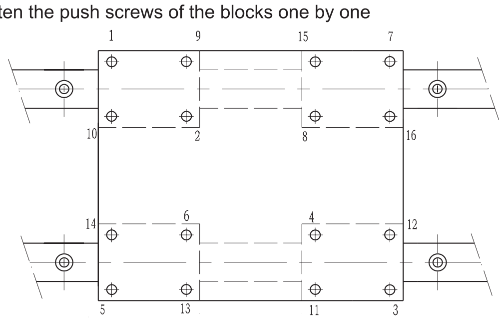


Fig-7

▲ Mounting methods of master guide (two methods shown below):

<1>.Use the U-type collet to tighten the side datum plane of the rail and bed, then tighten the mounting bolts(mated screw thread recommended) in sequence to the specified torque. (refer to Fig-8)

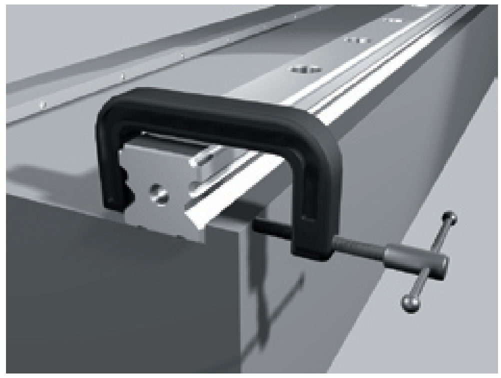


Fig-8

<2>.When there is no bed, fix one end of linear guideway, use a dial gauge and a straight edge to confirm the straightness of the side datum plane of the rail from one end to the other. Tighten the mounting bolts in sequence.

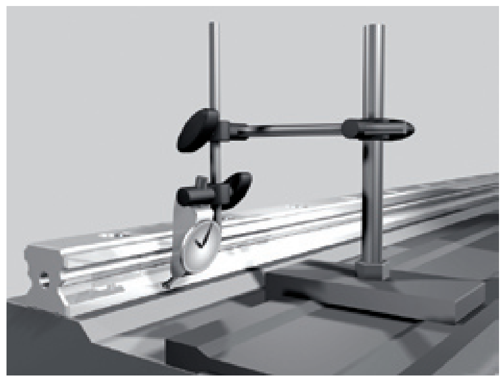


Fig-9

▲ Mounting methods of subsidiary LMG:

Shown as fig-10, fix magnet watch base on the block of master guide, pointer of dial gauge contacts on the side datum surface of subsidiary guide, read the parallelism from one end and tighten the subsidiary guide in sequence. In addition, methods shown in fig.8 and fig-9 could be referred to.

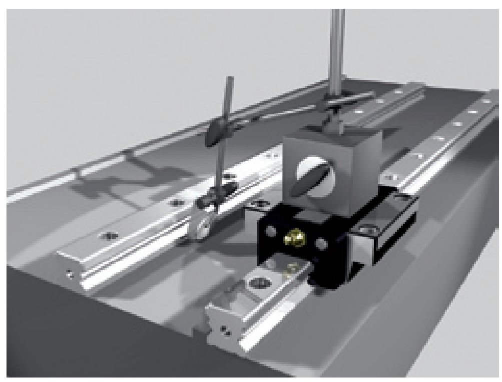


Fig-10

▲ Distinguish of Joint guide:

When using the joint guide, we use the same English capital letter represents the same series guide, consecutive Arabic number represents the joint sequence. Two sides (head joint with head) with the same Arabic letter (see fig-11)

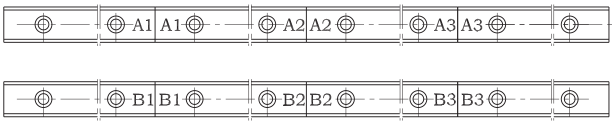


Fig-11

▲ When tighten the bolts, suggest using constant-torque wrench. Recommended torque value shown in Tab-11

Tab-11 *Unit:N.m*

Nominal dia.of screw (mm)	M4	M5	M6	M8	M10	M12	M16
Torque value (N·m)	2.6~4.0	5.1~8.5	8.7~14	21.6~30.5	42.2~67.5	73.5~118	178~295

(After tighten the screws, if the top tap hole needs dustproof and seal, please use the tap hole cap packed together with the products.)

8. Seal accessories of linear guideway

With the widely using of linear guideways, kinds of condition and situation will be used. In order to meet different customer's seal protection requirements, we designed below seal types to choose when ordering:

Note: No side seal for GGB16, GGB20

Seal code	Seal type	Application
MM	End seal	Precision measuring instruments etc. without dust
MN	End seal+ side seal	Normal seal
MX	End seal+ side seal+ scraper	With scrap iron, dirty etc.
MY	Tighten-end seal+ side seal	With powder, scrap wood, dust etc.
MZ	Tighten-end seal+ side seal+ scraper	With mist, scrap iron, dirty etc.

(Note: MN is the normal seal, no mark in ordering)

If the working condition is worse, with enough room, besides the seal of rail, the dustproof bellows can be added. (see fig-12)

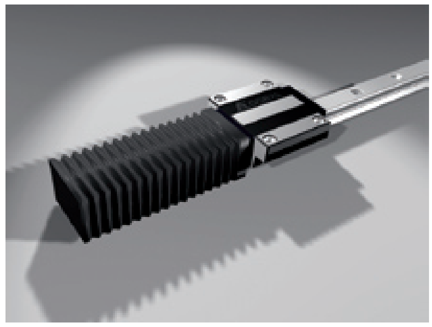


Fig-12

9. Lubrication of linear guideway

Keep working condition clear and tidy to avoid scrap iron, dirty, foreign materials that stick to body of linear guideway. If there is dust in workshop, dust-proof device equipment should be assembled including the under seal of LMG.(See fig-13)

The main purpose of lubrication is to eliminate friction and abrasion to avoid super heat, which will damage the inner structure as well as influence motion function. Before ex-factory, the linear guides are injected with low-noise grease to make sure the good lubrication of balls in motion, but to avoid the deficiency caused by the wastage of lubrication, we suggest supplementing periodically when the blocks motion travel to 50km. When linear guideway is moving at a high velocity (V≥35m/min) N32 lubrication oil is recommended (refer to GGB443-84). It is equivalent to 20# machinery oil in old standard, when temperature is 40℃, oil's viscosity is 28.5~35.2cst. Linear guideway should be lubricated periodically or connected with oil hose (shown as Fig-13). Li grease is recommended when it's running at low velocity (V<35m/min)

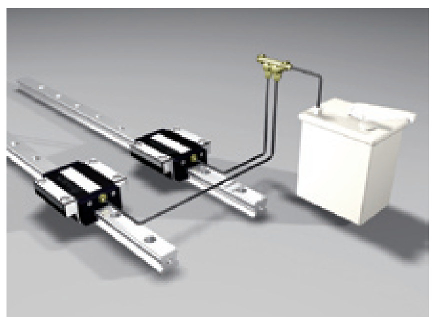


Fig-13

(In the low velocity condition, it is not allowed to use the gas to clean the internal grease before installation)

GZB series-Heavy load Roller caged linear guideway

1. Structure and Characteristic

● Structure

GZB roller heavy loading linear motion guide is consisted of rail, block, roller, re-circulator, retainer, roller cage and seal gasket etc.(see fig-1)

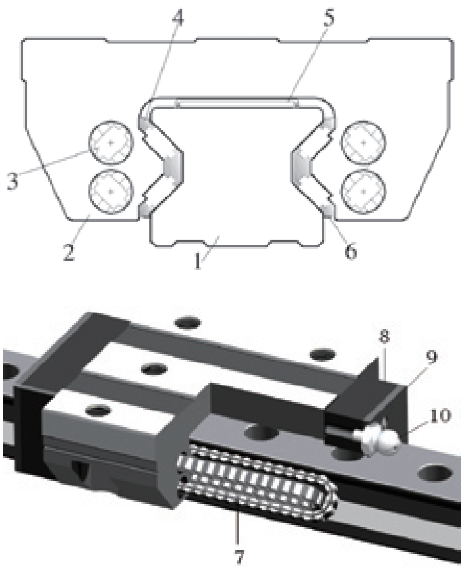
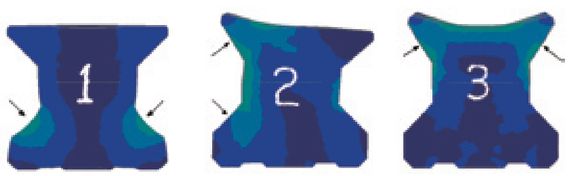


Fig-1

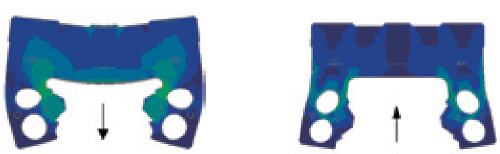
● Characteristic

◆ Heavy load

1. Line contact instead of traditional point contact and consequently greatly improved loading capacity with high rigidity of rollers.
2. Roller guide use V shape groove design and can bear more torque. In different applications, the distortion and stress distribution of roller rails are shown as below
   max. distortion ratio of no. 1, no. 2, no. 3 rail: 1:1.25:2
   max. stress ratio of no. 1, no. 2, no. 3 rail:1:1.15:1.2

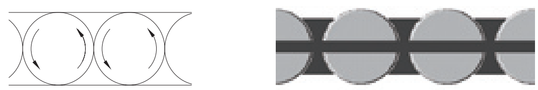


3. Optimize the structure of block with finite element analysis. Stress distribution and distortion fig. in different forces.



◆ Low noise

Use roller cage among the rollers, avoid internal collision and reduce the noise which is caused by collision among the rollers.
Roller contacts see fig-2
Noise data comparisons see fig-3



Contact condition without cage　　Contact condition under GZB product

Fig-2

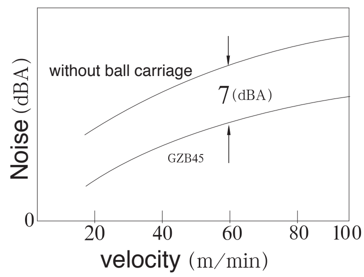


Fig-3

◆ High speed and accuracy

Roller cage prevents roller deflecting motion and moves stably. At the same time, it forms the oil film contact between roller and cage, avoid friction among rollers, reduce the heat when roller guide is running and achieve high speed and precision movement.

◆ Long term maintenance free

With a certain amount of grease in the cage, it can achieve long term maintenance free and prolong life.

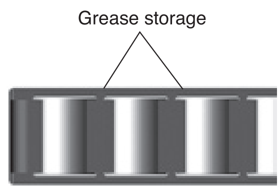


Fig-4

◆ Equal load in four directions

GZB roller heavy loading linear guide contact angle between roller and raceway is 45º, so it has equal load in four directions.(see fig-5)

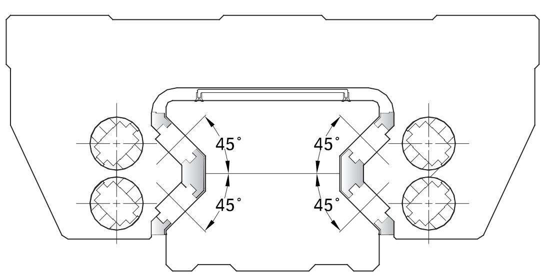
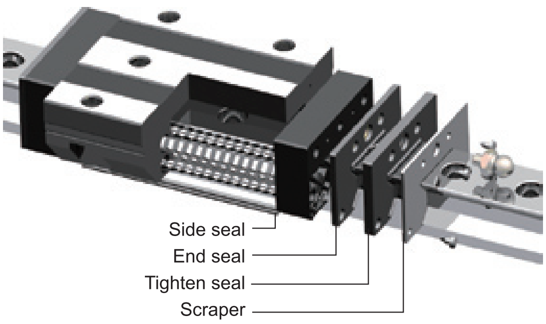


Fig-5

2. Seal



Seal code	Seal type	Amounting dimension L_1 Increase (mm)							
		GZB25	GZB35	GZB45	GZB55	GZB65	GZB85	GZB100	GZB125
MN	End seal	+0	+0	+0	+0	+0	+0	+0	+0
MX	End seal+ scraper	+3	+3	+4	+5	+6	+6	+6	+6
MY	Tighten-end seal	+2	+2	+2.5	+2.5	+3	+4	+5	+6
MZ	Tighten-end seal+ scraper	+3	+3.5	+4.5	+5	+6	+8	+10	+12

Note: MN code is the normal seal type, no mark when ordering.

3. Preload type and Application

Details see Tab-1

Tab-1

Preload type	Application
P_0 (0.1C)	With strong rigidity, impact and vibration condition, normally used for main rails of heavy duty machines
P_1 (0.05C)	High repeatability positioning accuracy, suspension/torque load and single LMG, Normally used in precision positioning mechanism and measuring devices
P (0.025C)	Small impact or vibration, easy movement if using double LMG at the same time

4. Code rule and Definition

GZB 35 A A L T MM 2 P_1 2 7000 (2) −4

- −4: Accuracy grade, total 1, 2, 3, 4, 5, 6 grades
- (2): Number of joint guide (non joint is not specified)
- 7000: Rail length (see dimension table for max. single length)
- 2: Number of rails used in the same surface
- P_1: Preload, total P_0, P_1, P, P_3
- 2: Number of blocks used per rail
- MM: Seal type (total MM, MN, MX, MY, MZ, MN is the normal type without mark)
- T: Code of special requested block (standard is not specified)
- L: Code of block length (standard is not specified, L for lengthen)
- A: Block fixed mode(A for thread hole, up-lock or down-lock)
- A: Code of block width (A for wide (flange) type, B for narrow type)
- 35: Nominal dimension of rail (present size: 25, 35, 45, 55, 65, 85, 100, 125)
- GZB: Type code of heavy load roller guide

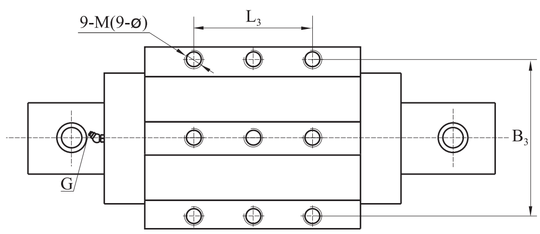
5. Accuracy grade

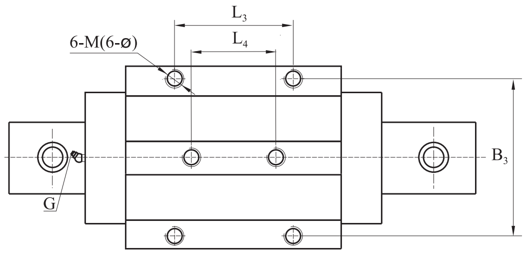
Details see page 7, Tab-2

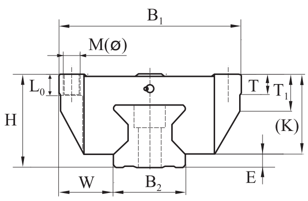
GZB-AA/AAL heavy load roller LMG

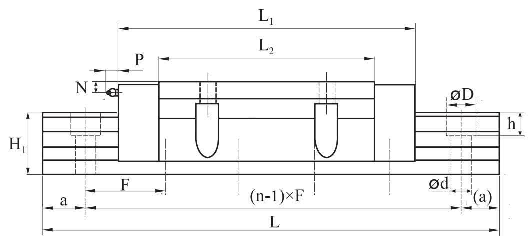
Notes:
1. L_1 dimensions are based on MN seal type, details see seal type.
2. AA/AAL blocks of GZB series are flange type and top mounting holes are thread holes, up-lock see dimension M, down-lock see dimension ø.
3. GZB85, GZB100, GZB125 blocks in the top L_3, B_3 directions are symmetrically distributed of three-row mounting holes, total 9 holes.
4. Please note if need oil of side surface.

Type	Dimension of assembly		Dimension of block												Dimension of rail		
	H	W	B_1	B_3	K	T	T_1	M	ø	L_0	L_1	L_2	L_3	L_4	B_2	H_1	dxDxh
GZB25AA GZB25AAL	36	23.5	70	57	31.5	9.5	10	8	6.8	10	100 120	66 86	45	40	23	24	7×11×9
GZB35AA GZB35AAL	48	33	100	82	42	13	21	10	8.5	12	128 147	86 105	62	52	34	30.5	9×14×12
GZB45AA GZB45AAL	60	37.5	120	100	51	15	25	12	10.5	15	154 182	102 130	80	60	45	38	14×20×16
GZB55AA GZB55AAL	70	43.5	140	116	60	20	29	14	12.5	18	172 210	118 156	95	70	53	44	16×23×20
GZB65AA GZB65AAL	90	53.5	170	142	76	25	37	16	14.5	23	210 270	147 207	110	82	63	55	18×26×22
GZB85AAL	110	65	215	185	95	24	44	20	17.5	26	350	254	140	140	85	73	24×35×28
GZB100AAL	120	75	250	220	105	25	51.5	20	17.5	30	395	286	200	200	100	80	26×39×32
GZB125AAL	160	97.5	320	270	135.5	30	66	24	21	45	491	360	205	205	125	115	33×48×45

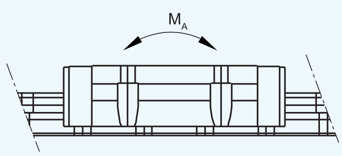


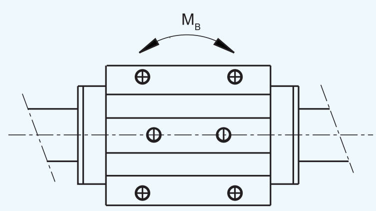


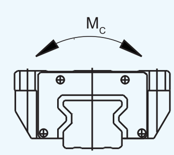




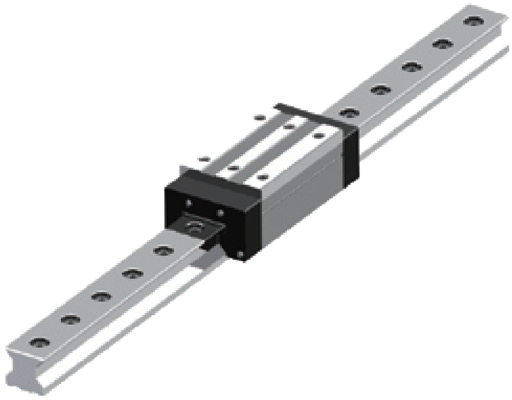
		Dimension of oil cup			Dynamic load rating	Static load rating	Torque rating			Block weight	Rail weight
F	Max. single length	G	P	N	C(KN)	C_O(KN)	M_A(N.m)	M_B(N.m)	M_C(N.m)	kg	kg/m
30	6000	M6	12	5.5	26.5 33.8	50.8 71.6	570 830	570 830	710 980	0.6 0.8	3.2
40	6000	M6	13	8.5	50.5 61	121 162	1548 2708	1548 2708	2343 3283	1.6 2.0	5.9
52.5	6000	M8×1	14	11	84.5 99.6	191 236	3156 5560	3156 5560	4858 6736	2.5 3.5	9.8
60	6000	M8×1	14	13	123 154	292 390	5267 9713	5267 9713	8243 11927	4.3 5.9	13.3
75	6000	M8×1	14	17	192 248	451 613	10823 20808	10823 20808	17762 22957	8.6 12.3	20.3
90	6000	M8×1	14	21	460	1050	45600	45600	51420	21.6	35.2
105	6000	M10×1	16	23	547	1330	61200	61200	73140	31.5	46.8
120	6000	M10×1	16	23	1040	1924	123176	123176	114438	65.5	84.6





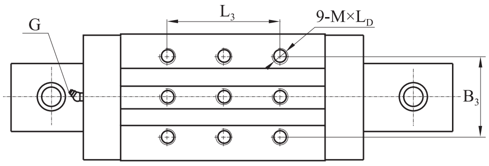


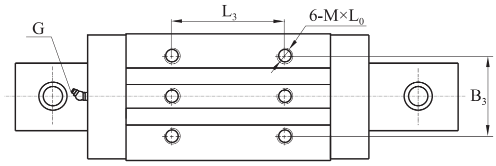
GZB-BA/BAL heavy load roller LMG

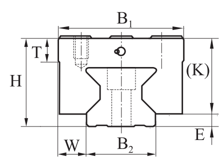


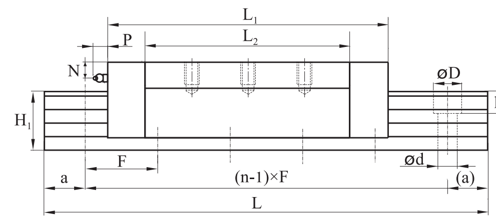
Notes:
1. L_1 dimensions are based on MN seal type, details see seal type.
2. BA/BAL blocks of GZB series are narrow-high type and top mounting holes are thread holes.
3. GZB85, GZB100, GZB125 blocks in the top L_3, B_3 directions are symmetrically distributed of three-row mounting holes, total 9 holes.
4. Please note if need oil of side surface.

Type	Dimension of assembly		Dimension of block								Dimension of rail		
	H	W	B_1	B_3	K	T	$M \times L_0$	L_1	L_2	L_3	B_2	H_1	d×D×h
GZB25BA GZB25BAL	40	12.5	48	35	35.5	9.5	M6×8	100 120	66 86	35 50	23	24	7×11×9
GZB35BA GZB35BAL	55	18	70	50	49	10	M8×12	128 147	86 105	50 72	34	30.5	9×14×12
GZB45BA GZB45BAL	70	20.5	86	60	61	15	M10×16	154 182	102 130	60 80	45	38	14×20×16
GZB55BA GZB55BAL	80	23.5	100	75	70	18	M12×18	172 210	118 156	75 95	53	44	16×23×20
GZB65BA GZB65BAL	90	31.5	126	76	76	23	M16×16	210 270	147 207	70 120	63	55	18×26×22
GZB85BAL	110	35.5	156	100	95	30	M18×25	350	254	140	85	73	24×35×28
GZB100BAL	120	50	200	130	105	33	M20×27	395	286	200	100	80	26×39×32
GZB125BAL	160	57.5	240	184	135.5	40	M24×30	491	360	205	125	115	33×48×45

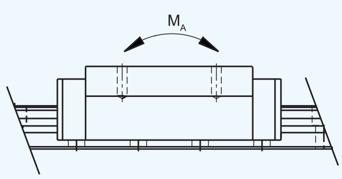


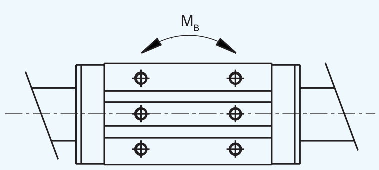


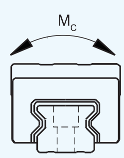




		Dimension of oil cup			Dynamic load rating	Static load rating	Torque rating			Block weight	Rail weight
F	Max. single length	G	P	N	C(KN)	C_O(KN)	M_A(N.m)	M_B(N.m)	M_C(N.m)	kg	kg/m
30	6000	M6	12	9.5	26.5 33.8	50.8 71.6	570 830	570 830	710 980	0.5 0.7	3.2
40	6000	M6	13	15.5	50.5 61	121 162	1548 2708	1548 2708	2343 3283	1.4 1.7	5.9
52.5	6000	M8×1	14	21	84.5 99.6	191 236	3156 5560	3156 5560	4858 6736	2.48 3.2	9.8
60	6000	M8×1	14	23	123 154	292 390	5267 9713	5267 9713	8243 11927	3.8 5.1	13.3
75	6000	M8×1	14	17	192 248	451 613	10823 20808	10823 20808	17762 22957	6.3 8.9	20.3
90	6000	M8×1	14	21	460	1050	45600	45600	51420	14.7	35.2
105	6000	M10×1	16	23	547	1330	61200	61200	73140	24.5	46.8
120	6000	M10×1	16	23	1040	1924	123176	123176	114438	46	84.6







GGB four direction equal load ball LM guide

GGB is the earliest developed LM guide and is one of the widely used guides. Design with equal 45º contact angle, which makes equal load in vertical upside ,vertical downside, horizontal left and horizontal right four orientations(see fig-1), and it has heavy rated load, good rigidity, high stiffness and strong torque resistance of three directions, so it also calls four direction equal load LM guide.

GGB series is classified into interchangeable and non-interchangeable type. All the specs, dimensions, loads etc. are the same. The big difference is that it can interchange the blocks and rails under not high precision condition, which greatly save the stock and maintenance period.

1. Basic structure of GGB series

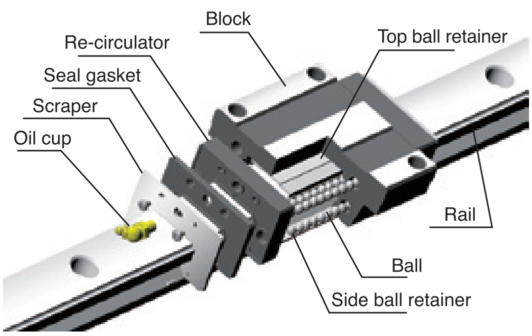


Fig-1

2. Application

Machining center, NC lathe machine, wire spark machine, portage device, wood machinery, laser machine, precision test instrument, packing machine, food machinery, medical machinery, tool grinding machine, plane grinding machine.

3. Code rule and definition

GGB 25 A A L T MN 2 P_1 2× 8400 (2) − 4

- 4: Accuracy grade, total 1, 2, 3, 4, 5, 6 grades
- (2): Number of joint guide (non joint is not specified)
- 8400: Rail length
- 2×: Number of rails used in the same surface
- P_1: Preload, total P_0, P_1, P, P_3
- 2: Number of blocks used per rail
- MN: Seal type
- T: Code of special requested block (standard is not specified)
- L: Code of block length (standard is not specified, L for lengthen)
- A: Mounting hole of block (A for thread hole, B for through hole)
- A: Code of block width (A for wide (flange) type, B for narrow type)
- 25: Nominal dimension of rail
- GGB: Type code of four direction equal load ball guide

4. Seal type and dimension increase

Details see Tab-1

Tab-1

Seal code	Seal type	Amounting dimension L_1 Increase (mm)								
		GGB16	GGB20	GGB25	GGB30	GGB35	GGB45	GGB55	GGB65	GGB85
MM	End seal	+0	+0	+0	+0	+0	+0	+0	+0	+0
MN	End seal+ side seal	+0	+0	+0	+0	+0	+0	+0	+0	+0
MX	End seal+ side seal+ scraper	+2	+2	+2	+3	+3	+4	+4	+5	+5
MY	Tighten-end seal+ side seal	+0	+0	+0	+0	+0	+1	+0.4	+0	+0
MZ	Tighten-end seal+ side seal+ scraper	+2	+2	+2	+3	+3	+5	+4.4	+5	+5

5. Preload type and Application

Tab-2

- Recommended preload under different accuracy

Accuracy grade	Preload grade			
Grade	P_0	P_1	P	P_3
2, 3, 4	√	√	√	
5		√	√	√

Tab-3

- Recommended preload under different application

Preload type	Application
P_0(0.1C)	With strong rigidity, impact and vibration condition, normally used for main rails of heavy duty machines
P_1(0.05C)	High repeatability positioning accuracy, suspension/torque load and single LMG, Normally used in precision positioning mechanism and measuring devices
P(0.025C)	Small impact or vibration, easy movement if using double LMG at the same time
P_3(with clearance)	Transmission machine

6. Use of interchangeable block

In the general transmission application, it needs many interchangeable LMG. Interchangeable, when you move the block from the rail, it can be assembled to any other rails and meet the same requirements, that is, interchange freely. Normally, the blocks separate packing and shipping as shown of Fig-2

- Code rule of interchangeable guide

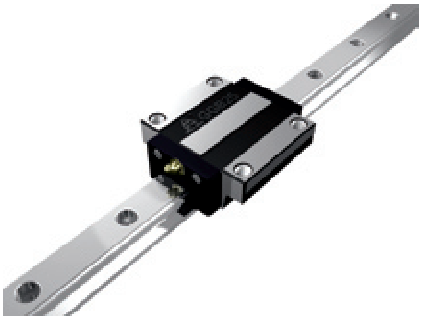
Example: GGB25BAMY2P2X3000-5H (6H)
Interchangeable rails with “H” mark behind the accuracy grade, the parameter of 5H,6H same as grade 5 and 6 at page 7.

- At present, the preload of interchangeable guide is P and P_3

The packing of interchangeable block see fig-2

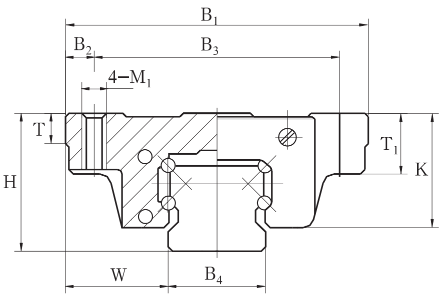
Fig-2

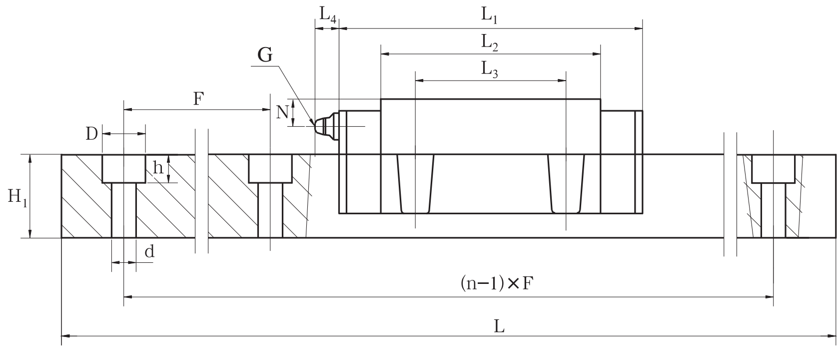
GGB-AA/AAL four direction equal load ball LM guide



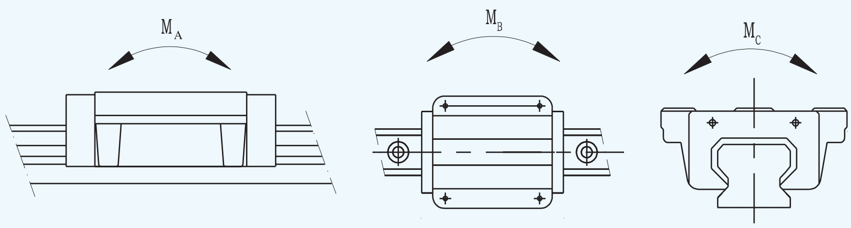
Note:
1. M_A, M_B, M_C are shown in right-under diagram, each indicates rated torque value of one block.
2. L_{max} is the maximum length of one rail, please contact if need rail joint.
3. Distance from both ends to the mounting hole in one rail is equal if without special request.
4. There is no baffle of both ends of GGB35~85 rails, please note if you need.
5. Please note if need oil of side surface.
6. Because of the height difference of GGB25AA/AAL and height & hole distance difference of GGB45AA/AAL, we classify with I and II, II is the recommended one.

Type	Dimension of assembly		Dimension of block										Dimension of oil cup		
	H	W	B_1	B_2	B_3	K	T	T_1	M_1	L_1	L_2	L_3	L_4	G	N
GGB16AA	24	15.5	47	4.5	38	19.4	7	11	M5	58	40.5	30	2.5	ø4	4
GGB20AA GGB20AAL	30	21.5	63	5	53	24	10	10	M6	70 86	50 66	40	11	M6	6
GGB25 Ⅰ AA GGB25 Ⅰ AAL GGB25 Ⅱ AA GGB25 Ⅱ AAL	37 36	23.5	70	6.5	57	29.8 28.8	10	16	M8	79.5 98.5 79.5 98.5	59 78 59 78	45	11	M6	7.2
GGB30AA GGB30AAL	42	31	90	9	72	35	10	18	M10	95.2 117.2	70 92	52	11	M6	7
GGB35AA GGB35AAL	48	33	100	9	82	38	13	21	M10	107.8 131.8	81 105	62	11	M6	8
GGB45 Ⅰ AA GGB45 Ⅰ AAL GGB45 Ⅱ AA GGB45 Ⅱ AAL	62 60	37.5	120	10	100	51 49	15	25	M12	135 163 135 163	102 130 102 130	80	11	M6	12
GGB55AA GGB55AAL	70	43.5	140	12	116	57	20	29	M14	161 199	118 156	95	14	M8×1	12
GGB65AA GGB65AAL	90	53.5	170	14	142	76	23	37	M16	195 255	147 207	110	14	M8×1	12
GGB85AA GGB85AAL	110	65	215	15	185	94	30	55	M20	243.4 300.4	179 236	140	14	M8×1	14

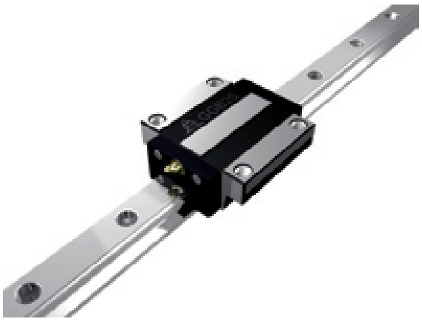




Dimension of rail					Dynamic load rating	Static load rating	Torque rating			Weight (kg)	
B_4	H_1	d×D×h	F	Max. single length	C(KN)	C_0(KN)	M_A(N.m)	M_B(N.m)	M_C(N.m)	Block (per/pc)	Rail (per/meter)
16	15	4.5×7.5×5.3	60	1200	8.51	13.38	70	70	100	0.155	1.62
20	18	6×9.5×8.5	60	3000	13.70 18.43	19.27 26.50	160 260	160 260	230 310	0.32 0.47	2.3
23	22	7×11×9	60	6000	20.19 27.17 20.19 27.17	29.98 40.68 29.98 40.68	260 450 260 450	260 450 260 450	390 500 390 500	0.545 0.75 0.545 0.75	3.3
28	26	9×14×12	80	6000	28.08 37.77	46.33 61.77	430 720	430 720	650 870	1.1 1.2	4.7
34	29	9×14×12	80	6000	34.97 46.43	58.53 76.54	610 1030	610 1030	1030 1380	1.3 2.3	6.5
45	38	14×20×16	100 105	6000	60.14 80.83 60.14 80.83	94.57 126.09 94.57 126.09	1290 2080 1290 2080	1290 2080 1290 2080	2100 2790 2100 2790	2.5 3.3 2.5 3.3	11.2
53	44	16×23×20	120	6000	92.62 126.51	137.57 187.60	2180 3650	2180 3650	3640 4860	4.2 5.7	15
63	53	18×26×22	150	6000	154.13 220.24	221.89 322.75	4170 7300	4170 7300	6800 9100	7.3 10.7	22.2
85	65	24×35×28	180	6000	247.88 351.45	346.70 441.26	10400 12800	10400 12800	12900 17200	17.0 23.0	35.5



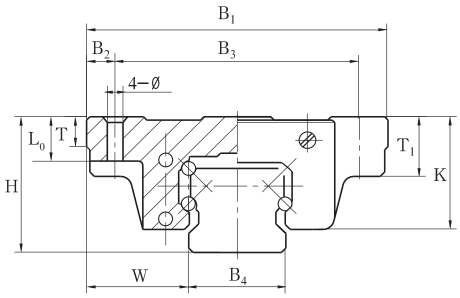
GGB-AB/ABL four direction equal load ball LM guide

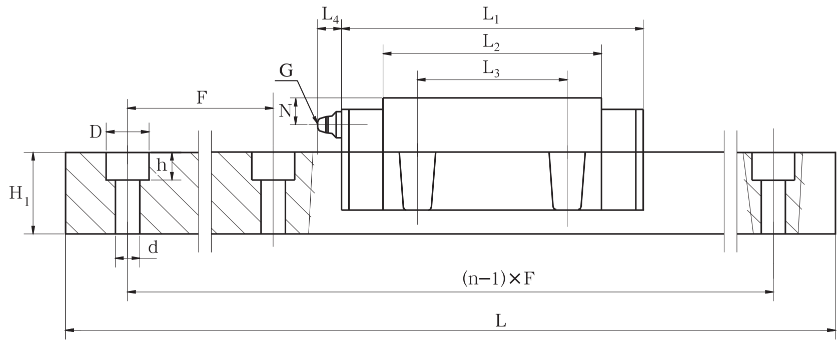


Note:

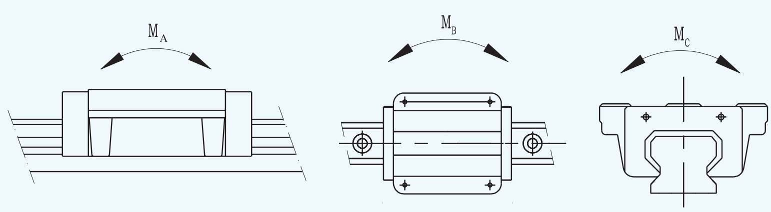
1. M_A, M_B, M_C are shown in right-under diagram, each indicates rated torque value of one block.
2. L_{max} is the maximum length of one rail, please contact if need rail joint.
3. Distance from both ends to the mounting hole in one rail is equal if without special request.
4. There is no baffle of both ends of GGB35~85 rails, please note if you need.
5. Please note if need oil of side surface.
6. Because of the height difference of GGB25AB/ABL and height & hole distance difference of GGB45AB/ABL, we classify with I and II, II is the recommended one.

Type	Dimension of assembly		Dimension of block											Dimension of oil cup		
	H	W	B_1	B_2	B_3	K	T	T_1	ø	L_0	L_1	L_2	L_3	L_4	G	N
GGB16AB	24	15.5	47	4.5	38	19.4	7	11	4.5	7	58	40.5	30	2.5	ø4	4
GGB20AB GGB20ABL	30	21.5	63	5	53	24	10	10	7	10	70 86	50 66	40	11	M6	6
GGB25ⅠAB GGB25ⅠABL GGB25ⅡAB GGB25ⅡABL	37 36	23.5	70	6.5	57	29.8 28.8	10	16	7	10	79.5 98.5 79.5 98.5	59 78 59 78	45	11	M6	7.2
GGB30AB GGB30ABL	42	31	90	9	72	35	10	18	9	10	95.2 117.2	70 92	52	11	M6	7
GGB35AB GGB35ABL	48	33	100	9	82	38	13	21	11	13	107.8 131.8	81 105	62	11	M6	8
GGB45ⅠAB GGB45ⅠABL GGB45ⅡAB GGB45ⅡABL	62 60	37.5	120	10	100	51 49	15	25	13	15	135 163 135 163	102 130 102 130	80	11	M6	12
GGB55AB GGB55ABL	70	43.5	140	12	116	57	20	29	14	17	161 199	118 156	95	14	M8×1	12
GGB65AB GGB65ABL	90	53.5	170	14	142	76	23	37	16	23	195 255	147 207	110	14	M8×1	12
GGB85AB GGB85ABL	110	65	215	15	185	94	30	55	18	30	243.4 300.4	179 236	140	14	M8×1	14





Dimension of rail					Dynamic load rating	Static load rating	Torque rating			Weight (kg)	
B_4	H_1	d×D×h	F	Max. single length	C(KN)	C_0(KN)	M_A(N.m)	M_B(N.m)	M_C(N.m)	Block (per/pc)	Rail (per/meter)
16	15	4.5×7.5×5.3	60	1200	8.51	13.38	70	70	100	0.155	1.62
20	18	6×9.5×8.5	60	3000	13.70 18.43	19.27 26.50	160 260	160 260	230 310	0.32 0.47	2.3
23	22	7×11×9	60	6000	20.19 27.17 20.19 27.17	29.98 40.68 29.98 40.68	260 450 260 450	260 450 260 450	390 500 390 500	0.545 0.75 0.545 0.75	3.3
28	26	9×14×12	80	6000	28.08 37.77	46.33 61.77	430 720	430 720	650 870	1.1 1.2	4.7
34	29	9×14×12	80	6000	34.97 46.43	58.53 76.54	610 1030	610 1030	1030 1380	1.3 2.3	6.5
45	38	14×20×16	100 105	6000	60.14 80.83 60.14 80.83	94.57 126.09 94.57 126.09	1290 2080 1290 2080	1290 2080 1290 2080	2100 2790 2100 2790	2.5 3.3 2.5 3.3	11.2
53	44	16×23×20	120	6000	92.62 126.51	137.57 187.60	2180 3650	2180 3650	3640 4860	4.2 5.7	15
63	53	18×26×22	150	6000	154.13 220.24	221.89 322.75	4170 7300	4170 7300	6800 9100	7.3 10.7	22.2
85	65	24×35×28	180	6000	247.88 351.45	346.70 441.26	10400 12800	10400 12800	12900 17200	17.0 23.0	35.5

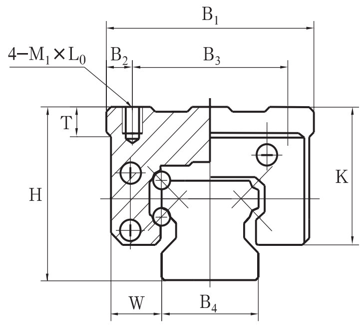


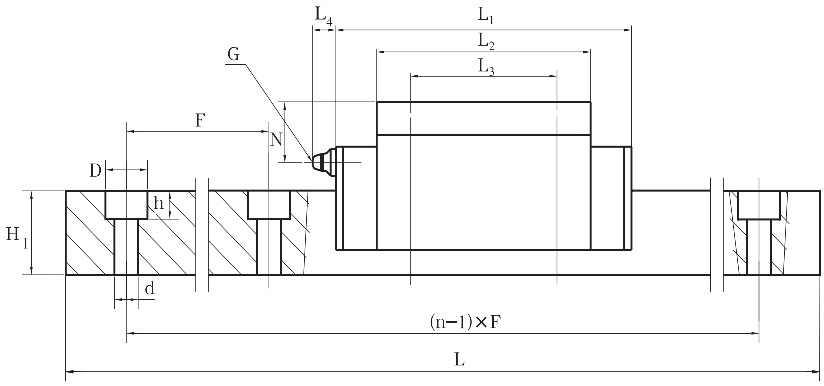
GGB-BA/BAL four direction equal load ball LM guide

Note:

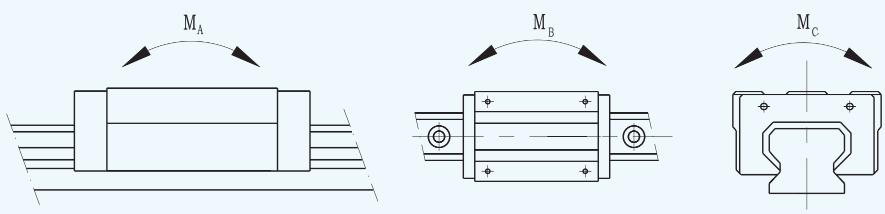
1. M_A, M_B, M_C are shown in right-under diagram, each indicates rated torque value of one block.
2. L_{max} is the maximum length of one rail, please contact if need rail joint.
3. Distance from both ends to the mounting hole in one rail is equal if without special request.
4. There is no baffle of both ends of GGB35~85 rails, please note if you need.
5. Please note if need oil of side surface.
6. Because of the hole distance difference of GGB45BA/BAL, we classify with I and II, II is the recommended one.

Type	Dimension of assembly		Dimension of block									Dimension of oil cup		
	H	W	B_1	B_2	B_3	K	T	M_1×L_0	L_1	L_2	L_3	L_4	G	N
GGB16BA	28	9	34	4	26	23.4	6	M4×5	58	40.5	26	2.5	ø4	9
GGB20BA GGB20BAL	30	12	44	6	32	24	8	M5×5	70 86	50 66	36 50	11	M6	5
GGB25BA GGB25BAL	40	12.5	48	6.5	35	32.8	8	M6×8	79.5 98.5	59 78	35 50	11	M6	10.2
GGB30BA GGB30BAL	45	16	60	10	40	38	8	M8×8	95.2 117.2	70 92	40 60	11	M6	10
GGB35BA GGB35BAL	55	18	70	10	50	45	10	M8×12	107.8 131.8	81 105	50 72	11	M6	17
GGB45ⅠBA GGB45ⅠBAL GGB45ⅡBA GGB45ⅡBAL	70	20.5	86	13	60	59	15	M10×16	135 163 135 163	102 130 102 130	60 80 60 80	11	M6	21
GGB55BA GGB55BAL	80	23.5	100	12.5	75	67	18	M12×18	161 199	118 156	75 95	14	M8×1	22
GGB65BA GGB65BAL	90	31.5	126	25	76	76	23	M16×16	195 255	147 207	70 120	14	M8×1	12
GGB85BA GGB85BAL	110	39	163	31.5	100	94	30	M18×25	243.4 300.4	179 236	80 140	14	M8×1	14





Dimension of rail					Dynamic load rating	Static load rating	Torque rating			Weight (kg)	
B_4	H_1	d×D×h	F	Max. single length	C(KN)	C_0(KN)	M_A(N.m)	M_B(N.m)	M_C(N.m)	Block (per/pc)	Rail (per/meter)
16	15	4.5×7.5×5.3	60	1200	8.51	13.38	70	70	100	0.18	1.62
20	18	6×9.5×8.5	60	3000	13.70 18.43	19.27 26.50	160 260	160 260	230 310	0.35 0.47	2.3
23	22	7×11×9	60	6000	20.19 27.17	29.98 40.68	260 450	260 450	390 500	0.67 0.75	3.3
28	26	9×14×12	80	6000	28.08 37.77	46.33 61.77	430 720	430 720	650 870	0.9 1.1	4.7
34	29	9×14×12	80	6000	34.97 46.43	58.53 76.54	610 1030	610 1030	1030 1380	2.0 2.3	6.5
45	38	14×20×16	100 105	6000	60.14 80.83 60.14 80.83	94.57 126.09 94.57 126.09	1290 2080 1290 2080	1290 2080 1290 2080	2100 2790 2100 2790	3.1 3.3 3.1 3.3	11.2
53	44	16×23×20	120	6000	92.62 126.51	137.57 187.60	2180 3650	2180 3650	3640 4860	5.4 5.7	15
63	53	18×26×22	150	6000	154.13 220.24	221.89 322.75	4170 7300	4170 7300	6800 9100	9.3 10.7	22.2
85	65	24×35×28	180	6000	247.88 351.45	346.70 441.26	10400 12800	10400 12800	12900 17200	13.0 16.0	35.5



GGC type Miniature linear guideway

1. Description

GGC type miniature linear guideway designed with 2-row ball circulation and contact angle 45º of Gothic structure to reach equal loads in four directions. Via optimize design under the limited space, use biggish size balls improving the load capacity and getting the high load and toque function.

2. Application

Semiconductor equipment, medical equipment, optics table, measuring equipment, electric spark wire cutting machine, computer embroidery machine.

3. Dimension

Unit:mm

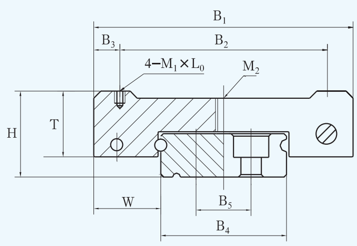
4. Preload and application

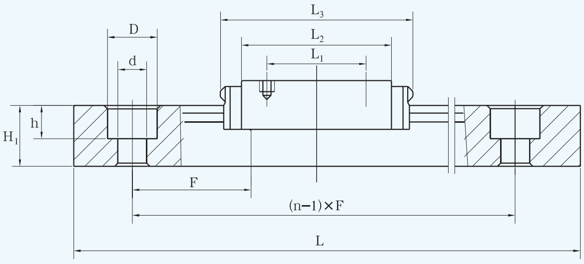
Tab-1

Preload class Code	Application
Normal preload P_1	High repeatability positioning field
Light preload P	High repeatability positioning field

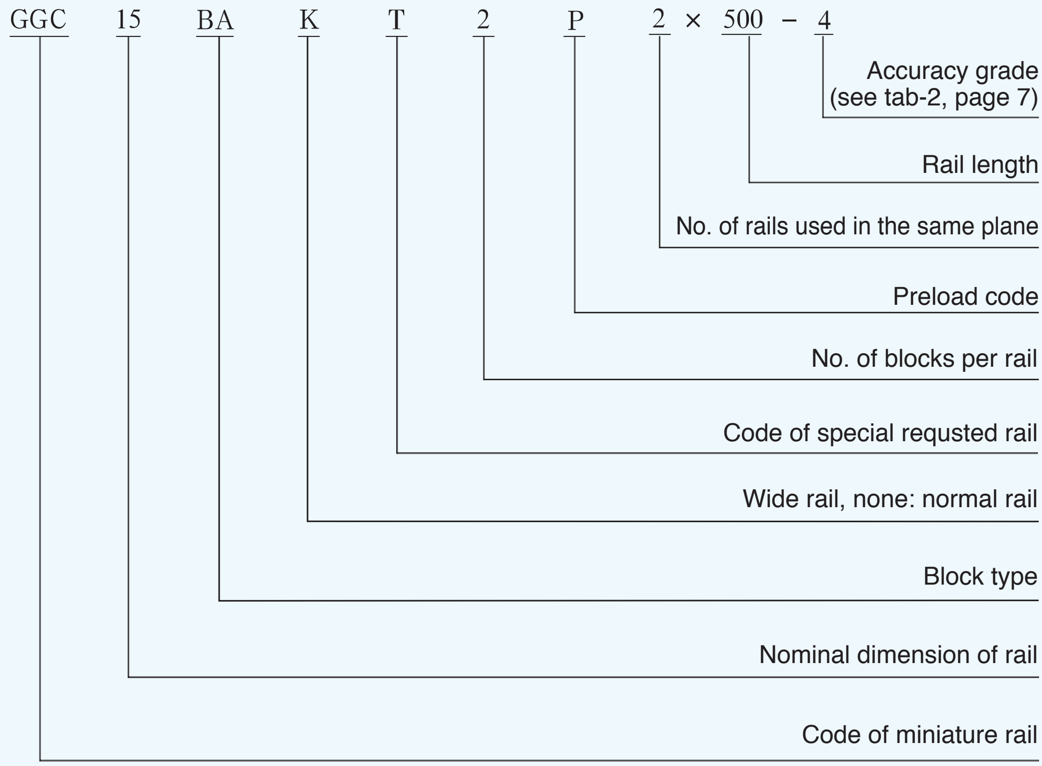
Note:
1. M_A, M_B, M_C are shown in right-under diagram, each indicates rated torque of one block respectively.
2. L_{max} is the maximum length of one rail
3. Distance from each end to the hole in one rail is equal if without special request.

Type	Dimension of assembly		Dimension of block								
	H	W	B_1	B_2	B_3	T	L_1	L_2	L_3	$M_1 \times L_0$	M_2
GGC9BA	10	5.5	20	15	2.5	7.8	13	18	32	M2×2.5	M3
GGC9BAK	12	6	30	21	4.5	7.8	12	27	41	M3×3	M3
GGC12BA	13	7.5	27	20	3.5	10	15	23	37	M3×3.5	M3
GGC12BAK	14	8	40	28	6	10	15	32.4	46.4	M3×3.5	M4
GGC15BA	16	8.5	32	25	3.5	12	20	25.7	43	M3×4	M4
GGC15BAK	16	9	60	45	7.5	12	20	41.3	55.3	M4×4.5	M5

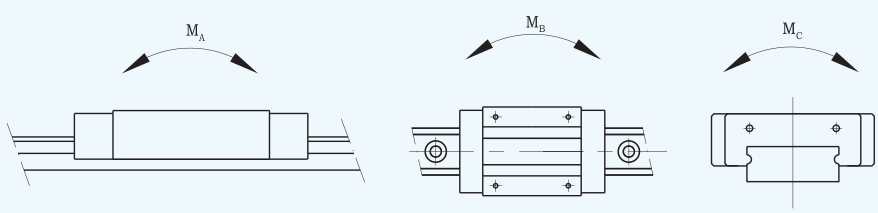




5. Code rule and definition



Dimension of rail						Dynamic load rating	Static load rating	Torque rating			Weight (kg)	
H_1	B_4	B_5	d×D×h	F	Max. single length	C(KN)	C_0(KN)	M_A(N.m)	M_B(N.m)	M_C(N.m)	Block (per/pc)	Rail (per/meter)
5.5	9	0	2.6×4.5×3	20	500	1.71	1.8	6.58	6.58	10.8	0.014	0.32
7.5	18	0	3.6×6×4.5	25	600	2.56	2.7	14.8	14.8	32.4	0.032	0.98
7.5	12	0	3.5×6×4.5	25	600	3.48	3.5	13.6	13.6	24.3	0.028	0.61
8.5	24	0	4.5×8×4.5	40	1200	4.45	4.6	28.8	28.8	73	0.06	1.87
9.5	15	0	3.5×6×4.5	40	1400	5.4	5.5	25.4	25.4	47.3	0.065	0.91
9.5	42	23	4.5×8×4.5	40	1400	7.5	8.5	68.6	68.6	70.3	0.135	2.79



GGD heavy load radial linear guideway

1. Structure and feature

● Structure

GGD series heavy load radial linear guideway with ball carriage is consist of rail, block, ball, re-circulator, top seal, side seal, ball carriage, end seal and oil cup or oil tube etc.(see fig-1)

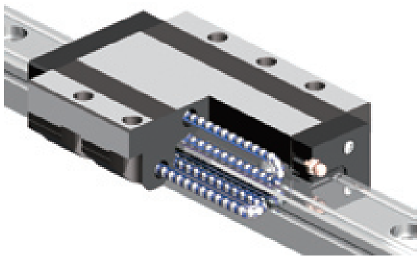


Fig-1

● Feature

Radial heavy load, High rigidity, Small volume

1. The radial force angle of GGD guide is perpendicularly downwards, which greatly improve the radial loading capacity, see fig-2.

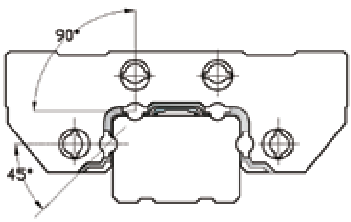


Fig-2

2. Improve the fitness f between raceway and balls, thereby enhance each raceway loading capacity and rigidity, see fig-3.

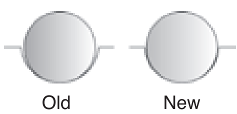


Fig-3

3. It reduced the dimension of assembly height, and optimize with finite element analysis, mutual force points of 4-row are reduced to the best, not only enhance the torsional capacity of rail, deformation capacity of block, also save the design space for users. GGD rail deformation and stress distribution fig. under torsion, GGD block deformation and stress distribution fig. under force, See fig-4.

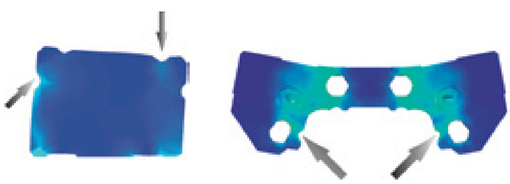


Fig-4

4. The related formula among radial load rating, anti-radial load rating and axial load rating, see tab-1.

Tab-1

Direction	Basic dynamic load rating	Basic static load rating
radial	C	C_o
Anti-radial	C_R=0.64C	C_{OR}=0.68C_o
Axial	C_H=0.46C	C_{OH}=0.36C_o

◆ Low noise

Use ball carriage among the balls, avoid the internal collision, reduce the noise caused by collision among the balls and move much more smoothly. Ball contacts see fig-5, Noise data comparisons see fig-6.

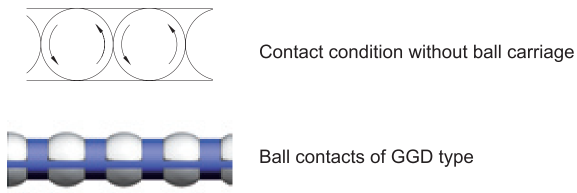


Fig-5

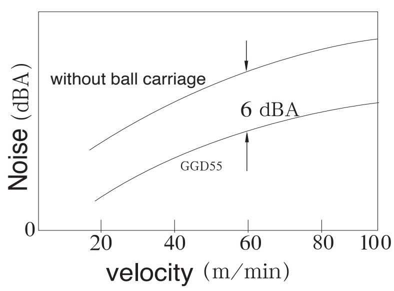


Fig-6

◆ High speed and accuracy

Ball carriage avoids the friction of balls, greatly reduce the friction variation, in addition, it comes into being oil film contact between ball and carriage, reduce the heat during running and achieve high speed and precision movement.

◆ Long term maintenance free

With a certain amount of grease in the ball carriage, it can achieve long term maintenance free and prolong life. See fig-7.

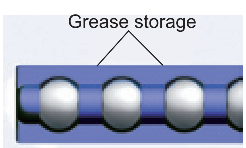
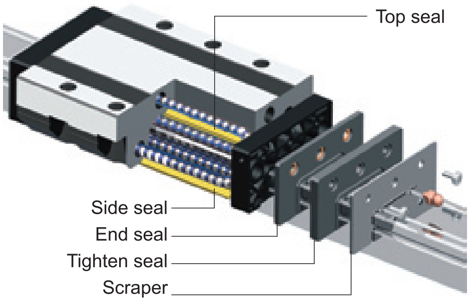


Fig-7

2. Seal Type



Note: no symbol of MN code as the normal seal type.

Seal code	Seal type	Amounting dimension L_1 Increase (mm)			
		GGD35	GGD45	GGD55	GGD65
MM	End seal	+0	+0	+0	+0
MN	End seal+ side seal	+0	+0	+0	+0
MX	End seal+ side seal+ scraper	+3	+4	+4	+4
MY	Tighten-end seal+ side seal	+0	+0	+0	+0
MZ	Tighten-end seal+ side seal+ scraper	+3	+4	+4	+4

3. Preload class and application (see tab-2)

Tab-2

Preload type	Application
P_0(0.1C)	With strong rigidity, impact and vibration condition, normally used for main rails of heavy duty machines
P_1(0.05C)	High repeatability positioning accuracy, suspension/torque load and single LMG, Normally used in precision positioning mechanism and measuring devices
P(0.025C)	Small impact or vibration, easy movement if using double LMG at the same time
P_3(with clearance)	Used in transmission mechanism

4. Code rule and definition

GGD 65 A A L T MM 2 P_1 2 × 7000 (2) −4

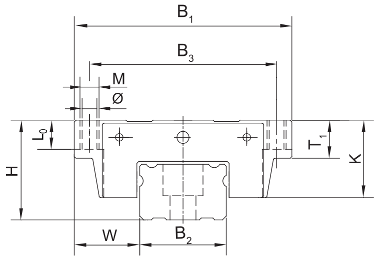
- −4: Accuracy grade, total 1, 2, 3, 4, 5, 6 grades
- (2): Number of joint rail (non-joint is not specified)
- 7000: Rail length
- 2: Number of rails used in the same surface
- P_1: Preload, total P_0, P_1, P, P_3
- 2: Number of blocks used per rail
- MM: Seal type (total MM, MN, MX, MY, MZ, MN is the normal type without mark)
- T: Code of special requested block (standard is not specified)
- L: Code of block length (standard is not specified, L for lengthen)
- A: Block fixed mode(A for thread hole, up-lock or down-lock)
- A: Code of block width (A for wide (flange) type, B for narrow type)
- 65: Nominal dimension of rail(present size: 35, 45, 55, 65)
- GGD: Type code of heavy load radial ball guide

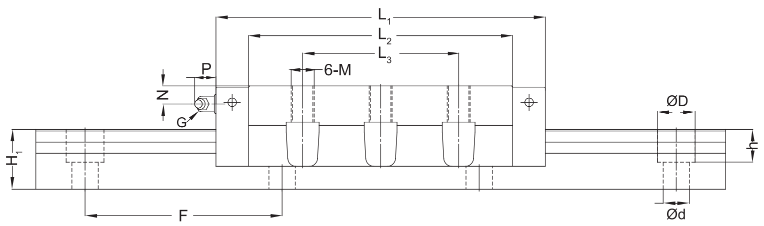
GGD-AA/AAL heavy load radial guideway

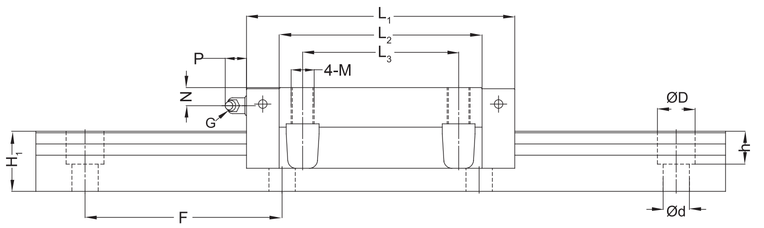
Note:

1. L_1 dimension is for the normal seal type MN, details please see seal type.
2. GGD series AA/AAL block is the flange type, and top mount hole is thread hole,up-lock see dimension M, down-lock see dimension ø.
3. Right side figs. are the side-view of standard block AA and lengthen AAL type.
4. Please note if need oil of side surface.

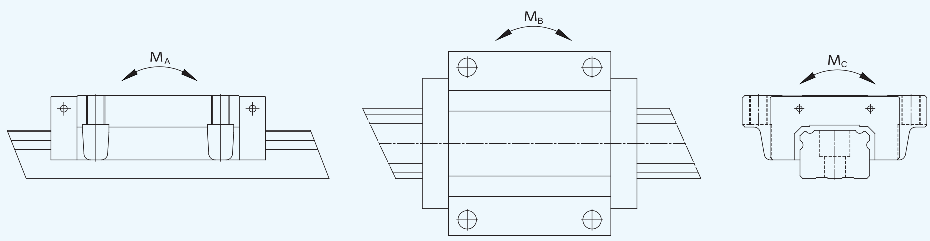
Type	Dimension of assembly		Dimension of block										Dimension of rail	
	H	W	B_1	B_3	K	L_0	T_1	M	ø	L_1	L_2	L_3	B_2	H_1
GGD35AA GGD35AAL	44	33	100	82	35	14	20	M10	8.5	116.4 138.4	86 108	62	34	24.2
GGD45 AA GGD45AAL	52	37.5	120	100	43.1	20	22	M12	10.5	139.4 174	106 137	80	45	29
GGD55 AA GGD55AAL	63	43.5	140	116	49	22	24	M14	12.5	163 203	124 161	95	53	36.5
GGD65AAL	75	53.5	170	142	60	25	28	M16	14.5	255.5	207	110	63	43







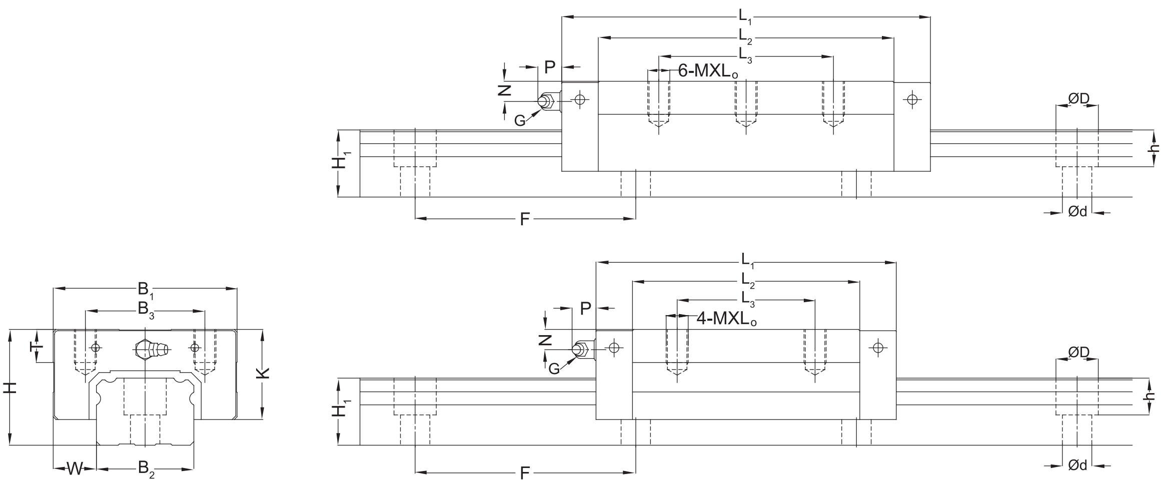
			Dimension of oil cup			Dynamic load rating	Static load rating	Torque rating		
d×D×h	F	Max. single length	G	P	N	C(KN)	C_0(KN)	M_A(N.m)	M_B(N.m)	M_C(N.m)
9×14×12	80	6000	M6	8.8	8	76 91	121 167	1338 2258	855 1416	1807 2366
14×20×16	105	6000	M8	15	10	112 133	183 235	2767 4566	1725 2844	3569 4777
16×23×20	120	6000	M8	15	11	143 174	244 321	4255 7142	2642 4435	5684 7420
18×26×22	150	6000	M8	15	16	279	481	13022	8363	13143



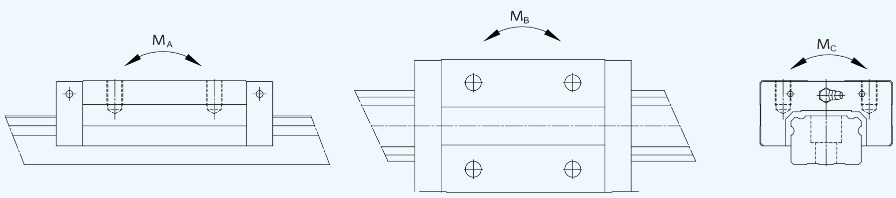
GGD-BA/BAL heavy load radial guideway

Note:
1. L_1 dimension is for the normal seal type MN, details please see seal type.
2. GGD series BA/BAL block is the narrow type, and top mount hole is screw hole.
3. Right side fig. are the side-view of standard block BA and lengthen BAL type.

Type	Dimension of assembly		Dimension of block								Dimension of rail	
	H	W	B_1	B_3	K	T	$M \times L_0$	L_1	L_2	L_3	B_2	H_1
GGD35BA GGD35BAL	44	18	70	50	35	12	M8×12	116.4 138.4	86 108	50 72	34	24.2
GGD45BA GGD45BAL	52	20.5	86	60	43.1	14.7	M10×15	139 174	106 137	60 80	45	29
GGD55BA GGD55BAL	63	23.5	100	65	49	17.7	M12×17	163 203	124 161	75 95	53	36.5
GGD65BAL	75	31.5	126	76	60	21	M16×20	255.5	207	110	63	43



			Dimension of oil cup			Dynamic load rating	Static load rating	Torque rating		
d×D×h	F	Max. single length	G	P	N	C(KN)	C_0(KN)	M_A(N.m)	M_B(N.m)	M_C(N.m)
9×14×12	80	6000	M6	8.8	8	76 91	121 167	1338 2258	855 1416	1807 2366
14×20×16	105	6000	M8	15	10	112 133	183 235	2767 4566	1725 2844	3569 4777
16×23×20	120	6000	M8	15	11	143 174	244 321	4255 7142	2642 4435	5684 7420
18×26×22	150	6000	M8	15	16	279	481	13022	8363	13143



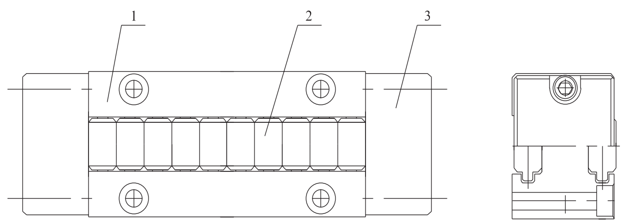
GZD ROLLER GUIDE BLOCK

1. Description

- The roller guide block is a precision linear motion guide. It has strong loading capacity and higher rigidity. In the condition of high frequency back and forth such as repetitive motion, starting and stopping, it can reduce weight of complete machine, transmission gearing and power cost.
- The roller guide block can reach higher sensitivity and high functional plane linear motion. In the condition of heavy load and varied load it has small elastic transmutation and get stable linear motion and no crawl.
- The roller guide block can center automatically because its rolling body – roller has good guide by its rolling. Therefore the positioning accuracy can be improved.
- The rollers in the roller guide block move circularly. Therefore there is no length limit of machine tools by taking the roller guide block. The quantity of guide block depends on loading capacity and specification.
- The roller guide block has wide application. The small type of guide block is used for linear motion parts of mould and instrument. The big type of guide block is used for plane linear motion of heavy machine tools and precision instrument, especial for NC, CNC machine tools.

2. Basic structure

The roller guide block is consisted of block, roller and recirculator. The rollers are doing infinite circulation motion in the block which is hardened and precision ground. To prevent the roller run out from the block, rollers are designed as step roller and block designed with special slot, which made the rollers have centering automatically by moving to avoid side moving. It is in favor of motion flexibly under load and has long life.



1. block 2. roller 3. re-circulator

Fig-1

3. Accuracy

The accuracy of roller guide block depends on height of guide block mainly. For the multi-roller guide blocks used in the same plane, to get the equal distributing load, it should have the consistent height dimension for the same group roller guide block. Usually the tolerance of height is 0--10 um. Height variation of geminate roller guide blocks, see tab-1

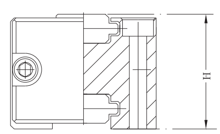


Fig-2

Tab-1 Accuracy of height dimension ***Unit:μm***

Accuracy class	Allowed tolerance of height H	Height variation of the same group
2	0~-10	2
3		3
4		5
5		10

Note:

- Height variation of the same group is the difference of max. and min. height dimension H of the multi-roller guide blocks used in the same plane.
- Please show the number of roller guide blocks used in the same plane when ordering.

The manufacturer will produce in grade according to the accuracy class, except class 5, others grade coded according to the height dimensions, the same codes are in the same group in installation. The customer only need to specify the accuracy class in ordering, not the grade code.

Tab-2 Tolerance in grade of H ***Unit:μm***

Accuracy class	2		3		4		5	
	Grade code	Height difference	Grade code	Height difference	Grade code	Height difference	Grade code	Height difference
Accuracy	B2	0~-2	C3	0~-3	D5	0~-5	-	0~-10
	B4	-2~-4	C6	-3~-6	D10	-5~-10		
	B6	-4~-6	C9	-6~-9				
	B8	-6~-8						
	B10	-8~-10						

4. Rated load and life

- Basic rated dynamic load C

The basic rated dynamic load is , i.e. a group of same roller guide block runs separately and 90% of its reach rated life 100km, in the condition of no damage of material due to contact fatigue, a constant load in the direction and quantity.

- Basic rated static load C_0

The basic rated static load defines static load. The nominated contact stress constant reaches max load in the center of the contact area between rollers and guide

- Life calculation

1) Calculation of life

Calculation formula of roller guide block life

$$L=100x\left(\frac{f_h f_t f_c f_a}{f_w}\cdot\frac{C}{P_c}\right)^{10/3}\ (km)$$

L—rated life(km)　C—rated dynamic load(KN)　P_c—calculated load(KN)　f_t—temperature coefficient

f_c—contact coefficient　f_a—accuracy coefficient　f_w—load coefficient　f_h—hardness coefficient(actual hardness of groove HRC/580)$^{3.6}$

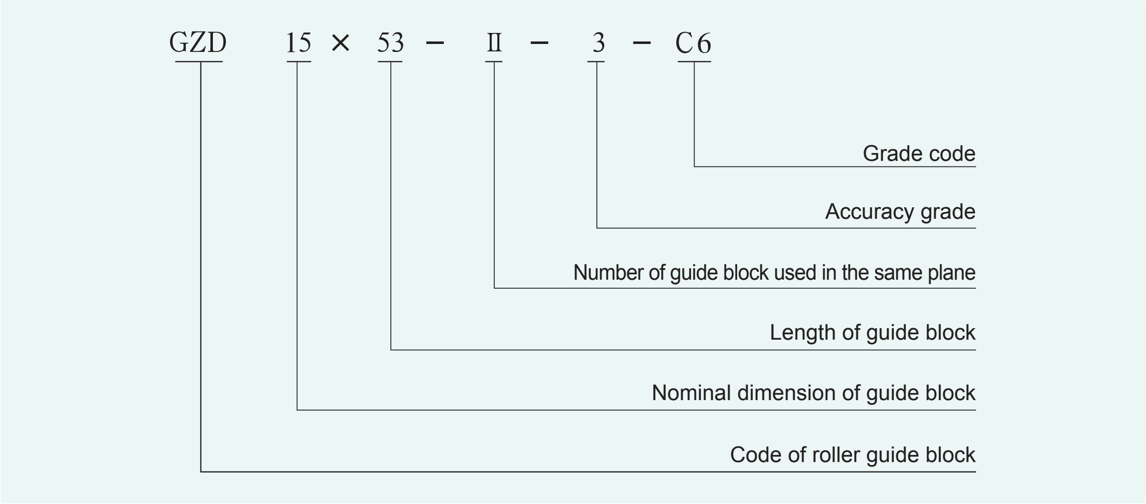
ft, fc, fa, fw data information refer to page 9.

2) calculation of life time

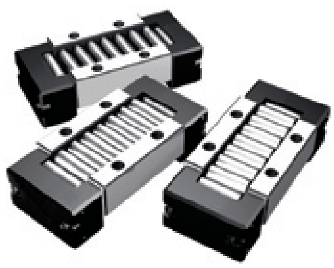
$$L_h=\frac{L\times10^6}{2\times l\times n\times60}\ (h)$$

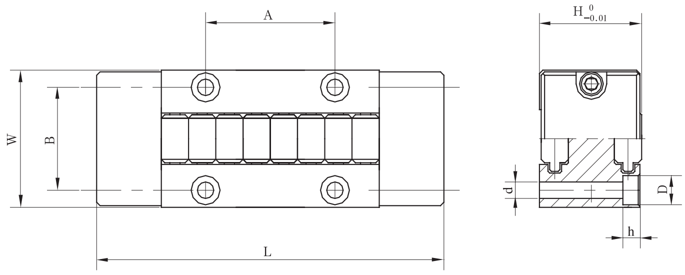
L_h—life time(h)　l —stroke length(mm)　n—repetitive times per min(min^{-1})　L—rated life(km)

5. Code rule and definition



6. Dimension





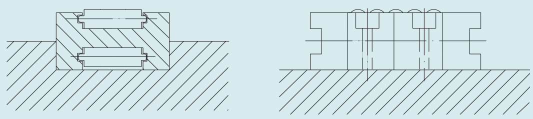
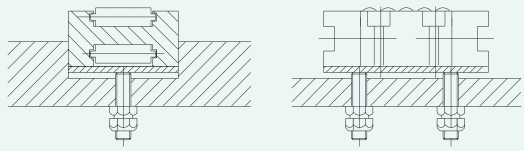
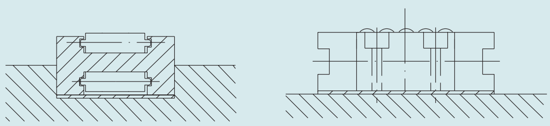
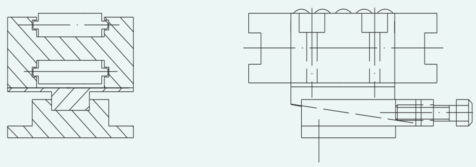
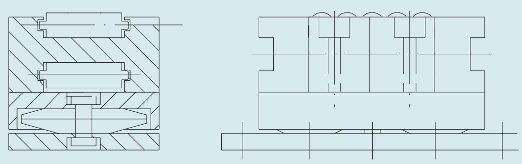
Tab-3　　*unit: mm*

Model	length L	width W	height H	Dia. for mounting hole dxDxh	Center distance of mounting hole A	B	Basic rated dynamic load C(KN)	Basic rated static load C_0(KN)	Weight Block per/pc
GZD15×53	52.8	26.5	15	ø 3.4	19	19.3	23.0	29.0	0.12
GZD20×70	70	30	20	ø 3.6×ø 6×4	26	23	38.3	53.4	0.25
GZD30×123	123	40	30	ø 4.5×ø 8.5×5	58	30	63.5	72.3	0.92
GZD40×132	132	51.4	40	ø 5.5×ø 10×6	50.8	41.5	89.1	121	1.7

7. Installation and operation

When installed the roller guide block, it should ensure the assembled accuracy and parallelism between the block and rail. The normal installation way of roller guide block in the rail of machine tools is shown as Tab-4. To exert the performance of the roller guide block well, bed rail should be hardened to face more than HRC58, surface roughness over Ra0.4~0.8μm, hardened depth should reach 1~2mm.

Tab-4 Normal installation way of roller guide block in the rails

Item no.	Installation way	Sketch	Feature
1	Direct installation		Structure simple, but with higher producing accuracy requirements to the parts
2	Installed in the pad board		precision dimension control via grinding the plate
3	Installed in the wedge iron		Easy to adjust
4	Installed in the adjustable gasket		No precision machining for the mount surface, bust cost time in adjust the accuracy
5	Installed in the spring pad		Because of the automatic compensation of the spring, the requirement to the parts is not high, but the force couldn't be over the preload of the spring

To make the roller guide block to achieve the expectant performance and durability, it should ensure the under installation and adjustable accuracy.

(1) the parallelism between the mounting and guide face: To make the guide block with equably force, the parallelism tolerance between the roller block mount ref. side and guide rolling contact surface should control in less than 0.02mm/1000mm.

(2) Lean accuracy in length direction of roller: To ensure the roller not lateral excursion and skid in the running, the parallelism of roller length direction and mounting ref. side of machine tool should control in less than 0.02mm/300mm

(3) Lean accuracy of roller block side face:To avoid the roller lateral excursion and skid in running, the parallelism of roller axes direction and right and left of rolling face should control in less than 0.02mm/300mm, the position accuracy is higher, the lean accuracy will be controlled better.

8.Lubrication

The main function of lubrication is to eliminate friction and tear to avoid huge heat, which will damage the inner structure as well as influence motion function. When the roller cross guide is moving at a high speed(V≥15m/min),N32 lubrication oil is recommended(refer to GB443-84). When temperature is 40ºC, oil's viscosity is 28.5~35.2cst, correspond to the old standard 20# mechanical oil. The roller guide block should be lubricated periodically or connected with oil hose. Li grease(GB7324-94 2#) is recommended, if roller cross guide is running at low speed(V≤15m/min).

GZV precision roller cross guide

1. Structure and feature

- Structure:

"YIGONG" Roller cross guide consists of two rails with V type groove, retainer and cylinder roller. The cylinder rollers, which range crosswise each other, shuttle along V type ground groove. It can take the load from all directions with high accuracy and smooth linear motion.

- Feature:

small rolling friction, good stability;
small start friction, good following function;
large contact area, small elastic deformation, many efficient motion units, easy motion with high rigidity and load;
flexible structure design, easy installation and use.

2. Rated life of roller cross guide

- Calculation of rated life

$$L = 100\left(\frac{f_t}{f_w}\cdot\frac{C}{P_c}\right)^{10/3} \quad \text{(Km)}$$

In formula: L—rated life f_t—temperature coefficient f_w—load coefficient C—rated dynamic load P_c—calculated load

Temperature coefficient f_t: if working temperature ℃≤100, f_t=1

Load coefficient f_w

Tab-1

Working condition	No outer impact or shock Speed which is less than15m/min	No obvious impact or middle s speed which is less than 1.5--60m/min
f_w	1～1.5	1.5～2.0

- Calculation of life time

$$L_h = \frac{L\times 10^3}{2\times l\times n\times 60} \quad (h)$$

In formula: L_h—life time L—rated life l—travel length n—reciprocating times per minute

3. Calculation of load

- Travel length and quantity of roller

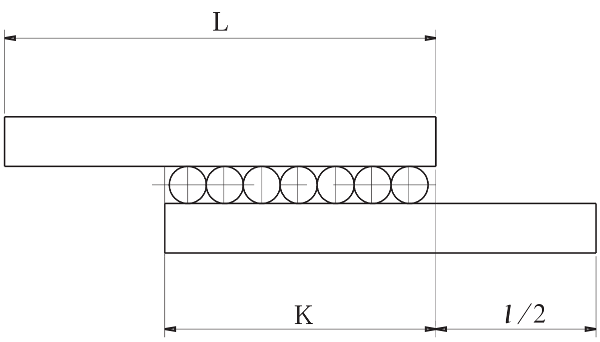


Fig-1

◆ Calculation of guide length

The length of guide is more than 1.5 times of travel: L≥1.5 l

In formula: L—guide length(mm) l —travel length (mm)

◆ The length of retainer: K≤L- l /2

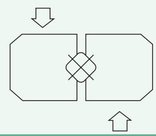
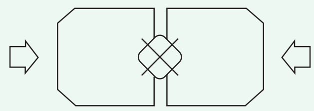
In formula: K—retainer length(mm)

◆ Calculation of roller quantity: N=(K-2a)/f+1

In formula: N—roller quantity(decimal fraction is not calculated) a—end distance of retainer f—roller interval

● Calculation of load

Tab-2

	Vertical load	Side load
Load direction		
Rated dynamic load C	$C=\left(\frac{N}{2}\right)^{3/4}C_1$	$C=\left(\frac{N}{2}\right)^{3/4}2^{7/9}C_1$
Rated static load C_0	$C_0=\left(\frac{N}{2}\right)C_{01}$	$C_0=2\times\left(\frac{N}{2}\right)C_{01}$

In table: C—rated dynamic load(N)C_0—rated static load(N) C_1—rated dynamic load of each roller(N)

C_{01}—rated static load of each roller(N) N—quantity of roller N/2—quantity of roller (decimal fraction is not calculated)

4. Selection of accuracy grade

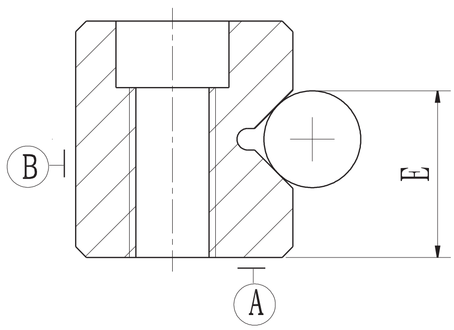


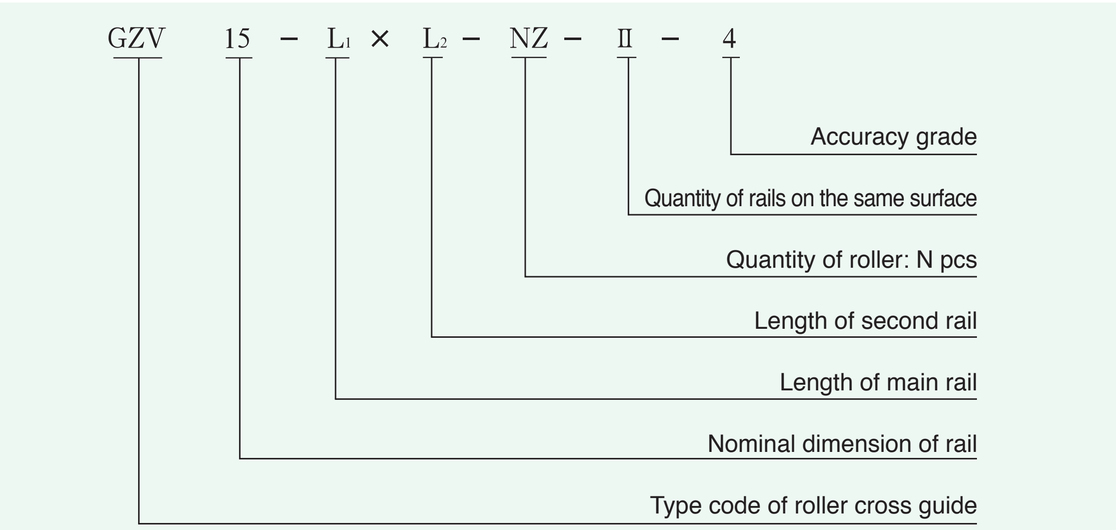
Fig-2

Tab-3

Item(mm) \ Accuracy grade (μm)		2	3	4	5
Parallelism of rail's V-shape surface to A-side and B-side	≤200	2	4	6	10
	>200-400	4	6	8	12
	>400-600	5	8	12	14
	>600-800	6	9	13	16
	>800-1000	7	10	15	17
Limited deflection of height E		±10	±10	±15	±20
Consistency of height E of same group of rail		10	10	15	20

5. Code rule and dimension series

● Code rule of roller cross guide



Notes: Two rails consist of a set of roller cross guide. The quantity of rails on the same surface means there are some sets of roller cross guide to be used on the same surface. As shown in above code rule II means that there are two sets of roller cross guide on the same surface, namely, four rails to be used at the same time.

● Size series

◆ Basic dimension of roller cross guide

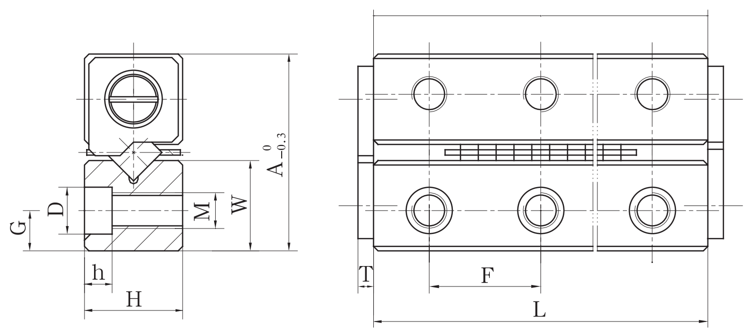


Fig-3

Tab-4 *unit:mm*

Dimension / Specification	A	H	W	M	D	h	G	F	T	Max. rail length L_{max}	Weight of one rail per meter (kg)
GZV3	18	8	8.4	M4	6	3.1	3.5	25	3	300	0.45
GZV4	22	11	10	M5	7.5	4.1	4.5	40	3	500	0.75
GZV6	31	15	14.2	M6	9.5	5.2	6	50	3	800	1.47
GZV9	44	22	20.2	M8	10.5	6.2	9	50	4	1400	3.07
GZV12	58	28	27	M10	13.5	8.2	12	100	5	1400	5.32
GZV15	71	36	33	M12	16.5	10.2	14	100	5	1400	8.30

Note:*mark is in developing.

◆ Basic dimension of retainer

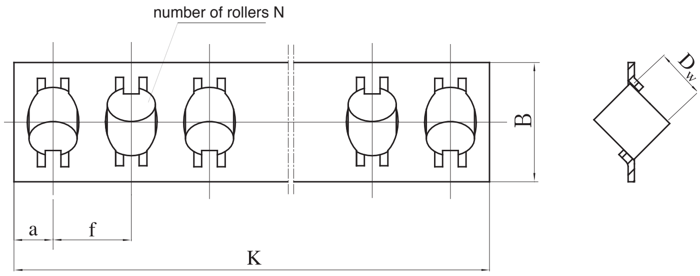


Fig-4

Tab-5

Dimension / Specification	D_w (mm)	a (mm)	f (mm)	B (mm)	C_1 (KN)	C_{01} (KN)
*GZV1	1.5	1.5	2.5	3.8	0.107	0.118
*GZV2	2	2	4	5.6	0.263	0.274
GZV3	3	2.5	5	7.6	0.545	0.597
GZV4	4	5	7	10	1.05	1.16
GZV6	6	6	9	14	2.06	2.41
GZV9	9	9.5	14	21	5.904	6.74
GZV12	12	10	20	25	12.15	13.77
GZV15	15	14	22	34	19.62	22.32

In Tab-5: C_1—the rated dynamic load of each roller (KN)
C_{01}—the rated static load of each roller (KN)

Note:* mark is in developing.

6. Notice for operation

● Accuracy of equipped mounting surface

The structure of equipped fixed surface of roller cross guide is shown separately as Fig-5:

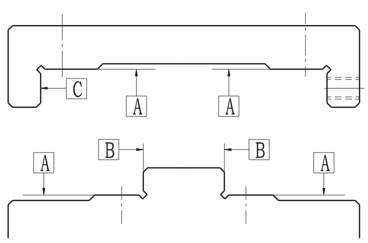


Fig-5

The accuracy of equipped mounting surface will have influence on the running accuracy and performance. If the higher running accuracy is needed, the accuracy of equipped mounting surface will be enhanced relatively.

A surface: the accuracy will have impact on the running accuracy directly.

B & C surface: plane: impact on preload.

Verticality: the verticality against A surface has impact on assembly rigidity on the direction of preload.

So we suggest that try to improve the assembled surface accuracy. The accuracy value is close to the parallelism value.

● Preload method

The preload is adjusted by preload adjustable bolt. The dimension & specification of the bolt is as same as fix bolt. The bolt center is half of rail height.

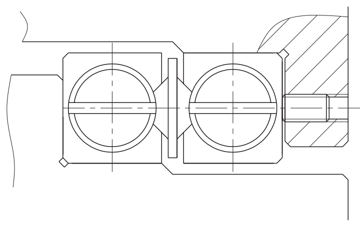


Fig-6

The value of preload depends on different machines and equipments. Over-preload will reduce the life of guide and damage the raceway. And during the use, the cylinder roller is easy to deflect, so that it self-locked. Therefore usually no-preload and lower preload is recommended. If there is higher accuracy and rigidity requirement, it is commended to use fixed plane as shown diagram 7 or wedge block as shown diagram 8 to preload.

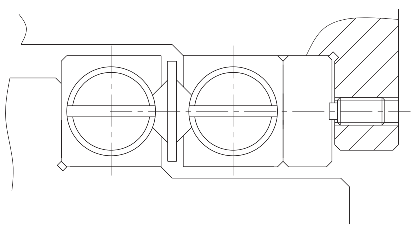


Fig-7

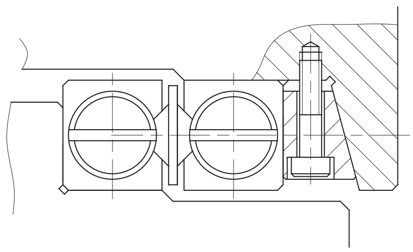


Fig-8

● The roller cross guide can run under high temperature, but it is less than 100℃.

● The speed of roller cross guide is less than 30m/min.

7. Lubrication

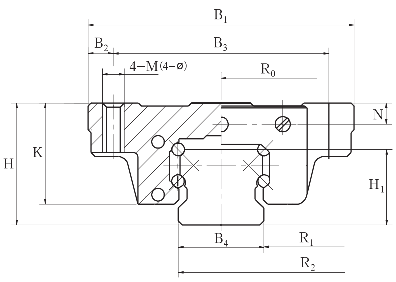
The main function of lubrication is to eliminate friction and tear to avoid huge heat, which will damage the inner structure as well as influence motion function. When the roller cross guide is moving at a high speed (v≥15m/min), N32 lubrication oil is recommended (refer to GB443-89). When temperature is 40℃,oil's viscosity is 28.8-35.2mm^2/s. The roller cross guide should be lubricated periodically or connected with oil hose. Li grease (GB7324-94 2#) is recommended, if roller cross guide is running at low speed (v<15m/min).

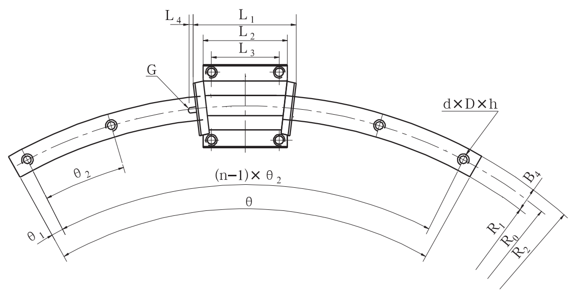
GGY arc LMG

Notes:

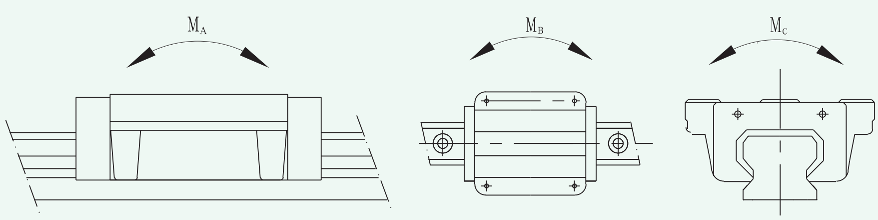
1. M_A.M_B.M_C mean rated torque of a block.
2. We can produce R_0 in according to customer's requirements, following table shows developed products.

Type	Dimesion of assembly		Dimension of block									Dimension of oil cup	
	H	B_1	B_2	B_3	K	L_1	L_2	L_3	M	ø	L_4	G	N
GGY16/168AA(AB)	24	47	4.5	38	19.4	58	40.5	30	M5	4.5	2.5	ø4	4
GGY16/228AA(AB)	24	47	4.5	38	19.4	58	40.5	30	M5	4.5	2.5	ø4	4
GGY16/300AA(AB)	24	47	4.5	38	19.4	58	40.5	30	M5	4.5	2.5	ø4	4
GGY16/390AA(AB)	24	47	4.5	38	19.4	58	40.5	30	M5	4.5	2.5	ø4	4
GGY25/230AA(AB)	37	70	6.5	57	30.5	79.5	59	45	M8	7	11	M6	6





Dimension of rail								Min. terminal angle	Dynamic load rating	Static load rating	Torque rating			Weight	
B_4	H_1	d×D×h	θ_2	R_0	R_1	R_2	θ_{max}	θ_1	C(KN)	C_0(KN)	M_A(N.m)	M_B(N.m)	M_C(N.m)	滑块/个	导轨/米
16	15	4.5×7.5×5.3	15°	168	160	176	160°	3°	5.67	6.35	51.8	51.8	82.9	0.2	1.5
16	15	4.5×7.5×5.3	15°	228	220	236	160°	3°	5.67	6.35	51.8	51.8	82.9	0.2	1.5
16	15	4.5×7.5×5.3	15°	300	292	308	75°	2°	5.67	6.35	51.8	51.8	82.9	0.2	1.5
16	15	4.5×7.5×5.3	15°	390	382	398	65°	2°	5.67	6.35	51.8	51.8	82.9	0.2	1.5
23	22	7×11×9	15°	230	218.5	241.5	160°	3°	16.8	21.5	142.2	142.2	233.5	0.99	3.3



Ball screw assembly is consisted of screw, nut and ball. The function is transfer the rotary motion into linear motion or transfer the linear motion into rotary motion. This is further extension and development of slide ball screw. The important significance of development is as same as change of bearing from rolling motion to sliding motion. Because of excellent friction function, ball screw is widely used for all kinds of industrial equipments and precision instrument.

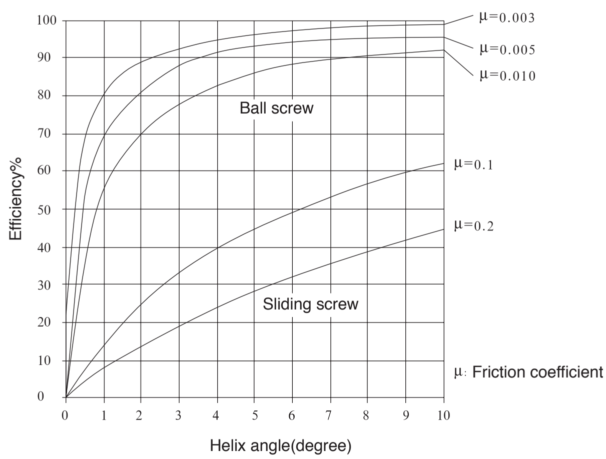
Since 1964, the company developed the China's first ball screw, it has on the leading position in China in the research and manufacture of ball screw. In order to meet the development of CNC machine tools, the company established "large, heavy-load, high-speed, high-precision" of product development direction. In product development, we opened DKFZD End-cap high-speed high-precision ball screw and CMFZD Intubation large heavy-load ball screw etc. completely new products with independent intellectual property rights, declaration and licensing patents, total 14 items, In processing technology, it is the first application of technology in induction hardening of ball screw on heat treatment which greatly enhanced the production efficiency. In recent years, the company has changed decades of traditional process techniques, improved the productivity and quality and greatly reduced the product lead time by successful introduction of the world-class processing technology of high-speed hard whirling from German company. Using pre-process with defined length, the lead time can be shortened to 15 days.

At present, the company can produce the ball screw min. dia. of 6 mm, min. lead 1mm; max. dia. 205mm; max. single length 10m, max. load more than 100 ton which of various applications; it can provide a mass of 2 m P1 grade, 3m P2 grade; 5m P3 grade; 8m P5 grade various ball screws, it's the professional ball screw manufacturer of all specifications.

Features

1. High transfer efficiency

Balls with free motion transfer the force and motion between screw and nut in the ball screw assembly. This transfer wise replaces the traditional direct function wise between screw and nut. Therefore the minimum rolling friction takes the place of the sliding friction of traditional ball screw. The transfer efficiency of ball screw will reach more than 90%. The drive torque of transfer unit reduces to 1/3 of sliding screw. This reduces the heat rate largely.



2. High positioning accuracy

Ball screw has low heat rate and small temperature increase. In the machining the measures have been taken to prolong and preload so as to avoid axial clearance. Ball screw has high positioning accuracy and repeating positioning accuracy.

3. Reversibility

Ball screw has not sticky friction of sliding screw. It clears crawl which exist during transference. Ball screw can realize two transfer wise—from rotary motion to linear motion and from linear motion to rotary motion—and transfer momentum.

4. Long service life

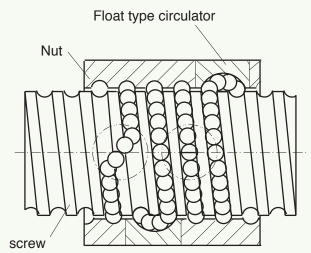
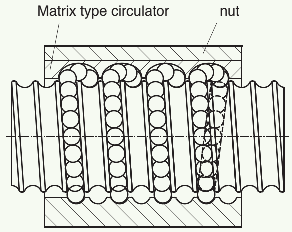
Because of strict control of shape of running track, surface hardness and material, the actual life of ball screw is much longer than sliding screw.

5. Good synchronization

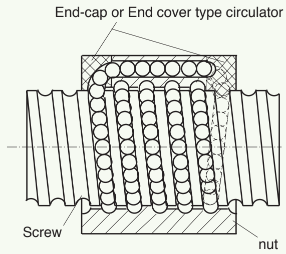
Due to smooth running, avoidance of axial clearance and consistency of manufacture, several sets of ball screw can drive same unit or several same parts. The synchronization is good.

Structure of ball screw

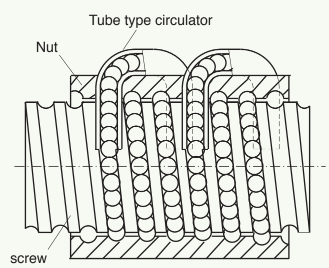
Circulation mode

Circulation mode	Inner cycle, Float type (F)	Inner cycle, Matrix type(J)
Configuration		
	Number of circulation n_1: the number of circulation from the exit of one circulator to the enter of the other circulator is one circulation Number of columns m: number of circulators Number of reverser n_2: 4 Total number of circulation n: $n=n_1 x n_2 xm$ Fig. shown:n=1x4x1=4	
trait	Small mounting dimension of nut, apply to middle and small lead, middle and low speed, manufacture technology relatively simple	
Out dia. of nut	small	
Number of circulation	All kinds of choice (Generally≤8)	
Number of columns	1	

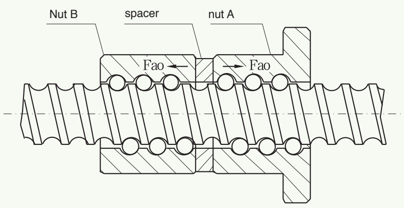
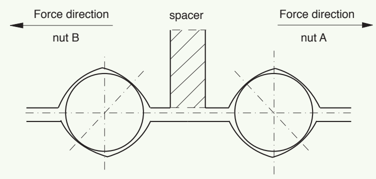
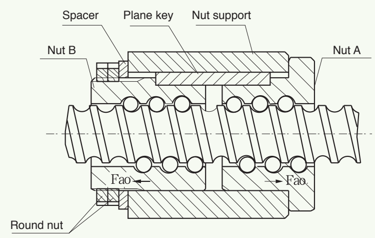
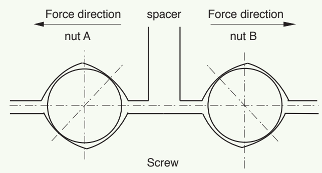
Circulation mode

Circulation mode	Inner cycle, End-cap type (DK)	Inner cycle, End housing type(DG)
Configuration		Number of circulation n_1: the number of circulation from the exit of one circulator to the enter of the other circulator is one circulation Number of columns m: 1 Number of reverser n_2: 2 Total number of circulation n: n= $n_1$xm Fig shown: n=5x1=5
trait	Smooth motion, apply to middle lead and speed situation	Apply to large lead, high speed, not high accuracy required situation
Out dia. of nut	small	
Number of circulation	All kinds of choice (Generally≤6)	0.8 or 1.8
Number of columns	Generally=1	2 or 4

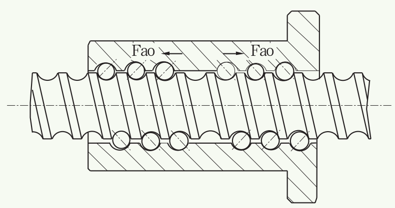
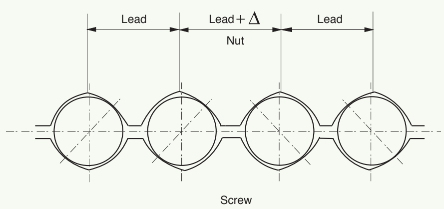
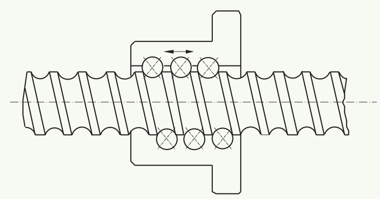
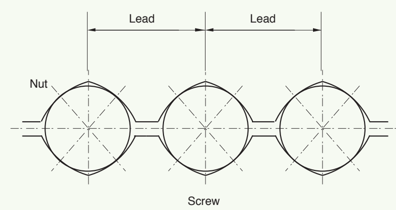
Circulation mode

Circulation mode	External cycle, tube type(C)	
Configuration		Number of circulation n_1: the number of circulation from the exit of one tube to the enter of the other tube Fig shown: 2.5 Number of columns m: 1 Number of reverser n_2: 2 Total number of circulation n: n= $n_1 x n_2 xm$ Fig shown: n=2.5x1x2=5
trait	Large mounting dimension of nut, widely used, manufacture technology relatively complex	
Out dia. of nut	big	
Number of circulation	All kinds of choice	
Number of columns	Generally=1	

Preload mode

Preload mode	Double nuts, preloaded by spacer (D)	Double nuts, preloaded by thread(L)
configuration	 Double nut spacer preloaded  Ball contact	 Double nut thread preloaded  Ball contact
trait	Most widely used,with suitable pre-tightness force	Used in middle and low accuracy and speed, customer can adjust the pre-tightness force by themselves.
Nut length	Little long	long

Preload mode

Preload mode	Single nut, lead change(B)	Single nut, increase ball dia. (Z)
configuration	 Single nut, lead change  Ball contact	 Single nut, increase ball dia  Ball contact
trait	Apply to middle and high accuracy, low load situation	Apply to low accuracy and load situation
Nut length	middle	short

Production range of ball screw

Tab-1   *unit: mm*

<table>
<tr><th>Accuracy grade / Length range / Nominal dia.</th><th><300</th><th>300 ~ 400</th><th>400 ~ 500</th><th>500 ~ 700</th><th>700 ~ 1000</th><th>1000 ~ 1500</th><th>1500 ~ 2000</th><th>2000 ~ 2500</th><th>2500 ~ 3000</th><th>3000 ~ 3500</th><th>3500 ~ 4000</th><th>4000 ~ 5000</th><th>5000 ~ 6000</th><th>6000 ~ 7000</th><th>7000 ~ 8000</th><th>8000 ~ 10000</th><th>over 10000</th></tr>
<tr><td>6~12</td><td>1</td><td>3</td><td colspan="2">7</td><td colspan="13"></td></tr>
<tr><td>12</td><td>1</td><td>3</td><td>5</td><td>7</td><td colspan="13"></td></tr>
<tr><td>16</td><td>1</td><td>3</td><td>5</td><td colspan="2">7</td><td colspan="12"></td></tr>
<tr><td>20</td><td colspan="2">1</td><td>3</td><td>5</td><td colspan="2">7</td><td colspan="11"></td></tr>
<tr><td>25</td><td colspan="2">1</td><td colspan="3">3</td><td>5</td><td>7</td><td colspan="10"></td></tr>
<tr><td>32</td><td colspan="5">1</td><td colspan="2">5</td><td colspan="4">7</td><td colspan="6"></td></tr>
<tr><td>40</td><td colspan="7">1</td><td>3</td><td>5</td><td colspan="4">7</td><td colspan="4"></td></tr>
<tr><td>50</td><td colspan="7">1</td><td colspan="2">2</td><td>5</td><td colspan="3">7</td><td colspan="4"></td></tr>
<tr><td>63</td><td colspan="7">1</td><td colspan="4">2</td><td>3</td><td colspan="2">5</td><td colspan="2">7</td><td>10</td></tr>
<tr><td>80</td><td colspan="7">1</td><td colspan="4">2</td><td>3</td><td colspan="3">5</td><td>7</td><td>10</td></tr>
<tr><td>100</td><td colspan="7">1</td><td colspan="4">2</td><td>3</td><td colspan="3">5</td><td>7</td><td>10</td></tr>
<tr><td>120</td><td colspan="7">1</td><td colspan="4">2</td><td>3</td><td colspan="3">5</td><td>7</td><td>10</td></tr>
<tr><td>125</td><td colspan="7">1</td><td colspan="4">2</td><td>3</td><td colspan="3">5</td><td>7</td><td>10</td></tr>
<tr><td>160</td><td colspan="7">1</td><td colspan="4">2</td><td>3</td><td colspan="3">5</td><td>7</td><td>10</td></tr>
</table>

Code rule and definition

Code rule of ball screw

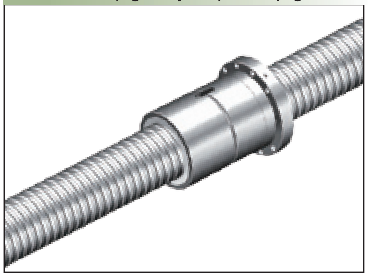
F F Z D 32 05 T L −3 −P 3 /1500 ×1200

- 1200 — Total length of thread (mm)
- 1500 — Total length of ball screw (mm)
- 3 — Accuracy grade (divided into 7 grades, such as: 1,2,3,4,5,7,10)
- P — Type (P or T)
- 3 — Number of circles of load balls
- L — Thread direction (L for left-rotation, R for right-rotation)
- T — Special models (mark T for size different from the catalogue, no mark for the same size)
- 05 — Nominal lead P_{ho}
- 32 — Nominal diameter d_o
- D — Preload type (mark D for preload with spacer, mark B for deflected lead preload, mark L for thread preload, mark Z for increase ball diameter preload nut)
- Z — Cylinder nut mark
- F — Flange nut mark
- F — Circulation mode (mark F for inner cycle float; mark CM for outer cycle return tube enclosed, mark CT for return tube external; mark DK for end cap type; mark DG for outer cycle end housing; mark J for inner cycle matrix type)

Structure type of ball screw

There are 10 models of standard nut in Yigong precision ball screw assembly. Besides, in order to meet customer's requirements, we can manufacture non-standard nut such as special shape (quadrate nut, nut with axial lines cross), special function (high temperature proof and corrosion proof nut) and over long specification (lengthening, heavy load). Welcome to enquiry, if you have any requirements.

JF/JFZD model(big heavy load) see page 72/74



DKF/DKFZD model (high speed and accuracy grade) see page 76/80

FF/FFZ model see page 84

FFZD model see page 92

FFZL model see page 98

JF model (mini type) see page 100

CMFZD model see page 102

CTF model see page 104

DGF model see page 106

DGZ model see page 108

Lead accuracy of ball screw assembly

Accuracy grade

Ball screw assembly is divided into positioning BSA(P) and transmission BSA (T). There are seven accuracy grades, that is 1, 2, 3, 4, 5, 7, 10.
The highest precision is grade one, then lowering one by one.
Travel deviation and travel alteration (see fig-1 and tab-2)

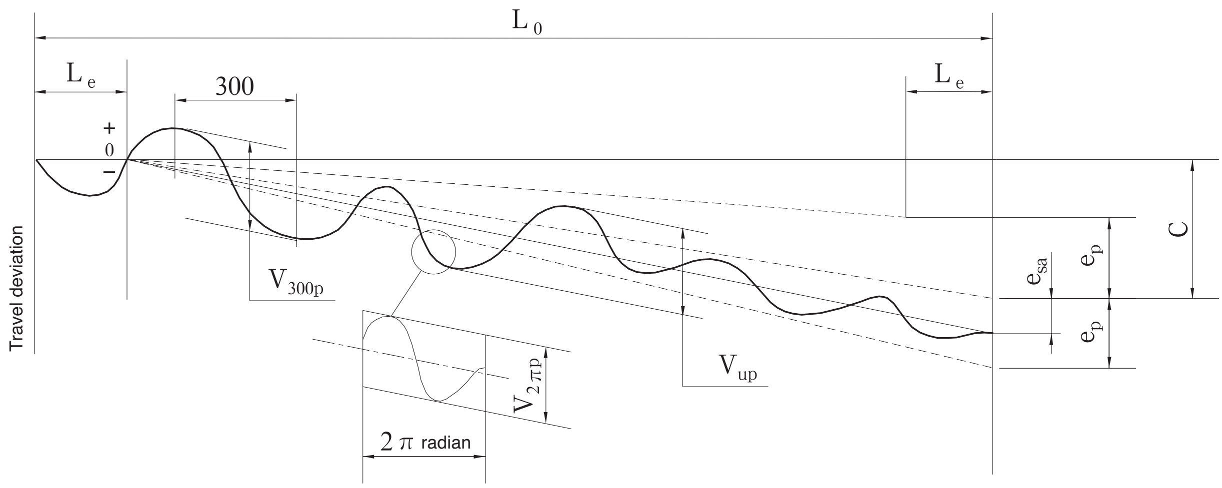


Fig-1

Tab-2 Travel deviation and travel alteration(from GB/T 17587.3-1998) *unit:μm*

No.	Testing content	Symbol	Effective travel distance(mm)	Accuracy grade 1	2	3	4	5	7	10
1	Travel alteration over any travel distance 300mm	V_{300p}	—	6	8	12	16	23	52	210
2	Travel alteration in one-revolution(only applied for P type)	$V_{2\pi p}$	only applied for P type	4	5	6	7	8	—	—
3	Average travel deviation within effective travel distance lU (only applied for P type)	e_p	≤315	6	8	12	16	23	—	—
			>315 ~ 400	7	9	13	18	25	—	—
			>400 ~ 500	8	10	15	20	27	—	—
			>500 ~ 630	9	11	16	22	32	—	—
			>630 ~ 800	10	13	18	25	36	—	—
			>800 ~ 1000	11	15	21	29	40	—	—
			>1000 ~ 1250	13	18	24	34	47	—	—
			>1250 ~ 1600	15	21	29	40	55	—	—
			>1600 ~ 2000	18	25	35	48	65	—	—
			>2000 ~ 2500	22	30	41	57	78	—	—
			>2500 ~ 3150	26	36	50	69	96	—	—
			>3150 ~ 4000	32	45	62	86	115	—	—
			>4000 ~ 5000	-	-	76	110	140	—	
			>5000 ~ 6300	-	-	-	-	170	—	—
	Average travel deviation within effective travel distance L_u (only applied for T type)	e_p	$e_p = \frac{2L_u}{300} V_{300p}$	Notes:1. Travel compensation C=0 2. As for V_{300p} see No.1						

No.	Testing content	Symbol	Effective travel distance(mm)	Accuracy grade						
				1	2	3	4	5	7	10
4	Travel deviation within effective travel distance L_u (only applied for P type)	V_{up}	≤315	6	8	12	16	23	—	—
			>315 ~ 400	6	9	12	18	25	—	—
			>400 ~ 500	7	9	13	19	26	—	—
			>500 ~ 630	7	10	14	20	29	—	—
			>630 ~ 800	8	11	16	22	31	—	—
			>800 ~ 1000	9	12	17	24	34	—	—
			>1000 ~ 1250	10	14	19	27	39	—	—
			>1250 ~ 1600	11	16	22	31	44	—	—
			>1600 ~ 2000	13	18	25	36	51	—	—
			>2000 ~ 2500	15	21	29	41	59	—	—
			>2500 ~ 3150	17	24	34	49	69	—	—
			>3150 ~ 4000	21	29	41	58	82	—	—
			>4000 ~ 5000	-	-	49	70	99	—	
			>5000 ~ 6300	-	-	-	-	119	—	—
			Note: 1.Travel deviation L_u for T type doesn't need to test. 2.If the thread length is longer than 6300mm, please contact us.							

Effective travel distance L_u can be calculated as per below formula (Unit: mm)

$$L_u = L_1 - 2L_e$$

In formula: L_u– effective travel distance, mm L_1– total length of screw thread, mm L_e– remaining distance (see tab-3), mm

Tab-3   *Unit: mm*

Nominal lead	4	5	6	8	10	12	16	20
Remaining distance(L_e)	16	20	24	32	40	45	50	60

Position tolerance of installation reference surface for ball screw

(see fig-2 and tab-4)

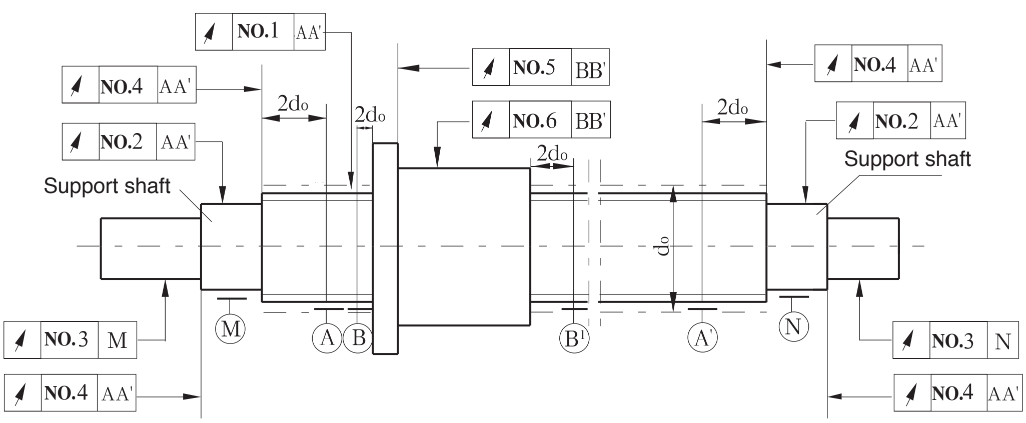
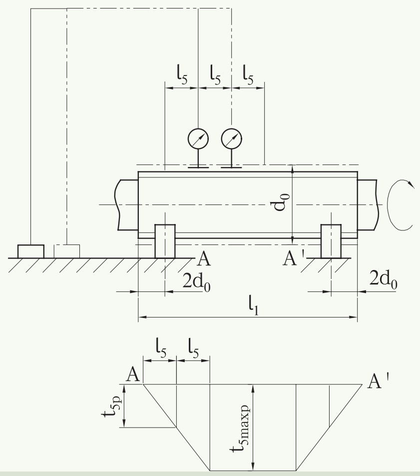
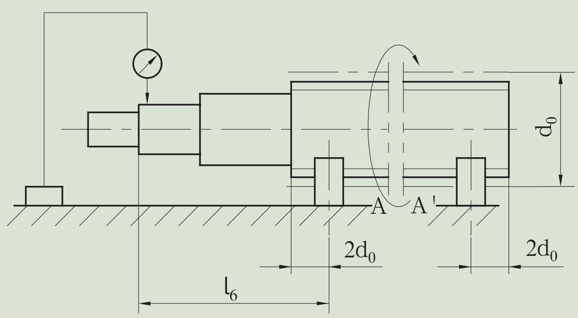
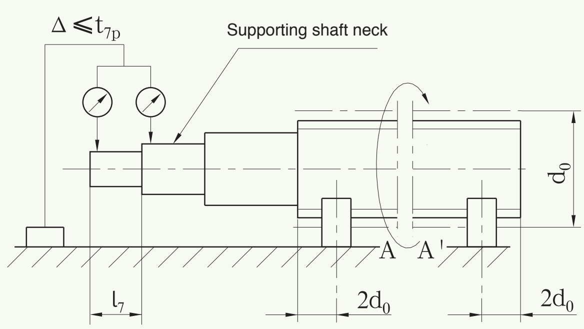


Fig-2

Tab-4 (From GB/T 17587.3-1998)

Serial number	Diagram	Testing item
1		Radical jumping of outer diameter of ball screw in each l_5 length is t_5, so that the straightness toward AA' can be determined.
2		Radical jumping of supporting shaft neck towards AA' in each l length. If l_6 is ≤t, it is t_6; if $l_6 > l$, its virtual value is $t_{6a} \le t_{6p} \frac{l_6}{l}$
3		Radical jumping of shaft neck towards supporting shaft neck. If $l_7 \le l$, it is t_7; if $l_7 > l$, its virtual value is $t_{7a} \le t_{7p}$ l_7/l .

	Tolerance	Testing tool	Testing explanation According to relevant clause of GB/T 10931.1

Ball screw for positioning and transmission

Nominal diameter d_0 mm	l_5 mm	Standard tolerance grade						
		1	2	3	4	5	7	10
		t_{5p},um in l_5 length						
≥6~12	80	20	22	25	28	32	40	80
>12~25	160							
>25~50	315							
>50~100	630							
>100~200	1250							
Ratio of length and diameter l_1/d_0		t_{5maxp} of length $l_1 \geq 4 l_5$, μm						
≤40		40	45	50	57	64	80	160
>40~60		60	67	75	85	96	120	240
>60~80		100	112	125	142	160	200	400
>80~100		160	180	200	225	256	320	640

Testing tool: Indicator, double V-type iron with same height

5.612.2
Putting ball screw on V-type iron in AA'. Adjusting indicator so that its finder contacts cylinder surface vertically in l_5. Turning ball screw slowly, writing down the reading variety on indicator. Repeating test in stated test distance.
Notice:
1. according to negotiation it is allowable to test with holding center hole of ball screw. Here l_1 is total length of ball screw.
2. If l_1 is <2 l_5, it will be tested in $l_1/2$.

Ball screw of positioning or transmission

Nominal diameter d_0 mm	l mm	Standard tolerance grade						
		1	2	3	4	5	7	10
		t_{6p}, μm in l length						
≥6~20	80	10	11	12	16	20	40	63
>20~50	125	12	14	16	20	25	50	80
>50~125	200	16	18	20	26	32	63	100
>125~200	315			25	32	40	80	125

Testing tool: Indicator, double V-type iron with same height

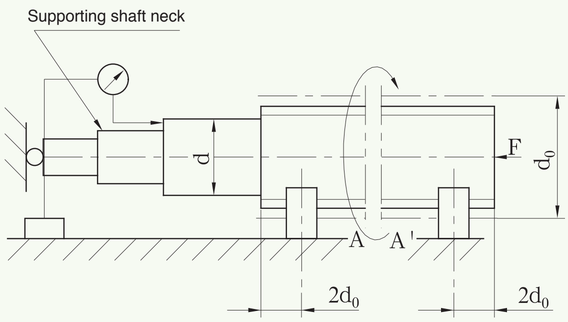
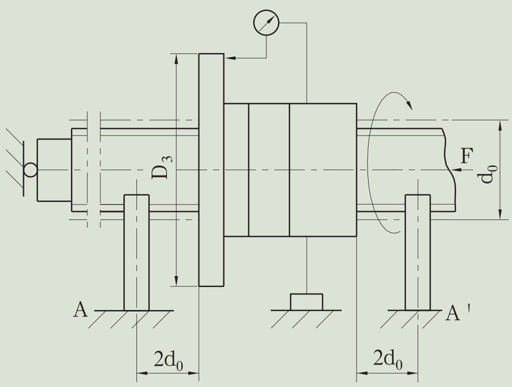
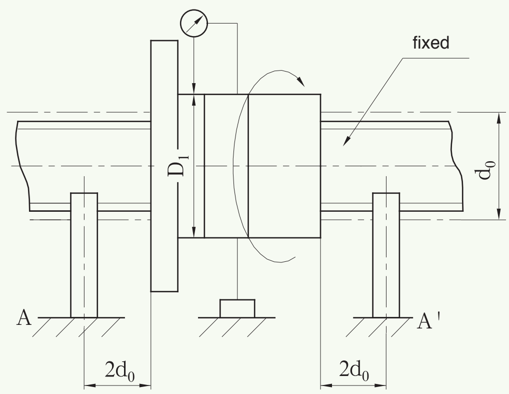
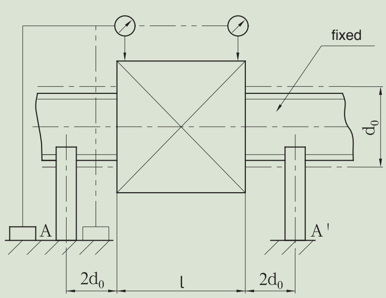
5.612.2
Putting ball screw on V-type iron in AA'. The indicator finder contacts cylinder surface vertically in l_6. Turning ball screw slowly, writing down the reading variety on indicator. Repeating test in stated test distance.
Notice:
according to negotiation it is allowable to test with holding center hole of ball screw. Here l_0 is distance from test point to shaft end.

Ball screw of positioning or transmission

Nominal diameter d_0 mm	l mm	Standard tolerance grade						
		1	2	3	4	5	7	10
		T_{7p}, μm in l length						
≥6~20	80	5	6	6	7	8	12	16
>20~50	125	6	7	8	9	10	16	20
>50~125	200	8	9	10	11	12	20	25
>125~200	315			12	14	16	25	32

Testing tool: Indicator, double V-type iron with same height

5.612.2
Putting ball screw on V-type iron in AA'. Adjusting indicator so that its finder contacts cylinder surface vertically in l_7. Moving ball screw slowly, write down the reading variety on indicator.
Notice:
according to negotiation it is allowable to test with holding center hole of ball screw.

Serial number	Diagram	Testing item	
4		Plane jumping t_8 of supporting neck towards AA'	
5		Surface jumping t_9 of nut mounting surface towards AA' (only for nut with preload)	
6		Radical jumping t_{10} of nut mounting diameter towards AA' (only for nut with preload and rotation nut)	
7		Parallelism t_{11} of rectangular nut towards AA' (only for nut with preload)	

Tolerance	Testing tool	Testing explanation According to relevant clause of GB/T 10931.1

Ball screw for positioning and transmission

Nominal diameter d_0 mm	Standard tolerance grade						
	1	2	3	4	5	7	10
	t_{8p} μm						
≥6~63	3	4	4	5	5	6	10
>63~125	4	5	5	6	6	8	12
>125~200	—	6	6	7	8	10	16

Indicator, double V-type iron with same height

5.612.2
Putting ball screw in AA' on V-type iron. Avoiding ball screw from axial move (putting ball between center hole of ball screw and fixing surface) Adjusting indicator so that its finder contacts relative diameter between shaft neck and cylinder surface.. Turning ball screw, write down the reading variety on indicator.
Notice:
according to negotiation it is allowable to test with holding center hole of ball screw.

Ball screw of positioning or transmission

Diameter of nut mounting surface D_3 mm	Standard tolerance grade						
	1	2	3	4	5	7	10
	t_{9p} μm						
≥16~32	10	11	12	14	16	20	—
>32~63	12	14	16	18	20	25	—
>63~125	16	18	20	22	25	32	—
>125~250	20	22	25	28	32	40	—
>250~500	—	—	32	36	40	50	—

Indicator, double V-type iron with same height

5.632
Putting ball screw with preload in AA' on V-type iron so as to avoid axial move of ball screw (putting ball between center hole of ball screw and fixed surface). Let the finder of indicator contact mounting surface of flange of nut diameter D_3 vertically. The nut does not move. Turning ball screw slowly and write down the reading variety on indicator.

Ball screw of positioning or transmission

Outer diameter of but D_1 mm	Standard tolerance grade						
	1	2	3	4	5	7	10
	t_{10p} μm						
≥16~32	10	11	12	14	16	20	—
>32~63	12	14	16	18	20	25	—
>63~125	16	18	20	22	25	32	—
>125~250	20	23	25	28	32	40	—
>250~500	—	—	32	36	40	50	—

Indicator, double V-type iron with same height

5.612.2
Putting ball screw with preload in AA' on V-type iron. Let finder of indicator contact cylinder surface of nut mounting diameter D_1 vertically. Fixing ball screw and turning nut slowly, write down the reading variety on indicator.

Ball screw for positioning and transmission

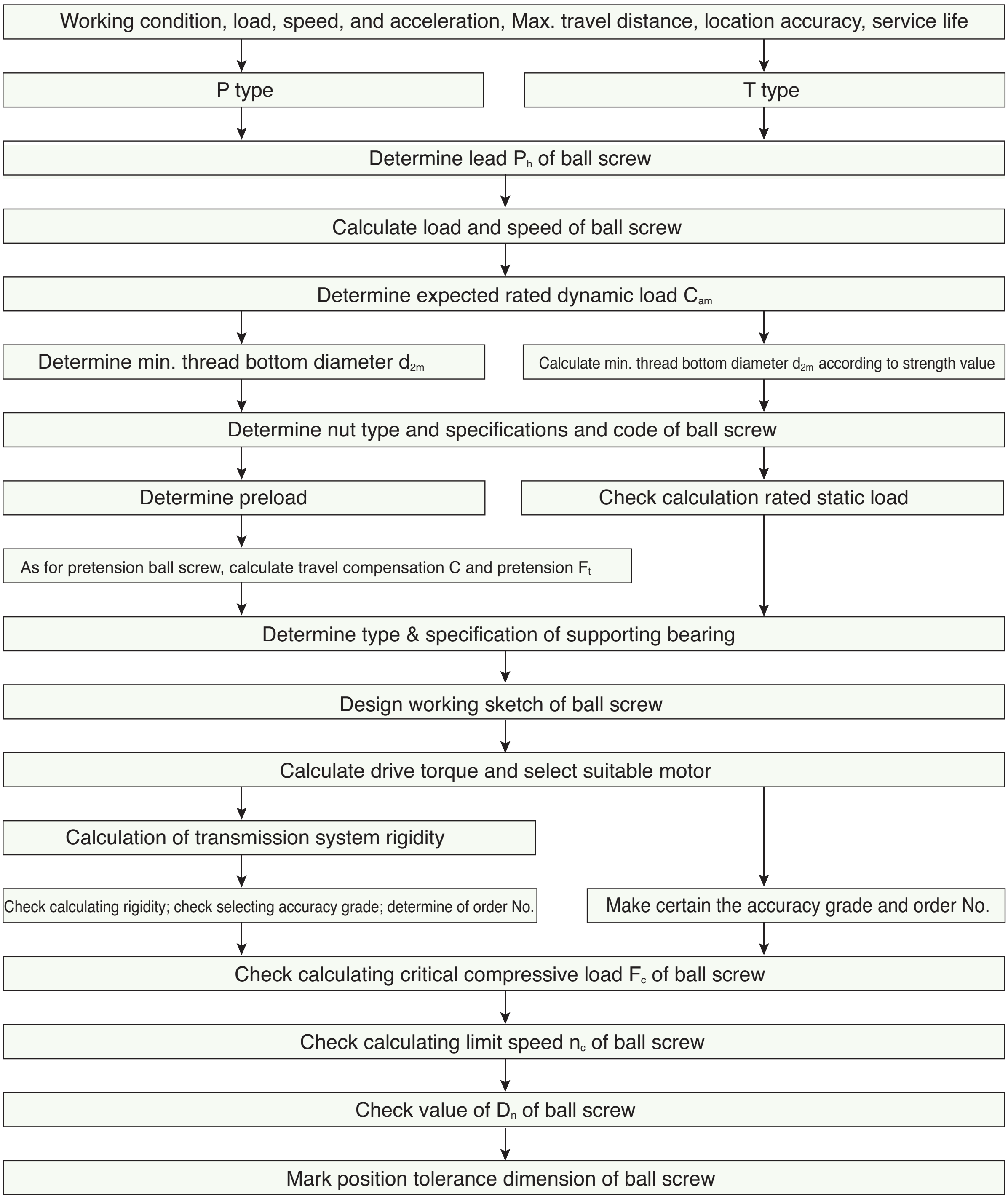
Standard tolerance grade						
1	2	3	4	5	7	10
t_p, um in length of 100mm						
16	18	20	22	25	32	—

Indicator, double V-type iron with same height

5.412.2
Putting ball screw with preload in AA' on V-type iron. Let finder of indicator contact tested surface vertically. Test along stated length l and write down the reading variety on indicator.

Parameter calculation and selection of ball screw

Calculation step and process



1. To determine the lead P_h of ball screw

To determine the lead P_h by transmission diagram, max. working speed V_{max}, Max.speed of motor n_{max} and the ratio of transmission i

$$P_h = \frac{V_{max}}{i \cdot n_{max}}$$

When motor is connected with ball screw directly, i=1

$$P_h = \frac{V_{max}}{n_{max}}$$

The round-off process should be done with the calculated value P_h.

2. To calculate the load and speed of ball screw

- Min. load F_{min}

Transmission force of machine when without load,e.g. friction force caused by weight of the worktable.

- Max. load F_{max}

Transmission force of machine when with max.load, is equal to axial component of cutting force and guide friction (the guide friction resulted from machine weight, workpiece weight, fixture weight and vertical component of cutting)

- Equivalent speed nm and equivalent load F_m:

When speed is $n_1, n_2, n_3, \ldots n_n$, the ratio of working tie to total time is respectively $t_1\%, t_2\%, \ldots t_n\%$, the load is $F_1, F_2, \ldots F_n$ respectively

$$n_m = n_1 \frac{t_1}{100} + n_2 \frac{t_2}{100} + \cdots\cdots + n_n \frac{t_n}{100}$$

$$F_m = \sqrt[3]{\frac{F_1^3 n_1 \frac{t_1}{100} + F_2^3 n_2 \frac{t_2}{100} + \cdots\cdots + F_n^3 n_n \frac{t_n}{100}}{n_m}}$$

When the speed is approximately proportionate to the load and every speed is available distribute, make calculation according to the following formula:

$$n_m = \frac{n_{max} + n_{min}}{2}$$

$$F_m = \frac{2F_{max} + F_{min}}{3}$$

3.To determine the expected rated dynamic load

- To calculate on the basis of expected working time L_h (Unit: hour)

$$C_{am} = \sqrt[3]{60 n_m L_h} \cdot \frac{F_m f_w}{100 f_a f_c} \quad \text{(N)}$$

- To calculate on the basis of expected running distance L_s (Unit: km)

$$C_{am} = \sqrt[3]{\frac{L_s}{P_h}} \cdot \frac{F_m f_w}{f_a f_c} \quad \text{(N)}$$

In formula:

L_h~expected working time (Unit: hour)(see Tab-5)

L_s~expected working distance (Unit: Km), usually L_s is 250Km

f_a~accuracy coefficient. Select it according to accuracy grade which is firstly determined(see Tab-6).

f_c~reliability coefficient. Usually f_c=1. in important condition, a group of same ball screw is required that the rated service life should go beyond 90% under the same circumstance (see Tab-7)

F_w~load coefficient, selecting by load character (see Tab-8)

Tab-5 expected working time L_h of all kinds of machine

Machine type	L_h(hour)	Note
General machinery	5000~10000	L_h=250 (day) x 16 (hour) x 10 (year) x 0.5(running ratio)
General machine tool	10000~20000	
NC machine tool	20000	
Precision machine tool	20000	
Measuring machinery	15000	
Aviation machinery	1000	

Tab-6 Accuracy coefficient f_a

Accuracy grade	1.2.3	4.5	7	10
f_a	1.0	0.9	0.8	0.7

Tab-7 reliability coefficient f_c

Reliability %	90	95	96	97	98	99
f_c	1	0.62	0.53	0.44	0.33	0.21

Tab-8 load character coefficient f_w

Load character	without impact (Stable motion)	light impact	with impact or vibration
f_w	1~1.2	1.2~1.5	1.5~2

- As for ball screw with preload,Dynamic preload Cam can be calculated from the following formula:

$$C_{am} = f_e F_{max}$$

In formula:

f_e~preload coefficient (see Tab-9)

Tab-9 preload coefficient f_e

Preload type	light preload	medium preload	heavy preload
f_e	6.7	4.5	3.4

The bigger one of three calculation is the ultimate C_{am}

4. Determine min. thread bottom diameter d_{2m} according to accuracy requirements

- Estimate max. axial deformation δ_m roughly

In general case, the main factors affecting blind space listed below according to affecting degree:

a. drawing compression rigidity of bal screw K_s;

b. axial rigidity of supporting bearing K_b

c. contact rigidity between balls and rolling track K_c
d. servo system rigidity converted over ball screw K_R
e. coupling rigidity K_te. coupling rigidity K_t
f . twist rigidity of ball screw K_k
g. rigidity of nut seat, bearings seat K_h

Then,the rigidity of transmission system of ball screw can be calculated as following formula:

$$\frac{1}{K}=\frac{1}{K_s}+\frac{1}{K_b}+\frac{1}{K_c}+\frac{1}{K_R}+\frac{1}{K_t}+\frac{1}{K_k}+\frac{1}{K_h}$$

K_s, K_b, K_c is three important factors affecting value of rigidity. Generally, the below formula are used:

$$\frac{1}{K}=\frac{1}{K_s}+\frac{1}{K_b}+\frac{1}{K_c}$$

The rigidity of system is different when moving unit on mechanical equipment is in different position. The min. rigidity is remarked by K_{min}. When workload works in axial direction of ball screw, a elastic deformations comes into being, δ=F/K. accuracy of transmission system is especially affected by this deformation.

Usually,servo system precision of machine tool or machinery will be examined without load. At this time, max. axial workload on ball screw is static friction F_o. When moving units start or return, a tolerance $2F_o/K_{min}$ (i.e. blind friction error) is produced because moving direction changed. This is the main factor affecting positioning accuracy (usually is 1/2—2/3 accuracy of repetitive position) so, the max. permissible axial deformation is:

$$\delta_m=\frac{F_0}{K_{min}}\approx\left(\frac{1}{2}\sim\frac{2}{3}\right)\cdot \text{Accuracy of repetitive position}$$

The most important factor affecting positioning accuracy is the accuracy of ball screw. Next is drawing compression elastic deformation of ball screw (this deformation change according to different position of screw nut on ball screw), and others are friction torque and so on. Estimate it roughly by formula $\delta_m \le (1/4—1/5)$ positioning accuracy. δ_m(unit:μm) is the smaller value estimated in the above mentioned two methods.

- To estimate bottom diameter of ball screw d_{2m} roughly.

a. when mounting,one end of ball screw is fixed, the other is free (see Fig-2)

$$d_{2m}\geqslant 2\times 10\sqrt{\frac{10F_0L}{\pi\delta_m E}}=0.078\sqrt{\frac{F_0L}{\delta_m}}$$

In formula:
E—young's elastic modulus 2.1 x 10^5 N/mm^2
δ_m—estimated max. permissible axial deformation (μm)
F_o—static friction of guide (N) $F_o=\mu_o w$(μ_o is static friction coefficient)
L—max. distance from nut to fixed end (mm)
L≈travel distance + safety distance + remaining distance + half of nut length + half of supporting bearing length
≈travel distance + (2~4) P_h+ 4P_h + (4~6)P_h + (1/20~1/10) travel distance
≈(1.05~1.1) travel distance + (10~14)P_h

b. When mounting, both ends are fixed.(see Fig-3)

$$d_{2m}\geqslant 10\sqrt{\frac{10F_0L}{\pi\delta_m E}}=0.039\sqrt{\frac{F_0L}{\delta_m}}$$

In formula:
L= distance between the fixed supporting bearings(mm)
L≈ travel distance + safety distance + two remaining distance + nut length + one supporting length
≈ (1.1~1.2) travel distance + (10~14) P_h

5.To determine the specification code of ball screw

Determine nut type(which is shown in catalogue)according to transmission model and working conditions. Refer to catalogue, find out suitable bottom diameter d_2 and rated dynamic load C_a. choose $d_2 \ge d_{2m}$, $C_a \ge C_{am}$ carefully and avoid overlarge value d_2 and C_a, otherwise dimension and moment of inertia will beyond value of proper ones. Then determine nominal diameter, recycling number, specification code of nut and relevant connecting dimension.

6. To determine preload F_p of ball screw with preload

As for selection of ball screw with preloaded nut type, preload F_p should be specified.
When max. axial load F_{max} is certain value,

$$F_p=\frac{1}{3}F_{max}$$

When it can't

$$F_p=\xi C_a$$

Value of C_a (rated dynamic load) can be found from catalogue, ξ can be selected from Tab-10

Tab-10

Preload type	light load	medium load	heavy load
ξ	0.05	0.075	0.1

7. To calculate the distance compensation C and pre-extension Ft

As for ball screw which needs pre-extension(see Fig-2), the distance compensation C for target value and the pre-extension force should be specified for both fixed end of ball screw.

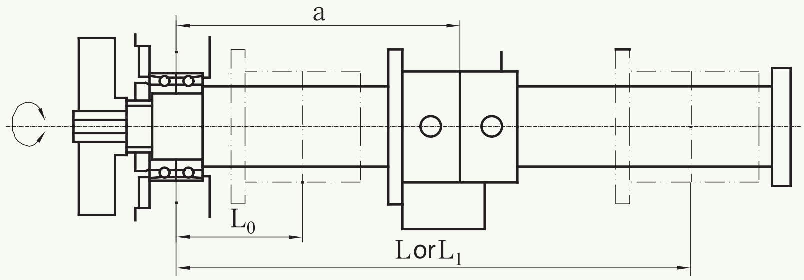
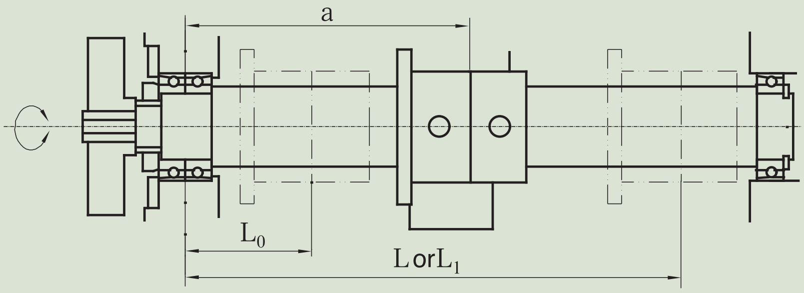
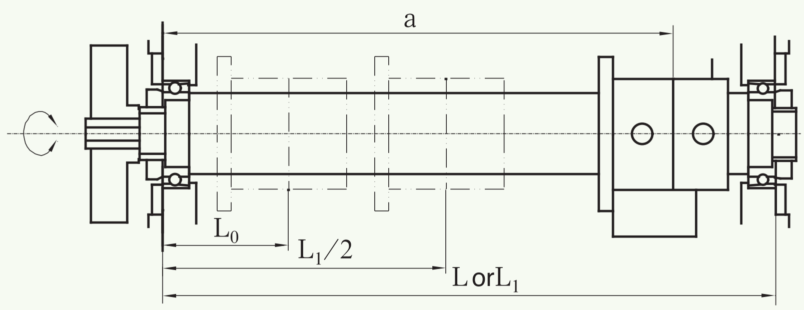
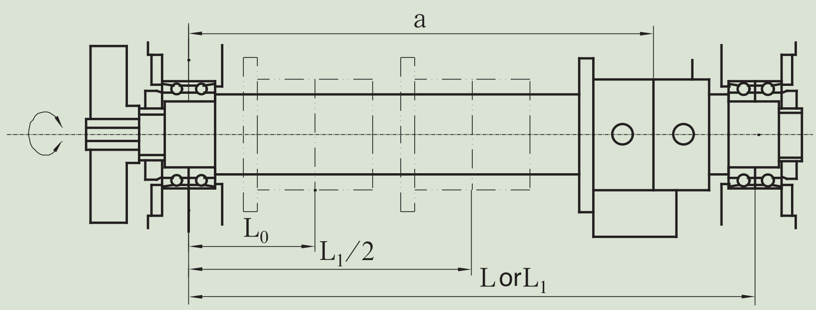
$$C=\alpha\cdot\Delta t\cdot L_u=11.8\Delta t\cdot L_u 10^{-6}$$

In formula:
C—travel distance compensation(μm)
Δt—temperature variation. Generally is 2~5°C
α —coefficient of linear expansion of bal screw 11.8 x 10-6/°C
L_u—effective travel distance (mm)
L_u≈travel distance of worktable + length for nut + two safety travel
≈travel distance + (8~14)P_h

$$F_t=\frac{\Delta IAE}{L}=\alpha\cdot\Delta t\frac{\pi d_2^2}{4}E=1.95\Delta t d_2^2$$

In formula:
F_t—pre-extension force(N)
d_2—thread bottom diameter of ball screw(mm)
E—young's elastic modulus 2.1 x 10^5(N/mm^2)
Δt—temperature variation. Generally is 2~5°C

Fig-3

Supporting model	Diagram
One end fixed, One end free G--Z	
One end fixed One end movable G—Y	
Two ends supporting J---J	
Two ends fixed G—G	

8. To determine specifications code of bearing used for ball screw

- To calculate max. axial load F_{Bmax} over bearing; as for ball screw with pre-extension force, pre-extension force F_t should be considered.
- To select bearing model according to requirements for ball screw bearing.
- To determine inner diameter of bearing. Inner diameter of bearing is better equal to or smaller than outer diameter of ball screw. When choose innercycle type ball screw, inner diameter of bearing one end should be slightly smaller than bottom diameter of ball screw, value of pre-extension force should be larger than 1/3 of max. load, i.e. F_{Bmax}.
- Others checking items of bearings, see products catalogue.

9. Working drawing design of ball screw

- Thread length of ball screw $L_s = L_u + 2L_e$
  L_e is remaining travel distance (see P53 Tab-3)
  L_u is equal to travel distance and nut length
- Mounting and connecting dimension, see products catalogue.
- Nut should not support axial load and overturning moments. Axial resultant of forces working on nut should be made passing through the spindle core of ball screw.
- The cylindrical surface of nut and innerside surface of flange can be used as the standard surface, at the same time the holes of nut seat and bearing of ball screw will be concentric. The end surface will be vertical to spindle line of nut seat. When the load without big impact, we can only use the innerside surface of flange and fringe as the fixing standard surface, and the end surface of nut seat will be guaranteed to vertical to the guide. When assembling, be sure to keep cylindrical circle and the supporting bearing hole of screw concentric.
- When return-tube type ball screw is laid horizontally, tube will be put upside of ball screw of spindle line, in order that balls can circulate smoothly.
- To guarantee the rigidity of nut seat, bearing seat and fastening screw, when designing and design strengthen rib in direction of supports.
- To determine the length of ball screw according to working drawing.

10. Selection of motor

- To calculate kinds of torque working on ball screw

With additional load, Friction torque T_F(N.m) resulted is calculated from:

$$T_F = \frac{FP_h}{2\pi\eta} \times 10^{-3}$$

Preload torque T_p(N.m) resulted from preload F_p is calculated from:

$$T_p = \frac{F_p P_h}{2\pi} \cdot \frac{1-\eta^2}{\eta^2} \times 10^{-3}$$

In formula:
P_h—lead of ball screw
η—efficiency of unpreload ball screw
screw with accuracy grade 1.2.3 its n=0.9
screw with less accuracy than grade 4 its n=0.85
F—additional axial load wotked on ball screw, its value is different when in different circumstance. When calculating starting torque,if machine starts without load, F is guide friction; (as for vertical motion F also includes framework weight). If the machine is with full load, f is friction and max. working load, (as for vertical motion, F also includes framework weight). When calculating working torque of motor, F is guide friction and working load. (as for vertical motion, F also include the framework weight).

- To calculate the rotational moment of inertia with load J_L(kg.m^2) and moment of inertia of transmission system J(kg.m^2)

$$J_L = \Sigma J_i\left(\frac{n_i}{n_m}\right)^2 + \Sigma m_j\left(\frac{V_j}{2\pi n_m}\right)^2$$

$$J = J_m + J_L$$

In formula:
J_i, n_i—the moment of inertia(kg.m^2) and the speed (r/min) of every rotation elements
M_j, V_j—the mass (kg) and the speed(m/min) of every linear motion elements
J_m, n_m—the rotational moment of inertia(kg.m^2) and the speed(r/min) of motor

- Rotational acceleration Ta and max. acceleration torque T_{am}

When rotational speed of motor rises from speed n_1 to n_2:

$$T_a = J \cdot \frac{2\pi(n_1 - n_2)}{60t_a}$$

When rotational speed of motor is from zero to max. n_{max}:

$$T_{am} = J \cdot \frac{2\pi n_{max}}{60t_a}$$

In formula:
n—rotational speed of motor(r/min)
n_{max}—max. rotational speed of motor(r/min)
t_a—accelerating time(s)
t_a≈(3~4) tm or specified according to technical data required
t_m—motor time constant.(consult the motor catalogue)

- Max. starting torque of motor T_r (N.m)

$$T_r = T_{am} + (T_F + T_p + T_b + T_f)\,i + T_e$$

In formula:
i—transmission ratio of motor to ball screw, when directly connecting i=1
T_b, T_f are the torque generated by ball screw supports of both ends
T_e—friction torque caused by other transmission elements except balls screw converted to motor.

- Max. torque, when motor is in non-stop running operation

The torque of motor,when machine works in continuous and regular running state under max. working load T_M(N.m)

$$T_M = (T_F + T_p + T_b + T_f)\,i + T_e$$

- Three aspects need attentions, when selecting motor according to catalogue

a. matching inertia, chosen from the motor instruction.
b. check the value of max. torque of motor ≥ T_r
c. check the rated torque of motor≥T_M, and the continuous work area $T_M$of motor.

11. To calculate rigidity of transmission system

- To calculate rigidity K of transmission system

$$\frac{1}{K} = \frac{1}{K_s} + \frac{1}{K_b} + \frac{1}{K_c} + \frac{1}{K_R} + \frac{1}{K_d} + \frac{1}{K_t} + \frac{1}{K_h} + \frac{1}{K_ø} \quad \text{(Formula 1)}$$

In formula:
K_s—extensional rigidity of ball screw. Calculation see follow explanation.
K_b—axial rigidity of ball screw supporting bearing. Consult concerned bearing catalogue for detailed data.

K_c—contact rigidity between balls and ball screw raceway. Consult catalogue concerned.

K_R—servo rigidity converted to ball screw,generally it is neglected. When exact value is required, it can be calculated by the formula:

$$K_R = K_R'\left(\frac{2\pi}{P_h}\right)^2$$

and $K_R' = \dfrac{K_s K_t (1+K_{vo})}{K_m R_m}$ consult servo motor catalogue

K_d—rigidity of screw nut, usually neglected, when necessary, it can be calculated exactly from formula: $K_d \approx 4K_c$.

K_t—rigidity of shaft-joint converted to ball screw, usually neglected, it can be calculated exactly from formula when necessary

$$K_t = K_t'\left(\frac{2\pi}{P_h}\right)^2$$

K_t' is the rigidity of shaft-joint introduced in this catalogue.

K_h—rigidity of nut seat, bearing seat, usually neglected, exactly calculated by the methods of limited elements.

K_ϕ—torsion rigidity of ball screw, usually neglected.

Usual calculation:

$$K = \frac{1}{K_s} + \frac{1}{K_b} + \frac{1}{K_c} \quad \text{(formula 2)}$$

● To calculate Ks(N/μm)

There is a functional relationship between extensional rigidity K_s and distance a between nut and fixed point of ball screw. see Fig-4

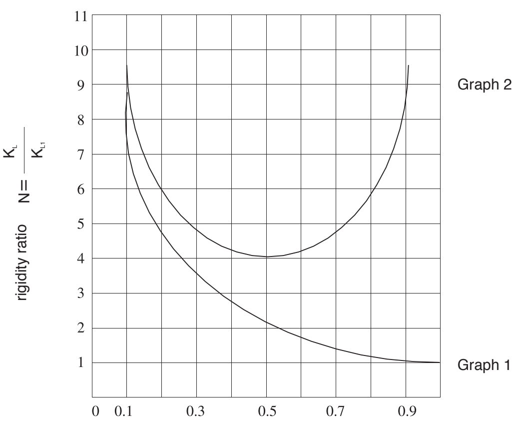


Fig-4 Extensional rigidity and travel distance

Travel distance ratio: $n=L/L_1$

Graph.1: one end is fixed, the other is free or movable.

Graph.2: both ends are fixed or two supporting bearings.

a. One end of support is fixed, the other is free.

$$K_s = \frac{\pi d_2^2 E}{4a} \times 10^{-3} = 1.65 \frac{d_2^2}{a} \times 10^2$$

In formula:

K_s—extensional rigidity(N/mm²)

E—young's elastic moduls 2.1×10^5(N/mm²)

d_2—bottom diameter of ball screw(mm)

When a $=L_1$ (max. distance between nut and fixed support, the rigidity is the min. one.(see page 61, Fig-3)

$$K_{s\,min} = 1.65 \frac{d_2^2}{L_1} \times 10^2$$

When $a=L_0$ (nut is at the beginning point of travel), rigidity is the max. one. (see page 61, Fig-3)

$$K_{s\,max} = 1.65 \frac{d_2^2}{L_0} \times 10^2$$

b. When both ends of support are fixed.

$$K_s = \frac{\pi d_2^2 E L_1}{4a(L_1 - a)} = 6.6 \frac{d_2^2 L_1}{4a(L_1 - a)} \times 10^2$$

When a = $L_1/2$(nut is at the midpoint of both ends of supporting bearing), rigidity is the min. one.(see page 61, Fig-3)

$$K_{s\,min} = 6.6 \frac{d_2^2}{L_1} \times 10^2$$

In formula:

L_1—distance between two supporting bearings (see page 61, Fig-3)

When $a=L_0$ (nut is at either end of the travel), rigidity is the max. one.(see page 61, Fig-3)

$$K_{s\,max} = 6.6 \frac{d_2^2 L_1}{4L_0(L_1 - L_0)} \times 10^2$$

● To calculate K_b(N/μm)

a. The rigidity K_B of unpreload bearing and the combined rigidity K_{B0} of a pair of preload bearings can be found from catalogue or approximately calculated from the formulas shown in Tab-11.

Tab-11 to calculate K_B and K_{B0}

Bearings model	K_B(N/μm)	K_{BO}(N/μm)
Angle contact ball bearing (6000T)	$2.34\sqrt[3]{d_Q Z^2 F_a \sin^5\beta}$	$2\times 2.34\sqrt[3]{d_Q Z^2 F_{a\,max} \sin^5\beta}$
Thrust ball bearing (8000T)	$1.95\sqrt[3]{d_Q Z^2 F_a}$	$2\times 1.95\sqrt[3]{d_Q Z^2 F_{a\,max}}$
Conical roller bearing (7000T)	$7.8\sin^{1.9}\beta\, L_r^{0.8} Z^{0.9} F_a^{0.1}$	$2\times 7.8\sin^{1.9}\beta\, L_r^{0.8} Z^{0.9} F_{a\,max}^{0.1}$
Thrust cylindrical roller bearing (9000T)	$7.8 L_r^{0.8} Z^{0.9} F_a^{0.1}$	$2\times 7.8 L_r^{0.8} Z^{0.9} F_{a\,max}^{0.1}$

Notes:

(1) The condition of using the formula in the table:

Preload of ball bearing:

$$F_p = \frac{1}{2\sqrt{2}} F_{a\,max} \approx \frac{1}{3} F_{a\,max}$$

Preload of roller bearing:

$$F_p \approx \frac{1}{2} \times F_{a\,max}$$

(2) in the table:

β—bearing contact angle (deg)

d_Q—rolling body diameter (mm)

L_r—roller effective length (mm)

Z—number of rolling body

F_a—axial working load(N)

F_{amax}—max. axial working load(N)

b. Supporting bearing rigidity K_b of ball screw (see Tab-12 and page 61 & Fig-3)

Tab-12 To calculate K_b

One end fixed, one end free	$K_b=K_{BO}$
Two ends support	preload $K_b=K_{BO}$ unpreload $K_b=K_B$
One end fixed, one end movable	fixed end with preload $K_b=K_{BO}$
Two ends fixed	fixed end with preload $K_b=2K_{BO}$

- To calculate K_c

a. As for unpreload ball screw, the axial working load is F(N):

$$K_c = K_c'\left(\frac{F}{0.3C_a}\right)^{\frac{1}{3}}$$

In formula:
K_c'—rigidity shown in catalogue(N/μm)
C_a—rated dynamic load

b. As for preload ball screw, the axial preload F_p(N)

$$K_c = K_c'\left(\frac{F_p}{0.1C_a}\right)^{\frac{1}{3}}$$

In formula: the definition of K_c' and C_a are the same as above

12. Check the rigidity of transmission system and accuracy selection of ball screw

Substitute K_{smax}, K_b, K_c and other relevant values into formula 1 of page 62 and formula 2 of page 63, then get K_{max}.
Substitute K_{smin}, instead of K_{smax} into the formula, then value of K_{min}.
Since CNC machine tool's accuracy is tested under conditions without load, $\Delta=2F_o/K_{min}$ is described as blind friction error.
F_o is the static friction of guide when machine is idly running.

$$\delta_k = F_0\left(\frac{1}{K_{min}} - \frac{1}{K_{max}}\right)$$

is the positioning deviation caused by the variation of transmission system rigidity. According to JB/GQ1140-89, CNC machine tool reverse disparity mainly depends on Δ, and positioning deviation mainly depends on the accuracy of ball screw, next depends on δ_k.

- Check the rigidity of transmission system

0.8Δ≤reverse disparity i.e. Kmin≥1.6F_o/reverse disparity

- Accuracy selection of ball screw

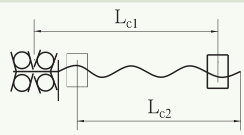
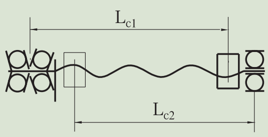
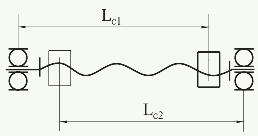
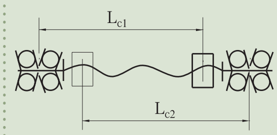
Ball screw used in open-loop control system:
$e_p+V_{up}\le 0.8$x (positioning accuracy- δ_k)
$e_p+V_{300p}\le 0.8$x (positioning accuracy/ 300mm- δ_k)
Semi-closed loop control system or open-loop control system with compensable travel distance:
$e_p\le 0.8$x (positioning accuracy- δ_k)
$V_{300p}\le 0.8$x (positioning accuracy/ 300mm- δ_k)
At first, select the type of ball screw according to using conditions(P type or T type), then refer to the accuracy standard table.(see P52, Tab-2)
Determine e_p, V_{up} or V_{300p} of ball screw according to the calculating results, then determine its accuracy grade.

13. Check and verify the critical compressed load Fc of ball screw(verify the stediness of compression lever)

$$F_c = K_1K_2\frac{d_2^4}{L_{c1}^2}\times 10^5 \geqslant F'_{max}$$

In formula:
d_2—screw thread bottom diameter of ball screw, see catalogue(mm).
L_{c1}—max.pressed length of bal screw(mm). (see Tab-13)

Tab-13

Supporting model	diagram	K_2	λ	f
One end fixed One end free		0.25	1.875	3.4
One end fixed One end movable		2	3.927	15.1
Two ends support		1	3.142	9.7
Two ends fixed		4	4.730	21.9

F'_{max}—max. axial compressed load of ball screw. If the max. load is not compressed, F'_{max} is not equal to F_{max}. Calculate F'max value depends on working conditions.
K_1—safety coefficient. Ball screw vertically installed, K_1=1/2
Ball screw horizontally installed K_1=1/3
K_2—supporting coefficient. It is relevant to supporting model.(see Tab-13)

14. Check and verify limit rotating speed n_c of ball screw (avoiding resonance when rotating at high speed)

$$n_c = K_1\frac{60\lambda^2}{2\pi L_{c2}^2}\sqrt{\frac{EI}{PA}} = f\frac{d_2}{L_{c2}^2}\times 10^7$$

In formula:
n_c—limit rotating speed(r/min)
L_{c2}—length for critical rotating calculated speed (see Tab-14)
E—young's modulus 2.1×10^5(N/mm^2)
ρ—density of material, density of steel material is

$$\frac{7.8\times10^{-5}\,N/mm^3}{9.8\times10^3\ mm/s^2}$$

I—min. moment of inertia of ball screw

$$I=\frac{\pi}{64}d_2^4(mm^4)$$

A—min. transverse section area of ball screw

$$\frac{1}{4}\pi d_2^2 (mm^2)$$

K_1—safety coefficient, generally K_1=0.8
F, λ —coefficient related to supporting model (see P64, Tab-13)

15. Check and verify value of D_n

$$D_{PW} \cdot n_{max} \leq 100000$$

In formula:
D_{pw}---diameter of pitch circle of bal screw(mm) $D_{pw} \approx d_2 + D_w$(mm)
N_{max}---max. rotating speed of ball screw

16. Form and position tolerance size marking of ball screw, see Fig-2 P53 and Tab-4 P54

Some transmission type ball screw (such as T type), with low accuracy requirement, but its transmitted load is very large. At that time, the calculation of transmission accuracy and rigidity of the transmission system can be omitted, but the following two is required to be calculated.

17. Check and verify value of basic axial rated static load C_{oa}

$$f_s F_{a\,max} \leq C_{oa}$$

In formula:
C_{oa}—basic rated static load of ball screw(N), consult this catalogue
f_s—static safety coefficient f_s=1~2 for common load f_s=2~3 for load with impact and vibration
F_{amax}—max. axial load(N)

18. Check and verify calculation of intensity

$$[\sigma] \cdot \frac{1}{4}\pi d_2^2 \geqslant F_{a\,max} \qquad d_2 \geqslant \sqrt{\frac{4F_{a\,max}}{\pi[\sigma]}}$$

[σ]---permissible stress(N/mm^2)
d_2---thread bottom diameter of ball screw, consult catalogue

Calculation example:

Design calculating of ball screw used for feeding worktable of a machine center:
Given that: weight of worktable W_1=5000N
Max. weight of workpiece and fixture W_2=3000N
Max. length of worktable L_k=1000mm
Friction coefficient of worktable's guide: dynamic friction coefficient μ=0.1 Static friction coefficient 7 μ_0=0.2 Rapid federate: V_{max}=15m/mim
Positioning accuracy: 20μm/300mm
Repeat positioning accuracy:10μm for total travel distance:25μm
Demanded service life:2000hours(2 shifts working,10 years in operation)
For other working conditions, see Tab-14

Tab-14

Cutting type	longitudinal cutting force P_{xi}(N)	vertical cutting force P_{zi}(N)	Feed speed V_i(m/min)	Working time t%	Axial load over ball screw (N)	Speed of ball screw (r/min)
High force cutting	2000	1200	0.6	10	2920	60
Common cutting	1000	500	0.8	30	1850	80
Precisely cutting	500	200	1	50	1320	100
Rapid feed	0	0	15	10	800	1500

1) To determine the lead Ph of ball screw

$$P_h = \frac{V_{max}}{i \cdot n_{max}}$$

P_h: Lead of ball screw (mm)
V_{max}: max. working speed m/min
n_{max}: Max. speed of motor r/min
i: ratio of transmission
i=1, when motor is connected with ball screw directly
To find in Tab-14:
V_{max}=15m/min
n_{max}=1500r/min
replace and gotten
P_h=10mm
Take
P_h=10mm

2) To determine equivalent speed and equivalent load

- In condition of all kinds of cutting ways, speed of ball screw is:

$$n_i = \frac{V_i}{P_h} \times 10^3$$

n_i: speed of ball screw r/min i=1,2,Λ,n
V_i: feed speed m/min i=1,2,Λ,n
To find in Tab-14
V_1=0.6, V_2=0.8, V_3=1, V_4=15
Replace and gotten
n_1=60, n_2=80, n_3=100, n_4=1500

- In condition of all kinds of cutting ways, axial load of ball screw

$$F_i = P_{xi} + \mu \cdot (W_1 + W_2 + P_{zi})$$

F_i: axial load of ball screw N i=1,2,Λ,n
P_{xi}: longitudinal cutting force N i=1,2,Λ,n
P_{zi}: vertical cutting force N i=1,2,Λ,n
To find in Tab-14
P_{x1}=2000N, P_{x2}=1000N, P_{x3}=500N,P_{x4}=0N
P_{z1}=1200N, P_{z2}=500N, P_{z3}=200N, P_{z4}=0N
Given: W_1=5000N, W_2=3000N
Replaced and gotten
F_1=2920N, F_2=1850N, F_3=1320N, F_4=800N

- Equivalent speed

$$n_m = n_1\frac{t_1}{100} + n_2\frac{t_2}{100} + \Lambda + n_n\frac{t_n}{100}$$

n_m: equivalent r/min
t_1, t_2, Λ, t_n: percent of working time
To find in Tab-14
t_1=10, t_2=30, t_3=50, t_4=10
Replaced and gotten
n_m=230r/min

- Equivalent load

$$F_m = \sqrt[3]{F_1^3\frac{n_1t_1}{n_m100} + F_2^3\frac{n_2t_2}{n_m100} + \Lambda + F_n^3\frac{n_nt_n}{n_m100}}$$

F_m: equivalent load N
Replaced and gotten
F_m=1290N

3) The expected rated dynamic load

- To calculate on the basis of expected working time

$$C_{am} = \sqrt[3]{60n_mL_h}\,\frac{F_mf_w}{100f_af_c}$$

C_{am}: the expected rated dynamic load N
To find in Tab-8: f_w=1.3 with light impact
To find in Tab-6: f_a=1 on basis 1~3 items
To find in Tab-7: f_c=0.44 if reliability 97%
Given: L_h=20000hours
Replaced and gotten
C_{am}=24815N

- To calculate according to max. load F_{max}, if the preloaded ball screw will be used

$C_{am}=f_eF_{max}$
To find in Tab-9: f_e=4.5 with middle preload.
Replaced and gotten
C_{am}=13140N
To adopt the biggest value of above two results
C_{am}=24815N

4) To determine permissible min. thread bottom diameter

- To estimate max. permissible axial deformation of ball screw

① δ_m≤(1/3~1/4) repeat positioning accuracy
② δ_m≤(1/4~1/5) positioning accuracy
δm: max. axial deformation μm
Given: repeat positioning accuracy is 10μm, positioning accuracy is 25μm
① δ_m=3
② δ_m=6
To adopt the smaller value of two results δ_m=3μm

- To estimate min. thread bottom diameter

Take both ends fixed supporting if ball screw requires pre-extension

$$d_{2m} = 10\sqrt{\frac{10F_0L}{\pi\,\delta_mE}} = 0.039\sqrt{\frac{F_0L}{\delta_m}}$$

d_{2m}: min. thread bottom diameter mm
L≈(1.1~1.2) travel + (10~14)P_h
Static friction $F_o=\mu_0W_1$
Given: travel is 1000mm, W_1=5000N, μ_0=0.2
Replaced and gotten
L=1320mm
F_0=1000N
d_{2m}=25.9mm

5) To determine specification and code of ball screw

- Innercycle float flange type, with cylinder double nuts combined spacer preload type is selected.
- To determine related type & specifications of ball screw referring to catalogue in accordance with the calculating results of P_h, C_{am}, d_{2m}

FFZD4010-3
P_h=10
C_a=30000>C_{am}=24815
d_2=34.3>d_{2m}=25.9

6) To determine preload of ball screw

$$F_p = \frac{1}{3}F_{max}$$

Thereinto F_{max}=2920N
F_p≈1000N

7) Travel distance compensation value and extensional force

- Travel distance compensation value

$$C=11.8\Delta tL_u\times10^{-3}$$

In formula:
$L_u=L_K+L_n+2L_a$
L_K=1000
L_n=146 (L_1 in catalog)
L_k=(2~4) P_h=30
L_u≈1210mm
Δt difference in temperature is 2.5℃
C≈36μm

- Pre-extension

$$F_t = 1.95\,\Delta t d_2^2$$

Replaced and gotten
F_t≈4807N

8) To determine bearing type and specification of ball screw

- Max. axial load over bearing

$F_{Bmax}=F_t+F_{max}$
Replaced and gotten
F_{Bmax}=7727N

- Bearing type

Both ends fixed supporting model, back to back angle-tough thrust ball bearing (touch angle)60°

- Inner diameter of bearing

d is little smaller than d_2=34.3 F_{BP}=1/3F_{Bmax}
d=30mm
Replace and gotten
F_{BP}=2575N

- Preload force of bearing

Preload ≥ F_{BP}

- Choose type & specification referring to catalogue

Preload ≥ F_{BP}, if d=30mm
Therefore to select bearing 7602030TVP
d=30mm
preload is
2900>F_{BP}=2575N

9) Designing working drawings of ball screw

- Thread length of ball screw L_s

L_s=L_u+2L_e After finding from Tab-3, the excess distance L_e=40
Designing working drawing

- Distance between two fixed supports L_1

Finding this catalogue for mounting and specification dimension of nut
Total length of ball screw L

- Distance between starting point of travel with fixed support L_o

Gotten rom the working drawing
L_s=1290
L_1=1350
L=1410
L_o≈130

10) Selection of motor (omitted)

11) Rigidity o ftransmission system

- Extensional rigidity of ball screw

Min. value of extensional rigidity

$$K_{s\,min} = 6.6\frac{d_2^{\,2}}{L_1}\times 10^2$$

K_{smin}: min. value of extensional rigidity N/μm
d_2:bottom diameter
L_1=distance of fixed supporting
K_{smin}=575N/m

Max. value of extensional rigidity

$$K_{s\,max} = 6.6\frac{d_2^{\,2}L_1}{4L_0(L_1-L_0)}\times 10^2$$

K_{smax}: max. value of extensional rigidity N/μm
K_{smax}=1652 N/μm

- Combined rigidity of support bearing

Combined rigidity of a pair of preload bearing

$$K_{BO} = 2\times 2.34\sqrt[3]{d_Q Z^2 F_{a\,max}\,Sin^5\beta}$$

K_{Bo}: combined rigidity of a pair of preload bearing N/μm
d_Q: diameter of ball mm
Z: number of ball
F_{amax}: max. axial work load N
β: contact angle of bearing
Check 7602030 TUP bearing from the relative bearing catalogue F_{amax} is equal to 3 times of preload
d_Q=7.144 Z=17 β=60°
F_{amax}=8700 N/μm
K_{Bo}=964 N/μm

Combined rigidity of support bearing

According to Table-12 fixed support on both ends
K_b=2 K_{BO}
K_b=1932N/μm
K_b: combined rigidity of support bearing N/μm

Contact rigidity of ball and raceway of ball screw

$$K_C = K_C'\left(\frac{F_p}{0.1C_a}\right)^{\frac{1}{3}}$$

K_c: contact rigidity of ball and raceway N/μm
K_c': Finding rigidity from catalogue N/μm
F_p: Preload of ball screw N
C_a: rated dynamic load N
Finding from catalogue
K_C' =973 N/μm; Ca=30000 N;
F_P=1000 N
K_C=1453 N/μm

12) Verifying rigidity and selecting of accuracy

$$\frac{1}{K_{min}} = \frac{1}{K_{s\,min}} + \frac{1}{K_b} + \frac{1}{K_c}$$

$$\frac{1}{K_{min}} = \frac{1}{339}\ N/\mu m$$

$$\frac{1}{K_{max}} = \frac{1}{K_{s\,max}} + \frac{1}{K_b} + \frac{1}{K_c}$$

$$\frac{1}{K_{max}} = \frac{1}{552}\ N/\mu m$$

F_0=$\mu_0$$W_1$
Given W_1=5000N,μ_0=0.2
F_0=1000N
F_0: static friction N
U_0: static friction coefficient
W_1= positive pressure N

- Checking rigidity of transmission system

$$K_{min} = \frac{1.6F_0}{\text{reverse difference value}}$$

K_{min}: rigidity of transmission system N/μm
Given: reverse difference value or repeat positioning accuracy is 10μm
K_{min}=339>160

- Positioning error caused by variation of transmission rigidity

$$\delta_K = F_0\left(\frac{1}{K_{min}} - \frac{1}{K_{max}}\right)$$

$$\delta_K = 1.14\,\mu m$$

- Ascertain accuracy grade

V_{300p}:travel variation over any thread length 300mm for semi-closed loop system,
$V_{300p} \leq 0.8$Xpositioning accuracy- δ_K
Positioning accuracy is 20μm/300
V_{300p}<14.86μm
The accuracy of ball screw is grade 3
V_{300p}=12μm<14.86μm

- Determine code & specification of ball screw

Determined type: FFZD
Nominal diameter: 40 lead: 10
Thread length: 1290
Total length of ball screw: 1410
P type accuracy grade 3
FFZD4010-3-P_3/1410 X 1290

13) Check and verify critical compression load

F_c : N
It is unnecessary to verify again because max. axial load F_{max} over ball screw is less than pre-extension force F.

14) Check and verify critical rotating speed

$$n_C = f\frac{d_2}{L_{C2}^{\ 2}} \times 10^7$$

n_c: critical rotating speed
f: coefficient refer to support type
d_2: bottom diameter of ball screw
L_{c2}: calculating length according to critical rotating speed
f=21.9 from Tab-13
d_2=34.3 from catalogue
$L_{c2}=L_1-L_o$ from working drawing and Tab-13
$n_c=5046>n_{max}=1500$

15) Verification

$D_n = D_{pw} \cdot n_{max}$
D_{pw}: round diameter of ball screw mm
n_{max}: max. speed of ball screw n/min
D_{pw}≈41.4mm
n_{max}=1500r/min
D_n=62100<70000

16) Form and position tolerance dimension mark of ball screw(omitted)

Safe use of ball screw

1. Lubrication

In order to make use of function of ball screw, ball screw must be lubricated in working condition. There are following lubrication methods:

- Lubrication grease

The quantity of lubrication grease is generally 1/3 of inner space of nut. Before the ball screw leaves factory, Lithium lubrication grease GB7324-94 2# has been brought into inner space of nut.

- Lubrication oil

The quantity standard of lubrication oil is shown as Tab.15. But it is changeable as difference of travel, sort of lubrication, use condition (heat control). Please pay attention.

Tab-15 the quantity standard of lubrication oil (3 minutes' interval)

Shaft neck (mm)	Quantity(cc)
ø4~ø8	0.03
ø10~ø14	0.05
ø15~ø18	0.07
ø20~ø25	0.10
ø28~ø32	0.15
ø36~ø40	0.25
ø45~ø50	0.30
ø55~ø63	0.40
ø70~ø100	0.50
ø100~ø160	0.60

2. Dust-proof protection

Ball screw is as like as rolling bearing. If pollutant and strange thing comes into nut, ball screw will be worn soon. It is the reason to damage. So under consideration of pollutant and strange thing, the dust-proof protection unit (shield and lag) must be used. Ball screw will be protected completely.

In addition, if there is no strange thing, but there is floating dust, the wiper seals may be installed on the two ends of ball screw. Users select suitable specification in the light of code rule according to requirements.

3. Use

Please pay attention to following points to use ball screw:

- Nut should work in the available travel. If it is necessary, limit unit must be installed on the two ends of travel in order to avoid that the ball fall when nut goes over-travel. If the nut deviates screw or ball falls, please have a contact with us.
- Because of high transmission efficiency, ball screw could not keep self-hold. When used to drive in vertical direction reverse transmission as a result of dead weight after the motion stops or motor is out of electricity should be prevented. There are many mechanisms to prevent reverse transmission such as worm wheel and arbor, Hydraulic braker, electromagnetic braker and overrunning coupler as well. If overrunning coupler is to need, we can design and manufacture for customer.

4. Installation

By installation of ball screw, pay attention to following points:

- Ball screw is only used to take the axial load. Radial force and torque let ball screw have a bad load such as surface contact force. It will damage the ball screw forever. Therefore, if ball screw is mounted in machine tools, note:
  - ◆ The axial line of ball screw must be parallel with axial line of linear motion guide. The three points of bearing seat of two ends for machine tools and nut seat must be in same line.
  - ◆ If nut is mounted, nut is so near to supporting bearing as soon as possible.
  - ◆ When installed the supporting bearings, close to the nut fixing part as possible.
- By installation ball screw into machine tools, do not uninstall the nut from ball screw. If necessary, help unit must be used. Otherwise ball screw will fall by installation. By installation nut, pay attention to following points:
  - ◆ The outer diameter of help unit is smaller bottom diameter 0.1—0.2mm.
  - ◆ The help unit must be near thread shoulder of ball screw.
  - ◆ Do not pay too much power to avoid damage nut by installation.
  - ◆ Avoid impact and be eccentric when setting installation hole.

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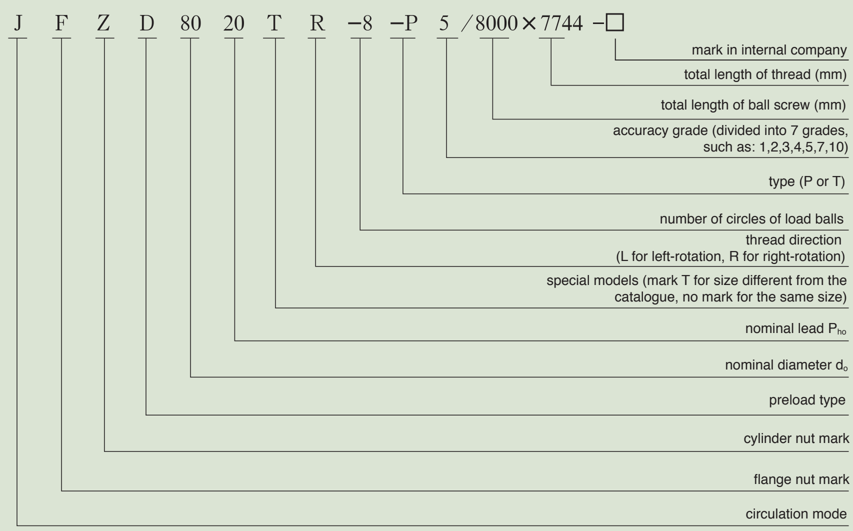
Large Heavy Load Ball Screw Assembly

- Large : Length can be reached to 15m
- Load : Max. load 376T
- Dia. : 63, 80, 100, 120, 160, 200
- Short Delivery Time : 30 days

JF/JFZD large heavy load ball screw assembly

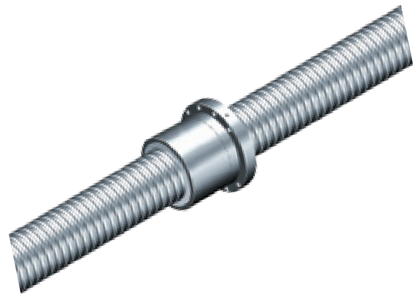
Code rule of ball screw



Load table

Diameter (mm)	Lead (mm)	Ball Dia. (mm)	Dynamic load of different circle (KN)			Static load of different circle (KN)		
D_0	P_h	D_w	n=4	n=5	n=8	n=4	n=5	n=8
80	20	12.700			305.1			1074.7
	25	12.700		203.7	305.1		670.5	1072.8
	32	12.700		202.8	303.9		668.4	1069.5
100	20	12.700		233.7	350.1		887.3	1419.7
	25	15.875		304.3	457		1050.5	1679.3
	32	15.875		304.3	455.9		1047.4	1675.9
	40	15.875	250.2			835.5		
125	20	12.700		258	386.6		1103.2	1765.1
	25	18.256		406.2	608.5		1523.5	2437.6
	32	20.638		463.0	693.6		1665.2	2664.4
	40	20.638	381.2			1329.7		
160	20	12.700		291.9	437.3		1493.2	2389.1
	25	18.256		464.5	695.9		2015.5	3224.7
	32	20.638		543.9	814.8		2306.2	3690
	40	25.4	592			2213.4		
200	25	18.256		532.9	798.3		2736.4	4378.3
	32	20.638		605.3	906.8		2949.6	4719.4
	40	25.4	670.8		1257.5	2882.8		5949.6

JF type large heavy load ball screw



Notes:

1. K_c is theoretical calculation value when preload F_p is $0.1C_a$ and axial load F is $0.3C_a$.
2. When axial load F is not equal to $0.3C_a$,

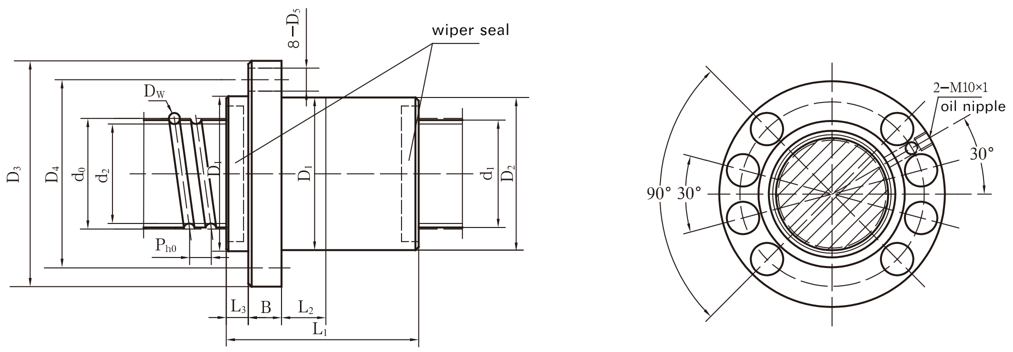
$$K_C = K(\frac{F}{0.3C_a})^{\frac{1}{3}}$$

In formula:

K is rigidity value shown in Table.

3. This type ball screw can be used in high temperature working environment

Code and spec.	Nominal dia. d_o	Basic lead P_{ho}	Outer dia. of ball screw d_1	Ball dia. D_w	Bottom dia. of ball screw d_2	Number of circles n	Basic rated load		Rigidity K_C N/μm
							Dynamic load C_a KN	Static load C_{oa} KN	
JF8020-8	80	20	78	12.7	68.9	8	305.1	1074.7	3959
JF8025-5	80	25	78	12.7	68.9	5	203.7	670.5	2520
JF8025-8	80	25	78	12.7	68.9	8	305.1	1072.8	3944
JF8032-5	80	32	78	12.7	68.9	5	202.8	668.4	2503
JF8032-8	80	32	78	12.7	68.9	8	303.9	1069.5	3919
JF10020-5	100	20	97	12.7	87.9	5	233.7	887.3	3177
JF10020-8	100	20	97	12.7	87.9	8	350.1	1419.7	4973
JF10025-5	100	25	97	15.875	85.7	5	304.3	1050.5	3114
JF10025-8	100	25	97	15.875	85.7	8	457.0	1679.3	4876
JF10032-5	100	32	97	15.875	85.7	5	304.3	1047.4	3102
JF10032-8	100	32	97	15.875	85.7	8	455.9	1675.9	4855
JF10040-4	100	40	97	15.875	85.7	4	250.2	835.5	2447
JF12520-5	125	20	123.5	12.7	114.4	5	258.0	1103.2	3790
JF12520-8	125	20	123.5	12.7	114.4	8	386.6	1765.1	5932
JF12525-5	125	25	123.5	18.256	110.6	5	406.2	1523.5	3872
JF12525-8	125	25	123.5	18.256	110.6	8	608.5	2437.6	6061
JF12532-5	125	32	123.5	20.638	109.2	5	463.0	1665.2	3865
JF12532-8	125	32	123.5	20.638	109.2	8	693.6	2664.4	6050
JF12540-4	125	40	123.5	20.638	109.2	4	381.2	1329.7	3112
JF16020-5	160	20	156.5	12.7	147.4	5	291.9	1493.2	4269
JF16020-8	160	20	156.5	12.7	147.4	8	437.3	2389.1	6682
JF16025-5	160	25	156.5	18.256	143.6	5	464.5	2015.5	4399
JF16025-8	160	25	156.5	18.256	143.6	8	695.9	3224.7	6885
JF16032-5	160	32	156.5	20.638	142.2	5	543.9	2306.2	5053
JF16032-8	160	32	156.5	20.638	142.2	8	814.8	3690.0	7909
JF16040-4	160	40	156.5	25.4	138.6	4	592.0	2213.4	4056
JF20025-5	200	25	196.5	18.256	183.6	5	532.9	2736.4	6232
JF20025-8	200	25	196.5	18.256	183.6	8	798.3	4378.3	9755
JF20032-5	200	32	196.5	20.638	182.2	5	605.3	2949.6	6156
JF20032-8	200	32	196.5	20.638	182.2	8	906.8	4719.4	9637
JF20040-4	200	40	196.5	25.4	178.6	4	670.8	2882.8	5030
JF20040-8	200	40	196.5	25.4	178.6	4	1257.5	5949.6	19797



Mounting & connecting dimension									Code and spec.
D_1(g6)	$D_2(^{-0.1}_{-0.2})$	L_2	L_3	D_3	B	D_5	D_4	L_1	
125	125	25	15	170	32	13.5	150	218	JF 8020-8
125	125	25	15	170	32	13.5	150	189	JF 8025-5
125	125	25	15	170	32	13.5	150	264	JF 8025-8
125	125	25	15	170	32	13.5	150	231	JF 8032-5
125	125	25	15	170	32	13.5	150	327	JF 8032-8
150	150	25	20	207	32	17.5	180	160	JF 10020-5
150	150	25	20	207	32	17.5	180	220	JF 10020-8
150	150	25	20	207	32	17.5	180	196	JF 10025-5
150	150	25	20	207	32	17.5	180	271	JF 10025-8
150	150	25	20	207	32	17.5	180	240	JF 10032-5
150	150	25	20	207	32	17.5	180	336	JF 10032-8
150	150	40	20	207	36	17.5	180	238	JF 10040-4
170	170	25	25	244	36	22	210	158	JF 12520-5
170	170	25	25	244	36	22	210	218	JF 12520-8
190	190	25	25	258	36	22	224	204	JF 12525-5
190	190	25	25	258	36	22	224	279	JF 12525-8
190	190	25	25	258	36	22	224	252	JF 12532-5
190	190	25	25	258	36	22	224	348	JF 12532-8
190	190	40	25	258	40	22	224	252	JF 12540-4
220	220	25	25	294	40	22	260	163	JF 16020-5
220	220	25	25	294	40	22	260	223	JF 16020-8
240	240	40	25	314	40	22	280	201	JF 16025-5
240	240	40	25	314	40	22	280	276	JF 16025-8
240	240	40	25	314	40	22	280	241	JF 16032-5
240	240	40	25	314	40	22	280	337	JF 16032-8
240	240	40	25	314	40	22	280	251	JF 16040-4
280	280	40	25	349	50	22	315	195	JF 20025-5
280	280	40	25	349	50	22	315	270	JF 20025-8
280	280	40	25	349	50	22	315	242	JF 20032-5
280	280	40	25	349	50	22	315	338	JF 20032-8
300	300	40	25	369	50	22	335	252	JF 20040-4
300	300	40	25	369	50	22	335	412	JF 20040-8

JFZD heavy load ball screw

Notes:

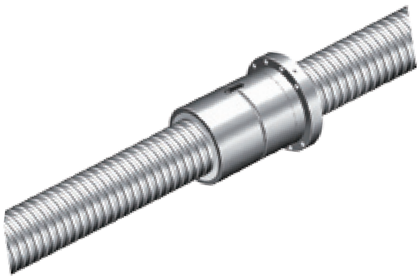
1. K_c is theoretical calculation value when preload F_p is $0.1C_a$ and axial load F is $0.3C_a$.
2. When axial load F is not equal to $0.3C_a$,

$$K_C = K\left(\frac{F}{0.3C_a}\right)^{\frac{1}{3}}$$

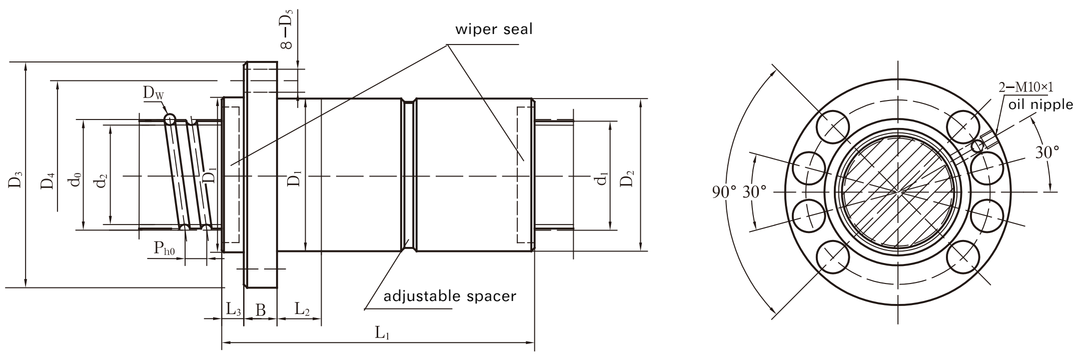
In formula:

K is rigidity value shown in Table.

3. This type ball screw can be used in high temperature working environment

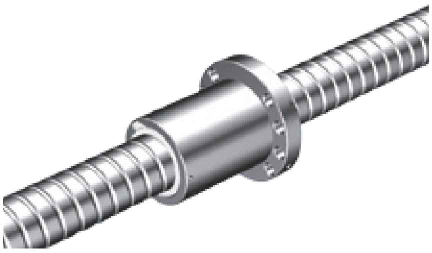


Code and spec.	Nominal dia. d_o	Basic lead P_{ho}	Outer dia. of ball screw d_1	Ball dia. D_w	Bottom dia. of ball screw d_2	Number of circles n	Basic rated load		Rigidity K_C N/μm
							Dynamic load C_a KN	Static load C_{oa} KN	
JFZD8020-8	80	20	78	12.7	68.9	8	305.1	1074.7	7919
JFZD8025-5	80	25	78	12.7	68.9	5	203.7	670.5	5040
JFZD8025-8	80	25	78	12.7	68.9	8	305.1	1072.8	7889
JFZD8032-5	80	32	78	12.7	68.9	5	202.8	668.4	5007
JFZD8032-8	80	32	78	12.7	68.9	8	303.9	1069.5	7838
JFZD10020-5	100	20	97	12.7	87.9	5	233.7	887.3	6354
JFZD10020-8	100	20	97	12.7	87.9	8	350.1	1419.7	9947
JFZD10025-5	100	25	97	15.875	85.7	5	304.3	1050.5	6229
JFZD10025-8	100	25	97	15.875	85.7	8	457.0	1679.3	9752
JFZD10032-5	100	32	97	15.875	85.7	5	304.3	1047.4	6204
JFZD10032-8	100	32	97	15.875	85.7	8	455.9	1675.9	9711
JFZD10040-4	100	40	97	15.875	85.7	4	250.2	835.5	4895
JFZD12520-5	125	20	123.5	12.7	114.4	5	258.0	1103.2	7580
JFZD12520-8	125	20	123.5	12.7	114.4	8	386.6	1765.1	11865
JFZD12525-5	125	25	123.5	18.256	110.6	5	406.2	1523.5	7745
JFZD12525-8	125	25	123.5	18.256	110.6	8	608.5	2437.6	12123
JFZD12532-5	125	32	123.5	20.638	109.2	5	463.0	1665.2	7731
JFZD12532-8	125	32	123.5	20.638	109.2	8	693.6	2664.4	12101
JFZD12540-4	125	40	123.5	20.638	109.2	4	381.2	1329.7	6225
JFZD16020-5	160	20	156.5	12.7	147.4	5	291.9	1493.2	8538
JFZD16020-8	160	20	156.5	12.7	147.4	8	437.3	2389.1	13365
JFZD16025-5	160	25	156.5	18.256	143.6	5	464.5	2015.5	8798
JFZD16025-8	160	25	156.5	18.256	143.6	8	695.9	3224.7	13771
JFZD16032-5	160	32	156.5	20.638	142.2	5	543.9	2306.2	10106
JFZD16032-8	160	32	156.5	20.638	142.2	8	814.8	3690.0	15819
JFZD16040-4	160	40	156.5	25.4	138.6	4	592.0	2213.4	8112
JFZD20025-5	200	25	196.5	18.256	183.6	5	532.9	2736.4	12465
JFZD20025-8	200	25	196.5	18.256	183.6	8	798.3	4378.3	19511
JFZD20032-5	200	32	196.5	20.638	182.2	5	605.3	2949.6	12313
JFZD20032-8	200	32	196.5	20.638	182.2	8	906.8	4719.4	19274
JFZD20040-4	200	40	196.5	25.4	178.6	4	670.8	2882.8	10061



Mounting & connecting dimension									Code and spec.
D_1(g6)	D_2($^{-0.1}_{-0.2}$)	L_2	L_3	D_3	B	D_5	D_4	L_1	
125	125	25	15	170	32	13.5	150	412	JFZD 8020-8
125	125	25	15	170	32	13.5	150	348	JFZD 8025-5
125	125	25	15	170	32	13.5	150	498	JFZD 8025-8
125	125	25	15	170	32	13.5	150	425	JFZD 8032-5
125	125	25	15	170	32	13.5	150	617	JFZD 8032-8
150	150	25	20	207	32	17.5	180	300	JFZD 10020-5
150	150	25	20	207	32	17.5	180	420	JFZD 10020-8
150	150	25	20	207	32	17.5	180	371	JFZD 10025-5
150	150	25	20	207	32	17.5	180	521	JFZD 10025-8
150	150	25	20	207	32	17.5	180	446	JFZD 10032-5
150	150	25	20	207	32	17.5	180	638	JFZD 10032-8
150	150	40	20	207	36	17.5	180	436	JFZD 10040-4
170	170	25	25	244	36	22	210	298	JFZD 12520-5
170	170	25	25	244	36	22	210	418	JFZD 12520-8
190	190	25	25	258	36	22	224	374	JFZD 12525-5
190	190	25	25	258	36	22	224	524	JFZD 12525-8
190	190	25	25	258	36	22	224	476	JFZD 12532-5
190	190	25	25	258	36	22	224	668	JFZD 12532-8
190	190	40	25	258	40	22	224	470	JFZD 12540-4
220	220	25	25	294	40	22	260	303	JFZD 16020-5
220	220	25	25	294	40	22	260	423	JFZD 16020-8
240	240	40	25	314	40	22	280	380	JFZD 16025-5
240	240	40	25	314	40	22	280	530	JFZD 16025-8
240	240	40	25	314	40	22	280	433	JFZD 16032-5
240	240	40	25	314	40	22	280	625	JFZD 16032-8
240	240	40	25	314	40	22	280	451	JFZD 16040-4
280	280	40	25	349	50	22	315	358	JFZD 20025-5
280	280	40	25	349	50	22	315	508	JFZD 20025-8
280	280	40	25	349	50	22	315	434	JFZD 20032-5
280	280	40	25	349	50	22	315	626	JFZD 20032-8
300	300	40	25	369	50	22	335	452	JFZD 20040-4

DKF high speed ball screw



Notes:

1. K_c is theoretical calculation value when preload F_p is $0.1C_a$ and axial load F is $0.3C_a$.
2. When axial load F is not equal to $0.3C_a$,

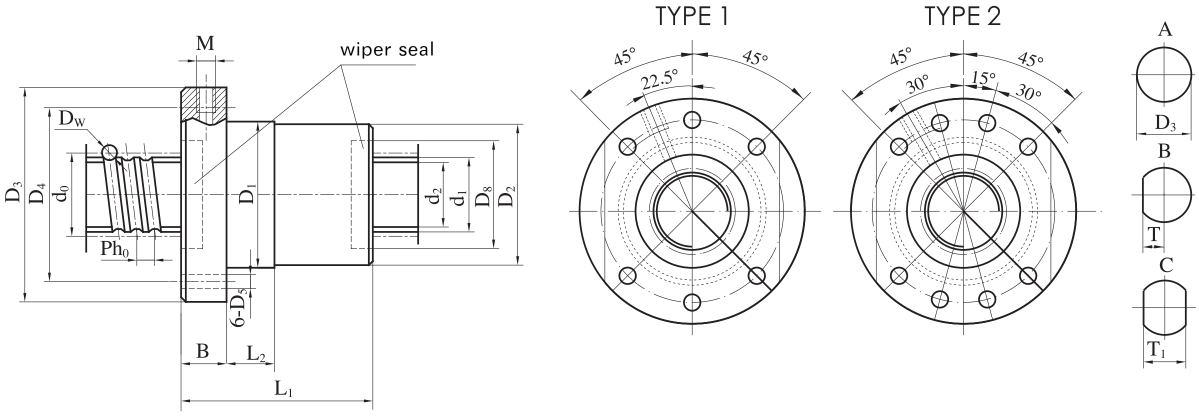
$$K_c = K\left(\frac{F}{0.3C_a}\right)^{\frac{1}{3}}$$

In formula:

K is rigidity value shown in Table.

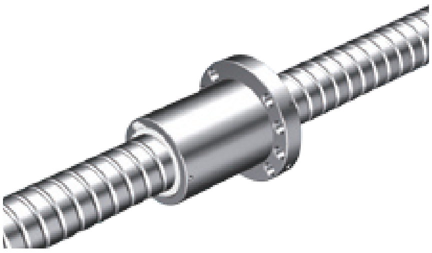
3. This type ball screw can be used in high temperature working environment

Code and spec.	Nominal dia. d_o	Basic lead P_{ho}	Outer dia. of ball screw d_1	Ball dia. D_w	Bottom dia. of ball screw d_2	Number of circles n	Basic rated load		Rigidity K_C N/μm
							Dynamic load C_a KN	Static load C_{oa} KN	
DKF2506-4	25	6	24	3	22.0	4	12.8	32.5	534
DKF2506-5	25	6	24	3	22.0	5	15.6	39.0	660
DKF2510-4	25	10	24	3.969	21.1	4	16.1	39.3	505
DKF3206-5	32	6	31	3.969	28.1	5	25.4	67.6	832
DKF3206-6	32	6	31	3.969	28.1	6	30.0	81.8	990
DKF3210-4	32	10	31	6.35	26.4	4	33.7	81.2	662
DKF3210-5	32	10	31	6.35	26.4	5	41.6	103.7	830
DKF3212-4	32	12	31	6.35	26.4	4	33.8	81.4	663
DKF3212-5	32	12	31	6.35	26.4	5	41.6	103.9	831
DKF4010-5	40	10	39	6.35	34.4	5	46.9	131.2	1013
DKF4010-6	40	10	39	6.35	34.4	6	55.3	158.8	1215
DKF4012-5	40	12	39	6.35	34.7	5	46.9	131.3	1011
DKF4012-6	40	12	39	6.35	34.7	6	55.3	158.8	1214
DKF4016-5	40	16	39	6.35	34.7	5	46.5	131.3	1004
DKF4016-6	40	16	39	6.35	34.7	6	55.1	158.9	1206
DKF4020-5	40	20	39	6.35	34.7	5	46.7	131.3	1004
DKF4020-6	40	20	39	6.35	34.7	6	55.0	158.9	1205
DKF4025-4	40	25	39	6.35	34.7	4	37.9	103.7	794
DKF4025-5	40	25	39	6.35	34.7	5	46.5	131.3	995
DKF5010-5	50	10	49	6.35	44.4	5	52.2	165.0	1219
DKF5010-6	50	10	49	6.35	44.4	6	61.5	199.6	1461
DKF5012-5	50	12	49	6.35	44.4	5	52.2	165.0	1219
DKF5012-6	50	12	49	6.35	44.4	6	61.5	199.6	1461
DKF5016-5	50	16	49	6.35	44.4	5	52.5	165.5	1226
DKF5016-6	50	16	49	6.35	44.4	6	61.5	200.2	1470
DKF5020-5	50	20	49	6.35	44.4	5	52.1	165.7	1215
DKF5020-6	50	20	49	6.35	44.4	6	61.4	200.5	1457
DKF5025-4	50	25	49	6.35	44.4	4	42.3	130.4	966



Mounting & connecting dimension												Code and spec.
D_1(g6)	D2($^{-0.1}_{-0.2}$)	L_2	D_3	B	D_4	D_5	TYPE	T	T_1	M	L_1	
40	40	10	65	10	54	6.6	1	25.5	51	M6	47	DKF2506-4
40	40	10	65	10	54	6.6		25.5	51	M6	53	DKF2506-5
45	45	15	65	11	54	6.6		25.5	51	M6	65	DKF2510-4
50	50	10	80	12	65	9		31	62	M6	58	DKF3206-5
50	50	10	80	12	65	9		31	62	M6	64	DKF3206-6
62	62	15	92	14	77	9		37	74	M6	73	DKF3210-4
62	62	15	92	14	77	9		37	74	M6	83	DKF3210-5
62	62	15	92	14	77	9		37	74	M6	81	DKF3212-4
62	62	15	92	14	77	9		37	74	M6	93	DKF3212-5
70	70	20	100	14	85	9	2	35	70	M8X1	83	DKF4010-5
70	70	20	100	14	85	9		35	70	M8X1	93	DKF4010-6
70	70	20	100	14	85	9		37.5	75	M8X1	92	DKF4012-5
70	70	20	100	14	85	9		37.5	75	M8X1	104	DKF4012-6
70	70	30	100	14	85	9		37.5	75	M8X1	113	DKF4016-5
70	70	30	100	14	85	9		37.5	75	M8X1	129	DKF4016-6
70	70	30	100	14	85	9		37.5	75	M8X1	132	DKF4020-5
70	70	30	100	14	85	9		37.5	75	M8X1	152	DKF4020-6
70	70	30	100	14	85	9		37.5	75	M8X1	133	DKF4025-4
70	70	30	100	14	85	9		37.5	75	M8X1	158	DKF4025-5
82	82	20	118	16	100	11		46	92	M8X1	91	DKF5010-5
82	82	20	118	16	100	11		46	92	M8X1	101	DKF5010-6
82	82	20	118	16	100	11		46	92	M8X1	100	DKF5012-5
82	82	20	118	16	100	11		46	92	M8X1	112	DKF5012-6
82	82	30	118	16	100	11		46	92	M8X1	117	DKF5016-5
82	82	30	118	16	100	11		46	92	M8X1	133	DKF5016-6
82	82	30	118	16	100	11		46	92	M8X1	139	DKF5020-5
82	82	30	118	16	100	11		46	92	M8X1	159	DKF5020-6
82	82	30	118	16	100	11		46	92	M8X1	139	DKF5025-4

DKF high speed ball screw



Notes:

1. K_c is theoretical calculation value when preload F_p is $0.1C_a$ and axial load F is $0.3C_a$.
2. When axial load F is not equal to $0.3C_a$,

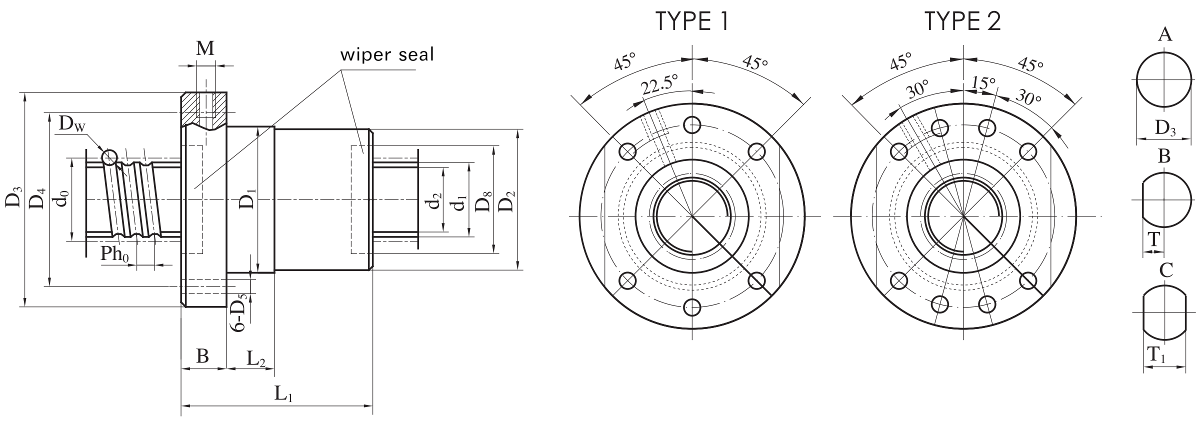
$$K_C = K\left(\frac{F}{0.3C_a}\right)^{\frac{1}{3}}$$

In formula:

K is rigidity value shown in Table.

3. This type ball screw can be used in high temperature working environment

Code and spec.	Nominal dia. d_o	Basic lead P_{ho}	Outer dia. of ball screw d_1	Ball dia. D_w	Bottom dia. of ball screw d_2	Number of circles n	Basic rated load		Rigidity K_C N/μm
							Dynamic load C_a KN	Static load C_{oa} KN	
DKF5025-5	50	25	49	6.35	44.4	5	52.0	165.7	1209
DKF5030-4	50	30	49	6.35	44.4	4	42.3	131.0	960
DKF5030-5	50	30	49	6.35	44.4	5	51.8	165.7	1201
DKF6310-5	63	10	61	6.35	56.4	5	56.8	202.5	1434
DKF6310-6	63	10	61	6.35	56.4	6	66.9	244.8	1718
DKF6312-5	63	12	61	6.35	56.4	5	56.8	202.5	1457
DKF6312-6	63	12	61	6.35	56.4	6	66.9	244.8	1747
DKF6312-5	63	12	61	7.938	55.3	5	102.3	358.8	1952
DKF6312-6	63	12	61	7.938	55.3	6	120.5	433.8	2340
DKF6316-5	63	16	61	6.35	56.4	5	56.8	202.5	1457
DKF6316-6	63	16	61	6.35	56.4	6	66.9	244.8	1747
DKF6316-5	63	16	61	10	53.9	5	76.9	234.5	1528
DKF6316-6	63	16	61	10	53.9	6	90.6	283.6	1818
DKF6320-5	63	20	61	6.35	56.4	5	56.9	204.3	1456
DKF6320-6	63	20	61	6.35	56.4	6	67.1	247.4	1745
DKF6320-5	63	20	61	10	53.9	5	138.1	447.2	1985
DKF6320-6	63	20	61	10	53.9	6	162.8	541.3	2381
DKF6325-4	63	25	61	6.35	56.4	4	46.8	163.1	1160
DKF6325-5	63	25	61	6.35	56.4	5	57.3	206.3	1451
DKF6325-4	63	25	61	10	53.9	4	112.6	353.3	1580
DKF6325-5	63	25	61	10	53.9	5	137.9	447.3	1979
DKF6330-4	63	30	61	6.35	56.4	4	46.7	163.1	1252
DKF6330-5	63	30	61	6.35	56.4	5	57.1	206.2	1441
DKF6330-4	63	30	61	10	53.9	4	112.4	353.4	1574
DKF6330-5	63	30	61	10	53.9	5	137.6	447.4	1971
DKF6340-4	63	40	61	6.35	56.4	4	46.5	163.2	1131
DKF6340-5	63	40	61	6.35	56.4	5	56.8	206.4	1415
DKF6340-4	63	40	61	10	53.9	4	111.8	353.4	1559
DKF6340-5	63	40	61	10	53.9	5	137.5	447.4	1952



Mounting & connecting dimension												Code and spec.
D_1(g6)	D2($^{-0.1}_{-0.2}$)	L_2	D_3	B	D_4	D_5	TYPE	T	T_1	M	L_1	
82	82	30	118	16	100	11		46	92	M8X1	164	DKF5025-5
82	82	30	118	16	100	11		46	92	M8X1	159	DKF5030-4
82	82	30	118	16	100	11		46	92	M8X1	189	DKF5030-5
95	95	20	135	22	115	13.5		50	100	M8X1	91	DKF6310-5
95	95	20	135	22	115	13.5		50	100	M8X1	101	DKF6310-6
95	95	20	135	22	115	13.5		50	100	M8X1	99	DKF6312-5
95	95	20	135	22	115	13.5		50	100	M8X1	111	DKF6312-6
98	98	20	138	25	118	13.5		51.5	103	M8X1	105	DKF6312-5
98	98	20	138	25	118	13.5		51.5	103	M8X1	117	DKF6312-6
95	95	30	135	22	115	13.5		50	100	M8X1	119	DKF6316-5
95	95	30	135	22	115	13.5		50	100	M8X1	135	DKF6316-6
107	107	30	147	28	127	13.5		56	112	M8X1	134	DKF6316-5
107	107	30	147	28	127	13.5		56	112	M8X1	150	DKF6316-6
95	95	40	135	22	115	13.5		50	100	M8X1	138	DKF6320-5
95	95	40	135	22	115	13.5	2	50	100	M8X1	158	DKF6320-6
107	107	40	147	28	127	13.5		56	112	M8X1	153	DKF6320-5
107	107	40	147	28	127	13.5		56	112	M8X1	173	DKF6320-6
95	95	40	135	22	115	13.5		50	100	M8X1	138	DKF6325-4
95	95	40	135	22	115	13.5		50	100	M8X1	163	DKF6325-5
107	107	40	147	28	127	13.5		56	112	M8X1	153	DKF6325-4
107	107	40	147	28	127	13.5		56	112	M8X1	178	DKF6325-5
95	95	40	135	22	115	13.5		50	100	M8X1	158	DKF6330-4
95	95	40	135	22	115	13.5		50	100	M8X1	188	DKF6330-5
107	107	40	147	28	127	13.5		56	112	M8X1	172	DKF6330-4
107	107	40	147	28	127	13.5		56	112	M8X1	202	DKF6330-5
95	95	40	135	22	115	13.5		50	100	M8X1	198	DKF6340-4
95	95	40	135	22	115	13.5		50	100	M8X1	238	DKF6340-5
107	107	40	147	28	127	13.5		56	112	M8X1	210	DKF6340-4
107	107	40	147	28	127	13.5		56	112	M8X1	250	DKF6340-5

DKFZD high speed precision ball screw

Notes:

1. K_c is theoretical calculation value when preload F_p is $0.1C_a$ and axial load F is $0.3C_a$.
2. When axial load F is not equal to $0.3C_a$,

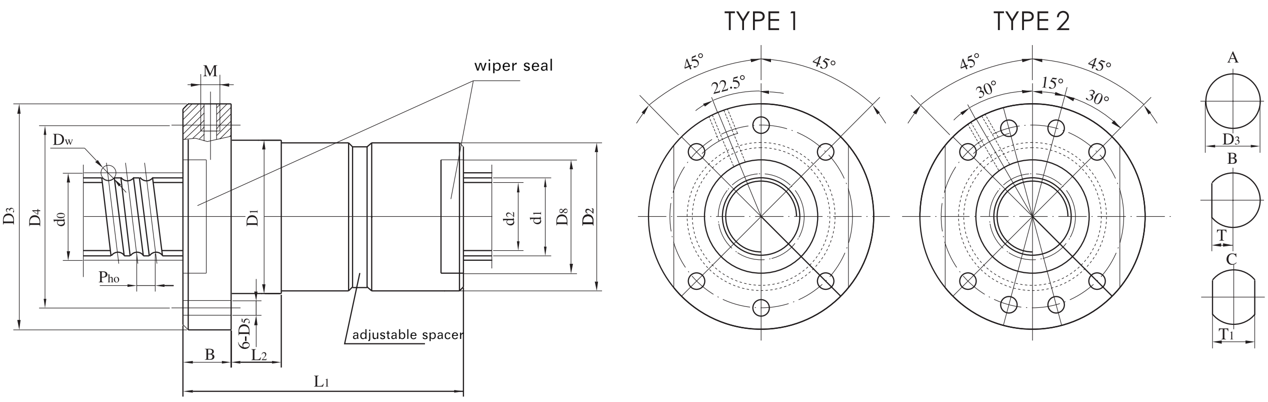
$$K_C = K\left(\frac{F}{0.3C_a}\right)^{\frac{1}{3}}$$

In formula:

K is rigidity value shown in Table.

3. This type ball screw can be used in high temperature working environment

Code and spec.	Nominal dia. d_o	Basic lead P_{ho}	Outer dia. of ball screw d_1	Ball dia. D_w	Bottom dia. of ball screw d_2	Number of circles n	Basic rated load		Rigidity K_C N/μm
							Dynamic load C_a KN	Static load C_{oa} KN	
DKFZD2506-4	25	6	24	3	22	4	12.8	32.5	1068
DKFZD2506-5	25	6	24	3	22	5	15.6	39	1321
DKFZD2510-4	25	10	24	3.969	21.1	4	16.1	39.3	1011
DKFZD3206-5	32	6	31	3.969	28.1	5	25.4	67.6	1664
DKFZD3206-6	32	6	31	3.969	28.1	6	30	81.8	1980
DKFZD3210-4	32	10	31	6.35	26.4	4	33.7	81.2	1324
DKFZD3210-5	32	10	31	6.35	26.4	5	41.6	103.7	1661
DKFZD3212-4	32	12	31	6.35	26.4	4	33.8	81.4	1326
DKFZD3212-5	32	12	31	6.35	26.4	5	41.6	103.9	1663
DKFZD4010-5	40	10	39	6.35	34.4	5	46.9	131.2	2026
DKFZD4010-6	40	10	39	6.35	34.4	6	55.3	158.8	2431
DKFZD4012-5	40	12	39	6.35	34.7	5	46.9	131.3	2023
DKFZD4012-6	40	12	39	6.35	34.7	6	55.3	158.8	2428
DKFZD4016-5	40	16	39	6.35	34.7	5	46.5	131.3	2009
DKFZD4016-6	40	16	39	6.35	34.7	6	55.1	158.9	2412
DKFZD4020-5	40	20	39	6.35	34.7	5	46.7	131.3	2009
DKFZD4020-6	40	20	39	6.35	34.7	6	55	158.9	2410
DKFZD4025-4	40	25	39	6.35	34.7	4	37.9	103.7	1588
DKFZD4025-5	40	25	39	6.35	34.7	5	46.5	131.3	1990
DKFZD5010-5	50	10	49	6.35	44.4	5	52.2	165	2438
DKFZD5010-6	50	10	49	6.35	44.4	6	61.5	199.6	2923
DKFZD5012-5	50	12	49	6.35	44.4	5	52.2	165	2438
DKFZD5012-6	50	12	49	6.35	44.4	6	61.5	199.6	2923
DKFZD5016-5	50	16	49	6.35	44.4	5	52.5	165.5	2452
DKFZD5016-6	50	16	49	6.35	44.4	6	61.5	200.2	2940
DKFZD5020-5	50	20	49	6.35	44.4	5	52.1	165.7	2430
DKFZD5020-6	50	20	49	6.35	44.4	6	61.4	200.5	2914



Mounting & connecting dimension												Code and spec.
D_1(g6)	D2($^{-0.1}_{-0.2}$)	L_2	D_3	B	D_4	D_5	TYPE	T	T_1	M	L_1	
40	40	10	65	10	54	6.6		25.5	51	M6	86	DKFZD2506-4
40	40	10	65	10	54	6.6		25.5	51	M6	98	DKFZD2506-5
45	45	15	65	11	54	6.6		25.5	51	M6	122	DKFZD2510-4
50	50	10	80	12	65	9		31	62	M6	108	DKFZD3206-5
50	50	10	80	12	65	9	1	31	62	M6	120	DKFZD3206-6
62	62	15	92	14	77	9		37	74	M6	135	DKFZD3210-4
62	62	15	92	14	77	9		37	74	M6	155	DKFZD3210-5
62	62	15	92	14	77	9		37	74	M6	149	DKFZD3212-4
62	62	15	92	14	77	9		37	74	M6	173	DKFZD3212-5
70	70	20	100	14	85	9		37.5	75	M8X1	155	DKFZD4010-5
70	70	20	100	14	85	9		37.5	75	M8X1	175	DKFZD4010-6
70	70	20	100	14	85	9		37.5	75	M8X1	173	DKFZD4012-5
70	70	20	100	14	85	9		37.5	75	M8X1	197	DKFZD4012-6
70	70	30	100	14	85	9		37.5	75	M8X1	213	DKFZD4016-5
70	70	30	100	14	85	9		37.5	75	M8X1	245	DKFZD4016-6
70	70	30	100	14	85	9		37.5	75	M8X1	257	DKFZD4020-5
70	70	30	100	14	85	9	2	37.5	75	M8X1	297	DKFZD4020-6
70	70	30	100	14	85	9		37.5	75	M8X1	251	DKFZD4025-4
70	70	30	100	14	85	9		37.5	75	M8X1	301	DKFZD4025-5
82	82	20	118	16	100	11		46	92	M8X1	163	DKFZD5010-5
82	82	20	118	16	100	11		46	92	M8X1	183	DKFZD5010-6
82	82	20	118	16	100	11		46	92	M8X1	181	DKFZD5012-5
82	82	20	118	16	100	11		46	92	M8X1	205	DKFZD5012-6
82	82	30	118	16	100	11		46	92	M8X1	217	DKFZD5016-5
82	82	30	118	16	100	11		46	92	M8X1	249	DKFZD5016-6
82	82	30	118	16	100	11		46	92	M8X1	264	DKFZD5020-5
82	82	30	118	16	100	11		46	92	M8X1	304	DKFZD5020-6

DKFZD high speed precision ball screw

Notes:

1. K_c is theoretical calculation value when preload F_p is $0.1C_a$ and axial load F is $0.3C_a$.
2. When axial load F is not equal to $0.3C_a$,

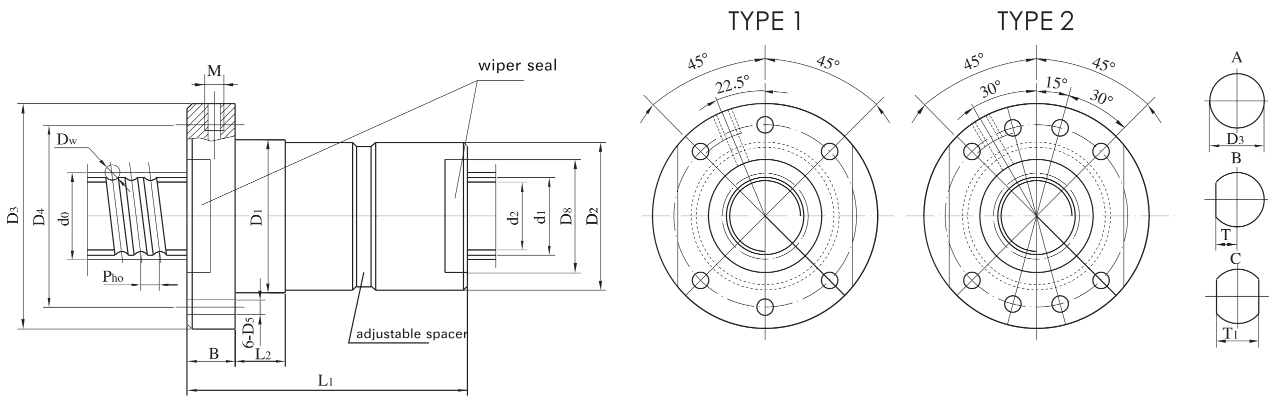
$$K_C = K\left(\frac{F}{0.3C_a}\right)^{\frac{1}{3}}$$

In formula:

K is rigidity value shown in Table.

3. This type ball screw can be used in high temperature working environment

Code and spec.	Nominal dia. d_o	Basic lead P_{ho}	Outer dia. of ball screw d_1	Ball dia. D_w	Bottom dia. of ball screw d_2	Number of circles n	Basic rated load		Rigidity K_C N/μm
							Dynamic load C_a KN	Static load C_{oa} KN	
DKFZD5025-4	50	25	49	6.35	44.4	4	42.3	130.4	1933
DKFZD5025-5	50	25	49	6.35	44.4	5	52	165.7	2419
DKFZD5030-4	50	30	49	6.35	44.4	4	42.3	131	1920
DKFZD5030-5	50	30	49	6.35	44.4	5	51.8	165.7	2403
DKFZD6310-5	63	10	61	6.35	56.4	5	56.8	202.5	2868
DKFZD6310-6	63	10	61	6.35	56.4	6	66.9	244.8	3437
DKFZD6312-5	63	12	61	6.35	56.4	5	56.8	202.5	2915
DKFZD6312-6	63	12	61	6.35	56.4	6	66.9	244.8	3494
DKFZD6312-5	63	12	61	7.938	55.3	5	102.3	358.8	3904
DKFZD6312-6	63	12	61	7.938	55.3	6	120.5	433.8	4680
DKFZD6316-5	63	16	61	6.35	56.4	5	56.8	202.5	2915
DKFZD6316-6	63	16	61	6.35	56.4	6	66.9	244.8	3494
DKFZD6316-5	63	16	61	10	53.9	5	76.9	234.5	3056
DKFZD6316-6	63	16	61	10	53.9	6	90.6	283.6	3637
DKFZD6320-5	63	20	61	6.35	56.4	5	56.9	204.3	2912
DKFZD6320-6	63	20	61	6.35	56.4	6	67.1	247.4	3490
DKFZD6320-5	63	20	61	10	53.9	5	138.1	447.2	3971
DKFZD6320-6	63	20	61	10	53.9	6	162.8	541.3	4763
DKFZD6325-4	63	25	61	6.35	56.4	4	46.8	163.1	2321
DKFZD6325-5	63	25	61	6.35	56.4	5	57.3	206.3	2903
DKFZD6325-4	63	25	61	10	53.9	4	112.6	353.3	3161
DKFZD6325-5	63	25	61	10	53.9	5	137.9	447.3	3959
DKFZD6330-4	63	30	61	6.35	56.4	4	46.7	163.1	2305
DKFZD6330-5	63	30	61	6.35	56.4	5	57.1	206.2	2882
DKFZD6330-4	63	30	61	10	53.9	4	112.4	353.4	3149
DKFZD6330-5	63	30	61	10	53.9	5	137.6	447.4	3943
DKFZD6340-4	63	40	61	6.35	56.4	4	46.5	163.2	2263
DKFZD6340-5	63	40	61	6.35	56.4	5	56.8	206.4	2830
DKFZD6340-4	63	40	61	10	53.9	4	111.8	353.4	3118
DKFZD6340-5	63	40	61	10	53.9	5	137.5	447.4	3904



Mounting & connecting dimension												Code and spec.
D_1(g6)	D2($^{-0.1}_{-0.2}$)	L_2	D_3	B	D_4	D_5	TYPE	T	T_1	M	L_1	
82	82	30	118	16	100	11		46	92	M8X1	258	DKFZD5025-4
82	82	30	118	16	100	11		46	92	M8X1	308	DKFZD5025-5
82	82	30	118	16	100	11		46	92	M8X1	302	DKFZD5030-4
82	82	30	118	16	100	11		46	92	M8X1	362	DKFZD5030-5
95	95	20	135	22	115	13.5		50	100	M8X1	168	DKFZD6310-5
95	95	20	135	22	115	13.5		50	100	M8X1	188	DKFZD6310-6
95	95	20	135	22	115	13.5		50	100	M8X1	180	DKFZD6312-5
95	95	20	135	22	115	13.5		50	100	M8X1	204	DKFZD6312-6
98	98	20	138	25	118	13.5		51.5	103	M8X1	198	DKFZD6312-5
98	98	20	138	25	118	13.5		51.5	103	M8X1	222	DKFZD6312-6
95	95	30	135	22	115	13.5		50	100	M8X1	227	DKFZD6316-5
95	95	30	135	22	115	13.5		50	100	M8X1	259	DKFZD6316-6
107	107	30	147	28	127	13.5		56	112	M8X1	242	DKFZD6316-5
107	107	30	147	28	127	13.5		56	112	M8X1	274	DKFZD6316-6
95	95	40	135	22	115	13.5	2	50	100	M8X1	263	DKFZD6320-5
95	95	40	135	22	115	13.5		50	100	M8X1	303	DKFZD6320-6
107	107	40	147	28	127	13.5		56	112	M8X1	288	DKFZD6320-5
107	107	40	147	28	127	13.5		56	112	M8X1	328	DKFZD6320-6
95	95	40	135	22	115	13.5		50	100	M8X1	257	DKFZD6325-4
95	95	40	135	22	115	13.5		50	100	M8X1	307	DKFZD6325-5
107	107	40	147	28	127	13.5		56	112	M8X1	283.5	DKFZD6325-4
107	107	40	147	28	127	13.5		56	112	M8X1	333.5	DKFZD6325-5
95	95	40	135	22	115	13.5		50	100	M8X1	301	DKFZD6330-4
95	95	40	135	22	115	13.5		50	100	M8X1	361	DKFZD6330-5
107	107	40	147	28	127	13.5		56	112	M8X1	329	DKFZD6330-4
107	107	40	147	28	127	13.5		56	112	M8X1	389	DKFZD6330-5
95	95	40	135	22	115	13.5		50	100	M8X1	389	DKFZD6340-4
95	95	40	135	22	115	13.5		50	100	M8X1	469	DKFZD6340-5
107	107	40	147	28	127	13.5		56	112	M8X1	400	DKFZD6340-4
107	107	40	147	28	127	13.5		56	112	M8X1	480	DKFZD6340-5

Ball screw with FF/ FFZ type inner cycle, single nut

Notes:

1.K_c is theoretical calculation value when preload F_p is $0.1C_a$ and axial load F is $0.3C_a$.

2.When axial load F is not equal to $0.3C_a$,

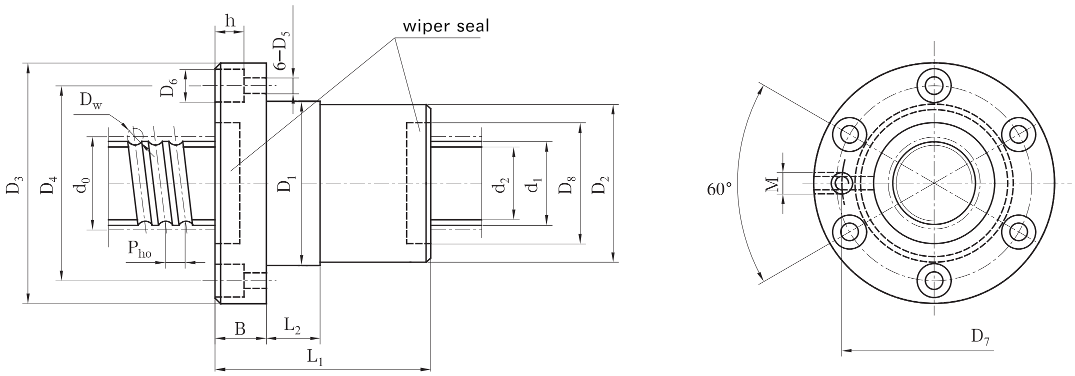
$$K_C = K\left(\frac{F}{0.3C_a}\right)^{\frac{1}{3}}$$

In formula:

K is rigidity value shown in Table.

3.The normal working environment temperature for FF type ball screw is ±80℃.

Code and spec.	Nominal dia. d_o	Basic lead P_{ho}	Outer dia. of ball screw d_1	Ball dia. D_w	Bottom dia.of ball screw d_2	Number of circles n	Basic rated load		Rigidity K_C N/μm
							Dynamic load C_a KN	Static load C_{oa} KN	
FF1204-3	12	4	11.3	2.381	9.5	3	4	6.7	208
FF1604-3	16	4	15.3	2.381	13.5	3	4.8	9.7	221
FF1605-3	16	5	15.5	3.5	12.9	3	7.6	13.2	200
FF2004L-3	20	4	19.3	2.381	17.5	3	5.3	12.1	259
FF2004-3	20	4	19.1	3	16.9	3	7.3	15.4	259
FF2005-3	20	5	19.5	3.5	16.9	3	9.1	18.3	268
FF2504-3	25	4	24.1	3	21.9	3	8.3	20.2	327
FF2505-3	25	5	24.5	3.5	21.9	3	10.2	23.6	328
FF2506-3	25	6	23.9	3.969	20.9	3	11.3	23.7	318
FF3204-3	32	4	31.1	3	28.9	3	9.6	27.9	411
FF3204-5	32	4	31.1	3	28.9	5	15	46.5	670
FF3205-3	32	5	31.5	3.5	28.9	3	11.7	31.4	413
FF3205-5	32	5	31.5	3.5	28.9	5	18.1	52.4	673
FF3206-3	32	6	30.9	3.969	27.9	3	13	32.1	419
FF3206-5	32	6	30.9	3.969	27.9	5	20.2	53.5	683
FF3208-3	32	8	30.6	5	26.9	3	17.1	38.8	408
FF3208-5	32	8	30.6	5	26.9	5	26.4	64.8	664
FF3210-3	32	10	31	5.953	26.5	3	20.6	43.8	395
FF3210-5	32	10	31	5.953	26.5	5	32	73	644
FF4005-3	40	5	39.5	3.5	36.9	3	13	40.6	512
FF4005-5	40	5	39.5	3.5	36.9	5	20.2	67.7	835



Mounting & connecting dimension													Code and spec.
D_1(g6)	$D_2(^{-0.1}_{-0.2})$	L_2	D_3	B	D_4	D_5	D_6	h	D_7	M	D_8	L_1	
22	22	10	44	8	32	4.8	8.5	4.5	32	M2.5	16	35	FF1204-3
28	28	10	52	10	38	5.8	10	6	32	M6	20	37	FF1604-3
28	28	10	52	10	38	5.8	10	6	32	M6	22	42	FF1605-3
36	36	10	62	11	48	5.8	10	6	40	M6	25	38	FF2004L-3
36	36	10	62	11	48	5.8	10	6	40	M6	25	38	FF2004-3
36	36	10	62	11	48	5.8	10	6	40	M6	25	43	FF2005-3
40	40	10	66	11	53	5.8	10	6	46	M6	30	38	FF2504-3
40	40	10	66	11	53	5.8	10	6	46	M6	30	43	FF2505-3
40	40	10	66	11	53	5.8	10	6	46	M6	30	49	FF2506-3
50	50	10	76	11	63	5.8	10	6	56	M6	38	38	FF3204-3
50	50	10	76	11	63	5.8	10	6	56	M6	38	47	FF3204-5
50	50	10	82	13	67	7	12	7	62	M6	38	45	FF3205-3
50	50	10	82	13	67	7	12	7	62	M6	38	56	FF3205-5
50	50	10	82	13	67	7	12	7	62	M6	38	51	FF3206-3
50	50	10	82	13	67	7	12	7	62	M6	38	66	FF3206-5
50	50	10	82	13	67	7	12	7	62	M6	38	67	FF3208-3
50	50	10	82	13	67	7	12	7	62	M6	38	82	FF3208-5
53	53	15	90	15	71	9	15	9	70	M6	44	76	FF3210-3
53	53	15	90	15	71	9	15	9	70	M6	44	99	FF3210-5
60	60	10	94	15	75	9	15	9	74	M6	48	47	FF4005-3
60	60	10	94	15	75	9	15	9	74	M6	48	58	FF4005-5

Ball screw with FF/ FFZ type inner cycle, single nut

Notes:

1. K_c is theoretical calculation value when preload F_p is $0.1C_a$ and axial load F is $0.3C_a$.
2. When axial load F is not equal to $0.3C_a$,

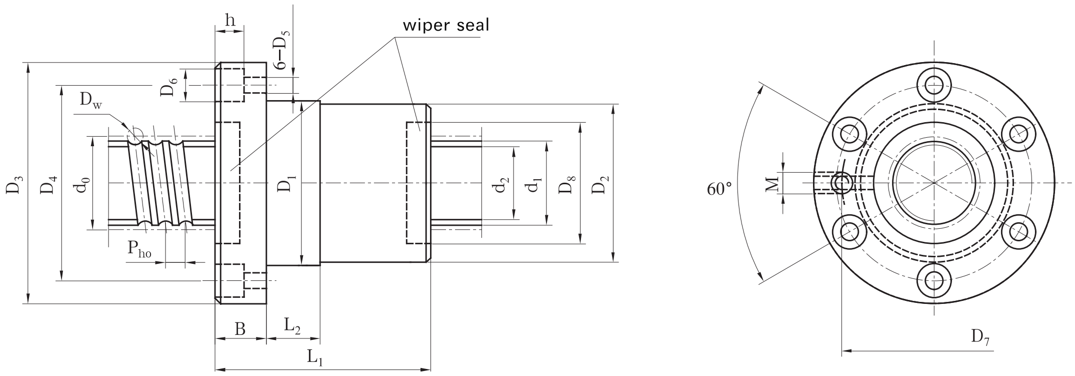
$$K_C = K\left(\frac{F}{0.3C_a}\right)^{\frac{1}{3}}$$

In formula:

K is rigidity value shown in Table.

3. The normal working environment temperature for FF type ball screw is ±80℃.

Code and spec.	Nominal dia. d_o	Basic lead P_{ho}	Outer dia. of ball screw d_1	Ball dia. D_w	Bottom dia.of ball screw d_2	Number of circles n	Basic rated load		Rigidity K_C N/μm
							Dynamic load C_a KN	Static load C_{oa} KN	
FF4006-3	40	6	38.9	3.969	35.9	3	15.1	43.8	508
FF4006-5	40	6	38.9	3.969	35.9	5	23.5	73	829
FF4008-3	40	8	38.6	5	34.9	3	19.8	51	502
FF4008-5	40	8	38.6	5	34.9	5	30.7	84.9	790
FF4010-3	40	10	39.5	7.144	34.3	3	30	66.3	486
FF4010-5	40	10	39.5	7.144	34.3	5	46.5	110.5	792
FF4012-4	40	12	38	7.144	32.7	4	36.5	81.3	545
FF4012-5	40	12	38	7.144	32.7	5	44.2	101.6	720
FF5005-3	50	5	49	3.5	46.4	3	14.3	51.1	606
FF5005-5	50	5	49	3.5	46.4	5	22.2	85.1	990
FF5006-3	50	6	48.9	3.969	45.9	3	17	57.2	612
FF5006-5	50	6	48.9	3.969	45.9	5	26.4	95.4	998
FF5008-3	50	8	48.6	5	44.9	3	22.4	67	634
FF5008-5	50	8	48.6	5	44.9	5	34.7	111	1034
FF5010-3	50	10	49.5	7.144	44.3	3	35.8	93.2	636
FF5010-5	50	10	49.5	7.144	44.3	5	55.6	155.3	1037
FF5012-4	50	12	48	7.144	42.7	4	44.4	117	568
FF5012-5	50	12	48	7.144	42.7	5	53.8	146.3	900



Mounting & connecting dimension													Code and spec.
D_1(g6)	$D_2(^{-0.1}_{-0.2})$	L_2	D_3	B	D_4	D_5	D_6	h	D_7	M	D_8	L_1	
60	60	10	94	15	75	9	15	9	74	M6	48	53	FF4006-3
60	60	10	94	15	75	9	15	9	74	M6	48	68	FF4006-5
63	63	15	108	18	85	11	18	11	85	M6	50	67	FF4008-3
63	63	15	108	18	85	11	18	11	85	M6	50	87	FF4008-5
63	63	20	108	18	85	11	18	11	80	M8×1	52	78	FF4010-3
63	63	20	108	18	85	11	18	11	80	M8×1	52	101	FF4010-5
63	63	20	108	18	85	11	18	11	85	M8×1	50	105	FF4012-4
63	63	20	108	18	85	11	18	11	85	M8×1	50	116	FF4012-5
71	71	10	110	15	90	9	15	9	84	M8×1	60	47	FF5005-3
71	71	10	110	15	90	9	15	9	84	M8×1	60	58	FF5005-5
71	71	15	110	15	90	9	15	9	84	M8×1	60	53	FF5006-3
71	71	15	110	15	90	9	15	9	84	M8×1	60	68	FF5006-5
75	75	15	118	18	95	11	18	11	90	M8×1	60	68	FF5008-3
75	75	15	118	18	95	11	18	11	90	M8×1	60	84	FF5008-5
75	75	15	118	18	95	11	18	11	90	M8×1	62	77	FF5010-3
75	75	15	118	18	95	11	18	11	90	M8×1	62	102	FF5010-5
75	75	20	118	18	95	11	18	11	90	M8×1	60	104	FF5012-4
75	75	20	118	18	95	11	18	11	90	M8×1	60	123	FF5012-5

Ball screw with FF/ FFZ type inner cycle, single nut

Notes:

1. K_c is theoretical calculation value when preload F_p is $0.1C_a$ and axial load F is $0.3C_a$.
2. When axial load F is not equal to $0.3C_a$,

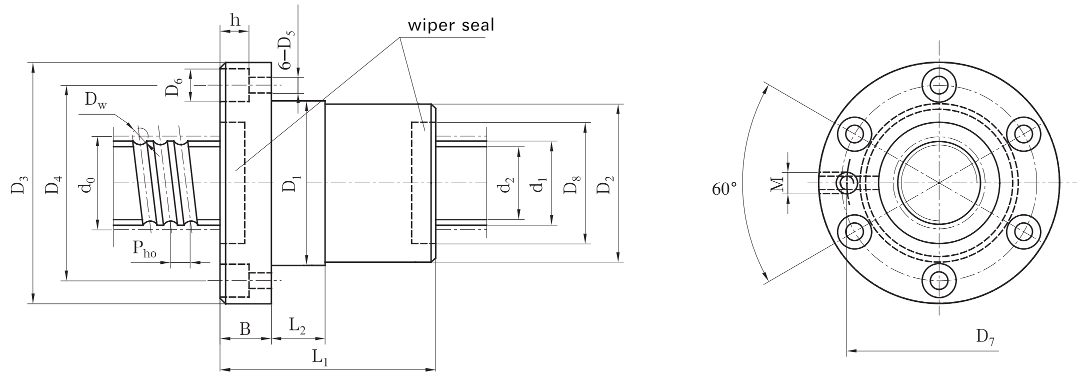
$$K_c = K\left(\frac{F}{0.3C_a}\right)^{\frac{1}{3}}$$

In formula:

K is rigidity value shown in Table.

3. The normal working environment temperature for FF type ball screw is ±80℃.

Code and spec.	Nominal dia. d_o	Basic lead P_{ho}	Outer dia. of ball screw d_1	Ball dia. D_w	Bottom dia.of ball screw d_2	Number of circles n	Basic rated load		Rigidity K_C N/μm
							Dynamic load C_a KN	Static load C_{oa} KN	
FF6308-4	63	8	61	5	57.3	4	33	121.1	1009
FF6308-5	63	8	61	5	57.3	5	40	151.5	1249
FF6310-4	63	10	61	7.144	55.7	4	51.5	160.6	1011
FF6310-5	63	10	61	7.144	55.7	5	62.4	200.7	1252
FF6312-4	63	12	61	7.144	55.8	4	50.3	153.3	1024
FF6312-5	63	12	61	7.144	55.8	5	60.9	191.7	1268
FF6316-4	63	16	61	10	53.8	4	76	201	941
FF6316-5	63	16	61	10	53.8	5	92.5	251.2	1147
FF6320-4	63	20	61	10	53.8	4	76.2	200.6	1061
FF6320-5	63	20	61	10	53.8	5	92.3	250.8	1306
FF8010-4	80	10	78	7.144	72.7	4	58.1	211.4	1239
FF8010-5	80	10	78	7.144	72.7	5	70.3	264.3	1535
FF8012-4	80	12	78	7.144	72.7	4	58.3	211	1283
FF8012-5	80	12	78	7.144	72.7	5	70.7	264	1588
FF8016-4	80	16	78	10	70.8	4	88.3	271.9	1309
FF8016-5	80	16	78	10	70.8	5	107	339.9	1620
FF8020-4	80	20	78	10	70.8	4	85.2	258	1242
FF8020-5	80	20	78	10	70.8	5	103.3	322.5	1516
FF10016-4	100	16	97	10	89.8	4	100	357.2	1710
FF10016-5	100	16	97	10	89.8	5	121.1	446.5	2079
FF10020-4	100	20	97	10	89.8	4	100	356.9	1607
FF10020-5	100	20	97	10	89.8	5	121	446.1	1989
FF12016-5	120	16	117	10	109.8	5	135.6	570.4	2458
FF12016-7	120	16	117	10	109.8	7	181.1	798.6	2675
FF12020-5	120	20	117	10	109.8	5	135.5	570.1	2376
FF12020-7	120	20	117	10	109.8	7	181	798.2	2573



						Mounting & connecting dimension							
D_1(g6)	$D_2\left(^{-0.1}_{-0.2}\right)$	L_2	D_3	B	D_4	D_5	D_6	h	D_7	M	D_8	L_1	Code and spec.
90	90	20	132	18	110	11	18	11	104	M8×1	75	76	FF6308-4
90	90	20	132	18	110	11	18	11	104	M8×1	75	87	FF6308-5
90	90	20	138	22	112	13.5	22	13	112	M8×1	75	95	FF6310-4
90	90	20	138	22	112	13.5	22	13	112	M8×1	75	107	FF6310-5
90	90	20	138	22	112	13.5	22	13	112	M8×1	75	105	FF6312-4
90	90	20	138	22	112	13.5	22	13	112	M8×1	75	123	FF6312-5
95	95	30	148	28	118	13.5	22	13	118	M8×1	75	140	FF6316-4
95	95	30	148	28	118	13.5	22	13	118	M8×1	75	163	FF6316-5
95	95	40	148	28	118	13.5	22	13	118	M8×1	75	165	FF6320-4
95	95	40	148	28	118	13.5	22	13	118	M8×1	75	189	FF6320-5
105	105	20	156	22	130	13.5	22	13	130	M8×1	90	95	FF8010-4
105	105	20	156	22	130	13.5	22	13	130	M8×1	90	107	FF8010-5
110	110	25	158	22	132	13.5	22	13	132	M8×1	90	105	FF8012-4
110	110	25	158	22	132	13.5	22	13	132	M8×1	90	123	FF8012-5
118	118	30	168	28	140	13.5	22	13	140	M8×1	95	145	FF8016-4
118	118	30	168	28	140	13.5	22	13	140	M8×1	95	165	FF8016-5
118	118	40	168	28	140	13.5	22	13	140	M10×1	95	166	FF8020-4
118	118	40	168	28	140	13.5	22	13	140	M10×1	95	194	FF8020-5
140	140	40	204	28	170	17.5	28	17	170	M10×1	115	145	FF10016-4
140	140	40	204	28	170	17.5	28	17	170	M10×1	115	165	FF10016-5
140	140	40	204	28	170	17.5	28	17	170	M10×1	115	170	FF10020-4
140	140	40	204	28	170	17.5	28	17	170	M10×1	115	194	FF10020-5
160	160	40	225	28	190	17.5	28	17	190	M10×1	135	165	FF12016-5
160	160	40	225	28	190	17.5	28	17	190	M10×1	135	205	FF12016-7
160	160	40	225	28	190	17.5	28	17	190	M10×1	135	194	FF12020-5
160	160	40	225	28	190	17.5	28	17	190	M10×1	135	242	FF12020-7

FFB type inner cycle, deflected lead preload flange nut

Notes:

1. K_c is theoretical calculation value when preload F_p is $0.1C_a$ and axial load F is $0.3C_a$.
2. When axial load F is not equal to $0.3C_a$,

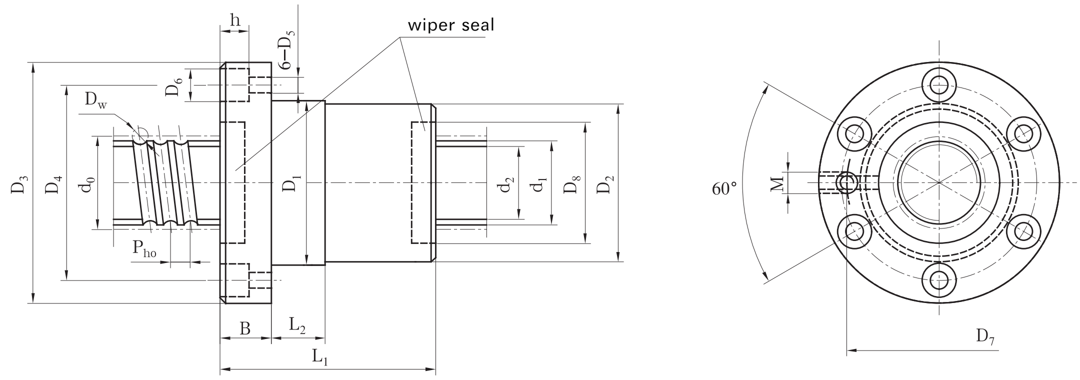
$$K_C = K\left(\frac{F}{0.3C_a}\right)^{\frac{1}{3}}$$

In formula:

K is rigidity value shown in Table.

3. The normal working environment temperature for FF type ball screw is ±80℃.

Code and spec.	Nominal dia. d_o	Basic lead P_{ho}	Outer dia. of ball screw d_1	Ball dia. D_w	Bottom dia.of ball screw d_2	Number of circles n	Basic rated load		Rigidity K_C N/μm
							Dynamic load C_a KN	Static load C_{oa} KN	
FFB2004L-2	20	4	19.3	2.381	17.5	2	5.2	10.2	356
FFB2004-2	20	4	19.1	3	16.9	2	5.2	10.2	356
FFB2005-2	20	5	19.5	3.5	16.9	2	6.4	12.2	364
FFB2504-2	25	4	24.1	3	21.9	2	5.9	13.5	445
FFB2505-2	25	5	24.5	3.5	21.9	2	7.3	15.7	446
FFB2506-2	25	6	23.9	3.969	20.9	2	7.9	15.8	432
FFB3204-2	32	4	31.1	3	28.9	2	6.8	18.6	447
FFB3205-2	32	5	31.5	3.5	28.9	2	8.2	21	560
FFB3206-2	32	6	30.9	3.969	27.9	2	9.2	21.4	569
FFB3210-2	32	10	31	5.953	26.5	2	14.5	29.2	537
FFB4005-2	40	5	39.5	3.5	36.9	2	9.2	27	695
FFB4006-2	40	6	38.9	3.969	35.9	2	10.6	29.2	690
FFB4008-2	40	8	38.6	5	34.9	2	14	34	705
FFB4010-2	40	10	39.5	7.144	34.3	2	21.1	44.2	660
FFB5005-2	50	5	49	3.5	46.4	2	10	34	822
FFB5006-2	50	6	48.9	3.969	45.9	2	12	38.1	830
FFB5008-2	50	8	48.6	5	44.9	2	15.8	44.6	861
FFB5010-2	50	10	49.5	7.144	44.3	2	25.3	62.1	864



Mounting & connecting dimension													Code and spec.
D_1(g6)	$D_2(^{-0.1}_{-0.2})$	L_2	D_3	B	D_4	D_5	D_6	h	D_7	M	D_8	L_1	
36	36	10	62	11	48	5.8	10	6	42	M6	25	49	FFB2004L-2
36	36	10	62	11	48	5.8	10	6	42	M6	25	49	FFB2004-2
36	36	10	62	11	48	5.8	10	6	42	M6	25	55	FFB2005-2
40	40	10	66	11	53	5.8	10	6	46	M6	30	49	FFB2504-2
40	40	10	66	11	53	5.8	10	6	46	M6	30	55	FFB2505-2
40	40	10	66	11	53	5.8	10	6	46	M6	30	65	FFB2506-2
50	50	10	76	11	63	5.8	10	6	56	M6	38	47	FFB3204-2
50	50	10	82	13	67	7	12	7	62	M6	38	57	FFB3205-2
50	50	10	82	13	67	7	12	7	62	M6	38	65	FFB3206-2
53	53	15	90	15	71	9	15	9	70	M6	44	96	FFB3210-2
60	60	10	94	15	75	9	15	9	75	M6	48	58	FFB4005-2
60	60	10	94	15	75	9	15	9	75	M6	48	68	FFB4006-2
63	63	15	108	18	85	11	18	11	85	M6	50	84	FFB4008-2
63	63	20	108	18	85	11	18	11	80	M8×1	50	101	FFB4010-2
71	71	15	110	15	90	9	15	9	84	M8×1	60	58	FFB5005-2
71	71	15	110	15	90	9	15	9	84	M8×1	60	68	FFB5006-2
75	75	15	118	18	95	11	18	11	90	M8×1	60	87	FFB5008-2
75	75	15	118	18	95	11	18	11	90	M8×1	62	102	FFB5010-2

FFZD type inner cycle, combined spacer preload nut

Notes:

1. K_c is theoretical calculation value when preload F_p is $0.1C_a$ and axial load F is $0.3C_a$.
2. When axial load F is not equal to $0.3C_a$,

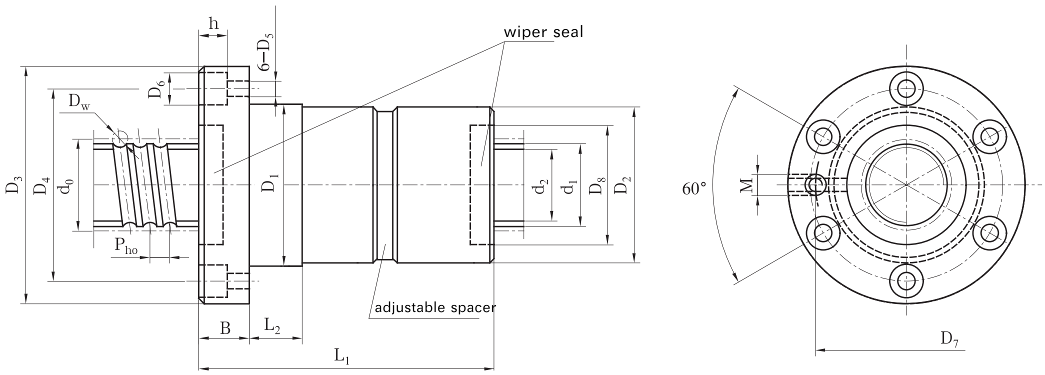
$$K_C = K\left(\frac{F}{0.3C_a}\right)^{\frac{1}{3}}$$

In formula:

K is rigidity value shown in Table.

3. The normal working environment temperature for FF type ball screw is ±80℃.

Code and spec.	Nominal dia. d_o	Basic lead P_{ho}	Outer dia. of ball screw d_1	Ball dia. D_w	Bottom dia.of ball screw d_2	Number of circles n	Dynamic load C_a KN	Static load C_{oa} KN	Rigidity K_C N/μm
FFZD1204-3	12	4	11.3	2.381	9.5	3	4	6.7	417
FFZD1604-3	16	4	15.3	2.381	13.5	3	4.8	9.7	442
FFZD1605-3	16	5	15.5	3.5	12.9	3	7.6	13.2	400
FFZD2004L-3	20	4	19.3	2.381	17.5	3	5.3	12.1	519
FFZD2004-3	20	4	19.1	3	16.9	3	7.3	15.4	519
FFZD2005-3	20	5	19.5	3.5	16.9	3	9.1	18.3	536
FFZD2504-3	25	4	24.1	3	21.9	3	8.3	20.2	654
FFZD2505-3	25	5	24.5	3.5	21.9	3	10.2	23.6	657
FFZD2506-3	25	6	23.9	3.969	20.9	3	11.3	23.7	636
FFZD3204-3	32	4	31.1	3	28.9	3	9.6	27.9	823
FFZD3204-5	32	4	31.1	3	28.9	5	15	46.5	1340
FFZD3205-3	32	5	31.5	3.5	28.9	3	11.7	31.4	826
FFZD3205-5	32	5	31.5	3.5	28.9	5	18.1	52.4	1346
FFZD3206-3	32	6	30.9	3.969	27.9	3	13	32.1	839
FFZD3206-5	32	6	30.9	3.969	27.9	5	20.2	53.5	1367
FFZD3208-3	32	8	30.6	5	26.9	3	17.1	38.8	816
FFZD3208-5	32	8	30.6	5	26.9	5	26.4	64.8	1328
FFZD3210-3	32	10	31	5.953	26.5	3	20.6	43.8	791
FFZD3210-5	32	10	31	5.953	26.5	5	32	73	1288
FFZD4005-3	40	5	39.5	3.5	36.9	3	13	40.6	1025
FFZD4005-5	40	5	39.5	3.5	36.9	5	20.2	67.7	1671



Mounting & connecting dimension													Code and spec.
D_1(g6)	$D_2(^{-0.1}_{-0.2})$	L_2	D_3	B	D_4	D_5	D_6	h	D_7	M	D_8	L_1	
22	22	10	44	8	32	4.8	8.5	4.5	32	M2.5	16	66	FFZD1204-3
28	28	10	52	10	38	5.8	10	6	32	M6	20	69	FFZD1604-3
28	28	10	52	10	38	5.8	10	6	32	M6	22	83	FFZD1605-3
36	36	10	62	11	48	5.8	10	6	40	M6	25	73	FFZD2004L-3
36	36	10	62	11	48	5.8	10	6	40	M6	25	72	FFZD2004-3
36	36	10	62	11	48	5.8	10	6	40	M6	25	83	FFZD2005-3
40	40	10	66	11	53	5.8	10	6	46	M6	30	74	FFZD2504-3
40	40	10	66	11	53	5.8	10	6	46	M6	30	84	FFZD2505-3
40	40	10	66	11	53	5.8	10	6	46	M6	30	97	FFZD2506-3
50	50	10	76	11	63	5.8	10	6	56	M6	38	73	FFZD3204-3
50	50	10	76	11	63	5.8	10	6	56	M6	38	92	FFZD3204-5
50	50	10	82	13	67	7	12	7	62	M6	38	85	FFZD3205-3
50	50	10	82	13	67	7	12	7	62	M6	38	108	FFZD3205-5
50	50	10	82	13	67	7	12	7	62	M6	38	99	FFZD3206-3
50	50	10	82	13	67	7	12	7	62	M6	38	127	FFZD3206-5
50	50	10	82	13	67	7	12	7	62	M6	42	123	FFZD3208-3
50	50	10	82	13	67	7	12	7	62	M6	42	152	FFZD3208-5
53	53	15	90	15	71	9	15	9	70	M6	44	146	FFZD3210-3
53	53	15	90	15	71	9	15	9	70	M6	44	191	FFZD3210-5
60	60	10	94	15	75	9	15	9	75	M6	48	88	FFZD4005-3
60	60	10	94	15	75	9	15	9	75	M6	48	111	FFZD4005-5

FFZD type inner cycle, combined spacer preload nut

Notes:

1.K_c is theoretical calculation value when preload F_p is $0.1C_a$ and axial load F is $0.3C_a$.

2.When axial load F is not equal to $0.3C_a$,

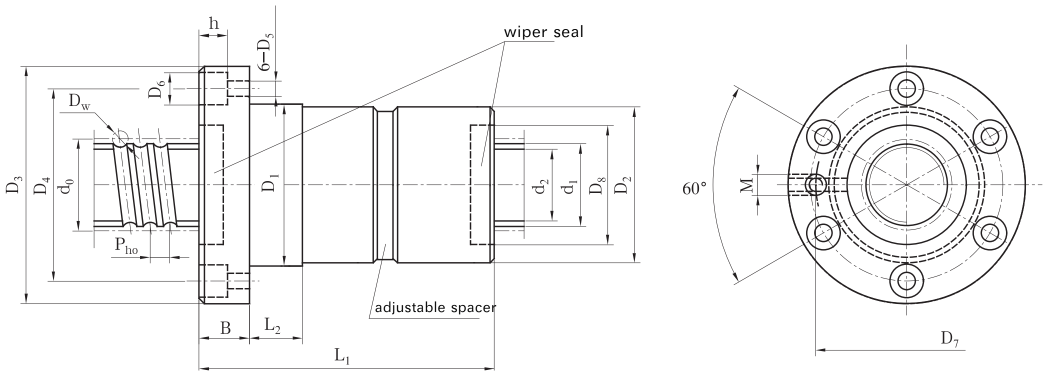
$$K_C = K(\frac{F}{0.3C_a})^{\frac{1}{3}}$$

In formula:

K is rigidity value shown in Table.

3.The normal working environment temperature for FF type ball screw is ±80℃.

Code and spec.	Nominal dia. d_o	Basic lead P_{ho}	Outer dia. of ball screw d_1	Ball dia. D_w	Bottom dia.of ball screw d_2	Number of circles n	Basic rated load		Rigidity K_C N/μm
							Dynamic load C_a KN	Static load C_{oa} KN	
FFZD4006-3	40	6	38.9	3.969	35.9	3	15.1	43.8	1017
FFZD4006-5	40	6	38.9	3.969	35.9	5	23.5	73	1658
FFZD4008-3	40	8	38.6	5	34.9	3	19.8	51	1004
FFZD4008-5	40	8	38.6	5	34.9	5	30.7	84.9	1580
FFZD4010-3	40	10	39.5	7.144	34.3	3	30	66.3	973
FFZD4010-5	40	10	39.5	7.144	34.3	5	46.5	110.5	1585
FFZD4012-3	40	12	38	7.144	32.7	3	36.5	81.3	909
FFZD4012-5	40	12	38	7.144	32.7	5	44.2	101.6	1440
FFZD5005-3	50	5	49	3.5	46.4	3	14.3	51.1	1213
FFZD5005-5	50	5	49	3.5	46.4	5	22.2	85.1	1981
FFZD5006-3	50	6	48.9	3.969	45.9	3	17	57.2	1224
FFZD5006-5	50	6	48.9	3.969	45.9	5	26.4	95.4	1997
FFZD5008-3	50	8	48.6	5	44.9	3	22.4	67	1269
FFZD5008-5	50	8	48.6	5	44.9	5	34.7	111	2069
FFZD5010-3	50	10	49.5	7.144	44.3	3	35.8	93.2	1273
FFZD5010-5	50	10	49.5	7.144	44.3	5	55.6	155.3	2075
FFZD5012-4	50	12	48	7.144	42.7	4	44.4	117	1137
FFZD5012-5	50	12	48	7.144	42.7	5	53.8	146.3	1801



Mounting & connecting dimension													Code and spec.
D_1(g6)	$D_2(^{-0.1}_{-0.2})$	L_2	D_3	B	D_4	D_5	D_6	h	D_7	M	D_8	L_1	
60	60	10	94	15	75	9	15	9	74	M6	48	101	FFZD4006-3
60	60	10	94	15	75	9	15	9	74	M6	48	128	FFZD4006-5
63	63	15	108	18	85	11	18	11	85	M6	50	128	FFZD4008-3
63	63	15	108	18	85	11	18	11	85	M6	50	163	FFZD4008-5
63	63	20	108	18	85	11	18	11	80	M8×1	52	146	FFZD4010-3
63	63	20	108	18	85	11	18	11	80	M8×1	52	193	FFZD4010-5
63	63	20	108	18	85	11	18	11	80	M8×1	50	164	FFZD4012-3
63	63	20	108	18	85	11	18	11	80	M8×1	50	227	FFZD4012-5
71	71	10	110	15	90	9	15	9	84	M8×1	60	87	FFZD5005-3
71	71	10	110	15	90	9	15	9	84	M8×1	60	111	FFZD5005-5
71	71	15	110	15	90	9	15	9	84	M8×1	60	101	FFZD5006-3
71	71	15	110	15	90	9	15	9	84	M8×1	60	130	FFZD5006-5
75	75	15	118	18	95	11	18	11	90	M8×1	60	127	FFZD5008-3
75	75	15	118	18	95	11	18	11	90	M8×1	60	163	FFZD5008-5
75	75	15	118	18	95	11	18	11	90	M8×1	62	147	FFZD5010-3
75	75	15	118	18	95	11	18	11	90	M8×1	62	194	FFZD5010-5
75	75	20	118	18	95	11	18	11	90	M8×1	60	195	FFZD5012-4
75	75	20	118	18	95	11	18	11	90	M8×1	60	223	FFZD5012-5

FFZD type inner cycle, combined spacer preload nut

Notes:

1.K_c is theoretical calculation value when preload F_p is $0.1C_a$ and axial load F is $0.3C_a$.

2.When axial load F is not equal to $0.3C_a$,

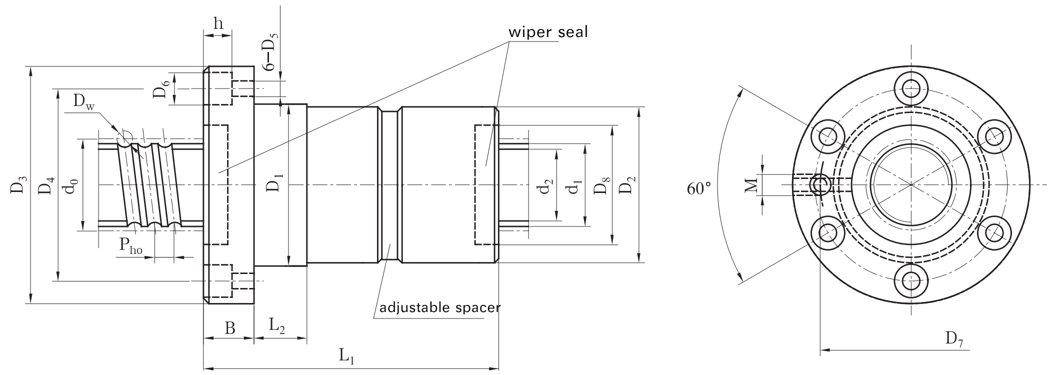
$$K_c = K\left(\frac{F}{0.3C_a}\right)^{\frac{1}{3}}$$

In formula:

K is rigidity value shown in Table.

3.The normal working environment temperature for FF type ball screw is ±80℃.

Code and spec.	Nominal dia. d_o	Basic lead P_{ho}	Outer dia. of ball screw d_1	Ball dia. D_w	Bottom dia.of ball screw d_2	Number of circles n	Dynamic load C_a KN	Static load C_{oa} KN	Rigidity K_C N/μm
FFZD6308-4	63	8	61	5	57.3	4	33	121.1	2018
FFZD6308-5	63	8	61	5	57.3	5	40	151.5	2499
FFZD6310-4	63	10	61	7.144	55.7	4	51.5	160.6	2023
FFZD6310-5	63	10	61	7.144	55.7	5	62.4	200.7	2505
FFZD6312-4	63	12	61	7.144	55.8	4	50.3	153.3	2049
FFZD6312-5	63	12	61	7.144	55.8	5	60.9	191.7	2537
FFZD6316-4	63	16	61	10	53.8	4	76	201	1882
FFZD6316-5	63	16	61	10	53.8	5	92.5	251.2	2290
FFZD6320-4	63	20	61	10	53.8	4	76.2	200.6	2122
FFZD6320-5	63	20	61	10	53.8	5	92.3	250.8	2612
FFZD8010-4	80	10	78	7.144	72.7	4	58.1	211.4	2479
FFZD8010-5	80	10	78	7.144	72.7	5	70.3	264.3	3071
FFZD8012-4	80	12	78	7.144	72.7	4	58.3	211	2566
FFZD8012-5	80	12	78	7.144	72.7	5	70.7	264	3177
FFZD8016-4	80	16	78	10	70.8	4	88.3	271.9	2618
FFZD8016-5	80	16	78	10	70.8	5	107	339.9	3241
FFZD8020-4	80	20	78	10	70.8	4	85.2	258	2484
FFZD8020-5	80	20	78	10	70.8	5	103.3	322.5	3032
FFZD10016-4	100	16	97	10	89.8	4	100	357.2	3420
FFZD10016-5	100	16	97	10	89.8	5	121.1	446.5	4159
FFZD10020-4	100	20	97	10	89.8	4	100	356.9	3214
FFZD10020-5	100	20	97	10	89.8	5	121	446.1	3979
FFZD12016-5	120	16	117	10	109.8	5	135.6	570.4	4917
FFZD12016-7	120	16	117	10	109.8	7	181.1	798.6	5351
FFZD12020-5	120	20	117	10	109.8	5	135.5	570.1	4753
FFZD12020-7	120	20	117	10	109.8	7	181	798.2	5146



Mounting & connecting dimension													
D_1(g6)	$D_2(^{-0.1}_{-0.2})$	L_2	D_3	B	D_4	D_5	D_6	h	D_7	M	D_8	L_1	Code and spec.
90	90	20	132	18	110	11	18	11	104	M8×1	75	147	FFZD6308-4
90	90	20	132	18	110	11	18	11	104	M8×1	75	163	FFZD6308-5
90	90	20	138	22	112	13.5	22	13	112	M8×1	75	175	FFZD6310-4
90	90	20	138	22	112	13.5	22	13	112	M8×1	75	198	FFZD6310-5
90	90	20	138	22	112	13.5	22	13	112	M8×1	75	203	FFZD6312-4
90	90	20	138	22	112	13.5	22	13	112	M8×1	75	230	FFZD6312-5
95	95	30	148	28	118	13.5	22	13	118	M8×1	85	266	FFZD6316-4
95	95	30	148	28	118	13.5	22	13	118	M8×1	85	306	FFZD6316-5
95	95	40	148	28	118	13.5	22	13	118	M8×1	75	304	FFZD6320-4
95	95	40	148	28	118	13.5	22	13	118	M8×1	75	354	FFZD6320-5
105	105	20	156	22	130	13.5	22	13	130	M8×1	90	181	FFZD8010-4
105	105	20	156	22	130	13.5	22	13	130	M8×1	90	204	FFZD8010-5
110	110	25	158	22	132	13.5	22	13	132	M8×1	90	211	FFZD8012-4
110	110	25	158	22	132	13.5	22	13	132	M8×1	90	237	FFZD8012-5
118	118	30	168	28	140	13.5	22	13	140	M8×1	95	274	FFZD8016-4
118	118	30	168	28	140	13.5	22	13	140	M8×1	95	298	FFZD8016-5
118	118	40	168	28	140	13.5	22	13	140	M10×1	95	306	FFZD8020-4
118	118	40	168	28	140	13.5	22	13	140	M10×1	95	358	FFZD8020-5
140	140	40	204	28	170	17.5	28	17	170	M10×1	115	263	FFZD10016-4
140	140	40	204	28	170	17.5	28	17	170	M10×1	115	300	FFZD10016-5
140	140	40	204	28	170	17.5	28	17	170	M10×1	115	315	FFZD10020-4
140	140	40	204	28	170	17.5	28	17	170	M10×1	115	372	FFZD10020-5
160	160	40	225	28	190	17.5	28	17	190	M10×1	135	300	FFZD12016-5
160	160	40	225	28	190	17.5	28	17	190	M10×1	135	380	FFZD12016-7
160	160	40	225	28	190	17.5	28	17	190	M10×1	135	370	FFZD12020-5
160	160	40	225	28	190	17.5	28	17	190	M10×1	135	466	FFZD12020-7

Ball screw with FFZL type inner cycle, thread preload nut

Notes:

1. K_c is theoretical calculation value when preload F_p is $0.1C_a$ and axial load F is $0.3C_a$.
2. When axial load F is not equal to $0.3C_a$,

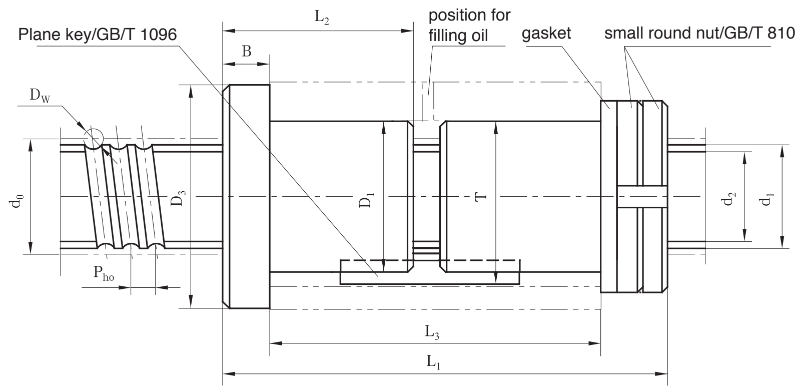
$$K_C = K\left(\frac{F}{0.3C_a}\right)^{\frac{1}{3}}$$

In formula:

K is rigidity value shown in Table.

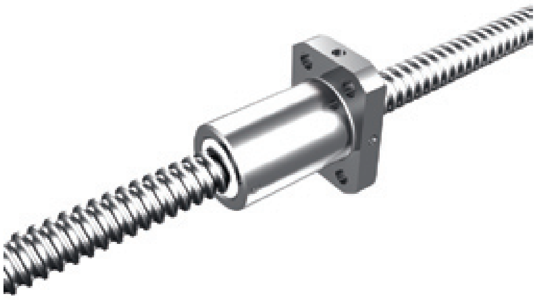
3. The normal working environment temperature for FF type ball screw is ±80℃.

Code and spec.	Nominal dia. d_o	Basic lead P_{ho}	Outer dia. of ball screw d_1	Ball dia. D_w	Bottom dia.of ball screw d_2	Number of circles n	Basic rated load: Dynamic load C_a KN	Basic rated load: Static load C_{oa} KN	Rigidity K_C N/μm
FFZL2004L-3	20	4	19.3	2.381	17.5	3	5.3	12.1	519
FFZL2004-3	20	4	19.1	3	16.9	3	7.3	15.4	519
FFZL2005-3	20	5	19.5	3.5	16.9	3	9.1	18.3	536
FFZL2505-3	25	5	24.5	3.5	21.9	3	10.2	23.6	657
FFZL2506-3	25	6	23.9	3.969	20.9	3	11.3	23.7	636
FFZL3205-3	32	5	31.5	3.5	28.9	3	11.7	31.4	826
FFZL3206-3	32	6	30.9	3.969	27.9	3	13	32.1	839
FFZL4006-3	40	6	38.9	3.969	35.9	3	15.1	43.8	1017
FFZL4008-3	40	8	38.6	5	34.9	3	19.8	51	1004
FFZL4010-3	40	10	39.5	7.144	34.3	3	30	66.3	973
FFZL4012-3	40	12	38	7.144	32.7	3	24.9	70.7	909
FFZL5006-4	50	6	48.9	3.969	45.9	4	21.7	76.3	1558
FFZL5008-4	50	8	48.6	5	44.9	4	28.7	89.3	1756
FFZL5010-4	50	10	49.5	7.144	44.3	4	46	124.2	1874
FFZL5012-4	50	12	48	7.144	42.7	4	44.7	117	1137
FFZL6308-4	63	8	61	5	57.3	4	33	121.1	2018
FFZL6310-4	63	10	61	7.144	55.7	4	51.5	160.6	2023
FFZL6312-4	63	12	61	7.144	55.8	4	50.3	153.3	2049
FFZL8010-4	80	10	78	7.144	72.7	4	58.1	214.9	2479
FFZL8012-4	80	12	78	7.144	72.7	4	58.3	211	2566



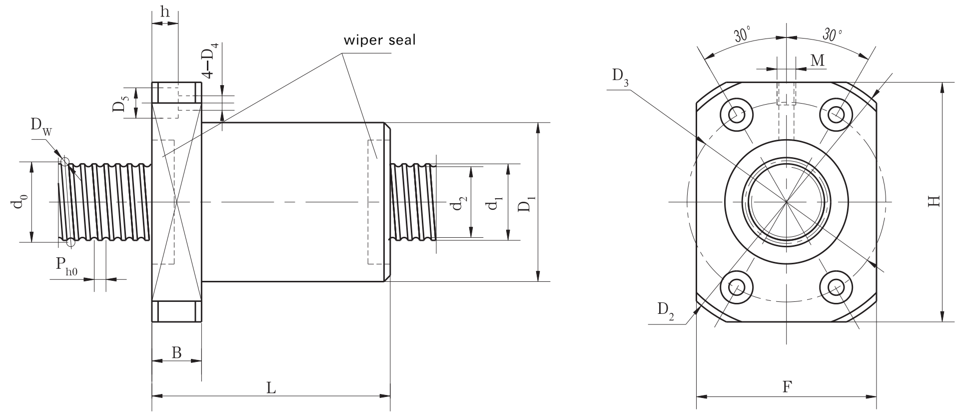
Mounting & connecting dimension							Small round nut GB/T 810	Plane key GB/T 1096	Code and spec.
D_1(h6)	D_3	L_1	L_2	L_3	B	T			
30	45	70	28	44	6	32	M30×1.5	4×4×30	FFZL2004L-3
30	45	70	28	44	6	32	M30×1.5	4×4×30	FFZL2004-3
34	48	81	34	55	6	36.5	M33×1.5	5×5×40	FFZL2005-3
42	58	84	34.5	55	8	44.5	M42×1.5	5×5×40	FFZL2505-3
45	62	95	41	66	8	48	M45×1.5	6×6×45	FFZL2506-3
50	68	88	37	55	8	52.5	M48×1.5	5×5×40	FFZL3205-3
50	68	99	41	66	8	53	M48×1.5	6×6×45	FFZL3206-3
60	80	101	42	66	10	63	M60×2	6×6×45	FFZL4006-3
60	80	119	52	84	10	63	M60×2	8×7×55	FFZL4008-3
65	85	140	62	102	13	68	M64×2	6×6×60	FFZL4010-3
65	85	161	75	121	15	68	M64×2	6×6×60	FFZL4012-3
72	95	117	50	78	10	75.5	M72×2	8×7×55	FFZL5006-4
75	95	144	64	102	12	79	M72×2	12×8×80	FFZL5008-4
75	95	167	76	124	13	79	M72×2	12×8×100	FFZL5010-4
75	95	191	89	146	15	79	M72×2	12×8×110	FFZL5012-4
85	110	144	64	102	12	89	M85×2	12×8×80	FFZL6308-4
90	115	168	77	124	14	95	M90×2	16×10×100	FFZL6310-4
90	115	195	90	150	15	95	M90×2	16×10×110	FFZL6312-4
110	135	180	79	127	15	116	M110×2	20×12×110	FFZL8010-4
110	135	204	91	150	16	116	M110×2	20×12×110	FFZL8012-4

Ball screw with JF mini-type



Notes:
The normal working environment temperature for FF mini-type ball screw is ±80℃.

Code and spec.	Nominal dia. d_o	Basic lead P_{ho}	Outer dia. of ball screw d_1	Ball dia. D_w	Bottom dia.of ball screw d_2	Number of circles n	Basic rated load	
							Dynamic load C_a KN	Static load C_{oa} KN
JF0801.5-4	8	1.5	8	1.2	7	4	1.7	3.2
JF0802-4	8	2	8	1.588	6.7	4	2.3	4
JF0802.5-4	8	2.5	8	1.588	6.7	4	2.3	4
JF1001.5-4	10	1.5	9.8	1.2	8.9	4	1.9	4.1
JF1002-4	10	2	9.8	1.588	8.5	4	2.7	4.9
JF1002.5-4	10	2.5	9.5	2	7.9	4	3.6	6.3
JF1201.5-4	12	1.5	11.8	1.2	10.8	4	2.1	5
JF1202-4	12	2	11.9	1.588	10.6	4	3.1	6.5
JF1202.5-4	12	2.5	11.7	2	10.1	4	4	7.8
JF1203-4	12	3	11.3	2.381	9.6	4	4.7	8.2
JF1602-4	16	2	15.9	1.588	14.6	4	3.5	8.7
JF1602.5-4	16	2.5	15.7	2	14.2	4	4.8	10.9
JF1603-4	16	3	15.3	2.381	13.5	4	6	12.5
JF2002-4	20	2	19.9	1.588	18.8	4	3.9	11.3
JF2002.5-4	20	2.5	19.7	2	18.1	4	5.3	14
JF2003-4	20	3	19.3	2.381	17.5	4	6.7	16.1



Mounting & connecting dimension											Code and spec.
D_1(g6)	D_2	L	D_3	B	h	D_4	D_5	F	H	M	
16	32	25	23	6	3.5	3.4	6.5	20	29	2.5	JF0801.5-4
16	32	27	23	6	3.5	3.4	6.5	20	29	2.5	JF0802-4
16	32	30	23	6	3.5	3.4	6.5	20	29	2.5	JF0802.5-4
18	38	27	27	8	4.5	4.5	8	24	34	2.5	JF1001.5-4
18	38	29	27	8	4.5	4.5	8	24	34	2.5	JF1002-4
18	38	32	27	8	4.5	4.5	8	24	34	2.5	JF1002.5-4
20	40	27	29	8	4.5	4.5	8	25	36	2.5	JF1201.5-4
20	40	29	29	8	4.5	4.5	8	25	36	2.5	JF1202-4
20	40	33	29	8	4.5	4.5	8	25	36	2.5	JF1202.5-4
20	43	36	32	8	4.5	4.5	8	27	38	2.5	JF1203-4
25	47	35	35	10	5.5	5.5	9.5	30	43	6	JF1602-4
25	47	33	35	10	5.5	5.5	9.5	30	43	6	JF1602.5-4
25	47	38	35	10	5.5	5.5	9.5	30	43	6	JF1603-4
30	52	35	40	10	5.5	5.5	9.5	32	47	6	JF2002-4
30	52	33	40	10	5.5	5.5	9.5	32	47	6	JF2002.5-4
30	52	38	40	10	5.5	5.5	9.5	32	47	6	JF2003-4

Ball screw with CMFZD outer cycle, tube enclosed spacer preload nut

Notes:

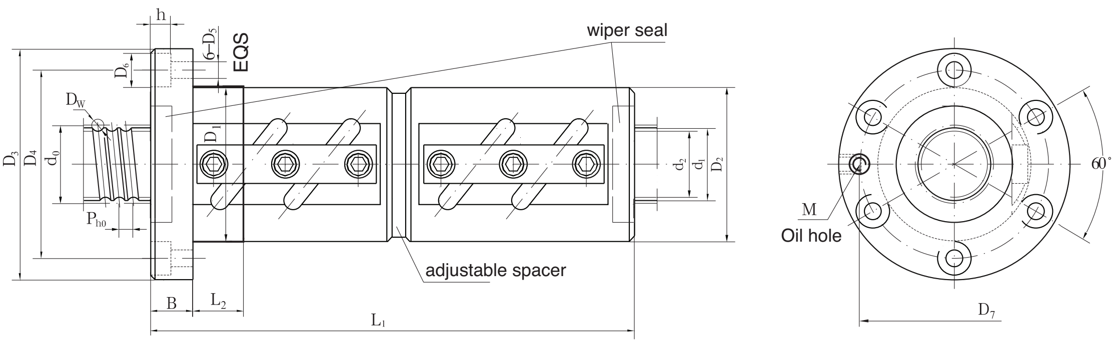
1. K_c is theoretical calculation value when preload F_p is $0.1C_a$ and axial load F is $0.3C_a$.
2. When axial load F is not equal to $0.3C_a$,

$$K_C = K\left(\frac{F}{0.3C_a}\right)^{\frac{1}{3}}$$

In formula:

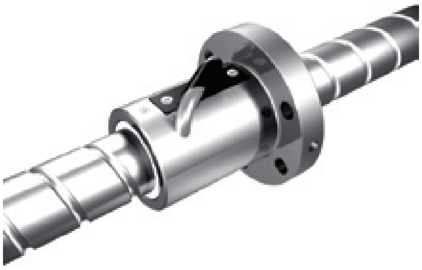
K is rigidity value shown in Table.

Code and spec.	Nominal dia. d_o	Basic lead P_{ho}	Outer dia. of ball screw d_1	Ball dia. D_w	Bottom dia.of ball screw d_2	Number of circles n	Basic rated load		Rigidity K_C N/μm
							Dynamic load C_a KN	Static load C_{oa} KN	
CMFZD2506-5	25	6	24	3.969	21.1	2.5×2	21.5	55.8	1322
CMFZD2508-2.5	25	8	24	4.763	20.5	2.5×1	14.9	32.3	698
CMFZD2508-3.5	25	8	24	4.763	20.5	3.5×1	20	46.6	962
CMFZD2808-5	28	8	28	4.763	24.5	2.5×2	28.7	74.6	1567
CMFZD2810-2.5	28	10	28	4.763	24.5	2.5×1	15.8	37.3	806
CMFZD3208-5	32	8	31	4.763	27.5	2.5×2	30.6	85.3	1706
CMFZD3210-5	32	10	31	6.35	26.4	2.5×2	44.6	113.4	1771
CMFZD3212-2.5	32	12	31	6.35	26.4	2.5×1	24.5	56.7	911
CMFZD3212-3.5	32	12	31	6.35	26.4	3.5×1	32.7	79.3	1255
CMFZD4010-5	40	10	39	6.35	34.4	2.5×2	49.3	138.3	2144
CMFZD4012-5	40	12	39	7.144	33.9	2.5×2	57.7	157	2186
CMFZD4016-5	40	16	39	7.144	33.9	2.5×2	57.6	157	2171
CMFZD5010-5	50	10	49	6.35	44.4	2.5×2	55.2	177.4	2582
CMFZD5016-5	50	16	49	7.938	43.3	2.5×2	74.6	222.7	2629
CMFZD6310-5	63	10	61	6.35	56.3	2.5×2	60.9	224	3079
CMFZD6320-5	63	20	61	10	53.8	2.5×2	106.1	337.8	3247



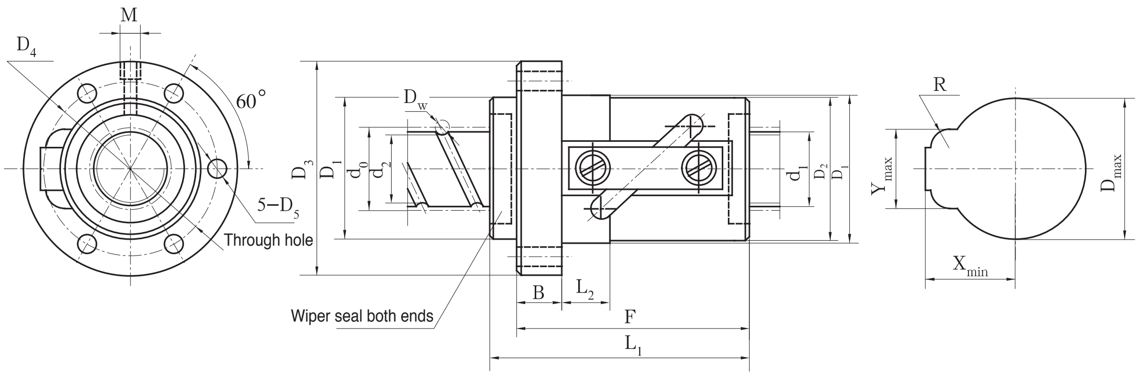
Mounting & connecting dimension												Code and spec.
D_1(g6)	$D_2(^{-0.1}_{-0.2})$	L_2	D_3	B	D_4	D_5	D_6	h	D_7	M	L_1	
53	53	20	76	11	64	5.5	9.5	5	ø56	M6	122	CMFZD2506-5
58	58	15	85	15	71	6.6	11	6.5	ø65	M6	106	CMFZD2508-2.5
58	58	15	85	15	71	6.6	11	6.5	ø65	M6	122	CMFZD2508-3.5
60	60	15	104	18	82	11	18	11	ø82	M6	164	CMFZD2808-5
60	60	15	94	15	76	9	15	9	ø74	M6	128	CMFZD2810-2.5
66	66	15	100	15	82	9	15	9	ø80	M6	154	CMFZD3208-5
74	74	15	108	15	90	9	15	9	ø88	M6	189	CMFZD3210-5
74	74	15	108	18	90	9	15	9	ø88	M6	144	CMFZD3212-2.5
74	74	15	108	18	90	9	15	9	ø88	M6	164	CMFZD3212-3.5
82	82		124	18	102	11	18	11		M8×1	193	CMFZD4010-5
84	84	20	126	18	104	11	18	11	ø100	M8×1	225	CMFZD4012-5
86	86	20	128	18	106	11	18	11	ø102	M8×1	273	CMFZD4016-5
93	93	20	135	18	113	11	18	11	ø108	M8×1	193	CMFZD5010-5
105	105	20	152	25	128	14	20	13	ø124	M8×1	285	CMFZD5016-5
108	108	20	154	22	130	14	20	13	ø126	M8×1	197	CMFZD6310-5
122	122	20	180	28	150	18	26	17.5	ø150	M8×1	345	CMFZD6320-5

Ball screw with CTF outer cycle tube



Notes:
The lead accuracy of CTF type of BSA is the grade 5, 7, 10 of GB/T17587.3-1998

Code and spec.	Nominal dia. d_o	Basic lead P_{ho}	Outer dia. of ball screw d_1	Ball dia. D_w	Bottom dia.of ball screw d_2	Number of circles n	Basic rated load	
							Dynamic load C_a KN	Static load C_{oa} KN
CTF1610-2.5	16	10	15	3.175	12.7	2.5×1	6.8	13.1
CTF2010-2.5	20	10	18.9	3.969	15.9	2.5×1	10.3	20.6
CTF2016-1.5	20	16	18.9	3.969	15.9	1.5×1	6.5	12.1
CTF2020-1.5	20	20	18.9	3.969	15.9	1.5×1	6.3	11.9
CTF2520-1.5	25	20	23.8	4.763	20.1	1.5×1	9.3	18.6
CTF2525-1.5	25	25	23.8	4.763	20.1	1.5×1	9.1	18.3
CTF3225-1.5	32	25	30.8	4.763	27.1	1.5×1	10.3	22.9
CTF3232-1.5	32	32	30.8	4.763	27.1	1.5×1	10.4	24.1
CTF4032-1.5	40	32	38.2	6.35	33.5	1.5×1	17	39.4
CTF4040-1.5	40	40	38.2	6.35	33.5	1.5×1	16.6	38.8

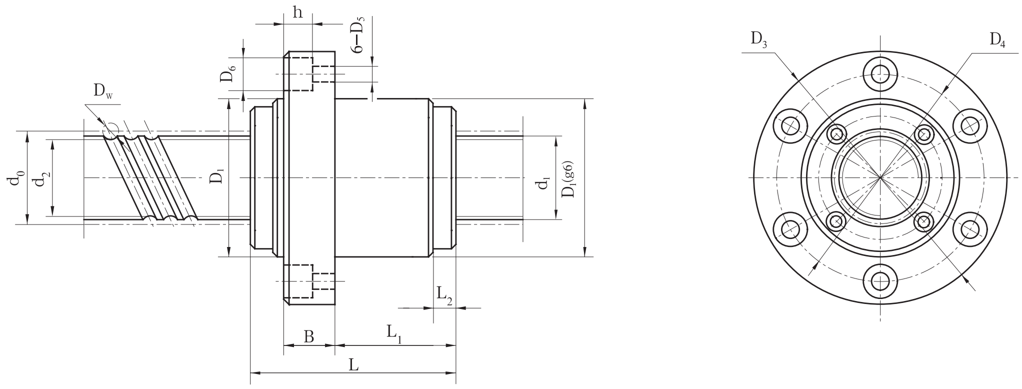


Mounting & connecting dimension													Code and spec.
D_1(g6)	$D_2(^{-0.1}_{-0.2})$	D_3	D_4	D_5	X	Y	L_1	F	B	L_2	M	R	
32	32	53	42	5.5	19.3	19.5	57	52	10	10	M6	8	CTF1610-2.5
36	36	60	48	6.6	24	24	59	54	12	15	M6	10	CTF2010-2.5
36	36	60	48	7	23	24	66	61	12	15	M6	10	CTF2016-1.5
36	36	60	48	7	23	24	74	69	12	15	M6	10	CTF2020-1.5
40	40	66	53	7	28	29	78	72	12	15	M6	10	CTF2520-1.5
40	40	66	53	7	28	29	89	83	12	15	M6	10	CTF2525-1.5
50	50	82	67	9	32	33	85	79	15	20	M6	12	CTF3225-1.5
50	50	82	67	9	33	35	99	91	15	20	M6	12	CTF3232-1.5
63	63	108	85	11	42	44	112	104	18	25	M8×1	14	CTF4032-1.5
63	63	108	85	11	41	44	122	112	18	25	M8×1	14	CTF4040-1.5

Ball screw with DGF inner cycle end housing

Notes:
1. The lead accuracy of DGF type of BSA is the grade 5,7,10 of GB/T17587.3-1998
2. The normal working environment temperature is ±80℃.

Code and spec.	Nominal dia. d_o	Basic lead P_{ho}	Outer dia of ball screw d_1	Ball dia. D_w	Bottom dia.of ball screw d_2	Number of circles n	Basic rated load Dynamic load C_a KN	Basic rated load Static load C_{oa} KN
DGF2020-0.8×4	20	20	19.3	3.5	16.4	0.8×4	5.6	11.2
DGF2020-1.8×4	20	20	19.3	3.5	16.4	1.8×4	11.4	25.2
DGF2525-0.8×4	25	25	24.3	3.5	21.4	0.8×4	6.4	14.5
DGF2525-1.8×4	25	25	24.3	3.5	21.4	1.8×4	12.9	32.7
DGF3232-0.8×4	32	32	31	4.763	27.1	0.8×4	11	25.6
DGF3232-1.8×4	32	32	31	4.763	27.1	1.8×4	22	57.7
DGF4040-0.8×4	40	40	39	5	34.9	0.8×4	12.9	33.7
DGF4040-1.8×4	40	40	39	5	34.9	1.8×4	26	75.9

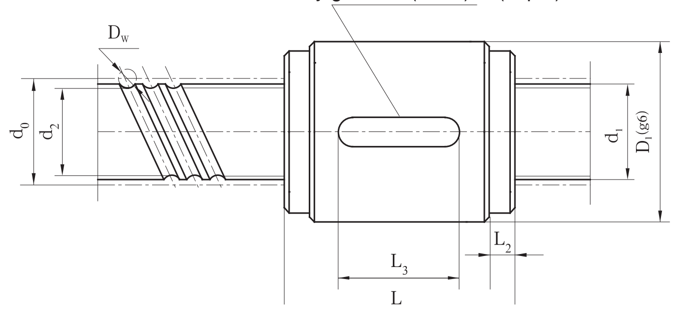


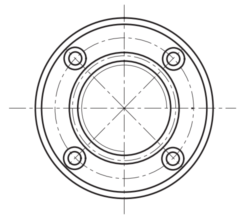
Mounting & connecting dimension												Code and spec.
D_1(g6)	D_3	D_4	D_5	D_6	B	h	L	L_1	L_2	L_3	b × t	
40	66	53	5.8	10	9	5	31	13	8	–	–	DGF2020-0.8×4
40	66	53	5.8	10	11	6	51	33	8	–	–	DGF2020-1.8×4
45	70	56	5.8	10	10	5	35	16	8	–	–	DGF2525-0.8×4
45	70	56	5.8	10	11	6	60	40	8	–	–	DGF2525-1.8×4
60	92	75	7	12	13	7	48	22	12	–	–	DGF3232-0.8×4
60	92	75	7	12	13	7	80	54	12	–	–	DGF3232-1.8×4
71	110	90	9	15	15	9	54	26	12	–	–	DGF4040-0.8×4
71	110	90	9	15	15	9	94	66	12	–	–	DGF4040-1.8×4

Ball screw with DGZ inner cycle end housing type

Notes: 1. The lead accuracy of DGZ type of BSA is the grade 5,7,10 of GB/T17587.3-1998
2. The normal working environment temperature is ±80℃.

Code and spec.	Nominal dia. d_o	Basic lead P_{ho}	Outer dia of ball screw d_1	Ball dia. D_w	Bottom dia. of ball screw d_2	Number of circles n	Basic rated load	
							Dynamic load C_a KN	Static load C_{oa} KN
DGZ2020-0.8×4	20	20	19.3	3.5	16.4	0.8×4	5.6	11.2
DGZ2020-1.8×4	20	20	19.3	3.5	16.4	1.8×4	11.4	25.2
DGZ2525-0.8×4	25	25	24.3	3.5	21.4	0.8×4	6.4	14.5
DGZ2525-1.8×4	25	25	24.3	3.5	21.4	1.8×4	12.9	32.7
DGZ3232-0.8×4	32	32	31	4.763	27.1	0.8×4	11	25.6
DGZ3232-1.8×4	32	32	31	4.763	27.1	1.8×4	22	57.7
DGZ4040-0.8×4	40	40	39	5	34.9	0.8×4	12.9	33.7
DGZ4040-1.8×4	40	40	39	5	34.9	1.8×4	26	75.9





Mounting & connecting dimension												Code and spec.
D_1(g6)	D_3	D_4	D_5	D_6	B	h	L	L_1	L_2	L_3	b × t	
40	–	–	–	–	–	–	31	–	8	10	5×5	DGZ2020-0.8×4
40	–	–	–	–	–	–	51	–	8	20	5×5	DGZ2020-1.8×4
45	–	–	–	–	–	–	35	–	8	12	5×5	DGZ2525-0.8×4
45	–	–	–	–	–	–	60	–	8	30	5×5	DGZ2525-1.8×4
60	–	–	–	–	–	–	48	–	12	15	6×6	DGZ3232-0.8×4
60	–	–	–	–	–	–	80	–	12	40	6×6	DGZ3232-1.8×4
71	–	–	–	–	–	–	54	–	12	20	6×6	DGZ4040-0.8×4
71	–	–	–	–	–	–	94	–	12	50	6×6	DGZ4040-1.8×4

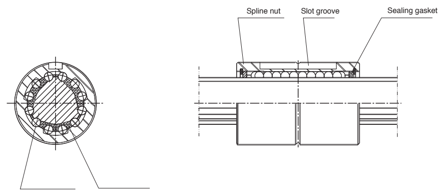
Precision linear motion spline series

Configuration and features

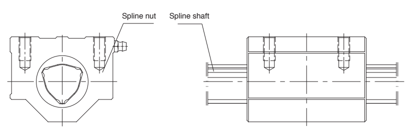
The spline is a kind of linear motion system. When spline motions along the precision ground Shaft by balls, the torque is transferred. The spline has compact structure. It can transfer the Over load and motive power. It has longer lifetime.

At present the factory manufacture two kinds of spline, namely convex spline and concave spline. Usually the convex spline can take bigger radial load and torque than concave spline.

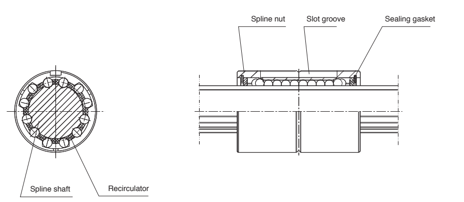
Linear motion rolling spline,(shown as Fig.1) has three rails sharing in excircle of spline shaft, balls are running in certain six loading paths formed by bulge outs of the three rails and the respective sections of spline nut.



GJ Type

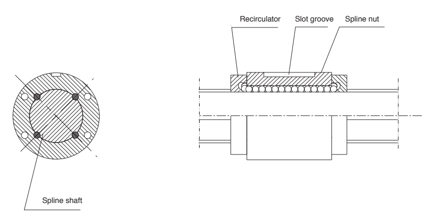


GJH Type



GJG Type

Sealing gasl



GJZD Type

Fig.1

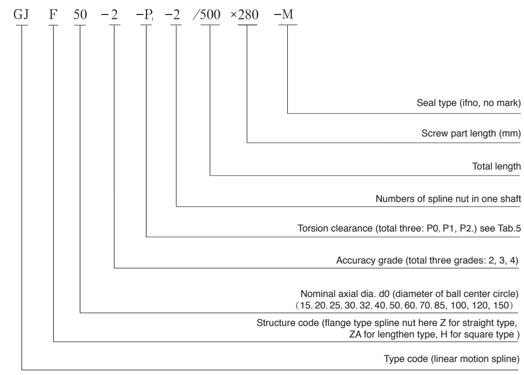
After finished process, radius of roller track slots is nearly R value as that of balls. When torsion force is pressed between the spline nut and the spline shaft, three torsion-oriented loading balls lines transform the force steadily and equally. When the orientation reverses, three other rows work . If a relative motion takes place between the shaft and the spline nut, balls will move back and forth between roller tracks and unload zone.

Spline shaft is made of high-grade alloy steel quenching HRC 58, and spline nut is made of high-grade alloy cementite steel quenching HRC 58, so long service life and hard intensity can be obtained.

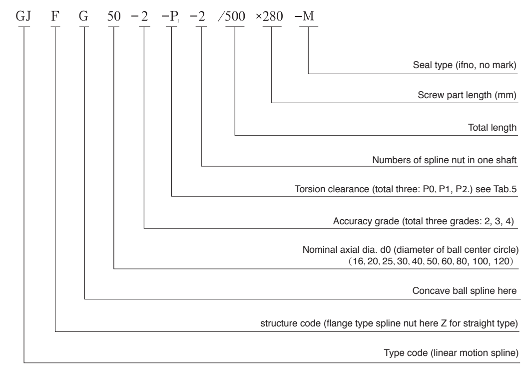
Clearance of rotating direction can be controlled to zero value or interfere state, high-speed motion and rotating can be available, In addition, linear motion spline with compact structure is ease to assemble.

Code rule and connotation

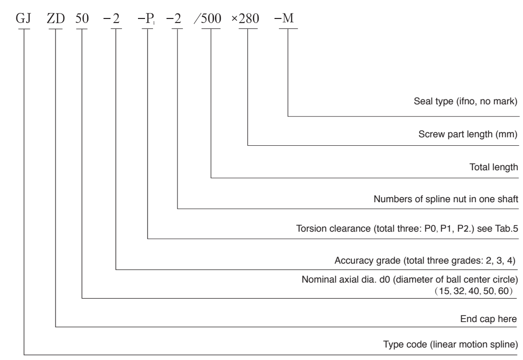
GJ Tpye, GJH Tpye



GJG Tpye



GJZD Tpye



Accuracy grade

Spline series is divided into three accuracy grades, such as super as super-grade C, precision grade D and common grade E. Accuracy items see Fig.2. Allowable variation requirements of both axle necks of spline shaft are recommended for users.

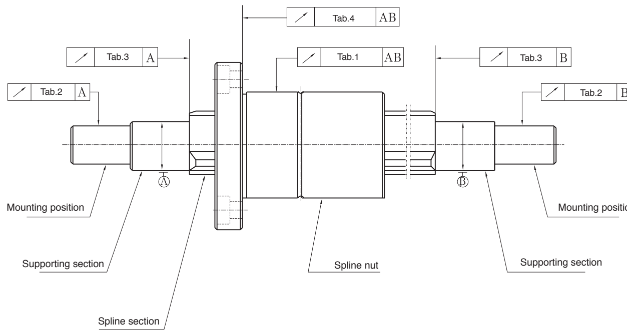


Fig.2

Tab.1 Radical circle jumping of spline nut surface toward axial line of supporting section

Unit: μm

Dia. / Accuracy / Length	15 20			25 30 32			40 50			60 70			85 100 120			150		
	2	3	4	2	3	4	2	3	4	2	3	4	2	3	4	2	3	4
<200	18	34	56	18	32	53	16	32	53	16	30	51	16	30	51	—	—	—
200~315	25	45	71	21	39	58	19	36	58	17	34	55	17	32	53	—	—	—
315~400	—	53	83	25	44	70	21	39	63	19	36	58	17	34	55	—	—	—
400~500	—	—	95	29	50	78	24	43	68	21	38	61	19	35	57	19	36	46
500~630	—	—	112	34	57	88	27	47	74	23	41	65	20	37	60	21	39	49
630~800				42	68	103	32	54	84	26	45	71	22	40	64	24	43	53
800~1000				—	—	124	38	63	97	30	51	79	24	43	69	27	48	58
1000~1250							—	—	114	35	59	90	28	48	76	32	55	63
1250~1600							—	—	139	—	—	106	—	—	86	40	65	80
1600~2000													—	—	99	—	—	100

Tab.2 Concentral of supporting section and mounting position Unit: μm

Accuracy grade / Nominal axial dia.	Precision	Super-precision	Common
	2	3	4
15 16 20	12	19	46
25 30 32	13	22	53
40 50	15	25	62
60 70 80	17	29	73
85 100 120	20	34	86
150	23	40	100

Tab.3 Verticality of axis end plane towards axial line of supporting section

Unit: μm

Accuracy grade / Nominal axial dia.	Precision	Super-precision	Common
	2	3	4
15 16 20	8	11	27
25 30 32	9	13	33
40 50	11	16	39
60 70 80	13	19	46
85 100 120	15	22	54
150	18	25	63

Tab.4 Verticality of flange mounting surface towards supporting section

Unit: μm

Accuracy grade / Nominal axial dia.	Precision	Super-precision	Common
	2	3	4
15 16 20	9	13	33
25 30 32	11	16	39
40 50	13	19	46
60 70 80 85	15	22	54
100 120 150	18	25	63

Tab.5 Torsion clearance of linear motion rolling spline

Unit: μm

Accuracy grade / Nominal axial dia.	Common	Light-preload	Middle-preload
	P_0	P_1	P_2
15 16	±3	-9 ~ -3	-15 ~ -9
20 25 30 32	±4	-12 ~ -4	-20 ~ -12
40 50 60	±6	-18 ~ -6	-30 ~ -18
70 80 85	±8	-24 ~ -8	-40 ~ -24
100 120 150	±10	-30 ~ -10	-50 ~ -30

Note: "—"represents interference value.

Tab.6 Applications of Rolling spline

Unit: μm

Torsion clearance	Service conditions	Application casee
P_2	High rigidity required in situations of impacts or vibration	Spot welding shaft, tools carriers, indexing shaft
P_1	Used in lightly impact or vibration conditions of light moment of suspension arm	Rockers of automatic robots, main axle of kinds of reloading machines, painting dressing
P_0	Used for torsion supporting section of certain orientation, easy moving with small force	Measuring devices, main axle of machines such as: automatic draught machines, automatic reels, packing machines and plate benders

Tab.7 Load coefficient fw

Unit: μm

Impact and vibration	Speed	f_w
No impact, light vibration	V≤15m/min	1.0~1.5
Light impact	V>15~60m/min	1.5~2.0
Impact conditions	V>60m/min	2.0~3.5

Tab.8 Contact coefficient fc

Unit: μm

Number of spline nut	f_c
1	1.00
2	0.81
3	0.72
4	0.66
5	0.61

Tab.9 Temperature coefficient fT

Unit: μm

Temperature of linear motion system	≤100° C	100° C~150° C	150° C~ 200° C
f_T	1	1~0.9	0.9~0.75

Service life calculation

From formula: $L = 50(\frac{f_T \cdot f_C \cdot f_H \cdot C_T}{f_w T_C})^3$ rated service life with certain bearing torsion is calculated. Within certain travel distance and travel times, the service life with single bearing torsion can be calculated from the equation below:

$$L_h = \frac{L \times 10^3}{120\, L_S n_1}$$

$$f_H = \frac{(\text{Actual, HRC})^{3.6}}{\text{HRC58}}$$

L— Rated service life (KM)

fw— Load coefficient (Tab.7)

fc— Contact coefficient (Tab.8)

fT— Temperature coefficient (Tab.9)

fH— Hardness coefficient

CT— Rated torsion value (N-m)

Tc— Calculated torsion (N-m)

Lh— Service life (hr)

Ls— Travel distance (m)

n1— Return times per minute (opm)

GJZ Convex type

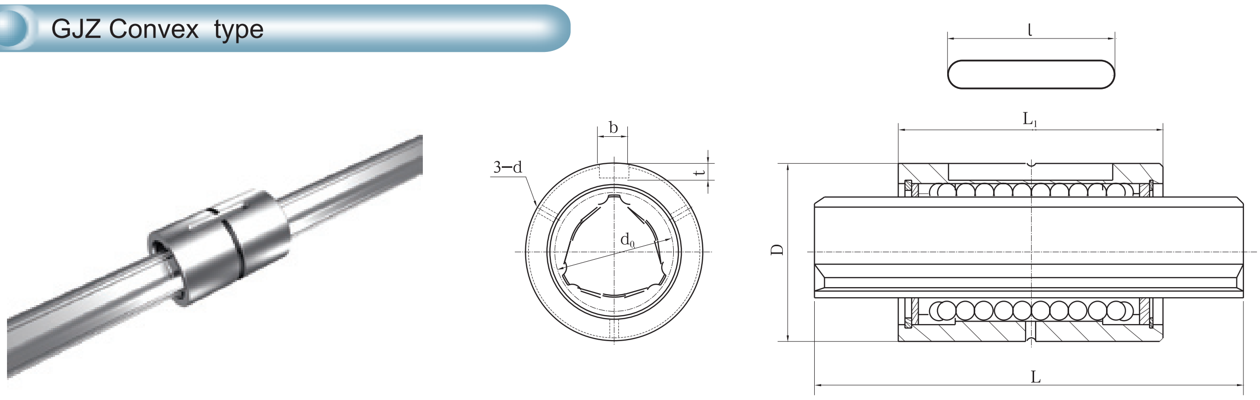


Fig.3

Tab.10

Code and type	Nominal axial dia. d0	External dia. D	Length of spline nut L1	Max. length of shaft L	Width of slot groove b	Depth of slot groove t	Length of slot groove l	Oil hole d	Standard rated torque: Dynamic torsion N-m	Standard rated torque: Stationary torsion N-m	Basic rated load: Dynamic load C KN	Basic rated load: Static load C_o KN
GJZ15	15	23 (0 / -0.013)	40 (0 / -0.3)	400	3.5H8	2 (0 / -0.3)	20	2	27.8	65.2	3.9	8.1
GJZ20	20	30 (0 / -0.013)	50 (0 / -0.3)	600	4H8	2.5 (+0.1 / 0)	26	3	62.3	135.2	6.6	12.7
GJZ25	25	38 (0 / -0.016)	60 (0 / -0.3)	800	5H8	3 (+0.2 / 0)	36	3	127.3	268.3	10.9	20.2
GJZ30	30	45 (0 / -0.016)	70 (0 / -0.3)	1400	6H8	3 (+0.2 / 0)	40	3	155.7	318.7	11.1	20
GJZ32	32	48 (0 / -0.016)	70 (0 / -0.3)	1400	8H8	4 (+0.2 / 0)	40	3	236.4	459.9	15.8	27.1
GJZ40	40	60 (0 / -0.019)	90 (0 / -0.3)	1500	10H8	5 (+0.2 / 0)	56	4	548	1081.9	29.3	50.9
GJZ50	50	75 (0 / -0.019)	100 (0 / -0.3)	1500	14H8	5.5 (+0.2 / 0)	60	4	880.6	1711.6	37.7	64.5
GJZ70	70	100 (0 / -0.022)	110 (0 / -0.3)	1700	18H8	6 (+0.1 / 0)	68	2	2488	4141.1	76.1	111.5
GJZ85	85	120 (0 / -0.022)	140 (0 / -0.3)	1900	20H8	7 (+0.1 / 0)	80	3	3978	6927.4	100.2	153.6
GJZ100	100	140 (0 / -0.025)	160 (0 / -0.4)	1900	28H8	9 (+0.1 / 0)	93	3	6905.9	11737.2	147.9	221.3

GJZA Convex type

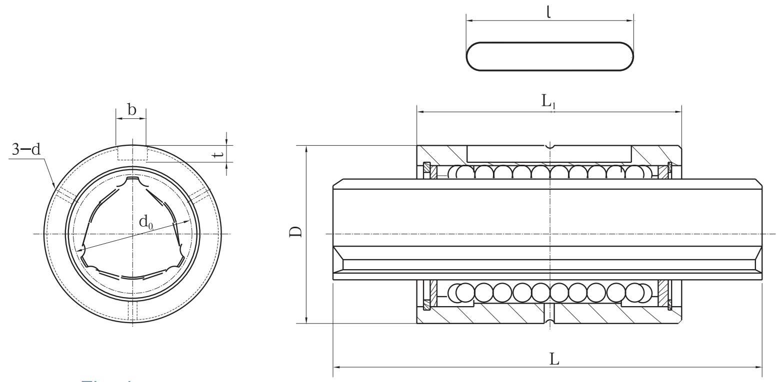
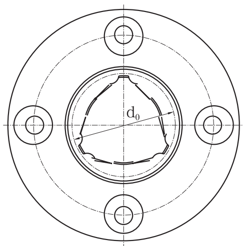


Fig. 4

Tab. 11

Code and type	Nominal axial dia. d0	External dia. D		Length of spline nut L1		Max. length of shaft L	Width of slot groove b	Depth of slot groove t		Length of slot groove l	Oil hole d	Standard rated torque		Basic rated load	
												Dynamic torsion N-m	Stationary torsion N-m	Dynamic load C KN	Static load C_o KN
GJZA15	15	23	0 / -0.013	50	0 / -0.3	400	3.5H8	2	0 / -0.3	20	2	38.9	105.9	5.5	13.3
GJZA20	20	30	0 / -0.013	60	0 / -0.3	600	4H8	2.5	+0.1 / 0	26	3	100	270.5	10.719	25.499
GJZA25	25	38	0 / -0.016	70	0 / -0.3	800	5H8	3	+0.2 / 0	36	3	152.0	345.0	13	26
GJZA30	30	45	0 / -0.016	80	0 / -0.3	1400	4H8	3	+0.2 / 0	26	3	192.2	425.8	16.3	33.1
GJZA32	32	48	0 / -0.016	80	0 / -0.3	1400	8H8	4	+0.2 / 0	40	3	288.9	613.2	19.3	36.1
GJZA40	40	60	0 / -0.019	100	0 / -0.3	1500	10H8	5	+0.2 / 0	56	4	651.9	1390.9	34.9	65.5
GJZA50	50	75	0 / -0.019	112	0 / -0.3	1500	14H8	5.5	+0.2 / 0	60	4	1048.0	2200.7	44.9	82.9
GJZA60	60	90	0 / -0.022	127	0 / -0.3	1500	16H8	6	+0.2 / 0	70	4	2135.9	4172.9	76.2	131.1
GJZA70	70	100	0 / -0.022	135	0 / -0.3	1700	18H8	6	+0.1 / 0	68	4	3153.4	5797.6	96.5	156.1
GJZA85	85	120	0 / -0.022	155	0 / -0.3	1900	20H8	7	+0.1 / 0	80	5	4437.2	8082.0	111.8	179.2
GJZA100	100	140	0 / -0.025	175	0 / -0.4	1900	28H8	9	+0.1 / 0	93	5	6943.8	11737.2	148.7	221.3
GJZA120	120	160	0 / -0.025	200	0 / -0.4	1900	28H8	9	+0.1 / 0	123	6	10153.5	18779.5	181.3	295
GJZA150	150	205	0 / -0.029	250	0 / -0.4	1900	32H8	10	+0.1 / 0	157	6	19564.1	33532.7	279.4	421.5

GJF Convex type



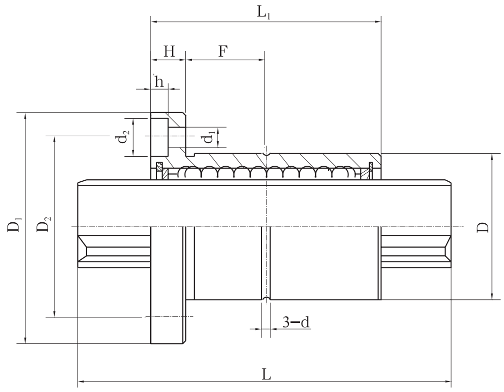
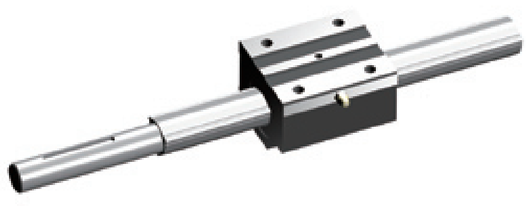


Fig. 5

Tab. 12

Code and type	Nominal axial dia. d_0	External dia. D		Length of spline nut L_1		Max. length of shaft L	Dia. of flange D_1		Dia. of center circle of mounting D_2	Thick-ness of flange H	Depth of counter bore h	Oil hole d	Dia. of counter bore d_2	Dia. of cross hole d_1	Position of oil hole F	Standard rated torque		Basic rated load	
																Dynamic torsion N-m	Stationary torsion N-m	Dynamic load C KN	Static load C_0 KN
GJF15	15	23	0 -0.013	40	0 -0.3	400	43	0 -0.2	32	7	4.4	2	8	4.5	13	27.8	65.2	3.9	8.1
GJF20	20	30	0 -0.013	50	0 -0.3	600	49	0 -0.2	38	7	4.4	3	8	4.5	18	62.3	135.2	6.6	12.7
GJF25	25	38	0 -0.016	60	0 -0.3	800	60	0 -0.2	47	9	5	3	10	5.8	21	127.3	268.3	10.9	20.2
GJF30	30	45	0 -0.016	70	0 -0.3	1400	70	0 -0.2	54	10	6	3	11	6.6	25	155.7	318.7	11.1	20
GJF32	32	48	0 -0.016	70	0 -0.3	1400	73	0 -0.2	57	10	6	3	12	7	25	236.4	459.9	15.8	27.1
GJF40	40	57	0 -0.019	90	0 -0.3	1500	90	0 -0.2	70	14	7	4	15	9	31	548.0	1081.9	29.3	50.9
GJF50	50	70	0 -0.019	100	0 -0.3	1500	108	0 -0.2	86	16	9	4	18	11	34	880.6	1711.6	37.7	64.5
GJF60	60	85	0 -0.022	127	0 -0.3	1500	124	0 -0.2	102	18	11	4	18	11	45.5	2135.9	4172.9	76.2	131.1
GJF70S	70	100	0 -0.022	110	0 -0.3	1700	142	0 -0.2	117	20	13	4	20	13.5	35	2488	4141.1	76.1	111.5
GJF70	70	100	0 -0.022	135	0 -0.3	1700	142	0 -0.2	117	20	13	4	20	14	47.5	3153.4	5797.6	96.5	156.1
GJF85S	85	120	0 -0.025	140	0 -0.3	1900	168	0 -0.4	138	22	13	4	20	13.5	48	3978	6927.4	100.2	153.6
GJF85	85	120	0 -0.022	155	0 -0.3	1900	168	0 -0.2	138	22	13	5	20	13	55.5	4437.2	8082.0	111.8	179.2
GJF100	100	135	0 -0.025	160	0 -0.4	1900	195	0 -0.4	162	25	17.5	5	26	18	55	6905.9	11737.2	147.9	221.3

GJH Convex type



Note: material: GCr 15

surface hardness: HRC58

Tab. 13

Code and type	H	W	L	Max. length of shaft L_1	F	W_1	B	C	M	K	N	T	h	Oil cup	Standard rated torque		Basic rated load	
															Dynamic torsion N-m	Stationary torsion N-m	Dynamic load C KN	Static load C_o KN
GJH15	29	34	40	400	15±0.1	17±0.1	26	26	M4 depth 10	23	9	6	5	ø4 forced filling	38.9	105.9	5.5	13.3
GJH20	38	48	60	600	20±0.1	24±0.1	35	35	M6 depth 12	29	12	7	6	straight-through M6	100	270.5	10.7	25.4
GJH25	47	60	70	800	25±0.1	30±0.1	40	40	M8 depth 14	35	16	10	7	straight-through M6	152.0	345.0	13.0	26.0
GJH30	57	70	80	1400	30±0.1	35±0.1	50	50	M8 depth 16	42	19	10	7	straight-through M6	288.9	613.2	19.3	36.1
GJH40	70	86	102	1500	38±0.1	43±0.1	60	60	M10 depth 20	58	26	15	10	straight-through M6	1048.0	2200.7	34.9	65.5
GJH50	86	100	112	1500	48±0.1	50±0.1	75	75	M12 depth 20	74	32	15	10	straight-through M6	2135.9	4172.9	44.9	82.9

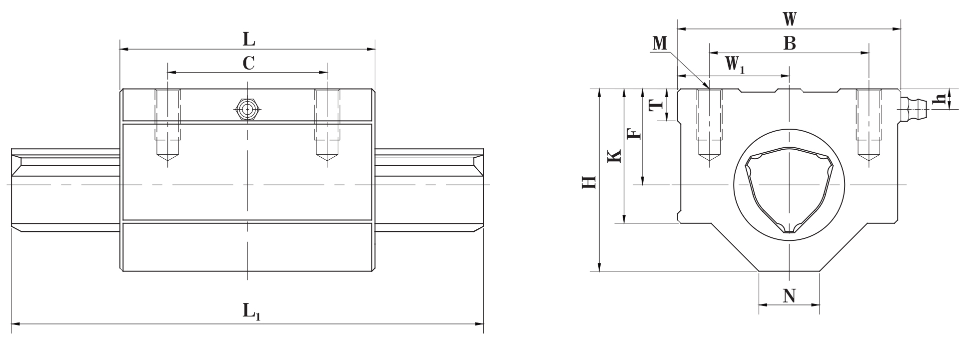


Fig. 6

GJZG Convex type

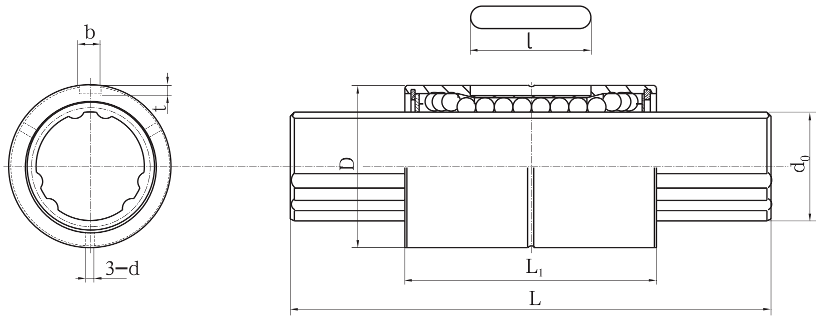


Fig. 7

Tab. 14

Code and type	Shaft dia. d_0(h7)	External dia. D(h6)	Length of spline nut L_1	Max. length of shaft L	Width of slot groove b	Depth of slot groove t	Length of slot groove l	Oil hole d	Standard rated torque		Basic rated load	
									Dynamic torsion N-m	Stationary torsion N-m	Dynamic load C KN	Static load C_0 KN
GJZG16	16 $^{0}_{-0.018}$	31 $^{0}_{-0.016}$	50 $^{0}_{-0.2}$	500	3.5H8	2 $^{+0.1}_{0}$	17.5	2	32	30	7.5	15.6
GJZG20	20 $^{0}_{-0.021}$	35 $^{0}_{-0.016}$	63 $^{0}_{-0.2}$	600	4H8	2.5 $^{+0.1}_{0}$	29	2	55	55	10.1	24.7
GJZG25	25 $^{0}_{-0.021}$	42 $^{0}_{-0.016}$	71 $^{0}_{-0.3}$	800	4H8	2.5 $^{+0.1}_{0}$	36	3	103	105	13.7	30.1
GJZG30	30 $^{0}_{-0.021}$	48 $^{0}_{-0.016}$	80 $^{0}_{-0.3}$	1400	4H8	2.5 $^{+0.1}_{0}$	40	3	148	171	17.1	37.1
GJZG40	40 $^{0}_{-0.025}$	64 $^{0}_{-0.019}$	100 $^{0}_{-0.3}$	1500	6H8	3.5 $^{+0.1}_{0}$	52	4	375	415	32.1	70.2
GJZG50	50 $^{0}_{-0.025}$	80 $^{0}_{-0.019}$	125 $^{0}_{-0.3}$	1500	8H8	4 $^{+0.2}_{0}$	58	4	760	840	49.4	104.9
GJZG60	60 $^{0}_{-0.03}$	90 $^{0}_{-0.022}$	140 $^{0}_{-0.3}$	1500	12H8	5 $^{+0.2}_{0}$	67	5	1040	1220	64.2	128.2
GJZG80	80 $^{0}_{-0.03}$	120 $^{0}_{-0.022}$	160 $^{0}_{-0.4}$	1700	16H8	6 $^{+0.2}_{0}$	76	5	1920	2310	87.3	170.7
GJZG100	100 $^{0}_{-0.035}$	150 $^{0}_{-0.025}$	190 $^{0}_{-0.4}$	1900	20H8	7 $^{+0.2}_{0}$	110	5	3010	3730	109.9	222
GJZG120	120 $^{0}_{-0.035}$	180 $^{0}_{-0.025}$	220 $^{0}_{-0.4}$	1900	32H8	11 $^{+0.2}_{0}$	120	6	4100	5200	176.5	347

GJFG Convex type

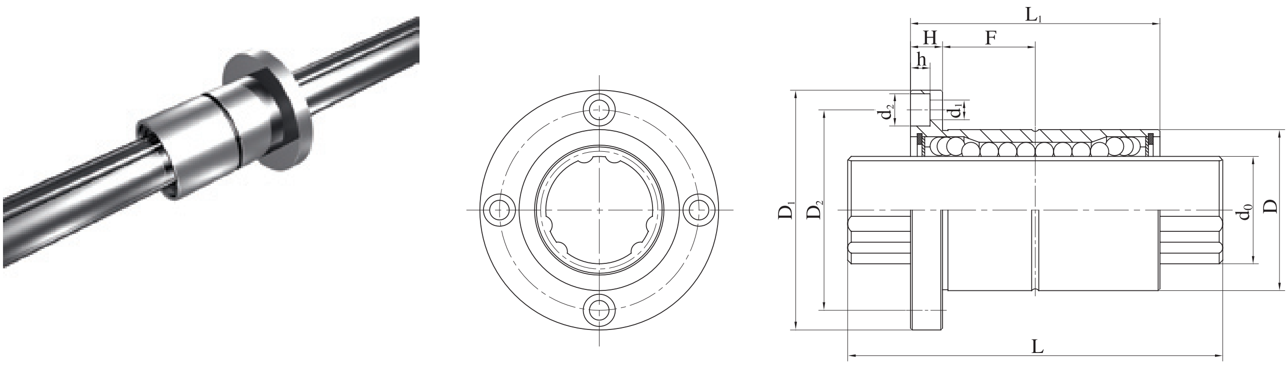
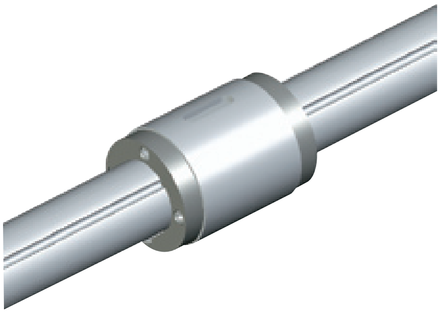


Fig. 8

Tab. 15

Code and type	Shaft dia. d_0(h7)		External dia. D(h6)		Length of spline nut L_1		Max. length of shaft L	Dia. of flange D_1		Dia. of center circle of mounting D_2	Thick-ness of flange H	Depth of counter bore h	Dia. of counter bore d_2	Dia. of cross hole d_1	Oil hole d	Position of oil hole F	Standard rated torque		Basic rated load	
																	Dynamic torsion N-m	Stationary torsion N-m	Dynamic load C KN	Static load C_o KN
GJFG16	16	0 / -0.018	31	0 / -0.016	50	0 / -0.2	500	51	0 / -0.2	40	7	4.4	8	4.5	2	18	32	30	7.5	15.6
GJFG20	20	0 / -0.021	35	0 / -0.016	63	0 / -0.2	600	58	0 / -0.2	45	9	5.4	9.5	5.5	2	22.5	55	55	10.1	24.7
GJFG25	25	0 / -0.021	42	0 / -0.016	71	0 / -0.3	800	65	0 / -0.3	52	9	5.4	9.5	5.5	3	26.5	103	105	13.7	30.1
GJFG30	30	0 / -0.021	48	0 / -0.016	80	0 / -0.3	1400	75	0 / -0.3	60	10	6.5	11	6.6	3	30	148	171	17.1	37.1
GJFG40	40	0 / -0.025	64	0 / -0.019	100	0 / -0.3	1500	100	0 / -0.3	82	14	8.6	14	9	4	36	375	415	32.1	70.2
GJFG50	50	0 / -0.025	80	0 / -0.019	125	0 / -0.3	1500	124	0 / -0.3	102	16	11	17.5	11	4	46.5	760	840	49.4	104.9
GJFG60	60	0 / -0.03	90	0 / -0.022	140	0 / -0.3	1500	134	0 / -0.3	112	16	11	18	11	5	54	1040	1220	64.2	128.2
GJFG80	80	0 / -0.03	120	0 / -0.022	160	0 / -0.4	1700	168	0 / -0.3	144	20	12.8	20	13.5	5	60	1920	2310	87.3	170.7
GJFG100	100	0 / -0.035	150	0 / -0.025	190	0 / -0.4	1900	200	0 / -0.3	170	25	16.8	26	17.5	5	70	3010	3730	109.9	222
GJFG120	120	0 / -0.035	180	0 / -0.025	220	0 / -0.4	1900	252	0 / -0.3	216	30	20.6	32	22	6	80	4100	5200	176.5	347

GJZD Convex type



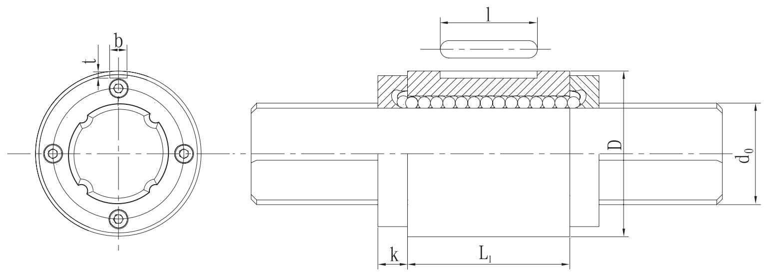


Fig. 9

Tab. 16

Code and type	Shaft dia. d_0(h7)	External dia. D(h6)	Length of spline nut L_1	Width of end cap	Max. length of shaft L	Width of slot groove b	Depth of slot groove t	Length of slot groove l	Standard rated torque Dynamic torsion N-m	Standard rated torque Stationary torsion N-m
∗GJZD15	12.5 $^{-0.016}_{-0.034}$	25 $^{-0.005}_{-0.014}$	30	5	500	3.5H8	2 $^{+0.1}_{0}$	20	103	105
∗GJZD32	31 $^{-0.025}_{-0.05}$	55 $^{-0.01}_{-0.029}$	48	11	1400	4H8	2.5 $^{+0.1}_{0}$	40	148	171
∗GJZD40	39 $^{-0.025}_{-0.05}$	68 $^{-0.01}_{-0.029}$	66	12	1200	6H8	3.5 $^{+0.2}_{0}$	52	375	415
∗GJZD50	50 $^{-0.025}_{-0.5}$	80 $^{-0.01}_{-0.029}$	72	14	1500	8H8	4 $^{+0.2}_{0}$	58	760	840
∗GJZD60	58.5 $^{-0.03}_{-0.06}$	95 $^{-0.012}_{-0.034}$	93	17	1500	12H8	5 $^{+0.2}_{0}$	67	1040	1220

Notes items

- Special requirements for shaft end

Fracture surface of spline shaft, shown as Fig.10. When axle neck of spline needs some processing, make sure that: d<D(see tab.17; 18; 19)

Tab. 17 Convex type

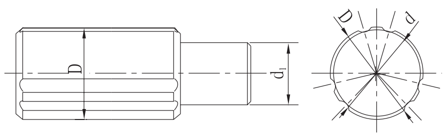
Nominal axial dia.	15	20	25	30	32	40	50	60	70	85	100	120	150
d	11.6	15.3	19	22.5	24	30.5	38.5	46	53.8	66.8	79	98	120.8
D	14.4	19.5	24	29.2	31	38.5	48.5	57.8	69	82	98	117	147

Tab. 18 Concave type

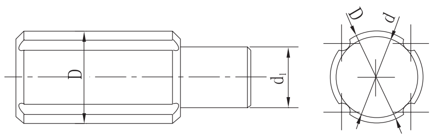
Nominal axial dia.	16	20	25	30	40	50	60	80	100	120
d	14.8	18.6	23	27.8	36.77	46.5	55	74	94.6	112.6
D	16	20	25	30	40	50	60	80	100	120

Tab. 19 GJZD type

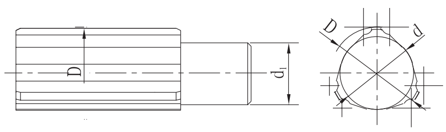
Nominal axial dia.	15	32	40	50	60
d	11	27.24	35	43.65	52.86
D	12.5	31	39	50	58.5



Concave type



GJZD type



Convex type

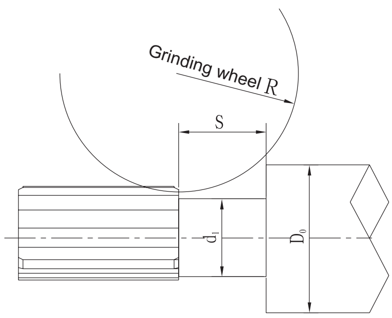


Fig. 10

Note: R=40~150. Usually small size means low accuracy grade.

$$S \geqslant 1.2\sqrt{R(D_0-d)}$$

- Configuration and mounting of spline nut

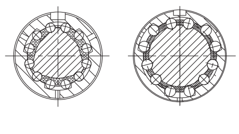
◆ The correct mounting method is to keep slot groove of spline nut horizontal with mounting holes of flange.

Spline nut's slot grooves of GJZ type, GJZA type and GJZG type, Shown as Fig. 9(a), lie right two bearing balls lines.

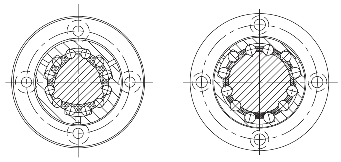
(a) GJZ, GJZA, GJZG type mounting section

(b) GJF, GJFG type flange mounting section

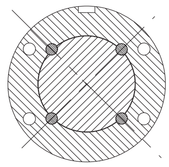
(c) GJZD mounting section



(a) GJZ, GJZA, GJZG type mounting section



(b) GJF, GJFG type flange mounting section



(c) GJZD mounting section

Fig. 11

One of the four mounting holes of the GJF type and GJFG flange is aimed to one bulge of spline, shown as Fig.11(b). If there is any special request for slot groove, please consult with us.

◆ Mounting of spline nut

When fit spline nut to mounting base, please push it in with proper tooling. Do not touch side plate and sealing gasket. Tool di front end faceoff angle 2×30º.

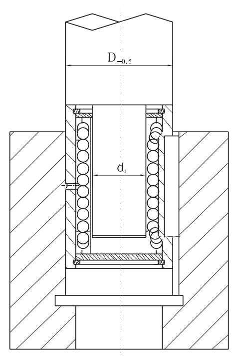


Fig. 12

size of proper tooling

Tab. 20 Application of convex spline

Nominal axial dia.	15	20	25	30	32	40	50	60	70	85	100	120	150
D	23	30	38	45	48	60	75	90	100	120	140	160	205
d_1	11.6h9	15.3h9	19h9	22.5h9	24h9	30.5h9	38.5h9	46h9	53.8h9	66.8h9	79h9	98h9	120.8h9

Tab. 21 Application of concave spline

Nominal axial dia.	16	20	25	30	40	50	60	80	100	120
D	16	20	25	30	40	50	60	80	100	120
d_1	14.8h9	18.6h9	23h9	27.8h9	36.77h9	46.5h9	55h9	74h9	94.6h9	112.6h9

Tab. 22 Application of GJZD spline

Nominal axial dia.	15	32	40	50	60
D	12.5	31	39	50	58.5
d_1	11	27.24 h9	35 h9	43.65 h9	52.86 h9

◆ Assemble axle with spline nut

When fit spline shaft with spline nut, pay attention to watch that matchmarks to avoid mistake. No permission fitting with reckless force. Lubrication oil is recommended for external diameter of main axle. Shown as Fig.13.

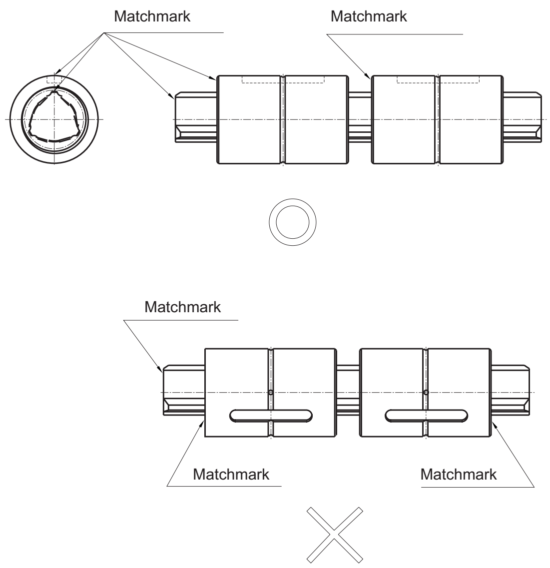


Fig. 13

CNC Precision Worktable

CNC precision worktable is consisted of linear motion guide as guide supporting and ball screw as motion enforcing parts.It has advantage such as high accuracy high efficiency, long lifetime, less abrasion, saved energy, small friction coefficient, compact structure and wide application. It is widely used for measure, laser weld, laser cutting, gelatinization, boring, small type CNC machine tools, ray screener, carving& milling machine, actual teaching situation etc.

Type of worktable

Code rules:

S ZH T Q 30 25 20 T − P3

- P3: Accuracy grade
- T: T means type is different from those shown in the sample book
- 20: Travel of Z coordinate(unit of double coordinate: cm, unit of single coordinate: mm)
- 25: Travel of Y coordinate(unit of double coordinate: cm, unit of single coordinate: mm)
- 30: Travel of X coordinate(unit of double coordinate: cm, unit of single coordinate: mm)
- Q: The meterial of worktable, Q means aluminium alloy structure worktable, cast iron type and steel type is without symbol
- T: Width of worktable bottom: T means middle, K means wide, narrow type is without symbol
- ZH: Symbol of worktable structure Here is right angle coordinate
- S: sort symbol:S meansd oublec oordinatew orktable,D meanss inglec oordinatew orktable

Selection principle

There are 49 types of standard type single & double coordinate worktable manufactured in our factory, and all there worktables belong to 10 series,such as DZH, DZHT,DZHK, SZH, SZHT and SZHK.

Double coordinate worktable SZH, SZHT and SZHK are consisted of two single coor dinate worktable DZH, DZHT and DZHK respectirely.The principle is that the above worktable travel is not longer than underside worktable travel.

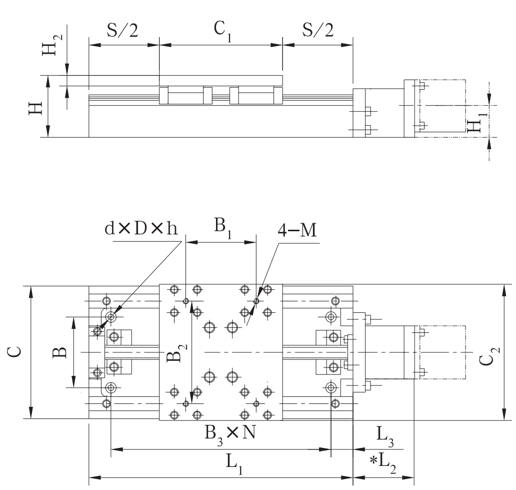
We can provide integration unit of machine& electric. Customerc an select motor, drive and CNC system according to requirement to meet the needs of speed, load, pulse. The series of standard worktable has no dustproof unit and electric limit unit. When customers wants it, we will make it as a special project. If customers select motor by themselves, the power of motor should not be much higher or lower. Generally the relative motors will be selected according to the neck of ball screw.

Type of ball screw and linear motion guide, parameter for neck of ball screw in series standard worktable

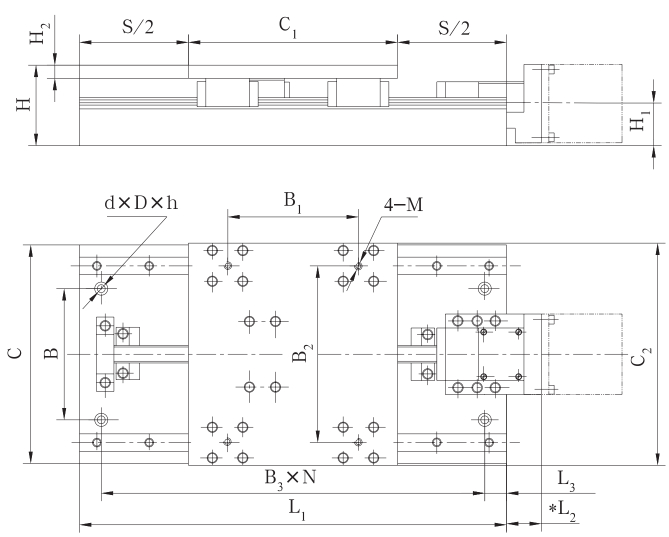
Type of worktable	Type of ball screw	Type of linear motion guide	Diamerer for neck ol ball	length for neck ol ball screw	Key slot(L×W×H)
DZH	GGB16BA2P2	FFB1604-2	ø 10	12	10×3×1.8
DZHT	GGB25BA2P2	FFB2005-2	ø 12	20	20×4×2.5
DZHK	GGB35BA2P2	FFB2505-2	ø 16	20	20×5×3
SZH	GGB16BA2P2	FFB1604-2	ø 10	12	10×3×1.8
SZHT	GGB25BA2P2	FFB2005-2	ø 12	20	20×4×2.5
SZHK	GGB35BA2P2	FFB2505-2	ø 16	20	20×5×3

Dimension

Single coordinate worktable DZH



Single coordinate worktable DZHT DZHK



Dimension

Type	Travel	Length	Bottom base		Height		Surface dimension						Installation dimension			
	S	$*L_2$	L_1	C	H	H_1	C_1	C_2	H_2	B_1	B_2	M	B	B_3×N	L_3	d×D×h
DZH50	50	75.5	200	150	70	36	140	154	12	80	116	M6	80	150×1	25	7×12×7
DZH100	100	75.5	250	150	70	36	140	154	12	80	116	M6	80	200×1	25	7×12×7
DZH150	150	75.5	300	150	70	36	140	154	12	80	116	M6	80	125×2	25	7×12×7
DZHT200	200	25	450	250	92	48	240	254	15	150	202	M8	150	200×2	25	9×15×9
DZHT250	250	25	500	250	92	48	240	254	15	150	202	M8	150	225×2	25	9×15×9
DZHT300	300	25	550	250	92	48	240	254	15	150	202	M8	150	250×2	25	9×15×9
DZHT400	400	25	650	250	92	48	240	254	15	150	202	M8	150	300×2	25	9×15×9
DZHK400	400	34	800	400	120	65	380	405	20	260	330	M10	260	350×2	50	14×22×13
DZHK500	500	34	900	400	120	65	380	405	20	260	330	M10	260	400×2	50	14×22×13
DZHK600	600	34	1000	400	120	65	380	405	20	260	330	M10	260	300×3	50	14×22×13

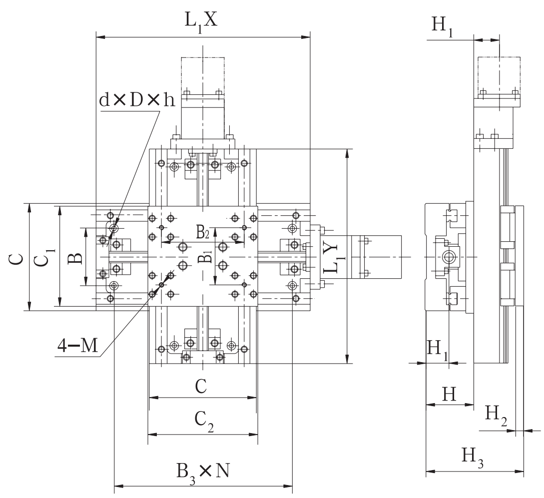
Notice:

l.The list files of type are basic type

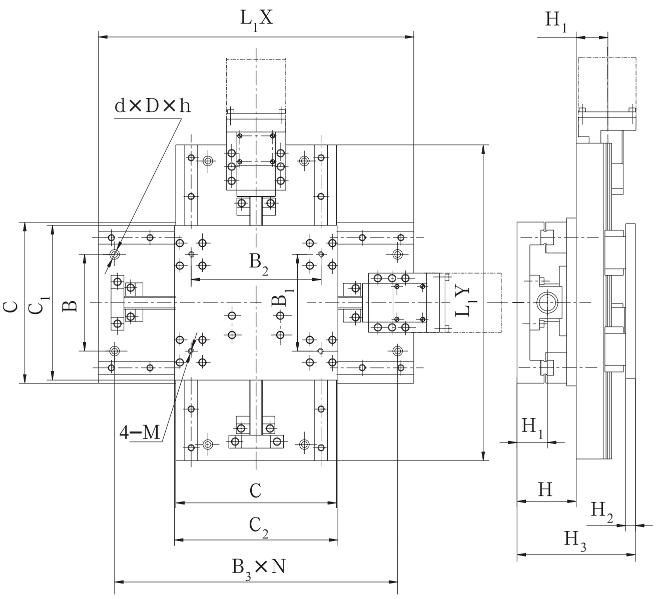
2.$*L_2$ dimension is changeable with changes of motor neck. The figure 75, 25, 34 is stated according to length of shaft neck 2l, 26, 34 of 57BYG, 90BYG, 110BYG step motor. Motor is equipped according to CNC system.

3.We cm equip motor and CNC system or not according to customers require, and we can make a new design for customer's special require

Double coordinate worktable SZH



Doublec oordinatew orktableS ZHT SZHK



Dimension

Type	Travel	Bottom base			Height			Surface dimension						Installation dimension		
	SX×SY	L_1X	L_1Y	C	H	H_1	H_3	C_1	C_2	H_2	B_1	B_2	M	B	B_3×N	d×D×h
SZH0505	50×50	200	200	150	70	36	140	140	154	12	80	116	M6	80	150×1	7×12×7
SZH1005	100×50	250	200	150	70	36	140	140	154	12	80	116	M6	80	200×1	7×12×7
SZH1010	100×100	250	250	150	70	36	140	140	154	12	80	116	M6	80	200×1	7×12×7
SZH1505	150×50	300	200	150	70	36	140	140	154	12	80	116	M6	80	125×2	7×12×7
SZH1510	150×100	300	250	150	70	36	140	140	154	12	80	116	M6	80	125×2	7×12×7
SZH1515	150×150	300	300	150	70	36	140	140	154	12	80	116	M6	80	125×2	7×12×7
SZHT2020	200×200	450	450	250	92	48	184	240	254	15	150	202	M8	150	200×2	9×15×9
SZHT2520	250×200	500	450	250	92	48	184	240	254	15	150	202	M8	150	225×2	9×15×9
SZHT2525	250×250	500	500	250	92	48	184	240	254	15	150	202	M8	150	225×2	9×15×9
SZHT3020	300×200	550	450	250	92	48	184	240	254	15	150	202	M8	150	250×2	9×15×9
SZHT3025	300×250	550	500	250	92	48	184	240	254	15	150	202	M8	150	250×2	9×15×9
SZHT3030	300×300	550	550	250	92	48	184	240	254	15	150	202	M8	150	250×2	9×15×9
SZHT4020	400×200	650	450	250	92	48	184	240	254	15	150	202	M8	150	300×2	9×15×9
SZHT4025	400×250	650	500	250	92	48	184	240	254	15	150	202	M8	150	300×2	9×15×9
SZHT4030	400×300	650	550	250	92	48	184	240	254	15	150	202	M8	150	300×2	9×15×9
SZHK4040	400×400	800	800	400	120	65	240	380	405	20	260	330	M10	260	350×2	14×22×13
SZHK5040	500×400	900	800	400	120	65	240	380	405	20	260	330	M10	260	400×2	14×22×13
SZHK5050	500×500	900	900	400	120	65	240	380	405	20	260	330	M10	260	400×2	14×22×13
Note	If installation direction of motor is not accorded with above figure, please note it in your order.															

Accuracy grade

Accuracy grade

Type	Travel	Load(N)	Accuracy grade	Repeat positioning accuacy	Positioning accuacy	Move linearity	Parallenlism of operating suface
DZH50	50	300	P3 P4	±0.003 ±0.005	0.015 0.025	0.010 0.015	0.015 0.025
DZH100	100						
DZH150	150						
DZHT200	200	1000	P3 P4	±0.003 ±0.006	0.025 0.040	0.015 0.025	0.025 0.040
DZHT250	250						
DZHT300	300						
DZHT400	400						
DZHK400	400	2500	P3 P4	±0.004 ±0.007	0.030 0.050	0.020 0.030	0.030 0.050
DZHK500	500						
DZHK600	600						

Accuracy gracle

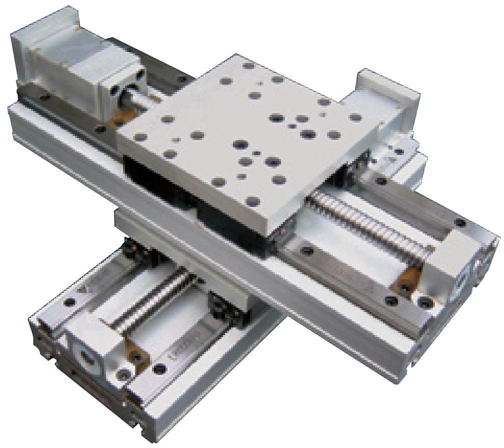
Type	TraveX×Y	Load(N)	Accuracy grade	Repeat positioning accuacy	Positioning accuacy	Move linearity	Parallenlism of operating suface	X. Y squareness
SZH0505	50×50	150	P3 P4	±0.003 ±0.005	0.015 0.025	0.010 0.015	0.015 0.030	0.015 0.030
SZH1005	100×50							
SZH1010	100×100							
SZH1505	150×50							
SZH1510	150×100							
SZH1515	150×150							
SZHT2020	200×200	500	P3 P4	±0.003 ±0.006	0.025 0.040	0.015 0.025	0.025 0.040	0.025 0.040
SZHT2520	250×200							
SZHT2525	250×250							
SZHT3020	300×200							
SZHT3025	300×250							
SZHT3030	300×300							
SZHT4020	400×200							
SZHT4025	400×250							
SZHT4030	400×300							
SZHK4040	400×400	1000	P3 P4	±0.004 ±0.007	0.030 0.050	0.020 0.030	0.030 0.050	0.030 0.050
SZHK5040	500×400							
SZHK5050	500×500							

New product-aluminium alloy structure worktable

● Brief introduction of the product

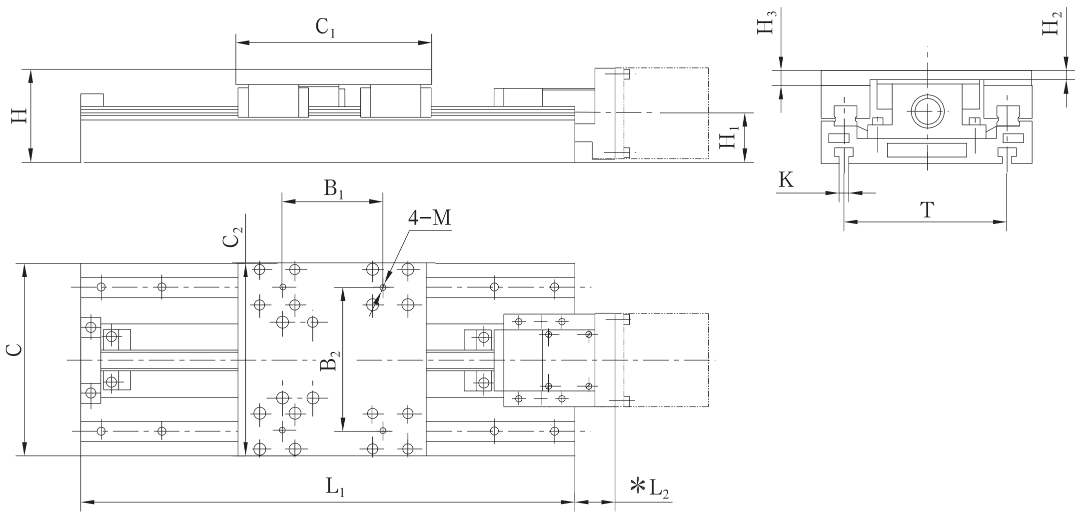
With the material aluminium alloy of the base component, it has advantage such as high accuracy, long lifetime, light weight, compact structure and beauty. It is widely used for measure, laser weld, laser cutting, gelatinization, insen, ray screener and actual teaching situation etc. There are two types of single coordinate worktable DZHQ and double coordinate worktable SZHQ for customer to choose.

We can provide integration unit of machine & electric. Customer can select motor, drive and CNC system according to requirement to meet the needs of speed, load, pulse etc.



Dimension of DZHQ type

Single coordinate worktable DZHQ



Dimension

Type	Travel	Length	Bottom base		Height		Surface dimension							Installation dimension	
	S	$*L_2$	L_1	C	H	H_1	C_1	C_2	B_1	B_2	H_2	H_3	M	T	K
DZHQ70	70	16	260	124	78	47	124	124	54	86	10	15.5	M6	86	8
DZHQ120	120	16	310	124	78	47	124	124	54	86	10	15.5	M6	86	8
DZHQ170	170	16	360	124	78	47	124	124	54	86	10	15.5	M6	86	8
DZHQ220	220	16	410	124	78	47	124	124	54	86	10	15.5	M6	86	8
DZHQ320	320	16	510	124	78	47	124	124	54	86	10	15.5	M6	86	8

Note

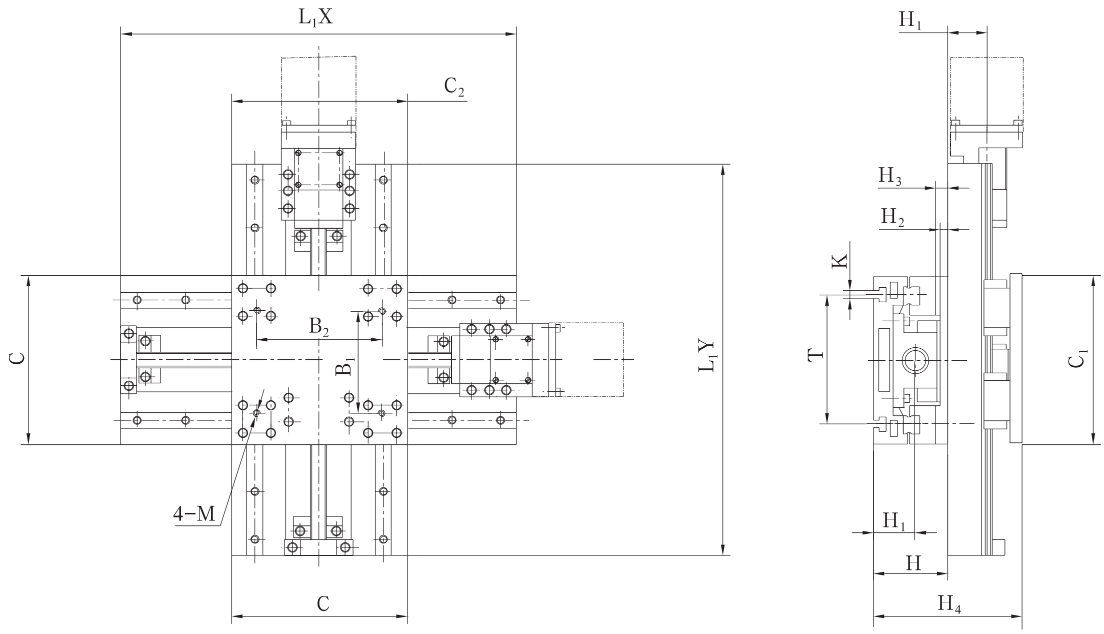
1.The list files of type are basic type. We can add the organ type dustproof cover according customer's needs, but the actual travel will be decreased.

2.$*L_2$ dimension is changeable with changes of motor neck. The figure here is stated according to the length of shaft neck 21mm of MSMA022 AC servo motor.

3.We can equip motor and CNC system according to customer's needs for series worktable. When motor equipped by themselves, then dimension of flange of the motor should ≤60x60mm.

Dimension of SZHQ type

Double coordinate worktable SZHQ



Dimension

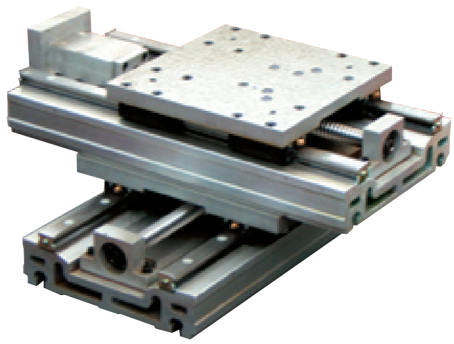
Type	Travel	Bottom base		Height				Surface dimension						Installation dimension		
	SX×SY	L_1X	L_1Y	C	H	H_1	H_4	C_1	C_2	B_1	B_2	H_2	H_3	M	T	K
SZHQ0707	70×70	260	260	124	78	47	156	124	124	54	86	10	15.5	M6	86	8
SZHQ1207	120×70	310	260	124	78	47	156	124	124	54	86	10	15.5	M6	86	8
SZHQ1212	120×120	310	310	124	78	47	156	124	124	54	86	10	15.5	M6	86	8
SZHQ1707	170×70	360	260	124	78	47	156	124	124	54	86	10	15.5	M6	86	8
SZHQ1712	170×120	360	310	124	78	47	156	124	124	54	86	10	15.5	M6	86	8
SZHQ1717	170×170	360	360	124	78	47	156	124	124	54	86	10	15.5	M6	86	8
Note	1. SZHQ double coordinat worktable consist of two DZHQ single coordinate worktables added together which of the same series and working travel or different working travel. 2. If customers request special products, With principle travel of under layer ≥ travel of upper layer, the max. spec. of upper worktable is DZHQ170. 3. If the fixing direction of motor is different from the above table, please mark when ordering.															

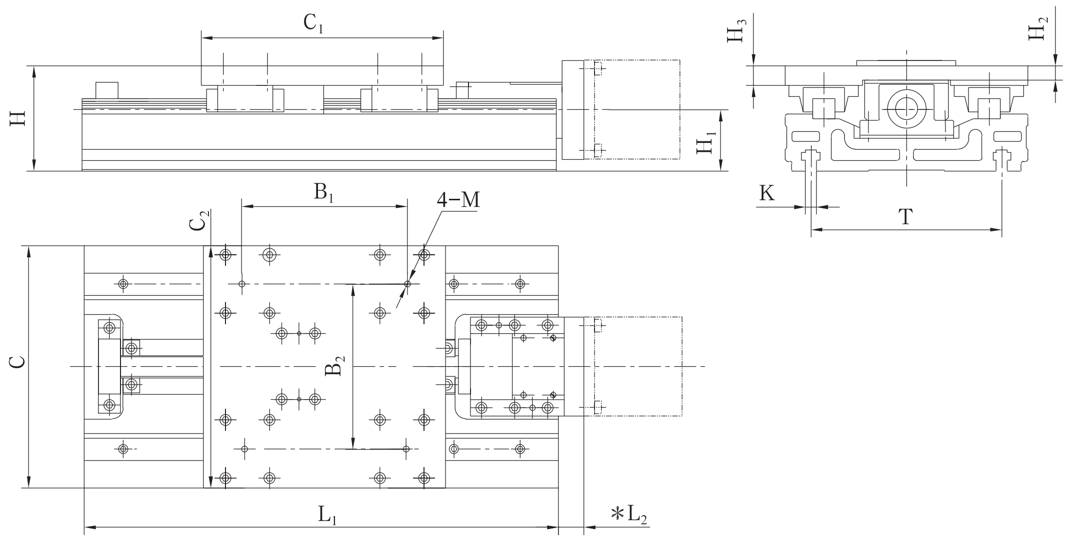
Type of ball screw and linear motion guide, parameters for neck of ball screw in DZHQ and SZHQ

Type of worktable	Type of ball screw	Type of the linear motion guide	Diameter for neck of ball screw	Length for neck of ball screw	Key slot (L×W×H)
DZHQ	GGB16BA2P2	FFB1604-2	ø10	12	10×3×1.8
SZHQ	GGB16BA2P2	FFB1604-2	ø10	12	10×3×1.8

Dimension of DZHQ type

Single coordinate worktable DZHTQ





Dimension

Type	Travel	Length	Bottom base		Height		Surface dimension							Installation dimension	
	S	*L_2	L_1	C	H	H_1	C_1	C_2	B_1	B_2	H_2	H_3	M	T	K
DZHTQ220	220	25	450	220	95.5	55.5	220	220	150	150	13	18	M8	173	10
DZHTQ270	270	25	500	220	95.5	55.5	220	220	150	150	13	18	M8	173	10
DZHTQ320	320	25	550	220	95.5	55.5	220	220	150	150	13	18	M8	173	10
DZHTQ420	420	25	650	220	95.5	55.5	220	220	150	150	13	18	M8	173	10

Note

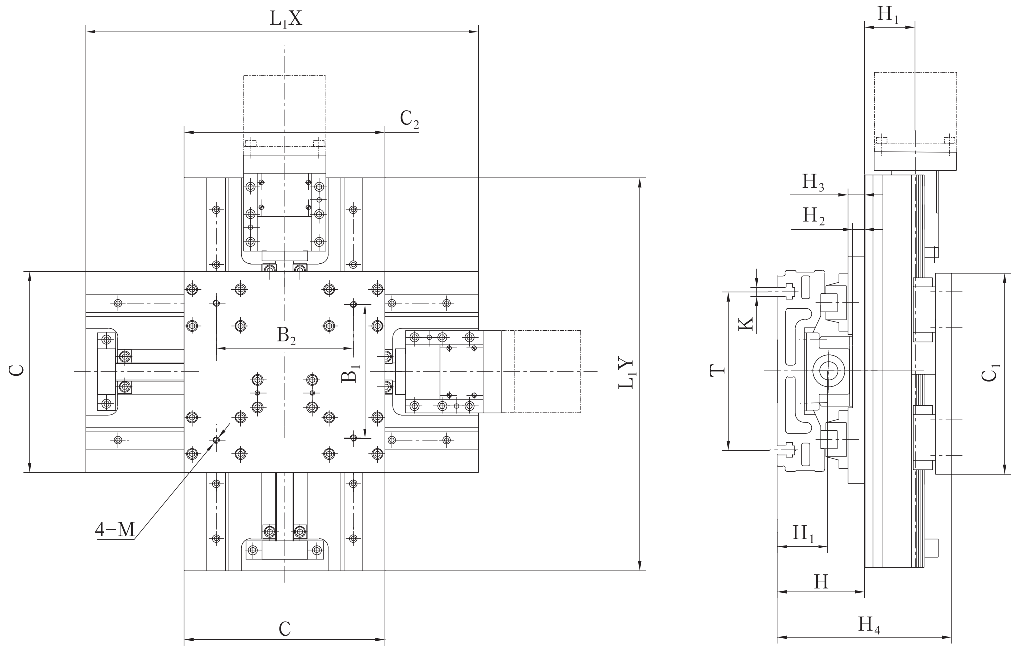
1.The list files of type are basic type. We can add the organ type dustproof cover according customer's needs, but the actual travel will be decreased.

2.*L_2 dimension is changeable with changes of motor neck. The figure here is stated according to the length of shaft neck 26mm of MSMA022 AC servo motor.

3.We can equip motor and CNC system according to customer's needs for series worktable. When motor equipped by themselves, then dimension of flange of the motor should ≤90x90mm.

Dimension of DZHQ type

Single coordinate worktable SZHTQ



Dimension

Type	Travel	Bottom base			Height			Surface dimension						Installation dimension		
	SX×SY	L_1X	L_1Y	C	H	H_1	H_4	C_1	C_2	B_1	B_2	H_2	H_3	M	T	K
SZHTQ2222	220×220	450	450	220	95.5	55.5	191	220	220	150	150	13	18	M8	173	10
SZHTQ2722	270×220	500	450	220	95.5	55.5	191	220	220	150	150	13	18	M8	173	10
SZHTQ2727	270×270	500	500	220	95.5	55.5	191	220	220	150	150	13	18	M8	173	10
SZHTQ3222	320×220	550	450	220	95.5	55.5	191	220	220	150	150	13	18	M8	173	10
SZHTQ3227	320×270	550	500	220	95.5	55.5	191	220	220	150	150	13	18	M8	173	10
SZHTQ3232	320×320	550	550	220	95.5	55.5	191	220	220	150	150	13	18	M8	173	10

Note

1. SZHQ double coordinat worktable consist of two DZHQ single coordinate worktables added together which of the same series and working travel or different working travel. The upper layer is standard worktable, the under layer: $C_1 \times C_2$=220×260, other parts are the same as DZHTQ type.
2. If customers request special products, With principle travel of under layer ≥ travel of upper layer, the max. spec. of upper worktable is DZHQ170.
3. If the fixing direction of motor is different from the above table, please mark when ordering.

Type of ball screw and linear motion guide, parameters for neck of ball screw in DZHTQ and SZHTQ

Type of worktable	Type of ball screw	Type of the linear motion guide	Diameter for neck of ball screw	Length for neck of ball screw	Key slot (L×W×H)
DZHTQ	GGB20AA2P2	FFB2005-2	ø12	20	20×4×2.5
SZHTQ	GGB20AA2P2	FFB2005-2	ø12	20	20×4×2.5

Accuracy of DZHQ and SZHQ aluminium alloy worktable

Accuracy gracle

Type of worktable	Travel	Load(N)	Repeat positioning accuracy	Positioning accuracy	Move linearity
DZHQ70	70	200	±0.005	0.025	0.02
DZHQ120	120				
DZHQ170	170				
DZHQ220	220	200	±0.005	0.04	0.03
DZHQ320	320				
DZHTQ220	220	600	±0.006	0.04	0.03
DZHTQ270	270				
DZHTQ320	320				
DZHTQ420	420	600	±0.006	0.05	0.04

Accuracy of SZHQ and SZHTQ aluminium alloy worktable

Accuracy gracle

Type	Travel	Load(N)	Repeat positioning accuacy	Positioning accuacy	Move linearity	X. Y squareness
SZHQ0707	70×70	150	±0.005	0.025	0.02	0.025
SZHQ1207	120×70					
SZHQ1212	120×120					
SZHQ1707	170×70					
SZHQ1712	170×120					
SZHQ1717	170×170					
SZHTQ2222	220×220	500	±0.006	0.04	0.03	0.04
SZHTQ2722	270×220					
SZHTQ2727	270×270					
SZHTQ3222	320×220					
SZHTQ3227	320×270					
SZHTQ3232	320×320					

Note: If the accuracy is not with the table, please consult wih us.

Electric explanation

Electric control of DZH SZH

Control Machine	Type	Number of control coordinat	Display	Control function	Notes	
	CNC-32T/2	2	LCD	G, T, M, S	NC display controller of one row for selection	
Step drive	Type	Power supply	Max.output current (peak value)	Driving model	Frequency of step impulse	Excitation model
	SH-20806	10~70V(DC)	3A/phase(6A/phase)	Double poles constant current PWM	0~1MHZ	There are 8 kinds of operation modle under the max. subdirision 64
Step motor	Type	Phase	Pace angle	Static torque	Impulse equivalent	Static current
	57BYG250E-SAFRML-0302	2	0.9°/1.8°	1.5NM	0.01/0.02mm	3A(6A)

Electric control of DZHT SZHT

Control Machine	Type	Number of control coordinat	Display	Control function	Notes	
	CNC-32T/2	2	LCD	G, T, M, S		
Step drive	Type	Power supply	Output phase current (available value)	Driving model	Frequency of step impulse	Excitation model
	SH-50806B	Single phase 80V AC 200VA	1~6A/phase	Frequency/voltage increase constant current PWM	0~1MHZ	Complete step: 10 paces/5 phase Half step: 20 paces 5 phases
Step motor	Type	Phase	Pace angle	Static torque	Impulse equivalent	Static current
	90BYG550B-SAKRML-0301	5	0.36°/0.72°	≥4NM	0.005/0.01mm	3A

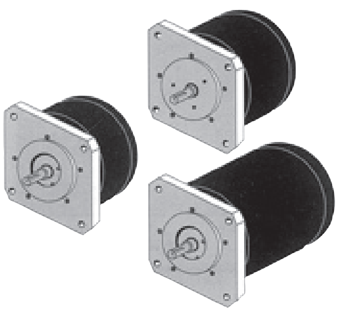
Electric control of DZHK SZHK

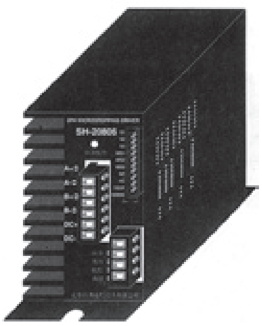
Control Machine	Type	Number of control coordinat	Display	Control function	Notes	
	CNC-32T/2	2	LCD	G, T, M, S		
Step drive	Type	Power supply	Output phase current (available value)	Driving model	Frequency of step impulse	Excitation model
	SH-50806B	Single phase 80V AC 200VA	1~6A/phase	Frequency/voltage increase constant current PWM	0~1MHZ	Complete step: 10 paces/5 phase Half step: 20 paces 5 phases
Step motor	Type	Phase	Pace angle	Static torque	Impulse equivalent	Static current
	110BYG550B-SAKRML-0301	5	0.36°/0.72°	≥8NM	0.005/0.01mm	3A

System type of CNC precision worktable (general)

- System introduction

System introduction	This system adopts 240×128 display with high lightness. Chinese edit in full screen, friendly interface of man and machine. It is a multi-function CNC system suitable for general accuracy.
Controllable number of axes	2
min. enacted value	X: 0.005mm, Z: 0.01mm
Program input model	64KB
Main axis	Digital type: S01-S10 Simulation type: 0~5V(+10V)
Max.programming size	±9999.999mm
Move speed	2.7~2000mm/min
Program management	Edit, insert, delete, copy, rename
Program type	Increment, absolute, mixed program
Operational type	Automatic, hard, jog, MDI single/continuation





Type	Power	Output plase current	Drive mode	Excitation mode	Suitable motor
WD-5LD	Single phase 80V±15% 50/60HZ capacity 250VA/axes	6-8A(average)	Frequency and voltage ajusted, constant carrier cutted, half current locked	10 paces 5 phases (0.72degree)/ 20 paces 5phases (0.36degree)	90BYG, 110BYG, 130BYG mixed moter with 5 phases 5 lines

Installation and use

● Installation of CNC precision worktable

CNC precision worktable must be installed on base with good rigidity. The min roughness of base installation surface is Ral.60 and the plane is grade 7. If necessary , it will be scraped and ground. According to the position of the installation hole of the base for CNC precision worktable, the installation holes of the base will be machined. They are tightened with inner hexagonal bolt.

● Notice points of using CNC precision worktable

The travel program of CNC precision worktable must be in effective travel. It does not exceed mechanical limit travel block frequently. It does not be directly used for limit. In the condition of frequent exchange of program, the electric limit block must be set automatically so as to protect the precision worktable.

The rolling machine parts of worktable must be clean. The scrap iron and dust do not be allowed to enter in the groove inner. The groove must not be impacted by hard sub thing to avoid damage and accuracy.

Before operation, all goods in travel of worktable should be cleaned up so as to avoid impacting and having accident.

By continuous operation, fixation must be inspected in period. If it is loose, it must be tightened in time. Especially the bolt for joint and motor, the bolt must be tight.

If the worktable has step motor, the section of higher and lower speed should be avoided(see motor characteristic curve). Otherwise, it will be vibration in low speed or lose-step in high speed.

Before operating the worktable that equipped with motor and CNC system by our factory, please inspect the electorcircuit. The worktable is manipulable after you insure that all pints are connected well.

All rolling machine parts in CNC precision worktable must be lubricated lubrication periodically so as to ensure permanence of accuracy. By continuous use and use with high speed, take mass lubrication system is advised.

The standard type worktable has not dust-proof unit. Do not use it in condition of scrape iron and dust. If there are special requirements, notice it in order.

The worktable is normally used for horizontal installation. The worktable is low load when it be installed vertical. The ball screw assembly has no self-locked function. Self-lock must be considered enough. Self-lock is usually mechanical balance with heavy hammer or tight clasp of motor.

Lord of worktable is usually in the area of worktable operation surface. If lord location is out of table surface, the big polarization appears. Pay attention to power point of load.

There are four installation holes. When something is installed, depth of tighten should be smaller than thickness of table so as to avoid transfiguration of the worktable.

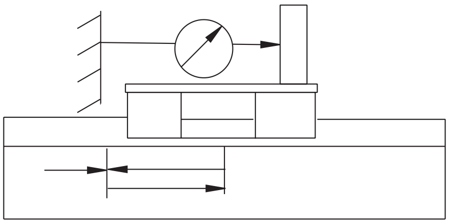
Do not dismantle CNC worktable optionally. If the worktable must be dismantled, the nut must not get out from ball screw and block must not get out from rail. Otherwise worktable must be sent to our factory to reassemble.

If there is high requirement of position accuracy and repeat position accuracy, the drive unit with subdivision of circuit should be selected to subdivide impulse after reduce error. To ensure compatibility, motor and drive should be selected from same company are selected.

Inspection method of worktable

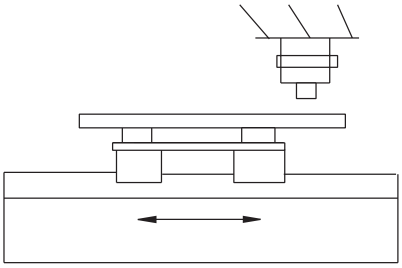
● Repeat position accuracy

Selecting one point on the worktable, seven times of repeat positions are made with moving more than 0.1mm from same direction. Then stop positions are measured and max difference is registered. In the middle of worktable travel, three positions near two ends are measured.



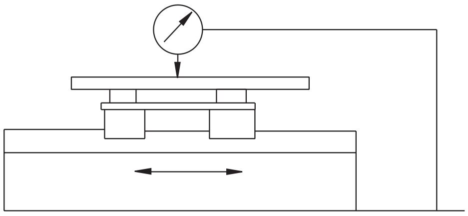
● Position accuracy

The worktable moves in positive and negative directions. The stop position is reference point. The worktable makes position according to stated interval with moving in the same direction. By reference position, the difference between actual move distance and stated move distance is measured. The difference between measured max value and min value is error value.



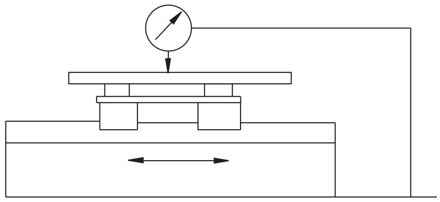
● Position accuracy

At first the precision ruler is regulated to be parallel with reference bottom surface. The value of two ends is equal. Then the total travel is measured by moving worktable. The max difference is error value.



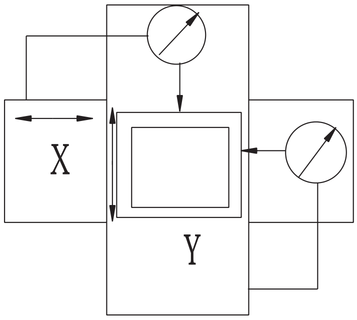
- Parallelism of table moving

After put the precision ruler of standard on the worktable, move worktable through the total travel. The max difference is error value.



- Move right angle of XY

Regulating angle ruler to make one side of angle ruler is parallel with X direction of the worktable. Then the worktable of Y direction pusted to the middle of travel of X direction. The meter feeler is put to another side of the angle ruler. Move the worktable of Y direction. In the effective length of angle ruler is measured. The max difference is read. The ratio of the travel length of Y direction and measured length is multiplied by read difference. Then uprightness value of X and Y travel is calculated.



Precision linear motion bushing

1.Configuration and features

● Configuration

Cylindrical ball bushing consists of linear motion ball bearing, rail shaft, ball bearing supporting base, shaft supporting base, other parts and so on .There are two types: close type and open type; They both are classified according to products' structure. The former has two types : clearance -adjustable and clearance-nonadjustable; the latter has only one : clearance -adjustable type . see Fig . 1 GTA type , Fig. 2 GTB type and Fig.3 GTC type. Thereinto GTC type linear motion bushing is other model of open type linear motion bushing. The difference of GTC and GTA is different mounting way. It is more flexible than GTA. It can not only save mounting space, but also keep relevant accuracy.

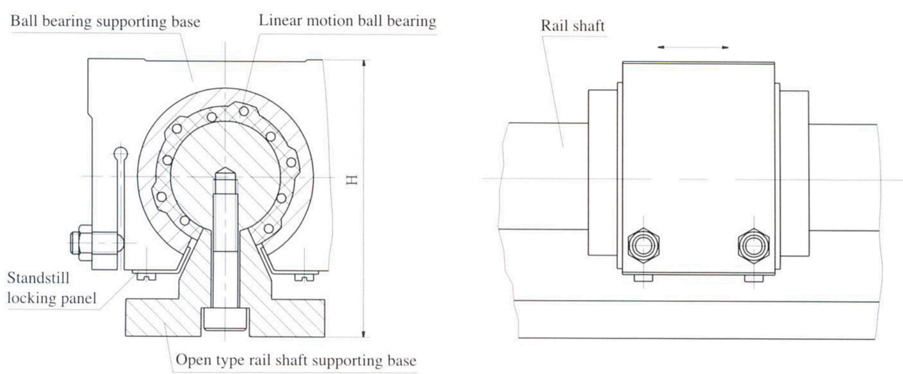


Fig.1 GTA GTAt open-type Linear motion bushing

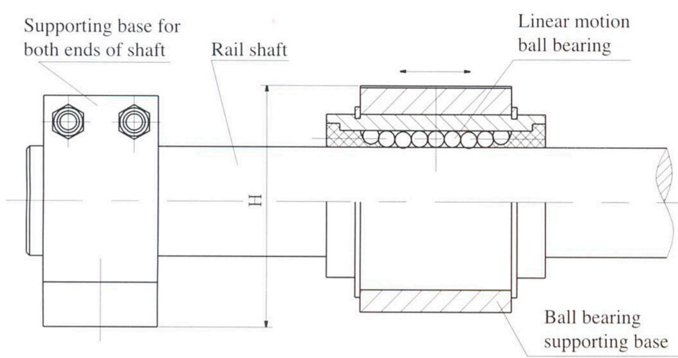


Fig.2 GTB GTBt close type Linear motion bushing

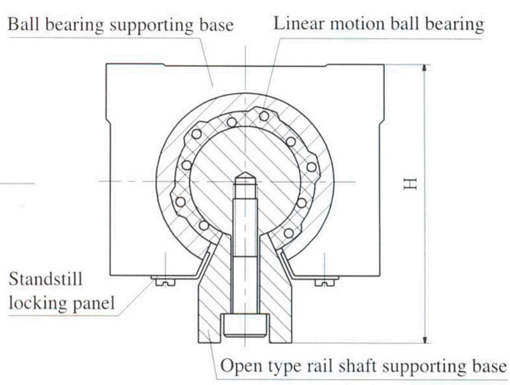


Fig.3 GTC open-type linear motion bushing

When necessary, two more supporting bases for rail shaft may be fitted with GTA (general series) and GTAt (special series) open type. It is to eliminate the influence caused by deadweight of rail shaft on total height (H) of ball bearing supporting base and motion parallelism. This configuration is special suitable for specifications of large travel distance ,so higher motion accuracy could be achieved.

Two or more supporting bases could not be fitted with these types ball bushing : such as GTB(general series), GTBt(special series), GTB-t clearance-adjustable(general series) and GTBt-t clearance-nonadjustable(special series). Therefore ,the deadweight of rail shaft will inevitably influence the total height (H) of bearing supporting base and motion parallelism. Thus, these types are generally used in short travel distance or low motion accuracy occasions .

● Characters and features

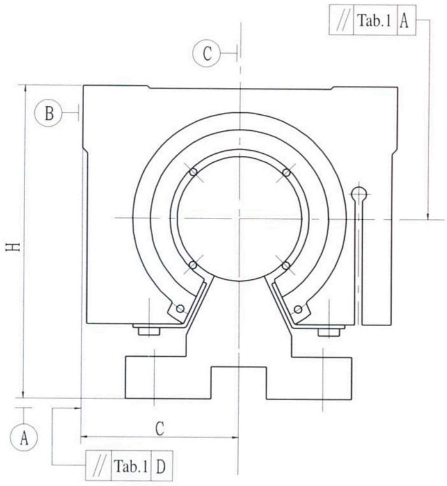
◆ Friction coefficient value is very small, only 0.001~0.004. Power consumption is very low and energy could be economized.

◆ Flexible accurate motion performance in trace amount ; no crawling at low speed.

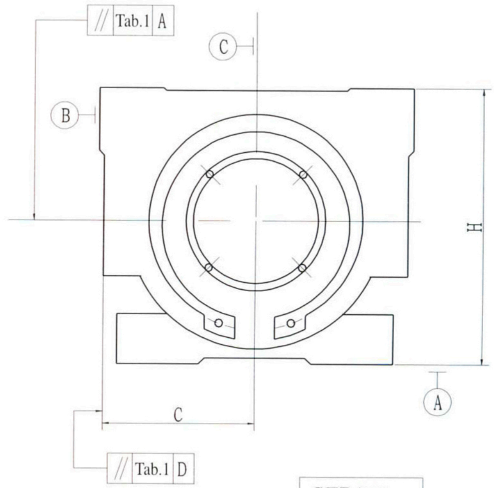
- Self-adjustable structure , so the lower accuracy of supplementary parts could be used .
- Lubrication is easy and maintenance is convenient . Replacing parts can be done promptly.
- Motion speed and positioning accuracy are very high and long travel distance is available .
- Rail shaft is made of good-quality alloy steel after quenching HRC58-63, capable of standing wear ; stability performance and accuracy-keeping function.

2. Accuracy grade

● Accuracy grade are classified as three precision grade (grade J), common grade (including two kinds : grade P, grade P_1) according to manufacturing accuracy of balls bearing . Permission tolerance values of each grade are shown in Tab.1.



GTA type
GTAt type



GTB type
GTBt type
GTB–t type
GTBt–t type

Tab.1　　Accuracy grade　　　　*Unit: μ m*

No.	Item	Accuracy grade J	P	P_1
1	Parallelism of meter with rail axis and supporting base surface Ⓐ	10	15	20
2	Parallelism of meter with rail shaft and supporting base surface Ⓑ	15	20	30
3	Dimensional tolerance of height H	± 40	± 50	± 100
4	Coherence parameter of both size H of two bearing supporting base on one rail shaft	15	25	35
5	Tolerance for size C of rail axis with mounting surface. Ⓑ	± 40	± 150	± 250
6	Coherence parameter of both size C of two supporting base on one rail shaft	20	30	60

Notes:
1 Accuracy testing should be done in certain positions of supporting base of rail shaft for GTA type, respectively positions approaching both ends of rail for GTB type.
2 Ref. end A and ref. end B should be vertically settled , otherwise accuracy testing is invalid.
3 Coherence of size C and its dimensional tolerances only apply for ref. ball bushings, when two sets are used on the same surface.

● Mate of rail shaft with inscribed circle of ball bearing is g6/H7, the same for mounting external circle with inner bore of supporting base.

Different type for different use

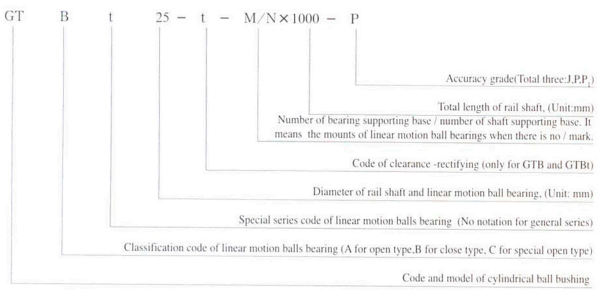
Clearance- nonadjustable type :GTB, GTBt

Clearance-adjustable type : GTA　GTAt　GTB -t　GTBt-t and GTC

If special requirements are demanded , please consult with us .

● When both are fitted in parallelism on the same surface , if each size H is requested in a coherence with the others , please make the notify in your contact.

3. Code rules and connotations



Code example

GTAt25-2/3 x1000-P shows that it belongs to open type, special series. The diameter of the rail shaft is 25 mm; one set ball bushing is fitted with two bearing carriers (including bearing) and three supporting bases for shaft ,and its total length is 1000mm,accuracy grade is P.

GTB40-2x1500-J shows that it belongs to close type, non-clearance-rectifying type. The diameter of the inscribed circle of ball bearing and rail shaft is 40mm;a ball bushing is fitted with two sets linear motion balls bearing , and its total length is 1500mm,accuracy grade is J.

4.Service life calculation and examples

- Rated service life calculation:

$$L = 50\left(\frac{f_T \cdot f_C \cdot f_H}{f_w} \cdot \frac{C}{P_C}\right)^3 \qquad (1)$$

L — Rated service life Km

f_T — Temperature coefficient, see Tab.5

f_c — Contact coefficient, see Tab.6

f_w — Load coefficient, see Tab. 7

Tab.5 Temperature coefficient f_T

Working temperature	f_T
< 100° C	1.00
> 100° C~150° C	0.90
> 150° C~200° C	0.73
> 200° C~250° C	0.60

Tab.6 Contact coefficient f_C

Numbers of bearings on each rail shaft	f_C
1	1.00
2	0.81
3	0.72
4	0.66
5	0.61

C — Rated dynamic load kgf

P_c — Calculated load kgf

f_H — Hardness coefficient

$$P_C = \frac{\text{P(Load on bearings)}}{\text{M(Numbers of bearings)}}$$

$$f_H = \left(\frac{\text{Actual value HRC}}{\text{HRC58}}\right)^{3.6} \quad \text{usually } f_H=1$$

Tab.7 Loading coefficient f_W

Working conditions	f_w
No external impact or vibration, running at low speed, the speed V ≤ 15m/min.	1 ~ 1.5
Small impact or vibration, running at middle-scale speed, 15<V ≤ 60m/min	1.5 ~ 2
Strong external impact or vibration, running at high speed , speed V>60m/min	2 ~ 3.5

When $f_T=1$ $f_C=0.81$ $f_W=1.6$ $f_H=1$,

Formular (1) can be calculated into:

$$L = 6.25\left(\frac{C}{P_C}\right)^3 \qquad (2)$$

formula

$$L_h = \frac{L \cdot 10^3}{2 \cdot L_S \cdot n \cdot 60} \qquad (3)$$

In formula: L_h — Rated service life (Unit:hour)

L_s — Length of one-way travel distance (Unit:m)

n — Go-return times per minute (Unit: c/min)

- Calculation example

Choose specification and type code roughly according to known conditions, then check the corresponding rated dynamic load to see if these products are suitable.

Example: from Tab.2,GTA25 type is selected, and the relevant rated dynamic load is C=870N,ie.89kgf

Weight of worktable and workpiece is P=40kgf. There are four linear motion balls bearings in two rails shafts ,i.e. M=4.

$$L = \frac{P}{M} = \frac{40}{4} = 10\text{kgf}$$

One-way travel distance of bearing l_s=0.6m.Go-return times per minute n=4, 6 hours every day and 300 working days every year ,total working time is 6×300 hour, i.e. 1800 hours. When the expected service life is beyond 5 years , so assumed $f_T=1$, $f_C=0.81$, $f_W=1.6$, $f_H=1$, calculate formula below:

$$L = 6.25\left(\frac{C}{P_C}\right)^3 = 6.25\left(\frac{89}{10}\right)^3 = 4406\text{Km}$$

$$L_h = \frac{L \cdot 10^3}{2 \cdot l_S \cdot n \cdot 60} = \frac{4406 \times 10^3}{2 \times 0.6 \times 4 \times 60} = 15298$$

(Life cycle T rated service life L_h (hour)/working hours per year.)

=15298/1800 ≈ 8.5(year)

Conclusion: the selected one is suitable.

Notes: If other calculation methods for selecting products are needed, please consult with us.

5.Mounting and adjustment of linear balls bearing

● Lubrication grease should be smeared in the uncontaminated inside of bearing.

● Proper tooling are used to press on housing washer surface ,when press bearing in fit supporting base .Shown as Fig.4, be sure not to knock at the bearing directly to avoid deformation.

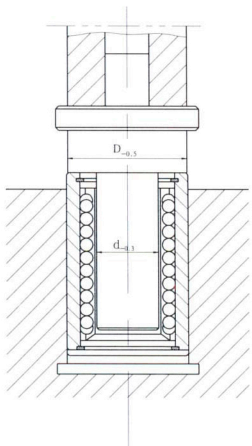


Fig.4

● Insert rail shaft into bearing gently, centering line should be ensured. Deflection plugging will likely deform container and make balls drop. see Fig.5

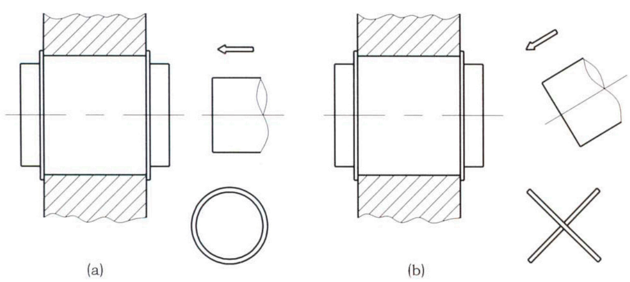


Fig.5

● No permission rotating bearing when plugging it in supporting base, forcing rotate will damage bearing . see Fig.6.

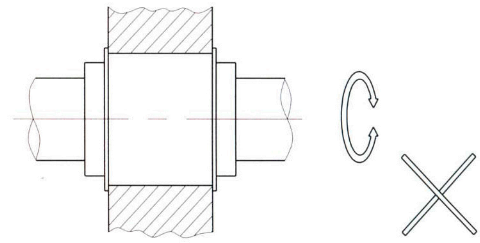


Fig.6

● Do not fix adjusting screw with housing washer of the bearing directly to avoid deformation. see Fig.7.

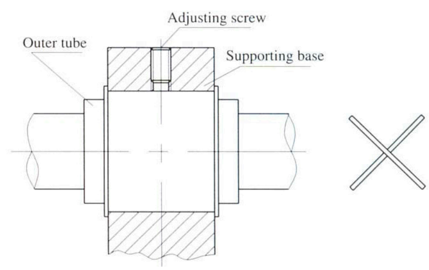


Fig.7

● Clearance-adjustable(close type) type and open type and clearnce-adjustable type should be mounted as shown in Fig.8 and Fig.9; then , tighten the clearance with a screw and pay attention that preload pressure should not to be too large .

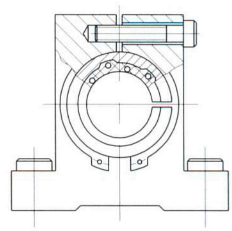


Fig.8

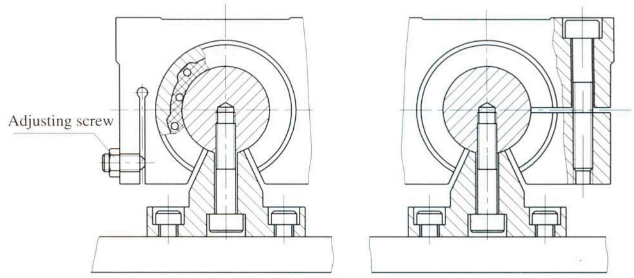


Fig.9

● Mounting methods of balls bearing supporting base , see Fig.10 and Fig.11.

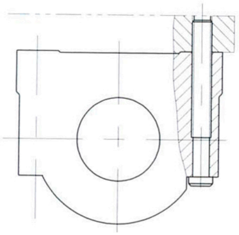


Fig.10

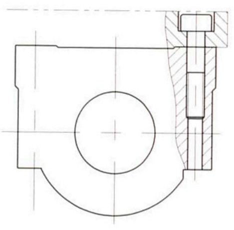


Fig.11

● Common methods of fixing ball bearing see Fig.12, Fig.13 and Fig. 14.

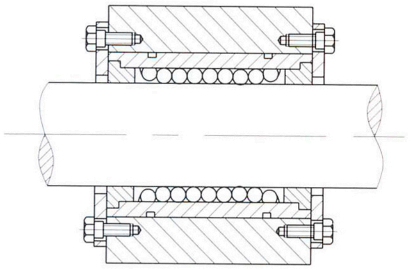


Fig.12

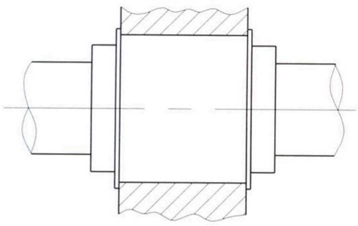


Fig.13

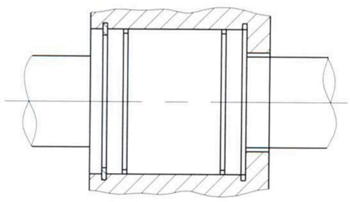


Fig.14

6.Range of application

● Machines and tools

CNC machine, multi axial drilling machine , tooling grinding machine, plane grinding machine, spline grinding machine, broaching machine, pneumatic control spot welding machine , oil press, automatic gas cutting machine , profile cut tracing machine , centerless grinder wheel dresser and so on.

● Measuring device and control machine

Omnipotent projector , tooth gear instrumentation , pneumatic control limited gauging , indicator , automated door , precision measuring machine, water level recorder .

● Electric apparatus and electronics instrument

Computer and its external devices, automatic recorder for currency, voltagetemperature, image pickup device , tap recorder , X, Y arithmometer, digital three-way detector , X ray device .

● Transportation machine

Transfermatic conveying devices, go-return moving machines, adjustable operating machine , speed indictor, acceleration indictor.

● General working machine

Movable photo microscope, detecting device , card-choosing machine, imitation machine, typewriter, electronic recording device .

● Textile and fiber machine

Lifting device for spinning machine frame, cutting muller, automatic reeling machine, automatic yarn twisting machine and so on .

● Others applicable occasions

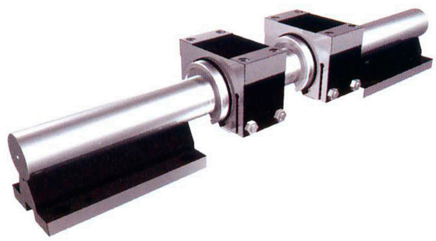
Graph plotter, diagnosis machine bed, game machine , motor base for adjustment, packing machine , printing machine , suppleness control unit and so on .

(We reserve the right to modify and improve data without prior notice .)

7. Dimension series of cylindrical linear motion bushing

Dimension series of GTA , GTAt type

see Tab.2



Unit:mm

Tab.2

Code and spec.	General series																
	Overall size (mm)																
	$d_{(js6)}$	d_1	d_2	$D_{(h6)}$	L	L_1	A	A_1(-0.2)	A_2	J	J_1	K	C	W	W_1	B	B_1
GTA13	13	5	5.8	23	≤ 500	100	32	20.5	11	80	15	10	27	54	53	36	36
GTA16	16	5	5.8	28	≤ 650	100	37	23.5	13	80	15	10	28	56	54	42	36
GTA20	20	6	7	32	≤ 800	125	42	27.5	16	100	20	12.5	30	60	58	45	40
GTA25	25	6	7	40	≤ 1000	125	59	37.5	24	100	20	12.5	35.5	71	68	56	40
GTA30	30	6	7	45	≤ 1500	150	64	41	26	120	25	15	40	80	77	63	45
GTA35	35	8	9	52	≤ 1800	150	70	45.5	28	120	25	15	45	90	87	71	53
GTA38	38	8	9	57	≤ 2000	150	76	54.5	38	120	25	15	50	100	96	80	53
GTA40	40	8	9	60	≤ 2000	150	80	56.5	38	120	25	15	50	100	96	80	53
GTA50	50	8	11	80	≤ 2500	200	100	69	50	160	30	20	62.5	125	121	100	67
GTA60	60	8	11	90	≤ 3000	200	110	79	56	160	30	20	70	140	135	110	67
GTA80	80	8	13.5	120	≤ 3500	250	140	99.5	75	200	40	25	90	180	175	150	85

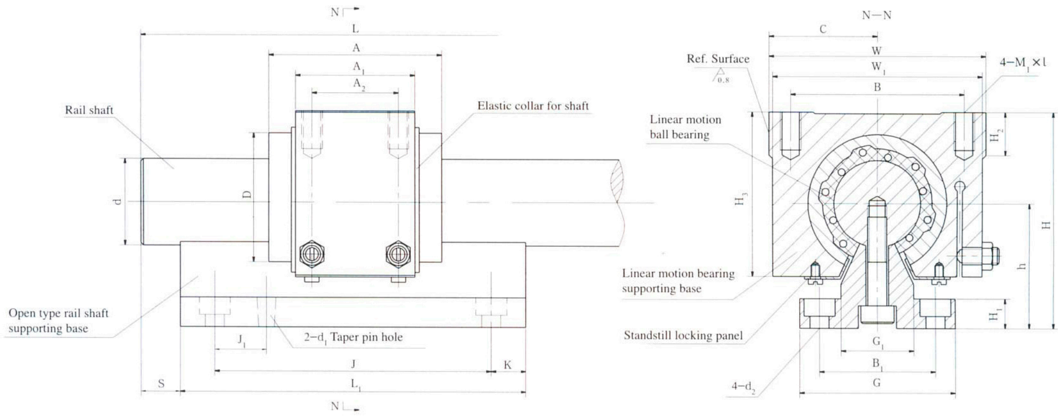
Notes:

1.4-d_2 holes are fixed by socket head cap screw .

2.Size S is specified by users , please note in the contract.

3.Special design for open type rail shaft-bearing base.

4.Rated dynamic load and rated static load should be positive pressure.

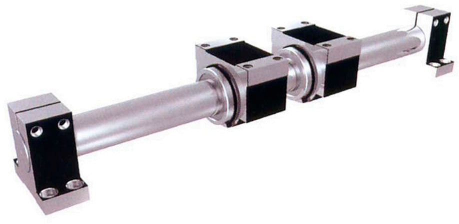


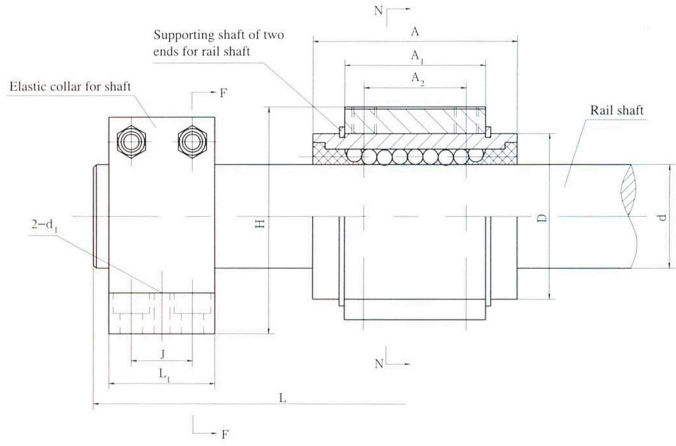
General series										Special series							
Overall size (mm)								Rated dynamic load (N)	Rated static load (N)	Code and spec.	Overall size (mm)					Rated dynamic load (N)	Rated static load (N)
G	G_1	h	H	H_1	H_2	H_3	$M_1 \times l$				d(js6)	D(h6)	A	A_1(-0.2)	A_2		
50	22	36	56	11	9	33	M5 × 8	260	480	GTAt12	12	22	32	20.4	11	250	480
50	24	39	63	10	10	40	M5 × 14	420	720	GTAt16	16	26	36	22.4	12	280	550
56	24	41	67	11	12	43	M6 × 14	550	920	GTAt20	20	32	45	28.5	16	550	970
56	24	41	71	11	14	52	M6 × 14	870	1560	GTAt25	25	40	58	40.5	26	870	1560
60	26	51	85	11	16	58	M8 × 16	1270	2150	GTAt30	30	47	68	48.5	32	1270	2150
71	34	58	96	14	18	66	M8 × 16	1670	3040								
71	34	58	100	14	20	73	M8 × 16	2050	3520								
71	34	58	100	14	20	74	M8 × 18	2050	3520	GTAt40	40	62	80	56.5	40	2050	3520
90	42	72	125	17	25	95	M12 × 25	4010	6950	GTAt50	50	75	100	72.5	53	4010	6950
90	48	85	145	17	28	108	M12 × 25	4800	8030	GTAt60	60	90	125	95.5	71	5190	8910
110	60	110	190	20	35	143	M12 × 25	8820	14210	GTAt80	80	120	165	125.5	100	8820	14120

Notes: Dimensions of this products line are the same with that of general series expect for those listed in this table specially.

Dimension series of GTB, GTBt, GTBt-t type

see Tab.3





Tab.3

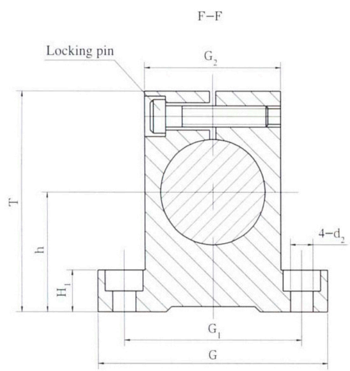
Code and spec.	General series																
	Overall size (mm)																
	d(js6)	d_1	d_2	D(h6)	h	c	G	G_1	G_2	L	L_1	T	H_1	H	H_3	H_2	A
GTB13	13	5	5.8	23	20	25	45	32	20	≤500	32	38	10	40	28	9	32
GTB16	16	5	5.8	28	24	28	50	36	24	≤650	32	46	10	48	34	10	37
GTB20	20	6	7	32	27	30	60	45	30	≤800	38	50	12	53	38	12	42
GTB25	25	6	7	40	33	35.5	67	50	36	≤1000	38	60	12	63	42	14	59
GTB30	30	6	7	45	37	40	75	56	42	≤1500	38	67	12	71	50	16	64
GTB35	35	8	9	52	42	45	85	67	50	≤1800	48	75	16	80	56	18	70
GTB38	38	8	9	57	48	50	90	71	54	≤2000	48	85	16	90	63	20	76
GTB40	40	8	9	60	48	50	90	71	54	≤2000	48	85	16	90	63	20	80
GTB50	50	8	11	80	57	62.5	110	85	65	≤2500	52	105	20	110	75	25	100
GTB60	60	8	11	90	65	70	125	100	80	≤3000	52	120	20	125	85	28	110
GTB80	80	8	13.5	120	80	90	160	130	105	≤3500	60	150	25	160	110	25	140

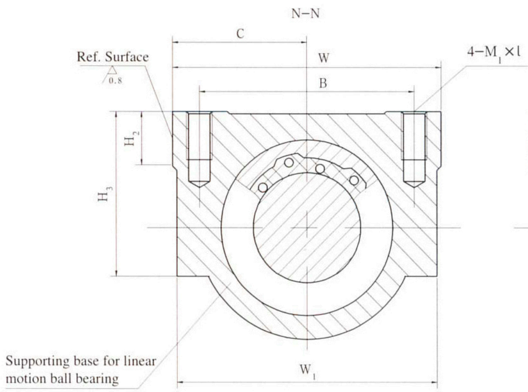
Notes:

1.Size listed in the table for GTB-t type are the same as those of GTB type.

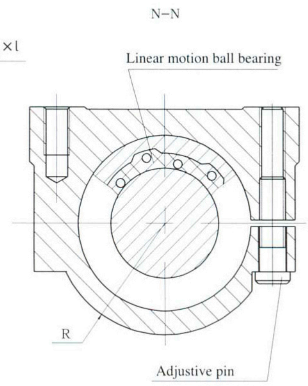
2.4-d_2 holes are fixed by socket head cap screw .

3.Rated dynamic load and rated static load should be positive pressure.





GTB type
GTBt type



GTB-t type
GTBt-t type

General series										Special series							
Overall size (mm)								Rated dynamic load (N)	Rated static load (N)	Code and spec.	Overall size (mm)					Rated dynamic load (N)	Rated static load(N)
A_1(-0.2)	A_2	J	W	W_1	B	R	M_1 × l				d(js6)	D(h6)	A	A_1(-0.2)	A_2		
20.5	11	18	50	48	36	18	M5 × 12	260	480	GTBt12	12	22	32	20.4	11	250	480
23.8	13	18	56	54	42	22	M5 × 12	420	720	GTBt16	16	26	36	22.4	12	280	500
27.8	16	22	60	58	45	24	M6 × 14	550	920	GTBt20	20	32	45	28.3	16	550	970
37.4	24	22	71	68	56	28	M6 × 14	870	1560	GTBt25	25	40	58	40.5	26	870	1560
41	26	22	80	77	63	32	M8 × 16	1270	2150	GTBt30	30	47	68	48.5	32	1270	2150
45.5	28	28	90	87	71	36	M8 × 16	1670	3040								
54.5	40	28	100	96	80	40	M8 × 18	2050	3520								
56.4	40	28	100	96	80	40	M8 × 18	2050	3520	GTBt40	40	62	80	56.5	40	2050	3520
69	50	30	125	121	100	50	M12 × 22	4010	6950	GTBt50	50	75	100	72.5	53	4010	6950
79	56	30	140	135	110	56	M12 × 22	4800	8030	GTBt60	60	90	125	95.5	71	5190	8910
99.4	75	34	180	175	150	70	M12 × 25	8820	14210	GTBt80	80	120	165	125.5	100	8820	14120

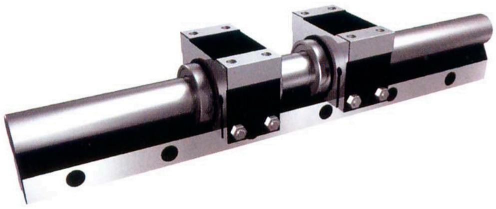
Notes:

(1) Dimensions of this products line are the same as those general series expect for those listed in this table specially.

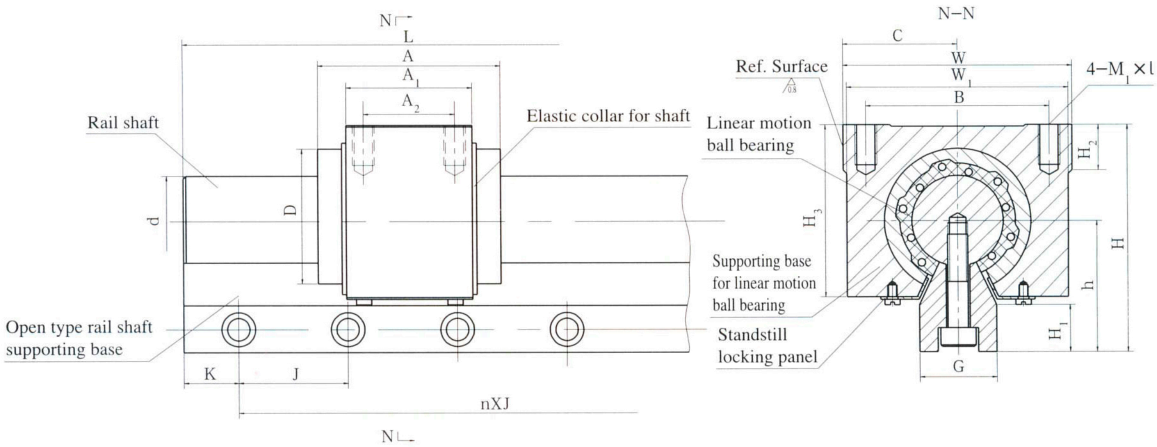
(2) Sizes listed in the table for GTBt-t are the same as those of GTBt type.

Dimension of GTC type bushing

see Tab.4



Unit:mm



Tab.4

Code and spec	d (js6)	D (h6)	L	A	A_1 (-0.2)	A_2	J	K	C	W	W_1	B	G	h	H	H_2	H_3	$M_1 \times l$	Rated dynamic load (N)	Rated static load (N)
	General series, Special series																			
	Overall size (mm)																			
GTC25	25	40	≤1000	59	37.5	24	60	30	35.5	71	68	56	24	40.5	71	14	52	M5×10	870	1560
GTCt25	25	40	≤1000	58	40.5	26	60	30	35.5	71	68	56	24	40.5	71	14	52	M5×10	870	1560

Notes: GTCt25 type is special series.

Management Concept

Brand is gold, Service is heart

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