

Thrust Bearings



Single direction thrust ball bearings



Double direction thrust ball bearings



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Single direction thrust ball bearings

The steel balls of single direction thrust ball bearings are arranged between a shaft housing washer. The contact angle is 90° and axial loads can be supported in only one direction. Generally, these bearings are unsuitable for high speed operation.

Whereas the shaft washers (rotating rings) have a flat back face, the housing washers (fixed rings) can have either a flat or spherical back face. The spherical type housing washer allows for a certain bearing mounting error and is available in two types. One type is made by forming the face of the housing washer in a spherical shape. The other is a separable type which is used with an aligning seat having a spherical face (please refer to Fig. 1).

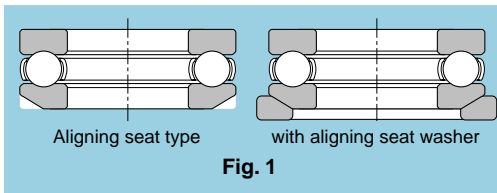


Fig. 1

Double direction thrust ball bearings

Double direction thrust ball bearings are arranged with steel balls occupying the spaces between each of the housing washers and the central shaft washer. This design can accommodate axial loads in either direction.

Like single direction thrust bearings, the double direction thrust bearings have three types of housing washers. These three types are flat face housing washer, an aligning seat type housing washer and a housing washer with aligning seat (please refer to Fig. 2).

Plastic cages, pressed steel and machined cages shown in Table 1 are available for both single and double direction thrust ball bearings.

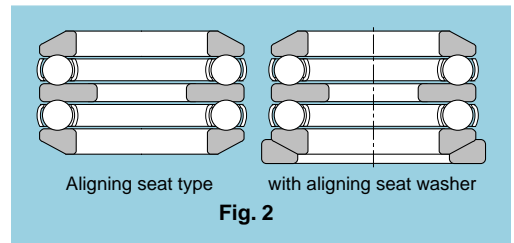


Fig. 2

Table 1 The standard cages for thrust ball bearings

Bearing series		Plastic cage	Pressed cage	Machined cage
Single direction type	511	51100-51106	51107-51152	51156-511/530
	512	—	51200-51224	51226-51260
	513	—	51305-51320	51322-51340
	514	—	51405-51415	51416-51420
Double direction type	522	—	52202-52224	52226, 52228
	523	—	52305-52320	52322, 52324
	524	—	52405-52415	52416-52426

Thrust roller bearings

Regarding the thrust roller bearings, roller and cage assemblies (Type K) are located between the raceway rings (Types WS and GS). These bearings can receive an axial load only in one direction.

When using the roller and cage assemblies, a compact design can be achieved by using the shaft and/or housing as the raceway(s). In such cases, it is necessary to treat and finish the raceway face to a hardness of HRC 58 to 64 and a surface roughness of 0.4μ. When heat treatment and grinding cannot be applied to the shaft or housing.



Double direction angular contact thrust ball bearing



Spherical roller thrust bearing

Pressed steel cages are used for needle roller thrust bearings or thrust roller bearings. The design of the roller and cage assemblies should be made so as to be guided by the bore and outer diameter.

Accuracy and fitting of the thrust roller bearings are given in Table 2 and Table 3, respectively.

Table 2 Accuracy of thrust roller bearings

Table 2 (1) Tolerance and allowable values of inner rings
Unit: μm

Nominal diameter of bearing d (mm)		Δ_{dmp} Class 0, 6, 5		V_{dp} Class 0, 6, 5	S_{t} Class 0 6 5		
over	incl.	high	low	max	max		
—	18	0	-8	6	10	5	3
18	30	0	-10	8	10	5	3
30	50	0	-12	9	10	6	3
50	80	0	-15	11	10	7	4
80	120	0	-20	15	15	8	4
120	180	0	-25	19	15	9	5

Table 2 (2) Tolerance and allowable values of outer rings
Unit: μm

Nominal diameter of bearing D (mm)		Δ_{Dmp} Class 0, 6, 5		V_{Dp} Class 0, 6, 5	$S_{\text{t}}^{(1)}$ Class 0 6 5		
over	incl.	high	low	max	max		
18	30	0	-13	10	According to the allowable value of S_{t} against " d " of the same bearing.		
30	50	0	-16	12			
50	80	0	-19	14			
80	120	0	-22	17			
120	180	0	-25	19			
180	250	0	-30	23			

1) To be used for flat seat bearings

Table 2 (3) Tolerance

Unit: mm

Bearing parts	Type symbol	Dimensional symbol	Tolerance
Thrust needle roller and cage assemblies	K811 K812 K893	Bore diameter D Outer diameter D'_{c} Height D_w	E11 ¹⁾ a13
Inner rings	WS811 WS812 WS893	Height B	h11
Outer rings	GS811 GS812 GS893	Height B	h11

1) Bearing cages with the symbol "T2" attached to the nominal product numbers are Type E12 cages.

Table 3 Recommended fitting conditions

Recommended parts		Types and grades	
		Bore diameter	Housing holes
K811	Bore diameter guiding	h8 ¹⁾	—
	Outer diameter guiding	—	H9 ¹⁾
K812, K893	Bore diameter guiding	h8 ¹⁾	—
	Outer diameter ²⁾ guiding	—	H11
Inner rings	WS811, WS812, WS893	h6 (h8)	—
Outer rings	GS811, GS812, GS893	—	H7 (H9)

1) It is recommendable to finish the guide surface by grinding in order to guide the cage correctly.

2) To be applied only for low speed operations or vibrating conditions.

Double direction angular contact thrust ball bearings

The structure of the double direction angular contact thrust ball bearings is made by combining the angular ball bearings in a back-to-back mounting so that the bearings can support axial loads in either direction. As the contact angle is 60° , the bearings have a high axial rigidity.

Since the double direction angular contact thrust ball bearing has high rotational accuracy, they are used especially for handling the axial loads from the main shafts of machine tools by combining them with double row cylindrical bearings of Type NN49 (NNU499) or NN30 having the same diameter.

As for the cages, machined cages made of copper alloy are used in these bearings.

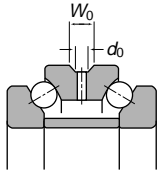


Table 4 Dimensions of oil grooves and oil holes

Unit: mm

Outside diameter D		Oil groove W_0		Oil hole d_0	
over	incl.	Bearing series		Bearing series	
		5629	5620	5629	5620
—	50	—	4.5	—	2
50	80	—	6	—	3
80	150	8	8	4	4
150	200	8	12	4	6
200	210	12	12	6	6
210	260	12	14	6	6
260	320	14	16	6	8
320	400	16	22	8	12
400	480	22	22	12	12

Spherical roller thrust bearings

This bearing design is similar to that of the radial spherical roller bearing design with the exception that it consists of only one row of rollers and a particularly large contact angle. Since the spherical roller thrust bearings use barrel-shaped rollers as rolling elements, they have a self-aligning nature. This bearing can allow some mounting error and shaft deflection (please refer to Fig. 3).

Thrust ball bearings

When large axial loads are applied, a certain amount of radial load can also be handled. However, it is necessary to use these bearings where the load conditions meet $F_r/F_a \leq 0.55$.

Machined cages made of copper alloy are used in these bearings.

Oil lubrication is used with these bearings.

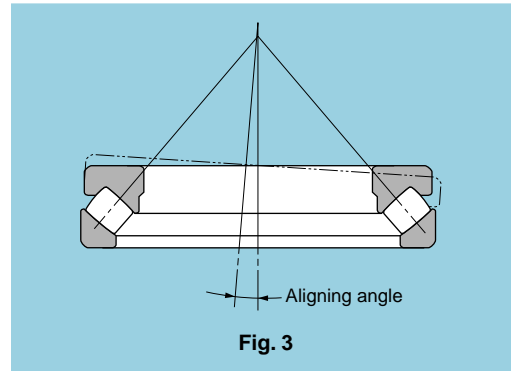


Fig. 3