

701-8848

Thrust Roller Bearings

NTN Thrust Roller Bearings incorporate a roller and cage thrust assembly, which has needle rollers or cylindrical rollers radially arranged in a cage, and a disc-shaped bearing washer. It can carry an axial load in one direction.

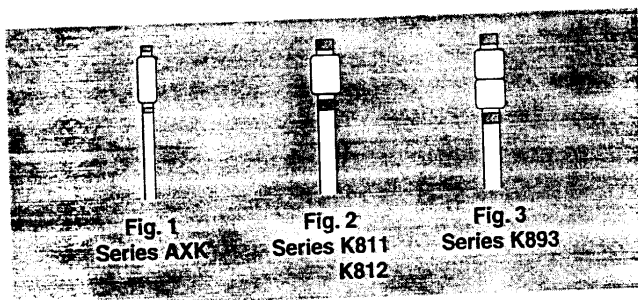
A shaft and housing can be used directly as a raceway, without the use of a bearing washer. This arrangement contributes to the design of compact, lightweight machinery featuring a low profile.

Theoretically, a perfect rolling motion is impossible with this type of thrust roller bearing because slippage occurs on the raceway surface. However, this phenomenon poses no problem in most practical bearing applications, and the bearing is capable of relatively high-speed operation.

Types and designs

NTN Roller and Cage Thrust Assemblies are available in the **series AXK**, which has needle rollers; and in **series K811, K812, and K893**, each of which incorporates cylindrical rollers. Each pocket of the **series K811 and K812** has a single row of cylindrical rollers, while those of **series K893** have two rows of cylindrical rollers.

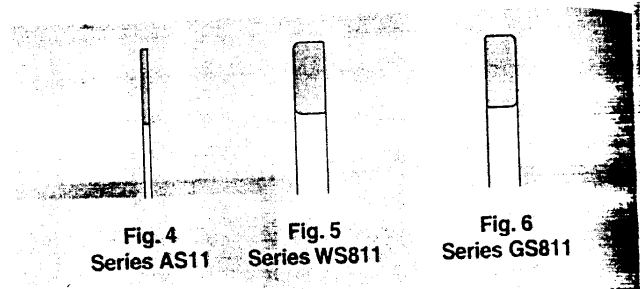
Series AXK bearings, which have needle rollers, use a pressed-steel cage. **Series K811, K812 and K893** bearings have an aluminum alloy cage as standard; they can optionally employ a pressed-steel cage (suffix **J**) or a cage of molded polyamide reinforced with glass fiber or carbon fiber (suffix **T2**). The **T2** cage features a maximum allowable operating temperature of 120°C and maximum allowable continuous operating temperature of 100°C.



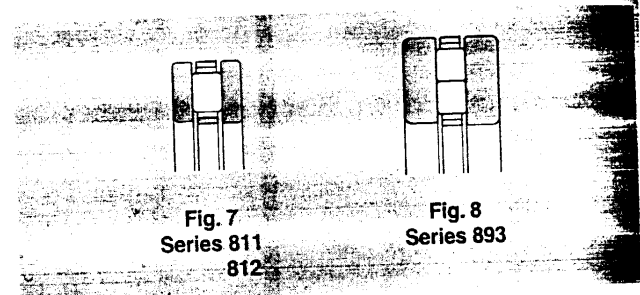
The bearing washers for NTN Thrust Roller Bearings are available in an **AS** model made of surface-hardened 1 mm-thick steel plate, and in **WS** and **GS** models, which are machined types.

The **AS** model can be used on either the shaft or housing side. This bearing washer, however, requires that the adjacent mechanical components have sufficient rigidity and good form accuracy. Before being mounted, the bearing washer may remain somewhat warped. This phenomenon should not be regarded as a problem because the warpage will be eliminated once a predetermined level of thrust load is exerted on the washer.

The bore of the **WS** model is fitted to a shaft, and the outside surface of the **GS** model is fitted to a housing. Both models therefore provide the bearings with greater rigidity and higher running accuracy.

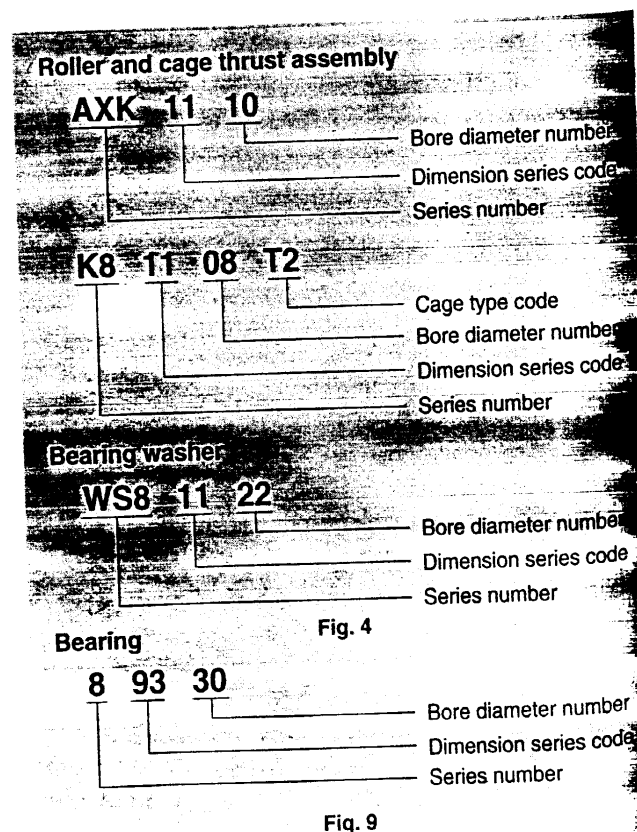


Bearing models **811, 812, and 893** are formed by respectively combining the roller and cage thrust assemblies of models **K811, K812, and K893** with the associated model **WS** or **GS** bearing washer. They are standard series bearings whose dimension series, specified in JIS B 1512 (ISO 104) (Boundary dimensions for rolling bearings), are 11, 12, and 93, respectively.



Interpreting bearing numbers

The bearing numbers of NTN Roller and Cage Thrust Assemblies, Bearing Rings, and Thrust Roller Bearings comprise a series number, dimension series code, bore diameter number, and suffix.



Bearing tolerances

The dimensional accuracy, form accuracy, and running accuracy of **series 811, 812, and 893** thrust cylindrical roller bearings are given in **Sec. 6 "Bearing Tolerances," Table 6.3, page A-30.**

The bore (D_{c1}) of roller and cage thrust assemblies (**series AXK, K811, K812, and K893**) is machined to a tolerance of E11 (or E12 for bearings having a suffix **T2**). The outside surface (D_c) of the **series AXK** is machined to a tolerance of c12, while those of the **series K811, K812, and K893** are machined to a tolerance of a13.

Raceway surface requirements

When the shaft and housing are used as a raceway for a roller and cage thrust assembly, the raceway should satisfy the requirements in **Table 1.**

Table 1 Raceway requirements

Characteristics	Requirement
Squareness (max.)	IT6 (IT4)
Surface roughness	0.4a
Surface hardness	HRC58~64
Effective depth of hardness penetration	See formula (14.1) on page A-59.

Remarks: Data in parentheses are for applications requiring greater running accuracy.

Guiding of cages

To respond to the centering phenomenon during running, the roller and cage thrust assemblies (**series AXK, K811, K812, and K893**) must be guided with their bore (shaft side) or outside surface (housing side).

Generally, the bore is often employed for guiding because of lower velocity relative to the cage. In particular, guiding with the bore should be selected for high-speed applications. To guide a cage, the dimensional tolerances for the shaft and housing should be h8 with the shaft diameter (bore guide) and H9 with the housing bore diameter (outside surface guide). The guide surface must be finish-ground.

Bearing washer fits

The fits of the shafts and housing that mount the thrust bearing washers (**AS, WS, and GS** models) are given in **Table 2** below.

Table 2 Fit to shaft and housing

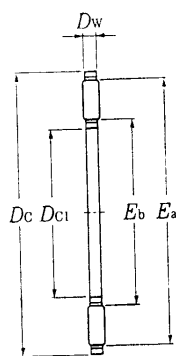
Bearing washer	Shaft	Housing
Series AS	h10	H11
Series WS	h6	—
Series GS	—	H7

Mounting dimensions

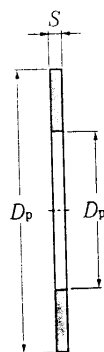
The mounting dimensions for a shaft and housing to which model **WS** and **GS** bearing washers are installed are summarized in the associated bearing tables.

The surface to which an **AS** model bearing ring is mounted must be uniformly flat and rigid enough to support the whole bearing ring face.

Type AXK11
Type AS11
Type WS811
Type GS811



Type AXK
(Thrust needle roller
and cage assembly)



Type AS race rings
(Washer)

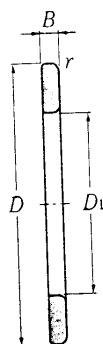


Type WS race rings
(Inner ring)

D_{ci} 10~140mm

Boundary dimensions											Basic load ratings				
D_{ci}	D_c	D_w	D_p	D_{p1}	$S^{2)}$	d	d_1	D	D_1	B	$r_{s \min}^1)$	dynamic N	static N	dynamic kgf	static kgf
E11	c12	$\begin{smallmatrix} 0 \\ -0.01 \end{smallmatrix}$	e13	E12	± 0.05	$\begin{smallmatrix} 0.2 \\ -0.5 \end{smallmatrix}$			$\begin{smallmatrix} +0.5 \\ +0.2 \end{smallmatrix}$			C_a	C_{oa}	C_a	C_{oa}
10	24	2	24	10	1	10	24	24	10	$\begin{smallmatrix} 2.75 \\ -0.060 \end{smallmatrix}$	0.3	9 150	25 300	935	2 580
12	26	2	26	12	1	12	26	26	12	$\begin{smallmatrix} 2.75 \\ -0.060 \end{smallmatrix}$	0.3	9 850	28 900	1 010	2 940
15	28	2	28	15	1	15	28	28	16	$\begin{smallmatrix} 2.75 \\ -0.060 \end{smallmatrix}$	0.3	11 300	36 000	1 150	3 700
17	30	2	30	17	1	17	30	30	18	$\begin{smallmatrix} 2.75 \\ -0.060 \end{smallmatrix}$	0.3	11 900	39 500	1 220	4 050
20	35	2	35	20	1	20	35	35	21	$\begin{smallmatrix} 2.75 \\ -0.060 \end{smallmatrix}$	0.3	13 200	46 500	1 340	4 750
25	42	2	42	25	1	25	42	42	26	$\begin{smallmatrix} 3 \\ -0.060 \end{smallmatrix}$	0.6	14 600	58 000	1 490	5 900
30	47	2	47	30	1	30	47	47	32	$\begin{smallmatrix} 3 \\ -0.060 \end{smallmatrix}$	0.6	16 300	69 500	1 660	7 100
35	52	2	52	35	1	35	52	52	37	$\begin{smallmatrix} 3.5 \\ -0.075 \end{smallmatrix}$	0.6	17 800	81 500	1 820	8 300
40	60	3	60	40	1	40	60	60	42	$\begin{smallmatrix} 3.5 \\ -0.075 \end{smallmatrix}$	0.6	27 400	110 000	2 790	11 300
45	65	3	65	45	1	45	65	65	47	$\begin{smallmatrix} 4 \\ -0.075 \end{smallmatrix}$	0.6	29 800	128 000	3 050	13 100
50	70	3	70	50	1	50	70	70	52	$\begin{smallmatrix} 4 \\ -0.075 \end{smallmatrix}$	0.6	31 500	143 000	3 250	14 500
55	78	3	78	55	1	55	78	78	57	$\begin{smallmatrix} 5 \\ -0.075 \end{smallmatrix}$	0.6	38 000	186 000	3 850	19 000
60	85	3	85	60	1	60	85	85	62	$\begin{smallmatrix} 4.75 \\ -0.075 \end{smallmatrix}$	1	44 500	234 000	4 550	23 900
65	90	3	90	65	1	65	90	90	67	$\begin{smallmatrix} 5.25 \\ -0.075 \end{smallmatrix}$	1	46 500	254 000	4 750	25 900
70	95	4	95	70	1	70	95	95	72	$\begin{smallmatrix} 5.25 \\ -0.075 \end{smallmatrix}$	1	53 500	253 000	5 500	25 800
75	100	4	100	75	1	75	100	100	77	$\begin{smallmatrix} 5.75 \\ -0.075 \end{smallmatrix}$	1	55 000	266 000	5 650	27 100
80	105	4	105	80	1	80	105	105	82	$\begin{smallmatrix} 5.75 \\ -0.075 \end{smallmatrix}$	1	56 500	279 000	5 750	28 400
85	110	4	110	85	1	85	110	110	87	$\begin{smallmatrix} 5.75 \\ -0.075 \end{smallmatrix}$	1	57 500	291 000	5 900	29 700
90	120	4	120	90	1	90	120	120	92	$\begin{smallmatrix} 6.5 \\ -0.090 \end{smallmatrix}$	1	71 000	390 000	7 250	39 500
100	135	4	135	100	1	100	135	135	102	$\begin{smallmatrix} 7 \\ -0.090 \end{smallmatrix}$	1	90 500	550 000	9 200	56 500
110	145	4	145	110	1	110	145	145	112	$\begin{smallmatrix} 7 \\ -0.090 \end{smallmatrix}$	1	93 500	590 000	9 550	60 500
120	155	4	155	120	1	120	155	155	122	$\begin{smallmatrix} 7 \\ -0.090 \end{smallmatrix}$	1	99 000	650 000	10 100	66 500
130	170	5	170	130	1	130	170	170	132	$\begin{smallmatrix} 9 \\ -0.090 \end{smallmatrix}$	1	140 000	900 000	14 300	92 000
140	180	5	180	140	1	140	178	180	142	$\begin{smallmatrix} 9.5 \\ -0.090 \end{smallmatrix}$	1	145 000	960 000	14 800	97 500

¹⁾ Minimum dimensions of the chamfer dimension r .



Type GS race rings
(Outer ring)

Limiting speeds			Bearing numbers				Reference dimensions		Mass		
rpm	grease	oil	thrust needle roller and cage assembly (*consistant with cylindrical)	washer	inner ring	outer ring	mm		AXK11	AS11	WS811 GS811
							E _b	E _a			
3 500		14 000	AXK1100	AS1100	WS81100	GS81100	11	21	0.0028	0.003	0.008
3 300		13 000	AXK1101	AS1101	WS81101	GS81101	13	23	0.003	0.0033	0.009
2 800		11 000	AXK1102	AS1102	WS81102	GS81102	17	27	0.0035	0.0035	0.01
2 500		10 000	AXK1103	AS1103	WS81103	GS81103	19	29	0.004	0.0038	0.011
2 100		8 500	AXK1104	AS1104	WS81104	GS81104	22	34	0.005	0.0051	0.014
1 800		7 000	AXK1105	AS1105	WS81105	GS81105	29	41	0.007	0.007	0.021
1 500		6 000	AXK1106	AS1106	WS81106	GS81106	35	46	0.008	0.008	0.025
1 400		5 500	AXK1107	AS1107	WS81107	GS81107	40	51	0.001	0.0091	0.033
1 200		4 700	AXK1108	AS1108	WS81108	GS81108	45	58	0.0185	0.0123	0.044
1 100		4 300	AXK1109	AS1109	WS81109	GS81109	50	63	0.0205	0.0136	0.055
1 000		3 900	AXK1110	AS1110	WS81110	GS81110	55	68	0.0235	0.0148	0.06
900		3 500	AXK1111	AS1111	WS81111	GS81111	60	76	0.0308	0.0189	0.095
800		3 200	AXK1112	AS1112	WS81112	GS81112	65	83	0.0390	0.0223	0.101
750		3 000	AXK1113	AS1113	WS81113	GS81113	70	88	0.04	0.0239	0.125
750		2 900	AXK1114	AS1114	WS81114	GS81114	74	93	0.06	0.0254	0.134
700		2 700	AXK1115	AS1115	WS81115	GS81115	79	98	0.061	0.027	0.155
650		2 600	AXK1116	AS1116	WS81116	GS81116	84	103	0.063	0.0284	0.163
600		2 400	AXK1117	AS1117	WS81117	GS81117	89	108	0.0668	0.0301	0.175
600		2 300	AXK1118	AS1118	WS81118	GS81118	94	118	0.086	0.0388	0.25
500		2 000	AXK1120	AS1120	WS81120	GS81120	105	133	0.112	0.0505	0.35
480		1 900	AXK1122	AS1122	WS81122	GS81122	115	143	0.122	0.0549	0.385
430		1 700	AXK1124	AS1124	WS81124	GS81124	125	153	0.131	0.0592	0.415
400		1 600	AXK1126	AS1126	WS81126	GS81126	136	167	0.205	0.074	0.663
380		1 500	AXK1128	AS1128	WS81128	GS81128	146	177	0.219	0.079	0.749