

5. Tapered Roller Bearings



Tapered Roller Bearings

Tapered roller bearings

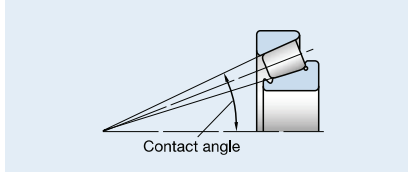
Tapered Roller Bearings	158-161
Features	
Numbering System	
Bearing Tables	

5. Tapered Roller Bearings

Tapered Roller Bearings

Design, Types and Features

Tapered roller bearings are designed so that the apices of the cones formed by the raceways of the cone and cup and the conical rollers all coincide at one point on the central axis of the bearing. When a radial load is imposed, an axial force also occurs; therefore, it is necessary to use two bearings in opposition or some other multiple arrangement.



The suffix J after the basic number of some high load capacity bearings (HR series) indicates that the cup back face raceway diameter, cup width, and contact angle conform to ISO specifications. Therefore, the cone assembly and cup of bearings with the same basic number suffixed with J are internationally interchangeable.

Design and Features of Combinations of Tapered Roller Bearings

Figure	Arrangement	Examples of Bearing No.	Features
	Back-to-back	HR32920JDB+KLR30	Two standard bearings are combined. The bearing clearances are adjusted by cone spacers or cup spacers. The cones, cups and spacers are marked with serial numbers as well as symbols for matching. Components with the same serial number need to be assembled with regard to these matching symbols.
	Face-to-face	HR32920JDF+KR	

Dimensions Related to Mounting

The dimensions related to mounting tapered roller bearings are listed in the bearing tables. Since the cages protrude from the ring faces of tapered roller bearings, please use care when designing shafts and housings.

When heavy axial loads are imposed, the shaft shoulder dimensions and strength must be sufficient to support the cone rib.

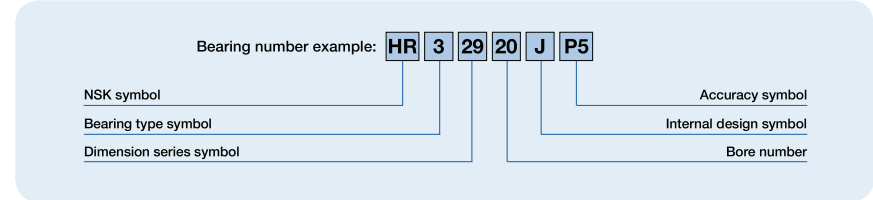
Permissible Misalignment

The permissible misalignment angle for tapered roller bearings is approximately 0.0009 radian (3').

Limiting Speeds

The limiting speeds listed in the bearing tables should be adjusted depending on the bearing load conditions. For more details, please contact NSK.

Numbering System of Tapered Roller Bearings

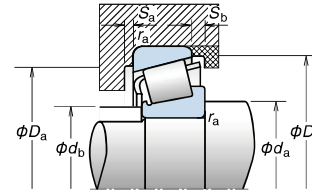
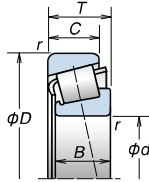


HR	NSK symbol	HR: High load capacity
3	Bearing type	3: Tapered roller bearing
29	Dimension series	20: 20 Series 29: 29 Series
20	Bore number	Bearing bore = Bore number x5 (mm)
J	Internal design	X: Bearing boundary dimensions conform to ISO specifications (20 Series) J: Cup back face raceway diameter, cup width, and contact angle conform to ISO specifications
P5	Accuracy	P5: ISO Class 5, P4: ISO Class 4

5. Tapered Roller Bearings

Bore Diameter **100-360 mm**

Single-Row Tapered Roller Bearings



Dynamic Equivalent Load
 $P = X F_r + Y F_a$

$F_a/F_r \leq e$		$F_a/F_r > e$	
X	Y	X	Y
1	0	0.4	Y_1

Static Equivalent Load
 $P_0 = 0.5 F_r + Y_0 F_a$

When $F_r > 0.5 F_r + Y_0 F_a$, use $P_0 = F_r$.

The values of e , Y_1 and Y_0 given in the table below.

Bearing Numbers	Boundary Dimensions (mm)							Basic Load Ratings (kN)		Effective Load Center (mm) a	Mass (kg) (approx.)	Limiting Speeds (min ⁻¹)	
	d	D	T	B	C	Cone	Cup	C _r (Dynamic)	C _{0r} (Static)			Grease	Oil
						r (min.)	r (min.)						
HR32020XJ	100	150	32	32	24	2	1.5	176	294	32.5	1.95	2 200	3 000
HR32920J	100	140	25	25	20	1.5	1.5	117	205	24.2	1.18	2 200	3 200
HR32021XJ	105	160	35	35	26	2.5	2	204	340	34.3	2.48	2 000	2 800
HR32921J	105	145	25	25	20	1.5	1.5	119	212	25.3	1.23	2 200	3 000
HR32022XJ	110	170	38	38	29	2.5	2	236	390	35.9	3.09	2 000	2 600
HR32922J	110	150	25	25	20	1.5	1.5	123	224	26.5	1.29	2 200	2 800
HR32024XJ	120	180	38	38	29	2.5	2	242	405	39.7	3.27	1 800	2 400
HR32924J	120	165	29	29	23	1.5	1.5	161	291	29.2	1.8	1 900	2 600
HR32026XJ	130	200	45	45	34	2.5	2	320	535	43.9	5.06	1 600	2 200
HR32028XJ	140	210	45	45	34	2.5	2	325	555	46.6	5.32	1 600	2 200
HR32928J	140	190	32	32	25	2	1.5	206	390	33.6	2.64	1 700	2 200
HR32030XJ	150	225	48	48	36	3	2.5	375	650	49.8	6.6	1 400	2 000
HR32032XJ	160	240	51	51	38	3	2.5	425	750	53.0	7.93	1 300	1 800
HR32932J	160	220	38	38	30	2.5	2	296	570	38.7	4.32	1 400	1 900
HR32034XJ	170	260	57	57	43	3	2.5	505	890	56.6	10.6	1 200	1 700
HR32934J	170	230	38	38	30	2.5	2	294	560	41.7	4.44	1 400	1 800
HR32036XJ	180	280	64	64	48	3	2.5	640	1 130	60.4	14.3	1 200	1 600
HR32936J	180	250	45	45	34	2.5	2	350	685	53.9	6.56	1 300	1 700
HR32038XJ	190	290	64	64	48	3	2.5	650	1 170	63.4	14.9	1 100	1 500
HR32938J	190	260	45	45	34	2.5	2	365	715	55.3	6.83	1 200	1 600
HR32040XJ	200	310	70	70	53	3	2.5	760	1 370	67.4	18.9	1 000	1 400
HR32940J	200	280	51	51	39	3	2.5	480	935	54.2	9.65	1 100	1 500
HR32044XJ	220	340	76	76	57	4	3	885	1 610	73.6	24.4	950	1 300
HR32944J	220	300	51	51	39	3	2.5	490	990	59.2	10.3	1 000	1 400
HR32048XJ	240	360	76	76	57	4	3	920	1 730	79.1	26.2	850	1 200
HR32948J	240	320	51	51	39	3	2.5	500	1 040	65.1	11.1	950	1 300
HR32052XJ	260	400	87	87	65	5	4	1 160	2 160	86.3	38.5	800	1 100
HR32952J	260	360	63.5	63.5	48	3	2.5	730	1 450	69.8	18.6	850	1 100
HR32056XJ	280	420	87	87	65	5	4	1 180	2 240	91.6	40.6	710	1 000
HR32956J	280	380	63.5	63.5	48	3	2.5	765	1 580	75.3	20	800	1 100
HR32060XJ	300	460	100	100	74	5	4	1 440	2 700	98.4	56.6	670	900
HR32960J	300	420	76	76	57	4	3	1 010	2 100	79.9	31.4	710	950
HR32064XJ	320	480	100	100	74	5	4	1 510	2 910	104.5	60	630	850
HR32972J	360	480	76	76	57	4	3	1 080	2 340	96.8	36.1	560	800

Constant e	Axial Load Factors		Abutment and Fillet Dimensions (mm)									
			d _a (min.)	d _s (max.)	D _a		D _b (min.)	S _a (min.)	S _b (min.)	内輪 r _a (max.)	外輪 r _a (max.)	
	(max.)	(min.)										
0.46	1.3	0.72	112	109	141	136	144	6	8	2	1.5	
0.33	1.8	1.0	111	109	132	132	134	5	5	1.5	1.5	
0.44	1.4	0.74	120	115	150	144	154	6	9	2	2	
0.34	1.8	0.96	116	114	137	137	140	5	5	1.5	1.5	
0.43	1.4	0.77	125	121	160	153	163	7	9	2	2	
0.36	1.7	0.93	121	119	142	142	145	5	5	1.5	1.5	
0.46	1.3	0.72	135	131	170	162	173	7	9	2	2	
0.35	1.7	0.95	131	129	156	155	160	6	6	1.5	1.5	
0.43	1.4	0.76	145	144	190	179	192	8	11	2	2	
0.46	1.3	0.72	155	152	200	189	202	8	11	2	2	
0.36	1.7	0.92	152	150	180	178	184	6	7	2	1.5	
0.46	1.3	0.72	168	164	213	202	216	8	12	2.5	2	
0.46	1.3	0.72	178	175	228	216	231	8	13	2.5	2	
0.35	1.7	0.95	175	173	208	206	212	7	8	2	2	
0.44	1.4	0.74	188	187	248	232	249	10	14	2.5	2	
0.38	1.6	0.86	185	180	218	215	222	7	8	2	2	
0.42	1.4	0.78	198	199	268	248	267	10	16	2.5	2	
0.48	1.3	0.69	195	192	240	227	241	8	11	2	2	
0.44	1.4	0.75	208	209	278	258	279	10	16	2.5	2	
0.48	1.3	0.69	205	201	250	237	251	8	11	2	2	
0.43	1.4	0.77	218	221	298	277	297	11	17	2.5	2	
0.39	1.5	0.84	218	216	268	258	271	9	12	2.5	2	
0.43	1.4	0.77	241	244	326	303	326	12	19	3	2.5	
0.43	1.4	0.78	238	235	288	278	293	9	12	2.5	2	
0.46	1.3	0.72	261	262	346	321	346	12	19	3	2.5	
0.46	1.3	0.72	258	255	308	297	314	9	12	2.5	2	
0.43	1.4	0.76	287	287	382	357	383	14	22	4	3	
0.41	1.5	0.81	278	278	348	333	347	11	15.5	2.5	2	
0.46	1.3	0.72	307	305	402	374	402	14	22	4	3	
0.43	1.4	0.76	298	297	368	352	368	12	15.5	2.5	2	
0.43	1.4	0.76	327	330	442	408	439	15	26	4	3	
0.39	1.5	0.84	321	324	406	387	405	13	19	3	2.5	
0.46	1.3	0.72	347	350	462	430	461	15	26	4	3	
0.46	1.3	0.72	381	381	466	445	466	13	19	3	2.5	

Tapered roller bearings