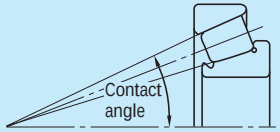
TAPERED ROLLER BEARINGS

DESIGN, TYPES, AND FEATURES

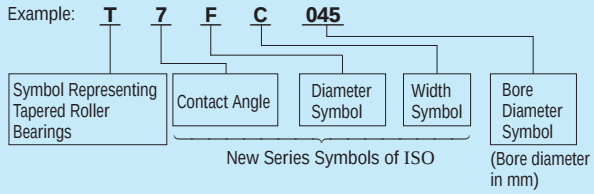


Tapered roller bearings are designed so the apices of the cones formed by the raceways of the cone and cup and the conical rollers all coincide at one point on the axis of the bearing. When a radial load is imposed, an axial force component occurs; therefore, it is necessary to use two bearings in opposition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

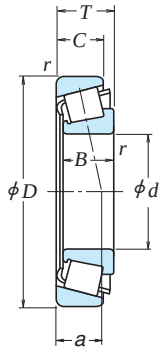
For metric-design medium-angle and steep-angle tapered roller bearings, the respective contact angle symbol C or D is added after the bore number. For normal-angle tapered roller bearings, no contact angle symbol is used. Medium-angle tapered roller bearings are primarily used for the pinion shafts of differential gears of automobiles.

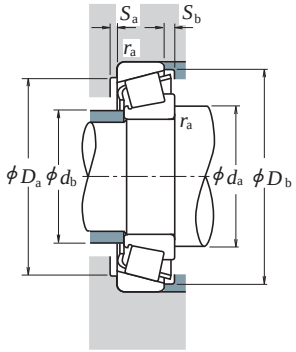
Among those with high load capacity(HR series), some bearings have the basic number suffixed by J to conform to the specifications of ISO for the cup back face raceway diameter, cup width, and contact angle. Therefore, the cone assembly and cup of bearings with the same basic number suffixed by J are internationally interchangeable.

Among metric-design tapered roller bearings specified by ISO 355, there are those having new dimensions that are different than the dimension series 3XX used in the past. Part of them are listed in the bearing tables. They conform to the specifications of ISO for the smaller end diameter of the cup and contact angle. The cone and cup assemblies are internationally interchangeable. The bearing number formulation, which is different than that for past metric design, is as follows:



Bore Diameter 30 – 35 mm





Dynamic Equivalent Load

$P = XF_r + YF_a$

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

Static Equivalent Load

$P_0 = 0.5F_r + Y_0F_a$

When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

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

d	D	T	B	C	Cone r min.	Cup r min.	Basic Load Ratings (N) C_r	C_{0r}	Basic Load Ratings {kgf} C_r	C_{0r}	Limiting Speeds (min⁻¹) Grease	Oil
30	47	12	12	9	0.3	0.3	17 600	24 400	1 800	2 490	7 500	10 000
	55	17	17	13	1	1	36 000	44 500	3 700	4 550	6 700	9 000
	55	20	20	16	1	1	42 000	54 000	4 250	5 500	6 700	9 000
	62	17.25	16	14	1	1	43 000	47 500	4 400	4 850	6 000	8 000
	62	17.25	16	12	1	1	35 500	37 000	3 650	3 800	5 600	7 500
	62	21.25	20	17	1	1	52 000	60 000	5 300	6 150	6 000	8 500
	62	21.25	20	16	1	1	48 000	56 000	4 900	5 750	6 000	8 000
	62	25	25	19.5	1	1	66 500	79 500	6 800	8 100	6 000	8 000
	72	20.75	19	16	1.5	1.5	59 500	60 000	6 050	6 100	5 300	7 500
	72	20.75	19	14	1.5	1.5	56 500	55 500	5 800	5 650	5 300	7 100
	72	20.75	19	14	1.5	1.5	49 000	52 500	5 000	5 350	4 800	6 700
	72	20.75	19	14	1.5	1.5	49 000	52 500	5 000	5 350	4 800	6 800
	72	28.75	27	23	1.5	1.5	80 000	88 500	8 150	9 000	5 600	7 500
	72	28.75	27	23	1.5	1.5	76 000	86 500	7 750	8 800	5 600	7 500
32	58	17	17	13	1	1	37 500	47 000	3 800	4 800	6 300	8 500
	58	21	20	16	1	1	41 000	50 000	4 150	5 100	6 300	8 500
	65	18.25	17	15	1	1	48 500	54 000	4 950	5 500	5 600	8 000
	65	18.25	17	14	1	1	45 500	52 500	4 650	5 350	5 600	7 500
	65	22.25	21	18	1	1	56 000	65 000	5 700	6 650	6 000	8 000
	65	22.25	21	17	1	1	49 500	60 000	5 050	6 100	5 600	7 500
	65	26	26	20.5	1	1	70 000	86 500	7 150	8 850	5 600	8 000
	75	21.75	20	17	1.5	1.5	56 000	56 000	5 700	5 700	5 300	7 100
35	55	14	14	11.5	0.6	0.6	27 400	39 000	2 790	3 950	6 300	8 500
	62	18	18	14	1	1	43 500	55 500	4 400	5 650	5 600	8 000
	62	21	21	17	1	1	49 000	65 000	4 950	6 650	5 600	8 000
	72	18.25	17	15	1.5	1.5	54 000	59 500	5 500	6 050	5 300	7 100
	72	18.25	17	13	1.5	1.5	47 000	54 500	4 750	5 550	5 000	6 700
	72	24.25	23	19	1.5	1.5	70 500	83 500	7 150	8 550	5 300	7 100
	72	24.25	23	18	1.5	1.5	60 500	71 500	6 200	7 300	5 000	7 100
	72	28	28	22	1.5	1.5	86 500	108 000	8 850	11 100	5 300	7 100
	80	22.75	21	18	2	1.5	76 000	79 000	7 750	8 050	4 800	6 700
	80	22.75	21	16	2	1.5	68 000	70 500	6 900	7 200	4 800	6 300
	80	22.75	21	15	2	1.5	62 000	68 000	6 350	6 950	4 300	6 000
	80	22.75	21	15	2	1.5	62 000	68 000	6 350	6 950	4 300	6 000
	80	32.75	31	25	2	1.5	99 000	111 000	10 100	11 300	5 000	6 700

Bearing Numbers	ISO355 Dimension Series approx.	Abutment and Fillet Dimensions (mm) d_a min.	d_b max.	D_a max.	D_a min.	D_b min.	S_a min.	S_b min.	Cone r_a max.	Cup r_a max.	Eff. Load Centers (mm) a	Constant e	Axial Load Factors Y_1	Y_0	Mass (kg) approx.
HR 32906 J	2BD	34	34	44	42	44	3	3	0.3	0.3	9.2	0.32	1.9	1.0	0.074
HR 32006 XJ	4CC	39	35	49	47	53	3	4	1	1	13.5	0.43	1.4	0.77	0.172
HR 33006 J	2CE	39	35	49	48	52	3	4	1	1	13.1	0.29	2.1	1.1	0.208
HR 30206 J	3DB	39	37	56	52	58	2	3	1	1	13.9	0.37	1.6	0.88	0.238
HR 30206 C	—	39	36	56	49	59	2	5	1	1	17.8	0.68	0.88	0.49	0.221
HR 32206 J	3DC	39	36	56	51	58.5	2	4	1	1	15.4	0.37	1.6	0.88	0.297
HR 32206 C	—	39	35	56	48	59	2	5	1	1	17.8	0.55	1.1	0.60	0.293
HR 33206 J	2DE	39	35	56	52	59.5	5	5.5	1	1	16.1	0.34	1.8	0.97	0.355
HR 30306 J	2FB	41	40	63	62	66	3	4.5	1.5	1.5	15.1	0.32	1.9	1.1	0.403
HR 30306 C	—	41	38	63	59	67	3	6.5	1.5	1.5	18.5	0.55	1.1	0.60	0.383
HR 30306 DJ	(7FB)	44	40	63	55	68	3	6.5	1.5	1.5	23.1	0.83	0.73	0.40	0.393
HR 31306 J	7FB	44	40	63	55	68	3	6.5	1.5	1.5	23.1	0.83	0.73	0.40	0.393
HR 32306 J	2FD	43	38	63	59	66	3	5.5	1.5	1.5	18.0	0.32	1.9	1.1	0.57
HR 32306 CJ	5FD	43	36	63	54	68	3	5.5	1.5	1.5	22.0	0.55	1.1	0.60	0.583
HR 320/32 XJ	4CC	41	37	52	49	55	3	4	1	1	14.2	0.45	1.3	0.73	0.191
330/32	—	41	37	52	50	55	2	4	1	1	13.8	0.31	1.9	1.1	0.225
HR 302/32	—	41	39	59	56	61	3	3	1	1	14.7	0.37	1.6	0.88	0.277
HR 302/32 C	—	41	39	59	54	62	3	4	1	1	16.9	0.55	1.1	0.60	0.273
HR 322/32	—	41	38	59	54	61	3	4	1	1	15.9	0.37	1.6	0.88	0.336
HR 322/32 C	—	41	39	59	51	62	3	5	1	1	20.2	0.59	1.0	0.56	0.335
HR 332/32 J	2DE	41	38	59	55	62	5	5.5	1	1	17.0	0.35	1.7	0.95	0.40
303/32	—	44	42	66	64	68	3	4.5	1.5	1.5	15.9	0.33	1.8	1.0	0.435
HR 32907 J	2BD	43	40	50	50	52.5	3	2.5	0.6	0.6	10.7	0.29	2.1	1.1	0.123
HR 32007 XJ	4CC	44	40	56	54	60	4	4	1	1	15.0	0.45	1.3	0.73	0.229
HR 33007 J	2CE	44	40	56	55	59	4	4	1	1	14.1	0.31	2.0	1.1	0.267
HR 30207 J	3DB	46	43	63	62	67	3	3	1.5	1.5	15.0	0.37	1.6	0.88	0.34
HR 30207 C	—	46	44	63	59	68	3	5	1.5	1.5	19.6	0.66	0.91	0.50	0.331
HR 32207 J	3DC	46	42	63	61	67.5	3	5	1.5	1.5	17.9	0.37	1.6	0.88	0.456
HR 32207 C	—	46	42	63	58	68.5	3	6	1.5	1.5	20.6	0.55	1.1	0.60	0.442
HR 33207 J	2DE	46	41	63	61	68	5	6	1.5	1.5	18.3	0.35	1.7	0.93	0.54
HR 30307 J	2FB	47	45	71	69	74	3	4.5	2	1.5	16.7	0.32	1.9	1.1	0.538
HR 30307 C	—	47	44	71	65	74	3	6.5	2	1.5	20.3	0.55	1.1	0.60	0.518
HR 30307 DJ	7FB	51	44	71	62	77	3	7.5	2	1.5	25.2	0.83	0.73	0.40	0.519
HR 31307 J	7FB	51	44	71	62	77	3	7.5	2	1.5	25.2	0.83	0.73	0.40	0.52
HR 32307 J	2FE	49	43	71	66	74	3	7.5	2	1.5	20.7	0.32	1.9	1.1	0.765

Remarks The suffix C represents medium-angle tapered roller bearings. Since they are designed for specific applications, please consult NSK when using bearings with suffix C.