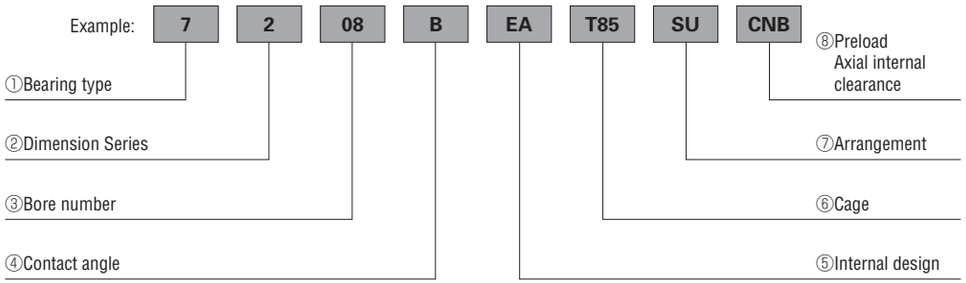
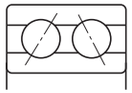
☐ Formulation of Bearing Designations

Single-Row Matched Angular Contact Ball Bearings



①Bearing type	7: Single-row angular contact ball bearings, matched angular contact ball bearings
②Dimension Series	2: 02 Series, 3: 03 Series, 9: 19 Series, 0: 10 Series
③Bore number	Bore diameter for 03 and under—00: 10 mm, 01: 12 mm, 02: 15 mm, 03: 17 mm 04 and over—Bore diameter = Bore number × 5 (mm)
④Contact angle	C: 15°, A5: 25°, A: 30°, B: 40°
⑤Internal design	EA: High Load Capacity
⑥Cage	W: Pressed steel Cage, MR: Machined brass cage (ball-guided), No designation: Machined brass cage (inner ring guided), TYN: Polyamide resin cage, T85: Polyamide 46 resin cage, T7: L-PPS resin cage
⑦Arrangement	SU: Universal arrangement (single-row), DU: Universal arrangement (double-row), DB: Back-to-back arrangement, DF: Face-to-face arrangement, DT: Tandem arrangement
⑧Preload / Axial internal clearance	EL: Extra light preload, L: Light preload, M: Medium preload, H: Heavy preload Omitted: CN clearance, C3: Clearance greater than CN, C4: Clearance greater than C3, CNB: CN Clearance equivalent (universal arrangement)

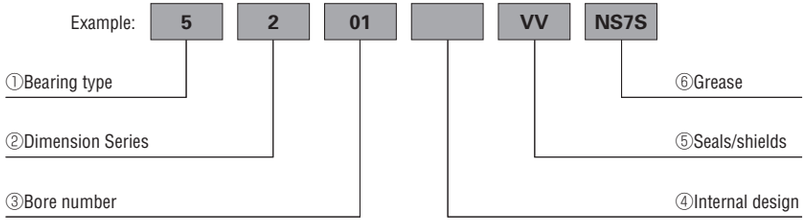


DOUBLE-ROW ANGULAR CONTACT BALL BEARINGS

Double-row angular contact ball bearings are essentially a back-to-back mounting of two single-row angular contact ball bearings, but their inner and outer rings are each integrated into one. These bearings can sustain axial loads in both directions and offer good capacity for sustaining moment loads. They are often used as fixed-end bearings and contain cages made of pressed steel.

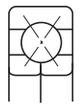
☐ Formulation of Bearing Designations

Double-Row Angular Contact Ball Bearings



①Bearing type	5: Double-row angular contact ball bearings
②Dimension Series	2: 02 Series 3: 03 Series
③Bore number	Bore diameter for 03 and under—00: 10 mm, 01: 12 mm, 02: 15 mm, 03: 17 mm 04 and over—Bore diameter = Bore number × 5 (mm)
④Internal design	ZZ: Steel shield on both sides, DDU: Rubber contact seal on both sides VV: Rubber non-contact seal on both sides
⑤Seals/shields	Z: Steel shield on one sides, DU: Rubber contact seal on one side, V: Rubber non-contact seal on one side
⑥Grease*	NS7: NS HI-LUBE

*A grease code is required when using shields or seals on both sides.



Four-Point-Contact Ball Bearings

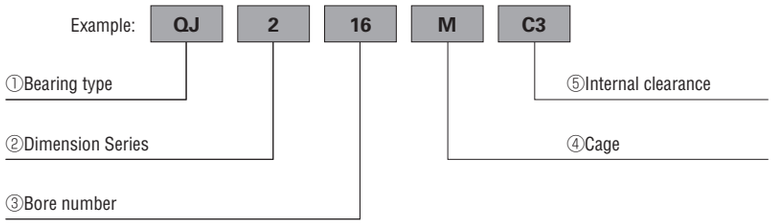
The inner ring is split radially into two pieces. This design allows one bearing to sustain significant axial loads in either direction.

The contact angle is 35°, so axial load capacity is high. These bearings are suitable for carrying pure axial loads or combined loads where axial loads are high.

The cages used are made of machined brass.

☐ Formulation of Bearing Designations

Four-Point-Contact Ball Bearings



①Bearing type	QJ: Four-point contact ball bearings
②Dimension Series	10: 10 Series, 2: 02 Series, 3: 03 Series
③Bore number	Bore diameter for 03 and under—00: 10 mm, 01: 12 mm, 02: 15 mm, 03: 17 mm 04 and over—Bore diameter = Bore number × 5 (mm)
④Cage	M: Machined-brass Cage (outer ring guided)
⑤Internal clearance	Omitted: CN clearance, C3: Clearance greater than CN, C4: Clearance greater than C3

PRECAUTIONS FOR USE OF ANGULAR CONTACT BALL BEARINGS

Under severe operating conditions where speed and temperature are close to bearing limits, lubrication is marginal, and vibration and moment loads are heavy, angular contact ball bearings may not be suitable, particularly when using certain types of cages. In such cases, please consult with NSK beforehand.

If the load on angular contact ball bearings becomes too small, or if the ratio of the axial and radial loads for matched bearings exceeds '*e*' (listed in the bearing tables) during operation, slippage occurs between the balls and raceways, which may result in smearing. This is especially true with large bearings since the weight of the balls and cage is high. If such load conditions are expected, please consult with NSK for bearing selection.

TOLERANCES AND RUNNING ACCURACY

SINGLE-ROW ANGULAR CONTACT BALL BEARINGS.....Table 7.2 (Pages A128 to A131)
HIGH-ACCURACY ANGULAR CONTACT BALL BEARINGS Tolerances: Class 6, Running Accuracy: Class 5.....Table 7.2 (Pages A128 to A131)
MATCHED ANGULAR CONTACT BALL BEARINGS.....Table 7.2 (Pages A128 to A131)
DOUBLE-ROW ANGULAR CONTACT BALL BEARINGS.....Table 7.2 (Pages A128 to A131)
FOUR-POINT-CONTACT BALL BEARINGS.....Table 7.2 (Pages A128 to A131)

RECOMMENDED FITS

SINGLE-ROW ANGULAR CONTACT BALL BEARINGS AND HIGH-ACCURACY ANGULAR CONTACT BALL BEARINGS..... Table 8.3 (Page A164)
Table 8.5 (Page A165)
MATCHED ANGULAR CONTACT BALL BEARINGS.. Table 8.3 (Page A164)
Table 8.5 (Page A165)
DOUBLE-ROW ANGULAR CONTACT BALL BEARINGS..... Table 8.3 (Page A164)
Table 8.5 (Page A165)
FOUR-POINT-CONTACT BALL BEARINGS..... Table 8.3 (Page A164)
Table 8.5 (Page A165)

INTERNAL CLEARANCES

MATCHED ANGULAR CONTACT BALL BEARINGS..... Table 8.18 (Page A174)

Matched angular contact ball bearings with precision classes over P5 are primarily used in the main spindles of machine tools; as such, they are used with a preload for rigidity. For ease of selection, internal clearances are adjusted to produce Very Light, Light, Medium, and Heavy preloads. These bearings also use a special fitting; please refer to Tables 9.1 and 9.5 (Pages A194 and A197) for more information.

The clearance (or preload) of matched bearings is obtained by axially tightening a pair of bearings till the side faces of their inner or outer rings are pressed against each other.

HIGH-ACCURACY ANGULAR CONTACT BALL BEARINGS

Axial Internal Clearance (Measured Clearances) Units : μm

Nominal Bore Diameter *d* (mm)		Axial Internal Clearance			
		CNB		GA	
over	incl.	min.	max.	min.	max.
12	**18**	17	25	–2	6
18	**30**	20	28		
30	**50**	24	32		
50	**80**	29	41	–3	9

DOUBLE-ROW ANGULAR CONTACT BALL BEARINGS

For the clearance in double-row angular contact ball bearings, please consult with NSK.

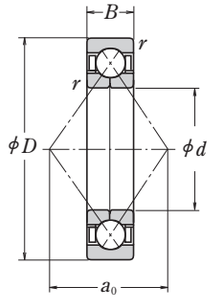
FOUR-POINT CONTACT BALL BEARINGS.....Table 8.19 (Page A174)

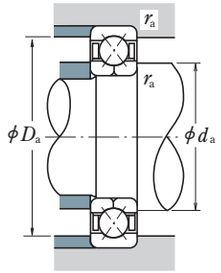
LIMITING SPEEDS (Grease/Oil)

Limiting speeds (grease/oil) listed in the bearing tables are for matched angular contact ball bearings with standard cages. Please consult NSK regarding bearings with optional cages, as limiting speeds (grease/oil) may differ from those listed. For example, limiting speeds (grease/oil) of machined cages (no designation) are 1.25 times higher than pressed cages.

FOUR-POINT-CONTACT BALL BEARINGS

Bore Diameter 30 – 95 mm





Dynamic Equivalent Load

$P_a = F_a$

Static Equivalent Load

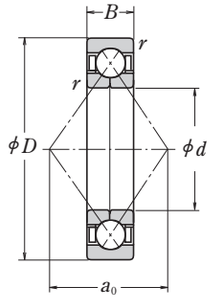
$P_{0a} = F_a$

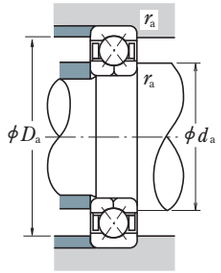
Boundary Dimensions (mm)				Basic Load Ratings (N)		Limiting Speeds (min^{-1})		Bearing Designation	Load Center Spacing (mm)	Abutment and Fillet Dimensions (mm)			Mass (kg)
d	D	B	r min.	C_a	C_{0a}	Grease	Oil		a_0	d_a min.	D_a max.	r_a max.	approx.
30	62	16	1	34 000	45 000	8 500	12 000	**QJ 206**	32.2	36	56	1	0.24
	72	19	1.1	51 000	63 000	8 000	11 000	**QJ 306**	35.7	37	65	1	0.42
35	72	17	1.1	45 000	61 500	7 500	10 000	**QJ 207**	37.5	42	65	1	0.35
	80	21	1.5	60 500	80 000	7 100	9 500	**QJ 307**	40.3	44	71	1.5	0.57
40	80	18	1.1	53 500	77 500	6 700	9 000	**QJ 208**	42.0	47	73	1	0.45
	90	23	1.5	74 000	100 000	6 300	8 500	**QJ 308**	45.5	49	81	1.5	0.78
45	85	19	1.1	60 000	88 500	6 300	8 500	**QJ 209**	45.5	52	78	1	0.52
	100	25	1.5	96 000	133 000	5 600	7 500	**QJ 309**	50.8	54	91	1.5	1.05
50	90	20	1.1	63 000	97 000	5 600	8 000	**QJ 210**	49.0	57	83	1	0.59
	110	27	2	112 000	159 000	5 000	6 700	**QJ 310**	56.0	60	100	2	1.35
55	100	21	1.5	78 000	122 000	5 300	7 100	**QJ 211**	54.3	64	91	1.5	0.77
	120	29	2	130 000	187 000	4 500	6 300	**QJ 311**	61.3	65	110	2	1.75
60	110	22	1.5	94 000	150 000	4 800	6 300	**QJ 212**	59.5	69	101	1.5	0.98
	130	31	2.1	148 000	217 000	4 300	5 600	**QJ 312**	66.5	72	118	2	2.15
65	120	23	1.5	107 000	179 000	4 300	6 000	**QJ 213**	64.8	74	111	1.5	1.2
	140	33	2.1	168 000	250 000	3 800	5 300	**QJ 313**	71.8	77	128	2	2.7
70	125	24	1.5	117 000	197 000	4 000	5 600	**QJ 214**	68.3	79	116	1.5	1.3
	150	35	2.1	189 000	285 000	3 600	5 000	**QJ 314**	77.0	82	138	2	3.18
75	130	25	1.5	121 000	212 000	3 800	5 300	**QJ 215**	71.8	84	121	1.5	1.5
	160	37	2.1	206 000	320 000	3 400	4 800	**QJ 315**	82.3	87	148	2	3.9
80	125	22	1.1	84 500	167 000	3 800	5 300	**QJ 1016**	71.8	87	118	1	1.05
	140	26	2	136 000	236 000	3 600	5 000	**QJ 216**	77.0	90	130	2	1.85
	170	39	2.1	223 000	360 000	3 200	4 300	**QJ 316**	87.5	92	158	2	4.6
85	130	22	1.1	86 500	176 000	3 800	5 000	**QJ 1017**	75.3	92	123	1	1.1
	150	28	2	157 000	276 000	3 400	4 800	**QJ 217**	82.3	95	140	2	2.2
	180	41	3	240 000	405 000	3 000	4 000	**QJ 317**	92.8	99	166	2.5	5.34
90	140	24	1.5	103 000	208 000	3 400	4 800	**QJ 1018**	80.5	99	131	1.5	1.45
	160	30	2	180 000	320 000	3 200	4 300	**QJ 218**	87.5	100	150	2	2.75
	190	43	3	258 000	450 000	2 800	3 800	**QJ 318**	98.0	104	176	2.5	6.4
95	145	24	1.5	106 000	220 000	3 400	4 500	**QJ 1019**	84.0	104	136	1.5	1.5
	170	32	2.1	195 000	340 000	3 000	4 000	**QJ 219**	92.8	107	158	2	3.35
	200	45	3	276 000	495 000	2 600	3 600	**QJ 319**	103.3	109	186	2.5	7.4

Remark Please contact NSK when using four-point contact ball bearings.

FOUR-POINT-CONTACT BALL BEARINGS

Bore Diameter 100 – 200 mm





Dynamic Equivalent Load

$P_a = F_a$

Static Equivalent Load

$P_{0a} = F_a$

Boundary Dimensions (mm)				Basic Load Ratings (N)		Limiting Speeds (min^{-1})		Bearing Designation	Load Center Spacing (mm)	Abutment and Fillet Dimensions (mm)			Mass (kg)
d	D	B	r min.	C_a	C_{0a}	Grease	Oil		a_0	d_a min.	D_a max.	r_a max.	approx.
100	150	24	1.5	108 000	232 000	3 200	4 300	**QJ 1020**	87.5	109	141	1.5	1.6
	180	34	2.1	219 000	390 000	2 800	3 800	**QJ 220**	98.0	112	168	2	4.0
	215	47	3	335 000	640 000	2 400	3 400	**QJ 320**	110.3	114	201	2.5	9.3
105	160	26	2	127 000	269 000	3 000	4 000	**QJ 1021**	92.8	115	150	2	2.0
	190	36	2.1	239 000	435 000	2 600	3 600	**QJ 221**	103.3	117	178	2	4.7
	225	49	3	335 000	640 000	2 400	3 200	**QJ 321**	115.5	119	211	2.5	10.5
110	170	28	2	153 000	315 000	2 800	3 800	**QJ 1022**	98.0	120	160	2	2.5
	200	38	2.1	259 000	490 000	2 600	3 400	**QJ 222**	108.5	122	188	2	5.6
	240	50	3	355 000	710 000	2 200	3 000	**QJ 322**	122.5	124	226	2.5	12.5
120	180	28	2	162 000	350 000	2 600	3 600	**QJ 1024**	105.0	130	170	2	2.65
	215	40	2.1	291 000	585 000	2 400	3 200	**QJ 224**	117.3	132	203	2	6.9
	260	55	3	395 000	835 000	2 000	2 800	**QJ 324**	133.0	134	246	2.5	15.4
130	200	33	2	186 000	415 000	2 400	3 200	**QJ 1026**	115.5	140	190	2	4.0
	230	40	3	300 000	635 000	2 200	3 000	**QJ 226**	126.0	144	216	2.5	7.7
	280	58	4	440 000	970 000	1 900	2 600	**QJ 326**	143.5	148	262	3	19
140	210	33	2	190 000	435 000	2 200	3 000	**QJ 1028**	122.5	150	200	2	4.3
	250	42	3	350 000	775 000	2 000	2 800	**QJ 228**	136.5	154	236	2.5	9.8
	300	62	4	480 000	1 110 000	1 700	2 400	**QJ 328**	154.0	158	282	3	24
150	225	35	2.1	217 000	505 000	2 000	2 800	**QJ 1030**	131.3	162	213	2	5.2
	270	45	3	395 000	925 000	1 800	2 600	**QJ 230**	147.0	164	256	2.5	12
	320	65	4	505 000	1 230 000	1 600	2 200	**QJ 330**	164.5	168	302	3	29
160	240	38	2.1	246 000	580 000	1 900	2 600	**QJ 1032**	140.0	172	228	2	6.4
	290	48	3	420 000	1 010 000	1 700	2 400	**QJ 232**	157.5	174	276	2.5	15
	340	68	4	555 000	1 400 000	1 500	2 000	**QJ 332**	175.1	178	322	3	31
170	260	42	2.1	295 000	705 000	1 800	2 400	**QJ 1034**	150.5	182	248	2	8.6
	310	52	4	470 000	1 180 000	1 600	2 200	**QJ 234**	168.0	188	292	3	19.5
	360	72	4	620 000	1 610 000	1 400	2 000	**QJ 334**	185.6	188	342	3	41
180	280	46	2.1	330 000	830 000	1 700	2 200	**QJ 1036**	161.0	192	268	2	11
	320	52	4	485 000	1 270 000	1 500	2 000	**QJ 236**	175.1	198	302	3	20.5
	380	75	4	655 000	1 770 000	1 300	1 800	**QJ 336**	196.1	198	362	3	48
190	290	46	2.1	355 000	925 000	1 600	2 200	**QJ 1038**	168.0	202	278	2	11.5
	340	55	4	480 000	1 290 000	1 400	2 000	**QJ 238**	185.6	208	322	3	23
	400	78	5	720 000	1 980 000	1 300	1 700	**QJ 338**	206.6	212	378	4	54.5
200	310	51	2.1	380 000	1 020 000	1 500	2 000	**QJ 1040**	178.6	212	298	2	15
	360	58	4	535 000	1 480 000	1 300	1 800	**QJ 240**	196.1	218	342	3	27
	420	80	5	760 000	2 180 000	1 200	1 600	**QJ 340**	217.1	222	398	4	61.5

Remark Please contact NSK when using four-point contact ball bearings.