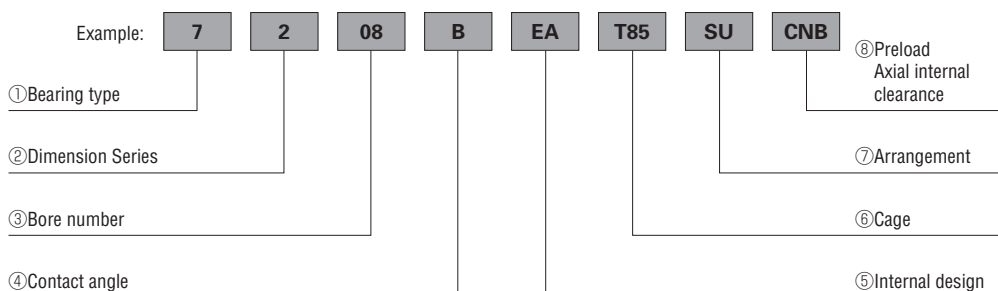
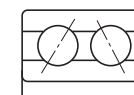


ANGULAR CONTACT BALL BEARINGS**Formulation of Bearing Designations**

Single-Row Matched Angular Contact Ball Bearings



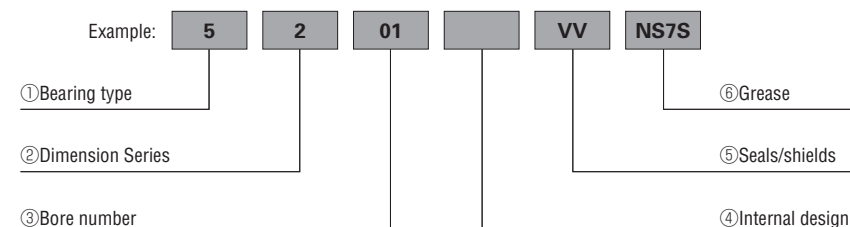
- ① Bearing type 7: Single-row angular contact ball bearings, matched angular contact ball bearings
- ② Dimension Series 2: 02 Series, 3: 03 Series, 9: 19 Series, 0: 10 Series
- ③ Bore number Bore diameter for 03 and under—00: 10 mm, 01: 12 mm, 02: 15 mm, 03: 17 mm
04 and over—Bore diameter = Bore number × 5 (mm)
- ④ Contact angle C: 15°, A5: 25°, A: 30°, B: 40°
- ⑤ Internal design EA: High Load Capacity
- ⑥ Cage 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
- ⑦ Arrangement SU: Universal arrangement (single-row), DU: Universal arrangement (double-row),
DB: Back-to-back arrangement, DF: Face-to-face arrangement, DT: Tandem arrangement
- ⑧ Preload / 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



- ① Bearing type 5: Double-row angular contact ball bearings
- ② Dimension Series 2: 02 Series 3: 03 Series
- ③ Bore 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)
- ④ Internal design ZZ: Steel shield on both sides, DDU: Rubber contact seal on both sides VV: Rubber non-contact seal on both sides
- ⑤ Seals/shields Z: Steel shield on one sides, DU: Rubber contact seal on one side, V: Rubber non-contact seal on one side
- ⑥ Grease* NS7: NS HI-LUBE

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

**Four-Point-Contact Ball Bearings**

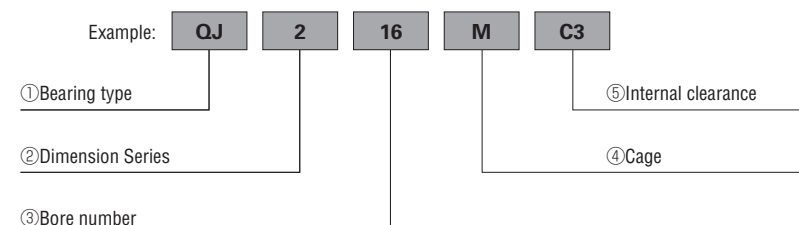
The inner ring is split radially into two pieces. This design allows one bearing to sustain significant axial loads in either direction.

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



- ① Bearing type QJ: Four-point contact ball bearings
- ② Dimension Series 10: 10 Series, 2: 02 Series, 3: 03 Series
- ③ Bore 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)
- ④ Cage M: Machined-brass Cage (outer ring guided)
- ⑤ Internal 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.

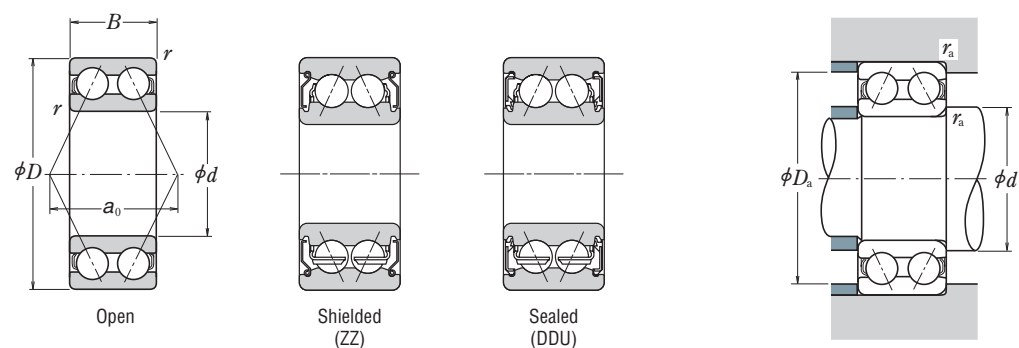
FOUR-POINT CONTACT BALL BEARINGS Table 8.19 (Page A174)

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.

DOUBLE-ROW ANGULAR CONTACT BALL BEARINGS

Bore Diameter 10 – 45 mm

**Dynamic Equivalent Load**

$$P = XF_r + YF_a$$

$F_a/F_r \leq e$		$F_a/F_r > e$		e
X	Y	X	Y	
1	0.92	0.67	1.41	0.68

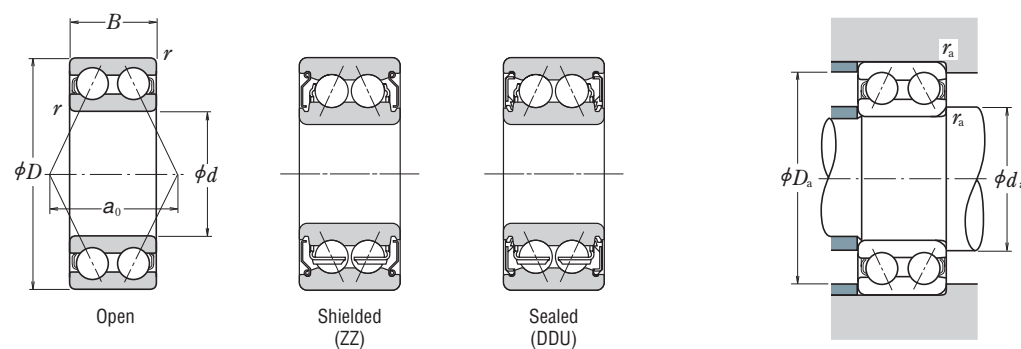
Static Equivalent Load

$$P_0 = F_r + 0.76 F_a$$

Boundary Dimensions (mm)				Basic Load Ratings (N)		Limiting Speeds (min ⁻¹)			Bearing Designations			Load Center Spacings (mm) a_0	Abutment and Fillet Dimensions (mm)			Mass (kg) approx.
d	D	B	r min.	C_r	C_{0r}	Grease Open ZZ	Oil DDU	Oil Open	Open	Shielded	Sealed		d_a min.	D_a max.	r_a max.	
10	30	14.3	0.6	7 850	3 900	17 000	—	22 000	5200	—	—	14.5	15	25	0.6	0.050
	30	14.3	0.6	7 850	3 900	17 000	15 000	—	—	5200ZZ	5200DDU	14.5	14	26	0.6	0.050
12	32	15.9	0.6	11 600	5 800	15 000	—	20 000	5201	—	—	16.7	17	27	0.6	0.060
	32	15.9	0.6	9 350	5 300	15 000	12 000	—	—	5201BZZ	5201BDDU	16.3	16	28	0.6	0.060
15	35	15.9	0.6	12 900	7 050	13 000	—	17 000	5202	—	—	18.3	20	30	0.6	0.070
	35	15.9	0.6	9 350	5 300	13 000	12 000	—	—	5202BZZ	5202BDDU	16.3	19	31	0.6	0.070
	42	19	1	19 400	10 200	11 000	—	15 000	5302	—	—	22	21	36	1	0.13
	42	19	1	16 100	9 100	11 000	10 000	—	—	5302AZZ	5302ADDU	21	21	36	1	0.13
17	40	17.5	0.6	16 100	9 050	11 000	—	15 000	5203	—	—	20.8	22	35	0.6	0.10
	40	17.5	0.6	14 000	8 300	11 000	10 000	—	—	5203AZZ	5203ADDU	20.1	21	36	0.6	0.10
	47	22.2	1	23 100	12 600	10 000	—	13 000	5303	—	—	25	23	41	1	0.18
	47	22.2	1	21 600	12 400	10 000	9 500	—	—	5303AZZ	5303ADDU	24.3	23	41	1	0.18
20	47	20.6	1	21 600	12 400	10 000	—	13 000	5204	—	—	24.3	26	41	1	0.16
	47	20.6	1	17 500	10 700	10 000	9 000	—	—	5204AZZ	5204ADDU	23	26	41	1	0.16
	52	22.2	1.1	27 100	15 000	9 000	—	12 000	5304	—	—	26.7	27	45	1	0.22
	52	22.2	1.1	21 600	12 800	9 000	8 500	—	—	5304AZZ	5304ADDU	25.4	27	45	1	0.22
25	52	20.6	1	23 400	14 700	8 500	—	11 000	5205	—	—	26.8	31	46	1	0.18
	52	20.6	1	18 600	12 300	8 500	7 500	—	—	5205BZZ	5205BDDU	25.4	31	46	1	0.18
	62	25.4	1.1	36 000	20 700	7 500	—	10 000	5305	—	—	31.8	32	55	1	0.35
	62	25.4	1.1	27 800	18 200	7 500	6 300	—	—	5305AZZ	5305ADDU	30.9	32	55	1	0.36
30	62	23.8	1	32 500	21 100	7 100	—	9 500	5206	—	—	31.6	36	56	1	0.30
	62	23.8	1	27 800	18 200	7 100	6 300	—	—	5206BZZ	5206BDDU	30.9	36	56	1	0.30
	72	30.2	1.1	45 000	28 100	6 300	—	8 500	5306	—	—	36.5	37	65	1	0.57
	72	30.2	1.1	43 000	28 700	6 300	5 300	—	—	5306AZZ	5306ADDU	36.6	37	65	1	0.57
35	72	27	1.1	43 000	28 700	6 300	—	8 000	5207	—	—	36.6	42	65	1	0.46
	72	27	1.1	37 500	25 300	6 300	5 300	—	—	5207AZZ	5207ADDU	36.3	42	65	1	0.46
	80	34.9	1.5	56 000	36 000	5 600	—	7 500	5307	—	—	41.6	44	71	1.5	0.76
	80	34.9	1.5	48 500	33 500	5 600	4 800	—	—	5307AZZ	5307ADDU	41.5	44	71	1.5	0.79
40	80	30.2	1.1	48 500	33 500	5 600	—	7 100	5208	—	—	41.5	47	73	1	0.62
	80	30.2	1.1	40 000	29 000	5 600	4 800	—	—	5208AZZ	5208ADDU	39.4	47	73	1	0.63
	90	36.5	1.5	62 500	41 000	5 300	—	6 700	5308	—	—	45.5	49	81	1.5	1.03
	90	36.5	1.5	54 500	38 000	5 300	4 500	—	—	5308AZZ	5308ADDU	43.8	49	81	1.5	1.05
45	85	30.2	1.1	54 500	38 000	5 000	—	6 700	5209	—	—	43.4	52	78	1	0.67
	85	30.2	1.1	45 500	33 500	5 000	4 300	—	—	5209A1ZZ	5209A1DDU	42.5	52	78	1	0.67
	100	39.7	1.5	75 500	51 000	4 500	—	6 000	5309	—	—	50.6	54	91	1.5	1.37

DOUBLE-ROW ANGULAR CONTACT BALL BEARINGS

Bore Diameter 50 – 85 mm

**Dynamic Equivalent Load**

$$P = XF_r + YF_a$$

$F_a/F_r \leq e$		$F_a/F_r > e$		e
X	Y	X	Y	
1	0.92	0.67	1.41	0.68

Static Equivalent Load

$$P_0 = F_r + 0.76 F_a$$

Boundary Dimensions (mm)				Basic Load Ratings (N)		Limiting Speeds (min ⁻¹)			Bearing Designations			Load Center Spacings (mm) a_0	Abutment and Fillet Dimensions (mm)			Mass (kg) approx.
d	D	B	$r_{min.}$	C_r	C_{0r}	Grease		Oil	Open	Shielded	Sealed		d_a min.	D_a max.	r_a max.	
50	90	30.2	1.1	58 500	43 500	4 800	—	6 000	5210	—	—	45.9	57	83	1	0.72
	90	30.2	1.1	44 500	36 000	4 800	4 000	—	—	5210AZZ	5210ADDU	44	57	83	1	0.73
	110	44.4	2	89 500	61 500	4 300	—	5 600	5310	—	—	55.6	60	100	2	1.84
55	100	33.3	1.5	61 500	49 000	4 300	—	5 600	5211	—	—	50.1	64	91	1.5	1.01
	100	33.3	1.5	54 500	43 500	4 300	3 600	—	—	5211AZZ	5211ADDU	49.2	64	91	1.5	1.01
	120	49.2	2	105 000	73 000	3 800	—	5 000	5311	—	—	60.6	65	110	2	2.40
60	110	36.5	1.5	76 000	62 000	3 800	—	5 000	5212	—	—	56.5	69	101	1.5	1.33
	130	54	2.1	138 000	98 500	3 400	—	4 500	5312	—	—	69.2	72	118	2	2.92
65	120	38.1	1.5	84 000	69 000	3 600	—	4 500	5213	—	—	59.7	74	111	1.5	1.71
	140	58.7	2.1	156 000	113 000	3 200	—	4 300	5313	—	—	72.8	77	128	2	3.67
70	125	39.7	1.5	103 000	82 000	3 400	—	4 500	5214	—	—	63.8	79	116	1.5	1.75
	150	63.5	2.1	175 000	128 000	3 000	—	3 800	5314	—	—	78.3	82	138	2	4.55
75	130	41.3	1.5	103 000	83 000	3 200	—	4 300	5215	—	—	66.1	84	121	1.5	1.88
80	140	44.4	2	109 000	93 000	3 000	—	3 800	5216	—	—	69.6	90	130	2	2.51
85	150	49.2	2	128 000	110 000	2 800	—	3 600	5217	—	—	75.3	95	140	2	3.16