Single Row Angular Contact Ball Bearings

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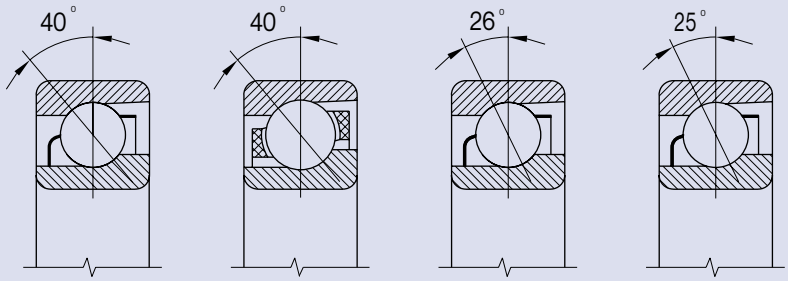
The raceways of single row angular contact ball bearings are in such a position that the connecting line of their contact points with the balls forms an acute angle with the perpendicular to the bearing axis, the so-called contact angle. The bearings of designs B or BE have the contact angle of $\alpha = 40°$ and have a number of balls with good conformity which ensures their high load rating. They can carry radial loads acting simultaneously with high thrust forces in one direction. Therefore, two bearings are usually arranged opposite each other, so that axial guiding in both directions can be achieved. Single row angular contact ball bearings are non-separable although they have only one rib on both rings.

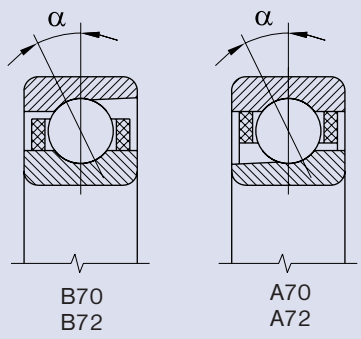
In the production of single-row angular contact ball bearings, the innovation process takes place, the output of which are bearings in new design BE with the contact angle of $\alpha = 40°$ and a solid polyamide cage containing a filler.

Until the complete introduction of bearings in BE design, a few bearing sizes in the original B-version with the contact angle of $\alpha = 40°$ and a steel – sheet cage are still manufactured. Besides, some bearing sizes in the design AA, with the contact angle of $\alpha = 26°$, are still manufactured.



Single Row Angular Contact Ball Bearings for High Frequency of Rotation

The single row angular contact ball bearings of types A70, A72 or B70 and B72 are special bearing types. These are intended for high rotational speeds. They differ from the standard angular contact ball bearings in the internal design of rings, in the contact angle magnitude, cage design and in the high accuracy class. The bearings are non-separable although the inner ring (types A70 and A72) or the outer ring (types B70 and B72) have one rib, only.



The single row angular contact ball bearings of the design CB have the contact angle of $\alpha = 10°$. These are usually manufactured within the tolerance class P4 and are intended for high accuracy, high speed applications e. g. for electric grinding spindles and devices.

The single row angular contact ball bearings of the design CA have the contact angle of $\alpha = 12°$ and the bearings of the design C have the contact angle of $\alpha = 15°$. These are manufactured within the higher tolerance classes P5 and P4. They are mostly used for machine tool spindles and for similar high-speed applications.

The single row angular contact ball bearings of the design AA have the contact angle of $\alpha = 26°$ and are manufactured within the higher tolerance classes P5 and P4. These are used in arrangements of machine tool spindles and similar high-speed applications with a relatively heavier axial load.

Boundary Dimensions

The boundary dimensions of single row angular contact ball bearings indicated in the dimension tables correspond to the International Standard ISO 15.

Cages

The single row angular contact ball bearings of types 72 and 73 in the designs B and AA are equipped with a pressed steel sheet cage which is not designated. The bearigns of series 72 and 73 in the design BE have a polyamide cage with filler (TNG).

The single row angular contact ball bearings for high rotational speeds of types A70 and A72 are equipped with a solid special textite (fabric reinforced phenolic resin) cage. It is guided on the outer ring (TA). The single row angular contact ball bearings of types B70 and B72 are equipped with a solid textite (fabric reinforced phenolic resin) cage guided on the inner ring (TB) or on the outer ring (TA).

For special applications some sizes of bearings with a solid machined brass cage guided on the inner ring are manufactured (MB).

Designation

The designation of bearings in their basic version is indicated in the dimension tables. The modification of the basic version is designated by additional symbols (prefixes and suffixes) according to STN 02 4608. The meaning of symbols most frequently used for single row angular contact ball bearings is indicated in the following table.

Symbol	Example of designation	Meaning
A...	**A**727CBTA	Inner ring with one rib
B...	**B**7202CATB P5	Outer ring with one rib
CB	B7205**CB**TB P4	Contact angle $\alpha = 10°$
CA	B7210**CA**TB P5	Contact angle $\alpha = 12°$
C	A7005**C**TA P4T	Contact angle $\alpha = 15°$
A	B7018**A**TA	Contact angle $\alpha = 25°$
AA	7202**AA**	Contact angle $\alpha = 26°$
B	7204**B** P6	Contact angle $\alpha = 40°$
BE	7302**BE**TNG	Contact angle $\alpha = 40°$, enhanced load carrying capacity
TNG	7200BE**TNG**	Solid cage made of polyamide with a filler, guided on balls
TA	B7017AA**TA** P5	Solid cage made of textite, guided on outer ring
TB	B7200CB**TB** P4T	Solid cage made of textite, guided on inner ring
MB	B4215AA**MB** P5	Solid brass cage guided on inner ring
P6	7303AA **P6**	Higher tolerance class than normal
P5	B7014AATB **P5**	Higher tolerance class than P6
P4	B7024CATB **P4**	Higher tolerance class than P5
U	B7003CTA P4**U**L	Universal bearing matching
O	B7213CATB P5**O**M	Bearing Pairs in Back-to-Back Arrangement "O"
X	B7016AATB P4**X**L	Bearing Pairs in Face-to-Face Arrangement "X"
T	B7207CATB P5**T**	Bearing Pairs in Tandem Arrangement "T"
OT	B7212CATB P5**OT**	Bearings matched in sets of three bearings, Arrangement "OT"
TTT	B7206CATB P4**TTT**	Bearings matched in sets of four bearings, Arrangement "TTT"
L	B7216AATB P5**O**L	Light preload
M	B7204CBTB P4X**M**	Medium preload
S	B7018CATB P5**O**S	Heavy preload

Tolerances

The single row angular contact ball bearings of types 72 and 73 are commonly manufactured in the standard tolerance class P0 (the symbol P0 is not indicated). For special applications requiring a high accuracy or for higher rotational speeds, these bearings are supplied in the higher tolerance classes P6 or P5. The single row angular contact ball bearings of types A70, A72, B70 and B72 with the contact angle $\alpha = 12°$ (CA), $\alpha = 15°$ (C) and $\alpha = 26°$ (AA), for high rotational speeds, are manufactured in the higher tolerance classes P5 and P4 only.

The bearings of types A72 and B72 with the contact angle $\alpha = 10°$ (CB) are manufactured only in the high tolerance class P4.

The limiting values of dimensional and runnig accuracy deviations correspond to STN ISO 492.

Internal Clearance

The single row angular contact ball bearings are usually mounted in pairs.

The suitable operating clearance or preload is adjusted during mounting and depends on the arrangement design and operating conditions.

Bearings Matched in Pairs

The single row angular contact ball bearings of types A70, A72, B70 and B72 for high rotational speeds are also supplied in matched pairs. The arrangement in pairs is suitable for applications where a high rigidity and load ratings are required. The bearings in pairs can be arranged as follows:

1. Bearing Pairs in Back-to-Back Arrangement (O)

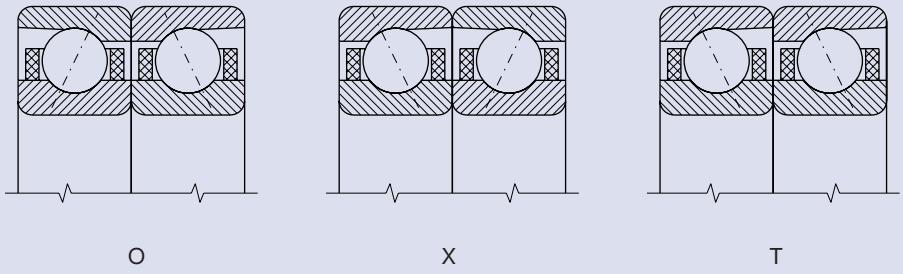
The bearing pair provides a high rigidity against tilting and can carry axial forces in both directions. These forces are always accomodated only by one of the bearings. The pair is suitable for accomodating tilting moments.

2. Bearing Pairs in Face-to-Face Arrangement (X)

The bearing pair provides slightly smaller rigidity against tilting than the back-to-back arrangement O. It is capable of carrying axial forces in both directions. However, these forces are always accomodated by one bearing of the pair, only.

3. Bearing Pairs in Tandem Arrangement (T)

The bearing pair provides a high rigidity and is suitable for carrying the axial forces acting in one direction.



The matched bearing pair is delivered in a common package. Bearings belonging to different bearing pairs are not interchangeable. The position of the greatest radial runout is marked by a line on the ring faces. The mutual bearing position in relation to each other or the order of the matched bearings is marked by lines converging in the shape "V" on the outer cylindrical surfaces of the matched pair.

The bearings are mounted in the arrangement so that the lines indicating the points of the greatest radial runout of the corresponding bearing rings (inner or outer) may lie on a line parallel to the shaft axis.

The matched bearing pairs in the arrangement O and X are supplied with light (L), medium (M) or heavy (S) axial preloads, designation, e. g. B7204CBTB P4OL or A7201AATA P5XM.
The axial preload F_p corresponds to the following equation:

$$F_p = kC_r \cdot 10^{-2}$$

where:

F_p – axial preload (kN)
C_r – radial basic dynamic load rating (the values are indicated in the dimension tables) (kN)
k – axial preload factor according to the table

The radial basic dynamic load rating of the matched pair C_{rs} is:

$$C_{rs} = 1{,}62\ C_r$$

The radial basic static load rating of the matched pair C_{ors} is:

$$C_{ors} = 2\ C_{or}$$

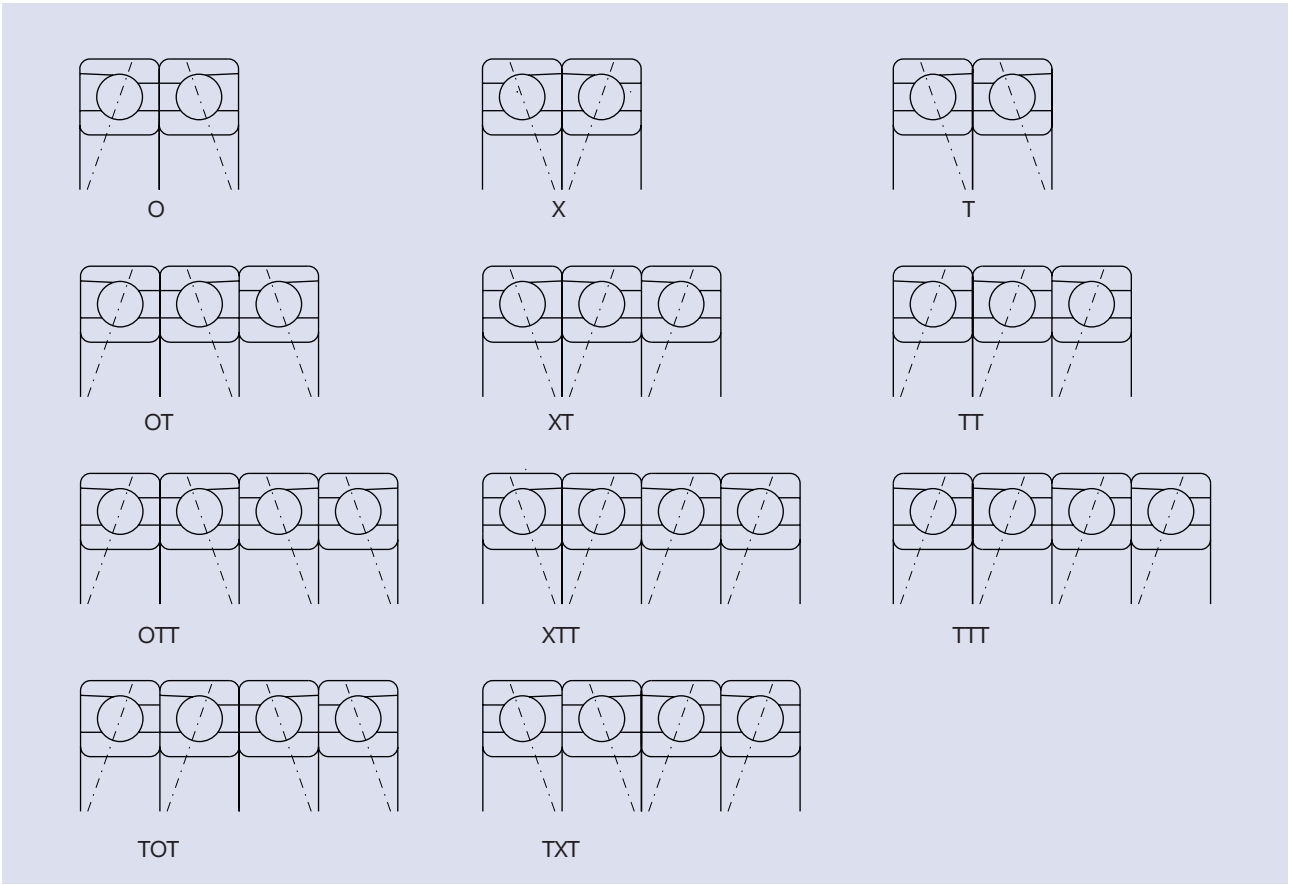
Where C_r and C_{or} are values of the radial basic load ratings in kN of the corresponding separate bearing indicated in the dimension tables. The limiting rotational speed of the matched pairs is lower than the values indicated in the dimension tables for individual bearings: namely, for the matched pairs with a light preload (L) by 20%, a medium preload (M) by 35% and a heavy preload by 60%.

Except for symbols shown in the table also U symbol is used and it indicates that respective bearings can be universally matched, e. g. B7003CTA P4UL. They are manufactured with a light prelod (UL) or a medium preload (UM) in "X" or "O" matching.

Axial Preload		Factor k			
Magnitude	Designation	Contact angle α			
		10°	12°	15°	26°
		Bearing Design			
		CB	CA	C	AA
Light	L	0,4	0,5	0,7	1,2
Medium	M	1,4	1,6	2	3,5
Heavy	S	2,8	3,2	4	7

Bearings matched in sets of three and four bearings

For special cases of accurate arrangements requiring a high rigidity and load rating single row angular contact ball bearings for high rotational speeds of types A70, A72, B70 and B72 are supplied in matched sets of three or four bearings in the arrangements OT, XT, TT, OTT, XTT, TTT, TOT and TXT.

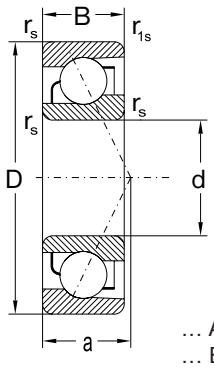


Radial Equivalent Dynamic and Static Load

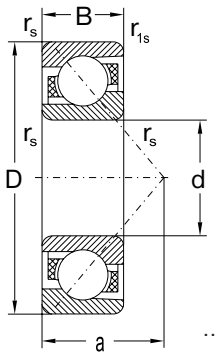
The methods of calculation are determined according to STN ISO 281 (dynamic load) and STN ISO 76 (static load).

Single Row Angular Contact Ball Bearings

d = 10 – 70 mm



… AA
… B



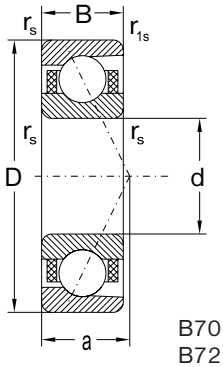
… BETNG

Dimensions						Basic load rating		Limiting speed for lubrication with		Bearing designation	Mass	Ident. symbol of the producer
d	D	B	r_s min	r_{1s} min	a	dynamic C_r	static C_{or}	grease	oil			
mm						kN		min^{-1}			kg	
10	30	9	0,6	0,3	13	6,963	3,290	21 000	28 000	**7200BETNG**	0,030	S
12	32	10	0,6	0,3	14	7,530	3,778	19 000	26 000	**7201BETNG**	0,037	S
15	35	11	0,6	0,3	12	8,970	4,875	17 000	20 000	**7202AA**	0,050	S
	35	11	0,6	0,3	16	8,040	4,368	17 000	20 000	**7202B**	0,050	S
	42	13	1	0,6	18	13,034	6,575	14 000	17 000	**7302BETNG**	0,080	S
17	47	14	1	0,6	15	15,115	7,890	12 600	15 000	**7303AA**	0,120	S
	47	14	1	0,6	20	13,795	7,200	12 600	15 000	**7303B**	0,120	S
	47	14	1	0,6	20	14,798	8,000	12 600	15 000	**7303BTNG**	0,107	S
20	47	14	1	0,6	15	14,858	8,535	12 600	15 000	**7204AA**	0,110	S
	47	14	1	0,6	21	13,307	7,645	12 600	15 000	**7204B**	0,110	S
25	62	17	1,1	0,6	27	24,380	14,570	9 400	11 000	**7305B**	0,240	S
35	80	21	1,5	1	35	36,650	24,100	7 100	8 400	**7307B**	0,480	S
40	80	18	1,1	0,6	23	37,600	26,600	7 100	8 400	**7208AA**	0,370	N
	80	18	1,1	0,6	34	36,900	24,600	7 900	9 400	**7208BETNG**	0,370	N
	90	23	1,5	1	27,2	48,200	33,500	6 300	7 500	**7308AA**	0,660	N
	90	23	1,5	1	39	44,700	30,400	7 100	8 400	**7308BETNG**	0,660	N
45	85	19	1,1	0,6	25,5	39,800	29,300	6 300	7 500	**7209AA**	0,425	N
	85	19	1,1	0,6	37	38,300	27,100	7 500	8 900	**7209BETNG**	0,425	N
	100	25	1,5	1	43	58,300	40,386	5 600	6 700	**7309B**	0,880	S
50	90	20	1,1	0,6	27	41,400	32,200	6 000	7 100	**7210AA**	0,480	N
	90	20	1,1	0,6	39	39,800	29,900	6 700	7 900	**7210BETNG**	0,480	N
55	100	21	1,5	1	29,5	52,628	40,460	5 300	6 300	**7211AA**	0,630	S, N
	120	29	2	1	51	78,742	56,380	4 700	5 600	**7311B**	1,450	S
60	110	22	1,5	1	32	63,400	50,625	5 000	6 000	**7212AA**	0,800	S, N
65	120	23	1,5	1	34	70,800	59,600	4 500	5 300	**7213AA**	1,000	N
	140	33	2,1	1,1	41	110,000	84,100	4 000	4 700	**7313AA**	2,710	N
70	150	35	2,1	1,1	44,5	123,000	96,200	3 800	4 500	**7314AA**	3,160	N

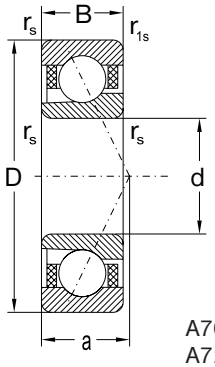
...AA $\alpha = 26°$
...B $\alpha = 40°$
...BE $\alpha = 40°$

Single Row Angular Contact Ball Bearings for High Frequency of Rotation

d = 7 – 40 mm



B70...
B72...



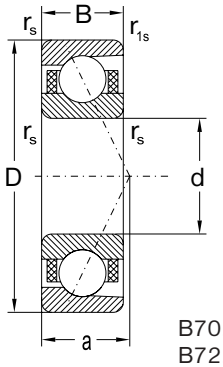
A70...
A72...

Dimensions						Basic load rating		Limiting speed for lubrication with		Bearing designation	Mass	Ident. symbol of the producer
d	D	B	r_s min	r_{1s} min	a	dynamic C_r	static C_{or}	grease	oil			
mm						kN		min^{-1}			kg	
7	22	7	0,30	0,15	5	2,220	0,900	94 000	140 000	**A727CBTA**	0,0134	S
9	26	8	0,60	0,30	5,50	3,650	1,640	71 000	106 000	**A729CBTA**	0,0197	S
10	30	9	0,60	0,30	7	4,530	3,280	45 000	65 000	**B7200CTA**	0,0280	S
	30	9	0,60	0,30	6	5,000	2,290	60 000	89 000	**B7200CBTB**	0,0270	S
	30	9	0,60	0,30	6,50	6,670	2,900	42 000	63 000	**B7200CATB**	0,0280	S
12	32	10	0,60	0,30	7	5,480	2,655	56 000	84 000	**B7201CBTB**	0,0350	S
	32	10	0,60	0,30	7,50	7,430	3,465	38 000	56 000	**B7201CATB**	0,0360	S
	32	10	0,60	0,30	10,50	7,045	3,210	33 000	50 000	**A7201ATA**	0,0360	S
15	35	11	0,60	0,30	7,50	6,480	3,450	50 000	75 000	**B7202CBTB**	0,0420	S
	35	11	0,60	0,30	8	8,265	4,180	33 000	50 000	**B7202CATB**	0,0430	S
17	35	10	0,30	0,15	9	6,240	3,470	30 000	45 000	**A7003CTA**	0,0390	S
	35	10	0,30	0,15	8	4,550	4,250	44 000	67 500	**B7003CTA**	0,0390	S
	40	12	0,60	0,30	8,50	7,830	4,250	45 000	67 000	**B7203CBTB**	0,0600	S
	40	12	0,60	0,30	9	10,206	5,290	28 000	42 000	**B7203CATB**	0,0610	S
20	42	12	0,60	0,30	10	9,830	5,450	28 000	42 000	**A7004CTA**	0,0680	S
	42	12	0,60	0,30	10	7,220	6,900	39 000	57 000	**B7004CTA**	0,0660	S
	47	14	1	0,60	10	9,600	5,540	40 000	60 000	**B7204CBTB**	0,0980	S
	47	14	1	0,60	10,50	13,670	7,322	25 000	38 000	**B7204CATB**	0,1000	S
	47	14	1	0,60	15	13,000	6,990	22 000	33 000	**B7204AATB**	0,1020	S
25	47	12	0,60	0,30	11	11,080	6,870	25 000	38 000	**A7005CTA**	0,0800	S
	47	12	0,60	0,30	11	7,940	7,850	33 000	47 000	**B7005CTA**	0,0800	S
	52	15	1	0,60	11	13,125	7,960	33 000	50 000	**B7205CBTB**	0,1190	S
	52	15	1	0,60	11,50	14,815	8,630	22 000	33 000	**B7205CATB**	0,1220	S
	52	15	1	0,60	17	13,960	8,155	20 000	30 000	**B7205AATB**	0,1240	S
30	55	13	1	0,60	12	14,400	9,550	22 000	30 000	**A7006CTA**	0,1160	S
	55	13	1	0,60	12,20	10,220	11,090	26 000	40 000	**B7006CTA**	0,1150	S
	62	16	1	0,60	12	16,810	10,720	28 000	42 000	**B7206CBTB**	0,1840	S
	62	16	1	0,60	13	20,570	12,420	20 000	30 000	**B7206CATB**	0,1890	S
	62	16	1	0,60	19	19,420	11,580	17 000	25 000	**B7206AATB**	0,1920	S
35	62	14	1	0,60	14	18,290	12,700	17 000	25 000	**A7007CTA**	0,1550	S
	62	14	1	0,60	13	12,800	14,730	22 000	36 000	**B7007CTA**	0,1550	S
	62	14	1	0,60	18,50	17,300	12,050	9 400	11 000	**B7007AATB**	0,1480	S
	72	17	1,10	0,60	13	21,015	14,345	25 000	38 000	**B7207CBTB**	0,2680	S
	72	17	1,10	0,60	14	28,935	18,600	16 000	24 000	**B7207CATB**	0,2750	S
	72	17	1,10	0,60	15	30,660	20,295	16 000	24 000	**B7207CAMB**	0,3230	S
	72	17	1,10	0,60	10	27,200	17,400	13 000	20 000	**B7207AATB**	0,2810	S
40	68	15	1	0,60	20,50	18,560	14,135	8 400	10 000	**B7008AATB**	0,1850	S
	80	18	1,10	0,60	14	24,500	17,300	22 000	33 000	**B7208CBTB**	0,3370	S
	80	18	1,10	0,60	15,50	36,730	23,775	13 000	20 000	**B7208CATB**	0,3470	S

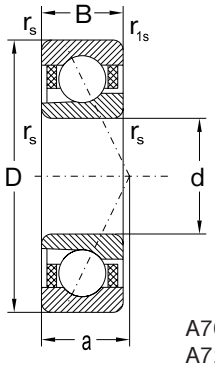
...CB $\alpha = 10°$ ...C $\alpha = 15°$ ...AA $\alpha = 26°$ ...BE $\alpha = 40°$
...CA $\alpha = 12°$ ...A $\alpha = 25°$ ...B $\alpha = 40°$

Single Row Angular Contact Ball Bearings for High Frequency of Rotation

d = 45 – 130 mm



B70...
B72...



A70...
A72...

Dimensions						Basic load rating		Limiting speed for lubrication with		Bearing designation	Mass	Ident. symbol of the producer
						dynamic	static	grease	oil			
d	D	B	r_s min	r_{1s} min	a	C_r	C_{or}					
mm						kN		min^{-1}			kg	
45	68	12	0,60	0,30	13,60	9,060	10,900	19 000	32 000	**B71909CTA**	0,1290	S
	75	16	1	0,60	16	23,410	18,140	13 000	20 000	**A7009CTA**	0,2420	S
	75	16	1	0,60	16	15,500	19,380	18 000	30 000	**B7009CTA**	0,2450	S
	85	19	1,10	0,60	15	28,295	20,310	20 000	30 000	**B7209CBTB**	0,3810	S
	85	19	1,10	0,60	16,50	36,855	24,615	12 600	19 000	**B7209CATB**	0,3810	S
	100	25	1,50	1	28	60,330	38,775	5 600	6 700	**B7309CATB**	0,7710	S
50	80	16	1	0,6	15,8	22,660	18,520	9 500	11 000	**B7010AATB**	0,253	S
	90	20	1,1	0,6	16	32,330	23,560	18 000	27 000	**B7210CBTB**	0,432	S
	90	20	1,1	0,6	17,5	38,990	27,260	12 000	18 000	**B7210CATB**	0,443	S
	90	20	1,1	0,6	26	36,560	25,920	10 600	16 000	**B7210AATB**	0,447	S
55	90	18	1,1	0,6	26,5	30,990	25,380	6 300	7 500	**B7011AATB**	0,395	S
	100	21	1,5	1	17	38,460	29,120	17 000	25 000	**B7211CBTB**	0,567	S
	100	21	1,5	1	18,5	48,200	34,500	11 000	17 000	**B7211CATB**	0,582	S
60	110	22	1,5	1	18	42,980	33,800	15 000	22 000	**B7212CBTB**	0,735	S
	110	22	1,5	1	20	58,260	42,600	10 000	15 000	**B7212CATB**	0,754	S
	110	22	1,5	1	32	54,820	39,960	8 900	13 000	**B7212AATB**	0,759	S
65	120	23	1,5	1	21,5	70,500	54,780	8 900	13 000	**B7213CATB**	0,994	S
70	110	20	1,1	0,6	32	41,153	36,460	7 900	12 000	**B7014AATB**	0,597	S
	125	24	1,5	1	20,5	58,560	47,660	12 600	19 000	**B7214CBTB**	1,040	S
	125	24	1,5	1	22,5	76,650	60,135	7 900	12 000	**B7214CATB**	1,070	S
75	130	25	1,5	1	23,5	76,530	61,390	7 500	11 000	**B7215CATB**	1,160	S
	130	25	1,5	1	37,5	71,525	58,325	6 700	10 000	**B7215AATB**	1,260	S
	130	25	1,5	1	37,5	74,900	62,490	4 200	5 000	**B7215AAMB**	1,390	S
80	125	22	1,1	0,6	22	55,360	50,013	7 500	11 000	**B7016CATB**	0,841	S
	125	22	1,1	0,6	36	53,440	49,440	6 700	10 000	**B7016AATB**	0,848	S
	140	26	2	1	24,5	89,500	73,050	6 700	10 000	**B7216CATB**	1,410	S
	140	26	2	1	40	84,070	68,040	6 300	9 400	**B7216AATB**	1,420	S
85	130	22	1,1	0,6	37	54,440	52,690	4 200	5 000	**B7017AATA**	0,912	S
	130	28	1,1	0,6	37	56,240	55,330	6 300	9 400	**B7017AAMB**	1,060	S
	150	28	2	1	26,5	100,520	86,080	6 300	9 400	**B7217CATB**	1,800	S
	150	28	2	1	42,5	94,260	80,670	6 000	8 900	**B7217AATB**	1,820	S
90	140	24	1,5	1	24	67,630	62,470	6 300	9400	**B7018CATB**	1,150	S
	140	24	1,5	1	26,8	65,220	62,600	4 000	4 800	**B7018ATA**	0,597	S
	140	24	1,5	1	40	65,290	61,755	4 000	4 700	**B7018AATB**	1,160	S
100	180	34	2,1	1,1	51	141,100	120,960	5 300	7 900	**B7220AATB**	3,320	S
120	180	28	2	1	30	101,100	103,660	5 000	7 500	**B7024CATB**	2,100	S
	180	28	2	1	35	97,460	102,120	3 000	3 600	**B7024ATA**	0,155	S
	180	28	2	1	50,5	96,100	101,280	3 000	3 500	**B7024AATB**	2,090	S
130	165	11	1	0,5	41,5	13,475	19,100	3 200	3 800	**B70826AAMB**	0,635	S

...CB α = 10°
...CA α = 12°
...C α = 15°
...A α = 25°
...AA α = 26°
...B α = 40°
...BE α = 40°