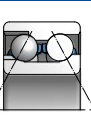




# DOUBLE ROW ANGULAR CONTACT BALL BEARINGS



## DOUBLE ROW ANGULAR CONTACT BALL BEARINGS

Double-row ball bearings with angular contact correspond with their construction and function to a pair of single row ball bearings with angular contact in „O“ - type configuration. They have rather deep raceways on both rings and may not be disassembled. In case of „E“ type construction, a lubrication bore is made on one side.

With optimal size of the balls and their conformity to the raceways relatively high load ratings are achieved. They can carry axial and radial loads in both directions and are suitable even for high rotation rate. In case of “E” type bearings assembling, it must be done so that the prevailing axial force acts on the ball row on the side without the filling groove.



## DESIGN SPECIFICATION

### MAIN DIMENSIONS

Main dimensions of double row angular contact ball bearings specified in the dimension tables are in accordance with the international standards ISO 15. The bearings are commonly produced in the basic P0 tolerance class. Double row angular contact ball bearings are very sensitive to the misalignment of the rings.

### BEARINGS WITH SHIELDS OR SEALS

Double row angular contact ball bearings with sealing on one or on both sides are manufactured with metal shields (Z, -2Z) or with seals (RS, -2RS). The sealing rings made of rubber, vulcanized on metal reinforcing ring, provide an effective friction type sealing. The bearings are manufactured in the design with a seal and the grinded outer diameter of the inner ring shoulder (RSR, -2RSR). Bearings with seals are suitable for operation within the temperature range from -30°C to 110°C.

Bearing deliveries with sealing capacity within 180°C (RS2, -2RS2), or eventually delivery of bearings with other sealing design, must be negotiated in advance.

Bearings sealed on both sides (-2Z, -2RS) are filled with a quality lubricant the properties of which usually ensure the lubrication during the whole bearing life under normal operating conditions. The bearings of this design cannot be relubricated. They can be used within the operating temperature range from -30°C to 110°C. The delivery of bearings with different lubricant should be discussed with the supplier in advance.

### LUBRICATION

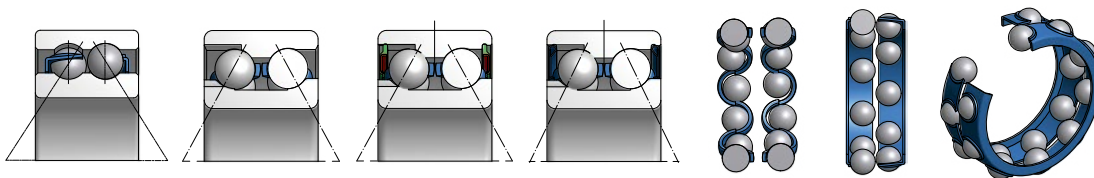
For bearings sealed on both sides, the designation of the lubricant filling different from standard lubricant is indicated by a symbol combination. The first two letters indicate the operating temperature range (a symbol in accordance with STN 02 4608) and the third identifies the lubricant name.

- TL** - Lubricant for low operating temperatures (from -60°C to 100°C)
- TM** - Lubricant for medium operating temperatures (from -30°C to 110°C)
- TH** - Lubricant for high operating temperatures (from -40°C to 250°C)
- TW** - Lubricant for low and high operating temperatures (from -40°C to 150°C)

*Note: The symbols of lubricants for medium operating temperatures need not to be marked on the bearings.*

### CAGE

The single row deep groove ball bearings of the basic design are equipped with a pressed cage made of steel sheet, guided on balls, which is not designated. The cages for double row angular contact ball bearings are manufactured in two version in dependence on the inner construction of the bearing. (see picture).



In special cases the bearings are produced with different types of cages: bearings with a solid polyamide cage (TNH, TNGH), with a solid cage of textite (TB). The supply of these bearings should be discussed in advance.

## DOUBLE ROW ANGULAR CONTACT BALL BEARINGS

### TOLERANCES

Double row angular contact ball bearings are produced in tolerance classes P0 and P6. For special arrangements requiring high precision or for arrangements with a high rotation speed, the bearings with higher tolerance classes P6, P5 and P4 are used. The limit values of deviations in tolerances and the operation of these bearing types are specified in tables 10a to 13b of this catalogue.

### BEARING CLEARANCE

Normally produced double row angular contact ball bearings have normal axial clearance which is not indicated. In specific cases bearings with axial clearance C2 (smaller than normal clearance) or with the radial clearance C3, C4 (greater than normal clearance) can be produced. The ranges of axial clearances of double row angular contact ball bearings are given in table 19a of this catalogue.

### VIBRATION LEVEL

Commonly produced double row angular contact bearings have standard vibration level specified by the manufacturer. For special arrangements with silent running bearings with reduced vibration level (C6) are produced.

### COMBINATION OF SYMBOLS

The symbols for the tolerance classes, internal bearing clearances and vibration levels are combined with the simultaneous omission of the symbol C in the second and the following bearing special characteristics e. g.:

<b>P6 + C3 = P63</b>	3205 P63
<b>C3 + C6 = C36</b>	3205-2RS C36
<b>P6 + C3 + C6 = P636</b>	3205-2Z P636

### MISALIGNMENT

The misalignment of the rings is not admissible for double row angular contact ball bearings. The misalignment causes additional load of the bearing and the durability is lowered.

### RADIAL EQUIVALENT DYNAMIC LOAD

Double row angular contact ball bearings:

$$P = F_r + 0,73 \cdot F_a \quad \text{for } F_a/F_r \leq 0,68$$

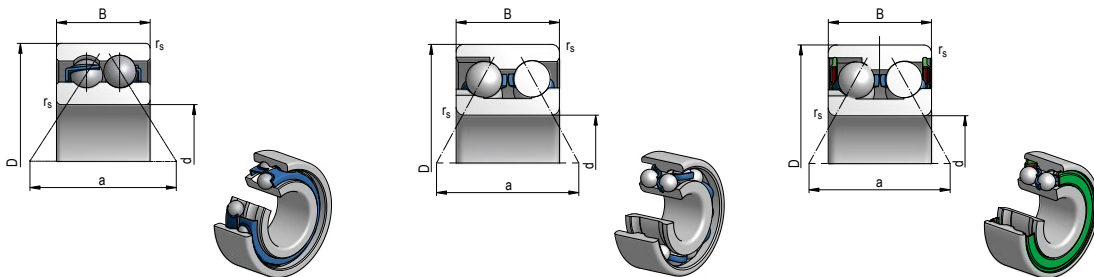
$$P = 0,67 \cdot F_r + 1,41 \cdot F_a \quad \text{for } F_a/F_r > 0,68$$

### DESIGNATION

The designation of basic designs and common modifications of the bearings are specified in the dimension tables. Modification of the basic design is designated with additional symbols according to STN 02 4608. The meaning of the most used symbols for single row deep groove ball bearings is in the table.

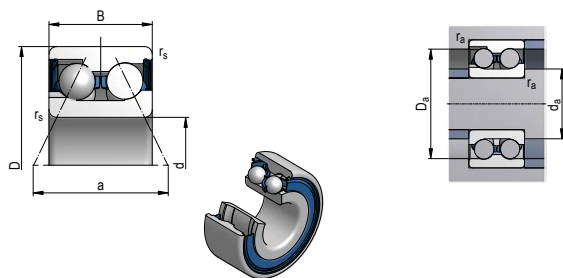
Symbol	Example of Designation	Meaning
<b>RSR</b>	3205RSR	Seal on one side adhering to the grinded outer diameter of the inner ring shoulder
<b>-2RSR</b>	3307-2RSR	Seal on both sides adhering to the grinded outer diameter of the inner ring shoulder
<b>Z</b>	3206Z	Metal shield on one side
<b>-2ZR</b>	3208-2ZR	Metal shields on both sides adhering to the grinded outer diameter of the inner ring shoulder
<b>TNH</b>	3309TNH	Plastic cage guided on balls
<b>P6</b>	3205 P6	Higher tolerance class than standard
<b>P5</b>	3307E P5	Higher tolerance class than P6
<b>C2</b>	3304 C2	Radial clearance less than normal
<b>C3</b>	3305-2Z C3	Radial clearance greater than normal
<b>C4</b>	3307-2RS C4	Radial clearance greater than C3
<b>C5</b>	3206-2Z C5	Radial clearance greater than C4
<b>C6</b>	3305 C6	Reduced vibration level

## DOUBLE ROW ANGULAR CONTACT BALL BEARINGS



Dimensions mm					Basic Load Rating kN		Limiting Speed for Lubrication min <sup>-1</sup>		Bearing Designation		Abutment and Fillet Dimensions mm			Weight kg
d	D	B	r <sub>s min</sub>	a					Cylindrical Bore	2RS	d <sub>a max</sub>	D <sub>a max</sub>	r <sub>s max</sub>	
10	30	14,3	0,6	17,4	5,8	3,56	16000	19000	3200	3200-2RS	14	25	0,5	0,050
10	30	14,3	1	20,4	7,66	4,72	16000	19000	3200E	3200E-2RS	12	22	0,5	0,055
10	35	19	1	27	11,33	7,06	12000	15000	3300E	3300E-2RS	20,5	26,5	0,5	0,100
12	32	15,9	0,6	19,4	7,48	4,43	14000	17000	3201	3201-2RS	18,5	26	0,5	0,060
12	32	15,9	1	21,4	10,06	6,26	14000	17000	3201E	3201E-2RS	16,5	23	0,5	0,065
12	37	19	1,5	27	12,75	8,29	11000	13000	3301E	3301E-2RS	21,5	27,5	0,6	0,090
15	35	15,9	0,6	21,4	8,05	5,26	13000	16000	3202	3202-2RS	21,5	29,5	0,5	0,066
15	35	15,9	1	24,4	9,7	7,9	13000	16000	3202E	3202E-2RS	19,5	26,5	0,5	0,070
15	42	19	1	27	15,8	11,9	10600	12600	3302	3302-2RS	21,5	38	0,6	0,129
15	42	19	1,5	24	10,34	14,57	10600	12600	3302E	3302E-2RS	19,5	35	0,6	0,129
17	40	17,5	0,6	24,4	10,64	7,02	11000	13000	3203	3203-2RS	24,5	33,5	0,6	0,095
17	40	17,5	1	26,4	10,73	9,72	11000	13000	3203E	3203E-2RS	22,5	30,5	0,6	0,130
17	47	22,2	1	27,5	20,41	12,08	9400	11000	3303	3303-2RS	24,5	41,5	0,6	0,190
17	47	22,2	1,5	24,5	18,02	13,08	9400	11000	3303E	3303E-2RS	22,5	38,5	0,6	0,190
20	47	20,6	1	29,3	13,82	11,52	9400	11000	3204	-	29,5	40,5	1	0,169
20	47	20,6	1,5	29,9	20,666	15,176	9400	11000	3204E	-	27,5	37,5	1	0,160
20	52	22,2	1,1	30,9	12,22	18,77	8400	10000	3304	3304-2RS	29,5	45,5	1	0,230
20	52	22,2	2	27,9	21,15	15,71	8400	10000	3304E	3304E-2RS	27,5	43,5	1	0,230
25	52	20,6	1	32,1	15,64	12,7	8400	10000	3205	-	33,5	45,5	1	0,185
25	52	20,6	1	35	18,94	18,088	8400	10000	3205E	-	31	42	1	0,185
25	62	25,4	1,1	37,2	17,36	20,08	7100	8400	3305	-	36,5	50,5	1	0,350
25	62	25,4	1,1	40	34,67	26,91	7100	8400	3305E	-	34	47	1	0,360
30	62	23,8	1	38,5	27,39	20,36	7100	8400	3206	-	39,5	53,5	1	0,302
30	62	23,8	1	39,1	28,76	27,95	7100	8400	3206E	-	37	51	1	0,302
30	72	30,2	1,1	44,8	39,13	27,13	6000	7100	3306	3306-2RS	43	61,5	1	0,555
30	72	30,2	1,1	45,2	38,94	36,73	6000	7100	3306E	3306E-2RS	41	57	1	0,570
35	72	27	1,1	44,7	37,14	27,16	6000	7100	3207	3207-2RS	45,5	61,5	1	0,454
35	72	27	1,1	44,7	38,31	38,44	6000	7100	3207E	3207E-2RS	41	57	1	0,454
35	80	34,9	1,5	50,9	48,88	34,88	5300	6300	3307	3307-2RS	49	68	1,5	0,798
35	80	34,9	1,5	52,2	49,92	47,79	5300	6300	3307E	3307E-2RS	45	64	1,5	0,798
40	80	30,2	1,1	49	39,57	31,24	5300	6300	3208	-	53	69	1	0,619
40	80	30,2	1,1	49,8	42,72	44,68	5300	6300	3208E	-	51	66	1	0,626
40	90	36,5	1,5	55,7	40,16	54,98	4700	5600	3308	3308-2RS	56	73	1,5	0,991
40	90	36,5	1,5	56,5	67,16	66,39	4700	5600	3308E	3308E-2RS	53	70	1,5	1,030
45	85	30,2	1,1	52,1	39,37	32,02	5000	6000	3209	3209-2RS	57	73	1	0,657
45	85	30,2	1,1	52,7	47,35	46,32	5000	6000	3209E	3209E-2RS	55	71	1	0,657
45	100	39,7	1,5	62,2	72,54	54,9	4200	5000	3309	3309-2RS	57	88	1,5	1,400
45	100	39,7	1,5	62,2	87,17	74,43	4200	5000	3309E	3309E-2RS	55	85	1,5	1,370
50	90	30,2	1,1	55,2	41,53	35,73	4500	5300	3210	3210-2RS	62	78	1	0,715

## DOUBLE ROW ANGULAR CONTACT BALL BEARINGS



Dimensions mm					Basic Load Rating kN		Limiting Speed for Lubrication min <sup>-1</sup>		Bearing Designation		Abutment and Fillet Dimensions mm			Weight kg
d	D	B	r <sub>s</sub> min	a					Cylindrical Bore	2RS	d <sub>a</sub> max	D <sub>a</sub> max	r <sub>a</sub> max	
50	90	30,2	2	55,2	47,66	46,42	4500	5300	3210E	3210E-2RS	60	76	1	0,715
50	110	44,4	2,1	73	85,44	65,11	3800	4500	3310	3310-2RS	62	100	2	1,780
50	110	44,4	3	73	87,43	76,25	3800	4500	3310E	3310E-2RS	60	98	2	1,780
55	100	33,3	1,5	61,8	53,27	46,35	4200	5000	3211	3211-2RS	62	91	1,5	0,950
55	100	33,3	2,3	61,8	60,85	60,27	4200	5000	3211E	3211E-2RS	60	89	1,5	0,950
55	120	49,2	2,1	80	106,37	82,63	3300	4000	3311	3311-2RS	65	110	2	2,250
55	120	49,2	3	80	96,64	108,06	3300	4000	3311E	3311E-2RS	63	108	2	2,250
60	110	36,5	1,5	67,4	59,99	54,43	3800	4500	3212	-	67	101	1,5	1,350
60	110	36,5	1,5	67,4	59,9	53,6	3800	4500	3212N	-	67	101	1,5	1,340
60	130	54	2,1	86	95,82	121,62	3200	3800	3312	-	72	118	2	2,930
65	120	38,1	1,5	76	66,37	73,4	3500	4200	3213	-	72	111	1,5	1,760
65	140	58,7	2,1	94	110	137,62	3000	3500	3313	-	77	128	2	3,710
70	125	39,7	1,5	81	80,51	73,49	3200	3800	3214	-	77	116	1,5	1,850
70	150	63,5	3	101	134	127	2800	3800	3314	-	82	138	2	5,050
75	130	41,3	1,5	84	87,9	81,52	3200	3800	3215	-	82	121	1,5	1,920
75	160	68,3	3	107	140	137	2600	3600	3315	-	87	148	2	5,600
80	140	44,4	3	91	95	91,5	2800	3600	3216	-	90	130	2	2,650
80	170	68,3	3	111	160	156	2400	3400	3316	-	92	158	2	6,000
85	150	49,5	3	97	104	98	2600	3600	3217	-	95	140	2	3,320
85	180	73	4	119	176	176	2200	3200	3317	-	99	166	2,5	8,300
90	160	52,4	3	104	125	116	2400	3400	3218	-	100	150	2	4,200
90	190	73	4	125	200	208	2000	3000	3318	-	104	176	2,5	9,250
95	170	55,6	3	112	146	134	2200	3200	3219	-	107	158	2	5,000
95	200	77,8	4	133	216	236	1900	2800	3319	-	109	186	2,5	11,000
100	180	60,3	3	118	156	143	2000	3000	3220	-	112	168	2	6,100
100	215	82,6	4	139	232	232	1800	2600	3320	-	114	201	2,5	13,500
110	200	69,8	3	132	193	193	1900	2800	3222	-	122	188	2	8,700
110	240	92,1	4	154	265	315	1700	2400	3322	-	124	226	2,5	19,000