

# Double row deep groove ball bearings

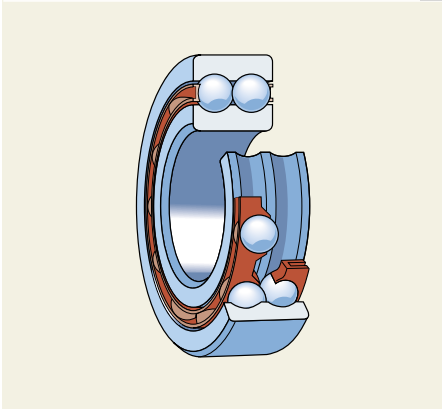
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## Double row deep groove ball bearings

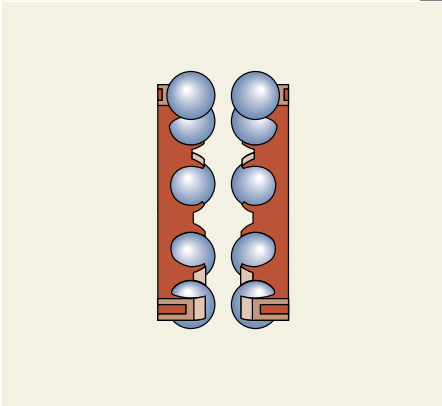
SKF double row deep groove ball bearings (→ **fig 1**) correspond in design to single row deep groove ball bearings. They have deep uninterrupted raceways and high conformity between the balls and raceways. They are able to carry axial loads acting in both directions in addition to radial loads.

Double row deep groove ball bearings are very suitable for bearing arrangements where the load carrying capacity of a single row bearing is inadequate. For the same outside and bore diameters, double row bearings are slightly wider than single row bearings but have considerably higher load carrying capacity than single row bearings in the 62 and 63 series.

**Fig 1**



**Fig 2**



## Bearing data – general

### Dimensions

The boundary dimensions of SKF double row deep groove ball bearings are in accordance with ISO 15:1998.

### Tolerances

SKF double row deep groove ball bearings are produced to Normal tolerances. The values for tolerances correspond to ISO 492:2002 and can be found in **table 8** on **page 125**.

### Internal clearance

SKF double row deep groove ball bearings have Normal radial internal clearance as standard. The clearance limits are as specified in ISO 5753:1991 and can be found in **table 3** on **page 297**.

### Misalignment

Misalignment of the inner ring relative to the outer ring of a double row deep groove ball bearing can only be accommodated by force, which leads to increased ball loads and cage forces and a reduction in bearing service life. For this reason, the maximum permissible angular misalignment is two minutes of arc. Any misalignment of the bearing rings will result in increased noise during operation.

### Cages

SKF double row deep groove ball bearings are fitted with two glass fibre reinforced polyamide 6,6 cages (→ **fig 2**), designation suffix TN9.

### Note:

Double row deep groove ball bearings with polyamide 6,6 cages can be operated at temperatures up to +120 °C. The lubricants generally used for rolling bearings do not have a detrimental effect on cage properties, with the exception of a few synthetic oils and greases with a synthetic oil base, and lubricants containing a high proportion of EP additives when used at high temperatures.

For detailed information regarding the temperature resistance and the applicability of cages, please refer to the section “Cage materials”, starting on **page 140**.

### Minimum load

In order to obtain satisfactory operation, double row deep groove ball bearings, like all ball and roller bearings, must be subjected to a given minimum load, particularly if they are to operate at high speeds or are subjected to high accelerations or rapid changes in the direction of load. Under such conditions the inertia forces of the balls and cages, and the friction in the lubricant, can have a detrimental effect on the rolling conditions in the bearing arrangement and may cause damaging sliding movements to occur between the balls and raceways.

The requisite minimum load to be applied to double row deep groove ball bearings can be estimated using

$$F_{rm} = k_r \left( \frac{v n}{1\,000} \right)^{2/3} \left( \frac{d_m}{100} \right)^2$$

where

$F_{rm}$  = minimum radial load, kN

$k_r$  = minimum radial load factor  
(→ product table)

$v$  = oil viscosity at operating temperature,  $\text{mm}^2/\text{s}$

$n$  = rotational speed, r/min

$d_m$  = bearing mean diameter  
=  $0,5(d + D)$ , mm

When starting up at low temperatures or when the lubricant is highly viscous, even greater minimum loads may be required. The weight of the components supported by the bearing, together with external forces, generally exceeds the requisite minimum load. If this is not the case, the double row deep groove ball bearings must be subjected to additional radial load.

### Axial load carrying capacity

If double row deep groove ball bearings are subjected to a purely axial load, this axial load should generally not exceed the value of  $0,5 C_0$ . Excessive axial loads can lead to a substantial reduction in bearing life.

### Equivalent dynamic bearing load

For dynamically loaded double row deep groove ball bearings

$$P = F_r \quad \text{when } F_a/F_r \leq e$$

$$P = 0,56 F_r + Y F_a \quad \text{when } F_a/F_r > e$$

The factors  $e$  and  $Y$  depend on the relationship  $f_0 F_a/C_0$ , where  $f_0$  is a calculation factor (→ product table),  $F_a$  the axial component of the load and  $C_0$  the basic static load rating.

If the bearings are mounted with the usual fits (shaft tolerance j5 or k5, depending on the shaft diameter, and housing bore tolerance J7) the values for  $e$  and  $Y$  given in **table 1** can be used to calculate the equivalent load.

### Equivalent static bearing load

For statically loaded double row deep groove ball bearings

$$P_0 = 0,6 F_r + 0,5 F_a$$

If  $P_0 < F_r$ ,  $P_0 = F_r$  should be used.

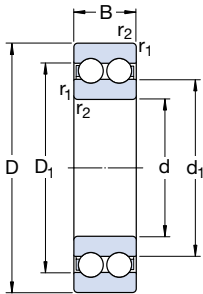
**Table 1**

Calculation factors for double row deep groove ball bearings

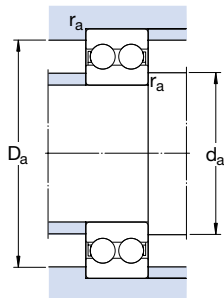
$f_0 F_a/C_0$	$e$	$Y$
<b>0,172</b>	0,19	2,30
<b>0,345</b>	0,22	1,99
<b>0,689</b>	0,26	1,71
<b>1,03</b>	0,28	1,55
<b>1,38</b>	0,30	1,45
<b>2,07</b>	0,34	1,31
<b>3,45</b>	0,38	1,15
<b>5,17</b>	0,42	1,04
<b>6,89</b>	0,44	1,00

Intermediate values are obtained by linear interpolation

## Double row deep groove ball bearings d 10 – 65 mm

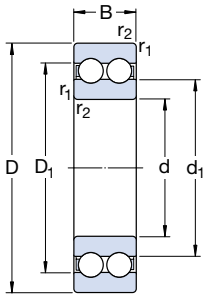


Principal dimensions			Basic load ratings		Fatigue load limit $P_u$	Speed ratings		Mass	Designation
d	D	B	dynamic	static $C_0$		Reference speed	Limiting speed		
mm			kN		kN	r/min		kg	–
<b>10</b>	30	14	9,23	5,2	0,224	40 000	22 000	0,049	<b>4200 ATN9</b>
<b>12</b>	32 37	14 17	10,6 13	6,2 7,8	0,26 0,325	36 000 34 000	20 000 18 000	0,053 0,092	<b>4201 ATN9</b> <b>4301 ATN9</b>
<b>15</b>	35 42	14 17	11,9 14,8	7,5 9,5	0,32 0,405	32 000 28 000	17 000 15 000	0,059 0,120	<b>4202 ATN9</b> <b>4302 ATN9</b>
<b>17</b>	40 47	16 19	14,8 19,5	9,5 13,2	0,405 0,56	28 000 24 000	15 000 13 000	0,090 0,16	<b>4203 ATN9</b> <b>4303 ATN9</b>
<b>20</b>	47 52	18 21	17,8 23,4	12,5 16	0,53 0,68	24 000 22 000	13 000 12 000	0,14 0,21	<b>4204 ATN9</b> <b>4304 ATN9</b>
<b>25</b>	52 62	18 24	19 31,9	14,6 22,4	0,62 0,95	20 000 18 000	11 000 10 000	0,16 0,34	<b>4205 ATN9</b> <b>4305 ATN9</b>
<b>30</b>	62 72	20 27	26 41	20,8 30	0,88 1,27	17 000 16 000	9 500 8 500	0,26 0,50	<b>4206 ATN9</b> <b>4306 ATN9</b>
<b>35</b>	72 80	23 31	35,1 50,7	28,5 38	1,2 1,63	15 000 14 000	8 000 7 500	0,40 0,69	<b>4207 ATN9</b> <b>4307 ATN9</b>
<b>40</b>	80 90	23 33	37,1 55,9	32,5 45	1,37 1,9	13 000 12 000	7 000 6 700	0,50 0,95	<b>4208 ATN9</b> <b>4308 ATN9</b>
<b>45</b>	85 100	23 36	39 68,9	36 56	1,53 2,4	12 000 11 000	6 700 6 000	0,54 1,25	<b>4209 ATN9</b> <b>4309 ATN9</b>
<b>50</b>	90 110	23 40	41 81,9	40 69,5	1,7 2,9	11 000 10 000	6 000 5 300	0,58 1,70	<b>4210 ATN9</b> <b>4310 ATN9</b>
<b>55</b>	100 120	25 43	44,9 97,5	44 83	1,9 3,45	10 000 9 000	5 600 5 000	0,80 2,15	<b>4211 ATN9</b> <b>4311 ATN9</b>
<b>60</b>	110 130	28 46	57,2 112	55 98	2,36 4,15	9 500 8 500	5 300 4 500	1,10 2,65	<b>4212 ATN9</b> <b>4312 ATN9</b>
<b>65</b>	120 140	31 48	67,6 121	67 106	2,8 4,5	8 500 8 000	4 800 4 300	1,45 3,25	<b>4213 ATN9</b> <b>4313 ATN9</b>

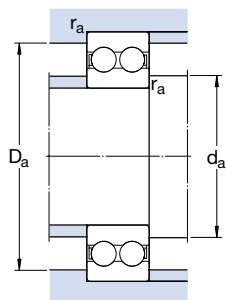


Dimensions				Abutment and fillet dimensions			Calculation factors	
d	d <sub>1</sub>	D <sub>1</sub>	r <sub>1,2</sub> min	d <sub>a</sub> min	D <sub>a</sub> max	r <sub>a</sub> max	k <sub>r</sub>	f <sub>o</sub>
mm				mm			-	
10	16,7	23,3	0,6	14	26	0,6	0,05	12
12	18,3 20,5	25,7 28,5	0,6 1	16 17	28 32	0,6 1	0,05 0,06	12 12
15	21,5 24,5	29 32,5	0,6 1	19 20	31 37	0,6 1	0,05 0,06	13 13
17	24,3 28,7	32,7 38,3	0,6 1	21 22	36 42	0,6 1	0,05 0,06	13 13
20	29,7 31,8	38,3 42,2	1 1,1	25 26,5	42 45,5	1 1	0,05 0,06	14 13
25	34,2 37,3	42,8 49,7	1 1,1	30 31,5	47 55,5	1 1	0,05 0,06	14 13
30	40,9 43,9	51,1 58,1	1 1,1	35 36,5	57 65,5	1 1	0,05 0,06	14 13
35	47,5 49,5	59,5 65,4	1,1 1,5	41,5 43	65,5 72	1 1,5	0,05 0,06	14 13
40	54 56,9	66 73,1	1,1 1,5	46,5 48	73,5 82	1 1,5	0,05 0,06	15 14
45	59,5 63,5	71,5 81,5	1,1 1,5	51,5 53	78,5 92	1 1,5	0,05 0,06	15 14
50	65,5 70	77,5 90	1,1 2	56,5 59	83,5 101	1 2	0,05 0,06	15 14
55	71,2 76,5	83,8 98,5	1,5 2	63 64	92 111	1,5 2	0,05 0,06	16 14
60	75,6 83,1	90,4 107	1,5 2,1	68 71	102 119	1,5 2	0,05 0,06	15 14
65	82,9 89,6	99,1 115	1,5 2,1	73 76	112 129	1,5 2	0,05 0,06	15 14

**Double row deep groove ball bearings**  
**d 70 – 100 mm**



Principal dimensions			Basic load ratings		Fatigue load limit $P_u$	Speed ratings		Mass	Designation
d	D	B	dynamic C	static $C_0$		Reference speed	Limiting speed		
mm			kN		kN	r/min		kg	-
<b>70</b>	125	31	70,2	73,5	3,1	8 000	4 300	1,50	<b>4214 ATN9</b>
	150	51	138	125	5	7 000	3 800	3,95	<b>4314 ATN9</b>
<b>75</b>	130	31	72,8	80	3,35	7 500	4 000	1,60	<b>4215 ATN9</b>
	160	55	156	143	5,5	6 700	3 600	4,80	<b>4315 ATN9</b>
<b>80</b>	140	33	80,6	90	3,6	7 000	3 800	2,00	<b>4216 ATN9</b>
<b>85</b>	150	36	93,6	102	4	7 000	3 600	2,55	<b>4217 ATN9</b>
<b>90</b>	160	40	112	122	4,65	6 300	3 400	3,20	<b>4218 ATN9</b>
<b>100</b>	180	46	140	156	5,6	5 600	3 000	4,70	<b>4220 ATN9</b>



Dimensions				Abutment and fillet dimensions			Calculation factors	
d	d <sub>1</sub> ~	D <sub>1</sub> ~	r <sub>1,2</sub> min	d <sub>a</sub> min	D <sub>a</sub> max	r <sub>a</sub> max	k <sub>r</sub>	f <sub>o</sub>
mm				mm			-	
<b>70</b>	89,4 96,7	106 124	1,5 2,1	78 81	117 139	1,5 2	0,05 0,06	15 14
<b>75</b>	96,9 103	114 132	1,5 2,1	83 86	122 149	1,5 2	0,05 0,06	16 14
<b>80</b>	102	120	2	89	131	2	0,05	16
<b>85</b>	105	125	2	94	141	2	0,05	15
<b>90</b>	114	136	2	99	151	2	0,05	15
<b>100</b>	130	154	2,1	111	169	2	0,05	15