

# Rolling Bearings

Deep Groove Ball Bearings



## DEEP GROOVE BALL BEARINGS

### SINGLE-ROW DEEP GROOVE BALL BEARINGS

Open Type, Shielded Type, Sealed Type      Bore Diameter 10 – 240mm ..... B8  
 Open Type      Bore Diameter 260 – 800mm ..... B20

**MAXIMUM TYPE BALL BEARINGS**      Bore Diameter 25 – 110mm ..... B26

**MAGNETO BEARINGS**      Bore Diameter 4 – 20mm ..... B28

Extra Small and Miniature Ball Bearings are described on Pages B30 to B45.



### DESIGN, TYPES, AND FEATURES

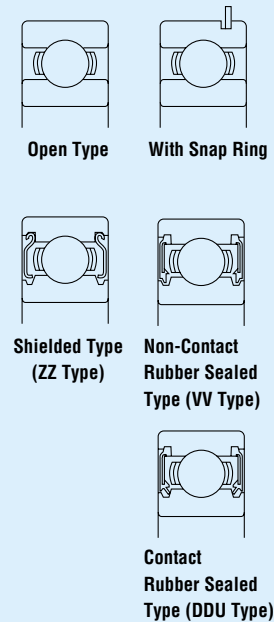
#### SINGLE-ROW DEEP GROOVE BALL BEARINGS

Single-Row Deep Groove Ball Bearings are classified into the types shown below.

The proper amount of good quality grease is packed in shielded and sealed ball bearings. A comparison of the features of each type is shown in Table 1.

**Table 1 Features of Sealed Ball Bearings**

| Type                                 | Shielded Type (ZZ Type) | Non-Contact Rubber Sealed Type (VV Type)                     | Contact Rubber Sealed Type (DDU Type)              |
|--------------------------------------|-------------------------|--|--|
| Torque                               | Low                     | Low  | Higher than ZZ, VV types due to contact seal       |
| Speed capability                     | Good                    | Good   | Limited by contact seals                           |
| Grease sealing effectiveness         | Good                    | Better than ZZ type  | A little better than VV type                       |
| Dust resistance                      | Good                    | Better than ZZ type (usable in moderately dusty environment) | Best (usable even in very dusty environment)       |
| Water resistance                     | Not suitable            | Not suitable   | Good (usable even if fluid is splashed on bearing) |
| Operating temperature <sup>(1)</sup> | -10 to +110°C           | -10 to +110°C  | -10 to +100°C                                      |

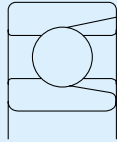


**Note** <sup>(1)</sup> The above temperature range applies to standard bearings. By using cold or heat resistant grease and changing the type of rubber, the operating temperature range can be extended. For such applications, please contact NSK.

For deep groove ball bearings, pressed cages are usually used. For big bearings, machined brass cages are used. (Refer to Table 2)  
Machined cages are also used for high speed applications.

**Table 2 Standard Cages for Deep Groove Ball Bearings**

| Series | Pressed Steel Cages | Machined Brass Cages |
|--------|---------------------|----------------------|
| 68     | 6800 – 6838         | 6840 – 68/800        |
| 69     | 6900 – 6936         | 6938 – 69/800        |
| 160    | 16001 – 16026       | 16028 – 16064        |
| 60     | 6000 – 6040         | 6044 – 60/670        |
| 62     | 6200 – 6240         | 6244 – 6272          |
| 63     | 6300 – 6332         | 6334 – 6356          |

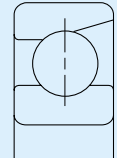


**MAXIMUM TYPE BALL BEARINGS**

Maximum Type Ball Bearings contain a larger number of balls than normal deep groove ball bearings because of filling slots in the inner and outer rings. Because of their filling slots, they are not suitable for applications with high axial loads.

BL2 and BL3 types of bearings have boundary dimensions equal to those of single-row deep groove ball bearings of Series 62 and 63 respectively. Besides the open type, ZZ type shielded bearings are also available.

When using these bearings, it is important for the filling slot in the outer ring to be outside of the loaded zone as much as possible.  
Their cages are pressed steel.



**MAGNETO BEARINGS**

The groove in the inner ring is a little shallower than that of deep groove ball bearings and one side of the outer ring is relieved. Consequently, the outer ring is separable, which makes it convenient for mounting.

Pressed cages are standard, but for high speed applications, machined synthetic resin cages are used.

**PRECAUTIONS FOR USE OF DEEP GROOVE BALL BEARINGS**

For deep groove ball bearings, if the bearing load is too small during operation, slippage occurs between the balls and raceways, which may result in smearing. The higher the weight of balls and cage, the higher this tendency becomes, especially for large bearings. If very small bearing loads are expected, please contact NSK for selection of an appropriate bearing.

**TOLERANCES AND RUNNING ACCURACY**

**SINGLE-ROW DEEP GROOVE BALL BEARINGS**.....Table 8.2 (Pages A60 to A63)  
**MAXIMUM TYPE BALL BEARINGS** .....Table 8.2 (Pages A60 to A63)  
**MAGNETO BEARINGS**.....Table 8.5 (Pages A70 and A71)

**RECOMMENDED FITS**

**SINGLE-ROW DEEP GROOVE BALL BEARINGS**.....Table 9.2 (Page A84)  
.....Table 9.4 (Page A85)  
**MAXIMUM TYPE BALL BEARINGS** .....Table 9.2 (Page A84)  
.....Table 9.4 (Page A85)  
**MAGNETO BEARINGS**.....Table 9.2 (Page A84)  
.....Table 9.4 (Page A85)

**INTERNAL CLEARANCES**

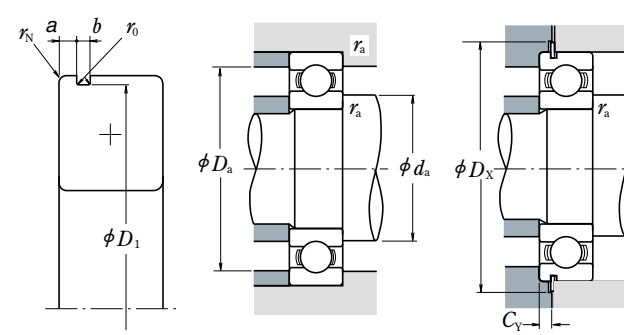
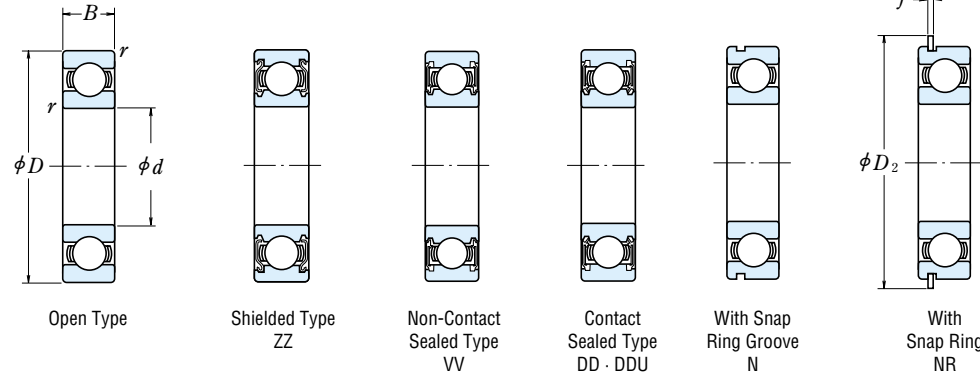
**SINGLE-ROW DEEP GROOVE BALL BEARINGS**.....Table 9.9 (Page A89)  
**MAXIMUM TYPE BALL BEARINGS** .....Table 9.9 (Page A89)  
**MAGNETO BEARINGS**.....Table 9.11 (Page A89)

**LIMITING SPEEDS**

The limiting speeds listed in the bearing tables should be adjusted depending on the bearing load conditions. Also, higher speeds are attainable by making changes in the lubrication method, cage design, etc. Refer to Page A37 for detailed information.

# SINGLE-ROW DEEP GROOVE BALL BEARINGS

Bore Diameter 10 – 22 mm



## Dynamic Equivalent Load

$$P = XF_r + YF_a$$

| $\frac{f_0 F_a}{C_{Or}}$ | e    | $\frac{F_a}{F_r} \leq e$ |   | $\frac{F_a}{F_r} > e$ |      |
|--------------------------|------|--------------------------|---|-----------------------|------|
|                          |      | X                        | Y | X                     | Y    |
| 0.172                    | 0.19 | 1                        | 0 | 0.56                  | 2.30 |
| 0.345                    | 0.22 | 1                        | 0 | 0.56                  | 1.99 |
| 0.689                    | 0.26 | 1                        | 0 | 0.56                  | 1.71 |
| 1.03                     | 0.28 | 1                        | 0 | 0.56                  | 1.55 |
| 1.38                     | 0.30 | 1                        | 0 | 0.56                  | 1.45 |
| 2.07                     | 0.34 | 1                        | 0 | 0.56                  | 1.31 |
| 3.45                     | 0.38 | 1                        | 0 | 0.56                  | 1.15 |
| 5.17                     | 0.42 | 1                        | 0 | 0.56                  | 1.04 |
| 6.89                     | 0.44 | 1                        | 0 | 0.56                  | 1.00 |

## Static Equivalent Load

$$\frac{F_a}{F_r} > 0.8, P_0 = 0.6F_r + 0.5F_a$$

$$\frac{F_a}{F_r} \leq 0.8, P_0 = F_r$$

| Boundary Dimensions (mm) | Basic Load Ratings (N) |          |       |          | Factor $f_0$ | Limiting Speeds (min <sup>-1</sup> ) |           |      | Bearing Numbers |          |        |              |           |           |            |
|--------------------------|------------------------|----------|-------|----------|--------------|--------------------------------------|-----------|------|-----------------|----------|--------|--------------|-----------|-----------|------------|
|                          | $C_r$                  | $C_{Or}$ | (kgf) |          |              | Grease                               |           | Oil  | Open            | Shielded | Sealed |              |           |           |            |
|                          |                        |          | $C_r$ | $C_{Or}$ |              | Open Z · ZZ<br>V · VV                | DU<br>DDU |      |                 |          |        | Open Z       |           |           |            |
| <b>10</b>                | 19                     | 5        | 0.3   | 1 720    | 840          | 175                                  | 86        | 14.8 | 34 000          | 24 000   | 40 000 | <b>6800</b>  | <b>ZZ</b> | <b>VV</b> | <b>DD</b>  |
|                          | 22                     | 6        | 0.3   | 2 700    | 1 270        | 275                                  | 129       | 14.0 | 32 000          | 22 000   | 38 000 | <b>6900</b>  | <b>ZZ</b> | <b>VV</b> | <b>DD</b>  |
|                          | 26                     | 8        | 0.3   | 4 550    | 1 970        | 465                                  | 201       | 12.4 | 30 000          | 22 000   | 36 000 | <b>6000</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 30                     | 9        | 0.6   | 5 100    | 2 390        | 520                                  | 244       | 13.2 | 24 000          | 18 000   | 30 000 | <b>6200</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 35                     | 11       | 0.6   | 8 100    | 3 450        | 825                                  | 350       | 11.2 | 22 000          | 17 000   | 26 000 | <b>6300</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
| <b>12</b>                | 21                     | 5        | 0.3   | 1 920    | 1 040        | 195                                  | 106       | 15.3 | 32 000          | 20 000   | 38 000 | <b>6801</b>  | <b>ZZ</b> | <b>VV</b> | <b>DD</b>  |
|                          | 24                     | 6        | 0.3   | 2 890    | 1 460        | 295                                  | 149       | 14.5 | 30 000          | 20 000   | 36 000 | <b>6901</b>  | <b>ZZ</b> | <b>VV</b> | <b>DD</b>  |
|                          | 28                     | 7        | 0.3   | 5 100    | 2 370        | 520                                  | 241       | 13.0 | 28 000          | —        | 32 000 | <b>16001</b> | —         | —         | —          |
|                          | 28                     | 8        | 0.3   | 5 100    | 2 370        | 520                                  | 241       | 13.0 | 28 000          | 18 000   | 32 000 | <b>6001</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 32                     | 10       | 0.6   | 6 800    | 3 050        | 695                                  | 310       | 12.3 | 22 000          | 17 000   | 28 000 | <b>6201</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 37                     | 12       | 1     | 9 700    | 4 200        | 990                                  | 425       | 11.1 | 20 000          | 16 000   | 24 000 | <b>6301</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
| <b>15</b>                | 24                     | 5        | 0.3   | 2 070    | 1 260        | 212                                  | 128       | 15.8 | 28 000          | 17 000   | 34 000 | <b>6802</b>  | <b>ZZ</b> | <b>VV</b> | <b>DD</b>  |
|                          | 28                     | 7        | 0.3   | 4 350    | 2 260        | 440                                  | 230       | 14.3 | 26 000          | 17 000   | 30 000 | <b>6902</b>  | <b>ZZ</b> | <b>VV</b> | <b>DD</b>  |
|                          | 32                     | 8        | 0.3   | 5 600    | 2 830        | 570                                  | 289       | 13.9 | 24 000          | —        | 28 000 | <b>16002</b> | —         | —         | —          |
|                          | 32                     | 9        | 0.3   | 5 600    | 2 830        | 570                                  | 289       | 13.9 | 24 000          | 15 000   | 28 000 | <b>6002</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 35                     | 11       | 0.6   | 7 650    | 3 750        | 780                                  | 380       | 13.2 | 20 000          | 14 000   | 24 000 | <b>6202</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 42                     | 13       | 1     | 11 400   | 5 450        | 1 170                                | 555       | 12.3 | 17 000          | 13 000   | 20 000 | <b>6302</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
| <b>17</b>                | 26                     | 5        | 0.3   | 2 630    | 1 570        | 268                                  | 160       | 15.7 | 26 000          | 15 000   | 30 000 | <b>6803</b>  | <b>ZZ</b> | <b>VV</b> | <b>DD</b>  |
|                          | 30                     | 7        | 0.3   | 4 600    | 2 550        | 470                                  | 260       | 14.7 | 24 000          | 15 000   | 28 000 | <b>6903</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 35                     | 8        | 0.3   | 6 000    | 3 250        | 610                                  | 330       | 14.4 | 22 000          | —        | 26 000 | <b>16003</b> | —         | —         | —          |
|                          | 35                     | 10       | 0.3   | 6 000    | 3 250        | 610                                  | 330       | 14.4 | 22 000          | 13 000   | 26 000 | <b>6003</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 40                     | 12       | 0.6   | 9 550    | 4 800        | 975                                  | 490       | 13.2 | 17 000          | 12 000   | 20 000 | <b>6203</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 47                     | 14       | 1     | 13 600   | 6 650        | 1 390                                | 675       | 12.4 | 15 000          | 11 000   | 18 000 | <b>6303</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
| <b>20</b>                | 32                     | 7        | 0.3   | 4 000    | 2 470        | 410                                  | 252       | 15.5 | 22 000          | 13 000   | 26 000 | <b>6804</b>  | <b>ZZ</b> | <b>VV</b> | <b>DD</b>  |
|                          | 37                     | 9        | 0.3   | 6 400    | 3 700        | 650                                  | 375       | 14.7 | 19 000          | 12 000   | 22 000 | <b>6904</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 42                     | 8        | 0.3   | 7 900    | 4 450        | 810                                  | 455       | 14.5 | 18 000          | —        | 20 000 | <b>16004</b> | —         | —         | —          |
|                          | 42                     | 12       | 0.6   | 9 400    | 5 000        | 955                                  | 510       | 13.8 | 18 000          | 11 000   | 20 000 | <b>6004</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 47                     | 14       | 1     | 12 800   | 6 600        | 1 300                                | 670       | 13.1 | 15 000          | 11 000   | 18 000 | <b>6204</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 52                     | 15       | 1.1   | 15 900   | 7 900        | 1 620                                | 805       | 12.4 | 14 000          | 10 000   | 17 000 | <b>6304</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
| <b>22</b>                | 44                     | 12       | 0.6   | 9 400    | 5 050        | 960                                  | 515       | 14.0 | 17 000          | 11 000   | 20 000 | <b>60/22</b> | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 50                     | 14       | 1     | 12 900   | 6 800        | 1 320                                | 695       | 13.5 | 14 000          | 9 500    | 16 000 | <b>62/22</b> | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 56                     | 16       | 1.1   | 18 400   | 9 250        | 1 870                                | 940       | 12.4 | 13 000          | 9 500    | 16 000 | <b>63/22</b> | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |

| With Snap Ring Groove | With Snap Ring | Snap Ring Groove Dimensions (1) (mm) |       |                    |                    |                    | Snap Ring (1) Dimensions (mm) |       | Abutment and Fillet Dimensions (mm) |                        |                    |                    |                    | Mass (kg) approx |       |
|-----------------------|----------------|--------------------------------------|-------|--------------------|--------------------|--------------------|-------------------------------|-------|-------------------------------------|------------------------|--------------------|--------------------|--------------------|------------------|-------|
|                       |                | a max                                | b min | D <sub>1</sub> max | r <sub>0</sub> max | r <sub>N</sub> min | D <sub>2</sub> max            | f max | d <sub>a</sub> (2) min              | d <sub>a</sub> (2) max | r <sub>a</sub> max | D <sub>x</sub> min | C <sub>Y</sub> max |                  |       |
| —                     | —              | —                                    | —     | —                  | —                  | —                  | —                             | 12    | 12                                  | 17                     | 0.3                | —                  | —                  | 0.005            |       |
| <b>N</b> (3)          | <b>NR</b> (3)  | 1.05                                 | 0.8   | 20.8               | 0.2                | 0.2                | 24.8                          | 0.7   | 12                                  | 12.5                   | 20                 | 0.3                | 25.5               | 1.5              | 0.009 |
| <b>N</b> (4)          | <b>NR</b> (4)  | 1.35                                 | 0.87  | 24.5               | 0.2                | 0.3                | 28.7                          | 0.84  | 12                                  | 13                     | 24                 | 0.3                | 29.4               | 1.9              | 0.018 |
| <b>N</b>              | <b>NR</b>      | 2.06                                 | 1.35  | 28.17              | 0.4                | 0.5                | 34.7                          | 1.12  | 14                                  | 16                     | 26                 | 0.6                | 35.5               | 2.9              | 0.032 |
| <b>N</b>              | <b>NR</b>      | 2.06                                 | 1.35  | 33.17              | 0.4                | 0.5                | 39.7                          | 1.12  | 14                                  | 16.5                   | 31                 | 0.6                | 40.5               | 2.9              | 0.052 |
| —                     | —              | —                                    | —     | —                  | —                  | —                  | —                             | —     | 14                                  | 14                     | 19                 | 0.3                | —                  | —                | 0.006 |
| <b>N</b>              | <b>NR</b>      | 1.05                                 | 0.8   | 22.8               | 0.2                | 0.2                | 26.8                          | 0.7   | 14                                  | 14.5                   | 22                 | 0.3                | 27.5               | 1.5              | 0.010 |
| —                     | —              | —                                    | —     | —                  | —                  | —                  | —                             | —     | 14                                  | —                      | 26                 | 0.3                | —                  | —                | 0.019 |
| <b>N</b> (4)          | <b>NR</b> (4)  | 1.35                                 | 0.87  | 26.5               | 0.2                | 0.3                | 30.7                          | 0.84  | 14                                  | 15.5                   | 26                 | 0.3                | 31.4               | 1.9              | 0.022 |
| <b>N</b>              | <b>NR</b>      | 2.06                                 | 1.35  | 30.15              | 0.4                | 0.5                | 36.7                          | 1.12  | 16                                  | 17                     | 28                 | 0.6                | 37.5               | 2.9              | 0.037 |
| <b>N</b>              | <b>NR</b>      | 2.06                                 | 1.35  | 34.77              | 0.4                | 0.5                | 41.3                          | 1.12  | 17                                  | 18                     | 32                 | 1                  | 42                 | 2.9              | 0.060 |
| —                     | —              | —                                    | —     | —                  | —                  | —                  | —                             | —     | 17                                  | 17                     | 22                 | 0.3                | —                  | —                | 0.007 |
| <b>N</b>              | <b>NR</b>      | 1.3                                  | 0.95  | 26.7               | 0.25               | 0.3                | 30.8                          | 0.85  | 17                                  | 17                     | 26                 | 0.3                | 31.5               | 1.8              | 0.015 |
| —                     | —              | —                                    | —     | —                  | —                  | —                  | —                             | —     | 17                                  | —                      | 30                 | 0.3                | —                  | —                | 0.027 |
| <b>N</b>              | <b>NR</b>      | 2.06                                 | 1.35  | 30.15              | 0.4                | 0.3                | 36.7                          | 1.12  | 17                                  | 19                     | 30                 | 0.3                | 37.5               | 2.9              | 0.031 |
| <b>N</b>              | <b>NR</b>      | 2.06                                 | 1.35  | 33.17              | 0.4                | 0.5                | 39.7                          | 1.12  | 19                                  | 20.5                   | 31                 | 0.6                | 40.5               | 2.9              | 0.045 |
| <b>N</b>              | <b>NR</b>      | 2.06                                 | 1.35  | 39.75              | 0.4                | 0.5                | 46.3                          | 1.12  | 20                                  | 22.5                   | 37                 | 1                  | 47                 | 2.9              | 0.083 |
| —                     | —              | —                                    | —     | —                  | —                  | —                  | —                             | —     | 19                                  | 19                     | 24                 | 0.3                | —                  | —                | 0.007 |
| <b>N</b>              | <b>NR</b>      | 1.3                                  | 0.95  | 28.7               | 0.25               | 0.3                | 32.8                          | 0.85  | 19                                  | 19.5                   | 28                 | 0.3                | 33.5               | 1.8              | 0.017 |
| —                     | —              | —                                    | —     | —                  | —                  | —                  | —                             | —     | 19                                  | —                      | 33                 | 0.3                | —                  | —                | 0.033 |
| <b>N</b>              | <b>NR</b>      | 2.06                                 | 1.35  | 33.17              | 0.4                | 0.3                | 39.7                          | 1.12  | 19                                  | 21.5                   | 33                 | 0.3                | 40.5               | 2.9              | 0.041 |
| <b>N</b>              | <b>NR</b>      | 2.06                                 | 1.35  | 38.1               | 0.4                | 0.5                | 44.6                          | 1.12  | 21                                  | 23.5                   | 36                 | 0.6                | 45.5               | 2.9              | 0.067 |
| <b>N</b>              | <b>NR</b>      | 2.46                                 | 1.35  | 44.6               | 0.4                | 0.5                | 52.7                          | 1.12  | 22                                  | 25.5                   | 42                 | 1                  | 53.5               | 3.3              | 0.113 |
| <b>N</b>              | <b>NR</b>      | 1.3                                  | 0.95  | 30.7               | 0.25               | 0.3                | 34.8                          | 0.85  | 22                                  | 22                     | 30                 | 0.3                | 35.5               | 1.8              | 0.017 |
| <b>N</b>              | <b>NR</b>      | 1.7                                  | 0.95  | 35.7               | 0.25               | 0.3                | 39.8                          | 0.85  | 22                                  | 24                     | 35                 | 0.3                | 40.5               | 2.3              | 0.037 |
| —                     | —              | —                                    | —     | —                  | —                  | —                  | —                             | —     | 22                                  | —                      | 40                 | 0.3                | —                  | —                | 0.048 |
| <b>N</b>              | <b>NR</b>      | 2.06                                 | 1.35  | 39.75              | 0.4                | 0.5                | 46.3                          | 1.12  | 24                                  | 25.5                   | 38                 | 0.6                | 47                 | 2.9              | 0.068 |
| <b>N</b>              | <b>NR</b>      | 2.46                                 | 1.35  | 44.6               | 0.4                | 0.5                | 52.7                          | 1.12  | 25                                  | 26.5                   | 42                 | 1                  | 53.5               | 3.3              | 0.107 |
| <b>N</b>              | <b>NR</b>      | 2.46                                 | 1.35  | 49.73              | 0.4                | 0.5                | 57.9                          | 1.12  | 26.5                                | 28                     | 45.5               | 1                  | 58.5               | 3.3              | 0.145 |
| <b>N</b>              | <b>NR</b>      | 2.06                                 | 1.35  | 41.75              | 0.4                | 0.5                | 48.3                          | 1.12  | 26                                  | 26.5                   | 40                 | 0.6                | 49                 | 2.9              | 0.074 |
| <b>N</b>              | <b>NR</b>      | 2.46                                 | 1.35  | 47.6               | 0.4                | 0.5                | 55.7                          | 1.12  | 27                                  | 29.5                   | 45                 | 1                  | 56.5               | 3.3              | 0.119 |
| <b>N</b>              | <b>NR</b>      | 2.46                                 | 1.35  | 53.6               | 0.4                | 0.5                | 61.7                          | 1.12  | 28.5                                | 30.5                   | 49.5               | 1                  | 62.5               | 3.3              | 0.179 |

Notes (1) For tolerances for the snap ring grooves and snap ring dimensions, refer to Pages A50 to A53.

(2) When heavy axial loads are applied, increase  $d_a$  and decrease  $D_a$  from the above values.

(3) Ring types N and NR applicable only to open-type bearings.

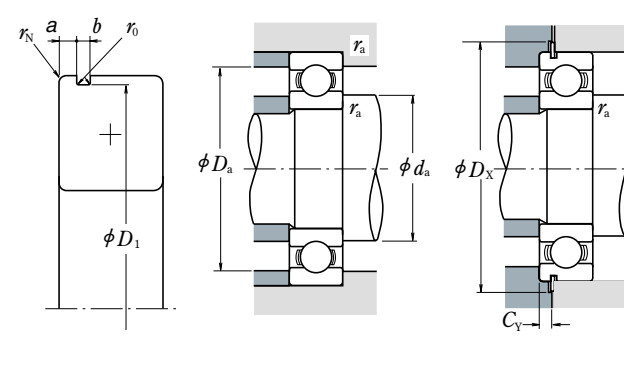
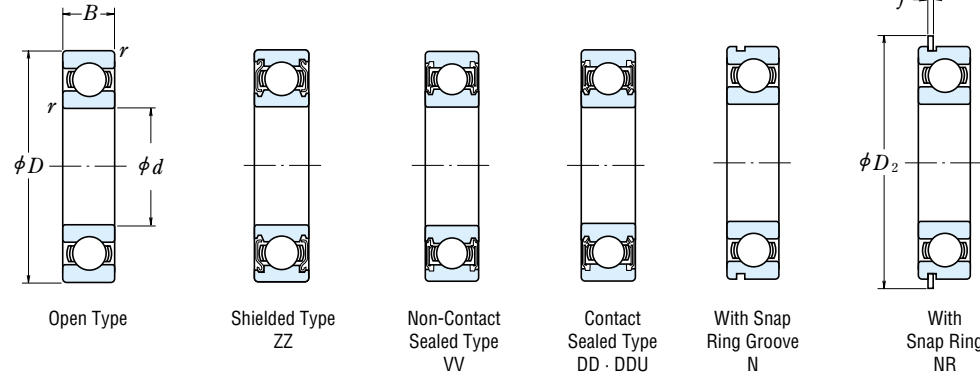
Notes (4) Snap ring groove dimensions and snap ring dimensions are not conformed to ISO15.

Remarks 1. Diameter Series 7 (extra thin section bearings) are also available, please contact NSK.

2. When using bearings with rotating outer rings, contact NSK if they are sealed, shielded, or have snap rings.

# SINGLE-ROW DEEP GROOVE BALL BEARINGS

Bore Diameter 25 – 45 mm



## Dynamic Equivalent Load

$$P = XF_r + YF_a$$

| $\frac{f_0 F_a}{C_{0r}}$ | e    | $\frac{F_a}{F_r} \leq e$ |   | $\frac{F_a}{F_r} > e$ |      |
|--------------------------|------|--------------------------|---|-----------------------|------|
|                          |      | X                        | Y | X                     | Y    |
| 0.172                    | 0.19 | 1                        | 0 | 0.56                  | 2.30 |
| 0.345                    | 0.22 | 1                        | 0 | 0.56                  | 1.99 |
| 0.689                    | 0.26 | 1                        | 0 | 0.56                  | 1.71 |
| 1.03                     | 0.28 | 1                        | 0 | 0.56                  | 1.55 |
| 1.38                     | 0.30 | 1                        | 0 | 0.56                  | 1.45 |
| 2.07                     | 0.34 | 1                        | 0 | 0.56                  | 1.31 |
| 3.45                     | 0.38 | 1                        | 0 | 0.56                  | 1.15 |
| 5.17                     | 0.42 | 1                        | 0 | 0.56                  | 1.04 |
| 6.89                     | 0.44 | 1                        | 0 | 0.56                  | 1.00 |

## Static Equivalent Load

$$\frac{F_a}{F_r} > 0.8, P_0 = 0.6F_r + 0.5F_a$$

$$\frac{F_a}{F_r} \leq 0.8, P_0 = F_r$$

| Boundary Dimensions (mm) | Basic Load Ratings (N) |          |       |          | Factor $f_0$ | Limiting Speeds (min <sup>-1</sup> ) |          |      | Bearing Numbers |          |        |        |    |    |     |
|--------------------------|------------------------|----------|-------|----------|--------------|--------------------------------------|----------|------|-----------------|----------|--------|--------|----|----|-----|
|                          | $C_r$                  | $C_{0r}$ | (kgf) |          |              | Grease                               |          | Oil  | Open            | Shielded | Sealed |        |    |    |     |
|                          |                        |          | $C_r$ | $C_{0r}$ |              | Open Z · ZZ · V · VV                 | DU · DDU |      |                 |          |        | Open Z |    |    |     |
| 25                       | 37                     | 7        | 0.3   | 4 500    | 3 150        | 455                                  | 320      | 16.1 | 18 000          | 10 000   | 22 000 | 6805   | ZZ | VV | DD  |
|                          | 42                     | 9        | 0.3   | 7 050    | 4 550        | 715                                  | 460      | 15.4 | 16 000          | 10 000   | 19 000 | 6905   | ZZ | VV | DDU |
|                          | 47                     | 8        | 0.3   | 8 850    | 5 600        | 905                                  | 570      | 15.1 | 15 000          | —        | 18 000 | 16005  | —  | —  | —   |
|                          | 47                     | 12       | 0.6   | 10 100   | 5 850        | 1 030                                | 595      | 14.5 | 15 000          | 9 500    | 18 000 | 6005   | ZZ | VV | DDU |
|                          | 52                     | 15       | 1     | 14 000   | 7 850        | 1 430                                | 800      | 13.9 | 13 000          | 9 000    | 15 000 | 6205   | ZZ | VV | DDU |
|                          | 62                     | 17       | 1.1   | 20 600   | 11 200       | 2 100                                | 1 150    | 13.2 | 11 000          | 8 000    | 13 000 | 6305   | ZZ | VV | DDU |
| 28                       | 52                     | 12       | 0.6   | 12 500   | 7 400        | 1 270                                | 755      | 14.5 | 14 000          | 8 500    | 16 000 | 60/28  | ZZ | VV | DDU |
|                          | 58                     | 16       | 1     | 16 600   | 9 500        | 1 700                                | 970      | 13.9 | 12 000          | 8 000    | 14 000 | 62/28  | ZZ | VV | DDU |
|                          | 68                     | 18       | 1.1   | 26 700   | 14 000       | 2 730                                | 1 430    | 12.4 | 10 000          | 7 500    | 13 000 | 63/28  | ZZ | VV | DDU |
| 30                       | 42                     | 7        | 0.3   | 4 700    | 3 650        | 480                                  | 370      | 16.4 | 15 000          | 9 000    | 18 000 | 6806   | ZZ | VV | DD  |
|                          | 47                     | 9        | 0.3   | 7 250    | 5 000        | 740                                  | 510      | 15.8 | 14 000          | 8 500    | 17 000 | 6906   | ZZ | VV | DDU |
|                          | 55                     | 9        | 0.3   | 11 200   | 7 350        | 1 150                                | 750      | 15.2 | 13 000          | —        | 15 000 | 16006  | —  | —  | —   |
|                          | 55                     | 13       | 1     | 13 200   | 8 300        | 1 350                                | 845      | 14.7 | 13 000          | 8 000    | 15 000 | 6006   | ZZ | VV | DDU |
|                          | 62                     | 16       | 1     | 19 500   | 11 300       | 1 980                                | 1 150    | 13.8 | 11 000          | 7 500    | 13 000 | 6206   | ZZ | VV | DDU |
|                          | 72                     | 19       | 1.1   | 26 700   | 15 000       | 2 720                                | 1 530    | 13.3 | 9 500           | 6 700    | 12 000 | 6306   | ZZ | VV | DDU |
| 32                       | 58                     | 13       | 1     | 15 100   | 9 150        | 1 530                                | 935      | 14.5 | 12 000          | 7 500    | 14 000 | 60/32  | ZZ | VV | DDU |
|                          | 65                     | 17       | 1     | 20 700   | 11 600       | 2 120                                | 1 190    | 13.6 | 10 000          | 7 100    | 12 000 | 62/32  | ZZ | VV | DDU |
|                          | 75                     | 20       | 1.1   | 29 900   | 17 000       | 3 050                                | 1 730    | 13.2 | 9 000           | 6 300    | 11 000 | 63/32  | ZZ | VV | DDU |
| 35                       | 47                     | 7        | 0.3   | 4 900    | 4 100        | 500                                  | 420      | 16.7 | 14 000          | 7 500    | 16 000 | 6807   | ZZ | VV | DD  |
|                          | 55                     | 10       | 0.6   | 10 600   | 7 250        | 1 080                                | 740      | 15.5 | 12 000          | 7 500    | 15 000 | 6907   | ZZ | VV | DDU |
|                          | 62                     | 9        | 0.3   | 11 700   | 8 200        | 1 190                                | 835      | 15.6 | 11 000          | —        | 13 000 | 16007  | —  | —  | —   |
|                          | 62                     | 14       | 1     | 16 000   | 10 300       | 1 630                                | 1 050    | 14.8 | 11 000          | 6 700    | 13 000 | 6007   | ZZ | VV | DDU |
|                          | 72                     | 17       | 1.1   | 25 700   | 15 300       | 2 620                                | 1 560    | 13.8 | 9 500           | 6 300    | 11 000 | 6207   | ZZ | VV | DDU |
|                          | 80                     | 21       | 1.5   | 33 500   | 19 200       | 3 400                                | 1 960    | 13.2 | 8 500           | 6 000    | 10 000 | 6307   | ZZ | VV | DDU |
| 40                       | 52                     | 7        | 0.3   | 6 350    | 5 550        | 650                                  | 565      | 17.0 | 12 000          | 6 700    | 14 000 | 6808   | ZZ | VV | DD  |
|                          | 62                     | 12       | 0.6   | 13 700   | 10 000       | 1 390                                | 1 020    | 15.7 | 11 000          | 6 300    | 13 000 | 6908   | ZZ | VV | DDU |
|                          | 68                     | 9        | 0.3   | 12 600   | 9 650        | 1 290                                | 985      | 16.0 | 10 000          | —        | 12 000 | 16008  | —  | —  | —   |
|                          | 68                     | 15       | 1     | 16 800   | 11 500       | 1 710                                | 1 180    | 15.3 | 10 000          | 6 000    | 12 000 | 6008   | ZZ | VV | DDU |
|                          | 80                     | 18       | 1.1   | 29 100   | 17 900       | 2 970                                | 1 820    | 14.0 | 8 500           | 5 600    | 10 000 | 6208   | ZZ | VV | DDU |
|                          | 90                     | 23       | 1.5   | 40 500   | 24 000       | 4 150                                | 2 450    | 13.2 | 7 500           | 5 300    | 9 000  | 6308   | ZZ | VV | DDU |
| 45                       | 58                     | 7        | 0.3   | 6 600    | 6 150        | 670                                  | 625      | 17.2 | 11 000          | 6 000    | 13 000 | 6809   | ZZ | VV | DD  |
|                          | 68                     | 12       | 0.6   | 14 100   | 10 900       | 1 440                                | 1 110    | 15.9 | 9 500           | 5 600    | 12 000 | 6909   | ZZ | VV | DDU |
|                          | 75                     | 10       | 0.6   | 14 900   | 11 400       | 1 520                                | 1 160    | 15.9 | 9 000           | —        | 11 000 | 16009  | —  | —  | —   |
|                          | 75                     | 16       | 1     | 20 900   | 15 200       | 2 140                                | 1 550    | 15.3 | 9 000           | 5 300    | 11 000 | 6009   | ZZ | VV | DDU |
|                          | 85                     | 19       | 1.1   | 31 500   | 20 400       | 3 200                                | 2 080    | 14.4 | 7 500           | 5 300    | 9 000  | 6209   | ZZ | VV | DDU |
|                          | 100                    | 25       | 1.5   | 53 000   | 32 000       | 5 400                                | 3 250    | 13.1 | 6 700           | 4 800    | 8 000  | 6309   | ZZ | VV | DDU |

| With Snap Ring Groove | With Snap Ring | Snap Ring Groove Dimensions (1) (mm) |       |                    |                    |                    | Snap Ring (1) Dimensions (mm) |       | Abutment and Fillet Dimensions (mm) |                        |                    |                    |                    | Mass (kg) approx |       |
|-----------------------|----------------|--------------------------------------|-------|--------------------|--------------------|--------------------|-------------------------------|-------|-------------------------------------|------------------------|--------------------|--------------------|--------------------|------------------|-------|
|                       |                | a max                                | b min | D <sub>1</sub> max | r <sub>0</sub> max | r <sub>N</sub> min | D <sub>2</sub> max            | f max | d <sub>a</sub> (2) min              | d <sub>a</sub> (2) max | r <sub>a</sub> max | D <sub>x</sub> min | C <sub>Y</sub> max |                  |       |
| N                     | NR             | 1.3                                  | 0.95  | 35.7               | 0.25               | 0.3                | 39.8                          | 0.85  | 27                                  | 27                     | 35                 | 0.3                | 40.5               | 1.8              | 0.021 |
| N                     | NR             | 1.7                                  | 0.95  | 40.7               | 0.25               | 0.3                | 44.8                          | 0.85  | 27                                  | 28.5                   | 40                 | 0.3                | 45.5               | 2.3              | 0.042 |
| N                     | NR             | —                                    | —     | —                  | —                  | —                  | —                             | —     | 27                                  | —                      | 45                 | 0.3                | —                  | —                | 0.059 |
| N                     | NR             | 2.06                                 | 1.35  | 44.6               | 0.4                | 0.5                | 52.7                          | 1.12  | 29                                  | 30                     | 43                 | 0.6                | 53.5               | 2.9              | 0.079 |
| N                     | NR             | 2.46                                 | 1.35  | 49.73              | 0.4                | 0.5                | 57.9                          | 1.12  | 30                                  | 32                     | 47                 | 1                  | 58.5               | 3.3              | 0.129 |
| N                     | NR             | 3.28                                 | 1.9   | 59.61              | 0.6                | 0.5                | 67.7                          | 1.7   | 31.5                                | 36                     | 55.5               | 1                  | 68.5               | 4.6              | 0.235 |
| N                     | NR             | 2.06                                 | 1.35  | 49.73              | 0.4                | 0.5                | 57.9                          | 1.12  | 32                                  | 34                     | 48                 | 0.6                | 58.5               | 2.9              | 0.096 |
| N                     | NR             | 2.46                                 | 1.35  | 55.6               | 0.4                | 0.5                | 63.7                          | 1.12  | 33                                  | 35.5                   | 53                 | 1                  | 64.5               | 3.3              | 0.175 |
| N                     | NR             | 3.28                                 | 1.9   | 64.82              | 0.6                | 0.5                | 74.6                          | 1.7   | 34.5                                | 38                     | 61.5               | 1                  | 76                 | 4.6              | 0.287 |
| N                     | NR             | 1.3                                  | 0.95  | 40.7               | 0.25               | 0.3                | 44.8                          | 0.85  | 32                                  | 32                     | 40                 | 0.3                | 45.5               | 1.8              | 0.024 |
| N                     | NR             | 1.7                                  | 0.95  | 45.7               | 0.25               | 0.3                | 49.8                          | 0.85  | 32                                  | 34                     | 45                 | 0.3                | 50.5               | 2.3              | 0.052 |
| N                     | NR             | —                                    | —     | —                  | —                  | —                  | —                             | —     | 32                                  | —                      | 53                 | 0.3                | —                  | —                | 0.087 |
| N                     | NR             | 2.08                                 | 1.35  | 52.6               | 0.4                | 0.5                | 60.7                          | 1.12  | 35                                  | 36.5                   | 50                 | 1                  | 61.5               | 2.9              | 0.116 |
| N                     | NR             | 3.28                                 | 1.9   | 59.61              | 0.6                | 0.5                | 67.7                          | 1.7   | 35                                  | 38.5                   | 57                 | 1                  | 68.5               | 4.6              | 0.199 |
| N                     | NR             | 3.28                                 | 1.9   | 68.81              | 0.6                | 0.5                | 78.6                          | 1.7   | 36.5                                | 42.5                   | 65.5               | 1                  | 80                 | 4.6              | 0.345 |
| N                     | NR             | 2.08                                 | 1.35  | 55.6               | 0.4                | 0.5                | 63.7                          | 1.12  | 37                                  | 38.5                   | 53                 | 1                  | 64.5               | 2.9              | 0.122 |
| N                     | NR             | 3.28                                 | 1.9   | 62.6               | 0.6                | 0.5                | 70.7                          | 1.7   | 37                                  | 40                     | 60                 | 1                  | 71.5               | 4.6              | 0.225 |
| N                     | NR             | 3.28                                 | 1.9   | 71.83              | 0.6                | 0.5                | 81.6                          | 1.7   | 38.5                                | 44.5                   | 68.5               | 1                  | 83                 | 4.6              | 0.389 |
| N                     | NR             | 1.3                                  | 0.95  | 45.7               | 0.25               | 0.3                | 49.8                          | 0.85  | 37                                  | 37                     | 45                 | 0.3                | 50.5               | 1.8              | 0.027 |
| N                     | NR             | 1.7                                  | 0.95  | 53.7               | 0.25               | 0.5                | 57.8                          | 0.85  | 39                                  | 39                     | 51                 | 0.6                | 58.5               | 2.3              | 0.075 |
| N                     | NR             | —                                    | —     | —                  | —                  | —                  | —                             | —     | 37                                  | —                      | 60                 | 0.3                | —                  | —                | 0.107 |
| N                     | NR             | 2.08                                 | 1.9   | 59.61              | 0.6                | 0.5                | 67.7                          | 1.7   | 40                                  | 41.5                   | 57                 | 1                  | 68.5               | 3.4              | 0.151 |
| N                     | NR             | 3.28                                 | 1.9   | 68.81              | 0.6                | 0.5                | 78.6                          | 1.7   | 41.5                                | 44.5                   | 65.5               | 1                  | 80                 | 4.6              | 0.284 |
| N                     | NR             | 3.28                                 | 1.9   | 76.81              | 0.6                | 0.5                | 86.6                          | 1.7   | 43                                  | 47                     | 72                 | 1.5                | 88                 | 4.6              | 0.464 |
| N                     | NR             | 1.3                                  | 0.95  | 50.7               | 0.25               | 0.3                | 54.8                          | 0.85  | 42                                  | 42                     | 50                 | 0.3                | 55.5               | 1.8              | 0.031 |
| N                     | NR             | 1.7                                  | 0.95  | 60.7               | 0.25               | 0.5                | 64.8                          | 0.85  | 44                                  | 46                     | 58                 | 0.6                | 65.5               | 2.3              | 0.112 |
| N                     | NR             | —                                    | —     | —                  | —                  | —                  | —                             | —     | 42                                  | —                      | 66                 | 0.3                | —                  | —                | 0.13  |
| N                     | NR             | 2.49                                 | 1.9   | 64.82              | 0.6                | 0.5                | 74.6                          | 1.7   | 45                                  | 47.5                   | 63                 | 1                  | 76                 | 3.8              | 0.19  |
| N                     | NR             | 3.28                                 | 1.9   | 76.81              | 0.6                | 0.5                | 86.6                          | 1.7   | 46.5                                | 50.5                   | 73.5               | 1                  | 88                 | 4.6              | 0.366 |
| N                     | NR             | 3.28                                 | 2.7   | 86.79              | 0.6                | 0.5                | 96.5                          | 2.46  | 48                                  | 53                     | 82                 | 1.5                | 98                 | 5.4              | 0.636 |
| N                     | NR             | 1.3                                  | 0.95  | 56.7               | 0.25               | 0.3                | 60.8                          | 0.85  | 47                                  | 47.5                   | 56                 | 0.3                | 61.5               | 1.8              | 0.038 |
| N                     | NR             | 1.7                                  | 0.95  | 66.7               | 0.25               | 0.5                | 70.8                          | 0.85  | 49                                  | 50                     | 64                 | 0.6                | 72                 | 2.3              | 0.126 |
| N                     | NR             | —                                    | —     | —                  | —                  | —                  | —                             | —     | 49                                  | —                      | 71                 | 0.6                | —                  | —                | 0.167 |
| N                     | NR             | 2.49                                 | 1.9   | 71.83              | 0.6                | 0.5                | 81.6                          | 1.7   | 50                                  | 53.5                   | 70                 | 1                  | 83                 | 3.8              | 0.241 |
| N                     | NR             | 3.28                                 | 1.9   | 81.81              | 0.6                | 0.5                | 91.6                          | 1.7   | 51.5                                | 55.5                   | 78.5               | 1                  | 93                 | 4.6              | 0.42  |
| N                     | NR             | 3.28                                 | 2.7   | 96.8               | 0.6                | 0.5                | 106.5                         | 2.46  | 53                                  | 61.5                   | 92                 | 1.5                | 108                | 5.4              | 0.829 |

Notes (1) For tolerances for the snap ring grooves and snap ring dimensions, refer to Pages A50 to A53.

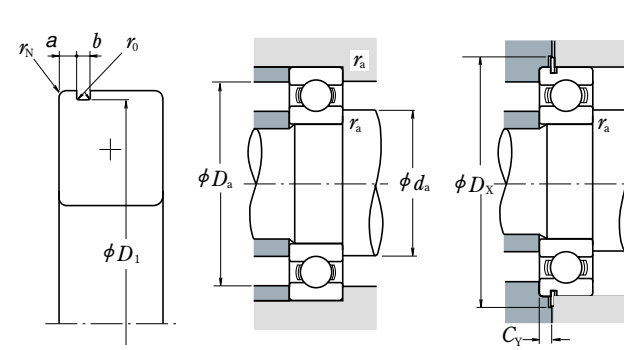
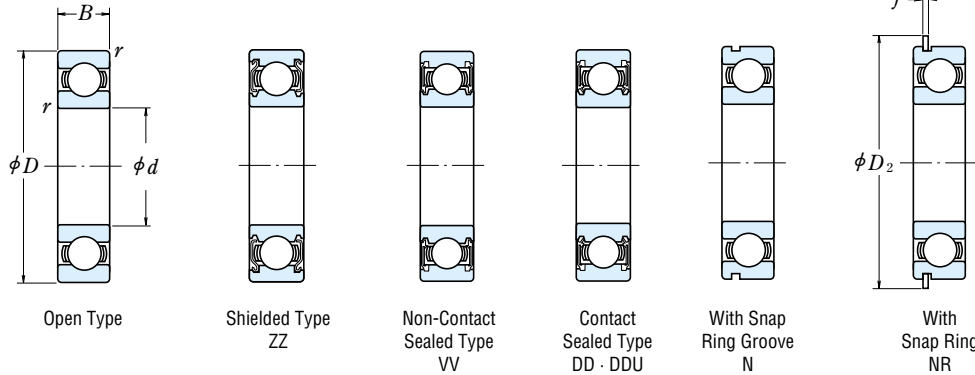
(2) When heavy axial loads are applied, increase  $d_a$  and decrease  $D_a$  from the above values.

Remarks 1. Diameter Series 7 (extra thin section bearings) are also available, please contact NSK.

2. When using bearings with rotating outer rings, contact NSK if they are sealed, shielded, or have snap rings.

# SINGLE-ROW DEEP GROOVE BALL BEARINGS

Bore Diameter 50 – 75 mm



### Dynamic Equivalent Load

$$P = XF_r + YF_a$$

| $\frac{f_0 F_a}{C_{0r}}$ | $e$  | $\frac{F_a}{F_r} \leq e$ |   | $\frac{F_a}{F_r} > e$ |      |
|--------------------------|------|--------------------------|---|-----------------------|------|
|                          |      | X                        | Y | X                     | Y    |
| 0.172                    | 0.19 | 1                        | 0 | 0.56                  | 2.30 |
| 0.345                    | 0.22 | 1                        | 0 | 0.56                  | 1.99 |
| 0.689                    | 0.26 | 1                        | 0 | 0.56                  | 1.71 |
| 1.03                     | 0.28 | 1                        | 0 | 0.56                  | 1.55 |
| 1.38                     | 0.30 | 1                        | 0 | 0.56                  | 1.45 |
| 2.07                     | 0.34 | 1                        | 0 | 0.56                  | 1.31 |
| 3.45                     | 0.38 | 1                        | 0 | 0.56                  | 1.15 |
| 5.17                     | 0.42 | 1                        | 0 | 0.56                  | 1.04 |
| 6.89                     | 0.44 | 1                        | 0 | 0.56                  | 1.00 |

### Static Equivalent Load

$$\frac{F_a}{F_r} > 0.8, P_0 = 0.6F_r + 0.5F_a$$

$$\frac{F_a}{F_r} \leq 0.8, P_0 = F_r$$

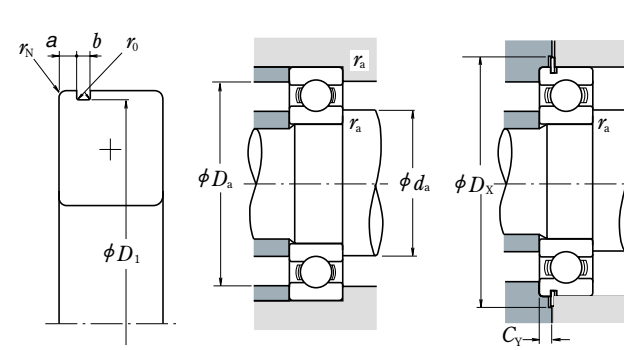
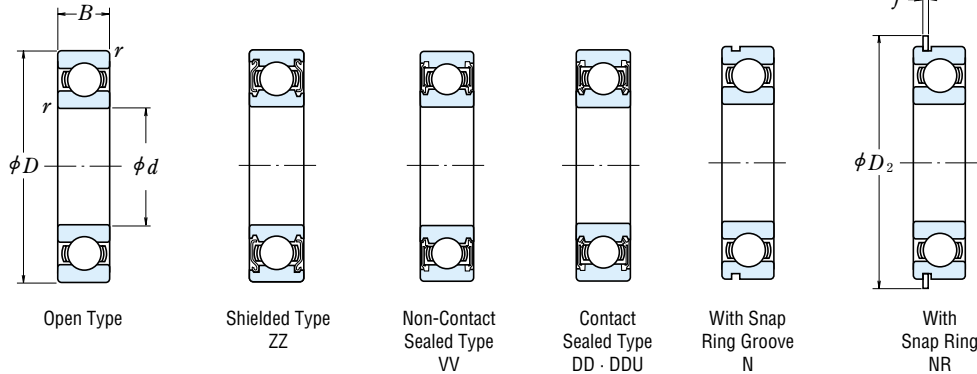
| Boundary Dimensions (mm) | Basic Load Ratings (kgf) |          |       |          | Factor $f_0$ | Limiting Speeds (min <sup>-1</sup> ) |        |        | Bearing Numbers |          |        |              |           |           |            |
|--------------------------|--------------------------|----------|-------|----------|--------------|--------------------------------------|--------|--------|-----------------|----------|--------|--------------|-----------|-----------|------------|
|                          | (N)                      |          | (kgf) |          |              | Grease                               |        | Oil    | Open            | Shielded | Sealed |              |           |           |            |
|                          | $C_r$                    | $C_{0r}$ | $C_r$ | $C_{0r}$ |              | Open Z · ZZ                          | DU DDU | Open Z |                 |          |        |              |           |           |            |
| <b>50</b>                | 65                       | 7        | 0.3   | 6 400    | 6 200        | 655                                  | 635    | 17.2   | 9 500           | 5 300    | 11 000 | <b>6810</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 72                       | 12       | 0.6   | 14 500   | 11 700       | 1 480                                | 1 200  | 16.1   | 9 000           | 5 300    | 11 000 | <b>6910</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 80                       | 10       | 0.6   | 15 400   | 12 400       | 1 570                                | 1 260  | 16.1   | 8 500           | —        | 10 000 | <b>16010</b> | —         | —         | —          |
|                          | 80                       | 16       | 1     | 21 800   | 16 600       | 2 220                                | 1 700  | 15.6   | 8 500           | 4 800    | 10 000 | <b>6010</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 90                       | 20       | 1.1   | 35 000   | 23 200       | 3 600                                | 2 370  | 14.4   | 7 100           | 4 800    | 8 500  | <b>6210</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 110                      | 27       | 2     | 62 000   | 38 500       | 6 300                                | 3 900  | 13.2   | 6 000           | 4 300    | 7 500  | <b>6310</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
| <b>55</b>                | 72                       | 9        | 0.3   | 8 800    | 8 500        | 900                                  | 865    | 17.0   | 8 500           | 4 800    | 10 000 | <b>6811</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 80                       | 13       | 1     | 16 000   | 13 300       | 1 630                                | 1 350  | 16.2   | 8 000           | 4 500    | 9 500  | <b>6911</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 90                       | 11       | 0.6   | 19 400   | 16 300       | 1 980                                | 1 660  | 16.2   | 7 500           | —        | 9 000  | <b>16011</b> | —         | —         | —          |
|                          | 90                       | 18       | 1.1   | 28 300   | 21 200       | 2 880                                | 2 170  | 15.3   | 7 500           | 4 500    | 9 000  | <b>6011</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 100                      | 21       | 1.5   | 43 500   | 29 300       | 4 450                                | 2 980  | 14.3   | 6 300           | 4 300    | 7 500  | <b>6211</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 120                      | 29       | 2     | 71 500   | 44 500       | 7 300                                | 4 550  | 13.1   | 5 600           | 4 000    | 6 700  | <b>6311</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
| <b>60</b>                | 78                       | 10       | 0.3   | 11 500   | 10 900       | 1 170                                | 1 120  | 16.9   | 8 000           | 4 500    | 9 500  | <b>6812</b>  | <b>ZZ</b> | <b>VV</b> | <b>DD</b>  |
|                          | 85                       | 13       | 1     | 19 400   | 16 300       | 1 980                                | 1 660  | 16.2   | 7 500           | 4 300    | 9 000  | <b>6912</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 95                       | 11       | 0.6   | 20 000   | 17 500       | 2 040                                | 1 780  | 16.3   | 7 100           | —        | 8 500  | <b>16012</b> | —         | —         | —          |
|                          | 95                       | 18       | 1.1   | 29 500   | 23 200       | 3 000                                | 2 370  | 15.6   | 7 100           | 4 000    | 8 500  | <b>6012</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 110                      | 22       | 1.5   | 52 500   | 36 000       | 5 350                                | 3 700  | 14.3   | 5 600           | 3 800    | 7 100  | <b>6212</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 130                      | 31       | 2.1   | 82 000   | 52 000       | 8 350                                | 5 300  | 13.1   | 5 300           | 3 600    | 6 300  | <b>6312</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
| <b>65</b>                | 85                       | 10       | 0.6   | 11 900   | 12 100       | 1 220                                | 1 230  | 17.0   | 7 500           | 4 000    | 8 500  | <b>6813</b>  | <b>ZZ</b> | <b>VV</b> | <b>DD</b>  |
|                          | 90                       | 13       | 1     | 17 400   | 16 100       | 1 770                                | 1 640  | 16.6   | 7 100           | 4 000    | 8 500  | <b>6913</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 100                      | 11       | 0.6   | 20 500   | 18 700       | 2 090                                | 1 910  | 16.5   | 6 700           | —        | 8 000  | <b>16013</b> | —         | —         | —          |
|                          | 100                      | 18       | 1.1   | 30 500   | 25 200       | 3 100                                | 2 570  | 15.8   | 6 700           | 4 000    | 8 000  | <b>6013</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 120                      | 23       | 1.5   | 57 500   | 40 000       | 5 850                                | 4 100  | 14.4   | 5 300           | 3 600    | 6 300  | <b>6213</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 140                      | 33       | 2.1   | 92 500   | 60 000       | 9 450                                | 6 100  | 13.2   | 4 800           | 3 400    | 6 000  | <b>6313</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
| <b>70</b>                | 90                       | 10       | 0.6   | 12 100   | 12 700       | 1 230                                | 1 300  | 17.2   | 6 700           | 3 800    | 8 000  | <b>6814</b>  | <b>ZZ</b> | <b>VV</b> | <b>DD</b>  |
|                          | 100                      | 16       | 1     | 23 700   | 21 200       | 2 420                                | 2 160  | 16.3   | 6 300           | 3 600    | 7 500  | <b>6914</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 110                      | 13       | 0.6   | 26 800   | 23 600       | 2 730                                | 2 410  | 16.3   | 6 000           | —        | 7 100  | <b>16014</b> | —         | —         | —          |
|                          | 110                      | 20       | 1.1   | 38 000   | 31 000       | 3 900                                | 3 150  | 15.6   | 6 000           | 3 600    | 7 100  | <b>6014</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 125                      | 24       | 1.5   | 62 000   | 44 000       | 6 350                                | 4 500  | 14.5   | 5 000           | 3 400    | 6 300  | <b>6214</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 150                      | 35       | 2.1   | 104 000  | 68 000       | 10 600                               | 6 950  | 13.2   | 4 500           | 3 200    | 5 300  | <b>6314</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
| <b>75</b>                | 95                       | 10       | 0.6   | 12 500   | 13 900       | 1 280                                | 1 410  | 17.3   | 6 300           | 3 600    | 7 500  | <b>6815</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 105                      | 16       | 1     | 24 400   | 22 600       | 2 480                                | 2 300  | 16.5   | 6 000           | 3 400    | 7 100  | <b>6915</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 115                      | 13       | 0.6   | 27 600   | 25 300       | 2 820                                | 2 580  | 16.4   | 5 600           | —        | 6 700  | <b>16015</b> | —         | —         | —          |
|                          | 115                      | 20       | 1.1   | 39 500   | 33 500       | 4 050                                | 3 400  | 15.8   | 5 600           | 3 400    | 6 700  | <b>6015</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 130                      | 25       | 1.5   | 66 000   | 49 500       | 6 750                                | 5 050  | 14.7   | 4 800           | 3 200    | 5 600  | <b>6215</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 160                      | 37       | 2.1   | 113 000  | 77 000       | 11 600                               | 7 850  | 13.2   | 4 300           | 2 800    | 5 000  | <b>6315</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |

| With Snap Ring Groove | With Snap Ring | Snap Ring Groove Dimensions (1) (mm) |       |                    |                    |                    | Snap Ring (1) Dimensions (mm) |       | Abutment and Fillet Dimensions (mm) |                        |                    |                    |                    | Mass (kg) approx |       |
|-----------------------|----------------|--------------------------------------|-------|--------------------|--------------------|--------------------|-------------------------------|-------|-------------------------------------|------------------------|--------------------|--------------------|--------------------|------------------|-------|
|                       |                | a max                                | b min | D <sub>1</sub> max | r <sub>0</sub> max | r <sub>N</sub> min | D <sub>2</sub> max            | f max | d <sub>a</sub> (2) min              | d <sub>a</sub> (2) max | r <sub>a</sub> max | D <sub>x</sub> min | C <sub>Y</sub> max |                  |       |
| <b>N</b>              | <b>NR</b>      | 1.3                                  | 0.95  | 63.7               | 0.25               | 0.3                | 67.8                          | 0.85  | 52                                  | 52.5                   | 63                 | 0.3                | 68.5               | 1.8              | 0.050 |
| <b>N</b>              | <b>NR</b>      | 1.7                                  | 0.95  | 70.7               | 0.25               | 0.5                | 74.8                          | 0.85  | 54                                  | 55                     | 68                 | 0.6                | 76                 | 2.3              | 0.135 |
| —                     | —              | —                                    | —     | —                  | —                  | —                  | —                             | —     | 54                                  | —                      | 76                 | 0.6                | —                  | —                | 0.175 |
| <b>N</b>              | <b>NR</b>      | 2.49                                 | 1.9   | 76.81              | 0.6                | 0.5                | 86.6                          | 1.7   | 55                                  | 58.5                   | 75                 | 1                  | 88                 | 3.8              | 0.261 |
| <b>N</b>              | <b>NR</b>      | 3.28                                 | 2.7   | 86.79              | 0.6                | 0.5                | 96.5                          | 2.46  | 56.5                                | 60                     | 83.5               | 1                  | 98                 | 5.4              | 0.459 |
| <b>N</b>              | <b>NR</b>      | 3.28                                 | 2.7   | 106.81             | 0.6                | 0.5                | 116.6                         | 2.46  | 59                                  | 68                     | 101                | 2                  | 118                | 5.4              | 1.06  |
| <b>N</b>              | <b>NR</b>      | 1.7                                  | 0.95  | 70.7               | 0.25               | 0.3                | 74.8                          | 0.85  | 57                                  | 59                     | 70                 | 0.3                | 76                 | 2.3              | 0.081 |
| <b>N</b>              | <b>NR</b>      | 2.1                                  | 1.3   | 77.9               | 0.4                | 0.5                | 84.4                          | 1.12  | 60                                  | 61.5                   | 75                 | 1                  | 86                 | 2.9              | 0.189 |
| —                     | —              | —                                    | —     | —                  | —                  | —                  | —                             | —     | 59                                  | —                      | 86                 | 0.6                | —                  | —                | 0.257 |
| <b>N</b>              | <b>NR</b>      | 2.87                                 | 2.7   | 86.79              | 0.6                | 0.5                | 96.5                          | 2.46  | 61.5                                | 64                     | 83.5               | 1                  | 98                 | 5                | 0.381 |
| <b>N</b>              | <b>NR</b>      | 3.28                                 | 2.7   | 96.8               | 0.6                | 0.5                | 106.5                         | 2.46  | 63                                  | 66.5                   | 92                 | 1.5                | 108                | 5.4              | 0.619 |
| <b>N</b>              | <b>NR</b>      | 4.06                                 | 3.1   | 115.21             | 0.6                | 0.5                | 129.7                         | 2.82  | 64                                  | 72.5                   | 111                | 2                  | 131.5              | 6.5              | 1.37  |
| <b>N</b>              | <b>NR</b>      | 1.7                                  | 1.3   | 76.2               | 0.4                | 0.3                | 82.7                          | 1.12  | 62                                  | 64                     | 76                 | 0.3                | 84                 | 2.5              | 0.103 |
| <b>N</b>              | <b>NR</b>      | 2.1                                  | 1.3   | 82.9               | 0.4                | 0.5                | 89.4                          | 1.12  | 65                                  | 66                     | 80                 | 1                  | 91                 | 2.9              | 0.192 |
| —                     | —              | —                                    | —     | —                  | —                  | —                  | —                             | —     | 64                                  | —                      | 91                 | 0.6                | —                  | —                | 0.281 |
| <b>N</b>              | <b>NR</b>      | 2.87                                 | 2.7   | 91.82              | 0.6                | 0.5                | 101.6                         | 2.46  | 66.5                                | 69                     | 88.5               | 1                  | 103                | 5                | 0.412 |
| <b>N</b>              | <b>NR</b>      | 3.28                                 | 2.7   | 106.81             | 0.6                | 0.5                | 116.6                         | 2.46  | 68                                  | 74.5                   | 102                | 1.5                | 118                | 5.4              | 0.783 |
| <b>N</b>              | <b>NR</b>      | 4.06                                 | 3.1   | 125.22             | 0.6                | 0.5                | 139.7                         | 2.82  | 71                                  | 79                     | 119                | 2                  | 141.5              | 6.5              | 1.72  |
| <b>N</b>              | <b>NR</b>      | 1.7                                  | 1.3   | 82.9               | 0.4                | 0.5                | 89.4                          | 1.12  | 69                                  | 69                     | 81                 | 0.6                | 91                 | 2.5              | 0.128 |
| <b>N</b>              | <b>NR</b>      | 2.1                                  | 1.3   | 87.9               | 0.4                | 0.5                | 94.4                          | 1.12  | 70                                  | 71.5                   | 85                 | 1                  | 96                 | 2.9              | 0.218 |
| —                     | —              | —                                    | —     | —                  | —                  | —                  | —                             | —     | 69                                  | —                      | 96                 | 0.6                | —                  | —                | 0.30  |
| <b>N</b>              | <b>NR</b>      | 2.87                                 | 2.7   | 96.8               | 0.6                | 0.5                | 106.5                         | 2.46  | 71.5                                | 73                     | 93.5               | 1                  | 108                | 5                | 0.439 |
| <b>N</b>              | <b>NR</b>      | 4.06                                 | 3.1   | 115.21             | 0.6                | 0.5                | 129.7                         | 2.82  | 73                                  | 80                     | 112                | 1.5                | 131.5              | 6.5              | 1.0   |
| <b>N</b>              | <b>NR</b>      | 4.9                                  | 3.1   | 135.23             | 0.6                | 0.5                | 149.7                         | 2.82  | 76                                  | 85.5                   | 129                | 2                  | 152                | 7.3              | 2.11  |
| <b>N</b>              | <b>NR</b>      | 1.7                                  | 1.3   | 87.9               | 0.4                | 0.5                | 94.4                          | 1.12  | 74                                  | 74.5                   | 86                 | 0.6                | 96                 | 2.5              | 0.134 |
| <b>N</b>              | <b>NR</b>      | 2.5                                  | 1.3   | 97.9               | 0.4                | 0.5                | 104.4                         | 1.12  | 75                                  | 77.5                   | 95                 | 1                  | 106                | 3.3              | 0.349 |
| —                     | —              | —                                    | —     | —                  | —                  | —                  | —                             | —     | 74                                  | —                      | 106                | 0.6                | —                  | —                | 0.441 |
| <b>N</b>              | <b>NR</b>      | 2.87                                 | 2.7   | 106.81             | 0.6                | 0.5                | 116.6                         | 2.46  | 76.5                                | 80.5                   | 103.5              | 1                  | 118                | 5                | 0.608 |
| <b>N</b>              | <b>NR</b>      | 4.06                                 | 3.1   | 120.22             | 0.6                | 0.5                | 134.7                         | 2.82  | 78                                  | 84                     | 117                | 1.5                | 136.5              | 6.5              | 1.09  |
| <b>N</b>              | <b>NR</b>      | 4.9                                  | 3.1   | 145.24             | 0.6                | 0.5                | 159.7                         | 2.82  | 81                                  | 92                     | 139                | 2                  | 162                | 7.3              | 2.57  |
| <b>N</b>              | <b>NR</b>      | 1.7                                  | 1.3   | 92.9               | 0.4                | 0.5                | 99.4                          | 1.12  | 79                                  | 79.5                   | 91                 | 0.6                | 101                | 2.5              | 0.149 |
| <b>N</b>              | <b>NR</b>      | 2.5                                  | 1.3   | 102.6              | 0.4                | 0.5                | 110.7                         | 1.12  | 80                                  | 82                     | 100                | 1                  | 112                | 3.3              | 0.364 |
| —                     | —              | —                                    | —     | —                  | —                  | —                  | —                             | —     | 79                                  | —                      | 111                | 0.6                | —                  | —                | 0.463 |
| <b>N</b>              | <b>NR</b>      | 2.87                                 | 2.7   | 111.81             | 0.6                | 0.5                | 121.6                         | 2.46  | 81.5                                | 85.5                   | 108.5              | 1                  | 123                | 5                | 0.649 |
| <b>N</b>              | <b>NR</b>      | 4.06                                 | 3.1   | 125.22             | 0.6                | 0.5                | 139.7                         | 2.82  | 83                                  | 90                     | 122                | 1.5                | 141.5              | 6.5              | 1.19  |
| <b>N</b>              | <b>NR</b>      | 4.9                                  | 3.1   | 155.22             | 0.6                | 0.5                | 169.7                         | 2.82  | 86                                  | 98.5                   | 149                | 2                  | 172                | 7.3              | 3.08  |

Notes (1) For tolerances

# SINGLE-ROW DEEP GROOVE BALL BEARINGS

Bore Diameter 80 – 105 mm



### Dynamic Equivalent Load

$$P = XF_r + YF_a$$

| $\frac{f_0 F_a}{C_{0r}}$ | $e$  | $\frac{F_a}{F_r} \leq e$ |   | $\frac{F_a}{F_r} > e$ |      |
|--------------------------|------|--------------------------|---|-----------------------|------|
|                          |      | X                        | Y | X                     | Y    |
| 0.172                    | 0.19 | 1                        | 0 | 0.56                  | 2.30 |
| 0.345                    | 0.22 | 1                        | 0 | 0.56                  | 1.99 |
| 0.689                    | 0.26 | 1                        | 0 | 0.56                  | 1.71 |
| 1.03                     | 0.28 | 1                        | 0 | 0.56                  | 1.55 |
| 1.38                     | 0.30 | 1                        | 0 | 0.56                  | 1.45 |
| 2.07                     | 0.34 | 1                        | 0 | 0.56                  | 1.31 |
| 3.45                     | 0.38 | 1                        | 0 | 0.56                  | 1.15 |
| 5.17                     | 0.42 | 1                        | 0 | 0.56                  | 1.04 |
| 6.89                     | 0.44 | 1                        | 0 | 0.56                  | 1.00 |

### Static Equivalent Load

$$\frac{F_a}{F_r} > 0.8, P_0 = 0.6F_r + 0.5F_a$$

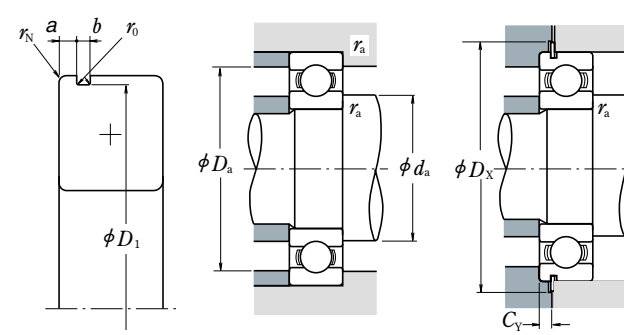
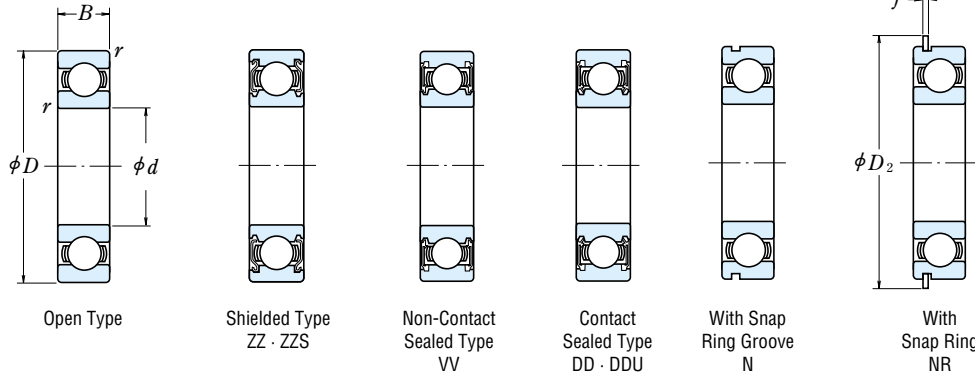
$$\frac{F_a}{F_r} \leq 0.8, P_0 = F_r$$

| Boundary Dimensions (mm) | Basic Load Ratings (kgf) |          |       |          | Factor $f_0$ | Limiting Speeds (min <sup>-1</sup> ) |           |        | Bearing Numbers |          |        |              |           |           |            |
|--------------------------|--------------------------|----------|-------|----------|--------------|--------------------------------------|-----------|--------|-----------------|----------|--------|--------------|-----------|-----------|------------|
|                          | (N)                      |          | (kgf) |          |              | Grease                               |           | Oil    | Open            | Shielded | Sealed |              |           |           |            |
|                          | $C_r$                    | $C_{0r}$ | $C_r$ | $C_{0r}$ |              | Open Z · ZZ<br>V · VV                | DU<br>DDU | Open Z |                 |          |        |              |           |           |            |
| <b>80</b>                | 100                      | 10       | 0.6   | 12 700   | 14 500       | 1 290                                | 1 470     | 17.4   | 6 000           | 3 400    | 7 100  | <b>6816</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 110                      | 16       | 1     | 25 000   | 24 000       | 2 540                                | 2 450     | 16.6   | 5 600           | 3 200    | 6 700  | <b>6916</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 125                      | 14       | 0.6   | 32 000   | 29 600       | 3 250                                | 3 000     | 16.4   | 5 300           | —        | 6 300  | <b>16016</b> | —         | —         | —          |
|                          | 125                      | 22       | 1.1   | 47 500   | 40 000       | 4 850                                | 4 050     | 15.6   | 5 300           | 3 200    | 6 300  | <b>6016</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 140                      | 26       | 2     | 72 500   | 53 000       | 7 400                                | 5 400     | 14.6   | 4 500           | 3 000    | 5 300  | <b>6216</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 170                      | 39       | 2.1   | 123 000  | 86 500       | 12 500                               | 8 850     | 13.3   | 4 000           | 2 800    | 4 800  | <b>6316</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
| <b>85</b>                | 110                      | 13       | 1     | 18 700   | 20 000       | 1 910                                | 2 040     | 17.1   | 5 600           | 3 200    | 6 700  | <b>6817</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 120                      | 18       | 1.1   | 32 000   | 29 600       | 3 250                                | 3 000     | 16.4   | 5 300           | 3 000    | 6 300  | <b>6917</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 130                      | 14       | 0.6   | 33 000   | 31 500       | 3 350                                | 3 200     | 16.5   | 5 000           | —        | 6 000  | <b>16017</b> | —         | —         | —          |
|                          | 130                      | 22       | 1.1   | 49 500   | 43 000       | 5 050                                | 4 400     | 15.8   | 5 000           | 3 000    | 6 000  | <b>6017</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 150                      | 28       | 2     | 84 000   | 62 000       | 8 550                                | 6 300     | 14.5   | 4 300           | 2 800    | 5 000  | <b>6217</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 180                      | 41       | 3     | 133 000  | 97 000       | 13 500                               | 9 850     | 13.3   | 3 800           | 2 600    | 4 500  | <b>6317</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
| <b>90</b>                | 115                      | 13       | 1     | 19 000   | 21 000       | 1 940                                | 2 140     | 17.2   | 5 300           | 3 000    | 6 300  | <b>6818</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 125                      | 18       | 1.1   | 33 000   | 31 500       | 3 350                                | 3 200     | 16.5   | 5 000           | 2 800    | 6 000  | <b>6918</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 140                      | 16       | 1     | 41 500   | 39 500       | 4 250                                | 4 000     | 16.3   | 4 800           | —        | 5 600  | <b>16018</b> | —         | —         | —          |
|                          | 140                      | 24       | 1.5   | 58 000   | 50 000       | 5 950                                | 5 050     | 15.6   | 4 800           | 2 800    | 5 600  | <b>6018</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 160                      | 30       | 2     | 96 000   | 71 500       | 9 800                                | 7 300     | 14.5   | 4 000           | 2 600    | 4 800  | <b>6218</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 190                      | 43       | 3     | 143 000  | 107 000      | 14 500                               | 11 000    | 13.3   | 3 600           | 2 400    | 4 300  | <b>6318</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
| <b>95</b>                | 120                      | 13       | 1     | 19 300   | 22 000       | 1 970                                | 2 240     | 17.2   | 5 000           | 2 800    | 6 000  | <b>6819</b>  | <b>ZZ</b> | <b>VV</b> | <b>DD</b>  |
|                          | 130                      | 18       | 1.1   | 33 500   | 33 500       | 3 450                                | 3 400     | 16.6   | 4 800           | 2 800    | 5 600  | <b>6919</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 145                      | 16       | 1     | 43 000   | 42 000       | 4 350                                | 4 250     | 16.4   | 4 500           | —        | 5 300  | <b>16019</b> | —         | —         | —          |
|                          | 145                      | 24       | 1.5   | 60 500   | 54 000       | 6 150                                | 5 500     | 15.8   | 4 500           | 2 600    | 5 300  | <b>6019</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 170                      | 32       | 2.1   | 109 000  | 82 000       | 11 100                               | 8 350     | 14.4   | 3 800           | 2 600    | 4 500  | <b>6219</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 200                      | 45       | 3     | 153 000  | 119 000      | 15 600                               | 12 100    | 13.3   | 3 000           | 2 400    | 3 600  | <b>6319</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
| <b>100</b>               | 125                      | 13       | 1     | 19 600   | 23 000       | 2 000                                | 2 340     | 17.3   | 4 800           | 2 800    | 5 600  | <b>6820</b>  | <b>ZZ</b> | <b>VV</b> | <b>DD</b>  |
|                          | 140                      | 20       | 1.1   | 43 000   | 42 000       | 4 350                                | 4 250     | 16.4   | 4 500           | 2 600    | 5 300  | <b>6920</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 150                      | 16       | 1     | 42 500   | 42 000       | 4 300                                | 4 300     | 16.5   | 4 300           | —        | 5 300  | <b>16020</b> | —         | —         | —          |
|                          | 150                      | 24       | 1.5   | 60 000   | 54 000       | 6 150                                | 5 550     | 15.9   | 4 300           | 2 600    | 5 300  | <b>6020</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 180                      | 34       | 2.1   | 122 000  | 93 000       | 12 500                               | 9 500     | 14.4   | 3 600           | 2 400    | 4 300  | <b>6220</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 215                      | 47       | 3     | 173 000  | 141 000      | 17 700                               | 14 400    | 13.2   | 2 800           | 2 200    | 3 400  | <b>6320</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
| <b>105</b>               | 130                      | 13       | 1     | 19 800   | 23 900       | 2 020                                | 2 440     | 17.4   | 4 800           | 2 600    | 5 600  | <b>6821</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 145                      | 20       | 1.1   | 42 500   | 42 000       | 4 300                                | 4 300     | 16.5   | 4 300           | —        | 5 300  | <b>6921</b>  | <b>ZZ</b> | <b>VV</b> | —          |
|                          | 160                      | 18       | 1     | 52 000   | 50 500       | 5 300                                | 5 150     | 16.3   | 4 000           | —        | 4 800  | <b>16021</b> | —         | —         | —          |
|                          | 160                      | 26       | 2     | 72 500   | 66 000       | 7 400                                | 6 700     | 15.8   | 4 000           | 2 400    | 4 800  | <b>6021</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 190                      | 36       | 2.1   | 133 000  | 105 000      | 13 600                               | 10 700    | 14.4   | 3 400           | 2 200    | 4 000  | <b>6221</b>  | <b>ZZ</b> | <b>VV</b> | <b>DDU</b> |
|                          | 225                      | 49       | 3     | 184 000  | 154 000      | 18 700                               | 15 700    | 13.2   | 2 600           | 2 000    | 3 200  | <b>6321</b>  | <b>ZZ</b> | —         | <b>DDU</b> |

| With Snap Ring Groove | With Snap Ring | Snap Ring Groove Dimensions (1) (mm) |       |                    |                    |                    | Snap Ring (1) Dimensions (mm) |       | Abutment and Fillet Dimensions (mm) |                        |                    |                    |                    | Mass (kg) approx |       |
|-----------------------|----------------|--------------------------------------|-------|--------------------|--------------------|--------------------|-------------------------------|-------|-------------------------------------|------------------------|--------------------|--------------------|--------------------|------------------|-------|
|                       |                | a max                                | b min | D <sub>1</sub> max | r <sub>0</sub> max | r <sub>N</sub> min | D <sub>2</sub> max            | f max | d <sub>a</sub> (2) min              | d <sub>a</sub> (2) max | r <sub>a</sub> max | D <sub>x</sub> min | C <sub>Y</sub> max |                  |       |
| <b>N</b>              | <b>NR</b>      | 1.7                                  | 1.3   | 97.9               | 0.4                | 0.5                | 104.4                         | 1.12  | 84                                  | 84.5                   | 96                 | 0.6                | 106                | 2.5              | 0.151 |
| <b>N</b>              | <b>NR</b>      | 2.5                                  | 1.3   | 107.6              | 0.4                | 0.5                | 115.7                         | 1.12  | 85                                  | 87.5                   | 105                | 1                  | 117                | 3.3              | 0.391 |
| —                     | —              | —                                    | —     | —                  | —                  | —                  | —                             | —     | 84                                  | —                      | 121                | 0.6                | —                  | —                | 0.621 |
| <b>N</b>              | <b>NR</b>      | 2.87                                 | 3.1   | 120.22             | 0.6                | 0.5                | 134.7                         | 2.82  | 86.5                                | 91                     | 118.5              | 1                  | 136.5              | 5.3              | 0.872 |
| <b>N</b>              | <b>NR</b>      | 4.9                                  | 3.1   | 135.23             | 0.6                | 0.5                | 149.7                         | 2.82  | 89                                  | 95.5                   | 131                | 2                  | 152                | 7.3              | 1.42  |
| <b>N</b>              | <b>NR</b>      | 5.69                                 | 3.5   | 163.65             | 0.6                | 0.5                | 182.9                         | 3.1   | 91                                  | 104.5                  | 159                | 2                  | 185                | 8.4              | 3.67  |
| <b>N</b>              | <b>NR</b>      | 2.1                                  | 1.3   | 107.6              | 0.4                | 0.5                | 115.7                         | 1.12  | 90                                  | 90.5                   | 105                | 1                  | 117                | 2.9              | 0.263 |
| <b>N</b>              | <b>NR</b>      | 3.3                                  | 1.3   | 117.6              | 0.4                | 0.5                | 125.7                         | 1.12  | 91.5                                | 94.5                   | 113.5              | 1                  | 127                | 4.1              | 0.55  |
| —                     | —              | —                                    | —     | —                  | —                  | —                  | —                             | —     | 89                                  | —                      | 126                | 0.6                | —                  | —                | 0.652 |
| <b>N</b>              | <b>NR</b>      | 2.87                                 | 3.1   | 125.22             | 0.6                | 0.5                | 139.7                         | 2.82  | 91.5                                | 96                     | 123.5              | 1                  | 141.5              | 5.3              | 0.918 |
| <b>N</b>              | <b>NR</b>      | 4.9                                  | 3.1   | 145.24             | 0.6                | 0.5                | 159.7                         | 2.82  | 94                                  | 102                    | 141                | 2                  | 162                | 7.3              | 1.76  |
| <b>N</b>              | <b>NR</b>      | 5.69                                 | 3.5   | 173.66             | 0.6                | 0.5                | 192.9                         | 3.1   | 98                                  | 110.5                  | 167                | 2.5                | 195                | 8.4              | 4.28  |
| <b>N</b>              | <b>NR</b>      | 2.1                                  | 1.3   | 112.6              | 0.4                | 0.5                | 120.7                         | 1.12  | 95                                  | 95.5                   | 110                | 1                  | 122                | 2.9              | 0.276 |
| <b>N</b>              | <b>NR</b>      | 3.3                                  | 1.3   | 122.6              | 0.4                | 0.5                | 130.7                         | 1.12  | 96.5                                | 98.5                   | 118.5              | 1                  | 132                | 4.1              | 0.585 |
| —                     | —              | —                                    | —     | —                  | —                  | —                  | —                             | —     | 95                                  | —                      | 135                | 1                  | —                  | —                | 0.873 |
| <b>N</b>              | <b>NR</b>      | 3.71                                 | 3.1   | 135.23             | 0.6                | 0.5                | 149.7                         | 2.82  | 98                                  | 103                    | 132                | 1.5                | 152                | 6.1              | 1.19  |
| <b>N</b>              | <b>NR</b>      | 4.9                                  | 3.1   | 155.22             | 0.6                | 0.5                | 169.7                         | 2.82  | 99                                  | 107.5                  | 151                | 2                  | 172                | 7.3              | 2.18  |
| <b>N</b>              | <b>NR</b>      | 5.69                                 | 3.5   | 183.64             | 0.6                | 0.5                | 202.9                         | 3.1   | 103                                 | 117                    | 177                | 2.5                | 205                | 8.4              | 4.98  |
| <b>N</b>              | <b>NR</b>      | 2.1                                  | 1.3   | 117.6              | 0.4                | 0.5                | 125.7                         | 1.12  | 100                                 | 101.5                  | 115                | 1                  | 127                | 2.9              | 0.297 |
| <b>N</b>              | <b>NR</b>      | 3.3                                  | 1.3   | 127.6              | 0.4                | 0.5                | 135.7                         | 1.12  | 101.5                               | 103.5                  | 123.5              | 1                  | 137                | 4.1              | 0.601 |
| —                     | —              | —                                    | —     | —                  | —                  | —                  | —                             | —     | 100                                 | —                      | 140                | 1                  | —                  | —                | 0.904 |
| <b>N</b>              | <b>NR</b>      | 3.71                                 | 3.1   | 140.23             | 0.6                | 0.5                | 154.7                         | 2.82  | 103                                 | 108.5                  | 137                | 1.5                | 157                | 6.1              | 1.23  |
| <b>N</b>              | <b>NR</b>      | 5.69                                 | 3.5   | 163.65             | 0.6                | 0.5                | 182.9                         | 3.1   | 106                                 | 114                    | 159                | 2                  | 185                | 8.4              | 2.64  |
| <b>N</b>              | <b>NR</b>      | 5.69                                 | 3.5   | 193.65             | 0.6                | 0.5                | 212.9                         | 3.1   | 108                                 | 123.5                  | 187                | 2.5                | 215                | 8.4              | 5.76  |
| <b>N</b>              | <b>NR</b>      | 2.1                                  | 1.3   | 122.6              | 0.4                | 0.5                | 130.7                         | 1.12  | 105                                 | 105.5                  | 120                | 1                  | 132                | 2.9              | 0.31  |
| <b>N</b>              | <b>NR</b>      | 3.3                                  | 1.9   | 137.6              | 0.6                | 0.5                | 145.7                         | 1.7   | 106.5                               | 111                    | 133.5              | 1                  | 147                | 4.7              | 0.828 |
| —                     | —              | —                                    | —     | —                  | —                  | —                  | —                             | —     | 105                                 | —                      | 145                | 1                  | —                  | —                | 0.945 |
| <b>N</b>              | <b>NR</b>      | 3.71                                 | 3.1   | 145.24             | 0.6                | 0.5                | 159.7                         | 2.82  | 108                                 | 112.5                  | 142                | 1.5                | 162                | 6.1              | 1.29  |
| <b>N</b>              | <b>NR</b>      | 5.69                                 | 3.5   | 173.66             | 0.6                | 0.5                | 192.9                         | 3.1   | 111                                 | 121.5                  | 169                | 2                  | 195                | 8.4              | 3.17  |
| —                     | —              | —                                    | —     | —                  | —                  | —                  | —                             | —     | 113                                 | 133                    | 202                | 2.5                | —                  | —                | 7.04  |
| <b>N</b>              | <b>NR</b>      | 2.1                                  | 1.3   | 127.6              | 0.4                | 0.5                | 135.7                         | 1.12  | 110                                 | 110.5                  | 125                | 1                  | 137                | 2.9              | 0.324 |
| <b>N</b>              | <b>NR</b>      | 3.3                                  | 1.9   | 142.6              | 0.6                | 0.5                | 150.7                         | 1.7   | 111.5                               | 116                    | 138.5              | 1                  | 152                | 4.7              | 0.856 |
| —                     | —              | —                                    | —     | —                  | —                  | —                  | —                             | —     | 110                                 | —                      | 155                | 1                  | —                  | —                | 1.24  |
| <b>N</b>              | <b>NR</b>      | 3.71                                 | 3.1   | 155.22             | 0.6                | 0.5                | 169.7                         | 2.82  | 114                                 | 120                    | 151                | 2                  | 172                | 6.1              | 1.58  |
| <b>N</b>              | <b>NR</b>      | 5.69                                 | 3.5   | 183.64             | 0.6                | 0.5                | 202.9                         | 3.1   | 116                                 | 127.5                  | 179                | 2                  | 205                | 8.4              | 3.79  |
| —                     | —              | —                                    | —     | —                  | —                  | —                  | —                             | —     | 118                                 | 138                    | 212                | 2.5                | —                  | —                | 8.09  |

# SINGLE-ROW DEEP GROOVE BALL BEARINGS

Bore Diameter 110 – 160 mm



### Dynamic Equivalent Load

$$P = XF_r + YF_a$$

| $\frac{f_0 F_a}{C_{0r}}$ | $e$  | $\frac{F_a}{F_r} \leq e$ |   | $\frac{F_a}{F_r} > e$ |      |
|--------------------------|------|--------------------------|---|-----------------------|------|
|                          |      | X                        | Y | X                     | Y    |
| 0.172                    | 0.19 | 1                        | 0 | 0.56                  | 2.30 |
| 0.345                    | 0.22 | 1                        | 0 | 0.56                  | 1.99 |
| 0.689                    | 0.26 | 1                        | 0 | 0.56                  | 1.71 |
| 1.03                     | 0.28 | 1                        | 0 | 0.56                  | 1.55 |
| 1.38                     | 0.30 | 1                        | 0 | 0.56                  | 1.45 |
| 2.07                     | 0.34 | 1                        | 0 | 0.56                  | 1.31 |
| 3.45                     | 0.38 | 1                        | 0 | 0.56                  | 1.15 |
| 5.17                     | 0.42 | 1                        | 0 | 0.56                  | 1.04 |
| 6.89                     | 0.44 | 1                        | 0 | 0.56                  | 1.00 |

### Static Equivalent Load

$$\frac{F_a}{F_r} > 0.8, P_0 = 0.6F_r + 0.5F_a$$

$$\frac{F_a}{F_r} \leq 0.8, P_0 = F_r$$

| Boundary Dimensions (mm) | Basic Load Ratings (kgf) |          |       |          | Factor $f_0$ | Limiting Speeds (min <sup>-1</sup> ) |        |        | Bearing Numbers |          |        |                         |
|--------------------------|--------------------------|----------|-------|----------|--------------|--------------------------------------|--------|--------|-----------------|----------|--------|-------------------------|
|                          | (N)                      |          | (kgf) |          |              | Grease                               |        | Oil    |                 |          |        |                         |
|                          | $C_r$                    | $C_{0r}$ | $C_r$ | $C_{0r}$ |              | Open Z · ZZ V · VV                   | DU DDU | Open Z | Open            | Shielded | Sealed |                         |
| <b>110</b>               | 140                      | 16       | 1     | 28 100   | 32 500       | 2 860                                | 3 350  | 17.1   | 4 300           | 2 400    | 5 300  | <b>6822 ZZ VV DDU</b>   |
|                          | 150                      | 20       | 1.1   | 43 500   | 44 500       | 4 450                                | 4 550  | 16.6   | 4 300           | 2 400    | 5 000  | <b>6922 ZZ VV DDU</b>   |
|                          | 170                      | 19       | 1     | 57 500   | 56 500       | 5 850                                | 5 800  | 16.3   | 3 800           | —        | 4 500  | <b>16022 — — —</b>      |
|                          | 170                      | 28       | 2     | 85 000   | 73 000       | 8 650                                | 7 450  | 15.5   | 3 800           | 2 200    | 4 500  | <b>6022 ZZ VV DDU</b>   |
|                          | 200                      | 38       | 2.1   | 144 000  | 117 000      | 14 700                               | 11 900 | 14.3   | 2 800           | 2 200    | 3 400  | <b>6222 ZZ VV DDU</b>   |
|                          | 240                      | 50       | 3     | 205 000  | 179 000      | 20 900                               | 18 300 | 13.2   | 2 400           | —        | 3 000  | <b>6322 ZZ — — —</b>    |
| <b>120</b>               | 150                      | 16       | 1     | 28 900   | 35 500       | 2 950                                | 3 650  | 17.3   | 4 000           | 2 200    | 4 800  | <b>6824 ZZ VV DD</b>    |
|                          | 165                      | 22       | 1.1   | 53 000   | 54 000       | 5 400                                | 5 500  | 16.5   | 3 800           | —        | 4 500  | <b>6924 ZZ — — —</b>    |
|                          | 180                      | 19       | 1     | 56 500   | 57 500       | 5 800                                | 5 850  | 16.5   | 3 600           | —        | 4 300  | <b>16024 — — —</b>      |
|                          | 180                      | 28       | 2     | 88 000   | 80 000       | 9 000                                | 8 150  | 15.7   | 3 600           | 2 200    | 4 300  | <b>6024 ZZ VV DDU</b>   |
|                          | 215                      | 40       | 2.1   | 155 000  | 131 000      | 15 800                               | 13 400 | 14.4   | 2 600           | 2 000    | 3 200  | <b>6224 ZZ VV DDU</b>   |
|                          | 260                      | 55       | 3     | 207 000  | 185 000      | 21 100                               | 18 800 | 13.5   | 2 200           | 1 800    | 2 800  | <b>6324 ZZS — — —</b>   |
| <b>130</b>               | 165                      | 18       | 1.1   | 37 000   | 44 000       | 3 750                                | 4 450  | 17.1   | 3 600           | 2 000    | 4 300  | <b>6826 ZZS VV DD</b>   |
|                          | 180                      | 24       | 1.5   | 65 000   | 67 500       | 6 650                                | 6 850  | 16.5   | 3 400           | —        | 4 000  | <b>6926 ZZ — — —</b>    |
|                          | 200                      | 22       | 1.1   | 75 500   | 77 500       | 7 700                                | 7 900  | 16.4   | 3 000           | —        | 3 600  | <b>16026 — — —</b>      |
|                          | 200                      | 33       | 2     | 106 000  | 101 000      | 10 800                               | 10 300 | 15.8   | 3 000           | 1 900    | 3 600  | <b>6026 ZZ — — DDU</b>  |
|                          | 230                      | 40       | 3     | 167 000  | 146 000      | 17 000                               | 14 900 | 14.5   | 2 400           | —        | 3 000  | <b>6226 ZZ — — —</b>    |
|                          | 280                      | 58       | 4     | 229 000  | 214 000      | 23 400                               | 21 800 | 13.6   | 2 200           | —        | 2 600  | <b>6326 ZZS — — —</b>   |
| <b>140</b>               | 175                      | 18       | 1.1   | 38 500   | 48 000       | 3 900                                | 4 850  | 17.3   | 3 400           | 1 900    | 4 000  | <b>6828 ZZ VV DDU</b>   |
|                          | 190                      | 24       | 1.5   | 66 500   | 72 000       | 6 800                                | 7 300  | 16.6   | 3 200           | —        | 3 800  | <b>6928 ZZS VV — —</b>  |
|                          | 210                      | 22       | 1.1   | 77 500   | 82 500       | 7 900                                | 8 400  | 16.5   | 2 800           | —        | 3 400  | <b>16028 — — —</b>      |
|                          | 210                      | 33       | 2     | 110 000  | 109 000      | 11 200                               | 11 100 | 16.0   | 2 800           | 1 800    | 3 400  | <b>6028 ZZ — — DDU</b>  |
|                          | 250                      | 42       | 3     | 166 000  | 150 000      | 17 000                               | 15 300 | 14.9   | 2 200           | 1 700    | 2 800  | <b>6228 ZZS — — DDU</b> |
|                          | 300                      | 62       | 4     | 253 000  | 246 000      | 25 800                               | 25 100 | 13.6   | 2 000           | —        | 2 400  | <b>6328 ZZS — — —</b>   |
| <b>150</b>               | 190                      | 20       | 1.1   | 47 500   | 58 500       | 4 850                                | 5 950  | 17.1   | 3 200           | 1 800    | 3 800  | <b>6830 ZZ VV DDU</b>   |
|                          | 210                      | 28       | 2     | 85 000   | 90 500       | 8 650                                | 9 200  | 16.5   | 2 600           | 1 700    | 3 200  | <b>6930 ZZS — — DDU</b> |
|                          | 225                      | 24       | 1.1   | 84 000   | 91 000       | 8 550                                | 9 250  | 16.6   | 2 600           | —        | 3 000  | <b>16030 — — —</b>      |
|                          | 225                      | 35       | 2.1   | 126 000  | 126 000      | 12 800                               | 12 800 | 15.9   | 2 600           | 1 700    | 3 000  | <b>6030 ZZ VV DDU</b>   |
|                          | 270                      | 45       | 3     | 176 000  | 168 000      | 18 000                               | 17 100 | 15.1   | 2 000           | —        | 2 600  | <b>6230 ZZS — — —</b>   |
|                          | 320                      | 65       | 4     | 274 000  | 284 000      | 28 000                               | 28 900 | 13.9   | 1 800           | —        | 2 200  | <b>6330 ZZS — — —</b>   |
| <b>160</b>               | 200                      | 20       | 1.1   | 48 500   | 61 000       | 4 950                                | 6 250  | 17.2   | 2 600           | 1 700    | 3 200  | <b>6832 ZZS VV DDU</b>  |
|                          | 220                      | 28       | 2     | 87 000   | 96 000       | 8 850                                | 9 800  | 16.6   | 2 600           | 1 600    | 3 000  | <b>6932 ZZS — — DDU</b> |
|                          | 240                      | 25       | 1.5   | 99 000   | 108 000      | 10 100                               | 11 000 | 16.5   | 2 400           | —        | 2 800  | <b>16032 — — —</b>      |
|                          | 240                      | 38       | 2.1   | 137 000  | 135 000      | 13 900                               | 13 800 | 15.9   | 2 400           | 1 600    | 2 800  | <b>6032 ZZ — — DDU</b>  |
|                          | 290                      | 48       | 3     | 185 000  | 186 000      | 18 900                               | 19 000 | 15.4   | 1 900           | —        | 2 400  | <b>6232 ZZS — — —</b>   |
|                          | 340                      | 68       | 4     | 278 000  | 287 000      | 28 300                               | 29 200 | 13.9   | 1 700           | —        | 2 000  | <b>6332 ZZS — — —</b>   |

| With Snap Ring Groove | With Snap Ring | Snap Ring Groove Dimensions (1) (mm) |       |                    |                    |                    | Snap Ring (1) Dimensions (mm) |       | Abutment and Fillet Dimensions (mm) |                        |                    |                    |                    | Mass (kg) approx |       |
|-----------------------|----------------|--------------------------------------|-------|--------------------|--------------------|--------------------|-------------------------------|-------|-------------------------------------|------------------------|--------------------|--------------------|--------------------|------------------|-------|
|                       |                | a max                                | b min | D <sub>1</sub> max | r <sub>0</sub> max | r <sub>N</sub> min | D <sub>2</sub> max            | f max | d <sub>a</sub> (2) min              | d <sub>a</sub> (2) max | r <sub>a</sub> max | D <sub>x</sub> min | C <sub>Y</sub> max |                  |       |
| <b>N</b>              | <b>NR</b>      | 2.5                                  | 1.9   | 137.6              | 0.6                | 0.5                | 145.7                         | 1.7   | 115                                 | 117                    | 135                | 1                  | 147                | 3.9              | 0.497 |
| <b>N</b>              | <b>NR</b>      | 3.3                                  | 1.9   | 147.6              | 0.6                | 0.5                | 155.7                         | 1.7   | 116.5                               | 121                    | 143.5              | 1                  | 157                | 4.7              | 0.893 |
| <b>N</b>              | <b>NR</b>      | —                                    | —     | —                  | —                  | —                  | —                             | —     | 115                                 | —                      | 165                | 1                  | —                  | —                | 1.51  |
| <b>N</b>              | <b>NR</b>      | 3.71                                 | 3.5   | 163.65             | 0.6                | 0.5                | 182.9                         | 3.1   | 119                                 | 124.5                  | 161                | 2                  | 185                | 6.4              | 1.94  |
| <b>N</b>              | <b>NR</b>      | 5.69                                 | 3.5   | 193.65             | 0.6                | 0.5                | 212.9                         | 3.1   | 121                                 | 134                    | 189                | 2                  | 215                | 8.4              | 4.45  |
| <b>N</b>              | <b>NR</b>      | —                                    | —     | —                  | —                  | —                  | —                             | —     | 123                                 | 147                    | 227                | 2.5                | —                  | —                | 9.51  |
| <b>N</b>              | <b>NR</b>      | 2.5                                  | 1.9   | 147.6              | 0.6                | 0.5                | 155.7                         | 1.7   | 125                                 | 127                    | 145                | 1                  | 157                | 3.9              | 0.537 |
| <b>N</b>              | <b>NR</b>      | 3.7                                  | 1.9   | 161.8              | 0.6                | 0.5                | 171.5                         | 1.7   | 126.5                               | 132                    | 158.5              | 1                  | 173                | 5.1              | 1.21  |
| <b>N</b>              | <b>NR</b>      | —                                    | —     | —                  | —                  | —                  | —                             | —     | 125                                 | —                      | 175                | 1                  | —                  | —                | 1.6   |
| <b>N</b>              | <b>NR</b>      | 3.71                                 | 3.5   | 173.66             | 0.6                | 0.5                | 192.9                         | 3.1   | 129                                 | 134.5                  | 171                | 2                  | 195                | 6.4              | 2.08  |
| <b>N</b>              | <b>NR</b>      | —                                    | —     | —                  | —                  | —                  | —                             | —     | 131                                 | 146                    | 204                | 2                  | —                  | —                | 5.29  |
| <b>N</b>              | <b>NR</b>      | —                                    | —     | —                  | —                  | —                  | —                             | —     | 133                                 | 161                    | 247                | 2.5                | —                  | —                | 12.5  |
| <b>N</b>              | <b>NR</b>      | 3.3                                  | 1.9   | 161.8              | 0.6                | 0.5                | 171.5                         | 1.7   | 136.5                               | 138                    | 158.5              | 1                  | 173                | 4.7              | 0.758 |
| <b>N</b>              | <b>NR</b>      | 3.7                                  | 1.9   | 176.8              | 0.6                | 0.5                | 186.5                         | 1.7   | 138                                 | 144                    | 172                | 1.5                | 188                | 5.1              | 1.57  |
| <b>N</b>              | <b>NR</b>      | —                                    | —     | —                  | —                  | —                  | —                             | —     | 136.5                               | —                      | 193.5              | 1                  | —                  | —                | 2.4   |
| <b>N</b>              | <b>NR</b>      | 5.69                                 | 3.5   | 193.65             | 0.6                | 0.5                | 212.9                         | 3.1   | 139                                 | 148.5                  | 191                | 2                  | 215                | 8.4              | 3.26  |
| <b>N</b>              | <b>NR</b>      | —                                    | —     | —                  | —                  | —                  | —                             | —     | 143                                 | 157                    | 217                | 2.5                | —                  | —                | 5.96  |
| <b>N</b>              | <b>NR</b>      | —                                    | —     | —                  | —                  | —                  | —                             | —     | 146                                 | 175                    | 264                | 3                  | —                  | —                | 15.2  |
| <b>N</b>              | <b>NR</b>      | 3.3                                  | 1.9   | 171.8              | 0.6                | 0.5                | 181.5                         | 1.7   | 146.5                               | 148.5                  | 168.5              | 1                  | 183                | 4.7              | 0.832 |
| <b>N</b>              | <b>NR</b>      | 3.7                                  | 1.9   | 186.8              | 0.6                | 0.5                | 196.5                         | 1.7   | 148                                 | 153.5                  | 182                | 1.5                | 198                | 5.1              | 1.67  |
| <b>N</b>              | <b>NR</b>      | —                                    | —     | —                  | —                  | —                  | —                             | —     | 146.5                               | —                      | 203.5              | 1                  | —                  | —                | 2.84  |
| <b>N</b>              | <b>NR</b>      | —                                    | —     | —                  | —                  | —                  | —                             | —     | 149                                 | 158.5                  | 201                | 2                  | —                  | —                | 3.48  |
| <b>N</b>              | <b>NR</b>      | —                                    | —     | —                  | —                  | —                  | —                             | —     | 153                                 | 171.5                  | 237                | 2.5                | —                  | —                | 7.68  |
| <b>N</b>              | <b>NR</b>      | —                                    | —     | —                  | —                  | —                  | —                             | —     | 156                                 | 187                    | 284                | 3                  | —                  | —                | 18.5  |
| <b>N</b>              | <b>NR</b>      | 3.3                                  | 1.9   | 186.8              | 0.6                | 0.5                | 196.5                         | 1.7   | 156.5                               | 160                    | 183.5              | 1                  | 198                | 4.7              | 1.15  |
| <b>N</b>              | <b>NR</b>      | —                                    | —     | —                  | —                  | —                  | —                             | —     | 159                                 | 166                    | 201                | 2                  | —                  | —                | 3.01  |
| <b>N</b>              | <b>NR</b>      | —                                    | —     | —                  | —                  | —                  | —                             | —     | 156.5                               | —                      | 218.5              | 1                  | —                  | —                | 3.62  |
| <b>N</b>              | <b>NR</b>      | —                                    | —     | —                  | —                  | —                  | —                             | —     | 161                                 | 170                    | 214                | 2                  | —                  | —                | 4.24  |
| <b>N</b>              | <b>NR</b>      | —                                    | —     | —                  | —                  | —                  | —                             | —     | 163                                 | 186                    | 257                | 2.5                | —                  | —                | 10    |
| <b>N</b>              | <b>NR</b>      | —                                    | —     | —                  | —                  | —                  | —                             | —     | 166                                 | 203                    | 304                | 3                  | —                  | —                | 22.7  |
| <b>N</b>              | <b>NR</b>      | 3.3                                  | 1.9   | 196.8              | 0.6                | 0.5                | 206.5                         | 1.7   | 166.5                               | 170.5                  | 193.5              | 1                  | 208                | 4.7              | 1.23  |
| <b>N</b>              | <b>NR</b>      | —                                    | —     | —                  | —                  | —                  | —                             | —     | 169                                 | 176                    | 211                | 2                  | —                  | —                | 2.71  |
| <b>N</b>              | <b>NR</b>      | —                                    | —     | —                  | —                  | —                  | —                             | —     | 168                                 | —                      | 232                | 1.5                | —                  | —                | 4.2   |
| <b>N</b>              | <b>NR</b>      | —                                    | —     | —                  | —                  | —                  | —                             | —     | 171                                 | 181.5                  | 229                | 2                  | —                  | —                | 5.15  |
| <b>N</b>              | <b>NR</b>      | —                                    | —     | —                  | —                  | —                  | —                             | —     | 173                                 | 202                    | 277                | 2.5                | —                  | —                | 12.8  |
| <b>N</b>              | <b>NR</b>      | —                                    | —     | —                  | —                  | —                  | —                             | —     | 176                                 | 215.5                  | 324                | 3                  | —                  | —                | 26.2  |

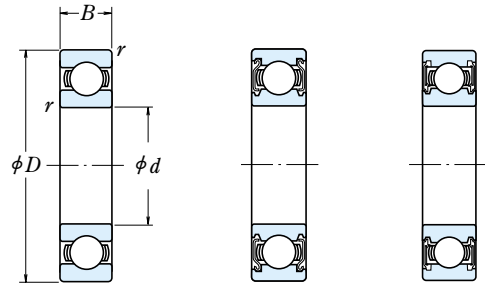
Notes (1) For tolerances for the snap ring grooves and snap ring dimensions, refer to Pages A50 to A53.

(2) When heavy axial loads are applied, increase  $d_a$  and decrease  $D_a$  from the above values.

Remarks When using bearings with rotating outer rings, contact NSK if they are sealed, shielded, or have snap rings.



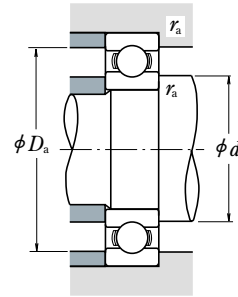
Bore Diameter 170 – 240 mm



Open Type

Shielded Type  
ZZS

Non-Contact  
Sealed Type  
VV



Dynamic Equivalent Load

$$P = X F_r + Y F_a$$

| $\frac{f_0 F_a}{C_{0r}}$ | $e$  | $\frac{F_a}{F_r} \leq e$ |   | $\frac{F_a}{F_r} > e$ |      |
|--------------------------|------|--------------------------|---|-----------------------|------|
|                          |      | X                        | Y | X                     | Y    |
| 0.172                    | 0.19 | 1                        | 0 | 0.56                  | 2.30 |
| 0.345                    | 0.22 | 1                        | 0 | 0.56                  | 1.99 |
| 0.689                    | 0.26 | 1                        | 0 | 0.56                  | 1.71 |
| 1.03                     | 0.28 | 1                        | 0 | 0.56                  | 1.55 |
| 1.38                     | 0.30 | 1                        | 0 | 0.56                  | 1.45 |
| 2.07                     | 0.34 | 1                        | 0 | 0.56                  | 1.31 |
| 3.45                     | 0.38 | 1                        | 0 | 0.56                  | 1.15 |
| 5.17                     | 0.42 | 1                        | 0 | 0.56                  | 1.04 |
| 6.89                     | 0.44 | 1                        | 0 | 0.56                  | 1.00 |

Static Equivalent Load

$$\frac{F_a}{F_r} > 0.8, P_0 = 0.6 F_r + 0.5 F_a$$

$$\frac{F_a}{F_r} \leq 0.8, P_0 = F_r$$

| Boundary Dimensions (mm) | Basic Load Ratings (N) |     |     |           | Factor $f_0$ | Limiting Speeds (min <sup>-1</sup> ) |          |       | Bearing Numbers |          |        |              |            |           |            |
|--------------------------|------------------------|-----|-----|-----------|--------------|--------------------------------------|----------|-------|-----------------|----------|--------|--------------|------------|-----------|------------|
|                          | $d$                    | $D$ | $B$ | $r_{min}$ |              | Grease                               |          | Oil   | Open            | Shielded | Sealed |              |            |           |            |
|                          |                        |     |     |           |              | $C_r$                                | $C_{0r}$ | $C_r$ |                 |          |        | $C_{0r}$     | Open Z     |           |            |
| 170                      | 215                    | 22  | 1.1 | 60 000    | 75 000       | 6 100                                | 7 650    | 17.1  | 2 600           | 1 600    | 3 000  | <b>6834</b>  | <b>ZZS</b> | <b>VV</b> | <b>DDU</b> |
|                          | 230                    | 28  | 2   | 86 000    | 97 000       | 8 750                                | 9 850    | 16.7  | 2 400           | —        | 2 800  | <b>6934</b>  | <b>ZZS</b> | —         | —          |
|                          | 260                    | 28  | 1.5 | 114 000   | 126 000      | 11 700                               | 12 900   | 16.5  | 2 200           | —        | 2 600  | <b>16034</b> | —          | —         | —          |
|                          | 260                    | 42  | 2.1 | 161 000   | 161 000      | 16 400                               | 16 400   | 15.8  | 2 200           | —        | 2 600  | <b>6034</b>  | <b>ZZS</b> | <b>VV</b> | —          |
|                          | 310                    | 52  | 4   | 212 000   | 224 000      | 21 700                               | 22 800   | 15.3  | 1 800           | —        | 2 200  | <b>6234</b>  | <b>ZZS</b> | —         | —          |
|                          | 360                    | 72  | 4   | 325 000   | 355 000      | 33 500                               | 36 000   | 13.6  | 1 600           | —        | 2 000  | <b>6334</b>  | —          | —         | —          |
| 180                      | 225                    | 22  | 1.1 | 60 500    | 78 500       | 6 200                                | 8 000    | 17.2  | 2 400           | —        | 2 800  | <b>6836</b>  | —          | <b>VV</b> | —          |
|                          | 250                    | 33  | 2   | 119 000   | 128 000      | 12 100                               | 13 100   | 16.4  | 2 200           | —        | 2 600  | <b>6936</b>  | <b>ZZS</b> | —         | —          |
|                          | 280                    | 31  | 2   | 145 000   | 157 000      | 14 700                               | 16 000   | 16.3  | 2 000           | —        | 2 400  | <b>16036</b> | —          | —         | —          |
|                          | 280                    | 46  | 2.1 | 180 000   | 185 000      | 18 400                               | 18 800   | 15.6  | 2 000           | —        | 2 400  | <b>6036</b>  | <b>ZZS</b> | <b>VV</b> | —          |
|                          | 320                    | 52  | 4   | 227 000   | 241 000      | 23 200                               | 24 600   | 15.1  | 1 700           | —        | 2 000  | <b>6236</b>  | <b>ZZS</b> | —         | —          |
|                          | 380                    | 75  | 4   | 355 000   | 405 000      | 36 000                               | 41 500   | 13.9  | 1 500           | —        | 1 800  | <b>6336</b>  | —          | —         | —          |
| 190                      | 240                    | 24  | 1.5 | 73 000    | 93 500       | 7 450                                | 9 550    | 17.1  | 2 200           | —        | 2 600  | <b>6838</b>  | —          | <b>VV</b> | —          |
|                          | 260                    | 33  | 2   | 113 000   | 127 000      | 11 500                               | 13 000   | 16.6  | 2 200           | —        | 2 600  | <b>6938</b>  | —          | —         | —          |
|                          | 290                    | 31  | 2   | 149 000   | 168 000      | 15 200                               | 17 100   | 16.4  | 2 000           | —        | 2 400  | <b>16038</b> | —          | —         | —          |
|                          | 290                    | 46  | 2.1 | 188 000   | 201 000      | 19 200                               | 20 500   | 15.8  | 2 000           | —        | 2 400  | <b>6038</b>  | <b>ZZS</b> | —         | —          |
|                          | 340                    | 55  | 4   | 255 000   | 282 000      | 26 000                               | 28 700   | 15.0  | 1 600           | —        | 2 000  | <b>6238</b>  | <b>ZZS</b> | —         | —          |
|                          | 400                    | 78  | 5   | 355 000   | 415 000      | 36 000                               | 42 500   | 14.1  | 1 400           | —        | 1 700  | <b>6338</b>  | —          | —         | —          |
| 200                      | 250                    | 24  | 1.5 | 74 000    | 98 000       | 7 550                                | 10 000   | 17.2  | 2 200           | —        | 2 600  | <b>6840</b>  | —          | —         | —          |
|                          | 280                    | 38  | 2.1 | 143 000   | 158 000      | 14 600                               | 16 100   | 16.4  | 2 000           | —        | 2 400  | <b>6940</b>  | <b>ZZS</b> | —         | —          |
|                          | 310                    | 34  | 2   | 161 000   | 180 000      | 16 400                               | 18 300   | 16.4  | 1 900           | —        | 2 200  | <b>16040</b> | —          | —         | —          |
|                          | 310                    | 51  | 2.1 | 207 000   | 226 000      | 21 100                               | 23 000   | 15.6  | 1 900           | —        | 2 200  | <b>6040</b>  | <b>ZZS</b> | —         | —          |
|                          | 360                    | 58  | 4   | 269 000   | 310 000      | 27 400                               | 31 500   | 15.2  | 1 500           | —        | 1 800  | <b>6240</b>  | <b>ZZS</b> | —         | —          |
|                          | 420                    | 80  | 5   | 380 000   | 445 000      | 38 500                               | 45 500   | 13.8  | 1 300           | —        | 1 600  | <b>6340</b>  | —          | —         | —          |
| 220                      | 270                    | 24  | 1.5 | 76 500    | 107 000      | 7 800                                | 10 900   | 17.4  | 1 900           | —        | 2 400  | <b>6844</b>  | <b>ZZS</b> | —         | —          |
|                          | 300                    | 38  | 2.1 | 146 000   | 169 000      | 14 900                               | 17 300   | 16.6  | 1 800           | —        | 2 200  | <b>6944</b>  | <b>ZZS</b> | —         | —          |
|                          | 340                    | 37  | 2.1 | 180 000   | 217 000      | 18 400                               | 22 100   | 16.5  | 1 600           | —        | 2 000  | <b>16044</b> | —          | —         | —          |
|                          | 340                    | 56  | 3   | 235 000   | 271 000      | 24 000                               | 27 600   | 15.6  | 1 700           | —        | 2 000  | <b>6044</b>  | <b>ZZS</b> | —         | —          |
|                          | 400                    | 65  | 4   | 310 000   | 375 000      | 31 500                               | 38 500   | 15.1  | 1 300           | —        | 1 600  | <b>6244</b>  | —          | —         | —          |
|                          | 460                    | 88  | 5   | 410 000   | 520 000      | 42 000                               | 53 000   | 14.3  | 1 200           | —        | 1 500  | <b>6344</b>  | —          | —         | —          |
| 240                      | 300                    | 28  | 2   | 98 500    | 137 000      | 10 000                               | 14 000   | 17.3  | 1 700           | —        | 2 000  | <b>6848</b>  | —          | —         | —          |
|                          | 320                    | 38  | 2.1 | 154 000   | 190 000      | 15 700                               | 19 400   | 16.8  | 1 700           | —        | 2 000  | <b>6948</b>  | <b>ZZS</b> | —         | —          |
|                          | 360                    | 37  | 2.1 | 196 000   | 243 000      | 19 900                               | 24 700   | 16.5  | 1 500           | —        | 1 900  | <b>16048</b> | —          | —         | —          |
|                          | 360                    | 56  | 3   | 244 000   | 296 000      | 24 900                               | 30 000   | 15.9  | 1 500           | —        | 1 900  | <b>6048</b>  | —          | —         | —          |
|                          | 440                    | 72  | 4   | 340 000   | 430 000      | 34 500                               | 44 000   | 15.2  | 1 200           | —        | 1 500  | <b>6248</b>  | —          | —         | —          |
|                          | 500                    | 95  | 5   | 470 000   | 625 000      | 48 000                               | 63 500   | 14.2  | 1 100           | —        | 1 300  | <b>6348</b>  | —          | —         | —          |

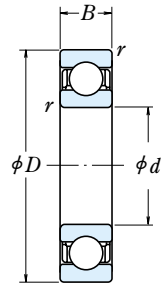
| Abutment and Fillet Dimensions (mm) |             |       |        | Mass (kg) |
|-------------------------------------|-------------|-------|--------|-----------|
| $d_a^{(1)}$                         | $D_a^{(1)}$ | $r_a$ | approx |           |
| 176.5                               | 182         | 208.5 | 1      | 1.86      |
| 179                                 | 186         | 221   | 2      | 3.34      |
| 178                                 | —           | 252   | 1.5    | 5.71      |
| 181                                 | 194.5       | 249   | 2      | 6.89      |
| 186                                 | 215         | 294   | 3      | 15.8      |
| 186                                 | —           | 344   | 3      | 36.6      |
| 186.5                               | 192         | 218.5 | 1      | 1.98      |
| 189                                 | 198.5       | 241   | 2      | 4.16      |
| 189                                 | —           | 271   | 2      | 7.5       |
| 191                                 | 208         | 269   | 2      | 8.88      |
| 196                                 | 223         | 304   | 3      | 15.9      |
| 196                                 | —           | 364   | 3      | 43.1      |
| 198                                 | 202.5       | 232   | 1.5    | 2.53      |
| 199                                 | —           | 251   | 2      | 5.18      |
| 199                                 | —           | 281   | 2      | 7.78      |
| 201                                 | 218         | 279   | 2      | 9.39      |
| 206                                 | 236         | 324   | 3      | 22.3      |
| 210                                 | —           | 380   | 4      | 49.7      |
| 208                                 | —           | 242   | 1.5    | 2.67      |
| 211                                 | 222         | 269   | 2      | 7.28      |
| 209                                 | —           | 301   | 2      | 10        |
| 211                                 | 231.5       | 299   | 2      | 12        |
| 216                                 | 252         | 344   | 3      | 26.7      |
| 220                                 | —           | 400   | 4      | 55.3      |
| 228                                 | 233.5       | 262   | 1.5    | 2.9       |
| 231                                 | 242         | 289   | 2      | 7.88      |
| 231                                 | —           | 329   | 2      | 13.1      |
| 233                                 | 254.5       | 327   | 2.5    | 18.6      |
| 236                                 | —           | 384   | 3      | 37.4      |
| 240                                 | —           | 440   | 4      | 73.9      |
| 249                                 | —           | 291   | 2      | 4.48      |
| 251                                 | 262         | 309   | 2      | 8.49      |
| 251                                 | —           | 349   | 2      | 13.9      |
| 253                                 | —           | 347   | 2.5    | 19.9      |
| 256                                 | —           | 424   | 3      | 50.5      |
| 260                                 | —           | 480   | 4      | 94.4      |

Note (1) When heavy axial loads are applied, increase  $d_a$  and decrease  $D_a$  from the above values.

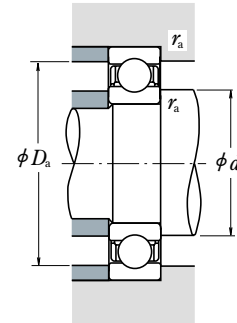
Remarks When using bearings with rotating outer rings, contact NSK if they are sealed or shielded.

# SINGLE-ROW DEEP GROOVE BALL BEARINGS

Bore Diameter 260 – 360 mm



Open Type



## Dynamic Equivalent Load

$$P = XF_r + YF_a$$

| $\frac{f_0 F_a}{C_{0r}}$ | $e$  | $\frac{F_a}{F_r} \leq e$ |   | $\frac{F_a}{F_r} > e$ |      |
|--------------------------|------|--------------------------|---|-----------------------|------|
|                          |      | X                        | Y | X                     | Y    |
| 0.172                    | 0.19 | 1                        | 0 | 0.56                  | 2.30 |
| 0.345                    | 0.22 | 1                        | 0 | 0.56                  | 1.99 |
| 0.689                    | 0.26 | 1                        | 0 | 0.56                  | 1.71 |
| 1.03                     | 0.28 | 1                        | 0 | 0.56                  | 1.55 |
| 1.38                     | 0.30 | 1                        | 0 | 0.56                  | 1.45 |
| 2.07                     | 0.34 | 1                        | 0 | 0.56                  | 1.31 |
| 3.45                     | 0.38 | 1                        | 0 | 0.56                  | 1.15 |
| 5.17                     | 0.42 | 1                        | 0 | 0.56                  | 1.04 |
| 6.89                     | 0.44 | 1                        | 0 | 0.56                  | 1.00 |

## Static Equivalent Load

$$\frac{F_a}{F_r} > 0.8, P_0 = 0.6F_r + 0.5F_a$$

$$\frac{F_a}{F_r} \leq 0.8, P_0 = F_r$$

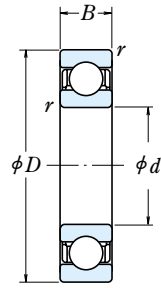
| Boundary Dimensions (mm) |     |     |           | Basic Load Ratings |          |             |          | Factor | Limiting Speeds |       | Bearing Numbers |
|--------------------------|-----|-----|-----------|--------------------|----------|-------------|----------|--------|-----------------|-------|-----------------|
| $d$                      | $D$ | $B$ | $r_{min}$ | $C_r$ (N)          | $C_{0r}$ | $C_r$ (kgf) | $C_{0r}$ |        | Grease          | Oil   |                 |
| 260                      | 320 | 28  | 2         | 101 000            | 148 000  | 10 300      | 15 100   | 17.4   | 1 600           | 1 900 | <b>6852</b>     |
|                          | 360 | 46  | 2.1       | 204 000            | 255 000  | 20 800      | 26 000   | 16.5   | 1 500           | 1 800 | <b>6952</b>     |
|                          | 400 | 44  | 3         | 237 000            | 310 000  | 24 100      | 31 500   | 16.4   | 1 400           | 1 700 | <b>16052</b>    |
|                          | 480 | 80  | 5         | 400 000            | 540 000  | 41 000      | 55 000   | 15.1   | 1 100           | 1 300 | <b>6252</b>     |
|                          | 540 | 102 | 6         | 505 000            | 710 000  | 51 500      | 72 500   | 14.6   | 1 000           | 1 200 | <b>6352</b>     |
| 280                      | 350 | 33  | 2         | 133 000            | 191 000  | 13 600      | 19 500   | 17.3   | 1 500           | 1 700 | <b>6856</b>     |
|                          | 380 | 46  | 2.1       | 209 000            | 272 000  | 21 300      | 27 700   | 16.6   | 1 400           | 1 700 | <b>6956</b>     |
|                          | 420 | 44  | 3         | 243 000            | 330 000  | 24 700      | 33 500   | 16.5   | 1 300           | 1 600 | <b>16056</b>    |
|                          | 480 | 80  | 5         | 400 000            | 550 000  | 41 000      | 56 000   | 15.2   | 1 000           | 1 300 | <b>6256</b>     |
|                          | 580 | 108 | 6         | 570 000            | 840 000  | 58 000      | 86 000   | 14.5   | 900             | 1 100 | <b>6356</b>     |
| 300                      | 380 | 38  | 2.1       | 166 000            | 233 000  | 17 000      | 23 800   | 17.1   | 1 300           | 1 600 | <b>6860</b>     |
|                          | 420 | 56  | 3         | 269 000            | 370 000  | 27 400      | 38 000   | 16.4   | 1 300           | 1 500 | <b>6960</b>     |
|                          | 460 | 50  | 4         | 285 000            | 405 000  | 29 000      | 41 000   | 16.4   | 1 200           | 1 400 | <b>16060</b>    |
|                          | 460 | 74  | 4         | 355 000            | 500 000  | 36 500      | 51 000   | 15.8   | 1 200           | 1 400 | <b>6060</b>     |
|                          | 540 | 85  | 5         | 465 000            | 670 000  | 47 500      | 68 500   | 15.1   | 950             | 1 200 | <b>6260</b>     |
| 320                      | 400 | 38  | 2.1       | 168 000            | 244 000  | 17 200      | 24 900   | 17.2   | 1 300           | 1 500 | <b>6864</b>     |
|                          | 440 | 56  | 3         | 266 000            | 375 000  | 27 100      | 38 000   | 16.5   | 1 200           | 1 400 | <b>6964</b>     |
|                          | 480 | 50  | 4         | 293 000            | 430 000  | 29 800      | 44 000   | 16.5   | 1 100           | 1 300 | <b>16064</b>    |
|                          | 480 | 74  | 4         | 390 000            | 570 000  | 40 000      | 58 000   | 15.7   | 1 100           | 1 300 | <b>6064</b>     |
|                          | 580 | 92  | 5         | 530 000            | 805 000  | 54 500      | 82 500   | 15.0   | 850             | 1 100 | <b>6264</b>     |
| 340                      | 420 | 38  | 2.1       | 175 000            | 265 000  | 17 800      | 27 100   | 17.3   | 1 200           | 1 400 | <b>6868</b>     |
|                          | 460 | 56  | 3         | 273 000            | 400 000  | 27 800      | 40 500   | 16.6   | 1 100           | 1 300 | <b>6968</b>     |
|                          | 520 | 82  | 5         | 440 000            | 660 000  | 45 000      | 67 500   | 15.6   | 1 000           | 1 200 | <b>6068</b>     |
|                          | 620 | 92  | 6         | 530 000            | 820 000  | 54 000      | 83 500   | 15.3   | 800             | 1 000 | <b>6268</b>     |
|                          | 360 | 440 | 38        | 2.1                | 192 000  | 290 000     | 19 600   | 29 600 | 17.3            | 1 100 | 1 300           |
| 480                      |     | 56  | 3         | 280 000            | 425 000  | 28 500      | 43 000   | 16.7   | 1 100           | 1 300 | <b>6972</b>     |
| 540                      |     | 82  | 5         | 460 000            | 720 000  | 47 000      | 73 500   | 15.7   | 950             | 1 200 | <b>6072</b>     |
| 650                      |     | 95  | 6         | 555 000            | 905 000  | 57 000      | 92 000   | 15.4   | 750             | 950   | <b>6272</b>     |

Note (1) When heavy axial loads are applied, increase  $d_a$  and decrease  $D_a$  from the above values.

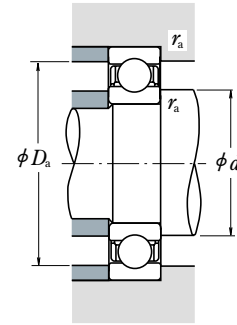
| Abutment and Fillet Dimensions (mm) |               |            | Mass (kg) |
|-------------------------------------|---------------|------------|-----------|
| $d_{a(1)min}$                       | $D_{a(1)max}$ | $r_{amax}$ |           |
| 269                                 | 311           | 2          | 4.84      |
| 271                                 | 349           | 2          | 14        |
| 273                                 | 387           | 2.5        | 21.1      |
| 276                                 | 384           | 3          | 29.4      |
| 280                                 | 460           | 4          | 67        |
| 286                                 | 514           | 5          | 118       |
| 289                                 | 341           | 2          | 7.2       |
| 291                                 | 369           | 2          | 15.1      |
| 293                                 | 407           | 2.5        | 22.7      |
| 296                                 | 404           | 3          | 31.2      |
| 300                                 | 480           | 4          | 70.4      |
| 306                                 | 554           | 5          | 144       |
| 311                                 | 369           | 2          | 10.3      |
| 313                                 | 407           | 2.5        | 23.9      |
| 316                                 | 444           | 3          | 31.5      |
| 316                                 | 444           | 3          | 44.2      |
| 320                                 | 520           | 4          | 87.8      |
| 331                                 | 389           | 2          | 10.8      |
| 333                                 | 427           | 2.5        | 25.3      |
| 336                                 | 464           | 3          | 33.2      |
| 336                                 | 464           | 3          | 46.5      |
| 340                                 | 560           | 4          | 111       |
| 351                                 | 409           | 2          | 11.5      |
| 353                                 | 447           | 2.5        | 26.6      |
| 360                                 | 500           | 4          | 62.3      |
| 366                                 | 594           | 5          | 129       |
| 371                                 | 429           | 2          | 11.8      |
| 373                                 | 467           | 2.5        | 27.9      |
| 380                                 | 520           | 4          | 65.3      |
| 386                                 | 624           | 5          | 145       |

# SINGLE-ROW DEEP GROOVE BALL BEARINGS

Bore Diameter 380 – 600 mm



Open Type



## Dynamic Equivalent Load

$$P = XF_r + YF_a$$

| $\frac{f_0 F_a}{C_{0r}}$ | $e$  | $\frac{F_a}{F_r} \leq e$ |   | $\frac{F_a}{F_r} > e$ |      |
|--------------------------|------|--------------------------|---|-----------------------|------|
|                          |      | X                        | Y | X                     | Y    |
| 0.172                    | 0.19 | 1                        | 0 | 0.56                  | 2.30 |
| 0.345                    | 0.22 | 1                        | 0 | 0.56                  | 1.99 |
| 0.689                    | 0.26 | 1                        | 0 | 0.56                  | 1.71 |
| 1.03                     | 0.28 | 1                        | 0 | 0.56                  | 1.55 |
| 1.38                     | 0.30 | 1                        | 0 | 0.56                  | 1.45 |
| 2.07                     | 0.34 | 1                        | 0 | 0.56                  | 1.31 |
| 3.45                     | 0.38 | 1                        | 0 | 0.56                  | 1.15 |
| 5.17                     | 0.42 | 1                        | 0 | 0.56                  | 1.04 |
| 6.89                     | 0.44 | 1                        | 0 | 0.56                  | 1.00 |

## Static Equivalent Load

$$\frac{F_a}{F_r} > 0.8, P_0 = 0.6F_r + 0.5F_a$$

$$\frac{F_a}{F_r} \leq 0.8, P_0 = F_r$$

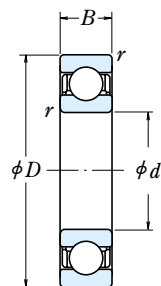
| Boundary Dimensions (mm) |     |     |           | Basic Load Ratings |              |             |                | Factor | Limiting Speeds |        | Bearing Numbers |
|--------------------------|-----|-----|-----------|--------------------|--------------|-------------|----------------|--------|-----------------|--------|-----------------|
| $d$                      | $D$ | $B$ | $r_{min}$ | $C_r$ (N)          | $C_{0r}$ (N) | $C_r$ (kgf) | $C_{0r}$ (kgf) |        | $f_0$           | Grease |                 |
| 380                      | 480 | 46  | 2.1       | 238 000            | 375 000      | 24 200      | 38 000         | 17.1   | 1 000           | 1 200  | <b>6876</b>     |
|                          | 520 | 65  | 4         | 325 000            | 510 000      | 33 000      | 52 000         | 16.6   | 950             | 1 200  | <b>6976</b>     |
|                          | 560 | 82  | 5         | 455 000            | 725 000      | 46 500      | 74 000         | 15.9   | 900             | 1 100  | <b>6076</b>     |
| 400                      | 500 | 46  | 2.1       | 241 000            | 390 000      | 24 600      | 40 000         | 17.2   | 950             | 1 200  | <b>6880</b>     |
|                          | 540 | 65  | 4         | 335 000            | 540 000      | 34 000      | 55 000         | 16.7   | 900             | 1 100  | <b>6980</b>     |
|                          | 600 | 90  | 5         | 510 000            | 825 000      | 52 000      | 84 000         | 15.7   | 850             | 1 000  | <b>6080</b>     |
| 420                      | 520 | 46  | 2.1       | 245 000            | 410 000      | 25 000      | 41 500         | 17.3   | 900             | 1 100  | <b>6884</b>     |
|                          | 560 | 65  | 4         | 340 000            | 570 000      | 35 000      | 58 500         | 16.8   | 900             | 1 100  | <b>6984</b>     |
|                          | 620 | 90  | 5         | 530 000            | 895 000      | 54 000      | 91 000         | 15.8   | 800             | 1 000  | <b>6084</b>     |
| 440                      | 540 | 46  | 2.1       | 248 000            | 425 000      | 25 300      | 43 500         | 17.4   | 900             | 1 100  | <b>6888</b>     |
|                          | 600 | 74  | 4         | 395 000            | 680 000      | 40 500      | 69 000         | 16.6   | 800             | 1 000  | <b>6988</b>     |
|                          | 650 | 94  | 6         | 550 000            | 965 000      | 56 000      | 98 500         | 16.0   | 750             | 900    | <b>6088</b>     |
| 460                      | 580 | 56  | 3         | 310 000            | 550 000      | 31 500      | 56 000         | 17.1   | 800             | 1 000  | <b>6892</b>     |
|                          | 620 | 74  | 4         | 405 000            | 720 000      | 41 500      | 73 500         | 16.7   | 800             | 950    | <b>6992</b>     |
|                          | 680 | 100 | 6         | 605 000            | 1 080 000    | 62 000      | 110 000        | 15.8   | 710             | 850    | <b>6092</b>     |
| 480                      | 600 | 56  | 3         | 315 000            | 575 000      | 32 000      | 58 500         | 17.2   | 800             | 950    | <b>6896</b>     |
|                          | 650 | 78  | 5         | 450 000            | 815 000      | 45 500      | 83 000         | 16.6   | 750             | 900    | <b>6996</b>     |
|                          | 700 | 100 | 6         | 605 000            | 1 090 000    | 61 500      | 111 000        | 15.9   | 710             | 850    | <b>6096</b>     |
| 500                      | 620 | 56  | 3         | 320 000            | 600 000      | 33 000      | 61 000         | 17.3   | 750             | 900    | <b>68/500</b>   |
|                          | 670 | 78  | 5         | 460 000            | 865 000      | 47 000      | 88 000         | 16.7   | 710             | 850    | <b>69/500</b>   |
|                          | 720 | 100 | 6         | 630 000            | 1 170 000    | 64 000      | 120 000        | 16.0   | 670             | 800    | <b>60/500</b>   |
| 530                      | 650 | 56  | 3         | 325 000            | 625 000      | 33 000      | 63 500         | 17.4   | 710             | 850    | <b>68/530</b>   |
|                          | 710 | 82  | 5         | 455 000            | 870 000      | 46 500      | 88 500         | 16.8   | 670             | 800    | <b>69/530</b>   |
|                          | 780 | 112 | 6         | 680 000            | 1 300 000    | 69 500      | 133 000        | 16.0   | 600             | 750    | <b>60/530</b>   |
| 560                      | 680 | 56  | 3         | 330 000            | 650 000      | 33 500      | 66 500         | 17.4   | 670             | 800    | <b>68/560</b>   |
|                          | 750 | 85  | 5         | 525 000            | 1 040 000    | 53 500      | 106 000        | 16.7   | 600             | 750    | <b>69/560</b>   |
|                          | 820 | 115 | 6         | 735 000            | 1 500 000    | 75 000      | 153 000        | 16.2   | 560             | 670    | <b>60/560</b>   |
| 600                      | 730 | 60  | 3         | 355 000            | 735 000      | 36 000      | 75 000         | 17.5   | 600             | 710    | <b>68/600</b>   |
|                          | 800 | 90  | 5         | 550 000            | 1 160 000    | 56 500      | 118 000        | 16.9   | 560             | 670    | <b>69/600</b>   |
|                          | 870 | 118 | 6         | 790 000            | 1 640 000    | 80 500      | 168 000        | 16.1   | 530             | 630    | <b>60/600</b>   |

Note (1) When heavy axial loads are applied, increase  $d_a$  and decrease  $D_a$  from the above values.

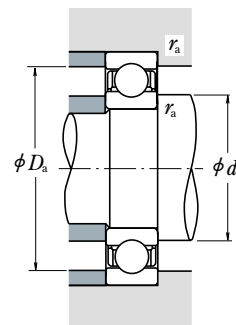
| Abutment and Fillet Dimensions (mm) |                 |           | Mass (kg) |
|-------------------------------------|-----------------|-----------|-----------|
| $d_a^{(1)}$ min                     | $D_a^{(1)}$ max | $r_a$ max |           |
| 391                                 | 469             | 2         | 19.5      |
| 396                                 | 504             | 3         | 40        |
| 400                                 | 540             | 4         | 68        |
| 411                                 | 489             | 2         | 20.5      |
| 416                                 | 524             | 3         | 42        |
| 420                                 | 580             | 4         | 88.4      |
| 431                                 | 509             | 2         | 21.4      |
| 436                                 | 544             | 3         | 43.6      |
| 440                                 | 600             | 4         | 92.2      |
| 451                                 | 529             | 2         | 22.3      |
| 456                                 | 584             | 3         | 60.2      |
| 466                                 | 624             | 5         | 106       |
| 473                                 | 567             | 2.5       | 34.3      |
| 476                                 | 604             | 3         | 62.6      |
| 486                                 | 654             | 5         | 123       |
| 493                                 | 587             | 2.5       | 35.4      |
| 500                                 | 630             | 4         | 73.5      |
| 506                                 | 674             | 5         | 127       |
| 513                                 | 607             | 2.5       | 37.2      |
| 520                                 | 650             | 4         | 82        |
| 526                                 | 694             | 5         | 131       |
| 543                                 | 637             | 2.5       | 39.8      |
| 550                                 | 690             | 4         | 89.8      |
| 556                                 | 754             | 5         | 184       |
| 573                                 | 667             | 2.5       | 41.5      |
| 580                                 | 730             | 4         | 105       |
| 586                                 | 793.5           | 5         | 203       |
| 613                                 | 717             | 2.5       | 50.9      |
| 620                                 | 780             | 4         | 120       |
| 626                                 | 844             | 5         | 236       |

# SINGLE-ROW DEEP GROOVE BALL BEARINGS

Bore Diameter 630 – 800 mm



Open Type



| Boundary Dimensions (mm) |          |          |                         | Basic Load Ratings |           |        |         | Factor | Limiting Speeds (min <sup>-1</sup> ) |        | Bearing Numbers |
|--------------------------|----------|----------|-------------------------|--------------------|-----------|--------|---------|--------|--------------------------------------|--------|-----------------|
| <i>d</i>                 | <i>D</i> | <i>B</i> | <i>r</i> <sub>min</sub> | (N)                |           | {kgf}  |         |        | <i>f</i> <sub>0</sub>                | Grease |                 |
| <b>630</b>               | 780      | 69       | 4                       | 420 000            | 890 000   | 43 000 | 90 500  | 17.3   |                                      |        | 560             |
|                          | 850      | 100      | 6                       | 625 000            | 1 350 000 | 64 000 | 138 000 | 16.7   | 530                                  | 630    | <b>69/630</b>   |
|                          | 920      | 128      | 7.5                     | 750 000            | 1 620 000 | 76 500 | 165 000 | 16.4   | 480                                  | 600    | <b>60/630</b>   |
| <b>670</b>               | 820      | 69       | 4                       | 435 000            | 965 000   | 44 500 | 98 000  | 17.4   | 500                                  | 630    | <b>68/670</b>   |
|                          | 900      | 103      | 6                       | 675 000            | 1 460 000 | 68 500 | 149 000 | 16.7   | 480                                  | 560    | <b>69/670</b>   |
|                          | 980      | 136      | 7.5                     | 765 000            | 1 730 000 | 78 000 | 177 000 | 16.6   | 450                                  | 530    | <b>60/670</b>   |
| <b>710</b>               | 870      | 74       | 4                       | 480 000            | 1 100 000 | 49 000 | 113 000 | 17.4   | 480                                  | 560    | <b>68/710</b>   |
|                          | 950      | 106      | 6                       | 715 000            | 1 640 000 | 72 500 | 167 000 | 16.8   | 450                                  | 530    | <b>69/710</b>   |
| <b>750</b>               | 920      | 78       | 5                       | 525 000            | 1 260 000 | 53 500 | 128 000 | 17.4   | 430                                  | 530    | <b>68/750</b>   |
|                          | 1 000    | 112      | 6                       | 785 000            | 1 840 000 | 80 000 | 188 000 | 16.7   | 400                                  | 500    | <b>69/750</b>   |
| <b>800</b>               | 980      | 82       | 5                       | 530 000            | 1 310 000 | 54 000 | 133 000 | 17.5   | 400                                  | 480    | <b>68/800</b>   |
|                          | 1 060    | 115      | 6                       | 825 000            | 2 050 000 | 84 500 | 209 000 | 16.8   | 380                                  | 450    | <b>69/800</b>   |

**Note** (1) When heavy axial loads are applied, increase *d<sub>a</sub>* and decrease *D<sub>a</sub>* from the above values.

## Dynamic Equivalent Load

$$P = XF_r + YF_a$$

| $\frac{f_0 F_a}{C_{0r}}$ | <i>e</i> | $\frac{F_a}{F_r} \leq e$ |          | $\frac{F_a}{F_r} > e$ |          |
|--------------------------|----------|--------------------------|----------|-----------------------|----------|
|                          |          | <i>X</i>                 | <i>Y</i> | <i>X</i>              | <i>Y</i> |
| 0.172                    | 0.19     | 1                        | 0        | 0.56                  | 2.30     |
| 0.345                    | 0.22     | 1                        | 0        | 0.56                  | 1.99     |
| 0.689                    | 0.26     | 1                        | 0        | 0.56                  | 1.71     |
| 1.03                     | 0.28     | 1                        | 0        | 0.56                  | 1.55     |
| 1.38                     | 0.30     | 1                        | 0        | 0.56                  | 1.45     |
| 2.07                     | 0.34     | 1                        | 0        | 0.56                  | 1.31     |
| 3.45                     | 0.38     | 1                        | 0        | 0.56                  | 1.15     |
| 5.17                     | 0.42     | 1                        | 0        | 0.56                  | 1.04     |
| 6.89                     | 0.44     | 1                        | 0        | 0.56                  | 1.00     |

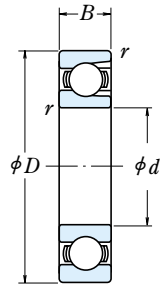
## Static Equivalent Load

$$\frac{F_a}{F_r} > 0.8, P_0 = 0.6F_r + 0.5F_a$$

$$\frac{F_a}{F_r} \leq 0.8, P_0 = F_r$$

| Abutment and Fillet Dimensions (mm)                |  |                                     | Mass (kg) |
|--|--|-------------------------------------|-----------|
| <i>d<sub>a</sub></i> <sup>(1)</sup> <sub>min</sub> | <i>D<sub>a</sub></i> <sup>(1)</sup> <sub>max</sub> | <i>r<sub>a</sub></i> <sub>max</sub> |           |
| 646  | 764  | 3                                   | 71.3      |
| 656  | 824  | 5                                   | 163       |
| 662  | 888  | 6                                   | 285       |
| 686  | 804  | 3                                   | 75.4      |
| 696  | 874  | 5                                   | 181       |
| 702  | 948  | 6                                   | 351       |
| 726  | 854  | 3                                   | 92.6      |
| 736  | 924  | 5                                   | 208       |
| 770  | 900  | 4                                   | 110       |
| 776  | 974  | 5                                   | 245       |
| 820  | 960  | 4                                   | 132       |
| 826  | 1 034  | 5                                   | 275       |

Bore Diameter 25 – 110 mm



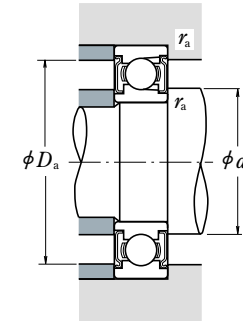
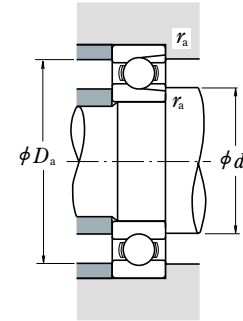
Open Type



Shielded Type  
(One Shield) Z



Shielded Type  
(Two Shields) ZZ

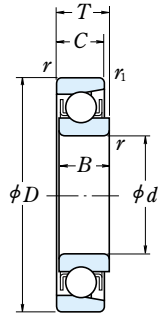


| Boundary Dimensions (mm) |     |    |       | Basic Load Ratings (N) (kgf) |                 |                |                 | Limiting Speeds (min <sup>-1</sup> ) |            | Open             |
|--------------------------|-----|----|-------|------------------------------|-----------------|----------------|-----------------|--------------------------------------|------------|------------------|
| d                        | D   | B  | r min | C <sub>r</sub>               | C <sub>0r</sub> | C <sub>r</sub> | C <sub>0r</sub> | Grease Open Z · ZZ                   | Oil Open Z |                  |
| 25                       | 52  | 15 | 1     | 14 400                       | 10 500          | 1 470          | 1 070           | 12 000                               | 15 000     | BL 205<br>BL 305 |
|                          | 62  | 17 | 1.1   | 21 500                       | 15 500          | 2 200          | 1 580           | 11 000                               | 13 000     |                  |
| 30                       | 62  | 16 | 1     | 21 000                       | 16 300          | 2 150          | 1 660           | 10 000                               | 12 000     | BL 206<br>BL 306 |
|                          | 72  | 19 | 1.1   | 27 900                       | 20 700          | 2 840          | 2 110           | 9 000                                | 11 000     |                  |
| 35                       | 72  | 17 | 1.1   | 27 800                       | 22 100          | 2 830          | 2 250           | 9 000                                | 11 000     | BL 207<br>BL 307 |
|                          | 80  | 21 | 1.5   | 37 000                       | 29 100          | 3 800          | 2 970           | 8 000                                | 9 500      |                  |
| 40                       | 80  | 18 | 1.1   | 35 500                       | 28 800          | 3 600          | 2 940           | 8 000                                | 9 500      | BL 208<br>BL 308 |
|                          | 90  | 23 | 1.5   | 46 500                       | 36 000          | 4 750          | 3 650           | 7 500                                | 9 000      |                  |
| 45                       | 85  | 19 | 1.1   | 37 000                       | 32 000          | 3 800          | 3 250           | 7 500                                | 9 000      | BL 209<br>BL 309 |
|                          | 100 | 25 | 1.5   | 55 500                       | 44 000          | 5 650          | 4 500           | 6 300                                | 8 000      |                  |
| 50                       | 90  | 20 | 1.1   | 39 000                       | 35 000          | 3 950          | 3 550           | 6 700                                | 8 500      | BL 210<br>BL 310 |
|                          | 110 | 27 | 2     | 65 000                       | 52 500          | 6 600          | 5 350           | 6 000                                | 7 100      |                  |
| 55                       | 100 | 21 | 1.5   | 48 000                       | 44 000          | 4 900          | 4 500           | 6 300                                | 7 500      | BL 211<br>BL 311 |
|                          | 120 | 29 | 2     | 75 000                       | 61 500          | 7 650          | 6 250           | 5 600                                | 6 700      |                  |
| 60                       | 110 | 22 | 1.5   | 58 000                       | 54 000          | 5 950          | 5 550           | 5 600                                | 6 700      | BL 212<br>BL 312 |
|                          | 130 | 31 | 2.1   | 85 500                       | 71 500          | 8 700          | 7 300           | 5 000                                | 6 000      |                  |
| 65                       | 120 | 23 | 1.5   | 63 500                       | 60 000          | 6 450          | 6 150           | 5 300                                | 6 300      | BL 213<br>BL 313 |
|                          | 140 | 33 | 2.1   | 103 000                      | 89 500          | 10 500         | 9 150           | 4 800                                | 5 600      |                  |
| 70                       | 125 | 24 | 1.5   | 69 000                       | 66 000          | 7 050          | 6 750           | 5 000                                | 6 000      | BL 214<br>BL 314 |
|                          | 150 | 35 | 2.1   | 115 000                      | 102 000         | 11 800         | 10 400          | 4 300                                | 5 300      |                  |
| 75                       | 130 | 25 | 1.5   | 72 000                       | 72 000          | 7 350          | 7 300           | 4 500                                | 5 600      | BL 215<br>BL 315 |
|                          | 160 | 37 | 2.1   | 126 000                      | 116 000         | 12 800         | 11 800          | 4 000                                | 5 000      |                  |
| 80                       | 140 | 26 | 2     | 84 000                       | 85 000          | 8 600          | 8 650           | 4 300                                | 5 300      | BL 216<br>BL 316 |
|                          | 170 | 39 | 2.1   | 136 000                      | 130 000         | 13 900         | 13 300          | 3 800                                | 4 500      |                  |
| 85                       | 150 | 28 | 2     | 93 000                       | 93 000          | 9 500          | 9 450           | 4 000                                | 5 000      | BL 217<br>BL 317 |
|                          | 180 | 41 | 3     | 147 000                      | 145 000         | 15 000         | 14 800          | 3 600                                | 4 300      |                  |
| 90                       | 160 | 30 | 2     | 107 000                      | 107 000         | 10 900         | 10 900          | 3 800                                | 4 500      | BL 218<br>BL 318 |
|                          | 190 | 43 | 3     | 158 000                      | 161 000         | 16 100         | 16 400          | 3 400                                | 4 000      |                  |
| 95                       | 170 | 32 | 2.1   | 121 000                      | 123 000         | 12 300         | 12 500          | 3 600                                | 4 300      | BL 219<br>BL 319 |
|                          | 200 | 45 | 3     | 169 000                      | 178 000         | 17 300         | 18 100          | 2 800                                | 3 600      |                  |
| 100                      | 180 | 34 | 2.1   | 136 000                      | 140 000         | 13 800         | 14 200          | 3 400                                | 4 000      | BL 220           |
| 105                      | 190 | 36 | 2.1   | 148 000                      | 157 000         | 15 000         | 16 000          | 3 200                                | 3 800      | BL 221           |
| 110                      | 200 | 38 | 2.1   | 160 000                      | 176 000         | 16 300         | 17 900          | 2 800                                | 3 400      | BL 222           |

Remarks When using Maximum Type Ball Bearings, please contact NSK.

| Bearing Numbers   |                  | Abutment and Fillet Dimensions (mm) |                    |                    |                    | Mass (kg) approx |
|-------------------|------------------|-------------------------------------|--------------------|--------------------|--------------------|------------------|
| With One Shielded | With Two Shields | d <sub>a</sub> min                  | d <sub>b</sub> max | D <sub>a</sub> max | r <sub>a</sub> max |                  |
| BL 205 Z          | BL 205 ZZ        | 30                                  | 32                 | 47                 | 1                  | 0.133            |
| BL 305 Z          | BL 305 ZZ        | 31.5                                | 36                 | 55.5               | 1                  | 0.246            |
| BL 206 Z          | BL 206 ZZ        | 35                                  | 38.5               | 57                 | 1                  | 0.215            |
| BL 306 Z          | BL 306 ZZ        | 36.5                                | 42                 | 65.5               | 1                  | 0.364            |
| BL 207 Z          | BL 207 ZZ        | 41.5                                | 44.5               | 65.5               | 1                  | 0.307            |
| BL 307 Z          | BL 307 ZZ        | 43                                  | 44.5               | 72                 | 1.5                | 0.486            |
| BL 208 Z          | BL 208 ZZ        | 46.5                                | 50                 | 73.5               | 1                  | 0.394            |
| BL 308 Z          | BL 308 ZZ        | 48                                  | 52.5               | 82                 | 1.5                | 0.685            |
| BL 209 Z          | BL 209 ZZ        | 51.5                                | 55.5               | 78.5               | 1                  | 0.449            |
| BL 309 Z          | BL 309 ZZ        | 53                                  | 61.5               | 92                 | 1.5                | 0.883            |
| BL 210 Z          | BL 210 ZZ        | 56.5                                | 60                 | 83.5               | 1                  | 0.504            |
| BL 310 Z          | BL 310 ZZ        | 59                                  | 68                 | 101                | 2                  | 1.16             |
| BL 211 Z          | BL 211 ZZ        | 63                                  | 66.5               | 92                 | 1.5                | 0.667            |
| BL 311 Z          | BL 311 ZZ        | 64                                  | 72.5               | 111                | 2                  | 1.49             |
| BL 212 Z          | BL 212 ZZ        | 68                                  | 74.5               | 102                | 1.5                | 0.856            |
| BL 312 Z          | BL 312 ZZ        | 71                                  | 79                 | 119                | 2                  | 1.88             |
| BL 213 Z          | BL 213 ZZ        | 73                                  | 80                 | 112                | 1.5                | 1.09             |
| BL 313 Z          | BL 313 ZZ        | 76                                  | 85.5               | 129                | 2                  | 2.36             |
| BL 214 Z          | BL 214 ZZ        | 78                                  | 84                 | 117                | 1.5                | 1.19             |
| BL 314 Z          | BL 314 ZZ        | 81                                  | 92                 | 139                | 2                  | 2.87             |
| BL 215 Z          | BL 215 ZZ        | 83                                  | 90                 | 122                | 1.5                | 1.29             |
| BL 315 Z          | BL 315 ZZ        | 86                                  | 98.5               | 149                | 2                  | 3.43             |
| BL 216 Z          | BL 216 ZZ        | 89                                  | 95.5               | 131                | 2                  | 1.61             |
| BL 316 Z          | BL 316 ZZ        | 91                                  | 104.5              | 159                | 2                  | 4.08             |
| BL 217 Z          | BL 217 ZZ        | 94                                  | 102                | 141                | 2                  | 1.97             |
| BL 317 Z          | BL 317 ZZ        | 98                                  | 110.5              | 167                | 2.5                | 4.77             |
| BL 218 Z          | BL 218 ZZ        | 99                                  | 107.5              | 151                | 2                  | 2.43             |
| BL 318 Z          | BL 318 ZZ        | 103                                 | 117                | 177                | 2.5                | 5.45             |
| BL 219 Z          | BL 219 ZZ        | 106                                 | 114                | 159                | 2                  | 2.95             |
| BL 319 Z          | BL 319 ZZ        | 108                                 | 124                | 187                | 2.5                | 6.4              |
| BL 220 Z          | BL 220 ZZ        | 111                                 | 121.5              | 169                | 2                  | 3.54             |
| BL 221 Z          | BL 221 ZZ        | 116                                 | 127.5              | 179                | 2                  | 4.23             |
| —                 | —                | 121                                 | —                  | 189                | 2                  | 4.84             |

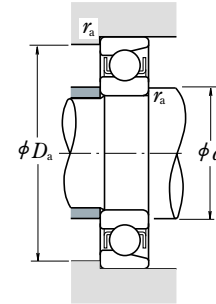
Bore Diameter 4 – 20 mm



Outside Diameter Tolerance (Class N)

Units : μm

| Nominal Outside Diameter D (mm) |      | Single Plane Mean Outside Diameter ΔD <sub>mp</sub> |     |           |     |
|---------------------------------|------|---|-----|-----------|-----|
|                                 |      | E Series  |     | EN Series |     |
| Over                            | Incl | High  | Low | High      | Low |
| —                               | 10   | + 8   | 0   | 0         | - 8 |
| 10                              | 18   | + 8   | 0   | 0         | - 8 |
| 18                              | 30   | + 9   | 0   | 0         | - 9 |
| 30                              | 50   | +11   | 0   | 0         | -11 |



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 | 0.5           | 2.5 | 0.2 |

| Boundary Dimensions (mm) |    |       |                  |                    | Basic Load Ratings (N) {kgf} |                 |                |                 | Limiting Speeds (min <sup>-1</sup> ) |        | Bearing Numbers |           |
|--------------------------|----|-------|------------------|--------------------|------------------------------|-----------------|----------------|-----------------|--------------------------------------|--------|-----------------|-----------|
| d                        | D  | B,C,T | r <sub>min</sub> | r <sub>1 min</sub> | C <sub>r</sub>               | C <sub>0r</sub> | C <sub>r</sub> | C <sub>0r</sub> | Grease                               | Oil    | E Series        | EN Series |
| 4                        | 16 | 5     | 0.15             | 0.1                | 1 650                        | 288             | 168            | 29              | 34 000                               | 40 000 | E 4             | EN 4      |
| 5                        | 16 | 5     | 0.15             | 0.1                | 1 650                        | 288             | 168            | 29              | 34 000                               | 40 000 | E 5             | EN 5      |
| 6                        | 21 | 7     | 0.3              | 0.15               | 2 490                        | 445             | 254            | 46              | 30 000                               | 36 000 | E 6             | EN 6      |
| 7                        | 22 | 7     | 0.3              | 0.15               | 2 490                        | 445             | 254            | 46              | 30 000                               | 36 000 | E 7             | EN 7      |
| 8                        | 24 | 7     | 0.3              | 0.15               | 3 450                        | 650             | 350            | 66              | 28 000                               | 34 000 | E 8             | EN 8      |
| 9                        | 28 | 8     | 0.3              | 0.15               | 4 550                        | 880             | 465            | 90              | 24 000                               | 30 000 | E 9             | EN 9      |
| 10                       | 28 | 8     | 0.3              | 0.15               | 4 550                        | 880             | 465            | 90              | 24 000                               | 30 000 | E 10            | EN 10     |
| 11                       | 32 | 7     | 0.3              | 0.15               | 4 400                        | 845             | 450            | 86              | 22 000                               | 26 000 | E 11            | EN 11     |
| 12                       | 32 | 7     | 0.3              | 0.15               | 4 400                        | 845             | 450            | 86              | 22 000                               | 26 000 | E 12            | EN 12     |
| 13                       | 30 | 7     | 0.3              | 0.15               | 4 400                        | 845             | 450            | 86              | 22 000                               | 26 000 | E 13            | EN 13     |
| 14                       | 35 | 8     | 0.3              | 0.15               | 5 800                        | 1 150           | 590            | 117             | 19 000                               | 22 000 | —               | EN 14     |
| 15                       | 35 | 8     | 0.3              | 0.15               | 5 800                        | 1 150           | 590            | 117             | 19 000                               | 22 000 | E 15            | EN 15     |
|                          | 40 | 10    | 0.6              | 0.3                | 7 400                        | 1 500           | 750            | 153             | 17 000                               | 20 000 | BO 15           | —         |
| 16                       | 38 | 10    | 0.6              | 0.2                | 6 900                        | 1 380           | 705            | 141             | 17 000                               | 22 000 | —               | EN 16     |
| 17                       | 40 | 10    | 0.6              | 0.3                | 7 400                        | 1 500           | 750            | 153             | 17 000                               | 20 000 | L 17            | —         |
|                          | 44 | 11    | 0.6              | 0.3                | 7 350                        | 1 500           | 750            | 153             | 16 000                               | 19 000 | —               | EN 17     |
|                          | 44 | 11    | 0.6              | 0.3                | 7 350                        | 1 500           | 750            | 153             | 16 000                               | 19 000 | BO 17           | —         |
| 18                       | 40 | 9     | 0.6              | 0.2                | 5 050                        | 1 030           | 515            | 105             | 17 000                               | 20 000 | —               | EN 18     |
| 19                       | 40 | 9     | 0.6              | 0.2                | 5 050                        | 1 030           | 515            | 105             | 17 000                               | 20 000 | E 19            | EN 19     |
| 20                       | 47 | 12    | 1                | 0.6                | 11 000                       | 2 380           | 1 120          | 243             | 14 000                               | 17 000 | E 20            | EN 20     |
|                          | 47 | 14    | 1                | 0.6                | 11 000                       | 2 380           | 1 120          | 243             | 14 000                               | 17 000 | L 20            | —         |

| Abutment and Fillet Dimensions (mm) |                    |                    | Mass (kg) |
|-------------------------------------|--------------------|--------------------|-----------|
| d <sub>a min</sub>                  | D <sub>a max</sub> | r <sub>a max</sub> |           |
| 5.2                                 | 14.8               | 0.15               | 0.005     |
| 6.2                                 | 14.8               | 0.15               | 0.004     |
| 8                                   | 19                 | 0.3                | 0.011     |
| 9                                   | 20                 | 0.3                | 0.013     |
| 10                                  | 22                 | 0.3                | 0.014     |
| 11                                  | 26                 | 0.3                | 0.022     |
| 12                                  | 26                 | 0.3                | 0.021     |
| 13                                  | 30                 | 0.3                | 0.029     |
| 14                                  | 30                 | 0.3                | 0.028     |
| 15                                  | 28                 | 0.3                | 0.021     |
| 16                                  | 33                 | 0.3                | 0.035     |
| 17                                  | 33                 | 0.3                | 0.034     |
| 19                                  | 36                 | 0.6                | 0.055     |
| 20                                  | 34                 | 0.6                | 0.049     |
| 21                                  | 36                 | 0.6                | 0.051     |
| 21                                  | 40                 | 0.6                | 0.080     |
| 21                                  | 40                 | 0.6                | 0.080     |
| 22                                  | 36                 | 0.6                | 0.051     |
| 23                                  | 36                 | 0.6                | 0.049     |
| 25                                  | 42                 | 1                  | 0.089     |
| 25                                  | 42                 | 1                  | 0.101     |

- Remarks
1. The outside diameters of Magneto Bearings Series E always have plus tolerances.
  2. When using Magneto Bearings other than E, please contact NSK.

## EXTRA SMALL BALL BEARINGS AND MINIATURE BALL BEARINGS

### EXTRA SMALL BALL BEARINGS · MINIATURE BALL BEARINGS

|               |                               |     |
|---------------|-------------------------------|-----|
| Metric Design | Bore Diameter 1 – 9mm         | B34 |
| With Flange   | Bore Diameter 1 – 9mm         | B38 |
| Inch Design   | Bore Diameter 1.016 – 9.525mm | B42 |
| With Flange   | Bore Diameter 1.191 – 9.525mm | B44 |

### DESIGN AND TYPES

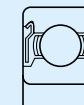
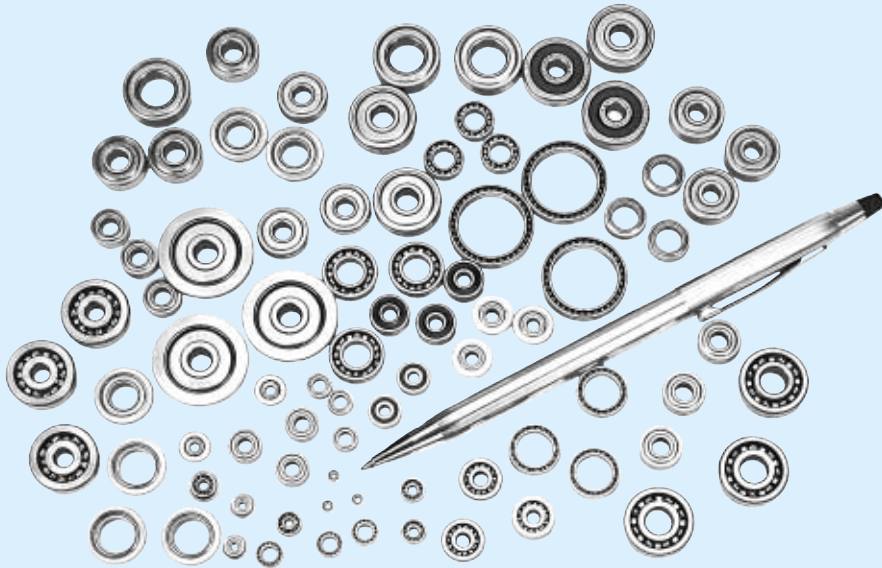
The size ranges of extra small and miniature ball bearings are shown in Table 1. The design, types, and type symbols are shown in Table 2. Those types among them that are listed in the bearing tables are indicated by the shading   in Table 2.

**Table 1 Size Ranges of Bearings**

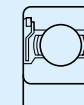
Units : mm

| Design | Extra Small Ball Bearings                                 | Miniature Ball Bearings      |
|--------|---|------------------------------|
| Metric | Outside diameter $D \geq 9$<br>Bore diameter $d < 10$     | Outside diameter $D < 9$     |
| Inch   | Outside diameter $D \geq 9.525$<br>Bore diameter $d < 10$ | Outside diameter $D < 9.525$ |

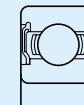
Please refer to NSK Miniature Ball Bearings (CAT. No. E126) for details.



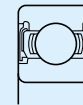
ZZ



ZS











DD



VV

Table 2 Design, Types, and Type Symbols

| Design · Types   | Type Symbols |      |         |         | Remarks                                   |
|--|--------------|------|---------|---------|---|
|  | Metric       | Inch | Special |         |   |
|  |              |      | Metric  | Inch    |   |
|   | 6 0 0        | R    | MR      | —       | Shielded · sealed bearings are available. |
| <br>Thin section                        | —            | —    | SMT     | —       |   |
| <br>With flange                         | F6 0 0       | FR   | MF      | —       | Shielded · sealed bearings are available. |
| <br>Extended inner ring                 | —            | —    | —       | RW      | Shielded bearings are available.          |
| <br>With flange and extended inner ring | —            | —    | —       | FRW     | Shielded bearings are available.          |
| <br>For synchro motors                  | —            | —    | —       | SR00X00 | Shielded bearings are available.          |
| <br>Pivot Ball Bearings               | —            | —    | BCF     | —       |   |
| <br>Thrust Ball Bearings              | —            | —    | F       | —       |   |

Remarks Single-row angular contact ball bearings are available besides those shown above.

TOLERANCES AND RUNNING ACCURACY

METRIC DESIGN BEARINGS .....Table 8.2(Pages A60 to A63)

The flange tolerances for metric design bearings are listed in Table 3.

Table 3 Flange Tolerances for Metric Flanged Bearings

(1) Tolerances of Flange Outside Diameter Units : μm

| Nominal Flange Outside Diameter<br>$D_1$ (mm) |      | Deviation of Flange Outside Diameter<br>$\Delta D_{is}$ |     |      |     |
|---|------|---|-----|------|-----|
|   |      | ①   |     | ②    |     |
| over  | incl | high  | low | high | low |
| 10  | 18   | +220  | -36 | 0    | -36 |
| 10  | 18   | +270  | -43 | 0    | -43 |
| 18  | 30   | +330  | -52 | 0    | -52 |

Remarks ②is applied when the flange outside diameter is used for positioning.

(2) Flange Width Tolerances and Running Accuracies Related to Flange Units : μm

| Nominal Bearing Outside Diameter<br>$D$<br>(mm) | Deviation of Flange Width<br>$\Delta C_{1S}$ | Variation of Flange Width<br>$\Delta C_{1S}$                                 |   |                    | Variation of Bearing Outside Surface Generatrix Inclination with Flange Backface<br>$S_{D1}$ |         |         | Flange Backface Runout with Raceway<br>$S_{ea1}$ |         |         |         |         |         |
|---|--|--|---|--------------------|--|---------|---------|--|---------|---------|---------|---------|---------|
|   |  | Normal and Classes 6,5,4,2   |   | Normal and class 6 | Class 5  | Class 4 | Class 2 | Class 5  | Class 4 | Class 2 | Class 5 | Class 4 | Class 2 |
|   |  | high   | low   | max                | max  |         |         | max  |         |         |         |         |         |
| 2.5 <sup>(1)</sup>                              | 6  | Use the $\Delta B_S$ tolerance for $d$ of the same bearing of the same class | Use the $\Delta V_{BS}$ tolerance for $d$ of the same bearing of the same class | 5                  | 2.5  | 1.5     | 8       | 4  | 1.5     | 11      | 7       | 3       |         |
| 6   | 18   |  |   | 5                  | 2.5  | 1.5     | 8       | 4  | 1.5     | 11      | 7       | 3       |         |
| 18  | 30   |  |   | 5                  | 2.5  | 1.5     | 8       | 4  | 1.5     | 11      | 7       | 3       |         |

Notes (1) 2.5mm is included

INCH DESIGN BEARINGS .....Table 8.2 (Pages A60 to A63)

The flange tolerances for inch design flanged bearings are listed in Table 8.8(2) (Pages A76 and A77).

INSTRUMENT BALL BEARINGS .....Table 8.8 (Pages A76 to A77)

RECOMMENDED FITS

Please refer to NSK Miniature Ball Bearings (CAT.No.E126).

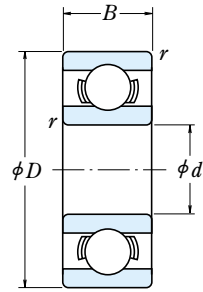
INTERNAL CLEARANCES .....Table 9.10 (Page A89)

LIMITING SPEEDS

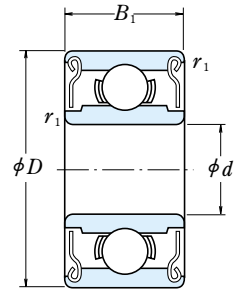
The limiting speeds listed in the bearing tables should be adjusted depending on the bearing load conditions. Also, higher speeds are attainable by making changes in the lubrication method, cage design, etc. Refer to Page A37 for detailed information.



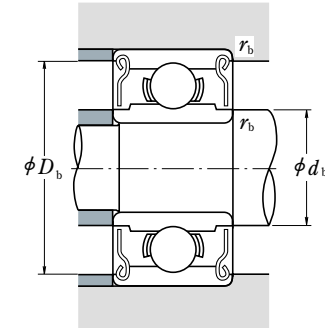
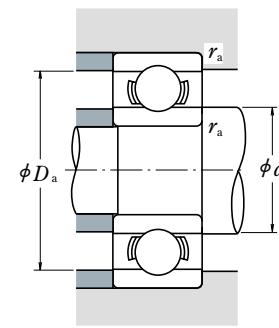
Metric Design  
Bore Diameter 1 – 4 mm



Open Type



Shielded Type  
ZZ · ZZ1



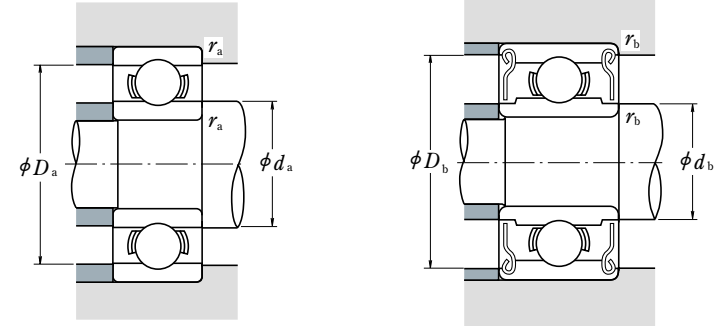
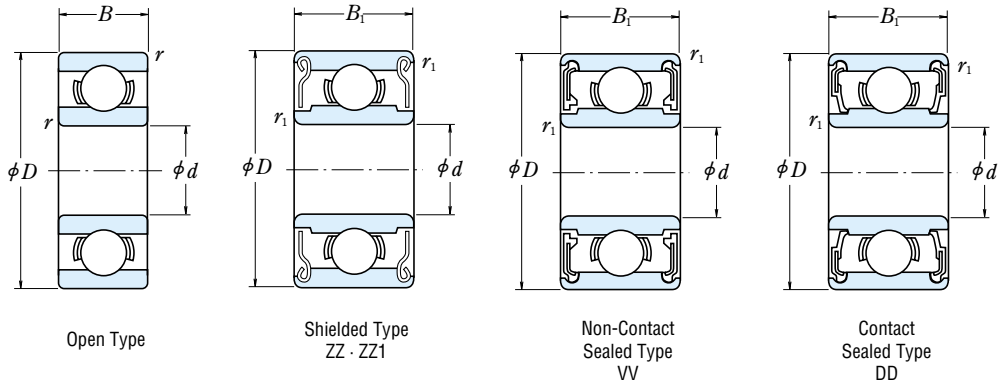
| d   | Boundary Dimensions (mm) |     |                |                                 |  | Basic Load Ratings (N) |                 |                |                 | Limiting Speeds (min <sup>-1</sup> ) |            | Open     |
|-----|--------------------------|-----|----------------|---------------------------------|--|------------------------|-----------------|----------------|-----------------|--------------------------------------|------------|----------|
|     | D                        | B   | B <sub>1</sub> | r <sup>(1)</sup> <sub>min</sub> | r <sub>1</sub> <sup>(1)</sup> <sub>min</sub> | C <sub>r</sub>         | C <sub>0r</sub> | C <sub>r</sub> | C <sub>0r</sub> | Grease Open Z · ZZ                   | Oil Open Z |          |
| 1   | 3                        | 1   | —              | 0.05                            | —  | 80                     | 23              | 8              | 2.5             | 130 000                              | 150 000    | 681      |
|     | 3                        | 1.5 | —              | 0.05                            | —  | 80                     | 23              | 8              | 2.5             | 130 000                              | 150 000    | MR 31    |
|     | 4                        | 1.6 | —              | 0.1                             | —  | 138                    | 35              | 14             | 3.5             | 100 000                              | 120 000    | 691      |
| 1.2 | 4                        | 1.8 | 2.5            | 0.1                             | 0.1  | 138                    | 35              | 14             | 3.5             | 110 000                              | 130 000    | MR 41 X  |
| 1.5 | 4                        | 1.2 | 2              | 0.05                            | 0.05   | 112                    | 33              | 11             | 3.5             | 100 000                              | 120 000    | 681 X    |
|     | 5                        | 2   | 2.6            | 0.15                            | 0.15   | 237                    | 69              | 24             | 7               | 85 000                               | 100 000    | 691 X    |
|     | 6                        | 2.5 | 3              | 0.15                            | 0.15   | 330                    | 98              | 34             | 10              | 75 000                               | 90 000     | 601 X    |
| 2   | 5                        | 1.5 | 2.3            | 0.08                            | 0.08   | 169                    | 50              | 17             | 5               | 85 000                               | 100 000    | 682      |
|     | 5                        | 2   | 2.5            | 0.1                             | 0.1  | 187                    | 58              | 19             | 6               | 85 000                               | 100 000    | MR 52 B  |
|     | 6                        | 2.3 | 3              | 0.15                            | 0.15   | 330                    | 98              | 34             | 10              | 75 000                               | 90 000     | 692      |
| 2.5 | 6                        | 2.5 | 2.5            | 0.15                            | 0.15   | 330                    | 98              | 34             | 10              | 75 000                               | 90 000     | MR 62    |
|     | 7                        | 2.5 | 3              | 0.15                            | 0.15   | 385                    | 127             | 39             | 13              | 63 000                               | 75 000     | MR 72    |
|     | 7                        | 2.8 | 3.5            | 0.15                            | 0.15   | 385                    | 127             | 39             | 13              | 63 000                               | 75 000     | 602      |
| 3   | 6                        | 1.8 | 2.6            | 0.08                            | 0.08   | 208                    | 74              | 21             | 7.5             | 71 000                               | 80 000     | 682 X    |
|     | 7                        | 2.5 | 3.5            | 0.15                            | 0.15   | 385                    | 127             | 39             | 13              | 63 000                               | 75 000     | 692 X    |
|     | 8                        | 2.5 | —              | 0.2                             | —  | 560                    | 179             | 57             | 18              | 60 000                               | 67 000     | MR 82 X  |
| 3   | 8                        | 2.8 | 4              | 0.15                            | 0.15   | 550                    | 175             | 56             | 18              | 60 000                               | 71 000     | 602 X    |
|     | 6                        | 2   | 2.5            | 0.1                             | 0.1  | 208                    | 74              | 21             | 7.5             | 71 000                               | 80 000     | MR 63    |
|     | 7                        | 2   | 3              | 0.1                             | 0.1  | 390                    | 130             | 40             | 13              | 63 000                               | 75 000     | 683 A    |
| 3   | 8                        | 2.5 | —              | 0.15                            | —  | 560                    | 179             | 57             | 18              | 60 000                               | 67 000     | MR 83    |
|     | 8                        | 3   | 4              | 0.15                            | 0.15   | 560                    | 179             | 57             | 18              | 60 000                               | 67 000     | 693      |
|     | 9                        | 2.5 | 4              | 0.2                             | 0.15   | 570                    | 187             | 58             | 19              | 56 000                               | 67 000     | MR 93    |
| 3   | 9                        | 3   | 5              | 0.15                            | 0.15   | 570                    | 187             | 58             | 19              | 56 000                               | 67 000     | 603      |
|     | 10                       | 4   | 4              | 0.15                            | 0.15   | 630                    | 218             | 64             | 22              | 50 000                               | 60 000     | 623      |
|     | 13                       | 5   | 5              | 0.2                             | 0.2  | 1 300                  | 485             | 133            | 49              | 40 000                               | 48 000     | 633      |
| 4   | 7                        | 2   | —              | 0.1                             | —  | 310                    | 115             | 32             | 12              | 60 000                               | 67 000     | MR 74    |
|     | 7                        | —   | 2.5            | —                               | 0.1  | 255                    | 107             | 26             | 11              | 60 000                               | 71 000     | —        |
|     | 8                        | 2   | 3              | 0.15                            | 0.1  | 395                    | 139             | 40             | 14              | 56 000                               | 67 000     | MR 84    |
| 4   | 9                        | 2.5 | 4              | (0.15)                          | (0.15)                                       | 640                    | 225             | 65             | 23              | 53 000                               | 63 000     | 684 A    |
|     | 10                       | 3   | 4              | 0.2                             | 0.15   | 710                    | 270             | 73             | 28              | 50 000                               | 60 000     | MR 104 B |
|     | 11                       | 4   | 4              | 0.15                            | 0.15   | 960                    | 345             | 98             | 35              | 48 000                               | 56 000     | 694      |
| 4   | 12                       | 4   | 4              | 0.2                             | 0.2  | 960                    | 345             | 98             | 35              | 48 000                               | 56 000     | 604      |
|     | 13                       | 5   | 5              | 0.2                             | 0.2  | 1 300                  | 485             | 133            | 49              | 40 000                               | 48 000     | 624      |
|     | 16                       | 5   | 5              | 0.3                             | 0.3  | 1 730                  | 670             | 177            | 68              | 36 000                               | 43 000     | 634      |

Note (1) The values in parentheses are not based on ISO 15.

Remark 1. When using bearings with a rotating outer ring, please contact NSK if they are shielded.

| Bearing Numbers |        | Abutment and Fillet Dimensions (mm) |                               |                               |                               |                               |                               | Mass (g)    |          |
|-----------------|--------|-------------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------|----------|
| Shielded        | Sealed | d <sub>a</sub> <sub>min</sub>       | d <sub>b</sub> <sub>max</sub> | D <sub>a</sub> <sub>max</sub> | D <sub>b</sub> <sub>min</sub> | r <sub>a</sub> <sub>max</sub> | r <sub>b</sub> <sub>max</sub> | approx Open | Shielded |
| —               | —      | 1.4                                 | —                             | 2.6                           | —                             | 0.05                          | —                             | 0.03        | —        |
| —               | —      | 1.4                                 | —                             | 2.6                           | —                             | 0.05                          | —                             | 0.04        | —        |
| —               | —      | 1.8                                 | —                             | 3.2                           | —                             | 0.1                           | —                             | 0.09        | —        |
| MR 41 XZZ       | —      | 2.0                                 | 1.9                           | 3.2                           | 3.5                           | 0.1                           | 0.1                           | 0.10        | 0.14     |
| 681 XZZ         | —      | 1.9                                 | 2.1                           | 3.6                           | 3.6                           | 0.05                          | 0.05                          | 0.07        | 0.11     |
| 691 XZZ         | —      | 2.7                                 | 2.5                           | 3.8                           | 4.3                           | 0.15                          | 0.15                          | 0.17        | 0.20     |
| 601 XZZ         | —      | 2.7                                 | 3.0                           | 4.8                           | 5.4                           | 0.15                          | 0.15                          | 0.33        | 0.38     |
| 682 ZZ          | —      | 2.6                                 | 2.7                           | 4.4                           | 4.2                           | 0.08                          | 0.08                          | 0.12        | 0.17     |
| MR 52 BZZ       | —      | 2.8                                 | 2.7                           | 4.2                           | 4.4                           | 0.1                           | 0.1                           | 0.16        | 0.23     |
| 692 ZZ          | —      | 3.2                                 | 3.0                           | 4.8                           | 5.4                           | 0.15                          | 0.15                          | 0.28        | 0.38     |
| MR 62 ZZ        | —      | 3.2                                 | 3.0                           | 4.8                           | 5.2                           | 0.15                          | 0.15                          | 0.30        | 0.29     |
| MR 72 ZZ        | —      | 3.2                                 | 3.8                           | 5.8                           | 6.2                           | 0.15                          | 0.15                          | 0.45        | 0.49     |
| 602 ZZ          | —      | 3.2                                 | 3.8                           | 5.8                           | 6.2                           | 0.15                          | 0.15                          | 0.51        | 0.58     |
| 682 XZZ         | —      | 3.1                                 | 3.7                           | 5.4                           | 5.4                           | 0.08                          | 0.08                          | 0.23        | 0.29     |
| 692 XZZ         | —      | 3.7                                 | 3.8                           | 5.8                           | 6.2                           | 0.15                          | 0.15                          | 0.41        | 0.55     |
| —               | —      | 4.1                                 | —                             | 6.4                           | —                             | 0.2                           | —                             | 0.56        | —        |
| 602 XZZ         | —      | 3.7                                 | 4.1                           | 6.8                           | 7.0                           | 0.15                          | 0.15                          | 0.63        | 0.83     |
| MR 63 ZZ        | —      | 3.8                                 | 3.7                           | 5.2                           | 5.4                           | 0.1                           | 0.1                           | 0.20        | 0.27     |
| 683 AZZ         | —      | 3.8                                 | 4.0                           | 6.2                           | 6.4                           | 0.1                           | 0.1                           | 0.32        | 0.45     |
| —               | —      | 4.2                                 | —                             | 6.8                           | —                             | 0.15                          | —                             | 0.54        | —        |
| 693 ZZ          | —      | 4.2                                 | 4.3                           | 6.8                           | 7.3                           | 0.15                          | 0.15                          | 0.61        | 0.83     |
| MR 93 ZZ        | —      | 4.6                                 | 4.3                           | 7.4                           | 7.9                           | 0.2                           | 0.15                          | 0.73        | 1.18     |
| 603 ZZ          | —      | 4.2                                 | 4.3                           | 7.8                           | 7.9                           | 0.15                          | 0.15                          | 0.87        | 1.45     |
| 623 ZZ          | —      | 4.2                                 | 4.3                           | 8.8                           | 8.0                           | 0.15                          | 0.15                          | 1.65        | 1.66     |
| 633 ZZ          | —      | 4.6                                 | 6.0                           | 11.4                          | 11.3                          | 0.2                           | 0.2                           | 3.38        | 3.33     |
| —               | —      | 4.8                                 | —                             | 6.2                           | —                             | 0.1                           | —                             | 0.22        | —        |
| MR 74 ZZ        | —      | —                                   | 4.8                           | —                             | 6.3                           | —                             | 0.1                           | —           | 0.29     |
| MR 84 ZZ        | —      | 5.2                                 | 5.0                           | 6.8                           | 7.4                           | 0.15                          | 0.1                           | 0.36        | 0.56     |
| 684 AZZ         | —      | 4.8                                 | 5.2                           | 8.2                           | 8.1                           | 0.1                           | 0.1                           | 0.63        | 1.01     |
| MR 104 BZZ      | —      | 5.6                                 | 5.9                           | 8.4                           | 8.8                           | 0.2                           | 0.15                          | 1.04        | 1.42     |
| 694 ZZ          | —      | 5.2                                 | 5.6                           | 9.8                           | 9.9                           | 0.15                          | 0.15                          | 1.7         | 1.75     |
| 604 ZZ          | —      | 5.6                                 | 5.6                           | 10.4                          | 9.9                           | 0.2                           | 0.2                           | 2.25        | 2.29     |
| 624 ZZ          | —      | 5.6                                 | 6.0                           | 11.4                          | 11.3                          | 0.2                           | 0.2                           | 3.03        | 3.04     |
| 634 ZZ1         | —      | 6.0                                 | 7.5                           | 14.0                          | 13.8                          | 0.3                           | 0.3                           | 5.24        | 5.21     |

Metric Design  
Bore Diameter 5 – 9 mm



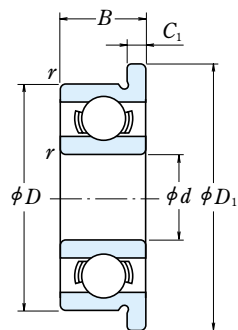
| Boundary Dimensions (mm) |     |     |                |                                 | Basic Load Ratings (N) (kgf)                 |                |                 |                | Limiting Speeds (min <sup>-1</sup> ) Grease |                    |        | Open   |        |
|--------------------------|-----|-----|----------------|---------------------------------|--|----------------|-----------------|----------------|---|--------------------|--------|--------|--------|
| d                        | D   | B   | B <sub>1</sub> | r <sup>(1)</sup> <sub>min</sub> | r <sub>1</sub> <sup>(1)</sup> <sub>min</sub> | C <sub>r</sub> | C <sub>0r</sub> | C <sub>r</sub> | C <sub>0r</sub>                             | Open Z · ZZ V · VV | D · DD |        | Open Z |
| 5                        | 8   | 2   | —              | 0.1                             | —  | 310            | 120             | 31             | 12  | 53 000             | —      | 63 000 | MR 85  |
|                          | 8   | —   | 2.5            | —                               | 0.1  | 278            | 131             | 28             | 13  | 53 000             | —      | 63 000 | —      |
|                          | 9   | 2.5 | 3              | 0.15                            | 0.15   | 430            | 168             | 44             | 17  | 50 000             | —      | 60 000 | MR 95  |
|                          | 10  | 3   | 4              | 0.15                            | 0.15   | 430            | 168             | 44             | 17  | 50 000             | —      | 60 000 | MR 105 |
|                          | 11  | —   | 4              | —                               | 0.15   | 715            | 276             | 73             | 28  | 48 000             | —      | 56 000 | —      |
|                          | 11  | 3   | 5              | 0.15                            | 0.15   | 715            | 281             | 73             | 29  | 45 000             | —      | 53 000 | 685    |
|                          | 13  | 4   | 4              | 0.2                             | 0.2  | 1 080          | 430             | 110            | 44  | 43 000             | 40 000 | 50 000 | 695    |
|                          | 14  | 5   | 5              | 0.2                             | 0.2  | 1 330          | 505             | 135            | 52  | 40 000             | 38 000 | 50 000 | 605    |
|                          | 16  | 5   | 5              | 0.3                             | 0.3  | 1 730          | 670             | 177            | 68  | 36 000             | 32 000 | 43 000 | 625    |
|                          | 19  | 6   | 6              | 0.3                             | 0.3  | 2 340          | 885             | 238            | 90  | 32 000             | 30 000 | 40 000 | 635    |
| 6                        | 10  | 2.5 | 3              | 0.15                            | 0.1  | 495            | 218             | 51             | 22  | 45 000             | —      | 53 000 | MR 106 |
|                          | 12  | 3   | 4              | 0.2                             | 0.15   | 715            | 292             | 73             | 30  | 43 000             | 40 000 | 50 000 | MR 126 |
|                          | 13  | 3.5 | 5              | 0.15                            | 0.15   | 1 080          | 440             | 110            | 45  | 40 000             | 38 000 | 50 000 | 686 A  |
|                          | 15  | 5   | 5              | 0.2                             | 0.2  | 1 730          | 670             | 177            | 68  | 40 000             | 36 000 | 45 000 | 696    |
|                          | 17  | 6   | 6              | 0.3                             | 0.3  | 2 260          | 835             | 231            | 85  | 38 000             | 34 000 | 45 000 | 606    |
|                          | 19  | 6   | 6              | 0.3                             | 0.3  | 2 340          | 885             | 238            | 90  | 32 000             | 30 000 | 40 000 | 626    |
|                          | 22  | 7   | 7              | 0.3                             | 0.3  | 3 300          | 1 370           | 335            | 140   | 30 000             | 28 000 | 36 000 | 636    |
|                          | 7   | 11  | 2.5            | 3                               | 0.15   | 0.1            | 455             | 201            | 47  | 21                 | 43 000 | —      | 50 000 |
| 13                       | 3   | 4   | 0.2            | 0.15                            | 540  | 276            | 55              | 28             | 40 000                                      | —                  | 48 000 | MR 137 |        |
| 14                       | 3.5 | 5   | 0.15           | 0.15                            | 1 170  | 510            | 120             | 52             | 40 000                                      | 34 000             | 45 000 | 687    |        |
| 17                       | 5   | 5   | 0.3            | 0.3                             | 1 610  | 710            | 164             | 73             | 36 000                                      | 28 000             | 43 000 | 697    |        |
| 19                       | 6   | 6   | 0.3            | 0.3                             | 2 340  | 885            | 238             | 90             | 36 000                                      | 32 000             | 43 000 | 607    |        |
| 22                       | 7   | 7   | 0.3            | 0.3                             | 3 300  | 1 370          | 335             | 140            | 30 000                                      | 28 000             | 36 000 | 627    |        |
| 26                       | 9   | 9   | 0.3            | 0.3                             | 4 550  | 1 970          | 465             | 201            | 28 000                                      | 22 000             | 34 000 | 637    |        |
| 8                        | 12  | 2.5 | 3.5            | 0.15                            | 0.1  | 545            | 274             | 56             | 28  | 40 000             | —      | 48 000 | MR 128 |
|                          | 14  | 3.5 | 4              | 0.2                             | 0.15   | 820            | 385             | 83             | 39  | 38 000             | 32 000 | 45 000 | MR 148 |
|                          | 16  | 4   | 5              | 0.2                             | 0.2  | 1 610          | 710             | 164            | 73  | 36 000             | 28 000 | 43 000 | 688 A  |
|                          | 19  | 6   | 6              | 0.3                             | 0.3  | 2 240          | 910             | 228            | 93  | 36 000             | 28 000 | 43 000 | 698    |
|                          | 22  | 7   | 7              | 0.3                             | 0.3  | 3 300          | 1 370           | 335            | 140   | 34 000             | 28 000 | 40 000 | 608    |
|                          | 24  | 8   | 8              | 0.3                             | 0.3  | 3 350          | 1 430           | 340            | 146   | 28 000             | 24 000 | 34 000 | 628    |
|                          | 28  | 9   | 9              | 0.3                             | 0.3  | 4 550          | 1 970           | 465            | 201   | 28 000             | 22 000 | 34 000 | 638    |
|                          | 9   | 17  | 4              | 5                               | 0.2  | 0.2            | 1 330           | 665            | 136   | 68                 | 36 000 | 24 000 | 43 000 |
| 20                       | 6   | 6   | 0.3            | 0.3                             | 1 720  | 840            | 175             | 86             | 34 000                                      | 24 000             | 40 000 | 699    |        |
| 24                       | 7   | 7   | 0.3            | 0.3                             | 3 350  | 1 430          | 340             | 146            | 32 000                                      | 24 000             | 38 000 | 609    |        |
| 26                       | 8   | 8   | (0.6)          | (0.6)                           | 4 550  | 1 970          | 465             | 201            | 28 000                                      | 22 000             | 34 000 | 629    |        |
| 30                       | 10  | 10  | 0.6            | 0.6                             | 5 100  | 2 390          | 520             | 244            | 24 000                                      | —                  | 30 000 | 639    |        |

| Bearing Numbers |        | Abutment and Fillet Dimensions (mm) |                               |                               |                               |                               |                               | Mass (g)    |                 |
|-----------------|--------|-------------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------|-----------------|
| Shielded        | Sealed | d <sub>a</sub> <sub>min</sub>       | d <sub>b</sub> <sub>max</sub> | D <sub>a</sub> <sub>max</sub> | D <sub>b</sub> <sub>min</sub> | r <sub>a</sub> <sub>max</sub> | r <sub>b</sub> <sub>max</sub> | approx Open | approx Shielded |
| —               | —      | 5.8                                 | —                             | 7.2                           | —                             | 0.1                           | —                             | 0.26        | —               |
| MR 85 ZZ        | —      | —                                   | 5.8                           | —                             | 7.4                           | —                             | 0.1                           | —           | 0.34            |
| MR 95 ZZ1       | —      | —                                   | 6.2                           | 6.0                           | 7.8                           | 8.2                           | 0.15                          | 0.15        | 0.50            |
| MR 105 ZZ       | —      | —                                   | 6.2                           | 6.0                           | 8.8                           | 8.4                           | 0.15                          | 0.15        | 0.95            |
| MR 115 ZZ       | VV     | —                                   | 6.3                           | —                             | 9.8                           | —                             | 0.15                          | —           | 1.49            |
| 685 ZZ          | —      | —                                   | 6.2                           | 6.2                           | 9.8                           | 9.9                           | 0.15                          | 0.15        | 1.2             |
| 695 ZZ          | VV DD  | —                                   | 6.6                           | 6.6                           | 11.4                          | 11.2                          | 0.2                           | 0.2         | 2.45            |
| 605 ZZ          | — DD   | —                                   | 6.6                           | 6.9                           | 12.4                          | 12.2                          | 0.2                           | 0.2         | 3.54            |
| 625 ZZ1         | VV DD  | —                                   | 7.0                           | 7.5                           | 14.0                          | 13.8                          | 0.3                           | 0.3         | 4.95            |
| 635 ZZ1         | VV DD  | —                                   | 7.0                           | 8.5                           | 17.0                          | 16.5                          | 0.3                           | 0.3         | 8.56            |
| MR 106 ZZ1      | —      | —                                   | 7.2                           | 7.0                           | 8.8                           | 9.3                           | 0.15                          | 0.1         | 0.56            |
| MR 126 ZZ       | — DD   | —                                   | 7.6                           | 7.2                           | 10.4                          | 10.9                          | 0.2                           | 0.15        | 1.27            |
| 686 AZZ         | VV DD  | —                                   | 7.2                           | 7.4                           | 11.8                          | 11.7                          | 0.15                          | 0.15        | 1.91            |
| 696 ZZ1         | VV DD  | —                                   | 7.6                           | 7.9                           | 13.4                          | 13.3                          | 0.2                           | 0.2         | 3.88            |
| 606 ZZ          | VV DD  | —                                   | 8.0                           | 8.2                           | 15.0                          | 14.8                          | 0.3                           | 0.3         | 5.97            |
| 626 ZZ1         | VV DD  | —                                   | 8.0                           | 8.5                           | 17.0                          | 16.5                          | 0.3                           | 0.3         | 8.15            |
| 636 ZZ          | VV DD  | —                                   | 8.0                           | 10.5                          | 20.0                          | 19.0                          | 0.3                           | 0.3         | 14              |
| MR 117 ZZ       | —      | —                                   | 8.2                           | 8.0                           | 9.8                           | 10.5                          | 0.15                          | 0.1         | 0.62            |
| MR 137 ZZ       | —      | —                                   | 8.6                           | 9.0                           | 11.4                          | 11.6                          | 0.2                           | 0.15        | 1.58            |
| 687 ZZ1         | VV DD  | —                                   | 8.2                           | 8.5                           | 12.8                          | 12.7                          | 0.15                          | 0.15        | 2.13            |
| 697 ZZ1         | VV DD  | —                                   | 9.0                           | 10.2                          | 15.0                          | 14.8                          | 0.3                           | 0.3         | 5.26            |
| 607 ZZ1         | VV DD  | —                                   | 9.0                           | 9.1                           | 17.0                          | 16.5                          | 0.3                           | 0.3         | 7.67            |
| 627 ZZ          | VV DD  | —                                   | 9.0                           | 10.5                          | 20.0                          | 19.0                          | 0.3                           | 0.3         | 12.7            |
| 637 ZZ1         | VV DD  | —                                   | 9.0                           | 12.8                          | 24.0                          | 22.8                          | 0.3                           | 0.3         | 24              |
| MR 128 ZZ1      | —      | —                                   | 9.2                           | 9.0                           | 10.8                          | 11.3                          | 0.15                          | 0.1         | 0.71            |
| MR 148 ZZ       | VV DD  | —                                   | 9.6                           | 9.2                           | 12.4                          | 12.8                          | 0.2                           | 0.15        | 1.86            |
| 688 AZZ1        | VV DD  | —                                   | 9.6                           | 10.2                          | 14.4                          | 14.2                          | 0.2                           | 0.2         | 3.12            |
| 698 ZZ          | VV DD  | —                                   | 10.0                          | 10.0                          | 17.0                          | 16.5                          | 0.3                           | 0.3         | 7.23            |
| 608 ZZ          | VV DD  | —                                   | 10.0                          | 10.5                          | 20.0                          | 19.0                          | 0.3                           | 0.3         | 12.1            |
| 628 ZZ          | VV DD  | —                                   | 10.0                          | 12.0                          | 22.0                          | 20.5                          | 0.3                           | 0.3         | 17.2            |
| 638 ZZ1         | VV DD  | —                                   | 10.0                          | 12.8                          | 26.0                          | 22.8                          | 0.3                           | 0.3         | 28.3            |
| 689 ZZ1         | VV DD  | —                                   | 10.6                          | 11.5                          | 15.4                          | 15.2                          | 0.2                           | 0.2         | 3.53            |
| 699 ZZ1         | VV DD  | —                                   | 11.0                          | 12.0                          | 18.0                          | 17.2                          | 0.3                           | 0.3         | 8.45            |
| 609 ZZ          | VV DD  | —                                   | 11.0                          | 12.0                          | 22.8                          | 20.5                          | 0.3                           | 0.3         | 14.5            |
| 629 ZZ          | VV DD  | —                                   | 11.0                          | 12.8                          | 24.0                          | 22.8                          | 0.3                           | 0.3         | 19.5            |
| 639 ZZ          | VV     | —                                   | 13.0                          | 16.1                          | 26.0                          | 25.6                          | 0.6                           | 0.6         | 36.5            |

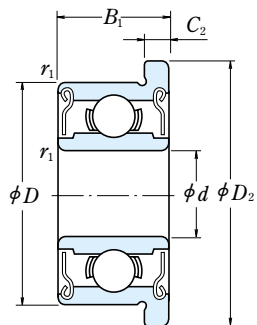
Note <sup>(1)</sup> The values in parentheses are not based on ISO 15.

Remarks 1. When using bearings with a rotating outer ring, please contact NSK if they are sealed or shielded.  
2. Bearings with snap rings are also available, please contact NSK.

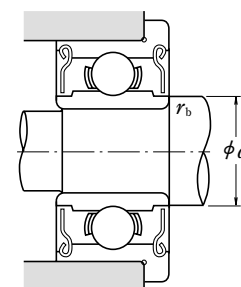
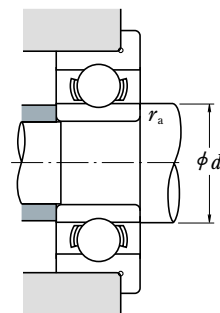
Metric Design With Flange  
Bore Diameter 1 – 4 mm



Open Type



Shielded Type  
ZZ · ZZ1



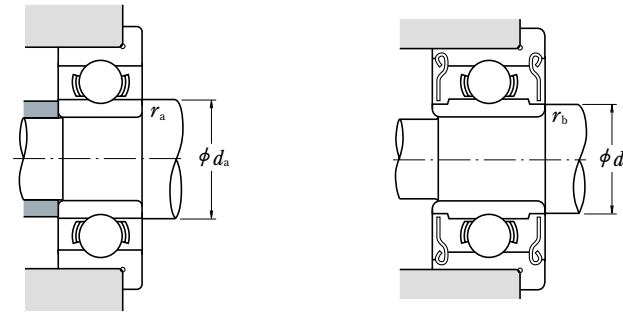
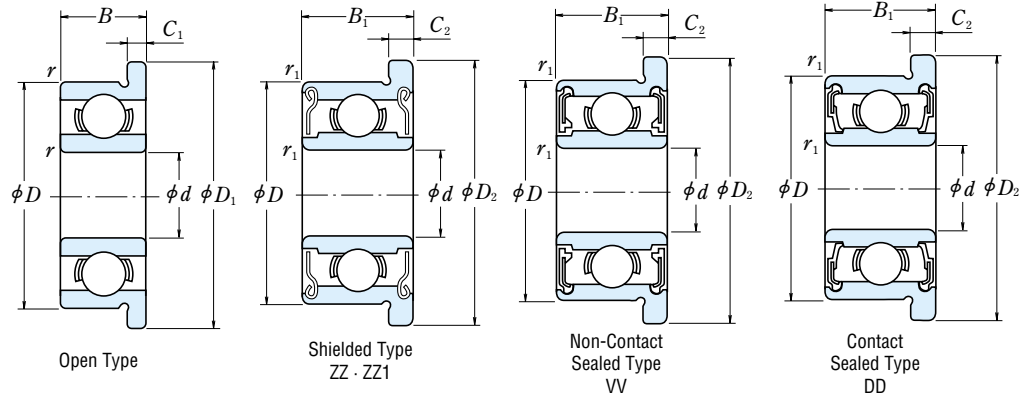
| d   | Boundary Dimensions (mm) |                |                |     |                |                |                |                                 | Basic Load Ratings (N) (kgf)                 |                |                 |                | Limiting Speeds (min <sup>-1</sup> ) |                    |            |
|-----|--------------------------|----------------|----------------|-----|----------------|----------------|----------------|---------------------------------|--|----------------|-----------------|----------------|--------------------------------------|--------------------|------------|
|     | D                        | D <sub>1</sub> | D <sub>2</sub> | B   | B <sub>1</sub> | C <sub>1</sub> | C <sub>2</sub> | r <sup>(1)</sup> <sub>min</sub> | r <sub>1</sub> <sup>(1)</sup> <sub>min</sub> | C <sub>r</sub> | C <sub>0r</sub> | C <sub>r</sub> | C <sub>0r</sub>                      | Grease Open Z · ZZ | Oil Open Z |
| 1   | 3                        | 3.8            | —              | 1   | —              | 0.3            | —              | 0.05                            | —  | 80             | 23              | 8              | 2.5                                  | 130 000            | 150 000    |
|     | 4                        | 5              | —              | 1.6 | —              | 0.5            | —              | 0.1                             | —  | 140            | 36              | 14             | 3.5                                  | 100 000            | 120 000    |
| 1.2 | 4                        | 4.8            | —              | 1.8 | —              | 0.4            | —              | 0.1                             | —  | 138            | 35              | 14             | 3.5                                  | 110 000            | 130 000    |
| 1.5 | 4                        | 5              | 5              | 1.2 | 2              | 0.4            | 0.6            | 0.05                            | 0.05   | 112            | 33              | 11             | 3.5                                  | 100 000            | 120 000    |
|     | 5                        | 6.5            | 6.5            | 2   | 2.6            | 0.6            | 0.8            | 0.15                            | 0.15   | 237            | 69              | 24             | 7                                    | 85 000             | 100 000    |
|     | 6                        | 7.5            | 7.5            | 2.5 | 3              | 0.6            | 0.8            | 0.15                            | 0.15   | 330            | 98              | 34             | 10                                   | 75 000             | 90 000     |
| 2   | 5                        | 6.1            | 6.1            | 1.5 | 2.3            | 0.5            | 0.6            | 0.08                            | 0.08   | 169            | 50              | 17             | 5                                    | 85 000             | 100 000    |
|     | 5                        | 6.2            | 6.2            | 2   | 2.5            | 0.6            | 0.6            | 0.1                             | 0.1  | 187            | 58              | 19             | 6                                    | 85 000             | 100 000    |
|     | 6                        | 7.5            | 7.5            | 2.3 | 3              | 0.6            | 0.8            | 0.15                            | 0.15   | 330            | 98              | 34             | 10                                   | 75 000             | 90 000     |
| 2.5 | 6                        | 7.2            | —              | 2.5 | —              | 0.6            | —              | 0.15                            | —  | 330            | 98              | 34             | 10                                   | 75 000             | 90 000     |
|     | 7                        | 8.2            | 8.2            | 2.5 | 3              | 0.6            | 0.6            | 0.15                            | 0.15   | 385            | 127             | 39             | 13                                   | 63 000             | 75 000     |
|     | 7                        | 8.5            | 8.5            | 2.8 | 3.5            | 0.7            | 0.9            | 0.15                            | 0.15   | 385            | 127             | 39             | 13                                   | 63 000             | 75 000     |
|     | 8                        | 9.2            | —              | 2.5 | —              | 0.6            | —              | 0.2                             | —  | 560            | 179             | 57             | 18                                   | 60 000             | 67 000     |
| 3   | 6                        | 7.1            | 7.1            | 1.8 | 2.6            | 0.5            | 0.8            | 0.08                            | 0.08   | 208            | 74              | 21             | 7.5                                  | 71 000             | 80 000     |
|     | 7                        | 8.5            | 8.5            | 2.5 | 3.5            | 0.7            | 0.9            | 0.15                            | 0.15   | 385            | 127             | 39             | 13                                   | 63 000             | 75 000     |
|     | 8                        | 9.2            | —              | 2.5 | —              | 0.6            | —              | 0.2                             | —  | 560            | 179             | 57             | 18                                   | 60 000             | 67 000     |
|     | 8                        | 9.5            | 9.5            | 2.8 | 4              | 0.7            | 0.9            | 0.15                            | 0.15   | 550            | 175             | 56             | 18                                   | 60 000             | 71 000     |
| 4   | 6                        | 7.2            | 7.2            | 2   | 2.5            | 0.6            | 0.6            | 0.1                             | 0.1  | 208            | 74              | 21             | 7.5                                  | 71 000             | 80 000     |
|     | 7                        | 8.1            | 8.1            | 2   | 3              | 0.5            | 0.8            | 0.1                             | 0.1  | 390            | 130             | 40             | 13                                   | 63 000             | 75 000     |
|     | 8                        | 9.2            | —              | 2.5 | —              | 0.6            | —              | 0.15                            | —  | 560            | 179             | 57             | 18                                   | 60 000             | 67 000     |
|     | 8                        | 9.5            | 9.5            | 3   | 4              | 0.7            | 0.9            | 0.15                            | 0.15   | 560            | 179             | 57             | 18                                   | 60 000             | 67 000     |
|     | 9                        | 10.2           | 10.6           | 2.5 | 4              | 0.6            | 0.8            | 0.2                             | 0.15   | 570            | 187             | 58             | 19                                   | 56 000             | 67 000     |
|     | 9                        | 10.5           | 10.5           | 3   | 5              | 0.7            | 1              | 0.15                            | 0.15   | 570            | 187             | 58             | 19                                   | 56 000             | 67 000     |
| 4   | 10                       | 11.5           | 11.5           | 4   | 4              | 1              | 1              | 0.15                            | 0.15   | 630            | 218             | 64             | 22                                   | 50 000             | 60 000     |
|     | 13                       | 15             | 15             | 5   | 5              | 1              | 1              | 0.2                             | 0.2  | 1 300          | 485             | 133            | 49                                   | 36 000             | 43 000     |
|     | 7                        | 8.2            | —              | 2   | —              | 0.6            | —              | 0.1                             | —  | 310            | 115             | 32             | 12                                   | 60 000             | 67 000     |
|     | 7                        | —              | 8.2            | —   | 2.5            | —              | 0.6            | —                               | 0.1  | 255            | 107             | 26             | 11                                   | 60 000             | 71 000     |
|     | 8                        | 9.2            | 9.2            | 2   | 3              | 0.6            | 0.6            | 0.15                            | 0.1  | 395            | 139             | 40             | 14                                   | 56 000             | 67 000     |
|     | 9                        | 10.3           | 10.3           | 2.5 | 4              | 0.6            | 1              | (0.15)                          | (0.15)                                       | 640            | 225             | 65             | 23                                   | 53 000             | 63 000     |
|     | 10                       | 11.2           | 11.6           | 3   | 4              | 0.6            | 0.8            | 0.2                             | 0.15   | 710            | 270             | 73             | 28                                   | 50 000             | 60 000     |
|     | 11                       | 12.5           | 12.5           | 4   | 4              | 1              | 1              | 0.15                            | 0.15   | 960            | 345             | 98             | 35                                   | 48 000             | 56 000     |
|     | 12                       | 13.5           | 13.5           | 4   | 4              | 1              | 1              | 0.2                             | 0.2  | 960            | 345             | 98             | 35                                   | 48 000             | 56 000     |
|     | 13                       | 15             | 15             | 5   | 5              | 1              | 1              | 0.2                             | 0.2  | 1 300          | 485             | 133            | 49                                   | 40 000             | 48 000     |
| 16  | 18                       | 18             | 5              | 5   | 1              | 1              | 0.3            | 0.3                             | 1 730  | 670            | 177             | 68             | 36 000                               | 43 000             |            |

Note (1) The values in parentheses are not based on ISO 15.

Remark 1. When using bearings with a rotating outer ring, please contact NSK if they are shielded.

| Bearing Numbers |            |        | Abutment and Fillet Dimensions (mm) |                               |                               |                               | Mass (g) |          |
|-----------------|------------|--------|-------------------------------------|-------------------------------|-------------------------------|-------------------------------|----------|----------|
| Open            | Shielded   | Sealed | d <sub>a</sub> <sub>min</sub>       | d <sub>b</sub> <sub>max</sub> | r <sub>a</sub> <sub>max</sub> | r <sub>b</sub> <sub>max</sub> | Open     | Shielded |
| F 681           | —          | —      | 1.4                                 | —                             | 0.05                          | —                             | 0.04     | —        |
| F 691           | —          | —      | 1.8                                 | —                             | 0.1                           | —                             | 0.14     | —        |
| MF 41 X         | —          | —      | 2.0                                 | —                             | 0.1                           | —                             | 0.12     | —        |
| F 681 X         | F 681 XZZ  | —      | 1.9                                 | 2.1                           | 0.05                          | 0.05                          | 0.09     | 0.14     |
| F 691 X         | F 691 XZZ  | —      | 2.7                                 | 2.5                           | 0.15                          | 0.15                          | 0.23     | 0.28     |
| F 601 X         | F 601 XZZ  | —      | 2.7                                 | 3.0                           | 0.15                          | 0.15                          | 0.42     | 0.52     |
| F 682           | F 682 ZZ   | —      | 2.6                                 | 2.7                           | 0.08                          | 0.08                          | 0.16     | 0.22     |
| MF 52 B         | MF 52 BZZ  | —      | 2.8                                 | 2.7                           | 0.1                           | 0.1                           | 0.21     | 0.27     |
| F 692           | F 692 ZZ   | —      | 3.2                                 | 3.0                           | 0.15                          | 0.15                          | 0.35     | 0.48     |
| MF 62           | —          | —      | 3.2                                 | —                             | 0.15                          | —                             | 0.36     | —        |
| MF 72           | MF 72 ZZ   | —      | 3.2                                 | 3.8                           | 0.15                          | 0.15                          | 0.52     | 0.56     |
| F 602           | F 602 ZZ   | —      | 3.2                                 | 3.1                           | 0.15                          | 0.15                          | 0.60     | 0.71     |
| F 682 X         | F 682 XZZ  | —      | 3.1                                 | 3.7                           | 0.08                          | 0.08                          | 0.25     | 0.36     |
| F 692 X         | F 692 XZZ  | —      | 3.7                                 | 3.8                           | 0.15                          | 0.15                          | 0.51     | 0.68     |
| MF 82 X         | —          | —      | 4.1                                 | —                             | 0.2                           | —                             | 0.62     | —        |
| F 602 X         | F 602 XZZ  | —      | 3.7                                 | 3.5                           | 0.15                          | 0.15                          | 0.74     | 0.98     |
| MF 63           | MF 63 ZZ   | —      | 3.8                                 | 3.7                           | 0.1                           | 0.1                           | 0.27     | 0.33     |
| F 683 A         | F 683 AZZ  | —      | 3.8                                 | 4.0                           | 0.1                           | 0.1                           | 0.37     | 0.53     |
| MF 83           | —          | —      | 4.2                                 | —                             | 0.15                          | —                             | 0.56     | —        |
| F 693           | F 693 ZZ   | —      | 4.2                                 | 4.3                           | 0.15                          | 0.15                          | 0.70     | 0.97     |
| MF 93           | MF 93 ZZ   | —      | 4.6                                 | 4.3                           | 0.2                           | 0.15                          | 0.81     | 1.34     |
| F 603           | F 603 ZZ   | —      | 4.2                                 | 4.3                           | 0.15                          | 0.15                          | 1.0      | 1.63     |
| F 623           | F 623 ZZ   | —      | 4.2                                 | 4.3                           | 0.15                          | 0.15                          | 1.85     | 1.86     |
| F 633           | F 633 ZZ   | —      | 4.6                                 | 6.0                           | 0.2                           | 0.2                           | 3.73     | 3.59     |
| MF 74           | —          | —      | 4.8                                 | —                             | 0.1                           | —                             | 0.29     | —        |
| —               | MF 74 ZZ   | —      | —                                   | 4.8                           | —                             | 0.1                           | —        | 0.35     |
| MF 84           | MF 84 ZZ   | —      | 5.2                                 | 5.0                           | 0.15                          | 0.1                           | 0.44     | 0.63     |
| F 684           | F 684 ZZ   | —      | 4.8                                 | 5.2                           | 0.1                           | 0.1                           | 0.70     | 1.14     |
| MF 104 B        | MF 104 BZZ | —      | 5.6                                 | 5.9                           | 0.2                           | 0.15                          | 1.13     | 1.59     |
| F 694           | F 694 ZZ   | —      | 5.2                                 | 5.6                           | 0.15                          | 0.15                          | 1.91     | 1.96     |
| F 604           | F 604 ZZ   | —      | 5.6                                 | 5.6                           | 0.2                           | 0.2                           | 2.53     | 2.53     |
| F 624           | F 624 ZZ   | —      | 5.6                                 | 6.0                           | 0.2                           | 0.2                           | 3.38     | 3.53     |
| F 634           | F 634 ZZ1  | —      | 6.0                                 | 7.5                           | 0.3                           | 0.3                           | 5.73     | 5.62     |

Metric Design With Flange  
Bore Diameter 5 – 9 mm



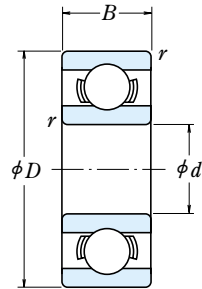
| d  | Boundary Dimensions (mm) |                |                |     |                |                |                |                  | Basic Load Ratings (N) (kgf) |                |                 |                | Limiting Speeds (min <sup>-1</sup> ) |                           |        |            |
|----|--------------------------|----------------|----------------|-----|----------------|----------------|----------------|------------------|------------------------------|----------------|-----------------|----------------|--------------------------------------|---------------------------|--------|------------|
|    | D                        | D <sub>1</sub> | D <sub>2</sub> | B   | B <sub>1</sub> | C <sub>1</sub> | C <sub>2</sub> | r <sub>min</sub> | r <sub>1 min</sub>           | C <sub>r</sub> | C <sub>0r</sub> | C <sub>r</sub> | C <sub>0r</sub>                      | Open Grease Z · ZZ V · VV | D · DD | Open Oil Z |
| 5  | 8                        | 9.2            | —              | 2   | —              | 0.6            | —              | 0.1              | —                            | 310            | 120             | 31             | 12                                   | 53 000                    | —      | 63 000     |
|    | 8                        | —              | 9.2            | —   | 2.5            | —              | 0.6            | —                | 0.1                          | 278            | 131             | 28             | 13                                   | 53 000                    | —      | 63 000     |
|    | 9                        | 10.2           | 10.2           | 2.5 | 3              | 0.6            | 0.6            | 0.15             | 0.15                         | 430            | 168             | 44             | 17                                   | 50 000                    | —      | 60 000     |
|    | 10                       | 11.2           | 11.6           | 3   | 4              | 0.6            | 0.8            | 0.15             | 0.15                         | 430            | 168             | 44             | 17                                   | 50 000                    | —      | 60 000     |
| 11 | 12.5                     | 12.5           | 3              | 5   | 0.8            | 1              | 0.15           | 0.15             | —                            | 715            | 281             | 73             | 29                                   | 45 000                    | —      | 53 000     |
|    | 13                       | 15             | 15             | 4   | 4              | 1              | 1              | 0.2              | 0.2                          | 1 080          | 430             | 110            | 44                                   | 43 000                    | 40 000 | 50 000     |
|    | 14                       | 16             | 16             | 5   | 5              | 1              | 1              | 0.2              | 0.2                          | 1 330          | 505             | 135            | 52                                   | 40 000                    | 38 000 | 50 000     |
|    | 16                       | 18             | 18             | 5   | 5              | 1              | 1              | 0.3              | 0.3                          | 1 730          | 670             | 177            | 68                                   | 36 000                    | 32 000 | 43 000     |
| 19 | 22                       | 22             | 6              | 6   | 1.5            | 1.5            | 0.3            | 0.3              | —                            | 2 340          | 885             | 238            | 90                                   | 32 000                    | 30 000 | 40 000     |
|    | 10                       | 11.2           | 11.2           | 2.5 | 3              | 0.6            | 0.6            | 0.15             | 0.1                          | 495            | 218             | 51             | 22                                   | 45 000                    | —      | 53 000     |
|    | 12                       | 13.2           | 13.6           | 3   | 4              | 0.6            | 0.8            | 0.2              | 0.15                         | 715            | 292             | 73             | 30                                   | 43 000                    | 40 000 | 50 000     |
|    | 13                       | 15             | 15             | 3.5 | 5              | 1              | 1.1            | 0.15             | 0.15                         | 1 080          | 440             | 110            | 45                                   | 40 000                    | 38 000 | 50 000     |
| 15 | 17                       | 17             | 5              | 5   | 1.2            | 1.2            | 0.2            | 0.2              | —                            | 1 730          | 670             | 177            | 68                                   | 40 000                    | 36 000 | 45 000     |
|    | 17                       | 19             | 19             | 6   | 6              | 1.2            | 1.2            | 0.3              | 0.3                          | 2 260          | 835             | 231            | 85                                   | 38 000                    | 34 000 | 45 000     |
|    | 19                       | 22             | 22             | 6   | 6              | 1.5            | 1.5            | 0.3              | 0.3                          | 2 340          | 885             | 238            | 90                                   | 32 000                    | 30 000 | 40 000     |
|    | 22                       | 25             | 25             | 7   | 7              | 1.5            | 1.5            | 0.3              | 0.3                          | 3 300          | 1 370           | 335            | 140                                  | 30 000                    | 28 000 | 36 000     |
| 7  | 11                       | 12.2           | 12.2           | 2.5 | 3              | 0.6            | 0.6            | 0.15             | 0.1                          | 455            | 201             | 47             | 21                                   | 43 000                    | —      | 50 000     |
|    | 13                       | 14.2           | 14.6           | 3   | 4              | 0.6            | 0.8            | 0.2              | 0.15                         | 540            | 276             | 55             | 28                                   | 40 000                    | —      | 48 000     |
|    | 14                       | 16             | 16             | 3.5 | 5              | 1              | 1.1            | 0.15             | 0.15                         | 1 170          | 510             | 120            | 52                                   | 40 000                    | 34 000 | 45 000     |
|    | 17                       | 19             | 19             | 5   | 5              | 1.2            | 1.2            | 0.3              | 0.3                          | 1 610          | 715             | 164            | 73                                   | 36 000                    | 28 000 | 43 000     |
| 19 | 22                       | 22             | 6              | 6   | 1.5            | 1.5            | 0.3            | 0.3              | —                            | 2 340          | 885             | 238            | 90                                   | 36 000                    | 32 000 | 43 000     |
|    | 22                       | 25             | 25             | 7   | 7              | 1.5            | 1.5            | 0.3              | 0.3                          | 3 300          | 1 370           | 335            | 140                                  | 30 000                    | 28 000 | 36 000     |
|    | 12                       | 13.2           | 13.6           | 2.5 | 3.5            | 0.6            | 0.8            | 0.15             | 0.1                          | 545            | 274             | 56             | 28                                   | 40 000                    | —      | 48 000     |
|    | 14                       | 15.6           | 15.6           | 3.5 | 4              | 0.8            | 0.8            | 0.2              | 0.15                         | 820            | 385             | 83             | 39                                   | 38 000                    | 32 000 | 45 000     |
| 16 | 18                       | 18             | 4              | 5   | 1              | 1.1            | 0.2            | 0.2              | —                            | 1 610          | 710             | 164            | 73                                   | 36 000                    | 30 000 | 43 000     |
|    | 19                       | 22             | 22             | 6   | 6              | 1.5            | 1.5            | 0.3              | 0.3                          | 2 240          | 910             | 228            | 93                                   | 36 000                    | 28 000 | 43 000     |
|    | 22                       | 25             | 25             | 7   | 7              | 1.5            | 1.5            | 0.3              | 0.3                          | 3 300          | 1 370           | 335            | 140                                  | 34 000                    | 28 000 | 40 000     |
|    | 17                       | 19             | 19             | 4   | 5              | 1              | 1.1            | 0.2              | 0.2                          | 1 330          | 665             | 136            | 68                                   | 36 000                    | 24 000 | 43 000     |
| 20 | 23                       | 23             | 6              | 6   | 1.5            | 1.5            | 0.3            | 0.3              | —                            | 1 720          | 840             | 175            | 86                                   | 34 000                    | 24 000 | 40 000     |

| Bearing Numbers |            |        | Abutment and Fillet Dimensions (mm) |                    |                    |                    | Mass (g)    |          |
|-----------------|------------|--------|-------------------------------------|--------------------|--------------------|--------------------|-------------|----------|
| Open            | Shielded   | Sealed | d <sub>a min</sub>                  | d <sub>b max</sub> | r <sub>a max</sub> | r <sub>b max</sub> | approx Open | Shielded |
| MF 85           | —          | —      | 5.8                                 | —                  | 0.1                | —                  | 0.33        | —        |
| —               | MF 85 ZZ   | —      | —                                   | 5.8                | —                  | 0.1                | —           | 0.41     |
| MF 95           | MF 95 ZZ1  | —      | 6.2                                 | 6.0                | 0.15               | 0.15               | 0.59        | 0.66     |
| MF 105          | MF 105 ZZ  | —      | 6.2                                 | 6.0                | 0.15               | 0.15               | 1.05        | 1.46     |
| F 685           | F 685 ZZ   | —      | 6.2                                 | 6.2                | 0.15               | 0.15               | 1.37        | 2.18     |
| F 695           | F 695 ZZ   | VV DD  | 6.6                                 | 6.6                | 0.2                | 0.2                | 2.79        | 2.84     |
| F 605           | F 605 ZZ   | — DD   | 6.6                                 | 6.9                | 0.2                | 0.2                | 3.9         | 3.85     |
| F 625           | F 625 ZZ1  | VV DD  | 7.0                                 | 7.5                | 0.3                | 0.3                | 5.37        | 5.27     |
| F 635           | F 635 ZZ1  | VV DD  | 7.0                                 | 8.5                | 0.3                | 0.3                | 9.49        | 9.49     |
| MF 106          | MF 106 ZZ1 | —      | 7.2                                 | 7.0                | 0.15               | 0.1                | 0.65        | 0.77     |
| MF 126          | MF 126 ZZ  | — DD   | 7.6                                 | 7.2                | 0.2                | 0.15               | 1.38        | 1.94     |
| F 686 A         | F 686 AZZ  | VV DD  | 7.2                                 | 7.4                | 0.15               | 0.15               | 2.25        | 3.04     |
| F 696           | F 696 ZZ1  | VV DD  | 7.6                                 | 7.9                | 0.2                | 0.2                | 4.34        | 4.26     |
| F 606           | F 606 ZZ   | VV DD  | 8.0                                 | 8.2                | 0.3                | 0.3                | 6.58        | 6.61     |
| F 626           | F 626 ZZ1  | VV DD  | 8.0                                 | 8.5                | 0.3                | 0.3                | 9.09        | 9.09     |
| F 636           | F 636 ZZ   | VV DD  | 8.0                                 | 10.5               | 0.3                | 0.3                | 14.6        | 14.7     |
| MF 117          | MF 117 ZZ  | —      | 8.2                                 | 8.0                | 0.15               | 0.1                | 0.72        | 0.82     |
| MF 137          | MF 137 ZZ  | —      | 8.6                                 | 9.0                | 0.2                | 0.15               | 1.7         | 2.23     |
| F 687           | F 687 ZZ1  | VV DD  | 8.2                                 | 8.5                | 0.15               | 0.15               | 2.48        | 3.37     |
| F 697           | F 697 ZZ1  | VV DD  | 9.0                                 | 10.2               | 0.3                | 0.3                | 5.65        | 5.65     |
| F 607           | F 607 ZZ1  | VV DD  | 9.0                                 | 9.1                | 0.3                | 0.3                | 8.66        | 8.66     |
| F 627           | F 627 ZZ   | VV DD  | 9.0                                 | 10.5               | 0.3                | 0.3                | 14.2        | 14.2     |
| MF 128          | MF 128 ZZ1 | —      | 9.2                                 | 9.0                | 0.15               | 0.1                | 0.82        | 1.15     |
| MF 148          | MF 148 ZZ  | VV DD  | 9.6                                 | 9.2                | 0.2                | 0.15               | 2.09        | 2.39     |
| F 688 A         | F 688 AZZ  | VV DD  | 9.6                                 | 10.2               | 0.2                | 0.2                | 3.54        | 4.47     |
| F 698           | F 698 ZZ   | VV DD  | 10.0                                | 10.0               | 0.3                | 0.3                | 8.35        | 8.3      |
| F 608           | F 608 ZZ   | VV DD  | 10.0                                | 10.5               | 0.3                | 0.3                | 13.4        | 13.5     |
| F 689           | F 689 ZZ1  | VV DD  | 10.6                                | 11.5               | 0.2                | 0.2                | 3.97        | 4.91     |
| F 699           | F 699 ZZ1  | VV DD  | 11.0                                | 12.0               | 0.3                | 0.3                | 9.51        | 9.51     |

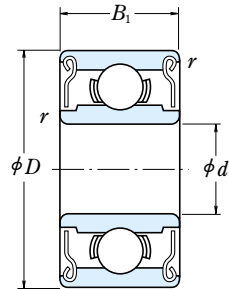
Remark 1. When using bearings with a rotating outer ring, please contact NSK if they are shielded.

Inch Design

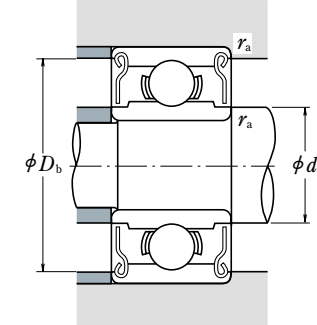
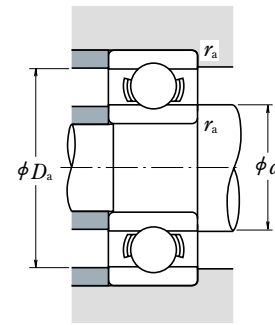
Bore Diameter 1.016 – 9.525 mm



Open Type



Shielded Type  
ZZ · ZS



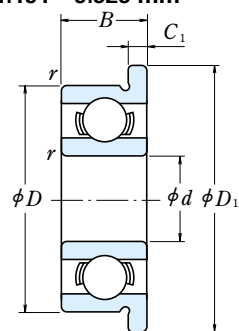
| d     | Boundary Dimensions (mm) |        |                |                  | Basic Load Ratings (N) (kgf) |                 |                |                 | Limiting Speeds (min <sup>-1</sup> ) |            | Bearing Open |
|-------|--------------------------|--------|----------------|------------------|------------------------------|-----------------|----------------|-----------------|--------------------------------------|------------|--------------|
|       | D                        | B      | B <sub>1</sub> | r <sub>min</sub> | C <sub>r</sub>               | C <sub>0r</sub> | C <sub>r</sub> | C <sub>0r</sub> | Grease Open Z · ZZ                   | Oil Open Z |              |
| 1.016 | 3.175                    | 1.191  | —              | 0.1              | 80                           | 23              | 8              | 2.5             | 130 000                              | 150 000    | R 09         |
| 1.191 | 3.967                    | 1.588  | 2.380          | 0.1              | 138                          | 35              | 14             | 3.5             | 110 000                              | 130 000    | R 0          |
| 1.397 | 4.762                    | 1.984  | 2.779          | 0.1              | 231                          | 66              | 24             | 6.5             | 90 000                               | 110 000    | R 1          |
| 1.984 | 6.350                    | 2.380  | 3.571          | 0.1              | 310                          | 108             | 32             | 11              | 67 000                               | 80 000     | R 1-4        |
| 2.380 | 4.762                    | 1.588  | —              | 0.1              | 188                          | 60              | 19             | 6               | 80 000                               | 95 000     | R 133        |
|       | 4.762                    | —      | 2.380          | 0.1              | 143                          | 52              | 15             | 5.5             | 80 000                               | 95 000     | —            |
|       | 7.938                    | 2.779  | 3.571          | 0.15             | 550                          | 175             | 56             | 18              | 60 000                               | 71 000     | R 1-5        |
| 3.175 | 6.350                    | 2.380  | 2.779          | 0.1              | 283                          | 95              | 29             | 9.5             | 67 000                               | 80 000     | R 144        |
|       | 7.938                    | 2.779  | 3.571          | 0.1              | 560                          | 179             | 57             | 18              | 60 000                               | 67 000     | R 2-5        |
|       | 9.525                    | 2.779  | 3.571          | 0.15             | 640                          | 225             | 65             | 23              | 53 000                               | 63 000     | R 2-6        |
|       | 9.525                    | 3.967  | 3.967          | 0.3              | 630                          | 218             | 64             | 22              | 56 000                               | 67 000     | R 2          |
| 3.967 | 12.700                   | 4.366  | 4.366          | 0.3              | 640                          | 225             | 65             | 23              | 53 000                               | 63 000     | R 2A         |
|       | 7.938                    | 2.779  | 3.175          | 0.1              | 360                          | 149             | 37             | 15              | 53 000                               | 63 000     | R 155        |
|       | 4.762                    | 7.938  | 2.779          | 3.175            | 0.1                          | 360             | 149            | 37              | 15                                   | 53 000     | 63 000       |
| 6.350 | 9.525                    | 3.175  | 3.175          | 0.1              | 710                          | 270             | 73             | 28              | 50 000                               | 60 000     | R 166        |
|       | 12.700                   | 3.175  | 4.762          | 0.15             | 1 300                        | 485             | 133            | 49              | 43 000                               | 53 000     | R 3          |
|       | 15.875                   | 4.978  | 4.978          | 0.3              | 420                          | 204             | 43             | 21              | 48 000                               | 56 000     | R 168B       |
|       | 19.050                   | 5.558  | 7.142          | 0.4              | 1 080                        | 440             | 110            | 45              | 40 000                               | 50 000     | R 188        |
| 7.938 | 12.700                   | 3.967  | 3.967          | 0.15             | 1 610                        | 660             | 164            | 68              | 38 000                               | 45 000     | R 4B         |
|       | 12.700                   | 3.967  | 3.967          | 0.15             | 2 620                        | 1 060           | 267            | 108             | 36 000                               | 43 000     | R 4AA        |
|       | 9.525                    | 22.225 | 5.558          | 7.142            | 0.4                          | 540             | 276            | 55              | 28                                   | 40 000     | 48 000       |
| 9.525 | 22.225                   | 5.558  | 7.142          | 0.4              | 3 350                        | 1 410           | 340            | 144             | 32 000                               | 38 000     | R 6          |

| Numbers   | Abutment and Fillet Dimensions (mm) |                    |                    |                    |                    | Mass (g)           |      |                 |
|-----------|-------------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|------|-----------------|
|           | Shielded                            | d <sub>a</sub> min | d <sub>b</sub> max | D <sub>a</sub> max | D <sub>b</sub> min | r <sub>a</sub> max | Open | approx Shielded |
| —         | —                                   | 1.9                | —                  | 2.3                | —                  | 0.1                | 0.04 | —               |
| R 0 ZZ    | —                                   | 2.0                | 1.9                | 3.1                | 3.5                | 0.1                | 0.09 | 0.11            |
| R 1 ZZ    | —                                   | 2.2                | 2.3                | 3.9                | 4.1                | 0.1                | 0.15 | 0.19            |
| R 1-4 ZZ  | —                                   | 2.8                | 3.9                | 5.5                | 5.9                | 0.1                | 0.35 | 0.50            |
| —         | —                                   | 3.2                | —                  | 3.9                | —                  | 0.1                | 0.10 | —               |
| R 133 ZS  | —                                   | —                  | 3.0                | —                  | 4.2                | 0.1                | —    | 0.13            |
| R 1-5 ZZ  | —                                   | 3.6                | 4.1                | 6.7                | 7.0                | 0.15               | 0.60 | 0.72            |
| R 144 ZZ  | —                                   | 4.0                | 3.9                | 5.5                | 5.9                | 0.1                | 0.25 | 0.27            |
| R 2-5 ZZ  | —                                   | 4.0                | 4.3                | 7.1                | 7.3                | 0.1                | 0.55 | 0.72            |
| R 2-6 ZS  | —                                   | 4.4                | 4.6                | 8.3                | 8.2                | 0.15               | 0.96 | 1.13            |
| R 2 ZZ    | —                                   | 5.2                | 4.8                | 7.5                | 8.0                | 0.3                | 1.36 | 1.39            |
| R 2A ZZ   | —                                   | 5.2                | 4.6                | 10.7               | 8.2                | 0.3                | 3.3  | 3.23            |
| R 155 ZS  | —                                   | 4.8                | 5.5                | 7.1                | 7.3                | 0.1                | 0.51 | 0.56            |
| R 156 ZS  | —                                   | 5.6                | 5.5                | 7.1                | 7.3                | 0.1                | 0.39 | 0.42            |
| R 166 ZZ  | —                                   | 5.6                | 5.9                | 8.7                | 8.8                | 0.1                | 0.81 | 0.85            |
| R 3 ZZ    | —                                   | 6.8                | 6.5                | 10.7               | 11.2               | 0.3                | 2.21 | 2.79            |
| R 168 BZZ | —                                   | 7.2                | 7.0                | 8.7                | 8.9                | 0.1                | 0.58 | 0.62            |
| R 188 ZZ  | —                                   | 7.6                | 7.4                | 11.5               | 11.6               | 0.15               | 1.53 | 2.21            |
| R 4B ZZ   | —                                   | 8.4                | 8.4                | 13.8               | 13.8               | 0.3                | 4.5  | 4.43            |
| R 4AA ZZ  | —                                   | 9.4                | 9.0                | 16.0               | 16.6               | 0.4                | 7.48 | 9.17            |
| R 1810 ZZ | —                                   | 9.2                | 9.0                | 11.5               | 11.6               | 0.15               | 1.56 | 1.48            |
| R 6 ZZ    | —                                   | 12.6               | 11.9               | 19.2               | 20.0               | 0.4                | 9.02 | 11              |

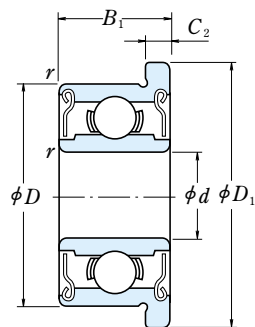
- Remarks 1. When using bearings with a rotating outer ring, please contact NSK if they are shielded.  
2. Bearings with double shields (ZZ, ZS) are also available with single shields (Z, ZS).

Inch Design With Flange

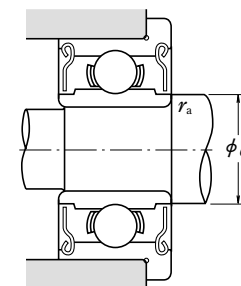
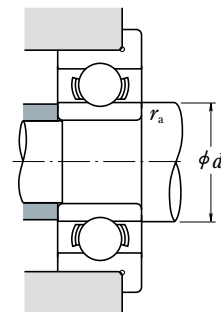
Bore Diameter 1.191 – 9.525 mm



Open Type



Shielded Type  
ZZ · ZS



| d     | Boundary Dimensions (mm) |                |       |                |                |                |                  | Basic Load Ratings (N) (kgf) |                 |                |                 |
|-------|--------------------------|----------------|-------|----------------|----------------|----------------|------------------|------------------------------|-----------------|----------------|-----------------|
|       | D                        | D <sub>1</sub> | B     | B <sub>1</sub> | C <sub>1</sub> | C <sub>2</sub> | r <sub>min</sub> | C <sub>r</sub>               | C <sub>0r</sub> | C <sub>r</sub> | C <sub>0r</sub> |
| 1.191 | 3.967                    | 5.156          | 1.588 | 2.380          | 0.330          | 0.790          | 0.1              | 138                          | 35              | 14             | 3.5             |
| 1.397 | 4.762                    | 5.944          | 1.984 | 2.779          | 0.580          | 0.790          | 0.1              | 231                          | 66              | 24             | 6.5             |
| 1.984 | 6.350                    | 7.518          | 2.380 | 3.571          | 0.580          | 0.790          | 0.1              | 310                          | 108             | 32             | 11              |
| 2.380 | 4.762                    | 5.944          | 1.588 | —              | 0.460          | —              | 0.1              | 188                          | 60              | 19             | 6               |
|       | 4.762                    | 5.944          | —     | 2.380          | —              | 0.790          | 0.1              | 143                          | 52              | 15             | 5.5             |
| 3.175 | 7.938                    | 9.119          | 2.779 | 3.571          | 0.580          | 0.790          | 0.15             | 550                          | 175             | 56             | 18              |
|       | 6.350                    | 7.518          | 2.380 | 2.779          | 0.580          | 0.790          | 0.1              | 283                          | 95              | 29             | 9.5             |
|       | 7.938                    | 9.119          | 2.779 | 3.571          | 0.580          | 0.790          | 0.1              | 560                          | 179             | 57             | 18              |
|       | 9.525                    | 10.719         | 2.779 | 3.571          | 0.580          | 0.790          | 0.15             | 640                          | 225             | 65             | 23              |
| 3.967 | 9.525                    | 11.176         | 3.967 | 3.967          | 0.760          | 0.760          | 0.3              | 630                          | 218             | 64             | 22              |
|       | 7.938                    | 9.119          | 2.779 | 3.175          | 0.580          | 0.910          | 0.1              | 360                          | 149             | 37             | 15              |
| 4.762 | 7.938                    | 9.119          | 2.779 | 3.175          | 0.580          | 0.910          | 0.1              | 360                          | 149             | 37             | 15              |
|       | 9.525                    | 10.719         | 3.175 | 3.175          | 0.580          | 0.790          | 0.1              | 710                          | 270             | 73             | 28              |
|       | 12.700                   | 14.351         | 4.978 | 4.978          | 1.070          | 1.070          | 0.3              | 1 300                        | 485             | 133            | 49              |
| 6.350 | 9.525                    | 10.719         | 3.175 | 3.175          | 0.580          | 0.910          | 0.1              | 420                          | 204             | 43             | 21              |
|       | 12.700                   | 13.894         | 3.175 | 4.762          | 0.580          | 1.140          | 0.15             | 1 080                        | 440             | 110            | 45              |
|       | 15.875                   | 17.526         | 4.978 | 4.978          | 1.070          | 1.070          | 0.3              | 1 610                        | 660             | 164            | 68              |
| 7.938 | 12.700                   | 13.894         | 3.967 | 3.967          | 0.790          | 0.790          | 0.15             | 540                          | 276             | 55             | 28              |
| 9.525 | 22.225                   | 24.613         | 7.142 | 7.142          | 1.570          | 1.570          | 0.4              | 3 350                        | 1 410           | 340            | 144             |

| Limiting Speeds (min <sup>-1</sup> ) |            | Bearing Numbers |            | Abutment and Fillet Dimensions (mm) |                    |                    | Mass (g) |                 |
|--------------------------------------|------------|-----------------|------------|-------------------------------------|--------------------|--------------------|----------|-----------------|
| Grease Open Z · ZZ                   | Oil Open Z | Open            | Shielded   | d <sub>a</sub> min                  | d <sub>b</sub> max | r <sub>a</sub> max | Open     | approx Shielded |
| 110 000                              | 130 000    | FR 0            | FR 0 ZZ    | 2.0                                 | 1.9                | 0.1                | 0.11     | 0.16            |
| 90 000                               | 110 000    | FR 1            | FR 1 ZZ    | 2.2                                 | 2.3                | 0.1                | 0.20     | 0.25            |
| 67 000                               | 80 000     | FR 1-4          | FR 1-4 ZZ  | 2.8                                 | 3.9                | 0.1                | 0.41     | 0.58            |
| 80 000                               | 95 000     | FR 133          | —          | 3.2                                 | —                  | 0.1                | 0.13     | —               |
| 80 000                               | 95 000     | —               | FR 133 ZS  | —                                   | 3.0                | 0.1                | —        | 0.19            |
| 60 000                               | 71 000     | FR 1-5          | FR 1-5 ZZ  | 3.6                                 | 4.1                | 0.15               | 0.68     | 0.82            |
| 67 000                               | 80 000     | FR 144          | FR 144 ZZ  | 4.0                                 | 3.9                | 0.1                | 0.31     | 0.35            |
| 60 000                               | 67 000     | FR 2-5          | FR 2-5 ZZ  | 4.0                                 | 4.3                | 0.1                | 0.62     | 0.81            |
| 53 000                               | 63 000     | FR 2-6          | FR 2-6 ZS  | 4.4                                 | 4.6                | 0.15               | 1.04     | 1.25            |
| 56 000                               | 67 000     | FR 2            | FR 2 ZZ    | 5.2                                 | 4.8                | 0.3                | 1.51     | 1.55            |
| 53 000                               | 63 000     | FR 155          | FR 155 ZS  | 4.8                                 | 5.5                | 0.1                | 0.59     | 0.67            |
| 53 000                               | 63 000     | FR 156          | FR 156 ZS  | 5.6                                 | 5.5                | 0.1                | 0.47     | 0.53            |
| 50 000                               | 60 000     | FR 166          | FR 166 ZZ  | 5.6                                 | 5.9                | 0.1                | 0.90     | 0.98            |
| 43 000                               | 53 000     | FR 3            | FR 3 ZZ    | 6.8                                 | 6.5                | 0.3                | 2.97     | 3.09            |
| 48 000                               | 56 000     | FR 168B         | FR 168 BZZ | 7.2                                 | 7.0                | 0.1                | 0.66     | 0.75            |
| 40 000                               | 50 000     | FR 188          | FR 188 ZZ  | 7.6                                 | 7.4                | 0.15               | 1.64     | 2.49            |
| 38 000                               | 45 000     | FR 4B           | FR 4B ZZ   | 8.4                                 | 8.4                | 0.3                | 4.78     | 4.78            |
| 40 000                               | 48 000     | FR 1810         | FR 1810 ZZ | 9.2                                 | 9.0                | 0.15               | 1.71     | 1.63            |
| 32 000                               | 38 000     | FR 6            | FR 6 ZZ    | 12.6                                | 11.9               | 0.4                | 10.1     | 12.1            |

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