In-house Manufacturing.
Individually Optimized Bearings.
Significant Price Advantage.

SIMPLY
WELL-ENGINEERED
PRODUCT CATALOG
DEEP GROOVE BALL BEARINGS
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3.0 PRODUCT OFFERING

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Whether it’s conveyor or drive technology, mechanical and plant engineering, pumps and compressors, automotive and agricultural technology, or the sports and leisure sectors – all industries around the globe value LFD’s high quality bearings, manufactured according to German standards.
SERVICE AND CONSULTING

Founded in 1978, the LFD Group is a family business operating on a worldwide scale. Our team of professionals in engineering, production, management, sales and logistics provides LFD clients with the right solutions for all of their requirements. We are continuously expanding our service range and advancing specific concepts for a variety of industries, while pursuing a positive environmental performance.

The individual requirements dictate the design of LFD bearings. Service life, noise level, maintenance-free operation – LFD meticulously implements your distinctive specifications. In doing so, we always keep in mind the established budget.

LFD can specifically factor in particular operating conditions, such as very high or very low temperatures, speeds, or forces.

Our engineering staff provides you with comprehensive expert advice on the following:
- Selection of fits
- Mounting/Adjustment
- Materials
- Seals
- Lubricants
- Bearing suitability
- Special bearings
- Bearing design

AUTOMIZED PRODUCTION LINES

100 million deep groove ball bearings per year, produced on automated production lines, represent LFD’s core business. Our new German production site for taper and cylindrical roller bearings allows for maximum control of quality requirements.

The individual components are tested with optical and tactile measuring devices. Our product portfolio also includes LFD spherical roller bearings, LFD spherical plain bearings, and LFD bearing units.

DEVELOPMENT LABORATORY

The LFD development laboratory based at our headquarters in Dortmund is equipped with state-of-the-art measuring technologies, providing us with the capacity to efficiently document new developments for our clients and to promptly implement optimizations.

LFD bearings are designed to cover a wide range of applications already in their standard version. Our engineering team acts as advisor and collaborates closely with the customer during the design stage. That way, our bearings are directly adapted to the particular operating conditions – an additional cost advantage for LFD clients.
QUALITY MANAGEMENT BASED ON GERMAN STANDARDS

Having our own automated production lines guarantees bearings of consistently high quality. The LFD Group strives to provide clients in all sectors with optimum bearings. All of our products are manufactured in accordance with DIN standards or your specific requirements.

Our quality management system takes effect already at the steel works. The particularly high quality of the bearing steel provides the basis: a remarkable degree of purity guarantees, among other things, high utilization levels and therefore long service life. All procurement for our in-house factories is subject to strict requirements. Within the LFD Group, quality management according to German DIN standards is used as a matter of course in all lines of production. As a result, LFD bearings are exceptionally resistant, even under extremely harsh conditions.

LOGISTICS WITH WORLDWIDE STORAGE CAPACITIES

In addition to the central warehouse in Germany, the LFD Group also maintains storage facilities in the USA, Italy and China. Our international presence with offices worldwide ensures fast response and delivery times for LFD customers.

Powerful partners in logistics with subsidiaries around the globe provide further benefits – close proximity to our customers is a priority for us.
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1.1 ROLLING BEARINGS

In rolling bearings, forces are transferred through the bearing rings, depending on the type of load, via the rolling elements (balls, rollers or needles) into other components. In contrast to slide bearings with sliding friction, rolling bearings show rolling friction.

1.2 LOAD CAPACITY AND SERVICE LIFE

The fatigue life can be calculated with a formula, which includes the dynamic load rating, the bearing load and the operating speed.

In the advanced method according to ISO 281, the failure probability as well as the influences of material and lubricant are also taken into account with the factors $a_1$, $a_2$ and $a_3$.

In general, a reliability of 90% is estimated.

As a formula, this is represented for a rotating inner ring as follows:

$$L_{10h} [h] = \frac{C_r^{\frac{1}{3}}}{\sqrt{n}} \times 10^6 \times \frac{60}{n}$$

$n$ – speed in [min^{-1}]  $C_r$ – dynamic load in [N]  $P_r$ – equivalent bearing load in [N] modified in accordance to ISO 281 standards $L_{10h} \text{mod} = a_2 \times a_3 \times L_{10h}$ (for $a_1 = 1$)

$a_1$ - Life adjustment factor for reliability acc. to DIN ISO 281
$a_2$ - Life adjustment factor for special bearing designs acc. to DIN ISO 281
$a_3$ - Life adjustment factor for special operating conditions acc. to DIN ISO 281

a) The reliabilities with corresponding $a_1$ values are shown in the following table:

<table>
<thead>
<tr>
<th>Reliability</th>
<th>$L_n$</th>
<th>$a_1$</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 %</td>
<td>$L_{10}$</td>
<td>1,00</td>
</tr>
<tr>
<td>95 %</td>
<td>$L_5$</td>
<td>0,64</td>
</tr>
<tr>
<td>96 %</td>
<td>$L_4$</td>
<td>0,55</td>
</tr>
<tr>
<td>97 %</td>
<td>$L_3$</td>
<td>0,47</td>
</tr>
<tr>
<td>98 %</td>
<td>$L_2$</td>
<td>0,37</td>
</tr>
<tr>
<td>99 %</td>
<td>$L_1$</td>
<td>0,25</td>
</tr>
</tbody>
</table>

Table 1: Life adjustment factor $a_1$

b) Heat stabilized bearings usually have a lower hardness than standard bearings made of GCr15 or 100 Cr6 material; therefore, a correction must be made by using the factor $a_2$.

<table>
<thead>
<tr>
<th>Heat stabilization</th>
<th>$a_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>max. temperature 200 °C</td>
<td>0,68</td>
</tr>
<tr>
<td>max. temperature 250 °C</td>
<td>0,30</td>
</tr>
</tbody>
</table>

Table 2: Life adjustment factor $a_2$

c) Under ideal conditions, the lubricant influence factor $a_3$ is higher than 1, however, with lower speeds and contamination etc., a significant reduction of the service life has to be expected ($a_3 << 1$). For special cases, please contact our consulting service.

1.3 EQUIVALENT DYNAMIC LOAD ($P_r$)

$$P_r = X \times F_r + Y \times F_a$$

The factors $X$ and $Y$ are determined by the ratio $F_a/C_{0r}$.

A number of relations are listed in the following table:

<table>
<thead>
<tr>
<th>$F_a/C_{0r}$</th>
<th>e</th>
<th>$F_a/F_r \leq e$</th>
<th>$F_a/F_r &gt; e$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0,01</td>
<td>0,18</td>
<td>2,46</td>
<td></td>
</tr>
<tr>
<td>0,02</td>
<td>0,20</td>
<td>2,14</td>
<td></td>
</tr>
<tr>
<td>0,04</td>
<td>0,24</td>
<td>1,83</td>
<td></td>
</tr>
<tr>
<td>0,07</td>
<td>0,27</td>
<td>1,61</td>
<td></td>
</tr>
<tr>
<td>0,10</td>
<td>0,29</td>
<td>1,48</td>
<td></td>
</tr>
<tr>
<td>0,15</td>
<td>0,32</td>
<td>1,35</td>
<td></td>
</tr>
<tr>
<td>0,20</td>
<td>0,35</td>
<td>1,25</td>
<td></td>
</tr>
<tr>
<td>0,30</td>
<td>0,38</td>
<td>1,13</td>
<td></td>
</tr>
<tr>
<td>0,40</td>
<td>0,41</td>
<td>1,05</td>
<td></td>
</tr>
<tr>
<td>0,50</td>
<td>0,44</td>
<td>1,00</td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Compiled presentation of the equation for the factors $X$, $Y$ and $e$.

For small or miniature ball bearings with a bore diameter of less than $d=10$ mm, the load ratio $F_a/C_{0r}$ should not exceed the limit of 0,25.

1.4 PERMISSIBLE STATIC LOAD

The static load rating is used to design bearings operating at low speeds or with oscillating movements.

$$S_0 = C_{0r} / P_{0r \text{ max}}$$

The static load safety factor $S_0$ should be calculated in accordance with the following criteria:

<table>
<thead>
<tr>
<th>Operation condition</th>
<th>$S_0$</th>
</tr>
</thead>
<tbody>
<tr>
<td>High running precision required</td>
<td>&gt; 2</td>
</tr>
<tr>
<td>Standard requirements</td>
<td>1</td>
</tr>
<tr>
<td>Low requirements</td>
<td>&gt; 0,5</td>
</tr>
</tbody>
</table>

Table 4: Standard values for the static load safety factor
1.5 RADIAL CLEARANCE

The radial clearance is measured using an unmounted radial bearing with an outer ring, inner ring, and rolling element set.

The radial clearance is defined as the distance by which a bearing ring can be shifted toward the other in the radial direction from one limit position to the other, e.g. an inner ring toward an outer ring (see Fig. 1).

It is classified in groups according to DIN 620-4, ISO 5753 standards (see Table 5 and Fig. 3).

1.6 AXIAL CLEARANCE

The axial clearance is defined as the distance by which a bearing ring can be shifted toward the other in the axial direction from one limit position to the other, e.g. an inner ring toward an outer ring (see Fig. 2).

1.7 OPERATING BEARING CLEARANCE

Besides the term radial clearance, which refers to an unmounted bearing, the term operating clearance is also frequently used. Factor operating clearance can be determined when a bearing is mounted and has achieved the operating temperature; the radial clearance is generally smaller than in an unmounted bearing.

Interference fits between inner ring and shaft and/or between outer ring and housing lead to a reduction of the operating clearance. The interference causes the expansion of the inner ring and the contraction of the outer ring.

Temperature influences such as a heat supply through a shaft or the cooling of the outer ring also result in inner ring expansion and/or outer ring contraction.

In general, we recommend a radial clearance of CN and larger (see Fig. 3).

Smaller clearances than CN are suitable for special applications. For such requirements, please contact our LFD engineers.

<table>
<thead>
<tr>
<th>Suffix</th>
<th>Radial clearance groups</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2</td>
<td>clearance smaller than CN</td>
<td>DIN 620-4, ISO 5753</td>
</tr>
<tr>
<td>CN</td>
<td>normal clearance</td>
<td></td>
</tr>
<tr>
<td>C3</td>
<td>clearance larger than CN</td>
<td></td>
</tr>
<tr>
<td>C4</td>
<td>clearance larger than C3</td>
<td></td>
</tr>
<tr>
<td>C5</td>
<td>clearance larger than C4</td>
<td></td>
</tr>
</tbody>
</table>

Table 5: Radial clearance groups
1.7.1 Radial clearance of deep groove ball bearings

<table>
<thead>
<tr>
<th>Nominal bore diameter d [mm]</th>
<th>Radial clearance in [μm]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C2</td>
</tr>
<tr>
<td></td>
<td>min.</td>
</tr>
<tr>
<td>1.5</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>40</td>
<td>40</td>
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<tr>
<td>50</td>
<td>50</td>
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<tr>
<td>65</td>
<td>65</td>
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<tr>
<td>80</td>
<td>80</td>
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<tr>
<td>100</td>
<td>100</td>
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<tr>
<td>120</td>
<td>120</td>
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<tr>
<td>140</td>
<td>140</td>
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<tr>
<td>160</td>
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<tr>
<td>180</td>
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<td>200</td>
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<td>225</td>
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<td>250</td>
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<tr>
<td>280</td>
<td>280</td>
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<tr>
<td>315</td>
<td>315</td>
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<tr>
<td>355</td>
<td>355</td>
</tr>
<tr>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>450</td>
<td>450</td>
</tr>
<tr>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>560</td>
<td>560</td>
</tr>
</tbody>
</table>

Table 6: Radial clearance acc. to DIN 620-4

1.7.2 Reduced radial clearance

<table>
<thead>
<tr>
<th>Nominal bore diameter d [mm]</th>
<th>CM [μm]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>min.</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>30</td>
<td>30</td>
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<tr>
<td>40</td>
<td>40</td>
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<tr>
<td>50</td>
<td>50</td>
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<tr>
<td>65</td>
<td>65</td>
</tr>
<tr>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>140</td>
<td>140</td>
</tr>
<tr>
<td>160</td>
<td>160</td>
</tr>
<tr>
<td>180</td>
<td>180</td>
</tr>
</tbody>
</table>

Table 7: Reduced radial clearance for special applications (e.g. electric motor bearing)

1.8 FITS

The appropriate fit on the shaft and in the housing – in the axial, radial, and tangential direction – is chosen according to the function of the bearing. In most cases, radial or tangential location is achieved by tight fits and an ultimate traction. A form-fitting fastening is usually used for axial location.

When selecting a fit, the following should be taken into account:

- In order to achieve the optimal use of the bearing load capacity, the bearing rings have to be supported around their entire circumference.
- In a non-locating bearing arrangement, the bearing should be able to compensate for the axial displacement.
- Mounting and dismounting of the bearing with the appropriate tools has to be simple.
- Temperature influences between inner and outer ring, with regard to the operating clearance, have to be taken into account.
### 1.8.1 Fits for radial bearings of accuracy class P0

#### Fits: shaft/beARING

<table>
<thead>
<tr>
<th>Ø d [mm]</th>
<th>( \lambda_{	ext{bear}} )</th>
<th>g5</th>
<th>g6</th>
<th>h5</th>
<th>h6</th>
<th>j5</th>
<th>j6</th>
</tr>
</thead>
<tbody>
<tr>
<td>over incl.</td>
<td>upper</td>
<td>lower</td>
<td>bearing shaft</td>
<td>bearing shaft</td>
<td>bearing shaft</td>
<td>bearing shaft</td>
<td>bearing shaft</td>
</tr>
<tr>
<td>3 6</td>
<td>0 – 8</td>
<td>4F – 9L</td>
<td>4F – 12L</td>
<td>8F – 5L</td>
<td>8F – 8L</td>
<td>11F – 2L</td>
<td>10.5F – 2.5L</td>
</tr>
<tr>
<td>6 10</td>
<td>0 – 8</td>
<td>3F – 11L</td>
<td>3F – 14L</td>
<td>8F – 6L</td>
<td>8F – 9L</td>
<td>12F – 2L</td>
<td>11F – 3L</td>
</tr>
<tr>
<td>18 30</td>
<td>0 – 10</td>
<td>3F – 16L</td>
<td>3F – 20L</td>
<td>10F – 9L</td>
<td>10F – 13L</td>
<td>15F – 4L</td>
<td>14F – 5.5L</td>
</tr>
<tr>
<td>80 120</td>
<td>0 – 20</td>
<td>8F – 27L</td>
<td>8F – 34L</td>
<td>20F – 15L</td>
<td>20F – 28L</td>
<td>26F – 9L</td>
<td>27F – 7.5L</td>
</tr>
</tbody>
</table>

F: firm (tight) fit
L: loose fit

Table 8: Fits: shaft/bearing (tolerances in μm)

### Fits: housing/beARING

<table>
<thead>
<tr>
<th>Ø D [mm]</th>
<th>( \lambda_{	ext{bear}} )</th>
<th>G7</th>
<th>H6</th>
<th>J6</th>
<th>J7</th>
<th>Js7</th>
</tr>
</thead>
<tbody>
<tr>
<td>over incl.</td>
<td>upper</td>
<td>lower</td>
<td>bearing shaft</td>
<td>bearing shaft</td>
<td>bearing shaft</td>
<td>bearing shaft</td>
</tr>
<tr>
<td>6 10</td>
<td>0 – 8</td>
<td>5F – 28L</td>
<td>0 – 17L</td>
<td>0 – 23L</td>
<td>4F – 13L</td>
<td>7F – 16L</td>
</tr>
<tr>
<td>10 18</td>
<td>0 – 8</td>
<td>6F – 32L</td>
<td>0 – 19L</td>
<td>0 – 26L</td>
<td>5F – 14L</td>
<td>8F – 18L</td>
</tr>
<tr>
<td>18 30</td>
<td>0 – 9</td>
<td>7F – 37L</td>
<td>0 – 22L</td>
<td>0 – 30L</td>
<td>5F – 17L</td>
<td>9F – 21L</td>
</tr>
<tr>
<td>30 50</td>
<td>0 – 11</td>
<td>9F – 45L</td>
<td>0 – 27L</td>
<td>0 – 36L</td>
<td>6F – 21L</td>
<td>11F – 25L</td>
</tr>
<tr>
<td>50 80</td>
<td>0 – 13</td>
<td>10F – 53L</td>
<td>0 – 32L</td>
<td>0 – 43L</td>
<td>6F – 26L</td>
<td>12F – 31L</td>
</tr>
<tr>
<td>80 120</td>
<td>0 – 15</td>
<td>12F – 62L</td>
<td>0 – 37L</td>
<td>0 – 50L</td>
<td>6F – 31L</td>
<td>13F – 37L</td>
</tr>
<tr>
<td>120 150</td>
<td>0 – 18</td>
<td>14F – 72L</td>
<td>0 – 43L</td>
<td>0 – 59L</td>
<td>7F – 36L</td>
<td>14F – 44L</td>
</tr>
<tr>
<td>150 180</td>
<td>0 – 25</td>
<td>14F – 75L</td>
<td>0 – 50L</td>
<td>0 – 65L</td>
<td>7F – 43L</td>
<td>14F – 51L</td>
</tr>
<tr>
<td>180 200</td>
<td>0 – 30</td>
<td>15F – 91L</td>
<td>0 – 59L</td>
<td>0 – 76L</td>
<td>7F – 52L</td>
<td>16F – 60L</td>
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<td>0 – 35</td>
<td>17F – 104L</td>
<td>0 – 67L</td>
<td>0 – 87L</td>
<td>7F – 60L</td>
<td>17F – 71L</td>
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<tr>
<td>250 315</td>
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<td>18L – 115L</td>
<td>0 – 76L</td>
<td>0 – 97L</td>
<td>7F – 69L</td>
<td>18F – 78L</td>
</tr>
<tr>
<td>315 400</td>
<td>0 – 45</td>
<td>20L – 128L</td>
<td>0 – 85L</td>
<td>0 – 108L</td>
<td>7F – 78L</td>
<td>20F – 88L</td>
</tr>
<tr>
<td>400 500</td>
<td>0 – 45</td>
<td>20L – 128L</td>
<td>0 – 85L</td>
<td>0 – 108L</td>
<td>7F – 78L</td>
<td>20F – 88L</td>
</tr>
</tbody>
</table>

F: firm (tight) fit
L: loose fit

Table 9: Fits: housing/bearing (tolerances in μm)
1.8.2 Shaft and housing fits according to the type of loading

<table>
<thead>
<tr>
<th>Type of loading</th>
<th>Figure</th>
<th>Load on the bearing rings</th>
<th>Fit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inner ring:</td>
<td></td>
<td>circumferential load</td>
<td></td>
</tr>
<tr>
<td>Outer ring:</td>
<td>stationary</td>
<td>constant load direction</td>
<td></td>
</tr>
<tr>
<td>Load direction:</td>
<td>constant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inner ring:</td>
<td>stationary</td>
<td>constant load direction</td>
<td></td>
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<td>Outer ring:</td>
<td>circumferential load</td>
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<tr>
<td>Load direction:</td>
<td>constant</td>
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<td></td>
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</table>

Table 10: Type of loading

1.8.3 Housing fits

<table>
<thead>
<tr>
<th>Housing</th>
<th>Type of loading</th>
<th>Housing fit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Split and unsplit housing</td>
<td>point load on the outer ring</td>
<td>all types of load</td>
</tr>
<tr>
<td></td>
<td>light up to normal</td>
<td>light up to normal</td>
</tr>
<tr>
<td></td>
<td>normal up to heavy load</td>
<td>normal up to heavy load</td>
</tr>
<tr>
<td></td>
<td>heavy impact load</td>
<td>heavy impact load</td>
</tr>
<tr>
<td>Unsplit housing</td>
<td>light or alternating heavy load</td>
<td>all types of load</td>
</tr>
<tr>
<td></td>
<td>normal up to heavy load</td>
<td>all types of load</td>
</tr>
<tr>
<td></td>
<td>high load, small wall thickness high impact load</td>
<td>all types of load</td>
</tr>
</tbody>
</table>

Table 11: Housing fits

1.8.4 Shaft fits

<table>
<thead>
<tr>
<th>Type of bearing</th>
<th>Type of loading</th>
<th>Ball bearing</th>
<th>Cylindrical or taper roller bearing</th>
<th>Spherical roller bearing</th>
<th>Shaft fit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light up to alternating load</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>h5</td>
</tr>
<tr>
<td>Normal up to heavy load</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>k6</td>
</tr>
<tr>
<td>Severe load or impact load</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>n6</td>
</tr>
</tbody>
</table>

Table 12: Shaft fits

Note: 1) These recommendations refer to solid steel shafts.
2) js6 is recommended for axially loaded radial bearings for all shaft diameters.
3) Loads are classified as follows:
   - light loads: \( P_r < 0.06 C_r \)
   - normal loads: \( 0.06 C_r < P_r < 0.12 C_r \)
   - heavy loads: \( P_r > 0.12 C_r \)
   - with: \( P_r \) equivalent radial load
   - \( C_r \) dynamic load rating
1.9 TOLERANCES OF BEARINGS

It goes without saying that all bearings in this catalog comply with the applicable ISO standards as well as the DIN 625 and DIN 620 standards (with the exception of 620-6). All data in this catalog have been thoroughly compiled and verified. However, we do not accept any liability for possible errors or omissions.

The dimensions and tolerances are defined in specific standards (e.g. DIN 620, DIN 625 or ISO 15). They describe the form and running accuracy.

The tolerance class P0 lists the standard tolerance values; P6 and P5 etc. are higher precision classes according to DIN 620.

A comparable classification is being made according to American standards (ANSI).

<table>
<thead>
<tr>
<th>DIN 620</th>
<th>P0</th>
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<th>P5</th>
<th>P4</th>
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<td>ABEC-1</td>
<td>ABEC-3</td>
<td>ABEC-5</td>
<td>ABEC-7</td>
</tr>
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</table>

ISO standard tolerances (IT qualities) acc. to DIN ISO 286

<table>
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<th>Nominal dimension in [mm]</th>
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<th>IT1</th>
<th>IT2</th>
<th>IT3</th>
<th>IT4</th>
<th>IT5</th>
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<th>IT7</th>
<th>IT8</th>
<th>IT9</th>
<th>IT10</th>
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<th>IT12</th>
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<tbody>
<tr>
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<td>2500</td>
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<td>10000</td>
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</table>

Table 13: ISO standard tolerances (IT qualities) acc. to DIN ISO 286
1.10 TOLERANCES OF RADIAL BEARINGS

Explanations for the abbreviations used in the tables:

1. Dimensions
   d  Nominal dimension of the bore diameter
   D  Nominal dimension of the outer diameter
   B  Nominal dimension of the outer ring width

2. Dimensional deviations
   ∆dmp  Deviation of the mean bore diameter from the nominal dimension
   ∆Dmp  Deviation of the mean outer diameter from the nominal dimension
   ∆Bs   Deviation of the inner ring width from the nominal dimension
   ∆Cs   Deviation of the outer ring width from the nominal dimension

3. Dimension variations
   Vdp  Variation of the bore diameter in a radial plane
   Vdmp Variation of the mean bore diameter
   Vdp  Variation of the outer diameter in a radial plane
   VBs  Variation of the inner ring width
   VCs  Variation of the outer ring width

4. Concentricity tolerances
   Kia  Concentricity of the inner ring (radial runout)
   Kea  Concentricity of the outer ring (radial runout)

1.10.1 Accuracy class P0

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</thead>
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<td>Ød (mm)</td>
</tr>
<tr>
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</tr>
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</tr>
<tr>
<td>0,6 - 2,5</td>
</tr>
<tr>
<td>2,5 - 10</td>
</tr>
<tr>
<td>10 18</td>
</tr>
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<td>18 30</td>
</tr>
<tr>
<td>30 50</td>
</tr>
<tr>
<td>50 80</td>
</tr>
<tr>
<td>80 120</td>
</tr>
<tr>
<td>120 180</td>
</tr>
<tr>
<td>180 250</td>
</tr>
<tr>
<td>250 315</td>
</tr>
<tr>
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<tr>
<td>630 800</td>
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<tr>
<td>800 1000</td>
</tr>
</tbody>
</table>

Table 14: Tolerance accuracy class P0 for the inner ring (tolerances in μm)

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</tr>
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</tr>
<tr>
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</tr>
<tr>
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</tr>
<tr>
<td>6 18</td>
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<tr>
<td>630 800</td>
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<tr>
<td>800 1000</td>
</tr>
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</table>

Table 15: Tolerance accuracy class P0 for the outer ring (tolerances in μm)
### 1.10.2 Accuracy class P6

**Inner ring**

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<th>V dp Series 0, 1</th>
<th>V dp Series 2, 3, 4</th>
<th>V dmp</th>
<th>K1a</th>
<th>ΔBs</th>
<th>V Bs</th>
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<td>lower</td>
<td>max.</td>
<td>max.</td>
<td>upper</td>
<td>lower</td>
<td>max.</td>
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**Outer ring**

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<th>Ø D [mm]</th>
<th>Dimension Δdmp</th>
<th>V dp Series 7, 8, 9</th>
<th>V dp Series 0, 1</th>
<th>V dp Series 2, 3, 4</th>
<th>V dmp</th>
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### 1.10.3 Accuracy class P5

**Inner ring**

<table>
<thead>
<tr>
<th>Ø d [mm]</th>
<th>Dimension Δdmp</th>
<th>V dp Series 7, 8, 9</th>
<th>V dp Series 0, 1</th>
<th>V dp Series 2, 3, 4</th>
<th>V dmp</th>
<th>K1a</th>
<th>ΔBs</th>
<th>V Bs</th>
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**Outer ring**

<table>
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<th>V dp Series 7, 8, 9</th>
<th>V dp Series 0, 1</th>
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**Table 16**: Tolerance accuracy class P6 for the inner ring (tolerances in μm)

**Table 17**: Tolerance accuracy class P6 for the outer ring (tolerances in μm)

**Table 18**: Tolerance accuracy class P5 for the inner ring (tolerances in μm)

**Table 19**: Tolerance accuracy class P5 for the outer ring (tolerances in μm)
1.11 CONSTRUCTIVE DESIGN OF BEARINGS

A bearing arrangement to support a shaft generally requires two bearings, which are arranged on the shaft with a defined distance to each other. Depending on the application, we distinguish between non-locating, locating, adjusted and floating bearings.

1.11.1 Non-locating bearings

In a conventional bearing arrangement including two radial bearings, tolerance differences on the shaft and housing, as well as temperature differences, play a decisive role. A non-locating bearing has to compensate tolerance and temperature differences. In this way, axial tensions can be prevented (see Fig. 4 and Fig. 5).

1.11.2 Locating bearings

Locating bearings are intended to ensure the transmission of axial forces and the axial guidance of the shaft (see Fig. 4 and Fig. 5).
1.11.3 Adjusted bearings

In this type of bearing arrangement, the bearing rings are adjusted in an axial direction. Most of the time, taper roller bearings or angular contact ball bearings in O or X arrangement are used. One bearing ring is adjusted to the other with the desired clearance or preload. This solution is well suited for close shaft guidances, e.g. spindle bearings in machine tools.

An adjusted bearing arrangement is also ideal for alternating axial loads, which are, depending on the load direction, absorbed by the right or left bearing.

Adjusted bearing arrangements can also be achieved by preloading with springs (see Fig. 6). Special spring washers are available for this purpose. When adjusting the bearing, the thermal expansion of the shaft has to be taken into account.

1.11.4 Floating bearings

Floating bearings are frequently used if the shaft does not require close axial guidance. This is a cost-efficient alternative to other bearing arrangements.

Most of the time, the axial displacement is realized by the outer ring. In order to avoid an axial tension of the bearing, the mobility of the shaft (I) has to be set in the axial direction according to the temperature difference between bearing and shaft (see Fig. 7).

1.11.5 Press lines

Press lines are lines which can be drawn perpendicular to the contact points or contact lines between outer rings, balls and inner rings (see Fig. 8, 9 and 10).

1.11.6 O arrangement

By extending the press lines (max. 40 degrees), a cone is formed. If the tips of the cone are located outside the bearing, this is referred to as an O arrangement. This type of arrangement shows a higher tilting stiffness than X arrangements (see Fig. 8).

1.11.7 X arrangement

If the cone tips obtained by extending the press lines by max. 40 degrees are situated within the bearings, this is referred to as an X arrangement (see Fig. 9).

1.11.8 Tandem arrangement

If the cone tips point in the same direction, this is called a tandem arrangement (see Fig. 10).
1.12 BEARING SELECTION

The question of which bearing to choose cannot be answered in a general way. In fact, more detailed information regarding application and application environment is required.

The following information is essential to choose the right bearing:

- Bearing loading
- Type of loading (axial, radial forces, moments...)
- Application geometry (shaft diameter, shaft length, housing bore...)
- Type of movement (rotating or oscillating)
- Ambient temperature
- Type of lubrication (grease, oil lubrication...)

These are the main criteria for selecting a bearing.

Furthermore, we need data regarding the application environment and/or environmental influences, in order to choose the right bearing. The fact that a bearing will be used in water or in a vacuum is as important as information regarding load or speed.

All information provided in this catalog is nonbinding, it only shows a selection of our options. Therefore, all required features have to be specified when placing an order.
1.13 FRICTION AND LUBRICATION

The main purpose of lubrication is to minimize friction and wear between two machine parts which move relatively to each other. This is achieved by building a load-carrying lubricant film between both machine parts.

1.13.1 Friction conditions combined with a lubricant:

- dry friction
- mixed friction
- fluid friction

**Dry friction or dry lubrication:**
The load is mainly carried by the roughness peaks of both solid objects (see Fig. 11).

**Mixed friction or mixed lubrication:**
The load is carried by the roughness peaks and the lubricant (see Fig. 12).

**Fluid friction or full fluid film lubrication:**
The load is fully carried by the lubricant (see Fig. 13).

Fluid friction or full fluid film lubrication is classified in:

- hydrostatic lubrication
- hydromechanical lubrication

**Function of a lubricant:**

- minimizing friction
- minimizing wear
- dampening the running noise
- protection against contamination and corrosion
- heat dissipation

1.13.2 Type of lubrication - Lubrication - Lubricants

**Type of lubrication:**

- grease lubrication
- oil lubrication

For mechanical machine parts – whether they show rotary or linear movement – the choice between oil and grease lubrication is made depending on the application. In order to select the right type of lubricant, the bearing type, adjacent constructions, operating conditions and lubricant supply have to be taken into account.

**Lubrication**

Deep groove ball bearings sealed on both sides are considered to be lubricated for life and have the advantage of being maintenance-free, e.g. no relubrication, no need for tools, cost reduction. Therefore, it must be kept in mind that the durability of the grease might limit the service life of the bearing.

The standard greases used are lithium soap greases with a mineral oil base and a service temperature range between -25 °C and +120 °C. It may be necessary, depending on the operating conditions, to use a special grease or even to perform maintenance operations. For high temperatures while using kiln truck bearings, paste-like lubricants such as molybdenum disulphide can be used as total loss lubrication.

The formation of a lubricant film requires a minimum relative speed and can be estimated using the empirical formula $n \times d_m > 10,000$.

The mean bearing diameter $d_m$ is determined from $0,5 \times (d+D)$.

Heavy bearing loads require lubricants with EP-additives which possess an excellent pressure absorption capacity.

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Type</th>
<th>Sealant</th>
<th>Base oil</th>
<th>Operating temperature °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shell</td>
<td>Gadus S2 (Alvania No.R2)</td>
<td>Lithium</td>
<td>Mineral</td>
<td>-30 ~ +130</td>
</tr>
<tr>
<td></td>
<td>Aeroshell No.7</td>
<td>Microgel</td>
<td>Diester</td>
<td>-73 ~ +149</td>
</tr>
<tr>
<td>Kyodo Yushi</td>
<td>Multemp SRL</td>
<td>Lithium</td>
<td>Diester</td>
<td>-50 ~ +150</td>
</tr>
<tr>
<td>Klüber</td>
<td>Isoflex Topas NB52</td>
<td>Barium</td>
<td>Synthetic hydrocarbon</td>
<td>-50 ~ +120</td>
</tr>
<tr>
<td></td>
<td>Isoflex LDS 18 Special A</td>
<td>Lithium</td>
<td>Diester</td>
<td>-50 ~ +120</td>
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<tr>
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<td>Asonic GHY 72</td>
<td>Polyurea</td>
<td>Ester</td>
<td>-40 ~ +180</td>
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<tr>
<td></td>
<td>Staburags NBU 12</td>
<td>Barium</td>
<td>Mineral</td>
<td>-15 ~ +130</td>
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<tr>
<td></td>
<td>Barrierta LSS-2</td>
<td>PTFE</td>
<td>Polyphenyletheröl</td>
<td>-40 ~ +260</td>
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<td></td>
<td>Chevron SRI 2</td>
<td>Polyurea</td>
<td>Mineral</td>
<td>-30 ~ +175</td>
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</table>

Table 20: Lubricants (other lubricants available on request)
1.14 MATERIALS

The right choice of the bearing material is decisive for the operating reliability and performance of the bearing. The hardenability of the rings and rolling elements is a very important aspect for choosing the bearing material as it determines the bearing’s load capacity and fatigue strength.

The material used for the rings and rolling elements is a low-alloy, through hardening chromium steel of high purity.

The standard material used for rings and balls is GCr15 chromium steel. This material is designed for an operating temperature range of -20 °C up to +120 °C and is therefore adapted to the respective RS-disc material NBR.

The following weight percentages are permissible for the most important steel components:

**GCr15**

<table>
<thead>
<tr>
<th>Component</th>
<th>Permissible Weight Percentage</th>
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<tbody>
<tr>
<td>C</td>
<td>0,95 ... 1,10 %</td>
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<tr>
<td>Mn</td>
<td>≤ 0,50 %</td>
</tr>
<tr>
<td>Si</td>
<td>0,15 ... 0,35 %</td>
</tr>
<tr>
<td>P</td>
<td>&lt; 0,025 %</td>
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<tr>
<td>S</td>
<td>&lt; 0,025 %</td>
</tr>
<tr>
<td>Cr</td>
<td>1,30 ... 1,60 %</td>
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</table>

The cages are made of sheet steel and are designed, according to size, with the following composition:

<table>
<thead>
<tr>
<th>Designation</th>
<th>C</th>
<th>Mn</th>
<th>Si</th>
<th>P</th>
<th>S</th>
<th>Cr</th>
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</thead>
<tbody>
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<td>08F</td>
<td>0,05 ... 0,11</td>
<td>0,25 ... 0,50</td>
<td>&lt;0,03</td>
<td>&lt;0,04</td>
<td>&lt;0,04</td>
<td>&lt;0,1</td>
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</table>

**AISI 440C**

<table>
<thead>
<tr>
<th>Component</th>
<th>Permissible Weight Percentage</th>
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</thead>
<tbody>
<tr>
<td>C</td>
<td>0,95 ... 1,20 %</td>
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<tr>
<td>Mn</td>
<td>≤ 1,0 %</td>
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<tr>
<td>Si</td>
<td>≤ 1,0 %</td>
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<tr>
<td>P</td>
<td>≤ 0,04 %</td>
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<tr>
<td>S</td>
<td>≤ 0,03 %</td>
</tr>
<tr>
<td>Cr</td>
<td>16 ... 18 %</td>
</tr>
</tbody>
</table>

For corrosion resistant bearings, the rings and rolling elements are manufactured in AISI 440C. The cages of these bearings are made of AISI 304 (other special materials available upon request). The following weight percentages are permissible for the most important steel components:

<table>
<thead>
<tr>
<th>Designation</th>
<th>C</th>
<th>Mn</th>
<th>Si</th>
<th>P</th>
<th>S</th>
<th>Cr</th>
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<tbody>
<tr>
<td>08F</td>
<td>0,05 ... 0,11</td>
<td>0,25 ... 0,50</td>
<td>&lt;0,03</td>
<td>&lt;0,04</td>
<td>&lt;0,04</td>
<td>&lt;0,1</td>
</tr>
</tbody>
</table>
1.15 CAGES

The main tasks of a cage are:

- separating the rolling elements, in order to keep friction and a hereby generated heat at the minimum
- keeping the same distance between rolling elements, in order to ensure an even load distribution and a smooth run
- guiding the rolling elements in the unloaded zone of the bearing
- preventing the rolling elements from falling out (in case of dismountable bearings)

The selection of different cage materials depends on several aspects: chemical reactions caused by the lubricant; operating temperature of the bearing, and loading of the cage.

This is why we offer you sheet metal cages and brass cages, the latter in different versions: metal, plastic and hard tissue. The standard deep groove ball bearings have sheet metal cages.

For special applications requiring cage materials other than the standard range, please contact our LFD engineers.

1.16 MOUNTING

1.16.1 Storage of bearings

Bearings are precision machine elements and therefore need to be mounted with the greatest care by expert staff.

The bearings should be kept in the original package until mounting. Otherwise, there is the risk of contamination and corrosion.

Larger bearings should be stored lying flat, especially if the design has narrow outer rings.

LFD bearings are treated with preservative oil before packaging. This oil does not gum or harden.

Bearings should be stored in a dry place, protected from direct sunlight. Contact with acids, alkaline solutions and gases must be avoided.

1.16.2 Mounting preparation

The installer should be familiar with each assembly step and should compare the dimensions and tolerances on the drawings with the components (shaft/housing) to verify their accuracy (e.g. the dimensional accuracy of the bore). The shaft and housing fits for the bearing rings should also be checked. For this purpose, various measuring devices (e.g. outside and inside micrometers) can be used.

The mounting site has to be dry and dust-free. The bearing must not be modified afterwards, and the bearing seat on the shaft and in the housing must be kept clean.

The right bearing designation for the construction must also be taken into account.

1.16.3 Tapered seats

The taper ratio for the bearing rings is standardized. Generally, the taper ratio is 1:12; in the case of some wider bearings it is 1:30.

In the case of tapered seats, the inner ring of bearings should absorb and transfer the load on its entire width. The taper ratio of small taper rings can be tested with a ring gauge. The inner ring must not be used as a ring gauge.
1.16.4 Mounting procedures

There are three different methods for mounting a bearing:

1. Mechanical mounting method
2. Hydraulic mounting method
3. Thermic mounting method

1.16.5 Bearing mounting

As stated earlier, bearings are precision machine elements and have to be installed carefully. Due to the large range of bearing designs and different sizes, a generalized mounting method for bearings cannot be described at this point. The appropriate mounting method is chosen according to bearing design and size (see paragraph Mounting procedures).

Direct hammer blows on the bearing rings, which are hardened, should be avoided because they could be damaged otherwise.

Bearing should be mounted on the shaft or in the housing by means of a mechanical or hydraulic press. This ensures an even force transmission.

When mounting the bearing on a shaft or in a housing, it is important to ensure that the mounting force is not being transferred from one bearing ring to the other via the rolling elements, as this could damage the bearing raceway.

If the bearing is to be re-used, this also applies to the dismounting (see Fig. 14 and 15).

![Mounting of a bearing on a shaft](image)

- Incorrect mounting, force transmission via rolling element
- Correct mounting, force transmission via inner ring

![Mounting of a bearing in a housing](image)

- Incorrect mounting, force transmission via rolling element
- Correct mounting, force transmission via outer ring
1.16.6 Bearing dismounting

The following methods are applied for mounting/dismounting of a bearing:

1. Mechanical mounting method
2. Hydraulic mounting method
3. Thermic mounting method

The dismounting of a bearing is as important as its mounting, if the bearing is to be re-used. There are special tools, such as extractors, which facilitate the bearing dismounting. When an extractor is used, it has to be applied to the bearing ring which is to be removed. Otherwise, the bearing raceway will be damaged.

Regarding non-separable bearings, bearing rings are removed one by one. In separable bearings, however, surrounding components with loose or slide fits have to be removed first, in order to release the bearing from its press fit.

When using a hammer for dismounting, one can apply, for example, a metal drift on the ring, to prevent a direct impact of the hammer blows on the bearing rings.
1.17 DEEP GROOVE BALL BEARINGS

Description of deep groove ball bearings
The best-known and top-selling bearing worldwide is the single-row deep groove ball bearing. The field of application is wide-ranging. Moreover, it has a very good price/performance ratio. The deep groove ball bearing is designed to transmit mainly radial forces. Due to its raceway geometry, the balls are guided narrowly on their track. This is why axial forces can be transferred to both directions in this type of bearing.

Features of deep groove ball bearings:
- Absorption of axial and radial forces
- Suited for high speeds
- Not demountable
- Limited angular adjustability

Cages
The standard version of our single-row deep groove ball bearings has a sheet steel cage (other cage designs available upon request).

Clearance
The standard version of our single-row deep groove ball bearings is supplied with normal clearance (other clearances available upon request).

Tolerances
The standard version of our single-row deep groove ball bearings has the tolerance class P0 (designs with tighter tolerances available upon request).

Angle setting
The compensation of misalignments in deep groove ball bearings is very limited. Therefore, bearing seats must align very well in the housing and on the shaft. Misalignments interfere with an optimal run of the ball in its raceway, which can cause a premature bearing failure.

Temperature range
The standard version of our single-row deep groove ball bearing is suited for temperatures between -20°C and +120°C. The use of this bearing type outside the specified range requires prior consultation with the LFD engineers.

EMQ design
LFD has developed the EMQ design for special requirements and applications (e.g. electric motors). Thanks to an optimized design, special attention is given to noise features, among other things.

1.18 STRUCTURE OF A DEEP GROOVE BALL BEARING

- Outer ring
- Ball
- Inner ring
- Cage
- Optionally: cover or sealing disc
1.19 BEARING DESIGNATION

The complete bearing designation is composed of a prefix, the base designation and a suffix. In general, prefix symbols indicate special designs. Non-corrosive materials are indicated with the abbreviation for stainless steel for instance.

The base designation provides information about the bearing series (first two digits) and the bore dimensions (last two digits). From code digit 04 and greater, the dimension of the bore diameter is five times the value of the bore diameter code digit (e.g. 6208 means that the bore diameter is \( d = 40 \text{ mm} \)). Exceptions are indicated by a forward slash in front of the code digit.

Cage designs, covers, and seals, etc. are encoded in form of suffixes. The most important abbreviations are listed in the following table:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z</td>
<td>Metal shield</td>
</tr>
<tr>
<td>RS</td>
<td>Contact seal</td>
</tr>
<tr>
<td>RZ</td>
<td>Non-contact seal</td>
</tr>
<tr>
<td>N</td>
<td>Ring groove in outer ring, without snap ring</td>
</tr>
<tr>
<td>NR</td>
<td>Ring groove in outer ring, with snap ring</td>
</tr>
<tr>
<td>V</td>
<td>Extended inner ring, special design</td>
</tr>
<tr>
<td>TNGH</td>
<td>Glass-fiber reinforced plastic cage</td>
</tr>
<tr>
<td>M</td>
<td>Brass cage</td>
</tr>
<tr>
<td>C2</td>
<td>Radial tolerance smaller than normal</td>
</tr>
<tr>
<td>C3</td>
<td>Radial tolerance larger than normal</td>
</tr>
<tr>
<td>C4</td>
<td>Radial tolerance larger than C3</td>
</tr>
<tr>
<td>P6</td>
<td>Accuracy class 6</td>
</tr>
<tr>
<td>PX (n)</td>
<td>Special tolerances</td>
</tr>
<tr>
<td>L (n)</td>
<td>Lubricating grease, e.g. L1 Shell Gadus S2</td>
</tr>
<tr>
<td>VZ</td>
<td>Galvanized surfaces</td>
</tr>
<tr>
<td>EMQ</td>
<td>Optimized design (for special applications such as electric motors)</td>
</tr>
</tbody>
</table>

Example: 6204 ZZ C3 L2 PX1

Example: EMQ 6204
2.0 BEARING DESIGNATIONS

2.1 MR 72, 683, 623, 694, 634, 605 ......................... 52
2.2 6800, 6900, 6000, 6200, 6300, 16003, 6403 ............. 62
2.3 AISI 440 C SS 607, SS 6800, SS 6900, SS 6000, SS 6200, SS 6300 . 94
### 2.1 MR 72 ... 694-2RS MINIATURE BALL BEARINGS

**Designation**

<table>
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<th>Designation</th>
<th>Main dimensions [mm]</th>
<th>Load rating [N]</th>
<th>Limiting speed [min⁻¹]</th>
<th>Dimensions [mm]</th>
<th>Weight [kg]</th>
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<td><strong>B</strong></td>
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* RZ seal available on request

Optimized load rating available on request – * on request – ** also available as EMQ bearing, see chapter 1.18
### 2.1 MR 624 ... 635-2RS MINIATURE BALL BEARINGS

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<th>Main dimensions [mm]</th>
<th>Load rating [N]</th>
<th>Limiting speed [min⁻¹]</th>
<th>Dimensions [mm]</th>
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<td>695-2RS</td>
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<td>625-ZZ</td>
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</tr>
</tbody>
</table>

Optimized load rating available on request – * on request – ** also available as EMQ bearing, see chapter 1.18

* RZ seal available on request

---

**Dimensions**

- **d**: Diameter of the bore
- **D**: Outside diameter
- **B**: Width
- **open**: Open
- **-Z**: Seal Z
- **-ZZ**: Seal ZZ
- **-RS**: Seal RS
- **-2RS**: Seal 2RS
- **-RZ**: Seal RZ
- **-2RZ**: Seal 2RZ

**Optimized load rating** available on request – * on request – ** also available as EMQ bearing, see chapter 1.18
### 2.1 MR 106 ... 627-2RS MINIATURE BALL BEARINGS

<table>
<thead>
<tr>
<th>Designation</th>
<th>Main dimensions [mm]</th>
<th>Load rating [N]</th>
<th>Limiting speed [min⁻¹]</th>
<th>Dimensions [mm]</th>
<th>Weight [kg]</th>
</tr>
</thead>
<tbody>
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<td>45000 54000</td>
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<tr>
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<td>d 6, D 10, B 3,0</td>
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<td>MR 106-2RS</td>
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* RZ seal available on request

Optimized load rating available on request – * on request

** also available as EMQ bearing, see chapter 1.18
2.1 MR 128 ... 629-2RS MINIATURE BALL BEARINGS

Optimized load rating available on request – * on request – ** also available as EMQ bearing, see chapter 1.18

* RZ seal available on request

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### 2.2 6800 ... 6301-2RS DEEP GROOVE BALL BEARINGS

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Optimized load rating available on request – ** on request – ** also available as EMQ bearing, see chapter 1.18

* RZ seal available on request
## 2.2 6802 ... 63003-2RS DEEP GROOVE BALL BEARINGS

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Optimized load rating available on request – * on request – ** also available as EMQ bearing, see chapter 1.18

* RZ seal available on request
2.2 6203 ... 6404 DEEP GROOVE BALL BEARINGS

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*RZ seal available on request

Optimized load rating available on request – ** on request – ** also available as EMQ bearing, see chapter 1.18
2.2 6805 ... 63006-2RS DEEP GROOVE BALL BEARINGS

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Optimized load rating available on request – * on request – ** also available as EMQ bearing, see chapter 1.18

* RZ seal available on request
2.2 6206 ... 6407 DEEP GROOVE BALL BEARINGS

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<td>8500, 10000</td>
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<td>8500</td>
<td>44,0, 71,0</td>
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* RZ seal available on request

Optimized load rating available on request – ** on request – ** also available as EMQ bearing, see chapter 1.18
2.2 6808 ... 16009-2RS DEEP GROOVE BALL BEARINGS

* RZ seal available on request

![Bearings Diagram](image)

### Designation | Main dimensions [mm] | Load rating [N] | Limiting speed [min⁻¹] | Dimensions [mm] | Weight [kg]
--- | --- | --- | --- | --- | ---
6808 | d 40 52 7 | D 4500 4050 | B 12000 14000 | Cr 42,0 50,0 | Da 0,033
6808-ZZ | d 40 52 7 | D 4500 4050 | B 12000 | Cr 42,0 50,0 | Da 0,033
6808-2RS | d 40 52 7 | D 4500 4050 | B 6700 | Cr 42,0 50,0 | Da 0,033
6908 | d 40 62 12 | D 14600 10200 | B 11000 13000 | Cr 44,0 58,0 | Da 0,110
6908-ZZ | d 40 62 12 | D 14600 10200 | B 11000 | Cr 44,0 58,0 | Da 0,110
6908-2RS | d 40 62 12 | D 14600 10200 | B 6300 | Cr 44,0 58,0 | Da 0,110
16008 | d 40 68 9 | D 13300 9800 | B 9500 12000 | Cr 42,0 66,0 | Da 0,130
16008-ZZ | d 40 68 9 | D 13300 9800 | B 9500 | Cr 42,0 66,0 | Da 0,130
16008-2RS | d 40 68 9 | D 13300 9800 | B 6300 | Cr 42,0 66,0 | Da 0,130
6008 ** | d 40 68 15 | D 16800 11600 | B 9500 12000 | Cr 44,6 63,4 | Da 0,210
6008-ZZ ** | d 40 68 15 | D 16800 11600 | B 9500 | Cr 44,6 63,4 | Da 0,210
6008-2RS ** | d 40 68 15 | D 16800 11600 | B 9500 | Cr 44,6 63,4 | Da 0,210
63008-2RS | d 40 68 21 | D 15900 10900 | B 5900 | Cr 44,6 63,3 | Da 0,260
6208 ** | d 40 80 18 | D 32000 17800 | B 8500 10000 | Cr 47,0 73,0 | Da 0,402
6208-ZZ ** | d 40 80 18 | D 32000 17800 | B 8500 | Cr 47,0 73,0 | Da 0,402
6208-2RS * | d 40 80 18 | D 32000 17800 | B 5600 | Cr 47,0 73,0 | Da 0,402
6208-ZZ ** | d 40 80 18 | D 32000 17800 | B 5600 | Cr 47,0 73,0 | Da 0,402
6308-2RS ** | d 40 90 23 | D 40700 24000 | B 5000 | Cr 49,0 81,0 | Da 0,635
6308-ZZ ** | d 40 90 23 | D 40700 24000 | B 5000 | Cr 49,0 81,0 | Da 0,635
6308-2RS ** | d 40 90 23 | D 40700 24000 | B 5000 | Cr 49,0 81,0 | Da 0,635
6308-2RS ** | d 40 90 23 | D 42000 24500 | B 5000 | Cr 49,0 81,0 | Da 0,908
6408 | d 40 110 27 | D 64000 35000 | B 6700 8000 | Cr 53,0 97,0 | Da 1,227
6809 | d 45 58 7 | D 6400 5650 | B 9500 12000 | Cr 47,0 56,0 | Da 0,040
6809-ZZ | d 45 58 7 | D 6400 5650 | B 9500 | Cr 47,0 56,0 | Da 0,040
6809-2RS | d 45 58 7 | D 6400 5650 | B 5900 | Cr 47,0 56,0 | Da 0,040
6909 | d 45 68 12 | D 15100 11200 | B 9800 12000 | Cr 49,0 64,0 | Da 0,128
6909-ZZ | d 45 68 12 | D 15100 11200 | B 9800 | Cr 49,0 64,0 | Da 0,128
6909-2RS | d 45 68 12 | D 15100 11200 | B 5600 | Cr 49,0 64,0 | Da 0,128
16009 | d 45 75 10 | D 15600 12300 | B 9000 11000 | Cr 48,2 71,8 | Da 0,170
16009-ZZ | d 45 75 10 | D 15600 12300 | B 9000 | Cr 48,2 71,8 | Da 0,170
16009-2RS | d 45 75 10 | D 15600 12300 | B 9000 | Cr 48,2 71,8 | Da 0,170

Optimized load rating available on request – * on request – ** also available as EMQ bearing, see chapter 1.18
### 2.2 6009 ... 6410 DEEP GROOVE BALL BEARINGS

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<th>Weight [kg]</th>
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<td>75</td>
<td>16</td>
<td>9000</td>
<td>11000</td>
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<td>16</td>
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<td>10000</td>
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<td>20</td>
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<td>20</td>
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<td>27</td>
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Optimized load rating available on request – ** on request – ** also available as EMQ bearing, see chapter 1.18

* RZ seal available on request
### 2.2 6811 ... 62212-2RS DEEP GROOVE BALL BEARINGS

<table>
<thead>
<tr>
<th>Designation</th>
<th>Main dimensions [mm]</th>
<th>Load rating [N]</th>
<th>Limiting speed [min⁻¹]</th>
<th>Dimensions [mm]</th>
<th>Weight [kg]</th>
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<td>6811-2RS</td>
<td>d 55  72  9  B 8800 8100 4800 57,0 70,0 0,083</td>
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<tr>
<td>6311-ZZ **</td>
<td>d 55 120 29  B 71500 44600 5300 66,0 109,0 1,380</td>
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<tr>
<td>6311-2RS **</td>
<td>d 55 120 29  B 71500 44600 3600 66,0 109,0 1,380</td>
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<td>62311-2RS</td>
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<td>6812-ZZ</td>
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<td>6812-2RS</td>
<td>d 60  78 10  B 11500 10600 4400 62,0 76,0 0,106</td>
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<tr>
<td>16012</td>
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Optimized load rating available on request  –  * on request  –  ** also available as EMQ bearing, see chapter 1.18

* RZ seal available on request
2.2 6312 ... 16014 DEEP GROOVE BALL BEARINGS

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<th>Dimensions [mm]</th>
<th>Weight [kg]</th>
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<td>dyn. Cₚ = 11600</td>
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<td>0.440</td>
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2.2 6014 ... 6816-2RS DEEP GROOVE BALL BEARINGS

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Optimized load rating available on request – * on request – ** also available as EMQ bearing, see chapter 1.18

* RZ seal available on request
2.2 6916 ... 6417 DEEP GROOVE BALL BEARINGS

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2.2 6818 ... 6319-2RS DEEP GROOVE BALL BEARINGS

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* RZ seal available on request

Optimized load rating available on request – ** on request – ** also available as EMQ bearing, see chapter 1.18
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Optimized load rating available on request – * on request – ** also available as EMQ bearing, see chapter 1.18

* RZ seal available on request
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Optimized load rating available on request  –  * on request  –  ** also available as EMQ bearing, see chapter 1.18

* RZ seal available on request
### 2.2 6926 ... 6330 DEEP GROOVE BALL BEARINGS

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Optimized load rating available on request – * on request – ** also available as EMQ bearing, see chapter 1.18

* RZ seal available on request
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Optimized load rating available on request – * on request – ** also available as EMQ bearing, see chapter 1.18

* RZ seal available on request
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* RZ seal available on request

Optimized load rating available on request – * on request – ** also available as EMQ bearing, see chapter 1.18
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* RZ seal available on request

Optimized load rating available on request – * on request  – ** also available as EMQ bearing, see chapter 1.18
### 3.0 PRODUCT OFFERING

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LFD Bearings Product Offering

LFD Deep Groove Ball Bearings
- Series: 60.., 62.., 63.., 64.., 68.., 69.., 160.., -2Z/2RS
- Are suitable for radial and axial loads in both directions
- Are especially versatile
- Suitable for high speeds
- Simple structure for more economic bearing solutions
- Also available in steel with increased corrosion resistance (AISI 440C)

LFD Taper Roller Bearings
- Series: 320.., 330.., 331.., 302.., 322.., 332.., 303.., 313.., 323..
- Suitable for high radial and axial loads in one direction
- Capable of absorbing simultaneously acting radial and axial loads
- Dismountable; the inner ring (including rollers and cage) can be mounted separately from the outer ring

LFD Spherical Roller Bearings
- Series: 213.., 222.., 223.., 230.., 231.., 232.., 240.., 241.., 239..
- Suitable for high axial and radial loads in both directions
- Designed for very high loads
- Compensate for angular misalignments

LFD Cylindrical Roller Bearings
- Series: N, NJ, NU, NUP 2.., 3.., 4.., 22.., 23.., (E)..
- Suitable for high radial loads
- Reinforced E-version designed for highest load carrying capacities
- Detachable design facilitating mounting and dismounting
- Various cylindrical roller guide configurations, with or without guiding lips on outer or inner ring

LFD Bearing Units
- In different types
- Available as grey cast iron or sheet steel housings with sealed, deep groove ball bearings inserted
- Fixed to the shaft by grub screws, eccentric collar, or adapter sleeve
- Compensate for static misalignment of the shaft by the spherical outer ring of the inserted ball bearing
- Under normal service conditions, the sealed bearings are oiled with lubricant for their entire service life

LFD Plummer Blocks
- SNL 5.., 7225.., S 30.., K, SD 31.., TS
- Reinforced design
- Optimum heat dissipation
- Can be relubricated, with oil or grease lubrication
- Made of grey cast iron, or spheroidal graphite iron for higher strength
- Combination of cylindrical and tapered, self-aligning ball bearings and spherical roller bearings 22.., 23.., 222.., 223.., 240.., 230.., 231.. and 232..
- For locating or non-locating bearings
- Different sealing options

LFD Spherical Plain Bearings
- In different types, maintenance-free and requiring maintenance
- For high radial loads
- Sliding contact surface: hard chromium/PTFE fabric or composite
- Sliding contact surface: steel/steel
- Rod ends
- Hydraulic rod ends
- Standardized accessories

System Engineering

LFD Agri Hub
- Quick mounting
- Relubrication-free
- Cost reduction
- Reinforced stone protection
Success Through Precision.

THE LFD GROUP
The LFD Group is represented on all continents.
In addition to the central warehouse in Germany, the LFD Group also maintains storage capacities in Italy, USA, Chile and China. With branch offices around the globe, the LFD Group provides a quick response and short delivery times.
Please see your corresponding contact at: www.LFD.eu/contacts