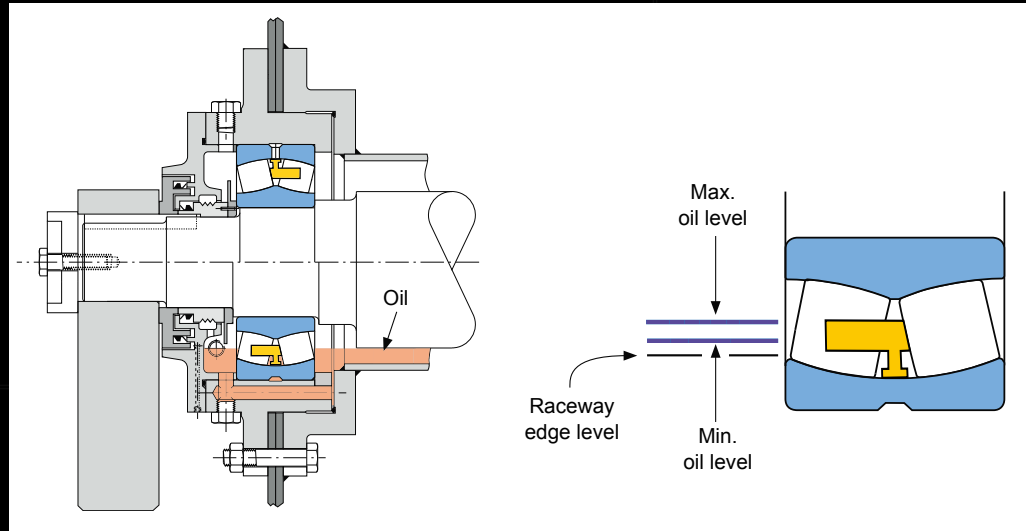
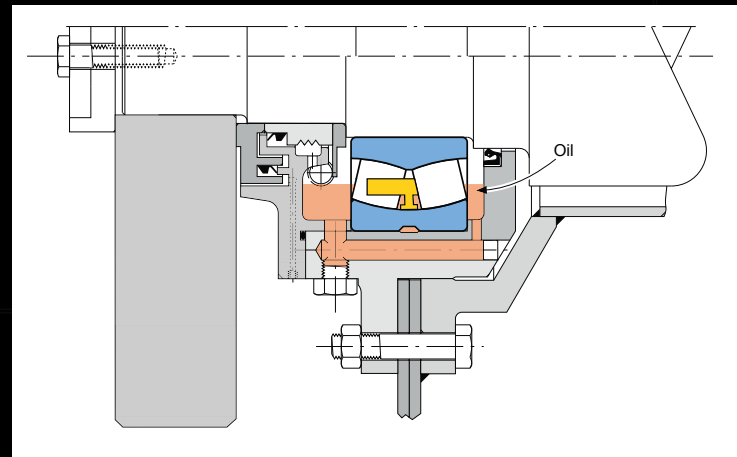


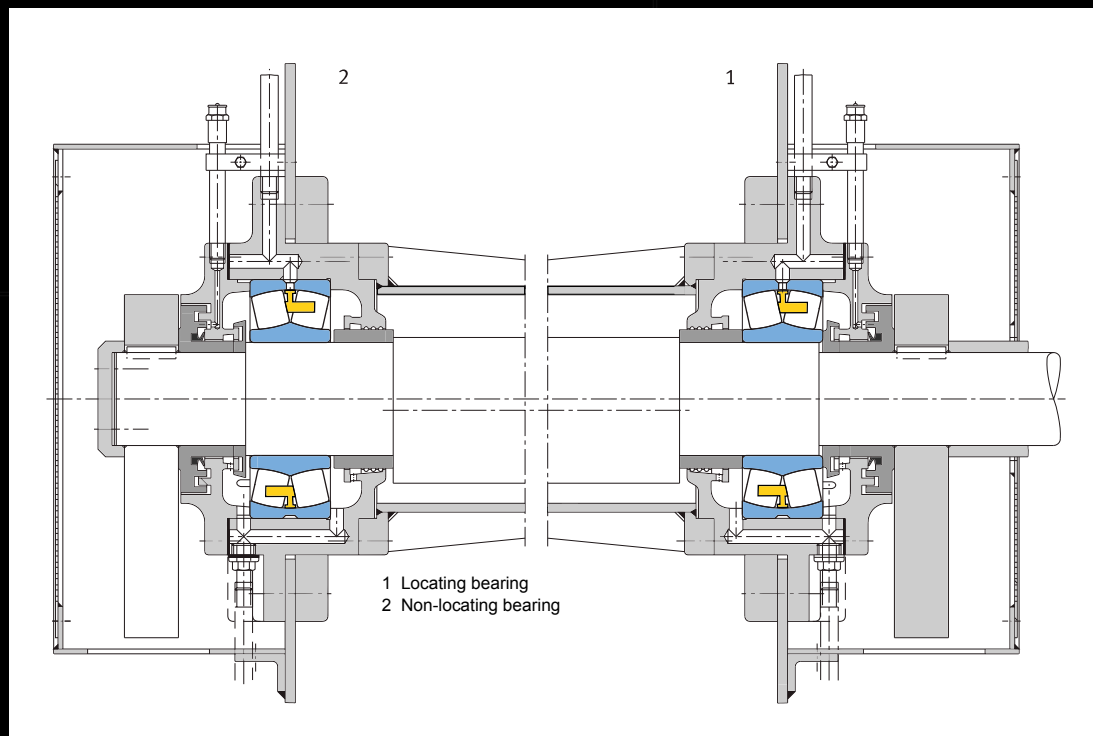
Example of lubrication in oil bath



Example of lubrication with circulation pump



Example of ZKL spherical roller bearing vibration applications



History is the base for the present and a challenge for the **future**.



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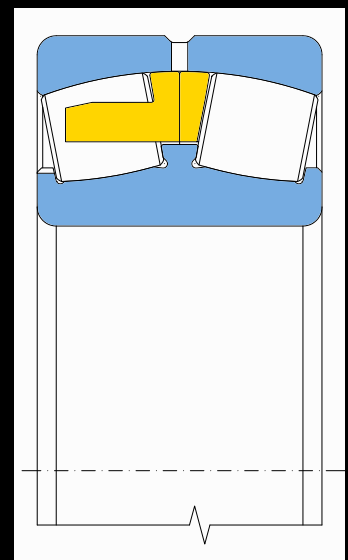
ZKL SPHERICAL ROLLER BEARINGS FOR VIBRATION MACHINERY AND EQUIPMENT

ZKL spherical roller bearings for vibration machinery and equipment

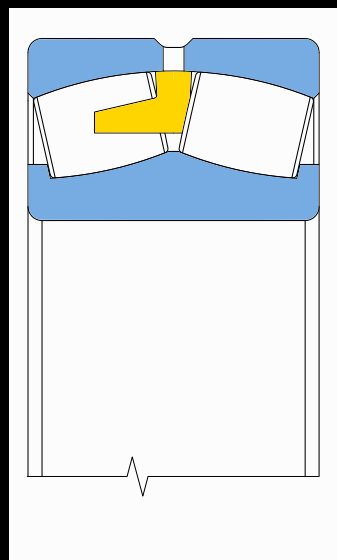
For increased reliability in environments with increased vibration and impact levels ZKL produces double-row spherical roller bearings of 223 series, or 233 series, with identification EMHD2.

Structure

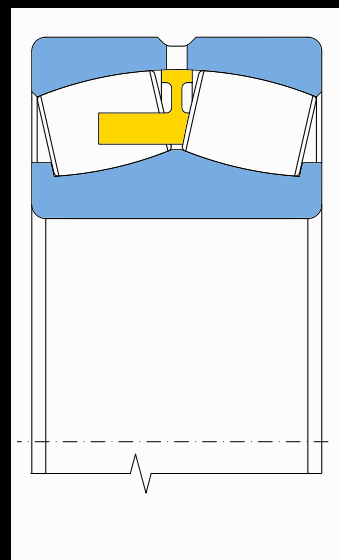
These are bearings with higher load-bearing capacity and symmetrical spherical rollers, a single-component massive brass case on the outer race. The bearings are provided with standard radial clearance within the scope of C4 and tapered tolerances of the connection dimensions of the bore (in the case of bearings with cylindrical bore) and outer diameter. The outer races are as a standard equipped with a perimeter groove with three lubrication holes W33. The increased radial clearance and the way of the cage guidance and the groove with lubrication holes are not specifically identified for these bearings as they are included in the combined identification of D2.



**New structure
22308 – 19 EMHD2**



Old structure MD1



**New structure
22320 – 36 EMHD2**

Dimensions and tolerances

| Tolerances of bore dimensions and outer diameter of spherical roller bearings by ZKL for vibration applications | | | | | | | | | |
|---|-----------------|--|----------------|-----------------|--|-----|-----------------|--|--|
| Diameter of the bore | Tolerance class | | Outer diameter | Tolerance class | | D | Tolerance class | | |
| | Normal | For bearings in vibration applications | | Normal | For bearings in vibration applications | | Normal | For bearings in vibration applications | For bearings in vibration applications |
| d | min | max | min | max | min | max | min | max | max |
| mm | μm | μm | μm | μm | mm | μm | μm | μm | μm |
| 30 do 50 | 0 | -12 | 0 | -7 | 80 do 150 | 0 | -15; (-18) | -5 | -13 |
| 50 do 80 | 0 | -15 | 0 | -9 | 150 do 180 | 0 | -25 | -5 | -18 |
| 80 do 120 | 0 | -20 | 0 | -12 | 180 do 315 | 0 | -30; (-35) | -10 | -23 |
| 120 do 180 | 0 | -25 | 0 | -15 | 315 do 400 | 0 | -40 | -13 | -28 |

The principal dimensions of spherical roller bearings by ZKL designed for vibration machines comply with ISO 15-1998 standard.

Tolerance values comply with ISO 492-2002 standard.

Spherical roller bearings by ZKL for vibration applications are made with higher precision than standard P0.

Inner Radial Clearance

Bearings for vibration applications, series 223 and 233, are made as a standard with inner radial clearance C4. The bearing clearance is included in D2. The inner radial clearance value C4 complies with ISO 5753-1991 standard.

| Inner radial clearance of spherical roller bearings | | | | | |
|---|------------------|-----|--------------|-----|-----|
| Bore diameter d | Cylindrical bore | | Tapered bore | | |
| | min | max | min | max | |
| 30 | 40 | 60 | 80 | 65 | 85 |
| 40 | 50 | 75 | 100 | 80 | 100 |
| 50 | 65 | 90 | 120 | 95 | 120 |
| 65 | 80 | 110 | 145 | 120 | 150 |
| 80 | 100 | 135 | 180 | 140 | 180 |
| 100 | 120 | 160 | 210 | 170 | 220 |
| 120 | 140 | 190 | 240 | 200 | 260 |
| 140 | 160 | 220 | 280 | 230 | 300 |
| 160 | 180 | 240 | 310 | 260 | 340 |
| 180 | 200 | 260 | 340 | 290 | 370 |
| 200 | 225 | 290 | 380 | 320 | 410 |
| 225 | 250 | 320 | 420 | 350 | 450 |

Misalignment

The structure of spherical roller bearings by itself allows for their tipping i.e. the misalignment may be balanced by tipping of the outer race in relation to the inner race without any negative effect on the bearing.

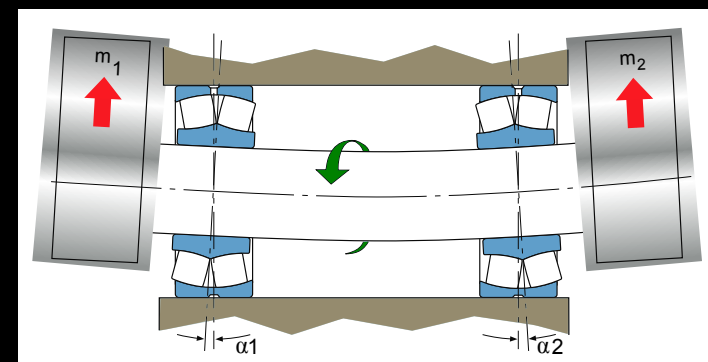
Tipping angle of bearing series 223 and 233 is 2°.

The actual application determines whether this value may be used to the full or not.

If the misalignment position changes in relation to the outer race, for example in

- vibration sieves with rotating imbalance where the shaft sag rotates with the shaft rotation
- support rolls of paper mill machines where the stationary shaft sags,

then the operating bearing slips. As this is associated with heat generation, the tipping of the inner race in relation to the outer race is not recommended to exceed 0.1°. Higher tipping values than 0.2° to 0.3° are also possible, though, if adequate lubrication and cooling are provided.



Effect of Operation Temperature on Bearing Materials

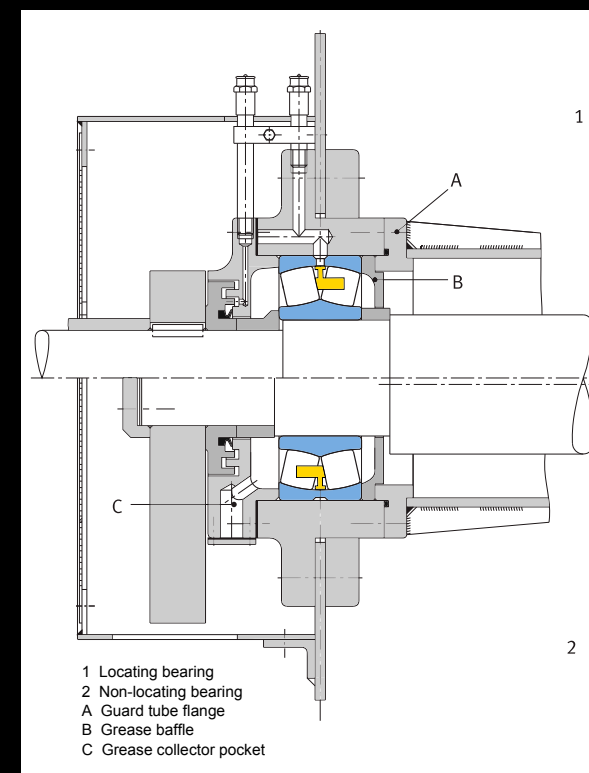
All ZKL spherical roller bearings are subject to special heat treatment allowing their use at operation temperatures up to 200 °C without impermissible dimensional changes. The corresponding additional identification S₁ is not used.

Axial Load

Double-row spherical roller bearings under radial load may transfer considerable axial loads. In the case of the axial to radial load ratio $F_a / F_r > e$ (the coefficient shown in the tables) grease re-lubrication interval shortening is recommended.

Lubrication

Example of grease lubrication



Product Table

| d | D | B | r _e | a | b | Basic load-bearing capacity | | Limit fatigue load P _v | Limit rotation frequency for lubrication | | Bearing type | | Connection dimensions | | | Weight | | Clamping case | Folding case | Locknut | Coefficients | | | | |
|-----|-----|------|----------------|-----|------|-----------------------------|-----------------|-----------------------------------|--|------|------------------|--------------|-----------------------|----------------|----------------|--------|-------|---------------|--------------|---------|--------------|----------------|----------------|----------------|-----|
| | | | | | | D _r | D _{or} | | Grease | Oil | Cylindrical bore | Tapered bore | d _s | D _s | r _s | ~ | K | | | | e | Y ₁ | Y ₂ | Y ₀ | |
| mm | | | | | | kN | | kN | min ⁻¹ | | | | mm | | | kg | | | | | | | | | |
| min | | | | | | kN | | kN | min ⁻¹ | | | | mm | | | kg | | | | | | | | | |
| 40 | 90 | 33 | 1.5 | 3 | 5.5 | 154 | 160 | 20 | 4100 | 5100 | 22308EMHD2** | 22308EKMHHD2 | 49 | 81 | 1.5 | 1.07 | 1.05 | H2308 | AH2308 | KM9 | 0.36 | 1.8 | 2.6 | 1.8 | |
| 50 | 110 | 40 | 2 | 3 | 5.5 | 220 | 238 | 29 | 3300 | 4000 | 22310EMHD2** | 22310EKMHHD2 | 60 | 100 | 2 | 1.92 | 1.88 | H2310 | AH2310X | KM11 | 0.36 | 1.9 | 2.7 | 1.8 | |
| 55 | 120 | 43 | 2 | 3 | 5.5 | 253 | 279 | 34 | 3000 | 3800 | 22311EMHD2** | 22311EKMHHD2 | 65 | 110 | 2 | 2.44 | 2.39 | H2311 | AH2311X | KM12 | 0.35 | 1.9 | 2.8 | 1.9 | |
| 60 | 130 | 46 | 2.1 | 3 | 5.5 | 304 | 315 | 38 | 2800 | 3600 | 22312EMHD2** | 22312EKMHHD2 | 72 | 118 | 2 | 3.03 | 2.97 | H2312 | AH2312X | KM13 | 0.35 | 1.9 | 2.9 | 1.9 | |
| 65 | 140 | 48 | 2.1 | 3 | 5.5 | 329 | 351 | 42 | 2600 | 3400 | 22313EMHD2** | 22313EKMHHD2 | 77 | 128 | 2 | 3.64 | 3.56 | H2313 | AH2313 | KM15 | 0.34 | 2 | 3 | 2 | |
| 70 | 150 | 51 | 2.1 | 3 | 5.5 | 376 | 402 | 48 | 2400 | 3100 | 22314EMHD2** | 22314EKMHHD2 | 82 | 138 | 2 | 4.40 | 4.31 | H2314 | AH2314X | KM16 | 0.34 | 2 | 3 | 2 | |
| 75 | 160 | 55 | 2.1 | 4.5 | 8.3 | 436 | 489 | 57 | 2300 | 3000 | 22315EMHD2** | 22315EKMHHD2 | 87 | 148 | 2 | 5.48 | 5.36 | H2315 | AH2315X | KM17 | 0.33 | 2 | 3 | 2 | |
| 80 | 170 | 58 | 2.1 | 4.5 | 8.3 | 487 | 551 | 63 | 2200 | 2800 | 22316EMHD2** | 22316EKMHHD2 | 92 | 158 | 2 | 6.51 | 6.37 | H2316 | AH2316X | KM18 | 0.33 | 2 | 3 | 2 | |
| 85 | 180 | 60 | 3 | 4.5 | 8.3 | 530 | 603 | 68 | 2000 | 2600 | 22317EMHD2** | 22317EKMHHD2 | 99 | 166 | 2.5 | 7.48 | 7.34 | H2317 | AH2317X | KM19 | 0.32 | 2.1 | 3.1 | 2 | |
| 90 | 190 | 64 | 3 | 4.5 | 8.3 | 590 | 673 | 74 | 1900 | 2400 | 22318EMHD2** | 22318EKMHHD2 | 104 | 176 | 2.5 | 8.89 | 8.70 | H2318 | AH2318X | KM20 | 0.33 | 2.1 | 3.1 | 2 | |
| 95 | 200 | 67 | 3 | 4.5 | 8.3 | 665 | 744 | 81 | 1800 | 2300 | 22319EMHD2** | 22319EKMHHD2 | 109 | 186 | 2.5 | 10.30 | 10.00 | H2319 | AH2319X | KM21 | 0.33 | 2.1 | 3.1 | 2 | |
| 100 | 215 | 73 | 3 | 4.5 | 8.3 | 750 | 842 | 90 | 1700 | 2200 | 22320EMHD2** | 22320EKMHHD2 | 114 | 201 | 2.5 | 12.8 | 12.6 | H2320 | AH2320X | KM22 | 0.33 | 2 | 3 | 2 | |
| 110 | 240 | 80 | 3 | 6 | 11.1 | 868 | 1000 | 103 | 1500 | 1900 | 22322EMHD2** | 22322EKMHHD2 | 124 | 226 | 2.5 | 17.9 | 17.5 | H2322 | AH2322X | KM25 | 0.33 | 2.1 | 3.1 | 2 | |
| 110 | 240 | 92.1 | 3 | 6 | 11.1 | 900 | 1160 | 120 | 1400 | 1800 | 23322EMHD2** | - | 124 | 226 | 2.5 | 20.5 | - | - | - | - | - | - | 1.8 | 2.6 | 1.7 |
| 120 | 260 | 86 | 3 | 6 | 11.1 | 1020 | 1180 | 119 | 1400 | 1800 | 22324EMHD2** | 22324EKMHHD2 | 134 | 246 | 2.5 | 22.9 | 22.5 | H2324 | AH2324X | KM27 | 0.33 | 2.1 | 3.1 | 2 | |
| 130 | 280 | 93 | 4 | 7.5 | 13.9 | 1180 | 1380 | 136 | 1300 | 1700 | 22326EMHD2** | 22326EKMHHD2 | 148 | 262 | 3 | 28.0 | 27.4 | H2326 | AH2326X | KM29 | 0.33 | 2.1 | 3.1 | 2 | |
| 140 | 300 | 102 | 4 | 7.5 | 13.9 | 1320 | 1560 | 150 | 1200 | 1500 | 22328EMHD2** | 22328EKMHHD2 | 158 | 282 | 3 | 34.9 | 34.2 | H2328 | AH2328X | KM31 | 0.34 | 2 | 3 | 2 | |
| 150 | 320 | 108 | 4 | 9 | 16.7 | 1520 | 1850 | 175 | 1000 | 1400 | 22330EMHD2** | 22330EKMHHD2 | 168 | 302 | 3 | 42.3 | 41.5 | H2330 | AH2330X | KM33 | 0.33 | 2 | 3 | 2 | |
| 160 | 340 | 114 | 4 | 9 | 16.7 | 1690 | 2090 | 194 | 1000 | 1300 | 22332EMHD2** | 22332EKMHHD2 | 178 | 322 | 3 | 52.0 | 51.0 | H2332 | AH2332 | KM36 | 0.33 | 2 | 3 | 2 | |
| 170 | 360 | 120 | 4 | 9 | 16.7 | 1780 | 2280 | 179 | 950 | 1250 | 22334EMHD2** | 22334EKMHHD2 | 188 | 342 | 3 | 59.1 | 57.8 | H2334 | AH2334 | KM38 | 0.34 | 2 | 3 | 2 | |
| 180 | 380 | 126 | 4 | 12 | 22.3 | 1950 | 2530 | 227 | 900 | 1200 | 22336EMHD2** | 22336EKMHHD2 | 198 | 362 | 3 | 68.7 | 67.2 | H2336 | AH2336 | KM40 | 0.33 | 2.1 | 3.1 | 2 | |

The following equation applies to bearings re-lubricated with an automatic lubrication unit:

$$m_1 = 0.00004 \cdot D \cdot B$$

Where:

- m_1 – required lubricant quantity
- D – external diameter of bearing
- B – bearing width