

FAG



Sealed FAG Spherical Roller Bearings

The cost-effective and environmentally friendly solution

SCHAEFFLER GROUP
INDUSTRIAL

Application

Continuous casting plants feature a large number of spherical roller bearings. Most of the bearings are grease-lubricated. Ensuring continuous supply of many bearings means that an enormous amount of grease is used. Therefore, in order to reduce costs and meet increasingly stringent obligations to protect the environment, the operators of continuous casting plants are eager to reduce the grease consumption.

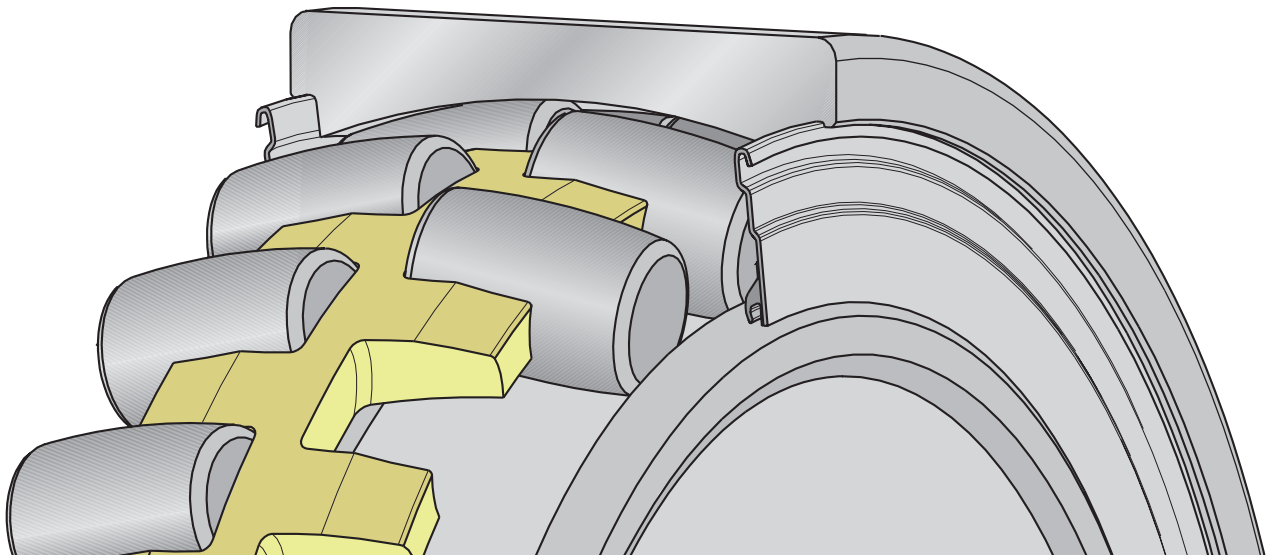
Field experience shows that sealed spherical roller bearings are an excellent solution to this problem. They require up to 80% less grease than open bearings.

The new, improved design of sealed spherical roller bearings is also suitable for other fields of application, e.g. pumps, transmissions, materials handling engineering. If necessary, the bearing design has to be adapted accordingly.

Characteristics of the new design of sealed spherical roller bearings:

- Main dimensions identical with those of open bearings, facilitating in many cases simple substitution
- Load ratings of most sizes comparable with those of open bearings with metal cage
- E-design, i.e. inner ring without centre lip
- Machined brass cage or pressed steel cage
- Greasing with a lubricant tested by FAG (DIN 51502 KP2R-30), for temperature range $-35...+180\text{ °C}$
- Dimensionally stable up to 200 °C
- Radial clearance C4

Sealed FAG spherical roller bearing for continuous casting mills



- Rubbing seals made of fluorocautchouc, suitable for temperatures of $-30...+180\text{ °C}$ – for a short period $+200\text{ °C}$

Safety note: FAG use fluorinated materials for seals made of fluorocautchouc (FKM, FPM, e.g. Viton®). It has to be taken into account that the very efficient fluorinated materials, when heated above $+300\text{ °C}$, can give off gasses and vapours which are detrimental to health. This has to be remembered especially if bearing parts are dismantled with a welding torch. Where high temperatures cannot be avoided the safety data sheet for the fluorinated material in question should be observed. The data sheet is available on request.

- Self-aligning capability 0.5° from centre position
- Special design with circumferential groove and three lubricating holes in the outer ring available (suffix H40F)

Programme

The FAG product programme covers sealed spherical roller bearings with bore diameters ranging from 40 to 200 mm. The delivery periods for sealed spherical roller bearings will be indicated upon inquiry.

Equivalent dynamic load

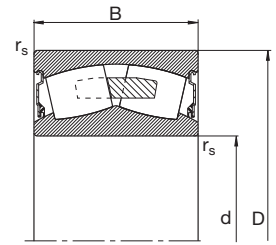
$$P = F_r + Y_1 \cdot F_a \quad [\text{kN}] \quad \text{for } F_a/F_r \leq e$$

$$P = 0.67 F_r + Y_2 \cdot F_a \quad [\text{kN}] \quad \text{for } F_a/F_r > e$$

Equivalent static load

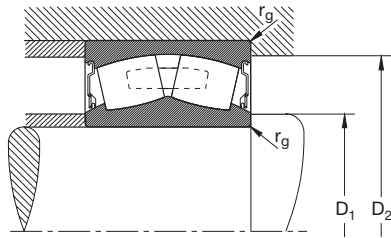
$$P_0 = F_r + Y_0 \cdot F_a \quad [\text{kN}]$$

Sealed spherical roller bearings



| Dimension | | | | Load rating · Factor | | | | | | Mass |
|-----------|-----|------|-----------------------|------------------------|------|----------------|----------------|--------------------------|----------------|--------------|
| d | D | B | r _s min | dyn. C _r | e | Y ₁ | Y ₂ | stat. C _{0r} | Y ₀ | m ≈ kg |
| mm | | | | kN | | | | | | |
| 40 | 80 | 28 | 1.1 | 88 | 0.28 | 2.41 | 3.59 | 95 | 2.35 | 0.62 |
| 45 | 85 | 28 | 1.1 | 93 | 0.26 | 2.62 | 3.9 | 106 | 2.56 | 0.69 |
| 50 | 90 | 28 | 1.1 | 98 | 0.24 | 2.81 | 4.19 | 114 | 2.75 | 0.72 |
| 55 | 100 | 31 | 1.5 | 120 | 0.23 | 2.92 | 4.35 | 146 | 2.86 | 1.03 |
| 60 | 110 | 34 | 1.5 | 143 | 0.24 | 2.84 | 4.23 | 166 | 2.78 | 1.32 |
| 65 | 120 | 38 | 1.5 | 173 | 0.24 | 2.81 | 4.19 | 208 | 2.75 | 1.8 |
| 70 | 125 | 38 | 1.5 | 173 | 0.23 | 2.95 | 4.4 | 228 | 2.89 | 1.85 |
| 70 | 150 | 51 | 2.1 | 305 | 0.29 | 2.32 | 3.45 | 345 | 2.26 | 4.2 |
| 75 | 130 | 38 | 1.5 | 183 | 0.22 | 3.1 | 4.62 | 236 | 3.03 | 2 |
| 80 | 140 | 40 | 2 | 212 | 0.22 | 3.14 | 4.67 | 270 | 3.07 | 2.43 |
| 85 | 150 | 44 | 2 | 260 | 0.22 | 3.04 | 4.53 | 325 | 2.97 | 3.05 |
| 90 | 150 | 72 | 2.5 ¹⁾ | 390 | 0.43 | 1.59 | 2.36 | 600 | 1.55 | 5.5 |
| 90 | 160 | 48 | 2 | 285 | 0.23 | 2.9 | 4.31 | 360 | 2.83 | 3.9 |
| 90 | 160 | 52.4 | 2 | 325 | 0.26 | 2.55 | 3.8 | 425 | 2.5 | 4.4 |
| 100 | 150 | 50 | 2 | 255 | 0.26 | 2.6 | 3.87 | 430 | 2.54 | 3.1 |
| 100 | 165 | 52 | 2 | 335 | 0.26 | 2.62 | 3.9 | 480 | 2.56 | 4.2 |
| 100 | 170 | 65 | | 415 | 0.32 | 2.09 | 3.11 | 655 | 2.04 | 6.1 |
| 100 | 180 | 60.3 | 2.1 | 405 | 0.24 | 2.84 | 4.23 | 550 | 2.78 | 7.2 |
| 100 | 180 | 55 | 2.1 | 360 | 0.28 | 2.43 | 3.61 | 465 | 2.37 | 5.74 |
| 110 | 170 | 45 | 2 | 275 | 0.20 | 3.31 | 4.92 | 440 | 3.23 | 3.7 |
| 110 | 170 | 60 | 2 | 355 | 0.28 | 2.39 | 3.56 | 600 | 2.34 | 5 |
| 110 | 180 | 69 | 2 | 450 | 0.33 | 2.06 | 3.06 | 680 | 2.01 | 7 |
| 110 | 200 | 62 | 2.1 | 455 | 0.25 | 2.71 | 4.04 | 585 | 2.65 | 8 |
| 120 | 180 | 46 | 2 | 300 | 0.28 | 2.43 | 3.61 | 450 | 2.37 | 4 |
| 120 | 180 | 60 | 2 | 400 | 0.28 | 2.39 | 3.56 | 695 | 2.34 | 5.4 |
| 130 | 200 | 52 | 2 | 390 | 0.20 | 3.46 | 5.15 | 600 | 3.38 | 5.75 |
| 130 | 200 | 69 | 2 | 480 | 0.29 | 2.3 | 3.42 | 850 | 2.25 | 7.9 |
| 130 | 210 | 80 | 2 | 600 | 0.32 | 2.09 | 3.11 | 1000 | 2.04 | 10.8 |
| 140 | 210 | 69 | 2 | 520 | 0.27 | 2.49 | 3.71 | 915 | 2.43 | 8.2 |
| 140 | 225 | 85 | 2.1 | 655 | 0.32 | 2.09 | 3.11 | 1140 | 2.04 | 12.7 |
| 150 | 225 | 75 | 2.1 | 600 | 0.27 | 2.49 | 3.71 | 1060 | 2.43 | 10.3 |
| 150 | 250 | 100 | 2.1 | 880 | 0.35 | 1.95 | 2.9 | 1530 | 1.91 | 20 |
| 160 | 240 | 80 | 2.1 | 655 | 0.28 | 2.45 | 3.64 | 1200 | 2.39 | 12.7 |
| 160 | 270 | 86 | 2.1 | 865 | 0.25 | 2.67 | 3.97 | 1290 | 2.61 | 19.4 |
| 170 | 260 | 90 | 2.1 | 830 | 0.18 | 3.66 | 5.46 | 1460 | 3.58 | 15.5 |
| 170 | 280 | 109 | 2.1 | 1040 | 0.34 | 1.99 | 2.96 | 1800 | 1.94 | 26.3 |
| 180 | 280 | 100 | 2.1 | 965 | 0.29 | 2.33 | 3.47 | 1730 | 2.28 | 22.8 |
| 190 | 290 | 75 | 2.1 | 800 | 0.2 | 3.46 | 5.15 | 1270 | 3.38 | 17.2 |
| 200 | 310 | 109 | 3 | 1180 | 0.29 | 2.33 | 3.47 | 2240 | 2.28 | 30.5 |
| 200 | 340 | 140 | 3 | 1660 | 0.37 | 1.83 | 2.72 | 2900 | 1.79 | 52.5 |

¹⁾ inner ring chamfer r_{smin} = 0.6 mm



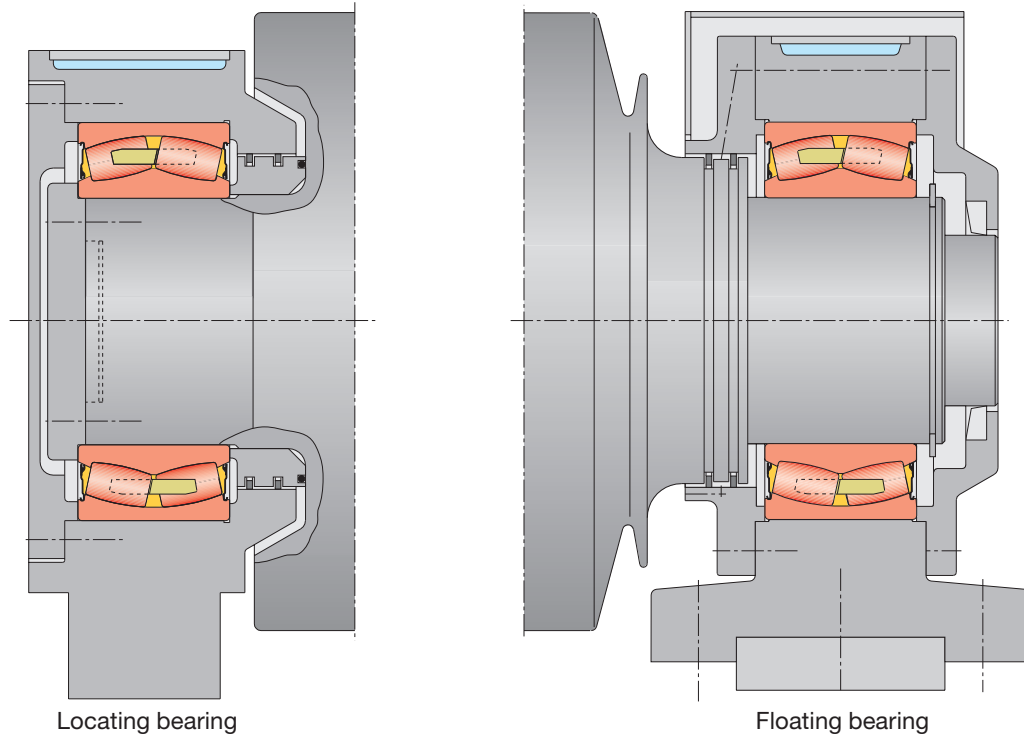
| Code sealed bearing | permissible speed ³⁾ min ⁻¹ | Abutment | | | Code open bearing | Dimension | | |
|---------------------------|---|-----------------------------|-----------------------|-----------------------|-------------------------|-----------|-----|------|
| | | D ₁ min mm | D ₂ max | r _g max | | d mm | D | B |
| FAG | | | | | FAG | | | |
| 803019 | 2400 | 47 | 73 | 1 | 22208 | 40 | 80 | 23 |
| 803020 | 2400 | 52 | 78 | 1 | 22209 | 45 | 85 | 23 |
| 803021 | 2200 | 57 | 83 | 1 | 22210 | 50 | 90 | 23 |
| 803022 | 1900 | 64 | 91 | 1.5 | 22211 | 55 | 100 | 25 |
| 803023 | 1700 | 69 | 101 | 1.5 | 22212 | 60 | 110 | 28 |
| 803024 | 1500 | 74 | 111 | 1.5 | 22213 | 65 | 120 | 31 |
| 803014 | 1400 | 79 | 116 | 1.5 | 22214 | 70 | 125 | 31 |
| 803030 | 1000 | 82 | 138 | 2.1 | 22314 | 70 | 150 | 51 |
| 803025 | 1400 | 84 | 121 | 1.5 | 22215 | 75 | 130 | 31 |
| 803026 | 1300 | 91 | 129 | 2 | 22216 | 80 | 140 | 33 |
| 803015 | 1200 | 96 | 139 | 2 | 22217 | 85 | 150 | 36 |
| 803007 | 750 | 96 | 138 | 2 ²⁾ | 541019 | 90 | 150 | 72 |
| 803027 | 1000 | 101 | 149 | 2 | 22218 | 90 | 160 | 40 |
| 803031 | 950 | 101 | 149 | 2 | 23218 | 90 | 160 | 52.4 |
| 803041 | 1200 | 107 | 143 | 1.5 | 24020 | 100 | 150 | 50 |
| 803000 | 900 | 111 | 154 | 2 | 23120 | 100 | 165 | 52 |
| 803008 | 700 | 111 | 156 | 2 | 533653 | 100 | 170 | 65 |
| 803032 | 750 | 112 | 168 | 2.1 | 23220 | 100 | 180 | 60.3 |
| 803028 | 900 | 112 | 168 | 2 | 22220 | 100 | 180 | 46 |
| 803013 | 950 | 119 | 161 | 2 | 23022 | 110 | 170 | 45 |
| 803033 | 800 | 119 | 161 | 2 | 24022 | 110 | 170 | 60 |
| 803004 | 750 | 121 | 169 | 2 | 24122 | 110 | 180 | 69 |
| 803029 | 800 | 122 | 188 | 2.1 | 22222 | 110 | 200 | 53 |
| 803034 | 950 | 129 | 171 | 2 | 23024 | 120 | 180 | 46 |
| 803001 | 750 | 129 | 171 | 2 | 24024 | 120 | 180 | 60 |
| 803045 | 900 | 139 | 191 | 2 | 23026 | 130 | 200 | 52 |
| 803002 | 630 | 139 | 191 | 2.1 | 24026 | 130 | 200 | 69 |
| 803005 | 530 | 141 | 199 | 2 | 24126 | 130 | 210 | 80 |
| 803003 | 670 | 149 | 201 | 2 | 24028 | 140 | 210 | 69 |
| 803006 | 530 | 152 | 213 | 2.1 | 24128 | 140 | 225 | 85 |
| 803035 | 630 | 160 | 215 | 2.1 | 24030 | 150 | 225 | 75 |
| 803036 | 400 | 162 | 238 | 2.1 | 24130 | 150 | 250 | 100 |
| 803012 | 560 | 170 | 230 | 2.1 | 24032 | 160 | 240 | 80 |
| 803010 | 560 | 172 | 258 | 2.1 | 23132 | 160 | 270 | 86 |
| 803037 | 530 | 180 | 250 | 2.1 | 24034 | 170 | 260 | 90 |
| 803038 | 380 | 182 | 268 | 2.1 | 24134 | 170 | 280 | 109 |
| 803011 | 450 | 190 | 270 | 2.1 | 24036 | 180 | 280 | 100 |
| 803039 | 600 | 200 | 280 | 2.1 | 23038 | 190 | 290 | 75 |
| 803044 | 400 | 210 | 300 | 2.1 | 24040 | 200 | 310 | 109 |
| 803040 | 280 | 215 | 325 | 2.5 | 24140 | 200 | 340 | 140 |

²⁾ radius on shaft shoulder $r_{gmax} = 0.6$ mm

³⁾ At the indicated speeds, taking into account the prevailing operating conditions, sealed spherical roller bearings have to be relubricated if necessary. In such cases the special design of these bearings should be ordered (suffix .H40F).

Examples · Customer benefit

Examples for continuous slab casting plant



Customer benefit

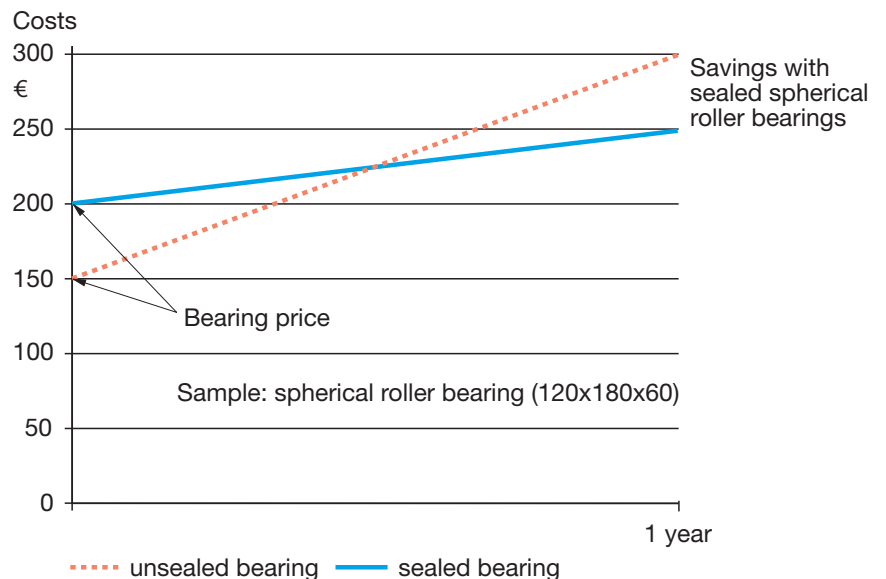
The following comparison for a continuous casting plant shows the extent of savings made possible by using sealed spherical roller bearings instead of open bearings.

The following costs were taken into account in the calculation: grease for re-lubricating the open bearing and for pre-sealing the sealed bearing (€ 1.50/kg); disposal and removal of the grease from the coolant circuit (same amount).

The production costs of new plants are reduced due to the fact that no pumping units and lubricating lines are needed. In addition, less maintenance is required.

As a rule, sealed spherical roller bearings reach significantly longer lives than open bearings. Thus the higher bearing price pays off quickly.

Cost comparison unsealed/sealed spherical roller bearings



Schaeffler KG

Heavy Industries
Steel

Georg-Schäfer-Strasse 30
97421 Schweinfurt (Germany)

Internet www.fag.com

E-Mail steel@schaeffler.com

Phone +49 9721 91-0

Fax +49 9721 91-3435

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