
ZKL

12.12 SPECIAL ROLLER BEARINGS

- Hybrid bearings
- Electrically insulated bearings
- Split bearings
- Other special bearings

HYBRID BEARINGS

Hybrid bearings have races made of bearing steel and rolling elements made of silicon nitride (Si_3N_4). Hybrid bearings feature excellent electrical insulation properties that apply mainly in the area of electric motors. Silicon nitride rolling elements prevents passage of current through the bearings which protects also the bearing rings against damage by electric current.

Silicon nitride has also significantly lower density than steel which takes effects mainly at high revolutions by reduction of centrifugal forces which reduces tension of outer ring. This has positive effect to the durability of high rpm bearings. It also reduces inertial forces which takes effect mostly in sudden changes of revolution frequency. Lower inertial forces of rolling elements load cage partitions significantly less, comparing to the standard steel elements.

Silicon nitride has higher elasticity module than bearing steel. This takes effect in contact area by lower contact surface resulting in reduction of rolling and sliding friction. Along with lower weight of ceramic elements and lower centrifugal forces, friction can be reduced at high revolutions. Friction in bearing is closely related to the service temperature of bearing. The lower the friction factor in the bearing, the lower the service temperature. Hybrid bearings are therefore suitable for applications with high revolution frequencies.

Hybrid bearings are capable of operation at low service viscosity since in contact of hybrid rings and silicon nitride elements no abrasion occurs. Hybrid bearings are suitable also in operations where bearings operate at very big dynamic stress, or when bearings are greased only with a very thin lubrication film. Hybrid bearings are used in locations where vibrations act, or where bearings perform oscillation movements only.

Silicon nitride also features lower thermal ductility; bearing is thus less sensitive to temperature changes.

Availability of hybrid bearings has to be discussed with the supplier.

SPECIAL ZKL BEARINGS

Besides standardised bearings in basic and different designs stated in this catalogue, ZKL supplies also special roller bearings. They usually feature non-standardised dimensions and cannot be included in standardised series. Production of special bearings often utilises different materials. These bearings are purposefully designed for applications in machines and equipment where the construction does not allow use of standardised bearings. The dimensions and basic parameters of the bearings are stated in the table section.

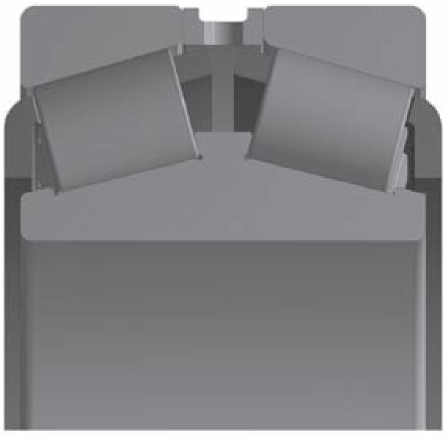
OTHER SPECIAL BEARINGS

ZKL manufactures additional type and dimensional series of bearings, parameters of which are not listed in this catalogue. More detailed information about special ZKL bearings is available in professional company publications. Use of special roller bearings is mainly recommended in more demanding cases of location, and supplies of bearings, their locations and assembly should be consulted with the supplier. Further information on special roller bearings is available at the ZKL technical and consultancy services.

Fig. 12.12.3

Multi row roller bearings

They are used to capture extremely big radial forces with limited build-up dimensions, mainly in smelting industry for location of rolling mill rollers. Rings of these bearings are provided with lubrication holes to ensure supply of lubricant in all roller rows.



obr. 12.12.4

Single row and double row tapered roller bearings

They are used mainly in automotive industry and in heavy machinery.

Double and four row tapered roller bearings

They are used to locate rolling mill rollers and rollers of other plants in steel rolling mills. They are manufactured with axial clearance the size of which is determined upon the service conditions.

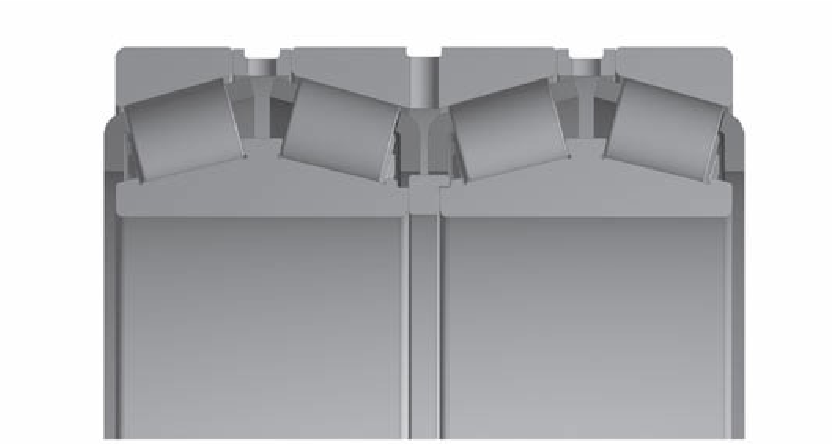


Fig. 12.12.5

Crossed roller bearings

In standard design, crossed roller bearings are compact two ring bearings with cross arrangement of rollers in raceway between the inner and outer ring. In majority of cases, rollers are separated with plastic separators or alternatively with a massive or segment cage. The contact angle of raceway is usually 45°. The bearings are supplied with clearance or prestress, depending on the use. Bearing rings are provided with bores for fixing bolts. Inner space is protected with rubber sealing to prevent excessive leak of grease from the bearing and penetration of impurities inside the bearing.

It is manufactured with outer diameter between 300 to 1 600 mm, and with inner or outer gearing or – more precisely – without gearing for location of building and earth-moving machinery, robots and manipulators, machine tools, mining combine harvesters, stamp plates, wind power plants, rotary furnaces and mill mixers.

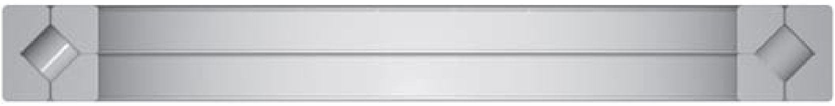


Fig. 12.12.6

Fig. 12.12.7

Large size ball bearings with four-point contact and double row ball bearings with angular contact

Bearings suitable for continuously rotating plants and also for machines with cyclic operation character of medium sizes, such as excavators and cranes. To ensure higher revolution frequency, bearings with massive or segment cage are made. They have a relatively low friction torque. The rigidity of location with the use of ball bearings is lower than that of bearings with crossed rollers. Usually they have a contact angle of 45º. They are manufactured with outer diameter ranging between 300 and 1600 with inner or outer gearing or – more precisely – without gearing.

Double direction cylindrical roller and tapered thrust bearings

They are used to capture big radial forces in rolling mill rollers' locations, and also where high rigidity in axial direction is required, mainly in locations of carousel desks.

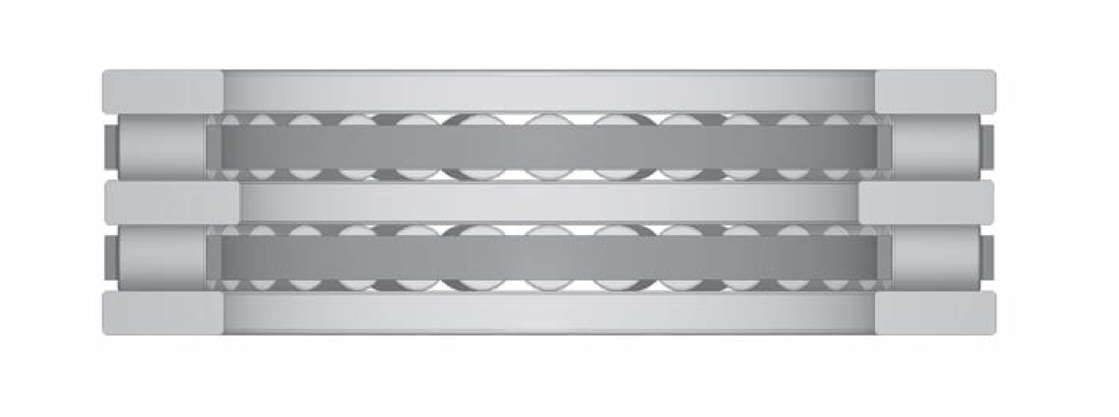


Fig. 12.12.8