

1. RADIAL CONTACT DEEP-GROOVE BALL BEARINGS

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ROLLING BEARINGS



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INTRODUCTION:**1. Radial contact single-row and double-row deep-groove ball bearings****1.1. Dimension series**

- single-row - 617.. 618.. 628.. 638.. 619.. 160.. 60.. 630.. 161.. 62.. 622.. 632.. 63.. 623.. 633.. 64..
- double-row - 42.. 43..
- magneto - E.. Bo.. L.. M..

1.2. Structure

Radial contact single-row and double-row ball bearings are inseparable and consist of an outer ring, an inner ring and a cage with balls.

They are, above all, adapted for operation with high rotational speed and designed for transferring radial loads. Ball bearings can also normally transfer small loads, in the narrow range, in the axial direction, especially double-row bearings.



Fig.1 Single-row radial contact deep-groove ball bearing, uncovered version

They rank among most commonly used rolling bearings because of their simple construction, numerous construction variants and low prices. Ball bearings for magnetos miss one of the lips on the outer ring and that is why they are dismountable. This feature enables separate mounting of both rings.

1.3. Construction variants

Depending on needs deep-groove ball bearings can be delivered in various construction variants, e.g. with reduced or increased clearance, with higher accuracy classes or with special cages suited for operation with high rotational speed.



Fig.2 Double-row radial contact deep-groove ball bearing, uncovered version

Furthermore deep-groove ball bearings are manufactured in many construction variants, what enables substantial simplification or improvement of bearing-closed pairs used in machines and installations. The best example for this may be the application of bearings with ZZ-type steel shields or 2RS-type rubber seals or a groove in the N-type outer ring for fixing a bearing in the mounting in the longitudinal direction with the help of the R-type ring. Bearings with two steel shields or two rubber seals are filled by the manufacturer with a proper amount of plastic lubricant, that will do for the whole life of a bearing under normal operation conditions.



Fig.3 Single-row radial contact deep-groove ball bearing, version with steel shields mounted on both sides

For special uses one also manufactures bearings with a tapered bore of 1:12 taper for mounting them with bearing sleeves. And in aggressive environment ball bearings made of acid resistant steel (SS designation behind the bearing's symbol) are used.



Fig.4 Single-row radial contact deep-groove ball bearing, sealed version with rubber seals on both sides

1.4. Cages

Standard cages of radial contact deep-groove ball bearings are made most often of steel sheet. One can quite often encounter bearings with light cages made of thermoplastic material, too. However, the use of such bearings is highly reduced because the material they are made of is not stable to heat. Bearings of larger sizes are usually equipped with massive steel or brazen cages.

In high-speed bearings solid cages made of heat-hardening material, textolite (T symbol) are used. The cages, because of their low weight, have a low moment of inertia, what in turn enables them to reach very high rotational speed. Also the vibration level of textolite cages is the lowest in comparison with cages made of other materials, and continuous operation temperature of heat-hardening material can be above 100°C.

1.5. Features

Single-row radial contact deep-groove ball bearings of narrow series feature very high rotational parameters with relatively low load capacities. Wide series are characterized by high load capacity and rigidity, but definitely lower rotational parameters. Compared to single-row series, double-row series feature higher ability to transfer axial load and to reach higher rigidity of the bearing-closed pair. Sealed bearings are, above all, designed for devices with rotating internal ring. In case of construction solutions with rotating outer ring, the lubricant outflow is possible even with relatively low rotational speed. With applications where the vibration level (noise) is very important. e.g. home appliances, the P66EMQ-version bearings are recommended.

1.6. Misalignment

Ball bearings have normally a reduced ability of angular displacement. For that reason the surfaces of mounting points should be coaxial. All inaccuracies in this regard result in adverse ball operation and additional stresses, what in turn reduces the longevity of the bearing. Permissible angular misalignment in a bearing depends on such factors as: radial clearance, size and internal construction of a bearing and forces and moments acting upon it.

1.7. Heat stability

Ball bearings of standard makes can be usually operated in temperatures ranging from -30 do $+120^{\circ}\text{C}$.

For larger bearings the upper temperature limit reaches 200°C . Under operating conditions other than normal, e.g. high rotational speed or higher temperature, one uses heat-stabilized bearings suited for an appropriate temperature level (with S0, S1, S2, S3 designation behind the symbol). Filling the sealed bearings with a special temperature-resistant lubricant substantially improves their capacity for operation in high temperatures.

1.8. Stainless-steel bearings

For special uses one usually makes ball bearings from high-alloy chromium steel.

These bearings are specially marked with an SS-designation behind the symbol. Stainless-steel 2RS double-sealed bearings are insensitive and resistant to water, steam, alkalis, developers and to a certain extent to acids. The reduction of acid resistance relates to seals made of synthetic rubber in the first place.

1.9. Silent-running bearings

In bearing mountings, from which a very low level of vibration (silent running) is demanded, P66 EMQ bearings in several dimension series are implemented, whereas 608 ZZ and 608 2RS bearings in the ABEC1, ABEC3, ABEC5, ABEC7 makings (with substantially increased rotational and noise parameters) are implemented in skateboards and roller-blades. The American marking system corresponds approximately the following markings: ABEC1 – somewhere between P0 and P6, ABEC3 – between P6 and P5, ABEC5 – between P5 and P4, ABEC7 – above P4.

1.10. Ball bearings for magnetos

Special variant of radial contact deep-groove ball bearings are ball bearings for magnetos.

Their construction is similar to regular ball bearings, they only differ in the construction of their outer ring, which has only one lip, what enables its separate mounting.



Fig.5 Single-row radial contact deep-groove ball bearing, for magnetos

These bearings are used in small electric devices in the first place. Ball bearings for magnetos are made in the Bo..., E..., L..., M... dimension series, standardized for the 30 mm bore diameter, whereas the E-series, the size of which corresponds to the 161-series, is the most common.

1.11. Application

Because of their universal features, very simple construction, easiness of mounting and dismounting and low cost, the radial contact deep-groove ball bearings find application in all branches of industry. They nearly dominated the market for miniature bearings. Rotational speed in the range of a few hundred thousand revolutions per minute is quite normal for miniature ball bearings. Advanced technology makes it possible to produce a ball bearing with outside diameter of only 1 mm.