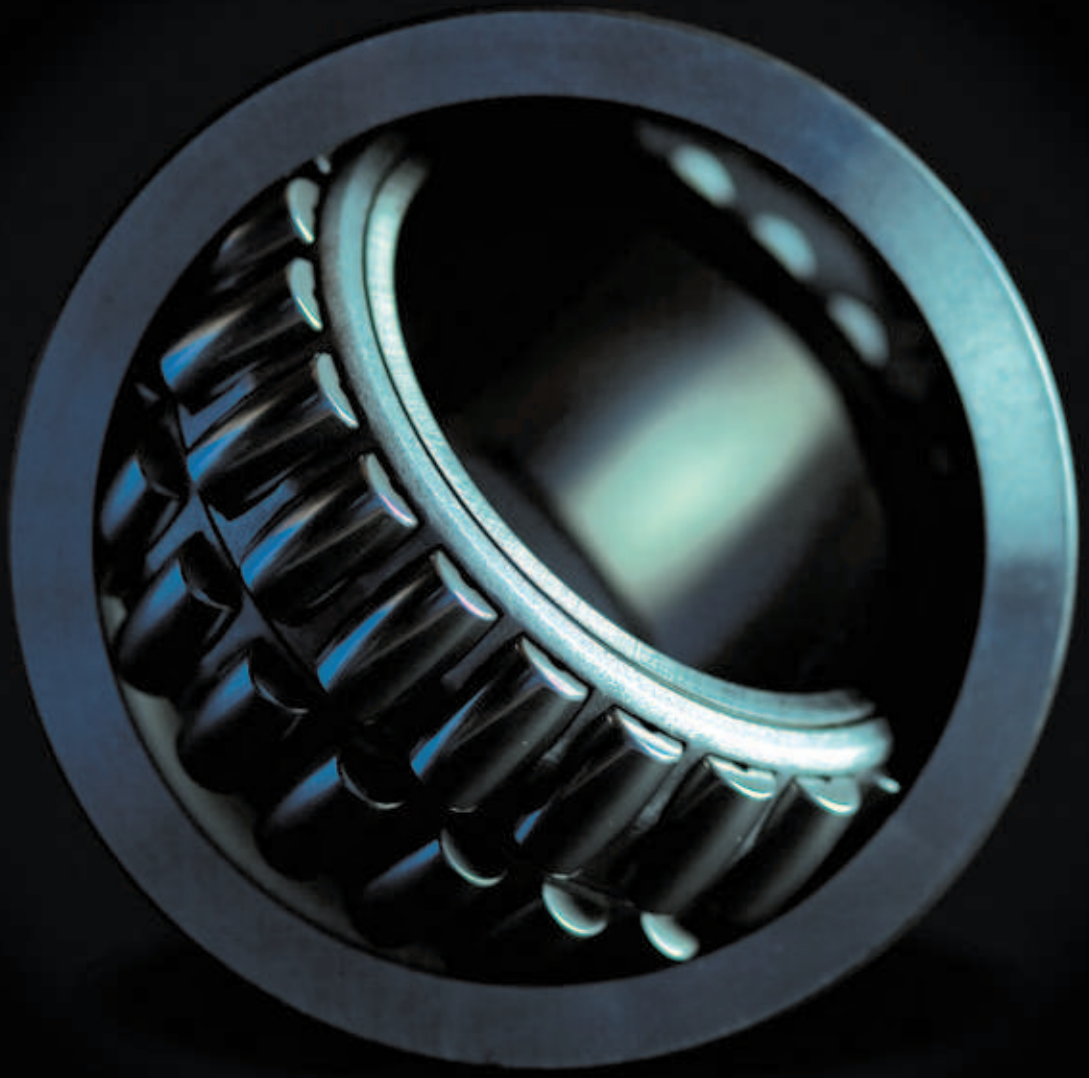
History is the basis of the present and a challenge for the **future**.

ZKL GROUP



Measuring the radial clearance of spherical-roller bearings

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Theoretical radial clearance of a bearing

The theoretical inner radial clearance, i. e. the clearance of a radial-contact bearing, is defined as the diameter of the outer ring raceway minus the diameter of the inner ring raceway minus two times the roller diameter.

In radial bearings, the theoretical radial clearance is calculated by the formula:

$$\mathbf{Gr = D_1\,m - (2Dwm + d_1\,m)}$$

where: D_1m denotes the arithmetic mean of the maximum and minimum diameter of the outer ring raceway; in double-row self-aligned bearings, it denotes the arithmetic mean of the maximum and minimum diameter of the outer ring ball raceway – see fig. 1.

d_1m denotes the arithmetic mean of the maximum and minimum diameter of the inner ring raceway; in double-row self-aligned bearings, it denotes the arithmetic mean of the maximum and minimum diagonal dimension of the two raceways – see fig. 1.

Dwm denotes the arithmetic mean of the roller diameters in the bearing, each of which represents an independent arithmetic mean of the maximum and minimum diameter of each roller.

Gr denotes the radial clearance.

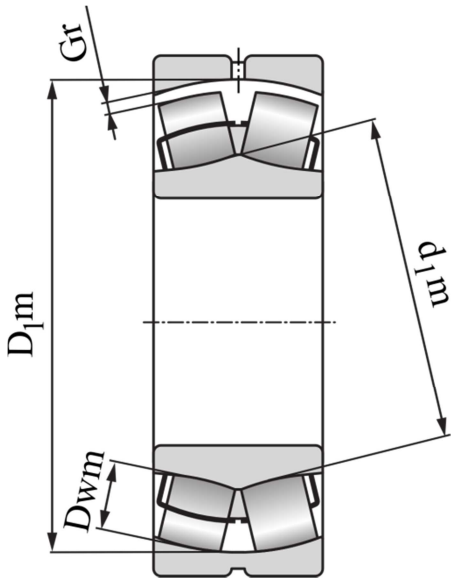

Fig. 1

The conditions of measuring the radial clearance of double-row spherical-roller bearings

In bearing assembly, measuring the inner clearance represents the most important parameter. Use thin protective gloves when manipulating the bearing. Make sure the rolling elements are correctly positioned during measuring.

When measuring the radial clearance of double-row spherical-roller bearings, first put the bearing in the vertical position on a flat mat and align the outer and inner bearing ring so that their faces are parallel and lie in the same plane. Before measuring, stabilize the rolling elements and turn the bearing by ½ - 1 revolutions to the left and to the right to set the spherical rollers in the correct position.

Use feeler gauges to measure the radial clearance. We recommend using combinations of feeler gauges with the thickness of each gauge not exceeding 0.2 mm.

The measuring procedure:

a) Outer diameter of the bearing ØD≤400 mm

The measuring takes place at the highest point of the bearing, with a randomly chosen spherical roller positioned precisely at the top of the bearing. Measure the radial clearance by passing the feeler gauge through the bearing at the center of the top spherical roller – see fig. 2 and fig. 3.

Set the minimum radial clearance value, which must pass through the bearing, and the maximum radial clearance value, which must not pass through the bearing. To obtain a highly precise value of the radial clearance, step by step increase or decrease the feeler gauge value.

Repeat the same measuring procedure at the same point on the other side of the bearing. The values obtained by this procedure for the two rows of spherical-rollers should be approximately the same. To obtain the resulting value, take the mean of several measurements carried out at different points in the bearing after turning the bearing a little, or turning the bearing rings against one another. Make at least 2 measurements in each row, making always sure the bearing is well aligned and the spherical roller you are using to take the measurement is positioned precisely at the top of the bearing.

Fig. 2

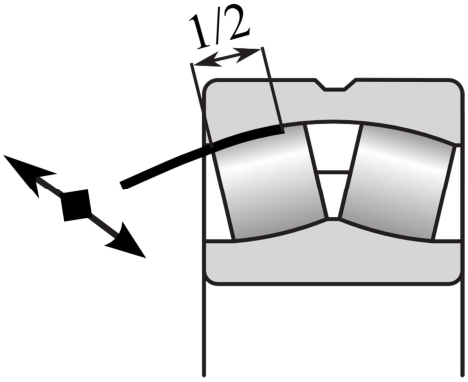

Fig. 3

b) Outer diameter of the bearing ØD ≥ 400 mm

In the case of larger spherical-roller bearings, it may be difficult to turn the bearing over several times in order to set the spherical rollers in the correct working position against the face of the central collar. Therefore, you need to put the rolling components in the correct working position manually (e. g. in the M model). Put your hand on the outer ring surface and use your thumb to apply pressure on the non-functional face of the spherical-roller in order to push the spherical roller into the working position towards the support face of central collar of the inner ring.

In bearings with no central collar, release the spherical rollers in the cage manually.

Then use a feeler gauge to measure the radial clearance, passing the feeler gauge through the bearing at a randomly chosen spherical roller positioned exactly at the top of the bearing. The measurement is made at the highest point of the bearing– see fig. 2 and fig. 3.

Set the minimum value of radial clearance (the feeler gauge must pass through the bearing) and the maximum value of radial clearance (the feeler gauge must not pass through the bearing). To make a high-precision radial clearance measurement, step by step increase and decrease the values of the feeler gauges.

Repeat the same measuring procedure at the same point on the other side of the bearing, the resulting measurement values obtained for the two rows of spherical rollers must be approximately the same. To obtain the resulting value, take the mean of several measurements made at several points in the bearing after turning the bearing a little, or turning the bearing rings against one another. Make at least two measurements in each row, making always sure the bearing is aligned correctly and that the spherical roller you are using is positioned precisely at the top of the bearing.

c) A more precise version of the measuring procedure — outer diameter of the bearing ØD ≥ 200 mm

Insert the feeler gauges between the rolling elements of the double-row bearing so that one element in each row is positioned at the top of the bearing and the rest of the elements are arranged symmetrically with respect to the bearing center. Measure the respective radial clearances (fig. 4).

To get the radial clearance Gr, use the values Gr_{T1} and Gr_{T2} obtained by measuring between the elements of each row positioned at the top of the bearing. The clearance value Gr_T is obtained by the formula:

$$Gr_T = 0{,}5 \cdot (Gr_{T1} + Gr_{T2})$$

Further, you need to measure the clearance on the right and left hand side of the bearing, while keeping the rolling elements distributed symmetrically. The respective clearance values are:

$$Gr_L = 0{,}5 \cdot (Gr_{L1} + Gr_{L2})$$
$$Gr_R = 0{,}5 \cdot (Gr_{R1} + Gr_{R2})$$

The resulting inner clearance is given by the relation:

$$Gr = 0{,}5 \cdot (Gr_T + Gr_L + Gr_R)$$

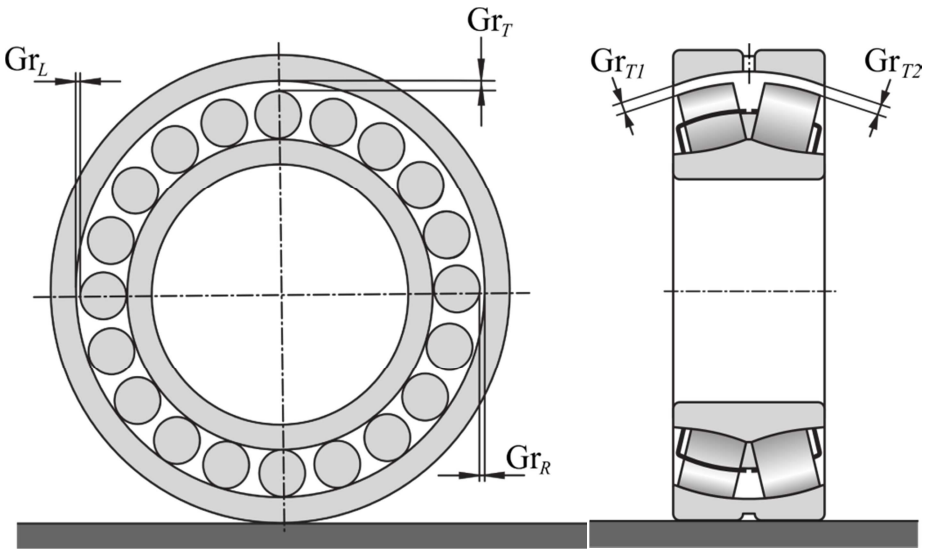

Fig. 4

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