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Rolling bearings

Gauging methods for dimensional and running tolerances

DIN 620 Part 1

Wälzlager; Messverfahren für Mass- und Lauftoleranzen

Supersedes January 1979 edition

As it is current practice in standards published by the International Organization for Standardization (ISO), the comma has been used throughout as a decimal marker.

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1 Field of application and purpose

1.1 Concepts relating to dimensions and tolerances for rolling bearings are defined in DIN ISO 1132, but not the gauging methods by which these tolerances can be measured in conformity with the definitions.

The purpose of this standard is therefore to specify methods by means of which rolling bearing tolerances can be measured in conformity with the definitions even outside special measuring laboratories.

1.2 The tolerances defined in DIN ISO 1132, the numerical values of which are laid down in DIN 620 Part 2, Part 3 and Part 6, apply as a general rule to individual bearing components immediately after manufacture, for parts which are not subjected to external forces, including measuring forces. They represent tolerances for the final inspection of the components concerned by the manufacturer, and in particular they do not allow any direct conclusions to be drawn in respect of the correct functioning of the bearings.

1.3 In accordance with this standard, deviations can be made from the gauging methods free of measuring forces, on condition that the deformation in the direction of measurement caused by the measuring force and by the dead weight of the component concerned amounts to less than 10 % of those tolerances which are being checked in respect of compliance.

1.4 It is presupposed that the condition specified in subclause 1.3 is being complied with in the case of the gauging methods described in clauses 4 and 5, with the measuring forces laid down in subclause 2.3.3. As regards bearing components which exhibit small cross sections only, and which are therefore more prone to deformation, it will be necessary to adopt other gauging methods, preferably methods free of measuring forces.

1.5 The measurement of the assembled bearing radial runout and face runout accuracies in accordance with subclauses 5.1 and 5.2 is intended to act as an acceptance inspection for the benefit of the user, who is unable in some cases to dismantle the rolling bearings.

1.6 Checks of the rolling bearing tolerances in accordance with the conditions described in subclauses 1.3 to 1.5 above do not correspond to the conditions outlined in subclause 1.2, but the results of these checks are quite adequate in practice, as experience has demonstrated, on condition that the measurements are assessed under the following aspects:

1.6.1 The exceeding of the tolerance in accordance with subclause 4.1.4 (Δ_{ds} or Δ_{Ds}) must not lead to rejection of the bearing in the case of measurements on the assembled rolling bearing or of measurements made a long time after completion of manufacture.

1.6.2 For the radial runout of the inner ring or of the outer ring, respectively, on the assembled bearing, in accordance with subclause 5.1, K_{ia} and K_{ea} have been laid down in accordance with DIN 620 Part 2. The magnitude of these values coincides with the values of wall thickness variations K_i or K_e, respectively, applying to the single ring.

In case of doubt, the measurement on the single ring shall be determining.

1.7 Other gauging methods are permissible. In arbitration procedures, the gauging methods described in this standard shall apply.

2 General conditions

2.1 Treatment of the rolling bearings before gauging

Before gauging, any grease or corrosion preventive compound adhering to the rolling bearings shall be removed if it is likely to affect the measurement results. A suitable organic solvent, with a small addition (≈ 3 %) of machine oil or acid-free kerosene shall be used to wash the rolling bearings, because otherwise the surfaces completely devoid of grease will tend to rust.

After completion of gauging, the rolling bearings or rolling bearing components shall be washed again immediately and coated with grease.

2.2 Reference temperature

The reference temperature shall be 20 °C. The object measured, the reference piece and the measuring instrument shall all exhibit the same temperature at the time of measurement.

2.3 Measuring instruments

2.3.1 Gauge blocks (end measuring blocks) conforming to DIN 861 Part 1, accuracy grade 1.

2.3.2 Precision dial indicators with mechanical indication conforming to DIN 879 Part 1.

2.3.2.1 Precision dial indicators with mechanical indication conforming to DIN 879 Part 1, scale interval 1 µm.

2.3.2.2 Precision dial indicators with mechanical indication conforming to DIN 879 Part 1, scale interval 10 µm.

2.3.3 Measuring forces and radius of measuring tip

Table 1.

	Nominal range mm over	up to	Measuring force F N max.	Radius of measuring tip mm min
Bore diameter d	-	10	1,5	0,8
	10	30	1,5	2,5
	30	—	1,5	2,5
Outside diameter D	all sizes		1,5	2,5

2.4 Measurement zone

When checking the dimensions of the bore diameter and of the outside diameter, the deviations on the "Not Go" side are not applicable to measurements in radial planes situated at distances of less than $2 \cdot r_{2\,smax}$ from the side faces of the bearings (values for $r_{2\,smax}$ in accordance with DIN 620 Part 6).

2.5 Reference face

The reference face of the ring is the unstamped face, and in the case of rings of single row angular contact ball bearings and of tapered roller bearings, the reference face is the face which absorbs the axial thrust. In the case of shaft washers and housing washers, the reference face is the end face facing the raceway.

Note: Because a directionally orientated insertion of the rings into the processing machines is often impossible to achieve in the modern flow-line production of radial rolling bearings, the tolerances of a ring or of a bearing will be deemed to have been complied with even in cases where they have been complied with in respect of either one of the two side faces. In such cases therefore the position of the marking or stamping is irrelevant.

3 Dimension letters and symbols

3.1 Dimension letters

d nominal bore diameter

D nominal outside diameter

B nominal width of inner ring

C nominal width of outer ring, if different from B

T nominal bearing width, nominal dimension

3.2 Symbols

Δ deviation of an actual dimension from the nominal dimension

V variation of an actual dimension (algebraic difference between the largest and the smallest individual value of a dimension)

3.3 Subscripts

m arithmetic mean of actual values (mean)

s actual value of single measurement (single)

p related to measurements in one single radial plane (plane)

s min smallest individual value

s max largest individual value

Example:

Δ_{dmp} deviation of the arithmetic mean obtained from measurements in a single plane from the nominal bore diameter.

4 Methods for the checking and measurement of rolling bearing components

4.1 Measurement of diameters on cylindrical surfaces (bore diameters, outside diameters)

Two point measurement with precision dial indicator in accordance with subclause 2.3.2.1, setting by means of gauge blocks in accordance with subclause 2.3.1 or in accordance with setting standard, measuring arrangement in accordance with figures 1 and 2.

The measurements shall be carried out in various radial planes. Minimum and maximum values shall be determined in each of these planes.

Measured values: $d_{ps\,max}$; $d_{ps\,min}$ or $D_{ps\,max}$; $D_{ps\,min}$

The minimum and maximum values obtained from the measurements in any one single plane shall be used to calculate the deviation of an actual value from the nominal value and to calculate the variations. First of all, the following values shall be calculated from the measured values:

$$d_{mp} = \frac{d_{ps\,max} + d_{ps\,min}}{2}; \quad D_{mp} = \frac{D_{ps\,max} + D_{ps\,min}}{2}$$

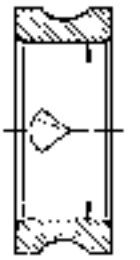

Figure 1.

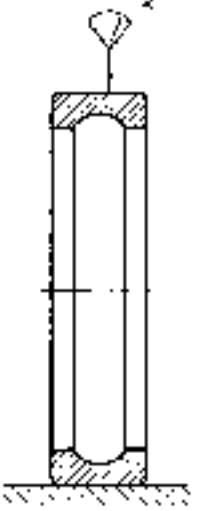

Figure 2.

4.1.1 Mean diameter deviation, Δ_{dmp} or Δ_{Dmp}
(see DIN ISO 1132 *), subclauses 4.1.8 and 4.2.8)

$\Delta_{dmp} = d_{mp} - d$; $\Delta_{Dmp} = D_{mp} - D$

4.1.2 Diameter variation in a single radial plane, V_{dp} or V_{Dp}
(see DIN ISO 1132 *), subclauses 4.1.9 and 4.2.9)

$V_{dp} = d_{ps\,max} - d_{ps\,min}$; $V_{Dp} = D_{ps\,max} - D_{ps\,min}$

4.1.3 Mean diameter variation, V_{dmp} or V_{Dmp}
(see DIN ISO 1132 *), subclauses 4.1.10 and 4.2.10)

$V_{dmp} = d_{mp\,max} - d_{mp\,min}$.
$V_{Dmp} = D_{mp\,max} - D_{mp\,min}$

The maximum and minimum mean diameters which can be ascertained within the measurement zone on a ring must differ by an amount not exceeding V_{dmp} or V_{Dmp} at the very most.

4.1.4 Deviation of the single diameter, Δ_{ds} or Δ_{Ds}
(see DIN ISO 1132 *), subclauses 4.1.3 and 4.2.3)

$\Delta_{ds} = d_s - d$; $\Delta_{Ds} = D_s - D$

Note: This tolerance is only indicated additionally in tolerance class P2.

4.2 Measurement of the width

Two point measurement with precision dial indicator in accordance with subclause 2.3.2.2, setting in accordance with setting standard, measuring arrangement in accordance with figure 3.

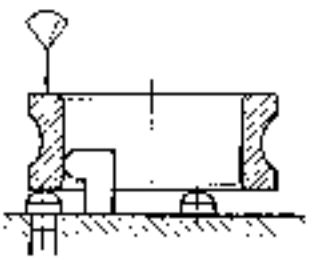

Figure 3.

*) June 1982 edition