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R 1132

ROLLING BEARINGS

TOLERANCES

DEFINITIONS

1st EDITION

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BRIEF HISTORY

The ISO Recommendation R 1132, *Rolling bearings – Tolerances – Definitions*, was drawn up by Technical Committee ISO/TC 4, *Rolling bearings*, the Secretariat of which is held by the Sveriges Standardiseringskommission (SIS).

Work on this question led to the adoption of a Draft ISO Recommendation.

In June 1962, this Draft ISO Recommendation (No. 413) was circulated to all the ISO Member Bodies for enquiry. As the results of this consultation were not considered satisfactory, the Technical Committee presented a second Draft ISO Recommendation No. 413, which was circulated to all the ISO Member Bodies in November 1966. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Australia	Hungary	Switzerland
Austria	India	Turkey
Belgium	Israel	U.A.R.
Canada	Italy	United Kingdom
Chile	Japan	U.S.A.
Czechoslovakia	Netherlands	U.S.S.R.
France	Romania	Yugoslavia
Germany	Spain	
Greece	Sweden	

One Member Body opposed the approval of the Draft :

Portugal

This second Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in November 1969, to accept it as an ISO RECOMMENDATION.

ISO Recommendation | R 1132 | November 1969

ROLLING BEARINGS

TOLERANCES

DEFINITIONS

1. GENERAL

1.1 Applicability of tolerances

The tolerances apply exclusively to the concepts of boundary dimensions, running accuracy and internal clearance defined in sections 2, 3 and 4 respectively of this ISO Recommendation.

1.2 Tolerance limits

The tolerance limits are ultimate limits.

1.3 Absolute dimensions

At a temperature of + 20 °C (+ 68 °F), and provided that the bearing parts are completely unstressed by external forces, including measuring loads and the gravitational force on the part itself, a boundary dimension of a bearing or bearing part should not deviate from the nominal dimension more than indicated by the tolerance to be applied. In order to assure the correlation between the bearing dimensions and the absolute unit of length, the gauges and measuring instruments should, at suitable intervals, be adjusted or calibrated by means of master gauges, the absolute dimensions of which should be determined scientifically.

1.4 Tolerance terms

All recommended tolerances, including the internal clearance tolerances termed "manufacturing limits", apply at the time of the final manufacturing inspection.

The "acceptance limits", given for bearing internal clearance, include the expected scatter of the results of clearance measurements, made by bearing users as part of their acceptance inspection.

With regard to "diameter tolerances acceptable after ageing" of the bearings, there is generally no reason to reject a bearing on account of diameter variation (see clauses 2.1.3 and 2.2.3), unless the diameter deviations indicated are exceeded.

1.5 Definitions of axes, directions, planes, "reference side"

1.5.1 *Inner ring (or small bore washer) axis.* Axis of a cylinder inscribed in a basically cylindrical bore or of a cone inscribed in a basically tapered bore. The inner ring (or small bore washer) axis is also the bearing axis.

1.5.2 *Outer ring (or large bore washer) axis.* Axis of a cylinder circumscribed round the outside basically cylindrical surface.

1.5.3 *Radial directions.* Directions through the bearing or ring axis in a radial plane.

1.5.4 *Radial planes.* Planes perpendicular to the bearing or ring axis. It is, however, acceptable to consider radial planes referred to in the definitions as being parallel with the plane tangent to the reference side of a ring.

1.5.5 *Axial direction.* Direction parallel with the bearing or ring axis. It is, however, acceptable to consider axial directions referred to in the definitions as being perpendicular to the plane tangent to the reference side of a ring or the seat face of a thrust bearing washer.

1.5.6 *Axial planes.* Planes containing the bearing or ring axis.

1.5.7 *"Reference side" of a ring.* Side of the ring so designated by the manufacturer of the bearing.

1.5.8 *"Middle of raceway".* Point or line on a raceway surface halfway between the two edges of the raceway.

1.5.9 *"Cylinder" and "cone".* Cylinders and cones circular in sections perpendicular to their axis.

1.6 Diameter deviations near ring sides

In radial planes nearer the side of a ring than twice the nominal ring chamfer dimension, only the low deviation of the bore diameter tolerance and the high deviation of the outside diameter tolerance apply. In other respects the definitions in clauses 2.1, 2.2, 2.3 and 2.4 only concern the surfaces between the side zones mentioned.

2. BOUNDARY DIMENSIONS

2.1 Bore diameter

2.1.1 *Single diameter of a bore*. Distance between two parallel tangents to the line of intersection between the bore and a radial plane.

2.1.2 *Bore diameter deviation (of a basically cylindrical bore)*. Difference between a single diameter of the bore and the nominal bore diameter.

2.1.3 *Bore diameter variation (of a basically cylindrical bore)*. Difference between the largest and the smallest single diameter of the bore of one individual ring.

2.1.4 *Mean bore diameter (of a basically cylindrical bore)*. Arithmetical mean of the largest and the smallest single diameter of the bore.

2.1.5 *Mean bore diameter deviation (of a basically cylindrical bore)*. Difference between the mean diameter of the bore and the nominal bore diameter.

2.1.6 *Tapered bore deviations*. See the relevant ISO Recommendation.

2.2 Outside diameter

2.2.1 *Single diameter of an outside surface*. Distance between two parallel tangents to the line of intersection between the outside surface and a radial plane.

2.2.2 *Outside diameter deviation (of a basically cylindrical outside surface)*. Difference between a single diameter of the outside surface and the nominal outside diameter.

2.2.3 *Outside diameter variation (of a basically cylindrical outside surface)*. Difference between the largest and the smallest single diameter of the outside surface on one individual ring.

2.2.4 *Mean outside diameter (of a basically cylindrical outside surface)*. Arithmetical mean of the largest and the smallest single diameter of the outside surface.

2.2.5 *Mean outside diameter deviation (of a basically cylindrical outside surface)*. Difference between the mean diameter of the outside surface and the nominal outside diameter.

2.3 Deviation from circular form (of a basically circular line on a surface)

2.3.1 *Inside surface of a bearing ring*. Greatest radial distance between the circle inscribed in the line and any point on the line.

2.3.2 *Outside surface of a bearing ring or a rolling body*. Greatest radial distance between the circle circumscribed round the line and any point on the line.

2.4 Deviation from cylindrical form (of a basically cylindrical surface)

2.4.1 *Bore*. Greatest radial distance, in any radial plane, between the cylinder inscribed in the bore and any point on the bore surface.

2.4.2 *Outside surface*. Greatest radial distance, in any radial plane, between the cylinder circumscribed round the outside surface and any point on the outside surface.

2.5 Width and height

2.5.1 *Ring width*. Distance between the points of intersection between the two sides of the ring and a straight line perpendicular to the plane tangent to the reference side of the ring.

2.5.2 *Ring width deviation*. Difference between a ring width and the nominal width.

2.5.3 *Ring width variation*. Difference between the largest and the smallest ring width of one individual ring.

2.5.4 *Tapered roller bearing width (single row)*. Distance between, on the one hand, the point of intersection between the plane tangent to the back face of the inner ring and the bearing axis and, on the other hand, the point of intersection between the plane tangent to the back face of the outer ring and the bearing axis.

2.5.5 *Bearing width deviation*. Difference between the bearing width and the nominal bearing width.

2.5.6 *Thrust bearing height*. Distance between the points of intersection between the bearing axis and the planes tangent to the thrust supporting faces of the washers.

2.6 Ring chamfer dimension

2.6.1 *High limit*. Radial distance (chamfer height) or axial distance (chamfer width) from the imaginary sharp ring corner, over which ring material may be removed.

2.6.2 *Low limit*. Radius of an imaginary circular arc, in an axial plane, tangent to the ring side and the bore or the outside surface of the ring, beyond which no ring material is allowed to project.

3. RUNNING ACCURACY

3.1 Radial runout

3.1.1 *Inner ring raceway*. Difference between the greatest and the smallest radial distance between the bore surface and the middle of a raceway on the outside of the ring.

3.1.2 *Outer ring raceway*. Difference between the greatest and the smallest radial distance between the outside surface and the middle of a raceway on the inside of the ring.

3.1.3 *Assembled bearing inner ring (radial or angular contact)*. Difference between the greatest and the smallest radial distance between the bore surface of the inner ring, in different relative angular positions of this ring, and a point in a fixed position relative to the outer ring, both inner and outer ring raceways being in contact with the rolling bodies at the angular position of the point mentioned and the bearing parts being otherwise in normal relative positions.

3.1.4 *Assembled bearing outer ring (radial or angular contact)*. Difference between the greatest and the smallest radial distance between the outside surface of the outer ring, in different relative angular positions of this ring, and a point in a fixed position relative to the inner ring, both inner and outer ring raceways being in contact with the rolling bodies at the angular position of the point mentioned and the bearing parts being otherwise in normal relative positions.

3.2 Side runout with bore (inner ring, reference side)

Difference between the greatest and the smallest axial distance between a plane perpendicular to the ring axis and the reference side of the ring at a radial distance from the axis equal to half the mean inner ring raceway diameter.

3.3 Outside cylindrical surface runout with side (outer ring, reference side)

Total variation of the relative position, in radial direction parallel with the reference side, of points on the same generatrix of the outside surface at a distance of twice the nominal ring chamfer dimension from the sides of the ring.

3.4 Raceway runout with side (groove type radial ball bearing)

3.4.1 *Ball bearing raceway groove.* Difference between the greatest and the smallest axial distance between the plane tangent to the reference side of the ring and the middle of the raceway groove.

3.4.2 *Assembled ball bearing inner ring*. Approximately the difference between the greatest and the smallest axial distance between the reference side surface of the inner ring, in different relative angular positions of this ring, at a radial distance from the inner ring axis equal to half the mean raceway diameter, and a point in a fixed position relative to the outer ring, the inner and outer ring raceways being in angular contact with all the balls.

3.4.3 *Assembled ball bearing outer ring*. Approximately the difference between the greatest and the smallest axial distance between the reference side surface of the outer ring, in different relative angular positions of this ring, at a radial distance from the outer ring axis equal to half the mean raceway diameter, and a point in a fixed position relative to the inner ring, the inner and outer ring raceways being in angular contact with all the balls.