INTERNATIONAL STANDARD

ISO 1224-1

First edition
2007-06-15

Rolling bearings — Instrument precision bearings —

Part 1: Boundary dimensions, tolerances and characteristics of metric series bearings

Roulements — Roulements de précision pour instruments — Partie 1: Dimensions d'encombrement, tolérances et caractéristiques, séries métriques

Reference number
ISO 1224-1:2007(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 1224-1 was prepared by Technical Committee ISO/TC 4, *Rolling bearings*.

This first edition of ISO 1224-1, together with ISO 1224-2, cancels and replaces ISO 1224:1984, which has been technically revised.

ISO 1224 consists of the following parts, under the general title *Rolling bearings — Instrument precision bearings*:

— *Part 1: Boundary dimensions, tolerances and characteristics of metric series bearings*

— *Part 2: Boundary dimensions, tolerances and characteristics of inch series bearings*

Rolling bearings — Instrument precision bearings —

Part 1: Boundary dimensions, tolerances and characteristics of metric series bearings

1 Scope

This part of ISO 1224 specifies the characteristics that define instrument precision rolling bearings, metric series, their types, boundary dimensions, tolerances and internal clearance, classifications used for selective assembly, torque definitions and test condition, and limitations of bearing yield rates.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 15, *Rolling bearings — Radial bearings — Boundary dimensions, general plan*

ISO 582, *Rolling bearings — Chamfer dimensions — Maximum values*

ISO 1132-1, *Rolling bearings — Tolerances — Part 1: Terms and definitions*

ISO 5593:1997, *Rolling bearings — Vocabulary*

ISO 15241, *Rolling bearings — Symbols for quantities*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1132-1, ISO 5593 and the following apply.

3.1
perpendicularity of inner ring bore with respect to the face
⟨basically cylindrical surface⟩ total variation of the relative position, in a radial direction parallel with the plane tangential to the reference face of the inner ring, of points on the same generatrix of the bore at a distance from the side faces of the ring equal to 1,2 times the largest axial single chamfer dimension

3.2
axial runout of outer ring flange back face of assembled bearing
⟨radial groove ball bearing⟩ difference between the largest and the smallest of the axial distances between the back face of the outer ring flange, in different angular positions of this ring, at a radial distance from the outer ring axis equal to half the mean diameter of the flange back face, and a point in a fixed position relative to the inner ring

NOTE For a measurement to be valid, the inner and outer ring raceways shall be in contact with all the balls.

3.3
torque quality
torque quality of an instrument ball bearing is a function of average and maximum torques

NOTE Maximum torque is most frequently specified for slow speed (near zero) applications and for limited arcs of travel. Where considerable rotation is involved, average torque may be the criterion.

3.4
maximum torque
maximum value of torque recorded during any test cycle

3.5
average torque
arithmetic mean value of the torque readings obtained during the test cycle

3.6
test load
specified axial load coincident with the axis of rotation of the bearing

4 Symbols

For the purposes of this document, the symbols given in ISO 15241 and the following apply.

The symbols (except those for tolerances) shown in Figure 1 and the values given in the Tables 1 to 6 denote nominal dimensions unless specified otherwise.

B	inner ring width
C	outer ring width
C_1	outer ring flange width
D	outside diameter of bearing
D_1	outside diameter of outer ring flange
d	bore diameter
K_{ea}	radial runout of outer ring of assembled bearing
K_{ia}	radial runout of inner ring of assembled bearing
r	chamfer dimension (except where r_1 is applicable)
$r_{s\,min}$	smallest single chamfer dimension of r
$r_{s\,max}$	largest single chamfer dimension of r
r_1	chamfer dimension of front face of angular contact ball bearing inner and outer rings
$r_{1s\,min}$	smallest single chamfer dimension of r_1
S_D	perpendicularity of outer ring outside surface with respect to the face[1)]
S_d	perpendicularity of inner ring face with respect to the bore[1)]
S_{dr}	perpendicularity of inner ring bore with respect to the face[1)]

S_{ea} axial runout of outer ring of assembled bearing[1)]

S_{ea1} axial runout of outer ring flange back face of assembled bearing[1)]

S_{ia} axial runout of inner ring of assembled bearing[1)]

V_{Bs} variation of inner ring width

V_{Cs} variation of outer ring width

V_{C1s} variation of outer ring flange width

V_{Dmp} variation of mean outside diameter

V_{Dsp} variation of outside diameter in a single plane

V_{dmp} variation of mean bore diameter

V_{dsp} variation of bore diameter in a single plane

Δ_{Bs} deviation of a single inner ring width

Δ_{Cs} deviation of a single outer ring width

Δ_{C1s} deviation of a single outer ring flange width

Δ_{Dmp} deviation of mean outside diameter in a single plane

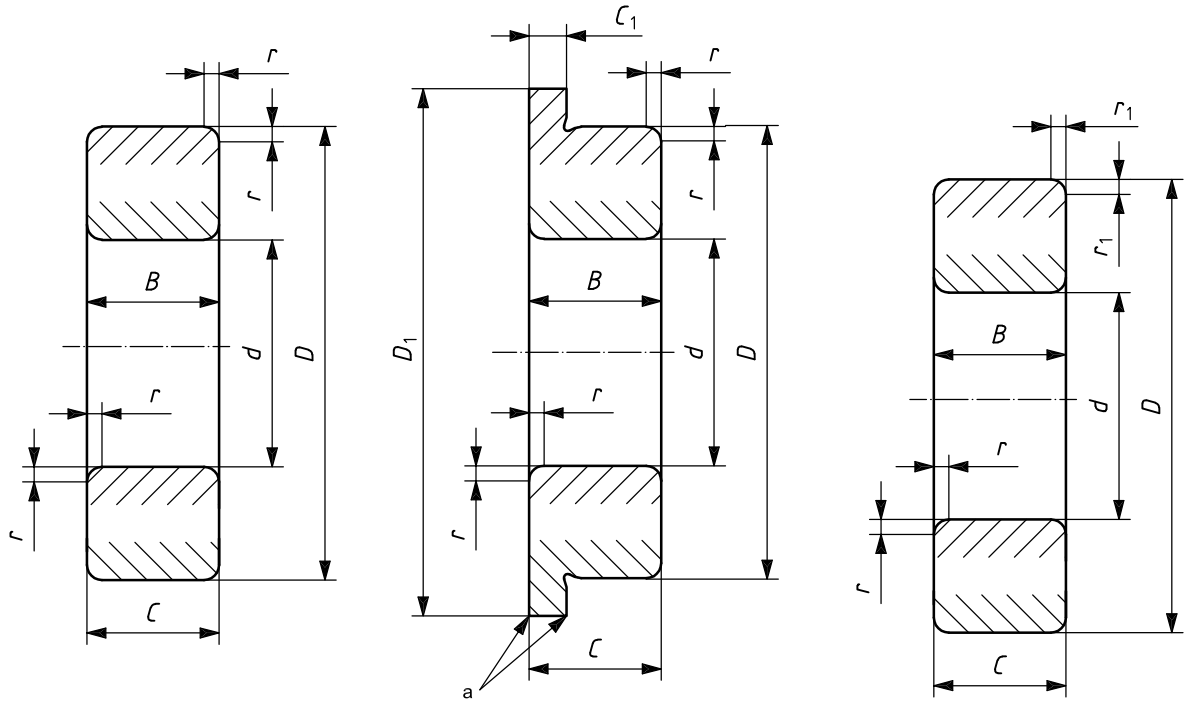
Δ_{Ds} deviation of a single outside diameter

Δ_{D1s} deviation of a single outside diameter of outer-ring flange

Δ_{dmp} deviation of mean bore diameter in a single plane

Δ_{ds} deviation of a single bore diameter

1) For angular contact ball bearings, the back face is the reference face.



a) Single-row deep groove ball bearings **b) Angular contact ball bearings**

a Broken corner.

Figure 1 — Instrument precision bearing

5 Characteristics

Satisfactory performance of instrument precision bearings necessitates that they be produced to special tolerances, as given in Clause 8. In addition, these bearings shall be particularly free from foreign matter and meet one or more specific requirements in the following categories:

a) low or uniform torque or both, either at starting or in rotation (this requirement does not apply to bearings with seals);

b) smooth running or vibration limitations;

c) limitations of bearing yield rates.

Due to the many specialized requirements that exist in instrument applications, specification of these categories should be established only after full agreement between the manufacturer and the customer.

6 Bearing types

Single-row deep groove ball bearings meet the majority of the requirements and may be open or capped, with or without a flanged outer ring. However, for specific applications, angular contact ball bearings, non-separable or with separable inner ring, may be required.

7 Boundary dimensions

Boundary dimensions for metric series instrument precision bearings are given in Table 1.

Table 1 — Metric series bearings

Dimensions in millimetres

d	D	B and C	$r_{s\,min}$[a]	$r_{1s\,min}$[a]	Flanged bearings		Applicable types of bearing	Dimension series[b]
					D_1	C_1		
0,6	2	0,8	0,05	0,05	—	—	open	17
1	2,5	1	0,05	0,05	—	—	open	17
1	3	1	0,05	0,05	3,8	0,3	open	18
1	3	1,5	0,05	0,05	3,8	0,45	capped	38
1	4	1,6	0,1	0,05	5	0,5	open	19
1	4	2,3	0,1	0,05	5	0,6	capped	39
1,5	3	1	0,05	0,05	—	—	open	17
1,5	4	1,2	0,05	0,05	5	0,4	open	18
1,5	4	2	0,05	0,05	5	0,6	capped	38
1,5	5	2	0,15	0,08	6,5	0,6	open	19
1,5	5	2,6	0,15	0,08	6,5	0,8	capped	39
2	4	1,2	0,05	0,05	—	—	open	17
2	5	1,5	0,08	0,05	6,1	0,5	open	18
2	5	2,3	0,08	0,05	6,1	0,6	capped	38
2	6	2,3	0,15	0,08	7,5	0,6	open, capped	19
2	6	3	0,15	0,08	7,5	0,8	capped	39
2,5	5	1,5	0,08	0,05	—	—	open	17
2,5	6	1,8	0,08	0,05	7,1	0,5	open	18
2,5	6	2,6	0,08	0,05	7,1	0,8	capped	38
2,5	7	2,5	0,15	0,08	8,5	0,7	open, capped	19
2,5	7	3,5	0,15	0,08	8,5	0,9	capped	39
3	6	2	0,08	0,05	—	—	open	17
3	7	2	0,1	0,05	8,1	0,5	open	18
3	7	3	0,1	0,05	8,1	0,8	capped	38
3	8	3	0,15	0,08	9,5	0,7	open, capped	19
3	8	4	0,15	0,08	9,5	0,9	capped	39
3	10	4	0,15	0,08	11,5	1	open, capped	02
4	7	2	0,08	0,05	—	—	open	17
4	9	2,5	0,1	0,05	10,3	0,6	open	18
4	9	4	0,1	0,05	10,3	1	capped	38
4	11	4	0,15	0,08	12,5	1	open, capped	19
4	13	5	0,2	0,1	15	1	open, capped	0,2