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Rullningslager – toleranser –
Del 2: Mätning och mätprinciper och -metoder
(ISO 1132-2:2001, IDT)

Rolling bearings – Tolerances –
Part 2: Measuring and gauging principles and methods
(ISO 1132-2:2001, IDT)

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Den internationella standarden ISO 1132-2:2001 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av ISO 1132-2:2001.

The International Standard ISO 1132-2:2001 has the status of a Swedish Standard. This document contains the official version of ISO 1132-2:2001.

Upplysningar om sakinnehållet i standarden lämnas av SIS, Swedish Standards Institute, telefon 08-555 520 00. Standarder kan beställas hos SIS Förlag AB som även lämnar allmänna upplysningar om svensk och utländsk standard.

Information about the content of the standard is available from the Swedish Standards Institute (SIS), telephone +46 8 555 520 00. Standards may be ordered from SIS Förlag AB, who can also provide general information about Swedish and foreign standards.

Denna standard är framtagen av kommittén för Rullningslager, SIS/TK 105.

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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 3.

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 part of ISO 1132 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 1132-2 was prepared by Technical Committee ISO/TC 4, *Rolling bearings*.

This first edition of ISO 1132-2 cancels and replaces ISO/TR 9274:1991, in the form of a technical revision thereof.

ISO 1132 consists of the following parts, under the general title *Rolling bearings — Tolerances*:

— *Part 1: Terms and definitions*

— *Part 2: Measuring and gauging principles and methods*

Annex A forms a normative part of this part of ISO 1132.

Rolling bearings — Tolerances —

Part 2:
Measuring and gauging principles and methods

1 Scope

This part of ISO 1132 establishes guidelines for measurement of dimensions, running accuracy and internal clearance of rolling bearings. The purpose is to outline the fundamentals of various measuring and gauging principles which may be used in order to clarify and comply with the definitions of ISO 1132-1 and ISO 5593.

The measuring and gauging methods described in this part of ISO 1132 may differ amongst themselves and do not provide for a unique interpretation. It is recognized that there are other adequate measuring and gauging methods and that technical development may result in even more convenient methods. Therefore, this part of ISO 1132 does not imply any obligation to apply any particular method. However, the methods specified may be referred to in cases of dispute.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 1132. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 1132 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 1:1975, *Standard reference temperature for industrial length measurements*.

ISO 76:1987, *Rolling bearings — Static load ratings.*

ISO 104:—[1)], *Rolling bearings — Thrust bearings — Boundary dimensions, general plan*.

ISO 286-2:1988, *ISO system of limits and fits — Part 2: Tables of standard tolerance grades and limit deviations for holes and shafts*.

ISO 1132-1:2000, *Rolling bearings — Tolerances — Part 1: Terms and definitions*.

ISO 3030:1996, *Rolling bearings — Radial needle roller and cage assemblies — Dimensions and tolerances*.

ISO 3031:2000, *Rolling bearings — Thrust needle roller and cage assemblies, thrust washers — Boundary dimensions and tolerances*.

ISO 3245:1997, *Rolling bearings — Needle roller bearings, drawn cup without inner rings — Boundary dimensions and tolerances.*

1) To be published. (Revision of ISO 104:1994)

ISO 4291:1985, *Methods for the assessment of departure from roundness — Measurement of variations in radius*.

ISO 5593:1997, *Rolling bearings — Vocabulary*.

ISO 15241:2001, *Rolling bearings — Symbols for quantities*.

3 Terms and definitions

For the purpose of this part of ISO 1132, the terms and definitions given in ISO 1132-1 and ISO 5593 apply. The following additional terms and definitions are used throughout this part of ISO 1132. An index of methods with their respective symbols, as specified in ISO 1132-1, is included in annex A.

3.1
measurement
set of operations having the object of determining the dimension(s) or variation of a feature

3.2
gauge
device of defined geometric form and size used to assess the conformance of a feature of a work piece to a dimensional specification.

NOTE The device could give only “GO” and/or “NOT GO” information (e.g. plug gauge).

3.3
gauging
inspection of size and/or form by means of a gauge

3.4
measuring and gauging principle
fundamental geometric basis for the measurement or gauging of the considered geometric characteristic

3.5
measuring and gauging method
practical application of a principle by the use of different types of measuring and gauging equipment and operations

3.6
measuring and gauging equipment
technical device used to perform a specific method of measuring (e.g. calibrated indicator)

3.7
measuring force
force applied by the stylus of an indicator or a recorder to the feature being measured

3.8
measuring load
external force applied to the specimen being measured in order to accomplish the measurement

4 Symbols

For the purposes of this part of ISO 1132, the symbols given in ISO 15241 and the following apply.

The symbols (except those for tolerances) shown in the figures and the values given in the tables denote nominal dimensions unless specified otherwise. Additionally, the drawing symbols given in Table 1 are applied throughout this part of ISO 1132.

Table 1 — Drawing symbols

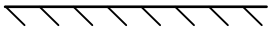
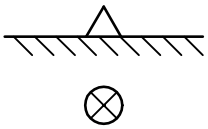
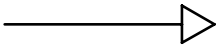
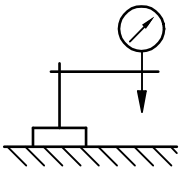
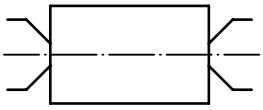
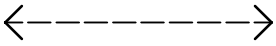
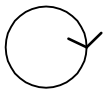
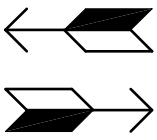
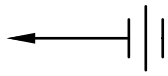
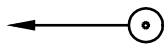
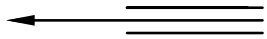
Symbol	Interpretation
	Surface plate (measuring plane)
 (Front view) (Top view)	Fixed support
	Fixed gauge support
 (Front view) (Top view)	Indicator or recorder
	Measuring stand with indicator or recorder Symbols for measuring stands can be drawn in different ways in accordance with the measuring equipment used.
	Centred arbor
	Intermittent linear traverse
	Turning against fixed support(s)
	Rotation about centre
	Loading, direction of loading
	Loading alternately in opposite directions

Table 1 — Drawing symbols *(continued)*

Symbol	Interpretation
 (Front view)  (Top view)	Movable support for indicator moving perpendicular to the measured surface
	Movable support for indicator moving parallel to (along) the measured surface

5 General conditions

5.1 Measuring equipment

Measurements of the various dimensions, runouts and clearances can be performed on different types of measuring equipment and with differing degrees of accuracy. The principles described are commonly used by bearing manufacturers and users and generally they provide an accuracy sufficient for practical purposes. It is recommended that the total measuring inaccuracy should not exceed 10 % of the actual tolerance zone. However, the measuring and gauging methods may not always fully check the indicated requirements. Whether or not such methods are sufficient and acceptable depends on the magnitude of the actual deviations from the ideal dimension or form and the inspection circumstances.

Bearing manufacturers frequently use specially designed measuring equipment for individual components, as well as for assemblies, to increase speed and accuracy of measurement. Should the dimensional or geometrical errors appear to exceed those in the relevant specifications, when using equipment as indicated in any of the methods in this part of ISO 1132, the matter should be referred to the bearing manufacturer.

5.2 Masters and indicators

Dimensions are determined by comparing the actual component with appropriate gauge blocks or masters whose calibration is traceable through national standards organizations to the length of the international prototype as defined in ISO 1. For such comparison, a calibrated indicator of appropriate sensitivity is used.

5.3 Arbors

In all cases when the arbor method of measuring runout is used, the rotational accuracy of the arbor shall be determined so that subsequent bearing measurements may be suitably corrected for any appreciable arbor inaccuracy. A precision arbor having a taper of approximately 0,000 2:1 on diameter shall be used.

In cases when an arbor is used to measure the bore diameter of a roller complement, a precision arbor having a taper of approximately 0,000 5:1 on diameter shall be used.

5.4 Temperature

Before any measurements are made, the part to be measured, the measuring equipment and master shall be brought to the temperature of the room in which the measurements are to be made. The recommended room temperature is 20 °C, see ISO 1. Care shall be taken to avoid heat transfer to the component or assembled bearing during measurement.

5.5 Measuring force and radius of measuring stylus

To avoid undue deflection of thin rings, the measuring force shall be minimized. If significant distortion is present, a load deflection factor shall be introduced to correct the measured value to the free unloaded value. The maximum measuring force and minimum radius of the measuring stylus are given in Table 2.

Table 2 — Maximum measuring forces and minimum radii of measuring stylus

Bearing feature	Nominal size range mm		Measuring force [a] N	Stylus radius [b] mm
	>	⩽	max.	min.
Bore diameter d	—	10	2	0,8
	10	30	2	2,5
	30	—	2	2,5
Outside diameter D	—	30	2	2,5
	30	—	2	2,5

[a] The maximum measuring force is intended to give repeatable measurements without distortion of the specimen. Where distortion occurs, a lower measuring force may be used.

[b] Smaller radii may be used with an appropriate reduction in the measuring force applied.

5.6 Coaxial measuring load

To maintain bearing assemblies in their proper relative positions, the coaxial measuring load given in Tables 3 and 4 should be applied for the methods where specified.

Table 3 — Coaxial measuring loads for radial ball bearings and angular contact ball bearings with contact angles ⩽ 30°

Outside diameter mm		Coaxial load on the bearing N
>	⩽	min.
—	30	5
30	50	10
50	80	20
80	120	35
120	180	70
180	—	140