INTERNATIONAL STANDARD

ISO 3548-2

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Plain bearings — Thin-walled half bearings with or without flange —

Part 2: Measurement of wall thickness and flange thickness

Paliers lisses — Demi-coussinets minces à collerette ou sans collerette —

Partie 2: Mesurage de l'épaisseur de paroi et de l'épaisseur de collerette

Reference number
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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 3548-2 was prepared by Technical Committee ISO/TC 123, *Plain bearings*, Subcommittee SC 5, *Quality analysis and assurance*.

Together with ISO 3547-7, this part of ISO 3548 replaces ISO 12306, which has been cancelled.

ISO 3548 consists of the following parts, under the general title *Plain bearings — Thin-walled half bearings with or without flange*:

— *Part 2: Measurement of wall thickness and flange thickness*

Tolerances, design features and methods of test is to form the subject of a part 1 of ISO 3548[1)] and the measurement of peripheral length is to form the subject of a part 3.

1) It is intended to replace ISO 3548:1999 with ISO 3548-1.

Plain bearings — Thin-walled half bearings with or without flange —

Part 2: Measurement of wall thickness and flange thickness

1 Scope

This part of ISO 3548 specifies, in accordance with ISO 12301, the checking of the wall-thickness of thin-walled half bearings with or without flange and describes the required checking methods and measuring equipment. It applies to a maximum bearing diameter of 150 mm. If this part of ISO 3548 is applied to a greater diameter, an agreement can be formulated between the supplier and the user.

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 3548, *Plain bearings — Thin-walled half bearings with or without flange — Tolerances, design features and methods of test*

ISO 12301, *Plain bearings — Quality control techniques and inspection of geometrical and material quality characteristics*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
wall thickness
s_3
radial distance between the opposing measuring points at the inside and the outside surface diameter

See Figure 1.

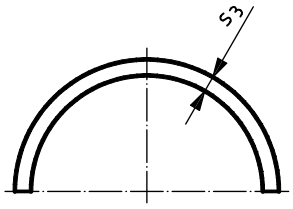


Figure 1 — Wall thickness, s_3, of a half bearing

3.2
measuring point
measuring line
agreed points [lines] established to facilitate agreement on checking

NOTE The establishment of measuring points [lines] does not preclude the need to comply with dimensional specifications in other areas.

3.3
tolerance
range between the upper specified limit and the lower specified limit

3.4
uncertainty of measurement
deviation of the measured value from the real value caused by statistical or systemic factors

4 Symbols and units

For the purposes of this part of ISO 3548, the symbols and units are as given in Table 1.

Table 1 — Symbols and units

Symbol	Parameter	Unit
a_{ch}	Distance to measuring position	mm
a_1	Distance to measuring position, rectangular from parting line	mm
α_2	Angle to measuring position from parting line	grad
B	Width	mm
C_i	Inner chamfer width	mm
D_n	Nominal outside diameter	mm
e_B	Eccentricity	mm
F_{pin}	Measuring pin load	N
H	Distance to measuring position from bearing parting line	mm
s_a	Wall thickness at angle α_2	mm
s_3	Wall thickness	mm
u	Wall thickness reduction at angle α_2	mm
x_1	Centre point of nominal outside diameter	mm
x_2	Centre point of eccentric bore	mm

5 Purpose of checking

In order to ensure the required bearing clearance and consequently the operational efficiency of the plain bearing unit, the wall thickness tolerances shall be as specified in ISO 3548.

6 Checking methods

6.1 Measuring principle

The gauging axis of the measuring device shall be in the radial direction and at a right angle to the outside surface of the test piece in order to find the minimum value of the wall thickness, s_3. The measured values may be recorded by a single measurement or by a sum of measurements (see Figure 2).

a) Single measurement by contact (mechanical/electronic gauge)

b) Sum measurement by contact/non-contact (electronic/pneumatic gauge)

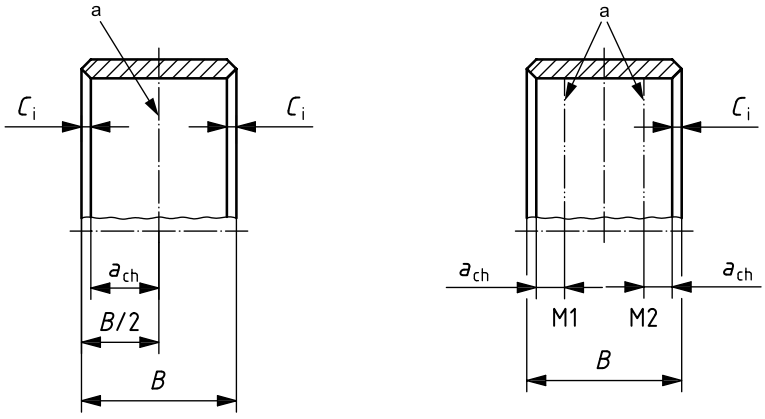
Figure 2 — Measuring principle of wall thickness measurement

The presence of lubricating holes, oil pockets, oil grooves, markings or special chamfers may require deviation from the measuring lines and measuring points specified in this clause and shall be agreed upon separately.

If any wall thickness does not conform to the specified values due to the manufacturing process, because of deformation of the bearing backing in the area of marking or at non-load bearing places, that wall thickness shall be defined separately.

6.2 Line measurement around the circumference

Measurement of the wall thickness around the circumference shall be carried out at the measuring lines specified in Figure 3 and Table 2.



Key

C_i inner chamfer width

a Measuring lines, M.

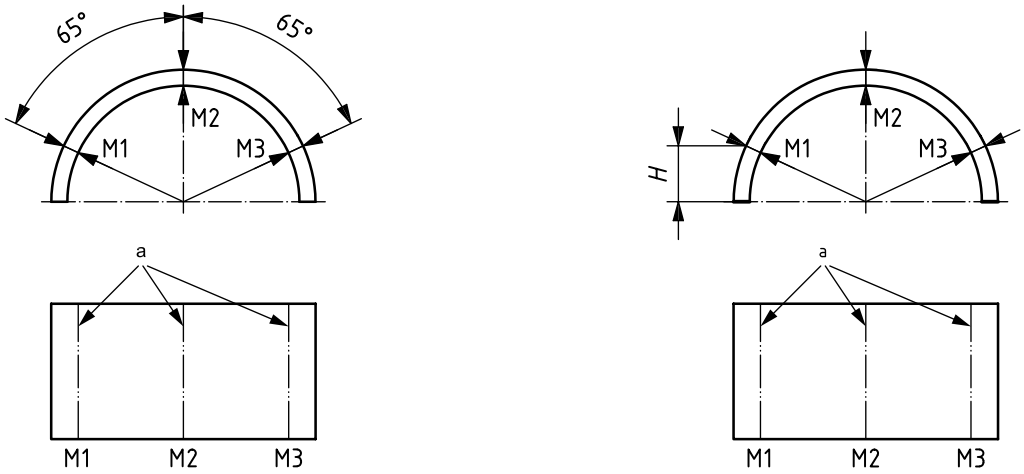
Figure 3 — Position of measuring lines

Table 2 — Distance to measuring position a_{ch}

Width B	Distance to measuring position a_{ch}	Number of measuring lines M
$B \leqslant 15$	$B/2 - C_i$	1
$15 < B \leqslant 50$	4	2
$B > 50$	6	2

6.3 Line measurement in the axial direction

Measurement of the wall thickness in the axial direction shall be carried out using the definition of measuring lines specified in Figure 4 a) (Method A) or using the definition of measuring lines specified in Figure 4 b) and Table 3 (Method B). The position of measuring lines for bearings > 150 mm nominal outside diameter is subject to agreement between the manufacturer and the customer.



a) Method A **b) Method B**

Key

a Measuring lines, M.

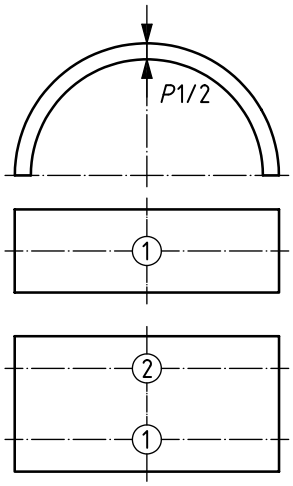
Figure 4 — Position of measuring lines

Table 3 — Distance to measuring position

Nominal outside diameter D_n mm	Radius for measuring inside surface mm
$25 < D_n \leqslant 40$	6 $H \leqslant 8$
$40 < D_n \leqslant 90$	$9 \leqslant H \leqslant 13$
$90 < D_n \leqslant 120$	$H = 13$
$120 < D_n \leqslant 150$	$H = 20$

6.4 Point measurement

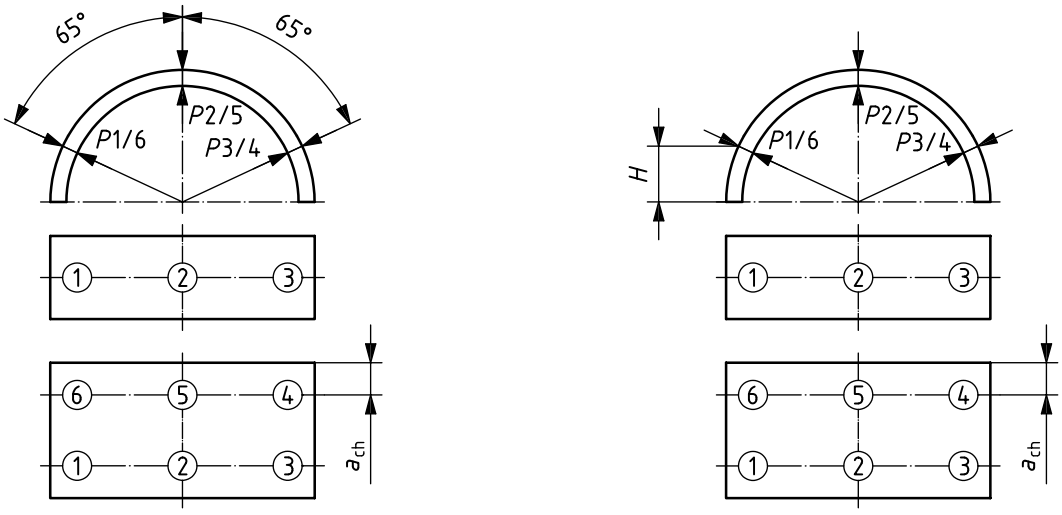
Point-by-point measurement of wall thickness shall be carried out by using the definition of measuring points specified in Figure 5 or Figure 6 a) (Method A) or Figure 6 b) and Table 3 (Method B) for widths of $B \leqslant 90$ mm. In the case of $B > 90$ mm, the measurement method shall be subject to agreement between the manufacturer and the customer. The measuring position distance, a_{ch}, shall be taken from Table 2.



Key

P measuring point

Figure 5 — One- or two-point measuring scheme for half bearings



a) Method A **b) Method B**

Key

P measuring point

Where the bearing design requires variable wall thickness, the measuring points shall be as specified on drawings.

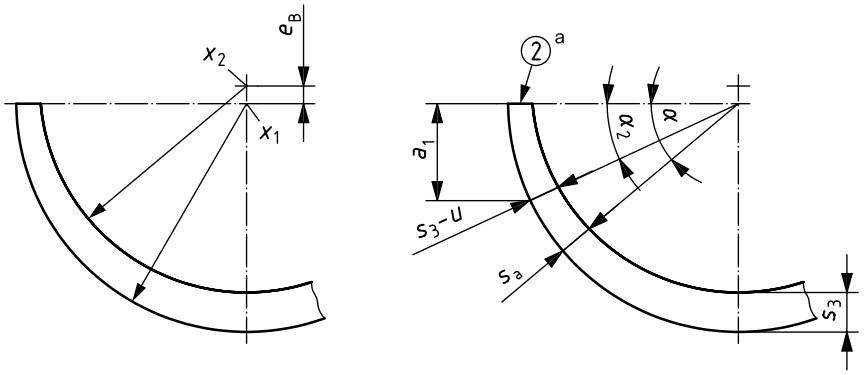
Figure 6 — Three- or six-point measuring scheme for half bearings

6.5 Grading of bearings

Grading is in all cases (whether circumference, line or point measurement) carried out by referral to the measuring points in the crown. When measuring two points or lines in the crown, grading is carried out using the highest reading.

6.6 Eccentric bore

In special applications, bearings with and without flange may be used with an eccentric bore. This means that wall thickness changes continuously from the crown to the parting line (see Figure 7). Measuring lines or points are defined by the angle a_2 or the distance a_1 (for Method A) or H (for Method B). If there is no other definition given, $a_2 = 25$ °.



Key

a Measuring point 2.

Figure 7 — Eccentric bore and changing wall thickness from crown to parting line

7 Requirements for measuring equipment and specimen for the contact method

7.1 Radius for measuring the outside surface

The radius at the gauge measuring pin positioned on the outside surface shall be 3,0 mm ± 0,2 mm.

7.2 Radius for measuring the inside surface

The radius at the gauge measuring pin positioned on the inside surface is given in Table 4 as a function of the plain bearing outside diameter, D_n, and the lining material.

Table 4 — Radius for measuring the inside surface

Nominal outside diameter D_n mm	Radius for measuring inside surface mm	
	Metallic lining material	Plastic lining material
$D_n \leqslant 10$	1,5 ± 0,2	1,5 ± 0,2
$10 < D_n \leqslant 25$	3 ± 0,2	3 ± 0,2
$25 < D_n \leqslant 150$	3 ± 0,2	5 ± 0,2

7.3 Measuring pin load

The measuring pin load, F_{pin}, applied to the lining material shall be 0,8 N to 2,5 N in accordance with ISO 12301. Load should be adapted to the hardness of the lining material (e.g. for soft sliding overlays, use low load).

7.4 Set-up

The measuring device shall be set to the nominal value of the thickness by a master block.

7.5 Periodic checking

The measuring device shall be checked periodically with the master block from the set-up.

7.6 Failures on the inside and/or outside surface

The presence of grease, dirt, burrs, etc., or damage or deformation on the outside surface can influence the measurement. Therefore, these influences shall be eliminated by cleaning the bearing before measurement, if necessary. Any slight hollows on the outside surface shall be excluded from measurement, if these areas are process related and agreed on between the manufacturer and the customer. A slight amount of corrosion protection may be allowed, as long as it does not influence the measurement.

8 Checking of measuring equipment

The equipment used for measuring shall be checked for accuracy of measurement at a frequency specified by the user, based on the type of equipment and on the experience gained from previous checks. The limits shall comply with current industry requirements.

Bibliography

[1] ISO 286-1 [2], *Geometrical product specifications (GPS) — ISO code system for tolerances of linear sizes — Part 1: Basis of tolerances, deviations and fits*

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

[3] ISO/R 1938, *ISO system of limits and fits — Part II: Inspection of plain workpieces*

2) To be published. (Revision of ISO 286-1:1998)

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