INTERNATIONAL STANDARD

ISO 4386-2

Second edition
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Plain bearings — Metallic multilayer plain bearings —

Part 2: Destructive testing of bond for bearing metal layer thicknesses greater than or equal to 2 mm

Paliers lisses — Paliers lisses métalliques multicouches — Partie 2: Détermination, par essai destructif, de l'adhérence du matériau antifriction d'épaisseur supérieure ou égale à 2 mm

Reference number
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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 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 4386-2 was prepared by Technical Committee ISO/TC 123, *Plain bearings*, Subcommittee SC 2, *Materials and lubricants, their properties, characteristics, test methods and testing conditions*.

This second edition cancels and replaces the first edition (ISO 4386-2:1982), which has been technically revised.

ISO 4386 consists of the following parts, under the general title *Plain bearings — Metallic multilayer plain bearings*:

— *Part 1: Non-destructive ultrasonic testing of bond of thickness greater than or equal to 0,5 mm*

— *Part 2: Destructive testing of bond for bearing metal layer thicknesses greater than or equal to 2 mm*

— *Part 3: Non-destructive penetrant testing*

Introduction

Long years of experience with bond tests led to an adaptation of this part of ISO 4386. The test apparatus has been modified, to reduce the negative local bending stress influence on the specimen. The geometry of the test specimen has been modified to avoid negative influence due to tolerances. A description of the specimen machining sequence has been added to get a more uniform specimen. A subclause on the application for quality control has been added.

Plain bearings — Metallic multilayer plain bearings —

Part 2: Destructive testing of bond for bearing metal layer thicknesses greater than or equal to 2 mm

1 Scope

This part of ISO 4386 specifies a tensile test method for determination of the bond strength between the bearing metal and the backing. The test can be applied to multilayer plain bearings with bearing metals based on lead, tin, copper or aluminium. For tested layer thicknesses of ≥ 2 mm, a raw lining thickness of a minimum additional 1 mm is necessary.

The backings are from steel, cast steel or copper alloys. The bond strength test does not apply to bearings with cast iron backing.

The test applies to all thrust bearings and to journal bearings with an inner diameter of backing ≥ 90 mm.

The test can be used for comparative investigations into the influence on the bond strength of various processes and types of material. In addition, the test is suitable for production control and for process qualification of bearing production.

For non-destructive ultrasonic testing of the bond between bearing metal and backing for bearing metal layer thicknesses ≥ 2 mm, see ISO 4386-1.

2 Normative references

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

ISO 4381, *Plain bearings — Tin casting alloys for multilayer plain bearings*

3 Principle

During the tensile testing carried out vertically to the bond surface, the bond strength R_{Ch}, in newtons per square millimetre, is the quotient of the maximum force, F_{max}, in newtons and the bond surface, A, in square millimetres, of the specimen (see Table 2).

NOTE The subscript "Ch" refers to the test method proposed by Chalmers.

$$R_{Ch} = \frac{F_{max}}{A} \quad (1)$$

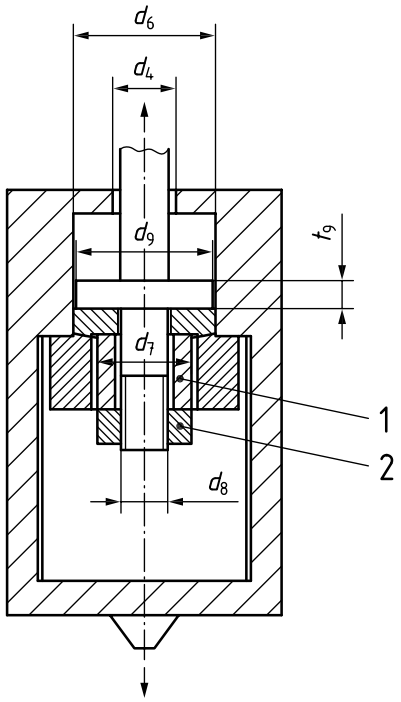
4 Test equipment

4.1 General

A calibrated tensile testing machine shall be used with apparatus in accordance with Table 1.

By means of careful adjustment of the apparatus, it shall be ensured that the force is acting vertically to the bond surface in order to avoid incorrect measurements.

4.2 Testing apparatus



Key

1 distance tube
2 nut

Figure 1 — Main dimensions of apparatus

NOTE Details not indicted in this part of ISO 4386 are expected to be chosen accordingly.

Table 1 — Dimensions and tolerances for test apparatus

Dimensions in millimetres

Type of specimen	Apparatus geometry data					
	d_4	d_6	d_7	d_8	d_9	t_9
	$^{+0,1}_{0}$	$^{+0,1}_{0}$	$^{0}_{-0,1}$	n.a.	n.a.	n.a.
T 100	8,1	19,8	15,9	M 8	19	4
T 200	12,1	29,1	23,9	M 12	28	4

5 Specimen

5.1 General

Tin casting alloys for multilayer plain bearings are specified in ISO 4381.

For selection of the type of specimen in the case of journal bearings, the inner diameter, d_1, of the bearing has to be considered.

Specimen T 100 is valid from the minimum diameter d_1 = 90 mm up to d_1 = 200 mm.

Specimen T 200 is valid for all diameters d_1 > 200 mm.

For the thrust bearings specimen, T 100 and T 200 may be used. Whenever possible, T 200 should be preferred.

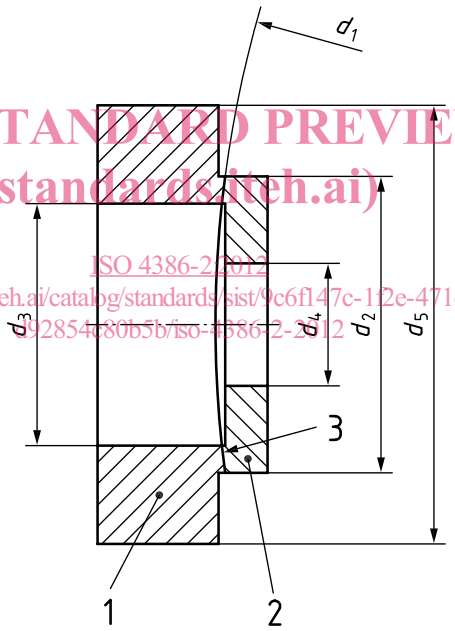
Both bearing metal faces shall be machined as a precondition for fixing the bearing metal layer on the test apparatus to avoid bending deformation of the bearing metal during test procedure. Use test apparatus in accordance with Table 1.

Specimens shall be manufactured in accordance with Table 2, Figure 2 and 5.1.

Table 2 — Dimensions and tolerances for specimens (see Figure 2)

Dimensions in millimetres

Type of specimen	Bond surface	Inner diameter of the backing of journal bearing	Specimen geometry data			
			d_2	d_3	d_4	d_5
	A mm^2	d_1	h8	H8	$^{+0,1}_{0}$	
T 100	100	90 - 200	19,60	16	8,1	29
T 200	200	> 200	28,85	24	12,1	38



Key

1 backing
2 bearing metal
3 bond surface equal to test surface

Figure 2 — Specimen (from a journal bearing) for bond testing