
**Plain bearings — Testing of the
tribological behaviour of bearing
materials —**

**Part 1:
Testing of bearing metals**

iTeh STANDARD PREVIEW
(standards.iteh.ai)
*Paliers lisses — Essai du comportement tribologique des matériaux
antifricition —
Partie 1: Essai des matériaux métalliques*

ISO 7148-1:2012

<https://standards.iteh.ai/catalog/standards/sist/f6036038-6db9-4463-9f68-d726d10f3c60/iso-7148-1-2012>



iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 7148-1:2012

<https://standards.iteh.ai/catalog/standards/sist/f6036038-6db9-4463-9f68-d726d10f3c60/iso-7148-1-2012>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2012

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

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	iv
1 Scope	1
2 Normative references	1
3 Symbols and units	1
4 Special features for the tribological testing of metallic bearing materials	2
5 Test methods	2
5.1 Test method A — Pin-on-disc	2
5.2 Test method B — Block-on-ring	3
5.3 Test method C — Rotation under thrust load	4
6 Test specimens	5
6.1 Disc	5
6.2 Ring	5
6.3 Pin	5
6.4 Block	5
6.5 Sleeve	5
6.6 Plate	6
6.7 Preparation of the test specimens	6
7 Test methods and test equipment	7
8 Lubrication	7
9 Designation	7
10 Test conditions	7
11 Test procedure	8
Annex A (informative) Test report	9
Bibliography	11

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 7148-1 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 third edition cancels and replaces the second edition (ISO 7148-1:1999), which has been technically revised.

ISO 7148 consists of the following parts, under the general title *Plain bearings — Testing of the tribological behaviour of bearing materials*:

- *Part 1: Testing of bearing metals* [ISO 7148-1:2012](https://standards.iteh.ai/catalog/standards/sist/f6036038-6db9-4463-9f68-d726d1015c60/iso-7148-1-2012)
- *Part 2: Testing of polymer-based bearing materials* <https://standards.iteh.ai/catalog/standards/sist/f6036038-6db9-4463-9f68-d726d1015c60/iso-7148-1-2012>

Plain bearings — Testing of the tribological behaviour of bearing materials —

Part 1: Testing of bearing metals

1 Scope

This part of ISO 7148 specifies tribological tests of metallic bearing materials for plain bearings under conditions of boundary lubrication.

The test procedures described in this part of ISO 7148 enable the friction and wear behaviour of bearing material/mating/lubricant combinations to be compared with that of other combinations, thus facilitating the selection of a bearing material for running repeatedly or for long periods under conditions of boundary lubrication, low speed and continuous sliding. Owing to differences in test conditions, measured friction and wear values can be expected to vary from one test facility to another.

The test results give useful information for practical application only if all parameters of influence are identical. The more the test conditions deviate from the actual application, the greater the uncertainty of the applicability of the results.

(standards.iteh.ai)

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 4385, *Plain bearings — Compression testing of metallic bearing materials*

3 Symbols and units

See Table 1.

Table 1 — Symbols and units

Symbol	Term	Unit
A, B, C	Test method	—
a	Sliding distance	km
A_5	Elongation at fracture	%
f	Coefficient of friction; ratio between friction force and normal force, i.e.: $f = \frac{F_f}{F_n}$	—
F_f	Friction force	N
F_n	Normal force	N
K_A	Overlap ratio (area of contact divided by area of wear track)	—

Table 1 (continued)

Symbol	Term	Unit
K_w	Coefficient of wear, volumetric wear rate related to the normal force, i.e.: $K_w = \frac{V_w}{F_n \times a} = \frac{w_v}{F_n}$	mm ³ /(N · km)
l_w	Linear wear as measured by change in distance	mm
m_w	Mass of material removed by wear	g
R_a	Surface roughness	µm
$R_{d0,2}$	Compression limit 0,2 %	N/mm ²
R_m	Tensile strength	N/mm ²
$R_{p0,2}$	0,2 % Proof stress	N/mm ²
T	Specimen's temperature near the sliding surface during testing under steady-state conditions	°C
T_{amb}	Ambient temperature	°C
T_L	Lubricant temperature	°C
t_{Ch}	Test duration	h
U	Sliding velocity	m/s
V_w	Material removed by wear as measured by change in volume	mm ³
w_l	Linear wear rate, i.e.: $w_l = \frac{l_w}{a}$	mm/km
w_v	Volumetric wear rate, i.e.: $w_v = \frac{V_w}{a}$	mm ³ /km
η	Lubricant viscosity	mPa · s

4 Special features for the tribological testing of metallic bearing materials

Plain bearings made of metallic materials usually require lubrication (e.g. oil or grease) to ensure a low rate of friction and wear.

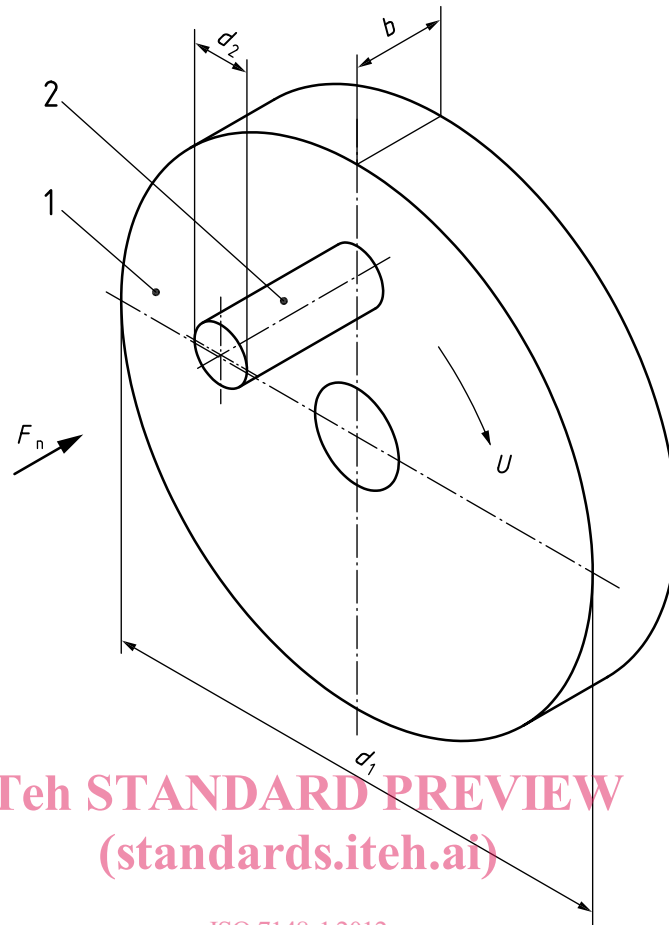
If possible, lubricated plain bearings should be designed to run under hydrodynamic conditions, where the sliding surfaces of the journal and the plain bearing are always fully separated by a film of lubricant. Under such conditions, friction depends on the rheological properties of the lubricant, and wear normally does not occur.

If hydrodynamic operation cannot be ensured, boundary lubrication prevails and wear of the bearing and mating material is likely. This may be during the starting or running down phase of a hydrodynamic plain bearing or when high loads, low sliding velocities, poor lubrication or oscillating movements prevent hydrodynamic action.

5 Test methods

5.1 Test method A — Pin-on-disc

Figure 1 shows a schematic drawing of a disc and pin assembly.



iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 7148-1:2012

<https://standards.iteh.ai/catalog/standards/sist/f6036038-6db9-4463-9f68-d726d10f3c60/iso-7148-1-2012>

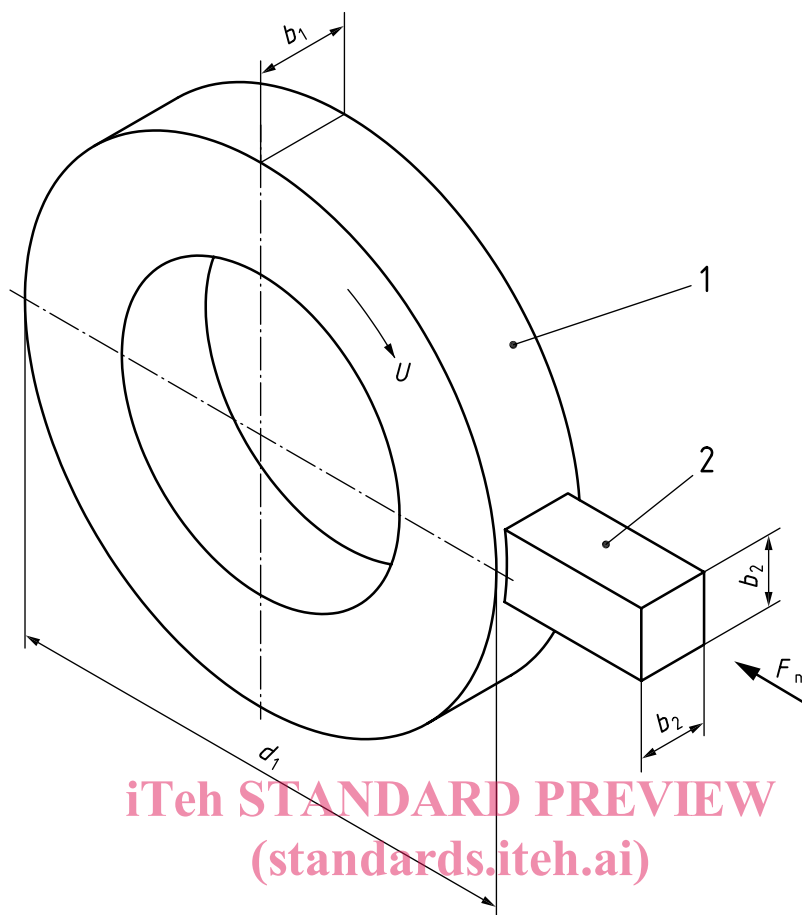
Key

- 1 disc or ring
- 2 pin or block

Figure 1 — Pin-on-disc test method

5.2 Test method B — Block-on-ring

Figure 2 shows a schematic drawing of a block and ring assembly.



iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 7148-1:2012

<https://standards.iteh.ai/catalog/standards/sist/f6036038-6db9-4463-9f68-d726d10f3c60/iso-7148-1-2012>

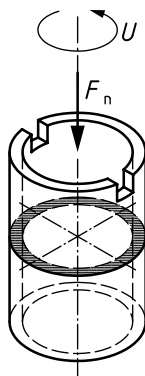
Key

- 1 disc or ring
- 2 pin or block

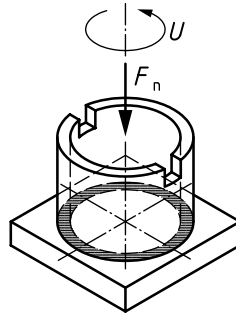
Figure 2 — Block-on-ring test method

5.3 Test method C — Rotation under thrust load

Figure 3 shows schematic drawings of a sleeve-to-sleeve and sleeve-to-plate assembly.



a) C1 — Sleeve-to-sleeve



b) C2 — Sleeve-to-plate

Figure 3 — Rotation under thrust load

6 Test specimens

6.1 Disc

The disc shall have the following preferred dimensions:

- diameter, d_1 : 40 mm to 110 mm;
- width b : 8 mm to 12 mm.

The diameter of the sliding track shall be noted in the test report.

6.2 Ring

ISO 7148-1:2012

<https://standards.iteh.ai/catalog/standards/sist/f6036038-6db9-4463-9f68->

The ring shall have an outside diameter, d_1 , of 40 mm to 80 mm and the width, b_1 , of the ring shall exceed the width, b_2 , of the block.

6.3 Pin

The pin shall preferably have a diameter, d_2 , of 3 mm to 10 mm.

6.4 Block

The cross-section of the block shall be 5 mm to 10 mm high and 5 mm to 10 mm wide.

6.5 Sleeve

The sleeve can be made by machining. The preferred basic dimensions of the sleeve are shown in Figure 4.