

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

Part 2: Testing of polymer-based bearing materials

ICS 21.100.10

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Summary of pages

This document comprises a front cover, an inside front cover, the ISO title page, pages ii to iv, pages 1 to 19 and a back cover.

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This British Standard, having been prepared under the direction of the Engineering Sector Committee, was published under the authority of the Standards Committee and comes into effect on 15 February 2000

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Amendments issued since publication

Amd. No.	Date	Comments

ISBN 0 580 34111 9

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

Part 2:

Testing of polymer-based bearing materials

*Paliers lisses — Essai du comportement tribologique des matériaux
antifriction —*

Partie 2: Essai des matériaux pour paliers à base de polymères



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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.

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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 7148 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 7148-2 was prepared by Technical Committee ISO/TC 123, *Plain bearings*, Subcommittee SC 2, *Materials and lubricants, their properties, characteristics, test methods and testing conditions*.

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

$\frac{3}{4}$ Part 1: *Testing of bearing metals*

$\frac{3}{4}$ Part 2: *Testing of polymer-based bearing materials*

Annex A of this part of ISO 7148 is for information only.

Introduction

A first step towards the specification of basic test conditions for friction and wear tests of polymer-based plain bearing materials was made with International Technical Reports ISO/TR 7147, ISO/TR 8285 and ISO/TR 9993. This initial step, lasting several years and which comprised the development of basic test equipment (pin-on-disc device) and its testing in parallel experiments in several institutes, is now concluded. It was subsequently found that in the absence of any other uniform recommendations or standards, a reference for comparative testing was often needed especially in the case of new material development without detailed knowledge of specific applications. At the same time it was found necessary to limit the test variables or to accurately define them in order to obtain in addition, as wide a comparison as possible. It ought be possible to use different test combinations or to test for specific applications (i.e. tests which simulate service conditions). This part of ISO 7148 takes these requirements into account and specifies instructions for the preparation of test specimens, for test principles and test equipment as well as for the selection of test variables, test procedure and analysis.

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

Part 2: Testing of polymer-based bearing materials

1 Scope

This part of ISO 7148 specifies tribological tests of polymer-based plain bearing materials under specified working conditions, i.e. load, sliding velocity and temperature, with and without lubrication. From the test results, data are obtained which indicate the relative tribological behaviour of metal-polymer and polymer-polymer rubbing parts.

The purpose of this part of ISO 7148 is to obtain, for polymer material combinations used in plain bearings, reproducible measured values for friction and wear under specified and exactly-defined test conditions without lubrication (dry surfaces) and with lubrication (boundary lubrication).

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 will be the uncertainty of the applicability of the results.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 7148. 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 7148 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 527-2, *Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics.*

ISO 1184, *Plastics — Determination of tensile properties of films.*

ISO 2818, *Plastics — Preparation of test specimens by machining.*

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

ISO 6691, *Thermoplastic polymers for plain bearings — Classification and designation.*

3 Symbols and units

See Table 1.

Table 1 — Symbols and units

Symbol	Term	Unit
A, B, C, D	Test method	—
a	Sliding distance	km
dr	Dry	—
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
gr	Grease	—
K_w	Coefficient of wear, volumetric wear rate related to the normal force, i.e.: $K_w = \frac{V_w}{F_n a} = \frac{w_v}{F_n}$	mm ³ /(N·km)
l_w	Linear wear as measured by change in distance	mm
M_f	Friction moment	Nm
oi	Oil	—
pl	Polymer-based material	—
$\bar{p}$	Specific force per unit area (force/projected contact area)	N/mm ²
$R_{d,B}$	Compression strength	N/mm ²
$R_{d0,2}$	Compression limit 0,2 %	N/mm ²
so	Solid lubricant	—
T	Specimen's temperature near the sliding surface during testing under steady-state conditions	°C
T_{amb}	Ambient temperature	°C
T_g	Glass temperature	°C
T_{lim}	Maximum permissible 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