

TECHNICAL REPORT

ISO
TR 6281

First edition
1990-04-15

Plain bearings — Testing under conditions of hydrodynamic and mixed lubrication in test rigs — Guidelines

*Paliers lisses — Essai des paliers lisses dans les conditions de lubrification
hydrodynamique et mixte dans des machines d'essai pour paliers — Principes
directeurs*



Reference number
ISO/TR 6281 : 1990 (E)
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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.

The main task of ISO technical committees is to prepare International Standards. In exceptional circumstances a technical committee may propose the publication of a technical report of one of the following types :

- type 1, when the necessary support within the technical committee cannot be obtained for the publication of an International Standard, despite repeated efforts;
- type 2, when the subject is still under technical development requiring wider exposure;
- type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical reports are accepted for publication directly by ISO Council. Technical reports types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical reports type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/TR 6281, which is a technical report of type 2, was prepared by Technical Committee ISO/TC 123, *Plain bearings*.

The reasons which led to the decision to publish this document in the form of a technical report type 2 are explained in the introduction.

Annexes A, B, C and D of this Technical Report are given for information only.

Introduction

Test rigs for plain bearings, using different test systems, are used all over the world. The wide range of practical applications with different requirements led to the design of numerous test rigs for plain bearings. Unfortunately, since the conditions of lubrication in these test rigs are usually not well defined, the test results obtained with one rig cannot generally be directly compared with results obtained on another test rig, nor can the results be related to practical applications. Different test rigs may even produce different rankings.

This Technical Report aims to improve the comparability and the transferability of the results by a better definition of the operating conditions, in particular with regard to conditions of lubrication.

The following parameters can be used to describe the lubrication adequately:

- a) the minimum lubricant film thickness, its distribution as a function of time and of location in the bearing under dynamic loading;
- b) the maximum lubricant film pressure;
- c) the distribution of pressure in the peripheral and the lateral directions as a function of time under dynamic loading conditions and the resulting (alternating) stresses in the bearing material;
- d) the maximum and the mean lubricant film temperature, the coefficient of friction and the variation of these parameters as a function of time.

Since tribochemical reactions may occur between lubricant and material, it is also necessary to characterize the lubricant in as detailed a way as possible.

It was therefore decided to first specify uniform guidelines for the testing of plain bearings.

During the ISO/TR 123/SC 2 meeting in Vienna on 12 October 1984 it was decided to make this method known in the form of a Technical Report. Further experience will be gathered with a view to publishing an International Standard.

Plain bearings — Testing under conditions of hydrodynamic and mixed lubrication in test rigs — Guidelines

1 Scope

This Technical Report establishes guidelines for the testing of oil-lubricated plain bearings without flange in bearing test rigs, running under conditions of full hydrodynamic lubrication and mixed lubrication, where the load is carried to a greater or lesser extent by mechanical contact.

This Technical Report deals with both static and dynamic loading in solid and multi-layer bearings.

Annex B gives examples of four types of test rigs.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Technical Report. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this Technical Report are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 3448 : 1975, *Industrial liquid lubricants — ISO viscosity classification*.

ISO 3675 : 1976, *Crude petroleum and liquid petroleum products — Laboratory determination of density or relative density — Hydrometer method*.

ISO 7146 : — ¹⁾, *Plain bearings — Terms, characteristics and causes of changes in appearance and damage*.

ISO 7902-1 : — ¹⁾, *Hydrodynamic plain journal bearings under steady-state conditions — Circular cylindrical bearings — Part 1: Calculation procedure*.

3 Test objectives

The test objectives with plain bearing test rigs operating under conditions of mixed or full hydrodynamic lubrication may be to obtain information on the following properties:

- A: running-in characteristics
- B : wear resistance
- C: compatibility between bearing and shaft material (resistance to scuffing)
- D: embeddability
- E: resistance to shaft scoring (which may result from contamination with solid particles)
- F: static-load-carrying capacity
- G: deformability
- H: conformability
- I: dynamic-load-carrying capacity (fatigue strength)
- J: resistance to erosion (cavitation erosion, fluid erosion, particle erosion)
- K: resistance to corrosion

The determination of these properties requires operating conditions which may result in the immediate establishment of full hydrodynamic lubrication conditions or in mixed lubrication conditions. The operating conditions needed for some objectives may imply repeated, time-dependent change between full hydrodynamic and mixed lubrication.

In any case, it is necessary to give a clear description of the operating conditions and to relate them unambiguously to the lubrication conditions (see clause 6).

NOTE — Specific test methods exist for only some of the above properties.

1) To be published.