SLOVENSKI STANDARD
SIST ISO/TR 10129:2002

01-marec-2002

Drsni ležaji - Preskušanje kovin za ležaje - Odpornost kovine proti korozivnemu delovanju maziva v kopeli

Plain bearings -- Testing of bearing metals -- Resistance to corrosion by lubricants under static conditions

Paliers lisses -- Essai des matériaux antifriction -- Résistance à la corrosion par des lubrifiants dans des conditions statiques

Ta slovenski standard je istoveten z: **ISO/TR 10129:1993**

ICS:

21.100.10	Drsni ležaji	Plain bearings

SIST ISO/TR 10129:2002 **en**

TECHNICAL REPORT

ISO TR 10129

First edition
1993-06-01

Plain bearings — Testing of bearing metals — Resistance to corrosion by lubricants under static conditions

Paliers lisses — Essai des matériaux antifriction — Résistance à la corrosion par des lubrifiants dans des conditions statiques

Reference number
ISO/TR 10129:1993(E)

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 technical committees is to prepare International Standards, but in exceptional circumstances a technical committee may propose the publication of a Technical Report of one of the following types:

— type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;

— type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;

— 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 of 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 of 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 10129, which is a Technical Report of type 2, was prepared by Technical Committee ISO/TC 123, *Plain bearings*, Sub-Committee SC 2, *Materials and lubricants, their properties, characteristics, test methods and testing conditions.*

The reasons justifying the decision to publish this document as a type 2 Technical Report are given in the introduction.

International Organization for Standardization
Case Postale 56 • CH-1211 Genève 20 • Switzerland
Printed in Switzerland

Introduction

Plain bearings based on different metallic materials are used in practice all over the world. With respect to the different kinds of lubricants, it is necessary to test the compatibility between the metals and lubricants.

At the meeting of ISO/TC 123/SC 2 in Munich on 1987-09-10, it was decided (Resolution 156) to publish this method in the form of a Technical Report. In the meantime it is planned to gather information throughout the world for a future International Standard.

ISO/TC 123 adopted this procedure by majority at its plenary meeting in Munich on 1987-09-16 (Resolution 90).

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Plain bearings — Testing of bearing metals — Resistance to corrosion by lubricants under static conditions

1 Scope

This Technical Report describes the testing of bearing metals with lubricants with regard to their corrosion resistance.

It is essential that certain properties of the materials combined within the tribological system remain unchanged or change only within a permissible range over a long period of time. It is on account of these properties that the materials are regarded as being especially suitable for the tribological system. As to the tribological system "plain bearing", the compatibility between the bearing material and lubricant is of special interest and is dependent on chemical and mechanical actions.

The test established in this Technical Report determines the behaviour of plain bearing metals with respect to corrosion by lubricants (lubricating oils) under conditions of static load, that is without any mechanical action taking place simultaneously.

In order for such corrosion tests to be evaluated and compared, it is necessary to carry them out in accordance with the conditions laid down in this Technical Report. Other conditions are to be indicated in detail. This Technical Report includes the most important general principles concerning the method of carrying out the corrosion tests.

2 Definition

For the purposes of this Technical Report, the following definition applies.

2.1 corrosion: Reaction of a metallic material to its environment, which causes a measurable change in the material and may result in corrosion damage. In most cases, this reaction is of an electrochemical nature. It may, however, also involve chemical or metallophysical processes.

NOTE 1 Material changes which are solely caused by or only in combination with mechanical influences are not dealt with in this Technical Report. For damage, see also ISO 7146:1993, *Plain bearings — Terms, characteristics and causes of damage and changes in appearance.*

3 General principles

3.1 In general, corrosion tests are carried out as comparison tests, i.e. several materials and lubricants are compared with one another. However, it is also possible to include in the test reference materials or reference lubricants, the behaviour of which is already known.

3.2 The duration of the test shall be chosen and, if necessary, extended, so that at the end of the test definite information on the corrosion behaviour of the material tested and, possibly, of the reference material can be obtained under the specified test conditions.

3.3 A value for a single material is less informative due to a greater dispersion of the results which often occurs when determining an increase or decrease in mass. Therefore, each result shall be given as a mean value from three tests.

4 Lubricants

The quantity of lubricant used shall be at least 10 ml per square centimetre of bearing metal surface.

Specifications indicating the type and the performance level of the oils are used to characterize the lubricants which are used for the tests.

However, in order to be able to draw conclusions concerning, for example, the additives used and their effect, it is recommended to give the precise chemical and physical data as follows:

— density at 15 °C, in grams per millilitre;

— flash point, in degrees Celsius;

— neutralization value;

— saponification value;

— base number;

— viscosity at 40 °C, in square millimetres per second;

— viscosity at 100 °C, in square millimetres per second;

— sulfate ash yield, as a percentage by mass;

— zinc content, as a percentage by mass;

— phosphorus content, as a percentage by mass;

— barium content, as a percentage by mass;

— calcium content, as a percentage by mass;

— corrosive sulfur content, as a percentage by mass.

5 Apparatus

5.1 Beaker, tall form, of capacity 400 ml.

5.2 Heating bath, preferably an oil bath, capable of maintaining the required temperature to within ± 2 °C.

The heating bath shall be large enough to allow the beaker to be immersed up to 3/4 of its height.

6 Preparation of test samples

6.1 Test samples of bearing metals shall be cut out from parts sufficiently large that any influences of strong mechanical cold-working and of high temperature rise at the edges of the cut are eliminated. Burrs shall be removed. In the case of multilayer materials (e.g. steel/bearing metal), the steel backing and the steel edges should be covered.

6.2 The surface of the bearing metal shall not be less than 25 cm^2 in order to eliminate as far as possible the influence of irregularities.

6.3 The surface condition of the test samples during the tests shall agree as far as possible with the surface condition of the bearing metal in practice. The test samples shall be thoroughly cleaned and degreased. It is recommended to use suitable organic solvents, e.g. white spirit, pure tetrachloroethylene or methanol.

6.4 The test samples shall clearly be marked. As local corrosion may occur as a result of the mechanical strain caused by the stamping of figures or letters, it is recommended to use an electromechanical method of marking.

7 Test procedure

Weigh the test samples.

Place the bearing metal test samples in the beakers (5.1) in such a way that they are completely covered by the lubricant. Protect the beakers against dirt by means of a cover.

Do not measure the influence at the phase limit air/lubricant. In principle, test only samples of the same bearing metal in one beaker in order to avoid any interaction. Eliminate from the air any components which may interfere with the tests.

During the test, maintain the beakers at the specified test temperature to within ± 2 °C. Recommended test temperatures are 80 °C, 100 °C, 120 °C and 150 °C.

The duration of the test shall be 20 days at least; it may be extended if necessary (see 3.2). Intermediate assessments shall be made after 1 week and after 2 weeks.

For the purpose of the intermediate and final assessments, clean the test samples by means of spraying using an appropriate solvent. Dry them in a hot-air cabinet until constant weight is reached. Record the weight.

8 Expression of results

8.1 Mass changes

Data concerning the mass changes of the samples are only really informative when the surface of the test samples is uniformly attacked.

The mass change of the samples (mass loss or increase in mass) shall be given as the mean value from three samples at least.

8.2 Surface changes

During the intermediate and final assessments, check the surfaces of the test samples with regard to the frequency, extension and distribution of single corrosion points as well as discolourations.

Record the surface condition by means of photographs, preferably by means of a scanning electron microscope because of the depth of focus.

8.3 Microstructural changes

Metallographical structure tests are necessary if, for example, a constituent or the grain boundary is especially attacked during the corrosion process. Use an appropriate drawing or a photograph to record the positions of the ground sections and, if necessary, the places where the test samples were taken.

8.4 Type and nature of the corrosion products

Indicate the colour and nature of the corrosion products in the test report. For basic tests, it may be useful to determine the chemical composition and structure of the corrosion products.

8.5 Change of lubricant

The chemical composition or the physical properties of the lubricant may change on reaction with the bearing metal. The recording of this change may help considerably when evaluating the compatibility test. The list given in clause 4 may serve as a basis for the data to be determined.

9 Test report

The test report shall contain at least the following information:

a) reference to the present Technical Report;

b) chemical composition of the bearing metal samples, and their designation if necessary;

c) condition of the material, e.g. cast, hot-rolled, cold-rolled or method of heat treatment;

d) type of sample, e.g. test sample cut out of solid or multilayer material (e.g. steel/AlSn6Cu) or prefabricated part (bearing liner or bush);

e) method of sampling, e.g. longitudinal direction or at right angles to the production line;

f) dimensions of the test sample;

g) surface roughness of the test sample;

h) method of cleaning;

i) microsection before and after testing, to determine the structure, e.g. grain size, distribution of lead or tin in the case of heterogeneous alloys;

j) test duration and test temperature;

k) type and nature of the corrosion products;

l) date and place of testing and name of tester.