INTERNATIONAL STANDARD

Plain bearings — Metallic thin-walled half bearings — Determination of the $\sigma_{0,01}$*-limit

Paliers lisses — Demi-coussinets minces métalliques — Détermination de la limite élastique $\sigma_{0,01}$*

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document 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 6282:1983), which has been technically revised. The main changes compared to the previous edition are as follows:

— The Scope has been revised.

— Clauses 3, 4, 5, and 6 have been revised.

— Figure 1 has been revised.

Plain bearings — Metallic thin-walled half bearings — Determination of the $\sigma_{0,01}$*-limit

1 Scope

This document specifies a method of determining the $\sigma_{0,01}$*-limit for the steel backing of thin-walled multilayer half bearings for bearing diameters up to 80 mm. It can also be used for bearing diameters up to 160 mm.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1
$\sigma_{0,01}$*-limit
compressive hoop stress in a half bearing which creates a permanent set of 0,01 %

Note 1 to entry: The $\sigma_{0,01}$*-limit is different from the usual $\sigma_{0,01}$-limit as a result of the geometry of the test specimen and the method of application of the test load. In order to make the distinction, the $\sigma_{0,01}$-limit of half bearings is marked with an asterisk (*).

3.2
compressive hoop stress of a half bearing
F/S
quotient of the normal load, *F*, applied to an area of cross-section, *S*, which is determined mathematically

Note 1 to entry: *F* is expressed in newtons (N), *S* is in square millimetres (mm^2) and *F/S* is in megapascals (MPa), which equals newtons per square millimetre.

Note 2 to entry: The area of cross-section, *S*, is calculated as follows for the most common material combinations:

$S = L \cdot e_1$ for steel/lead alloys or steel/tin alloys

$$S = L\left(e_1 + \frac{e_2}{2}\right) \text{ for steel/copper alloys}$$

$$S = L\left(e_1 + \frac{e_2}{3}\right) \text{ for steel/aluminium alloys}$$

where

      L is the bearing width, in millimetres (mm);

      e_1 is the thickness of the steel backing, in millimetres (mm);

      e_2 is the thickness of the bearing metal layer, in millimetres (mm).

Note 3 to entry: If annular grooves and/or chamfers extend into the steel backing, then the cross-section of the steel backing is to be reduced correspondingly for the calculation.

Note 4 to entry: In the case of oil holes, the inclusion in the calculation should be subject to an agreement between manufacturer and user.

Note 5 to entry: Dependent upon the shape of the locating nick at the joint face and the extent to which the load is carried by it there may be an effect on the measured $\sigma_{0,01}$*-limit.

4 Apparatus

4.1 Pressure testing machine, with hydraulic or pneumatic application of load, equipped with a load indicator having an accuracy of ±1 %, or better, of the end scale value, and a length measuring device.

4.2 Master shell and checking block in accordance with Figure 1.

The master shell shall have the same width as the half bearing to be tested, whereas the checking block may be wider.

NOTE   This test equipment is also used for the determination of the peripheral length of thin-walled half bearings (see ISO 3548-3).

5 Preparation of test specimen

If possible, half bearings ready for mounting shall be tested. If the necessary test load cannot be applied by the test equipment, then the width of the half bearing is to be reduced correspondingly.

Any reduced width bearing should not include the locating nick.

The surface of the steel backing is to be clean. Excessive oiling or degreasing should be avoided as the presence of residual manufacturing lubricants should be sufficient to enable accurate measurement.

6 Procedure

6.1 The measuring temperature should be between 20 and 25 °C. Therefore, it is important to ensure that the measuring equipment (including master shell) and test bearings are at the same temperature.

6.2 Insert the checking block into the measuring equipment, line it up and secure it against lateral movement.

6.3 Insert the master shell into the checking block and adjust the load to F_0 to give a compressive stress of 100 MPa. Unload and remove the master shell.

6.4 Insert the half bearing to be tested into the checking block, apply load F_0 and adjust the length measuring device to read zero. Unload and remove the half bearing from the checking block.

NOTE   The application of the load F_0 is necessary to ensure the flexible half bearing conforms to the checking block.

6.5 Insert the master shell into the checking block and adjust a load F_1 which is greater than F_0. Unload and remove the master shell.

6.6 Insert the half bearing into the checking block and adjust the load F_1 for 10 s. Unload and remove the half bearing from the checking block.

6.7   Insert the master shell into the checking block and apply the load F_0. Unload and remove the master shell.

6.8   Insert the half bearing into the checking block and apply the load F_0. The reduction in the peripheral length of the half bearing, caused by the application of load F_1 in accordance with 6.6, is indicated by the length measuring device. Unload and remove the half bearing from the checking block.

6.9   Insert the master shell into the checking block and increase the load to F_2 in accordance with 6.5 to 6.8. Unload and remove the master shell.

6.10   Repeat the procedure given in 6.5 to 6.8 by incrementally increasing the load F until a permanent set of about 0,01 % in the peripheral direction of the half bearing is recorded.

The increment of compressive stress which gives the permanent set of 0,01 % shall not exceed 50 MPa.

7   Expression of results

The "evaluation sheet" as presented in Annex A serves for the evaluation of the measured values obtained in accordance with 6.5 and the following subclauses.

The following formula allows calculation of the reduction of the peripheral length of the half bearing, $\Delta l_{0,01}$, expressed in micrometres (µm):

$$\Delta l_{0,01} = 0,05 \cdot \pi \cdot D_{cbM}$$

where D_{cbM} is the measured diameter of the checking block bore (Dcb), in millimetres (mm).
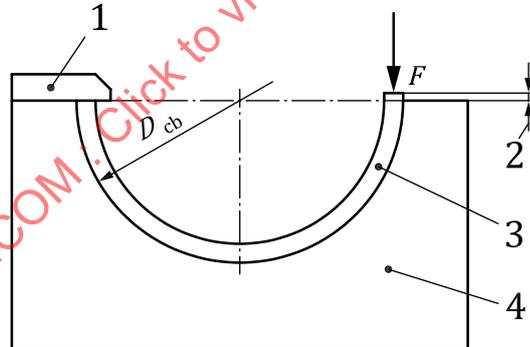
Key
1   fixed stop
2   nip (crush)
3   master shell or half bearing shell to be measured
4   checking block

Figure 1 — Checking block

Annex A
(informative)

Evaluation sheet for the determination of the $\sigma_{0,01}$*-limit of metallic thin-walled half bearings

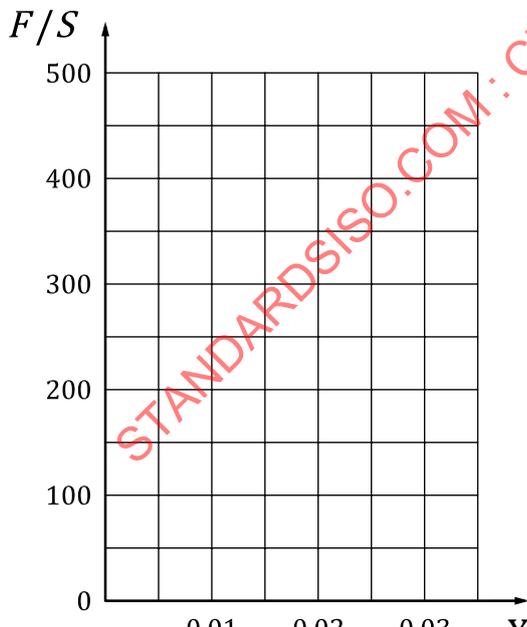| Load F N	Compressive stress F/S MPa	Indication of length measuring device (see 6.8) μm	Permanent set %

	Number of test specimen	$\sigma_{0,01}$*-limit MPa

Figure A.1 — Permanent set as a percentage of peripheral length