
**Implants for surgery — Wear of total
hip-joint prostheses —**

**Part 1:
Loading and displacement parameters
for wear-testing machines and
corresponding environmental
conditions for test**

*Implants chirurgicaux — Usure des prothèses totales de l'articulation
de la hanche —*

*Partie 1: Paramètres de charge et de déplacement pour machines
d'essai d'usure et conditions environnementales correspondantes d'essai*

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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 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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](http://www.iso.org/foreword)

The committee responsible for this document is ISO/TC 150, *Implants for surgery*, Subcommittee SC 4, *Bone and joint replacements*.

This third edition cancels and replaces the second edition (ISO 14242-1:2012), which has been technically revised.

ISO 14242 consists of the following parts, under the general title *Implants for surgery — Wear of total hip-joint prostheses*:

- *Part 1: Loading and displacement parameters for wear-testing machines and corresponding environmental conditions for test*
- *Part 2: Methods of measurement*
- *Part 3: Loading and displacement parameters for orbital bearing type wear testing machines and corresponding environmental conditions for test*

Implants for surgery — Wear of total hip-joint prostheses —

Part 1:

Loading and displacement parameters for wear-testing machines and corresponding environmental conditions for test

1 Scope

This part of ISO 14242 specifies the relative angular movement between articulating components, the pattern of the applied force, the speed and duration of testing, the sample configuration, and the test environment to be used for the wear testing of total hip-joint prostheses.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3696, *Water for analytical laboratory use — Specification and test methods*

ISO 7206-1, *Implants for surgery — Partial and total hip joint prostheses — Part 1: Classification and designation of dimensions*

ISO 14242-2, *Implants for surgery — Wear of total hip-joint prostheses — Part 2: Methods of measurement*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7206-1 and the following apply.

3.1

abduction/adduction

angular movement shown in [Figure 1 a\)](#)

3.2

flexion/extension

angular movement shown in [Figure 1 b\)](#)

3.3

inward/outward rotation

angular movement shown in [Figure 1 c\)](#)

3.4

polar axis

axis of the acetabular component which intersects the centre of the spherical articulating surface and is perpendicular to the plane of the flange or, if no flange is present, perpendicular to the plane of the entry diameter

4 Principle

The femoral and acetabular components of a test specimen are placed in position in their normal configuration. The test apparatus transmits a specified time-varying force between the components, together with specified relative angular displacements. A control specimen, if polymers are the object of investigation, is subjected to the same time-varying force to determine the creep of the test specimen and/or the amount of mass change due to fluid transfer. The test takes place in a controlled environment simulating physiological conditions.

5 Test and control specimens and test fluid

5.1 Fluid test medium, calf serum diluted with deionized water in accordance with ISO 3696.

The fluid test medium shall be filtered through a 2 µm filter and have a protein mass concentration of 30 g/l ± 2 g/l. To minimize microbial contamination, the fluid test medium shall be stored frozen until required for testing. An antimicrobial reagent (such as sodium azide) can be added.

WARNING — Antimicrobial reagents can be potentially hazardous.

Routine monitoring of the pH of the fluid test medium can be undertaken. If so, the values and the relevant number of load cycles should be included in the test report [see [Clause 8](#) item f) 6)].

The recommended protein concentration of 30 g/l has been shown to result in reasonably physiological wear mechanisms and wear rates with a variety of materials in a variety of hip simulators, and is stipulated here in the interest of facilitating comparison of results among laboratories implementing this part of ISO 14242. Nevertheless, the user should routinely validate the results obtained in a hip simulator by direct comparison with implants of the same design and bearing materials that have been worn *in vivo*. If substantial differences are noted, the user might wish to use a higher or lower concentration of protein in the test lubricant, if it can be documented that this provides a closer agreement with *in vivo* wear mechanisms and wear rates.

NOTE The use of a fluid test medium of non-biological origin can be considered when performance requirements relating to this test method are being decided.

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5.2 Test specimen, femoral head and acetabular components.

The acetabular component shall have the articulating surface attached by its normal immediate backing (for example bone cement or a machined replica of the inner surface of the backing) unless this is impractical due to physical features of the implant system. If the component forming the articulating surface is fixed to the backing by a rim/snap-fit system, the machined replica shall provide the same fixation conditions.

If it is not practical to use the normal backing or cement fixation due to physical features of the implant system, the support system for the acetabular component should reproduce the design features and conditions intended for clinical use but should allow removal of the component for measurement of wear without destruction.

The features connecting the acetabular component to the test rig shall prevent any movement and should not apply forces in restricted regions that might develop localized points of high stress.

5.3 Control specimen, identical to test specimen.

6 Apparatus

6.1 Testing machine, capable of producing the angular displacements specified in [Figures 1](#) and [2](#) in association with the corresponding forces specified in [Figures 1](#) and [3](#), and operating at a frequency of 1 Hz ± 0,1 Hz.