INTERNATIONAL STANDARD

ISO 23160

First edition
2011-06-01

Watch cases and accessories — Tests of the resistance to wear, scratching and impacts

Boîtes de montres et leurs accessoires — Essais de résistance à l'usure, aux rayures et aux impacts

Reference number
ISO 23160:2011(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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 document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 23160 was prepared by Technical Committee ISO/TC 114, *Horology*, Subcommittee SC 6, *Precious metal coverings*.

This first edition of ISO 23160:2011 cancels and replaces ISO 3160-3:1993, which has been technically revised.

Introduction

The quality of a watch depends on many factors. Of these, the resistance of a watch to wear, scratches and impacts is an important aspect contributing to consumer satisfaction.

This International Standard describes tests to simulate the deterioration of the aesthetic of watch cases and their accessories in wearing conditions. In addition, it describes tests for evaluating the wear resistance of surfaces. Where possible, a calibration process is described. The intention of this is to measure and adjust the strain of wear.

For instance, results that simulate a year's wear can be seen after just a few hours, allowing the resistance of decorative layers or the base material to be examined and compared.

The results are evaluated through visual observation, by comparing the parts subjected to accelerated wear tests with reference samples. Evaluation can be completed by measuring roughness and colour changes.

Watch cases and accessories — Tests of the resistance to wear, scratching and impacts

1 Scope

This International Standard specifies tests for the evaluation of the resistance of watch cases and their wristlets to wear, scratching and impacts occurring when wearing the watch.

This International Standard is applicable mainly to complete watch cases fitted with wristlets. However, certain tests can be applied to the watch case only, to the complete or partial wristlet, or to specially prepared samples.

NOTE In order to simulate the state of degradation of a worn watch, it is possible to combine all tests described in this International Standard, by agreement between the contracting parties.

2 Normative references

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

ISO 2819, *Metallic coatings on metallic substrates — Electrodeposited and chemically deposited coatings — Review of methods available for testing adhesion*

ISO 8251, *Anodizing of aluminium and its alloys — Measurement of abrasion resistance of anodic oxidation coatings*

ISO 11640, *Leather — Tests for colour fastness — Colour fastness to cycles of to-and-fro rubbing*

ISO 27874, *Metallic and other inorganic coatings — Electrodeposited gold and gold alloy coatings for electrical, electronic and engineering purposes — Specification and test methods*

3 Terms and definitions

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

3.1
wear
surface alteration, in particular resulting from friction against clothing

3.2
scratches
surface alterations resulting from general friction against all kinds of objects

3.3
impacts
surface alterations resulting from general shocks against hard and rough surfaces, as well as drops, when wearing the watch

4 Wear resistance

4.1 Wear test using moving ceramic chips

4.1.1 Objective

The aim of this test is to simulate general wear which results from wearing the watch.

4.1.2 Description of test

This wear test is performed using an industrial rotating or vibrating polishing machine, on which a receptacle made of a synthetic organic material is mounted, containing the tested parts and an abrasive load.

On gold plated components, one cycle corresponds to one year of effective wear. For other layers, the correspondence shall be established.

The test conditions depend on the type of machine being used. An example of the test conditions of two machines is shown in B.1.

4.1.3 Abrasive load

4.1.3.1 General

The abrasive load shall be composed of abrasive ceramic elements mixed with fresh water containing a surface tension agent.

Other abrasive elements may also be used, as long as the results remain within the agreed limits established in the calibration test, as described in 4.1.5.

4.1.3.2 Ceramic chips

It is recommended that cylindrical abrasive elements, truncated at 45° at each end and consisting of agglomerated grains of corundum, be used, in accordance with the characteristics defined in Figure 1 and Table 1.

Dimensions in millimetres

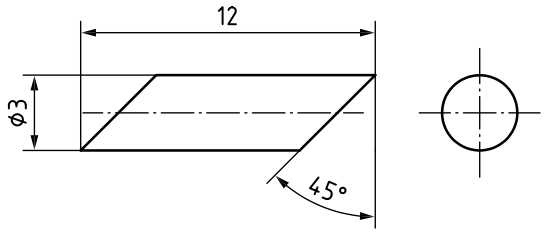


Figure 1 — Details of ceramic chips

Table 1 — Characteristics of ceramic chips

Dimensions	diameter 3 mm, length 12 mm
Indicative density	2,56 g/cm^3
Hardness	900 HV ± 100 HV
Indicative chips composition	— Al_2O_3 45 % — SiO_2 43 % — C 10 % — Na, Mg, K, Ca, Ti, Fe
Abrasive mix (indicative proportions)	— 1 l after being run in chips — 200 ml water — 6 ml concentrated surface tension agent
An example of ceramic chips is given in B.2.1.	

4.1.3.3 Ceramic balls

It is recommended that abrasive elements in the form of small balls, consisting of agglomerated grains of corundum, be used, in accordance with the characteristics defined in Table 2.

Table 2 — Characteristics of ceramic balls

Dimensions	diameter 3 mm to 4 mm
Indicative density	2,56 g/cm^3
Hardness	1 320 HV ± 25 HV
Indicative balls composition	— Al_2O_3 40 % — SiO_2 50 % — C 10 % — Na, Mg, K, Ca, Ti, Fe
Abrasive mix (indicative proportions)	— 1 kg ceramic balls — 250 ml water — 25 ml concentrated surface tension agent
An example of ceramic balls is given in B.2.2.	

4.1.4 Operating procedure

The watch case and its wristlet shall be introduced into the receptacle containing the abrasive load described in 4.1.3. They shall be examined after each cycle.

For calibration, new calibration washers shall be subjected to one wear cycle and their loss of mass measured. The chips shall be run in for at least 50 h.

The type of parts being tested determines the limit of durability of the chips. In all cases, the amount of wear should stay within the defined limits.

4.1.5 Calibration

The duration of the test to simulate the wear of watch cases and wristlets after one year's wear can be evaluated by observing the loss of mass of a standard washer in accordance with the characteristics defined in Figure 2 and Table 3. Once this loss of mass has been established, the duration of one cycle of the accelerated wear test can be determined and observed.

Loss of mass after one cycle should be 6 mg ± 2 mg, measured using a precision balance with a resolution of 0,1 mg.

Dimensions in millimetres

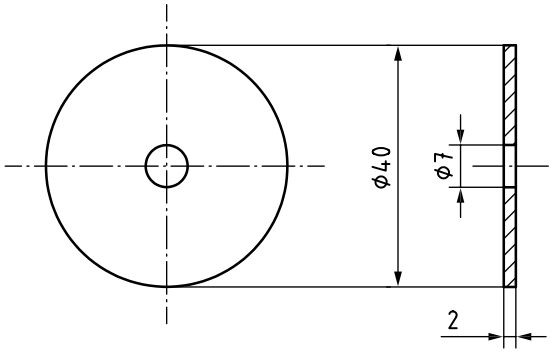


Figure 2 — Details of a standard washer

Table 3 — Characteristics of a standard washer

Material	Stainless steel 1.4435 or 1.4404
Hardness max.	210 HV1 ± 10 HV1
Roughness	N5 (Ra 0,4 µm)

4.1.6 Evaluation of results

Evaluation of wear is done principally by visual inspection and by comparison with reference samples. See Annex A.

Metallographic sections or other methods of determining the thickness of the samples or their coating(s) may be performed to assess the wear which has occurred.

In addition, a corrosion test can be carried out to reveal any possible exposure of the base material.

The limit of wear resistance shall be defined by agreement between the contracting parties.

4.2 Wear test using continuous friction against a textile belt

4.2.1 Objective

The aim of this test is to simulate mild wear resulting from friction against clothes, similar to actual watch wearing conditions.

4.2.2 Description of test

4.2.2.1 General

The test device drives a textile friction belt, applying pressure against a test sample in accordance with Figure 3.

4.2.2.2 Test conditions

The test conditions shall be as follows:

a) strain force of the textile belt: 50 N;

b) speed of the textile belt: 0,5 m/s;

c) penetration of the test sample: 15 mm;

d) test duration: 3 h.

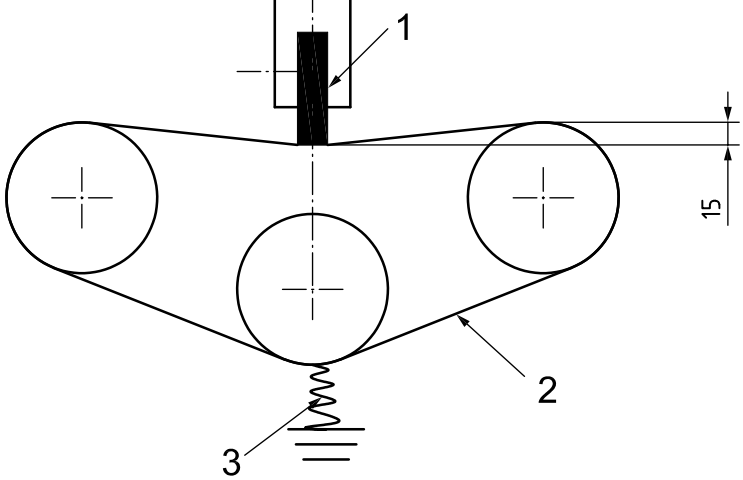
4.2.2.3 Test sample

The textile belt test can be used to test wear resistance of case coatings, wristlets and other components.

Before beginning the test, the adhesion force of the decorative coatings shall be checked, using the methods specified in ISO 2819 and ISO 27874.

The test sample shall be correctly positioned, with parallel contact to the textile belt.

Dimensions in millimetres



Key

1 sample
2 textile belt
3 tension on wheel

Figure 3 — Device for wear test using a textile belt