INTERNATIONAL STANDARD

ISO 16253

First edition
2007-10-15

Watch-cases and accessories — Vapour phase deposited coatings

Boîtes de montres et leurs accessoires — Revêtements déposés en phase vapeur

Reference number
ISO 16253:2007(E)

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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 16253 was prepared by Technical Committee ISO/TC 114, *Horology*, Subcommittee SC 6, *Precious metal coverings*.

Introduction

This International Standard has been developed in order to meet the global need for a definition of the requirements and tests that enable characterization of coatings applied by vapour phase deposition to watch-cases and their accessories.

It defines the terms used in connection with the main vapour phase deposition processes, and presents the requirements relating to the appearance and strength of the deposited coatings, as well as their resistance to physical and chemical attack. On the conclusion of an agreement between the customer and the supplier, some latitude is left as to the choice of standard test methods and determination of acceptable limit values.

This International Standard defines a simple structure, which facilitates identification of the base material, the deposited coatings and their thickness, in order to give information to consumers. It advises manufacturers to provide these indications in the documents supplied with the watch.

To protect the consumer, this International Standard stipulates the conditions for marking watch-cases and their accessories, as well as the required compliance with ISO 3160-1, which specifies the thickness and minimum gold content for gold alloy coatings.

Watch-cases and accessories — Vapour phase deposited coatings

1 Scope

This International Standard specifies the general requirements and test methods for hard coatings obtained by vapour phase deposition processes intended to improve mainly the surface aspect and wear and corrosion resistance, and/or to offer protection against contact-allergy. It is applicable to watch-cases and accessories.

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 3160-1, *Watch-cases and accessories — Gold alloy coverings — Part 1: General requirements*

ISO 3160-2, *Watch-cases and accessories — Gold alloy coverings — Part 2: Determination of fineness, thickness, corrosion resistance and adhesion*

ISO 3160-3[1)], *Watch cases and accessories — Gold alloy coverings — Part 3: Abrasion resistance tests of a type of coating on standard gauges*

ISO 4524-5, *Metallic coatings — Test methods for electrodeposited gold and gold alloy coatings — Part 5: Adhesion tests*

ISO 8654, *Colours of gold alloys — Definition, range of colours and designation*

ISO 9227, *Corrosion test in artificial atmospheres — Salt spray tests*

EN 12472, *Method for the simulation of wear and corrosion for the detection of nickel release from coated items*

CR 12471, *Screening test for nickel release from alloys and coatings in items that come into direct and prolonged contact with the skin*

1) Standard cancelled and replaced by ISO 23160 (in preparation).

3 Terms and definitions

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

3.1
vapour phase deposited coating
coating that is deposited by the transfer of atoms from a source to the substrate through vapour phase

NOTE The transfer can be purely physical (PVD: physical vapour deposition) or can be done through chemical reaction (CVD: chemical vapour deposition). The gas phase transfer can be used to form chemical compounds like ceramics, by injecting a reactive gas.

3.2
ion plating
coating process in which the substrate and the growing layer are continuously receiving impacts of energetic particles, usually ions from the plasma of a glow discharge, accelerated toward the biased substrate

3.3
sputtering
coating process in which atoms ejected from a target (cathode) surface by the impacts of gaseous ions from the plasma of a glow discharge, are deposited on to the substrate

3.4
hard coating
coating with a hard material such as titanium nitride (TiN) or titanium carbide (TiC) having a hardness value of more than 1 000 HV (Vickers hardness)

4 Requirements

4.1 Coating

4.1.1 Appearance of coating

The appearance of the coating shall be tested according to the method and conditions specified in Annex A. The coating on the significant surface of the coated item shall be free from harmful defects or from any sign of a defect which is detrimental to usage, such as coating peel-off, irregular colour tone, roughness, cracks, pits, exposure of base material and any permanent stain.

4.1.2 Thickness of coating

The thickness of the coating is specified according to agreement between the customer and the supplier. The thickness of the coating shall be tested according to one of the methods given in 5.3 and the coating thickness at the significant surface shall comply with the specified thickness.

4.1.3 Adhesion of coating

The adhesion of the coating shall be tested according to one of the methods given in 5.4 and the coating shall be free from such signs of defective adhesion as peeling or blister.

4.1.4 Corrosion resistance of coating

The corrosion resistance of the coating shall be tested according to one of the methods given in 5.5 and shall comply with the specified criteria, when the corrosion resistance is specified.

4.1.5 Hardness of coating

The hardness of the coating shall be tested according to one of the methods given in 5.6 and shall comply with the specified value, when the hardness of coating is specified.

4.1.6 Wear resistance of coating

The wear resistance of the coating shall be tested according to one of the methods given in 5.7.1 and shall comply with the specified criteria, when the wear resistance is specified.

Considering the very small thickness of the coating, a certain degree of wear of the edges can be considered as acceptable; whereas wear, change of colour or of appearance of the flat or rounded sides (with a large radius), is not acceptable.

Where parts are coated with a thin layer of gold, the wear resistance test can reveal a change in colour, whose criteria for acceptance should be defined between customer and supplier.

4.1.7 Nickel release

Where the base material of the coated parts is likely to release nickel, it is recommended to apply to them the method of simulation of wear and corrosion, according to 5.7.2. The measured values shall comply with the legislation in force in the country where the product is to be sold.

4.1.8 Colour of coating

The colour of the coating shall be measured before and after the wear resistance test, according to the method given in 5.8, and shall comply with the specified value, when the colour is specified.

4.2 Base material, processes and coatings

It is recommended to customers and suppliers to indicate the base material, the processes and the coatings, using Annex B.

4.3 Underlayer

If the substrate requires the deposit of an underlayer or barrier, its characteristics shall be verified before applying a vapour phase deposited coating, according to the existing standards.

5 Test methods

5.1 Test samples

Samples for testing shall be issued from the regular production batch. If it is not possible, a representative sample shall be prepared from the same base material as the product and treated in the same production batch.

5.2 Visual inspection

The visual inspection shall comply with the test method and test conditions specified in Annex A.

5.3 Thickness measurement

The measurement of the coating thickness can be made using one of the methods specified in ISO 3160-2.

In case of dispute, the measurement of a metallographic section examined by means of a scanning electron microscope shall be the reference.