INTERNATIONAL STANDARD

ISO 9211-4

Fourth edition
2022-03

Optics and photonics — Optical coatings —

Part 4: Specific test methods: abrasion, adhesion and resistance to water

Optique et photonique — Traitements optiques —

Partie 4: Méthodes d'essai spécifiques: abrasion, adhérence et résistance à l'eau

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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 of 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 172, *Optics and photonics*, Subcommittee SC 3, *Optical materials and components*.

This fourth edition cancels and replaces the third edition (ISO 9211-4:2012), which has been technically revised.

The main changes are as follows:

— Addition of a new adhesion test method (pull-off test).

A list of all parts in the ISO 9211 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Optics and photonics — Optical coatings —

Part 4: Specific test methods: abrasion, adhesion and resistance to water

1 Scope

ISO 9211 describes surface treatments of components and substrates, excluding ophthalmic optics (spectacles), by the application of optical coatings and gives a standard form for their specification. It defines the general characteristics and the test and measurement methods wherever necessary, but it is not intended to define the process method.

This document describes specific test methods of abrasion, adhesion and resistance to water for coating environmental durability tests that are identified in ISO 9211-3 but not described in other normative references. They are typically performed in sequence with other environmental durability tests, an example is shown in ISO 9211-3:2008, Annex A.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 48-2, *Rubber, vulcanized or thermoplastic — Determination of hardness — Part 2: Hardness between 10 IRHD and 100 IRHD*

ISO 9211-1, *Optics and photonics — Optical coatings — Part 1: Vocabulary*

ISO 14997:2017, *Optics and photonics — Test methods for surface imperfections of optical elements*

ISO 29862, *Self adhesive tapes — Determination of peel adhesion properties*

EN 13144:2018, *Metallic and other inorganic coatings — Method for quantitative measurement of adhesion by tensile test*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 9211-1 apply.

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

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

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

4 Preparation prior to testing

Recommended storage time is at least 12 h after the coating process under ambient atmospheric conditions, or as specified between manufacturer and customer.

Before and after subjecting a coated specimen (component or witness sample) to any inspection or test, the specimen shall be properly cleaned using nonresidue cleaning agents only. This is a mutually agreed