INTERNATIONAL STANDARD

ISO 9211-3

Second edition
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Optics and photonics — Optical coatings —

Part 3: Environmental durability

Optique et photonique — Traitements optiques —

Partie 3: Durabilité environnementale

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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 9211-3 was prepared by Technical Committee ISO/TC 172, *Optics and photonics*, Subcommittee SC 3, *Optical materials and components*.

This second edition cancels and replaces the first edition (ISO 9211-3:1994) subclauses 3.1 to 3.5 of which have been technically revised or deleted and renumbered; Table 1 of which has been expanded and technically revised and Table 2 of which has been deleted and replaced by new informative Annex A.

ISO 9211 consists of the following parts, under the general title *Optics and photonics — Optical coatings*:

— *Part 1: Definitions*

— *Part 2: Optical properties*

— *Part 3: Environmental durability*

— *Part 4: Specific test methods*

Optics and photonics — Optical coatings —

Part 3: Environmental durability

1 Scope

ISO 9211 identifies 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 whenever necessary. It is not intended to define the process method.

This part of ISO 9211 specifies categories of use for optical coatings and identifies which environmental tests are necessary to prove that the coatings meet the required specification. Definitions and the extent of testing are given in ISO 9022-1.

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 9022-1, *Optics and optical instruments — Environmental test methods — Part 1: Definitions, extent of testing*

ISO 9022-2, *Optics and optical instruments — Environmental test methods — Part 2: Cold, heat and humidity*

ISO 9022-4, *Optics and optical instruments — Environmental test methods — Part 4: Salt mist*

ISO 9022-6, *Optics and optical instruments — Environmental test methods — Part 6: Dust*

ISO 9022-9:1994, *Optics and optical instruments — Environmental test methods — Part 9: Solar radiation*

ISO 9022-11, *Optics and optical instruments — Environmental test methods — Part 11: Mould growth*

ISO 9022-12, *Optics and optical instruments — Environmental test methods — Part 12: Contamination*

ISO 9022-14, *Optics and optical instruments — Environmental test methods — Part 14: Dew, hoarfrost, ice*

ISO 9211-4, *Optics and optical instruments — Optical coatings — Part 4: Specific test methods*

3 Categories of use

3.1 Definitions of categories

Five categories of use are defined. Each category requires either different environmental tests and/or different severity of testing. These categories are listed below in order of severity of requirement.

Category A

This category refers to components in applications which would normally only apply when they are to be mounted internally within sealed units. In this category, handling is in a protected and controlled environment and should only take place with extreme care. Physical contact with the optically coated surface is discouraged.

Category B

This category refers to applications where components will be exposed only to a controlled environment. Such applications may involve mild abrasion such as occurs with carefully controlled cleaning.

Category C

This category refers to applications where components will be exposed to normal outdoor ambient conditions and cleaning but without severe abrasion and scratching.

Category D

This category refers to applications where components will be exposed to severe outdoor ambient conditions and uncontrolled cleaning with the risk of severe abrasion and scratching.

Category O

This category refers to applications which require special, non standard, specifications. Since the specification of the components in such cases will not exactly fit into one of the categories A to D, the recommended way to specify in such a case is to indicate first the category in which most requirements are satisfied. The exceptional requirements can then be specified from other categories or by indicating the test degree of severity.

EXAMPLE "Category C; Abrasion, Humidity: Category B; Adhesion: 03".

3.2 Operating and storage conditions

The temperature specifications listed in Table 1 are meant as storage conditions. For some types of coating, e.g. bandpass filters and accurate edge filters, it may be necessary that spectral tolerances shall be maintained within a certain temperature range. This should be specified separately, according to the requirements of the application.

3.3 Influence of the substrate

It should be kept in mind that it is not the coating but the entire coating-substrate combination which determines the category of use.

For instance, coatings on glass, normally satisfying category C, might not do so when applied to sensitive or unstable substrates. This is likely to become apparent with the rain, solubility, humidity, heat, and salt spray tests, for example.

3.4 Cemented coatings

This part of ISO 9211 does not apply to cemented coatings. The environmental stability of such a substrate-coating-cement-substrate combination depends too much on properties of the cement, as well as the (relative) properties, e.g. thermal expansion, of the two substrate components involved.