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Optics and photonics — Preparation of drawings for optical elements and systems —

Part 9: Surface treatment and coating

*Optique et photonique — Indications sur les dessins pour éléments et systèmes optiques —
Partie 9: Traitement de surface et revêtement*

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Foreword

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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. www.iso.org/directives

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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](#)

The committee responsible for this document is ISO/TC 172, *Optics and photonics*, Subcommittee SC 1, *Fundamental standards*.

This second edition cancels and replaces the first edition (ISO 10110-9:1996), which has been technically revised.

ISO 10110 consists of the following parts, under the general title *Optics and photonics — Preparation of drawings for optical elements and systems*:

- Part 1: *General*
- Part 2: *Material imperfections - Stress birefringence*
- Part 3: *Material imperfections - Bubbles and inclusions*
- Part 4: *Material imperfections - Inhomogeneity and striae*
- Part 5: *Surface form tolerances*
- Part 6: *Centring tolerances*
- Part 7: *Surface imperfection tolerances*
- Part 8: *Surface texture*
- Part 9: *Surface treatment and coating*
- Part 10: *Table representing data of optical elements and cemented assemblies*
- Part 11: *Non-toleranced data*
- Part 12: *Aspheric surfaces*
- Part 14: *Wavefront deformation tolerance*

- *Part 17: Laser irradiation damage threshold*
- *Part 19: General description of surfaces and components*

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Optics and photonics — Preparation of drawings for optical elements and systems —

Part 9: Surface treatment and coating

1 Scope

ISO 10110 specifies the presentation of design and functional requirements for optical elements and systems in technical drawings used for manufacturing and inspection.

This part of ISO 10110 specifies rules for indicating the treatments and coatings applied to optical surfaces for functional and/or protective purposes.

2 Normative references

ISO 128, *Technical drawings — General principles of presentation*

ISO 9211-1:2010, *Optics and photonics — Optical coatings — Part 1: Definitions*

ISO 9211-2, *Optics and photonics — Optical coatings — Part 2: Optical properties*

ISO 10110, *Optics and photonics — Preparation of drawings for optical elements and systems*

3 Terms and definitions

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

3.1 functional coating

thin film deposited to affect surface reflectance, to separate spectral wavelength regions, and/or to produce certain polarization or other special properties

Note 1 to entry: There is a wide variety of functional coatings, e.g. reflective, antireflective, wavelength selective, conductive or protective coatings. The different types of functional coatings are listed in Table A.1 of ISO 9211-1:2010 (see [Annex A](#)).

3.2 protective surface treatment

paint or plating protection applied to optical surfaces, particularly rear surface mirrors, to prevent damage from handling, environmental effects and other causes

Note 1 to entry: Surfaces may also be painted or covered in certain areas to limit their optically effective apertures for stray light control.

4 General

ISO 10110-1 stipulates that all indications apply fundamentally to the finished product. Accordingly, the dimensions given in drawings which mention surface treatments or coatings refer to the dimensions after application of the treatments or coatings (see [Figure 1](#)). However, in certain cases, the dimensions of a part before the application of surface treatments may be important. In such cases it shall be explicitly indicated in the drawing that these dimensions refer to the untreated part.

5 Indications in drawings

5.1 General

The form of the specification for optical coatings is defined in ISO 9211-2.

When coating performance requirements are complex, they are described in separate specification documents, which shall be referenced in the drawings. If the specification is simple, it may be given directly on the drawing. In this case, the following symbols shall be used according to ISO 9211-1:

$\tau(\lambda)$ for spectral transmittance

$\rho(\lambda)$ for spectral reflectance

$\alpha(\lambda)$ for spectral absorptance

NOTE Wherever the Greek letters are mistakable, $T(\lambda)$, $R(\lambda)$ and $A(\lambda)$ may be used.

Wavelengths shall be given in nanometers.

5.2 Indication of functional coatings

For a suitable optical element, especially a lens element or a prism, the data may be given in tabular form as described in ISO 10110-1. The preferred form for the indication of functional coatings is the tabular form. An example is shown in [Annex B](#).

If the specification of a coating is too long to be included in the appropriate table field, it shall be given in the drawing field in a box as described below or in a separate coating specification document. An example is shown in [Annex C](#).

Functional coatings shall be indicated by λ . This symbol shall be located outside the element and tangent to the surface to be coated. Exceptions are elements in which the coating is protected by a protective layer and cemented (or optically contacted) subassemblies; in these cases the coating symbol shall be placed inside the optical element (see [Figure 2](#) and [Figure 3](#)).

In drawings of a subassembly, the position of the coating symbol λ indicates to which of the two joined surfaces the coating is to be deposited: the coating symbol is placed inside the optical element that is to be coated prior to assembly (see [Figure 3](#)).

The coating symbol shall have a leader line to a box, containing the specification reference or specification.

Examples are given in [Figures 2](#) to [5](#).

The function of the coating shall be included in the box. Unless otherwise noted, the specifications shall refer to the indicated surface alone. "In the case of functional coatings that are to be cemented, it shall be indicated whether the specification applies before or after cementing" (see [Figure 3](#)).

Unless indicated otherwise, the coating shall extend at least over the optically effective surface. If necessary, toleranced dimensions shall be given for the area to be coated. In cases in which different zones of the same surface are to be coated differently, the zones shall be indicated by dimensioning (see [Annex D](#)).

5.3 Indication of protective treatments

Protective treatments shall be indicated by a thick "chain" line (line type 04.2, ISO 128-24) adjacent to the surface. The length of this line indicates the region to be treated. If necessary, dimensions shall be given for this region.

The specification of the surface treatment shall be given in a box, which is connected to the thick "chain" line by a leader. Examples are given in [Figures 1](#) and [2](#).

6 Imperfections of functional coatings

ISO 10110-7 specifies the indication of an acceptability level for coating imperfections, which are described in ISO 9211-1.

7 Examples

Examples of functional coating and protective surface treatment indications are given in [Figures 1](#) to [5](#).

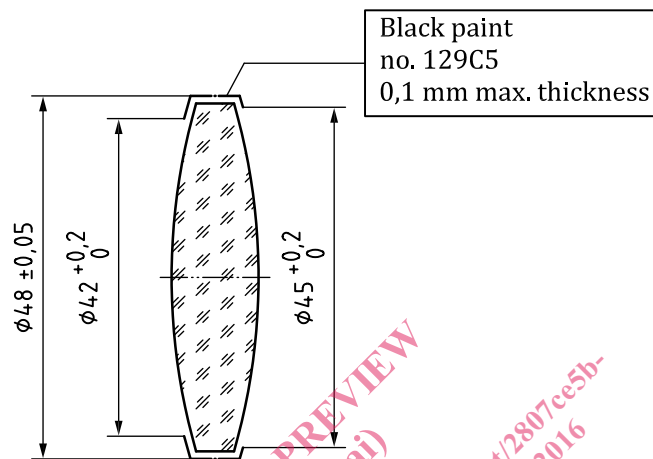


Figure 1 — Example of protective surface treatment indication (The outer diameter of $48 \pm 0,05$ refers to the part after painting)

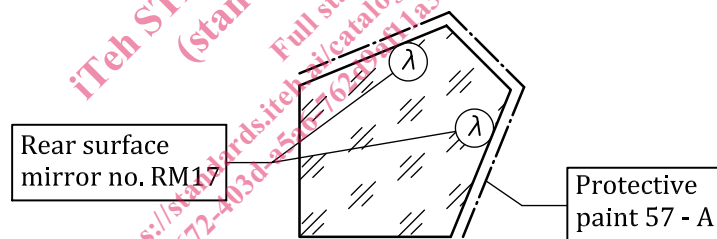


Figure 2 — Example of indication of a protective surface treatment combined with a functional coating