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

**Part 7:
Surface imperfection tolerances**

*Optique et photonique — Indications sur les dessins pour éléments et
systèmes optiques —*

Partie 7: Tolérances d'imperfection de surface



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Foreword

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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 10110-7 was prepared by Technical Committee ISO/TC 172, *Optics and photonics*, Subcommittee SC 1, *Fundamental standards*.

This second edition cancels and replaces the first edition (ISO 10110-7:1996), 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*

Introduction

A localized surface imperfection, such as a dig or a scratch resulting from handling or manufacture, can degrade the perceived quality of an optical component. Dark-field inspection reveals the location of very small imperfections. The use of an appearance comparison scale, together with tolerance levels agreed by the manufacturer and user, permits classification of a component as “accept” or “reject”. This form of subjective inspection based on visibility or a visual assessment of area, although economic and fast, lacks precision.

Measurement is only required as a second stage operation following inspection necessary to determine location and to select a surface imperfection worthy of study, see ISO 14997. In such cases, a drawing notation indicating this level of inspection is required and can be added to the specification. This process, not depending on the eye, is more time consuming and is usually only carried out when a surface imperfection could influence performance as, for example, in laser or low-light level systems or when a more precise measure is demanded.

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

Part 7: Surface imperfection tolerances

1 Scope

ISO 10110 specifies the presentation of design and functional requirements for single optical elements and for optical assemblies in technical drawings used for their manufacture and inspection.

This part of ISO 10110 specifies the indication of the level of acceptability of surface imperfections within the effective aperture of individual optical elements and optical assemblies. These include localized surface imperfections, edge chips and long scratches.

It is to be noted that the acceptance level for localized imperfections is specified taking into account functional effects (affecting image formation or durability of the optical element) as well as cosmetic (appearance) effects.

This part of ISO 10110 applies to transmitting and reflecting surfaces of finished optical elements, whether or not they are coated, and to optical assemblies. It recognizes that permissible imperfections may be specified according to the area affected by imperfections on components or in optical assemblies.

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 10110-1:2006, *Optics and photonics — Preparation of drawings for optical elements and systems — Part 1: General*

ISO 14997:2003, *Optics and optical instruments — Test methods for surface imperfections of optical elements*

3 Terms and definitions

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

See Figure 1 for an illustration of the classification of imperfections.

3.1

localized surface imperfection

localized artifact within the effective aperture of an optical surface, optical element or optical assembly produced by improper treatment during or after fabrication or in use

NOTE 1 Examples of localized artifacts are scratches, pits, streaks, scuffs and fixture marks. Also included are localized coating blemishes such as grey spots and colour sites that absorb or reflect light differently from the bulk of the coating. Imperfections can be on or under a surface. ISO 9802 includes a glossary of terms in use.

NOTE 2 Surface imperfections in optical assemblies can occur on any surface of the assembly.