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

Part 5:  
**Surface form tolerances**

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

*Partie 5: Tolérances de forme de surface*



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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 10110-5 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 10110-5:1996) which has been technically revised. It also incorporates the Technical Corrigendum ISO 10110-5:1996/Cor.1:1996.

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

This part of ISO 10110 refers to deformation in the form (shape) of an optical surface and provides a means of specifying tolerances for certain types of surface deformation in terms of “fringe spacings”.

Because it is common practice to measure the surface form deviation interferometrically as the wavefront deformation caused by a single reflection from the optical surface at normal ( $90^\circ$  to surface) incidence, it is possible to describe a single definition of interferometric data reduction that can be used in both cases, i.e. in surface form deviation as well as wavefront deformation. One “fringe spacing” is equal to a surface deformation that causes a deformation of the reflected wavefront of one wavelength.

The surface under test together with the test glass is, for example, such an interferometer. The surface form deviation is represented by the wavefront deviation which is the difference between the wavefront reflected by the actual surface and that reflected by the test glass surface.

Because of the potential for confusion and misinterpretation, nanometres rather than fringe spacings should be used where possible. Where fringe spacings are used as units, the wavelength should also be specified. A value expressed in nanometres is (e.g. in the case of test glass testing) a converted value of one which is expressed in fringe spacings.

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

## Part 5: Surface form tolerances

### 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 tolerance for surface form.

NOTE 1 The terminology of interferometry is used for the specification of tolerances and, in particular, for the units in which the tolerances are to be specified; however, this does not stipulate that only interferometric methods may be used for the actual testing of optical parts. Other non-interferometric methods may be used if the results are converted to the units specified here.

This part of ISO 10110 applies to surfaces of both spherical and aspheric form.

NOTE 2 ISO 10110-12 allows the surface form tolerance for aspheric surfaces to be specified without reference to this part of ISO 10110.

### 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 7944:1998, *Optics and optical instruments — Reference wavelengths*

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

ISO 10110-10, *Optics and photonics — Preparation of drawings for optical elements and systems — Part 10: Table representing data of optical elements and cemented assemblies*

ISO 14999-4:2007, *Optics and photonics — Interferometric measurement of optical elements and optical systems — Part 4: Interpretation and evaluation of tolerances specified in ISO 10110*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14999-4 apply.

NOTE ISO 14999-4 provides the definitions for all the deformation functions.