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Second edition
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**Optics and photonics —
Interferometric measurement of
optical elements and optical systems —
Part 4:
Interpretation and evaluation of
tolerances specified in ISO 10110**

*Optique et photonique — Mesurage interférométrique de composants
et de systèmes optiques —*

*Partie 4: Directives pour l'évaluation des tolérances spécifiées dans
l'ISO 10110*



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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).

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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 14999-4:2007), which constitutes the following changes:

- a) clauses for tolerancing cylindrical and torical wavefronts, the representation of the measured wavefront deformation in terms of Zernike coefficients, and for tolerancing of the slope deviation have been added;
- b) the name of quantity A has been changed to power deviation. For further details, see [3.3.1](#), Note 2 to entry.

ISO 14999 consists of the following parts, under the general title *Optics and photonics — Interferometric measurement of optical elements and optical systems*:

- *Part 1: Terms, definitions and fundamental relationships* [Technical Report]
- *Part 2: Measurement and evaluation techniques* [Technical Report]
- *Part 3: Calibration and validation of interferometric test equipment and measurements* [Technical Report]
- *Part 4: Interpretation and evaluation of tolerances specified in ISO 10110*

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Introduction

This part of ISO 14999 provides a theoretical frame upon which are based indications from ISO 10110-5 and/or ISO 10110-14.

A table listing the corresponding nomenclature, functions, and values used in ISO 10110-5 and ISO 14999-4 is given in ISO 10110-5, Annex B.

ISO 10110-5 refers to deformations in the form of an optical surface and provides a means for specifying tolerances for certain types of surface deformations in terms of "nanometers".

ISO 10110-14 refers to deformations of a wavefront transmitted once through an optical system and provides a means of specifying similar deformation types in terms of optical "wavelengths".

As 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° to surface) incidence, it is possible to describe a single definition of interferometric data reduction that can be used in both cases. One "fringe spacing" (as defined in ISO 10110-5) is equal to a surface deformation that causes a deformation of the reflected wavefront of one wavelength.

Certain scaling factors apply depending on the type of interferometric arrangement, e.g. whether the test object is being measured in single pass or double pass.

Due to the potential for confusion and misinterpretation, units of nanometres rather than units of "fringe spacings" or "wavelengths" are to be used for the value of surface form deviation or the value of wavefront deformation, where possible. Where "fringe spacings" or "wavelengths" are used as units, the wavelength is also to be specified.