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

**Part 14:  
Wavefront deformation tolerance**

*Optique et photonique — Préparation des dessins pour éléments et  
systèmes optiques —*

*Partie 14: Tolérance de déformation du front d'onde*



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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](http://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](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

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

This third edition cancels and replaces the second edition (ISO 10110-14:2007), which has been technically revised. The main changes compared to the previous edition are as follows:

- this document has been adjusted to ISO 10110-5 which includes the use of general surfaces.
- a new subclause “Additional forms” has been added as 5.2.2, which includes “PV and robust PV wavefront deviation” and “Wavefront deviation described by Zernike coefficients”.
- examples have been added in [Clause 6](#).
- subclause 4.5 has been deleted.

A list of all parts in the ISO 10110 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

This document makes it possible to specify a functional tolerance for the performance (expressed as single-pass wavefront deformation) of an optical system, which may have optical power or contain powered optical elements. This tolerance therefore includes the effect of surface form deformations, inhomogeneities, and possible interactions among the various individual errors.

Optical elements are often tested in a “double-pass” configuration, in which the wavefront passes through or, in the case of reflective optics, reflects from the element under test twice, as shown in ISO/TR 14999-1:2005, Figure 18.



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

## Part 14: Wavefront deformation tolerance

### 1 Scope

This document specifies rules for the indication of the permissible deformation of a wavefront transmitted through or, in the case of reflective optics, reflected from an optical element or assembly in the ISO 10110 series, which standardizes drawing indications for optical elements and systems.

This document is also applicable when using optical systems with general surfaces (ISO 10110-19).

The deformation of the wavefront refers to its departure from the desired shape. The tilt of the wavefront with respect to a given reference surface is excluded from this document.

There is no requirement that a tolerance for wavefront deformation is indicated.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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, *Optics and photonics — Preparation of drawings for optical elements and systems — Part 1: General*

ISO 14999-4, *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.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

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

### 4 Specification of tolerances for wavefront deformation

#### 4.1 General

It should be noted that it is possible to specify a tolerance on the wavefront deformation only - without specifying tolerances on the individual surfaces. In this case, the manufacturer has to ensure that the wavefront satisfies the specified tolerance. However, the manufacturer is not bound by tolerances on the form of the individual surfaces of the element or system. The manufacturer is free, for instance, to allow the surface form deformations to be large provided they cancel each other.