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

Part 11: Non-toleranced data

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

Partie 11: Données non tolérancées

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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 (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).

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

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 10110-11:1996), which has been technically revised.

It also incorporates the Corrigendum (ISO 10110-11:1996/Cor.1:2006).

The following changes were made.

a) Additional categories have been added for categories not included in the former version. New parameters specified are clear aperture to part edge, mean index of refraction tolerance, and Abbe number error. Some terminology has also been updated as well.

b) Some numbers have been updated to reflect common shop practice, with the intent that the numbers given here represent "loose" values for traditional optical fabrication processes at given sizes. This part of ISO 10110 covers cases where numbers are not included and assuming less stringent requirements is the default for non-toleranced data.

c) Referenced normative and other ISO 10110 documents have been updated appropriately.

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; roughness and waviness*

— *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*

Introduction

Non-toleranced data covers cases where information required to fabricate optical components is not included on drawings. It is effectively the default values for the standard, dependent on size of the optic for many of the values. Because these values are the default, they are intentionally chosen to be values deemed as loose fabrication requirements for industry. These values do not represent absolute limits, however, and can be made looser for given drawings and application.

The current revision is an update to the 1996 edition of this part of ISO 10110. This version includes a few additional parameters and has magnitudes of some values updated. The values are intended to represent reasonable loose quantities for current standard practice optical fabrication with traditional methodology. Although it is quite difficult to come up with universal values representing such standard practice, it is important to have quantities defined as defaults for cases where such information is not included on drawings, whether unintentional or by design choice.

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

Part 11: Non-toleranced data

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 the permissible deviations and material imperfections when these are not explicitly indicated.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 10110-2, *Optics and optical instruments — Preparation of drawings for optical elements and systems — Part 2: Material imperfections — Stress birefringence*

ISO 10110-3, *Optics and optical instruments — Preparation of drawings for optical elements and systems — Part 3: Material imperfections — Bubbles and inclusions*

ISO 10110-4, *Optics and optical instruments — Preparation of drawings for optical elements and systems — Part 4: Material imperfections — Inhomogeneity and striae*

ISO 10110-5, *Optics and photonics — Preparation of drawings for optical elements and systems — Part 5: Surface form tolerances*

ISO 10110-6, *Optics and photonics — Preparation of drawings for optical elements and systems — Part 6: Centring tolerances*

ISO 10110-7, *Optics and photonics — Preparation of drawings for optical elements and systems — Part 7: Surface imperfection tolerances*

ISO 10110-8, *Optics and photonics — Preparation of drawings for optical elements and systems — Part 8: Surface texture; roughness and waviness*

3 Permissible deviations and material imperfections

Complete functional properties of an optical element, dimensions and tolerances as well as surface and material properties should be indicated in optical drawings.

The permissible deviations and material imperfections are given in Table 1 when such quantities are not specified in drawings.

NOTE In cases in which the values given in Table 1 are appropriate, the drawing can be simplified by omission of their indications.

These tolerances do not represent absolute limits. Even looser tolerances may be used; however, they shall then be indicated in the drawing.

If a drawing of an optical part contains no indication of qualities mentioned in the various parts of ISO 10110, the values of Table 1 shall be applied. The surface texture specifications for an optical element in accordance with ISO 10110-8 shall always be given in the drawing; no implicit indication for surface texture is therefore given in this part of ISO 10110.

Table 1 — Permissible deviations and material imperfections in case explicit indications are not given

Property	Range of maximum (diagonal) dimension of the part mm			
	2 up to 10	over 10 up to 30	over 30 up to 100	over 100 up to 300
Part diameter or edge length (mm)	+0/ −0,15	+0/ −0,15	+0/ −0,75	+0,2/ −1,5
Clear aperture to part edge (mm)	0,5	1	1	2
Thickness (mm)	±0,1	±0,2	±0,4	±0,8
Angle deviation of prisms and plate	±0° 30′	±0° 30′	±0° 30′	±0° 30′
Width of protective chamfer (mm)	0,1 to 0,3	0,3 to 0,5	0,3 to 0,8	0,8 to 1,6
Principal refractive index	$\pm 2{,}0 \times 10^{-3}$	$\pm 2{,}0 \times 10^{-3}$	$\pm 2{,}0 \times 10^{-3}$	$\pm 2{,}0 \times 10^{-3}$
Abbe number	±0,8 %	±0,8 %	±0,8 %	±0,8 %
Stress birefringence in accordance with ISO 10110-2 (nm/cm)	0/20	0/20	0/30	0/40
Bubbles and inclusions in accordance with ISO 10110-3	1/3 × 0,16	1/5 × 0,25	1/5 × 0,4	1/5 × 0,63
lnhomogeneity and striae in accordance with ISO 10110-4	2/1;1	2/1;1	2/0;1	2/0;1
Surface form tolerances in accordance with ISO 10110-5	3/5(1)	3/5(2)	3/5(2) (all Ø 30 mm)	3/8(2) (all Ø 60 mm)
Centring tolerances in accordance with ISO 10110-6	4/20′	4/10′	4/10′	4/10′
Surface imperfections in accordance with ISO 10110-7	5/3 × 0,16	5/5 × 0,25	5/5 × 0,4	5/5 × 0,63

NOTE 1 This part of ISO 10110 does not provide implicit specifications for laser irradiation damage threshold (see ISO 10110-17), or additional surface imperfections for coated optics for edge chips (see ISO 10110-7).

NOTE 2 Default numbers apply to the finished part.

NOTE 3 Principal refractive index and Abbe number variation may be assessed at convenient wavelength values because differences between these parameters at different wavelengths is assumed to be inconsequential for non-toleranced data (see ISO 12123).