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

This fourth edition cancels and replaces the third edition (ISO 10110-5:2015), which has been technically revised.

The main changes are as follows:

— permitted units were added (waves for deviation; µrad, °, ', '' for slope);

— multiple basic forms were added (e.g. both full aperture and all subaperture indications for irregularity);

— local slope was refined: circular subpupils for 2D slope (instead of square), and downsampling of the map prior to evaluation (provided that the downsampled resolution is still finer than the indicated slope sampling interval);

— new Zernike residual indication (for a simple mid spatial frequency specification);

— new Zernike coefficient indication (tabular form only);

— new local curvature indication;

— permission added to use trimmed PV estimators (PVr and PV%) to evaluate PV irregularity and PV total deviation unless specifically disallowed by a note on the drawing;

— indication code key (glossary) added;

— sampling length and interval for Peak and RMS slope indications were consolidated;

— examples for the new indications were added, and each specification form has a relevant example;

— consistency and clarity of Zernike polynomial notation were improved;

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

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This document refers to deviations in the form (shape) of an optical surface and provides a means of specifying tolerances for certain types of surface form deviation in terms of nanometres.

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, i.e. in surface form deviation as well as wavefront deformation. As the analysis of most measurements is software based, the deviations are expressed in nanometres. Interferometric measurements, however, use the unit "fringe spacings". One "fringe spacing" is equal to a surface form deviation that causes a deformation of the reflected wavefront of one wavelength. A value expressed in nanometres is an indication of the actual height deviation of the surface itself (and not that of the reflected wavefront).

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

Due to the potential for confusion and misinterpretation, nanometres rather than fringe spacings are to be used. Where fringe spacings are used as units, the wavelength is also to be specified.

In addition, tolerances for slope deviations of surfaces can be given in units of mrad, µrad, arcmin or arcsec.