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Microlens arrays - Part 4: Test methods for geometrical properties (ISO/DIS 14880-4:2005)

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Microlens arrays - Part 4: Test methods for geometrical properties (ISO/DIS 14880-4:2005)

Réseau de microlentilles - Partie 4: Méthodes d'essai pour les propriétés géométriques (ISO/DIS 14880-4:2005)

Mikrolinsenarrays - Teil 4: Prüfverfahren für geometrische Eigenschaften (ISO/DIS 14880-4:2005)

This draft European Standard is submitted to CEN members for parallel enquiry. It has been drawn up by the Technical Committee CEN/TC 123.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

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Foreword

This document (prEN ISO 14880-4:2005) has been prepared by Technical Committee ISO/TC 172 "Optics and optical instruments" in collaboration with Technical Committee CEN/TC 123 "Lasers and laser-related equipment", the secretariat of which is held by DIN.

This document is currently submitted to the parallel Enquiry.

Endorsement notice

The text of ISO 14880-4:2005 has been approved by CEN as prEN ISO 14880-4:2005 without any modifications.

DRAFT INTERNATIONAL STANDARD ISO/DIS 14880-4

ISO/TC **172**/SC **9** Secretariat: **DIN**

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Microlens arrays —

Part 4:
Test methods for geometrical properties

Réseau de microlentilles —

Partie 4: Méthodes d'essai pour les propriétés géométriques

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ISO/CEN PARALLEL ENQUIRY

The CEN Secretary-General has advised the ISO Secretary-General that this ISO/DIS covers a subject of interest to European standardization. **In accordance with the ISO-lead mode of collaboration as defined in the Vienna Agreement, consultation on this ISO/DIS has the same effect for CEN members as would a CEN enquiry on a draft European Standard.** Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month FDIS vote in ISO and formal vote in CEN.

In accordance with the provisions of Council Resolution 15/1993 this document is circulated in the English language only.

Conformément aux dispositions de la Résolution du Conseil 15/1993, ce document est distribué en version anglaise seulement.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Pour accélérer la distribution, le présent document est distribué tel qu'il est parvenu du secrétariat du comité. Le travail de rédaction et de composition de texte sera effectué au Secrétariat central de l'ISO au stade de publication.

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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 14880-4 was prepared by Technical Committee ISO/TC 172, *Optics and photonics*, Subcommittee SC 9, *Electro-optical systems*.

ISO 14880 consists of the following parts, under the general title *Microlens arrays*:

— *Part 1: Vocabulary*

— *Part 2: Test methods for wavefront aberrations*

— *Part 3: Test methods for optical properties other than wavefront aberrations*

— *Part 4: Test methods for geometrical properties*

Introduction

This standard specifies methods for testing geometrical properties of microlens arrays. Examples of applications for microlens arrays include three-dimensional displays, coupling optics associated with arrayed light sources and photo-detectors, enhanced optics for liquid crystal displays, and optical parallel processor elements.

The market in microlens arrays has generated a need for agreement on basic terminology and test methods. Standard terminology and clear definitions are needed not only to promote applications but also to encourage scientists and engineers to exchange ideas and new concepts based on common understanding.

Part 4 contributes to the purpose of ISO 14880, which is to improve the compatibility and interchangeability of lens arrays from different suppliers and to enhance development of the technology using microlens arrays.

The measurement of physical characteristics of pitch and surface modulation depth can be made using a stylus instrument and non-contact optical probe system. Physical thickness can be measured with a micrometer. The measurement processes are described in the main body.

Microlens arrays — Part 4: Test methods for geometrical properties

1 Scope

This standard specifies methods for testing geometrical properties of microlenses in microlens arrays. It applies to microlens arrays with very small lenses formed on one or more surfaces of a common substrate and to graded index microlenses.

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 14880–1, *Microlens array – Vocabulary*

ISO 14880–2, *Microlens arrays – Part 2: Test methods for wavefront aberrations*

ISO 3274, *Geometrical Product Specifications(GPS) — Surface texture: Profile method — Nominal characteristics of contact (stylus) instruments*

ISO 4287, *Geometrical Product Specifications(GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters*

ISO 4288, *Geometrical Product Specifications(GPS) — Surface texture: Profile method — Rules and procedures for the assessment of surface texture*

ISO 5436-1, *Geometrical Product Specifications (GPS) — Surface texture: Profile method; Measurement standards — Part 1: Material measures*

ISO/TR 14999-1*), *Optics and photonics — Interferometric measurement of optical elements and optical systems — Part 1: Definitions and fundamental relationships*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14880-1 and the following apply.

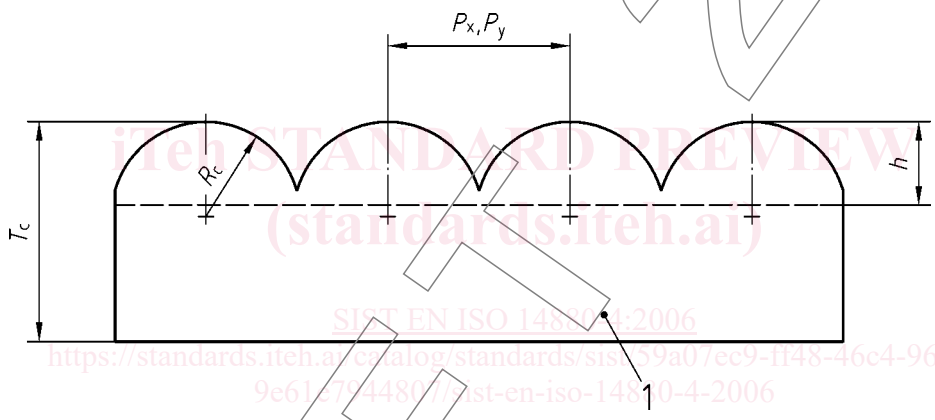
Table 1 lists the terms, symbols, units and definitions of the geometrical properties, which are used in this standard. The symbols adopted for this standard are chosen for clarity in this application to microlens arrays but some may not be those commonly used for surface texture measurement.

*) to be published

Table 1 — Terms, symbols, units and definitions

Term	Symbol	Unit	Definition
Pitch	P_X, P_Y	mm	The distance between the centres of adjacent lenses. For a stylus instrument this will generally equate to RS_m.
Surface modulation depth [lens sag]	h	mm	Peak to valley deviation of the surface height. For stylus instruments this will generally equate to R_z.
Physical thickness	T_C	mm	The maximum local thickness of the array.
Radius of curvature	R_C	mm	The distance from the vertex of the microlens to the centre of curvature of the lens surface, for rotationally invariant microlenses or cylindrical microlenses.

The terms P_x, P_y and h are terms used here to sescribe geometrical parameter encountered in the measurement of surface texture. P_x, P_y are spacing parameters and are defined as the average value of the length of the mean line section containing a profile peak and adjacent valley. An amplitude parameter, h, is defined as the average difference between peak of the lens profile and the rim. Figure 1 illustrates the geometrical properties of microlens arrays which are to be measured.



Key

1 substrate
T_C physical thickness
R_C radius of curvature
P_X ,P_Y pitch
h surface modulation depth (lens sag)

Figure 1 — Geometrical properties of microlens arrays

4 Coordinate system

To measure the geometrical properties of a microlens array, a Cartesian coordinate system is used, as shown in Figure 2. In a right-handed Cartesian set, the *x*-axis provides the direction of trace, the *y*-axis lies nominally on the real surface, and the *z*-axis is the outward direction from the material to the surrounding medium.