BS ISO 14997:2017

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Optics and photonics — Test methods for surface imperfections of optical elements

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National foreword

This British Standard is the UK implementation of ISO 14997:2017. It supersedes BS ISO 14997:2011 , which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee CPW/172, Optics and Photonics.

A list of organizations represented on this committee can be obtained on request to its secretary.

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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
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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).

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For an explanation on 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 the following URL: 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 14997:2011), which has been technically revised to adapt ISO 14997 to the new version of ISO 10110-7 .

The main change compared to the previous edition is as follows:

— the addition of language required to accommodate visibility inspection.

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Introduction

Standard practice in the optics industry since the 1950s has been to visually inspect optical surfaces for small, localized imperfections and determine if they are acceptable.

This document was developed in response to worldwide demand for the standardization of test methods for surface imperfections. Surface imperfections, such as digs and scratches, arise from localized damage during or after manufacture. They can be visible as a result of the light they scatter, giving rise to a false impression of poor quality. Alternatively, this light can appear as unwanted veiling glare (stray radiation) in an image plane, or it can lead to degradation in signal quality at an image sensor. Imperfections can also provide centres of stress, eventually leading to failure of components exposed to high laser radiation power/energy densities. In most cases, however, surface imperfections are representative of the quality of workmanship and do not have any impact whatsoever on the performance of the component in question.

Since modern methods of surface examination are capable of atomic resolution, no surface is likely to be found totally free of localized imperfections. Most surfaces produced are satisfactory for their intended purpose, but a small proportion can have suffered obvious damage and will be reworked or regarded as unacceptable. This can leave some components that, although slightly damaged, can still be found acceptable, when tested, depending on the level of acceptability of surface imperfections requested by the customer and specified on drawings in ISO 10110-7 . This document describes how these methods are implemented.

In some cases, it is necessary to measure or estimate the size of the imperfections on an optical surface. In other cases, however, it is necessary or desirable to assess their brightness or appearance, and not their size. In these cases, visual inspection is preferred over dimensional measurements.

This document describes the human evaluation of surface imperfections for the dimensional and visibility methods. New developments open the route to machine vision approaches which are more objective and exhibit an increased reproducibility, less conflict and an optimized production closer to the allowed specification, lowering cost[10],[11]. Some of these machine vision-based approaches may be able to validate the surface imperfection specifications of ISO 10110-7 . It is incumbent upon the manufacturers and users of objective measurement equipment to demonstrate compatibility with the methods described herein and to report their results consistent with the notation described in ISO 10110-7 .

It should be noted that other light scattering imperfections, which also need to be measured, can arise as digs distributed over the surface of an incompletely polished surface, and as bubbles and as striae within an optical material. The measurement of laser damage thresholds also requires sensitive means for quantifying the level of radiation scattered by damage in its early stages.

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