SLOVENSKI STANDARD
SIST EN ISO 11254-2:2002

01-maj-2002

Laserji in z laserji povezana oprema - Ugotavljanje praga poġkodbe na optiļ ni povrġini, povzroļ ene z laserjem - 2. del: Preskus S na 1 (ISO 11254-2:2001)

Lasers and laser-related equipment - Determination of laser-induced damage threshold of optical surfaces - Part 2: S-on-1 test (ISO 11254-2:2001)

Laser und Laseranlagen - Bestimmung der laserinduzierten Zerstörschwelle optischer Oberflächen - Teil 2: S auf 1-Prüfung (ISO 11254-2:2001)

Lasers et équipements associés aux lasers - Détermination du seuil d'endommagement provoqué par laser sur les surfaces optiques - Partie 2: Essai S sur 1 (ISO 11254-2:2001)

Ta slovenski standard je istoveten z: **EN ISO 11254-2:2001**

ICS:

31.260	Optoelektronika, laserska oprema	Optoelectronics. Laser equipment

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EUROPEAN STANDARD

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EUROPÄISCHE NORM

EN ISO 11254-2

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English version

Lasers and laser-related equipment - Determination of laser-induced damage threshold of optical surfaces - Part 2: S-on-1 test (ISO 11254-2:2001)

Lasers et équipements associés aux lasers - Détermination du seuil d'endommagement provoqué par laser sur les surfaces optiques - Partie 2: Essai S sur 1 (ISO 11254-2:2001)

Laser und Laseranlagen - Bestimmung der laserinduzierten Zerstörschwelle optischer Oberflächen - Teil 2: S auf 1-Prüfung (ISO 11254-2:2001)

This European Standard was approved by CEN on 15 September 2001.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

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Foreword

This document (EN ISO 11254-2:2001) 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 European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2002, and conflicting national standards shall be withdrawn at the latest by March 2002.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Endorsement notice

The text of ISO 11254-2:2001 has been approved by CEN as EN ISO 11254-2:2001 without any modifications.

NOTE Normative references to International Standards are listed in Annex ZA (normative).

Annex ZA
(normative)

Normative references to international publications with their relevant European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE Where an International Publication has been modified by common modifications, indicated by (mod.), the relevant EN/HD applies.

Publication	Year	Title	EN	Year
ISO 11145	2001	Optics and optical instruments - Lasers and laser-related equipment - Vocabulary and symbols	EN ISO 11145	2001

INTERNATIONAL STANDARD

ISO 11254-2

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2001-09-15

Lasers and laser-related equipment — Determination of laser-induced damage threshold of optical surfaces —

Part 2:
S-on-1 test

Lasers et équipements associés aux lasers — Détermination du seuil d'endommagement provoqué par laser sur les surfaces optiques —

Partie 2: Essai S sur 1

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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 3.

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 part of ISO 11254 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 11254-2 was prepared by Technical Committee ISO/TC 172, *Optics and optical instruments*, Subcommittee SC 9, *Electro-optical systems*.

ISO 11254 consists of the following parts, under the general title *Lasers and laser-related equipment — Dtermination of laser-induced damage threshold of optical surfaces*:

— *Part 1: 1-on-1 test*

— *Part 2: S-on-1 test*

Annexes A to D of this part of ISO 11254 are for information only.

Introduction

Repetitive laser radiation may deteriorate and damage optical surfaces at irradiation levels below those measured for single shot damage (ISO 11254-1 refers). Besides reversible mechanisms induced by thermal heating and distortion, irreversible damage mechanisms due to ageing, microdamage and generation or migration of defects are observed. This part of ISO 11254 is concerned with the determination of irreversible damage of optical surfaces under the influence of a repetitively pulsed laser beam. The degradation of the optical quality is a function of the laser operating parameters and the optical system in which the component is placed.

In this part of ISO 11254, two evaluation methods are described for the reduction of raw data of a damage test. The characteristic damage curve method is based on a large number of S-on-1 test sites on the optical surface of the specimen. The characteristic damage curve comprises a set of three graphs indicating energy density values with damage probability values of 10 %, 50 % and 90 % for a selected number of pulses. The characteristic damage curve represents the results of a complete and extended laser-induced damage test, and it is recommended for basic investigations in newly developed or critical laser optics.

The second method, the extrapolation method, is created from a considerably smaller number of test sites. This method generates a distribution diagram of damage and non-damage regions for the behaviour of the damage threshold as a function of the number of pulses per site. This diagram is of limited reliability and may be employed for the quality control of optical laser components, which are already qualified by a complete damage test, or for the preparation of extended damage testing.

The present state of research in laser-induced damage and ageing is not sufficient for an accurate quantitative determination of the service life for optical components under real operating conditions. Realistic laser damage tests adapted to industrial applications are dependent on a large number of pulses (10^9 to 10^{11} pulses) and require a disproportionate experimental expense. This part of ISO 11254 therefore also outlines a procedure for an extrapolation of the S-on-1 threshold from the characteristic damage curve to estimate the real lifetime of an optical component.

NOTE 1 This part of ISO 11254 is provisionally restricted to irreversible damage of optical surfaces. Laser-induced damage to the bulk of optical components shall be considered in a revision of this part of ISO 11254.

NOTE 2 The laser-induced damage threshold (LIDT) of an optical component which is subjected to repetitive radiation can be affected by a variety of different degradation mechanisms including contamination, thermal heating, migration or generation of internal defects and structural changes. These mechanisms are influenced by the laser operating parameters, the environment and the mounting conditions of the component under test. For these reasons, it is necessary to record all parameters and to realize that the damage behaviour may differ in systems with altered operating conditions.

Safety Warning: The extrapolation of damage data may lead to bad or erroneous calculated results and to an overestimation of the LIDT. This may in the cases of toxic materials (e.g. ZnSe, GaAs, CdTe, ThF_4, chalcogenides, Be, Cr, Ni) lead to severe health hazards. See annex D for further comments.

Lasers and laser-related equipment — Determination of laser-induced damage threshold of optical surfaces —

Part 2:
S-on-1 test

1 Scope

This part of ISO 11254 specifies a test method for determining the laser-induced damage threshold of optical surfaces subjected to a succession of similar laser pulses.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 11254. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 11254 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 10110-7:1996, *Optics and optical instruments — Preparation of drawings for optical elements and systems — Part 7: Surface imperfection tolerances*.

ISO 11145:1994, *Optics and optical instruments — Lasers and laser-related equipment — Vocabulary and symbols*.

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this part of ISO 11254, the terms and definitions given in ISO 11145 and the following apply.

3.1.1
surface damage
any permanent laser radiation-induced change of the surface characteristics of the specimen which can be observed by an inspection technique described within this part of ISO 11254

3.1.2
S-on-1 test
test programme that uses a series of pulses with constant energy density on each unexposed site with a short and constant time interval between two successive pulses

NOTE The length of the time interval between the pulses of a series is given by the inverse value of the pulse repetition rate of the laser source.