



SLOVENSKI STANDARD
SIST EN ISO 13694:2000
01-november-2000

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Optics and optical instruments - Lasers and laser-related equipment - Test methods for laser beam power (energy) density distribution (ISO 13694:2000)

Optik und optische Instrumente - Laser und Laseranlagen - Prüfverfahren für die Leistungs-(Energie-)dichteverteilung von Laserstrahlen (ISO 13694:2000)

Optique et instruments d'optique - Lasers et équipements associés aux lasers - Méthodes d'essai de distribution de puissance (d'énergie) du faisceau laser (ISO 13694:2000)

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Ta slovenski standard je istoveten z: EN ISO 13694:2000

ICS:

31.260	Optoelektronika, laserska oprema	Optoelectronics. Laser equipment
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SIST EN ISO 13694:2000

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN ISO 13694

April 2000

ICS 31.260

English version

Optics and optical instruments - Lasers and laser-related
equipment - Test methods for laser beam power (energy)
density distribution (ISO 13694:2000)

Optique et instruments d'optique - Lasers et équipements
associés aux lasers - Méthodes d'essai de distribution de
puissance (d'énergie) du faisceau laser (ISO 13694:2000)

Optik und optische Instrumente - Laser und Laseranlagen -
Prüfverfahren für die Leistungs-(Energie-)dichteverteilung
von Laserstrahlen (ISO 13694:2000)

This European Standard was approved by CEN on 1 April 2000.

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 Central Secretariat 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 Central Secretariat 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.

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

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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EN ISO 13694:2000

Foreword

The text of the International Standard ISO 13694:2000 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 October 2000, and conflicting national standards shall be withdrawn at the latest by October 2000.

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.

NOTE FROM CEN/CS: The foreword is susceptible to be amended on reception of the German language version. The confirmed or amended foreword, and when appropriate, the normative annex ZA for the references to international publications with their relevant European publications will be circulated with the German version.

Endorsement notice

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The text of the International Standard ISO 13694:2000 was approved by CEN as a European Standard without any modification.

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INTERNATIONAL STANDARD
FOR THE
TESTING OF LASERS
CLASSIFICATION OF LASERS
AND LASER RELATED EQUIPMENT
CLASSIFICATION OF LASERS
AND LASER RELATED EQUIPMENT
CLASSIFICATION OF LASERS
AND LASER RELATED EQUIPMENT

INTERNATIONAL STANDARD

**ISO
13694**

First edition
2000-04-01

Optics and optical instruments — Lasers and laser-related equipment — Test methods for laser beam power [energy] density distribution

*Optique et instruments d'optique — Lasers et équipements associés aux
lasers — Méthodes d'essai de distribution de la densité de puissance
[d'énergie] du faisceau laser*

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Reference number
ISO 13694:2000(E)

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Printed in Switzerland

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ISO 13694:2000(E)**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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 13694 was prepared by Technical Committee ISO/TC 172, *Optics and optical instruments*, Subcommittee SC 9, *Electro-optical systems*.

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Introduction

Many applications of lasers involve using the near-field as well as the far-field power [energy] density distribution of the beam¹⁾. The power [energy] density distribution of a laser beam is characterized by the spatial distribution of irradiant power [energy] density with lateral displacement in a particular plane perpendicular to the direction of propagation. In general, the power [energy] density distribution of the beam changes along the direction of propagation. Depending on the power [energy], size, wavelength, polarization and coherence of the beam, different methods of measurement are applicable in different situations. Five methods are commonly used: camera arrays (1D and 2D), apertures, pinholes, slits and knife edges.

This International Standard provides definitions of terms and symbols to be used in referring to power density distribution, as well as requirements for its measurement. For pulsed lasers, the distribution of time-integrated power density (i.e. energy density) is the quantity most often measured.

According to ISO 11145, it is possible to use two different definitions for describing and measuring the laser beam diameter. One definition is based on the measurement of the encircled power [energy]; the other is based on determining the spatial moments of the power [energy] density distribution of the laser beam.

The use of spatial moments is necessary for calculating the beam propagation factor K and the times-diffraction-limit factor M^2 from measurements of the beam widths at different distances along the propagation axis. ISO 11146 describes this measurement procedure. For other applications, other definitions for the beam diameter may be used. For some quantities used in this International Standard, the first definition (encircled power [energy]) is more appropriate and easier to use.

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1) For the purposes of this International Standard, "near-field" is defined as the radiation field of a laser at a distance z from the beam waist which is less than the Rayleigh-length z_R . "Far-field" is defined in ISO 11145.

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Optics and optical instruments — Lasers and laser-related equipment — Test methods for laser beam power [energy] density distribution

1 Scope

This International Standard specifies methods by which the measurement of power [energy] density distribution is made and defines parameters for the characterization of the spatial properties of laser power [energy] density distribution functions at a given plane.

The methods given in this International Standard are intended to be used for the testing and characterization of both continuous wave (cw) and pulsed laser beams used in optics and optical instruments.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard 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 11145:1994, *Optics and optical instruments — Laser and laser-related equipment — Vocabulary and symbols*.

ISO 11146:1999, *Lasers and laser-related equipment — Test methods for laser beam parameters — Beam widths, divergence angle and beam propagation factor*.

ISO 11554:1998, *Optics and optical instruments — Lasers and laser-related equipment — Test methods for laser beam power, energy and temporal characteristics*.

IEC 61040:1990, *Power and energy measuring detectors — Instruments and equipment for laser radiation*.

3 Terms and definitions

For the purposes of this International Standard, the terms and definitions given in ISO 11145 and IEC 61040 and the following apply.

3.1 Measured quantities

3.1.1

power density

$E(x,y,z)$

part of the beam power at location z which impinges on the area δA at the location (x,y) divided by the area δA