SLOVENSKI STANDARD
SIST EN 62471:2008

01-december-2008

Fotobiološka varnost sijalk in sistemov s sijalkami (IEC 62471:2006, spremenjen)

Photobiological safety of lamps and lamp systems (IEC 62471:2006, modified)

Photobiologische Sicherheit von Lampen und Lampensystemen (IEC 62471:2006, modifiziert)

Sécurité photobiologique des lampes et des appareils utilisant des lampes (CEI 62471:2006, modifiée)

Ta slovenski standard je istoveten z: **EN 62471:2008**

ICS:

29.140.01	Žarnice na splošno	Lamps in general

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EUROPEAN STANDARD

NORME EUROPÉENNE

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EN 62471

September 2008

ICS 29.140

Partially supersedes EN 60825-1:1994 + A1:2002 + A2:2001

English version

Photobiological safety of lamps and lamp systems
(IEC 62471:2006, modified)

Sécurité photobiologique des lampes
et des appareils utilisant des lampes
(CEI 62471:2006, modifiée)

Photobiologische Sicherheit
von Lampen und Lampensystemen
(IEC 62471:2006, modifiziert)

This European Standard was approved by CENELEC on 2008-09-01. CENELEC 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 CENELEC 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 CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

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Foreword

The text of the International Standard IEC 62471:2006, prepared by IEC TC 76 "Optical radiation safety and laser equipment", together with the common modifications prepared by the Technical Committee CENELEC TC 76, Optical radiation safety and laser equipment, was submitted to the formal vote and was approved by CENELEC as EN 62471 on 2008-09-01.

This European Standard partially supersedes EN 60825-1:1994 + corrigendum February 1995 + A1:2002 + A2:2001 + A2:2001/corrigendum April 2004.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2009-09-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2011-09-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 62471:2006/CIE S 009:2002 was approved by CENELEC as a European Standard with agreed common modifications as given below.

The International Standard IEC 62471:2006 was prepared as CIE S 009:2002 by the International Commission on Illumination. It was submitted to the IEC National Committees for voting under the Fast Track Procedure. It is published as a double logo IEC and CIE standard.

COMMON MODIFICATIONS

4 Exposure limits

Move the contents of the whole Clause 4 into a new informative Annex ZB. Keep the numbering.

Replace the current Clause 4 with the following:

4 Exposure limits

The original Clause 4 of IEC 62471:2006 contains provisions governing limiting values for the exposure of persons falling within the area of the health and safety of workers. Within Europe those limiting values are already covered by the Artificial Optical Radiation Directive (2006/25/EC). Thus, the limits of the directive have to be applied instead of those fixed in IEC 62471:2006.

For information the original Clause 4 of IEC 62471:2006 was moved to the informative Annex ZB under retention of the respective numbering.

4.1 General

Delete the first paragraph.

Table 6.1 – Emission limits for risk groups of continuous wave lamps

Add the following note to the table:

NOTE The action functions: see Table 4.1 and Table 4.2
The applicable aperture diameters: see 4.2.1
The limitations for the angular subtenses: see 4.2.2
The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5.

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Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
CIE 17.4	1987	International Lighting Vocabulary (ILV)	-	-
CIE 53	1982	Methods of characterizing the performance of radiometers and photometers	-	-
CIE 63	1984	The spectroradiometric measurement of light sources	-	-
CIE 105	1993	Spectroradiometry of pulsed optical radiation sources	-	-
ISO/IEC Guide	1995	Guide to the expression of uncertainty in measurement (GUM)	-	-

NORME INTERNATIONALE

INTERNATIONAL STANDARD

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Sécurité photobiologique des lampes et des appareils utilisant des lampes

Photobiological safety of lamps and lamp systems

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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PHOTOBIOLOGICAL SAFETY OF LAMPS AND LAMP SYSTEMS

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

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The International Standard IEC 62471 has been submitted by the International Commission on Illumination (CIE) and has been processed through IEC technical committee 76: Optical radiation safety and laser equipment

This standard was prepared as Standard CIE S 009:2002 by the International Commission on Illumination. It was submitted to the IEC National Committees for voting under the Fast Track Procedure as the following documents:

FDIS	Report on voting
76/340/FDIS	76/343/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication is published as a double logo standard.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

The International Commission on Illumination (abbreviated as CIE from its French title) is an organization devoted to international cooperation and exchange of information among its member countries on all matters relating to the science and art of lighting.

Foreword of the International Commission on Illumination (CIE)

Standards produced by the Commission Internationale de l'Eclairage (CIE) are a concise documentation of data defining aspects of light and lighting, for which international harmony requires such unique definition. CIE Standards are therefore a primary source of internationally accepted and agreed data, which can be taken, essentially unaltered, into universal standard systems.

The CIE undertook a major review of the official recommendations on photobiological effects, their dose relationships and measurement. Based on the guidelines given by the International Commission on Non-Ionising Radiation Protection (ICNIRP), the CIE undertook to apply these guidelines to lamps and lamp systems. The present standard describes present day knowledge of the subject but does not absolve those carrying out experiments with humans from their responsibility for the safety and well being of the subjects involved.

This Standard has been prepared by CIE Technical Committee 6-47, "Photobiological Lamp Safety Standard", and was approved by the National Committees of the CIE. During the preparation of the standard IEC TC34 co-operated with CIE TC 6-47 through the participation of a number of their members.

NOTE CIE kindly acknowledges the consent of the Illuminating Engineering Society of North America who permitted to use extensive parts of the documents ANSI/IESNA RP-27.1. "Photobiological Safety for Lamps and Lamp Systems – General Requirements", ANSI/IESNA RP-27.2. "Photobiological Safety for Lamps and Lamp Systems – Measurement Systems - Measurement Techniques" and ANSI/IESNA RP-27.3. "Photobiological Safety for Lamps and Lamp Systems – Risk Group Classification and Labeling" as much of the basis for this standard. (Each publication may be purchased from Publications Department, IESNA, 120 Wall Street, 17th floor, New York, New York 10005-4001, by fax 212-248-5017 or through the web site: http://www.iesna.org).

INTRODUCTION

Lamps were developed and produced in large quantities and became commonplace in an era when industry-wide safety standards were not the norm. The evaluation and control of optical radiation hazards from lamps and lamp systems is a far more complicated subject than similar tasks for a single-wavelength laser system. The required radiometric measurements are quite involved, for they do not deal with the simple optics of a point source, but rather with an extended source that may or may not be altered by diffusers or projection optics. Also the wavelength distribution of the lamp may be altered by ancillary optical elements, diffusers, lenses, and the like, as well as variations in operating conditions.

To evaluate a broad-band optical source, such as an arc lamp, an incandescent lamp, a fluorescent lamp, an array of lamps or a lamp system, it is first necessary to determine the spectral distribution of optical radiation emitted from the source at the point or points of nearest human access. This accessible emission spectral distribution of interest for a lighting system may differ from that actually being emitted by the lamp alone due to the filtration by any optical elements (e.g., projection optics) in the light path. Secondly, the size, or projected size, of the source must be characterized in the retinal hazard spectral region. Thirdly, it may be necessary to determine the variation of irradiance and effective radiance with distance. The performance of the necessary measurements is normally not an easy task without sophisticated instruments. Thus it was decided to include reference measurement techniques for lamps and lamp systems in this standard. The measurement techniques along with the described risk group classification scheme will provide common ground for both lamp manufacturers and users to define the specific photobiological hazards of any given lamp and/or lamp system.

Finally, there are well known optical radiation hazards associated with some lamps and lamp systems. The purpose of this standard is to provide a standardized technique for evaluation of potential radiation hazards that may be associated with various lamps and lamp systems.

PHOTOBIOLOGICAL SAFETY OF LAMPS AND LAMP SYSTEMS

1. SCOPE

This International Standard gives guidance for evaluating the photobiological safety of lamps and lamp systems including luminaires. Specifically it specifies the exposure limits, reference measurement technique and classification scheme for the evaluation and control of photobiological hazards from all electrically powered incoherent broadband sources of optical radiation, including LEDs but excluding lasers, in the wavelength range from 200 nm through 3000 nm.

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.

CIE 17.4-1987 *International lighting vocabulary* (ILV) – Joint publication IEC/CIE

CIE 53-1982 *Methods of characterizing the performance of radiometers and photometers*

CIE 63-1984 *The spectroradiometric measurement of light sources*

CIE 105-1993 *Spectroradiometry of pulsed optical radiation sources*

ISO *Guide to the expression of uncertainty in measurement,* ISO, Geneva, 1995.

3. DEFINITIONS, SYMBOLS AND ABBREVIATIONS

For the purposes of this standard, the following definitions, symbols and abbreviations apply.

3.1 actinic dose (see ILV 845-06-23)

Quantity obtained by weighting spectrally the dose according to the actinic action spectrum value at the corresponding wavelength.

Unit: $J \cdot m^{-2}$

Note: This definition implies that an action spectrum is adopted for the actinic effect considered, and that its maximum value is generally normalized to 1. When giving a quantitative amount, it is essential to specify which quantity dose or actinic dose is meant, as the unit is the same.

3.2 angular subtense (α)

Visual angle subtended by the apparent source at the eye of an observer or at the point of measurement. In this standard subtended angles are denoted by the full included angle, not the half angle.

Unit: radian

Note: The angular subtense α will generally be modified by incorporation of lenses and mirrors as projector optics, i.e. the angular subtense of the apparent source will differ from the angular subtense of the physical source.

3.3 aperture, aperture stop

Opening that defines the area over which average optical emission is measured. For spectral irradiance measurements this opening is usually the entrance of a small sphere placed in front of the radiometer/spectroradiometer entrance slit.

3.4 blue light hazard (BLH)

Potential for a photochemically induced retinal injury resulting from radiation exposure at wavelengths primarily between 400 nm and 500 nm. This damage mechanism dominates over the thermal damage mechanism for times exceeding 10 seconds.

3.5 continuous wave (CW) lamp

Lamp that is operated with a continuous output for a time greater than 0,25 s, i.e., a non-pulsed lamp.

Note: In this standard, General lighting service (GLS) lamps are defined to be Continuous wave lamps.

3.6 erythema (see ILV 845-06-15)

Reddening of the skin; as used in this standard the reddening of the skin resulting from inflammatory effects from solar radiation or artificial optical radiation.

Note: The degree of delayed erythema is used as a guide to dosages applied in ultraviolet therapy.

3.7 exposure distance

Nearest point of human exposure consistent with the application of the lamp or lamp system. For lamps radiating in all directions the distance is measured from the centre of the filament or arc source. For reflector-type lamps the distance is measured from the outside edge of the lens or the plane defining the end of the reflector in a lens free reflector.

Unit: m

3.8 exposure limit (EL)

Level of exposure to the eye or skin that is not expected to result in adverse biological effects.

3.9 eye movements

The normal eye, when focused on an object, moves slightly in a random motion with a frequency of a few hertz. This rapid eye movement causes the image from a point source to be spread over an area of the retina equivalent to an angular subtense of about 0,011 radians. Furthermore, for times greater than about 100 seconds the focused stare capability breaks down causing further spreading of the radiant power over the retina due to task determined eye movements, e.g. as in reading.

3.10 field of view

Solid angle as "seen" by the detector (acceptance angle), such as the radiometer/ spectroradiometer, out of which the detector receives radiation.

Unit: sr

Note 1: The field of view should not be confused with the angular subtense of the apparent source α.
Note 2: A plane angle is sometimes used to describe a circular symmetric solid angle field of view.

3.11 general lighting service (GLS) lamps

Term for lamps intended for lighting spaces that are typically occupied or viewed by people. Examples would be lamps for lighting offices, schools, homes, factories, roadways, or automobiles. It does not include lamps for such uses as film projection, reprographic processes, "suntanning", industrial processes, medical treatment and searchlight applications.

3.12 hazard distance

See skin hazard distance or ocular hazard distance.

3.13 illuminance (at a point of a surface) **(E_v)** (see ILV 845-01-38)

Quotient of the luminous flux $d\Phi_v$ incident on an element of the surface containing the point, by the area dA of that element.

$$E_v = \frac{d\Phi_v}{dA} \qquad (3.1)$$

Unit: lx

3.14 infrared radiation (IR) (see ILV 845-01-04)

Optical radiation for which the wavelengths are longer than those for visible radiation.

Note: For infrared radiation, the range between 780 nm and 10^6 nm is commonly subdivided into: IR-A (780 nm to 1400 nm), IR-B (1400 nm to 3000 nm), and IR-C (3000 nm to 10^6 nm).

Infrared radiation is often evaluated in terms of the spectral total radiation per unit area (irradiance) incident upon a surface. Examples of applications of infrared radiation are industrial heating, drying, baking, and photo-reproduction. Some applications, such as infrared viewing systems, involve detectors sensitive to a restricted range of wavelengths. In these cases, the spectral characteristics of the source and detector are of importance.

3.15 intended use

Use of a product, process or service in accordance with specifications, instructions and information provided by the supplier.

3.16 irradiance (at a point of the surface) (see ILV 845-01-37)

Quotient of the radiant flux $d\Phi$ incident on an element of a surface containing the point, by the area dA of that element, i.e.,

$$E = \frac{d\Phi}{dA} \qquad (3.2)$$

Unit: $W \cdot m^{-2}$

3.17 lamp (see ILV 845-07-03)

Source made to produce optical radiation, usually visible.

Note: The term "lamp" is sometimes used for certain types of luminaires.

These types of luminaires consist of a lamp with shade, reflector, enclosing globe, housing, or other accessories.

As used in this standard, the term means an electrically powered source, other than a laser, that produces radiation in the visible region of the electromagnetic spectrum. Devices that generate light and have integral components for optical control, such as lenses or reflectors, also are considered lamps. Examples include a lensed LED, lens-end lamp, and reflector types, that consist of a source within a parabolic or elliptical reflector assembly, normally including a lens cover.

3.18 lamp system

Any manufactured product or assemblage of components that incorporates or is intended to incorporate a lamp.

3.19 large source

Size of the source image on the retina which is so large that radial heat flow in the radial direction from the center of the image to the surrounding biological tissue is negligibly small compared to heat flow in the axial direction.