



SLOVENSKI STANDARD

SIST EN 62471-5:2015

01-december-2015

Fotobiološka varnost sijalčnih sistemov - 5. del: Slikovni projektorji

Photobiological safety of lamps and lamp systems - Part 5: Image projectors

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Ta slovenski standard je istoveten z: **EN 62471-5:2015**

[SIST EN 62471-5:2015](https://standards.iteh.ai/catalog/standards/sist/07a0fce2-6df9-4755-821d-ef4d152c5b9b/sist-en-62471-5-2015)

<https://standards.iteh.ai/catalog/standards/sist/07a0fce2-6df9-4755-821d-ef4d152c5b9b/sist-en-62471-5-2015>

ICS:

29.140.99	Drugi standardi v zvezi z žarnicami	Other standards related to lamps
37.040.10	Fotografska oprema. Projektorji	Photographic equipment. Projectors

SIST EN 62471-5:2015

en

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 62471-5:2015

<https://standards.iteh.ai/catalog/standards/sist/07a0fce2-6df9-4755-821d-e4d152c5b9b/sist-en-62471-5-2015>

EUROPEAN STANDARD

EN 62471-5

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2015

ICS 29.140

English Version

Photobiological safety of lamps and lamp systems - Part 5:
Image projectors
(IEC 62471-5:2015)

Sécurité photobiologique des lampes et des appareils
utilisant des lampes - Partie 5: Projecteurs d'images
(IEC 62471-5:2015)

Photobiologische Sicherheit von Lampen und
Lampensystemen - Teil 5: Photobiologische Sicherheit von
Lampensystemen für Bildprojektoren
(IEC 62471-5:2015)

This European Standard was approved by CENELEC on 2015-07-14. 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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

SIST EN 62471-5:2015

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



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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

EN 62471-5:2015**European Foreword**

The text of document 76/519/FDIS, future edition 1 of IEC 62471-5, prepared by IEC/TC 76 "Optical radiation safety and laser equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62471-5:2015.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2016-04-16
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2018-07-14

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Endorsement notice**iTeh STANDARD PREVIEW**

The text of the International Standard IEC 62471-5:2015 was approved by CENELEC as a European Standard without any modification. (standards.iteh.ai)

[SIST EN 62471-5:2015](https://standards.iteh.ai/catalog/standards/sist/07a0fce2-6df9-4755-821d-e4d152c5b9b/sist-en-62471-5-2015)

<https://standards.iteh.ai/catalog/standards/sist/07a0fce2-6df9-4755-821d-e4d152c5b9b/sist-en-62471-5-2015>

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u> series	<u>Title</u>	<u>EN/HD</u>	<u>Year</u> series
IEC 60050		International Electrotechnical Vocabulary - -		
IEC 60065	-	Audio, video and similar electronic apparatus - Safety requirements	EN 60065	-
IEC 60825-1	2014	Safety of laser products -- Part 1: Equipment classification and requirements	EN 60825-1	2014
IEC 60950-1	-	Information technology equipment - Safety -- Part 1: General requirements	EN 60950-1	-
IEC 62471	-	Photobiological safety of lamps and lamp systems	EN 62471	-

[SIST EN 62471-5:2015](https://standards.iteh.ai/catalog/standards/sist/07a0fce2-6df9-4755-821d-e4d152c5b9b/sist-en-62471-5-2015)

<https://standards.iteh.ai/catalog/standards/sist/07a0fce2-6df9-4755-821d-e4d152c5b9b/sist-en-62471-5-2015>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 62471-5:2015](#)

<https://standards.iteh.ai/catalog/standards/sist/07a0fce2-6df9-4755-821d-e4d152c5b9b/sist-en-62471-5-2015>



IEC 62471-5

Edition 1.0 2015-06

INTERNATIONAL STANDARD



Photobiological safety of lamps and lamp systems –
Part 5: Image projectors **(standards.iteh.ai)**

SIST EN 62471-5:2015
<https://standards.iteh.ai/catalog/standards/sist/07a0fce2-6df9-4755-821d-ef4d152c5b9b/sist-en-62471-5-2015>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.140

ISBN 978-2-8322-2737-4

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references.....	8
3 Terms and definitions	9
4 General	15
4.1 Basis for risk groups	15
4.2 Example applications	16
4.2.1 RG0 / RG1 projectors.....	16
4.2.2 RG2 projectors.....	16
4.2.3 RG3 projectors.....	16
4.3 Projector lamps.....	16
4.4 Assessment criteria (background).....	16
5 Risk group determination	17
5.1 Test conditions.....	17
5.2 Measurement conditions for image projectors	18
5.2.1 Measurement throw ratio	18
5.2.2 Measurement distance	18
5.3 The position and size of apparent source, the calculation of angular subtense.....	18
5.4 Measurement of irradiance – specified apertures	19
5.5 Measurement of radiance .. SIST.EN.62471-5:2015	19
5.6 Accessible emission limits / catalog/standards/sist/07a0fce2-6df9-4755-821d-e4d152c5b9b/sist-en-62471-5-2015	20
5.6.1 For CW emission.....	20
5.6.2 For pulsed emission	21
5.6.3 Spectral weighting functions.....	22
5.7 Applying information from the lamp manufacturers	23
5.7.1 General	23
5.7.2 Limits provided in irradiance/radiant exposure	24
5.7.3 Limits provided in radiance or radiance dose	24
6 Manufacturer's requirements.....	24
6.1 General.....	24
6.2 Determination of HD (hazard distance)	25
6.3 Safety feature "soft start"	25
6.4 Optional safety features	25
6.4.1 Projection of warning message.....	25
6.4.2 Power reduction by sensor system	25
6.5 Labelling on products	25
6.5.1 General	25
6.5.2 RG0 projector	26
6.5.3 RG1 projector	26
6.5.4 RG2 projector	27
6.5.5 RG3 projector	28
6.6 User information.....	28
6.6.1 General	28
6.6.2 Assessment of user accessible area	29

6.6.3	User information (user manual)	29
6.6.4	User information for maintenance	30
6.7	Labelling and user information for image projectors where the risk group will be changed by interchangeable lens	30
6.7.1	General	30
6.7.2	Labelling on the projector	30
6.7.3	Mark on the interchangeable lens	32
6.7.4	The user information in the user manual of the projector	32
6.7.5	The user information in the user manual of the interchangeable lens	32
7	Information for service	33
Annex A (normative)	Test scheme for lamp types	34
Annex B (informative)	Example of calculations	35
B.1	Radiance calculations	35
B.1.1	General	35
B.1.2	Calculation from measured irradiance	35
B.1.3	Calculation from luminous output	36
B.2	Calculation example of risk group (CW)	37
B.2.1	Example of a 5 000 lm projector	37
B.2.2	10 000 lm professional-use projector with an apparent source of small subtense angle (CW)	39
B.2.3	2 000 lm projector with small apparent source (CW)	40
B.3	Calculation example of risk group (pulsed emission)	41
B.3.1	General	41
B.3.2	14 000 lm projector with one peak	41
B.3.3	14 000 lm projector with two peaks	44
Annex C (informative)	Example of intra-beam of projector sources with millimetre scale	47
Annex D (informative)	Measurement distance	48
Annex E (informative)	Hazard distance as a function of modifying optics	50
Bibliography	51
Figure 1	– Exit pupil in projector	10
Figure 2	– Examples of the application of the definition of pulse duration	13
Figure 3	– Definition of throw ratio	15
Figure 4	– Diameter of the apparent source	18
Figure 5	– RG1 label (optional)	26
Figure 6	– RG2 label	27
Figure 7	– RG2 caution symbol	27
Figure 8	– Sample design of RG2 caution pictogram	27
Figure 9	– RG3 label	28
Figure 10	– Optical radiation warning symbol	28
Figure 11	– "Not for household use" symbol	28
Figure 12	– RG2 label with the caution for RG3	31
Figure 13	– RG2 caution label with the caution for RG3	31
Figure 14	– RG2 pictogram with the caution for RG3	32
Figure B.1	– Image of the apparent source and measurement condition	37

Figure B.2 – Picture of the apparent source of a projector at the exit pupil of the projection lenses with a scale.....	37
Figure B.3 – Example with one peak of pulsed emission	42
Figure B.4 – Example with two peaks of pulsed emission.....	44
Figure C.1 – Examples of intra-beam images of projector sources with millimetre scale.....	47
Figure E.1 – Hazard distance as a function of modifying optics (example).....	50
Table 1 – Measurement criteria — field of view (angles of acceptance) for CW source	19
Table 2 – Measurement criteria — field of view (angles of acceptance) for pulsed source	19
Table 3 – AEL (accessible emission limits) for risk groups of lamps and lamp systems emitting CW optical radiation.....	20
Table 4 – Time base values associated with the risk groups and hazards.....	20
Table 5 – Basic retinal thermal emission limit	20
Table 6 – The values of C_5 and α for AEL calculation	21
Table 7 – Pulse duration dependent values of α_{\max}	22
Table 8 – Spectral weighting functions $B(\lambda)$ and $R(\lambda)$ for assessing retinal hazards	23
Table 9 – Labelling on products	26
Table 10 – User information in user manual.....	29
Table A.1 –Required evaluations.....	34

ITEH STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 62471-5:2015

<https://standards.iteh.ai/catalog/standards/sist/07a0fce2-6df9-4755-821d-e4d152c5b9b/sist-en-62471-5-2015>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PHOTOBIOLOGICAL SAFETY OF LAMPS AND LAMP SYSTEMS –

Part 5: Image projectors

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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62471-5 has been prepared by IEC technical committee 76: Optical radiation safety and laser equipment.

The text of this standard is based on the following documents:

FDIS	Report on voting
76/519/FDIS	76/521/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 has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability 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.

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN 62471-5:2015](#)

<https://standards.iteh.ai/catalog/standards/sist/07a0fce2-6df9-4755-821d-e24d152c5b9b/sist-en-62471-5-2015>

INTRODUCTION

Most lamps and lamp systems are safe and do not pose photobiological risks except under unusual exposure conditions. This also is the case for optical image projectors where experience shows that even high power cinema projectors may be safe for accidental momentary viewing and can only under some conditions pose optical hazards at close distances or for intentional 'long-duration' staring into the source. The rapid development of solid-state and other lamps or lamp systems has permitted new projector products, and generated the need for a photobiological safety standard for this group of lamp systems.

Optical radiation hazards from all types of lamps and lamp systems are currently assessed by the application of IEC 62471:2006 (CIE S 009:2002), *Photobiological safety of lamps and lamp systems*. IEC 62471 covers LEDs, incandescent, low- and high-pressure gas-discharge, arc and other lamps. Following the concept of vertical standards, the risk group classification system in IEC 62471 for lamps is to be adapted for specific product groups such as image projectors.

This part of IEC 62471 provides a risk group classification system for image projectors, and measurement conditions for optical radiation emitted by image projectors. It includes manufacturing requirements that may be required as a result of an image projector system being assigned to a particular risk group. Therefore, this part of IEC 62471 provides safety requirements for lamp systems that are intended to produce projected visible optical radiation, such as theatre projectors, data projectors and home-use projectors. The assigned risk group of a projector product also may be used by projector manufacturers to assist with any risk assessments, e.g. for occupational exposure in workplaces. National requirements may exist for the assessment of products or occupational exposure.

The emission limits provided in this part of IEC 62471 are derived from the exposure limits specified by ICNIRP in their 2013 Guidelines for incoherent visible and infrared radiation [1]¹. These exposure limits are also the basis for the emission limits to be specified in the future International Standard IEC 62471-12.

¹ Numbers in square brackets refer to the Bibliography.

² Revision of IEC 62471:2006.

PHOTOBIOLOGICAL SAFETY OF LAMPS AND LAMP SYSTEMS –

Part 5: Image projectors

1 Scope

This part of IEC 62471 provides requirements regarding photobiological safety of the optical radiation emitted by image projectors. This part of IEC 62471 does not deal with other hazards such as electrical, mechanical or fire hazards.

This part of IEC 62471 provides requirements regarding:

- optical radiation safety assessment of image projectors;
- projector risk groups;
- testing conditions and measurement conditions;
- manufacturer's requirements including user information.

The scope of this part of IEC 62471 is photobiological safety of image projectors including the emissions from laser-illuminated projectors that fulfill the requirements as specified in IEC 60825-1:2014, 4.4 and for which visible light emission has been excluded from classification in IEC 60825-1.

This part of IEC 62471 does not address safety requirements for laser display products where collimated laser beams — generally scanned — are employed. It does address those laser-illuminated projectors that employ a laser source to illuminate, for example, a micro-electro-mechanical system (MEMS) without scanned beams or crystal-based display projector system.

NOTE Image projectors containing lasers are subject to those provisions of IEC 60825-1 applicable to the embedded laser. See IEC 60825-1:2014, 4.4 for which visible light emission has been excluded from the laser product classification.

This part of IEC 62471 includes projectors for only visible image projection and does not include ultraviolet (UV) projectors, infrared (IR) projectors, general lighting service (GLS) lamps (GLS; defined in IEC 62471) or projector lamp systems used for general lighting, which are treated in separate International Standards.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62471, *Photobiological safety of lamps and lamp systems*

IEC 60825-1:2014, *Safety of laser products – Part 1: Equipment classification and requirements*

IEC 60050 (all parts), *International Electrotechnical Vocabulary* (available at <http://www.electropedia.org>)

IEC 60950-1, *Information technology equipment – Safety – Part 1: General requirements*

IEC 60065, *Audio, video and similar electronic apparatus – Safety requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62471, IEC 60050-845 [2] and the following apply.

3.1

accessible emission

AE

level of radiation determined at a certain distance from the product and with measurement conditions described in Clause 5

Note 1 to entry: The accessible emission is compared with the AEL (see 3.2) to determine the risk group of the product.

3.2

accessible emission limit

AEL

maximum accessible emission permitted within a particular risk group

3.3

angle of acceptance

γ

plane angle within which a detector will respond to optical radiation

Note 1 to entry: The angle of acceptance is usually measured in radians (SI unit).

Note 2 to entry: This angle of acceptance may be controlled by apertures or optical elements in front of the detector. The angle of acceptance is also sometimes referred to as the field of view (see 3.12).

Note 3 to entry: The angle of acceptance should not be confused with the angular subtense of the source (see 3.4) or the beam divergence.

3.4

angular subtense

α

visual angle subtended by the apparent source at the eye of an observer or at the point of measurement

Note 1 to entry: In this part of IEC 62471, subtended angles are denoted by the full included angle, not the half angle.

Note 2 to entry: SI unit: radian.

Note 3 to entry: The angular subtense α may be modified by incorporation of lenses and mirrors as projector optics, i.e. the angular subtense of the apparent source may differ from the angular subtense of the physical source.

Note 4 to entry: The limitations of α in this part of IEC 62471 are:

For continuous wave: $\alpha_{\max} = 0,1$ rad, $\alpha_{\min} = 0,0015$ rad.

For pulsed emission: α_{\max} is described in Table 7, $\alpha_{\min} = 0,0015$ rad.

3.5

cinema-use projector

image projector used for projection in theatrical environment

3.6

consumer product

item intended for consumers or likely to be used by consumers, even if not intended for them