

INTERNATIONAL STANDARD

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**Photobiological safety of lamps and lamp systems –
Part 6: Ultraviolet lamp products**

**Sécurité photobiologique des lampes et des appareils utilisant des lampes –
Partie 6: Appareils à lampes ultraviolettes**



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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.140.01; 31.260

ISBN 978-2-8322-5828-6

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PHOTOBIOLOGICAL SAFETY OF LAMPS AND LAMP SYSTEMS –**Part 6: Ultraviolet lamp products****FOREWORD**

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The text of this International Standard is based on the following documents:

FDIS	Report on voting
76/714/FDIS	76/718/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

In this standard, the following print types are used:

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INTRODUCTION

Most lamps and lamp products are safe and do not pose photobiological risks except under unusual exposure conditions; however, one group of products-ultraviolet lamp products-can under some conditions pose optical hazards during use and require risk assessment for direct and indirect exposure of the eyes and skin. Optical radiation hazards from all types of lamps or other broadband light sources are assessed by the application of IEC 62471:2006/CIE S009:2002. IEC 62471 covers light emitting diodes (LEDs), incandescent, low- and high- pressure gas-discharge, arc and other lamps. It also covers lamps which are designed primarily to emit ultraviolet radiant energy, such as ultraviolet sources intended to excite fluorescence of irradiated materials, for insect light traps, for scientific studies, mineral identification, for non-destructive testing, germicidal irradiation, and other purposes.

This document provides a risk group (RG) classification system for all ultraviolet lamp products, and the assessment distances and measurement conditions for different products (Annex A and Annex C). It includes manufacturing and user safety requirements that may be required as a result of an ultraviolet lamp product being assigned to a particular risk group. The scope is limited to products where the sole intent is to emit ultraviolet radiant energy. The advantage of applying this document, intended solely for ultraviolet lamp products, instead of the horizontal IEC 62471 standard, is that the risks from visible and infrared optical radiation need not be assessed using this document, as they are assumed to be insignificant for a lamp that emits mainly UV. The assigned risk group of an ultraviolet lamp product using this document may also be used to assist with any needed risk assessments, e.g. for occupational exposure in workplaces.

PHOTOBIOLOGICAL SAFETY OF LAMPS AND LAMP SYSTEMS –

Part 6: Ultraviolet lamp products

1 Scope

This part of IEC 62471 provides the optical radiation safety requirements for ultraviolet lamp products, including UV LED lamp products.

This document provides requirements for:

- optical radiation safety assessment and ultraviolet-product risk groups;
- user information for safety measures;
- appropriate labelling of ultraviolet lamp products.

This document addresses those lamps and lamp products where the ultraviolet emission serves the primary purpose of the product and where more than half of the radiant power emitted between 180 nm and 3 000 nm is in the spectral region 180 nm to 400 nm. If more than half of the optical radiation emitted between 180 nm and 3 000 nm is outside of the spectral region 180 nm to 400 nm, then the base standard IEC 62471 should be used. This document covers medical diagnostic and cosmetic devices/products that emit primarily UV radiation.

Because photobiological effects from UV radiation are based on the total accumulated exposure (dose) received, this document relies on the concept of ‘time-weighted average’ exposures where the assessment distance for determining the RG is chosen based on realistic exposure distances and exposure durations. In other words, it is not expected that people will be exposed at very close distances, e.g. 20 cm to 30 cm, for extended periods of time. This document provides assessment distances and specific guidance that are application-specific and realistic rather than the more general values in IEC 62471 where the specific application is unknown and time-weighted average exposures are not application-specific.

This document does not provide requirements for:

- lamps which primarily emit visible (such as GLS – general lighting source) and/or infrared radiant energy;
- lamp products used for general lighting or infrared illumination or heating, which are treated in separate standards;
- fluorescent ultraviolet lamps for tanning (covered by IEC 60335-2-27 and IEC 61228);
- medical treatment devices/products (see IEC 60601-2-57), but covers UV medical diagnostic products;
- non-optical hazards, e.g. ozone, mercury, etc.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

IEC 60335-2-27, *Household and similar electrical appliances – Safety – Part 2-27: Particular requirements for appliances for skin exposure to optical radiation*

IEC 60417:2002, *Graphical symbols for use on equipment – 12-month subscription to regularly updated online database comprising all graphical symbols published in IEC 60417*

IEC 60601-2-57, *Medical electrical equipment – Part 2-57: Particular requirements for the basic safety and essential performance of non-laser light source equipment intended for therapeutic, diagnostic, monitoring and cosmetic/aesthetic use*

IEC 61549, *Miscellaneous lamps*

IEC 62471:2006/CIE S009:2002, *Photobiological safety of lamps and lamp systems*

ISO 7010: *Graphical symbols – Safety colours and safety signs – Registered safety signs*

ISO 15004-2: *Ophthalmic instruments – Fundamental requirements and test methods – Part 2: Light hazard protection*

CIE 247:2021, *Guide for the Gonioradiometric Measurement of Upper Air Ultraviolet Germicidal Irradiation Luminaires*, ISBN 978-3-902842-19-0, Vienna

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

actinic UV

UV radiation capable of producing a photochemical effect

Note 1 to entry: In the context of this document, the biological effects have a demonstrated action spectrum, $S(\lambda)$, and refer most significantly to UV-B and UV-C effects, e.g. UV erythema (skin reddening), UV photokeratitis ('welder's flash' or 'snowblindness'), etc. See also Annex B.

3.2

assessment distance

distance used to determine the risk group classification of a lamp or lamp product

Note 1 to entry: The risk group assessment distance takes account of the TWA exposure (variable irradiance, exposure distances and durations).

Note 2 to entry: This is usually the distance from the closest point of human access to the emission, to the point of assessment or measurement.

3.3

blue light hazard

potential for a photochemically induced retinal injury resulting from radiation exposure at wavelengths primarily between 400 nm and 500 nm

Note 1 to entry: This damage mechanism normally dominates over thermal mechanisms for intense visible light for viewing times exceeding 10 s, but is rarely of concern from UV lamps (unless the basic lamp is an arc lamp).

[SOURCE: IEC 60050-845:2020, 845-26-055]