IEC 61228

Edition 2.0 2008-01

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Fluorescent ultraviolet lamps used for tanning – Measurement and specification method

Lampes fluorescentes à ultraviolet utilisées pour le bronzage – Méthode de mesure et de spécification

IEC 61228:2008

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

PRICE CODE
CODE PRIX

M

ICS 17.240; 29.140.01; 97.170

ISBN 2-8318-9523-5

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FLUORESCENT ULTRAVIOLET LAMPS USED FOR TANNING – MEASUREMENT AND SPECIFICATION METHOD

FOREWORD

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International Standard IEC 61228 has been prepared by subcommittee 34A: Lamps, of IEC technical committee 34: Lamps and related equipment.

This second edition cancels and replaces the first edition published in 1993 and its Amendment 1 (1996). It constitutes a technical revision.

In this second edition, an equivalency code for the lamps in introduced. This equivalency code characterises the spectral energy distribution and is to be applied when replacing lamps in tanning equipment.

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

FDIS	Report on voting
34A/1242/FDIS	34A/1266/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 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- withdrawn,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.

FLUORESCENT ULTRAVIOLET LAMPS USED FOR TANNING – MEASUREMENT AND SPECIFICATION METHOD

1 Scope

This International Standard describes the method of measuring, evaluating and specifying the characteristics of fluorescent ultraviolet lamps that are used in appliances for tanning purposes. It includes specific requirements regarding the marking of such lamps.

These recommendations relate only to type testing.

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.

IEC 60050-845:1987, *International Electrotechnical Vocabulary (IEV) – Chapter 845: Lighting*

IEC 60081, *Double-capped fluorescent lamps – Performance specifications*

IEC 60901, *Single-capped fluorescent lamps – Performance specifications*

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

CIE 63:1984, *The spectroradiometric measurement of light sources*

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

3 Terms and definitions

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

3.1
ultraviolet lamp
lamp which radiates especially strongly in the ultraviolet, the visible radiation produced, if any, not being of direct interest

[IEV 845-07-52]

3.2
fluorescent lamp
discharge lamp of the low-pressure mercury type in which most of the light is emitted by one or several layers of phosphors excited by the ultraviolet radiation from the discharge

[IEV 845-07-26]

3.3
type test
test or a series of tests made on a type test sample for the purpose of checking compliance of the design of a given product with the requirements of the relevant standard

3.4
spectroradiometer
instrument for measuring radiometric quantities in narrow wavelength intervals over a given spectral region

[IEV 845-05-07]

3.5
bandwidth at a given wavelength
width at half-amplitude points of the transmittance function of a monochromator (unit: nm)

3.6
spectral
adjective that, when applied to a quantity X pertaining to electromagnetic radiation, indicates:

– either that X is a function of the wavelength λ, symbol: $X(\lambda)$;

– or that the quantity referred to is the spectral concentration of X, symbol: $X_\lambda = \mathrm{d}X/\mathrm{d}\lambda$.

X_λ is also a function of λ and in order to stress this it may be written $X_\lambda(\lambda)$ without any change of meaning

[IEV 845-01-16]

3.7
irradiance
quotient of the radiant flux $\mathrm{d}\phi_e$ incident on an element of the surface containing the point, by the area $\mathrm{d}A$ of that element (unit: W/m^2)

[IEV 845-01-37]

3.8
action spectrum
efficiency of monochromatic radiations for producing a specified phenomenon in a specified system

[IEV 845-06-14, modified]

3.9
effective
adjective that, when applied to a quantity pertaining to electromagnetic radiation, indicates that the quantity referred to is weighted according to a specified action spectrum

3.10
nominal value
approximate quantity value used to designate or identify a lamp

3.11
rated value
quantity value for a characteristic of a lamp for specified operating conditions

NOTE The value and/or conditions are specified in this standard, or assigned by the manufacture or responsible vendor.

4 General test conditions

4.1 Ageing

Before the initial measurements, lamps shall be aged for a period of 5 h ± 0,25 h under normal operating conditions.

4.2 Operating position

During ageing and measurement, lamps shall be operated in a horizontal position. Ageing is preferably in a horizontal position; a vertical position may also be applied.

4.3 Ambient temperature

The measurement shall be made in a draught-free atmosphere at an ambient temperature of 25 °C ± 1 °C.

NOTE If applicable, lamps may also be measured under conditions different from the above standard ambient temperature conditions to establish the optimum UV irradiance, as described in Annex A.

4.4 Test voltage

The test voltage applied to the circuit shall be as specified on the relevant lamp data sheet.

4.5 Ballast

Lamps shall be operated with a reference ballast. In cases where a reference ballast has not been established, an appropriate test ballast shall be specified by the lamp manufacturer or responsible vendor. The ballast shall be operating at a frequency of 50 – 60 Hz.

5 Test requirements

5.1 General

Spectroradiometric measurements shall be made in accordance with the relevant recommendations of the CIE (International commission on illumination), as given in CIE 63.

Additional information about UV measurements is given in Annex B of IEC 62471.

Requirements for electrical measurements are given in Annex B of IEC 60081 and IEC 60901.

5.2 Spectroradiometric measuring system

Lamps shall be measured in an appropriate spectroradiometric system to obtain the spectral irradiance.

The system input optics shall have cosine response to accurately measure irradiance.

The spectroradiometer shall have a bandwidth not exceeding 2,5 nm.

The distance between detector and lamp axis is not specified but shall be not less than 10 cm.

NOTE 1 For the publication of the final lamp specifications, the measured irradiance values are corrected to arrive at irradiance values at 25 cm distance from the lamp axis (see 6.3).

NOTE 2 A bandwidth of 1 nm is advisable for greater measurement accuracy in cases where a rapid change of the spectral irradiance occurs within a small bandwidth area.

NOTE 3 The bandwidth should be at least 2,5 times the measurement interval.(e.g. 2,5 nm bandwidth requires 1 nm measurement interval)

6 Measurement and evaluation procedure

6.1 Measurement

The spectral irradiance shall be measured at intervals of 1 nm from 250 nm to 400 nm. Under the test conditions, the lamp power, current and voltage shall be recorded.

6.2 Calculation of the total effective UV irradiance

The total effective UV irradiance shall be calculated from the spectral irradiance using the following formula:

$$E_{\text{eff}} = \Sigma\, E_\lambda \,.\, S(\lambda) \,.\, \Delta\lambda$$

where

E_{eff} is the total effective irradiance (W/m^2);

E_λ is the spectral irradiance (W/(m^2.nm));

$S(\lambda)$ is the weighting factor according to the applicable action spectrum;

$\Delta\lambda$ is the wavelength interval (nm).

The wavelength interval for the calculation shall preferably be equal to the bandwidth.

The applicable action spectra for erythema and NMSC are given in Annex B.

For the total effective UV irradiance weighted according to the erythema action spectrum, the summation shall be performed over the following wavelength range:

250 nm ≤ λ ≤ 400 nm.

For the total effective UV irradiance weighted according to the NMSC action spectrum, the summation shall be performed over two wavelength ranges:

250 nm ≤ λ ≤ 320 nm, and

320 nm < λ ≤ 400 nm.

NOTE The limit of 320 nm is chosen in accordance with IEC 60335-2-27, where for this application the CIE nomenclature UV-A and UV-B with a limit of 315 nm is not used.

6.3 Correction factors

In order to arrive at the final total effective UV irradiance values, the following two correction factors may have to be applied:

a) for lamps having the optimum UV irradiance at an ambient temperature other than 25 °C, a factor to obtain the optimum UV irradiance, as described in Annex A;

b) for lamps measured at a distance other than 25 cm, a factor to obtain the UV irradiance at 25 cm distance. This geometrical factor can be obtained for each lamp type either experimentally or by calculation.

7 Lamp specification

The following information shall be given for each lamp type in the manufacturers literature:

a) lamp dimensions;

b) for reflector lamps, the reflector angle α, i.e. the angle subtended at the lamp axis by the reflector coating;

c) the type of ballast for which the lamp is designed;

d) the rated electrical characteristics:
   - lamp wattage;
   - lamp current;
   - lamp voltage;

e) three rated total effective UV irradiance values at 25 cm distance from the lamp axis and weighted according to Annex B:
   - the erythema action spectrum over the wavelength range 250 nm ≤ λ ≤ 400 nm;
   - the NMSC action spectrum over the wavelength range 250 nm ≤ λ ≤ 320 nm;
   - the NMSC action spectrum over the wavelength range 320 nm < λ ≤ 400 nm.

f) the equivalency code (see Clause 8).

The values under items d) and e) shall be given under conditions of optimum UV irradiance.

The values under item e) shall be given in mW/m² and rounded to the nearest integer.

8 Lamp marking

The following information shall be legibly and durably marked on the lamp:

a) the type reference of the lamp, containing:
   - a mark of origin (this may take the form of a trade mark, the manufacturer's name or the name of the responsible vendor);
   - the nominal lamp wattage (marked "W" or "watts");
   - a further identification of the specific lamp type (mostly in the form of a commercial designation);

b) the equivalency code, in the form: "Wattage–Reflector type code–UV code".
   - The wattage in the equivalency code shall be the nominal lamp wattage.
   - The following reflector type code shall be used in the equivalency code:
     - O for non-reflector lamps;
     - B for lamps with a broad reflector angle α > 230°;
     - N for lamps with a narrow reflector angle α < 200°;
     - R for lamps with a regular reflector 200° ≤ α ≤ 230°.

– The following UV code shall be used in the equivalency code:

UV code = X/Y

X = total erythema effective UV irradiance over the range 250 nm – 400 nm;

Y = ratio of the NMSC effective UV irradiances ≤ 320 nm and > 320 nm.

X is to be given in mW/m^2 rounded to the nearest integer, Y is to be rounded to the nearest first decimal. The effective values are at 25 cm distance and under conditions of optimum UV irradiance.

EXAMPLE

100 W reflector lamp with 220° reflector angle

erythema effective UV irradiance (250 nm – 400 nm) = 47 mW/m^2

short wave NMSC effective UV irradiance (≤ 320 nm) = 61 mW/m^2

long wave NMSC effective UV irradiance (> 320 nm) = 19 mW/m^2

Equivalency code: 100–R–47/3,2