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INTERNATIONAL STANDARD

colour inside

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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-27: Particular requirements for appliances for skin exposure to ultraviolet and infrared radiation

FOREWORD

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International Standard IEC 60335-2-27 has been prepared by IEC technical committee 61: Safety of household and similar electrical appliances.

This fifth edition cancels and replaces the fourth edition published in 2002, its Amendment 1 (2004) and Amendment 2 (2007). It constitutes a technical revision.

The principal changes in this edition as compared with the fourth edition of IEC 60335-2-27 are as follows (minor changes are not listed):

– clarification of the radiation measurement procedure (32.101);
– guidelines for an exposure time schedule (Annex DD).

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

FDIS	Report on voting
61/3911/FDIS	61/3969/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.

This part 2 is to be used in conjunction with the latest edition of IEC 60335-1 and its amendments. It was established on the basis of the fourth edition (2001) of that standard.

NOTE 1 When “Part 1” is mentioned in this standard, it refers to IEC 60335-1.

This part 2 supplements or modifies the corresponding clauses in IEC 60335-1, so as to convert that publication into the IEC standard: Safety requirements for appliances for skin exposure to ultraviolet and infrared radiation.

When a particular subclause of Part 1 is not mentioned in this part 2, that subclause applies as far as is reasonable. When this standard states "addition", "modification" or "replacement", the relevant text in Part 1 is to be adapted accordingly.

NOTE 2 The following numbering system is used:

– subclauses, tables and figures that are numbered starting from 101 are additional to those in Part 1;

– unless notes are in a new subclause or involve notes in Part 1, they are numbered starting from 101, including those in a replaced clause or subclause;

– additional annexes are lettered AA, BB, etc.

NOTE 3 The following print types are used:

– requirements: in roman type;

– *test specifications: in italic type*;

– notes: in small roman type.

Words in **bold** in the text are defined in Clause 3. When a definition concerns an adjective, the adjective and the associated noun are also in bold.

The committee has decided that the contents of the base publication and its amendments 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.

NOTE 4 The attention of National Committees is drawn to the fact that equipment manufacturers and testing organizations may need a transitional period following publication of a new, amended or revised IEC publication in which to make products in accordance with the new requirements and to equip themselves for conducting new or revised tests.

It is the recommendation of the committee that the content of this publication be adopted for implementation nationally not earlier than 12 months or later than 36 months from the date of publication.

The following differences exist in the countries indicated below.

- 7.1: The markings are different (USA).
- 10.1: The deviations are different (USA).
- 10.2: The deviations are different (USA).
- 19.101: The test is different (USA).
- 20.1: The test is carried out at an angle of 8° (USA).
- Clause 22: Series resistors are to be incorporated in some UV emitters (Australia).
- 22.107: The requirement is not applicable (USA).
- 22.108: The maximum timer setting is shorter (USA).
- 32.101: The irradiance limits and the tests are different (USA).
- 32.101: The total erythema **effective UV irradiance** shall not be greater than 0,3 W/m^2 (Belgium)
- 32.101: The **effective irradiance** limits and wavelength intervals are different (Spain).
- 32.102: The requirements for protective goggles are different (USA).
- Annex DD: The recommended number of exposures for each part of the body is to be based upon a maximum yearly dose of 5 kJ/m^2, weighted according to the erythema action spectrum shown in Figure 103 and taking into account the recommended schedule of exposure (Finland).

A list of all parts of the IEC 60335 series, under the general title: *Household and similar electrical appliances – Safety*, can be found on the IEC website.

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.

INTRODUCTION

It has been assumed in the drafting of this International Standard that the execution of its provisions is entrusted to appropriately qualified and experienced persons.

This standard recognizes the internationally accepted level of protection against hazards such as electrical, mechanical, thermal, fire and radiation of appliances when operated as in normal use taking into account the manufacturer's instructions. It also covers abnormal situations that can be expected in practice and takes into account the way in which electromagnetic phenomena can affect the safe operation of appliances.

This standard takes into account the requirements of IEC 60364 as far as possible so that there is compatibility with the wiring rules when the appliance is connected to the supply mains. However, national wiring rules may differ.

If an appliance within the scope of this standard also incorporates functions that are covered by another part 2 of IEC 60335, the relevant part 2 is applied to each function separately, as far as is reasonable. If applicable, the influence of one function on the other is taken into account.

When a part 2 standard does not include additional requirements to cover hazards dealt with in Part 1, Part 1 applies.

NOTE 1 This means that the technical committees responsible for the part 2 standards have determined that it is not necessary to specify particular requirements for the appliance in question over and above the general requirements.

This standard is a product family standard dealing with the safety of appliances and takes precedence over horizontal and generic standards covering the same subject.

NOTE 2 Horizontal and generic standards covering a hazard are not applicable since they have been taken into consideration when developing the general and particular requirements for the IEC 60335 series of standards. For example, in the case of temperature requirements for surfaces on many appliances, generic standards, such as ISO 13732-1 for hot surfaces, are not applicable in addition to Part 1 or part 2 standards.

An appliance that complies with the text of this standard will not necessarily be considered to comply with the safety principles of the standard if, when examined and tested, it is found to have other features that impair the level of safety covered by these requirements.

An appliance employing materials or having forms of construction differing from those detailed in the requirements of this standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be considered to comply with the standard.

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-27: Particular requirements for appliances for skin exposure to ultraviolet and infrared radiation

1 Scope

This clause of Part 1 is replaced by the following.

This International Standard deals with the safety of electrical appliances incorporating emitters for exposing the skin to ultraviolet or infrared radiation, for household and similar use, their **rated voltage** being not more than 250 V for single-phase appliances and 480 V for other appliances.

Appliances not intended for normal household use but which nevertheless may be a source of danger to the public, such as appliances intended to be used in tanning salons, beauty parlours and similar premises, are also within the scope of this standard.

As far as practicable, this standard deals with the common hazards presented by appliances that are encountered by persons using the UV appliances in tanning salons, beauty parlours and similar premises or at home. However, in general, it does not take into account

– persons (including children) whose
  - physical, sensory or mental capabilities; or
  - lack of experience and knowledge

  prevents them from using the appliance safely without supervision or instruction;
– children playing with the appliance.

NOTE 101 Attention is drawn to the fact that

– for appliances intended to be used in vehicles or on board ships or aircraft, additional requirements may be necessary;

– in many countries, additional requirements are specified by the national health authorities, the national authorities responsible for the protection of labour and similar authorities;

– IEC 60598-1 is applicable as far as is reasonable.

NOTE 102 This standard does not apply to

– appliances for medical purposes;

– appliances that use UV radiation for purposes other than tanning the skin;

– appliances intended to be used in locations where special conditions prevail, such as the presence of a corrosive or explosive atmosphere (dust, vapour or gas).

2 Normative references

This clause of Part 1 is applicable.

3 Definitions

This clause of Part 1 is applicable except as follows.

3.101
ultraviolet emitter
UV emitter
radiating source constructed to emit non-ionizing electromagnetic energy at wavelengths of 400 nm or less

NOTE A fluorescent UV lamp for tanning is an example of a **UV emitter**.

3.102
infrared emitter
IR emitter
radiating source constructed to emit electromagnetic energy at wavelengths of 800 nm or longer

3.103
effective irradiance
irradiance of electromagnetic radiation weighted according to a specified action spectrum

3.104
UV filter
device used to reduce or modify the ultra-violet radiation passing through it by altering the spectral distribution of the radiation

4 General requirement

This clause of Part 1 is applicable.

5 General conditions for the tests

This clause of Part 1 is applicable except as follows.

5.1 *Addition:*

*Appliances with **UV emitters** are tested as **motor-operated appliances**.*

*Appliances with **IR emitters** only are tested as **heating appliances**.*

6 Classification

This clause of Part 1 is applicable except as follows.

6.101 UV appliances shall be one of the following types with respect to the emission of ultraviolet radiation:

– appliances suitable for household use;
– appliances for commercial use only.

NOTE 1 Appliances for household use may also be for commercial use, such as in tanning salons, beauty parlours and similar premises.

NOTE 2 Detailed classification of the appliances is described in Annex BB.

Compliance is checked by inspection and by the relevant tests.

7 Marking and instructions

This clause of Part 1 is applicable except as follows.

7.1 *Addition:*

UV appliances intended for commercial use, such as in tanning salons, beauty parlours and similar premises shall be marked with the "not for household use" symbol shown in 7.6 or with the substance of the following:

Not for household use

Appliances having fluorescent UV lamps for tanning shall be marked with the fluorescent UV lamp equivalency code range. This equivalency code range identifies the fluorescent UV lamps for tanning that shall be used in the appliance.

NOTE 101 Details of the fluorescent UV lamp code that is marked on the lamp are given in IEC 61228 and are reproduced in Annex CC for information. An example of the fluorescent UV lamp equivalency code range to be marked on the appliance is given in 22.111.

For **UV emitters** other than fluorescent UV lamps for tanning, the appliance shall be marked with the type reference of the emitters that are recommended for use.

Appliances having **UV emitters** shall be marked with the substance of the following:

WARNING: Ultraviolet radiation can cause injury to eyes and skin, such as skin aging and eventually skin cancer. Read instructions carefully. Wear the protective goggles provided. Certain medicines and cosmetics may increase sensitivity.

NOTE 102 For appliances having **UV emitters** intended only for use in tanning salons, beauty parlours and similar premises, this warning may be given on a permanent label intended to be fixed on the wall adjacent to the UV appliance. The wording "Read instructions carefully" may be replaced by "Consult the attendant for further information".

Appliances having **UV emitters** with a luminance exceeding 100 000 cd/m² shall be marked with the substance of the following:

WARNING: Intense light. Do not stare at the emitter.

NOTE 103 The method of measuring luminance is given in Annex AA.

NOTE 104 If these warnings are combined, the word "warning" need not be repeated.

7.6 *Addition:*

Not for household use

NOTE 101 This symbol incorporates the prohibition sign of ISO 3864-1.

7.12 *Addition:*

The instructions shall give clear information with regard to the proper use of the appliance.

UV appliances shall include a statement that non-users, especially children, must not be present when the appliance is being operated.

The instructions for appliances having **UV emitters** shall include the substance of the following:

– a statement that UV appliances are not to be used by
  - persons under the age of 18 years;
  - persons who tend to freckle;
  - persons with a natural red hair colour;
  - persons having abnormal discoloured patches on the skin;
  - persons having a large number of moles;
  - persons having asymmetrical irregularly shaped moles larger than 5 mm in diameter with variable pigmentation and irregular borders; in case of doubt, seek medical advice;
  - persons suffering from sunburn;
  - persons not able to tan at all or persons that burn easily when exposed to the sun;
  - persons having a history of frequent severe sunburn during childhood;
  - persons suffering from or previously suffering from skin cancer or predisposed to skin cancer;
  - persons under a doctors care for diseases that involve photosensitivity;
  - persons receiving photosensitising medications.
– a statement that if unexpected side effects, such as itching, occur within 48 h of the first session of using a UV appliance, medical advice should be sought prior to further UV exposure;
– a statement that exposures should not exceed the minimal amount of UV radiation exposure required to cause perceptible reddening of the skin (a person's minimal erythemal dose (MED);
– a statement that if skin reddening (erythema) is visible approximately 16 h – 24 h after any exposure, further exposure should cease. After one week, exposures may be restarted from the beginning of the schedule of exposure;
– information concerning the intended exposure distance (unless this is controlled by the construction of the UV appliance);
– recommended schedule of exposure specifying duration and intervals (based on the **UV emitter** characteristics, distances and skin sensitivity), see Annex DD;
– recommended number of exposures that should not be exceeded in one year, see Annex DD;
– a statement that the appliance must not be used if the timer is faulty or the filter is broken or removed;
– identification of alternative components that may influence the ultraviolet radiation, such as filters and reflectors;
– identification of replaceable **UV emitters** and a statement that they are only to be replaced by types marked on the appliance. For fluorescent UV lamps for tanning, it shall be stated that they are only to be replaced by types marked with an equivalency code, the UV component of which falls within the UV component equivalency code range that is marked on the appliance. In this case, an example of the equivalency code shall be given and the UV component aspect of the fluorescent UV lamp for tanning equivalency code shall be explained.

The instructions for appliances having **UV emitters** shall contain the substance of the following information and precautions:

– ultraviolet radiation from the sun or from UV appliances can cause skin or eye damage that may be irreversible. These biological effects depend upon the quality and quantity of the radiation as well as the skin sensitivity of the individual;

– the skin may develop sunburn after overexposure. Excessively repeated exposures to ultraviolet radiation from the sun or from UV appliances may lead to premature ageing of the skin as well as increased risk of development of skin tumours. These risks increase with increasing cumulative UV exposure. Exposure at an early age increases the risk of skin damage later in life;

– the unprotected eye may develop surface inflammation and in some cases damage may occur to the retina after excessive exposure. Cataracts may develop after many repeated exposures;

– in cases of pronounced individual sensitivity or allergic reaction to ultraviolet radiation, medical advice is recommended before starting exposure;

– the type reference of the protective goggles to be used;

– the following precautions must be taken:

  - always use the protective goggles provided. Contact lenses and sun glasses are not a substitute for goggles;
  - remove cosmetics well in advance of exposure and do not use any sunscreens or products that accelerate tanning;
  - certain medical conditions or side effects of certain medicines may be aggravated by ultraviolet exposure. In case of doubt, seek medical advice;
  - allow at least 48 h between the first two exposures;
  - do not sunbathe and use the appliance on the same day;
  - follow the recommendations concerning exposure durations, exposure intervals and distances from the lamp;
  - seek medical advice if persistent lumps or sores appear on the skin or if there are changes in pigmented moles;
  - protect sensitive skin parts such as scars, tattoos and genitals from exposure.

For appliances having a lid that has to be opened in normal use, the instructions shall include a warning that the appliance must not be switched on with the lid in the closed position and that, before closing the lid for storage, the appliance must be disconnected from the supply and allowed to cool down.

NOTE 101 This warning is not required if the appliance complies with the tests of 19.2 and 19.3.

The instructions for appliances having **IR emitters** shall include advice for the protection of the eyes against exposure to infrared radiation and advise that adequate precautions must be taken to safeguard the user against the dangers of excessive exposure.

If the “Not for household use” symbol is used, its meaning shall be explained.

7.14 *Addition:*

The height of the “not for household use” symbol shall be at least 10 mm.

Compliance is checked by measurement.

7.15 *Addition:*

The additional warnings and markings specified in 7.1 of this Part 2 shall be visible after the appliance has been installed and without removal of a cover.

8 Protection against access to live parts

This clause of Part 1 is applicable except as follows.

NOTE 101 Compliance with the relevant requirements of Section 8 of IEC 60598-1 is to be maintained during the replacement of emitters, unless the instructions forbid replacement by the user and **tools** are needed.

8.1.3 Not applicable.

9 Starting of motor-operated appliances

This clause of Part 1 is not applicable.

10 Power input and current

This clause of Part 1 is applicable except as follows.

10.1 *Modification:*

The following deviations apply:

– *appliances having **UV emitters** only:* *+ 10 %;*

– *other appliances:* $^{+\ 5}_{-10}$ *%*

10.2 *Modification:*

The following deviations apply:

– *appliances having **UV emitters** only:* *+ 10 %;*

– *other appliances:* $^{+\ 5}_{-10}$ *%*

11 Heating

This clause of Part 1 is applicable except as follows.

11.2 *Modification:*

Appliances normally placed on a floor or table are placed on the floor of the test corner with their back as near as possible to one of the walls and away from the other wall.

If the direction of the radiation is adjustable, the appliance is adjusted to the most unfavourable position of normal use.

Addition:

Appliances having fluorescent UV lamps for tanning shall be fitted with a fluorescent UV lamp having either a short mount electrode or long mount electrode, whichever provides the more unfavourable results.

11.7 *Replacement:*

The appliance is operated until steady conditions are established.

NOTE 101 If necessary, timers are reset immediately.

Parts operated by motors in appliances for wall mounting or ceiling mounting are fully raised and lowered five times without rest periods, or for 5 min, whichever is shorter.

11.8 *Addition:*

The temperatures of ballast windings and their associated wiring shall not exceed the values specified in Subclause 12.4 of IEC 60598-1, when measured under the conditions stated.

The temperature rises for surfaces in contact with the skin shall not exceed those specified for handles that are continuously held in the hand.

12 Void

13 Leakage current and electric strength at operating temperature

This clause of Part 1 is applicable.

14 Transient overvoltages

This clause of Part 1 is applicable.

15 Moisture resistance

This clause of Part 1 is applicable.

16 Leakage current and electric strength

This clause of Part 1 is applicable.

17 Overload protection of transformers and associated circuits

This clause of Part 1 is applicable.

18 Endurance

This clause of Part 1 is not applicable.

19 Abnormal operation

This clause of Part 1 is applicable except as follows.

19.1 *Modification:*

Instead of the tests specified, appliances are subjected the tests of 19.4 to 19.12, 19.101 and 19.102, as applicable.

In addition, 19.2 and 19.3 are applicable for appliances having a lid but without a warning in the instructions that the appliance must not be switched on with the lid closed.

19.2 *Replacement:*

Appliances having a lid that is opened in normal use are tested with the lid closed.

*The test is carried out under the conditions specified in Clause 11. Appliances having **UV emitters** are supplied at 0,94 times **rated voltage** and other appliances are operated at 0,85 times **rated power input**.*

19.3 *Replacement:*

*The test of 19.2 is repeated but appliances having **UV emitters** are supplied at 1,1 times **rated voltage** and other appliances are operated at 1,24 times **rated power input**.*

19.9 Not applicable.

19.101 *Appliances, other than those for mounting at a height more than 1,8 m above the floor, are supplied at **rated voltage** and operated as specified in Clause 11. When steady conditions are established, a piece of dry bleached cotton flannelette having a specific mass of 130 g/m^2 to 165 g/m^2, a width of 100 mm and long enough to pass over the front of the appliance, is stretched over the appliance in the most unfavourable position.*

The flannelette shall not smoulder or ignite within 10 s.

NOTE If smouldering has started, a hole will have formed in the material with its edge glowing red. Blackening without smouldering is ignored.

19.102 *Appliances having discharge lamps are operated under the fault conditions specified in Subclause 12.5.1 a), d) and e) of IEC 60598-1, the appliance being supplied at **rated voltage**.*

The temperatures of ballast or transformer windings shall not exceed the values specified in Subclause 12.5 of IEC 60598-1.

20 Stability and mechanical hazards

This clause of Part 1 is applicable.

21 Mechanical strength

This clause of Part 1 is applicable except as follows.

21.1 *Addition:*

For emitters, including adjacent glass parts and any lens that protrude from the enclosure, the impact energy is reduced to 0,35 J.

NOTE 101 The test is carried out on emitters and on glass parts that do not hit the floor if the appliance is dropped.

*For **UV filters**, the impact energy is increased to 1,0 J and compliance with 32.101 shall not be impaired.*

21.101 Guards intended to prevent inadvertent ignition of flammable material shall have adequate mechanical strength.

Compliance is checked by the following test.

The appliance is placed so that the central part of the guard is horizontal. A flat disc having a diameter of 10 cm and a mass of 2,5 kg is placed on the centre of the guard for 1 min.

After the test, the guard shall show no significant permanent deformation.

21.102 Parts of the appliance that are intended to support a person shall have adequate mechanical strength.

Compliance is checked by the following test.

A mass of 135 kg, evenly distributed over an area of 30 cm × 50 cm, is placed on the surface intended to support a person for 1 min.

After removal of the load, the appliance shall not be damaged to such an extent that compliance with this standard, in particular with Clause 29, is impaired.

NOTE In case of doubt, **supplementary insulation** and **reinforced insulation** are subjected to the electric strength test of 16.3.

22 Construction

This clause of Part 1 is applicable except as follows.

22.24 *Replacement:*

Bare heating elements shall be supported to prevent excessive displacement occurring during normal use. The rupture of a heating element shall not give rise to a hazard.

Compliance is checked by inspection and by the following test.

*The heating element is cut in the most unfavourable place. The conductors shall not come into contact with **accessible metal parts** or fall out of the appliance.*

22.35 *Addition:*

The requirement does not apply to handles, levers and knobs which are only intended for short time use such as those touched during entering or leaving the appliance.

Modification:

The relaxation for **stationary appliances** is not applicable.

22.101 Appliances having a lid that has to be opened in normal use shall be constructed so that the lid does not close inadvertently.

Compliance is checked by the following test.

The appliance is placed in any normal position of use on a plane inclined at an angle of 15° to the horizontal.

The lid shall remain in the open position.

22.102 Appliances incorporating parts that are suspended or intended to be raised and lowered over a person shall incorporate a safety device to prevent injury if the suspension means fails or there is excessive travel of the part.

Compliance is checked by inspection and by manual test.

22.103 **UV emitters** intended for full body exposure or used over a person shall be protected against accidental damage.

Compliance is checked by inspection and by the following test.

A cylindrical rod, having a diameter of 100 mm ± 1 mm and a hemispherical end, is applied with a force of 5 N.

It shall not be possible to touch the emitter with the rod.

22.104 **Fixed appliances** intended to be used over a person shall have means for fixing that are protected against loosening.

Compliance is checked by inspection and by manual test.

22.105 Appliances having **UV emitters** intended to be used by a person lying down shall be constructed so that the emission of ultraviolet radiation is automatically stopped if the timer fails.

Compliance is checked by the following test.

*The appliance is supplied at **rated voltage** and operated under **normal operation**. A fault in the timer is simulated. The emission of ultraviolet radiation shall cease before the exposure time has exceeded 110 % of the set value.*

NOTE Appliances having **UV emitters** that are intended to be used when inclined at an angle more than 35° to the vertical are considered to be appliances for use by a person lying down.

22.106 UV appliances shall be provided with a timer that terminates the emission of ultraviolet radiation. The timer shall be incorporated in the appliance or, for appliances intended to be permanently connected to fixed wiring, be supplied for incorporation in the wiring system.

The settings marked on the timer shall be compatible with the times specified in the recommended schedule of exposure, the highest setting providing a dose not exceeding 600 J/m^2

Compliance is checked by inspection, by measurement and by calculating the dose from the total ***effective irradiance*** *determined during the test of 32.101, weighted according to the erythema action spectrum of Figure 103.*

NOTE For appliances intended for permanent connection to fixed wiring, the timer may be supplied for incorporation in the wiring system.

22.107 Metal parts in contact with the skin and which support the body in normal use shall not be earthed.

The requirement does not apply to hinges or other parts of the enclosure, such as handles, levers and knobs that could be touched when entering or leaving the appliance.

Compliance is checked by inspection and by the tests specified for ***double insulation*** *or* ***reinforced insulation****.*

22.108 Appliances intended to be fixed to a wall by screws or other permanent fixing devices shall be constructed so that the method of fixing is obvious or specified in the installation instructions.

Compliance is checked by inspection.

22.109 Guards intended to prevent inadvertent ignition of flammable material shall be securely attached to the appliance so that it is not possible to detach them completely without the aid of a **tool**.

Compliance is checked by inspection and by manual test.

22.110 UV appliances shall incorporate a control that terminates the emission of radiation. The control shall be easily accessible to the user during exposure and be readily identified by touch and sight.

Compliance is checked by inspection.

22.111 For appliances that are marked with a fluorescent UV lamp equivalency code range, the limits of the range shall be as follows:

– for the X component of the range,
  - the upper limit of the range shall be equal to the total erythema effective UV irradiance of the originally supplied fluorescent UV lamp and that is used during type testing;
  - the lower limit of the range shall be equal to 0,75 times the upper limit of the range;
– for the Y component of the range,
  - the lower limit of the range shall be equal to 0,85 times the arithmetic mean value of the range;
  - the upper limit of the range shall be equal to 1,15 times the arithmetic mean value of the range.

Compliance is checked by inspection.

NOTE An example of the equivalency code range calculation is as follows.

If the equivalency code of the lamp fitted in the appliance during type testing is

100–R–47/3,2

the equivalency code range that must be marked on the appliance is calculated as follows:

lower value of X range: $0{,}75 \times 47 = 35{,}25$

lower value of Y range: $0{,}85 \times 3{,}2 = 2{,}72$

upper value of Y range: $1{,}15 \times 3{,}2 = 3{,}68$

X is to be rounded to the nearest integer, Y is to be rounded to the nearest first decimal.

The fluorescent UV lamp equivalency code range is then:

100–R–(35-47)/(2,7-3,7)

22.112 Appliances fitted with **UV filters** shall be constructed so that the emission of non-melanoma skin cancer (NMSC) effective UV radiation is not increased if the filter is removed.

*Compliance is checked by the test of 32.101 with the **UV filters** removed.*

22.113 Appliances completely surrounding a person shall be capable of being opened from the inside without the use of any electrical means.

Compliance is checked by the following test.

The appliance is disconnected from any electrical source of supply with doors and lids closed.

A force is then applied to a point, equivalent to an accessible inside point, of each appropriate door or lid of the appliance, at the midpoint of the edge farthest from the hinge axis in the direction perpendicular to the plane of the lid or door.

The force shall be applied at a rate not exceeding 15 N/s and the lid or door shall open before the force exceeds 150 N.

23 Internal wiring

This clause of Part 1 is applicable except as follows.

23.3 *Addition:*

The number of flexings for conductors that are only flexed when the appliance is stored is 5 000. The number of flexings for conductors flexed in normal use is increased to 50 000.

24 Components

This clause of Part 1 is applicable except as follows.

24.1 *Addition:*

*If the current flowing through the terminals of lampholders or ballasts exceeds the rated value, the terminal shall comply with Subclause 15.6 of IEC 60598-1. The current for the test is 1,1 times the current measured when the appliance is operated at **rated voltage**.*

24.2 *Modification:*

Switches controlling a motor for raising or lowering part of the appliance, and switches of **portable appliances** having a **rated current** not exceeding 2 A, may be fitted in flexible cords.

25 Supply connection and external flexible cords

This clause of Part 1 is applicable except as follows.

25.5 *Addition:*

Type Z attachment is allowed for appliances having a mass not exceeding 3 kg.

25.7 *Addition:*

Supply cords having a rubber sheath or a sheath of other material likely to be affected by ultraviolet radiation shall not be used.

NOTE 101 The emitter and the reflector are not considered to be parts that the **supply cord** is likely to touch in normal use.

26 Terminals for external conductors

This clause of Part 1 is applicable.

27 Provision for earthing

This clause of Part 1 is applicable.

28 Screws and connections

This clause of Part 1 is applicable.

29 Clearances, creepage distances and solid insulation

This clause of Part 1 is applicable except as follows.

29.3 *Addition:*

The requirement does not apply if the insulation is provided by the envelope of an **UV emitter** or by the glass envelope of an **IR emitter**.

30 Resistance to heat and fire

This clause of Part 1 is applicable except as follows.

30.2.3 Not applicable.

31 Resistance to rusting

This clause of Part 1 is applicable.

32 Radiation, toxicity and similar hazards

This clause of Part 1 is applicable except as follows.

32.101 Appliances shall not present a toxic or similar hazard. The radiation from appliances incorporating **UV emitters** shall be limited.

Compliance is checked by the following test.

*The appliance is provided with **UV emitters** that have been aged by supplying them at **rated voltage** for a period of approximately*

– *5 h for fluorescent lamps;*

– *1 h for high-intensity discharge lamps.*

NOTE 1 A high-intensity discharge lamp is an electric discharge lamp in which the radiation-producing arc is stabilized by the wall temperature and the arc has a bulb wall loading in excess of 3 W/cm^2.

NOTE 2 For appliances containing both fluorescent lamps and high-intensity discharge lamps, the high-intensity discharge lamps can be aged for the same period as the fluorescent lamps.

*The appliance is supplied at **rated voltage** and operated for approximately half the maximum exposure time allowed by the timer. The irradiance is then measured with the measuring instrument being placed so that the highest irradiance is recorded at positions which model the human body as follows.*

- *For appliances which expose persons from below, the measuring instrument is placed on the surface the person lies on.*
- *For appliances that are arranged over a person, the measuring instrument is placed on the surface of a half-cylinder with a radius of 300 mm in case of full body exposure (position 2 in Figure 101) or of 150 mm in case of facial exposure (position 1 in Figure 101). The half-cylinder is placed directly on the surface the person lays on and is aligned along the centre line of this surface. The half-cylinder for the facial measurement is placed on a 50 mm base that is itself placed directly on the surface the person lays on and is aligned along the centre line of this surface.*
- *For appliances having upper and lower radiating surfaces, each part is measured separately while the other part is covered. If the distance between two radiating surfaces is less than 300 mm or 200 mm for a facial measurement, the measurement is made at the surface of the upper panel.*
- *For appliances exposing an upright standing person from all sides, the measuring instrument is placed on the surface of a cylinder with a radius of 300 mm. The cylinder is positioned in the centre of the appliance. During the measurement, the opposite side of the cylinder should be covered.*
- *For appliances without a defined exposure position such as that placed on a table, the measuring instrument is placed parallel to the emitting surface at the shortest recommended exposure distance. If no distance is indicated, the measuring instrument is placed directly on the emitting surface.*
- *For appliances exposing a sitting person, the measuring instrument is placed on the surface of a half-cylinder with a radius of 300 mm in case of full body exposure (position 2, 3 and 4 of Figure 102) or of 150 mm in case of facial exposure (position 1 of Figure 102). The half-cylinder is located in the position of the body part to be exposed. The half-cylinder for the facial measurement is placed on a 50 mm base.*

The measuring instrument used shall measure the mean irradiance over a circular area having a diameter not exceeding 20 mm. The response of the instrument shall be proportional to the cosine of the angle between incident radiation and the normal to the circular area. The spectral irradiance shall be measured at intervals of 1 nm in an appropriate spectroradiometer system. The spectroradiometer shall have a bandwidth not exceeding 2,5 nm.

NOTE 3 Details of the instrument used for the measurements are given in IEC 61228.

Appliances suitable for household use shall have a total ***effective irradiance*** *not exceeding*

- *0,35 W/m^2, for wavelengths up to 320 nm,*
- *0,15 W/m^2, for wavelengths between 320 nm and 400 nm,*

weighted according to the non-melanoma skin cancer action spectrum of Figure 103.

Appliances for commercial use only shall have a total ***effective irradiance*** *not exceeding 1 W/m^2, weighted according to the non-melanoma skin cancer action spectrum of Figure 103.*

NOTE 4 The exposure dose referred to in 22.106 and Annex DD (except for the total yearly dose) is calculated from the total effective irradiance weighted according to the erythema action spectrum of Figure 103.

NOTE 4 The total **effective irradiance** is given by:

$$E_{\text{eff}} = \sum_{250\text{ nm}}^{400\text{ nm}} S_\lambda E_\lambda \Delta\lambda$$

where

E_{eff} is the total **effective irradiance**;

S_λ is the relative spectral effectiveness (weighting factor) according to Figure 103;

E_λ is the spectral irradiance in W/(m^{2}nm);

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

The wavelength interval for the calculation should preferably be 1 nm but should not exceed 2,5 nm. It should ideally be equal to the bandwidth of the spectroradiometer used.

Appliances shall have a total irradiance not exceeding 0,003 W/m^2, for wavelengths between 200 nm and 280 nm.

NOTE 5 The total irradiance is given by:

$$E = \sum_{200\text{ nm}}^{280\text{ nm}} E_\lambda \Delta\lambda$$

where

E is the total irradiance;

E_λ is the spectral irradiance in W/(m^{2}nm);

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

32.102 UV appliances shall be supplied with at least two pairs of protective goggles that ensure adequate front and side protection for the eyes and that provide enough luminous transmittance to make it possible to see through them.

Compliance is checked by inspection and by the following test that is carried out on each pair of goggles.

The transmission is measured at the centre of each ocular by means of a spectrophotometer having a bandwidth not exceeding 2,5 nm. A beam of light having a diameter of approximately 5 mm is used. The transmission is measured between 250 nm and 550 nm at intervals of of not more than 5 nm. The luminous transmission is measured between 380 nm and 780 nm at intervals of not more than 5 nm.

The transmission shall not exceed the values specified in Table 101 and the luminous transmission shall not be less than 1 %.

Table 101 – Maximum transmission of goggles

Wavelength λ	Maximum transmission %
$250 < \lambda \leq 320$	0,1
$320 < \lambda \leq 400$	1
$400 < \lambda \leq 550$	5

Dimensions in millimetres

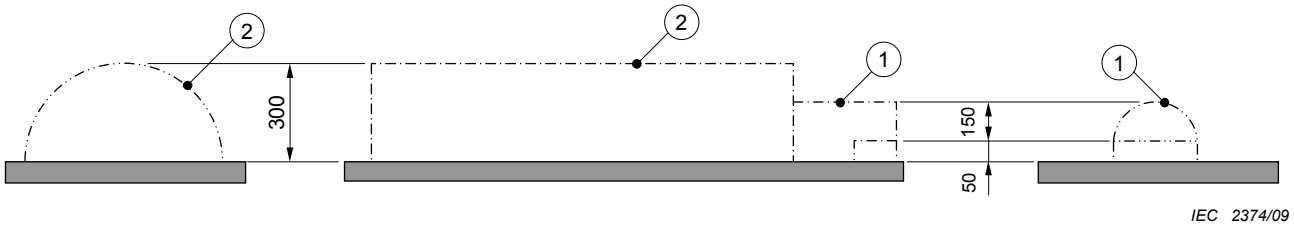
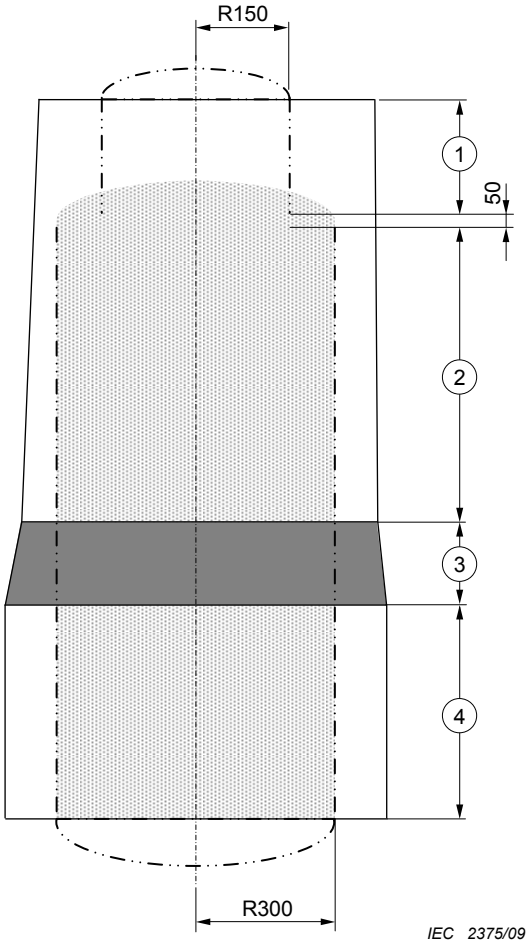


Figure 101 – Measuring points for appliances that are arranged over a person

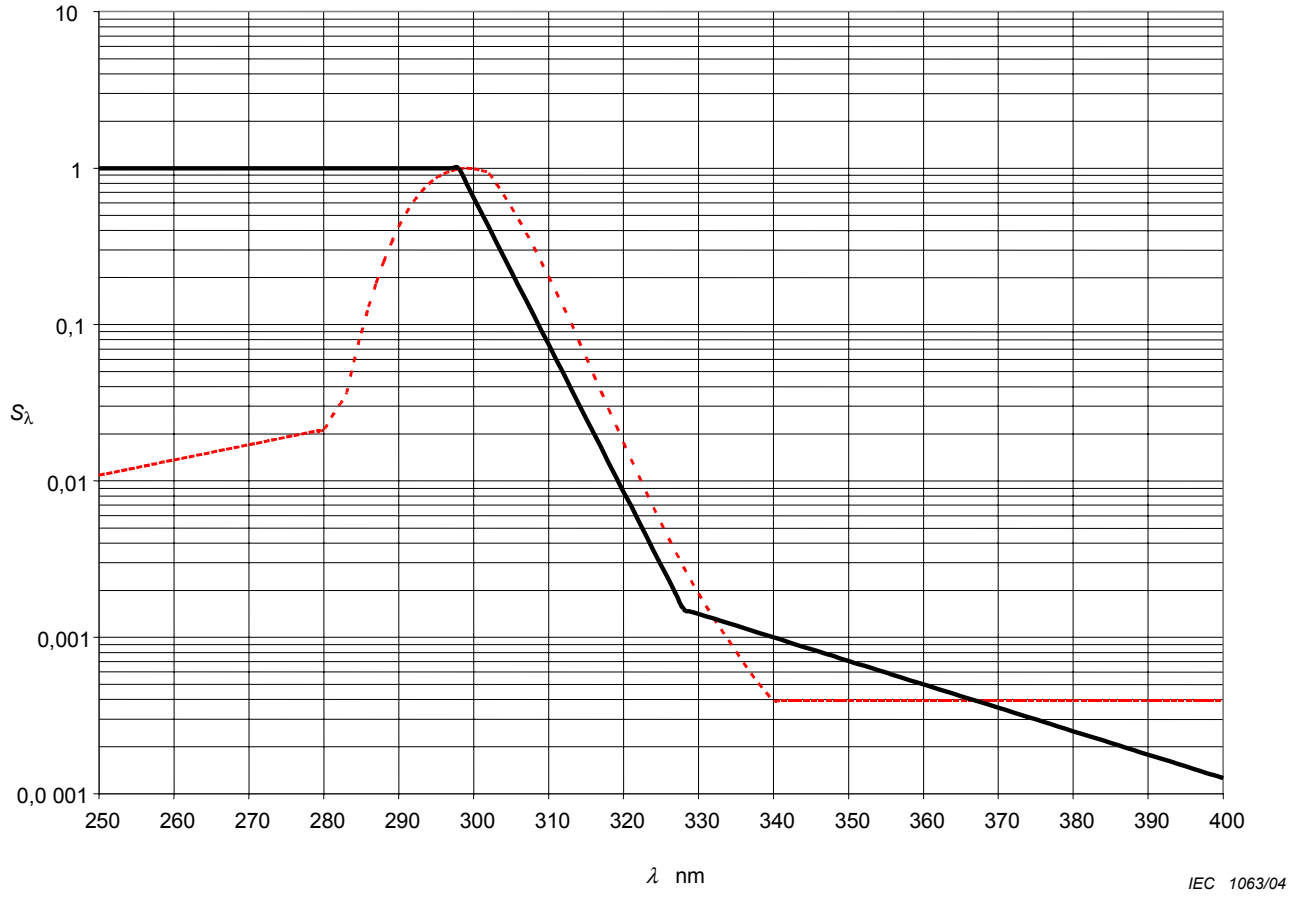
Dimensions in millimetres



Key

R radius

Figure 102 – Measuring points for appliances exposing a sitting person



Key

Non-melanoma skin cancer action spectrum

Erythema action spectrum

NOTE 1 The erythema action spectrum is defined from the following parameters:

Wavelength (λ)	Weighting factor (S_λ)
$\lambda \leq 298$	1
$298 < \lambda \leq 328$	$10^{0,094(298-\lambda)}$
$328 < \lambda \leq 400$	$10^{0,015(140-\lambda)}$

Figure 103 – UV action spectra

NOTE 2 The weighting factor for each wavelength of the non-melanoma skin cancer action spectrum and erythema action spectrum is as follows.

Wave-length (λ) nm	Weighting factor (S_λ)	
	NMSC[a]	Erythema
250	0,010 900	1,000 000
251	0,011 139	1,000 000
252	0,011 383	1,000 000
253	0,011 633	1,000 000
254	0,011 888	1,000 000
255	0,012 158	1,000 000
256	0,012 435	1,000 000
257	0,012 718	1,000 000
258	0,013 007	1,000 000
259	0,013 303	1,000 000
260	0,013 605	1,000 000
261	0,013 915	1,000 000
262	0,014 231	1,000 000
263	0,014 555	1,000 000
264	0,014 886	1,000 000
265	0,015 225	1,000 000
266	0,015 571	1,000 000
267	0,015 925	1,000 000
268	0,016 287	1,000 000
269	0,016 658	1,000 000
270	0,017 037	1,000 000
271	0,017 424	1,000 000
272	0,017 821	1,000 000
273	0,018 226	1,000 000
274	0,018 641	1,000 000
275	0,019 065	1,000 000
276	0,019 498	1,000 000
277	0,019 942	1,000 000
278	0,020 395	1,000 000
279	0,020 859	1,000 000
280	0,021 334	1,000 000
281	0,025 368	1,000 000
282	0,030 166	1,000 000
283	0,035 871	1,000 000
284	0,057 388	1,000 000
285	0,088 044	1,000 000
286	0,129 670	1,000 000
287	0,183 618	1,000 000
288	0,250 586	1,000 000
289	0,330 048	1,000 000
290	0,420 338	1,000 000
291	0,514 138	1,000 000
292	0,609 954	1,000 000
293	0,703 140	1,000 000
294	0,788 659	1,000 000
295	0,861 948	1,000 000
296	0,919 650	1,000 000
297	0,958 965	1,000 000
298	0,988 917	1,000 000
299	1,000 000	0,805 378
300	0,991 996	0,648 634
301	0,967 660	0,522 396
302	0,929 095	0,420 727
303	0,798 410	0,338 844
304	0,677 339	0,272 898
305	0,567 466	0,219 786
306	0,470 257	0,177 011
307	0,385 911	0,142 561
308	0,313 889	0,114 815
309	0,253 391	0,092 469
310	0,203 182	0,074 473
311	0,162 032	0,059 979
312	0,128 671	0,048 306
313	0,101 794	0,038 905
314	0,079 247	0,031 333
315	0,061 659	0,025 235
316	0,047 902	0,020 324
317	0,037 223	0,016 368
318	0,028 934	0,013 183
319	0,022 529	0,010 617
320	0,017 584	0,008 551
321	0,013 758	0,006 887
322	0,010 804	0,005 546
323	0,008 525	0,004 467
324	0,006 756	0,003 597
325	0,005 385	0,002 897
326	0,004 316	0,002 333
327	0,003 483	0,001 879
328	0,002 830	0,001 514
329	0,002 316	0,001 462
330	0,001 911	0,001 413
331	0,001 590	0,001 365
332	0,001 333	0,001 318
333	0,001 129	0,001 274
334	0,000 964	0,001 230
335	0,000 810	0,001 189
336	0,000 688	0,001 148
337	0,000 589	0,001 109
338	0,000 510	0,001 072
339	0,000 446	0,001 035
340	0,000 394	0,001 000
341	0,000 394	0,000 966
342	0,000 394	0,000 933
343	0,000 394	0,000 902
344	0,000 394	0,000 871
345	0,000 394	0,000 841
346	0,000 394	0,000 813
347	0,000 394	0,000 785
348	0,000 394	0,000 759
349	0,000 394	0,000 733
350	0,000 394	0,000 708
351	0,000 394	0,000 684
352	0,000 394	0,000 661
353	0,000 394	0,000 638
354	0,000 394	0,000 617
355	0,000 394	0,000 596
356	0,000 394	0,000 575
357	0,000 394	0,000 556
358	0,000 394	0,000 537
359	0,000 394	0,000 519
360	0,000 394	0,000 501
361	0,000 394	0,000 484
362	0,000 394	0,000 468
363	0,000 394	0,000 452
364	0,000 394	0,000 437
365	0,000 394	0,000 422
366	0,000 394	0,000 407
367	0,000 394	0,000 394
368	0,000 394	0,000 380
369	0,000 394	0,000 367
370	0,000 394	0,000 355
371	0,000 394	0,000 343
372	0,000 394	0,000 331
373	0,000 394	0,000 320
374	0,000 394	0,000 309
375	0,000 394	0,000 299
376	0,000 394	0,000 288
377	0,000 394	0,000 279
378	0,000 394	0,000 269
379	0,000 394	0,000 260
380	0,000 394	0,000 251
381	0,000 394	0,000 243
382	0,000 394	0,000 234
383	0,000 394	0,000 226
384	0,000 394	0,000 219
385	0,000 394	0,000 211
386	0,000 394	0,000 204
387	0,000 394	0,000 197
388	0,000 394	0,000 191
389	0,000 394	0,000 184
390	0,000 394	0,000 178
391	0,000 394	0,000 172
392	0,000 394	0,000 166
393	0,000 394	0,000 160
394	0,000 394	0,000 155
395	0,000 394	0,000 150
396	0,000 394	0,000 145
397	0,000 394	0,000 140
398	0,000 394	0,000 135
399	0,000 394	0,000 130
400	0,000 394	0,000 126

[a] NMSC – non-melanoma skin cancer

Figure 103 – UV action spectra *(continued)*

Annexes

The annexes of Part 1 are applicable except as follows.

Annex AA
(normative)

Measurement of luminance

Luminance is measured by means of collimating optics. The measurement is made at the shortest possible distance from the light source, but not less than 0,2 m. At the point of measurement, the optics shall collect all light passing through the entrance aperture within the solid angle of acceptance, the corresponding plane angle being 1°.

During the measurement, the appliance is operated at ***rated voltage****.*

Annex BB
(informative)

Detailed classification of UV appliances

This annex provides details of a classification of UV appliances based on amounts of radiation in the ranges 250 nm to 320 nm and 320 nm to 400 nm.

BB.1 Definitions

For the purposes of this annex, the following definitions apply.

BB.1.1
UV type 1 appliance
appliance having a **UV emitter** such that the biological effect is caused by radiation having wavelengths longer than 320 nm and characterized by a relatively high irradiance in the range 320 nm to 400 nm

BB.1.2
UV type 2 appliance
appliance having a **UV emitter** such that the biological effect is caused by radiation having wavelengths both shorter and longer than 320 nm and characterized by a relatively high irradiance in the range of 320 nm to 400 nm

BB.1.3
UV type 3 appliance
appliance having a **UV emitter** such that the biological effect is caused by radiation having wavelengths both shorter and longer than 320 nm and characterized by a limited irradiance over the whole UV radiation band

BB.1.4
UV type 4 appliance
appliance having a **UV emitter** such that the biological effect is mainly caused by radiation having wavelengths shorter than 320 nm

BB.1.5
UV type 5 appliance
appliance having a **UV emitter** such that the biological effect is caused by radiation having wavelengths both shorter and longer than 320 nm and characterized by a relatively high irradiance over the whole UV radiation band

BB.2 Classification

UV appliances can be classified as one of the following types:

– **UV type 1 appliance**;
– **UV type 2 appliance**;
– **UV type 3 appliance**;
– **UV type 4 appliance**;
– **UV type 5 appliance**.

NOTE **UV type 1 appliances**, **UV type 2 appliances**, **UV type 4 appliances** and **UV type 5 appliances** are intended to be used in tanning salons, beauty parlours and similar premises, under supervision of appropriately trained persons. They are not intended for household use.

UV type 3 appliances are suitable for household and similar use and may be used by unskilled persons. They are also suitable for use in tanning salons, beauty parlours and similar premises.

BB.3 Effective irradiance

The **effective irradiance** for each type of UV appliance, weighted according to the non-melanoma skin cancer action spectrum of Figure 103, is given in Table BB.1

Table BB.1 – Limits of effective irradiance

UV type appliance	Effective irradiance W/m²		Maximum total effective irradiance W/m²
	250 nm < λ ≤ 320 nm	320 nm < λ ≤ 400 nm	
1	< 0,001	≥ 0,15	1,0
2	0,001 – 0,35	≥ 0,15	1,0
3	< 0,35	< 0,15	-
4	≥ 0,35	< 0,15	1,0
5	≥ 0,35	≥ 0,15	1,0
λ is the wavelength of the radiation.			

Annex CC
(informative)

Fluorescent UV lamp equivalency code

The equivalency code for fluorescent UV lamps for tanning, as detailed in IEC 61228, that is legibly and durably marked on the lamp is as follows.

The equivalency code is of the form: Wattage–Reflector type code–UV code.

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 $\alpha > 230°$;

N for lamps with a narrow reflector angle $\alpha < 200°$;

R for lamps with a regular reflector $200° \leq \alpha \leq 230°$.

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.

NOTE An example of a lamp equivalency code is given below:

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

The equivalency code of the lamp is:

100–R–47/3,2

Annex DD
(informative)

Guidelines for the development of an exposure time schedule

This annex provides detailed information about the requirements for an exposure time schedule.

- The exposure time schedule need not depend on the skin type.
- The recommended exposure time for the first exposure for untanned skin should not exceed that required to provide a dose of 100 J/m^2, weighted according to the erythema action spectrum shown in Figure 103, or as a result of a test on a small area of the skin. For calculation of the recommended exposure time for the first exposure, use the formula in Note 4 of 32.101.
- Wait 48 h between first and second exposure, since delayed unexpected side effects can occur until 48 h after the first exposure.

  NOTE The reason for the small first dose is to check for unexpected side effects following to any UV exposure. This reason should be explained to the user.
- The recommended exposure time for the second exposure for untanned skin should not exceed that required to provide a dose of 250 J/m^2, weighted according to the erythema action spectrum shown in Figure 103.
- A single dose should not exceed 600 J/m^2, weighted according to the erythema action spectrum shown in Figure 103.
- Waiting period between subsequent exposures should be approximately 48 h due to cumulative behaviour of the erythemal reaction.
- A tanning course (a consecutive series of exposures) should not exceed a total dose of 3 kJ/m^2, weighted according to the erythema action spectrum shown in Figure 103.
- Increases in the dose should be applied gradually over the period of the tanning course.
- The recommended number of exposures per year for each part of the body is to be based upon a maximum yearly dose of 25 kJ/m^2, weighted according to the non-melanoma skin cancer action spectrum shown in Figure 103 and taking into account the recommended schedule of exposure.

Bibliography

The bibliography of Part 1 is applicable except as follows.

Addition:

IEC 61228, *Fluorescent ultraviolet lamps used for tanning – Measurement and specification method*

ISO 3864-1, *Graphical symbols – Safety colours and safety signs – Part 1: Design principles for safety signs in workplaces and public areas*

ISO 13732-1, *Ergonomics of the thermal environment – Methods for the assessment of human responses to contact with surfaces – Part 1: Hot surfaces*

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