

INTERNATIONAL STANDARD



**Household and similar electrical appliances – Safety –
Part 2-109: Particular requirements for UV radiation water treatment appliances**

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INTERNATIONAL
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-109: Particular requirements for UV radiation water treatment appliances

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 60335-2-109:2010+AMD1:2013+AMD2:2016 CSV. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 60335-2-109 has been prepared by IEC technical committee 61: Safety of household and similar electrical appliances. It is an International Standard.

This second edition cancels and replaces the first edition published in 2010, Amendment 1:2013 and Amendment 2:2016. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) alignment with IEC 60335-1:2020;
- b) modification or conversion of some notes to normative text (Clause 1, 6.2, 22.102);
- c) introduction of IEC 60417 symbol for maximum operating depth (7.1, 7.6, 7.12.1);
- d) addition of external accessible surface temperature limits (11.3, 11.8);
- e) clarification of requirements for remote operation (22.40, 22.49, 22.51);
- f) the requirements to emit harmful radiation are deleted, because they are covered in Part 1 (Clause 32).

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

Draft	Report on voting
61/7011/FDIS	61/7075/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.

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.

This part 2 is to be used in conjunction with the latest edition of IEC 60335-1 and its amendments unless that edition precludes it; in that case, the latest edition that does not preclude it is used. It was established on the basis of the sixth edition (2020) 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: Particular requirements for UV radiation water treatment appliances.

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 this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document 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 can 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.

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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.

Guidance documents concerning the application of the safety requirements for appliances can be accessed via TC 61 supporting documents on the IEC website

<https://www.iec.ch/tc61/supportingdocuments>

This information is given for the convenience of users of this International Standard and does not constitute a replacement for the normative text in this standard.

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~~ can 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~~ Horizontal publications, basic safety publications and group safety publications 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.

NOTE 3 Standards dealing with non-safety aspects of household appliances are:

- IEC standards published by TC 59 concerning methods of measuring performance;
- CISPR 11, CISPR 14-1 and relevant IEC 61000-3 series standards concerning electromagnetic emissions;
- CISPR 14-2 concerning electromagnetic immunity;
- IEC standards published by TC 111 concerning environmental matters.

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-109: Particular requirements for UV radiation water treatment appliances

1 Scope

This clause of Part 1 is replaced by the following.

This part of IEC 60335 deals with the safety of **UV radiation water treatment appliances** for household and similar ~~purposes~~ use, their **rated voltage** being not more than 250 V for single-phase appliances and 480 V for other appliances including direct current (DC) supplied appliances and **battery-operated appliances**.

Appliances not intended for normal household use but that nevertheless ~~may~~ can be a source of danger to the public, such as appliances intended to be used by laymen in shops and in light industry and farms, are within the scope of this standard.

As far as is practicable, this standard deals with the common hazards presented by appliances that are encountered by all persons in and around the home. However, in general, it does not take into account

- persons (including children) whose
 - physical, sensory or mental capabilities; or
 - lack of experience and knowledgeprevents 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~~ can 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.

NOTE 102—This standard does not apply to

- pumps (IEC 60335-2-41);
- luminaires for aquariums (IEC 60598-2-11);
- luminaires for swimming pools and similar applications (IEC 60598-2-18);
- appliances intended exclusively for professional use;
- 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 except as follows.

Addition:

IEC 60584-1, *Thermocouples – Part 1: EMF specifications and tolerances*

IEC 60598-1:2020, *Luminaires – Part 1: General requirements and tests*

~~ISO 4892-2:2006, *Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps*~~

~~Amendment 1 (2009)~~

~~ISO 4892-4:2004, *Plastics – Methods of exposure to laboratory light sources – Part 4: Open-flame carbon-arc lamps*~~

3 Terms and definitions

This clause of Part 1 is applicable except as follows.

3.1 Definitions relating to physical characteristics

3.1.9 ~~Replacement~~ Modification:

Replace the first paragraph with the following:

~~normal operation~~

operation of the appliance with water at the most onerous temperature specified in the instructions

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3.5 Definitions relating to types of appliances

~~3.402~~ 5.101

UV radiation water treatment appliance

appliance that treats water using electromagnetic energy at wavelengths in the ultraviolet band using **UV-C emitters**

3.6 Definitions relating to parts of an appliance

3.6.101

UV-C emitter

radiating source constructed to emit non-ionizing electromagnetic energy at wavelengths of 100 nm to 280 nm

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.

5.101 UV radiation water treatment appliances are tested as **motor-operated appliances**.

6 Classification

This clause of Part 1 is applicable except as follows.

6.1 Addition:

UV radiation water treatment appliances shall be **class I, class II** or **class III**.

Appliances immersed in water shall be **class III** ~~with a rated voltage not exceeding 12 V a.c. or a no load voltage not exceeding 30 V d.c.~~ or **class I**.

UV radiation water treatment appliances for use in swimming pools shall be **class III** ~~with a rated voltage not exceeding 12 V if they are immersed in the pool water, when persons are in the pool.~~

6.2 Addition:

Appliances for use in water shall be IPX8.

Appliances for use above water shall be at least IPX7 unless they are intended to be fixed, in which case they shall be at least IPX1.

Appliances intended to be used outdoors shall be at least IPX4.

NOTE 101 The wiring rules applicable to installation of appliances in locations containing items such as baths, showers and swimming pools ~~may~~ can require a higher IP rating.

These requirements do not apply to **class III appliances** having a **rated voltage** not exceeding 24 V.

7 Marking and instructions

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This clause of Part 1 is applicable except as follows.

7.1 Addition:

UV radiation water treatment appliances containing replaceable **UV-C emitters** shall be marked with the type reference of the emitter and with the substance of the following warning:

WARNING: UV radiation is dangerous for the eyes and skin. Do not operate the UV-C emitter outside the appliance.

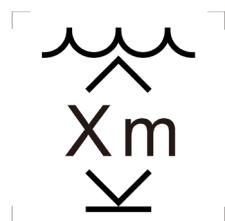
If it is intended that replacement of the **UV-C emitter** can be carried out by the user, the appliance shall be marked with "Read the instructions" or with symbol ISO 7000-0790 (2004-01).

The appliance shall be marked with the minimum and maximum water temperatures with which it ~~can~~ may be used.

The appliance shall be marked with the rated pressure if the appliance is intended to be connected to a pressurized water system other than the water mains.

Appliances for use in water shall be marked ~~with~~ to indicate the maximum operating depth, ~~if greater than 1 m~~ in metres, with a minimum of 1 m, using symbol IEC 60417-6444 (2020-12).

7.6 Addition:



[symbol IEC 60417-6444
(2020-12)]

maximum operating depth where
X specifies the value

Note 101 The indication of the maximum operating depth in metres can be located on the left or right side adjacent to the arrows.

7.12 Addition:

The instructions for **UV radiation water treatment appliances** containing **UV-C emitters** shall contain the substance of the following:

WARNING: Do not operate the UV-C emitter when it is removed from the appliance enclosure.

The instructions for **UV radiation water treatment appliances** containing **UV-C emitters** shall give details concerning

- the method, frequency of cleaning, and necessary precautions to be taken;
- precautions to be taken when replacing **UV-C emitters** and starters, if applicable.

The instructions of appliances containing **UV-C emitters** shall ~~contain the substance of~~ include the following:

- if the replacement of the **UV-C emitter** by the user is not allowed, this must be clearly stated; and
- the substance of the following:
 - This appliance contains a UV-C emitter;
 - Appliances that are obviously damaged must not be operated;
 - Unintended use of the appliance or damage to the housing may result in the escape of dangerous UV-C radiation. UV-C radiation may, even in little doses, cause harm to the eyes and skin.

The instructions of appliances containing replaceable **UV-C emitters** shall also contain the substance of the following:

- Read the maintenance instructions before opening the appliance.
- The appliance must be disconnected from the supply before replacing the UV-C emitter.

The instructions for appliances intended to be used in aquariums, garden ponds and the like, except for those of **class III construction**, shall include the substance of the following:

WARNING: Disconnect the appliance from the supply before carrying out maintenance.

If symbols ISO 7000-0790 (2004-01) and IEC 60417-6444 (2020-12) are used, the meaning shall be explained.

7.12.1 Addition:

The installation instructions shall state that the appliance is to be supplied through a residual current device (RCD) having a rated residual operating current not exceeding 30 mA.

The installation instruction of **class III appliances** shall include details regarding the fixing and location of **safety isolating transformers** to prevent them from falling into the water or from being affected by water.

7.15 Addition:

The type reference of replaceable **UV-C emitters** shall be visible during their replacement.

8 Protection against access to live parts

This clause of Part 1 is 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.

11 Heating

This clause of Part 1 is applicable except as follows.

11.3 Addition:

[IEC 60335-2-109:2023](https://standards.iteh.ai/catalog/standards/iec/89c4a6b9-daed-4adc-937e-0105b2ae15b4/iec-60335-2-109-2023)

*Where the external **accessible surfaces** are suitably flat and access permits, then the test probe of Figure 101 may be used to measure the temperature rises of external **accessible surfaces** specified in Table 101. The probe is applied with a force of $4\text{ N} \pm 1\text{ N}$ to the surface in such a way that the best possible contact between the probe and the surface is ensured. The measurement is performed after a contact period of 30 s.*

The probe may be held in place using a laboratory stand clamp or similar device. Any measuring instrument giving the same results as the probe may be used.

11.7 ~~Replacement~~ Modification:

Replace the first paragraph with the following:

Appliances are operated until steady conditions are established.

11.8 Modification:

Replace the first paragraph with the following:

During the test, the temperature rises are monitored continuously and shall not exceed the values shown in Table 3 and Table 101.

**Table 101 – Maximum temperature rises
for specified external accessible surfaces under normal operating conditions**

Surface	Temperature rise of external accessible surfaces ^a	
	K	
	Surfaces of appliances situated not more than 850 mm above the floor after installation or in normal use	Surfaces of appliances situated more than 850 mm above the floor after installation or in normal use
Bare metal	38	42
Coated metal ^b	42	49
Glass and ceramic	51	56
Plastic and plastic coating > 0,4 mm ^{c, d}	58	62

NOTE The temperature rise limits of handles, knobs, grips, keyboards, keypads and similar parts are specified in Table 3.

^a Temperature rises are not measured on:

- the underside of appliances intended to be used on a working surface or floor; where these surfaces are inaccessible to a 75 mm diameter probe having a hemispherical end;
- the rear surface of appliances which, according to the instructions, shall be placed against a wall and where these surfaces are inaccessible to a 75 mm diameter probe having a hemispherical end.

^b Metal is considered coated when a coating having a minimum thickness of 90 µm made of enamel, powder or non-substantially plastic coating is used.

^c The temperature rise limit of plastic also applies for plastic material having a metal finish of thickness less than 0,1 mm.

^d When the thickness of the plastic coating does not exceed 0,4 mm, the temperature rise limits of coated metal for underlying metal apply or the temperature rise limits for glass or ceramic material for underlying glass or ceramic material apply.

12 ~~Void~~ Charging of metal-ion batteries [2-109:2023](#)

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This clause of Part 1 is applicable.

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 except as follows.

15.1.1 Addition:

*IPX8 appliances are tested as described in IEC 60529:1989 including IEC 60529:1989, 14.2.8, and IEC 60529:1989/AMD1:1999 and IEC 60529:1989/AMD2:2013, the appliance being immersed for a period of two hours. During the first hour of immersion, the appliance is supplied at **rated voltage**; during the second hour of immersion, it is disconnected from the supply.*