

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Household and similar electrical appliances – Safety –
Part 2-35: Particular requirements for instantaneous water heaters

Appareils électrodomestiques et analogues – Sécurité –
Partie 2-35: Exigences particulières pour les chauffe-eau instantanés



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**HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES –
SAFETY –****Part 2-35: Particular requirements for instantaneous water heaters****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 part of International Standard IEC 60335 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 including its Amendment 1 (2006) and its Amendment 2 (2009). It constitutes a technical revision.

The principal changes in this edition as compared with the fourth edition of IEC 60335-2-35 are as follows (minor changes are not listed):

- converted notes to normative text (7.12, 7.102, 8.1.5, 22.104, and 22.109.3);
- deleted notes in 19.13, 22.109, and A.101;
- added Annex R and 22.108 for appliances with programmable electronic circuits;
- added requirements for water heaters (22.50, 22.51).

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

FDIS	Report on voting
61/4454/FDIS	61/4507/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 fifth edition (2010) 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 instantaneous water heaters.

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; [IEC 60335-2-35:2012](https://standards.iteh.ai/catalog/standards/sist/7ce2a8ff-67b5-40d2-8fad-708f734554a9/iec-60335-2-35-2012)
- 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 publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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.

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.

The following differences exist in the countries indicated below.

- 6.1: Bare-element water heaters are not allowed (India).
- 6.1: Class 0I appliances are allowed (Japan).
- 7.1: Marking of rated pressure is different and marking of water resistivity is not required (USA).
- 19.4: Flow switches tested for reliability are not short-circuited (USA).
- 19.13: The water temperatures are different (USA).
- 22.101: For closed water heaters, the minimum rated pressure is 1,0 MPa (Norway, Sweden).
- 22.103: Closed water heaters have to incorporate a temperature relief valve or a combined temperature and pressure relief valve that has to operate before the water temperature reaches 100 °C (United Kingdom).
- 22.103: The pressure relief valve is not required to be provided with the heater (USA).

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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.

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 2-35: Particular requirements for instantaneous water heaters

1 Scope

This clause of Part 1 is replaced by the following.

This International Standard deals with the safety of electric **instantaneous water heaters** for household and similar purposes and intended for heating water below boiling temperature, their **rated voltage** being not more than 250 V for single-phase appliances and 480 V for other appliances.

NOTE 101 **Instantaneous water heaters** incorporating bare heating elements are within the scope of this standard.

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

As far as is practicable, this standard deals with the common hazards presented by appliances which 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 knowledge
 prevents them from using the appliance safely without supervision or instruction;
- children playing with the appliance.

NOTE 102 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;
- in many countries regulations exist for the installation of equipment connected to the water mains.

NOTE 103 This standard does not apply to

- appliances for heating liquids (IEC 60335-2-15);
- storage water heaters (IEC 60335-2-21);
- appliances intended exclusively for industrial purposes;
- 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);
- commercial dispensing appliances and vending machines (IEC 60335-2-75).

2 Normative references

This clause of Part 1 is applicable.

3 Terms and definitions

This clause of Part 1 is applicable except as follows.

3.1.9 *Replacement:*

normal operation

operation of the appliance while supplied with water, the flow being adjusted to attain the highest outlet water temperature without operation of the **thermal cut-out**

3.101

instantaneous water heater

stationary appliance for heating water while it flows through the appliance

Note 1 to entry: **Instantaneous water heaters** are referred to as water heaters.

3.102

closed water heater

instantaneous water heater intended to operate at the pressure of the water system, the flow of water being controlled by one or more valves in the outlet system

Note 1 to entry: The operating pressure can be the output pressure of a reducing or boosting device.

3.103

open-outlet water heater

instantaneous water heater in which the flow of water is controlled by a valve in the inlet pipe, there being no valve in the outlet pipe

3.104

bare-element water heater

instantaneous water heater in which uninsulated heating elements are immersed in the water

3.105

rated pressure

water pressure assigned to the appliance by the manufacturer

3.106

flow switch

device that operates in response to a flow of water

3.107

pressure switch

device that operates in response to a change in pressure

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.

5.2 *Addition:*

NOTE 101 Additional samples can be required for the tests of 22.109.

5.3 *Addition:*

When the tests are carried out on a single appliance, the tests of 22.102, 22.107, 22.108 and 24.102 are carried out before the tests of Clause 19.

5.7 Addition:

Water having a temperature of $15\text{ °C} \pm 5\text{ °C}$ is used for the tests.

6 Classification

This clause of Part 1 is applicable except as follows.

6.1 Modification:

Bare-element water heaters shall be **class I** or **class III**.

Other water heaters shall be **class I**, **class II** or **class III**.

6.2 Addition:

Water heaters shall be at least IPX1.

NOTE 101 Specific zones in which the water heater is installed require a higher degree of protection as specified in IEC 60364.

7 Marking and instructions

This clause of Part 1 is applicable except as follows.

7.1 Addition:

The marked rated frequency for bare-element water heaters shall not be less than 50 Hz.

Appliances shall be marked with the **rated pressure** in pascals.

Bare-element water heaters shall be marked with the minimum water resistivity with which the appliance may be used, and the marked value shall not be greater than 1 300 Ωcm .

7.12 Addition:

The instructions for **open-outlet water heaters** to be used with a spray head shall state that the spray head must be descaled regularly.

The instructions for an appliance not incorporating a flow switch shall include the substance of the following:

WARNING: Do not switch on if there is a possibility that the water in the heater is frozen.

7.12.1 Addition:

The installation instructions for **open-outlet water heaters** shall state that the outlet must not be connected to any tap or fitting other than those specified.

If a pressure relief device is required for **closed water heaters**, the instructions shall state that it must be fitted during installation, unless it is incorporated in the appliance.

The installation instructions for **bare-element water heaters** shall state the substance of the following:

- the resistivity of the water supply must not be less than ... Ωcm ;
- the appliance must be permanently connected to fixed wiring (not necessary if it complies with the requirements for the connection by a supply cord fitted with a plug specified in 13.2 and 24.101);
- the appliance must be earthed (for **class I appliances** only).

When **bare-element water heaters** cannot be emptied, the installation instruction shall state that the appliance is not to be installed in locations where freezing can occur.

In a multiple water outlet system where the water temperature can be set at each individual water outlet, the instructions shall state the substance of the following:

The system shall be installed so that the control for setting the water temperature in normal use installed at a shower outlet shall take priority over any other controls in the system that set the water temperature in normal use at other water outlets.

7.15 Addition:

The additional markings for **bare-element water heaters** shall be visible during the installation of the appliance.

7.101 The water inlet and water outlet shall be identified. This identification shall not be on **detachable parts**. If colours are used, blue shall be used for the inlet and red for the outlet. An alternative means of identification may be by means of arrows showing the direction of the water flow.

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Compliance is checked by inspection.

7.102 Class I bare-element water heaters shall be marked to state that the appliance must be earthed.

Compliance is checked by inspection.

The use of a removable label or tag attached to the appliance is an acceptable means of meeting this requirement.

8 Protection against access to live parts

This clause of Part 1 is applicable except as follows.

8.1.5 Addition:

The connections to the water mains and electrical supply are assumed to be in position during the test.

The requirement does not apply to wall-mounted appliances intended to be permanently connected to fixed wiring by cables having a nominal cross-sectional area more than 2,5 mm².

However, the cross-sectional area of the cable entry shall not exceed 25 cm² and there shall be no **accessible live parts** within the projection of the opening.

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.

11.7 Replacement:

The appliance is operated until steady conditions are established.

12 Void

13 Leakage current and electric strength at operating temperature

This clause of Part 1 is applicable except as follows

13.2 Addition:

Bare-element water heaters are tested with water having the resistivity marked on the appliance.

NOTE 101 The appropriate resistivity can be obtained by adding ammonium phosphate to the water.

For class I bare-element water heaters, the leakage current is measured between a metal sieve positioned in the water 10 mm from the orifice of the outlet, and the earthing terminal. For single-phase appliances, the terminals of the heating element are connected through the selector switch to each pole of the supply in turn, as shown in Figure 101. For three-phase appliances, the earthing terminal is connected to the neutral conductor, as shown in Figure 102.

The leakage current shall not exceed 0,25 mA.

*For bare-element water heaters intended to be connected to the power supply by a **supply cord** fitted with a plug, the leakage current test is repeated. During this test, the leakage current is measured between the earthing terminal of the appliance and the neutral conductor, as shown in Figure 103. The leakage current, measured with the selector switch in each position, shall not exceed 2,75 mA.*

14 Transient overvoltages

This clause of Part 1 is applicable.

15 Moisture resistance

This clause of Part 1 is applicable except as follows.

15.1.2 Addition:

Wall-mounted appliances are fixed at a distance of 3 mm from the mounting surface, unless the installation instructions specify a larger value.

16 Leakage current and electric strength

This clause of Part 1 is applicable except as follows.

16.2 Addition:

Bare-element water heaters are tested with water having the resistivity marked on the appliance.

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.

19.2 Not applicable.

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19.3 Not applicable.

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19.4 Addition:

*For **open-outlet water heaters**, **flow switches** and **pressure switches** that operate during the test of Clause 11 are short-circuited, the water-control valve being adjusted to the most unfavourable position.*

NOTE 101 The closed position of the valve can be the most unfavourable position.

***Flow switches of closed water heaters** are short-circuited and any pressure relief device rendered inoperative, the outlet valve being closed. However, if the appliance has no **flow switch** and back-siphonage is likely to occur, the water heater is filled with just sufficient water to cover the heating element and operated with the outlet valve open.*

NOTE 102 Back-siphonage is not considered likely to occur if a non-return valve or a pipe interrupter is incorporated in the appliance or if the instructions state that a non-return valve has to be included in the installation.

19.13 Addition:

During the test of 19.4, the water container shall not rupture and the water temperature shall not exceed

- 99 °C, for **open-outlet water heaters** having a capacity exceeding 1 l;
- 140 °C, for **closed water heaters** having a capacity exceeding 1 l.