

# INTERNATIONAL STANDARD



**Household and similar electrical appliances – Safety –  
Part 2-21: Particular requirements for storage water heaters**

[IEC 60335-2-21:2022](https://standards.iteh.ai/catalog/standards/sist/41e967a2-f91f-480d-a67d-6d341efa9822/iec-60335-2-21-2022)

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INTERNATIONAL  
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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

### HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

#### Part 2-21: Particular requirements for storage water heaters

#### FOREWORD

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**This commented version (CMV) of the official standard IEC 60335-2-21:2022 edition 7.0 allows the user to identify the changes made to the previous IEC 60335-2-21:2012+AMD1:2018 CSV edition 6.1. Furthermore, comments from IEC TC 61 experts are provided to explain the reasons of the most relevant changes, or to clarify any part of the content.**

**A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text. Experts' comments are identified by a blue-background number. Mouse over a number to display a pop-up note with the comment.**

**This publication contains the CMV and the official standard. The full list of comments is available at the end of the CMV.**

IEC 60335-2-21 has been prepared by IEC technical committee 61: Safety of household and similar electrical appliances. It is an International Standard.

This seventh edition cancels and replaces the sixth edition published in 2012 and Amendment 1:2018. This edition constitutes a technical revision.

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

- a) the text has been aligned with IEC 60335-1:2020;
- b) some notes have been converted to normative text (Clause 1, 5.2, 15.3, 19.1, 19.2, 19.3, 19.4, 22.47, 22.104, 22.110, Annex AA introduction);
- c) updated requirement restricting use of appliance inlets (25.1).

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

Draft	Report on voting
61/6675/FDIS	61/6751/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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/standardsdev/publications](http://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 storage 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;
- 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](http://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 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.

- Clause 1: Immersion heater units intended to be retrofitted in a heat exchange closed water heater are not allowed unless:
  - the immersion heater unit has been tested with the tank models and brands listed in the instructions of the immersion heater unit;
  - the tank models and brands list the models of the immersion heater units that can be retrofitted (Australia, Netherlands, New Zealand).
- 6.1: Class 0I appliances are allowed (Japan).
- 6.2: IPX0 water heaters are allowed (France).
- 7.1: Additional markings are required (Australia, New Zealand and South Africa).
- 7.12.1: Additional instructions are required (South Africa).
- 13.2: An additional leakage current test is required (China).
- 22.101: Pressure reducing valves have to be designed for an inlet pressure of 2 MPa (South Africa).
- 22.102: The temperature limit is 95 °C (South Africa).
- 22.101: The minimum rated pressure is 1,0 MPa (Denmark, Finland, Norway and Sweden).
- 22.103: Closed water heaters have to incorporate a pressure-relief device sensitive to both pressure and temperature that operates before the water temperature reaches 99 °C (South Africa).
- 22.103: Closed water heaters have to incorporate a temperature relief valve or a combined temperature and pressure-relief valve that operates before the water temperature reaches 100 °C (United Kingdom).
- 22.106: The thermal cut-out of single-phase closed water heaters need only provide single-pole disconnection (Japan).
- 22.106: For all closed water heaters, the thermal cut-out is to provide all-pole disconnection (France).
- 22.110: Additional requirements apply to plastic or resin-based containers for open outlet, cistern type and low pressure type (South Africa).
- 24.1.4 Additional requirements apply to thermal cut-outs (South Africa).
- 24.102: The maximum water temperature is 99 °C (Japan and Norway).
- 24.102: The temperature limit of 130 °C is only allowed for closed water heaters having a rated pressure of at least 0,4 MPa (South Africa).

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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.

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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~~ 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.~~ **1**

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. **2**

# HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

## Part 2-21: Particular requirements for storage water heaters

### 1 Scope

This clause of Part 1 is replaced by the following.

This part of IEC 60335 deals with the safety of electric **storage 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 including direct current (DC) supplied appliances and **battery-operated appliances**. **3**

This standard also deals with:

- appliances not intended for normal household use, but which nevertheless ~~may be~~ possibly pose a source of danger to the public, such as appliances intended to be used by laymen in shops, ~~in light industry~~ and on farms, ~~are within the scope of this standard~~;
- ~~This standard is also applicable to~~ immersion heater units intended to be retrofitted in a **heat exchange closed water heater** having provision for retrofitting. ~~Such a unit shall comply with the~~ Additional requirements are given in Annex AA.

~~NOTE—Australia, Netherlands and New Zealand do not allow immersion heater units intended to be retrofitted in a heat exchange closed water heater unless:~~

- ~~— the immersion heater unit has been tested with the tank models and brands listed in the instructions of the immersion heater unit;~~
- ~~— the tank models and brands list the models of the immersion heater units that can be retrofitted.~~

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

~~NOTE 102—~~This standard does not apply to

- appliances for boiling water (IEC 60335-2-15);
- instantaneous water heaters (IEC 60335-2-35);
- commercial dispensing appliances and vending machines (IEC 60335-2-75);

- 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).

## 2 Normative references

This clause of Part 1 is applicable except as follows:

*Addition:*

IEC 60584-1:~~2013~~, *Thermocouples – Part 1: EMF specifications and tolerances*

IEC 60730-1:2013, *Automatic electrical controls – Part 1: General requirements*

IEC 60730-1:2013/AMD1:2015

IEC 60730-1:2013/AMD2:2020

## 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~~ *Addition:* **4**  
~~normal operation~~

operation of the appliance (in accordance with the instructions and filled with cold water)

~~3.407~~**1.101**

**rated pressure** water pressure assigned to the appliance by the manufacturer

### 3.5 Definitions relating to types of appliances

**3.5.101**

**storage water heater**

**stationary appliance** for heating and storing water in a container and incorporating devices to control the water temperature

**3.5.102**

**closed water heater**

unvented **storage 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: A **closed water heater** is shown in Figure 101a).

Note 2 to entry: The operating pressure may be the output pressure of a reducing or boosting device.

**3.5.103**

**cistern-fed water heater**

**storage water heater** that is vented to atmosphere and intended to be supplied by water under gravity from a separate cistern, the flow of water being controlled by one or more valves in the outlet system

Note 1 to entry: A **cistern-fed water heater** is shown in Figure 101d).

Note 2 to entry: The water heater may be installed so that the expanded water returns to the cistern.

Note 3 to entry: In a **cistern-fed water heater**, the pressure in the container results from the column of water in the cistern.

### 3.5.104

#### **cistern-type water heater**

**storage water heater** having a container supplied by water under gravity from a cistern incorporated in the appliance

Note 1 to entry: The expanded water can return to the cistern, the flow of water being controlled by one or more valves in the outlet system.

Note 2 to entry: A **cistern-type water heater** is shown in Figure 101c).

Note 3 to entry: In a **cistern-type water heater**, the surface of the water is always at atmospheric pressure.

### 3.5.105

#### **open-outlet water heater**

**storage water heater** in which the flow of water is only controlled by a valve in the inlet pipe and in which the expanded or displaced water flows through the outlet

Note 1 to entry: An **open-outlet water heater** is shown in Figure 101b).

Note 2 to entry: In an **open-outlet water heater**, the static pressure at the outlet is always at atmospheric pressure.

### 3.5.106

#### **low-pressure water heater**

**storage water heater** that is vented to atmosphere and intended to be connected to the water mains through a pressure reducing valve, the flow of water being controlled by one or more valves in the outlet system

Note 1 to entry: A **low-pressure water heater** is shown in Figure 101e).

### ~~3.108~~ 3.5.107

#### **heat exchange water heater**

**storage water heater** in which heated water is fed into a heat exchanger, such as a coiled tube or similar device, which is itself immersed in a container with the water to be heated

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Note 1 to entry: The heated water fed into the heat exchanger is heated from a primary heat source such as a solar panel or heat pump.

Note 2 to entry: A **heat exchange water heater** is shown in Figure 101f).

## 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 appliances can be required if damage occurs during the tests of 19.2 or 19.3.*

### 5.3 Addition:

*When the tests are carried out on a single appliance, the tests of 22.47, 22.102, 22.103, and 24.102 are carried out before the tests of Clause 19.*

## 6 Classification

This clause of Part 1 is applicable except as follows.

### 6.1 Modification:

Water heaters shall be **class I**, **class II** or **class III**.

### 6.2 Addition:

Water heaters for installation outdoors shall be at least IPX4. Other water heaters shall be at least IPX1.

## 7 Marking and instructions

This clause of Part 1 is applicable except as follows.

### 7.1 Addition:

Appliances, other than **cistern-type water heaters**, shall be marked with the **rated pressure** in pascals.

Appliances shall be marked with the rated capacity in litres.

**Closed water heaters** shall be marked with a statement that a pressure-relief device is to be fitted in the installation, unless it is incorporated in the appliance.

**Closed water heaters** having a **rated pressure** less than 0,6 MPa and **low-pressure water heaters** shall be marked with a statement that a pressure reducing valve is to be fitted in the installation.

**Open-outlet water heaters** shall be marked, close to the outlet connection or on a tag attached to the appliance, with the substance of the following:

WARNING: This outlet acts as a vent and must only be connected to a fitting recommended by the manufacturer. It must not be connected to a tap.

### 7.12 Addition:

The instructions for **closed water heaters** shall state the substance of the following:

- the water ~~may~~ can drip from the discharge pipe of the pressure-relief device and that this pipe must be left open to the atmosphere;
- the pressure-relief device is to be operated regularly to remove lime deposits and to verify that it is not blocked;
- how the water heater can be drained.

#### 7.12.1 Addition:

The installation instructions shall state the substance of the following:

- the type or characteristics of the pressure-relief device and how to connect it, unless it is incorporated in the appliance;
- a discharge pipe connected to the pressure-relief device is to be installed in a continuously downward direction and in a frost-free environment;

- the type or characteristics of a pressure reducing valve and the installation details (for appliances having a **rated pressure** less than 0,6 MPa).

The instructions for **closed water heaters** incorporating a heat exchanger shall give details on the installation of control devices and the temperature settings that are necessary to prevent operation of the **thermal cut-out** caused by the heat from the exchanger.

The instructions for **cistern-fed water heaters** and **low-pressure water heaters** shall contain the substance of the following:

WARNING: Do not connect any pressure-relief device to the vent pipe of this water heater.

**7.101** The water inlet and the 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.

*Compliance is checked by inspection.*

## 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:

*Where the external **accessible surfaces** are suitably flat and access permits, then the test probe of Figure 102 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: 5

*The appliance is operated until steady conditions are established or until the **thermostat** interrupts the current for the first time after 16 h, whichever is shorter.*

### 11.8 Modification:

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 of external accessible surfaces under normal operating conditions**

Surface <sup>a</sup>	Temperature rise K
Bare metal	42
Coated metal <sup>b</sup>	49
Glass and ceramic	56
Plastic and plastic coating > 0,4 mm <sup>c,d</sup>	62
<sup>a</sup> Temperature rises are not measured on: <ul style="list-style-type: none"> <li>– tapping connections, pipes, hoses, plumbing fittings, pressure relief valves and sight gauges;</li> <li>– appliances intended for installation on the roof;</li> <li>– surfaces not accessible to the 75 mm diameter probe having a hemispherical end.</li> </ul> <sup>b</sup> Metal is considered coated when a coating having a minimum thickness of 90 µm made of enamel or non-substantially plastic coating is used. <sup>c</sup> The temperature rise limit of plastic also applies for plastic material having a metal finish of thickness less than 0,1 mm. <sup>d</sup> When the thickness of the plastic coating does not exceed 0,4 mm, the temperature rise limits of the coated metal or of glass and ceramic material apply.	

## 12 ~~Void~~ Charging of metal-ion batteries **6**

This clause of Part 1 is applicable. [IEC 60335-2-21:2022](https://standards.iteh.ai/catalog/standards/sist/41e967a2-f91f-480d-a67d-6d341efa9822/iec-60335-2-21-2022)

## 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.

### 15.2 Addition:

*The test is only applicable to cistern-type water heaters.*

### 15.3 Addition:

**NOTE 101**—If the appliance is too large for the humidity cabinet, the test can be carried out on those parts that contain electrical components.

## 16 Leakage current and electric strength

This clause of Part 1 is applicable.