IEC 60335-2-21

Edition 7.0 2022-10
COMMENTED VERSION

INTERNATIONAL STANDARD

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

IEC 60335-2-21:2022-10 CMV(en)

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

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 13.120; 91.140.65

ISBN 978-2-8322-5897-2

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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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. 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 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 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).

IMPORTANT – The "colour inside" logo on the cover page of this document 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.

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~~ 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 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~~ 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 after installation in accordance with the instructions and filled with cold water

3.~~107~~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

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 N ± 1 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 [a]	*Temperature rise* K
Bare metal	*42*
Coated metal [b]	*49*
Glass and ceramic	*56*
Plastic and plastic coating > 0,4 mm [c,d]	*62*

[a] *Temperature rises are not measured on:*
- *tapping connections, pipes, hoses, plumbing fittings, pressure relief valves and sight gauges;*
- *appliances intended for installation on the roof;*
- *surfaces not accessible to the 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 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 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.

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.

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 for appliances incorporating heating elements, the following applies.

*For **closed water heaters**, **low-pressure water heaters** and **open-outlet water heaters**, compliance is checked by the tests of 19.2, 19.3 and 19.4 if applicable. However, 19.101 applies instead for appliances not liable to be emptied in normal use and having all four of the following features:*

– *an outer enclosure of metal, except for the cover used for the supply terminals and controls that may be non-metallic, or a water container of metal and an outer enclosure of non-metallic material;*

~~NOTE 101 Non-metallic covers can be used for the supply terminals and controls.~~

– *non-combustible thermal insulation;*

~~NOTE 102 Insulation withstanding the needle flame test of Annex E is considered to be non-combustible.~~

– *a capacity exceeding 30 l;*

– *a **rated power input** not exceeding 6 kW.*

~~NOTE 103~~ *Appliances are not considered liable to be emptied in normal use if emptying through the inlet is prevented by a check valve, a pipe interrupter or an air gap. These devices ~~can~~ may be fitted in the inlet pipe in accordance with the instructions. Emptying through openings provided for servicing purposes only is not considered to be normal use.*

Thermal insulation complying with the needle flame test of normative Annex E is considered to be non-combustible.

~~NOTE 104~~ ***Cistern-fed water heaters** and **cistern-type water heaters** are not subjected to the tests specified for appliances incorporating heating elements.* **7**

19.2 *Addition:*

The appliance is operated empty, any thermal control that operates during the test of Clause 11 being short-circuited.

~~NOTE 101~~ *If the appliance is provided with more than one thermal control, these are short-circuited in turn.*

19.3 *Addition:*

~~NOTE 101~~ *If the water heater has been damaged during the previous test, a new appliance is used.*

19.4 *Replacement:*

*For **open-outlet water heaters**, the test of 19.2 is repeated but with the container filled with water to a level at least 10 mm above the highest point of the heating element. The appliance is operated at 1,15 times **rated power input** under **normal operation**.*

~~NOTE 101~~ *If the water heater has been damaged during previous tests, a new appliance is used.*

19.13 *Addition:*

There shall be no leakage from the container during the tests.

19.101 *The appliance is tested for 24 h under the conditions specified in Clause 11 but with the container empty.*

20 Stability and mechanical hazards

This clause of Part 1 is applicable.

21 Mechanical strength

This clause of Part 1 is applicable.

22 Construction

This clause of Part 1 is applicable except as follows.

22.6 *Addition:*

The enclosure shall have a drain hole positioned so that the water can drain without impairing electrical insulation, unless condensed water cannot accumulate within the enclosure in normal use. The hole shall be at least 5 mm in diameter or 20 mm^2 in area with a width of at least 3 mm. Holes that do not meet these dimensions are considered to be blocked when determining compliance. **8**

Compliance is checked by inspection and measurement.

22.20 *Addition:*

Thermal insulation shall not be used for **basic insulation** of internal wiring.

22.47 *Replacement:*

Appliances shall withstand the water pressure occurring in normal use.

Compliance is checked by subjecting the appliance to a water pressure of

– *twice the **rated pressure**, for **closed water heaters**. If the water heater is supplied through a pressure reducing valve, the container is instead subjected to twice the maximum working pressure in the container during the test of Clause 11;*

NOTE 101 The pressure reducing valve can be incorporated in the water-inlet pipe.

~~NOTE 2 The working pressure is the maximum pressure in the container measured during the test of Clause 11.~~

– *1,5 times **rated pressure**, for **cistern-fed water heaters** and **low-pressure water heaters**;*

– *0,15 MPa, for **open-outlet water heaters**;*

– *0,03 MPa, for **cistern-type water heaters**.*

Heat exchangers incorporated in an appliance are subjected to a pressure test based on the maximum working pressure in the heat exchanger during the test of Clause 11.

Pressure-relief devices are rendered inoperative. The pressure is raised at a rate of 0,13 MPa/s to the specified value and is maintained at that value for 15 min.

Water shall not leak from the appliance and there shall be no permanent deformation to such an extent that compliance with this standard is impaired.

~~NOTE 3 Heat exchangers incorporated in an appliance are subjected to a pressure test based on their working pressure.~~

~~NOTE 4~~ *Damage to a protective coating on the inside of containers is not considered to be a hazard.*

22.101 The **rated pressure** of **closed water heaters** intended for direct connection to the water main shall be at least 0,6 MPa.

The **rated pressure** of **closed water heaters** and **low-pressure water heaters**, intended to be supplied by a pressure reducing valve that is not incorporated in the appliance, shall be at least 0,1 MPa.

The **rated pressure** of **cistern-fed water heaters** shall not exceed 0,2 MPa.

NOTE The **rated pressure** of **open-outlet water heaters** is 0 Pa.

Compliance is checked by inspection.

22.102 **Closed water heaters** shall be constructed so that repeated drawing off does not cause the water to boil.

Compliance is checked by the following test.

The appliance is operated as specified in Clause 11.

*When the **thermostat** has operated for the first time, water is drawn off at a rate of approximately 2 l/min or 10 % of the capacity of the appliance per minute, whichever is less, until the **thermostat** switches on again.*

*When the **thermostat** next operates, water is drawn off again at the same rate until the **thermostat** switches on, this sequence being repeated until steady conditions are established.*

The temperature of the water, measured by means of a thermocouple at the outlet, shall not exceed 98 °C.

22.103 Pressure-relief devices of **closed water heaters** shall prevent the pressure in the container from exceeding the **rated pressure** by more than 0,1 MPa.

Compliance is checked by subjecting the container to a slowly increasing water pressure.

NOTE The pressure-relief device can be fitted during installation.

22.104 The outlet of **open-outlet water heaters** shall be constructed so that the water flow is not limited to such an extent that the container is subjected to a significant pressure.

NOTE This requirement is considered to be met if the cross-sectional area of the water outlet is not less than that of the inlet.

The vent pipe of **low pressure water heaters** shall have an internal diameter of at least 20 mm.

Compliance is checked by inspection and measurement.

22.105 **Cistern-type water heaters** shall be constructed so that the container is always at atmospheric pressure by means of a vent having an area of at least 30 mm^2 and a minimum dimension of at least 3 mm.

Compliance is checked by inspection and by measurement.

22.106 **Closed water heaters** shall incorporate a **thermal cut-out** providing **all-pole disconnection** and which operates independently from the **thermostat**. However, for appliances intended to be connected to fixed wiring, the neutral conductor need not be disconnected.

Compliance is checked by inspection.

22.107 Heating elements and thermal control sensors in contact with the outer surface of the container shall be held in position securely.

Compliance is checked by inspection.

22.108 Appliances for wall mounting shall have reliable provision for fixing to a wall, independent of the connection to the water mains.

Compliance is checked by inspection.

22.109 Appliances having a capacity of more than 15 l that cannot be emptied through a drain fitted in the water pipes shall incorporate means for draining that requires a **tool** for its operation.

Compliance is checked by inspection and by manual test.

NOTE 1 Residual water in the container below the end of the inlet pipe is disregarded.

NOTE 2 The means for draining can be combined with a pressure-relief valve.

22.110 **Open-outlet water heaters** having plastic containers shall be constructed to ensure that the appliance is only likely to be installed in the intended orientation.

NOTE Appliances marked with the mounting position adjacent to the water connections are considered to meet this requirement.

Compliance is checked by inspection.

22.111 **Closed water heaters** incorporating a heat exchanger shall be constructed so that during normal use the **thermal cut-out** does not operate due to heat from the exchanger.

Thermostatic valves, by-pass valves and similar controlling devices used for this purpose shall be supplied with the appliance.

Compliance is checked by inspection.

23 Internal wiring

This clause of Part 1 is applicable.

24 Components

This clause of Part 1 is applicable except as follows.

24.1.4 *Addition:*

Thermal cut-outs *incorporated in* ***closed water heaters*** *shall comply with the requirements for Type 2.B controls in IEC 60730-1:2013, Clauses 13, 15, 16, 17 and 20, including IEC 60730-1:2013/AMD1:2015, Clauses 13 and 20 and IEC 60730-1:2013/AMD2:2020, Clauses 13, 17 and 20, unless they are tested with the appliance.*

24.101 **Thermal cut-outs** shall be non-self-resetting. They shall have a trip-free switching mechanism or be located so that they can only be reset after removal of a **non-detachable cover**.

Compliance is checked by inspection.

24.102 The operating temperature of the **thermal cut-out** of a **closed water heater** shall ensure that the water temperature cannot exceed 99 °C or that the **thermal cut-out** operates before its temperature exceeds 110 °C.

Compliance is checked by the test of 24.102.1 for water temperatures not exceeding 99 °C or by the test of 24.102.2 for ***thermal cut-outs*** *having an operating temperature up to 110 °C.*

24.102.1 *The appliance is operated under the conditions specified in Clause 11 until the* ***thermostat*** *operates for the first time. A quantity of water equal to 25 % of the capacity of the container is then drawn off so that it is replaced by cold water.*

Immediately after the ***thermostat*** *operates for the second time, it is short-circuited. The test is continued until the* ***thermal cut-out*** *operates. The outlet valve is then opened and the temperature of the water measured at the outlet.*

The temperature shall not exceed 99 °C.

If compliance relies on the operation of an ***electronic circuit****, the test is repeated under the following conditions applied separately:*

– *the fault conditions in a) to g) of 19.11.2 applied one at a time to the* ***electronic circuit****;*

– *the electromagnetic phenomena tests of 19.11.4.1 to 19.11.4.7 applied to the appliance. The tests are carried out with surge protective devices disconnected, unless they incorporate spark gaps.* **9**

The temperature of the water at the outlet shall not exceed 99 °C during or after each of the tests.

If the ***electronic circuit*** *is programmable, the software shall contain measures to control the fault/error conditions specified in Table R.1 and is evaluated in accordance with the relevant requirements of normative Annex R.*

24.102.2 *The operating temperature of the **thermal cut-out** is measured by means of a thermocouple positioned on its sensing element or as close as possible to it.*

The water temperature for appliances having vertically oriented metallic water containers is measured by a thermocouple attached to the outer surface of the upper dome. If the water container is horizontally oriented, two thermocouples are attached to the outer surface. The position of the thermocouple is shown in Figure 103.

The water temperature for appliances having non-metallic water containers is measured at the most unfavourable position by a thermocouple positioned 50 mm below the upper inner surface of the container. This method may also be used to measure the water temperature of appliances having metallic containers.

*The appliance is operated at 1,15 times **rated power** input under **normal operation** with the outlet valve closed and **thermostats** short-circuited. The test is continued until the **thermal cut-out** operates.*

*The **thermal cut-out** shall operate before its temperature exceeds 110 °C. The water temperature shall not exceed 20 K of the maximum permitted operating temperature of the **thermal cut-out**.*

*If compliance relies on the operation of an **electronic circuit**, the test is repeated under the following conditions applied separately:*

– *the fault conditions in a) to g) of 19.11.2 applied one at a time to the **electronic circuit**;*
– *the electromagnetic phenomena tests of 19.11.4.2 and 19.11.4.5 applied to the appliance.*

The temperature of the water at the outlet shall not exceed 110 °C during or after each of the tests.

25 Supply connection and external flexible cords

This clause of Part 1 is applicable except as follows.

25.1 *Modification:*

Appliances having a capacity exceeding 5 l or a **rated current** exceeding 16 A shall not incorporate an appliance inlet. **10**

26 Terminals for external conductors

This clause of Part 1 is applicable.

27 Provision for earthing

This clause of Part 1 is applicable except as follows.

27.1 *Addition:*

For **class I water heaters**, the sheath of the heating element shall be permanently and reliably connected to the earthing terminal unless

– the container is provided with inlet and outlet pipes of metal that are permanently and reliably connected to the earthing terminal, and

– other **accessible metal parts** of the container in contact with the water are permanently and reliably connected to the earthing terminal.

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.

30 Resistance to heat and fire

This clause of Part 1 is applicable except as follows.

30.1 *Addition:*

The temperature rises occurring during the tests of 19.2, 19.3 and 19.101 are not taken into account.

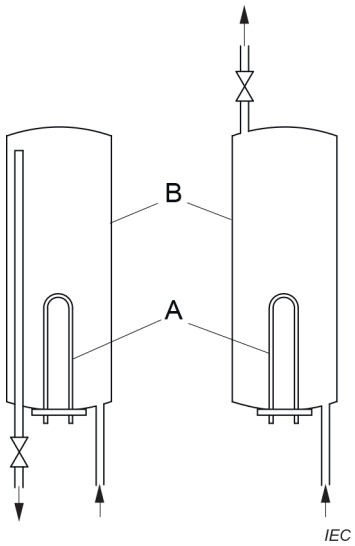
30.2.2 Not applicable.

31 Resistance to rusting

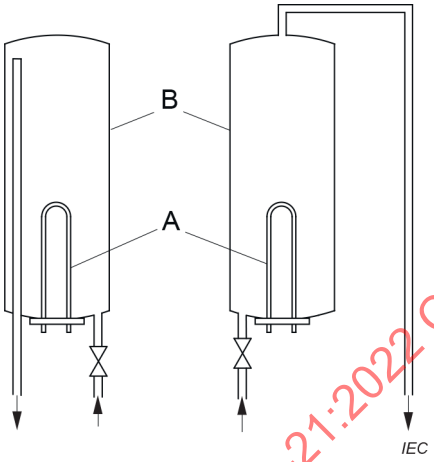
This clause of Part 1 is applicable.

32 Radiation, toxicity and similar hazards

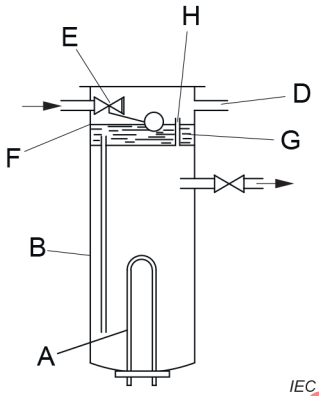
This clause of Part 1 is applicable.



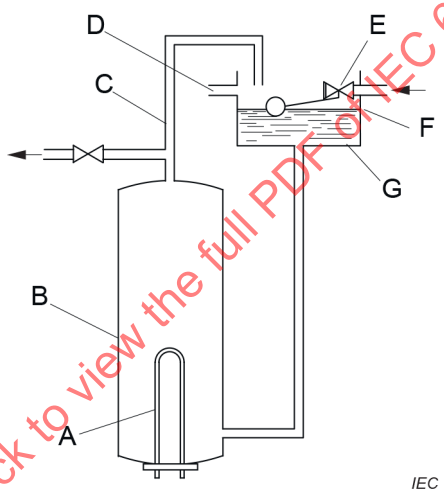
a) Closed water heaters



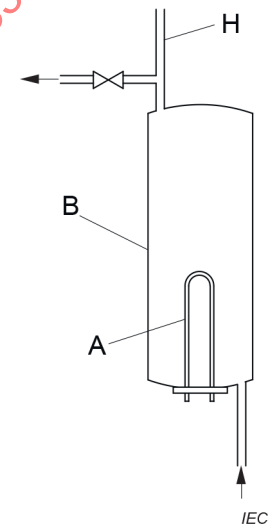
b) Open-outlet water heaters



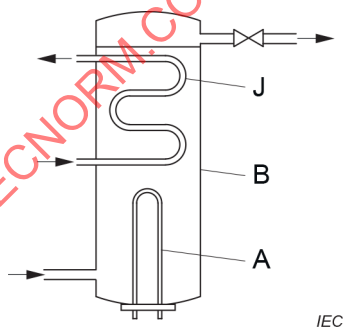
c) Cistern-type water heater



d) Cistern-fed water heater



e) Low-pressure water heater

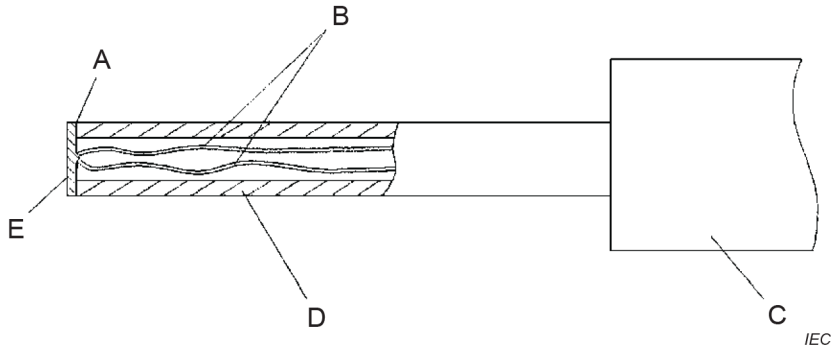


f) Heat exchange water heater

Key

A	Heating element	B	Container
C	Expansion pipe	D	Overflow pipe
E	Ball valve	F	Water level
G	Cistern	H	Vent pipe
J	Heat exchanger		

Figure 101 – Examples of types of storage water heaters



Key

A adhesive

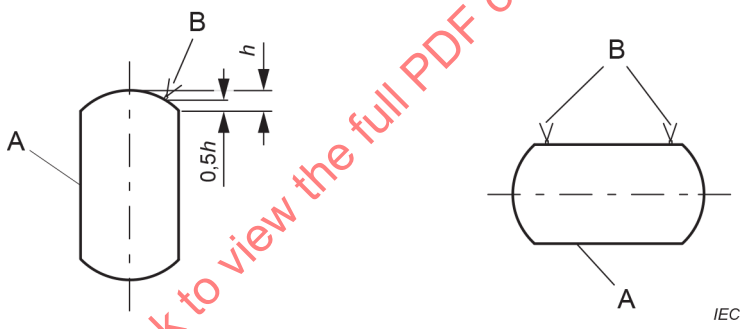
B thermocouple wires 0,3 mm diameter to IEC 60584-1 Type K ~~(chrome-alumel)~~

C handle arrangement permitting a contact force of 4 N ± 1 N

D polycarbonate tube: inside diameter 3 mm, outside diameter 5 mm

E tinned copper disc: 5 mm diameter, 0,5 mm thick with a flat contact face

Figure ~~103~~ 102 – Probe for measuring surface temperatures



Key

A container

B external thermocouple

Figure ~~102~~ 103 – Example of positions of the thermocouples

Annexes

The annexes of Part 1 are applicable except as follows.

Annex A
(informative)

Routine tests

A.101 Pressure test

The water container is subjected to a pressure test using a fluid.

When a liquid is used, the pressure is

– *for **closed water heaters**, 0,7 MPa for those having a **rated pressure** not greater than 0,6 MPa, and 1,1 times **rated pressure** for others;*
– *for **cistern-fed water heaters** and **low-pressure water heaters**, 1,1 times rated **pressure**;*
– *for **open-outlet water heaters**, 0,05 MPa;*
– *for **cistern-type water heaters**, 0,03 MPa.*

When gas is used, these pressures may be reduced but are to be sufficient to reveal leakage.

Leakage of the fluid ~~is~~ shall not ~~to~~ occur during the test.

Annex R
(normative)

Software evaluation

R.2.2.5 *Modification:*

For programmable **electronic circuits** with functions requiring software incorporating measures to control the fault/error conditions specified in Table R.1 or Table R.2, detection of a fault/error shall occur before compliance with Clause 19 ~~and~~ or 24.102.1 is impaired.

R.2.2.9 *Modification:*

The software and safety-related hardware under its control shall be initialized and shall terminate before compliance with Clause 19 ~~and~~ or 24.102.1 is impaired.

Annex AA
(normative)

Additional requirement for immersion heater units intended for the installation in heat exchange closed water heaters

The following ~~requirements of~~ modifications to this standard are for **immersion heater units** intended for the installation in a **heat exchange closed water heater**. ~~Other subclauses of this standard not mentioned in this annex are applicable. Where "water heater" is written, the requirement applies for "**immersion heater units**" of this annex.~~

~~NOTE Water storage tanks without an integrated heat exchanger can be retrofitted with an **immersion heater unit** if the retrofitting is allowed by the manufacturer of the container. In this case, the manufacturer needs to specify the acceptable **immersion heater units** in the instruction for installation of the water storage tank.~~

The clause numbers in this annex refer to the clause numbers in the main part of this standard that are modified or not applicable. Clauses that are additional to the clauses in the main part of this standard are identified by adding the annex letter followed by the numbering starting at 1.

Other subclauses of this standard not mentioned in this annex are applicable. Where "water heater" is written, the requirement applies for "**immersion heater units**" of this annex.

~~AA.~~3 Terms and definitions

3.1 Definitions relating to physical characteristics

~~AA.~~**3.1.9** ~~*Replacement*~~ *Addition:*
normal operation
operation of the **immersion heater unit** after installation in accordance with the instructions in the smallest tank specified, the tank being thermally insulated and filled with water

NOTE 101 Accessible parts of the **immersion heater unit** are not thermally insulated.

3.5 Definitions relating to types of appliances

AA.3.~~2015~~5.1
immersion heater unit
appliance consisting of heating element and controls in a single unit to control the temperature in both normal and abnormal conditions and intended to be retrofitted to a **heat exchange closed water heater**

~~AA.~~5 General conditions for the tests

~~AA.~~**5.2** *Addition:*

*Additional **immersion heater units** may be ~~required~~ used for the tests of Clause 19 and 22.102.*

~~AA.~~**5.3** *Addition:*

*The test is to be carried out in a water tank according to the instructions of the manufacturer of the **immersion heater unit**.*

NOTE 101 Several tests for different mounting positions (vertically from the top or bottom, horizontally) can be required.

~~AA.~~7 Marking and instructions

~~AA.~~7.1 *Replacement:*

Immersion heater units for multiple supply shall be marked with their **rated power input** for each supply circuit.

Immersion heater units shall be marked with the **rated pressure**. The **rated pressure** shall not be lower than 0,6 MPa.

~~AA.~~7.12.1 *Replacement:*

The installation instruction shall include the following:

– type, the volume or volume range, and dimensions of the tank in which the immersion heater unit can be installed;

– the positioning of the immersion heater unit within the tank;

– a statement that the installer must check that there is water in the tank before the immersion heater unit is switched on the first time;

– that a pressure-relief device is to be installed in the installation, unless it is not already part of the water tank installation;

– the type and properties of the pressure-relief device and how to install it;

– that a discharge pipe connected to the pressure relief device shall be installed with a steady downward inclination in a frost-free environment.

The instructions for **immersion heater units** for water tanks with an incorporated heat exchanger shall include instructions for the installation of **thermal controls** and their temperature setting in order to prevent the **thermal cut-out** from operating due to the heat of the heat exchanger.

For water storage tanks without an integrated heat exchanger that may be retrofitted with an **immersion heater unit**, the instructions shall provide information that retrofitting with an **immersion heater unit** is possible and shall specify the acceptable **immersion heater units**. **11**

~~AA.~~19 Abnormal operation

~~AA.~~19.1 *Addition:*

*For **immersion heater units**, the tests of 19.2 and 19.3 are applicable.*

~~AA.~~19.13 *Addition:*

*During the test, the **immersion heater unit** shall not show any leakage.*

~~AA.~~22 Construction

~~AA.~~22.47 *Replacement:*

The **immersion heater units** shall withstand the water pressure occurring in normal use.

Compliance is checked by the following:

*The **immersion heater units** are exposed to a water pressure which is twice as high as the **rated pressure**.*

The pressure is raised to the specified value at a rate of 0,13 MPa/s and maintained at this value for 5 min.

*No water is allowed to leak and no permanent deformation of the parts of the **immersion heater unit** intended to withstand the water pressure is allowed to an extent which would impair conformity to this standard.*

~~AA.~~**22.101** *Replacement:*

The **rated pressure** of **immersion heater units** intended to be exposed directly to the water main shall be at least 0,6 MPa.

~~AA.~~**22.111** *Replacement:*

Void.

AA.22.~~112~~1 **Immersion heater units** shall be supplied with a seal or similar means to ensure that there is no leakage from the tank after installation.

Compliance is checked by inspection during the test of Clause 11.

AA.22.~~113~~2 The **immersion heater unit** shall not be able to be removed from the tank without the aid of a tool.

Compliance is checked by inspection.

The cover of the compartment containing the supply terminals shall be prevented from rotating by more than 180° with respect to the fixed part of the **immersion heater unit**.

Compliance is checked by inspection.

~~AA.~~24 Components

~~AA.~~**24.102** *Replacement:*

The **thermal cut-out** shall operate before the water temperature exceeds 99 °C and the water temperature shall not exceed the opening temperature of the **thermal cut-out** by more than 20 K.

Compliance is checked by the following test.

*The operating temperature of the **thermal cut-out** is measured with a thermo element that is attached to the sensor element or arranged in its close vicinity.*

If the tank is in a horizontal position, the water temperature is measured at the most unfavourable position by a thermocouple positioned 50 mm below the upper inner surface of the container.

*The **immersion heater unit** is operated at 1,15 times its **rated power input** with the **thermostat** short-circuited but under the conditions of **normal operation** and with the output valve of the tank closed.*

The test is continued until the thermal cut-out operates.

Bibliography

The bibliography of Part 1 is applicable except as follows.

Addition:

IEC 60335-2-15, *Household and similar electrical appliances – Safety – Part 2-15: Particular requirements for appliances for heating liquids*

IEC 60335-2-35, *Household and similar electrical appliances – Safety – Part 2-35: Particular requirements for instantaneous water heaters*

IEC 60335-2-75, *Household and similar electrical appliances – Safety – Part 2-75: Particular requirements for commercial dispensing appliances and vending machines*

List of comments

1 This revision is for alignment with IEC 60335-1:2020.

2 This revision is for alignment with IEC 60335-1:2020.

3 This revision is for alignment with IEC 60335-1:2020.

4 This revision maintains the normal operation while charging as specified in IEC 60335-1:2020.

5 This revision maintains the test duration while charging as specified in IEC 60335-1:2020.

6 This revision is for alignment with IEC 60335-1:2020.

7 Clarification of the tests in Clause 19 that are not applied to cistern-fed water heaters and cistern-type water heaters.

8 Clarification that a drain hole needs to meet the minimum dimensions or it is considered to be blocked when determining compliance.

9 This is added based on Subclause 19.11.4 of IEC 60335-1:2020.

10 Low capacity storage water heaters are operated similar to instantaneous water heaters. They are located similar to under-sink mounted instantaneous water heaters and waste disposers which are allowed to have an appliance inlet in accordance with IEC 60335-2-35 and IEC 60335-2-16, respectively.

11 This requirement is relocated from the introduction of Annex AA.

IEC 60335-2-21

Edition 7.0 2022-10

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

Appareils électrodomestiques et analogues – Sécurité –
Partie 2-21: Exigences particulières pour les chauffe-eau à accumulation

IEC 60335-2-21:2022-10(en-fr)

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-21: Particular requirements for storage 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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9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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. 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 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 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).

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 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 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.

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 2-21: 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**.

This standard also deals with:

– appliances not intended for normal household use, but which nevertheless possibly pose a source of danger to the public, such as appliances intended to be used by laymen in shops and on farms;

– **immersion heater units** intended to be retrofitted in a **heat exchange closed water heater** having provision for retrofitting. Additional requirements are given in Annex AA.

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 knowledge

  prevents them from using the appliance safely without supervision or instruction;

– children playing with the appliance.

Attention is drawn to the fact that

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

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, *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 *Addition:*
operation of the appliance after installation in accordance with the instructions and filled with cold water

3.1.101
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).

3.5.107
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

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:*

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 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 N ± 1 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 *Modification:*

*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 [a]	*Temperature rise* K
Bare metal	*42*
Coated metal [b]	*49*
Glass and ceramic	*56*
Plastic and plastic coating > 0,4 mm [c,d]	*62*

[a] *Temperature rises are not measured on:*
- *tapping connections, pipes, hoses, plumbing fittings, pressure relief valves and sight gauges;*
- *appliances intended for installation on the roof;*
- *surfaces not accessible to the 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 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 the coated metal or of glass and ceramic material apply.*

12 Charging of metal-ion batteries

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.

15.2 *Addition:*

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

15.3 *Addition:*

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.

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 for appliances incorporating heating elements, the following applies.

*For **closed water heaters**, **low-pressure water heaters** and **open-outlet water heaters**, compliance is checked by the tests of 19.2, 19.3 and 19.4 if applicable. However, 19.101 applies instead for appliances not liable to be emptied in normal use and having all four of the following features:*

- *an outer enclosure of metal, except for the cover used for the supply terminals and controls that may be non-metallic, or a water container of metal and an outer enclosure of non-metallic material;*
- *non-combustible thermal insulation;*
- *a capacity exceeding 30 l;*
- *a **rated power input** not exceeding 6 kW.*

Appliances are not considered liable to be emptied in normal use if emptying through the inlet is prevented by a check valve, a pipe interrupter or an air gap. These devices may be fitted in the inlet pipe in accordance with the instructions. Emptying through openings provided for servicing purposes only is not considered to be normal use.

Thermal insulation complying with the needle flame test of normative Annex E is considered to be non-combustible.

***Cistern-fed water heaters** and **cistern-type water heaters** are not subjected to the tests specified for appliances incorporating heating elements.*

19.2 *Addition:*

The appliance is operated empty, any thermal control that operates during the test of Clause 11 being short-circuited.

If the appliance is provided with more than one thermal control, these are short-circuited in turn.

19.3 *Addition:*

If the water heater has been damaged during the previous test, a new appliance is used.

19.4 *Replacement:*

*For **open-outlet water heaters**, the test of 19.2 is repeated but with the container filled with water to a level at least 10 mm above the highest point of the heating element. The appliance is operated at 1,15 times **rated power input** under **normal operation**.*

If the water heater has been damaged during previous tests, a new appliance is used.

19.13 *Addition:*

There shall be no leakage from the container during the tests.

19.101 *The appliance is tested for 24 h under the conditions specified in Clause 11 but with the container empty.*

20 Stability and mechanical hazards

This clause of Part 1 is applicable.

21 Mechanical strength

This clause of Part 1 is applicable.

22 Construction

This clause of Part 1 is applicable except as follows.

22.6 *Addition:*

The enclosure shall have a drain hole positioned so that the water can drain without impairing electrical insulation, unless condensed water cannot accumulate within the enclosure in normal use. The hole shall be at least 5 mm in diameter or 20 mm^2 in area with a width of at least 3 mm. Holes that do not meet these dimensions are considered to be blocked when determining compliance.

Compliance is checked by inspection and measurement.

22.20 *Addition:*

Thermal insulation shall not be used for **basic insulation** of internal wiring.

22.47 *Replacement:*

Appliances shall withstand the water pressure occurring in normal use.

Compliance is checked by subjecting the appliance to a water pressure of

– *twice the **rated pressure**, for **closed water heaters**. If the water heater is supplied through a pressure reducing valve, the container is instead subjected to twice the maximum working pressure in the container during the test of Clause 11;*

NOTE 101 The pressure reducing valve can be incorporated in the water-inlet pipe.

– *1,5 times **rated pressure**, for **cistern-fed water heaters** and **low-pressure water heaters**;*

– *0,15 MPa, for **open-outlet water heaters**;*

– *0,03 MPa, for **cistern-type water heaters**.*

Heat exchangers incorporated in an appliance are subjected to a pressure test based on the maximum working pressure in the heat exchanger during the test of Clause 11.

Pressure-relief devices are rendered inoperative. The pressure is raised at a rate of 0,13 MPa/s to the specified value and is maintained at that value for 15 min.

Water shall not leak from the appliance and there shall be no permanent deformation to such an extent that compliance with this standard is impaired.

Damage to a protective coating on the inside of containers is not considered to be a hazard.

22.101 The **rated pressure** of **closed water heaters** intended for direct connection to the water main shall be at least 0,6 MPa.

The **rated pressure** of **closed water heaters** and **low-pressure water heaters**, intended to be supplied by a pressure reducing valve that is not incorporated in the appliance, shall be at least 0,1 MPa.

The **rated pressure** of **cistern-fed water heaters** shall not exceed 0,2 MPa.

NOTE The **rated pressure** of **open-outlet water heaters** is 0 Pa.

Compliance is checked by inspection.

22.102 **Closed water heaters** shall be constructed so that repeated drawing off does not cause the water to boil.

Compliance is checked by the following test.

The appliance is operated as specified in Clause 11.

*When the **thermostat** has operated for the first time, water is drawn off at a rate of approximately 2 l/min or 10 % of the capacity of the appliance per minute, whichever is less, until the **thermostat** switches on again.*

*When the **thermostat** next operates, water is drawn off again at the same rate until the **thermostat** switches on, this sequence being repeated until steady conditions are established.*

The temperature of the water, measured by means of a thermocouple at the outlet, shall not exceed 98 °C.

22.103 Pressure-relief devices of **closed water heaters** shall prevent the pressure in the container from exceeding the **rated pressure** by more than 0,1 MPa.

Compliance is checked by subjecting the container to a slowly increasing water pressure.

NOTE The pressure-relief device can be fitted during installation.

22.104 The outlet of **open-outlet water heaters** shall be constructed so that the water flow is not limited to such an extent that the container is subjected to a significant pressure. This requirement is considered to be met if the cross-sectional area of the water outlet is not less than that of the inlet.

The vent pipe of **low pressure water heaters** shall have an internal diameter of at least 20 mm.

Compliance is checked by inspection and measurement.

22.105 Cistern-type water heaters shall be constructed so that the container is always at atmospheric pressure by means of a vent having an area of at least 30 mm^2 and a minimum dimension of at least 3 mm.

Compliance is checked by inspection and by measurement.

22.106 Closed water heaters shall incorporate a **thermal cut-out** providing **all-pole disconnection** and which operates independently from the **thermostat**. However, for appliances intended to be connected to fixed wiring, the neutral conductor need not be disconnected.

Compliance is checked by inspection.

22.107 Heating elements and thermal control sensors in contact with the outer surface of the container shall be held in position securely.

Compliance is checked by inspection.

22.108 Appliances for wall mounting shall have reliable provision for fixing to a wall, independent of the connection to the water mains.

Compliance is checked by inspection.

22.109 Appliances having a capacity of more than 15 l that cannot be emptied through a drain fitted in the water pipes shall incorporate means for draining that requires a **tool** for its operation.

Compliance is checked by inspection and by manual test.

NOTE 1 Residual water in the container below the end of the inlet pipe is disregarded.

NOTE 2 The means for draining can be combined with a pressure-relief valve.

22.110 Open-outlet water heaters having plastic containers shall be constructed to ensure that the appliance is only likely to be installed in the intended orientation.

Appliances marked with the mounting position adjacent to the water connections are considered to meet this requirement.

Compliance is checked by inspection.

22.111 Closed water heaters incorporating a heat exchanger shall be constructed so that during normal use the **thermal cut-out** does not operate due to heat from the exchanger.

Thermostatic valves, by-pass valves and similar controlling devices used for this purpose shall be supplied with the appliance.

Compliance is checked by inspection.

23 Internal wiring

This clause of Part 1 is applicable.

24 Components

This clause of Part 1 is applicable except as follows.

24.1.4 *Addition:*

Thermal cut-outs *incorporated in* ***closed water heaters*** *shall comply with the requirements for Type 2.B controls in IEC 60730-1:2013, Clauses 13, 15, 16, 17 and 20, including IEC 60730-1:2013/AMD1:2015, Clauses 13 and 20 and IEC 60730-1:2013/AMD2:2020, Clauses 13, 17 and 20, unless they are tested with the appliance.*

24.101 **Thermal cut-outs** shall be non-self-resetting. They shall have a trip-free switching mechanism or be located so that they can only be reset after removal of a **non-detachable cover**.

Compliance is checked by inspection.

24.102 The operating temperature of the **thermal cut-out** of a **closed water heater** shall ensure that the water temperature cannot exceed 99 °C or that the **thermal cut-out** operates before its temperature exceeds 110 °C.

Compliance is checked by the test of 24.102.1 for water temperatures not exceeding 99 °C or by the test of 24.102.2 for ***thermal cut-outs*** *having an operating temperature up to 110 °C.*

24.102.1 *The appliance is operated under the conditions specified in Clause 11 until the* ***thermostat*** *operates for the first time. A quantity of water equal to 25 % of the capacity of the container is then drawn off so that it is replaced by cold water.*

Immediately after the ***thermostat*** *operates for the second time, it is short-circuited. The test is continued until the* ***thermal cut-out*** *operates. The outlet valve is then opened and the temperature of the water measured at the outlet.*

The temperature shall not exceed 99 °C.

If compliance relies on the operation of an ***electronic circuit****, the test is repeated under the following conditions applied separately:*

– *the fault conditions in a) to g) of 19.11.2 applied one at a time to the* ***electronic circuit****;*
– *the electromagnetic phenomena tests of 19.11.4.1 to 19.11.4.7 applied to the appliance. The tests are carried out with surge protective devices disconnected, unless they incorporate spark gaps.*

The temperature of the water at the outlet shall not exceed 99 °C during or after each of the tests.

If the ***electronic circuit*** *is programmable, the software shall contain measures to control the fault/error conditions specified in Table R.1 and is evaluated in accordance with the relevant requirements of normative Annex R.*

24.102.2 *The operating temperature of the* ***thermal cut-out*** *is measured by means of a thermocouple positioned on its sensing element or as close as possible to it.*

The water temperature for appliances having vertically oriented metallic water containers is measured by a thermocouple attached to the outer surface of the upper dome. If the water container is horizontally oriented, two thermocouples are attached to the outer surface. The position of the thermocouple is shown in Figure 103.

The water temperature for appliances having non-metallic water containers is measured at the most unfavourable position by a thermocouple positioned 50 mm below the upper inner surface of the container. This method may also be used to measure the water temperature of appliances having metallic containers.

The appliance is operated at 1,15 times ***rated power*** *input under* ***normal operation*** *with the outlet valve closed and* ***thermostats*** *short-circuited. The test is continued until the* ***thermal cut-out*** *operates.*

The ***thermal cut-out*** *shall operate before its temperature exceeds 110 °C. The water temperature shall not exceed 20 K of the maximum permitted operating temperature of the* ***thermal cut-out****.*

If compliance relies on the operation of an ***electronic circuit****, the test is repeated under the following conditions applied separately:*

– *the fault conditions in a) to g) of 19.11.2 applied one at a time to the* ***electronic circuit****;*

– *the electromagnetic phenomena tests of 19.11.4.2 and 19.11.4.5 applied to the appliance.*

The temperature of the water at the outlet shall not exceed 110 °C during or after each of the tests.

25 Supply connection and external flexible cords

This clause of Part 1 is applicable except as follows.

25.1 *Modification:*

Appliances having a capacity exceeding 5 l or a **rated current** exceeding 16 A shall not incorporate an appliance inlet.

26 Terminals for external conductors

This clause of Part 1 is applicable.

27 Provision for earthing

This clause of Part 1 is applicable except as follows.

27.1 *Addition:*

For **class I water heaters**, the sheath of the heating element shall be permanently and reliably connected to the earthing terminal unless

– the container is provided with inlet and outlet pipes of metal that are permanently and reliably connected to the earthing terminal, and

– other **accessible metal parts** of the container in contact with the water are permanently and reliably connected to the earthing terminal.

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.

30 Resistance to heat and fire

This clause of Part 1 is applicable except as follows.

30.1 *Addition:*

The temperature rises occurring during the tests of 19.2, 19.3 and 19.101 are not taken into account.

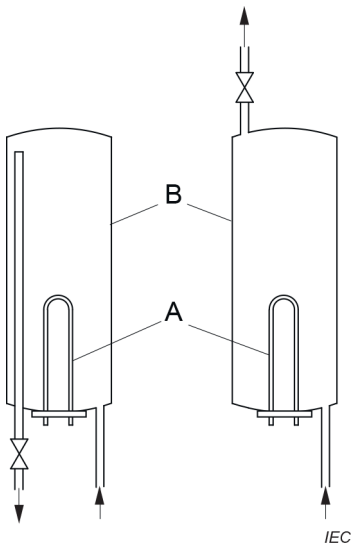
30.2.2 Not applicable.

31 Resistance to rusting

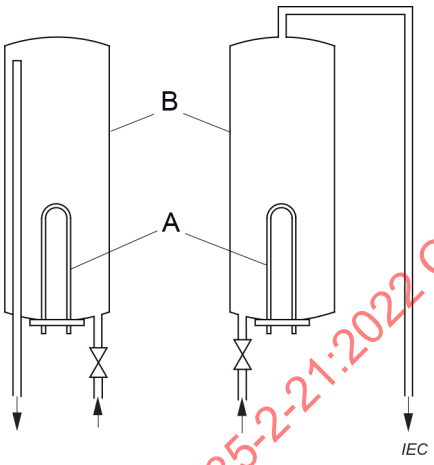
This clause of Part 1 is applicable.

32 Radiation, toxicity and similar hazards

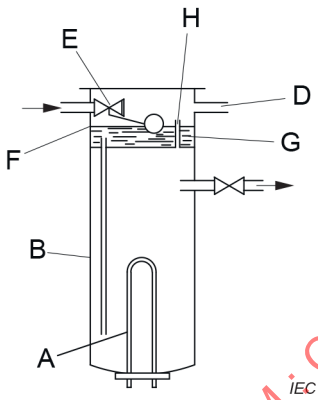
This clause of Part 1 is applicable.



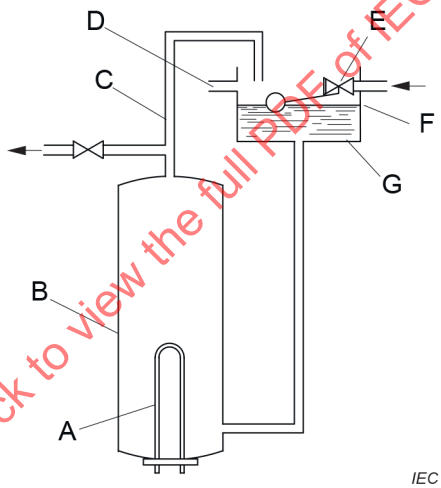
a) Closed water heaters



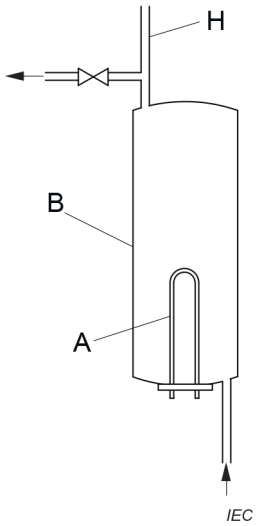
b) Open-outlet water heaters



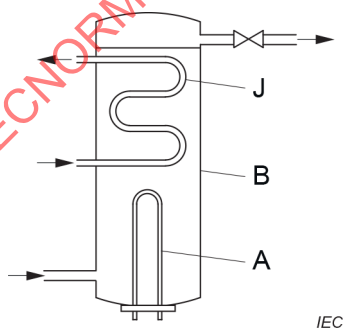
c) Cistern-type water heater



d) Cistern-fed water heater



e) Low-pressure water heater

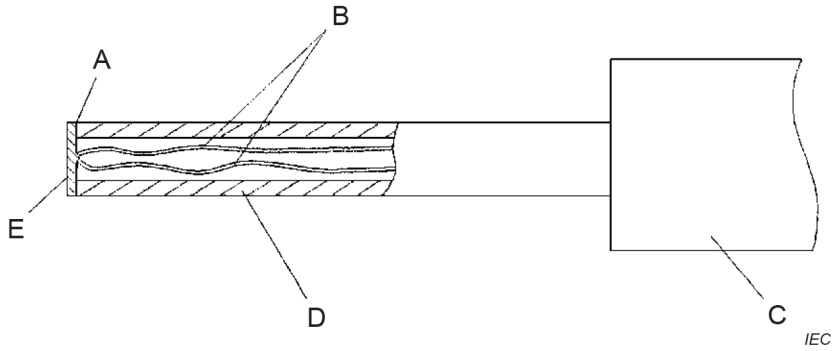


f) Heat exchange water heater

Key

A	Heating element	B	Container
C	Expansion pipe	D	Overflow pipe
E	Ball valve	F	Water level
G	Cistern	H	Vent pipe
J	Heat exchanger		

Figure 101 – Examples of types of storage water heaters



Key

A adhesive

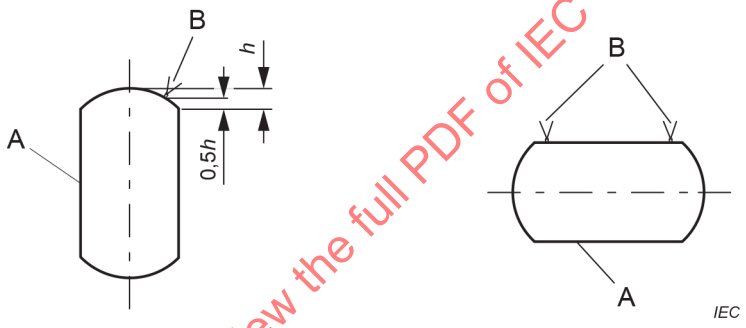
B thermocouple wires 0,3 mm diameter to IEC 60584-1 Type K

C handle arrangement permitting a contact force of 4 N ± 1 N

D polycarbonate tube: inside diameter 3 mm, outside diameter 5 mm

E tinned copper disc: 5 mm diameter, 0,5 mm thick with a flat contact face

Figure 102 – Probe for measuring surface temperatures



Key

A container

B external thermocouple

Figure 103 – Example of positions of the thermocouples

Annexes

The annexes of Part 1 are applicable except as follows.

Annex A
(informative)

Routine tests

A.101 Pressure test

The water container is subjected to a pressure test using a fluid.

When a liquid is used, the pressure is

– *for **closed water heaters**, 0,7 MPa for those having a **rated pressure** not greater than 0,6 MPa, and 1,1 times **rated pressure** for others;*
– *for **cistern-fed water heaters** and **low-pressure water heaters**, 1,1 times rated **pressure**;*
– *for **open-outlet water heaters**, 0,05 MPa;*
– *for **cistern-type water heaters**, 0,03 MPa.*

When gas is used, these pressures may be reduced but are to be sufficient to reveal leakage.

Leakage of the fluid shall not occur during the test.

Annex R
(normative)

Software evaluation

R.2.2.5 *Modification:*

For programmable **electronic circuits** with functions requiring software incorporating measures to control the fault/error conditions specified in Table R.1 or Table R.2, detection of a fault/error shall occur before compliance with Clause 19 or 24.102.1 is impaired.

R.2.2.9 *Modification:*

The software and safety-related hardware under its control shall be initialized and shall terminate before compliance with Clause 19 or 24.102.1 is impaired.

Annex AA
(normative)

Additional requirement for immersion heater units intended for the installation in heat exchange closed water heaters

The following modifications to this standard are for **immersion heater units** intended for the installation in a **heat exchange closed water heater**.

The clause numbers in this annex refer to the clause numbers in the main part of this standard that are modified or not applicable. Clauses that are additional to the clauses in the main part of this standard are identified by adding the annex letter followed by the numbering starting at 1.

Other subclauses of this standard not mentioned in this annex are applicable. Where "water heater" is written, the requirement applies for "**immersion heater units**" of this annex.

3 Terms and definitions

3.1 Definitions relating to physical characteristics

3.1.9 *Addition:*
normal operation
operation of the **immersion heater unit** after installation in accordance with the instructions in the smallest tank specified, the tank being thermally insulated and filled with water

NOTE 101 Accessible parts of the **immersion heater unit** are not thermally insulated.

3.5 Definitions relating to types of appliances

AA.3.5.1
immersion heater unit
appliance consisting of heating element and controls in a single unit to control the temperature in both normal and abnormal conditions and intended to be retrofitted to a **heat exchange closed water heater**

5 General conditions for the tests

5.2 *Addition:*

*Additional **immersion heater units** may be used for the tests of Clause 19 and 22.102.*

5.3 *Addition:*

*The test is to be carried out in a water tank according to the instructions of the manufacturer of the **immersion heater unit**.*

NOTE 101 Several tests for different mounting positions (vertically from the top or bottom, horizontally) can be required.

7 Marking and instructions

7.1 *Replacement:*

Immersion heater units for multiple supply shall be marked with their **rated power input** for each supply circuit.

Immersion heater units shall be marked with the **rated pressure**. The **rated pressure** shall not be lower than 0,6 MPa.

7.12.1 *Replacement:*

The installation instruction shall include the following:

– type, the volume or volume range, and dimensions of the tank in which the immersion heater unit can be installed;

– the positioning of the immersion heater unit within the tank;

– a statement that the installer must check that there is water in the tank before the immersion heater unit is switched on the first time;

– that a pressure-relief device is to be installed in the installation, unless it is not already part of the water tank installation;

– the type and properties of the pressure-relief device and how to install it;

– that a discharge pipe connected to the pressure relief device shall be installed with a steady downward inclination in a frost-free environment.

The instructions for **immersion heater units** for water tanks with an incorporated heat exchanger shall include instructions for the installation of **thermal controls** and their temperature setting in order to prevent the **thermal cut-out** from operating due to the heat of the heat exchanger.

For water storage tanks without an integrated heat exchanger that may be retrofitted with an **immersion heater unit**, the instructions shall provide information that retrofitting with an **immersion heater unit** is possible and shall specify the acceptable **immersion heater units**.

19 Abnormal operation

19.1 *Addition:*

*For **immersion heater units**, the tests of 19.2 and 19.3 are applicable.*

19.13 *Addition:*

*During the test, the **immersion heater unit** shall not show any leakage.*

22 Construction

22.47 *Replacement:*

The **immersion heater units** shall withstand the water pressure occurring in normal use.

Compliance is checked by the following:

*The **immersion heater units** are exposed to a water pressure which is twice as high as the **rated pressure**.*

The pressure is raised to the specified value at a rate of 0,13 MPa/s and maintained at this value for 5 min.

*No water is allowed to leak and no permanent deformation of the parts of the **immersion heater unit** intended to withstand the water pressure is allowed to an extent which would impair conformity to this standard.*

22.101 *Replacement:*

The **rated pressure** of **immersion heater units** intended to be exposed directly to the water main shall be at least 0,6 MPa.

22.111 *Replacement:*

Void.

AA.22.1 **Immersion heater units** shall be supplied with a seal or similar means to ensure that there is no leakage from the tank after installation.

Compliance is checked by inspection during the test of Clause 11.

AA.22.2 The **immersion heater unit** shall not be able to be removed from the tank without the aid of a tool.

Compliance is checked by inspection.

The cover of the compartment containing the supply terminals shall be prevented from rotating by more than 180° with respect to the fixed part of the **immersion heater unit**.

Compliance is checked by inspection.

24 Components

24.102 *Replacement:*

The **thermal cut-out** shall operate before the water temperature exceeds 99 °C and the water temperature shall not exceed the opening temperature of the **thermal cut-out** by more than 20 K.

Compliance is checked by the following test.

*The operating temperature of the **thermal cut-out** is measured with a thermo element that is attached to the sensor element or arranged in its close vicinity.*

If the tank is in a horizontal position, the water temperature is measured at the most unfavourable position by a thermocouple positioned 50 mm below the upper inner surface of the container.

*The **immersion heater unit** is operated at 1,15 times its **rated power input** with the **thermostat** short-circuited but under the conditions of **normal operation** and with the output valve of the tank closed.*

The test is continued until the thermal cut-out operates.

Bibliography

The bibliography of Part 1 is applicable except as follows.

Addition:

IEC 60335-2-15, *Household and similar electrical appliances – Safety – Part 2-15: Particular requirements for appliances for heating liquids*

IEC 60335-2-35, *Household and similar electrical appliances – Safety – Part 2-35: Particular requirements for instantaneous water heaters*

IEC 60335-2-75, *Household and similar electrical appliances – Safety – Part 2-75: Particular requirements for commercial dispensing appliances and vending machines*

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SOMMAIRE

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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APPAREILS ÉLECTRODOMESTIQUES ET ANALOGUES – SÉCURITÉ –

Partie 2-21: Exigences particulières pour les chauffe-eau à accumulation

AVANT-PROPOS

1) La Commission Electrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. A cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
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8) L'attention est attirée sur les références normatives citées dans cette publication. L'utilisation de publications référencées est obligatoire pour une application correcte de la présente publication.
9) L'attention est attirée sur le fait que certains des éléments de la présente Publication de l'IEC peuvent faire l'objet de droits de brevet. L'IEC ne saurait être tenue pour responsable de ne pas avoir identifié de tels droits de brevets.

L'IEC 60335-2-21 a été établie par le comité d'études 61 de l'IEC: Sécurité des appareils électrodomestiques et analogues. Il s'agit d'une Norme internationale.

Cette septième édition annule et remplace la sixième édition parue en 2012 et l'Amendement 1:2018. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) le texte a été aligné sur l'IEC 60335-1:2020;
b) certaines notes ont été converties en texte normatif (Article 1, 5.2, 15.3, 19.1, 19.2, 19.3, 19.4, 22.47, 22.104, 22.110, introduction de l'Annexe AA);
c) l'exigence qui limite l'emploi de socles de connecteurs a été mise à jour (25.1).

Le texte de cette Norme internationale est issu des documents suivants:

Projet	Rapport de vote
61/6675/FDIS	61/6751/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2, il a été développé selon les Directives ISO/IEC, Partie 1 et les Directives ISO/IEC, Supplément IEC, disponibles sous www.iec.ch/members_experts/refdocs. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous www.iec.ch/standardsdev/publications.

Une liste de toutes les parties de la série IEC 60335, publiées sous le titre général *Appareils électrodomestiques et analogues – Sécurité*, se trouve sur le site web de l'IEC.

La présente partie 2 doit être utilisée conjointement avec la dernière édition de l'IEC 60335-1 et ses amendements sauf si cette édition l'exclut. Dans ce cas, la dernière édition qui n'exclut pas la présente partie 2 est utilisée. Elle a été établie sur la base de la sixième édition (2020) de cette norme.

NOTE 1 L'expression "la Partie 1" utilisée dans la présente norme fait référence à l'IEC 60335-1.

La présente partie 2 complète ou modifie les articles correspondants de l'IEC 60335-1, de façon à transformer cette publication en norme IEC: Exigences particulières pour les chauffe-eau à accumulation.

Lorsqu'un paragraphe particulier de la Partie 1 n'est pas mentionné dans cette partie 2, ce paragraphe s'applique pour autant que cela soit raisonnable. Lorsque la présente norme mentionne "addition", "modification" ou "remplacement", le texte correspondant de la Partie 1 doit être adapté en conséquence.

NOTE 2 Le système de numérotation suivant est utilisé:

– les paragraphes, tableaux et figures qui s'ajoutent à ceux de la Partie 1 sont numérotés à partir de 101;
– à l'exception de celles qui sont dans un nouveau paragraphe ou de celles qui concernent des notes de la Partie 1, les notes sont numérotées à partir de 101, y compris celles des articles ou paragraphes qui sont remplacés;
– les annexes qui sont ajoutées sont désignées AA, BB, etc.

NOTE 3 Les caractères d'imprimerie suivants sont utilisés:

– exigences: caractères romains;
– *modalités d'essais: caractères italiques;*
– notes: petits caractères romains.

Les termes en **gras** dans le texte sont définis à l'Article 3. Lorsqu'une définition concerne un adjectif, l'adjectif et le nom associé figurent également en gras.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous webstore.iec.ch dans les données relatives au document recherché. A cette date, le document sera

- reconduit,
- supprimé,
- remplacé par une édition révisée, ou
- amendé.

NOTE 4 L'attention des Comités nationaux est attirée sur le fait que les fabricants d'appareils et les organismes d'essai peuvent avoir besoin d'une période transitoire après la publication d'une nouvelle publication IEC, ou d'une publication amendée ou révisée, pour fabriquer des produits conformes aux nouvelles exigences et pour adapter leurs équipements aux nouveaux essais ou aux essais révisés.

Le comité recommande que le contenu de cette publication soit adopté pour application nationale (obligatoire) au plus tôt 12 mois et au plus tard 36 mois après la date de publication.

Les différences suivantes existent dans les pays indiqués ci-après.

– Article 1: Les éléments thermoplongeurs destinés à être mis à niveau dans un chauffe-eau fermé à échange thermique ne sont pas autorisés, sauf si:
  - l'élément thermoplongeur a été soumis à l'essai avec les marques et modèles de cuves indiqués dans les instructions de l'élément thermoplongeur;
  - les modèles et marques de cuves correspondent aux modèles d'éléments thermoplongeurs qui peuvent être mis à niveau (Australie, Pays-Bas, Nouvelle-Zélande).
– 6.1: Les appareils de la classe 0I sont autorisés (Japon).
– 6.2: Les chauffe-eau IPX0 sont autorisés (France).
– 7.1: Des marquages supplémentaires sont exigés (Afrique du Sud, Australie et Nouvelle-Zélande).
– 7.12.1: Des instructions supplémentaires sont exigées (Afrique du Sud).
– 13.2: Un essai de courant de fuite supplémentaire est exigé (Chine).
– 22.101: Les réducteurs de pression doivent être construits pour une pression d'entrée de 2 MPa (Afrique du Sud).
– 22.102: La limite de température est de 95 °C (Afrique du Sud).
– 22.101: La pression assignée minimale est de 1,0 MPa (Danemark, Finlande, Norvège et Suède).
– 22.103: Les chauffe-eau fermés doivent comporter un dispositif limiteur de pression, sensible à la fois à la pression et à la température, qui se déclenche avant que la température de l'eau atteigne 99 °C (Afrique du Sud).
– 22.103: Les chauffe-eau fermés doivent comporter une vanne de limitation de température ou une vanne combinée de limitation de température et de pression, qui se déclenche avant que la température de l'eau atteigne 100 °C (Royaume-Uni).
– 22.106: Le coupe-circuit thermique des chauffe-eau fermés monophasés doit uniquement assurer une coupure omnipolaire (Japon).
– 22.106: Pour tous les chauffe-eau fermés, le coupe-circuit thermique doit assurer une coupure omnipolaire (France).
– 22.110: Les cuves en matière plastique ou à base de résine pour les chauffe-eau à écoulement libre, à réservoir incorporé et à basse pression sont soumises à des exigences supplémentaires (Afrique du Sud).
– 24.1.4: Les coupe-circuits thermiques sont soumis à des exigences supplémentaires (Afrique du Sud).
– 24.102: La température maximale de l'eau est de 99 °C (Japon et Norvège).
– 24.102: La limite de température de 130 °C est admise uniquement pour les chauffe-eau fermés dont la pression assignée est supérieure ou égale à 0,4 MPa (Afrique du Sud).

INTRODUCTION

Il a été admis par hypothèse, en établissant la présente Norme internationale, que l'exécution de ses dispositions était confiée à des personnes expérimentées et ayant une qualification appropriée.

Les documents de recommandations concernant l'application des exigences de sécurité pour les appareils peuvent être consultés dans les documents de support du CE 61, accessibles sur le site web de l'IEC à l'adresse:

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

Cette information est donnée à l'intention des utilisateurs de la présente Norme internationale et ne constitue nullement un remplacement du texte normatif de la présente norme.

La présente norme reconnaît le niveau de protection internationalement accepté contre les risques électriques, mécaniques, thermiques, liés au feu et au rayonnement des appareils, lorsqu'ils fonctionnent comme en usage normal en tenant compte des instructions du fabricant. Elle couvre également les situations anormales qui peuvent être attendues dans la pratique et elle tient compte de la façon dont les phénomènes électromagnétiques peuvent altérer le fonctionnement sûr des appareils.

La présente norme tient compte autant que possible des exigences de l'IEC 60364, de façon à rester compatible avec les règles d'installation quand l'appareil est raccordé au réseau d'alimentation. Cependant, des règles nationales d'installation peuvent être différentes.

Si un appareil relevant du domaine d'application de la présente norme comporte également des fonctions couvertes par une autre partie 2 de l'IEC 60335, la partie 2 correspondante est appliquée à chaque fonction séparément, dans la limite du raisonnable. Si cela s'applique, l'influence d'une fonction sur les autres fonctions est prise en compte.

Lorsqu'une partie 2 ne comporte pas d'exigences complémentaires pour couvrir les dangers traités dans la Partie 1, la Partie 1 s'applique.

NOTE 1 Cela signifie que les comités d'études responsables pour les parties 2 ont déterminé qu'il n'était pas nécessaire de spécifier des exigences particulières pour l'appareil en question en plus des exigences générales.

La présente norme est une norme de famille de produits traitant de la sécurité d'appareils et a préséance sur les normes horizontales et génériques couvrant le même sujet.

NOTE 2 Les publications horizontales, les publications fondamentales de sécurité et les publications groupées de sécurité couvrant un danger ne s'appliquent pas, parce qu'elles ont été prises en considération lorsque les exigences générales et particulières ont été étudiées pour la série de normes IEC 60335.

Un appareil conforme au texte de la présente norme ne sera pas nécessairement jugé conforme aux principes de sécurité de la norme si, lorsqu'il est examiné et soumis aux essais, il apparaît qu'il présente d'autres caractéristiques qui compromettent le niveau de sécurité visé par ces exigences.

Un appareil utilisant des matériaux ou présentant des modes de construction différents de ceux décrits dans les exigences de la présente norme peut être examiné et soumis aux essais en fonction de l'objectif poursuivi par ces exigences et, s'il est jugé pratiquement équivalent, il peut être estimé conforme aux principes de sécurité de la présente norme.

NOTE 3 Les normes traitant des aspects non relatifs à la sécurité des appareils électrodomestiques sont:

– les normes IEC publiées par le comité d'études 59 concernant les méthodes de mesure d'aptitude à la fonction;
– les normes CISPR 11 et CISPR 14-1, ainsi que les normes applicables de la série IEC 61000-3 concernant les émissions électromagnétiques;
– la norme CISPR 14-2 concernant l'immunité électromagnétique;
– les normes IEC publiées par le comité d'études 111 concernant l'environnement.

APPAREILS ÉLECTRODOMESTIQUES ET ANALOGUES – SÉCURITÉ –

Partie 2-21: Exigences particulières pour les chauffe-eau à accumulation

1 Domaine d'application

L'article de la Partie 1 est remplacé par le texte suivant.

La présente partie de l'IEC 60335 traite de la sécurité des **chauffe-eau à accumulation** électriques à usage domestique et analogue, destinés au chauffage de l'eau à une température inférieure à la température d'ébullition, dont la **tension assignée** est inférieure ou égale à 250 V pour les appareils monophasés et à 480 V pour les autres appareils, y compris les appareils alimentés en courant continu et les **appareils alimentés par batteries**.

La présente norme traite également des:

– appareils non destinés à un usage domestique normal, mais qui peuvent néanmoins constituer une source de danger pour le public, tels que les appareils destinés à être utilisés par des usagers non avertis dans des magasins et des fermes;

– **éléments thermoplongeurs** destinés à être mis à niveau dans un **chauffe-eau fermé à échange thermique** prévu pour la mise à niveau. Des exigences supplémentaires sont données à l'Annexe AA.

Dans la mesure du possible, la présente norme traite des dangers courants que présentent les appareils et auxquels sont exposés tous les individus situés à l'intérieur et autour de l'habitation. Cependant, elle ne tient en général pas compte

– des personnes (y compris des enfants) dont:

  - les capacités physiques, sensorielles ou mentales; ou
  - le manque d'expérience et de connaissance

  les empêchent d'utiliser l'appareil en toute sécurité sans surveillance ou instruction;

– des enfants qui jouent avec l'appareil.

L'attention est attirée sur le fait que

– pour les appareils destinés à être utilisés dans des véhicules ou à bord de navires ou d'avions, des exigences supplémentaires peuvent être nécessaires;

– dans de nombreux pays, des exigences supplémentaires sont spécifiées par les organismes nationaux de la santé, par les organismes nationaux responsables de la protection des travailleurs et par des organismes similaires;

– dans de nombreux pays, des réglementations existent pour l'installation des équipements raccordés au réseau d'alimentation en eau.

La présente norme ne s'applique pas

– aux appareils destinés à faire bouillir l'eau (IEC 60335-2-15);

– aux chauffe-eau instantanés (IEC 60335-2-35);

– aux distributeurs commerciaux avec ou sans moyen de paiement (IEC 60335-2-75);

– aux appareils prévus exclusivement pour des usages industriels;

– aux appareils destinés à être utilisés dans des locaux qui présentent des conditions particulières, telles que la présence d'une atmosphère corrosive ou explosive (poussière, vapeur ou gaz).

2 Références normatives

L'article de la Partie 1 s'applique, avec l'exception suivante.

Addition:

IEC 60584-1, *Couples thermoélectriques – Partie 1: Spécifications et tolérances en matière de FEM*

IEC 60730-1:2013, *Dispositifs de commande électrique automatiques – Partie 1: Exigences générales*
IEC 60730-1:2013/AMD1:2015
IEC 60730-1:2013/AMD2:2020

3 Termes et définitions

L'article de la Partie 1 s'applique, avec les exceptions suivantes.

3.1 Définitions relatives aux caractéristiques physiques

3.1.9 *Addition:*
fonctionnement de l'appareil après avoir été installé conformément aux instructions et rempli d'eau froide

3.1.101
pression assignée
pression d'eau assignée à l'appareil par le fabricant

3.5 Définitions relatives aux types d'appareils

3.5.101
chauffe-eau à accumulation
appareil fixe destiné à chauffer et à conserver de l'eau dans une cuve, qui incorpore des dispositifs destinés à réguler la température de l'eau

3.5.102
chauffe-eau fermé
chauffe-eau à accumulation sans mise à l'air libre prévu pour fonctionner à la pression du système d'alimentation en eau, dans lequel le débit d'eau est commandé par un ou plusieurs robinets placés dans le circuit de sortie

Note 1 à l'article: Un **chauffe-eau fermé** est représenté à la Figure 101a).

Note 2 à l'article: La pression de fonctionnement peut être la pression à la sortie d'un dispositif qui réduit ou augmente la pression.

3.5.103
chauffe-eau à réservoir séparé
chauffe-eau à accumulation qui comporte une mise à l'air libre et qui est destiné à être alimenté en eau par gravité à partir d'un réservoir séparé, l'écoulement de l'eau étant commandé par un ou plusieurs robinets placés dans le circuit de sortie

Note 1 à l'article: Un **chauffe-eau à réservoir séparé** est représenté à la Figure 101d).

Note 2 à l'article: Le chauffe-eau peut être installé de telle sorte que l'eau dilatée soit réinjectée dans le réservoir.

Note 3 à l'article: Dans un **chauffe-eau à réservoir séparé**, la pression dans la cuve résulte de la colonne d'eau dans le réservoir.

3.5.104
chauffe-eau à réservoir incorporé
chauffe-eau à accumulation dont la cuve est alimentée en eau par gravité à partir d'un réservoir qui fait partie intégrante de l'appareil

Note 1 à l'article: L'eau dilatée peut être réinjectée dans le réservoir, l'écoulement de l'eau étant commandé par un ou plusieurs robinets placés dans le circuit de sortie.

Note 2 à l'article: Un **chauffe-eau à réservoir incorporé** est représenté à la Figure 101c).

Note 3 à l'article: Dans un **chauffe-eau à réservoir incorporé**, la surface de l'eau est toujours à la pression atmosphérique.

3.5.105
chauffe-eau à écoulement libre
chauffe-eau à accumulation dans lequel le débit d'eau est commandé par un robinet dans la conduite d'entrée et où l'eau dilatée et déplacée s'écoule par la conduite de sortie

Note 1 à l'article: Un **chauffe-eau à écoulement libre** est représenté à la Figure 101b).

Note 2 à l'article: Dans les **chauffe-eau à écoulement libre**, la pression statique au niveau de la sortie est toujours la pression atmosphérique.

3.5.106
chauffe-eau à basse pression
chauffe-eau à accumulation ouvert à l'air libre et destiné à être raccordé au réseau d'alimentation en eau par un réducteur de pression, l'écoulement de l'eau étant commandé par un ou plusieurs robinets placés dans le circuit de sortie.

Note 1 à l'article: Un **chauffe-eau à basse pression** est représenté à la Figure 101e).

3.5.107
chauffe-eau à échange thermique
chauffe-eau à accumulation dans lequel l'eau chauffée alimente un échangeur thermique, comme un tube en spirale ou un dispositif analogue, qui lui-même est immergé dans une cuve qui contient l'eau à chauffer

Note 1 à l'article: L'eau chauffée injectée dans l'échangeur thermique est chauffée par une source de chaleur primaire, comme un panneau solaire ou une pompe à chaleur.

Note 2 à l'article: Un **chauffe-eau à échange thermique** est représenté à la Figure 101f).

4 Exigences générales

L'article de la Partie 1 s'applique.

5 Conditions générales d'essais

L'article de la Partie 1 s'applique, avec les exceptions suivantes.

5.2 *Addition:*

Des appareils supplémentaires peuvent être exigés si l'appareil est endommagé au cours des essais du 19.2 ou du 19.3.

5.3 *Addition:*

Lorsqu'ils sont effectués sur un seul appareil, les essais des 22.47, 22.102, 22.103 et 24.102 sont effectués avant les essais de l'Article 19.

6 Classification

L'article de la Partie 1 s'applique, avec les exceptions suivantes.

6.1 Modification:

Les chauffe-eau doivent être de la **classe I**, de la **classe II** ou de la **classe III**.

6.2 *Addition:*

Les chauffe-eau destinés à être installés en extérieur doivent être classés au moins IPX4. Les autres chauffe-eau doivent être classés au moins IPX1.

7 Marquage et instructions

L'article de la Partie 1 s'applique, avec les exceptions suivantes.

7.1 *Addition:*

Les appareils autres que les **chauffe-eau à réservoir incorporé** doivent porter un marquage de la **pression assignée** en pascals.

Les appareils doivent porter le marquage de la capacité assignée en litres.

Pour les **chauffe-eau fermés**, un marquage doit indiquer qu'un dispositif limiteur de pression doit être mis en place lors de l'installation, si ce dispositif n'est pas incorporé à l'appareil.

Pour les **chauffe-eau fermés** dont la **pression assignée** est inférieure à 0,6 MPa et les **chauffe-eau à basse pression**, un marquage doit indiquer qu'un réducteur de pression doit être mis en place dans l'installation.

Pour les **chauffe-eau à écoulement libre**, un marquage à proximité du raccordement de sortie ou une étiquette fixée à l'appareil doit comporter en substance les indications suivantes:

MISE EN GARDE: Cette sortie agit comme un évent et doit uniquement être raccordée à un accessoire recommandé par le fabricant. Elle ne doit pas être raccordée à un robinet.

7.12 *Addition:*

Les instructions pour les **chauffe-eau fermés** doivent comporter en substance les indications suivantes:

– le tuyau de décharge du dispositif limiteur de pression doit être maintenu ouvert à l'air libre, car de l'eau peut s'écouler du tuyau;
– le dispositif limiteur de pression doit être mis en fonctionnement régulièrement afin d'éliminer les dépôts de tartre et de vérifier qu'il n'est pas bloqué;
– la méthode utilisée pour vidanger le chauffe-eau.

7.12.1 *Addition:*

Les instructions d'installation doivent indiquer en substance:

– le type ou les caractéristiques du dispositif limiteur de pression, ainsi que la méthode utilisée pour le raccorder, si ce dispositif n'est pas incorporé dans l'appareil;
– un tuyau de décharge raccordé au dispositif limiteur de pression doit être installé dans un environnement maintenu hors gel et en pente continue vers le bas;

– le type ou les caractéristiques du réducteur de pression et les détails concernant l'installation (pour les appareils dont la **pression assignée** est inférieure à 0,6 MPa).

Les instructions pour les **chauffe-eau fermés** qui incorporent un échangeur thermique doivent fournir des informations pour l'installation des dispositifs de commande et les réglages de température qui sont nécessaires afin d'éviter le déclenchement du **coupe-circuit thermique** sous l'effet de la chaleur produite par l'échangeur.

Les instructions pour les **chauffe-eau à réservoir séparé** et les **chauffe-eau à basse pression** doivent comporter en substance les indications suivantes:

MISE EN GARDE: Ne raccorder aucun dispositif limiteur de pression au tuyau de mise à l'air libre de ce chauffe-eau.

7.101 L'entrée et la sortie de l'eau doivent être identifiées. Cette identification ne doit pas figurer sur des **parties amovibles**. Si des couleurs sont utilisées, le bleu doit être utilisé pour l'entrée et le rouge pour la sortie. L'identification peut être réalisée par des flèches qui montrent le sens d'écoulement de l'eau.

La conformité est vérifiée par un examen.

8 Protection contre l'accès aux parties actives

L'article de la Partie 1 s'applique.

9 Démarrage des appareils à moteur

L'article de la Partie 1 ne s'applique pas.

10 Puissance et courant

L'article de la Partie 1 s'applique.

11 Echauffements

L'article de la Partie 1 s'applique, avec les exceptions suivantes.

11.3 *Addition:*

*Lorsque les **surfaces accessibles** extérieures sont suffisamment planes et permettent l'accès, le calibre d'essai de la Figure 102 peut être utilisé pour mesurer les échauffements des **surfaces accessibles** extérieures spécifiées dans le Tableau 101. Le calibre est appliqué sur la surface avec une force de 4 N ± 1 N de manière à établir le meilleur contact possible entre le calibre et la surface. Le mesurage est effectué après une durée de contact de 30 s.*

Le calibre peut être maintenu en place à l'aide d'une pince de laboratoire sur statif ou d'un dispositif analogue. Tout instrument de mesure qui donne les mêmes résultats que le calibre peut être utilisé.

11.7 *Modification:*

*L'appareil est mis en fonctionnement jusqu'à l'établissement des conditions de régime ou jusqu'à ce que le **thermostat** coupe pour la première fois le courant après 16 h, si cette durée est plus courte.*