

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Household and similar electrical appliances – Safety –
Part 2-81: Particular requirements for foot warmers and heating mats**

**Appareils électrodomestiques et analogues – Sécurité –
Partie 2-81: Exigences particulières pour les chancelières et les carpettes
chauffantes électriques**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-81: Particular requirements for foot warmers and heating mats

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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IEC 60335-2-81 has been prepared by IEC technical committee 61: Safety of household and similar electrical appliances. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2015, Amendment 1:2017 and Amendment 2:2020. This edition constitutes a technical revision.

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

- a) alignment with IEC 60335-1:2020;
- b) conversion of some notes to normative text (Clause 1, 13.2, 16.2, 21.103, 21.104, 21.105, 21.106);
- c) addition of test probe 19 for accessibility (8.1.1, 8.1.3, 20.2, B.22.3, B.22.4);

- d) addition of external surface temperatures (Clause 11);
- e) addition of the test of 21.107 for control units intended to be placed on a surface;
- f) alignment of 30.102 with IEC 60335-2-17.

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

Draft	Report on voting
61/7272/FDIS	61/7298/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/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 foot warmers and heating mats.

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 following differences exist in the countries indicated below.

- 6.1: Class 0 appliances are allowed if their rated voltage does not exceed 150 V (Japan)

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, or
- revised.

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

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

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INTRODUCTION

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

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

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

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

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

This standard takes into account the requirements of IEC 60364 as far as possible so that there is compatibility with the wiring rules when the appliance is connected to the supply mains. However, national wiring rules 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 2-81: Particular requirements for foot warmers and heating mats

1 Scope

This clause of Part 1 is replaced by the following.

This part of IEC 60335 deals with the safety of electric **foot warmers** and **heating mats** for household and similar purposes, their **rated voltage** being not more than 250 V including direct current (DC) supplied appliances and **battery-operated appliances**.

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

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

- persons (including children) whose
 - physical, sensory or mental capabilities; or
 - lack of experience and knowledgeprevents them from using the appliance safely without supervision or instruction;
- children playing with the appliance.

Additional requirements can be necessary for appliances intended to be used in vehicles or on-board ships or aircraft. In many countries, additional requirements are specified by the national health authorities, the national authorities responsible for the protection of labour, the national water supply authorities and similar authorities.

This standard does not apply to:

- appliances specifically intended for use under medical supervision;
- electric blankets and pads (IEC 60335-2-17);
- electrically heated carpets (IEC 60335-2-106);
- electrical heating appliances for breeding and rearing animals (IEC 60335-2-71).

2 Normative references

This clause of Part 1 is applicable except as follows.

Addition:

IEC 60320-1, *Appliance couplers for household and similar general purposes – Part 1: General requirements*

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

ISO 2439, *Flexible cellular polymeric materials – Determination of hardness (indentation technique)*

3 Terms and definitions

This clause of Part 1 is applicable except as follows.

3.1 Definitions relating to physical characteristics

3.1.9 *Modification:*

normal operation

Replace the first paragraph with the following:

operation of the appliance under the following conditions:

Foot warmers are unfilled and placed on a horizontal surface.

Heating mats are placed on a horizontal surface and covered by a piece of expanded polystyrene having dimensions approximately 300 mm × 150 mm × 50 mm.

Note 101 to entry: The density of the polystyrene is approximately $20 \text{ kg/m}^3 \pm 5 \text{ kg/m}^3$.

3.5 Definitions relating to types of appliances

3.5.101

foot warmer

appliance into which the user's feet are inserted in order to warm them

3.5.102

heating mat

appliance having an area not exceeding $0,5 \text{ m}^2$, on which the user's feet are placed in order to warm them

3.6 Definitions relating to parts of appliances

3.6.101

heating element with PTC characteristics

heating element of the appliance consisting of a pair of conductors separated by conductive material that has a rapid non-linear increase in resistance when the temperature is raised through a particular range

3.6.102

control unit

device, external to the functional part, by means of which the power input of the appliance or the temperature of the functional part can be adjusted or regulated

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:*

A 15 m length of heating element or internal wiring is required for the tests of 21.102.

Twelve samples of the enclosure material of **foot warmers**, each having dimensions 200 mm × 100 mm, are required for the test of 30.101.

5.3 Addition:

Washable appliances are laundered twice in accordance with the instructions before testing is started.

The tests of Clause 13, Clause 15 and Clause 16 are not carried out on **class III appliances** having a **rated voltage** not exceeding 24 V or on **class III constructions** having a **working voltage** not exceeding 24 V.

5.5 Addition:

If the appliance is provided with a **detachable cover**, the tests are carried out with or without this cover, whichever is more unfavourable.

6 Classification

This clause of Part 1 is applicable except as follows.

6.1 Modification:

Replace the first paragraph with the following:

Appliances shall be **class II** or **class III**.

7 Marking and instructions

This clause of Part 1 is applicable except as follows.

7.1 Addition:

Washable appliances shall be marked with symbol ISO 7000-3114 (2011-10) and with symbol ISO 7000-3124 (2011-10).

Appliances to be used with a **detachable control unit** shall be marked with the reference of the **control unit** to be used.

7.6 Addition:



[symbol ISO 7000-3114 (2011-10)]

do not dry clean



[symbol ISO 7000-3124 (2011-10)]

do not bleach

7.12 Addition:

The instructions shall include the following:

- the appliance is not to be used if there are signs of damage;
- the appliance is not to be used for warming animals;
- details regarding laundering or cleaning.

The instructions for **foot warmers** shall state that outdoor shoes must be removed before use.

The instructions for **heating mats** shall state that the appliance has to be repaired or replaced if the cover is worn. They shall explain how such wear can be observed.

The instructions for **foot warmers** intended to be used after preheating without supply and incorporating an appliance inlet shall state that the cord set must be disconnected from the supply after preheating.

If symbol ISO 7000-3114 (2011-10) and symbol ISO 7000-3124 (2011-10) are used, their meaning shall be explained.

The instruction for appliances with **detachable control units** shall state that the appliances are only to be used with the type that is marked on the appliances.

7.101 Detachable control units shall be marked with a reference number or by other means of identification.

Compliance is checked by inspection.

8 Protection against access to live parts

This clause of Part 1 is applicable except as follows.

8.1.1 Addition:

In addition to the use of test probe 18, test probe 19 of IEC 61032 is also applied wherever test probe 18 is used and with the same test conditions used for test probe 18.

9 Starting of motor-operated appliances

This clause of Part 1 is not applicable.

10 Power input and current

This clause of Part 1 is applicable except as follows.

10.101 The power input of appliances incorporating **heating elements with PTC characteristics** shall significantly decrease with an increase in temperature.

Compliance is checked by the following test.

*The appliance is supplied at **rated voltage** and operated under **normal operation**. The power input shall have decreased by at least 50 % from the initial value when steady conditions are established, any control operating during this period being short-circuited.*

11 Heating

This clause of Part 1 is applicable except as follows:

11.2 Modification:

Appliances are placed as near as possible to one wall of the test corner and away from the other wall.

11.3 Addition:

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

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

11.7 Modification:

Replace the first paragraph with the following:

Appliances are operated until steady conditions are established.

11.8 Modification:

Replace the first paragraph with the following:

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

Add the following to footnote "k" of Table 3:

Similar parts held for short periods include handles or grips of vents and air shutters.

Addition:

When polyvinyl chloride is used for insulating heating elements, the temperature rise of the insulation shall not exceed 80 K.

Table 101 – Maximum temperature rises for specified external and other surfaces under normal operating conditions

<i>Surface</i>	<i>Temperature rise of external and other accessible surfaces</i>
	<i>K</i>
<i>Surfaces likely to be in contact with the user's feet</i>	40
<i>Other surfaces of:</i>	
– <i>bare metal</i>	38
– <i>coated metal</i> ^a	42
– <i>glass and ceramic</i>	51
– <i>plastic and plastic coating > 0,4 mm</i> ^{b, c}	58
<i>NOTE The temperature rise limits of handles, knobs, grips, keyboards, keypads and similar parts are specified in Table 3.</i>	
^a <i>Metal is considered coated when a coating having a minimum thickness of 90 µm made of enamel, powder or non-substantially plastic coating is used.</i>	
^b <i>The temperature rise limit of plastic also applies for plastic material having a metal finish of thickness less than 0,1 mm.</i>	
^c <i>When the thickness of the plastic coating does not exceed 0,4 mm, the temperature rise limits of coated metal for underlying metal apply or the temperature rise limits for glass or ceramic material for underlying glass or ceramic material apply.</i>	

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 except as follows.

13.2 Addition:

When testing the top surface of **heating mats**, the dimensions of the metal foil are 300 mm × 150 mm.

If the **heating mat** is reversible, each surface is tested in turn.

Foot warmers are also tested with the inside surface completely covered with metal foil.

14 Transient overvoltages

This clause of Part 1 is applicable.