

This is a preview - click here to buy the full publication



IEC 60335-2-81

Edition 3.2 2020-06
CONSOLIDATED VERSION

INTERNATIONAL STANDARD



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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 13.120; 97.100.10

ISBN 978-2-8322-8466-7

Warning! Make sure that you obtained this publication from an authorized distributor.

REDLINE VERSION



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



CONTENTS

FOREWORD	4
INTRODUCTION	7
1 Scope	8
2 Normative references	8
3 Terms and definitions	9
4 General requirement.....	9
5 General conditions for the tests	9
6 Classification.....	10
7 Marking and instructions.....	10
8 Protection against access to live parts.....	11
9 Starting of motor-operated appliances	11
10 Power input and current.....	11
11 Heating.....	11
12 Void.....	12
13 Leakage current and electric strength at operating temperature.....	12
14 Transient overvoltages	12
15 Moisture resistance	12
16 Leakage current and electric strength.....	12
17 Overload protection of transformers and associated circuits	13
18 Endurance	13
19 Abnormal operation	13
20 Stability and mechanical hazards.....	13
21 Mechanical strength	13
22 Construction	16
23 Internal wiring.....	17
24 Components	17
25 Supply connection and external flexible cords	17
26 Terminals for external conductors.....	17
27 Provision for earthing	17
28 Screws and connections.....	18
29 Clearances, creepage distances and solid insulation	18
30 Resistance to heat and fire.....	18
31 Resistance to rusting.....	20
32 Radiation, toxicity and similar hazards.....	20
Annexes	25
Bibliography.....	27
Figure 101 – Equipment for the flexing test for foot warmers.....	21
Figure 102 – Equipment for flexing heating elements and internal wiring	22
Figure 103 – Equipment for the spark ignition test	23
Figure 104 – Details of the mask.....	24

Figure 105 – Apparatus for pressure test on connectors25

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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 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.

This consolidated version of the official IEC Standard and its amendments has been prepared for user convenience.

IEC 60335-2-81 edition 3.2 contains the third edition (2015-04) [documents 61/4841/FDIS and 61/4896/RVD], its amendment 1 (2017-10) [documents 61/5292/CDV and 61/5378A/RVC] and its amendment 2 (2020-06) [documents 61/5934/CDV and 61/6007/RVC].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendments 1 and 2. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

IEC 60335-2-81:2015+AMD1:2017 – 5 –
+AMD2:2020 CSV © IEC 2020

This part of International Standard IEC 60335 has been prepared by IEC technical committee 61: Safety of household and similar electrical appliances.

This third edition constitutes a technical revision.

The principal changes in this edition as compared with the second edition of IEC 60335-2-81 are as follows (minor changes are not listed):

- Requirements for washable appliances (5.3, 7.1, 7.6, 7.12);
- Requirements for controls in flexible cords (15.1.1, 24.2);
- Requirements for appliance inlets (22.105, 24.1.5, 29.1.3).

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

This part 2 is to be used in conjunction with the latest edition of IEC 60335-1 and its amendments. It was established on the basis of the fifth edition (2010) of that standard.

NOTE 1 When “Part 1” is mentioned in this standard, it refers to IEC 60335-1.

This part 2 supplements or modifies the corresponding clauses in IEC 60335-1, so as to convert that publication into the IEC standard: Safety requirements for 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 committee has decided that the contents of the base publication and its amendments will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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

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

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

A list of all parts of the IEC 60335 series, under the general title: *Household and similar electrical appliances – Safety*, can be found on the IEC website.

The following differences exist in the countries indicated below.

- 3.1.9: Normal operation is different (USA)
- 6.1: Class 0 appliances are allowed if their rated voltage does not exceed 150 V (Japan)
- 6.1: Class 0 and class I appliances are allowed (USA)
- 7.6: Symbols not permitted to replace required text (USA)
- 11.8: Temperature limit is different (USA)
- 13.2: Method and limit is different (USA)
- 19.2: The test is different (USA)
- 21.101: The test is different (USA)
- 22.101: The tests are different (USA)

IMPORTANT – The “colour inside” logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this publication 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.

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

This standard takes into account the requirements of IEC 60364 as far as possible so that there is compatibility with the wiring rules when the appliance is connected to the supply mains. However, national wiring rules may differ.

If an appliance within the scope of this standard also incorporates functions that are covered by another part 2 of IEC 60335, the relevant part 2 is applied to each function separately, as far as is reasonable. If applicable, the influence of one function on the other is taken into account.

When a part 2 standard does not include additional requirements to cover hazards dealt with in Part 1, Part 1 applies.

NOTE 1 This means that the technical committees responsible for the part 2 standards have determined that it is not necessary to specify particular requirements for the appliance in question over and above the general requirements.

This standard is a product family standard dealing with the safety of appliances and takes precedence over horizontal and generic standards covering the same subject.

NOTE 2 Horizontal and generic standards covering a hazard are not applicable since they have been taken into consideration when developing the general and particular requirements for the IEC 60335 series of standards. For example, in the case of temperature requirements for surfaces on many appliances, generic standards, such as ISO 13732-1 for hot surfaces, are not applicable in addition to Part 1 or part 2 standards.

An appliance that complies with the text of this standard will not necessarily be considered to comply with the safety principles of the standard if, when examined and tested, it is found to have other features that impair the level of safety covered by these requirements.

An appliance employing materials or having forms of construction differing from those detailed in the requirements of this standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be considered to comply with the standard.

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

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

1 Scope

This clause of Part 1 is replaced by the following.

This International Standard 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.

Appliances not intended for normal household use but which nevertheless may be 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.

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

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

NOTE 101 Attention is drawn to the fact that

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

NOTE 102 This standard does not apply to

- 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:~~2004~~, *Appliance couplers for household and similar general purposes – Part 1: General requirements*
~~IEC 60320-1:2004/AMD1:2007~~¹

¹—There exists a consolidated edition 2.1 (2007) that includes the second edition and its Amendment 1.

IEC 60335-2-81:2015+AMD1:2017 – 9 –
+AMD2:2020 CSV © IEC 2020

IEC 60320-3, *Appliance couplers for household and similar general purposes – Part 3: Standard sheets and gauges*

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

FINAL VERSION

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



CONTENTS

FOREWORD	4
INTRODUCTION	7
1 Scope	8
2 Normative references	8
3 Terms and definitions	9
4 General requirement.....	9
5 General conditions for the tests	9
6 Classification.....	10
7 Marking and instructions.....	10
8 Protection against access to live parts.....	11
9 Starting of motor-operated appliances	11
10 Power input and current.....	11
11 Heating.....	11
12 Void.....	12
13 Leakage current and electric strength at operating temperature.....	12
14 Transient overvoltages	12
15 Moisture resistance	12
16 Leakage current and electric strength.....	12
17 Overload protection of transformers and associated circuits	13
18 Endurance	13
19 Abnormal operation	13
20 Stability and mechanical hazards.....	13
21 Mechanical strength	13
22 Construction	16
23 Internal wiring.....	17
24 Components	17
25 Supply connection and external flexible cords	17
26 Terminals for external conductors.....	17
27 Provision for earthing	17
28 Screws and connections.....	18
29 Clearances, creepage distances and solid insulation	18
30 Resistance to heat and fire.....	18
31 Resistance to rusting.....	20
32 Radiation, toxicity and similar hazards.....	20
Annexes	25
Bibliography.....	27
Figure 101 – Equipment for the flexing test for foot warmers.....	21
Figure 102 – Equipment for flexing heating elements and internal wiring	22
Figure 103 – Equipment for the spark ignition test	23
Figure 104 – Details of the mask.....	24

Figure 105 – Apparatus for pressure test on connectors25

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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 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.

This consolidated version of the official IEC Standard and its amendments has been prepared for user convenience.

IEC 60335-2-81 edition 3.2 contains the third edition (2015-04) [documents 61/4841/FDIS and 61/4896/RVD], its amendment 1 (2017-10) [documents 61/5292/CDV and 61/5378A/RVC] and its amendment 2 (2020-06) [documents 61/5934/CDV and 61/6007/RVC].

This Final version does not show where the technical content is modified by amendments 1 and 2. A separate Redline version with all changes highlighted is available in this publication.

IEC 60335-2-81:2015+AMD1:2017 – 5 –
+AMD2:2020 CSV © IEC 2020

This part of International Standard IEC 60335 has been prepared by IEC technical committee 61: Safety of household and similar electrical appliances.

This third edition constitutes a technical revision.

The principal changes in this edition as compared with the second edition of IEC 60335-2-81 are as follows (minor changes are not listed):

- Requirements for washable appliances (5.3, 7.1, 7.6, 7.12);
- Requirements for controls in flexible cords (15.1.1, 24.2);
- Requirements for appliance inlets (22.105, 24.1.5, 29.1.3).

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

This part 2 is to be used in conjunction with the latest edition of IEC 60335-1 and its amendments. It was established on the basis of the fifth edition (2010) of that standard.

NOTE 1 When “Part 1” is mentioned in this standard, it refers to IEC 60335-1.

This part 2 supplements or modifies the corresponding clauses in IEC 60335-1, so as to convert that publication into the IEC standard: Safety requirements for 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 committee has decided that the contents of the base publication and its amendments will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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

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

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

A list of all parts of the IEC 60335 series, under the general title: *Household and similar electrical appliances – Safety*, can be found on the IEC website.

The following differences exist in the countries indicated below.

- 3.1.9: Normal operation is different (USA)
- 6.1: Class 0 appliances are allowed if their rated voltage does not exceed 150 V (Japan)
- 6.1: Class 0 and class I appliances are allowed (USA)
- 7.6: Symbols not permitted to replace required text (USA)
- 11.8: Temperature limit is different (USA)
- 13.2: Method and limit is different (USA)
- 19.2: The test is different (USA)
- 21.101: The test is different (USA)
- 22.101: The tests are different (USA)

IMPORTANT – The “colour inside” logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this publication 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.

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

This standard takes into account the requirements of IEC 60364 as far as possible so that there is compatibility with the wiring rules when the appliance is connected to the supply mains. However, national wiring rules may differ.

If an appliance within the scope of this standard also incorporates functions that are covered by another part 2 of IEC 60335, the relevant part 2 is applied to each function separately, as far as is reasonable. If applicable, the influence of one function on the other is taken into account.

When a part 2 standard does not include additional requirements to cover hazards dealt with in Part 1, Part 1 applies.

NOTE 1 This means that the technical committees responsible for the part 2 standards have determined that it is not necessary to specify particular requirements for the appliance in question over and above the general requirements.

This standard is a product family standard dealing with the safety of appliances and takes precedence over horizontal and generic standards covering the same subject.

NOTE 2 Horizontal and generic standards covering a hazard are not applicable since they have been taken into consideration when developing the general and particular requirements for the IEC 60335 series of standards. For example, in the case of temperature requirements for surfaces on many appliances, generic standards, such as ISO 13732-1 for hot surfaces, are not applicable in addition to Part 1 or part 2 standards.

An appliance that complies with the text of this standard will not necessarily be considered to comply with the safety principles of the standard if, when examined and tested, it is found to have other features that impair the level of safety covered by these requirements.

An appliance employing materials or having forms of construction differing from those detailed in the requirements of this standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be considered to comply with the standard.

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

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

1 Scope

This clause of Part 1 is replaced by the following.

This International Standard 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.

Appliances not intended for normal household use but which nevertheless may be 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.

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

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

NOTE 101 Attention is drawn to the fact that

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

NOTE 102 This standard does not apply to

- 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 60320-3, *Appliance couplers for household and similar general purposes – Part 3: Standard sheets and gauges*

