IEC 60335-2-111

Edition 2.0 2024-10
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

Household and similar electrical appliances – Safety – Part 2-111: Particular requirements for electric ondol-mattress with a non-flexible heated part

IEC 60335-2-111:2024-10 RLV(en)

Documents
Document Sharing Hub

Full document details: IEC 60335-2-111 2024 RLV

THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2024 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, …). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

Documents
Document Sharing Hub

Full document details: IEC 60335-2-111 2024 RLV

IEC 60335-2-111

Edition 2.0 2024-10
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

Household and similar electrical appliances – Safety – Part 2-111: Particular requirements for electric ondol-mattress with a non-flexible heated part

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 13.120, 97.100.10, 97.140

ISBN 978-2-8322-9875-6

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

® Registered trademark of the International Electrotechnical Commission

Documents
Document Sharing Hub

Full document details: IEC 60335-2-111 2024 RLV

CONTENTS

FOREWORD 4
INTRODUCTION 2
1 Scope 8
2 Normative references 9
3 Terms and definitions 9
4 General requirement 10
5 General conditions for the tests 10
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~~ Charging of metal-ion batteries 12
13 Leakage current and electric strength at operating temperature 12
14 Transient overvoltages 13
15 Moisture resistance 13
16 Leakage current and electric strength 13
17 Overload protection of transformers and associated circuits 13
18 Endurance 14
19 Abnormal operation 14
20 Stability and mechanical hazards 14
21 Mechanical strength 15
22 Construction 15
23 Internal wiring 16
24 Components 16
25 Supply connection and external flexible cords 16
26 Terminals for external conductors 16
27 Provision for earthing 16
28 Screws and connections 17
29 Clearances, creepage distances and solid insulation 17
30 Resistance to heat and fire 17
31 Resistance to rusting 17
32 Radiation, toxicity and similar hazards 17
Annexes 19
Annex B (normative) Battery-operated appliances, separable batteries and detachable batteries for battery-operated appliances 20
Annex AA (normative) Specification for thermal insulation 21
Bibliography 22

Documents
Document Sharing Hub
Full document details: IEC 60335-2-111 2024 RLV

Figure 101 – Arrangement for measuring leakage current and electric strength of the ondol-mattress 18
Figure 102 – Positioning of the thermal insulation on an ondol-mattress incorporating thermostats 18

Documents
Document Sharing Hub
Full document details: IEC 60335-2-111 2024 RLV

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-111: Particular requirements for electric ondol-mattress with a non-flexible heated part

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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.

This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 60335-2-111:2015. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

Documents
Document Sharing Hub

Full document details: IEC 60335-2-111 2024 RLV

IEC 60335-2-111 has been prepared by IEC technical committee 61: Safety of household and similar electrical appliances. It is an International Standard.

This second edition cancels and replaces the first edition published in 2015. 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);

c) application of test probe 19 has been introduced (8.1.1, 20.2, B.22.3, B.22.4).

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

Draft	Report on voting
61/7280/FDIS	61/7303/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: Safety requirements for electric ondol-mattress with a non-flexible heated part.

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.

Documents
Document Sharing Hub

Full document details: IEC 60335-2-111 2024 RLV

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, 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.

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.

Documents
Document Sharing Hub

Full document details: IEC 60335-2-111 2024 RLV

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~~ 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. ~~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.

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.

AVA Documents Document Sharing Hub

Full document details: IEC 60335-2-111 2024 RLV

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-111: Particular requirements for electric ondol-mattress with a non-flexible heated part

1 Scope

This clause of Part 1 is replaced by the following.

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

This standard also applies to **control units** supplied with the appliance.

Appliances not intended for normal household use, but that nevertheless ~~may~~ can be a source of danger to the public, such as appliances intended to be used in community spas or by persons in cold ambient temperatures, 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

~~– the use of appliances by young children or infirm persons without supervision;~~

~~– playing with the appliance by young children.~~

– 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~~ This standard does not apply to

– 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);
– blankets, pads and similar flexible heating appliances (IEC 60335-2-17);
– room heaters (IEC 60335-2-30);
– water bed heaters (IEC 60335-2-66);
– heating appliances for breeding and rearing animals (IEC 60335-2-71);
– foot warmers and heating mats (IEC 60335-2-81);
– flexible sheet heating elements for room heating (IEC 60335-2-96);
– heated carpets and heating units for room heating installed under removable floor coverings (IEC 60335-2-106);
– appliances specifically intended for use under medical supervision (IEC 80601-2-35).

AVA Documents Document Sharing Hub

Full document details: IEC 60335-2-111 2024 RLV

2 Normative references

This clause of Part 1 is applicable except as follows.

Addition:

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 ~~*Replacement*~~ *Modification:*
normal operation

Replace the first paragraph with the following:

operation of the appliance under the following conditions:

The **ondol-mattress** is placed on the floor of the test corner away from the walls, any legs forming part of the **bed frame** being removed.

The base of the **bed frame** is replaced by a piece of 20 mm thick plywood. The ondol-plate is covered by a sheet of thermal insulation.

Note ~~1~~101 to entry: The specification for the thermal insulation is given in normative Annex AA.

3.5 Definitions relating to types of appliances

3.5.101
ondol-mattress
appliance comprising an ondol-plate that incorporates an embedded **heating element** that heats the ondol-plate, and a **bed frame** that supports the ondol-plate

Note 1 to entry: Ondol-plates are usually made from inorganic material such as stone or loess.

3.5.102
controlled appliance
appliance incorporating means in the **ondol-mattress** for sensing changes in temperature when the appliance is operated under **normal operation**, thus automatically controlling the average power input

3.6 Definitions relating to parts of an appliance

3.6.101
heating element
heating conductor such as a heating sheet or wires covered with insulation material

~~**3.102**~~
~~**ondol-mattress**~~
~~appliance comprising an ondol-plate that incorporates an imbedded **heating element** that heats the ondol-plate, and a **bed frame** that supports the ondol-plate~~

~~Note 1 to entry: Ondol-plates are usually made from inorganic material such as stone or loess.~~

Documents
Document Sharing Hub
Full document details: IEC 60335-2-111 2024 RLV

3.~~103~~6.102
control unit
device, incorporated in the **bed frame** or external to the **bed frame**, by means of which the average power input of the appliance can be adjusted or regulated

Note 1 to entry: Multi-position cord switches are not considered to be **control units** unless they incorporate components for regulating the power input.

~~**3.104**~~
~~**controlled appliance**~~
~~appliance incorporating means in the **ondol-mattress** for sensing changes in temperature when the appliance is operated under **normal operation**, thus automatically controlling the average power input~~

3.~~105~~6.103
bed frame
frame that supports the ondol-plate

Note 1 to entry: The **bed frame** ~~may~~ can incorporate legs to provide a gap between the underside of the ondol-plate and the floor.

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.

5.8.101 ***Controlled appliances*** *are supplied as specified for* ***motor-operated appliances****.*

6 Classification

This clause of Part 1 is applicable.

7 Marking and instructions

This clause of Part 1 is applicable except as follows.

7.1 *Addition:*

Appliances shall be marked with

– the **rated power input**;
– symbol ISO 7000-0790 (2004-01) or the substance of "Please read the instructions";
– symbol ISO 7000-0434A (2004-01) or the substance of "Caution: Do not use with a helpless person, an infant or a person insensitive to heat".

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

Appliances to be used with **detachable transformer** shall be marked with the reference of the transformer to be used.

AVA Documents
Document Sharing Hub
Full document details: IEC 60335-2-111 2024 RLV

Detachable control units and **detachable transformers** shall be marked with the reference of the appliances with which they can be used.

7.12 *Addition:*

The instructions shall contain the substance of the following:

Important instructions. Retain for future use.

This appliance is not intended for medical use in a hospital.

This appliance must not be used by persons insensitive to heat and other very vulnerable persons who are unable to react to overheating.

Examine the appliance frequently for signs of wear or damage. If there are such signs, if the appliance has been misused or does not work, discontinue use and notify the supplier.

The instructions shall contain the substance of the markings required in 7.1. If symbols are used, they shall be explained.

The instructions shall specify the appropriate settings of controls for continuous use of the appliance.

The instructions for appliances provided with **detachable control units** or **detachable transformers** shall state that the appliance is only to be used with the types that are marked on the appliance.

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.

11 Heating

This clause of Part 1 is applicable except as follows.

11.2 ~~*Modification*~~*Addition:*

*When there is a separate **control unit**, it is placed away from the appliances.*

Documents
Document Sharing Hub
Full document details: IEC 60335-2-111 2024 RLV

11.3 *Addition:*

*Thermocouples used for determining the surface temperature of the **ondol-mattress** are soldered to plates of copper or brass measuring 65 mm × 65 mm × 0,5 mm. The temperatures are determined in at least four places.*

11.7 ~~*Replacement*~~ *Modification:*

Replace the first paragraph with the following:

Appliances are operated until steady conditions are established.

11.8 *Addition:*

*The surface temperature of the **ondol-mattress** shall not exceed 56 °C.*

11.101 It shall be possible to operate the **ondol-mattress** without risk of heatstroke to the user.

Compliance is checked by the following test.

*The appliance is operated under **normal operation** supplied as specified in 11.4. The **control unit** or cord switch is adjusted to the highest setting recommended for continuous use.*

*When steady conditions are established, but at least 1 h after switching on the appliance, the surface temperature is measured. The temperature of the surface of the **ondol-mattress** is determined by means of a thermocouple attached to the centre of a plate of copper or brass having dimensions 300 mm × 300 mm × 0,5 mm.*

The temperature shall not exceed 37 °C.

12 ~~Void~~ 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.

13.1 *Modification:*

*For testing the **ondol-mattress**, a sheet of metal foil, approximately 0,1 mm thick and of ~~sufficient~~ a size necessary to cover the area of that part of the **ondol-mattress** incorporating the current-carrying parts, is inserted between the **ondol-mattress** and the sheet of thermal insulation. A uniformly distributed load of approximately 35 kg/m^2 is placed on the sheet of thermal insulation.*

The arrangement is shown in Figure 101.

13.2 *Modification:*

The leakage current is measured between any pole of the supply and the sheet of metal foil.

Documents
Document Sharing Hub
Full document details: IEC 60335-2-111 2024 RLV

*The leakage current for the **ondol-mattress** shall not exceed 1 mA/m^2 of the heating part with a maximum of 2,5 mA.*

13.3 *Modification:*

*For the **ondol-mattress**, the test voltage is applied between **live parts** and the sheet of metal foil.*

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:*

*A quantity of the spillage solution corresponding to 1 l/m^2 of the upper surface area of the **ondol-mattress** is poured uniformly over the **ondol-mattress** at the rate of approximately 1 l/min.*

*The spillage solution is allowed to soak into the **ondol-mattress** for a period of 30 min.*

*After 30 min, the appliance shall then withstand the electric strength test of 16.3 and inspection shall show that there is no trace of water on insulation that could result in a reduction of **clearances** and **creepage distances** below the values specified in Clause 29.*

16 Leakage current and electric strength

This clause of Part 1 is applicable except as follows.

16.2 *Addition:*

*A sheet of metal foil, approximately 0,1 mm thick and of ~~sufficient~~ a size necessary to cover the area of that part of the **ondol-mattress** incorporating the current-carrying parts, is inserted between the **ondol-mattress** and the sheet of thermal insulation. A uniformly distributed load of approximately 35 kg/m^2 is placed on the top sheet of thermal insulation.*

The leakage current for the heating part shall not exceed 2,5 mA.

16.3 *Addition:*

*After the **ondol-mattress** is covered with metal foil, it is tested with the voltage applied between **live parts** and the sheet of metal foil.*

17 Overload protection of transformers and associated circuits

This clause of Part 1 is applicable.

Documents
Document Sharing Hub
Full document details: IEC 60335-2-111 2024 RLV

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, the following applies.

The appliance is subjected to the tests of 19.101 and 19.102 ~~and 19.103~~.

*The appliances incorporating **electronic circuits** are also subjected to the tests of 19.11, 19.12 and 19.14.*

The appliance is supplied with a voltage

- *between 0,9 times and 1,1 times the **rated voltage**, for **controlled appliances**;*
- *resulting in a power input between 0,85 times and 1,24 times the **rated power input**, for other appliances.*

19.13 *Addition*:

*The temperature of the surface of the **ondol-mattress** shall not exceed 80 °C.*

19.101 *Appliances are operated under **normal operation** except that the sheet of thermal insulation covers only part of the ondol-mattress. The test is carried out eight times, the boundary of the area covered being in turn parallel to each of the sides and to the diagonals of the **ondol-mattress** as shown in Figure 102.*

19.102 *Appliances are operated under the conditions specified in Clause 11. Any control that limits the temperature during the test of Clause 11 is short-circuited.*

19.103 **Ondol-mattresses** shall be constructed so that failure of a component, other than **heating elements** or internal wiring, does not give rise to a temperature which could be hazardous to the human body.

*Compliance is checked by carrying out the test of 11.101 but simulating failure of components which might reasonably be expected to occur in normal use. During the test, the temperature of the surface of the **ondol-mattress** shall not exceed 56 °C.*

*Appliances can have one overshoot of up to 85 °C provided that when the temperature exceeds 56 °C a **non-self-resetting thermal cut-out** operates.*

20 Stability and mechanical hazards

This clause of Part 1 is applicable except as follows.

20.1 *Addition:*

*The test is only applied to **control units** intended to be placed on a surface.*

AVA Documents Document Sharing Hub

Full document details: IEC 60335-2-111 2024 RLV

20.2 *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.

21 Mechanical strength

This clause of Part 1 is applicable except as follows.

21.1 *Addition:*

Control units intended to be placed on a surface are also subjected to the test of 21.101.

21.101 *The **control unit** is dropped from a height of 40 mm onto a rigidly mounted steel plate having a thickness of at least 15 mm and a mass of at least 15 kg. It is dropped so that it lands on its base, the test being carried out 100 times.*

*A sandbag with the weight of 80 kg and a square bottom with a length of 300 mm on each side is placed on the **control unit** for 1 min.*

*The **control unit** is then dropped three times from a height 500 mm onto a hardwood floor by pulling it from a horizontal support by means of its cord so that it falls freely.*

*After the test, the **control unit** shall not be damaged to such an extent that compliance with this standard is impaired. If the **control unit** still operates, the appliance shall withstand the tests of Clause 11.*

22 Construction

This clause of Part 1 is applicable except as follows.

22.101 The **ondol-mattress** shall be constructed so that **heating elements** and internal wiring are retained in their intended position. No part of the **heating element** shall cross over another part of the **heating element**.

Crossing of internal wiring shall be avoided ~~as far as possible. When this is unavoidable,~~ unless the wiring ~~shall be~~ is secured in order to prevent any relative movement.

Compliance is checked by inspection.

22.102 The insulation of **heating elements** and internal wiring shall be integral with the conductors in the heating part, for other than **class III construction**.

Compliance is checked by inspection.

22.103 **Control units** intended to stand on a table shall not have openings on the underside that could allow small items to penetrate and touch live parts.

*Compliance is checked by inspection and measuring the distance between the supporting surface and **live parts** through openings. This distance shall be at least 8 mm.*

22.104 **Control units** that automatically switch from a high heat output to a low heat output after a pre-set time shall not automatically switch back to the high heat output setting.

AVA Documents
Document Sharing Hub
Full document details: IEC 60335-2-111 2024 RLV

Compliance is checked by inspection and during the test of 11.101.

22.105 Fuse links or **thermal links** that are incorporated to protect the **ondol-mattress** against overheating or ignition shall not be replaceable by the user.

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 *Modification:*

Thermostats are operated for 100 000 cycles of operation and **self-resetting thermal cut-outs** for 10 000 cycles of operation.

24.2 *Addition:*

Appliances may be fitted with switches or **control units** in flexible cords.

24.101 **Thermal cut-outs** incorporated in appliances for compliance with 19.102 shall not be self-resetting.

Compliance is checked by inspection.

25 Supply connection and external flexible cords

This clause of Part 1 is applicable except as follows.

25.2 *Addition:*

Ondol-mattresses *having two separate* ***heated areas*** *may have two means of connection to the supply.*

25.15 *Modification:*

Flexible cords connected to the **ondol-mattress** are subjected to a pull force of 100 N that is only applied three times for 1 min each time, the longitudinal measurement not being made.

Flexible cords connected to switches and **control units** are subjected to a pull force of 100 N.

26 Terminals for external conductors

This clause of Part 1 is applicable.

27 Provision for earthing

This clause of Part 1 is applicable.

Documents
Document Sharing Hub
Full document details: IEC 60335-2-111 2024 RLV

28 Screws and connections

This clause of Part 1 is applicable except as follows.

28.2 *Addition:*

The requirement does not apply to the connections to the **heating elements**.

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.

30.2.2 Not applicable.

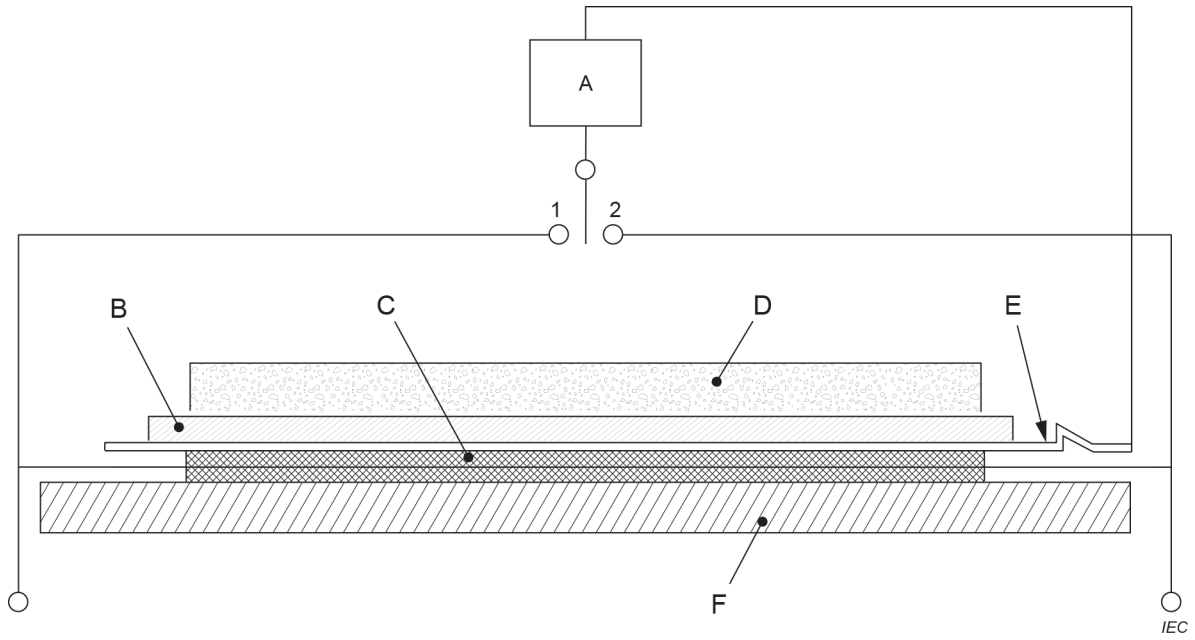
31 Resistance to rusting

This clause of Part 1 is applicable.

32 Radiation, toxicity and similar hazards

This clause of Part 1 is applicable.

Documents
Document Sharing Hub
Full document details: IEC 60335-2-111 2024 RLV



Key

A circuit of Figure 4 of IEC 60990:2016

B sheet of thermal insulation

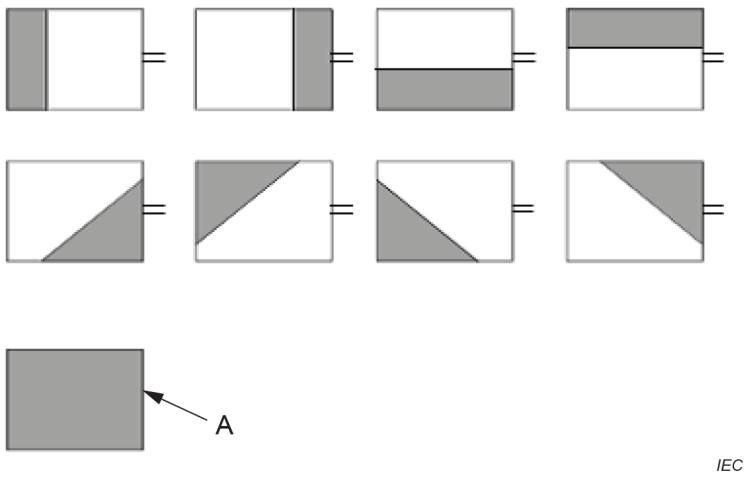
C **ondol-mattress**

D uniformly distributed load

E aluminium foil

F plywood base

Figure 101 – Arrangement for measuring leakage current and electric strength of the ondol-mattress



Key

A thermal insulation

Figure 102 – Positioning of the thermal insulation on an ondol-mattress incorporating thermostats

Documents
Document Sharing Hub
Full document details: IEC 60335-2-111 2024 RLV

Annexes

The annexes of Part 1 are applicable except as follows:

Documents
Document Sharing Hub

Full document details: IEC 60335-2-111 2024 RLV

Annex B
(normative)

Battery-operated appliances, separable batteries and detachable batteries for battery-operated appliances

Annex B of Part 1 Is applicable except as follows.

B.22.3 *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.

B.22.4 *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.

AVA Documents
Document Sharing Hub

Full document details: IEC 60335-2-111 2024 RLV