

INTERNATIONAL STANDARD

IEC 60335-1

1991

AMENDMENT 2
1999-06

Amendment 2

**Safety of household and similar
electrical appliances –**

**Part 1:
General requirements**

Amendement 2

*Sécurité des appareils électrodomestiques
et analogues –*

*Partie 1:
Prescriptions générales*

© IEC 1999 — Copyright - all rights reserved

International Electrotechnical Commission
Telefax: +41 22 919 0300

3, rue de Varembe Geneva, Switzerland
e-mail: inmail@iec.ch

IEC web site <http://www.iec.ch>



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE

T

For price, see current catalogue

FOREWORD

This amendment has been prepared by IEC technical committee 61: Safety of household and similar electrical appliances.

The text of this amendment is based on the following documents:

FDIS	Report on voting
61/1569/FDIS	61/1623/RVD

Full information on the voting for the approval of this amendment can be found in the report on voting indicated in the above table

NOTE – This version does not contain editorial modifications which only concern the French text

FOREWORD

Delete the two paragraphs beginning "Individual countries may wish" and "If the functions of an appliance".

Modify the list of differences existing in some countries as follows:

2.8.5: *Delete.*

6.1: *Add "Greece, India and Switzerland".*

13.2: *Add "India".*

23.7: *Delete the first reference.*

24.1.3: *Replace by "The number of cycles is different and the note does not apply (USA).".*

25.16: *Add "New Zealand" to the first difference quoted.*

Replace "cold" by "cord".

27.2: *Delete "as IEC 685-2-1 is not used"*

Add:

2: *Steady conditions are defined (Poland).*

22.44: *Appliances may be acceptable based on additional evaluation (USA).*

27.6: *The requirement does not apply (USA).*

INTRODUCTION

Replace the last paragraph and the footnote by:

Individual countries may wish to consider the application of the standard, so far as reasonable, to appliances not mentioned in part 2, and to appliances designed on new principles.

If the functions of an appliance are covered by different parts 2 of IEC 60335, the relevant part 2 is applied to each function separately, so far as is reasonable. If applicable, the influence of one function on the other is taken into account.

Standards dealing with non-safety aspects of household appliances are:

- IEC Standards published by TC 59 concerning methods of measuring performance;
- CISPR 11¹⁾ and CISPR 14-1²⁾ concerning electromagnetic emissions;
- CISPR 14-2³⁾ and IEC 61000 series concerning electromagnetic compatibility.

1 Scope

Commence the last paragraph of the requirement by: "However, this standard" and combine it with the previous paragraph.

In note 3, delete the seventh and eighth dashed items.

2 Definitions

2.2.6 *In the third dashed item of the note, add "supplied at" before "rated voltages".*

2.4.6 *Delete "with" after "incorporating".*

2.4.8 *Delete note 4.*

2.7.2 *Replace the text by:*

detachable part: Part which can be removed without the aid of a **tool**, a part which is removed in accordance with the instructions for use, even if a **tool** is needed for removal, or a part which does not fulfil the test of 22.11.

NOTE 1 – If for installation purposes a part has to be removed, this part is not considered to be detachable even if the instructions state that it is to be removed.

NOTE 2 – Components which can be removed without the aid of a **tool** are considered to be detachable parts.

NOTE 3 – A part which can be opened is considered to be a part which can be removed.

* IEC 60364: *Electrical installations of buildings*

¹⁾ CISPR 11: *Electromagnetic disturbance characteristics – Industrial, scientific and medical (ISM) radio-frequency equipment – Limits and methods of measurement*

²⁾ CISPR 14-1: *Limits and methods of measurement of radio disturbance characteristics of electrical motor operated and thermal appliances for household and similar purposes, electric tools and electrical apparatus*

³⁾ CISPR 14-2: *Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 2: Immunity – Product family standard*

4 General conditions for the tests

Add:

Unless otherwise specified, the tests are carried out in accordance with this clause.

4.2 Replace the first paragraph by:

The tests are carried out on a single appliance, which shall withstand all the relevant tests. However, the tests of clauses 20, 22 (except 22.11 and 22.18) to 26, 28, 30 and 31 may be carried out on separate appliances.

Add to note 1:

If the tests of 24.1.3 are carried out, three switches or three additional appliances are needed.

If an intentionally weak part becomes open-circuit during the tests of clause 19, an additional appliance is needed.

If the tests of annex R are carried out, four additional transformers are needed.

4.3 Delete "Unless otherwise specified".

4.10 Delete "Unless otherwise specified".

4.11 Delete "Unless otherwise specified".

7 Marking and instructions

7.6 Add to the list of symbols



[Symbol No. 1641 of ISO 7000]read the instructions



[Symbol No. 0434 of ISO 7000]caution

7.12.2 Replace the requirement by:

If a **stationary appliance** is not provided with a **supply cord** and a plug or with other means for disconnection from the supply having a contact separation of at least 3 mm in all poles, the instructions shall state that means for disconnection must be incorporated in the fixed wiring according to the wiring rules.

8 Protection against access to live parts

8.1.2 Add the following after the first paragraph:

The test pin is also applied through openings in earthed metal enclosures having a non-conductive coating such as enamel or lacquer.

Add the following note:

NOTE – Appliance outlets are not considered to be socket-outlets.

8.1.5 Replace the test specification by:

Compliance is checked by inspection and by the test of 8.1.1.

10 Power input and current

10.2 In table 2, replace "Rated current input" by "Rated current".

11 Heating

11.8 Table 3

Replace the temperature rise of 40 K for pins of appliance inlets for cold conditions by 45 K.

Replace the text concerning lampholders by:

<i>Lampholders with T-marking⁹⁾</i>	
– B15 and B22 marked T1	140
– B15 and B22 marked T2	185
– other lampholders	T-25
<i>Lampholders without T-marking⁹⁾:</i>	
– E14 and B15	110
– B22, E26 and E27	140
– other lampholders and starter holders for fluorescent lamps	55

In the section concerning the outer surfaces of capacitors, replace the text of the second bullet by "capacitors complying with IEC 60384-14".

Notes to table 3

Add the following to the second paragraph of note 2):

However, if a thermostat or a temperature limiter is mounted on a heat-conducting part, the declared temperature limit of the mounting surface (T_s) is also applicable. Therefore, the temperature rise of the mounting surface has to be measured.

Add:

9) Locations for measuring the temperature rises are specified in table 12.1 of IEC 60598-1.

Add the following notes after the table:

NOTE 3 – The temperature rise limit for metal applies to parts having a metal coating at least 0,1 mm thick and to metal parts having a plastic coating less than 0,3 mm thick.

NOTE 4 – The temperature of the terminals of switches is measured if the switch is tested in accordance with annex S.

13 Leakage current and electric strength at operating temperature

13.3 In the fourth paragraph of the test specification, replace "rapidly" by "gradually".

15 Moisture resistance

15.1 Add the following note:

NOTE – The external enclosure is carefully wiped to remove any surplus water before inspection. Care has to be taken when dismantling to avoid displacing any water within the appliance.

15.1.1 Replace the third and fourth dashed items by:

- IPX3 appliances, as described in subclause 14.2.3a;
- IPX4 appliances, as described in subclause 14.2.4a;

In the last line, add "approximately" before "1 % NaCl".

Add the following note:

NOTE – The hand-held spray nozzle may be used for testing appliances which cannot be placed under the oscillating tube specified in IEC 60529.

15.1.2 Replace the sixth paragraph by:

For IPX4, the horizontal centre line of the appliance is aligned with the pivot axis of the oscillating tube. However, for appliances normally used on the floor or table, the movement is limited to two times 90° from the vertical for a period of 5 min, the support being placed at the level of the pivot axis of the oscillating tube.

Add to the last paragraph:

However, if the instructions state that a part has to be removed for **user maintenance** and a **tool** is needed, this part is not removed.

15.3 In the fifth paragraph of the test specification and in note 2, replace "(93 ± 2) %" by "(93 ± 3) %".

16 Leakage current and electric strength

16.3 In the second paragraph, replace "insulated" by "insulating".

In the fourth paragraph, replace "rapidly" by "gradually".

17 Overload protection of transformers and associated circuits

Replace the last paragraph of the test specifications by:

The temperature of windings shall not exceed the values specified in table 6. However, these limits do not apply to fail-safe transformers complying with subclause 15.5 of IEC 61558-1.

19 Abnormal operation

19.1 Add the following note:

NOTE 5 – When it is stated that a control is short-circuited, it may be rendered inoperative instead.

19.6 Replace the second paragraph by:

The **working voltage** of the **PTC heating element** is increased by 5 % and the appliance is operated until steady conditions are re-established. The voltage is then increased in similar steps until 1,5 times **working voltage** is reached or until the **PTC heating element** ruptures, whichever occurs first.

19.7 Replace the last sentence of the second paragraph by:

The test is repeated with the capacitors short-circuited one at a time unless they are of class P2 of IEC 60252.

19.10 Replace the second paragraph by:

During the test, parts shall not be ejected from the appliance.

19.11 Replace the third paragraph by:

*During and after each test, the temperature of the windings shall not exceed the values specified in table 6. However, these limits do not apply to fail-safe transformers complying with subclause 15.5 of IEC 61558-1. The appliance shall comply with the conditions specified in 19.13. Any current flowing through **protective impedance** shall not exceed the limits specified in 8.1.4.*

Delete note 3.

19.11.2 Replace fault condition c) by:

c) Short circuit of capacitors, unless they comply with IEC 60384-14.

19.13 In table 7, replace the first line by:

Wooden supports, walls, ceiling and floor of the test corner and wooden cabinets¹⁾

20 Stability and mechanical hazards

20.1 Replace the second sentence of the second paragraph of the test specification by:

However, if part of an appliance comes into contact with the horizontal supporting surface when the appliance is tilted through an angle of 10°, the appliance is placed on a horizontal support and tilted in the most unfavourable direction through an angle of 10°.

In note 2, replace "plane" by "support".

20.2 In the first paragraph of the test specification, replace "plate" by "face". (In two places.)

Add the following note:

NOTE 3 – Enclosures which can be opened by overriding an interlock by applying the test finger are considered to be **detachable parts**.

21 Mechanical strength

Replace the first paragraph of the test specification by:

Compliance is checked by applying blows to the appliance by means of the spring hammer as specified in IEC 60068-2-75.

22 Construction

22.20 Replace the test specification by:

Compliance is checked by inspection and, if necessary, by appropriate tests.

22.21 Add the following note:

NOTE 2 – Magnesium oxide and mineral ceramic fibres used for the electrical insulation of heating elements are not considered to be hygroscopic materials.

22.22 Replace the text by:

Appliances shall not contain asbestos.

Compliance is checked by inspection.

22.32 Add the following note:

NOTE 4 – In case of doubt, the following test is carried out to determine if ceramic material is tightly sintered.

The ceramic material is broken into pieces which are immersed in a solution containing 1 g of fuchsine in each 100 g of methylated spirit. The solution is maintained at a pressure not less than 15 MPa for a period so that the product of the test duration in hours and the test pressure in MPa is not less than 180.

The pieces are removed from the solution, rinsed, dried and broken into smaller pieces.

The freshly broken surfaces are examined and are not to show any trace of dye.

22.33 Replace by:

Conductive liquids which are or may become accessible in normal use shall not be in direct contact with **live parts**. Electrodes shall not be used for heating liquids.

For **class II construction**, conductive liquids which are or may become accessible in normal use shall not be in direct contact with **basic insulation** or **reinforced insulation**.

For **class II construction**, conductive liquids which are in contact with **live parts**, shall not be in direct contact with **reinforced insulation**.

NOTE 1 – Liquids which are in contact with unearthed **accessible metal parts** are considered to be accessible.

NOTE 2 – An air layer is not considered to be sufficient as one of the layers of **double insulation** if it is likely to be bridged by leaking liquid.

Compliance is checked by inspection.

22.40 Replace the requirement by:

Motor-operated appliances and **combined appliances** which are intended to be moved while in operation or which have accessible moving parts, shall be fitted with a switch to control the motor. The actuating member of this switch shall be easily visible and accessible.

22.42 Replace the note by:

NOTE 1 – Resistors complying with test a) of subclause 14.1 of IEC 60065 and capacitors complying with IEC 60384-14 are considered to be components having a sufficiently stable impedance.

NOTE 2 – Class X capacitors specified in IEC 60384-14 are not considered to be suitable components for use as **protective impedance**.

Add the following subclause:

22.44 Appliances shall not have an enclosure which is shaped and decorated so that the appliance is likely to be treated as a toy by children.

Compliance is checked by inspection.

NOTE – Examples are enclosures representing animals or persons or resembling scale models.

23 Internal wiring

23.3 In the first sentence of the second paragraph, replace "conductors" by "the wiring".

Combine the first two paragraphs.

23.5 Replace "insulation" by "**basic insulation**" in the first paragraph of the test specification (two places) and in note 1.

Add the following note:

NOTE 3 – For **class II construction**, the requirements for **supplementary insulation** and **reinforced insulation** apply, except that the sheath of a cord complying with IEC 60227 or IEC 60245 may provide **supplementary insulation**.

24 Components

24.1 Add the following note:

NOTE 2 – Unless otherwise specified, the requirements of clause 29 apply between **live parts** of components and **accessible parts** of the appliance.

24.1.1 Replace the first paragraph by:

Capacitors likely to be permanently subjected to the supply mains voltage and used for radio interference suppression or for voltage dividing shall comply with annex Q.

NOTE – Examples of capacitors likely to be permanently subjected to the supply mains voltage are capacitors incorporated in appliances

- for which 30.2.3 is applicable;
- for which 30.2.2 is applicable, unless the capacitor is disconnected from the supply by the on-off switch. This switch has to be double-pole if the capacitor is connected to earth.

Replace the third paragraph by:

Safety isolating transformers which have not been separately tested and found to comply with IEC 61558-2-6 shall comply with annex R.

Replace the last paragraph by:

Switches shall comply with IEC 61058-1 unless they are tested with the appliance.

24.1.2 Add the following to the list of controls:

- *timers* 3 000
- *energy regulators* 10 000

24.1.3 Replace this subclause by:

Switches which have not been separately tested and found to comply with IEC 61058-1 under conditions covering those occurring in the appliance, shall comply with annex S.

The test of subclause 17.2.7 of IEC 61058-1 is carried out for 10 000 cycles of operation.

*Switches intended for operation under no load and which can be operated only with the aid of a **tool** are not subjected to the tests of clause 17 of IEC 61058-1. This applies also for such switches operated by hand which are interlocked so that they cannot be operated under load but switches without this interlock are subjected to the test of subclause 17.2.7 of IEC 61058-1 for 100 cycles of operation.*

NOTE – The test of subclause 17.2.7 of IEC 61058-1 is only carried out on switches required by this standard.

24.1.5 Add:

Capacitors in appliances for which 30.2.3 is applicable and which are permanently connected in series with a motor winding shall be of class P1 or P2 of IEC 60252.

24.2 Add the following note after the third dashed item:

NOTE – The use of solder having a melting point at least 230 °C is allowed.

24.4 Add "or IEC 60906-1" after "IEC 60083".

24.5 Add "or IEC 60906-1" after "IEC 60083".

25 Supply connection and external flexible cords

25.7 *In the first sentence of the second paragraph, replace "Polyvinyl chloride insulated cords" by "Polyvinyl chloride sheathed cords".*

26 Terminals for external conductors

26.1.1 *In note 1, replace "IEC 999" by "IEC 60999-1".*

In note 2, replace "IEC 685-2-1" by "IEC 60998-2-2".

26.4 *In the test specification, replace "IEC 999" by "IEC 60999-1".*

26.10 Replace the requirement by:

Terminals shall only be accessible after removal of a **non-detachable part**.

27 Provision for earthing

27.2 Delete the first paragraph.

Replace the test specification by:

Compliance is checked by inspection and by manual test.

27.4 *In the first sentence of note 4, replace "those transmitting current." by "those liable to transmit a fault current."*

27.5 *In note 3, replace "Care is taken that the contact resistance ..." by "Care is taken to ensure that the contact resistance ..."*

Add the following subclause:

27.6 The printed conductors of printed circuit boards shall not be used to provide earthing continuity in **hand-held appliances**. They may be used to provide earthing continuity in other appliances if

- at least two tracks are used with independent soldering points and the appliance complies with 27.5 for each circuit;
- the material of the printed circuit board complies with IEC 60249-2-4 or IEC 60249-2-5.

Compliance is checked by inspection and by the relevant tests.

28 Screws and connections

28.1 *In the first paragraph replace "standard and electrical connections" by "standard, electrical connections and connections providing earthing continuity".*

In the second paragraph, replace "electrical connection" by "electrical connection or connection providing earthing continuity".

Replace the third paragraph by:

Screws used for electrical connections or for connections providing earthing continuity shall screw into metal.

Delete note 1.

Replace the first and second paragraphs of the test specification by:

Compliance is checked by inspection and by the following test.

Screws and nuts are tested if they

- are used for electrical connections;
- are used for connections providing earthing continuity, unless at least two screws or nuts are used;
- are likely to be tightened
 - *during **user maintenance**;*
 - *when replacing a **supply cord** having a **type X attachment**;*
 - *during installation.*

In the last paragraph of the test specification, delete "electrical".

28.2 *Replace "Electrical connections" by "Electrical connections and connections providing earthing continuity".*

Add to the requirement:

This requirement does not apply to electrical connections in circuits carrying a current not exceeding 0,5 A.

28.3 *In the first paragraph, replace "the connection of current-carrying parts" by "electrical connections".*

In the second paragraph, replace "the electrical connection of current-carrying parts" by "electrical connections".

In the third paragraph, replace "to provide" by "in connections providing".

28.4 *In the first paragraph, replace "provide" by "connections providing".*

In the second paragraph of the requirement, replace "electrical connections" by "electrical connections or for connections providing earthing continuity".

Figures

Replace figures 4 to 7 by the following.

IECNORM.COM: Click to view the full PDF of IEC 60335-1:1991/AMD2:1999

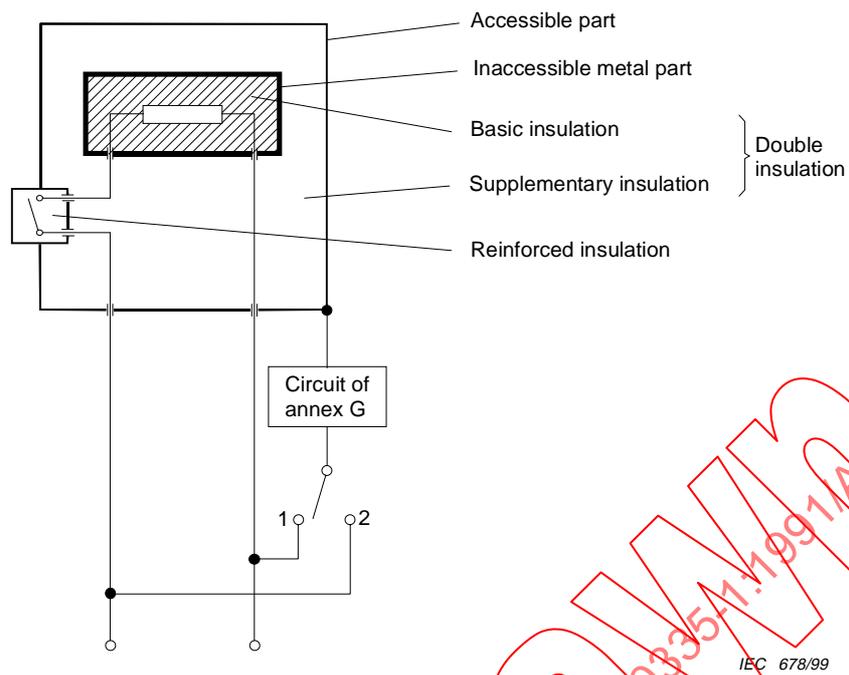


Figure 4 – Diagram for leakage current measurement at operating temperature for single-phase connection of class II appliances

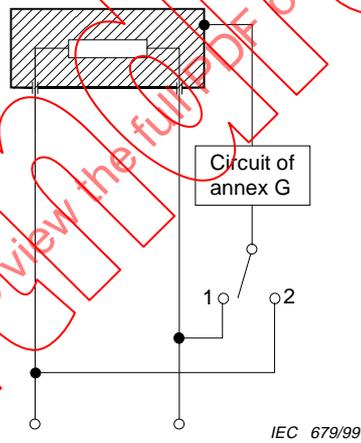


Figure 5 – Diagram for leakage current measurement at operating temperature for single-phase connection of appliances other than those of class II

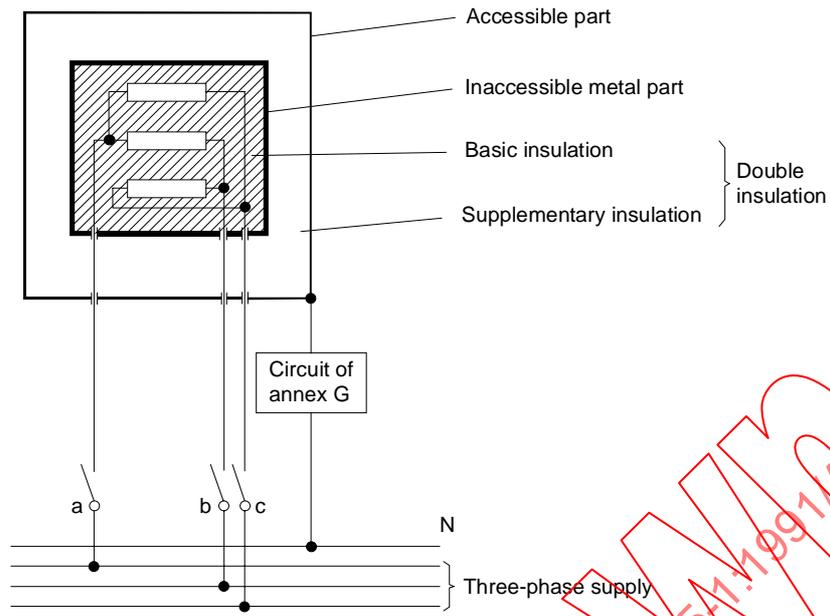


Figure 6 – Diagram for leakage current measurement at operating temperature for three-phase connection of class II appliances

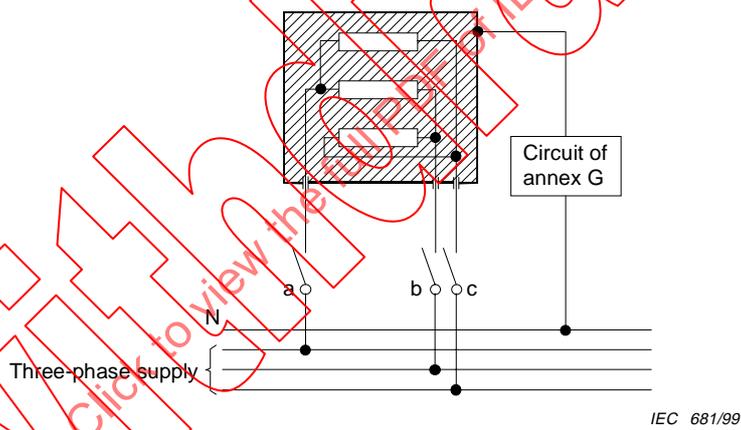


Figure 7 – Diagram for leakage current measurement at operating temperature for three-phase connection of appliances other than those of class II

Figure 10

Add a tolerance of $\pm 0,02$ mm to the dimension 0,2 at the tip of the fingernail.

Delete the dimension 1,5 at the tip of the fingernail.

IECNORM.COM: Click to view the full PDF of IEC 60335-1:1991/AMD2:1999
Withdrawn

Annexes

Annex A

Replace by:

Annex A (normative)

Normative references

A.1 The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

A.1.1 IEC standards:

60051-2:1984, *Direct acting indicating analogue electrical-measuring instruments and their accessories – Part 2: Special requirements for ammeters and voltmeters.*

60061-1:1969, *Lamp caps and holders together with gauges for the control of interchangeability and safety – Part 1: Lamp caps.*

60065:1998, *Safety requirements for mains operated electronic and related apparatus for household and similar general use.*

60068-2-75:1997, *Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests.*

60085:1984, *Thermal evaluation and classification of electrical insulation.*

60112:1979, *Method for determining the comparative and proof tracking indices of solid insulating materials under moist conditions.*

60127 (all parts), *Miniature fuses.*

60227 (all parts), *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V.*

60245 (all parts), *Rubber insulated cables – Rated voltages up to and including 450/750 V.*

60249-2-4:1987, *Base materials for printed circuits – Part 2: Specifications – Specification No. 4: Epoxide woven glass fabric copper-clad laminated sheet, general purpose grade.*

60249-2-5:1987, *Base materials for printed circuits – Part 2: Specifications – Specification No. 5: Epoxide woven glass fabric copper-clad laminated sheet, of defined flammability (vertical burning test).*

60252:1993, *A.C. motor capacitors.*

60309 (all parts), *Plugs, socket-outlets and couplers for industrial purposes.*

60320 (all parts), *Appliance couplers for household and similar general purposes.*

60384-14:1993, *Fixed capacitors for use in electronic equipment – Part 14: Sectional specification: Fixed capacitors for electromagnetic interference suppression and connection to the supply mains.*

60417:1973, *Graphical symbols for use on equipment – Index, survey and compilation of the single sheets.*

60529:1989, *Degrees of protection provided by enclosures (IP Code).*

60598-1:1996, *Luminaires – Part 1: General requirements and tests.*

60695-2-1/0:1994, *Fire hazard testing – Part 2: Test methods – Section 1/Sheet 0: Glow-wire test – General.*

60695-2-1/1:1994, *Fire hazard testing – Part 2: Test methods – Section 1/Sheet 1: Glow-wire end product test and guidance.*

60695-2-2:1991, *Fire hazard testing – Part 2: Test methods – Section 2: Needle-flame test.*

60695-2-3:1984, *Fire hazard testing – Part 2: Test methods – Bad-connection test with heaters.*

60707:1981, *Methods of test for the determination of the flammability of solid electrical insulating materials when exposed to an igniting source.*

60730 (all parts) *Automatic electrical controls for household and similar use.*

60906-1:1986, *IEC system of plugs and socket-outlets for household and similar purposes – Part 1: Plugs and socket-outlets 16 A 250 V a.c.*

60998-2-2:1991, *Connecting devices for low voltage circuits for household and similar purposes – Part 2-2: Particular requirements for connecting devices as separate entities with screwless-type clamping units.*

60999-1:1990, *Connecting devices – Safety requirements for screw-type and screwless-type clamping units for electrical copper conductors.*

61058-1:1996, *Switches for appliances – Part 1: General requirements.*

61558-1:1997, *Safety of power transformers, power supply units and similar – Part 1: General requirements and tests.*

61558-2-6:1997, *Safety of power transformers, power supply units and similar – Part 2: Particular requirements for safety isolating transformers for general use.*

A.1.2 ISO standards

1463:1982, *Metallic and oxide coatings – Measurement of coating thickness – Microscopical method.*

2178:1982, *Non-magnetic coatings on magnetic substrates – Measurement of coating thickness – Magnetic method.*

7000:1989, *Graphical symbols for use on equipment – Index and synopsis.*

A.2 Reference documents

60083:1997, *Plugs and socket-outlets for domestic and similar general use standardized in member countries of IEC.*

IECNORM.COM: Click to view the full PDF of IEC 60335-1:1991/AMD2:1999
Withdrawn

Annex B

Appliances powered by rechargeable batteries

B.8 Protection against access to live parts

B.8.2 *Replace the text by:*

Appliances having batteries which according to the instructions for use may be replaced by the user, need only have **basic insulation** between **live parts** and the inner surface of the battery compartment. If the appliance can be operated without the batteries, **double insulation** or **reinforced insulation** is required.

Annex F

Motors not isolated from the supply mains and having basic insulation not designed for the rated voltage of the appliance

F.19.101 *Add the following as the second dashed item:*

- *short circuit of each diode of the rectifier;*

Add the following note:

NOTE – The defects are simulated as shown in figure F.1.

Figure F.1 *Replace the legend by:*

—	original connection
---	short-circuited
≈	open circuit
A	short-circuit of the terminals of the motor
B	short-circuit of a diode
C	open circuit of the supply to the motor
D	open circuit of the shunt resistor

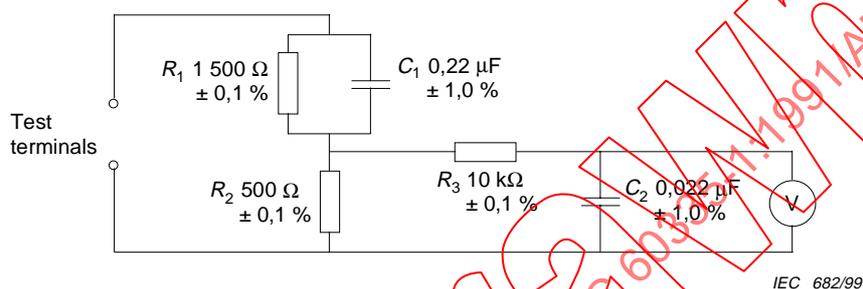
Annex G

Replace by:

Annex G (normative)

Circuit for measuring leakage current

Leakage currents are measured using the following circuit.



The leakage current is calculated from the reading of the voltmeter divided by 500 Ω .

NOTE 1 – This network simulates the impedance of the human body and takes into account the physiological reaction as a function of frequency.

NOTE 2 – The voltmeter is to be capable of measuring the true r.m.s. value from zero to 1 MHz.