

BS 3456 : Part 201 : 1990

EN 60 335 : Part 1 : 1988

UDC 621.365 : 64-621-83 : 614.8.004.1-777 : 621.396.669.8

British Standard Specification for

Safety of household and similar electrical appliances

Part 201. General requirements

Sécurité des appareils électrodomestiques et analogues
Partie 201. Règles générales

Sicherheit von Elektrogeräten für den Haushalt und ähnliche Zwecke
Teil 201. Allgemeine Anforderungen

This European Standard EN 60 335-1 has the status of a British Standard

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National foreword

This Part of BS 3456 has been prepared under the direction of the Light Electrical Engineering Standards Policy Committee and is the English language version of EN 60 335-1 'Safety of household and similar electrical appliances: Part 1: 'General requirements', published by the European Committee for Electrotechnical Standardization (CENELEC). It was derived from the 1983 reprint of IEC Publication 335-1 (Second edition, 1976), which has the same title as the European Standard, and incorporates Amendments 1, 2 and 3 to IEC 335-1.

This Part of BS 3456 partly supersedes Part 101 : 1987 of BS 3456. As in the case of Part 101 of BS 3456, this Part of BS 3456 gives general requirements. Many subordinate standards giving particular requirements for different types of appliances will be published which will refer to the general requirements given in this standard. Only when all the subordinate Sections of Part 102 have either been withdrawn or superseded by new Sections of Part 202 will it be possible to withdraw Part 101. This arrangement will follow a parallel arrangement in CENELEC.

Since the 1983 reprint Amendments 4, 5 and 6 to IEC Publication 335-1 have been published and it is expected that in CENELEC similar amendments to the European Standard will also be published. This will lead to amendments to this Part of BS 3456. Because the many IEC subordinate standards giving particular requirements refer to the IEC Standard at various stages of amendment, separate amendments will be made to this Part of BS 3456 so that the subordinate Sections of Part 202 of BS 3456 can be aligned with the parallel European and IEC Standards.

Compliance with the Electrical Equipment (Safety) Regulations 1975 will generally be assured if appliances comply with BS 3456. For more precise details regarding the relevance of BS 3456 to the Regulations, reference should be made to the 'Administrative Guidance on the Electrical Equipment (Safety) Regulations 1975 and the Electrical Equipment (Safety) (Amendment) Regulations 1976', available from HMSO (ISBN 0 11513 817 X).

Terminology and conventions. Some terminology and certain conventions are not identical with those used in British Standards. Attention is drawn to the fact that the page numbers quoted in the text of EN 60 335 : Part 1, in relation to figures, are the page numbers of IEC Publication 335-1. These page references do not therefore correspond to the EN page numbers as shown in the shoulder heading of each page; all the relevant figures may be found on EN pages 84 to 97.

Cross-references. Details of other international publications quoted in this Part of BS 3456 are given in the preface. Where there are British Standards either identical or technically equivalent to these international standards the relationship is given in a national appendix X.

Product approval. Attention is drawn to the fact that products conforming to this British Standard may be approved by the British Electrotechnical Approvals Board for the purposes of participation in the CENELEC Certification Agreement and in the CB Scheme of the IECEE. (Details of the BEAB Approval Marks Scheme are given on the inside of the back cover.)

Attention is drawn to the fact that it is possible that household appliances may need to comply with additional non-safety requirements specified in the Building Regulations and/or Water Byelaws.

Compliance with a British Standard does not of itself confer immunity from legal obligations.



Amendment No. 1
published and effective from 28 February 1990
to BS 3456 : Part 201 : 1990
[EN 60 335-1 : 1988]

Safety of household and similar electrical appliances
Part 201. General requirements

NOTE. The English language version of European Standard 60 335-1 : 1988 was implemented in the UK by the publication of BS 3456 : Part 201 : 1990. This amendment implements Amendment No. 2 to EN 60 335-1, Amendment No. 1 having already been included in EN 60 335-1 : 1988 and consequently BS 3456 : Part 201 : 1990.

Revised text

Text of EN 60 335-1. Amend the text of European Standard EN 60 335-1 in accordance with the details given on the attached pages.

National appendix X. Insert the following cross-references in the list given in national appendix X.

International Standards*	British Standards
HD 214	BS 5901 Method of test for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions (Technically equivalent)
HD 441	BS 6334 Methods of test for the determination of the flammability of solid electrical insulating materials when exposed to an igniting source (Technically equivalent)
HD 444.2.1	BS 6458 Fire hazard testing for electrotechnical products Part 2 : Methods of test Section 2.1 : Glow-wire test (Technically equivalent)
HD 444.2.2	BS 6458 Fire hazard testing for electrotechnical products Part 2 : Methods of test Section 2.2 : Needle-flame test (Technically equivalent)
HD 444.2.3	BS 6458 Fire hazard testing for electrotechnical products Part 2 : Methods of test Section 2.3 : Bad-connection test with heaters. (Technically equivalent)
IEC 817	BS 7003 Specification for spring-operated impact-test apparatus and its calibration (Identical)

UDC 621.365 : 64-621-83 : 64 : 614.8.004.1-777 : 621.396.669.8

Key words: Household electrical appliance; protection against electric shock; protection against fire risk; protection against mechanical hazard

Amendment 2 to the English version of EN 60 335-1

Safety of household and similar electrical appliances Part 1. General requirements

(Amendment No. 4 (1984) to IEC 335-1 (1976) modified)

Sécurité des appareils électrodomestiques et
analogues
Première partie. Règles générales (Modification
no. 4 (1984) à la CEI 335-1 (1976), modifiée)

Sicherheit elektrischer Geräte für den
Hausgebrauch und ähnliche Zwecke
Teil 1. Allgemeine Anforderungen (Nachtrag 4
(1984) zur IEC 335-1 (1976), modifiziert)

Amendment 2 modifies the European Standard EN 60 335-1, edition June 1988.

It was ratified by CENELEC on 2 March 1988.

This amendment exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CENELEC Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxemburg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Electrotechnische Normung

Central Secretariat: rue Bréderode 2, B-1000 Brussels

FOREWORD

This amendment has been prepared by the Secretariat of CENELEC Technical Committee 61.

The following dates are applicable

- date of announcement (doa) 1988-06-01
- date of latest publication (dop) 1989-01-01

This document supplements or modifies the corresponding clauses of Amendment No. 4 to IEC 335-1, so as to convert it into Amendment 2 to EN 60 335-1.

There are no special national conditions (snc) causing a deviation from this amendment.

There are no national deviations from this amendment.

BRIEF HISTORY

The proposal to endorse Amendment No. 4 to IEC Publication 335-1, document CENELEC/TC 61 (SEC) 463, was circulated under the enquiry procedure in November 1985.

This proposal was discussed during the Nice meeting in November 1986 when it was decided to submit a draft for an amendment to EN 60 335-1 to the voting procedure. This procedure started in September 1987.

The text of this draft was ratified by the CENELEC Technical Board on 2 March 1988.

CONTENTS

Add the following after APPENDIX G:

APPENDIX H – Selection and sequence of the tests of Clause 30

APPENDIX J – Burning test

APPENDIX K – Glow-wire test

APPENDIX L – Bad-connection test with heaters

APPENDIX M – Needle-flame test

APPENDIX N – Proof tracking test

APPENDIX O – Severity of the duty conditions of insulating material with respect to the risk of tracking

PREFACE

Add the following to the list headed '*Other publications quoted in this standard*':

HD 214:	Method for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions.
HD 441:	Methods of test for the determination of the flammability of solid electrical insulating materials when exposed to an igniting source.
HD 444.2.1:	Fire hazard testing. Part 2: Test Methods. Glow-wire test and guidance.
HD 444.2.2:	Fire hazard testing. Part 2: Test Methods. Needle-flame test.
HD 444.2.3:	Fire hazard testing. Part 2: Test Methods. Bad-connection test with heaters.

INFORMATION as to original IEC text

It reads:

Add the following to the list of notes regarding differing national practices:

Sub-clause 23.9: consolidation of the ends of stranded conductors by lead-tin soldering is allowed.

Sub-clause 30.3: the glow-wire test referred to in Appendix K is made at a higher temperature. In some other countries, the material of the enclosure of certain appliances may be required to be classified in accordance with IEC Publication 707. Moreover, if there is no evidence with regard to the classification of the material, the enclosure may be required to withstand the needle-flame test referred to in Appendix M and additional tests with regard to the resistance to ignition may be necessary.

Add the following to the list of other IEC publications quoted:

112 (1979)	Method for Determining the Comparative and the Proof Tracking Indices of Solid Insulating Materials under Moist Conditions.
695-2-1 (1980):	Fire Hazard Testing. Part 2: Test Methods. Glow-wire Test and Guidance.
695-2-2 (1980):	Needle-flame Test.
695-2-3(1984)	Bad-connection Test with Heaters.
707 (1981):	Methods of Test for the Determination of the Flammability of Solid Electrical Insulating Materials when Exposed to an Igniting Source.
817 (1984)	Spring-operated Impact-test Apparatus and its Calibration.

Addition:

This amendment replaces IEC Publication 553: Report on Evaluation of Non-metallic Enclosures and Other Parts of Household and Similar Appliances with Regard to Resistance to Fire.

7. Marking

7.14 Addition:

If compliance with this standard depends upon the operation of a replaceable thermal link, the reference number or other means for identifying the link shall be marked on the link or at a place such that it is clearly visible when the appliance has been dismantled to the extent necessary for replacing the link.

15. Moisture resistance

15.1 Modification:

Instead of the particular reference to traces of water on insulation, the following applies:

in particular, there shall be no trace of water on insulation which could result in a reduction of creepage distances and clearances below the values specified in Sub-clause 29.1.

Addition:

For the tests of Sub-clauses 15.2 and 15.3, appliances for building-in are built in in accordance with the manufacturer's instructions.

15.3 Modification:

Instead of the particular reference to traces of water on insulation, the following applies:

in particular, there shall be no trace of water on insulation which could result in a reduction of creepage distances and clearances below the values specified in Sub-clause 29.1.

21. Mechanical strength

21.1 Modification:

Instead of the description how to support the sample, the following applies:

The sample as a whole is rigidly supported against a plane surface and three blows are applied to every point of the enclosure that is likely to be weak.

Deletion.

INFORMATION as to original IEC text

It reads:

Addition:

For the calibration of the spring-operated impact-test apparatus, see IEC Publication 817: Spring-operated Impact-test Apparatus and its Calibration.

22. Construction

22.15 Delete this sub-clause.

23. Internal wiring

Additional sub-clause:

- 23.9 Stranded conductors shall not be consolidated by lead-tin soldering where they are subject to contact pressure, unless the clamping means is so designed that there is no risk of bad contact due to cold flow of the solder.

Compliance is checked by inspection.

Consolidation of stranded conductors by lead-tin soldering is allowed if spring terminals are used; securing the clamping screws alone is not considered adequate.

Soldering of the tip of a stranded conductor is allowed.

25. Supply connection and external flexible cables and cords

25.4 Addition:

Type X attachment shall not be used for flat twin tinsel cords.

25.6 Modification:

Instead of the types of power supply cord specified, the following applies:

Power supply cords shall be not lighter than:

- braided flexible cord (code designation H03 RT-F), if specifically allowed in the relevant Part 2;

INFORMATION as to original IEC text
The code designation H03 RT-F reads 245 IEC 51.

- ordinary tough rubber sheathed flexible cord (code designation H05 RR-F) or ordinary polychloroprene sheathed flexible cord (code designation H05 RN-F);

INFORMATION as to original IEC text
It reads:

- ordinary tough rubber sheathed flexible cord (code designation 245 IEC 53);

- flat twin tinsel cord (code designation H03 VH-Y), if specifically allowed in the relevant Part 2;

- light polyvinyl chloride sheathed flexible cord (code designation H03 VV-F or H03 VVH2-F), for appliances having a mass not exceeding 3 kg;

- ordinary polyvinyl chloride sheathed flexible cord (code designation H05 VV-F or H05 VVH2-F), for appliances having a mass exceeding 3 kg.

INFORMATION as to original IEC text
The code designations given above read as follows:
H03 VH-Y is 227 IEC 41
H03 VV-F or H03 VVH2-F is 227 IEC 52
H05 VV-F or H05 VVH2-F is 227 IEC 53

25.10 *Add the following sentence to the first paragraph:*

The curvature shall extend over an angle of at least 60°, as shown in Figure 19.

Replace the table by the following:

Rated current of appliance (A)	Nominal cross-sectional area (mm ²)
Up to and including 0.2	tinsel cord ¹⁾
over 0.2 up to and including 3	0.5 ²⁾
over 3 up to and including 6	0.75
over 6 up to and including 10	1
over 10 up to and including 16	1.5
over 16 up to and including 25	2.5
over 25 up to and including 32	4
over 32 up to and including 40	6
over 40 up to and including 63	10
¹⁾ This type of cord is only allowed if specifically stated in the relevant Part 2 and if the length of the power supply cord, measured between the point where the cord, or cord guard, enters the appliance, and the entry to the plug, does not exceed 2 m. ²⁾ This nominal cross-sectional area is only allowed if the length of the power supply cord, measured between the point where the cord, or cord guard, enters the appliance, and the entry to the plug, does not exceed 2 m.	

25.11 *Replace the paragraph preceding the table by the following:*

Immediately afterwards, the cable or cord, other than that of an automatic cord reel, is subjected for 1 min to a torque of the value shown in the following table.

26. Terminals for external conductors

26.2 *Replace the text preceding the table by the following:*

Terminals for the connection to fixed wiring and those for type X attachment shall allow the connection of conductors having nominal cross-sectional areas as shown in the following table, unless the appliance is so designed that only one type of cable or cord can be fitted, in which case the terminals shall be suitable for the connection of that cable or cord.

26.3 *Addition:*

Terminals with screw clamping and screwless terminals shall not be used for the connection of the conductors of flat twin tinsel cords.

28. Screws and connections

28.5 *Addition:*

The second requirement does not imply that more than one rivet is necessary for providing earthing continuity.

29. Creepage distances, clearances and distances through insulation

29.1 Replace the seventh paragraph of the test specification by the following:

If necessary, a force is applied to any point on bare conductors other than those of heating elements, to any point on uninsulated metal capillary tubes of thermostats and similar devices and to the outside of metal enclosures, in an endeavour to reduce the creepage distances and clearances while taking the measurements.

Addition:

In the last line of the explanation, replace the reference to 'Sub-clause 30.3' by 'Sub-clause 30.5'.

30. Resistance to heat, fire and tracking

Replace this clause by the following¹⁾:

30.1 External parts of non-metallic material and parts of insulating material retaining live parts in position, the deterioration of which might cause the appliance to fail to comply with this standard, shall be sufficiently resistant to heat.

Compliance is checked by subjecting a specimen of the relevant parts to a ball-pressure test, which is made by means of the apparatus shown in Figure 14.

INFORMATION as to original IEC text
After figure 14, 'page 131' is given.

Before starting the test, the specimen is kept for 24 h in an atmosphere having a temperature between 15 °C and 35 °C and a relative humidity between 45 % and 75 %.

The specimen is placed on a support in such a way that its upper surface is horizontal and a steel ball having a diameter of 5 mm is pressed against this surface with a force of 20 N. The thickness of the specimen is at least 2.5 mm, this thickness being obtained, if necessary, by placing two or more specimens together.

The test is made in a heating cabinet at a temperature the value of which is the higher of 40 °C (40 K) plus the maximum temperature rise determined during the test of Clause 11, with a tolerance of ± 2 °C (± 2 K), and:

75 $\pm$ 2 °C for external parts,

125 $\pm$ 2 °C for parts retaining live parts in position.

However, for parts of thermoplastic material providing supplementary insulation or reinforced insulation, the test is made at a temperature which is 25 °C (25 K) in excess of the maximum temperature rise determined during the tests of Clause 19, with a tolerance of ± 2 °C (2 K), if this will lead to a higher temperature.

Before the test is started, the ball and the support on which the specimen is placed are brought to the temperature specified.

After 1 h, the ball is removed from the specimen, which is then cooled, within 10 s, to approximately room temperature by immersion in cold water. The diameter of the impression caused by the ball is then measured and shall not exceed 2 mm.

For coil formers, only those parts which support or retain in position terminals or terminations are subjected to the test.

The test is not made on parts of ceramic material.

¹⁾ The tests specified in this clause are based on the present IEC standards dealing with this subject. Other concepts for determining the resistance to fire, such as preselection testing, are under consideration by the IEC and will be studied when available.

Appendix H shows the selection and sequence of the tests of this clause.

- 30.2 Parts of non-metallic material shall be adequately resistant to ignition and to spread of fire.

This requirement does not apply to decorative trims, knobs and other parts not likely to be ignited or to propagate flames originating from inside the appliance.

Compliance is checked by the tests of Sub-clauses 30.3 and 30.4.

- 30.3 Separately moulded specimens of the relevant parts are subjected to the burning test referred to in Appendix J.

If separately moulded specimens are not available, or if there is no evidence that the material withstands the burning test, or if the separately moulded specimens do not withstand that test, the glow-wire test referred to in Appendix K is made on the relevant parts of the appliance, the test being made at a temperature of 550 °C, unless a higher temperature is specified in the relevant Part 2.

- 30.4 For appliances which are operated while attended, parts of insulating material retaining in position connections carrying a current exceeding 0.5 A and which, in the event of a failure, might give rise to fire hazard, are subjected to the glow-wire test referred to in Appendix K, the test being made at a temperature of 750 °C.

This test is, however, not made on hand-held appliances, on appliances which have to be kept switched on by hand and on appliances which are continuously loaded by hand.

For appliances liable to be operated while unattended, connections retained in position by parts of insulating material and carrying a current exceeding 0.5 A and which, in the event of a failure, might give rise to fire hazard, are subjected to the bad-connection test with heaters referred to in Appendix L or, if this test cannot be made due to the design of the connection, the parts of insulating material retaining the connection in position are subjected to the glow-wire test referred to in Appendix K, the test being made at a temperature of 850 °C.

If the parts do not withstand the glow-wire test or the bad-connection test with heaters, the needle-flame test referred to in Appendix M is made on all other parts of non-metallic material which are positioned within a distance of 50 mm from those parts, unless these other parts are shielded by a separate barrier or enclosure from the parts originally tested, in which case the barrier or enclosure is subjected to the needle-flame test.

Examples of connections which, in the event of a failure, might give rise to fire hazard are screw connections which may be made or remade during installation or user servicing of the appliance.

- 30.5 Insulating material across which a tracking path may occur between live parts of different polarity or between live parts and earthed metal parts, and insulating material of commutators and brush-caps, shall have adequate resistance to tracking, taking into account the severity of its duty conditions.

INFORMATION as to original IEC text
The preceding paragraph ends 'as specified in the relevant Part 2.'

For parts of insulating material used under severe or extra-severe duty conditions, compliance is checked by the proof tracking test referred to in Appendix N.

For parts of insulating material used under normal duty conditions and parts of ceramic material, no tracking test is made.

INFORMATION as to original IEC text
The paragraph above reads:

For parts of insulating material other than ceramic, compliance is checked by the proof tracking test referred to in Appendix N.

For parts of insulating material used under severe duty conditions, the test voltage is 175 V. If the specimens do not withstand this test and there is no hazard other than fire, surrounding parts are subjected to the needle-flame test referred to in Appendix M.

For parts of insulating material used under extra-severe duty conditions, the test voltage is 250 V. If the specimens do not withstand this test, but withstand the test made with a test voltage of 175 V, and there is no hazard other than fire, surrounding parts are subjected to the needle-flame test referred to in Appendix M.

The needle-flame test is made on all parts of non-metallic material positioned within a distance of 50 mm from any place where a tracking path may occur, unless these parts are shielded by a separate barrier or enclosure from that tracking path, in which case the barrier or enclosure is subjected to the needle-flame test.

For the severity of the duty conditions of insulating material, see Appendix O.

Figure 15

Delete this figure.

After Figure 18 add the new Figure 19.

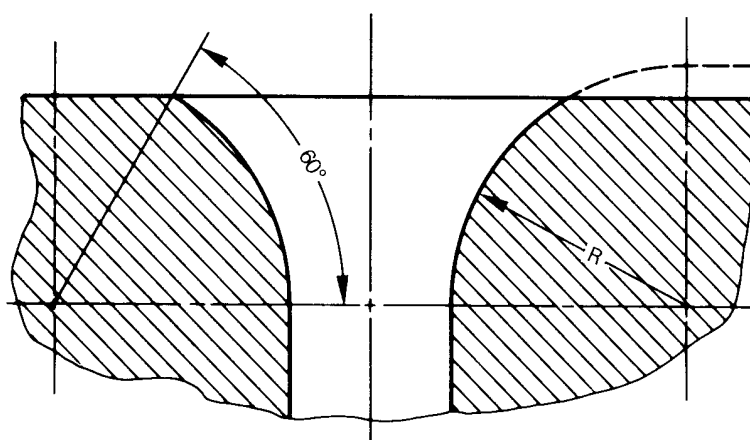


FIG. 19. — Rounding of bell-mouthed opening for power supply cord.

APPENDIX B

Introduce the following before Clause B16.

B11. Heating

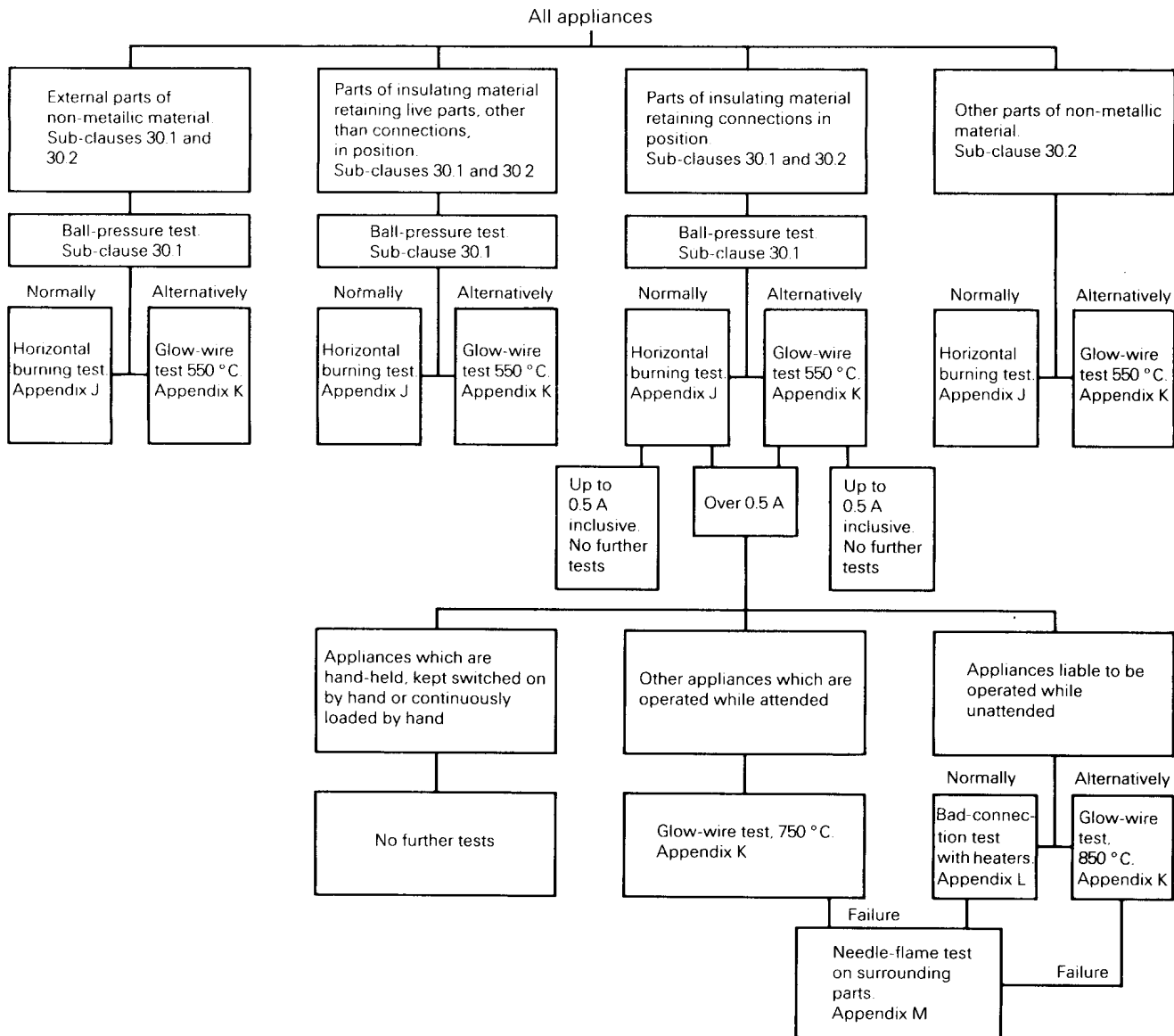
B11.8 For capacitors used in electronic circuits, temperature rises are not determined.

Add the following Appendices H to O.

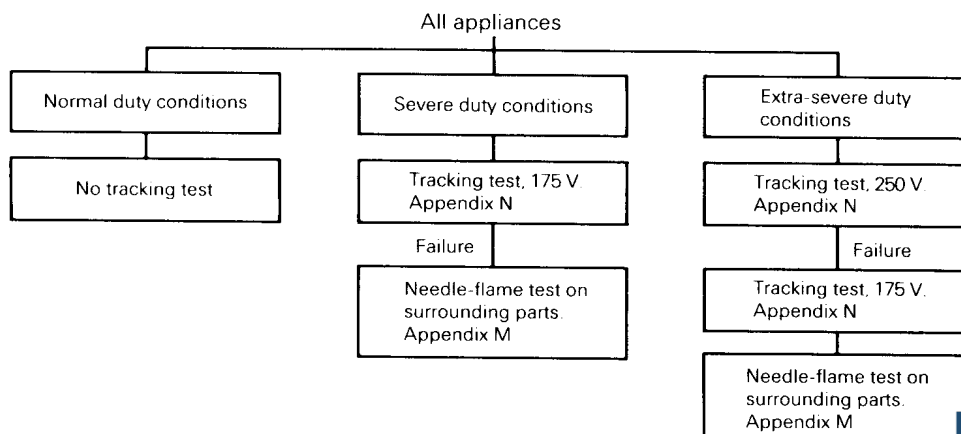
APPENDIX H

SELECTION AND SEQUENCE OF THE TESTS OF CLAUSE 30

Resistance to heat and fire



Resistance to tracking



APPENDIX J

BURNING TEST

The burning test is made in accordance with HD 441: Methods of Test for the Determination of the Flammability of Solid Electrical Insulating Materials when Exposed to an Igniting Source.

INFORMATION as to original IEC text
IEC Publication 707 is cited instead of HD 441.

For the purpose of this standard, method FH, Flame-Horizontal specimen, is used.

For the evaluation of the test results, category FH3 applies, the maximum burning rate being 40 mm/min.

If more than one specimen do not withstand the test, the material is rejected.

If one specimen does not withstand the test, the test is repeated on another set of five specimens, all of which shall then withstand the test.

APPENDIX K

GLOW-WIRE TEST

The glow-wire test is made in accordance with HD 444-2-1: Fire Hazard Testing, Part 2: Test Methods, Glow-wire Test and Guidance.

INFORMATION as to original IEC text
IEC Publication is cited instead of HD 444-2-1.

For the purpose of this standard, the following applies.

Addition:

3. General description of the test

The last but one paragraph on page 7 is replaced by:

If the specimen is a sub-assembly or component, it is removed from the appliance or the test is made on a separate identical part.

INFORMATION as to original IEC text
The addition to Clause 3 is not included.

4. Description of test apparatus

Deletion.

The last paragraph on page 9 and the first paragraph and the note on page 11 are not applicable.

INFORMATION as to original IEC text
It reads:

The first paragraph on page 11 is replaced by:

In cases where burning or glowing particles might fall from the specimen onto an external surface underneath the complete appliance, the test is made with a piece of white pine-wood board, approximately 10 mm thick and covered with a single layer of tissue paper, positioned at a distance of 200 ± 5 mm below the place where the tip of the glow-wire is applied to the specimen. If the specimen is a complete appliance, the appliance itself, in its normal position of use, is placed on, or mounted above, the pine-wood board covered with a single layer of tissue paper. Before starting the test, the board is conditioned as described in Clause 7 for the specimen.

5. Severities

The duration of application of the tip of the glow-wire to the specimen is 30 ± 1 s.

10. Observations and measurements

Item c) does not apply.

APPENDIX L

BAD-CONNECTION TEST WITH HEATERS

The bad-connection test with heaters is made in accordance with HD 444-2-3: Part 2: Test Methods. Bad-connection Test with Heaters.

INFORMATION as to original IEC text
IEC Publication 695-2-3 is cited instead of HD 444-2-3.

For the purpose of this standard, the following applies.

3. General description of the test

Add the following:

Crimped connections are not subjected to the test if either:

- a bad connection cannot give rise to a fire hazard;
- the continuous current is less than 0.5 A, or
- the conductors are chosen in accordance with the following table and are used together with the correct matching connector:

Continuous current (A)	Cross-sectional area (mm ²)	
	a	b
0.5 up to and including 4.0	—	0.5
4.0 up to and including 6.0	0.75	1.0
6.0 up to and including 10.0	1.0	1.5
10.0 up to and including 16.0	1.5	2.5
16.0 up to and including 25.0	2.5	4.0

Column a applies to tinned stranded conductors.
Column b applies to other stranded conductors.

Crimped connections are not considered to give rise to a fire hazard, if the insulating parts which retain the connections withstand the glow-wire test described in Appendix K, at the test temperatures specified in Sub-clause 30.4.

Sleeves on the ends of stranded conductors intended for insertion into screw terminals are not regarded as crimped connections in the sense of this requirement.

When establishing the value of the continuous current, inrush currents are disregarded.

4. Description of test apparatus

The paragraph concerning the evaluation of the possibility of spread of fire on page 11, including the three dashed paragraphs, and the first paragraph of the note, are replaced by:

In cases where burning or glowing particles might fall from the specimen onto an external surface underneath the complete appliance, the test is made with a piece of white pine-wood board, approximately 10 mm thick and covered with a single layer of tissue paper, positioned at a distance of 200 ± 5 mm below the place where the test flame is applied to the specimen. If the specimen is a complete appliance, the appliance itself, in its normal position of use, is placed on, or mounted above, the pine-wood board covered with a single layer of tissue paper. Before starting the test, the board is conditioned as described in Clause 6 for the specimen.

5. Severities

The duration of application of the test power is 30 ± 1 min.

8. Test procedure

Sub-clause 8.6 is replaced by:

The test is made on one specimen. If the specimen does not withstand the test, the test is repeated on two further specimens, both of which shall then withstand the test.

11. Information to be given in the relevant specification

The first dashed paragraph under Item h does not apply.

APPENDIX M

NEEDLE-FLAME TEST

The needle-flame test is made in accordance with HD 444-2-2: Part 2: Test Methods. Needle-flame Test.

INFORMATION as to original IEC text
IEC Publication 695-2-2 is cited instead of HD 444-2-2.

For the purpose of this standard, the following applies.

4. Description of test apparatus

The sixth paragraph is replaced by:

In cases where burning or glowing particles might fall from the specimen onto an external surface underneath the complete appliance, the test is made with a piece of white pine-wood board, approximately 10 mm thick and covered with a single layer of tissue paper, positioned at a distance of 200 ± 5 mm below the place where the test flame is applied to the specimen. If the specimen is a complete appliance, the appliance itself, in its normal position of use, is placed on, or mounted above, the pine-wood board covered with a single layer of tissue paper. Before starting the test, the board is conditioned as described in Clause 6 for the specimen.

5. Severities

The duration of application of the test flame is 30 ± 1 s.

8. Test procedure

The words "or from any source of ignition accidentally applied", occurring in Sub-clause 8.4, do not apply.

Moreover, the last paragraph on page 11 and the first paragraph on page 13 are replaced by:

At the beginning of the test, the test flame is applied in such a way that at least the tip of the flame is in contact with the surface of the specimen.

During application of the test flame, the burner must not be moved. The test flame is removed immediately after the specified period of time has elapsed. For examples of test positions, see Figure 1, page 16.

Sub-clause 8.5 is replaced by:

The test is made on one specimen. If the specimen does not withstand the test, the test is repeated on two further specimens, both of which shall then withstand the test.

10. Evaluation of test results

Add the following:

When a layer of tissue paper is used, there shall be no ignition of the tissue paper or scorching of the white pine-wood board, a slight discoloration of the white pine-wood board being neglected.

APPENDIX N

PROOF TRACKING TEST

The proof tracking test is made in accordance with HD 214: Method for Determining the Comparative and the Proof Tracking Indices of Solid Insulating Materials under Moist Conditions.

INFORMATION as to original IEC text
IEC Publication 112 is cited instead of HD 214.

For the purpose of this standard, the following applies.

3. Test specimen

The last sentence of the first paragraph does not apply.

5. Test apparatus

The note in Sub-clause 5.1 does not apply.

Moreover, Note 4 in Sub-clause 5.3 does not apply and the test solution A described in Sub-clause 5.4 is used.

6. Procedure

The voltage referred to in Sub-clause 6.1 is set to the value specified for the test voltage in Sub-clause 30.5 of this standard.

Moreover, Sub-clause 6.2 does not apply and the proof tracking test of Sub-clause 6.3 is made five times; for the latter test, Notes 2 and 3 of Clause 3 also apply.

APPENDIX O

SEVERITY OF THE DUTY CONDITIONS OF INSULATING MATERIAL WITH RESPECT TO THE RISK OF TRACKING

The severity of the duty conditions of the insulating material with respect to the risk of tracking depends upon the rate of accumulation of any conductive deposit and upon the period of time during which the insulating material is subjected to electric stress.

For the purpose of the requirement, the following duty conditions are recognized.

1. *Normal duty conditions*: there is substantially no deposition of conductive material and a long period of electric stress, or a light deposition of conductive material and a short period of electric stress.

The insulating materials used in many household appliances are not considered to be subject to deposition of conductive material.

The insulating materials used in motors which produce carbon dust, or in switching devices which are subject to deposition of conductive material, but withstand the relevant electric strength test made after an appropriate endurance test, are considered to be subject to a light deposition of conductive material.

Insulating materials having a proof tracking index (P.T.I.) below 175 are considered to be adequate for use under normal duty conditions.

2. *Severe duty conditions*: there is a light deposition of conductive material and a long period of electric stress, or a heavy deposition of conductive material and a short period of electric stress.

The insulating materials used in heating appliances where the air from household premises is caused to blow over these materials, for example in fan heaters, are considered to be subject to a light deposition of conductive material and a long period of electric stress.

3. *Extra-severe duty conditions*: there is a heavy deposition of conductive material and a long period of electric stress, or an extra-heavy deposition of conductive material and a short period of electric stress.

Examples of insulating materials used under extra-severe duty conditions are:

- insulating materials used for those parts of a refrigerator which are subject to condensation or to heavy deposition of conductive material, the refrigerator being on circuit continuously for a very long period;
- insulating materials used for those parts of a washing machine or a dishwasher which are subject to pollution by detergents and to a short period of electric stress.

A long period of electric stress is considered to exist between live parts of different polarity and between live parts and earthed metal parts in the case of:

- appliances intended for continuous operation;
- the input side of a mains switch of appliances not intended for continuous operation;

- appliances provided with a single-pole switch or similar device and connected to the supply by means of a reversible plug or the like.

If there is no single-pole switch, it is assumed that appliances not intended for continuous operation are disconnected in all poles from the supply by means of a switch in the fixed wiring or a plug and that, therefore, a long period of electric stress will not occur.



Amendment No. 10
published and effective from 15 June 1994
to BS 3456 : Part 201 : 1990

Specification for safety of household and similar electrical appliances
Part 201. General requirements

NOTE. The English language version of European Standard EN 60335-1 was implemented in the United Kingdom by the publication of BS 3456 : Part 201 : 1990. This amendment implements the corrigendum to EN 60335-1.

This amendment together with the European Standard EN 60335-1 : 1988 has the status of a British Standard.

Revised text

National foreword

Delete sentence 1 of paragraph 3, as added by Amendment 8, and substitute 'Amendments A52 to A55 and the corrigenda to EN 60335-1 have been implemented as Amendments 5 to 10 to Part 201 of BS 3456.'

AMD 8213/June 1994

Text of EN 60335-1

In annex ZY, insert the following in clause 1.

- 24 SWEDEN (Ordinance 1991 : 1290)
- Mercury is not allowed in switches and controls, such as level switches, thermostats and relays.

AMD 8213/June 1994



Amendment No. 2
published and effective from 30 November 1990
to BS 3456 : Part 201 : 1990
[EN 60 335-1 : 1988]

Safety of household and similar electrical appliances
Part 201. General requirements

NOTE. The English language version of European Standard 60 335-1 : 1988 was implemented in the UK by the publication of BS 3456 : Part 201 : 1990. This amendment implements Amendment No. 5 to EN 60 335-1.

Revised text

Text of EN 60 335-1. Amend the text of European Standard EN 60 335-1 in accordance with the details given on the attached pages.

The common modifications on page 4 have been incorporated as specified.

National appendix X. Insert the following cross-references in the list given in national appendix X.

'HD 395.1

BS 5724 Medical electrical equipment
 Part 1. Specification for general safety requirements
 (Technically equivalent)

IEC 384-14

BS 6201 Fixed capacitors for use in electronic equipment
 Part 3 : 1982 Specification for fixed capacitors for radio interference suppression. Selection of methods of test and general requirements
 (Identical)

UDC: 621.365 : 64-621-83 : 64 : 614.8.004.1-777 : 621.396.669.8

Key words: Household electrical appliance; protection against electric shock; protection against fire risk; protection against mechanical hazard.

Amendment 5 to the English version of EN 60 335-1
Safety of household and similar electrical appliances
Part 1: General requirements
(Amendment No. 5 (1986) to IEC 335-1 (1976) modified)

Sécurité des appareils électrodomestiques et
analogues
Première partie: Règles générales (Modification
no. 5 (1986) à la CEI 335-1 (1976), modifiée)

Sicherheit elektrischer Geräte für den Hausgebrauch
und ähnliche Zwecke
Teil 1: Allgemeine Anforderungen (Nachtrag 5
(1986) zur IEC 335-1 (1976), modifiziert)

Amendment 5 modifies the European Standard EN 60 335-1, edition June 1988.

It was ratified by CENELEC on 7 March 1989.

This amendment exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CENELEC Central Secretariat has the same status as the official versions.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

General Secretariat: rue Bréderode 2, B-1000 Brussels

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Brief history

The proposal to endorse Amendment No. 5 to IEC Publication 335-1, document CENELEC/TC 61 (SEC) 513, was circulated under the enquiry procedure in October 1986.

This proposal was discussed during the Neusiedl meeting in May 1988 when it was decided to submit a draft for an amendment to EN 60 335-1 to the voting procedure. This procedure started in September 1988.

The text of this draft was ratified by the CENELEC Technical Board on the 7th of March 1989.

There are no amendments numbered 3 and 4 to EN 60 335-1.

Foreword

This amendment has been prepared by the Secretariat of CENELEC Technical Committee 61.

The following dates are applicable

- date of announcement (doa) 1989-09-01
- date of latest publication (dop) 1990-03-01

This document supplements or modifies the corresponding clauses of Amendment No. 5 to IEC 335-1, so as to convert it into Amendment 5 to EN 60 335-1.

There are no special national conditions (snc) causing a deviation from this amendment.

There are no national deviations from this amendment.

Endorsement notice

Amendment No. 5 (1986) to IEC 335-1 applies, taking into account the following common modifications.

Common modifications

- Prefaces Delete the first preface.
Replace the text of the second preface by:
Add the following to the list of other publications quoted:
HD 395.1: Safety of medical electrical equipment.
IEC 384-14: Fixed capacitors for use in electronic equipment, Part 14: Sectional specification: Fixed capacitors for radio interference suppression. Selection of methods of test and general requirements.
IEC 685-2-1: Connecting devices (junction and/or tapping) for household and similar fixed electrical installations, Part 2: Particular requirements. Screwless terminals for connecting copper conductors without special preparation.

1. **Scope**
 - 1.1 Replace 'IEC Publication 601' by 'HD 395.1'.
8. **Protection against electric shock**

Add:

 - 8.6 Delete the word 'live' from the fifth line.
26. **Terminals for external conductors**
 - 26.9 Delete.
29. **Creepage distances, clearances and distances through insulation**
 - 29.1 Delete the first line and the table.

Appendix B Delete the modifications.

Prefaces

Delete the first preface.

INFORMATION as to original IEC text.

It reads:

PREFACE

This amendment has been prepared by Technical Committee No. 61:
Safety of Household and Similar Electrical Appliances.

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

Six Months' Rule	Reports on Voting
61(CO)366	61(CO)436, 436A
61(CO)378	61(CO)426
61(CO)379	61(CO)437
61(CO)381	61(CO)428
61(CO)382	61(CO)429
61(CO)382A	61(CO)459
61(CO)383	61(CO)430
61(CO)402	61(CO)448
61(CO)403	61(CO)449
61(CO)404	61(CO)450
61(CO)405	61(CO)451
61(CO)406	61(CO)452
61(CO)413	61(CO)455

Further information can be found in the relevant Reports on Voting indicated in the table above.

Replace the text of the second preface by:

Add the following to the list of other publications quoted:

- HD 395.1: Safety of medical electrical equipment.
- IEC 384-14: Fixed capacitors for use in electronic equipment, Part 14 : Sectional specification: Fixed capacitors for radio interference suppression. Selection of methods of test and general requirements.
- IEC 685-2-1: Connecting devices (junction and/or tapping) household and similar fixed electrical installations, Part 2: Particular requirements. Screwless terminals for connecting copper conductors without special preparation.

INFORMATION as to original IEC text.

It reads:

Add the following to the list of notes regarding differing national practices.

Sub-clause 4.6: In some countries appliances are tested at a voltage based on the nominal system voltage regardless of the rated voltage of the appliance.

Add the following to the list of other IEC publications quoted:

- 384-14 (1981): Fixed Capacitors for Use in Electronic Equipment, Part 14: Sectional Specification: Fixed Capacitors for Radio Interference Suppression. Selection of Methods of Test and General Requirements.
- 601 (1977): Safety of Medical Electrical Equipment.
- 685-2-1 (1980): Connecting Devices (Junction and/or Tapping) for Household and Similar Fixed Electrical Installations, Part 2: Particular Requirements. Screwless Terminals for Connecting Copper Conductors without Special Preparation.

1. Scope

1.1 *Replace the line referring to appliances for medical purposes by the following:*

- appliances for medical purposes (HD 395.1 : Safety of Medical Electrical Equipment).

INFORMATION as to original IEC text.

It reads:

- appliances for medical purposes (IEC Publication 601: Safety of Medical Electrical Equipment).

2. Definitions

2.2.5 *Replace the explanation by the following:*

If no current is assigned to the appliance, the rated current for the purpose of this standard is:

- for heating appliances, the current determined from the rated input and the rated voltage;
- for motor-operated appliances, the current measured when the appliance is operating under normal load at rated voltage.

2.2.10 *Replace the definitions for type M, type Y and type Z attachments by the following:*

- **type M attachment** denotes a method of attachment such that the flexible cable or cord can easily be replaced without the aid of special purpose tools, by a special cable or cord with, for example, a moulded-on cord guard or crimped terminations or by replacing a part of the appliance incorporating the cord;
- **type Y attachment** denotes a method of attachment such that the flexible cable or cord can only be replaced by the use of a special purpose tool either for gaining access to the connections or for making the connections.

Type Y attachment may be used either with a common flexible cable or cord, or with a special cable or cord:

- **type Z attachment** denotes a method of attachment such that the flexible cable or cord cannot be replaced without breaking or destroying the appliance.

2.2.27 *Add the following explanation:*

Adhesives are not recognized as a means for fastening a fixed appliance to a support, unless specifically allowed in Part 2.

Add the following definition:

2.2.49 **Function and interconnection cable or cord** denotes a flexible cable or cord provided as part of a complete appliance for purposes other than connection to the supply mains.

A remote hand-held switching device, an exposed interconnection between two parts of an appliance or a separate signalling circuit are examples of function and interconnection cables or cords.

4. General notes on tests

4.6 *Replace the first sentence of the last explanation by the following:*

If a heating appliance not incorporating a motor is designed for one rated voltage range, the upper limit of the voltage range will usually be the most unfavourable voltage within the range.

4.9 *Replace the first paragraph of the explanation by the following:*

If the adjusting means of the control is accessible without the aid of a tool, this sub-clause applies whether the setting can be altered by hand or with the aid of a tool; if the adjusting means is not accessible without the aid of a tool and if the setting is not intended to be altered by the user, this sub-clause does not apply.

7. Marking

7.1 *Delete the additional requirement regarding motors with windings insulated with Class B, Class F or Class H material.*

7.6 Add the following explanation:

Additional symbols are allowed provided they do not give rise to misunderstanding.

7.7 Add the following before the first line of the requirement:

Except for type Z attachment, terminals shall be indicated as follows.

7.12 Replace the requirement regarding appliances with type Z attachments by the following:

The instruction sheet shall contain the substance of the following information:

- for appliances with type M attachment:
If the supply cord of this appliance is damaged, it must be replaced by the special cord (quote the appropriate part reference);
- for appliances with type Y attachment:
If the supply cord of this appliance is damaged, it must only be replaced by a repair shop appointed by the manufacturer, because special purpose tools are required;
- for appliances with type Z attachment:
The supply cord of this appliance cannot be replaced; if the cord is damaged, the appliance should be discarded.

7.14 Addition:

For stationary appliances at least the maker's or responsible vendor's name, trade-mark or identification mark and the maker's model or type reference shall be visible when the appliance is installed as in normal use; these markings need not be placed together and may be beneath a detachable cover.

Add the following explanation:

The petroleum spirit to be used for the test is aliphatic solvent hexane having a maximum aromatics content of 0.1% by volume, a kauri-butanol value of 29, an initial boiling point of approximately 65 °C, a dry point of approximately 69 °C and a specific mass of approximately 0.68 kg/l.

8. Protection against electric shock

8.1 Add the following explanation:

For appliances provided with a power supply cord and without a switching device in their supply circuit, the withdrawal of the plug from a fixed socket-outlet is considered to be a single switching action.

8.6 Add:

Delete the word 'live' from the fifth line.

11. Heating

11.8 In footnote ¹⁾ of the table replace the word "below" by "above".

14. Radio and television interference suppression

14.1 Replacement:

Attention is drawn to the fact that compliance with the requirements concerning the limits for interference effects generated by the appliance, as specified in the C.I.P.S.R. recommendations and when measured in

accordance with the relevant C.I.S.P.R. specifications, will in most cases ensure that the appliance has the required degree of radio and television interference suppression.

Under particularly unfavourable conditions, national authorities may require a greater degree of suppression than that recommended by the C.I.S.P.R., which may necessitate the fitting of additional suppressors; it is therefore recommended that this be taken into account when designing the appliance.

15. Moisture resistance

15.1 *Replace the paragraph dealing with the treatment for watertight appliances by the following:*

Immediately after the treatment for watertight appliances, the appliance shall withstand the electric strength test specified in Sub-clause 16.4 and inspection shall show that water has not entered those spaces of the appliance where live parts are located.

16. Insulation resistance and electric strength

16.2 *Replace the last two paragraphs by the following:*

The values specified above are doubled:

- if the appliance has no control device other than a thermal cut-out, a thermostat without an “off” position or an energy regulator without an “off” position;*
- if all control devices have an “off” position and a contact opening of at least 3 mm in each pole;*

However, for Class II appliances, doubling of the value of 0.25 mA is only allowed if all control devices have an “off” position and a contact opening of at least 3 mm in each pole.

22. Construction

22.29 *Replace the requirement by the following:*

Spacers intended to prevent the appliance from overheating walls and the like, shall be so fixed that it is not possible to remove them from the outside of the appliance by hand or by means of a screwdriver or a spanner.

22.35 *Delete this sub-clause.*

Add the following sub-clause:

22.36 Asbestos shall not be used in the construction of appliances, unless the liberation of dust of impregnated asbestos or of asbestos fibres into the surrounding air is adequately prevented.

Compliance is checked by inspection.

The intention of this requirement is to avoid the risk associated with the inhalation of fibres or dust of asbestos.

25. Supply connection and external flexible cables and cords

25.11 *Replace the text of the first dash in the paragraph commencing "For type M, type Y and type Z attachments," by the following:*

- a separate insulating lining fixed to the cord anchorage;

25.12 *Replace the line reading "— to fixed wiring and for type X attachment, in addition:" by the following:*

- to fixed wiring and for type X and type M attachments, in addition:

25.13 *Delete the explanation.*

26. Terminals for external conductors

26.1 *Modification:*

Instead of the explanation concerning requirements for resilient connecting means the following applies:

Requirements for screwless terminals are given in IEC Publication 685-2-1: Connecting Devices (Junction and/or Tapping) for Household and Similar Fixed Electrical Installations, Part 2: Particular Requirements. Screwless Terminals for Connecting Copper Conductors without Special Preparation.

INFORMATION as to original IEC text.

It reads:

26.9 *Add the following lines in the table:*

over 32 up to and including 40	5.0	0.6	6.0
over 40 up to and including 63	6.0	0.6	6.5

27. Provision for earthing

27.2 *Replace the first two paragraphs by the following:*

Terminals with screw clamping shall comply with the relevant requirements of Clause 26. Screwless terminals shall comply with IEC Publication 685-2-1.

Terminals for the connection of external equipotential bonding conductors shall allow the connection of conductors having nominal cross-sectional areas of 2.5 mm² to 6 mm² and shall not be used to provide earthing continuity between different parts of the appliance. It shall not be possible to loosen the conductors without the aid of a tool.

Replace the test specification by the following:

Compliance is checked by inspection, by manual test and:

- *for screwless terminals by the tests specified in IEC Publication 685-2-1.*

28. Screws and connections

28.1 *Add the following footnote in the table:*

For screws in engagement with a thread of insulating material and which are likely to be tightened by the user the torque is increased by 20%.

Replace the last line of the first column of the table by:

over 5.3

28.2 *Replace the test specification by the following:*

Compliance is checked by inspection.

28.5 *Replace the first explanation by the following:*

The first requirement does not apply to screws in the earthing circuit if at least two screws are used for the connection or if an alternative earthing circuit is provided.

29. Creepage distances, clearances and distances through insulation

INFORMATION as to original IEC text.

It reads:

29.1 *Add in the table under 'between live parts of different polarity²⁾' the following:*

– for positive temperature coefficient (PTC) resistors including their connecting wires, if protected against deposition of moisture or dirt ³⁾	–	–	1.0	1.0	1.0	1.0	–	–
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Add the following explanation:

The values specified in the table do not apply to cross-over points of motor windings.

29.2 *Add the following paragraph to the requirement:*

Moreover, this requirement does not apply if the supplementary insulation or the reinforced insulation is inaccessible and meets one of the following conditions:

- the maximum temperature rise determined during the tests of Clause 19 does not exceed the permissible value specified in Sub-clause 11.8,
- the insulation, after having been conditioned for 7 days (168 h) in an oven maintained at a temperature equal to 50 °C (50 K) in excess of the maximum temperature rise determined during the tests of Clause 19, withstands an electric strength test as specified in Sub-clause 16.4, this test being made on the insulation both at the temperature occurring in the oven and at approximately room temperature.

32. Radiation, toxicity and similar hazards

32.1 *Instead of the explanation, the following applies:*

Test specifications are given in Part 2 where necessary.

Appendix B

Delete the modifications.

INFORMATION as to original IEC text.

It reads:

APPENDIX B

B19 Abnormal operation

B19.101 *Replace this sub-clause by the following:*

Electronic circuits shall be so designed and applied that any fault condition will not render the appliance unsafe with regard to electric shock, fire hazard, mechanical hazard or dangerous malfunction.

Compliance is checked by evaluating the fault conditions specified in Sub-clause B19.103 for all circuits or parts of circuits, taking into account the conditions specified in Sub-clause B19.102.

If the safety of the appliance under any of the fault conditions depends on the operation of a miniature fuse-link, acceptability of this provision is checked by the test of Sub-clause B19.104.

During and after each test the temperature of windings shall not exceed the values specified in the table of Sub-clause 19.6 and the appliance shall comply with the conditions specified in Sub-clause 19.11. In particular, live parts shall not be accessible to the standard test finger or the test pin, as specified in Sub-clause 8.1.

After the tests, basic insulation, supplementary insulation and reinforced insulation shall withstand an electric strength test as specified in Sub-clause 16.4.

If a conductor on a printed circuit board opens, the appliance is considered to have withstood the particular test, provided all three of the following conditions are met:

- the material of the printed circuit board withstands the burning test of Sub-clause 20.1 of IEC Publication 65,*
- any loosened conductor does not reduce the creepage distances or clearances between live parts and accessible metal parts below the value specified in Clause B29,*
- the appliance withstands the tests of Sub-clause B19.103 with the interrupted conductor bridged.*

Unless it is necessary to replace components after any of the tests, the electric strength test need only be carried out after the final test on the electronic circuit.

In general, examination of the appliance and its circuit diagram will reveal the fault conditions which have to be simulated, so that testing can be limited to those cases which may be expected to give the most unfavourable result.

In certain cases, it may be preferable to simulate all fault conditions rather than to analyze the circuit diagram.

Examples of constructions of appliances incorporating electronic circuits are shown in Figure B1.

Add the following sub-clauses:

B19.102 The fault conditions 1) to 5) specified in Sub-clause B19.103 are not applied to circuits or parts of circuits where all of the three following conditions are met:

- *the electronic circuit is supplied by an extra-low voltage transformer or through a limiting impedance, provided the circuit is a low-power circuit as described below,*
- *the requirements of Sub-clause 8.1 are met, even with one component of the limiting impedance short-circuited or open-circuited with the basic insulation between the primary winding and secondary winding of an extra-low voltage transformer bridged,*
- *protection against electric shock, fire hazard, mechanical hazard or dangerous malfunction in other parts of the appliance does not rely on the correct functioning of the electronic circuit.*

A low-power circuit is determined as follows and further explained in Figure B2.

The appliance is operated at rated voltage or at the upper limit of the rated voltage range and a variable resistor, adjusted to its maximum resistance, is connected between the point to be investigated and the opposite pole of the supply source.

The resistance is then decreased until the power consumed by the resistor reaches a maximum. Any point nearest to the supply at which the maximum power delivered to this resistor does not exceed 15 W after 5 s, is called a low power point. The part of the circuit farther from the supply source is considered to be a low-power circuit.

The measurements are made only from one pole of the supply source, preferably the one that gives the fewest low power points.

When determining the low power points, it is recommended to start with points close to the supply source.

B19.103 The following fault conditions are considered and, if necessary, applied one at a time, together with any consequential fault.

- 1) *Short-circuit of creepage distances and clearances between live parts of different polarity, if these distances are less than the values specified in Clause B29, unless the relevant part is adequately encapsulated.*
- 2) *Short-circuit between live parts of different polarity across insulation which does not withstand the tests of Clause 16.*
- 3) *Open-circuit at the terminals of any component.*
- 4) *Short-circuit across resistors and capacitors, unless:*
 - *the resistor withstands the tests of Sub-clause 14.1, of IEC Publication 65,*
 - *the capacitor withstands the tests of Sub-clause 14.2 of IEC Publication 65, provided it is used in circuits where the peak voltage across its terminals does not exceed 354 V,*
 - *the capacitor complies with IEC Publication 384-14: Fixed Capacitors for Use in Electronic Equipment. Part 14: Specification: Fixed Capacitors for Radio Interference Suppression. Selection of Methods of Test and General Requirements.*
- 5) *Short-circuit across any two terminals of electronic devices and electronic units.*
- 6) *Short-circuit of each lower power circuit by connecting the low power point to the pole of the supply from which the measurements are made.*

For the simulation of the fault conditions, the appliance is operated under the conditions specified in Clause 11, but at rated voltage or at the most unfavourable voltage within the voltage range.

If any of the fault conditions have to be simulated, the duration of the test is:

- as specified in Sub-clause 11.7, but only for one operating cycle, and only if the fault cannot be recognized by the user;*
- as specified in Sub-clause 19.6, if the fault can be recognized by the user, for example, when the motor of a kitchen machine stops;*
- until steady conditions are established, for circuits continuously connected to the supply mains, for example, stand-by circuits.*

In each case, the test is considered to be ended if interruption of the supply occurs.

Fault condition 5) is not applied in the case of discrete components, such as opto-couplers, provided with insulation withstanding the tests of Clauses 16 and 29.

B19.104 *If, for any of the fault conditions specified in Sub-clause B19.103, the safety of the appliance depends on the operation of a miniature fuse-link complying with IEC Publication 127, it is verified that the fuse-link is able to act as a protecting device by replacing the miniature fuse-link by an ammeter for the relevant test.*

If the current measured does not exceed 2.1 times the rated current of the fuse-link, the circuit is not considered to be adequately protected and the test is carried out with the fuse-link short-circuited.

If the current measured is at least 2.75 times the rated current of the fuse-link, the circuit is considered to be adequately protected.

If the current measured exceeds 2.1 times the rated current of the fuse-link but does not exceed 2.75 times the rated current, the fuse-link is short-circuited and the test is carried out for the relevant period or for 2 min, whichever is shorter.

In case of doubt, the maximum resistance of the fuse-link has to be taken into account when determining the current.

The verification whether the fuse-link acts as a protecting device is based on the fusing characteristics specified in IEC Publication 127, which also gives the information necessary to calculate the maximum resistance of the fuse-link.

