



UL 60335-1

Underwriters Laboratories Inc. Standard for Safety

Safety of Household and
Similar Electrical Appliances,
Part 1: General Requirements



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UL Standard for Safety for Safety of Household and Similar Electrical Appliances, Part 1: General Requirements, UL 60335-1

Fifth Edition, Dated October 31, 2011

Summary of Topics

UL 60335-1 is an adoption of IEC 60335-1, Safety Standard for of Household and Similar Electrical Appliances, Part 1: General Requirements, (Edition 4.2, Issued by the IEC September 2006). Please note that the national difference document incorporates all of the U.S. national differences for UL 60335-1.

The new requirements are substantially in accordance with Proposal(s) on this subject dated September 3, 2010.

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The requirements in this Standard are now in effect, except for those paragraphs, sections, tables, figures, and/or other elements of the Standard having future effective dates as indicated in the preface. The prior text for requirements that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.

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Association of Standardization and Certification
NMX-J-521/1-ANCE
First Edition



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First Edition
(IEC 60335-1:2001+A1:2004+A2:2006, MOD)



Underwriters Laboratories Inc.
UL 60335-1
Fifth Edition

Safety of Household and Similar Appliances, Part 1: General Requirements

October 31, 2011

This national standard is based on publication IEC 60335-1, Edition 4.2:2006 (Edition 4:2001 consolidated with amendment 1:2004 and amendment 2:2006), including the Interpretation Sheet issued February, 2007.



ANSI/UL 60335-1-2011

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This ANSI/UL Standard for Safety consists of the Fifth Edition. The most recent designation of ANSI/UL 60335-1 as an American National Standard (ANSI) occurred on October 21, 2011. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface. The National Difference Page and IEC Foreword are also excluded from the ANSI approval of IEC-based standards.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at <http://csds.ul.com>.

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CONTENTS

Preface	7
NATIONAL DIFFERENCES	10
FOREWORD	11
INTRODUCTION	17
1 Scope	18
2 Normative references	19
3 Definitions	23
4 General requirement	30
5 General conditions for the tests	30
6 Classification	34
7 Marking and instructions	34
8 Protection against access to LIVE PARTS	42
9 Starting of motor-operated appliances	45
10 Power input and current	45
11 Heating	47
12 Void	54
13 Leakage current and electric strength at operating temperature	54
14 Transient overvoltages	57
15 Moisture resistance	58
16 Leakage current and electric strength	62
17 Overload protection of transformers and associated circuits	64
18 Endurance	65
19 Abnormal operation	65
20 Stability and mechanical hazards	74
21 Mechanical strength	76
22 Construction	77
23 Internal wiring	90
24 Components	92
25 Supply connection and external flexible cords	96
26 Terminals for external conductors	106
27 Provision for earthing	109
27.7DV.1 Size of Protective Conductors	112
28 Screws and connections	114
29 CLEARANCES, CREEPAGE DISTANCES, and solid insulation	118
30 Resistance to heat and fire	125
31 Resistance to rusting	131
32 Radiation, toxicity, and similar hazards	131

Annex A (informative) Routine tests

A.1 Earth continuity test	143
A.1DV.1 Earth continuity test	144
A.2 Electric strength test	144
A.3 Functional test	145

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Annex B (normative) Appliances powered by rechargeable batteries

3 Definitions	146
5 General conditions for the tests	146
7 Marking and Instructions	146
8 Protection against access to LIVE PARTS	147
11 Heating	147
19 Abnormal operation	147
21 Mechanical strength	148
22 Construction	148
25 Supply connection and external flexible cords	148
30 Resistance to heat and fire	148

Annex C (normative) Ageing test on motors**Annex D (normative) Thermal motor protectors****Annex E (normative) Needle-flame test**

7 Severities	152
9 Test procedure	152
9.1 Position of test specimen	152
9.2 Application of needle-flame	152
9.3 Number of test specimens	152
11 Evaluation of test results	152

Annex F (normative) Capacitors

1.5 Terminology	153
1.6 Marking	153
3.4 Approval testing	153
4.1 Visual examination and check of dimensions	153
4.2 Electrical tests	154
4.12 Damp heat, steady state	154
4.13 Impulse voltage	154
4.14 Endurance	154
4.17 Passive flammability test	154
4.18 Active flammability test	154

Annex G (normative) Safety isolating transformers

7 Marking and instructions	155
17 Overload protection of transformers and associated circuits	155
22 Construction	155
29 CLEARANCES, CREEPAGE DISTANCES, and solid insulation	155

Annex H (normative) Switches

8 Marking and documentation	156
13 Mechanism	156
15 Insulation resistance and dielectric strength	156
17 Endurance	156
20 CLEARANCES, CREEPAGE DISTANCES, solid insulation and coatings of rigid printed board assemblies	157

Annex I (normative) Motors having BASIC INSULATION that is inadequate for the RATED VOLTAGE of the appliance

8 Protection against access to LIVE PARTS	158
11 Heating	158
16 Leakage current and electric strength	158
19 Abnormal operation	158
22 Construction	159

Annex J (normative) Coated printed circuit boards

5.7 Conditioning of the test specimens	160
5.9 Additional tests	160

Annex K (normative) Overvoltage categories**Annex L (informative) Guidance for the measurement of clearances and creepage distances****Annex M (normative) Pollution degree****Annex N (informative) Proof tracking test**

7 Test apparatus	166
7.3 Test solutions	166
10 Determination of proof tracking index (PTI)	166
10.1 Procedure	166
10.2 Report	166

Annex O (informative) Selection and sequence of the tests of clause 30**Annex P (informative) Guidance for the application of this standard to appliances used in warm damp equable climates**

5 General conditions for the tests	170
7 Marking and instructions	170
11 Heating	170
13 Leakage current and electric strength at operating temperature	170

15 Moisture resistance	170
16 Leakage current and electric strength	170
19 Abnormal operation	171

Annex Q (informative) Sequence of tests for the evaluation of electronic circuits

Annex R (informative) Software evaluation

H.2 Definitions	175
H.7 Information	175
H.11.12 Controls using software	175

Annex DVA (informative) Component Standards Cross Reference

Annex DVB (Normative) Mexican Standards and Relevant Requirements

Annex DVC (Normative) Mechanical requirements for direct plug in appliances

DVC.1 Maximum tipping moment	195
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Bibliography

Index of defined words

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Preface

This is the harmonized ANCE, CSA, and UL standard for general requirements for safety of household and similar appliances. It is the first edition of NMX-J-521/1-ANCE, the first edition of CAN/CSA C22.2 No. 60335-1, and the fifth edition of UL 60335-1. This edition of CAN/CSA-C22.2 No. 60335-1 replaces the previous edition published in 2003 as CAN/CSA-E60335-1/4E. This edition of UL 60335-1 supersedes the previous edition(s) published in March, 2004. This Standard is based on the Standard for Safety of Household and Similar Appliances, part 1: General Requirements, IEC Publication 60335-1, edition 4.2, including the Interpretation Sheet issued February, 2007.

This harmonized standard was prepared by the Association of Standardization and Certification (ANCE), the Canadian Standards Association (CSA), and Underwriters Laboratories Inc. (UL). The efforts and support of Industry Associations [Cámara Nacional de Manufacturas Eléctricas (CANAME), the Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI), the Air-Conditioning, Heating, and Refrigeration Institute (AHRI), and the Association of Home Appliance Manufacturers (AHAM)], and of the Technical Harmonization Sub-Committee (THSC 61D TC1) of the Council on the Harmonization of Electrotechnical Standards of the Nations of the Americas (CANENA), are gratefully acknowledged.

This standard is considered suitable for use for conformity assessment within the stated scope of the standard.

The present Mexican Standard was developed by the CT 61 from the Comité de Normalización de la Asociación de Normalización y Certificación, A.C., CONANCE.

This standard was reviewed by the CSA Subcommittee on Safety of Household Electrical Appliances, under the jurisdiction of the CSA Technical Committee on Consumer and Commercial Products and the CSA Strategic Steering Committee on Requirements for Electrical Safety, and has been formally approved by the CSA Technical Committee.

This standard has been approved by the Standards Council of Canada (SCC) as a National Standard of Canada.

This Standard has been approved by the American National Standards Institute (ANSI) as an American National Standard.

Where reference is made to a specific number of samples to be tested, the specified number is to be considered a minimum quantity.

Note: Although the intended primary application of this standard is stated in its scope, it is important to note that it remains the responsibility of the users of the standard to judge its suitability for their particular purpose.

Level of harmonization

This standard adopts the IEC text with national differences. This standard is published as an equivalent standard for CSA and UL. An equivalent standard is a standard that is substantially the same in technical content, except as follows: Technical national differences are allowed for codes and governmental regulations as well as those recognized as being in accordance with NAFTA Article 905, for example, because of fundamental climatic, geographical, technological, or infrastructural factors, scientific justification, or the level of protection that the country considers appropriate. Presentation is word for word except for editorial changes.

All national differences from the IEC text are included in the ANCE, CSA, and UL versions of the standard. While the technical content is the same in each organization's version, the format and presentation may differ.

It is the intent and objective of the US, Canadian, and Mexican SDOs and associated Industries to avoid the use of single country deviations to the greatest extent possible and practical. Single country deviations should only be used as a last resort when all other options have been explored. Further this includes a commitment to review and reconsider any and all single country revisions at each revision cycle with the intent of finding solutions to remove the single country deviation in the spirit of tri-national harmonization. A list of work item requests will be recorded between revision cycles and by default removal of all single country deviations will be on the list for the next revision cycle.

Reasons for differences from IEC

National Differences from the IEC are being added in order to address regulatory and safety situations present in Canada, Mexico, and the US.

Interpretations

The interpretation by the standards development organization of an identical or equivalent standard is based on the literal text to determine compliance with the standard in accordance with the procedural rules of the standards development organization. If more than one literal interpretation has been identified, a revision is to be proposed as soon as possible to each of the standards development organizations to more accurately reflect the intent.

ANCE effective date

The effective date for ANCE will be announced through the *Diario Oficial de la Federación (Official Gazette)* and is indicated on the cover page.

CSA Effective Date

The effective date for CSA International will be announced through CSA Informs or a CSA certification notice.

UL Effective Date

As of October 31, 2011 all products Listed or Recognized by UL must comply with the requirements in this standard.

A UL effective date is one established by Underwriters Laboratories Inc. and is not part of the ANSI approved standard.

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GENERAL

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There are five types of National Differences as noted below. The difference type is noted on the first line of the National Difference in the standard. The standard may not include all types of these National Differences.

DR – These are National Differences based on the **national regulatory requirements**.

D1 – These are National Differences which are based on **basic safety principles and requirements**, elimination of which would compromise safety for consumers and users of products.

D2 – These are national differences from IEC requirements based on existing **safety practices**. These requirements reflect national safety practices, where empirical substantiation (for the IEC or national requirement) is not available or the text has not been included in the IEC standard.

DC – These are National Differences based on the **component standards** and will not be deleted until a particular component standard is harmonized with the IEC component standard.

DE – These are National Differences based on **editorial comments or corrections**.

Each national difference contains a description of what the national difference entails. Typically one of the following words is used to explain how the text of the national difference is to be applied to the base IEC text:

Addition / Add - An addition entails adding a complete new numbered clause, subclause, table, figure, or annex. Addition is not meant to include adding select words to the base IEC text.

Modification / Modify - A modification is an altering of the existing base IEC text such as the addition, replacement or deletion of certain words or the replacement of an entire clause, subclause, table, figure, or annex of the base IEC text.

Deletion / Delete - A deletion entails complete deletion of an entire numbered clause, subclause, table, figure, or annex without any replacement text.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SAFETY OF HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – Part 1: General requirements

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

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

This consolidated version of IEC 60335-1 is based on the fourth edition (2001) [documents 61/1965/FDIS and 61/1998/RVD], its amendment 1 (2004) [documents 61/2569/FDIS and 61/2639/RVD], its amendment 2 (2006) [documents 61/2996/FDIS and 61/3053/RVD] and its corrigenda of January 2002 and of December 2005.

It bears the edition number 4.2.

A vertical line in the margin shows where the base publication has been modified by amendments 1 and 2.

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

The text of this interpretation sheet is based on the following documents:

ISH	Report on voting
61/3142/ISH	61/3219/RVD

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

This part is to be used in conjunction with the appropriate part 2 of IEC 60335. The parts 2 contain clauses to supplement or modify the corresponding clauses in this part to provide the relevant requirements for each type of appliance.

Annexes B, C, D, E, F, G, H, I, J, K, M, N and R form an integral part of this standard.

Annexes A, L, O, P and Q are for information only.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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

NOTE 1 The following annexes contain provisions suitably modified from other IEC standards:

– Annex E	Needle flame test	IEC 60695-2-2
– Annex F	Capacitors	IEC 60384-14
– Annex G	Safety isolating transformers	IEC 61558-1 and IEC 61558-2-6
– Annex H	Switches	IEC 61058-1
– Annex J	Coated printed circuit boards	IEC 60664-3
– Annex N	Proof tracking test	IEC 60112
– Annex R	Software evaluation	IEC 60730-1

NOTE 2 The following print types are used:

- requirements: in roman type
- test specifications: in italic type

- notes: in small roman type.
- Words in **bold** in the text are defined in clause 3. When a definition concerns an adjective, the adjective and associated noun are also in bold.

The following differences exist in some countries indicated below.

- Clause 3: Steady conditions are defined (Poland).
- 3.4.2: SAFETY EXTRA-LOW VOLTAGE shall not exceed 30 V (42,4 V peak) (USA).
- 5.7: The ambient temperature is $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$ (China, Japan and USA).
- 5.14: Accessible metal parts that are not liable to become energized (such as a metal nameplate or decorative parts on a plastic enclosure) do not need to be earthed. Accessible non-metallic parts need only provide BASIC INSULATION (USA).
- 6.1: CLASS 0 APPLIANCES AND CLASS 0I APPLIANCES are not allowed (Australia, Austria, Belgium, Czech Republic, Finland, France, Germany, Greece, Hungary, India, Israel, Ireland, Italy, Netherlands, New Zealand, Norway, Poland, Singapore, Slovakia, Sweden, Switzerland, United Kingdom, Yugoslavia).
- 6.2: Protection against harmful ingress of water is determined by methods other than those given in IEC 60529 (USA).
- 7.1: The IP number is not required to be marked (USA).
- 7.6: Some of these symbols are not used (USA).
- 7.8: Additional methods are permitted for identifying earthing terminals and terminals for neutral conductors (USA).
- 7.12.2: The requirements for full disconnection do not apply (Japan, USA).
- 7.14: Different tests are used (USA).
- 8.1.1: The test is not necessarily repeated with the 20 N force (USA).
- 8.1.1: Protection against contact with LIVE PARTS of the lamp cap is not required (USA).
- 8.1.2 and 8.1.3: The test probe 13 and test probe 41 are not used (USA).
- 8.1.5: BUILT-IN APPLIANCES, FIXED APPLIANCES and appliances delivered in separate units are not required to be protected by at least BASIC INSULATION before installation (USA).
- Clause 9: The ability of a motor to start without blowing a quick-acting fuse is required (USA).
- 10.1 and 10.2: Positive limits of 5 % for HEATING APPLIANCES and 10 % for MOTOR-OPERATED APPLIANCES are required and in general there are no negative national differences (USA).
- 11.4, 11.5 and 11.6: HEATING APPLIANCES and heater circuits of COMBINED APPLIANCES are operated at RATED POWER INPUT OR RATED VOLTAGE, whichever is the more severe; all other appliances and circuits are operated at RATED VOLTAGE (USA).
- 11.8, table 3: Temperature rise limits for certain materials are different (USA).
- 13.2: The test circuit and some leakage current limits are different (India, USA).
- 13.3: The values of certain test voltages are different depending on the RATED VOLTAGE (USA).
- 13.3: A 500 VA test transformer is used (USA).

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- 15.1.1 and 15.1.2: The IP system is not used and the tests are different (USA).
- 15.3: The test is conducted with a relative humidity of $(88 \pm 2) \%$ at a temperature of $32 \text{ °C} \pm 2 \text{ °C}$ (USA).
- 16.2: The test is conducted at nominal supply voltage, and some of the leakage current value different (USA).
- 16.3: Some test voltages and methods are different (USA).
- 19.1: The circuit protection device is permitted to provide necessary protection (USA).
- 19.2 to 19.4: Generally the tests are conducted at nominal supply voltage or RATED POWER INPUT (USA).
- 19.11: Different tests are carried out to evaluate solid state devices used in protective electronic circuits (USA).
- 19.13: The temperature rise limits of table 9 are not applicable (USA).
- 20.1: A stability test at 15 ° is not conducted, and an appliance tested in an overturned position is judged under abnormal test criteria (USA).
- 21.1: Impact force is applied by a falling steel ball instead of the spring hammer (USA).
- Clause 22: The d.c. component in the appliance neutral is limited (Australia).
- 22.1: The IP system is not used and tests are different (USA).
- 22.2: The second paragraph of this subclause dealing with single-phase CLASS I APPLIANCES with heating elements cannot be complied with because of the supply system (France and Norway).
- 22.2: Double-pole switches or PROTECTIVE DEVICES are required (Norway).
- 22.2: Disconnection of the neutral is not necessary for all STATIONARY APPLIANCES (USA).
- 22.2: The SUPPLY CORD is not required to be fitted with a plug (Ireland).
- 22.3: The test is different (USA).
- 22.6: This test is not conducted (USA).
- 22.11: Different criteria for snap-on constructions are required (USA).
- 22.12: Positive forms of securement are required (USA).
- 22.14: Sharp edges are evaluated by means of a sharp edge testing device (USA).
- 22.35 and 22.36: Metal parts are generally not required to be separated by DOUBLE OR REINFORCED INSULATION (USA).
- 22.44: Appliances may be acceptable based on additional evaluation (USA).
- 22.46: The evaluation of software is different (USA).
- 23.5: Requirements for insulated internal wiring are different (USA).
- 23.7: The requirement only applies to wiring that is accessible when making supply connections (USA).
- 24.1.3: The number of cycles is different and the note 1 does not apply (USA).
- 24.1.4: The numbers of cycles is different and note 1 does not apply (USA).

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- 24.3: The requirement for full disconnection does not apply (USA).
- 25.1: The SUPPLY CORD is not required to be fitted with a plug (Ireland).
- 25.3: A set of SUPPLY LEADS is not permitted (Norway, Sweden, Denmark, Finland, Netherlands).
- 25.3: The use of a set of terminals for connection of a flexible cord is not generally permitted (USA).
- 25.8: Conductor cross-sectional areas are different (Australia, New Zealand and USA).
- 25.8: 0,5 mm² SUPPLY CORDS are not allowed for CLASS I APPLIANCES (Australia and New Zealand).
- 25.10: Green insulation is also permitted (USA).
- 25.13: Only one separate insulation is required (USA).
- 25.16: A pull of 35 lbs is applied except for small appliances. Generally the torque test is not applied (USA).
- 26.3: The tests only apply to terminals for connection to fixed wiring (USA).
- 26.6: Cross-sectional areas are specified according to American Wire Gauge (AWG) (USA).
- 27.6: The requirement does not apply (USA).
- 28.1: Generally, tests of this type are not required (USA).
- Clause 29: The requirements for CLEARANCES and CREEPAGE DISTANCES are different (USA).
- 29.1: Different rated impulse voltages are used between 50 V and 150 V (Japan).
- 29.3: The third dashed item of the test specification does not apply (Germany).
- 30.1: The minimum value for the ball-pressure test for parts retaining LIVE PARTS is 95°C or 40 K higher than the clause 11 temperature rise. For enclosures, the minimum value is 75°C or a mold-stress test is conducted at 10 K above the clause 11 temperature (USA).
- 30.2.1: An ignition test cannot be used to assure a slow burning rate (USA).
- Annex B, 7.12: Appliances having non-replaceable batteries shall be marked with an appropriate symbol when the batteries have a content of mercury or cadmium exceeding 0,025% by weight (Sweden and Switzerland).
- Annex B, 21.101: The requirement is different (USA).
- Annex I: The annex applies to motors having a WORKING VOLTAGE not exceeding 30 V (USA).

DV.1 DE Modification to replace the fourth paragraph following item (9) of the Foreword:

Due to formatting differences, marginal lines are not being used to identify where the base publication has been modified by amendments 1 and 2.

DV.2 DE Modification to replace the eighth paragraph following item (9) of the Foreword:

This standard is to be used with an appropriate ANCE, CSA, or UL 60335 part 2 standard

DV.3 DE Modification of Note 2 to replace the last item with the following:

Words in SMALL ROMAN CAPS in the text are defined in clause 3.

DV.4 DE Modification to add the following after Note 2:

The numbering system in the standard uses a space instead of a comma to indicate thousands and uses a comma instead of a period to indicate a decimal point. For example, 1 000 means 1,000 and 1,01 means 1.01.

DV.5 D2 Deletion of the country deviations:

Delete all dashed items

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INTRODUCTION

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

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

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

If 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.

NOTE 1 Throughout this publication, when "Part 2" is mentioned, it refers to the relevant part of IEC 60335.

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

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

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

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

NOTE 2 Standards dealing with non-safety aspects of household appliances are

- IEC Standards published by TC 59 concerning methods of measuring performance;
- CISPR 11, CISPR 14-1, IEC 61000-3-2, and IEC 61000-3-3 concerning electromagnetic emissions;
- CISPR 14-2 concerning electromagnetic immunity.

DV.6 D2 Modification of the second paragraph in the introduction:

Delete the last sentence of the second paragraph in the Introduction.

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 1: General Requirements

1 Scope

This International Standard deals with the safety of electrical appliances for household and similar purposes, their **RATED VOLTAGE** being not more than 250 V for single-phase appliances and 480 V for other appliances.

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

NOTE 1 Examples of such appliances are catering equipment, cleaning appliances for industrial and commercial use and appliances for hairdressers.

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

- persons (including children) whose
 - physical, sensory or mental capabilities; or
 - lack of experience and knowledge

prevents them from using the appliance safely without supervision or instruction;

- children playing with the appliance.

NOTE 2 Attention is drawn to the fact that

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

NOTE 3 This standard does not apply to

- appliances intended exclusively for industrial purposes;
- appliances intended to be used in locations where special conditions prevail, such as the presence of corrosive or explosive atmosphere (dust, vapor or gas);
- audio, video and similar equipment (IEC 60065);
- appliances for medical purposes (IEC 60601);
- hand-held motor-operated electric **TOOLS** (IEC 60745);
- personal computers and similar equipment (IEC 60950);

– transportable motor-operated electric TOOLS (IEC 61029).

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60061-1,

Lamp caps and holders together with gauges for the control of interchangeability and safety – Part 1: Lamp caps

IEC 60068-2-2,

Environmental testing – Part 2: Tests. Tests B: Dry heat

IEC 60068-2-32,

Environmental testing – Part 2: Tests – Test Ed: Free fall (Procedure 1)

IEC 60068-2-75,

Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests

IEC/TR3 60083,

Plugs and socket-outlets for domestic and similar general use standardized in member countries of IEC

IEC 60085:2004,

Electrical insulation – Thermal classification

IEC 60112: 2003,

Method for the determination of the proof and the comparative tracking indices of solid insulating materials

IEC 60127 (all parts),

Miniature fuses

IEC 60227 (all parts),

Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V

IEC 60238,

Edison screw lampholders

IEC 60245 (all parts),

Rubber insulated cables – Rated voltages up to and including 450/750 V

IEC 60252-1,

AC motor capacitors – Part 1: General – Performance testing and rating – Safety requirements – Guide for installation and operation

IEC 60320-1,

Appliance couplers for household and similar general purposes – Part 1: General requirements

IEC 60320-2-2,

Appliance couplers for household and similar general purposes – Part 2-2: Interconnection couplers for household and similar equipment

IEC 60320-2-3,

Appliance couplers for household and similar general purposes – Part 2-3: Appliance coupler with a degree of protection higher than IPX0

IEC 60384-14:2005,

Fixed capacitors for use in electronic equipment – Part 14: Sectional specification: Fixed capacitors for electromagnetic interference suppression and connection to the supply mains

IEC 60417-DB:2002¹,

Graphical symbols for use on equipment

IEC 60529,

Degrees of protection provided by enclosures (IP Code)

IEC 60598-1: 2003,

Luminaires – Part 1: General requirements and tests

IEC 60664-1: 1992,

Insulation coordination for equipment within low voltage systems – Part 1: Principles, requirements and tests

Amendment 1 (2000)

Amendment 2 (2002)²

IEC 60664-3:2003,

Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution

IEC 60691:2002,

Thermal-links – Requirements and application guide

IEC 60695-2-11,

Fire Hazard testing – Part 2-11: Glowing/hot wire based test methods – Glow-wire flammability test method for end-products

IEC 60695-2-12,

Fire hazard testing – Part 2-12: Glowing/hot wire based test methods – Glow-wire flammability test method for materials

IEC 60695-2-13,

Fire hazard testing – Part 2-13: Glowing/hot wire based test methods – Glow-wire ignitability test method for materials

IEC 60695-10-2,

Fire hazard testing – Part 10: Guidance and test methods for the minimization of the effects of abnormal heat on electrotechnical products involved in fires – Section 2: Method for testing products made from non-metallic materials for resistance to heat

IEC 60695-11-5:2004,

Fire hazard testing – Part 11-5: Test flames – Needle-flame test method – Apparatus, confirmatory test arrangement and guidance

IEC 60695-11-10,

Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods

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IEC 60730-1: 1999,
*Automatic electrical controls for household and similar use – Part 1: General requirements
Amendment 1 (2003)*³

IEC 60730-2-8: 2000,
*Automatic electrical controls for household and similar use – Part 2-8: Particular requirements for
electrically operated water valves, including mechanical requirements
Amendment 1 (2002)*⁴

IEC 60738-1,
Thermistors – Directly heated positive step-function temperature coefficient – Part 1: Generic specification

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

IEC 60990: 1999,
Methods of measurement of touch-current and protective conductor current

IEC 60999-1:1999,
*Connecting devices – Electrical copper conductors – Safety requirements for screw-type and
screwless-type clamping units – Part 1: General requirements and particular requirements for clamping
units for conductors from 0,2 mm² up to 35 mm² (included)*

IEC 61000-4-2,
*Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 2:
Electrostatic discharge immunity test*

IEC 61000-4-3,
*Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated,
radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4,
*Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 4:
Electrical fast transient/burst immunity test*

IEC 61000-4-5,
*Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 5: Surge
immunity test*

IEC 61000-4-6,
*Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to
conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-11:2004,
*Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips,
short interruptions and voltage variations immunity tests
Amendment 1 (2000)*

IEC 61000-4-13,
*Electromagnetic compatibility (EMC) – Part 4-13: Testing and measurement techniques – Harmonics and
interharmonics including mains signaling at a.c. power port, low frequency immunity tests*

IEC 61032: 1997,
Protection of persons and equipment by enclosures – Probes for verification

IEC 61058-1: 2000,
Switches for appliances – Part 1: General requirements
*Amendment 1 (2001)*⁵

IEC 61180-1,
High-voltage test techniques for low-voltage equipment – Part 1: Definitions, test and procedure requirements

IEC 61180-2,
High-voltage techniques for low-voltage equipment – Part 2: Test equipment

IEC 61558-1: 1997,
Safety of power transformers, power supply units and similar – Part 1: General requirements and tests
*Amendment 1 (1998)*⁶

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

IEC 61770,
Electric appliances connected to the water mains – Avoidance of backsiphonage and failure of hose-sets

IEC 62151,
Safety of equipment electrically connected to a telecommunication network

ISO 2768-1,
General tolerances – Part 1: Tolerances for linear and angular dimensions without individual tolerance indications

ISO 7000-DB:2004

ISO 9772: 2001,
Cellular plastics – Determination of horizontal burning characteristics of small specimens subjected to a small flame

¹ DB refers to the IEC on-line database.

² There exists a consolidated edition 1.2 (2002) that includes edition 1 and its amendments 1 and 2.

³ There exists a consolidated edition 3.1 (2003) that includes edition 3 and its amendment 1.

⁴ There exists a consolidated edition 2.1 (2003) that includes edition 2 and its amendment 1.

⁵ There exists a consolidated edition 3.1 (2001) that includes edition 3 and its amendment 1.

⁶ There exists a consolidated edition 1.1 (1998) that includes edition 1 and its amendment 1.

2DV.1 DR Addition:

This standard is applicable to household and similar electrical appliances and equipment which are designed to be installed in accordance with relevant installation codes: National Electrical Code (NEC) ANSI/NFPA 70; or CSA C22.1 Canadian Electrical Code (CEC) Part I; or Mexican Electrical Installations NOM-001-SEDE.

2DV.2 DC Addition:

Certain IEC component standard requirements are replaced by the relevant requirements of component standards, examples of which are listed in Annex DVA.

2DV.3 DR Addition:

In Mexico, international standards are informative. For the relevant applicable standard in each clause, see annex DVB.

2DV.4 DE Addition:

Add the following normative reference:

ISO 9773,
Plastics – Determination of burning behaviour of thin flexible vertical specimens in contact with a small-flame ignition source

3 Definitions

An index of the defined terms is provided at the end of this publication.

3.1 When the terms “voltage” and “current” are used, they are r.m.s. values, unless otherwise specified.

3.1.1 **RATED VOLTAGE:** Voltage assigned to the appliance by the manufacturer.

3.1.2 **RATED VOLTAGE RANGE:** Voltage range assigned to the appliance by the manufacturer, expressed by its lower and upper limits.

3.1.3 **WORKING VOLTAGE:** Maximum voltage to which the part under consideration is subjected when the appliance is supplied at its **RATED VOLTAGE** and operating under **NORMAL OPERATION**.

NOTE 1 The different positions of controls and switching devices are taken into account.

NOTE 2 **WORKING VOLTAGE** takes into account resonant voltages.

NOTE 3 When deducing the **WORKING VOLTAGE**, the effect of transient voltages is ignored.

3.1.4 **RATED POWER INPUT:** Power input assigned to the appliance by the manufacturer.

3.1.5 **RATED POWER INPUT RANGE:** Power input range assigned to the appliance by the manufacturer, expressed by its lower and upper limits.

3.1.6 **RATED CURRENT:** Current assigned to the appliance by the manufacturer.

NOTE If no current is assigned to the appliance, the **RATED CURRENT** is:

- for HEATING APPLIANCES, the current calculated from the RATED POWER INPUT and the RATED VOLTAGE;
- for MOTOR-OPERATED APPLIANCES and COMBINED APPLIANCES, the current measured when the appliance is supplied at RATED VOLTAGE and operated under NORMAL OPERATION.

3.1.7 RATED FREQUENCY: Frequency assigned to the appliance by the manufacturer.

3.1.8 RATED FREQUENCY RANGE: Frequency range assigned to the appliance by the manufacturer, expressed by its lower and upper limits.

3.1.9 NORMAL OPERATION: Conditions under which the appliance is operated in normal use when connected to the supply mains.

3.1.10 RATED IMPULSE VOLTAGE: Voltage derived from the RATED VOLTAGE and the overvoltage category of the appliance, characterizing the specified withstand capability of its insulation against transient overvoltages.

3.1.11 DANGEROUS MALFUNCTION: Unintended operation of the appliance that may impair safety.

3.1.12 REMOTE OPERATION: Control of an appliance by a command that can be initiated out of sight of the appliance using means such as telecommunications, sound controls or bus systems.

NOTE An infra-red control by itself is not considered one used for REMOTE OPERATION. However, it may be incorporated as part of a system such as a telecommunication, sound control or bus system.

3.2

3.2.1 DETACHABLE CORD: Flexible cord, for supply or interconnection, intended to be connected to the appliance by means of a suitable appliance coupler.

3.2.2 INTERCONNECTION CORD: External flexible cord provided as part of a complete appliance for purposes other than connection to the supply mains.

NOTE A remote hand-held switching device, an external interconnection between two parts of an appliance and a cord connecting an accessory to the appliance or to a separate signaling circuit are example of INTERCONNECTION CORDS.

3.2.3 SUPPLY CORD: Flexible cord, for supply purposes, which is fixed to the appliance.

3.2.4 TYPE X ATTACHMENT: Method of attachment of the SUPPLY CORD such that it can easily be replaced.

NOTE The SUPPLY CORD may be specially prepared and only available from the manufacturer or its service agent. A specially prepared cord may also include a part of the appliance.

3.2.5 TYPE Y ATTACHMENT: Method of attachment of the SUPPLY CORD such that any replacement is intended to be made by the manufacturer, its service agent or similar qualified person.

3.2.6 TYPE Z ATTACHMENT: Method of attachment of the SUPPLY CORD such that it cannot be replaced without breaking or destroying the appliance.

3.2.7 SUPPLY LEADS: Set of wires intended for connecting the appliance to fixed wiring and accommodated in a compartment within or attached to the appliance.

3.3

3.3.1 BASIC INSULATION: Insulation applied to LIVE PARTS to provide basic protection against electric shock.

3.3.2 SUPPLEMENTARY INSULATION: Independent insulation applied in addition to BASIC INSULATION, in order to provide protection against electric shock in the event of a failure of BASIC INSULATION.

3.3.3 DOUBLE INSULATION: Insulation system comprising both BASIC INSULATION and SUPPLEMENTARY INSULATION.

3.3.4 REINFORCED INSULATION: Single insulation applied to LIVE PARTS, which provides a degree of protection against electric shock equivalent to DOUBLE INSULATION under the conditions specified in this standard.

NOTE It is not implied that the insulation is one homogeneous piece. The insulation may comprise several layers which cannot be tested singly as SUPPLEMENTARY INSULATION OR BASIC INSULATION.

3.3.5 FUNCTIONAL INSULATION: Insulation between conductive parts of different potential which is necessary only for the proper functioning of the appliance.

3.3.6 PROTECTIVE IMPEDANCE: Impedance connected between LIVE PARTS and ACCESSIBLE CONDUCTIVE PARTS of CLASS II CONSTRUCTION such that the current, in normal use and under likely fault conditions in the appliance, is limited to a safe value.

3.3.7 CLASS 0 APPLIANCE: Appliance in which protection against electric shock relies upon BASIC INSULATION only, there being no means for the connection of conductive ACCESSIBLE PARTS, if any, to the protective conductor in the fixed wiring of the installation, reliance in the event of a failure of the BASIC INSULATION being placed upon the environment.

NOTE CLASS 0 APPLIANCES have either an enclosure of insulating material which may form a part or the whole of the BASIC INSULATION, or a metal enclosure which is separated from LIVE PARTS by an appropriate insulation. If an appliance with an enclosure of insulating material has provision for earthing internal parts, it is considered to be a CLASS I APPLIANCE OR CLASS 0I APPLIANCE.

3.3.8 CLASS 0I APPLIANCE: Appliance having at least BASIC INSULATION throughout and incorporating an earthing terminal but having a SUPPLY CORD without earthing conductor and a plug without earthing contact.

3.3.9 CLASS I APPLIANCE: Appliance in which protection against electric shock does not rely on BASIC INSULATION only but which includes an additional safety precaution, in that conductive ACCESSIBLE PARTS are connected to the PROTECTIVE EARTHING CONDUCTOR in the fixed wiring of the installation in such a way that conductive ACCESSIBLE PARTS cannot become live in the event of a failure of the BASIC INSULATION.

NOTE This provision includes a protective conductor in the SUPPLY CORD.

3.3.10 CLASS II APPLIANCE: Appliance in which protection against electric shock does not rely on BASIC INSULATION only but in which additional safety precautions are provided, such as DOUBLE INSULATION OR REINFORCED INSULATION, there being no provision for protective earthing or reliance upon installation conditions.

NOTE 1 Such an appliance may be of one of the following types:

- An appliance having a durable and substantially continuous enclosure of insulating material which envelops all metal parts, with the exception of small parts, such as nameplates, screws and rivets, which are isolated from LIVE PARTS by insulation at least equivalent to REINFORCED INSULATION; such an appliance is called an insulation-encased CLASS II APPLIANCE;
- an appliance having a substantially continuous metal enclosure, in which DOUBLE INSULATION OR REINFORCED INSULATION IS USED throughout; such an appliance is called a metal-encased CLASS II APPLIANCE;
- an appliance which is a combination of an insulation-encased CLASS II APPLIANCE and a metal-encased CLASS II APPLIANCE.

NOTE 2 The enclosure of an insulation-encased CLASS II APPLIANCE may form a part or the whole of the SUPPLEMENTARY INSULATION or of the REINFORCED INSULATION.

NOTE 3 If an appliance with DOUBLE INSULATION OR REINFORCED INSULATION throughout has provision for earthing, it is considered to be a CLASS I or a CLASS 0I APPLIANCE.

3.3.11 CLASS II CONSTRUCTION: Part of an appliance for which protection against electric shock relies upon DOUBLE INSULATION OR REINFORCED INSULATION.

3.3.12 CLASS III APPLIANCE: Appliance in which protection against electric shock relies on supply at SAFETY EXTRA-LOW VOLTAGE and in which voltages higher than those of SAFETY EXTRA-LOW VOLTAGE are not generated.

3.3.13 CLASS III CONSTRUCTION: Part of an appliance for which protection against electric shock relies upon SAFETY EXTRA-LOW VOLTAGE and in which voltages higher than those of SAFETY EXTRA-LOW VOLTAGE are not generated.

3.3.14 CLEARANCE: Shortest distance in air between two conductive parts or between a conductive part and the accessible surface.

3.3.15 CREEPAGE DISTANCE: Shortest distance along the surface of insulation between two conductive parts or between a conductive part and the accessible surface.

3.4

3.4.1 EXTRA-LOW VOLTAGE: Voltage supplied from a source within the appliance that does not exceed 50 V between conductors and between conductors and earth when the appliance is supplied at RATED VOLTAGE.

3.4.1DV DR Modification to replace the definition with the following:

EXTRA-LOW VOLTAGE: Voltage that does not exceed 30 V rms or 42,4 V peak ac or dc.

3.4.2 SAFETY EXTRA-LOW VOLTAGE: Voltage not exceeding 42 V between conductors and between conductors and earth, the no-load voltage not exceeding 50 V.

When SAFETY EXTRA-LOW VOLTAGE is obtained from the supply mains, it is to be through a SAFETY ISOLATING TRANSFORMER or a convertor with separate windings, the insulation of which complies with DOUBLE INSULATION OR REINFORCED INSULATION requirements.

NOTE 1 The voltage limits specified are based on the assumption that the SAFETY ISOLATING TRANSFORMER is supplied at its RATED VOLTAGE.

NOTE 2 SAFETY EXTRA-LOW VOLTAGE is also known as SELV.

3.4.2DV DR Modification to replace the first paragraph with the following:

SAFETY EXTRA-LOW VOLTAGE: Voltage not exceeding 30 V rms or 42,4 V peak or 30 V dc between conductors and between conductors and earth. Where an appliance is intended for use immersed in water, SAFETY EXTRA-LOW VOLTAGE is 15 V rms or 21,2 V peak or 15 V dc.

3.4.3 SAFETY ISOLATING TRANSFORMER: Transformer, the input winding of which is electrically separated from the output winding by an insulation at least equivalent to DOUBLE INSULATION OR REINFORCED INSULATION that is intended to supply an appliance or circuit at SAFETY EXTRA-LOW VOLTAGE.

3.4.4 PROTECTIVE EXTRA-LOW VOLTAGE CIRCUIT: Earthed circuit operating at SAFETY EXTRA-LOW VOLTAGE which is separated from other circuits by BASIC INSULATION and protective screening, DOUBLE INSULATION OR REINFORCED INSULATION.

NOTE 1 Protective screening is the separation of circuits from LIVE PARTS by means of an earthed screen.

NOTE 2 A PROTECTIVE EXTRA-LOW VOLTAGE CIRCUIT is also known as a PELV circuit.

3.5

3.5.1 PORTABLE APPLIANCE: Appliance that is intended to be moved while in operation or an appliance, other than a FIXED APPLIANCE, having a mass less than 18 kg.

3.5.2 HAND-HELD APPLIANCE: PORTABLE APPLIANCE intended to be held in the hand during normal use.

3.5.3 STATIONARY APPLIANCE: FIXED APPLIANCE or an appliance which is not a PORTABLE APPLIANCE.

3.5.4 FIXED APPLIANCE: Appliance that is intended to be used while fastened to a support or while secured in a specific situation.

3.5.5 BUILT-IN APPLIANCE: FIXED APPLIANCE intended to be installed in a cabinet, in a prepared recess in a wall or in a similar situation.

3.5.6 HEATING APPLIANCE: Appliance incorporating heating elements but without any motor.

3.5.7 MOTOR-OPERATED APPLIANCE: Appliance incorporating motors but without any heating element.

NOTE Magnetically driven appliances are considered to be MOTOR-OPERATED APPLIANCES.

3.5.8 COMBINED APPLIANCE: Appliance incorporating heating elements and motors.

3.6

3.6.1 NON-DETACHABLE PART: Part that can only be removed or opened with the aid of a TOOL or a part that fulfills the test of 22.11.

3.6.2 DETACHABLE PART: Part that can be removed or opened without the aid of a TOOL, a part that is removed in accordance with the instructions for use, even if a TOOL is needed for removal, or a part that does not fulfill the test of 22.11.

NOTE 1 If for installations 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.

3.6.3 ACCESSIBLE PART: Part or surface that can be touched by means of test probe B of IEC 61032, and if the part or surface is metal, any conductive part connected to it.

NOTE ACCESSIBLE NON-METALLIC PARTS with conductive coatings are considered to be ACCESSIBLE METAL PARTS.

3.6.4 LIVE PART: Conductor or conductive part intended to be energized in normal use, including a neutral conductor but, by convention, not a PEN conductor.

NOTE 1 Parts, accessible or not, complying with 8.1.4 are not considered to be LIVE PARTS.

NOTE 2 A PEN conductor is a protective earthed neutral conductor combining the functions of both a protective conductor and a neutral conductor.

3.6.4DV DE Modification to add the following note:

NOTE 3 A LIMITED POWER SOURCE is not considered to be LIVE PARTS.

3.6.5 TOOL: Screwdriver, coin or any other object that may be used to operate a screw or similar fixing means.

3.7

3.7.1 THERMOSTAT: Temperature-sensing device, the operating temperature of which may be either fixed or adjustable and which during NORMAL OPERATION keeps the temperature of the controlled part between certain limits by automatically opening and closing a circuit.

3.7.2 TEMPERATURE LIMITER: Temperature-sensing device, the operating temperature of which may be either fixed or adjustable and which during NORMAL OPERATION operates by opening or closing a circuit when the temperature of the controlled part reaches a predetermined value.

NOTE It does not make the reverse operation during the normal duty cycle of the appliance. It may or may not require manual resetting.

3.7.3 THERMAL CUT-OUT: Device which during abnormal operation limits the temperature of the controlled part by automatically opening the circuit, or by reducing the current, and is constructed so that its setting cannot be altered by the user.

3.7.4 SELF-RESETTING THERMAL CUT-OUT: THERMAL CUT-OUT that automatically restores the current after the relevant part of the appliance has cooled down sufficiently.

3.7.5 NON-SELF-RESETTING THERMAL CUT-OUT: THERMAL CUT-OUT that requires a manual operation for resetting, or replacement of a part, in order to restore the current.

NOTE Manual operation includes disconnection of the appliance from the supply mains.

3.7.6 PROTECTIVE DEVICE: Device, the operation of which prevents a hazardous situation under abnormal operation conditions.

3.7.7 THERMAL LINK: THERMAL CUT-OUT which operates only once and requires partial or complete replacement.

3.8

3.8.1 ALL-POLE DISCONNECTION: Disconnection of both supply conductors by a single initiating action or, for three-phase appliances, disconnection of the three supply conductors by a single initiating action.

NOTE For three-phase appliances the neutral conductor is not considered to be a supply conductor.

3.8.2 OFF POSITION: Stable position of a switching device in which the circuit controlled by the switch is disconnected from its supply or, for electronic disconnection, the circuit is de-energized.

NOTE The OFF POSITION does not imply an ALL-POLE DISCONNECTION.

3.8.3 VISIBLY GLOWING HEATING ELEMENT: Heating element that is partly or completely visible from the outside of the appliance and has a temperature of at least 650 °C when the appliance has been operated under NORMAL OPERATION at RATED POWER INPUT until steady conditions have been established.

3.8.4 PTC HEATING ELEMENT: Element intended for heating consisting mainly of positive temperature coefficient resistors that are thermally sensitive and have a rapid non-linear increase in resistance when the temperature is raised through a particular range.

3.8.5 USER MAINTENANCE: Any maintenance operation stated in the instructions for use, or marked on the appliance, that the user is intended to perform.

3.9

3.9.1 ELECTRONIC COMPONENT: Part in which conduction is achieved principally by electrons moving through a vacuum, gas or semiconductor.

NOTE Neon indicators are not considered to be ELECTRONIC COMPONENTS.

3.9.2 ELECTRONIC CIRCUIT: Circuit incorporating at least one ELECTRONIC COMPONENT.

3.9.3 PROTECTIVE ELECTRONIC CIRCUIT: ELECTRONIC CIRCUIT that prevents a hazardous situation under abnormal operating conditions.

NOTE Parts of the circuit may also be used for functional purposes.

3.9.4 SOFTWARE CLASS B: Software that includes code intended to prevent hazards if a fault, other than a software fault, occurs in the appliance.

3.9.5 SOFTWARE CLASS C: Software that includes code intended to prevent hazards without the use of other PROTECTIVE DEVICES.

3.10DV D2 Addition:

LIMITED POWER SOURCE: A power source whose output voltage is SELV and the maximum output current and other parameters are limited in accordance with Table 3.10DV.1.

Table 3.10DV.1 – Limits for inherently LIMITED POWER SOURCES

Output voltage ¹⁾ (U _{OC})		Output current ²⁾ (I _{SC}) A	Apparent power ³⁾ (S) VA
V a.c.	V d.c.		
≤ 20	≤ 20	≤ 8,0	≤ 5 × U _{OC}
20 < U _{OC} ≤ 30	20 < U _{OC} ≤ 30	≤ 8,0	≤ 100
–	30 < U _{OC} ≤ 42,4	≤ 150 / U _{OC}	≤ 100

¹⁾ U_{OC}: Output voltage measured with all load circuits disconnected. Voltages are for substantially sinusoidal a.c. and ripple free d.c. For non-sinusoidal a.c. and d.c. with ripple greater than 10% of the peak, the peak voltage shall not exceed 42,4 V.

²⁾ I_{SC}: Maximum output current with any non-capacitive load, including a short circuit measured 5 s after application of the load if the limited power circuit is protected by an electronic circuit or a PTC and 60 s if protected by an impedance.

³⁾ S (VA): Maximum output VA with any load. Initial transients lasting less than 5 s are permitted to exceed the limit if the limited power circuit is protected by an electronic circuit or a PTC and 60 s if protected by an impedance.

3.11DV D2 Addition:

PROTECTIVE EARTHING CONDUCTOR: A conductor connecting the main protective earthing terminal or lead in the equipment to the building earth, or in the power SUPPLY CORD, connecting a main protective earthing terminal in the equipment to an earth point in the building installation.

3.12DV D2 Addition:

PROTECTIVE BONDING CONDUCTOR: A conductor in the equipment, or a combination of conductive parts in the equipment, connecting a main protective earthing terminal to a part of the equipment that is required to be earthed.

4 General requirement

Appliances shall be constructed so that in normal use they function safely so as to cause no danger to persons or surroundings, even in the event of carelessness that may occur in normal use.

In general this principle is achieved by fulfilling the relevant requirements specified in this standard and compliance is checked by carrying out all the relevant tests.

4DV DE Modification of the first paragraph:

Replace “cause no danger to persons or surroundings.” with “reduce the risk of fire, electric shock, and/or injury to persons.”

5 General conditions for the tests

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

5.1 Tests according to this standard are type tests.

NOTE Routine tests are described in annex A.

5.2 The tests are carried out on a single appliance that 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. The test of 22.3 is carried out on a new appliance.

NOTE 1 Additional samples may be required for example if the appliance has to be tested under different conditions, for example if it can be supplied with different voltages.

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

The testing of components may require the submission of additional samples of these components.

If the test of annex C has to be carried out, six samples of the motor are needed.

If the tests of annex D are carried out, an additional appliance may be used.

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

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

NOTE 2 The cumulative stress resulting from successive tests on ELECTRONIC CIRCUITS is to be avoided. It may be necessary to replace components or to use additional samples. The number of additional samples should be kept to a minimum by an evaluation of the relevant ELECTRONIC CIRCUITS.

NOTE 3 If an appliance has to be dismantled in order to carry out a test, care is to be taken to insure that it is reassembled as originally supplied. In case of doubt, subsequent tests may be carried out on a separate sample.

5.3 The tests are carried out in the order of the clauses. However, the test of 22.11 on the appliance at room temperature is carried out before the tests of clause 8. The tests of clause 14, and 21.2 and 22.24 are carried out after the tests of clause 29. The test of 19.14 is carried out before the tests of 19.11.

If it is evident from the construction of the appliance that a particular test is not applicable, the test is not carried out.

5.4 When testing appliances that are also supplied by other energies such as gas, the influence of their consumption has to be taken into account.

5.5 The tests are carried out with the appliance or any movable part of it placed in the most unfavourable position which may occur in normal use.

5.6 Appliances provided with controls or switching devices are tested with these controls or devices adjusted to their most unfavourable setting, if the setting can be altered by the user.

NOTE 1 If the adjusting means of the control is accessible without the aid of a TOOL, this subclause 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 subclause does not apply.

NOTE 2 Adequate sealing is regarded as preventing alteration of the setting by the user.

5.7 The tests are carried out in a draught free location and in general at an ambient temperature of 20 °C ± 5 °C.

If the temperature attained by any part is limited by a temperature sensitive device or is influenced by the temperature at which a change of state occurs, for example when water boils, the ambient temperature is maintained at 23 °C ± 2 °C in case of doubt.

5.8.1 Appliances for a.c. only are tested with a.c. at RATED FREQUENCY, and those for a.c. and d.c. are tested at the more unfavourable supply.

Appliances for a.c. that are not marked with RATED FREQUENCY or are marked with a frequency range of 50 Hz to 60 Hz are tested with either 50 Hz or 60 Hz, whichever is the more unfavourable.

5.8.2 Appliances having more than one RATED VOLTAGE are tested on the basis of the most unfavourable voltage.

For MOTOR-OPERATED APPLIANCES, and COMBINED APPLIANCES, marked with a RATED VOLTAGE RANGE, when it is specified that the supply voltage is equal to the RATED VOLTAGE multiplied by a factor, the appliance is supplied at

- the upper limit of the RATED VOLTAGE RANGE multiplied by this factor, if greater than 1;
- the lower limit of the RATED VOLTAGE RANGE multiplied by this factor, if smaller than 1.

When a factor is not specified, the supply voltage is the most unfavourable within the RATED VOLTAGE RANGE.

NOTE 1 If a HEATING APPLIANCE has a RATED VOLTAGE RANGE, the upper limit of the voltage range will usually be the most unfavourable voltage within the range.

NOTE 2 For MOTOR-OPERATED APPLIANCES, COMBINED APPLIANCES and appliances having more than one RATED VOLTAGE or RATED VOLTAGE RANGE, it may be necessary to make some of the tests at the minimum, the mean and the maximum values of the RATED VOLTAGE or the RATED VOLTAGE RANGE in order to establish the most unfavourable voltage.

5.8.3 For HEATING APPLIANCES and COMBINED APPLIANCES, marked with a RATED POWER INPUT RANGE, when it is specified that the power input is equal to the RATED POWER INPUT multiplied by a factor, the appliance is operated at

- the upper limit of the RATED POWER INPUT RANGE multiplied by this factor, if greater than 1;
- the lower limit of the RATED POWER INPUT RANGE multiplied by this factor, if smaller than 1.

When a factor is not specified, the power input is the most unfavourable within the RATED POWER INPUT RANGE.

5.8.4 For appliances marked with a RATED VOLTAGE RANGE and RATED POWER INPUT corresponding to the mean of the RATED VOLTAGE RANGE, when it is specified that the power input is equal to RATED POWER INPUT multiplied by a factor, the appliance is operated at

- the calculated power input corresponding to the upper limit of the RATED VOLTAGE RANGE multiplied by this factor, if greater than 1;

– the calculated power input corresponding to the lower limit of the *RATED VOLTAGE RANGE* multiplied by this factor, if smaller than 1.

When a factor is not specified, the power input corresponds to the power input at the most unfavourable voltage within the *RATED VOLTAGE RANGE*.

5.9 When alternative heating elements or accessories are made available by the appliance manufacturer, the appliance is tested with those elements or accessories which give the most unfavourable results.

5.10 The tests are carried out on the appliance as supplied. However, an appliance constructed as a single appliance but supplied in a number of units is tested after assembly in accordance with the instructions provided with the appliance.

BUILT-IN APPLIANCES and *FIXED APPLIANCES* are installed in accordance with the instructions provided with the appliance before testing.

5.11 Appliances intended to be connected to fixed wiring by means of a flexible cord are tested with the appropriate flexible cord connected to the appliance.

5.12 For *HEATING APPLIANCES* and *COMBINED APPLIANCES* when it is specified that the appliance has to operate at a power input multiplied by a factor, this applies only to heating elements without appreciable positive temperature coefficient of resistance.

For heating elements with appreciable positive temperature coefficient of resistance, other than *PTC HEATING ELEMENTS*, the supply voltage is determined by supplying the appliance at *RATED VOLTAGE* until the heating element reaches its operating temperature. The supply voltage is then rapidly increased to the value necessary to give the power input required for the relevant test, this value of the supply voltage being maintained throughout the test.

NOTE In general, the temperature coefficient is considered to be appreciable if, at *RATED VOLTAGE*, the power input of the appliance in cold condition differs by more than 25 % from the power input at operating temperature.

5.13 The tests for appliances with *PTC HEATING ELEMENTS* are carried out at a voltage corresponding to the specified power input. When a power input greater than the *RATED POWER INPUT* is specified, the factor for multiplying the voltage is equal to the square root of the factor for multiplying the power input.

5.14 If *CLASS 01 APPLIANCES* or *CLASS I APPLIANCES* have *ACCESSIBLE METAL PARTS* that are not earthed and are not separated from *LIVE PARTS* by an intermediate metal part that is earthed, such parts are checked for compliance with the appropriate requirements specified for *CLASS II CONSTRUCTION*.

If *CLASS 01 APPLIANCES* or *CLASS I APPLIANCES* have *ACCESSIBLE NON-METALLIC PARTS*, such parts are checked for compliance with the appropriate requirements specified for *CLASS II CONSTRUCTION* unless these parts are separated from *LIVE PARTS* by an intermediate metal part that is earthed.

NOTE Guidance is given in Annex P for enhanced requirements that may be used to ensure an acceptable level of protection against electrical and thermal hazards for particular types of appliances used in an installation without a protective earthing conductor in countries that have warm damp equable climates.

5.15 If appliances have parts operating at SAFETY EXTRA-LOW VOLTAGE, such parts are checked for compliance with the appropriate requirements specified for CLASS III CONSTRUCTION.

5.16 When testing ELECTRONIC CIRCUITS, the supply is to be free from perturbations from external sources that can influence the results of the tests.

5.17 Appliances powered by rechargeable batteries are tested according to annex B.

5.18 If linear and angular dimensions are specified without a tolerance, ISO 2768-1 is applicable.

6 Classification

6.1 Appliances shall be of one of the following classes with respect to protection against electric shock:

CLASS 0, CLASS 0I, CLASS I, CLASS II, CLASS III.

Compliance is checked by inspection and by the relevant tests.

6.1DV.1 DR Modification to add the following:

Class 0I appliances are not allowed.

NOTE Class 0I may be allowed if specified in the applicable part 2.

6.1DV.2 DR Modification to add the following:

CLASS 0 appliances shall not exceed 150 volts (rms) to ground.

6.2 Appliances shall have the appropriate degree of protection against harmful ingress of water.

Compliance is checked by inspection and by the relevant tests.

NOTE The degrees of protection against harmful ingress of water are given in IEC 60529.

7 Marking and instructions

7.1 Appliances shall be marked with the

- RATED VOLTAGE OR RATED VOLTAGE RANGE in volts;
- symbol for nature of supply, unless the RATED FREQUENCY is marked;
- RATED POWER INPUT in watts or RATED CURRENT in amperes;
- name, trade mark or identification mark of the manufacturer or responsible vendor;
- model or type reference;
- symbol 5172 of IEC 60417, for CLASS II APPLIANCES only;
- IP number according to degree of protection against ingress of water, other than IPX0.

Compliance is checked by inspection.

NOTE 1 The first numeral of the IP number need not be marked on the appliance.

NOTE 2 Additional markings are allowed provided they do not give rise to misunderstanding.

NOTE 3 If components are marked separately, the marking of the appliance and that of the components is to be such that there can be no doubt with regard to the marking of the appliance itself.

NOTE 4 If the appliance is marked with rated pressure, the units used may be bars but only together with pascals and placed in brackets.

The enclosure of electrically-operated water valves incorporated in external hose-sets for connection of an appliance to the water mains shall be marked with symbol IEC 60417-5036 (DB:2002-10) if their WORKING VOLTAGE exceeds EXTRA-LOW VOLTAGE.

7.1DV.1 D2 Modification to add the following note:

NOTE 5 Where IP numbers are required to be marked, alternate markings may be used. Where the alternate markings are used, compliance with 6.2 is determined by the applicable part 2.

7.1DV.2 DR Modification to add the following paragraph and notes after the last paragraph:

If the temperature rise of the insulation of the fixed wiring supplying an appliance for permanent connection to the supply mains exceeds the temperature rise specified in Table 3 during the test of Clause 11, the equipment shall be marked with the substance of the following:

“Use supply wires suitable for ____ °C”

NOTE 6 The temperature specified in the marking will be 75°C or 90°C except where another rating is permitted by national electrical installation code wiring rules.

NOTE 7 Additional information (e.g. AWG size) may be provided as part of the marking where appropriate to facilitate installation in accordance with the national electrical installation code wiring rules.

Compliance is checked by inspection and during the test of Clause 11.

7.2 STATIONARY APPLIANCES for multiple supply shall be marked with the substance of the following:

Warning: Before obtaining access to terminals, all supply circuits must be disconnected.

This warning shall be placed in the vicinity of the terminal cover.

Compliance is checked by inspection.

7.3 Appliances having a range of rated values and which can be operated without adjustment throughout the range shall be marked with the lower and upper limits of the range separated by a hyphen.

NOTE 1 Example: 115-230 V: The appliance is suitable for any value within the marked range (a curling iron with a PTC HEATING ELEMENT).

Appliances having different rated values and which have to be adjusted for use at a particular value by the user or installer, shall be marked with the different values separated by an oblique stroke.

NOTE 2 Example: 115/230 V: The appliance is only suitable for the marked values (a shaver with a selector switch).

NOTE 3 This requirement is also applicable to appliances with provision for connection to both single-phase and multi-phase supplies.

Example: 230 V/400 V: The appliance is only suitable for the voltage values indicated, 230 V being for single-phase operation and 400 V for three-phase operation (a dishwasher with terminals for both supplies).

Compliance is checked by inspection.

7.4 If the appliance can be adjusted for different RATED VOLTAGES, the voltage to which the appliance is adjusted shall be clearly discernible.

NOTE If frequent changes in voltage setting are not required, this requirement is considered to be met if the RATED VOLTAGE to which the appliance is to be adjusted can be determined from a wiring diagram fixed to the appliance. The wiring diagram may be on the inside of a cover that has to be removed to connect the supply conductors. It is not to be on a label loosely attached to the appliance.

Compliance is checked by inspection.

7.5 For appliances marked with more than one RATED VOLTAGE or with one or more RATED VOLTAGE RANGES, the RATED POWER INPUT or RATED CURRENT for each of these voltages or ranges shall be marked. However, if the difference between the limits of a RATED VOLTAGE RANGE does not exceed 10 % of the arithmetic mean value of the range, the marking for RATED POWER INPUT or RATED CURRENT may be related to the arithmetic mean value of the range.

The upper and lower limits of the RATED POWER INPUT or RATED CURRENT shall be marked on the appliance so that the relation between input and voltage is clear.

Compliance is checked by inspection.

7.6 When symbols are used, they shall be as follows:

	[symbol 5031 of IEC 60417]	direct current
	[symbol 5032 of IEC 60417]	alternating current
3	[symbol IEC 60417-5032-1 (DB:2002-10)]	three-phase alternating current
3N	[symbol IEC 60417-5032-2 (DB:2002-10)]	three-phase alternating current with neutral
	[symbol 5016 of IEC 60417]	fuse-link
NOTE 1	The rated current of the fuse link may be indicated in association with this symbol.	
		time lag miniature fuse-link where X is the symbol for the time/current characteristic as given in IEC 60127
	[symbol 5019 of IEC 60417]	protective earth
	[symbol 5172 of IEC 60417]	class II equipment
	[symbol 5012 of IEC 60417]	lamp
NOTE 2	The rated wattage of the lamp may be indicated in association with this symbol.	
	[symbol ISO 7000-1641 (DB:2004-01)]	operator's manual; operating instructions
	[symbol 0434 of ISO 7000]	caution
	[symbol ISO 7000-0790 (DB:2004-01)]	read operator's manual
	[symbol IEC 60417-5021 (DB:2002-10)]	equipotentiality
	[symbol IEC 60417-5036 (DB:2002-10)]	dangerous voltage

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The symbol for nature of supply shall be placed next to the marking for RATED VOLTAGE.

The symbol for CLASS II APPLIANCES shall be placed so that it will be obvious that it is a part of the technical information and is unlikely to be confused with any other marking.

Units of physical quantities and their symbols shall be those of the international standardized system.

Compliance is checked by inspection.

NOTE 3 Additional symbols are allowed provided that they do not give rise to misunderstanding.

NOTE 4 Symbols specified in IEC 60417 and ISO 7000 may be used.

7.7 Appliances to be connected to more than two supply conductors and appliances for multiple supply shall have a connection diagram fixed to them, unless the correct mode of connection is obvious.

Compliance is checked by inspection.

NOTE 1 The correct mode of connection for three-phase appliances is considered to be obvious if the terminals for the supply conductors are indicated by arrows pointing towards the terminals.

NOTE 2 Marking in words is an acceptable means of indicating the correct mode of connection.

NOTE 3 The connection diagram may be the wiring diagram referred to in 7.4.

7.8 Except for TYPE Z ATTACHMENT, terminals used for connection to the supply mains shall be indicated as follows:

- terminals intended exclusively for the neutral conductor shall be indicated by the letter N;
- protective earthing terminals shall be indicated by the symbol 5019 of IEC 60417.

These indications shall not be placed on screws, removable washers or other parts which can be removed when conductors are being connected.

Compliance is checked by inspection.

7.8DV DR Modification to add the following note:

NOTE The marking of the letter N for the neutral conductor terminal is not required for Type Y attachments.

7.9 Unless it is obviously unnecessary, switches which may give rise to a hazard when operated shall be marked or placed so as to indicate clearly which part of the appliance they control. Indications used for this purpose shall, wherever practicable, be comprehensible without a knowledge of languages or national standards.

Compliance is checked by inspection.

7.10 The different positions of switches on STATIONARY APPLIANCES and the different positions of controls on all appliances shall be indicated by figures, letters or other visual means.

NOTE 1 This requirement also applies to switches which are part of a control.

If figures are used for indicating the different positions, the OFF POSITION shall be indicated by the figure 0 and the position for a higher value, such as output, input, speed, cooling effect, shall be indicated by a higher figure.

The figure 0 shall not be used for any other indication unless it is positioned and associated with other numbers so that it does not give rise to confusion with the indication of the OFF POSITION.

NOTE 2 For example, the figure 0 may be used on a digital programming keyboard.

Compliance is checked by inspection.

7.11 Controls intended to be adjusted during installation or in normal use shall be provided with an indication for the direction of adjustment.

NOTE An indication of + and – is considered to be sufficient.

Compliance is checked by inspection.

7.12 Instructions for use shall be provided with the appliance so that the appliance can be used safely.

NOTE Instructions for use may be marked on the appliance as long as they are visible in normal use.

If it is necessary to take precautions during USER MAINTENANCE, appropriate details shall be given.

Compliance is checked by inspection.

The instructions shall state the substance of the following:

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.

Children should be supervised to ensure that they do not play with the appliance.

7.12.1 If it is necessary to take precautions during installation of the appliance, appropriate details shall be given.

Compliance is checked by inspection.

7.12.2 If a STATIONARY APPLIANCE is not fitted with a SUPPLY CORD and a plug, or with other means for disconnection from the supply mains having a contact separation in all poles that provide full disconnection under overvoltage category III conditions, the instructions shall state that means for disconnection must be incorporated in the fixed wiring according with the wiring rules.

Compliance is checked by inspection.

7.12.3 If the insulation of the fixed wiring supplying an appliance for permanent connection to the supply mains can come into contact with parts having a temperature rise exceeding 50 K during the test of clause 11, the instructions shall state that the fixed wiring insulation must be protected, for example, by insulating sleeving, having an appropriate temperature rating.

Compliance is checked by inspection and during the test of clause 11.

7.12.3DV DR Deletion:

Delete Clause 7.12.3.

7.12.4 The instructions for BUILT-IN APPLIANCES shall include information with regard to the following:

- dimensions of the space to be provided for the appliance;
- dimensions and position of the means for supporting and fixing the appliance within this space;
- minimum distances between the various parts of the appliance and the surrounding structure;
- minimum dimensions of ventilating openings and their correct arrangement;
- connection of the appliance to the supply mains and the interconnection of any separate components;
- necessity to allow disconnection of the appliance from the supply after installation, unless the appliance incorporates a switch complying with 24.3. The disconnection may be achieved by having the plug accessible or by incorporating a switch in the fixed wiring in accordance with the wiring rules.

Compliance is checked by inspection.

7.12.5 For appliances with TYPE X ATTACHMENT having a specially prepared cord, the instructions shall contain the substance of the following.

If the SUPPLY CORD is damaged, it must be replaced by a special cord or assembly available from the manufacturer or its service agent.

For appliances with TYPE Y ATTACHMENT, the instructions shall contain the substance of the following.

If the SUPPLY CORD is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified person in order to avoid a hazard.

For appliances with TYPE Z ATTACHMENT, the instructions shall contain the substance of the following.

The SUPPLY CORD cannot be replaced. If the cord is damaged the appliance should be scrapped.

Compliance is checked by inspection.

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7.12.6 The instructions for HEATING APPLIANCES incorporating a NON-SELF-RESETTING THERMAL CUT-OUT that is reset by disconnection of the supply mains shall contain the substance of the following:

CAUTION: In order to avoid a hazard due to inadvertent resetting of the thermal cutout, this appliance must not be supplied through an external switching device, such as a timer, or connected to a circuit that is regularly switched on and off by the utility.

Compliance is checked by inspection.

7.12.7 The instructions for FIXED APPLIANCES shall state how the appliance is to be fixed to its support.

NOTE The method of fixing is not to depend on the use of adhesives since they are not considered to be a reliable fixing means.

Compliance is checked by inspection.

7.12.8 The instructions for appliances connected to the water mains shall state

- the maximum inlet water pressure, in pascals;
- the minimum inlet water pressure, in pascals, if this is necessary for the correct operation of the appliance.

The instructions for appliances connected to the water mains by detachable hose-sets shall state that the new hose-sets supplied with the appliance are to be used and that old hose-sets should not be reused.

Compliance is checked by inspection.

7.13 Instructions and other text required by this standard shall be written in the official language of the country in which the appliance is to be sold.

Compliance is checked by inspection.

7.14 The markings required by the standard shall be clearly legible and durable.

Compliance is checked by inspection and by rubbing the marking by hand for 15 s with a piece of cloth soaked with water and again for 15 s with a piece of cloth soaked with petroleum spirit.

After all the tests of this standard, the marking shall be clearly legible. It shall not be easily possible to remove marking plates nor shall they show curling.

NOTE 1 In considering the durability of the marking, the effect of normal use is taken into account. For example, marking by means of paint or enamel, other than vitreous enamel, on containers that are likely to be cleaned frequently, is not considered to be durable.

NOTE 2 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 0,66 kg/l.

7.14DV D2 Modification to delete Note 2 and add the following to the end of the first paragraph of the test specification:

The petroleum spirit to be used for the test is aliphatic solvent hexane.

7.15 The markings specified in 7.1 to 7.5 shall be on a main part of the appliance.

Markings on the appliance shall be clearly discernible from the outside of the appliance but if necessary after removal of a cover. For PORTABLE APPLIANCES it shall be possible to remove or open this cover without the aid of a TOOL.

For STATIONARY APPLIANCES at least the name or trade mark or identification mark of the manufacturer or responsible vendor and the model or type reference shall be visible when the appliance is installed as in normal use. These markings may be beneath a DETACHABLE COVER. Other markings may be beneath a cover only if they are near to the terminals. For FIXED APPLIANCES, this requirement applies after the appliance has been installed according to the instructions provided with the appliance.

Indications for switches and controls shall be placed on or near these components. They shall not be placed on parts which can be positioned or repositioned in such a way that the marking is misleading.

Compliance is checked by inspection.

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

NOTE Marking on the link is allowed as long as the marking is legible after the link has functioned.

This requirement does not apply to links which can only be replaced together with a part of the appliance.

Compliance is checked by inspection.

7.17DV DR Addition:

Appliances requiring the usage of time delay overcurrent protective devices in accordance with 9DV.2 shall be so marked to indicate the use of time delay fuses only.

7.18DV DR Addition:

Appliances equipped with output terminals supplied from a LIMITED POWER SOURCE shall be marked to indicate Class 2 wiring.

8 Protection against access to LIVE PARTS

8.1 Appliances shall be constructed and enclosed so that there is adequate protection against accidental contact with LIVE PARTS.

Compliance is checked by inspection and by the tests of 8.1.1 to 8.1.3 as applicable, taking into account 8.1.4 and 8.1.5.

8.1.1 The requirement of 8.1 applies for all positions of the appliance when it is operated as in normal use, and after the removal of DETACHABLE PARTS.

NOTE 1 This excludes the use of screw-type fuses and screw-type miniature circuit breakers which are accessible without the aid of a TOOL.

Lamps located behind a DETACHABLE COVER are not removed, provided that the appliance can be isolated from the supply mains by means of a plug or an all-pole switch. However, during insertion or removal of lamps which are located behind a DETACHABLE COVER, protection against contact with LIVE PARTS of the lamp cap shall be ensured.

Test probe B of IEC 61032 is applied without appreciable force, the appliance being in every possible position except that appliances normally used on the floor and having a mass exceeding 40 kg are not tilted. Through openings, the test probe is applied to any depth that the probe will permit and is rotated or angled before, during and after insertion to any position. If the opening does not allow the entry of the probe, the force on the probe in the straight position is increased to 20 N. If the probe then enters the opening, the test is repeated with the probe in the angled position.

NOTE 2 "Without appreciable force" is considered to be a force not exceeding 1 N.

It shall not be possible to touch LIVE PARTS or LIVE PARTS protected only by lacquer, enamel, ordinary paper, cotton, oxide film, beads or sealing compound except self-hardening resins, with the test probe.

8.1.1DV D1 Modification to add the following after the third paragraph:

The articulated probe of Figure 12DV shall be applied without appreciable force when the product is:

- a) A hand-held product, or a hand-held part of a product, or
- b) Accessible to children while the product is operating.

8.1.2 Test probe 13 of IEC 61032 is applied without appreciable force through openings in CLASS 0 APPLIANCES, CLASS II APPLIANCES and CLASS II CONSTRUCTIONS, except for those giving access to lamp caps and LIVE PARTS in socket-outlets.

NOTE 1 Appliance outlets are not considered to be socket-outlets.

NOTE 2 "Without appreciable force" is considered to be a force not exceeding 1 N.

The test probe is also applied through openings in earthed metal enclosures having a nonconductive coating such as enamel or lacquer.

It shall not be possible to touch LIVE PARTS with the test pin.

8.1.3 Instead of test probe B and test probe 13, for appliances other than those of CLASS II, test probe 41 of IEC 61032 is applied without appreciable force to LIVE PARTS of VISIBLY GLOWING HEATING ELEMENTS, all poles of which can be disconnected by a single switching action. It is also applied to parts supporting such elements, provided that it is obvious from the outside of the appliance, without removing covers and similar parts, that these supporting parts are in contact with the element.

NOTE 1 “Without appreciable force” is considered to be a force not exceeding 1 N.

It shall not be possible to touch these LIVE PARTS.

NOTE 2 For appliances provided with a SUPPLY CORD and without a switching device in their supply circuit, the withdrawal of the plug from a socket-outlet is considered to be a single switching action.

8.1.4 An ACCESSIBLE PART is not considered to be live if

- the part is supplied at SAFETY EXTRA-LOW VOLTAGE, provided that
 - for a.c., the peak value of the voltage does not exceed 42,4 V,
 - for d.c., the voltage does not exceed 42,4 V,

or

- the part is separated from LIVE PARTS by PROTECTIVE IMPEDANCE.

If PROTECTIVE IMPEDANCE is used, the current between the part and the supply source shall not exceed 2 mA for d.c., its peak value shall not exceed 0,7 mA for a.c. and

- for voltages having a peak value over 42,4 V up to and including 450 V, the capacitance shall not exceed 0,1 μF ;
- for voltages having a peak value over 450 V up to and including 15 kV, the discharge shall not exceed 45 μC .
- for voltages having a peak value over 15 kV, the energy in the discharge shall not exceed 350 mJ.

Compliance is checked by measurement, the appliance being supplied at RATED VOLTAGE.

Voltages and currents are measured between the relevant parts and each pole of the supply source. Discharges are measured immediately after the interruption of the supply. The quantity of electricity in the discharge is measured using a resistor having a nominal non-inductive resistance of 2 000 Ω .

NOTE 1 Details of a suitable circuit for measuring the current are given in figure 4 of IEC 60990.

NOTE 2 The quantity of electricity is calculated from the sum of all areas recorded on the voltage/time graph without taking voltage polarity into account.

8.1.5 LIVE PARTS of BUILT-IN APPLIANCES, FIXED APPLIANCES and appliances delivered in separate units, shall be protected at least by BASIC INSULATION before installation or assembly.

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

8.2 CLASS II APPLIANCES and CLASS II CONSTRUCTIONS shall be constructed and enclosed so that there is adequate protection against accidental contact with BASIC INSULATION and metal parts separated from LIVE PARTS by BASIC INSULATION only.

It shall only be possible to touch parts which are separated from LIVE PARTS by DOUBLE INSULATION OR REINFORCED INSULATION.

Compliance is checked by inspection and by applying test probe B of IEC 61032, as described in 8.1.1.

NOTE BUILT-IN APPLIANCES and FIXED APPLIANCES are tested after installation.

9 Starting of motor-operated appliances

NOTE Requirements and tests are specified in part 2 when necessary.

9DV DR Addition of 9DV.1 – 9DV.4:

9DV.1 An appliance shall start and operate on a circuit protected by a non-time delay fuse having a current rating corresponding to the supply mains to which the appliance would normally be connected.

9DV.2 The use of time delay fuses is acceptable for stationary appliances marked as indicated in Clause 7.17DV.

9DV.3 Compliance is checked by the test specified in 9DV.4

9DV.4 The appliance shall be capable of starting 3 times at the conditions of Clause 11 at the rated voltage. The appliance shall start under conditions representing the beginning of normal operation and the beginning of the normal operating cycle. The performance is unacceptable if the fuse opens or an overload protector provided as part of the appliance operates.

10 Power input and current

10.1 If an appliance is marked with RATED POWER INPUT, the power input at normal operating temperature shall not deviate from the RATED POWER INPUT by more than the deviation shown in table 1.

The deviation for MOTOR-OPERATED APPLIANCES applies for COMBINED APPLIANCES if the power input of the motors is more than 50% of the RATED POWER INPUT. The permissible deviations apply for both limits of the range for appliances marked with a RATED VOLTAGE RANGE having limits differing by more than 10 % of the arithmetic mean value of the range.

NOTE In case of doubt, the power input of motors may be measured separately.

Compliance is checked by measurement when the power input has stabilized

- all circuits which can operate simultaneously being in operation;
- the appliance being supplied at RATED VOLTAGE;

– the appliance being operated under *NORMAL OPERATION*.

If the power input varies throughout the operating cycle, the power input is determined as the mean value of the power input occurring during a representative period.

The test is carried out at both the upper and lower limits of the ranges for appliances marked with one or more *RATED VOLTAGE RANGES*, unless the marking of the *RATED POWER INPUT* is related to the arithmetic mean value of the relevant voltage range, in which case the test is carried out at a voltage equal to the arithmetic mean value of that range.

Table 1 – Power input deviation

Type of appliance	RATED POWER INPUT W	Deviation
All appliances	≤ 25	+ 20 %
HEATING APPLIANCES and COMBINED APPLIANCES	> 25 and ≤ 200	± 10 %
	> 200	+ 5 % or 20 W (whichever is the greater) – 10 %
MOTOR-OPERATED APPLIANCES	> 25 and ≤ 300	+ 20 %
	> 300	+ 15% or 60 W (whichever is the greater)

10.2 If an appliance is marked with *RATED CURRENT*, the current at normal operating temperature shall not deviate from *RATED CURRENT* by more than the deviation shown in table 2.

The deviation for *MOTOR-OPERATED APPLIANCES* applies for *COMBINED APPLIANCES* if the current of the motors is more than 50 % of the *RATED CURRENT*. The permissible deviations apply for both limits of the range for appliances marked with a *RATED VOLTAGE RANGE* having limits differing by more than 10 % of the arithmetic mean value of the range.

NOTE In case of doubt, the current of the motors may be measured separately.

Compliance is checked by measurement when the current has stabilized

- all circuits which can operate simultaneously being in operation;
- the appliance being supplied at *RATED VOLTAGE*;
- the appliance being operated under *NORMAL OPERATION*.

If the current varies throughout the operating cycle, the current is determined as the mean value of the current occurring during a representative period.

The test is carried out at both the upper and lower limits of the ranges for appliances marked with one or more *RATED VOLTAGE RANGES*, unless the marking of the *RATED CURRENT* is related to the arithmetic mean value of the relevant voltage range, in which case the tests are made at a voltage equal to the arithmetic mean value of that range.