

CONSOLIDATED VERSION

VERSION CONSOLIDÉE



**Household and similar electrical appliances – Safety –
Part 1: General requirements**

**Appareils électrodomestiques et analogues – Sécurité –
Partie 1: Exigences générales**

This is a preview. [Click here to purchase the full publication.](#)



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2013 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.

If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de la CEI ou du Comité national de la CEI du pays du demandeur.

Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

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

About IEC publications

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

Useful links:

IEC publications search - www.iec.ch/searchpub

The advanced search enables you to find IEC publications by a variety of criteria (reference number, text, technical committee,...).

It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available on-line and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary (IEV) on-line.

Customer Service Centre - webstore.iec.ch/csc

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

A propos de la CEI

La Commission Electrotechnique Internationale (CEI) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Liens utiles:

Recherche de publications CEI - www.iec.ch/searchpub

La recherche avancée vous permet de trouver des publications CEI en utilisant différents critères (numéro de référence, texte, comité d'études,...).

Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

Just Published CEI - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications de la CEI. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (VEI) en ligne.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

CONSOLIDATED VERSION

VERSION CONSOLIDÉE



**Household and similar electrical appliances – Safety –
Part 1: General requirements**

**Appareils électrodomestiques et analogues – Sécurité –
Partie 1: Exigences générales**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 13.120; 97.030

ISBN 978-2-8322-1299-8

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

REDLINE VERSION

VERSION REDLINE

**Household and similar electrical appliances – Safety –
Part 1: General requirements**

**Appareils électrodomestiques et analogues – Sécurité –
Partie 1: Exigences générales**

This is a preview. [Click here to purchase the full publication.](#)

CONTENTS

FOREWORD.....	5
INTRODUCTION.....	8
1 Scope.....	9
2 Normative references	9
3 Terms and definitions	13
4 General requirement.....	21
5 General conditions for the tests	21
6 Classification.....	24
7 Marking and instructions.....	25
8 Protection against access to live parts.....	32
9 Starting of motor-operated appliances	33
10 Power input and current	34
11 Heating	35
12 Void.....	40
13 Leakage current and electric strength at operating temperature.....	40
14 Transient overvoltages	43
15 Moisture resistance	44
16 Leakage current and electric strength.....	46
17 Overload protection of transformers and associated circuits	48
18 Endurance.....	49
19 Abnormal operation	49
20 Stability and mechanical hazards	58
21 Mechanical strength	59
22 Construction.....	60
23 Internal wiring.....	71
24 Components	73
25 Supply connection and external flexible cords	77
26 Terminals for external conductors.....	85
27 Provision for earthing	87
28 Screws and connections	89
29 Clearances, creepage distances and solid insulation	92
30 Resistance to heat and fire.....	100
31 Resistance to rusting.....	105
32 Radiation, toxicity and similar hazards.....	105
Annex A (informative) Routine tests	119
Annex B (normative) Appliances powered by rechargeable batteries that are recharged in the appliance	121
Annex C (normative) Ageing test on motors	126
Annex D (normative) Thermal motor protectors	127
Annex E (normative) Needle-flame test.....	128
Annex F (normative) Capacitors.....	129
Annex G (normative) Safety isolating transformers	131

Annex H (normative) Switches	132
Annex I (normative) Motors having basic insulation that is inadequate for the rated voltage of the appliance	134
Annex J (normative) Coated printed circuit boards	136
Annex K (normative) Overvoltage categories	137
Annex L (informative) Guidance for the measurement of clearances and creepage distances	138
Annex M (normative) Pollution degree	142
Annex N (normative) Proof tracking test.....	143
Annex O (informative) Selection and sequence of the tests of Clause 30	144
Annex P (informative) Guidance for the application of this standard to appliances used in warm damp equable climates.....	150
Annex Q (informative) Sequence of tests for the evaluation of electronic circuits	151
Annex R (normative) Software evaluation	153
Annex S (normative) Battery-operated appliances powered by batteries that are non-rechargeable or not recharged in the appliance	167
 Bibliography.....	 170
Index of defined words.....	172
 Figure 1 – Circuit diagram for leakage current measurement at operating temperature for single-phase connection of class II appliances and for parts of class II construction	 106
Figure 2 – Circuit diagram for leakage current measurement at operating temperature for single-phase connection of appliances, other than those of class II appliances or parts of class II construction	107
Figure 3 – Circuit diagram for leakage current measurement at operating temperature for three-phase connection of with neutral class II appliances and for parts of class II construction	108
Figure 4 – Circuit diagram for leakage current measurement at operating temperature for three-phase connection of with neutral appliances other than those of class II or parts of class II construction	110
Figure 5 – Small part	111
Figure 6 – Example of an electronic circuit with low-power points	112
Figure 7 – Test finger nail	113
Figure 8 – Flexing test apparatus.....	114
Figure 9 – Constructions of cord anchorages	115
Figure 10 – An example of parts of an earthing terminal	116
Figure 11 – Examples of clearances	117
Figure 12 – Example of the placement of the cylinder	118
Figure B.1 – Example of forms of constructions for appliances covered by Annex B.....	124
Figure I.1 – Simulation of faults	135
Figure L.1 – Sequence for the determination of clearances.....	139
Figure L.2 – Sequence for the determination of creepage distances	141
Figure O.1 – Tests for resistance to heat	144
Figure O.2 – Selection and sequence of tests for resistance to fire in hand-held appliances	145

Figure O.3 – Selection and sequence of tests for resistance to fire in attended appliances	146
Figure O.4 – Selection and sequence of tests for resistance to fire in unattended appliances	147
Figure O.5 – Some applications of the term "within a distance of 3 mm"	149
Figure S.1 – Examples of battery marking representing three batteries	169
Table 1 – Power input deviation	34
Table 2 – Current deviation	35
Table 3 – Maximum normal temperature rises	38
Table 4 – Voltage for electric strength test	43
Table 5 – Characteristics of high-voltage sources	43
Table 6 – Impulse test voltage	44
Table 7 – Test voltages	48
Table 8 – Maximum winding temperature	51
Table 9 – Maximum abnormal temperature rise	56
Table 10 – Dimensions of cables and conduits	78
Table 11 – Minimum cross-sectional area of conductors	80
Table 12 – Pull force and torque	82
Table 13 – Nominal cross-sectional area of conductors	86
Table 14 – Torque for testing screws and nuts	91
Table 15 – Rated impulse voltage	93
Table 16 – Minimum clearances	93
Table 17 – Minimum creepage distances for basic insulation	97
Table 18 – Minimum creepage distances for functional insulation	98
Table 19 – Minimum thickness for accessible parts of reinforced insulation consisting of a single layer	99
Table A.1 – Test voltages	120
Table C.1 – Test conditions	126
Table R.1 ^e – General fault/error conditions	155
Table R.2 ^e – Specific fault/error conditions	158
Table R.3 – Semi-formal methods	164
Table R.4 – Software architecture specification	164
Table R.5 – Module design specification	165
Table R.6 – Design and coding standards	165
Table R.7 – Software safety validation	166
Table S.101 – Battery source impedance	168

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

This Consolidated version of IEC 60335-1 bears the edition number 5.1. It consists of the fifth edition (2010) [documents 61/3974/FDIS and 61/4014/RVD], its corrigendum 1 (2010), its corrigendum 2 (2011) and its amendment 1 (2013) [documents 61/4639/FDIS and 61/4675/RVD]. The technical content is identical to the base edition and its amendment.

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions and deletions are displayed in red, with deletions being struck through. A separate Final version with all changes accepted is available in this publication.

This publication has been prepared for user convenience.

International Standard IEC 60335-1 has been prepared by IEC technical committee 61: Safety of household and similar electrical appliances.

The principal changes in this edition as compared with the fourth edition of IEC 60335-1 are as follows (minor changes are not listed):

- updated the text of the standard to align with the most recent editions of the dated normative references;
- modified the functional safety requirements using programmable electronic circuits including software validation requirements;
- updated Clause 29 to cover insulation requirements subjected to high frequency voltages as in switch mode power supply circuits;
- updated Subclause 30.2 to further align the pre-selection option with the end-product test option;
- deleted some notes and converted many other notes to normative text;
- clarified requirements for class III appliances and class III constructions.

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

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.

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

– Annex E	Needle-flame test	IEC 60695-11-5
– 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.

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

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

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

NOTE 3 The attention of National Committees is drawn to the fact that equipment manufacturers and testing organizations may need a transitional period following publication of a new, amended or revised IEC publication in which to make products in accordance with the new requirements and to equip themselves for conducting new or revised tests.

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

The following differences exist in the countries indicated below.

- Introduction: The Part 1 standard (UL60335-1) is only used in combination with a part 2 (UL60335-2-x). National differences are specified in these standards (USA).
- 5.7: The ambient temperature is $25\text{ °C} \pm 10\text{ °C}$ (Japan).
- 5.7: The ambient temperature is $27\text{ °C} \pm 5\text{ °C}$ (India).
- 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).
- 7.12.2: The requirements for full disconnection do not apply (Japan).
- 13.2: The test circuit and some leakage current limits are different (India).
- 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).
- 22.35 Accessible metal parts separated from live parts by earthed metal parts are not regarded as likely to become live in the event of an insulation fault (USA).
- 24.1: IEC component standard requirements are replaced by the relevant requirements of component standards specified in UL60335-1 and parts 2 (UL60335-2-x) (USA).
- 25.3: A set of supply leads is not permitted (Norway, Denmark, Finland, Netherlands).
- 25.8: 0,5 mm² supply cords are not allowed for class I appliances (Australia and New Zealand).
- 26.6: Conductor cross-sectional areas are different (USA).
- 29.1: Different rated impulse voltages are used between 50 V and 150 V (Japan).

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