

This is a preview - click here to buy the full publication



IEC 60335-1

Edition 6.0 2020-09

INTERNATIONAL STANDARD



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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 13.120; 97.030

ISBN 978-2-8322-8600-5

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

CONTENTS

FOREWORD.....	6
INTRODUCTION.....	9
1 Scope.....	11
2 Normative references	11
3 Terms and definitions	16
4 General requirement.....	28
5 General conditions for the tests.....	28
6 Classification.....	32
7 Marking and instructions	32
8 Protection against access to live parts	41
9 Starting of motor-operated appliances.....	43
10 Power input and current.....	43
11 Heating	45
12 Charging of metal-ion batteries	51
13 Leakage current and electric strength at operating temperature	52
14 Transient overvoltages	55
15 Moisture resistance	55
16 Leakage current and electric strength.....	58
17 Overload protection of transformers and associated circuits.....	60
18 Endurance.....	60
19 Abnormal operation	60
20 Stability and mechanical hazards	71
21 Mechanical strength.....	72
22 Construction.....	74
23 Internal wiring.....	86
24 Components	88
25 Supply connection and external flexible cords	93
26 Terminals for external conductors	101
27 Provision for earthing.....	103
28 Screws and connections	105
29 Clearances, creepage distances and solid insulation	107
30 Resistance to heat and fire	116
31 Resistance to rusting	121
32 Radiation, toxicity and similar hazards	121
Annex A (informative) Routine tests	135
Annex B (normative) Battery-operated appliances, separable batteries and detachable batteries for battery-operated appliances.....	137
Annex C (normative) Ageing test on motors.....	158
Annex D (normative) Thermal motor protectors.....	159
Annex E (normative) Needle-flame test	160

Annex F (normative) Capacitors	161
Annex G (normative) Safety isolating transformers	163
Annex H (normative) Switches	164
Annex I (normative) Motors having basic insulation that is inadequate for the rated voltage of the appliance	166
Annex J (normative) Coated printed circuit boards	168
Annex K (informative) Overvoltage categories	169
Annex L (informative) Guidance for the measurement of clearances and creepage distances	170
Annex M (informative) Pollution degree	173
Annex N (normative) Proof tracking test	174
Annex O (informative) Selection and sequence of the tests of Clause 30	175
Annex P (informative) Guidance for the application of this standard to appliances used in tropical climates	180
Annex Q (informative) Sequence of tests for the evaluation of electronic circuits	182
Annex R (normative) Software evaluation	185
Annex S (informative) Guidance for the application of this standard on measurement of power input and current based on the requirements of 10.1 and 10.2 concerning the representative period	199
Annex T (normative) UV-C radiation effect on non-metallic materials	200
Annex U (normative) Appliances intended for remote communication through public networks	203
Bibliography	207
Index of defined terms	210
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	122
Figure 2 – Circuit diagram for leakage current measurement at operating temperature for single-phase connection of other than class II appliances or parts of class II construction	123
Figure 3 – Circuit diagram for leakage current measurement at operating temperature for three-phase with neutral class II appliances and for parts of class II construction	124
Figure 4 – Circuit diagram for leakage current measurement at operating temperature for three-phase with neutral appliances other than those of class II or parts of class II construction	125
Figure 5 – Small part	126
Figure 6 – Example of an electronic circuit with low-power points	126
Figure 7 – Test finger nail	127
Figure 8 – Flexing test apparatus	128
Figure 9 – Constructions of cord anchorages	129
Figure 10 – An example of parts of an earthing terminal	130
Figure 11 – Examples of clearances	131
Figure 12 – Example of the placement of the cylinder	132
Figure 13 – Small parts cylinder	133
Figure 14 – Example of a specified operating region of a lithium-ion cell during charging	134
Figure B.1 – Examples of battery-operated appliance constructions and application of normative Annex B	155

Figure B.2 – Examples of correct polarity connection marking representing three batteries	157
Figure I.1 – Simulation of faults	167
Figure L.1 – Sequence for the determination of clearances	170
Figure L.2 – Sequence for the determination of creepage distances	171
Figure L.3 – Measurement of clearances	172
Figure O.1 – Tests for resistance to heat	175
Figure O.2 – Selection and sequence of tests for resistance to fire in hand-held appliances	176
Figure O.3 – Selection and sequence of tests for resistance to fire in attended appliances	176
Figure O.4 – Selection and sequence of tests for resistance to fire in unattended appliances	177
Figure O.5 – Some applications of the term "within a distance of 3 mm"	179
Figure Q.1 – Flowchart outlining the sequence of tests for the evaluation of electronic circuits	183
Figure S.1 – Flowchart giving guidance on measurement of power input and current concerning the representative period	199
Table 1 – Power input deviation	43
Table 2 – Current deviation	44
Table 3 – Maximum normal temperature rises	47
Table 4 – Voltage for electric strength test	54
Table 5 – Characteristics of high-voltage sources	54
Table 6 – Impulse test voltage	55
Table 7 – Test voltages	59
Table 8 – Maximum winding temperature	63
Table 9 – Maximum abnormal temperature rise	69
Table 10 – Dimensions of cables and conduits	94
Table 11 – Minimum cross-sectional area of conductors	96
Table 12 – Pull force and torque	98
Table 13 – Nominal cross-sectional area of conductors	102
Table 14 – Torque for testing screws and nuts	106
Table 15 – Rated impulse voltage	108
Table 16 – Minimum clearances	109
Table 17 – Minimum creepage distances for basic insulation	113
Table 18 – Minimum creepage distances for functional insulation	114
Table 19 – Minimum thickness for accessible parts of reinforced insulation consisting of a single layer	116
Table A.1 – Test voltages	136
Table B.1 – Artificial source characteristics	139
Table B.2 – Total area of openings for metal-ion cells	147
Table B.3 – Volume of air injected at 2 070 kPa	147
Table C.1 – Test conditions	158
Table R.1 – General fault/error conditions	187

Table R.2 – Specific fault/error conditions	189
Table R.3 – Semi-formal methods	195
Table R.4 – Software architecture specification	195
Table R.5 – Module design specification.....	196
Table R.6 – Design and coding standards	197
Table R.7 – Software safety validation	197
Table T.1 – Minimum property retention limits after UV-C exposure	201
Table T.2 – Minimum electric strength for internal wiring after UV-C exposure.....	202
Table U.1 – Examples of acceptable measures against unauthorised access and transmission fault/error modes	205

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.

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

This sixth edition cancels and replaces the fifth edition published in 2010, Amendment 1:2013 and Amendment 2:2016. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition (minor changes are not listed):

- a) updated the text of this standard to align with the most recent editions of the dated normative references;
- b) deleted some notes and converted many other notes, in whole or in part, to normative text;
- c) changed some Annex designations from normative to informative;
- d) introduced information on Guidance documents concerning the application of the safety requirements covered by IEC 60335 series and on how to retrieve them;

- e) clarified requirements for PELV circuits;
- f) clarification of requirements on measurement of power input and rated current when they vary throughout the operating cycle;
- g) replaced normative Annex S with the informative Annex S "Guidance for the application of this standard on measurement of power input and current based on the requirements of 10.1 and 10.2 concerning the representative period";
- h) introduced and clarified mechanical strength requirements for appliances with integral pins for insertion into socket-outlets;
- i) revised requirements for battery-operated appliances;
- j) introduced requirements for metal-ion batteries including a new Clause 12 Charging of metal-ion batteries;
- k) introduced the application of test probe 18;
- l) introduced requirements for appliances incorporating appliance outlets and socket-outlets accessible to the user;
- m) revised and clarified requirements for appliances incorporating a functional earth;
- n) introduced moisture resistance test requirements for appliances that incorporate an automatic cord reel and that have a second numeral IP rating;
- o) clarified the appliance test criteria for the moisture resistance for appliances and parts of appliances with integral pins for insertion into socket-outlets;
- p) introduced limits on the output voltage of an accessible safety extra-low voltage outlet or connector or Universal Serial Bus (USB) under abnormal operation conditions;
- q) introduced requirements to cover optical radiation hazards;
- r) introduced external communication software management items into normative Annex R;
- s) revised external communication requirements in Table R.1 and Table R.2;
- t) introduced in new normative Annex U cyber security requirements to avoid unauthorized access and the effects of transmission failures via remote communication through public networks.

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

FDIS	Report on voting
61/6012/FDIS	61/6089/RVD

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

The language used for the development of this International Standard is English.

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

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

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.

This sixth edition of IEC 60335-1 is only to be used in conjunction with parts 2 that have been established on the basis of this edition.

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 the associated noun are also in bold.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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

NOTE 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 °C ± 10 °C (Japan).
- 5.7: The ambient temperature is 27 °C ± 5 °C (India).
- 6.1: Class 0 appliances and class 0I appliances are not allowed (Australia, European Union, India, Israel, New Zealand, Norway, Singapore, Switzerland, United Kingdom).
- 7.12.2: The requirements for full disconnection do not apply (Japan).
- 7.12.8: The maximum inlet water pressure shall be at least 1,0 MPa (Denmark, Norway, Sweden and Finland).
- 13.2: The test circuit and some leakage current limits are different (India).
- 19.5: The test is also applicable to appliances intended to be permanently connected to fixed wiring (Norway).
- 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).
- 22.2: The second paragraph of this subclause, that deals with single-phase, permanently connected class I appliances having heating elements, is not applicable due to the supply system (Norway).
- 22.2: Double-pole switches or protective devices are required (Norway).
- 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).

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 document using a colour printer.

INTRODUCTION

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

Guidance documents concerning the application of the safety requirements for appliances can be accessed via TC 61 supporting documents on the IEC website –

www.iec.ch/tc61/supportingdocuments

This information is given for the convenience of users of this International Standard and does not constitute a replacement for the normative text in this standard.

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

This standard takes into account the requirements of IEC 60364 as far as possible so that there is compatibility with the wiring rules when the appliance is connected to the supply mains. However, national wiring rules may 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, as far as is reasonable. If applicable, the influence of one function on the other is taken into account.

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

When a part 2 standard does not include additional requirements to cover hazards dealt with in Part 1, Part 1 applies.

NOTE 1 This means that the technical committees responsible for the part 2 standards have determined that it is not necessary to specify particular requirements for the appliance in question over and above the general requirements.

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

NOTE 2 Horizontal publications, basic safety publications and group safety publications covering a hazard are not applicable since they have been taken into consideration when developing the general and particular requirements for the IEC 60335 series of standards.

Individual countries may wish to consider the application of this standard, as far as is reasonable, to appliances not mentioned in a part 2, and to appliances designed on new principles. In this case, consideration should be given to defining normal operation, specifying the classification of the appliance according to Clause 6 and specifying whether the appliance is operated attended or unattended. Consideration should also be given to particular categories of likely users and to related specific risks such as access to live parts, hot surfaces or hazardous moving parts.

An appliance that complies with the text of this standard will not necessarily be considered to comply with the safety principles of this 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 this standard.

NOTE 3 Standards dealing with non-safety aspects of household appliances are:

- IEC standards published by TC 59 concerning methods of measuring performance;
- CISPR 11, CISPR 14-1 and relevant IEC 61000-3 series standards concerning electromagnetic emissions;
- CISPR 14-2 concerning electromagnetic immunity;
- IEC standards published by TC 111 concerning environmental matters.

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 including direct current (DC) supplied appliances and **battery-operated 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.

This standard deals with the reasonably foreseeable hazards presented by appliances that are encountered by all persons. However, in general, it does not take into account:

- persons (including children) whose
 - physical, sensory or mental capabilities; or
 - lack of experience and knowledgeprevents them from using the appliance safely without supervision or instruction;
- children playing with the appliance.

Additional requirements may be necessary for appliances intended to be used in vehicles or on board ships or aircraft. 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.

This standard does not apply to:

- appliances intended exclusively for industrial purposes;
- appliances intended to be used in locations where special conditions prevail, such as the presence of a corrosive or explosive atmosphere (dust, vapour or gas);
- audio, video and similar electronic apparatus (IEC 60065);
- medical electrical equipment (IEC 60601 series);
- hand-held motor-operated electric tools (IEC 60745 series);
- information technology equipment (IEC 60950-1);
- transportable motor-operated electric tools (IEC 61029 series);
- audio/video, information and communication technology equipment (IEC 62368-1);
- electric motor-operated hand-held tools, transportable tools and lawn and garden machinery (IEC 62841 series).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60034-1, *Rotating electrical machines – Part 1: Rating and performance*

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

IEC 60065:2014, *Audio, video and similar electronic apparatus – Safety requirements*

IEC 60068-2-2, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-31, *Environmental testing – Part 2-31: Tests – Test Ec: Rough handling shocks, primarily for equipment-type specimens*

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

IEC 60068-2-78, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

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

IEC 60085:2007, *Electrical insulation – Thermal evaluation and designation*

IEC 60112:2003, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

IEC 60112:2003/AMD1:2009¹

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 60227-5:2011, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 5: Flexible cables (cords)*

IEC 60238, *Edison screw lampholders*

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

IEC 60252-1:2010, *AC motor capacitors – Part 1: General – Performance, testing and rating – Safety requirements – Guidance for installation and operation*

IEC 60252-1:2010/AMD1:2013²

IEC 60309-2, *Plugs, socket-outlets and couplers for industrial purposes – Part 2: Dimensional interchangeability requirements for pin and contact-tube accessories*

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

IEC 60320-1, *Appliance couplers for household and similar general purposes – Part 1: General requirements*

IEC 60320-2-3, *Appliance couplers for household and similar general purposes – Part 2-3: Appliance couplers with a degree of protection higher than IPX0*

¹ There exists a consolidated edition 4.1:2009 that includes edition 4 and its Amendment 1.

² There exists a consolidated edition 2.1:2013 that includes edition 2 and its Amendment 1.

IEC 60320-3, *Appliance couplers for household and similar general purposes – Part 3: Standard sheets and gauges*

IEC 60384-14:2013, *Fixed capacitors for use in electronic equipment – Part 14: Sectional specification – Fixed capacitors for electromagnetic interference suppression and connection to the supply mains*

IEC 60384-14:2013/AMD1:2016³

IEC 60417, *Graphical symbols for use on equipment*

IEC 60445:2017, *Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals, conductor terminations and conductors*

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

IEC 60529:1989/AMD1:1999

IEC 60529:1989/AMD2:2013⁴

IEC 60598-1:2014, *Luminaires – Part 1: General requirements and tests*

IEC 60598-1:2014/AMD1:2017⁵

IEC 60603-11, *Connectors for frequencies below 3 MHz for use with printed boards – Part 11: Detail specification for concentric connectors (dimensions for free connectors and fixed connectors)*

IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60664-3:2016, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution*

IEC 60664-4:2005, *Insulation coordination for equipment within low-voltage systems – Part 4: Consideration of high-frequency voltage stress*

IEC 60691, *Thermal-links – Requirements and application guide*

IEC 60695-2-11:2014, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products (GWEPT)*

IEC 60695-2-12, *Fire hazard testing – Part 2-12: Glowing/hot-wire based test methods – Glow-wire flammability index (GWFI) test method for materials*

IEC 60695-2-13, *Fire hazard testing – Part 2-13: Glowing/hot-wire based test methods – Glow-wire ignition temperature (GWIT) test method for materials*

IEC 60695-10-2, *Fire hazard testing – Part 10-2: Abnormal heat – Ball pressure test*

IEC 60695-11-5:2016, *Fire hazard testing – Part 11-5: Test flames – Needle-flame test method – Apparatus, confirmatory test arrangement and guidance*

³ There exists a consolidated edition 4.1:2016 that includes edition 4 and its Amendment 1.

⁴ There exists a consolidated edition 2.2:2013 that includes edition 2 and its Amendment 1 and Amendment 2.

⁵ There exists a consolidated edition 8.1:2017 that includes edition 8 and its Amendment 1.

IEC 60695-11-10, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods*

IEC 60730-1:2013, *Automatic electrical controls – Part 1: General requirements*
IEC 60730-1:2013/AMD1:2015⁶

IEC 60730-2-8:2018, *Automatic electrical controls – Part 2-8: Particular requirements for electrically operated water valves, including mechanical requirements*

IEC 60730-2-9:2015, *Automatic electrical controls – Part 2-9: Particular requirements for temperature sensing controls*
IEC 60730-2-9:2015/AMD1:2018⁷

IEC 60730-2-10, *Automatic electrical controls for household and similar use – Part 2-10: Particular requirements for motor-starting relays*

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

IEC 60799, *Electrical accessories – Cord sets and interconnection cord sets*

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 60934, *Circuit-breakers for equipment (CBE)*

IEC 60990:2016, *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 4-2: Testing and measurement techniques – 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 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – 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 61000-4-11:2020, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16 A per phase*

⁶ There exists a consolidated edition 5.1:2015 that includes edition 5 and its Amendment 1.

⁷ There exists a consolidated edition 4.1:2018 that includes edition 4 and its Amendment 1.

IEC 61000-4-13:2002, *Electromagnetic compatibility (EMC) – Part 4-13: Testing and measurement techniques – Harmonics and interharmonics including mains signalling at a.c. power port, low frequency immunity tests*

IEC 61000-4-13:2002/AMD1:2009

IEC 61000-4-13:2002/AMD2:2015⁸

IEC 61000-4-34:2005, *Electromagnetic compatibility (EMC) – Part 4-34: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current more than 16 A per phase*

IEC 61000-4-34:2005/AMD1:2009⁹

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

IEC 61058-1:2016, *Switches for appliances – Part 1: General requirements*

IEC 61058-1-1:2016, *Switches for appliances – Part 1-1: Requirements for mechanical switches*

IEC 61058-1-2:2016, *Switches for appliances – Part 1-2: Requirements for electronic switches*

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

IEC 61210, *Connecting devices – Flat quick-connect terminations for electrical copper conductors – Safety requirements*

IEC 61558-1:2017, *Safety of transformers, reactors, power supply units and combinations thereof – Part 1: General requirements and tests*

IEC 61558-2-6:2009, *Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V – Part 2-6: Particular requirements and tests for safety isolating transformers and power supply units incorporating safety isolating transformers*

IEC 61558-2-16:2009, *Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V – Part 2-16: Particular requirements and tests for switch mode power supply units and transformers for switch mode power supply units*

IEC 61558-2-16:2009/AMD1:2013¹⁰

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

IEC 62133-1:2017, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications – Part 1: Nickel systems*

IEC 62133-2:2017, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications – Part 2: Lithium systems*

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

⁸ There exists a consolidated edition 1.2:2015 that includes edition 1 and its Amendment 1 and Amendment 2.

⁹ There exists a consolidated edition 1.1:2009 that includes edition 1 and its Amendment 1.

¹⁰ There exists a consolidated edition 1.1:2013 that includes edition 1 and its Amendment 1.

IEC 62471:2006, *Photobiological safety of lamps and lamp systems*

IEC 62477-1, *Safety requirements for power electronic converter systems and equipment – Part 1: General*

IEC 62821 (all parts), *Electric cables – Halogen-free, low smoke, thermoplastic insulated and sheathed cables of rated voltages up to and including 450/750 V*

ISO 178, *Plastics – Determination of flexural properties*

ISO 179-1, *Plastics – Determination of Charpy impact properties – Part 1: Non-instrumented impact test*

ISO 180, *Plastics – Determination of Izod impact strength*

ISO 527 (all parts), *Plastics – Determination of tensile properties*

ISO 1463, *Metallic and oxide coatings – Measurement of coating thickness – Microscopical method*

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

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

ISO 4892-1:2016, *Plastics – Methods of exposure to laboratory light sources – Part 1: General guidance*

ISO 4892-2: 2013, *Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps*

ISO 7000, *Graphical symbols for use on equipment – Registered symbols*

ISO 8256, *Plastics – Determination of tensile-impact strength*

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

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