BS EN 60335-1:2012+A16:2023

Incorporating corrigenda October 2013, January 2014 and October 2014

BSI Standards Publication

# Household and similar electrical appliances — Safety

Part 1: General requirements

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Full document details: BS EN 60335-1:2012+A16:2023

# National foreword

This British Standard is the UK implementation of EN 60335-1:2012+A16:2023, incorporating corrigendum January 2014. It is derived from IEC 60335-1:2010, incorporating amendment 1:2013 and amendment 2:2016. It supersedes BS EN 60335-1:2012+A15:2021, which will be withdrawn on 10 November 2026.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated by ▌A1⟩ ⟨A1▐.

Tags indicating changes by CENELEC carry the number of the CENELEC amendment. For example, text altered by CENELEC amendment A11 is indicated by ▌A11⟩ ⟨A11▐.

CENELEC common modifications have been implemented at the appropriate places in the text. The start and finish of each common modification is indicated in the text by tags ▌C⟩ ⟨C▐.

Where a common modification to an IEC amendment has been introduced, the tags carry the number of the amendment. For example, the common modifications introduced by CENELEC to IEC amendment 1 are indicated by ▌C1⟩ ⟨C1▐.

The UK participation in its preparation was entrusted to Technical Committee CPL/61, Safety of household and similar electrical appliances.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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National Annex of this kind, the relevant Annex ZA or ZZ in the body of the European text will indicate the relationship to UK regulation applicable in Great Britain. References to EU legislation may need to be read in accordance with the UK designation and the applicable UK law. Further information on designated standards can be found at www.bsigroup.com/standardsandregulation.

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**Amendments/corrigenda issued since publication**

| Date | Text affected |
|---|---|
| 31 October 2013 | Compliance paragraph in Subclause 20.2 reinstated |
| 31 May 2014 | Implementation of CENELEC corrigendum January 2014: Contents and Subclause 7.12 corrected |
| 31 August 2014 | Implementation of CENELEC amendment A11:2014, including the revision of Annex ZF |
| 31 October 2014 | Tags added to CENELEC European foreword and title updated in Foreword to amendment A11 |
| 31 December 2017 | Implementation of CENELEC amendment A13:2017, including the revision of Annex ZC and replacement of Annex ZZ with Annexes ZZA and ZZB, and correction to the amendments/corrigenda information in national foreword |
| 29 February 2020 | Implementation of IEC amendment 1:2013 with CENELEC endorsement A1:2019, including the revision of Annex ZC |
| 29 February 2020 | Implementation of CENELEC amendment A14:2019, including the revision of Annexes ZA, ZB, ZD and ZF and the addition of Annexes ZH and ZI |
| 29 February 2020 | Implementation of IEC amendment 2:2016 with CENELEC endorsement A2:2019, including the revision of Annex ZC |

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| Date | Text affected |
|---|---|
| 30 June 2021 | Implementation of CENELEC amendment A15:2021, including the revision of Annexes ZA, ZB, ZC, ZF and ZH |
| 30 November 2023 | Implementation of CENELEC amendment A16:2023, including the revision of Annexes ZC, ZE, and ZF |

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# EN 60335-1:2012+A16

November 2023

ICS 13.120; 97.030

English version

# Household and similar electrical appliances - Safety - Part 1: General requirements

(IEC 60335-1:2010, modified)

Appareils électrodomestiques et analogues - Sécurité - Partie 1: Exigences générales (CEI 60335-1:2010, modifiée)

Sicherheit elektrischer Geräte für den Hausgebrauch und ähnliche Zwecke - Teil 1: Allgemeine Anforderungen (IEC 60335-1:2010, modifiziert)

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Ref. No. EN 60335-1:2012+A16:E

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# European foreword

This document (EN 60335-1:2012*)* consists of the text of IEC 60335-1:2010 prepared by IEC/TC 61 "Safety of household and similar electrical appliances", together with the common modifications prepared by CLC/TC 61, "Safety of household and similar electrical appliances".

The following dates are fixed:

| | | |
|---|---|---|
| • latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement | (dop) | 2012-11-21 |
| • latest date by which the national standards conflicting with this document have to be withdrawn | (dow) | 2014-11-21 |

A11 The dow stated in this EN 60335-1:2012 and its relevant amendments is applicable only when the Part 1 is used to test products for which no Part 2 exists. This means that when a Part 2 exists the dow is the one mentioned in the relevant Part 2. A11

This document supersedes EN 60335-1:2002 + corr. Jul.2009 + corr. May.2010 + A1:2004 + A2:2006 + A11:2004 + A12:2006 + A13:2008 + A14:2010 + A15:2011 + corr. Jan.2007 + corr. Feb.2007.

Clauses, subclauses, notes, tables, figures and annexes which are additional to those in IEC 60335-1:2010 are prefixed “Z”.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For the relationship with EU Directive(s) see informative Annex ZZ, which is an integral part of this document.

This part of EN 60335 is to be used in conjunction with the appropriate Part 2. The Parts 2 contain clauses to supplement or modify the corresponding clauses in Part 1 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 | EN 60695-11-5 |
| – Annex F | Capacitors | EN 60384-14 |
| – Annex G | Safety isolating transformers | EN 61558-1 and EN 61558-2-6 |
| – Annex H | Switches | EN 61058-1 |
| – Annex J | Coated printed circuit boards | EN 60664-3 |
| – Annex N | Proof tracking test | EN 60112 |

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.

Special national conditions causing a deviation from this European Standard are listed in Annex ZA.

National deviations from this European Standard are listed in Annex ZB.

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## Endorsement notice

The text of the International Standard IEC 60335-1:2010 was approved by CENELEC as a European Standard with common modifications.

# Foreword to amendment A11

This document (EN 60335-1:2012/A11:2014) has been prepared by CLC/TC 61 "Safety of household and similar electrical appliances".

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2015-06-16
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2014-11-21

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# Foreword to amendment A13

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The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2018-05-03
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2020-05-03

This Amendment 13 to EN 60335-1:2012 cancels and replaces with immediate effect EN 60335-1:2012/A12:2017.

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## Foreword to amendment A1

This document (EN 60335-1:2012/A1:2019) consists of the text of IEC 60335-1:2010/A1:2013 + COR:2014, prepared by IEC/TC 61 “Safety of household and similar electrical appliances”, together with the common modifications prepared by CLC/TC 61 “Safety of household and similar electrical appliances”.

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2020-02-09
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2021–07-30

This amendment supplements or modifies the corresponding clauses of EN 60335-1:2012 and its amendments A11:2014 and A13:2017.

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**Endorsement notice**

The text of the International Standard IEC 60335-1:2010/A1:2013 + COR:2014 was approved by CENELEC as a European Standard with agreed common modifications.

## Foreword to amendment A14

This document (EN 60335-1:2012/A14:2019) has been prepared by CLC/TC 61 “Safety of household and similar electrical appliances”.

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2020-07-10
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2021–07–30

This amendment supplements or modifies the corresponding clauses of EN 60335-1:2012 and its amendments A11:2014, A13:2017 and A1:2019.

EN 60335-1:2012/A14:2019 is to be read in conjunction with EN 60335-1:2012 and its amendments, which are referred to in this text as “Part 1”.

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This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For the relationship with EU Directive(s) see informative Annexes ZZ, which are part of EN 60335-1:2012 and its amendments.

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## Foreword to amendment A2

This document (EN 60335-1:2012/A2:2019) consists of the text of IEC 60335-1:2010/A2:2016 + COR:2016 prepared by IEC/TC 61 "Safety of household and similar electrical appliances", together with the common modifications prepared by CLC/TC 61 "Safety of household and similar electrical appliances".

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2020-02-09
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2021-07-30

This amendment supplements or modifies the corresponding clauses of EN 60335-1:2012 and its amendments A11:2014, A13:2017, A1:2019 and A14:2019.

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For the relationship with EU Directive(s) see informative Annexes ZZ.

**Endorsement notice**

The text of the International Standard IEC 60335-1:2010/A2:2016 + COR:2016 was approved by CENELEC as a European Standard with agreed common modifications.

## Foreword to amendment A15

This document (EN 60335-1:2012/A15:2021) has been prepared by CLC/TC 61 “Safety of household and similar electrical appliances”.

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2022–03–01
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2024–03–01

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## European foreword to amendment A16

This document (EN 60335-1:2012/A16:2023) has been prepared by CLC/TC 61 “Safety of household and similar electrical appliances”.

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| • latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement | (dop) | 2024–05–10 |
| • latest date by which the national standards conflicting with this document have to be withdrawn | (dow) | 2026–11–10 |

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Any feedback and questions on this document should be directed to the users’ national committee. A complete listing of these bodies can be found on the CENELEC website.

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

This fifth edition cancels and replaces the fourth edition published in 2001 including its Amendment 1 (2004) and amendment 2 (2006). It constitutes a technical revision.

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;

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– 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.

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

| FDIS | Report on voting |
|---|---|
| 61/3974/FDIS | 61/4014/RVD |

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

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 this publication 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.

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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, 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).

A2 – 7.12.8: The maximum inlet water pressure shall be at least 1,0 MPa (Denmark, Norway, Sweden). A2

– 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 $mm^2$ 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).

The contents of the corrigenda of July 2010 and April 2011 have been included in this copy.

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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 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.

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

〈C〉 For appliances not covered by a particular Part 2 of EN 60335 additional consideration may need to be given to particular categories of likely users, including vulnerable people and children and to related specific risks (e.g. access to live parts, or to hot surfaces or to moving parts) that may be covered by a particular Part 2 considered to be closest to the product under examination.〈C〉

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

NOTE 2 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 3 Horizontal and generic standards 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. For example, in the case of temperature requirements for surfaces on many appliances, generic standards, such as ISO 13732-1 for hot surfaces, are not applicable in addition to Part 1 or part 2 standards.

〈A2〉 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. 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. 〈A2〉 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 4 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;
- IEC standards published by TC 111 concerning environmental matters.

〈A15〉 This European amendment A15 supplements or modifies the corresponding clauses of EN 60335-1:2012+A11:2014+A13:2017+A1:2019+A14:2019+A2:2019. 〈A15〉

〈A16〉 This European Amendment A16 supplements or modifies the corresponding clauses of the standard EN 60335-1:2012+A11:2014+A13:2017+A1:2019+A14:2019+A2:2019 +A15:2021(Part 1) 〈A16〉

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# HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

## Part 1: General requirements

## 1 Scope

[C⟩ This European Standard deals with the safety of electrical appliances for household environment and commercial purposes, their **rated voltage** being not more than 250 V for single-phase and 480 V for others.

NOTE 1 Battery-operated appliances and other d.c. supplied appliances are within the scope of this standard. [A1⟩ Dual supply appliances, either mains-supplied or battery-operated, are regarded as **battery-operated appliances** when operated in the battery mode. ⟨A1]

NOTE Z1 Examples of appliance for household environment are appliances for typical housekeeping functions used in the household environment that may also be used by non expert users for typical housekeeping functions:

- in shops, offices and other similar working environments;
- in farm houses;
- by clients in hotels, motels and other residential type environments;
- in bed and breakfast type environments.

NOTE Z2 Household environment includes the dwelling and its associated buildings, the garden, etc.

Appliances and machines intended to be used by expert or trained users in shops, in light industry and on farms, and appliances and machines which are declared to be for commercial use by lay persons are within the scope of this standard.

Additional requirements for such appliances are given in Annex ZE.

NOTE 2 [AC1⟩ Void ⟨AC1].

NOTE Z3 Examples of such appliances and machines are catering equipment, cleaning machines for commercial use, and appliances for hairdressers.

NOTE Z4 Criteria applied for the allocation of products covered by standards in the EN 60335 series under either the Low Voltage Directive (LVD) or the Machinery Directive (MD) are given for information in Annex ZF.

This standard deals with the reasonably foreseeable hazards presented by appliances and machines that are encountered by all persons.

However, in general, it does not take into account:

- **children** playing with the appliance;
- the use of the appliance by **very young children**;
- the use of the appliance by **young children** without supervision.

It is recognized that **very vulnerable people** may have needs beyond the level addressed in this standard.

NOTE 3 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 4 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);
- appliances for medical purposes (IEC 60601);
- hand-held motor-operated electric tools (IEC 60745);
- personal computers and similar equipment (IEC 60950-1);
- transportable motor-operated electric tools (IEC 61029).⟨C]

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## 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.

A1 IEC 60034-1, *Rotating electrical machines – Part 1: Rating and performance* A1

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

IEC 60065:2001, *Audio, video and similar electronic apparatus – Safety requirements*
Amendment 1 (2005)[1)]

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*

C IEC/TR 60083: A14 2015 A14, *Plugs and socket-outlets for domestic and similar general use standardized in member countries of IEC* C

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*
Amendment 1 (2009)[2)]

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*

A2 IEC 60252-1, *AC motor capacitors – Part 1: General – Performance, testing and rating – Safety requirements – Guide for installation and operation* A2

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

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 coupler 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, *Graphical symbols for use on equipment*

A2 IEC 60445:2010, *Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals, conductor terminations a d conductors* A2

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
Amendment 1 (1999)[3)]

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1) There exists a consolidated edition 7.1 (2005) that includes edition 7 and its Amendment 1.

2) There exists a consolidated edition 4.1 (2009) that includes edition 4 and its Amendment 1.

3) There exists a consolidated edition 2.1 (2001) that includes edition 2 and its Amendment 1.

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IEC 60598-1:2008, *Luminaires – Part 1: General requirements and tests*

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

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 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 60695-2-11:2000, *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 10-2: Abnormal heat – Ball pressure test*

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*

IEC 60730-1:1999, *Automatic electrical controls for household and similar use – Part 1: General requirements*
Amendment 1 (2003)
Amendment 2 (2007)[4)]

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)[5)]

[A1] IEC 60730-2-9:2008[6)], *Automatic electrical controls for household and similar use – Part 2-9: Particular requirements for temperature sensing controls* [A1]

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 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 mm$^2$ up to 35 mm$^2$ (included)*

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

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4) There exists a consolidated edition 3.2 (2007) that includes edition 3 and its Amendment 1 and Amendment 2.

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

6) There exists a consolidated edition 3.1 (2011) that includes edition 3:2008 and its Amendment 1:2011.

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

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*
Amendment 1 (2009)[7)]

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*
Amendment 1 (2009)

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)
Amendment 2 (2007)[8)]

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 61558-1:2005, *Safety of power transformers, power supply units and similar products – Part 1: General requirements and tests*
Amendment 1(2009)[9)]

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*

A1 IEC 61558-2-16, *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 62477-1, *Safety requirements for power electronic converter systems and equipment – Part 1: General* A1

A2 IEC 62821-1, *Electric cables – Halogen-free, low smoke, thermoplastic insulated and sheathed cables of rated voltages up to and including 450/750 V – Part 1: General requirements* A2

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

C *Text deleted* C

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7) There exists a consolidated edition 1.1 (2009) that includes edition 1 and its Amendment 1.

8) There exists a consolidated edition 3.2 (2008) that includes edition 3 and its Amendment 1 and Amendment 2.

9) There exists a consolidated edition 2.1 (2009) that includes edition 2 and its Amendment 1.

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[A2] ISO 178:2010, *Plastics – Determination of flexural properties*
ISO 178:2010/AMD 1:2013
ISO 179-1:2010, *Plastics – Determination of Charpy impact properties – Part 1: Non-instrumented impact test*
ISO 180:2000, *Plastics – Determination of Izod impact strength*
ISO 180:2000/AMD 1:2006
ISO 180:2000/AMD 2:2013
ISO 527 (all parts), *Plastics – Determination of tensile properties* [A2]
ISO 2768-1, *General tolerances – Part 1: Tolerances for linear and angular dimensions without individual tolerance indications*
[A2] ISO 4892-1:1999, 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: Xenonarc lamps* [A2]
ISO 7000:2004, *Graphical symbols for use on equipment – Index and synopsis*
[A2] ISO 8256:2004, *Plastics – Determination of tensile-impact strength* [A2]
ISO 9772:2001, *Cellular plastics – Determination of horizontal burning characteristics of small specimens subjected to a small flame*
Amendment 1 (2003)
ISO 9773, *Plastics – Determination of burning behaviour of thin flexible vertical specimens in contact with a small-flame ignition source*
[A14] *Text deleted* [A14]

[A15] *Text deleted* [A15]

[C] EN 62233, *Measurement methods for electromagnetic fields of household appliances and similar apparatus with regard to human exposure (IEC 62233)*

EN 41003, *Particular safety requirements for equipment to be connected to telecommunication networks and/or a cable distribution system* [C]

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

NOTE 1 An Index of the defined terms is provided at the end of this publication.

NOTE 2 When the terms “voltage” and “current” are used, they are r.m.s. values, unless otherwise specified.

### 3.1 Definitions relating to physical characteristics

[C] When the term “appliance” is used, it is intended to cover appliances and/or machines for household use and appliances and/or machines for commercial use.[C]

**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**, with controls and switching devices positioned so as to maximize the value

NOTE 1 **Working voltage** takes into account resonant voltages.
NOTE 2 When deducing the **working voltage**, the effect of transient voltages is ignored.

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**3.1.4**
**rated power input**
power input assigned to the appliance by the manufacturer

NOTE If no power input is assigned to the appliance, the **rated power input** for **heating appliances** and **combined appliances** is the power input measured when the appliance is supplied at **rated voltage** and operated under **normal operation**

**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 it is 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 over-voltages

**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 Definitions relating to means of connection

**3.2.1**
**supply leads**
set of wires intended for connecting the appliance to fixed wiring and accommodated in a compartment within or attached to the appliance

**3.2.2**
**interconnection cord**

〈A1〉 external flexible cord between two parts of an appliance, provided as part of a complete appliance for purposes other than connection to the supply mains

NOTE In **battery-operated appliances**, if the battery is placed in a separate box, the flexible lead or flexible cord connecting the box with the appliance is considered to be an **interconnection cord**. 〈A1〉

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**3.2.3**
**supply cord**
flexible cord, for supply purposes, that 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 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

### 3.3 Definitions relating to protection against electric shock

**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**, that 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 constructions** so 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**.

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**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 earthing 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 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**.

A1 *Text deleted* A1

**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

NOTE **Basic insulation** may be required in addition to supply at **SELV**. Refer to 8.1.4.

**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

NOTE **Basic insulation** may be required in addition to supply at **SELV**. Refer to 8.1.4.

A2 *Text deleted* A2

**3.3.14**
**clearance**
shortest distance in air between two conductive parts or between a conductive part and the **accessible surface**

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**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**

A1 **3.3.16**
**battery-operated appliance**
appliance deriving its energy from batteries enabling the appliance to perform its intended function without a mains connection A1

## 3.4 Definitions relating to extra-low voltage

**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**

**3.4.2**
**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**.

**3.4.3**
**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 Definitions relating to types of appliances

**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 location

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**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 location

**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 Definitions relating to parts of an appliance

**3.6.1**
**non-detachable part**
part that can only be removed or opened with the aid of a **tool** or a part that fulfils 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 or opened in accordance with the instructions for use, even if a **tool** is needed for removal, or a part that does not fulfil the test of 22.11

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

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

**3.6.3**
**accessible part**
part or surface that can be touched by means of test probe B [C〉and probe 18 〈C] 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.

**3.6.5**
**tool**
screwdriver, coin or any other object that may be used to operate a screw or similar fixing means

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**3.6.6**
**small part**
part, where each surface lies completely within a circle of 15 mm diameter, or a part where some of the surface lies outside a 15 mm diameter circle but in such a way that it is not possible to fit a circle of 8 mm diameter on any of the surfaces

NOTE A part that is too small to grip and at the same time to be able to apply the glow-wire tip is shown in example A in Figure 5. A part that is large enough to grip but that is too small to be able to apply the glow-wire tip is shown in example B in Figure 5. A part that is not a **small part** is shown in example C in Figure 5.

A1 **3.6.7**
**battery box**
separate compartment for containing the batteries that is detachable from the appliance A1

A2 **3.6.8**
**detachable power supply part**
part of the appliance the output of which is intended to be detachable from the **class III construction** part of the appliance

Note 1 to entry: Means of detachment are a flexible cord and connector or an appliance outlet fitted to the **detachable power supply part**.

Note 2 to entry: A **detachable power supply part** is also referred herein after as a **detachable power supply unit** or **detachable supply unit**. A2

## 3.7 Definitions relating to safety components

**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 A **temperature limiter** 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

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**3.7.8**
**intentionally weak part**
part intended to rupture under conditions of abnormal operation to prevent the occurrence of a condition which could impair compliance with this standard

NOTE Such a part may be a replaceable component, such as a resistor or a capacitor, or a part of a component to be replaced, such as an **inaccessible thermal link** incorporated in a motor.

## 3.8 Definitions relating to miscellaneous matters

**3.8.1**
**all-pole disconnection**
disconnection of both supply conductors by a single initiating action or, for multi-phase appliances, disconnection of all supply conductors by a single initiating action

NOTE For multi-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 Definitions relating to electronic circuits

**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.

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〈C〉 **3.Z.1**
**children**
young persons comprising **very young children, young children** and **older children**

**3.Z.2**
**very young children**
young persons aged from 0 up to and including 3 years

**3.Z.3**

**young children**
young persons older than 3 years and younger than 8 years

**3.Z.4**

**older children**
young persons aged from 8 years up to and including 14 years

**3.Z.5**
**vulnerable people**
persons having reduced physical, sensory or mental capabilities (e.g. partially disabled, elderly having some reduction in their physical and mental capabilities), or lack of experience and knowledge (e.g. older children)

**3.Z.6**
**very vulnerable people**
persons having very extensive and complex disabilities

**3.Z.7**
**use of the appliance**
all actions required to have the appliance perform its intended function, such as plugging in, switching on, using, regulating, cleaning the appliance or performing **user maintenance**

NOTE Z1 Children are not expected to perform cleaning or user maintenance of the appliance, very young children are not expected to use appliances, young children are not expected to use appliances safely unless continuous supervision is given, older children and vulnerable people can use appliances safely after they have been given appropriate supervision or instruction concerning use of the appliance.

NOTE Z2 Very vulnerable people are not expected to use appliances safely unless continuous supervision is given or appliances are adapted accordingly with arrangements beyond the scope of this standard.〈C〉

## 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.*

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A15 *Text deleted* A15

## 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 22.10, 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 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 test of Annex D has to be 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 ensure 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 that 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.

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*For appliances fitted with a voltage selector switch, unless otherwise specified, the tests are carried out with the switch in the position corresponding to the **rated voltage** value used for the tests.*

**5.7** *The tests are carried out in a draught-free location 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** *Test conditions relating to frequency and voltage*

**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 **rated 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;*

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– *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.*

A2 *A **class III construction** part of the appliance is tested connected to its **detachable power supply part** taking into account the instructions provided with the appliance.* A2

***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** and for **heating appliances** and **combined appliances** where the heating elements are supplied via a switch mode power supply 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 0I 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 0I 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**.*

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**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** [A1] *Appliances powered by rechargeable batteries that are recharged in the appliance are tested in accordance with Annex B.*

***Battery-operated appliances*** *powered by batteries that are non-rechargeable or not recharged in the appliance are tested in accordance with Annex S.* [A1]

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

**5.19** *If a component or part of the appliance has both a* ***self resetting feature*** *and a* ***non-self-resetting feature*** *and if the* ***non-self-resetting feature*** *is not required in order to comply with the standard, then appliances incorporating such a component or part shall be tested with the* ***non-self-resetting feature*** *rendered inoperative.*

## 6 Classification

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

[C] *Text deleted* [C] **class I**, **class II**, **class III**.

[A2] If an appliance consists of a part of **class III construction** and a **detachable power supply part**, the complete appliance is classified as a **class I appliance** or **class II appliance** in accordance with the classification applicable to its **detachable power supply part**. [A2]

*Compliance is checked by inspection and by the relevant tests.*

**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 IEC 60417-5172 (2003-02) for **class II appliances** only;

– IP number according to degree of protection against ingress of water, other than IPX0;

[A2] – symbol IEC 60417-5180 (2003-02), for **class III appliances**. This marking is not necessary for appliances operated only by batteries (primary batteries or secondary batteries recharged outside of the appliance) or appliances powered by rechargeable batteries recharged in the appliance. [A2]

[C] The marking of **rated voltage** or **rated voltage range**, for appliances intended to be connected to the supply mains, shall cover:

- 230 V for single-phase appliances;
- 400 V for multi-phase appliances. [C]

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.

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A1 **Class II appliances** and **class III appliances** incorporating a functional earth shall be marked with the symbol IEC 60417-5018 (2011-07). A1

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 (2002-10) if their **working voltage** exceeds **extra-low voltage**.

*Compliance is checked by inspection.*

**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** or an appliance incorporating an input switch mode power supply).

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: A1 230 V∼/400 V 3N∼: The appliance is only suitable for the voltage values indicated, 230 V∼being for single-phase, a.c. operation and 400 V 3N∼for three-phase, a.c. with neutral operation (an appliance with terminals for both supplies). A1

*Compliance is checked by inspection.*

**7.4** A1 If the appliance can be adjusted for different **rated voltages** or **rated frequencies**, the voltage or the frequency to which the appliance is adjusted shall be clearly discernible. If frequent changes in voltage setting or frequency setting are not required, this requirement is considered to be met if the **rated voltage** or **rated frequency** to which the appliance is to be adjusted can be determined from a wiring diagram fixed to the appliance A1

NOTE 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

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| | | |
|---|---|---|
| ⎓ | [symbol IEC 60417- 5031 (2002-10)] | direct current |
| ∼ | [symbol IEC 60417- 5032 (2002-10)] | alternating current |
| 3 ∼ | [symbol IEC 60417- 5032-1 (2002-10)] | three-phase alternating current |
| 3N ∼ | [symbol IEC 60417- 5032-2 (2002-10)] | three-phase alternating current with neutral |
| | [symbol IEC 60417- 5016 (2002-10)] | fuse-link |

NOTE 1 The **rated current** of the fuse link may be indicated in association with this symbol.

| | | |
|---|---|---|
| x | | time-lag miniature fuse-link where X is the symbol for the time/current characteristic as given in IEC 60127 |
| | [symbol IEC 60417- 5019 (2006-08)] | protective earth |
| | [symbol IEC 60417- 5018 (2006-10)] | functional earthing |
| | [symbol IEC 60417- 5172 (2003-02)] | class II equipment |
| | [symbol IEC 60417- 5012 (2002-10)] | lamp |

NOTE 2 The rated wattage of the lamp may be indicated in association with this symbol.

| | | |
|---|---|---|
| | A1 symbol ISO 7000-0434A (2004-01) A1 | caution |
| | [symbol ISO 7000-0790 (2004-01)] | read operator's manual |
| | [symbol IEC 60417- 5021 (2002-10)] | equipotentiality |
| | [symbol IEC 60417-5036 (2002-10)] | dangerous voltage |
| III | [symbol IEC 60417-5180 (2003-02)] | Class III appliance |

The symbol for nature of supply shall be placed next to the marking for **rated voltage**.

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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.

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.

*Compliance is checked by inspection.*

**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 multi-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 symbol IEC 60417- 5019 (2006-08);

A1 – functional earthing terminals shall be indicated by symbol IEC 60417-5018 (2011-07). A1

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.*

**7.9** 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. 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 or 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 For example, figure 0 may be used on a digital programming keyboard.

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[C2] *Text deleted* [C2]

*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** [A1] Instructions [A1] shall be provided with the appliance so that the appliance can be used safely.

NOTE [A1] Instructions [A1] 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.

[C] The instructions shall include the substance of the following:

This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision. [C]

The instructions for appliances having a part of **class III construction** supplied from a **detachable power supply unit** shall state that the appliance is only to be used with the power supply unit provided with the appliance.

The instructions for **class III appliances** shall state that it must only be supplied at safety extra low voltage corresponding to the marking on the appliance. This instruction is not necessary for battery-operated appliances if the battery is a primary battery or secondary battery charged outside of the appliance.

[A1] For appliances intended for use at altitudes exceeding 2 000 m, the maximum altitude of use shall be stated.

The instructions for appliances incorporating a functional earth shall state the substance of the following:

This appliance incorporates an earth connection for functional purposes only. [A1]

*Compliance is checked by inspection.*

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[C2] *Text deleted* [C2]

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

If an appliance is intended to be permanently connected to the water mains and not connected by a hose-set, this shall be stated.

[A1] For appliances marked with different **rated voltages** or different **rated frequencies** (separated by a /), instructions shall be included to indicate to the user or installer what action must be taken to adjust the appliance for operation at the required **rated voltage** or **rated frequency**. [A1]

*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 in accordance 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 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.*

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**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 persons 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.*

**7.12.6** If a **non-self-resetting thermal cut-out** is required in order to comply with the standard then the instructions for 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 cut-out, 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. The method of fixing stated is not to depend on the use of adhesives since they are not considered to be a reliable fixing means.

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*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.*

A2 **7.12.9** For each language, the instructions specified in 7.12 and from 7.12.1 to 7.12.8 shall appear together before any other instructions supplied with the appliance. Alternatively, these instructions may be supplied with the appliance separately from any functional use booklet. They may follow the description of the appliance that identifies parts, or follow the drawings/sketches common to the languages of the instructions.

In addition, instructions shall also be available in an alternative format such as on a website or on request from the user in a format such as a DVD.

*Compliance is checked by inspection.* A2

**7.13** Instructions and other text required by this standard shall be written in an 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.

A2 The signal words WARNING, CAUTION, DANGER if in the Latin alphabet shall be in uppercase having a height not less than

– 3,5 mm for appliances normally used on the floor
– 2,0 mm for **portable appliances** with a printable surface of less than 10 $cm^2$; and
– 3,0 mm for other appliances.

NOTE A height of 3,5 mm is similar to Arial 14 pt, 3,0 mm is similar to 12 pt Arial and 2,0 mm is similar to 8 pt Arial. Other typefaces might differ in the pt value.

Uppercase letter of the text explaining the signal word shall be no smaller than 1,6 mm, with other letters according to the font size of the uppercase letter.

Countries that do not use the Latin alphabet need to specify the minimum size of the script to be used taking into account what is specified for the Latin alphab t.

Unless contrasting colours are used, moulded in, engraved, or stamped markings shall be either raised above or have a depth below the surface of at least 0,25 mm.

*Compliance is checked by inspection, by measurement 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. The petroleum spirit to be used for the test is aliphatic solvent hexane.* A2

*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 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.

C2 *Text deleted* C2

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

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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 trademark 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.

[A1] The symbol IEC 60417-5018 (2011-07) shall be placed next to the symbol IEC 60417-5172 (2003-02) or the symbol IEC 60417-5180 (2003-02) as appropriate. [A1]

*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.*

## 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**.*

[A1] *Text deleted* [A1]

*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.*

[C] [AC1] *Test probe B and probe 18 of EN 61032 are applied with a force not exceeding 1 N, 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.* [AC1] *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 when probe B is used or 10 N when probe 18 is used. If the probe then enters the opening, the test is repeated with the probe in the angled position. However when using test probe 18 the appliance shall be fully assembled as in normal use without any parts removed; parts that are intended to be removed for user maintenance shall not be removed.* [C]

*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 probe.*

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**8.1.2** *Test probe 13 of IEC 61032 is applied with a force not exceeding 1 N 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 Appliance outlets are not considered to be socket-outlets.

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

*It shall not be possible to touch* ***live parts*** *with the test probe.*

**8.1.3** *Instead of test probe B* [A14] *, test probe 18* [A14] *and test probe 13, for appliances other than those of* ***class II****, test probe 41 of IEC 61032 is applied with a force not exceeding 1 N 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.*

*It shall not be possible to touch these* ***live parts****.*

[A2] *If a single switching action is obtained by a switching device, the switching device shall provide full disconnection and the* ***clearances*** *for full disconnection specified in 20.1.5.3 of IEC 61058-1:2000 shall be obtained from Table 22 of IEC 61058-1:2000 using the next higher step for rated impulse withstand voltage.*

*For appliances provided with a* ***supply cord*** *and without a switching device in their supply circuit, a single switching action may be obtained by the withdrawal of the plug from a socket outlet.*

*Compliance is checked by inspection and by manual test.* [A2]

**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 and energy 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.*

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**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* ⟦C⟧ *test probes of EN 61032* ⟨C⟧ *in accordance with the conditions specified in 8.1.1.*

⟦C⟧ *Test probe B and probe 18 of EN 61032 are* ⟨C⟧ *applied to* ***built-in appliances*** *and* ***fixed appliances*** *only after installation.*

## 9 Starting of motor-operated appliances

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

## 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.

**Table 1 – Power input deviation**

| Type of appliance | Rated power input<br>W | Deviation |
|---|---|---|
| All appliances | ≤25 | +20 % |
| **Heating appliances** and **combined appliances** | >25 and ≤200 | ±10 % |
| | >200 | +5 % or 20 W<br>(whichever is the greater)<br>–10 % |
| **Motor-operated appliances** | >25 and ≤300 | +20 % |
| | >300 | +15 % or 60 W<br>(whichever is the greater) |

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 with*

– *all circuits which can operate simultaneously being in operation;*

– *the appliance being supplied at* ***rated voltage****;*

– *the appliance being operated under* ***normal operation****.*

⟦A1⟧ *If the power input varies throughout the operating cycle and the maximum value of the power input exceeds, by a factor greater than two, the arithmetic mean value of the power input occurring during a representative period, then the power input is the maximum value that is exceeded for more than 10 % of the representative period. Otherwise the power input is taken as the arithmetic mean value.* ⟨A1⟧

*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.*

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

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**Table 2 – Current deviation**

| Type of appliance | Rated current<br>A | Deviation |
|---|---|---|
| All appliances | ≤0,2 | +20 % |
| **Heating appliances** and **combined appliances** | >0,2 and ≤1,0 | ±10 % |
| | >1,0 | +5 % or 0,10 A<br>(whichever is the greater)<br>–10 % |
| **Motor-operated appliances** | >0,2 and ≤1,5 | +20 % |
| | >1,5 | +15 % or 0,30 A<br>(whichever is the greater) |

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 with*

– *all circuits which can operate simultaneously being in operation;*

– *the appliance being supplied at **rated voltage**;*

– *the appliance being operated under **normal operation**.*

A1 *If the current varies throughout the operating cycle and the maximum value of the current exceeds, by a factor greater than two, the arithmetic mean value of the current occurring during a representative period, then the current is the maximum value that is exceeded for more than 10 % of the representative period. Otherwise the current is taken as the arithmetic mean value.* A1

*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 test is carried out at a voltage equal to the arithmetic mean value of that range.*

## 11 Heating

**11.1** Appliances and their surroundings shall not attain excessive temperatures in normal use.

*Compliance is checked by determining the temperature rise of the various parts under the conditions specified in 11.2 to 11.7.*

**11.2** ***Hand-held appliances** are held in their normal position of use.*

*Appliances with pins for insertion into socket-outlets are plugged into an appropriate wall-mounted socket-outlet.*

***Built-in appliances** are installed in accordance with the instructions.*

*Other **heating appliances** and other **combined appliances** are placed in a test corner as follows:*

– *appliances normally placed on a floor or table in use, are placed on the floor as near to the walls as possible;*

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– *appliances normally fixed to a wall are fixed to one of the walls, as near to the other wall and floor or ceiling as is likely to occur, taking into account the instructions;*

– *appliances normally fixed to a ceiling are fixed to the ceiling as near to the walls as is likely to occur, taking into account in the instructions.*

*Other **motor-operated appliances** are positioned as follows:*

– *appliances normally placed on a floor or table in use are placed on a horizontal support;*

– *appliances normally fixed to a wall are fixed to a vertical support;*

– *appliances normally fixed to a ceiling are fixed underneath a horizontal support.*

*Dull black-painted plywood approximately 20 mm thick is used for the test corner, the supports and for the installation of **built-in appliances**.*

*For appliances provided with an automatic cord reel, one-third of the total length of the cord is unreeled. The temperature rise of the cord sheath is determined as near as possible to the hub of the reel and also between the two outermost layers of the cord on the reel.*

*For cord storage devices, other than automatic cord reels, which are intended to accommodate the **supply cord** partially while the appliance is in operation, 50 cm of the cord is unwound. The temperature rise of the stored part of the cord is determined at the most unfavourable place.*

**11.3** *Temperature rises, other than those of windings, are determined by means of fine-wire thermocouples positioned so that they have minimum effect on the temperature of the part under test.*

NOTE 1 Thermocouples having wires with a diameter not exceeding 0,3 mm are considered to be fine-wire thermocouples.

*Thermocouples used for determining the temperature rise of the surface of walls, ceiling and floor of the test corner are attached to the back of small blackened disks of copper or brass, 15 mm in diameter and 1 mm thick. The front of the disk is flush with the surface of the board.*

*As far as is possible, the appliance is positioned so that the thermocouples detect the highest temperatures.*

*The temperature rise of electrical insulation, other than that of windings, is determined on the surface of the insulation at places where failure could cause*

– *a short circuit;*

– *contact between **live parts** and **accessible metal parts**;*

– *bridging of insulation;*

– *a reduction of **clearances** or **creepage distances** below the values specified in Clause 29.*

NOTE 2 If it is necessary to dismantle the appliance to position thermocouples, care has to be taken to ensure that the appliance has been correctly reassembled. In case of doubt, the power input is remeasured.

NOTE 3 The point of separation of the cores of a multicore cord and the point where insulated wires enter lampholders are examples of places where thermocouples are positioned.

*Temperature rises of windings are determined by the resistance method unless the windings are non-uniform or if it is difficult to make the necessary connections, in which case the temperature rise is determined by means of thermocouples. At the beginning of the test, the windings are to be at room temperature.*

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*The temperature rise of a winding is calculated from the formula:*

$$\Delta t = \frac{R_2 - R_1}{R_1} (k + t_1) - (t_2 - t_1)$$

*where*

$\Delta t$ *is the temperature rise of the winding;*

$R_1$ *is the resistance at the beginning of the test;*

$R_2$ *is the resistance at the end of the test;*

$k$ *is equal to*

- *225 for aluminium windings and copper/aluminium windings with an aluminium content ≥ 85 %,*
- *229,75 for copper/aluminium windings with an copper content > 15 % to < 85 %,*
- *234,5 for copper windings and copper/aluminium windings with an copper content ≥ 85 %;*

$t_1$ *is the room temperature at the beginning of the test;*

$t_2$ *is the room temperature at the end of the test.*

NOTE 4 It is recommended that the resistance of windings at the end of the test be determined by taking resistance measurements as soon as possible after switching off and then at short intervals so that a curve of resistance against time can be plotted for ascertaining the resistance at the instant of switching off.

**11.4** ***Heating appliances*** *are operated under* ***normal operation*** *and at 1,15 times* ***rated power input****.*

**11.5** ***Motor-operated appliances*** *are operated under* ***normal operation*** *and supplied with the most unfavourable voltage between 0,94 times and 1,06 times the* ***rated voltage****.*

**11.6** ***Combined appliances*** *are operated under* ***normal operation*** *and supplied with the most unfavourable voltage between 0,94 times and 1,06 times the* ***rated voltage****.*

**11.7** *The appliance is operated for a duration corresponding to the most unfavourable conditions of normal use.*

NOTE The duration of the test may consist of more than one cycle of operation.

**11.8** *During the test, the temperature rises are monitored continuously and shall not exceed the values shown in Table 3.* [C〉*Text deleted*〈C]

*If the temperature rise of the motor winding exceeds the value specified in Table 3 or if there is doubt with regard to the temperature classification of the insulation of the motor, the tests of Annex C are carried out.*

***Protective devices*** *shall not operate and sealing compound shall not flow out. However, components in* ***protective electronic circuits*** *are allowed to operate provided they are tested for the number of cycles of operation specified in 24.1.4.*

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**Table 3 – Maximum normal temperature rises**

| *Part* | *Temperature rise* *K* |
|---|---|
| *Windings* [a]*, if the winding insulation according to IEC 60085 is:* | |
| – *class 105 (A)* | *75 (65)* |
| – *class 120 (E)* | *90 (80)* |
| – *class 130 (B)* | *95 (85)* |
| – *class 155 (F)* | *115* |
| – *class 180 (H)* | *140* |
| – *class 200 (N)* | *160* |
| – *class 220 (R)* | *180* |
| – *class 250* | *210* |
| *Pins of appliance inlets:* | |
| – *for very hot conditions* | *130* |
| – *for hot conditions* | *95* |
| – *for cold conditions* | *45* |
| A1 *Pins of appliances for insertion into socket-outlets* | *45* A1 |
| *Terminals, including earthing terminals, for external conductors of* ***stationary appliances****, unless they are provided with a* ***supply cord*** | *60* |
| *Ambient of switches,* ***thermostats*** *and* ***temperature limiters*** [b]*:* | |
| – *without T-marking* | *30* |
| – *with T-marking* | *T-25* |
| *Rubber, polychloroprene or polyvinyl chloride insulation of internal and external wiring, including* ***supply cords****:* | |
| – *without temperature rating or with a temperature rating not exceeding 75 °C* | *50* |
| – *with temperature rating (T)* [j] *where T exceeds 75 °C* | *T-25* |
| *Cord sheaths used as* ***supplementary insulation*** | *35* |
| *Sliding contacts of cord reels* | *65* |
| *Points where the insulation of wires can come into contact with parts of a terminal block or compartment for fixed wiring, for a* ***stationary appliance*** *not provided with a* ***supply cord****.* | *50* [c] |
| *Rubber, other than synthetic, used for gaskets or other parts, the deterioration of which could affect safety:* | |
| – *when used as* ***supplementary insulation*** *or as* ***reinforced insulation*** | *40* |
| – *in other cases* | *50* |
| *Lampholders with T-marking* [d] | |
| – *B15 and B22 marked T1* | *140* |
| – *B15 and B22 marked T2* | *185* |
| – *other lampholders* | *T-25* |
| *Lampholders without T-marking* [d] | |
| – *E14 and B15* | *110* |
| – *B22, E26 and E27* | *140* |
| – *other lampholders and starter holders for fluorescent lamps* | *55* |

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