IEC 60335-2-110

Edition 2.0 2024-07
EXTENDED VERSION

INTERNATIONAL STANDARD

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This extended version of IEC 60335-2-110:2024 includes the content of the references made to IEC 60335-1:2020

Household and similar electrical appliances – Safety – Part 2-110: Particular requirements for commercial microwave appliances with insertion or contacting applicators

IEC 60335-2-110:2024-07 EXV(en)

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Household and similar electrical appliances – Safety – Part 2-110: Particular requirements for commercial microwave appliances with insertion or contacting applicators

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IEC 60335-1
Edition 6.0 2020-09

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 1: General requirements

INTERPRETATION SHEET 1

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

The text of this Interpretation Sheet is based on the following documents:

Draft	Report on voting
61/5999/DISH	61/6009/RVDISH

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

INTRODUCTION

Edition 6 of IEC 60335-1:2020 defines and introduces requirements for a detachable power supply part of an appliance. In the document, 24.2 prohibits the use of a power supply in a flexible cord.

QUESTION:

Does Subclause 24.2 prohibit the use of a detachable power supply part?

ANSWER

No, a "detachable power supply part" is a defined term and is not captured by the term "power supply" as used in Subclause 24.2.

NOTE A detachable power supply part is captured by the defined term when the output of the power supply part is detachable from the class III construction part of the appliance at:

– the power supply part, or

– the class III construction part of the appliance.

However, the supply cord (if any) does not have to be detachable from the detachable power supply part.

ICS 13.120; 97.030

IEC 60335-1:2020-09/ISH1:2021-11(en)

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HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-110: Particular requirements for commercial microwave appliances with insertion or contacting applicators

FOREWORD

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This extended version (EXV) of the official IEC Standard provides the user with the comprehensive content of the Standard.

IEC 60335-2-110:2024 EXV includes the content of IEC 60335-2-110:2024, and the references made to IEC 60335-1:2020.

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IEC 60335-2-110 has been prepared by subcommittee 61B: Safety of microwave appliances for household and commercial use, of IEC technical committee 61: Safety of household and similar electrical appliances. It is an International Standard.

This second edition cancels and replaces the first edition published in 2013 and Amendment 1:2019. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

– Subclause 7.1 has been improved in clarity.
– Subclauses 19.11.2 and 19.103 have been improved in clarity.
– Clause 28 has been modified to add screw requirements.

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

Draft	Report on voting
61B/688/CDV	61B/691A/RVC

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

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

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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.

This part 2 is to be used in conjunction with the latest edition of IEC 60335-1 and its amendments unless that edition precludes it; in that case, the latest edition that does not preclude it is used. It was established on the basis of the sixth edition (2020) of that standard.

NOTE 1 When "Part 1" is mentioned in this standard, it refers to IEC 60335-1.

This part 2 supplements or modifies the corresponding clauses in IEC 60335-1, so as to convert that publication into the IEC standard: Particular requirements for commercial microwave appliances with insertion or contacting applicators.

When a particular subclause of Part 1 is not mentioned in this part 2, that subclause applies as far as is reasonable. When this standard states "addition", "modification" or "replacement", the relevant text in Part 1 is to be adapted accordingly.

NOTE 2 The following numbering system is used:

– subclauses, tables and figures that are numbered starting from 101 are additional to those in Part 1;
– unless notes are in a new subclause or involve notes in Part 1, they are numbered starting from 101, including those in a replaced clause or subclause;
– additional annexes are lettered AA, BB, etc.

NOTE 3 The following print types are used:

– requirements: in roman type;
– *test specifications: in italic type*;
– notes: in small roman type.

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Words in **bold** in the text are defined in Clause 3. When a definition concerns an adjective, the adjective and the associated noun are also in **bold**.

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

- reconfirmed,
- withdrawn, or
- revised.

NOTE 4 The attention of National Committees is drawn to the fact that equipment manufacturers and testing organizations can 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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INTRODUCTION to IEC 60335-1:2020

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

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

www.iec.ch/tc61/supportingdocuments

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

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

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

If the functions of an appliance are covered by different parts 2 of IEC 60335, the relevant part 2 is applied to each function separately, as far as is reasonable. If applicable, the influence of one function on the other is taken into account.

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

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

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

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

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

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

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

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

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

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

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INTRODUCTION to IEC 60335-2-110:2024

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

Guidance documents concerning the application of the safety requirements for appliances can be accessed via TC 61 and SC 61B supporting documents on the IEC website
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https://www.iec.ch/sc61b/supportingdocuments

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

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

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

If an appliance within the scope of this standard also incorporates functions that are covered by another part 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.

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

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

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

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

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

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HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-110: Particular requirements for commercial microwave appliances with insertion or contacting applicators

1 Scope

This part of IEC 60335 deals with the safety of microwave appliances intended for commercial use, their **rated voltage** being not more than 250 V for single-phase appliances connected between one phase and neutral and 480 V for other appliances.

As far as is practicable, this standard deals with the common hazards presented by these types of appliances.

Appliances covered by this standard incorporate an open-ended **applicator** (as example an overview is given in Figure 103) for treatment of the **load**. They are divided into three types:

– with **insertion applicator**, typically for moisture removal by insertion into holes in floors, walls or ceilings (an example is given in Figure 106);
– with **large area contacting applicator**, typically for drying of floors, walls or ceilings (examples are given in Figure 104 and Figure 105);
– with **small area contacting applicator**, typically for paint removal and spot-heating (an example is given in Figure 107).

Microwave appliances with **insertion applicator**, **large area contacting applicator** or **small area contacting applicator** are using electromagnetic energy in one or several of the ISM frequency bands between 300 MHz and 30 GHz, for supplying energy to an external load which is heated so that a resulting process of drying, moisture transport which can result in forces due to formation of steam, decomposition or chemical modification, melting, or termination of organisms such as bacteria or fungus occurs.

NOTE 101 ISM frequency bands are the electromagnetic frequencies established by the ITU and reproduced in CISPR 11.

NOTE 102 Food and beverages are not loads in the meaning of this standard.

Appliances with **insertion applicator** and with **large area contacting applicator** are **portable appliances**. Appliances with **small area contacting applicator** are **handheld appliances**.

Appliances that use non-electrical energy are within the scope of this standard. The microwave-related portion is considered **motor-operated**.

The rationales for the **microwave barrier** and associated leakage tests are described in informative Annex AA.

Attention is drawn to the fact that

– these appliances can radiate microwave energy outside a **restricted area** where they are used. The additional requirements specified by national authorities responsible for the protection for non-ionising radiation that the limit of power flux density is 10 W/m^2, averaged over any time period of 6 min, outside this **restricted area** is taken into consideration in this standard;

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– these appliances are intended to exclusively treat the **load** in **normal operation**, i.e. this standard does not apply to appliances or systems employing free space microwave propagation;
– for appliances intended to be used in tropical countries, special requirements can be necessary;
– in many countries, additional requirements are specified by the national health authorities, and national authorities responsible for the protection of labour and for non-ionising radiation protection.

This standard does not apply to

– household microwave ovens, including combination microwave ovens (IEC 60335-2-25);
– commercial microwave ovens with a cavity door, commercial combination microwave ovens with a cavity door and commercial microwave ovens without a cavity door and with transportation means (IEC 60335-2-90);
– industrial microwave heating equipment (IEC 60519-6);
– appliances for medical purposes (IEC 60601-1);
– appliances and equipment for laboratory use (IEC 61010 series);
– 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);

Some of the specifications and tests in this standard are not applicable for other than 2 450 MHz appliances.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

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

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

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

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

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

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

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

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IEC 60112:2003, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*
IEC 60112:2003/AMD1:2009[1]

IEC 60127 (all parts), *Miniature fuses*

IEC 60227 (all parts), *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V*

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

IEC 60238, *Edison screw lampholders*

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

IEC 60252-1:2010, *AC motor capacitors – Part 1: General – Performance, testing and rating – Safety requirements – Guidance for installation and operation*
IEC 60252-1:2010/AMD1:2013[2]

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

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

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

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

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

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IEC 60384-14:2013, *Fixed capacitors for use in electronic equipment – Part 14: Sectional specification – Fixed capacitors for electromagnetic interference suppression and connection to the supply mains*
IEC 60384-14:2013/AMD1:2016[3]

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

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

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

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

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Full document details: IEC 60335-2-110 2024 EXV

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IEC 60529:1989/AMD1:1999
IEC 60529:1989/AMD2:2013[4]

IEC 60598-1:2014, *Luminaires – Part 1: General requirements and tests*
IEC 60598-1:2014/AMD1:2017[5]

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

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

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

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

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

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

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

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

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

IEC 60730-2-9:2015, *Automatic electrical controls – Part 2-9: Particular requirements for temperature sensing controls*
IEC 60730-2-9:2015/AMD1:2018[7]

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

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

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

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

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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*

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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.*

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

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

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

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

IEC 61000-4-13:2002, *Electromagnetic compatibility (EMC) – Part 4-13: Testing and measurement techniques – Harmonics and interharmonics including mains signalling at a.c. power port, low frequency immunity tests*
IEC 61000-4-13:2002/AMD1:2009
IEC 61000-4-13:2002/AMD2:2015[8]

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

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

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IEC 61558-2-16:2009/AMD1:2013[10]

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

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

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

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

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

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

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ISO 898-1, *Mechanical properties of fasteners made of carbon steel and alloy steel – Part 1: Bolts, screws and studs with specified property classes – Coarse thread and fine pitch thread*

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

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

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

ISO 3506-1, *Fasteners − Mechanical properties of corrosion-resistant stainless steel fasteners − Part 1: Bolts, screws and studs with specified grades and property classes*

ISO 3506-2, *Fasteners − Mechanical properties of corrosion-resistant stainless steel fasteners − Part 2: Nuts with specified grades and property classes*

ISO 3506-3, *Mechanical properties of corrosion-resistant stainless steel fasteners – Part 3: Set screws and similar fasteners not under tensile stress*

ISO 3506-4, *Mechanical properties of corrosion-resistant stainless steel fasteners – Part 4: Tapping screws*

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

ISO 7010, *Graphical symbols – Safety colours and safety signs – Registered safety signs*

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

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

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

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

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/

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- ISO Online browsing platform: available at http://www.iso.org/obp

When the terms "voltage" and "current" are used, they are RMS values, unless otherwise specified.

When the term "earthing" is used, it means "protective earthing", unless otherwise specified.

3.1 Definitions relating to physical characteristics

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 to entry: **Working voltage** takes into account resonant voltages.

Note 2 to entry: When deducing the **working voltage**, the effect of transient voltages is ignored.

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

Note 1 to entry: 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 1 to entry: If no current is assigned to the appliance, the **rated current** is 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

Note 101 to entry: The **rated frequency** is the input frequency.

3.1.8
rated frequency range
frequency range assigned to the appliance by the manufacturer, expressed by its lower and upper limits

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3.1.9
normal operation
heating operation of the **appliance** under the following conditions:

The **appliance** is operated according to the manufacturer's instructions for **intended use**. However, using a typical **load** for **intended use** can be impractical, since it can be part of a building, unless the manufacturer makes useful and realistic such **loads** available for the tests. If that is not the case, the appliance is operated under the following conditions:

The initial temperature of the test **load** which is used for microwave energy absorption shall be (20 ± 5) °C.

The highest generator power settings are to be used.

Appliances with an **insertion applicator** for moisture removal are operated by insertion into holes in floor, wall or ceiling structures under the following conditions:

a) The test **load** consists of a metal tank filled with water, having an open top water surface exceeding that of the horizontal dimensions of the appliance by at least 70 mm on all sides and having a water column height of at least 150 mm plus the length of the longest insertion distance of the **insertion applicator**. At the top sides of the tank there are horizontal supports of a **microwave-transparent** material, with a suitable opening for the applicator antenna. The water level is adjusted so that the distance from the housing of the appliance to the test **load** is the same as in its **intended use**.

Note 101 to entry: If it is obvious that good microwave impedance matching of the **insertion applicator** can be obtained only if the hole into which it is inserted is not water-filled, a sleeve or similar of a highly **microwave transparent** material such as PTFE is used around the **insertion applicator**. If wave propagation in the axial direction occurs in the test set-up and the manufacturer can show that it is not possible in actual use, or monitoring devices then shut down the **insertion applicator**, a thin-wall plastic tube with inner diameter corresponding to the maximum hole diameter according to the manufacturer's specification can be used.

b) Appliances with **large area contacting applicator** for drying of floor, wall or ceiling structures are operated under the following conditions: the test **load** consists of a metal tank filled with water, having an open top water surface exceeding that of the horizontal dimensions of the appliance by at least 70 mm on all sides and having a water column height of at least 150 mm. At the top of two opposite tank sides there are horizontal supports of a **microwave-transparent** material, extending just so far inwards that the **traction drive** rests on the support. The water level is adjusted so that the distance from the **applicator** to the test **load** is the same as in its **intended use**. The proper reversal function of the **traction drive** is tested under the following conditions: the appliance is operated on a horizontal plywood surface with a thickness of 20 mm and an area sufficient to allow back and forth movement between blocks representing walls.

Note 102 to entry: If needed for representative operation of the appliance, the horizontal supports are extended as to activate the mechanical **microwave interlocks**.

Appliances with **small area contacting applicator** for paint removal and spot-heating are operated under the following conditions:

The test **load** consists of a grinding wheel or grinding block made of fine-grained silicon carbide at least 15 mm in thickness, and its length and width exceeding the corresponding dimensions of the **applicator** opening by at least 30 mm; however this test **load** shall be so large that it can be air-cooled from the underside without the appliance being influenced.

Appliances operated with **integral batteries** or **separable batteries** not disconnected from the appliance for charging purposes:

– the **battery** that is **fully discharged** is charged with the **battery-operated appliance** performing its intended function, if allowed by the construction of the appliance;
– the **battery** that is **fully discharged** is charged without the **battery-operated appliance** performing its intended function

Note 1 to entry: Operation of a **battery-operated appliance** to perform its intended function is considered to be **normal operation**.

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3.1.10
rated impulse voltage
voltage derived from the **rated voltage** and the overvoltage category of the appliance, characterizing the specified withstand capability of its insulation against transient overvoltages

3.1.11
dangerous malfunction
unintended operation of the appliance that may impair safety

3.1.12
outlet load
load that can be connected to appliance outlets accessible to the user and socket-outlets accessible to the user

Note 1 to entry: Outlets with a voltage not exceeding **SELV** are not considered to be an appliance outlet.

3.1.101
rated microwave power output
microwave power output assigned to the appliance by the manufacturer

Note 1 to entry: This can be lower than the **available microwave power**, due to intentional microwave power losses in microwave absorbers (see Note in 101.1) and coaxial cables acting for protection of the microwave generator of **small area contacting applicators** (see 22.101).

3.1.102
available microwave power
microwave generator nominal output under impedance matched condition which is obtained by the generator manufacturer specification and measurement of its electrical input to the generator in the appliance during the first 10 s of operation at maximum power

Note 1 to entry: Magnetrons will typically have a stationary power output 3 s after energising.

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
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 1 to entry: 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**.

Note 2 to entry: The output cord from a **charging system** or a **detachable power supply part** is an **interconnection cord**.

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 1 to entry: 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.

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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 1 to entry: 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 1 to entry: **Class 0 appliances** have either an enclosure of insulating material which may form a part or the whole of the **basic insulation**, or a metal enclosure which is separated from **live parts** by an appropriate insulation. If an appliance with an enclosure of insulating material has provision for earthing internal parts, it is considered to be a **class I appliance** or **class 0I appliance**.

3.3.8
class 0I appliance
appliance having at least **basic insulation** throughout and incorporating an earthing terminal but having a **supply cord** without earthing conductor and a plug without earthing contact

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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 1 to entry: 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 to entry: 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 to entry: The enclosure of an insulation-encased **class II appliance** may form a part or the whole of the **supplementary insulation** or of the **reinforced insulation**.

Note 3 to entry: **Class II appliances** may incorporate an earth for functional purposes.

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 1 to entry: **Basic insulation** may be required in addition to supply at **SELV**. Refer to 8.1.4.

Note 2 to entry: **Class III appliances** may incorporate an earth for functional purposes.

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 1 to entry: **Basic insulation** may be required in addition to supply at **SELV**. Refer to 8.1.4.

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

3.3.15
creepage distance
shortest distance along the surface of insulation between two conductive parts or between a conductive part and the **accessible surface**

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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 or functional 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 or functional earth, the no-load voltage not exceeding 50 V

Note 1 to entry: 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 2 to entry: The voltage limits specified are based on the assumption that the **safety isolating transformer** is supplied at its **rated voltage**.

Note 3 to entry: **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 **extra-low voltage** that is separated from other circuits, except circuits operating at **safety extra-low voltage**, by **basic insulation** and protective screening, **double insulation** or **reinforced insulation**

Note 1 to entry: Protective screening is the separation of circuits from **live parts** by means of an earthed screen.

Note 2 to entry: 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

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

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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 1 to entry: Magnetically driven appliances are considered to be **motor-operated appliances**.

3.5.8
combined appliance
appliance incorporating heating elements and motors

3.5.9
battery-operated appliance
appliance deriving its energy from **batteries** enabling the appliance to perform its intended function without a supply connection

Note 1 to entry: A **battery-operated appliance** can have a supply connection.

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 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**, part that is removed or opened in accordance with the instructions for use, even if a **tool** is needed for removal, or part that does not fulfil the test of 22.11

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

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

Note 3 to entry: If a part has to be removed solely to discard a **battery** before scrapping the appliance, this part is not considered to be a **detachable part** even if the instructions state that it is to be removed.

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

Note 1 to entry: **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 to entry: Parts, accessible or not, complying with 8.1.4 are not considered to be **live parts**.

Note 2 to entry: A PEN conductor is a protective earthed neutral conductor combining the functions of both a protective conductor and a neutral conductor.

Note 3 to entry: Parts, whether they are **accessible parts** or not, of **battery-operated appliances** and **batteries** not exceeding the electrical limits of B.22.3 and B.22.4, are not considered to be **live parts**.

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

3.6.6
small part
part, where each surface lies completely within a circle of 15 mm diameter, or 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 1 to entry: 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.

3.6.7
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**.

3.6.8
cell
basic functional unit, consisting of an assembly of electrodes, electrolyte, container, terminals, and usually separators that is a source of electric energy obtained by direct conversion of chemical energy

[SOURCE: IEC 60050-482:2004, 482-01-01]

3.6.9
battery
assembly of one or more **cells** ready for use as a source of electrical energy, characterised by its voltage, size, terminal arrangement, capacity and rate capability

Note 1 to entry: A **detachable battery** and **separable battery** have an enclosure that is equivalent in properties to that of the appliance itself, but **integral batteries** may have no enclosure or an enclosure less substantial than that of the appliance, as they are protected by the enclosure of the appliance.

3.6.10
detachable battery
rechargeable **battery** in an enclosure separate from the **battery-operated appliance**, intended for use with specific appliances and intended to be removed from the appliance for charging purposes

Note 1 to entry: A standard automotive **battery** is not considered a **detachable battery**.

Note 2 to entry: A **detachable battery** is not considered a **battery** that is replaceable.

3.6.11
separable battery
battery contained in an enclosure separate from the **battery-operated appliance,** intended for use with specific appliances and connected to the appliance by a cord external to the enclosure of the appliance

Note 1 to entry: A standard automotive **battery** is not considered a **separable battery**.

Note 2 to entry: A **separable battery** is not considered a **battery** that is replaceable.

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3.6.12
integral battery
battery contained within the **battery-operated appliance** and not removed from the appliance for charging purposes

Note 1 to entry: A **battery** that is only to be removed from the **battery-operated appliance** for disposal or recycling is still considered to be an **integral battery**.

3.6.101
applicator
structure which applies the microwave energy to the **load**

3.6.102
microwave transparent
property of a material having negligible absorption and reflection of microwaves

Note 1 to entry: The relative permittivity of a **microwave transparent** material is less than 7 and the relative loss factor is less than 0,015.

3.6.103
insertion applicator
applicator for insertion into the **load**, in which all **available microwave power** is intended to be absorbed

3.6.104
large area contacting applicator
applicator with a metallic enclosure, having at least one geometric non-metallic opening through which microwave energy is applied to a closely located external **load** in which all **available microwave power** is intended to be absorbed

3.6.105
small area contacting applicator
applicator with a metallic enclosure, having at least one geometric non-metallic opening or appropriate device through which microwave energy is applied to a very closely located external **load** in which all **rated microwave power** is intended to be absorbed

3.6.106
traction drive
means or system used to accomplish movement of an appliance with **large area contacting applicator** on a floor

3.6.107
microwave enclosure
overall structure that is intended to confine the microwave energy

Note 1 to entry: Barriers mounted outside the **microwave enclosure** are not considered a part of it.

3.6.108
microwave barrier
microwave transparent part of the microwave appliance that is mounted outside the **microwave enclosure** for limiting access into it and can only be removed with the aid of **tools**

Note 1 to entry: A **microwave barrier** can be mounted between the **microwave enclosure** and the external cover of the appliance.

Note 2 to entry: Devices such as an array of metal chains or hinged metal plates at the periphery of the opening of an **applicator** intended to reduce microwave leakage are not considered **microwave barriers**.

Note 3 to entry: **Microwave barriers** cannot be hinged or flexed.

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3.6.109
microwave guard
constructive part of the appliance that is mounted outside or at the **microwave enclosure** for reducing microwave leakage by shielding and/or absorption and can only be removed with the aid of **tools**

Note 1 to entry: **Microwave guards** can move or open when the **applicator** is brought into contact with the **load**.

Note 2 to entry: Devices such as an array of metal chains or hinged metal plates at the periphery of the opening of an **applicator** intended to reduce microwave leakage are considered **microwave guards**.

3.6.110
maintenance door
constructive part of the appliance that can be opened or removed with the aid of **tools** to get access for service and repair

3.6.111
microwave interlock
device or system that prevents the operation of the microwave generator if conditions of microwave leakage occur or are likely to occur

Note 1 to entry: Examples of **microwave interlock** are switches which stop the microwave power when a contacting **applicator** is lifted up or an **insertion applicator** is removed from its **load** during operation, and an integral leakage monitor which does the same if there is insufficient proximity between an **applicator** and the **load** or if an attempt is made to start the appliance without a **load**.

3.6.112
viewing opening
opening into the **applicator** through which the treatment can be visually monitored

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 pre-determined value

Note 1 to entry: 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

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Note 1 to entry: Manual operation includes disconnection of the appliance from the supply mains.

3.7.6
protective device
device, the operation of which prevents a hazardous situation under abnormal operation conditions

3.7.7
thermal link
thermal cut-out which operates only once and requires partial or complete replacement

3.7.8
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 1 to entry: 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 a **thermal link** that is not an **accessible part** 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 1 to entry: 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 1 to entry: 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

3.8.6
room temperature
ambient temperature specified in the general conditions for the tests

Note 1 to entry: The ambient temperature is specified in 5.7.

3.8.101
load
object to be treated into which the **applicator** is introduced or put in close position to

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3.8.102
instructed person
person who is instructed and monitored to know how to avoid any danger caused by the operation of a microwave appliance with **insertion applicator**, **large area contacting applicator**, or **small area contacting applicator**

3.8.103
skilled person
person with professional education, knowledge and experience to discern and to avoid any danger caused by the operation of a microwave appliance with **insertion applicator**, **large area contacting applicator**, or **small area contacting applicator**

3.8.104
ordinary person
person who is neither a **skilled person** nor an **instructed person**

3.8.105
intended use
any use of the appliance which is foreseeable, as described in the user instructions, and which is consistent with such activities as operating, starting, stopping, connecting to or disconnecting from the supply mains

3.8.106
user control
any **control** device requiring the operator's actuation to perform specific functions

3.8.107
restricted area
space where the operation of the equipment takes place, plus any area outside this where the exposure level from the equipment exceeds 10 W/m^2, averaged over any 6 min

Note 1 to entry: The **restricted area** is determined by measuring the microwave leakage through floor, wall or ceiling structures of the treatment zone. The thickness of the **load** in the radially outgoing direction from the **applicator** is considered only if the **load** is accessible from behind for microwave leakage measurements in **normal operation**.

3.8.108
biased-off switch
switch that automatically returns to the **off-position** when its actuating member is released

3.8.109
start switch
biased-off switch that shall be actuated by the operator before the **operation switch** will function

3.8.110
operation switch
biased-off switch designed so that it will automatically disconnect the microwave generator or the supply main circuit when the operator's actuating force is removed

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 1 to entry: Neon indicators are not considered to be **electronic components**.

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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 1 to entry: Parts of the circuit may also be used for functional purposes.

3.10 Definitions relating to battery charging and discharging

3.10.1
battery system
system that includes a **battery**, **charging system** and the **battery-operated appliance**

Note 1 to entry: The **battery system**, including interfaces, may contain more than one **battery** and **charging system.**

3.10.2
charging system
circuitry that charges and maintains the state of charge of the **battery**

Note 1 to entry: Parts of the **charging system** may perform other functions such as charge balancing and may be separately enclosed.

3.10.3
specified operating region for charging
region during charging in which a **cell** operates within its voltage and current range as specified by the **cell** manufacturer

Note 1 to entry: An example of a specified operating region of a lithium-ion **cell** during charging is shown in Figure 14.

3.10.4
upper limit charging voltage
highest charging voltage in the **specified operating region for charging**

3.10.5
venting
condition intended by design that occurs when a **cell** provides a controlled release of excessive internal pressure without expulsion of major components of the **cell**

3.10.6
fully charged
at the maximum state of charge

Note 1 to entry: For **cells** and **batteries** that are rechargeable, this is the maximum state of charge permitted by the **charging system**.

Note 2 to entry: The maximum state of charge for **non-rechargeable batteries** and **batteries** that are rechargeable is specified in the artificial source characteristics of Table B.1.

3.10.7
fully discharged
discharged at a steady rate of current to attain, at 5 h of steady discharge (C_5 rate), or the fastest discharge rate allowed by the **cell** manufacturer or **battery** manufacturer if it is slower than the C_5 rate, until

– discharge terminates due to operation of discharge termination circuitry; or

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– the **battery** (or **cell**) reaches a total voltage with an average voltage per **cell** equal to the end-of-discharge voltage for the **cell** chemistry being used, unless a different end of discharge voltage is specified by the **cell** manufacturer

Note 1 to entry: Examples of the end-of-discharge voltages for **fully discharged** common **cell** chemistries are typically

– 0,9 V/**cell** for nickel cadmium;
– 0,9 V/**cell** for nickel metal-hydride;
– 1,75 V/**cell** for lead-acid;
– 2,5 V/**cell** for lithium iron-phosphate;
– 3,0 V/**cell** for lithium cobalt-oxide.

3.11 Definitions relating to remote functionality

3.11.1
entity
person, device, appliance, product, or service that interacts with an appliance

3.11.2
message
data which is transmitted from a sender (data source) to one or more receivers (data sink)

3.11.3
public network
network carrying digital data or analogue signals or both where access to the data and signals is not restricted by the physical space within the household or similar use environment of the appliance

Note 1 to entry: Determination of confinement to the physical space includes consideration of the network's range of communication, configuration, or construction.

For the purposes of this standard, examples of **public networks** include but are not limited to:

– PAN (personal area network);
– LAN (local area network) connected devices which may or may not be connected to a gateway,
– PLC (power line communication);
– SRD (short range devices);
– WAN (wide area network);

For the purposes of this standard, examples of networks which are not considered as being **public networks** include but are not limited to:

– NFC (near field communication);
– optical communication with line of sight (infra-red rays or visual rays);
– hardwired configurations constructed of physical media;

without connection to a **public network**.

3.11.4
remote communication
transmission of data between the appliance and an **entity** that can be initiated out of sight of the appliance, using communication means such as radio wave modulation, sound wave modulation or bus systems

Note 1 to entry: Examples of transmission of data includes but are not limited to remote monitoring, software downloading or control parameter modifications.

Note 2 to entry: Transmission of data can be one-way (simplex) or two-way (duplex).

3.11.5
remote operation
control of an appliance by **remote communication**

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Note 1 to entry: **Remote communication** that results in a change of appliance operation, such as change of rotational speed, temperature, spatial movement, start/stop of the intended function, is considered **remote operation**. It is possible to have **remote communication** that does not lead to **remote operation.**

Note 2 to entry: A line of sight infra-red signal by itself is not considered one used for **remote operation**.

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.

4.101 *Instead of the requirements on supervision of the* **microwave interlocks** *by monitored* ***microwave interlocks*** *as in IEC 60335-2-90, this standard applies the concepts of* **restricted area** *and microwave leakage checks of* **microwave interlock** *function for* ***l*****arge area contacting applicators** *and* **insertion applicators** *– and* **start switch** *as well as* **operation switch** *for* **small area contacting applicators**.

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 informative 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 12, 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.*

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 normative Annex C has to be carried out, six samples of the motor are needed.

If the test of normative Annex D has to be carried out, an additional appliance may be used.

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

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

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

The cumulative stress resulting from successive tests on ***electronic circuits*** *shall be avoided. It may be necessary to replace components or to use additional samples. The number of additional samples shall be kept to a minimum by an evaluation of the relevant* ***electronic circuits****.*

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If an appliance has to be dismantled in order to carry out a test, care shall 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, 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.

Modification:

Instead of carrying out the tests in the order of clauses, the following sequence of clauses and subclauses applies: Clause 32, 22.107, Clause 101, Clauses 7 to 17, Clause 20, Clause 21, Clause 18, Clause 19, Clause 22 (except 22.107), Clauses 23 to 31.

NOTE 101 Clause 101 deals with the protection against leakage by basic design of **microwave enclosures**; Clause 22 deals with the additional requirements applicable when handling and against improper handling of the appliance, and against other hazards caused by the microwaves; 32.1 deals with the leakage measurement instrumentation and handling, plus limiting values.

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.*

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

For appliances fitted with a voltage selector switch, 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 alternating current (AC) only are tested with AC at* ***rated frequency****, and those for AC and DC are tested at the more unfavourable supply.*

Appliances for AC 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.*

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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**.*

*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. For **motor-operated appliances**, **combined appliances** and appliances having more than one **rated voltage** or **rated voltage range**, it may be necessary to make some of the tests at the minimum, the mean and the maximum values of the **rated voltage** or the **rated voltage range** in order to establish the most unfavourable voltage.*

5.8.3 *For **heating appliances**, and **combined appliances**, marked with a **rated power input range**, when it is specified that the power input is equal to the **rated power input** multiplied by a factor, the appliance is operated at*

- *the upper limit of the **rated power input range** multiplied by this factor, if greater than 1;*
- *the lower limit of the **rated power input range** multiplied by this factor, if smaller than 1.*

*When a factor is not specified, the power input is the most unfavourable within the **rated power input range**.*

5.8.4 *For appliances marked with a **rated voltage range** and **rated power input** corresponding to the mean of the **rated voltage range**, when it is specified that the power input is equal to **rated power input** multiplied by a factor, the appliance is operated at:*

- *the calculated power input corresponding to the upper limit of the **rated voltage range** multiplied by this factor, if greater than 1;*
- *the calculated power input corresponding to the lower limit of the **rated voltage range** multiplied by this factor, if smaller than 1.*

*When a factor is not specified, the power input corresponds to the power input at the most unfavourable voltage within the **rated voltage range**.*

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

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

*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.*

***Built-in appliances** and **fixed appliances** are installed in accordance with the instructions provided with the appliance before testing.*

*If **batteries** intended for use with the appliance use metal-ion chemistry, the manufacturer or responsible agent shall provide the following information for each type of **battery***

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– *end-of-discharge voltage;*

– ***upper limit charging voltage**, for **batteries** comprising series connected **cells**;*

– *rated capacity of the **battery** (C_5 Ah).*

*If **cells** intended for use with the appliance use metal-ion chemistry, the manufacturer or responsible agent shall provide the **specified operating region for charging** for each type of **cell**.*

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 informative Annex P for enhanced requirements that can 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 tropical climates.

5.15 *If appliances have parts operating at **safety extra-low voltage**, such parts are checked for compliance with the appropriate requirements specified for **class III construction**.*

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

5.17 ***Battery-operated appliances** and remote controls containing **batteries** are tested in accordance with normative Annex B.*

***Battery-operated appliances** having a functional earth connection or a supply connection are tested in accordance with the relevant clauses of the main part of this standard and normative Annex B.*

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NOTE A supply connection can include a mains connection.

__Battery-operated appliances__ having a supply connection are considered dual supply appliances. Dual supply appliances are regarded as __battery-operated appliances__ when deriving their energy from __batteries__.

__Separable batteries__ and __detachable batteries__ for __battery-operated appliances__ are tested in accordance with normative Annex B.

5.18 *To condition __batteries__ that are rechargeable, the __batteries__ shall be __fully discharged__ and then __fully charged__ in accordance with the appliance manufacturer's instructions. The sequence shall be repeated at least 2 h after the __battery__ was charged.*

For __batteries__ where there is a series arrangement of parallel clusters of __cells__, the cluster shall be treated as a single __cell__ for those tests that require altering the amount of charge on a single __cell__ prior to conducting the test.

5.19 *Measurements of __cell__ voltages or __battery__ voltages shall be made using a single pole resistive-capacitive low pass filter with a –3 dB roll off frequency of 5 kHz ± 0,5 kHz. To determine if the __upper limit charging voltage__ has been exceeded, the peak value of the filtered voltage shall be measured with a tolerance of ±1 %.*

When measuring __cell__ voltages or __battery__ voltages, the peak value of any superimposed ripple exceeding 10 % of the average value shall be included. Transient voltages are ignored, such as a temporary increase of voltage, for example, after the __battery__ is removed from the __charging system__.

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

5.21 *Probes are applied with a force not exceeding 1 N.*

5.22 *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 this standard, then appliances incorporating such a component or part shall be tested with the __non-self-resetting feature__ rendered inoperative.*

5.101 The microwave-related portion of the appliance is considered **motor-operated**.

6 Classification

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

class 0, **class 0I**, **class I**, **class II**, **class III**.

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**.

Compliance is checked by inspection and by the relevant tests.

Modification:

Microwave appliances shall be **class I**.

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

Large area contacting applicators and **insertion applicators** shall be at least IPX1. **Small area contacting applicators** shall be at least IPX5.

Compliance is checked by inspection and by the relevant tests.

NOTE The degrees of protection against harmful ingress of water are given in IEC 60529:1989 including IEC 60529:1989/AMD1:1999 and IEC 60529:1989/AMD2:2013.

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;
– substance of the following warnings, if applicable:
  - WARNING:Switch off and remove plug from mains before adjusting, cleaning or if the cord is entangled or damaged.
  - WARNING:Keep the flexible supply cord away from the microwave-energised parts.
– 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.

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

Appliance outlets accessible to the user and socket-outlets accessible to the user:

– that are incorporated in appliances connected to the supply mains; and
– that operate at **rated voltage**

shall be marked with their **outlet load** in watts or amperes.

Appliances intended to be supplied from a **detachable power supply part** for the purposes of recharging the **battery** shall be marked with symbol ISO 7000-0790 (2004-01). They shall also be marked with symbol IEC 60417-6181 (2016-01) and the model or type reference of the **detachable power supply part** or with the substance of the following:

Use only with <model or type reference> supply unit

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

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**.

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Full document details: IEC 60335-2-110 2024 EXV

Where appropriate IEC/ISO symbols or pictograms are available, they can be used.

Where appropriate, appliances shall be marked with symbols ISO 7000-0434A (2004-01) and IEC 60417-6167 (2012-07).

Appliances shall be marked with the nominal frequency in megahertz of the ISM band in which they operate.

Appliances shall be marked with the **rated microwave power output**.

Appliances shall be marked on an affixed inspection tag or label, with the date when the latest complying microwave leakage and function test in accordance with the service manual was carried out.

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

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

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

Compliance is checked by inspection.

7.4 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.

The wiring diagram may be on the inside of a cover that has to be removed to connect the supply conductors. It shall not 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

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shall be marked. However, if the difference between the limits of a **rated voltage range** does not exceed 10 % of the arithmetic mean value of the range, the marking for **rated power input** or **rated current** may be related to the arithmetic mean value of the range.

The upper and lower limits of the **rated power input** or **rated current** shall be marked on the appliance so that the relation between input and voltage is clear.

Compliance is checked by inspection.

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

⎓	[symbol 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 current rating of the fuse link can 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 (2011-07)]	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 can be indicated in association with this symbol.

	[symbol ISO 7000-0434A (2004-01)]	Caution
	[symbol ISO 7000-0790 (2004-01)]	read operator's manual
	[symbol IEC 60417-5021 (2002-10)]	Equipotentiality

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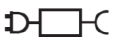
	[symbol IEC 60417-5036 (2002-10)]	dangerous voltage
	[symbol IEC 60417-5180 (2003-02)]	**Class III appliance**
	[symbol IEC 60417-6181 (2016-01)]	**detachable power supply part**
	[symbol IEC 60417-6166 (2012-07)]	caution, non-ionizing electromagnetic radiation; caution, microwave radiation
	[symbol IEC 60417-6167 (2012-07)]	keep out of microwave radiation
	[symbol ISO 7010-P004 (2011-05)]	no thoroughfare

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

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

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

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

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.

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; or
– marked in words.

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

Compliance is checked by inspection.

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;

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– protective earthing terminals shall be indicated by symbol IEC 60417-5019 (2006-08);
– functional earthing terminals shall be indicated by symbol IEC 60417-5018 (2011-07).

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**. The figure 0 may be used on a digital programming keyboard.

Compliance is checked by inspection.

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

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

Compliance is checked by inspection.

7.12 Instructions shall be provided in hard copy form with the appliance so that the appliance can be used safely.

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

NOTE If the instructions are marked on the appliance they are considered to be provided in hard copy form.

If it is necessary to take precautions during **user maintenance**, appropriate details shall be given.

The instructions shall state the substance of the following:

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

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

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

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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.

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.

For appliances intended to be connected to a supply for the purposes of recharging the **battery**, the instructions shall state the substance of the following:

WARNING: Use only an external supply with the following specifications: <voltage and nature of supply> <power / current of supply>

For appliances intended to be supplied from a **detachable power supply part** for the purposes of recharging the **battery**, the type reference of the **detachable power supply part** shall be stated along with the substance of the following:

WARNING: Only use the supply unit provided with this appliance.

For appliances intended for use with **batteries** that use metal-ion chemistries, the instructions shall state the normal temperature range for charging the **battery**.

If the symbol for **detachable power supply part** is used, its meaning shall be explained.

The instructions shall include the substance of the following.

– WARNING: If **microwave barriers** or **microwave guards** are damaged, the appliance must not be operated until repairs by a **skilled person** have been carried out;
– WARNING: It is hazardous for anyone other than a **skilled person** to carry out any service or repair operation that involves the removal of any cover or barrier which gives protection against exposure to microwave energy;
– if smoke is observed, switch off or unplug the appliance;
– failure to maintain the appliance in a clean condition could lead to deterioration that could adversely affect the life of the appliance and possibly result in a hazardous situation;
– the appliance shall not be cleaned with a water jet.

Appliances shall be operated only by **instructed persons** or **skilled persons**.

An instruction sheet shall be supplied with the appliance.

The instructions shall include:

a) those warnings required to be marked on the appliance together with further explanation, where appropriate;
b) specifications of the load surface irregularities (non-flatness) with which the appliance may be used;
c) that the appliance shall not be used in standing water;
d) advice on the use and type of extension cords to be used (not lighter than required in 25.7);
e) instructions for fitting and use of attachments, if any;
f) the substance of the following, where appropriate:

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WARNING: If parts of **viewing openings**, **microwave barriers**, **microwave guards**, the housing or any other means named by the manufacturer are damaged, the appliance shall not be operated until it is repaired by a **skilled person**. Until repairs are carried out, the appliance shall be set in a permanent non-operational condition (e.g. with key switch, code-card or similar devices). Further details are included in the instructions for use.

The **instructed persons** shall regularly, but at a minimum of once a year, be instructed by a **skilled person**. A record of the instruction provided shall be required.

1) Training

- Read the instructions. Be familiar with the **user controls** and the use of the appliance.
- Never allow **non-instructed persons** to use the appliance.

2) Preparation

- Inspect all areas where the appliance is to be used and remove all foreign objects.

3) Operation

- Operate the appliance only in daylight or in good artificial light.
- The main switch key shall not be left with the appliance when it is unattended.
- The key shall be stored in a safe place.
- Use extreme caution when reversing or pulling an operating **insertion applicator** or **large area contacting applicator** towards you.
- Overheating of potentially flammable **loads** such as wood and some composite materials can be locally and internally heated to charring, which can in turn cause the microwave absorption rate to increase so that a fire occurs. The microwave power setting needs to be reduced and the treatment shall be constantly attended. Attention shall also be paid to the risk of a delayed hazardous condition.
- If smoke is observed, switch off the appliance, contain the fire by an extinguisher, pay attention to the risk of recurrence and see to it that the overheated region does not expand to unattended spaces.
- Never operate the appliance with defective **microwave barriers** or **microwave guards**, or without other safety devices in place.
- Switch on the appliance according to instructions and with all parts of your body which are not used for handling of the appliance well away from the **applicator**.
- Do not put hands or feet near or under **applicators**, **microwave barriers** or **microwave guards**.
- Pull the plug from the socket:
  - before clearing a blockage;
  - before checking, cleaning or working on the appliance;
  - after striking a foreign object. Inspect the appliance and, if damaged, do not operate it until it has been repaired by a **skilled person**.

Compliance is checked by inspection.

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.

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**.

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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.

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.

If a cord set is required to be provided with the appliance according to Subclause 22.58, the instructions shall contain the substance of the following:

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

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Compliance is checked by inspection.

7.12.6 If a **non-self-resetting thermal cut-out** is required in order to comply with this 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.

Compliance is checked by inspection.

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

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

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

Compliance is checked by inspection.

7.12.9 For each language, the instructions specified in 7.12 and from 7.12.1 to 7.12.8 shall be in hard copy form and 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.

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 this standard shall be clearly legible.

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.

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