IEC 60335-2-90

Edition 3.1 2010-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Household and similar electrical appliances – Safety – Part 2-90: Particular requirements for commercial microwave ovens

Appareils électrodomestiques et analogues – Sécurité – Partie 2-90: Règles particulières pour les fours à micro-ondes à usage commercial

IEC 60335-2-90:2006+A1:2010

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-90: Particular requirements for commercial microwave ovens

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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This consolidated version of IEC 60335-2-90 consists of the third edition (2006) [documents 61B/306/FDIS and 61B/311/RVD] and its amendment 1 (2010) [documents 61B/416/FDIS and 61B/424/RVD]. It bears the edition number 3.1.

The technical content is therefore identical to the base edition and its amendment and has been prepared for user convenience. A vertical line in the margin shows where the base publication has been modified by amendment 1. Additions and deletions are displayed in red, with deletions being struck through.

This part of international standard IEC 60335-2-90 has been prepared by subcommittee 61B: Safety of microwave ovens, of IEC technical committee 61: Safety of household and similar electrical appliances.

This part 2 is to be used in conjunction with the latest edition of IEC 60335-1 and its amendments. It was established on the basis of the fourth edition (2001) 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: Safety requirements for commercial microwave ovens.

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.

Words in **bold** type 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 following differences exist in the countries indicated below.

– 5.3: Microwave leakage is not to exceed 10 W/m^2 during the initial test (Japan, USA and Canada).
– 6.1: Microwave ovens may be class OI if the rated voltage does not exceed more than 150 V (Japan).
– 7.12: Some warnings have to be marked on the appliance and be visible to the user (Canada).
– Clause 18: The test is carried out on two appliances (USA).
– 19.11.2: The input voltage variation is not applied (USA).
– 19.13: Microwave leakage is only measured at the end of each test (USA).
– 21.102: The applied force is 222 N (USA).
– 21.105: Microwave leakage is not to exceed 50 W/m^2 (Japan and USA).
– 22.111: Microwave leakage is only measured at the end of the test (USA).
– 22.112: Microwave leakage is not to exceed 50 W/m^2 (Japan and USA).
– 22.116: All access to the cavity has to be prevented (USA).
– 27.2: A terminal for an external equipotential conductor is not required (Japan).

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

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

NOTE 4 The attention of National Committees is drawn to the fact that equipment manufacturers and testing organizations may need a transitional period following publication of a new, amended or revised IEC publication in which to make products in accordance with the new requirements and to equip themselves for conducting new or revised tests. 1

It is the recommendation of the committee that the content of the amendment 1 be adopted for implementation nationally not earlier than 12 months or later than 36 months from the date of publication.

INTRODUCTION

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

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

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

If 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.

~~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.~~

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.

1

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 and generic standards covering a hazard are not applicable since they have been taken into consideration when developing the general and particular requirements for the IEC 60335 series of standards. For example, in the case of temperature requirements for surfaces on many appliances, generic standards, such as ISO 13732-1 for hot surfaces, are not applicable in addition to Part 1 or part 2 standards.

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.

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-90: Particular requirements for commercial microwave ovens

1 Scope

This clause of Part 1 is replaced by the following.

This International Standard deals with:

- the safety of **microwave ovens** with a cavity door 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.
- the safety of **combination microwave ovens** with a cavity door, the requirements for which are contained in Annex AA.
- the safety of **microwave ovens** without a cavity door and with **transportation means** that are intended for commercial use only, for the heating of food and beverages, the requirements for which are contained in Annex BB..

Microwave ovens, covered by annex BB, have **transportation means** for moving the **microwave load** through the **microwave oven**. Requirements for tunnel microwave ovens and several types of microwave vending machines are covered.

This standard also deals with **microwave ovens** intended to be used on board ships, for which Annex EE is applicable.

NOTE 101 In annex BB a microwave oven without a cavity door and with transportation means is described as a **microwave oven**. All clauses of this standard apply to these appliances unless otherwise specified in Annex BB.

This international standard also takes into account **ordinary persons** having access to the **removing area** of the vending machine.

NOTE 102 The appliance may be built into a vending machine, in which case IEC 60335-2-75 may also be applicable.

NOTE 103 Appliances that use non-electrical energy are within the scope of this standard.

In general, this standard does not take into account

– the use of appliances by young children or infirm persons without supervision;

– playing with the appliance by young children.

This international standard does not take into account the use of a **microwave oven** without a **cavity** door and with **transportation means** by **ordinary persons** except in the vicinity of **entrance and exit ports**.

NOTE 104 The rationales for particular microwave exposure conditions and measures related to microwave energy being confined by an open structure are in Annex BB.

NOTE 105 Attention is drawn to the fact that

– for appliances intended to be used in vehicles or on board ships or aircraft, additional requirements may be necessary;

– for appliances intended to be used in tropical countries, special requirements may be necessary;

– in many countries, the national health authorities, the national authorities responsible for the protection of labour and similar authorities specify additional requirements;

– in many countries, national authorities specify additional requirements to BB.22.119.1;

– responsible for the protection of labour and similar authorities

NOTE 106 This standard does not apply to,

– household **microwave ovens** including **combination microwave ovens** (IEC 60335-2-25)

– industrial microwave heating equipment (IEC 60519-6)

– appliances for medical purposes (IEC 60601)

– 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).

2 Normative references

This clause of Part 1 is applicable except as follows

Addition:

1 IEC 60068-2-6, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-27, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60068-2-52, *Environmental testing – Part 2-52: Tests – Test Kb: Salt mist, cyclic (sodium chloride solution)*

3 Definitions

This clause of Part 1 is applicable except as follows.

3.1.7 *Addition:*

NOTE 101 The **rated frequency** is the input frequency.

3.1.9 *Replacement:*

normal operation
operation of the appliance under the following conditions

The appliance is operated with 1 000 g ± 50 g of potable water at an initial temperature of 20 °C ± 2 °C in a cylindrical borosilicate glass vessel having a maximum thickness of 3 mm and an outside diameter of approximately 190 mm. The vessel is placed on the centre of the **shelf**. If the **rated microwave power output** exceeds 2 200 W, two such vessels are used and placed contiguously in the **cavity**.

3.101
microwave oven
appliance using electromagnetic energy in one or several of the ISM frequency bands[1] between 300 MHz and 30 GHz, for heating food and beverages in a **cavity**

3.102
rated microwave power output
microwave power output assigned to the appliance by the manufacturer

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

3.103
cavity
space enclosed by the inner walls and the door in which the load is placed

3.104
shelf
horizontal support in the **cavity** on which the load is placed

3.105
door interlock
device or system that prevents the operation of the magnetron unless the oven door is closed

3.106
monitored door interlock
door interlock system that incorporates a supervision device

3.107
temperature-sensing probe
device that is inserted into the food to measure its temperature and is a part of an oven control

Addition:

NOTE For more details see figure 104.

3.108
instructed person
person who is sufficiently instructed and monitored to know how to avoid any danger caused by the operation of **microwave ovens**

3.109
skilled person
person with suitable professional education, knowledge and experience to discern and to avoid any danger caused by the operation of **microwave ovens**

3.110
ordinary person
person who is neither a skilled person nor an instructed person

3.111
transportation means
means to transport the microwave load through the microwave oven

NOTE An example of a **transportation means** is a belt, an arm or an inclined plane.

3.112
load
food and beverages that can be heated up in a **microwave oven**

3.113
microwave enclosure
structure that is intended to confine microwave energy to a defined region

NOTE 1 Barriers mounted outside the microwave enclosure are not considered a part of the microwave enclosure.

NOTE 2 A microwave enclosure may consist of a cavity, quarter wave chokes (acting by impedance transformation), mode chokes (acting by field pattern mismatching) and microwave energy absorbers.

3.114
microwave barrier
physical barrier, which is microwave transparent, limiting access to the **microwave enclosure,** mounted outside the **microwave enclosure** and can only be removed with the aid of tools

NOTE 1 A **microwave barrier** may be mounted between the **microwave enclosure** and the external cover of the appliance.

NOTE 2 Devices such as an array of metal chains or hinged metal plates at entrance and exit ports intended to reduce microwave leakage are not considered **microwave barriers**.

NOTE 3 Construction requirements are in BB.22.119.

3.115
entrance and exit ports
openings in the **microwave enclosure** through which **microwave loads** move

3.116
loading area
area on which the **microwave load** is placed

3.117
means of monitored microwave interlock
means of microwave interlock that incorporates a supervision device

3.118
protective blocking structure
movable mechanical structure located in the removing area limiting access to the **microwave enclosure**

3.119
removing area
area from which the **microwave load** is removed

3.120
viewing opening
opening in the **cavity** through which the warm up process can be visually monitored

3.121
fixed means of connection
all parts of the **microwave enclosure** that are permanently open with the exception of **entrance and exit ports** and **viewing openings**

NOTE **Fixed means of connection** may be used for venting and water flushing.

3.122
detachable means of access
all parts of the **microwave enclosure** that can be opened or removed without the aid of tools to get access to the inside for maintenance, with the exception of **entrance and exit ports** and **viewing openings**

NOTE Examples of detachable means of access are tunnels that are opened by drop down or sliding action and cavity lamp covers.

3.123
means of microwave interlock
mechanical or electrical safety devices or systems that operate when certain conditions are not fulfilled (e.g. an **interlock** system that prevents the operation of the **microwave generator** when a **means of access** is open)

3.124
maintenance cover
structural feature of any part of the equipment that can be opened or removed by the use of a tool to provide access for routine maintenance, service, replacement of expendable parts etc. in microwave containing areas

3.125
cleaning cover
part of the microwave enclosure that can be opened or removed, only with the aid of a tool, for frequent cleaning purposes, during operation

3.126
reference surface
surface in the vicinity of entrance and exits ports defined depending on the reading of microwave leakage of BB.32

NOTE 1 If the leakage reading is less or equal to 50 W/m^2, the reference surface is the surface of the geometric opening of the **microwave enclosure** without **microwave barrier.**

NOTE 2 If the leakage reading exceeds 50 W/m^2, the reference surface is an artificial surface located 50 mm away from the locations where the sensor of the instrument measures leakage readings of 50 W/m^2 straight inwards towards the appliance.

NOTE 3 For further explanation refer to BB.32.

3.127
combination microwave oven
microwave oven in which heat is also provided in the **cavity** by simultaneous or consecutive operation of resistive heating elements

NOTE The resistive heating elements are used to provide radiant heat, convection heat or steam.

4 General requirement

This clause of Part 1 is applicable.

5 General conditions for the tests

This clause of Part 1 is applicable except as follows.

5.2 *Addition:*

NOTE 101 An additional sample may be required for the test of 19.104. Six samples of the interlocks are required for the test of 24.1.4.

5.3 *Modification:*

Instead of carrying out the tests in the order of clauses, the following sequence of clauses and subclauses applies: 32, 22.113, 22.108, 22.116, 7 to 17, 20, 21 (except 21.101 to 21.105), 18, 19 (except 19.104), 22 (except 22.108, 22.113 and 22.116), 23 to 31, 21.101 to 21.105 and 19.104.

5.101 ***Microwave ovens*** *are tested as* ***motor-operated appliances.***

5.102 **Class III temperature-sensing probes** are only subjected to the tests of 22.112.

6 Classification

This clause of Part 1 is applicable except as follows.

6.1 *Modification:*

Microwave ovens shall be **class I.**

7 Marking and instructions

This clause of Part 1 is applicable except as follows.

7.1 *Addition:*

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

If the removal of any cover results in microwave leakage exceeding the value specified in Clause 32, the cover shall be marked with the substance of the following:

WARNING: Microwave energy – Do not remove this cover

If an appliance incorporates a socket-outlet protected by means of fuses other than D-type fuses, it shall be marked with the rated current of the relevant fuse. When a miniature fuse-link is provided, this marking shall indicate that the fuse-link is to have a high breaking capacity.

1 If appliances have **accessible metal surfaces**, other than working surfaces, that have a temperature rise exceeding 90 K during the test of Clause 11, they shall be marked with symbol IEC 60417-5041(2002-10) or with the substance of the following:

CAUTION: Hot surface.

7.6 *Addition:*

Add the following symbol:

[symbol 5021 of IEC 60417] equipotentiality

1  [symbol IEC 60417-5041 (2002-10)] Caution, hot surface

7.12 *Addition:*

The instructions shall include the substance of the following:

– WARNING: If the door or door seals are damaged, the oven must not be operated until it has been repaired by a competent person;

– WARNING: It is hazardous for anyone other than a competent person to carry out any service or repair operation that involves the removal of any cover which gives protection against exposure to microwave energy;