

# CONSOLIDATED VERSION

# VERSION CONSOLIDÉE



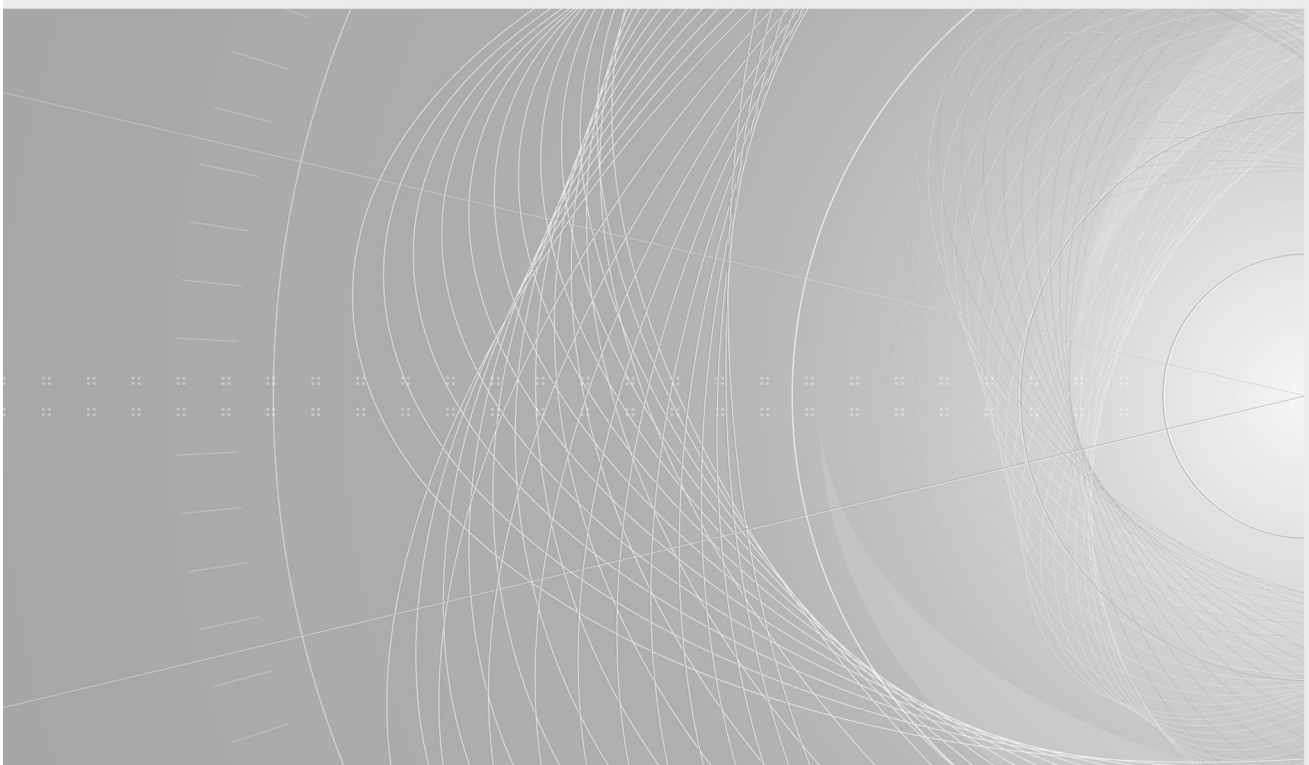
**Household microwave ovens – Methods for measuring performance**

**Fours à micro-ondes à usage domestique – Méthodes de mesure de l'aptitude à la fonction**

Document Preview

[IEC 60705:2010](#)

<https://standards.iteh.ai/catalog/standards/iec/a9e9b582-2222-429f-9d73-8e00b26979f3/iec-60705-2010>





**THIS PUBLICATION IS COPYRIGHT PROTECTED**  
**Copyright © 2018 IEC, Geneva, Switzerland**

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

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

Tel.: +41 22 919 02 11  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

#### **About the IEC**

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

#### **About IEC publications**

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

#### **IEC Catalogue - [webstore.iec.ch/catalogue](http://webstore.iec.ch/catalogue)**

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

#### **IEC publications search - [webstore.iec.ch/advsearchform](http://webstore.iec.ch/advsearchform)**

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

#### **IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)**

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

#### **Electropedia - [www.electropedia.org](http://www.electropedia.org)**

The world's leading online dictionary of electronic and electrical terms containing 21 000 terms and definitions in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

#### **IEC Glossary - [std.iec.ch/glossary](http://std.iec.ch/glossary)**

67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

#### **IEC Customer Service Centre - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)**

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [sales@iec.ch](mailto:sales@iec.ch).

#### **A propos de l'IEC**

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

#### **A propos des publications IEC**

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

#### **Catalogue IEC - [webstore.iec.ch/catalogue](http://webstore.iec.ch/catalogue)**

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

#### **Recherche de publications IEC - [webstore.iec.ch/advsearchform](http://webstore.iec.ch/advsearchform)**

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

#### **IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)**

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

#### **Electropedia - [www.electropedia.org](http://www.electropedia.org)**

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient 21 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

#### **Glossaire IEC - [std.iec.ch/glossary](http://std.iec.ch/glossary)**

67 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

#### **Service Clients - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)**

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: [sales@iec.ch](mailto:sales@iec.ch).

# CONSOLIDATED VERSION

# VERSION CONSOLIDÉE



---

**Household microwave ovens – Methods for measuring performance**

**Fours à micro-ondes à usage domestique – Méthodes de mesure de l'aptitude à la fonction**

iTeh Standards  
(<https://standards.itih.ai>)  
Document Preview

[IEC 60705:2010](#)

<https://standards.itih.ai/catalog/standards/iec/a9e9b582-2222-429f-9d73-8e00b26979f3/iec-60705-2010>

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

---

ICS 97.040.20

ISBN 978-2-8322-5777-7

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



# REDLINE VERSION

# VERSION REDLINE



## Household microwave ovens – Methods for measuring performance

Fours à micro-ondes à usage domestique – Méthodes de mesure de l'aptitude à la fonction

Document Preview

[IEC 60705:2010](#)

<https://standards.iteh.ai/catalog/standards/iec/a9e9b582-2222-429f-9d73-8e00b26979f3/iec-60705-2010>

## CONTENTS

FOREWORD.....	5
<b>INTRODUCTION to Amendment 1.....</b>	<b>7</b>
1 Scope.....	8
2 Normative references.....	8
3 Terms and definitions .....	8
4 Classification.....	10
4.1 According to type.....	10
4.2 According to characteristics .....	10
5 List of measurements .....	10
6 General conditions for measurements .....	12
6.1 General .....	12
6.2 Supply voltage .....	12
6.3 Test room.....	12
6.4 Water .....	13
6.5 Initial condition of the appliance .....	13
6.6 Control setting .....	13
<b>6.7 Instruments and measurements.....</b>	<b>13</b>
<b>6.8 Positioning the appliance.....</b>	<b>14</b>
7 Dimensions and volume.....	14
7.1 External dimensions .....	14
7.2 Usable internal dimensions and <del>usable</del> <b>calculated</b> volume.....	15
7.2.1 General .....	15
7.2.2 Usable height.....	17
7.2.3 Usable width.....	17
7.2.4 Usable depth .....	18
7.2.5 Reciprocating tray.....	18
7.2.6 <del>Usable</del> <b>Calculated</b> volume.....	18
<b>7.2.7 Dimensions of food support.....</b>	<b>18</b>
7.3 Overall internal dimensions and overall volume .....	18
7.3.1 General .....	18
7.3.2 Overall height ( <i>H</i> ) .....	19
7.3.3 Overall width ( <i>W</i> ).....	19
7.3.4 Overall depth ( <i>D</i> ) .....	19
7.3.5 Overall volume of rectangular cavities .....	19
7.3.6 Overall volume of non-rectangular cavities .....	19
8 Determination of microwave power output.....	19
9 Efficiency.....	20
10 Technical tests for performance.....	21
10.1 General .....	21
10.2 Square tank test .....	21
10.2.1 Procedure.....	21
10.2.2 Evaluation.....	22
10.3 Multiple <del>cup</del> <b>beakers</b> test .....	22
10.3.1 Procedure.....	22

10.3.2 Evaluation.....	25
11 Heating performance .....	25
11.1 Heating beverages.....	25
11.1.1 General .....	25
11.1.2 Procedure.....	25
11.1.3 Evaluation.....	26
11.2 Heating simulated food .....	26
11.2.1 Test purpose .....	26
11.2.2 Procedure.....	26
11.2.3 Evaluation.....	27
12 Cooking performance.....	27
12.1 General .....	27
12.2 Evaluation .....	27
12.3 Tests.....	28
12.3.1 Egg custard .....	28
12.3.2 Sponge cake.....	28
12.3.3 Meatloaf .....	29
12.3.4 Potato gratin .....	30
12.3.5 Cake.....	31
12.3.6 Chicken .....	31
13 Defrosting performance .....	32
13.1 General .....	32
13.2 Evaluation .....	32
13.3 Meat defrosting.....	33
13.3.1 Purpose of test .....	33
13.3.2 Container.....	33
13.3.3 Ingredients .....	34
13.3.4 Procedure.....	34
14 Energy consumption for the microwave function .....	35
14.1 General .....	35
14.2 Test load .....	35
14.3 Preparation.....	35
14.4 Positioning the load in the appliance .....	36
14.5 Measurement of energy consumption for a cooking cycle .....	36
14.6 Calculation for the energy consumption of a cooking cycle .....	37
14.7 Final result .....	38
14.8 Reporting of test results.....	38
15 Consumption measurement of low power modes.....	38
Annex A (informative) Regional defrosting tests.....	40
A.1 General .....	40
A.2 Introduction .....	40
A.3 Test methods .....	40
A.4 Evaluation .....	41
Annex B (informative) Dishes for Clause 12 and 13 .....	42
Annex C (informative) Stirrer .....	43
Annex D (informative) Glass container for Clauses 8 and 14.....	44
Annex E (informative) Data and calculation sheet: Energy consumption for a cooking cycle with microwave function (Clause 14).....	45

Annex F (informative) Energy consumption for the cooling down period .....	47
Bibliography .....	49
Figure 1 – External dimensions of the microwave oven .....	14
Figure 2 – Usable internal dimensions .....	17
Figure 3 – Square tank .....	21
Figure 4 – <del>Cup</del> Beaker .....	22
Figure 5 – <del>Cup</del> Beaker positions for the test of 10.3.....	24
Figure 6 – <del>Cup</del> Beaker position for the test of 11.1 .....	25
Figure 7 – Rectangular tank .....	26
Figure 8 – Shallow dish .....	34
Figure C.1 – Plastic stirring adapter.....	43
Figure C.2 – Example stirrer.....	43
Figure D.1 – Example: small beaker (600 ml) .....	44
Figure F.1 – Phases of energy consumption measurement – example .....	48
Table 1 – List of measurements .....	11
Table 2 – Instruments .....	13
Table 3 – Measurements .....	14
Table 4 – Test loads for measuring the energy consumption .....	35
Table D.1 – Specification – glass containers.....	44

ITeH Standards  
(<https://standards.iteh.ai>)  
Document Preview

<https://standards.iteh.ai>

<https://standards.iteh.ai/catalog/standards/iec/a9e9b582-2222-429f-9d73-8e00b26979f3/iec-60705-2010>



## INTERNATIONAL ELECTROTECHNICAL COMMISSION

# HOUSEHOLD MICROWAVE OVENS – METHODS FOR MEASURING PERFORMANCE

## FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

### DISCLAIMER

**This Consolidated version is not an official IEC Standard and has been prepared for user convenience. Only the current versions of the standard and its amendment(s) are to be considered the official documents.**

**This Consolidated version of IEC 60705 bears the edition number 4.2. It consists of the fourth edition (2010-04) [documents 59K/195/FDIS and 59K/198/RVD], its amendment 1 (2014-06) [documents 59K/252/FDIS and 59K/255/RVD] and its amendment 2 (2018-05) [documents 59K/297/FDIS and 59K/299/RVD]. The technical content is identical to the base edition and its amendments.**

**In this Redline version, a vertical line in the margin shows where the technical content is modified by amendments 1 and 2. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.**

International Standard IEC 60705 has been prepared by subcommittee 59K: Ovens and microwave ovens, cooking ranges and similar appliances, of IEC technical committee 59: Performance of household and similar electrical appliances.

The main changes from the previous edition are as follows:

- the definition of rounding is given in 3.5;
- the usable volume and the overall volume are respectively determined in 7.2 and 7.3.

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

In this standard, the following print types are used:

- *test specifications: in italic type*
- notes: in small roman type
- other texts: in roman type.

Words in **bold** in the text are defined in Clause 3.

This standard contains an attached file in the form of an Excel®<sup>1</sup> 97-2003 data sheet program. This file is intended to be used as a complement and does not form an integral part of the standard.

The following differences exist in some countries:

Clause 7: Metric dimensional measures are not in common use (USA).

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.

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

<sup>1</sup> Excel® is the trademark of a product supplied by Microsoft®. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

## INTRODUCTION to Amendment 1

This amendment includes the following significant technical changes:

- the usable volume is renamed to calculated volume and the measurement method for the calculated volume is revised (see 7.2), which is in accordance with IEC 60350-1;
- new definitions for **microwave function**, **combination microwave function**, **set to off mode**, **set to standby mode**, **cooling down period** and **food support** in Clause 3;
- a method for measuring the energy consumption of the **microwave function** in Clause 14;
- more precise requirements for instruments and measurements in Table 2;
- additional product specific requirements for measuring the energy consumption of low power modes in Clause 15;
- a method for measuring the energy consumption for the **cooling down period** in Annex F (informative).

iTeh Standards  
(<https://standards.iteh.ai>)  
Document Preview

[IEC 60705:2010](https://standards.iteh.ai/catalog/standards/iec/a9e9b582-2222-429f-9d73-8e00b26979f3/iec-60705-2010)

<https://standards.iteh.ai/catalog/standards/iec/a9e9b582-2222-429f-9d73-8e00b26979f3/iec-60705-2010>

# HOUSEHOLD MICROWAVE OVENS – METHODS FOR MEASURING PERFORMANCE

## 1 Scope

This ~~International Standard~~ document applies to **microwave ovens** for household use. It also applies to **microwave ovens with grills** and **combination microwave ovens**.

This ~~standard~~ document defines the main performance characteristics of ~~household microwave ovens~~ these appliances, which are of interest to the user, and it specifies methods for measuring these characteristics.

NOTE 1 This ~~standard~~ document does not deal with

- **microwave ovens** that cannot accept a load having a diameter of  $\geq 200$  mm or a height of  $\geq 120$  mm;
- safety requirements (see IEC 60335-2-25 [1]<sup>2</sup> and IEC 60335-2-90 [2]).

NOTE 2 This ~~standard~~ document does not apply to ovens incorporating conventional heating means only (see IEC 60350) [3].

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60350-1:2011, *Household electric cooking appliances – Part 1: Ranges, ovens, steam ovens and grills – Methods for measuring performance*

IEC 60584-2, *Thermocouples – Part 2: Tolerances*

IEC 62301:2011, *Household electrical appliances – Measurement of standby power*

ISO 80000-1:2009, *Quantities and units – Part 1: General*

## 3 Terms and definitions

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

### 3.1

#### **microwave oven**

appliance using electromagnetic energy in **one or several of the ISM frequency bands of 2 450 MHz between 300 MHz and 30 GHz**, for heating food and beverages in ~~the~~ a cavity

~~NOTE 1 – The microwave oven may incorporate a browning element.~~

~~NOTE 2~~ 1 ISM frequency bands are the electromagnetic frequencies established by the ITU and reproduced in CISPR 11 [4].

<sup>2</sup> Figures in square brackets refer to the Bibliography.

### 3.2

#### **combination microwave oven**

**microwave oven** in which ~~the~~ microwave energy is combined with ~~thermal~~ energy transfer by forced air circulation, by conventional heating, by hot steam and by steam

Note 1 to entry: For definitions of a forced air circulation function, conventional heating function, hot steam function and steam function, IEC 60350-1:2016 is relevant.

### 3.3

#### **microwave transparent**

property of a material having negligible absorption and reflection of microwaves

NOTE The relative permittivity of a microwave transparent material is less than 7 and the relative loss factor is less than 0,015.

### 3.4

#### **rated voltage**

voltage assigned to the appliance by the manufacturer

### 3.5

#### **microwave function**

function using electromagnetic energy in one or several of the ISM frequency bands between 300 MHz and 30 GHz for heating food and beverages in a cavity

### 3.6

#### **combination microwave function**

heat transfer by electromagnetic energy simultaneously or sequentially with energy transfer by forced air circulation, conventional heating, by hot steam or by steam

Note 1 to entry: For definitions of a forced air circulation function, conventional heating function, hot steam function and steam function, IEC 60350-1:2016 is relevant.

### 3.7

#### **set to off mode**

action where the product is switched off using appliance controls or switches that are accessible and intended for operation by the user during normal use to attain the lowest power consumption that may persist for an indefinite time while connected to a main power source and used in accordance with the manufacturer's instructions

NOTE 1 All actions required to **set to off mode** like for example empty the water tank, remove food, close the door, etc. have to be taken.

NOTE 2 See 3.5 of IEC 62301:2011 for the definition of "off mode".

### 3.8

#### **set to standby mode**

action where the product is switched to standby using appliance controls or switches that are accessible and intended for operation by the user during normal use to attain the lowest power consumption that may persist for an indefinite time while connected to a main power source and used in accordance with the manufacturer's instructions

NOTE See 3.6 of IEC 62301:2011 for the definition of "standby mode".

### 3.9

#### **cooling down period**

unstable condition persisting after completion of the active mode and the appliance is **set to off mode** where the power consumption may change without any intervention by the user

### 3.10

#### **food support**

horizontal support in the cavity on which the load is placed

NOTE If the appliance is fitted with a turntable, the turntable is the **food support**. The **food support** can also be a shelf or a reciprocating tray. If recommended by manufacturer's instruction also the cavity bottom can be the **food support**.

### 3.11

#### **microwave oven with grill**

**microwave oven** in which microwave energy is combined with grill

Note 1 to entry: For a definition of a grill, IEC 60350-1:2016 is relevant.

### 3.12

#### **microwave function with grill**

heat transfer by electromagnetic energy simultaneously or sequentially with energy transfer by radiant heat typically from the top

Note 1 to entry: For a definition of a grill, IEC 60350-1:2016 is relevant.

## 4 Classification

Appliances are classified according to their type and characteristics.

### 4.1 According to type

- **Microwave ovens**
- **Combination microwave ovens**
- **Microwave oven with grill**

The manufacturers shall define the primary cooking function of the appliance, **microwave function** or thermal heat. The primary cooking function has to be measured with an existing method according to energy consumption.

If the primary cooking function is declared as a **microwave function** IEC 60705 shall be applied for energy consumption measurement. If the primary cooking function is declared as a thermal heat IEC 60350-1 shall be applied for energy consumption measurement.

NOTE There is currently no measurement method for the energy consumption for grilling and steam functions.

The type of oven shall be stated in the report.

### 4.2 According to characteristics

- Usable cavity dimensions
- ~~With or without a turntable~~
- Dimensions of shelves
- Moved **food support**, e.g. reciprocating tray, turntable
- Possible thermal heating modes (grilling, hot air, steam function etc.).

The characteristics of the oven shall be stated in the report.

## 5 List of measurements

~~Performance is measured by the tests listed in Table 1.~~

Table 1 shows which measurement shall be applied for which function.