

INTERNATIONAL STANDARD

NORME INTERNATIONALE



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

**Appareils de cuisson électrodomestiques –
Partie 1: Cuisinières, fours, fours à vapeur et grils – Méthodes de mesure de
l'aptitude à la fonction**



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2023 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 Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
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 corrigendum or an amendment might have been published.

IEC publications search - 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 It also gives information on projects, replaced and withdrawn publications.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

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

IEC Customer Service Centre - 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.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

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.

Recherche de publications IEC -

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

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

Service Clients - 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.

IEC Products & Services Portal - products.iec.ch

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 300 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 19 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

INTERNATIONAL STANDARD

NORME INTERNATIONALE



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

**Appareils de cuisson électrodomestiques –
Partie 1: Cuisinières, fours, fours à vapeur et grils – Méthodes de mesure de
l'aptitude à la fonction**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 97.040.20

ISBN 978-2-8322-6647-2

**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.**

CONTENTS

FOREWORD.....	6
1 Scope.....	9
2 Normative references	9
3 Terms and definitions	10
4 List of measurements	13
4.1 Dimensions and mass	13
4.2 Oven and combi steam oven	13
4.3 Steam oven and combi steam oven.....	13
4.4 Grill.....	13
4.5 Warming compartments	13
4.6 Cleaning	13
5 General conditions for the measurement	14
5.1 Test room	14
5.2 Electricity supply.....	14
5.3 Instrumentation	14
5.4 Positioning the appliance	15
5.5 Preheating	16
5.6 Setting of controls.....	16
5.7 Rounding	16
6 Dimensions and mass.....	16
6.1 Overall dimensions	16
6.2 Internal dimensions and calculated volume	18
6.2.1 General	18
6.2.2 Internal height	19
6.2.3 Internal width.....	20
6.2.4 Internal depth	20
6.2.5 Calculated volume	20
6.3 Overall internal dimensions and overall volume.....	20
6.3.1 General	20
6.3.2 Overall height (H)	21
6.3.3 Overall width (W)	21
6.3.4 Overall depth (D).....	21
6.3.5 Overall volume of rectangular cavities	21
6.3.6 Overall volume of non-rectangular cavities	21
6.4 Dimensions of shelves and steaming accessories	21
6.5 Dimensions of grill grids.....	21
6.5.1 Entire area.....	21
6.5.2 Usable area	21
6.6 Dimensions of warming compartments	22
6.7 Mass of the appliance	22
7 Preheating and accuracy	22
7.1 Purpose	22
7.2 Test setup.....	22
7.3 Preheating the empty oven	23
7.4 Accuracy of the control	23
7.4.1 Purpose.....	23

7.4.2	Measurements	23
7.4.3	Assessment	24
8	Energy consumption and time for heating a load	24
8.1	Purpose	24
8.2	Symbols and abbreviations	24
8.3	Test load	25
8.3.1	General	25
8.3.2	Pre-treatment	25
8.3.3	Preparation	26
8.4	Measurement	26
8.4.1	Test Procedure	26
8.4.2	Oven settings	29
8.4.3	Phase 1	30
8.4.4	Phase 2	31
8.5	Calculation	31
8.5.1	Smoothing the measured values	31
8.5.2	Determining the average temperature rise for a heating function (phase 2)	31
8.5.3	Determining the average temperature rise for an eco function (phase 2)	33
8.5.4	Calculation of average ambient temperature	35
8.5.5	Determining the <i>c</i> -factor	36
8.5.6	Determining the <i>s</i> -factor	36
8.6	Acceptance verification of the test results	37
8.6.1	Average temperature rise and standard deviation	37
8.6.2	Temperature setting and average temperature rise	38
8.6.3	<i>c</i> -factor	38
8.6.4	<i>s</i> -factor	38
8.7	Final electric energy consumption	38
8.8	Time for heating a load	39
8.9	Reporting of test results	39
9	Cooking tests	40
9.1	General	40
9.2	Heat distribution	40
9.2.1	Shortbread	40
9.2.2	Small cakes	42
9.3	Ability to supply heat	47
9.3.1	Fatless sponge cake	47
9.3.2	Apple pie	48
10	Steam ovens and combi steam ovens	50
10.1	Ability to supply steam	50
10.1.1	Purpose	50
10.1.2	Ingredients and steaming accessory	50
10.1.3	Procedure	50
10.1.4	Assessment	51
10.2	Distribution of steam	52
10.2.1	Purpose	52
10.2.2	Ingredients, steaming accessories and number of levels	52
10.2.3	Procedure	53
10.2.4	Assessment	54

10.3	Determination of the capacity	56
10.3.1	Purpose	56
10.3.2	Ingredients	56
10.3.3	Mass of peas, steaming accessories and number of levels	56
10.3.4	Procedure	56
10.3.5	Assessment	57
10.4	Accuracy of the temperature control	59
11	Effective grilling area	59
11.1	Purpose	59
11.2	Ingredients	59
11.3	Preparation	59
11.4	Procedure	60
11.5	Assessment	60
11.5.1	General	60
11.5.2	Criteria of validity	60
11.5.3	Criteria of assessment	61
12	Warming compartments	62
13	Cleaning	62
13.1	Pyrolytic self-cleaning ovens	62
13.2	Ovens with catalytic cleaning	62
14	Consumption measurement of low-power modes	63
14.1	Purpose and combination of appliances	63
14.2	Measurement	63
14.2.1	Principles	63
14.2.2	Determination of power consumption in off mode	64
14.2.3	Determination of power consumption in standby mode	65
14.2.4	Determination of power consumption in standby mode in condition of networked standby	65
14.2.5	Determination of power consumption in delay start	65
Annex A (normative)	Colour measuring instrument	67
Annex B (informative)	Addresses of suppliers	68
B.1	General	68
B.2	Testing ingredients for small cakes	68
B.3	Food mixer	70
B.4	Colour measuring instrument	71
B.5	Steaming basket	71
Annex C (normative)	Description of the test brick	72
C.1	Specification	72
C.2	Supplier and order specification	72
Annex D (informative)	Check of applied microwave energy during the measurement according to Clause 8	74
D.1	General	74
D.2	Procedure	74
Annex E (informative)	Marking the temperature setting for checking the oven temperature	75
Annex F (informative)	Approach to calculate the f -factor	76
Annex G (normative)	Low-power mode measurements	77
Bibliography		79

Figure 1 – Position of the thermocouple for measuring ambient temperature.....	14
Figure 2 – Dimensions of appliances	17
Figure 3 – Dimensions of built-in appliances	18
Figure 4 – Internal dimensions.....	19
Figure 5 – Gauge for measuring these dimensions	19
Figure 6 – Examples for determining the entire area and usable area of a grill grid.....	22
Figure 7 – Example of a thermocouple	25
Figure 8 – Entire process of measurement.....	27
Figure 9 – Installation observer thermocouple.....	28
Figure 10 – Vertical installation of the observer thermocouple	28
Figure 11 – Horizontal installation of the observer thermocouple	29
Figure 12 – Example – average temperature rise for a heating function	32
Figure 13 – Examples – set temperature reached	34
Figure 14 – Example – set temperature not reached	35
Figure 15 – Shape of the nozzle for extruding pastry	41
Figure 16 – Position of pastry strips on the baking tray	41
Figure 17 – Template for the sectioning of small cakes	46
Figure 18 – Reference values of cooking time (t_{ref})	58
Figure 19 – Determining the assessable area of a slice of toast – Example	60
Figure A.1 – Colour measuring instrument	67
Figure C.1 – Position of the thermocouples.....	73
Figure D.1 – Filament lamp.....	74
Figure E.1 – Polar coordinate paper – Example	75
Table 1 – Instruments	15
Table 2 – Measurements.....	15
Table 3 – Symbols	24
Table 4 – Temperature rise for three settings.....	30
Table 5 – Ingredients	43
Table B.1 – Ingredient specification	69
Table B.2 – Food mixer – revolutions per minute	70
Table B.3 – Mixing time and setting	70
Table G.1 – Step by step instruction for measuring low-power modes	77

INTERNATIONAL ELECTROTECHNICAL COMMISSION

HOUSEHOLD ELECTRIC COOKING APPLIANCES –

Part 1: Ranges, ovens, steam ovens and grills – 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.

IEC 60350-1 has been prepared by subcommittee 59K: Performance of household and similar electrical cooking appliances, of IEC technical committee 59: Performance of household and similar electrical appliances. It is an International Standard.

This third edition cancels and replaces the second edition published in 2016 and Interpretation Sheet 1:2021. This edition constitutes a technical revision.

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

- a) new definitions for heating function, eco function and definitions relevant for low power mode considerations are amended in Clause 3;
- b) order of clauses is changed;
- c) revision of 5.3;
- d) update of 6.2 in order to improve the reliability of volume measurement;
- e) removal of 6.7, Level of shelf;

- f) revision of Clause 7 concerning the accuracy of **eco functions** with residual heat use;
- g) revision of Clause 8 in order to improve the reliability of the method for measuring the energy consumption, especially regarding anti-circumvention;
- h) unique energy consumption measurement for all **heating functions** and **eco functions** with an indication of the energy consumption for a temperature increase of 165 K (compared to 155 K currently for forced air circulation function, for example), which results in higher energy consumption values compared to the previous edition;
- i) R_y replaced by L^* in Clause 9 and reference to IEC TS 63350;
- j) cooking time for reference measurement introduced for broccoli in Clause 10;
- k) yellow part replaced by hue angle value in Clause 10;
- l) requirements for digital assessment (see former 7.5.3.6.3) are obsolete as specified in IEC TS 63350;
- m) revision of Clause 14 (Consumption measurement of low power modes, previous Clause 12);
- n) former Annex G (informative) is cancelled due to the fact that this method for measuring an associated activity has been not applied;
- o) former Annexes B and F are obsolete, up-to-date shade charts are specified in IEC TS 63350;
- p) former Annex E will be substituted by a supporting document located on the IEC's website.

The document contains supplementary material highlighted by notes indicating the link.

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

Draft	Report on voting
59K/365/FDIS	59K/370/RVD

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.

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

A list of all parts in the IEC 60350 series, published under the general title *Household electric cooking appliances*, can be found on the IEC website.

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.

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

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

HOUSEHOLD ELECTRIC COOKING APPLIANCES –

Part 1: Ranges, ovens, steam ovens and grills – Methods for measuring performance

1 Scope

This part of IEC 60350 specifies methods for measuring the performance of electric **cooking ranges, ovens, steam ovens, and grills** for household use.

NOTE 1 This document is also applicable to portable appliances with similar functionalities that were previously covered by the withdrawn IEC 61817.

The **ovens** covered by this document can be with or without microwave function.

Manufacturers are expected to define the primary cooking function of the appliance – microwave function or thermal heat. The primary cooking function is measured with an existing method according to energy consumption. If the primary cooking function is declared in the instruction manual as a microwave function, IEC 60705 is applied for energy consumption measurement. If the primary cooking function is declared as a thermal heat, then IEC 60350-1 is applied for energy consumption measurement.

If the primary function is not declared by the manufacturer, the performance of the microwave function and thermal heat is measured as far as it is possible.

NOTE 2 For measurement of energy consumption and time for heating a load (see Clause 8), this document is furthermore not applicable to:

- microwave combination function;
- **ovens** with reciprocating trays or turntable;
- **small cavity ovens** (see 3.16);
- **ovens** without adjustable temperature control;
- **heating functions** and **eco functions** other than defined in this document;
- appliances with only solo **steam function**.

NOTE 3 This document does not apply to

- microwave ovens (IEC 60705).

This document defines the main performance characteristics of these appliances that are of interest to the user and specifies methods for measuring these characteristics.

This document does not specify a classification or ranking for performance.

NOTE 4 This document does not deal with safety requirements (IEC 60335-2-6 and IEC 60335-2-9).

NOTE 5 Appliances covered by this document can be built-in or for placing on a working surface or the floor.

NOTE 6 There is no measurement method for the energy consumption for grilling and **steam functions** available.

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 60584-1, *Thermocouples – Part 1: EMF specifications and tolerances*

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

IEC TS 63350:2022, *Household electrical appliances – Specification of the properties of a digital system for measuring the performance*

IEC 63474¹, *Electrical and electronic household and office equipment – Measurement of networked standby power consumption of edge equipment*

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

3 Terms and definitions

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

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

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

active mode

mode in which the appliance is connected to a mains power source, has been activated, and is performing any of the intended functions

EXAMPLE Producing heat transfer by thermal heat, electromagnetic energy or condensation

Note 1 to entry: Examples of recognised associated functions include displaying recipes, running an egg timer, software download, running a cooling fan and the like.

3.2

combi steam oven

appliance or compartment of a **cooking range** in which food is cooked by a combination of **oven** and **steam oven**

Note 1 to entry: Appliances with only a steam assist function also exist. For these **ovens**, the **steam function** can only be tested if this function is described in the instruction manual or if the appliance provides a setting for **steam function**.

Note 2 to entry: The term "steam" does not refer to the evaporated water from the food.

3.3

cooking range

appliance having a **hob** and at least one **oven** and which can incorporate a **grill**

3.4

delay start

condition where the user has selected a specified delay to the beginning of any **active mode**

Note 1 to entry: This mode is only applicable if the appliance provides a delay start function for the user.

¹ Under preparation. Stage at the time of publication: IEC CDV 63474:2022.