

INTERNATIONAL STANDARD

AMENDMENT 2

Electric cooking ranges, hobs, ovens and grills for household use – Methods for measuring performance

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IEC 60350:1999/AMD2:2008

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

FOREWORD

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

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

FDIS	Report on voting
59K/161/FDIS	59K/163/RVD

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

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the maintenance result 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- withdrawn,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.

A bilingual version of this publication may be issued at a later date.

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2 Normative references

Add, to the existing list, the title of the following standard:

IEC 62301:2005, *Household electrical appliances – Measurement of standby power*

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5 General conditions for the measurements

5.1 Test room

Replace the existing second paragraph, added in Amendment 1, by the following:

For tests 8.1, 8.3 and 8.4.2, 23°C ± 2 °C shall be maintained during the complete test.

5.3 Instrumentation

Add the following 8th dash at the end of the existing list added in Amendment 1:

- the scale for weighing the ingredients shall be accurate to $\pm 0,1$ g.

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6 Dimensions and mass

6.3 Internal dimensions of ovens

Replace the existing title and text of this subclause by the following:

6.3 Usable internal dimensions and usable volume of ovens

Removable items specified in the user instructions shall be removed before a measurement is carried out.

The measurement of the usable oven volume is to be carried out at ambient temperature.

The height, width and depth of the usable volume in the cavity shall be measured in accordance with 6.3.1 to 6.3.3. The measurement procedure is also shown in Figure 4a.

For verification purposes a gauge, as shown in Figure 4b, shall be used to determine all of the three dimensions. The gauge shall be used without appreciable force.

Dimensions are stated in millimetres.

6.3.1 Usable height

The usable height is the maximum length of a cylinder with a diameter of 200 mm reaching vertically from the centre of the cavity floor to the lowest point on the ceiling. The lowest point of the ceiling can be constituted by a lamp, a heating element or similar object in the area of the cylinder.

In the event that either the width or the depth of the cavity is less than 250 mm, the diameter of the cylinder to be measured shall be reduced to 120 mm.

NOTE The centre of the cavity bottom is defined by the middle of the usable depth and the middle of the usable width.

6.3.2 Usable width

The usable width is the maximum length of a cylinder with a diameter of 200 mm reaching horizontally from the left-hand side wall to the right-hand side wall of the cavity.

In the event that either the height or the depth of the cavity is less than 250 mm, the diameter of the cylinder to be measured shall be reduced to 120 mm.

NOTE The centre of the side wall of the cavity is defined by the middle of the usable depth and the middle of the usable height.

6.3.3 Usable depth

The usable depth is the maximum length of a cylinder with a diameter of 200 mm reaching horizontally from the centre of the rear wall to the inner face of the closed door.

In the event that either the width or the height of the cavity is less than 250 mm, the diameter of the cylinder to be measured shall be reduced to 120 mm.

For measuring the usable depth, the gauge is placed on a support in such a way that the axis lies horizontally in the centre of the cavity, the axis being extended slightly over the expected usable depth. The door is closed carefully so that the gauge is compressed to give the usable depth.

NOTE The centre of the rear wall of the cavity is defined by the middle of the usable height and the middle of the usable width.

6.3.4 Usable volume

The usable volume is calculated from these three dimensions and is stated in litres rounded to the next full litre.

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Add the following new subclause 6.4:

6.4 Overall internal dimensions and overall volume of ovens

Where the surfaces forming the boundaries of the cavity incorporate protrusions or depressions, the planes used for measurement shall be those comprising the largest percentages of the total areas of the surfaces. Holes in surfaces shall be disregarded when calculating areas for this determination.

The following volumes or spaces shall be disregarded:

- those occupied by removable items specified by the manufacturer as not essential for the operation of the appliance, such as shelves, racks or temperature probes;
- those occupied by heating elements;
- those occupied by minor irregularities in the cooking compartment walls, including covers over temperature sensors and lamps;
- those occupied by the convection baffle;
- corner radii smaller than 50 mm at the intersections of the interior surfaces of the cooking cavity.

Dimensions are stated in millimetres.

NOTE The overall dimensions of warming drawers may be measured using the same principles.

6.4.1 Overall height (H)

Overall height (H) is the maximum vertical distance in mm between the plane of the cooking cavity bottom and the plane of the cavity ceiling.

6.4.2 Overall width (W)

Overall width (W) is the maximum horizontal distance in mm between the planes of the cavity side walls.

6.4.3 Overall depth (*D*)

Overall depth (*D*) is the maximum horizontal distance in mm from the plane of the inside surface of the door when closed to the plane of the rear cavity wall.

6.4.4 Overall volume of rectangular cavities

The overall volume is the total internal volume of the cavity in which cooking takes place, expressed as the product of *H*, *W* and *D* determined as above, divided by 10^6 and rounded to the nearest litre.

6.4.5 Overall volume of non-rectangular cavities

Non-rectangular cavities shall have the volume of any non-conforming section such as a curved door or cavity wall determined by direct measurement and the application of conventional geometrical calculations. The remainder of the cavity shall be treated as a rectangular cavity and the individual volumes added together. The volume is expressed to the nearest litre.

Renumber existing subclauses 6.4 to 6.10 as 6.5 to 6.11, respectively.

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8.4.2 Small cakes

Replace the entire existing subclause 8.4.2 by the following new subclause:

8.4.2 Small cakes

This test is intended to assess the vertical and horizontal heat distribution, especially for a mixture that rises during cooking.

NOTE The test is carried out using the general conditions of measurements as stated in Clause 5.

8.4.2.1 Ingredients

The quantities of ingredients for 30 to 40 small cakes are indicated in Table 3. For a reproducible result always prepare the same amount and discard any surplus mixture.

Table 3 – Ingredients

Ingredients	Quantities g	Remarks
Butter, with a fat content of 83 % ± 2 %	340 ± 0,5	Unsalted butter should be used. If unsalted butter is not available the salt content of butter should be subtracted from the salt added to the mixture.
White sugar, fine (grain size 0,10 mm – 0,35 mm, d95/d05)	340 ± 0,5	d95/d05: 90 % of the sugar crystals shall have a grain size of 0,10 mm – 0,35 mm
Eggs	300 ± 1	Middle sized hen eggs (approximately 55 g ± 5 g) are beaten and sieved until homogeneous, then weighed. If frozen egg mixture is used, follow the instructions of Clause C.1.
Wheat flour without raising agent, unbleached Mineral content: maximum 0,5 % (dry substance)	450 ± 1	Gluten: at least 24,0 %
Baking powder	15 ± 0,5	Phosphate baking powder (double acting) shall be used (not baking soda).
Salt	6 ± 0,1	
NOTE 1 For reproducible results ingredients as defined in Annex C shall be used.		
NOTE 2 The eggs are sieved to remove any chalazae.		
NOTE 3 If more than 40 small cakes are required, two identical kitchen machines should be used simultaneously.		

8.4.2.2 Paper cases

As the paper quality affects the rising height and spreading, only the paper cases specified in Annex C shall be used for reproducible results. The paper cases are 48 mm in base diameter and 29 mm in height. They are made of 70 g/m² bleached greaseproof paper.

NOTE A supplier of paper cases is indicated in Annex C.

8.4.2.3 Quantity

The baking sheet shall be measured according to 6.4 and cover at least 80 % of the usable width and 70 % of the usable depth of the cavity measured according to 6.3. If the supplied baking sheet or the sheet recommended in the instructions fits these dimensions, this baking sheet shall be used. If the supplied or recommended baking sheet does not fit the above condition or no recommendation is given, then a baking sheet fitting the above condition, made of aluminium, no coating, matt finished, 0,9 mm ± 0,1 mm thickness, lip height maximum 6 mm shall be used.

The width and the depth of the baking sheets are measured in accordance with 6.4 and each divided by 75 mm to give the number of small cakes to be placed along its sides. The numbers are rounded down to give a whole number of cakes. Multiply the number of cakes from the depth and the width to give the total number for the whole tray.

Example:

A width of 470 mm divided by 75 mm equals 6,3. This gives 6 columns of cakes.

A depth of 295 mm divided by 75 mm equals 3,9. This gives 3 rows of cakes.

Therefore the total number of cakes on the tray is 18.

The base of the outermost cakes should be at a distance of approximately 14 mm from the edge of the usable area of the baking sheet measured according to 6.4. Distribute the cakes evenly on the tray, in such a way that they do not touch each other.

The manufacturer's instructions regarding the number of baking sheets which may be cooked simultaneously are followed.

8.4.2.4 Procedure

All ingredients shall be at ambient temperature before starting.

Beat together butter and sugar in a food mixer until it becomes soft and pale in colour so that all the sugar is incorporated into the mix. Gradually add the egg mixture. Sift the flour, baking powder and salt together and gently fold into the mixture; loosen the mixture as required from the edge of the bowl to ensure that the mixture is homogeneous.

The temperature of the mixture shall be $23\text{ °C} \pm 2\text{ °C}$ directly after mixing.

NOTE 1 A suitable food mixer for which the mixing time has been determined is indicated in Annex C.

NOTE 2 Ensure that the paper cases maintain a uniform circular shape by carefully peeling cases from the outside of the batch without distortion.

Weigh $28\text{ g} \pm 0,5\text{ g}$ of the mixture into the centre of the paper cases and place them evenly on the baking sheets. Bake immediately.

NOTE 3 The tests are carried out using corrected temperature control settings according to the differences determined by the test of 8.2.

a) Baking on one level

Follow the operating instructions with respect to the heating function, temperature, shelf position and preheating. If preheating is recommended, small cakes are placed in the oven when the end of the preheating phase is indicated, for example by visual or acoustic signal, or after a recommended pre-heating time. If no instructions are given, the oven is set to 160 °C for forced air circulation function or to 185 °C for conventional heating function and the baking sheet is placed in the middle of the usable cavity of the cold oven. While the small cakes are baking, the position of the baking sheet shall not be changed.

The baking time shall not exceed 40 min when baking on one level (including preheating time).

b) Baking on two levels

The baking sheets are placed simultaneously in the oven one above the other and removed simultaneously at the end of baking. While the small cakes are baking, the position of the baking sheets shall not be changed. Follow the operating instructions with respect to the heating function, temperature, shelf position and preheating. If preheating is recommended, the small cakes are placed in the oven when the end of the preheating phase is indicated, for example by visual or acoustic signal, or after a recommended pre-heating time.

If no instructions for small cakes on two levels are given, the oven is set to 160 °C for forced air circulation function and the baking sheets are spaced evenly in the cold oven. The horizontal position of the baking sheets shall be in the middle of the cavity base area. The vertical position of the sheets shall be spaced at one third and two third of the usable height of the ovens as near as possible without modifying the shelf racks.

NOTE 4 Baking on two levels is not carried out for small oven cavities, as defined in 3.14

The baking time shall not exceed 50 min when baking on two levels (including preheating time).

c) Baking on more than two levels

If the operating instructions recommend baking on more than two levels simultaneously then cakes are baked in accordance with the instructions (heating function, temperature, shelf position, preheating and baking time).

8.4.2.5 Assessment

Within 30 min after baking, the paper cases are very carefully removed so that the largest base area possible can be assessed. For assessment according to 8.4.2.5.3, at least 50 % of the base shall be undamaged. Otherwise the test shall be repeated.

NOTE Cooling the small cakes quickly can aid clean removal of paper cases.

Browning of the top and base of the cakes, the differences of browning between these, and the evenness of rise, are assessed within one hour after baking. If small cakes have been baked on several levels simultaneously, each sheet shall be assessed separately (single result) and additionally they are assessed together (overall result).

The requirements of the results of these small cakes baked on one or more levels are different. This shall be considered in the evaluation.

8.4.2.5.1 Visual assessment

For comparative results the evaluation of browning may be done by a visual check using the criteria for assessment in 8.4.2.5.3.

The shade numbers of the Table B.1 of Annex B are used to evaluate browning. For a visual check, the same background colour and illumination shall be used for each tray.

8.4.2.5.2 Digital assessment

For reproducible results of the evaluation of browning any digital measurement system shall be used which meets the following requirements when the measurements are taken.

a) Evenness of light distribution on the measurement area

The reflection value R_y of a uniform coloured shade chart shall be measured over the entire surface to be analysed, for example, the size of the baking sheet or one small cake. The shade chart shall be coloured in shade number 10, which is defined in Annex B.

The mean value of the reflection value R_y over the entire surface is determined. More than 90 % of the entire surface may deviate from the mean value by up to ± 5 %. Less than 10 % of the entire surface may deviate by up to ± 8 %.

The entire surface is divided in 1 cm² sections. None of the mean values of the 1 cm² sections shall deviate by more than ± 5 % of the mean value of the entire surface.

NOTE 1 Shade number 10 is used to check the quality of the illumination as it is the most desired shade.

NOTE 2 Each small cake can be measured separately.

b) Recognition of the reference colours

The shade numbers defined in Annex B shall be confirmed in all positions of the surface to be assessed.

This is ensured using the following check:

Flat circular calibrated colour samples with a diameter of 70 mm in every shade number defined in Annex B are placed at a height of 28 mm. The reflection value R_y of the