

BS EN 50304:2009+A1:2010
BS EN 60350:2009+A11:2010



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

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National foreword

This British Standard is the UK implementation of EN 50304:2009+A1:2010. It is dual numbered as BS EN 60350:2009+A11:2010.

It was derived by CENELEC from IEC 60350:1999, incorporating amendments 1:2005 and 2:2008. It supersedes BS EN 50304:2009 (BS EN 60350:2009) which will be withdrawn on 1 October 2013.

The start and finish of text introduced or altered by amendment, is indicated in the text by tags. Tags indicating changes to text will carry the number of the CENELEC amendment. Due to the dual publication of EN 50304:2009+A1:2010 and BS EN 60350:2009+A11:2010, the amendment is indicated by the tag **A1** **A1**.

The CENELEC common modifications have been implemented at the appropriate places in the text and are indicated by tags (e.g. **C** **C**). The UK participation in its preparation was entrusted to Technical Committee CPL/59, Performance of household electrical appliances.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Date	Text affected
31 March 2011	Implementation of CENELEC amendment A1:2010/A11:2010

**Electric cooking ranges, hobs, ovens and grills for household use -
Methods for measuring performance**
(IEC 60350:1999 + A1:2005 + A2:2008, modified)

Cuisinières, foyers de cuisson, fours
électriques et grils à usage domestique -
Méthodes de mesure de l'aptitude à la
fonction
(CEI 60350:1999 + A1:2005 + A2:2008,
modifiée)

Elektrische Herde, Kochmulden, Backöfen
und Grillgeräte für den Hausgebrauch -
Verfahren zur Messung der
Gebrauchseigenschaften
(IEC 60350:1999 + A1:2005 + A2:2008,
modifiziert)

This European Standard was approved by CENELEC on 2008-12-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: avenue Marnix 17, B - 1000 Brussels

Foreword

This European Standard was prepared by the Technical Committee CENELEC TC 59X, Consumer information related to household electrical appliances.

A first draft, based on IEC 60350:1999 + A1:2005, with common modifications prepared by CENELEC TC 59X, was submitted to the Unique Acceptance Procedure.

The text of document 59K/161/FDIS, future amendment A2 to IEC 60350:1999, was submitted the IEC-CENELEC parallel vote procedure. A further draft amendment (prAA), covering the common modifications requested by the National Committees during the parallel vote on IEC 60350:1999/A2 (59K/161/FDIS), was submitted to the formal vote.

The combined texts were approved by CENELEC on 2008-12-01 for publication as a consolidated edition of the double-numbered European Standard EN 50304/EN 60350, consisting of IEC 60350:1999 + A1:2005 + A2:2008 + common modifications + the text of EN 50304:2001.

This European Standard supersedes EN 50304:2001 (+ corrigendum March 2002) and EN 60350:1999 (+ corrigendum February 2000).

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2009-12-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2009-12-01

According to the decision of CLC/TC 59X, taken at the meeting in Brussels in January 2006, this European Standard has been drawn up as a document which follows, as far as suitable, the structure of IEC 60350:1999 + A1:2005 + A2:2008.

In this European Standard the common modifications to the International Standard are indicated by tagging **[C]** **[C]**.

This European Standard has been prepared under Mandate M/203 given to CEN and CENELEC by the European Commission.

This European Standard is suitable for direct comparison and is considered sufficiently reproducible within given limits for the purpose of energy labelling according to the Commission Directive 92/75/EEC on "Indication by labelling and standard product information of the consumption of energy and other resources by household appliances". All paragraphs which are relevant for the measuring of energy labelling are listed in Annex ZA.

This European Standard also defines permitted tolerances to values declared by the manufacturer and control procedures for checking these values.

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

Clauses, subclauses, notes, tables, figures and annexes which are additional to those in IEC 60350:1999 are prefixed "Z".

Foreword to amendment A1/A11

This amendment to the double-numbered European Standard EN 50304:2009/EN 60350:2009 was prepared by the Working Group WG 5 'Induction cooking' of the Technical Committee CENELEC TC 59X, Performance of household and similar electrical appliances; this has been worked out in cooperation with members of CEN TC 194/WG 1/SG 2 ad-hoc group 'Cookware', after decision of CLC/TC 59X, submitting the task to establish a measuring method for the cookware detection system which shall be applicable for different sizes of cooking zones and cookware and independent of any particular brand of induction hob and cookware.

It was submitted to the formal vote and was accepted by CENELEC as EN 50304:2009/A1 / EN 60350:2009/A11 on 2010-10-01.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

The following dates were fixed:

- latest date by which the amendment has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2011-10-01
- latest date by which the national standards conflicting
with the amendment have to be withdrawn (dow) 2013-10-01

Clauses, subclauses, notes, tables and figures which are additional to those in IEC 60350:1999 are prefixed "Z". 

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1 Scope

This European Standard defines methods for measuring the performance of electric **cooking ranges, hobs, ovens** and **grills** for household use.

NOTE 1 Appliances covered by this standard may be built-in or for placing on a working surface or the floor.

NOTE 2 This standard does not apply to

- microwave **ovens** (EN 60705),
- portable appliances for cooking, grilling and similar functions (EN 61817).

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

NOTE 3 Some of the tests which are specified in this standard are not considered to be reproducible since the results may vary between laboratories. They are therefore intended for comparative testing purposes only.

This standard does not specify requirements for performance.

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

NOTE 5 For measurement of energy consumption and time for heating a load (see 8.3), this standard is furthermore not applicable to:

- microwave combination **ovens**;
- **small cavity ovens**;
- **ovens** without adjustable temperature control;
- heating functions other than defined in 3.16 to 3.18.

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.

EN 60584-2:1993, *Thermocouples – Part 2: Tolerances* (IEC 60584-2:1982 + A1:1989)

EN 62301:2005, Household electrical appliances – Measurement of standby power (IEC 62301:2005, mod.)

ISO 7724-1:1984, *Paints and varnishes – Colorimetry – Part 1: Principles*

ISO 7724-2:1984, *Paints and varnishes – Colorimetry – Part 2: Colour measurement*

ISO 7724-3:1984, *Paints and varnishes – Colorimetry – Part 3: Calculation of colour differences*

ISO/CIE 10526:1991, *CIE standard colorimetric illuminants*

ISO/CIE 10527:1991, *CIE standard colorimetric observers*

CIE 15.2:1986, *Colorimetry*

3 Definitions

For the purposes of this document the following definitions apply.

3.1

cooking range

appliance having a **hob** and at least one **oven**. It may incorporate a **grill**

3.2

hob

appliance or part of an appliance which incorporates one or more **cooking zones**

NOTE A **hob** is also known as a cooktop.

3.3

cooking zone

part of the **hob** or area marked on the surface of a **hob** on which pans are placed for heating

3.4

hotplate

part attached to the surface of a **hob** which forms a **cooking zone**

3.5

solid hotplate

hotplate having a closed surface which is usually constructed from cast iron with an integrated heating element

3.6

tubular hotplate

hotplate having a surface which is formed by the configuration of a **tsheathed** heating element in a substantially flat plane

3.7

glass ceramic hob

hob in which the heating elements are located beneath a glass ceramic surface

3.8

induction cooking zone

cooking zone on which the pan is heated by means of eddy currents

NOTE 1 The eddy currents are induced in the bottom of the pan by the electromagnetic field of a coil.

NOTE 2 The **hob** surface may be of glass ceramic.

3.9

grill

appliance or part of an appliance in which food is cooked by radiant heat

3.10

oven

appliance or compartment of a **cooking range** in which food is cooked by radiation, by natural convection, by forced-air circulation or by a combination of these heating methods

3.11

pyrolytic self-cleaning oven

oven in which cooking deposits are removed by heating the **oven** to a sufficiently high temperature

3.12

oven with catalytic cleaning

oven in which cooking deposits are removed by breaking them down on a special coating

3.13

warming compartment

separate compartment in which dishes are placed in order to preheat them prior to serving, or in which food is maintained at serving temperature

3.14

small cavity oven

oven with the following dimensions related to the usable volume:

- both width and depth < 250 mm,
- or height < 120 mm

NOTE The definition of **small cavity ovens** in this standard is due to the size of the test load used in 8.3.

3.15

multiple cavity appliance

appliance that has more than one separate **oven** cavity in which food is cooked and which can be controlled independently, but cannot be installed separately

3.16 Smallest detected diameter for induction hobs (see 7.Z1).

conventional heating function

heat transmission to the food by radiation and natural convection only

NOTE This does not include **ovens** that have a top heating element only (i.e. for the grilling function).

3.17

forced air circulation function

heat transmission to the food by forced air convection, i.e. circulating the air with the help of a fan

NOTE This does not include circulated air functions which operate a grill element only.

3.18

hot steam function

heat transmission to the food with hot steam (temperature >> 100 °C) at ambient pressure (1 bar)

4 List of measurements

The performance of the appliance is determined by the tests listed in 4.1 to 4.6.

4.1 Dimensions and mass

The following measurements are carried out:

- overall dimensions (see 6.1);
- dimensions of **hotplates** and **cooking zones** (see 6.2);
- internal dimensions of **ovens** (see 6.3);
- dimensions of shelves (see 6.4);
- dimensions of grill grids (see 6.5);
- dimensions of **warming compartments** (see 6.6);
- level of **hotplates** (see 6.7);
- distance between the **hotplates** or **cooking zones** (see 6.8);
- level of the shelf (see 6.9);
- mass of the appliance (see 6.10).

4.2 Hotplates and cooking zones

The following tests are carried out:

- ability to heat water (see 7.1);
- ability to control the temperature of a load (see 7.2);
- heat distribution (see 7.3).

 – Smallest detected diameter for induction hobs (see 7.Z1). 

4.3 Oven

The following tests are carried out:

- preheating the empty **oven** (see 8.1);
- accuracy of the control (see 8.2);
- energy consumption and time for heating a load (8.3);
- heat distribution (see 8.4);
- ability to supply heat (see 8.5).

4.4 Grill

The following tests are carried out:

- grilling area (see 9.1);
- grilling (see 9.2).

4.5 Warming compartments

The following test is carried out:

- temperature control and energy consumption (see Clause 10).

4.6 Cleaning

The following tests are carried out:

- spillage capacity of **hobs** (see 11.1);
- cleaning of **pyrolytic self-cleaning ovens** (see 11.2);
- cleaning of **ovens with catalytic cleaning** (see 11.3).

5 General conditions for the measurements

Unless otherwise specified, the measurements are made under the following conditions.

5.1 Test room

The tests are carried out in a substantially draught-free room in which the ambient temperature is maintained at $20\text{ °C} \pm 5\text{ °C}$.

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

This ambient temperature is measured at a point that is at the same height as the centre of the usable volume of the **oven** cavity in test and at a distance of 0,5 m diagonally from one of the front edges of the appliance, see Figure 10.

The measurement of the ambient temperature shall not be influenced by the appliance itself or by any other appliance.

5.2 Electricity supply

The appliance is supplied at rated voltage, $\pm 1\%$

If the appliance has a rated voltage range, the tests are carried out at the nominal voltage of the country where the appliance is intended to be used.

For tests 8.1 and 8.3:

Ⓒ The supply voltage shall be maintained at the main terminal at $230\text{ V} \pm 1\%$ or at $400\text{ V} \pm 1\%$ as defined by the manufacturer's installation guide, while the heating elements are switched on. The supply frequency shall be at a nominal $50\text{ Hz} \pm 1\%$. Ⓒ

The supply voltage measured during the tests shall be recorded.

NOTE In case of a fixed cable, the plug (or the end of the cable) is the reference point to maintain the voltage.

5.3 Instrumentation

The temperature measuring instrument including thermocouples shall have an accuracy of 0,5 K within the temperature range of 0 °C to 100 °C and an accuracy of 2 K within the temperature range 100 °C to 300 °C.

The energy measuring meter shall have an accuracy of 1 %.

For tests 8.1 and 8.3:

- air temperature measurements in the empty **oven** are made with a thermocouple with a welded point (not with a black copper plate);
- temperature measurements in the brick (see 8.3) are made with two thermocouples with 1 mm steel tube diameter, class 1 according to EN 60584-2. The thermocouple shall be accurate to $\pm 1,5\text{ K}$.

NOTE The steel tube of the thermocouple eases the insertion of the thermocouple into the brick. Other types of thermocouples may be used provided they are shown to give the same results. (Care should be taken that the measuring point is the first contact point of the two thermowires.)

- the temperature measurement system excluding the thermocouple shall be accurate to $\pm 1,0\text{ K}$.
- the energy measurements shall be accurate to $\pm 1,5\%$ or $\pm 10\text{ Wh}$, whatever is the greater;
- the measurement of the voltage shall be accurate to $\pm 0,5\%$;
- the measurements of mass shall be accurate to $\pm 3\text{ g}$;
- the measurements of time shall be accurate to $\pm 5\text{ s}$;
- the scale for weighing the ingredients shall be accurate to $\pm 0,1\text{ g}$.

5.4 Positioning the appliance

Built-in appliances are installed in accordance with the instructions for installation. Other appliances are placed with their back against a wall, unless otherwise specified in the instructions.

Floor-standing appliances are positioned between kitchen cabinets. Table-top appliances are positioned away from side walls.

For tests 8.1 and 8.3 on **ovens** with integrated air-extraction by a fan (or similar device) to the outside of the building, the air outlet is discharged into a flue which has a pressure drop of 50 Pa when there is an airflow of 200 m³/h.

NOTE The condition of measurement for **ovens** with integrated air-extraction is similar to EN 61591:1997.

5.5 Preheating

The appliance is initially at room temperature. However, if preheating is specified, the appliance is preheated in accordance with the instructions for use. If no instructions are given, the appliance is considered to be preheated after the thermostat has switched off the first time.

5.6 Setting of controls

The control is set to give the temperature specified for the test. However, if the temperature cannot be attained due to the construction of the control, the nearest setting related to the specified temperature is chosen.

6 Dimensions and mass

6.1 Overall dimensions

The overall dimensions of the appliance are measured and stated in millimetres as follows:

- **cooking ranges** and other appliances placed on a surface are measured as shown in Figure 1;
- built-in **ovens** are measured as shown in Figure 2;
- built-in **hobs** are measured as shown in Figure 3.

6.2 Dimensions of hotplates and cooking zones

The main dimensions of **hotplates** and **cooking zones** are determined as follows:

- for **solid hotplates**, the diameter of the surface intended to come into direct contact with the bottom of saucepans is measured;
- for **tubular hotplates**, the diameter of the smallest periphery excluding any lead-in section is measured;
- for **glass ceramic hobs**, the diameters of the **cooking zones** are measured.

The dimensions are indicated in millimetres rounded to the nearest 5 mm.

If the **hotplates** or **cooking zones** are not circular the dimensions are determined as follows:

- for rectangular shapes, the lengths of the sides are measured;
- for elliptical and similar shapes, the major and minor dimensions are measured.

NOTE If the markings identifying **cooking zones** are not clear, this is stated.

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 millimeters.

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.

ⓘ This usable volume shall apply for energy label purposes. ⓘ

6.4 Overall internal dimensions and overall volume of ovens

For the determination of the energy label clause 6.4 is not applicable

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 millimeters.

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

6.4.1 Overall height (H)

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)

The maximum horizontal distance in mm between the planes of the cavity side walls.

6.4.3 Overall depth (D)

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.

6.5 Dimensions of shelves

The usable width and usable depth of the shelf are measured. The dimensions are determined 5 mm above the surface of the shelf.

The surface area is calculated and stated in square centimetres, rounded to the nearest 10 cm^2 .

NOTE The shelf may be a grid or a baking sheet.

6.6 Dimensions of grill grids

The width and depth of the grill grid are measured.

The surface area is calculated and stated in square centimetres, rounded to the nearest 10 cm^2 .

NOTE If the grill grid is the shelf of an **oven**, the dimensions are measured in accordance with 6.4.

6.7 Dimensions of warming compartments

The height, width and depth of the usable volume within the **warming compartment** are measured and indicated in millimetres.

NOTE When a heating element is located inside the **warming compartment**, the dimensions are measured up to its most protruding part.

6.8 Level of hotplates

Cooking ranges with adjustable feet and **hobs** are installed with the perimeter of the **hob** surface horizontal.

A device consisting of a disc and an annular ring is placed centrally on the **hotplate**. A spirit level is placed centrally on the ring, as shown in Figure 5.

A mass of 3 kg is placed on each of the remaining **hotplates**.

The spirit level is rotated to the position where it shows the maximum inclination from the horizontal. Its lower side is then lifted to the horizontal by inserting a feeler gauge between the level and the ring.

The measurement is carried out on each **hotplate**.

The deviation from the horizontal is given by the thickness of the gauge, in millimetres, to two decimal places. It is expressed as a percentage, rounded to the nearest 0,1 %.

NOTE The direct conversion from millimetres to percentage is possible due to the ring having a diameter of 100 mm.

6.9 Distance between hotplates or cooking zones

The shortest distance between the edges of adjacent **hotplates** or **cooking zones** is measured and indicated in millimetres, rounded to the nearest millimetre. If the **hob** has more than two **hotplates** or **cooking zones**, the distance between each pair is determined.

NOTE The result may be shown by means of a sketch.

6.10 Level of shelf

The shelf is placed in a central position in the **oven**.

NOTE 1 The shelf may be a grid or a baking sheet.

A device consisting of a disc and an annular ring is placed centrally on the shelf. A spirit level is placed centrally on the ring as shown in Figure 5. The spirit level is rotated to the position where it shows the maximum inclination from the horizontal. Its lower side is then lifted to the horizontal by inserting a feeler gauge between the level and the ring.

The deviation from the horizontal is given by the thickness of the gauge, in millimetres, to two decimal places. It is expressed as a percentage, rounded to the nearest 0,1 %.

NOTE 2 The direct conversion from millimetres to percentage is possible due to the ring having a diameter of 100 mm.

6.11 Mass of the appliance

The mass of the appliance, including accessories, is determined and expressed in kilograms, rounded to the nearest kilogram.

7 Hotplates and cooking zones

7.1 Ability to heat water

The purpose of this test is to assess the heat transfer from the **cooking zone** to water in a pan.

NOTE 1 This test is applicable for comparative testing only.

A steel saucepan which completely covers the **cooking zone** is used for the test, as specified in Figure 6.

NOTE 2 In order to prevent distortion of the base, a pan with sidewalls glued to the base by silicon-rubber may be used for heating water.

NOTE 3 Commercially available pans which have equivalent thermal and mechanical properties may be used.

The saucepan is filled with the quantity of potable water specified in Table 1. The water has a temperature of $15\text{ °C} \pm 1\text{ °C}$. The saucepan covered with the lid is positioned centrally on the **cooking zone**.

NOTE 4 For non-circular **cooking zones**, an appropriately shaped saucepan may be used.

Table 1 – Quantity of water in the saucepan

Diameter of cooking zone mm	Quantity of water <i>ℓ</i>
≤ 145	1
> 145 and ≤ 180	1,5
> 180 and ≤ 220	2

The **cooking zone** is heated with the control set at maximum. During the test the water is stirred continuously with the aid of a non-metallic stirrer. The time taken for the water temperature to rise by 75 K and the corresponding energy consumption are measured. The test is repeated with the pan turned through 90°.

The average value of the two results is determined.

The time is stated in minutes and seconds. The energy consumption is expressed in watt-hours.

7.2 Ability to control the temperature of a load

7.2.1 Temperature control

The purpose of this test is to check the function of a control.

NOTE 1 This test is applicable for comparative testing only.

NOTE 2 Controls may be automatic, step-by-step, energy-regulated or temperature-regulated.

A saucepan as shown in Figure 6 but without a lid is filled to a height of 30 mm with fresh sunflower oil at room temperature and placed on the **cooking zone**.

NOTE 3 Sunflower oil is considered to be fresh if it has not been used more than three times.

The **cooking zone** is heated with the control set at the minimum marked position. The temperature at the centre of the oil is recorded continuously by means of a thermocouple. The oil is not stirred. The time taken for the oil to reach a steady temperature is measured.

The test is repeated with the control set at the maximum position and also at an intermediate position.

NOTE 4 If a steady temperature is not reached within 30 min or when the oil temperature reaches 250 °C, the test is interrupted and the result noted.

The heating-up time and the temperature obtained for each setting are stated.

7.2.2 Temperature overshoot

The purpose of this test is to assess the heat retention of the **hotplate**.

NOTE This test is applicable for comparative testing only.

A saucepan, as shown in Figure 6 but without a lid, is filled to a height of 30 mm with fresh sunflower oil at room temperature and placed on the **cooking zone**.

The **cooking zone** is heated with the control set at the maximum position. The temperature at the centre of the oil is recorded. When the oil temperature reaches $80\text{ °C} \pm 0,5\text{ °C}$, the supply is switched off. The temperature in the oil is recorded continuously until the temperature starts declining.

The temperature overshoot is the difference between the highest recorded temperature and the temperature of the oil when the supply is switched off.

The temperature overshoot is stated in kelvins.

7.3 Heat distribution

The purpose of this test is to determine whether the **cooking zone** can steadily maintain a medium-high temperature and an even heat distribution when frying continuously.

NOTE This test is applicable for comparative testing only.

The assessment is made by frying a batch of pancakes in a frying pan, as shown in Figure 7.

7.3.1 Recipe for pancakes

The quantities of ingredients and approximate cooking durations corresponding to the diameter of the **cooking zone** are given in Table 2.

Table 2 – Ingredients and cooking durations

Ingredients	Diameter of the cooking zone mm		
	≤ 145	> 145 and ≤ 180	> 180 and ≤ 220
White wheat flour, without raising agent	140 g	140 g	200 g
Fresh milk, fat content 3 % to 4 %	270 g	270 g	400 g
Egg (without shell)	110 g	110 g	160 g
Salt	3 g	3 g	4 g
Batter quantity for each pancake	45 ml	55 ml	85 ml
Cooking duration for the first side	40 s to 60 s	50 s to 70 s	60 s to 80 s

7.3.2 Procedure

Whisk the milk and egg together, sieve the flour and salt together and add to the milk and egg mixture.

Leave the batter to rest for one hour at room temperature before baking the pancakes.

Grease the frying pan with approximately 5 g of vegetable oil. Heat the pan until the centre of the base has reached a temperature of $230\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$. Pour the relevant quantity of batter into the pan.

Fry the pancake until bubbles appear in the upper surface and the batter has set (approximate times are shown in Table 2). Turn the pancake and fry until the second side is golden brown. Fry a total of eight pancakes, maintaining the same orientation between the frying pan and the **cooking zone**

NOTE 1 A preliminary test may be necessary to determine the control setting in order to achieve the specified temperature.

NOTE 2 The frying pan is only greased for the first pancake.

NOTE 3 A contact probe can be used to measure the temperature of the pan.

7.3.3 Assessment

The evenness of browning of the side which is fried first is evaluated for each pancake by using the shade chart of Annex B.

The browning of each quadrant is determined. The difference between the lightest and the darkest shade of each pancake is stated.

The average browning of each pancake is determined. The maximum difference between these average values is stated.

7.4 Heat performance of hobs

7.4.1 Test purpose

Ceramic and induction **hobs** utilise electronic components for thermal protection. Temperature sensors are integrated into the **hob** or range, which reduce or cut off the power to the **cooking zones** when temperatures reach critical limits. Also, the electronic control system itself may require thermal protection. This design characteristic may alter the **hobs'** ability to heat food. The purpose of the test method is to determine the heating performance of **hobs** that have thermal protection.

7.4.2 Test procedure

Select saucepans according to Figure 6. Use the saucepan with oil on the **cooking zone** that has the maximum diameter according to Table 4. On the other **cooking zones**, fill the saucepans with water as indicated in Table 4. The water and the oil shall be at ambient temperature. The chips shall be frozen at $-18\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$.

7.Z1 Smallest detected diameter

7.Z1.1 Test purpose

Induction hobs may incorporate an electronic cookware detection means which automatically cuts off the power to the **cooking zone** concerned when no cookware or a cookware with a too small diameter is placed on the **cooking zone**, or a detected cookware is removed from the **cooking zone**.

The purpose of the test method is to determine the smallest diameter which is detected on the **cooking zone** under test.

NOTE 1 The detected diameter – measured with a disc – may not be identical to a base diameter of a cookware. This depends from the design and material of cookware.

Secretary's note: A method to determine the suitable cookware for induction cooking zones is included in CEN TS 12984-3.

NOTE 2 The purpose of this test is not to grant a specific power to this smallest diameter. 

7.Z1.2 Test procedure

Discs as defined in Figure Z1 are used, each being at ambient temperature at the beginning of the test. The test is started with a disc with a diameter which definitely will not be detected by the **cooking zone** to be tested.

Place the disc in the centre of the **cooking zone** marked on the appliance. Set the control to the lowest power level. If the disc is not detected by the cookware detection means, the test is to be done with a disc having a 5 mm larger diameter. This procedure is to be repeated until a disc is detected and is working continuously for at least 1 min.

The found detected diameter shall be verified in the hot condition. To do this: Bring up the amount of water according to Table 1 to the boiling point at maximum possible power level simultaneously on all **cooking zones** available on the **hob**. For that test any suitable cookware which covers the size of the **cooking zone** should be used. For cooking zones with a diameter larger than 220 mm use 3,5 l of water. Remove the cookware after the water on one **cooking zone** has started boiling. Check detection with the discs separately on each **cooking zone** over the whole voltage range of 230 V (+ 10 % - 6 %) within 2 min.

If verifying fails the test is to be repeated with the next larger diameter of the disc.

The smallest detected diameter is defined as the smallest diameter of the disc which was detected under all conditions mentioned above. 

Table 4 _ Quantities

Quantity of fresh sunflower oil in the saucepan		
Diameter of cooking zone mm	Quantity of oil l	Quantity of potato chips g
≤ 145	1	200
> 145 and ≤ 180	2	350
≥ 180 and ≤ 220	3	500
Quantity of potable water in the saucepan		
Diameter of cooking zone mm	Quantity of water l	
≤ 145	1	
> 145 and ≤ 180	1,5	
≥ 180 and ≤ 220	2	

The vessels filled with water are covered with glass lids. The temperature of the oil is recorded continuously by means of a suitable temperature sensor. The position of the sensors shall be 10 mm above the bottom of the saucepan and at a distance of 10 mm from the side of the saucepan. The vessels shall be centred over the **cooking zones**.

NOTE 1 Thermocouples are suitable solutions for sensors.

Set the power level for the saucepan selected for frying to maximum power.

Set the power level for the remaining saucepans to maximum power.

For a **hob** range equipped with an **oven**, the **oven** is to be operated. Set the thermostat so that the mean **oven** temperature is $180\text{ °C} \pm 5\text{ °C}$ for **ovens** with forced air circulation and $200\text{ °C} \pm 5\text{ °C}$ for **ovens** with natural convection. Operate the **oven** and be sure it is empty. When the **oven** reaches the temperature or after a maximum time of 20 min, set all **cooking zone** controls to maximum.

NOTE 2 An **oven** with a "cooling" fan can have a favourable influence on the thermal characteristics of the **hob**; in this case, the **oven** is not operated. A cooling fan is not the same as a convection fan. A convection fan is located at the rear of the **oven** cavity.