

INTERNATIONAL STANDARD

IEC
60335-2-36

Fourth edition
2000-02

Safety of household and similar electrical appliances –

Part 2-36: Particular requirements for commercial electric cooking ranges, ovens, hobs and hob elements

Sécurité des appareils électrodomestiques et analogues –

Partie 2-36: Règles particulières pour les cuisinières, les fours, les tables de cuisson et les foyers de cuisson électriques à usage collectif



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SAFETY OF HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES –**Part 2-36: Particular requirements for commercial electric
cooking ranges, ovens, hobs and hob elements****FOREWORD**

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 60335-2-36 has been prepared by subcommittee 61E: Safety of electrical commercial catering equipment, of IEC technical committee 61: Safety of household and similar electrical appliances.

It forms the fourth edition of IEC 60335-2-36 and replaces the third edition, published in 1993, its amendment 1 (1996) and amendment 2 (1998).

The text of this standard is based on the third edition, amendments 1 and 2 and the following documents:

FDIS	Report on voting
61E/347/FDIS	61E/361/RVD

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

This part 2 is to be used in conjunction with the latest edition of IEC 60335-1 and its amendments. It was established on the basis of the third edition (1991) of that standard.

This part 2 supplements or modifies the corresponding clauses in IEC 60335-1, so as to convert it into the IEC standard: Safety requirements for commercial electric cooking ranges, ovens, hobs and hob elements.

Where a particular subclause of part 1 is not mentioned in this part 2, that subclause applies as far as is reasonable. Where this standard states "addition", "modification" or "replacement", the relevant text in part 1 is to be adapted accordingly.

NOTE 1 The following print types are used:

- requirements: in roman type;
- *test specifications: in italic type;*
- notes: in small roman type.

Words in **bold** in the text are defined in clause 2.

NOTE 2 Subclauses, notes and figures which are additional to those in part 1 are numbered starting from 101.

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

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SAFETY OF HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES –

Part 2-36: Particular requirements for commercial electric cooking ranges, ovens, hobs and hob elements

1 Scope

This clause of part 1 is replaced by:

This standard deals with the safety of electrically operated commercial **cooking ranges**, ovens, **hobs**, **hob elements** and similar appliances not intended for household use, their **rated voltage** being not more than 250 V for single-phase appliances connected between one phase and neutral and 480 V for other appliances.

NOTE 1 These appliances are used for example in kitchens such as in restaurants, canteens, hospitals and commercial enterprises such as bakeries, butcheries, etc.

The electrical part of appliances making use of other forms of energy is also within the scope of this standard.

So far as is practicable, this standard deals with the common hazards presented by these types of appliances.

NOTE 2 Attention is drawn to the fact that

- for appliances intended to be used in vehicles or on board ships or aircraft, additional requirements may be necessary;
- for appliances intended to be used in tropical countries, special requirements may be necessary;
- in many countries additional requirements are specified by the national health authorities, the national authorities responsible for the protection of labour, the national water supply authorities and similar authorities.

This standard does not apply to

- appliances designed exclusively for industrial purposes;
- appliances intended to be used in locations where special conditions prevail, such as the presence of a corrosive or explosive atmosphere (dust, vapour or gas);
- continuous process appliances for the mass production of food;
- microwave ovens;
- steam-convection ovens;
- forced convection ovens (IEC 60335-2-42);
- steam cookers (IEC 60335-2-46);
- hot cupboards (IEC 60335-2-49).

2 Definitions

This clause of part 1 is applicable except as follows.

2.2.4 Addition:

NOTE The **rated power input** is the sum of the power inputs of all the individual elements in the appliance which can be on at one time; where several such combinations are possible, that giving the highest power input is used in determining the **rated power input**.

2.2.9 Replacement:

normal operation: Operation of the appliance under the following conditions:

- Solid **hob elements** are operated with no load and sheathed **hob elements** are operated with a load made of dull black, cold or hot rolled steel, 9 mm to 10 mm thick, which covers not less than 90 % and not more than 100 % of the element surface. The **hob elements** are operated with the controls set to give the temperatures as set out below, the temperature being measured at the geometrical centre or the hottest point of the solid element or load, if the element is unevenly heated.

Stepped controls are set to the first position which gives a temperature equal to or greater than 275 °C. Cycling controls are set so that the mean value of the temperature over the cycle is 275 °C ± 5 °C. If this temperature cannot be reached, the control is set at the maximum.

- Non-induction heating sources beneath a glass-ceramic or similar material are operated with a pan or pans containing initially cold water, the pan(s) being filled to a height of 60 mm ± 10 mm. The pan or pans are of aluminium, of ordinary quality, not brightly polished with a base concavity not exceeding 0,1 mm. The pan or pans shall cover the **cooking zone** to the greatest extent possible.

The pan or pans are covered with a lid. The controls are set at maximum until the water boils and then adjusted to maintain boiling. Water is added to maintain the water level during boiling.

- **Induction heating sources** beneath a glass-ceramic or similar material are operated with the pan or pans recommended by the manufacturer.

If one pan is used, it shall cover as closely as possible, but not less than, the full area of the **cooking zone**. The pan is positioned centrally.

For non-circular **cooking zones** a combination of the smallest number of pans is chosen to cover as much as possible the area of the **cooking zone**.

The pan or pans in each case are filled with initially cold frying oil to a height of 30 mm ± 5 mm. The controls are set to maximum until the temperature of the oil attains a value of 180 °C and then adjusted to maintain the oil at a temperature of 180 °C ± 15 °C.

A further test is made using initially cold water, the pan(s) being filled to a height of 60 mm ± 10 mm. The pan or pans are covered with a lid. The controls are set at maximum until the water boils and then adjusted to maintain boiling. Water is added to maintain the water level during boiling.

The condition providing the most unfavorable results (oil or water) is used.

- Ovens are operated with no load and with the controls set so that the mean value of the temperature over the thermostat cycle at the geometric centre of the usable space in the interior of the oven is maintained at 240 °C ± 4 °C. Stepped controls are set so that this temperature is 240 °C ± 15 °C. For ovens which are capable of attaining temperatures in excess of 290 °C, the controls are set so that the temperature is 50 °C ± 4 °C below the maximum temperature attainable. For ovens which are unable to attain a temperature of 240 °C, the controls are set to maximum.
- **Griddle plates** are operated with no load and with the controls set so as to give the temperatures set out below, the temperature being measured at the hottest point of each controlled cooking surface. Stepped controls are set to the first position which gives a temperature equal to or greater than 275 °C. Cycling controls are set so that the mean value of the temperature over the cycle is 275 °C ± 5 °C. If this temperature cannot be reached, the control is set to maximum.
- Motors incorporated in the appliance are operated in the intended manner under the most severe conditions which can be expected in normal use, taking into account the manufacturer's instructions.

2.2.101**cooking range**

a single cooking appliance incorporating one or more ovens together with one or more **hob elements** or **griddle plates** or a combination of these

NOTE An appliance incorporating a forced convection oven, steam-convection oven or microwave oven is considered to be an appliance incorporating another appliance (see also 4.102).

2.2.102**heating unit**

any part of the appliance which fulfils an independent cooking or heating function

NOTE 1 Examples are **hob elements**, **griddle plates** or ovens.

NOTE 2 If an oven incorporates more than one heating element or groups of elements which are so controlled that one element or group cannot be switched on while another element or group is energized, each of the elements or groups of elements is to be considered as a separate **heating unit** and tested accordingly.

2.2.103**hob element (boiling plate, surface element)**

heating unit designed to accommodate a vessel or vessels on its upper surface

NOTE A **hob element** may consist of an **induction** or non-induction **heating source** beneath a surface of glass-ceramic or similar material.

2.2.104**hob surface (cooking top)**

horizontal part of the appliance to which the **hob elements** are attached

2.2.105**hob**

a **hob surface** and one or more **hob elements**. It may be a separate appliance or part of a **cooking range**

NOTE A **hob** may also incorporate a **griddle plate**.

2.2.106**cooking zone**

area marked on a **hob surface** of glass-ceramic or similar material where the vessel is intended to be placed

2.2.107**induction heating source**

a heating source which operates by inducing eddy currents in a vessel positioned on the **hob element**.

2.2.108**griddle plate**

a **heating unit** having a cooking surface on which the food is intended to be placed directly

2.2.109**installation wall**

a special fixed construction containing supply facilities for appliances installed in conjunction with it

2.2.110**pan detector**

a device incorporated in a **hob element**, which prevents its operation unless a vessel is placed on the **cooking zone**

NOTE A **pan detector** is not considered to be a thermostat or **protective device**.

3 General requirement

This clause of part 1 is applicable except as follows.

Addition:

NOTE 101 The d.c. component in the appliance neutral is limited (Australia).

4 General conditions for the tests

This clause of part 1 is applicable except as follows.

4.2 *Addition:*

Hob elements which are submitted separately are tested when installed in an appropriate cooking range.

The test of 18.2 may be made on a separate sample.

4.3 *Addition:*

The test of 18.2 is made before the test of clause 11 unless it is made on a separate sample.

4.10 *Addition:*

Appliances intended for installation in a bank of other appliances and appliances intended to be fixed to an **installation wall** are enclosed to obtain protection against electric shock and harmful ingress of water equivalent to that obtained when installed in accordance with the instructions provided with the appliances.

NOTE Appropriate enclosures or additional appliances may be needed for test purposes.

4.101 Appliances are tested as **heating appliances**, even if they incorporate a motor.

4.102 Appliances, when assembled in combination with or incorporating other appliances, are tested in accordance with the requirements of this standard. The other appliances are operated simultaneously in accordance with the requirements of the relevant standard.

5 Void

6 Classification

This clause of part 1 is applicable except as follows.

6.1 *Replacement:*

Appliances shall be of **class I** with respect to protection against electric shock.

Compliance is checked by inspection and by the relevant tests.

NOTE **Class 0I appliances** are allowed if their **rated voltage** does not exceed 150 V (Japan).

6.2 *Addition:*

NOTE 101 For appliances intended to be installed in a kitchen, an appropriate degree of protection against harmful ingress of water is required according to their height of installation (France).

7 Marking and instructions

This clause of part 1 is applicable except as follows.

7.1 Addition:

In addition, appliances shall be marked with

- the water pressure or range of pressures, in kilopascals (kPa), for appliances intended to be connected to a water supply, unless this is indicated in the instruction sheet.

Appliances incorporating **induction heating sources** shall in addition be marked with

- operating frequency or operating frequency range in kilohertz (kHz);
- the total power input of all the induction **heating unit(s)** which can operate simultaneously, in watts or kilowatts, unless this is indicated in the instruction sheet.

NOTE 101 The power input to be marked or declared is the highest power input any switching arrangement will allow.

- the total power input of all the non-induction **heating unit(s)** which can operate simultaneously in watts or kilowatts unless this is indicated in the instruction sheet.

NOTE 102 The power input to be marked or declared is the highest power input any switching arrangement will allow.

Any cover giving access to **live parts** at a **working voltage** exceeding 250 V shall be marked by the following:

"WARNING – DANGEROUS VOLTAGE" or by the symbol for dangerous voltage (see 7.6).

Covers giving access to induction coils shall be marked by the following:

"CAUTION – MAGNETIC FIELD" or by the symbol for non-ionizing electromagnetic radiation (see 7.6).

NOTE 103 If it is not possible to mark these warnings on the cover, they may be placed close to the cover retaining screws.

7.6 Addition:

Add the following symbols:



.....non-ionizing electromagnetic radiation (IEC 60417-5140)*



.....dangerous voltage (IEC 60417-5036-a)*



.....equipotentiality (IEC 60417-5012-a)*

* See IEC 60417-1:1998, *Graphical symbols for use on equipment – Part 1: Overview and application*, and IEC 60417-2:1998, *Graphical symbols for use on equipment – Part 2: Symbol originals*

7.12 Addition:

If the appliance incorporates a **hob surface** of glass-ceramic or similar material which provides the enclosure of **live parts**, the instructions shall include the substance of the following warning:

WARNING – If the surface is cracked, immediately disconnect the appliance or appropriate part of the appliance from the supply.

The instructions for appliances with **hob surfaces** of glass-ceramic or similar material shall state that aluminium foil and plastic vessels are not to be placed on the hot surfaces. They shall also state that these surfaces are not to be used for storage.

The instructions for **hobs** incorporating halogen lamps shall warn the user to avoid looking direct at the lamps when on.

The instructions for appliances incorporating **induction heating sources** shall indicate the size of the smallest cooking vessel to be used. They shall also include the substance of the following:

- metallic objects such as kitchen utensils, cutlery etc. shall not be placed on the **hob surface** within the **cooking zones** since they could get hot;
- take care when operating the appliance, as rings, watches and similar objects worn by the user could get hot when in close proximity to the **hob surface**;
- only use vessels of the type and size recommended.

The instructions for appliances incorporating **induction heating sources** shall state that users with heart pacemakers should consult with the manufacturer, unless specific details are given.

The instructions for use for **hobs** with **hob elements** incorporating **pan detectors** shall include the substance of the following:

After use, switch the **hob element** off by means of its control. Do not rely on the **pan detector**.

7.12.1 Replacement:

The appliance shall be accompanied by an instruction sheet detailing any special precautions necessary for installation. For appliances intended for installation in a bank of other appliances and appliances intended to be fixed to an **installation wall**, details of how to ensure appropriate protection against electric shock and harmful ingress of water shall be supplied. If the controls of more than one appliance are combined in a separate enclosure, detailed installation instructions shall be supplied. Instructions for **user maintenance**, for example cleaning, shall also be given.

For appliances which are permanently connected to fixed wiring and for which leakage currents may exceed 10 mA, particularly if disconnected or not used for long periods, or during initial installation, the instruction sheet shall give recommendations regarding the rating of **protective devices**, i.e. earth leakage relays to be installed.

If the appliance is constructed so that it is not protected against water jets, clear and detailed instructions for the user shall be delivered together with the appliance. It shall be stated in the instructions that this appliance shall not be cleaned with a water jet.

In addition, for appliances incorporating **induction heating sources**, the instructions shall state that any repairs shall be carried out only by persons trained or recommended by the manufacturer.

Compliance is checked by inspection.

7.12.4 Addition:

- For appliances incorporating **induction heating sources**, a warning that care be taken to ensure that the splashback and surrounding area are free of metallic surfaces, if this is necessary due to the design of the appliance. The instructions for **built-in appliances** having a separate control panel for several appliances shall state that the control panel is only to be connected to the specified appliances in order to avoid a possible hazard.

7.15 Addition:

When it is not practical to place the making of **fixed appliances** so that it is visible after the appliance has been installed, the relevant information shall also be included in the instructions for use or on an additional label which can be fixed near the appliance after installation.

NOTE An example of such an appliance is a **built-in hob**.

7.101 If, during the test of clause 11, the temperature rise of the side and rear walls of the test corner above the level of the hob surface exceeds 65 K, and/or during the test of clause 19 the temperature rise of the walls above and below the **hob surface** exceeds 125 K, the installation instructions provided by the manufacturer shall include the substance of the following which shall also be included on a non-permanent label, for example a tie-on type, attached to the appliance:

"Where this appliance is to be positioned in close proximity to a wall, partitions, kitchen furniture, decorative finishes, etc., it is recommended that they be made of non-combustible material, if not, they shall be clad with a suitable non-combustible heat-insulating material, and that the closest attention be paid to fire prevention regulations."

Compliance is checked by inspection.

7.102 The **cooking zones** of **hob surfaces** of glass-ceramic or similar material shall be clearly identified by appropriate marking, unless they are obvious.

Compliance is checked by inspection.

7.103 Equipotential bonding terminals shall be indicated by the equipotentiality symbol (see 7.6).

These indications shall not be placed on screws, removable washers or other parts which can be removed when conductors are being connected.

Compliance is checked by inspection.

8 Protection against access to live parts

This clause of part 1 is applicable except as follows.

8.1 Addition:

Appliances intended to accommodate detachable **hob elements** shall be constructed so that there is adequate protection against accidental contact with **live parts** during insertion or removal of these elements.

8.101 Heating elements which are liable to be touched accidentally by a fork or similar pointed object in normal use, shall be so protected that it is not possible to touch their **live parts** with such an object.

*Compliance is checked by inserting the test pin shown in figure 101, at all points where the pin can enter in the vicinity of **live parts**. The pin is applied without appreciable force.*

9 Starting of motor-operated appliances

9.1 Fan motors providing a cooling effect in order to comply with the requirements of clause 11 shall start under all voltage conditions which may occur in use.

*Compliance is checked by starting the motor three times at a voltage equal to 0,85 times **rated voltage**, the motor being at room temperature at the beginning of the test.*

*The motor is started each time under the conditions occurring at the beginning of **normal operation** or, for automatic appliances, at the beginning of the normal cycle of operation, the motor being allowed to come to rest between successive starts. For appliances provided with motors having other than centrifugal starting switches, this test is repeated at a voltage equal to 1,06 times **rated voltage**.*

In all cases, the motor shall start and it shall function in such a way that safety is not affected and overload **protection devices** of the motor shall not operate.

NOTE The supply source must be such that during the test the drop in voltage does not exceed 1 %.

10 Power input and current

This clause of part 1 is applicable except as follows.

10.1 Modification:

Replace the first requirement paragraph by the following:

The power input of appliances without **induction heating sources**, at **rated voltage** and at normal operating temperature, shall not deviate from the **rated power input** by more than the deviation shown in table 1.

The power input of appliances having only **induction heating sources**, at **rated voltage** and at normal operating temperature, shall not deviate from the **rated power input** by more than 10 %.

The measurement is made before the controls are adjusted to the reduced setting.

For appliances incorporating **induction** and non-induction **heating sources** the following applies:

The power input of the **induction heating sources** and the non-induction heating sources are measured separately, in each case using a combination of **heating units** that can be on at the same time to give the highest power input. For the **induction heating sources**, the measurement is made before the controls are adjusted to the reduced setting.

The power inputs so measured shall in the case of the **induction heating sources** not deviate from the power input marked or declared by the manufacturer (see 7.1) by more than 10 %, and in the case of the non-induction heating sources not deviate from the power input marked or declared by the manufacturer (see 7.1) by more than that given in table 1 for **heating appliances**.

In addition, the power input of the appliance when the **induction** and non-induction **heating sources** are operated simultaneously shall not deviate from the **rated power input** by more than 10 %.

Addition:

NOTE 101 For appliances having more than one **heating unit**, the total power input may be determined by measuring the power input of each **heating unit** separately (see also 2.2.4).

11 Heating

This clause of part 1 is applicable except as follows.

11.2 Addition:

Appliances intended to be fixed to the floor and appliances with a mass greater than 40 kg and not provided with rollers, castors or similar means are installed in accordance with the manufacturer's instructions. If no instructions are given, these appliances are considered as appliances normally placed on the floor.

11.3 Addition:

NOTE 101 If the measurements can be unduly influenced by emissions from an **induction heating source**, i.e. the magnetic field, this must be taken into account.

In general, the use of thermocouples is not recommended because of the expected faulty heating-up of the thermocouples caused by the **induction heating source**. For example, the temperature rise of the **induction heating source** can be determined by using a platinum resistance, preferably of high resistance, with twisted connecting wires. The platinum resistances are placed on the hottest point of the winding so as to influence as little as possible the temperature to be measured.

11.4 Replacement:

*The non-induction **heating units** of the appliance are operated under **normal operation** at 1,15 times the power input marked or declared (see 7.1).*

If the temperature rise limits of motors, transformers or **electronic circuits** are exceeded, the test is repeated with the appliance supplied at 1,06 times **rated voltage**. In this case, only the temperature rises of motors, transformers and **electronic circuits** are measured.

*Induction **heating units** are operated simultaneously and supplied separately at the most unfavourable voltage between 0,94 times minimum **rated voltage** and 1,06 times maximum **rated voltage**.*

*If it is not possible to switch on all heating elements or **induction heating sources** at the same time, the test is made with each of the combinations that the switch arrangement will allow, the highest load possible with each switching arrangement being in circuit.*

*If the appliance is provided with a control which limits the total power input, the test is made with whichever combination of **heating units**, as may be selected by the control, imposes the severest condition.*

*In addition, appliances incorporating **induction heating sources** are also operated as above, but with the smallest size of pan as recommended by the manufacturer placed in the most onerous position consistent with being able to energize the coil, but within the **cooking zone**.*

NOTE The additional operating condition described above is not applied when reference to clause 11 is made in other tests.

11.7 Replacement:

Appliances are operated until steady conditions are established.

11.8 Addition:

*The limit of 65 K temperature rise for the rear and side test walls, including the part of the test corner which projects in front of the appliance, only applies below the level of the **hob surface**. If this temperature rise limit is exceeded above the **hob surface** then the requirements of 7.101 apply.*

12 Void

13 Leakage current and electric strength at operating temperature

This clause of part 1 is applicable except as follows.

13.1 Modification:

Instead of the first four paragraphs of the test specification the following applies:

Compliance is checked by the tests of 13.2 and 13.3, which are made after the appliance has been operated under the conditions specified in clause 11. The appliance is operated until the leakage current has reached a steady value or for the time specified in 11.7, whichever is the shorter period.

*If more than one pan is placed on a single **cooking zone**, they are electrically connected together.*

13.2 Modification:

Instead of the permissible leakage current for **stationary class I appliances**, the following applies:

- for cord and plug connected appliances 1 mA per kW rated power input of the appliance with a maximum of 10 mA
- for other appliances 1 mA per kW rated power input of the appliance with no maximum

NOTE 101 Leakage current limits are different (Japan).

Addition:

*If there is earthed metal between **live parts** and the surface of glass-ceramic or similar material, the leakage current is measured for each of the **cooking zones** in turn, only the pan(s) concerned being connected to earthed metal.*

*The leakage current shall not exceed 1 mA per kW of the power input of the **heating unit** being tested.*

NOTE 102 The power input of the **heating unit** is measured under the conditions of clause 10.

*If there is no earthed metal between **live parts** and the surface of glass-ceramic or similar material, the leakage current is measured between each pole of the supply and the pan(s) for each of the **cooking zones** in turn, the pan(s) concerned being unconnected to earthed metal.*

*In addition, the leakage current is measured between each pole of the supply and a probe consisting of a flat metal disc 50 mm in diameter. The probe is placed in all positions on the **hob surface** outside the **cooking zones**, the pans remaining in position.*

For each measurement the leakage current shall not exceed 0,25 mA.

For **hob elements** with **induction heating sources**, the leakage current is also measured between live parts and the pan(s) for each of the **cooking zones** in turn, using the circuit shown in figure 103. It shall not exceed 0,7 mA (peak) multiplied by the operating frequency in kilohertz or 70 mA (peak), whichever is less.

NOTE 103 Care should be taken that the measurement is not influenced by, for example, antennae effect.

13.3 Addition:

If there is earthed metal between **live parts** and the surface of glass-ceramic or similar material, all the pans on the **hob surface** are electrically connected together and to earthed metal.

A test voltage of 1 000 V is then applied between **live parts** and the pans.

If there is no earthed metal between **live parts** and the surface of glass-ceramic or similar material, all the pans on the **hob surface** are electrically connected together, but not connected to earthed metal.

A test voltage of 3 750 V is then applied between **live parts** and the pans.

For **hob elements** incorporating **induction heating sources** having **working voltages** above 250 V, the following test voltages apply:

- 1 000 V is increased to $1,2 \times U + 700$ V
- 2 750 V is increased to $1,2 \times U + 2\,450$ V
- 3 750 V is increased to $2,4 \times U + 3\,150$ V

where U is the **working voltage**.

NOTE 101 Care is taken to ensure that the voltage applied does not overstress the other insulations.

14 Void

15 Moisture resistance

This clause of part 1 is applicable except as follows.

15.1.1 Addition:

In addition, IPX0, IPX1, IPX2, IPX3 and IPX4 appliances are subjected for 5 min to the following splash test:

The apparatus shown in figure 102 is used. During the test, the water pressure is so regulated that the water splashes up 150 mm above the bottom of the bowl. The bowl is placed on the floor for appliances normally used on the floor and, for all other appliances on a horizontal support 50 mm below the lowest edge of the appliance; the bowl is moved around in such a way as to splash the appliance from all directions. Care is taken that the appliance is not hit by the direct jet.

15.1.2 Modification:

Appliances normally used on a table are placed on a support having dimensions which are 15 cm ± 5 cm in excess of those of the orthogonal projection of the appliance on the support.

Addition:

*If detailed instructions regarding the cleaning of movable but **non-detachable** (for example hinged) **hob elements** are given in the instruction sheet, tests on these **hob elements** are carried out with the elements in the horizontal position of normal use.*

15.2 Replacement:

Appliances shall be constructed so that spillage of liquid in normal use does not affect their electrical insulation.

Compliance is checked by the following test:

*Appliances with **type X attachment**, except those having a specially prepared cord, are fitted with the lightest permissible type of flexible cable or cord of the smallest cross-sectional area specified in 26.2 and other appliances are tested as delivered.*

Detachable parts are removed.

*Appliances are positioned so that the **hob surface** is horizontal and if the **hob elements** are adjustable separately, their surfaces are also horizontal.*

*A vessel having a diameter equal to or not more than 25 mm smaller than the largest inscribed circle on the **hob element** or **cooking zone** is completely filled with cold salt water and placed in the most unfavourable position, not overlapping the **hob element** or the **cooking zone**.*

A further quantity of cold salt water equal to approximately 2 l is poured steadily into the vessel over a period of 1 min.

NOTE 1 The test is made on each **hob element** separately, the tray or other receptacle being emptied each time.

For appliances incorporating ovens or grills, the spillage test is made by pouring steadily over a period of 1 min approximately 1 l of cold salt water over the bottom surface of the oven or grilling compartment.

*For appliances incorporating **griddle plates**, approximately 1 l of cold salt water is poured steadily over a period of 1 min onto the centre of the surface of the **griddle plate**.*

*If controls are mounted in the **hob surface** of the appliance, 1 l of cold salt water is poured steadily over a period of 1 min over the controls.*

NOTE 2 The salt water solution contains approximately 1 % NaCl.

*Immediately after this treatment, the appliance shall withstand an electric strength test as specified in 16.3 and inspection shall show that water which may have entered the appliance does not impair compliance with this standard, in particular, there shall be no trace of water on insulation for which **creepage distances** and **clearances** are specified in 29.1.*

15.3 Addition:

NOTE 101 If it is not possible to place the whole appliance in the humidity cabinet, parts containing electrical components are tested separately, taking into account the conditions which occur in the appliance.

15.101 Appliances which are provided with a tap intended for filling or cleaning, shall be constructed so that the water from the tap cannot come into contact with **live parts**.

Compliance is checked by the following test:

The tap is fully opened for 1 min with the appliance connected to a water supply having the maximum water pressure indicated by the manufacturer. Tiltable and movable parts, including lids, are tilted or placed in the least favourable positions. Swivelling outlets of water taps are positioned so as to direct water onto those parts which will give the least favourable result. Immediately following this treatment the appliance shall withstand an electric strength test as specified in 16.3.

16 Leakage current and electric strength

This clause of part 1 is applicable except as follows.

16.1 Addition:

For appliances provided with **hob surfaces** of glass-ceramic or similar material, the tests of 16.2 and 16.3 are made with a pan or pans as described in 2.2.9.

If more than one pan is placed on a single **cooking zone**, they are electrically connected together.

16.2 Modification:

Instead of the permissible leakage current for **stationary class I appliances**, the following applies:

- for cord and plug connected appliances 2 mA per kW **rated power input** of the appliance with a maximum of 10 mA
- for other appliances 2 mA per kW **rated power input** of the appliance with no maximum

NOTE 101 Leakage current limits are different (Japan).

Addition:

If there is earthed metal between **live parts** and the surface of glass-ceramic or similar material, the leakage current is measured for each of the **cooking zones** in turn, only the pan(s) concerned being connected to earthed metal.

The leakage current shall not exceed 2 mA per kW of the power input of the **heating unit** being tested.

If there is no earthed metal between **live parts** and the surface of glass-ceramic or similar material, the leakage current is measured between **live parts** and the pan(s) for each of the **cooking zones** in turn, the pan(s) concerned not being connected to earthed metal.

In addition, the leakage current is measured between **live parts** and a probe consisting of a flat metal disc 50 mm in diameter. The probe is placed in all positions on the **hob surface** outside the **cooking zones**, the pans remaining in position.

For each measurement the leakage current shall not exceed 0,25 mA.

16.3 Addition:

If there is earthed metal between **live parts** and the surface of glass-ceramic or similar material, all the pans on the **hob surface** are electrically connected together and to the earthed metal.

A test voltage of 1 250 V is then applied between **live parts** and the pans.

If there is no earthed metal between **live parts** and the surface of glass-ceramic or similar material, all the pans on the **hob surface** are electrically connected together, but not connected to earthed metal.

A test voltage of 3 750 V is then applied between **live parts** and the pans.

For **hob elements** incorporating **induction heating sources** having **working voltages** above 250 V, the following test voltages apply:

- 1 250 V is increased to $1,2 \times U + 950$ V
- 2 500 V is increased to $1,2 \times U + 2\,200$ V
- 3 750 V is increased to $2,4 \times U + 3\,150$ V

where U is the **working voltage**.

17 Overload protection of transformers and associated circuits

This clause of part 1 is applicable.

18 Endurance

18.1 Appliances incorporating **induction heating sources** shall be constructed so that, in normal use, there is no failure that impairs compliance with this standard. The insulation shall not be damaged and connections shall not work loose.

Compliance is checked by energizing each **induction heating source** 100 000 times by moving the smallest pan recommended by the manufacturer (or an equivalent metallic object) on and off the **hob element** at a rate of six times per minute (5 s for each movement). The test is made at the least favourable voltage as determined in clause 11.

18.2 Appliances incorporating surfaces of glass-ceramic or similar material shall withstand thermal stresses liable to occur in normal use.

Compliance is checked by the following test:

The appliance is operated with all heating sources beneath the glass-ceramic or similar material energized at the same time. Non-induction heating sources are operated with a pan filled with water according to 2.2.9 but placed in the least favourable position on the **cooking zone**. **Induction heating sources** are operated with an empty pan.

The controls are set at maximum and the appliance is operated for 500 cycles, each cycle comprising 10 min on and 20 min off, the supply being 1,1 times **rated voltage**. The operation of **thermostats** or **temperature limiters** during the test is ignored.

Immediately after the last energized period the pan(s) is (are) removed and the hob surface is subjected to a spillage test using $2^{+0,1}_0$ l of cold water between 10 °C and 15 °C, poured steadily over the surface for 1 min.

Fifteen minutes later all excess water is removed from the surface.

After the test the surface shall not be cracked or broken and the appliance shall withstand the test in 16.3.

19 Abnormal operation

This clause of part 1 is applicable except as follows.

19.1 Modification:

Replace the first paragraph of the test specification by:

All appliances are subjected to the tests of 19.2 and 19.3.

In addition, appliances provided with a control limiting the temperature during the tests of clause 11 are subjected to the test of 19.4 and where applicable to the test of 19.5. However, for these tests, **hob elements with induction heating sources** are not energized and appliances incorporating only **induction heating sources** are not tested.

Appliances incorporating **induction heating sources** are also subjected to the test of 19.101.

Appliances incorporating **PTC heating elements** are also subjected to the test of 19.6.

19.2 Modification:

- **Induction heating sources** beneath a surface of glass-ceramic or similar material are operated with an empty pan, placed in the least favourable position consistent with being able to energize the coil, even if not within the **cooking zone**. The **induction heating sources** are supplied with a voltage of 0,94 times the **rated voltage**.
- Non-induction heating sources beneath a surface of glass-ceramic or similar material are operated without a pan or with an empty pan, whichever is the least favourable condition.
- For all **heating units** the controls are adjusted to the highest setting.

19.2 Addition:

Pan detectors are rendered inoperative.

19.3 Modification:

Induction heating sources are supplied with a voltage of 1,06 times the **rated voltage**.

If more than one **hob element** with a non-induction heating source is incorporated in an appliance, the supply voltage is that required to provide a power input of 1,15 times the **rated power input** under **normal operation**.

19.4 Addition:

NOTE 101 The main contacts of the contactor intended for switching on and off the heating element(s) in normal use are locked in the "ON" position. However, if two contactors operate independently of each other or if one contactor operates two independent sets of main contacts, these contacts are locked in the "ON" position in turn.

19.12 Addition:

The test is also repeated if, for any of the fault conditions specified in 19.101, the safety of the appliance depends on the operation of a miniature fuse-link complying with IEC 60127.

19.13 Modification:

For **hob elements** incorporating **induction heating sources** having **working voltages** above 250 V, the following test voltages apply:

- 1 000 V is increased to $1,2 \times U + 700$ V
- 2 750 V is increased to $1,2 \times U + 2\,450$ V
- 3 750 V is increased to $2,4 \times U + 3\,150$ V

where U is the **working voltage**.

Addition:

*If the temperature rise of the walls above and below the **hob surface** exceeds 125 K, the requirements of 7.101 apply.*

The temperature of the windings of induction coils shall not exceed the values shown in table 6 of 19.7.

19.101 Appliances incorporating **induction heating sources** shall be constructed so that the risk of fire, mechanical hazard or electric shock is obviated as far as is practicable in the event of incorrect operation or the development of defects in control devices or circuit components.

*Compliance is checked by applying any form of operation or any defect in the relevant circuits which may be expected in normal use while the appliance is operated under conditions of **normal operation at rated voltage** or at the upper limit of the **rated voltage range**. Only one fault condition is reproduced at a time, the tests being made consecutively.*

NOTE Examples of fault conditions are:

- drop-out of contactors and of electromagnetic components;
- failure of motors to start;
- drop in voltage supply, re-appearance of the voltage, voltage interruptions of up to 0,5 s;
- fault conditions specified in 19.11 as applicable.

Examination of the appliance and its circuit diagrams will generally show the fault conditions to be simulated.

20 Stability and mechanical hazards

This clause of part 1 is applicable except as follows.

20.101 Appliances other than appliances intended to be fixed to the floor shall have adequate stability when the doors are open and subjected to a load.

Compliance is checked by the following tests:

Doors having a horizontal hinge at their lower edge are opened and a weight is gently placed on the surface of the door so that its centre of gravity is vertically over the geometric centre of the door. The contact area of the weight is such as will cause no damage to the door, and its mass is:

- *for appliances normally used on a floor:*
 - *for oven doors: 23 kg or such higher value as, according to the manufacturer's cooking instructions, can be placed in the oven;*
 - *for other doors: 7 kg;*
- *for appliances normally used on a table or similar support and provided with doors having a horizontal hinge at their lower edge and a projection of at least 225 mm from the hinge to the opening edge:*
 - *7 kg or such higher value as, according to the manufacturer's cooking instructions, can be placed in the oven.*

Doors, except those where the lower level of the oven is above a hob, having a vertical hinge are opened through an angle of 90°, and a downward force of 140 N is then applied gently to the top of the door at the extremity furthest from the hinge.

This test is repeated with the door opened as far as possible, but not through an angle of more than 180°.

During these tests, the appliance shall not tilt.

NOTE For the weight, a sandbag may be used.

For appliances provided with more than one door, the tests are made on each door separately.

For non-rectangular doors, the force is applied to that point furthest from the hinge where such a force might be exerted in normal use.

Damage to, and deformation of, doors and hinges are neglected.

21 Mechanical strength

This clause of part 1 is applicable except as follows.

Addition

NOTE 101 For appliances intended to be installed in a kitchen, different values of impact energy are applicable according to the height of the impact point (France).

21.101 Shelves shall be constructed so that they do not fall away from the shelf supports either when inside the oven or extended out by 50 % of their depth. They shall not tip when extended out by 50 %.

Compliance is checked by the following test:

Load a cake tin or similar container, having an area of 75 % of that of the shelf, with evenly distributed weights of mass totalling 40 kg for each square metre of tin area. Insert a shelf, with the loaded tin centrally disposed, on the supports provided in the oven. Move the shelf as far as possible to the left, leave for 1 min and then withdraw it. Re-insert the shelf and move it to the extreme right, leave for 1 min and again withdraw it

During this test the shelf shall not fall away from the support.

The test is then repeated with the shelf extended out by 50 % of its depth. Then apply an additional force of 10 N vertically downward on the centre of the exposed front edge of the shelf. During this test the shelf shall not tip.

NOTE A small angle of deflection is allowed.

21.102 Hob surfaces of glass-ceramic or similar material shall withstand the stresses liable to occur in normal use.

Compliance is checked by the following test:

Heating sources beneath a surface of glass-ceramic or similar material are operated in accordance with the conditions of clause 11 until steady conditions are established. After switching off, the **hob surface** is immediately subjected to the following test:

A vessel having a copper or aluminium base which is flat over a diameter of $220 \text{ mm} \pm 10 \text{ mm}$ with edges rounded with a radius of at least 10 mm is uniformly filled with sand or shot so that the total mass is 4 kg. The vessel is dropped flat from a height of 150 mm onto the surface.

The test is carried out 10 times on any part of the **hob surface** but not within 20 mm of control knobs.

The heating sources are then again operated in accordance with the conditions of clause 11 until steady conditions are established.

Immediately after switching off, a quantity of $2^{+0.1}_0 \text{ l}$ of cold water at $15^\circ\text{C} \pm 5^\circ\text{C}$ is then poured steadily over a period of 1 min over the surface; 15 min later all excess water is removed. The appliance is then allowed to cool to approximately ambient temperature. An additional quantity of $2^{+0.1}_0 \text{ l}$ of cold water is then again poured steadily over a period of 1 min over the surface.

Fifteen minutes later all excess water is removed and the surface wiped dry.

After the tests the surface shall not be cracked or broken and the appliance shall withstand the test of 16.3.

22 Construction

This clause of part 1 is applicable except as follows.

22.101 Appliances shall be protected in such a manner that moisture and grease or deposits from the discharge of the oven vent will not collect in such a way as to affect **creepage distance** and **clearance** values.

Compliance is checked by inspection.

22.102 Thermal cut-outs protecting circuits with heating elements and those for motors of which the unexpected starting may cause a hazard shall be of the non-self-resetting, trip-free type and shall provide **all-pole disconnection** from the supply.

If the **non-self-resetting thermal cut-out** is only accessible after removing parts with the aid of a tool, the trip-free type is not required.

NOTE **Thermal cut-outs** of the trip-free type have an automatic action, with a reset actuating member, so constructed that the automatic action is independent of manipulation or position of the reset mechanism.

Compliance is checked by inspection and by manual test.

22.103 Lights, switches or push-buttons shall be coloured red only for the indication of danger, alarm or similar situations.

Compliance is checked by inspection.

22.104 Hinged lids shall be protected against accidental falling.

Compliance is checked by inspection and manual test.

22.105 Detachable hob elements and their supports shall be constructed so that the **hob elements** are prevented from rotating about a vertical axis and are adequately supported in all possible positions of adjustment of the supports.

Hinged **hob elements** shall be protected against accidental dropping.

*Compliance is checked by applying a force of 20 N in the least favourable position and direction to the raised **hob element**. The **hob element** shall not rotate or fall back to its operating position.*

NOTE Hinged **hob elements** which can be opened through an angle of at least 100°, even if placed against a wall, are not subjected to this test.

22.106 Induction heating sources shall have adequate visual or audible warning that the control is in the "ON" position.

Compliance is checked by inspection.

NOTE The position of a control knob does not, in itself, constitute an adequate warning.

22.107 Appliances incorporating **induction heating sources** shall be constructed so that the power input of these sources is limited to a value of 120 % of the marked or declared power input.

Compliance is checked by inspection and measurement.

22.108 Portable appliances shall be so constructed as to prevent a hazard resulting from objects penetrating the bottom surface.

Compliance is checked by inspection and by measurement, if necessary.

NOTE Appliances without legs are considered to comply with this requirement if **live parts** are at least 6 mm from the supporting surface measured through any opening. If the appliance is fitted with legs, this distance is increased to 10 mm for appliances intended to be placed on a table and to 20 mm for appliances intended to be placed on the floor.

22.109 Hob elements with induction heating sources shall be constructed so that the **hob element** does not operate when only a small metal object is placed on the **cooking zone**.

Compliance is checked by the following test:

*A disc of low carbon sheet steel 1,5 mm thick and having a diameter of 50 mm is placed flat in the most unfavourable position on the **cooking zone**. The controls are at their highest setting.*

The disc shall not be heated.

NOTE A temperature rise not exceeding 35 K is ignored.

22.110 In appliances incorporating a **pan detector**, a signal lamp shall indicate when the control for the **hob element** is not switched to the **off position**.

Compliance is checked by inspection.

23 Internal wiring

This clause of part 1 is applicable except as follows.

23.3 Addition:

*When the capillary tube of the **thermostat** is liable to flexing in normal use the following applies:*

- *where the capillary tube is fitted as part of the internal wiring, part 1 applies;*
- *where the capillary tube is separate, it is subjected to 1 000 flexings at a rate not exceeding 30 per min.*

NOTE 101 If, in any of the above cases, it is not possible to move the movable part of the appliance at the given rate, due for example to the mass of the part, the rate of flexing may be reduced.

After the test, the capillary tube shall show no sign of damage within the meaning of this standard and no damage impairing its further use.

However, if a rupture of the capillary tube renders the appliance inoperative (fail-safe), separate capillary tubes are not tested, and those fitted as part of the internal wiring are not inspected for compliance with the requirements.

Compliance in this instance is checked by rupturing the capillary tube.

NOTE 102 Care must be taken to ensure that the rupture does not seal the capillary tube.

24 Components

This clause of part 1 is applicable except as follows.

24.1.2 Addition:

- *energy regulators*
 - *for automatic action* 100 000
 - *for manual action* 10 000
- ***self-resetting thermal cut-outs***
 - *for radiant heating elements of glass-ceramic **hobs*** 100 000
 - *for other heating elements* 10 000

25 Supply connection and external flexible cords

This clause of part 1 is applicable except as follows.

25.1 Modification:

Appliances shall not be provided with an appliance inlet.

25.3 Addition:

Fixed appliances and appliances with a mass greater than 40 kg and not provided with rollers, castors or similar means shall be constructed so that the **supply cord** can be connected after the appliance has been installed in accordance with the manufacturer's instructions.

The connection to the supply wires of **hobs**, **built-in cooking ranges** and **built-in ovens** may be made before the appliance is installed.

Addition:

Terminals for permanent connection of cables to fixed wiring may also be suitable for the **type X attachment** of a **supply cord**. In this case, a cord anchorage complying with 25.16 shall be fitted to the appliance.

If the appliance is provided with a set of terminals allowing the connection of a flexible cord, they shall be suitable for the **type X attachment** of the cord.

In both cases the instruction sheets shall give full particulars of the power **supply cord**.

Compliance is checked by inspection.

25.7 Modification:

Instead of the types of **supply cords** specified, the following applies:

Supply cords shall be oil-resistant, sheathed flexible cable not lighter than ordinary polychloroprene or other equivalent synthetic elastomer-sheathed cord (code designation 60245 IEC 57).

26 Terminals for external conductors

This clause of part 1 is applicable.

27 Provision for earthing

This clause of part 1 is applicable except as follows.

27.2 Addition:

Stationary appliances shall be provided with a terminal for the connection of an external equipotential conductor. This terminal shall be in effective electrical contact with all fixed exposed metal parts of the appliance, and shall allow the connection of a conductor having a nominal cross-sectional area of up to 10 mm². It shall be located in a position convenient for the connection of the bonding conductor after installation of the appliance.

NOTE 101 Small fixed exposed metal parts, for example nameplates and the like, are not required to be in electrical contact with the terminal.

28 Screws and connections

This clause of part 1 is applicable.

29 Creepage distances, clearances and distances through insulation

This clause of part 1 is applicable except as follows.

29.1 Addition:

Circuits with voltages greater than 480 V (680 V peak) shall have **creepage distances** and **clearances** between **live parts** of different potential and between **live parts** and **accessible metal parts** not less than those stated in the table 101.

Table 101 – Minimum clearances and creepage distances

Voltage (peak value)	Clearance Mm	Creepage distance mm
Over 680 up to and including 800	3,5	5
Over 800 up to and including 1 000	4	6
Over 1 000 up to and including 1 100	4,5	7
Over 1 100 up to and including 1 250	4,5	8
Over 1 250 up to and including 1 400	5,5	9
Over 1 400 up to and including 1 600	7	10
Over 1 600 up to and including 1 800	8	11
Over 1 800 up to and including 2 000	9	11,5
Over 2 000 up to and including 2 200	10	12
Over 2 200 up to and including 2 500	11	13
Over 2 500 up to and including 2 800	12	14
Over 2 800 up to and including 3 200	13	14,5
Over 3 200 up to and including 3 600	14	15,5
Over 3 600 up to and including 4 000	14,5	16,5
Over 4 000	15,5	17,5

For circuits with voltages greater than 4 000 V peak value, **creepage distances** and **clearances** between **live parts** of different polarity and between **live parts** and **accessible metal parts** are additionally checked by applying a voltage, for 1 min, determined by the following formula:

$$U_T = 2 \times U + 750 \text{ V}$$

where U is the **working voltage** and U_T the test voltage.

There shall be no flash-over or breakdown.

29.2 Addition:

NOTE 101 The distances through insulation between metal parts, in case of supplementary and of **reinforced insulation** for **working voltages** exceeding 250 V (354 V peak), are not specified.

The value of the test voltage V (in volts), which is used to determine if the insulation is adequate, is given by the formula:

- for **supplementary insulation** $V = 1,2 \times U + 2\,200 \text{ V}$
- for **reinforced insulation** $V = 2,4 \times U + 3\,150 \text{ V}$

where U is the **working voltage**.