

Specification for

Safety of commercial electrical appliances using microwave energy for heating foodstuffs

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Consumer Standards Advisory Committee of BSI	Hospital Caterers' Association
Department of Health and Social Security	Industrial Catering Association
Electrical Association for Women	Medical Research Council
	An individual expert

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Foreword

This British Standard has been prepared under the authority of the Electrical Industry Standards Committee.

Users of this standard should satisfy themselves that the installation of equipment conforming to this British Standard meets the requirements of any Byelaws issued by the Ministry of Housing and Local Government and the Scottish Development Department, where these are applicable.

Personnel carrying out appraisal of appliances to this specification are warned that as a result of tests appliances may give rise to microwave leakage which could be hazardous to their health and to other people in the vicinity. Precautions should be taken to safeguard themselves and any other person who may be exposed to these hazards.

This British Standard has been based on the latest draft IEC Specification for the safety of microwave cooking appliances for household and similar purposes and includes the appropriate requirements of BS 3456-1:1969, and this standard, BS 5175, conforms to the general arrangement and clause numbering of BS 3456 and the associated IEC Specifications with the addition of a clause and related appendix concerning microwave leakage. It is considered that the requirements for microwave ovens for household use are so similar to those applicable for commercial ovens that it has not been necessary to differentiate between these applications.

Attention is drawn to the statutory regulations covering radio interference generation by microwave equipment.

Certification. It is strongly recommended that in view of the nature of this specification manufacturers and purchasers should make use of the certification facilities described on the inside back cover of this standard.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 50, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

1.1 This British Standard specifies the requirements for the testing of microwave ovens with or without additional forms of heating.

It applies to equipment for operation on either single phase or polyphase supplies, where the voltage to earth does not exceed 250 V a.c. This standard does not cover the use of equipment in ships, vehicles or aircraft.

Continuous process ovens are not within the scope of this standard.

NOTE 1 This specification requires a rated output frequency of 2 450 MHz. The value of 915 MHz specified in some international specifications is not permissible in the UK.

NOTE 2 The titles of these standards publications referred to in this standard are listed on page 50.

2 Definitions

For the purposes of this British Standard the following definitions apply. The Terms voltage and current imply the r.m.s. values unless otherwise stated.

2.1

rated voltage

the voltage (for three-phase supply, the line voltage) assigned to the appliance by the maker

2.2

rated voltage range

the voltage range assigned to the appliance by the maker expressed by its lower and upper limits

2.3

rated input

the input power from the supply under normal load and at normal operating temperature assigned to the appliance by the maker

2.4

maximum rated input

the highest power input of the range, when an input range is marked on the appliance. When the mean input of the element is marked the maximum rated input is given by the following formula:

$$\text{Mean rated input} \times \left(\frac{\text{Maximum rated voltage}}{\text{Mean rated voltage}} \right)^2$$

where the mean rated voltage is the arithmetic mean of the lower and upper limits of the rated voltage range

2.5

minimum rated input

the lowest power input of the range, when an input range is marked on the appliance. When the mean input of the element is marked the minimum rated input is given by the following formula:

$$\text{Mean rated input} \times \left(\frac{\text{Minimum rated voltage}}{\text{Mean rated voltage}} \right)^2$$

2.6

rated input current

the current taken from the supply by the appliance and assigned by the maker

2.7

rated input frequency

the frequency of the supply assigned to the appliance by the maker

2.8

rated input frequency range

the frequency range of the supply assigned to the appliance by the maker, expressed by its lower and upper limits

2.9

rated output

the microwave power, in watts, generated by the appliance when it is operated under normal load conditions. The rated output is assigned to the appliance by the maker

2.10

rated output frequency

the frequency at which the rated output is generated, assigned to the appliance

2.11

functional insulation

the insulation necessary for the proper functioning of the appliance and for basic protection against electric shock

2.12

supplementary insulation (protective insulation)

an independent insulation provided in addition to the functional insulation in order to ensure protection against electric shock in event of a failure of the functional insulation

2.13

double insulation

insulation comprising both functional insulation and supplementary insulation

2.14**reinforced insulation**

an improved functional insulation with such mechanical and electrical qualities that it provides the same degree of protection against electric shock as double insulation

2.15**graded insulation**

the insulation in a circuit, or components of a circuit, between live parts of different polarity, or between live parts and accessible metal parts, the electric strength of which varies according to the voltage across it at any particular point

2.16**Class I appliance**

an appliance having at least functional insulation throughout and provided with an earthing terminal or earthing contact and, for appliances designed for connection by means of flexible cable or cord, non-detachable flexible cable or cord or cord with earthing conductor

NOTE Class I appliances may have some parts of Class II or Class III construction.

2.17**Class II appliance**

an appliance with double insulation and/or reinforced insulation throughout and without provision for earthing. Such an appliance may be of one of the following types

- a) An appliance having a durable and substantially continuous enclosure of insulating material which envelopes all metal parts, with the exception of small parts, such as nameplates, screws and rivets, which are isolated from live parts by insulation at least equivalent to reinforced insulation; such an appliance is called an insulation-encased Class II appliance (formerly known as Class IIA).
- b) An appliance having a substantially continuous metal enclosure in which double insulation is used throughout, except for those parts where reinforced insulation is used, because the application of double insulation is manifestly impracticable; such an appliance is called a metal-encased Class II appliance (formerly known as Class II B).
- c) An appliance which is a combination of types a) and b).

NOTE 1 The enclosure of an insulation-encased Class II appliance may form a part or the whole of the supplementary insulation or of the reinforced insulation.

NOTE 2 If an appliance with double insulation and/or reinforced insulation throughout has an earthing terminal or earthing contact it is deemed to be of Class I construction.

2.18**Class III appliance**

an appliance designed for operation from a safety extra-low voltage supply (see 2.20)

NOTE 1 Appliances intended to be operated from a safety extra-low voltage supply and having internal circuits which operate at a voltage other than extra-low voltage are not included in the classification.

A more comprehensive definition is under consideration.

NOTE 2 If an appliance has parts in more than one of the above classifications, namely Classes I, II and III, the overall classification is that with the lower number.

NOTE 3 Requirements for Class III appliances are formulated on the assumption that the supply to the appliance will be isolated from the electricity supply mains.

2.19**extra-low voltage**

a working voltage (see 2.40) normally not exceeding 50 V a.c. with the maximum r.m.s. voltage to earth of 30 V, or 50 V d.c.

2.20 safety extra-low voltage supply

a supply obtained from a source which is independent of the supply mains, or from the supply mains through a safety isolating transformer or converter with separate windings, this supply being such that the no-load voltage does not exceed 50 V between conductors

2.21**transportable appliance**

an appliance weighing 18 kg or less or equipped with wheels with the intention of providing means for moving the appliance from one place to another

2.22**stationary appliance**

an appliance intended to be fixed to a supporting surface, or which cannot be easily moved from one place to another

2.23**appliance for building-in**

an appliance intended to be installed in a cupboard fitment or in a prepared recess in a wall or in a similar situation

NOTE In general, appliances for building-in do not have a finish on all sides, as some of the sides are out of sight when the appliance is installed.

2.24**microwave oven**

a cooking appliance designed to heat food by the use of microwave energy

2.25**normal load**

a load simulating normal usage. It consists of a suitable non-metallic vessel having a diameter of about 220 mm containing $1\,000 \pm 50$ ml of water at room temperature with the addition of 1 % by mass of sodium chloride in solution. It is placed at the centre of the load carrying surface provided by the manufacturer

2.26**conditions of adequate heat discharge**

the conditions that apply when the appliance is operating under normal conditions of use

2.27**rated operating time**

the operating time assigned to the appliance by the maker, or the maximum time permitted by the operation of a timer if fitted

2.28**continuous operation**

operation under normal load for an unlimited period

2.29**short-time operation**

operation under normal load for a specified period starting from cold, the intervals between each period of operation being sufficient to allow the appliance to cool down to room temperature

2.30**intermittent operation**

operation in a series of specified identical cycles, each cycle being composed of a period of operations under normal load followed by a rest period with the appliance running idle or switched off

2.31**non-detachable flexible cable or cord**

a flexible cable or cord which can only be removed from the appliance with the aid of a tool

2.32**non-detachable heating element (or part)**

a heating element (or part) which can only be removed with the aid of a tool

2.33**detachable heating element (or part)**

a heating element (or part) which can be removed without the aid of a tool

2.34**thermostat**

a device which is sensitive to temperature and serves to keep the temperature of an appliance or of parts of it between certain limits during normal operation by automatically opening and closing the circuit or by varying the current

2.35**temperature limiter**

the temperature sensing device the operating temperature of which may be either fixed or adjustable and which in normal use operates the opening or closing of a circuit when the temperature of an appliance or parts of it reaches a predetermined value. It does not make the reverse operation during the normal duty cycle of the appliance

2.36**thermal cut-out**

a device which during abnormal operation limits the temperature of an appliance or of parts of it, by automatically opening the circuit or by reducing the current, and which is so constructed that its setting cannot be altered by the user

2.37**self-resetting thermal cut-out**

a thermal cut-out which automatically restores the current after the relevant part of the appliance has cooled down sufficiently

2.38**non self-resetting thermal cut-out**

a thermal cut-out which requires resetting by hand or replacement of a part in order to restore the current

2.39**tool**

a screwdriver, a coin or any other object which may be used to operate a screw or similar fixing means

2.40**working voltage**

the maximum voltage to which the part under consideration is subjected when the appliance is operating at rated voltage under conditions of normal use or likely fault

NOTE An example of a likely fault is a failure of a pilot lamp, where, if there is a series resistor, the whole resistor is regarded as at the same potential.

2.41**creepage distance**

the shortest path between two conductive parts or between a conductive part and the bounding surface of the appliance measured along the surface of the insulation

2.42**clearance**

the shortest distance between two conductive parts or between a conductive part and the bounding surface of the appliance measured through air

NOTE The bounding surface of an insulation encased appliance or component is the outer surface of the enclosure considered as though metal foil were pressed into contact with accessible surfaces of insulating material.

2.43**user maintenance**

any maintenance operation for which details are given in the manufacturer's instructions for the user

2.44**stand-by**

the condition at which an appliance is maintained ready for immediate use

NOTE A period of time may be required to bring the appliance to this condition after switching on, and during this time the appliance is not normally capable of being operated during the period from switch-on to stand-by.

3 General requirement

3.1 Appliances shall be so designed and constructed that at in normal use they function reliably and cause no danger to persons or surroundings, even in the event of such careless use as may occur in normal service.

3.1.1 Test. Compliance shall be checked in general by carrying out all the relevant tests specified.

3.2 Notwithstanding the requirements specified in this standard, designs or constructions to which the tests specified do not fully apply but which give an equivalent degree of safety and durability of safety may be regarded as complying with the requirements of this standard, subject to the findings of a special investigation by the approving authority and pending the issue of an amendment or extension to this standard.

4 General conditions for the tests

4.1 Tests in accordance with this standard shall be type tests.

4.2 Unless otherwise specified the tests shall be made on a single sample as delivered which shall withstand all the relevant tests.

NOTE 1 If the appliance is designed for different supply voltages, etc., more than one sample may be needed for test purposes.

NOTE 2 If the tests described in 11.2 have to be made, three additional samples are needed for test purposes.

NOTE 3 If it is necessary to dismantle parts of the appliance which are of Class II construction for any of the tests described in clauses 11 to 19, one additional sample is needed for test purposes. The testing of components may necessitate the submission of additional samples of these components. When the submission of such samples is necessary, they should be submitted together with the appliance.

NOTE 4 If a heating element or an internally weak part ruptures during the tests described in clause 19 an additional sample is required.

NOTE 5 In order to test functional insulation and supplementary insulation of components which have Class II construction, separately, a sample having special facilities may be submitted.

4.3 Before testing is started it shall be verified that the appliance is in working order by carrying out the test in 32.2 and determining that microwave leakage does not exceed the permissible limit.

The tests shall then be conducted in the following order of the clauses:

32.2 to 32.4, 7 to 11, 13 to 17, 20 and 21, 18, 32.5 to 32.8, 19, 22 to 31, 32.9 to 32.11.

NOTE When preparing the sample for the various tests care is taken that the condition of the appliance is not so affected as to influence the results of the tests.

4.4 The tests shall be carried out with the appliance, or any movable part of it, placed in the most unfavourable position which may occur in normal use, unless otherwise specified.

4.5 If the test results are influenced by the temperature of the ambient air, the room temperature shall be maintained at 20 ± 5 °C. If, however, the temperature attained by any part is limited by a temperature sensitive device, or is influenced by the temperature at which a change of state occurs, for example the temperature of boiling water, the room temperature shall in case of doubt be maintained at 23 ± 2 °C.

NOTE If the temperatures measured are within 10 °C of the limits specified, the room temperature 23 ± 2 °C is used.

4.6 Appliances for a.c. only shall be tested with a.c., at rated frequency.

Appliances designed for more than one rated voltage shall be tested at the most unfavourable voltage and nature of supply.

Appliances designed for more than one rated voltage shall be tested at the most unfavourable voltage within the relevant ranges multiplied by the appropriate factor.

When it is specified that the supply voltage is equal to the rated voltage multiplied by a factor, the supply voltage for appliances marked with a rated voltage range shall be equal to

- a) the upper limit of the rated voltage range multiplied by this factor, if greater than 1;
- b) the lower limit of the rated range multiplied by this factor, if smaller than 1.

Appliances not marked with rated frequency shall be tested at 50 Hz.

Appliances marked with a rated frequency range shall be tested at 50 Hz provided that this frequency is within the range, otherwise they shall be tested at the most unfavourable frequency within the range.

NOTE 1 For appliances designed for one rated voltage range the upper limit of the range is usually the most unfavourable voltage within the range.

NOTE 2 If the appliance is designed for more than one rated voltage or rated voltage range it may be necessary to make some of the tests more than once in order to establish the most unfavourable voltage.

4.7 Appliances for which alternative accessories or heating elements are available shall be tested with those accessories or elements which give the most unfavourable results, provided that the accessories or the elements used are within the appliance manufacturer's specification.

4.8 If, in a combined appliance in normal use, the heating element cannot be operated unless the motor is running, the element shall be tested with the motor running. If the heating element can be operated without the motor running, the element shall be tested with or without the motor running, whichever is the more unfavourable. The motor and heater shall be fed from separate supplies, so enabling the prescribed voltage to be applied to each.

4.9 Appliances provided with a thermostat, a regulating device or a similar control shall be tested with these controls adjusted to their most unfavourable setting if the setting can be altered by the user.

NOTE 1 If the adjusting means of the control is accessible without the aid of a tool this subclause applies whether the setting can be altered by hand or with the aid of a tool.

NOTE 2 If the adjusting means is not accessible without the aid of a tool this subclause applies only if the setting can be altered by hand.

NOTE 3 Adequate sealing is regarded as preventing alteration of the setting by the user.

4.10 Where appropriate, appliances for building-in shall be installed in accordance with the manufacturer's instructions for installation as far as these are in accordance with normal installation conditions.

4.11 Appliances intended to be used with a non-detachable flexible cable or cord shall be tested with the flexible cable or cord connected to the appliance.

4.12 For motor-operated appliances, when the conditions of normal load are specified, the appliance shall be loaded according to these conditions irrespective of any marking of short-time or intermittent operation, unless it is evident from the design of the appliance that these conditions will not occur in normal use.

For heating appliances, when it is specified that the appliances shall be connected to a test voltage so that the input is greater than the rated input, the test voltage as defined in the relevant clauses applies only to heating elements without appreciable positive temperature coefficient of resistance. For other heating elements the test voltage shall be determined in the following manner.

The rated voltage shall be applied until the heating element reaches its operating temperature. The voltage shall then be rapidly increased to the value necessary to give the required test input and the tests shall be made as specified, this value of the voltage being maintained throughout.

The temperature coefficient is deemed to be appreciable if, at rated voltage, the input of the appliance in cold condition differs by more than 15 % from the input at operating temperature.

NOTE Marking of the input in cold condition is required only if the difference exceeds 25 %.

4.13 For the purposes of the tests described in clauses 8, 16, 25 and 27, parts separated from live parts by double insulation or reinforced insulation shall not be regarded as likely to become live in the event of an insulation fault; connection of accessible metal parts to an earthing terminal or earthing contact is not considered to give the required protection.

Inaccessible metal parts which are connected to an earthing terminal shall be treated as accessible metal parts.

For the purpose of the label specified in 7.14 the word "Live" refers only to the line. Throughout the remainder of the standard the word "live" refers to both line and neutral terminals and parts connected thereto.

4.14 If appliances have parts with double insulation or reinforced insulation, such parts shall be checked for compliance with the appropriate requirements specified for class II appliances.

Similarly, if an appliance has parts operating from a safety extra-low voltage supply such parts shall be checked for compliance with the appropriate requirements specified for class III appliances.

4.15 When it is specified that metal foil is in contact with accessible surfaces of insulating material, the foil shall be stretched across openings; for corners and the like it shall be pressed into the corner using the tip of test finger I specified in BS 3042.

4.16 Unless otherwise specified, accessible metal parts are those which can be touched by test finger I specified in BS 3042.

4.17 The high voltage transformer used for the tests of clauses **13**, **16** and **19** shall be capable of giving an output voltage variable between 500 V and the maximum given in Table 4. It shall be capable of maintaining an output voltage of 1 250 V when a current of 100 mA is passing. The over-current relay shall not trip when the output current is less than 100 mA. Care shall be taken that the r.m.s. value of the applied test voltage is measured within $\pm 3\%$ with a high impedance instrument.

5 Rating

5.1 The maximum rated voltage shall be 250 V for single phase, or 440 V for three-phase appliances, the maximum voltage between the supply lines and earth being 250 V.

The rated output frequency shall be $2\,450 \pm 50$ MHz.

5.1.1 Test. Compliance shall be checked by inspection.

6 Classification

Appliances shall be of Class I construction only.

7 Marking

7.1 Appliances shall be marked with the following.

- a) The words "microwave appliance".
 - b) The number of this British Standard, i.e. BS 5175.
- NOTE The mark BS 5175 on or in relation to the product is a claim by the manufacturer that the product complies with the requirements of the standard.
- c) Rated voltage(s), or rated voltage range(s) in volts.
 - d) Rated input frequency, or rated input frequency range in hertz or cycles per second, unless the appliance is designed for a.c. 50 Hz.
 - e) Rated input current in amperes for the microwave equipment and a rated input in kilowatts for any resistive heating elements incorporated in the oven.
 - f) Rated current of the appropriate fuse in amperes if the inrush current requires a fuse of greater rating than that appropriate to the marked input current. See **9.2**.
 - g) Maker's name or trade mark or name of responsible vendor.
 - h) Maker's model or type reference.
 - i) Rated operating time or rated operating time and rated resting time in hours, minutes or seconds if applicable.
 - j) Rated output frequency in megahertz.

NOTE 1 The rated input to be marked on the appliance is the total maximum input that can be on circuit at the same time; for example, if an appliance has alternative circuits which can be selected by a control device, the rated input is that corresponding to the highest loading possible.

NOTE 2 Additional markings may be used providing they do not give rise to misunderstanding.

7.1.1 Test. Compliance shall be checked by inspection.

7.2 The appliance shall, where applicable, be marked in accordance with **7.2.1**, **7.2.2** and **7.2.3**.

7.2.1 For any cover giving access to live parts at a voltage exceeding 250 V the following wording shall be marked on the cover or close to the cover securing screws:

"WARNING — HIGH VOLTAGE"

7.2.2 If access covers are likely to be removed by the user in order to make simple adjustments and if thereby live parts are rendered accessible, a permanent notice shall be fixed to the appliance stating the substance of the following:

"Remove plug or disconnect from the mains before removing covers"

7.2.3 Service access covers shall bear a permanent label stating the following if, after removal of the cover, the microwave leakage limits given in **32.1.1** are exceeded:

"WARNING — MICROWAVE ENERGY DO NOT REMOVE THIS COVER"

7.2.4 Warnings shall be permanently marked on the appliance in red and in capital letters not less than 3 mm high. The warnings shall be marked on the covers or panels such that they are readily visible before the panels or covers are removed. The markings shall not be incorporated with the markings prescribed in **7.1**.

7.2.5 Test. Compliance shall be checked by inspection.

7.3 Detachable heating elements shall be marked with the following.

- a) Rated voltage(s) or rated voltage range(s) in volts.
- b) Rated input in watts or kilowatts, if greater than 25 W.
- c) Maker's name or trade mark.
- d) Maker's model or type reference.

Non-detachable heating elements shall be similarly marked so far as space permits.

7.3.1 Test. Compliance shall be checked by inspection.

7.4 If the appliance can be adjusted to suit different rated voltages or different rated inputs, the voltage or input to which the appliance is adjusted shall be easily and clearly discernible.

7.4.1 Test. Compliance shall be checked by inspection.

NOTE For appliances where frequent changes in voltage setting are not required, this requirement is deemed to be met if the rated voltage or the rated input to which the appliance is adjusted can be determined from a wiring diagram fixed to the appliance; the wiring diagram may be on the inside of a cover which has to be removed to connect the supply conductors. This diagram may be on a card which is riveted to the cover, or on a paper or similar label secured to the cover by an adhesive, but not on a label loosely attached to the appliance.

7.5 For appliances or detachable heating elements marked with more than one rated voltage or rated voltage range, the rated input for each of these voltages or ranges shall be marked, if greater than 25 W.

For appliances or detachable heating elements marked with a voltage range, the upper and lower limits of the rated input shall be marked on the appliance or detachable heating element so that the relation between input and voltage appears distinctly, unless the difference between the limits of a rated voltage range does not exceed 10 % of the mean value of the range, in which case the marking for rated input may be related to the mean value of this range.

If the input of the appliance or detachable heating element in cold condition differs by more than 25 % from the input at operating temperature, the input in cold condition shall be marked in addition, and shall be placed in brackets after the marking of the input at operating temperature.

7.5.1 Test. Compliance shall be checked by inspection.

7.6 When symbols are used, they shall be as follows:

volts:	V
amperes:	A
hertz or cycles per second:	Hz
watts:	W
kilowatts:	kW
microfarads:	μF
litres:	l
kilograms:	kg
kilonewtons per square metre:	kN/m^2
hours:	h
minutes:	min
seconds:	s
alternating current:	~
three-phase four-wire:	3 N ~
rated current of the appropriate fuse:	 A

The symbol for nature of supply shall be placed next to the marking for rated voltage.

7.6.1 Test. Compliance shall be checked by inspection.

7.7 In appliances intended for connection to single-phase supplies the line terminal shall be indicated by the letter L; for appliances intended to be connected to three-phase supplies, the terminals shall be identified by the symbols L1, L2 and L3.

The neutral terminal shall be identified by the letter N. The earth terminal shall be indicated by the symbols $\perp$

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

7.7.1 Test. Compliance shall be checked by inspection.

7.8 Unless it is obviously unnecessary, switches shall be marked or placed so as to indicate clearly which component they control. Indications used for this purpose shall wherever practicable be comprehensible without a knowledge of languages, national standards, etc.

7.8.1 Test. Compliance shall be checked by inspection.

7.9 The different positions of regulating devices, and the different positions of switches on stationary appliances, shall be indicated by figures, letters or other visual means.

If figures are used for indicating the different positions, the OFF position shall be indicated by the Figure 0 or the word OFF and the position for a greater output, input, speed, cooling effect, etc., shall be indicated by a higher figure.

The figure 0 shall not be used for any other indication.

The position of the moving contacts of a switch shall correspond to the indications for the different positions of its operating means.

7.9.1 Test. Compliance shall be checked by inspection.

NOTE 1 The indications for the different positions of the operating means of a control device need not be placed on the device itself.

NOTE 2 Neon indicator lamps are regarded as other visual means provided that the indication is visible under normal daylight conditions. Tungsten lamps are not regarded as such.

7.10 Thermostats, regulating devices and the like, intended to be adjusted during installation or in normal use, shall be provided with an indication for the direction of adjustment to increase or to decrease the value of the characteristic being adjusted.

7.10.1 Test. Compliance shall be checked by inspection.

NOTE An indication of + and – is deemed to be sufficient.

7.11 If it is necessary to take special precautions when installing or using the appliance, details of these shall be given in printed instructions provided with the appliance. Where applicable the information detailed in **7.12**, **7.13**, **7.14**, **7.15** and **7.16** shall also be given in these instructions

User instructions for maintenance of the microwave cooking appliance shall be included in the manufacturer's instruction sheets. These instructions shall include the manufacturer's recommended method for cleaning door seals and door seal areas and instructions for inspecting these areas for damage, and a warning that if these areas are damaged the appliance should not be operated until it has been repaired by a service technician trained by the manufacturer.

Instruction sheets for microwave cooking appliances shall warn the user that it is dangerous for anyone other than a service technician trained by the manufacturer to perform repair service.

Instruction sheets for microwave cooking appliances with door viewing screens which are not protected by glass or plastics shall contain a warning that insertion of any object through the holes in the door screen should be avoided.

The instructions shall also include a warning that the appliance shall not be operated without food in the oven, operation in this manner being likely to damage the appliance.

7.11.1 Test. Compliance shall be checked by inspection.

NOTE Special precautions may, for example, be necessary for appliances for building-in, in order to ensure that after building-in the conditions necessary for safe operation are achieved. The instruction sheet for appliances for building-in should include clear information with regard to the following:

- a) dimensions of the space to be provided for the appliance;
- b) dimensions and position of the means for supporting and fixing the appliance within this space;
- c) minimum clearance between the various parts of the appliance and the surrounding parts of the fitment;
- d) minimum dimensions of ventilating openings and their correct arrangement;
- e) connection of the appliance to the supply and the interconnection of separate components, if any.

7.12 For a stationary appliance not provided with a doublepole switch, or not intended for connection through a plug or socket, the instructions supplied with the appliance shall include a note to the effect that a double-pole switch should be provided in the installation.

7.12.1 Test. Compliance shall be checked by inspection.

7.13 For all appliances the following information shall be given on a label attached to the end of the flexible cable or cord, if supplied with the appliance; otherwise the label shall be attached to or near the input terminals. For appliances other than those intended to be permanently connected to fixed wiring the information shall also be included in the user instructions.

“WARNING — THIS APPLIANCE MUST BE EARTHED”

7.13.1 Test. Compliance shall be checked by inspection.

7.14 For all appliances supplied with a flexible cable or cord having cores coloured green-and-yellow, brown and blue, a label shall be attached and shall state the following:

“IMPORTANT

The wires in this mains lead are coloured in accordance with the following code:

Green-and-yellow:	Earth
Blue:	Neutral
Brown:	Live'

In addition, the user instructions and label shall include the substance of the following:

“As the colours of the wires in the mains lead of this appliance may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows.

The wire which is coloured green-and-yellow must be connected to the terminal in the plug which is marked with the letter E or by the earth symbol or coloured green or green-and-yellow.

The wire which is coloured blue must be connected to the terminal which is marked with the letter N or coloured black.

The wire which is coloured brown must be connected to the terminal which is marked with the letter L or coloured red.”

NOTE 1 The label specified in **7.13** may be used for this purpose. A separate label is not required.

NOTE 2 For appliances intended for export, alternative labelling may be required.

7.14.1 Test. Compliance shall be checked by inspection.

7.15 If the appliance is provided with a flexible cord having conductors with a cross-sectional area of 0.5 mm^2 or less a label shall be attached to the end of the flexible cord stating the following:

“This appliance must be protected by a 3 A fuse if a 13 A (BS 1363) plug is used or, if any other type of plug is used, by a 5 A fuse either in the plug or adaptor or at the distribution board”

This information shall also be included in the user instructions.

NOTE The label specified in 7.13 or 7.14 may be used for this purpose. A separate label is not required.

7.15.1 Test. Compliance shall be checked by inspection.

7.16 For appliances with a rated input exceeding 13 A a label shall be attached to the flexible cord stating that the appliance must be connected to an outlet having a rated current greater than 13 A and that a 13 A BS 1363 plug is therefore not suitable.

NOTE The label specified in 7.13 or 7.14 may be used for this purpose. A separate label is not required.

7.16.1 Test. Compliance shall be checked by inspection.

7.17 Marking shall be easily legible and, except for nondetachable heating elements, durable.

Marking specified in 7.1, 7.2 and 7.4 shall be on a main part of the appliance.

Marking specified in 7.3 shall be on a main part of the element.

The marking of appliances shall be clearly discernible from the outside, if necessary after removal of a cover.

For fixed appliances this marking shall be visible after the appliance has been fixed as in normal use, if necessary after removal of a cover.

For stationary appliances the marking shall only be beneath a cover if it is near to the terminals for external conductors.

Marking on heating elements shall be clearly discernible when the element is removed from the appliance.

Marking on, and indication for, switches, thermostats, thermal cut-outs and other control devices shall be placed in the vicinity of these components; they shall not be placed on removable parts if these parts can be replaced in such a way that the marking will be misleading.

7.17.1 Test. Compliance shall be checked by inspection and by rubbing the marking by hand for 15 s with a piece of cloth soaked with water and again for 15 s with a piece of cloth soaked with petroleum spirit.

After all the tests of this standard, the marking shall be easily legible; it shall not be easily possible to remove marking plates and they shall show no curling.

NOTE In considering the durability of the marking, the effect of normal use is taken into account by the testing authority. Thus, for example, marking by means of paint on containers that are likely to be cleaned frequently is not deemed to be durable.

7.18 Instruction sheets shall be written in English and where symbols are used they shall be those indicated in this standard.

7.18.1 Test. Compliance shall be checked by inspection.

8 Protection against electric shock

8.1 Appliances shall be so constructed and enclosed that there is adequate protection against accidental contact with live parts with functional insulation and, for class II parts, with metal parts separated from live parts by functional insulation only.

This requirement shall apply for all positions of the appliance when it is wired and operated as in normal use, even after the removal of detachable parts and/or the opening of lids and doors, and those non-detachable parts that the user is instructed to remove for user maintenance.

This requirement does not apply:

- a) where functional insulation is accessible behind non-detachable parts that the user is instructed to remove the user maintenance or behind any detachable part marked with an instruction to unplug or disconnect the appliance from the mains before removal;
- b) to lamps behind a cover, if an appliance can be isolated from the supply by means of a plug and socket outlet or by means of a double-pole switch with an obvious indication of the OFF position.

If a part has to be removed or a cover opened during normal operation or user maintenance, that part or cover shall be regarded as a detachable part even if a tool has to be used for its removal.

NOTE As an example, cleaning of an air filter is considered as user maintenance.

The insulating properties of lacquer, enamel, paper, cotton oxide film on metal parts, beads and sealing compound shall not be relied upon to give the required protection against accidental contact with live parts.

For the purpose of this clause, parts connected to the output winding of a safety isolating transformer having a rated output voltage not exceeding 24 V are not considered to be live parts.

8.1.1 Test. Compliance shall be checked by inspection and, except for heating elements which glow visibly and parts supporting such elements, as mentioned below, by a test with test finger I specified in BS 3042. In addition apertures, other than those in metal parts connected to an earthing terminal or earthing contact, shall be tested with short test pin no. I specified in BS 3042. The test pin, however, shall not be applied to lamp caps or to contact tubes of socket outlets.

The tests shall be made during and after the removal of all detachable parts except that, where an appliance which can be isolated from the supply by means of a plug and socket outlet or a double-pole switch with an obvious indication of the OFF position has a lamp behind a cover such as a decorative cover or oven lamp lens removable without the use of a tool, the lamp shall not be removed. Non-detachable parts which the user is instructed to remove for user maintenance shall also be removed.

The test finger and the test pin shall be applied with the least force necessary, in every possible position, except that appliances normally used on the floor and having a mass exceeding 40 kg shall not be tilted.

Appliances for wall-mounting and appliances for building-in shall be tested before mounting or building-in.

Apertures preventing the entry of the finger shall be further tested by means of rigid test finger III specified in BS 3042, which shall be applied with a force of 30 N; if this finger enters, the test with test finger I specified in BS 3042 shall be repeated, the finger being pushed through the aperture, if necessary.

It shall not be possible to touch bare live parts or live parts protected only by lacquer, enamel, paper, cotton, oxide film, beads or sealing compound only, with test finger I specified in BS 3042. In addition it shall not be possible to touch functional insulation or, for class II parts, metal parts separated from live parts by functional insulation only, unless, when the appliance is fully assembled, such functional insulation is behind a non-detachable part that the user is instructed to remove for user maintenance or behind any detachable part marked with an instruction to unplug or disconnect the appliance from the mains before removal.

For Class II parts, it shall not be possible to touch, with short test pin no. 1 specified in BS 3042, bare live parts or live parts protected by lacquer, enamel, paper, cotton, oxide film, beads and sealing compound.

For heating elements which glow visibly in normal use and for parts supporting such elements, provided that it is obvious from the outside of the appliance, without removing covers and the like, that these parts are in contact with the element, the test shall be made with the test probe shown in Figure 10 of BS 3042:1971, instead of the test finger. The probe shall be applied as a dimensional gauge and care shall be taken not to distort the parts being checked. An electrical contact indicator shall be used to show contact.

Where components are movable the test with the test finger, pin or probe shall be made with each component in the most unfavourable position within the range of the adjustment.

NOTE 1 Self-hardening resins are not regarded as sealing compound.

NOTE 2 It is recommended that a lamp be used for the indication of contact and that the voltage be not less than 40 V.

NOTE 3 The fact that appliances for wall-mounting and appliances for building-in are tested before mounting or building-in does not imply that such appliances are completely enclosed for the tests; the functional insulation of wiring in appliances may give the required protection against electric shock, provided it is not accessible after installation of the appliance.

NOTE 4 For the purposes of this standard, components connected between the secondary side of an isolating transformer and an earthed chassis are not considered as live at the point of connection to the chassis.

8.2 Shafts of operating knobs, handles, levers and the like shall not be live.

8.2.1 Test. Compliance shall be checked by inspection.

8.3 Handles, levers and knobs which are held or actuated in normal use shall be either of insulating material or adequately covered by insulating material, if their shafts or fixings are likely to become live in the event of an insulation fault (see 4.13).

For stationary appliances this requirement does not apply, provided the shafts or fixings are either reliably connected to an earthing terminal or earthing contact or separated from live parts by earthed metal.

NOTE A metal shaft is considered to be earthed if the bearing through which it passes is bonded to the earthing terminal.

8.3.1 Test. Compliance shall be checked by inspection.

8.4 Appliances intended to be connected to the supply by means of a plug shall be so designed that in normal use there is no risk of electric shock at the plug pins from charged capacitors.

8.4.1 Test. Compliance shall be checked by the following test, which shall be made 10 times. The appliance shall be operated at rated voltage or at the upper limit of the rated voltage range.

The appliance switch, if any, shall then be moved to the OFF position and the appliance disconnected from the supply by means of the plug.

1 s after disconnection, the voltage between the pins of the plug shall be measured with an instrument which does not appreciably affect the value to be measured.

This voltage shall not exceed 34 V.

The test shall only be made if the capacitor exceeds 0.1 μF .

9 Starting

9.1 Appliances shall start under the supply voltage conditions which may occur in normal use.

Centrifugal and other automatic starting switches shall operate reliably and without chattering.

9.1.1 Test. Compliance shall be checked by operating the appliance, so loaded that the conditions for starting are the most unfavourable encountered in normal use, 10 times at a voltage equal to 0.9 times minimum rated voltage, regulating devices, if any, being set as in normal use.

Appliances provided with a centrifugal or other automatic starting switch shall, in addition, be operated 10 times at a voltage equal to 1.1 times maximum rated voltage.

9.2 The starting current of appliances shall not blow a quick-acting fuse with a rated current

- a) according to the marking, if the rated current of the appropriate fuse is marked on the appliance or on a label attached thereto, or
- b) equal to the rated current of the appliance, with a minimum of 13 A, if the rated current of the appropriate fuse is not marked on the appliance or on a label.

9.2.1 Test. Compliance shall be checked by the following test. The appliance shall be connected in series with a silver wire, having a length of 85 mm and a diameter as shown in Table 1.

Table 1 — Diameter of silver wire

Rated current of fuse	Diameter of silver wire
A	mm
3	0.15
13	0.34
20	0.46
25	0.53

The wire shall have a silver content not less than 99.9 % and shall be stretched horizontally along the centre line of a box with inside dimensions of 80 mm × 80 mm × 150 mm. The appliance shall be so loaded that the conditions for starting are the most unfavourable encountered in normal use.

Heating elements incorporated in the appliance shall be operated, but shall not be connected to a separate supply. The appliance shall then be started 10 times at a voltage equal to 0.9 times minimum rated voltage and 10 times at a voltage equal to 1.1 times maximum rated voltage. The interval between consecutive starts shall be made sufficiently long to prevent undue heating, but not less than 5 min.

During the test the silver wire shall not melt, nor shall any overload protection device operate.

The supply source shall be such that there is no significant drop in voltage during the test.

10 Electrical input and electrical output

10.1 The input current of the microwave equipment at rated voltage and at normal operating temperature shall not differ from the rated input current by more than + 15 %.

The input of heating elements where fitted shall not differ from the rated input by more than + 5 % or – 10 % or 10 W, whichever is the greater.

10.1.1 Test. Compliance shall be checked by measuring the input of the microwave equipment and heating element operated at rated voltage in accordance with the conditions of adequate heat discharge and/or normal load when the input has stabilized.

If the load varies, the input current shall be taken as the mean value of the input current occurring during a representative period.

10.2 If the heating element has a marking for the input in cold condition, this shall not differ by more than 20 % from the marked value.

10.2.1 Test. Compliance shall be checked by inspection and by measurement.

NOTE For appliances and heating elements marked with one or more rated voltage ranges, the tests described in **10.1.1** and **10.2.1** are made at both the upper and lower limits of the ranges unless the marking of the rated input is related to the mean value of the relevant voltage range, in which case the tests are made at a voltage equal to the mean value of that range.

10.3 The output frequency shall be $2\,450 \pm 50$ MHz.

10.3.1 Test. Compliance shall be checked by measurement.

11 Heating

11.1 Appliances and their surroundings shall not attain excessive temperatures in normal use.

11.1.1 Test. Compliance shall be checked by determining the temperature rise of the various parts under the following conditions.

Appliances for building-in shall be built-in as in normal use, dull black painted plywood walls, about 20 mm thick, being used.

The oven shall be placed in its normal operating position in a right angled test corner consisting of two dull black painted plywood walls 20 mm thick and shall be placed on a dull black painted plywood floor 20 mm thick as near to the walls as possible.

If for any reason the appliance does not perform properly, the test shall be repeated with the appliance withdrawn sufficiently far from the wall as will enable it to function in accordance with the manufacturer's intention.

NOTE Microwave ovens may be designed as free-standing appliances with the result that if the appliance is pushed up against a wall a thermal cut-out may operate as a result of restriction of the air intake. In such cases operation of the thermal cut-out is not regarded as a failure to comply with the requirements of this clause, provided that the manufacturer's instructions state the minimum working distance from the wall and that the temperatures when the appliance is pushed close against the wall at no time exceed the limits specified in this clause.

Temperature rises of windings shall be determined by the resistance method, other temperature rises shall be determined by means of fine wire thermocouples so chosen and positioned that they have the minimum effect on the temperature of the part under test.

Thermocouples used for determining the temperature rise of the surface of walls, ceiling and floor shall be attached to the back of small blackened discs of copper or brass 15 mm in diameter and 1 mm thick which are flush with the surface.

So far as is possible the appliance shall be positioned so that parts likely to attain the highest temperatures touch the discs.

In determining the temperature rises of handles, knobs and the like, the test authority shall give consideration to all parts which are gripped in normal use and if of insulating material to parts in contact with hot metal.

The temperature rise of electrical insulation other than that of windings shall be determined on the surface of the insulation at places where failure could cause a short circuit, contact between live parts and accessible metal parts, bridging of insulation or reduction of creepage distances and clearances below the values specified in **28.1**.

The microwave equipment shall be operated under normal load and at the most unfavourable voltage as determined by the testing authority between 0.94 times minimum rated voltage and 1.06 times maximum rated voltage.

Conventional heating elements shall be operated from a separate supply, the supply voltage being such that the input is 1.15 times maximum rated input of the heating elements.

The appliance shall be operated with the normal load in position on consecutive cycles of operation until a total operating time of 90 min has been reached. However, the last cycle of operation shall be completed.

One cycle of operation is equal to the time necessary to bring the normal load to the boil. If the maximum timer setting is not sufficient for this purpose, the timer shall be restarted as soon as possible. If the cycle is terminated by a temperature limiter, a rest period shall be allowed for the temperature limiter to reset (or be reset, if manual) and the test shall be continued as soon as possible.

A rest period of 1 min shall be inserted between each cycle of operation, during which time the normal load shall be replaced, the door remaining open during this period. For each cycle of operation the initial load temperature shall be $20 \pm 2^\circ\text{C}$.

Heating elements, if any, shall be operated simultaneously with microwave generation. If these elements cannot be operated simultaneously they shall be operated in accordance with the manufacturer's instructions. Heating elements which remain switched on during the rest period shall not be switched off when the door is opened.

Microwave ovens which incorporate a standby facility shall be operated under standby conditions until steady temperatures are obtained prior to the commencement of the test.

During the test thermal cut-outs shall not operate, the temperature rises shall not exceed the values shown in Table 2 and sealing compound, if any, shall not flow.

The measurements specified in clause **13** shall be made at the end of this test.

NOTE The point of separation of the cores of a multi-core cable or cord and where insulated wires enter lampholders are examples of places where thermocouples are positioned.

11.2 The tests of **11.2.1** to **11.2.5** shall be made on three additional samples if

- a) the temperature of the winding exceeds the value specified for the test described in **11.1.1**, or
- b) the temperature rise exceeds 75°C and the testing authority is doubtful as to the classification of the winding insulation.

11.2.1 Test. The temperature rise of the windings and core laminations shall be determined by the test described in **11.1.1**.

11.2.2 Test. The samples shall then be dismantled as far as is possible without damaging any part. Windings and core laminations shall be kept for 10 days (240 h) in a heating cabinet the temperature of which is $(80 + \Delta t) \pm 1^\circ\text{C}$ where Δt is the temperature rise measured during the test described in **11.2.1**.

11.2.3 Test. After this treatment the samples shall be reassembled and the temperature rise of the windings and core laminations shall be determined again. This temperature rise shall not exceed the value determined according to **11.2.1** by more than 10 %.