



BS 3456 : Part 102 : Section 102.25 : 1988

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British Standard Specification for
**Safety of household and
similar electrical appliances**

Part 102. Particular requirements

Section 102.25 Appliances for heating
food by means of microwave energy

(Implementation of CENELEC HD 270 S1)

Sécurité des appareils électrodomestiques et analogues
Partie 102. Règles particulières
Section 102.25 Appareils de cuisson à micro-ondes

Sicherheit von Elektrogeräten für den Haushalt und ähnliche Zwecke
Teil 102. Besondere Anforderungen
Abschnitt 102.25 Mikrowellengeräte zur Erwärmung von Lebensmitteln

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Foreword

This Section of BS 3456 : Part 102 has been prepared under the direction of the Light Electrical Engineering Standards Committee. It is aligned with the CENELEC * Harmonization Document for appliances for heating food by means of microwave energy, HD 270 S1, which in turn is based on IEC † Publication 335-25 (1976 — First edition). Its number is directly related to the number of the equivalent Section of the IEC publication.

It is a revision of BS 3456 : Section 2.33 : 1976 which is withdrawn in accordance with the CENELEC Internal Regulations.

It gives the particular requirements for appliances for heating food by means of microwave energy and is to be read in conjunction with BS 3456 : Part 101 : 1987 'General requirements' which it supplements or modifies. The many references to Part 1 should be read as references to BS 3456 : Part 101 which is the implementation of the CENELEC Harmonization Document for the general requirements, HD 251 S3. In the original IEC text of the particular requirements the precise line numbers in the IEC Part 1 are given. The lines in Part 101 of BS 3456 are not numbered but sufficient information has been included in these particular requirements for the relevant matter in Part 101 to be identified. For ease of production the text of the IEC standard has been used, but it has been modified as described below.

The CENELEC modifications that appear in HD 270 S1 have been included in the text in the appropriate position and are indicated by a single side line in the margin of the page. References are included to items of the original IEC text which are given in appendix X together with the justifications in the CENELEC Harmonization Document for the modifications.

The United Kingdom deviations are included in the text of the standard and are indicated by a double side line in the margin of the page. In the event of any conflict between the requirements in the Harmonization Document and the requirement in the United Kingdom deviation, the requirement in the United Kingdom deviation takes precedence and users of this British Standard should operate to the United Kingdom deviation.

A complete list of all national deviations to the CENELEC Harmonization Document is given in appendix Y.

In this British Standard the following print types are used to differentiate between requirements, test specifications and explanatory matter.

Requirements: in roman type.

Test specifications: in italic type.

Explanatory matter: in small roman type.

The CENELEC Harmonization Document was approved by the CENELEC Technical Board on 9 December 1981.

Cross-references

International standards	Corresponding British Standards
HD 195 S3 (Clause 14)	BS 415 : 1979 Specification for safety requirements for mains-operated electronic and related apparatus for household and similar general use (Clause 14 technically equivalent)
IEC 335-1 : 1976 } HD 251 S3 : 1982 }	BS 3456 Specification for safety of household and similar electrical appliances Part 101 : 1987 General requirements (Technically equivalent)
IEC 335-6 : 1971	Section 2.1 : 1972 Cooking ranges, cooking tables and similar appliances (Technically equivalent)
CEE Publication 15 : 1964	BS 3535 : 1962 Specification for safety isolating transformers for industrial and domestic purposes (Technically equivalent)

Product approval. Attention is drawn to the fact that products conforming to this British Standard may be approved by the British Electrotechnical Approvals Board for the purposes of participation in the CENELEC Certification Agreement and in the CB Scheme of the IECEE. (Details of the BEAB approval mark scheme are given on the inside back cover.)

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

* CENELEC = European Committee for Electrotechnical Standardization.

† IEC = International Electrotechnical Commission.

British Standard Specification for

Safety of household and similar electrical appliances

Part 102. Particular requirements

Section 102.25 Appliances for heating food by means of microwave energy

NOTE. For information see X.1.

1. Scope

This clause of Part 1 applies except as follows:

1.1 Replacement:

This standard is applicable to appliances for heating food by means of microwave energy using electromagnetic energy in one or more of the I.S.M. bands above 300 MHz to heat food. These ovens are adapted to the household environment and may also use thermal cooking means as employed in conventional cooking ranges and ovens intended for household use.

Combination microwave cooking appliances and microwave cooking appliances provided with additional means for browning accomplished by radiant heating means shall also comply with the relevant clauses of IEC Publication 335-6, Part 2: Particular Requirements for Ranges.

Unless otherwise specified, the input power comes from the supply source to the oven at a line-to-line voltage of 430 V or less, and for a line-to-neutral voltage of 250 V or less and a supply frequency of 50 Hz or 60 Hz.

The forms of appliances for heating food by means of microwave energy include portable, stationary, stationary-combination, built-in and built-in-combination.

NOTE. Throughout this British Standard the term 'microwave cooking appliances' should be understood to include microwave appliances for the reheating of frozen food.

NOTE. For information see X.1.

2. Definitions

This clause of Part 1 applies except as follows:

2.2.4 Replacement:

The rated input is the sum of the rated inputs of all the individual units in the appliance which can be on at one time under the conditions of maximum total input.

For the purpose of calculating the size of terminals and cables, a diversity factor of 0.75 is allowed on current as calculated from the rated input and the rated voltage if there are more than three heating units.

2.2.24 Replacement:

NOTE. For information see X.4.

Portable microwave cooking appliance denotes an appliance weighing 18 kg or less or an appliance which is equipped with wheels with the intention of providing means for moving the appliance from one place to another and which provides microwave heating in a cavity with or without an additional browning function accomplished by other heating means.

2.2.26 Replacement:

NOTE. For information see X.5.

Stationary microwave cooking appliance denotes an appliance weighing over 18 kg and without wheels, and which provides microwave heating in a cavity with or without an additional browning function accomplished by other heating means.

2.2.29 Replacement:

Conditions of adequate heat discharge denote that the microwave cooking appliance is operated under the following conditions:

- Microwave cooking appliances are operated at all microwave power levels provided with a water load of $1\,000 \pm 50\text{ cm}^3$ in a vessel transparent to microwave energy having a diameter of about 22 cm placed in the centre of the load-carrying surface provided by the manufacturer. The water shall contain approximately 1 % NaCl.

NOTE. For information see X.7.

- If a combination microwave cooking appliance is designed for simultaneous microwave and conventional cooking, it is operated in this manner, with the water load described above and with the conventional cooking parts operated in accordance with the manufacturer's recommendations and the relevant particular requirements of Part 2.

Additional definitions:

2.2.101

Cavity denotes the space enclosed by inner walls and door into which food is placed to be heated or cooked by microwave energy.

2.2.102

Elastomers denote a class of flexible rubber or plastic polymerized compounds used at door seal systems to reduce microwave energy leakage.

2.2.103

Microwave enclosure denotes inner oven walls, door, waveguide and radiation shielding around magnetron filament connections.

2.2.104

Interlock denotes a mechanical or electrical safety device or system, the function of which is to prohibit one class of events if another class of conditions does not exist; e.g. an interlock prohibits the operation of a microwave generator if the door to the cavity is not closed.

2.2.105

I.S.M. band denotes that portion of the frequency spectrum assigned by governmental agencies or established by international treaty for industrial, scientific and medical purposes.

These frequencies are used in microwave heating.

2.2.106

Microwave leakage denotes microwave energy escaping from any part of the enclosure.

2.2.107

Magnetron denotes the type of microwave generator usually used in microwave cooking appliances.

2.2.108

Microwave denotes an electromagnetic wave of frequency between 300 MHz and 30 000 MHz.

2.2.109

Microwave oven denotes a microwave cooking appliance designed to heat food by the use of microwave energy.

2.2.110

Cover denotes a removable metal piece covering an opening designed into the appliance.

2.2.111

Spurious frequency denotes any frequency other than fundamental or harmonic.

2.2.112

Stirrer denotes a moving propeller-like element used in microwave cooking appliances to diffuse the microwave energy throughout the cavity.

2.2.113

Transparent denotes the property of a structure or substance that allows it to transmit microwave energy with negligible absorption or reflection.

2.2.114

Waveguide denotes a metal tube or duct for directing microwave energy.

2.2.115

Usable oven space definition is under consideration.

2.2.116

NOTE. For information see X.7.

Combination microwave cooking appliance denotes an appliance which combines some or all of the thermal heating functions of conventional cooking ranges and ovens with microwave heating in a cavity with or without an additional browning function accomplished by other heating means.

In addition to meeting the requirements of this standard, combination microwave cooking appliances must meet the requirements of IEC Publication 335-6.

3. General requirement

This clause of Part 1 applies.

4. General notes on tests

This clause of Part 1 applies except as follows:

4.3 *Replacement:*

NOTE. For information see X.8.

Before testing is started, it shall be verified that the microwave cooking appliance is in acceptable working order by carrying out the test of Sub-clause 32.2 and determining that the microwave leakage does not exceed the allowable limit.

The tests are then to 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.

5. Rating

This clause of Part 1 applies.

6. Classification

This clause of Part 1 applies.

See Sub-clause 22.1.

NOTE. For information see X.9.

7. Marking

This clause of Part 1 applies except as follows:

7.1 Items (c) and (d)

Replacement

- rated input frequency or rated input frequency range, in hertz, unless the appliance is designed for d.c. only or for a.c. of both 50 Hz and 60 Hz;
- rated input, in watts or kilowatts, of the conventional heating function;
- rated input, in watts or kilowatts, of the microwave heating function;

NOTE. For information see X.10.

7.1 *Addition*

The appliance shall in addition be marked with the output frequency in megahertz.

NOTE. For information see Y.B.2.

7.5 Addition

For conventional heating elements, the rated input shall be indicated on each heating element and on the rating plate of the appliance.

NOTE. For information see X.11.

7.12 Addition:

Service instructions for microwave cooking appliances shall clearly identify all parts subject to removal for servicing which expose the serviceman to potentials above 250 V to earth and/or microwave leakage above the level specified in Sub-clause 32.1.1.

Service instructions for microwave cooking appliances shall contain the following or equivalent clearly legible text:

CAUTION
MICROWAVE RADIATION

PERSONNEL SHOULD NOT BE EXPOSED TO THE MICROWAVE ENERGY WHICH MAY RADIATE FROM THE MAGNETRON OR OTHER MICROWAVE GENERATING DEVICE IF IT IS IMPROPERLY USED OR CONNECTED. ALL INPUT AND OUTPUT MICROWAVE CONNECTIONS, WAVEGUIDES, FLANGES AND GASKETS MUST BE SECURE. NEVER OPERATE THE DEVICE WITHOUT A MICROWAVE ENERGY ABSORBING LOAD ATTACHED. NEVER LOOK INTO AN OPEN WAVEGUIDE OR ANTENNA WHILE THE DEVICE IS ENERGIZED.

7.13 Addition:

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 area 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 plastic shall contain a warning that insertion of any object through the holes in the door screen should be avoided.

Additional Sub-clause:

7.101

The microwave cooking appliance shall be marked with the following or equivalent wording in clearly legible lettering at least 3 mm high in an area that is visible when removing cover(s) if the removal of the cover(s) will allow a microwave leakage exceeding the value specified in Sub-clause 32.1.1:

WARNING
MICROWAVE ENERGY
DO NOT REMOVE THIS COVER

8. Protection against electric shock

This clause of Part 1 applies except as follows:

8.1 Addition:

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.

9. Starting of motor-operated appliances

This clause of Part 1 applies.

10. Input and current

This clause of Part 1 applies except as follows:

10.1 Addition:

For the purpose of this test, the microwave cooking appliance is considered to be a motor-operated appliance.

Individually-marked conventional heating elements shall comply with the tolerances specified for heating appliances.

11. Heating

This clause of Part 1 applies except as follows:

11.2 Addition:

For the purpose of this test, the microwave cooking appliance is considered to be a heating appliance and is placed in the specified test corner for conducting heating tests.

11.4 Addition:

If the microwave cooking appliance incorporates a "stand by" facility, it is operated under these conditions for a sufficient period of time to enable a steady condition to be established before the beginning of the heating test.

Amendment

For microwave cooking appliances, the supply voltage shall be the same as for motor-operated appliances. This also applies to microwave cooking appliances with additional means for browning accomplished by other heating means.

11.7 Replacement:

NOTE. For information see X.12.

Microwave cooking appliances are operated in consecutive cycles of operation, under conditions of adequate heat discharge, until a total minimum operating time of 90 min (exclusive of rest periods) has been reached. The last cycle of operation must be completed.

One cycle of operation is considered to be equal to the time necessary to bring the water load specified in Sub-clause 2.2.29 from an initial water temperature of $20 \pm 2^{\circ}\text{C}$ to a full boil. If the maximum timer setting is not sufficient for this purpose, the timer is to be restarted at once. If the cycle is terminated by the temperature limiter, a rest period is allowed for the temperature limiter to reset (or if manual, be reset as soon as possible) and the test is continued.

Each cycle as defined above is followed by a 1 min rest period during which the water load is replaced, the door remaining open during this period.

Conventional parts are operated simultaneously, if possible, according to the relevant clauses of IEC Publication 335-6. Heating elements in the microwave cavity which remain switched on during the resting period are not switched off when the door is opened.

If the water load is not observable during this test, a preliminary test shall be made to determine the approximate time required to bring the water to a boil.

Appliances without conventional heating elements are operated in accordance with conditions of adequate heat discharge for six consecutive cycles, each cycle comprising a period of operation of 15 min and a rest period of 1 min. During each rest period, the water load is replaced and the door remains open.

If a timer is provided which permits a maximum period of operation less than 15 min, the timer is immediately restarted.

NOTE. For information see Y.B.3.

Appliances incorporating conventional heating elements are operated as described for appliances without such heating elements, the conventional heating elements being energized for the last two cycles.

If the design of the appliance does not allow simultaneous operation with microwave heating and conventional heating, the microwave heating is limited to four cycles, which are followed by two cycles of conventional heating.

If the design of the appliance is such that operation of the conventional heating elements is limited to less than 15 min, the last two cycles are made for the maximum period possible. Appliances incorporating automatic programme controllers permitting sequential operation with microwave heating and conventional heating, are operated with the most unfavourable programme that the user can select in accordance with the manufacturer's instructions. The test is interrupted every 15 min to replace the water load. The door remains open for 1 min each time the water load is replaced. The duration of the test is 90 min or the maximum time permitted by the timer, whichever is the longer period.

Conventional ovens incorporating microwave facilities are operated in accordance with Sub-clause 11.7 of IEC Publication 335-6, with a water load sufficient to ensure that evaporation does not reduce the load below 1 litre during a test period. The microwave facility is operated, from the moment the oven thermostat operates for the first time, for the maximum period specified in IEC Publication 335-6.

Combination appliances operated in more than one mode are tested in accordance with the requirements that will give the most unfavourable results.

NOTE. For information see Y.B.4.

12. Operation under overload conditions

This clause of Part 1 does not apply.

13. Electrical insulation at operating temperature, leakage current (hot)

This clause of Part 1 applies except as follows:

13.2 *Addition:*

In no case shall the leakage current exceed the following values:

For Class I stationary appliances	5 mA or 1 mA per kW rated input for each element, whichever is greater, with a maximum 10 mA for the appliance as a whole
with heating elements which are detachable or can be switched off separately	
For other Class I stationary appliances	5 mA or 1 mA per kW rated input, whichever is greater, with a maximum 10 mA for the appliance as a whole
For Class I portable appliances	0.75 mA

*Supplement**Deleted*

NOTE. For information see X.13.

13.3 This sub-clause of Part 1 does not apply.

14. **Radio interference suppression**

This clause of Part 1 applies.

15. **Moisture resistance**

This clause of Part 1 applies except as follows:

15.3 Paragraph 4.

Replacement:

NOTE. For information see X.14.

Microwave cooking appliances are subjected to the following spillage test:

A quantity of salt water solution, equal to approximately 0.5 l and containing approximately 1% NaCl, is poured over the bottom surface of the cooking cavity.

For appliances provided with a tray or other receptacle for collecting spilled liquid, the capacity of the receptacle is measured and the spillage test is made by pouring a quantity of the salt water solution equal to the capacity of the receptacle plus approximately 0.5 l in the receptacle, causing it to overflow.

16. Insulation resistance, leakage current (cold) and electric strength

This clause of Part 1 applies except as follows:

16.1 Addition:

Additional sub-clauses:

Microwave cooking appliances are tested in accordance with the provisions for motor-operated appliances except that browning elements or conventional heating elements incorporated in the appliance are tested in accordance with the provisions for heating appliances.

16.101 Additional sub-clauses:

Parts of secondary circuits of a microwave cooking appliance—except secondary windings of power transformers which are connected to earth on one side—are subjected for 1 min to the application of a test voltage: 1) between primary and secondary circuits; 2) between secondary circuits and the body with all chassis-connected components disconnected at the chassis. The value of the test voltage is in accordance with the maximum steady state voltage in the circuit as follows:

<i>250 V or less</i>	<i>test voltages in Part 1 apply</i>
<i>greater than 250 V</i>	<i>twice the maximum voltage + 750 V</i>

Flashover will not be considered a failure if it occurs in a properly designed spark gap or other protective device if such flashover does not constitute a fire or shock hazard, and providing the breakdown voltage is not less than 150% of the measured switching transient voltage. It is normal to remove the microwave generator tube during breakdown tests. The secondary circuit voltages shall be measured with meters having a maximum impedance of 30 MΩ. A direct current source is to be used for a direct current circuit. A sinusoidal voltage is to be used for testing alternating current circuits. In a circuit which has a composite (a.c. + d.c.) peak potential, a sinusoidal equivalent potential shall be used which has a peak value equal to the composite peak potential.

Care should be taken that no insulation be subjected to a higher test voltage than is required, based upon the actual working voltage.

16.102

The secondary windings of power transformers which have been connected to earth on one side shall have adequate insulation.

Compliance is checked by the following test:

An alternating voltage is applied to the terminals of the input winding of the transformer, the voltage being, as nearly as possible, of sine-wave form and of a frequency suitably increased above the rated frequency so as to avoid excessive excitation current during the test. The value of the induced test voltage in the high-voltage winding is equal to twice the voltage occurring in normal use.

The test is started at a voltage not greater than one-third of the test value, which is increased to the appropriate value as rapidly as is consistent with its exact magnitude indicated by the measuring instrument connected to the high-voltage windings.

At the end of the test, the voltage is reduced rapidly to less than one-third of its full value before switching off.

The duration of the test is 60 s for any test frequency up to and including twice the rated frequency.

When the test frequency exceeds a value of twice the rated frequency, the duration of the test, in seconds, shall be 120 times the rated frequency divided by the test frequency, or 15 s, whichever is the greater. During the test, no breakdown or flashover shall occur between turns in the same winding or between windings, including the primary and secondary.