इंटरनेट मानक

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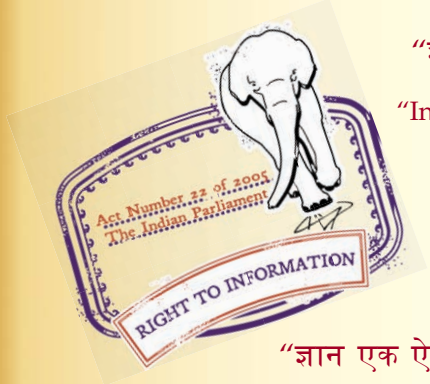
Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

"जानने का अधिकार, जीने का अधिकार"
Mazdoor Kisan Shakti Sangathan
"The Right to Information, The Right to Live"

"पुराने को छोड नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS 302-2-25 (1994): Safety of household and similar electrical appliances, Part 2: Particular requirements: Section 25 Microwave ovens [ETD 32: Electrical Appliances]



"ज्ञान से एक नये भारत का निर्माण"
Satyanarayan Gangaram Pitroda
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"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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IS 302-2-25 : 1994
(Reaffirmed 2004)

भारतीय मानक

घरेलू और समान विद्युत साधित्रों की सुरक्षा

भाग 2 विवरणात्मक अपेक्षाएं

अनुभाग 25 सूक्ष्म तरंग — अवन

Indian Standard

SAFETY OF HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES

PART 2 PARTICULAR REQUIREMENTS

Section 25 Microwave Ovens

UDC 641·539

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

June 1994

Price Group 8

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Electrical Appliances Sectional Committee had been approved by the Electrotechnical Division Council.

This standard specifies general and the safety requirements. The composite standard specifying the requirement of safety and performance requirements are covered under IS 11676-1986 Specification of microwave ovens for household and similar purposes.

This standard is to be read in conjunction with IS 302-1 (1979) 'Safety of household and similar electrical appliances : Part 1 General requirement'. For the sake of convenience, the clauses of this standard correspond to those of IS 302-1 (1979) instead of reproducing full text of each clause, clauses of IS 302-1 (1979) which are applicable (which means that relevant provisions of the clause apply) or not applicable and the subclause or portions thereof which are not applicable are indicated as under:

a) In the case of a clause where it is applicable or not applicable, the wording used is 'This clause of IS 302-1 (1979) is applicable/not applicable'.

b) In case of a subclause or part thereof 'not applicable' wherever a subclause of IS 302-1 (1979) is to be replaced by a new text it has been indicated as under:

'Replacement' — followed by the new text.

Any addition to the existing provisions of a subclause of IS 302-1 (1979) has been indicated as under:

'Addition' — followed by the text of the additional matter.

Clauses/tables which are additional to those of IS 302-1 (1979) are numbered starting from 101 and additional subclauses are numbered with the main clause number followed by 101,102, etc, for exemple **2.101.**

Should however any deviations exist between IS 302-1 (1979) and this standard, the provisions of the latter shall apply.

While preparing this standard assistance has been derived from IEC Publication 335-2-25 (1988) 'Safety of household and similar electrical appliances : Part 2 Particular requirements for microwave oven' and IEC Publication 335-1 (1976) 'Safety of household and similar electrical appliances'.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

The Indian Standards which are necessary adjuncts to this standard are given in Annex BB.

AMENDMENT NO. 1 APRIL 2002
TO
IS 302-2-25 : 1994 SAFETY OF HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES

PART 2 PARTICULAR REQUIREMENTS

Section 25 Microwave Ovens

(*Page* 14, *clause* **101.1**, *lines* 2 *and* 3) — Substitute 'a sample' *for* 'two samples of the same type and rating'.

(*Page* 14, *clause* **101.1.1**, *line* 1) - Substitute 'Sample' *for* 'Both samples'.

(ETD 32)

Reprography unit, BIS, New Delhi, India

Indian Standard

SAFETY OF HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES

PART 2 PARTICULAR REQUIREMENTS

Section 25 Microwave Ovens

1 SCOPE

This clause of IS 302-1 (1979) is applicable except as follows:

1.1 Replacement

This standard covers the general and safety requirements of appliances for heating food and beverages using microwaves with or without additional forms of heating. The microwave oven should be operating at a voltage not exceeding 250 V ac, single phase 50 Hz and under *ISM bands of (915 $\pm$ 50) MHz or (2 450 $\pm$ 50) MHz.

*ISM frequency bands are electromagnetic frequencies established by International Treaty for Industrial, Scientific and Medical Purposes.

For the microwave oven with browning function IS 4159 : 1983 'Specification for mineral filled sheathed heating elements' is also applicable.

This standard does not take into account the special hazards which exist in nurseries and other places where there are young children or aged or infirm persons without supervision, in such cases additional requirement may be necessary.

1.2 Replacement

This standard does not apply to:

a) appliances designed exclusively for industrial purposes;

b) appliances intended to be used in locations where special conditions prevail, such as the presence of corrosive or explosive atmosphere (dust, vapour or gas); and

c) appliances for medical purposes.

1.101 Additional Subclause

Until a separate standard is formulated, microwave ovens for commercial purposes are also bound by this standard.

2 TERMINOLOGY

This clause of IS 302-1 (1979) is applicable except as follows.

2.6 Replacement

Rated frequency refers to input frequency.

2.30 Replacement

Normal load denotes that the appliance is operated with a potable water load of initially (1 000 $\pm$ 50) g in a cylindrical borosilicate glass vessel having a maximum material thickness of 3 mm and an outside diameter of approximately 190 mm. The load is placed at the centre of the shelf. The initial temperature of the water is 27 $\pm$ 2°C.

Additional Subclauses

2.101 Microwave oven denotes an appliance designed to use microwave energy for heating food and beverages in a cavity. Examples of heating are defrosting, warming and cooking.

2.102 Combination microwave oven denotes an appliance which combines some or all of the thermal heating functions of conventional ovens with microwave heating in a cavity. Microwave ovens incorporating browning function only are not considered to be combination microwave ovens.

2.103 Cavity denotes the space enclosed by the inner walls and door and into which food and beverages are placed.

2.104 Microwave enclosures denote a structure intended to effectively confine the microwave energy to a defined region.

Examples are the cavity, door seals and waveguides.

2.105 Shelf denote a horizontal support in the cavity on which the load is placed.

2.106 A browning function denotes a process which supplements microwave cooking by means of radiant heating elements.

2.107 Magnetron denotes a type of vaccum tube used to generate microwaves.

2.108 Stirrer denotes a device which changes the microwave relationship between the load in the cavity and the microwave generator by mechanical, electrical or magnetic means.

Examples of such devices are a rotating shelf, a moving secondary antenna or a metal propeller.

2.109 Microwave transparency denotes the property of a material having negligible absorption and reflection of microwaves.

The relative permittivity of a microwave transparent material is less than 7 and the loss factor is less 0·015.

2.110 Interlock denotes a safety device or system, which prevents a particular situation unless specified conditions exist.

An example of an interlock is a switch which prevents the operation of the magnetron unless the cavity door is closed.

2.111 Primary door safety interlock denotes an interlock provided with a supervision device which in case of failure of the interlock prevents further operation of microwave oven until the interlock is repaired or replaced.

2.112 Temperature sensing probe : Device which is inserted into the food to measure temperature and which is the detachable component of a control incorporated in a microwave oven.

2.113 Steaming function : Process which supplements microwave cooking by steam which is generated at approximately atmospheric pressure.

3 GENERAL REQUIREMENTS

3.1 Replacement

This clause of IS 302-1 (1979) is applicable except as follows:

In general, compliance is checked by carrying out the relevant tests as specified in **4.3** of this standard.

4 GENERAL NOTES ON TESTS

This clause of IS 302-1 (1979) is applicable except as follows.

4.2 Addition

An additional sample may be required for the test of **19.106**.

Six samples of the interlock are required for the test of **18.101**.

4.3 This clause is applicable except as follows:

The test is carried out in the following order of the clauses and subclauses given below:

32.1, **32.102** to **32.104**, **7** to **10**, **11** with **32.101**, **13** to **17**, **20**, **21.1** to **21.4**, **18**, **19** except **19.106**, **22** to **31**, **21.101** to **21.105** and **19.106**.

4.101 Addition

Unless otherwise specified, microwave ovens are tested as motor operated appliance.

4.102 Class III temperature sensing probes are not subjected to the tests, except that of **22.116**.

5 RATING

This clause of IS 302-1 (1979) is applicable.

6 CLASSIFICATION

This clause of IS 302-1 (1979) is applicable.

7 MARKING

This clause of IS 302-1 (1979) is applicable except as follows.

7.1 Addition

a) The word 'Microwave Appliance'.

b) Rated microwave frequency in megahertz as per ISM band. This frequency shall be the centre frequency of ISM band.

c) Rated power output in watts.

d) Any cover giving access to the parts of, at a voltage exceeding 250 V and if they are likely to be removed by the user shall be marked with the words 'WARNING HIGH VOLTAGE'.

e) If the 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 warning notice shall be fixed to the appliance stating the substance of the following:

'Remove plug or disconnect from mains before removing covers'.

f) If the removal of any covers allows microwave leakage exceeding the limit specified as per **32.1** the following marking should be made on the cover warning in clearly legible lettering at least 3 mm high:

WARNING

MICROWAVE ENERGY
DO NOT REMOVE THIS COVER

7.2 Replacement

The rated input of heating elements providing a browning function shall be marked either on each element or on rating plate.

7.3 Not applicable.

7.5 Add the following in the list of symbols

MHz.....Mega hertz
g .....Grams

7.8 This clause of IS 302-1 (1979) is not applicable.

7.12 Addition

A microwave cooking appliance shall be provided with a user instruction manual that warns the user against reasonable, foreseable uses or misuses of the product thereby reducing the risk of fire, electric shock, injury to persons and exposure to excessive microwave emission. These instructions shall include the methods for cleaning door seals, cavity adjacent parts. A warning shall be included stating that if these areas are damaged the ovens must not be operated until it has been repaired by a qualified service person. The instruction sheet shall warn the user that it is hazardous for anyone other than a qualified service person trained by the manufacturer to service or repair the oven.

The instruction sheet shall include the following matter 'Before use, the user should check the utensils are suitable for use in microwave ovens.

Furthermore, instruction sheets for microwave ovens shall warn the user about possible hazards caused by delayed eruptive boiling of liquids.

The instruction sheet shall state the minimum height of the free space necessary above the top surface of the oven.

The instruction sheet for microwave ovens provided with a socket for a temperature sensing probe shall include the substance of the following:

Only note the temperature sensing probe recommended for this microwave oven.

Additional Subclauses

7.101 Instruction for servicing shall clearly identify all parts which are liable to be removed when the appliance is serviced and which gives access to potentials above 250 volts to earth or which may cause undue microwave exposure.

Instruction for servicing shall clearly and legibly contain the following text:

CAUTION

MICROWAVE RADIATION

DO NOT BECOME EXPOSED TO RADIATION FROM MICROWAVE GENERATOR, IF IT IS IMPROPERLY USED OR CONNECTED. ALL ELECTRICAL CONNECTIONS, WAVEGUIDES, DOOR AND GASKETS MUST BE SECURE, NEVER OPERATE THE DEVICE WITHOUT, A MICROWAVE ENERGY ABSORBING LOAD WITHIN IT.

8 PROTECTION AGAINST ELECTRIC SHOCK

This clause of IS 302-1 (1979) is applicable except as follows.

8.2 Not applicable.

8.3 Not applicable.

8.4 Not applicable.

9 STARTING OF MOTOR OPERATED APPLIANCES

This clause of IS 302-1 (1979) is applicable.

10 INPUT AND CURRENT

This clause of IS 302-1 (1979) is applicable except as follows.

Additional Subclause

10.101 Heating elements providing browning function shall comply with the tolerances specified for heating appliances.

11 TEMPERATURE RISE

This clause of IS 302-1 (1979) is applicable except as follows.

11.2 Addition

Microwave ovens are located for test as specified for heating appliances.

11.4 Addition

For microwave cooking appliances, the input voltage shall be the same as for motor operated appliances.

11.7 Replacement

Microwave oven is operated according to **11.7.1.**

Microwave ovens incoporating components intended to be energized prior to heating the load (stand-by condition) are tested in this mode until steady conditions are established, followed immediately by the test according to **11.7.1.**

a) Microwave ovens with sequential browning function are tested according to **11.7.2**;

b) Microwave ovens with simultaneous browning function are tested according to **11.7.3**;

c) Microwave ovens with sequential conventional heating means are tested according to **11.7.4**;

d) Microwave ovens with simultaneous conventional heating means are tested according to **11.7.5**;

e) Microwave ovens with automatic programmes are tested according to **11.7.6**;

— Microwave ovens with sequential steaming function are tested in accordance with **11.7.7**;

— Microwave ovens with simultaneous steaming function are tested in accordance with **11.7.8**.

For microwave ovens with a steaming function, the steam generator is filled with potable water having a temperature of 27°C ± 2°C before starting each test.

Appliances are kept at room temperature before each test, unless otherwise specified.

11.7.1 Microwave ovens are operated at full power under normal load for consecutive periods. Each operating period is separated by a minute rest period with the door open, during which time the water load is replaced.

The total time of operating period is 90 min. The time of each operating period is determined by the formula:

$$t = 9\,000/P$$

where

t is the time in minutes, and

P is the microwave power output in watts rounded off to the nearest hundred watt.

The microwave power output is determined according to Annex AA.

11.7.2 Microwave ovens incorporating a browning function that can only be energized sequentially to microwave power are further operated immediately after the test specified in **11.7.1** after removal of water load. The browning function with its control set at maximum for a period of 10 minutes or for a longer time, if specified by the manufacturer.

11.7.3 Microwave ovens incorporating a browning function that can be operated simultaneously with microwave power are operated as specified in **11.7.1** but with the control for browning function set at maximum. The appliance is operated in this mode for the final 10 minutes of the total operating period or for a longer time, if specified by the manufacturer.

The browning function is switched off during any rest period for load replacement which may occur during the browning function test time.

11.7.4 Microwave ovens incorporating conventional heating means other than a browning function, where sequential operation is intended are operated under the condition specified in **11.7.1** but for a total operating period of 30 minutes. At the end of this time the water load is removed and the conventional heating switched on as specified in **11** of IS 4159 : 1983.

If the design does not permit the operation of microwave power prior to conventional heating the sequence is reversed.

11.7.5 Microwave ovens incoporating conventional heating means, other than a browning function, where simultaneous operation is intended are operated with the conventional heating means switched on as specified in **11** of IS 4159 : 1983.

The microwave generator is switched on throughout the test with its control set according to the manufacturers' instructions for roasting meat. If instructions are not provided, the microwave power setting is at 50 percent or at the lowest microwave power setting above 50 percent that can be selected.

If evaporation reduces the water load to 500 g it is replenished with boiling water to approximately 1 000 g. During the replenishment the door is opened for not longer than 10 s.

11.7.6 Microwave oven incorporating automatic programmes are operated with a water load as specified in **2.30** and with the most unfavourable programme that can be selected in accordance with the manufacturers' instruction. If necessary the programme is repeated so that the load test time for appliances with microwave heating only is not less than 90 minutes and for appliances incorporating conventional heating means the total time is not less than 60 minutes.

If evaporation reduces the water load to 500 g it is replenished with boiling water to

approximately 1 000 g. During the replenishment the door is opened for not longer than 10 seconds.

11.7.7 Microwave ovens incorporating a steaming function that can only be operated sequentially to microwave power are initially operated under the conditions specified in **11.7.1** but for a period of 30 min. The water load is then removed and the steaming function operated for the maximum period allowed by any timer controlling the steaming function or until the appliance switches off automatically.

11.7.8 Microwave ovens incorporating a steaming function that can be operated simultaneously with microwave power are operated under normal load with the steaming function switched on.

The microwave oven is operated for the maximum period allowed by any timer for simultaneous operation or until the appliance is switched off automatically.

The microwave generator is switched on with its power control set according to the manufacturer's instructions. If instructions are not provided, the microwave power setting is at 50 percent or the lowest microwave power setting above 50 percent that can be selected.

12 OPERATION UNDER OVERLOAD CONDITIONS OF APPLIANCES WITH HEATING ELEMENTS

This clause of IS 302-1 (1979) is not applicable.

13 ELECTRICAL INSULATION AND LEAKAGE CURRENT AT OPERATING TEMPERATURE

This clause of IS 302-1 (1979) is applicable.

14 RADIO AND TELEVISION INTERFERENCE SUPPRESSION

This clause of IS 302-1 (1979) is applicable.

15 MOISTURE RESISTANCE

This clause of IS 302-1 (1979) is applicable except as follows.

15.3 Replacement

Appliances shall be so constructed that spillage of liquid does not affect the electrical insulation. Compliance is checked by the following test:

Appliances provided with an appliance inlet are fitted with an appropriate connector and flexible cable for cord, appliances with type-X attachment are fitted with the lightest permissible type flexible cable or cord of the smallest cross-sectional area specified in **26.2** and other appliances are tested as delivered.

A quantity equal to 500 g of water containing approximately 1 percent NaCl is poured steadily over the shelf over a period of 1 minute.

However, the appliance is provided with a shelf or other receptacle intended for collecting spilled liquid, the receptacle is filled with the saline solution and further quantity equal to 500 ml is then added over a period of 1 minute. Immediately after this treatment, the appliance shall withstand an electric strength test as specified in **16.4** 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 which could result in a reduction of creepage distances and clearances below the values specified in **29.1**.

The appliance is allowed to stand in normal test-room atmosphere for 24 h before being subjected to the test of **15.4**.

Appliances provided with a steaming function are also subjected to the following test:

The water container is completely filled with water containing approximately 1 percent NaCl and a further quantity equal to 15 percent of the capacity of the container or 0·5 l, whichever is greater, is poured in steadily over a period of 1 min.

Additional Subclause

15.101 Temperature sensing probes shall be constructed so that the insulation is not affected by water.

Compliance is checked by the following test which is performed outside the microwave oven:

The probe is completely immersed in water containing approximately 1 percent NaCl and having a temperature of 27°C ± 5°C. The water is heated to the boiling point in approximately 15 min. The probe is then removed from the boiling water and immediately immersed in water having a temperature of 27°C ± 5°C for 30 min.

This procedure is carried out five times, after which the probe is removed from the water. All traces of liquid are removed from the surface by wiping with a soft cloth.

The probe shall then withstand the test of **16.2**.

16 INSULATION RESISTANCE AND ELECTRIC STRENGTH (After Humidity Treatment)

This clause of IS 302-1 (1979) is applicable except as follows.

16.1 Addition

Heating elements are tested as specified for heating appliances. Appliances are additionally checked by the test of sub-clause.

Additional Subclause

16.101 A voltage is applied for 1 min between:

a) The primary and secondary windings of power transformers;

b) The secondary circuit and the body after any component connected to earth has been disconnected.

The voltage is ac except for dc circuits for which dc voltage is applied.

The value of voltage is twice the maximum working voltage plus 750 V but with a minimum of 1 250 V.

The maximum working voltage for a composite (dc plus ac) voltage is equal to 0·707 multiplied by the composite peak value.

During the test there shall be no flashover or breakdown that will give rise to a fire or shock hazard.

The magnetron is not connected during the test. A meter having a maximum impedance of 30 MΩ is used for measuring secondarycircuit voltage.

16.102 Power transformer shall have adequate internal insulation.

Compliance is checked by the following test:

A sinusoidal voltage is applied to the primary terminals of the power transformer such that twice the working voltage is induced in the secondary winding.

The frequency of the applied voltage is increased above rated frequency so as to avoid excessive excitation current, the duration of the test being,

a) 60 s for frequencies up to twice the rated frequency;

b) 120 times the rated frequency divided by the test frequency with a minimum of 15 s for frequencies above twice the rated frequency.

In each case, a maximum of one-third of the test voltage is initially applied after which it is increased rapidly.

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

During the test, there shall be no flash over or breakdown between windings or between adjacent turns of the same winding.

17 OVERLOAD PROTECTION

This clause of IS : 302-1 (1979) is applicable except as follows.

17.1 Addition

The tests are not applied to the main power transformer and its associated circuits which are checked during the test of **19** of IS 302-1 (1979).

18 ENDURANCE

This clause of IS 302-1 (1979) is applicable, except as follows.

18.1 Replacement

Instead of the test specification, the following shall apply:

Compliance is checked by the test of **18.101**. In addition, for motors, compliance is checked by the tests of **18.2**, **18.5** and **18.6**.

18.101 Addition

It may be necessary to make special connections so that only the motors are operated.

Additional Subclauses

18.101 Interlocks other than those subjected to the test of **18.102** are subjected to the following tests which are made on 6 samples at the rate not exceeding 6 cycles per min.

Interlocks likely to be operated during normal use are subjected to 50 000 cycles of operation.

Interlocks likely to be operated during user maintenance are subjected to 5 000 cycles of operation.

The tests are carried out with the interlock controlling its normal electric load.

After the tests, interlocks shall show no damage impairing their future use.

18.102 The door system of microwave ovens, including hinges, microwave seals and other associated parts, shall be constructed as to withstand wear that may be expected in normal use.

Compliance is checked by subjecting the door system to a total of 1 00 000 cycles of operation.

The door system is subjected to 10 000 cycles while the appliance is supplied at the rated input and containing an appropriate microwave absorbing load, and to 10 000 cycles of operation with the power switched off.

The device for opening the door is attached to the door handle or applied to the normal operating area.

The door opening shall be from the closed position to an angle of 135° to 180° or the maximum travel, if this is less than 135°. The rate of operation is 6 cycles per minute or less if necessary to ensure that the cycle 'on' time is sufficient to allow microwave energy to be present in the cavity during the power on portion of the test. The power off portion of the test may be conducted at the same rate.

Before starting the test and after each 10 000 cycles of operation, following conditioning operations are carried out:

a) If a dry load is used during the test, 100 g water load is added in the microwave oven operated until the water is evaporated:

b) The conventional heating means of combination microwave ovens are operated for 1 h as specified in **11** of IS 4159 : 1983;

c) Microwave ovens incorporating a browning function are operated for one browning cycle using the maximum setting of the timer or 10 min, whichever is longer;

d) Pyrolytic self-cleaning appliances are subjected to one cleaning operation; and

e) If ohmic contact is an essential part of the microwave sealing function, a liberal coating of light cooking oil is applied to all the door sealing surfaces.

After each of the above conditioning operations, the microwave leakage shall not exceed the limit specified in **32.1.**

At the end of the test, the door system shall be in operating order and the microwave leakage shall not exceed the limit specified in **32.1.**

Controls may be by-passed in order to carry out the test.

Components within the appliance which are damaged as a result of the test and do not create a hazard within the meaning of this standard may be replaced in order to complete the test.

19 ABNORMAL OPERATION

This clause of IS 302-1 (1979) is applicable except as follows.

19.1 Replacement

Appliances shall be so designed that the risk of fire, mechanical damage impairing safety, protection against electric shock or radiation hazards due to microwave leakage, as a result of abnormal or careless operation, is obviated as far as is practicable.

Compliance is checked by the tests of **19.101** to **19.105.**

The tests are carried out at rated voltage and until steady conditions are established unless otherwise specified.

If, in any of the tests, a non-resetting thermal cut-out operates, a heating element ruptures or the current is otherwise interrupted before steady conditions are established, the heating period is considered to be ended, but the interruption is due to the rupture of a heating element or of an intentionally weak part, the relevant test is repeated on a second sample which shall then also comply with the conditions specified in **19.11.**

Rupture of heating element or of an intentionally weak part in the second sample will not in itself entail a rejection.

An intentionally weak part is a part designed to fail under conditions of abnormal operation so as to prevent the occurrence of a condition which is unsafe within the meaning of this standard. Such a part may be a replaceable component, such as a resistor, a capacitor or a thermal fuse, or a part of a component to be replaced, such as an inaccessible and non-resettable thermal cut-out incorporated in a motor.

During and after each test the requirements of **19.11** apply.

Fuses, thermal cut-outs, over current devices or the like, incorporated into the appliance, may be used to provide necessary protection.

19.7 Addition

The temperature of the winding shall not exceed the values shown in the following table:

Type of Appliance	*Limiting Temp in Degree Celsius*				
	Class A	*Class E*	*Class B*	*Class F*	*Class H*
Appliances intended for attended use	200	215	225	240	260
Appliances and parts therof that are unattended:					
—If impedance protected	150	165	175	190	210
—If protected by protective devices which operate during the first hour, maximum value	200	215	225	240	260
After first hour, maximum value	175	190	200	215	235
After first hour arithematic average	150	165	175	190	210

Microwave ovens with programmable features that allow a delayed start and those with a keep-warm function are considered to be for unattended use; other microwave ovens are considered to be for attended use.

During the tests, the microwave leakage shall not exceed the limits specified under **32.1** but with the load specified for each subclause. If the appliance is operable after each test, it shall comply with **32.1**.

Additional sub-clauses:

19.101 Appliances are operated at the most onerous microwave power level and without load in the cavity.

The period of operation is the maximum time permitted by the timer or similar control or until steady conditions are established, whichever is shorter.

19.102 Microwave ovens incorporating a browning function and combination microwave ovens are operating according to **11.7.2** to **11.7.5** as applicable but with all controls at thire most unfavourable setting.

If there is no time control for the browning function, the function is operated until steady conditions are established.

Microwave ovens incorporating a steaming function are operated in accordance with **11.7.7** or **11.7.8** as appropriate but with all contracts at their most unfavourable settings.

19.103 Appliances are operated under normal load with the timer or other control intended to operate in normal use made inoperative.

If the appliance is provided with more than one control, these are made inoperative in turn.

19.104 Appliances are operated under normal load and with any single fault condition stimulated that is likely to occur in the magnetron or its supply mains circuit. However, the filament of the magnetron is not short circuited.

The period of operation is the maximum time permitted by the timer or other control, or 90 min, whichever is shorter. Compliance is checked by analysing the circuit diagram to determine the fault conditions which are likely to occur in the power supply of the magnetron or the magnetron itself. The fault conditions are stimulated under the conditions of operations specified in **11.7.1**.

Only one fault condition is reproduced at a time. If a fault condition results in currents that vary inversely with input voltage or vary more than proportionately with input voltage when 0·94 to 1·06 times the rated voltage is applied. The first condition is stimulated using the most unfavourable input voltage within these limits.

Examples of fault conditions are:

a) Open circuiting of components such as capacitors, resistors and semi-conductors.

b) Short circuiting of components such as capacitors, resistors and semi-conductors. No high voltage components are included under this test.

c) Open circuiting and short circuiting of the cathode to anode circuit of the magnetron.

d) Short circuiting of any distance where flash over occurs during the electric strength test of **16.101**.

19.105 Appliances are operated under normal load and with any single fault condition stimulated that is likely to occur in electromechanical and mechanical components.

The period of operation is the maximum time permitted by the timer or other control or 90 min, whichever is the shortest.

Compliance is checked by examining the appliance to determine the fault conditions which are likely to result in a hazard. The fault conditions are stimulated under the conditions of operation specified in **11.7**, but using the most unfavourable control setting.

Only one fault condition is reproduced at a time.

Examples of fault conditions are:

a) Locking of air inlets or outlets

b) Locking of moving parts liable to be jamed or driven by motors with a locked rotor torque smaller than the full load torque.

19.106 Microwave ovens shall be so constructed that any fire likely to occur in the cavity due to prolonged operation will be contained within the appliance.

Compliance is checked by the following test:

The oven is supplied at rated voltage and operated at the maximum microwave power level and most unfavourable setting permitted by the timer or any other control device.

The load consists of a potato having an approximately ellipsoid shape and a mass between 125 g and 150 g. The length of the shortest principal axis is at least 40 mm. The length of the longest principal axis is not more than 140 mm and may be symmetrically reduced in order to obtain the specified mass.

The load is placed in the position on the shelf where it is most likely to ignite and propagate flame to other combustible materials.

The test is terminated 15 min after the generation of microwave power is ceased or a fire in the cavity has extinguished.

During the test, if microwave energy can be generated, a damaged detachable shelf is replaced and the requirements of **19.11** apply.

If the oven fails this test, it shall be repeated on a new oven.

20 STABILITY AND MECHANICAL HAZARDS

This clause of 302-1 (1979) is applicable except as follows.

20.1 Addition

Compliance is also checked by the test of **20.101.**

Additional Subclause

20.101 This test is only carried out on appliances with bottom hinge doors.

The door is 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 weight has a contact area that causes no damage to the door and its mass is:

For appliances normally used on the floor:

— 22·5 kg for cavity doors

— 7 kg for other doors

For appliances normally used on a table or similar support and having a door with a projection of at least 225 mm from the hinge to the opening edge:

— 7 kg for stationary ovens

— 3·5 kg for other ovens

During the test, the appliance shall not tilt — A sand bag may be used for the weight.

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 farthest from the hinge where such a force might be exerted in normal use.

21 MECHANICAL STRENGTH

This clause of IS 302-1 (1979) is applicable except as follows.

21.1 Addition

Compliance is also checked by the test of **21.101** to **21.105.**

After each of the test the oven shall comply with **32.1** unless otherwise specified, and the microwave enclosure shall not show undue distortion.

After the test, temperature sensing probes are subjected to the cycle of the procedure specified in **15.101** and shall then withstand the test of **16.2.**

Additional Subclause

21.101 Doors are placed mid-way between the fully open and closed position and then moved to the open position by means of a force of 65 N. The force is applied to the inside surface of the hinge door at a point 25 mm from its free end to the handle of a sliding door.

The force is applied by means of a spring balance having a spring constant 10·5 N/cm. It is initially applied with an opposing force applied to the other side of the hinged door and to the handle of a sliding door. This opposing force is then removed to allow the door to complete its travel.

The opening operation is carried out 10 times.

The test is then repeated but with the door moved from the midway position to the closed position and with a force of 90 N applied to the outside surface of a hinged door at a point 25 mm from its free edge and to the handle of a sliding door.

The closing operation is carried out 10 times.

21.102 Side hinged doors are placed in the fully opened position.

A downward force of 140 N or the maximum force that can be applied in any door position without tilting the appliance, whichever is smaller, is then applied to the free edge of the door and the door is closed. With the force remaining, the door is fully opened again.

The test is carried out 5 times.

Bottom hinged doors are opened and a force of 140 N or the maximum force that can be applied without tilting the appliance whichever is smaller is applied to the inside surface of the door. The force is applied for 15 min at the most unfavourable position 25 mm from the free edge.

21.103 For hinged doors a cube of wood having a side dimension of 2 cm is attached to an inside corner farthest from the hinge. An attempt is made to close the door by a force of 90 N applied at the other corner farthest from the hinge in the direction perpendicular to the surface of the door. The force is maintained for 5 s.

The cube is then removed and the door is closed by the minimum force applied to the centre of the handle and to the manual opening device, if applicable, which will permit microwave generation. If there is a mechanical hysteresis action of a door interlock, the force is reduced in order to obtain maximum door gap permitting microwave generation. During the test the microwave leakage is measured under the conditions of **32.1** and shall not exceed 50 W/m^2.

The test is then repeated with the wooden cube attached to the other corner farthest from the hinge.

21.104 The cavity door is closed and its outside surface is subjected to three impacts each having an energy of 3 Nm. These impacts are applied to the central part of the door and, may be at the same point.

The impact is applied by means of a steel ball having a diameter 60 mm and the mass of approximately 500 g.

The ball is suspended by a suitable cord which is held in the plane of the door. The ball is allowed to fall as a pendulum through the distance required to strike the surface with the specified impact.

The door is then opened and the mating surface of the door seal on the oven body is subjected to three similar impacts.

The inside surface of hinged doors is subjected to three impacts as before. The test is made with the door in the fully opened position; the impacts are applied to the central part of the door and may be at the same point. However, if bottom hinge doors are horizontal when in the fully open position the impacts are applied by allowing the steel ball to fall freely through a distance such that the specified impact is obtained.

Bottom hinge doors are further tested by subjecting the door seal to three similar impacts. The impacts are made at three different locations by appropriate application of the steel ball.

21.105 Bottom hinge doors are opened and a hard board dowel having a diameter of 10 mm and a length of 300 mm is placed along the bottom hinge. The dowel is positioned such that one end is flush with an outside edge of the door.

A closing force of 90 N is applied to the centre of the handle in a direction perpendicular to the surface of the door. The force is maintained for 5 s. The dowel is then repositioned so that the end of the dowel is flush with the other outside edge and the test is repeated.

The dowel is then positioned so that it is placed centrally within the door hinge and the test carried out yet again.

After these tests, microwave leakage is measured under the conditions of **32.1** and shall not exceed 10 mW/cm^2.

22 CONSTRUCTION

This clause of IS 302-1 (1979) is applicable except as follows:

22.1 Microwave ovens shall be of Class-1 construction.

Compliance is checked by inspection and by the relevant tests.

Additional Subclauses

22.101 Microwave ovens shall be so designed that the opening of the cavity door operates at least two interlocks.

Compliance is checked by inspection.

22.102 The switch contact of at least one door interlock shall disconnect the microwave generator or its supply main circuit.

Compliance is checked by inspection.

22.103 At least one of the door interlocks shall be concealed and not operable by manipulation. This interlock shall be operable by manipulation. This interlock shall operate before any accessible interlock can be defeated.

Compliance is checked as follows:

The cavity door is opened whilst simultaneously attempting to defeat any accessible interlock by manual means. Before the door can be opened far enough for any such accessible interlock to be defeated, at least one interlock shall operate. The oven door is then opened and an attempt is made to operate the concealed interlock manually and also by means of a straight rod having a diameter of 3 mm and a useful length of 100 mm.

Interlocks which operate magnetically are, in addition, subjected to a test by applying a magnet to the enclosure over the interlock switch. The magnet has similar configuration and magnetic orientation to the magnets which operate the interlock. It shall be capable of exerting a force of (50 $\pm$ 5) N when applied to a mild steel armature having dimensions of 80 mm $\times$ 50 mm $\times$ 8 mm. In addition, at a distance of 1 cm from the armature, the magnet shall be capable of applying a force of (5 $\pm$ 0·5) N.

It shall not be possible to operate the interlock during the test.

22.104 The primary safety interlock shall be so designed that undue microwave leakage is prevented.

Compliance is checked by the following test.

All door interlocks except the primary door safety interlock are made inoperative and the test of **32.103** is carried out.

22.105 Failure of primary door safety interlock shall cause the oven to become inoperable.

Compliance is checked by the following test:

The interlock is made inoperative and the oven is operated with the door closed. An attempt is then made to gain access to the cavity in the normal way. Either it shall not be possible to open the door or the microwave generator shall shut down and become inoperable.

If an internal fuse in the circuit supplying the microwave ruptures, the following test is carried out:

The fuse is replaced and the oven is connected to a supply source having a prospective short-circuit capacity of 1·5 kA. The interlock is made inoperative and the access to the cavity is gained as before. The test is carried out three times. The internal fuse shall rupture each time. This test is carried out three more times, except that an impedance of (0·4 + j0·25) ohm is inserted in series between the supply source and the oven. The internal fuse shall rupture each time.

During these tests, the shorting switch shall not fail in the open position.

22.106 The failure of any single electrical and mechanical component which affects the operation of a door interlock shall not cause any other door interlock to become inoperative.

Compliance is checked by inspection and by the tests of component faults.

22.107 The interlock system shall not allow operation of the microwave generator with the door open due to single fault such as failure of basic insulation to earth.

Compliance is checked by inspection of the circuit diagram, of the oven and by tests of relevant faults.

22.108 Oven vent shall be designed that any moisture or grease discharged through them cannot affect the creepage distances and the clearances between bare live parts and other parts of the appliance.

Compliance is checked by inspection.

22.109 Microwave oven shall not give rise to undue microwave leakage in the event of cooking oil contaminating the door seals.

Compliance is checked as follows.

The door seals are coated with cooking oil. If the door seal is of open choke type, the trough is filled with cooking oil.

Oven is then subjected to the test of **32.1**.

22.110 Microwave oven shall not give rise to undue microwave leakage if thin material is introduced between the door and its mating surface.

Compliance is checked by closing the door on a strip of paper having a width of (60 ± 5) mm and a thickness of (0·15 ± 0·05) mm. The paper is placed in ten different positions in the seal between the door and its mating surface and the test of **32.1** is carried out each time.

22.111 If the ovens for building-in are vented, they shall be vented through the front unless provision is made for venting through the duct.

Compliance is checked by inspection.

22.112 Interlocks operated by detachable parts shall be guarded so that accidental tripping is prevented.

Compliance is checked by inspection and by the manual test.

22.113 The interlock and the door system shall be designed to prevent undue microwave leakage when the door corners are subjected to mechanical distortion.

Compliance is checked by the following test:

Doors are closed and a pulling force is applied perpendicular to the surface of the door to each corner in turn to expect that for hinged doors the corners close to the hinge are not tested. If the door is latching, the maximum operation of the manual opening device permitting microwave generation is also applied.

The force is slowly increased until the microwave generation is turned off or to a maximum of 40 N. During the test the microwave leakage is measured under the conditions of **32.1** and shall not exceed 10 mW/cm^2.

Immediately after removing the force, the microwave leakage is measured again and shall not exceed 5 mW/cm^2.

22.114 It shall not be possible to remove the cavity door of a microwave oven without the aid of the tool unless the microwave generator cannot operate without the door being properly re-installed.

Compliance is checked by inspection and by manual test.

22.115 Microwave ovens with temperature sensing probes shall be constructed so that the probe is not damaged and that undue microwave leakage does not occur if the probe or its cord is trapped by the oven door.

Compliance is checked by the following test:

The load specified in **32.1** is placed in the oven and the probe connected as in normal use, the sensing part or cord being allowed to rest in the most unfavourable position likely to occur. The door is then closed against the sensing part or cord with a force of 90 N for 5 s. The force is applied to the door in the most unfavourable place. The force is then released and if the oven can be operated the microwave leakage is measured in accordance with **32.1** and shall not exceed 100 W/m^2.

After the test the probe shall comply with **8.1**, **15.101** and **29.1** and the microwave oven shall comply with **32.1**.

22.116 Appliances incorporating a steaming function shall be constructed so that the steam generator is switched off when the cavity door is opened.

Compliance is checked by inspection.

22.117 Appliances incorporating a steaming function shall be constructed so that the discharge of water from the water container does not affect the electrical insulation.

Compliance is checked by inspection and by manual test.

23 INTERNAL WIRING

This clause of IS 302-1 (1979) is applicable.

24 COMPONENTS

This clause of IS 302-1 (1979) is applicable except as follows.

Addition

24.2 However, a shorting switch intended to cause the rupture of an internal fuse in the circuit supplying the microwave generator can be fitted if it is necessary to use a tool for the replacement. Furthermore, the fuse rating shall not exceed the lowest value of the fuse in the supply line in which the appliance can be operated.

Additional Subclauses

24.101 Socket-outlets incorporated in ovens shall be of single phase type provided with an earthing contact and having a rated current not exceeding 16 A. Both poles of such socket outlets shall be protected by means of fuses or miniature circuit-breakers incorporated in the oven and placed behind a non-detachable cover, except that, for ovens having a rated current not exceeding 16 A, the poles of the socket-outlet need not be protected, and that, for ovens intended to be permanently connected to a fixed wiring only, the pole intended to be connected to the neutral conductor shall not be protected.

Compliance is checked by inspection.

24.102 The microwave ovens shall incorporate a time control device.

25 SUPPLY CONNECTIONS AND EXTERNAL FLEXIBLE CABLES AND CORDS

25.6 Addition

The length of the power supply cord external to the appliance shall be not less than 2·05 m when supplied without a plug and not less than 2·0 m when supplied with a plug.

This clause of IS 302-1 (1979) is applicable except as follows.

25.19 Addition

For temperature sensing probes the total number of flexings is 5 000. Probes with circular section cords are turned 90° after 2 500 flexings.

26 TERMINALS FOR EXTERNAL CONDUCTORS

This clause of IS 302-1 (1979) is applicable.

27 PROVISION FOR EARTHING

This clause of IS 302-1 (1979) is applicable.

28 SCREWS AND CONNECTIONS

This clause of IS 302-1 (1979) is applicable.

29 CREEPAGE DISTANCES AND CLEARANCES

This clause of IS 302-1 (1979) is applicable except as follows.

29.1 Addition

Circuits and voltages greater than 250 V r.m.s. (354 V peak) shall have creepage distances and clearances between live parts of different polarity and between live parts and accessible

metal parts not less than those stated in the following table.

Voltage (Peak Value) V	*Clearance mm*	*Creepage Distance mm*
Over 354 up to and including 500	3	4
Over 500 up to and including 630	3·5	4·5
Over 630 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 the 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:

$$V = 2\,U + 750$$

where V is the test voltage and U is working voltage.

There shall be no flashover or breakdown.

The creepage distances and the clearances specified do not apply across a spark gap or similar device which is necessary for the correct functioning of the oven.

30 RESISTANCE TO HEAT FIRE AND TRACKING

This clause of IS 302-1 (1979) is applicable.

31 RESISTANCE TO RUSTING

This clause of IS 302-1 (1979) is applicable.

32 RADIATION HAZARDS

This clause of IS 302-1 (1979) is applicable except as follows.

32.1 Addition

Microwave ovens shall be so designed that excessive microwave leakage is prevented.

Compliance is checked by measuring the energy flux density of microwave leakage at any point 5 cm or more from the external surface of the appliance. It shall not exceed 5 mW/cm^2.

The energy flux density of microwave leakage is determined by measuring the microwave power density by means of an instrument which reaches 90 percent of its steady-state reading in 2 s to 3 s when subjected to a stepped input signal.

Unless otherwise specified, the measurements are made with the microwave oven supplied at rated voltage and with the microwave power control set at the maximum. A load of (275 ± 15) g of potable water having an initial temperature of (27 ± 2)°C contained in a microwave transparent thin-wall vessel having an inside diameter of approximately 85 mm, is placed at the centre of the shelf. The instrument antenna is moved over the external surface of the oven to locate the points of maximum leakage, particular attention being given to the door and its seals.

If the temperature of the load affects the results, the measurement is repeated with a fresh load.

Additional Clauses

32.101 Temperature resulting from the operation of conventional heating means shall not give rise to undue microwave leakage.

Compliance is checked by test of **32.1** immediately after the relevant test of **11.**

32.102 The removable or detachable parts shall not give rise to undue microwave leakage.

Compliance is checked as follows:

Detachable parts are removed, except

— those parts which are interlocked to prevent microwave generation when they are removed;

— shelves, unless a horizontal surface greater than 85 mm in diameter is made available when they are removed.

The oven is then subjected to the test of **32.1**, the vessel being placed on the horizontal surface as close as possible to the centre of the cavity.

32.103 Microwave ovens shall be constructed such that any position of the cavity door does not give rise to undue microwave leakage.

Compliance is checked as follows:

The door is held in any position that can be obtained during the door opening sequence. This sequence is performed using small increments.

During the test the oven shall comply with **32.1**.

32.104 Appliances shall be constructed such that there is no access to the cavity through the viewing screen.

Compliance is checked by inspection and by the following test:

A straight steel rod having a diameter of 1 mm and a blunt end is pressed perpendicularly against the viewing screen with a force of 2 N. The rod shall not enter the cavity.

101 TESTS

101.1 Type Tests

The tests specified in Table 101 shall constitute the type tests and shall be carried out on two samples of the same type and rating selected preferably at random from a regular production lot. Before commencement of the tests, the samples shall be visually examined and inspected for obvious visual defects in respect of components, parts and their assembly, construction, mechanical hazards, marking, provision, of suitable terminals for supply connections, earthing and the effectiveness of screws and connections. The external surface finish shall be even and free from finishing defects.

NOTE — Additional samples may be required for the test of **19.106** (*see also* **4.2**).

101.1.1 *Criteria of Acceptance*

Both samples shall successfully pass all the type tests for proving conformity with the requirements of the standard. If any of the samples fails in any of the type tests, the testing authority, at its discretion, may call for fresh samples not exceeding twice the original number and subject them again to all tests or to the test(s) in which failure(s) had occurred. No failure should be permitted in the repeat test(s).

Table 101 Schedule of Type Tests

(*Clause* 101.1)

Sl No.	Tests	Clause Reference
i)	Protection against electric shock	8
ii)	Starting of motor operated appliances	9
iii)	Input	10
iv)	Temperature-rise	11
v)	Operation under overload conditions	12
vi)	Electrical insulation and leakage current at operating temperature	13
vii)	Radio and television interference suppression	14
viii)	Moisture resistance	15
ix)	Insulation resistance and electric strength (after humidity treatment)	16
x)	Overload protection	17
xi)	Endurance (Under consideration)	18
xii)	Abnormal operation	19
xiii)	Stability and mechanical hazards	20
xiv)	Mechanical strength	21
xv)	Construction	22
xvi)	Internal wiring	23
xvii)	Components	24
xviii)	Cord grip and cord guard	25
xix)	Terminals for external conductors	26
xx)	Provision for earthing	27
xxi)	Screws and connections	28
xxii)	Creepage distances and clearances	29
xxiii)	Resistance to heat, time and tracking	30
xxiv)	Resistance to rusting	31
xxv)	Radiation hazards	32

101.2 Acceptance Tests

The following shall constitute the acceptance tests:

Tests	*Clause Reference*
a) Protection against electric shock	8
b) Input	10
c) Temperature-rise	11
d) Electrical insulation and leakage current at operating temperature	13
e) Moisture resistance	15
f) Insulation resistance and electric strength (after humidity treatment)	16
g) Provision for earthing	27

NOTE — For the purpose of acceptance test, the humidity treatment shall be done for 24 hours while conducting the test for moisture resistance (**15**).

101.2.1 A recommended sampling procedure for acceptance tests is given in Appendix B of IS 302-1 (1979).

101.3 Routine Tests

The following tests shall constitute the routine tests:

Tests	*Clause Reference*
a) Protection against electric shock	8
b) High voltage	13.3.2 of IS 302-1 (1979)
c) Provisions for earthing	27

ANNEX A

TABLES OF TYPE TESTS

This Annex A of IS 302-1 (1979) is replaced as follows:

The tests are conducted in the order of the clauses as given under **4.3** of this standard.

ANNEX B

SAMPLING PROCEDURE FOR ACCEPTANCE TESTS

This Annex B of IS 302-1 (1979) is applicable.

ANNEX C

ELECTRONIC CIRCUITS

This Annex C of IS 302-1 (1979) is applicable except as follows:

Magnetron and its power supply circuit is not applicable under this test.

ANNEX D

MEASUREMENT OF TEMPERATURE WITH THERMOMETER

This Annex D of IS 302-1 (1979) is applicable.

ANNEX E

ALTERNATIVE TESTS FOR PROTECTED MOTOR UNITS

This Annex E of IS 302-1 (1979) is applicable.

ANNEX F

IMPACT TEST APPARATUS

This Annex F of IS 302-1 (1979) is applicable.

ANNEX G

THERMAL CONTROLS AND OVERLOAD RELEASES

This Annex G of IS 302-1 (1979) is applicable.

ANNEX H

MEASUREMENT OF CREEPAGE DISTANCES AND CLEARANCES

This Annex H of IS 302-1 (1979) is applicable.

ANNEX J

TEST FOR FIRE-RESISTING PROPERTIES

This Annex J of IS 302-1 (1979) is applicable.

ANNEX K

BNF JET TEST FOR DETERMINATION OF THICKNESS OF COPPER AND NICKEL PLATING

This Annex K of IS 302-1 (1979) is not applicable.

ANNEX L

APPROXIMATE MEASUREMENT OF THICKNESS OF CHROMIUM ON NICKEL, STEEL AND COPPER

This Annex L of IS 302-1 (1979) is not applicable.

ANNEX AA

(*Clause* 11.7.1)

DETERMINATION OF MEASUREMENT OF MICROWAVE POWER OUTPUT

Microwave power output measurement is made with the microwave oven supplied at its rated voltage and operated at its maximum microwave power setting with a load of (1 000 ± 5) g of potable water.

The water is contained in a cylindrical borosilicate glass vessel having a maximum thickness of 3 mm and an outside diameter of approximately 190 mm.

The oven and the empty vessel are at ambient temperature prior to the start of the test.

The initial temperature of the water is (27 ± 2)°C. It is measured immediately before the water is added to the vessel. After addition of the water to the vessel, the load is immediately placed on the centre of the shelf which is in the lowest position and the microwave power switched on.

The time t for the temperature of the water to rise by a value kT of (27 ± 2) °C is measured, where t is the time in seconds and kT is the temperature rise. The initial and final water temperatures are selected so that the maximum difference between the final water temperature and the ambient temperature is 5°C.

The microwave power output P in watts is calculated from the following formula:

$$P = 4\ 187\ (kT)/t$$

t is measured while the microwave generator is operating at full power. Magnetron filament heat-up time is not included.

The water is stirred to equalize temperature throughout the vessel, prior to measuring the final water temperature.

Stirring devices and measuring instruments are selected in order to minimize addition or removal of heat.

Operating time is measured while the microwave generator is operating at full power. Magnetron heat-up time is not included.

The water is stirred to equalize temperature throughout the vessel, prior to measuring the final temperature.

Stirring devices and measuring instruments are selected such that no addition or removal of heat is possible while making the measurement.

ANNEX BB

(*Foreword*)

IS No.	*Title*	*IS No.*	*Title*
302-1 (1979)	Safety of household and similar electrical appliances : Part 1 General requirements (*fifth revision*)	4159 : 1983	Mineral filled sheathed heating elements (*first revision*)

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