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

Part 3. Complete particular specifications
Section 3.21 Portable immersion heaters

Spécification pour la sécurité des appareils de ménage et autres appareils
électriques analogues

Partie 3. Spécifications particulières complètes
Section 3.21 Thermoplongeurs portatifs

Spezifikation für die Sicherheit von Haushaltsgeräten und ähnlichen
Elektrogeräten

Teil 3. Komplette besondere Spezifikationen
Abschnitt 3.21 Tragbare Tauchheizer

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Amendment No. 1
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Specification for safety of household and
similar electrical appliances
Part 3. Complete particular specifications
Section 3.21 Portable immersion heaters

Revised text

AMD 5221
October 1986

Contents

Below the entry for appendix C insert the following new entry.

'D. Specification for flannelette material'

AMD 5221
October 1986

Clause 7.12

At the end of the penultimate paragraph, after 'fire' insert
 'in particular stating that the appliance should not be
 placed on textile material.'

AMD 5221
October 1986

Clause 19.1

In paragraph 2 delete line 3 and substitute
 'the tests in **19.4** and **19.101**'.

AMD 5221
October 1986

New clause

After clause **19.11** insert the following new clause.

'**19.101** A separate sample of the appliance shall, after completing the test specified in **21.102**, be operated with a supply voltage such that the input is 1.24 times rated input and in accordance with conditions of adequate heat discharge. The water shall be allowed to boil for 10 s. During the next 5 s the appliance, while still energized, shall be removed from the vessel, shaken to remove surplus water and positioned on the floor of the test corner with the major axis approximately horizontal. Immediately after this, a 25 mm wide strip of flannelette complying with appendix D and of length sufficient to cover the appliance shall be placed over the appliance in the most unfavourable position. After a further 20 s the flannelette strip shall be removed.

There shall be no smouldering or ignition of the flannelette strip.'

New appendix D

After appendix C insert the following new appendix.

Appendix D

Specification for flannelette material

The flannelette material* used for the test in 19.101 shall comply with the following specification.

Composition	all cotton
Mass/m ²	135 g to 152 g
Foreign matter	3 % maximum
Threads per mm	warp 2.32 to 2.44 weft 2.28 to 2.40
Weave	plain or 2/2 twill
Finish	bleached and raised (not sueded)

The flannelette used for testing shall be dry. Since humidity can alter the performance of the material, immediately before making the test the flannelette shall be aired, but not overheated, and then allowed to cool for 10 minutes.'

Insert the following associated footnote.

* For information on the availability of flannelette material to this specification, apply to Enquiry Section, BSI, Linford Wood, Milton Keynes, MK14 6LE, enclosing a stamped addressed envelope for reply.'



Amendment No. 2
published and effective from 31 August 1988
to BS 3456 : Part 3 : Section 3.21 : 1981

Specification for safety of household and
similar electrical appliances
Part 3. Complete particular specifications
Section 3.21 Portable immersion heaters

Revised text

AMD 5895
August 1988

Clause 21.1

In the last paragraph (commencing 'For aquarium heaters'), delete the first sentence and substitute the following.

'For aquarium heaters and combined heater/thermostats, compliance shall be checked as above except that the impact test apparatus shall be adjusted to provide an impact energy of 0.2 ± 0.02 N m, and in all cases the heater shall be mounted vertically on the polyamide sheet placed against a solid wall in such a way as to ensure that it is supported along the complete length of the glass envelope. The impact test apparatus shall then be applied once to each of three points on the enclosure that are liable to be weak. Before each impact the hammer head shall be cleaned, in particular to ensure that no frangible material has become embedded in the hammer head.'

AMD 5895
August 1988

Clause 21.101

After paragraph 2 insert the following new paragraph.

'This operation shall be carried out 50 times.'

AMD 5895
August 1988

Insertion of marginal markings used to indicate national deviations from CENELEC harmonized documents

Insert marginal markings, as illustrated in the footnote to the foreword on page 1, against the following.

Clause 7.1, item (i)
 Clause 7.12, where amended by Amendment No.1
 Clause 19.2, the first sentence
 Clause 19.101 (as incorporated by Amendment No.1)
 Clause 21.1, paragraphs 18, 19 and 20 (commencing 'To ensure. . .' and ending '. . . as prescribed in 16.4.')

Clause 21.2
 Clause 21.3
 Appendix D (as incorporated by Amendment No.1)

Foreword

This revised specification for portable immersion heaters has been prepared under the direction of the Light Electrical Engineering Standards Committee and is one of the new series of stand-alone specifications that will replace the existing sections of Part 2 of BS 3456.

A need for revision of the whole of the BS 3456 series has arisen from the harmonization programme of the European Committee for Electrotechnical Standardization (CENELEC). This standard is technically identical with the CENELEC harmonization document (HD) for these appliances with some additions in respect of aquarium heaters. The HD comprises HD 251.S2 for the general requirements and HD 262 for the particular requirements. Any minor changes that may be required as a result of revision of HD 262 to align it with HD 251.S2 will be introduced by amendment action as soon as this revision has been agreed by CENELEC.

CENELEC harmonization documents recognize certain national deviations that cannot, for the moment, be removed. Such United Kingdom departures, in accordance with CENELEC regulations, are denoted in the text by a marginal marking as shown below*. Deviations for other countries may be ascertained by reference to the relevant CENELEC harmonization documents.

For ease of cross-referencing between this standard, the CENELEC HDs and the IEC standards on which the HDs are based, the clause and subclause numbers have been kept in line with those of the second edition of International Electrotechnical Commission Publication 335-1 : 1976, which is the reference document for HD 251.S2. Where a clause of the IEC standard does not apply to the appliances covered by this standard the clause number has been retained marked 'No

requirement'. Additional subclauses introduced by either the CENELEC HDs or by UK deviations from the HDs are numbered with the main clause number, followed by .I, .II etc, for additional clauses for general requirements and .101, .102 etc., for additional clauses for requirements particular to portable immersion heaters.

Appliances complying with the requirements of British Standards in the BS 3456 series of specifications are not necessarily suitable for use in premises to which the Offices, Shops and Railway Premises Act of 1963, the Factories Act and the Health and Safety at Work etc. Act apply.

Compliance with the Electrical Equipment (Safety) Regulations: 1975 and the Electrical Equipment (Safety) (Amendment) Regulations: 1976, will generally be assured if appliances comply with the requirements of BS 3456. For more precise details regarding the relevance of BS 3456 to the regulations, reference should be made to the 'Administrative Guidance on the Electrical Equipment (Safety) Regulations: 1975 and the Electrical Equipment (Safety) (Amendment) Regulations 1976', available from HMSO (ISBN 0 11 511831 4).

Certification. The British Electrotechnical Approvals Board (BEAB) uses the series of specifications in BS 3456 as the requirements for granting its certification mark (see the inside back cover for details).

This British Standard supersedes BS 3456 : Part 2 : Section 2.8 which will be withdrawn on the date agreed by the CENELEC General Assembly for standards conflicting with HD to be withdrawn. Until this date BEAB will accept for approval appliances complying either with the requirements of this standard or with BS 3456 : Part 2 : Section 2.8.

*The marginal marking used in the text to indicate national deviations from CENELEC harmonized documents is as follows:



British Standard Specification for

Safety of household and similar electrical appliances

Part 3. Complete particular specifications

Section 3.21. Portable immersion heaters

1. Scope

1.1 BS 3456 : Part 3 : Section 3.21 specifies requirements for portable immersion heaters intended for heating water and the like for household and similar purposes; this includes aquarium immersion heaters.

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

Portable immersion heaters are not allowed to be used in bathrooms.

This standard does not apply to:

- appliances designed exclusively for industrial purposes;
- appliances intended to be used in locations where special conditions prevail, such as the presence of a corrosive or explosive atmosphere (dust, vapour or gas);
- appliances for high frequency heating;
- professional medical appliances in accordance with BS 5724 : Part 1.

For appliances intended to be used in vehicles or on board ships or aircraft, additional requirements may be necessary.

For appliances intended to be used in tropical countries, special requirements may be necessary.

1.2 This standard is concerned with safety and takes into account the influence on safety of components that are necessary to achieve a required degree of radio and television interference suppression.

NOTE. The titles of the standards publications referred to in this standard are listed on the inside back cover.

2. Definitions

Where the terms 'voltage' and 'current' are used, they imply the r.m.s. values unless otherwise specified.

For the purposes of this British Standard the following definitions apply.

2.1 rated voltage. The voltage assigned to the appliance by the manufacturer.

2.2 rated voltage range. The voltage range assigned to the appliance by the manufacturer, expressed by its lower and upper limits.

2.3 working voltage. The maximum voltage to which the part under consideration can be subjected when the appliance is operating at its rated voltage and under normal conditions of use.

NOTE 1. Normal conditions of use include changes of voltage within the appliance imposed by likely occurrences such as the operation of a circuit breaker or the failure of a lamp.

NOTE 2. When deducing the working voltage, the effect of possible transient voltages on the supply mains is ignored.

2.4 rated input. The input under conditions of adequate heat discharge and at normal operating temperature assigned to the appliance by the manufacturer.

2.5 rated current. The current assigned to the appliance by the manufacturer.

NOTE. If no current is assigned to the appliance, the rated current for the purposes of this standard is determined by calculation from the rated input and the rated voltage.

2.6 rated frequency. The frequency assigned to the appliance by the manufacturer.

2.7 rated frequency range. The frequency range assigned to the appliance by the manufacturer expressed by its lower and upper limits.

2.8 No requirement.

2.9 No requirement.

2.10 power supply cord. A flexible cable or cord, for supply purposes, fixed to, or assembled with, the appliance according to one of the following methods.

type X attachment. A method of attachment such that the flexible cable or cord can easily be replaced, without the aid of special purpose tools, by a flexible cable or cord not requiring any special preparation.

type M attachment. A method of attachment such that the flexible cable or cord can easily be replaced, without the aid of special purpose tools, by a special cable or cord with, for example, a moulded-on cord guard or crimped terminations.

type Y attachment. A method of attachment such that the flexible cable or cord can be replaced only with the aid of special purpose tools normally available only to the manufacturer or his agents.

NOTE. Type Y attachments may be used either with common flexible cables or cords or with special cables or cords.

type Z attachment. A method of attachment such that the flexible cable or cord cannot be replaced without breaking or destroying a part of the appliance.

2.11 No requirement.

2.12 basic insulation. Insulation applied to live parts to provide basic protection against electric shock.

NOTE. Basic insulation does not necessarily include insulation used exclusively for functional purposes.

2.13 supplementary insulation. Independent insulation applied in addition to basic insulation, in order to ensure protection against electric shock in the event of a failure of the basic insulation.

2.14 double insulation. Insulation comprising both basic insulation and supplementary insulation.

2.15 reinforced insulation. A single insulation system applied to live parts, which provides a degree of protection

against electric shock equivalent to double insulation under the conditions specified in this standard.

NOTE. The term 'insulation system' does not imply that the insulation is one homogeneous piece. It may comprise several layers that cannot be tested singly as supplementary or basic insulation.

2.16 No requirement.

2.17 No requirement.

2.18 class I appliance. An appliance in which protection against electric shock does not rely on basic insulation only, but which includes an additional safety precaution in such a way that means are provided for the connection of accessible conductive parts to the protective (earthing) conductor in the fixed wiring of the installation so that accessible conductive parts cannot become live in the event of a failure of the basic insulation.

NOTE 1. Class I appliances may have parts with double insulation, or parts operating at safety extra-low voltage.

NOTE 2. For appliances intended for use with a flexible cord or cable, this provision includes a protective (earthing) conductor as part of the flexible cord or cable.

2.19 class II appliance. An appliance in which protection against electric shock does not rely on basic insulation only, but in which additional safety precautions, such as double insulation or reinforced insulation, are provided, there being no provision for protective earthing or reliance upon installation conditions.

Such an appliance may be of one of the following types:

- (a) an appliance having a durable and substantially continuous enclosure of insulating material that envelops 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';
- (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';
- (c) an appliance which is a combination of the 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 considered to be of class I construction. Class II appliances may be provided with means for maintaining the continuity of protective circuits, provided that such means are within the appliance and are insulated from accessible conductive parts by double insulation or reinforced insulation.

NOTE 3. Class II appliances may have parts operating at safety extra-low voltage.

2.20 class III appliance. An appliance in which protection against electric shock relies on supply at safety extra-low voltage and in which voltages higher than this are not generated.

NOTE. Appliances intended to be operated at safety extra-low voltage and having internal circuits that operate at a voltage other than safety extra-low voltage are not included in the classification and are subject to additional requirements.

2.21 extra-low voltage. A voltage supplied from a source within the appliance and, when the appliance is operated at its rated voltage, not exceeding 42 V between conductors and between conductors and earth, the extra-low voltage circuit being separated from other circuits by basic insulation only.

2.22 safety extra-low voltage. A nominal voltage not exceeding 42 V between conductors and between conductors and earth, the no-load voltage not exceeding 50 V.

NOTE 1. When safety extra-low voltage is obtained from the supply mains, it is essential that it be through a safety isolating transformer or a converter with separate windings.

NOTE 2. The voltage limits specified are based on the assumption that the safety isolating transformer is operated at its rated supply voltage.

2.23 safety isolating transformer. A transformer, the input winding of which is electrically separated from the output windings by an insulation at least equivalent to double insulation or reinforced insulation, and which is designed to supply a distribution circuit, an appliance or other equipment at safety extra-low voltage.

NOTE. Transformers complying with the requirements of BS 3535 without provision for earthing and with the appropriate output voltages are considered to be safety isolating transformers for the purposes of this specification.

2.24 portable appliance. Either an appliance that is moved while in operation or an appliance that can easily be moved from one place to another while connected to the supply.

2.25 No requirement.

2.26 No requirement.

2.27 No requirement.

2.28 No requirement.

2.29 conditions of adequate heat discharge. Conditions that denote that the appliance is operated when placed in a vessel of appropriate shape filled with a quantity of initially cold water sufficient to immerse the appliance to the minimum depth of immersion, except that, for aquarium immersion heaters, the quantity of water is equal to 25 litres per 100 W rated input.

2.30 No requirement.

2.31 No requirement.

2.32 continuous operation. Operation in accordance with conditions of adequate heat discharge for an unlimited period.

2.33 No requirement.

2.34 No requirement.

2.35 non-detachable part. A part that cannot be removed without the aid of a tool.

2.36 detachable part. A part that can be removed without the aid of a tool.

2.37 thermostat. A temperature-sensing device, the operating temperature of which may be either fixed or adjustable and which, during normal operation, keeps the temperature of an appliance, or of parts of it, between certain limits by automatically opening and closing a circuit.

2.38 temperature limiter. A temperature-sensing device, the operating temperature of which may be either fixed or adjustable and which, during normal operation, operates by opening or closing a circuit when the temperature of an appliance, or of parts of it, reaches a predetermined value.

NOTE. A temperature limiter does not make the reverse operation during the normal duty cycle of the appliance. It may or may not require manual resetting.

2.39 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.

2.40 self-resetting thermal cut-out. A thermal cut-out that automatically restores the current after the relevant part of the appliance has cooled down sufficiently.

2.41 non-self-resetting thermal cut-out. A thermal cut-out that requires resetting by hand, or replacement of a part, in order to restore the current.

2.42 tool. A screwdriver, a coin or any other object that may be used to operate a screw or similar fixing means.

2.43 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 insulating material.

2.44 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 the appliance is the outer surface of the enclosure, considered as though metal foil were pressed into contact with accessible surfaces of insulating material.

2.45 all-pole disconnection. Disconnection of both supply conductors by a single switching action.

NOTE. The protective earthing conductor is not considered to be a supply conductor.

2.46 No requirement.

2.47 accessible part or accessible surface. A part or surface that can be touched by means of test finger I specified in BS 3042 (see figure 1).

2.48 body. All accessible metal parts, shafts of handles, knobs, grips and the like and metal foil in contact with all accessible surfaces of insulating material but excluding inaccessible metal parts.

3. General requirements

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

TEST. In general, compliance shall be checked by carrying out all the relevant tests specified.

3.1 Additionally, where the standard is used for the purposes of granting nationally recognized certification marks, 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 authority granting the certification mark and pending the issue of an amendment or extension to this standard.

4. General conditions for the tests

4.1 Tests carried out according to this standard are type tests.

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

NOTE 1. If it is evident from the design of the appliance that a particular test is not applicable, this test is not carried out.

NOTE 2. If the appliance is designed for different supply voltages, for both a.c. and d.c., more than one sample may be required.

NOTE 3. If it is necessary to dismantle a class II appliance for the relevant tests, one additional sample is required.

NOTE 4. 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 5. If the appliance is an aquarium heater with an enclosure that fractures during the impact test of 21.1, the test of 21.101, 11.2 and subsequent tests are made on a new sample.

4.3 The tests shall be carried out in the order of the clauses of this standard except that the tests of clause 21 shall be carried out before the tests of clause 11.

NOTE. Before testing is started, the appliance is operated at rated voltage in order to verify that it is in working order.

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

4.5 If the test results are influenced by the temperature of the ambient air, the room temperature shall be, in general, 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 is, in case of doubt, maintained at 23 ± 2 °C.

4.6 Appliances for a.c. only shall be tested with a.c., at rated frequency, if marked; those for d.c. only shall be tested with d.c. and those for a.c./d.c. shall be tested at the more unfavourable supply.

Appliances for a.c. that are not marked with a rated frequency shall be tested at 50 Hz.

Appliances for a.c. that are marked with a rated frequency range of 50 Hz to 60 Hz shall be tested at 50 Hz or 60 Hz, whichever is the more unfavourable.

Appliances marked with a rated frequency range other than 50 Hz to 60 Hz shall be tested at the most unfavourable frequency within the range.

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

Unless otherwise specified, appliances designed for one or more rated voltage ranges shall be tested at the most unfavourable voltage within the relevant range.

When testing appliances for d.c. only, the possible influence of polarity on the operation of the appliance shall be taken into consideration.

NOTE. If an appliance is designed for one rated voltage range, the upper limit of the voltage range will usually be the most unfavourable within the range. If the appliance is designed for more than one rated voltage or rated voltage range, it may be necessary to carry out some of the tests at the minimum, the mean and the maximum values of the rated voltage range in order to establish the most unfavourable voltage.

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

4.8 No requirement.

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

4.10 No requirement.

4.11 Unless otherwise specified, appliances intended to be supplied by means of a flexible cable or cord shall be tested with the appropriate flexible cable or cord connected to the appliance.

4.12 When it is specified that the appliance has to be supplied at a voltage such that the input is greater than rated input, this voltage shall apply only to heating elements without an appreciable positive temperature coefficient of resistance. For other heating elements, this voltage shall be determined as follows.

First, the rated voltage is supplied until the heating element reaches its operating temperature. The supply voltage is then rapidly increased to the value necessary to give the input required for the relevant test and the test is carried out as specified, the value of the supply voltage being maintained throughout the test.

NOTE. In general, the temperature coefficient is considered to be appreciable if, at rated voltage, the input of the appliance in cold condition differs by more than 25 % from the input at operating temperature.

4.13 No requirement.

4.14 Class III appliances shall be tested together with their supply transformers if these are sold with the appliances.

4.15 For the purposes of **8.6, 8.7, 16.4, 25.11** and **27.1**, parts separated from live parts by double insulation or reinforced insulation shall be regarded as not being likely to become live in the event of an insulation fault; connection of accessible metal parts to an earthing terminal or earthing contact does not remove the necessity for carrying out the relevant tests.

4.16 If class I appliances have accessible metal parts that are not connected to an earthing terminal or earthing contact and that are not separated from live parts by an intermediate metal part which is connected to an earthing terminal or earthing contact, such parts shall be checked for compliance with the appropriate requirements specified for class II appliances.

4.17 If class I or class II appliances have parts operating at safety extra-low voltage, such parts shall be checked for compliance with the appropriate requirements specified for class III appliances.

4.18 For testing appliances incorporating electronic circuits, see appendix A.

5. Rating

5.1 The maximum rated voltage is 250 V.

TEST. Compliance shall be checked by inspection of the marking.

NOTE. The requirements of this standard are based on the assumption that, in normal use, the voltage between the supply lines and earth does not exceed 254 V.

5.I Appliances intended for direct connection to the UK mains supply shall have a rated voltage that covers use at 240 V and a rated frequency that covers use at 50 Hz.

TEST. Compliance shall be checked by inspection of the marking.

6. Classification

The appliances covered by this standard shall be classified:

- (a) according to protection against electric shock:
 - class I appliances;
 - class II appliances;
 - class III appliances;

NOTE 1. The class numbers are not intended to reflect the safety level of the appliances, but only the means by which the safety is obtained.

NOTE 2. If class III appliances are sold with a separate safety isolating transformer for their supply from the mains, their classification is not altered.

- (b) according to degree of protection against moisture:
 - appliances proof against accidental total immersion;
 - appliances intended to be completely immersed in normal use (aquarium heaters only);
 - watertight appliances.

7. Marking

7.1 Appliances shall be marked with:

- (a) rated voltage(s) or rated voltage range(s), in volts; optional for appliances with detachable heating elements only;
- (b) symbol for nature of supply, if applicable;
- (c) rated frequency or rated frequency range, in hertz, unless the appliance is designed for d.c. only or for a.c. of both 50 Hz and 60 Hz;
- (d) rated input in watts or kilowatts, if greater than 25 W;
- (e) manufacturer's or responsible vendor's name, trade mark or identification mark;
- (f) manufacturer's model or type reference;
- (g) symbol for class II construction, for class II appliances only;
- (h) symbol for degree of protection against moisture, if applicable;
- (i) the maximum and minimum depths of immersion if intended to be completely immersed.

NOTE 1. The rated input is the total maximum input of the circuits that can be in operation simultaneously.

NOTE 2. Additional markings are allowed, provided they do not give rise to misunderstanding.

NOTE 3. The maximum and minimum depths of immersion may be indicated by lines on the appliance provided the meaning of these lines is given in the instruction sheet accompanying the appliance.

7.2 No requirement.

7.3 Detachable heating elements shall be marked with:

- (a) rated voltage(s) or rated voltage range(s) in volts;
- (b) rated input in watts or kilowatts, if greater than 25 W;
- (c) manufacturer's name or responsible vendor's name, trade mark or identification mark;
- (d) manufacturer's model or type reference;
- (e) symbol for degree of protection against moisture, if applicable.

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.

NOTE. For appliances for which frequent changes in voltage setting are not required, this requirement is considered to be complied with 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 it is essential that it is 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.

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 the 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 parentheses after the marking of the input at operating temperature.

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

V	volts
A	amperes
Hz	hertz
W	watts
kW	kilowatts
	alternating current
	direct current
	class II construction

 watertight construction (two drops)

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

The dimensions of the symbol for class II construction shall be such that the length of the sides of the outer square is about twice the length of the sides of the inner square. The length of the sides of the outer square shall be not less than 5 mm, unless the largest dimension of the appliance does not exceed 150 mm, in which case the dimensions of the symbol may be reduced, but the length of the sides of the outer square shall be not less than 3 mm.

The symbol for class II construction shall be so placed that it will be obvious that it is a part of the technical information and is unlikely to be confused with any other marking.

This list of symbols is not exclusive and other symbols for different purposes are allowed if they do not lead to misunderstanding.

7.7 For class I appliances, the line terminal shall be indicated by the letter L.

Terminals intended exclusively for the neutral conductor shall be indicated by the letter N.

Earthing terminals shall be indicated by the symbol .

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

7.8 No requirement.

7.9 Unless it is obviously unnecessary, switches, the operation of which might cause a hazard, shall be so marked or placed as to indicate clearly which part of the appliance they control.

Indications used for this purpose shall, wherever practicable, be comprehensible without a knowledge of languages, national standards, etc.

7.10 The different positions of regulating devices shall be indicated by figures, letters or other visual means. The 'off' position shall not be indicated by words only.

If figures are used for indicating the different positions, the 'off' position shall be indicated by the figure 0 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.

7.11 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.

NOTE. An indication of + and - is considered to be sufficient.

7.12 If it is necessary to take special precautions when installing or using the appliance, details of these shall be given in an instruction sheet that accompanies the appliance.

For appliances with type Z attachment, the instruction sheet shall contain the substance of the following information:

'The supply cord of this appliance cannot be replaced; if the cord is damaged, the appliance should be discarded.'

For appliances intended to be completely immersed a warning against operating whilst not fully immersed shall be given on a label attached to the heater or in the instruction leaflet.

The instruction sheet shall state that care should be taken that the appliance is always switched off when not immersed in liquid and that care should be taken when handling the appliance after removal from the liquid, to avoid the risk of burns or fire.

The instruction sheet shall include the following warning: 'WARNING — THIS IMMERSION HEATER MUST NOT BE USED IN BATHROOMS'.

7.13 Instruction sheets and other texts required by this standard shall be written in the official language(s) of the country in which the appliance is to be sold. For appliances for sale in the United Kingdom instructions shall be in English.

Where symbols are used, they shall be those indicated in this standard, although additional symbols are permitted provided they do not give rise to misunderstanding.

TEST. Compliance with the requirements of **7.1** to **7.7** and **7.9** to **7.13** shall be checked by inspection.

7.14 Marking required by this standard shall be easily legible and durable.

Marking specified in **7.1** to **7.5** shall be on a main part of the appliance or detachable heating element.

The marking shall be clearly discernible from the outside, if necessary, after removal of a cover; the removal of this cover shall not require the use of a tool.

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

Marking on, and indications 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 is misleading.

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 specified in 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 1. A revision of the test for checking the durability of the marking is under consideration.

NOTE 2. In considering the durability of the marking, the effect of normal use is taken into account. Thus, for example, marking by means of paint or enamel other than vitreous enamel on containers that are likely to be cleaned frequently is not considered to be durable.

7.I A label shall be attached to the flexible cord of all class I appliances fitted with a flexible cable or cord having cores coloured green-and-yellow, blue and brown. This label 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 that 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 $\perp$ or coloured green or green-and-yellow.

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

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

For class II appliances fitted with a flexible cord, instructions shall be given by the manufacturer for the correct connection of the plug. These instructions shall make it clear that neither core is to be connected to the earth terminal of a three-pin plug.

TEST. Compliance shall be checked by inspection.

7.II For class I appliances the following warning notice shall be given on a label attached to the end of the flexible cord.

'WARNING – THIS APPLIANCE MUST BE EARTHED'

The warning shall also be included in the user instructions.

NOTE. The label specified in 7.I may be used for this purpose: a separate label is not required.

TEST. Compliance shall be checked by inspection.

NOTE. For appliances intended for export, labelling other than that specified in 7.I and 7.II may be required.

7.III No requirement.

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 and, for class II appliances, with metal parts separated from live parts by basic insulation only. This requirement applies for all positions of the appliance when it is wired and operated as in normal use, even after opening of lids and doors and removal of detachable parts, except for lamps located behind a detachable cover, provided that the appliance can be isolated from the supply by means of a plug or an all-pole switch, the 'off' position of which is clearly indicated. During the insertion or removal of lamps, protection against accidental contact with live parts of the lamp cap shall also be ensured.

There shall be, in addition, adequate protection against the risk of contact with basic insulation. Such insulation may, however, be accessible after removing a cover that requires the use of tools for removal and has to be

removed for user maintenance, or after removing a cover that can be removed without tools if marked 'Remove plug before removing this cover' or 'Disconnect from the mains before removing this cover'.

The insulating properties of lacquer, enamel, ordinary 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.

The enclosure of the appliance shall have no openings, other than those necessary for the use and working of the appliance, giving access to live parts and, for class II appliances, to parts separated from live parts by basic insulation only.

NOTE 1. Unless otherwise specified, parts operating at safety extra-low voltage not exceeding 24 V are not considered to be live parts.

NOTE 2. If a manufacturer instructs the user to remove a part during normal operation or user maintenance, that part is regarded as a detachable part even if a tool has to be used for its removal.

NOTE 3. This requirement excludes the use of screw-type fuses and screw-type miniature circuit-breakers if they are accessible without the aid of a tool. It implies that sockets used as terminal devices for detachable heating elements have to be so designed as to prevent accidental contact with live parts when the heating element has been removed.

NOTE 4. Self-curing resins are not regarded as sealing compound.

TEST. Compliance shall be checked by inspection and by a test with test finger I specified in BS 3042 (see figure 1).

In addition, all apertures in class II appliances, and apertures in class I appliances other than those in metal parts connected to an earthing terminal or earthing contact, and those giving access to live parts in socket outlets and lamp caps, shall be tested with test pin I specified in BS 3042 (see figure 2). The test finger and the test pin are applied, without appreciable force, in every possible position.

Apertures preventing the entry of the finger shall be further tested by means of a straight unjointed test finger of the same dimensions, which is applied with a force of 20 N; if this finger enters, the test with test finger I is repeated, the finger being introduced through the aperture. If the unjointed test finger does not enter, the force applied is increased to 30 N. If then the guard is so displaced or the aperture so distorted that test finger I can be inserted without force, the test with test finger I is repeated. An electrical contact indicator shall be used to show contact.

It shall not be possible to touch bare live parts or live parts protected by lacquer, enamel, ordinary paper, cotton, oxide film, beads or sealing compound only, with test finger I specified in BS 3042.

It shall not be possible to touch basic insulation with test finger I unless it is under a detachable cover which either requires the use of a tool for removal or is marked, 'Remove plug before removing this cover' or 'Disconnect from the mains before removing this cover'.

For class II appliances it shall not be possible to touch bare live parts with the test pin I specified in BS 3042 or to touch metal parts separated from live parts by basic insulation only with test finger I specified in BS 3042.

NOTE 1. When applying test finger I, either or both of the jointed sections should be turned through any angle up to 90° with respect to the axis of the finger in the same direction only.

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.

8.2 No requirement.

8.3 No requirement.

8.4 Conducting liquids that are or may become accessible in normal use shall not be in direct contact with live parts