



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

**Part 3. Complete particular specifications
Section 3.11 Mains-operated toothbrushes**

Spécification relative à la sécurité des appareils électrodomestiques
Partie 3. Spécifications particulières complètes
Section 3.11 Broses à dents automatiques branchées sur le secteur

Spezifikation bezüglich der Sicherheit von elektrischen Haushaltsgeräten
Teil 3. Volle einzelne Spezifikationen
Abschnitt 3.11 Netzbetriebene Zahnbürsten

BS 3456 : Part 3 : Section 3.11 : 1979

Contents

	Page		Page
Foreword	1	Tables	
Cooperating organizations	Back cover	1. No requirement	
Specification		2. No requirement	
1. Scope	2	3. Permissible temperature rises	8
2. Definitions	2	4. Insulation resistance	10
3. General requirements	4	5. Test voltage	11
4. General conditions for the tests	4	6. No requirement	
5. Rating	5	7. Limiting temperatures of windings under abnormal operation	12
6. Classification	5	8. No requirement	
7. Marking	5	9. No requirement	
8. Protection against electric shock	6	10. No requirement	
9. Starting of motor-operated toothbrushes	7	11. No requirement	
10. No requirement		12. No requirement	
11. Heating	7	13. No requirement	
12. No requirement		14. No requirement	
13. Electrical insulation and leakage current at operating temperature	9	15. No requirement	
14. Radio and television interference suppression	9	16. No requirement	
15. Moisture resistance	10	17. No requirement	
16. Insulation resistance and electric strength	10	18. No requirement	
17. Overload protection	11	19. Torque values for screws and nuts	18
18. Endurance	11	20. Creepage distances and clearances	20
19. Abnormal operation	12	Figures	
20. Stability and mechanical hazards	12	1. Standard test finger	22
21. Mechanical strength	13	2. Test pin	22
22. Construction	13	3. No requirement	
23. Internal wiring	15	4. Diagram for leakage current measurement at operating temperature for connection of class II toothbrushes	23
24. Components	16	5. Diagram for leakage current measurement at operating temperature for connection of toothbrushes other than those of class II	23
25. Supply connection and external flexible cords	16	6. No requirement	
26. No requirement		7. No requirement	
27. No requirement		8. No requirement	
28. Screws and connections	18	9. No requirement	
29. Creepage distances, clearances and distances through insulation	19	10. No requirement	
30. Resistance to heat, fire and tracking	20	11. No requirement	
31. Resistance to rusting	21	12. Impact-test apparatus	24
32. No requirement		13. No requirement	
Appendices		14. Ball-pressure apparatus	25
A. Electronic circuits	28	15. Hot mandrel apparatus	25
B. Measurement of creepage distances and clearances	30	16. Arrangement and dimensions of the electrodes for the tracking test	26
C. Classification of controls in accordance with the requirements of BS 3955 : Part 3 as type 1 or type 2	32	17. Apparatus for flexing test specified in 25.10	27
		18. No requirement	

Foreword

This specification for mains-operated toothbrushes has been prepared under the direction of the Light Electrical Engineering Standards Committee and is one of the new series of 'stand-alone' specifications.

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). The general requirements of this standard are technically identical with the CENELEC harmonization documents HD 250 and HD 251 and their agreed revisions which will shortly be adopted as HD 251.S2. The particular requirements were developed by BSI sub-committee LEL/161/15. Any minor changes that may be required as a result of the subsequent revisions of 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 which cannot, for the moment, be removed. Such UK 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 mains-operated toothbrushes 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 mains-operated toothbrushes.

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 and the Factories Act apply.

Compliance with the Electrical Equipment (Safety) Regulations: 1975 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) for household equipment uses the series of specifications in BS 3456 as the requirements for granting its certification mark (see the inside back cover for details).

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



British Standard Specification for

Safety of household and similar electrical appliances

Part 3. Complete particular specifications

Section 3.11 Mains-operated toothbrushes

1. Scope

1.1 BS 3456: Part 3 : Section 3.11 specifies requirements for mains-operated electric toothbrushes.

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.

This standard does not apply to:

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

toothbrushes for medical purposes;

rechargeable battery-operated toothbrushes.

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

For toothbrushes 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, with the exception of definitions **2.16** and **2.17**, apply. Definitions **2.16** and **2.17** have been included because, although these classes of toothbrush are not permitted in the United Kingdom, they are referred to in corresponding international standards.

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

2.2 rated voltage range. The voltage range assigned to the toothbrush 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 toothbrush is operating at its rated voltage and under normal conditions of use.

NOTE 1. Normal conditions of use include changes of voltage within the toothbrush imposed by likely occurrences such as 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 or under normal load and at normal

operating temperature assigned to the toothbrush by the manufacturer.

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

NOTE. If no current is assigned to the toothbrush, the rated current for the purpose of this standard is determined by calculation from the rated input and the rated voltage and/or by measuring the current when the toothbrush is operating at rated voltage under normal load and at normal operating temperature.

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

2.7 rated frequency range. The frequency range assigned to the toothbrush 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 cord, for supply purposes, fixed to, or assembled with, the toothbrush according to one of the following methods.

type Y attachment. A method of attachment such that the flexible 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 cords or with special cords.

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

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 must be one homogeneous piece. It may comprise several layers which cannot be tested singly as supplementary or basic insulation.

2.16 class 0 toothbrush. A toothbrush in which protection against electric shock relies upon basic insulation; this implies that there are no means for the connection of accessible conductive parts, if any, to the

protective (earthing) conductor in the fixed wiring of the installation, reliance in the event of a failure of the basic insulation being placed upon the environment.

NOTE 1. Class 0 toothbrushes have either an enclosure of insulating material which may form a part or the whole of the basic insulation, or a metal enclosure which is separated from live parts by an appropriate insulation. If a toothbrush with an enclosure of insulating material has provision for earthing internal parts, it is considered to be of class I or class II construction.

NOTE 2. Class 0 toothbrushes may have parts with double insulation or reinforced insulation, or parts operating at safety extra-low voltage.

2.17 class 0I toothbrush. A toothbrush having at least basic insulation throughout and provided with an earthing terminal, but with a power supply cord without an earthing conductor and a plug without an earthing contact and which cannot be introduced into a socket-outlet with an earthing contact.

NOTE. Class 0I toothbrushes may have parts with double insulation or reinforced insulation, or parts operating at safety extra-low voltage.

2.18 class I toothbrush. A toothbrush 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 toothbrushes may have parts with double insulation, or parts operating at safety extra-low voltage.

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

2.19 class II toothbrush. A toothbrush 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 a toothbrush may be of one of the following types:

- (a) a toothbrush 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 a toothbrush is called an 'insulation-encased class II toothbrush';
- (b) a toothbrush 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 a toothbrush is called a 'metal-encased class II toothbrush';
- (c) a toothbrush which is a combination of the types (a) and (b).

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

NOTE 2. If a toothbrush with double insulation and/or reinforced insulation throughout has an earthing terminal or earthing contact, it is considered to be of class I or class 0I construction. Class II toothbrushes may be provided with means for maintaining the continuity of protective circuits, provided that such means are within the toothbrush and are insulated from accessible conductive parts by double insulation or reinforced insulation.

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

2.20 class III toothbrush. A toothbrush in which protection against electric shock relies on supply at safety

extra-low voltage and in which voltages higher than these are not generated.

NOTE. Toothbrushes 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 toothbrush and, when the toothbrush 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, 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 No requirement.

2.25 hand-held appliance. A portable appliance intended to be held in the hand during normal use, the motor, if any, forming an integral part of the appliance.

2.26 No requirement.

2.27 No requirement.

2.28 No requirement.

2.29 No requirement.

2.30 normal load. The toothbrush shall be operated with the brush head fitted and the unit suspended horizontally in free air. The toothbrush shall be operated for a sequence of 5 cycles, each cycle being 3 min 'on' and 1 min 'off'.

2.31 rated operating time. The operating time assigned to the toothbrush by the manufacturer.

2.32 No requirement.

2.33 short-time operation. Operation under normal load for a specified period, starting from cold, the intervals between each period of operation being sufficient to allow the toothbrush to cool down approximately to room temperature.

2.34 intermittent operation. Operation in a series of specified identical cycles, each cycle being composed of a period of operation under normal load, followed by a rest period with the toothbrush running idle or switched off.

2.35 non-detachable part. A part that can be removed only with the aid of a tool.

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

2.37 No requirement.

2.38 No requirement.

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 toothbrush 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 toothbrush, 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 toothbrush, measured through air.

NOTE. The bounding surface of the toothbrush 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. For single-phase a.c. toothbrushes and for d.c. toothbrushes, disconnection of both supply conductors by a single switching action.

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 Toothbrushes 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 toothbrush is designed for different supply voltages, for both a.c. and d.c., for different speeds, etc., more than one sample may be required.

NOTE 3. If it is necessary to dismantle a class II toothbrush 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 toothbrush.

4.3 Unless otherwise specified, the tests shall be carried out in the order of the clauses of this specification.

NOTE 1. Before testing is started, the toothbrush is operated at rated voltage in order to verify that it is in working order.

NOTE 2. The test specified in 13.1 is carried out after the tests of clause 21.

4.4 The tests shall be carried out with the toothbrush, 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, the room temperature is, in case of doubt, maintained at 23 ± 2 °C.

4.6 Toothbrushes 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.

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

Toothbrushes 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.

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

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

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

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

the upper limit of the rated voltage range multiplied by this factor, if greater than 1;

the lower limit of the rated voltage range multiplied by this factor, if smaller than 1.

NOTE. Where reference is made to maximum or minimum rated input, the rated input related to the upper limit or lower limit respectively of the rated voltage range is meant.

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

NOTE. It may be necessary to carry out some of the tests at the minimum, the mean and the maximum values of the rated voltage or the rated voltage range in order to establish the most unfavourable voltage.

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

4.8 No requirement.

4.9 Toothbrushes provided with 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** Toothbrushes shall be tested with the flexible cord connected to the appliance.
- 4.12** No requirement.
- 4.13** No requirement.
- 4.14** Class III toothbrushes shall be tested together with their supply transformers if these are sold with the toothbrushes.
- 4.15** For the purposes of **8.6**, **8.7** and **16.4**, 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.
- 4.16** No requirement.
- 4.17** If class II toothbrushes have parts operating at safety extra-low voltage, such parts shall be checked for compliance with the appropriate requirements specified for class III toothbrushes.
- 4.18** For testing toothbrushes 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.

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.

5.1 Toothbrushes 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

6.1 The toothbrushes covered by this standard shall be classified:

- (a) according to protection against electric shock:
class II toothbrushes;
class III toothbrushes.

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

NOTE 2. If class III toothbrushes 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:
watertight appliances.

7. Marking

7.1 Toothbrushes shall be marked with:

- (a) rated voltage(s) or rated voltage range(s), in volts;
- (b) symbol for nature of supply, if applicable;
- (c) rated frequency or rated frequency range, in hertz, unless the toothbrush is designed for d.c. only or for a.c. of both 50 Hz and 60 Hz;

If the rated current of the appropriate fuse-link is marked and if the fuse or fuse-link is of the time-lag type, information about the time/current

characteristic rating shall be included in the relevant marking;

- (d) manufacturer's or responsible vendor's name, trade mark or identification mark;
- (e) manufacturer's model or type reference;
- (f) symbol for class II construction, for class II toothbrushes only;
- (g) symbol for watertight toothbrushes.

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

7.2 No requirement.

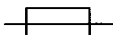
7.3 No requirement.

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

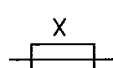
7.5 No requirement.

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

V	volts
A	amperes
Hz	hertz
W	watts
min	minutes
s	seconds
~	alternating current
—	direct current

 A rated current of the appropriate fuse-link

 time-lag D-type fuse-link

 time-lag miniature fuse-link where X is the symbol for time/current characteristic as given in BS 4265

 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 not be 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.

7.7 No requirement.

7.8 No requirement.

7.9 No requirement.

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, etc., shall be indicated by a higher figure.

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

7.11 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 using the toothbrush, details of these shall be given in an instruction sheet that accompanies the toothbrush.

For toothbrushes with type Z attachments, the instruction sheet shall contain the substance of the following information:

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

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 toothbrush 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 **7.13** 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.

The marking shall be clearly discernible from the outside.

Marking on, and indications for switches 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 No requirement.

7.II No requirement.

7.III No requirement.

7.101 The instructions shall contain a statement embodying the substance of the following: 'When used in bathrooms this toothbrush should be operated only from a shaver socket for which purpose the correct plug shall be fitted.'

8. Protection against electric shock

8.1 Toothbrushes shall be so constructed and enclosed that there is adequate protection against accidental contact

with live parts and, for class II toothbrushes, with metal parts separated from live parts by basic insulation only. This requirement applies for all positions of the toothbrush when it is wired and operated as in normal use, even after removal of detachable parts.

There shall be, in addition, adequate protection against the risk of contact with basic insulation.

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 toothbrush shall have no openings, other than those necessary for the use and working of the toothbrush, giving access to live parts and, for class II toothbrushes, 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. Self-hardening 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, apertures in class II toothbrushes 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.

For class II toothbrushes 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 For toothbrushes other than those of class III having a rated voltage not exceeding 24 V, metal parts that are in contact with skin shall be separated from live parts by double insulation or reinforced insulation and shall not be earthed.

TEST. Compliance shall be checked by inspection and by the tests specified for double insulation and reinforced insulation.

8.3 No requirement.

8.4 No requirement.

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

TEST. Compliance with the requirements of 8.4 and 8.5 shall be checked by inspection.

8.6 For toothbrushes other than those of class III, handles, levers and knobs that are held or actuated in normal use shall not become live in the event of an insulation fault. If these handles, levers or knobs are of metal, and if their shafts or fixings are likely to become live in the event of an insulation fault, they shall either be adequately covered by insulating material or their accessible parts shall be separated from their shafts or fixings by supplementary insulation.

TEST. Compliance shall be checked by inspection and, if necessary, by the tests specified for supplementary insulation.

8.7 For toothbrushes other than those of class III, handles which, in normal use, are continuously held in the hand, shall be so constructed that, when gripped as in normal use, contact between the operator's hand and metal parts that may become live in the event of an insulation fault is unlikely.

TEST. Compliance shall be checked by inspection and by manual test.

8.8 For class II toothbrushes, capacitors shall not be connected to accessible metal parts, and their casings, if of metal, shall be separated from accessible metal parts by supplementary insulation.

TEST. Compliance shall be checked by inspection and by the tests specified for supplementary insulation.

8.9 Toothbrushes intended to be connected to the supply by means of a plug shall be so designed that, in normal use, there is no risk of electric shock from charged capacitors when touching the pins of the plug.

TEST. Compliance shall be checked by the following test, which is carried out ten times.

The toothbrush is operated at rated voltage or at the upper limit of the rated voltage range.

The toothbrush switch, if any, is then moved to the 'off' position and the toothbrush is disconnected from the supply by means of the plug.

One second after disconnection, the voltage between the pins of the plug is measured with an instrument which does not appreciably affect the value to be measured.

This voltage shall not exceed 34 V.

NOTE. Capacitors having a rated capacitance not exceeding 0.1 μ F are not considered to entail a risk of electric shock.

9. Starting of motor-operated appliances

9.1 Motors shall start under all normal voltage conditions that may occur in use without contact chattering.

TEST. Compliance shall be checked by starting the toothbrush three times at a voltage equal to 0.85 times rated voltage, the toothbrush being at room temperature at the beginning of the test.

The motor shall be started each time under the conditions occurring at the beginning of normal operation, the motor being allowed to come to rest between successive starts.

This test shall be repeated at a voltage equal to 1.06 times rated voltage.

In all cases, the toothbrush shall function in such a way that safety is not affected.

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

9.2 No requirement.

Table 1. No requirement.

9.3 No requirement.

10. No requirement.

Table 2. No requirement.

11. Heating

11.1 Toothbrushes shall not attain excessive temperatures in normal use.

TEST. Compliance shall be checked by determining the temperature rise of the various parts under the conditions specified in 11.2 to 11.7.

11.2 Toothbrushes shall be suspended horizontally in still air.

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

In determining the temperature rises of handles, knobs, grips and the like, consideration shall be given to all parts that are gripped in normal use and, if of insulating material, to parts in contact with hot metal.

The temperature rise of electrical insulation, other than that of windings, shall be determined on the surface of the insulation at places where failure could cause a short circuit; or contact between live parts and accessible metal parts; bridging of insulation or reduction of creepage distances or clearances below the values specified in 29.1.

Temperature rises of windings shall be determined by the resistance method unless the windings are non-uniform or unless it involves severe complications to make the necessary connections, in which case the temperature rise shall be determined by means of thermocouples.

NOTE 1. If it is necessary to dismantle the toothbrush to position thermocouples, the input is measured again to check that the appliance has been correctly reassembled.

NOTE 2. The point of separation of the cores of a multicore cord and is an example of a place where a thermocouple is positioned.

11.4 No requirement.

11.5 Toothbrushes shall be operated under normal load and at the most unfavourable voltage between 0.94 times the minimum rated voltage and 1.06 times the maximum rated voltage.

11.6 No requirement.

11.7 The toothbrush shall be operated for a sequence of 5 cycles, each cycle being 3 min 'on' and 1 min 'off'.

11.8 During the test the temperature rises are to be monitored continuously and they shall not exceed the values shown in table 3; and sealing compound, if any, shall not flow out.

The measurements specified in 13.1 shall be made at the end of this test.

The temperature rise limits in the table may be exceeded if it can be shown that the temperatures are not in excess of the thermal capabilities of the materials as determined by ageing tests made on the materials themselves. Other materials not listed in the table may be used under the same conditions.

The values in the table are based on an ambient temperature not normally exceeding 25 °C but occasionally reaching 35 °C. However, the temperature rise values specified are based on 25 °C.

Table 3. Permissible temperature rises

Part	Temperature rise	Part	Temperature rise
	°C or K		°C or K
Windings ¹ , if the winding insulations is:		phenol-formaldehyde with mineral fillers	100 (200)
of class A material ²	75 (65)	melamine-formaldehyde	75 (150)
of class E material ²	90 (80)	urea-formaldehyde	65 (150)
of class B material ²	95 (85)	polyester with glass-fibre reinforcement	110
of class F material ²	115	silicone rubber	145
of class H material ²	140	polytetrafluoroethylene	265
Ambient of switches ³ :		pure mica and tightly sintered ceramic material, when such materials are used as supplementary insulation or reinforced insulation	400
without <i>T</i> -marking or temperature rating	30	thermoplastic material ⁷	—
with <i>T</i> -marking or temperature rating	7-25	Outer surface of capacitors:	
Rubber or polyvinyl chloride insulation of internal and external wiring including power supply cords:		with marking of maximum operating temperature (<i>T</i>)	7-35
without <i>T</i> -marking or temperature rating	50 ⁴	without marking of maximum operating temperature:	
with <i>T</i> -marking or temperature rating	7-25 ⁵	small ceramic capacitors for radio and television interference suppression	50
Cord sheaths used as supplementary insulation	35	other capacitors	20
Rubber, other than synthetic, used for gaskets or other parts, the deterioration of which could affect safety:		External enclosure of toothbrushes, except handles held in normal use	60
when used as supplementary insulation or as reinforced insulation	40	Handles, knobs, grips and the like which, in normal use, are continuously held:	
in other cases	50	of metal	30
Material used as insulation other than that specified for wires and windings ⁶ :		of porcelain or vitreous material	40
impregnated or varnished textile, paper or press board	70	of moulded material, rubber or wood	50
laminates bonded with:		Handles, knobs, grips and the like which, in normal use, are held for short periods periods only (e.g. of switches):	
melamine-formaldehyde, phenol-formaldehyde or phenol-furfural resins	85 (175)	of metal	35
urea-formaldehyde resin	65 (150)	of porcelain or vitreous material	45
mouldings of:		of moulded material, rubber or wood	60
phenol-formaldehyde with cellulose fillers	85 (175)		

NOTES TO TABLE 3

¹ To allow for the fact that the temperature of windings of universal motors, relays, solenoids, etc. is usually below the average at the points where thermocouples are placed, the figures without parentheses apply when the resistance method is used and those within parentheses apply when thermocouples are used. For windings of vibrator coils and a.c. motors, the figures without parentheses apply in both cases.

² The classification is in accordance with the requirements of BS 2757.

Examples of class A material are:

impregnated cotton, silk, artificial silk and paper;
enamels based on oleo- or polyamide resins.

Examples of class B material are:

asbestos, glass fibre, melamine-formaldehyde and phenol-formaldehyde resins.

Examples of class E material are:

mouldings with cellulose fillers, cotton fabric laminates and paper laminates bonded with melamine-formaldehyde, phenol-formaldehyde or phenol-furfural resins;
cross-linked polyester resins, cellulose triacetate films, polyethylene terephthalate films;
varnished polyethylene terephthalate textile bonded with oil-modified alkyd resin varnish;
enamels based on polyvinylformal, polyurethane or epoxy resins.

For totally enclosed motors the temperature rise limits for class A, class E and class B may be increased by 5 °C (5 K)

A totally enclosed motor is a motor so constructed that the circulation of the air between the inside and the outside of the case is prevented but it is not necessarily sufficiently enclosed to be called airtight.

³ 7 signifies the maximum operating temperature.

For the purposes of this test, switches marked with individual ratings may be considered as having no marking for the maximum operating temperature, if requested by the toothbrush manufacturer.

⁴ This limit applies to cords and wires complying with the requirements of BS 6500.

⁵ This limit will become applicable as soon as there are British Standards for high temperature cords and wires.

⁶ The values in parentheses apply, if the material is used for handles, knobs, grips and the like and it is in contact with hot metal.

⁷ There is no specific limit for thermoplastic material which has to withstand the tests specified in 30.1 or 30.2, for which purpose the temperature rise must be determined

The value of the temperature rise of a copper winding shall be calculated from the formula:

$$\Delta t = \frac{R_2 - R_1}{R_1} (234.5 + t_1) - (t_2 - t_1)$$

where

Δt is the temperature rise (in °C or K)

R_1 is the resistance at the beginning of the test (in Ω)

R_2 is the resistance at the end of the test (in Ω)

t_1 is the room temperature at the beginning of the test (in °C)

t_2 is the room temperature at the end of the test (in °C)

At the beginning of the test, the windings shall be at room temperature.

It is recommended that the resistance of windings at the end of the test be determined by taking resistance measurements as soon as possible after switching off, and then at short intervals so that a curve of resistance against time can be plotted for ascertaining the resistance at the instant of switching off.

NOTE. The classification of handles, knobs, grips and the like according to their material is derived from the constant:

$$b = \sqrt{\lambda \cdot c \cdot \gamma}$$

where

λ is the thermal conductivity of the material (in W/(m K))

c is the specific heat of the material (in J/(kg K))

γ is the specific mass of the material (in kg/m³)

The materials are classified as follows:

value of b greater than 3500 metal;

value of b between 1000 and 3500 porcelain or vitreous material;

value of b less than 1000 moulded material, rubber or wood.

An alternative method of determining the constant, b , is as follows.

Samples of materials with known values of the constant, b , and a sample of the material to be classified, all samples having the same dimensions, are fixed to a heated metal plate.

The temperatures of the upper surfaces of the various samples are measured and the temperatures of the reference samples are plotted as a function of the constant, b .

The constant, b , of the material to be classified is derived from this curve by reading off the value, b , corresponding to the temperature attained by the sample under investigation.

11.9 No requirement.

12. No requirement.

13. Electrical insulation and leakage current at operating temperature

13.1 The electrical insulation of the toothbrush at operating temperature shall be adequate and the leakage current in normal use shall not be excessive.

TEST. Compliance shall be checked by the test specified in **13.2** the toothbrush being operated under normal load for the time specified in **11.7**.

Toothbrushes shall be operated at a supply voltage equal to 1.06 times the rated voltage.

The tests shall be carried out while the toothbrush is connected to the supply.

13.2 The leakage current shall be measured between any pole of the supply and:

(a) accessible metal parts and metal foil with an area not exceeding 200 mm x 100 mm in contact with accessible surfaces of insulating material, connected together;

(b) metal parts of class II toothbrushes separated from live parts by basic insulation only.

The measuring circuit shall be as shown in the following figures:

(a) if of class II, figure 4;

(b) if of class III, figure 5.

The resistance of the measuring circuit shall be $2000 \pm 100 \Omega$ and, if it is suspected that high-frequency currents are being generated, the measuring instrument shall have an accuracy of at least 5 % for all frequencies within the range of 20 Hz to 5000 Hz, but it shall be insensitive to higher frequencies.

The test shall be carried out with a.c., unless the toothbrush is for d.c. only, in which case the test shall not be carried out.

The leakage current shall be measured with the selector switch, shown in figures 4 and 5, in each of the positions 1 and 2.

After an operating time as specified in **11.7**, the leakage current shall not exceed the following values;

(a) to accessible metal parts and metal foil:

(1) for class II appliances 0.25 mA

(2) for class III appliances 0.5 mA

(b) to metal parts of class II toothbrushes separated from live parts by basic insulation only 3.5 mA

Compliance shall be checked by the tests specified in:

(a) **13.2**, the toothbrushes being operated under normal load for the time specified in **11.7**; and

(b) **19.1**, which is carried out after the test specified in clause **21**.

If the toothbrush incorporates one or more capacitors and is provided with a single-pole switch, the measurements shall be repeated with the switch in the 'off' position.

NOTE 1. The cut-off frequency of 5000 Hz may, for example, be obtained by connecting a capacitor of 150 ± 7.5 nF in parallel with the resistive components of the measuring circuit. The measuring circuit may be partly or completely incorporated in the measuring instrument. If an instrument of the rectifier type is used, it should rectify linearly from 0.2 mA upwards within the frequency range of 20 Hz to 10000 Hz, and should be calibrated in r.m.s. values with a current of substantially sine-wave form. If high-frequency voltages are not present, the cut-off frequency of the measuring instrument may exceed 5000 Hz.

NOTE 2. It is recommended that the toothbrush be supplied through an isolating transformer; otherwise, it should be insulated from earth.

NOTE 3. The metal foil has the largest area possible on the surface under test, without exceeding the dimensions specified. If its area is smaller than the surface under test, it is moved so as to test all parts of the surface; the heat dissipation of the toothbrush should not, however, be affected by the metal foil.

NOTE 4. The test with the switch in the 'off' position is carried out to verify that capacitors connected behind a single-pole switch do not cause an excessive leakage current.

13.3 No requirement.

14. Radio and television interference suppression

The incorporation of components necessary to achieve an adequate degree of radio and television interference suppression shall not adversely affect the safety of the toothbrush.

TEST. Compliance shall be checked by the tests specified in this standard.

NOTE. Attention is drawn to the fact that compliance with the requirements concerning the limits for interference effects generated by the toothbrush, as specified in BS 800, and when measured in accordance with that standard, will in most cases ensure that the toothbrush has the required degree of radio and television interference suppression.

15. Moisture resistance

15.1 The enclosure of watertight appliances shall provide the degree of protection against moisture in accordance with the classification of the toothbrush.

TEST. Compliance shall be checked by the appropriate treatment specified in **15.2**.

Immediately after the treatment, the toothbrush shall withstand the electric strength test specified in **16.4**, with the exception of the test already made on the immersed toothbrush.

Appliances shall be allowed to stand in normal test-room atmosphere for 24 h before being subjected to the test specified in **15.4**.

15.2 Toothbrushes shall be tested as delivered.

Electrical components, covers and other parts that can be removed without the aid of a tool shall be removed and subjected, if necessary, to the relevant treatment with the main part.

Sealing rings of glands and other sealing means, if any, shall be aged in an atmosphere having the composition and pressure of the ambient air by suspending them freely in a heating cabinet ventilated by natural circulation.

They shall be kept in the cabinet at a temperature of 70 ± 2 °C, for 10 days (240 h).

Immediately afterwards, the samples shall be taken out of the cabinet and left at room temperature, avoiding direct daylight, for at least 16 h before being reassembled. The glands and other sealing means shall then be tightened with a torque equal to two-thirds of that applied during the test specified in **21.3**.

NOTE. The use of an electrically-heated cabinet is recommended. Natural circulation may be provided by holes in the walls of the cabinet.

Toothbrushes shall then be subjected for 24 h to the immersion test. For the immersion test, the appliance shall be immersed in water at a temperature of 20 ± 5 °C and containing approximately 1% NaCl, the top of the appliance being about 50 mm below the water level, except that appliances marked with maximum depth of immersion shall be immersed in accordance with this marking.

Plugs, if any, shall be kept dry and the appliances shall be operated under normal load.

Toothbrushes shall be operated for twice normal period.

After this treatment, the toothbrush shall withstand, while immersed, an electric strength test as specified in **16.4**, the following test voltage being applied only between live parts and the water:

- (a) 500 V for class III toothbrushes;
- (b) 3750 V for class II toothbrushes.

Class III toothbrushes having a rated voltage not exceeding 24 V are not subjected to this electric strength test.

During this test, the pins of the plug, if any, shall be connected together and mains switches, if any, shall be in the 'on' position.

NOTE. For class II toothbrushes the watertightness may be achieved by means of the supplementary insulation or the reinforced insulation, or by means of an enclosure exterior to this insulation.

15.3 No requirement.

15.4 Toothbrushes shall be proof against humid conditions that may occur in normal use.

TEST. Compliance shall be checked by the humidity treatment described in this subclause, followed immediately by the tests specified in clause **16**.

Electrical components covers and other parts that can be removed without the aid of a tool shall be removed and subjected, if necessary, to the humidity treatment with the main part.

The humidity treatment shall be carried out in a humidity cabinet containing air with a relative humidity of 93 ± 2 %.

The temperature of the air, at all places where samples can be located, is maintained within 1 °C (1 K) of any convenient value t between 20 °C and 30 °C.

Before being placed in the humidity cabinet, the sample shall be brought to a temperature of between t and $t + 4$ °C.

The sample shall be kept in the cabinet for 7 days (168 h)

NOTE 1. In most cases, the sample may be brought to the specified temperature by keeping it at this temperature for at least 4 h before the humidity treatment.

NOTE 2. A relative humidity of 93 ± 2 % can be obtained by placing in the humidity cabinet a saturated solution of sodium sulphate (Na_2SO_4) or potassium nitrate (KNO_3) in water, having a sufficiently large contact surface with the air.

NOTE 3. In order to achieve the specified conditions within the cabinet, it is necessary to ensure constant circulation of the air within and, in general, to use a cabinet which is thermally insulated.

After this treatment, the toothbrush shall show no damage within the meaning of this standard.

16. Insulation resistance and electric strength

16.1 The insulation and electric strength of toothbrushes shall be adequate.

TEST. Compliance shall be checked by the tests specified in **16.3** and **16.4**, which are made on the cold toothbrush, not connected to the supply, immediately after the test specified in **15.4**, in the humidity cabinet or in the room in which the sample was brought to the prescribed temperature, after reassembly of those parts which may have been removed.

16.2 No requirement.

16.3 The insulation resistance shall be measured with a d.c. voltage of approximately 500 V applied, the measurement being made 1 min after application of the voltage.

The insulation resistance shall be not less than that shown in table 4.

Table 4. Insulation resistance

Insulation to be tested	Insulation resistance
	M Ω
Between live parts and the body:	
for basic insulation	2
for reinforced insulation	7
Between live parts and metal parts of class II toothbrushes that are separated from live parts by basic insulation only	2
Between metal parts of class II toothbrushes that are separated from live parts by basic insulation only and the body	5

16.4 Immediately after the test specified in **16.3**, the insulation shall be subjected for 1 min to a voltage of substantially sine-wave form, having a frequency of 50 Hz. The value of the test voltage and the points of application are shown in table 5.