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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Electrically operated toothbrushes – Methods for measuring the performance

Brosses à dents électriques – Méthodes de mesure de l'aptitude à la fonction

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ELECTRICALLY OPERATED TOOTHBRUSHES – METHODS FOR MEASURING THE PERFORMANCE

FOREWORD

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IEC 63174 has been prepared by subcommittee 59L: Small household appliances, of IEC technical committee 59: Performance of household and similar electrical appliances. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
59L/208/FDIS	59L/211/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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- amended.

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ELECTRICALLY OPERATED TOOTHBRUSHES – METHODS FOR MEASURING THE PERFORMANCE

1 Scope

This document applies to **electrically operated toothbrushes** used for electric cleaning of teeth. **Rechargeable toothbrushes** and **primary battery operated toothbrushes**, both for adults and children, are within the scope of this document.

This document describes the test methods for measurement of the performance parameters as listed in Clause 4.

The purpose of this document is only to specify the measurement method; it does not define any limit values.

NOTE The **electrically operated toothbrushes** are classified as follows:

Classification with regard to supply modes:

– **primary battery operated toothbrush**;
– **rechargeable toothbrush**:
  - **wireless rechargeable toothbrush**;
  - **corded rechargeable toothbrush**.

Classification with regard to operating modes:

– **rotary electrically operated toothbrush**;
– **reciprocating electrically operated toothbrush**:
  - **linear reciprocating electrically operated toothbrush**;
  - **rotational reciprocating electrically operated toothbrush**;
– **vibratory electrically operated toothbrush**.

The different types are explained for information only, since the tests to be carried out are identical, except for **primary battery operated toothbrushes** and **rechargeable toothbrushes**.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62301, *Household electrical appliances – Measurement of standby power*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1
electrically operated toothbrush
hand-held electrically operated appliance, the brush **head** of which carries filaments, used primarily for cleaning surfaces within the oral cavity by means of a reciprocating, rotating, or vibrating brush

3.2
rechargeable toothbrush
electrically operated toothbrush powered by incorporated rechargeable batteries

3.3
wireless rechargeable toothbrush
rechargeable toothbrush that is charged with a wireless charging device (electro-magnetic induction)

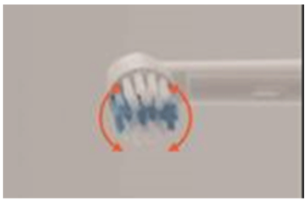
3.4
corded rechargeable toothbrush
rechargeable toothbrush that is charged by connecting a charging device to a connector

3.5
primary battery operated toothbrush
electrically operated toothbrush deriving its energy solely from non-rechargeable batteries

3.6
head
end part of **electrically operated toothbrush** with a non-detachable or detachable brush

3.7
rotary electrically operated toothbrush
electrically operated toothbrush fitted with a round brush **head** acting in a rotating motion

Note 1 to entry: The direction of rotation can oscillate during the cycle.



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3.8
reciprocating electrically operated toothbrush
electrically operated toothbrush fitted with a brush **head** acting in a reciprocating motion

Note 1 to entry: An example of reciprocating motion is a back-and-forth motion along the long axis of the toothbrush, or reciprocating rotational motion around the long axis of the toothbrush.

3.8.1
linear reciprocating electrically operated toothbrush
reciprocating electrically operated toothbrush whose reciprocating motion is back and forth along the longitudinal axis of the toothbrush

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3.8.2
rotational reciprocating electrically operated toothbrush
reciprocating electrically operated toothbrush whose reciprocating motion is rotational about the longitudinal axis of the toothbrush

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3.9
vibratory electrically operated toothbrush
electrically operated toothbrush fitted with a brush **head** acting in a vibrating motion

Note 1 to entry: Vibrations are continuous slight shaking motions of the brush **head** without moving in any particular direction.

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4 Items to be measured

– Weight of the toothbrush
– Vibration frequency
– Rotational speed
– Hours taken to fully charge the **rechargeable toothbrush**
– Working minutes after each charging or battery replacement
– Electrical endurance
– Mechanical endurance
– Button operation endurance
– Stand-by power

5 Testing method

5.1 Conditions for the tests

5.1.1 Unless otherwise specified, tests are carried out under the following environmental conditions:

– Temperature: 20 °C ± 5 °C

– Relative humidity: 50 %

5.1.2 Samples shall be tested under the operational conditions specified in the instructions for use.

5.1.3 The power supply used for the tests shall be the same as that specified for the **electrically operated toothbrush**. If the **electrically operated toothbrush** is provided with more than one power supply, it shall be tested with the one that gives the most unfavorable results.

5.2 Preparation of the test sample

For **rechargeable toothbrushes**, the sample is fully charged and discharged two times before subjecting it to the tests from 5.3 to 5.11.

5.3 Weight of electrically operated toothbrush

The hand-held part of the sample is weighed with scales and the weight is recorded in g.

5.4 Measurement of vibration frequency

The **rechargeable toothbrush** is fully charged.

The **primary battery operated toothbrush** is supplied from an external DC supply with the voltage equal to the battery's rated voltage, as specified in the instructions for use.

The toothbrush shall run under no-load condition for 1 min.

The vibration frequency is measured by a stroboscope. The recorded value for vibration frequency shall be the average value of three consecutive measurements.

5.5 Measurement of rotation speed

The **rechargeable toothbrush** is fully charged.

The **primary battery operated toothbrush** is supplied from an external DC supply with the voltage equal to the battery's rated voltage as specified in the instructions for use.

The toothbrush shall run under no-load condition for 1 min.

The rotational speed is measured by a stroboscope or digital speedometer. The recorded value for rotational speed shall be the average value of three consecutive measurements.

5.6 Hours taken to fully charge the rechargeable toothbrush

The sample is fully charged and then discharged until the rotation speed or vibrating speed falls to zero. The sample is connected to the charger in accordance with the instructions for use and the measurement of time is started. Measurement of time is stopped as soon as the fully-charged signal is on. The time from starting to stopping is recorded in hours.

5.7 Working time after each charging or battery replacement

5.7.1 Determination of working time of rechargeable toothbrush after fully charging

The sample is fully charged and discharged. Then it is fully recharged in accordance with the instructions for use. When it is fully charged, the toothbrush is disconnected from the power supply and is left to rest for 1 h.

The toothbrush is then operated under no-load condition, at the maximum working mode for 2 min and switched off for 2 min. This on-off cycle is repeated until the toothbrush is out of power and stops running. All on times during the test are accumulated and recorded in minutes.

NOTE Any low-energy prompting is ignored.

5.7.2 Determination of working time of primary battery operated toothbrush after battery replacement

The toothbrush is supplied from an external DC supply with a voltage equivalent to the nominal voltage of the primary battery, as marked on the toothbrush or specified in the instructions for use. The toothbrush is adjusted to the maximum working mode, then it is operated under no-load conditions for 2 min and switched off for 2 min. The test is repeated in such cycles.

A voltammeter is used to measure the energy consumption ε_t (Wh) of the toothbrush during the cycles. The test is terminated when the energy consumption ε_t (Wh) is equal to the reference energy (ε_0) of the battery.

When the instructions for use state that one LR03 cell is used, the reference energy (ε_0) of the battery is 1,0 Wh. When the instructions for use state that one LR6 cell is used, the reference energy (ε_0) of the battery is 2,8 Wh. When the instructions for use state that two LR6 cells are used, the reference energy (ε_0) of the battery is 3,5 Wh.

The accumulated working time during the test is calculated and recorded in minutes.

5.8 Electrical endurance

5.8.1 The **rechargeable toothbrush** is fully charged in accordance with the instructions for use at rated frequency and rated voltage. The toothbrush is operated according to the no-load test condition specified in 5.1 for 2 min, then stopped and rested for 2 min. This cycle is repeated until the toothbrush (including the charger) stops working or until the established number of cycles is reached, whichever is shorter. The accumulated working time is recorded. During this period, the toothbrush shall be recharged in accordance with the instructions for use when it is out of power.

NOTE The established number of cycles can be agreed between the manufacturer or the client and the laboratory before the test.

5.8.2 For **primary battery operated toothbrushes**, an equivalent DC supply with the voltage equal to the battery's rated voltage, as specified in the instructions, is used to power the toothbrush. The toothbrush is operated in accordance with the no-load test condition specified in 5.1 for 2 min, then stopped and rested for 2 min. This cycle is repeated until the toothbrush stops to work or until the established number of cycles is reached, whichever is shorter. The accumulated working time is recorded.

NOTE The established number of cycles can be agreed between the manufacturer or the client and the laboratory before the endurance test.

5.9 Mechanical endurance

5.9.1 Preparation of the drop test

5.9.1.1 Prior to the drop test, the appearance and the normal operation of the sample is checked. The sample shall be complete, in good order, and in normal starting-up, charging and motor rotation. Inspection is carried out in accordance with 5.9.1.2 to 5.9.1.4.

The inspection result shall be recorded in Table 1 to Table 4.

NOTE Pictures can be used to show the state of the sample.

5.9.1.2 Appearance and start-up operation are inspected visually.

5.9.1.3 For inspection of the running motor, the vibration rate and speed are measured in accordance with the method specified in 5.4 and 5.5, respectively.

5.9.1.4 For inspection of the charging function, the charging current is measured by the following method.

a) For the **corded rechargeable toothbrush**

The toothbrush is discharged completely. The toothbrush is connected to the charging connector of the charging device. The charging device is plugged to the supply mains and charging begins. After 5 min, a reading of the current is taken. The measuring diagram is as shown in Figure 1a.

b) For the **wireless rechargeable toothbrush**

The toothbrush is discharged completely. The toothbrush is placed on the charging base of the charging device. The charging device is plugged to the supply mains and charging begins. After 5 min, a reading of the current is taken. The measuring diagram is as shown in Figure 1b.