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Dentistry — Manual toothbrushes — Resistance of tufted portion to deflection

Art dentaire — Brosses à dents manuelles — Résistance à la déflexion de la surface garnie

Reference number
ISO 22254:2005(E)

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Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
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Foreword

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ISO 22254 was prepared by Technical Committee ISO/TC 106, *Dentistry*, Subcommittee SC 7, *Oral care products*.

This first edition, together with ISO 20126, cancels and replaces ISO 8627:1987.

This corrected version of ISO 22254:2005 incorporates the correction in the Foreword that this first edition, together with ISO 20126, both cancel and replace ISO 8627:1987.

Introduction

The stiffness of the tufted area of a manual toothbrush has been of great concern for both consumers and manufacturers. This International Standard provides a test method for determining the resistance of the tufted portion to deflection, which could be used to derive a stiffness as described in Annex A. However, this International Standard does not cover stiffness of manual toothbrushes and its classification. For stiffness determination, the measurement of the tufted area is required, but the result of the measurement varies over a wide range depending on the method of the measurement and the shape of the tuft holes. Therefore, the tufted area and stiffness determinations are described in Annex A. Since the perception of stiffness differs amongst different countries, stiffness may be classified differently in each country.

Dentistry — Manual toothbrushes — Resistance of tufted portion to deflection

1 Scope

This International Standard specifies a test method for determining the resistance of the tufted portion of manual toothbrushes to deflection. This International Standard is applicable to toothbrushes having a conventional, flat trim design and may not be applicable to toothbrushes with other designs. The results obtained with this International Standard may not correspond to consumer perceptions of the stiffness of toothbrush filaments.

2 Normative references

The following referenced documents are indispensable for the application 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.

ISO 1942 (all parts), *Dentistry — Vocabulary*

ISO 3696:1987, *Water for analytical laboratory use — Specification and test methods*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1942-1 to ISO 1942-5 and the following apply.

3.1
manual toothbrush
hand-powered device primarily for cleaning surfaces of teeth, the working end of which carries filaments

3.2
brush head
working end of a toothbrush to which the filaments are attached

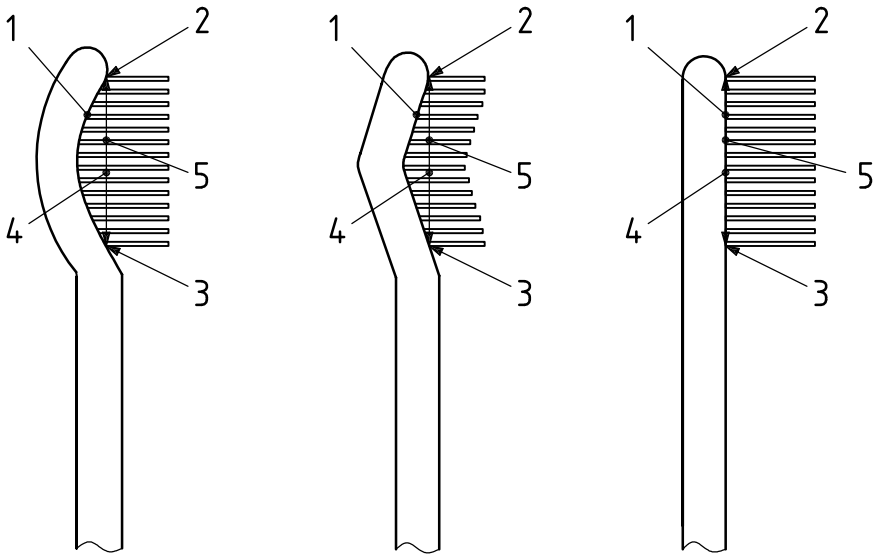
3.3
filament
single strand within the brush head

3.4
tuft
group of filaments gathered together and attached to the brush head

3.5
tuft hole surface
surface of the tuft holes, which can be convex, triangular or plane and which is limited by a peripheral tangent line to the outer tuft holes

3.6
tuft hole plane
plane between the base of the tufts (where they meet the face of the brush) at the top of the brush head and the base of the tufts at the bottom of the brush head

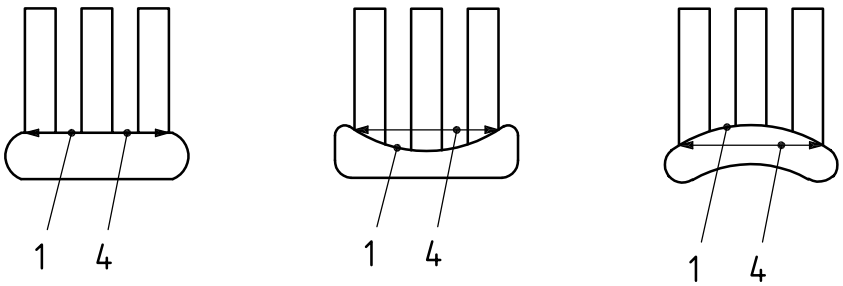
See Figure 1.



a) Side view of brush head

Key

1 tuft hole surface
2 top of brush head
3 bottom of brush head
4 tuft hole plane
5 tufted area

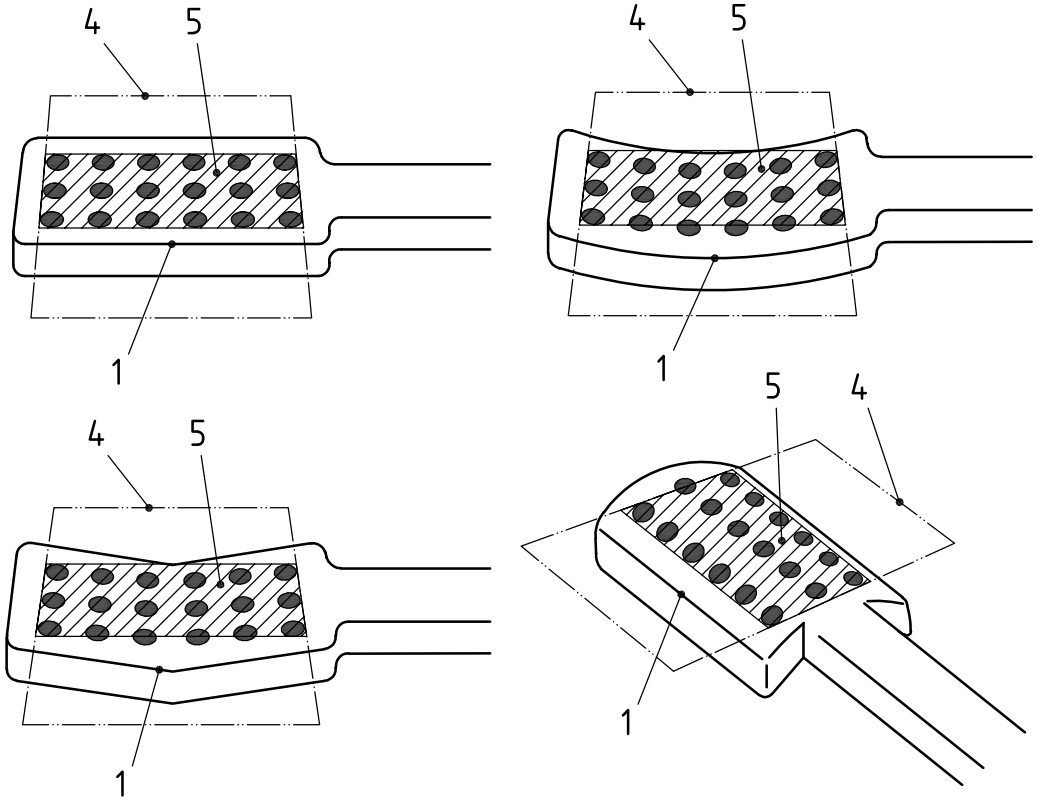


b) Top view of brush head

Key

1 tuft hole surface
4 tuft hole plane

Figure 1 — Tuft hole plane



c) After removal of tufts

Key

1 tuft hole surface
4 tuft hole plane
5 tufted area

Figure 1 (*continued*)

3.7
tufted area
linear projection of the tuft hole surface on to the tuft hole plane

NOTE An alternative definition is: area surrounded by a peripheral tangent line to the outer tufts where they meet the tuft hole plane.

3.8
brush neck
part of the toothbrush which joins the brush head to the handle

3.9
resistance to deflection
resisting force of the tufts to deflection under a force of 5 N, applied at right angles to the tuft hole plane

4 Sampling

The toothbrushes obtained for testing shall be as-manufactured and not modified in any way, except as specified for this International Standard.

Five brushes shall be tested.

The sampling method and the means of procurement are not covered by this International Standard and should be subject to agreement between the interested parties.

5 Test method

5.1 Apparatus

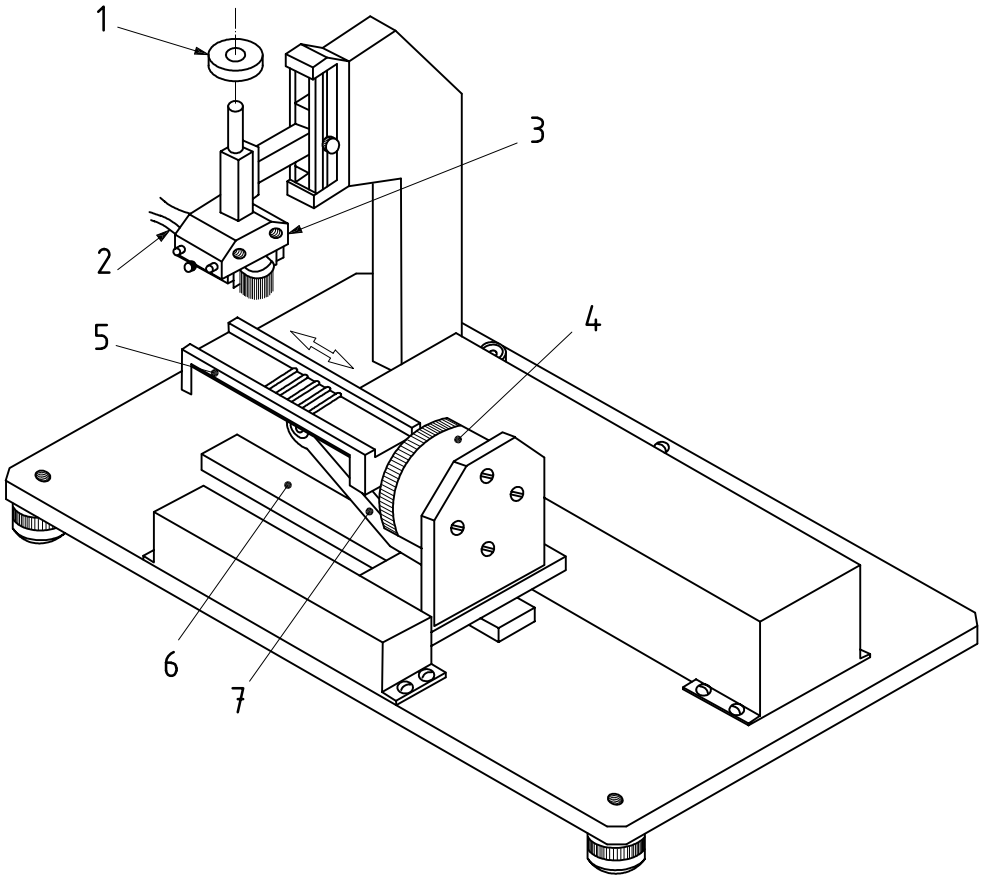
5.1.1 Test machine (see Figure 2), capable of measuring the resistance of the tufted portion to deflection, consisting of the following components:

5.1.1.1 Brushing table (see Figure 3), consisting of five rods (3,2 ± 0,1) mm diameter, with a distance between the centres of the two rods of (8,2 ± 0,1) mm, made of a hard metal such as stainless steel.

5.1.1.2 Vertical column, consisting of a gripping block for the brush head such that it does not flex and applies (5 ± 0,05) N to the gripped brush.

5.1.1.3 Load cell, of force range from 0 to 20 N and accurate to 0,05 N, connected to one end of the brushing table.

5.1.1.4 Driving unit, which moves the table back and forth along the longitudinal axis at a rate between 10 mm/s and 50 mm/s (traverse distance: more than the length of a brush head).

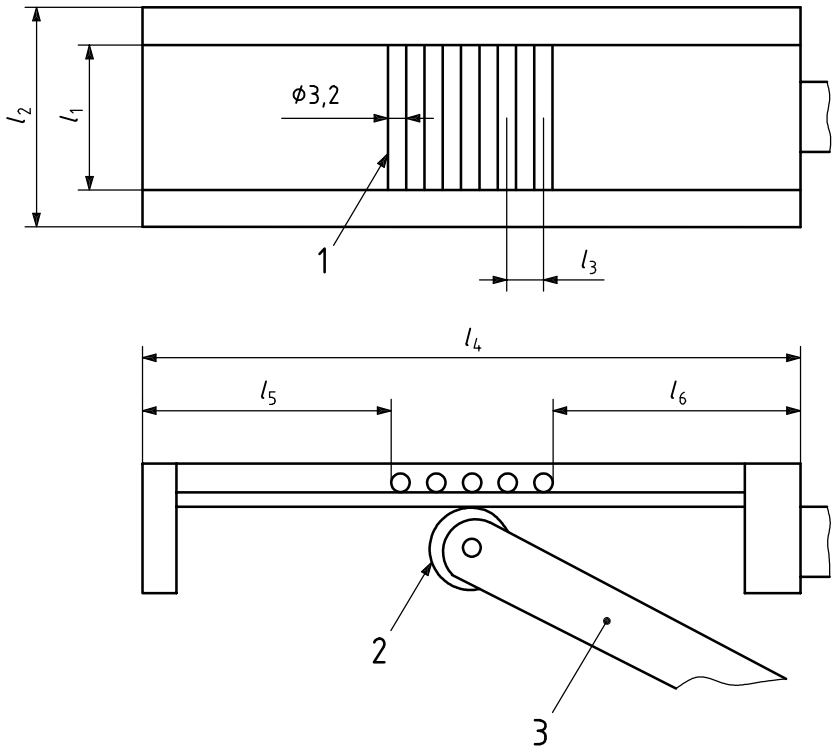


Key

1 mass to exert force
2 brush head
3 gripping block
4 load cell
5 brushing table
6 rail
7 support

Figure 2 — Test machine

Dimensions in millimetres



Key

1 rod
2 bearing
3 support

l_1	30 to 40	l_4	150 to 170
l_2	45 to 50	l_5	55 to 60
l_3	8,2	l_6	55 to 60

Figure 3 — Brushing table of test machine

5.2 Test conditions

All tests shall be conducted at (23 ± 5) °C unless otherwise specified.

5.3 Conditioning of toothbrushes

Cut off the brush head at the neck, discard the handle and weigh the brush head to the nearest 0,5 g. Immerse the brush head in water, in accordance with grade 3 of ISO 3696:1987, at (37 ± 2) °C for 90 s. After immersion, shake off excess water and fix the brush head in the gripping device.

5.4 Procedure

5.4.1 Positioning of the brush head

Attach the gripping device [(3) in Figure 2] to the test machine (see Figure 2), such that the tuft hole plane is parallel to the brushing table [(5) in Figure 2]. Position the brush head in line with the brushing table, avoiding contact with the rods [(1) in Figure 3]. Adjust the force on the brush head [(2) in Figure 2] to $(5 \pm 0{,}05)$ N, taking into account the mass of a brush head weighed in 5.3. Lower the brush head assembly on to the flat surface of the brushing table, until the load is completely transferred to the table.

NOTE A convenient method of positioning is to make use of a positioning block, e.g. made of a material such as a polyvinylsiloxane impression material (putty type) or epoxy resin, which fits the gripping block.

5.4.2 Measurement of resistance to deflection

Within $(3 \pm 0{,}25)$ min after removal of the brush head from the water, start the sliding movement of the brushing table at a sliding velocity between 10 mm/s and 50 mm/s. At the end of five cycles, record the maximum force in newtons given by the load cell [(4) in Figure 2] for each of the two directions. Calculate the mean of the two recorded values as the resistance to deflection.

Repeat the procedure for the remaining four toothbrushes and calculate the overall mean resistance to deflection.

NOTE A cycle is the travel of the brushing table from its original position to the limit of travel and back to the original position.

5.4.3 Test report

Report the resistance to deflection of each of the five toothbrushes tested, the mean resistance to deflection, the standard deviation and name of toothbrush.

Annex A
(informative)

Determination of stiffness of the tufted portion of toothbrush

The stiffness of the tufted portion of a toothbrush is determined by the following procedure after the measurement of the resistance to deflection.

Remove all tufts from the five tested brush heads and take a photograph or draw a tracing of the tuft hole plane for each of the five heads under three times to ten times magnification. Measure the tufted area either on the photograph or the tracing to within $\pm$ 0,1 cm^2 using a planimeter and calculate the tufted area, A, of the brush head. Calculate the stiffness, in newtons per square centimetre (N/cm^2) for each toothbrush, using the following formula:

$$S_{tf} = F/A$$

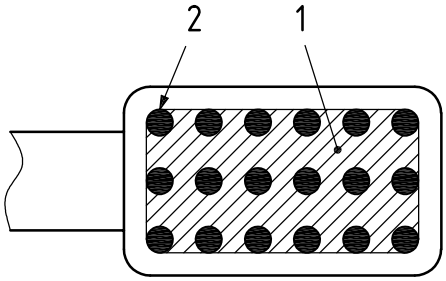
where

S_{tf} is the stiffness;

F is the resistance to deflection, in newtons;

A is the tufted area, in square centimetres.

Report the stiffness of each of the five toothbrushes tested and the mean stiffness.



Key
1 tufted area (shaded)
2 tufted hole (black circles)

Figure A.1 — Tufted portion of toothbrush

ICS 97.170

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