

# INTERNATIONAL STANDARD

# IEC 61855

First edition  
2003-01

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## Household electrical hair care appliances – Methods of measuring the performance

*Appareils électrodomestiques destinés aux soins  
des cheveux –  
Méthodes de mesure de l'aptitude à la fonction*



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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**HOUSEHOLD ELECTRICAL HAIR CARE APPLIANCES –  
METHODS FOR MEASURING THE PERFORMANCE**

## FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 61855 has been prepared by IEC technical committee 59: Performance of household electrical appliances.

The text of this standard is based on the following documents:

FDIS	Report on voting
59/307/FDIS	59/318/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until 2005-04. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

## INTRODUCTION

This standard does not deal with hair care appliances with radiant heating or with helmet dryers (see Scope) for the following reasons:

- the test methods are likely to be complicated and expensive and they might not be sufficiently repeatable;
- suitable and or proven test methods are not known at present;
- developing of test methods for these appliances will incur considerable costs;
- the market shares of these appliances are rather small.

National Committees who consider that hair care appliances with radiant heating and helmet dryers should be included into maintenance activities are requested to submit proposals suitable for the corresponding test method.

# HOUSEHOLD ELECTRICAL HAIR CARE APPLIANCES – METHODS FOR MEASURING THE PERFORMANCE

## 1 Scope

This International Standard applies to electrical appliances for household and similar use for drying and styling hair (including their accessories).

This standard defines the main performance characteristics that are of interest to the user and specifies methods of measuring these characteristics.

The measuring procedures are developed for comparable tests.

This standard does not specify requirements for performance.

This standard does not cover hair care appliances with radiant heating, helmet-type dryers or cutting devices.

NOTE 1 This standard does not deal with safety requirements (IEC 60335-2-23).

NOTE 2 Due to the influence of environmental conditions, variations in time, origin of test materials and proficiency of the operator, most of the described test methods will give more reliable results when applied for comparative testing of a number of appliances at the same time, in the same laboratory and by the same operator.

## 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.

IEC 60584-2, *Thermocouples – Part 2: Tolerances*

IEC 60704-2-9, *Household and similar electrical appliances – Test code for the determination of airborne acoustical noise – Part 2-9: Particular requirements for electrical hair care appliances*<sup>1</sup>

IEC 61254, *Electric shavers for household use – Methods for measuring the performance*

IEC/TR 61592, *Household electrical appliances – Guidelines for consumer panel testing*

ISO 2267:1986, *Surface active agents – Evaluation of certain effects of laundering- Methods of preparation and use of unsoiled cotton control cloth*

## 3 Definitions

For the purpose of this document, the following definitions apply.

### 3.1

#### **hairstyling appliance**

appliance for styling or curling hairs

NOTE Hairstyling appliances may comprise brushes and combs.

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<sup>1</sup> To be published.

**3.2  
hairstyling appliance with warm air**

hairstyling appliance in which a stream of warm air is produced for drying and styling the hair

**3.3  
curling appliance**

appliance in which heat is produced for styling dry hair.

NOTE The hair may contain a small quantity of residual moisture.

**3.4  
curling set**

set of rollers that can be heated for styling hair.

**3.5  
concentrator**

accessory for directing the air flow.

**3.6  
diffuser**

accessory providing a wide distribution of the airflow.

NOTE For the purposes of this standard, a volumiser is considered to be a diffuser.

**3.7  
rated voltage**

voltage assigned to the appliance by the manufacturer.

**3.8  
rated frequency**

frequency assigned to the appliance by the manufacturer.

## **4 List of measurements and tests**

Depending on the appliance, the following measurements or tests shall be carried out, as appropriate:

- mass, according to 6.1;
- length of the flexible cord, according to 6.2;
- power input, according to 6.3;
- heating-up time, according to 6.4;
- temperatures, according to 6.5;
- air flow of hand-held hairdryers and hairstyling appliances with warm air, according to 6.6;
- drying rate, according to 6.7;
- attachment of accessories, according to 6.8;
- ease of handling, according to 6.8.2;
- features, according to clause 8;
- instructions for use, according to clause 9;
- airborne acoustical noise, according to clause 7;
- drop test according to 6.9.



## 5 General conditions for measurements

Unless otherwise specified, the tests are carried out under the conditions of 5.1 to 5.5.

### 5.1 General

The measurements are made with controls adjusted to their highest setting and when steady conditions according to 5.4 are established.

### 5.2 Test room

The tests are carried out in a substantially draught-free room. The ambient temperature is maintained at  $(23 \pm 2)$  °C.

### 5.3 Power supply

The tests are carried out at the rated voltage  $\pm 1$  % and the rated frequency  $\pm 1$  %.

If a voltage or a frequency range is specified by the manufacturer the appliance is to be supplied at the nominal voltage and at the nominal frequency of the country in which the appliance is intended to be used. In this case the test voltage and frequency shall be stated in the report.

### 5.4 Steady conditions

For hand-held hairdryers and hairstyling appliances with warm air, steady conditions are considered to be established 10 min after switching on the appliance.

For other appliances steady conditions are considered to be established 20 min after switching on the appliance or when the thermostat has operated four times, if this occurs first.

### 5.5 Thermocouples

The thermocouples shall:

- be of class 1 according to IEC 60584-2;
- be accurate to  $\pm 1,5$  K;
- have a nominal diameter of 0,25 mm.

## 6 Measurements

### 6.1 Mass of the appliance

The mass of the appliance is determined including the flexible cord but excluding any accessory.

The mass of each accessory is measured separately.

The results are expressed in kg to the nearest 0,01 kg.

## 6.2 Length of the flexible cord

The length of the flexible cord is measured between the point where the cord or cord guard enters the appliance and the cord entry point of the plug. Coiled cords are stretched with a pull of 10 N before measurement. The length is expressed in metres rounded down to the nearest 0,05 m.

[IEC 61254, 5.3, modified]

## 6.3 Power input

The power input of the appliance is measured at rated voltage without any accessory, in accordance with 5.3. The accuracy of power-measurement is to be within  $\pm 1$  %.

The power input is expressed in watts, rounded off to the nearest integer.

## 6.4 Heating-up times

### 6.4.1 Hand-held hairdryers

Not applicable.

### 6.4.2 Curling appliances

The heating up time of curling appliances is the time taken for the temperature rise of the barrel to reach 100 K, measured in accordance with 6.5.3.1. The time is expressed in minutes and seconds.

NOTE This temperature rise implies a temperature of approximately 120 °C which is considered to be the minimum temperature necessary for styling of dry hair.

### 6.4.3 Curling set

Under consideration.

### 6.4.4 Other hair styling appliances

Under consideration.

## 6.5 Temperatures

### 6.5.1 General

The test methods are only applicable for comparative testing, except for the tests according to 6.5.2 and 6.5.3.1, which are considered to be reproducible.

### 6.5.2 Outlet air temperature of hand-held hairdryers

Controls are adjusted to obtain the highest outlet air temperature measured using the device as described in Figures 2 and 3. The temperature is measured within 30 s after steady conditions have been reached, in accordance with 5.4.

The measured outlet air temperature  $T_i$  of each measurement is the mean value of the five measuring points with the highest values and is expressed in °C, rounded off to one decimal place. The accuracy of measurement is to be within  $\pm 3$  K.

In order to compensate the variation of the ambient temperature the measured outlet air temperature  $T_i$  has to be corrected according to formula (1):

$$T_{i,\text{comp}} = T_i - T_{\text{act amb}} + 23 \quad [^{\circ}\text{C}] \quad (1)$$

where

$T_{i,\text{comp}}$  is the compensated outlet air temperature;

$T_{\text{act amb}}$  is the actual ambient temperature measured 100 mm from the air inlet side of the appliance immediately before switching it on;

23 is the nominal ambient temperature in  $^{\circ}\text{C}$ .

The distance between the device and the the air outlet is:

- without attachments: 25 and 100 mm, as shown in Figure 4a;
- with a concentrator: 100 mm, as shown in Figure 4b;
- with a diffuser: 50 mm, as shown in Figure 4c.

The measurement without attachments has to be carried out three times. The mean value out of these three measurements is the final outlet temperature and is calculated from formula (2):

$$T_{\text{fin}} = \frac{T_{1,\text{comp}} + T_{2,\text{comp}} + T_{3,\text{comp}}}{3} \quad [^{\circ}\text{C}] \quad (2)$$

NOTE Three measurements are needed to achieve a sufficient reproducibility of the drying rate.

The test can be repeated with the control adjusted to lower settings, if any, except for supplying cold air.

### 6.5.3 Hair styling appliances

#### 6.5.3.1 Temperature of the barrel of curling appliances

The appliance is positioned horizontally and at a distance of at least 100 mm from the test floor.

Five thermocouples are evenly distributed along the longitudinal edge at the top of the curling barrel (see Figure 5) on the side away from the test floor. The thermocouples are not placed under the curling tongue.

The temperature is the mean value of the three measuring points with the highest values and is expressed in  $^{\circ}\text{C}$ . This temperature shall be corrected according to formula (1) in 6.5.2. The ambient temperature is to be measured in a distance of 100 mm behind the handle immediately before switching on the appliance.

#### 6.5.3.2 Outlet air temperature of hairstyling appliances with warm air

The appliance is placed in a horizontal position over the thermocouple grid, specified in Figures 2 and 3. The appliance is centred with its axis parallel to the line of measuring points 2 and 52, the distance between the grid and the surface of the barrel holding the brush being 15 mm. The appliance is rotated about its horizontal axis to find out the position giving rise to the highest temperatures.

NOTE A brush is used for disentangling and/or shaping the hair.

The controls are adjusted to give the highest outlet air temperature, which is measured when steady conditions are established.

Steady conditions are considered to be established when the average of the five measuring points with the highest temperature does not vary by more than  $\pm 2$  K.

The outlet air temperature is the mean value of the five measuring points with the highest values and is expressed in °C. This temperature shall be corrected according to formula (1) in 6.5.2.

The measurement is to be accurate to  $\pm 3$  K.

## 6.6 Air flow of hand-held hairdryers and hairstyling appliances with warm air

Under consideration.

## 6.7 Drying rate

### 6.7.1 General

The purpose of this test is to assess the drying ability of a hairdryer under standardised test conditions.

The test is carried out at test conditions according to 5.2. The relative humidity in the test room shall be  $(50 \pm 5)$  %.

NOTE Temperature and humidity conditions within the specified ranges are required for good repeatability and reproducibility. Care should be taken to avoid changes during a test

### 6.7.2 Test equipment

The test equipment, as shown in Figure 6, consists of a balance, a stand for the hairdryer, a support for the test cloth and a stopwatch.

The balance is to have an accuracy of 0,02 g.

The test cloth is to be the control cloth according to ISO 2267 and is fixed to the aluminium circular frame by a rubber O-ring or other suitable means. Surplus cloth is removed.

The measurement of time is to be accurate to within 0,1 s

NOTE Comparative tests shall be made with test cloth from the same manufacturing charge.

### 6.7.3 Measuring procedure

A new piece of test cloth is to be used for each test. The pieces of test cloth used for the same test series are to come from the same batch.

The hairdryer without any attachment is supported by a stand and placed in front of the balance, on which the support with the piece of test cloth is placed, as shown in Figure 6. The hairdryer is positioned so that the airflow is perpendicular to the centre of the circular piece of test cloth. The distance  $D_d$  between the front of the hairdryer and the test cloth is adjusted so that the outlet air temperature is 75 °C.  $D_d$  is determined by using the temperatures recorded for the distances of 25 mm and 100 mm during the test of 6.5.2 and calculated from formula (4), rounded off to the nearest integer. This procedure is shown in Figure 1.

However, the minimum distance  $D_d$  is not less than 25 mm, even if the outlet temperature falls below 75 °C.

$$d_x = \frac{T_{\text{fin } 25} - 75}{T_{\text{fin } 25} - T_{\text{fin } 100}} \times 75 \text{ [mm]} \quad (3)$$

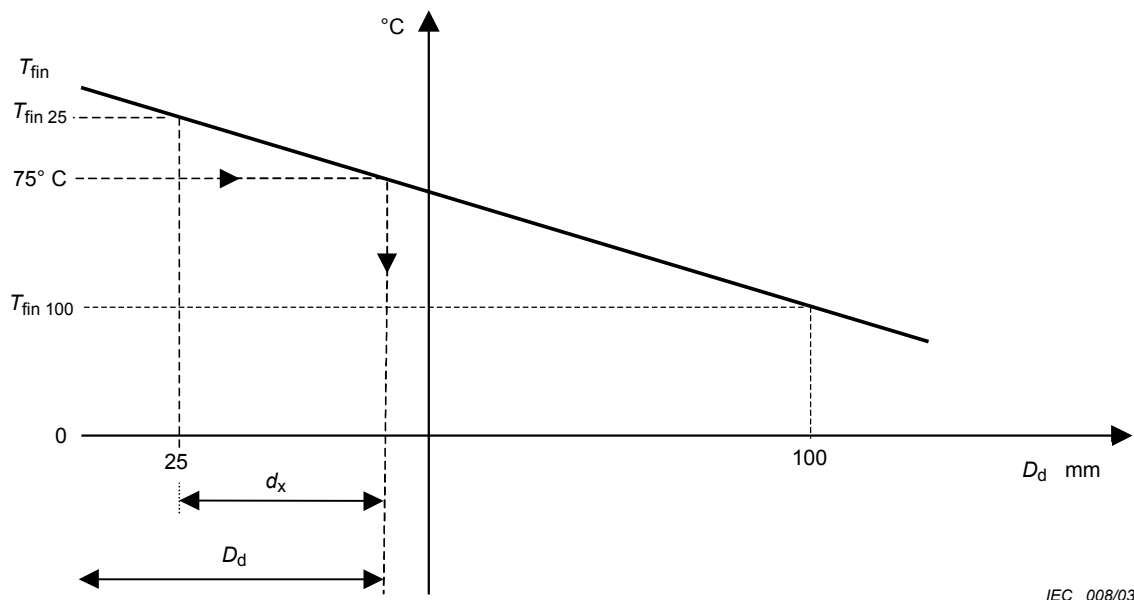
$$D_d = \frac{T_{fin\ 25} - 0.25 \cdot T_{fin\ 100} - 56,25}{T_{fin\ 25} - T_{fin\ 100}} 100 \text{ [mm]} \quad (4)$$

where

- $T_{fin\ 25}$  is the outlet temperature related to the distance of 25 mm;  
 $T_{fin\ 100}$  is the outlet temperature related to the distance of 100 mm;  
 75 °C is the standard temperature for drying hair;  
 $D_d$  is the distance to be used for measuring the drying rate.

NOTE 1 The temperature of 75 °C is considered to be an appropriate temperature for drying hair.

NOTE 2 The curve between  $T_{fin\ 25}$  at 25 mm and  $T_{fin\ 100}$  at 100 mm is non linear but the error introduced by formula (4) is negligible.



**Figure 1 – Graphical derivation of distance  $D_d$**

The hairdryer is operated to obtain steady conditions in accordance with 5.4. The balance is tared to zero. The test cloth is evenly moistened by spraying it with  $(10 \pm 0,5)$  g of distilled water at room temperature. Any surplus water is wiped off from the aluminium ring and the mass of water ( $m_1$ ) is determined in g to two decimal places. Both the hairdryer and the stopwatch are switched on for 60 s to dry the cloth. 5 s after the hairdryer has been switched off (waiting time), the residual mass of water ( $m_2$ ) is determined in grams to two decimal places.

NOTE The waiting time of 5 s is necessary for stabilisation.

#### 6.7.4 Determination of the drying rate

The drying rate DR is determined from the mass of water evaporated and calculated from formula (5).

$$DR = \frac{m_1 - m_2}{1 \text{ min}} \quad (5)$$

where

$m_1$  is the mass of water measured before drying;

$m_2$  is the mass of water measured after 1 min drying and 5 s stabilizing time.

The measurement is carried out three times. The mean drying rate is calculated as the average value of these three measurements.

The drying rate is expressed in g/min, rounded off to one decimal place.

### 6.8 Attachment of accessories

#### 6.8.1 Reliability

The test is carried out with the appliance at ambient temperature not being operated and again 15 min after the appliance has been operated.

The accessory is attached to the appliance. A mass of 1 kg is applied to the front of the accessory at its centre. The appliance is moved in all directions from the horizontal to the vertical without jerks.

It is checked whether the accessory remains in its initial position.

#### 6.8.2 Ease of handling

The purpose of this test is to check for the ease of fitting and removal of accessories. It is carried out by panel testing according to IEC 61592.

### 6.9 Drop test

The appliance is placed on a table having a height of 90 cm and with the cord inlet  $(30 \pm 5)$  cm from the table edge. The cord is perpendicular to the table edge. The appliance shall be pulled on the cord without jerks with a speed of  $(5 \pm 2)$  cm/s, allowing a free fall onto the board. The board is untreated plywood, having a density of  $(700 \pm 75)$  kg/m<sup>3</sup> and has dimensions of 1 m × 1 m × 19 mm.

The test is carried out three times, the appliance being switched off.

After the test the appliance is checked to ensure that it still operates satisfactorily. Significant damages or changes are to be noted, e.g.

- broken parts;
- impaired switch settings;
- change of input power;
- change in acoustical sound.

## **7 Measurement of airborne acoustical noise**

If noise is to be measured this shall be carried out according to IEC 60704-2-9.

## **8 Features**

### **8.1 Control settings**

The number of control settings and the intended functions are noted.

### **8.2 Accessories**

The number and type of accessories are noted.

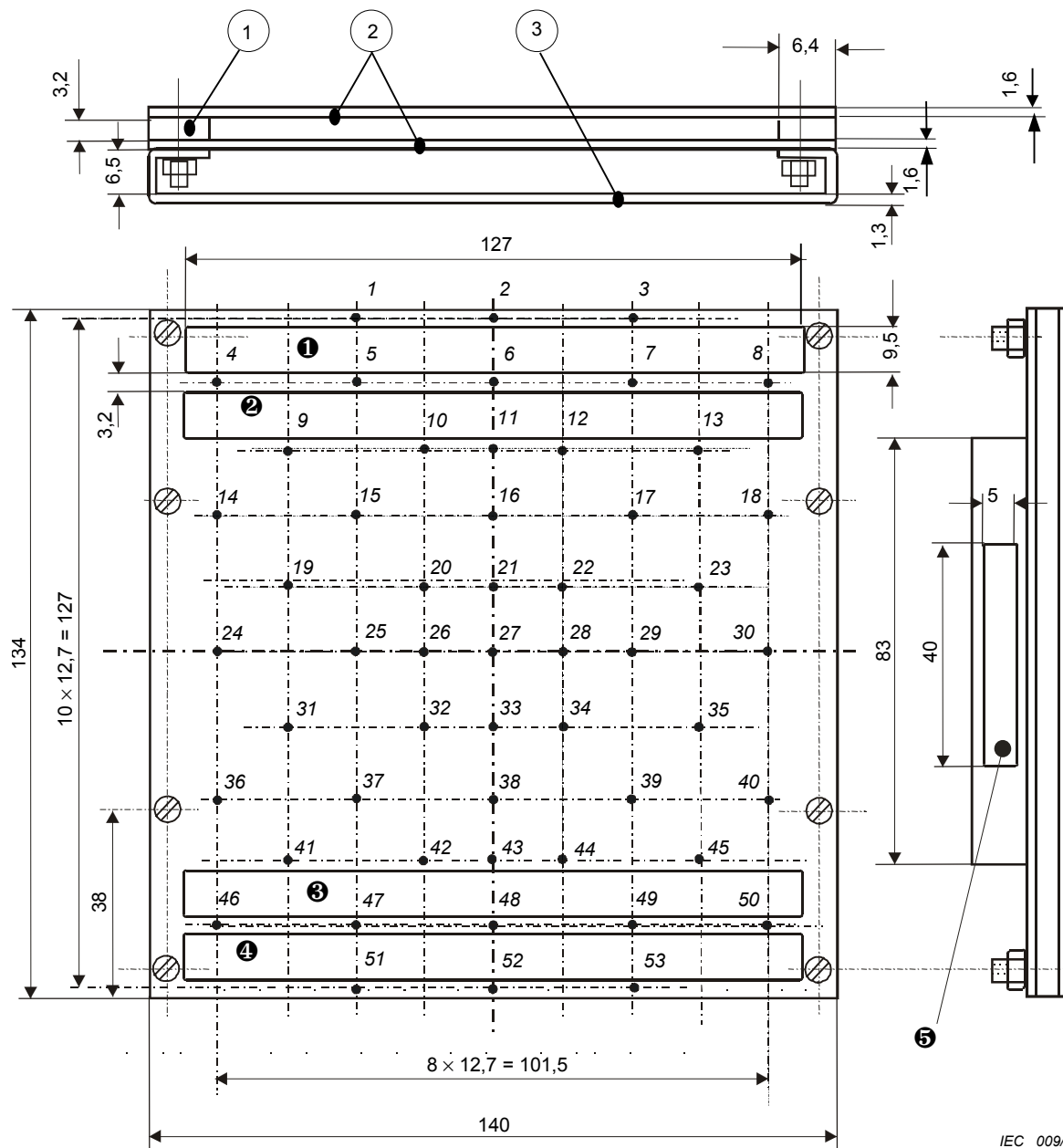
### **8.3 Additional features**

Special features relevant for the user, e.g. voltage selector, air inlet filter, temperature sensor, etc, are noted.

## **9 Instructions for use**

The instructions are checked to determine if they contain information about:

- the use of the appliance and its accessories, if any;
- the cleaning necessary to ensure the proper performance of the appliance.



IEC 009/03

**Key**

- |               |                                |
|---------------|--------------------------------|
| 1 wood        | ①...④ openings 1...4           |
| 2 glass epoxy | ⑤ 2 openings for thermocouples |
| 3 aluminium   | • 53 measuring point 53        |

Openings 1...4 to be kept free from parts for support.

Each screw (countersink-head, M3 × 15) shall be countersunk, so that its head is the same level with the front plate.

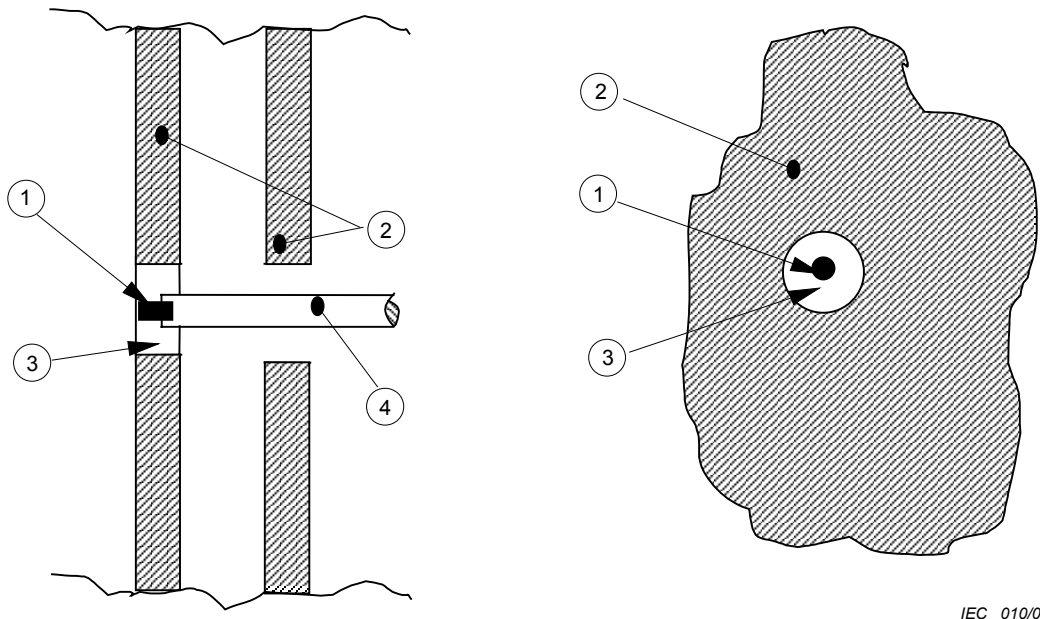
For the attachments of the thermocouples see Figure 3.

All dimensions in [mm]

**Figure 2 – Temperature measuring device (based on UL 859<sup>2</sup>)**

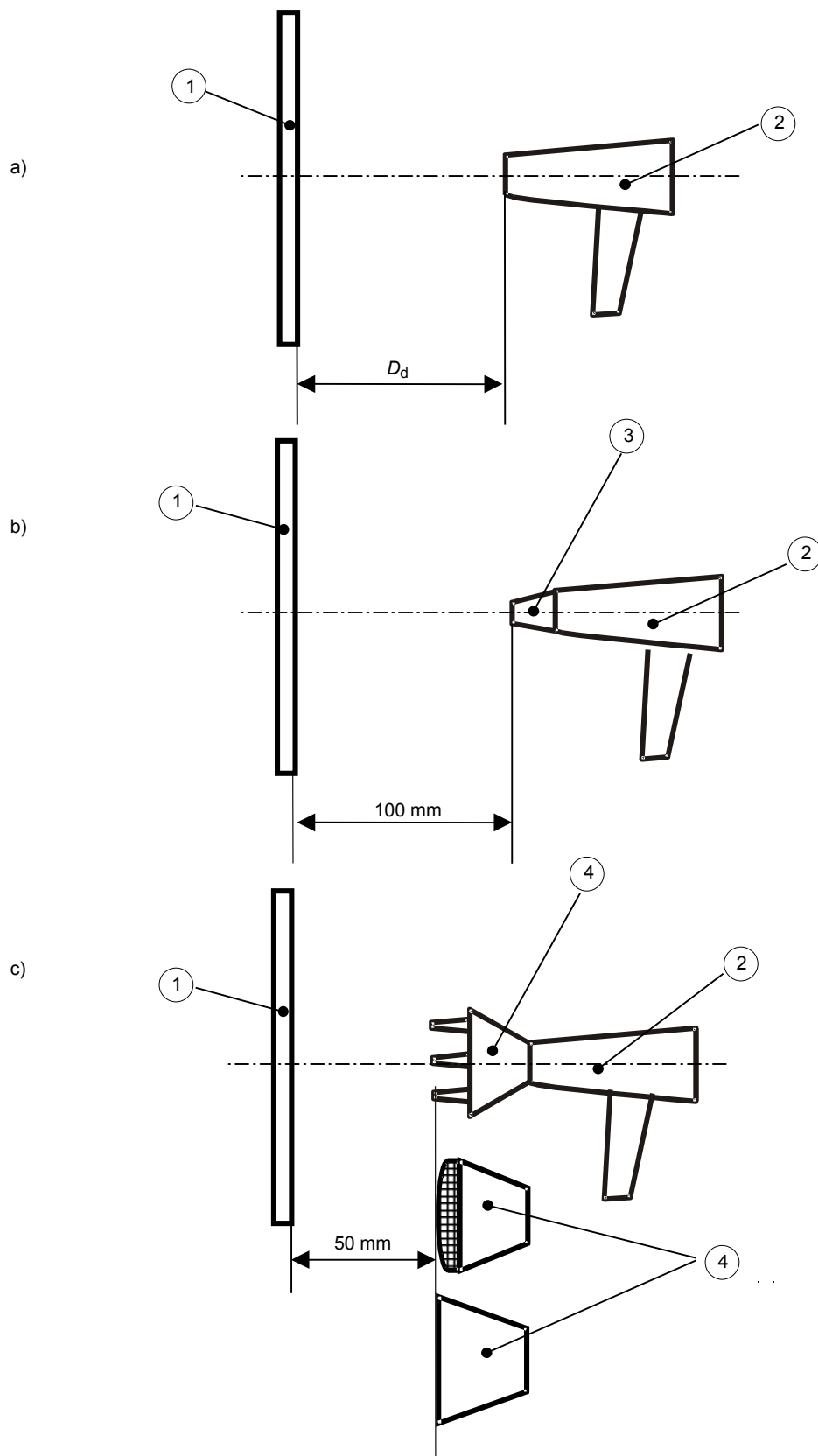
<sup>2</sup> See bibliography.



**Key**

- |   |                        |   |                      |
|---|------------------------|---|----------------------|
| 1 | thermocouple           | 3 | filled with epoxy    |
| 2 | glass – epoxy – plates | 4 | wire to thermocouple |

**Figure 3 – Attachment of the thermocouples**

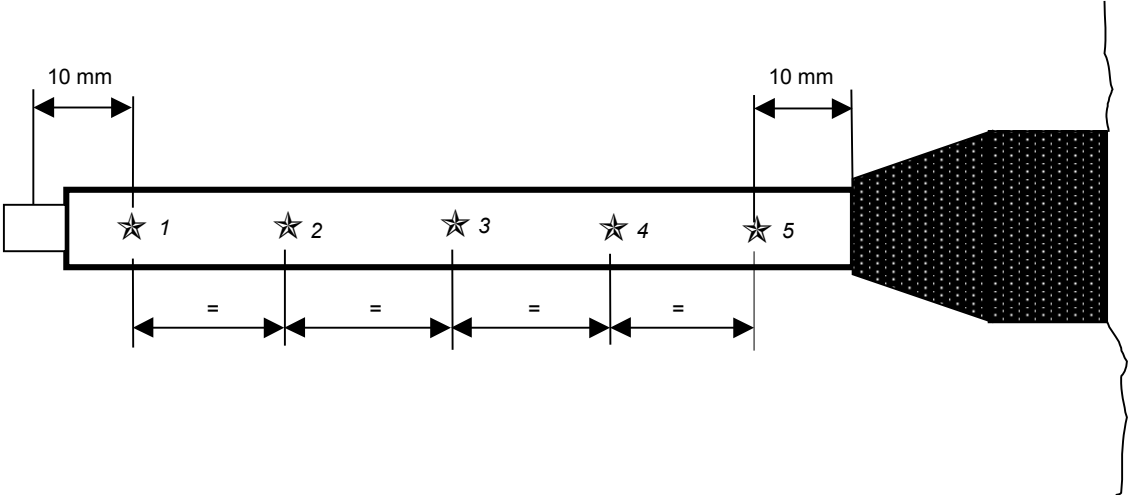


**Key**

- |   |                              |   |          |
|---|------------------------------|---|----------|
| 1 | temperature measuring device | 3 | nozzle   |
| 2 | hairdryer                    | 4 | diffuser |

**Figure 4 – Distance for temperature measurement**

IEC 011/03

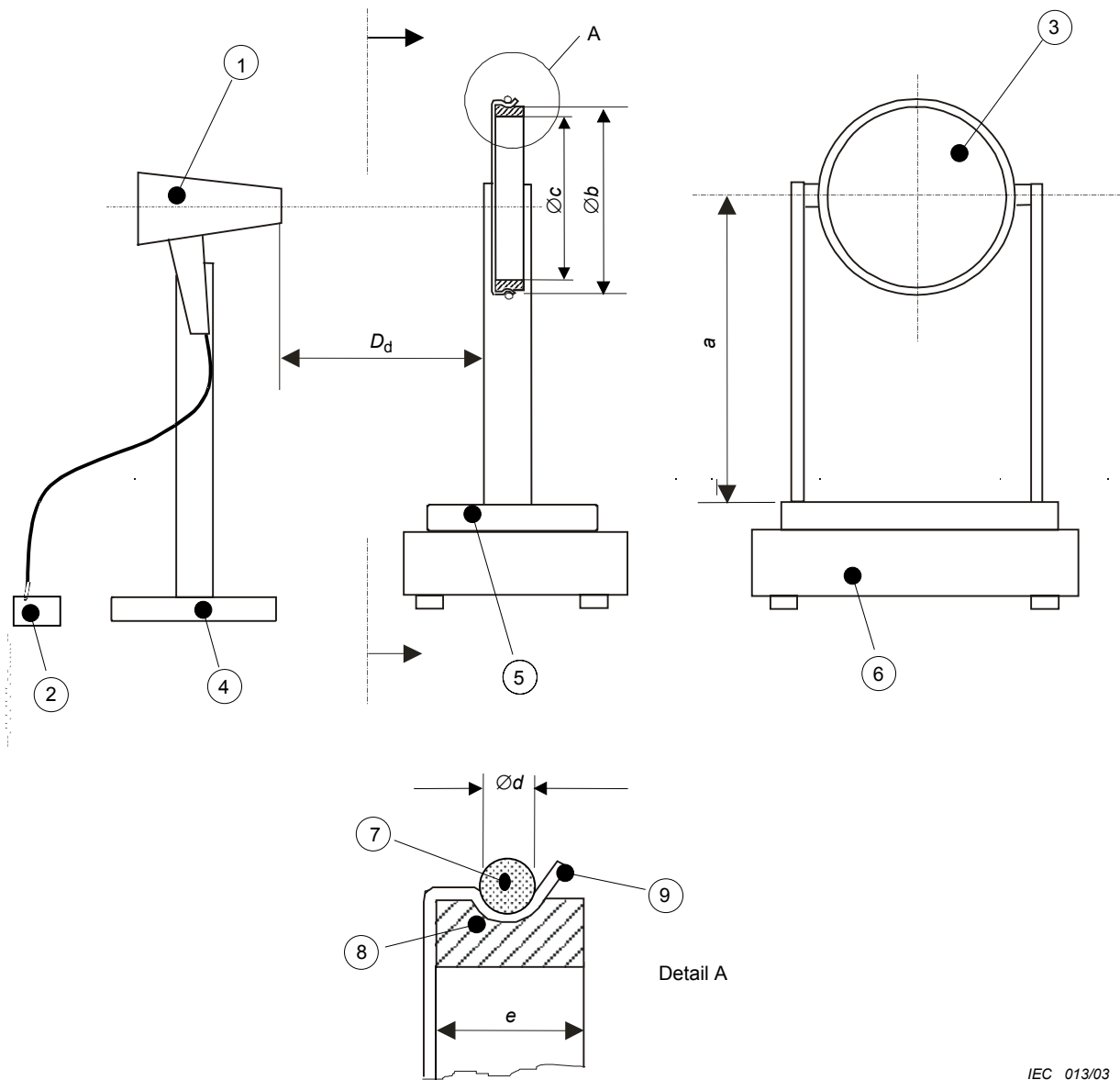


IEC 012/03

**Key**

★ 5 measuring point 5                      = equidistant from each other

**Figure 5 – Curling appliance, position of the measuring points**



IEC 013/03

**Key**

- |                 |                  |                             |
|-----------------|------------------|-----------------------------|
| 1 hair dryer    | 6 balance        | $a = 300 \pm 10 \text{ mm}$ |
| 2 on/off switch | 7 rubber ring    | $b = 260 \pm 1 \text{ mm}$  |
| 3 test cloth    | 8 aluminum ring  | $c = 245 \pm 1 \text{ mm}$  |
| 4 stand         | 9 surplus cotton | $d \sim 5 \text{ mm}$       |
| 5 support       |                  | $e = 10 \text{ mm}$         |

**Figure 6 – Test equipment for measuring the drying rate**

## **Annex A** (informative)

### **Additional information**

#### **A.1 Measurement of the volumising effect of diffusers (volumisers)**

At present there is no appropriate physical test method for measuring the volumising effect of diffusers (volumisers) that is sufficiently repeatable.

The volumising effect is dependent on the types of hair and on the handling of the appliance by the user.

However, the volumising effect can be assessed by panel testing according to IEC/TR 61592.

#### **A.2 Measurement of hair intake**

At present there is no appropriate physical test method for measuring the hair intake that is sufficiently repeatable.

The hair intake depends on the type and length of hair and on the handling of the appliance by the user.

However, the hair intake can be assessed by panel testing according to IEC/TR 61592.

#### **A.3 Information at the point of sale**

The following information for the consumer should be provided at the point of sale:

- mass (kg);
- cord length (m);
- rated power input (W);
- number of control positions;
- features, if appropriate.

#### **A.4 List of accessories supplied**

The following is a list of accessories that may be supplied with the hair dryer:

- brush;
- diffuser;
- spraying device;
- steam producing device;
- other accessories, if appropriate.

**Annex B**  
(informative)

**Test cloth**

Suitable test cloth can be ordered from the following companies:

- WFK Testgewebe GmbH, Christenfeld 10, D-41379 Brüggen-Bracht,  
Tel: +49 2157871977,  
Fax: +49 215790657,  
Type 10A
- EMPA Testmaterials, Mövenstrasse 12, CH- 9015 St. Gallen,  
Tel: 0049 71 311 80 55  
Fax: 0049 71 311 80 57, e-mail: testmat@empa.ch  
order code: 224

## Bibliography

IEC 60335-2-23, *Household and similar electrical appliances – Safety – Part 2-23: Particular requirements for skin or hair care*

UL (Underwriters Laboratories) 859, *Household Electric Personal Grooming Appliances*<sup>3</sup>

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<sup>3</sup> Available from:

Global Engineering Documents  
15 Inverness Way  
East, Englewood, Colorado – U.S.A.

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Thank you for your contribution to the standards-making process.

**A Prioritaire**

Nicht frankieren  
Ne pas affranchir



Non affrancare  
No stamp required

**RÉPONSE PAYÉE**

**SUISSE**

Customer Service Centre (CSC)  
**International Electrotechnical Commission**  
3, rue de Varembé  
1211 GENEVA 20  
Switzerland



**Q1** Please report on **ONE STANDARD** and **ONE STANDARD ONLY**. Enter the exact number of the standard: (e.g. 60601-1-1)

.....

**Q2** Please tell us in what capacity(ies) you bought the standard (tick all that apply). I am the/a:

- purchasing agent
- librarian
- researcher
- design engineer
- safety engineer
- testing engineer
- marketing specialist
- other.....

**Q3** I work for/in/as a: (tick all that apply)

- manufacturing
- consultant
- government
- test/certification facility
- public utility
- education
- military
- other.....

**Q4** This standard will be used for: (tick all that apply)

- general reference
- product research
- product design/development
- specifications
- tenders
- quality assessment
- certification
- technical documentation
- thesis
- manufacturing
- other.....

**Q5** This standard meets my needs: (tick one)

- not at all
- nearly
- fairly well
- exactly

**Q6** If you ticked NOT AT ALL in Question 5 the reason is: (tick all that apply)

- standard is out of date
- standard is incomplete
- standard is too academic
- standard is too superficial
- title is misleading
- I made the wrong choice
- other .....

**Q7** Please assess the standard in the following categories, using the numbers:

- (1) unacceptable,
- (2) below average,
- (3) average,
- (4) above average,
- (5) exceptional,
- (6) not applicable

- timeliness.....
- quality of writing.....
- technical contents.....
- logic of arrangement of contents .....
- tables, charts, graphs, figures.....
- other .....

**Q8** I read/use the: (tick one)

- French text only
- English text only
- both English and French texts

**Q9** Please share any comment on any aspect of the IEC that you would like us to know:

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