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Household electric direct-acting room heaters – Methods for measuring performance

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IEC 60675

Edition 2.2 2018-04
CONSOLIDATED VERSION

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 97.100.10

ISBN 978-2-8322-5622-0

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

HOUSEHOLD ELECTRIC DIRECT-ACTING ROOM HEATERS – METHODS FOR MEASURING PERFORMANCE

FOREWORD

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IEC 60675 edition 2.2 contains the second edition (1994-08) [documents 59C/51/FDIS and 59C/54/RVD], its amendment 1 (1998-07) [documents 59C/81/FDIS and 59C/84/RVD] and its amendment 2 (2018-04) [documents 59C/223/CDV and 59C/224/RVC].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendments 1 and 2. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

International standard IEC 60675 has been prepared by subcommittee 59C: Heating appliances, of IEC technical committee 59: Performance of household electrical appliances.

Annex A forms an integral part of this standard.

Annexes B to D are for information only.

In this standard, the following print types are used:

- *test specifications: in italic type*
- notes: in small roman type
- other texts: in roman type

Words in **bold** in the text are defined in clause 3.

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HOUSEHOLD ELECTRIC DIRECT-ACTING ROOM HEATERS – METHODS FOR MEASURING PERFORMANCE

1 Scope

This standard applies to electric **direct-acting room heaters**. They may be portable, stationary, fixed, or built-in.

It does not apply to:

- thermal-storage room heaters (IEC 60531);
- heating appliances incorporated in the building structure;
- central heating systems;
- heaters connected to an air duct;
- wall-paper, carpets or drapes incorporating flexible heating elements.

This standard defines the main performance characteristics of **direct-acting room heaters** and specifies methods for measuring these characteristics, for the information of users.

This standard does not specify values for performance characteristics.

NOTE – This standard does not deal with:

- safety requirements (IEC 60335-2-30);
- acoustical noise of **fan heaters** (IEC 60704-2-2).

2 Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the edition indicated was valid. All normative documents are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60584-1: 1977, *Thermocouples – Part 1: Reference tables*.

NOTE – Informative references (bibliography) are given in annex D.

3 Definitions

For the purposes of this standard, the following definitions apply:

3.1

direct-acting room heater

appliance which converts electrical energy into heat after a demand for heat has arisen in a room and transfers this heat to the room without delay

NOTE – In this standard, a **direct-acting room heater** is referred to as a **heater**.

3.2

panel heater

heater in which the temperature rise of all surfaces in contact with the circulating air does not exceed 75 K in normal use

NOTE 1 – **Panel heaters** may be oil filled.

NOTE 2 – **Panel heaters** may be in column form.

3.3

convector heater

heater in which the temperature rise of at least one non-visible part in contact with the circulating air exceeds 75 K in normal use. The air is discharged through one or more outlets by natural convection

NOTE – "Non-visible part" means that the part cannot be seen from a point situated 2 m in front of the **heater** and 1,2 m above the floor when the **heater** is installed.

3.4

fan heater

heater in which the movement of air through it is accelerated by a fan

3.5

radiant heater

heater in which the temperature rise of at least one visible surface exceeds 75 K in normal use

NOTE – The visible surface may be seen through solid material which is transparent to heat radiation. Materials such as quartz glass are considered to be transparent to heat radiation, while ordinary glass is not.

3.6

visibly glowing radiant heater

radiant heater in which the heating element is visible from the outside of the **heater** and has a temperature of at least 650 °C in normal use

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ambient temperature thermostat

thermostat, sensitive to the room temperature and adjustable by the user, with at least the sensing part incorporated in the **heater**

3.8

programmer

control for regulating the room temperature according to a programme preset by the user and which is incorporated in the **heater**

3.9

set-back device

device which allows the room temperature to be maintained at a lower value than the pre-set temperature without changing the setting of the **ambient temperature thermostat**

3.10

frost protection means

means which allows the room temperature to be maintained at a value of $7\text{ °C} \pm 3\text{ °C}$

NOTE – The means may be a particular setting of the **ambient temperature thermostat**.

3.11

rated power input

power input assigned to the **heater** by the manufacturer

3.12

energy ratio

ratio between the energy consumption during a representative period of operation and the product of the **rated power input** and this period

3.13

average room temperature

the arithmetic average of the maximum and minimum room temperatures for a setting of the **ambient temperature thermostat**

3.14

amplitude

difference between the maximum and the minimum room temperatures for a setting of the **ambient temperature thermostat**

3.15

drift

difference between the **average room temperatures** obtained at different **energy ratios** for a setting of the **ambient temperature thermostat**

3.16

usable power

average power input consumed by the **heater**

4 Classification

4.1 According to type

- **panel heater**;
- **convector heater**;
- **fan heater**;
- **radiant heater**;
- **visibly glowing radiant heater**.

The type of **heater** shall be stated.

NOTE 1 – A **heater** may be a combination of two or more types.

NOTE 2 – If there is doubt regarding the type of **heater**, the temperature rise of the relevant surfaces is determined.

NOTE 3 – Examples of types of **heaters** are shown in figure 1.

4.2 According to regulating features

- **heater** without regulation;
- **heater** with adjustable power input;
- **heater** with regulated air flow (**fan heaters** only);
- **heater** with an **ambient temperature thermostat**;
- **heater** with a **programmer**; -**heater** with a **set-back device**;
- **heater** with **frost protection means**.

If the **heater** has features such as means for connection to an external control, details are to be stated.

NOTE – An example is a **heater** having means for receiving an external signal for operating the **set-back device**.

A **heater** may have more than one regulating feature.

The regulating features of the **heater** shall be stated.

5 List of measurements

Performance is determined by means of the following measurements:

- dimensions and mass of the **heater**, length of the supply cord (clause 7);

NOTE 1 – This measurement is suitable for all **heaters**.

- temperature rises of air-outlet grilles and external surfaces (clause 8);

NOTE 2 – The measurement of temperature rises of air-outlet grilles is suitable for **convector heaters** and **fan heaters**.

NOTE 3 – The measurement of temperature rises of external surfaces is suitable for all **heaters** but is not applicable to those for mounting at a height above 1,8 m, to the back of wall-mounted **heaters** and to **visibly glowing radiant heaters**.

- temperature rises of surfaces surrounding the **heater** (clause 9);

NOTE 4 – This measurement is suitable for all **heaters**.

- warming-up time of the **heater** (clause 10);

NOTE 5 – This measurement is suitable for all **heaters**.

- stability of room temperature (clause 11);

NOTE 6 – This measurement is suitable for **heaters** with an **ambient temperature thermostat**.

- set-back (clause 12);

NOTE 7 – This measurement is suitable for **heaters** with a **set-back device**.

- frost protection temperature (clause 13);

NOTE 8 – This measurement is suitable for **heaters** with **frost protection means**.

- inrush current (clause 14);

NOTE 9 – This measurement is suitable for all **heaters**.

- effect of radiant heat (clause 15);

NOTE 10 – This measurement is suitable for all **heaters** except **fan heaters** and **heaters** for mounting at a height above 1,8 m.

The results of these measurements may be given in a test report.

NOTE 11 – An example of a test report form is shown in annex C.

- **usable power** (clause 16).

NOTE 12 – This measurement is suitable for all **heaters**.

6 General conditions for measurements

Unless otherwise specified, measurements are made under the following conditions:

Supply voltage:

*The **heater** is supplied at a voltage which gives the **rated power input** under steady conditions. If a power input range is marked on the **heater**, the voltage is that giving the mean value of the range.*

NOTE 1 – **Heaters** with PTC heating elements are supplied at rated voltage or at the mean value of the rated voltage range.

NOTE 2 – If the results obtained by testing the **heater** as specified are considered to be misleading due to the national nominal supply voltage, the **heater** may also be tested at a power input corresponding to the nominal voltage of the national supply system.

Adjustment:

Controls to be set by the user are set at the maximum position.

NOTE 3 – The intention is to obtain an **energy ratio** of 100 %. If this cannot be obtained due to the **ambient temperature thermostat** cycling, even at the lowest limit of the test room temperature, this thermostat is short-circuited or otherwise rendered inoperative.

Test rooms:

The tests of clauses 7, 8, 9, 10, 14, 15 and 16 are carried out in a draught-free room in which the ambient temperature is maintained at $23\text{ °C} \pm 2\text{ °C}$.

The tests of clauses 11, 12 and 13 are carried out in a room where the heat losses can be adjusted. This room is referred to as a "climatic test room" and an example is given in annex A.

*Positioning of the **heater**:*

*For the measurement of clauses 8, 9 and 10, the **heater** is placed in a corner which consists of two walls, a floor and, if necessary, a ceiling, at right angles. The corner is made of dull-black painted plywood having a thickness of approximately 20 mm.*

*The **heater** is positioned in the corner as follows:*

- *Portable **fan heaters** are placed with the back 150 mm from one of the walls and away from the other wall.*
- *Other **heaters** normally placed on a floor are positioned with their back as near as possible to one of the walls and away from the other wall. However, portable **heaters** intended to emit heat in several directions are moved away from the wall by a distance of 300 mm.*
- ***Heaters** normally fixed to a wall are fixed to one of the walls, as near to the other wall and to the floor as is likely to occur in normal use, unless otherwise stated in the instructions for installation. A dull-black painted plywood shelf having a thickness of approximately 20 mm and a depth of 200 mm is fixed over the **heater** as near as possible to the top of the **heater** unless otherwise stated in the instructions.*
- ***Heaters** normally fixed to the ceiling are fixed to the ceiling as near to the walls as is likely to occur in normal use, unless otherwise stated in the instructions for installation.*

*However, built-in **heaters** are installed according to the instructions for installation, using dull-black painted plywood approximately 20 mm thick. The **heater** is installed as close as possible to a similar dull-black painted floor or ceiling, unless otherwise stated in the instructions.*

7 Dimensions, mass and means of connection to the supply

*The overall length, height and depth of the **heater**, including any knobs, handles and fixing brackets, are determined.*

The dimensions are stated in millimetres, rounded up to the nearest 5 mm.

The mass is stated in kilograms, rounded up to the nearest 0,1 kg.

*The length between the point of entry of the cord to the **heater** and the entry to the plug or the end of the outer sheath at the free end of the cord, is determined, unless the heater is provided with terminals for connection to fixed wiring.*

NOTE – It is recorded whether or not a plug is fitted.

The length of the supply cord is stated in metres, rounded down to the nearest 0,05 m, or it is stated that the **heater** is for connection to fixed wiring.

8 Temperature rises of air-outlet grilles and external surfaces

The temperature rises of air-outlet grilles of **convector heaters** and **fan heaters** are determined.

The temperature rises of external surfaces are determined except for:

- **heaters** for mounting at a height above 1,8 m;
- the back of wall-mounted **heaters**;
- **visibly glowing radiant heaters**;

NOTE – The surface of **radiant heaters** through which the heating element is visible is considered to be an external surface and not an air-outlet grille.

The temperature rises are measured by means of the probe of figure 2. The probe is applied to the surface with a force of $4\text{ N} \pm 1\text{ N}$ in such a way that the best possible contact is ensured.

Air-outlet grilles and their surrounds to a distance of 25 mm from the edge of the outlets are divided into a minimum number of equal rectangles having sides not exceeding 25 mm in height and 150 mm in length. The probe is applied to the grille as near to the centre of the rectangles as possible.

Other surfaces are divided into a minimum number of equal rectangles having sides not exceeding 150 mm. The probe is applied to the centre of the rectangles.

The temperature rise distribution, the highest and the average temperature rises of the various parts are stated, rounded to the nearest 1 K.

9 Temperature rises of surfaces surrounding the heater

The temperature rises of surfaces surrounding the **heater** such as walls, floor, ceiling and shelf are determined.

The measurements are made by using fine-wire thermocouples having a diameter not exceeding 0,3 mm, attached to the back of small blackened disks of copper or brass, 15 mm in diameter and 1 mm thick. The front of the disks are flush with the surface of the board. The thermocouples are positioned to measure the highest temperature rise of each surface.

The highest temperature rises are stated, rounded to the nearest 1 K.

10 Warming-up time of the heater

The warming-up time of the **heater** is determined.

*The time taken for the **heater** to attain 90 % of the temperature rise under steady conditions is measured. The temperature rise of the hottest point of external surfaces or air-outlet grilles,*