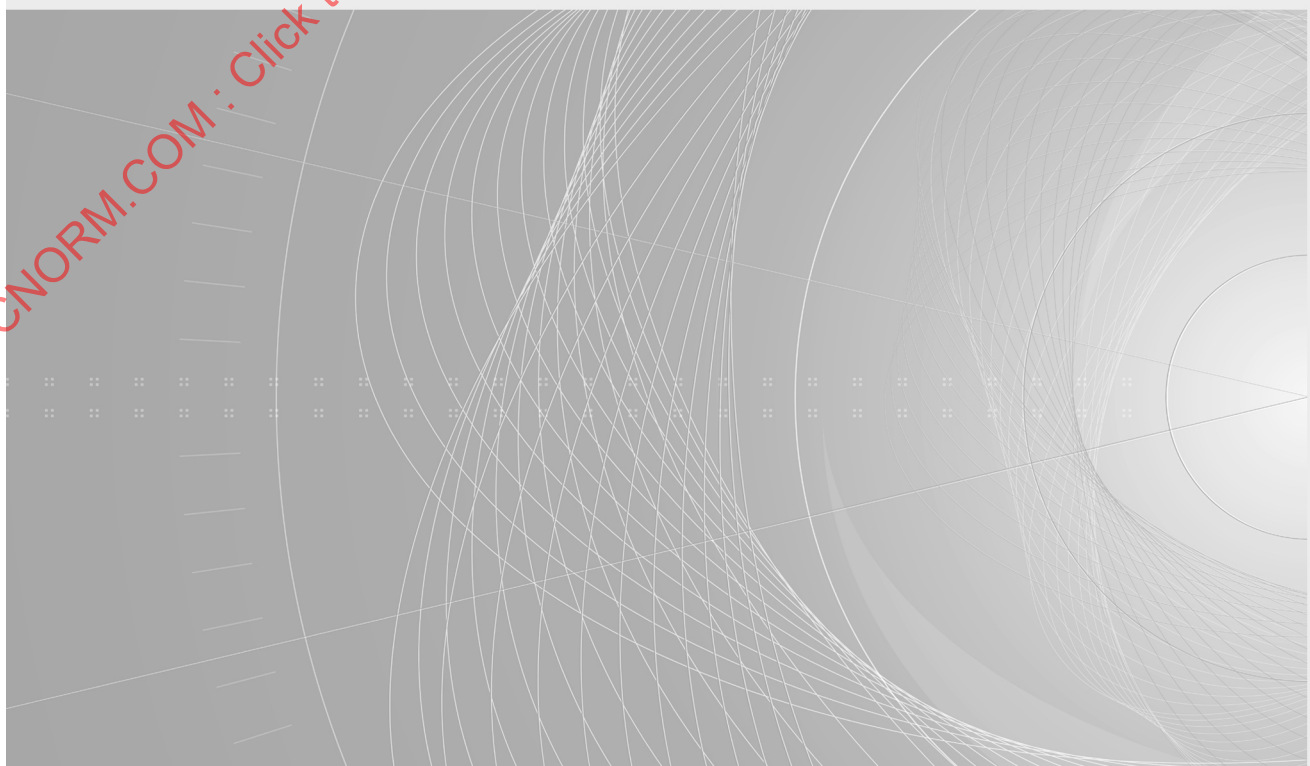
IEC 60675

Edition 2.2 2018-04

CONSOLIDATED VERSION

colour inside

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



IEC 60675:1994-08+AMD1:1998-07+AMD2:2018-04 CSV(en)

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue
The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - webstore.iec.ch/advsearchform
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org
The world's leading online dictionary of electronic and electrical terms containing 21 000 terms and definitions in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary
67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC 60675

Edition 2.2 2018-04

CONSOLIDATED VERSION

colour inside

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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 97.100.10

ISBN 978-2-8322-5622-0

Warning! Make sure that you obtained this publication from an authorized distributor.

IEC 60675

Edition 2.2 2018-04

REDLINE VERSION

colour inside

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

IEC 60675:1994-08+AMD1:1998-07+AMD2:2018-04 CSV(en)

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

———————

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

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

This Consolidated version of IEC 60675 bears the edition number 2.2. It consists of 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]. The technical content is identical to the base edition and its amendments.

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.

The committee has decided that the contents of the base publication and its amendments will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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

A bilingual version may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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

3.7
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 °C ± 3 °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 °C ± 2 °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 N ± 1 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,*

whichever reaches steady conditions first, is used as a reference as long as it is representative of the temperature rise of the surface.

NOTE – Steady conditions are considered to be reached when the temperature rise within 15 min does not vary more than 2 K.

The warming-up time is stated to the nearest minute, preceded by "approximately".

11 Stability of room temperature

The **amplitude** and **drift** are determined for **heater**s incorporating an **ambient temperature thermostat.**

11.1 Basic method of evaluation

*The **heater** is placed in the test chamber of a climatic test room (see annex A).*

*The temperature inside the test chamber is measured for three different **energy ratios** which are obtained by changing the temperature in the refrigerating chamber, without changing the setting of the **ambient temperature thermostat.** The measurements are made when the **average room temperature** is stable over a period of five consecutive fluctuations or 2 h, whichever is shorter.*

*The first measurement is made with the **ambient temperature thermostat** set to give a temperature in the test room between 20 °C and 25 °C at a high **energy ratio.** The high **energy ratio** is (80 ± 5) % but if the ratio is not attainable due to the capacity of the climatic test room, the highest possible **energy ratio** is used.*

NOTE 1 – If the **energy ratio** of (80 ± 5) % cannot be attained with a **heater** belonging to a family, the method of 11.2 is used instead.

*The temperature of the refrigerating chamber is then increased to give an **energy ratio** of (50 ± 5) %, The third measurement is made with a low **energy ratio**. The low **energy ratio** is (20 ± 5) %, but if this results in heat-losses less than 150 W, the low energy ratio is that corresponding to 150 W.*

*The **amplitude** is determined for the **energy ratio** of (50 ± 5) %.*

*The **drift** is determined from the **average room temperature** at the high and low **energy ratios** using the following formula:*

$$D = (t_B - t_A) \times \frac{60}{A - B}$$

where

*D is the **drift;***

*t_A is the **average room temperature** at the high **energy ratio**;*

*t_B is the **average room temperature** at the low **energy ratio**;*

*A is the measured value of the high **energy ratio;***

*B is the measured value of the low **energy ratio**.*

NOTE 2 – In the formula, 60 is the difference between the ratios of 80 % and 20 %.

NOTE 3 – If the **average room temperature** at the **energy ratio** of 50 % does not fall between t_A and t_B, the formula is not applicable and the maximum difference of the three values is stated as the **drift**.

The **amplitude** and the **drift** are stated to the nearest 0,1 K.

~~If the tests are not carried out in a climatic test room complying with annex A, this is stated.~~

11.2 Method for a family of heaters

The **amplitude** and **drift** for a family of **heaters** may be determined using the following procedure. **Heaters** are considered to belong to a family when they have the same basic construction and have:

– the same dimensions except that the length of the heating element is proportional to the **rated power input**;

– the same **ambient temperature thermostat;**

NOTE – **Ambient temperature thermostats** are considered to be the same if they have the same type reference, and for electronic thermostats, the same triac and heat sink if these components influence the sensor.

– the same arrangement for the space containing the **ambient temperature thermostat**;

– the same construction at the end of the heating element adjacent to the space containing the **ambient temperature thermostat.**

*If there are more than two **heaters** in a family within the capacity of the climatic test room, only the **heater** having the lowest **rated power input** and the **heater** having the highest **rated power input** need to be tested. The **amplitude** and **drift** for **heaters** having an intermediate **rated power input** are calculated by interpolation between the values found for the two **heaters** tested.*

*If any **heater** within the family has a **rated power input** higher than the capacity of the climatic test room, the **amplitude** and **drift** are determined as follows.*

*The **amplitude** and **drift** for the **heater** having the highest **rated power input** within the capacity of the climatic test room are determined as specified in 11.1. A resistive load located outside the test chamber is then connected in parallel with the heating element of this **heater.** The load is such that the total power input is equal to the power input of the **heater** having the highest **rated power input**. The **amplitude** and **drift** are determined as specified in 11.1.*

*The **amplitude** and **drift** for any **heater** within the family having an intermediate **rated power input** are calculated by interpolation between the values determined for the **heater** with and without external load.*

The **amplitude** and **drift** are stated for each of the **heaters**, rounded to the nearest 0,1 K.

12 Set-back

The set-back is determined for **heaters** incorporating a **set-back device.**

*The **average room temperature** is determined for the high **energy ratio** as specified in 11.1. The **set-back device** is then activated without changing the setting of the **ambient temperature thermostat** and the **average room temperature** is determined again.*

The set-back is the difference between the two values of **average room temperature**. It is stated, rounded to the nearest 0,5 K.

13 Frost protection temperature

The frost protection temperature is determined for **heaters** incorporating **frost protection means**.

*The temperature of the refrigerating chamber of the climatic test room is maintained at the value attained when the **heater** was tested at the high **energy ratio** as specified in 11.1.*

*The **frost protection means** is then activated and the room temperature is measured when steady conditions are established.*

NOTE 1 – If the **ambient temperature thermostat** does not cycle under this condition, the temperature in the refrigeration chamber is reduced.

The minimum room temperature is stated, rounded down to the nearest 1 °C.

NOTE 2 – The **heater** is not considered to have **frost protection means** if the value is beyond 7 °C ± 3 °C.

14 Inrush current

The inrush current is determined.

*The current is measured from the time the **heater** is switched on until it stabilizes.*

The **heater** is considered to have an inrush current if the maximum value after 10 s is higher than 1,1 times the stable value.

The inrush current is stated, rounded to the nearest ampere.

15 Effect of radiant heat

The effect of radiant heat is determined for **panel heaters** and **radiant heaters**.

*A dull-black painted plywood board approximately 20 mm thick, having a width of 1,5 m and a height of 1 m, is positioned vertically on the floor symmetrically in front of the **heater** at a distance of 1m.*

Thermocouples as specified in clause 9, except that the discs are not blackened, are arranged on the board, the distance between adjacent thermocouples being not more than 10 cm. A similar thermocouple protected against heat radiation is placed behind the board at a horizontal distance of 0,2 m from the centre.

NOTE – Protection can be achieved by placing the thermocouple in a thin wall reflecting cylinder which is open at both ends.

The temperatures are measured when steady conditions are established. The temperature rises are calculated, being the difference between the arithmetic average temperature of the thermocouples on the board and the protected thermocouple.

The following temperatures rises of the board are stated rounded to the nearest 1 K:

NOTE 1 – During the period where measurements are made, the ambient temperature of the room is to be maintained within 0,5 K.

– the temperature rise distribution;
– the highest and lowest temperature rises;
– the average temperature rise;
– the lowest and the average temperature rise of the central part of the board over a width of 0,5 m.

NOTE 2 – The board may be positioned to measure the effect of radiant heat from the sides of the **heater**.

NOTE 3 – If the top of the **heater** is higher than 1 m above the floor, the board may be positioned vertically.

NOTE 4 – The test is not suitable for **heaters** for mounting at a height above 1,8 m.

16 Measurement of the usable power

The measurement of **usable power** is determined for **heaters** which cycle during the test of clause 10.

*The **heater** is operated until steady conditions are established. The energy consumed during the subsequent 10 complete cycles of operation of the thermostat is measured. If necessary, the test is continued for further complete cycles to ensure that the time during which the energy measurement is carried out is at least 1 h.*

NOTE – Any **ambient temperature thermostat** is short-circuited.

The **usable power** is determined by dividing the energy consumed by the time taken and is stated if less than 90 % of the **rated power input**.

17 Verification of the maximum room temperature promoted by the manufacturer

Only if promoted by the manufacturer and underlined by values, is the maximum room temperature achievable for **direct-acting room heaters** with a built-in **ambient temperature thermostat** determined under the conditions of low-heat requirement in the **climatic test room** in accordance with Annex A.

The temperature of the refrigerating chamber is set to give an **energy ratio** of 80 % ± 5 %.

If the **ambient temperature thermostat** is not cycling, the air exchange between the refrigerating chamber and the test chamber, and, if necessary, the cooling unit of the refrigerating chamber, can be stopped.

*The heater is operated at maximum settings of heating capability and **ambient temperature thermostat** until steady conditions are established. Portable heaters are placed as near as possible to one of the walls and fixed heaters are installed, both according to the manufacturer's instructions.*

The temperature of the test chamber is measured in accordance with Annex A and stated rounded to the nearest 1 K.

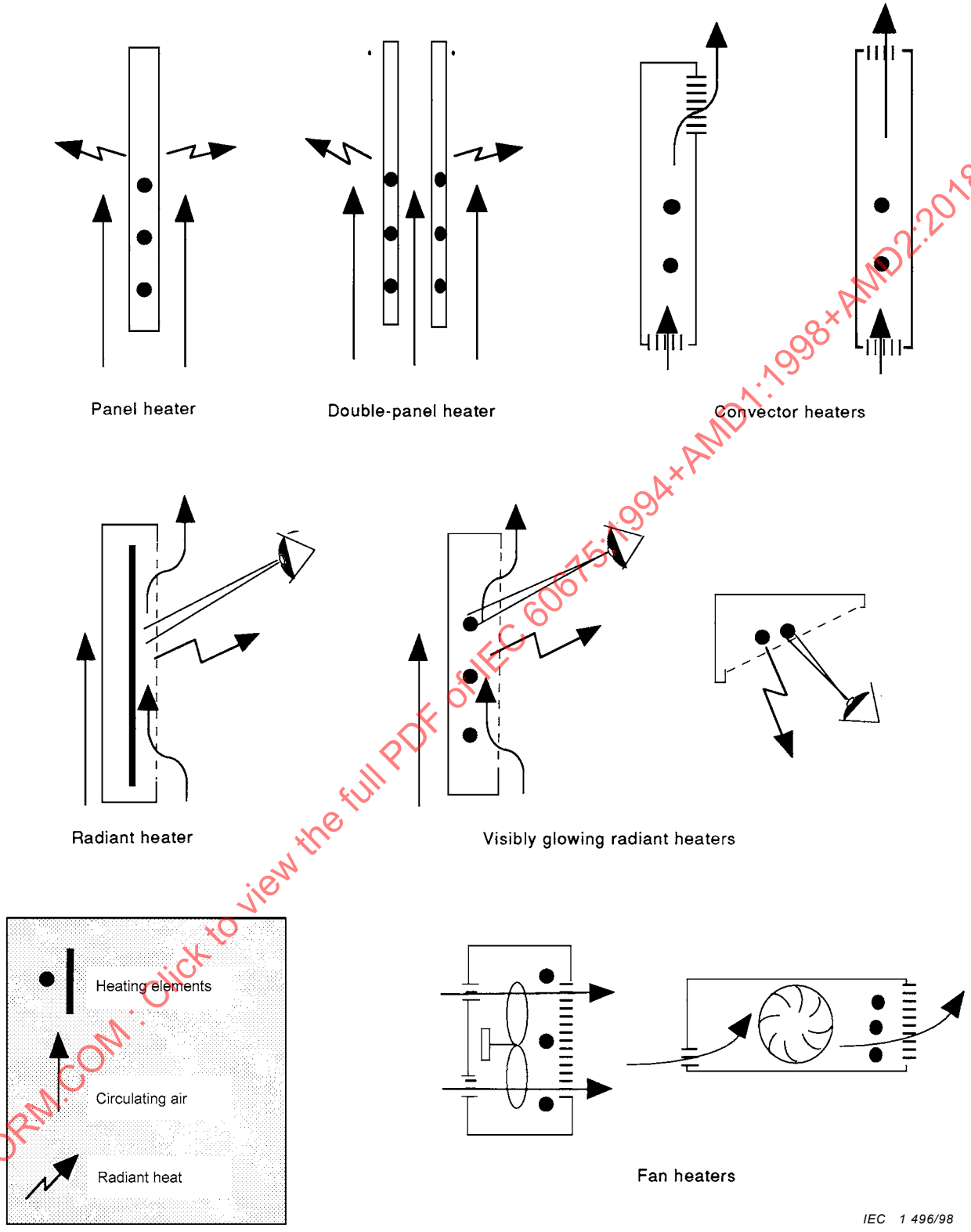
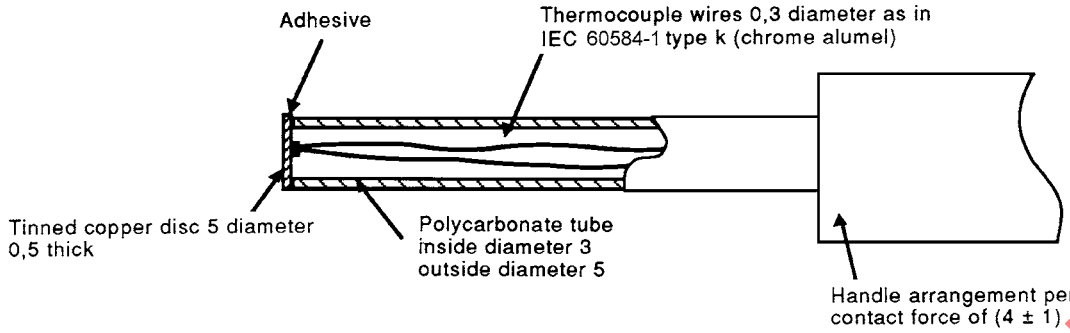


Figure 1 – Examples of types of heaters



Dimensions in milllimetres

NOTE – The contact face of the disc is to be flat. The thermocouple is to be soldered with care to ensure that the disc temperature is measured.

Figure 2 – Probe for measuring surface temperature

Annex A
(normative)

Climatic test room

The climatic test room consists of a test chamber for simulating the indoor temperature and a refrigerating chamber for simulating the outdoor temperature. The chambers are separated by a wall, referred to as the exterior wall, as shown in figure A.1.

The heat demand in the test chamber is created by changing the temperature in the refrigerating chamber. The test chamber has a volume between 30 m^3 and 40 m^3, a length between 3 m and 4 m, a width between 3 m and 4 m and a height between 2,4 m and 2,6 m.

In the exterior wall, there is a window of at least 3 m × 1,5 m having a coefficient of thermal conductance not more than 3 W/m^2 K. The wall under the window has a height of at least 0,8 m and has a coefficient of thermal conductance not more than 0,5 W/m^2 K. The remainder of the exterior wall has a coefficient of thermal conductance not more than 1,0 W/m^2 K. The other walls, the floor and the ceiling have a coefficient of thermal conductance not more than 0,6 W/m^2 K.

Cold air in the test chamber is supplied from the refrigerating chamber through two inlets placed symmetrically above the window. The air is returned to the refrigerating chamber at the upper corners of the exterior wall by means of ducting. The extraction point in the test chamber is on the wall opposite to the exterior wall at a height not more than 0,4 m above the floor.

The air exchange between the refrigerating chamber and the test chamber is approximately one test chamber volume per hour.

The refrigerating chamber is to be capable of creating a heat-loss through the exterior wall of at least 1 000 W.

The ambient temperature surrounding the climatic test room is to be within 2 °C of the mean temperature of the test chamber when setting the **ambient temperature thermostat** in 11.1.

The **heater** is placed in the test chamber against the wall, below the centre of the window, according to the instructions. If the **heater** is too high to be placed below the window, it is placed on one of the adjacent walls with its centre at a distance of 2 m from the exterior wall, so that the side of the **heater** containing the **ambient temperature thermostat** is closer to the exterior wall. No heat source other than the appliance under test is to be in the test room.

The temperature of the test chamber is measured by means of a thermocouple placed inside a thin-wall black globe having a diameter of approximately 10 cm. The globe is located centrally at a distance of 2 m from the exterior wall and at a height of 1,2 m above the floor. The recording instrument is located outside the test chamber.

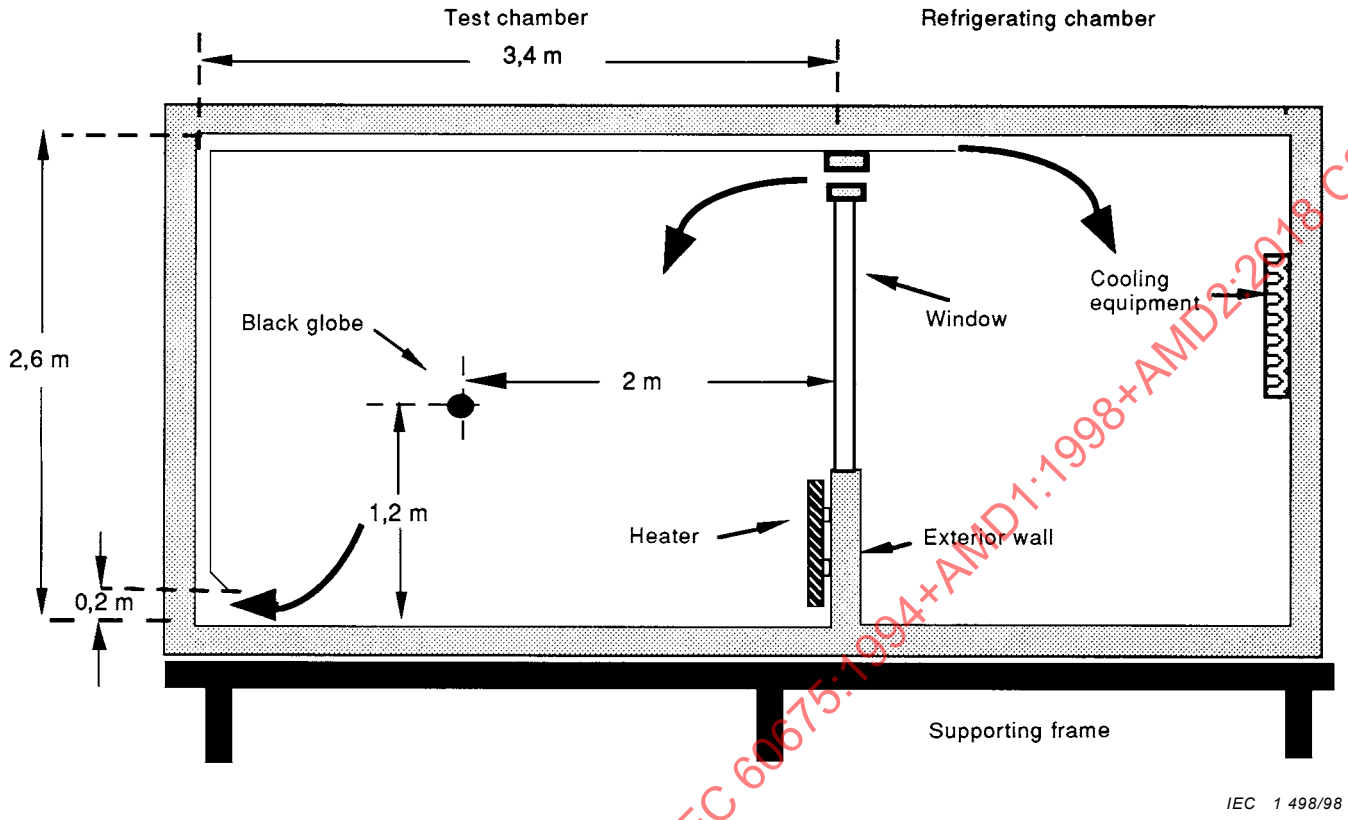


Figure A.1 – Example of a climatic room

Annex B
(informative)

Information provided at point-of-sale

The following information should be provided at the point of sale to assist the purchaser with the selection of an appropriate **heater**:

rated power input (see 3.11);

type of **heater** (see 4.1);

regulating features (see 4.2);

dimensions and mass of the **heater** (see clause 7);

means for connection to the supply, length of any supply cord and whether a plug is fitted (see clause 7);

average temperature rise of the front surface of **panel heaters** and **radiant heaters** other than visibly glowing radiant heaters (see clause 8);

average temperature rise of the air outlet grille of **fan heaters** and **convector heaters** (see clause 8).

usable power (if applicable, see clause 16).

maximum achievable room temperature (if applicable).

Annex C
(informative)

Test report form

ELECTRIC DIRECT-ACTING ROOM HEATER

TEST REPORT ACCORDING TO IEC 60675*

*IEC 60675: HOUSEHOLD ELECTRIC DIRECT-ACTING ROOM HEATERS – METHODS FOR MEASURING PERFORMANCE

REFERENCE NO. :

.....

TEST LABORATORY :

.....

.....

TESTED BY : ..... DATE: .....

CHECKED BY : ..... DATE: .....

MANUFACTURER : .....

TEST LABORATORY : .....

MODEL/TYPE REF. : .....

NOMINAL RATING : ..... W ..... V ..... Hz

REMARKS :

.....

.....

.....

.....

.....

.....

.....

_____

NOTE – It is recorded in the remarks if the climatic test room described in annex A is not used.

The following results were obtained when the heater was tested according to IEC 60675:

	Recorded by the laboratory	Stated by the manufacturer
Classification (see clause 4)		
According to type (see 4.1):		
Panel heater	☐	☐
Convector heater	☐	☐
Fan heater	☐	☐
Radiant heater	☐	☐
Visibly glowing radiant heater	☐	☐
According to regulation features (see 4.2):		
Heater without regulation	☐	☐
Heater with adjustable power input	☐	☐
Heater with regulated air flow (fan heater only)	☐	☐
Heater with ambient temperate thermostat	☐	☐
Heater with programmer	☐	☐
Heater with set-back device	☐	☐
Heater with frost protection means	☐	☐
Heater with other features	☐	☐
(description: .....)		

Dimensions, mass and means of connection to the supply (see clause 7)

Dimensions: ~~Longueur~~ Length..... mm Height ..... mm Depth .....mm

Mass: ..... kg

Supply connection ☐ Length of the supply cord: ..... mm ☐ plug fitted
☐ without plug

☐ terminals for connection to the fixed wiring

Temperature rises of air-outlet grilles and external surfaces (see clause 8)

	Max.	Average
Temperature rise of air-outlet grilles:	..... K	..... K
Temperature rise of front surface:	..... K	..... K
Temperature rise of back surface:	..... K	..... K

NOTE – The temperature rise distribution is given in the enclosed documents.

Temperature rises of surfaces surrounding the heater (see clause 9)

Max. temperature rise of the wall: ..... K Max. temperature rise of the shelf: ..... K

Max. temperature rise of the floor: ..... K Max. temperature rise of the left side wall: ..... K

Max. temperature rise of the ceiling: .... K Max. temperature rise of the right side wall: ..... K

Warming-up time of the heater (see clause 10)

Warming-up time: Approximately..... min

Stability of room temperature (see clause 11)

Amplitude:..... K

The average room temperature is ..... °C at the high energy ratio of..... %

The average room temperature is ..... °C at the low energy ratio of ..... %

Drift:..... K

Set-back (see clause 12)

Set-back:..... K

Frost protection temperature (see clause 13)

Frost protection temperature:..... °C

Inrush current (see clause 14)

Inrush current:..... A

Effect of radiant heat (see clause 15)

	Central part	Full board
Highest temperature rise:		..... K
Lowest temperature rise:	..... K	..... K
Average temperature rise:	..... K	..... K

NOTE – The temperature rise distribution is given in the enclosed documents.

Usable power (see clause 16)

Usable power..... kW

Maximum achievable room temperature (if applicable)

Maximum room temperature achieved ..... °C

Annex D
(informative)

Bibliography

The following standards are quoted in this standard:

IEC 60335-2-30: 1990, *Safety of household and similar electrical appliances – Part 2: Particular requirements for room heaters*

IEC 60531: 1976, *Methods for measuring the performance of household electric room heaters of the storage type*

IEC 60704-2-2: 1985, *Test code for the determination of airborne acoustical noise emitted by household and similar electrical appliances – Part 2: Particular requirements for forced draught convection heaters*

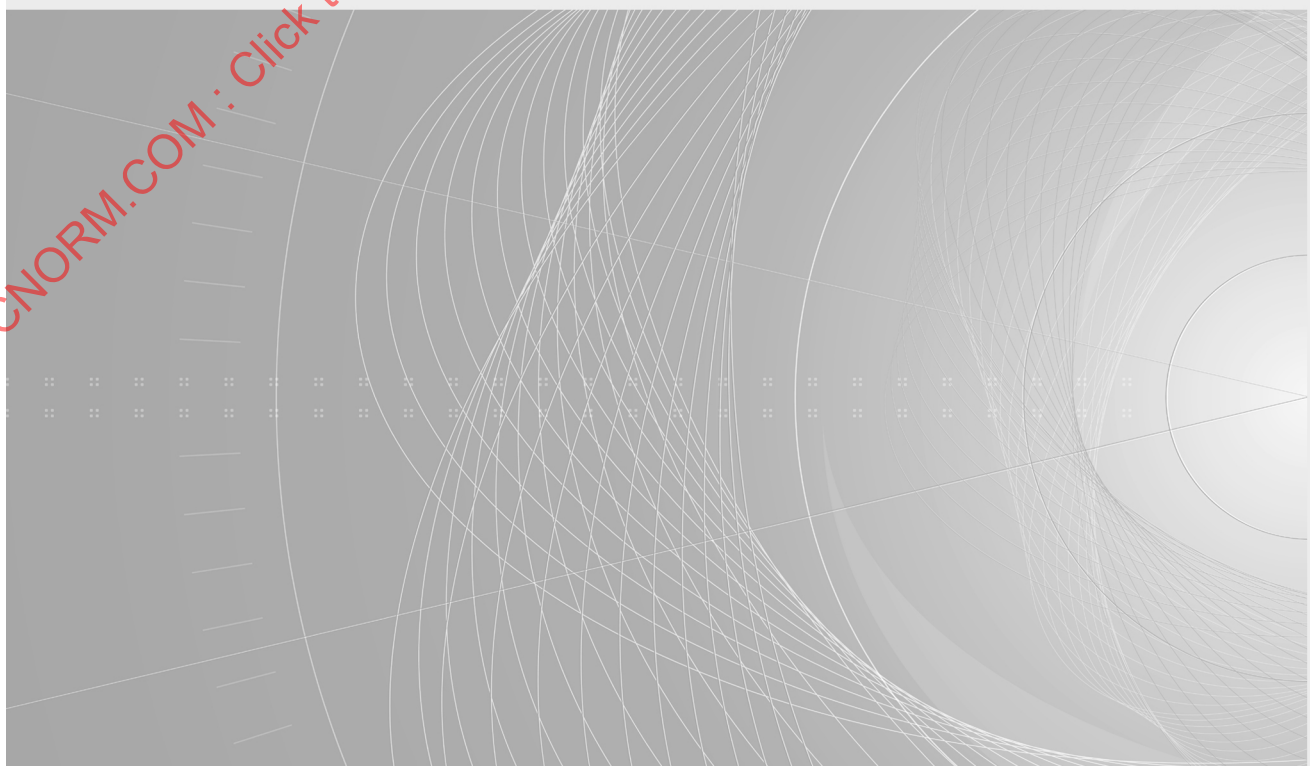
_____

IEC 60675

Edition 2.2 2018-04

FINAL VERSION

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



IEC 60675:1994-08+AMD1:1998-07+AMD2:2018-04 CSV(en)

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

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

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

DISCLAIMER
This Consolidated version is not an official IEC Standard and has been prepared for user convenience. Only the current versions of the standard and its amendment(s) are to be considered the official documents.

This Consolidated version of IEC 60675 bears the edition number 2.2. It consists of 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]. The technical content is identical to the base edition and its amendments.

This Final version does not show where the technical content is modified by amendments 1 and 2. A separate Redline version with all changes highlighted 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.

The committee has decided that the contents of the base publication and its amendments will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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

A bilingual version may be issued at a later date.

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

3.7
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 °C ± 3 °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 °C ± 2 °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 N ± 1 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,*

whichever reaches steady conditions first, is used as a reference as long as it is representative of the temperature rise of the surface.

NOTE – Steady conditions are considered to be reached when the temperature rise within 15 min does not vary more than 2 K.

The warming-up time is stated to the nearest minute, preceded by "approximately".

11 Stability of room temperature

The **amplitude** and **drift** are determined for **heater**s incorporating an **ambient temperature thermostat.**

11.1 Basic method of evaluation

*The **heater** is placed in the test chamber of a climatic test room (see annex A).*

*The temperature inside the test chamber is measured for three different **energy ratios** which are obtained by changing the temperature in the refrigerating chamber, without changing the setting of the **ambient temperature thermostat.** The measurements are made when the **average room temperature** is stable over a period of five consecutive fluctuations or 2 h, whichever is shorter.*

*The first measurement is made with the **ambient temperature thermostat** set to give a temperature in the test room between 20 °C and 25 °C at a high **energy ratio.** The high **energy ratio** is (80 ± 5) % but if the ratio is not attainable due to the capacity of the climatic test room, the highest possible **energy ratio** is used.*

NOTE 1 – If the **energy ratio** of (80 ± 5) % cannot be attained with a **heater** belonging to a family, the method of 11.2 is used instead.

*The temperature of the refrigerating chamber is then increased to give an **energy ratio** of (50 ± 5) %, The third measurement is made with a low **energy ratio**. The low **energy ratio** is (20 ± 5) %, but if this results in heat-losses less than 150 W, the low energy ratio is that corresponding to 150 W.*

*The **amplitude** is determined for the **energy ratio** of (50 ± 5) %.*

*The **drift** is determined from the **average room temperature** at the high and low **energy ratios** using the following formula:*

$$D = (t_B - t_A) \times \frac{60}{A - B}$$

where

*D is the **drift;***

*t_A is the **average room temperature** at the high **energy ratio**;*

*t_B is the **average room temperature** at the low **energy ratio**;*

*A is the measured value of the high **energy ratio;***

*B is the measured value of the low **energy ratio**.*

NOTE 2 – In the formula, 60 is the difference between the ratios of 80 % and 20 %.

NOTE 3 – If the **average room temperature** at the **energy ratio** of 50 % does not fall between t_A and t_B, the formula is not applicable and the maximum difference of the three values is stated as the **drift**.

The **amplitude** and the **drift** are stated to the nearest 0,1 K.

11.2 Method for a family of heaters

The **amplitude** and **drift** for a family of **heaters** may be determined using the following procedure. **Heaters** are considered to belong to a family when they have the same basic construction and have:

– the same dimensions except that the length of the heating element is proportional to the **rated power input**;

– the same **ambient temperature thermostat;**

NOTE – **Ambient temperature thermostats** are considered to be the same if they have the same type reference, and for electronic thermostats, the same triac and heat sink if these components influence the sensor.

– the same arrangement for the space containing the **ambient temperature thermostat**;

– the same construction at the end of the heating element adjacent to the space containing the **ambient temperature thermostat.**

*If there are more than two **heaters** in a family within the capacity of the climatic test room, only the **heater** having the lowest **rated power input** and the **heater** having the highest **rated power input** need to be tested. The **amplitude** and **drift** for **heaters** having an intermediate **rated power input** are calculated by interpolation between the values found for the two **heaters** tested.*

*If any **heater** within the family has a **rated power input** higher than the capacity of the climatic test room, the **amplitude** and **drift** are determined as follows.*

*The **amplitude** and **drift** for the **heater** having the highest **rated power input** within the capacity of the climatic test room are determined as specified in 11.1. A resistive load located outside the test chamber is then connected in parallel with the heating element of this **heater.** The load is such that the total power input is equal to the power input of the **heater** having the highest **rated power input**. The **amplitude** and **drift** are determined as specified in 11.1.*

*The **amplitude** and **drift** for any **heater** within the family having an intermediate **rated power input** are calculated by interpolation between the values determined for the **heater** with and without external load.*

The **amplitude** and **drift** are stated for each of the **heaters**, rounded to the nearest 0,1 K.

12 Set-back

The set-back is determined for **heaters** incorporating a **set-back device.**

*The **average room temperature** is determined for the high **energy ratio** as specified in 11.1. The **set-back device** is then activated without changing the setting of the **ambient temperature thermostat** and the **average room temperature** is determined again.*

The set-back is the difference between the two values of **average room temperature**. It is stated, rounded to the nearest 0,5 K.

13 Frost protection temperature

The frost protection temperature is determined for **heaters** incorporating **frost protection means**.

*The temperature of the refrigerating chamber of the climatic test room is maintained at the value attained when the **heater** was tested at the high **energy ratio** as specified in 11.1.*

*The **frost protection means** is then activated and the room temperature is measured when steady conditions are established.*

NOTE 1 – If the **ambient temperature thermostat** does not cycle under this condition, the temperature in the refrigeration chamber is reduced.

The minimum room temperature is stated, rounded down to the nearest 1 °C.

NOTE 2 – The **heater** is not considered to have **frost protection means** if the value is beyond 7 °C ± 3 °C.

14 Inrush current

The inrush current is determined.

*The current is measured from the time the **heater** is switched on until it stabilizes.*

The **heater** is considered to have an inrush current if the maximum value after 10 s is higher than 1,1 times the stable value.

The inrush current is stated, rounded to the nearest ampere.

15 Effect of radiant heat

The effect of radiant heat is determined for **panel heaters** and **radiant heaters**.

*A dull-black painted plywood board approximately 20 mm thick, having a width of 1,5 m and a height of 1 m, is positioned vertically on the floor symmetrically in front of the **heater** at a distance of 1m.*

Thermocouples as specified in clause 9, except that the discs are not blackened, are arranged on the board, the distance between adjacent thermocouples being not more than 10 cm. A similar thermocouple protected against heat radiation is placed behind the board at a horizontal distance of 0,2 m from the centre.

NOTE – Protection can be achieved by placing the thermocouple in a thin wall reflecting cylinder which is open at both ends.

The temperatures are measured when steady conditions are established. The temperature rises are calculated, being the difference between the arithmetic average temperature of the thermocouples on the board and the protected thermocouple.

The following temperatures rises of the board are stated rounded to the nearest 1 K:

NOTE 1 – During the period where measurements are made, the ambient temperature of the room is to be maintained within 0,5 K.

– the temperature rise distribution;
– the highest and lowest temperature rises;
– the average temperature rise;
– the lowest and the average temperature rise of the central part of the board over a width of 0,5 m.

NOTE 2 – The board may be positioned to measure the effect of radiant heat from the sides of the **heater**.

NOTE 3 – If the top of the **heater** is higher than 1 m above the floor, the board may be positioned vertically.

NOTE 4 – The test is not suitable for **heaters** for mounting at a height above 1,8 m.

16 Measurement of the usable power

The measurement of **usable power** is determined for **heaters** which cycle during the test of clause 10.

*The **heater** is operated until steady conditions are established. The energy consumed during the subsequent 10 complete cycles of operation of the thermostat is measured. If necessary, the test is continued for further complete cycles to ensure that the time during which the energy measurement is carried out is at least 1 h.*

NOTE – Any **ambient temperature thermostat** is short-circuited.

The **usable power** is determined by dividing the energy consumed by the time taken and is stated if less than 90 % of the **rated power input**.

17 Verification of the maximum room temperature promoted by the manufacturer

Only if promoted by the manufacturer and underlined by values, is the maximum room temperature achievable for **direct-acting room heaters** with a built-in **ambient temperature thermostat** determined under the conditions of low-heat requirement in the **climatic test room** in accordance with Annex A.

The temperature of the refrigerating chamber is set to give an **energy ratio** of 80 % ± 5 %.

If the **ambient temperature thermostat** is not cycling, the air exchange between the refrigerating chamber and the test chamber, and, if necessary, the cooling unit of the refrigerating chamber, can be stopped.

*The heater is operated at maximum settings of heating capability and **ambient temperature thermostat** until steady conditions are established. Portable heaters are placed as near as possible to one of the walls and fixed heaters are installed, both according to the manufacturer's instructions.*

The temperature of the test chamber is measured in accordance with Annex A and stated rounded to the nearest 1 K.

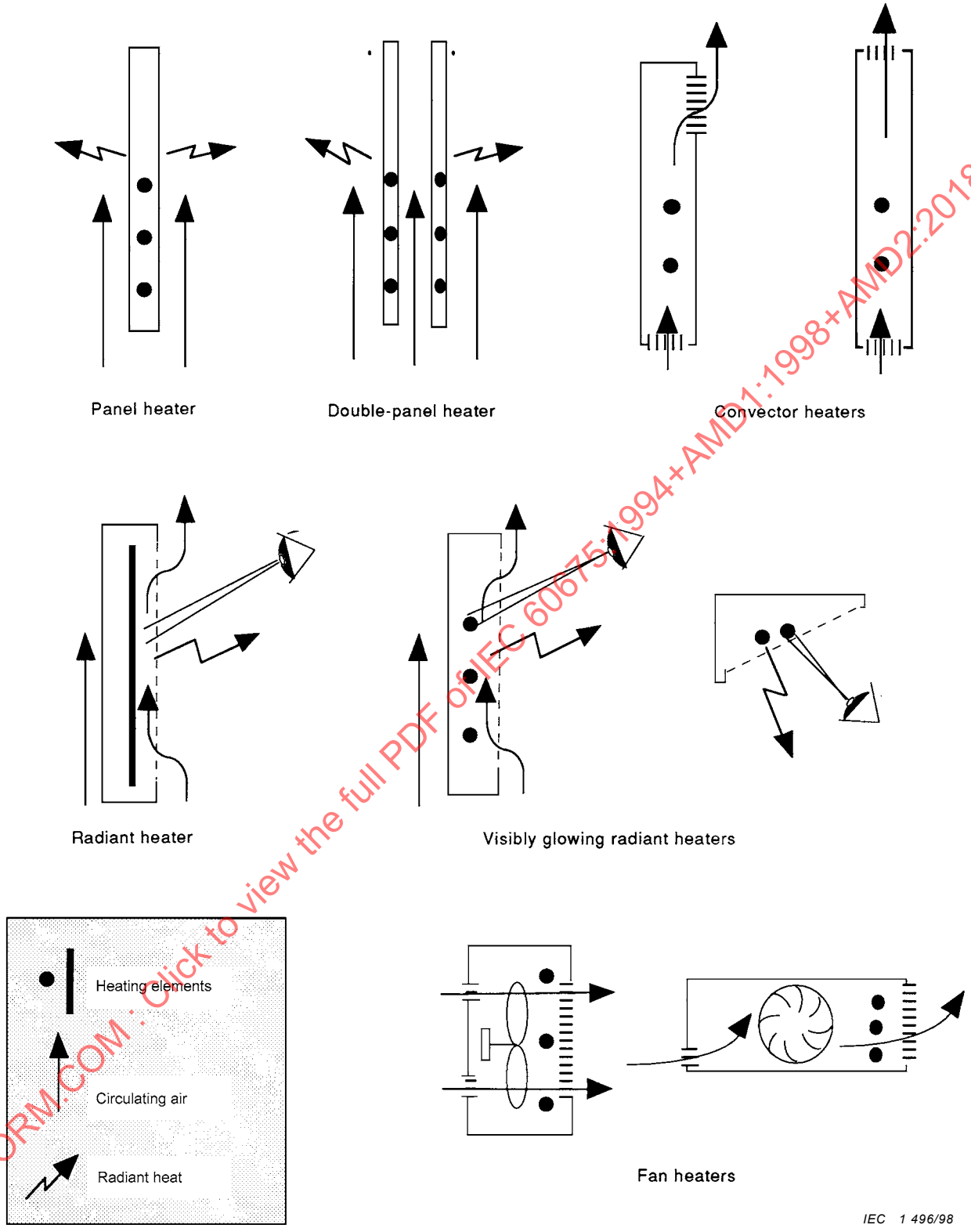


Figure 1 – Examples of types of heaters