

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



**Household electric direct-acting room heaters – Methods for measuring performance –  
Part 3: Additional provisions for the measurement of radiation efficiency**

**Appareils électrodomestiques de chauffage des locaux à action directe –  
Méthodes de mesure de l'aptitude à la fonction –  
Partie 3: Dispositions supplémentaires pour la mesure du rendement de rayonnement**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

**Part 3: Additional provisions for the measurement of radiation efficiency**

**FOREWORD**

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International Standard IEC 60675-3 has been prepared by subcommittee 59C: Electrical heating appliances for household and similar purposes, of IEC technical committee 59: Performance of household and similar electrical appliances.

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

FDIS	Report on voting
59C/257/FDIS	59C/261/RVD

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

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

This International Standard is to be used in conjunction with IEC 60675:1994, IEC 60675:1994/AMD1:1998 and IEC 60675:1994/AMD2:2018. This document supplements or modifies the corresponding clauses of IEC 60675:1994. Where the text indicates an "addition" to or a "replacement" of the relevant provision of IEC 60675:1994, these changes are made to the relevant text of IEC 60675:1994. Where no change is necessary, the words "This clause of IEC 60675:1994 is applicable" are used. When a particular subclause of IEC 60675:1994 is not mentioned in this part, that subclause applies as far as is reasonable.

Additional specific provisions to those in Part 1, given as individual clauses or subclauses, are numbered starting from 101.

NOTE The following numbering system is used:

- subclauses, tables and figures that are numbered starting from 101 are additional to those in Part 1;
- unless notes are in a new subclause or involve notes in Part 1, they are numbered starting from 101, including those in a replaced clause or subclause;
- additional annexes are lettered AA, BB, etc.

In this document, the following print types are used:

- **terms listed in Clause 3 of this document and of IEC 60675:1994 and IEC 60675-2:2020: Arial bold.**
- *test specifications: in italic type.*

A list of all parts in the IEC 60675 series, published under the general title *Household electric direct-acting room heaters – Methods for measuring performance*, can be found on the IEC website.

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The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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

## Part 3: Additional provisions for the measurement of radiation efficiency

### 1 Scope

*This clause of IEC 60675:1994 is applicable, with the following modification:*

*Replace the first paragraph with the following content:*

This document applies to electric direct-acting room heaters.

This document defines performance characteristics related to the radiant effect and specifies methods for measuring the **radiation efficiency** for the information of users.

This document is used to measure the **radiation efficiency** of direct-acting room heaters.

### 2 Normative references

*Replace Clause 2 of IEC 60675:1994 with the following content:*

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

IEC 60675:1994, *Household electric direct-acting room heaters – Methods for measuring performance*

IEC 60675:1994/AMD1:1998

IEC 60675:1994/AMD2:2018

IEC 60675-2:2020, *Household electric direct-acting room heaters – Methods for measuring performance – Part 2: Additional provisions for the measurement of the radiation factor*

### 3 Terms, definitions and symbols

*Replace Clause 3 of IEC 60675:1994 with the following content:*

For the purposes of this document, the terms and definitions given in IEC 60675:1994, IEC 60675:1994/AMD1:1998, IEC 60675-2:2020 and the following apply.

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

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

#### 3.101

##### **radiant factor**

ratio of the measured infrared heat output to the measured total energy input, expressed in %

Note 1 to entry: The **radiant factor** can be measured for **panel heaters**, **convector heaters** and **radiant heaters**

### 3.102

#### **radiation efficiency**

ratio of the heat flow into a (testing) chamber by radiation exchange between an active radiant heating surface and the inner surfaces of the chamber to the nominal electric power of a heater inside this **testing chamber**

Note 1 to entry: The **radiant factor** and the **radiation efficiency** are measured on different physical background and not comparable.

### 3.103

#### **active radiant heating surface**

room-facing surfaces of heaters

Note 1 to entry: Areas with average temperatures below 40 °C, like frames, mounting devices, operation panels, and other additions, shall be excluded from being part of the respective **active radiant heating surface**.

### 3.104

#### **rated power**

electrical input  $Q_M$  in W, measured in steady-state conditions calculated as the average of the electrical input during the measurement of the **radiation efficiency** over the period necessary for confirming steady-state conditions

Note 1 to entry: Steady-state conditions are reached when the heater's surface temperature does not vary by more than 1 K over 10 min.

### 3.105

#### **emissivity**

ratio of radiant flux of a specific surface as compared to the radiant flux of a standard black body, at the same temperature and in the same environment

### 3.106

#### **examinee**

heater that is being tested in accordance with this document

### 3.107

#### **infrared camera**

measurement device for recording and pictorial representation of the surface temperatures of heaters

### 3.108

#### **low temperature infrared heater**

heater without visibly glowing parts, with one or more **active radiant heating surfaces**, each with an average temperature between 40 °C and 200 °C, and a **nominal radiation efficiency** of 40 % or higher as determined by this document

Note 1 to entry: "Without visibly glowing parts" denotes that, in case of an installed heater, those parts cannot be detected with the naked eye from a point situated 2 m in front of the heater and 1,2 m above the floor.

### 3.109

#### **model**

heater with the identical construction and appearance as other heaters made by the same manufacturer

### 3.110

#### **model series**

group of **models**

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**3.111****nominal heat-up time**

time period from turning-on the heater until arriving at 2/3 of the temperature in the **steady-state operating condition** of the heater

**3.112****nominal radiation efficiency**

ratio of the heat flow into a **testing chamber** by radiation exchange between an **active radiant heating surface** and the inner surfaces of the chamber to the nominal electric power of a heater inside this **testing chamber**

Note 1 to entry: For calculation of the **nominal radiation efficiency**, see AA.2.1.1.

**3.113****dynamic factor**

parameter that can be used for benchmarking of **low temperature infrared heaters**

Note 1 to entry: This parameter is based on the **nominal radiation efficiency** and the **nominal heat-up time**.

Note 2 to entry: For the calculation of the **dynamic factor**, see AA.2.2.

**3.114****radiant heat correction factor**

parameter that specifies how much of the radiant flux of a heater is absorbed in the air

**3.115****steady-state operating condition**

status of heater with steady-state operating temperature of its **active radiant heating surfaces** over a predetermined period of time

**3.116****testing chamber**

standardized environment for testing heaters

**3.117****corrected radiation efficiency**

**nominal radiation efficiency** reduced by the influence of absorption in air.

Note 1 to entry: For calculation of the **corrected radiation efficiency**, see AA.2.1.2.

**3.118****relative radiation efficiency**

ratio of the **nominal radiation efficiency** of the test device to the **radiation efficiency** of an idealized version of the test device

Note 1 to entry: For calculation of the **relative radiation efficiency**, see AA.2.1.3.

**3.119 Symbols**

The symbols given in Table 100 are used in this document.

**Table 100 – Symbols used in this document**

Symbol	Designation	Dimension
$P_{elnom}$	Electric nominal power	W
$P_{el}$	Measured electrical input in steady-state conditions	W
$L$	Length	m
$W$	Width	m
$D$	Depth	m
--	Length of power cable	m
--	Weight	kg
$A_{pixel}$	Active radiant heating surface	m <sup>2</sup>
$\varepsilon_h$	Hemispherical emissivity of an active radiant heating surface	--
$\sigma$	Stefan-Boltzmann constant (= 5,670 4 × 10 <sup>-8</sup> )	W / m <sup>2</sup> K <sup>4</sup>
$T_{front}$	Infrared camera image-pixel temperature of an active radiant heating surface	K
$T_{wall}$	Simple average temperature of all 6 interior surfaces of the testing chamber	K
$A_{TOT}$	Radiant heat correction factor for radiant heat absorption in air	--
$\phi_{radc}$	Radiant flux after applying the radiant heat correction factor	W
$R_{nom}$	Nominal radiation efficiency	%
$D_f$	Dynamic factor	--
$t_{nom}$	Nominal heat-up time	minutes
$s_o$	Repetitive precision	W
$s_m$	Comparative precision	W

#### 4 Classification

This clause of IEC 60675:1994 is applicable.

#### 5 List of measurements

This clause of IEC 60675:1994 and IEC 60675:1994/AMD1:1998 is applicable.

#### 6 General conditions for measurements

This clause of IEC 60675:1994 and IEC 60675:1994/AMD1:1998 is applicable.

#### 7 Dimensions, mass and means of connection to the supply

This clause of IEC 60675:1994 is applicable.

#### 8 Temperature rises of air-outlet grilles and external surfaces

This clause of IEC 60675:1994 is applicable.

## 9 Temperature rises of surfaces surrounding the heater

This clause of IEC 60675:1994 is applicable.

## 10 Warming-up time of the heater

This clause of IEC 60675:1994 is applicable.

## 11 Stability of room temperature

This clause of IEC 60675:1994 and IEC 60675:1994/AMD1:1998 is applicable.

## 12 Set-back

This clause of IEC 60675:1994 is applicable.

## 13 Frost protection temperature

This clause of IEC 60675:1994 is applicable.

## 14 Inrush current

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Replace Clause 15 of IEC 60675:1994 with the following content:  
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## 15 Effect of radiant heat

### 15.1 Determination of radiant factor

For **panel heaters**, **convector heaters** and **radiant heaters** the **radiant factor** shall be determined in accordance with Annex AA of IEC 60675-2:2020.

### 15.2 Determination of radiation efficiency

For **low temperature radiant heaters**, the **radiation efficiency** may be determined in accordance with Annex AA of this document.

## 16 Measurement of the usable power

This clause of IEC 60675:1994/AMD1:1998 is applicable.

## 17 Verification of the maximum room temperature promoted by the manufacturer

This clause of IEC 60675:1994/AMD2:2018 is applicable.

**Annex A**  
(normative)

**Climatic test room**

This annex of IEC 60675:1994 is applicable.

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**Annex B**  
(informative)

**Information provided at point-of-sale**

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**Annex C**  
(informative)

**Test report form**

*The following content replaces the content of Annex C of IEC 60675:1994:*

See Test report according to Annex AA of this document.

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