

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Electric room heating – Underfloor heating – Performance characteristics –
Definitions, method of testing, sizing and formula symbols**

**Chauffage électrique de locaux – Chauffage par le sol – Caractéristiques de
performance – Définitions, méthode d'essai, calibrage et symboles de formule**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRIC ROOM HEATING – UNDERFLOOR HEATING –
PERFORMANCE CHARACTERISTICS – DEFINITIONS, METHOD
OF TESTING, SIZING AND FORMULA SYMBOLS**

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International Standard IEC 62999 has been prepared by subcommittee 59C: Heating appliances, of IEC technical committee 59: Performance of household and similar electrical appliances.

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

CDV	Report on voting
59C/193/CDV	59C/197/RVC

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

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

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ELECTRIC ROOM HEATING – UNDERFLOOR HEATING – PERFORMANCE CHARACTERISTICS – DEFINITIONS, METHOD OF TESTING, SIZING AND FORMULA SYMBOLS

1 Scope

This International Standard applies to electrical underfloor heating of dwellings and all other buildings whose use corresponds to dwellings or is at least similar, having a maximum load bearing in use of 4 kN/m².

This Standard defines the main characteristics of electrical underfloor heating and establishes the method of testing of these characteristics as information for the user.

This Standard does not deal with:

- installation and safety requirements.

2 Normative references

IEC 60335-2-96, *Household and similar electrical appliances – Safety – Part 2-96: Particular requirements for flexible sheet heating elements for room heating*

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3 Terms and definitions

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For the purposes of this document, the following terms and definitions apply.

3.1

electrical underfloor heating system

electrical underfloor heating, switching, control and regulation appliances and electrical installation

3.1.1

underfloor heating

in situ flooring constructed as an electrical underfloor heating system

Note 1 to entry: It is generally laid on a dry, level, load-bearing substructure.

3.1.2

underfloor direct heating

underfloor direct heating, by which the heat generated from electrical energy is transferred with the least possible time lag to the room to be heated mainly via the surface of the floor

Note 1 to entry: There is no restriction on the amount of time electrical energy can be converted into heat.

3.1.3

underfloor warming

underfloor warming increases comfort by means of pleasant warmth on the feet

Note 1 to entry: It is not necessary to calculate the heat load of the room, and the insulating layers as the underfloor warming are not considered when calculating the heat load of the room.

3.1.4

controlled underfloor heating

underfloor direct heating, by which the conversion of electricity into heat may be interrupted according to the provisions laid out in Note 1

Note 1 to entry: The conversion of electricity into heat may be interrupted – for no longer than 2 h continuously – no longer than 8 h total in a 24 h period. The period of use will be equivalent to at least the previous period of interruption.

3.1.5

underfloor storage heating

underfloor heating, by which the electrical energy is converted into heat and transferred with an intended time lag to the room to be heated mainly via the surface of the floor

Note 1 to entry: The charging takes place during the charging time period t_F and, as a rule, during an additional charging time t_{ZF} of minimum 2 h.

3.1.6

underfloor storage heating system

underfloor heating, auxiliary heating, switching, control and regulation appliances and electrical installation

3.1.7

electrical auxiliary heating

necessary heating equipment with a rating Q_Z in the room being heated, additional to, and different from, the underfloor heating (e.g. periphery heating, convector panels, etc.)

3.1.8

heating circuit

independently switched, regulated or controlled section of an underfloor heating system

3.2

duration of design charge

duration of the charge for which the storage heating system is designed and which is determined as the basis for testing

Note 1 to entry: It constitutes the largest continuous charging time within a period of 24 h.

3.3

auxiliary charge

sum of the auxiliary charging times occurring between two design charge times

3.4

designed rating of a heating element

manufacturer's stated power rating for the heating element in W at the design voltage

3.5

capacity of a room

capacity in W of underfloor heating in a room is the sum of the measured power ratings of the installed heating elements of an underfloor heating system in that room

3.6

design temperature

ϑ_N

highest permissible heating cable nominal temperature in °C, taking into consideration the specific operating properties, such as heat resistance of heat and sound insulation materials

Note 1 to entry: The design limiting temperature is the highest permissible temperature which is allowed by the manufacturer of the surface heating element.

3.7

maximum surface temperature

temperature which, for physiological purposes, cannot be exceeded on the uncovered upper surface of the flooring

Note 1 to entry: This temperature may be exceeded in peripheral areas.

3.8

standard internal temperature

value of the room temperature necessary for the calculation, t_i in °C; it is the resulting temperature, defined as the mean of the dry air temperature and the mean radiant temperature

3.9

standard heat load of an underfloor heated room

$$\dot{Q}_N^*$$

standard heat load of an underfloor heated room, it is used only to size the underfloor heating

Note 1 to entry: Its value (as with that of the standard heat load of an underfloor heated room \dot{Q}_N^*) in W, is calculated, taking into account the partially limited heating of the rooms in the dwelling. Areas of the room which are equipped with surface heating elements (flooring, ceiling) remain unconsidered. To differentiate between the standard heat load \dot{Q}_N in W this value will be denoted as the standard heat load of an underfloor heated room, \dot{Q}_N^* in W.

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3.10

standard heat load per unit surface area

$$\dot{q}_N^*$$

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standard heat load \dot{Q}_N related to the area of the flooring surface A of the room to be heated, in W/m^2

$$\dot{q}_N^* = \frac{\dot{Q}_N}{A}$$

3.11

design heating capacity of a room with an underfloor direct heating system

$$\dot{Q}_H^*$$

design heating capacity of a room with underfloor direct heating \dot{Q}_H^* in W

3.12

design heating capacity per unit area of a room with an underfloor direct heating system \dot{q}_H^*

design heating capacity of a room with underfloor direct heating \dot{Q}_H^* in relation to its floor area A in m^2 , in W/m^2

$$\dot{q}_H^* = \frac{\dot{Q}_H^*}{A}$$

3.13**maximum capacity per unit area** P_F

largest possible capacity in W/m² which can be installed, taking into account the maximum surface temperature, the construction of the underfloor heating system and the energy supply charging time

3.14**capacity per unit area**

capacity P in W in relation to the floor area to be heated A_F

$$P_{IN} = \frac{P}{A_F}$$

3.15**mean heating capacity**

average heating capacity in W of the heating floor area for a given time, taking into account the floor upper surface temperature, the standard room temperature and the mean temperature on the inside surfaces of walls and ceilings

3.16**mean heat flow density** \dot{q}_F

heat flow per surface area in W/m² from the floor to the heated room

3.17**localised hot spots**

occur when the floor area is covered with a highly insulating material (such as cushions or mattresses) or by defective switching, regulation or control apparatus. This results in an undue thermal strain on the underfloor heating

3.18**effective heat storage capacity for underfloor storage heating**

partial amount of the heat storage capacity of a building (room) in W/m³K, having an influence on the heat load

3.19**storage mass of a heated room in relation to external surface**

$m/\sum A_a$ in kg/m² is the quotient of the storage mass of the room m in kg and the sum of the external surfaces of the room $\sum A_a$ in m²

3.20**permanent fixture area**

non-heating area of the floor surface which is designated for full-surface mounting or the installation of furnishings

Note 1 to entry: The floor areas in WC, shower or bathroom, on which bathroom fittings such as WC, shower or bathtub are to be installed, count as permanent fixture areas.

3.21**peripheral zone area** A_R

floor area with a maximum width of 1 m which heats at a higher temperature, generally in front of glazed external walls or external doors

Note 1 to entry: This is not deemed to be an area of permanent dwelling; in m².

3.22 dwelling area

A_v
area of permanent residing within the heating floor area

Note 1 to entry: It is the product of the heating floor area minus the border area, in m².

3.23 components of electric underfloor heating

- insulating layer (for heat- and soundproofing);
- damp proofing;
- heating element;
- heat and load distribution layer;
- floor covering

3.24 insulating layer

heat insulation below the flooring, which can also serve as sound proofing

3.25 damp proofing

layer of material that serves to prevent the insulating layer becoming damp from the water used to mix the flooring screed and also to prevent mortar pollution

Note 1 to entry: At the same time it prevents the heating cables from sinking into open joints in the insulation.

3.26 heating element

combination of a heating cable or laminar heating element and, if applicable, its cold tails which connect it to the terminals of the electrical installation

3.26.1 heating conductor

electrically conducting component of the heating cable in which electrical energy is directly converted into heat

3.26.2 heating cable

insulated heating conductor

3.26.3 laminar heating conductor

electrically conducting planar component of a laminar heating element allowing the direct conversion of electrical energy into heat

3.26.4 laminar heating element

insulated laminar heating conductor. Contact strips provide power supply

3.26.5 heating loop

heating element comprising a heating cable and its connected cold tails, whose geometric fixing takes place during the installation of the system

3.26.6**heating mat**

combination of one or more heating elements, geometrically fixed by the manufacturer using suitable equipment

3.26.7**cold tail**

insulated conductor providing the connection between the heating cable and the terminals of the electrical installation, at the same time preventing an undue warming of the terminals on the supply side

3.26.8**point of connection**

connection (e.g. coupling sleeve) between a heating cable or laminar heating element and its cold tail

3.27**load distribution layer in electric underfloor heating**

for example heating screed

3.28**storage layer**

comprises the heating screed, floor covering and all other construction elements above the heating layer which have heat conductivity values of $\lambda \geq 1,0 \text{ W/(m} \cdot \text{K)}$

3.29**floor covering**

upper layer of the underfloor heating able to be walked upon

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3.30**laying methods (see Figure 1)**

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3.30.1**bedding in heating screed**

the heating element is bedded directly in the freshly laid heating screed as shown in Figure 2 construction A

3.30.2**bedding below heating screed**

the heating element is bedded directly below, or only partially in the fresh heating screed as shown in Figure 3, construction B. The heating screed can have a separating layer