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**Električno ogrevanje prostorov, talno ogrevanje, značilne lastnosti - Definicije, metode preskušanja, dimenzioniranje in simboli formul**

Electric room heating, underfloor heating, characteristics of performance - Definitions, method of testing, sizing and formula symbols

Elektrische Raumheizung, Fußbodenheizung, Charakteristika der Gebrauchstauglichkeit - Definitionen, Testmethoden, Dimensionierung und Formelsymbole

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

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**Electric room heating, underfloor heating, characteristics of performance -  
Definitions, method of testing, sizing and formula symbols**

Chauffage électrique de locaux -  
Chauffage par le sol -  
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European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

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## Foreword

This document (EN 50559:2013) has been prepared by CLC/TC 59X "Performance of household and similar electrical appliances".

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2013-12-24
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2015-12-24

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## Introduction

*No draft of this present preliminary standard has been published.*

A preliminary standard is the result of standardisation work which, due to certain reservations about the contents or due to a compilation process deviating from a standard, has not yet been published by DIN.

The national working body UK 513.4 „Raumheizgeräte“ (Room Heating) of the DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE (<http://www.dke.de>) is responsible for this preliminary standard.

In cases of a dated reference in the normative text, the reference is always applied to the issue being referred to.

The correlation between the quoted standard and the relevant German Standard is given in so far as a correlation exists, fundamentally by means of the number of the relevant IEC-Publication.

Example: IEC 60068 has been taken over by CENELEC as EN 60068, and incorporated into the German Standards as DIN EN 60068.

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## 1 Scope

This European 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/m<sup>2</sup>.

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

This European Standard does not deal with:

- installation and safety requirements;
- DIN VDE 0100-723.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1264-1, *Water based surface embedded heating and cooling systems — Part 1: Definitions and symbols*

EN 1264-2, *Water based surface embedded heating and cooling systems — Part 2: Floor heating: Prove methods for the determination of the thermal output using calculation and test methods*

EN 1264-3, *Water based surface embedded heating and cooling systems — Part 3: Dimensioning*

EN 1264-4, *Water based surface embedded heating and cooling systems — Part 4: Installation*

EN 1264-5, *Water based surface embedded heating and cooling systems — Part 5: Heating and cooling surfaces embedded in floors, ceilings and walls — Determination of the thermal output*

EN 12831, *Heating systems in buildings — Method for calculation of the design heat load*

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

## 3 Terms and definitions

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

### 3.1

#### **electrical underfloor heating system**

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

#### 3.1.1

##### **underfloor heating**

in situ flooring constructed as a 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 is not considered when calculating the heat load of the room.

**3.1.4****controlled underfloor heating**

underfloor 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: 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, the switching, control and regulation appliances and the 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

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**3.6****design temperature  $\vartheta_N$** 

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 for 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,  $\vartheta_i$  in °C; 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**

$\dot{Q}_N^*$  the standard heat load of an underfloor heated room, 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 using EN 12831, 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  $\dot{q}_N^*$** 

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

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

**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 in accordance with EN 12831, which is also valid for controlled underfloor heating

**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<sup>2</sup>, in W/m<sup>2</sup>

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

**3.13****maximum capacity per unit area  $P_F$** 

largest possible capacity in  $\text{W/m}^2$  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  $\text{W}$  in relation to the floor area to be heated  $A_F$

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

**3.15****mean heating capacity**

average heating capacity in  $\text{W}$  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  $\text{W/m}^2$  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  $\text{W/m}^3\text{K}$ , having an influence on the heat load

Note 1 to entry: Evaluation, see EN 12831 and DIN V 4108-6:2003-06, 6.5.2.

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

$m/\Sigma A_a$  in  $\text{kg/m}^2$  is the Quotient of the storage mass of the room  $m$  in  $\text{kg}$  and the sum of the external surfaces of the room  $\Sigma A_a$  in  $\text{m}^2$

**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  $\text{m}^2$ .

**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 m<sup>2</sup>.

### 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 serving 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

Note 1 to entry: See EN 1264-1.

**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**

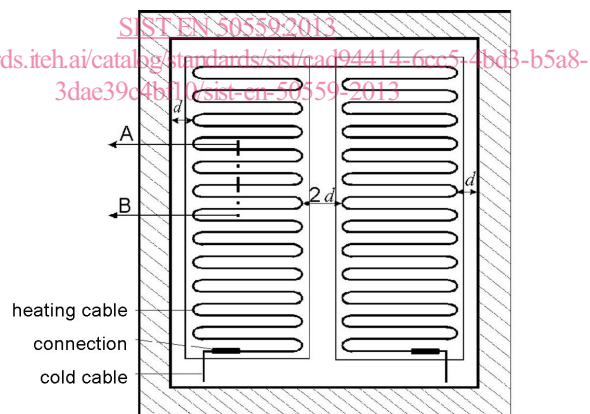
upper layer of the underfloor heating able to be walked upon

**3.30 Laying methods****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" (corresponding to Type A in EN 1264)

**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 (corresponding to Type C in EN 1264)

**Key**

$d$  = depth of heating screed

**Figure 1 — Layout diagram of an underfloor heating system**