
**Prosto viseče grelne in hladilne površine za vodo s temperaturo do 120 °C - 5. del:
Odprte ali zaprte stropne grelne površine - Metoda preskušanja toplotne moči**

Free hanging heating and cooling surfaces for water with a temperature below 120°C -
Part 5: Open or closed heated ceiling surfaces - Test method for thermal output

An der Decke frei abgehängte Heiz- und Kühlflächen für Wasser mit einer Temperatur
unter 120 °C - Teil 5: Prüfverfahren für die Wärmeleistung von offenen oder
geschlossenen Deckenheizflächen

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Panneaux rayonnants de chauffage et de rafraîchissement alimentés avec une eau à
une température inférieure à 120 °C - Partie 5 : Méthode d'essai pour la détermination
de la puissance thermique des surfaces de plafond de chauffage ouverts ou fermés

Ta slovenski standard je istoveten z: EN 14037-5:2016

ICS:

91.140.10	Sistemi centralnega ogrevanja	Central heating systems
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EUROPEAN STANDARD

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NORME EUROPÉENNE

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English Version

Free hanging heating and cooling surfaces for water with a temperature below 120°C - Part 5: Open or closed heated ceiling surfaces - Test method for thermal output

Panneaux rayonnants de chauffage et de rafraîchissement alimentés avec une eau à une température inférieure à 120 °C - Partie 5 : Méthode d'essai pour la détermination de la puissance thermique des surfaces de plafond de chauffage ouverts ou fermés

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This European Standard was approved by CEN on 18 March 2016.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (EN 14037-5:2016) has been prepared by Technical Committee CEN/TC 130 “Space heating appliances without integral heat sources”, the secretariat of which is held by UNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2017, and conflicting national standards shall be withdrawn at the latest by March 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

The European Standard EN 14037, *Free hanging heating and cooling surfaces for water with a temperature below 120°C*, consists of the following parts:

- *Part 1: Pre-fabricated ceiling mounted radiant panels for space heating - Technical specifications and requirements*
- *Part 2: Pre-fabricated ceiling mounted radiant panels for space heating - Test method for thermal output*
- *Part 3: Pre-fabricated ceiling mounted radiant panels for space heating - Rating method and evaluation of radiant thermal output*
- *Part 4: Pre-fabricated ceiling mounted radiant panels for space heating - Test method for cooling capacity*
- *Part 5: Open or closed heated ceiling surfaces - Test method for thermal output*

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This European Standard results from the recognition, that heated and chilled ceiling radiant panels falling into the field of application hereinafter stated are traded on the basis of their thermal output. For evaluating and comparing different heated and chilled ceiling surfaces it is therefore necessary to refer to a heating stipulated value.

As installations with ceiling mounted radiant panels can also be used in practice for space cooling, it is necessary to have a test method for evaluating the cooling capacity. Installations with different free hanging heating and cooling surfaces need, for the use of space heating a test method for evaluating the heating output. The test method differs from the method for ceiling mounted radiant panels.

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1 Scope

This European Standard describes the test method and the test installation for determining the thermal output of ceiling mounted heating surfaces according to the specifications 3.1, 3.2. and 3.3.

This part applies to determine thermal output when chilled ceilings according to EN 14240 are also used for heating.

NOTE Test results according to this part cannot be compared with results according EN 14037-2 because great discrepancies are given at open ceilings, convective components and heating surfaces without upper insulation.

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 14037-1:2016, *Pre-fabricated ceiling mounted radiant panels for space heating - Technical specifications and requirements*

EN 14037-2:2016, *Pre-fabricated ceiling mounted radiant panels for space heating - Test method for thermal output*

EN ISO/IEC 17025:2005, *General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025:2005)*

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3 Terms and definitions

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For the purposes of this document, the terms and definitions given in EN 14037-1:2016 and the following apply.

3.1

open or closed ceiling surface

open or closed active and non-active elements of chilled ceilings, which are additionally used for heating, which are part of suspended ceilings and generally constructed modular from industrially prefabricated elements

3.2

free hanging sail

surface composed of one or more elements of a cooling installation which is additionally used for heating

Note 1 to entry: Depending on the use of the sails they can be covered with thermal insulation or noise absorption material.

3.3

suspended ceiling with integrated heating elements

single closed elements which are used for heating and are thermally insulated on the upper side, integrated in closed hanging ceilings and combined with non-active elements

3.4

mean radiant temperature

temperature in a defined point of the room resulting from the radiation of all surrounding surfaces and of the heated ceiling surface

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3.5

standard temperature difference of heated ceiling surfaces

mean water temperature 35°C and reference room temperature 20°C, determined temperature difference 15 K

3.6

active heated ceiling surface

relating to thermal output of heated ceiling surfaces

3.7

module

1 m² active surface of a heated ceiling surface

4 Symbols and units

For the purposes of this document, the symbols and units given in EN 14037-1:2016 and the following apply.

Table 1 — Symbols and units

No.	Quantity	Symbol	Unit
1	Installation surface	A_i	m ²
2	Active surface	A_a	m ²
3	Total active surface	A_{actot}	m ²
4	Constant of the characteristic equation of the active surface	K_{act}	W/K ^{n_{act}}
5	Constant of the characteristic equation of the module	K_{actM}	W/(m ² K ^{n_{act}})
6	Constant of the characteristic equation of the installation surface	K_{tot}	W/K ^{n_{tot}}
7	Exponent of the characteristic equation of the active surface	n_{act}	-
8	Exponent of the characteristic equation of the installation surface	n_{tot}	-
9	Active area ratio	R_a	-
10	Modular thermal output	Φ_L	W/m ²
11	Standard modular thermal output ^a	Φ_{Ls}	W/m ²
12	Standard temperature difference of a heated cooling surface when heating (15 K) ^a	ΔT_s	K

a "s" indicates that the value is in standard conditions.

5 Testing of thermal output

The test is carried out in a testing system, which consists of a closed booth with controlled temperatures of the inside surfaces plus a set of two master panels built according to EN 14037-2:2016, Clause 6.

Differing from the definitions of the test booth according to EN 14037-2:2016, the ceiling and the upper part of the vertical walls of the test booth shall be insulated until 0,5 m ($\pm 0,02$ m) below the ceiling with a specific thermal resistance of $> 2,5$ (m K)/W.

The method for measuring the thermal output consists of the measurement of mass flow and enthalpy difference between inlet and outlet (by weighing method). Other measurement methods shall guarantee in minimum the precision obtained by weighing method. The natural convection within the test booth shall not be affected by additional means.

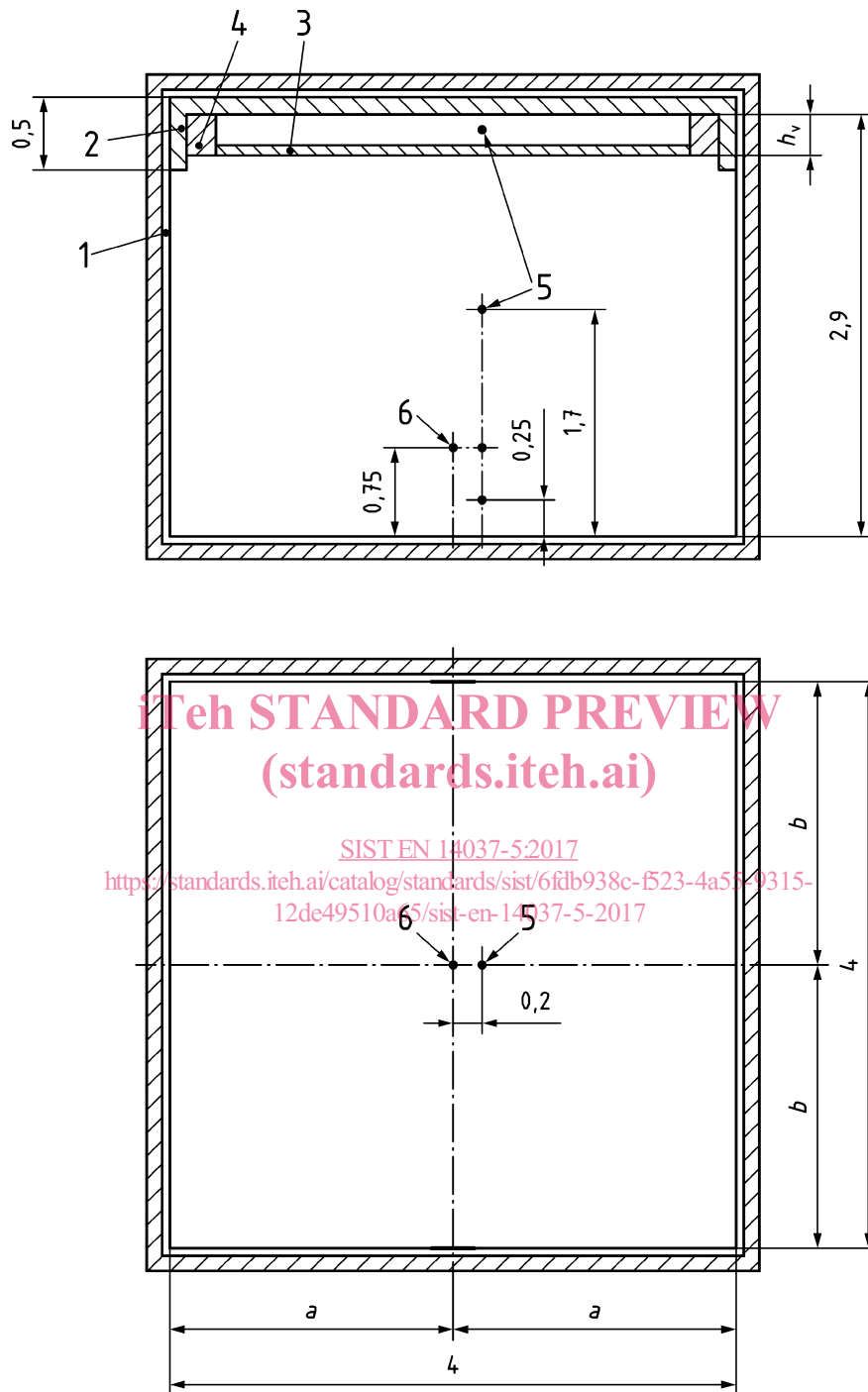
All laboratories that make tests according to this standard have to make comparable measurements with the other laboratories (according to EN 14037-2:2016, Clause 6).

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Dimension in meter

**Key**

- 1 test booth
- 2 insulation
- 3 test specimen
- 4 edge insulation plate
- 5 measuring point of air temperature
- 6 measuring point of Globe temperature
- h_v distance from the lower surface to the test item to the insulated ceiling of the test booth

Figure 1 — Example of a test booth with arrangement of a closed heated ceiling and the temperature measuring points

6 Test methods

The test method shall be carried out according to EN 14037-2:2016, Clause 7.

7 Carrying out the measurement

7.1 General

The natural convection inside the test booth shall not be influenced by additional means.

7.2 Test design

The test sample shall be installed in the test booth according to the instructions of the manufacturer. The arrangement of the sample shall be symmetrical if possible otherwise as much regular as possible. In case of closed ceilings (see 3.1 and 3.3) filling parts have to be installed when the projected surface is smaller than the test booth. The filling parts shall be thermally insulated according to Clause 5.

The total standard heat output of the installed sample shall be minimum 400 W and the active surface shall cover at least 15 % of the total ceiling of the test booth (approx. 2,2 m²).

The active area ratio shall be calculated with:

$$R_a = \frac{A_a}{A_i} \quad (1)$$

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where

R_a the active area ratio;

A_a the active surface, it consists of the sum of the connected surface elements, that are projected on the floor and connected to the heating system, overlapping surfaces will be single evaluated.

A_i the installation surface.

At closed ceiling surfaces the active area ratio shall be declared together with the standard output value.

The distance from the lower surface of the test item to the insulated ceiling of the test booth h_v (void behind the item including the height of the test item) shall not exceed 300 mm.

7.3 Connection of the test sample to the measuring circuit

After installation and connection to the measuring circuit, the test sample and the water circuit shall be carefully vented. During the test, the measuring circuit shall be free of air inclusions.

The procedure of venting is to be described in the working instructions of the test laboratory.

If the connecting pipes are not an element of the standard installation, but are intended for the test, they shall be provided with a maximum thermal conductivity of 4 W/(m² · K).

7.4 Mass flow

The water flow rate shall be regulated so that the result of the difference between inlet and outlet temperature shall be 4 K ± 0,2 K at a temperature difference of 20 K ± 2 K. During the test for measuring the three points of the characteristic equation, the mass flow rate shall be constant at each measuring point and shall not differ more than 5 % from one point to another.