
Stropne sevalne plošče za ogrevanje in hlajenje površin za vodo s temperaturo pod 120°C - 5. del: Preskusna metoda toplotne moči odprtih ali zaprtih ogrevalnih stropnih površin

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

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

Panneaux rayonnants de plafond alimentés en eau à une température inférieure à 120°C - Partie 5: Méthode d'essai pour la détermination de la puissance thermique des surfaces de chauffe

Ta slovenski standard je istoveten z: prEN 14037-5

ICS:

91.140.10	Sistemi centralnega ogrevanja	Central heating systems
91.140.65	Oprema za ogrevanje vode	Water heating equipment

oSIST prEN 14037-5:2012**en,fr,de**

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[kSIST FprEN 14037-5:2013](#)

<https://standards.iteh.ai/catalog/standards/sist/ca2a552f-8e5e-478b-a7c6-ee6fe36ecfb7/ksist-fpren-14037-5-2013>

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 14037-5

November 2011

ICS 91.140.10

English Version

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

Panneaux rayonnants de plafond alimentés en eau à une température inférieure à 120 °C - Partie 5: Méthode d'essai pour la détermination de la puissance thermique des surfaces de chauffe

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

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 130.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

This draft European Standard was established by CEN 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.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Foreword.....	3
Introduction	4
1 Scope	4
2 Normative references	4
3 Terms and definitions	5
4 Testing of thermal output	5
5 Test methods.....	7
6 Carrying out the measurement.....	7
6.1 General.....	7
6.2 Test design	7
6.3 Connection of the test sample to the measuring circuit	7
6.4 Mass flow	7
6.5 Test temperature.....	8
6.6 Reference room temperature.....	8
6.7 Steady state conditions	8
6.8 Heat output.....	8
6.9 Result of measurement – characteristic equation.....	8
6.10 Standard output	9
6.11 Interpolation of values of the thermal output	9
7 Upper insulation.....	9
8 Test report	9
8.1 General.....	9
8.2 Data	9
9 Examples for the determination of the active length of different ceiling mounted heating surfaces	11
Annex A (informative) Specimen of the test report for heating capacity	16
Bibliography	18

ITech STANDARD PREVIEW
(standards.itech.ai)

<https://standards.itech.ai/catalog/standards/sist/ca2a552f-8e5e-478b-a7c6-ee6fe36ecfb7/ksist-fpren-14037-5-2013>

Foreword

This document (prEN 14037-5:2011) 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 document is currently submitted to the CEN Enquiry.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[kSIST FprEN 14037-5:2013](https://standards.iteh.ai/catalog/standards/sist/ca2a552f-8e5e-478b-a7c6-ee6fe36ecfb7/ksist-fpren-14037-5-2013)

<https://standards.iteh.ai/catalog/standards/sist/ca2a552f-8e5e-478b-a7c6-ee6fe36ecfb7/ksist-fpren-14037-5-2013>

Introduction

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

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: Technical specifications and requirements
- Part 2: Test method for thermal output of ceiling mounted radiant panels
- Part 3: Rating method and evaluation of radiant thermal output of ceiling mounted radiant panels
- Part 4: Test method for cooling capacity of ceiling mounted radiant panels
- Part 5: Test method for thermal output of open or closed heated ceiling surfaces

iTeh STANDARD PREVIEW (standards.iteh.ai)

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 of prEN 14037-1, clause 3.3.2, 3.3.3 and 3.3.4.

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 can not be compared with results according prEN 14037-2 because great discrepancies are given at open ceilings, convective components and heating surfaces without upper insulation.

2 Normative references

The following referenced documents are indispensable for the application 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.

prEN 14037-1, *Free hanging heating and cooling surfaces for water with a temperature below 120°C - Part 1: Technical specifications and requirements*

prEN 14037-2, *Free hanging heating and cooling surfaces for water with a temperature below 120°C - Part 2: Test method for thermal output of ceiling mounted radiant panels*

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

EN 14240, *Ventilation for buildings – Chilled ceilings – Testing and rating*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in prEN 14037-1 apply.

4 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 prEN 14037-2, Clause 6.

Differing from the definitions of the test booth according to prEN 14037-2, 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 thermal resistance of $\geq 2,5$ ($\text{m}^2\text{K}/\text{W}$).

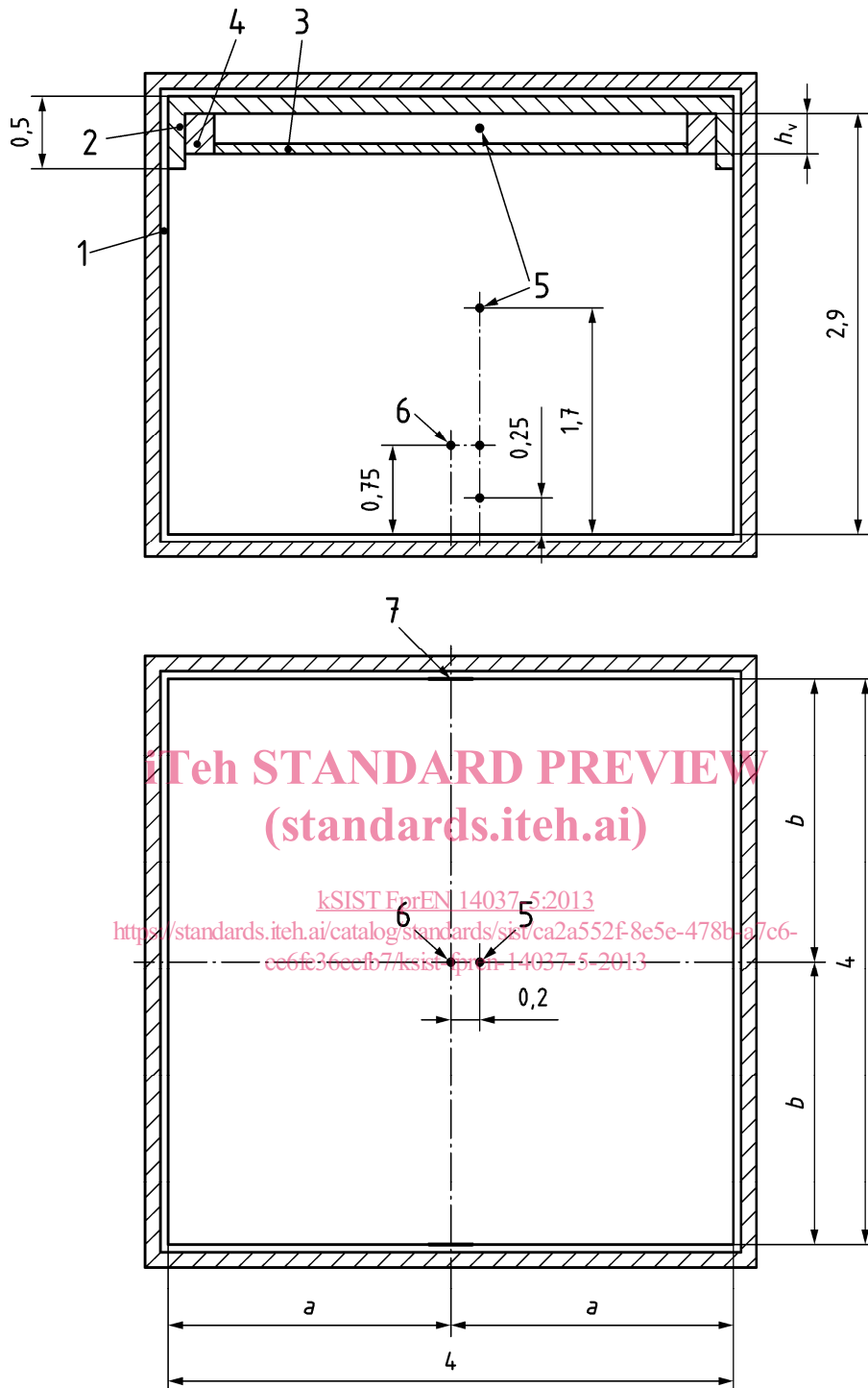
The method for measuring the thermal output consists of the measurement of mass flow and enthalpy difference between inlet and outlet (by weighing method). Other measurement methods shall guarantee in minimum the precision obtained by weighing method. The natural convection within the test booth must 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 prEN 14037-2, Clause 6).

iTeh STANDARD PREVIEW (standards.iteh.ai)

[ksIST FprEN 14037-5:2013](https://standards.iteh.ai/catalog/standards/sist/ca2a552f-8e5e-478b-a7c6-ee6fe36ecfb7/ksist-fpren-14037-5-2013)

<https://standards.iteh.ai/catalog/standards/sist/ca2a552f-8e5e-478b-a7c6-ee6fe36ecfb7/ksist-fpren-14037-5-2013>

**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
- 7 Measuring point of the wall temperature

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

5 Test methods

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

6 Carrying out the measurement

6.1 General

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

6.2 Test design

The test sample shall be installed in the test cabin 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 prEN 14037-1, 3.3.2 and 3.3.4) filling panels have to be installed when the projected surface is smaller than the test booth. The filling parts shall be thermally insulated according to clause 4.

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:

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

Where is

- R_a the active area ratio, <https://standards.iteh.ai/catalog/standards/sist/ca2a552f-8e5e-478b-a7c6-ee6fe36ecfb7/ksist-fpren-14037-5-2013>
- 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.

6.3 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 water-attracting 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.

6.4 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 ± 0,2K at a temperature difference of 20K ± 2K. 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.

prEN 14037-5:2011 (E)

6.5 Test temperature

To determine the characteristic equation measurements are carried out at three different mean temperatures of the ceiling heating surface. These mean temperatures shall be calculated from the respective inlet and outlet temperatures. They shall be within the following ranges:

28°C to 32°C.

38°C to 42°C;

48°C to 52°C;

6.6 Reference room temperature

A reference room temperature of 20 (± 0,5)°C in the steady state conditions has to be held for 30 min during the measurement

6.7 Steady state conditions

Steady state conditions shall be maintained throughout the duration of the test, as far as both, the primary fluid circuit and the ambient conditions in the test installation are concerned. Parameters are to be monitored at regular intervals. Steady state conditions are deemed to exist when the standard deviations of all readings (not less than twelve sets) amount to less than half of the ranges specified below:

water and air temperature ±0,1 K

water flow rate

1,0 %

[kSIST FprEN 14037-5:2013](https://standards.iteh.ai/catalog/standards/sist/ca2a552f-8e5e-478b-a7c6-ee6fe36ecfb7/ksist-fpren-14037-5-2013)

<https://standards.iteh.ai/catalog/standards/sist/ca2a552f-8e5e-478b-a7c6-ee6fe36ecfb7/ksist-fpren-14037-5-2013>

6.8 Heat output

The measured heat output is calculated by:

$$\Phi_{me} = q_m (h_2 - h_1) \quad (2)$$

To take in account air pressures deviating from $p_s = 101,325$ kPa, the measured output Φ_{me} shall be corrected as follows:

$$\Phi = \Phi_{me} \left(0,65 + 0,35 \left(\frac{p_s}{p} \right)^{0,4} \right) \quad (3)$$

6.9 Result of measurement – characteristic equation

Having been corrected according to 6.7 the values of the thermal output are plotted over the measured values of excess temperature and the characteristic equation as well as its mathematical function is determined. The equation for the characteristic of a model reads follows:

$$\text{Characteristic equation of the test sample} \quad \Phi_{tot} = K_{tot} \cdot \Delta T^{n_{tot}} \quad (4)$$

$$\text{Characteristic equation of the active surface} \quad \Phi_L = K_{act} \cdot \Delta T^{n_{act}} \quad (5)$$

The constant K and the exponent n are determined by regression according to prEN 14037-2, Annex C. The standard output is calculated from the function of the characteristic equation.

6.10 Standard output

The standard output is the thermal output related to the active surface with an temperature difference of 15 K. The standard output is calculated from the function of the characteristic equation.

6.11 Interpolation of values of the thermal output

An interpolation of the values of standard thermal output according to a characteristic geometrical size can be carried out. The interpolation of the thermal output and exponent is allowed, if the ratio of characteristic geometrical size does not exceed 2. Interpolation shall be linear. An extrapolation is not allowed.

For example a characteristic geometrical size could be the surface coverage or a distance.

7 Upper insulation

To keep the high energy efficiency for radiant heating surfaces it is recommended to insulate these surfaces at the upper side and to design the elements for low convection. It should be considered that surfaces with reduced or without upper insulation which are mainly used for cooling will result in a much lower efficiency in the heating.

8 Test report

8.1 General

The laboratory shall prepare a test report based on the procedures and calculation contained in this European Standard. The test report shall be in accordance with EN ISO/IEC 17025.

The laboratory is only allowed to prepare a test report with reference to this standard, if the test sample fulfils the construction requirements of prEN 14037, 3.3.2.

8.2 Data

Following data shall be at least stated in the test report:

- Name and address of the test institute
- Location of test (if different from the test institute)
- Name and address of the customer
- Identification of test method used
- Description of the test booth
- Identification of the test samples including, trade mark, model number, dimensions
- Dates of testing
- The active area ratio
- Information about upper insulation