
Stropne sevalne plošče za ogrevanje in hlajenje površin za vodo s temperaturo pod 120°C - 4. del: Preskusne metode zmogljivosti hlajenja sevalnih stropnih plošč

Free hanging heating and cooling surfaces for water with a temperature below 120°C - Part 4: Test method for cooling capacity of ceiling mounted radiant panels

An der Decke frei abgehängte Heiz- und für Wasser mit einer Temperatur unter 120°C - Teil 4: Prüfverfahren für die Kühlleistung von Deckenstrahlplatten

Panneaux rayonnants de plafond alimentés en eau à une température inférieure à 120°C - Partie 4: Méthode d'essai de la capacité de refroidissement des panneaux rayonnants de plafond

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Free hanging heating and cooling surfaces for water with a temperature below 120 °C - Part 4: Test method for cooling capacity of ceiling mounted radiant panels

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An der Decke frei abgehängte Heiz- und Kühlflächen für Wasser mit einer Temperatur unter 120 °C - Teil 4: Prüfverfahren für die Kühlleistung von Deckenstrahlplatten

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

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

This document (prEN 14037-4:2011) 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.

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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

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1 Scope

This European Standard defines the technical specifications and requirements for the definition of the cooling capacity of ceiling mounted radiant panels according to the specifications of prEN 14037-1, clause 3.3.1. The test according to this standard requires the measurement of the thermal output according to prEN 14037-2 of the model.

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)*

3 Terms and definitions

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

4 Testing of cooling capacity

4.1 Short description

The cooling capacity of the test sample has to be determined in its steady condition with measurements of the water flow and the temperature increase in the water. The cooling capacity shall be quoted as function of the temperature difference between the reference temperature and the average water temperature.

The test is carried out in a testing system according to prEN 14037-2, which consists of a closed booth with controlled temperatures of the inside surfaces plus master panel 1 (according to prEN 14037-2, Clause 6). All laboratories performing tests according to this standard shall participate in inter-laboratory comparison exercises (according to prEN 14037-2, Clause 6).

For covering the cooling capacity, the test booth will be heated with a number of electrical heated cooling load simulators which are positioned on the floor of the test booth. To get reproducible results, the simulators have to be arranged according to 4.2.

4.2 Test booth

The test is carried out in a test booth according to prEN 14037-2, Clause 5.

Differing from these definitions the surfaces, floor and ceiling of the test booth shall be insulated in the way that the average heat flow in those surfaces is lower than 0,40 W/m² during the test. This heat flow shall be determined by preliminary calibration tests of the booth or by calculations.

Differing to prEN 14037-2, 5.4 the reference temperature during the measurement shall be 32 °C ± 0,5K in the steady condition for minimum 30 minutes.

The temperature(s) of inner surfaces of walls, floor and ceiling of the test booth (under the insulation) shall be controlled and be kept on a value, which is necessary to guarantee a max. temperature difference between these surfaces and the reference temperature of less than 1,0 K.

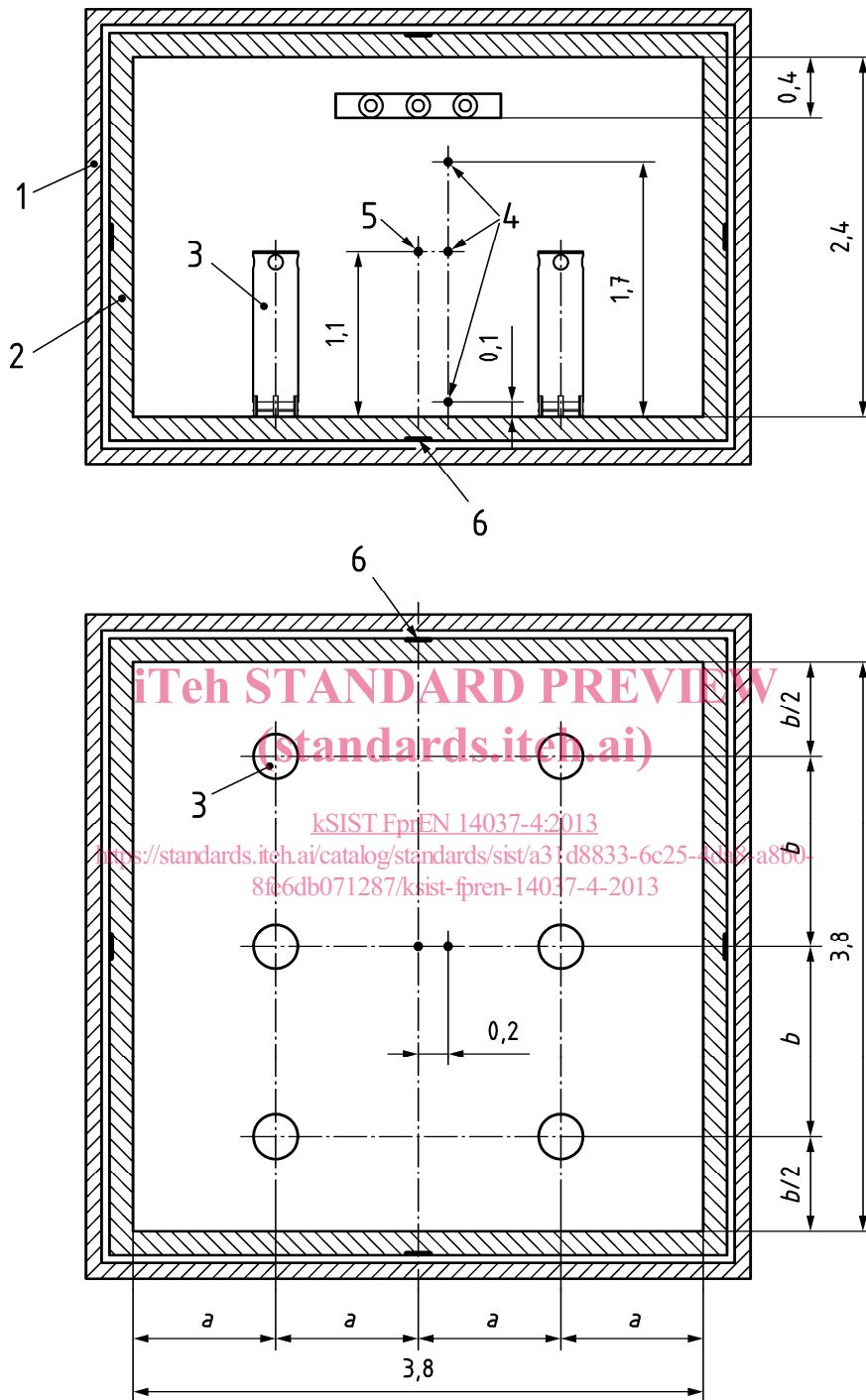
The radiant emissivity of the surface of the insulation has to be at least 0,9.

The test booth will be heated with 6 electrical heated cooling load simulators (see figures 1 and 2), which are positioned on the floor of the test booth.

The output of each simulator must not exceed 180 W and shall be continuously adjustable, e.g. with an adjustable transformer or a thyristor. Each simulator shall have an identical heat output and the same number of bulbs.

The housing of the simulators consists of painted steel sheet. The emissivity of the inside and outside surface shall be at least 0,9. The active power of the simulators shall be measured with a measuring instrument of the accuracy class 1,0 % or better.

Dimensions in Meter

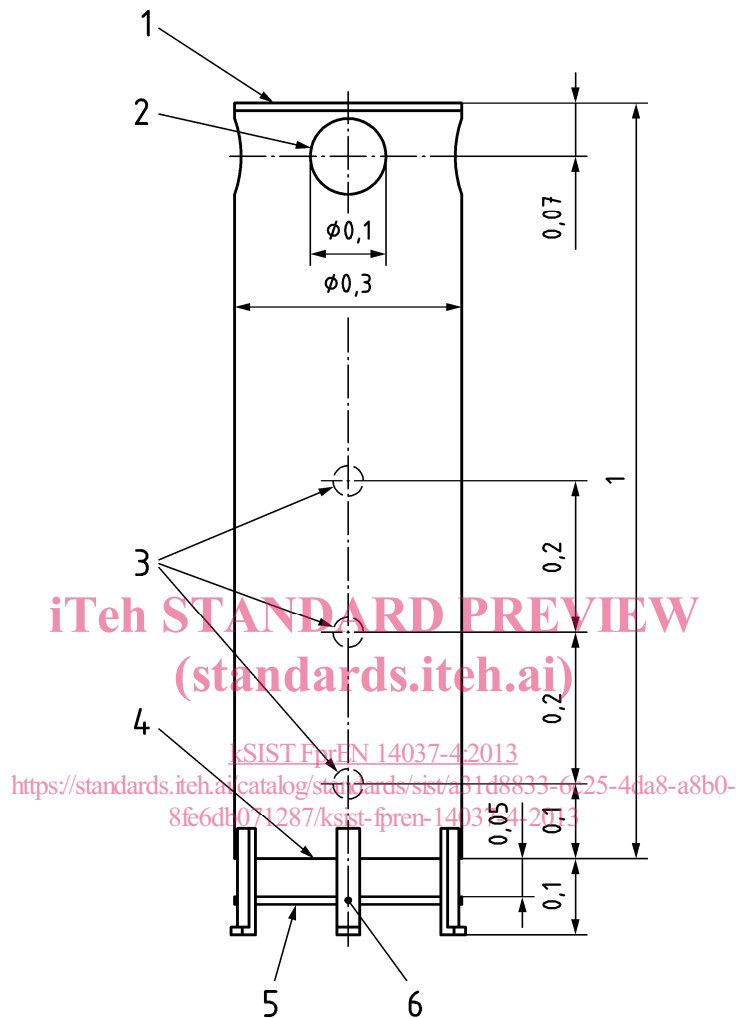


Key

- 1 Test booth
- 2 Insulation
- 3 Cooling load simulator
- 4 Measuring point of air temperature
- 5 Measuring point of globe temperature
- 6 Measuring point of temperature under insulation

Figure 1 — Test booth with an installed radiant ceiling panel, the cooling load simulators and the measuring points for the temperatures

Dimensions in Meter

**Key**

- 1 Cover
- 2 4 holes, evenly distributed during the scale
- 3 bulb with 60 W performance
- 4 no bottom
- 5 bottom
- 6 bases, distributed during the scale

Figure 2 — Cooling load simulators (Dummy)**4.3 Test methods**

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

Instead of a heating unit a cooling unit will be installed in the measuring circuit.

The aim of the test is to establish the standard cooling capacity of a ceiling mounted radiant panel by determining the related values of cooling capacity and temperature difference. Neither of these quantities can be measured directly, but shall be calculated using the values of other measureable quantities, either directly or with additional information (calibration test, material properties table), by using mathematical relationships.

prEN 14037-4:2011 (E)

The maximum uncertainty in measuring the cooling capacity shall not exceed ± 25 W.

5 Carrying out the measurement**5.1 General**

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

5.2 Dimension and construction of the test samples

Dimension, construction and hydraulic of the test samples relate to the data in prEN 14037-2, 8.1. The minimum active surface of tested panel shall be in total 2,7 m². In case that one panel has less than 2,7 m² active surface, two or three equal panels shall be tested together. If one or two panels exceed 2,7 m², no additional panel shall be tested. If more than one panel is tested, they shall be hydraulically connected in series.

5.3 Selection of the models to be tested for determining the cooling capacity of a type

For determining the cooling capacity of a type, the models with the minimum and maximum width are to be tested. The calculation of the cooling capacity of types in between is calculated by a linear interpolation.

5.4 Manufacturer documents for the test samples

The requirements on the manufacturer documents for the test samples relate to the data in prEN 14037-2, 8.3.

5.5 Arrangement of the sample in the test booth

The requirements on the arrangement of the sample in the test booth relate to the data in prEN 14037-2, 8.4. In case of two or three panels, distances between the panels shall be equal to the width of the panels. They shall be installed symmetrically to the centre axis of the test booth and parallel to the rows of the dummies.

In case of more panels installed, the connection pipe work shall be insulated as described in prEN 14037-2, 8.4.

5.6 Upper insulation of the test sample

The requirements on the upper insulation of the test sample relate to the data in prEN 14037-2, 8.5.

5.7 Connection of the test sample to the measuring circuit

The requirements on the connection of the test sample to the measuring circuit relate to the data in prEN 14037-2, 8.6.

5.8 Tests

The measuring of the standard cooling capacity is carried out with insulated connection components (according to test 1 in prEN 14037-2, 8.7). It is calculated by:

$$\Phi_{me} = q_m (h_2 - h_1) \quad (1)$$

5.9 Mass flow

The water flow shall be regulated as in the thermal output test in prEN 14037-2 that a Reynolds value $Re = 4\,500 \pm 500$ results in the tubes of the ceiling mounted radiant panel at a water temperature of 50°C.

5.10 Test temperature

The measuring shall be carried out at a reference temperature of 32°C and a temperature difference of 15 K \pm 0,5 K.