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Bauaufsichtlich anerkannte Stelle für
Prüfung, Überwachung und Zertifizierung

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Test Report P5-121e/2014

Determination of Core Thermal Resistance of the Reflective Insulation »Aluthermo Optima« According EN 16012 -Hot box method-

Client:
Aluthermo SA
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Stuttgart, June 10, 2014

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1 Introduction

The Fraunhofer Institute for Building Physics (IBP) was ordered by the company Aluthermo SA, to determine the thermal resistance of the reflective insulation "Aluthermo Optima" according to DIN EN 16012:2012-04 with the hot box meeting the requirements of the EN ISO 8990.

2 Sampling

Three rolls of "Aluthermo Optima" with a thickness of about 42 mm were delivered to the Fraunhofer IBP at the 12th December 2013. The rolls were delivered without labels.

3 Description of Test Specimen

The investigated test sample was assembled according DIN EN 16012, figure 5, by the Fraunhofer IBP with the "Aluthermo Optima" insulation and installed in the hot box:

19 mm MDF-board,
30 mm Air cavity "Cold Side" (CS),
40 mm "Aluthermo Optima",
30 mm Air cavity "Warm Side" (WS),
19 mm MDF-board.

Area related mass:	1,10 kg/m²
Mean thickness (DIN EN 823):	40 mm

Figure 1 shows the hot-box measurement according DIN EN 16012 with the reflective insulation together with the two air cavities.

4 Measurements

The reflective insulation was tested according DIN EN 16012:2012-04 in a hot-box apparatus that conforms to the requirement of EN ISO 8990. To perform the measurements the test specimen was vertically installed in the opening of the partition wall between a cooled and a heated room. The temperature in the heated room remained constant at approx. 21°C and in the cooled room at approx. 10°C. A hot box was installed on the internal side of the test specimen, which was kept at the same temperature as the heated room by means of electrical heating. The thermal energy applied to the hot box flows through the installed test specimen during testing.

5 Measurement Results

In addition to the following results, table 1 contains a survey of the test results as well as further characteristics and calculation values of the measurement:

Core thermal resistance, $R_{\text{"Aluthermo Optima"}} = 1{,}07\ m^2K/W$
Thermal resistance $R_{\text{air cavity CS}} = 0{,}65\ m^2K/W$
Thermal resistance $R_{\text{air cavity WS}} = 0{,}65\ m^2K/W$

Thermal resistance "Alutherma Optima" with the two air cavities =
$R_{\text{"Aluthermo Optima"}} + R_{\text{aircavity CS}} + R_{\text{air cavity WS}} = 2{,}37\ m^2K/W$

Note: The results exclusively refer to the tested object.

The test laboratory is recognized by the Deutsches Institut für Bautechnik (DIBt) as a testing facility under applicable building regulations LBO/BRL No. BWU-10 and as a Notified Body No. 1004 to the terms of the Regulation of Construction Products (EU-BauPVO). It has been granted flexible accreditation under DIN EN ISO/IEC 17025 by the Deutsche Akkreditierungsstelle GmbH (DAkkS) under accreditation No. D-PL-11140-11-04.

This test report comprises 3 pages of text, 1 table and 3 figures.

Stuttgart, June 10, 2014/JHA

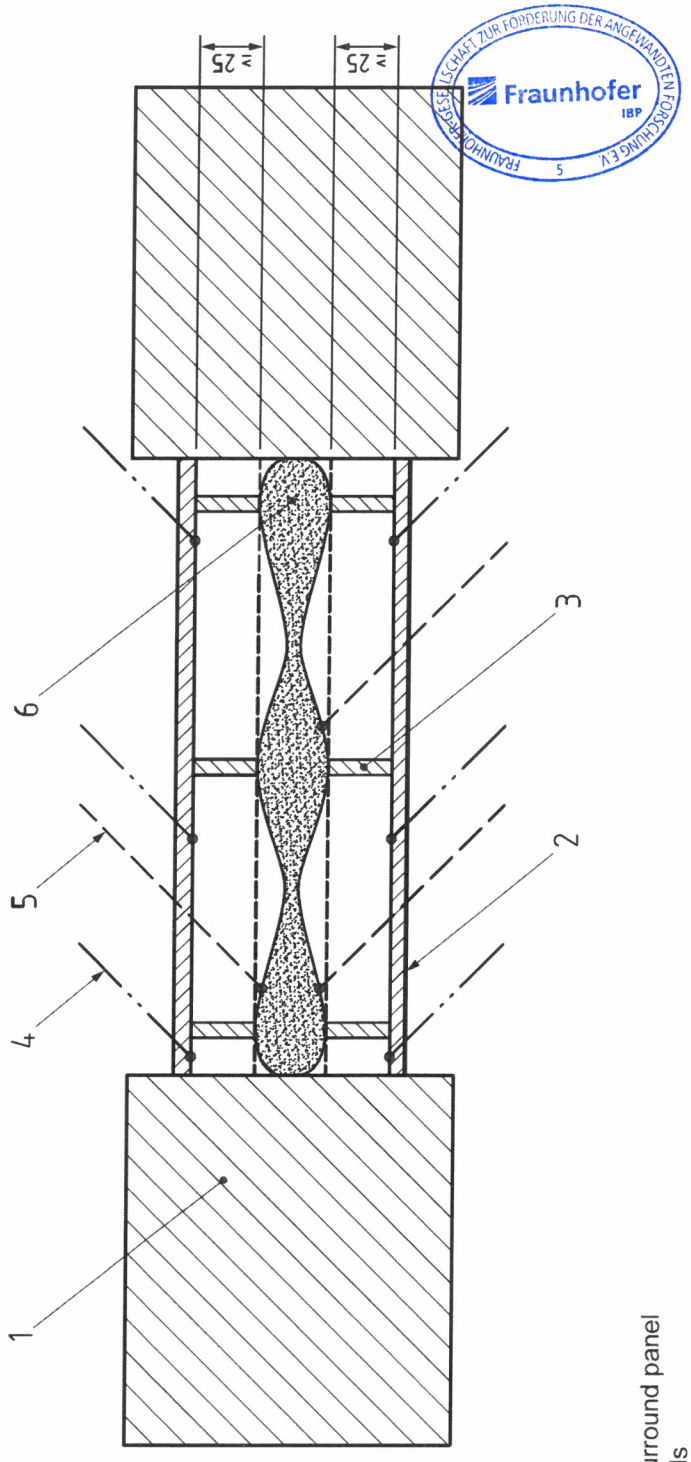
Dipl.-Ing. (FH) Andreas Zegowitz

Dipl.-Ing. (FH) Rainer Schübler

Table 1: Mean air temperatures, mean heat flow density, thermal resistance and properties of the reflective insulation "Aluthermo Optima" with adjacent air cavities.

Description	Unit	Measurement/ Calculation Values
Air temperature difference, $\Delta\theta_c$	K	11.6
Performance Hot-Box, Φ_{in}	W	8.81
Heat flow density of test specimen, q_{sp}	W/m²	4.1
External air velocity, v_e	m/s	ca. 1.6
Total heat transmission resistance, $R_{s,t}$	m²K/W	0.18
Ambient temperature hot, θ_{ni}	°C	20.6
Ambient temperature warm, θ_{ne}	°C	9.1
Ambient temperature difference, $\Delta\theta_n$	K	11.5
Temperature difference across the air cavities	K	9.1
Mean test temperature	°C	14.6
Emissivity of both surfaces of the reflective insulation, ε_m	-	0.05
Thermal resistance of the MDF-boards	m²K/W	0.12
Thermal resistance of the vertical air cavity (30 mm) Cold Side (CS), $R_{\text{air cavity CS}}$	m²K/W	0.65
Thermal resistance of the vertical air cavity (30 mm) Warm Side (WS), $R_{\text{air cavity WS}}$	m²K/W	0.65
Core-Thermal resistance "Aluthermo Optima" (approx. 40 mm), $R_{\text{"Aluthermo Optima"}}$	m²K/W	1.07
Core Thermal resistance "Aluthermo Optima" + air cavites = $R_{\text{"Aluthermo Optima" + Air cavity CS + Air cavity WS}}$	m²K/W	2.37
Uncertainty of measurement, ΔU_f	m²K/W	± 0.14

test period: calendar week 21, 2014.



Key

1 hot box surround panel
2 cavity walls
3 small expanded polystyrene pillars
4 thermocouples measuring the INSIDE surface temperature of the cavity walls
5 thermocouples measuring the surface temperature of the specimen
6 test specimen

Figure 5 — Typical test element used to measure the thermal resistance of an insulated air cavity

Figure 1: Assembly of test specimen with a reflective insulation according to DIN EN 16012-04.

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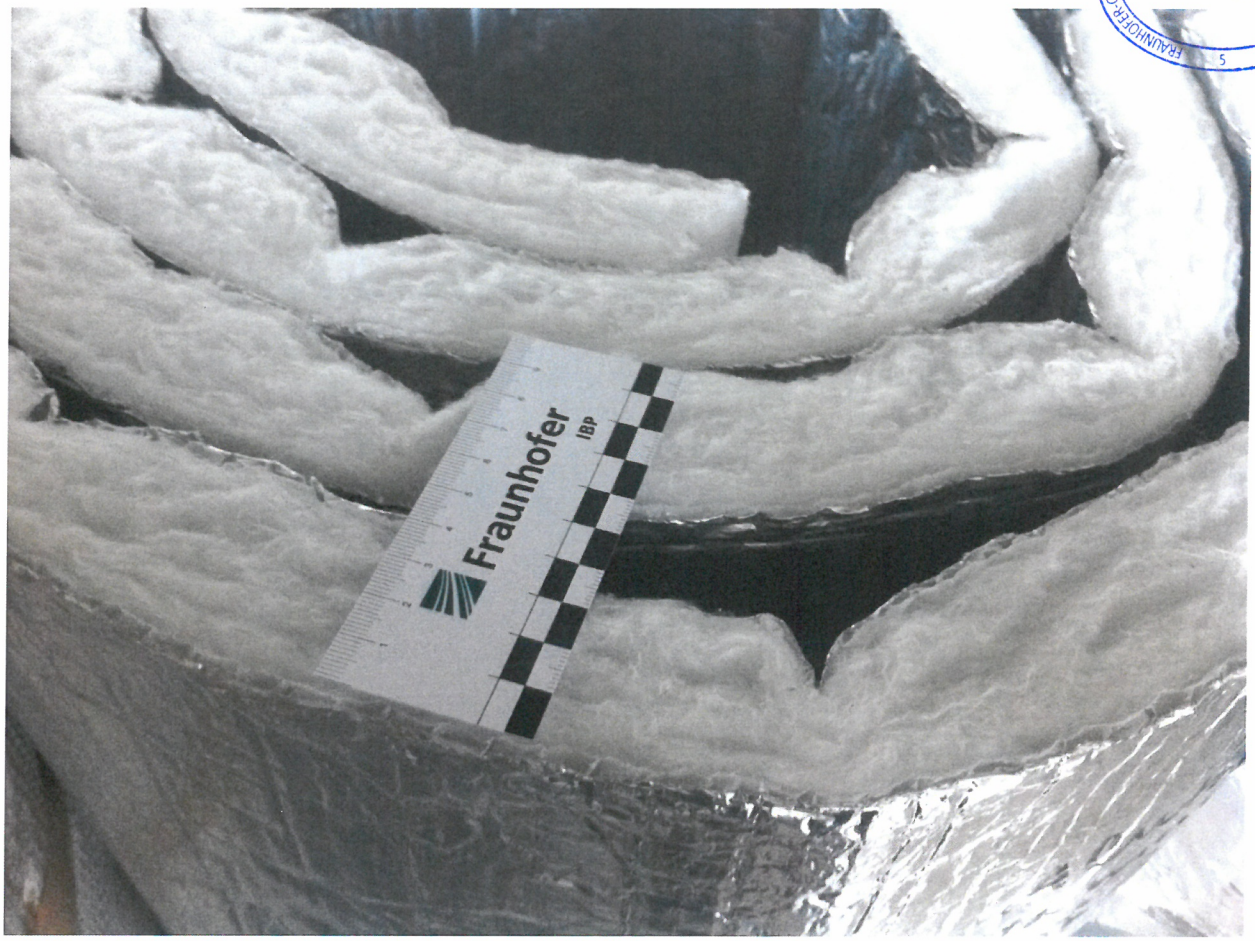

Figure 2: Photo of the reflective insulation "Aluthermo Optima".

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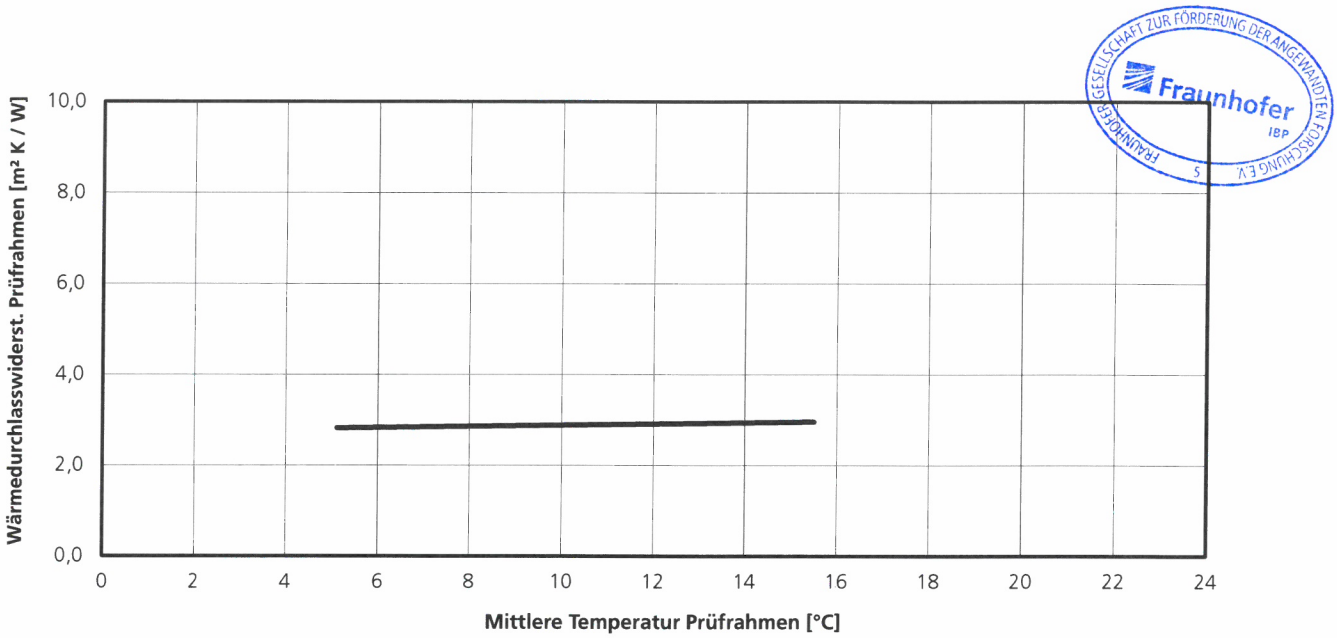

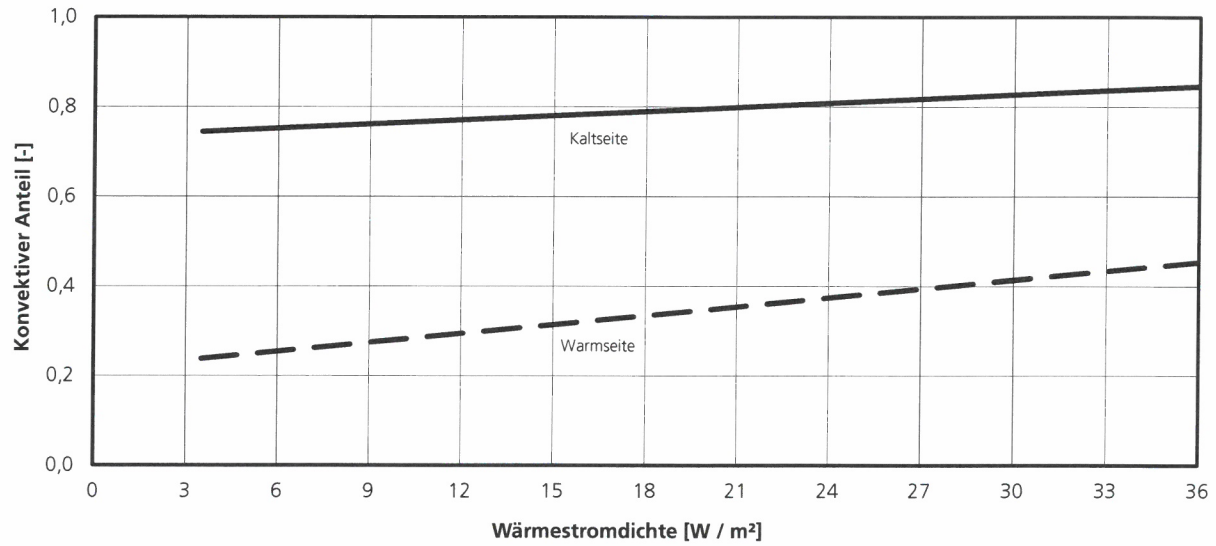

Figure 3: Diagram of results of calibration measurements: thermal resistance of test frame and share of convection.