

Test Report P5-064e/2014

Determination of the Influence of a Curtain "THERMO" on the Thermal Transmittance of a Window

Client:

Englisch Dekor GmbH & Co. KG

Scheydgasse 29

1210 Wien

AUSTRIA

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1 Introduction

The Fraunhofer Institute for Building Physics IBP, Stuttgart, was ordered by Englisch Dekor GmbH & Co. KG, Wien, to determine the influence of a curtain on the thermal transmittance U of a window according to DIN EN 12567-1: 2010-12 (hot box method).

2 Sampling

The curtain fabric with IBP marking "12/009" was delivered to the Fraunhofer Institute for Building Physics IBP, Stuttgart, by the client on January 16, 2012.

3 Description of the test specimen

The curtain system delivered consists of a one piece curtain "THERMO" (art. no. 29895) and a double rail including accessories, curtain tapes and gliding clips. The curtain was gathered by factor 2.0 to a width of 1.40 m by the client. The curtain system was installed by the client on the inside of the window at the test stand of the institute.

The window with the dimensions of 1.23 m x 1.48 m consisted of a PVC sash and a PVC frame and an uncoated double insulating glazing without gas filling, and was provided and installed by the Fraunhofer IBP Stuttgart. A sketch of the installation is shown in figure 1.

Tested specimen	One piece curtain (art. no. 29895), Linen weave made of 66% polyester and 34 % aluminum ribbon, Specific weight 62 g/m ² (details from client)
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Dimensions of the installed curtain system:

Curtain length	1.57 m
Distance from floor to curtain	20 mm
Height from window lintel to ceiling	60 mm
Depth from window lintel to frame	160 mm
Distance from glazing to rail system	219 mm
Area of window (projection), A_t	1.820 m ²

4 Measurement

The testing was carried out on the basis of DIN EN 12567-1: 2010-12 (hot box method) as a comparative test on a window with the curtain system "THERMO", and without the curtain (shown in figure 2).

The test specimen was vertically installed in the opening of a partition between a cooled room and a heated room for measurement section 1. The temperature in the heated room was constantly kept at approx. 21 °C, and approx. 1 °C in the cooled room during testing. A hot box was fitted on the internal side of the test specimen, keeping the same temperature as in the heated room by means of an electrical heating. During the testing, the thermal energy flow supplied to the hot box was through the window. Afterwards the curtain "THERMO" was installed and the measuring was repeated. Both sections had additional temperature measuring points to determine the difference of the mean surface temperature of the window and the air temperature between curtain and window (see figure 1).

5 Measurement results

Tables 1 and 2 summarize the mean temperatures and mean heat flow densities with and without the curtain as well as further parameters and calculated values of the measurement.

It was found out that the curtain "THERMO" leads to a reduction of the inner surface temperature of the window and to a reduction of the thermal transmittance U .

The mean measured thermal transmittances of the investigated curtain on the basis of DIN EN ISO 12567-1 were:

Window without curtain	$U = 2.4 \text{ W/(m}^2\cdot\text{K)}$
Window with curtain "THERMO"	$U = 2.0 \text{ W/(m}^2\cdot\text{K)}$

Note:

The result exclusively refers to the test specimen. The tests were carried out on January 2012.

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, 2 tables and 3 figures.

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Stuttgart, March 14, 2014/JHA

Head of the Test Laboratory

Dipl.-Ing. (FH) Andreas Zegowitz

Responsible Engineer

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Table 1: Measured air and surface temperatures of a window with and without curtain "THERMO", referring to test sections 1 and 2.

Designation	Unit	Section 1 window without curtain	Section 2 window with curtain "THERMO"
Ambient temperature inside	°C	20.0	20.1
Air temperature, 60 mm distance from inside glazing	°C	20.0	17.3
Mean temperature of inside glazing	°C	14.0	11.9
Mean temperature of sash inside	°C	17.6	15.8
Mean temperature of frame inside	°C	15.2	13.7
Ambient temperature outside	°C	0.4	0.4
Mean temperature of glazing outside	°C	2.6	2.3
Mean temperature of sash outside	°C	1.7	1.5
Mean temperature of frame outside	°C	0.8	0.8

Test period: calendar weeks 3 and 4 in 2012.



Table 2: Mean air temperatures, mean heat flow density and parameters for the thermal transmittance of a window with and without curtain "THERMO", referring to test sections 1 and 2.

Designation	Unit	Section 1 window without curtain	Section 2 window with curtain "THERMO"
Air temperature difference, $\Delta\theta_c$	K	19.6	20.0
Wattage of hot box, Φ_{in}	W	87.6	73.5
Heat flow density of thermal insulation and test specimen, q_t	W/m ²	46.32	38.69
External air velocity, v_e	m/s	ca. 1.6	ca. 1.6
Total heat transmission resistance, $R_{s,t}$	m ² K/W	0.15	0.16
Ambient temperature, warm, θ_{ni}	°C	20.0	20.1
Ambient temperature, cold, θ_{ne}	°C	0.4	0.4
Ambient temperature difference, $\Delta\theta_n$	K	19.6	19.7
Thermal transmittance, measured, U	W/(m ² K)	2.4	2.0
Measurement uncertainty, ΔU_f	W/(m ² K)	0.12	0.10

Test period: calendar weeks 3 and 4 in 2012.



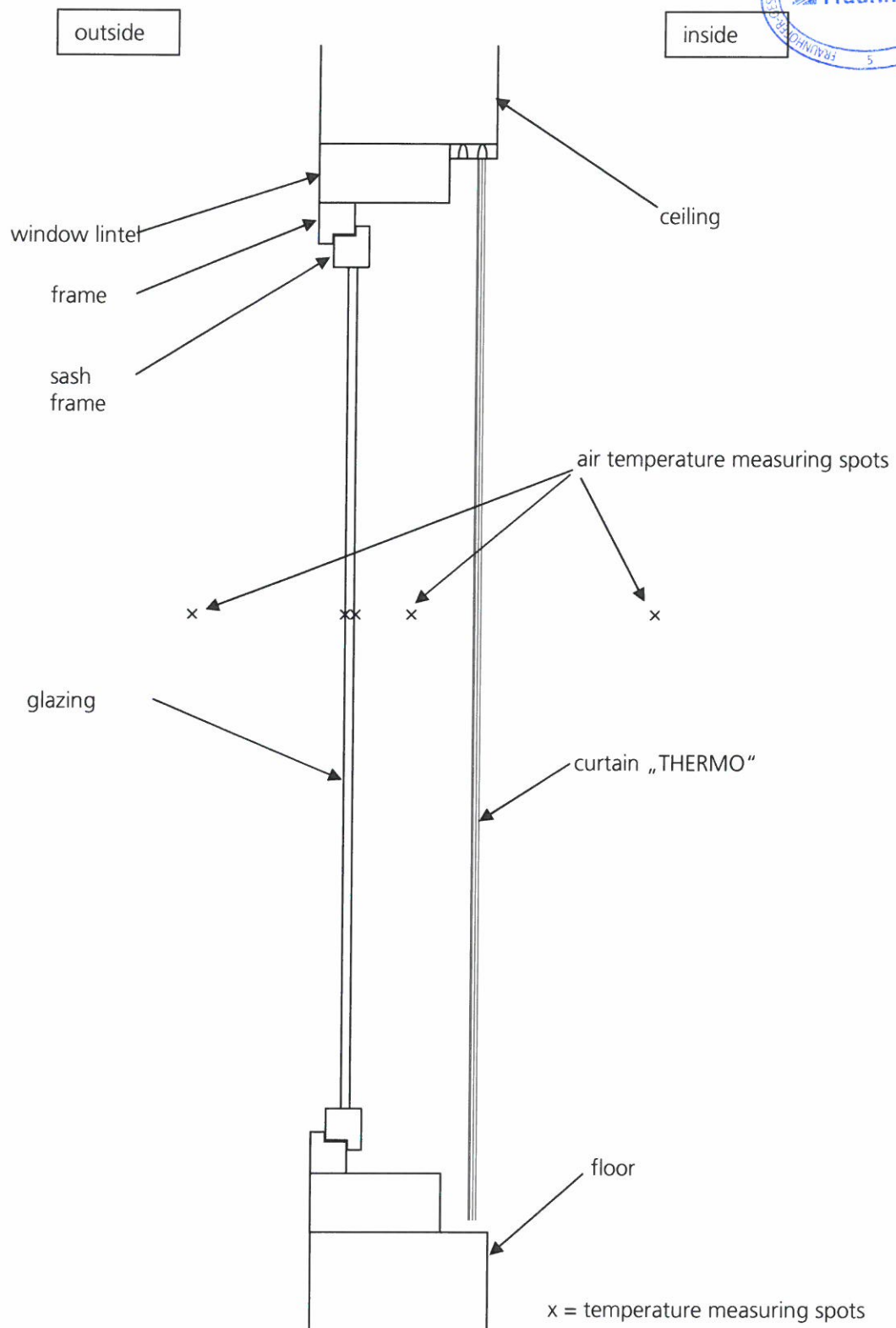


Figure 1: Sectional drawing of the window with curtain "THERMO" and temperature measuring spots (not to scale; sketch of Fraunhofer IBP).



Figure 2: Test setup of the inside of section 1: window without curtain (above), and of section 2: window with curtain (below).

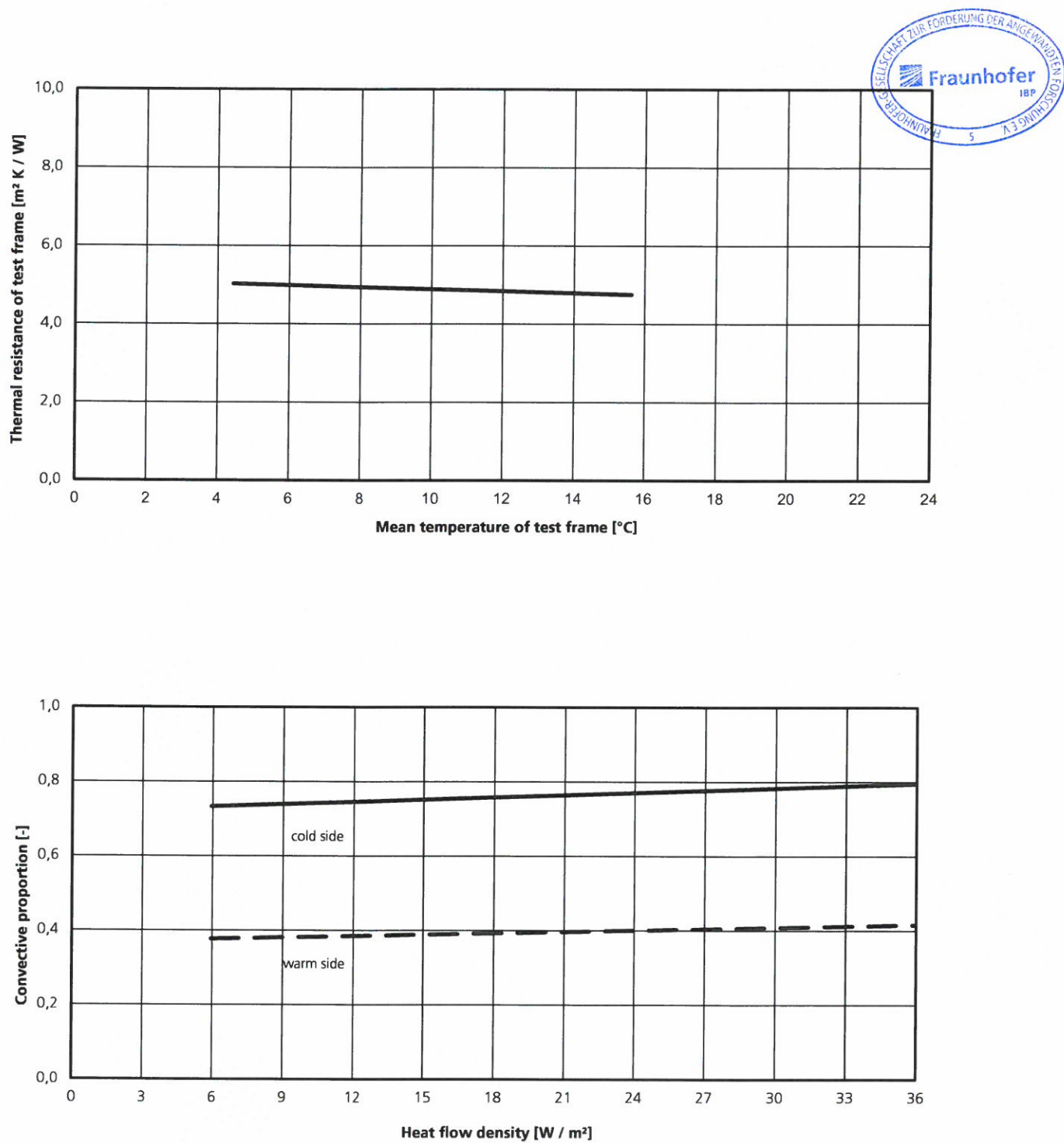


Figure 3: Results of calibration measurements: Thermal resistance of test frame and convective proportion.