

Fraunhofer-Institut für Bauphysik IBP
Bauaufsichtlich anerkannte Stelle für
Prüfung, Überwachung und Zertifizierung

Institutsleitung

Prof. Dr. Philip Leistner
Prof. Dr. Klaus Peter Sedlbauer

Test Report P5-037e/2020

**Determination of the Influence of a Curtain
“Eos Delitherm” on the
Thermal Transmittance of a Window**

Client:
Delius GmbH & Co. KG
Goldstraße 16-18
33602 Bielefeld
Germany

Stuttgart, February 20, 2020



Prüflaboratorium
durch DAkkS GmbH akkreditiert nach
DIN EN ISO/IEC 17025:2018

Prüfstelle Wärmekennwerte
Nobelstraße 12 | 70569 Stuttgart
Telefon +49 711 970-3333
Telefax +49 711 970-3340
www.pruefstellen.ibp.fraunhofer.de

1 Introduction

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

2 Sampling

The curtain fabric with IBP marking "20/030" was delivered to the Fraunhofer Institute for Building Physics IBP, Stuttgart, by the client on January 8, 2020.

3 Description of the test specimen

The curtain system delivered consists of a one piece curtain "Eos Delitherm" (art. no. 41777) and a double rail. The piece of curtain with a width of 2.8 m was prepared by the client with curtain tapes and gliding clips ready for installation. The dimensions of the curtain were gathered by factor 2.0 to a width of 1.40 m and height of 1.57 m. The curtain system was installed on the inside of the window. 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. 41777),
made of 75 % polyester and 25 %
metallised yarn,
Specific weight 120 g/m²
(details from client).

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 "Eos Delitherm", 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. 20 °C, and approx. 0 °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 "Eos Delitherm" 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 "Eos Delitherm" 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 "Eos Delitherm":	$U = 2.0 \text{ W/(m}^2\cdot\text{K)}$

Note:

The result exclusively refers to the test specimen.

The test laboratory is recognized by the Deutsches Institut für Bautechnik (DIBt) as a testing facility under applicable building regulations LBO as "PÜZ-Stelle" 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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Responsible Engineer: Dipl.-Ing. (FH) Rainer Schübler

Deputy Head of the Test Laboratory

Engineer in substitution

Dipl.-Ing. (FH) Christian Schumacher

Dipl.-Ing. Michael Würth



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

Designation	Unit	Section 1 window without curtain	Section 2 window with curtain
Ambient temperature inside	°C	19.6	19.7
Air temperature, 60 mm distance from inside glazing	°C	19.6	16.2
Mean temperature of inside glazing	°C	13.7	11.2
Mean temperature of sash inside	°C	17.3	15.0
Mean temperature of frame inside	°C	14.9	13.1
Ambient temperature outside	°C	0.3	0.4
Mean temperature of glazing outside	°C	2.4	2.1
Mean temperature of sash outside	°C	1.3	1.2
Mean temperature of frame outside	°C	0.8	0.9

Test period: calendar week 4 in 2020



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

Designation	Unit	Section 1 window without curtain	Section 2 window with curtain
Air temperature difference, $\Delta\theta_c$	K	19.4	19.9
Wattage of hot box, Φ_{in}	W	87.2	71.5
Heat flow density of thermal insulation and test specimen, q_t	W/m ²	46.15	38.23
External air velocity, v_e	m/s	approx. 1.6	approx. 1.6
Total heat transmission resistance, $R_{s,t}$	m ² K/W	0.15	0.16
Ambient temperature, warm, θ_{ni}	°C	19.6	19.8
Ambient temperature, cold, θ_{ne}	°C	0.3	0.4
Ambient temperature difference, $\Delta\theta_n$	K	19.3	19.4
Thermal transmittance, measured, U	W/(m ² K)	2.4	2.00
Measurement uncertainty, ΔU_f	W/(m ² K)	0.12	0.10

Test period: calendar week 4 in 2020



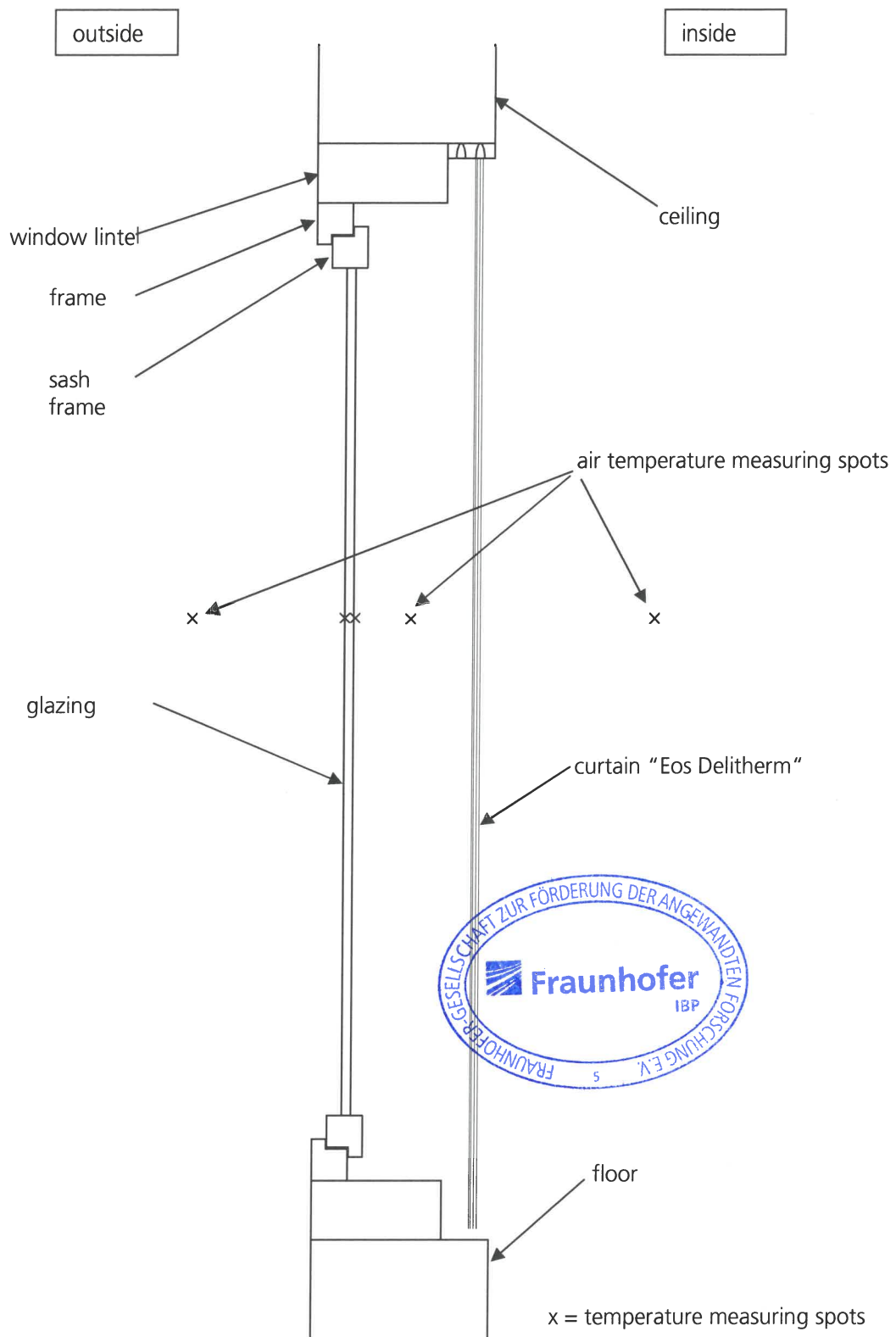


Figure 1: Sectional drawing of the window with curtain "Eos Delitherm" and temperature measuring spots (not to scale; sketch of Fraunhofer IBP).



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

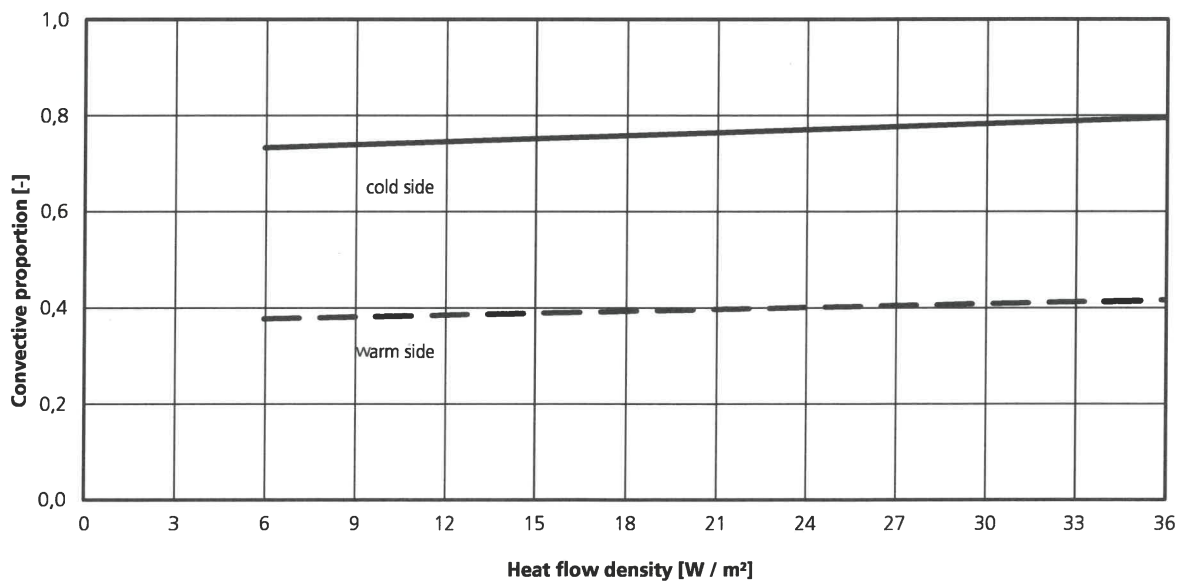
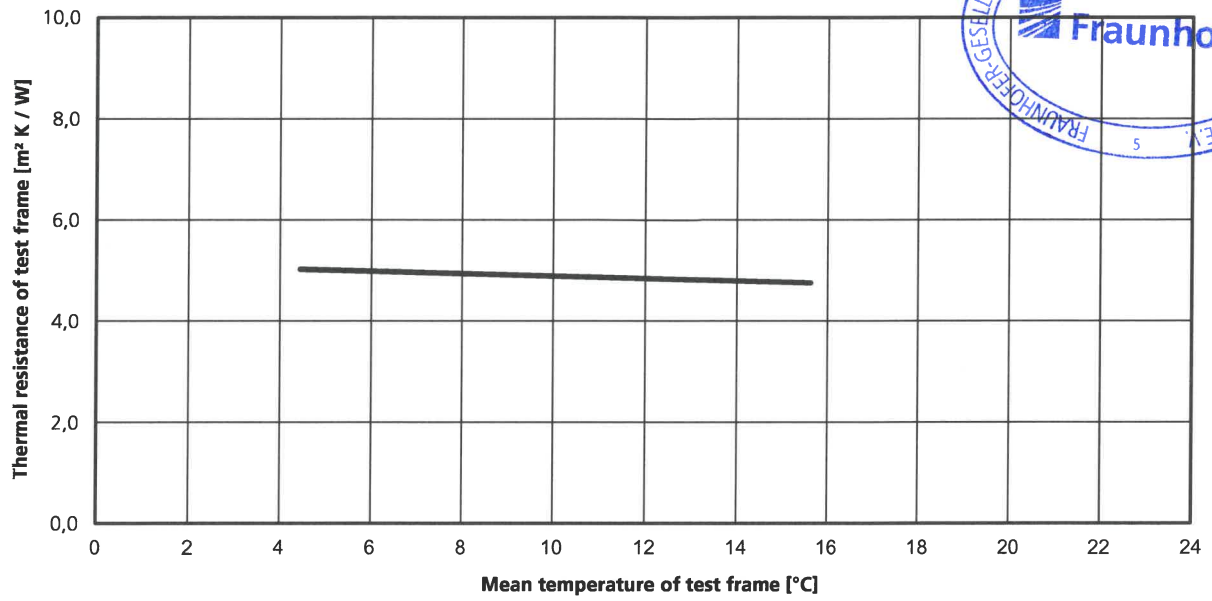


Figure 3: Results of calibration measurements: Thermal resistance of test frame and convective proportion.