TEST LABORATORY

The test laboratory is accredited in compliance with DIN EN ISO/IEC 17025 by the Deutsche Akkreditierungsstelle GmbH. The accreditation is also valid for products of Regulation EU 2016/425. Test methods not included in the scope of accreditation are marked by a *.

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SÄCHSISCHES TEXTIL FORSCHUNGS INSTITUT e.V.

TEST REPORT

Order no. STFI:	**P2025 2417.1**
Order no. applicant:	none
Report date:	17th November 2025
Testing officer:	Reinhardt
Applicant:	Zimmer+Rhode GmbH Mrs.Meike Ludwig Zimmersmühlenweg 14-18 61440 Oberursel
Testing application:	
of:	3rd November 2025
order receipt on:	3rd November 2025
sample receipt on:	10th November 2025

Chairman of the Board
Dipl.-Ing.-Ök. Andreas Berthel

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Material to analyse:

signed by client	code for order processing
SUNBEAM FR colour: 1292	P2417_25_6

Sampling was carried out by the client; the testing laboratory has no information on this.

Analysis content:

(1) Measurement of the remission and transmission in the visible light range in accordance with DIN EN 14500: 2021-09

(2) Measurement of the remission and transmission in the global radiation range in accordance with DIN EN 14500: 2021-09

(3)* Calculation of the total energy permeability degree g_{tot} and the direct solar transmittance $\tau_{e,tot}$ of a window system with sun protective material, following DIN EN ISO 52022-1: 2018-01 and approximate calculation of the reduce factor F_c and the secondary heat transfer factor $q_{i,tot}$ following DIN EN 14501: 2025-04

(4)* Classification of the total energy permeability degree g_{tot} in accordance with DIN EN 14501: 2025-04 (p.14; paragraph 5.2; table 2)

(5)* Classification of the secondary heat transfer factor $q_{i,tot}$ in accordance with DIN EN 14501: 2025-04 (p.15; paragraph 5.3; table 3)

* Standards for calculation and assessment are not allowed for accreditation

Conditions:

Optical tests

test parameter	symbol	range of radiation
light transmission degree	$\tau_{v,n-h}$	(380 – 780) nm (standard light D65)
light remission degree	$\rho_{v,n-h}$	(380 – 780) nm (standard light D65)
light absorption coefficient	α_v	(380 – 780) nm (standard light D65)
UV - transmission degree	τ_{UV}	(280 – 380) nm
solar transmission degree	$\tau_{e,n-h}$	(300 – 2500) nm
solar remission degree	$\rho_{e,n-h}$	(300 – 2500) nm
solar absorption coefficient	α_e	(300 – 2500) nm

Equipment: UV-VIS-NIR double beam spectrophotometer, company PERKIN - ELMER Corp., USA; 150 mm integrating sphere; irradiation perpendicular to the integrating sphere opening; 8° slope of the sample area to the light incidence axis for remission measurements

For each material sample of the client three samples in the format (55 x 75) mm are taken, one in the machine direction, one in the cross machine direction and one diagonally. The irradiation takes place, if not otherwise noted, on the material side which is faced to the solar radiation in usage (marked by client). The results are mean values of three measurements.

Description of classification for thermal comfort:

The description of classification for total energy permeability degree and the secondary heat transfer factor is given in DIN EN 14501: 2025-04 (p.12; paragraph 5.1; table 1).

Influence on thermal comfort					
class	**0**	**1**	**2**	**3**	**4**
	very small effect	small effect	moderate effect	high effect	very high effect

Test results:

(1) Light range and UV-range

Code	light transmission degree	light remission degree	light absorption coefficient	UV-transmission degree[1)]
P2417_25	$\tau_{v,n\text{-}h}$	$\rho_{v,n\text{-}h}$	α_v	τ_{UV}
6	0,083	0,655	0,262	0,019

[1)] For products that have fluorescence effects, e.g. due to the finishing with optical brighteners, the measured result of the UV-transmission degree using the measurement method described above can be incorrect (increased).

(2) Global radiation range

Code	solar transmission degree	solar remission degree	solar absorption coefficient
P2417_25	$\tau_{e,n\text{-}h}$	$\rho_{e,n\text{-}h}$	α_e
6	0,081	0,654	0,265

(3-5)* Total energy permeability degree g_{tot}, direct solar transmittance $\tau_{e,tot}$, reduce factor F_c; secondary heat transfer factor $q_{i,tot}$ and the classification of g_{tot} and $q_{i,tot}$

Usage as internal sun protection material

	Single glazing					
Code	U_g = 5,8 W/(m²K) g = 0,85			τ_e = 0,83 ρ'_e =0,08		
	g_{tot}		F_c	$\tau_{e,tot}$	$q_{i,tot}$	
P2417_25	value	class			value	class
6	0,34	2	0,40	0,07	0,27	1

	Double glazing with air filling					
Code	U_g = 2,9 W/(m²K) g = 0,76			τ_e = 0,69 ρ'_e =0,14		
	g_{tot}		F_c	$\tau_{e,tot}$	$q_{i,tot}$	
P2417_25	value	class			value	class
6	0,36	1	0,48	0,06	0,30	0

	Double glazing with argon filling and low-e coating					
Code	U_g = 1,2 W/(m²K) g = 0,59			τ_e = 0,49 ρ'_e =0,27		
	g_{tot}		F_c	$\tau_{e,tot}$	$q_{i,tot}$	
P2417_25	value	class			value	class
6	0,36	1	0,60	0,05	0,31	0

	Solar controlled double glazing with argon filling and low-e coating					
Code	U_g = 1,1 W/(m²K) g = 0,32			τ_e = 0,27 ρ'_e =0,38		
	g_{tot}		F_c	$\tau_{e,tot}$	$q_{i,tot}$	
P2417_25	value	class			value	class
6	0,25	2	0,78	0,03	0,22	1

	Triple glazing with argon filling and low-e coating					
Code	U_g = 0,8 W/(m²K) g = 0,55			τ_e = 0,50 ρ'_e =0,23		
	g_{tot}		F_c	$\tau_{e,tot}$	$q_{i,tot}$	
P2417_25	value	class			value	class
6	0,35	1	0,63	0,05	0,30	0

Mounting assumptions:

- sun protective material inside and closed
- aerated air interspace to the glazing

The mathematical model in DIN EN ISO 52022-1: 2018-01 (simplified method) for calculation of g_{tot} is appropriated to a coarse compare of sun protection materials. The model is only valid for the following boundary requirements:

- $0 \leq \tau_{e,n\text{-}h} \leq 0{,}5$
- $0{,}1 \leq \rho_{e,n\text{-}h} \leq 0{,}8$

If the above-mentioned boundary requirements are not fulfilled, the calculation of F_c from g_{tot} and g is not guaranteed either. The calculation is recommended in accordance with DIN EN ISO 52022-3: 2018-01 (detailed calculation method). There for it is necessary to measure the reflection of the sample side which is not directly exposed by the sun radiation and the sample thickness at least in addition to the data of this order. In case of known conditions to be used at a building it is unalterable.

Further information on the test procedures or results are available at the accredited testing laboratory and can be provided to the client upon request.

The test results refer to the delivered specimen. This test report shall not be published in parts. The testing period is defined as timeframe between receipt of the sample and issue date of test report.

All materials received in connection with this order will be stored for a maximum period of six months unless agreed otherwise. Exempted from this practice are materials which will not be stored due to technical or safety-related reasons.

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stfi geprüft

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