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 number STFI:	**20202249.7**
Order number client:	none
Report date:	6 November 2020
Person responsible:	Reinhardt

Orderer:

Création Baumann AG
Mario Klaus
Bern-Zürich-Str. 23
4901 LANGENTHAL
SCHWEIZ

Test order:

Date:	8 October 2020
Order received:	14 October 2020
Material received:	14 October 2020

Chairman of the Board
Prof. Dr.-Ing. Hilmar Fuchs

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Material to analyse:

signed by client	
article name	colour
SHELTER	121

The sampling was supplied by the client. The test department is not informed about the sampling procedure.

Analysis content:

(1) Remission and transmission in the visible light range in accordance with DIN EN 410: 2011-04 (DIN EN 14500: 2008-08)

(2) Remission and transmission in the global radiation range in accordance with DIN EN 410: 2011-04 (DIN EN 14500: 2008-08)

(3)* Calculation of the total energy permeability degree g_{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 following DIN EN 14501: 2006-02

(4) Direct und diffuse transmission measurement in the visible light range in accordance with DIN EN 410: 2011-04 (DIN EN 14500: 2008-08)

(5) Direct und diffuse transmission measurement in the global radiation range in accordance with DIN EN 410: 2011-04 (DIN EN 14500: 2008-08)

(6)* Classification of glare control in accordance with DIN EN 14501: 2006-02 (p.15; paragraph 6.3; table 8)

(7)* Classification of privacy night in accordance with DIN EN 14501: 2006-02 (p.16; paragraph 6.4; table 9)

(8)* Classification of the visual contact with the outside in accordance with DIN EN 14501: 2006-02 (p.17; paragraph 6.5; table 10)

(9)* Classification of the daylight utilisation in accordance with DIN EN 14501: 2006-02 (p.18; paragraph 6.6; table 11) on the basis of the rotational symmetric diffuse/hemispherical light transmission degree $\tau_{v,dif-h}$, approximately calculated after equation 18 in DIN EN 14500: 2008-08

(10) Determination of the color rendering index in accordance with DIN EN 410: 2011-04

(11) Measurement of translucent areas (openings) of fabric structure occurs in accordance with test method PM 20. The relation of openings to the total area defines the "openness factor" according to ASHRAE Fundamentals: 2001, p. 30.49. Total measured area contains thread material area and openings. The procedure includes image analytical area measurement of fabric structures under the use of diffuse transmitted/reflected light.

* Standards for calculation and assessment are not allowed for accreditation

Conditions and equipment for 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
UV - transmission degree	τ_{uv}	280...380 nm (UV-radiation)
solar transmission degree	$\tau_{e,n-h}$	280...2500 nm (global radiation)
solar remission degree	$\rho_{e,n-h}$	280...2500 nm (global radiation)
solar absorption coefficient	α_e	280...2500 nm
normal/normal light transmission degree	$\tau_{v,n-n}$	380...780 nm (standard light D65)
normal/diffuse light transmission degree	$\tau_{v,n-dif}$	380...780 nm (standard light D65)
normal/normal solar transmission degree	$\tau_{e,n-n}$	280...2500 nm (global radiation)
normal/diffuse solar transmission degree	$\tau_{e,n-dif}$	280...2500 nm (global radiation)

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 window system (marked by client).

Description of classification for visual comfort:

Description of classification for glare control, privacy night, visual contact with the outside and the daylight utilisation is given in DIN EN 14501: 2006-02 (p.13; paragraph 6.1 table 5).

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

Conditions for the openness factor:

For each sample 10 images are recorded, detected as binary images and concerning their area parts analysed. In the case of the present sample measuring areas of 53,49 mm² were used for the calculation, so that in total an area of 5,35 cm² was analysed.

Equipment:

- Microscope (Co. Wild) with ring lamp
- Image analysis system Vidmess (Co. Thalheim Spezialoptik)

Test results:

(1) Light range **UV-range**

colour	light transmission degree	light remission degree	light absorption coefficient	UV-transmission degree[1)]
	$\tau_{v,n-h}$	$\rho_{v,n-h}$	α_v	τ_{UV}
121	0,2317	0,7150	0,0533	0,1740

[1)] In textile samples which were finished with an optical brightener the measured values of the UV-transmission degree could be doubtful (higher) under the use of the above described measuring method.

(2) Global radiation range

colour	solar transmission degree	solar remission degree	solar absorption coefficient
	$\tau_{e,n-h}$	$\rho_{e,n-h}$	α_e
121	0,2323	0,7010	0,0667

(3)* Total energy permeability degree g_{tot} and reduce factor F_c

colour	Double glazing with air interspace		Double glazing with low emission degree and argon interspace		Triple glazing with low emission degree and argon interspace	
	U_g=2,9 W/(m²K) g=0,76		U_g=1,2 W/(m²K) g=0,59		U_g=0,8 W/(m²K) g=0,55	
	g_{tot}	F_c	g_{tot}	F_c	g_{tot}	F_c
121	0,35	0,46	0,34	0,58	0,34	0,61

Mounting assumptions:

- sun protective material inside and closed
- aerated 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:

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

If the abov 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.

(4) Diffuse und normal transmission in the visible light range

colour	normal/hemispherical light transmission degree	normal/diffuse light transmission degree	normal/normal light transmission degree
	$\tau_{v,n-h}$	$\tau_{v,n-dif}$	$\tau_{v,n-n}$
121	0,2317	0,1973	0,0344

(5) Diffuse und normal transmission in the global radiation range

colour	normal/hemispherical solar transmission degree	normal/diffuse solar transmission degree	normal/normal solar transmission degree
	$\tau_{e,n-h}$	$\tau_{e,n-dif}$	$\tau_{e,n-n}$
121	0,2323	0,1980	0,0343

(6-8)* Classification

colour	glare control	privacy night	sight contact with the outside
121	1	2	0

(9)* Classification of the daylight utilisation

colour	diffuse/hemispherical light transmission degree	daylight utilisation
	$\tau_{v,dif-h}$	
121	0,2011	2

(10) Color rendering index without consideration of the glass

colour	colour rendering index
	R_a
121	94

The results are mean values from three measurements; spectrograms are kept in the test department.

(11) Translucent areas

colour	mean area parts of openings in mm²	mean area parts of openings in % („openness factor“)
121	1,81	3,38

Unless otherwise agreed, all materials we received within this order will be kept for a maximum time of 6 month. Materials which are not stored because of technical or safety reasons are excluded from that.

The testing period is defined as timeframe between receipt of samples and issue date of test report.

The test results are referring to the submitted samples. The test report is not allowed to copy in parts.

Dipl.-Ing. Marian Hierhammer
head of test department

stfi geprüft

Patrick Reinhardt, M.Sc.
field responsible collaborator