

# 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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## TEST REPORT

**Order number STFI:** 20200936.1  
**Order number client:** none

**Report date:** 07 May 2020  
**Person responsible:** Reinhardt

**Orderer:** Aktiebolaget Ludvig Svensson  
Louise Ekström  
Bangatan 8  
51182 KINNA  
SCHWEDEN

**Test order:**  
**Date:** 20 April 2020  
**Order received:** 20 April 2020  
**Material received:** 20 April 2020

**Material to analyse:**

signed by client		code for order processing
INCENDO	Colour: 8000	P0936_20_1
INCENDO	Colour: 8500	P0936_20_2

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 the protective properties against ultraviolet solar radiation in accordance with DIN EN 13758 -1: 2007-03

\* 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	$\alpha_v$	380...780 nm
UV - transmission degree	$\tau_{uv}$	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	$\alpha_e$	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.

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 UV - transmission tests:**

Equipment: Labsphere Ultraviolet Transmittance Analyzer UV-2000F

The samples were tested under normal climate conditions (20°C, 65% r. H.) without elongation.

The UV-transmission was measured in a wavelength range from (280 – 400) nm, whereas the UV-A range extends from (315 – 400) nm and the UV-B range from (280 – 315) nm. The solar spectrum of Albuquerque was used to calculate the UPF-rating in course of DIN EN 13758-1

**Test results:**

**(1) Light range**

**UV-range**

Code	light transmission degree	light remission degree	light absorption coefficient	UV-transmission degree <sup>1)</sup>
P0936_20	$\tau_{v,n-h}$	$\rho_{v,n-h}$	$\alpha_v$	$\tau_{uv}$
1	0,4037	0,5763	0,0200	0,2517
2	0,1793	0,0507	0,7700	0,1787

<sup>1)</sup> 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

Code	solar transmission degree	solar remission degree	solar absorption coefficient
P0936_20	$\tau_{e,n-h}$	$\rho_{e,n-h}$	$\alpha_e$
1	0,4013	0,5503	0,0484
2	0,2873	0,2650	0,4477

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

	Single glazing		Double glazing with air interspace		Double glazing with low emission degree and argon interspace		Triple glazing with low emission degree and argon interspace	
Code	$U_g=5,8 \text{ W}/(\text{m}^2\text{K})$ $g=0,85$		$U_g=2,9 \text{ W}/(\text{m}^2\text{K})$ $g=0,76$		$U_g=1,2 \text{ W}/(\text{m}^2\text{K})$ $g=0,59$		$U_g=0,8 \text{ W}/(\text{m}^2\text{K})$ $g=0,55$	
P0936_20	$g_{tot}$	$F_c$	$g_{tot}$	$F_c$	$g_{tot}$	$F_c$	$g_{tot}$	$F_c$
1	0,45	0,52	0,44	0,58	0,40	0,67	0,38	0,70
2	0,60	0,70	0,58	0,76	0,49	0,83	0,46	0,84

### 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 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.

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

Code	normal/hemispherical light transmission degree	normal/diffuse light transmission degree	normal/normal light transmission degree
P0936_20	$\tau_{v,n-h}$	$\tau_{v,n-dif}$	$\tau_{v,n-n}$
1	0,4037	0,2543	0,1494
2	0,1793	0,0153	0,1640

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

Code	normal/hemispherical solar transmission degree	normal/diffuse solar transmission degree	normal/normal solar transmission degree
P0936_20	$\tau_{e,n-h}$	$\tau_{e,n-dif}$	$\tau_{e,n-n}$
1	0,4013	0,2527	0,1486
2	0,2873	0,1233	0,1640

**(6-8)\* Classification**

Code	glare control	privacy night	sight contact with the outside
P0936_20			
1	0	0	2
2	0	0	4

**(9)\* Classification of the daylight utilisation**

Code	diffuse/hemispherical light transmission degree	daylight utilisation
P0936_20	$\tau_{v,dif-h}$	
1	0,3367	3
2	0,1347	2

**(10) Color rendering index without consideration of the glass**

Code	color rendering index
P0936_20	$R_a$
1	98
2	100

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

**(11) UV-transmission**

Code STFI	UPF		Transmission (UV-A) in %		Transmission (UV-B) in %		Rated UPF
	Mean	STD	Mean	STD	Mean	STD	
P0936_20							
1	6,13	0,14	20,51	0,40	15,94	0,38	5
2	6,03	0,15	17,45	0,41	16,55	0,42	5

The results are mean values from 10 measurements.

This UPF rating is for the fabric and does not address the amount of protection which is afforded by the design of the clothing article. Manipulations involved in garment manufacture such as stretching and sewing may lower the UPF-value of the material.


The protection offered by this item may be lessened,

- at points where the fabric is in close contact with the skin such as across the shoulders
- if the fabric is stretched or wet
- with time, due to effects of normal wear.


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



  
Patrick Reinhardt, M.Sc.  
field responsible collaborator