

TEST LABORATORY



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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 *.



Authorized for the testing of heat and flame-resistant protective clothing for car racers according to FIA 8856-2000 standard by the Fédération Internationale de l'Automobile (FIA) Paris.

TEST REPORT

Order number STFI: 20182761.1

Report date: 12 September 2019
Person responsible: Reinhardt

Orderer: DELIUS GmbH & Co.KG
Angelika Schmidt-Koch
Goldstr. 16-18
33602 Bielefeld

Test order:
Date: 13 November 2018
Order received: 14 November 2018
Material received: 14 November 2018

Material to analyse:

1 sample sun protective material

signed by client	code for order processing
sample Gamma Delitherm col.: 9550	P2761_18_1

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) Spectral values in the radiation range (300 – 2500) nm

* 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

Equipment: UV/Visible/NIR spectrophotometer Lambda 900, 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 the client). During the measurement an circular area with a diameter of 25 mm (integrating sphere port) is covered by the sample.

Test results:**(1) Light range****UV-range**

Code	light transmission degree	light remission degree	light absorption coefficient	UV-transmission degree
P2761_18	$\tau_{v,n-h}$	$\rho_{v,n-h}$	α_v	τ_{uv}
1	0,0030	0,4963	0,5007	0,0007

(2) Global radiation range

Code	solar transmission degree	solar remission degree	solar absorption coefficient
P2761_18	$\tau_{e,n-h}$	$\rho_{e,n-h}$	α_e
1	0,0043	0,4867	0,5090

(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	$U_g=5,8 \text{ W}/(\text{m}^2\text{K})$ $g=0,85$		$U_g=2,9 \text{ W}/(\text{m}^2\text{K})$ $g=0,76$		$U_g=1,2 \text{ W}/(\text{m}^2\text{K})$ $g=0,59$		$U_g=0,8 \text{ W}/(\text{m}^2\text{K})$ $g=0,55$	
P2761_18	g_{tot}	F_c	g_{tot}	F_c	g_{tot}	F_c	g_{tot}	F_c
1	0,43	0,50	0,44	0,59	0,41	0,69	0,40	0,72

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). Therefore it is necessary to measure reflection to the not the radiation exposed side and 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.

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



(4) Spectral values

Sample code: P2761_18_1

λ in nm	T in %	R in %	A in %
300	0,0033	6,1281	93,8686
310	0,0000	11,0355	88,9645
320	0,0070	36,4700	63,5230
330	0,0260	46,1392	53,8348
340	0,0367	47,6612	52,3021
350	0,0390	48,5190	51,4420
360	0,0465	49,2436	50,7099
370	0,0730	49,9913	49,9358
380	0,1291	50,3847	49,4863
390	0,1586	50,4411	49,4004
400	0,1794	50,5524	49,2682
410	0,1990	50,6222	49,1788
420	0,2059	50,6800	49,1142
430	0,2231	50,6197	49,1572
440	0,2078	50,5306	49,2615
450	0,2266	50,4476	49,3258
460	0,2619	50,3756	49,3625
470	0,2754	50,3585	49,3661
480	0,2455	50,2983	49,4562
490	0,2390	50,2111	49,5499
500	0,2644	50,0457	49,6899
510	0,2878	49,9121	49,8001
520	0,2924	49,8786	49,8290
530	0,2979	49,8394	49,8626
540	0,2960	49,7438	49,9602
550	0,3020	49,6872	50,0108
560	0,2986	49,5980	50,1034
570	0,3033	49,5184	50,1783
580	0,3086	49,4811	50,2103
590	0,3135	49,3906	50,2960
600	0,3188	49,2765	50,4047
610	0,3242	49,2584	50,4174
620	0,3345	49,2068	50,4587
630	0,3340	49,1525	50,5135
640	0,3405	49,0496	50,6099

λ in nm	T in %	R in %	A in %
650	0,3492	49,0194	50,6313
660	0,3539	49,0082	50,6379
670	0,3484	48,8840	50,7676
680	0,3508	48,7892	50,8600
690	0,3618	48,8520	50,7862
700	0,3723	48,8231	50,8046
710	0,3807	48,7856	50,8337
720	0,3893	48,8518	50,7589
730	0,3957	48,6736	50,9307
740	0,3971	48,5956	51,0072
750	0,4090	48,5856	51,0054
760	0,4141	48,6618	50,9241
770	0,4179	48,5707	51,0114
780	0,4211	48,4110	51,1678
790	0,4162	48,5863	50,9976
800	0,4185	48,5144	51,0672
850	0,5548	48,6968	50,7484
900	0,8904	49,3084	49,8012
950	0,7809	48,9947	50,2244
1000	0,7500	48,5882	50,6618
1100	0,3144	47,8152	51,8705
1200	0,7861	47,8445	51,3693
1300	1,1374	47,6830	51,1796
1400	0,8236	47,4299	51,7465
1500	1,1136	47,5584	51,3281
1600	0,1426	46,9894	52,8680
1700	0,6382	45,7007	53,6611
1800	0,7312	46,0964	53,1725
1900	0,1027	44,9077	54,9897
2000	0,6205	45,7704	53,6091
2100	0,4842	44,5069	55,0089
2200	0,7337	44,2946	54,9716
2300	0,0000	37,5999	62,4001
2400	0,0158	37,0440	62,9402
2500	0,0000	37,1422	62,8578

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. These test report is not allowed to copy in parts.



Dipl.-Ing. Marian Hierhammer
head of test department



Patrick Reinhardt, M.Sc.
field responsible collaborator

stfi
geprüft