

Specification	PCE - BK
Physical and chemical properties	D 1125
- p r o v i s i o n a l -	
HC - PHOTOSOLAR^â GRAU	D 1125
Colour:	grey
Application:	High index glass sensitive to light for corrective lenses and sun glare filter; luminous transmittance range 87% (t_0) / 25% (t_1) or filter categories 0 / 2 respectively
<p>The measured values of the paragraphs 1 - 1.2.3.2 and 2 - 4 have been taken from HC-PHOTOSOLAR[®] DUNKELBRAUN Paragraph 1.3 come from PHOTOSOLAR[®] SUPERGREY</p>	
<p>The subsequent properties are based primarily upon the measuring results of the very latest standards and measuring methods, which are defined in corresponding "Measuring and Test Procedures". SCHOTT DESAG retains the right to change the data in keeping with the latest technical standards. Non-toleranced numerical values are reference values of an average production quality.</p> <p>Values marked with \diamond do not apply to the type of glass or no values are available.</p> <p>Requirements deviating from these specifications must be defined in writing in a customer agreement.</p>	
Date of release:	31 July 1998

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Specification		PCE - BK D 1125	
Physical and chemical properties			
1.	Optical properties		
1.1	Refractive indices (20°C)		
	Pretreatment of samples	n_g	1.6185
	[x] Condition as supplied	$n_{F'}$	1.6113
	[] annealed at 40°C/h	n_F	1.6104
		n_e	1.6040 ^{+0.0006} -0.001
		n_d	1.6007
		n_D	1.6006
		$n_{C'}$	1.5972
		n_C	1.5965
1.1.1	Abbe value	n_e	42.8
		n_d	43.0
1.2	Transmittance data		
1.2.1	Spectral transmittance $t(I)$		
1.2.1.1	$t(I)$ - curve		
	Plot of spectral transmittance $t(I)$ for the light state $t_{0'}$ and dark state $t_{15'}$	◇	
1.2.1.2	$t(I)$ - individual values in % ($d = 2.0$ mm)	$t_{0'}$	$t_{15'}$
	$t(I)_{max}$ for the I - range 280 - 315 nm	< 0.003	< 0.003
	$t(I)_{max}$ for the I - range 315 - 350 nm	2.5	2
	t_{380}	28	8
	$t(I)_{min}$ for the I - range 450 - 650 nm	77	19
	$t(I)_{min}$ for the I - range 500 - 650 nm	77	19
1.2.1.3	Edge wavelength ($d = 2.0$ mm)		
	Edge wavelength I_C ($t = 0.46$) in nm for $t_{0'}$	393	

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1.2.2	Luminous transmittance t_v								
1.2.2.1	Luminous transmittance t_{vD65} or t_{vA} in % respectively under standard conditions ($d = 2.0$ mm)								
	Light state t_{vD65}	$t_{0'}(t_0)$	87						
	Dark state	$t_{15'}(t_1)$	25						
	Regeneration t_{vA}	$t_{R5'}$	-						
		$t_{R10'}$	71						
		$t_{R30'}$	78						
	Darkening-fading curve for 23 °C	see annex							
	Luminous transmittance t_{vD65} in % in relationship to the thickness	$t_{0'}(t_0)$	$t_{15'}(t_1)$						
	Thickness in mm	2.0	25						
		3.0	19						
		4.0	16.5						
1.2.2.2	Shade N / Filter category ($d = 2.0$ mm)								
	N	5 - 1.1 < 2.5							
	Filter category	$t_{0'}(t_0)$	$t_{15'}(t_1)$						
		0	2						
1.2.2.3	Luminous transmittance dark state $t_{15'}$ in % in relationship to the sample temperature J in °C ($d = 2.0$ mm)								
		-	-	t_w	t_1	t_s	-		
	J	-10	-5	5	23	35	50		
	$t_{15'}$	◇	◇	16	25	39	59		
1.2.2.4	Luminous transmittance dark state $t_{15'}$ in % in relationship to the illuminance E in klx ($d = 2.0$ mm)								
		t_1	-	-	t_a	-	-		
	E	50	30	20	15	10	5		
	$t_{15'}$	25	31	37	42	47	58		
1.2.2.5	Luminous transmittance dark state $t_{15'}$ in % in relationship to the variation the excitation spectrum in dependance of the edge wavelength l_c of a sharp cut filter in nm ($d = 2.0$ mm)								
	l_c	328	353	369	389	410	433	454	468
	$t_{15'}$	◇	◇	◇	◇	◇	◇	◇	◇

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Specification		PCE - BK D 1125	
Physical and chemical properties			
1.2.3	Special transmittance values in % ($d = 2.0$ mm)		
1.2.3.1	UV - transmittance for t_{15}		
		t_{UVA}	◇
		t_{SUV}	◇
		t_{SUVA}	◇
		t_{SUVB}	◇
1.2.3.2	IR - transmittance	t_{SIR}	$\geq t_{vD65}$
1.2.3.3	Solar blue - light transmittance	t_{sb}	◇
1.3	Colour		
1.3.1	Visual evaluation		
	The visual evaluation is made on the basis of a simultaneous comparison with internal limit samples.		
1.3.2	Colorimetry		
	colour locus as medium position	x_{10}	0.325
		y_{10}	0.336
	Chromaticity coordinates (colour locus) are referred to the Standard Illuminant D_{65} according to CIE 10°-observer for t_{15} (t_1) - for the time being they are only reference values ($d = 2.0$ mm) in view of the relative calibration possibility		
1.3.3	Signal recognition		
	Relative visual attenuation coefficient Q	Q_{blue}	1.00
	for signal lights for t_{15} (t_1) ($d = 2.0$ mm)	Q_{green}	0.97
		Q_{yellow}	1.04
		Q_{red}	1.10

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Physical and chemical properties		D 1125	
2. Thermal properties			
2.1 Viscosities and corresponding temperatures			
	Designation	Viscosity log <i>h</i> in dPas	Temperature <i>J</i> in °C
	Strain point	14.5	516
	Annealing point	13.0	541
	Softening point	7.6	692
	Forming temperature	6.0	772
	Forming temperature	5.0	838
	Forming temperature	4.0	923
2.2	Transformation temperature <i>Tg</i> in °C		539
2.3	Coefficient of mean linear thermal expansion <i>a</i> (20°C-300°C) in 10 ⁻⁶ K ⁻¹ (Static measurement)		6.0
2.4	Fuseability		◇
2.5	Mean specific heat capacity <i>c_p</i>(20°C-100°C) in J/(g · K)		◇

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Specification		PCE - BK D 1125
Physical and chemical properties		
3.	Mechanical properties	
3.1	Density r in g/cm³ (annealed at 40°C/h)	2.74
3.2	Stress optical coefficient C in 1.02×10^{-12} m²/N	3.49
3.3	<p>Breaking strength</p> <p>A higher mechanical strength can be realized by chemical toughening according to the ion exchange procedure (refer to annex 3.3.1).</p> <p>This toughening method may cause in slightly transmittance - and colourchange.</p>	
3.3.1	Chemical toughening	
	Processing temperature J in °C	440
	Processing time t in h	16
	Compressive stress D_s as birefringence in nm/cm	2600
	Penetration depth Nz up to neutral zone in µm	51
	Further information	see annex
3.4	Young's modulus E in kN/mm²	78
3.5	Poisson's ratio m	0.229
3.6	Torsion modulus G in kN/mm²	32
3.7	Knoop hardness HK_{100}	◇

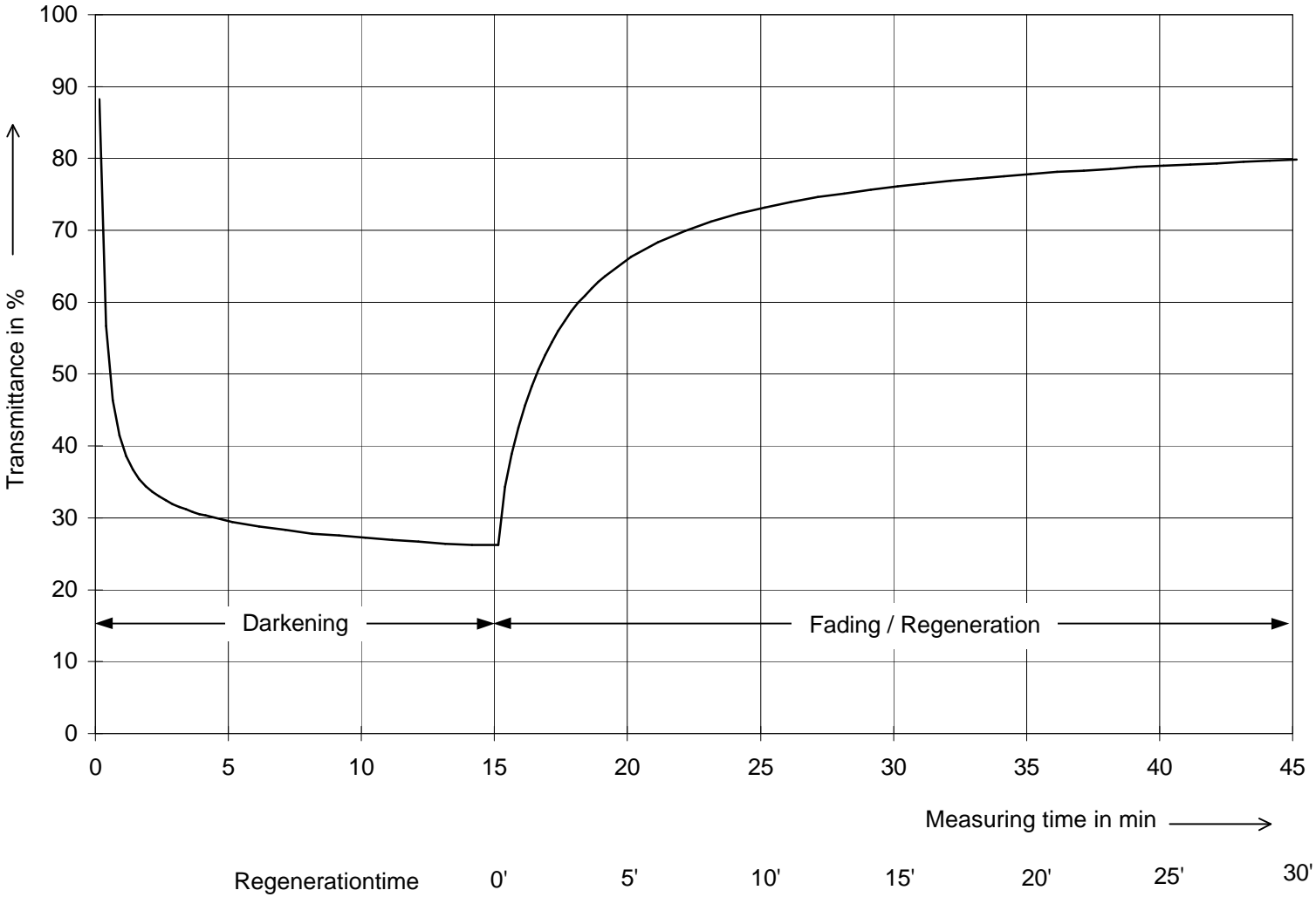
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Specification		PCE - BK	
Physical and chemical properties		D 1125	
4.	Chemical properties		
4.1	Hydrolytic resistance acc. to DIN ISO 719		
		Hydrolytic class	HGB 2
	Equivalent of alkali (Na ₂ O) per gram of glass grains in µg/g		42
4.2	Acid resistance acc. to DIN 12 116		
		Acid class	4
	Half surface weight loss after 6 hours in mg/dm ²		253
4.3	Alkali resistance acc. to DIN ISO 695		
		Class	A 2
	Surface weight loss after 3 hours in mg/dm ²		100
5.	Electrical properties		disregard
6.	Other properties		
6.1	Anti-reflection processes		◇
7.	Annex (diagrams, curves)		

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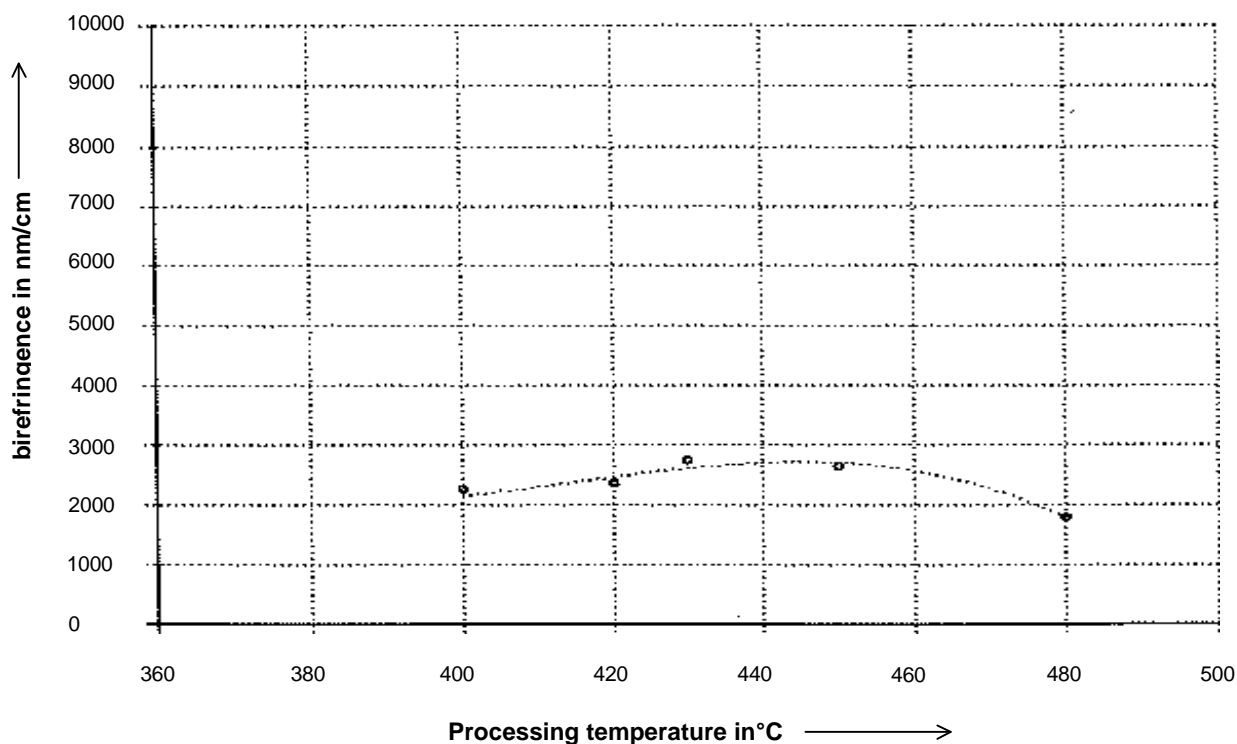
Darkening - Fading - Curve

Type of Glass: HC - PHOTOSOLAR^â GRAU
Thickness: 2 mm



Annex 3.3.1

Specification		PCE - BK	
Physical and chemical properties		D 1125	
Chemical toughening parameter			
Glass and chemical toughening parameters			
Transformation temperature	°C	539	
Glass thickness	mm	2	
Processing time	h	16	
Processing temperature	°C	440	
Salt bath (* weight percentages)	NaNO ₃ in % *	40.0	
	KNO ₃ in % *	59.5	
	SiO ₂ x H ₂ O in % *	0.5	
Chemical toughening results *			
Penetration depth	µm	51	
Birefringence	nm/cm	2600	
* measured across at a sample piece ground down to 0.3 mm ± 0.05 mm			
Ball drop test acc. FDA	% failed	not carried out	
Ball drop test acc. DIN	% failed	not carried out	



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