

<p>Specification Physical and chemical properties</p>	<p>PCE - BK D 0088</p>									
<table border="0" style="width: 100%;"> <tr> <td style="width: 30%;">SF 64</td> <td style="width: 40%;"></td> <td style="width: 30%; text-align: right;">D 0088</td> </tr> <tr> <td>Colour:</td> <td>clear</td> <td></td> </tr> <tr> <td>Application:</td> <td>High index light weight glass for corrective lenses with high power</td> <td></td> </tr> </table> <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>Because this glass type is produced by another Schott Group company we specified the original data sheet values of the manufacturer in <i>italic letters</i> and added another SCHOTT DESAG specific characteristic values.</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> <p>Date of release: 21 August 1995</p>		SF 64		D 0088	Colour:	clear		Application:	High index light weight glass for corrective lenses with high power	
SF 64		D 0088								
Colour:	clear									
Application:	High index light weight glass for corrective lenses with high power									

Form 0050/6A

Specification		PCE - BK	
Physical and chemical properties		D 0088	
1.	Optical properties		
1.1	Refractive indices (20°C)		
	Pretreatment of samples	n_g	◇
	[] Condition as supplied	$n_{F'}$	◇
	[x] annealed at 40°C/h	n_F	◇
		n_e	1.7067
		n_d	◇
		n_D	1.7010 ± 0.0014
		$n_{C'}$	◇
		n_C	◇
1.1.1	Abbe value	n_e	30.6
		n_D	30.8 ± 0.3
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 $d = 2.0$ mm ($I = 300$ nm - 1500 nm)	see annex	
1.2.1.2	$t(I)$ - individual values in % ($d = 2.0$ mm)		
	$t(I)_{max}$ for the I - range 280 - 315 nm	< 0.001	
	$t(I)_{max}$ for the I - range 315 - 350 nm	4	
	t_{380}	79.5	
	$t(I)_{min}$ for the I - range 450 - 650 nm	◇	
	$t(I)_{min}$ for the I - range 500 - 650 nm	◇	
1.2.1.3	Edge wavelength ($d = 2.0$ mm)		
	Edge wavelength $I_C (t = 0.46)$ in nm	362	
1.2.2	Luminous transmittance t_v		
1.2.2.1	Luminous transmittance t_{vD65} in % at nominal thickness	87.2* ± 0.5	
	$d = 2.0$ mm	* nominal transmittance	
	Luminous transmittance as a function of thickness		
	Thickness in mm	1.4	2.0
		3.0	4.0
		5.0	6.0
	t_{vD65} in %	87.2	87.2
		◇	◇
	t_{vA} in %	87.3	87.3
		◇	◇
	t_{vC} in %	87.2	87.2
		◇	◇

Form 0050/6B

Specification		PCE - BK D 0088	
Physical and chemical properties			
1.2.2.2	Shade N / Filter category		
	<i>N</i> for mean thickness <i>d</i> = mm (<i>t</i> _{VD65} = %)		◇
	<i>N</i> for mean thickness <i>d</i> = mm (<i>t</i> _{VD65} = %)		◇
	filter category for nominal transmittance <i>t</i> _{VD65} = %		◇
1.2.3	Special transmittance values in % (<i>d</i> = 2.0 mm)		
1.2.3.1	UV - transmittance		
		<i>t</i> _{UVA}	23.6
		<i>t</i> _{SUV}	◇
		<i>t</i> _{SUVA}	◇
		<i>t</i> _{SUVB}	◇
1.2.3.2	IR - transmittance	<i>t</i> _{SIR}	88
1.2.3.3	Solar blue - light transmittance	<i>t</i> _{sb}	◇
1.3	Colour		
1.3.1	Visual evaluation		◇
1.3.2	Colorimetry		
	Chromaticity coordinates	<i>x</i> ₁₀	0.315
		<i>y</i> ₁₀	0.332
	Chromaticity coordinates (colour locus) are referred to the Standard Illuminant D ₆₅ according to CIE 10°-observer for the nominal transmittance <i>t</i> _{VD65} = 87.2 % (refer to 1.2.2.1)		
1.3.3	Signal recognition		
	Relative visual attenuation coefficient <i>Q</i>	<i>Q</i> _{blue}	1.00
	for signal lights referred to the	<i>Q</i> _{green}	1.00
	nominal transmittance <i>t</i> _{VD65} = 87.2 %	<i>Q</i> _{yellow}	1.00
	(refer to 1.2.2.1)	<i>Q</i> _{red}	1.00
1.3.4	Yellowness index (<i>d</i> = 10 mm)		
		<i>Y</i> _i	◇

Form 0050/6B

Specification		PCE - BK	
Physical and chemical properties		D 0088	
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	574
	Annealing point	13.0	592
	Softening point	7.6	694
	Forming temperature	6.0	◇
	Forming temperature	5.0	◇
	Forming temperature	4.0	834
2.2	Transformation temperature <i>Tg</i> in °C		581
2.3	Coefficient of mean linear thermal expansion <i>a</i> (20°C-300°C) in 10 ⁻⁶ K ⁻¹ (Static measurement)		9.9
2.4	Fuseability		◇
2.5	Mean specific heat capacity <i>c_p</i>(20°C-100°C) in J/(g · K)		◇

Specification		PCE - BK
Physical and chemical properties		D 0088
3.	Mechanical properties	
3.1	Density r in g/cm³	2.99
3.2	Stress optical coefficient C in 1.02×10^{-12} m²/N	◇
3.3	Breaking strength A higher mechanical strength can be realized by chemical toughening according to the ion exchange procedure (refer to annex 3.3.1) or by thermal toughening.	
3.3.1	Chemical toughening	
	Processing temperature J in °C	460
	Processing time t in h	16
	Compressive stress D_s as birefringence in nm/cm	8450
	Penetration depth N_z up to neutral zone in µm	46
	Further information	see annex
3.3.2	Thermal toughening	
	Recommended minimum thickness d in mm for toughened safety glass lenses without corrective effect as per ball drop test (DIN EN 168)	2.5
3.4	Young's modulus E in kN/mm²	◇
3.5	Poisson's ratio m	◇
3.6	Torsion modulus G in kN/mm²	◇
3.7	Knoop hardness HK_{100}	◇

Form 0050/6B

Specification		PCE - BK	
Physical and chemical properties		D 0088	
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		56
4.2	Acid resistance acc. to DIN 12 116		
		Acid class	4
	Half surface weight loss after 6 hours in mg/dm ²		> 250
4.3	Alkali resistance acc. to DIN ISO 695		
		Class	A 1
	Surface weight loss after 3 hours in mg/dm ²		34
5.	Electrical properties		disregard
6.	Other properties		disregard
7.	Annex (diagrams, curves)		

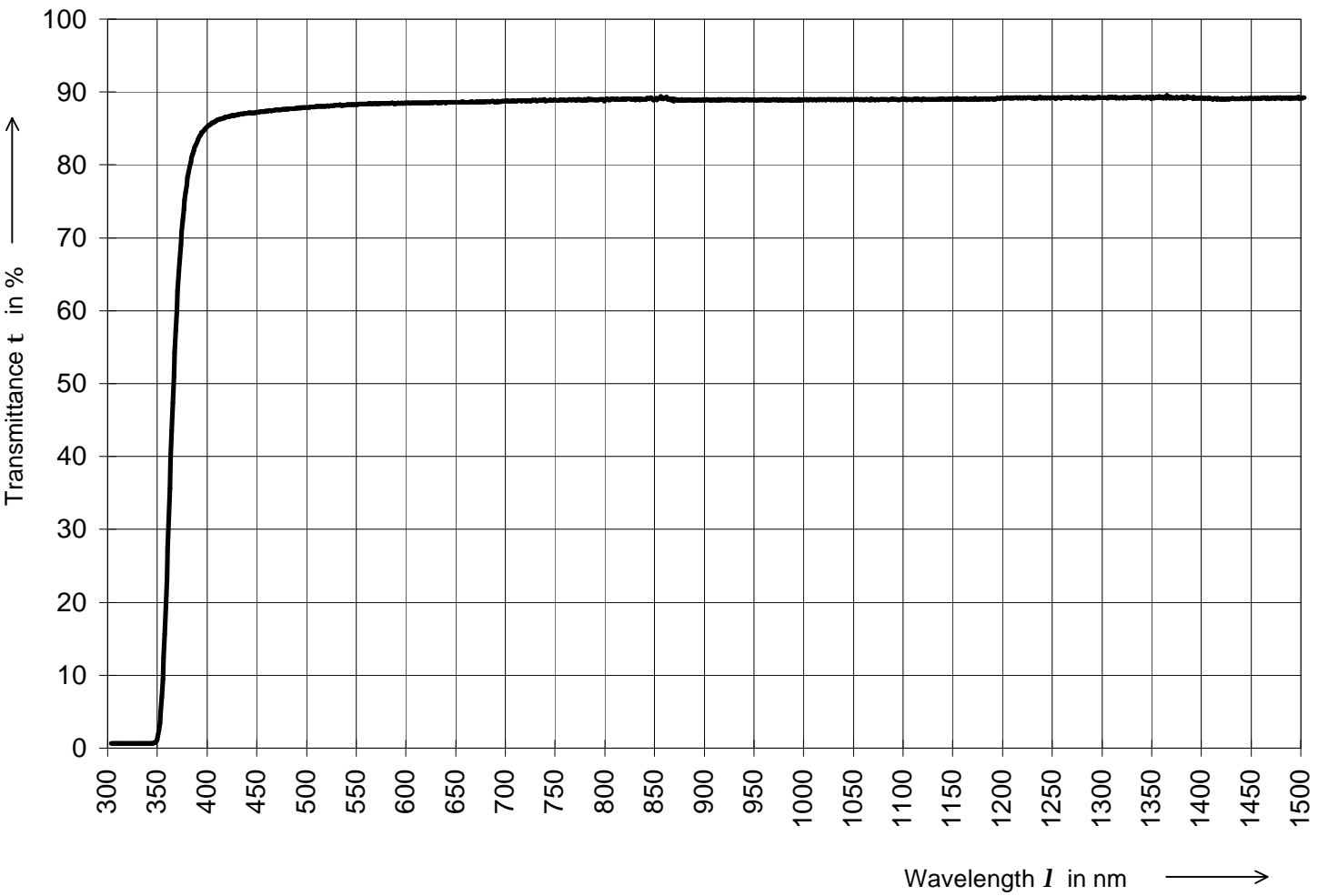
Specification

Physical and chemical properties

PCE - BK
D 0088

Spectral Transmittance

Type of Glass: SF 64
Thickness: 2.00 mm



Annex 3.3.1

Specification		PCE - BK																	
Physical and chemical properties		D 0088																	
Chemical toughening parameter																			
Glass and chemical toughening parameters																			
Transformation temperature	°C	578																	
Glass thickness	mm	2																	
Processing time	h	16																	
Processing temperature	°C	460																	
Salt bath (* weight percentages)	KNO ₃ in % *	99.5																	
	SiO ₂ x H ₂ O in % *	0.5																	
Chemical toughening results *																			
Penetration depth	µm	46																	
Birefringence	nm/cm	8450																	
* 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																	
<table border="1"> <caption>Data points from the Birefringence vs. Processing Temperature graph</caption> <thead> <tr> <th>Processing temperature (°C)</th> <th>Birefringence (nm/cm)</th> </tr> </thead> <tbody> <tr><td>380</td><td>4200</td></tr> <tr><td>400</td><td>5800</td></tr> <tr><td>420</td><td>6400</td></tr> <tr><td>440</td><td>8300</td></tr> <tr><td>460</td><td>8500</td></tr> <tr><td>480</td><td>7900</td></tr> <tr><td>500</td><td>6400</td></tr> </tbody> </table>				Processing temperature (°C)	Birefringence (nm/cm)	380	4200	400	5800	420	6400	440	8300	460	8500	480	7900	500	6400
Processing temperature (°C)	Birefringence (nm/cm)																		
380	4200																		
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420	6400																		
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