

Specification		PCE - BK	
Physical and chemical properties		D 1426 / D 1526	
1.	Optical properties		
1.1	Refractive indices (20°C)		
	Pretreatment of samples	n_g	1.5342
	[x] Condition as supplied (D 1426)	$n_{F'}$	1.5298
	[x] annealed at 40°C/h for bifocal (D 1526) *± 0,0003	n_F	1.5293
		n_e	1.5251 ± 0.001*
		n_d	1.5229
		n_D	1.5228
		$n_{C'}$	1.5205
		n_C	1.5201
1.1.1	Abbe value	n_e	56.5 ± 0.6
		n_d	56.7
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 $t_{15'}$	see annex	
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	< 0.001	< 0.001
	$t(I)_{\max}$ for the I - range 315 - 350 nm	5.2	1.8
	t_{380}	31.7	9.2
	$t(I)_{\min}$ for the I - range 450 - 650 nm	88	24.5
	$t(I)_{\min}$ for the I - range 500 - 650 nm	91	24.5
1.2.1.3	Edge wavelength ($d = 2.0$ mm)		
	Edge wavelength I_C ($t = 0.46$) in nm for $t_{0'}$	392	

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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}	$t_{0'}(t_0)$	91 ± 1	-				
	Dark state		$t_{15'}(t_1)$	25 ± 2	-				
	Regeneration	t_{vA}	$t_{R5'}$	-	67 ± 2				
			$t_{R10'}$	-	73 ± 2				
			$t_{R30'}$	-	80 ± 2				
	Darkening-fading curve for 23 °C			see annex					
	Luminous transmittance t_{vD65} in % in relationship to the thickness								
				$t_{0'}(t_0)$	$t_{15'}(t_1)$				
		2.0		91	25				
		3.0	Thickness in mm	91	20				
		4.0		90	15				
1.2.2.2	Shade N / Filter category ($d = 2.0$ mm)								
		N		5 - 1.1 < 2.5					
				$t_{0'}(t_0)$	$t_{15'}(t_1)$				
		Filter category		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		
	$t_{15'}$	◇	◇	17	25	39	57		
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	36	41	47	57		
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
	$t_{15'}$	25	27.5	30.5	37	52.5	83.5	91	91
	Diagram							see annex	

Form 0050/6B

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1.2.3	Special transmittance values in % ($d = 2.0$ mm)		
1.2.3.1	UV - transmittance for t_{15}		
		t_{UVA}	2.7
		t_{SUV}	1.0
		t_{SUVA}	1.5
		t_{SUVB}	< 0.05
1.2.3.2	IR - transmittance	t_{SIR}	$\geq t_{vD65}$
1.2.3.3	Solar blue - light transmittance	t_{sb}	23.8
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		
	Chromaticity coordinates	A x_{10}	0.321 ₂
		y_{10}	0.333 ₇
	Chromaticity coordinates (colour locus) are referred to the Standard Illuminant D ₆₅ according to CIE 10°-observer	B x_{10}	0.326 ₂
	for t_{15} (t_1) - for the time being they are only reference values	y_{10}	0.332 ₂
	($d = 2.0$ mm) in view of the relative calibration possibility	C x_{10}	0.329 ₃
	In case of verification, the measured values may additionally deviate by the measuring uncertainty of the used measuring devices.	y_{10}	0.337 ₇
	part of chromaticity coordinates	D x_{10}	0.324 ₃
		y_{10}	0.339 ₁
			see annex
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
1.3.4	Yellowness index ($d = 10$ mm)		
		Y_i	\diamond

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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
	Annealing point	13.0
	Softening point	7.6
	Forming temperature	6.0
	Forming temperature	5.0
	Forming temperature	4.0
2.2	Transformation temperature <i>T_g</i> in °C	504
2.3	Coefficient of mean linear thermal expansion <i>a</i> (20°C-300°C) in 10 ⁻⁶ K ⁻¹ (Static measurement)	6.5
2.4	Fuseability	
	Stress-free fusing with lower segments from SCHOTT DESAG, listed in the margin is possible with a maximum birefringence of 70 nm/cm measured 0.5 mm from the fusing area in the major blank.	V 512 V 513
2.5	Mean specific heat capacity <i>c_p</i>(20°C-100°C) in J/(g · K)	◇

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3.	Mechanical properties	
3.1	Density r in g/cm³	2.41
3.2	Stress optical coefficient C in 1.02×10^{-12} m²/N	3.48
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	390
	Processing time t in h	16
	Compressive stress D_s as birefringence in nm/cm	3930
	Penetration depth Nz up to neutral zone in µm	63
	Further information	see annex
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

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Physical and chemical properties		D 1426 / D 1526	
4.	Chemical properties		
4.1	Hydrolytic resistance acc. to DIN ISO 719		
	Hydrolytic class	HGB 3	
	Equivalent of alkali (Na ₂ O) per gram of glass grains in µg/g	105	
4.2	Acid resistance acc. to DIN 12 116		
	Acid class	4	
	Half surface weight loss after 6 hours in mg/dm ²	200	
4.3	Alkali resistance acc. to DIN ISO 695		
	Class	A 3	
	Surface weight loss after 3 hours in mg/dm ²	350	
5.	Electrical properties		disregard
6.	Other properties		
6.1	Anti-reflection processes		
	Luminous transmittance dark state $t_{15'}$ for $d = 2.0$ mm in relationship of the additional heat treatment		
	temperature/time	$t_{15'}$ in %	
	additional heat treatment	275°C/30'	25
	Additional heat treatment		
	The sample is put on a kaolin plate (room temperature) and then placed in a box furnace, in which the treatment temperature is already existing.		
	After the specified time, the sample and the kaolin plate are taken out and immediately put on a cold (room temperature) kaolin plate for rapid cooling.		
7.	Annex (diagrams, curves)		

Form 0050/6B

Specification

Physical and chemical properties

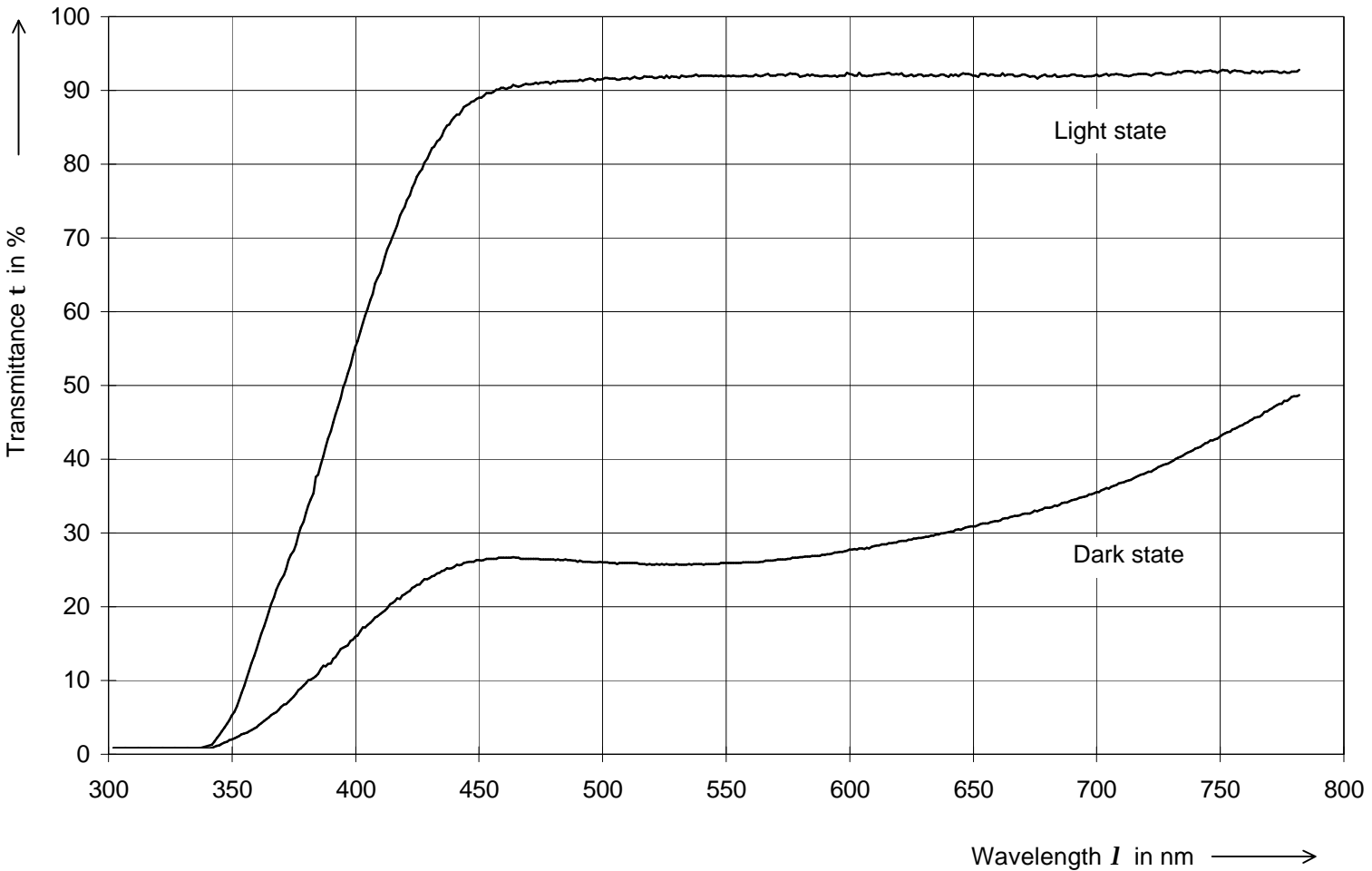
PCE - BK

D 1426 / D 1526

Spectral Transmittance

Type of Glass: PHOTOSOLAR[®] SUPERGREY

Thickness: 2 mm

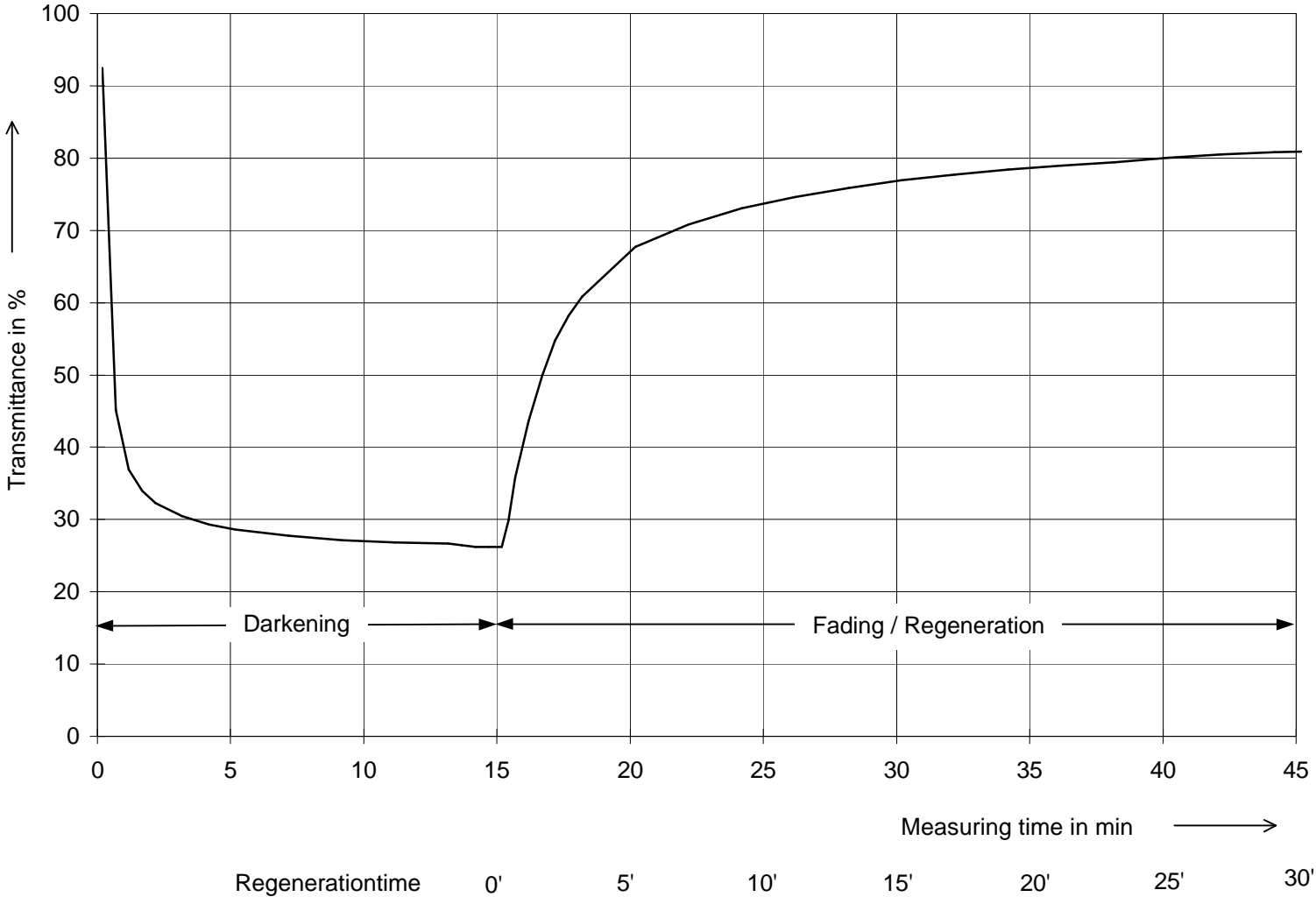


Specification
Physical and chemical properties

PCE - BK
D 1426 / D 1526

Darkening - Fading - Curve

Type of Glass: PHOTOSOLAR[®] SUPERGREY
Thickness: 2 mm



Specification

Physical and chemical properties

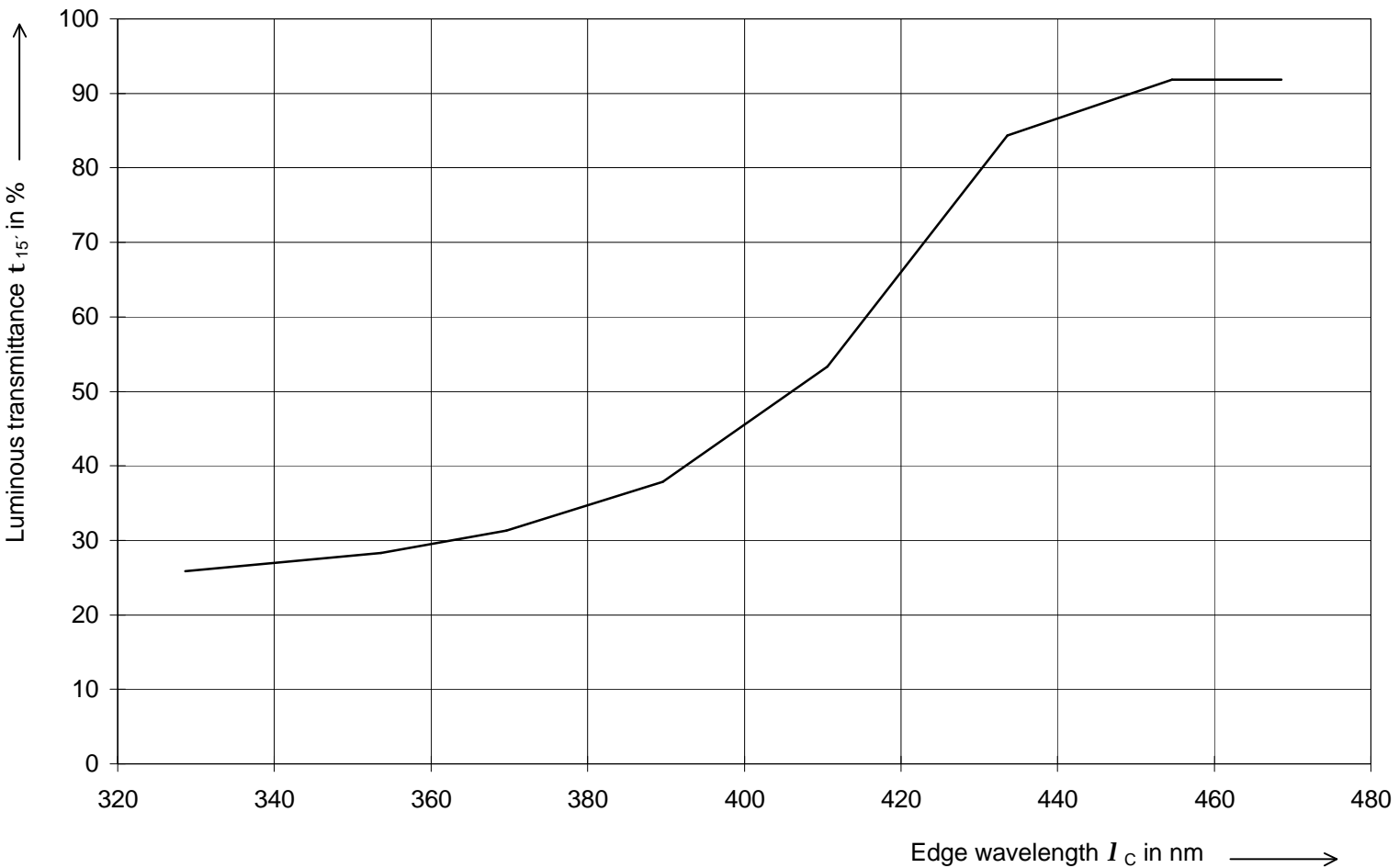
PCE - BK

D 1426 / D 1526

Luminous transmittance dark state in relationship to the variation the excitation spektrum (sharp cut filter)

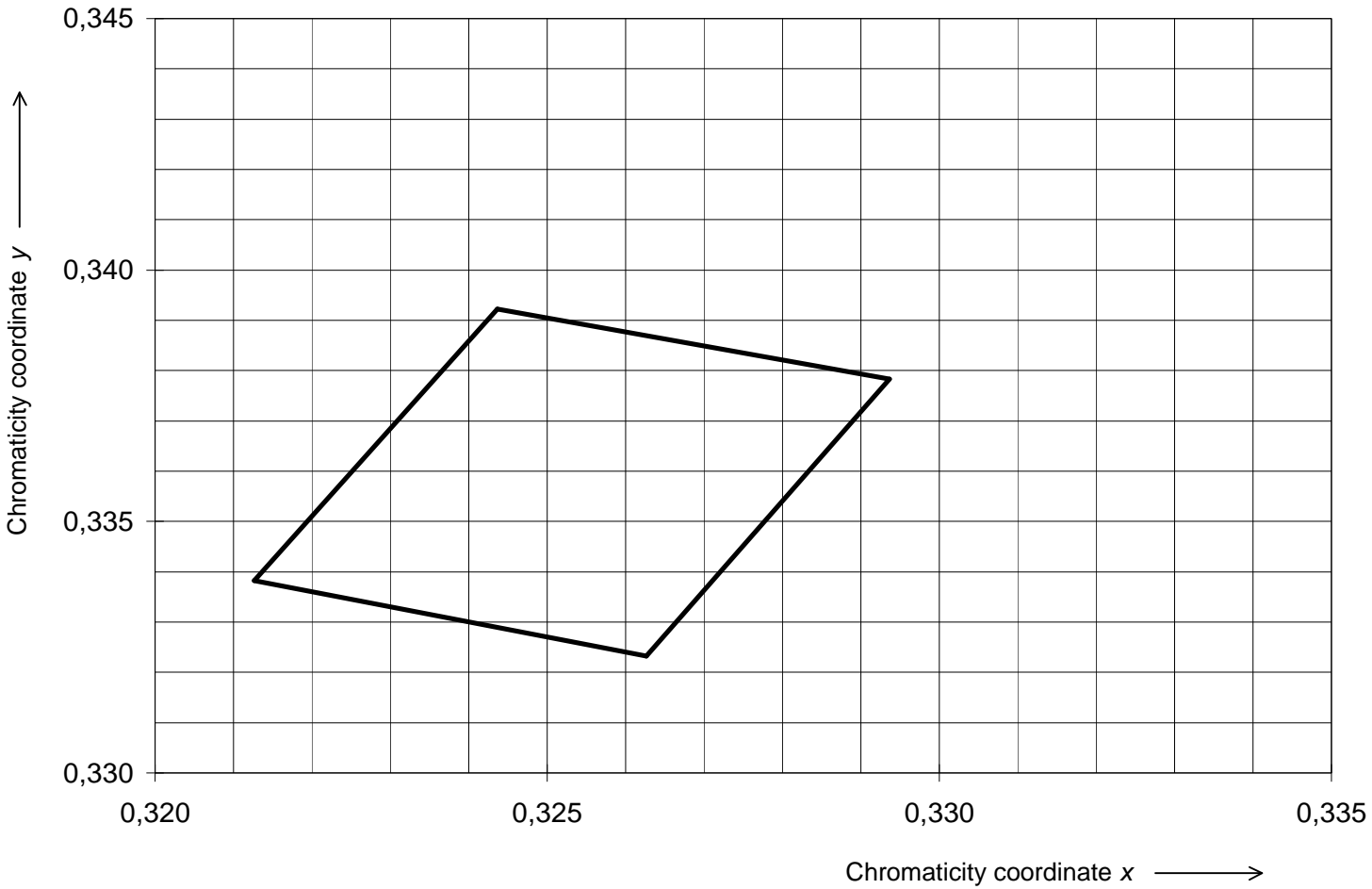
Type of Glass: PHOTOSOLAR^â SUPERGREY

Thickness: 2 mm



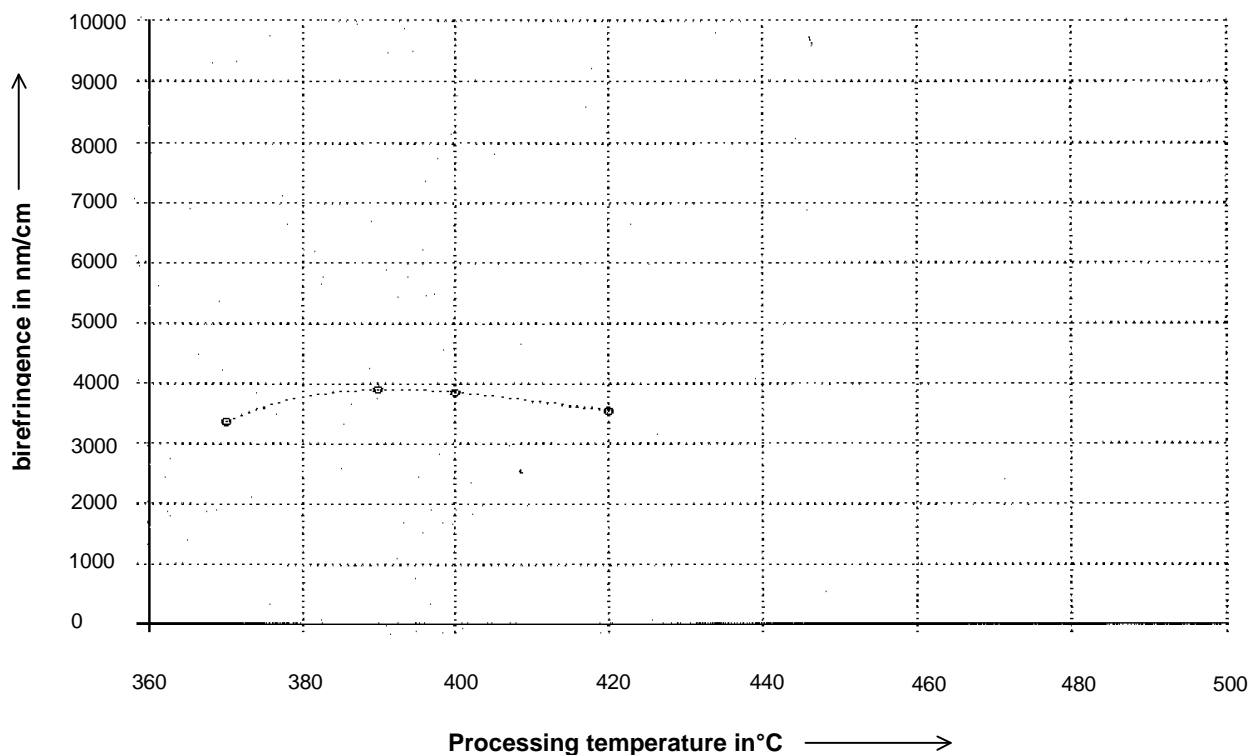
Chromaticity Coordinates

Type of Glass: PHOTOSOLAR[®] SUPERGREY
Thickness: 2 mm



Annex 3.3.1

Specification		PCE - BK	
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Chemical toughening parameter			
Glass and chemical toughening parameters			
Transformation temperature	°C	504	
Glass thickness	mm	2	
Processing time	h	16	
Processing temperature	°C	390	
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	63	
Birefringence	nm/cm	3930	
* measured across at a sample piece ground down to 0.3 mm ± 0.05 mm			
Ball drop test acc. FDA	% failed	passed	
Ball drop test acc. DIN	% failed	not carried out	



Form 0050/6B