

Specification Physical and chemical properties	PCE B 270 Superwite		
<table><tr><td>B 270 Superwite</td><td>D 0092</td></tr></table> <p>B 270 Superwite is a clear high transmission crown glass (modified soda-lime glass) available in form of sheets, optical rods, profiled rods, strips and chain moulded rod.</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". We retain 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> <p>Date of release: 23 June 2004</p>		B 270 Superwite	D 0092
B 270 Superwite	D 0092		

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Specification		PCE	
Physical and chemical properties		B 270 Superwite	
1.	Optical properties		
1.1	Refractive indices (20 °C)		
	Pretreatment of samples	n_g	1.5341
	annealed at 40 °C/h	$n_{F'}$	1.5297
		n_F	1.5292
		n_e	1.5251 ± 0.001*
		n_d	1.5230
		n_D	1.5229
	* ± 0.0003 upon request	$n_{C'}$	1.5207
		n_C	1.5203
	Further refractive indices in UV and IR (reference values)		see annex
1.1.1	Abbe value	n_e	58.3 ± 0.6
		n_d	58.5
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 and $d = 15$ mm ($I = 280$ nm to 650 nm)		see annex
	$d = 2.0$ mm and $d = 15$ mm ($I = 280$ nm to 2000 nm)		see annex
1.2.1.2	$t(I)$ - individual values in %		see annex
1.2.1.3	Edge wavelength ($d = 2.0$ mm)		
	Edge wavelength	$I_c(t = 0.46)$ in nm	312
	Solarization refer to 6.2		
	Additional data	$I_s(t = 0.05)$ in nm	294
		$I_p(t = 0.85)$ in nm	340
1.2.2	Luminous transmittance t_v		
1.2.2.1	Luminous transmittance as a function of thickness		
	thickness in mm	t_{vD65} in %	t_{vA} in %
	2.0	91.7	91.7
	4.0	91.6	91.6
	15.0	91.0	91.0

Specification		PCE	
Physical and chemical properties		B 270 Superwite	
1.2.3	Special transmittance values in % ($d = 2.0$ mm)		
1.2.3.1	UV - transmittance	t_{UVA}	84
		t_{UVB}	19
1.2.3.2	IR - transmittance	t_A	92.5
1.2.3.3	Solar direct transmittance	t_e	91.4
1.3	Colour		
1.3.1	Visual evaluation	disregard	
1.3.2	Colorimetry ($d = 2.0$ mm)		
		D_{65} x	0.314
		y	0.332
	Chromaticity coordinates (colour locus) are referred to the named Standard Illuminant according to CIE 2°-observer	A x	0.448
		y	0.408
1.3.3		disregard	
1.3.4	General colour rendering index R_a ($d = 2.0$ mm)	100	

Specification		PCE	
Physical and chemical properties		B 270 Superwite	
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	511 (~952 °F)	
Annealing point	13.0	541 (~1006 °F)	
Softening point	7.6	724 (~1335 °F)	
Forming temperature	6.0	827 (~1521 °F)	
Forming temperature	5.0	915 (~1679 °F)	
Forming temperature	4.0	1033 (~1891 °F)	
2.2 Transformation temperature <i>T_g</i> in °C			533 (~991 °F)
2.3 Coefficient of thermal expansion <i>a</i>			
2.3.1 Coefficient of mean linear thermal expansion			
<i>a</i> in 10 ⁻⁶ K ⁻¹ for the indicated temperature range (static measurement)			
		<i>a</i> (20 °C;300 °C)	9.4
		<i>a</i> (20 °C;200 °C)	9.0
		<i>a</i> (20 °C;100 °C)	8.2
2.3.2 Coefficient of mean linear thermal expansion			
<i>a</i> in 10 ⁻⁶ K ⁻¹ for the indicated temperature range (dynamic measurement)			
		<i>a</i> (20 °C;100 °C)	7.8
		<i>a</i> (20 °C;150 °C)	8.4
		<i>a</i> (20 °C;200 °C)	8.8
		<i>a</i> (20 °C;250 °C)	9.1
		<i>a</i> (20 °C;300 °C)	9.4
		<i>a</i> (20 °C;350 °C)	9.6
		<i>a</i> (20 °C;400 °C)	9.8
		<i>a</i> (20 °C;450 °C)	10.0
		<i>a</i> (20 °C;500 °C)	10.3

Specification		PCE
Physical and chemical properties		B 270 Superwite
2.3.3	Coefficient of mean linear thermal expansion <i>a</i> in 10 ⁻⁶ K ⁻¹ for the mentioned temperature intervals (dynamic measurement)	see annex
2.4	Fuseability <hr/> Stress-free fusion with suitable lower segments out of our product range is possible.	
2.5	Mean specific heat capacity <i>c_p</i> (20 °C to 100 °C) in J/ (g·K)	0.86
2.6	Thermal conductivity <i>l</i> in W/ (m·K) for the indicated temperatures <hr/>	
	<i>J</i> = 24.5 °C	0.92
	<i>J</i> = 89 °C	1.01
	<i>J</i> = 127 °C	1.08
	<i>J</i> = 167 °C	1.15
2.7	Specific thermal stress <i>j</i> in N/ (mm²·K)	0.86

Specification		PCE
Physical and chemical properties		B 270 Superwite
3.	Mechanical properties	
3.1	Density r in g/cm³	2.55
3.2	Stress optical coefficient C in 1.02×10^{-12} m²/N	2.7
3.3	Breaking strength	
	Admissible value for the bending strength σ_{zul} of technically annealed glasses as calculation basis (air) in N/mm ²	30
	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	420
	Processing time t in h	16
	Compressive stress Ds as birefringence in nm/cm	7200
	Penetration depth Nz up to neutral zone in μ m	48
	Further information	see annex
3.3.2	Thermal toughening	
	Recommended minimum thickness d in mm for toughened safety glass for building purposes according to DIN 1249 T10 - 1990	4.0
3.4	Young's modulus E in kN/mm²	71.5
3.5	Poisson's ratio m	0.219
3.6	Torsion modulus G in kN/mm²	29.3
3.7	Knoop hardness HK_{100}	542

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Specification		PCE	
Physical and chemical properties		B 270 Superwite	
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		170
4.2	Acid resistance acc. to DIN 12 116		
		Acid class	S 2
	Half surface weight loss after 6 hours in mg/dm ²		1.4
4.3	Alkali resistance acc. to DIN ISO 695		
		Class	A 2
	Surface weight loss after 3 hours in mg/dm ²		140
5.	Electrical properties		
5.1	Dielectric constant (Permittivity) ϵ_r at 1 MHz		7.0
5.2	Dissipation factor $\tan d$ bei 1 MHz		$30 \cdot 10^{-4}$
5.3	Electric volume resistivity r_D in W · cm		
	at the specified temperatures		
5.3.1	r_D for alternating current 50 Hz and 3 kHz		
		$J = 1260 \text{ °C}$	10.2
		$J = 1386 \text{ °C}$	6.8
5.3.2	r_D for direct current		
		$J = 250 \text{ °C}$	10^9
		$J = 350 \text{ °C}$	$1.6 \cdot 10^7$
		$J = 400 \text{ °C}$	$2 \cdot 10^6$
5.4	Temperature t_{k100} in °C for a specific electric volume resistivity of $10^8 \text{ W} \cdot \text{cm}$		301

Specification		PCE
Physical and chemical properties		B 270 Superwite
6. Other properties		
6.1 Lead equivalent in mm Pb at 15 mm glass thickness for X-rays		
Tube voltage 50 kV/0.16 mm Cu total filtering		0.24
Tube voltage 80 kV/0.16 mm Cu total filtering		0.32
Tube voltage 110 kV/0.40 mm Cu total filtering		0.33
Tube voltage 150 kV/0.70 mm Cu total filtering		0.27
Measuring and Test Procedures		
<p>For X-radiation (constant voltage) the lead equivalent is defined by the total filtering specified in the table (refer also to DIN 6845).</p> <p>The exposed area has a diameter of 50 mm. The absorption of radiation in the sample piece is compared to lead absorbers of such a thickness that the same attenuation of the dose performance is reached in both cases.</p> <p>As detector, a scintillation dosimeter (scintillator 44 mm diameter, 15 mm height) is used.</p> <p>The measuring inaccuracy is ± 0.03 mm.</p>		
6.2 Solarization		
Shifting of the edge wavelength I_c ($t = 0.46$) after UV-radiation in the direction of longer wavelength	ΔI_c in nm	2
Measuring and Test Procedures		
<p>The sample will be irradiated with a UV - F 400 floodlamp. The irradiation time amounts to 7h; the distance between floodlamp and samplefastening is 14 cm.</p>		
7. Annex (diagrams, curves)		

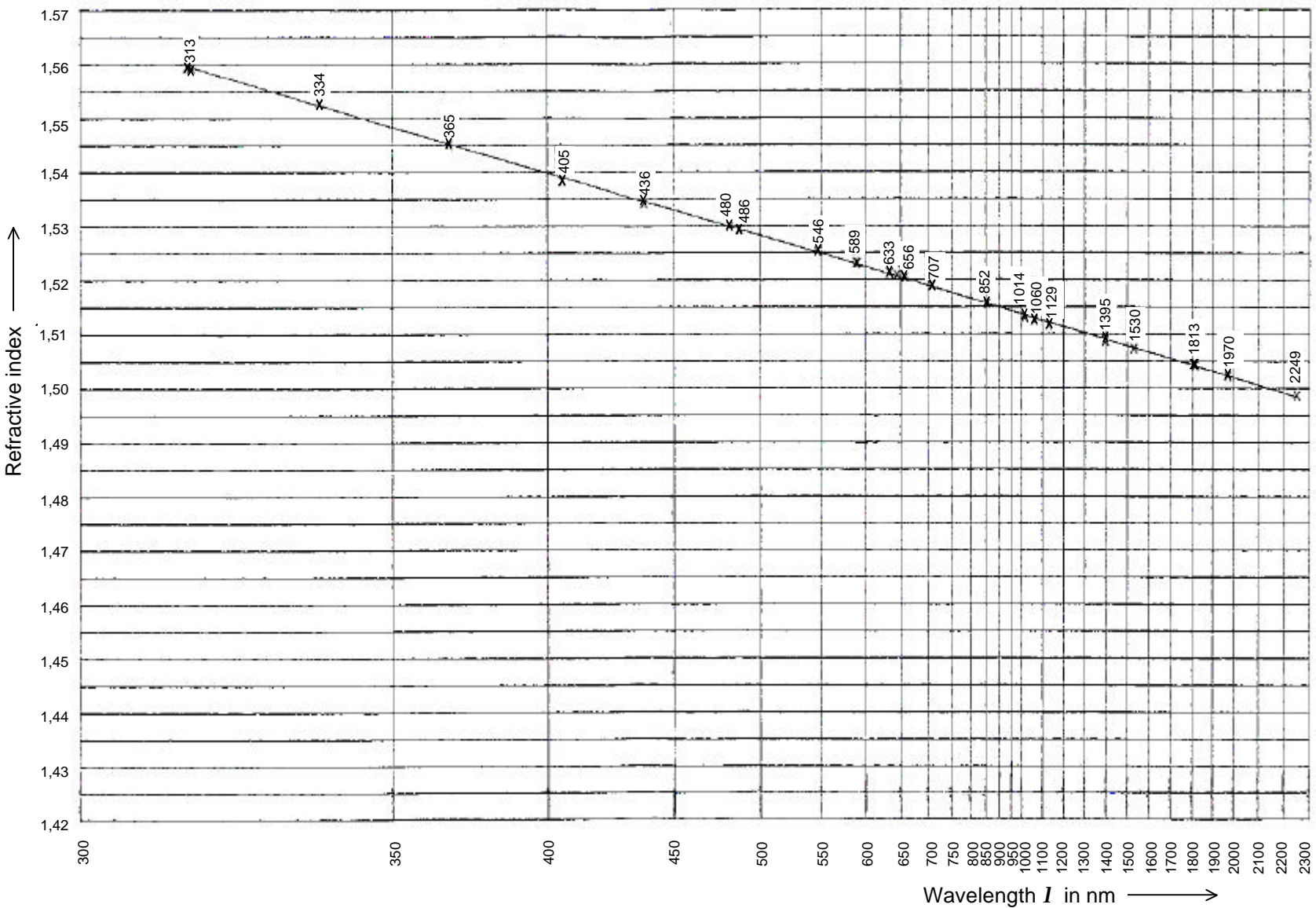
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Specification

Physical and chemical properties

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B 270 Superwite

Refractive indices of B 270 Superwite in relationship to the wavelength



Annex 1.2.1.1

Specification

Physical and chemical properties

PCE

B 270 Superwhite

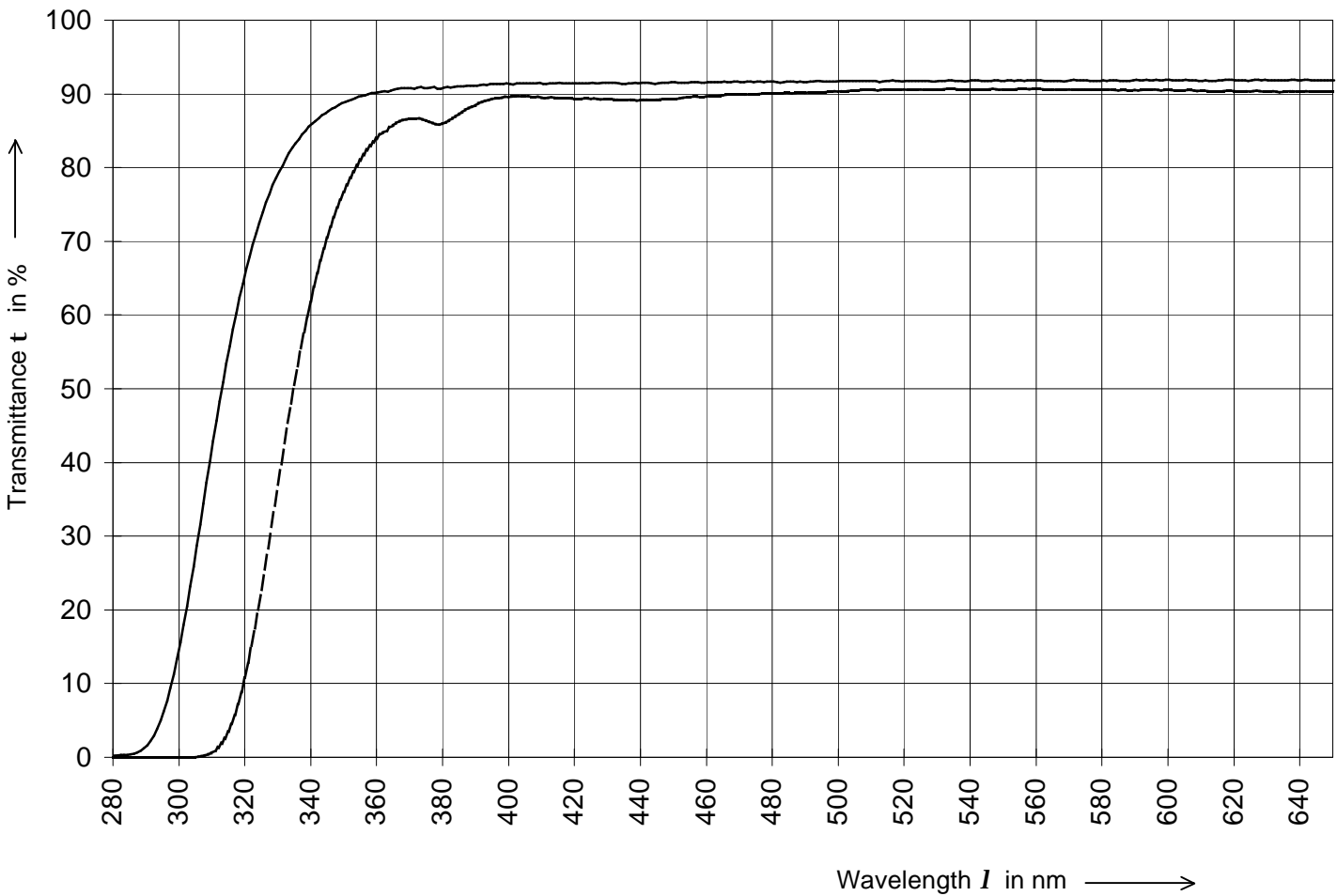
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Spectral Transmittance

Type of Glass: B 270 Superwhite

Thickness: 2.0 mm ———

Thickness: 15.0 mm - - - - -



Annex 1.2.1.1

Specification

Physical and chemical properties

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B 270 Superwite

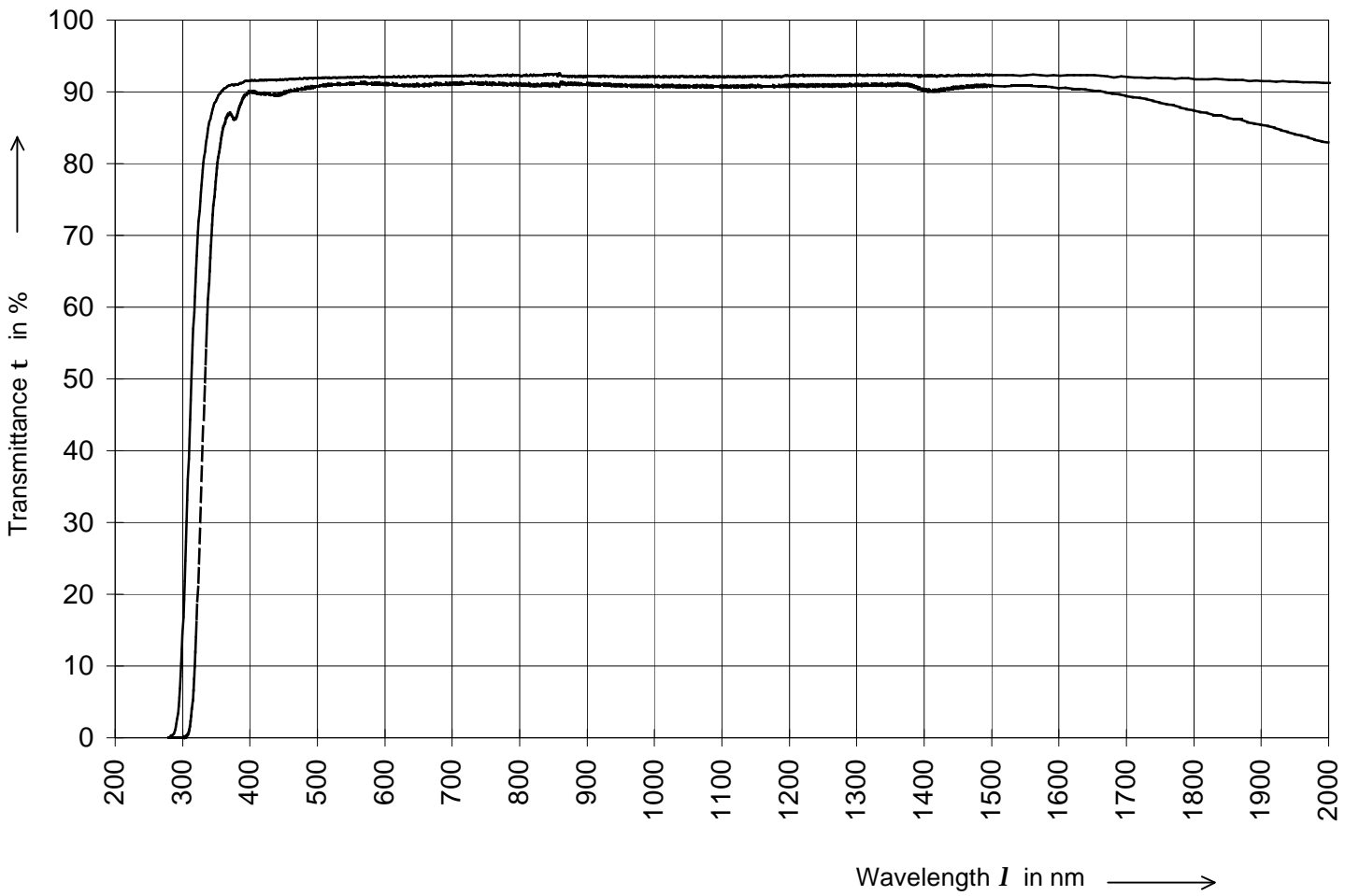
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Spectral Transmittance

Type of Glass: B 270 Superwite

Thickness: 2.0 mm —————

Thickness: 15.0 mm - - - - -



Annex 1.2.1.2

Specification											PCE			
Physical and chemical properties											B 270 Superwite			
Spectral transmittance $t(l)$ in % for the named thickness														
l in nm	thickness in mm													
	1	2	3	4	5	6	7	8	9	10	15	20	25	30
300	35.1	13.5	5.2	2.0	0.8	0.3	0.1	0.0	0.0	0.0				
310	60.0	39.6	26.1	17.2	11.4	7.5	4.9	3.3	2.2	1.4				
320	76.0	63.4	52.9	44.1	36.8	30.7	25.6	21.4	17.8	14.9	10.9	5.4	2.6	1.3
330	84.2	77.8	71.8	66.3	61.3	56.6	52.3	48.3	44.6	41.2	34.6	25.0	18.1	13.1
340	88.0	84.9	81.9	79.0	76.3	73.6	71.0	68.5	66.1	63.8	59.6	51.8	44.9	39.0
350	89.8	88.4	87.1	85.7	84.4	83.1	81.8	80.6	79.3	78.1	75.1	70.4	65.9	61.8
360	90.6	89.9	89.2	88.5	87.9	87.2	86.5	85.9	85.2	84.6	83.0	80.4	77.8	75.4
370	90.8	90.4	89.9	89.4	89.0	88.5	88.0	87.6	87.1	86.7	85.6	83.8	82.0	80.3
380	90.9	90.4	90.0	89.5	89.1	88.6	88.1	87.7	87.2	86.8	85.4	83.6	81.7	79.9
390	91.2	91.0	90.7	90.5	90.3	90.1	89.9	89.7	89.5	89.2	88.6	87.7	86.8	85.9
400	91.3	91.2	91.0	90.9	90.7	90.6	90.5	90.3	90.2	90.0	89.5	88.9	88.2	87.6
410	91.3	91.2	91.1	91.0	90.8	90.7	90.6	90.4	90.3	90.2	89.7	89.1	88.5	87.9
420	91.4	91.2	91.1	91.0	90.8	90.7	90.6	90.4	90.3	90.2	89.6	88.9	88.3	87.7
430	91.4	91.2	91.1	91.0	90.8	90.7	90.6	90.4	90.3	90.2	89.4	88.8	88.1	87.4
440	91.4	91.3	91.1	91.0	90.8	90.7	90.6	90.4	90.3	90.1	89.5	88.8	88.1	87.4
450	91.4	91.3	91.2	91.1	90.9	90.8	90.7	90.5	90.4	90.3	89.7	89.1	88.5	87.9
460	91.5	91.4	91.3	91.2	91.1	91.0	90.9	90.8	90.7	90.6	90.0	89.5	89.0	88.5
470	91.5	91.4	91.4	91.3	91.2	91.1	91.0	90.9	90.8	90.8	90.3	89.9	89.4	89.0
480	91.6	91.5	91.4	91.3	91.3	91.2	91.1	91.1	91.0	90.9	90.5	90.1	89.8	89.4
490	91.6	91.5	91.5	91.4	91.4	91.3	91.2	91.2	91.1	91.1	90.8	90.5	90.2	89.9
500	91.6	91.6	91.5	91.5	91.4	91.4	91.4	91.3	91.3	91.2	90.9	90.6	90.4	90.1
510	91.6	91.6	91.5	91.5	91.4	91.4	91.4	91.3	91.3	91.2	90.9	90.7	90.4	90.2
520	91.7	91.6	91.6	91.5	91.5	91.4	91.4	91.3	91.3	91.2	91.1	90.9	90.7	90.5
530	91.7	91.6	91.6	91.6	91.5	91.5	91.5	91.4	91.4	91.4	91.2	91.0	90.8	90.6
540	91.7	91.7	91.6	91.6	91.5	91.5	91.5	91.4	91.4	91.3	91.2	91.0	90.9	90.7
550	91.7	91.7	91.6	91.6	91.5	91.5	91.5	91.4	91.4	91.3	91.2	91.0	90.9	90.7
560	91.7	91.7	91.6	91.6	91.5	91.5	91.5	91.4	91.4	91.3	91.2	91.0	90.8	90.6
570	91.7	91.7	91.6	91.6	91.5	91.5	91.5	91.4	91.4	91.3	91.2	91.0	90.8	90.6
580	91.7	91.7	91.6	91.6	91.5	91.5	91.5	91.4	91.4	91.3	91.1	90.9	90.6	90.4
590	91.7	91.7	91.6	91.6	91.5	91.5	91.5	91.4	91.4	91.3	91.0	90.8	90.5	90.3
600	91.7	91.7	91.6	91.6	91.5	91.5	91.5	91.4	91.4	91.3	90.9	90.7	90.4	90.1
610	91.7	91.7	91.6	91.5	91.5	91.4	91.3	91.3	91.2	91.1	90.9	90.6	90.3	90.0
620	91.7	91.7	91.6	91.5	91.5	91.4	91.3	91.3	91.2	91.1	90.8	90.4	90.0	89.7
630	91.8	91.7	91.6	91.5	91.5	91.4	91.3	91.3	91.2	91.1	90.7	90.3	90.0	89.6
640	91.7	91.7	91.6	91.5	91.4	91.3	91.2	91.1	91.0	90.9	90.6	90.2	89.8	89.4
650	91.7	91.7	91.6	91.5	91.4	91.3	91.2	91.1	91.0	90.9	90.6	90.2	89.8	89.4
660	91.8	91.7	91.6	91.5	91.5	91.4	91.3	91.3	91.2	91.1	90.7	90.3	89.9	89.5
670	91.8	91.7	91.6	91.6	91.5	91.4	91.3	91.2	91.2	91.1	90.7	90.3	90.0	89.6
680	91.8	91.7	91.6	91.6	91.5	91.4	91.3	91.2	91.2	91.1	90.7	90.3	90.0	89.6
690	91.8	91.7	91.6	91.6	91.5	91.4	91.3	91.2	91.2	91.1	90.8	90.4	90.1	89.7
700	91.8	91.7	91.6	91.6	91.5	91.4	91.3	91.2	91.2	91.1	90.8	90.4	90.1	89.7
710	91.8	91.7	91.6	91.6	91.5	91.4	91.3	91.2	91.2	91.1	90.8	90.4	90.1	89.7
720	91.8	91.7	91.6	91.6	91.5	91.4	91.3	91.2	91.2	91.1	90.8	90.4	90.1	89.7
730	91.8	91.8	91.7	91.6	91.6	91.5	91.4	91.4	91.3	91.2	90.8	90.4	90.1	89.7
740	91.8	91.8	91.7	91.6	91.6	91.5	91.4	91.4	91.3	91.2	90.8	90.4	90.1	89.7
750	91.8	91.8	91.7	91.6	91.6	91.5	91.4	91.4	91.3	91.2	90.8	90.4	90.1	89.7
760	91.8	91.8	91.7	91.6	91.6	91.5	91.4	91.4	91.3	91.2	90.8	90.4	90.1	89.7
770	91.8	91.8	91.7	91.6	91.6	91.5	91.4	91.4	91.3	91.2	90.8	90.4	90.0	89.6
780	91.8	91.7	91.7	91.6	91.5	91.4	91.3	91.2	91.1	91.1	90.7	90.3	89.9	89.5
790	91.9	91.8	91.7	91.6	91.6	91.5	91.4	91.4	91.3	91.2	90.7	90.2	89.8	89.4
800	91.8	91.8	91.7	91.6	91.5	91.4	91.3	91.2	91.1	91.0	90.6	90.2	89.7	89.3

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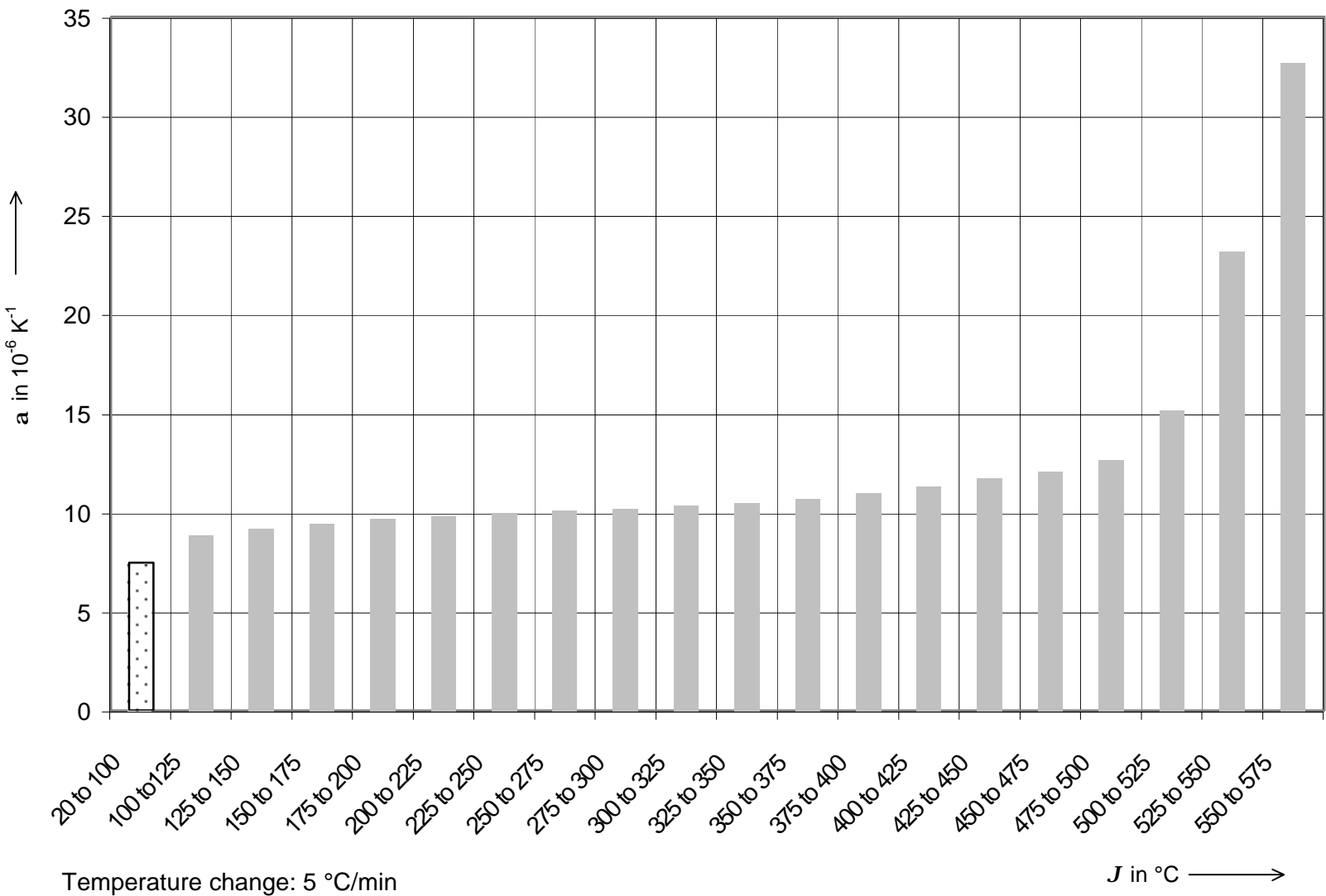
Specification

Physical and chemical properties

PCE

B 270 - Superwite

Coefficient of mean thermal expansion a at continuously increasing temperature, in steps of 25°



Annex 3.3.1

Specification		PCE													
Physical and chemical properties		B 270 Superwite													
Chemical toughening parameter															
Glass and chemical toughening parameters															
Transformation temperature	°C	533													
Glass thickness	mm	3													
Processing time	h	16													
Processing temperature	°C	420													
Salt bath (* weight percentages)	KNO ₃ in % *	99.5													
	SiO ₂ x H ₂ O in % *	0.5													
Chemical toughening results *															
Penetration depth	µm	48													
Birefringence	nm/cm	7200													
* 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>360</td> <td>3500</td> </tr> <tr> <td>400</td> <td>7200</td> </tr> <tr> <td>420</td> <td>7400</td> </tr> <tr> <td>440</td> <td>6200</td> </tr> <tr> <td>480</td> <td>2800</td> </tr> </tbody> </table>				Processing temperature (°C)	Birefringence (nm/cm)	360	3500	400	7200	420	7400	440	6200	480	2800
Processing temperature (°C)	Birefringence (nm/cm)														
360	3500														
400	7200														
420	7400														
440	6200														
480	2800														

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