

<b>Specification</b> Physical and chemical properties	PCP D 263 M
<p><b>D 263 M - Cover Glass</b></p> <p><b>D 0089 .</b></p> <p>D 263 M (cover glass) is a clear borosilicate glass of high chemical resistance. In medical and biological research it is used as microscopic cover glass for preparations.</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 <math>\diamond</math> 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 <b>customer agreement</b>.</p>	

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<b>Specification</b>		<b>PCP D 263-M</b>	
Physical and chemical properties			
<b>1. Optical properties</b>			
<b>1.1 Refractive indices (Condition as supplied)</b>			
		$n_e$	1.5255 ± 0.0015
		$n_D$	1.5230
<b>1.1.1</b>	<b>Abbe value</b>	$v_e$	55
<b>1.2 Transmittance data</b>			
<b>1.2.1 Spectral transmittance <math>\tau(\lambda)</math></b>			
<b>1.2.1.1</b>	<b><math>\tau(\lambda)</math> - curve</b>		
Plot of spectral transmittance $\tau(\lambda)$ for $d = 0.15$ mm ( $\lambda = 280$ nm to 800 nm)		see annex	
<b>1.2.1.2</b>	<b><math>\tau(\lambda)</math> - individual values (<math>d = 0.15</math> mm)</b>		
		$\lambda$ in nm	$\tau(\lambda)$ in %
		380	90.4
		632.8	91.8
		1064	92.0
<b>1.2.1.3</b>	<b>Edge wavelength (<math>d = 0.15</math> mm)</b>		
Edge wavelength		$\lambda_c$ ( $\tau = 0.46$ ) in nm	312
<b>1.2.2</b>	<b>Luminous transmittance <math>\tau_{VD65}</math> in % (<math>d = 0.15</math> mm)</b>		91.7 ± 0.3

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Physical and chemical properties		<b>D 263 M</b>
<b>2.</b>	<b>Thermal properties</b>	
<b>2.1</b>	<b>Viscosities and corresponding temperatures</b>	
	Designation	Viscosity lg $\eta$ in dPas
		Temperature $\vartheta$ 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
<b>2.2</b>	<b>Transformation temperature <math>T_g</math> in °C</b>	557
<b>2.3</b>	<b>Coefficient of thermal expansion <math>\alpha</math></b>	
<b>2.3.1</b>	<b>Coefficient of mean linear thermal expansion <math>\alpha(20\text{ °C};300\text{ °C})</math> in <math>10^{-6}\text{ K}^{-1}</math> (Static measurement)</b>	7.2
<b>2.4</b>	<b>Fuseability</b>	◇
<b>2.5</b>	<b>Mean specific heat capacity <math>c_p(20\text{ °C to }100\text{ °C})</math> in <math>\text{J}/(\text{g} \cdot \text{K})</math></b>	0.82

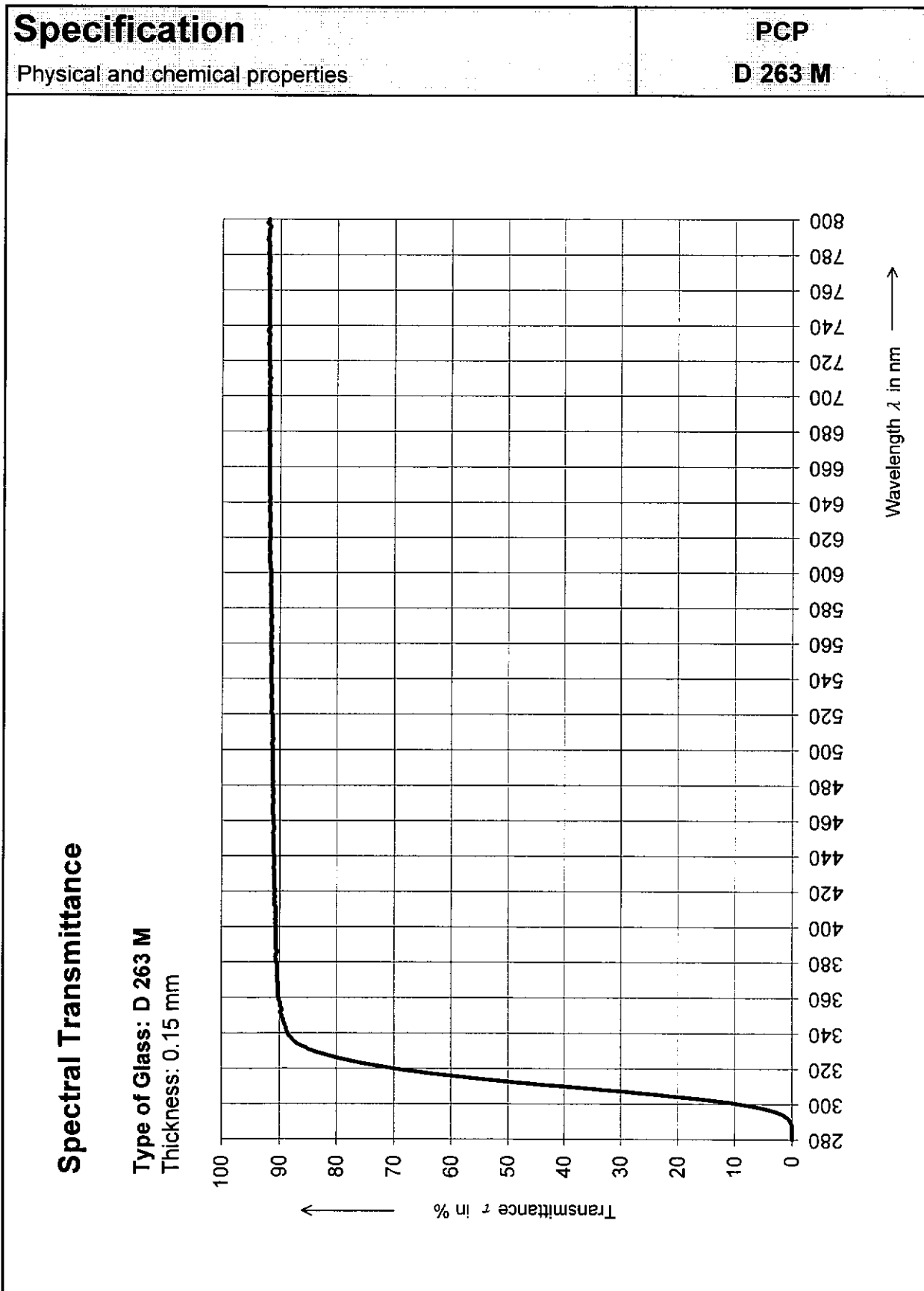
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<b>Specification</b>		<b>PCP</b>
Physical and chemical properties		<b>D 263 M</b>
<b>3.</b>	<b>Mechanical properties</b>	
<b>3.1</b>	<b>Density <math>\rho</math> in g/cm<sup>3</sup> (annealed at 40 °C/h)</b>	2.51
<b>3.2</b>	<b>Stress optical coefficient <math>C</math> in <math>1.02 \cdot 10^{-12}</math> m<sup>2</sup>/N</b>	3.4
<b>3.3</b>	<b>Breaking strength</b>	
	A higher mechanical strength can be realized by chemical toughening according to the ion exchange procedure (refer to annex 3.3.1).	
<b>3.3.1</b>	<b>Chemical toughening (<math>d = 0.15</math> mm)</b>	
	Processing temperature $\vartheta$ in °C	410
	Processing time $t$ in h	4
	Compressive stress $D_s$ as birefringence in nm/cm	6800
	Penetration depth $Nz$ up to neutral zone in $\mu$ m	36
	Further information	see annex
<b>3.4</b>	<b>Young's modulus <math>E</math> in kN/mm<sup>2</sup></b>	72.9
<b>3.5</b>	<b>Poisson's ratio <math>\mu</math></b>	0.208
<b>3.6</b>	<b>Torsion modulus <math>G</math> in kN/mm<sup>2</sup></b>	30.1
<b>3.7</b>	<b>Knoop hardness <math>HK</math> 0.1/20</b>	590

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<b>Specification</b>		<b>PCP D 263 M</b>	
Physical and chemical properties			
<b>4. Chemical properties</b>			
<b>4.1 Hydrolytic resistance acc. to DIN ISO 719</b>			
		Hydrolytic class	HGB 1
Equivalent of alkali (Na <sub>2</sub> O) per gram of glass grains in µg/g			20
<b>4.2 Acid resistance acc. to DIN 12116</b>			
		Acid class	S 2
Half surface weight loss after 6 hours in mg/dm <sup>2</sup>			1.4
<b>4.3 Alkali resistance acc. to DIN ISO 695</b>			
		Class	A 2
Surface weight loss after 3 hours in mg/dm <sup>2</sup>			88
<b>4.4 Hazardous Substances</b>			
EC-directive 2002/95/EC (RoHS-directive)			
Test Items	RoHS Limit in mg/kg	Value* in mg/kg	
Cadmium (Cd)	100	< Limit	
Lead (Pb)	1000	< Limit	
Mercury (Hg)	1000	< Limit	
Hexavalent chromium (Cr(VI))	1000	< Limit	
Polybrominated biphenyls (Sum of PBBs)	1000	< Limit	
Polybrominated diphenyl ethers (Sum of PBDEs)	1000	< Limit	
* Test Report SGS INSTITUTE			
<b>5. Electrical properties</b>			
<b>5.1 Dielectric constant (Permittivity) <math>\epsilon_r</math> at 1 MHz</b>		6.7	
<b>5.2 Dissipation factor <math>\tan \delta</math> at 1 MHz</b>		61 · 10 <sup>-4</sup>	
<b>5.3 Electric volume resistivity <math>\rho_D</math> in <math>\Omega \cdot \text{cm}</math> at the specified temperatures</b>			
<b>5.3.1 <math>\rho_D</math> for alternating current 50 Hz</b>			
		$\vartheta = 250^\circ\text{C}$	1.6 · 10 <sup>8</sup>
		$\vartheta = 350^\circ\text{C}$	3.5 · 10 <sup>6</sup>
<b>6. Other properties</b>		disregard	
<b>7. Annex (diagrams, curves)</b>			

Annex 1.2.1.1



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Annex 3.3.1

<b>Specification</b>		<b>PCP D 263 M</b>															
Physical and chemical properties																	
<b>Chemical toughening parameter</b>																	
<b>Glass and chemical toughening parameters</b>																	
Transformation temperature	°C	557															
Glass thickness	mm	0.15															
Processing time	h	4															
Processing temperature	°C	410															
Salt bath (* weight percentages)	KNO <sub>3</sub> in % *	99.5															
	SiO <sub>2</sub> x H <sub>2</sub> O in % *	0.5															
<b>Chemical toughening results *</b>																	
Penetration depth	μm	36															
Birefringence	nm/cm	6800															
* 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>Birefringence vs Processing Temperature Data</caption> <thead> <tr> <th>Processing temperature (°C)</th> <th>Birefringence (nm/cm)</th> </tr> </thead> <tbody> <tr> <td>380</td> <td>5800</td> </tr> <tr> <td>400</td> <td>7000</td> </tr> <tr> <td>420</td> <td>6500</td> </tr> <tr> <td>440</td> <td>6200</td> </tr> <tr> <td>460</td> <td>5000</td> </tr> <tr> <td>480</td> <td>3800</td> </tr> </tbody> </table>				Processing temperature (°C)	Birefringence (nm/cm)	380	5800	400	7000	420	6500	440	6200	460	5000	480	3800
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