

Specification Physical and chemical properties	PCP D 263™ T eco
<p data-bbox="236 548 727 600">D 263™ T_{eco} - Thin Glass</p> <p data-bbox="1075 555 1251 600">D 0289 2</p> <p data-bbox="236 689 963 824">D 263™ T eco (thin glass) is a clear borosilicate glass of high chemical resistance. The characteristics of this special composition substrate glass make it suitable for a variety of applications, i. e.</p> <ul data-bbox="236 904 676 1115" style="list-style-type: none">- Touch control panel- LCD- Electroluminescent displays- Solar cells- Micro scales for measuring devices- Glass substrate for coatings <p data-bbox="236 1173 900 1240">This glass meets the latest environmental requirements of our customers.</p> <p data-bbox="236 1635 1465 1787">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 data-bbox="236 1823 1203 1859">Values marked with \diamond do not apply to the type of glass or no values are available.</p> <p data-bbox="236 1899 1474 1935">Requirements deviating from these specifications must be defined in writing in a customer agreement.</p>	

VX 0050/1e

Specification		PCP	
Physical and chemical properties		D 263™ T eco	
1.	Optical properties		
1.1	Refractive indices		
	Pretreatment of samples	n_g	1.5354
	Condition as supplied	$n_{F'}$	1.5305
	["as drawn"]	n_F	1.5300
		n_e	1.5255 ± 0.0015
		n_d	1.5231
		n_D	1.5230
		$n_{C'}$	1.5209
		n_C	1.5204
1.1.1	Abbe value	v_e	55
1.2	Transmittance data		
1.2.1	Spectral transmittance $\tau(\lambda)$		
1.2.1.1	$\tau(\lambda)$ - curve		
	Plot of spectral transmittance $\tau(\lambda)$ for $d = 0.15$ mm ($\lambda = 250$ nm to 2000 nm) $d = 0.40$ mm ($\lambda = 280$ nm to 800 nm)		see annex see annex
1.2.1.2	$\tau(\lambda)$ - individual values ($d = 1.1$ mm)		
		λ in nm	$\tau(\lambda)$ in %
		380	89.8
		632.8	91.8
		1064	92.0
1.2.1.3	Edge wavelength ($d = 1.1$ mm)		
	Edge wavelength	$\lambda_c (\tau = 0.46)$ in nm	329
1.2.2	Luminous transmittance τ_{vD65} in % ($d = 1.1$ mm)		91.7 ± 0.3

VX 0050/1e

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2.	Thermal properties		
2.1	Viscosities and corresponding temperatures		
	Designation	Viscosity lg η in dPas	Temperature ϑ in °C
	Strain point	14.5	529
	Annealing point	13.0	557
	Softening point	7.6	736
	Forming temperature	6.0	839
	Forming temperature	5.0	929
	Forming temperature	4.0	1051
2.2	Transformation temperature T_g in °C		557
2.3	Coefficient of thermal expansion α		
2.3.1	Coefficient of mean linear thermal expansion $\alpha(20\text{ °C};300\text{ °C})$ in 10^{-6} K^{-1} (Static measurement)		7.2
2.4	Fuseability		◇
2.5	Mean specific heat capacity $c_p(20\text{ °C to }100\text{ °C})$ in J/(g · K)		0.75

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3.	Mechanical properties	
3.1	Density ρ in g/cm³ (annealed at 40 °C/h)	2.51
3.2	Stress optical coefficient C in $1.02 \cdot 10^{-12}$ m²/N	3.4
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).	
3.3.1	Chemical toughening ($d = 0.15$ mm)	
	Processing temperature ϑ 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 μm	36
	Further information	see annex
3.4	Young's modulus E in kN/mm²	72.9
3.5	Poisson's ratio μ	0.208
3.6	Torsion modulus G in kN/mm²	30.1
3.7	Knoop hardness HK 0.1/20	590

VX 0050/1e

Specification		PCP	
Physical and chemical properties		D 263™ T eco	
4.	Chemical properties		
4.1	Hydrolytic resistance acc. to DIN ISO 719		
	Hydrolytic class	HGB 1	
	Equivalent of alkali (Na ₂ O) per gram of glass grains in µg/g	20	
4.2	Acid resistance acc. to DIN 12116		
	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	88	
4.4	Hazardous Substances		
EC-directive 2002/95/EC (RoHS-directive)			
	Test Items	RoHS Limit in mg/kg	RL in mg/kg
	Cadmium (Cd)	100	1
	Lead (Pb)	1000	10
	Mercury (Hg)	1000	0.5
	Hexavalent Chromium (Cr(VI)) ¹	1000	1
	Polybrominated biphenyls (Sum of PBBs)	1000	500
	Polybrominated diphenyl ethers (Sum of PBDEs)	1000	500
Additional Hazardous Substances			
	Test Items	RL in mg/kg	Value in mg/kg
	Antimony (Sb) calculated as Sb ₂ O ₃	50	< RL*
	Arsenic (As)	50	< RL*
	Phosphorus (P)	50	< 100*
*acc. to EN ISO 11885 after digestion with nitric/hydrofluoric acid; determination by ICP-OES			
**acc. to DIN EN 1483 after digestion with nitric/hydrofluoric acid; determination by CV-AAS			
***acc. to IEC 62321 CDV Ed.2, C4; determination by UV/VIS Spektrometry			
**** acc. to high-resolution gas chromatography with mass-selective detector (GC/MS) after soxhlet extraction with toluene based EPA 3540C;			
1 Extractable fraction, RL = Report Limit, < RL = below Report Limit			

VX 0050/1e

Specification		PCP	
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5.	Electrical properties		
5.1	Dielectric constant (Permittivity) ϵ_r at 1 MHz	6.7	
5.2	Dissipation factor $\tan \delta$ at 1 MHz	$61 \cdot 10^{-4}$	
5.3	Electric volume resistivity ρ_D in $\Omega \cdot \text{cm}$ at the specified temperatures		
5.3.1	ρ_D for alternating current 50 Hz		
	$\vartheta = 250 \text{ }^\circ\text{C}$	$1.6 \cdot 10^8$	
	$\vartheta = 350 \text{ }^\circ\text{C}$	$3.5 \cdot 10^6$	
6.	Other properties		
6.1	Compaction		
	<p>Compaction specifies small negative changes in length which may occur after heat treatment ($\vartheta > 250 \text{ }^\circ\text{C}$) made by the customer.</p> <p>An anti-compaction treatment can be made by SCHOTT AG after determination of the required temperature profile.</p>		
7.	Annex (diagrams, curves)		

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Annex 1.2.1.1

Specification

Physical and chemical properties

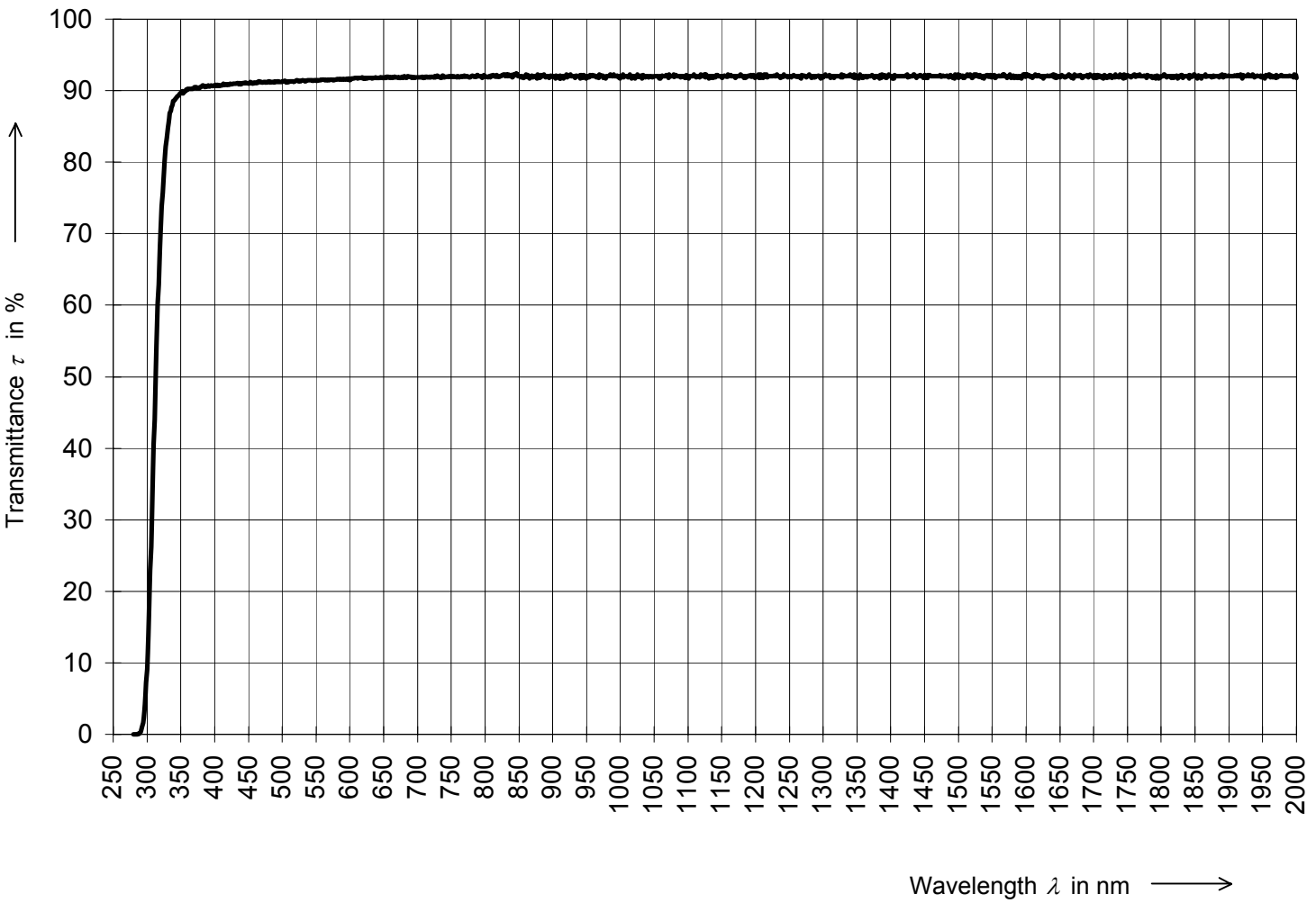
PCP

D 263™ T eco

Spectral Transmittance

Type of Glass: D 263™ T eco

Thickness: 0.15 mm



Annex 1.2.1.1

Specification

Physical and chemical properties

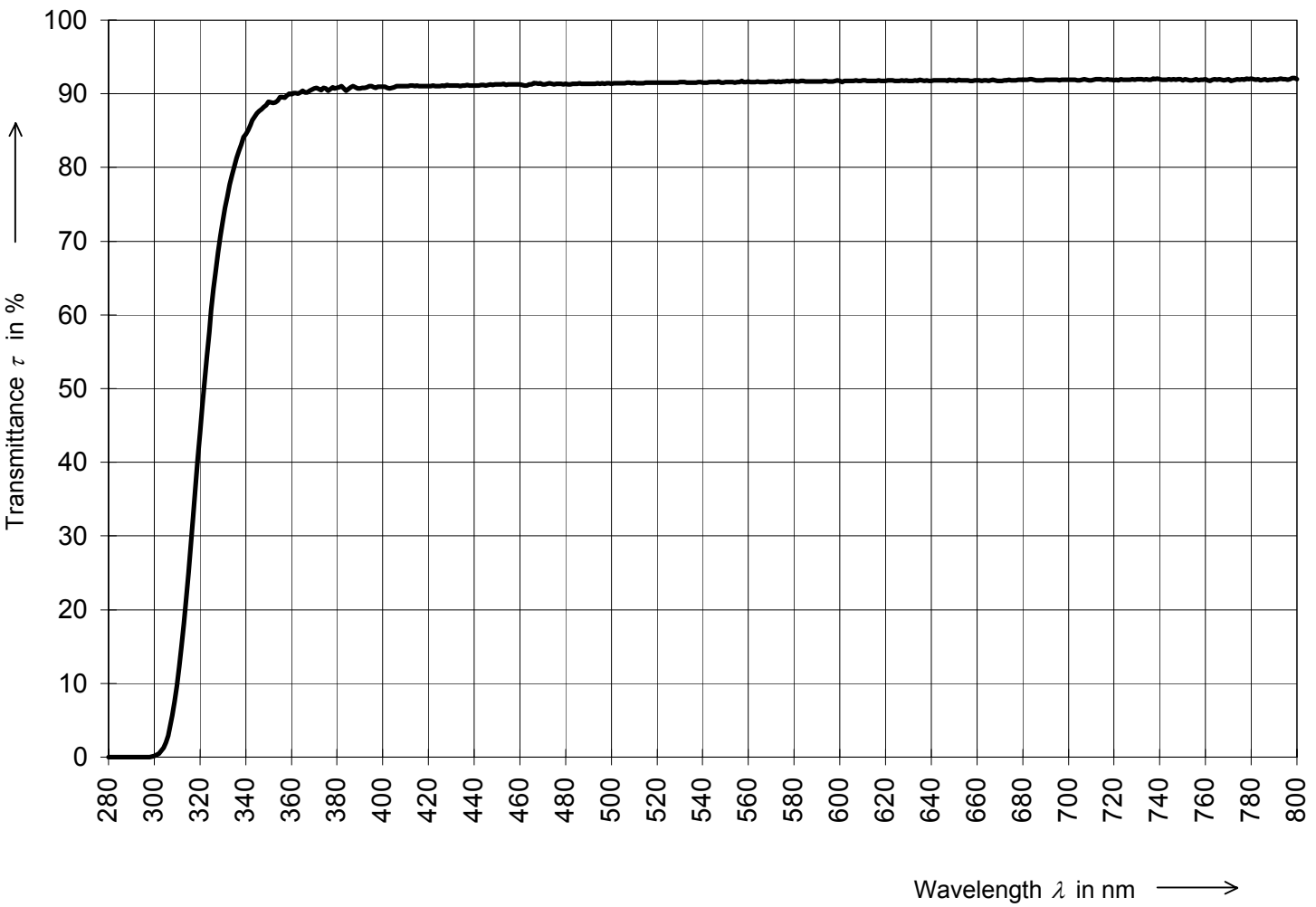
PCP

D 263™ T eco

Spectral Transmittance

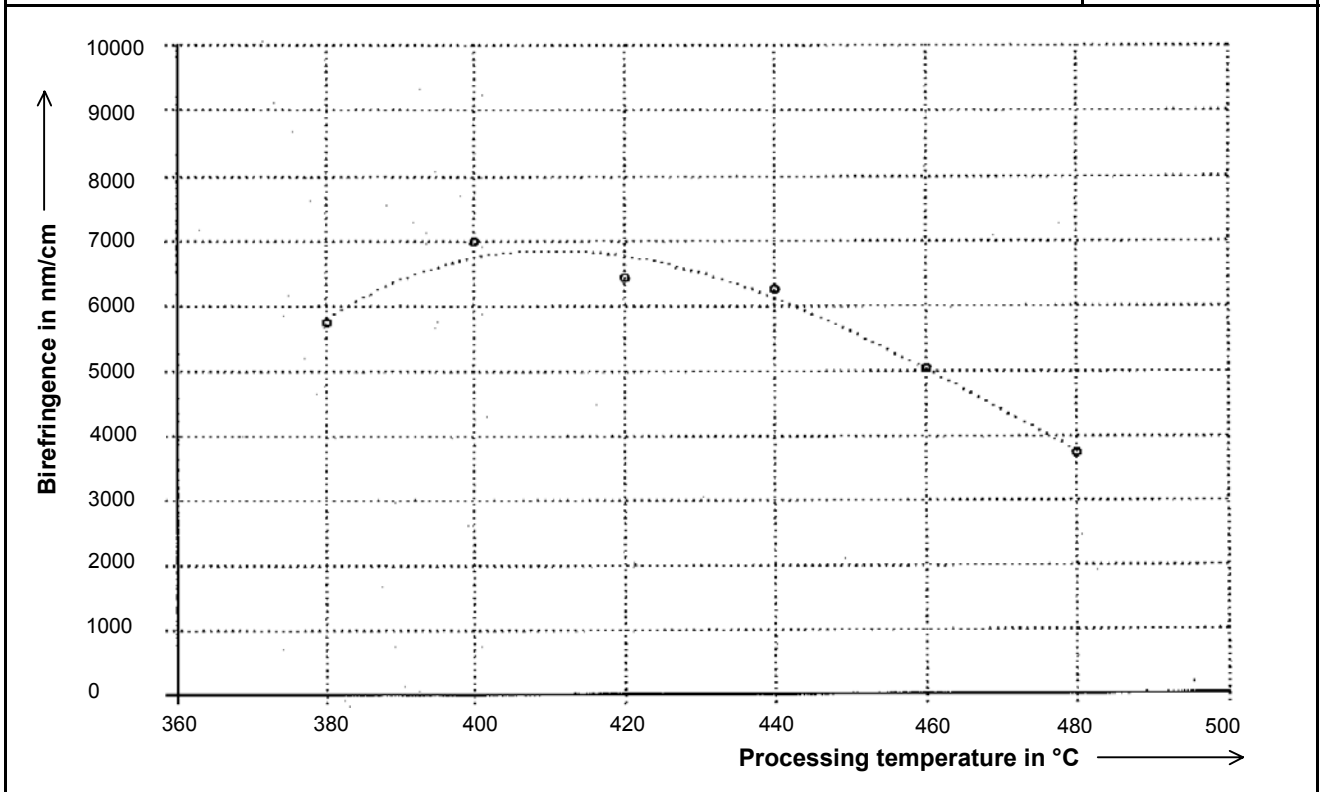
Type of Glass: D 263™ T eco

Thickness: 0.4 mm



Annex 3.3.1

Specification		PCP	
Physical and chemical properties		D 263™ T eco	
Chemical toughening parameter			
Glass and chemical toughening parameters			
Transformation temperature	°C	557	
Glass thickness	mm	0.15	
Processing time	h	4	
Processing temperature	°C	410	
Salt bath (* weight percentages)	KNO ₃ in % *	99.5	
	SiO ₂ x H ₂ O in % *	0.5	
Chemical toughening results *			
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	



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