



Chemical and physical properties

Microscope cover glasses made of borosilicate glass D 263® M

Chemical composition (approximative)

SiO ₂	B ₂ O ₃	Al ₂ O ₃	Na ₂ O	K ₂ O	ZnO	TiO ₂	Sb ₂ O ₃	Cl
64.0 %	8.5 %	4.0 %	6.5 %	7.0 %	5.5 %	4.0 %	< 0.5 %	< 0.1 %

Geometrical properties

Thickness:	Nominal thickness in mm	Tolerance thickness in mm	Flatness in mm acc. to SEMI M1 GBINFER
Nr. 0	0.100	± 0.015	2.5
Nr. 1	0.145	± 0.015	2.5
Nr. 1 ½	0.175	± 0.015	2.5
Nr. 2	0.210	± 0.020	2.5

Quality properties

Roughness (Ra)	≤ 1 nm
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Optical properties

Refractive indices	n_g	1.5354
	$n_{F'}$	1.5305
	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
Abbe value v_e		55
Photoelastic constant in (nm/cm)MPa		34.7



Thermal properties		
CTE (Coefficient of thermal expansion) α	in $10^{-6}K^{-1}$ (20-300 °C)	7.2
Mean specific heat capacity c_p	in J/(gK) (20-100 °C)	0.8
Transformation temperature T_g	in °C	557
<u>Viscosities</u>	Viscosity $\lg \eta$ in dPas	Temperature in °C
Strain point	14.5	529
Annealing point	13.0	557
Softening point	7.6	736

Mechanical properties		
Density ρ (annealed at 40 °C/h)	in g/cm ³	2.51
Chemical toughening ($d = 0.145$ mm)	Temperature ϑ in °C Time t in h Compressive stress (CS) in MPa Depth of layer (DoL) in μ m	390 4 290 15
Young's modulus E	in kN/mm ²	72.9
Poisson's ratio μ		0.21
Torsion modulus G	in kN/mm ²	30
Knoop hardness	HK 0.1/20	470
Vickers hardness	HV 0.2/25	510

Chemical properties		
Hydrolytic resistance (acc. to DIN ISO 719)	Hydrolytic class Equivalent of alkali per gram glass grains in μ g/g	HGB 1 20
Acid resistance (acc. to DIN 12115)	Class Half surface weight loss after 6 hours in mg/dm ²	S3 2.1
Alkali resistance (acc. to DIN ISO 695)	Class Surface weight loss after 3 hours in mg/dm ²	A 2 88



Elektrical properties		
Dielectric constant ϵ_r (at $\vartheta = 25^\circ\text{C}$)	at 1 MHz	6.7
	at 1 GHz	6.4
	at 5 GHz	6.3
Dissipation factor $\tan \delta$ (at $\vartheta = 25^\circ\text{C}$)	at 1 MHz	$61 \cdot 10^{-4}$
	at 1 GHz	$74 \cdot 10^{-4}$
	at 5 GHz	$101 \cdot 10^{-4}$
Electric volume resistivity ρ_D (for alternate current 50 Hz)	in $\Omega \cdot \text{cm}$	$1.6 \cdot 10^8$ ($\vartheta = 250^\circ\text{C}$)
	in $\Omega \cdot \text{cm}$	$3.5 \cdot 10^6$ ($\vartheta = 350^\circ\text{C}$)

Transmittance values		
Thickness 0.145 mm	Wavelength	$\tau(\lambda)$ in %
	at 254 nm	< 0.1
	at 380 nm	91.2
	at 632.8 nm	91.9
	at 1064 nm	92.2
Edge wavelength λ_c ($\tau = 0.46$)	Thickness	Wavelength
	in mm	in nm
	0.100	308
	0.145	312
	0.175	314
Luminous transmittance	Thickness in mm	τ_{VD65} in %
	0.145	91.7 ± 0.3

