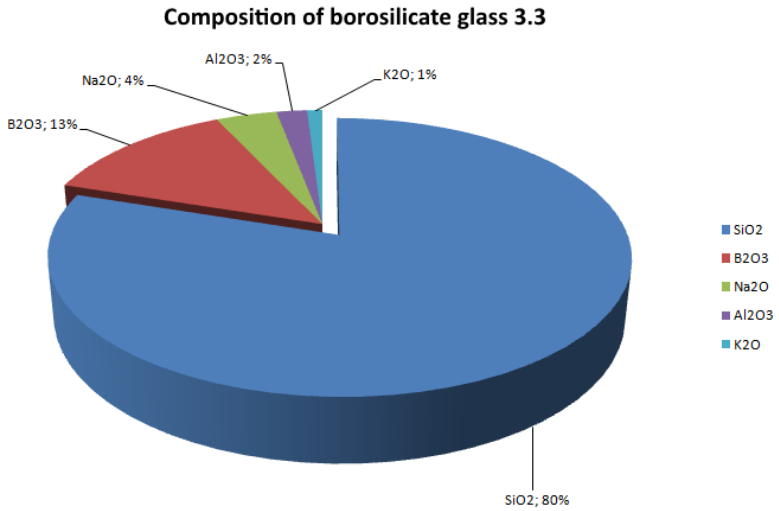
Borosilicate Glass 3.3 – DIN 7080

Main ingredients of this glass are sodium oxide Na_2O, boron oxide B_2O_3, silicon dioxide SiO_2. In those ingredients, boron and silicon have high content: boron 12,5 – 13,5 %, silicon 78 – 80 %.

SiO_2	80 %
B_2O_3	13 %
Na_2O	4 %
Al_2O_3	2 %
K_2O	1 %



The feature of borosilicate glass 3.3 is that it has **low thermal expansion coefficient**, **good thermal stability**, **chemical durability** and electric property. Therefore, it's chemical resistant, heat resistant and mechanical property is excellent. So borosilicate glass is also called **heat resistance glass**.
Borosilicate glass 3.3 can be milled, drilled, grounded and toughened. Its low coefficient of thermal expansion, **high thermal shock resistance** and ability to work at temperatures **up to 450 ° C** for a long period of time, make this type of glass particularly suitable for use in stable temperature conditions. Is suitable **for operation at low temperatures**.
This glass can withstand the temperature to about -196 °C (is suitable for use in contact with liquid nitrogen). During thawing ensure that the temperature difference does not exceed 100 K. In general is recommended for use down to -70 °C.
This glass is extremely resistant to water, alkalis, acids and organic substances.

Properties

Mechanical Performance

Density	2.23 ±0.02 g/cm^3
Bending strength	160 N/mm^2
Surface compressive stress	100 N/mm^2
Young's modulus	64 GPa
Poisson's ratio	0,2
Hardness	5.5 Mohs, (470 Knopp, 580 Vickers)

Thermodynamic Performance

Thermal expansion coefficient (0 – 300 °C)	3.3 ±0.1×10^{-6}K^{-1} (@ 0 – 300 °C)
Softening point	815 ±10 °C
Strain point	560 ±10 °C
Caloricity (20 – 100 °C)	0.83 KJ× (kgxK)$^{-1}$ (@ 20 – 100 °C)
Thermal coefficient	1.2 WxmxK^{-1}
Thermal shock resistance	180K

Maximum working temperature

Non-tempered glass

Short time (< 10h)	-196 up to 500 °C

Long time (> 10h)	-196 up to 450 °C
Tempered glass	
Short time (< 10h)	-70 up to 500 °C
Long time (> 10h)	-70 up to 280 °C

Chemical Performance

Water resistance	ISO 719 / DIN 12111 HGB1 / ISO 720 HGA1
Acid resistance	ISO 1776 / DIN 12116 1
Alkali resistance	ISO 695 / DIN 52322 A2

Optical Property

Refractive index	λ = 587.6 nm	n_D = 1.4724
	λ = 480.0 nm	n_F = 1.4782
	λ = 546.0 nm	n_E = 1.4740
	λ = 644.0 nm	n_C = 1.4701

Electric Property

Electric Volume Resistivity	8.6 x 10^{13} Ω×cm	(at 25 °C)
	1.4 x 10^{6} Ω×cm	(at 300 °C)
Dielectric dissipation fraction	38 × 10^{-4}	(at 1 MHz, 20 °C)
Dielectric constant ε_r	4.6	(at 1 MHz, 20 °C)

Light transmission