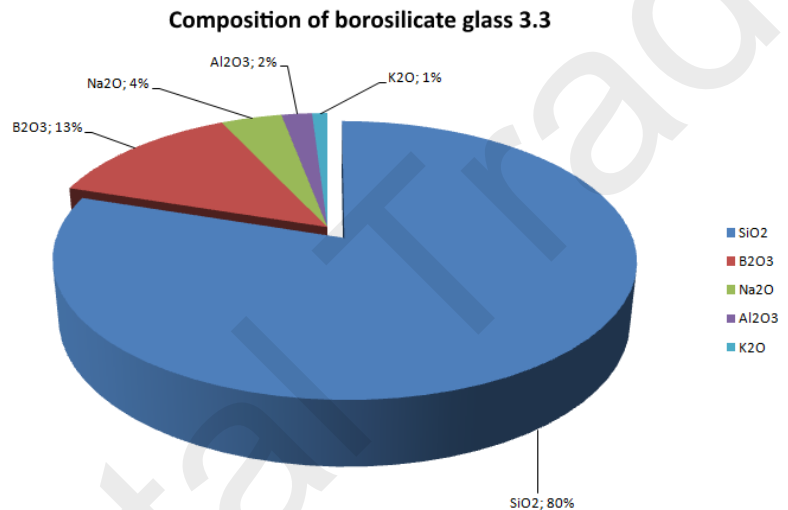


Borosilicate Glass 3.3 – DIN 7080

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	$2.23 \pm 0.02 \text{ g/cm}^3$
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)	$3.3 \pm 0.1 \times 10^{-6} \text{ K}^{-1}$ (@ 0 – 300 °C)
Softening point	$815 \pm 10 \text{ °C}$
Strain point	$560 \pm 10 \text{ °C}$
Caloricity (20 – 100 °C)	$0.83 \text{ KJ} \times (\text{kg} \times \text{K})^{-1}$ (@ 20 – 100 °C)
Thermal coefficient	$1.2 \text{ W} \times \text{m} \times \text{K}^{-1}$
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	$\lambda = 587.6 \text{ nm}$	$n_D = 1.4724$
	$\lambda = 480.0 \text{ nm}$	$n_F = 1.4782$
	$\lambda = 546.0 \text{ nm}$	$n_E = 1.4740$
	$\lambda = 644.0 \text{ nm}$	$n_C = 1.4701$

Electric Property

Electric Volume Resistivity	$8.6 \times 10^{13} \Omega \times \text{cm}$	(at 25 °C)
	$1.4 \times 10^6 \Omega \times \text{cm}$	(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

