Borosilicate Glass 3.3 – DIN 7080

Main ingredients of this glass are sodium oxide $\text{Na}_2\text{O}$, boron oxide $\text{B}_2\text{O}_3$, silicon dioxide $\text{SiO}_2$. In those ingredients, boron and silicon have high content: boron 12.5 – 13.5 %, silicon 78 – 80 %.

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\text{SiO}_2$</td>
<td>80 %</td>
</tr>
<tr>
<td>$\text{B}_2\text{O}_3$</td>
<td>13 %</td>
</tr>
<tr>
<td>$\text{Na}_2\text{O}$</td>
<td>4 %</td>
</tr>
<tr>
<td>$\text{Al}_2\text{O}_3$</td>
<td>2 %</td>
</tr>
<tr>
<td>$\text{K}_2\text{O}$</td>
<td>1 %</td>
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</tbody>
</table>

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: $2.23 \pm 0.02 \text{ g/cm}^3$
- Hardness: 5.5 Mohs, (470 Knopp, 580 Vickers)

**Thermodynamic Performance**
- Thermal expansion coefficient (0 – 300 °C): $3.3 \times 10^{-6} \text{K}^{-1}$ (@ 0 – 300 °C)
- Softening point: 815 ±10 °C
- Strain point: 560 ±10 °C
- Caloricty (20 – 100 °C): 0.83 KJx (kgxK)$^{-1}$ (@ 20 – 100 °C)
- Thermal coefficient: 1.2 WxmxK$^{-1}$
- Thermal shock resistance: 180K

While every attempt has been made to verify the source of the information, no responsibility is accepted for accuracy of data.
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 x 10^{-4} (at 1 MHz, 20 °C)

Dielectric constant ε_r
- 4.6 (at 1 MHz, 20 °C)

Light transmission

![Light transmission graph](image)