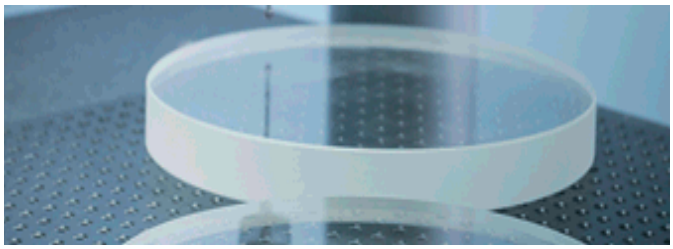
BOROFLOAT® 33 & Sight Glass: A Union of Inspiration & Quality

The sum of its properties is what makes it unique.

More than 20 years ago, SCHOTT set up the first micro-float production line for what would soon become one of the most influential specialty glass materials. The result was BOROFLOAT® – the world's first floated borosilicate glass. With high-quality German engineering at its core, BOROFLOAT® quickly became an outstanding example of what seamless interaction between advanced know-how, innovative technology and professional curiosity – all in combination with the developmental drive of our team of experts – can deliver.
The performance requirements for sight glasses, used to verify process conditions in piping, vessels, chemical reactors or other industrial equipment, are extremely high. Subjected to elevated temperatures, chemical attack and high pressure - specifying the right material is critical in order to ensure safety in even the harshest environments. While many materials fail to address such challenging conditions, this is where BOROFLOAT® feels right at home.



The performance requirements for sight glasses are extremely high.

BOROFLOAT® - The sum of its properties is what makes it unique for sight glass applications!

- Outstanding thermal resistance
- High chemical durability
- Excellent mechanical strength
- Exceptionally high transparency

BOROFLOAT® 33 sight glasses stand up to high thermal loads

A particularly low coefficient of thermal expansion makes BOROFLOAT® remarkably resistant to high temperature levels. Our borosilicate glass is proven to stand up to not only high, but also fluctuating temperatures which are typical for sight glass windows used in chemical, pharmaceutical, food & beverage and many other industries. Even with applications where rapid cooling from higher temperatures is the requirement, BOROFLOAT® easily passes the test.

Maximum operating temperatures	
Maximum Operating Temperature	
For short-term usage (< 10 h)	500 °C
For long-term usage (≥ 10 h)	450 °C

The maximum operation temperatures for BOROFLOAT® should be seen in conjunction with RTG (Resistance to Temperature Gradients) and RTS (Resistance to Thermal Shock) values. Such values and test methods are available on request.

Thermal properties	
Coefficient of Linear Thermal Expansion (C.T.E.) $\alpha_{(20 - 300\ °C)}$	$3.25 \times 10^{-6}\ K^{-1}$ *
Specific heat capacity $c_{p\ (20 - 100\ °C)}$	0.83 kJ/(kg·K)
Thermal conductivity $\lambda_{(90\ °C)}$	1.2 W/(m·K)

* According to ISO 7991.

BOROFLOAT® 33 sight glasses are extremely resistant to chemical attack

Chemical durability		
Hydrolytic resistance	(according to ISO 719 / DIN 12 111)	HGB 1
	(according to ISO 720)	HGA 1
Acid resistance	(according to ISO 1776 / DIN 12 116)	1
Alkali resistance	(according to ISO 695 / DIN 52 322)	A 2

Acids, alkalis and organic substances have virtually no negative impact on BOROFLOAT® glass. Its high resistance to water is another important performance benefit for many industrial applications. Such exceptional chemical resistance is the reason why this type of borosilicate glass has been successfully used in the chemical, pharmaceutical and food industry for over 130 years as annual edge sight glasses, laboratory glassware, chemical reactors, vials, ampules and even cookware.

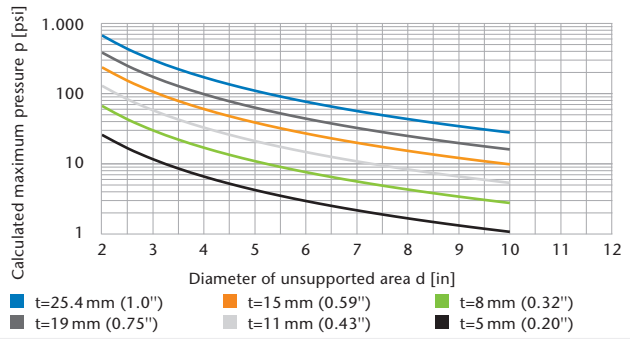
SCHOTT
glass made of ideas

BOROFLOAT® 33 sight glasses stand up to high mechanical loads

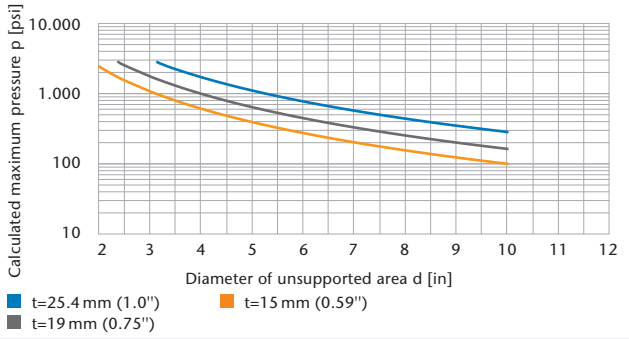
Mechanical properties	
Density ρ (25 °C)	2.23 g/cm³
Young's Modulus E (according to DIN 13316)	64 kN/mm²
Poisson's Ratio μ (according to DIN 13316)	0.2
Knoop Hardness $_{0.1/20}$ (according to ISO 9385)	480

To further increase strength, BOROFLOAT® glass can be thermally toughened to allow it to withstand even higher pressure loads. Thermally toughened BOROFLOAT® glass is characterized by high bending strength, in combination with outstanding abrasion and scratch resistance. These properties are particularly crucial when high pressure and mechanical loads play an important role. The material's low inherent weight makes it ideal for lightweight glazings and applications in modern high-tech facilities. BOROFLOAT® delivers lightweight resistance!

Circular sight glass at room temperature
annealed BOROFLOAT® 33 (design strength 870 psi)



Circular sight glass at room temperature
BOROFLOAT® 33 high pressure heat strengthened 8130 psi (design strength 9000 psi)



BOROFLOAT® 33 sight glasses guarantee clear views

Essential for view ports and sight glasses are outstanding visual quality along with high clarity and excellent transmission. BOROFLOAT® glass outperforms many soda-lime glasses due to its low iron content which results in exceptional UV and light transmission and has made BOROFLOAT® glass the material of choice for many optical applications.

BOROFLOAT® 33 sight glasses – your choice for any harsh environment

Elevated temperatures, chemical attack and high pressure – alone or in combination – need to be considered when specifying a material that can safely resist such environments. The thickness and diameter of a sight glass must be determined in order to be able to satisfactorily meet the expected pressure and thermal loads. SCHOTT has years of experience and supports sight glass fabricators in designing safe and lightweight products. Please request our technical paper „BOROFLOAT® & Sight Glass: A Union of Inspiration & Quality" to learn more about sight glass calculations. It contains calculation examples and pressure charts allowing you to easily determine which glass thickness and diameter to use for your specific application.

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