

Quartz Glass Plates

Characteristics

- High chemical purity
- Low bubble and inclusion content
- Available in transparent and opaque material quality

Applications

- Etch tanks
- Windows
- Support plates
- Pedestals for reaction chambers
- Cover plates

Heraeus Conamic provides transparent quartz glass plates with very good transmission (HSQ), white opaque quartz glass plates with high reflectivity (OM) as well as black opaque quartz glass plates with high absorption (HBQ).

Transparent quartz glass plates are offered in a wide variety of grades cut from various solid materials. They are used for instance to produce etch tanks or as windows and cover plates for various applications. Heraeus Conamic' grades are primarily differentiated by the production route and the chemical impurity characteristics. Therefore, transparent quartz glass plates are divided into two larger groups: flame fused and electrically fused. In each group a variety of grades is available, each with individual advantages for specific applications.

In addition to transparent quartz glass plates, Heraeus offers two unique opaque material grades with either high reflectivity (OM) or high absorption (HBQ). They are manufactured in a ceramic process to create outstanding properties regarding heat management.

Chemical Properties (Typical Values)

Trace Element Concentration (ppm)

Electrically fused quartz	Li	Na	K	Mg	Ca	Fe	Cu	Cr	Ni	Mn	Ti	Zr	Al	OH
HSQ® 300	0.5	0.2	0.3	< 0.03	0.5	0.1	0.01	< 0.01	< 0.01	< 0.03	1.1	1.0	15	< 30*
HSQ® 330 (S)	0.5	0.1	0.2	< 0.03	0.5	0.1	< 0.01	< 0.01	< 0.01	< 0.03	1.1	1.0	15	< 30*
HBQ® 100	0.1	0.1	0.2	< 0.03	0.4	0.2	< 0.01	< 0.01	< 0.03	< 0.03	1.1	1.0	15	n. s.
OM® 100	0.1	0.1	0.2	< 0.03	0.4	0.1	< 0.01	< 0.01	< 0.01	< 0.03	1.1	1.0	15	n. s.

Flame fused quartz	Li	Na	K	Mg	Ca	Fe	Cu	Cr	Ni	Mn	Ti	Zr	Al	OH
TSC-3®	0.2	0.3	0.2	< 0.01	0.4	0.05	< 0.01	< 0.01	< 0.01	< 0.01	1.1	0.8	15	170
TSC-4	0.04	0.2	0.08	< 0.01	0.7	0.1	< 0.01	< 0.01	< 0.01	< 0.01	1.3	0.7	8	170

Synthetic fused silica	Li	Na	K	Mg	Ca	Fe	Cu	Cr	Ni	Mn	Ti	Zr	Al	OH
HSQ® 900	< 0.002	< 0.01	< 0.01	< 0.01	< 0.02	< 0.03	< 0.001	< 0.001	n. s.	< 0.0005	< 0.03	< 0.04	< 0.04	0.2
Spectrosil® 1000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.02	< 0.01	< 0.01	< 0.01	n. s.	n. s.	< 0.01	n. s.	< 0.01	< 1350

*OH content can be reduced by additional annealing.



Heraeus Conamic cuts quartz glass solids into plates using band and wire saws. While band saws allow larger sizes to be cut, wire sawed plates have a smoother surface finish and excellent parallelism.

Depending on the size, specific surface finishes can be selected: cut, ground or polished. In addition to an improved surface finish, Heraeus Conamic offers to cut plates to customized shapes through water jet cutting.

Cut Plates

Material grades: HBQ® 100; HSQ® 300, 330 (S), 900; OM® 100; Spectrosil® 1000; TSC-3®, TSC-4

Cutting capabilities	Band saw cut	Wire saw cut
Thickness [mm]	> 5	2–14
Max. cut size [mm]	700 × 2000	500 × 600

Contour trimming capabilities	Standard cut (Water jet)	Precision cut (Laser)
Thickness [mm]	≥ 3	≤ 15
Minimum cut size [mm]	> 35 × 35	on request

Mechanical Data

Density	2.203 g/cm ³
Mohs Hardness	5.5...6.5
Micro Hardness	8600...9800 N/mm ²
Knoop Hardness	5800...6100 N/mm ²
Modulus of Elasticity (at 20°C)	7.25×10^4 N/mm ²
Modulus of Torsion	3.0×10^4 N/mm ²
Poisson's Ratio	0.17
Compressive Strength	~ 1150 N/mm ²
Tensile Strength	~ 50 N/mm ²
Bending Strength	~ 67 N/mm ²
Torsional Strength	~ 30 N/mm ²
Sound Velocity	5720 m/s

Electrical Data

Resistivity [$\Omega \times \text{cm}$]	
20°C	10^{18}
400°C	10^{10}
800°C	6.3×10^6
1200°C	1.3×10^5
Dielectric strength [kV/mm] (sample thickness ≥ 5 mm)	
20°C	25...40
500°C	4...5
Dielectric loss angle (tg δ)	
1 kHz	5.0×10^{-4}
1 MHz	1.0×10^{-4}
3×10^{10} Hz	4.0×10^{-4}
Dielectric constant (ϵ)	
20°C 0... 10^6 Hz	3.70
23°C 9... 10^8 Hz	3.77
23°C 3×10^{10} Hz	3.81

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Thermal Data

	electrically fused	flame fused	synthetic
Softening temperature	1710°C	1660°C	1600°C
Annealing temperature	1220°C	1160°C	1100°C
Strain temperature	1125°C	1070°C	1000°C
Max. working temperature			
continuous	1160°C	1110°C	950°C
short-term	1300°C	1250°C	1200°C

Mean specific heat [J/kg × K]	
0...100°C	772
0...500°C	964
0...900°C	1052

Heat conductivity [W/m × K]	
20°C	1.38
100°C	1.47
200°C	1.55
300°C	1.67
400°C	1.84
950°C	2.68

Mean thermal expansion coefficient K ⁻¹	
-50...0°C	2.7×10^{-7}
0...100°C	5.1×10^{-7}
0...200°C	5.8×10^{-7}
0...300°C	5.9×10^{-7}
0...600°C	5.4×10^{-7}
0...900°C	4.8×10^{-7}

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