Quartz Glass Plates

Applications
Etch tanks, windows, support plates,
pedestals for reaction chambers, cover plates

Characteristics
High temperature stability, corrosion resistant,
transparent or opaque

Heraeus Quarzglas provides transparent quartz glass plates with very good transmission and opaque plates with high reflectivity. Transparent quartz glass plates are offered in a wide variety of grades, from cost efficient direct drawn plates, to plates cut from various solid materials. They are used for instance to produce etch tanks or as windows and cover plates for various applications.

Heraeus Quarzglas' 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 Heraeus has a unique opaque material with exceptionally low transmission, which is also available in the form of plates (OM 100). It is made in a ceramic process and frequently used to block and reflect heat radiation.

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

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

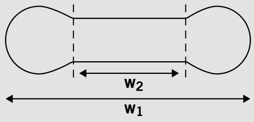
Direct drawn plates

Material grade: HSQ® 100
Length (mm): Standard: 1500; Max. length: 2500

Thickness (mm)	**Width** (mm)	
standard	**as drawn**	**with specified thickness tolerances**
2.0	190	130
2.3	220	150
2.5	230	170
3.0	250	200
3.5	260	210
4.0	270	220
5.0	285	250
6.0	320	280
7.0	330	290
8.0	335	300

Also available with ground surface in standard length 700 mm.

Plate cross section



w_1: as drawn

w_2: with specified thickness tolerances

Cut plates

Material grade: HSQ® 300, 330, TSC-3®, TSC-4, Spectrosil® 1000

Cutting capabilties		
	Band saw cut	**Wire saw cut**
Thickness (mm)	> 5	2–14
Max. cut size (mm)	700 x 2000	500 x 600

Contour trimming capabilties		
	Standard cut (Water jet)	**Precision cut** (Laser)
Thickness (mm)	≥ 3	≤ 8
Max. cut size (mm)	≥ 35 x 35	all sizes

Chemical purity – Trace element concentration (ppm)

Typical Values (= Statistical Average Value)

	Li	Na	K	Mg	Ca	Fe	Cu	Cr	Ni	Mn	Ti	Zr	Al	OH
Electrically fused quartz														
HSQ® 100/300	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	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*
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														
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														
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	< 10	< 10	< 10	< 10	< 15	< 10	< 10	< 10	n. s.	n. s.	< 10	n. s.	< 0.04	< 1350

* OH content can be reduced by additional annealing.

Technical Properties (typical values)

Mechanical Data	
Density	2.203 g/cm³
Mohs Hardness	5.5 … 6.5
Micro Hardness	8600 … 9800 N/mm²
Knoop Hardness	5800 … 6100 N/mm²
Modulus of elasticitiy (at 20°C)²	7.25 x 104 N/mm²
Modulus of torsion	3.0 x 104 N/mm²
Poisson's ratio	0.17
Compressive strength (approx.)	1150 N/mm²
Tensile strength (approx.)	50 N/mm²
Bending strength (approx.)	67 N/mm²
Torsional strength (approx.)	30 N/mm²
Sound velocity	5720 m/s

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

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 expansion coefficient K^{-1}	
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}
-50 … 0 °C	2.7×10^{-7}

Electrical resistivity in Ω*cm	
20 °C	10^{18}
400 °C	10^{10}
800 °C	6.3×10^{6}
1200 °C	1.3×10^{5}

Dielectric strength in kV/mm

(sample thickness ≥ 5 mm)

20 °C	25 … 40
500 °C	4 … 5

Dielectric loss angle (tgδ)	
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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