

Technical information for type GE 124 fused quartz

[The Micro-Tec quartz microscope slide, quartz coverslips and quartz discs](#) are made from high purity type GE 124 fused quartz. Fused quartz is an amorphous glassy material. The purity is 99.995% or better.

Chemical composition

Fused quartz consists mainly of SiO₂ with some trace elements. The typical chemical trace element composition of type GE 124 fused quartz contains the following elements in ppm (by weight)

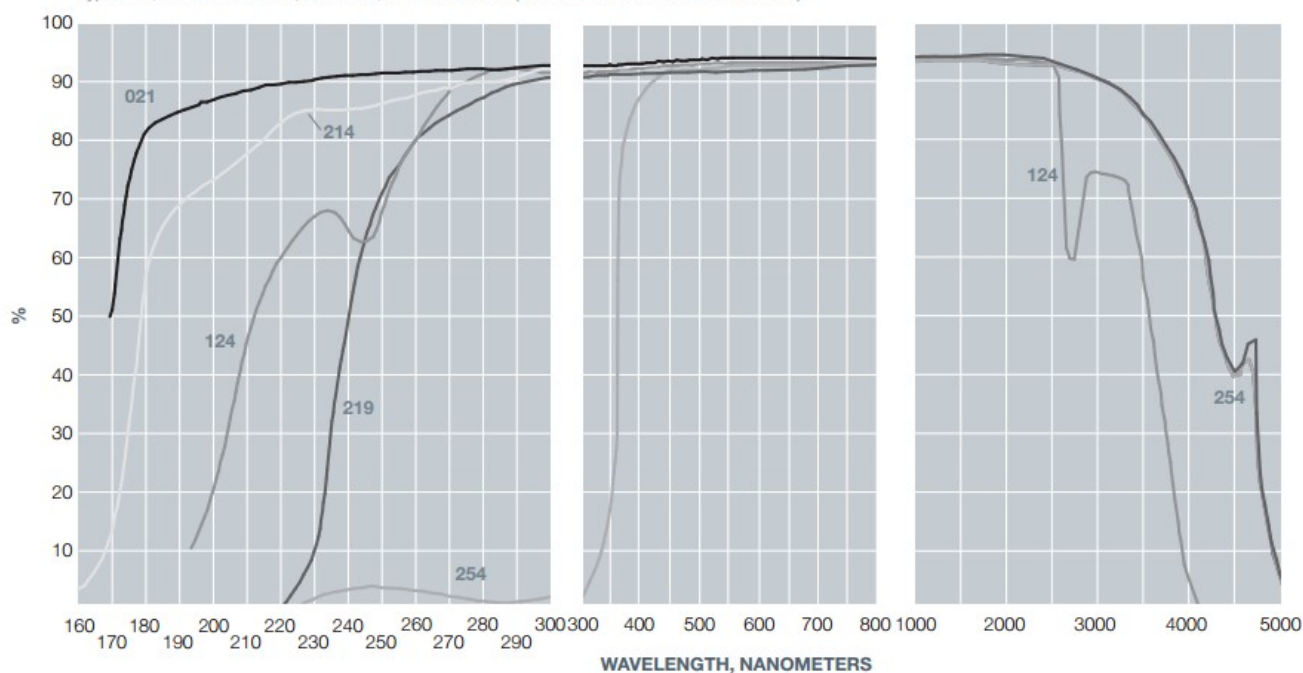
Li	0.6	Mn	<0.05
B	<0.2	Fe	0.2
Na	0.7	Ni	0.7
Mg	0.1	Cu	0.05
Al	14	As	<0.002
P	<0.2	Cd	<0.01
K	0.6	Zr	0.8
Ca	0.4	Sb	<0.003
Ti	1.1	OH	5
Cr	<0.05		

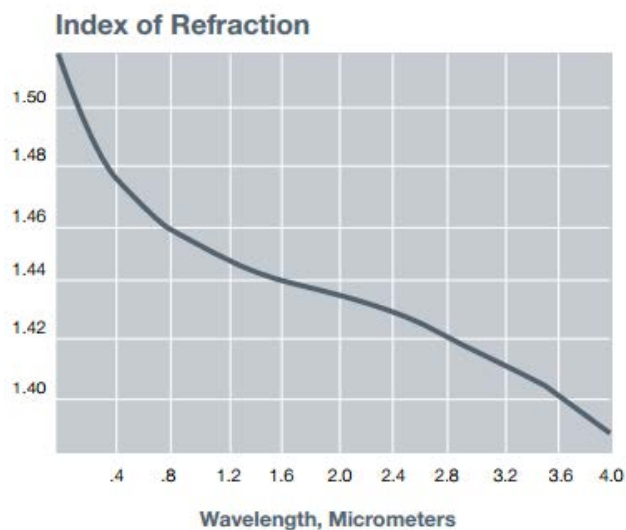
Optical Properties

The typical transmission curve shows the transmission for the UV to IR range. UV microscopy is mostly in the 250-290nm range where the material exhibits excellent transmittance.

Fused Quartz Average Transmittance Curves

Type 124, 10mm thickness; all others, 1mm thickness (Includes Surface Reflection Losses)





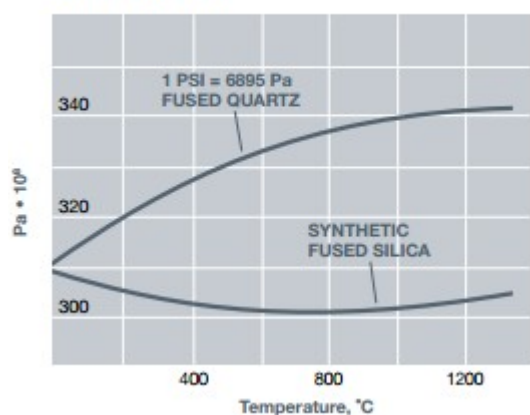
Physical and mechanical properties

The mechanical properties of fused quartz are similar to those of other glasses, although it has higher temperature stability, thermal shock resistance and higher compressive strength.

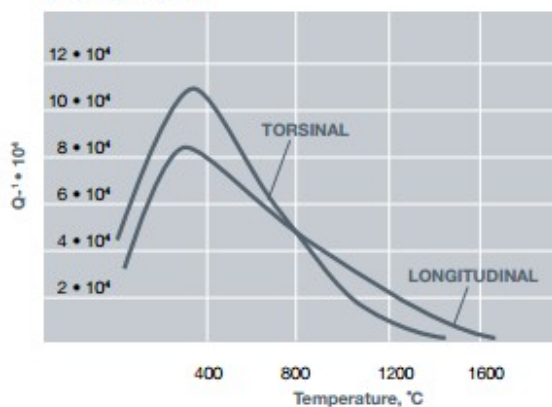
Parameter	Typical value
Density	$2.2 \times 10^3 \text{ kg/m}^3$
Hardness	5.5 - 6.5 Moh's scale
Tensile strength	$4.8 \times 10^7 \text{ Pa}$
Compressive strength	$>1.1 \times 10^9 \text{ Pa}$
Bulk modulus	$3.7 \times 10^{10} \text{ Pa}$
Rigidity modulus	$3.1 \times 10^{10} \text{ Pa}$
Young's modulus	$7.2 \times 10^{10} \text{ Pa}$
Poisson's ratio	0.17
Thermal expansion coefficient (20-230°C)	$5.5 \times 10^{-7} \text{ cm/cm.}^\circ\text{C}$
Thermal conductivity (20°C)	1.4 W/m.°C
Specific Heat (20°C)	670 J/kg.°C
Softening point	1683 °C
Annealing point	1215 °C
Strain point	1120 °C
Refraction Index	1.46
Constringence (Nu value)	67.56
Velocity of sound shear wave	$3.75 \times 10^3 \text{ m/s}$

Velocity of sound compression wave	5.90×10^3 m/s
Sonic attenuation	< 11db/m MHz
Permeability constants (700°C)	Cm ³ mm/cm ² sec.cm of Hg)
Helium	210×10^{-10}
Hydrogen	21×10^{-10}
Deuterium	17×10^{-10}
Neon	9.5×10^{-10}

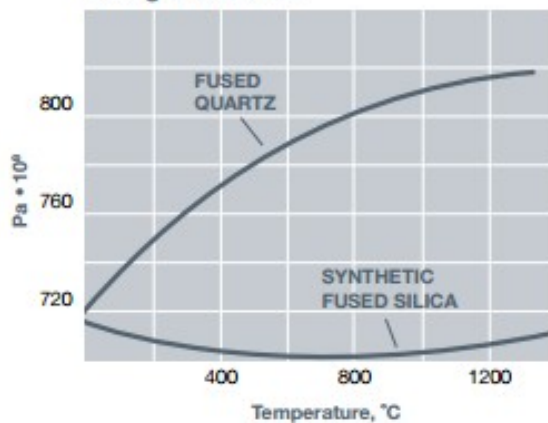
Shear Modulus



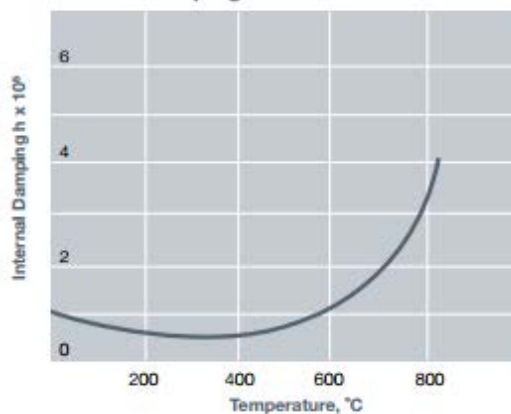
Internal Friction



Young's Modulus

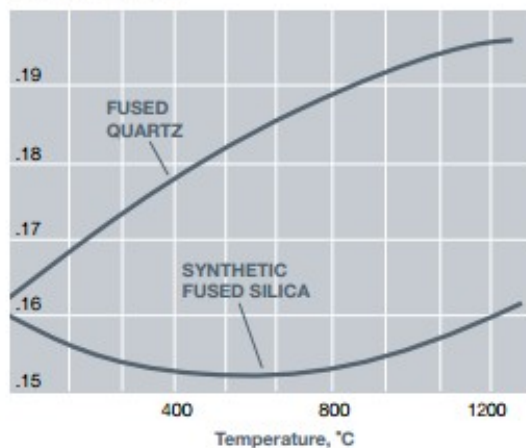


Internal Damping

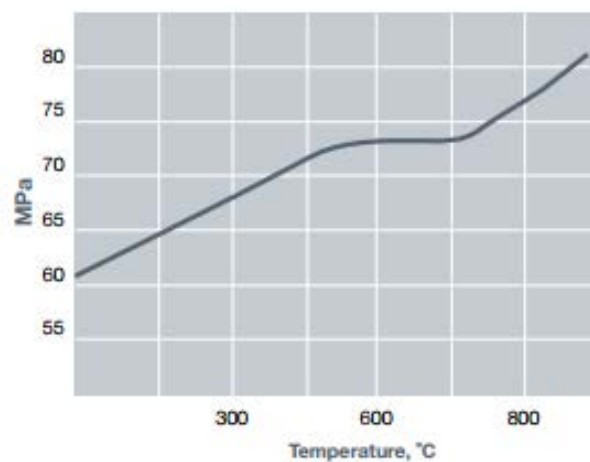




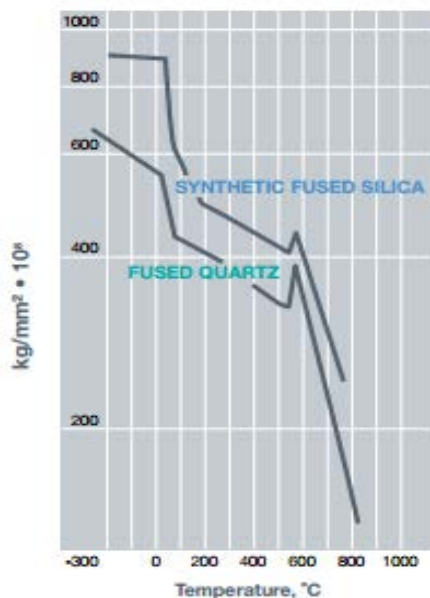
Poisson's Ratio



Modulus of Rupture

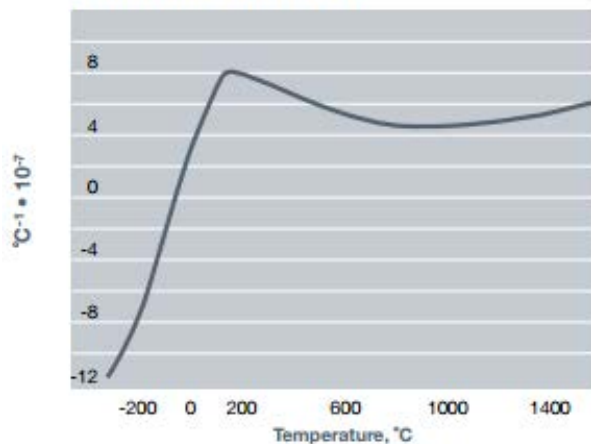


Hardness

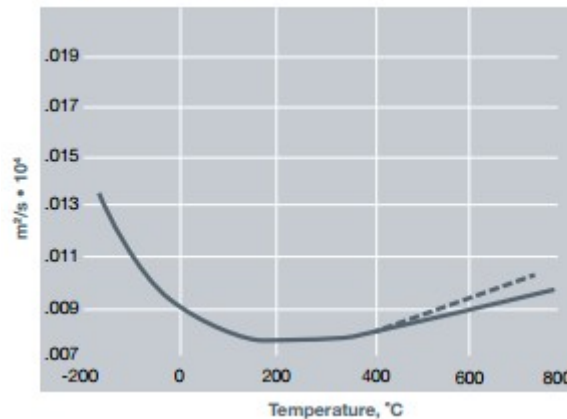


Thermal Properties

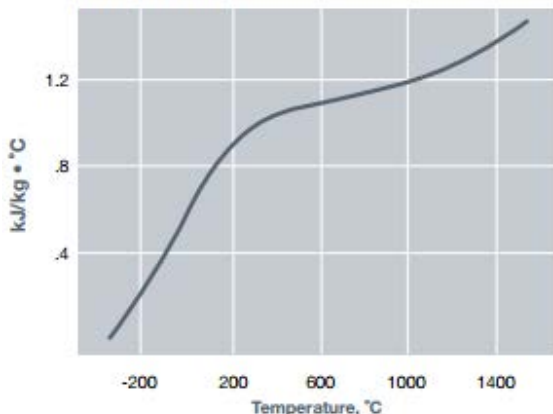
Coefficient of Expansion



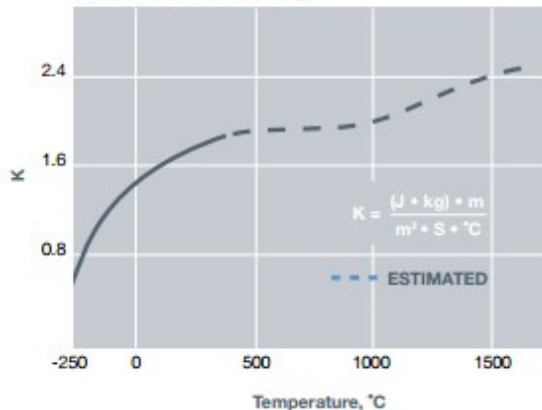
Thermal Diffusivity



Heat Capacity



Thermal Conductivity



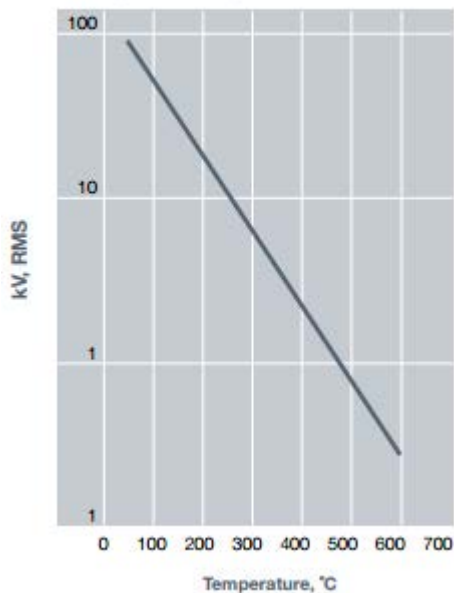
Electrical Properties

Fused quartz is preferred to glass for electrical insulation. Both electrical insulation and microwave transmission properties are retained at very high temperatures and a wide range of frequencies.

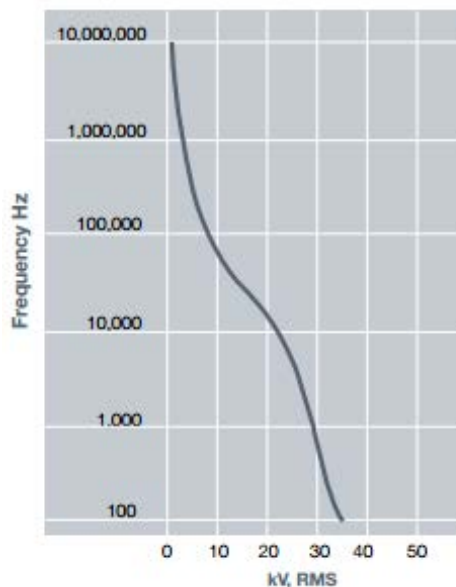
Electrical resistance (350°C)	7×10^7 ohm cm
Specific resistivity (20°C)	10^{-18} ohm/cm ³
Dielectric properties (20°C and 1Mhz)	
Constant	3.75
Strength	5×10^7 V/m
Loss factor	$< 4 \times 10^{-4}$
Dissipation factor	$< 1 \times 10^{-1}$



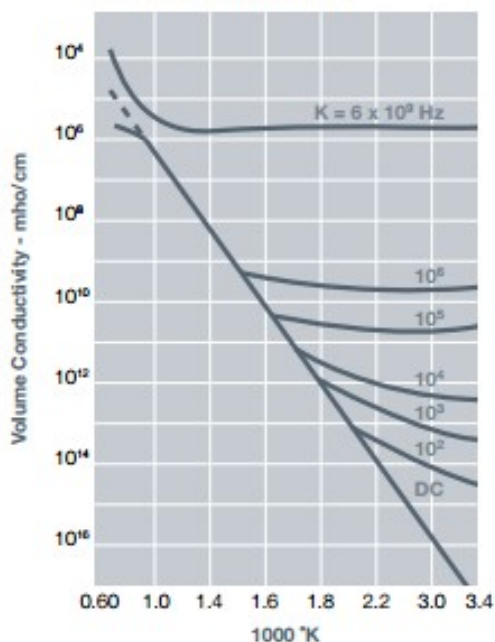
Dielectric Breakdown
Voltage vs. Temperature



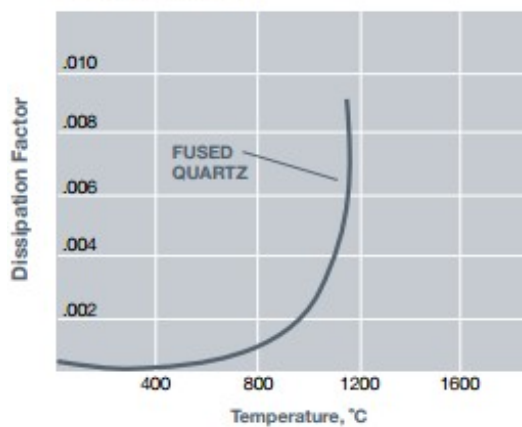
Dielectric Breakdown
Voltage vs. Frequency



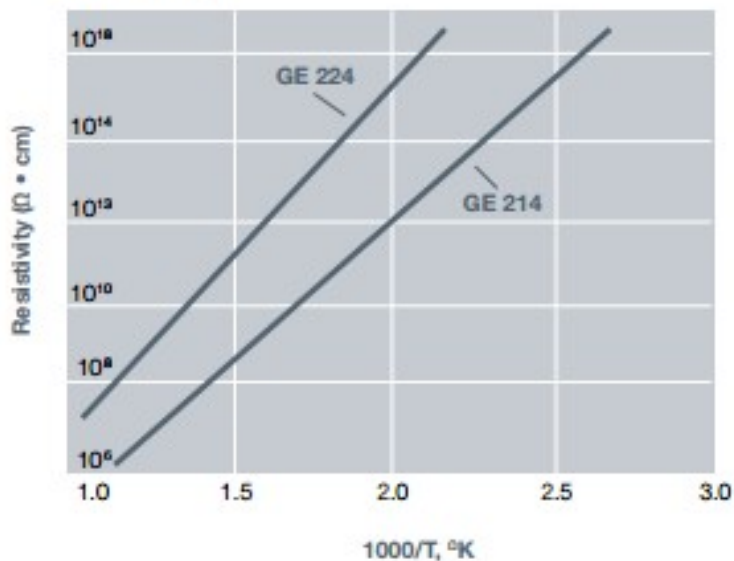
Volume Conductivity



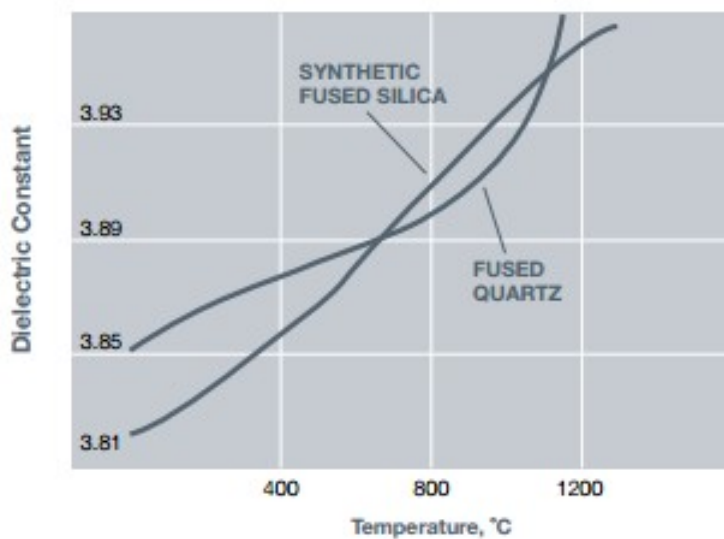
Dissipation Factor



Resistivity



Dielectric Constant



Acknowledgment: Momentive Corporation for providing technical data

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