Technical Support Bulletin

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.

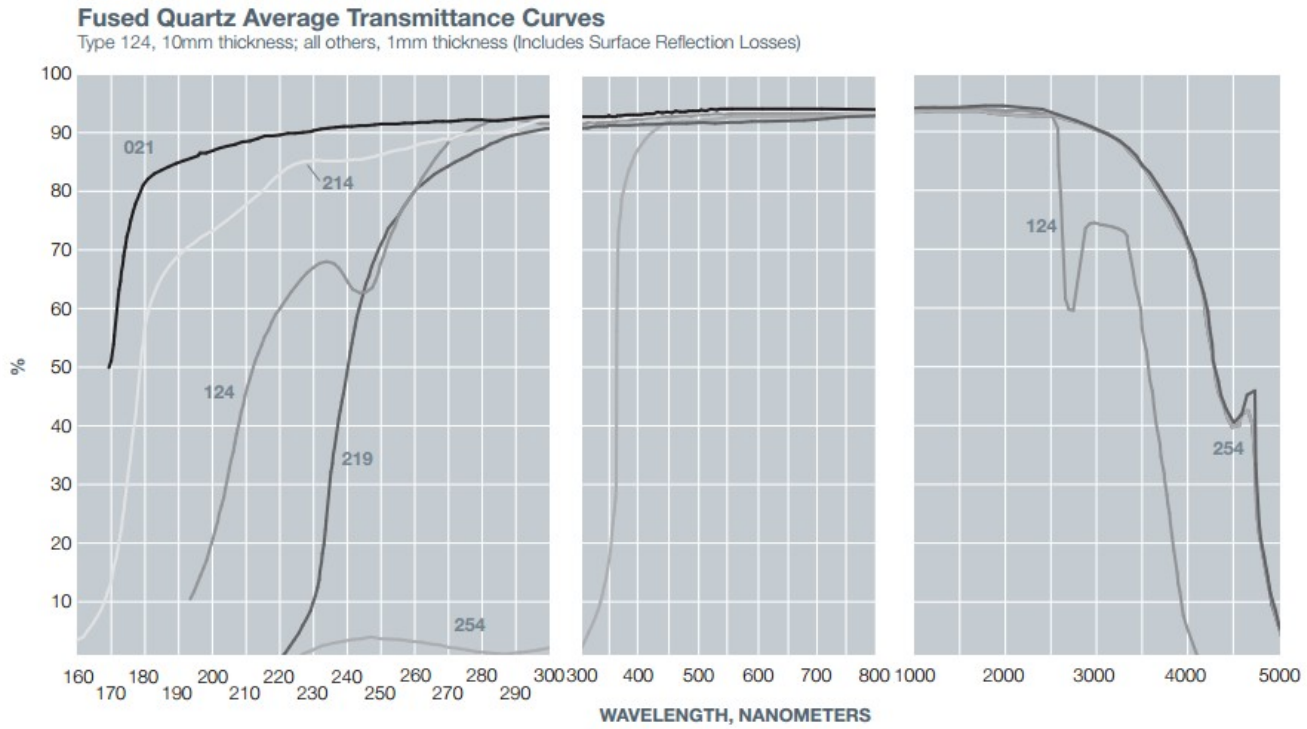
Chemical composition

Fused quartz consists mainly of SiO_2 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.



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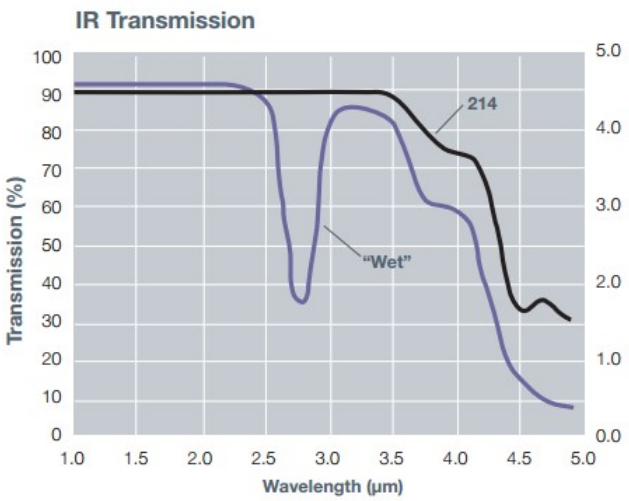

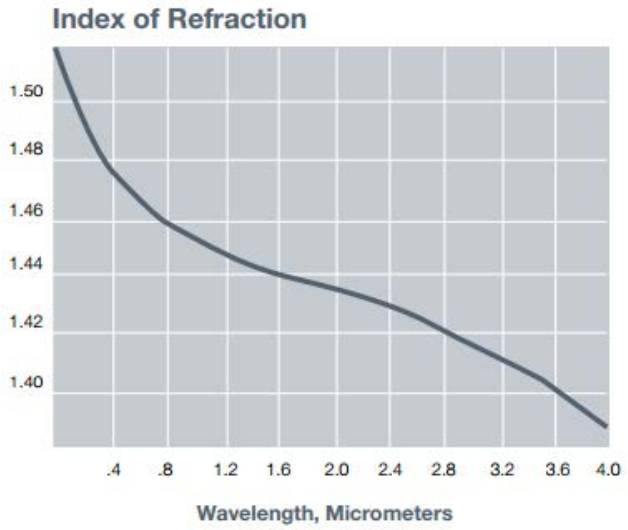

Physical and mechanical properties

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 x 10^3 kg/m^3
Hardness	5.5 - 6.5 Moh's scale
Tensile strength	4.8 x 10^7 Pa
Compressive strength	>1.1 x 10^9 Pa
Bulk modulus	3.7 x 10^{10} Pa
Rigidity modulus	3.1 x 10^{10} Pa
Young's modulus	7.2 x 10^{10} Pa
Poisson's ratio	0.17
Thermal expansion coefficient (20-230°C)	5.5 x 10^{-7}cm/cm.°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 x 10^3 m/s

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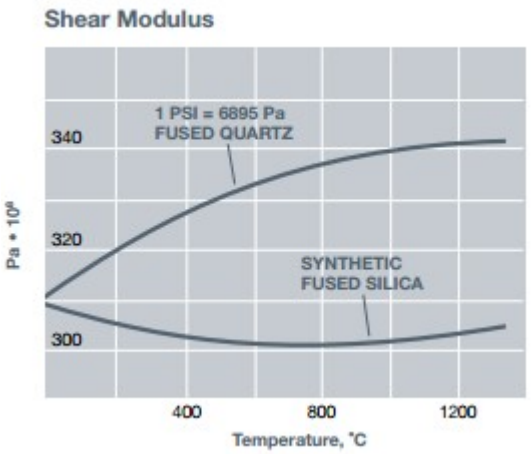
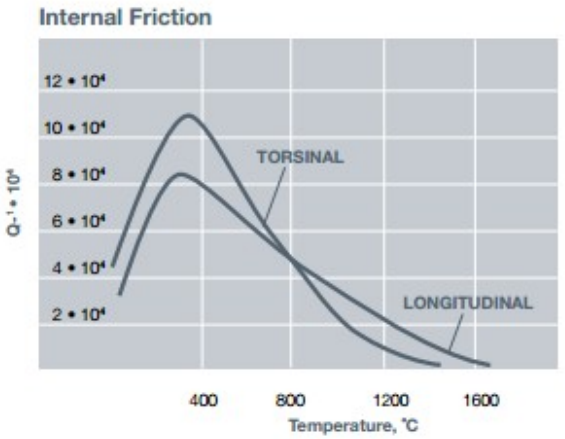
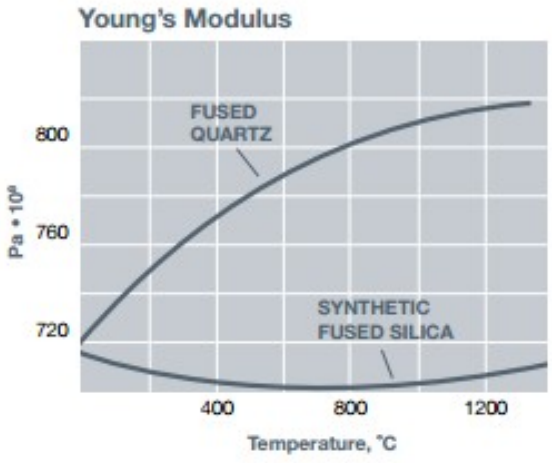
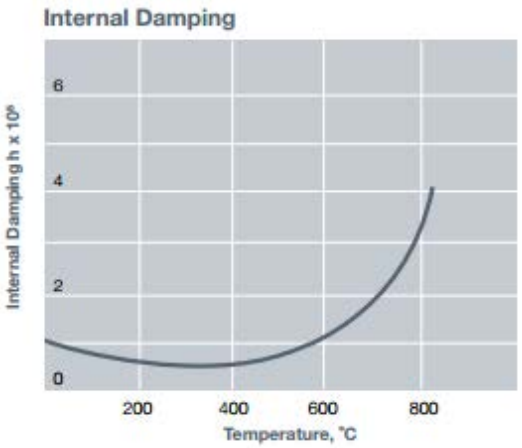
Velocity of sound compression wave	5.90 x 10^3 m/s
Sonic attentuation	< 11db/m MHz
Permeability constants (700°C)	Cm^3mm/cm^2 sec.cm of Hg)
Helium	210 x 10^{-10}
Hydrogen	21 x 10^{-10}
Deuterium	17 x 10^{-10}
Neon	9.5 x 10^{-10}









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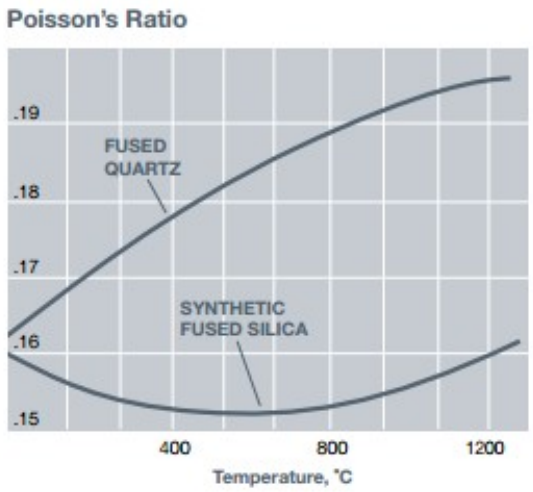

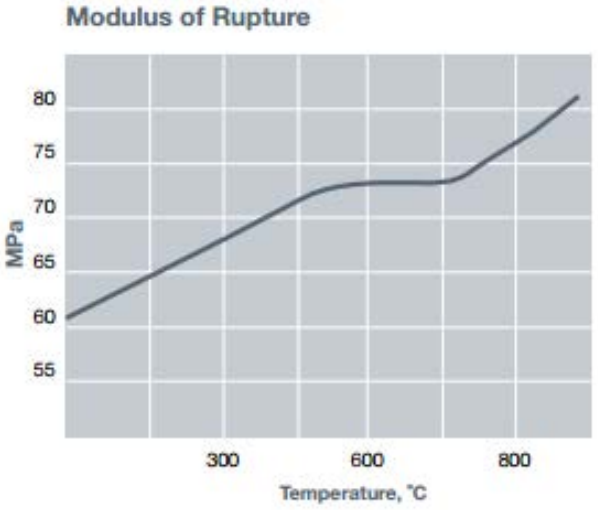

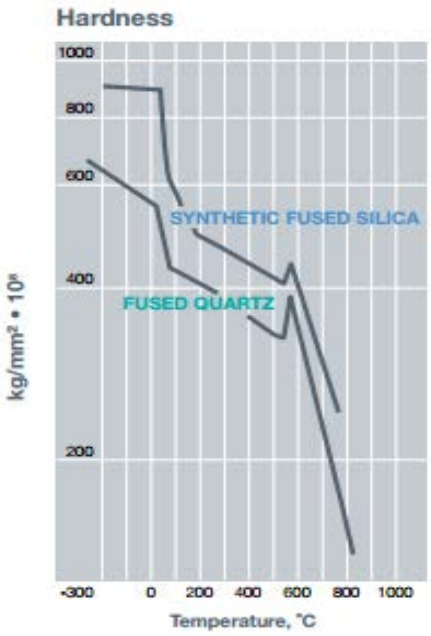

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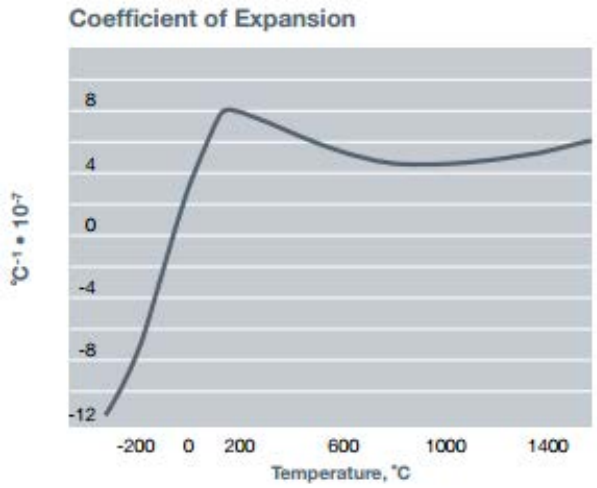
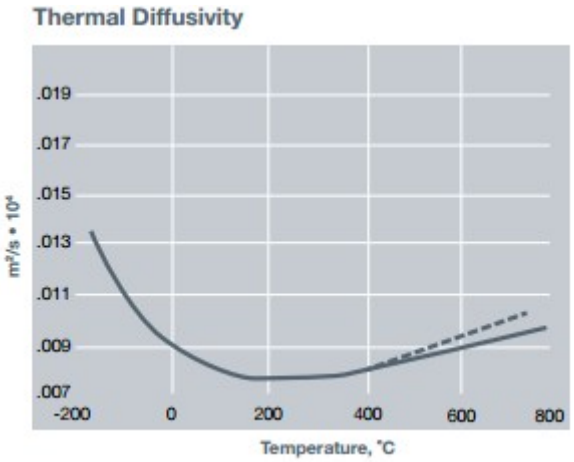
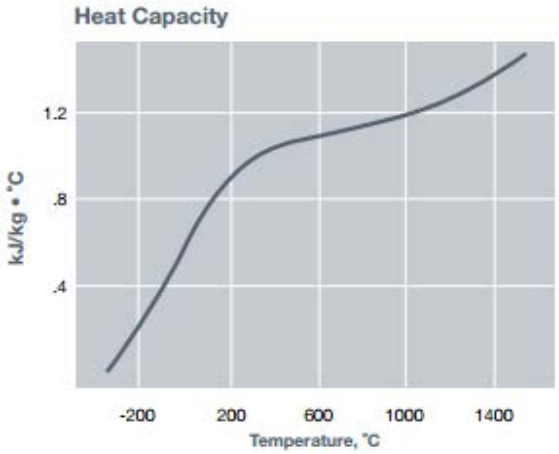
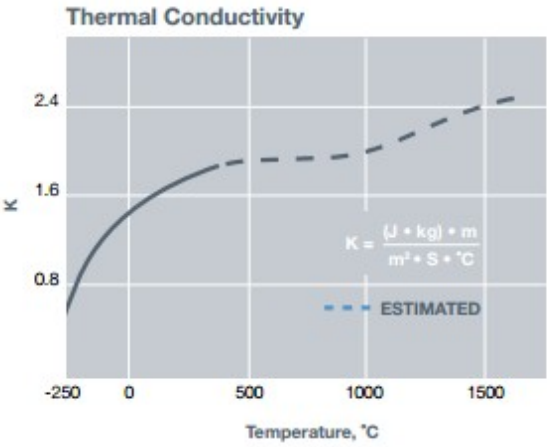
Thermal Properties









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 x 10^{7} ohm cm
Specific resistivity (20°C)	10^{-18} ohm/cm^{3}
Dielectric properties (20°C and 1Mhz)	
Constant	3.75
Strength	5 x 107 V/m
Loss factor	< 4 x 10^{-4}
Dissipation factor	< 1 x 10^{-1}

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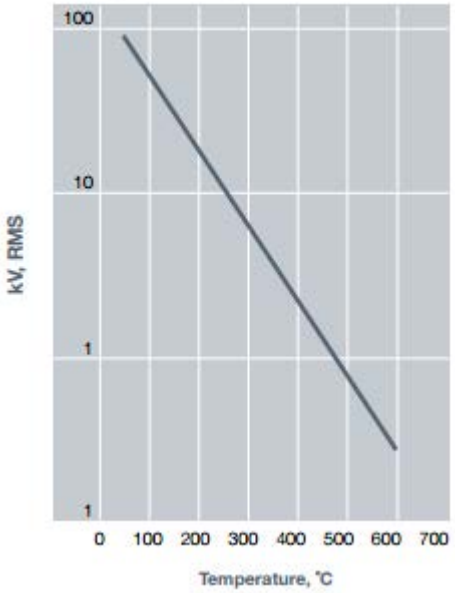
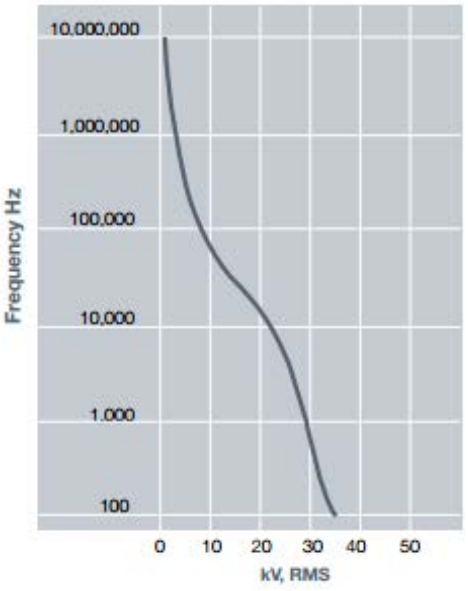
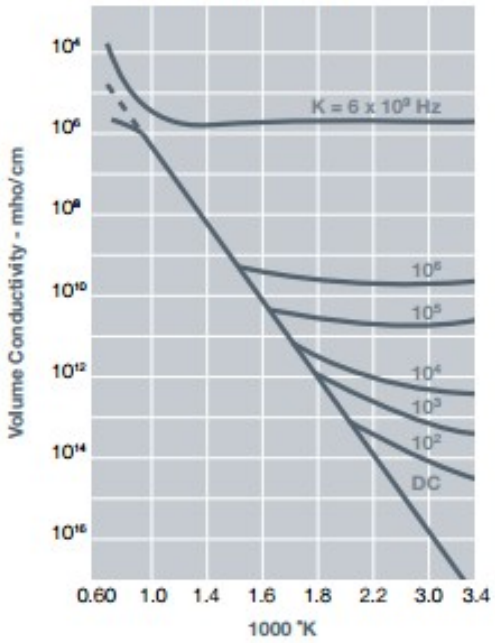
Dielectric Breakdown Voltage vs. Temperature



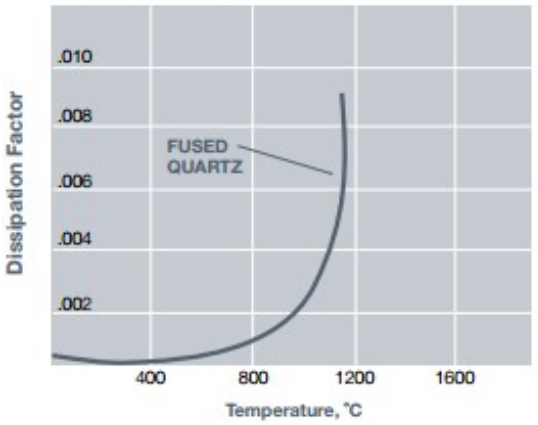
Dielectric Breakdown Voltage vs. Frequency



Volume Conductivity



Dissipation Factor



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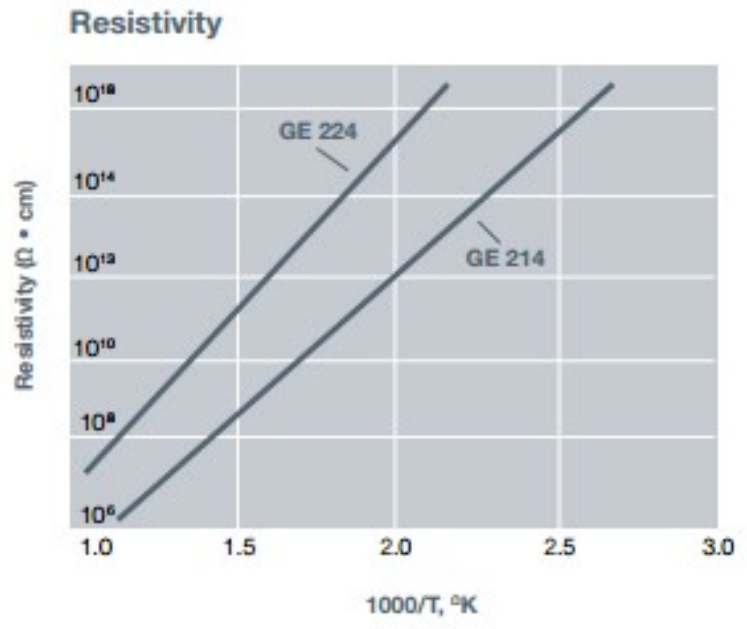

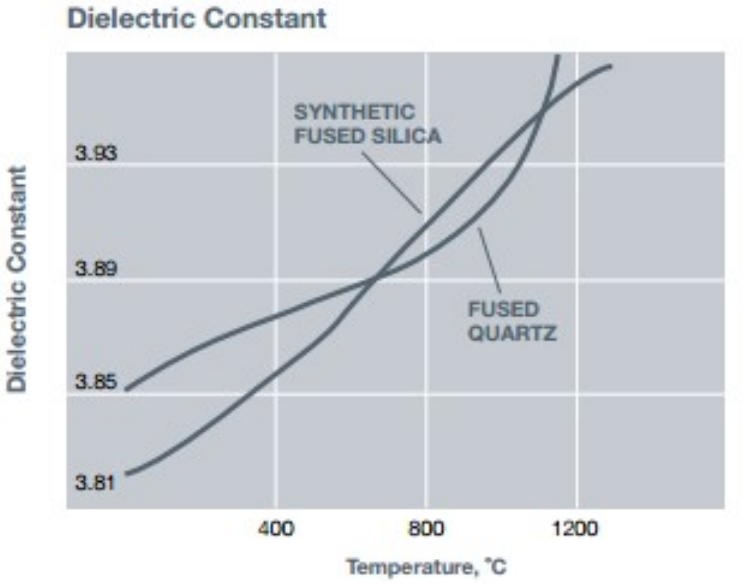

Acknowledgment: Momentive Corporation for providing technical data

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