

GE Synthetic Fused Silica for Optimal Transmittance and Purity

Quartz Tubing for Water Purification and Other Deep UV Applications

GE 021 synthetic fused silica is the newest addition to the GE Quartz tubing family. GE now offers materials designed to satisfy a full range of application requirements including UV transmittance, solarization resistance, and purity.

UV Lamp Applications

Type 021 is fused from synthetically derived raw material. The high purity of this material allows maximum transmittance of visible and UV radiation (see chart).

Its deep UV transparency makes GE 021 an ideal lamp envelope where radiation at wavelengths below 200nm is desired. Lamp efficiency and device efficacy are improved in a broad range of UV applications including water treatment and purification, paint and ink curing and drying, ozone generation, and various other germicidal applications.

The purity of Type 021 also means longer useful lifetimes for quartz tubing. The virtual absence of bulk metallic impurities greatly reduces the solarization rate of fused quartz and therefore minimizes the time dependent darkening effect which is often seen in irradiated natural fused quartz.

Unlike most other synthetic fused quartz materials, **GE 021 has a very low hydroxyl (OH⁻) content (< 10ppm).**

GE 021 tubing is available in a full range of diameters, and it carries the same tight tolerances as GE 214, the industry leader. Other physical properties are similar to GE 214 as outlined in Table III.



GE Fused Quartz – Average Transmittance Including Reflection Loss

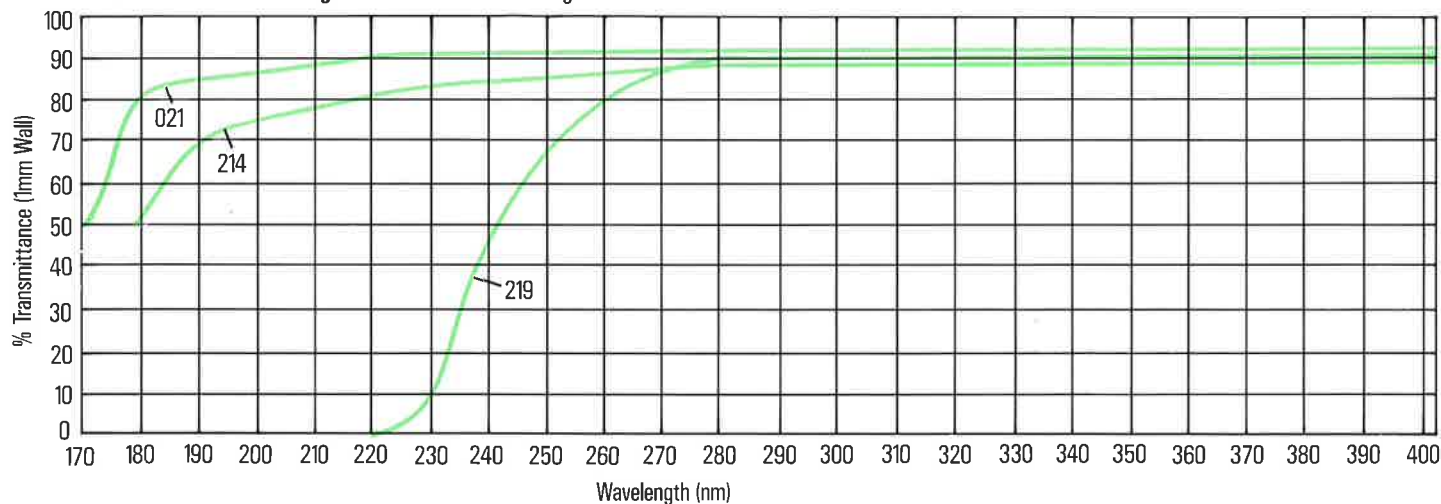


Table I: Typical Trace Element Composition (ppm by weight)

TYPE	Al	Ca	Cd	Cu	Fe	K	Li	Mg	Mn	Na	Ni	P	Ti	Zr	OH ⁻
021	<.5	<.05	<.01	<.03	<0.1	<.05	<.05	<.05	<.02	<.05	<.05	<0.1	<.05	<.02	<10
214	14	0.4	<.01	<.05	0.2	0.6	0.6	0.1	<.05	0.7	<0.1	<0.2	1.1	0.8	<5*
219	14	0.4	<.01	<.05	0.2	0.6	0.6	0.1	<.05	0.7	<0.1	<0.2	100	0.8	<5*

*Types 214A and 254A have <1ppm [OH⁻]

Natural Materials

- **Type 214, the worldwide standard clear fused quartz tubing**, is a high purity, high transmittance natural material with a low hydroxyl content. GE 214 is suitable for a broad range of lamp and semiconductor applications, including those where deep UV transmittance is desirable or allowable but where wavelengths below 200nm are not crucial.
- **Type 219, also known as “Ozone-Free” or “Germicidal” quartz tubing**, transmits visible and near UV radiation. It has a cutoff below 250nm to block the highest energy wavelengths that cause ozone generation and pose the greatest exposure risks. GE 219 transmits the 253.7 nanometer mercury emission very effectively, making it a useful material for “ozone-free” disinfection applications and various other UV treatments.

Semiconductor Applications

The ultra high purity of GE 021 makes it an ideal material for the most critical semiconductor processes. GE 021 can be produced in small or large diameters for use in diffusion and oxidation tubes, reactors, and wafer carriers.

Contact GE . . .

With two USA plants in Ohio and a plant in Germany, GE is the leading producer of lamp grade tubing for the worldwide lighting industry. GE products set the standard for purity and dimensional tolerances and are available in a full range of diameters and wall thicknesses. GE is also a leader in providing technical product and applications support to customers.

For more information on GE Type 021, Type 214, Type 219, or any other fused quartz product, contact an authorized GE Quartz representative or GE Quartz headquarters in Cleveland.

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Table II: Dimensional Tolerances

OD Range	Wall as % of OD	OD	WALL	Siding	Ovality	Bow/1220mm
<5mm	>18%	±2.50%	±10%	10%	2.0%	2.44mm
5mm-13mm	>18%	±2.00%	±10%	10%	1.5%	2.0mm
6mm-13mm	<18%	±1.25%	±8%	8%	1.5%	2.0mm
13mm-30mm	<18%	±1.50%	±8%	8%	1.5%	2.0mm
30mm-60mm	<18%	±1.50%	±10%	10%	1.5%	2.0mm

Table III: GE Clear Fused Quartz Physical Properties

	021	214	219
Density (g/cc)	2.2	2.2	2.21
Thermal Expansion Coefficient (cm/cm °C)	5.7x10 ⁻⁷	5.5x10 ⁻⁷	5.9x10 ⁻⁷
Softening Point (°C)	1610	1683	1660
Annealing Point (°C)	1163	1215	1204
Strain Point (°C)	1052	1120	1106
Log Viscosity: @1100 °C	14.0	14.9	14.8
@1200 °C	12.7	13.3	13.2
@1300 °C	11.6	11.9	11.9
Activation Energy kcal/mol/°K	118	155	142
Index of Refraction	1.456	1.456	1.460
Specific Heat (J/kg °K) (0-50 °C)	670	670	700
Compressive Strength (psi)	>160000	>160000	13660
Young's Modulus (psi)	10.5x10 ⁶	10.5x10 ⁶	10.91x10 ⁶
Electrical Resistivity (ohm cm @ 350 °C)	7x10 ⁹	7x10 ⁹	2.5x10 ¹⁰
Dielectric Constant (@ 1MHz)	3.75	3.75	5.8

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