

Umax: Lifetime Guarantee against corrosion & erosion

CG Thermal's best-in-class Umax SiC Ceramic Heat Exchanger is universally corrosion and erosion resistant, making it the premier option for harsh and corrosive process streams. Because of its superior qualities, CG Thermal offers a **Lifetime Guarantee** against corrosion and erosion for the Umax SiC tube.

Data below is listed at the highest possible reagent concentration and temperature recommended, based on test results and real-world applications.

NOTE: The information provided in the following pages is accurate to the best of our knowledge. It is intended to be used only as a guide. CG Thermal assumes no liability for the accuracy and completeness of this information.

Tube Materials Used In Harsh & Corrosive Process Streams					
Chemical Reagent	Umax	Impervite Graphite	Impervite PPS-GR	Hastelloy C	Tantalum
Acetamide	Umax® SiC Umax® Advanced Ceramic Heat Exchanger Universally Corrosion & Erosion Resistant	100% at 340F	*	50% at Boiling	Limited
Acetanilid		100% at 340F	*		
Acetic Acid		100% at 340F	*	100% at 250F	100% at 300F
Acetic Anhydride		100% at 340F	*		100% at 300F
Acetylene		100% at 340F	*	100% at 100F	
Acidified starch solutions		100% at 340F	*		
Alkl Aryl Sulfonate		100% at 340F	*		
Allyl Alcohol		100% at 340F	*	100% at 250F	
Alum		100% at 340F	*		
Alum, Ammonium		100% at 340F	*		
Alum, Chrome		100% at 340F	*		
Alum, Potassium		100% at 340F	*		
Aluminum Chloride		100% at 340F	*	5% at 70F	100% at 300F
Aluminum Fluoride		100% at 340F	*	Saturated at 140F	Not Recommended
Aluminum Hydroxide		Not Recommended	Not Recommended	Not Recommended	
Aluminum Nitrate		100% at 340F	*		
Aluminum Sulfate		100% at 340F	*	Saturated at Boiling	100% at 300F
Amino Acid + HCL and H2SO4		100% at 185F	*		
Ammonia (gas)		100% at 340F	*		
Ammonia (gas-dry)		100% at 70F	*		
Ammonia, aqueous		10% at 340F	*		
Ammonium Bifluoride		100% at 340F	*	Not Recommended	Not Recommended
Ammonium Carbonate		100% at 340F	*	Not Recommended	
Ammonium Chloride		100% at 340F	*	Saturated at 250F	100% at 300F
Ammonium Fluoride		100% at 340F	*	20% at 250F	Not Recommended
Ammonium Hydroxide		100% at 140F	*		

*Impervite PPS-GR is a novel material with limited testing data available at this time. In controlled tests and real-world applications, Impervite PPS-GR possesses a material compatibility similar to Impervite Graphite

CGThermal	Tube Materials Used In Harsh & Corrosive Process Streams				
Chemical Reagent	Umax	Impervite Graphite	Impervite PPS-GR	Hastelloy C	Tantalum

Ammonium Metaphosphate	Umax® SiC Umax® Advanced Ceramic Heat Exchanger Universally Corrosion & Erosion Resistant	100% at 340F	*		
Ammonium Nitrate		100% at 275F	*	Not Recommended	5% at 70F
Ammonium Persulfate Plus H2SO4		25% at 70F	*		
Ammonium Sulfate		100% at 340F	*	Not Recommended	100% at 300F
Ammonium Sulfite		100% at 340F	*		
Ammonium Thiocyanate		100% at 340F	*		
Amyl Acetate		100% at 340F	*		100% at 300F
Amyl Alcohol		100% at 340F	*		100% at 300F
Aniline		100% at 340F	*	Not Recommended	
Aniline Hydrochloride		60% at 340F	*		5% at 70F
Arsenic Trichloride		100% at 230F	*		
Aureomycin		100% at 340F	*		
Benzaldehyde		100% at 340F	*	100% at Boiling	
Benzene		100% at 340F	*	Not Recommended	70F
Benzene Hexachloride		100% at Boiling	*		
Benzoic Acid		100% at 340F	*	Not Recommended	100% at 300F
Benzylsulfonic Acid		60% at 340F	*		
Beta-Naphthol		100% at 340F	*		
Black Liquor		100% at 340F	*		
Borax		100% at 340F	*	Not Recommended	
Boric Acid		100% at 340F	*	10% at 250F	
Brine		100% at 340F	*		
Bromine		Not Recommended	Not Recommended		100% at 300F
Bromine water		Not Recommended	Not Recommended		100% at 300F
Butadiene		100% at 340F	*		
Butane		100% at 340F	*		
Butyl Acetate		100% at 340F	*	100% at 250F	Resistant
Butyl Acrylate + Acrylic Acid		100% at 340F	*		
Butyl Alcohol		100% at 340F	*		100% at 300F
Butyl Cellosolve		100% at 340F	*		
Butylene		100% at 340F	*		
Butyraldehyde		100% at 340F	*		
Butyric Acid		100% at 340F	*	5% at Boiling	100% at 300F
Calcium Bisulfide		100% at 340F	*		
Calcium Bi sulfite		100% at 340F	*		
Calcium Carbonate		100% at 340F	*	Not Recommended	70F
Calcium Chlorate		10% at 140F	*	Saturated at 175F	Dilute Hot or Cold
Calcium Chloride		100% at 340F	*	Saturated at Boiling	100% at 300F
Calcium Chloride + Calcium Chlorate		30% at 140F	*		

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CGThermal		Tube Materials Used In Harsh & Corrosive Process Streams				
Chemical Reagent		Umax	Impervite Graphite	Impervite PPS-GR	Hastelloy C	Tantalum
Calcium Hydroxide	<div>Umax®</div> <div>SiC Umax® Advanced Ceramic Heat Exchanger</div> <div>Universally Corrosion & Erosion Resistant</div>	Not Recommended	Not Recommended		100% at 300F	
Calcium Hypochlorite		100% at 90F	*		100% at 300F	
Calcium Nitrate		100% at 340F	*	Saturated at Boiling		
Calcium Oxide		100% at 340F	*			
Calcium Phosphate		100% at 340F	*			
Calcium Sulfate		100% at 340F	*	Not Recommended	100% at 300F	
Caprylic Acid		100% at 340F	*	100% at 250F		
Carbon Dioxide (dry)		100% at 340F	*		100% at 300F	
Carbon Dioxide (wet)		100% at 340F	*			
Carbon Disulfide		100% at Boiling	*			
Carbon Monoxide		100% at 340F	*			
Carbon Tetrachloride		100% at 340F	*	100% at 250F	Pure at 70F	
Carbonic Acid		100% at 340F	*		100% at 300F	
Carboxymethal Cellulose		100% at 340F	*			
Castor oil		100% at 340F	*			
Caustic Potash		Not Recommended	Not Recommended	Not Recommended		
Cellosolve solvent		100% at 340F	*			
Cellulose Acetate		100% at 340F	*	Not Recommended		
Chloral		Not Recommended	Not Recommended			
Chloral Hydrate		100% at 340F	*			
Chlorethylbenzene		100% at 257F	*			
Chlorinated Ehtyl Alcohols		100% at 340F	*			
Chlorine - Dry		100% at 70F	*		100% at 300F	
Chlorine- Wet		Not Recommended	Not Recommended		100% at 300F	
Chlorine Dioxide		Not Recommended	Not Recommended	15% at 140F		
Chloroacetic Acid		100% at Boiling	*	50% at 250F	100% at 300F	
Chlorobezene		100% at 340F	*			
Chloroethylbenzene		100% at 257F	*			
Chloroform		100% at 340F	*		70F	
Chlorosulfonic Acid		Not Recommended	Not Recommended	Not Recommended		
Chromic Acid		Not Recommended	Not Recommended	10% at Boiling	100% at 300F	
Citric Acid		100% at 340F	*	10% at Boiling	100% at 300F	
Copper Carbonate		100% at 340F	*	Not Recommended	Saturated	
Copper Chloride		100% at 340F	*	Saturated at Boiling	5% Agitated at 70F	
Copper cyanide		100% at 340F	*	Not Recommended	Saturated at Boiling	
Copper Fluoride		100% at 340F	*		Not Recommended	
Copper Nitrate		100% at 340F	*	Not Recommended	50% Aqueous at 70F	
Copper Sulfate		10% at 340F	*	Saturated at Boiling	5% at 70F	
Cresylic Acid + H2SO4		100% at 340F	*			

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CGThermal	Tube Materials Used In Harsh & Corrosive Process Streams				
Chemical Reagent	Umax	Impervite Graphite	Impervite PPS-GR	Hastelloy C	Tantalum

Cupric Chloride	Umax® <small>SIC Umax® Advanced Ceramic Heat Exchanger</small> <i>Universally Corrosion & Erosion Resistant</i>	100% at 340F	*		105F
Cyclohexane		100% at 340F	*		
Deoxidine		100% at 140F	*		
Dialkyl Phthalates		100% at 340F	*		
Dichloro derivatives		100% at 340F	*		
Diethyl Ether		100% at 340F	*		
Diethylamine		100% at 340F	*		
Diphenylamine		100% at 340F	*		
Electropolishing Solutions		Not Recommended	Not Recommended		
Epson Salts		100% at 340F	*		
Ethanolamine		100% at 340F	*	100% at Boiling	
Ethers		100% at 340F	*		
Ethyl Acetate		100% at 340F	*		Resistant
Ethyl Alcohol		100% at 340F	*		100% at 300F
Ethyl Chloride		100% at 340F	*		5% at 70F
Ethyl Mercaptan-water		Saturated at 340F	*		
Ethylene		100% at 340F	*		
Ethylene Chlorohydrin		0-8% at 122F	*		
Ethylene Dibromide		100% at 340F	*		
Ethylene Dichloride		100% at 340F	*		
Ethylene Glycol		100% at 340F	*		
Ethylene Oxide		100% at 340F	*	Not Recommended	
Ethylenediamine		100% at 340F	*		
Fatty Acids		100% at 340F	*		100% at 300F
Ferric Chloride		100% at 340F	*		100% at 300F
Ferric Nitrate		100% at 340F	*		5% at 70F
Ferric Sulfate		100% at 340F	*	Not Recommended	5% at 70F
Ferrous Chloride		100% at 340F	*	Not Recommended	70F
Ferrous Nitrate		100% at 340F	*		
Ferrous Sulfate		100% at 340F	*	Not Recommended	100% at 300F
Flourine		Not Recommended	Not Recommended		Not Recommended
Folic Acid		100% at 340F	*		
Formaldehyde		100% at 340F	*		100% at 300F
Formic Acid		100% at 340F	*	90% at Boiling	100% at 300F
Freons		100% at 340F	*		
Fructose		100% at 340F	*		
Fruit Juices, pulp		100% at 340F	*		
Furfural		100% at 340F	*	Not Recommended	Resistant
Gas - natural		100% at 340F	*		
Gasoline		100% at 340F	*		Resistant

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Chemical Reagent	Umax	Impervite Graphite	Impervite PPS-GR	Hastelloy C	Tantalum
Gin	<div>Umax®</div> <div>SiC Umax® Advanced Ceramic Heat Exchanger</div> <div>Universally Corrosion & Erosion Resistant</div>	100% at 340F	*		
Glucose		100% at 340F	*	100% at 250F	
Glycerine		100% at 340F	*		70F
Heptane		100% at 340F	*	100% at Boiling	
Hydrazine		Not Recommended	Not Recommended		
Hydrobromic Acid		100% at 340F	*		100% at 300F
Hydrochloric Acid		100% at 340F	36% at Boiling	50% at 70F	100% at 300F
Hydrofluoric Acid		48-60% at 185F	40% at Boiling		Not Recommended
Hydrofluosilicic Acid		20% at 340F	*		
Hydrogen Chloride		100% at 340F	*		100% at 300F
Hydrogen Peroxide		100% at 340F	*	Not Recommended	70F
Hydrogen Sulfide - aqueous		100% at 340F	*		
Hydrogen Sulfide - Dry		100% at 340F	*		
Hydroquinone		100% at 340F	*		
Hypo Sodium Thiosulfate		100% at 340F	*		
Iodine		Not Recommended	Not Recommended	Not Recommended	100% at 300F
Isopropyl Acetate		100% at 340F	*		
Isopropyl Ether		100% at 340F	*		
Keytones		100% at 340F	*		
Lead Acetate		100% at 340F	*	Not Recommended	Resistant
Magnesium Hydroxide		100% at 340F	*		
Magnesium Sulfate		100% at 340F	*		100% at 300F
Maleic Acid		100% at 340F	*		
Manganese Sulfate		100% at 340F	*	100% at Boiling	
Manganous Sulfate		100% at 340F	*		
Mercurous Nitrate		100% at 340F	*	Saturated at 100F	Resistant
Mercury		100% at 60F	*	100% at 250F	Resistant
Methyl Alcohol		100% at 340F	*		100% at 300F
Methyl Bromide		100% at 340F	*		
Methyl Chloride		100% at 340F	*		
Methyl Chloroform		100% at 340F	*		
Methyl Ethyl Keytone		100% at 340F	*		
Methyl Silicytate		100% at 340F	*		
Methylene Chloride		100% at 340F	*		
Mineral Oil		100% at 340F	*	100% at Boiling	100% at 300F
Naphtha		100% at 340F	*	100% at Boiling	
Nickel Chloride		100% at 340F	*	Saturated at Boiling	70F
Nickel Sulfate		100% at 340F	*	Not Recommended	10% at 70F
Nitric Acid		0-10% at 185F	*	10% at 140F	100% + Fuming at 300F

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Chemical Reagent	Umax	Impervite Graphite	Impervite PPS-GR	Hastelloy C	Tantalum

Nitric Acid	Umax® SiC Umax® Advanced Ceramic Heat Exchanger <i>Universally Corrosion & Erosion Resistant</i>	10-20% at 140F	*	30% at 140F	100% at 300F
Nitric Acid + hydrofluoric Acid		Not Recommended	Not Recommended		100% at 300F
Nitrobenzene		100% at 340F	*		100% at 300F
Nitroparaffin		85% at 340F	*		
Nitrous Acid		Not Recommended	Not Recommended		5% at 70F
Nitrous Oxide		Not Recommended	Not Recommended	Not Recommended	Dry
Octyl Alcohol		100% at 340F	*		100% at 300F
Oleic Acid		100% at 340F	*		10% at Boiling
Oxalic Acid		100% at 340F	*	Not Recommended	100% at 300F
Oxygen		100% at 340F	*		
Palmitic Acid		100% at 340F	*		
Palmitic Acid		100% at 340F	*		
Paraldehyde		100% at 340F	*		
Parkerizing solution		100% at 340F	*		
Pentaerythritol		100% at 340F	*		
Perchloric Acid		100% at 340F	*	Not Recommended	100% at 300F
Perchloroethylene		100% at 340F	*		
Petrolatum		100% at 340F	*		
Petroleum - oil based		100% at 340F	*		
Phenol		100% at 340F	*	100% at 250F	100% at 300F
Phenylhydrazine Hydrochloride		100% at 340F	*		
Phosphoric Acid		85% at 340F	85% at 175F	80% at 175F	100% at 300F
Phosphorous Trichloride		100% at 340F	*		Resistant
Phosphorous - red		100% at 340F	*		
Phosphorous - yellow		100% at 340F	*		
Phosphorous Oxychloride		100% at 340F	*		100% at 300F
Phosphorous Pentoxide		100% at 340F	*		
Photographic solutions		100% at 340F	*		
Phthalic Anhydride		100% at 340F	*	100% at 250F	
Plating Solutions - Brass		100% at 340F	*		
Plating Solutions - Cadmium		100% at 340F	*		
Plating Solutions - Chromium		Not Recommended	Not Recommended		Limited
Plating Solutions - Copper		100% at 340F	*		
Plating Solutions - Gold		100% at 340F	*		
Plating Solutions - Lead		100% at 340F	*		
Plating Solutions - Nickel		100% at 340F	*		
Plating Solutions - Tin		100% at 340F	*		
Plating Solutions - Zinc		100% at 340F	*		
Polyethylene		100% at 340F	*		
Potassium Aluminum Sulfate		100% at 340F	*		

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Chemical Reagent	Umax	Impervite Graphite	Impervite PPS-GR	Hastelloy C	Tantalum

Potassium Bicarbonate	Umax® SiC Umax® Advanced Ceramic Heat Exchanger <i>Universally Corrosion & Erosion Resistant</i>	30% at 340F	*	Not Recommended	
Potassium Bromide		30% at 340F	*	30% at Boiling	100% at 300F
Potassium Carbonate		50% at 340F	*	40% at Boiling	1% at 70F
Potassium Chlorate		Not Recommended	Not Recommended	Not Recommended	100% at 300F
Potassium Chloride		100% at 340F	*	30% at Boiling	100% at 300F
Potassium Chromate		30% at 340F	*	40% at Boiling	
Potassium Cyanide		30% at 340F	*		Resistant
Potassium Dichromate		30% at 340F	*	Not Recommended	100% at 300F
Potassium ferricyanate		30% at 340F	*		
Potassium Ferrocyanide		30% at 340F	*		5% at 70F
Potassium Hydroxide		100% at 340F	*	Not Recommended	5% at 70F
Potassium Hypochlorite		Not Recommended	Not Recommended		100% at 300F
Potassium Perchlorate		Not Recommended	Not Recommended	Not Recommended	
Potassium Permanganate		20% at 340F	*	Not Recommended	
Potassium Persulfate		10% at 340F	*	Not Recommended	
Propane		100% at 340F	*	Not Recommended	
Pyridine		100% at 340F	*	100% at 140F	
Salicylaldehyde		100% at 340F	*		
Salicytic Acid		100% at 340F	*		
Sea Water		100% at 340F	6.5% at 175F		Resistant
Silver Cyanide		100% at 340F	*		Resistant
Silver Nitrate		100% at 340F	*	50% at 250F	Resistant
Sodium		100% at 340F	*		
Sodium Acetate		100% at 340F	*	50% at 100F	
Sodium Benzoate		100% at 340F	*	Not Recommended	Resistant
Sodium Bicarbonate		20% at 340F	*	Not Recommended	100% at 150F
Sodium Bromide		100% at 340F	*	Saturated at Boiling	100% at 300F
Sodium Carbonate		100% at 340F	*	30% at Boiling	100% at 70F
Sodium Chlorate		Not Recommended	Not Recommended	Not Recommended	100% at 300F
Sodium Chloride		100% at 340F	*	25% at Boiling	100% at 300F
Sodium Chlorite		4% at 70F	*		
Sodium Chromate		80% at 340F	*		
Sodium Dichromate		100% at 340F	*		
Sodium Ferricyanide		100% at 340F	*	Saturated at 175F	Resistant
Sodium Fluoride		100% at 340F	*	5% at Boiling	Not Recommended
Sodium Hydroxide		67-80% at 275F	72% at 73F		
Sodium Hydroxide		Not Recommended	Not Recommended		
Sodium Hypochlorite		Not Recommended	Not Recommended	13% at Boiling	100% at 300F
Sodium Phosphate		100% at 340F	*	Not Recommended	
Sodium Sulfate		100% at 340F	*	Not Recommended	100% at 300F

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Chemical Reagent	Umax	Impervite Graphite	Impervite PPS-GR	Hastelloy C	Tantalum
Sodium Sulfite	Umax® SiC Umax® Advanced Ceramic Heat Exchanger <i>Universally Corrosion & Erosion Resistant</i>	10% at 340F	*	Not Recommended	100% at 300F
Sodium Thiosulfate		100% at 340F	*		
Stannic Chloride		100% at 122F	*		100% at 300F
Steam		100% at 340F	*	100% at 175F	Resistant
Stearic Acid		Not Recommended	Not Recommended	20% at 140F	Concentrated at 200F
Styrene		100% at 340F	*		
Sulfonated Detergents		100% at 340F	*		
Sulfur		100% at 340F	*		100% at 300F
Sulfur Dioxide		100% at 340F	*		100% at 300F
Sulfur Monochloride		100% at 122F	*		
Sulfur Trioxide		Not Recommended	Not Recommended	90% at 175F	
Sulfuric Acid		0-70% at 340F	70% at 302F	96% at 175F	100% at 300F
Sulfuric Acid w/ Nitric Acid		Not Recommended	Not Recommended		
Sulfurous Acid		Not Recommended	Not Recommended	Saturated at 300F	100% at 300F
Tannic Acid		100% at 340F	*	Not Recommended	10% at 70F
Tannic Chloride		100% at 340F	*		
Tanning Liquors		100% at 340F	*		
Tartaric Acid		100% at 340F	*	30% at Boiling	10% at 70F
Tetrachloroethane		100% at 340F	*		
Tetraethyl Lead		100% at 340F	*		
Tetramin C		100% at 340F	*		
Therminol (all types)		100% at 340F	*		
Titanium Dioxide		100% at 340F	*		
Toluene		100% at 340F	*		
Toluene Dilsocyanate		100% at 340F	*		
Trichloroacetic Acid		100% at 340F	*	20% at Boiling	
Trichloroethylene		100% at 340F	*	100% at 175F	
Tricresyl Phosphate		100% at 340F	*		
Triethanolamine		100% at 340F	*	100% at Boiling	
Trisodium Phosphate		100% at 340F	*	10% at 100F	
Urea		100% at 340F	*		
Vanillin		100% at 340F	*		
Vinegar		100% at 340F	*	100% at Boiling	
Vinyl Acetate		100% at 340F	*	10% at 250F	
Vinyl Chloride		100% at 340F	*		
Whiskey		100% at 340F	*		
Wine		100% at 340F	*		
Xylene		100% at 340F	*		
Zinc Ammonium Chloride		100% at 340F	*		

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Chemical Reagent	Umax	Impervite Graphite	Impervite PPS-GR	Hastelloy C	Tantalum
Zinc Chloride		100% at 340F	*	10% at Boiling	5% Still at Boiling
Zinc Nitrate		100% at 340F	*		
Zinc Oxide		100% at 340F	*		
Zinc Sulfate		100% at 340F	*	Not Recommended	25% at Boiling

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