

CHEMICAL RESISTANCE CHART

Notice: The Chemical Resistance Chart given on the following pages is intended as a *general guide* for rating the resistance of typical engineering materials to common industrial chemicals. *It is not intended as a guarantee of material performance.* The ratings in the chart are based on data obtained from technical publications, material manufacturers and laboratory tests. The information given in the chart should be used as a first approximation for material selection, rather than the final answer. This is because chemical effects are dependent on many

factors, which can cause chemical ratings to change within a given application. Such factors include variations in temperature, pressure and concentration, chemical combinations, impurities or filler materials, aeration, agitation and exposure time. It is recommended that pumps and materials first be tested under simulated field service conditions. *Never test or operate a pump before acceptable chemical ratings have been obtained and the proper safety precautions have been taken.*

Interpretation of Chemical Resistance Ratings

Rating	Meaning	Corrosion Rate (CR)	Units
A	Excellent – Virtually no effect; very low corrosion rate.	CR < 0.002	in/yr
		CR < 0.05	mm/yr
B	Good – Minor effect; low corrosion rate or slight discoloration observed.	$0.002 \leq CR < 0.02$	in/yr
		$0.05 \leq CR < 0.5$	mm/yr
C	Fair – Moderate effect; moderate to high corrosion rate. Softening, weakening or swelling may occur. <i>Not recommended for continuous use.</i>	$0.02 \leq CR < 0.05$	in/yr
		$0.5 \leq CR < 1.3$	mm/yr
D	Severe Effect – Immediate attack, explosive or very high corrosion rate. <i>Not recommended for any use.</i>	CR ≥ 0.05	in/yr
		CR ≥ 1.3	mm/yr
N	No Data Available	—	—

- Notes:**
- 1 Ratings for all chemicals apply at room temperature unless chemical is molten (e.g., paraffin wax, sulfur, etc.)
 - 2 Ratings for Carbon apply to Graphite-grade Carbon (i.e., Carbon-60)
 - 3 Ratings for SiC apply to Self Sintered Silicon Carbide
 - 4 Ratings for Ceramic apply to Ceramic Aluminum Oxide
 - 5 Ratings apply to chemicals at 100% concentration (except for salts which are based on aqueous solutions) unless stated otherwise

Definition of Terms:

SS = Stainless Steel
Alloy-20 = High-Nickel Stainless Steel
Alloy-C = Ni-Cr-Mo Alloy
Ti = Titanium
C = Carbon
SiC = Silicon Carbide
Cer. = Ceramic

Teflon® = Polytetrafluoroethylene (PTFE)
Ryton® = Polyphenylene Sulfide (PPS)
PEEK = Polyetheretherketone
Viton® = Fluorocarbon Rubber
EPDM = Ethylene-Propylene-Diene Rubber
NBR = Nitrile Buna Rubber
Kalrez® = Perfluorinated Elastomer

Chemical/Fluid	Metals					Plastics			Elastomers				Minerals		
	304 SS	316 SS	Alloy-20	Alloy-C	Ti	Teflon	Ryton	PEEK	Viton	EPDM	NBR	Kalrez	C	SIC	Cer.
A															
Acetaldehyde	A	A	A	A	A	A	A	A	D	B	C	A	A	A	A
Acetic Acid	B	A	A	A	A	A	A	A	B	A	B	A	A	A	A
Acelone	A	A	A	A	A	A	A	A	D	A	D	A	A	A	A
Acetonitrile	A	A	A	A	N	A	A	A	A	A	C	A	A	A	A
Aluminum Chloride, 20%	D	C	C	A	D	A	A	A	A	A	A	A	A	A	A
Alum. Potass. Sulfate, 10%	A	A	A	B	A	A	N	A	A	A	A	A	A	A	A
Aluminum Sulfate	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Ammonia, Anhydrous	A	A	A	A	A	A	A	A	A	A	A	B	A	A	A
Ammonium Chloride	D	B	B	B	A	A	A	A	A	A	A	A	A	A	A
Ammonium Hydroxide	A	A	A	A	A	A	A	A	D	A	D	B	A	A	A
Ammonium Nitrate	A	A	A	B	A	A	A	A	A	A	A	A	A	A	A
Ammonium Sulfate	C	B	B	B	A	A	A	A	D	A	A	A	A	A	A
Amyl Acetate	A	A	A	A	A	A	A	A	D	C	D	A	A	A	A
Aniline	A	A	A	B	A	A	A	A	C	B	D	A	A	A	A
Aqua Regia ¹	D	D	D	C	A	A	D	D	A	B	D	A	D	A	A
Asphalt	A	A	A	N	N	A	A	A	A	D	B	A	A	A	A
B															
Barium Hydroxide	B	A	A	B	A	A	A	N	A	A	A	A	A	A	A
Benzene	A	A	A	B	A	A	A ₃	A ₃	A	D	D	A	A	A	A
Benzoic Acid	B	B	B	A	A	A	A	A	A	D	D	A	A	A	A
Benzyl Alcohol	A	A	A	A	A	A	A ₃	N	A	D	D	A	A	A	A
Bitumen	A	A	A	A	A	A	A	A	A	D	B	A	A	A	A
Boric Acid	B	A	B	A	A	A	A	A	A	A	A	A	A	A	A
Brine (NaCl & Water)	B	B	B	A	A	A	A	A	A	C	A	A	A	A	A
Butadiene	A	A	A	A	A	A	A	N	A	D	D	A	A	A	A
Butane	A	A	A	A	A	A	A	A	A	D	A	A	A	A	A
Butyl Acetate	B	B	B	A	A	A	A	A	D	B	D	A	A	A	A
Butyl Alcohol	A	A	A	A	A	A	A	A	A	B	B	A	A	A	A
C															
Calcium Chloride	D	B	B	B	A	A	A	A	A	A	A	A	A	A	A
Calcium Hydroxide	B	B	B	A	A	A	A	A	A	A	A	A	A	A	A
Calcium Hypochlorite	D	B	C	B	A	A	A	A	A	A	B	A	A	A	A
Carbon Disulfide	B	B	B	B	A	A	A	D	A	D	D	A	A	A	A
Carbon Tetrachloride	A	A	A	A	A	A ₃	B	A	A	D	B	A	C	A	A
Carbonic Acid	A	A	A	A	A	A	A	A	A	A	B	A	A	A	A
Chlorine, anhydrous liquid	A	A	A	A	D	A	D	D	A	D	B	A	A	A	A
Chlorobenzene	B	B	B	B	A	A ₃	A ₃	A ₃	A	D	D	A	A	A	A
Chloroform	A	A	A	B	A	A ₃	B	A	A	D	D	A	C	A	A
Chlorosulfonic Acid	B	B	B	A	A	A	D	A	D	D	D	A	A	A	A
Chromic Acid, 30%	D	D	D	B	A	A	B	A	A	B	D	A	A	A	A
Citric Acid	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Copper Sulfate	B	B	B	A	A	B	A	A	A	A	A	A	A	A	A
Crude Oil	A	A	A	A	A	A	A	A	A	D	B	A	A	A	A
Cyclohexane	B	B	B	B	A	A	A	A	A	D	A	A	A	A	A
Cyclohexanol	A	A	A	A	A	A	A	A	A	D	A	A	A	A	A
D															
Diesel Fuel	A	A	A	A	A	A	A	A	A	D	A	A	A	A	A
Diethylamine (DEA)	A	A	A	A	A	A	N	A	C	A	C	A	A	A	A
Diethylether	A	A	A	A	A	A	A	A	D	D	D	A	A	A	A
Diethyl Phthalate (DOP)	A	A	A	A	A	A	A	N	B	B	D	A	A	A	A
Dowtherm	A	A	A	A	A	A	A	N	A	D	D	A	A	A	A

FOOTNOTE 1: 3:1 or 4:1 HCl/HNO₃
 FOOTNOTE 2: Depends on specific type of Freon
 FOOTNOTE 3: Swelling may occur

Chemical/Fluid	Metals					Plastics			Elastomers				Minerals		
	304 SS	316 SS	Alloy-20	Alloy-C	Ti	Teflon	Ryton	PEEK	Viton	EPDM	NBR	Kalrez	C	SiC	Cer.
E															
Ethanol	A	A	A	A	A	A	A	A	C	A	C	A	A	A	A
Ether	A	A	A	B	A	A	A	A	C	C	D	A	A	A	A
Ethyl Acetate	A	A	A	A	A	A	A	A	D	B	D	A	A	A	A
Ethylene Glycol	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Ethylene Oxide	A	A	A	A	A	A	N	A	D	C	D	A	A	A	A
F															
Fatty Acid	B	A	A	A	B	A	N	A	A	C	B	A	A	A	A
Ferric Chloride	D	D	D	B	A	A	A	B	A	A	A	A	C	A	A
Ferric Sulfate	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Fluorosilicic Acid	C	C	C	B	D	A	A	N	B	B	A	A	A	A	C
Formaldehyde	A	A	A	B	A	A	N	A	D	B	C	A	A	A	A
Freon, general	A	A	A	A	A	A ₃	A	A	----- See Footnote 2 -----			A	A	A	
Fuel Oil	A	A	A	A	A	B	A	A	A	D	A	A	A	A	A
G															
Gasoline, unleaded	A	A	A	A	A	A	A	A	A	D	A	A	A	A	A
Gasoline, high-aromatic	A	A	A	A	B	A	A ₃	A ₃	A	D	A	A	A	A	A
Glucose (Corn Syrup)	A	A	A	A	A	A	N	A	A	A	A	A	A	A	A
Glycerine	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
H															
Heptane	A	A	A	A	A	A	A	A	A	D	A	A	A	A	A
Hexane	A	A	A	A	A	A	A	A	A	D	A	A	A	A	A
Hydraulic Fluid, petro.	A	A	A	A	N	A	N	A	A	D	A	A	B	A	A
Hydraulic Fluid, synth.	A	A	A	A	N	A	N	A	A	D	B	A	B	A	A
Hydrazine	A	A	A	A	A	A	N	A	D	A	B	A	A	A	N
Hydrobromic Acid, 20%	D	D	D	A	A	A	N	D	A	A	D	A	A	A	N
Hydrochloric Acid, 37%	D	D	D	B	D	A	D	A	A	C	D	A	A	A	C
Hydrofluoric Acid, 20%	D	D	D	B	D	A	A	D	D	D	D	A	A	A	D
Hydrogen Peroxide, 50%	B	B	B	D	A	A	D	A	A	C	D	A	C	A	N
I-J-K-L															
Isopropanol	A	A	A	A	A	A	A	A	A	A	B	A	A	A	A
Jet Fuel	A	A	A	A	A	A	A	A	A	D	B	A	A	A	A
Kerosene	A	A	A	A	A	A	A	A	A	D	A	A	A	A	A
Lactic Acid	B	B	B	B	A	A	A	A	A	A	A	A	A	A	A
M															
Maleic Acid	A	B	B	B	A	A	N	A	A	D	D	A	A	A	N
Methanol	A	A	A	A	B	A	A	A	D	A	D	A	A	A	A
Methyl Ethyl Ketone (MEK)	A	A	A	A	A	A	A	A	D	A	D	A	A	A	A
Methylene Chloride	B	B	B	B	B	A ₃	A	A	B	D	D	A	C	A	A
Methylene Di-para-phenylene Isocyanate (MDI)	N	A	N	A	N	A	N	N	D	B	D	A	D	A	A
Mineral Oil	A	A	A	A	A	A	A	A	A	D	A	A	A	A	A
N															
Naphtha	A	A	A	A	A	A	A	A	A	D	B	A	A	A	A
Naphthalene	A	A	A	B	A	A	A	A	A	D	D	A	A	A	A
Nitric Acid, 20%	A	A	A	A	A	A	D	B	A	B	D	A	A	A	A
Nitrous Acid	D	B	B	D	B	A	N	A	C	A	C	A	A	A	A
O															
Oleic Acid	B	B	B	A	A	A	A	A	B	D	C	A	A	A	A
Oleum	A	A	A	B	D	A	B	N	A	D	D	A	D	A	A
Oxalic Acid	B	A	A	B	A	A	A	A	A	A	B	A	A	A	A

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Chemical/Fluid	Metals					Plastics			Elastomers				Minerals		
	304 SS	316 SS	Alloy-20	Alloy-C	Ti	Teflon	Ryton	PEEK	Viton	EPDM	NBR	Kalrez	C	SIC	Cer.
P															
Paraffin	A	A	A	B	A	A	N	A	A	D	A	A	A	A	A
Pentane	B	B	N	A	A	A	N	A	A	D	A	A	A	A	A
Perchloric Acid	D	D	D	B	D	A	A	A	A	A	D	A	D	A	A
Perchloroethylene	B	B	B	A	A	A ₃	A	A	A	D	B	A	A	A	A
Phenol	A	A	A	A	A	A	A ₃	D	A	D	D	A	A	A	A
Phosphoric Acid, 40%	B	B	B	A	C	A	C	A	A	B	D	A	A	A	A
Phthalic Acid	B	A	A	B	A	A	N	A	C	A	C	A	A	A	N
Potassium Hydroxide, 50%	B	B	B	B	C	A	A	A	D	A	B	A	A	A	D
Potassium Nitrate	B	B	B	B	A	A	A	A	A	A	A	A	A	A	B
Potassium Permanganate	B	B	B	A	A	A	A	A	C	A	C	A	A	A	A
Propanol	A	A	A	A	A	A	A	A	A	A	C	A	A	A	A
Propylene Glycol	B	B	B	B	A	A	N	N	C	A	C	A	A	A	A
Pyridine	A	A	A	B	B	A	A	A	A	B	D	A	A	A	A
S															
Silver Nitrate	B	A	A	A	A	A	A	A	A	A	B	A	A	A	A
Sodium Bicarbonate	A	A	A	B	A	A	A	A	A	A	A	A	A	A	A
Sodium Bisulfite	B	B	B	B	B	A	A	A	A	A	A	A	A	A	A
Sodium Chlorate	B	B	A	A	A	A	A	A	C	A	C	A	A	A	A
Sodium Chloride	B	B	B	A	A	A	A	A	A	C	A	A	A	A	A
Sodium Hydroxide, 50%	B	B	B	A	B	A	A	A	B	A	B	A	A	A	A
Sodium Hypochlorite, ≤20%	D	D	D	A	A	A	C	B	A	A	B	A	B	A	A
Sodium Peroxide	A	A	A	B	N	A	N	A	A	A	B	A	A	A	A
Sodium Silicate	A	A	A	B	A	A	A	A	A	A	A	A	A	A	A
Sodium Sulfide	B	B	B	B	A	A	A	A	A	A	A	A	A	A	A
Sulfur, molten	B	A	A	A	A	A	N	N	A	C	D	A	A	A	A
Sulfuric Acid, <10%	D	B	A	A	D	A	A	A	A	A	A	A	A	A	A
Sulfuric Acid, 10-75%	D	D	A	A	D	A	C	D	A	B	B	A	A	A	A
Sulfuric Acid, 75-93%	D	D	A	A	D	A	C	D	A	B	C	A	A	A	A
Sulfuric Acid, 93-100%	A	A	A	A	D	A	C	D	A	C	N	A	A	A	A
Sulfurous Acid	B	B	B	B	A	A	A	A	A	B	B	A	A	A	A
T															
Tall Oil (Liquid Rosin)	B	B	B	A	N	A	N	N	A	D	A	A	A	A	A
Tallow	A	A	N	N	N	A	N	A	A	D	A	A	A	A	A
Tetrahydrofuran (THF)	A	A	A	A	B	A	A	A	D	B	D	A	A	A	A
Thionyl Chloride	N	D	N	A	N	A ₃	N	N	A	D	B	A	A	A	A
Toluene	A	A	A	A	A	A	A ₃	A ₃	A	D	D	A	A	A	A
Toluene Di-Isocyanate (TDI)	N	A	N	A	N	A	N	N	D	B	D	A	D	A	A
Toluenesulphonic Acid	N	N	N	A	N	A	N	N	C	A	C	A	A	A	A
Trichloroethane	A	A	A	A	A	A ₃	N	A	A	D	D	A	A	A	A
Trichloroethylene	B	B	B	A	A	A ₃	C	A	A	D	C	A	A	A	A
Trichlorotrifluoroethane	A	A	A	A	A	A ₃	A	A	B	D	A	C	A	A	A
U-V-W-X															
Urea	B	B	B	B	A	A	A	A	A	A	B	N	A	A	B
Vinyl Chloride	B	A	A	A	A	A ₃	N	A	A	D	B	A	A	A	A
Water, distilled	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Water, deionized	A	A	N	A	A	A	A	A	A	A	A	A	A	A	B
Xylene	A	A	A	A	A	A	A ₃	A ₃	A	D	D	A	A	A	A

FOOTNOTE 1: 3:1 or 4:1 HCl/HNO₃
 FOOTNOTE 2: Depends on specific type of Freon
 FOOTNOTE 3: Swelling may occur