Chemical Resistance Guide for Valves

March 25, 2010

PURPOSE

This guide was developed by Val-Matic® Valve and Manufacturing Corporation as a convenience to its customers and should be utilized only as a guide for the selection of valve materials. Mixtures and other chemical concentrations of chemicals are beyond the scope of this guide. Performance of materials in existing systems also offer valuable information in predicting valve performance.

Information given in the table consist of the maximum recommended temperature for the listed material in ºF or a letter designating:

A	=	resistant under normal conditions
B	=	conditional resistance, review performance
C	=	not recommended
blank	=	no data available

Val-Matic offers no warranty or representation as to the accuracy or completeness of these tables. Use of these tables should be made under the direction of trained engineers or design professionals exercising independent judgment regarding the suggested use of the valve types and materials.

General Properties of Elastomers and Plastics

Buna-N (Nitrile, NBR), or copolymer of butadiene and acrylonitrile has excellent resistance to petroleum products, lubricants, and water over a wide temperature range of –50 to 200 degrees F. Nitrile is a widely used elastomer for hydraulic system o-rings. Buna-N does not have good resistance to outdoor exposure to ozone, sunlight, or weather.

Neoprene (Chloroprene, CR) is one of the first commercially available elastomers and is low in cost. Neoprene is unique with its moderate resistance to both petroleum products and oxygen over a wide temperature range of –50 to 200 degrees F. Neoprene is a widely used elastomer for seals with exposure to refrigerants, petroleum oils, and mild acids. Neoprene does not have good resistance to solvents such as MEK and acetone.

EPDM (Ethylene Propylene Diene) exhibits strong resistance to ozone, certain hydraulic fluids, brake fluids, steam, and water over a wide temperature range of –50 to 250 degrees F. EPDM has gained increased use in the municipal water industry because of its resistance to water disinfected with chloramines. It has poor resistance to petroleum-based fluids, mineral oils, and solvents.

Viton (Fluorocarbon, FKM) possesses a strong resistance to chemicals and air at high temperature applications to 400 degrees F. Viton is high in cost and is used in aircraft, automotive applications where resistance to petroleum oils, silicone fluids, and acids is needed. Viton also has superior chloramine resistance for drinking water applications.

Hypalon (Chlorosulfonated Polyethylene, CSM) is similar to neoprene in chemical resistance and useful in the range of –50 to 200 degrees F for acid and ozone resistance.

Natural Rubber (Natural Polyisoprene, NR) is produced from various plants with excellent wear properties and resistance to brake fluid, water, sewage, but not petroleum products. Natural rubber is economical and commonly used for lining trucks, railroad cars, and valves for abrasion resistance. Natural rubber has been mostly replaced by synthetic elastomers for industrial seals.

Teflon (PTFE), or Polytetrafluoroethylene, has outstanding resistance to chemical attack by most chemicals and solvents. PTFE has a temperature rating of -20 to 400 degrees F in valve applications. PTFE, a self lubricating compound, is used as a common seat and packing material in ball valves.

Nylon (Polyamide) is one of the first thermoplastics used as rubber cords, belts, sports apparel, and structural parts such as valve bearings. Nylon has excellent resistance to oils and solvents, but limited resistance to alkalis and Acids. Its application is limited to a maximum temperature of 210 degrees F.

General Properties of Metals

Carbon Steel has very good mechanical properties, good resistance to stress corrosion and sulfides. Carbon steel has high and low temperature strength, is very tough, and has excellent fatigue strength. Steel can be easily cast or welded in making ANSI Pressure-Temperature rated valve bodies or structural parts for applications up to 850 degrees F.

Nickel is an elemental metal common for chemical processing applications because of its corrosion resistance. Nickel is used for valve seats because of its good welding ability and lack of brittleness.

Gray Iron is an alloy of iron, carbon and silicon; easily cast; and has good pressure tightness in the as-cast condition. Because gray iron contains flakes of graphite, it is brittle but exhibits excellent

dampening properties and is easily machined. It is standard material for bodies and bonnets of ANSI Class 125 and 250 valves. Gray iron has corrosion resistance that is improved over steel in certain environments.

Ductile Iron has a chemical composition similar to gray iron, but special treatment during the casting process enhances its metallurgical graphite structure to yield higher mechanical properties and improved ductility similar to steel. It is standard material for bodies and bonnets of ANSI Class 150 and 300 valves

Bronze is one of the first copper alloys developed in the bronze age and is generally accepted as the industry standard for pressure-rated bronze valves and fittings. Bronze has a higher strength than pure copper, is easily cast, has improved machinability, and is very easily joined by soldering or brazing. Bronze is very resistant to pitting corrosion, with general resistance to most chemicals less than that of pure copper. Historically, bronze alloys have contained lead to improve machinability and leak tightness, but recently are being improved with the release of lead-free alloys for drinking water applications.

Aluminum Bronze is the most widely accepted disc material used in many valves for liquid service. Aluminum bronze is heat treatable and has the strength of steel. Formation of an aluminum oxide layer on exposed surfaces makes this metal very corrosion resistant.

304 SS is basic 18% chromium, 8% nickel austenitic stainless steel commonly used for valve trim. Its .08 max carbon content reduces intergranular corrosion usually associated with carbide precipitation that can occur during welding. It offers excellent resistance to a wide range of corrosives and atmospheric exposures.

17-4 PH SS is similar to 304 SS except it is capable of being heat treated, doubling its strength and making it a good choice for high performance valve trim. 17-4 PH withstands corrosive attack better than any of the 400 series stainless steels and in most conditions its corrosion resistance closely approaches that of 300 series stainless steel. 17-4 PH is primarily used as a stem material for high pressure butterfly and ball valves.

316 SS is chemically similar to 304 SS except with the addition of molybdenum providing better corrosion and pitting resistance and higher strength at elevated temperatures. It is non-magnetic with greater ductility than 400SS. 316SS has excellent corrosion resistance in a wide range of environments, is not susceptible to stress corrosion cracking, and is not affected by heat treatment. Most common uses in valves are stem, body and ball materials.

Nitronic 60 is a high-performance stainless steel alloy with excellent gall and wear resistance with corrosion resistance falls between 304SS and 316SS but with approximately twice the yield strength. Nitronic 60 is used fro valve trim when extreme wear resistance or strength is required.

Monel is a nickel-copper alloy used primarily as interior trim on valves. It is one of the most specified materials for corrosion resistance to sea and salt water. Monel is also very resistant to strong caustic solutions.

Inconel is nickel-copper-molybdenum alloy with excellent corrosion resistance in a wide range of corrosive media and is especially resistant to pitting and crevice corrosion. Like Monel, it is a favorable choice for seawater applications but with far greater strength.

Val-Matic® Chemical Resistance Guide for Valves

CHEMICAL	CONCENTRATION	ELASTOMERS AND PLASTICS								METALS										
		Buna-N	Neoprene	EPDM	Viton	Hypalon	Natural Rubber	Teflon	Nylon	Carbon Steel	Nickel	Cast Iron	Bronze	Alum. Bronze	304 SS	17-4 PH SS	316 SS	Nitronic 60	Monel	Inconel
Acetic Acid	25%	C	C	140	C	200	C	350	B	C	B	C	C	C	A	A	A	A	A	B
Acetic Anhydride		70	B	C	C	200	B	350	C	C	C	C	C	C	B	B	B	B	B	B
Acetone		C	C	130	C	B	B	350	70	A	200	A	A	A	A	A	A	A	A	A
Acetyl Chloride		C	C	C	185	C	C	200	C	A	A	C	A	A	A	A	A	A	A	
Acetylene		140	70	200	200	70	70	250	70	A	A	A	C	C	A	A	A	A	A	
Aluminum Acetate		B	C	200	C	C	70	350		C	B	C	C	C	B	B	A	B	B	
Alum	10%	140	140	200	200	70	70	275	70	C	A	C	B	B	A	A	A	A	A	B
Aluminum Chloride		70	160	210	250	200	70	280	C	C	C	C	C	C	B	C	A	B	B	C
Aluminum Fluoride		180	160	210	250	200	B	250	B	C	B	C	C	C	B	C	B	B	A	B
Aluminum Hydroxide		180	100	210	200	70	70	250	B	C	200	B	C	C	A	A	A	A	B	B
Aluminum Nitrate		180	100	210	100	100	70	250		C	B	C	C	C	A	A	A	A	C	
Ammonia Anhydrous		C	100	200	C	B	C	250	70	A	500	A	C	C	A	A	A	A	A	A
Ammonia Liquid		B	70	210	C	70	C	400	70	A		A	C	C	B	A	A	A	A	A
Ammonium Bifluoride		180	140	200	200		B	400		C	50	C	C	C	C	B	B	C	B	B
Ammonium Carbonate			140	210	250	140	70	400	70	A	C	B	C	C	B	B	B	B	B	A
Ammonium Chloride		180	160	210	250	200	70	400	70	C	B	C	C	C	C	C	B	C	B	A
Ammonium Hydroxide	30%	B	70	210	70	200	B	400	70	C	C	C	C	C	A	A	A	A	B	A
Ammonium Nitrate		180	160	250	100	200	150	400	70	B	50	B	C	C	A	A	A	A	A	A
Ammonium Phosphate		100	140	210	185	140	150	400	70	C	B	B	C	C	A	A	A	A	B	A
Ammonium Sulfate		180	160	210	200	200	150	400	70	C	B	B	C	C	B	B	B	B	B	A
Ammonium Sulfite		140	160	210	C	200	70	350	A	C	C	C	C	C	B	B	B	B	B	C
Aniline		C	C	140	C	70	C	200	C	C	B	B	C	C	A	A	A	A	B	B
Aniline Hydrochloride		C	C	B	1185	C	B	212	C	C	C	C	C	C	C	C	C	C	A	B
Arsenic Acid		160	180	185	200	200	150	400	70	C	B	C	C	C	A	B	A	A	A	C
Barium Carbonate		180	160	250	250	200	70	400	A	B		B	A	A	B	A	A	A	A	A
Barium Chloride		180	160	250	300	200	70	400	190	C	B	B	A	A	A	A	A	A	A	A
Barium Hydroxide		180	140	200	300	200	70	400	70	C	200	B	C	C	B	A	A	B	A	A
Barium Nitrate		180	160	200	300	200	C	250	A	A	B	A	C	C	B	B	A	B	B	B
Barium Sulfate		100	160	200	300	200	70	400	A	A	B	B	B	B	B	A	A	B	A	A
Barium Sulfide		C	160	140	300	200	70	400	B	C	50	B	C	C	B	A	A	B	A	A
Beer		70	140	200	200	200	70	300	140	C		C	A	A	A	A	A	A	A	A
Beet Sugar Liquor		100	160	210	185	200	70	70	A	B		B	C	A	A	A	A	A	A	A
Benzene		C	C	C	150	C	C	250	100	A	200	A	A	A	A	A	A	A	A	A
Benzyl Alcohol		C	B	C	B	140	C	400	C	B	50	B	A	A	A	A	A	A	A	A
Black Liquor		180	70	180	200	70	B	225		B	B	B	C	C	B	B	A	A	B	B
Bleach	5%	C	C	140	185	70	C	200	C	C		C	C	C	B	B	A	B	A	A
Borax		140	140	210	185	200	185	300	70	B		A	A	A	A	A	A	A	A	A
Boric Acid	5%	140	140	210	185	200	185		C	B	50	C	B	B	B	B	A	B	A	A
Brine		180	160	250	300	180	70	400	A	C	B	C	A	A	B	B	A	B	A	A
Bromine Water		C	C	C	185	70	C	300	C	C	50	C	C	C	C	C	C	C	C	C

Val-Matic Chemical Resistance Guide for Valves

CHEMICAL	CONCENTRATION	ELASTOMERS AND PLASTICS								METALS										
		Buna-N	Neoprene	EPDM	Viton	Hypalon	Natural Rubber	Teflon	Nylon	Carbon Steel	Nickel	Cast Iron	Bronze	Alum. Bronze	304 SS	17-4 PH SS	316 SS	Nitronic 60	Monel	Inconel
Butadiene		C	140	C	185	B	C	350	C	A	200	A	A	A	A	A	A	A	A	A
Butyl Acetate		140	C	C	C	C	C	175	140	B	300	B	B	B	A	A	A	A	A	A
Butyl Alcohol		B	140	200	200	140	A	300	B	A	A	A	B	B	A	A	A	A	A	A
Butylene		70	C	C	100	C	C	400	B	A	A	A	A	A	A	A	A	A	A	A
Butyl Stearate		100	C	C	185	C	C	250		B	B	B	A	A	A	A	A	A	A	A
Butyric Acid			C	140	70	C	C	300	C	C	C	C	A	A	A	A	A	A	A	A
Calcium Bisulfite		70	70	C	185	200	C	350	70	C	C	C	C	C	B	B	A	B	C	
Calcium Carbonate		100	70	210	300	70	A	350	A	B	B	B	C	C	A	A	A	A	A	A
Calcium Chlorate		70	70	140	185	70	A	350		B	B	B	B	B	A	A	A	A	A	A
Calcium Chloride		100	160	210	250	200	A	350	70	C	300	A	B	B	B	B	A	B	A	A
Calcium Hydroxide		140	70	210	250	200	A	250	120	C	B	C	C	C	A	A	A	A	A	A
Calcium Hypochlorite		C		70	185	140	C	200	C	C	C	C	C	C	B	B	B	B	C	
Calcium Nitrate		180	100	210	200	100	70	200	70	C	B	B	B	B	A	A	A	A	A	A
Calcium Sulfate		180	160	210	200	200	B	200	C	B	200	A	B	B	A	A	A	A	A	A
Camphor		100	C	210	250	70		350		B	B	B	B	B	A	A	A	A	B	
Cane Sugar		180	160	250	200	100	A	400	C	A	A	A	A	A	A	A	A	A	A	A
Carbitol		70	70	70	100	70		20		B	B	B	B	B	B	B	B	B	B	B
Carbon Dioxide	wet	180	160	200	200	200	B	400	A	A	150	A	A	A	A	A	A	A	A	A
Carbon Monoxide	gas	70	70	250	250	200	C	400	70	B	C	A	A	A	A	A	A	A	A	A
Carbon Tetrachloride		C	C	C	185	C	C	350	C	A	200	C	A	A	A	A	A	A	A	A
Carbonic Acid		180	70	210	200	70	C	350	70	B	B	B	C	C	A	A	A	A	A	A
Castor Oil		140	100	10	140	150	A	350	A	A	A	A	A	A	A	A	A	A	A	A
Caustic Potash- KOH		180	160	200	C	200	B	350	C	B	450	B	C	C	B	B	B	B	B	B
Caustic Soda-NaOH	20%	C	160	180	C	140	70	350	A	B	300	B	B	C	A	A	A	A	A	A
Chloramine	5%	B	B	A	A	B	70			C	50	C	B	B	B	B	B	B	B	
Chloric Acid	10%		140		140	200		140	C	C	C	C	C	C	C	C	B	B	C	C
Chlorinated Water	10ppm	140	C	210	185	B	B	400	C	C	A	B	B	C	A	A	A	A	A	A
Chlorinated Water	Sat	C	C	70	185	B	C	400	C	C	A	C	C	B	B	A	A	A	B	B
Chlorine	Liq		C	C		B	C		C	C	C	C	B		C	C				
Chloroacetic Acid	50%	C	C	70	C	200	C	200	C	C	B	C	C	C	C	C	C	C	B	
Chlorobenzene		C	C	C	70	C	C	200	C	B	B	C	A	A	A	A	A	A	A	A
Chloroform		C	C	C	70	C	C	200	A	C	A	C	A	A	A	A	A	A	A	A
Chlorosulfonic Acid		C	C	C	C	C	C	200	C	C	C	B	C	C	C	C	C	C	A	
Chromic Acid	10%	C		70	100	140	B	350	C	C	C	C	C	C	C	B	A	B	B	
Citric Acid		70	140	210	200	140	A	200	A	C	B	C	C	C	A	A	A	A	B	
Coconut Oil	5%	70	100	C	185	B	C	400		B	A	C	B	B	A	A	A	A	B	
Coffee		100		140	200		A		A	C	A	C	A	A	A	A	A	A	A	A
Coke Oven Gas		B		70	185	140		400		A		A	B	B	A	A	A	A	B	
Copper Acetate		180	160	100	140	C		350		C	B	C	C	C			A	A	B	
Copper Chloride		180	160	210	200	200	C	350	C	C		C	C	C	C	C	B	B	B	

Val-Matic Chemical Resistance Guide for Valves

CHEMICAL	CONCENTRATION	ELASTOMERS AND PLASTICS								METALS										
		Buna-N	Neoprene	EPDM	Viton	Hypalon	Natural Rubber	Teflon	Nylon	Carbon Steel	Nickel	Cast Iron	Bronze	Alum. Bronze	304 SS	17-4 PH SS	316 SS	Nitronic 60	Monel	Inconel
Copper Cyanide	25%	180	160	210	185	C	A	350	C	C		C	C	C	B	B	A	B	B	
Copper Nitrate		B	160	210	200	200	C	A	C	C	C	C	C	C	A	A	A	A	C	
Copper Sulfate	5%	180	160	210	200	200	C	A	C	C	B	C	C	C	A	A	A	A	C	
Corn Oil		180	C	C	300	C	C	400	A	B	A	B	B	B	A	A	A	A	B	
Cottonseed Oil		180		C	185	200	C	400	B	B	A	B	B	B	A	A	A	A	B	
Creosote		73	C	C	73	73	C	350	C	A	B	A	B	B	A	A	A	A	A	A
Cresylic Acid		C	C	C	185	C	C	200	C	B		A	A	A	A	A	A	A	A	A
Crude Oil		70	B	C	200	C	C	400	100	B	A	C	C	C	A	A	A	A	B	
Cyclohexane		C	C	C	185	C	C	300	A	A	B	B	C	C	A	A	A	A	A	A
Cyclohexanone		C	C	70	C	C	C	200	A	B	B	B	B	B			A		B	
Detergents		180	160	250	210	200	B	400	A	A	A	A	A	A	A	A	A	A	A	A
Dextrose		180	160	140	200	140		400		A	200	A	A	A	A	A	A	A	A	A
Diacetone Alcohol		C	C	70	C	A		350	70	A	A	A	A	A	A	A	A	A	A	A
Diesel Fuel		70	C	C	183	C	C	350	A	A	A	A	A	A	A	A	A	A	A	A
Diethylamine		70	A	70	C	C	A	200	A	B	B	A	C	C	A	A	A	A	B	B
Dimethyl Formamide		100	C	C	C	100	C	250	A	B		B	B	B	A	A	A	A	A	A
Dioxane		C	C	70	C	C				A	A	A	A	A	A	A	A	A	A	A
Disodium Phosphate		100		210	70	140	70	400			A	B	B	B	A	A	A	A	B	
Ether		C	C	C	C	C	C	A	A	B	A	B	A	A	A	A	A	A	A	A
Ethyl Acetate		C	C	70	C	C	C	200	A	A	A	A	A	B	A	A	A	A	A	A
Ethyl Alcohol- Ethanol		180	70	170	A	200	A	300	70	A	200	A	A	A	A	A	A	A	A	A
Ethyl Benzene		C	C	C	70	C	C	350		B	200	B	B	B	A	A	A	A	A	A
Ethyl Chloride		C	B	B	140	70	B	350	A	A	A	A	A	B	A	A	A	A	A	A
Ethylene Bromide		C	C	C	B	C	C	350		A		A	A	A	A	A	A	A	A	A
Ethylene Chloride		C	C	C	70	C	C	350	A						B	B	A	A	A	A
Ethylene Dichloride		C	C	C	120	C	C	350	70	A	B	A	A	A	A	A	A	A	A	A
Ethylene Glycol		180	160	210	250	200	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Ethylene Oxide		C	C	C	C	C	C	400	70	B	A	A	A	A	A	A	A	A	B	B
Fatty Acids		140	140	C	185	C	C	400	70	C	A	C	C	C			A		A	
Ferric Chloride	sat	180	160	225	200	200	A	400	A	C	C	C	C	C	C	C	C	C	C	C
Ferric Hydroxide		100	100	180	180	100		400		C		C	C	C	C		A		A	
Ferric Nitrate		180	160	210	200	140	A	400	70	C	A	C	C	C	B	A	A	A	C	
Ferric Sulfate		140	140	210	185	140	A	200	70	C	C	C	C	C	B	A	A	A	C	
Ferrous Chloride		180	A	200	200	A	A	400	C	C	C	C	C	C	C	C	C	C	C	C
Ferrous Nitrate		180	160	180	200	140		400							A	A	A	A		
Ferrous Sulfate	5%	180	160	200	200	140	B	400	C	C	C	C	C	B	A	A	A	A	A	A
Fish Oil		70		C	300					A	A	A	A	A	A	A	A	A	A	A
Flue Gas		180		C	300					A	A	A	A	A	A	A	A	A	A	A
Fluoboric Acid		160	160	140	140	140	A	350	C	C	50	C	B	B	A	A	A	A	A	A
Florine	wet	C		70	100		C	C	C	C	A	C	C	C	A	A	A	A	A	A

Val-Matic Chemical Resistance Guide for Valves

CHEMICAL	CONCENTRATION	ELASTOMERS AND PLASTICS								METALS										
		Buna-N	Neoprene	EPDM	Viton	Hypalon	Natural Rubber	Teflon	Nylon	Carbon Steel	Nickel	Cast Iron	Bronze	Alum. Bronze	304 SS	17-4 PH SS	316 SS	Nitronic 60	Monel	Inconel
Fluosilicic Acid	25%	100	100	140	210	200	A	300	C	C	50	C	B	B	B	B	B	B	A	B
Formaldehyde	40%	C	140	140	C	200	B	300	C	B	200	C	A	B	C	C	A	B	A	A
Formic Acid		C	140	200	C	70	C	300	C	C	200	C	C	B	B	A	A	A	A	A
Freon		70	C	C	70	130	C	300	C	B	A	B	A	A	A	A	A	A	A	A
Fructose		140	160	175	225	140	C	300	A	A	A	A			A	A	A	A	A	
Furfural		C	70	140	C	70	C	300	B	A	B	A	A	A	A	A	A	A	A	A
Gallic Acid		C	70	70	185	70	A	300	A	C		C	B	B	A	A	A	A	A	A
Gasoline		70	B	C	100	70	C	200	A	A	A	A	A	A	A	A	A	A	A	A
Gasahol		70	B	C	100	70	C	200	A	A	A	A	A	A	A	A	A	A	A	A
Gelatin		180	160	200	250	200	A	300	70	C	A	C	C	C	120	A	C	C		
Glucose		180	160	250	300	200	A	400	A	A	A	A	A	A	A	A	A	A	A	A
Glue		140	160	100	250	200	A	400	120	A	A	A	A	A	A	A	A	A	A	A
Glycerin		70	160	200	300	200	A	400	70	A	A	A	A	A	A	A	A	A	A	A
Glycol		140	160	200	250	200		300		A	A	A	A	A	A	A	A	A	A	A
Glycolic Acid		C	70	A	C	C	C	200		C	B	C	B	B	A	A	A	A	B	
Grease		150	100	C	200	C	C	A		A	A	A	C	C	A	A	A	A	A	A
Gypsum		180	160	210	200	200	C	350	A	A	A	A	B	B	A	A	A	A	A	A
Heptane		70	70	C	185	70	C	300	A	A	A	A	A	A	A	A	A	A	A	A
Hexanol		70	B	C	160	70		300		A	A	A	A	A	A	A	A	A	A	A
Hydraulic Oil		160	70	C	250	70	C	300	70	A	A	A	A	B	A	A	A	A	A	A
Hydrazine		70		70	C	70	C	250		C	C	C	C	C	A	A	A	A	A	
Hydrobromic Acid	20%	C	B	140	185	100	A	250	C	C	C	C	C	C	C	C	C	C	C	C
Hydrochloric Acid	35%	C		70	100	100	A	250	C	C	C	C	C	C	C	C	B	C	C	C
Hydrocyanic Acid	10%	70		200	185	200	B	250	B	C	50	C	C	C	C	B	A	B	A	C
Hydrofluoric Acid	20%	C	70	70	150	150	B	300	C	C	B	C	C	C	C	C	C	C	A	C
Hydrogen	Gas	180	160	250	300	200	B	300	120	A	A	A	A	A	A	A	A	A	A	A
Hydrogen Peroxide	50%	C	C	100	185	200	C	300	C	C	C	C	C	C	A	A	A	A	A	A
Hydrogen Sulfide	Gas	140	140	140	C	70	70	A	C	B	B	B	B	C	C	B	A	B	A	A
Hydrogen Sulfide	Wet	70	70	140	C	70	70	A	C	C	B	C	C	C	C	C	A	B	B	A
Hydroquinone		70	C	C	185	C	A	300	C	A	A				B	A	A	A	A	
Hypochlorous Acid	10%	C	A	70	70			300		C	C	C	C	C	C	C	C	C	C	C
Ink		70	70	70	70		C	300	C	C	A	C	A	A	C	C	A	B	A	A
Iodine		70	C	70	70	70	C	200	A	C	A	C	C	C	C	B	B	B	A	A
Isobutane		70	C	C	B	C	C	140	B	A	A	A	A	A	A	A	A	A	A	A
Isobutyl Alcohol		70	70	140	140	70	A	300	A	B	A	A	A	A	A	A	A	A	A	A
Isooctane	5%	70	70	C	185	200	70	300	70	A	A	A	A	A	A	A	A	A	A	A
Isopropyl Acetate		C	C	70	C	C	C	200	B	A	A	A	A	A	A	A	A	A	A	A
Isopropyl Alcohol		70	70	140	200	200		300		A	A	A	A	A	A	A	A	A	A	A
Isopropyl Ether		70	C	C	C	C	A	140	70	A	A	A	A	A	A	A	A	A	A	A
Jet Fuel JP-4		70	C	C	185	C	C	200	C	A	A	A	A	A	A	A	A	A	A	A

Val-Matic Chemical Resistance Guide for Valves

CHEMICAL	CONCENTRATION	ELASTOMERS AND PLASTICS								METALS										
		Buna-N	Neoprene	EPDM	Viton	Hypalon	Natural Rubber	Teflon	Nylon	Carbon Steel	Nickel	Cast Iron	Bronze	Alum. Bronze	304 SS	17-4 PH SS	316 SS	Nitronic 60	Monel	Inconel
Kerosene		140	70	C	300	C	C	250	A	A	A	A	A	A	A	A	A	A	A	A
Ketchup		140		210	200	B		250		C	A	C	C	C	A	A	A	A	A	A
Ketones		C	C	C	C	C	A	200	120	A		A	A	A	A	A	A	A	A	A
Lactic Acid	25%		140	70	70	140	A	300	B	C	B	B	C	C	A	A	A	A	A	A
Lard Oil		140	70	C	85	C	C	300	70	B	A	B	C	C	A	A	A	A	B	
Latex		70	100	70	70	C	B	200	70	A	A	A	A	A	A	A	A	A	A	A
Lead Acetate		70	160	210	C	100	A	300	A	C	B	C	C	C	A	A	A	A	A	B
Lead Nitrate		188	140	175	225	A	70	300		A	B	A	A	A	A	A	A	A	A	A
Lead Sulfate		180	140	210	225	200	70	300	B	C	B	C	B	B	B	B	B	B	B	B
Lemon Oil		A	140	C	200	100	C	300		C	B	C			A	A	A	A	A	A
Lime Slurry		100	100	100	70	160	A		70	A	A	A	A	A	A	A	A	A	A	A
Linoleic Acid		B		C	140	C	C	300		C	C	C	C	C	B	B	A	A	A	
Linseed Oil		180	70	B	250	200	C	300	B	A	B	A	A	A	A	A	A	A	A	A
Lithium Chloride		70	70	100	140	B	B	125	A	C	C	B	B	B			A		A	
Lubricating Oil		180	70	C	150	C	C	350	70	A	A	A	A	A	A	A	A	A	A	A
Magnesium Carbonate		140	140	170	210	140	70	225	70	B	B	B	B	B	A	A	A	A	A	A
Magnesium Chloride		180	160	170	170	200	A	400	70	C	C	C	B	B	C	C	C	C	A	
Magnesium Hydroxide		180	160	170	225	200	A	300	B	A	A	A	C	C	A	A	A	A	A	A
Magnesium Nitrate		70	160	140	225	140	A	300	70	B	B	A	C	C	A	A	A	A	B	
Magnesium Sulfate		180	160	175	200	140	B	300	70	A	A	A	A	A	A	A	A	A	A	A
Maleic Acid		C	C	70	200	C	B	250	A	C	B	C	C	B	B	B	A	B	B	
Malic Acid		100	70	C	200	70	B	250	A	C	B	C	B	B	A	A	A	A	A	A
Maganese Sulfate		180	160	175	200	140	120	300	120	A	B	A	A	A	A	A	A	A	A	A
Mercuric Chloride		140	140	210	185	140	A	300	C	C	C	C	C	C	C	C	C	C	C	C
Mercuric Cyanide		70	70	70	70	140	70	300	120	C	C	C	C	C			A			
Mercurous Nitrate		C	C	70	70	B	B	300		C	C	C	C	C	A	A	A	A	C	
Mercury		140	140	210	185	140	A	300	A	A	A	A	C	C	A	A	A	A	A	A
Methane		180	70	C	185	70	C	300	A	A	A	A	A	A	A	A	A	A	A	A
Methanol		140	140	100	100	140	A	300	B	A	A	A	A	A	A	A	A	A	A	A
Methyl Acetate		C	C	B	C	C	C	300	120	B	B	B	B	B	A	A	A	A	A	A
Methyl Amine		B	70	70	100	70	70	300		A	A	A	C	C			A		C	
Methyl Bromide		70	C	C	185	C	C	300	B	B	B	C	C	B	A	B	A	A	B	
Methyl Chloride		C	C	C	70	C	C	250	B	A	A	A	A	C	A	A	A	A	A	A
Methyl Ethyl Keytone		C	C	70	C	C	C	200	70	A	A	A	A	A	A	A	A	A	A	A
Methyl Formate		C	70	100	C	C	C	70	C	C	B	A	A	A	A	A	A	A	A	A
Methylene Chloride		C	C	C	70	C	B	250	C	B	B	B	B	B	A	A	A	A	A	B
Milk		180	160	250	300	200	A	400	A	C	C	C	B	B	A	A	A	A	A	A
Mineral Oil		140	70	C	300	B	C	300	A	A	A	A	A	A	A	A	A	A	A	A
Molasses		150	150	100	185	150	A	300	120	A	A	A	A	A	A	A	A	A	A	A
Monochloroacetic Acid	50%	70	C	C	70	C	B	200	C	C		C	C	C	C	C	C	C	B	

Val-Matic Chemical Resistance Guide for Valves

CHEMICAL	CONCENTRATION	ELASTOMERS AND PLASTICS								METALS										
		Buna-N	Neoprene	EPDM	Viton	Hypalon	Natural Rubber	Teflon	Nylon	Carbon Steel	Nickel	Cast Iron	Bronze	Alum. Bronze	304 SS	17-4 PH SS	316 SS	Nitronic 60	Monel	Inconel
Motor Oil		180	B	C	250	B		350	120	A	A	A	A	A	A	A	A	A	A	A
Morpholine		C	C	70	C	C	70	200	120	B	A	B	B	B	B	B	B	B	B	B
Naphtha		140	C	C	150	C	C	200	A	A	200	A	A	B	A	A	A	A	A	A
Naphthalene		C	C	C	170	C	C	250	70	A	400	A	A	B	A	A	A	A	A	A
Natural Gas		140	140	C	185	140	C	300	B	A	A	A	A	A	A	A	A	A	A	A
Nickel Chloride		180	160	210	210	200	A	400	C	C	200	C	C	B	A	A	A	A	C	B
Nicle; Nitrate		180	120	210	250	C	70	400	70	C	400	C	C	C	A	A	A	A	C	C
Nickel Sulfate		70	160	210	300	200	B	400	70	C	200	C	C	B	B	B	A	A	B	A
Nitric Acid	10%	C	C	70	185	100	C	250	C	C	C	C	C	C	A	A	A	A	C	B
Nitrobenzene		C	C	C	70	C	C	400	B	A	B	A	B	B	A	A	A	A	A	A
Nitrogen	Gas	140	140	140	185	100	A	300	A	A	A	A	A	A	A	A	A	A	A	A
Nitromethane		C	C	B	C		C	300	B	B	C	B	B	B	A	A	A	A	B	
Nitrous Acid		C	C	A	100		C	400		C	C	C	C	C	B	B	B	B	C	B
Nitrous Oxide		C	C	A	70	B	A	400	C	C	C	B	B	B	A	A	A	A	C	C
Oleic Acid		100	B	B	185	70	C	250	A	C	A	B	B	A	A	A	A	A	A	A
Oleum Acid		C	C	100	70	C	C	150	C	C		C	C	C	A	A	A	A	C	
Olive Oil		140	140	C	150	B	C	350	70	A		A	A	A	A	A	A	A	A	A
Oxalic Acid		C	100	150	100	C	B	300	B	C		C	C	C	A	A	A	A	A	A
Oxygen	Gas	C	140	210	185	140	B	400		A		A	A	A	A	A	A	A	A	A
Ozone	Gas	C	C	210	185	140	C	300	C	A		A	A	A	A	A	A	A	A	A
Palm Oil		140	C	C	70	C	C	200		C		C	C	C	A	A	A	A	A	A
Palmitic Acid		100	C	70	185	70	B	300	A	B	B	B	B	B	A	A	A	A	A	A
Peanut Oil		100	B	C	150	B	C	250		A		A	A	A	A	A	A	A	A	A
Perchloric Acid		C	70	70	70	70		250	C		C		B		C		A	B		
Perchloroetylene		C	C	C	200	C	C	200	C	B	A	B	B	B	A	A	A	A	A	A
Phosphoric Acid		70	140	140	200	200	B	300	B	C	50	C	C	C	A	A	A	A	C	
Picric Acid	10%	C	70	140	140	70	C	300	C	C	C	C	C	C	C	A	A	B	C	
Potash-KOH	180	70	140	200	180	B	400	C	A	B	A	B	B	A	A	A	A	A	A	A
Potassium Bicarbonate		70	160	170	200	200	A	400	70	A	B		B		B	B	B	B		
Potassium Bisulfate		180	140	170	200	140	70	400	B	C	B	C	B	B	A	A	A	A	C	
Potassium Bromate		180	140		250	140	70	400	B	A		A			A	A	A	A	A	A
Potassium Bromide		180	160	170	200	200	A	400	70	C	B	C	B	B	A	A	A	A	A	A
Potassium Carbonate		180	160	170	200	200	A	400	A	A	B	A	B	B	A	A	A	A	A	A
Potassium Chlorate		B	100	140	140	140		400	C	A	C	A	B	B	A	A	A	A	A	A
Potassium Chloride		180	160	210	200	200	A	400	70	C	B	B	A	B	A	A	A	A	A	A
Potassium Chromate		140	70	170	200	70	B	400	B	B	A	B	A	B	A	A	A	A	A	A
Potassium Cyanide		180	160	140	185	200	A	400	70	B	B	B	C	C	A	A	A	A	A	B
Potassium Hydroxide		B	160	210	140	140	B	400	C	B	A	B	C	C	A	A	A	A	A	A
Potassium Nitrate		180	140	210	250	140	A	400	B	B	B	B	A	B	B	A	A	A	A	A
Potassium Permanganate		C	200	210	140	100	70	400	C	A	B	A	B	B	A	A	A	A	A	A

Val-Matic Chemical Resistance Guide for Valves

CHEMICAL	CONCENTRATION	ELASTOMERS AND PLASTICS								METALS										
		Buna-N	Neoprene	EPDM	Viton	Hypalon	Natural Rubber	Teflon	Nylon	Carbon Steel	Nickel	Cast Iron	Bronze	Alum. Bronze	304 SS	17-4 PH SS	316 SS	Nitronic 60	Monel	Inconel
Potassium Sulfate		140	140	210	250	140	A	200	70	A	B	A	B	B	A	A	A	A	A	A
Potassium Sulfide		100	70	A	100	B	B	300	A	C	C	C	C	C	B	B	B	B	C	A
Potassium Sulfite		70	70	140	200	B	B	300	B	C	C	C	B	B	A	A	A	A	B	
Propane		70	70	C	70	B	C	300	70	A	200	A	A	A	A	A	A	A	A	A
Propyl Alcohol		140	140	140	250	140	70	350	C	A	200	A	A	A	A	A	A	A	A	A
Rosin Oil		70	70		100	70		200	A	C	A	C	C	C	A	A	A	A	A	A
Salicylic Acid		C	C	210	185	70	A	300	70	C	200	C	B	B	A	A	A	A	B	B
Silicone Oil		140	70	140	185	140	C	350	70	A		A	A	A	A	A	A	A	A	A
Silver Cyanide		C	70	140	140		70	350		C		C	C	C			100		A	
Silver Nitrate		140	160	210	250	200	A	350	70	C	C	C	C	C	B	B	A		C	A
Soap		180	140	210	250	140	B	400	70	B	200	B	B	A	A	A	A	A	B	A
Sodium Acetate		C		170	C	70	A	400	B	C	A	B	A	B	A	A	A	A	A	
Sodium Aluminate		180	140	200	200	140	B	300	70	A	B	B	C	B	A	A	A	A	A	A
Sodium Bicarbonate		180	160	250	300	200	A	400	A	C	200	A	A	B	A	A	A	A	A	A
Sodium Bisulfate		180	140	200	250	100	A	A	70	C	B	C	C	C	C	C	A	B	A	B
Sodium Bisulfite		180	140	200	250	200	A	400	C	C	C	C	B				A		C	B
Sodium Bromide		70	70	210	250	B	70	300	B	C	B	C	B	A	A	A	A	A	A	A
Sodium Carbonate		140	140	140	140	300	A	400	B	A	200	A	A	B	A	A	A	A	B	A
Sodium Chloride		140	160	140	200	100	A	350	70	C	B	B	A	B	B	B	B	B	A	A
Sodium Dichromate	20%	C	C	140	200	200	B	300	C	B		B	C	C	A	A	A	A	B	A
Sodium Fluoride		70	70	140	140	140	70	350	B	C	B	C	A	B	A	A	A	A	A	B
Sodium Hydroxide	15%	140	160	210	B	200	70	400	A	A	A	A	A	A	A	A	A	A	A	A
Sodium Hypochlorite		C	C	70	140	150	C	350	C	C	C	C	C	C	C	C	A	B	A	C
Sodium Metaphosphate		70		70	70	70	A		70	C	B	C	C	C	A	A	A	A	B	
Sodium Nitrate		140	140	210	225	140	B	400	70	A	200	A	A	B	A	A	A	A	A	A
Sodium Perborate		70	70	70	70	70	B	350	B	B	B	B	C	C	A	A	A	A	A	A
Sodium Peroxide		B	70	140	185	200	B	250	70	C	B	C	C	C	A	A	A	A	A	A
Sodium Phosphate		140	140	170	200	200	70	400	70	B	A	B	B	B	A	A	A	A	A	A
Sodium Silicate		140	140	200	200	200	A		70	A	A	A	C	B	A	A	A	A	A	A
Sodium Sulfate	SAT	140	140	140	200	140	B	400	A	A	B	A	A	B	A	A	A	A	A	A
Sodium Sulfide		180	140	140	200	200	B	350	70	C	B	B	C	C	A	A	A	A	A	A
Sodium Sulfite		140	140	140	200	140	B	350	C	B	B	B	A	C	A	A	A	A	C	A
Sodium Thiosulphate		140	160	200	200	200	B	350	B	C	B	C	B	C			A	A	A	
Soybean Oil		140	70	C	250	200	C	400	A	B		A	A	B	A	A	A	A	A	A
Stannic Chloride		140	C	100	200	70	A	350	B	C	C	C	C	C	C	C	C	C	C	C
Stannous Chloride		140	160	70	200	200	A	350	C	C	C	C	C	C			A		C	B
Starch		180	160	170	200	200	A	300	70	B		B	B	B	A	A	A	A	A	A
Steam		C	C	B	C	C	C	400	C	A	A	A	A	A	A	A	A	A	A	A
Stearic Acid		140	70	C	100	70	B	350	B	C	350	C	A	C	A	A	A	A	A	A
Sugar		100	140	140	200	140	A	350	70	C	A	B	C	C	A	A	A	A	A	A

Val-Matic Chemical Resistance Guide for Valves

CHEMICAL	CONCENTRATION	ELASTOMERS AND PLASTICS								METALS										
		Buna-N	Neoprene	EPDM	Viton	Hypalon	Natural Rubber	Teflon	Nylon	Carbon Steel	Nickel	Cast Iron	Bronze	Alum. Bronze	304 SS	17-4 PH SS	316 SS	Nitronic 60	Monel	Inconel
Sulfamic Acid		C	70	C	C	70	B	70		C		C	B	B			A		B	
Sulfur	Gas	C	70		250	70	B	350		C	300	B	C	C	A	A	A	A	A	A
Sulfur Chloride		C	C	C	70	70	C	350	C	A	C	A	B	A	A	A	A	A	A	A
Sulfur Dioxide	Dry	C	C	70	100	200	B	350	C	A	C	A	B	A	A	A	A	A	A	A
Sulfuric Acid	30%	C	100	140	200	100	C	250	C	C	C	C	C	C	C	B	A	B	A	C
Tannic Acid		100	100	70	100	100	A	250	C	C	A	B	A	A	A	A	A	A	A	A
Toluene		C	C	C	70	C	C	200	A	A	A	A	A	A	A	A	A	A	A	A
Tomato Juice		C	70	200	200	C		350	70	C		C	B	C	A	A	A	A	A	A
Tributyl Phosphate		C	C	70	C	C	B	300	B	B	B	A	B	B	A	A	A	A	A	A
Trichloroethylene		C	C	C	185	C	C	200	C	B	A	B	A	A	A	A	A	A	A	A
Trisodium Phosphate		70	70	70	185	185	A	350	A	B		B	C	C	A	A	A	A	A	A
Turpentine		70	C	C	150	C	C	A	B	A	B	A	A	A	A	A	A	A	A	A
Urea		140	140	210	185	140	70	A	A	C	B	C	B	B	A	A	A	A	B	
Urine		140	140	210	70	140	C	400	B	C		C			A	A	A	A	A	A
UV Radiation		C	B	B	A	A	C	A	A	A	A	A	A	A	A	A	A	A	A	A
Varnish		70	C	C	70	C	C	350	A	C		C	A	B	A	A	A	A	A	A
Vegetable Oil		70	70	C	200	70	C	300	A	A	A	A	A	A	A	A	A	A	A	A
Vinegar		C	70	140	C	200	B	300	A	C		C	C	C			A		A	A
Vinyl Acetate		70	C	70	C	C	D	350		B	A	B	B	B	A	A	A	A	A	A
Water, Acid Mine		180	160	200	70	180	B	400	A	C	B	C	C	C	A	A	A	A	B	B
Water, Brackish		180	160	250	200	200	A	400	A	C	C	C	B	C	B	A	A	B	A	B
Water, Deionized		70	160	200	70	200	A	400	A	C	C	C	B	C	A	A	A	A	A	A
Water Potable		180	160	250	A	200	A	400	A	B	A	B	A	A	A	A	A	A	A	A
Water, Chloramines		B	B	200	300		B	400	A	B	A	B	A	A	A	A	A	A	A	A
Water, Sea		180	160	250	200	200	A	400	A	C	B	C	B	C	B	A	B	B	A	B
Water, Waste		200	180	200	70	70	70	400	A	B	A	B	B	B	A	A	A	A	A	A
Whiskey		140	140	200	140	140	A	350	70	C		C	C	B	A	A	A	A	A	A
Wine		140	140	170	140	140	A	350	70	C		C	C	C	A	A	A	A	A	A
Xylene		C	C	C	150	C	C	350	120	A	A	A	A	A	A	A	A	A	A	A
Zinc Acetate		70	70	180	160	70	70	70		C		C	C	C	C	A	A	A	A	A
Zinc Chloride		70	160	180	200	200	A	400	A	C	B	C	C	C	C	B	B	B	A	B
Zinc Sulfate		140	140	180	200	200	B	400	A	C	B	C	C	B	A	A	A	A	A	A