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Real time information includes:

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- Order status
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Electronic Data Interchange (EDI) makes it possible to trade business documents at the speed of light. This technology cuts the cost of each transaction by eliminating the manual labor and paperwork involved in traditional order taking. This amounts to cost-savings, increased accuracy and better use of resources.

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- Improves customer service
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- Cuts transaction costs
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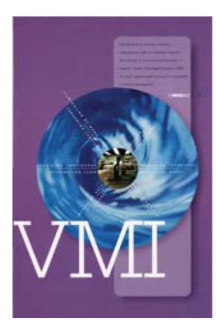

Material Ratings and Definitions

INTRODUCTION

This Chemical Resistance Guide has been compiled to assist the piping system designer in selecting chemical-resistant materials. The information given is intended as a guide only. Many conditions can affect the material choices. Careful consideration must be given to temperature, pressure and chemical concentrations before a final material can be selected.

The physical characteristics of thermoplastics and elastomers are more sensitive to temperature than metals. For this reason, a rating chart has been developed for each.

MATERIAL RATINGS FOR THERMOPLASTICS & ELASTOMERS

Temp. in °F	=	"A" rating, maximum temperature which is recommended, resistant under normal conditions
B to Temp. in °F	=	Conditional resistance, consult factory
C	=	Not recommended
Blank	=	No data available

MATERIAL RATINGS FOR METALS

A	=	Recommended, resistant under normal conditions
B	=	Conditional, consult factory
C	=	Not recommended
Blank	=	No data available

Temperature maximums for thermoplastics, elastomers and metals should always fall within published temp/pressure ratings for individual valves. **THERMOPLASTICS ARE NOT RECOMMENDED FOR COMPRESSED AIR OR GAS SERVICE.***

This guide considers the resistance of the total valve assembly as well as the resistance of individual trim and fitting materials. The rating assigned to the valve body plus trim combinations is always that of the least resistant part. In the cases where the valve body is the least resistant, there may be conditions under which the rate of corrosion is slow enough and the mass of the body large enough to be usable for a period of time. Such use should always be determined by test before installation of the component in a piping system.

In the selection of a butterfly valve for use with a particular chemical, the liner, disc, and stem must be resistant. All three materials should carry a rating of "A." The body of a properly functioning butterfly valve is isolated from the chemicals being handled and need not carry the same rating.

THERMOPLASTICS & ELASTOMERS

ABS — Acrylonitrile Butadiene Styrene Class 32222 conforming to ASTM D3965 is a time-proven material. The smooth inner surface and superior resistance to deposit formation makes ABS drain, waste, and vent material ideal for residential and commercial sanitary systems. The residential DWV system can be exposed in service to a wide temperature span. ABS-DWV has proven satisfactory for use from -40°F to 180°F. These temperature variations can occur due to ambient temperature or the discharge of hot liquids into the system. ABS-DWV is very resistant to a wide variety of materials ranging from sewage to commercial household chemical formulations. ABS-DWV is joined by solvent cementing or threading and can easily be connected to steel, copper, or cast iron through the use of transition fittings.

CPVC — Chlorinated Polyvinyl Chloride Class 23447 conforming to ASTM D1784, has physical properties at 73°F similar to those of PVC, and its chemical resistance is similar to or generally better than that of PVC. CPVC, with a design stress of 2000 psi and maximum service temperature of 210°F, has proven to be an excellent material for hot corrosive liquids, hot or cold water distribution, and similar applications above the temperature range of PVC. CPVC is joined by solvent cementing, threading or flanging.

PP (Polypropylene) — Polypropylene is a polyolefin, which is lightweight and generally high in chemical resistance. Although polypropylene is slightly lower in physical properties compared to PVC, it is chemically resistant to organic solvents as well as acids and alkalies. Generally, **polypropylene should not be used in contact with strong oxidizing acids, chlorinated hydrocarbons, and aromatics**. With a design stress of 1000 psi at 73° F, polypropylene has gained wide acceptance where its resistance to sulfur-bearing compounds is particularly useful in salt water disposal lines, crude oil piping, and low pressure gas gathering systems. Polypropylene has also proved to be an excellent material for laboratory and industrial drainage where mixtures of acids, bases, and solvents are involved. Polypropylene is joined by the heat fusion process, threading or flanging. **At 180°F, or when threaded, PP should be used for drainage only at a pressure not exceeding 20 psi.**

PVC — Polyvinyl Chloride Class 12454 conforming to ASTM D1784. PVC is the most frequently specified of all thermoplastic materials. It has been used successfully for over 40 years in such areas as chemical processing, industrial plating, chilled water distribution, deionized water lines, chemical drainage, and irrigation systems. PVC is characterized by high physical properties and resistance to corrosion and chemical attack by acids, alkalies, salt solutions, and many other chemicals. It is attacked, however, by polar solvents such as ketones, some chlorinated hydrocarbons and aromatics. The maximum service temperature of PVC is 140°F. With a design stress of 2000 psi, PVC has the highest long-term hydrostatic strength at 73°F of any of the major thermoplastics being used for piping systems. PVC is joined by solvent cementing, threading, or flanging.

PVDF — Polyvinylidene Fluoride is a strong, tough and abrasion-resistant fluorocarbon material. It resists distortion and retains most of its strength to 280°F. It is chemically resistant to most acids, bases, and organic solvents and is ideally suited for handling wet or dry chlorine, bromine and other halogens. No other

*** WARNING: Failure to follow these instructions could result in personal injury or property damage.**

Material Definitions

solid thermoplastic piping components can approach the combination of strength, chemical resistance and working temperatures of PVDF. PVDF is joined by the heat fusion process, threading or flanging.

EPDM — EPDM is a terpolymer elastomer made from ethylene-propylene diene monomer. EPDM has good abrasion and tear resistance and offers excellent chemical resistance to a variety of acids and alkalines. **It is susceptible to attack by oils and is not recommended for applications involving petroleum oils, strong acids, or strong alkalines.** It has good ozone resistance. It is fairly good with ketones and alcohols and has an excellent temperature range from -20°F to 250°F.

POLYCHLOROPRENE (CR) — Polychloroprenes were one of the first synthetic rubbers developed. Polychloroprene is an all-purpose polymer with many desirable characteristics and features high resiliency with low compression set, flame resistance, and is animal and vegetable oil resistant. Polychloroprene is principally recommended for food and beverage service. Generally, polychloroprene is not affected by moderate chemicals, fats, greases, and many oils and solvents. **Polychloroprene is attacked by strong oxidizing acids, most chlorinated solvents, esters, ketones, aromatic hydrocarbons, and hydraulic fluids. Polychloroprene has a moderate temperature range of -20°F to 160°F.**

NITRILE (NBR) — BUNA-N is a general purpose oil-resistant polymer known as nitrile rubber. Nitrile is a copolymer of butadiene and acrylonitrile and has a moderate temperature range of 20°F to 180°F. Nitrile has good solvent, oil, water, and hydraulic fluid resistance. It displays good compression set, abrasion resistance and tensile strength. **Nitrile should not be used in highly polar solvents such as acetone and methyl ethyl ketone, nor should it be used in chlorinated hydrocarbons, ozone or nitro hydrocarbons.**

FLUOROCARBON (FKM) — Fluorocarbon elastomers are inherently compatible with a broad spectrum of chemicals. Because of this extensive chemical compatibility, which spans considerable concentration and temperature ranges, fluorocarbon elastomers have gained wide acceptance as a material of construction for butterfly valve o-rings and seats. Fluorocarbon elastomers can be used in most applications involving mineral acids, salt solutions, chlorinated hydrocarbons, and petroleum oils. They are particularly good in hydrocarbon service. Fluorocarbon elastomers have one of the broadest temperature ranges of any of the elastomers, -20°F to 300°F; **however, they are not suited for steam service.**

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

GRAPHITE — Graphite is the packing and seal material of choice for most fire-rated products, primarily because of its high temperature rating of approximately 2000°F. Graphite has excellent chemical resistance, can retain compressibility at all temperatures and has a low coefficient of friction. **Graphite is not recommended for use in strong oxidizing atmospheres.**

METALS USED IN VALVES & FITTINGS

COPPER — Among the most important properties of wrot copper materials are their thermal and electrical conductivity, corrosion resistance, wear resistance, and ductility. Wrot copper performs well in high temperature applications and is easily joined by soldering or brazing. Wrot copper is exclusively used for fittings.

BRONZE — One of the first alloys developed in the bronze age 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.

SILICONE BRONZE — Silicone bronze has the ductility of copper but much more strength. The corrosion resistance of silicon bronze is equal to or greater than that of copper. Commonly used as stem material in pressure-rated valves, silicon bronze has greater resistance to stress corrosion cracking than common brasses.

ALUMINUM BRONZE — The most widely accepted disc material used in butterfly valves, 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. **Not recommended for high pH wet systems.**

BRASS — Generally, brass has good corrosion resistance. **Susceptible to de-zincification in specific applications**; excellent machinability. Primary uses for wrot brass are for ball valve stems and balls, and iron valve stems. A forging grade of brass is used in ball valve bodies and end pieces.

GRAY IRON — An alloy of iron, carbon and silicon, gray iron is easily cast, and has good pressure tightness in the as-cast condition. Gray iron has excellent dampening properties and is easily machined. It is standard material for bodies and bonnets of Class 125 and 250 iron body valves. Gray iron has corrosion resistance that is better than steel in certain environments.

DUCTILE IRON — Ductile iron has composition similar to gray iron. Special treatment modifies metallurgical structure, which yields higher mechanical properties; some grades are heat-treated to improve ductility. Ductile iron has the strength properties of steel using similar casting techniques to that of gray iron.

CARBON STEEL — Carbon steel has very good mechanical properties and is resistant to stress corrosion and sulfides. Carbon steel has high and low temperature strength, is very tough and has excellent fatigue strength. Mainly used in gate, globe, and check valves for applications up to 850°F, and in one-, two-, and three-piece ball valves.

Material Definitions and Standards

3% NICKEL IRON — 3% Nickel iron has improved corrosion resistance over gray and ductile iron. Higher temperature corrosion resistance and mechanical properties. Very resistant to oxidizing atmospheres.

NICKEL-PLATED DUCTILE IRON — Nickel coatings have received wide acceptance for use in chemical processing. These coatings have very high tensile strength, 50 to 225 ksi. To some extent, the hardness of a material is indicative of its resistance to abrasion and wear characteristics. Nickel plating is widely specified as a disc coating for butterfly valves.

400 SERIES STAINLESS STEEL — An alloy of iron, carbon, and chromium, 400 series stainless steel is normally magnetic due to its martensitic structure and iron content. It is resistant to high temperature oxidation and has improved physical and mechanical properties over carbon steel. Most 400 series stainless steels are heat-treatable. The most common applications in valves are for stem material in butterfly valves and backseat bushings and wedges in cast steel valves.

316 STAINLESS STEEL — An alloy of iron, carbon, nickel, and chromium, 316 stainless steel is nonmagnetic with more ductility than 400SS. Austinetic in structure, 316 stainless steel has very good corrosion resistance to 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.

630 STAINLESS STEEL — 630 stainless steel is a martensitic precipitation/age hardening stainless steel, offering high strength and hardness. 630 SS 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. 630 SS is primarily used as a stem material for butterfly and ball valves.

MATERIAL DESIGNATIONS & ASTM STANDARDS FOR LISTED VALVE METALS

Copper	ASTM B-75 Wrot & ASTM B-88
Bronze	ASTM B-61 Cast ASTM B-62 Cast ASTM B-584, Alloy 844
Silicon Bronze	ASTM B-98 Alloy B ASTM B-371 Wrot
Aluminum Bronze	ASTM B-148 Cast ASTM B-150 Rod
Brass	ASTM B-16 Wrot ASTM B-124 Forged
Gray Iron	ASTM A-126 Class B
Ductile Iron	ASTM A-395 Heat Treated ASTM A-536 As Cast
Carbon Steel	ASTM A-216-Grade WCB Cast ASTM A-105 Forged ASTM A-352-Grade LCB Cast
3% Ni-Iron	ASTM A-126-Class B Modified
Ni-Plated Ductile Iron	ASTM B-320 Plating
400 Series Stainless Steel	ASTM B-582 Type 416 Wrot ASTM A-217-Grade CA-15 ASTM A-276 Type 410 Wrot
316 Stainless Steel	ASTM 276 Type 316 ASTM A-351-Grade CF-8M
630 Stainless Steel	ASTM A-564 Type 630

Chemical Resistance Guide for Valves and Fittings

CHEMICALS AND FORMULA	CONCENTRATION	PLASTICS MAX TEMPERATURE (°F)							SEAL MATERIALS MAX TEMPERATURE (°F)						METALS												
		ABS	CPVC	PP	PVC	PVDF	PEX	PPSU	PTFE	EPDM	NITRILE (Buna-N)	POLYCHLORO-PRENE	FKM	GRAPHITE	BRONZE (85% Cu)	SILICON BRONZE	ALUMINUM BRONZE	BRASS	GRAY IRON	DUCTILE IRON	CARBON STEEL	3% NI/IRON	NI PLATED DUCTILE	400 SERIES SS	316 SS	630 SS	COPPER
Acetaldehyde CH_3CHO	Conc.		C	140	C		C		350	B to 200	C	C	C	A	C	C	C	C	B	B	A		B	B	A		C
Acetamide CH_3CONH_2									200	B to 200	B to 180	B to 200	C		A		A		A	A			A	A	A	A	
Acetic Acid CH_3COOH	25%	C	180	180	140		140	B to 73	350	176	C	70	C	A	C	C	C	C	C	C	C	C	C	A	A	A	C
Acetic Acid CH_3COOH	50%					B to 140	B to 176		350	140	C	C	C	A	C	C	C	C	C	C	C	C	C	A	A	A	C
Acetic Acid CH_3COOH	85%	C	C	120	73		73		350	70	C	C	C	A	C	C	C	C	C	C	C	C	C	A	A	A	C
Acetic Acid CH_3COOH	Glacial	C	C	120	73	B to 104	B to 68		350					A	C	C	C	C	C	C	C	C	C	C	A	B	C
Acetic Anhydride $(CH_3CO)_2O$		C	C	73	C	C	73		350	C	C	B to 70	C	A	C	C	C	C	C	C	C	C	C	C	B	B	C
Acetone CH_3COCH_3		C	C	B	C	B	C	C	350	B to 300	C	C	C	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Acetophenone $C_6H_5COCH_3$									350	B to 176	C	C	C		C	C	C	C	C	C	C	C	C	C	C		C
Acetyl Chloride CH_3COCl		C	C		C	C			200	C	C	C	B		A	A	A	A	C	C	A		C		A	A	A
Acetylene	Gas, 100%	73	C	73	C		73		250	B to 250	200	104	200		C	C	C	C	A	A	A	A	A		A	A	C
Acrylonitrile $H_2C{=}CHCN$			C		C		140		350	104	C	C	C	A	A	A	A	A	A	A	A	A	A	A	A	A	
Adipic Acid $COOH(CH_2)_4COOH$	Sat'd.		180	140	140	B to 176	140		350	140	B to 220	B to 160	176						C	C	B		C		B to 200		A
Allyl Alcohol $CH_2{=}CHCH_2OH$	96%		C	140	B to 73		C		250	B to 300	B to 180	B to 120	B to 70		A	A	A	A	A	A	A	A	A	A	A	A	
Allyl Chloride $CH_2{=}CHCH_2Cl$			C		C	140	C		350	C	B to 70	C	C								C						
Aluminum Acetate $Al(C_2H_4O_2)_3$	Sat'd.								350	176	C	C	C		C		C			C					A		
Aluminum Ammonium Sulfate (Alum) $AlNH_4(SO_4)_2 12H_2O$	Sat'd.		180	140	140		140		250	B to 200	B to 140	C	190	A	B	B	B	B			C			B	A		B
Aluminum Chloride (Aqueous) $AlCl_3$	Sat'd.	160	180	180	140	B to 212	140		250	176	B to 200	B to 200	176	A	C	C	C	C	C	C	C	C	C	C	A	C	C
Aluminum Fluoride AlF_3	Sat'd.	160	180	180	73	B to 212	140		250	B to 300	B to 200	B to 200	176	A	C	C	C	C	C	C	C		C	C	B	C	C
Aluminum Hydroxide $Al(OH)_3$	Sat'd.	160	180	180	140	B to 212	140		250	176	160	B to 180	176		C	C	C	C	B	B	C		B	B	A	A	C

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CHEMICALS AND FORMULA	CONCENTRATION	PLASTICS MAX TEMPERATURE (°F)							SEAL MATERIALS MAX TEMPERATURE (°F)						METALS												
		ABS	CPVC	PP	PVC	PVDF	PEX	PPSU	PTFE	EPDM	NITRILE (Buna-N)	POLYCHLORO-PRENE	FKM	GRAPHITE	BRONZE (85% Cu)	SILICON BRONZE	ALUMINUM BRONZE	BRASS	GRAY IRON	DUCTILE IRON	CARBON STEEL	3% NI/IRON	NI PLATED DUCTILE	400 SERIES SS	316 SS	630 SS	COPPER
Aluminum Nitrate $Al(NO_3)_3 \bullet {}_9H_2O$	Sat'd.		180	180	140	B to 212	140		250	176	140	B to 200	B to 400	A	C	C	C	C	C	C	C	C	C		A	A	C
Aluminum Potassium Sulfate (Alum) $AlK(SO_4)_2 \bullet {}_{12}H_2O$	Sat'd.	160	180	140	140	B to 212	140		400	B to 200	B to 200	B to 200	248	A	B	B	B	B			C			B	A		B
Aluminum Sulfate (Alum) $Al_2(SO_4)_3$	Sat'd.	160	180	140	140	B to 212	140		250	B to 300	B to 300	B to 200	B to 390	A	C	C	C	C	C	C	C		C	C		B	
Ammonia Gas NH_3	100%	C	C	140	140		140		400	140	B to 140	140	C	A	B			C	A		A				A	A	B
Ammonia Liquid NH_3	100%	160	C	140	C		140		400	212	70	B to 160	C	A	C	C	C	C			A			A	A	A	C
Ammonium Acetate CH_3COONH_4	Sat'd.	120	180	73	140	B to 212	140		400	140	140	140			C	C	C	C							B		
Ammonium Bifluoride NH_4HF_2	Sat'd.		180	180	140		140		400	140	B to 140	C	140	A	C			C	C	C	C	C	C	C	B	B	B
Ammonium Carbonate $(NH_4)_2CO_3$	Sat'd.		180	212	140	B to 248	140		400	176	B to 200	B to 200	212		C			C			A to 140	C		B	B	B	B
Ammonium Chloride NH_4Cl	Sat'd.	120	180	212	140	B to 212	140		400	300	B to 200	B to 212	250	A	C			C	C	C	C	C	C	C	B	C	
Ammonium Fluoride NH_4F	10%	120	180	212	140	B to 212	140		400	300	B to 200	B to 100	140	A	C			C			C				C		C
Ammonium Fluoride NH_4F	25%	120	180	212	C		140		400	300	B to 120	B to 100	140	A	C			C			C				C		C
Ammonium Hydroxide NH_4OH	10%	120	C	212	140		140		400	B to 300	200	200	B to 190	A	C	C		C			C			B	A	A	C
Ammonia Hydroxide NH_4OH	Sat'd.								400	B to 300	C	200	B to 190	A	C	C					C			B to 70	A to 140		C
Ammonium Nitrate NH_4NO_3	Sat'd.	120	180	212	140	B to 212	140		400	B to 300	200	200	176	A	C	C		C								A	C
Ammonium Persulphate $(NH_4)_2S_2O_8$			180	140	140	B to 212	140		200	B to 70	C	70	B to 140		C	C	C	C	C	C	C	C	C	B	A		C
Ammonium Phosphate (Monobasic) $NH_4H_2PO_4$	All	120	180	212	140	B to 248	140		400	B to 200	200	B to 200	B to 180	A	C	C	C	C	B	B	C		B	A	A	A	C
Ammonium Sulfate $(NH_4)_2SO_4$		120	180	212	140	B to 212	140		400	300	200	200	176	A	C	C	C	C	B	B	C	B	B	B	B	B	C
Ammonium Sulfide $(NH_4)_2S$	Dilute	120	180	212	140		140		350	B to 300	B to 180	B to 160	B to 70		C	C	C	C	C	C	C		C		B		C
Ammonium Thiocyanate NH_4SCN	50 - 60%	120	180	212	140	B to 212	73			B to 300	B to 180	B to 200	B to 190		C	C	C	C	C	C	C		C		A	A	C
Amyl Acetate $CH_3COOC_5H_{11}$		C	C	C	C	B to 122	73		100	210	C	C	C		B	B	B	B	B	B	B	A	B	A	A	A	
Amyl Alcohol $C_5H_{11}OH$			C		C	B to 212	B to 140		400	B to 300	B to 180	B to 200	B to 212	A	A	A	A	A	B	B	B		B	A	A	A	A

CHEMICALS AND FORMULA	CONCENTRATION	PLASTICS MAX TEMPERATURE (°F)							SEAL MATERIALS MAX TEMPERATURE (°F)						METALS												
		ABS	CPVC	PP	PVC	PVDF	PEX	PPSU	PTFE	EPDM	NITRILE (Buna-N)	POLYCHLORO-PRENE	FKM	GRAPHITE	BRONZE (85% Cu)	SILICON BRONZE	ALUMINUM BRONZE	BRASS	GRAY IRON	DUCTILE IRON	CARBON STEEL	3% NI/IRON	NI PLATED DUCTILE	400 SERIES SS	316 SS	630 SS	COPPER
n-Amyl Chloride $CH_3(CH_2)_3CH_2Cl$		C	C	C	C		C		400	C	C	C	200		A	A	A	A	A	A	A	A	A	A	A	A	
Aniline $C_6H_5NH_2$		C	C		C	B to 68	C		200	B to 140	C	C	B to 70	A	C	C	C	C	B	B	C	B	B	A	A	A	C
Aniline Hydrocloride $C_6H_5NH_2 \bullet HCl$	Sat'd.		C		C		140							C	C	C	C	C	C	C	C	C	C	C	C	C	
Anthraquinone $C_{14}H_8O_2$			180		140		C						C						C	C	C						
Anthraquinone Sulfonic Acid $C_{14}H_7O_2 \bullet SO_3 \bullet H_2O$			180	73	140		C																				
Antimony Trichloride $SbCl_3$	Sat'd.		180	140	140	B to 140	140			C	70	B to 70	70	A	C	C	C	C	C	C	C	C	C	C	C	C	
Aqua Regia (Nitrohydrochloric Acid)		C	B to 73	C	C	C	C		200	C	C	C	B to 190	C	C	C	C	C	C	C	C	C	C		B		
Argon Ar	Dry								350	B to 400	250	B to 100	B to 500		A		A		A		A				A	A	A
Arsenic Acid H_3AsO_4	80%		180	140	140	B to 248	140		400	B to 176	B to 200	B to 180	140	A	C	C	C	C	C	C	C		C	B	A	B	
Asphalt			C	73	C		73		350	C	C	C	212		A	A	A	A	A	A	A	A	A	A	A	A	A
Barium Carbonate $BaCO_3$	Sat'd.	120	180	140	140	B to 248	140		400	B to 300	140	B to 160	248		A	A	A	A	B	B	B	B	B	A	A	A	
Barium Chloride $BaCl_2 \bullet 2H_2O$	Sat'd.	120	180	140	140	B to 212	140		400	B to 300	B to 200	B to 160	B to 400	A	A	A	A	A	B	B	C	B	B	B	A		A
Barium Hydroxide $Ba(OH)_2$	Sat'd.	73	180	140	140				400	B to 300	B to 220	B to 200	248		C	C	C	C	B	B	C		B	A	A	A	
Barium Nitrate $Ba(NO_3)_2$	Sat'd.	73	180	140	73		140		250	176	140	B to 200	248	A	C	C	C	C	A	A	A		A		A		
Barium Sulfate $BaSO_4$	Sat'd.	73	180	140	140	B to 212	140		400	B to 300	B to 200	B to 200	B to 380	A	B	B	B	B	B	B	A		B	A	A	A	
Barium Sulfide BaS	Sat'd.	73	180	140	140				400	B to 310	B to 200	B to 200	B to 400		C	C	C	C	B	B	C		B	A	A	A	C
Beer		120	180	180	140	B to 248	B to 140		300	120	B to 250	B to 140	B to 300		A	A	A	A	C	C	C		C	A	A	A	A
Beet Sugar Liquors			180	180	140		73			B to 300	200	B to 180	B to 400				A		B	B	B				A	A	
Benzaldehyde C_6H_5CHO	10%	C	B to 73	73	B to 73		73			200	C	C	C	A	A	A	A	A	C	C	B		C	A	A	A	A
Benzene C_6H_6		C	C	C	C	C	B to 68	C	250	C	C	C	B to 140	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Benzene Sulfonic Acid $C_6H_5SO_3H$	10%		180	180	140		B to 73			C	C	B to 100	200		B	B	B	B	C	C	C		C	B	B	B	
Benzoic Acid C_6H_5COOH		160	180	73	140				350	C	C	B to 150	176		C	C	C	C	C	C		C	A	A	A	A	

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CHEMICALS AND FORMULA	CONCENTRATION	PLASTICS MAX TEMPERATURE (°F)							SEAL MATERIALS MAX TEMPERATURE (°F)						METALS												
		ABS	CPVC	PP	PVC	PVDF	PEX	PPSU	PTFE	EPDM	NITRILE (Buna-N)	POLYCHLORO-PRENE	FKM	GRAPHITE	BRONZE (85% Cu)	SILICON BRONZE	ALUMINUM BRONZE	BRASS	GRAY IRON	DUCTILE IRON	CARBON STEEL	3% NI/IRON	NI PLATED DUCTILE	400 SERIES SS	316 SS	630 SS	COPPER
Benzyl Alcohol $C_6H_5CH_2OH$			C	120	C	B to 122	140		400	C	C	B to 70	B to 250		A	A	A	A	B	B	B		B	A	A	A	A
Bismuth Carbonate $(BiO)_2CO_3$			180	180	140		140			70	70	70	B to 200														
Black Liquor	Sat'd.		180	140	140		120		225	220	140	70	212		C	C	C	C	B	B	B		B	B	A	B	
Bleach (Sodium Hypochlorite)	12% Cl	73	185	120	140		73																				
Blood									200	70	C	70	70		B		B		C	C			B		A	A	
Borax $Na_3B_4O_7 \bullet {}_{10}H_2O$	Sat'd.	160	180	212	140		140			300	B to 200	B to 200	200		A	A	A	A	A	A	B	A	A	A	A	A	
Boric Acid H_3BO_3	Sat'd.	160	180	212	140	B to 212	140			B to 300	B to 200	B to 200	185	A	B	B	B	B	C	C	B		C	B	A	B	
Brine	Sat'd.		180	140	140		140		400	B	B	B	B		A	A	A		C	C	C	B	C	B	A	B	
Bromic Acid $HBrO_3$			180	C	140	B to 212	C			200	C	C	200		C	C	C	C									C
Bromine Br_2	Liquid	73	C	C	C	B to 248	C		300	C	C	C	B to 350	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Bromine Br_2	Gas, 25%		180	C	140		C		200	C	C	C	B to 180	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Bromine Water	Sat'd.		180	C	140	B to 176	C		300	C	C	C	B to 210	C	C	C	C	C	C	C	C		C				C
Butadiene $H_2C{=}CHHC{=}CH_2$	50%		180	C	140		73		C	C	C	C	70		A	A	A	A	A	A	A	A	A	A	A	A	A
Butane C_4H_{10}	50%		180	140	140		140	73	350	C	B to 250	B to 200	B to 400		A	A	A	A	A	A	A	A	A	A	A	A	A
Butyl Acetate $CH_3COOCH_2CH_2CH_2CH_3$		C	C	C	C	C	C		175	C	C	C	C		B	B	B	B	B	B	B		B	A	A	A	
Butyl Alcohol $CH_3(CH_2)_2CH_2OH$			C	180	140		140		300	B to 250	B to 190	140	B to 390	A	B	B	B			B			A	A	A	A	B
Butyl Cellosolve			C		73				200	B to 300	C	C	C	A	A	A	A	A	A	A			A	A	A	A	
n-Butyl Chloride C_4H_9Cl		C	C						400	C	C	C	70		B	B	B	B	B	B	B		B	B	B	B	
Butylene © $CH_3CH{=}CHCH_3$	Liquid			C	140		120		400	C	250	C	B to 400		A	A	A	A			A			A	A	A	
Butyl Phthalate $C_{16}H_{22}O_4$			C	180		B to 140				250	C	C	C														
Butyl Stearate					73				250	C	C	C	B to 400		A	A	A	A	B	B			B	A	A	A	
Butyric Acid $CH_3CH_2CH_2COOH$		C	C	180	73		73		300	C	C	C	C		A	A	A	A	C	C	C	C	C	B	A	A	
Calcium Bisulfide $Ca(HS)_2 \bullet {}_6H_2O$			73		C		140		200	200	B to 140	140	140												A		

CHEMICALS AND FORMULA	CONCENTRATION	PLASTICS MAX TEMPERATURE (°F)							SEAL MATERIALS MAX TEMPERATURE (°F)						METALS												
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Mercuric Cyanide $Hg(CN)_2$	Sat'd.		180	140	140	B to 212	140		300	B to 210	B to 160	B to 70	C		C	C	C	C	C	C	C		C		A		C
Mercuric Sulfate $HgSO_4$	Sat'd.		180	140	140		140		300	70	70	B to 70	C	A	C	C	C	C									C
Mercurous Nitrate $HgNO_3 \bullet {}_2H_2O$	Sat'd.		180	140	140		140		300	100	B to 90	90	C	A	C	C	C	C	C	C	C		C	A	A	A	C
Mercury Hg			180	140	140	B to 248	140		300	210	140	140	185	A	C	C	C	C	A	A	A		A	A	A	A	C
Methane CH_4		C	73	73	140		140		300	C	B	B to 140	B		A	A	A	A	A	A	A	A	A	A	A	A	A
Methanol (Methyl Alcohol) CH_3OH			C	180	140		B to 140		300	B to 176	B to 160	160	C	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Methyl Acetate $CH_3CO_2CH_3$		C	C	140	C		C		300	160	C	C	C		B	B			B	B	B		B	B	A		
Methyl Acetone														C	A	A	A	A	A	A	A	A	A	A	A	A	A
Methyl Amine CH_3NH_2			C	C	C				300						C	C			A	A	B		A		A		
Methyl Bromide CH_3Br			C	C	C		C		300	C	C	C	185		C	C	B		C	C	B				B		
Methyl Cellosolve $HOCH_2CH_{20}CH_3$			C	73	C		C			C	C	C	C		A	A	B		B	B	B			A	A	A	
Methyl Chloride CH_3Cl	Dry	C	C	C	C		C		250	C	C	C	C		A	A	C	C	A	A	A	A	A	A	A	A	
Methyl Chloroform CH_3CCl_3		C	C	C	C		C		200	C	C	C	C						A	A			A		A		
Methyl Ethyl Ketone (MEK) $CH_3COC_2H_5$		C	C	73	C			C	200	B to 200	C	C	C	A	A	A	A	A	A	A	A		A	A	A	A	A
Methyl Formate										B to 120	C	C	C		A	A	A		A	A	C		A	A	A	A	
Methyl Isobutyl Ketone $(CH_3)_2CHCH_2COCH_3$		C	C	73	C		73		200	B to 130	C	C	C	A					A						A	A	
Methyl Isopropyl Ketone $CH_3COCH(CH_3)_2$			C		C		73		150	C	C	C	C														
Methyl Methacrylate $CH_2{=}C(CH_3)COOCH_3$			C		73		140		150	C	C	C	C								C						
Methylene Bromide CH_2Br_2			C	C	C		C		250	C	C	C	C														
Methylene Chloride CH_2Cl_2			C	C	C	C	C	C	250	C	C	C	C		B	B	B		B	B	B				A	A	
Methylene Chlorobromide CH_2ClBr			C		C														A	A					A		
Methylene Iodine CH_2I_2			C	C	C		C		200			C	70														
Methylsulfuric Acid CH_3HSO_4			180	140	140					70	C	70	C														
Milk		160	180	212	140	B to 212	140		400	250	250	250	250		B	B	B	B	C	C	C		C	C	A	A	A