CHEMICAL RESISTANCE GUIDE

This guide is offered as a general aid in selecting the appropriate materials used for a broad spectrum of aggressive chemicals routinely handled by the products we manufacture. Because chemicals and their properties can vary greatly, this chart is to be used at your discretion. The accuracy of these ratings cannot be guaranteed. Your chemical supplier is the best source for definitive material compatibility. Careful consideration must be given to all characteristics of the chemical and process system including chemical concentration, installation conditions, pressure, and temperature before a final material is selected.

Although the information set forth herein is presented in good faith and believed to be correct on the date of issuance, LMI makes no guarantee or representation as to the completeness or accuracy thereof, and disclaims all liability for any loss or damage resulting from use or reliance upon any information, recommendations or suggestions contained herein. ***LMI MAKES NO EXPRESS OR IMPLIED REPRESENTATIONS OF WARRANTIES AS TO THE FITNESS, MERCHANTABILITY, OR ANY OTHER MATTER WITH RESPECT TO THE INFORMATION CONTAINED HEREIN OR ANY PRODUCT OR SUBSTANCE REFERRED TO HEREIN,*** *whether used alone or in combination with any other material. Nothing contained herein is to be construed as a recommendation to use any product in conflict with any patent. The information is subject to change without notice.*

These materials represent the majority of standard liquid end materials used with products we manufacture.

As always, you can rely on your LMI distributor to help with standard and unique applications.

MATERIAL DESCRIPTIONS

METAL WETTED COMPONENTS

316 Stainless Steel – alloy of iron, carbon, nickel and chromium. A nonmagnetic stainless steel with more ductility than 400SS. Austenitic in structure, 316 stainless steel has excellent corrosion resistance to a wide range of chemicals. It is not susceptible to stress corrosion cracking or affected by heat treatment. 316 stainless steel is the most widely used material for pump heads, check valves, balls and other wetted components.

Alloy 20 – contains more nickel and chromium than 300 series stainless steel and with the addition of columbium that retards stress corrosion cracking and has improved resistance to sulphuric acid.

Cast Iron – an alloy of iron, carbon and silicon; easily cast; good pressure retention. Cast iron has excellent dampening properties and is easily machined. The cost of cast iron is moderately favorable to stainless steel and is often selected for industrial water treatment chemicals when it's acceptable.

Hastelloy® C – a high nickel-chromium molybdenum alloy that has outstanding resistance to a wide variety of chemical process environments, including strong oxidizers such as sodium hypochlorite, and ferric chloride. Hastelloy C is also resistant to nitric, hydrochloric, and sulfuric acids at moderate temperatures. It's often used as spring material in check valves of non-metallic pumps. Two grades of Alloy C are used in pump components, C276® and C22®. The two grades differ slightly in chemical compatibility, so care should be taken in the selection process.

NON-METAL WETTED COMPONENTS

Acrylic – resistant to many chemicals. Acrylic is often favored over other plastics for use as pump head material because it is clear and enables the user to observe pump performance.

Ceramic – Is used for seats, weights and ball checks in a number of pump products. Ceramic has the advantages of having a high level of hardness while being very corrosion resistant to a wide range of chemicals even at elevated temperatures. Alumina is not compatible with some chemicals such as hydrofluoric, hydrofluorosilicic, and hydrochloric acids.

Polyethylene – has excellent chemical resistance to strong acids and bases. It is also resistant to gentle oxidants and reducing agents. Its primary use in pumps is as a seat material in pump heads made primarily of other plastic materials.

Polypropylene – is generally high in chemical resistance but slightly lower in physical properties compared to PVC. It is chemically resistant to organic solvents, acids, and alkalines.It is typically not effective when in contact with strong oxidizing acids, chlorinated hydrocarbons, and aromatics.

PVC – PVC is the most frequently specified of all thermoplastic materials. It is characterized by high physical properties and resistance to corrosion and chemical attack by acids, alkalines, salt solutions, and many other chemicals. It is not successful handing ketones, some chlorinated hydrocarbons, and aromatics. The maximum service temperature of PVC is 140°F. PVC pipe connections can be solvent cemented (recommended for many chemicals) threaded, or flanged.

PVDF – a strong and abrasion-resistant fluorocarbon material. It resists distortion and retains most of its strength to 280°F. PVDF is excellent with most acids, bases, and organic solvents. It also applies well to chlorine, bromine and other halogens. No other plastic material approaches the combination of strength, chemical resistance and working temperatures of PVDF. PVDF is joined by a fusion process, threading or flanging.

NOTE REFERENCES

1. Consult LMI distributor
2. Absorption of moisture from the air dilutes chemical and increases corrosion.
3. Consult LMI distributor for assistance
4. Consult LMI distributor - Slurry - use HV liquid ends
5. Liquefied gas - consult LMI distibutor
6. Polypropylene only good to 38% concentration.
7. Polypropylene, PEEK, and FKM up to 80 % concentration.
8. Recommend liquid end flush
9. Recommend liquid end flushing
10. Subject to gas binding - use degassing head.
11. Use 316 ss if Titanium Dioxide must remain white
12. Use degassing head, double ball checks, Polyethylene must be HDPE
13. Use liquid ends with HV options
14. Use ceramic ball checks - Consult LMI distributor
15. Use HV liquid ends
16. Use PTFE ball checks
17. Use HV liquid ends
18. Usually requires high temp options - Consult LMI distributor
19. Volatile with hydrocarbons - Subject to gas binding - use degassing head.
20. Can be very corrosive - recommend plastics

NOTE: *For applications where Hastelloy® C sprins are not compatible, PVDF coated springs are avalable.*

NOTE: *For unlisted chemicals, consult your LMI distributor*

ELASTOMERS AND SEALS

Polyprel®/Aflas® – is a copolymer of tetrafluoroethylene and propylene with a fluorine content of about 54%. This material is resistant to petroleum products and phosphate-esters. Service temperatures are -25°F to 400°F. Aflas®provides improved chemical resistance to a wide spectrum of oils, rust inhibitors, amines, acids and bases. Aflas® is typically used for o-rings in various pump models.

Buna N – a general purpose oil-resistant polymer known as nitrile rubber. Nitrile is a copolymer of butadiene and acrylonitrile with a moderate temperature range of -20°F to 180°F. Nitrile is resistant with solvents, oils, water, and hydraulic fluid. Buna N should not be used with highly polar solvents such as acetone and methyl ethyl ketone, or in applications with chlorinated hydrocarbons, ozone or nitro hydrocarbons. In metering pumps Buna N is primarily used for o-ring seals.

EPDM – 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 is fairly good with ketones and alcohols and has a wide temperature range from -20°F to 250°F.

PTFE/Fluorofilm™ – has outstanding resistance to chemical attack by most chemicals and solvents. PTFE has a wide temperature rating of -20°F to 400°F as a seal. It is also used as the primary material in diaphragms where temperature limits vary based on backing material. FluoroFilm™ is a copolymer of PTFE and PFA.

Viton® (FKM) – compatible with a broad range of chemicals. Viton® is usually used for o-rings, and as a backing material for PTFE diaphragms. It can also be used for ball checks. FKM can be used in most applications involving mineral acids, salt solutions, chlorinated hydrocarbons, and petroleum oils. It is also good in hydrocarbon service. Viton® has a temperature range of -20°F to 300°F.

Viton is a registered trademark of Dupont

Aflas is a registered trademark of Asahi Glass Co.

Hastelloy is a registered trademark of Haynes International, Inc.

Fluorofilm is a trademark of Milton Roy, LLC

Polyprel is a registered trademark of Milton Roy, LLC

Solution Temperature Maximum

For liquid handling components of LMI metering pumps operation at 100 psi (6.9 Bar)

Material	Example Of Use	Temperature °F	Temperature °C
PVDF (Carbon Fiber Rainforced)	Fittings and Pump Head	250*	121*
Polyprel® (AFLAS®)	Seal Rings	250*	121*
Polyproplene	Fittings and Pump Head	170	77
Polyvinyl Chioride Rigid (PVC)	Fittings and Pump Head	140	60
Polyvinyl Chioride (Flexible Vinyl)	Suction Tubing	140	60
Polyethylene	Discharge Tubing	110	43
Acrylic	Pump Head	140	60
PTFE	Liquifam™ and Seal Rings	250*	121*
Viton®	Diaphragm and Seal Rings	225	107
Stainless Steel (316)	Fittings and Pump Head	250*	121*
Copolyer PTFE	Liquifam™	250*	121*
Hastelloy® C	Spring	250*	121*
EPDM	Seal Rings	225	107
CPVC	Pipe, Corp Stop	180	82
BUNA-N	Gasket, Corp Stop	220	104

** Limited by other pump components*

RATINGS: A - Excellent B - Use with caution C - Do not use Blank - Insufficient Data Temperature - Good up to listed temperature	Cast Iron	316 Stainless	Alloy 20	Hastelloy® C	Ceramic	PVC	PVDF	Polyethylene	Polypropylene	Acrylic	Viton® (FKM)	EPDM	PTFE	Buna N	Aflas®	Vinyl	Note Reference
Acetaldehyde	A	A	A	A		C	C	C	B	C	B	68°F	212° F	C	B	C	
Acetamide	C	C				68°F	C	68°F	68°F		c	68°F	250° F	A	B		
Acetate Solvents	A	A	A	A		C			A		C	V	250° F	C			
Acetic Acid 10%	C	A	A	A	A	A	220°F	A	A	B	C	A	250° F	C	C	C	
Acetic Acid 80%	C	B	B	A	A	C	150°F	B	B	C	C	A	250° F	C	C	C	
Acetic Acid Glacial	C	A	A	A	A	C	125°F		68	C	C	A	250° F	C	C	C	
Acetic Anhydride	C	A	A	A	A	C	C			C	C	C	250° F	C	C	C	
Acetone	A	A	A	A	A	C	C	C	A	C	C	A	250° F	C	C	C	
Acetylene	A	A	A	A			150°F	B	A		A	A	250° F	A			
Acrylonitrile	C	A	A	A			75°F			A	C	C	250° F	C	A	C	
Allyl Chloride	C		C			C	212°F	C	A				250° F		C		
Alum (general - see specific chemical)	C	B	A	A		A	A	A	A	A	C	A		A	A		
Aluminum Acetate							230°F						250° F	C			
Aluminum Chloride	B	A	A		A	A	230°F	A	A	A	A		212° F	A	A	A	
Aluminum Flouride							230°F						212° F	A			
Aluminum Hydroxide	B	A	A			A	230°F	A	A	A	A		212° F	A	A	A	
Aluminum Nitrate	C	A	A			A	230°F	A	A		C	A	212° F	A			
Aluminum Potassium Sulfate (Alum), 10%	C	A	A	C		A	A		A		A	A	A	A	A	A	
Aluminum Potassium Sulfate (Alum), 100%	C	B	B	C		A	A		A		A	A	A	A	A	A	
Aluminum Sulfate	C	A	A	A	A	A	230°F	A	A	A	A	A	212° F	A		A	
Amines	A	A	A	A		A					C	A		C	B	C	
Amines (filming)	C	A	A	B		A		C	B		C	B	A	C	B		
Ammonia Solutions		A	A	A	A	A	C	C	A		C	A	250° F	B			
Ammonia, Anhydrous	A	A	A	A		A	C	C	A	C	C	A	250° F	B	A	A	
Ammonium Bifluoride	C	B	B	B		A	150°F		A		A	A	250° F	A			
Ammonium Carbonate		A	A	A	A	A	230°F	A	A	C	A	A	250° F	C	B	A	
Ammonium Chloride	B	A	A	A	A	A	230°F	A	A	C	A	A	250° F	A	B		
Ammonium Di-Phosphate	B	A	A	A		A	150°F	A	A	A		A	250° F	A	C		
Ammonium Hydroxide	A	A	A	A	A	A	200°F	A	A	A	A	A	250° F	B	A	C	
Ammonium Mono Phosphate	C	A	A	A		A	230°F		A	A		A	250° F	A	C	A	
Ammonium Nitrate	C	A	A	A	A	A	230°F	A	A	A	A	A	250° F	A	C	A	
Ammonium Oxalate	C	A	A	A		A			A			A	250° F	A			
Ammonium Persulfate	C	B	B		A	A	75°F		A		A		250° F	C			
Ammonium Sulfate	C	A	A	A	A	A	230°F	A	A	A	A	A	250° F	A	C	A	
Ammonium Sulfide		B	A			A	125°F	A	A		C	A	250° F				
Ammonium Thiocyanate	C	A	B	A		A	230°F	A	A				250° F				
Ammonium Tri-Phosphate	A	A	A	A		A	150°F	A	A	A		A	250° F	A	C		
Amyl Acetate	A	A	A	A	A	C	100°F	C	C	C	C	C	250° F	C	C	C	
Amyl Alcohol		A	A	A	A	B	230°F	A	C	C	A	A	250° F	B	A	B	
Amyl Chloride	A	A	A	A	A	C	230°F	C	C		C	C	250° F	C	A		
Aniline	A	A	A	A	A	C	100°F	C	A	C	A	A	250° F	C	A	C	
Aniline Dyes	C	A	A	A		C		B	A		B	A	250° F	C			
Animal Oils		A				A		C	B		A	C	250° F				
Anise Oil	A	A	A														
Arsenic Acid	C	B	A	B		A	230°F	A	A		A	A	250° F	A	A	A	
Barium Carbonate	B	B	B	A	A	A	230°F	A	A	A	A		250° F	A	A	A	
Barium Chloride	C	A	A	A	A	A	230°F	A	A	A	A	A	250° F	A	A	A	
Barium Cyanide	B	A	A	A							B			C			
Barium Hydroxide	B	A	A	A	A	A	230°F	A	A	A	A		250° F	A	A	A	
Barium Nitrate	B	B	B			A	230°F		A		A	A	212° F	A			
Barium Sulfate		A	A		A	A	230°F	A	A	A	A		250° F	A	A	A	
Barium Sulfide		B	A		A	A	230°F	A	A		A	A	250° F	A			
Bay Oil	A	A	A				A				A		A				
Beer		A	A	A		A	212°F	A	A	A	A	A	250° F	A	A	A	
Beet Sugar Liquids		A	A	A		A	230°F			A	A	A	250° F	A	A	A	
Benzaldehyde		A	A	A	A	C	C	C	B		C	C	212° F	C	C		
Benzene	A	A	A	A	A	C	170°F	C	C	C	B	C	250° F	C	C	C	
Benzoic Acid	C	A	B	A	A	A	220°F	A	A	A	A	C	212° F	C	A	B	
Benzol	A	A	A	A	A	C		C	C		B	C		C	C		
Benzyl Alcohol	B	B	A	A	A	C	230°F		A	C	A	B	250° F	C	B	C	
Black Sulfate Liquor	A	A	A			A	170°F			A	A	B	212° F		A		
Bone Oil	A	A	A				A		A				A	A			
Borax (Sodium Borate)	A	A	A	A		A	230°F	A	A	A	A	A	250° F	B	A	A	
Boric Acid	C	A	A	A	A	A	230°F	A	A	A	A	A	250° F	A	A	A	
Bromic Acid	C	C	C			A	200°F						175° F		B		

RATINGS: A - Excellent B - Use with caution C - Do not use Blank - Insufficient Data Temperature - Good up to listed temperature	Cast Iron	316 Stainless	Alloy 20	Hastelloy® C	Ceramic	PVC	PVDF	Polyethylene	Polypropylene	Acrylic	Viton® (FKM)	EPDM	PTFE	Buna N	Aflas®	Vinyl	Note Reference
Bromine	C	C		A	A	C	125°F	C	C	C	A	C	250° F	C	B	C	
Butadiene	A	A	A	A		A	230°F				B	A	250° F	A	B		
Butane	A	A	A	A		A	230°F	C			B	C	250° F	A	B		5
Butanol		A	A	B		C	A		A		A	A	A				
Butyl Acetate		A	A	A		B	C	B	B			C	175° F		C		
Butyl Alcohol		A	A	A	A	A	220°F	A	A	C	A	B	250° F	A	A	B	
Butyl Mercaptan	C	B	B	A			230°F				A	A	140° F				
Butylene (Butene)	A	A	A	A		A	230°F				B	C		B			
Butyric Acid	C	A	A	A		B	230°F	C			B	C	250° F	C	A		
Calcium Acetate	C	A	A	A			230°F					A	250° F				
Calcium Bisulfate	C	A					230°F			A		A	250° F		A		
Calcium Bisulfide		B	B	A		120° F	A		A		A	C	212° F	A			
Calcium Bisulfite	C	A	A	A		A	200°F		A		A	C	212° F			A	
Calcium Carbonate		A	A	B	A	A	230°F	A	A	A	A	A	250° F	A	A	A	
Calcium Chlorate	B	A	B	A	A	A	230°F	A	A	A	A		250° F		A	A	
Calcium Chloride	C	B	A	A	A	A	230°F	A	A	A	A	A	250° F	A	A	A	
Calcium Hydroxide	A	A	A	A	A	A	230°F	A	A	A	A	A	212° F	A	A	B	
Calcium Hypochlorite	C	B	B	A	A	A	200°F	A	A	A		A	212° F	B	A	A	
Calcium Nitrate	B	A	A	A	A	A	230°F	A	A	A		A	212° F	A	A	A	
Calcium Sulfate	A	A	A	A	A	A	230°F	A	A	A	A		212° F	A	A	A	
Cane Sugar Liquors		A	A	A			230°F		A		B	A	250° F	A			
Carbolic Acid (See Phenol)	C	A	A	A	A	A		C	A		A	B	250° F	C			
Carbon																	4
Carbon Bisulfide	A	A	A	A		A			C		A	C	212° F	C	A		
Carbon Dioxide (wet)	C	A	A	A	A		230°F				A	A	250° F	A	A		5
Carbon Disulfide		A				C	75°F			C	A		250° F	C		C	
Carbon Tetrachloride	A	A	A	A	A	C	230°F	C	C	C	A	C	250° F	C	C	B	
Carbonic Acid	C	A	A	A	A	A	230°F	A	A	A	A	A	250° F	B	A	A	
Castor Oil		A			A	A			A	A	A		250° F		A	A	
Cellosolve						B	A		A		C	B	250° F	C	A		
Chelant (Chelate) Generic - user to specify																	
Chloral Hydrate			A			A		C					250° F				
Chloric Acid	C	C	A	A		A							140° F				
Chlorine Dioxide						A	A				B	C	A				
Chlorine, Anhydrous Liquid	C	C	C	C		C	175°F		C		A	B	212° F	C			
Chloroacetic Acid	C	C	A	A		A	C	C	B			A	212° F	C	C	C	
Chlorobenzene (Dry)	B	A	A	A	A	C	160°F	C	B	C	A	C	212° F	C	B	C	
Chloroform	B	A	A	A	A	C	125°F	C	C	C	A	C	212° F	C	C	C	
Chlorosulfonic Acid					A	A	C	C	C		C	C	175° F	C	B	C	
Chromic Acid 10%	C		A		A	A	175°F	A	A	C		C	250° F	C	A	A	
Chromic Acid 50% below 60° F	C	A	A	A	A	A	125°F	A	B	C	A	C	250° F	C	A		
Chromic Acid 50% to 140° F		B		A	A	A	125°F	B	B	C	C	C	250° F	C	A		
Citric Acid	C	A	A	A	A	A	230°F	A	A	A	A	A	212° F	A	A	A	
Coal Slurry																	3
Cobalt Acetate		A															
Coffee Extracts (Hot)		A	A	A								A		A			
Copper Acetate		A	A	A		A	230°F				C	A	250° F	B			
Copper Chloride	C	C	C	A	A	A	230°F	A	A	A		A	250° F	A	A	A	
Copper Cyanide		A			A	A	230°F	A	A	A	A	A	250° F	A	B	A	
Copper Nitrate		A			A	A	230°F	A	A	A	A	A	212° F	A	A	A	
Copper Sulfate	B	A	A	A		A	230°F	A	A	A	A	A	212° F	A	A	A	
Copper Sulfate (5% Solution)		A	A		A		230°F			A	A	C	212° F	A	A		
Corn Oil	C	B					230°F		A	A	A	C	250° F	A	A	A	
Corrosion Inhibitor (see specific chemical)																	
Cotton Seed Oil	A	A	A	A	A	A	230°F	C	B		A	C	250° F	A	A	A	
Creosote	B	B											250° F	A			
Cresol (Ortho, Meta, Para)							150°F			C			250° F	C	A	C	
Cresylic Acid (50%)	A	A	A	A		A	150°F				A	C	250° F	C	A		
Cyclohexane	B	A	A	A		C	230°F	C	C		A	C	250° F	A			
Detergents					A	A		A	A	A	A	A	250° F	A	B	A	
Diacetone							C						212° F	C	C		
Dichloroethane		A	A		A										C		
Diesel Fuel							230°F			A			250° F	A	A	A	
Diesel Fuel (2D, 3D, 4D, 5D)							230°F			A			250° F	A	A		
Diethylamine		A	A			C	C				C	A	212° F		C		

RATINGS: A - Excellent B - Use with caution C - Do not use Blank - Insufficient Data Temperature - Good up to listed temperature	Cast Iron	316 Stainless	Alloy 20	Hastelloy® C	Ceramic	PVC	PVDF	Polyethylene	Polypropylene	Acrylic	Viton® (FKM)	EPDM	PTFE	Buna N	Aflas®	Vinyl	Note Reference
Diethylene Glycol		A	A			A		A	A		A	A		A	A		
Dimethyl Sulfate	A						75°F				C		A		B		
Dimethyl Sulfide	A	A											A				
Dioxane							C						250° F	C	C		
Diphenyl Oxide													212° F	C			
Disodium Phosphate							200°F						250° F				
Dyes		A											250° F				
EDTA (Ethylenediaminetetraacetic acid)		A	A										250° F				
Epsom Salts (Magnesium Sulfate)	A	B	C	B		A	200°F	A	A		A	A	250° F	A			
Ethane		A	A			A	A		C		A	C	A	A			
Ethanolamine		A	A	B	A	C	C	C	C		C	B	250° F	B			
Ether	A	A	A	A		C	B	C	C	C	B	C	250° F	C	C	C	
Ethyl Acetate	A	A	A	A	A	C	C	C	B	C	C	A	250° F	C	C	C	
Ethyl Alcohol	B	A	A	A	A	A	212°F	A	A	C	A	A	250° F	A	A	B	
Ethyl Butyrate		A	A					C	C								
Ethyl Chloride	C	A	A	A	A	C	230°F	C	C	C	A	A	250° F	A	A	C	
Ethyl Mercaptan	B	A											A	C			
Ethyl Sulfate	C	C	A								C		A	A	A		
Ethylene Chloride	C	A				C		C	C	C	B	C	250° F	C		C	
Ethylene Dichloride	A	B	C	B	A	C	230°F	C	C		A		250° F	C	A		
Ethylene Glycol	A	A	A	A	A	A	230°F	A	A	A	A	A	250° F	A	A	A	
Ethylene Oxide	C	A	A	A		C	200°F	A	C		C	C	250° F	C	C		3
Fatty Acids	C	A	A	A	A	A	230°F	A	A	A	A	C	250° F	C	B	A	
Ferric Chloride	C	C	C	B		A	230°F	A	A	A	A	A	250° F	A	A	A	8
Ferric Nitrate		A	A	B		A	230°F	A	A	A	A	A	250° F	A	A	A	
Ferric Sulfate	C	A	A	A	A	A	230°F	A	A	A	A	A	250° F	B	A	A	1
Ferrous Chloride	C	C	C	A		A	230°F	A	A	A	A	A	250° F	B	A	A	
Ferrous Sulfate	C	B	A	A	A	A	230°F	A	A	A	A	A	250° F	B	A	A	
Fluosilicic Acid	C	B	B	B	C	A	230°F	A	A	A	A	A	250° F	A	A	A	16
Formaldehyde	C	A	A	A		A	125°F	A	A	A	A	A	250° F	B	C	A	
Formic Acid	C	A	A	A		B	230°F	A	A	A	C	A	250° F	C	C	C	
Freon 11		A	A		A						B		250° F	C	C		
Freon 12 (wet)	A	A									B	B	250° F	A	C		
Fruit Juice	C	A	A	A	A	A		A	A	A	A	A	250° F	A	A	A	
Fuel Oil		A	A			A	230°F		C	A		C	250° F	B			
Furan		A		B			C		C			C	212° F	C	C		
Furfural	A	A	A	A		C	75°F	C	C		C	A	250° F	C	C		
Furfuryl Alcohol		A		A			100°F				A	B	140° F		C		
Gallic Acid	C	A	A			A	75°F	A	A		A	B	250° F	C	B		
Gallotannic Acid	C	A	A	B	A	A	B		A		A	A	A	A			
Gasohol			B	B		A	230°F		C		A	C	250° F	C			
Gasoline		A	A	A	A	A	230°F	C	C	A	A	C	250° F	C	B	A	
Gelatin		B	B			A	230°F	A	A		A	A	250° F	A	A		
Glucose		A	A			A	230°F	A	A	A	A	A	250° F	A	A	A	
Glycerine	B	A	A	A	A	A	230°F	A	A	A	A	A	250° F	A	A	A	
Glycerol	B	A	A	A	A	A		A	A	A	A	A	250° F		A	A	
Glycolic Acid		B	B	B		A	100°F	A	A		C	A	250° F	A	B		
Glycols		C	B			A	230°F	A	A		A	A	250° F	A			
Heptane		A	A	A	A	A	230°F	100° F	C		A	C	250° F	A	C	B	
Hexane		A	B		A	A	230°F	C	A		A	C	250° F	A	C	B	
Hexyl Alcohol	A	A	A	A		A	175°F				C	C	250° F	A			
Hydrazine		A	C			C	200°F		80°F		C	A	212° F	B	A		
Hydrobromic Acid 50%	C	C	C	B		A	230°F	A	A	A		A	250° F	C	A		3
Hydrochloric Acid	C	C	C	B	C	A	230°F	A	A	A	A	A	250° F	C	A		6
Hydrochloric Acid- Anhydrous		C		A		A	230°F		B		A	C	250° F	C			3
Hydrocyanic Acid	C	A	A	A		A	230°F	A				A	250° F	C	A		
Hydrofluoric Acid 30%	C	C	B	B		A	230°F	A	A	C	A	A	250° F	C	A		3
Hydrofluoric Acid 75%		A	A	B	C	80° F	200°F	C	A	C	A	C	250° F	C	A		3
Hydrofluoric Acid 100%	C	C	C	B		A	200°F	A	A	C	B	A	250° F	C	A		14
Hydrofluosilicic Acid	C	B	B	B		A			A	A	A	A	212° F	B	A	A	16
Hydrogen Peroxide - Consult LMI Distributor		B	B	B	A		100°F	A	A	C			250° F	B	C		19
Hydrogen Sulfide, Aqueous	C	A	A	A	A	A	230°F	A	A	A	C	A	250° F	C	A	A	
Ink		A			A	A		A	A		A		212° F	A			
Iodine Solutions		C	C			C	150°F	C	B	A		B	250° F	B	A	B	

RATINGS: A - Excellent B - Use with caution C - Do not use Blank - Insufficient Data Temperature - Good up to listed temperature	Cast Iron	316 Stainless	Alloy 20	Hastelloy® C	Ceramic	PVC	PVDF	Polyethylene	Polypropylene	Acrylic	Viton® (FKM)	EPDM	PTFE	Buna N	Aflas®	Vinyl	Note Reference
Iodoform		A	B	C			200°F		80°F		A	A	250° F	C			
Iron Chloride (see ferric chloride)																	
Isobutyl Alcohol		B	B			80° F	230°F	B	80°F		A	A	250° F	C	A		
Isopropyl Acetate		A	B			C	C		B		C	B	250° F	C	C		
Isopropyl Alcohol		B	B	B	A	A	140°F	A	A	B	A	A	250° F		A		
Isopropyl Amine		A									C	A	A	C	A		
Isopropyl Ether		A	A			B	125°F		B		C	C	250° F	B	C		
Kerosene		A	A	A	A	A	230°F	C	B	A	A	C	250° F	A	B		
Ketones		A	A	A	A	C	C		C		C	A	250° F	C	C		
Lactic Acid (over 60% to 100° F)	C	B	B	A	A	B	125°F	A	B	A	A	B	250° F	B	A		
Lactic Acid (to 60% to 100° F)	C	B	B	B	A	C	125°F	A	B	A		B	250° F	B	A	A	
Lead Acetate		B	B	B	A	A	230°F	A	A	A	C	A	250° F	B	C		
Lead Nitrate		B		B		A	230°F		A		A	A	212° F				
Lime Slurries	A	A	A			B	A				B	B	212° F	A			13
Linseed Oil		A			A	A	230°F	C	A		A		250° F		A	A	
Lithium Bromide		A		A	A	A	220°F		A				250° F				1
Lithium Hydroxide		B	C	B									A	C			
Magnesium Carbonate		A			A	A	230°F	A	A	A	A	A	250° F	A	A	A	
Magnesium Chloride	C	C	A	A	A	A	230°F	A	A	A	A	A	250° F	A	A	A	
Magnesium Hydroxide		A	A	A	A	A	230°F	A	A	A	A	A	250° F	B	A	A	17
Magnesium Nitrate		A	A	A	A	A	230°F	A	A	A	A	A	250° F	A	A	A	
Magnesium Oxide	A	A	A							A	C		A	A	A	A	
Magnesium Sulfate		A	A	A		A		A	A	A	A	A	250° F	A	A	A	
Maleic Acid	C	A	A	A		A	230°F		A		A	C	250° F	C	A		
Maleic Anhydride		A					C						250° F	C	A		
Malic Acid	C	A	A	A		A	230°F	B	B		A		250° F	B			
Melamine Resins	C	A	A	A		A								C			
Mercaptans (see specific chemical)													212° F				
Mercuric Chloride (Dilute Solution)	C	C	A	A	A	A	230°F	A	A			A	250° F	A	A		
Mercuric Cyanide	C	B		A	A	A	230°F	A	A		A	A	250° F	A			
Mercury	A	A	A	A	A	A	230°F	A	A			A	250° F	A	A		1
Methanol (Methyl Alcohol 100%)	A	A	A	A	A	A	230°F	A	A	C	C	A	250° F	A	A	A	
Methyl Acetate	A	A		A		C	100°F		C		C	A	212° F	C	C		
Methyl Acetone	A	A	A			C					C	A	A	C			
Methyl Acrylate	A						75°F						250° F	C	C		
Methyl Alcohol 10%	A	A			A	A	230°F		A		B	A	250° F	A	A	A	
Methyl Amine		A	A			C	C		B		C	B	70° F	B	B		
Methyl Bromide	A	A	A	A		C	230°F	C	C		A	C	250° F	B	B		
Methyl Cellosolve	C	A	A			C	A		B		C	A	250° F	C	A		
Methyl Chloride	A	A	A	A		C	230°F	C	C		C	C	250° F	C	C		
Methyl Dichloride						A	C		C			C		C			
Methyl Ethyl Ketone (MEK)	A	A	A		A	C	C	C	B	C	C	A	250° F	C	C		
Methyl Isobutyl Ketone	C	B	C			C	C		A	C	C	B	250° F	C	C	C	
Methyl Isopropyl Ketone	C	A				C				C	C	C	212° F	C		C	
Methylene Chloride	B	A	A			C	75°F	C	C		B	B	250° F	C			
Mineral Oil		A		A	A	B	230°F		A	A	A	C	250° F	A	A	A	
Monochloracetic Acid-See Chloroacetic Acid																	
Monomethylamine - See Methylamine																	
Morpholine	A	A	A	A		A	75°F				C		250° F				
Naptha		A	A	A		A	230°F	C	B	A	A	C	212° F	B	C	A	
Napthalene	A	A	A	A	A	C	200°F	A	A		A	C	250° F	C	C	C	
Nickel Chloride	C	A	A	A	A	A	230°F	A	A	A	A	A	250° F	A	A	A	
Nickel Nitrate		A			A	A	230°F	A	A		A	A	250° F				
Nickel Sulfate	C	A	A	A	A	A	230°F	A	A	A	A	A	250° F	A	A	A	
Nicotinic Acid	C	A	A			A	230°F	A	A		A		250° F			C	
Nitric Acid 10%	C	A	B	B	A	A	175°F	B	B	C	A	C	250° F	C	A	B	
Nitric Acid 70% to 100° F	C	B	B	B	A	A	125°F	B	C	C	A	C	250° F	C	B		
Nitric Acid Concentrated	C	A	C	B	A	B	A	C	C	C	A	C	70° F	C	B	C	
Nitrobenzene	A	A	A	A		C	75°F	C	B		C	C	250° F	C	A		
Octyl Alcohol		A													A		
Oleic Acid		A	A	A	A	A	230°F	C	B		C	C	250° F	B	A		
Oxalic Acid	C	B	A	A	A	A	125°F	A	B	A	A	A	250° F	B	A	A	
Palm Oil	C	A		A		A	200°F	B			A	A	A	A			
Palmitic Acid	C	A		A		A	230°F	B	A		A	B	250° F	A	A		

RATINGS: A - Excellent B - Use with caution C - Do not use Blank - Insufficient Data Temperature - Good up to listed temperature	Cast Iron	316 Stainless	Alloy 20	Hastelloy® C	Ceramic	PVC	PVDF	Polyethylene	Polypropylene	Acrylic	Viton® (FKM)	EPDM	PTFE	Buna N	Aflas®	Vinyl	Note Reference
Paraffin	B	A	A	A	A	A	230°F	A	A		A		250° F	A			1
Paraffin Inhibitor (see specific chemical)																	
Peanut Oil	A	A	A	A		B	230°F		C		A	C	250° F	A			
Pentane		B	C	A		A	A		C		A	C	A	A			
Peppermint Oil		A	A				A				A		A	C			
Peracetic Acid (PAA)							A	B	A			A	A				12
Perchloric Acid	C	C	C	B		C	125°F	C	C	C	A	C	250° F		A		
Perchloroethylene (dry)		A	A			C	230°F	C	C	C	A	C	250° F	C	C	C	
Phenol (Carbolic Acid)	C	A	A	A	A	A	125°F	C	A	C	A	C	250° F	C	A	C	
Phosphoric Acid	C	A	A	A	A	A	220°F	A	A	A	A	C	250° F	C	A		7
Phosphorus Trichloride		A	A	A		C	200°F		C		A	A	250° F	C	A		
Phthalic Acid		A		B		C	200°F		A	A	A	A	250° F	C	B	A	
Phthalic Anhydride		A	B	A		C	A		C		A	A	250° F	C	C		
Picric Acid	C	A	A	A		C	75°F	B	B	A	A		250° F	B	A	A	
Potassium Bicarbonate		A		B	A	A	200°F	A	A		A	A	250° F	A			
Potassium Bromate						A	230°F	A	A				250° F				
Potassium Bromide	C	A	A	A	C	A	230°F	A	A	A	A		250° F	A	A	A	
Potassium Carbonate	B	A	A	A	C	A	230°F	A	A	A	A	A	250° F	A		A	
Potassium Chlorate		A			B	A	200°F	A	A	A		A	250° F	A	A	A	
Potassium Chloride	C	A	A	A		A	230°F	A	A	A	A	A	250° F	A	A	A	
Potassium Chromate	B	A	A	A	B	A	230°F	A	A		A	A	250° F	A			
Potassium Cyanide	A	A	A	A	C	A	230°F	A	A		A	A	250° F	A			
Potassium Dichromate	A	A	A	A	B	A	A	A	A		A	A	A	A	A	A	
Potassium Di-Phosphate	A	A	A	A		A				A	A		250° F				
Potassium Ferrocyanide	C	B			B	A	A	A	A	A	A	A	A	C	A	A	
Potassium Fluoride		A	A			B	230°F	A	A				250° F				
Potassium Hydroxide	B	A	A	A	C	A	C	A	A	A	C	A	250° F	B	A	B	
Potassium Hypochlorite	A	B		B		B	A					A	A	A			
Potassium Mono Phosphate	C	A	A	A		A				A	A		250° F				
Potassium Nitrate		A	A	A	B	A	230°F	A	A	A	A	A	250° F	A	A	A	
Potassium Permanganate	A	A	A	A	A	A	230°F	A	B	A	A	A	250° F	A	A		1
Potassium Sulfate	A	A	A	A	A	A	230°F	A	A	A	A	A	250° F	A	A	A	
Potassium Sulfide		A	A		A	A	230°F	A	A		A		250° F				
Potassium Sulfite		A	A			A		A	A		A	A					
Potassium Tetra Borate						A		A	A								
Propane (Liquified)		A	A			A	230°F					C	250° F	A	A		5
Propyl Alcohol	B	A	A		A	B	150°F	A	A		A	A	250° F	A			
Propylene Glycol	A	A	A		A	C	150°F	A	A		A	A	250° F	A	A		
Pyridine	A	A	A	B	A	C	C		A	C	C	B	250° F	C	C		
Pyrogallic Acid	C	B	B	B		A	A		A		A	B	250° F				
Resins and Rosins		A		A							A			A			
Rust Inhibitors (see specific chemical)																	
Scale Inhibitors (see specific chemical)																	
Silver Bromide	C	C	A	A													
Silver Nitrate	C	A	A			A	230°F	A	A	A	A	A	250° F	C	A	A	
Soap Solutions	A	A	A	A	A	A		A	A	A	A	A	250° F	A	A	A	
Soda Ash (See Sodium Carbonate)							230°F			A			250° F	A	A		8
Sodium Acetate	A	A	A	A	A	A	230°F	A	A	A	C	A	250° F	B	C		
Sodium Aluminate	B	A	A	A		B					A	A	212° F	A			1
Sodium Aluminum Sulfate (Soda Alum)		A	A			B	A				A	A	A				
Sodium Bicarbonate	C	A	A	C	A	A	230°F	A	A	A	A	A	250° F	A	A	A	
Sodium Bisulfate (to 100° F)	C	C	B	A	A	A	230°F	A	A	A	A	A	250° F	A	A	A	
Sodium Bisulfite (to 100° F)	C	A	A	A	A	A	230°F	A	A	A	A	A	250° F	A	A	A	
Sodium Borate (Borax)		A			A	A	230°F	A	A	A	A	A	250° F	A	A	A	
Sodium Carbonate (Soda Ash)	A	A	A	A	A	A	230°F	A	A	A	A	A	250° F	A	A	A	
Sodium Chlorate		A		A	A	A	230°F	A	A	A	A	A	250° F	A		B	
Sodium Chloride	C	B	A	A	A	A		A	A	A	A	A	250° F	A	A	A	
Sodium Chlorite (to 20%)	C	C	C	A		C	230°F	C	B				250° F		A		
Sodium Chromate	A	A	A	A		A	200°F	A	A		A			A			
Sodium Cyanide	A	A	A	A	A	A	230°F	A	A	A	A	A	250° F	A	A		
Sodium Di or Tri Phosphate	A	A	A	A		A			A	A	A	A	250° F				
Sodium Fluoride	B	B	A	B	A	A	230°F	A	A	A	A		250° F		A	A	16
Sodium Hydrosulfite			C	A		C					A	B	A	C			
Sodium Hydroxide 20% (75° to 210° F)	B	A	A	A	A	A	C	C		A	C	A	250° F	A	A		

RATINGS: A - Excellent B - Use with caution C - Do not use Blank - Insufficient Data Temperature - Good up to listed temperature	Cast Iron	316 Stainless	Alloy 20	Hastelloy® C	Ceramic	PVC	PVDF	Polyethylene	Polypropylene	Acrylic	Viton® (FKM)	EPDM	PTFE	Buna N	Aflas®	Vinyl	Note Reference
Sodium Hydroxide 20% (to 75° F)	B	A	A	A	A	A	C	A	A	A	A	A	250° F	A	A		
Sodium Hydroxide 50% (75° F)	B	A	B	A	A	A	C	A	B	A	C	A	250° F	C	A		1
Sodium Hydroxide 50% (75° to 175° F)	B	A	B		A	A	C			A	C	A	250° F	C	A		1
Sodium Hydroxide 80%					A					A			250° F	C	A		1
Sodium Hypochlorite	C	C	C	A	A	A	200°F	A	B	A	A	B	250° F	C	A	A	10
Sodium Metaphosphate	C	A	A			A	A		A	A	A	A	250° F	A	A	A	
Sodium Mono Phosphate	C	A	A	A		A				A	A	A	250° F		A	A	
Sodium Nitrate	B	A	A	A	A	A	230°F	A	A	A	A	A	250° F	C	C	A	
Sodium Perborate	A	A	A	A		B					A	A	250° F	B			
Sodium Permanganate		A				A		C	C		C	A	A	C			
Sodium Peroxide	A	A	A	A		B	200°F				A	A	250° F	C	B	A	
Sodium Polyphosphate	C	A	A	A		A				A	A		212° F				
Sodium Silicate	B	A	A	A	A	B			A	A	A	A	250° F	A	A	A	9
Sodium Sulfate	A	A	A	A	A	A		A	A	A	A	A	250° F	A	A	A	
Sodium Sulfide	C	A	A	A	A	B		A	A		A	A	250° F	A	A	A	
Sodium Sulfite	A	A	A	A		A		A	A		A	A	250° F		A	A	
Sodium Tetraborate		A				A					A	A	A	A			
Sodium Thiosulphate (Hypo)	C	B	A	A		B	230°F				A	A	250° F	B	A	A	
Stannic Chloride	C	C	C	B	A	A	230°F		A		A	A	250° F	A			
Starch	B	A	A	A	A	A	200°F	A	A		A	A	250° F	A			
Stearic Acid		A	A	A		A	230°F	A	A		A	A	250° F	C	A	A	
Styrene	A	A	A	C		C	175°F				B	C	250° F	C	C		
Sugar (Liquids)	A	A	A	A		A	230°F					A	212° F	A			15
Sulfate Liquors	C	B	C	B		B	A		A		A	A	250° F	A			15
Sulfur Chloride	C	A	A	A			75°F				A	C	250° F	C	A		
Sulfur Dioxide	A	A	A	A		A	175°F	B	B		C	A	250° F	C			
Sulfur Trioxide (dry)	B	C	A			A	C		C		A	C	250° F	C	A		
Sulfur, Molten	A	A	A	A			230°F				A	C	250° F	B	A		18
Sulfuric Acid (40% to 95%)	C	C	A	A	A	A	200°F	C	B	C	A	C	250° F	C	A	C	2
Sulfuric Acid (95% to 100%)	A	C	A	A	A	A	125°F	C	C	C	A	C	250° F	C	A	C	2
Sulfuric Acid (up to 40%)	C	C	A	A	A	A	230°F	B	A	C	A	B	250° F	C	A	B	2
Sulfurous Acid	C	B	A	A		A		A	A		A	B	250° F	C	A		
Tannic Acid	A	A	A	A	A	A	230°F	A	A		A	A	250° F	A	B		
Tanning Liquors		A	A	B		A			A		A	B	250° F	C	A		
Tartaric Acid	B	A	A	A	A	A	230°F	A	A		A	B	250° F	A	B		
Tetrachlorethane	A	A		A		C	230°F		C		A	C	250° F	C	C		
Tetrahydrofuran		A	C	A	A	C	C		C		C	C	250° F	C	C		
Titanium Dioxide	A	A	A	A		B						A					11
Toluene	A	A	A	A	A	C	175°F	C	C	C	A	C	250° F	C	C	C	
Toluol (see toluene)	A	A	A	A	A	C	175°F	C	C	C	A	C	250° F	C	C		
Trichlorethane	B	B	A	A		C	150°F		C		A	C	A	C			
Trichlorethylene	A	A	A	A	A	C	230°F	C	C	C	A	C	250° F	C	C	C	
Trichloropropane	A	A	A	A							A		A	A			
Tricresylphosphate	B	B	A	A	C	C	C		A		A	A	A	C			
Triethylamine	A	A	A		B	B	100°F		C		C	A	250° F	B	A		
Trisodium Phosphate (TSP)		B	C	A		A	A		A		A	A	A	A			
Turpentine	A	A			A	A	230°F	C	C	C	A	C	250° F	A	A	C	
Urea Formaldehyde	A	A	A	A	B			A	A				250° F				
Varnish	B	A	A	A			230°F				A	C	250° F				
Vinegar		A	A		A	A	230°F	A	A	A		A	250° F		A	A	
Vinyl Acetate		A			B	C	230°F				C	C	250° F		C		
Water, Deionized	C	A	A	A	B	A	230°F		A	A	A	A	250° F			A	20
Water, Distilled	C	A	C			A	A		A		A	A	A			A	
Water, Fresh					A		230°F			A			250° F		A	A	
Water, Salt	C	A	A	A	B	A	230°F		A	A	A	A	250° F	B	A	A	
Water, Sea	C	B	A	C		A		A	A	A	A	A	250° F	B	A	A	
Whiskey and Wines		A	A		A	A	230°F	A	A	A	A	A	250° F		A	A	
White Liquor (Pulp Mill)	C	A	C	A		A	A		A		A		250° F	A			
White Water (Paper Mill)	A	A	A			A			A		A		250° F				
Xylene		A	A		A	C	200°F	C	C	C	A	C	250° F		C	C	
Xylol (see Xylene)		A	A		A	C	200°F	C	C	C	A	C	250° F				
Zinc Chloride	C	C	A	A	C	A	230°F	A	A	A		A	250° F		A	A	
Zinc Hydrosulphite	C	B	A	A		A					A						
Zinc Sulfate	C	A	A	A	C	A	230°F	A	A	A	A	A	250° F		A	A	