

# TECHNICAL INFORMATION

## RECOMMENDED MATERIALS OF CONSTRUCTION FOR Jamesbury POLYMERIC-SEATED BALL AND BUTTERFLY VALVES

This listing of materials of construction is offered to assist specifying engineers in selecting valve materials to suit their particular applications. Wherever possible, listings are based on actual experience with Jamesbury polymeric-seated ball and butterfly valves, and may not be applicable to other valve designs using metallic seating, other design concepts, or different alloy grades. Otherwise, the listings reflect a selection of what is considered, in our opinion, to be reliable and current from among the generally available corrosion information.

The information presented is intended as a general guide for materials selection, based on temperature and fluid concentration only. Many other variables must be considered in making a final selection.

Other factors that influence corrosion rates include: Degree and frequency of temperature fluctuations, concentrations, aeration of fluids, high velocities or abrasives in the fluid stream, flashing or cavitating conditions, etc. Therefore the data presented should be interpreted as one of the bases for material selection and not as a complete recommendation. METSO AUTOMATION, ITS DISTRIBUTORS AND AGENTS, AND THE AUTHORS OF, AND CONTRIBUTORS TO, THIS PUBLICATION SPECIFICALLY DENY ANY WARRANTY, EXPRESSED, OR IMPLIED, FOR THE ACCURACY, CURRENCY, AND/OR RELIABILITY OF THE INFORMATION CONTAINED HEREIN AND/OR FOR THE FITNESS FOR ANY PARTICULAR USE AND/OR FOR THE PERFORMANCE OF ANY MATERIAL AND/OR EQUIPMENT CONTAINED HEREIN. SELECTION OF MATERIALS AND/OR EQUIPMENT IS AT THE SOLE RISK OF THE USER OF THIS PUBLICATION.

Although "B" ratings may often be satisfactory with only minor effect for valve bodies, ball and stem or disc and shaft materials should usually carry an "A" rating.

In throttling services, some additional judgement must be used in determining whether valve materials rated "B" will be suitable. The combined effects of corrosion and erosion must be considered. Where velocities are high or the fluid contains a considerable percentage of suspended solids, the oxidation products of corrosion are removed rapidly, continuously presenting a clean metal face to accelerate corrosion. Thus, where a carbon-steel body with stainless-steel trim may be perfectly acceptable at 10-psi (.7 bar) pressure drop, it may be unsatisfactory at 50-psi (3.4 bar) drop.

User preferences, trade practices, cost and experience should be of primary consideration in the final choice.

Scientific notation is used to clarify the conditions of temperature and concentration on which ratings are based. These are as follows:

- < Less than
- ≤ Less than or equal
- > Greater than
- ≥ Greater than or equal

For example, the chart for 316 stainless steel in aluminum sulfate service is listed as A:  $\leq 50\%$ ;  $\leq 200^{\circ}\text{F}$  (93.3°C). This means that at concentrations less than or equal to 50%, at temperatures less than or equal to 200°F (93.3°C), 316 stainless steel is given an "A" or "Excellent" rating.

Verify seat and seal compatibility for each specific application by referencing Bulletin T101-3.

In addition to materials compatibility, care should be taken to select materials and designs that are sufficiently rated for actual temperatures and pressures. Consult the catalog for pressure/temperature ratings of all applicable body and seat/seal materials.

Materials not listed in this guide are recommended for certain applications where specific experience dictates. Please contact Metso Automation's home office with specific application conditions for consideration of materials such as low-temperature steel alloys, 317 stainless steel, etc.

Fluid	Aluminum Bronze	Aluminum A—356	Carbon Steel / Ductile Iron	316 Stainless Steel	17—4 PH Stainless Steel	Alloy 20	Monel®	Hastelloy C®
Acetaldehyde	D	A: All conc. ≤ 70°F A: ≥ 90%; ≤ 200°F	A: 100%; ≤ 120°F C: ≤ 10%; 70°F	A: ≥ 90%; ≤ 200°F		A: 90%; ≤ 200°F	A: 100%; ≤ 200°F	A: 100%; ≤ 120°F
Acetic Acid (aerated)	D	A: 100% ≤ 175°F B: ≤ 90%; ≤ 120°F C: 70-90%; ≤ 175°F	D	A: All conc. ≤ 70°F A: ≤ 50%; ≤ 200°F B: > 50%; ≤ 175°F		A: All conc. ≤ 70°F A: ≤ 50%; ≤ 200°F B: > 50%; ≤ 200°F	A: All conc. ≤ 200°F	A: All conc. ≤ 200°F
Acetic Acid 20%				A: 75°F B: 150°F				
Acetic Acid 50%				A: 75°F B: 150°F				
Acetic Anhydride	D	A: 100% ≤ 120°F C: 100% ≤ 175°F	D	B: All conc. ≤ 200°F	B: ≤ 200°F	B: ≤ 200°F	B: 100%; ≤ 175°F C: 100%; ≤ 200°F	A: ≤ 200°F
Acetone	A: ≤ 200°F	B: ≤ 90%; ≤ 200°F A: 100%; ≤ 200°F	C: ≤ 10%; 70°F A: 100%; ≤ 400°F	B: ≤ 90%; ≤ 200°F A: 100%; ≤ 200°F	A: 75°F A: 150°F	B: ≤ 90%; ≤ 200°F A: 100%; ≤ 200°F	A: ≤ 200°F	A: ≤ 200°F
Acetylene	D: Explosive	A: Dry; ≤ 200°F	A: Dry; ≤ 400°F	A: Dry; ≤ 400°F		A: Dry; ≤ 400°F	A: Dry; ≤ 200°F	A: Dry; ≤ 200°F
Acrolein	B: 40%; ≤ 120°F B: 100%; ≤ 200°F	A: 40%; ≤ 70°F B: ≤ 10%; ≥ 120°F	B: 100%; ≤ 200°F B: ≤ 10%; ≤ 120°F	B: 100%; ≤ 200°F B: ≤ 10%; ≤ 120°F		B: 100%; ≤ 200°F B: ≤ 10%; ≤ 120°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F
Acrylonitrile	A: ≤ 200°F; 100%	A: 100%; ≤ 200°F D: 90%; ≤ 70°F	A: 100%; ≤ 200°F	A: 100%; ≤ 200°		A: 100%; ≥ 70°F B: 100%; ≥ 200°F	A: 100%; ≤ 200°F	A: 100%; ≤ 200°F
Adipic Acid	—	B: 100%; ≤ 200°F	A: 100%; ≤ 200°F	B: ≥ 90%; ≤ 200°F		B: ≥ 90%; ≤ 200°F	B: 100%; ≤ 200°F	A: ≥ 90%; ≤ 200°F
Air	A	A	A	A	A: 75°F A: 150°F	A	A	A
<b>Alcohols:</b>								
Allyl	B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F D: 90%; 300°F	A: All conc.; ≤ 200°F 100%; ≤ 400°F	A: All conc.; ≤ 200°F A: 100%; ≤ 300°F		A: All conc.; ≤ 200°F A: 100%; ≤ 300°F	B: All conc.; ≤ 200°F B: 100%; ≤ 300°F	B: All conc.; ≤ 200°F
Amyl	B: 100%; ≤ 200°F	A: 100%; ≤ 70°F D: 100%; ≤ 200°F	A: 100%; ≤ 200°F	A: ≤ 10%; ≤ 200°F B: 100%; ≤ 200°F	A: 75°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F
Butyl	A: 100%; ≤ 200°F	D: 100%; ≤ 200°F A: ≤ 90%; ≤ 200°F	A: 100%; ≤ 200°F	A: 100%; ≤ 200°F		A: 100%; ≤ 200°F	A: 100%; ≤ 200°F	—
Ethyl	A: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F 100%; 175 and D: ≥ 300°F	B: ≤ 90%; ≤ 70°F A: 100%; ≤ 70°F	A: All conc.; ≤ 200°F	A: 75°F	A: All conc.; ≤ 200°F	A: All conc.; ≤ 200°F	A: All conc.; ≤ 200°F
Isopropyl	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	A: 100%; ≤ 200°F	B: 100%; ≤ 200°F	A: 75°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F
Methyl	A: All conc.; ≤ 200°F	A: ≤ 90%; ≤ 200°F D: 100%; ≤ 200°F	B: All conc.; ≤ 200°F	A: All conc.; ≤ 200°F	A: 75°F	A: All conc.; ≤ 200°F	A: All conc.; ≤ 200°F	A: All conc.; ≤ 200°F
Propyl	A: 100%; ≤ 200°F	A: 100%; ≤ 200°F D: 100%; ≤ 200°F	A: 100%; ≤ 200°F	A: 100%; ≤ 200°F		A: 100%; ≤ 200°F	A: 100%; ≤ 200°F	A: 100%; ≤ 200°F
Aluminum Chloride	D	D	D	C: ≤ 20%; 70°F	D: 75°F D: 150°F	B: All conc.; ≤ 120°F	B: ≥ 30%; ≤ 70°F	—
Aluminum Fluoride					D: 75°F D: 150°F			

**Legend:** A = No Effect — Excellent B = Minor Effect C = Moderate Effect D = Severe Effect  
**Key to Concentration and Temperature Symbols:** < Less than ≤ Less than or equal to > Greater than ≥ Greater than or equal to  
**Notes:** \* Filled PTFE not for use with caustics. \*\* May ignite.

For conditions not indicated, consult  
 JAMESBURY's Home Office.

Fluid	Aluminum Bronze	Aluminum A—356	Carbon Steel / Ductile Iron	316 Stainless Steel	17—4 PH Stainless Steel	Alloy 20	Monel®	Hastelloy C®
Aluminum Sulfate	B: ≤ 30%; ≤ 70°F D: ≤ 60%; ≤ 200°F	A: ≤ 30%; ≤ 70°F D: All conc.; ≤ 200°F	D	A: ≤ 50%; ≤ 200°F	C: 175°F	A: ≤ 50%; ≤ 200°F B: 60%; ≤ 200°F	B: ≤ 30%; ≤ 70°F D: > 30%; > 70°F	A: ≤ 50%; ≤ 200°F B: 70%; ≤ 200°F
Alums	D	B: ≤ 70°F	D	B: ≤ 70°F		B: ≤ 70°F	B: ≤ 70°F	B: ≤ 70°F
Ammonia	D	A	A	A		B	A	A
Ammonia-anhydrous					A: 75°F A: 150°F			
Ammonium Carbonate	D	B: ≤ 70%; ≤ 200°	B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F		B: All conc.; ≤ 200°F	B: ≤ 10%; ≤ 200°F	B: All conc.; ≤ 200°F
Ammonium Chloride	D	B: ≤ 20%; ≤ 70°F D	C: ≤ 10%; ≤ 70°F D	A: ≤ 10%; ≤ 200°F B: 20—30%; ≤ 200°F	D: 175°F D: 1150°F	B: ≤ 40%; ≤ 200°F	B: ≤ 40%; ≤ 200°F	A: ≤ 40%; ≤ 200°F D: 50%; ≥ 175°F
Ammonium Hydroxide	D	A: ≤ 30%; ≤ 70°F B: ≤ 30%; ≤ 120°F	A: ≤ 30%; ≤ 70°F B: ≤ 30%; ≥ 120°F	A: ≥ 50%; ≤ 70°F B: ≤ 30%; ≥ 120°F		A: ≤ 50%; 70°F B: ≤ 30%; ≤ 120°F	D	A: All conc.; ≤ 70°F B: All conc.; ≥ 120°F
Ammonium Hydroxide 10%					A: 75°F A: 150°F			
Ammonium Hydroxide 18%					A: 75°F B: 150°F			
Ammonium Nitrate	D: Explosive	B: All conc.; ≤ 200°F	A: ≤ 50%; ≤ 175°F	A: All conc.; ≤ 200°F	A: 75°F	A: All conc.; ≤ 200°F	D: Explosive	B: ≤ 40%; ≤ 200°F
Ammonium Diphosphate	C: ≤ 10%; ≤ 70°F	D	B: ≤ 50%; ≤ 70°F	B: ≤ 10%; ≤ 200°F		B: ≤ 10%; ≤ 200°F		—
Ammonium Phosphate, Monobasic	C: ≤ 10%; ≤ 70°F	D	D	B: ≤ 40%; ≤ 200°F		B: ≤ 40%; ≤ 200°F	B: ≤ 40%; ≤ 200°F	B: ≤ 10%; ≤ 200°F
Ammonium Sulphate	D	D	D	B: ≤ 50%; ≤ 200°F	A: 75°F	B: ≤ 50%; ≤ 200°F	B: ≤ 50%; ≤ 200°F	B: ≤ 50%; ≤ 200°F
Ammonium Thiocyanate	D	B: All conc.; ≤ 200°F	D	A: ≤ 50%; ≤ 200°F		B: ≤ 50%; ≤ 200°F	B: ≤ 50%; ≤ 200°F	A: ≤ 50%; ≤ 200°F
Amyl Acetate	A: ≤ 10%; ≤ 200°F A: 100%; ≤ 70°F	A: 100%; ≤ 70°F D	B: 100%; ≥ 120°F A: 10%; ≤ 70°F	A: ≤ 10%; ≤ 200°F A: 100%; ≤ 300°F	A: 75°F	A: 100%; ≤ 300°F A: ≤ 10%; ≤ 200°F	A: 100%; ≤ 300°F A: ≤ 10%; ≤ 200°F	A: 100%; ≤ 200°F A: ≤ 10%; ≤ 200°F
Amyl Chloride	B: 100%; ≤ 70°F	B: ≤ 100%; ≤ 200°F D: Wet	A: 100%; ≤ 70°F D: 100%; ≤ 70°F	A: 100%; ≤ 175°F		A: 100%; ≤ 175°F	B: ≤ 10%; ≤ 70°F B: ≥ 90%; ≤ 200°F	B: ≥ 90%; ≤ 200°F
Aniline	D	B: 100%; ≤ 200°F	A: 100%; ≤ 70°F	A: 100%; ≤ 500°F	A: 75°F	A: 100%; ≤ 500°F	B: 100%; ≤ 300°F	B: 100%; ≤ 70°F
Aniline Dyes	C	C	B	A		A	—	—
Arsenic Acid Solutions	—	D	D	B: ≤ 30%; ≤ 200°F		B: ≤ 50%; ≤ 200°F	D	B: ≤ 100%; ≤ 200°F
Asphalt	A	A	A	A		A	A	A
ASTM #1 Oil					A: 75°F A: 150°F			
ASTM #3 Oil					A: 75°F A: 150°F			
ASTM Fuel A					A: 75°F A: 150°F			
ASTM Fuel B					A: 75°F A: 150°F			
ASTM Fuel C					A: 75°F A: 150°F			

Fluid	Aluminum Bronze	Aluminum A—356	Carbon Steel / Ductile Iron	316 Stainless Steel	17—4 PH Stainless Steel	Alloy 20	Monel®	Hastelloy C®
Barium Cyanide	D	D	B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F		B: All conc.; 200°F	D	—
Barium Hydroxide	D: ≤ 10% ≤ 70°F	D	B: ≤ 50%; ≤ 200°F	A: ≤ 50%; ≤ 200°F		A: ≤ 50%; ≤ 200°F	B: ≤ 50%; ≤ 200°F	B: ≤ 50%; ≤ 200°F
Barium Sulfide	D: ≤ 10% ≤ 70°F	D	A: ≤ 10% ≤ 70°F	B: ≤ 10% ≤ 70°F		B: ≤ 10% ≤ 70°F	D	—
Beer	A	A	C	A		A	A	—
Beet Sugar Liquors	C	A	B	A		A	—	—
Benzaldehyde	B: 100%; ≤ 200°F D: 100%; ≤ 70°F	A: All conc.; 120°F D	A: 100%; ≤ 200°F D	B: 100%; ≤ 200°F	A: 75°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F
Benzene	B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F	A: 75°F A: 150°F	A: ≤ 50%; ≤ 200°F	A: ≤ 75%; ≤ 200°F	B: All conc.; ≤ 200°F
Benzoic Acid	B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F	D	B: All conc.; ≤ 200°F		B: All conc.; ≤ 200°F	B: ≤ 50%; ≤ 200°F	A: ≤ 70%; ≤ 200°F
Benzyl Acetate	—	A: 100% ≤ 70°F	A: 100%; ≤ 70°F	B: 90%; ≤ 200°F		B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F
Black Sulfate Liquor	C	D	B	A		A	—	—
Bleaching Water	D	D	D	B		B	D	A
Borax (Sodium Tetraborate)	A: ≤ 30%; ≤ 200°F	B: ≤ 30%; ≤ 70°F	B: ≤ 30%; ≤ 200°F	A: ≤ 30%; ≤ 200°F		A: ≤ 30%; ≤ 200°F	A: ≤ 30%; ≤ 200°F	A: ≤ 30%; ≤ 200°F
Boric Acid	B: ≤ 70%; ≤ 300°F B: All conc.; ≤ 70°F	B: ≤ 30%; ≤ 125°F D: ≤ 30%; 200°F	C: ≤ 10%; ≤ 500°F D: 20%; 200°F	A: ≤ 10%; ≤ 200°F B: 20–50%; ≤ 200°F		B: ≤ 10%; ≤ 200°F B: 20–50%; ≤ 200°F	B: ≤ 40%; ≤ 300°F D: 60–80%; ≤ 300°F	A: All conc.; ≤ 400°F
Brine	A	D	D	B		B	A	A
Brines (aerated)					C: 175°F C: 150°F			
Bromine (wet)	D	D	D	D		D	D	A: ≤ 175°F
Butadiene	A: 100%; ≤ 200°F	A: 100%; ≤ 200°F	A: 100%; ≤ 200°F	A: 100%; ≤ 200°F		A: 100%; ≤ 200°F	A: 100%; ≤ 200°F	B: 100%; ≤ 200°F
Butane	A: ≤ 200°F	A: ≤ 200°F	A: ≤ 200°F	A: ≤ 200°F	A: 75°F A: 150°F	A: ≤ 200°F	A: ≤ 200°F	A: ≤ 200°F
Butylene	A	A	A	A		A	—	—
Butyl Acetate	B: ≤ 200°F	A: 100%; 120°F	A: 100%; ≤ 70°F	B: 100%; ≤ 70°F	A: 75°F	B: ≤ 30%; ≤ 175°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F
Butyraldehyde					A: 75°F			
Butyric Acid	D	B: All conc.; ≤ 70°F D	C: ≤ 10%; ≤ 70°F D: ≤ 10%; ≤ 70°F	B: All conc.; ≤ 200°F		B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F	A: All conc.; ≤ 200°F
Calcium Bicarbonate	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B:	B: 100%; ≤ 200°F		B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F
Calcium Bisulfite	D	B: 100%; ≤ 70°F	D	B: 100% sol.; ≤ 300°F		B: 100% sol.; ≤ 300°F	D	B: 100% sol.; ≤ 70°F
Calcium Carbonate	B: ≤ 10%; ≤ 70°F	D	B: ≤ 10%; ≤ 200°F	B: 100%; ≤ 70°F		B: 100%; ≤ 70°F	B: ≤ 10%; ≤ 200°F	B: 100%; ≤ 200°F
Calcium Chloride	B: ≤ 70%; ≤ 200°F	A: ≤ 60%; ≤ 175°F C: 30-70%; 300°F	B: 20-70%; ≤ 200°F A: ≤ 10%; ≤ 200°F	A: ≤ 30%; ≤ 175°F B: 30%; ≤ 175°F	B: 150°F	A: ≤ 30%; ≤ 200°F B: 30%; ≤ 175°F	A: ≤ 40%; ≤ 200°F	A: All conc.; ≤ 200°F
Calcium Hydroxide	B: ≤ 10%; ≤ 120°F	D	B: ≤ 10%; ≤ 200°F	B: ≤ 50%; ≤ 200°F		B: ≤ 10%; ≤ 200°F	B: ≤ 10%; ≤ 70°F	A: ≤ 50%; ≤ 200°F

**Legend:** A = No Effect — Excellent B = Minor Effect C = Moderate Effect D = Severe Effect  
**Key to Concentration and Temperature Symbols:** < Less than ≤ Less than or equal to > Greater than ≥ Greater than or equal to  
**Notes:** \* Filled PTFE not for use with caustics. \*\* May ignite.

For conditions not indicated, consult JAMESBURY's Home Office.

Fluid	Aluminum Bronze	Aluminum A—356	Carbon Steel / Ductile Iron	316 Stainless Steel	17—4 PH Stainless Steel	Alloy 20	Monel®	Hastelloy C®
Calcium Hydroxide 20%					A: 75°F B: 150°F			
Calcium Hypochlorite	B: ≤ 10%; ≤ 70°F	D	C: ≤ 10%; ≤ 70°F D:	A: ≤ 10%; ≤ 200°F B: 20%; ≤ 70°F	C: 175°F	B: ≤ 20%; ≤ 75°F	D	A: ≤ 30%; ≤ 120°F D: 30%; ≤ 200°F
Calcium Sulfate	B: ≤ 10%; ≤ 200°F	B: ≤ 10%; ≤ 200°F	B: ≤ 10%; ≤ 200°F	B: ≤ 10%; ≤ 200°F		B: ≤ 10%; ≤ 200°F	B: ≤ 10%; ≤ 200°F	B: ≤ 10%; ≤ 200°F
Calgon	—	—	D	A		A	—	A
Cane Sugar Liquors	A	A	A	A		A	—	—
Caprolactan	—	B: 100%; ≤ 200°F	C: 100%; ≤ 70°F	B: All conc.; ≤ 200°F		B: All conc.; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F
Carbon Dioxide (dry)					A: 75°F A: 150°F			
Carbon Disulfide	B: 100%; ≤ 70°F	A: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F		B: 100%; ≤ 200°F	B: 100%; ≤ 70°F	—
Carbon Monoxide	A: ≤ 70°F	A	A	A		A	A	A
Carbon Tetrachloride	C: 100%; ≤ 70°F D	D: Explosive	D: With water traces A: Dry; ≤ 70°F	A: 50%; ≤ 200°F D: 100%; ≤ 300°F		—	A: ≥ 50%; ≤ 200°F D: ≤ 10%; ≤ 70°F	A: ≤ 10%; 70°F B: 100%; ≥ 120°F
Carbon Tetrachloride (dry)					A: 75°F A: 150°F			
Carbon Tetrachloride (wet)					B: 75°F B: 150°F			
Castor Oil	A	A	B	A	A: 75°F B: 150°F	A	A	A
Cellulose Acetate	B: 100%; ≤ 70°F	A: 100%; ≤ 70°F	B: 100%; ≤ 70°F	B: 100%; ≤ 70°F		B: 100%; ≤ 70°F	B: 100%; ≤ 70°F	B: 100%; ≤ 70°F
China Wood (Tung) Oil	C	A	C	A		A	A	A
Chlorine (120°F)	D	D	B: ≤ 50 ppm water D: > 50 ppm water	B: ≤ 50 ppm water D: > 50 ppm water		B: ≤ 50 ppm water D: > 50 ppm water	A: ≤ 50 ppm water B: 50-150 ppm water D: ≥ 150 ppm water	A: ≤ 150 ppm water B: ≥ 150 ppm water
Chlorine (dry)					C: 75°F C: 150°F			
Chlorine (wet)					D: 75°F D: 150°F			
Chlorobenzene	B: 10 & 100%; ≤ 200°F	B: 100%; ≤ 70°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 75°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F
Chloroform	B: 100%; ≤ 200°F D: 90%; ≤ 175°F	B: 100%; ≤ 175°F D: 100%; > 200°F	B: 100%; ≤ 200°F D: 80%; ≤ 70°F	A: ≥ 80%; 70°F C: ≥ 175°F B: 100%; ≥ 120°F		A: 90%; 70°F C: ≥ 200°F B: 100%; ≥ 120°F	A: ≥ 90%; ≤ 200°F	B: ≥ 90%; ≤ 200°F
Chloroform (dry)					A: 75°F A: 150°F			
Chlorotoluene					B: 75°F			
Chlorosulfonic Acid	D D	B: 100%; ≤ 175°F D: 90%; ≤ 70°F	B: 100%; ≤ 200°F D: ≤ 10%; ≤ 70°F D: 90%; ≤ 70°F	B: 100%; ≤ 120°F B: > 90%; ≤ 70°F D: ≤ 10%; ≤ 70°F		B: 100%; ≤ 120°F B: > 90%; ≤ 70°F D: ≤ 10%; ≤ 70°F	B: 100%; ≤ 70°F D: ≤ 10%; ≤ 70°F	A: 100%; ≤ 200°F A: ≤ 50%; 70°F B: ≤ 10%; 200°F

Fluid	Aluminum Bronze	Aluminum A—356	Carbon Steel / Ductile Iron	316 Stainless Steel	17—4 PH Stainless Steel	Alloy 20	Monel®	Hastelloy C®
Chromic Acid	D	B: ≤ 10%; ≤ 70°F D: All others	A: 100%; ≤ 70°F B: 30%; ≤ 70°F D: ≤ 20%; ≤ 70°F	B: ≤ 50%; ≤ 70°F D: All others		B: ≤ 50%; ≤ 120°F D: ≥ 10%; ≥ 120°F D: 20—50%; 70°F	B: ≤ 10%; ≤ 120°F D: ≤ 10%; ≥ 120°F D: 20—50%; 70°F	B: ≤ 50%; ≤ 70°F B: All Conc.; 70°F
Chrome Alum	—	D	D	B: ≤ 10%; ≤ 70°F		B: ≤ 10%; 70°F	B: ≤ 10%; ≤ 200°F	—
Citric Acid	D	D	D	A: ≤ 50%; ≤ 200°F	A: 75°F	A: ≤ 50%; ≤ 200°F	A: ≤ 50%; ≤ 200°F	A: All conc.; ≤ 200°F
Coffee Extracts	—	—	—	A		A	—	—
Coke Oven Gas	C	A	A	A		A	—	—
Copper Acetate	D	D	B: ≤ 100%; ≤ 200°F	B: ≤ 100%; ≤ 200°F		B: ≤ 100%; ≥ 200°F	B: ≤ 100%; ≥ 200°F	B: ≤ 100%; ≥ 300°F
Copper Chloride	D	D	—	—		—	—	B: ≤ 40%; ≤ 70°F
Copper Sulfate	D	D	D	A: ≤ 10%; ≤ 200°F B: > 10%; ≤ 200°F	A: 75°F	A: ≤ 30%; ≤ 200°F B: > 30%; ≤ 200°F	B: ≤ 40%; ≤ 70°F D: ≤ 50%; ≥ 200°F	A: All conc.; ≤ 200°F
Creosote	B: 100%; ≤ 70°F	B: 100%; ≤ 70°F	B: 100%; ≤ 200°F	B: ≥ 90%; ≤ 200°F		B: ≥ 90%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 70°F
Cumene	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F		B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F
Cyclohexane	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F		B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F
Cyclohexanone	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F		B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F
Diacetone Alcohol	A: 100%; ≤ 200°F	A: 100%; ≤ 70°F	A: 100%; ≤ 200°F	A: 100%; ≤ 200°F		A: 100%; ≤ 200°F	A: 100%; ≤ 200°F	A: 100%; ≤ 200°F
Diethylamine	D	B: 100%; ≤ 70°F	A	B		B	B	—
DMT	—	—	—	A		A	—	—
Dowtherm (and related heat transfer media)	—	—	A	A		A	—	—
Ethanolamine, mono								
Ethanolamine, tri								
Ethyl Acetate	B: 100%; ≤ 70°F	A: 100%; ≤ 175°F C: 100%; ≥ 200°F	A: 100%; ≤ 70°F C: 100%; ≥ 200°F	B: 100%; ≤ 200°F	A: 75°F	B: 100%; ≤ 200°F B: ≤ 10%; ≤ 175°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F
Ethyl Acrylate	A: 100%; ≤ 200°F	A: 100%; ≤ 200°F	A: 100%; ≤ 200°F	A: 100%; ≤ 200°F		A: 100%; ≤ 200°F	A: 100%; ≤ 200°F	A: 100%; ≤ 200°F
Ethyl Benzene	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	A: 100%; ≤ 70°F	B: 100%; ≤ 200°F		B: 100%; ≥ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F
Ethyl Chloride	A: Dry; ≤ 200°F D: Wet; ≥ 200°F	B: Dry; ≤ 200°F	A: Dry D: All others	A: Dry D: All others		A: Dry D: All others	B: Dry; ≤ 200°F	B: Dry; ≤ 200°F B: All conc.; ≤ 70°F
Ethyl Ether	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	A: 100%; ≤ 70°F	A: 100%; ≤ 200°F		A: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F
Ethylene	A: 100%; ≤ 200°F	A: 100%; ≤ 200°F	A: 100%; ≤ 200°F	A: 100%; ≤ 200°F		A: 100%; ≤ 200°F	A: 100%; ≤ 200°F	A: 100%; ≤ 200°F
Ethylene Bromide	B: Dry; ≤ 200°F D: Wet; 70°F	B: Dry; ≤ 120°F D: Wet; ≤ 70°F	B: Dry; ≤ 200°F	A: Dry; ≤ 200°F		A: Dry; ≤ 200°F	B: Dry; ≤ 200°F	A: Dry; ≤ 200°F
Ethylene Chloride (dry)								
Ethylene Diamine								

**( See Introduction )**

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**Notes:** \* Filled PTFE not for use with caustics. \*\* May ignite.

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Fluid	Aluminum Bronze	Aluminum A—356	Carbon Steel / Ductile Iron	316 Stainless Steel	17—4 PH Stainless Steel	Alloy 20	Monel®	Hastelloy C®
Ethylene Dichloride	B: 100%; ≤ 200°F	B: Dry; ≤ 120°F D: Wet; ≤ 70°F	B: Dry; ≤ 200°F D: Wet; ≤ 70°F	A: 100%; 70°F		A: 100%; ≤ 70°F	A: ≥ 90%; ≤ 200°F	—
Ethylene Dichloride (dry)				A: 75°F				
Ethylene Glycol	B	A	B	B	A: 75°F	A	B	A
Ethylene Oxide	D	D	C	B: 100%; ≤ 300°F	B: 100%; ≤ 300°F	B: 100%; ≤ 70°F	B: 100%; ≤ 70°F	
Fatty Acids	C: ≤ 200°F	D	D	A	A	B: ≤ 200°F		A
Ferric Chloride	D: ≤ 30%; ≤ 70°F B: 100%; 200°F	D: ≤ 30%; ≤ 70°F	D: ≤ 50%; ≤ 70°F B: 100%; ≤ 200°F	D: ≤ 40%; ≤ 70°F	D: 75°F D: 150°F	D: ≥ 40%; ≥ 70°F	D: ≤ 40%; ≤ 70°F	B: ≤ 40%; ≤ 170°F D: ≤ 40%; ≤ 200°F
Ferric Nitrate	D	D	D	B: All conc.; ≤ 70°F B: ≤ 50%; ≤ 200°F	A: 75°F A: 150°F	A: All conc.; ≤ 200°F	D	B: 30-50%; ≤ 70°F A: ≤ 10%; ≤ 70°F
Ferric Sulfate					B: 175°F B: 1150°F			
Ferrous Chloride	D	D	D	D	D: 75°F D: 150°F	D	D	B
Ferrous Nitrate					A: 75°F A: 150°F			
Ferrous Sulfate	D	A: ≤ 10%; ≤ 70°F	D	B: ≤ 10%; ≤ 200°F B: All conc.; ≤ 70°F	B: 75°F B: 150°F	B: ≤ 50%; ≤ 200°F B: All conc.; ≤ 70°F	C: ≤ 10%; ≤ 200°F	B: All conc.; ≤ 200°F
Fluorine	B: Dry; ≤ 600°F D: Wet; ≤ 70°F	A: Dry; ≤ 600°F D: Wet; ≤ 70°F	A: Dry; ≤ 300°F D: Wet	A: Dry; ≤ 400°F		A: Dry; ≤ 400°F	A: Dry	A: Dry; ≤ 70°F
Fluorosilicic Acid (hydro)	B: ≤ 10%; ≤ 120°F	D	D	B: All conc.; ≤ 200°F		B: All conc.; ≤ 175°F	A: ≤ 30%; ≤ 120°F	B: All conc.; ≤ 70°F
Formaldehyde	A: ≤ 20%; ≤ 200°F B: > 20%; ≤ 200°F	B	A: 100%; ≤ 200°F D: All others	A: All conc.; ≥ 200°F	A: 75°F	—	A: ≤ 20%; ≤ 200°F B: > 20%; ≤ 200°F	B: All conc.; ≤ 200°F
Formic Acid	D	B: All conc.; ≤ 70°F	D	D		A: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F	A: All conc.; ≤ 200°F
Freon <sup>12</sup> (and other similar refrigerants)	A: Dry; ≤ 70°F D: Wet; ≤ 70°F	B: Dry; ≤ 70°F D: Wet; ≤ 70°F	A: Dry; ≤ 70°F D: Wet; ≤ 70°F	A: Dry; ≤ 70°F		A: Dry; ≤ 70°F	B: Dry; ≤ 70°F	—
Fruit Juices	—	—	—	A		A	—	—
Furfural	B: 100%; ≤ 200°F	A: All conc.; ≤ 200°F	D: 100%; ≤ 200°F	A: ≤ 20%; ≤ 200°F B: > 20%; ≤ 200°F		A: ≤ 20%; ≤ 200°F B: > 20%; ≤ 200°F	B: All conc.; ≤ 200°F	B: ≤ 20%; ≤ 200°F B: 100%; ≤ 70°F
Galic Acid	B: 100%; ≤ 200°F	B: 50%; ≤ 200°F	D	B: All conc.; ≤ 200°F		B: All conc.; ≤ 200°F	B: 100%; ≤ 200°F	D: 100%; ≤ 200°F
Gasoline				A: 75°F A: 150°F				
Gasoline (sour)	B	A	B	A		A	B	A
Gasoline (sweet)	A	A	A	A		A	A	A
Gelatin	C	A	B	A		A	—	—
Glacial Acetic Acid					B: 75°F			
Glucose	A	A	A	A		A	A	A
Glue (acid)	B	A	A	A		A	A	A
Glycerol	A: All conc.; ≤ 200°F	A: All conc.; ≤ 200°F	A: All conc.; ≤ 200°F	A: All conc.; ≤ 200°F		A: All conc.; ≤ 200°F	A: All conc.; ≤ 200°F	A: All conc.; ≤ 200°F

Fluid	Aluminum Bronze	Aluminum A—356	Carbon Steel / Ductile Iron	316 Stainless Steel	17—4 PH Stainless Steel	Alloy 20	Monel®	Hastelloy C®
Heptane and Hexane	A	A	A	A		A	A	A
Hexane					A: 75°F A: 150°F			
Hexanol (tertiary)	A	—	A	A		A	A	A
Hydrobromic Acid	D	D	D	D		D	D	—
Hydrochloric Acid	D	D	D	D		D	D	—
Hydrochloric Acid 10%					D: 75°F D: 150°F			
Hydrochloric Acid 20%					D: 75°F D: 150°F			
Hydrochloric Acid 37%					D: 75°F D: 150°F			
Hydrocyanic Acid	D: All conc.; ≤ 70°F B: 100%; ≤ 70°F	B: 40%; ≤ 70°F B: 100%; ≤ 200°F	B: 100%; ≤ 200°F D: All other conc.	B		B	B: ≥ 90%; ≤ 200°F D: ≤ 10%; ≤ 200°F	B: 100%; ≤ 200°F
Hydrofluoric Acid (air free)	D	D	A: ≥ 80%; ≤ 70°F D: All other conc.	B: 100%; ≤ 70°F D: All other conc.		B: 100%; ≤ 70°F D: All other conc.	A: All conc.; ≤ 70°F B: All conc.; ≥ 120°F	B: 100%; ≤ 200°F
Hydrogen (gas)	A	A	Depends on press.	A	A: 75°F A: 150°F	A	A	A
Hydrogen Peroxide	D	A: All conc.; ≤ 120°F	D	B	A: 75°F B: 150°F	B	D	D
Hydrogen Sulfide	B: Dry; ≤ 200°F D: Wet; ≤ 70°F	B: Dry D: Wet	B: Dry B: Wet; ≤ 70°F	A: Dry; ≤ 175°F B: Dry; ≥ 200°F A: Wet; ≤ 120°F		B: Dry B: Wet; ≤ 75°F	B: Dry D: Wet	B: Dry ≤ 300°F D: Wet
Hydrogen Sulfide (dry)					B: 175°F B: 1150°F			
Hydrogen Sulfide (wet)					D: 175°F D: 1150°F			
Ink	C	—	D	A		A	—	—
Iodine Solutions	D	D	D	D		D	D	B: All conc.; ≤ 200°F
Isopropyl Ether	A	A	A	A		A	A	A
Jet Fuel (JP 4, 5 6)	A	—	A	A		A	A	A
Kerosene	A	A	A	A	A: 75°F A: 150°F	A	A	A
Lactic Acid	D	B: All conc.; ≤ 70°F D: All conc.; ≥ 120°F	D	A: ≤ 50%; ≤ 120°F B: All others		B	D B: ≥ 80%; ≤ 200°F	B: All conc.; ≤ 200°F A: 30-60%; ≤ 120°F
Linoleic Acid (fatty acids)	C	D	D	A: 100%		A: 100%	B: 100%; ≤ 300°F	A: 100%
Linolenic Acid					B: 75°F			

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( See Introduction )

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Fluid	Aluminum Bronze	Aluminum A—356	Carbon Steel / Ductile Iron	316 Stainless Steel	17—4 PH Stainless Steel	Alloy 20	Monel®	Hastelloy C®
Magnesium Chloride	B: ≤ 30%; ≤ 120°F	B: ≤ 40%; ≤ 75°F	B: ≤ 30%; ≤ 70°F	B: ≤ 40%; ≤ 200°F	A: 75°F C: 1150°F	A: ≤ 50%; ≤ 200°F	B: ≤ 40%; ≤ 200°F	A: ≤ 40%; ≤ 200°F
Magnesium Hydroxide	A: ≤ 10%; ≤ 200°F	B: ≤ 10%; ≤ 75°F	B: ≤ 10%; ≤ 200°F A: ≤ 100%; ≤ 200°F	B: ≤ 10%; ≤ 200°F A: 100%; ≤ 200°F		B: ≤ 10%; ≤ 200°F A: 100%; ≤ 200°F	B: ≤ 10%; ≤ 200°F A: 100%; ≤ 200°F	B: ≤ 10%; ≤ 70°F A: 100%; ≤ 200°F
Magnesium Nitrate				A: 75°F A: 150°F				
Magnesium Sulfate Solutions	A: ≤ 40%; ≤ 200°F	A: ≤ 40%; ≤ 70°F B: ≤ 40%; ≥ 200°F	B: ≤ 30%; ≤ 200°F A: ≤ 10%; ≤ 70°F	A: ≤ 40%; ≤ 200°F B: > 40%; ≤ 200°F	A: 75°F A: 150°F	A: ≤ 50%; ≤ 200°F	A: ≤ 60%; ≤ 200°F	A: ≤ 50%; ≤ 200°F
Maleic Acid	C: 20—50%; ≤ 70°F B: ≤ 10%; ≤ 70°F	B: ≤ 50%; ≤ 70°F C: ≤ 50%; ≥ 120°F	B: ≥ 80%; ≤ 200°F D: ≤ 10%; ≤ 70°F	B: ≤ 50%; ≤ 200°F B: 100%; ≤ 200°F	B: 75°F	B: ≤ 50%; ≤ 200°F B: 100%; ≤ 70°F	B: ≤ 50%; ≤ 200°F C: ≤ 10%; ≤ 70°F	A: ≤ 10%; ≤ 200°F B: > 10%; ≤ 200°F
Maleic Anhydride	D	A	B: 100%; ≤ 400°F	A: 100%; ≤ 700°F		—	A: 100%; ≤ 400°F	A: Hast B
Mercuric Chloride	D	D	D	D		—	D	B: ≤ 30%; ≤ 175°F
Mercuric Cyanide	D	D	B: 100%; ≤ 70°F	B: ≤ 100%; ≤ 70°F		B: ≤ 100%; ≤ 70°F	D	B: 100%; ≤ 70°F
Mercury	D	D	A: 100%; ≤ 700°F	A: 100%; ≤ 700°F		A: 100%; ≤ 700°F	B: 100%; ≤ 700°F	B: 100%; ≤ 700°F
Methane	A: ≤ 200°F	A: ≤ 200°F	A: ≤ 700°F	A: ≤ 700°F		A: ≤ 700°F	A: ≤ 200°F	A: ≤ 200°F
Methyl Acetate	B: 100%; ≤ 70°F	B: ≥ 99%; ≤ 175°F	B: 90%; ≤ 70°F	B: 100%; ≤ 70°F		B: 100%; ≤ 175°F	A: 100%; ≤ 70°F	A: ≤ 60%; ≤ 200°F
Methyl Acetone	A	A	A	A		A	—	—
Methylamine	D	B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F		B: All conc.; ≤ 200°F	D: 100%; ≤ 70°F	B: 100%; 70°F
Methyl Chloride (dry)					A: 75°F			
Methyl Cellosolve	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F		B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F
Methyl Chloride	A: > 80%; ≤ 200°F Dry only	D: Ignites	A: 100%; ≤ 200°F D: Wet; ≤ 70°F	A: 100%; ≤ 200°F Dry only		A: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 70°F
Methyl Ethyl					A: 75°F A: 150°F			
Methyl Ethyl Ketone	B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F		B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F
Methyl Formate	B: ≤ 30%; ≤ 200°F	A: ≥ 90%; ≤ 120°F	B: ≤ 30%; ≤ 200°F	B: ≤ 30%; ≤ 200°F		B: ≤ 30%; ≤ 200°F	B: ≤ 30%; ≤ 200°F	B: ≤ 30%; ≤ 200°F
Methyl Isobutyl					A: 75°F A: 150°F			
Methylene Chloride	A: 100%; ≤ 70°F	B: 100%; ≤ 200°F C: 90%; ≤ 175°F	B: 100%; ≤ 200°F D: Wet all temp.	A: ≥ 80%; ≤ 200°F B: 100%; ≤ 200°		A: 100%; ≤ 200°F	B: ≥ 80%; ≤ 200°F	A: 100%; ≤ 200°F B: ≤ 40%; ≤ 200°F
Milk	—	A	—	A		A	B	—
Mixed Acids (sulfuric & nitric)	D	D	B: 70%	B: All conc.		B: All conc.; 70°F	D	—
Molasses	D	A	B	A		A	A	—
Naptha	A: ≤ 200°F	A: ≤ 200°F	A: Sulphur free ≤ 200°F	A: ≤ 200°F		A: ≤ 200°F	A: ≤ 200°F	A: ≤ 200°F
Naphthalene	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	A: 100%; ≤ 400°F	A: 75°F A: 150°F	A: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F
Natural Gas	A	A	Sulphur free	A		A	A	A
Nickel Ammonium Sulfate	—	B: ≤ 10%; ≤ 70°F	D	A: ≤ 20%; ≤ 300°F		A: ≤ 20%; ≤ 300°F	B: ≤ 10%; ≤ 200°F	—

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Nickel Chloride	D	D	D	B: 100%; ≤ 70°F		B: ≤ 50%; ≤ 120°F	B: ≤ 100%; ≤ 70°F	A: ≤ 40%; ≤ 200°F
Nickel Sulfate	C: ≤ 10%; ≤ 70°F	D	D	A: 30-40%; ≤ 175°F	A: 75°F A: 150°F	B: ≤ 40%; ≤ 200°F	B: ≤ 30%; ≤ 200°F	B: ≤ 60%; ≤ 200°F
Nitric Acid (5%)								
Nitric Acid (10%)	D	B: ≤ 70°F	D	A: ≤ 200°F	A: 75°F A: 150°F	A: ≤ 200°F	D: 70°F	—
Nitric Acid (80%)	D	B: ≤ 70°F D: ≤ 120°	D	A: ≤ 70°F D: ≤ 175°F		A: ≤ 70°F C: ≤ 175°F	D	—
Nitric Acid (Anhydrous)	D	A: ≤ 70°F C: ≤ 175°F	D	B: ≤ 70°F D: ≤ 120°F		B: ≤ 70°F D: ≤ 125°F	D	—
Nitric Acid (conc.)					A: 75°F C: 150°F			
Nitrobenzene	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	A: 100%; ≤ 200°F	B: 100%; ≤ 200°F		A: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F
Nitrocellulose	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F		B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	—
Nitrous Oxide	B: 100%; ≤ 70°F	D	A: 100%; ≤ 70°F	B: 100%; ≤ 70°F		B: 100%; ≤ 70°F	D	B: 100%; ≤ 70°F
Oils:								
Animal	A	A	A	A		A	—	—
Cottonseed	—	B	—	A		A	—	—
Diesel	B	A	B	A		A	A	A
Fish	C	A	D	A		A	B	—
Fuel	B	A	A	A		A	B	—
Hydraulic Petroleum	B	—	B	A		A	A	A
Hydraulic Synthetic	B	—	B	A		A	A	A
Lard	A	A	C	B		A	A	A
Linseed	B	A	A	A	A: 75°F A: 150°F	A	A	A
Lube and Grease	A	A	A	A		A	B	—
Mineral	A	A	A	A		A	A	—
Pine, Gum	B	A	B	A		A	—	—
Refined Petroleum	B	A	A	A		A	A	—
Sour Petroleum	C	A	B	A		A	A	—
Soybean	B	B	C	A		A	A	A
Transformer	B	A	B	A		A	A	A

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( See Introduction )

Fluid	Aluminum Bronze	Aluminum A—356	Carbon Steel / Ductile Iron	316 Stainless Steel	17—4 PH Stainless Steel	Alloy 20	Monel®	Hastelloy C®
Oleic Acid	D: 10%; ≤ 70°F C: 100%; ≤ 120°F	B: ≥ 90%; ≤ 200°F	B: 100%; ≤ 120°F	B: < 100%; ≤ 70°F A: 100%; ≤ 300°F	B: 75°F	B: All conc.; ≤ 200°F	A: 100%; ≤ 70°F B: 100%; ≥ 120°F	B: 100%; ≤ 200°F
Oleum (air free)	D	B: 100%; ≤ 70°F	B: 100%; ≤ 300°F	B: 100%; ≤ 400°F	B: 75°F	B: 100%; ≤ 400°F	D	B: 100%; ≤ 200°F
Ortho Dichlorobenzene								
Oxalic Acid	B: < 100%; ≤ 70°F C: 100%; ≤ 70°F	B: All conc.; ≤ 70°F D: All conc.; ≥ 120°F	D	B: < 100%; ≤ 70°F D: All conc.; ≤ 200°F		B: All conc.; ≤ 200°F	B: ≤ 30%; ≤ 200°F B: > 30%; ≤ 70°F	B: All conc.; ≤ 200°F
Oxalic Acid					B: 75°F			
Oxygen	A	A	C	B		B	A	A
Ozone	—	B: Wet A: Dry	C: Wet A: Dry	A: Wet A: Dry		A: Wet A: Dry	—	—
Palmitic Acid	—	B: ≥ 90%; ≤ 70°F D: 100%; ≤ 200°F	B: 100%; ≤ 70°F D: 100%; ≤ 400°F	A: 100%; ≤ 400°F	B: 75°F	A: 100%; ≤ 400°F	B: 100%; ≤ 70°F	—
Paraffin	A	A	B	A		A	A	A
Perchloroethylene	B: 100%; ≤ 70°F	B: 100%; ≤ 200°F	B: 100%; ≤ 700°F	B: 100%; ≤ 700°F		B: 100%; ≤ 700°F	A: 100%; ≤ 400°F	B: 100%; ≤ 70°F
Phenol	A: 100%; ≤ 70°F B: 100%; 70–400°F	A: ≥ 90%; ≤ 175°F D: 100%; ≤ 300°F	(Sulphur free) A: 100%; ≤ 200°F B: 90%; ≤ 300°F	A: 100%; ≤ 700°F B: 90%; ≤ 300°F		A: 100% B: 90%; ≤ 300°F	A: ≤ 10% A: 100% B: 90%; ≤ 300°F	A: 100% A: 90%; ≤ 200°F
Phosphoric Acid (aerated) (10%)					B: 75°F B: 150°F			
Phosphoric Acid (aerated) (20%)					B: 75°F B: 150°F			
Phosphoric Acid (aerated) (50%)					B: 75°F C: 1150°F			
Phosphoric Acid (aerated) (80%)					B: 75°F C: 1150°F			
Phosphoric Acid (85%) (air free)	B: ≥ 90%; ≤ 200°F D: ≤ 90%; ≥ 300°F	D	D	B: 70%; ≤ 200°F		B: All conc.; ≤ 200°F	B: ≥ 80%; ≤ 200°F D: ≥ 90%; ≥ 300°F	—
Phosphoric Acid (aerated)	D	D	D	A: ≥ 80%; ≤ 125°F B: ≤ 100%; ≤ 175°F		A: ≥ 90%; ≤ 125°F B: ≥ 80%; ≤ 200°F	D	—
Phosphoric Acid Vapors	D	—	D	B: ≤ 200°F		B: ≤ 200°F	D	—
Phosphate Esters	A	—	A	—		B	—	—
Phthalic Acid	B: 100%; ≤ 400°F	B: 100%; ≤ 200°F	B: 100%; ≤ 200°F	A: 100%; ≤ 500°F	B: 75°F	B: 100%; ≤ 400°F	B: 100%; ≤ 300°F	B: 100%; ≤ 300°F
Phthalic Anhydride	B: 100%; ≤ 70°F	A: 100%; ≤ 300°F	A: 100%; ≤ 300°F	A: 100%; ≤ 500°F		A: 100%; ≤ 400°F	A: 100%; ≤ 300°F	A: 100%; ≤ 500°F
Picric Acid	D	D	D	All conc.; 70°F B: ≤ 10%; ≤ 200°F		All conc.; 70% B: ≤ 10%; ≤ 200°F	C: ≤ 50%; ≤ 70°F	B: ≤ 20%; ≤ 200°F
Potassium Chloride	C: ≤ 10%; ≤ 70°F	D	C: ≤ 10%; ≤ 125°F	A: ≤ 100%; ≤ 75°F	B: 75°F	A: ≤ 30%; ≤ 200°F	B: ≤ 30%; ≤ 200°F	A: ≤ 100%; ≤ 300°F
Potassium Cyanide	D	D	B: ≥ 100%; ≤ 70°F	B: ≤ 100%; ≤ 200°F		B: ≤ 30%; ≤ 200°F	B: ≤ 100%; ≤ 70°F	B: ≤ 30%; ≤ 200°F
Potassium Hydroxide (10%)	D	D	B: ≤ 200°F	B: ≤ 200°F		B: ≤ 200°F	A: ≤ 200°F	—

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Potassium Hydroxide (10—40%)				B: 75°F B: 150°F				
Potassium Hydroxide (to 70%)	D	D	D	B: ≤ 200°F		B: ≤ 200°F	A: ≤ 200°F	—
Potassium Nitrate	B: All conc.; ≤ 200°F	A: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F	A: 75°F A: 75°F	B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F
Potassium Phosphate (monobasic)	D	D	B: ≤ 30%; ≤ 70°F	B: ≤ 30%; ≤ 200°F		B: ≤ 30%; ≤ 75°F	B: ≤ 10%; ≤ 200°F	B: ≤ 10%; ≤ 200°F
Potassium Phosphate (tribasic)	D	D	B: ≤ 30%; ≤ 70°F	B: ≤ 30%; ≤ 200°F		B: ≤ 30%; ≤ 70°F	—	—
Potassium Sulfate	B: ≤ 20%; ≤ 200°F D: ≤ 100%; ≤ 70°F	A: ≤ 20%; ≤ 200°F	B: ≤ 10%; ≤ 120°F D: ≤ 10%; ≤ 200°F	A: ≤ 20%; ≤ 200°F	A: 75°F A: 150°F	A: ≤ 20%; ≤ 200°F	A: ≤ 20%; ≤ 200°F	A: ≤ 20%; ≤ 200°F
Potassium Sulfide	B: ≤ 10%; ≤ 70°F	D	D	B: ≤ 10%; ≤ 70°F		B: ≤ 10%; ≤ 70°F	D	B: ≤ 10%; ≤ 70°F
Potassium Sulfite	D	D	D	B: ≤ 50%; ≤ 200°F		B: ≤ 50%; ≤ 200°F	D	—
Propane (LP Gas)	A: 100%; ≤ 200°F	A: 100%; ≤ 200°F	A: 100%; ≤ 700°F	A: 100%; ≤ 200°F		A: 100%; ≤ 200°F	A: 100%; ≤ 200°F	A: 100%; ≤ 200°F
Resins and Rosins	B: 100%	B: 100%; ≤ 300°F	B: 100%; ≤ 70°F	B: 100%		B: 100%	A: 100%	—
Soap and Detergents	C	C	C	A		A	—	—
Sodium Acetate	B: ≤ 60%; ≤ 200°F	A: All conc.; 70°F	B: ≤ 40%; 70°F	A: ≤ 10%; ≤ 300°F B: > 10%; ≤ 200°F		A: ≤ 10%; ≤ 300°F B: > 10%; ≤ 200°F	B: ≤ 60%; ≤ 200°F	B: ≤ 60%; ≤ 200°F
Sodium Aluminate	B: ≤ 50%; ≤ 200°F	D: All conc.	A: ≤ 40%; ≤ 200°F	A: ≤ 40%; ≤ 200°F		A: ≤ 40%; ≤ 200°F	A: ≤ 50%; ≤ 200°F	B: ≤ 10%; ≤ 70°F
Sodium Bisulfate	D	D	D: > 10%; > 70°F —: ≤ 10%; 70°F	A: ≤ 10%; ≤ 175°F D: > 10%; 200°F		A: ≤ 40%; ≤ 200°F	B: ≤ 40%; ≤ 200°F	—
Sodium Bisulfite	B: ≤ 10%; ≤ 120°F D: ≥ 20%; 70°F	B: ≤ 10%; ≤ 175°F	A: ≤ 10%; 70°F D: ≤ 10%; 200°F	B: ≤ 40%; ≤ 200°F		B: ≤ 40%; ≤ 200°F	B: ≤ 40%; ≤ 200°F	B: ≤ 40%; ≤ 200°F
Sodium Carbonate	D	D	B: ≤ 30%; ≤ 200°F	A: ≤ 10%; ≤ 200°F B: 20-30%; ≤ 175°F	A: 75°F A: 150°F	A: ≤ 20%; ≤ 200°F	A: ≤ 10%; ≤ 200°F B: 20-30%; ≤ 175°F	A: ≤ 10%; ≤ 200°F B: 20-30%; ≤ 175°F
Sodium Chlorate	—	B: ≤ 50%; 70°F	D	B: All conc.; ≤ 200°F		B: All conc.; ≤ 200°F	A: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F
Sodium Chloride	C: ≤ 10%; ≤ 200°F B: 20-30%; ≤ 200°F	C: ≤ 30%; 70°F	C: ≤ 20%; ≤ 175°F	B: ≤ 30%; ≤ 200°F	B: 75°F	B: ≤ 30%; ≤ 200°F	A: ≤ 30%; ≤ 120°F	B: ≤ 30%; ≤ 200°F
Sodium Cyanide	D	D	A: ≤ 10%; ≤ 200°F	A: ≤ 10%; ≤ 200°F		A: ≤ 10%; ≤ 200°F	D: ≤ 10%; 70°F	—
Sodium Hydroxide (10%)				A: 75°F A: 150°F				
Sodium Hydroxide (20%) (caustic soda)	D	D	A: 70°F B: 200°F	A: ≤ 200°F		A: ≤ 200°F	A: ≤ 200°F	—
Sodium Hydroxide (50%) (caustic soda)	D	D	A: 70°F B: 200°F	A: 70°F B: 200°F	A: 75°F B: 150°F	A: 70°F B: 200°F	A: ≤ 200°F	—
Sodium Hydroxide (70%) (caustic soda)	D	D	D	B: 70°F C: 200°F		B: ≤ 200°F	A: ≤ 200°F	—

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( See Introduction )

For conditions not indicated, consult JAMESBURY's Home Office.

Fluid	Aluminum Bronze	Aluminum A—356	Carbon Steel / Ductile Iron	316 Stainless Steel	17—4 PH Stainless Steel	Alloy 20	Monel®	Hastelloy C®
Sodium Hypochlorite	D	D: ≤ 10%; 70°F	D: ≤ 10%; 70°F	B: ≤ 10%; 70°F D: ≤ 10%; 200°F		B: ≤ 10%; ≤ 200°F	D: ≤ 10%; 70°F	A: ≤ 20%; ≤ 200°F
Sodium Metaphosphate	—	D: ≤ 10%; 70°F	A: 100%; 70°F	B: 100%; 70°F		B: 100%; 70°F	B: 10%; 70°F	—
Sodium Metasilicate	B: All conc.; ≤ 200°F	D	B: All conc.; ≤ 200°F	A: All conc.; ≤ 200°F		A: All conc.; ≤ 200°F	A: All conc.; ≤ 200°F	A: All conc.; ≤ 200°F
Sodium Nitrate	C: All conc.; 70°F	A: All conc.; 70°F	B: ≤ 40%; ≤ 200°F	A: ≤ 60%; ≤ 200°F		A: ≤ 60%; ≤ 200°F	B: All conc.; ≤ 200°F	B: ≤ 50%; 70°F
Sodium Nitrite	B: ≤ 60%; ≤ 200°F	B: ≤ 60%; ≤ 200°F	B: ≤ 60%; ≤ 200°F	B: ≤ 60%; ≤ 200°F		B: ≤ 60%; ≤ 200°F	B: ≤ 60%; ≤ 200°F	B: ≤ 60%; ≤ 200°F
Sodium Perborate	—	D	B: ≤ 10%; ≤ 200°F	B: ≤ 10%; ≤ 200°F		B: ≤ 10%; ≤ 200°F	B: ≤ 10%; ≤ 200°F	B: ≤ 10%; ≤ 200°F
Sodium Peroxide	D	B: ≤ 10%; ≤ 200°F	B: ≤ 10%; ≤ 200°F	B: ≤ 10%; ≤ 200°F		B: ≤ 10%; ≤ 200°F	B: ≤ 10%; ≤ 200°F	B: ≤ 10%; ≤ 200°F
Sodium Phosphate (monobasic)	B: All conc.; ≤ 200°F	D	B: All conc.; ≤ 70°F ≤ 200°F	B: All conc.; ≤ 200°F		B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F
Sodium Phosphate (dibasic)	B: All conc.; ≤ 200°F	D	B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F		B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F
Sodium Phosphate (tribasic)	B: All conc.; ≤ 200°F	D	B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F		B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F
Sodium Silicate	B: All conc.; ≤ 200°F	D	B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F		B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F	B: All conc.; ≤ 200°F
Sodium Sulfate				A: 75°F A: 150°F				
Sodium Sulfide	C: 30%; 70°F B: 10%; 70°F	D	D	B: ≤ 50%; ≤ 200°F D: ≤ 50%; ≥ 300°F		B: ≤ 50%; ≤ 200°F D: ≤ 50%; ≥ 300°F	B: ≤ 60%; ≤ 3200°F	B: ≤ 50%; ≤ 200°F
Sodium Sulfite	D	B: ≤ 10%; ≤ 200°F	B: ≤ 10%; ≤ 200°F	A: ≤ 10%; ≤ 200°F		A: ≤ 10%; ≤ 200°F	B: ≤ 20%; ≤ 200°F	B: ≤ 30%; ≤ 200°F
Sodium Thiosulfate	—	A: ≤ 20%; 70°F	D	B: ≤ 20%; ≤ 200°F		B: ≤ 20%; ≤ 200°F	B: ≤ 10%; ≤ 70°F	—
Stearic Acid	C: 100%; ≤ 200°F	B: 100%; ≤ 400°F	A: 100%; ≤ 120°F	A: 100%; ≤ 400°F		B: 100%; ≤ 400°F	C: 100%; ≤ 400°F	A: 100%
Styrene	D	A: 100%; 70°F	B: 100%; 70°F	A: 100%; 70°F		A: 100%; ≤ 70°F	B: 100%; ≤ 70°F	A: 100%; 70°F
Sulphur (molten)	—	A	C	A		A	A	A
Sulphur Dioxide	C: Dry; ≤ 300°F D: Wet	B: Dry; ≤ 300°F D: Wet	B: Dry D: Wet	B: Dry B: Wet		B: Dry B: Wet	B: Dry D: Wet	A: Dry D: Wet
Sulphur Dioxide (dry)				B: 75°F B: 150°F				
Sulphur Dioxide (wet)				D: 175°F D: 1150°F				
Sulphur Trioxide	B: Dry; 70°F	C: Dry; 70°F D: Wet	B: Dry D: Wet	B: Dry B: Wet		B: Dry B: Wet	B: Dry; ≤ 200°F	B: Dry B: Wet
Sulfuric Acid (0-7%)	D	D	D	B: 70°F		B: ≤ 200°F C: 120°-200°F	D	—
Sulfuric Acid (7-40%)	D	D	D	D		A: ≤ 120°F C: > 120°F	C: 70°F D: ≥ 120°F	—
Sulfuric Acid (10%)				C: 175°F D: 1150°F				

Fluid	Aluminum Bronze	Aluminum A—356	Carbon Steel / Ductile Iron	316 Stainless Steel	17—4 PH Stainless Steel	Alloy 20	Monel®	Hastelloy C®
Sulfuric Acid (30%)					D: 75°F D: 150°F			
Sulfuric Acid (40-75%)	D	D	D	D		A: ≤ 120°F C: > 120°F	B: 70°F D: ≥ 120°F	—
Sulfuric Acid (75%)					D: 75°F D: 150°F			
Sulfuric Acid (75-95%)	D	D	B: 70°F D: ≥ 120°F	C: 70°F D: ≥ 175°F		A: ≤ 120°F C: ≥ 175°F	D	—
Sulfuric Acid (98%)					B: 75°F D: 150°F			
Sulfuric Acid (95-100%)	D	D	B: 70°F D: ≥ 120°F	B: 70°F D: ≥ 120°F		A: ≤ 120°F C: ≥ 175°F	D	—
Sulfurous Acid	B: ≤ 10%; 70°F	B: ≤ 10%; 70°F	C: ≤ 10%; 70°F	B: ≤ 20%; 70°F		B: ≤ 60%; ≤ 200°F	D	B: All conc.; ≤ 200°F
Tall Oil	D	D	B: ≤ 200°F	B		B	B	A
Tallow (molten)	—	B	B	A		A	—	—
Tannic Acid	C: 100%; 70°F	B: ≤ 40%; 70°F D: 100%; 70°F	A: 100%; 70°F D: ≤ 10%; 70°F	A: All conc.; ≤ 200°F		B: All conc.; ≤ 200°F	B: ≤ 10%; ≤ 200°F	B: ≤ 10%; ≤ 200°F
Tartaric Acid	A: ≤ 10%; 70°F C: 20-40%; 70°F	B: ≤ 50%; 70°F D: ≤ 50%; ≥ 120°F	D	B: ≤ 50%; ≤ 200°F		A: ≤ 50%; ≤ 200°F B: 50-60%; ≤ 200°F	B: ≤ 50%; ≤ 200°F	B: ≤ 40%; ≤ 200°F
Tetraethyl Lead	D	B	—	B		B	—	—
Toluol and Toluene	A: ≤ 200°F	A: ≤ 200°F	A: ≤ 200°F	A: ≤ 200°F	A: 75°F A: 150°F	A: ≤ 200°F	A: ≤ 200°F	A: ≤ 200°F
Toluene Diisocyanate	—	—	—	A		A	—	—
Tributyl Phosphate	—	—	A: 100%; 70°F	—		B: 10%; ≤ 175°F	—	—
Trichloroethylene	B: Dry ≤ 300°F D: Wet	A: 100%; ≤ 120°F B: 100%; ≥ 175°F	B: Dry ≤ 300°F D: Wet	A: 90%; ≤ 200°F B: 100%	A: 75°F (dry)	B: All conc.; ≤ 200°F	A: ≥ 90%; ≤ 200°F	A: ≥ 90%; ≤ 200°F
Trisodium Phosphate (10%)					A: 75°F A: 150°F			
Turpentine	B: ≤ 120°F	B: ≤ 120°F	B: ≤ 120°F	B: ≤ 120°F	A: 75°F	B: ≤ 120°F	B: ≤ 120°F	B: ≤ 120°F
Urea	B: ≤ 60%; 70°F	B: ≤ 60%; ≤ 200°F	D	B: ≤ 50%; ≤ 200°F		B: ≤ 50%; ≤ 200°F	B: ≤ 50%; ≤ 70°F	—
Varnish	A	A	C	A		A	A	A
Vinyl acetate	B: 100%; 70°F	B: 100%; 70°F D: < 100%; 70°F	A: 100%; 70°F	B: 100%; 70°F		B: ≤ 10%; ≤ 175°F A: 100%; 70°F	A: 100%; ≤ 175°F	—
Vinyl Chloride	D: ≤ 10%; 70°F A: 100%; 70°F	B: 100%; 70°F	A: Dry; 70°F D: Wet; 70°	B: 100% A: 90%; ≤ 70°F		A: ≥ 90%; ≤ 200°F B: 100%; > 200°F	A: 100%; 70°F B: 90%; 70°F	A: 100%; ≤ 120°F
Water, Acid Mine	—	A: ≤ 120°F	D: 70°F	A: 70°F		A	C	—
Water, fresh (depends on mineral content)	A	B	B	A		A	A	A

**( See Introduction)**

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Water, deionized	D	A: 175°F	D: 70°F	A: ≤ 175°F		A: ≤ 175°F	A: ≤ 175°F	—
Water pH approx. 7					A: 75°F			
Water pH < 7					A: 75°F			
Water pH > 7					A: 75°F			
Water, Distilled (aerated)					A: 75°F			
Water, Distilled (air free)					A: 75°F			
Water, Salt	B	—	C	C: Depends on velocity		B	A	A
Waxes	—	A	—	A		A	—	—
Whiskey and Wines	—	B	—	A		A	B	—
Xylene					A: 75°F A: 150°F			
Xylene or Xylol	A: ≤ 200°F	A: ≤ 200°F	B: ≤ 200°F	B: ≤ 200°F		B: ≤ 200°F	A: ≤ 200°F	A: ≤ 200°F
Zinc Chloride	D	D	D	D: ≤ 50%; 200°F A: ≤ 10%; 70°F	C: 75°F	A: ≤ 30%; ≤ 175°F B: > 30%; ≤ 2 00°F	B: All conc.; ≤ 200°F	—
Zinc Nitrate					A: 75°F A: 150°F			
Zinc Sulfate	D	B: ≤ 10%; 70°F	D	A: ≤ 30%; ≤ 200°F	A: 75°F A: 150°F	A: ≤ 30%; ≤ 200°F	B: ≤ 30%; ≤ 200°F	B: ≤ 30%; ≤ 200°F

Monel is a registered trademark of Inco.  
Hastelloy is a registered trademark of Haynes International.

## **Installation, Maintenance and Operation Instructions:**

IMO's (Installation, Maintenance and Operating instructions) or AMI's (Assembly, Mounting and Installation Instructions) are shipped with the products. Additional copies of these instructions are available. Call your local Metso Automation Distributor, or visit our web site.

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