

Material of Construction					Horizontal Pumps-mechanical seal										Vertical Pumps						
Chemical Environment	Notes	% Conc	Max Operating Temperature, °F/°C			Seal Type		Seal Flush		Seal Face Materials				Pump Seal Elastomer			Shaft and Hardware				
			VR-1	VR-1 Mag Drive & Wrapped Shaft Pumps Only	EY-2	Single	Double	External	Internal	Carbon-Ceramic	Carbon-SilCar	SilCar-SilCar	Viton	EPR	Per-Fluro Elastomer	316SS	C-20	Hast C	Titanium		
Acetaldehyde		100	U	U	100/38	U	A	S	S	S	S	S	S	S	S	S	U	A	A	A	A
Acetic Acid		10	210/99	150/65	200/93	S	S	S	S	S	S	S	S	U	S	S	S	A	A	A	A
		15	210/99	150/65	CF	S	S	S	S	S	S	S	S	U	S	S	S	A	A	A	A
		25	210/99	150/65	120/49	S	S	S	S	S	S	S	S	U	S	S	S	A	A	A	A
		50	180/82	CF	120/49	S	S	S	S	S	S	S	S	U	S	S	S	B	A	A	A
		75	150/65	CF	75/24	S	S	S	S	S	S	S	S	U	S	S	S	S	B	A	A
Acetic Acid, Glacial		100	U	U	U																
Acetic Anhydride		100	U	U	100/38	S	S	S	S	S	S	S	U	S	S	S	S	A	CF	A	A
Acetone		1	CF	CF	200/93	S	S	S	S	S	S	S	U	S	S	S	S	A	A	A	A
		10	180/82	CF	200/93	S	S	S	S	S	S	S	U	S	S	S	S	A	A	A	A
		100	U	U	125/52	S	S	S	S	S	S	S	U	S	S	S	S	A	A	A	A
Acrylamide		50	100/38	100/38	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	CF	CF
Acrylic Acid		25	100/38	100/38	120/49	S	S	S	S	S	S	S	U	U	A	A	A	A	A	A	CF
		95	CF	CF	100/38	S	S	S	S	S	S	S	U	U	A	A	A	A	A	A	CF
Acrylonitrile		100	U	U	100/38	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	A	CF
Adipic Acid		All	CF	CF	250/121	U	A	S	S	S	S	S	U	U	S	S	S	B	B	CF	A
Alcohol, Butyl		All	120/49	U	CF	S	S	S	S	S	S	S	S	U	S	S	S	A	A	A	A
		100	120/49	U	200/93	S	S	S	S	S	S	S	S	U	S	S	S	A	A	A	A
Alcohol, Ethyl		10	CF	CF	200/93	S	S	S	S	S	S	S	S	A	S	S	S	A	A	A	A
		95	80/27	U	CF	S	S	S	S	S	S	S	S	A	S	S	S	A	A	A	A
		100	CF	U	175/79	S	S	S	S	S	S	S	S	A	S	S	S	A	A	A	A
Alcohol, Isobutyl		100	120/49	U	CF	S	S	S	S	S	S	S	S	A	S	S	S	A	A	A	A
Alcohol, Isopropyl		10	120/49	U	175/79	S	S	S	S	S	S	S	S	A	S	S	S	B	A	B	A
		100	120/49	U	150/65	S	S	S	S	S	S	S	S	A	S	S	S	B	A	B	A
Alcohol, Methyl		10	CF	CF	175/79	S	S	S	S	S	S	S	U	A	S	S	S	A	A	S	A
		100	CF	U	150/65	S	S	S	S	S	S	S	U	A	S	S	S	A	A	S	A
Alcohol, Sec. Butyl		10	CF	CF	200/93	S	S	S	S	S	S	S	S	A	A	S	S	S	CF	CF	CF
Alkyl Benzene Sulfonic Acid		92	200/93	CF	CF	S	S	S	S	S	S	S	S	A	U	S	S	CF	CF	A	CF
Allyl Alcohol		All	U	U	120/49	U	A	S	S	S	S	S	S	U	S	S	S	A	A	A	CF
Allyl Chloride		All	80/27	U	150/65	U	S	S	S	S	S	S	U	U	S	S	S	B	B	B	CF
Alpha Methyl Styrene		100	100/38	U	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	CF	CF
Alum		All	250/121	180/82	CF	S	S	S	S	S	S	S	S	U	A	S	S	B	B	B	CF
Aluminum Chloride		All	250/121	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	U	U	B	U
		1	250/121	180/82	275/135	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	U	U	B	U
Aluminum Chlorohydroxide		50	210/99	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	CF
Aluminum Fluoride	(*)	All	80/27	80/27	100/38	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	S	U	B	U

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(*)-VR-1V Required
(**)-VR-1 BPO/DMA Required

C/F for mech seal and elas. above:
(1) 50F
(2) 70F
(3)125F
(4)150F

Material of Construction					Horizontal Pumps-mechanical seal										Vertical Pumps					
Chemical Environment	Notes	% Conc	Max Operating Temperature, °F/°C			Seal Type		Seal Flush		Seal Face Materials				Pump Seal Elastomer			Shaft and Hardware			
			VR-1	VR-1 Mag Drive & Wrapped Shaft Pumps Only	EX-2	Single	Double	External	Internal	Carbon-Ceramic	Carbon-SilCar	SilCar-SilCar	Viton	EPR	Per-Fluro Elastomer	316SS	C-20	Hast C	Titanium	
Aluminum Hydroxide		100	180/82	180/82	200/93	S	S	S	S	S	S	S	U	U	S	B	A	B	B	
Aluminum Nitrate		10	210/99	180/82	225/107	S	S	S	S	S	S	S	U	S	S	A	B	CF	CF	
		100	210/99	180/82	225/107	S	S	S	S	S	S	S	U	S	S	A	B	CF	CF	
Aluminum Potassium Sulfate		All	250/121	180/82	225/107	S	S	S	S	S	S	S	U	S	S	U	B	B	CF	
Aluminum Sulfate		See Alum																		
Ammonia (Wet) Anhydrous		All	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	A	A	
Ammonium Acetate		65	80/27	U	275/135	S	S	S	S	S	S	S	U	U	A	B	B	CF	CF	
Ammonium Bicarbonate		10	160/71	160/71	200/93	S	S	S	S	S	S	S	S	S	S	B	B	CF	A	
		50	160/71	160/71	200/93	S	S	S	S	S	S	S	S	S	S	B	B	CF	A	
		Sat	U	U	200/93	S	S	S	S	S	S	S	S	S	S	S	S	CF	B	
Ammonium Bifluoride	(*)	100	150/65	150/65	CF	CF	CF	CF	CF	CF	CF	CF	A	U	U	U	B	B	U	
Ammonium Bisulfite		Sat	150/65	CF	275/135	CF	CF	CF	CF	S	S	S	S	S	S	B	B	A	A	
Ammonium Carbonate		All	150/65	150/65	225/107	U	A	S	S	S	S	S	U	S	S	B	B	B	A	
Ammonium Chloride		All	210/99	180/82	225/107	S	S	S	S	A	S	CF	U	S	U	U	B	A	A	
Ammonium Citrate		All	150/65	150/65	275/135	S	S	S	S	S	S	S	U	U	A	B	B	CF	B	
Ammonium Fluoride	(*)	All	150/65	150/65	100/38	S	S	S	S	CF	CF	CF	S	U	A	S	B	B	S	
Ammonium Hydroxide		5	150/65	150/65	200/93	S	S	S	S	CF	CF	CF	U	S	S	A	A	A	B	
		10	150/65	150/65	200/93	S	S	S	S	CF	CF	CF	U	S	S	A	A	A	B	
		20	150/65	150/65	175/79	S	S	S	S	CF	CF	CF	U	S	S	A	A	A	B	
		28	100/38	100/38	175/79	S	S	S	S	CF	CF	CF	U	S	S	A	A	A	B	
		100	U	U	175/79	S	S	S	S	CF	CF	CF	U	S	S	B	B	B	U	
Ammonium Nitrate		25	CF	CF	275/135	U	A	S	S	S	S	S	U	S	S	B	CF	B	A	
		Sat	150/65	180/82	CF	U	A	S	S	S	S	S	U	S	S	B	CF	B	A	
Ammonium Persulfate		All	210/99	180/82	100/38	S	S	S	S	S	S	S	U	S	S	B	B	B	A	
Ammonium Phosphate, dibasic		25	210/99	180/82	225/107	S	S	S	S	S	S	S	U	S	S	B	B	B	B	
		65	210/99	180/82	225/107	S	S	S	S	S	S	S	U	S	S	B	B	B	B	
		All	210/99	180/82	CF	S	S	S	S	S	S	S	U	S	S	B	B	B	B	
Ammonium Phosphate, monobasic		25	210/99	180/82	225/107	S	S	S	S	S	S	S	U	S	S	B	B	B	B	
		65	210/99	180/82	225/107	S	S	S	S	S	S	S	U	S	S	B	B	B	B	
		All	210/99	180/82	CF	S	S	S	S	S	S	S	U	S	S	B	B	B	B	

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(1) 50F
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Material of Construction					Horizontal Pumps-mechanical seal										Vertical Pumps					
Chemical Environment	Notes	% Conc	Max Operating Temperature, °F/°C			Seal Type		Seal Flush		Seal Face Materials				Pump Seal Elastomer			Shaft and Hardware			
			VR-1	VR-1 Mag Drive & Wrapped Shaft Pumps	EY-2	Single	Double	External	Internal	Carbon-Ceramic	Carbon-SilCar	SilCar-SilCar	Viton	EPR	Per-Fluro Elastomer	316SS	C-20	Hast C	Titanium	
Ammonium Sulfate		All	250/121	180/82	275/135	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	S	B	A	A	
Ammonium Thiocyanate		20	210/99	180/82	CF	S	S	S	S	S	S	S	S	U	S	A	B	A	B	
Ammonium Thiosulfate		60	140/60	CF	CF	S	S	S	S	S	S	S	U	U	A	A	B	A	A	
Amyl Acetate		All	100/38	CF	150/65	S	S	S	S	S	S	S	U	S	S	A	A	A	A	
Amyl Alcohol		All	140/60	120/49	175/79	S	S	S	S	S	S	S	S	A	S	A	A	A	B	
Amyl Chloride		100	120/49	CF	100/38	S	S	S	S	S	S	S	U	S	B	A	A	CF		
Aniline		100	U	U	150/65	S	S	S	S	S	S	U	U	A	B	B	A	A		
Aniline Sulfate		All	210/99	CF	100/38	S	S	S	S	S	S	U	U	A	B	B	CF	A		
Antimony Trichloride		100	CF	CF	150/65	CF	CF	CF	CF	CF	CF	U	U	A	U	S	B	B		
Aqua Regia (Chloronitric Acid)		100	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF		
Arsenic Acid		All	180/82	CF	CF	S	S	S	S	S	S	S	S	S	B	B	B	A		
Arsenious Acid		19Be	180/82	150/65	100/38	S	S	S	S	S	S	U	U	A	B	B	B	A		
Barium Acetate		All	180/82	CF	275/135	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	CF		
Barium Carbonate		All	180/82	180/82	275/135	U	A	CF	CF	CF	CF	U	U	A	B	B	B	B		
Barium Chloride		All	210/99	180/82	275/135	U	A	CF	CF	S	S	S	S	S	U	S	B	A		
Barium Hydroxide		10	150/65	150/65	225/107	U	A	CF	CF	S	S	S	S	S	B	B	S	B		
		All	150/65	150/65	CF	U	A	CF	CF	S	S	S	S	S	B	B	S	B		
Barium Sulfate		All	250/121	180/82	275/135	U	A	S	S	S	S	S	S	S	B	B	B	B		
Barium Sulfide		All	180/82	CF	275/135	U	A	S	S	S	S	S	S	S	B	B	CF	A		
Beer		All	120/49	U	250/121	S	S	S	S	S	S	S	S	U	A	A	A	A		
Beet, Sugar Liquor		Sat	180/82	U	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	CF	A		
Benzaldehyde		100	U	U	200/93	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF		
Benzene		10	U	U	200/93	U	A	S	S	S	S	S	U	S	B	B	B	A		
		100	U	U	180/82	U	A	S	S	S	S	S	U	S	B	B	B	A		
Benzene (5% in Kerosene)		All	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	A		
Benzene, Ethyl Benzene		1/3:2/3	80/27	U	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF		
Benzene, Hydrochloric Acid (Wet)		All	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF		
Benzene Sulfonic Acid		50	150/65	150/65	100/38	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	B		

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			VR-1	VR-1 Mag Drive & Wrapped Shaft Pumps Only	EY-2	Single	Double	External	Internal	Carbon-Ceramic	Carbon-SiCar	Silcar-Silcar	Viton	EPR	Per-Fluro Elastomer	316SS	C-20	Hast C	Titanium	
		75	150/65	150/65	100/38	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	B	
		100	150/65	150/65	75/24	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	B	
Benzoic Acid		Sat	210/99	180/82	200/93	U	A	S	S	S	S	S	S	U	S	B	B	A	A	
Benzyl Alcohol		All	80/27	U	150/65	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	
Benzyl Chloride		100	U	U	150/65	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	
Black Liquor (Pulp Mill)		All	180/82	CF	230/110	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	B	
Bleach Liquor(Pulp Mill)		100	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	B	
Blood Sugar		All	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	CF	A	
Boiler Wash Down		All	250/121	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	U	B	A	A	
Borax		100	210/99	180/82	CF	S	S	S	S	S	S	S	S	S	S	A	A	B	B	
Boric Acid		All	210/99	180/82	250/121	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	A	A	
Brass Plating Solution		All	180/82	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	B	
Brine		All	210/99	180/82	CF	S	S	S	S	S	S	S	S	S	S	S	B	A	A	
Bromic Acid		All	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	U	U	U	U	
Bromine Liquid		100	U	U	U															
Bromine, Wet Gas		100	100/38	100/38	U	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	U	U	U	A	
Bunker C Fuel Oil		100	220/104	150/65	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	CF	CF	
Butadiene		All	CF	CF	200/93	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	CF	A	
2-Butoxyethanol		100	100/38	U	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	A	A	
2,2-Butoxyethoxyethanol		100	100/38	U	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	B	B	
Butyl Acetate		100	80/27	U	175/79	S	S	S	S	S	S	S	U	U	A	B	A	A	A	
Butyl Benzyl Phthalate		100	210/99	CF	175/79	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	CF	B	A	
Butyl Carbitol		100	100/38	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	CF	CF	
Butyl Hypochlorite		98	U	U	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	
Butylene Glycol		100	180/82	CF	250/121	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	CF	B	A	
Butylene Oxide		100	U	U	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	
Butyric Acid		25	210/99	CF	100/38	S	S	S	S	S	S	S	U	A	U	B	B	A	A	
		50	210/99	CF	100/38	S	S	S	S	S	S	S	U	A	U	B	B	A	A	
		100	120/49	CF	CF	S	S	S	S	S	S	S	U	A	U	B	B	A	A	
Cadmium Chloride		All	210/99	180/82	CF	U	A	S	S	S	S	S	U	U	A	CF	CF	B	CF	
Cadmium Cyanide Plt Bath		All	180/82	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	B	
Calcium Bisulfite		All	210/99	180/82	100/38	S	S	S	S	S	S	S	U	S	S	B	A	A	A	

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			VR-1	VR-1 Mag Drive & Wrapped Shaft Pumps	EY-2	Single	Double	External	Internal	Carbon-Ceramic	Carbon-SiC	SiCar	SiCar-SiCar	Viton	EPR	Per-Fluro Elastomer	316SS	C-20	Hast C	Titanium
Calcium Carbonate		All	180/82	180/82	225/107	U	A	S	S	S	S	S	S	S	S	B	B	CF	B	
Calcium Chlorate		All	210/99	180/82	200/93	CF	CF	CF	CF	S	S	S	U	U	A	CF	CF	CF	CF	
Calcium Chloride		All	210/99	180/82	275/135	CF	CF	CF	CF	CF	CF	CF	S	S	S	S	B	A	A	
Calcium Hydroxide		15	150/65	150/65	225/107	CF	CF	CF	CF	CF	CF	CF	CF	CF	U	A	B	B	B	
		25	150/65	150/65	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	U	A	B	B	B	
		100	210/99	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	U	A	B	B	B	
Calcium Hypochlorite	(**)	All	180/82	180/82	U	U	A	S	S	CF	CF	CF	S	S	U	U	U	B	A	
Calcium Nitrate		All	210/99	180/82	225/107	S	S	S	S	S	S	S	S	S	S	U	U	B	B	
Calcium Sulfate		All	210/99	180/82	275/135	U	A	S	S	S	S	S	U	U	A	B	B	B	A	
Calcium Sulfite		All	210/99	180/82	100/38	U	A	S	S	S	S	S	S	S	S	B	B	B	A	
Cane, Sugar Liquor		Sat	180/82	CF	250/121	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	A	CF	CF	
Caprylic Acid		All	210/99	CF	100/38	S	S	S	S	S	S	S	U	S	B	B	A	A		
Caramel		100	120/49	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	CF	CF	
Carbon Disulfide		100	U	U	150/65	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	
Carbon Tetrachloride		100	180/82	CF	175/79	U	A	S	S	S	S	S	S	S	S	S	B	A	B	
Carbonic Acid		All	CF	CF	150/65	S	S	S	S	S	S	S	S	S	S	A	A	B	B	
Carboxyethyl Cellulose		10	150/65	150/65	CF	CF	CF	CF	S	CF	CF	CF	CF	CF	CF	B	A	CF	CF	
Carboxymethyl Cellulose		10	CF	CF	100/38	CF	CF	CF	S	CF	CF	CF	CF	CF	CF	B	A	CF	CF	
Carbowax (Polyethylene Glycol)		100	180/82	150/65	CF	CF	CF	CF	S	CF	CF	CF	CF	CF	CF	A	A	A	A	
Cascade Detergent		All	180/82	180/82	CF	CF	CF	CF	S	CF	CF	CF	CF	CF	CF	A	CF	CF	CF	
Castor Oil		100	160/71	160/71	250/121	S	S	S	S	S	S	S	U	S	A	A	A	A		
Chlorinated Wax		All	180/82	CF	150/65	CF	CF	CF	S	CF	CF	CF	CF	CF	CF	U	U	A	CF	
Chlorine, Wet Gas		100	220/104	180/82	U	CF	CF	CF	S	CF	CF	CF	CF	CF	CF	B	A	B	A	
Chlorine Dioxide		All	180/82	CF	CF	U	A	S	S	S	CF	CF	A	U	U	U	U	B	A	
Chlorine Water		Sat	180/82	CF	U	CF	CF	CF	S	CF	CF	CF	CF	CF	CF	U	S	B	A	
Chloroacetic Acid		10	120/49	CF	150/65	U	A	S	S	S	S	S	U	A	U	U	U	B	A	
		25	100/38	CF	100/38	U	A	S	S	S	S	S	U	A	U	U	U	B	A	
		50	100/38	CF	100/38	U	A	S	S	S	S	S	U	A	U	U	U	C	B	
Chloroacetic Acid, Glacial		All	U	U	100/38	CF	CF	CF	S	CF	CF	CF	CF	CF	CF	U	U	C	B	

A-Preferred
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CF-Consult Factory

(*)-VR-IV Required
(**)-VR-1 BPO/DMA Required

C/F for mech seal and elas. above:
(1) 50F
(2) 70F
(3)125F
(4)150F

Material of Construction					Horizontal Pumps-mechanical seal										Vertical Pumps					
Chemical Environment	Notes	% Conc	Max Operating Temperature, °F/°C			Seal Type		Seal Flush		Seal Face Materials				Pump Seal Elastomer			Shaft and Hardware			
			VR-1	VR-1 Mag Drive & Wrapped Shaft Pumps Only	EY-2	Single	Double	External	Internal	Carbon-Ceramic	Carbon-SilCar	SilCar-SilCar	Viton	EPR	Per-Fluro Elastomer	316SS	C-20	Hast C	Titanium	
Chlorobenzene		100	80/27	U	200/93	U	A	S	S	S	S	S	S	U	S	B	B	B	A	
Chloroform		100	U	U	185/85	U	A	S	S	S	S	S	A	U	U	B	B	B	A	
N-Chloro O-Tolyl (Insecticide Emulsion)		10	120/49	CF	CF	CF	CF	CF	S	CF	CF	CF	CF	CF	CF	B	B	B	CF	
Chloropyridine		100	120/49	U	CF	CF	CF	CF	S	CF	CF	CF	CF	CF	CF	A	A	B	B	
Chlorosulfonic Acid		100	U	U	75/24	S	S	S	S	CF	CF	CF	U	U	U	U	U	S	S	
Chrome Bath		All	120/49	120/49	CF	CF	CF	CF	S	CF	CF	CF	CF	CF	CF	U	B	A	U	
Chromic Acid		5	150/65	150/65	75/24	S	S	CF	S	A	B	B	U	U	A	U	S	A	B	
		10	150/65	150/65	75/24	S	S	CF	S	A	B	B	U	U	A	U	S	A	B	
		15	150/65	120/49	75/24	S	S	CF	S	A	B	B	U	U	A	U	S	A	B	
		20	150/65	120/49	U	S	S	CF	S	A	B	B	U	U	A	U	S	A	B	
		30	U	U	U															
		45	U	U	U															
Chromic Fluoride		All	CF	CF	CF	CF	CF	CF	S	CF	CF	CF	CF	CF	CF	U	U	B	CF	
Chromium Plate (with Sulfuric Acid-NR)		All	130/54	130/54	CF	CF	CF	CF	S	CF	CF	CF	CF	CF	CF	S	A	B	B	
Chromium Sulfate		All	210/99	180/82	100/38	U	A	S	S	S	S	S	U	U	A	U	B	B	CF	
Citric Acid		All	210/99	150/65	225/107	S	S	S	S	S	S	S	S	S	S	B	A	A	B	
Cobalt Citrate		12	180/82	120/49	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	A	
Coconut Oil		All	200/93	180/82	275/135	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	B	A	A	
Copper Acetate		All	CF	CF	200/93	S	S	S	S	S	S	S	U	S	S	B	B	B	CF	
Copper Chloride		All	250/121	180/82	225/107	U	A	S	S	A	U	U	S	S	U	U	U	B	B	
Copper Cyanide		All	210/99	180/82	225/107	S	CF	S	S	S	S	S	S	S	S	B	B	B	B	
Copper Cyanide Plating Bath		All	160/71	160/71	100/38	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	B	
Copper Cyanide, Potassium Cyanide, Potassium Hydroxide		8:3:2 oz/gal	100/38	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	B	
Copper Fluoroborate		40	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	CF	CF	
Copper Fluoride		Sat	CF	CF	225/107	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	CF	CF	
Copper Matte Dipping Bath		All	200/93	180/82	200/93	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	U	U	S	B	
Copper Nitrate		All	210/99	180/82	210/99	S	S	S	S	S	S	S	S	U	S	B	A	A	A	

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(**)-VR-1 BPO/DMA Required

C/F for mech seal and elas. above:
(1) 50F
(2) 70F
(3)125F
(4)150F

Material of Construction					Horizontal Pumps-mechanical seal										Vertical Pumps						
Chemical Environment	Notes	% Conc	Max Operating Temperature, °F/°C			Seal Type		Seal Flush		Seal Face Materials					Pump Seal Elastomer			Shaft and Hardware			
			VR-1	VR-1 Mag Drive & Wrapped Shaft Pumps Only	EY-2	Single	Double	External	Internal	Carbon-Ceramic	Carbon-SilCar	Silcar-Silcar	Viton	EPR	Per-Fluro Elastomer	316SS	C-20	Hast C	Titanium		
Copper Plating Solution		All	180/82	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	U	B	A	A		
Copper Sulfate		All	250/121	180/82	250/121	S	S	S	S	S	S	S	S	S	S	B	A	A	A		
Corn Oil		All	210/99	150/65	275/135	S	S	S	S	S	S	S	S	U	S	A	CF	CF	CF		
Corn Starch		Slu	210/99	CF	275/135	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF	CF		
Corn Sugar		All	180/82	CF	275/135	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	CF	CF	CF		
Cottonseed Oil		All	210/99	150/65	275/135	S	S	S	S	S	S	S	S	U	S	A	CF	CF	CF		
Crude Oil Sour/Sweet		100	250/121	150/65	275/135	S	S	S	S	S	S	S	S	U	S	A	A	CF	A		
Cumene		100	120/49	80/27	CF	U	A	S	S	S	S	S	S	U	S	B	B	B	B		
Cupric Chloride		5	250/121	180/82	200/93	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	U	U	B	B		
		50	250/121	180/82	200/93	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	U	U	B	B		
Cyclohexane		100	150/65	CF	175/79	S	S	S	S	S	S	S	S	U	S	B	B	B	B		
Cyclohexanol		All	CF	CF	200/93	S	S	S	S	S	S	S	S	U	S	A	A	A	CF		
Cyclohexanone		100	CF	CF	125/52	S	S	S	S	S	S	S	S	U	S	B	B	B	CF		
Deionized Water		100	180/82	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	A	A		
Deminerlized Water		100	180/82	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	A	A		
Desmut		10	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	A	U		
Detergents,Organic pH 9,11		All	180/82	160/71	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	B	A		
Detergents,Organic pH 12		100	180/82	160/71	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	B	A		
Detergents,Sulfonated		100	CF	CF	275/135	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF	CF		
Diacetone Alcohol (Acetol)		All	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	A	CF		
Diallylphthalate		All	210/99	150/65	150/65	S	S	S	S	S	S	S	S	U	U	S	A	CF	CF		
Di-Ammonium Phosphate		65	210/99	180/82	275/135	S	S	S	S	S	S	S	S	U	S	CF	CF	A	CF		
Dibutyl Ether		100	120/49	CF	125/52	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF	CF		
Dibutyl Sebacate		All	150/65	CF	CF	S	S	S	S	S	S	S	S	U	S	B	A	CF	CF		
Dibutylphthalate		All	180/82	CF	CF	S	S	S	S	S	S	S	S	U	U	A	A	A	CF		
Dichlorobenzene (Ortho)		100	100/38	U	180/82	U	A	S	S	S	S	S	S	U	S	B	B	A	A		
Dichloroethane		100	U	U	185/85	U	A	S	S	S	S	S	S	U	S	B	A	CF	CF		
Dichloroethylene		100	U	U	185/85	U	A	S	S	S	S	S	S	U	U	A	B	B	B	A	

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(*)-VR-IV Required
(**)-VR-1 BPO/DMA Required

C/F for mech seal and elas. above:
(1) 50F
(2) 70F
(3)125F
(4)150F

Material of Construction					Horizontal Pumps-mechanical seal										Vertical Pumps					
Chemical Environment	Notes	% Conc	Max Operating Temperature, °F/°C			Seal Type		Seal Flush		Seal Face Materials				Pump Seal Elastomer			Shaft and Hardware			
			VR-1	VR-1 Mag Drive & Wrapped Shaft Pumps Only	EY-2	Single	Double	External	Internal	Carbon-Ceramic	Carbon-SilCar	SilCar-SilCar	Viton	EPR	Per-Fluro Elastomer	316SS	C-20	Hast C	Titanium	
Dichloromethane		100	U	U	100/38	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF
2,4 Dichlorophenoxyacetic Acid		All	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF
Dichloropropane		100	80/27	U	185/85	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF
Dichloropropene		100	U	U	185/85	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF
Diesel Fuel		100	210/99	150/65	275/135	S	S	S	S	S	S	S	S	U	S	A	A	B	B	B
Diethanolamine		100	120/49	CF	150/65	S	S	S	S	S	S	S	U	U	A	A	A	A	A	A
Diethylamine		100	U	U	100/38	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF
Diethylbenzene		100	150/65	U	185/85	S	S	S	S	S	S	S	U	S	B	A	A	A	A	A
Diethyl Carbonate		100	80/27	U	100/38	S	S	S	S	S	S	S	U	U	A	A	A	A	A	A
Diethylene Glycol		100	210/99	180/82	275/135	S	S	S	S	S	S	S	S	S	A	A	B	A	A	A
Diethylene Glycol N-Butyl Ester		100	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	B	A	A	A
Diethylene Triamine		10	CF	CF	120/49	S	S	S	S	S	S	S	U	U	A	A	A	A	CF	CF
Diethylhexyl Phosphoric Acid (in Kerosene)		20	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	A	A	A	A
Di-Isobutyl Ketone		100	120/49	U	CF	U	A	S	S	S	S	S	U	U	A	A	A	A	CF	CF
Di-Isobutylene		100	100/38	80/27	225/107	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF	CF	CF	CF
Di-Isobutyl Phthalate		100	150/65	CF	175/79	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF	CF	CF	CF
Di-Isopropanolamine		100	120/49	100/38	120/49	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	A	A	A	A
Dimethyl Formamide		100	U	U	100/38	S	S	S	S	S	S	S	U	U	A	A	A	A	CF	CF
Dimethyl Ketone		See Acetone																		
Dimethyl Phthalate		100	180/82	CF	100/38	S	S	S	S	S	S	S	U	U	A	A	CF	CF	CF	CF
Dimethyl Sulfide		100	CF	U	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	B	B	B	B	B
2,2-Dimethyl Thiazolidine		1	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	CF	CF	CF	CF
Diocetyl Phthalate		100	210/99	150/65	175/79	S	S	S	S	S	S	S	S	S	A	CF	CF	CF	CF	CF
DMA #4		All	120/49	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	CF	CF	CF	CF
DMA #6		All	120/49	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	CF	CF	CF	CF
Diphenyl Oxide		100	100/38	U	CF	S	S	S	S	S	S	S	S	S	B	CF	B	A	A	A
Dipropylene Glycol		100	210/99	150/65	275/135	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	B	CF	CF	CF
Distilled Water		100	180/82	180/82	175/79	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	A	A	A	A
Divinylbenzene		100	120/49	U	175/79	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	CF	CF	CF	CF
Dodecyl Alcohol		100	CF	CF	225/107	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF	CF	CF	CF
Dodecene		100	180/82	120/49	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	CF	CF	CF	CF
Dodecyl Benzene Sulfonic Acid		All	200/93	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF	CF
Dowfax 2A1 Surfactant		45	120/49	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	A	CF	CF	CF	CF
Dowtherm A		100	150/65	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	A	B	A	A
Electrosol		5	150/65	CF	225/107	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF	CF	CF	CF

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(*)-VR-1V Required
(**)-VR-1 BPO/DMA Required

C/F for mech seal and elas. above:
(1) 50F
(2) 70F
(3)125F
(4)150F

Material of Construction					Horizontal Pumps-mechanical seal										Vertical Pumps						
Chemical Environment	Notes	% Conc	Max Operating Temperature, °F/°C			Seal Type		Seal Flush		Seal Face Materials					Pump Seal Elastomer			Shaft and Hardware			
			VR-1	VR-1 Mag Drive & Wrapped Shaft Pumps Only	EY-2	Single	Double	External	Internal	Carbon-Ceramic	Carbon-SilCar	SilCar-SilCar	Viton	EPR	Per-Fluro Elastomer	316SS	C-20	Hast C	Titanium		
Epichlorohydrin		100	CF	U	100/38	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	A	A	CF	
Esteron 99 Herbicide		100	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	U	CF	A	U	
Esters, Fatty Acids		100	180/82	150/65	275/135	S	S	S	S	S	S	S	S	U	S	A	CF	CF	CF		
Ethanol		See Alcohol, Ethyl																			
Ethanolamine		100	90/32	U	CF	S	S	S	S	S	S	S	U	S	S	A	A	CF	CF		
Ethyl Acetate		100	CF	U	150/65	S	S	S	S	S	S	S	U	U	A	A	A	A	CF		
Ethyl Acrylate		100	CF	U	150/65	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF		
Ethyl Alcohol		See Alcohol, Ethyl																			
Ethyl Benzene		100	100/38	CF	185/85	S	S	S	S	S	S	S	U	S	B	A	A	A			
Ethyl Bromide		All	CF	U	100/38	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF		
Ethyl Cellosolve		All	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	CF	CF			
Ethyl Chloride		100	CF	U	100/38	S	S	S	S	S	S	S	S	S	A	A	B	A			
Ethyl Ether		100	U	U	120/49	U	A	S	S	S	S	S	U	S	A	A	B	A			
Ethylene Chlorohydrin		100	100/38	U	CF	U	A	S	S	S	S	S	U	S	B	B	A	A			
Ethylene Dichloride		100	U	U	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF			
Ethylene Glycol		All	210/99	150/65	275/135	S	S	S	S	S	S	S	S	S	A	A	B	CF			
Ethylene Glycol Monobutyl Ether		100	100/38	U	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	A	A			
Ethylenediamine		100	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF			
Ethyl Sulfate		100	100/38	100/38	100/38	U	A	S	S	S	S	S	U	U	A	B	B	B	CF		
Fatty Acids		All	250/121	150/65	275/135	S	S	S	S	S	S	S	U	S	B	A	A	A			
Ferric Chloride		All	210/99	180/82	275/135	U	A	S	S	S	CF	CF	S	S	U	U	U	U	A		
Ferric Chloride:Ferrous Chloride		5:20	210/99	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	U	U	S	A			
Ferric Chloride:Ferrous Chloride:Hydrochloric Acid		48:0.2:0.2	220/104	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	S	B			
Ferric Chloride:Hydrochloric Acid		29:18:5	220/104	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	U	U	B	U			
Ferric Nitrate		100	CF	CF	275/135	S	S	S	S	S	S	S	S	S	B	A	B	A			
Ferric Sulfate		All	210/99	180/82	275/135	S	S	S	S	S	S	S	S	S	B	A	B	A			
Ferrous Chloride		All	210/99	180/82	275/135	S	S	S	S	A	CF	CF	U	U	U	U	B	A			
Ferrous Chloride:Ferric Chloride		20:5	210/99	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	U	U	S	A			
Ferrous Nitrate		All	210/99	180/82	275/135	CF	CF	CF	CF	CF	CF	CF	U	CF	B	A	B	A			

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(*)-VR-IV Required
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C/F for mech seal and elas. above:
(1) 50F
(2) 70F
(3)125F
(4)150F

Material of Construction						Horizontal Pumps-mechanical seal										Vertical Pumps					
Chemical Environment	Notes	% Conc	Max Operating Temperature, °F/°C			Seal Type		Seal Flush		Seal Face Materials					Pump Seal Elastomer			Shaft and Hardware			
			VR-1	VR-1 Mag Drive & Wrapped Shaft Pumps	EY-2	Single	Double	External	Internal	Carbon-Ceramic	Carbon-SilCar	SilCar-SilCar	Viton	EPR	Per-Fluro Elastomer	316SS	C-20	Hast C	Titanium		
Ferrous Sulfate		All	210/99	180/82	275/135	S	S	S	S	A	CF	CF	S	U	S	U	B	B	B		
Fertilizer, URAN		All	150/65	150/65	275/135	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	A		
Fertilizer, 8-8-8		All	150/65	150/65	275/135	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	CF		
Fluoboric Acid	(*)	All	210/99	150/65	75/24	S	S	S	S	S	S	S	U	S	S	S	B	A	U		
Fluoride Salts:HCL	(*)	30:10	120/49	120/49	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF		
Fluosilicic Acid	(*)	10	180/82	150/65	125/52	U	A	S	S	CF	CF	CF	S	S	S	CF	CF	CF	S		
		25	100/38	100/38	125/52	U	A	S	S	CF	CF	CF	S	S	S	CF	CF	CF	S		
		35	100/38	100/38	CF	U	A	S	S	CF	CF	CF	S	S	S	CF	CF	CF	S		
Formaldehyde		All	150/65	CF	150/65	U	A	S	S	S	S	S	U	S	S	B	B	B	CF		
Formic Acid		10	180/82	150/65	120/49	S	S	S	S	S	S	S	U	A	U	S	B	A	S		
		50	120/49	CF	CF	S	S	S	S	S	S	S	U	A	U	S	B	A	S		
		88	CF	CF	120/49	S	S	S	S	S	S	S	U	A	U	S	B	A	S		
		100	CF	CF	100/38	S	S	S	S	S	S	S	U	A	U	S	B	A	S		
Freon 11		100	100/38	U	75/24	S	S	S	S	CF	S	S	U	U	U	S	A	A	A		
Freon 12		100	100/38	U	75/24	S	S	S	S	CF	S	S	U	U	U	S	A	A	A		
Fuel Oil		100	210/99	150/65	275/135	S	S	S	S	S	S	S	U	S		A	A	A	A		
Furfural		100	U	U	100/38	S	S	S	S	S	S	S	U	U	A	B	B	B	A		
Furfuryl Alcohol		100	U	U	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF		
Galecron 4EC Insecticide		100	120/49	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	U	U	B	B		
Gasoline, Leaded		100	180/82	150/65	250/121	S	S	S	S	S	S	S	U	S		A	A	A	B		
Gluconic Acid		50	CF	CF	120/49	S	S	S	S	S	S	S	U	U	A	U	B	B	A		
Glucose		100	180/82	CF	275/135	S	S	S	S	CF	CF	CF	CF	CF	CF	A	CF	CF	CF		
Glutaraldehyde		50	120/49	120/49	150/65	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	CF		
Glutaric Acid		50	120/49	CF	CF	S	S	S	S	S	S	S	U	S	CF	CF	B	CF			
Glycerine		100	210/99	150/65	275/135	S	S	S	S	S	S	S	S	S	S	B	B	B	B		
Glycol, Ethylene		See Ethylene Glycol																			
Glycol, Propylene		See Propylene Glycol																			
Glycolic Acid		70	100/38	CF	100/38	S	S	S	S	S	S	S	U	U	A	A	CF	CF	B		

A-Preferred
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CF-Consult Factory

(*)-VR-IV Required
(**)-VR-1 BPO/DMA Required

C/F for mech seal and elas. above:
(1) 50F
(2) 70F
(3)125F
(4)150F

Material of Construction					Horizontal Pumps-mechanical seal										Vertical Pumps					
Chemical Environment	Notes	% Conc	Max Operating Temperature, °F/°C			Seal Type		Seal Flush		Seal Face Materials				Pump Seal Elastomer			Shaft and Hardware			
			VR-1	VR-1 Mag Drive & Wrapped Shaft Pumps	EY-2	Single	Double	External	Internal	Carbon-Ceramic	Carbon-SilCar	SilCar-SilCar	Viton	EPR	Per-Fluro Elastomer	316SS	C-20	Hast C	Titanium	
Hydrogen Sulfide		5	350/177	180/82	CF	S	S	S	S	S	S	S	S	U	S	S	B	A	A	A
		100	CF	CF	CF	S	S	S	S	S	S	S	S	U	S	S	B	A	A	A
Hydrosulfite Bleach		All	180/82	180/82	U	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A
Hydroxyacetic Acid		70	100/38	CF	CF	S	S	S	S	S	S	S	U	U	U		CF	CF	A	CF
Hypochlorous Acid	(**)	10	100/38	100/38	U	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B
		20	CF	CF	U	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B
Hypophosphorous Acid		50	120/49	120/49	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	CF
Insecticides		All	120/49	CF	CF	S	S	S	S	S	S	S	U	U	A		S	S	B	CF
Iodine		100	150/65	150/65	200/93	S	S	S	S	S	S	S	S	U	S		S	S	B	U
Iron Plating Solution		100	250/121	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	S	B	B	A
Iron and Steel Cleaning Bath		All	210/99	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	U	U	A	U
Isodecanol		100	150/65	120/49	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	A	CF
Isopropyl Alcohol		See Alcohol, Isopropyl																		
Isopropyl Amine		100	U	U	125/52	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	B	B
Isopropyl Myristate		100	230/110	150/65	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	A	CF	CF
Isopropyl Palmitate		100	230/110	150/65	275/135	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	A	CF	CF
Jet Fuel (JP-4)		100	140/60	140/60	275/135	S	S	S	S	S	S	S	S	U	S		A	A	A	A
Kerosene		100	180/82	150/65	275/135	S	S	S	S	S	S	S	S	U	S		A	A	A	A
Lactic Acid		All	210/99	150/65	275/135	S	S	S	S	S	S	S	S	S	S		B	B	A	A
Latex		100	120/49	120/49	275/135	U	A	S	S	S	S	S	S	S	S		A	CF	CF	CF
Lauric Acid		100	CF	CF	275/135	S	S	S	S	CF	CF	CF	U	U	A		A	CF	CF	CF
Lauroyl Chloride		100	120/49	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF		A	B	CF	CF
Lauryl Alcohol		100	180/82	120/49	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF		A	CF	CF	CF
Lauryl Chloride		100	210/99	150/65	200/93	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF		A	CF	CF	CF
Lead Acetate		All	230/110	CF	225/107	U	A	A	U	S	S	S	U	S	S		B	B	A	A

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(*)-VR-IV Required
(**)-VR-1 BPO/DMA Required

C/F for mech seal and elas. above:
(1) 50F
(2) 70F
(3)125F
(4)150F

Material of Construction					Horizontal Pumps-mechanical seal										Vertical Pumps					
Chemical Environment	Notes	% Conc	Max Operating Temperature, °F/°C			Seal Type		Seal Flush		Seal Face Materials				Pump Seal Elastomer			Shaft and Hardware			
			VR-1	VR-1 Mag Drive & Wrapped Shaft Pumps Only	EY-2	Single	Double	External	Internal	Carbon-Ceramic	Carbon-SilCar	Silcar-Silcar	Viton	EPR	Per-Fluro Elastomer	316SS	C-20	Hast C	Titanium	
Lead Nitrate		All	CF	CF	225/107	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	B	
Levulinic Acid		All	230/110	CF	250/121	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	A	CF	
Linseed Oil		100	230/110	150/65	275/135	S	S	S	S	S	S	S	S	U	S	A	A	A	A	
Lithium Bromide		Sat	250/121	180/82	275/135	S	S	S	S	CF	CF	CF	S	U	S	A	A	A	CF	
Lithium Carbonate		All	180/82	180/82	CF	U	A	A	U	S	CF	CF	U	U	A	B	B	B	A	
Lithium Chloride		Sat	250/121	180/82	275/135	U	A	A	U	S	CF	CF	U	U	A	U	A	CF	A	
Lithium Hydroxide		Sat	180/82	180/82	225/107	U	A	A	U	S	CF	CF	U	U	A	B	B	CF	CF	
Lithium Hypochlorite	(**)	All	180/82	180/82	CF	U	A	A	U	S	CF	CF	U	U	A	U	U	B	A	
Magnesium Bisulfite		All	210/99	180/82	225/107	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	A	
Magnesium Carbonate		All	180/82	180/82	225/107	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	B	
Magnesium Chloride		All	250/121	180/82	275/135	U	A	A	U	U	S	S	S	S	S	B	B	A	A	
Magnesium Hydroxide		100	210/99	180/82	225/107	U	A	A	U	S	S	S	S	S	S	B	B	B	CF	
Magnesium Nitrate		All	210/99	180/82	275/135	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	B	
Magnesium Phosphate		All	210/99	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	S	S	S	B	
Magnesium Sulfate		All	250/121	180/82	275/135	U	A	A	U	S	S	S	S	S	S	B	B	B	A	
Maleic Acid		100	210/99	180/82	175/79	U	A	A	U	S	S	S	S	U	S	B	B	A	A	
Mercaptoacetic Acid		All	80/27	U	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	
Mercuric Chloride		100	210/99	180/82	275/135	U	A	A	U	S	S	S	S	S	S	U	U	S	B	
Mercury		100	250/121	150/65	CF	U	A	A	U	S	S	S	S	S	S	A	A	B	A	
Methacrylic Acid		100	CF	CF	CF	S	S	S	S	S	S	S	U	S	S	CF	CF	CF	CF	
Methallyl Chloride (in solution w/HCl)		All	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	U	U	A	U	U	A	CF	
Methyl Alcohol (Methanol)		5	120/49	120/49	175/79	S	S	S	S	S	S	S	U	S	S	A	A	S	A	
		10	90/32	U	175/79	S	S	S	S	S	S	S	U	S	S	A	A	S	A	
		50	CF	U	175/79	S	S	S	S	S	S	S	U	S	S	A	A	S	A	
		80	CF	U	175/79	S	S	S	S	S	S	S	U	S	S	A	A	S	A	
		100	CF	U	150/65	S	S	S	S	S	S	S	U	S	S	A	A	S	A	

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(*)-VR-IV Required
(**)-VR-1 BPO/DMA Required

C/F for mech seal and elas. above:
(1) 50F
(2) 70F
(3)125F
(4)150F

Material of Construction					Horizontal Pumps-mechanical seal										Vertical Pumps						
Chemical Environment	Notes	% Conc	Max Operating Temperature, °F/°C			Seal Type		Seal Flush		Seal Face Materials					Pump Seal Elastomer			Shaft and Hardware			
			VR-1	VR-1 Mag Drive & Wrapped Shaft Pumps Only	EY-2	Single	Double	External	Internal	Carbon-Ceramic	Carbon-SilCar	Silcar-Silcar	Viton	EPR	Per-Fluro Elastomer	316SS	C-20	Hast C	Titanium		
Methyl Cellosolve		All	CF	CF	CF	S	S	S	S	S	S	S	U	U	A	A	A	CF	CF		
Methylene Chloride		100	U	U	100/38	S	S	S	S	S	S	S	U	U	A	B	B	A	A		
Methyl Ethyl Ketone		100	CF	U	175/79	S	S	S	S	S	S	S	Y	S	S	B	B	B	A		
Methyl Isobutyl Carbitol		100	CF	CF	75/24	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	CF	CF		
Methyl Isobutyl Ketone		100	100/38	U	175/79	S	S	S	S	S	S	S	U	U	A	B	B	B	A		
Methyl Styrene (Alpha)		See Alpha Methyl Styrene																			
Mineral Oil		100	250/121	150/65	275/135	S	S	S	S	S	S	S	U	S	A	A	CF	A			
Molybdenum Disulfide		100	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	A	CF			
Monochloroacetic Acid		See Chloroacetic Acid																			
Monochlorobenzene		See Chlorobenzene																			
Monoethanolamine		See Ethanolamine																			
Monomethylhydrazine		100	U	U	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF		
Morpholine		100	U	U	CF	S	S	S	S	S	S	S	U	U	A	CF	CF	CF	CF		
Motor Oil		All	250/121	150/65	275/135	S	S	S	S	S	S	S	U	S	A	A	CF	CF			
Muriatic Acid		See Hydrochloric Acid																			
Myristic Acid		100	250/121	150/65	250/121	S	S	S	S	S	S	S	U	U	A	A	CF	CF	CF		
Naphtha		100	210/99	180/82	275/135	S	S	S	S	S	S	S	U	A	A	A	A	A	A		
Naphthalene		100	210/99	180/82	225/107	S	S	S	S	S	S	S	U	A	A	A	A	A	A		
Neutralizer & Desmut		All	150/65	150/65	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	A	U			
Nickel Chloride		All	210/99	180/82	275/135	CF	CF	CF	CF	CF	CF	CF	CF	CF	U	S	A	A			
Nickel Nitrate		All	210/99	180/82	275/135	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	A			
Nickel Plating Solution		All	180/82	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF	CF			
Nickel Sulfate		All	210/99	180/82	275/135	S	S	S	S	S	S	S	S	S	B	B	B	B			
Nitric Acid	(2)	5	180/82	150/65	150/65	S	S	CF	S	A	B	B	A	U	B	A	B	B	B		
	(2)	10	150/65	120/49	120/49	S	S	CF	S	A	B	B	A	U	B	A	B	B	B		
	(2)	20	120/49	120/49	75/24	S	S	CF	S	A	B	B	A	U	B	A	B	B	B		
	(2)	25	100/38	100/38	75/24	S	S	CF	S	A	B	B	A	U	B	A	B	B	B		
Nitrobenzene		100	80/27	U	200/93	U	A	A	U	S	S	S	U	U	A	A	A	B	A		
Octanoic Acid		100	210/99	CF	225/107	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	CF	CF			

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(*)-VR-IV Required
(**)-VR-1 BPO/DMA Required

C/F for mech seal and elas. above:
(1) 50F
(2) 70F
(3)125F
(4)150F

Material of Construction						Horizontal Pumps-mechanical seal										Vertical Pumps				
Chemical Environment	Notes	% Conc	Max Operating Temperature, °F/°C			Seal Type		Seal Flush		Seal Face Materials				Pump Seal Elastomer			Shaft and Hardware			
			VR-1	VR-1 Mag Drive & Wrapped Shaft Pumps Only	EY-2	Single	Double	External	Internal	Carbon-Ceramic	Carbon-SiCar	Silcar-Silcar	Viton	EPR	Per-Fluro Elastomer	316SS	C-20	Hast C	Titanium	
Oil, Crude		100	250/121	150/65	275/135	S	S	S	S	S	S	S	S	U	S	B	A	A	A	
Oleic Acid		100	210/99	CF	275/135	S	S	S	S	S	S	S	U	U	S	B	A	A	A	
Oleum (Fuming Sulfuric)		100	U	U	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	
Oleum Sulfates (Alpha)		100	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	U	
Olive Oil		100	250/121	CF	275/135	S	S	S	S	S	S	S	U	S	A	CF	CF	CF	CF	
Oxalic Acid		Sat	120/49	CF	225/107	U	A	CF	CF	CF	CF	CF	CF	CF	S	B	B	U	U	
Ozone		2mg/l	100/38	100/38	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF	CF	CF	
Palmitic Acid		100	250/121	CF	CF	S	S	S	S	S	S	S	U	S	A	A	CF	CF	CF	
Peanut Oil		100	180/82	CF	CF	S	S	S	S	S	S	S	U	S	A	A	A	A	A	
Pentanedioic Acid		50	120/49	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	CF	CF	CF	
Perchloric Acid		10	150/65	150/65	CF	U	A	A	U	S	S	S	U	S	U	B	CF	A	A	
		30	100/38	100/38	CF	U	A	A	U	S	S	S	U	S	U	B	CF	A	A	
Perchloroethylene		100	120/49	U	150/65	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	A	A	A	
Peroxide Bleach		All	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	CF	A	A	
Phenol (Carbolic Acid)		5	80/27	U	175/79	U	A	A	U	S	S	S	U	S	A	A	A	A	A	
Phenol Sulfonic Acid		All	80/27	CF	CF	S	S	S	S	S	S	U	U	S	CF	CF	CF	CF	CF	
Phosphoric Acid(Aerated)	(4)	25	210/99	180/82	150/65	S	S	CF	S	A	B	B	A	B	S	A	B	B	U	
	(4)	50	210/99	180/82	150/65	S	S	CF	S	A	B	B	A	B	S	A	B	B	U	
	(4)	80	210/99	180/82	150/65	S	S	CF	S	A	B	B	A	B	S	A	B	B	U	
	(4)	85	210/99	180/82	125/52	S	S	CF	S	A	B	B	A	B	S	A	B	B	U	
	(4)	100	210/99	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	B	B	U	U	
Phosphoric Acid (Superphosphoric Acid)		105	210/99	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	U	U	
Phosphoric Acid (Polyphosphoric Acid)		115	210/99	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	U	U	
Phosphoric Acid:Hydrochloric Acid, Sat'd with Cl ₂		15:9	210/99	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	
Phosphorous Acid		70	180/82	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	A	CF	CF	
Phosphorous Pentoxide		54	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	CF	CF	CF	
Phosphorous Trichloride		100	U	U	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	
Phthalic Acid		All	210/99	CF	CF	S	S	S	S	S	S	U	U	S	B	B	B	B	B	
Pickling Acids:Sulfuric & Hydrochloric Acids		All	CF	CF	200/93	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	CF	CF	
Picric Acid (Alcoholic)		10	CF	U	100/38	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	A	A	A	A	
Platinum Plating Solution		All	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	
Polyethyleneimine		All	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	A	CF	CF	
Potassium Aluminum Sulfate		All	250/121	180/82	275/135	S	S	A	U	S	U	U	U	S	B	A	B	A	A	
Potassium Bicarbonate		10	180/82	180/82	225/107	S	S	A	U	S	S	S	U	S	A	B	B	A	A	
		50	180/82	180/82	225/107	S	S	A	U	S	S	S	U	S	B	B	B	A	A	

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(*)-VR-1V Required
(**)-VR-1 BPO/DMA Required

C/F for mech seal and elas. above:
(1) 50F
(2) 70F
(3)125F
(4)150F

Material of Construction					Horizontal Pumps-mechanical seal										Vertical Pumps						
Chemical Environment	Notes	% Conc	Max Operating Temperature, °F/°C			Seal Type		Seal Flush		Seal Face Materials					Pump Seal Elastomer			Shaft and Hardware			
			VR-1	VR-1 Mag Drive & Wrapped Shaft Pumps Only	EY-2	Single	Double	External	Internal	Carbon-Ceramic	Carbon-SilCar	SilCar-SilCar	Viton	EPR	Per-Fluro Elastomer	316SS	C-20	Hast C	Titanium		
Potassium Bromide		All	210/99	180/82	275/135	S	S	A	U	S	S	S	S	U	S	B	B	B	A		
Potassium Carbonate		10	180/82	180/82	CF	S	S	A	U	S	S	S	S	U	S	B	A	A	A		
		14	180/82	180/82	225/107	S	S	A	U	S	S	S	S	U	S	B	A	A	A		
		25	180/82	180/82	CF	S	S	A	U	S	S	S	S	U	S	B	A	A	A		
		50	180/82	180/82	CF	S	S	A	U	S	S	S	S	U	S	B	A	A	A		
		Sat	CF	CF	225/107	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	A	A	A		
Potassium Chlorate		20	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	B	A		
Potassium Chloride		All	210/99	180/82	275/135	U	A	A	U	S	S	S	S	S	S	U	B	A	A		
Potassium Dichromate		All	210/99	180/82	CF	S	S	A	U	S	S	S	S	S	S	B	B	B	A		
Potassium Ferricyanide		All	210/99	180/82	275/135	S	S	A	U	S	S	S	S	U	S	B	B	B	A		
Potassium Ferrocyanide		All	210/99	180/82	275/135	S	S	A	U	S	S	S	S	U	S	B	B	B	A		
Potassium Fluoride		All	180/82	180/82	150/65	S	S	A	U	S	S	S	S	U	S	B	CF	B	A		
Potassium Gold Cyanide		12	210/99	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF	CF		
Potassium Hydroxide		10	100/38	CF	CF	S	S	A	U	S	U	U	U	S	S	B	B	B	B		
		25	100/38	CF	CF	S	S	A	U	S	U	U	U	S	S	B	B	B	B		
		45	100/38	CF	CF	S	S	A	U	S	U	U	U	S	S	B	B	B	S		
		Sat	CF	CF	240/115	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	S		
Potassium Hydroxide:Potassium Cyanide:Copper Cyanide		2:3:8	100/38	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	CF	CF		
Potassium Nitrate		All	210/99	180/82	240/115	S	S	A	U	S	S	S	U	U	S	A	A	A	A		
Potassium Permanganate		All	210/99	180/82	CF	S	S	A	U	S	S	S	U	U	S	S	S	B	CF		
		5	210/99	180/82	225/107	S	S	A	U	S	S	S	U	U	S	B	B	B	A		
		10	210/99	180/82	175/79	S	S	A	U	S	S	S	U	U	S	B	B	B	A		
Potassium Persulfate		All	210/99	180/82	CF	S	S	A	U	S	S	S	S	U	S	B	B	CF	CF		
Potassium Pyrophosphate		60	150/65	130/54	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF	CF		
Potassium Sulfate		All	210/99	180/82	275/135	U	A	A	U	S	S	S	S	S	S	CF	B	B	A		
Propane		100	140/60	140/60	75/24	S	S	S	S	S	S	S	S	U	S	A	A	CF	A		
Propionic Acid		20	180/82	180/82	120/49	S	S	S	S	S	S	S	U	U	S	S	B	B	A		
		50	180/82	180/82	120/49	S	S	S	S	S	S	S	U	U	S	S	B	B	A		
		100	80/27	U	100/38	S	S	S	S	S	S	S	U	U	S	S	B	B	A		
Propylene Dichloride		100	CF	CF	CF	S	S	S	S	S	S	S	U	U	S	B	A	B	A		

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C/F for mech seal and elas. above:
(1) 50F
(2) 70F
(3)125F
(4)150F

Material of Construction					Horizontal Pumps-mechanical seal										Vertical Pumps						
Chemical Environment	Notes	% Conc	Max Operating Temperature, °F/°C			Seal Type		Seal Flush		Seal Face Materials					Pump Seal Elastomer			Shaft and Hardware			
			VR-1	VR-1 Mag Drive & Wrapped Shaft Pumps	EY-2	Single	Double	External	Internal	Carbon-Ceramic	Carbon-SilCar	SilCar-SilCar	Viton	EPR	Per-Fluro Elastomer	316SS	C-20	Hast C	Titanium		
Propylene Glycol		All	210/99	CF	275/135	S	S	S	S	S	S	S	S	S	U	S	B	CF	B	A	
Pulp Paper Mill Effluent		All	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF	CF	
Pyridine		100	U	U	125/52	U	A	A	U	S	S	S	S	U	S	A	A	B	A		
Red Liquor		All	180/82	150/65	CF	U	A	CF	CF	CF	CF	CF	CF	S	S	S	A	CF	CF	CF	
Salicylic Acid		All	160/71	CF	150/65	S	S	S	S	S	S	S	S	S	S	S	B	A	B	A	
Salt Brine		30	250/121	180/82	275/135	S	S	S	S	S	S	S	S	S	S	S	S	B	A	A	
Sea Water		All	210/99	180/82	CF	S	S	S	S	S	S	S	S	S	S	S	B	B	A	A	
Selenious Acid		All	210/99	180/82	CF	S	S	S	S	S	S	S	U	U	S	A	A	A	CF		
Silicic Acid		100	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	B	A	A		
Silver Nitrate		All	210/99	180/82	225/107	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	CF	A	
Silver Plating Solution		All	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	A	A		
Soaps		All	CF	CF	275/135	S	S	S	S	S	S	S	S	S	S	A	A	A	A		
Sodium Acetate		All	210/99	CF	225/107	S	S	A	U	S	S	S	U	S	S	CF	CF	A	A		
Sodium Alkyd Aryl Sulfonates		All	180/82	150/65	225/107	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF	CF		
Sodium Aluminate		All	160/71	120/49	225/107	S	S	A	U	S	S	S	S	U	S	A	A	B	A		
Sodium Benzoate		100	180/82	180/82	250/121	S	S	A	U	S	S	S	S	U	S	B	CF	CF	A		
Sodium Bicarbonate		All	180/82	180/82	225/107	S	S	A	U	S	S	S	S	S	S	A	A	A	A		
Sodium Bicarbonate:Sodium Carbonate		15:20	180/82	180/82	CF	S	S	A	U	S	S	S	S	S	S	A	A	B	A		
Sodium Bifluoride	(*)	All	120/49	120/49	CF	S	S	A	U	S	S	S	U	S	S	CF	CF	CF	A		
Sodium Bisulfate		All	210/99	180/82	225/107	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	A	A	B		
Sodium Bisulfite		Sat	210/99	180/82	250/121	S	S	A	U	S	S	S	S	S	S	CF	A	A	A		
Sodium Borate		Sat	210/99	180/82	CF	S	S	A	U	S	S	S	S	S	S	B	A	A	A		
Sodium Bromate		All	210/99	180/82	CF	S	S	A	U	S	S	S	S	S	S	A	A	A	CF		
Sodium Bromide		All	210/99	180/82	275/135	S	S	A	U	S	S	S	S	S	S	CF	CF	CF	A		
Sodium Carbonate		10	180/82	180/82	225/107	S	S	A	U	S	S	S	S	S	S	A	A	A	A		
		25	180/82	180/82	225/107	S	S	A	U	S	S	S	S	S	S	A	A	A	A		
		32	180/82	180/82	225/107	S	S	A	U	S	S	S	S	S	S	B	A	A	A		

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(1) 50F
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Material of Construction						Horizontal Pumps-mechanical seal										Vertical Pumps					
Chemical Environment	Notes	% Conc	Max Operating Temperature, °F/°C			Seal Type		Seal Flush		Seal Face Materials					Pump Seal Elastomer			Shaft and Hardware			
			VR-1	VR-1 Mag Drive & Wrapped Shaft Pumps Only	EY-2	Single	Double	External	Internal	Carbon-Ceramic	Carbon-SilCar	Silcar-Silcar	Viton	EPR	Per-Fluro Elastomer	316SS	C-20	Hast C	Titanium		
		35	180/82	180/82	225/107	S	S	A	U	S	S	S	S	S	S	S	B	A	A	A	
		50	180/82	180/82	225/107	S	S	A	U	S	S	S	S	S	S	S	B	A	A	A	
Sodium Carbonate:Sodium Bicarbonate		20:15	180/82	180/82	CF	S	S	A	U	S	S	S	S	S	S	S	A	A	A	A	
Sodium Chlorate		50	210/99	180/82	200/93	U	A	A	U	S	S	S	S	S	S	S	B	B	B	B	
		Sat	CF	CF	200/93	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	B	
Sodium Chlorate:Sodium Chloride		3.2M:3.4M	210/99	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	A	
Sodium Chloride		Sat	210/99	180/82	275/135	S	S	A	U	S	S	S	S	S	S	S	S	CF	CF	A	
Sodium Chloride & Cl ₂		Sat	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	U	B	A	A	
Sodium Chloride:Sodium Chlorate		3.4M:3.2M	210/99	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	A	
Sodium Chlorite		10	180/82	180/82	CF	U	A	A	U	S	S	S	S	S	S	S	CF	CF	CF	A	
		50	180/82	180/82	CF	U	A	A	U	S	S	S	S	S	S	S	CF	CF	CF	A	
Sodium Chromate		50	210/99	180/82	CF	S	S	A	U	S	S	S	S	S	S	S	A	A	A	A	
Sodium Cyanide		6	210/99	CF	250/121	U	A	A	U	S	S	S	S	S	S	S	U	A	CF	A	
		All	210/99	CF	CF	U	A	S	S	S	S	S	S	S	S	S	U	A	CF	A	
Sodium Dichromate		100	210/99	180/82	CF	S	S	A	U	S	S	S	U	U	U	U	A	CF	A	CF	
Sodium Diphosphate		100	210/99	180/82	CF	S	S	A	U	S	S	S	U	U	S	S	B	B	A	A	
Sodium Dodecylbenzene Sulfonate		20	160/71	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	A	CF	
Sodium Ferricyanide		All	210/99	CF	275/135	S	S	A	U	S	S	S	S	U	S	S	B	B	A	A	
Sodium Ferrocyanide		All	210/99	180/82	275/135	S	S	A	U	S	S	S	S	U	S	S	B	B	A	A	
Sodium Fluoride	(*)	All	180/82	180/82	200/93	S	S	A	U	S	S	S	U	S	S	S	U	S	A	A	
Sodium Fluoro Silicate	(*)	All	120/49	120/49	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	CF	CF	CF	
Sodium Hexametaphosphate		All	180/82	180/82	CF	U	A	A	U	S	S	S	U	U	S	S	B	B	B	B	
Sodium Hydrosulfide		All	180/82	180/82	CF	S	S	A	U	S	S	S	U	U	S	S	B	B	CF	CF	
Sodium Hydroxide		0.5	150/65	150/65	200/93	S	S	S	CF	A	B	B	U	A	A	A	A	B	B	B	
		1	150/65	150/65	200/93	S	S	S	CF	A	B	B	U	A	A	A	A	B	B	B	
		5	150/65	150/65	200/93	S	S	S	CF	A	B	B	U	A	A	A	A	B	B	B	
		10	150/65	150/65	215/101	S	S	S	CF	A	B	B	U	A	A	A	A	B	B	B	
		15	150/65	150/65	215/101	S	S	S	CF	A	B	B	U	A	A	A	A	B	B	B	
		25	150/65	150/65	225/107	S	S	S	CF	A	B	B	U	A	A	A	A	B	B	B	
		50	150/65	150/65	240/115	S	S	S	CF	A	B	B	U	A	A	A	A	B	B	B	
Sodium Hypochlorite (pH>11)	(**)(3)	0.5	180/82	150/65	CF	S	S	S	CF	A	B	B	A	B	S	S	U	U	B	A	
	(**)(3)	1	180/82	150/65	CF	S	S	S	CF	A	B	B	A	B	S	S	U	U	B	A	
	(**)(3)	5-1/4	180/82	150/65	CF	S	S	S	CF	A	B	B	A	B	S	S	U	U	B	A	

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(1) 50F
(2) 70F
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(4)150F

Material of Construction						Horizontal Pumps-mechanical seal										Vertical Pumps					
Chemical Environment	Notes	% Conc	Max Operating Temperature, °F/°C			Seal Type		Seal Flush		Seal Face Materials				Pump Seal Elastomer				Shaft and Hardware			
			VR-1	VR-1 Mag Drive & Wrapped Shaft Pumps	EY-2	Single	Double	External	Internal	Carbon- Ceramic	Carbon- SiCar	SiCar- SiCar	Viton	EPR	Per-Fluro Elastomer	316SS	C-20	Hast C	Titanium		
	(**) (3)	10	180/82	150/65	CF	S	S	S	CF	A	B	B	A	B	S	U	U	B	A		
	(**) (3)	15	180/82	150/65	CF	S	S	S	CF	A	B	B	A	B	S	U	U	B	A		
	(**) (3)	18	180/82	150/65	CF	S	S	S	CF	A	B	B	A	B	S	U	U	B	A		
Sodium Hypochlorite,5% NaOH Scrubbing Cl2 ClO2	(**) (3)	All	CF	CF	CF	S	S	S	CF	A	B	B	A	B	S	U	U	B	A		
Sodium Lauryl Sulfate		All	160/71	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	A	CF		
Sodium Methoxide		40	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	S	A	A	B		
Sodium Monophosphate		All	210/99	180/82	CF	S	S	A	U	S	S	S	U	U	S	B	B	A	A		
Sodium Nitrate		All	210/99	180/82	275/135	S	S	A	U	S	S	S	U	S	S	A	A	A	A		
Sodium Nitrite		All	210/99	180/82	275/135	S	S	A	U	S	S	S	U	S	S	U	CF	CF	A		
Sodium Peroxide		All	CF	CF	CF	U	A	A	U	S	S	S	S	S	S	A	A	CF	CF		
Sodium Persulfate		20	210/99	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	CF	CF		
Sodium Phosphate		10	210/99	180/82	CF	S	S	A	U	S	S	S	S	S	S	B	B	B	B		
Sodium Polyacrylate, pH 9-10.5		25	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	A	CF	CF		
Sodium Silicate		All	210/99	180/82	225/107	S	S	A	U	S	S	S	S	S	S	A	A	B	A		
Sodium Sulfate		All	210/99	180/82	275/135	S	S	A	U	S	S	S	S	S	S	B	B	B	B		
Sodium Sulfide		All	210/99	180/82	CF	S	S	A	U	S	S	S	S	S	S	B	B	B	B		
Sodium Sulfite		All	210/99	180/82	CF	S	S	A	U	S	S	S	S	S	S	S	B	B	A		
Sodium Tetraborate		Sat	180/82	180/82	CF	S	S	A	U	S	S	S	S	S	S	A	CF	CF	CF		
Sodium Thiocyanate		57	180/82	180/82	225/107	S	S	A	U	CF	CF	CF	U	U	S	A	A	CF	CF		
Sodium Thiosulfate		All	180/82	180/82	200/93	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	A	A	A		
Sodium Tripolyphosphate		Sat	210/99	180/82	225/107	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF	CF		
Sodium Xylene Sulfonate		All	160/71	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	A	CF		
Solder Plate		All	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	A	U		
Solvent Composite-35% Xylene, 35% Kerosene, 30% Di- 2-Ethylhexyl, Phosphoric Acid		All	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	A	A		
Solvent Extraction Solutions- 4% Trioctylphosphine Oxide, 4% Diethylhexyl Phosphoric Acid, 92% Kerosene		All	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	A	A		
Solvent Extraction Solutions- 3% Isodecanol, 6% Alamine 336, 91% Kerosene		All	180/82	150/65	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	CF	CF		
Sorbitol Solutions		All	160/71	CF	175/79	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF	CF		
Soya Oil		100	210/99	150/65	275/135	S	S	S	S	S	S	S	S	U	S	A	CF	CF	CF		
Stannic Chloride		All	210/99	180/82	225/107	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	U	U	S	B		

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(1) 50F
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Material of Construction					Horizontal Pumps-mechanical seal										Vertical Pumps					
Chemical Environment	Notes	% Conc	Max Operating Temperature, °F/°C			Seal Type		Seal Flush		Seal Face Materials				Pump Seal Elastomer			Shaft and Hardware			
			VR-1	VR-1 Mag Drive & Wrapped Shaft Pumps Only	EY-2	Single	Double	External	Internal	Carbon-Ceramic	Carbon-SilCar	SilCar-SilCar	Viton	EPR	Per-Fluro Elastomer	316SS	C-20	Hast C	Titanium	
Stannous Chloride		All	210/99	180/82	225/107	S	S	A	U	S	S	S	S	U	S	U	B	B	B	
Stearic Acid		All	210/99	150/65	275/135	S	S	S	S	S	S	S	U	U	S	B	A	A	A	
Styrene		100	100/38	U	185/85	S	S	S	S	S	S	S	U	S	A	A	U	CF		
Styrene Acrylic Emulsion		All	120/49	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	CF	A		
Succinonitrile, Aqueous		All	100/38	U	120/49	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	A	CF		
Sugar Beet, Liquor		All	180/82	CF	275/135	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF	CF		
Sugar Cane, Liquor		All	180/82	CF	275/135	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF	CF		
Sugar/Sucrose		All	210/99	CF	275/135	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	CF	CF	CF		
Sulfamic Acid		10	210/99	180/82	150/65	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF	CF		
		25	150/65	150/65	150/65	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF	CF		
Sulfanilic Acid		All	210/99	180/82	CF	S	S	S	S	S	S	S	U	U	S	CF	CF	B	CF	
Sulfated Detergents		All	CF	CF	225/107	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF		
Sulfonated Detergents		100	180/82	160/71	275/135	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF		
Sulfate/Sulfite Liquors (Pulp Mill)		All	200/93	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	A	A		
Sulfur Dioxide, Wet		100	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	A	A	CF		
Sulfur, Wettable, Fungicide		100	180/82	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	A		
Sulfur Trioxide		100	210/99	180/82	CF	U	A	A	U	S	S	S	U	S	B	B	B	U		
Sulfuric Acid	(3)	1	220/104	180/82	200/93	S	S	CF	S	A	B	B	A	U	B	A	B	B	U	
	(3)	5	220/104	180/82	200/93	S	S	CF	S	A	B	B	A	U	B	A	B	B	U	
	(3)	10	220/104	180/82	200/93	S	S	CF	S	A	B	B	A	U	B	A	B	B	U	
	(2)	25	220/104	180/82	175/79	S	S	CF	S	A	B	B	A	U	B	A	B	B	U	
	(4)	50	210/99	180/82	175/79	S	S	CF	S	A	B	B	A	U	B	U	A	B	U	
	(4)	70	180/82	180/82	175/79	S	S	CF	S	A	B	B	A	U	B	U	A	B	U	
	(4)	75	120/49	100/38	150/65	S	S	CF	S	A	B	B	A	U	B	U	A	B	U	
	(4)	80	100/38	CF	120/49	S	S	CF	S	A	B	B	A	U	B	U	A	B	U	
	(1)	93	U	U	120/49	S	S	CF	S	A	B	B	A	U	B	A	B	B	U	
	(1)	100	U	U	100/38	S	S	CF	S	A	B	B	A	U	B	A	B	B	U	

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Material of Construction					Horizontal Pumps-mechanical seal											Vertical Pumps					
Chemical Environment	Notes	% Conc	Max Operating Temperature, °F/°C			Seal Type		Seal Flush		Seal Face Materials					Pump Seal Elastomer			Shaft and Hardware			
			VR-1	VR-1 Mag Drive & Wrapped Shaft Pumps Only	EY-2	Single	Double	External	Internal	Carbon-Ceramic	Carbon-SiC	SiCar	SiCar-SiCar	SiCar	Viton	EPR	Per-Fluoro Elastomer	316SS	C-20	Hast C	Titanium
Sulfuric Acid:Ferrous Sulfate		10:Sat	210/99	180/82	200/93	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	CF	CF	
Sulfuric Acid:Phosphoric Acid		10:20	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	CF	
Sulfurous Acid		10	120/49	120/49	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	S	B	A	U	
Superphosphoric Acid (76% P2O5)		105%H 3PO4	210/99	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	B	CF	
Tannic Acid		All	210/99	150/65	CF	S	S	S	S	S	S	S	S	S	S	B	B	A	A		
Tartaric Acid		All	210/99	150/65	275/135	S	S	S	S	S	S	S	S	S	S	B	B	B	A		
Tetrachloroethylene		100	100/38	U	175/79	S	S	S	S	S	S	S	S	U	U	B	B	A	A		
Tetrachloropyridine		See Chloropyridine																			
Tetraethyl Lead		100	CF	CF	CF	U	A	A	U	S	S	S	S	U	S	A	CF	CF	CF		
Tetrapotassium Pyrophosphate		See Potassium Pyrophosphate																			
Tetrasodium Ethylene Diamine		All	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	CF	CF		
Thioglycolic Acid		All	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	CF	CF		
Thionyl Chloride		100	U	U	CF	U	A	A	U	S	S	S	S	U	S	U	S	B	CF		
Tin Fluoborate Plating Bath	(*)	All	210/99	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	CF	CF		
Titanium Tetrachloride		All	180/82	CF	CF	U	A	A	U	CF	CF	CF	U	U	S	S	B	B	A		
Tobias Acid		100	210/99	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF	CF		
Toluene		100	100/38	U	200/93	U	A	S	S	S	S	S	U	S	A	A	A	A			
Toluene Sulfonic Acid		All	200/93	CF	CF	S	S	S	S	S	S	S	U	U	CF	CF	A	CF			
Tomato Sauce		All	190/88	CF	250/121	S	S	S	S	S	S	S	U	S	A	A	A	CF			
Transformer Oils		100	150/65	CF	CF	S	S	S	S	S	S	S	U	S	A	CF	CF	CF			
Tributyl Phosphate		100	140/60	100/38	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF	CF			
Trichloroacetic Acid		50	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	U	CF	A	U			
Trichloroethane		100	120/49	U	175/79	U	A	S	S	S	S	S	U	S	A	CF	CF	CF			
Trichloroethylene		100	U	U	150/65	U	A	S	S	S	S	S	U	S	B	A	B	A			
Trichloromonofluoro-methane	(*)	100	CF	CF	120/49	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	A	CF			
Trichlorophenoxyacetic		All	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	U	CF	A	U			
Tricresyl Phosphate		100	160/71	CF	CF	S	S	S	S	S	S	S	U	S	B	B	A	A			
Triethanolamine		100	120/49	U	150/65	S	S	S	S	S	S	S	U	U	A	A	B	CF			
Triethylamine		All	120/49	U	CF	S	S	S	S	S	S	S	U	S	A	CF	CF	CF			

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(*)-VR-IV Required
(**)-VR-1 BPO/DMA Required

C/F for mech seal and elas. above:
(1) 50F
(2) 70F
(3)125F
(4)150F

Material of Construction					Horizontal Pumps-mechanical seal										Vertical Pumps					
Chemical Environment	Notes	% Conc	Max Operating Temperature, °F/°C			Seal Type		Seal Flush		Seal Face Materials				Pump Seal Elastomer			Shaft and Hardware			
			VR-1	VR-1(1)	EY-2	Single	Double	External	Internal	Carbon-Ceramic	Carbon-SiCar	SiCar-SiCar	Viton	EPR	Per-Fluro Elastomer	316SS	C-20	Hast C	Titanium	
Trimethylene Chlorobromide		100	80/27	U	150/65	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF
Triocetyl Phosphine Oxide, Diethyl Hexyl Phosphinic Acid, Kerosene		4:4:92	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF
Trisodium Phosphate		All	250/121	180/82	225/107	S	S	A	U	S	S	S	U	U	S	B	B	A	CF	CF
Tung Oil		100	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	CF	CF	CF
Turpentine		100	210/99	100/38	150/65	S	S	S	S	S	S	S	U	S	A	A	A	A	A	A
TWEEN Surfactant		All	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF	CF	CF
TYDEX 12 Flocculant		12	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	U	A	CF	CF
ULTRAWET Surfactants		All	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF	CF	CF
URAN Fertilizer Urea Ammonium Nitrate Composition		All	150/65	150/65	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A
Urea		50	160/71	150/65	225/107	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	A	A
Urea: Ammonium Nitrate:Water		35:44:20	150/65	150/65	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A
Vanillin Black Liquor		All	120/49	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B	B	B	B	B
VERSENE Chelating Agents		All	120/49	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	B
Vinegar		100	210/99	150/65	CF	S	S	S	S	S	S	S	S	U	A	A	A	A	A	A
Vinyl Acetate		100	U	U	120/49	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	CF	CF	CF
Vinyl Toluene		100	120/49	U	200/93	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	CF	CF	CF
Water, Sea		100	180/82	180/82	275/135	S	S	S	S	S	S	S	S	S	S	S	B	A	A	A
Water, Steam Condensate		100	180/82	180/82	CF	S	S	S	S	S	S	S	S	S	S	A	CF	CF	CF	CF
Whey		All	150/65	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	CF	CF	CF
White Liquor (Pulp Mill)		All	180/82	180/82	257/135	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	A	CF	CF
Xylene		100	100/38	U	200/93	U	A	A	U	S	S	S	S	U	S	A	A	A	A	A
Zinc Chloride		70	250/121	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	U	B	A	A	A
Zinc Cyanide		100	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	A	A	A
Zinc Cyanide Plating Bath		All	180/82	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	A	A	A	A
Zinc Electrolyte		All	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	B	A	A	A
Zinc Fluoborate Plating Bath	(*)	All	200/93	180/82	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	A	CF	A	A
Zinc Sulfate		All	250/121	180/82	CF	S	S	S	S	S	S	S	S	S	S	S	A	A	A	A

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