



The information contained in this Drum Pump Chemical Resistance Guide is to be used only as a general guide for proper drum pump tube selection. No warranty is implied nor is any guarantee provided. When compatibility data are inconclusive, field testing is recommended. An asterisk indicates the material is flammable and may only be handled with a stainless steel pump tube and appropriate drive motor which are properly grounded and bonded according to Operating Instructions. Always consult with a safety engineer for proper drive motor selection when pumping flammables. All test data listed is at room temperature (72°F, 22°C) unless otherwise stated.

<p>R = Recommended M = Minor to moderate, should be field tested X = Not recommended — = No data * = Flammable or explosive</p>	 <p>Use only explosion-proof motors on flammable liquids. Only metallic pumps should be used for transferring flammable or explosive liquids. All pumps and containers must be properly grounded and bonded to prevent static discharge and sparking, which could cause electric shock, fire or explosion. A ground wire should be used on any explosion-proof motor as well as the container when transferring explosive material. Always consult with a Safety Engineer for proper pump / motor selection.</p>
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	POLY (PHT) HIGH-TEMP - MAX 170°F (77°C)	POLYPROPYLENE - MAX 175°F (80°C)	CPVC - MAX 175°F (80°C)	STAINLESS STEEL 316 - MAX 175°F (80°C)	POLY (PHT) HIGH-TEMP - MAX 170°F (77°C)	POLYPROPYLENE - MAX 175°F (80°C)	CPVC - MAX 175°F (80°C)	STAINLESS STEEL 316 - MAX 175°F (80°C)
* Acetaldehyde	X	X	R	X				
Acetamide (PVDF, R to 75°F/24°C)	—	R	R	—				
* Acetate solvents	X	X	R	X				
Acetic acid (10% -80%)	R	R	M	R				
Acetic acid (80%)	—	R	M	X				
Acetic acid, glacial (PVDF, R to 120°F/49°C) (PP, R to 100°F/38°C)	R	R	M	X				
Acetic anhydride	X	X	R	X				
* Acetone	X	X	R	X				
* Acetyl chloride	X	X	M	X				
* Acetylene	X	X	R	X				
* Alcohols	X	X	R	X				
Aluminum chloride	R	R	X	R				
Aluminum fluoride	R	R	X	R				
Aluminum hydroxide	R	R	R	R				
Aluminum nitrate	R	R	R	R				
Aluminum potassium sulfate	R	R	R	R				
Aluminum sulfate	R	R	R	R				
Amines	—	—	R	X				
* Ammonia, aqua (10%)	X	X	R	X				
* Ammonia, aqueous	X	X	R	X				
* Ammonia, (concentrated)	X	X	R	X				
Ammonium bifluoride (PP, R to 70°F/21°C)	R	R	R	R				
Ammonium carbonate	R	R	R	R				
Ammonium chloride	R	R	M	R				
Ammonium fluoride (10%)	—	R	—	R				
Ammonium fluoride (25%)	R	R	—	R				
Ammonium hydroxide	R	R	R	X				
Ammonium nitrate	R	R	R	R				
Ammonium nitrite (PP, R to 70°F/21°C)	R	—	—	—				
Ammonium oxalate	R	—	R	—				
Ammonium persulfate					R	R	R	R
Ammonium phosphate, dibasic					R	R	R	R
Ammonium phosphate, monobasic					R	R	R	R
Ammonium phosphate, tribasic					R	R	R	R
Ammonium sulfate					R	R	R	R
Ammonium sulfide (PVDF & CPVC / PVDF, R to 125°F/52°C)					—	R	—	R
Ammonium thiocyanate					—	R	—	R
Ammonium thiosulfate					—	R	R	R
* Amyl acetate					X	X	R	X
* Amyl chloride					X	X	R	X
Aniline (PVDF, R to 75°F/24°C)					M	R	R	X
Aniline dyes					—	—	M	—
Aniline hydrochloride (PVDF, R to 75°F/24°C)					—	R	X	X
Anisole					—	—	R	—
Aqua regia (80%) (PVDF, R to 75°F/24°C)					X	R	X	X
Arsenic acid					R	R	R	R
Barium carbonate					R	R	R	R
Barium chloride					R	R	M	R
Barium hydroxide					R	R	R	R
* Barium nitrate					X	X	R	X
Barium sulfate					R	R	R	R
Barium sulfide					R	R	R	R
Benzaldehyde (PVDF, R to 75°F/24°C)					X	R	R	X
Benzene, benzol					X	X	R	X
Benzene sulfonic acid (PVDF, R to 75°F/24°C)					—	R	M	X
Benzoic acid					M	R	R	R
Bismuth carbonate					R	R	—	R
Black liquors					R	R	—	—
Boric acid					R	R	R	R
Brine acid					—	R	—	—

DRUM PUMP Chemical Resistance Guide (cont'd.)

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Bromic acid	R	R	—	R	Cresylic acid (PVDF, R to 150°F/66°C)	—	R	R	M
Bromine liquid (PVDF, R to 150°F/66°C)	—	R	X	X	* Cyclohexane	X	X	R	X
Bromine water	—	R	M	X	* Cyclohexanol	X	X	M	X
* Butane	X	X	R	X	* Cyclohexanone	X	X	M	X
* Butyl acetate	X	X	M	X	Diacetone alcohol	X	X	R	X
Butyl phenol	—	—	—	—	* Dichloroethylene	X	X	X	X
* Butylene	X	X	R	X	Diesel fuels	X	R	R	X
Butyric acid	R	R	R	X	* Diethyl ether	X	X	M	X
Calcium bisulfide	R	R	M	R	* Diisobutylene	X	X	M	X
Calcium bisulfite	R	R	M	R	Dimethyl formamide	—	X	R	X
Calcium chlorate	R	R	R	R	Diethyl phthalate	—	—	R	—
Calcium chloride	R	R	M	R	Dyes	—	—	R	—
Calcium hydroxide	R	R	R	R	* Epichlorohydrine	X	X	R	X
Calcium hypochlorite (PVDF & CPVC / PVDF, R to 70°F/21°C)	R	R	R	R	* Ethanolamine	X	X	R	X
Calcium nitrate	R	R	M	R	* Ether	X	X	R	X
Calcium sulfate	R	R	R	R	* Ethyl acetate	X	X	R	X
Calcium sulfite	R	—	M	—	* Ethyl chloride	X	X	R	X
* Carbon disulfide	X	X	R	X	* Ethyl ether	X	X	R	X
Carbonic acid	R	R	R	R	* Ethylene chloride	X	X	R	X
Carbon tetrachloride	X	R	R	X	* Ethylene dichloride	X	X	R	X
Cellosolve®	R	R	M	X	Ethylene glycol	R	R	R	R
* Cetyl alcohol	X	X	R	X	* Ethylene oxide	X	X	—	X
Chlorine liquid	X	R	X	X	Fatty acids	M	M	R	M
Chloroacetic acid	X	X	X	X	Ferric chloride	R	R	M	R
* Chlorobenzene	X	X	R	X	Ferric nitrate	R	R	R	R
Chlorobenzyl chloride (PVDF, R to 125°F/52°C)	—	R	—	X	Ferric sulfate	R	R	R	R
Chloroform (PVDF, R to 125°F/52°C)	X	R	R	X	Ferrous chloride	R	R	X	R
Chlorosulfonic acid (100%)	X	X	X	X	Ferrous sulfate	R	R	M	R
Chromic/sulfuric acid	X	X	X	X	Fluoboric acid (CPVC / PVDF, R to 140°F/60°C)	R	R	M	R
Chromic acid (10%) (PVDF & CPVC / PVDF, R to 120°F/49°C)	R	R	R	R	Fluosilicic acid	R	M	—	M
Chromic acid (50%) (PVDF, R to 120°F/49°C) (CPVC / PVDF, R to 70°F/21°C)	R	R	M	R	Formaldehyde (PVDF, R to 120°F/49°C)	R	R	R	X
Citric acid	R	R	R	R	Formic acid	R	R	R	X
Citric oils	R	—	R	—	Furfural	X	M	R	X
Copper chloride	R	R	X	R	Gallic acid (PVDF & CPVC / PVDF, R to 75°F/24°C)	M	R	M	R
Copper cyanide	R	R	R	R	Gelatin	X	R	R	R
Copper nitrate	R	R	R	R	Glue P.V.A.	M	R	R	R
* Copper sulfate	R	R	R	R	Glycerin	R	R	R	R
					Glycolic acid (PP, R to 70°F/21°C) (PVDF & CPVC / PVDF, R to 75°F/24°C)	R	R	—	R
					Glycols	—	R	M	R

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Potassium hydroxide (PVDF & CPVC / PVDF, R to 150°F/66°C)	R	R	R	R	Sodium thiosulfate	R	R	R	R
Potassium nitrate	R	R	R	R	Stannic chloride	R	R	X	R
Potassium permanganate	M	R	M	R	Stearic acid	X	R	R	R
Potassium sulfate	R	R	M	R	Sulfate liquors	R	—	X	—
Propionic acid (CPVC / PVDF, R to 140°F/60°C)	—	R	M	R	Sulfur	R	R	R	R
Silicone oil	R	R	R	R	Sulfur chloride (PVDF, R to 75°F/24°C)	X	R	X	R
Silver nitrate	R	R	R	R	Sulfur dioxide	X	R	R	X
Soap solutions	R	R	R	R	Sulfuric acid (10%)	R	R	M	R
Sodium acetate	X	X	R	X	Sulfuric acid (10%-75%)	R	R	M	R
Sodium bicarbonate	R	R	R	R	Sulfuric acid (66° Baumè) (PVDF & CPVC / PVDF, R to 120°F/49°C)	X	R	M	R
Sodium bisulfate	R	R	R	R	Sulfurous acid	R	R	M	R
Sodium bisulfite	R	R	R	R	Tannic acid	R	R	R	R
Sodium borate	—	R	M	R	Tartaric acid	R	R	R	R
Sodium bromide	R	R	R	R	* Tetrahydrofuran	X	X	R	X
Sodium carbonate	R	R	R	R	Tetralin	—	—	R	—
Sodium chlorate (50%)	R	R	R	R	Titanium tetrachloride (PVDF, R to 150°F/66°C)	—	R	M	X
Sodium chloride	R	R	R	R	* Toluene (toluol)	X	X	R	X
Sodium cyanide	R	R	R	R	Transformer oil	R	—	R	—
Sodium hydroxide (20%)	R	R	R	R	Trichloroacetic acid (PVDF & CPVC/PVDF, R to 75°F/24°C)	—	R	X	R
Sodium hydroxide (50%)	R	X	M	X	1, 1, 1, Trichloroethane	—	—	X	—
Sodium hydroxide (80%)	R	X	X	X	Trichloroethylene	X	R	R	X
Sodium hypochlorite to 20%	X	R	X	R	Tricresylphosphate	—	X	R	X
Sodium metaphosphate	X	—	R	—	Triethylamine (PVDF, R to 125°F/52°C)	—	R	—	X
Sodium nitrate	R	R	R	R	* Vinyl chloride	X	X	—	X
Sodium perborate	R	—	X	—	* Wood oil	X	X	R	X
Sodium phosphate	R	R	M	R	* Xylene (xylol)	X	X	R	X
Sodium silicate	R	R	R	R	Zinc hydrosulfite	—	R	R	R
Sodium sulfate	R	R	R	R					
Sodium sulfide	R	R	R	R					

DRUM PUMP Chemical Resistance Guide (cont'd.)

TECHNICAL DATA

Standard Formulas

PRESSURE AND HEAD

$$\text{Pressure (lbs. per sq. in.)} = \frac{\text{Head in feet} \times \text{Specific Gravity}}{2.31}$$

$$= \text{Head in feet} \times \text{Specific Gravity} \times .434$$

$$\text{Head in feet} = \frac{\text{lbs. per square inch} \times 2.31}{\text{Specific Gravity}}$$

TEMPERATURE

$$(1.8 \times ^\circ\text{C}) + 32 = ^\circ\text{F}$$

$$.555 (^\circ\text{F} - 32) = ^\circ\text{C}$$

$$\text{Degrees Kelvin} - 273.2 = \text{Degrees Centigrade}$$

VELOCITY

$$\text{Pipe Velocity (ft. / sec.)} = \frac{.408 \times \text{GPM}}{(\text{pipe diameter})^2} = \frac{.321 \times \text{GPM}}{\text{pipe area}}$$

$$\text{Velocity Head (feet)} = \frac{(\text{pipe velocity ft./sec.})^2}{64.4}$$

CONVERSION TABLE

PRESSURE IN POUNDS PER SQUARE INCH TO FEET OF HEAD

Pounds Pressure	Ft. of Head	Pounds Pressure	Ft. of Head
1	2.31	19	43.9
2	4.62	20	46.2
3	6.93	25	57.7
4	9.24	30	69.3
5	11.6	35	80.8
6	13.9	40	92.4
7	16.2	45	103.9
8	18.5	50	115.5
9	20.8	55	127
10	23.1	60	138.6
11	25.4	65	150.1
12	27.7	70	161.7
13	30	75	173.2
14	32.3	80	184.8
15	34.6	85	196.3
16	37	90	207.9
17	39.3	95	219.4
18	41.6	100	230.9

CONVERSION FACTORS

FLOW

Lbs of Water / Hr x .002	=	Gal Min
Gal / Min x 500	=	Lbs of Water / Hr
$\frac{\text{Lbs of Fluid / Hr}}{\text{Specific Gravity}} \times .002$	=	Gal Min
Liters / Min x .264	=	Gal / Min (US)
GPM x 3.785	=	Liters / Min
Cu Meters / Hr x 4.4	=	Gal / Min (US)
Gal / Min x .227	=	Cu Meters / Hr
Kg of Water / Min x .264	=	Gal / Min (US)
Gal / Min x 3.8	=	Kg of Water / Min

PRESSURE

Ft of Water x .433	=	PSI
PSI x 2.31	=	Ft of Water
Inches Hg x .491	=	PSI
Inches Hg x 1.133	=	Ft of Water
ATM x 14.7	=	PSI
ATM x 33.9	=	Ft of Water
Kg / Sq cm x 14.22	=	PSI
Meters of Water x 1.42	=	PSI
ATM x 760	=	mm Hg
mm Hg x .039	=	Inches Hg
Bar x 14.5	=	PSI
Newton / Meter ² x 1	=	Pascal
PSI x 6.9	=	kPa (Kilopascal)
kPa x .145	=	PSI

VOLUME

Lbs of Water x .119	=	Gal
Gal (Brit) x 1.2	=	Gal (US)
Gal x 128	=	Fluid Ounces
Cubic Ft x 7.48	=	Gal
Cubic In x .00433	=	Gal
Gal x 3.785	=	Liters
Liter x .264	=	Gal
Cubic Meters x 264.2	=	Gallons
Cubic Meter x 1000	=	Liter
Liters x 1000	=	Cubic Centimeters
Cubic Centimeters x .0338	=	Fluid Ounces
Fluic Ounces x 29.57	=	Cubic Centimeters

LENGTH

Mils x .001	=	Inches
Meters x 3.281	=	Feet
Centimeters x .394	=	Inches
Millimeters x .0394	=	Inches
Microns x .0000394	=	Inches

MASS

Gal of Water x 8.336	=	Lbs
Cubic Ft of Water x 62.4	=	Lbs
Ounces x .0625	=	Lbs
Kilograms x 2.2	=	Lbs
Lbs x .454	=	Kilo
Metric Ton x 2205	=	Lbs

METRIC PREFIXES

Mega	=	1,000,000
Kilo	=	1,000
Hecto	=	100
Deca	=	10
Deci	=	.1
Centi	=	.01
Milli	=	.001
Micro	=	000,001

APPLICATIONS WORKSHEET

APPLICATION INFO

What type of application is this? Sanitary Industrial

What type of fluid is the customer pumping? _____

What is the viscosity of liquid being pumped (in centipoises)? _____ cps

Are there any solids present? NO YES - If so, what size? _____

Total Dynamic Head: Vertical _____ Feet
 Horizontal _____ Feet

Elbows? NO YES - If so, how many? _____

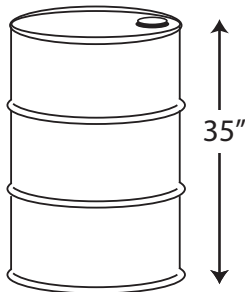
Valves? NO YES - If so, how many? _____

Flow Meters? NO YES - If so, how many? _____

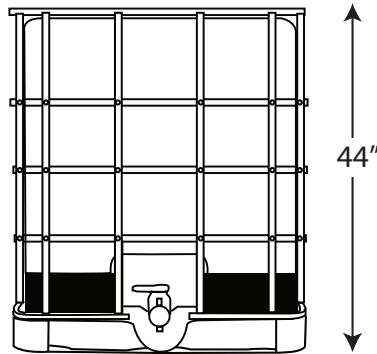
CONTAINER INFO

What type of container is the customer pumping out of?

55 Gallon Drum



Tote Tank



Other

Does the container have a hygienic bag liner? (Sanitary applications only) YES NO

PUMP INFO

Desired Flow Rate? _____ GPM (Gallons Per Minute)

Type of motor required? Air Electric-115V Electric-230V Explosion Proof

Type of motor enclosure? (Electric motors only) Open Drip Proof TEFC

Note: Information subject to change without notice.

Registered trademarks:
Cellosolve - Union Carbide; Freon - DuPont; Kynar - Atchem; Hastelloy - Haynes, Int'l.



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