



Blackmer Gear Pump

LIQUID APPLICATION SELECTION GUIDE



Blackmer[®]

Where Innovation Flows



Blackmer®, a product brand of PSG®, a Dover company, is a global provider of innovative, high-quality industrial gear pumps for the safe and efficient transfer of high-value and hard-to-seal fluids. Our mission is to engineer the world's safest and most reliable internal gear pumps by understanding our customers' needs and providing unparalleled customer service through our highly skilled and experienced team.

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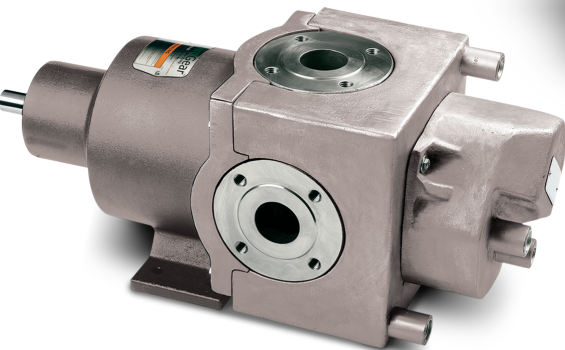
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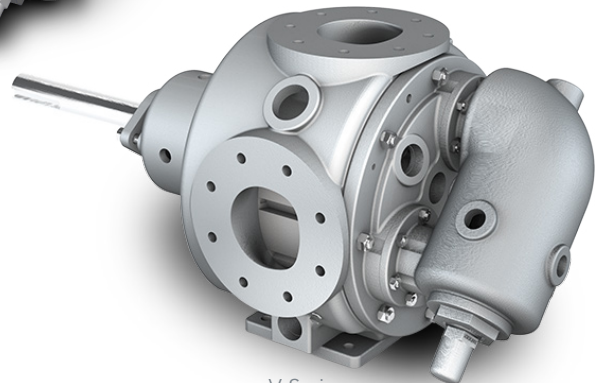
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E Series



G Series



V Series

Section 1 | Liquid Application List

Introduction

Blackmer presents this liquid application list to assist users in making the appropriate pump selection for a particular service. This liquid list provides details on many applications that apply to internal gear pump technology. However, the information is broad in scope and is meant to serve as a general guide for proper pump selection and not a definitive specification tool.

Each liquid has been catalogued in alphabetical order and is comprised of alternative names, physical properties, recommended pump configurations, and detailed application notes. The outline below specifies the elements that characterize each liquid.

LIQUID NAME <i>(Alphabetized, spelling per chemical dictionaries)</i>
OTHER NAMES: (Alternative names found in chemical dictionaries and industry)
VISCOSITY: (Includes: SSU-Seconds Saybolt Universal and cst-Centistokes)
SPECIFIC GRAVITY: (Values are for ambient conditions unless otherwise noted)
PUMP MODEL: (Recommended Blackmer Gear product)
MATERIALS: (Recommended external materials of construction)
BUSHINGS: (Recommended bushing material)
O-RINGS (E-SERIES ONLY): (Recommended O-ring material on E-Series pumps)
SEAL TYPE: (Recommended seal type)
SEAL ELASTOMER: (Recommended seal elastomer)
NOTES: <i>(Includes items such as additional physical properties, typical uses, health or safety hazards, applicable industry standards and precautions regarding pump operation).</i>

Our constant development of new technologies and expansion in positive displacement pump markets may effect product recommendations. This liquid application list will continue to evolve in order to provide the most current product and application data.

Section 1 | Liquid Application List

ACETONE

OTHER NAMES: Dimethyl ketone

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: .79

PUMP MODEL: E Series (Seal-less), G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FEP-encapsulated FKM, PFA-encapsulated Silicone, FFKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: PTFE

NOTES: Acetone is an extremely flammable, colorless liquid, B.P. 133°F; miscible with water, alcohol, ether, chloroform, and most oils. Used in making acetic anhydride; solvent for cellulose acetate; solvent in paints, lacquers, and adhesives; also used as a solvent in epoxy resins and pharmaceuticals; used in purest form to clean and dry precision parts.

ADHESIVE

OTHER NAMES: Cement, Glue, Mucilage, Paste

VISCOSITY: 5,000 to 1,000,000 SSU (1,100 to 220,000 cSt), depending on composition and temperature.

SPECIFIC GRAVITY: NA

PUMP MODEL: E Series (Seal-less), G Series (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite, Bronze, Hardened Cast Iron

O-RINGS (E-SERIES ONLY): FEP-encapsulated FKM

SEAL TYPE: Triple Lip with Grease Barrier, Packing

SEAL ELASTOMER: PTFE, FKM

NOTES: Adhesives are made from many different basic materials, among them dextrin, latex, liquid rubber, resin, sodium silicate and starch. Adhesive are used in many industries, cardboard box, plywood, furniture, paper bags, pressure sensitive tapes, automotive, etc. Normally adhesive pumps are expected to run for long periods of time, thus large pumps running slowly to accommodate viscosity and long service life are recommended. Some adhesives have fillers which may require abrasion resistant pump parts. To reduce the amount of leakage through the stuffing box it is desirable to reduce system pressure the lowest practical limit and to provide. Steel fitted pumps are common due to high viscosity.

ALKYD RESINS

OTHER NAMES: NA

VISCOSITY: 100 to 10,000 SSU (20 to 2,200 cSt), depending on composition and temperature.

SPECIFIC GRAVITY: NA

PUMP MODEL: E Series (Seal-less), G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Triple Lip

SEAL ELASTOMER: FFKM

NOTES: Alkyd resins are used as protective and decorative coatings for metals, wood, paper, textiles; used in adhesives, printing inks, floor coverings, automotive and industrial finishes, paints, lacquers and enamels. Confirm viscosity and materials of construction with customer.

Section 1 | Liquid Application List

AMMONIA - Consult Factory

AMMONIUM HYDROXIDE - Consult Factory

AMYL ACETATE

OTHER NAMES: Amyl acetic ester, Banana oil

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: .88

PUMP MODEL: E Series (Seal-less), G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FEP-encapsulated FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: PTFE

NOTES: Liquid is used as a solvent for lacquers and paints and as a flavoring agent. Also used in printing and finishing textile fabrics. Flammable.

ADHESIVE

OTHER NAMES: Cement, Glue, Mucilage, Paste

VISCOSITY: 5,000 to 1,000,000 SSU (1,100 to 220,000 cSt), depending on composition and temperature.

SPECIFIC GRAVITY: NA

PUMP MODEL: E Series (Seal-less), G Series (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite, Bronze, Hardened Cast Iron

O-RINGS (E-SERIES ONLY): FEP-encapsulated FKM

SEAL TYPE: Triple Lip with Grease Barrier, Packing

SEAL ELASTOMER: PTFE, FKM

NOTES: Adhesives are made from many different basic materials, among them dextrin, latex, liquid rubber, resin, sodium silicate and starch. Adhesive are used in many industries, cardboard box, plywood, furniture, paper bags, pressure sensitive tapes, automotive, etc. Normally adhesive pumps are expected to run for long periods of time, thus large pumps running slowly to accommodate viscosity and long service life are recommended. Some adhesives have fillers which may require abrasion resistant pump parts. To reduce the amount of leakage through the stuffing box it is desirable to reduce system pressure the lowest practical limit and to provide. Steel fitted pumps are common due to high viscosity.

ANIMAL FATS - Refer to Fat

AQUEOUS AMMONIA - Consult Factory

AROCLOR - Refer to Heat Transfer Liquids

AROMATIC SOLVENT - Refer to Solvents

Section 1 | Liquid Application List

ASPHALT, CUT-BACK

OTHER NAMES: NA

VISCOSITY: 100 to 1,000 SSU (20 to 220 cSt) @ 70° to 200°F

SPECIFIC GRAVITY: NA

PUMP MODEL: V Series

MATERIALS: Iron

BUSHINGS: Bronze

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing, Triple Lip with Grease Barrier

SEAL ELASTOMER: FKM

NOTES: Used for coating road surfaces. Asphalt that has been diluted to a liquid or semi-solid with petroleum thinner. Jacketing usually required.

ASPHALT, EMULSIFIED

OTHER NAMES: Suspension or emulsion of asphalt in water.

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: NA

PUMP MODEL: G Series (Sealed), V Series

MATERIALS: Iron

BUSHINGS: Bronze

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing, Triple Lip with Grease Barrier

SEAL ELASTOMER: NA

NOTES: Used for coating roadways, cement waterproofing, roofing compounds. Pumps should be reduced in speed to control the tendency for the asphalt to dehydrate and build up between the clearances. Pumps should include special features like drilled idler teeth and extra clearances normally used for viscosities above 30,000 SSU. Pumps should also be flushed after use with a petroleum product such as kerosene or fuel oil.

BARIUM SULFATE SLURRY

OTHER NAMES: Barite

VISCOSITY: Varies with concentration and liquid used to make slurry.

SPECIFIC GRAVITY: 4.4 (Powder)

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Tungsten Carbide

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: FKM

NOTES: Barium Sulfate Slurry is a fine, white, powder soluble in concentrated sulfuric acid. It is used as a pigment for paints; filler for plastics and inks; and in pharmaceuticals. Barium sulfate is abrasive; pump should be fitted with abrasion resistant components with a seal flush plan 11. Reduce speed and pressure to increase pump life.

BEESWAX - Refer to Wax

Section 1 | Liquid Application List

BENZENE

OTHER NAMES: Benzol

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: .88

PUMP MODEL: **E Series** (Seal-less)

MATERIALS: Steel, Stainless Steel

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM

SEAL TYPE: NA

SEAL ELASTOMER: FKM, PTFE

NOTES: Benzene is a clear, colorless, liquid slightly soluble in water. Used in production of styrene, synthetic detergents, insecticides, fumigants and solvents. Benzene is extremely flammable and is corrosive to iron when wet. Confirm materials of construction with customer.

BENZINE - Refer to Petroleum Ether

BENZOL - Refer to Benzene

BIPHENYL - Refer to Heat Transfer Liquid

BITUMEN - Refer to Asphalt

BLACK LIQUOR

OTHER NAMES: NA

VISCOSITY: 200 to 500 SSU (40 to 110 cSt) @ 100° to 300°F

SPECIFIC GRAVITY: NA

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Stainless Steel

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Packing, Mechanical

SEAL ELASTOMER: FKM

NOTES: Check for pH control of black liquor, it can drop below 5. Jacketing sometimes requested.

Section 1 | Liquid Application List

BLACK LIQUOR SOAP

OTHER NAMES: Black liquor skimmings

VISCOSITY: 1,000 to 25,000 SSU (220 to 5,500 cSt) @ 100° to 200°F

SPECIFIC GRAVITY: NA

PUMP MODEL: E Series (Seal-less), G Series (Sealed)

MATERIALS: Iron, Steel, Stainless Steel

BUSHINGS: Carbon Graphite, Hardened Cast Iron

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Packing, Triple Lip

SEAL ELASTOMER: FKM

NOTES: Black liquor soap (skimmings) is the fatty and rosin acid content of black liquor that floats to the surface after partial evaporation of the water content. Black liquor soap is a raw material for tall oil. Jacketing sometimes requested.

BLACK STRAP MOLASSES - Refer to Molasses

BLOOD

OTHER NAMES: Animal Blood

VISCOSITY: 40 to 500 SSU (4 to 110 cSt)

SPECIFIC GRAVITY: NA

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite, Hardened Cast Iron

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing

SEAL ELASTOMER: NA

NOTES: Blood is dilatant (shear thickening) and slightly corrosive. Blood from packing houses is used for fertilizer, adhesives and feed for hogs and chickens. Reduced speed and steel fitted recommended if foreign materials are present.

BRIGHT STOCK

OTHER NAMES: NA

VISCOSITY: 10,000 to 100,000 SSU (2,200 to 22,000 cSt)

SPECIFIC GRAVITY: NA

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing, Triple Lip

SEAL ELASTOMER: FKM

NOTES: Bright stock is a lubricating oil of high viscosity, used for blending with neutral oils in preparing automotive engine lubricating oils. Steel fitted pumps are typically recommended due to high viscosity.

Section 1 | Liquid Application List

BRINE

OTHER NAMES: Seawater, Saltwater

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: 1.1

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite, Bronze

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: Buna-N

NOTES: Used in refrigeration and in food preservation. Rapid corrosion will occur when an iron pump that has handled brine is exposed to air.

BUNKER "C" FUEL OIL - Refer to Fuel Oil #6

BUTADIENE

OTHER NAMES: Vinylethylene

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: .62

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical, Triple Lip

SEAL ELASTOMER: Buna-N, FKM

NOTES: Used in the formulation of styrene-butadiene and nitrile-butadiene rubbers, latex paints, rocket fuels. Liquid is extremely flammable.

BUTANOL - Refer to Butyl Alcohol

BUTYL ALCOHOL

OTHER NAMES: 1-butanol

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: .81

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: Buna-N, FKM

NOTES: Used in preparation of esters and butyl acetates; as a solvent for resins and coatings; as a plasticizer; in detergent formulations; in some urea and melamine resins.

Section 1 | Liquid Application List

CALCIUM CHLORIDE BRINE

OTHER NAMES: NA

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: 1.1

PUMP MODEL: E Series (Seal-less), G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite, Bronze

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: Buna-N

NOTES: Calcium chloride is a white crystal soluble in water and alcohol. Used for dust-proofing roads, thawing snow and ice, freeze-proofing coal or sand, concrete conditioning; in the paper and pulp industry; and as refrigeration brine. Avoid the use of dissimilar metals to reduce tendency for electrolytic corrosion. Rapid corrosion will take place when an iron pump that has handled brine is exposed to air.

CALCIUM STEARATE

OTHER NAMES: NA

VISCOSITY: 2,000 to 10,000 SSU (440 to 2,200 cSt)

SPECIFIC GRAVITY: NA

PUMP MODEL: E Series (Seal-less), G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Packing

SEAL ELASTOMER: NA

NOTES: A white powder, insoluble in water and slightly soluble in hot alcohol. Used as a water repellent, flattening agent in lacquers, varnishes, paints, enamels and plastics; as a lubricant; in emulsions, cements, wax crayons; as a stabilizer for vinyl resins and as an anti-caking agent in foods. Calcium stearate may be abrasive if handled as a slurry and could require abrasion resistant features. Jacketing may be required if handling molten calcium stearate.

CANE SYRUP - Refer to Syrup

CARBOLIC ACID - Refer to Phenol

CARBON DISULFIDE

OTHER NAMES: Carbon Bisulfide

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: 1.3

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: FKM

NOTES: Clear, colorless liquid with strong odor; soluble in alcohol, benzene and ether, slightly soluble in water. Used in making viscose rayon, cellophane, carbon tetrachloride and flotation agents; used as a veterinary medicine; solvent for fats, resins, rubber, waxes and other chemical products; used in varnishes, lacquers, paint and varnish removers; used in making rubber textiles, fumigants, matches, preservatives and pesticides. Liquid is extremely flammable, highly volatile and poisonous.

Section 1 | Liquid Application List

CARBON TETRACHLORIDE

OTHER NAMES: Tetrachloromethane, Perchloromethane

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: 1.6

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: FKM

NOTES: Colorless liquid used for refrigerants and propellants, metal degreasing, grain fumigants and insecticides, fire extinguishers, dry cleaning solvents and general solvent. Vapor and liquid are hazardous. May be fatal if inhaled or swallowed. Can be corrosive if contains moisture and will require stainless steel. Confirm materials of construction with customer.

CASTOR OIL

OTHER NAMES: Ricinus oil

VISCOSITY: 200 to 3,000 SSU (40 to 650 cSt)

SPECIFIC GRAVITY: .96

PUMP MODEL: E Series (Seal-less), G Series (Seal-less),

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: Buna-N

NOTES: Pale, yellowish, transparent liquid with mild odor. Used in protective coatings, plastics, lubricants, fatty acids, textiles, rubber, hydraulic fluids, cosmetics, pharmaceuticals, flavoring, insulating compounds.

CAUSTIC - Refer to Sodium Hydroxide

CAUSTIC POTASH - Refer to Potassium Hydroxide

CAUSTIC SODA - Refer to Sodium Hydroxide

CHLORDAN

OTHER NAMES: Chlordane

VISCOSITY: 100 SSU (20 cSt) @ 100°F

SPECIFIC GRAVITY: 1.6

PUMP MODEL: E Series (Seal-less), G Series (Seal-less),

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FEP-encapsulated FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: FKM, PTFE

NOTES: Colorless, odorless liquid used as an insecticide in oil emulsions and dispersible liquids. Liquid is harmful if swallowed; can be absorbed through the skin. Will cause rapid rusting of iron parts when pump is left exposed to air. Keep full of liquid or flush and fill with oil.

Section 1 | Liquid Application List

CHLOROFORM

OTHER NAMES: Trichloromethane

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: 1.5

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: FKM

NOTES: Clear, colorless, volatile liquid used in making fluorocarbon refrigerants and propellants, fluorocarbon plastics, dyes and drugs, and anesthetics. Also used as a general solvent, fumigant and insecticide. Vapor is harmful; liquid may be fatal if swallowed. Iron construction suitable for "dry handling, any dilution or impurity can make liquid corrosive. Keep pump full of liquid at all times to prevent rapid oxidation or rusting. If pump is drained, fill with oil.

CHLOROTHENE - Refer to Trichlorethane

CHOCOLATE

OTHER NAMES: Bitter chocolate, sweet chocolate, milk chocolate, chocolate liquor, chocolate coating

VISCOSITY: Typically 500 to 10,000 SSU (110 to 2,200 cSt), but can reach several hundred thousand SSU.

SPECIFIC GRAVITY: NA

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing, Triple Lip

SEAL ELASTOMER: FKM

NOTES: Chocolate is made from cacao beans which are roasted, ground up and mixed with oils to produce a semi-liquid. Chocolate in the early stages of processing is known as bitter chocolate; bitter chocolate to which sugar has been added is known as sweet chocolate (the sugar in sweet chocolate can carbonize to form abrasives. The addition of milk to sweet chocolate produces milk chocolate. Chocolate liquor is chocolate which has been thinned for spraying on foods. Chocolate can be diluted with vegetable fats such as palm nut or coconut oils.

Special features such as jacketing, oversized ports, additional clearances, drilled idler gears, and suckback or flush grooves may be required to offset the tendency for chocolate to set up in stagnant areas.

If application details are difficult to obtain, a reasonable starting point is to select a pump that will be at about 100 RPM or less, has maximum extra clearance, has horsepower to handle 75,000 SSU and has appropriate special features.

Depending on the service and the pump being used, the pumps may require FDA compliant metallic materials, o-rings, gaskets and shaft seals.

Section 1 | Liquid Application List

CHOLINE CHLORIDE

OTHER NAMES: NA

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: NA

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: Buna-N

NOTES: White crystals with a salty, bitter taste and fishy odor. Soluble in water and alcohol; Used in medicines and animal feed supplements. Iron construction with Buna-N seal is suitable for ambient temperature concentrations up to 75%. Consult factory for higher concentrations.

CLAY COATINGS - Refer to Paper Coatings

COAL TAR

OTHER NAMES: NA

VISCOSITY: 200 to 10,000 SSU (40 to 2,200 cSt) at normal temperature range of 150° to 500°F. Semi-solid at ambient temperature.

SPECIFIC GRAVITY: 1.2

PUMP MODEL: G Series (Sealed), V Series

MATERIALS: Iron

BUSHINGS: Carbon Graphite, Bronze

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing, Triple Lip

SEAL ELASTOMER: FKM, FFKM

NOTES: Coal tar is a black, semi-solid material obtained in the destructive distillation of coal. A major raw material for a variety of dyes, drugs and other organic chemicals. Coal tar or its fractions are also used for waterproofing, paints, pipe coating, roofing, insulation, pesticides and in medicines. Be sure liquid is brought up to temperature before pumps are started. Jacketing typically recommended.

COAL TAR PITCH

OTHER NAMES: NA

VISCOSITY: Depends on grade and temperature.

SPECIFIC GRAVITY: NA

PUMP MODEL: G Series (Sealed), V Series

MATERIALS: Iron

BUSHINGS: Carbon Graphite, Bronze

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM, PFA-encapsulated Silicone, FFKM

SEAL TYPE: Packing, Mechanical, Triple Lip

SEAL ELASTOMER: Buna-N, FKM, PTFE, TFE/P, FFKM

NOTES: A dark brown residue left after coal tar is redistilled. Used as a binder for carbon electrodes, as a base for paints and coatings, briquetting coal, paving and roofing, plasticizer for elastomers and polymers, extenders, saturants and impregnants. Fluid must be brought up to temperature before pump is started. Abrasion resistant features, steel fitted, and jacketing may be required.

Section 1 | Liquid Application List

COCOA BUTTER

OTHER NAMES: Cacao butter, Theobroma oil

VISCOSITY: 200 to 10,000 SSU (40 to 2,200 cSt)

SPECIFIC GRAVITY: .86

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing, Triple Lip

SEAL ELASTOMER: FKM

NOTES: Yellowish-white, brittle solid with chocolate-like taste and odor. Used in making candies, pharmaceuticals and soaps. Certain grades may have a tendency to build up in the pump. Check user's experience before making recommendation.

COCONUT OIL

OTHER NAMES: Coconut palm oil, Coconut butter

VISCOSITY: 100 to 500 SSU (20 to 110 cSt)

SPECIFIC GRAVITY: .92

PUMP MODEL: E Series (Seal-less), G Series (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM

SEAL TYPE: Mechanical, Triple Lip

SEAL ELASTOMER: Buna-N, FKM

NOTES: White, semi-solid lard-like fat used in soaps, as a butter substitute; in food, cosmetics, candles, emulsions, alkyd resins, lubricating greases, synthetic detergents and as a source of glycerin and fatty acids. Depending on the service and the pump being used, the pumps may require FDA compliant metallic materials, o-rings, gaskets and shaft seals.

COD-LIVER OIL

OTHER NAMES: Morrhua oil

VISCOSITY: 500 SSU (110 cSt)

SPECIFIC GRAVITY: .92

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: Buna-N

NOTES: Used for medicine for its vitamin A and D content and in leather treatment.

COLD FAT - Refer to Fats

Section 1 | Liquid Application List

CONTACT CEMENT

OTHER NAMES: Rubber Cement

VISCOSITY: Varies depending on type of cement, but typically considered quite viscous.

SPECIFIC GRAVITY: NA

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing, Triple Lip

SEAL ELASTOMER: FKM

NOTES: Contact cement is generally considered a flammable shear sensitive emulsion. Used for wide variety of adhesive-type applications.

COOKING OILS, HOT

OTHER NAMES: NA

VISCOSITY: 40 SSU (4 cSt) @ 300° to 400°F

SPECIFIC GRAVITY: NA

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM

SEAL TYPE: Mechanical, Triple Lip

SEAL ELASTOMER: FKM, PTFE

NOTES: Hot cooking oils are used primarily for deep fat frying of vegetables and meats. Be sure that the oil in the pump is liquid before starting. Jacketing may be required.

CORN OIL - Refer to Vegetable Oil

CORN STARCH - Refer to Starch

CORN SYRUP

OTHER NAMES: Glucose, Starch syrup

VISCOSITY: 25,000 to 100,000 SSU (5,500 to 22,000 cSt)

SPECIFIC GRAVITY: 1.3

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM

SEAL TYPE: Packing, Triple Lip

SEAL ELASTOMER: FKM

NOTES: Used in making candy, jelly and other food products; in alcoholic fermentations, pharmaceuticals and in treating tobacco. Be sure pump and related equipment are sized for the maximum viscosity that will be encountered. Steel fitted recommended. Depending on the service and the pump being used, the pumps may require FDA compliant metallic materials, o-rings, gaskets and shaft seals.

Section 1 | Liquid Application List

COTTONSEED OIL

OTHER NAMES: NA

VISCOSITY: 200 to 500 SSU (40 to 110 cSt)

SPECIFIC GRAVITY: .92

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: Buna-N

NOTES: Used in medicine, soap stock, lubricants, glycerol, and cosmetic creams; in food as an oleo or butter substitute and in salad oils and cooking oils. Depending on the service and the pump being used, the pumps may require FDA compliant metallic materials, o-rings, gaskets and shaft seals.

CREOSOTE

OTHER NAMES: Creosote wood-tar; Creosote coal-tar

VISCOSITY: 100 to 300 SSU (20 to 65 cSt)

SPECIFIC GRAVITY: 1.1

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed), **V Series**

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing, Mechanical, Triple Lip

SEAL ELASTOMER: FKM

NOTES: Oily liquid with distinctive odor; coal-tar creosote is poisonous. Used as a wood preservative and disinfectant.

CRESOL

OTHER NAMES: Methyl phenol, Hydroxymethylbenzene; similar to Cresylic acid.

VISCOSITY: 40 to 100 SSU (4 to 20 cSt)

SPECIFIC GRAVITY: 1.04

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing, Mechanical

SEAL ELASTOMER: FKM

NOTES: Hazardous liquid which can cause severe burns. Rapidly absorbed through the skin.

CRESYLIC ACID - Refer to Cresol

Section 1 | Liquid Application List

CRUDE OIL

OTHER NAMES: NA

VISCOSITY: 40 to 25,000 SSU (4 to 5,500 cSt)

SPECIFIC GRAVITY: .78 to .97

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing, Mechanical, Triple Lip

SEAL ELASTOMER: Buna-N, FKM, PTFE

NOTES: Crude is refined into natural gas, gasoline, naphtha, kerosene, fuel oil, lubricating oil, paraffin was, road oil, asphalt and coke, and is a major raw material for many chemicals. Teflon seal required on sour crude which contains some acids.

DENATURED ALCOHOL - Refer to Ethyl alcohol

DETERGENTS

OTHER NAMES: Synthetic detergents, Syndets

VISCOSITY: 100 to 75,000 SSU (20 to 16,500 cSt), depending on composition and temperature.

SPECIFIC GRAVITY: 1.0 to 1.3

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite, Hardened Cast Iron

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM

SEAL TYPE: Packing, Triple Lip

SEAL ELASTOMER: FKM

NOTES: Detergents are used as household cleaners, and in industry for textile scouring, bleaching, de-sizing, dyeing, printing and finishing, metal cleaning and pickling, cleaning and sterilizing food processing equipment, cosmetics, processing leather, firefighting and making synthetic rubber. Detergents are materials which have a cleansing action like soap but are not derived directly from fats and oils. Detergents may contain varying percentages of alkylaryl sulfonates, sulfates, fatty alcohols, fatty acids or amines.

DIATOMACEOUS EARTH

OTHER NAMES: Diatomite, Kiseselguhr, Filter aid

VISCOSITY: Varies depending on solids content.

SPECIFIC GRAVITY: NA

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron, Steel, Stainless Steel

BUSHINGS: Carbon Graphite, Bronze, Hardened Cast Iron, Tungsten Carbide

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing

SEAL ELASTOMER: NA

NOTES: Soft earthy rock composed of the siliceous skeletons of small aquatic plants called diatoms. Sold as a powder which is able to absorb 1.5 to 4.0 times its weight of water. Diatomaceous earth is used for filtration, clarifying and decolorizing mineral fillers, thermal insulation, as an absorbent, and as a source of silica in chemical production. Abrasion resistant features recommended. Reduce speed and pressure to increase pump life.

Section 1 | Liquid Application List

DICHLOROMETHANE - Refer to Methylene Chloride

DIESEL FUEL - Refer to Fuel Oil #1 and #2

DIETHANOLAMINE

OTHER NAMES: DEA

VISCOSITY: 500 to 1,000 SSU (110 to 220 cSt)

SPECIFIC GRAVITY: 1.1

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: PTFE

NOTES: Colorless crystals or liquid used as a detergent for emulsion paints, used in cutting oils, shampoos, cleaners and polishes, and as a chemical intermediate for resins and plasticizers.

DIETHYLENE GLYCOL

OTHER NAMES: DEG, Dihydroxydiethyl ether

VISCOSITY: 200 to 1,000 SSU (40 to 220 cSt)

SPECIFIC GRAVITY: 1.1

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Mechanical, Triple Lip

SEAL ELASTOMER: Buna-N, FKM

NOTES: Used as a textile lubricant, conditioner and softener for casing, gelatin, vulcanizing fibers, book-binding pastes, and synthetic resins. Used as a solvent for nitrocellulose, gums, resins, oils organic compounds, for moistening and softening cork compositions, glues, parchments, paper, tobacco; as an anti-freeze to lower the freezing point of water.

DIISOCYANATE - Refer to Toluene Diisocyanate

DIMETHYL FORMAMIDE

OTHER NAMES: DMF

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: .95

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FEP-encapsulated FKM

SEAL TYPE: Mechanical, Triple Lip Seal with Grease Barrier

SEAL ELASTOMER: PTFE

NOTES: Non-corrosive liquid used as a solvent for vinyl resin and acetylene, butadiene and some petroleum components. Used in dyestuffs and pharmaceuticals.

Section 1 | Liquid Application List

DIMETHYLKETONE - Refer to Acetone

DIOCTYL PHTHALATE

OTHER NAMES: DOP

VISCOSITY: 300 to 400 SSU (65 to 85 cSt)

SPECIFIC GRAVITY: .99

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: FKM, PTFE

NOTES: Used as a plasticizer for resins and synthetic rubbers; used as a barrier fluid in handling TDI and other foam liquids.

DIVINYLBENZENE

OTHER NAMES: Vinylstyrene, DVB

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: .93

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FEP-encapsulated FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: FKM, PTFE

NOTES: Highly reactive liquid used in drying oils, casting resins and polyesters.

DODECYLBENZENE

OTHER NAMES: Alkane, Detergent alkylate

VISCOSITY: 50 SSU (7 cSt)

SPECIFIC GRAVITY: .86

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FEP-encapsulated FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: FKM, PTFE

NOTES: Used in making synthetic detergents.

DOP - Refer to Dioctyl Phthalate

DOWTHERM - Refer to Heat Transfer Oils

Section 1 | Liquid Application List

EDIBLE OILS

OTHER NAMES: NA

VISCOSITY: Varies depending temperature.

SPECIFIC GRAVITY: NA

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing

SEAL ELASTOMER: NA

NOTES: NA

ENAMEL

OTHER NAMES: Enamel paint

VISCOSITY: 100 to 25,000 SSU (40 to 5,500 cSt), depending on composition.

SPECIFIC GRAVITY: NA

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite, Hardened Cast Iron

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing, Triple Lip

SEAL ELASTOMER: FKM

NOTES: Enamel is a type of oil-based paint containing binders that form a film when exposed to air. Usually intended for use as a top coat; contains less pigment than paint formulations for priming or surfacing. Abrasion resistant features recommended. Reduce speed and pressure to increase pump life.

EPOXY RESINS

OTHER NAMES: NA

VISCOSITY: 5,000 to 100,000 SSU (1,100 to 22,000 cSt), depending on composition and pumping temperature. Normal temperature range is ambient to 200°F.

SPECIFIC GRAVITY: NA

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite, Bronze, Hardened Cast Iron, Tungsten Carbide

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Packing, Triple Lip

SEAL ELASTOMER: FKM, FFKM

NOTES: Epoxy resins are used for surface coatings, as adhesives and for laminating to make tanks, pipe and structural parts. Some are cast to make plastic metal-forming tools and dies; other grades are used for potting and encapsulation of electrical parts.

ETHANOL - Refer to Ethyl Alcohol

Section 1 | Liquid Application List

ETHANOLAMINE

OTHER NAMES: MEA, Monoethanolamine, Colamine

VISCOSITY: 500 to 1,000 SSU (110 to 220 cSt)

SPECIFIC GRAVITY: 1.02

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FEP-encapsulated FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: PTFE

NOTES: Used in dry cleaning, emulsion paints, polishes, agricultural sprays, pharmaceuticals and as a corrosion inhibitor.

ETHYL ACETATE

OTHER NAMES: Acetic ether

VISCOSITY: 300 SSU (65 cSt)

SPECIFIC GRAVITY: .89

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FEP-encapsulated FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: PTFE

NOTES: Flammable liquid used as a lacquer and plastic solvent, in flavoring and making perfumes, in pharmaceuticals.

ETHYL ACRYLATE

OTHER NAMES: NA

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: .92

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: Buna-N

NOTES: Used in making polymers and acrylic paints. Liquid is flammable and the vapor is harmful; may irritate skin and eyes.

Section 1 | Liquid Application List

ETHYL ALCOHOL

OTHER NAMES: Alcohol, Grain alcohol, Ethanol

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: .82

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: Buna-N

NOTES: Used as a solvent fuel blend and in the manufacture of dyes, synthetic drugs, synthetic rubber, detergents, cleaning solutions, cosmetics, pharmaceuticals and explosives. Used as an anti-freeze and a rocket fuel.

ETHYL CHLORIDE

OTHER NAMES: Chloroethane

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: .92

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: FKM, PTFE

NOTES: Highly flammable, volatile liquid used as a solvent for sulfur, fats, oils, resins, waxes, insecticides and medicine.

ETHYLENE ALCOHOL - Refer to Ethylene Glycol

ETHYLENE CHLORIDE - Refer to Ethylene Dichloride

ETHYLENE DICHLORIDE

OTHER NAMES: Ethylene chloride, 1,2-dichloroethane

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: 1.25

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: FKM

NOTES: Used in making vinyl chloride; as a solvent for fats, oils, waxes, rubber, resins, gums; as a fumigant; in dry-cleaning solvents; in lacquers, paints, varnish and finish removers; as a metal degreaser; in soaps and in wetting or penetrating agents. Flammable.

Section 1 | Liquid Application List

ETHYLENE GLYCOL

OTHER NAMES: Ethylene alcohol, glycol, antifreeze

VISCOSITY: 40 to 70 SSU (4 to 13 cSt)

SPECIFIC GRAVITY: 1.1

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Mechanical, Triple Lip

SEAL ELASTOMER: Buna-N, FKM

NOTES: Used as an anti-freeze in automobiles; with polyester fibers in films; as a dye solvent; in lacquers, resins, printing inks, glue mixtures; as a solvent for waxes and resins.

ETHYLENE OXIDE

OTHER NAMES: NA

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: .87

PUMP MODEL: **E Series** (Seal-less)

MATERIALS: Steel, Stainless Steel

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FEP-encapsulated FKM

SEAL TYPE: NA

SEAL ELASTOMER: NA

NOTES: Used in manufacturing glycols, acrylonitrile and ethanolamines; in making detergents, petroleum emulsifiers, and as a rocket propellant. Ethylene oxide is extremely flammable; vapor is harmful and may cause burns. Spontaneous combustion may take place at or near ambient temperatures. Jacketing recommended for controlling temperatures.

FATS

OTHER NAMES: Animal fat, cold fat, liquid fat, hot fat, lard, hashed fat, and ground fat

VISCOSITY: 40 SSU (4 cSt) for liquid fats, up to 100,000 SSU (22,000 cSt) for hashed and ground fats.

SPECIFIC GRAVITY: NA

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite, Hardened Cast Iron

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing, Mechanical, Triple Lip

SEAL ELASTOMER: Buna-N, FKM

NOTES: Ground pork fat is easily handled; beef fat is more difficult because of its dry nature. Jacketing and heat tracing of discharge line may be required for cold fats. Consider increased clearances if process includes steam cleaning. Buna-N seal recommended for liquid fats and packing recommended for ground fats.

Section 1 | Liquid Application List

FATTY ACID

OTHER NAMES: Oleic acid, palmitic acid, stearic acid

VISCOSITY: 200 to 500 SSU (40 to 110 cSt), depending on specific acid and temperature.

SPECIFIC GRAVITY: .84

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: FKM, PTFE

NOTES: Used in the making of soaps and synthetic detergents, lubricants, rubber products, cosmetics, waterproofing and as a food nutrient.

FILTER AID - Refer to Diatomaceous Earth

FISH OIL

OTHER NAMES: NA

VISCOSITY: 100 to 300 SSU (20 to 65 cSt)

SPECIFIC GRAVITY: .93

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: Buna-N

NOTES: Fish oils are a by-product of the cannery industry and are used as nutrients, as a source of vitamins, in soaps and for leather dressing.

FISH WASTE

OTHER NAMES: Fish solubles

VISCOSITY: 10,000 to 25,000 SSU (22,000 to 5,500 cSt)

SPECIFIC GRAVITY: NA

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite, Hardened Cast Iron

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing

SEAL ELASTOMER: NA

NOTES: Fish waste is residue from canning plants consisting of scales, skin, bones and offal. It is used primarily for fertilizer and pet foods. Abrasion resistant features and steel fitted may be considered. Reduce speed and pressure to increase pump life.

FLUOROCARBONS - Refer to Freon

FOAM - Refer to Polyurethane Foams

Section 1 | Liquid Application List

FORMALDEHYDE

OTHER NAMES: Oxymethylene, Formic aldehyde, Methanal, Formalin

VISCOSITY: 40 SSU (4 cSt) (37% Solution)

SPECIFIC GRAVITY: 1.1 (37% Solution)

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite Carbide

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: FKM, PTFE

NOTES: Used in urea and melamine resins, in making phenolic resins, ethylene glycol, fertilizer, dyes, embalming fluids and medicine.

FORMALIN - Refer to Formaldehyde

FREON - Consider LP-Gas type pump

FRUIT JUICES

OTHER NAMES: NA

VISCOSITY: 40 to 5,000 SSU (4 to 1,100 cSt), depending on composition.

SPECIFIC GRAVITY: NA

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: PTFE

NOTES: Sanitary design may be required. Confirm materials of construction with customer.

FUEL OIL, #1 and #2

OTHER NAMES: Diesel fuel

VISCOSITY: 50 to 70 SSU (7 to 13 cSt)

SPECIFIC GRAVITY: NA

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical, Triple Lip

SEAL ELASTOMER: Buna-N, FKM

NOTES: Maximum speed of 1,800 RPM. Carbon graphite bushings required above 100 psi.

Section 1 | Liquid Application List

FUEL OIL, #3 and #4

OTHER NAMES: Blended fuels

VISCOSITY: 50 to 500 SSU (7 to 110 cSt) at normal operating temperature, depending on blend.

SPECIFIC GRAVITY: NA

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical, Triple Lip

SEAL ELASTOMER: Buna-N, FKM

NOTES: Maximum speed of 1,200 RPM due to abrasiveness of heavy oils.

FUEL OIL, #5 and #6

OTHER NAMES: Bunkers fuels, Bunker "C" oil

VISCOSITY: 200 to 5,000 SSU (40 to 1,100 cSt) @ 120° to 150°F. 50,000 to 60,000 SSU (11,000 to 13,200 cSt) @ 70°F.

SPECIFIC GRAVITY: NA

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical, Triple Lip

SEAL ELASTOMER: FKM, PTFE

NOTES: Maximum speed of 900 RPM due to abrasiveness of most heavy oils. 400 to 700 RPM recommended.

FURFURAL

OTHER NAMES: Ant oil, Furfuraldehyde

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: 1.2

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: PTFE

NOTES: Made from oat hulls, rice hulls or corn cobs. Used as a solvent for the refining of lubricating oils, nitrocellulose and cellulose acetate. Used in the preparation of synthetic resins and as a weed killer and fungicide

Section 1 | Liquid Application List

GASOLINE

OTHER NAMES: NA

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: .75

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: Buna-N

NOTES: For powering internal combustion engines and as a solvent..

GELATIN

OTHER NAMES: NA

VISCOSITY: Varies widely depending on temperature and solvent used. Normally handled in 120° to 160°F.

SPECIFIC GRAVITY: NA

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing

SEAL ELASTOMER: NA

NOTES: Gelatin is a by-product of meat packing and is used in making photographic film, sizing, plastic compounds, rubber substitutes, adhesives, cements and pharmaceuticals.

GLUCOSE - Refer to Corn Syrup

GLUE - Refer to Adhesive

GLYCERIN

OTHER NAMES: Glycerol, Glycyl alcohol

VISCOSITY: 200 to 5,000 SSU (40 to 1,100 cSt)

SPECIFIC GRAVITY: 1.3

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Packing

SEAL ELASTOMER: Buna-N, FKM

NOTES: Used in alkyd resins, cellophane, explosives, pharmaceuticals, perfumery, cosmetics, food stuffs, as a solvent in printer's ink, and as an emulsifying agent in anti-freeze, paper coatings, and finishes.

Section 1 | Liquid Application List

GLYCEROL - Refer to Glycerin

GLYCOL - Refer to Ethylene Glycol

GREASE

OTHER NAMES: Lubricating grease, Automotive grease, Bearing grease, etc.

VISCOSITY: 10,000 to 500,000 SSU (2,200 to 110,000 cSt)

SPECIFIC GRAVITY: NA

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Packing, Triple Lip

SEAL ELASTOMER: FKM

NOTES: Lubricating media. Enlarged ports and steel fitted recommended due to viscosity.

HEAT TRANSFER OIL

OTHER NAMES: Trade names such as Dowtherm, Mobiltherm, Therminol, Ucon, etc.

VISCOSITY: 40 SSU (4 cSt) @ 400° to 600°F.

SPECIFIC GRAVITY: NA

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM, PFA-encapsulated Silicone, FFKM

SEAL TYPE: Mechanical, Triple Lip with Grease Barrier

SEAL ELASTOMER: FKM, PTFE, FFKM

NOTES: Heat transfer liquids are used for transferring heat from a source to a point of use such as dies, presses, cooking vessels, processing equipment, etc. Many of them can operate at temperatures up to 650°F without boiling. Because of low viscosity, use extra caution to verify pump performance. High temperature components often recommended.

HEPTANE

OTHER NAMES: Dipropylmethane

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: .68

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: Buna-N

NOTES: Used for determining octane ratings for gasoline, as an anesthetic and solvent.

Section 1 | Liquid Application List

HEXANE

OTHER NAMES: NA

VISCOSITY: .4 cPs

SPECIFIC GRAVITY: .66

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: Buna-N

NOTES: Used as an extraction solvent for vegetable oils, as a paint diluent and as an alcohol denaturant.

HONEY

OTHER NAMES: Bees Honey

VISCOSITY: 5,000 to 50,000 SSU (1,100 to 11,000 cSt), depending on extent of moisture removal and temperature.

SPECIFIC GRAVITY: 1.2

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing, Triple Lip

SEAL ELASTOMER: FKM

NOTES: Consider jacketing, steel fitted, and oversized ports.

HOT MELT ADHESIVES - Refer to Adhesives

HYDRAULIC FLUIDS

OTHER NAMES: Hydraulic Oils

VISCOSITY: 100 to 500 SSU (20 to 110 cSt)

SPECIFIC GRAVITY: NA

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: Buna-N, FKM, PTFE

NOTES: Standard construction with Buna N seals for water-glycol base liquids and for water and oil emulsion liquids. Phosphate ester base hydraulic fluids require FKM. Proprietary fluids sometimes require special elastomers, e.g., Pydraul can be handled with FKM; Skydrol 500-A requires Teflon a special EPR elastomer.

Section 1 | Liquid Application List

INK - Refer to Printing Ink

IRON OXIDE SLURRY

OTHER NAMES: Magnetic oxide Slurry, Ferrous oxide slurry, Chrome oxide slurry

VISCOSITY: 100 to 7,500 SSU (20 to 1,650 cSt), depending on concentration and additives.

SPECIFIC GRAVITY: NA

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Hardened Cast Iron, Tungsten Carbide

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Packing, Mechanical

SEAL ELASTOMER: FKM, PTFE

NOTES: Used in the manufacturing of magnetic tape and discs. Used in heavy-duty paint pigments, marine paints and metal primers. Also used for polishing compounds, as pigment in rubber products and in grease paints. Select abrasion resistant seal with elastomer compatible with carrier solvent used. Abrasion resistant features recommended. Reduce speed and pressure to increase pump life.

ISOBUTANE

OTHER NAMES: Dimethylpropane, Trimethylmethane

VISCOSITY: .1 cPs

SPECIFIC GRAVITY: .56

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: Buna-N

NOTES: Used as a refrigerant, fuel, and aerosol propellant. Consult factory prior to pump selection. Consider LP Gas type pump.

ISOBUTYL ALCOHOL

OTHER NAMES: Isopropylcarbinol, Isobutanol

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: .81

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: Buna-N

NOTES: Can be handled with same pump construction as ethyl alcohol.

ISOCYANATE - Refer to Toluene Diisocyanate

ISOPROPANOL - Refer to Isopropyl Alcohol

Section 1 | Liquid Application List

ISOPROPYL ACETATE

OTHER NAMES: NA

VISCOSITY: .5 cPs

SPECIFIC GRAVITY: .87

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: PTFE

NOTES: Used as a solvent for nitrocellulose, fats, oils, waxes, natural and synthetic resins; used in making artificial leather, dopes, films, lacquers, plastics and synthetic perfumes.

ISOPROPYL ALCOHOL

OTHER NAMES: IPA, Dimethylcarbinol, Isopropanol

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: .88

PUMP MODEL: E Series (Seal-less), G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: Buna-N

NOTES: Used for making acetone; as a solvent for oils, resins, pharmaceuticals, perfumes, and lacquers; as antifreeze and rocket fuel.

JET FUELS

OTHER NAMES: JP-4, JP-5, JP-6

VISCOSITY: 30 TO 50 SSU (3 to 7 cSt)

SPECIFIC GRAVITY: NA

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: Buna-N

NOTES: NA

JUICE - Refer to Fruit Juices

Section 1 | Liquid Application List

KEROSENE

OTHER NAMES: NA

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: .9

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: Buna-N

NOTES: Used as a fuel for jet engines; as a heating fuel and denaturant for alcohol.

KETONE - Refer to specific Ketone such as Methyl Ethyl Ketone (MEK)

LACQUER

OTHER NAMES: NA

VISCOSITY: 100 to 100,000 SSU (20 to 22,000 cSt), depending on composition.

SPECIFIC GRAVITY: .9 to 1.0

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite, Hardened Cast Iron

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing, Mechanical, Triple Lip

SEAL ELASTOMER: Buna-N, FKM, PTFE

NOTES: Used for coating metals and wood, especially furniture. Normally considered mildly abrasive. Mechanical seal acceptable if elastomer is compatible with solvent, consider flush line. Abrasion resistant features and steel fitted may be considered.

LACTIC ACID

OTHER NAMES: Milk acid

VISCOSITY: 200 to 500 SSU (40 to 110 cSt)

SPECIFIC GRAVITY: 1.2

PUMP MODEL: E Series (Seal-less), G Series (Sealed)

MATERIALS: Stainless Steel

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FEP-encapsulated FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: PTFE

NOTES: Used in foods and beverages, plastics and textiles, and as a flavoring and preservative.

Section 1 | Liquid Application List

LANOLIN

OTHER NAMES: Wool fat

VISCOSITY: Varies, depending on water content.

SPECIFIC GRAVITY: NA

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Packing, Mechanical

SEAL ELASTOMER: Buna-N

NOTES: Used in soaps; as an ointment base in cosmetics; as a leather dressing, finishing and softening agent. May be mixed with other oils or fatty acids.

LARD - Refer to Fats

LATEX

OTHER NAMES: NA

VISCOSITY: 100 to 25,000 SSU (20 to 5,500 cSt)

SPECIFIC GRAVITY: NA

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Stainless Steel

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing, Mechanical, Triple Lip

SEAL ELASTOMER: FKM, PTFE

NOTES: Latex is a milk-like fluid in which particles of natural or synthetic rubber or plastic are suspended in water. It is used in paints, in producing special papers, in adhesives, as a bonding agent in fibers and in making foam and sponge rubber. Latex is shear sensitive and tends to set up when stagnant. Special clearances required due to diluent characteristics of product.

LECITHIN

OTHER NAMES: NA

VISCOSITY: 5,000 to 50,000 SSU (1,100 to 11,000 cSt), depending on composition and temperature.

SPECIFIC GRAVITY: 1.0 to 1.2

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Mechanical, Triple Lip

SEAL ELASTOMER: FKM

NOTES: Used in making paints, varnishes, linoleum and oil cloth, printing inks, synthetic resins, caulking, soap and pharmaceuticals.

Section 1 | Liquid Application List

LIQUID FEED

OTHER NAMES: Liquid Cattle Feed, Morea, Beef Shake, Mol-Mix

VISCOSITY: 100 to 5,000 SSU (20 to 1,100 cSt) at ambient temperatures

SPECIFIC GRAVITY: 1.1 to 1.3

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing

SEAL ELASTOMER: NA

NOTES: Viscosity can increase greatly if outside in cold temperatures.

LUBRICATING OIL

OTHER NAMES: Lube oil

VISCOSITY: 200 to 1,000 SSU (40 to 220 cSt)

SPECIFIC GRAVITY: .90

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Mechanical, Triple Lip

SEAL ELASTOMER: Buna-N, FKM

NOTES: NA

LYE - Refer to Fats

MASSEQUITE

OTHER NAMES: NA

VISCOSITY: Up to 500,000 SSU (110,000 cSt)

SPECIFIC GRAVITY: NA

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Hardened Cast Iron, Tungsten Carbide

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing

SEAL ELASTOMER: NA

NOTES: Final product of sugar mill before drying process. Abrasion resistant features and steel fitted may be considered. Reduce speed and pressure to increase pump life.

Section 1 | Liquid Application List

MELAMINE RESINS

OTHER NAMES: NA

VISCOSITY: 2,000 to 5,000 SSU (440 to 1,100 cSt)

SPECIFIC GRAVITY: NA

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Packing, Triple Lip

SEAL ELASTOMER: FKM, FFKM

NOTES: Used as a molding compound for cellulose, wood flour, and mineral powders. Also used for laminating, adhesives, for increasing wet strength of paper, and for textile treatment to increase wrinkle resistance.

METHANOL

OTHER NAMES: Methyl alcohol, Wood alcohol

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: .97

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: Buna-N

NOTES: Used in rocket fuel, formaldehyde, as an automobile fuel, as a general solvent, and as a denaturant for ethyl alcohol.

METHYL ALCOHOL - Refer to Methanol

METHYLBENZENE - Refer to Toluene

METHYL CHLORIDE

OTHER NAMES: Chloromethane

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: .92

PUMP MODEL: **E Series** (Seal-less)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM

SEAL TYPE: NA

SEAL ELASTOMER: FKM, PTFE

NOTES: Used in making silicones, as a refrigerant, in medicine, as a fluid in thermometers, as a low temperature solvent, as a propellant in high pressure aerosols and as a pesticide. Corrosive in presence of water. Vapor is harmful.

Section 1 | Liquid Application List

METHYLENE CHLORIDE

OTHER NAMES: Methylene dichloride, Dichloromethane

VISCOSITY: .4 cPs

SPECIFIC GRAVITY: 1.3

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: PTFE

NOTES: Used in paint removers, as a fumigant, as a solvent for alkoids, crude rubbers, oils, resins and waxes; in textile and leather coatings, as a refrigerant, and local anesthetic; in the extraction of oils, fats, perfumes, flavors and drugs; as a propellant for aerosol and a blowing agent in foam. Corrosive in presence of water.

METHYL ETHYL KETONE

OTHER NAMES: MEK

VISCOSITY: .4 cPs

SPECIFIC GRAVITY: .82

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: PTFE

NOTES: Used in lacquers, dewaxing of lubricating oils, in paint removers, adhesives, dopes, in manufacturing smokeless powder, in cleaning fluids and printing.

MINERAL OIL

OTHER NAMES: NA

VISCOSITY: 100 to 5,000 SSU (20 to 1,100 cSt)

SPECIFIC GRAVITY: .9

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: Buna-N

NOTES: Steel fitted may be required.

MINERAL SPIRITS - Refer to Naphtha

Section 1 | Liquid Application List

MOLASSES

OTHER NAMES: Beet molasses, Cane molasses

VISCOSITY: 500 to 100,000 SSU (110 to 22,000 cSt)

SPECIFIC GRAVITY: NA

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite, Hardened Cast Iron

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing, Triple Lip

SEAL ELASTOMER: FKM

NOTES: Used in food for human consumption. Used as a raw material for butanol and acetone. It is also mixed with urea to make an animal feed called "liquid feed". Abrasion resistant features and steel fitted may be considered.

MONOETHANOLAMINE - Refer to Ethanolamine

MORPHOLINE

OTHER NAMES: NA

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: 1.0

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FEP-encapsulated FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: PTFE

NOTES: Used as a solvent for dyes, resins and waxes; as an emulsifying agent in water resistant adhesives and polishes, and as a corrosion inhibitor.

MUSTARD

OTHER NAMES: NA

VISCOSITY: Typically 25,000 SSU (5,500 cSt), depends on mix.

SPECIFIC GRAVITY: NA

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Stainless Steel

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing, Triple Lip

SEAL ELASTOMER: FKM

NOTES: Mustard is the yellow powder of the mustard seed mixed with a liquid for use as a condiment. Consider FDA packing.

Section 1 | Liquid Application List

NAPHTHA

OTHER NAMES: NA

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: .90

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: Buna-N

NOTES: Used primarily as a solvent for thinning paints and varnishes, and as a source for certain petro chemicals.

NAPHTHALENE

OTHER NAMES: Tar camphor

VISCOSITY: .8 cPs

SPECIFIC GRAVITY: 1.14

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: PTFE

NOTES: Used as a moth repellent, fungicide, cutting fluid, lubricant in synthetic resins; as a preservative and solvent.

OIL - Refer to specific oil, such as lubrication oil, fuel oil, etc.

OLEIC ACID - Refer to Fatty Acids

OLIVE OIL - Refer to Vegetable Oil

ORANGE JUICE - Refer to Fruit Juice

ORGANIC SOLVENTS - Refer to Solvent

ORTHOPHOSPHORIC ACID - Refer to Phosphoric Acid

Section 1 | Liquid Application List

PAINT

OTHER NAMES: NA

VISCOSITY: 100 to 25,000 SSU (20 to 5,500 cSt)

SPECIFIC GRAVITY: NA

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite, Hardened Cast Iron, Tungsten Carbide

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM

SEAL TYPE: Mechanical, Triple Lip

SEAL ELASTOMER: FKM, PTFE

NOTES: Check with user concerning shear sensitivity and materials of construction.

PALMITIC ACID - Refer to Fatty Acids

PAPER COATING

OTHER NAMES: Clay coatings

VISCOSITY: Typically 5,000 to 100,000 SSU (1,100 to 22,000 cSt). Liquid is generally thixotropic; the viscosity as it passes through the pump may be closer to 10,000 SSU (2,200 cSt).

SPECIFIC GRAVITY: 1.3 to 1.7

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite, Hardened Cast Iron, Tungsten Carbide

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Packing

SEAL ELASTOMER: NA

NOTES: Clay coating provides the "slick" surface on paper used for magazines or the opaque surface on fine paper production. Abrasion resistant features and steel fitted may be considered. Reduce speed and pressure to increase pump life.

PARAFFIN

OTHER NAMES: Paraffin wax, Paraffin hydrocarbon

VISCOSITY: 50 SSU (7 cSt) @ 120°F

SPECIFIC GRAVITY: NA

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: FKM

NOTES: Semi-white, waxy solid used in the manufacture of candies and wax paper; for waterproofing wood, impregnating matches, preserving eggs; in making crayons and ointments; as a preservative coating for food products, phonograph records, floor polishes, cosmetics and in tobacco packaging. Be sure pump is brought up to temperature before start-up. Jacketing may be required.

PASTE - Refer to Adhesives

Section 1 | Liquid Application List

PEANUT BUTTER

OTHER NAMES: NA

VISCOSITY: 10,000 to over 100,000 SSU (2,200 to 22,000 cSt). Normal pumping temperature is 90° to 180°F.

SPECIFIC GRAVITY: 1.1 to 1.2

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing, Triple Lip

SEAL ELASTOMER: FKM

NOTES: Pumping of peanut butter can be difficult due to viscosity and dewatering. Reduce pump speed to 1/3 to 1/4 normal operating speed to reduce heat buildup in bushing area. FDA packing may be required.

PEANUT OIL - Refer to Vegetable Oil

PENTACHLOROPHENOL

OTHER NAMES: PCP

VISCOSITY: 40 to 100 SSU (4 to 20 cSt)

SPECIFIC GRAVITY: 2.0

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: PTFE

NOTES: White powder or crystals soluble in alcohol, acetone, pine oil, benzene. Used as a fungicide, bactericide, herbicide and as a wood preservative. Can cause skin irritation.

PENTANE

OTHER NAMES: Amyl hydride

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: .63

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: Buna-N

NOTES: Flammable liquid soluble in hydrocarbons, oils and ether. Used as an anesthetic, in low temperature thermometers, as a general solvent, as a blowing agent in plastics and as a pesticide.

Section 1 | Liquid Application List

PERCHLOROETHYLENE

OTHER NAMES: Tetrachloroethylene, Perk

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: 1.6

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: FKM, PTFE

NOTES: Used as a dry cleaning solvent, vapor degreasing solvent, drying agent for metals; solvent for rubber, waxes, tar, paraffins, gum. May be corrosive in presence of water.

PERCHLOROMETHANE - Refer to Carbon Tetrachloride

PETROLATUM

OTHER NAMES: White mineral oil, Paraffin oil-white, Vaseline

VISCOSITY: 100 SSU (20 cSt) @ 100°F

SPECIFIC GRAVITY: .85

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: Buna-N

NOTES: Used in medicine, cosmetics, dispersants, diluents, plastics manufacture; as a binder in foods; as a defoaming agent, lubricant, release agent and protective coating.

PHENOL

OTHER NAMES: Carboic acid, Phenylic acid, Benzophenol, Hydro-benzene

VISCOSITY: 40 SSU (4 cSt) at melting point of 110°F.

SPECIFIC GRAVITY: 1.07

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite, Bronze

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: FKM

NOTES: Absorbs water from the air and liquefies. Poisonous. Used in making phenolic resins, epoxy resins, in weed killers, as a solvent for lubricating oils; for making acids and pharmaceuticals. Hazardous; rapidly absorbed through the skin causing severe burns. Jacketing may be required.

PHENOL-FORMALDEHYDE RESINS - Refer to Resins

Section 1 | Liquid Application List

PHOSPHORIC ACID

OTHER NAMES: NA

VISCOSITY: At ambient temperatures, viscosity varies from thin at 75% strength to a syrupy liquid at 85% strength, to crystals at 100% phosphoric acid.

SPECIFIC GRAVITY: 1.8

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Stainless Steel

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FEP-encapsulated FKM

SEAL TYPE: Packing, Mechanical

SEAL ELASTOMER: PTFE

NOTES: Phosphoric acid is a clear liquid, or a transparent, crystalline solid, depending on the concentration and the temperature. It is used in making fertilizers, soaps and detergents, in pickling and rust-proofing of metals, in pharmaceuticals, sugar refining, water treatment, animal feeds, waxes, and polishes and in foods. Depending on the service and the pump being used, the pumps may require FDA compliant metallic materials, o-rings, gaskets and shaft seals.

PHTHALIC ANHYDRIDE

OTHER NAMES: NA

VISCOSITY: 40 to 100 SSU (4 to 20 cSt)

SPECIFIC GRAVITY: NA

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FEP-encapsulated FKM

SEAL TYPE: Packing, Mechanical

SEAL ELASTOMER: PTFE

NOTES: Used in making alkyd resins, insecticides and plasticizers; as a hardener for resins. Transforms into a brittle solid upon contact with moisture. Jacketing may be required. Consider FDA packing.

PITCH

OTHER NAMES: Coal-tar pitch, Hot pitch, Roof pitch

VISCOSITY: 100 to 5,000 SSU (20 to 1,100 cSt), depending on particular type of pitch and temperature. Typical operating range 400° to 500°F.

SPECIFIC GRAVITY: NA

PUMP MODEL: **V Series**

MATERIALS: Iron

BUSHINGS: Bronze, Hardened Cast Iron

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing, Triple Lip

SEAL ELASTOMER: FKM, FFKM

NOTES: Be sure pumps are brought up to temperature before start up.

POLYESTER RESIN - Refer to Resin

Section 1 | Liquid Application List

POLYETHYLENE GLYCOL

OTHER NAMES: PEG, Polyoxyethylene, Polyglycol, Polyether glycol

VISCOSITY: 100 to 1,000 SSU (20 to 220 cSt)

SPECIFIC GRAVITY: NA

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing, Mechanical, Triple Lip

SEAL ELASTOMER: Buna-N, FKM

NOTES: Used in making plasticizers, softeners, lubricants; as a base for cosmetics and pharmaceuticals.

POLYMER

OTHER NAMES: NA

VISCOSITY: 1,000 to 100,000 SSU (220 to 22,000 cSt)

SPECIFIC GRAVITY: NA

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Packing, Mechanical, Triple Lip

SEAL ELASTOMER: Buna-N, FKM

NOTES: "Polymer" is a very general term. Be sure to identify the specific polymer before selecting pump

POLYOL

OTHER NAMES: Polyalcohol

VISCOSITY: 2,500 to 50,000 SSU (550 to 11,000 cSt)

SPECIFIC GRAVITY: NA

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM

SEAL TYPE: Mechanical, Triple Lip

SEAL ELASTOMER: Buna-N, FKM, PTFE

NOTES: Used in the manufacture of polyurethane foam.

POLYURETHANE FOAM

OTHER NAMES: Polyalcohol

Polyurethane foam is made by mixing Polyol with catalysts, surfactants, blowing agents and isocyanate to create foam insulation and padding material. The major pumping requirements are for resins, solvents, isocyanates (TDI, MDI) and Polyol. Generally, polyol is pumped with a G-Series pump while resins and isocyanates are pumped with E-Series pumps. Refer to the specific fluid for pump recommendations.

Section 1 | Liquid Application List

POLYVINYL ACETATE

OTHER NAMES: PVAc

VISCOSITY: 5,000 to 50,000 SSU (1,100 to 11,000 cSt)

SPECIFIC GRAVITY: 1.2

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite, Bronze

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing, Triple Lip

SEAL ELASTOMER: FKM

NOTES: Used in latex paints, hot melt and other types of adhesives; for coating and finishing fabrics; as a component of lacquers and inks; in caulking compounds and chewing gum. Tends to be shear and heat sensitive. Consider extra clearances and reducing speed.

POLYVINYL ALCOHOL (PVA)

OTHER NAMES: NA

VISCOSITY: 2,000 to 20,000 SSU (440 to 4,400 cSt)

SPECIFIC GRAVITY: 1.2 to 1.3

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Packing, Mechanical, Triple Lip

SEAL ELASTOMER: Buna-N, FKM

NOTES: Used in adhesives and binders for leather, cloth and paper; as an emulsifying agent, stabilizer and thickener; for temporary protective coatings.

POTASSIUM HYDROXIDE - Refer to Sodium Hydroxide

PRINTING INK

OTHER NAMES: NA

VISCOSITY: 200 SSU to 150,000 SSU (40 to 33,000 cSt), depending on type and temperature.

SPECIFIC GRAVITY: NA

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite, Hardened Cast Iron, Tungsten Carbide

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM

SEAL TYPE: Packing, Mechanical, Triple Lip

SEAL ELASTOMER: FKM, PTFE, FFKM

NOTES: Some inks such as carbon paper inks contain wax and are often handled at temperatures in the range of 180° to 200°F. Mechanical seals work best on oil based and solvent based inks. Abrasion resistant features and steel fitted may be considered. Reduce speed and pressure to increase pump life.

Section 1 | Liquid Application List

PROPYLENE GLYCOL

OTHER NAMES: Methylethylene glycol, Methyl glycol

VISCOSITY: 50 to 500 SSU (7 to 110 cSt)

SPECIFIC GRAVITY: 1.04

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Mechanical, Triple Lip

SEAL ELASTOMER: Buna-N, FKM

NOTES: Used in making polyester resins and anti-freeze solutions; as a solvent for fats, oils, waxes, resins, perfumes; serves as a lubricant in refrigeration machinery; as a plasticizer, solvent in foods, wetting agent, emulsifier and as an animal feed additive.

REFRIGERANTS - Refer to Anhydrous Ammonia and Freon

RESINS

OTHER NAMES: Synthetic Resins, Acrylate, Alkyd

VISCOSITY: 200 to 500,000 SSU (40 to 110,000 cSt), depending on type

SPECIFIC GRAVITY: NA

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron, Steel, Stainless Steel

BUSHINGS: Carbon Graphite, Bronze, Hardened Cast Iron, Tungsten Carbide

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM

SEAL TYPE: Packing, Mechanical, Triple Lip

SEAL ELASTOMER: Buna-N, FKM, FFKM, PTFE

NOTES: Resins are typically used in protective coatings, plastic parts, potting materials, hot melts, foam, adhesives, etc. Additives such as solvents, blowing agents, and abrasive solids are often mixed with various resins to produce a particular end product. Some resins are shear and/or heat sensitive. Abrasion resistant features steel fitted, and jacketing may be considered.

ROSIN

OTHER NAMES: Gum rosin, Colophony, Pine resin, Wood rosin

VISCOSITY: 200 to 100,000 SSU (40 to 22,000 cSt), depending on temperature and/or solvent. Rosins without solvents are often handled between 400° to 500°F.

SPECIFIC GRAVITY: NA

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron, Steel, Stainless Steel

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM

SEAL TYPE: Packing, Triple Lip

SEAL ELASTOMER: FKM, FFKM

NOTES: Used in making linoleum, soldering compounds, core oils, insulating compounds, molding, compounds, sealing waxes, medicines, paper sizing, printing inks and varnishes. Steel fitted and jacketing may be required.

ROOFING TAR - Refer to Tar

Section 1 | Liquid Application List

RUBBER CEMENT

OTHER NAMES: NA

VISCOSITY: 500 to 100,000 SSU (110 to 22,000 cSt)

SPECIFIC GRAVITY: .7 to .9

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing, Triple Lip

SEAL ELASTOMER: FKM

NOTES: Used as a binder, sound deadener, adhesive for paper and for repairing tires and tubes. A solvent flush at the stuffing box of a packed pump helps to prevent the build-up of rubberlike material around the packing. Larger ports and steel fitted may be considered.

SILICATE - Refer to Sodium Silicate

SHELLAC

OTHER NAMES: Lac, Garnet lac, Gum lac, Stick lac

VISCOSITY: 100 to 10,000 SSU (20 to 2,200 cSt)

SPECIFIC GRAVITY: NA

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing, Triple Lip

SEAL ELASTOMER: FKM

NOTES: Used in paints, stains, varnishes, as a general binder and for making sealing wax.

SILICONE

OTHER NAMES: NA

VISCOSITY: 40 to 100,000 SSU (4 to 22,000 cSt)

SPECIFIC GRAVITY: NA

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing, Mechanical, Triple Lip

SEAL ELASTOMER: FKM, PTFE

NOTES: Used in building products, weather-proofing, cosmetics, and other personal care products.

Section 1 | Liquid Application List

SOAP

OTHER NAMES: NA

VISCOSITY: 200 to 500,000 SSU (40 to 110,000 cSt). Normally handled between ambient and 200°F.

SPECIFIC GRAVITY: .9 to 1.0

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite, Hardened Cast Iron

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM

SEAL TYPE: Packing, Mechanical, Triple Lip

SEAL ELASTOMER: FKM, PTFE

NOTES: Some applications require steam flush cycles. Abrasion resistant features, steel fitted, and jacketing may be required.

SOAP SKIMMINGS - Refer to Black Liquor Soap

SODIUM CHLORIDE BRINE

OTHER NAMES: Brine, Sea water, Saltwater

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: 1.1 to 1.2

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Stainless Steel (recommended), Iron

BUSHINGS: Carbon Graphite, Bronze

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing, Mechanical

SEAL ELASTOMER: Buna-N

NOTES: Used in refrigeration and in food preservation. Rapid corrosion will occur when an iron pump that has handled Brine is exposed to air.

SODIUM HYDROXIDE

OTHER NAMES: Caustic, Caustic soda, Lye

VISCOSITY: 40 to 300 SSU (4 to 65 cSt), depending on concentration and temperature.

SPECIFIC GRAVITY: 1.1 at 1 0% concentration; 1.4 at 50% concentration

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FEP-encapsulated FKM

SEAL TYPE: Mechanical, Triple Lip with Grease Barrier

SEAL ELASTOMER: PTFE

NOTES: Used in the manufacture of chemicals, rayon and film; used in petroleum refining, pulp and paper, in making aluminum; in detergents, soaps and textiles; in reclaiming rubber and as an alkali in foods. Causes severe burns to skin and eyes. Seal-less recommended for concentrations above 50% or temperatures above 100°F.

Section 1 | Liquid Application List

SODIUM SILICATE

OTHER NAMES: Soluble glass, Silicate of soda, Liquid glass, Water glass

VISCOSITY: Typically 500 to 25,000 SSU (110 to 5,500 cSt). Usually handled between ambient temperature and 200°F.

SPECIFIC GRAVITY: NA

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite, Hardened Cast Iron, Tungsten Carbide

O-RINGS (E-SERIES ONLY): FEP-encapsulated FKM

SEAL TYPE: Packing

SEAL ELASTOMER: NA

NOTES: Used in making soaps and detergents, adhesives, pigments, in water treatment, bleaching and sizing of textiles and paper pulp; as a binder for foundry cores and molds and in waterproofing mortars and cements. Irritating to eyes and skin. Pump should be left filled with liquid or flushed thoroughly since air will dry the liquid, leaving an abrasive solid. Sodium silicate is extremely abrasive. Abrasion resistant features recommended. Reduce speed and pressure to increase pump life.

SOLVENTS

OTHER NAMES: Alcohol, Naphtha, Toluene, Ketones.

VISCOSITY: 30 to 40 SSU (3 to 4 cSt)

SPECIFIC GRAVITY: NA

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: FKM, PTFE

NOTES: A solvent is generally a liquid used to dissolve a solid or put it into solution. The term is used widely in the paint industry, metal cleaning, degreasing, plastics, etc.

SOYBEAN OIL

OTHER NAMES: Soya bean oil, Chinese bean oil, Soy oil

VISCOSITY: 50 to 500 SSU (7 to 110 cSt)

SPECIFIC GRAVITY: NA

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: Buna-N, FKM

NOTES: Used in making soaps, salad dressings, resins, linoleums and inks; as a substitute for linseed oil in paints and varnishes, as a cattle feed, butter substitute, and in the manufacture of glue. Soybean gums are sometimes handled as a by-product of soybean oil processing. These gums can have viscosities near 100,000 SSU. Pump selection should be as for soybean oil with consideration of viscosity for port size and pump speed.

Section 1 | Liquid Application List

STARCH

OTHER NAMES: Hot starch, Cooked starch, Raw starch, Starch slurry

VISCOSITY: 300 to over 100,000 SSU (65 to 22,000 cSt), depending on type and temperature.

SPECIFIC GRAVITY: 1.5

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron, Steel, Stainless Steel

BUSHINGS: Carbon Graphite, Bronze, Hardened Cast Iron, Tungsten Carbide

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Triple Lip with Grease Barrier, Packing

SEAL ELASTOMER: NA

NOTES: Used for making adhesives, for the sizing and finishing of textiles, in foods, in sizing paper, in making explosives, in medicines, face powders, cosmetics, bookbinding, making glucose, malt sugar, caramel and in cattle feeds. Abrasion resistant features may be considered.

STEARIC ACID - Refer to Fatty Acid

STODDARD SOLVENT - Refer to Solvents

STYRENE

OTHER NAMES: Styrene monomer, vinylbenzene, phenylethylene

VISCOSITY: Styrene monomer is approximately 40 SSU (4 cSt). If polymerization has taken place, viscosity may range up to 500,000 SSU (110,000 cSt).

SPECIFIC GRAVITY: .90

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM

SEAL TYPE: Packing, Mechanical, Triple Lip

SEAL ELASTOMER: FKM, PTFE

NOTES: Used for making polystyrene plastics, SBR and ABS resins, and protective coatings.

SUGAR SYRUP

OTHER NAMES: Liquid sugar, Sugar, Beet sugar, Cane sugar, Sucrose

VISCOSITY: 500 to 10,000 SSU (110 to 2,200 cSt), depending on type and temperature.

SPECIFIC GRAVITY: .90

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite, Bronze

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM

SEAL TYPE: Packing, Cartridge

SEAL ELASTOMER: FKM, PTFE

NOTES: In food, for sweetening in candy, preserves and jams; in making soap, pharmaceuticals, Carmel; as a chemical intermediate for detergents; as an emulsifying agent in plasticizers, resins, explosives, glues and insecticides. Depending on the service and the pump being used, the pumps may require FDA compliant metallic materials, o-rings, gaskets and shaft seals.

Section 1 | Liquid Application List

SULFUR

OTHER NAMES: Brimstone, Fluors of sulfur, Molten sulfur

VISCOSITY: 40 SSU (4 cSt) at normal handling range of 250° to 310°F. Viscosity increases rapidly until 370°F where it is almost solid.

SPECIFIC GRAVITY: NA

PUMP MODEL: E Series (Seal-less)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: NA

SEAL ELASTOMER: NA

NOTES: Used in making sulfuric acid, in the pulp and paper industry, in making carbon disulfide and other chemicals and dyes, for vulcanizing rubber and in medicines. Some sulfur contains abrasive impurities. Abrasion resistant features may be considered. Reduce speed and pressure to increase pump life.

SULFURIC ACID, CONCENTRATED

OTHER NAMES: Hydrogen sulfate, Oil of vitriol, Battery acid, Baume sulfuric acid (93.2%), 98% Sulfuric acid

VISCOSITY: 200 to 750 SSU (40 to 165 cSt)

SPECIFIC GRAVITY: 1.84

PUMP MODEL: E Series (Seal-less), G Series (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FEP-encapsulated FKM

SEAL TYPE: Packing, Mechanical

SEAL ELASTOMER: PTFE

NOTES: Used in making fertilizers, as a source of many chemicals, in petroleum refining, in making paints and pigments, in production of iron and steel, in the manufacture of rayon and cellulose film, in making industrial explosives and in textile finishing. Danger! Sulfuric acid causes severe burns. Iron pumps are typically considered expendable items. Consider packing if leaking can be tolerated.

SYRUP - Refer to Sugar Syrup

TALL OIL

OTHER NAMES: Tallol, Liquid rosin

VISCOSITY: 1,000 to 25,000 SSU (220 to 5,500 cSt). Generally handled between ambient to 200°F.

SPECIFIC GRAVITY: NA

PUMP MODEL: E Series (Seal-less), G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Packing, Triple Lip

SEAL ELASTOMER: FKM

NOTES: Used in drying oils, alkyd resins, linoleum, soaps, cutting oils, emulsifiers, flotation agents, lubricants and greases, and in making rubber. Jacketing may be required.

Section 1 | Liquid Application List

TALLOW - Refer to Fat

TAR

OTHER NAMES: Roofing tar

VISCOSITY: 500 SSU to 2,000 SSU (110 to 440 cSt) at normal pumping temperature range of 400° to 600°F.

SPECIFIC GRAVITY: NA

PUMP MODEL: V Series

MATERIALS: Iron

BUSHINGS: Bronze

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing

SEAL ELASTOMER: NA

NOTES: Used for coating roofs, cast iron pipe, gas transmission lines, etc. Jacketing recommended.

TDI - Refer to Toluene Diisocyanate

TETRACHLOROETHYLENE - Refer to Perchloroethylene

TETRAHYDROFURAN - Consult Factory

THERMINOL - Refer to Heat Transfer Oils

TITANIUM DIOXIDE SLURRY

OTHER NAMES: NA

VISCOSITY: 100 to 10,000 SSU (20 to 2,200 cSt), depending on type of slurry.

SPECIFIC GRAVITY: 3.8

PUMP MODEL: E Series (Seal-less), G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Hardened Cast Iron, Tungsten Carbide

O-RINGS (E-SERIES ONLY): FEP-encapsulated FKM

SEAL TYPE: Packing, Cartridge

SEAL ELASTOMER: PTFE

NOTES: Used as a paint pigment, in paper coating, in making floor coverings, and in printing inks. Flush plan with abrasion resistant features recommended. Reduce speed and pressure to increase pump life.

Section 1 | Liquid Application List

TOLUENE

OTHER NAMES: Toluol, Methylbenzene, Phenylmethane

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: .87

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: FKM, PTFE

NOTES: Used in blending aviation gasoline, as a raw material for benzene phenol, as a solvent for paints, coatings, gums, resins and rubber cement. Used for making chemicals, in medicines, dyes, perfumes and as a source of toluene diisocyanates used in polyurethane resins. Vapor is harmful.

TOLUENE DIISOCYANATE

OTHER NAMES: TDI, Toluene-2, 4-Isocyanate

VISCOSITY: 100 to 2,000 SSU (20 to 440 cSt)

SPECIFIC GRAVITY: 1.2

PUMP MODEL: E Series (Seal-less)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Resin Impregnated Carbon Graphite

O-RINGS (E-SERIES ONLY): FEP-encapsulated FKM

SEAL TYPE: NA

SEAL ELASTOMER: NA

NOTES: Used in combination with Polyol and Freon to make polyurethane foams, elastomers and resins, Vapor is extremely irritating to the eyes and nose. Contact with skin causes burns.

TRICHLOROETHANE

OTHER NAMES: Methyl chloroform

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: 1.3

PUMP MODEL: E Series (Seal-less), G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FEP-encapsulated FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: PTFE

NOTES: Used in medicine, as a pesticide, as a general solvent for fats, oils, waxes, resins and cutting oil compounds; as a coolant and lubricant.

Section 1 | Liquid Application List

TRIETHYLENE GLYCOL

OTHER NAMES: TEG

VISCOSITY: 200 to 500 SSU (40 to 110 cSt)

SPECIFIC GRAVITY: 1.12

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Mechanical, Triple Lip

SEAL ELASTOMER: FKM

NOTES: Used as a solvent for nitrocellulose and various gums and resins; used in making lacquers and as a textile conditioner.

TRICHLOROETHYLENE

OTHER NAMES: NA

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: 1.46

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: FKM, PTFE

NOTES: Used in metal degreasing, dry cleaning, as a solvent for oils, fats and waxes; as a refrigerant heat transfer fluid and fumigant. Vapor is harmful.

TRIETHANOLAMINE

OTHER NAMES: TEA

VISCOSITY: 500 to 2,000 SSU (110 to 440 cSt)

SPECIFIC GRAVITY: 1.13

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: FKM, PTFE

NOTES: Used in cosmetics, detergents and oil emulsions; as a corrosion inhibitor, plasticizer and insecticide.

Section 1 | Liquid Application List

TURPENTINE

OTHER NAMES: Spirits of turpentine, Turps

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: .87

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: FKM

NOTES: Used primarily as a general solvent and thinner for paints, varnishes and lacquers.

UREA FORMALDEHYDE RESIN - Refer to Resin

URETHANE FOAM - Refer to Polyurethane Foam

VARNISH

OTHER NAMES: NA

VISCOSITY: 200 SSU to 500,000 SSU (40 to 110,000 cSt), depending on composition and temperature.

SPECIFIC GRAVITY: NA

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Packing, Triple Lip

SEAL ELASTOMER: FKM

NOTES: Used primarily as a protective coating for furniture, woodwork, etc. Flush plan required if customer insists on mechanical seal.

VEGETABLE OIL

OTHER NAMES: Shortening, Corn oil, Cottonseed oil

VISCOSITY: 50 to 500 SSU (7 to 110 cSt)

SPECIFIC GRAVITY: .9 to 1.0

PUMP MODEL: G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical, Triple Lip

SEAL ELASTOMER: Buna-N, FKM

NOTES: Used industrially in cutting oils, for dressing leather, as a drying oil and lubricant. The edible oils are used in salad oils, shortenings, margarines, etc.

Section 1 | Liquid Application List

VINYL ACETATE

OTHER NAMES: NA

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: .93

PUMP MODEL: E Series (Seal-less), G Series (Sealed)

MATERIALS: Iron, Stainless Steel

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FEP-encapsulated FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: PTFE

NOTES: Used in making polyvinyl acetate, polyvinyl alcohol and polyvinyl chloride-acetate resins, which are used in latex paints, adhesives and textile finishing. Extremely flammable.

VISCOSE

OTHER NAMES: Rayon viscose

VISCOSITY: 25,000 to 250,000 SSU (5,500 to 55,000 cSt)

SPECIFIC GRAVITY: NA

PUMP MODEL: E Series (Seal-less), G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Packing, Triple Lip

SEAL ELASTOMER: FKM

NOTES: Viscose is made by treating shredded wool pulp with carbon disulfide and sodium hydroxide to form an orange, viscous solution of cellulose xanthate. After filtration and deaeration, the remaining solution is known as viscose. The primary end products of viscose are rayon fibers and cellophane. Consider reducing speed to 1/3 or 1/4 normal operating speed to reduce heat buildup in bushing area.

WAX

OTHER NAMES: Liquid wax, Molten wax, Beeswax, Paraffin

VISCOSITY: 40 to 500 SSU (4 to 110 cSt) when handled in the temperature range of 200° to 250°F.

SPECIFIC GRAVITY: .8 to 1.0

PUMP MODEL: E Series (Seal-less), G Series (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite, Hardened Cast Iron, Tungsten Carbide

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM

SEAL TYPE: Packing, Mechanical, Triple Lip

SEAL ELASTOMER: FKM, PTFE

NOTES: Used as protective coatings for furniture, floors, automobiles and machine tools; in waterproofing; in food preservation; in making paper and in the packaging industry; in the manufacture of printing inks, cosmetics, candles, and lubricants. Abrasion resistant features and jacketing may be considered.

Section 1 | Liquid Application List

WHEY

OTHER NAMES: Milk serum

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: NA

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: FKM

NOTES: NA

WOOD ALCOHOL - Refer to Methanol

XYLENE

OTHER NAMES: Xylol, Dimethylbenzene

VISCOSITY: 40 SSU (4 cSt)

SPECIFIC GRAVITY: .86

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): FKM

SEAL TYPE: Mechanical

SEAL ELASTOMER: FKM

NOTES: Used in aviation gasoline and protective coatings; as a solvent for alkyd resins, lacquers, enamels and rubber cements.

YEAST

OTHER NAMES: Barm

VISCOSITY: 40 to 1,000 SSU (4 to 220 cSt), depending on composition.

SPECIFIC GRAVITY: NA

PUMP MODEL: **G Series** (Sealed)

MATERIALS: Stainless Steel

BUSHINGS: Carbon Graphite

O-RINGS (E-SERIES ONLY): NA

SEAL TYPE: Mechanical

SEAL ELASTOMER: FKM, PTFE

NOTES: Used in the fermentation of sugars, molasses and cereal grains for making alcohol; for brewing, medicine and making bread.

Section 1 | Liquid Application List

ZINC OXIDE

OTHER NAMES: Zinc oxide coating, Zinc oxide slurry

VISCOSITY: 200 to 1,000 SSU (40 to 220 cSt)

SPECIFIC GRAVITY: NA

PUMP MODEL: **E Series** (Seal-less), **G Series** (Sealed)

MATERIALS: Iron

BUSHINGS: Carbon Graphite, Hardened Cast Iron, Tungsten Carbide

O-RINGS (E-SERIES ONLY): FKM, FEP-encapsulated FKM

SEAL TYPE: Cartridge

SEAL ELASTOMER: Buna-N, FKM, PTFE

NOTES: Used as a filler and catalyst in rubber and plastics; as a pigment in paints; in medicines and cosmetics. Verify materials of construction are compatible with solvent. Abrasion resistant features recommended. Reduce speed and pressure to increase pump life.

Section 2 | Net Positive Suction Head Required (NPSH_R)

NPSH may refer to one of two pressure values in cavitation analysis:

- NPSH Required (NPSH_R): Minimum pressure required at pump inlet port to avoid cavitation.
- NPSH Available (NPSH_A): Absolute pressure at the pump inlet port.

Please Note: NPSH_A must be higher than NPSH_R for proper pump operation and to avoid cavitation.

NPSH_R is a property of pump design and operating

conditions which shall be provided by the pump manufacturer. The tables below can be used to determine Blackmer Gear Pump models NPSH_R values.

- Table 1 applies to viscosities up to 750 SSU (163 cSt).
- For liquids other than water, divide by specific gravity (SG)
- For viscosities above 750 SSU (163 cSt), multiply results from table 1 by correction factors provide in Table 2.

Table 1: NPSH_R Values

MODEL	NPSHR - FEET OF LIQUID, SG = 1.0, VISCOSITIES UP TO 163 CST														
	PUMP SPEED RPM														
	100	125	155	190	230	280	350	420	520	640	780	950	1150	1450	1750
G1-2/4 • E1-2/4					1.7	1.8	1.9	2.1	2.4	2.8	3.4	4.5	6.2	9.5	13.5
G1-24/32 • E1-24/32		1.7	1.8	1.9	2.1	2.3	2.8	3.3	4.4	6.3	9.1				
G1/2-55/69/82 • E1-55/69/82 • V2-55	1.6	1.8	2.0	2.2	2.5	3.0	3.8	5.0	7.3	10.8					
G1/2-133/222 • E1-133/222 • V2-133	1.9	2.1	2.3	2.7	3.3	4.2	6.1	8.4	12.7						
V2-254/423	2.1	2.3	3.5	4.5	6.3	9.5									

Table 2: High Viscosity Correction Factors

VISCOSITY	MULTIPLIER
2,500 SSU (550 cSt)	1.3
5,000 SSU (1,100 cSt)	1.7
10,000 SSU (2,200 cSt)	2.0
25,000 SSU (5,500 cSt)	2.7
50,000 SSU (11,000 cSt)	3.1
100,000 SSU (22,000 cSt)	4.0
250,000 SSU (55,000 cSt)	5.3
500,000 SSU (110,000 cSt)	6.7
1,000,000 SSU (220,000 cSt)	10.7

NPSH_A is a function of system design and operating conditions.

The following formula can be used to calculate NPSH_A:

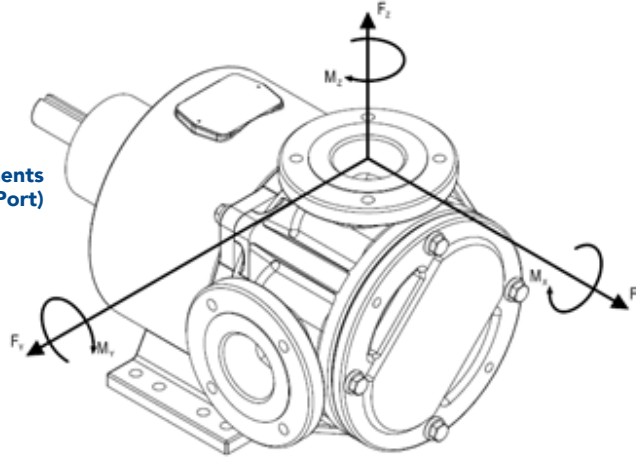
$$\text{NPSH}_A = H_A \pm H_Z - H_F + H_V - H_{VP}$$

VARIABLE	DESCRIPTION	COMMENTS
H_A	The absolute pressure on the surface of the liquid in the supply tank.	Typically atmospheric pressure (vented supply tank), but can be different for closed tanks.
		Altitude affects atmospheric pressure (Higher altitude equals lower pressure).
		Always positive (may be low, but even vacuum vessels are at a positive absolute pressure)
H_Z	The vertical distance between the surface of the liquid in the supply tank and the centerline of the pump.	Positive when liquid level is above the centerline of the pump (called static head)
		Negative when liquid level is below the centerline of the pump (called suction lift)
		Be sure to use the lowest liquid level allowed in the tank.
H_F	Friction losses in the suction piping	Piping and fittings restrict flow, working against liquid as it flows towards the pump inlet.
H_V	Velocity head at the pump suction port	Often not included as it can be quite small.
H_{VP}	Absolute vapor pressure of the liquid at the pumping temperature	Subtracted in the end to make sure that the inlet pressure stays above the vapor pressure.
		As temperatures rise, so does the vapor pressure.

Section 3 | Nozzle Loading

E-Series Maximum Allowable Forces and Moments

Figure 1: Direction of Forces and Moments (Shown for a Vertical Port)



Notations:

- **F:** Applied forces (lbs & N)
- **M:** Applied moments (lbf-ft & Nm)
- **x:** x-axis parallel to the pump shaft (reference Figure 1)
- **y:** y-axis horizontal and perpendicular to x-axis and z-axis (reference Figure 1)
- **z:** z-axis vertical and perpendicular to x-axis and y-axis (reference Figure 1)

max: maximum allowable forces and moments (reference Table 1 and Table 2)

Table 3: Maximum Allowable Forces and Moments (Threaded Ports)

MODEL	HORIZONTAL PORTS												VERTICAL PORTS (SHOWN IN FIGURE 1)											
	Fmax (lb)			Mmax (lbf-ft)			Fmax (N)			Mmax (Nm)			Fmax (lb)			Mmax (lbf-ft)			Fmax (N)			Mmax (Nm)		
	Fx	Fy	Fz	Mx	My	Mz	Fx	Fy	Fz	Mx	My	Mz	Fx	Fy	Fz	Mx	My	Mz	Fx	Fy	Fz	Mx	My	Mz
E1-2	360	360	285	230	25	90	1601	1601	1268	312	34	122	360	285	360	230	90	25	1601	1268	1601	312	122	34
E1-4	360	360	285	230	25	90	1601	1601	1268	312	34	122	360	285	360	230	90	25	1601	1268	1601	312	122	34
E1-24	420	575	435	442	50	152	1868	2558	1935	599	68	206	420	435	575	442	152	50	1868	1935	2558	599	206	68
E1-32	420	575	435	442	50	152	1868	2558	1935	599	68	206	420	435	575	442	152	50	1868	1935	2558	599	206	68

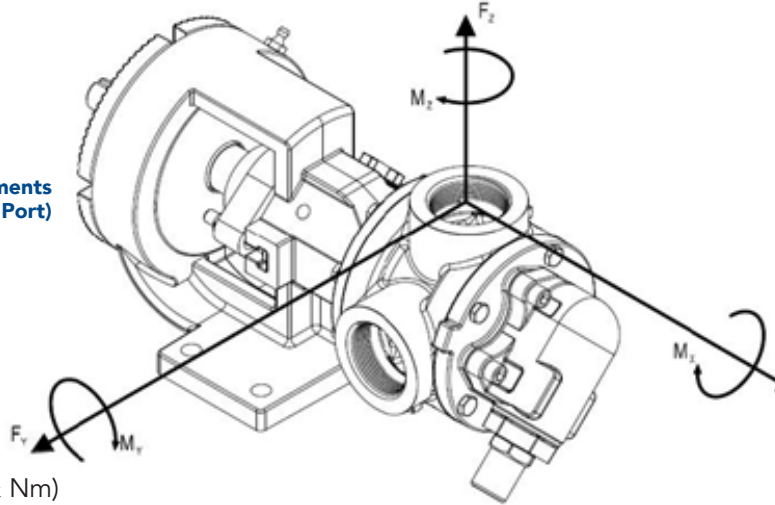
Table 4: Maximum Allowable Forces and Moments (Flanged Ports)

MODEL	HORIZONTAL PORTS												VERTICAL PORTS (SHOWN IN FIGURE 1)											
	Fmax (lb)			Mmax (lbf-ft)			Fmax (N)			Mmax (Nm)			Fmax (lb)			Mmax (lbf-ft)			Fmax (N)			Mmax (Nm)		
	Fx	Fy	Fz	Mx	My	Mz	Fx	Fy	Fz	Mx	My	Mz	Fx	Fy	Fz	Mx	My	Mz	Fx	Fy	Fz	Mx	My	Mz
E1-2	360	360	285	230	90	90	1601	1601	1268	312	122	122	360	285	360	230	90	90	1601	285	1601	312	122	122
E1-4	360	360	285	230	90	90	1601	1601	1268	312	122	122	360	285	360	230	90	90	1601	285	1601	312	122	122
E1-24	420	575	435	442	120	152	1868	2558	1935	599	163	206	420	435	575	442	152	120	1868	1935	2558	599	206	163
E1-32	420	575	435	442	120	152	1868	2558	1935	599	163	206	420	435	575	442	152	120	1868	1935	2558	599	206	163
E1-55	450	630	470	484	194	194	2002	2802	2091	656	263	263	450	470	630	484	194	194	2002	2091	2802	656	263	263
E1-69	450	630	470	484	194	194	2002	2802	2091	656	263	263	450	470	630	484	194	194	2002	2091	2802	656	263	263
E1-82	450	630	470	484	194	194	2002	2802	2091	656	263	263	450	470	630	484	194	194	2002	2091	2802	656	263	263
E1-133	450	630	470	484	194	194	2002	2802	2091	656	263	263	450	470	630	484	194	194	2002	2091	2802	656	263	263
E1-222	455	470	470	484	194	194	2024	2091	2091	656	263	263	455	470	470	484	194	194	2024	2091	2091	656	263	263

Section 3 | Nozzle Loading

G-Series Maximum Allowable Forces and Moments

Figure 2: Direction of Forces and Moments (Shown for a Vertical Port)



Notations:

- **F:** Applied forces (lbs & N)
 - **M:** Applied moments (lbf-ft & Nm)
 - **x:** x-axis parallel to the pump shaft (reference Figure 2)
 - **y:** y-axis horizontal and perpendicular to x-axis and z-axis (reference Figure 2)
 - **z:** z-axis vertical and perpendicular to x-axis and y-axis (reference Figure 1)
- max:** maximum allowable forces and moments (reference Table 3 and Table 4)

Table 3: Maximum Allowable Forces and Moments (Threaded Ports)

MODEL	HORIZONTAL PORTS												VERTICAL PORTS (SHOWN IN FIGURE 1)											
	Fmax (lb)			Mmax (lbf-ft)			Fmax (N)			Mmax (Nm)			Fmax (lb)			Mmax (lbf-ft)			Fmax (N)			Mmax (Nm)		
	Fx	Fy	Fz	Mx	My	Mz	Fx	Fy	Fz	Mx	My	Mz	Fx	Fy	Fz	Mx	My	Mz	Fx	Fy	Fz	Mx	My	Mz
G1-2	370	405	285	230	25	90	1646	1802	1268	312	34	122	360	360	375	230	94	25	1601	1601	1668	312	127	34
G1-4	370	405	285	230	25	90	1646	1802	1268	312	34	122	360	360	375	230	94	25	1601	1601	1668	312	127	34
G1-24	480	680	435	442	50	171	2135	3025	1935	599	68	232	420	575	620	442	152	50	1868	2558	2758	599	206	68
G1-32	480	680	435	442	50	171	2135	3025	1935	599	68	232	420	575	620	442	152	50	1868	2558	2758	599	206	68
G1-55	455	630	470	484	50	194	2024	2802	2091	656	68	263	450	660	560	484	220	50	2002	2936	2491	656	298	68

Table 4: Maximum Allowable Forces and Moments (Flanged Ports)

MODEL	HORIZONTAL PORTS												VERTICAL PORTS (SHOWN IN FIGURE 1)											
	Fmax (lb)			Mmax (lbf-ft)			Fmax (N)			Mmax (Nm)			Fmax (lb)			Mmax (lbf-ft)			Fmax (N)			Mmax (Nm)		
	Fx	Fy	Fz	Mx	My	Mz	Fx	Fy	Fz	Mx	My	Mz	Fx	Fy	Fz	Mx	My	Mz	Fx	Fy	Fz	Mx	My	Mz
G1-2	360	360	285	230	90	90	1601	1601	1268	312	122	122	360	285	360	230	90	90	1601	1268	1601	312	122	122
G1-4	360	360	285	230	90	90	1601	1601	1268	312	122	122	360	285	360	230	90	90	1601	1268	1601	312	122	122
G1-24	420	575	435	442	120	152	1868	2558	1935	599	163	206	420	435	575	442	152	120	1868	1935	2558	599	206	163
G1-32	420	575	435	442	120	152	1868	2558	1935	599	163	206	420	435	575	442	152	120	1868	1935	2558	599	206	163
G1-55	450	630	470	484	194	194	2002	2802	2091	656	263	263	450	470	630	484	194	194	2002	2091	2802	656	263	263
G1-69	450	630	470	484	194	194	2002	2802	2091	656	263	263	450	470	630	484	194	194	2002	2091	2802	656	263	263
G1-82	450	570	425	484	194	194	2002	2535	1890	656	263	263	450	425	570	484	194	194	2002	1890	2535	656	263	263
G1-133	450	630	470	484	194	194	2002	2802	2091	656	263	263	450	470	630	484	194	194	2002	2091	2802	656	263	263
G1-222	455	470	470	484	194	194	2024	2091	2091	656	263	263	455	470	470	484	194	194	2024	2091	2091	656	263	263

Section 4 | Maximum Particle Size

Due to tight clearances within an internal gear pump abrasive liquids can be difficult to pump and promote excess pump wear. When selecting internal gear pumps for abrasive applications it is important to know how concentrated and large the abrasive particles are. It is recommended to operate pumps at lower speeds and

pressures when pumping abrasive liquids, which may require an increased pump size. The table below provides the maximum particle size for all Blackmer Gear Pump models, which can be used as a guide during the pump selection process.

Table 1: Maximum Partilce Size

MODEL	INCH	mm
E1-2/4	0.005	0.127
E1-24/32	0.025	0.635
E1-55/69/82	0.025	0.635
E1-133/82	0.135	3.429
G1-2/4	0.015	0.381
G1-24/32	0.030	0.762
G1-55/69	0.063	1.600
G1-82	0.060	1.524
G1-133/222	0.135	3.429
V1-55	0.063	1.600
V1-133	0.135	3.429
V1-254/423	0.095	3.429



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