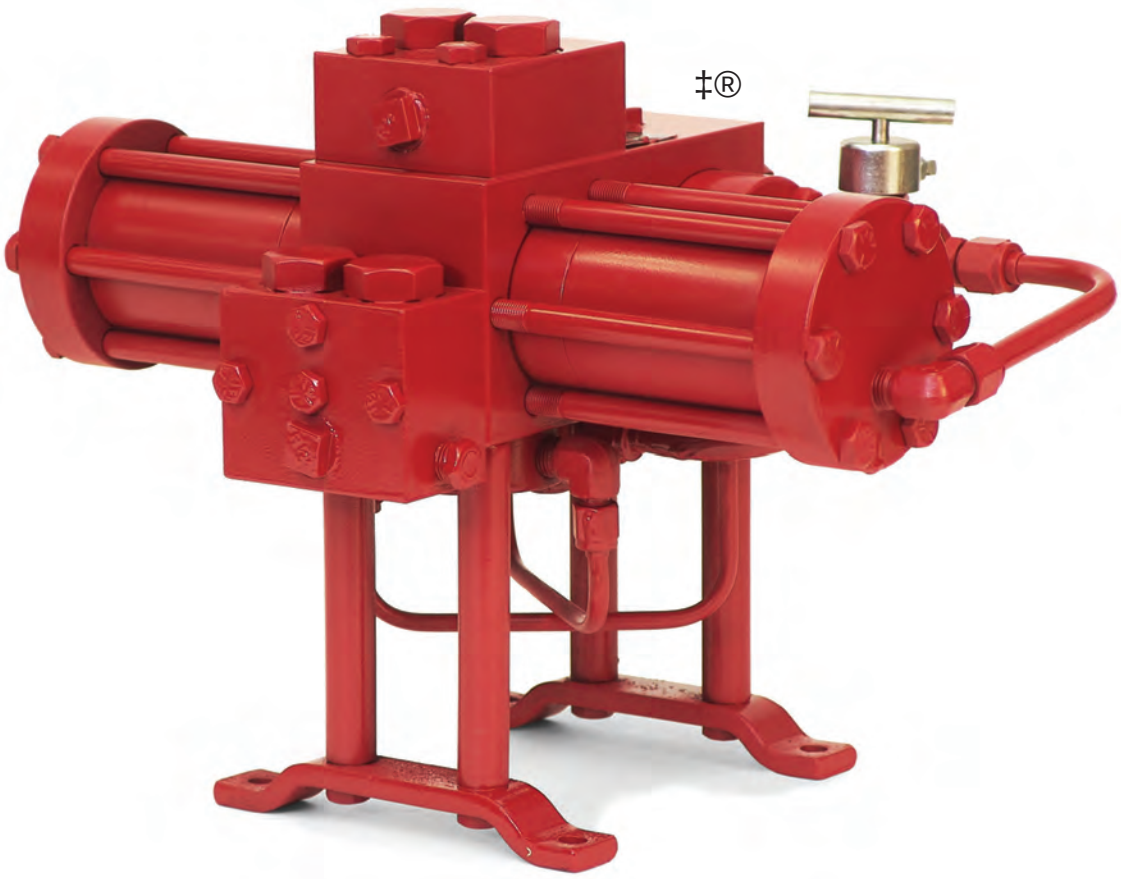
GLYCOL PUMPS



SECTION G

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PRESSURE VOLUME "PV" PUMP

APPLICATION:

Circulating pump for gas glycol dehydrators
Circulating pump for gas amine desulphurizers
Operating pressure of 300 - 2000 psig.

SMALL CYLINDER "SC" PUMP

APPLICATION:

Circulating pump for gas glycol dehydrators
Circulating pump for gas amine desulphurizers
Operating pressure of 100 - 500 psig.

"PV" TO "SC" CONVERSION

ELECTRIC GLYCOL PUMPS

APPLICATION:

Circulating pump for gas glycol dehydrators
Circulating pump for gas amine desulphurizers
Operating pressure of 300 - 2000 psig.

NEEDLE VALVES

CHECK VALVE BLOCKS

APPLICATION:

Available with Check valve blocks for single or split discharge.

GLYCOL FILTER CANISTER

APPLICATION:

For use with Kimray Glycol Pump to help prevent particle caused system wear

INSTALLATION, DIMENSIONS & CHARTS

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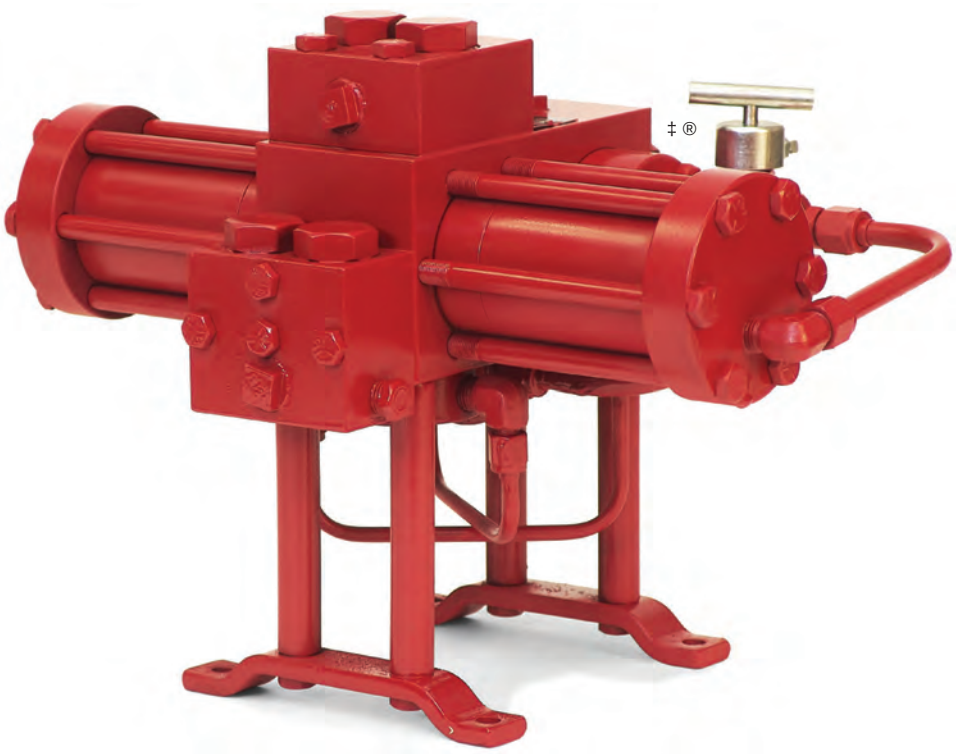

INTRODUCTION:

The Glycol Energy Exchange Pump, “Pressure Volume” or “PV-Series” Pump was developed in 1957. The initial consideration was a pump that would utilize the energy of the wet glycol at absorber pressure as a source of power. Within the confines of a system, energy can neither be created nor destroyed. Energy can, however, be stored, transferred, or changed from one form to another. The PV Series Pump transfers the energy available from the wet glycol, at absorber pressure, to an “equivalent” volume of dry glycol at reboiler pressure. In order to circulate the glycol, additional energy is needed to overcome friction losses within the pump and connecting piping. This additional energy is supplied by gas at absorber pressure.

The pump was designed as double acting with a maximum working pressure of 2000 psig with a factor of safety of ten. Corrosion and wear dictated use of the best materials available. These materials include stainless steel, hard chrome plating, nylon, Teflon, stellite, and “O”-rings specially compounded for glycol service. The pump contains two basic moving parts, a Piston-Rod Assembly, and a Pilot Piston. Each actuates a three-way D-slide.

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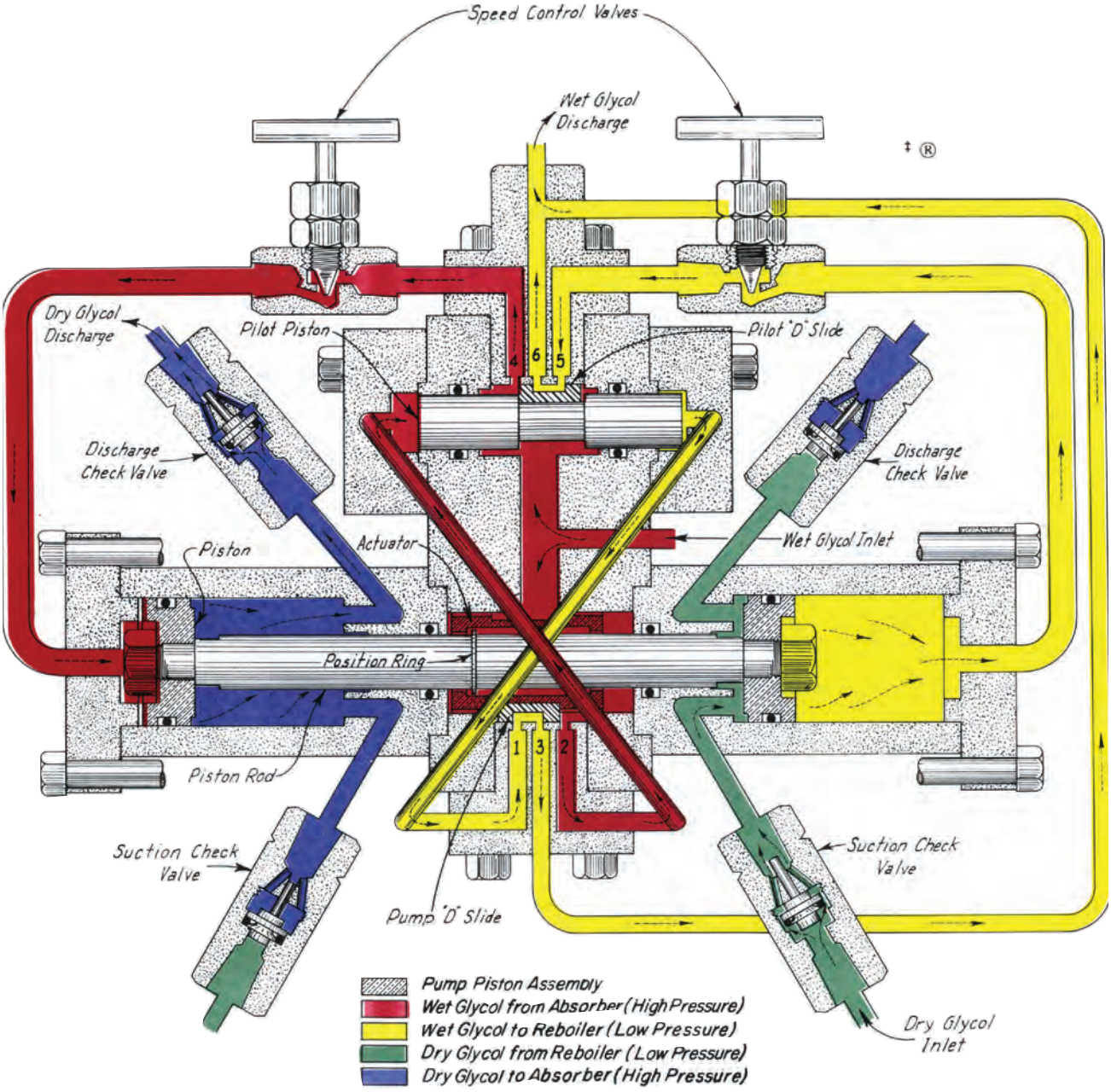

OPERATION:

The Kimray glycol pump is double acting, powered by Wet Glycol and a small quantity of gas at absorber pressure (Red). (Yellow) denotes Wet Glycol and gas at atmosphere or low pressure. Dry Glycol (Blue) is being pumped to the absorber. (Green) is Dry Glycol suction from the reboiler.

Wet Glycol (Red) from the absorber flows through port #4 and is throttled through the SPEED CONTROL VALVE to the left end of the Pump Piston Assembly, moving this assembly from left to right. Dry Glycol (Blue) is being pumped from the left cylinder to the absorber while the right cylinder is being filled with Dry Glycol (Green) from the reboiler. At he same time Wet Glycol (Yellow) is discharging from the right end of the Pump Piston Assembly to a atmosphere or low pressure system.

As the Pump Piston Assembly nears the end of its stroke, the POSITION RING on the PISTON ROD contacts the right end of the ACTUATOR. Further movement to the right moves the ACTUATOR and PUMP "D" SLIDE to uncover port #1 and communicate ports #2 and #3. This exhausts Wet Glycol (Red) to the right end of the PILOT PISTON. This causes the PILOT PISTON and PILOT "D" SLIDE to be driven from right to left.

In its new position the PILOT "D" SLIDE uncovers port #5 and communicates ports #4 and #6. THis exhausts Wet Glycol (Red) from the left end of the Pump Piston Assembly through ports #4 and #6 to the low pressure Wet Glycol (Yellow) system. Port #5 (which was communicated with port #6) now admits Wet Glycol (Red) through the right hand SPEED CONTROL VALVE to the right end of the Pump Piston Assembly.

The Pump Piston Assembly;y now starts the stroke from right to left. Follow above procedure reversing directions of flow..

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PRINCIPLE OF OPERATION:

Actions of each of the two basic parts of the pump are completely dependent upon the other. The pilot D-slide actuated by the Pilot Piston alternately feeds and exhausts absorber pressure to the power cylinders at opposite ends of the Piston-Rod Assembly. Likewise, the Pump D-slide actuated by the Piston-Rod Assembly alternately feeds and exhausts absorber pressure to opposite ends of the Pilot Piston.

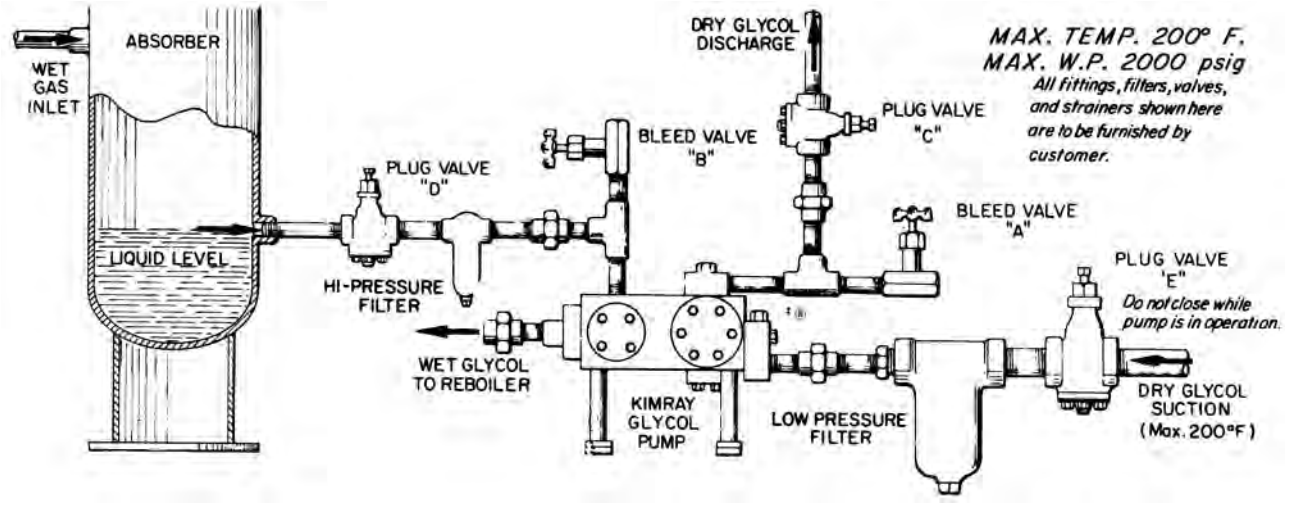
The force to circulate glycol within the dehydration system is supplied by absorber pressure acting on the area of the Piston Rod at its O-ring seals. The area of the Piston Rod is approximately 20 percent of that of the Piston. Neglecting pump friction and line losses, the resultant force is sufficient to produce a theoretical discharge pressure 25 percent greater than absorber pressure. The theoretical discharge pressure, for example, at 1500 psig absorber pressure would be 1875 psig. This theoretical "over-pressure" would develop against a blocked discharge line but is not sufficient to cause damage or create a hazard.

Approximately 25 to 30 psig pressure is required to overcome pump friction leaving the additional "over pressure" for line losses and circulation. It is recommended that these losses be held to approximately 10 percent of the absorber pressure or as noted in catalog.

Two Speed Control Valves are provided to regulate the flow of wet glycol and gas to and from the power cylinders. Reversing the direction of flow through the Speed Control Valves provides a flushing action which cleans the valve orifices.

If the wet glycol, returning to the pump from the absorber were to be completely fill the cylinder, no additional gas would be needed. However, the wet glycol will only occupy approximately 65 percent of the total volume of the cylinder and connecting tubing leaving 35 percent to be filled by gas from the absorber. This gas volume amounts to 1.7S.C.F. per gallon of dry glycol at 300 psig absorber pressure and 8.3S.C.F. at 1500 psig and may be considered as continuing power cost for pump operation. This gas can be utilized in the regeneration process of the dehydrator for "rolling" and or "stripping" purposes. It may also be recovered in a low pressure glycol gas separator and used to fire the reboiler pressure glycol gas separator and used to fire the reboiler.

By supplying some absorber gas to the cylinders, the wet glycol level is maintained at the wet glycol outlet connection on the absorber and eliminates the need of a liquid level controller and its attendant problems. Excess liquids such as hydrocarbons are removed from the absorber at approximately 55 percent of the pump rate, reducing the hazard of dumping a large volume of hydrocarbons into the reboiler as would be the case with a liquid level controller.



INSTALLATION:

A number of considerations should be made with regard to pump installation since it is the "heart" of a dehydration system. It is a moving mechanical device subject to wear and will ultimately need repair. Location of the pump is very important. East access to the pump for repair or exchange can save time and trouble.

Test connections (1/4" NPT with valve) located on the piping to and from the pump permit a fast means of trouble shooting pipe restrictions or blockage.

Filters, which are discussed later, should always be installed in the wet glycol piping between the absorber and pump and in the suction line to the pump, with provisions made for maintenance of the filters.

Suction piping should preferably be large enough to permit a positive feed to the pump. Feed pressure must be more than 4 or 5 inches of Hg vacuum to prevent pump cavitation.

Where two or more pumps are manifolded together, the *total* capacity must be considered in the piping design. Also, a manifold should be designed to provide each pump with its "Fairshare" of the wet glycol from the absorber. It is not necessary that the proportion be exact.

Pumps with lower "pumping ratios" are available to provide additional energy for pressures below 300 psig; but is it better not to use these pumps at pressures above 400 or 500 psig because of excess gas consumption. Conversion kits are available to change standard pumps to "SC" pumps with declining field pressures.

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HEAT EXCHANGERS:

Sufficient heat exchange is necessary to reduce dry glycol suction temperature to at least 200°F, preferably to 150°F.

SPLIT DISCHARGE CHECK VALVE BLOCK:

Kimray Glycol Pumps are available with check valve blocks for split discharge to serve two absorbers on a dehydration unit. See page 10.29 for a description.

VITON “O” RINGS:

Viton “O” rings for all moving seals in th Kimray Glycol Pumps are available. Viton repair kits can be ordered for pumps already in operation or new pumps can be ordered with viton “O” rings at additional cost.

Viton “O” rings are recommended for use when liquid hydrocarbons are found in the gas, for CO_2 service or for elevated operating temperatures. Under normal conditions (without the above problems) viton “O” rings will not give as long of a service life in the pump as standard Buna-N “O” rings.

SYSTEM PRESSURE DROPS:

The Kimray Glycol Pumps are designed to operate by using the energy from the wet glycol and some additional energy in the form of gas at absorber pressure. Excessive pressure drops in the lines connecting the pump to the system can cause the pump to run erratically or stall. The following conditions should be designed into the system to assure proper pump performance:

DRY GLYCOL SUCTION LINE: Size the suction line, low pressure filter and heat exchanger such that the pump will have a positive pressure at the suction inlet when running at the maximum rated speed. This line may need to be larger than the pipe fitting on the suction check valve block. (See pipe connection sizes on page 10.28.)

WET GLYCOL POWER LINE: Recommended line size is the same as the size of the pipe connection for the given pump. (Page 10.28) The pressure drop across the high pressure filter is a factor in considering the total system pressure drop.

DRY GLYCOL DISCHARGE LINE: Recommended line size is the same as the size of the pipe connection for the given pump and the absorber should be full opening to the recommended line size.

WET GLYCOL DISCHARGE LINE: Recommended line size is the same as the size of the pipe connection for the given pump. (Page 10.28.) If a glycol gas separator is used, the pressure maintained on the separator must be considered in the total system pressure drop. Also, heat exchanger coils in accumulator tanks also add to this pressure drop.

ISOLATING VALVES: All plug, gate, or blocking valves should be full opening to the recommended line size of the given pump.

If a positive feed is supplied to the pump at the dry suction inlet, the total system pressure drop will be the sum of the following pressure drops:

1. The pressure drop between the absorber and the pump in the wet glycol line.

2. The pressure drop between the pump and the absorber in the dry glycol discharge line including any pressure required to open and establish full flow in any check valves.

3. The pressure drop between the pump and the reboiler (at atmospheric pressure) in the wet glycol discharge line. This includes the liquid head to the reboiler, heat exchanger coil, and/or the pressure maintained on a glycol seperator.k

The sum of these pressure drops gives the total “system pressure drop”. The graphs on pages 10.11-10.15 give the maximum total system pressures and their effect on pump output. Exceeding the total allowable system pressure drop will cause the pump to run erratically or to stall.

To determine if a problem exists in an operating dehydration system, slowly open the speed control valves on the pump until it runs at the maximum recommended pump speed. (See graph page 10.8.) If the Pump cavitates before reaching the maximum pump speed, the suction line is restricted. If the pump will not run at the maximum rated speed, then there are probably restrictions in one or more of the other three connecting lines.

FILTERS:

Filters *should* be used on every dehydrator for protection of both the pump and reboiler. Many pumps are severely damaged in the first minutes or days of operation from flow line and vessel debris. Reboilers have been known to be filled with sand which had to first pass through the pump.

Filters should give protection from 25 to 150 micron particle sizes depending on the specific condition. The disc type, microin type, and sock type have all proven very satisfactory if they are properly maintained. Some metal filters are equipped with a cleaning device which should be operated daily or at least every few days as experience may dictate. Sock filters must be replaced at regular intervals. Preventative maintenance on these filters will save many dollars in major pump and reboiler repairs plus the reduction of costly down time.

A spring loaded by-pass on the filter is not recommended. It is better for the pump to stall due to lack of power than be exposed to dirt and grit from an open by-pass. Always install a high pressure filter between the absorber and the pump. A filter on the wet glycol discharge of the pump will protect the reboiler but does nothing for the pump. A low pressure filter on the pump suction protects against metallic particles from a new reboiler and its connecting piping. Filters will also keep the glycol free of heavy tars and residue from evaporated hydrocarbons and resinous compounds caused by polymerization of the glycol. Sock type filters are probably best for this type of filtration but should be changed rather frequently.

In addition to using filters it is often necessary to make a chemical analysis of the glycol, not only for pump protection but for better dehydration. Organic acids in glycol are produced from oxidation, thermal decomposition, and acid gases from the gas stream. These acids cause sorrosion in the system, and dissolve the plating on pump parts in a short time. Glycol acidity should be maintained between a pH of 7 to 9. Alkaline amines are usually recommended to control the pH value because they will neutralize any acid gases present and are easily regenerated.

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Another glycol contaminate which causes pump problems is salt. Salt water which continues to enter a dehydration system soon produces a super saturated condition in the reboiler. This results in salt deposits in the lines and in the pump as the hot glycol is cooled. A complete cleaning and washing of the entire system is required to remove the salt.

OPERATION:

A new pump or new dehydrator should be put into operation by first bringing the glycol circulation and operating temperature to an equilibrium condition by using 300 to 400 psig absorber pressure. This can be done with or without gas flow. If it is easier to start up under a no-flow condition, only enough gas need be supplied the absorber to maintain the pressure. In most instances the pump will pick up its prime without help and should do so in a few strokes. If the pump does not prime immediately, the dry glycol discharge should be opened to atmosphere until glycol discharges from both cylinders. When equilibrium has been established, the pump should be stopped an the absorber pressure increased for operation. Pump speed can then be reestablished to the desired rate.

The maximum operating temperature of the pump is limited by the moving “O”-ring seals. A maximum of 200 degrees is recommended. Packing life will be extended considerably at 150 degrees.

Always stop the pump when the pump main gas flow is turned off. A pump which continues to circulate with no gas flow elevates the complete dehydrator temperature, and in time to reboiler temperature.

If a pump has been deactivated for several months, the check valves should be removed and inspected before attempting to operate the pump. The pump startup should be similar to that of a new pump by first bringing the system to equilibrium.

TROUBLE SHOOTING:

If a glycol pump has been operating in a clean system it is very likely that no major service will be required for several years. Only a yearly replacement of packing will be required. Normally the pump will not stop pumping unless some internal part has been bent, worn, or broken, or some foreign object has fouled the pump, or the system has lost its glycol.

A pump which has been running without glycol for some time should be checked before returning to normal service. Probably the pump will need at least new “O”-rings. The cylinders and piston rods may also have been scored from the “dry run”

Following are some typical symptoms and causes. These are presented to assist in an accurate diagnosis of trouble.

SYMPTOMS

1. The pump will not operate.

2. The pump will start and run until the glycol returns from the absorber. The pump then stops or slows appreciably and will not run at its rated speed.

3. The pump operates until the system temperature is normal then the pump speeds up and cavities.

4. The pump lopes or pumps on one side only.

5. Pump stops and leaks excessive gas from wet glycol discharge.

6. Erratic pump speed. Pump changes speed every few minutes.

7. Broken Pilot Piston.

CAUSES

1. One or more of the flow lines to the pump are completely blocked or the system pressure is too low for standard pumps (below 300 psig) use “SC” pumps below 300 psig

2. The wet glycol discharge line to the reboiler is restricted. A pressure gauge installed on the line will show the restriction immediately.

3. The suction line is too small and increase in temperature and pumping rate cavities the pump.

4. A leaky check valve, a foreign object lodged under a check valve or a leaky piston seal.

5. Look for metal chips or shavings under the pump D-slides.

6. Traps in the wet glycol power piping sends alternate slugs of glycol and gas to the pump.

7. Insufficient glycol to the Main Piston D-slide ports. Elevate the control valve end of the pump to correct.

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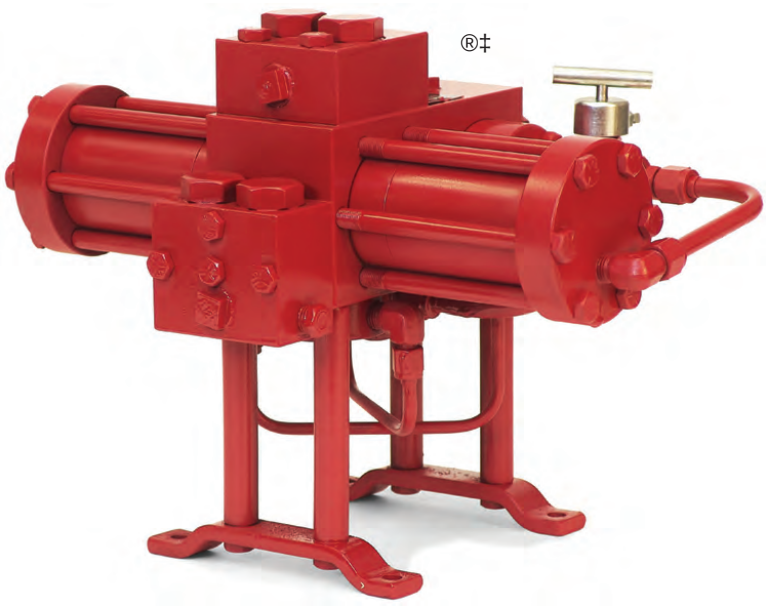

PUMPS AVAILABLE:

"PV" SERIES GLYCOL PUMPS					
Catalog Number	Model Number	Capacity Gal. / Hr.		Working Pressure	
		Min.	Max.**	Min.	Max.
GAD	1720 PV	8	40	300	2000
GAB	4020 PV	12	40	300	2000
GAF	9020 PV	27	90	300	2000
GAH	21020 PV	66	210	400	2000
GAJ	45020 PV	166	450	400	2000

**Maximum output is affected by system pressure drops. See system operation parameter for maximum output curves.

"SC" SERIES GLYCOL PUMPS					
Catalog Number	Model Number	Capacity Gal. / Hr.		Working Pressure	
		Min.	Max.**	Min.	Max.
GAC	2020 SC*	8	20	100	500
GAG	5020 SC*	12	50	100	500
GAI	10020 SC*	22	100	100	500
GAK	20020 SC*	60	200	100	500

MAXIMUM DESIGN PRESSURE FOR P.V. AND S.C. MODELS IS 2000 psig

APPLICATIONS:

Circulating pump for gas glycol dehydrators
Circulating pump for gas amine desulphurizers

FEATURES:

Eliminates absorber liquid level controls
No auxiliary power supply required
Low gas consumption
Completely sealed system prevents loss glycol
No springs or toggles, only two moving assemblies
Hydraulic "cushioned" check valves with removable seats of hardened stainless steel

OPERATION:

Materials for the vital working parts have been selected for greatest wear resistance. These materials include stainless steel, hard chrome plating, stellite, nylon and teflon. Moving "O" Ring seals are compounded specifically for ethylene glycol service. A complete operational check is given each pump after assembly.

"O" Ring sealed check valve darts are standard in all except the model 315 PV. Teflon sealed darts are available. Capsule type ball checks are available for 1720 PV, 2015 SC and 4020 PV.

*These pumps are designed for operating pressures between 100 and 500 psig maximum design pressure for all models is 2000 psig.

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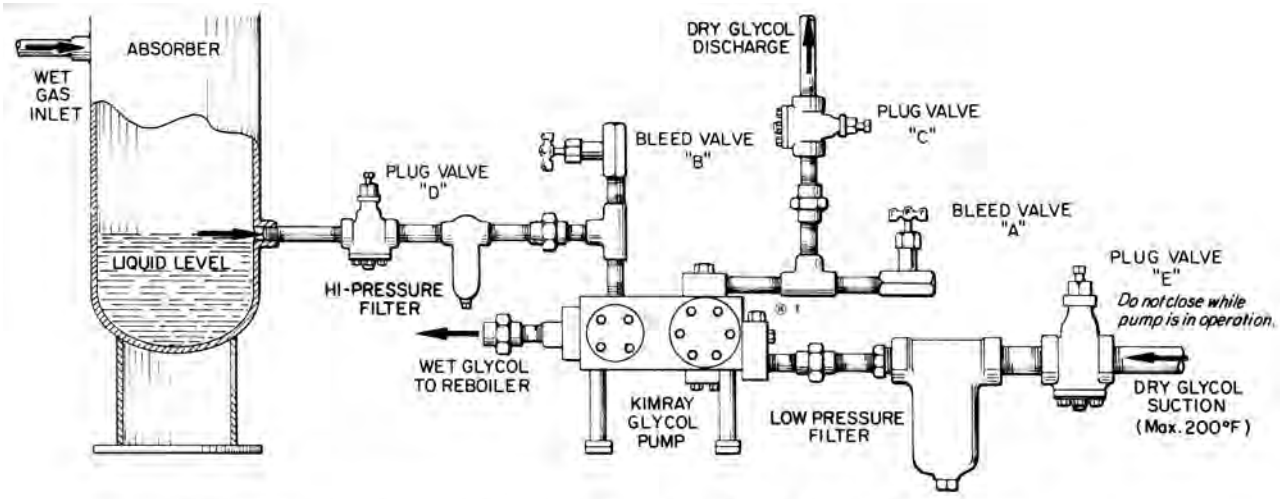

All fittings, filters, valves and strainers shown here are to be furnished by customer.

INSTALLATION:

For maximum pump life a high pressure filter should be installed in the **wet** glycol line between the absorber and pump. Also a low pressure filter or strainer is recommended for the dry glycol suction line between the accumulator and pump.

Adequate heat exchangers must be provided to keep the temperature of fluid flowing through the pump below 200°F.

The following filter and strainer line sizes are recommended minimum:

1720 PV	1/2" NPT
4020 PV & 2020 SC	1/2" NPT
9020 PV & 5020 SC	3/4" NPT
21020 PV & 10020 SC	1" NPT
45020 PV & 20020 SC	11/2" NPT

Relief valves "A" and "B" are required for removing pressure from the pump to allow inspection and repair. Relief valve "A" is also used for priming as described below. The plug valves and unions permit the pump and filters to be easily isolated or removed for inspection or repair.

OPERATING PROCEDURE:

1. Close both speed control valves, relief valves "A", "B" and plug valve "C".
2. Open plug valves "D" and "E".
3. Pressure absorber to about 300 psig.
4. With plug valve "C" closed, open relief valve "A".
5. Slowly open both speed control valves until pump is running about 1/3 rated max. strokes per minute. Count one stroke for each DISCHARGE of PUMP. When dry glycol discharges from valve "A" on each stroke, the pump is primed. Close valve "A" and open valve "C". Readjust speed control valves to 1/3 rated max. strokes per minute and continue operating pump until wet glycol returns from the absorber to the pump. This will be evidenced when the pump tries to meter liquid through the speed control valves instead of gas and causes the pump to slow down. Close both speed control valves.
6. Bring absorber to full operating pressure.
7. Adjust speed control valves for desired rate (see capacity chart).
8. Inspect and clean filters and strainers periodically.
9. For preventive maintenance, "O" Rings should be replaced annually. To check "O" Ring seal, close valve "C". If pump continues to run, seals should be replaced.

SYSTEM SHUTDOWN:

1. Close plug valve "D" Allow pump to stop running
2. Close plug valve "C" and "E"
3. Vent pressure from bleed relief "A" and "B"

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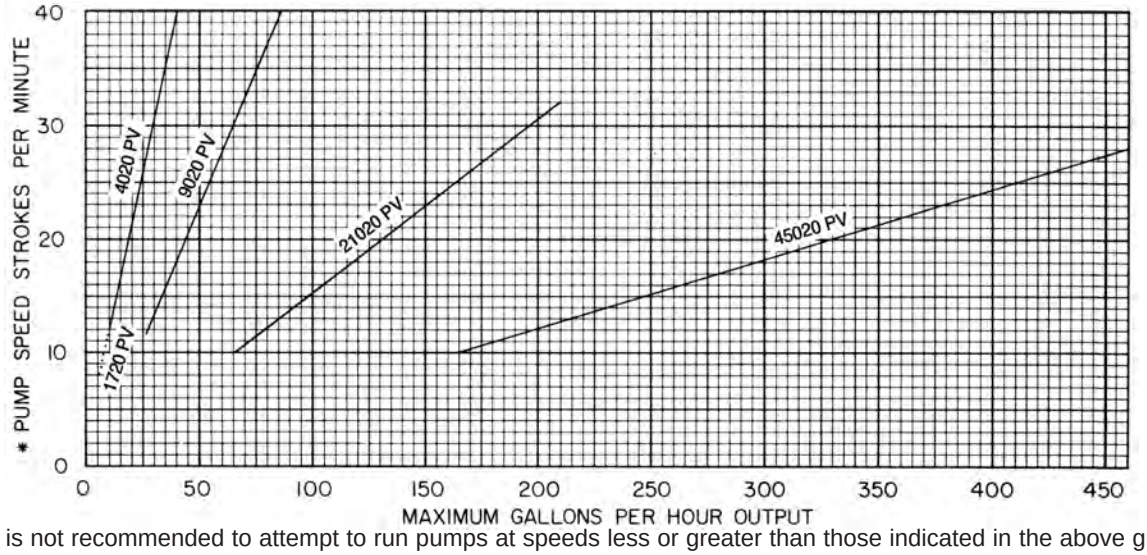
KIMRAY INC.®

"PV" & "SC" SERIES
CHARTS & DIMENSIONS

Model Number	Max. Cap		Size of Pipe Connections	Mounting Bolts	Approx. Weight	Max. Strokes Minute	Glycol Output Strokes/Gal.	Glycol Output Gal./Strokes
	G.P.M.	G.P.H.						
1720 PV	.67	40	1/2" N.P.T.	3/8" Dia.	66 Lbs.	40	59	0.017
4020 PV	.67	40	1/2" N.P.T.	3/8" Dia.	66 Lbs.	40	59	0.017
9020 PV	1.5	90	3/4" N.P.T.	1/2" Dia.	119 Lbs.	40	26.3	0.038
21020 PV	3.5	210	1" N.P.T.	1/2" Dia.	215 Lbs.	32	9	0.111
45020 PV	7.5	450	1 1/2" N.P.T.	1/2" Dia.	500 Lbs.	28	3.5	0.283
2020 SC	.33	20	1/2" N.P.T.	3/8" Dia.	66 Lbs.	55	147	0.0068
5020 SC	.83	50	3/4" N.P.T.	1/2" Dia.	119 Lbs.	50	52	0.019
10020 SC	1.67	100	1" N.P.T.	1/2" Dia.	215 Lbs.	48	25	0.040
20020SC	3.33	200	1 1/2" N.P.T.	1/2" Dia.	500 Lbs.	40	8.8	0.114

CIRCULATION RATE GRAPH

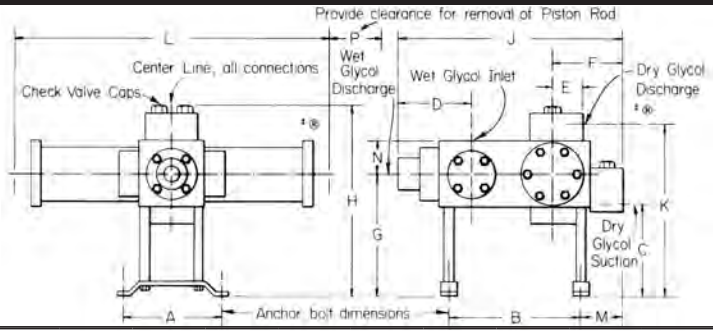


* It is not recommended to attempt to run pumps at speeds less or greater than those indicated in the above graph.

GAS CONSUMPTION

Operating Pressure --p.s.i.g.	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000
Cu. Ft./Gallon @ 14.4 & 60°F.	1.7	2.3	2.8	3.4	3.9	4.5	5.0	5.6	6.1	6.7	7.2	7.9	8.3	8.7	9.3	9.8	10.4	10.9

DIMENSIONS



Model Number "PV" Series "SC" Series	Dimensions, Inches													
	A	B	C	D	E	F	G	H	J	K	L	M	N	P
1720 PV	5 1/4	5 11/16	5 3/4	3 7/16	1 1/2	3 1/2	7 1/4	10 7/8	10 3/16	9 5/8	15	2 1/8	1 3/4	3
4020 PV & 2020 SC	5 1/4	5 11/16	5 3/4	3 7/16	1 1/2	3 1/2	7 1/4	10 7/8	10 3/16	9 5/8	15	2 1/8	1 3/4	3
9020 PV & 5020 SC	6 1/4	8 1/4±1/8	6 3/8	5	1 3/4	4 1/4	8 3/4	13 1/4	13 7/8	11 3/4	20	2 1/2	2	3
21020 PV & 10020 SC	7 5/8	10 1/8±1/8	7	5 3/8	2 1/4	5 3/4	9 1/4	14 3/4	16 5/8	13	24	3 3/16	2 1/2	4
45020 PV & 20020 SC	10 3/4	14 ± 1/8	9	6 5/8	2 5/8	6 1/2	11 3/8	19	21 1/8	16 3/8	34	3 3/4	3 1/2	6

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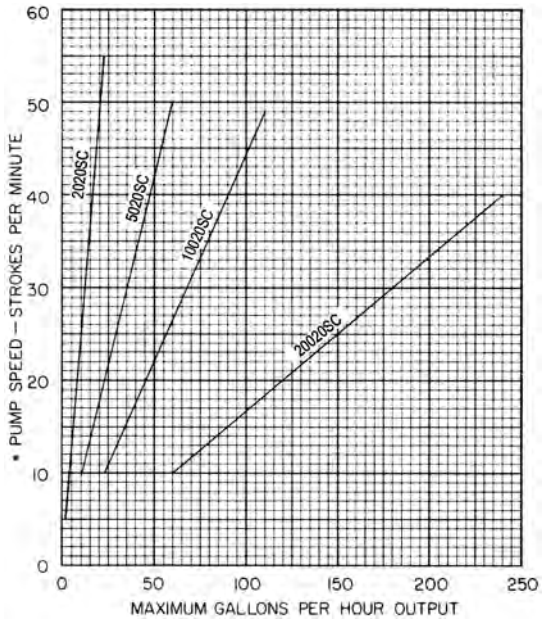
Current Revision:
Add 2000# to GAS CONSUMPTION



* It is not recommended to attempt to run pumps at speeds less or greater than those indicated in the above graph.

The "SC" (small cylinder) Series glycol pump was designed to extend the lower operating pressure of the "PV" Series pump downward from 300 psig too 100 psig Due to increased gas consumption it is recommended to use the "PV" Series pumps at pressures greater than 400 psig

Any Kimray "PV" Series glycol pump can be field converted to a "SC" Series pump of comparable size (see comparative table below). Likewise, "SC" Series pumps can be converted to "PV" Series pumps. The parts required for these conversions are stocked in kit form. To order conversion kits specify; (existing pump model) conversion kit to (converted pump model). Example: "4020 PV Conversion Kit to 2020 SC."

GAS CONSUMPTION

Operating Pressure - psig	100	200	300	400
Cu. Ft./Gal. @ 14.4 & 60°F.	1.0	1.9	2.8	3.7

COMPARATIVE TABLE

"PV" Series Model No.	"SC" Series Model No.
1720-4020	2020 SC
9020	5020 SC
21020	10020 SC
45020	20020 SC

Physical demensions of "SC" Series pumps re the same as the comparable "PV" Series pumps. See page 8.

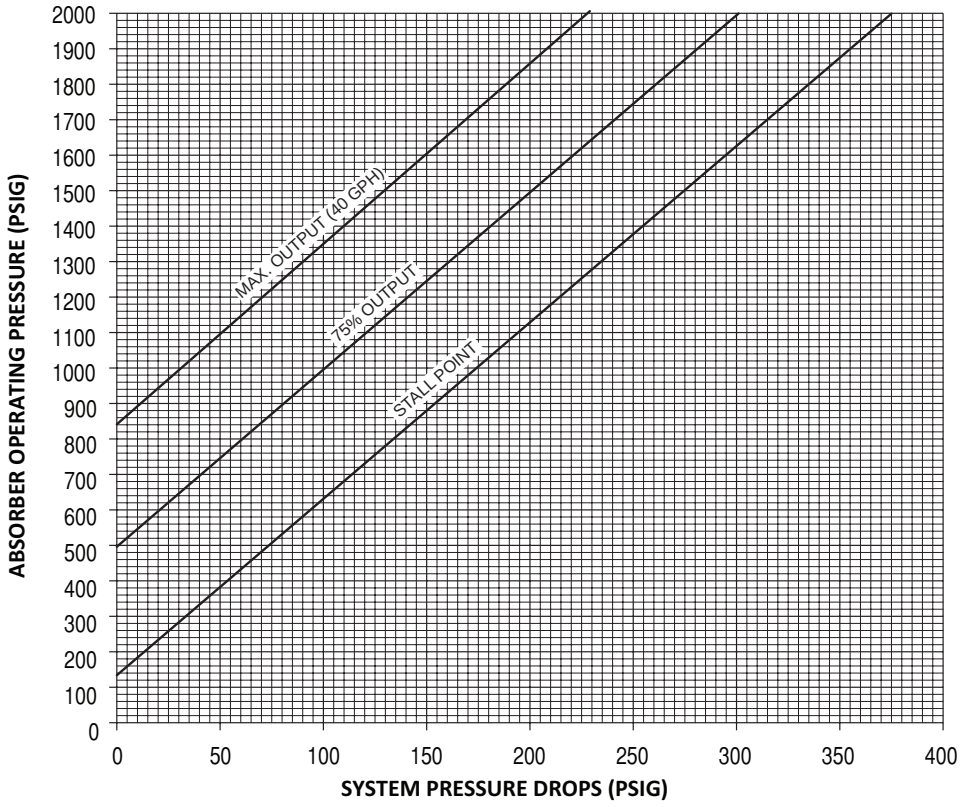
PARTS REQUIRED TO CONVERT FROM "PV" TO SC" SERIES

		PART NUMBER			
PART NAME	Quantity Required	4020 PV to 2020 SC	9020 PV to 5020 SC	21020 PV to 10020 SC	45020 PV to 20020 SC
Cylinder Liner	2	2108	2373	2412	‡1505
Piston	2	1506	776	1507	1508
Piston Seal Retainer	2	1509	1510	1511	1512
"O" Ring	2	156	773	774	329
Back-up Ring	4	1513	1457	1458	‡ 772
"O" Ring	2	154	154	155	1107
Lock Nut (Piston)	2	*_____	906	175	1140
Cylinder "O" Ring	2	773	774	329	

*The piston is the nut for this model and is furnished with a socket head set screw.
‡Full cylinder only.
‡Model 20020 SC only, requires 8, No. 772 Back-up rings.

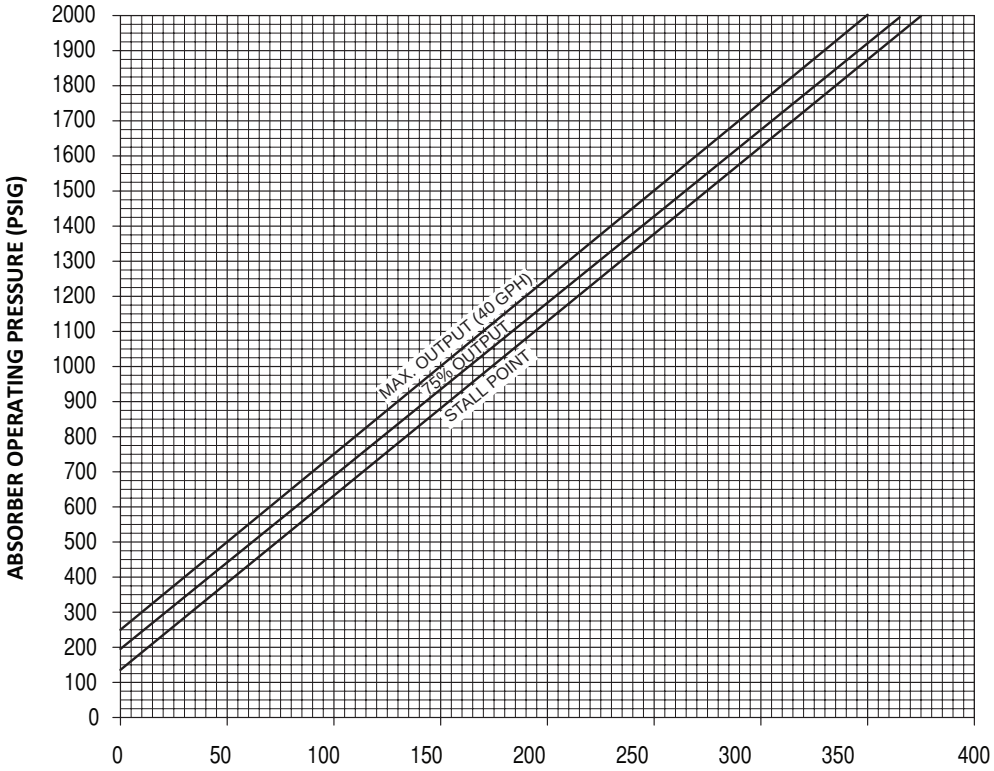
Kimray is an ISO 9001- certified manufacturer.

MODEL 1720 PV PUMPS
SYSTEM OPERATION PARAMETERS

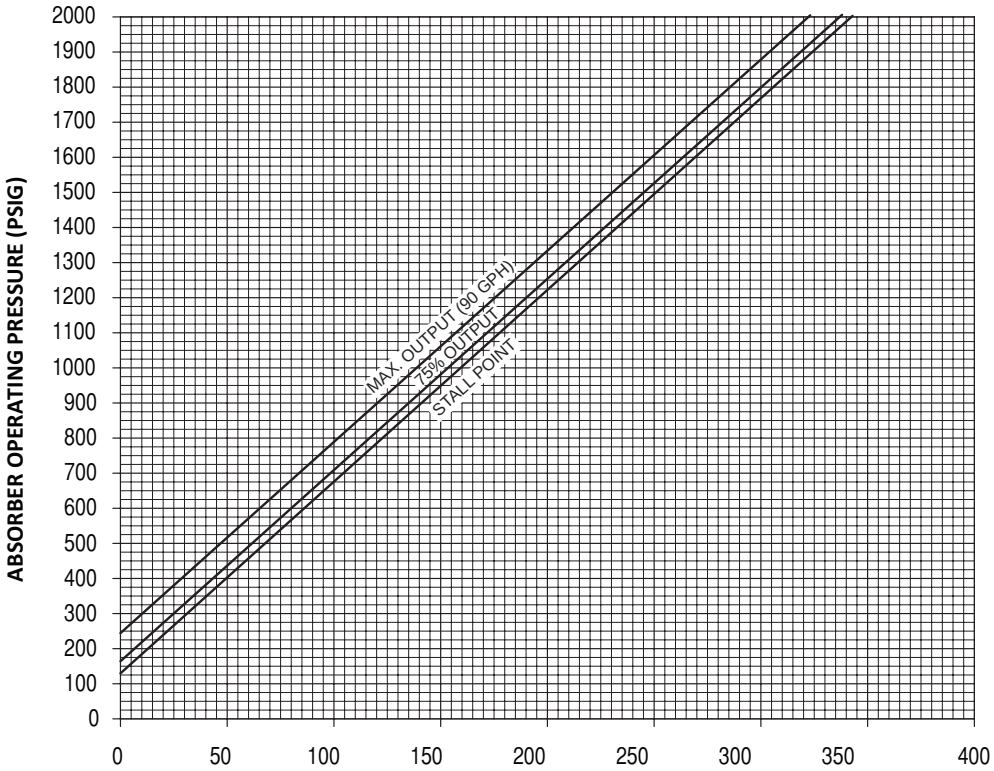


1720 PV Strokes/Minute Range 8-40

MODEL 4020 PV & 9020 PV PUMPS
SYSTEM OPERATION PARAMETERS

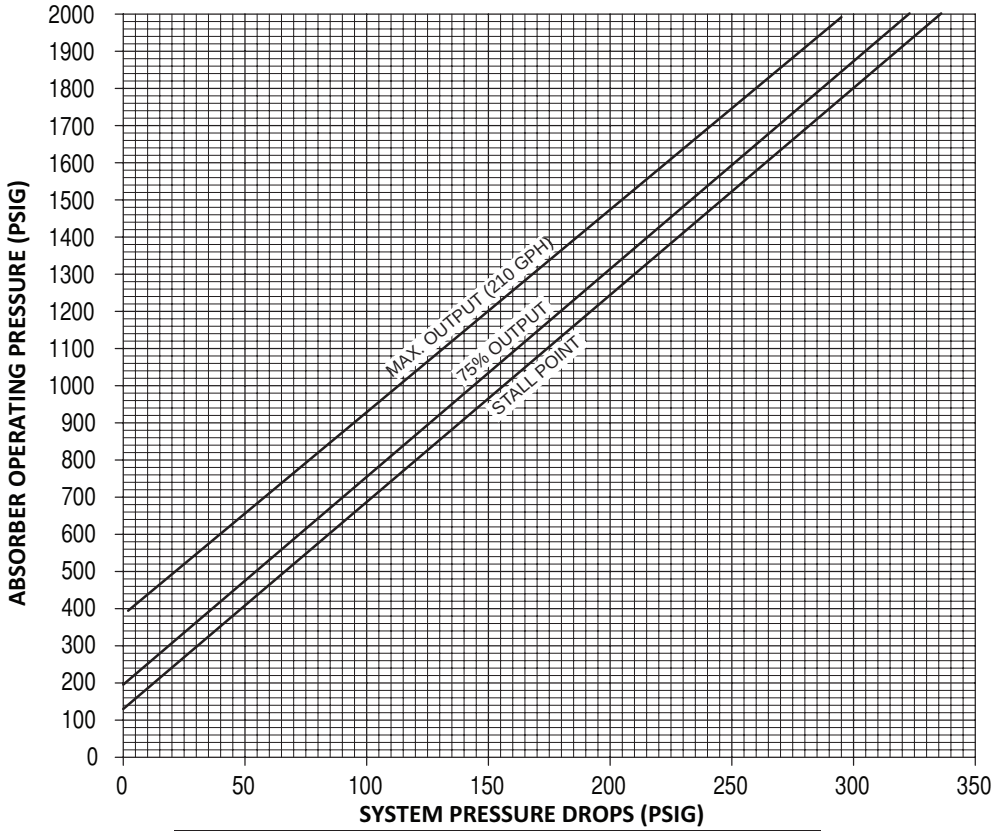


4020 PV Strokes/Minute Range 12-40

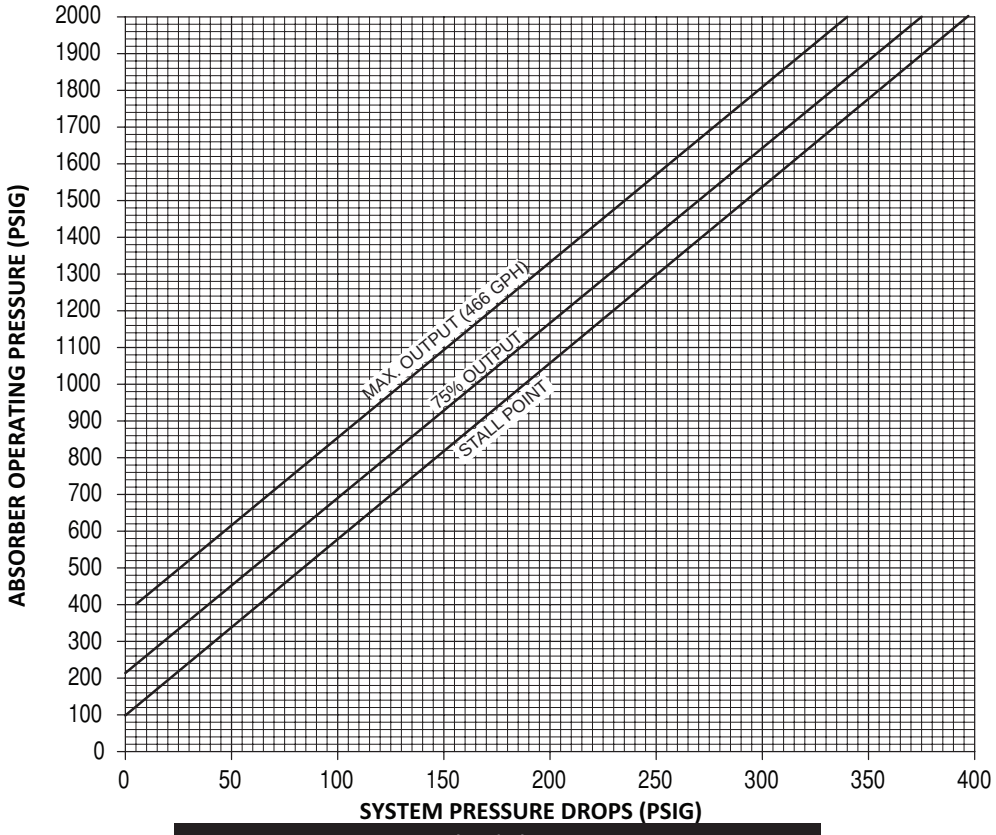


9020 PV Strokes/Minute Range 12-40

MODEL 21020 PV & 45020 PV PUMPS
SYSTEM OPERATION PARAMETERS

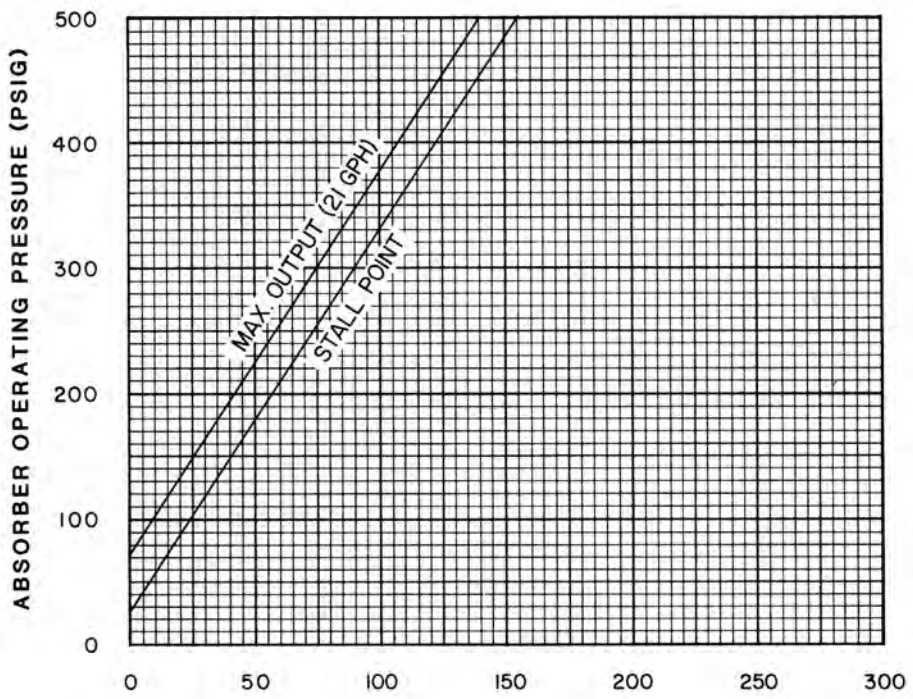


21020 PV Strokes/Minute Range 10-32

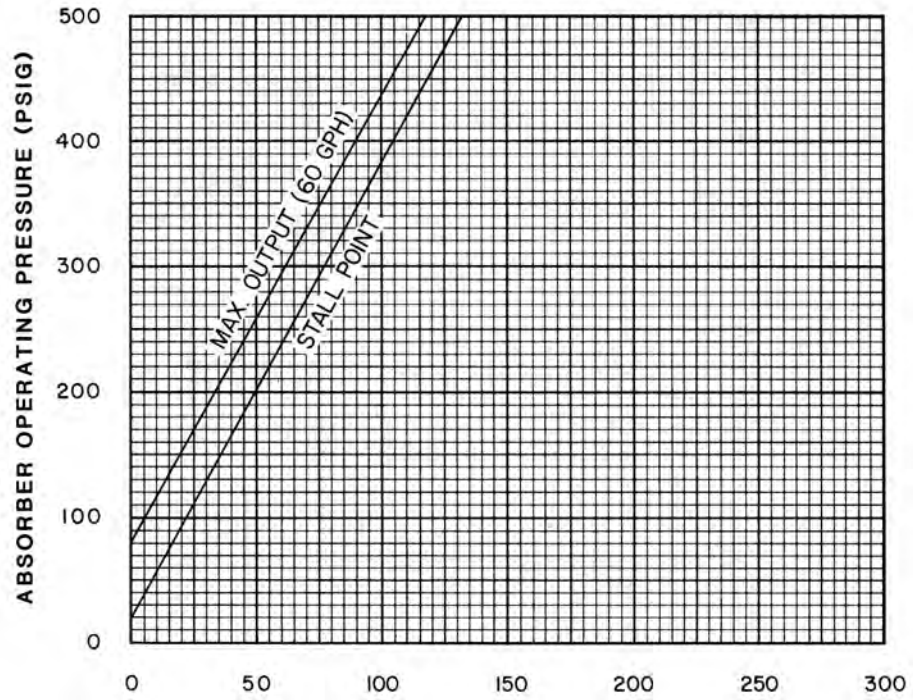


45020 PV Strokes/Minute Range 10-28

MODEL 2020 SC & 5020 SC PUMPS
SYSTEM OPERATION PARAMETERS

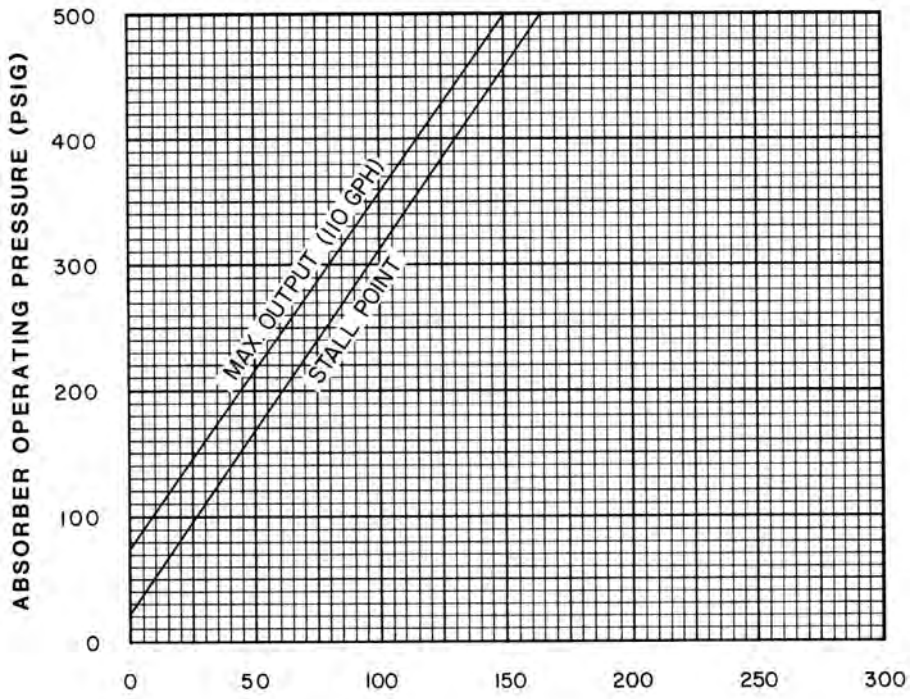


2020 SC Strokes/Minute Range 5-55

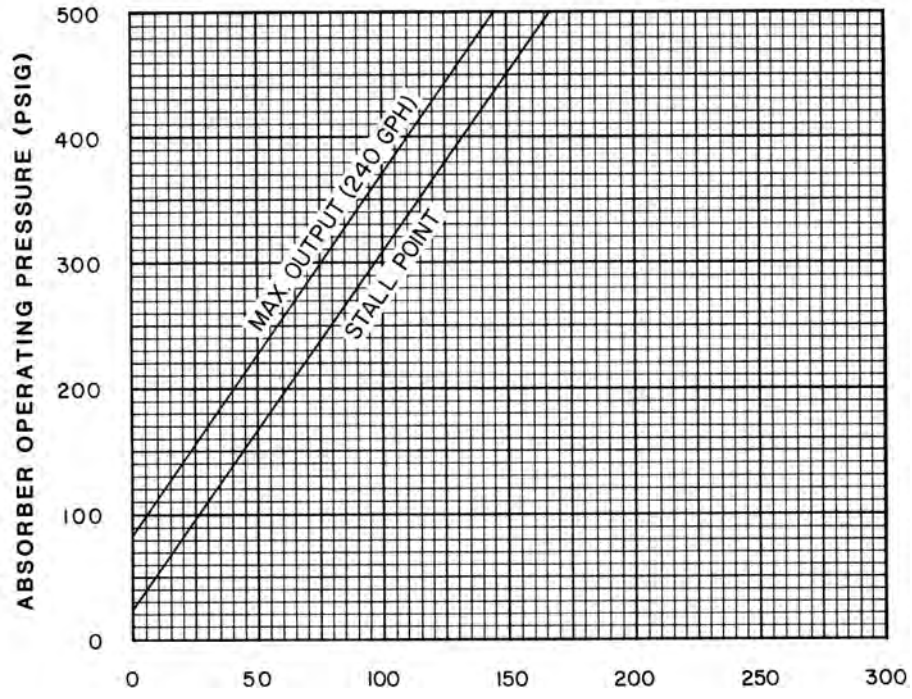


5020 SC Strokes/Minute Range 10-50

SYSTEM PRESSURE DROPS (PSIG)



10020 SC Strokes/Minute Range 10-48

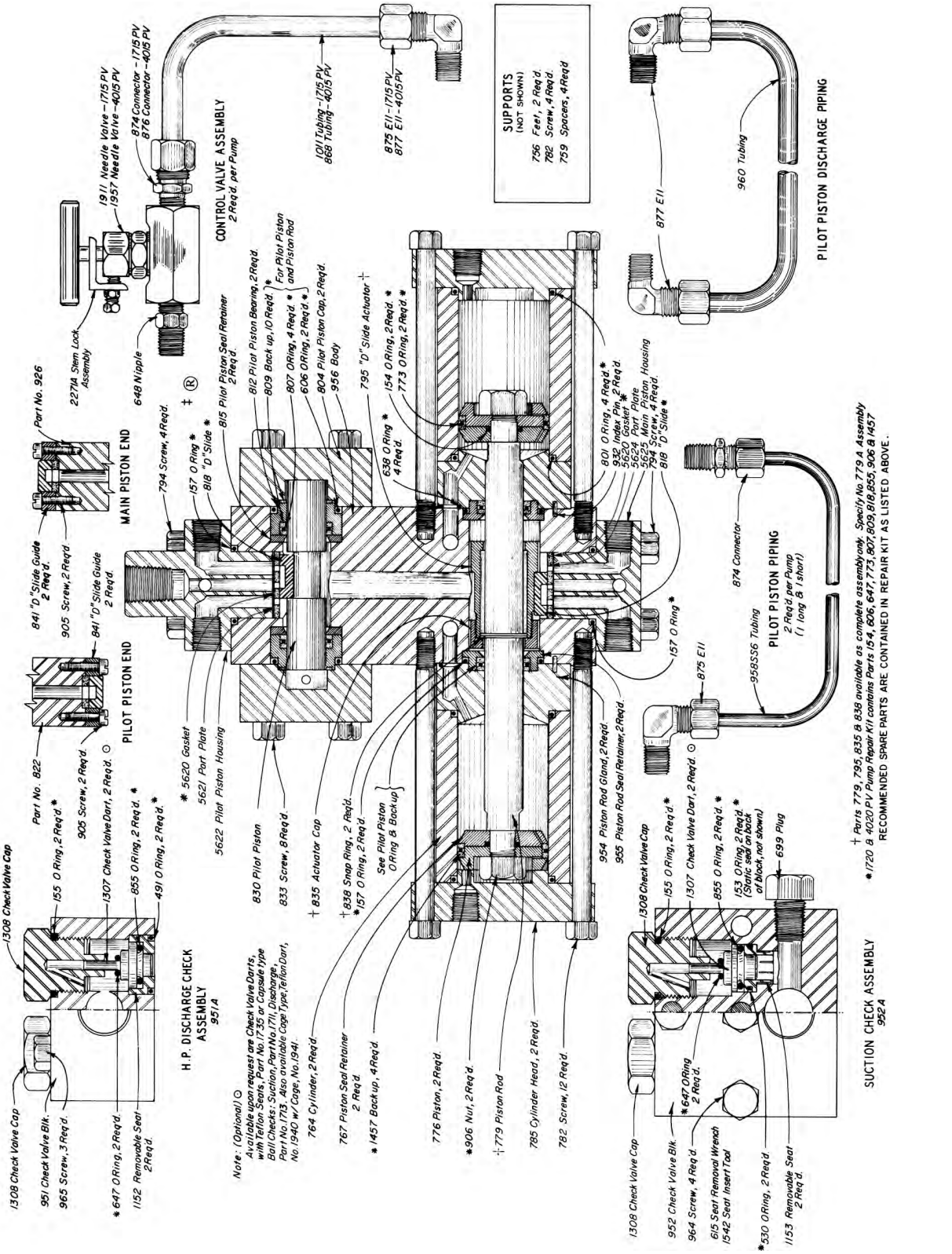


20020 SC Strokes/Minute Range 10-40

SYSTEM PRESSURE DROPS (PSIG)

Kimray is an ISO 9001- certified manufacturer.

MODEL 1720 PV & 4020 PV PUMP
STEEL



PUMPS AVAILABLE:

CAT. NO.	TYPE	OPER. PRESS MINIMUM	OPER. PRESS. MAXIMUM	REPAIR KIT
GAD	1720 PV	300	2000	RJB1
GAB	4020 PV	300	2000	RJB1

NOTES:

Kimray is an ISO 9001- certified manufacturer.

Current Revision:
Change 958 Tubing to 958SS6

‡ Configuration of Glycol pump is a trademark of Kimray, Inc.

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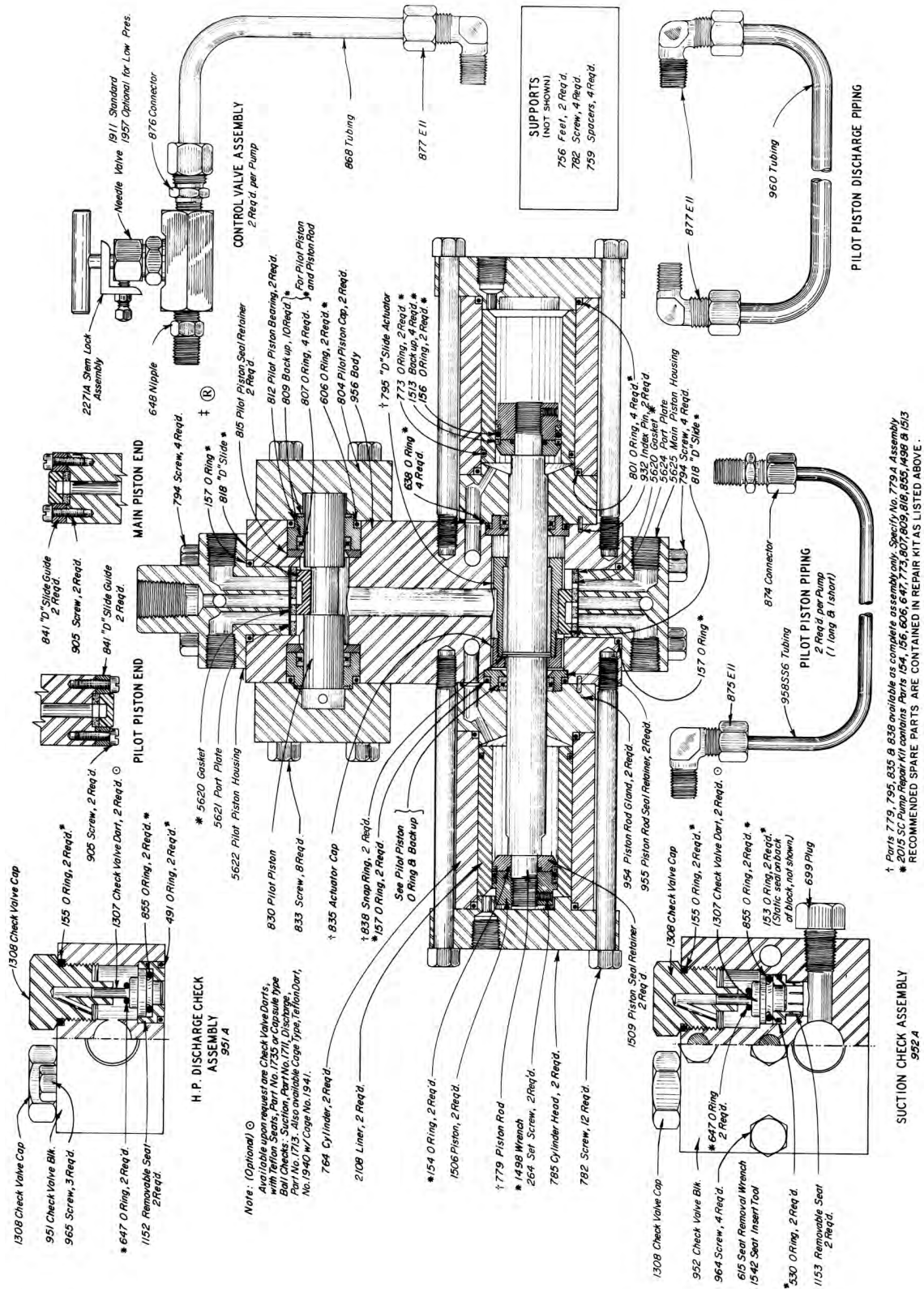
KIMRAY INC.®

MODEL 2020 SC PUMP
STEEL



PUMPS AVAILABLE:

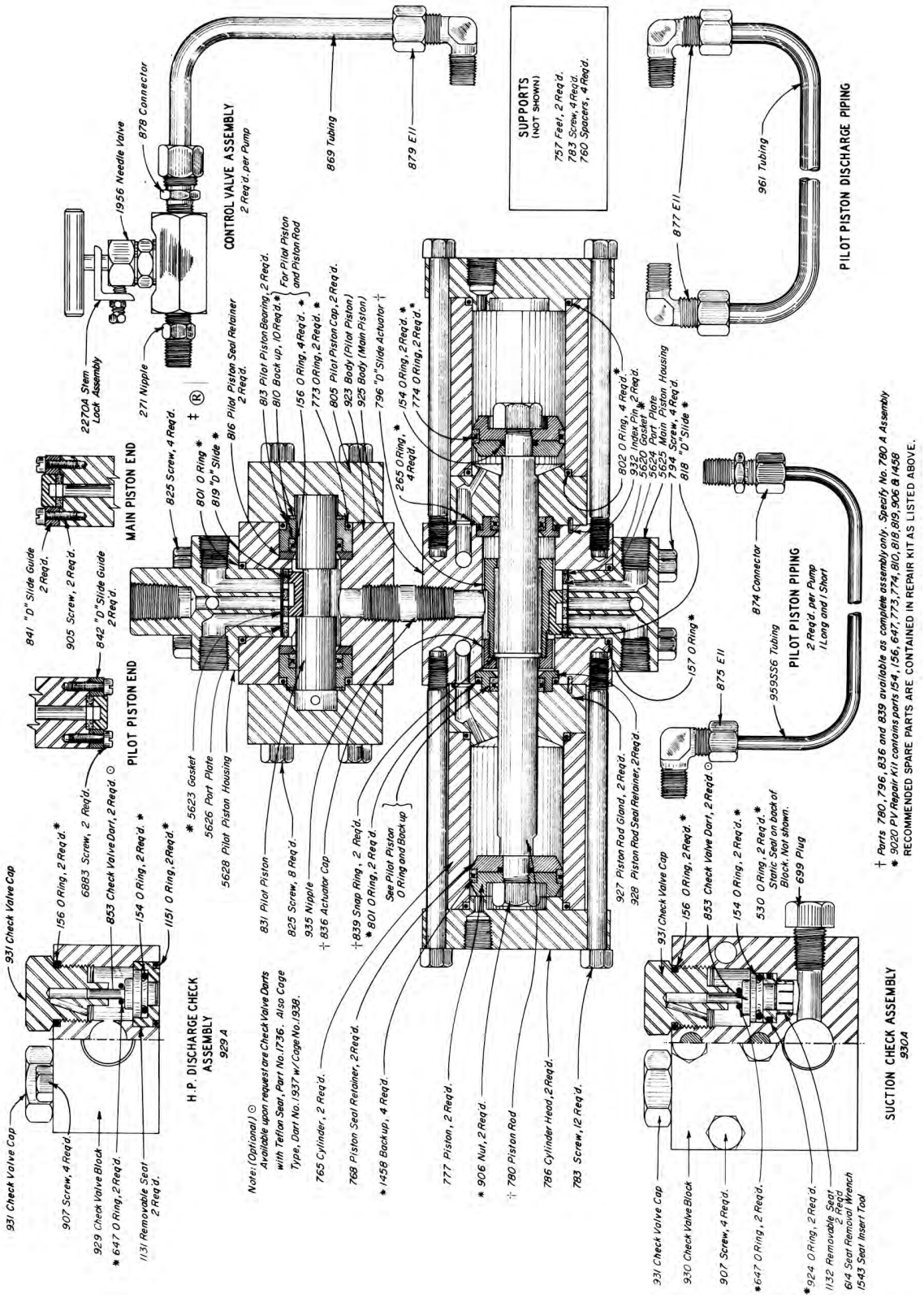
CAT. NO.	TYPE	OPER. PRESS MINIMUM	OPER. PRESS. MAXIMUM	REPAIR KIT
GAC	2020 SC	100	500	RJD1

NOTES:

Kimray is an ISO 9001- certified manufacturer.

‡ Configuration of Glycol pump is a trademark of Kimray, Inc.

MODEL 9020 PV PUMP
STEEL



PUMPS AVAILABLE:

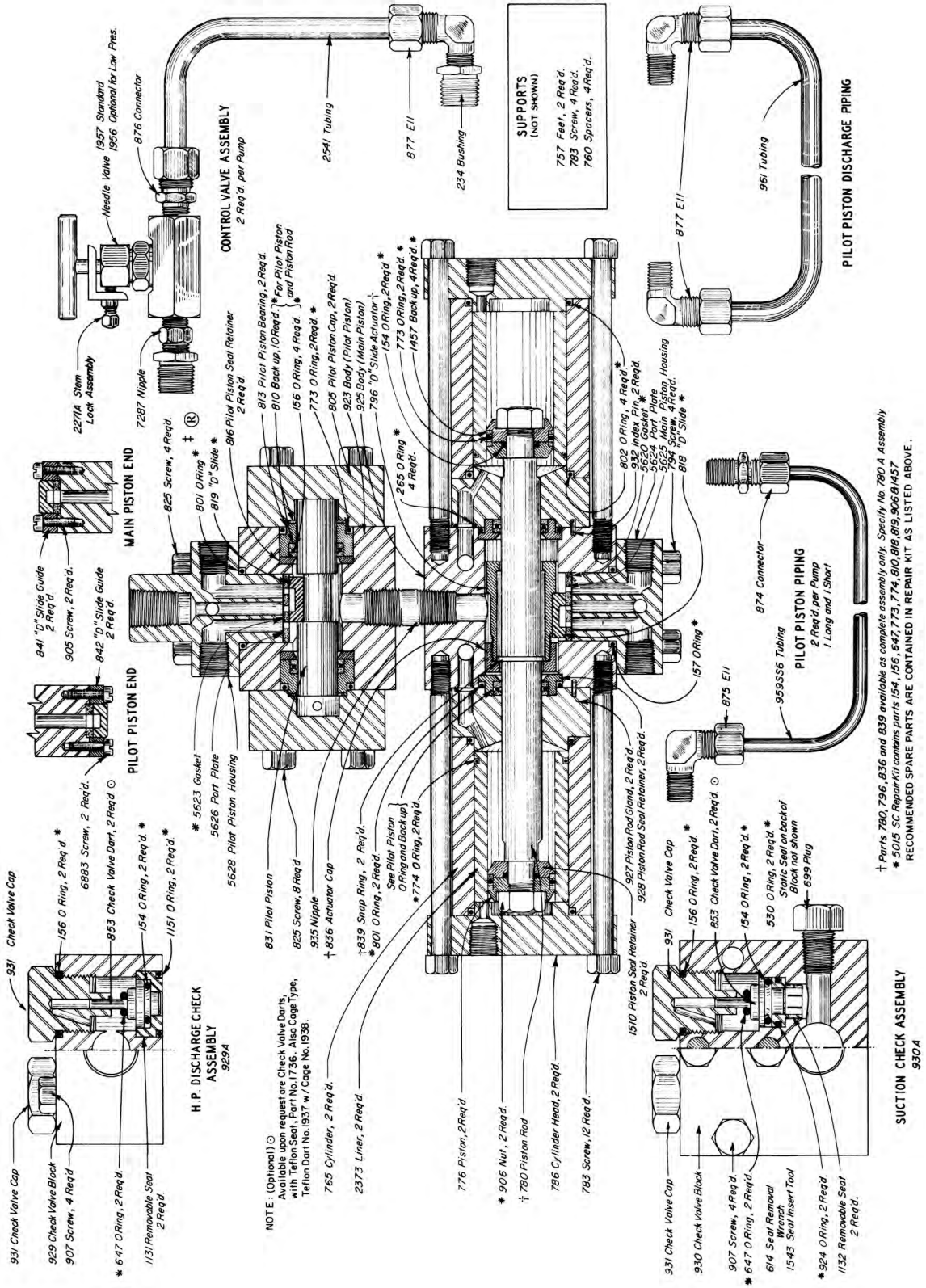
CAT. NO.	TYPE	OPER. PRESS MINIMUM	OPER. PRESS. MAXIMUM	REPAIR KIT
GAF	9020 PV	300	2000	RJF1

NOTES:

Kimray is an ISO 9001- certified manufacturer.

KIMRAY INC.®

MODEL 5020 SC PUMP
STEEL



PUMPS AVAILABLE:

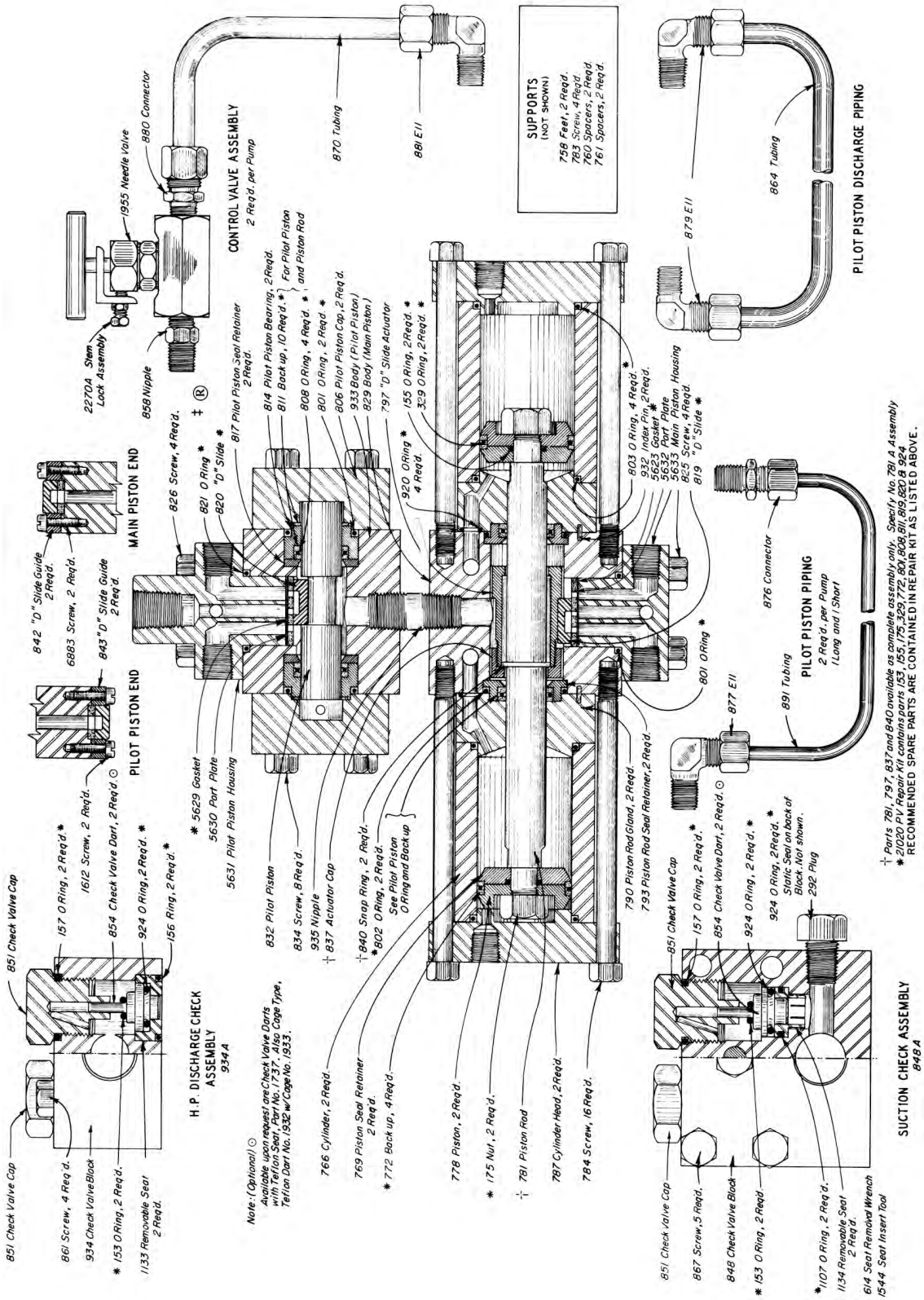
CAT. NO.	TYPE	OPER. PRESS MINIMUM	OPER. PRESS. MAXIMUM	REPAIR KIT
GAG	5020 SC	100	500	RJH1

NOTES:

Kimray is an ISO 9001- certified manufacturer.

‡ Configuration of Glycol pump is a trademark of Kimray, Inc.

MODEL 21020 PV PUMP
STEEL



PUMPS AVAILABLE:

CAT. NO.	TYPE	OPER. PRESS MINIMUM	OPER. PRESS. MAXIMUM	REPAIR KIT
GAH	21020 PV	300	2000	RJI1

NOTES:

Kimray is an ISO 9001- certified manufacturer.

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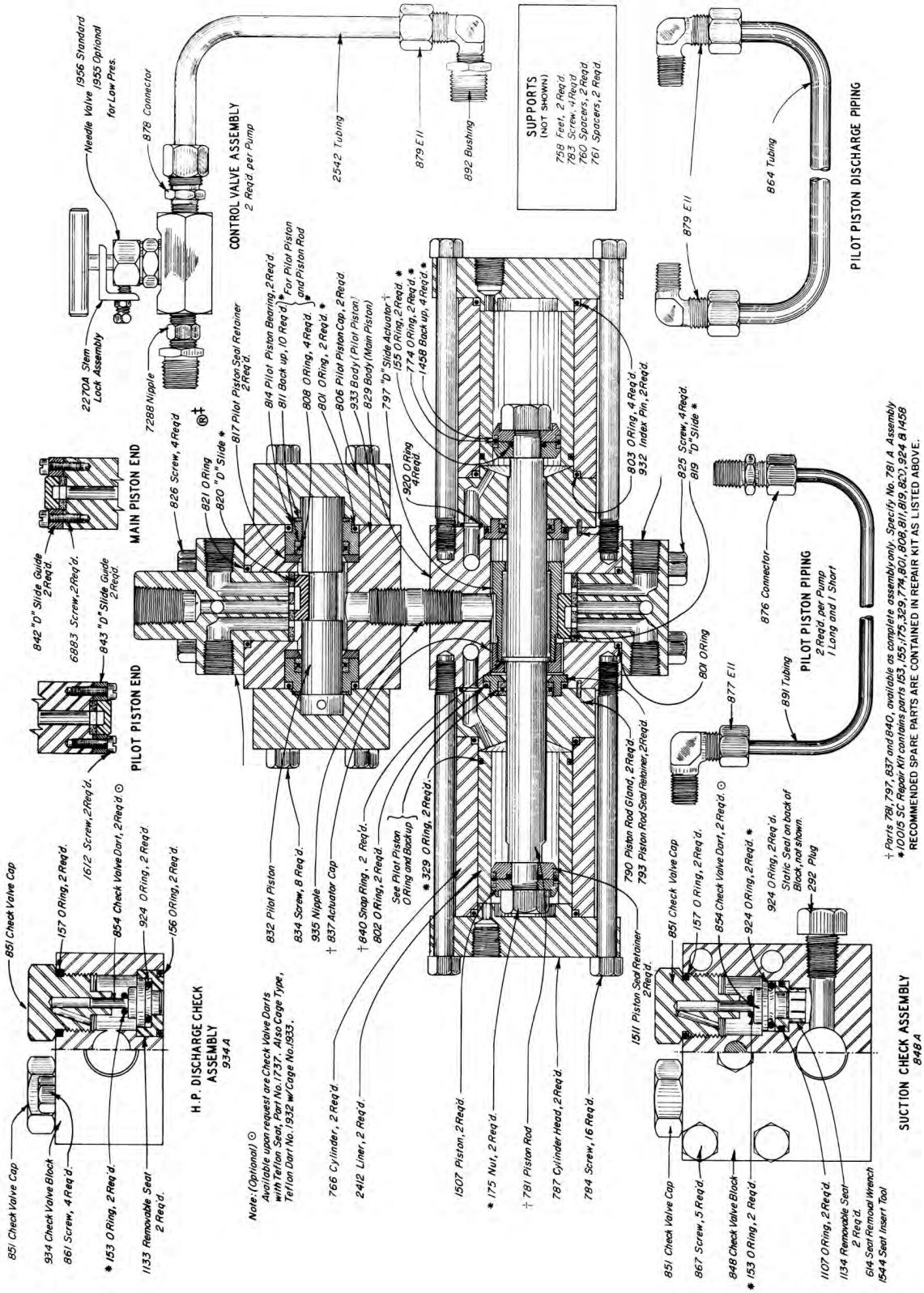
MODEL 10020 SC PUMP
STEEL



PUMPS AVAILABLE:

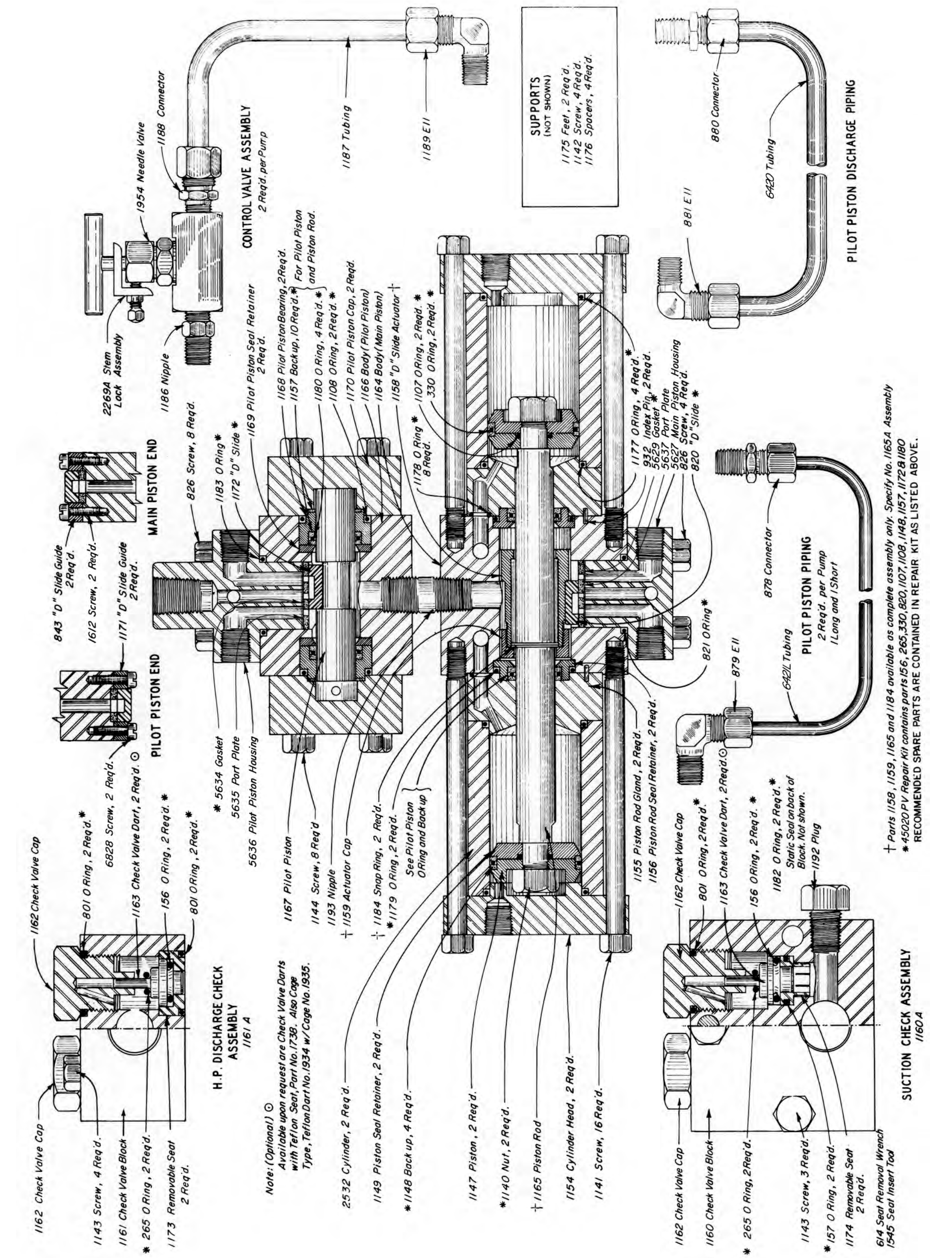
CAT. NO.	TYPE	OPER. PRESS MINIMUM	OPER. PRESS. MAXIMUM	REPAIR KIT
GAI	10020 SC	100	500	RJK1

NOTES:

Kimray is an ISO 9001- certified manufacturer.

‡ Configuration of Glycol pump is a trademark of Kimray, Inc.

MODEL 45020 PV PUMP
STEEL



PUMPS AVAILABLE:

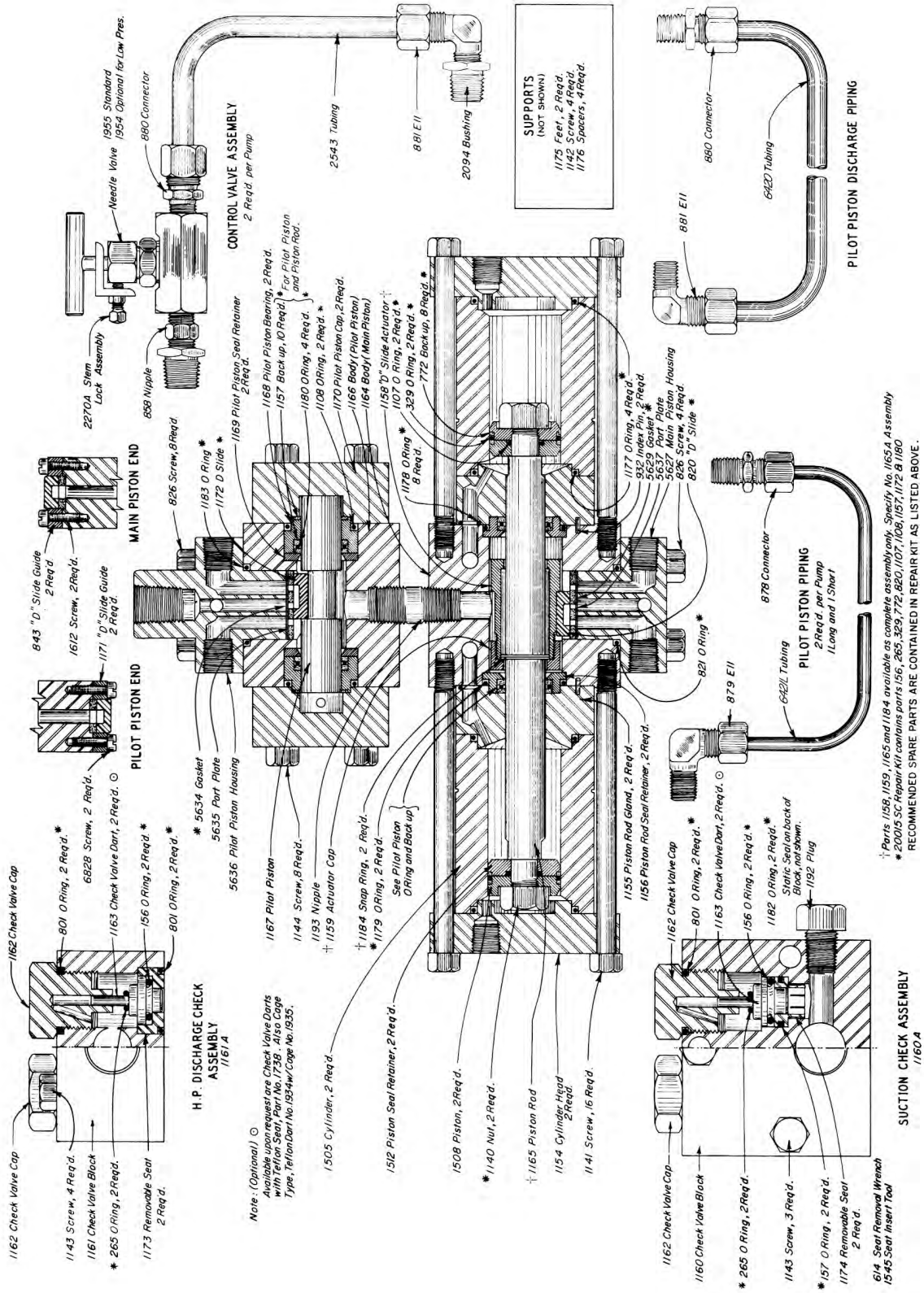
CAT. NO.	TYPE	OPER. PRESS MINIMUM	OPER. PRESS. MAXIMUM	REPAIR KIT
GAJ	45020 PV	300	2000	RJL1

NOTES:

Kimray is an ISO 9001- certified manufacturer.

KIMRAY INC.®

MODEL 20020 SC PUMP
STEEL



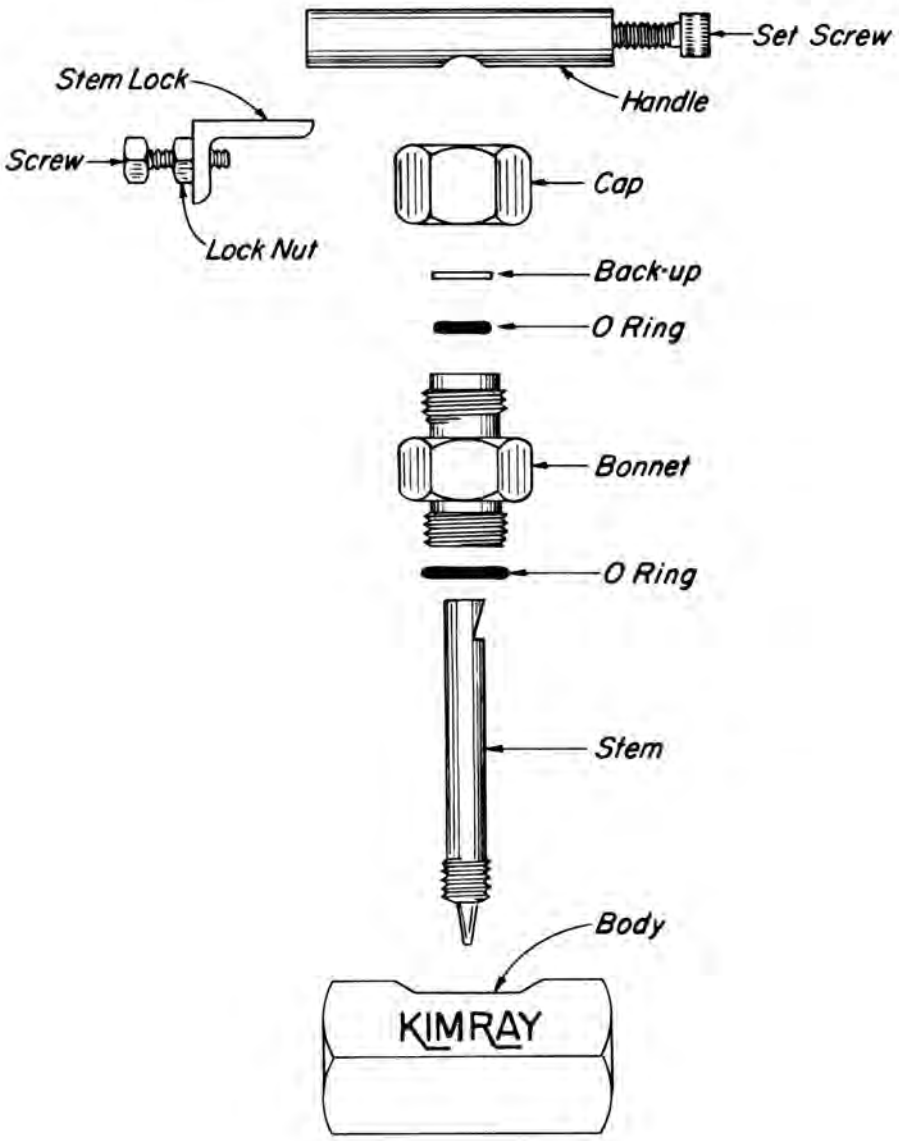
PUMPS AVAILABLE:

CAT. NO.	TYPE	OPER. PRESS MINIMUM	OPER. PRESS. MAXIMUM	REPAIR KIT
GAK	20020 SC	100	500	RJN1

NOTES:

Kimray is an ISO 9001- certified manufacturer.

‡ Configuration of Glycol pump is a trademark of Kimray, Inc.



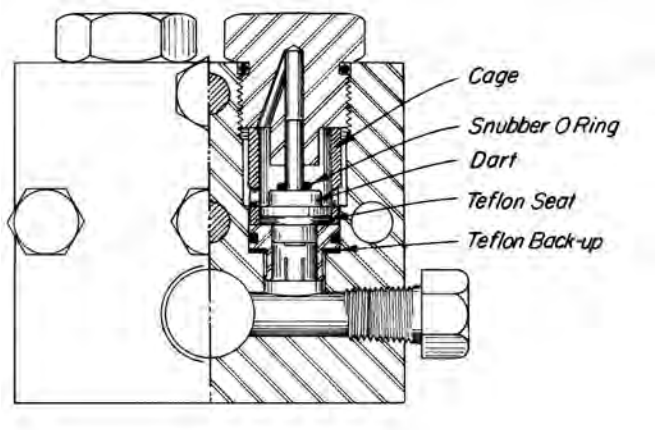
N.P.T. SIZE	VALVE NO.	ORIFICE SIZE	PUMP SIZE	BODY	BONNET	CAP	STEM	HANDLE	SET SCREW	BACK-UP	O-RING	O-RING	STEM LOCK	SCREW	LOCK NUT
TYPE 303 STAINLESS STEEL STANDARD ON ALL PUMPS EXCEPT 45020 PV PUMP															
1/8"	1603	1/16"	315	1603C	1603D	1603F	1603A	1603B	1964	1978	638	265	6746	6731	6732
1/4"	1911	1/16"	1720	1911A	1603D	1603F	1957A	1603B	1964	1978	638	265	6746	6731	6732
1/4"	1957	1/8"	4020	1957C	1603D	1603F	1957A	1603B	1964	1978	638	265	6746	6731	6732
3/8"	1956	3/16"	9020	1956C	1955D	1955F	1956A	1955B	1963	1979	153	2631	6747	6731	6732
1/2"	1955	9/32"	21020	1955C	1955D	1955F	1955A	1955B	1963	1979	153	2631	6747	6731	6732
CARBON STEEL STANDARD ON 45020 PV PUMP ONLY															
3/4"	1954	13/32"	45020	1954C	1954D	1954F	1954A	1954B	1962	1980	154	2131	6748	6731	6732
TYPE 316 STAINLESS STEEL - AVAILABLE ON SPECIAL ORDER AND EXTRA COST															
1/8"	1603S6	1/16"	315	1603C6	1603D6	1603F6	1603A	1603B	1964	1978	638	265	6746	6731	6732
1/4"	1911S6	1/16"	1720	1911A6	1603D6	1603F6	1957A	1603B	1964	1978	638	265	6746	6731	6732
1/4"	1957S6	1/8"	4020	1957C6	1603D6	1603F6	1957A	1603B	1964	1978	638	265	6746	6731	6732
3/8"	1956S6	3/16"	9020	1956C6	1955D6	1955F6	1956A	1955B	1963	1979	153	2631	6747	6731	6732
1/2"	1955S6	9/32"	21020	1955C6	1955D6	1955F6	1955A	1955B	1963	1979	153	2631	6747	6731	6732
3/4"	1954S6	13/32"	45020	1954C6	1954D6	1954F6	1954A	1954B	1962	1980	154	2131	6748	6731	6732

Kimray is an ISO 9001- certified manufacturer.

Cage and Teflon seat darts prevent spinning in Check Valve Blocks. Cage also acts as hold down for removable seat.

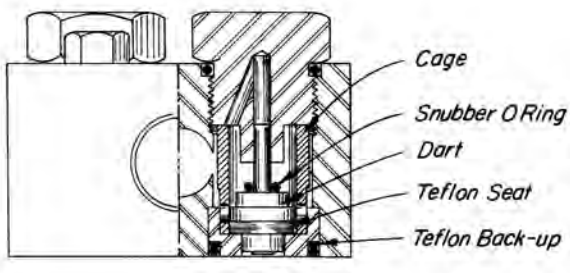
Snubber O Ring installed on stem portion of dart, decreases possibility of darts sticking in caps, snubs darts better, reduces spinning of dart and increases pump efficiency.

Installing Back-up below seats in Discharge Block allows more squeeze to O Ring, preventing leaks.



SUCTION CHECK ASSEMBLY

PART NUMBERS FOR INDICATED PUMPS						
PUMP SIZE	CAGE NO.	DART NO.	SUCTION BACK-UP	DIS. BACK-UP	SNUBBER O-RING	TEFLON DART W/O CAGE
1720 PV 2020 SC 4020 PV	1941	1940	1907	1666	647	1735
5020 SC 9020 PV	1938	1937	1908	1667	647	1736
10020 SC 21020 PV	1933	1932	1909	1668	153	1737
20020 SC 45020 PV	1935	1934	2445	1669	265	1738



DISCHARGE CHECK ASSEMBLY

CHECK VALVE BLOCKS for SPLIT DISCHARGE

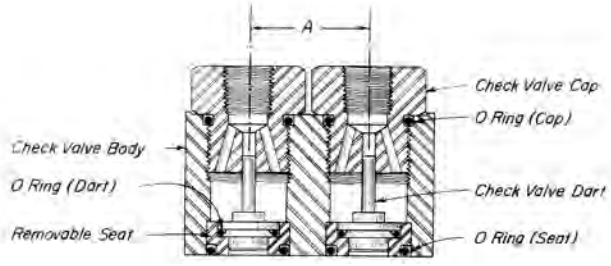
Kimray Glycol Pumps are available with check valve blocks for split discharge to serve two absorbers on a dehydration unit. On an original pump purchase there is no extra charge for this check block.

An accurately divided flow is assured since each absorber is served by one cylinder of the double acting pump.

For an installation of this type only one suction line is necessary. Also the high pressure wet glycol return may be manifolded through one filter or strainer to the pump.

When ordering any Kimray pump for this service, specify the pump number and service. For example: 4020 PV for “split discharge”.

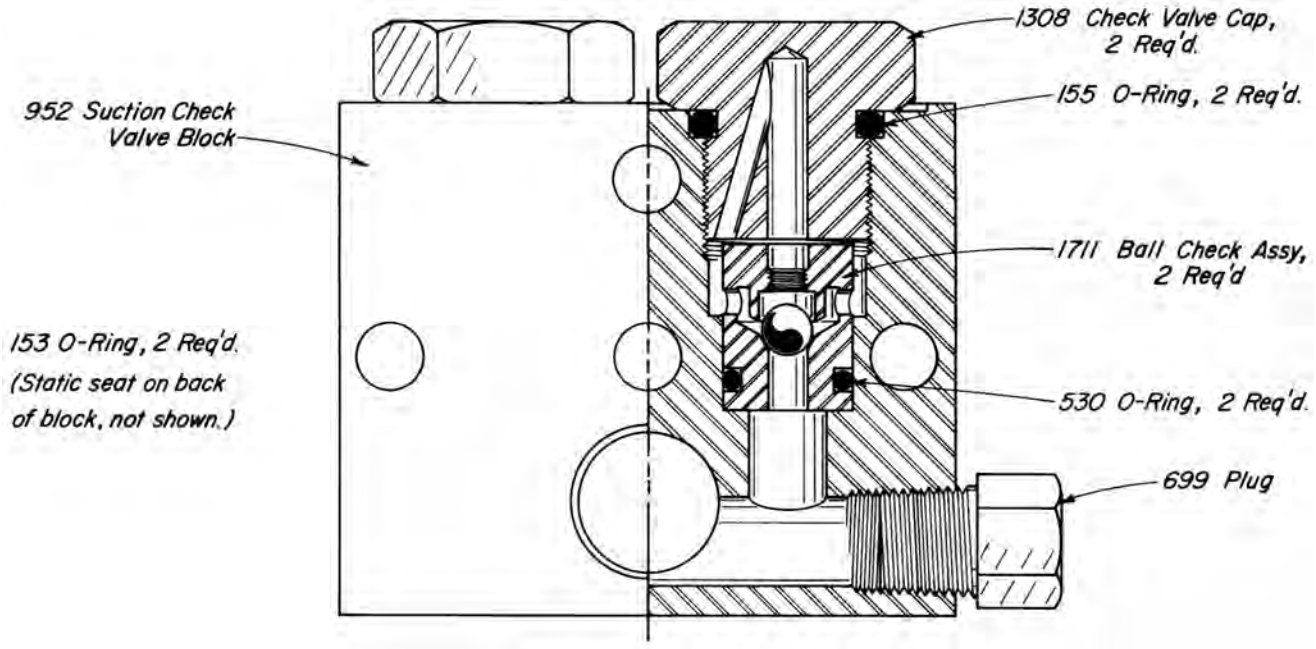
To order Check Valve Blocks for Split Discharge Assemblies add an “A” to the Check Valve Body number. Example: 1194A to order the assemblies with viton O Rings add a “V” to Check Valve Assemblies number; Example: 1194AV



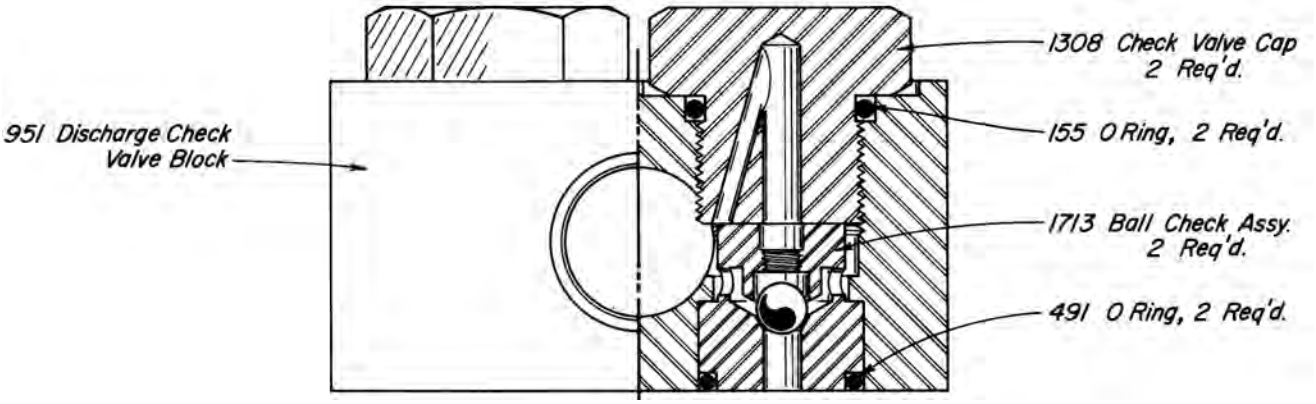
PART NUMBERS FOR INDICATED PUMPS						
PART NAME	QTY REQ'D	1720 PV	4020 PV and 2020 SC	9020 PV and 5020 SC	21020 PV and 10020 SC	45020 PV and 20020 SC
CHECK VALVE BODY	1	1194	1194	1195	1196	1197
“O” RING, SEAT	2	491	491	1151	156	801
REMOVABLE SEAT	2	1152	1152	1131	1133	1173
REV. REM. SEAT	2	1947	1947	1948	1949	1950
“O” RING, DART	2	855	855	154	924	156
DART	2	1307	1307	853	854	1163
“O” RING, CAP	2	155	155	156	157	801
CHECK VALVE CAP	2	1327	1327	1114	1199	1198
TAPPED HOLE SIZE	NPT	1/4	1/4	3/8	1/2	3/4
DIMENSION “A”	Inches	1 1/2	1 1/2	1 11/16	2 5/16	3

BALL CHECK VALVES for 2020 SC, 1720 PV & 4020 PV STEEL

SUCTION CHECK VALVE ASSEMBLY with BALL CHECK VALVE



DISCHARGE CHECK VALVE ASSEMBLY with BALL CHECK VALVE



ASSEMBLIES AVAILABLE:

CAT. NO.	TYPE	CHECK VALVE ONLY
952E	SUCTION	1711
951E	DISCHARGE	1713

NOTES:

Check Valve for Split Discharge with Ball Check Valves are available.

For easy removal of “Ball Checks” order “T” Wrench, Part Number 1827

Kimray is an ISO 9001- certified manufacturer.

APPLICATIONS:

For use with Kimray Glycol Pump to help prevent particle caused system wear.

FEATURES:

Sock type filter
In line filter removal
1/4" NPT Relief Valve connection
Hammer Union Cap
Solid Mount
3/4" NPT inlet and outlet connections

TEMPERATURE RANGE:

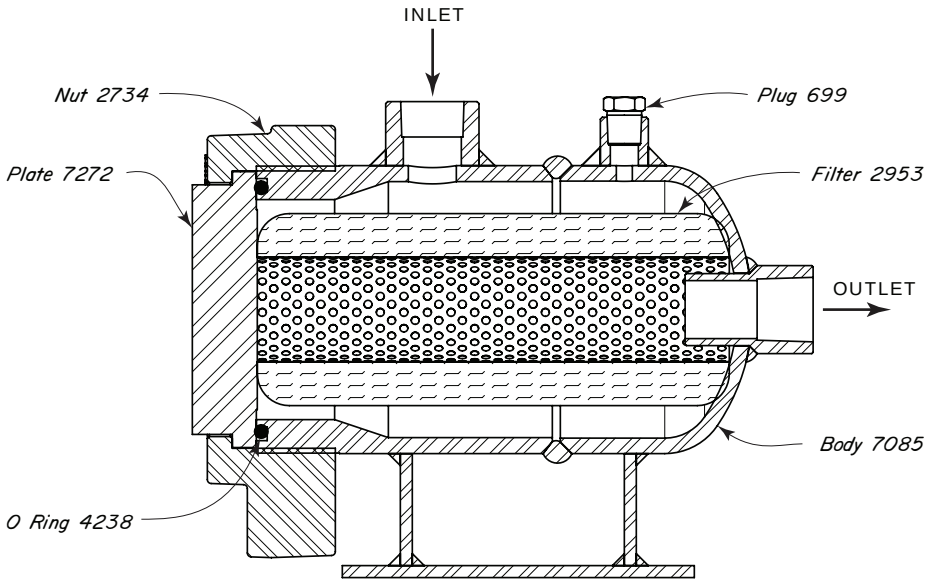
-20°F minumum to 650°F maximum

RECOMMENDED PUMPS:

4020PV
9020PV
2020SC
5020SC

DESCRIPTION:

The Kimray Glycol filter is used to filter particles of rust, sludge and debris from the glycol lines before the glycol reaches the pumping system. This allows the glycol pump to operate more freely and reduces pump wear. Filter itself is a disposable type that can be easily removed and replaced.



GLYCOL FILTER CANISTER AVAILABLE:

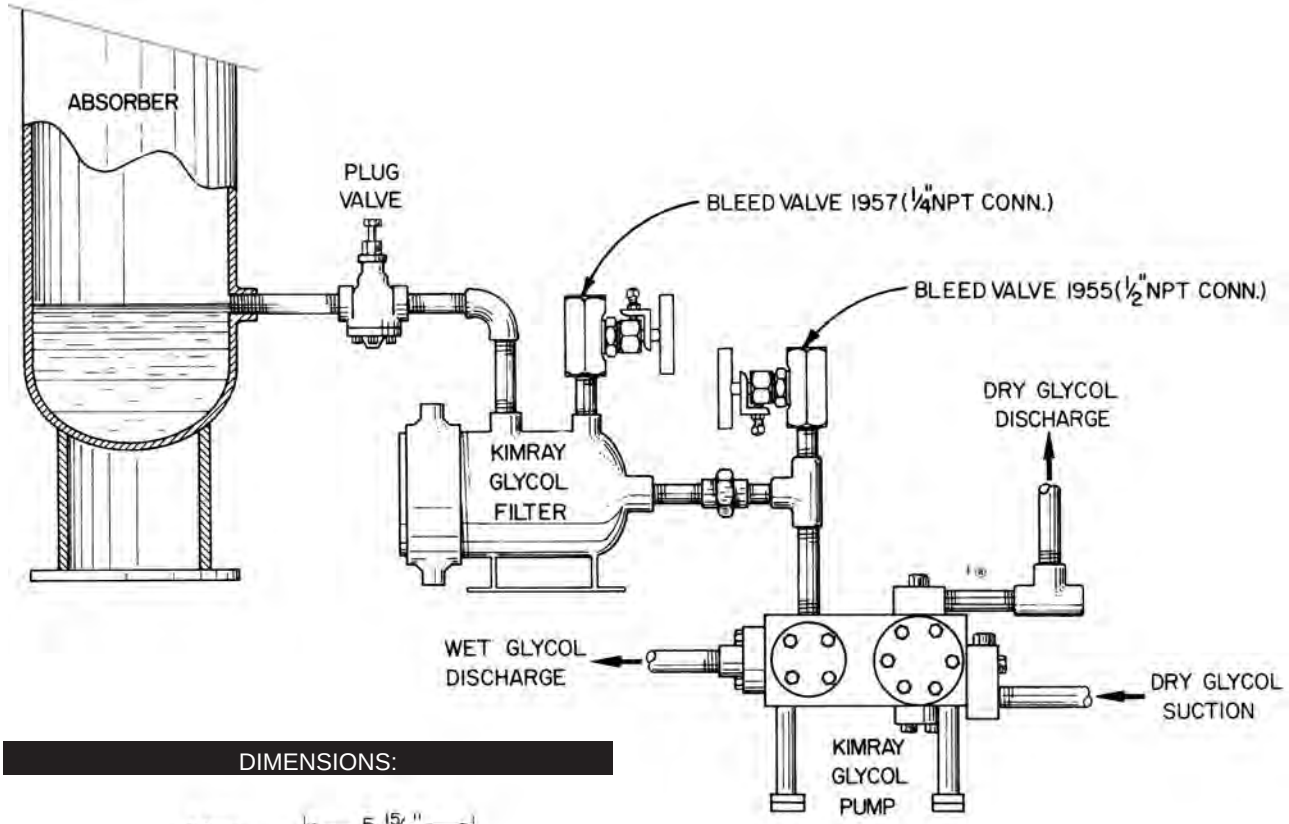
CAT NO.	DESCRIPTION	W.P.
YDB	GLYCOL FILTER CANISTER - STD	2000
2953	REPLACEMENT FILTER - STD	2000

NOTES:

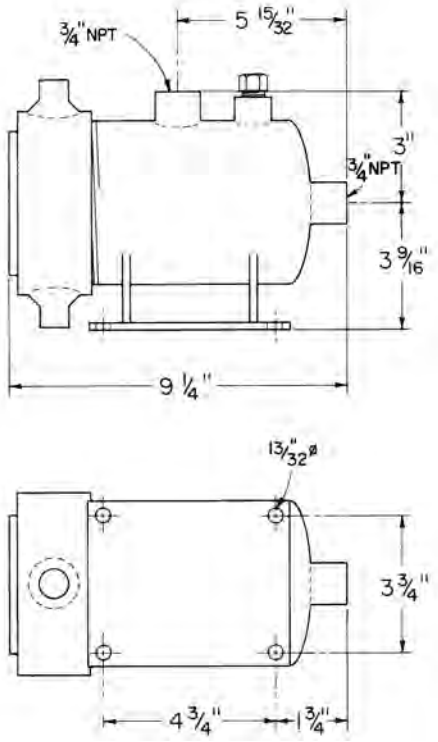
Kimray is an ISO 9001- certified manufacturer.

INSTALLATION:

The Kimray Glycol Filter Canister is installed between the Absorber and the Wet Glycol Inlet of the pump.



DIMENSIONS:



NOTES:

Bolts to attach the Kimray Glycol Filter to a particular unit are available as follows:

1" long, Part no. 380, 4 Req'd.
2" long, Part no. 191, 4 Req'd.
3" long, Part no. 1942, 4 Req'd.
(These bolts require #241 nut, 4 Req'd.)

APPLICATIONS:

- Circulating pump for gas glycol dehydrators, gas amine units and other pumping applications.

FEATURES:

- No Gas Emissions
- No Packing
- Hydraulically Balanced Diaphragms
- Double-ended Shaft
- Stud Extenders for easy Head Installation
- Pulse-Free flow
- Direct or Belt Driven

SPECIFICATIONS:

- Capacity @ max. pressure: rpm gpm l/min
  1500 psi (103 bar) 1200 8.3 31.4
- RPM: 1200 max.- 200 min.
- Inlet
  250 psi max
- Connections:
  Inlet: 1" NPT
  Outlet: 3/4" NPT
- Temperature:
  Max: 250° F (121.1° C)
  Min: 40° F (4.4° C)
  [contact factory for temperatures below 40° F (4.4° C)]
- Fluid End Material, Manifold : SA395 / SA479
- Elastomers: Highly Saturated Nitrile
- Oil Capacity: 2.75 quarts KIMRAY Part No. 7266
  2.60 Liters
- Weight (dry): 100 lbs (45.7 kg)
- Bi Directional Shaft Rotation

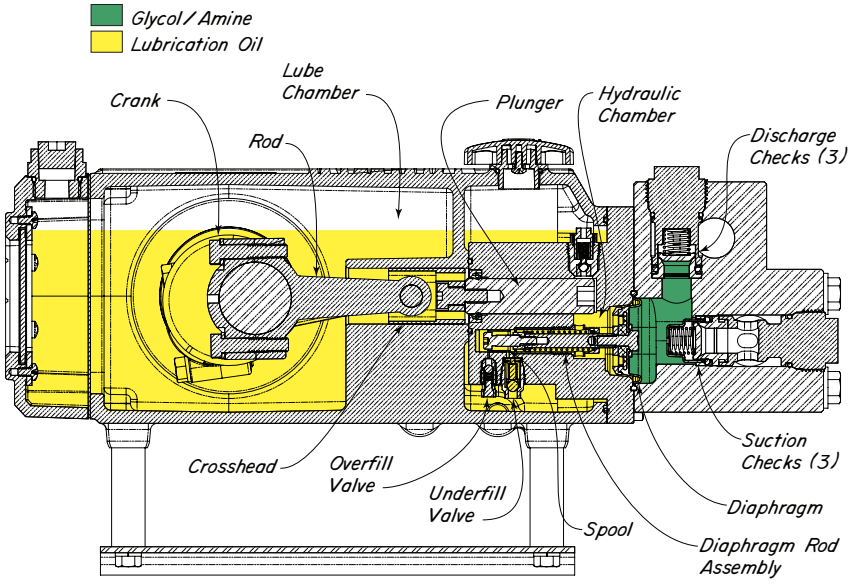
OPERATION:

The KIMRAY ELECTRIC GLYCOL PUMP is a uniquely designed hydraulically balanced diaphragm/plunger positive displacement pump. Power to the pump is provided by a properly sized and specified electric motor either directly connected or belt driven. PLUNGERS are utilized to energize DIAPHRAGMS which in turn pressurize glycol/amine solutions used in gas processing. The Plungers operate and are lubricated in clean oil isolated from the process fluids by DIAPHRAGMS. The DIAPHRAGMS are in contact with the hydraulic oil on one side and the glycol/amine solution and on the other side. KIMZOIL EGP1 is a hydraulic/lubrication oil designed for high end pump performance designed for this application. This design allows for the protection of the reciprocating pumping internals from the process fluids.

As shown in the diagram, the PLUNGER(S) are connected to the CROSSHEAD(s) and displace the oil (YELLOW) in the HYDRAULIC CHAMBER as they reciprocate. As the Plunger moves to the right on the pressure stroke, oil is displaced in the Hydraulic Chamber and forces the DIAPHRAGM(s) to move to the right. The Diaphragm movement displaces the glycol/amine solution (GREEN) on the opposing side of the Diaphragm and forces it through the DISCHARGE CHECK VALVE(s). During the pressure stroke, a small amount of oil (YELLOW) leaks past the clearance between the Plunger and cylinder.

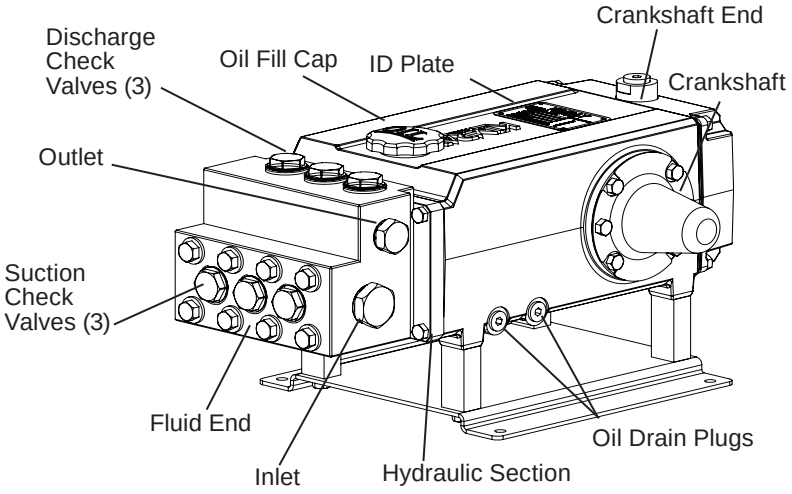
As the Plunger moves back on the suction stroke, the pressure drops in the Hydraulic Chamber and a small amount of oil is drawn in through the UNDER-FILL VALVE to replace the oil lost during the pressure stroke. The position of the Spool Valve regulates how much oil is drawn in. The SPOOL VALVE is positioned by the DIAPHRAGM ROD ASSEMBLY which is connected to the Diaphragm. The cycle then repeats.

When the Diaphragm moves too far forward, the Under-Fill port closes and the Over-Fill port opens. The Under-Fill Valve is a check valve that lets oil in during the suction stroke, but will not allow oil to leave. The OVER-FILL VALVE is a check valve that lets oil out during the pressure stroke, but prevents oil from coming in. The spool valve position opens the port to one of the two valves depending on the need for more or less oil.



Kimray is an ISO 9001- certified manufacturer.

Component Identification



LOCATION:

Locate the pump as close to the fluid supply source as possible.

Allow room for checking the oil level, changing the oil (two drain plugs on the bottom and back of pump), and removing the pump head components (inlet and discharge retainer plates, manifold, and related items).

MOUNTING

The pump shaft can rotate in either direction.

To prevent vibration, mount the pump and motor securely on a level rigid base.

On a belt-drive system, align the sheaves accurately; poor alignment wastes horsepower and shortens the belt and bearing life. Make sure the belts are properly tightened, as specified by the belt manufacturer.

On a direct-drive system, align the shafts accurately. Unless otherwise specified by the coupling manufacturer, maximum parallel misalignment should not exceed 0.015 in. (0.4 mm) and angular misalignment should be held to 1° maximum. Careful alignment extends life of the coupling, pump, shafts, and support bearings. Consult coupling manufacturer for exact alignment tolerances.

PUMPS AVAILABLE:

CAT. NO.	TYPE	OPER. PRESS MINIMUM	OPER. PRESS. MAXIMUM
GEA	50015 EV	0	1500

REPAIR KITS AVAILABLE:

CAT. NO.	TYPE	MATERIAL
RZAHSN	CHECK VALVE REPAIR KIT	HIGHLY SATURATED NITRILE
RZBHSN	COMPLETE REPAIR KIT	HIGHLY SATURATED NITRILE
RZCHSN	DIAPHRAGM REPAIR KIT	HIGHLY SATURATED NITRILE

OIL AVAILABLE:

CAT. NO.	TYPE	CAPACITY QUARTS	CAPACITY LITERS
7266	EGP1 KIMZOIL	2.75	2.60

ACCESSORIES

Consult installation drawing above for typical system components. Contact KIMRAY INC. or the distributor in your area for more details.

IMPORTANT PRECAUTIONS

Adequate Fluid Supply. To avoid cavitation and premature pump failure, be sure that the pump will have an adequate fluid supply and that the inlet line will not be obstructed.

Positive Displacement. This is a positive-displacement pump. Install a relief valve downstream from the pump.

Safety Guards. Install adequate safety guards over all pulleys, belts, and couplings. Follow all codes and regulations regarding installation and operation of the pumping system.

Shut-Off Valves. Never install shut-off valves between the pump and discharge pressure regulator, relief valve, or in the regulator bypass line.

Freezing Conditions. Protect the pump from freezing. See also the Maintenance Section.

Consult the Factory for the following situations:

- Extreme temperature applications – above 250° F (82° C) or below 40° F (4.4° C)
- Viscous fluid applications above 100 Cps
- Chemical compatibility problems
- Hot ambient temperatures – above 110° F (43° C)
- Conditions where pump oil may exceed 200° F (93° C) because of a combination of hot ambient temperatures, hot fluid temperature, and full horsepower load — an oil cooler may be required
- Pump RPM less than 200

CALCULATING REQUIRED HORSEPOWER (KW)*

$$\frac{\text{gpm x psi}}{1{,}460} = \text{electric motor HP*}$$

$$\frac{\text{lpm x bar}}{511} = \text{electric motor kW*}$$

* HP/kW is required application power.

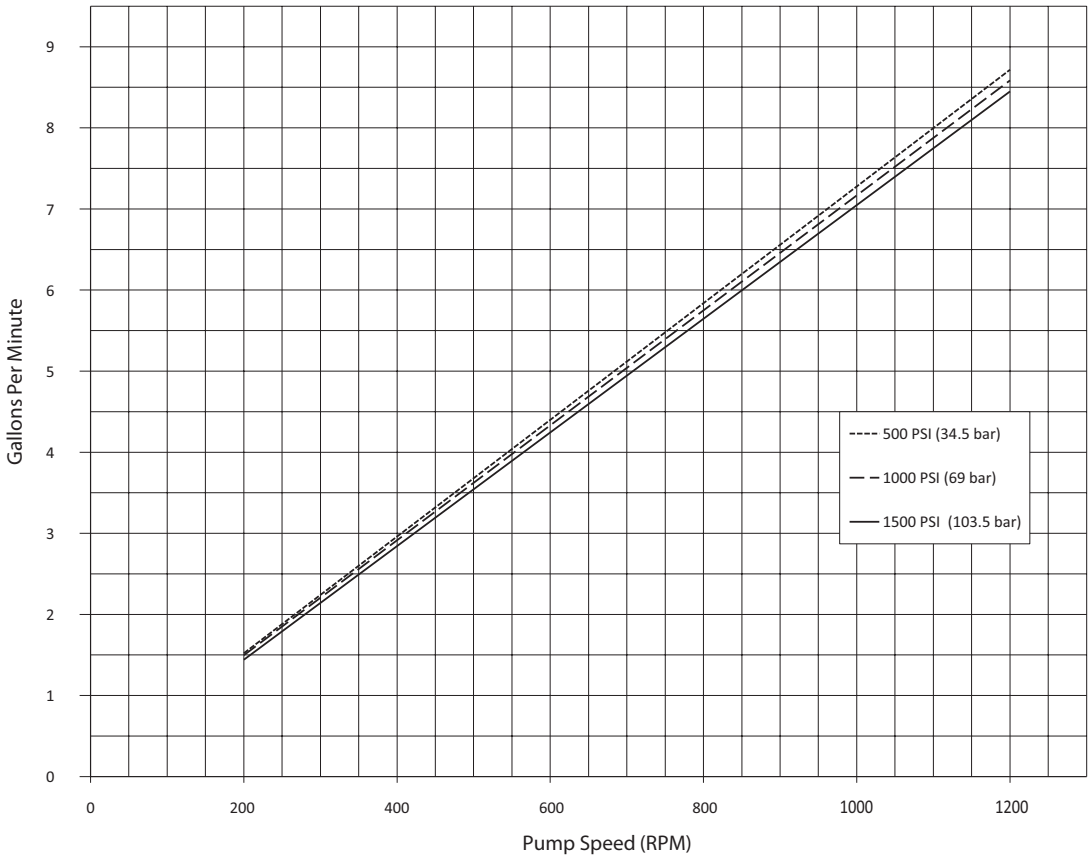
ATTENTION!

When sizing motors with variable speed drives (VFDs), it is very important to select a motor and a VFD rated for constant torque inverter duty service and that the motor is rated to meet the torque requirements of the pump throughout desired speed range.

Kimray is an ISO 9001- certified manufacturer.

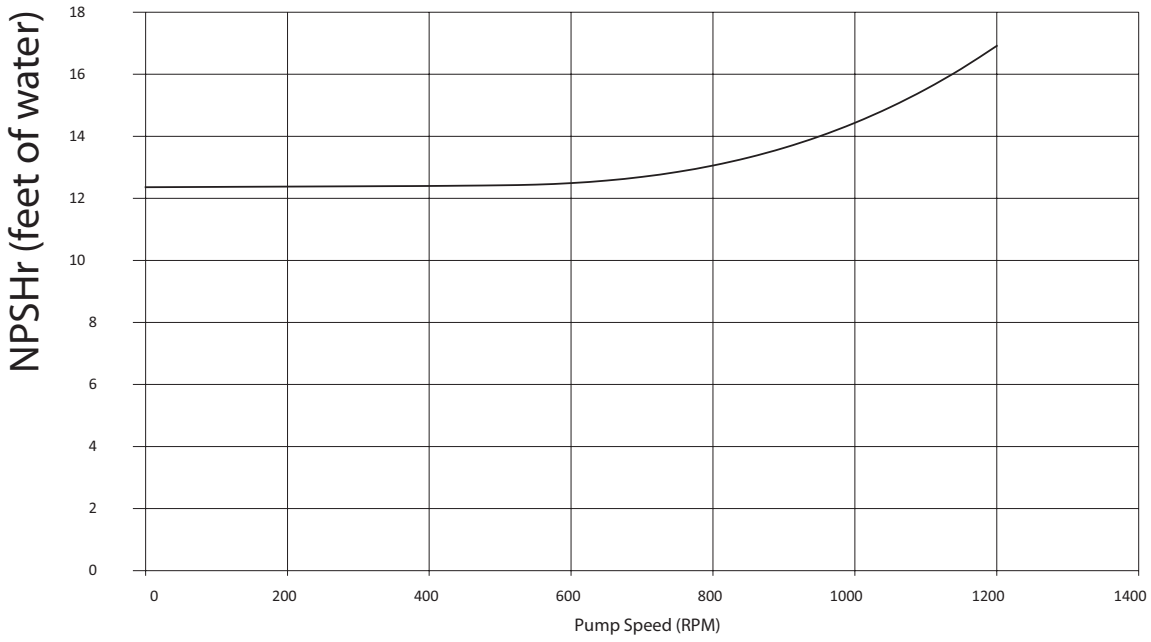
Performance

50015 EV Performance



Net Positive Suction Head – NPSHr

Net Positive Suction Head (NPSHr)



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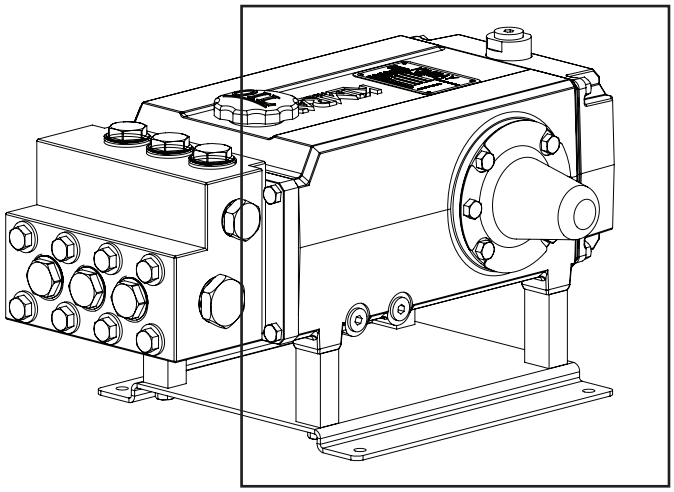
KIMRAY INC.®

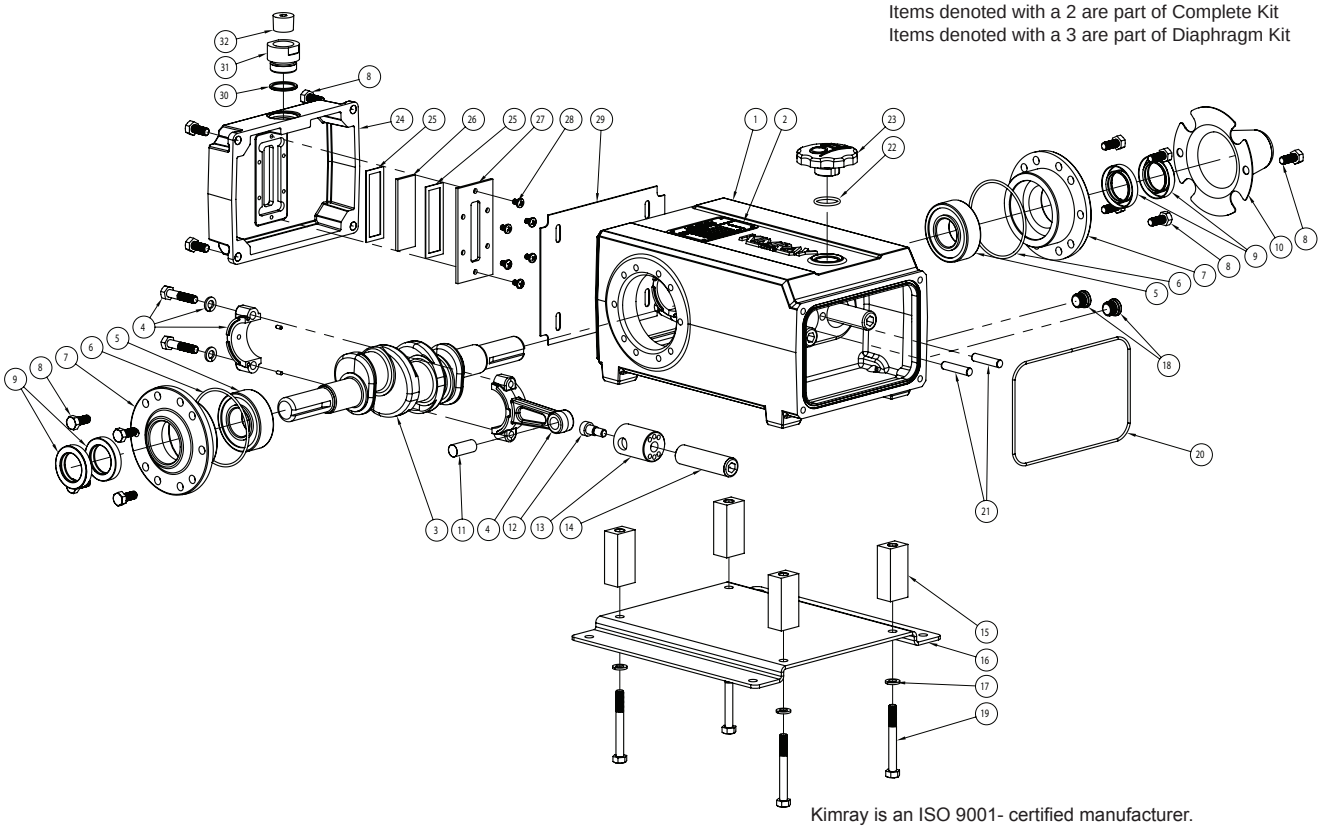
ELECTRIC PUMPS
STEEL

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.	KIT
1	189-401-02	CRANKCASE, T9, MACHINING	1	
2	189-511	PLATE, DATA	1	
3	172-102-02	CRANKSHAFT, FINISHED	1	
4	189-509	ROD, CONNECTING, ASSEMBLED	3	
	189-507	ROD, FRONT CONNECTING	1	
	189-508	ROD, REAR CONNECTING	1	
	189-510	PIN, DOWEL .125	2	
	189-522	SCREW, 5/16-18 UNC-2A X 1.375, HHCS	2	
	C22-014-2000	WASHER, M8 SPLIT LOCK	2	
5	172-004	BEARING, SPHERICAL ROLLER, 22206	2	
6	N10-073-2110	O-RING, BUNA, -150	2	
7	189-545	MACHINING, BEARING CARRIER	2	
8	189-525	SCREW, 5/16-18 UNC-2A, HHCS	14	
9	F20-031-2110	SEAL, BUNA	4	
10	189-500	COVER, CRANKSHAFT	1	
11	189-054	PIN, WRIST	3	
12	189-528	SCREW, SHOULDER, 5/16-18 UNC-2A, SHCS	3	
13	189-437	CROSSHEAD	3	
14	189-431	PLUNGER, .787	3	
15	189-520	SPACER, BASE PLATE 256 TC	4	
16	189-502-01	BRACKET, MOUNTING	1	
17	C22-014-2000	WASHER, M8 SPLIT LOCK	4	
18	189-032	PLUG, 3/8 SAE, STEEL	2	
19	189-521	SCREW, 5/16-18 UNC-2B X 2.75, HHCS	4	
20	D15-037-2110	O-RING, VITON, -164	1	
21	D03-026-2210	PIN, DOWEL, 5/16"	2	
22	D10-080-21XX	MATRIX, .862 ID X .103 WIDE O-RING	1	
23	189-595-XX	ASSY, METAL OIL CAP	1	
	189-590-XX	BASE, OIL CAP	1	
	189-591-XX	TOP, OIL CAP	1	
	189-595	SCREW, PHMS 0.164-32x0.375x0.375-S	1	



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.	KIT
24	189-560-02	COVER, LEVEL SWITCH	1	
25	189-553	GASKET	2	
26	189-552	GLASS, SIGHT	1	
27	189-556	FRAME, SIGHTGLASS	1	
28	189-565	SCREW, 10-24 PAN HEAD	6	
29	189-564	GASKET, REAR COVER, K9	1	
30	C63-026-2118	O-RING, C62 REGULATOR BODY, -119	1	
31	189-561	ADAPTER, INTERNAL FLOAT SWITCH	1	
32	189-313	PLUG, 1/2 INCH NPT	1	

Items denoted with a 1 are part of Valve Kit
Items denoted with a 2 are part of Complete Kit
Items denoted with a 3 are part of Diaphragm Kit



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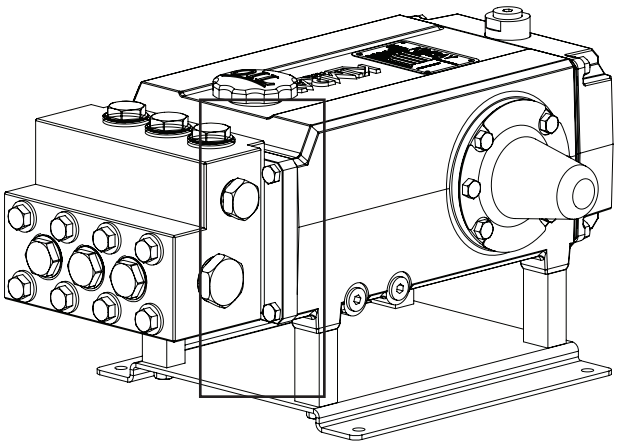

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.	KIT
33	189-403	PLATE, DIAPHRAGM, MACHINED BILLET 9L	2	
34	177-906	CARTRIDGE	3	
	177-119	PLUG	1	
	172-016	BALL, 3/16 DIAMETER	1	
	172-017	SEAT,	1	
	172-118	PIN	1	
	172-061	SPRING, OVERFILL VALVE	1	
	172-119	RETAINER	1	
35	177-905	CARTRIDGE, OVERFILL VAVLE	3	
	177-017	OVERFILL SEAT	1	
	172-016	BALL, 3/16 DIAMETER	1	
	172-061	SPRING, OVERFILL VALVE	1	
	177-018	RETAINER, OVERFILL SPRING	1	
36	177-904	CARTRIDGE, UNDERFILL VALVE	3	
	177-160	SEAT, UNDERFILL	1	
	172-161	CAGE, UNDERFILL	1	
	172-061	SPRING, OVERFILL VALVE	1	
	177-075	PIN, STOP	1	
	D25-015-3010	BALL, .250 DIA. ALLOY STEEL	1	
	189-594	CLIP, RETAINING	1	
37	189-451	SCREW, #10-24 UNC-2B x .625, SHSS	3	
38	189-429	VALVE, SPOOL, HOLLOW	3	
39	189-317	STOP, SPOOL	3	
40	189-316	WASHER, GUIDE	3	
41	189-452	ROD, BIAS SPRING, TAPERED	3	
42	189-558	SPRING, BIAS	3	
43	189-141	RETAINER, BIAS SPRING	3	
44	189-454	CLAMP, DIAPHRAGM, 9L	3	
45	189-125-01	DIAPHRAGM, INSERT MOLDED, 9L, HSN	3	2 & 3
46	177-141-01	SCREW, DIAPHRAGM FOLLOWER	3	
47	D03-073-213	O-RING, Viton, -153	1	
48	189-438	SEAL, SHAFT	3	
49	189-512	SCREW, 5/16-18 UNC-2B X 1.125, HHCS	4	

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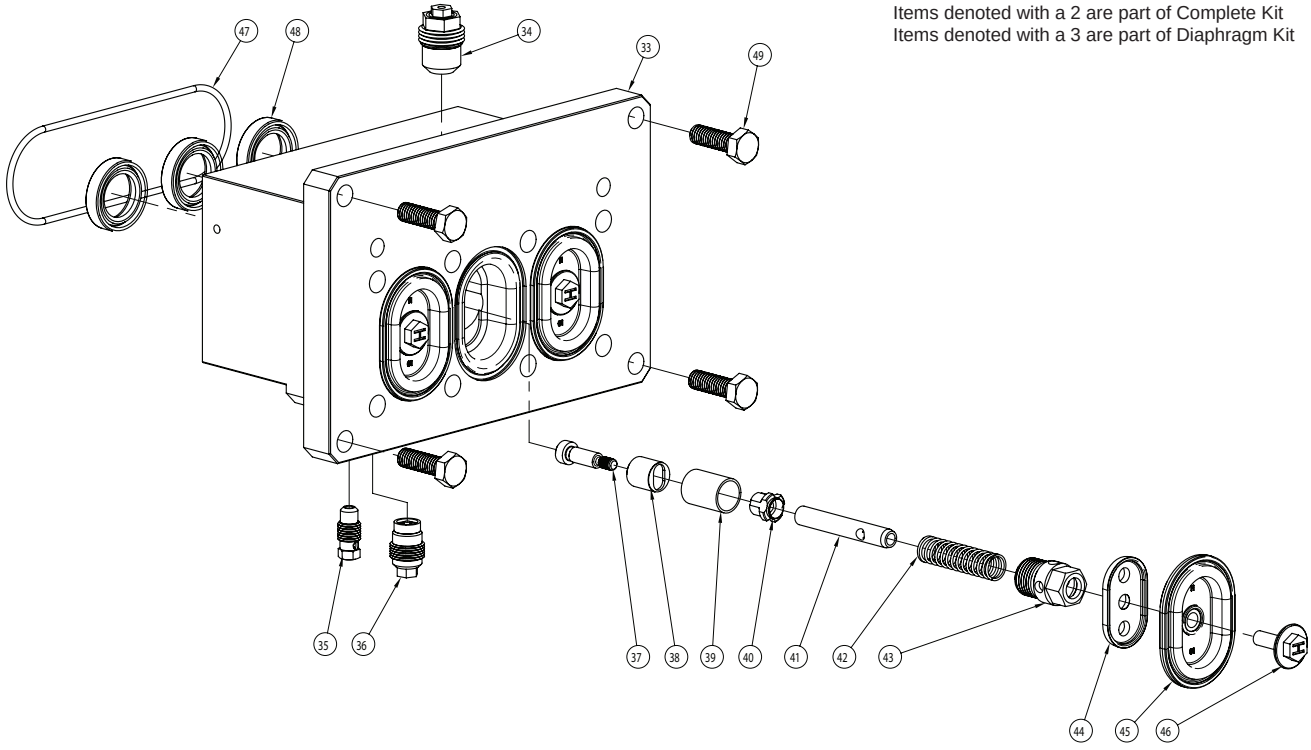
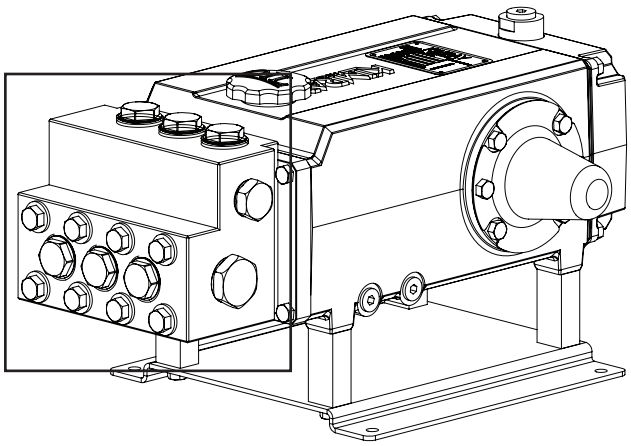
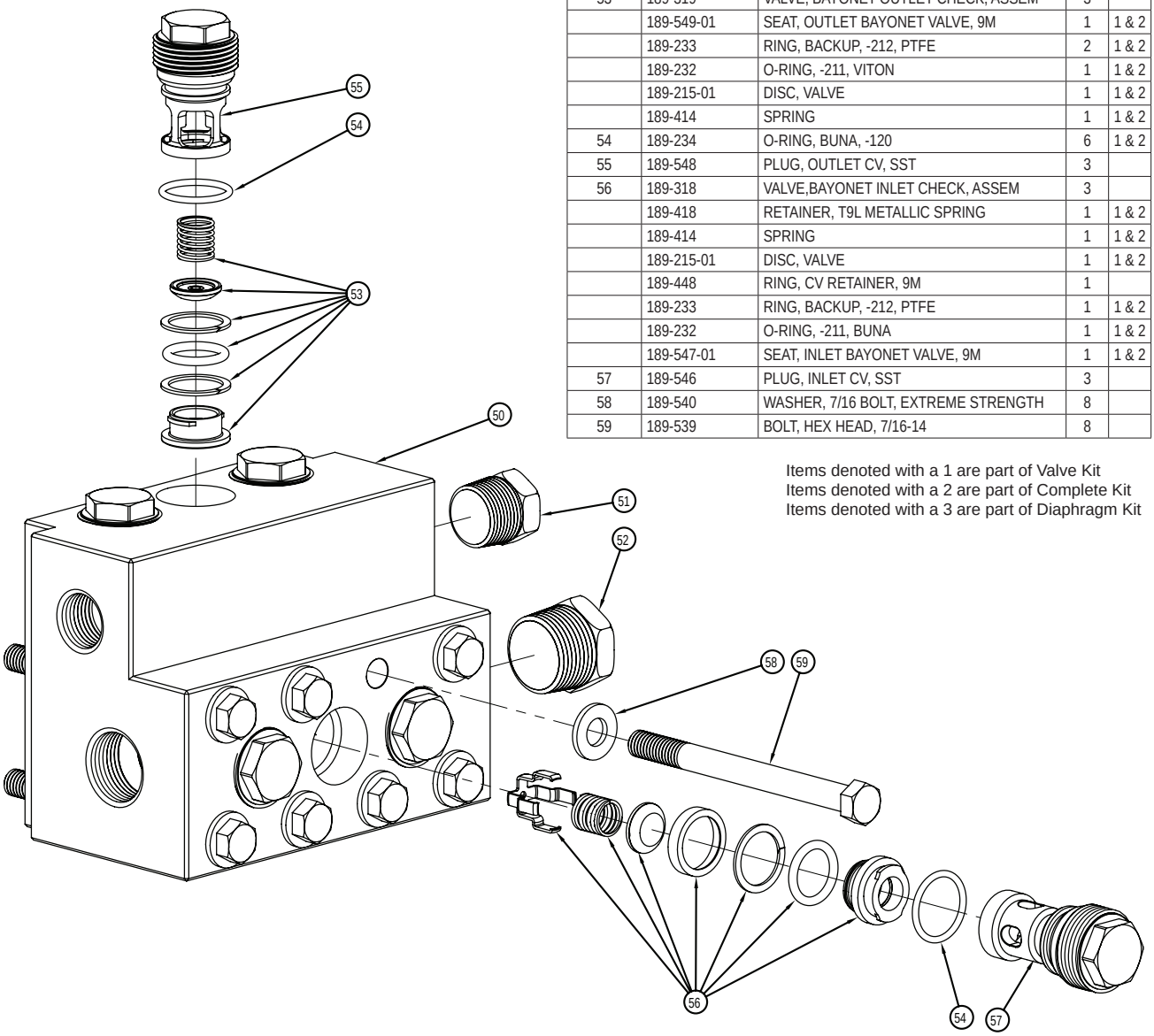
Items denoted with a 3 are part of Diaphragm Kit



Kimray is an ISO 9001- certified manufacturer.

ELECTRIC PUMPS
STEEL





ITEM NO.	PART NUMBER	DESCRIPTION	QTY.	KIT
50	189-406-XX	MANIFOLD, K9L MACHINED	1	
51	189-311	PLUG, 3/4 NPT SST	1	
52	189-312	PLUG, 1 NPT SST	1	
53	189-319	VALVE, BAYONET OUTLET CHECK, ASSEM	3	
	189-549-01	SEAT, OUTLET BAYONET VALVE, 9M	1	1 & 2
	189-233	RING, BACKUP, -212, PTFE	2	1 & 2
	189-232	O-RING, -211, VITON	1	1 & 2
	189-215-01	DISC, VALVE	1	1 & 2
	189-414	SPRING	1	1 & 2
54	189-234	O-RING, BUNA, -120	6	1 & 2
55	189-548	PLUG, OUTLET CV, SST	3	
56	189-318	VALVE,BAYONET INLET CHECK, ASSEM	3	
	189-418	RETAINER, T9L METALLIC SPRING	1	1 & 2
	189-414	SPRING	1	1 & 2
	189-215-01	DISC, VALVE	1	1 & 2
	189-448	RING, CV RETAINER, 9M	1	
	189-233	RING, BACKUP, -212, PTFE	1	1 & 2
	189-232	O-RING, -211, BUNA	1	1 & 2
	189-547-01	SEAT, INLET BAYONET VALVE, 9M	1	1 & 2
57	189-546	PLUG, INLET CV, SST	3	
58	189-540	WASHER, 7/16 BOLT, EXTREME STRENGTH	8	
59	189-539	BOLT, HEX HEAD, 7/16-14	8	

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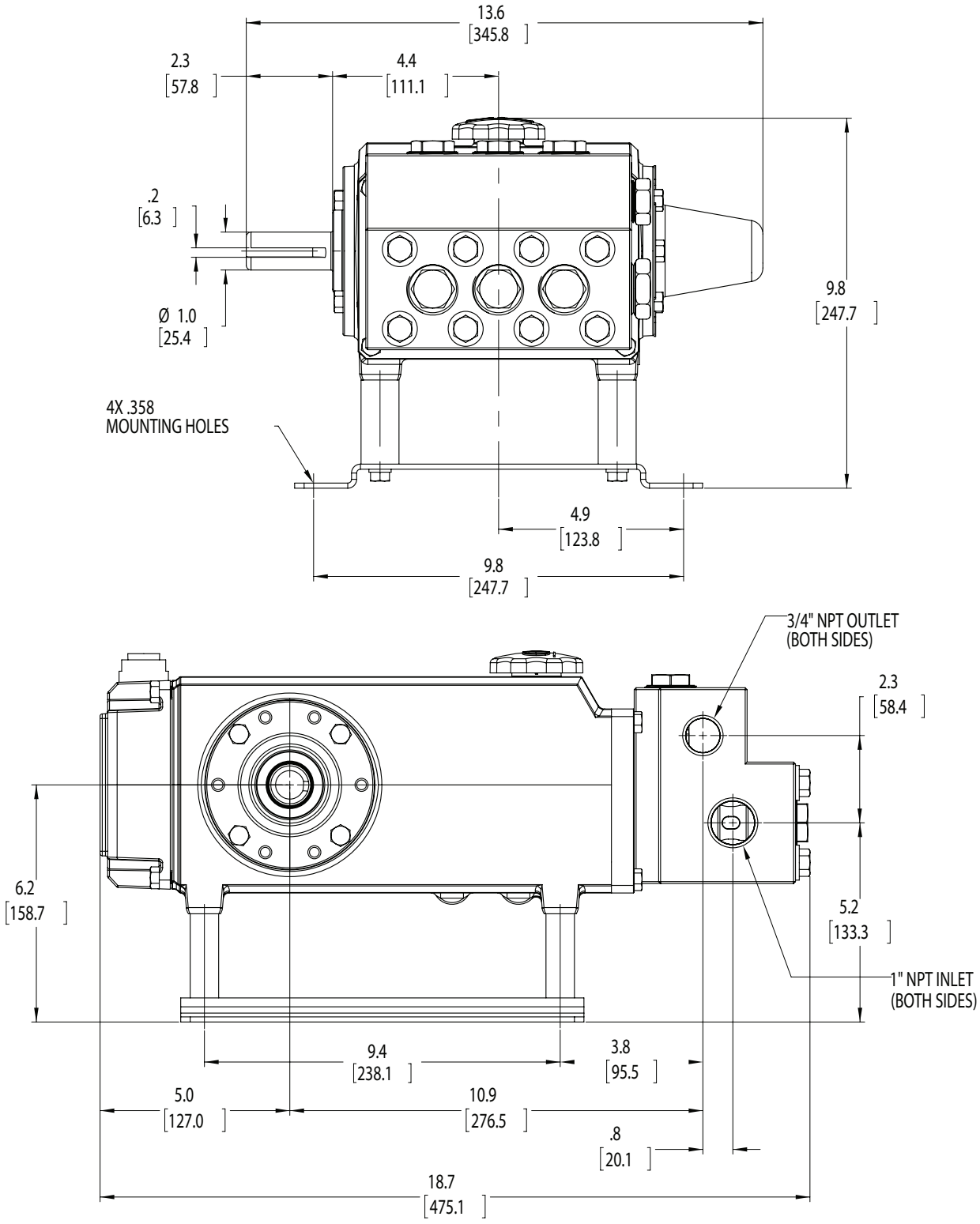
13.6
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2.3
[57.8]
4.4
[111.1]
.2
[6.3]
Ø 1.0
[25.4]
9.8
[247.7]
4X .358
MOUNTING HOLES
4.9
[123.8]
9.8
[247.7]
3/4" NPT OUTLET
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1" NPT INLET
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3.8
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5.0
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.8
[20.1]
18.7
[475.1]

Kimray is an ISO 9001- certified manufacturer.

APPLICATIONS:

- Circulating pump for gas glycol dehydrators, gas amine units and other pumping applications.

FEATURES:

- No Gas Emissions
- No Packing
- Hydraulically Balanced Diaphragms
- Inline Service
- Pulse-Free flow
- Direct Driven

SPECIFICATIONS:

- Capacity @ max. pressure: rpm gpm l/min
  1200 psi (83 bar) 1750 2.2 8.3
- RPM: 1750 max.- 200 min.
- Inlet
  250 psi max
- Connections:
  Inlet: 1/2" NPT
  Outlet: 3/8" NPT
- Temperature:
  Max: 250° F (121.1° C)
  Min: 40° F (4.4° C)
- Fluid End Material, Manifold : SA395 / SA479
- Elastomers: Viton®
- Oil Capacity: 1 Quart KIMRAY Part No. 7266
  0.95 Liters
- Weight (dry): 37 lbs (16.8 kg)
- Bi Directional Shaft Rotation
- For use with NEMA 56c Footed Motor only

Glycol / Amine
Lubrication Oil

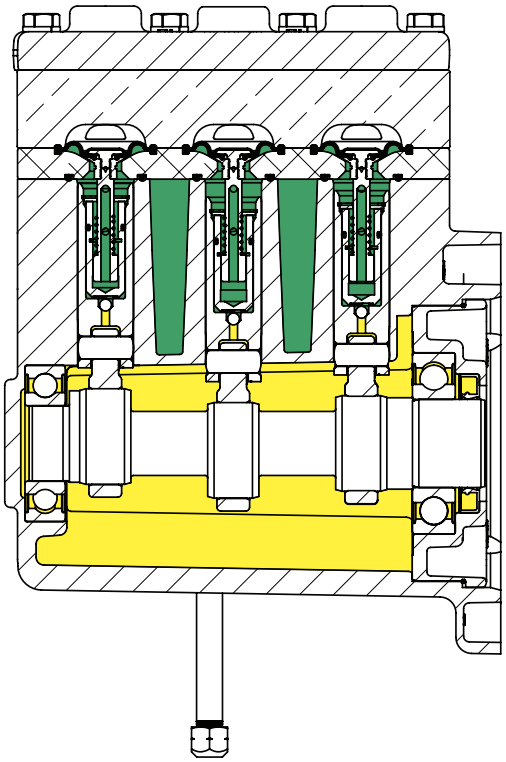
OPERATION:

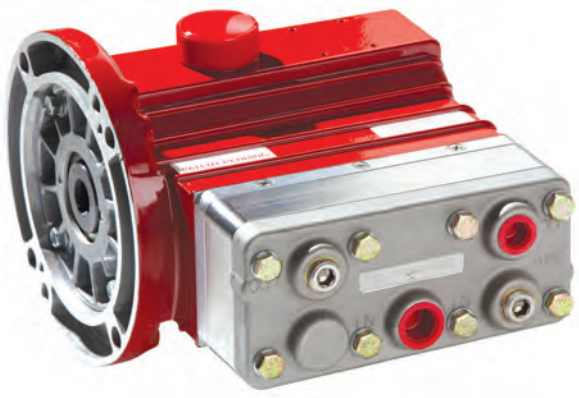
The KIMRAY ELECTRIC GLYCOL PUMP is a uniquely designed hydraulically balanced diaphragm/plunger positive displacement pump. Power to the pump is provided by a properly sized and specified electric motor either directly connected or belt driven. PLUNGERS are utilized to energize DIAPHRAGMS which in turn pressurize glycol/amine solutions used in gas processing. The Plungers operate and are lubricated in clean oil isolated from the process fluids by DIAPHRAGMS. The DIAPHRAGMS are in contact with the hydraulic oil on one side and the glycol/amine solution and on the other side. KIMZOIL EGP1 is a hydraulic/lubrication oil designed for high end pump performance designed for this application. This design allows for the protection of the reciprocating pumping internals from the process fluids.

As shown in the diagram, the PLUNGER(S) are connected to the CROSSHEAD(s) and displace the oil (YELLOW) in the HYDRAULIC CHAMBER as they reciprocate. As the Plunger moves to the right on the pressure stroke, oil is displaced in the Hydraulic Chamber and forces the DIAPHRAGM(s) to move to the right. The Diaphragm movement displaces the glycol/amine solution (GREEN) on the opposing side of the Diaphragm and forces it through the DISCHARGE CHECK VALVE(s). During the pressure stroke, a small amount of oil (YELLOW) leaks past the clearance between the Plunger and cylinder.

As the Plunger moves back on the suction stroke, the pressure drops in the Hydraulic Chamber and a small amount of oil is drawn in through the UNDER-FILL VALVE to replace the oil lost during the pressure stroke. The position of the Spool Valve regulates how much oil is drawn in. The SPOOL VALVE is positioned by the DIAPHRAGM ROD ASSEMBLY which is connected to the Diaphragm. The cycle then repeats.

When the Diaphragm moves too far forward, the Under-Fill port closes and the Over-Fill port opens. The Under-Fill Valve is a check valve that lets oil in during the suction stroke, but will not allow oil to leave. The OVER-FILL VALVE is a check valve that lets oil out during the pressure stroke, but prevents oil from coming in. The spool valve position opens the port to one of the two valves depending on the need for more or less oil.





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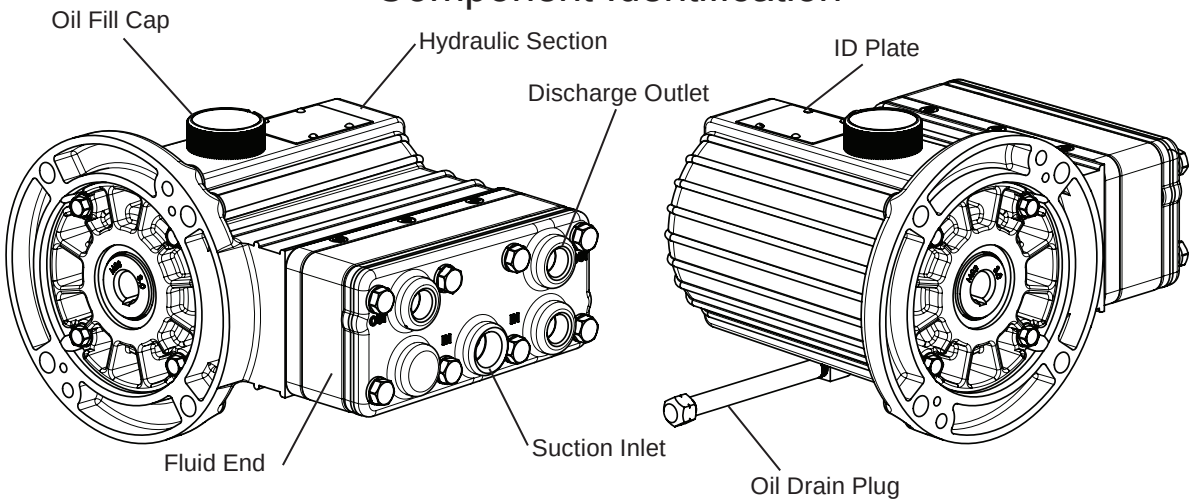
ELECTRIC PUMPS
OVERVIEW

Component Identification



LOCATION:

Locate the pump as close to the fluid supply source as possible.

Allow room for checking the oil level, changing the oil (two drain plugs on the bottom and back of pump), and removing the pump head components (inlet and discharge retainer plates, manifold, and related items).

MOUNTING

The pump shaft can rotate in either direction.

To prevent vibration, mount the pump and motor securely on a level rigid base.

On a belt-drive system, align the sheaves accurately; poor alignment wastes horsepower and shortens the belt and bearing life. Make sure the belts are properly tightened, as specified by the belt manufacturer.

On a direct-drive system, align the shafts accurately. Unless otherwise specified by the coupling manufacturer, maximum parallel misalignment should not exceed 0.015 in. (0.4 mm) and angular misalignment should be held to 1° maximum. Careful alignment extends life of the coupling, pump, shafts, and support bearings. Consult coupling manufacturer for exact alignment tolerances.

PUMPS AVAILABLE:

CAT. NO.	TYPE	OPER. PRESS MINIMUM	OPER. PRESS. MAXIMUM
GEB	12012 EV	0	1200

REPAIR KITS AVAILABLE:

CAT. NO.	TYPE	MATERIAL
RZGHSN	DIAPHRAGM REPAIR KIT	HIGHLY SATURATED NITRILE
RZHHSN	CHECK VALVE REPAIR KIT	HIGHLY SATURATED NITRILE
RZIHSN	COMPLETE REPAIR KIT	HIGHLY SATURATED NITRILE

OIL AVAILABLE:

CAT. NO.	TYPE	CAPACITY QUARTS	CAPACITY LITERS
7266	EGP1 KIMZOIL	1.0	1.05

ACCESSORIES

Consult installation drawing above for typical system components. Contact KIMRAY INC. or the distributor in your area for more details.

IMPORTANT PRECAUTIONS

Adequate Fluid Supply. To avoid cavitation and premature pump failure, be sure that the pump will have an adequate fluid supply and that the inlet line will not be obstructed.

Positive Displacement. This is a positive-displacement pump. Install a relief valve downstream from the pump.

Safety Guards. Install adequate safety guards over all pulleys, belts, and couplings. Follow all codes and regulations regarding installation and operation of the pumping system.

Shut-Off Valves. Never install shut-off valves between the pump and discharge pressure regulator, relief valve, or in the regulator bypass line.

Freezing Conditions. Protect the pump from freezing. See also the Maintenance Section.

Consult the Factory for the following situations:

- Extreme temperature applications – above 250° F (82° C) or below 40° F (4.4° C)
- Viscous fluid applications above 100 Cps
- Chemical compatibility problems
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- Pump RPM less than 200

CALCULATING REQUIRED HORSEPOWER (KW)*

$$\frac{6 \times RPM}{63{,}000} + \frac{GPM \times PSI}{1{,}460} = \text{electric motor HP*}$$

$$\frac{6 \times RPM}{84428} + \frac{lpm \times bar}{511} = \text{electric motor kW*}$$

* HP/kW is required application power.

ATTENTION!

When sizing motors with variable speed drives (VFDs), it is very important to select a motor and a VFD rated for constant torque inverter duty service and that the motor is rated to meet the torque requirements of the pump throughout desired speed range.

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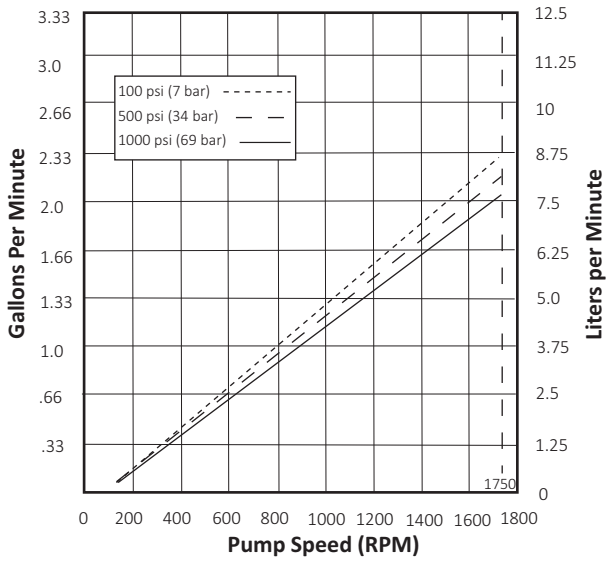
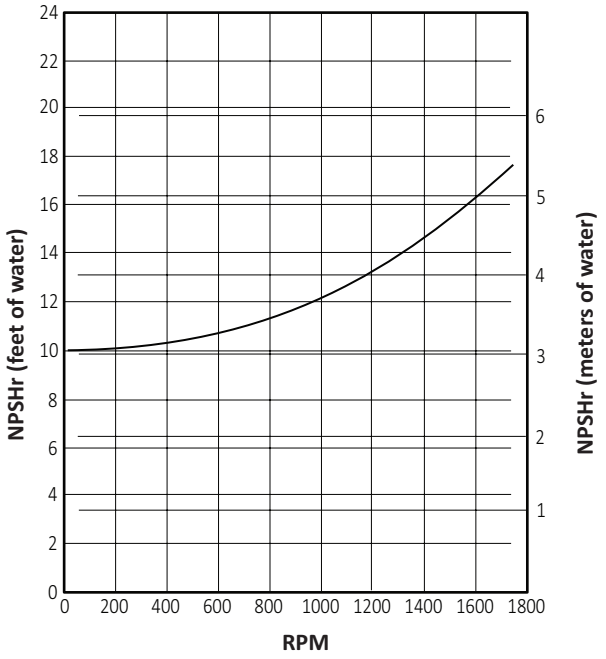
12012 EV Performance



Net Positive Suction Head (NPSHr)



ELECTRIC PUMPS
STEEL

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.	KIT
1	G10-024-2010	Cap Screw, socket-head,		
		M10 x 1.5 x 90 mm	8	
2	D11-048-2011	Washer, flat, hardened	8	
3	G03-004-1040	Manifold, brass	1	
	G03-004-1034	Manifold, 304 SST	1	
	G03-004-1036	Manifold, 316 SST	1	
4	D03-073-2140	O-ring, manifold, Buna	2	1,2,3
	D03-073-2141	O-ring, manifold, Viton	2	1,2,3
5	D25-046-2110	O-ring, valve seat, Buna	6	1,2
	D25-046-2111	O-ring, valve seat, Viton	6	1,2
6	D15-020-2010	Valve Seat, 17-4 SST	6	1,2
	D15-020-2011	Valve Seat, Nitronic 50	6	1,2
	D15-020-2016	Valve Seat, tungsten carbide	6	1,2
	D15-020-2017	Valve Seat, Hastelloy C	6	1,2

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.	KIT
7	D03-021-1011	Valve, Nitronic 50	6	1,2
	D03-021-1015	Valve, 17-4, machined	6	
	D03-021-1016	Valve, tungsten carbide	6	
	D03-021-1017	Valve, Hastelloy C	6	
8	D03-022-3113	Valve Spring, Hastelloy C	6	1,2
	D03-022-3114	Valve Spring, Elgiloy	6	1,2
	D03-022-3118	Valve Spring, 316 SST	6	1,2
9	D03-092-2110	Tetra Seal, Buna	6	1,2
	D03-092-2111	Tetra Seal, Viton	6	1,2
10	D03-023-1010	Retainer, valve spring, 17-7 SST	6	1,2
	D03-023-1017	Retainer, valve spring, Hastelloy C	6	1,2
	D03-023-2310	Retainer, valve spring, Celcon	6	1,2
	D03-023-2316	Retainer, valve spring, Nylon	6	1,2
	D03-023-2317	Retainer, valve spring, polypropylene	6	1,2
	D03-023-2318	Retainer, valve spring, Kynar	6	1,2

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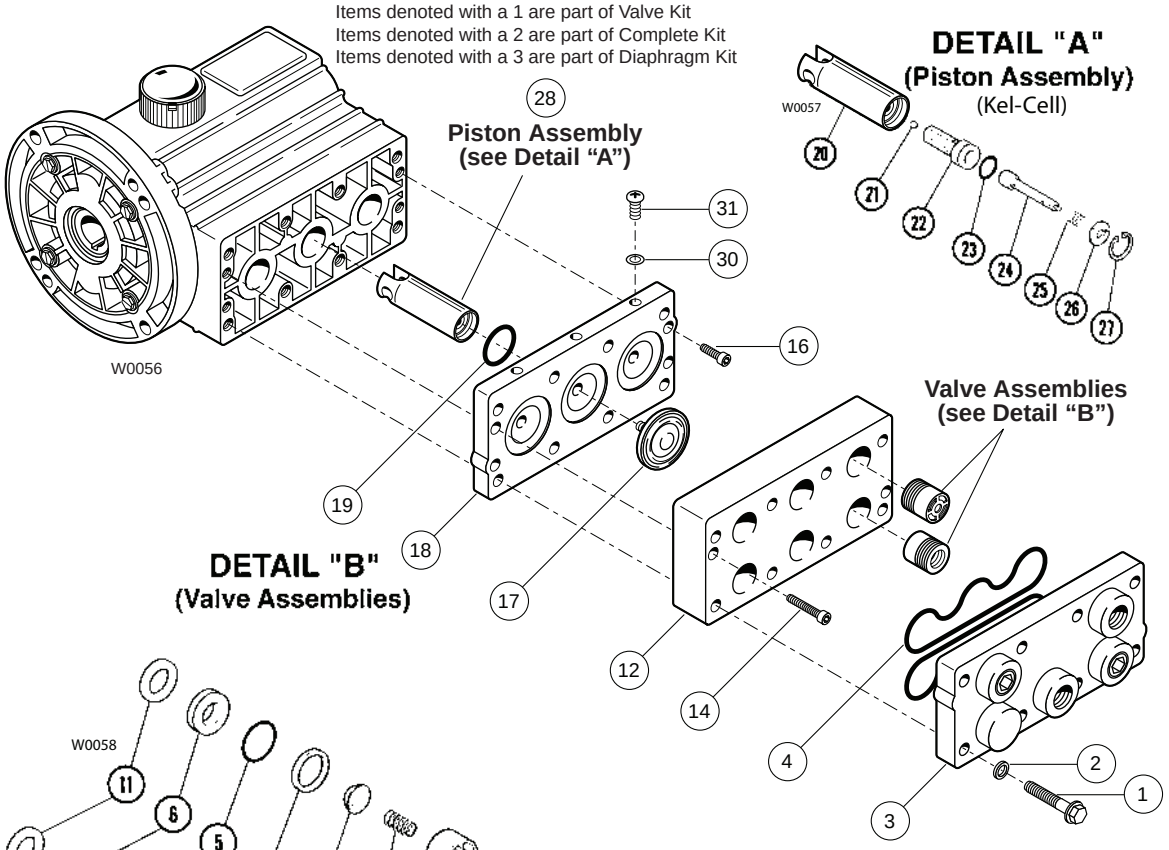
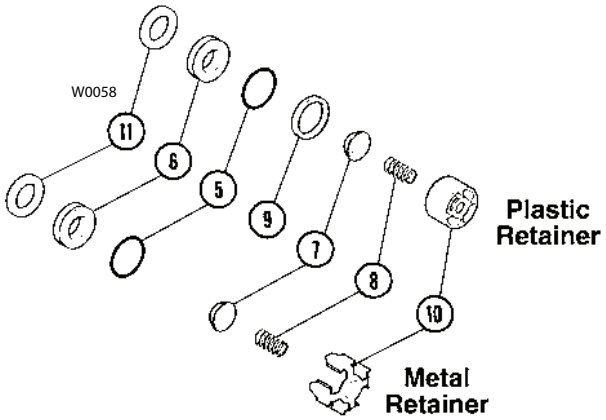
Items denoted with a 2 are part of Complete Kit
Items denoted with a 3 are part of Diaphragm Kit





ITEM NO.	PART NUMBER	DESCRIPTION	QTY.	KIT
11	D03-125-1011	Washer, dampening, SST	6	1,2
12	D03-003-1030	Valve Plate, brass	1	
	D03-003-1034	Valve Plate, 304 SST	1	
	D03-003-1036	Valve Plate, 316 SST	1	
14	G10-088-2010	Cap Screw, socket-head,		
		M6 x 1.0 x 30 mm	2	
16	G03-088-2010	Cap Screw, socket-head,		
		M6 x 1.0 x 20 mm	2	

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.	KIT
17	D03-018-1240	Diaphragm, Buna-N-XS	3	2,3
	D03-018-1245	Diaphragm, Viton-XT	3	2,3
18	D03-002-1012	Diaphragm Plate, steel	1	
19	D03-075-2110	O-ring, diaphragm plate, Buna	3	
20	D03-014-1004	Piston	3	
21	D10-015-3010	Ball	3	
22	D03-043-1000	Valve Cylinder	3	
23	D03-034-2110	O-ring, valve cylinder, Buna	3	
24	D03-044-1000	Valve Plunger	3	
25	D03-045-3110	Spring, sleeve valve	3	
26	D03-049-1000	Washer	3	
27	D03-048-2210	Snap Ring	3	
28	D03-014-1210	Piston Assembly	3	
29	D03-026-2210	Pin	2	

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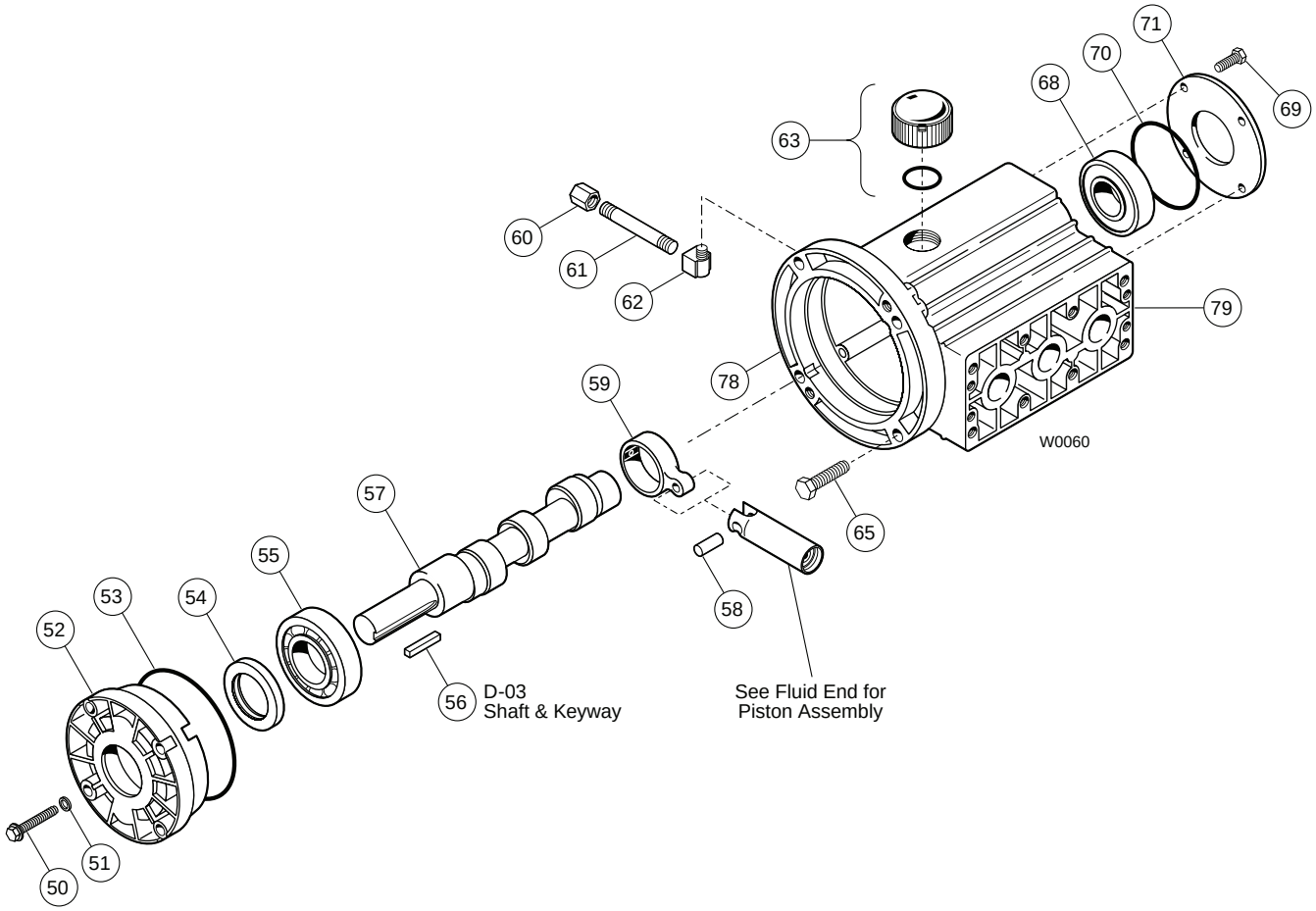

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.	KIT
50	G03-086-2010	Bolt, hex flange, M6 x 1.0 x 40 mm	4	
51	D25-047-2110	O-ring, back cover screws, Buna	4	
52	D03-131-1000	Back Cover	1	
53	D03-037-2110	O-ring, back cover, Buna	1	
54	D03-031-2110	Seal, Buna	1	
55	D03-011-2910	Back Bearing	1	
56	D10-085-2210	Key, shaft	1	
57	D03-009-1048	(S) Crank Shaft, shaft-driven, 22.2mm	2	
		O.D., 5.5 l/min @ 1450 RPM	1	
	D03-009-1042	(E) Crank Shaft, shaft-driven, 22.2mm	2	
		O.D., 6.5 l/min @ 1450 RPM	1	
	D03-009-1040	(X) Crank Shaft, shaft-driven, 22.2mm	2	
		O.D., 9.0 l/min @ 1450 RPM	1	
58	D03-133-1000	Pin	3	
59	D03-132-1004	Connecting Rod, aluminum-bronze	3	
60	D10-078-2210	Cap, brass, 1/8	1	
61	D10-077-2210	Pipe, brass, 1/8	1	
62	D10-076-2210	Elbow, brass, 1/8	1	
63	D03-039-1030	Cap with O-ring, oil fill	1	

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.	KIT
64	D10-080-2110	O-ring, oil fill, Buna	1	
65	G03-068-2010	Cap Screw, socket-head,	1	
		M10 x 1.5 x 40 mm	2	
66	G25-048-2010	Washer, M10	2	
67	G10-028-2010	Nut, hex, M10	2	
68	D03-010-2910	Front Bearing	1	
69	D03-087-2010	Cap Screw, hex-head, 1/2"	2	
70	D40-074-2110	O-ring, front cover, Buna	1	
71	D03-130-1000	Front Cover	1	
72	D03-025-1010	Base Plate	1	
73	D03-089-2010	Cap Screw, hex-head,3/4"	2	
74	D03-050-2010	Washer, lock	2	
78	G03-001-1218	Pump Housing Assembly	—	
	G03-001-1228	Pump Housing	1	
79	D10-040-2410	Name Plate	1	
82	G25-106-2318	Gasket, cover	1	
83	H25-105-1018	Cover, housing	1	
84	G25-090-2010	Cap Screw, hex-head,		
		M8 x 1.25 x 16 mm	6	
86	D03-026-2211	Pin	2	

Items denoted with a 1 are part of Valve Kit
Items denoted with a 2 are part of Complete Kit
Items denoted with a 3 are part of Diaphragm Kit

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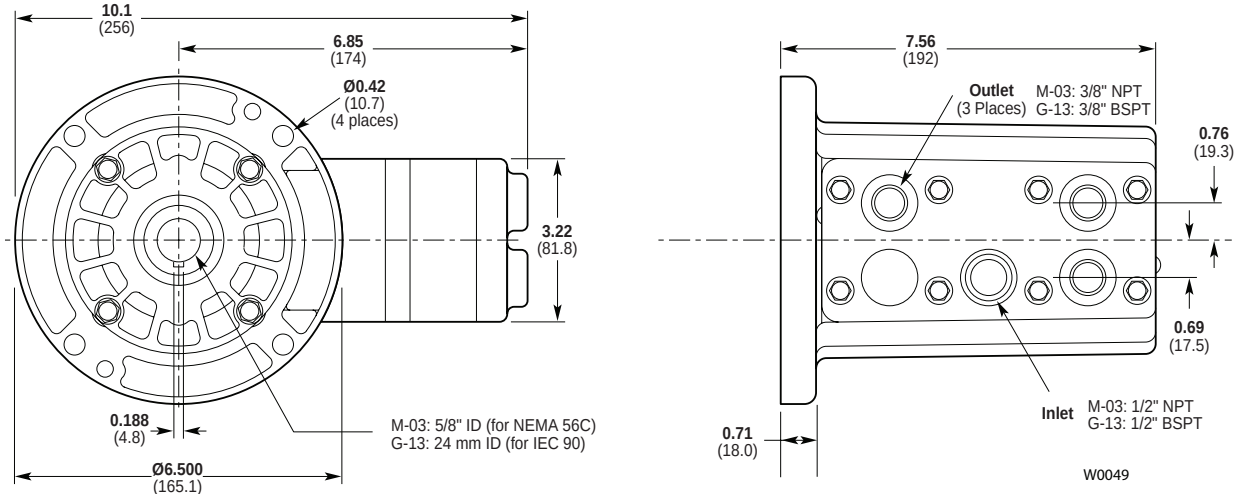
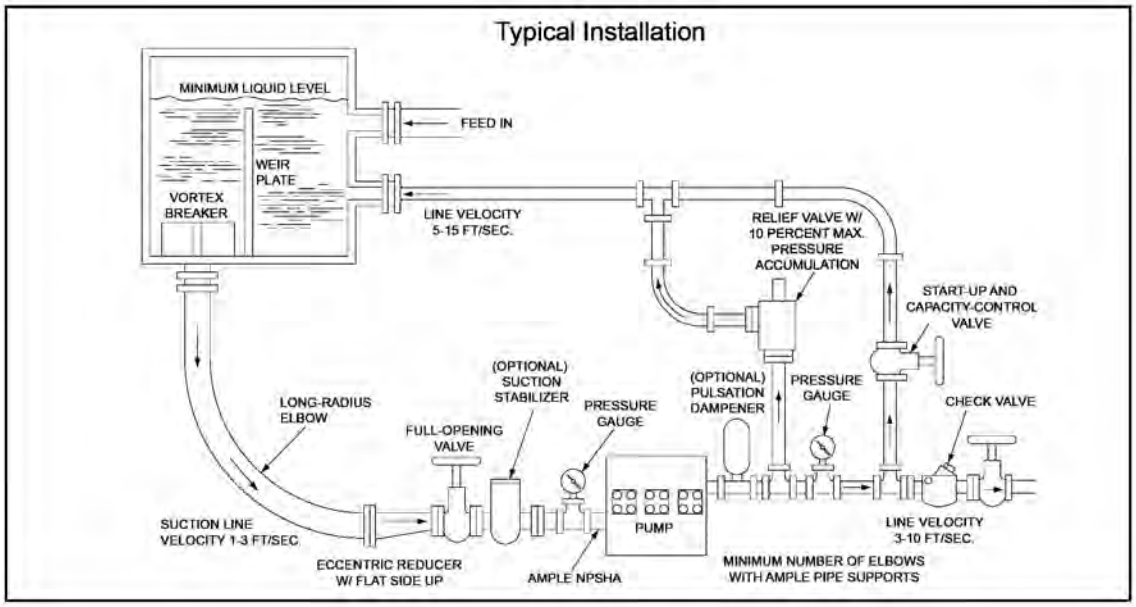

10.1
(256)
6.85
(174)
Ø0.42
(10.7)
(4 places)
3.22
(81.8)
0.188
(4.8)
Ø6.500
(165.1)
M-03: 5/8" ID (for NEMA 56C)
G-13: 24 mm ID (for IEC 90)
7.56
(192)
Outlet
(3 Places)
M-03: 3/8" NPT
G-13: 3/8" BSPT
0.76
(19.3)
0.69
(17.5)
Inlet
M-03: 1/2" NPT
G-13: 1/2" BSPT
0.71
(18.0)
W0049



INLET PIPING (Suction Feed)

CAUTION: When pumping at temperatures above 250° F (121.1° C), use a pressure-feed system.
Install drain cocks at any low points of the suction line, to permit draining in freezing conditions.
Provide for permanent or temporary installation of a vacuum gauge to monitor the inlet suction. To maintain maximum flow, vacuum at the pump inlet should not exceed 7 in. Hg at 70° F (180 mm Hg at 21° C). **Do not supply more than one pump from the same inlet line if possible.**

Supply Tank

Use a supply tank that is large enough to provide time for any trapped air in the fluid to escape. The tank size should be at least twice the maximum pump flow rate.
Isolate the pump and motor stand from the supply tank, and support them separately.
Install a separate inlet line from the supply tank to each pump.
Install the inlet and bypass lines so they empty into the supply tank below the lowest water level, on the opposite side of the baffle from the pump suction line.
If a line strainer is used in the system install it in the inlet line to the supply tank.
To reduce aeration and turbulence, install a completely submerged baffle plate to separate the incoming and outgoing liquids.
Install a vortex breaker in the supply tank, over the outlet port to the pump.
Place a cover over the supply tank, to prevent foreign objects from falling into it.

Hose and Routing

Size the suction line at least one size larger than the pump inlet, and so that the velocity will not exceed 1-3 ft/sec (0.3 to 0.9 m/s):
For pipe in inches: Velocity (ft/sec) = 0.408 x GPM/Pipe ID2
For pipe in mm: Velocity (m/sec) = 21.2 x LPM/Pipe ID2
Keep the suction line as short and direct as possible.
Use flexible hose and/or expansion joints to absorb vibration, expansion, or contraction.
If possible, keep suction line level. Do not have any high points collecting vapor unless high points are vented.
To reduce turbulence and resistance, do not use 90° elbows. If turns are necessary in the suction line, use 45° elbows or arrange sweeping curves in the flexible inlet hose.
If a block valve is used, be sure it is fully opened so that the flow to the pump is not restricted. The opening should be at least the same diameter as the inlet plumbing ID.
Do not use a line strainer or filter in the suction line unless regular maintenance is assured. If used, choose a top loading basket. It should have a free-flow area of at least three times the free-flow area of the inlet.
Install piping supports where necessary to relieve strain on the inlet line and to minimize vibration.

INLET PIPING (Pressure Feed)

Provide for permanent or temporary installation of a vacuum/pressure gauge to monitor the inlet vacuum or pressure. Pressure at the pump inlet should not exceed 250 psi (17 bar); if it could get higher, install an inlet pressure reducing regulator. Do not supply more than one pump from the same inlet line.

INLET CALCULATIONS

Acceleration Head

Calculating the Acceleration Head
Use the following formula to calculate acceleration head losses. Subtract this figure from the NPSHa, and compare the result to the NPSHr of the Hydra-Cell pump.
Ha = (L x V x N x C) ÷ (K x G)
where:
Ha = Acceleration head (ft of liquid)
L = Actual length of suction line (ft) — not equivalent length
V = Velocity of liquid in suction line (ft/sec) [V = GPM x (0.408 ÷ pipe ID2)]
N = RPM of crank shaft
C = Constant determined by type of pump — use 0.066 for the EV50015 Hydra-Cell pumps
K = Constant to compensate for compressibility of the fluid — use: 1.4 for de-aerated or hot water; 1.5 for most liquids; 2.5 for hydrocarbons with high compressibility
G = Gravitational constant (32.2 ft/sec2)

Friction Losses

Calculating Friction Losses in Suction Piping
When following the above recommendations (under “Inlet Piping”) for minimum hose/pipe I. D. and maximum length, frictional losses in the suction piping are negligible (i.e., Hf = 0) if you are pumping a water-like fluid.
When pumping more-viscous fluids such as lubricating oils, sealants, adhesives, syrups, varnishes, etc., frictional losses in the

ELECTRIC PUMPS
INSTALLATION

suction piping may become significant. As Hf increases, the available NPSH (NPSHa) will decrease, and cavitation will occur.
In general, frictional losses increase with increasing viscosity, increasing suction-line length, increasing pump flow rate, and decreasing suction-line diameter. Changes in suction-line diameter have the greatest impact on frictional losses: a 25% increase in suction-line diameter cuts losses by more than two times, and a 50% increase cuts losses by a factor of five times.
Consult the factory before pumping viscous fluids.

Minimizing Acceleration Head and Frictional Losses

To minimize the acceleration head and frictional losses:
- Keep inlet lines less than 6 ft (1.8 m) or as short as possible
- Use at least 1-1/2 in. (38.1 mm) I.D. inlet hose
- Use suction hose (low-pressure hose, non collapsing) for the inlet lines
- Minimize fittings (elbows, valves, tees, etc.)
- **Use a suction stabilizer on the inlet.**

Net Positive Suction Head

NPSHa must be equal to or greater than NPSHr. If not, the pressure in the pump inlet will be lower than the vapor pressure of the fluid — and cavitation will occur.

Calculating the NPSHa

Use the following formula to calculate the NPSHa:
NPSHa = Pt + Hz - Hf - Ha - Pvp
where:
Pt = Atmospheric pressure
Hz = Vertical distance from surface liquid to pump center line (if liquid is below pump center line, the Hz is negative)
Hf = Friction losses in suction piping
Ha = Acceleration head at pump suction
Pvp = Absolute vapor pressure of liquid at pumping temperature

NOTES:
- In good practice, NPSHa should be 2 ft greater than NPSHr
- All values must be expressed in feet of liquid

Atmospheric Pressure at Various Altitudes

Altitude (ft)	Pressure (ft of H2O)	Altitude (ft)	Pressure (ft of H2O)
0	33.9	1500	32.1
500	33.3	2000	31.5
1000	32.8	5000	28.2

DISCHARGE PIPING

Hose and Routing

Use the shortest, most-direct route for the discharge line.
Select pipe or hose with a working pressure rating of at least 1.5 times the maximum system pressure. EXAMPLE: Select a 1500 psi W.P.-rated hose for systems to be operated at 1000 psi-gauge pressure.
Use flexible hose between the pump and rigid piping to absorb vibration, expansion or contraction.
Support the pump and piping independently. Size the discharge line so that the velocity of the fluid will not exceed 7-10 ft/sec (2-3 m/sec):
For pipe in inches: Velocity (ft/sec) = 0.408 x GPM/Pipe ID2
For pipe in mm: Velocity (m/sec) = 21.2 x LPM/Pipe ID2

Pressure Relief

Install a pressure relief valve in the discharge line. Bypass pressure must not exceed the pressure limit of the pump.
Size the relief valve so that, when fully open, it will be large enough to relieve the full capacity of the pump without overpressurizing the system.
Locate the valve as close to the pump as possible and ahead of any other valves.

Adjust the pressure relief valve to no more than 10% over the maximum working pressure of the system. Do not exceed the manufacturer's pressure rating for the pump or relief valve.

Route the bypass line to the supply tank. See the diagram showing a typical installation at the beginning of the Installation Section.
If the pump may be run for a long time with the discharge closed and fluid bypassing, install a thermal protector in the bypass line (to prevent severe temperature buildup in the bypassed fluid).
CAUTION: Never install shutoff valves in the bypass line or between the pump and pressure relief valve.
Install a pressure gauge in the discharge line.

BEFORE INITIAL START-UP

Before you start the pump, be sure that:
- Pump is stored at a temperature between 40-180 F (4.4-82.2 C) for a minimum of 24 hours before start up.
- All shutoff valves are open, and the pump has an adequate supply of fluid.
- All connections are tight.
- The oil level is within the marking on the dipstick. Add oil as needed.
- The relief valve on the pump outlet is adjusted so the pump starts under minimum pressure.
- All shaft couplings or drive pulleys have adequate safety guards.

INITIAL START-UP

1. Pump must be at or above 40 F (4.4 C) for 24 hours prior to starting.
2. Open the bypass line start-up and capacity-control valve so the pump may be started against negligible discharge pressure.
3. Turn on power to the pump motor.
4. Check the inlet pressure or vacuum. To maintain maximum flow, inlet vacuum must not exceed 7 in. Hg at 70° F (180 mm Hg at 21° C). Inlet pressure must not exceed 250 psi (17 bar).
5. Listen for any erratic noise, and look for unsteady flow. If the pump does not clear, refer to the Troubleshooting Section.
6. If the system has an air lock and the pump fails to prime:
   a. Turn off the power.
   b. Remove the pressure gauge from the tee fitting at the pump outlet (see installation diagram).
   NOTE: Fluid may come out of this port when the plug is removed. Provide an adequate catch basin for fluid spillage, if required. Fluid will come out of this port when the pump is started, so we recommend that you attach adequate plumbing from this port so fluid will not be sprayed or lost. Use high-pressure-rated hose and fittings from this port. Take all safety precautions to assure safe handling of the fluid being pumped.
   c. Jog the system on and off until the fluid coming from this port is air-free.
   d. Turn off the power.
   e. Remove the plumbing that was temporarily installed, and reinstall the pressure gauge or plug.
7. Adjust the bypass line valve to the desired operating pres sure. Do not exceed the maximum pressure rating of the pump.
8. After the system pressure is adjusted, verify the safety relief valve setting by closing the bypass line valve until the relief valve opens.
   NOTE: Fluid may come out of the safety relief valve. Provide an adequate catch basin for fluid spillage. Take all safety precautions to assure safe handling of the spillage.
9. Reset the bypass line valve to obtain the desired system pressure.
10. Provide a return line from the relief valve to the supply tank, similar to the bypass line.

NOTE: The numbers in parentheses are the Reference Numbers on the exploded view illustrations found in this manual and in the Parts Manual.

DAILY

Check the oil level and the condition of the oil with the pump turned off. The oil level should be within the marking on the dipstick. Add oil as needed.
Use KIMZOIL EGP1 Electric Glycol Pump Oil (Kimray part no. 6928) for the application.

CAUTION: If you are losing oil but don't see any external leakage, or if the oil becomes discolored and contaminated, one of the diaphragms (41) may be damaged. Refer to the Fluid-End Service Section. Do not operate the pump with a damaged diaphragm.

CAUTION: Do not leave contaminated oil in the pump housing or leave the housing empty. Remove contaminated oil as soon as discovered, and replace it with clean oil.

PERIODICALLY

Change the oil after the first 500 hours of operation, and then according to the guidelines below.

Hours Between Oil Changes @ Various Process Fluid Temperatures

Pressure	RPM	<150°F (32°C)	<200°F (60°C)	<250°F (82°C)
<1000 psi (69 bar)	<800	6,000	4,500	3,000
	<1200	4,000	3,000	2,000
<1500 psi (100 bar)	<800	4,000	3,000	2,000
	<1200	2,000	1,500	1,000

NOTE: Minimum oil viscosity for proper hydraulic end lubrication is 16-20 cST (80-100 SSU) at 212°F (100°C).

NOTE: Use of an oil cooler is recommended when process fluid and/or hydraulic end oil exceeds 200°F (93°C).

When changing oil, remove both drain plugs (13) at the bottom of the pump so all oil and accumulated sediment will drain out.

CAUTION: Do not turn the drive shaft while the oil reservoir is empty.

Check the inlet pressure or vacuum periodically with a gauge. If vacuum at the pump inlet exceeds 7 in. Hg (180 mm Hg), check the inlet piping system for blockages. If the pump inlet is located above the supply tank, check the fluid supply level and replenish if too low.

CAUTION: Protect the pump from freezing. Refer also to the "Shutdown Procedure".

SHUTDOWN PROCEDURE DURING FREEZING TEMPERATURES

Take all safety precautions to assure safe handling of the fluid being pumped. Provide adequate catch basins for fluid drainage and use appropriate plumbing from drain ports, etc., when flushing the pump and system with a compatible anti-freeze.

PUMP STORAGE

CAUTION: If the pump is to be stored more than six months take the following steps to protect against corrosion:

1. Change crankcase oil.
2. Change oil behind diaphragms.
3. Remove suction and discharge valves and drain pump of all liquids. Use compressed air to dry inside passageways of manifold.
4. Apply light film of clean oil or corrosion inhibitor to all inside passageways of manifold.
5. Clean and dry valves and seats. Apply light film of clean oil or corrosion inhibitor to valves and seats.
6. Reinstall valves with new o-rings.
7. Plug suction and discharge ports to protect against dirt and moisture.
8. Store pump in clean and dry location.
9. Every month of storage rotate crankshaft 4 to 6 times.

ELECTRIC PUMPS
TROUBLESHOOTING

CAVITATION

- Inadequate fluid supply because:
— Inlet line collapsed or clogged
— Clogged line strainer
— Inlet line too small or too long
— Air leak in inlet line
— Worn or damaged inlet hose
— Suction line too long
— Too many valves and elbows in inlet line
- Fluid too hot for inlet suction piping system
- Air entrained in fluid piping system
- Aeration and turbulence in supply tank
- Inlet vacuum too high (refer to “Inlet Calculations” paragraph

Symptoms of Cavitation
- Excessive pump valve noise
- Premature failure of spring or retainer
- Volume or pressure drop
- Rough-running pump
- Premature failure

DROP IN VOLUME OR PRESSURE

A drop in volume or pressure can be caused by one or more of the following:
- Air leak in suction piping
- Clogged suction line or suction strainer
- Suction line inlet above fluid level in tank
- Inadequate fluid supply
- Pump not operating at proper RPM
- Relief valve bypassing fluid
- Worn pump valve parts
- Foreign material in inlet or outlet valves
- Loss of oil prime in cells because of low oil level
- Ruptured diaphragm
- Cavitation
- Warped manifold from overpressurized system
- O-rings forced out of their grooves from overpressurization
- Air leak in suction line strainer or gasket
- Cracked suction hose
- Empty supply tank
- Excessive aeration and turbulence in supply tank
- Worn and slipping drive belt(s)
- Worn spray nozzle(s)
- Cracked cylinder

PUMP RUNS ROUGH

- Worn pump valves
- Air lock in outlet system
- Oil level low
- Wrong weight of oil for cold operating temperatures (change to lighter weight)
- Cavitation
- Air in suction line
- Restriction in inlet/suction line
- Hydraulic cells not primed after changing diaphragm
- Foreign material in inlet or outlet valve
- Damaged diaphragm
- Fatigued or broken valve spring

PREMATURE FAILURE OF DIAPHRAGM

- Frozen pump
- Puncture by a foreign object
- Elastomer incompatible with fluid being pumped
- Pump running too fast
- Excess pressure
- Cavitation
- Aeration or turbulence in supply tank

VALVE WEAR

- Normal wear from high-speed operation
- Cavitation
- Abrasives in the fluid
- Valve incompatible with corrosives in the fluid
- Pump running too fast

LOSS OF OIL

- External seepage
- Rupture of diaphragm
- Frozen pump
- Worn shaft seal
- Oil drain plug or fill cap loose
- Valve plate and manifold bolts loose

PREMATURE FAILURE OF VALVE SPRING OR RETAINER

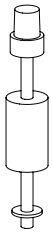
- Cavitation
- Foreign object in the pump
- Pump running too fast
- Spring/retainer material incompatible with fluid being pumped
- Excessive inlet pressure

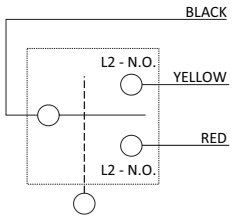
FLOAT SWITCH

FUNCTION / PURPOSE:
The FLOAT SWITCH is installed in the rear cover of the pump and is used to detect HIGH or LOW oil level in the crank case.

INSTALLATION DESCRIPTION
Install by removing the adapter and conduit plug from the pump rear cover, secure the switch into the adapter and reinstall the assembly into the rear cover.

PART NUMBER	DESCRIPTION
6926	500EV FLOAT SWITCH ASSY



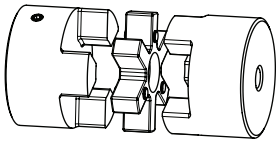


	CONTACT RATING	SWITCHING VOLTAGE	MAX CURRENT LOAD	
			AMPS AC	AMPS DC
SPT	20 VA	0-30	.4	.3
		120	.17	.13
		240	.08	.06

SHAFT COUPLINGS

FUNCTION / PURPOSE:
The SHAFT COUPLINGS join the motor and pump shafts with an elastomeric cushion. A properly sized coupling is required for each shaft. Additionally, a spider cushion installs between the two couplings.

PART NUMBER	DESCRIPTION
6902	BUNA COUPLING SPIDER
6900	Ø 1.000" BORE COUPLING
6917	Ø 1.375" BORE COUPLING
6901	Ø 1.625" BORE COUPLING

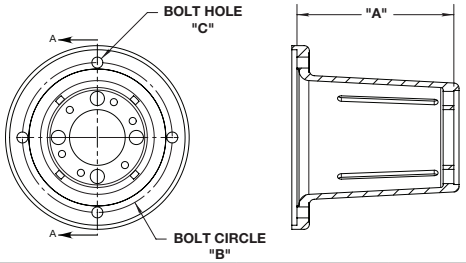


C-FACE MOTOR ADAPTER

FUNCTION / PURPOSE:
The MOTOR ADAPTER rigidly connects and aligns the pump and motor together for direct-drive applications. The adapter also serves as a protective guard around the spinning shafts.

PART NUMBER	DESCRIPTION	NEMA FRAME SIZE
GKF	50015 EV MOTOR ADAPTER KIT	213T / 215T
GKG	50015 EV MOTOR ADAPTER KIT	254T / 256T

INCLUDES MOUNTING HARDWARE

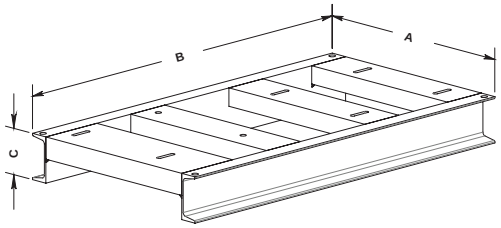


FRAME SIZE	A	B	C
213T/215T	6.100"	7.250"Ø	.531"Ø
254T/256T	7.600"	7.250"Ø	.531"Ø

SKID

PART NUMBER	DESCRIPTION	NEMA FRAME SIZE
GKH	50015 EV SKID KIT	213T / 215T
GKI	50015 EV SKID KIT	254T / 256T

INCLUDES MOUNTING HARDWARE



FRAME SIZE	A	B	C
213T/215T	19 11/64"	29 1/2"	4"
254T/256T	19 5/32"	35 5/16"	4"

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