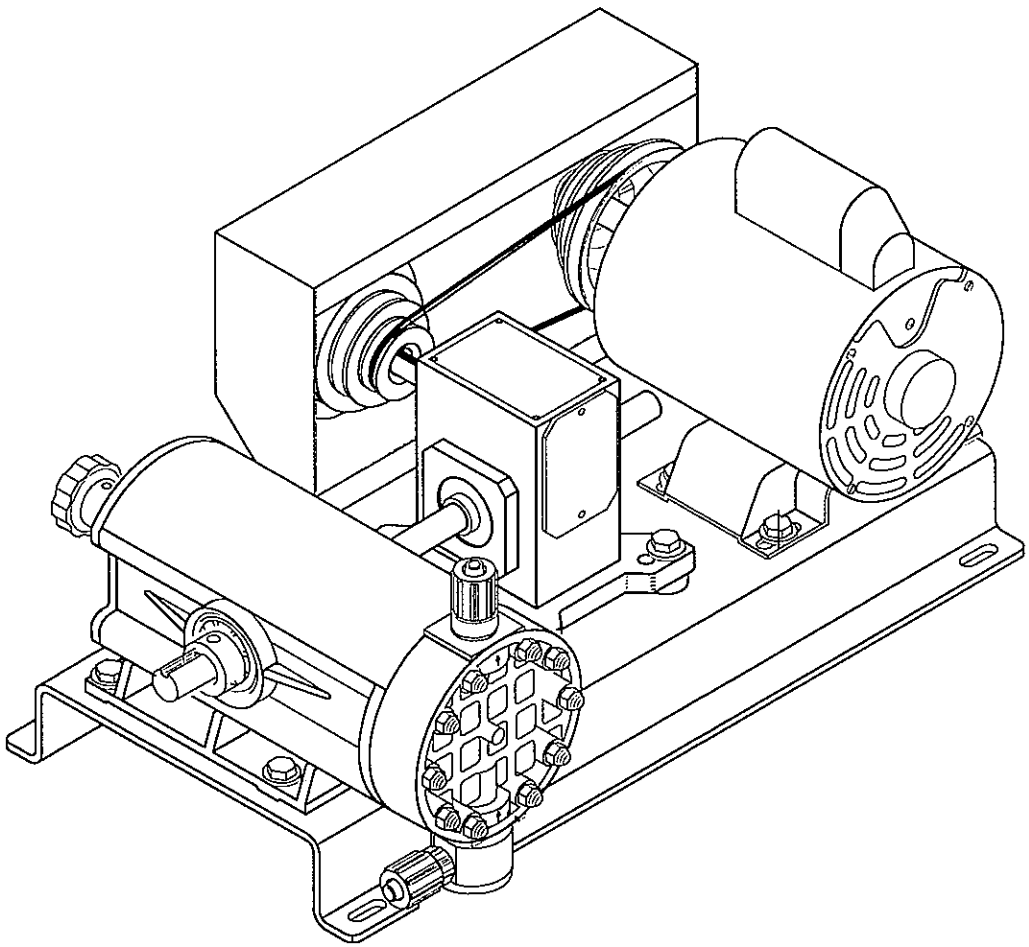
SERIES 300
Installation, Operation and Maintenance Manual



READ ALL WARNINGS CAREFULLY BEFORE INSTALLING PUMP

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SAFETY INSTRUCTIONS

READ ALL INSTRUCTIONS PRIOR TO USE

*** **⚠ DANGER**: Secure chemicals & metering pumps, making them inaccessible to children & pets.

*** **DO NOT PUMP FLAMMABLE LIQUIDS.**

*** Do not cut the plug or ground lug off the electrical cord. Consult a licensed electrician for proper installation or replacement.

** **⚠ WARNING**: Always wear protective clothing, including gloves and safety glasses, when working on or near chemical metering pumps.

** Inspect tubing regularly for cracking or deterioration and replace as necessary. **(Always wear protective clothing and safety glasses when inspecting tubing.)**

** Use **CAUTION** to keep fingers away from rotatiing parts.

** If pump is exposed to direct sunlight, use a U.V. resistant tubing.

** Follow directions and warnings provided from the chemical manufacturer. The user is responsible for determining the chemical compatibility with the chemical feed pump.

** Make sure the voltage on the pump name tag matches the installation voltage. If pump fails to start, check line voltage.

** Consult with local health officials and/or qualified water conditioning specialists when treating potable water.

** Always depressurize system prior to installation or disconnecting the metering pump tubing.

** If injection point is lower than the chemical tank and pump, install an anti-siphon valve.

** **DO NOT MODIFY PUMP.** This poses a potentially dangerous situation and will void the warranty.

* **⚠ CAUTION**: All pumps are factory tested with water. Remove tubing and thoroughly dry if the chemical being pumped will react with water (for example sulfuric acid).

* Hand tighten plastic connections **(Do not use wrench)**.

* Consult licensed plumber and electrician before installation to conform to local codes.

* **NOTE:** For accurate volume output, pump must be calibrated under all operating conditions.

INTRODUCTION

Series 300 is a reciprocating, positive displacement, diaphragm type chemical metering pump. Change in motor speed and stroke length provides an adjustable output from 0 to 100% of maximum rating.

The four check valves (suction, discharge, foot valve and injector) keep the fluid flowing toward the point of discharge. To insure the solution being pumped can only go forward, it is important that all check valves provide a positive, non-leaking backflow prevention.

The wetted end (those parts that contact the solution being pumped) is constructed of styrene acrylic nitrite (SAN), PVC, Teflon®, Hypalon® and polyethylene. These materials are very resistant to most chemicals. However, there are some chemicals, such as strong acids or organic solvents, which cause deterioration of some elastomer and plastic parts, such as diaphragm, valve seat or head. Alternate materials such as Viton®, polypropylene and stainless steel are available on request.

MANUFACTURER'S PRODUCT WARRANTY

The manufacturer warrants it equipment to be free of defects in material or workmanship. Liability under this policy extends for 18 months from the date of purchase or one year from the date of installation, whichever comes first. The manufacturer's liability is limited to repair or replacement of any device or part which is returned, prepaid, to the factory and which is proven defective upon examination. This warranty does not include installation or repair cost and in no event shall the manufacturer's liability exceed its selling price of such part.

The manufacturer disclaims all liability for damage to its products through improper installation, maintenance, use or attempts to operate such products beyond their functional capacity, intentionally or otherwise, or any unauthorized repair. Replaceable elastomeric parts are expendable and are not covered by any warranty either expressed or implied. The manufacturer is not responsible for consequential or other damages, injuries or expense incurred through use of its products.

The above warranty is in lieu of any other warranty, either expressed or implied. The manufacturer makes no warranty of fitness or merchantability. No agent of ours is authorized to make any warranty other the above.

Hypalon®, Viton® and Teflon® tradenames of EI DuPont.

PRECAUTIONS FOR OPERATION

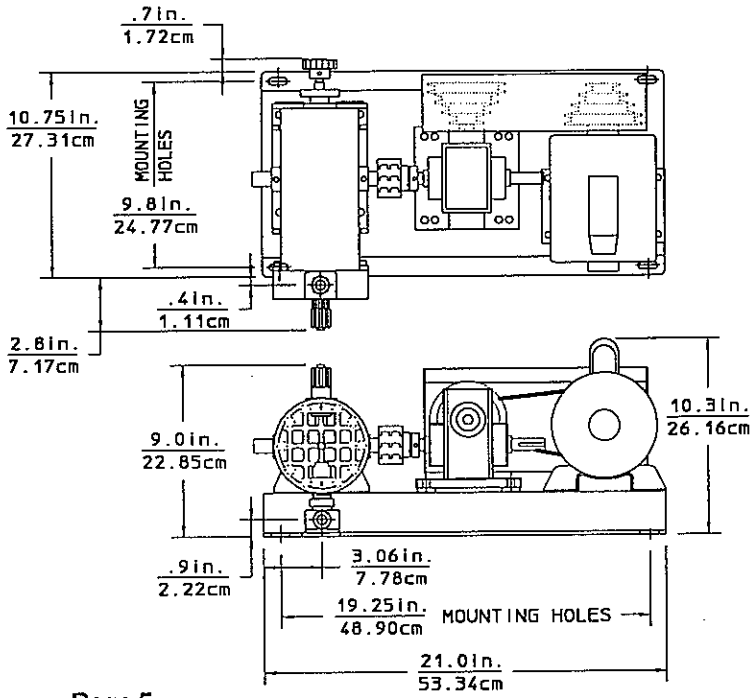
1. Tampering with electrical devices can be potentially hazardous. Always place chemicals and feeder installation well out of the reach of children.
2. Chemicals used may be dangerous and should be used carefully and according to warnings on the label. Follow the directions given with each type of chemical. Do no assume chemicals are the same because they look alike. Always store chemicals in a safe location away from children an others. We cannot be responsible for the misuse of chemicals being fed by the pump. Always have the Material Safety Data Sheet (MSDS) available for any fluid being pumped.
3. **ALWAYS WEAR PROTECTIVE CLOTHING, PROTECTIVE GLOVES AND SAFETY GLASSES WHEN WORKING ON OR NEAR METERING PUMPS.**
4. Be careful to check that the voltage of the installation matches the voltage indicated on the motor specification label. Whether plugging into a receptacle or wiring into a system, always be sure the feeder is grounded. IF RECEPTACLE IS UTILIZED, TO DISCONNECT, DO NOT PULL WIRE, BUT GRIP THE PLUG WITH FINGERS AND PULL OUT.
5. Never repair or move the metering pump while operating. Always disconnect electrical current before service. Before handling the feeder, always allow sufficient time for the motor housing to cool off. HANDLING THE FEEDER TOO SOON AFTER SHUTDOWN MAY CAUSE HAND BURNS. For safety, always wear protective clothing, protective gloves and safety glasses, when working on or near chemical metering pumps.
6. ALL PUMPS ARE PRETESTED WITH WATER BEFORE SHIPMENT. Remove head and dry thoroughly if you are pumping a material that will react with water (i.e. sulfuric acid). Valve seats, ball checks, gaskets and diaphragm should also be dried. Before placing feeder into service, extreme care should be taken to follow this procedure.
7. When used with pressurized systems, always be sure the pressure system does not exceed maximum pressure rating of 150 psi (10 bar).
8. Pump is NOT to be used to handle or meter flammable liquids or materials.
9. When metering hazardous material DO NOT use plastic tubing. Strictly use proper rigid pipe. Consult supplier for special adaptors or valve assemblies.
10. Factory will not be held responsible for improper installation of pump or plumbing. All cautions are to be read thoroughly prior to hook-up and plumbing. For all installations a professional plumber should be consulted. Always adhere to local plumbing codes and requirements.

GENERAL INFORMATION

1. Series 300 chemical feed pumps are supplied in simplex, duplex, triplex and quadplex construction. The Series 300 configuration utilizes a standard 56 frame motor with a four step pulley and speed reducer which is coupled to the pump. This configuration can provide 13, 24, 40 and 69 strokes/minute (SPM). Direct drive models are available in simplex and duplex configurations only and provide 30 or 60 SPM.
2. Standard motor available for Series 300 is open, drip-proof (ODP). Motor options include TEFC, explosion-proof, a large variety of voltage and frequency selections and an SCR variable speed drive (models 310 and 320 only).
3. Each standard Series 300 pump is shipped with the following:
   - Chemical pumps with motor – 115V, 60Hz, ODP.
   - 4 feet of $^{7}/_{16}$" OD PVC suction tubing.
   - 8 feet of ½" OD polyethylene (PE) discharge tubing.
   - 60:1 speed reducer (mounting to frame with motor and pump) except for direct drive models.
   - Compression type tube fittings (pump head valves and accessory kit valves.
   - Accessory kit including: back pressure spring, strainer/foot valve assembly and back check/injection valve.
4. Anti-siphon assembly and pressure valve are available as options.

PUMP CHARACTERISTICS

1. Output varies with motor speed. Using 60:1 speed reducer, output is variable from 0 to 500 GPD (1892.4 LPD). Direct drive models are capable of 0 to 430 GPD (1863 LPD). Refer to the Series 300 bulletin for details.
2. Strokes per minute with standard 60:1 speed reducer are 69, 40, 24 and 13 depending on pulley setting. Strokes per minute for direct drive models are 60 and 30 SPM.
3. Cam actuated diaphragm.
4. Operating pressure: 0 to 150 psi / 10 bar
5. Suction lift: 10 feet / 3 meters (water)
6. Pump output is fully adjustable from 0 to maximum output while running.
7. Pump assembly has lifetime lubricated mechanical components.
8. Maximum operating temperature: 125°F / 52°C
9. Pump motor opeating temperature: Usually 40°F / 4°C above ambient. Class A insulation is standard. Class B available upon request.



MATERIAL OF CONSTRUCTION

- Pump head is SAN (acrylic). PVC, polypropylene and stainless steel are optional
- Fittings (strainer, suction, discharge, injection) are PVC. Tubing connect ions are compression type to accommodate 3/8" ID x ½" OD discharge and 5/16" ID x 7/16" OD suction tubing. The fitting may also be provided with ½" MNPT connections on request for rigid pipe (pipe is supplied by customer). Optional materials for fittings are polypropylene and stainless steel. Stainless steel fittings, when requested, are provided with ½" MNPT connections and are available in suction and discharge fittings only.
- Diaphragm is metal backed, fabric reinforced Hypalon®. Viton® and Teflon® coated are optional.
- Valve seats, gaskets and o-rings are Hypalon. Viton is optional
- Ball checks are ceramic. Stainless steel and Teflon are optional.
- Discharge tubing, 3/8" x ½" is polyethylene and suction tubing, 5/16" x 7/16", is PVC.
- Pump housing is heavy duty, chemically resistant plastic (styrene acrylinetril, 35% glass filled).

INSTALLATION

1. All Series 300 Chemical Pumps can be supplied with Series 7000, 8000 or 9000 tank systems. When purchased this way, all suction plumbing is completed at the factory. The feeder tank, suction accessories, mixer and other controls are then shipped as a completely assembled system.
2. Flooded suction configuration, with pump mounted at the base of or under the chemical solution tank, is generally recommended as the most trouble-free method of installation. If this is not possible due to application limitations, the pump can be mounted over or on top of the solution container.

⚠ WARNING ***THE MAXIMUM LIFT OF THE CHEMICAL PUMP FOR WATER IS 10 FEET (3 METERS). DO NOT EXCEED THIS HEIGHT.***

3. Before start-up, be sure the voltage of the chemical feeder matches the voltage of the power supply: 115V, 60 Hz, single phase is standard. Other voltage requirements can be readily furnished. Power requirements and motor configuration should be noted when the unit is ordered.
4. When priming, make sure the pump capacity is set at 100%. This can only be noted when the pump is operating. The following steps should be followed to prepare pump for priming:
   - Be sure there is no pressure in the discharge line.
   - Disconnect discharge and suction tubing or piping.
   - Apply power to the pump and note output setting. Output indicator should read 100% on output indicator plate.
   - If output is not 100%, loosen the adjusting screw lock nut, then turn output adjustment knob counterclockwise until 100 % output is indicated.
5. Connect suction and discharge tubing or piping to pump. Place the free end of the discharge tube in the solution tank or an appropriate container. This provides a neat and safe method for catching the chemical being pumped during priming.

⚠ CAUTION ***ALWAYS READ WARNINGS ON CHEMICAL PACKAGE REGARDING HANDLING. WEAR SUITABLE EYE AND SKIN PROTECTION WHEN HANDLING ANY CHEMICAL.***

6. Flooded suction installation will prime immediately. Top mount installations will take a few seconds. Depending on the type of chemical being meters and the suction lift distance, it may be necessary to dampen the discharge valve area with the chemical being pumped in order to assist speedy priming.

7. After the pump is primed, connect free end of discharge tube to injection fitting.

8. Reset the output adjustment knob by turning clockwise to desired percentage of maximum output.

⚠ CAUTION ***Since output will vary in proportion to actual discharge pressure and chemical viscosity, it is recommended that a field test be performed to determine exact pumping rate.***

Maximum output can be varied by means of the V-belt and four-step pulleys. The following chart provides settings and outputs. The chart below is based on 310 Simplex at each pulley setting.

Capacity Chart, Standard Design

MOTOR PULLEY	REDUCER PULLEY	OUTPUT CAP** PER HEAD	STROKES PER MINUTE
4.0" 10.16 cm	1.75" 4.44 cm	500 GPD 1829 liters/day	69 SPM 69 SPM
3.25" 8.25 cm	2.50" 6.35 cm	300 GPD 1135 liters/day	40 SPM 40 SPM
2.50" 6.35 cm	3.25" 8.25 cm	175 GPD 662 liters/day	24 SPM 24 SPM
1.75" 4.44 cm	4.0" 10.16 cm	110 GPD 416 liters/day	13 SPM 13 SPM

9. Chemical injection into an open system or a closed, pressurized system can be accomplished with any Series 300 pump. When injecting against atmospheric pressure only, it is suggested that the back pressure spring be utilized in order to insure a positive seal in the discharge valve.

10. Series 300 Chemical Pumps are rated to inject at pressures up to 150 psi (10 bar). Making sure pressure at the point of injection has been released, install the back check valve assembly into a ½" NPT tee. The end of the injection check valve should be in the mainstream of the influent line. For large pipe diameter, the 6" check valve assembly is recommended to replace the standard back check valve. This extension can be cut to the proper length that will insure injection into the mainstream. This will assist more rapid chemical dilution, thereby reducing the possibility of clogging.

⚠ WARNING ***Be sure to install the injection assembly in a vertical position on the bottom side of the influent main.***

11. This will insure proper sealing of the injection assembly check valve and prevent back flow into the chemical pump's discharge line. Be sure arrow on injection fitting is pointing upward.

12. Under any installation condition where the possibility of siphoning or suction may occur, install an anti-siphon valve on the discharge side of the feeder. Replace the discharge valve housing with the anti-siphon valve adapter. Be careful when removing or disassembling the discharge valve assembly that small parts such as ball check and gaskets, are not lost. This item can be furnished by the factory or your dealer at extra cost.

13. If the line pressure on an installation could fluctuate above 150 psi (10 bar), install a pressure relief valve on the discharge side of the pump head, replacing the discharge valve housing with the pressure relief valve adapter. Once the pressure reaches a predetermined level, the preset relief valve will return the solution being pumped, back to the solution tank. This will prevent motor burnout or diaphragm rupture. The pressure relief valve is not part of the standard package and can be furnished by the factory or your dealer at extra cost. Read relief valve instructions carefully before installing.

MAINTENANCE

At installation and every month, it is recommended that the pump output knob and shaft, chain coupling and shafts be sprayed with an appropriate lubricant (LPS #1 or WD-40 equivalent).

The oil level in the gear reducer should be checked upon installation and every month thereafter and replaced at least once a year. Use oil supplied by manufacturer or any good grade SAE 30W non-detergent oil (Exxon Spartan EP68 or equivalent).

DIAPHRAGM, VALVE & GASKET REPLACEMENT

⚠ WARNING ***Before performing any maintenance or repairs on chemical metering pumps, be sure to disconnect all electrical connections and insure that all pressure valves are shut off and pressure in the pump and lines has been bled off. Always wear protective clothing, gloves and safety glasses when performing any maintenance or repairs on chemical metering pumps.***

1 On the pump housing at opposite end of the pump head, slightly loosen the four extreme headbolts one at a time in a crisscross pattern. Using 7/16" hex head socket or appropriate wrench, loosen headbolts directly behind the pump head. Loosen the remainder of headbolts and continue to loosen all headbolts equally in a circular pattern until head is removed. This procedure reduces stress on the head and prevents cracking. To install head, repeat this procedure starting with the four extreme headbolts and tighten equally in the crisscross pattern. Remaining headbolts are tightened equally in the circular pattern.

⚠ CAUTION ***Make sure arrows on the face of the pump head are pointing upward.***

2. With head removed, position the diaphragm in the full out position. This can be done by rotating the pulley. Grasp diaphragm between two fingers or appropriate smooth jawed pliers and turn diaphragm counterclockwise until released from diaphragm shaft.

3. Install new diaphragm by turning diaphragm clockwise by hand, then tighten with smooth-jawed pliers.

   Position diaphragm in the full in position before installing pump head. Rotate pulley to do this.

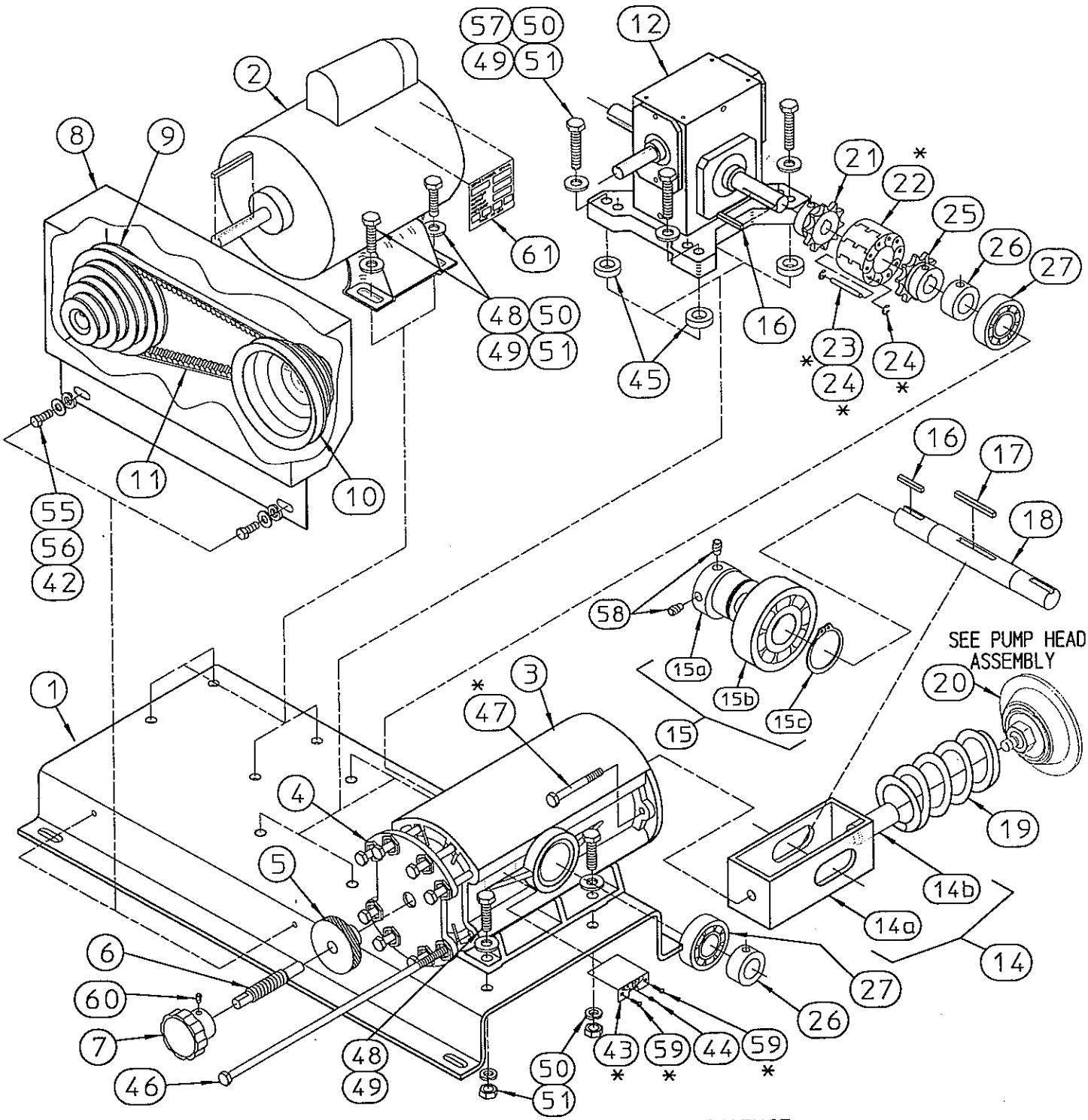
4. To replace parts inside the valve fittings, use the following procedure:

   a) Remove tubing by loosening coupling nut.

   b) Loosen valve by turning counterclockwise until released from either the pump head, injection fitting or strainer assembly.

5. Remove all seats, gaskets and check balls and replace in proper order as shown in the parts diagram.

SERIES 300 DRIVE ASSEMBLY

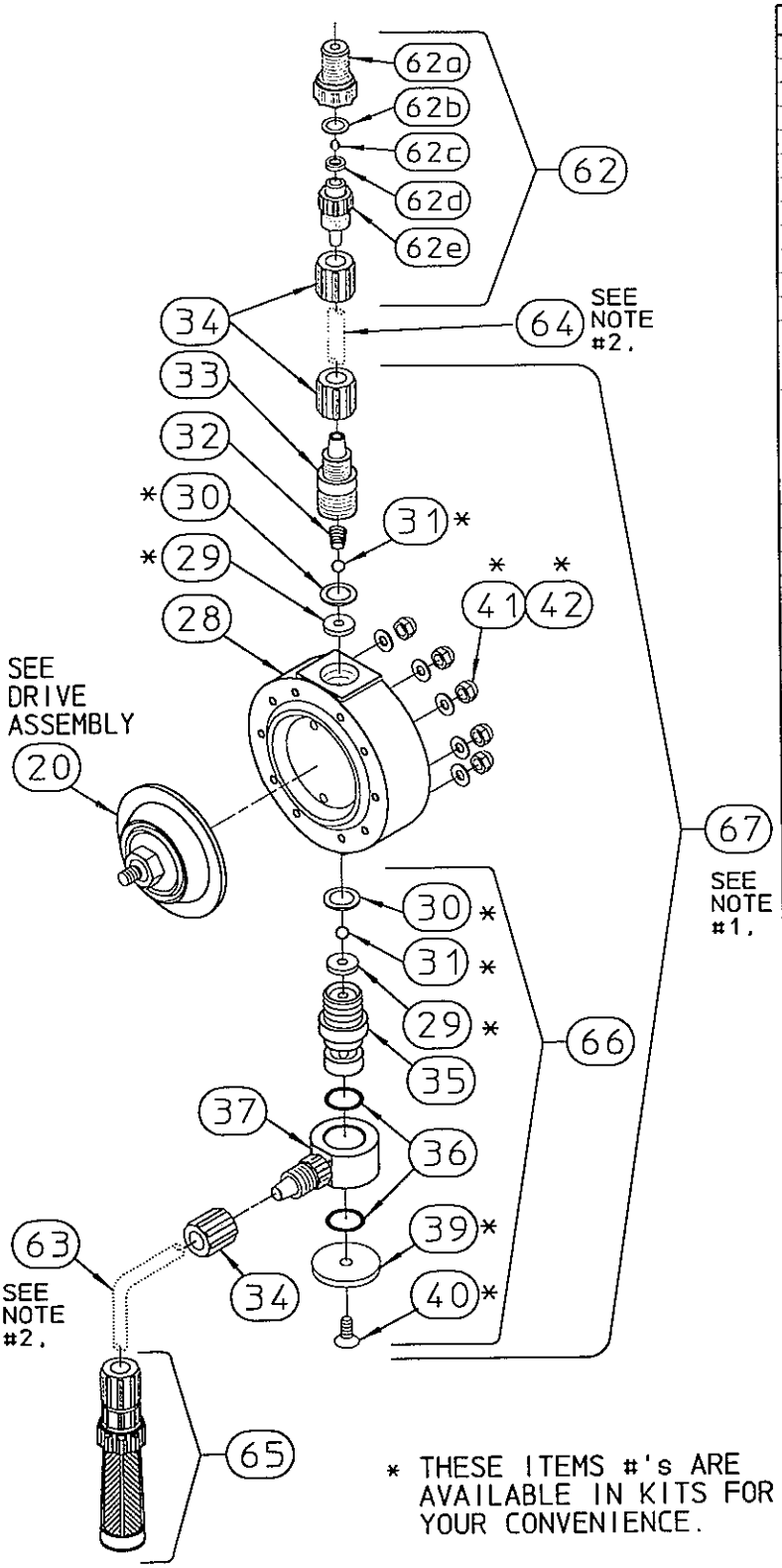


* THESE ITEMS #'s ARE AVAILABLE IN KITS FOR YOUR CONVENIENCE.

KITS PARTS LIST			
PART#	DESCRIPTION		QTY
J61519	KIT, GASKET, HYPALON:	ITEM # 30 - 27905	2
J61520	KIT, VALVE SEAT, HYPALON:	ITEM # 29 - 37446	2
J61521	KIT, ACORN NUT SET:	ITEM # 41 - 32960	10
		• 42 - 42022	10
J61522	KIT, OUTPUT INDICATOR:	ITEM # 59 - 37030	2
		• # 43 - 34381	1
J61523	KIT, COUPLING CHAIN:	ITEM # 22 - 24976	1
		• # 23 - 33765	1
		• # 24 - 36400	2

KITS PARTS LIST			
PART#	DESCRIPTION		QTY
J61526	KIT, VALVE COMPONENTS:	ITEM # 29 - 37446	2
		• # 30 - 27905	2
		• # 31 -L1000500-ALA	2
J61527	KIT, BASE, SUCTION SWIVEL:	ITEM # 39 - 20705	1
		• 40 - 37040	1
J61528	KIT, HEAD BOLT (.25"):	ITEM # 47 - 21407	2
		• 41 - 32960	2
		• 42 42022	2

SERIES 300 PUMP HEAD ASSEMBLY AND PARTS LIST



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ITEM#	PART#	DESCRIPTION	QTY
1	20700	BASE, SIMPLEX	1
2	32590	MOTOR	1
3	29238	HOUSING	1
4	29237	HOUSING, BACKPLATE	1
5	32970	NUT, ADJ. SCREW LOCK	1
6	37888	SHAFT, OUTPUT	1
7	30461	KNOB,OUTPUT	1
8	28661	BELT GUARD	1
9	35220	PULLEY, 4-STEP, .63" MOTOR	1
10	35221	PULLEY, 4-STEP, .50" REDUCER	1
11	20980	BELT	1
12	J35918	REDUCER, (REDUCER 133)	1
14	J21834	BRACKET ASSEMBLY	REF
a	21821	BRACKET, DRIVE	1
b	37889	DIAPHRAGM SHAFT	1
15	22260	CAM/BEARING ASSEMBLY	REF
a	22253	CAM	1
b	20643	CAM DRIVE BEARING	1
c	J36395	CAM BEARING LOCKING RING	1
16	J30120	KEY, CAM SHAFT	2
17	30121	KEY, CAM BEARING	1
18	37887	MAIN SHAFT	1
19	38982	SPRING, DIAPHRAGM RETURN	1
20	25712	DIAPHRAGM ASSEMBLY	1
21	39180	SPROCKET, MOTOR .63"	1
22	24976	COUPLING CHAIN	1
23	33765	PIN, COUPLING CHAIN	1
24	36400	COUPLING CHAIN RETAINING RING	2
25	39182	SPROCKET, MOTOR .75"	1
26	23702	COLLAR, LOCKING	2
27	20844	BEARING, BALL	2
28	28805	HEAD, ACRYLIC (SAN.)	1
29	37446	VALVE SEAT, (HYPALON)	2
30	27905	GASKET (HYPALON)	2
31	L1000500-ALA	BALL, VALVE	2
32	38983	VALVE SPRING (OPTIONAL)	1
33	41565	VALVE HOUSING	1
34	J24960	COUPLING NUT	3
35	41568	VALVE, SEAT, PVC	1
36	33081	O'RING (HYPALON)	2
37	J23723	COLLAR SUCTION SWIVEL ASSEMBLY	1
39	20705	BASE, SUCTION SWIVEL VALVE	1
40	37040	SCREW, 5/16-18 x .5" FHS	1
41	32960	NUT, 1/4-20 ACN, SST	10
42	42022	WASHER, .28" x .62" SST	12
43	34381	PLATE, OPERATION INDICATOR	1
44	33761	PIN, STOP .63"	1
45	J39740	SPACER, (REDUCER 133)	4
46	21409	BOLT, .25"-20 x 10.5"	8
47	21407	BOLT, .25"-20 x 2.25"	2
48	21411	BOLT, .31"-18 x 1"	8
49	42053	WASHER, .31"	12
50	J42052	WASHER, LOCK .31"	12
51	J32944	NUT, .31"-18	12
55	21400	BOLT, .25"-20 x .5" SST	2
56	J42051	WASHER, .25" LOCK	2
57	21413	BOLT, .31"-18 x 1.5" SST	4
58	37056	SET SCREW, .38"-24 x .5"	2
59	37030	SCREW, 4-ABX x .38" PHS	2
60	37047	SET SCREW, #10-32 x .25"	1
61	30608	LABEL, DATA	1
62	41637	BACK CHECK VALVE ASSEMBLY	REF
a	J26780	INJECTION FITTING	1
b	J27903	GASKET, TFE	1
c	J20560	BALL, VALVE (CERAMIC)	1
d	J37440	VALVE SEAT, HYP	1
e	41569	VALVE HSE	1
63	00006	TUBING, SUCTION .44" PVC	1
64	00008	TUBING, DISCHARGE .5" POLYE.	1
65	40087	STRAINER ASSEMBLY PVC/HYP	1
66	41677	VALVE SEAT SUCTION ASSEMBLY	1
67	28939	HEAD ASSEMBLY ACRYLIC(SAN-HY-C)	1

NOTES:
1. HEAD ASSEMBLY; ITEM #67 (28939) DOES NOT INCLUDE DIAPHRAGM, ITEM #20 (25712).
2. TUBING; ITEM #63 AND #64 NOT INCLUDED.

Troubleshooting

PROBLEM	PROBABLE CAUSE	REMEDY
FEEDER WILL NOT PRIME	Too much pressure at discharge.	Turn off all pressure valves, loosen outlet tubing connection at discharge point. Dampen ball check and valve seats with a few drops of solution. Set feeder dial to maximum rate and turn on feeder. When feeder is primed, reconnect all tubing connections.
	Check valves not seating.	Disassemble, loosen, clean and check for deterioration or swelling. Reassemble and prime.
	Output adjustment not set at maximum.	Always prime pump with output dial set at maximum capacity.
	Suction lift capabilities exceeded.	Check suction lift distance (10 ft / 3 meter maximum).
ANTI-SIPHON VALVE MALFUNCTIONS	Scale or particles have plugged diaphragm.	Remove, clean and reassemble, being careful not to wrinkle the diaphragm. Check sequence and position of parts to be sure reassembly is correct.
	Ruptured diaphragm.	Consult factory or your distributor for replacment.
PUMP MOTOR STALLS	Pumping against excessive pressure.	Test pressure to determine if it exceeds feeder specifications. If so, consult factory or your distributor.
	Low voltage to feeder.	Make sure voltage of power source matches the voltage on the feeder specifications label. If not, contact your distributor for replacement.
MOTOR RUNNING VERY HOT	Low voltage.	Power supply voltage should match voltage on feeder label. If not, contact your distributor for replacment.
LOSS OF CHEMICAL RESIDUAL	Feeder setting too low.	Adjust to higher setting. Feeder must be operating during adjustment.
	Scale at injection point or suction/discharge valve assemblies.	Clean injection parts with 8% muriatic acid or undiluted vinegar.
TOO MUCH CHEMICAL	Feeder setting too high.	Lower feeder setting. Feeder must be operating during adjustment.
	Chemical in solution tank too rich.	Dilute chemical solution. NOTE: For chemical that reacts with water, it may be necessary to purchase a more dilute grage of chemical direct from the supplier.
	Siphoning of chemical into infludent mainline due to vacuum or negative differential pressure.	Install a diaphragm type anti-siphon valve. Check location of injection point. Injection point should be above the level of the pump and tank to prevent siphoning. Injection point should be on the discharge side of the system pump to prevent siphoning.
LEAKAGE AROUND TUBING CONNECTIONS	Worn tube ends.	Cut about 1" off end of tubing then slip on as before. Make sure the coupling nut is securing slip ring tightly over tubing.
	Chemical attack.	Consult your distributor for alternate material.
FAILURE TO PUMP OR FEED	Leak in suction side of pump.	Examine suction tubing. If worn at end, cut about 1" off end and replace. Make sure coupling nut is securing tubing.
	Valve seats not sealing.	Clean valve seats if dirty or replace proper material if deterioration is noted.
	Low setting on feeder.	When pumping agains pressure the dials should be set above 40% max rated capacity for a reliable feed rate.
	Low solution level.	Solution must be above foot valve.
	Diaphragm ruptured.	Replace diaphragm. Check for pressure above 150 psi (10 bar) at injection point. NOTE: Chemical incompatibility with diaphragm material can cause rupture and leakage around the pump head.
	Pump head cracked or broken.	Replace pump head. Make sure fittings are hand tightened only. Using pliers or wrench can crack pump head. Chemical incompatibility can cause cracking and subsequent leakage.
	Pump head contains air or chlorine gas.	After turning off pressure lines, disconnect discharge tubing and bleed gas from pump head.
UNIT LOSES PRIME	Dirty check valve.	Remove and replace or clean off any scale or sediment.
	Ball checks not seating or not sealing properly.	Check seat and ball check for chips. Clean gently. If deformity or deterioration is noted, replace part with proper material. Resulting crystals can hold check valves open. Valves must be is assembled and cleaned.
	Solution container allowed to run dry.	Refill container with chemical.
FITTING LEAKAGE	Loose fittings.	All fitting can be hand tightened to prevent leakage. Clean off chemicals which have spilled on feeder.
	Broken or twisted gasket.	Check gaskets and replace if broken or damaged.
	Chemical attack.	Consult your distributor for alternate material.

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