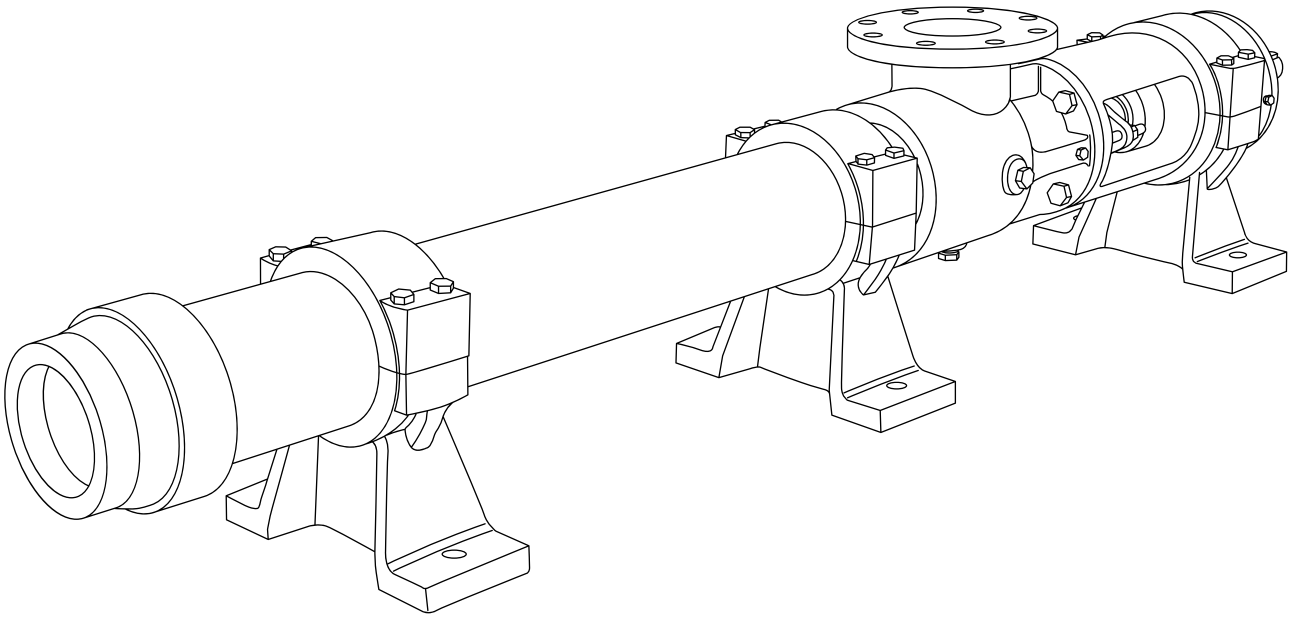
INSTALLATION, OPERATION & MAINTENANCE MANUAL

LIBERTY - SERIES

L-FRAME PROGRESSIVE CAVITY PUMP



! Read and understand this manual prior to installing, operating or maintaining this pump !

DATE OF PURCHASE: _____

SERIAL #: _____

CONTACT #: _____

P.O. #: _____

1.0 GENERAL

1.1 SELECTION & OPERATING CONSIDERATION

The Operating Principle of the Liberty Process Progressing Cavity Pump is based on two pumping elements. One is a high strength steel single thread helical screw rotor that turns in a double thread helical screw stator. The stator is made from a molded elastomer of various selected compounds bonded into a steel tube.

The outer circumference of the turning rotor is in contact with the internal circumference of the stator and provides an effective seal creating cavities of liquid that are moved from the suction end to the discharge end of the pumping elements.

The displacement of the liquid is uniformly positive, without pulsation or turbulence. The rate of flow is proportional to the speed of the rotating rotor. Pressure is uniform and independent of the pump speed, but is attributable to the length of the rotor and stator elements.

1.2 START UP PRECAUTIONS

Dry friction is harmful to Progressing Cavity Pumps. **Do not operate the pump until it is filled with the liquid to be pumped.** This liquid serves as a lubricant and as a seal between the rotor and stator and is not a priming operation. Approximately 10% of the pump's displacement rating will satisfy the cooling and lubricant requirements until full displacement capacity is attained.

WARNING! Non-observance or proper follow-up of the installation, operation and maintenance instructions may result in to either injury to the attending personnel or could even cause catastrophic failure of the pump/equipment.

2.0 INSTALLATION PROCEDURES

2.1 FOUNDATION

Mount the pump on a properly machined and fabricated steel base that is anchored with bolts on a level solid foundation.

2.2 PUMP ALIGNMENT

Alignment of direct driven pumps that are driven by a motor or a speed reducer should be carefully checked after the pump base has been mounted on the foundation. Check the alignment of the coupling halves with a straight edge. Alignment should be checked at least four points 900 around the O.D. of the coupling. A space between the pump and driver shaft ends should be held to no less than 1/8".

Belt driven pumps should be checked after mounting the pump base on the foundation. Make sure, with the help of a straight edge, that the belts and pulleys are in alignment and that the belts have the proper tension.

2.3 PUMP ROTATION

Pump rotation: The pump can be operated in either a clockwise or counterclockwise direction when viewing the pump from the driveshaft end. The recommended operating direction is clockwise when viewing the pump from the driveshaft end. The inlet and discharge ports are related to the rotation of the pump. Please contact Liberty Process Equipment if you have any questions regarding rotation.

2.4.1 PIPING SYSTEM

Piping to pump should generally be the same size as the pump inlet port and discharge port openings. Those systems handling viscous, volatile high pressure or high temperature materials may have to be more appropriately sized.

A. All threaded joints should be coated and sealed with pipe compound.
B. Provide for expansion in the piping system to all for movement and deflection.
C. Use pipe supports to keep the weight of the piping system from causing strain on the pump.
D. Make all lines as direct and free of fittings as possible. Minimize suction line by locating the pump below or close to the liquid being pumped.
E. When the pump is handling abrasive, corrosive liquids, slurries, sludge's, cements, adhesives or any liquids that harden, it should be flushed clean. The rotation of the pump can be operated both clockwise and counterclockwise to accomplish this operation most thoroughly.
F. It is good practice to consider installing pressure and/or vacuum gauges in both the inlet and outlet pipes to the pump to check that it conforms to your operating specifications.

2.4.2 PIPING SYSTEM

Progressing Cavity Pumps are positive displacement and the discharge outlet must be kept open or a relief valve or a by-pass piping arrangement should be provided. If the discharge or inlet into the system is to be shut off or closed, provisions must be made for a relief valve or by-pass arrangement or damage can be done to the pump and the drive, including the motor. Strainers, filters and foot valves should be properly sized so as not to affect performance of the pump and should usually be installed in the suction line..

3.0 MAINTENANCE

3.1 BEARINGS

Pump Bearings are anti-friction ball type and should be periodically grease lubricated. They are initially packed when assembled at the factory

A. Do not over lubricate.

B. Use quality anti-friction bearing grease.

C. It is recommended that under normal use, that no lubrication be added for the first 1200 hours of operation unless it is uncomfortable to hold the hand on the bearing housing.

D. The bearing shaft assembly should be inspected and cleaned after running the pump for approximately 2500 hours.

E. All old grease should be removed from the bearing housing, and only new grease applied to bearing races so as to fill them flush.

F. Add a few drops of oil to bearing seals before remounting assembly.

3.2 PACKING MAINTENANCE PROCEDURES

A. The Packing Gland should be firmly tightened so as to prevent excessive leakage through the packing, but not so tight that it will cause overheating. Always adjust packing gland evenly. Align the packing gland so that it evenly goes into the packing gland cavity of the pump housing.

B. Liberty Process Equipment Progressing Cavity Pumps are supplied with a lantern ring in the midsection of the packing with access to a lubrication fitting on the external surface of the pump body. Lubricating the packing regularly with small amounts of lubricant or flushing with water will extend the life of the packing and help maintain a good seal.

C. A scored driveshaft reduces the life of packing and should be replaced.

D. When replacing worn packing use standard die-cut formed packing. Do not use one piece spiral packing. Press into place the die-cut and preformed packing rings and stagger the joints 180˚ apart.

E. After packing is installed, tighten the gland bolts evenly and firmly. Bolts should be backed off gradually as the stuffing box warms up, to avoid overheating of the packing area.

F. A small amount of leakage through the packing can be normal and helpful for good operation and easily drained away from the base.

Precaution! Please check the fasteners on the pump and motor – motor-base plate assemblies since fasteners may loosen during transportation. This is particularly important for the couplings and coupling guards since the security of these fasteners can have a significant effect on the safety of the pump – motor unit.

4.0 OPERATION

4.1 PRE-START UP CHECKS

1. Read and understand all information furnished with pump.
2. Review operating conditions.
3. Check setting of relief valve in discharge line.
4. Check for proper position of belt or coupling guards. Do not operate pump without guards.
5. Fill the pump with the liquid to be pumped. Do not operate pump dry.
6. Rotate drive shaft of pump four or five rotations. This creates a seal between the rotor and stator to create pumping action.
7. Make sure the inlet and discharge lines are open.
8. Start the unit.
9. Check to see if the pump is delivering liquid. If it is not, refer to the section on checking pump performance.

4.2 CHECKING PUMP PERFORMANCE

A summary of possible causes of improper performance of Progressing Cavity Pumps.

No liquid delivered

1. Pump rotating in wrong direction.
2. Inlet lift too great.
3. Clogged inlet line.
4. Air pockets or vapor lock.
5. Air leaks in inlet line.
6. Faulty relief valve in system.

Pump takes too much power

1. Speed too high.
2. Liquid more viscous than anticipated.
3. Operating pressure higher than specified. Check this with gauge at the pump outlet.
4. Outlet line obstructed.
5. Mechanical defect, such as bent shaft, tight packing gland, or misalignment of piping.
6. Relief valve in system not operating properly.

Insufficient Liquid Delivered

1. Air leaks in inlet line.
2. Air leaks in through packing. -
3. Speed too low.
4. Excessive lift at inlet. Check this with gauge at the pump inlet.
5. Viscosity of liquid too high for size and length of inlet pipe.
6. Foot valve or end of inlet pipe not immersed deeply enough in liquid.
7. Foot valve, if used, too small, stuck, or not working properly.
8. Partial air pockets or vapor lock.
9. Pump damaged by misalignment.
10. Excessive clearance in pump caused by wear or corrosion.
11. Faulty relief valve in system.

Excessive Noise

1. Started pump. Liquid not getting into pump.
2. Air leaks in inlet line.
3. Air or gases in liquid.
4. Pump speed too high.
5. Improper mounting. Check alignment thoroughly.

5.0 ASSEMBLY INSTRUCTIONS

TOOLS USED

Hammer
Brass Punch
Level
9/16” Wrench
5/8” Wrench
3/4” Wrench
3/8” allen key Wrench
Pipe Dope
Oil
Tape Measure
Chain Wrench
Grease

5.1 INSERTING PACKING

Align Packing Rings and Lantern Ring then insert into Suction Housing. (each Packing ring should be rotated 180 degrees from each other)

Order of rings

3 Packing Rings
1 Lantern Ring
4 Packing Rings

Push rings into Suction Casing with the Drive Shaft to unsure they are in place.

5.2 ATTACHING SUPPORT

Remove the top of the Bearing Housing Support and add Bearing Housing.

Replace the top of the Bearing Housing Support and tighten into place.

5.3 INSERTING COLLAR PIN RETAINER

Add Collar Pin Retainer and Packing Gland into the Bearing Housing.

Then insert the Drive shaft in to the Bearing Housing.

(the bearing on Drive Shaft assembly may need to be pressed in to Bearing Housing with a press jack.)

5.4 INSTALL BEARING COVER PLATE

Add the Bearing House Cover Plate to the Bearing Housing with 4x 3/8” bolts with a 9/16” wrench.

5.5 INSERT PIN WASHERS AND PACKING GLAND BOLTS

Slide the Collar Pin Retainer over and insert the Drive Pin Washers into the Drive Shaft.

Add Packing Gland Bolts into Suction Casing.

5.6 ATTACHING SUCTION CASING TO BEARING HOUSING

Move the Packing Gland to the right down the Drive Shaft.

Slide the Packing Gland Bolts in the Suction Casing into the holes in the Bearing Housing.

Once the Suction Casing and the Bearing Housing are together move the Packing Gland back toward the Suction Casing onto the Packing Gland Bolts.

Tighten each 7/16” nut (5/8” wrench) equally but at this stage do not over tighten. (Adjustment are to be made when the pump is running.)

Bolt the Suction Housing to the Bearing Housing with 4x 1/2” bolts with a 3/4” wrench.

5.7 ATTACHING CON ROD WASHERS

Grease the end of the Connecting Rod and slide the Connecting Rod Washer into the end. Repeat for opposite side.

5.8 ATTACHING ROTOR PIN RETAINER TO ROTOR

Attach Rotor Pin Retainer to Rotor.
(Do not cover holes until after step 14)

Grease the Rotor Head and the Connecting Rod end

5.9 ATTACHING ROTOR AND CONNECTING ROD

Put the Connecting Rod into the Rotor and insert the Rotor Pin.

Hammer the Rotor Pin into the hole until flush on both sides.

5.10 SECURE CONNECTING ROD PIN

With a hammer, press, or by heating the ring move the Rotor Pin Retainer into place to cover the holes.

5.11 INSTALL ROTOR ASSEMBLY INTO STATOR

Lube the Stator with grease, oil, or detergent/Liquid Soap and insert the Rotor in to the cavity of the stator.

5.12 INSTALL DISCHARGE CASING ONTO THE MOTOR

To determine the distance from the top of the rotor to the top of the stator measure from the center of the collar pin retainer to the end of the suction casing.

(the amount of space should be between 3/8”-1/2” (shorter/less than) to align the pin as you screw in the stator.)

5.13 LUBRICATING STATOR ASSEMBLY

Lubricate the end of the Connecting Rod then apply pipe dope to the threads of the stator nearest to the Connecting Rod.

5.14 INSTALLING STATOR ASSEMBLY ONTO SUCTION CASING AND DRIVE END ASSEMBLY

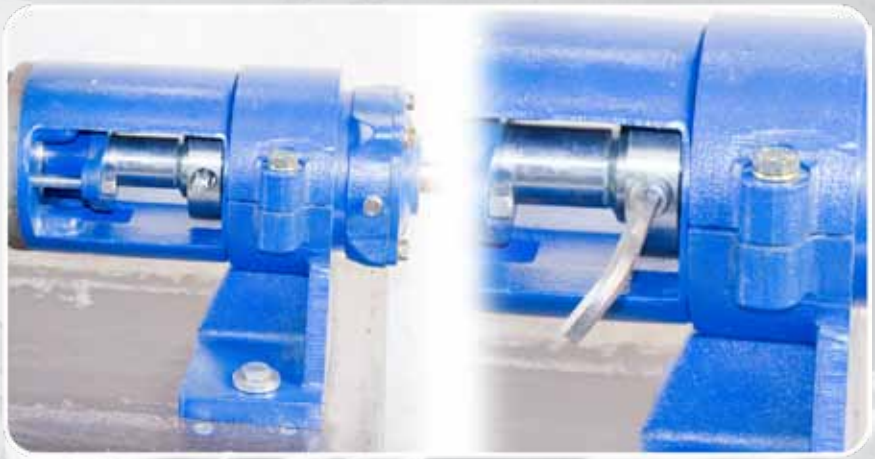
Screw the stator into the Suction Housing until the hole in the Connecting Rod lines up with the hole in the Collar Pin Retainer

5.15 FASTENING CONNECTING ROD TO DRIVE SHAFT

Line up holes in Connecting Rod and Drive Shaft

Insert the Shaft Pin into the hole lined up in the Connecting Rod and Drive Shaft.

Insert the Drive Pin Retaining Screw with the 3/8” allen key Wrench.



5.16 INSTALL STATOR SUPPORT AND REDUCER

Remove the top of the Stator Support Foot and place it under the Stator for support.

To the open end of the Stator, apply Pipe Dope to the threads of the Stator.

Thread the Reducer onto the end of the Stator and tighten the assembly with a pipe wrench.

(tighten the support foot at the opposite end, if the pump assembly twist out of alignment and finish tightening the Reducer and Stator assembly.)

5.17 ALIGN PUMP

Loosen the Support Feet and place a level on the inlet of the Suction Housing and rotate the pump until in alignment.

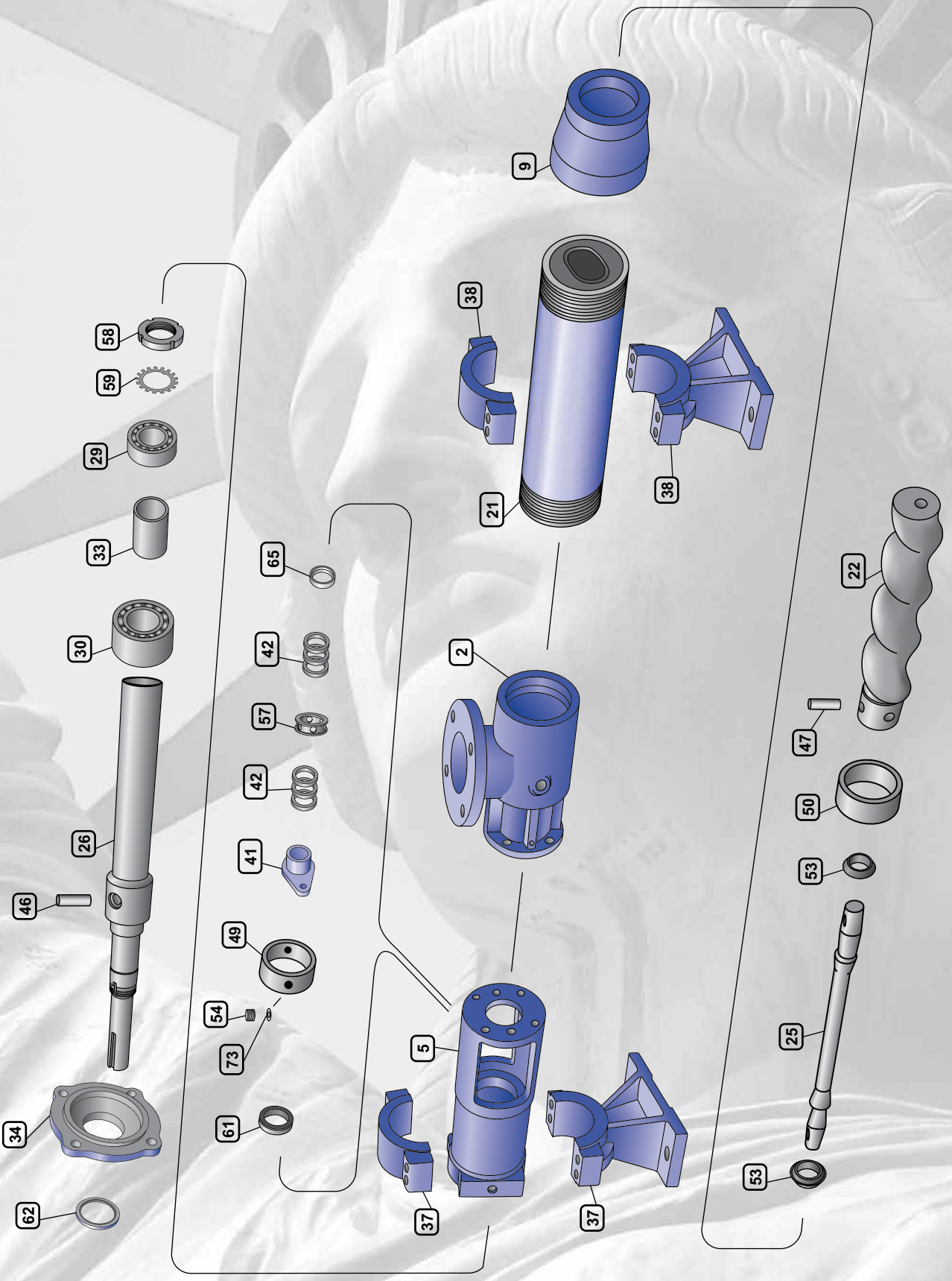
5.18 ALIGN SUPPORT FEET

Measure the distance between the Support Feet from center hole to center hole.

Once the Support Feet are the proper distance re-tighten both of the Support Feet.

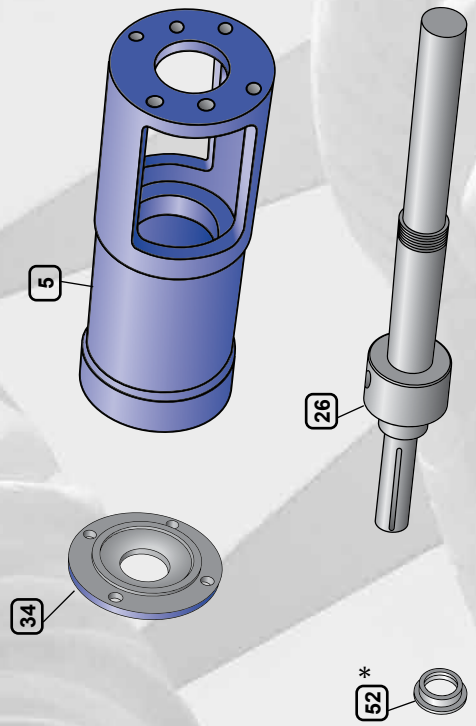
(Refer to the manual for the proper distance between the Support Feet.)

6.0 LIBERTY SERIES - PARTS LIST



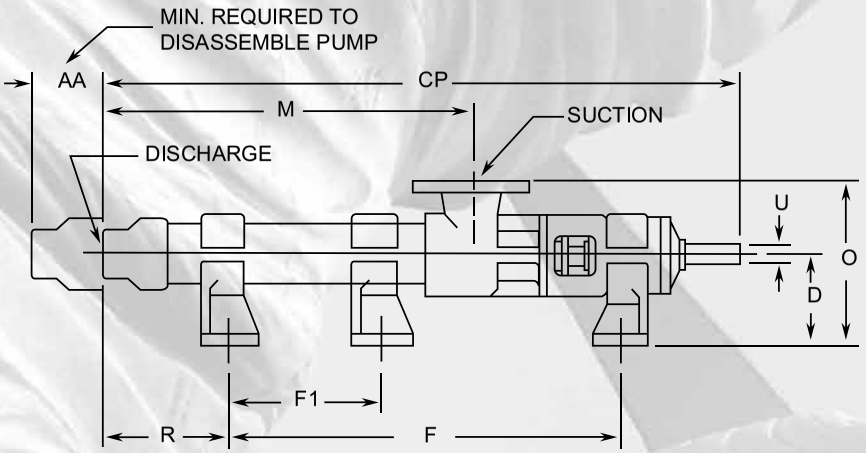
Parts above are for Liberty Series Pumps LL2, LL3, LL4, LL6, LL8

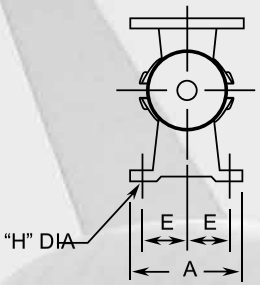
6.0 LIBERTY SERIES - PARTS LIST



Parts above are for Liberty Series Pumps LL10, LL10H, LL12, LL12H
* is for pump size LL10

LL Series Parts	
Part No.	**Part Name**
29	Radial Bearing
30	Thrust Bearing
33	Bearing Spacer
58	Bearing Lock Nut
59	Bearing Lock Washer
61	Radial Grease Seal
52*	Grease Seal Retainer *
62	Thrust Grease Seal
34	Bearing Cover Plate
37	Suction Housing Support
57	Lantern Ring
5	Bearing Housing
38	Stator Support
49	Collar Pin Retainer
50	Rotor Pin Retainer
53	Connecting Rod Washer
25	Connecting Rod
47	Rotor Pin
46	Drive Shaft Pin
54	Drive Pin Retaining Screw
2	Suction Housing
9	Pump Reducer
26	Drive Shaft
41	Packing Gland
42	Packing
65	Packing Gland Insert
73	Drive Pin Washer
21	Stator
22	Rotor





LIBERTY Pump Model	Dimensions of pump AA	CP	A	D	E	F	F1	H	M	O	R	U	Suct. Size	Disc Size	Approx. ≈ lbs.
2ML1	6.5	17.31	4.00	3.25	1.56	8.50	-	.37	7.62	5.88	4.56	.62	1.00	.75	22
3ML1	6.5	19.12	4.00	3.25	1.56	9.62	-	.37	9.44	5.88	5.25	.62	1.00	.75	24
6ML1	6.5	24.69	4.00	3.25	1.56	15.75	-	.37	15.00	5.88	4.69	.62	1.00	.75	30
1LL2	6.5	17.25	4.00	3.25	1.56	8.50	-	.37	7.56	5.88	4.50	.62	1.00	.75	22
2LL2	6.5	20.75	4.00	3.25	1.56	10.50	-	.37	11.06	5.88	6.00	.62	1.00	.75	25
3LL2	6.5	24.37	4.00	3.25	1.56	12.00	-	.37	14.69	5.88	8.12	.62	1.0	.75	31
6ML2	8.37	39.12	5.75	4.12	2.12	25.00	14.00	.44	26.50	7.31	7.94	.75	1.50	.75	55
1LL3	8.37	23.00	5.37	4.12	2.12	11.50	-	.44	10.37	7.31	5.81	.75	1.50	1.25	47
2LL3	8.37	28.31	5.37	4.12	2.12	13.00	-	.44	15.69	7.31	9.62	.75	1.50	1.25	51
3LL3	8.37	33.62	5.37	4.12	2.12	16.50	-	.44	21.00	7.31	11.44	.75	1.50	1.25	55
6ML3	11.37	54.62	7.00	5.50	2.75	37.50	22.00	.56	37.75	9.88	10.12	.94	2.50	1.25	105
1LL4	11.37	30.37	7.00	5.50	2.75	15.75	-	.56	13.50	9.88	7.62	.94	2.50	2.0	85
2LL4	11.37	37.44	7.00	5.50	2.75	22.00	-	.56	20.56	9.88	8.44	.94	2.50	2.0	91
3LL4	11.37	44.50	7.00	5.50	2.75	22.75	-	.56	27.62	9.88	14.75	.94	2.50	2.0	97
6ML4	14.25	71.25	8.62	6.25	3.50	45.00	25.00	.69	49.94	11.25	17.69	1.12	3.00	2.50	171
1LL6	14.25	39.37	8.62	6.25	3.50	20.00	-	.69	18.06	11.25	10.81	1.12	3.00	2.50	141
2LL6	14.25	50.00	.62	6.25	3.50	26.00	-	.69	28.69	11.25	15.44	1.12	3.00	2.50	159
3LL6	14.25	60.62	8.62	6.25	3.50	38.00	18.00	.69	39.31	11.25	14.06	1.12	3.00	2.500	192
1LL8	18.37	46.31	11.50	8.00	4.50	27.00	-	.88	20.50	14.00	10.06	1.37	4.00	4.00	303
2LL8	18.37	58.75	11.50	8.00	4.50	32.00	-	.88	32.94	14.00	17.50	1.37	4.00	4.00	322
3LL8	18.37	71.12	11.50	8.00	4.50	49.00	24.00	.88	45.31	14.00	12.88	1.37	4.00	4.00	372
1LL10	31.88	53.62	11.50	9.75	4.50	30.00	-	.88	22.37	16.69	10.12	1.88	6.00	5.00	412
2LL10	31.88	64.00	11.50	9.75	4.50	35.50	-	.88	32.75	16.69	15.00	1.88	6.00	5.00	460
3LL10	31.88	74.37	11.50	9.75	4.50	48.00	18.00	.88	43.12	16.69	12.88	1.88	6.00	5.00	545
1LL10H	31.88	59.00	11.50	9.75	4.50	30.00	-	.88	27.75	16.69	15.50	1.88	6.00	5.00	424
2LL10H	31.88	74.37	11.50	9.75	4.50	48.00	18.00	.88	43.12	16.69	12.88	1.88	6.00	5.00	545
1LL12	37.75	70.19	14.50	12.50	6.31	37.50	-	1.00	31.44	21.00	14.69	2.25	8.00	6.00	880
2LL12	37.75	85.88	14.50	12.50	6.31	55.50	20.50	1.00	47.50	21.00	12.37	2.25	8.00	6.00	1075
3LL12	37.75	101.44	14.50	12.50	6.31	69.00	27.00	1.00	62.69	21.00	14.44	2.25	8.00	6.00	1200
1LL12H	37.75	78.00	14.50	12.50	6.31	42.00	-	1.00	39.25	21.00	18.00	2.25	8.00	6.00	945
2LL12H	37.75	101.44	14.50	12.50	6.31	69.00	27.00	1.00	62.69	21.00	14.44	2.25	8.00	6.00	1205

Inches