

Pump System Malfunction

<u>MALFUNCTION</u>	<u>CAUSE</u>	<u>REMEDY</u>
The Pressure and/or the Delivery Drops	Worn packing seals Broken valve spring Belt slippage Worn or Damaged nozzle Fouled discharge valve Fouled inlet strainer Worn or Damaged hose Worn or Plugged relief valve on pump Cavitation Unloader	Replace packing seals Replace spring Tighten or Replace belt Replace nozzle Clean valve assembly Clean strainer Repair/Replace hose Clean, Reset, and Replace worn parts Check suction lines on inlet of pump for restrictions Check for proper operation
Water in crankcase	High humidity Worn seals	Reduce oil change interval Replace seals
Noisy Operation	Worn bearings Cavitation	Replace bearings, Refill crankcase oil with recommended lubricant Check inlet lines for restrictions and/or proper sizing
Rough/Pulsating Operation with Pressure Drop	Worn packing Inlet restriction Accumulator pressure Unloader Cavitation	Replace packing Check system for stoppage, air leaks, correctly sized inlet plumbing to pump Recharge/Replace accumulator Check for proper operation Check inlet lines for restrictions and/or proper size
Pressure Drop at Gun	Restricted discharge plumbing	Re-size discharge plumbing to flow rate of pump
Excessive Leakage	Worn plungers Worn packing/seals Excessive vacuum Cracked plungers Inlet pressure too high	Replace plungers Adjust or Replace packing seals Reduce suction vacuum Replace plungers Reduce inlet pressure
High Crankcase Temperature	Wrong Grade of oil Improper amount of oil in crankcase	Giant oil is recommended Adjust oil level to proper amount

REPAIR INSTRUCTIONS

LP301A/LP301A-SSP/LP301A-4000/LP600/LP600-4000

NOTE: Always take time to lubricate all metal and non-metal parts with a light film of oil before reassembling. This step will help ensure proper fit, at the same time protecting the pump non-metal parts (elastomers) from cutting and scoring.

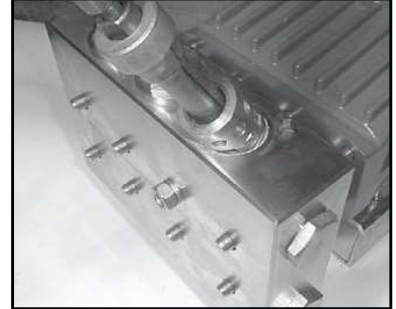
TO CHECK VALVES



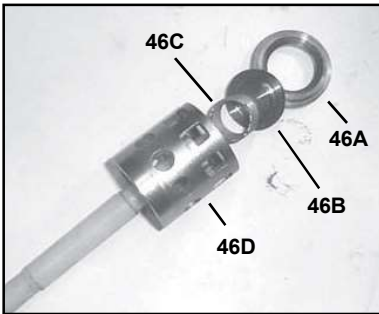
- 1) Loosen and remove tension plugs (48) with a 36mm socket wrench.



- 2) Remove the support ring (44B), O-ring (44A) and tension spring (45).



- 3) Take out discharge valve assemblies (46) by pulling them upwards out of the valve casing (43) with a snap-ring tongs or any other pull-off device. Then remove inlet valves in the same way.



- 4) Loosen valve seats (46A) and valve spring (46C) from spacer pipe (46D) by lightly hitting the valve plate (46B) with a plastic stick. LP600/LP600-4000 pumps have an additional valve spring guide (46E). Check sealing surface and replace worn parts. Reassemble with new O-rings (44A) if possible and oil them before installing.



- 5) Tighten up tension plugs (48) to 107 ft.-lbs. (145 NM)

REPAIR INSTRUCTIONS

LP301A/LP301A-SSP/LP301A-4000/LP600/LP600-4000

NOTE: Always take time to lubricate all metal and non-metal parts with a light film of oil before reassembling. This step will help ensure proper fit, at the same time protecting the pump non-metal parts (elastomers) from cutting and scoring.

TO CHECK SEALS AND PLUNGER PIPE



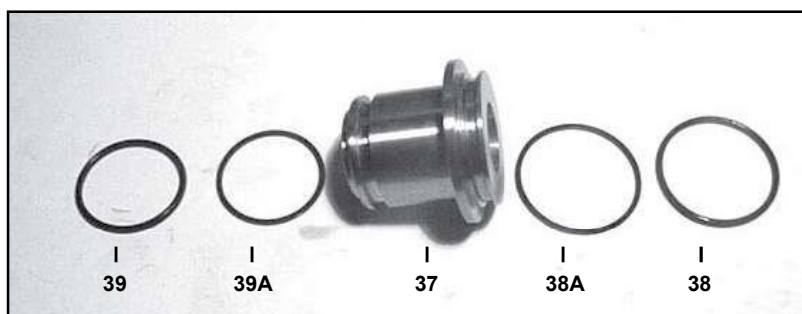
- 6) Loosen the 8 nuts (49A) with a 19mm socket and pull off valve casing (43) to the front.



- 7) Remove the seal sleeve (35) from the manifold and /or crankcase.



- 8) Remove seal case (37) from seal sleeve (35).



- 9) Check O-rings (39 & 38) and support rings (39A & 38A) on seal case (37).



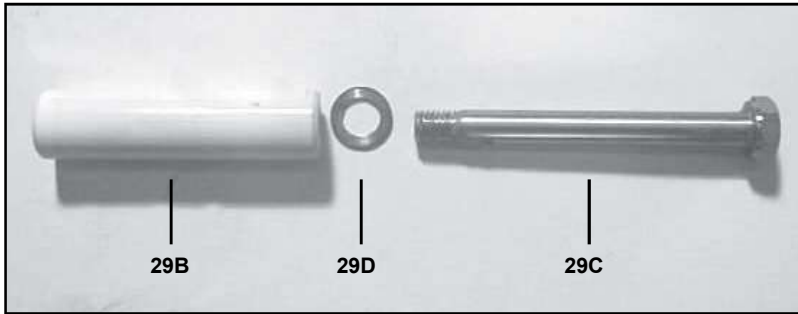
- 10) Remove leakage seal (36) from the seal sleeve. If worn or damaged replace with new seal.



- 11) Remove the pressure ring (40A), v-sleeves (40), sleeve (40C in LP600 only), and support ring (40B), from the seal sleeve. For LP301A and LP301A-4000 pumps, remove the pressure spring (41). Examine seals carefully and replace if worn. Clean surfaces of seal sleeves (35) which come in contact with the crankcase (1) and sealing surfaces of valve casing (43).

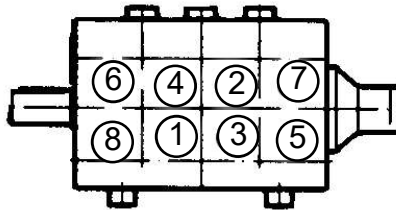
REPAIR INSTRUCTIONS

LP301A/LP301A-SSP/LP301A-4000/LP600/LP600-4000



12) Check plunger surface (29B). If plunger pipe is worn out, loosen tension screws (29C) with a 15mm socket and pull off plunger pipe to the front. Clean front surface of plunger (29B) thoroughly. Apply a small drop of locktite to tension screw. Put a **new** crush washer (29D) onto tension screw. Put a thin coat of glue (Loctite) on the ring (or ceramic plunger side) and tighten screw to 265 in.-lbs. (30 NM).

13) Replace complete seal sleeve (35)/seal case (37) assembly into crankcase (1). Make sure that the weep hole points downward. **Note: To replace the oil seals (31), you will need to disassemble the gear end (see instructions below).**



14) Place entire manifold/seal sleeve assembly over the studs and push firmly until seated against the crankcase.

15) Tighten hex nuts (49A) in a crosswise pattern (shown above) to 59 ft.-lbs. (80 Nm).

REPAIR INSTRUCTIONS

LP301A/LP301A-SSP/LP301A-4000/LP600/LP600-4000

TO DISMANTLE GEAR END

After removing valve casing (43) and plunger pipe (29B), drain the oil. Remove the gear cover (4) and both bearing covers (14). Loosen connecting rod screws (24A) and push the front of the connecting rod (24) forward as far as possible into the crosshead guide.

IMPORTANT! Connecting rods (24) are marked for identification. Do not twist connecting rod halves. Connecting rod is to be reinstalled in the same position on shaft journals.

Turning the crankshaft (22) slightly, hit it out carefully to the side with a rubber hammer.

IMPORTANT! Do not bend the connecting rod (24) shanks. Check crankshaft (22) and connecting rod (24) surfaces, radial shaft seals (15) and taper roller bearings (20).

To remove the oil seals (31) use a wooden rod and sharply hit down on the oil seals from the crankcase (1). Note: when replacing the oil seals, apply a small amount of locktight to the outside edges of each oil seal before re-inserting them into the crankcase.

To Reassemble

Using a soft tool, press in the outer bearing ring until the outer edge lines up with the outer edge of the bearing hole. Remove bearing cover (14) together with radial shaft seal (15) and o-ring (16). Fit crankshaft (22) through bearing hole on the opposite side. Press in outer bearing and tighten it inwards with the bearing cover, keeping the crankshaft in vertical position and turning slowly so that the taper rollers of the bearings touch the edge of the outer bearing ring. Adjust axial bearing clearance to at least 0.1mm and maximum 0.15mm by placing fitting discs (20A and 20B) under the bearing cover.

IMPORTANT! After assembly has been completed, the crankshaft should turn easily with very little clearance. Tighten connecting rod screws (24A) to 22 ft.-lbs. (30 Nm) Re-assemble the fluid end (see instructions above).

LP301A/LP301A-SSP/LP301A-4000/LP600/LP600-4000			
TORQUE SPECIFICATIONS			
<u>Position</u>	<u>Item#</u>	<u>Description</u>	<u>Torque Amount</u>
1	07759	Crankcase (Molycoate-Copper Paste on sealing area - seal sleeves)	
6	05943	Oil Sight Glass w/Gasket (Loctite 572)	29 ft.-lbs. (40 Nm)
10	01010/01010-0100	Cylinder Screw	221 in.-lbs. (25 Nm)
12	07109	Plug, 1/2" BSP	29 ft.-lbs. (40 Nm)
17	07114/07114-0100	Hexagon Screw	221 in.-lbs. (25 Nm)
24A	13277	Inner Hex Screw, Connecting Rod	22 ft.-lbs. (30 Nm)
29C	13031 (LP600)	Tension Screw, Plunger (Loctite 243)	22 ft.-lbs. (30 Nm)
29C	13031 (LP301A)	Tension Screw, Plunger (Loctite 243)	26 ft.-lbs. (35 Nm)
29D	07755	Copper Ring (Loctite 577 on both sides)	
29D	07161-0100	Crush Washer (Loctite 577 on both sides)	
31	07133	Oil Seal (Loctite 403)	
48	06077	Plug, Discharge (Pro Pack 550)	107 ft.-lbs. (145 Nm)
49	07140	Stud Bolt (Small amount on crackcase side Loctite 270)	
49A	07158	Hexagon Nut, Stud Bolts	59 ft.-lbs. (80 Nm)

Pump Mounting Selection Guide

Bushings

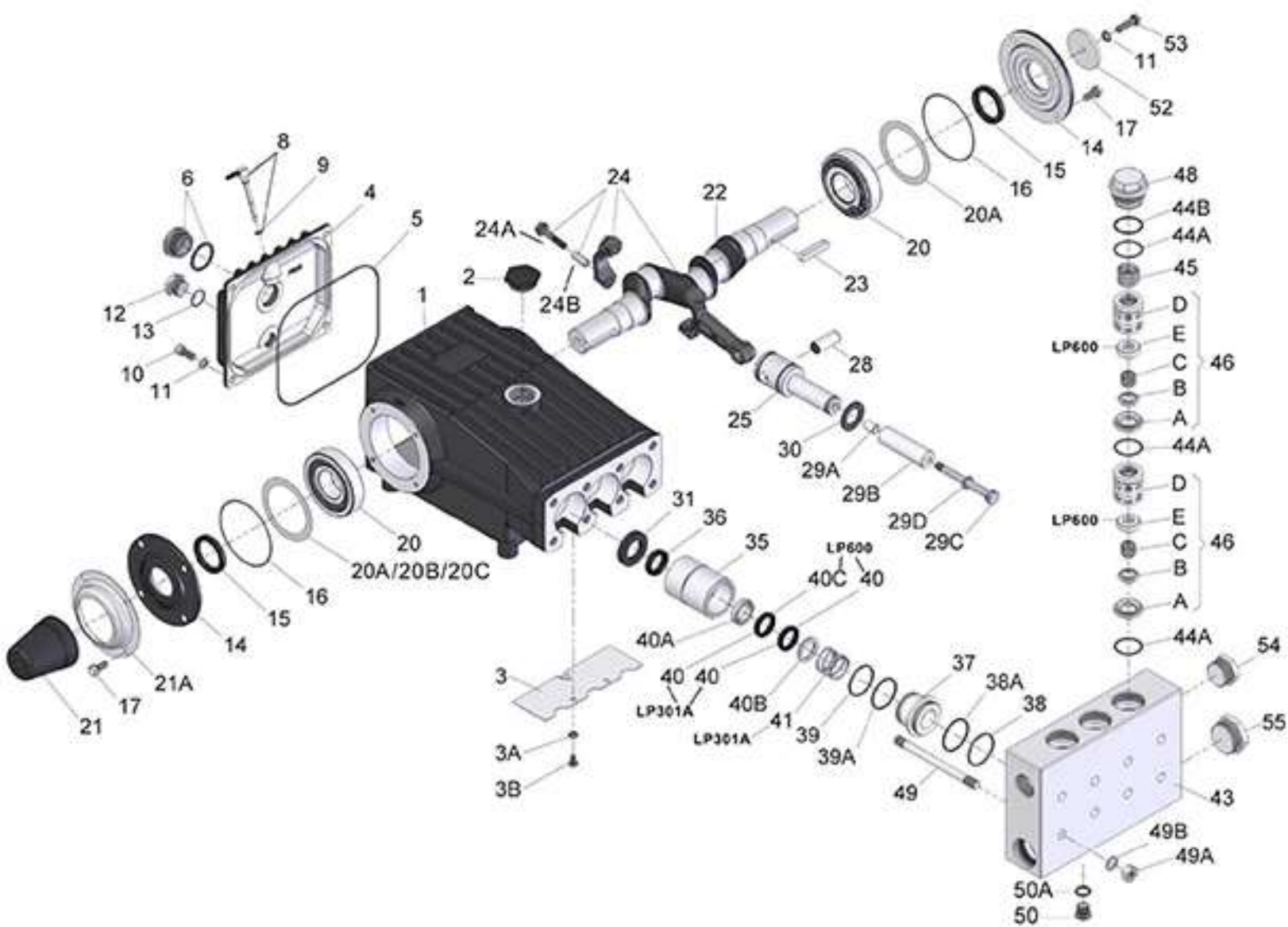
06496 - 35 mm H Bushing

Pulley & Sheaves

07165 - 12.75" Cast Iron - 4 gr.
AB Section

Rails

07357 - Plated Steel Channel Rails
(L=11.75"x W=1.88"x H=3.00")



Parts List

LP301A/LP301A-SSP/LP301A-4000/LP600/LP600-4000

ITEM	PART	DESCRIPTION	QTY	ITEM	PART	DESCRIPTION	QTY
1	07759	Crankcase	1	39A	07693	Support Ring for 39 (LP301A/LP301A-4000)	3
2	13000	Oil Filler Plug Assembly	1	40	07322	V-Sleeve (LP600/LP600-4000)	3
3	05940	Cover Plate	1	40	06083	V-Sleeve (LP301A/LP301A-4000)	6
3A	07223-0100	Spring Ring	2	40A	07268	Pressure Ring (LP600)	3
3B	05051	Hexagon Screw	2	40A	07268-0100	Pressure Ring, 316 S.S. (LP600-4000)	3
4	06085	Crankcase Cover	1	40A	13366	Pressure Ring (LP301A)	3
5	07104	O-ring, Crankcase Cover	1	40A	13366-0100	Pressure Ring, 316 S.S. (LP301A-4000)	3
6	05943	Oil Sight Glass w/Gasket	1	40B	07270	Support Ring for 40 (LP600)	3
8	06086	Oil Dipstick Assembly	1	40B	07270-0100	Support Ring for 40, 316 S.S. (LP600-4000)	3
9	01009	O-Ring For Dipstick	1	40B	13367	Guide Ring for 40 (LP301A)	3
10	01010	Cylinder Screw (LP600/LP301A)	4	40B	13438	Guide Ring for 40, 316 S.S. (LP301A-4000)	3
10	01010-0100	Cylinder Screw, 316 S.S. (LP600-4000/LP301A-4000)	4	40C	07322-0020	Sleeve, Teflon (LP600/LP600-4000)	3
11	01011-0400	Spring Ring (LP600/LP301A)	5	41	07338	Pressure Spring (LP301A/LP301A-4000 Only)	3
11	01011-0100	Spring Ring, 316 S.S. (LP600-4000/LP301A-4000)	5	43	13040	Valve Casing	1
12	07109	Plug, G1/2" (LP600/LP301A)	1	44A	07150	O-Ring	9
12	07109-0400	Plug, G1/2", 316 S.S. (LP600-4000/LP301A-4000)	1	44B	06266	Support Ring for O-Ring	3
13	06015	O-Ring	1	45	06078	Compression Spring	3
14	07111	Bearing Cover	2	46	08286	Valve Assy., Complete, 46A-E (LP600/LP600-4000)	6
15	07112	Radial Shaft Seal	2	46	07060	Valve Assy., Complete, 46A-D (LP301A/LP301A-4000)	6
16	07113	O-Ring for Bearing Cover	2	46A	07064	Valve Seat (LP301A/LP301A-4000)	6
17	07114	Hexagon Screw (LP600/LP301A)	8	46A	07064-0100	Valve Seat (LP600/LP600-4000)	6
17	07114-0100	Hexagon Screw, 316 S.S. (LP600-4000/LP301A-4000)	8	46B	13130	Valve Plate (LP600/LP600-4000)	6
20	07116	Taper Roller Bearing	2	46B	07063	Valve Plate (LP301A/LP301A-4000)	6
20A	07117	Shim, 0.1 mm	1-3	46C	07062-0100	Valve Spring	6
20B	13001	Shim, 0.15 mm	1-3	46D	07066	Spacer Pipe (LP301A/LP301A-4000)	6
20C	04491	Shim, 0.2 mm (May not be present)	1-3	46D	05472	Spacer Pipe (LP600/LP600-4000)	6
21	05376	Shaft Protector	1	46E	05473	Valve Spring Guide (LP600/LP600-4000)	6
21A	05377	Shaft Guard Holder	1	48	06077	Plug	3
22	13242	Crankshaft	1	49	07157	Stud bolt	8
23	13243	Key	1	49A	07158	Hexagon Nut	8
24	13340	Connecting Rod Assembly	3	49B	07159	Disc	8
24A	13277	Inner Hex Screw	6	50	12250	Plug, 1/2" BSP, S.S. (LP301A/LP301A-4000 Only)	1
24B	13278	Spring Washer	6	50A	06807	Steel Ring	1
25	13341	Crosshead Assembly	3	52	13020	Disc for Crankshaft	1
28	13232	Crosshead Pin	3	53	04561	Hexagon Screw	1
29A	07125	Centering Sleeve	3	54	13044 ⁺	Plug, 1" BSP	1
29B	07126	Plunger Pipe (LP600/LP600-4000)	3	55	13151 ⁺	Plug, 1-1/4" BSP	1
29B	07127	Plunger Pipe (LP301A/LP301A-4000)	3	05445*	Crankcase Assembly (LP301A/LP600) (1-29A/30-31/49A-B/52/53)		
29B	07127-SS	Hard Metal Plunger (LP301A-SSP)	3	04868*	Plunger Replacement Kit (LP600) (29B-D/35-40C)		
29C	13031	Tensioning Screw	3	04869*	Plunger Replacement Kit (LP301A) (29B-D/35-41)		
29D	07755	Copper Ring (LP600/LP301A/LP301-SSP)	3	05437*	Pump Head Assembly (LP600) (43-48/54/55)		
29D	07161A-0100	Crush Washer (LP600-4000/LP301A-4000 only)	3	04533*	Pump Head Assembly (LP301A) (43-48/54/55)		
30	07779	Oil Scraper	3			*For LP301A-4000 or LP600-4000, add "-0100" to the part number	
31	07133	Oil Seal	3				
35	13235	Seal Sleeve (LP600/LP600-4000)	3				
35	13364	Seal Sleeve (LP301A/LP301A-4000)	3				
36	13237	Leakage Seal (LP600/LP600-4000)	3				
36	13238	Leakage Seal (LP301A/LP301A-4000)	3				
37	13239	Seal Case (LP600/LP600-4000)	3				
37	13240	Seal Case (LP301A/LP301A-4000)	3				
38	07140	O-Ring, Seal Case	3				
38A	13241	Support Ring for 38	3				
39	13012	O-Ring (LP600/LP600-4000)	3				
39	12055	O-Ring (LP301A/LP301A-4000)	3				
39A	13036	Support Ring for 39 (LP600/LP600-4000)	3				

Repair Kits

LP301A/LP301A-SSP/LP301A-4000/LP600/LP600-4000

Plunger Packing Kits

LP301A - # 09459

For pumps manufactured on or after 4/96

<u>Item</u>	<u>Part #</u>	<u>Description</u>	<u>Qty.</u>
36	13238	Leakage Seal	3
38	07140	O-Ring	3
38A	13241	Support Ring	3
39	12055	O-Ring	3
39A	07693	Support Ring	3
40	06083	V-Sleeve	6
40A	13366	Pressure Ring	3

LP301A-4000 - # 09459-4000

<u>Item</u>	<u>Part #</u>	<u>Description</u>	<u>Qty.</u>
36	13238	Leakage Seal	3
38	07140	O-Ring	3
38A	13241	Support Ring	3
39	12055	O-Ring	3
39A	07693	Support Ring	3
40	06083	V-Sleeve	6
40A	13366-0100	Pressure Ring	3

LP600 - # 09197

<u>Item</u>	<u>Part #</u>	<u>Description</u>	<u>Qty.</u>
36	13237	Leakage Seal	3
38	07140	O-Ring	3
38A	13241	Support Ring	3
39	13012	O-Ring	3
39A	13036	Support Ring	3
40	07322	V-Sleeve	3
40A	07268	Pressure Ring	3
40C	07322-0020	Sleeve, Teflon	3

LP600-4000 - # 09197-4000

<u>Item</u>	<u>Part #</u>	<u>Description</u>	<u>Qty.</u>
36	13237	Leakage Seal	3
38	07140	O-Ring	3
38A	13241	Support Ring	3
39	13012	O-Ring	3
39A	13036	Support Ring	3
40	07322	V-Sleeve	3
40A	07268-0100	Pressure Ring	3
40C	07322-0020	Sleeve, Teflon	3

Valve Kits

LP301A/LP301A-4000 - # 09196

<u>Item</u>	<u>Part #</u>	<u>Description</u>	<u>Qty.</u>
44A	07150	O-Ring	9
44B	06266	Support Ring	3
46A	07064	Valve Seat	3
46B	07063	Valve Plate	3
46C	07062-0100	Valve Spring	3

LP301A/LP301A-4000 - # 09196A

<u>Item</u>	<u>Part #</u>	<u>Description</u>	<u>Qty.</u>
44A	07150	O-Ring	9
44B	06266	Support Ring	3
46A	07064	Valve Seat	6
46B	07063	Valve Plate	6
46C	07062-0100	Valve Spring	6

LP600/LP600-4000 - # 09195

<u>Item</u>	<u>Part #</u>	<u>Description</u>	<u>Qty.</u>
44A	07150	O-Ring	6
44B	06266	Support Ring	3
46A	07064-0100	Valve Seat	3
46B	13130	Valve Plate	3
46C	07062-0100	Valve Spring	3

LP600/LP600-4000 - # 09195A

<u>Item</u>	<u>Part #</u>	<u>Description</u>	<u>Qty.</u>
44A	07150	O-Ring	9
44B	06266	Support Ring	3
46A	07064-0100	Valve Seat	6
46B	13130	Valve Plate	6
46C	07062-0100	Valve Spring	6

Oil Seal Kit - # 09577

<u>Item</u>	<u>Part #</u>	<u>Description</u>	<u>Qty.</u>
31	07133	Oil Seal	3