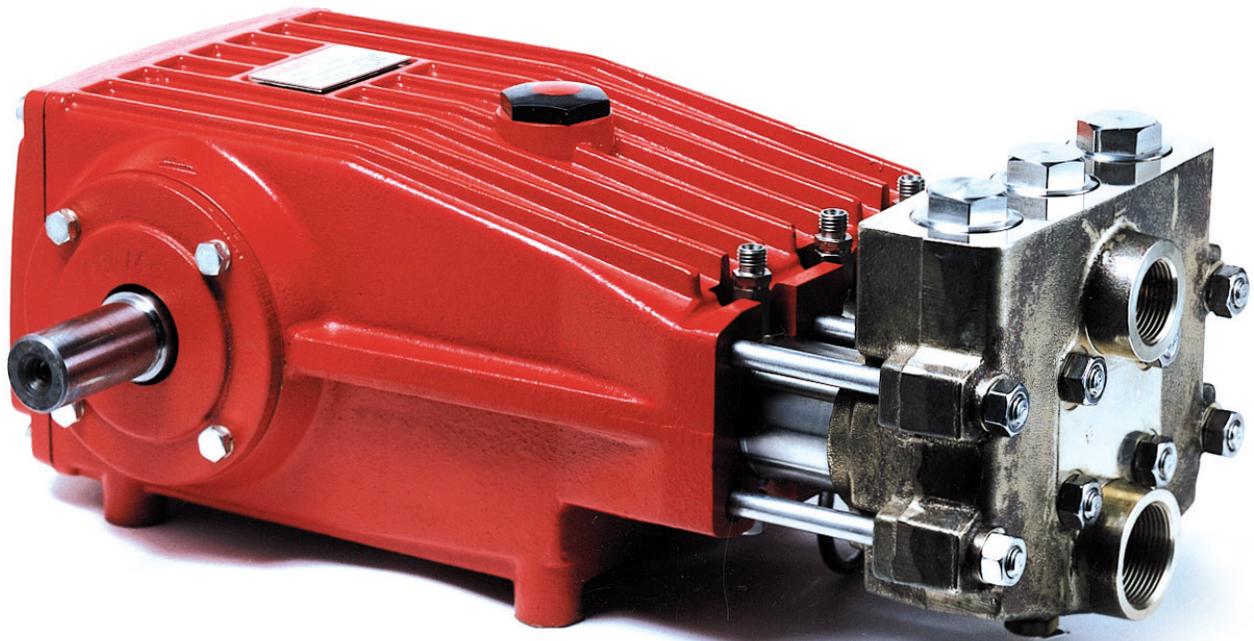


# Models

# LP350, LP400, LP450

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Triplex Ceramic  
Plunger Pump  
Operating Instructions/  
Repair and Service  
Manual



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**GIANT**  
Performance Under Pressure

## Contents:

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Updated 02/20

# INSTALLATION INSTRUCTIONS

## Operation and Maintenance

**Check oil level prior to starting and ensure trouble free water supply.**

**IMPORTANT!** If there is a **danger of frost**, the water in the pump and in the pump fittings (particularly the unloader valve) must be emptied. The second discharge port can also be used and the pump run "dry" for 1-2 minutes for this purpose.

Oil: Use only 95 fluid ounces (3.0 L) of SAE 90 Industrial gear lube oil. (Giant's p/n 01154)

Initial change after 50 operating hours and then every 500 operating hours, or after 6 months in any case.

**Caution!** When operating in damp places or with high temperature fluctuations, condensate (frothy oil) might occur in the gear box. In this situation, change the oil immediately. **Keep NPSH under control.**

Maximum input pressure is 145 PSI (10 bar), the maximum suction head is -4.35 PSI (-0.3 bar). Make sure that suction pulsation is sufficiently dampened. Water column resonance must be avoided.



### Safety Rules

Pump operation without safety valve as well as any excess in temperature or speed limits automatically voids the warranty. The safety valve must be regulated in accordance with the guidelines for liquid spraying units so that the admissible operating pressure can not be exceeded by more than 10%.

When the pump is in operation, the open shaft end must be covered up by a shaft protector (21). For direct drive operations, the driven shaft side and coupling must have a guard over the connected area.

Pressure in discharge line and in pump must be at zero before any maintenance to the pump takes place. Close the fluid supply to the inlet port(s). Disconnect fuses to ensure that the driving motor does not accidentally get switched on. Make sure that all parts on the pressure side of the unit are vented and refilled, with pressure at zero, before starting the pump.

In order to prevent air, or air/water mixture being absorbed and to prevent cavitation occurring, the pump-npshr, positive suction head and water temperature must be kept under control.

Required NPSH refers to water: Specific weight 0.0624 lb/ft<sup>3</sup> (1kg/dm<sup>3</sup>), viscosity 1°E at maximum permissible revolutions.

**Cavitation and/or compression of gases lead to uncontrollable pressure kicks which can ruin pump and unit parts and also be dangerous to the operator or anyone standing nearby.**

Giant pumps are suitable for pumping clean water and other non-aggressive or abrasive media with a specific weight similar to water.

**Before pumping other liquids - especially inflammable, explosive and toxic media - the pump manufacturer must under all circumstances be consulted with regard to the resistance of the pump material. It is the responsibility of the equipment manufacturer and/or operator to ensure that all pertinent safety regulations are adhered to.**

**NOTE: Contact Giant Industries for Service School Information. Phone: (419)-531-4600**

# Specifications

## Model LP350

	U.S.	Metric
Flow .....	22.6 GPM.....	85.5 L/min
Discharge Pressure .....	2300 PSI .....	160 bar
Power Consumption .....	37.4 BHP.....	27.9 kW
Crankshaft Speed .....		1000 RPM
Inlet Pressure.....	-4.35 to 145 PSI .....	-0.3 to 10 bar
Plunger Diameter .....	1.18" .....	30mm
Stroke .....	1.65" .....	42mm
Crankcase Oil Capacity .....	95 fl.oz. ....	3.0 L
Temperature of Pumped Fluids.....	140 °F @1000 RPM .....	60 °C @1000 RPM
.....	160 °F Up to 500 RPM .....	70 °C Up to 500 RPM
Inlet Port .....		1-1/4" BSP
Discharge Port .....		1" BSP
Shaft Mounting.....		Either side
Shaft Rotation .....		Top of pulley towards manifold
Weight (approximate) .....	110 lbs.....	50 kg
Crankshaft Diameter .....		35mm
NPSHR .....	29.2 Ft. of Head .....	8.9 mWs

### PULLEY INFORMATION

Pulley selection and pump speed are based on a 1725 RPM motor and "B" section belts. When selecting desired GPM, allow for a ±5% tolerance on pumps output due to variations in pulleys, belts and motors among manufacturers.

1. Select GPM required, then select appropriate motor and pump pulley from the same line.
2. The desired pressure is achieved by selecting the correct nozzle size that corresponds with the pump GPM.

### HORSEPOWER INFORMATION

Horsepower ratings shown are the power requirements for the pump. Gas engine power outputs must be approximately twice the pump power requirements shown above.

We recommend that a 1.1 service factor be specified when selecting an electric motor as the power source. To compute specific pump horsepower requirements, use the following formula:

$$HP = (GPM \times PSI) / 1440$$

<b>LP350 PULLEY SELECTION AND HORSEPOWER REQUIREMENTS</b>							
<b>PUMP PULLEY</b>	<b>MOTOR PULLEY</b>	<b>RPM</b>	<b>GPM</b>	<b>500 PSI</b>	<b>1000 PSI</b>	<b>2000 PSI</b>	<b>2300 PSI</b>
12.75"	3.95"	500	11.3	3.9	7.8	15.7	18.0
12.75"	4.95"	640	14.5	5.0	10.0	20.1	23.1
12.75"	5.75"	750	16.9	5.9	11.8	23.5	27.1
12.75"	6.15"	805	18.2	6.3	12.6	25.3	29.0
12.75"	6.55"	865	19.5	6.8	13.6	27.1	31.2
12.75"	6.95"	940	21.2	7.4	14.7	29.5	33.9
12.75"	7.50"	1000	22.6	7.8	15.7	31.4	36.1

# Specifications

## Model LP400

	U.S.	Metric
Flow .....	15.1 GPM .....	57 L/min
Discharge Pressure .....	3600 PSI .....	250 bar
Power Consumption .....	39 BHP .....	29.1 kW
Crankshaft Speed .....		Up to 1000 RPM
Inlet Pressure.....	-4.34 to 145 PSI .....	-0.3 to 10 bar
Plunger Diameter.....	0.94" .....	24mm
Stroke .....	1.65" .....	42mm
Crankcase Oil Capacity .....	95 fl.oz.....	3.0 L
Temperature of Pumped Fluids.....	140 °F @1000 RPM .....	60 °C @1000 RPM
.....	160 °F Up to 500 RPM .....	70 °C Up to 500 RPM
Inlet Port .....		1-1/4" BSP
Discharge Port.....		1" BSP
Shaft Mounting.....		Either side
Shaft Rotation.....		Top of pulley towards manifold
Weight (approximate) .....	110 lbs. ....	50 kg
Crankshaft Diameter.....		35mm
NPSHR .....	25.9 Ft. of Head .....	7.9 mWs

### PULLEY INFORMATION

Pulley selection and pump speed are based on a 1725 RPM motor and "B" section belts. When selecting desired GPM, allow for a ±5% tolerance on pumps output due to variations in pulleys, belts and motors among manufacturers.

1. Select GPM required, then select appropriate motor and pump pulley from the same line.
2. The desired pressure is achieved by selecting the correct nozzle size that corresponds with the pump GPM.

### HORSEPOWER INFORMATION

Horsepower ratings shown are the power requirements for the pump. Gas engine power outputs must be approximately twice the pump power requirements shown above.

We recommend that a 1.1 service factor be specified when selecting an electric motor as the power source. To compute specific pump horsepower requirements, use the following formula:

$$HP = (GPM \times PSI) / 1440$$

<b>LP400 PULLEY SELECTION AND HORSEPOWER REQUIREMENTS</b>							
PUMP PULLEY	MOTOR PULLEY	RPM	GPM	2000 PSI	2500 PSI	3000 PSI	3600 PSI
12.75"	3.95"	500	7.6	10.5	13.1	15.7	18.9
12.75"	4.95"	640	9.7	13.4	16.7	20.1	24.1
12.75"	5.75"	750	11.3	15.6	19.5	23.4	28.1
12.75"	6.15"	805	12.2	16.8	21.0	25.2	30.3
12.75"	6.55"	865	13.1	18.1	22.6	27.1	32.5
12.75"	6.95"	940	14.2	19.6	24.5	29.4	35.3
12.75"	7.50"	1000	15.1	20.8	26.0	31.2	37.5

# Specifications

## Model LP450

	U.S.	Metric
Flow .....	19.7 GPM.....	74.5 L/min
Discharge Pressure .....	2600 PSI.....	180 bar
Power Consumption .....	36.7 BHP.....	27.4 kW
Crankshaft Speed .....		Up to 1000 RPM
Inlet Pressure.....	-4.35 to 145 PSI.....	-0.3 to 10 bar
Plunger Diameter.....	1.1" .....	28mm
Stroke .....	1.65".....	42mm
Crankcase Oil Capacity .....	95 fl.oz. ....	3.0 L
Temperature of Pumped Fluids.....	140 °F @1000 RPM .....	60 °C @1000 RPM
.....	160 °F Up to 500 RPM.....	70 °C Up to 500 RPM
Inlet Port .....		1-1/4" BSP
Discharge Port.....		1" BSP
Shaft Mounting.....		Either side
Shaft Rotation.....		Top of pulley towards manifold
Weight (approximate) .....	110 lbs.....	50 kg
Crankshaft Diameter.....		35mm
NPSHR .....	28.2 Ft. of Head .....	8.6 mWs

### PULLEY INFORMATION

Pulley selection and pump speed are based on a 1725 RPM motor and "B" section belts. When selecting desired GPM, allow for a ±5% tolerance on pumps output due to variations in pulleys, belts and motors among manufacturers.

1. Select GPM required, then select appropriate motor and pump pulley from the same line.
2. The desired pressure is achieved by selecting the correct nozzle size that corresponds with the pump GPM.

### HORSEPOWER INFORMATION

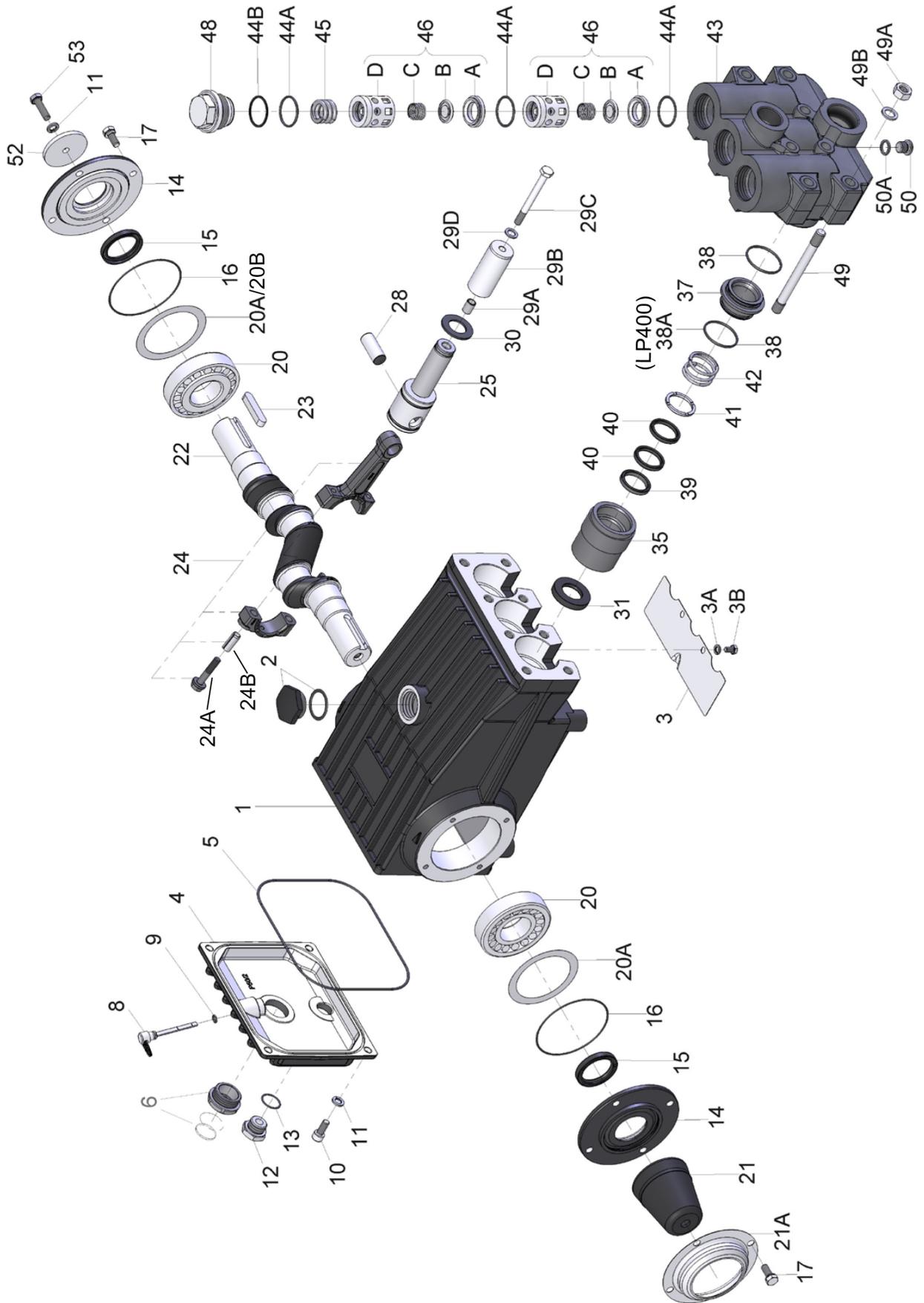
Horsepower ratings shown are the power requirements for the pump. Gas engine power outputs must be approximately twice the pump power requirements shown above.

We recommend that a 1.1 service factor be specified when selecting an electric motor as the power source. To compute specific pump horsepower requirements, use the following formula:

$$HP = (GPM \times PSI) / 1440$$

<b>LP450 PULLEY SELECTION AND HORSEPOWER REQUIREMENTS</b>							
<b>PUMP PULLEY</b>	<b>MOTOR PULLEY</b>	<b>RPM</b>	<b>GPM</b>	<b>1000 PSI</b>	<b>1500 PSI</b>	<b>2000 PSI</b>	<b>2600 PSI</b>
12.75"	3.95"	500	9.8	6.8	10.3	13.7	17.8
12.75"	4.95"	640	12.6	8.7	13.1	17.5	22.7
12.75"	5.75"	750	14.8	10.3	15.4	20.5	26.7
12.75"	6.15"	805	15.8	11.0	16.5	22.0	28.6
12.75"	6.55"	865	17.0	11.8	17.7	23.6	30.7
12.75"	6.95"	940	18.5	12.8	19.3	25.7	33.4
12.75"	7.50"	1000	19.7	13.7	20.5	27.3	35.5

# LP350, LP400, LP450 - EXPLODED VIEW



## LP350, LP400 & LP450 PARTS LIST

<u>ITEM #</u>	<u>PART #</u>	<u>DESCRIPTION</u>	<u>QTY</u>	<u>ITEM #</u>	<u>PART #</u>	<u>DESCRIPTION</u>	<u>QTY</u>
1	07759	Crankcase	1	37	06651	Seal Case (LP350/LP450)	3
2	13000	Oil Filler Plug Assembly	1	38	07140	O-Ring (LP400)	3
3	05940	Cover Plate	1	38	07700	O-Ring (LP350/LP450)	6
3A	07223-0100	Spring Ring	2	38A	12055	O-Ring (LP400)	3
3B	05051	Hexagon Screw	2	39	07271	Pressure Ring (LP350)	3
4	06085	Crankcase Cover	1	39	13366	Pressure Ring (LP400)	3
5	07104	O-Ring, Crankcase Cover	1	39	13013	Pressure Ring (LP450)	3
6	05943	Oil Sightglass with Gasket	1	40	13016	V-Sleeve (LP350)	6
8	06086	Oil Dipstick	1	40	06083	V-Sleeve (LP400)	6
9	01009	O-Ring, Dipstick	1	40	13015	V-Sleeve (LP450)	6
10	01010	Cylinder Screw	4	41	07273	Support Ring (LP350)	3
11	01011-0400	Spring Ring	5	41	13367	Support Ring (LP400)	3
12	07109	Plug	1	41	06652	Support Ring (LP450)	3
13	06015	O-Ring	1	42	07338	Pressure Spring (LP400)	3
14	07111	Bearing Cover	2	42	14084	Pressure Spring (LP350/LP450)	3
15	07112	Radial Shaft Seal	2	43	13018	Valve Casing	1
16	07113	O-Ring	2	44A	07150	O-Ring	9
17	07114	Hexagon Screw	8	44B	06266	Support Ring	3
20	07116	Taper Roller Bearing	2	45	06078	Compression Spring	3
20A	07117	Fitting Disc	1-3	46	07060	Valve Assembly	6
20B	13001	Fitting Dis (May not be present)	1-3	46A	07064	Valve Seat	6
21	05376	Shaft Protector	1	46B	07063	Valve Plate	6
21A	05377	Shaft Guard Holder	1	46C	07750-0100	Valve Spring	6
22	13242	Crankshaft	1	46D	07066	Spacer Pipe	6
23	13243	Fitting Key	1	48	06077	Plug	3
24	13340	Connecting Rod Assembly	3	49	07754	Stud bolt	8
24A	13277	Inner Hexagon Screw	6	49A	07158	Hexagon Nut	8
24B	13278	Spring Washer	6	49B	07159	Disc	8
25	13244	Crosshead / Plunger Assembly	3	50	07423	Plug, 1/4" BSP	1
28	13232	Crosshead Pin	3	50A	07161	Copper Ring	1
29A	07256	Centering Sleeve	3	52	13020	Disc for Crankshaft	1
29B	13046	Plunger Pipe (LP400)	3	53	06607	Hexagon Screw	1
29B	13005	Plunger Pipe (LP450)	3		04165	Crankcase Assembly (1-29A/30/31/49/49A-B/52/53)	
29B	07261	Plunger Pipe (LP350)	3		04276	Plunger Replacement Kit, LP350 (29B-D/35-42)	
29C	13007	Tensioning Screw	3		04274	Plunger Replacement Kit, LP400 (29B-D/35-42)	
29D	07258	Copper Ring	3		04275	Plunger Replacement Kit, LP450 (29B-D/35-42)	
30	07779	O-Ring	3		03189	Manifold Assembly (43-48/50/50A)	
31	07133	Oil Seal	3				
35	13392	Seal Sleeve (LP400)	3				
35	06650	Seal Sleeve (LP350, LP450)	3				
37	13393	Seal Case (LP400)	3				

### LP350, LP400 & LP450 REPAIR KITS

#### LP350 Packing Kit #09546

<u>Item</u>	<u>Part #</u>	<u>Description</u>	<u>Qty</u>
38	07700	O-Ring	6
40	13016	V-Sleeve	6

#### LP400 Packing Kit #09548

<u>Item</u>	<u>Part #</u>	<u>Description</u>	<u>Qty</u>
38	07140	O-Ring	3
38A	12055	O-Ring	3
40	06083	V-sleeve	6

#### LP450 Packing Kit #09549

<u>Item</u>	<u>Part #</u>	<u>Description</u>	<u>Qty</u>
38	07700	O-Ring	6
40	13015	V-Sleeve	6

#### Valve Kit

#09196

<u>Item</u>	<u>Part #</u>	<u>Description</u>	<u>Qty</u>
44A	07150	O-Ring	6
44B	06266	Support Ring	3
46A	07064	Valve Seat	3
46B	07063	Valve Plate	3
46C	07750-0100	Valve Spring	3

#### Oil Seal Kit

#09577

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

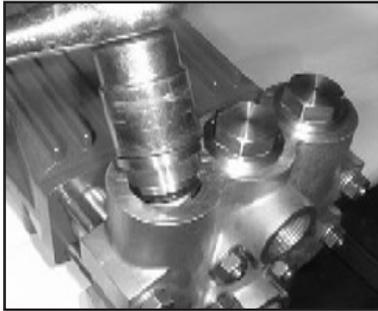
# PUMP SYSTEM MALFUNCTION

<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

<b>Preventative Maintenance Check List &amp; Recommended Spare Parts List</b>						
<b>Check</b>	<b>Daily</b>	<b>Weekly</b>	<b>50 hrs</b>	<b>Every 500 hrs</b>	<b>Every 1500 hrs</b>	<b>Every 3000 hrs</b>
Oil Level/Quality	X					
Oil Leaks	X					
Water Leaks	X					
Belts, Pulley		X				
Plumbing		X				
<b>Recommended Spare Parts</b>						
Oil Change p/n 01154			X	X		
Seal Spare Parts (1 kit/pump) (see page 7 for kit list)					X	
Oil Seal Kit (1 kit/pump) (see page 7 for kit list)					X	
Valve Spare Parts (1 kit/pump) (see page 7 for kit list)						X

## REPAIR INSTRUCTION - LP350, LP400, LP450

### TO CHECK VALVES



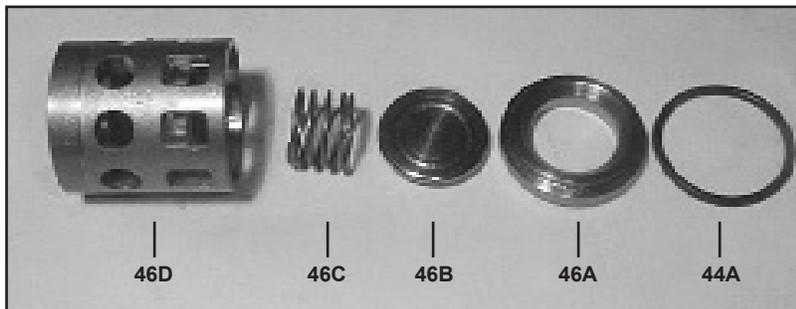
1) With a 30mm wrench remove the three (3) tension plugs (48) along with the tension springs (45) from the top of the valve casing (43).



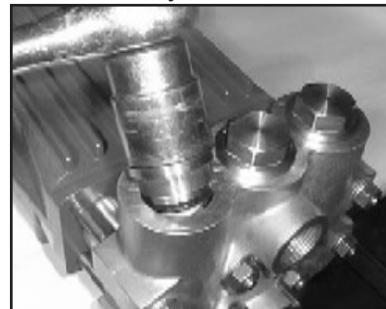
2) Remove discharge and inlet valve assemblies (46) by pulling them upwards out of the valve casing (43). It may be necessary to use a slide hammer tool.



3) With the valve assembly (46) pointed down, place a dowel rod through the top of spacer pipe (46D). Hold assembly in hand and tap end of dowel sharply with mallet until assembly breaks free.



4) Inspect valve seats (46A) and valve plates (46B) for damage and replace if needed. Check valve casing (43) surfaces for damage. Replace O-Rings (44A) and reinstall valve assemblies (46) into valve casing. (Lubricate O-Rings before installation.)



5) Replace tension plugs (48) and tighten them securely to 107 ft-lbs (145 Nm).

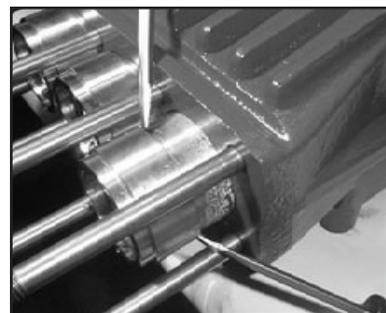
### SEAL AND PLUNGER REPLACEMENT



6) Remove the eight (8) manifold nuts and washers (49A,B) using a 19mm wrench and pull off valve casing (43).



7) If needed, tap valve casing with a rubber mallet to remove it.



8) Using two flat screw drivers, pry seal sleeve (35) out of crankcase guides.

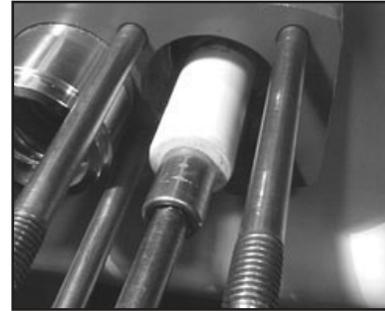
## REPAIR INSTRUCTION - LP350, LP400, LP450



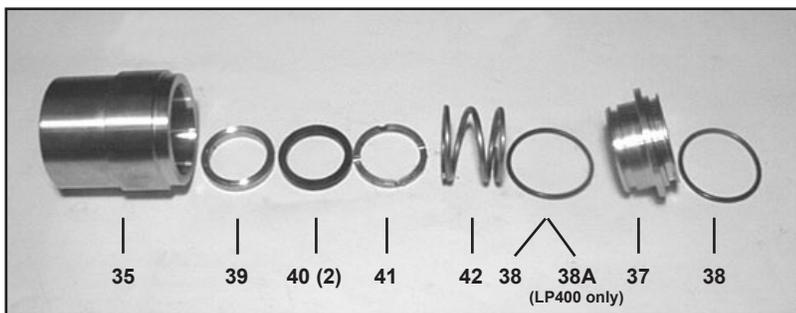
9) Remove seal case (37) from seal sleeve (35).



10) Check plunger surface (25 and 29B) and seals (40) for wear and pitting. If none is found, proceed to step twelve.

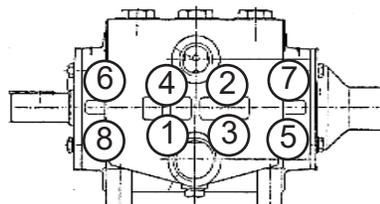


11) If plunger (29B) is worn, remove tension screw (29C) with a 17mm wrench. Clean tension screw with wire brush to remove any old locktite. Discard copper gasket (29D) and replace with new. Clean the front surface of plunger/ crosshead assembly (25). Install new plunger (29B) onto plunger/ crosshead assembly. Put some locktite on both surfaces of copper gasket and tension screw threads. Secure plunger in place with tension screw and gasket and tighten to 26 ft.-lbs. (35 Nm).



12) Remove v-sleeves (40) and support ring (41) for seal case (37) and replace with new elastomers. Lubricate parts before reinstalling into seal sleeve. Replace seal sleeve/ seal case assembly (35/37) into the valve casing (43).

14) Replace nuts and washers (49A, B) and tighten to 59 ft.-lbs. (80Nm) in the pattern as shown to the right.



13) Place entire manifold assembly sleeve assembly over the studs (49) and push firmly until seated against the crankcase (1).

# REPAIR INSTRUCTIONS - LP350, LP400, LP450

## DISASSEMBLY OF CRANKCASE

- 1) Remove valve casing (43) and plunger pipe (29B), drain oil.
- 2) Screw off gear cover (4) and bearing cover (14).
- 3) Remove connecting rod screws (24) and push the front of connecting rod forward as far as possible. Remove back halves of connecting rods, note which position from which they came from.
- 4) Turning the crankshaft slightly, carefully hit on side of crankshaft (22) with a rubber mallet until crankshaft is loose.

**CAUTION: Do not bend the connecting rod shafts. Check crankshaft and connecting rod surfaces, shaft seals and taper roller bearings.**

## REASSEMBLY

- 5) Using a soft tool, press in the outer bearing ring until the outer edge lines up with the outer edge of the bearing hole (1).
- 6) Remove the bearing cover (14) together with the shaft seal (15) and O-Ring (16). Fit crankshaft through bearing hole on the opposite side.
- 7) Press in outer bearing (20) inwards with the bearing cover (14). Make sure that the crankshaft is in a vertical position and turn it slowly so that the taper rollers of the bearings touch the edge of outer bearing ring.
- 8) Adjust axial bearing clearance to at least .004" and maximum at .006" by placing fitting discs (20A and/or 20B) under the bearing cover (14).

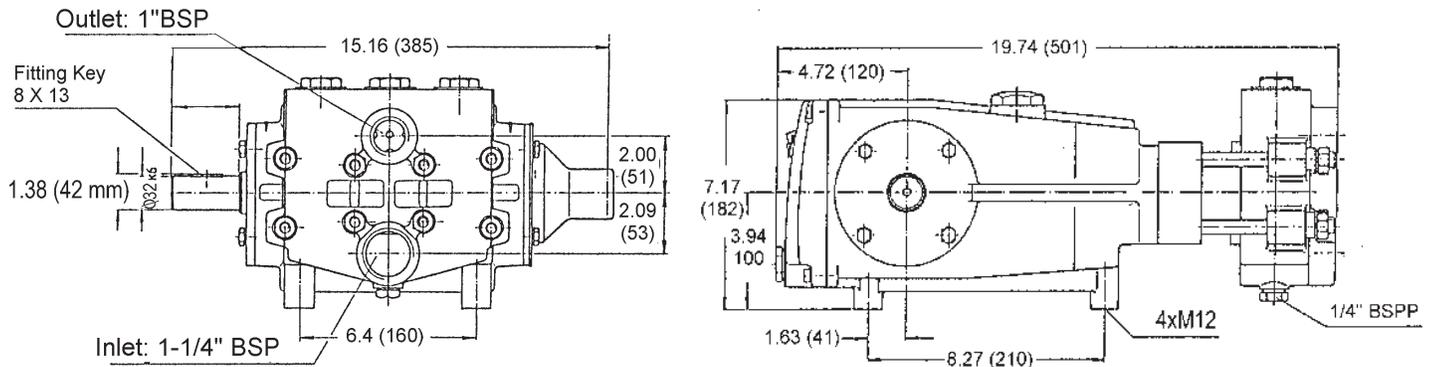
**CAUTION: After assembly has been completed, the crankshaft should turn easily and with very little clearance.**

- 9) Bolt connecting rod halves together making sure they are replaced in the same position from which they came. Tighten connecting rod screws (24A) to 21 ft.-lbs. (28 Nm).

## LP350, LP400, LP450 TORQUE SPECIFICATIONS

Pos.	Item #	Description	Lubrication Info	Torque Amount
1	07759	Crankcase	Molycote Cu-Paste	
6	05943	Oil Sight Glass	Loctite 572	29 ft.-lbs. (40 Nm)
10	01010	Cylinder Screw		221 in.-lbs. (25 Nm)
12	07109	Plug		29 ft.-lbs. (40 Nm)
17	07114	Hexagon Screw		221 in.-lbs. (25 Nm)
24	13340	Connecting Rod Assembly		21 ft.-lbs. (28 Nm)
29C	13007	Tension Screw	Loctite 243	26 ft.-lbs. (35 Nm)
31	07133	Oil Seal	Loctite 403	
48	06077	Plug		107 ft.-lbs. (145 Nm)
49	07754	Stud Bolt	Loctite 270	
49A	07158	Hexagon Nut		59 ft.-lbs. (80 Nm)

## LP350, LP400 & LP450 DIMENSIONS (inches)



### GIANT INDUSTRIES LIMITED WARRANTY

Giant Industries, Inc. pumps and accessories are warranted by the manufacturer to be free from defects in workmanship and material as follows:

1. Five (5) years from the date of shipment for all pumps used in portable pressure washers with NON-SALINE, clean water applications.
2. Two (2) years from the date of shipment for Giant pumps used in car wash applications.
3. One (1) year from the date of shipment for all other Giant industrial and consumer pumps.
4. Six (6) months from the date of shipment for all rebuilt pumps
5. Ninety (90) days from the date of shipment for all Giant accessories.

This warranty is limited to repair or replacement of pumps and accessories of which the manufacturer's evaluation shows were defective at the time of shipment by the manufacturer. The following items are NOT covered or will void the warranty:

1. Defects caused by negligence or fault of the buyer or third party.
2. Normal wear and tear to standard wear parts.
3. Use of repair parts other than those manufactured or authorized by Giant.
4. Improper use of the product as a component part.
5. Changes or modifications made by the customer or third party.
6. The operation of pumps and or accessories exceeding the specifications set forth in the Operations Manuals provided by Giant Industries, Inc.

Liability under this warranty is on all non-wear parts and limited to the replacement or repair of those products returned freight prepaid to Giant Industries which are deemed to be defective due to workmanship or failure of material. A Returned Goods Authorization (R.G.A.) number and completed warranty evaluation form is required prior to the return to Giant Industries of all products under warranty consideration. Call (419)-531-4600 or fax (419)-531-6836 to obtain an R.G.A. number.

Repair or replacement of defective products as provided is the sole and exclusive remedy provided hereunder and the MANUFACTURER SHALL NOT BE LIABLE FOR FURTHER LOSS, DAMAGES, OR EXPENSES, INCLUDING INCIDENTAL AND CONSEQUENTIAL DAMAGES DIRECTLY OR INDIRECTLY ARISING FROM THE SALE OR USE OF THIS PRODUCT.

THE LIMITED WARRANTY SET FORTH HEREIN IS IN LIEU OF ALL OTHER WARRANTIES OR REPRESENTATION, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND ALL SUCH WARRANTIES ARE HEREBY DISCLAIMED AND EXCLUDED BY THE MANUFACTURER.



**WARNING:** This product might contain a chemical known to the State of California to cause cancer, and birth defects or other reproductive harm.  
For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)