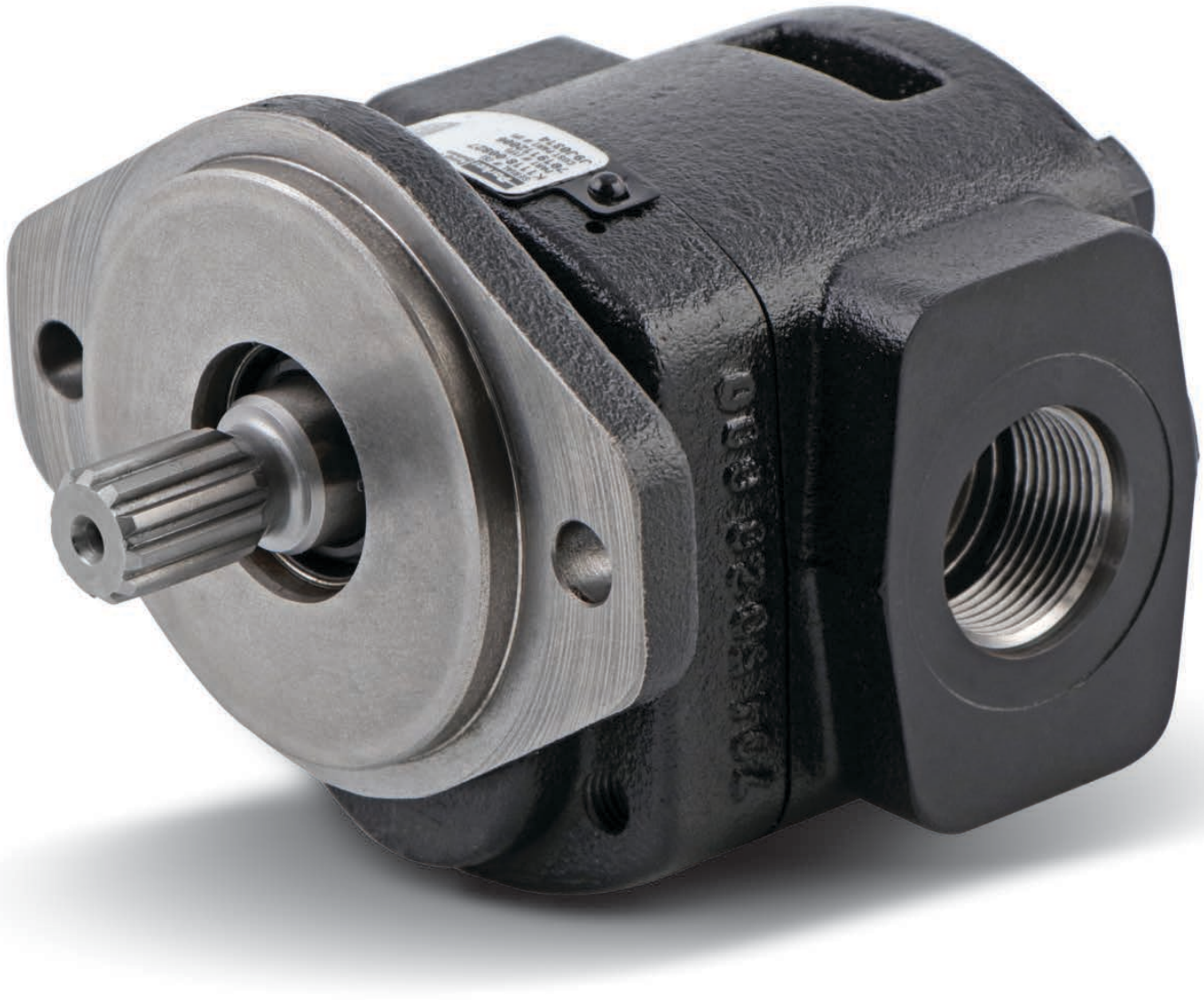


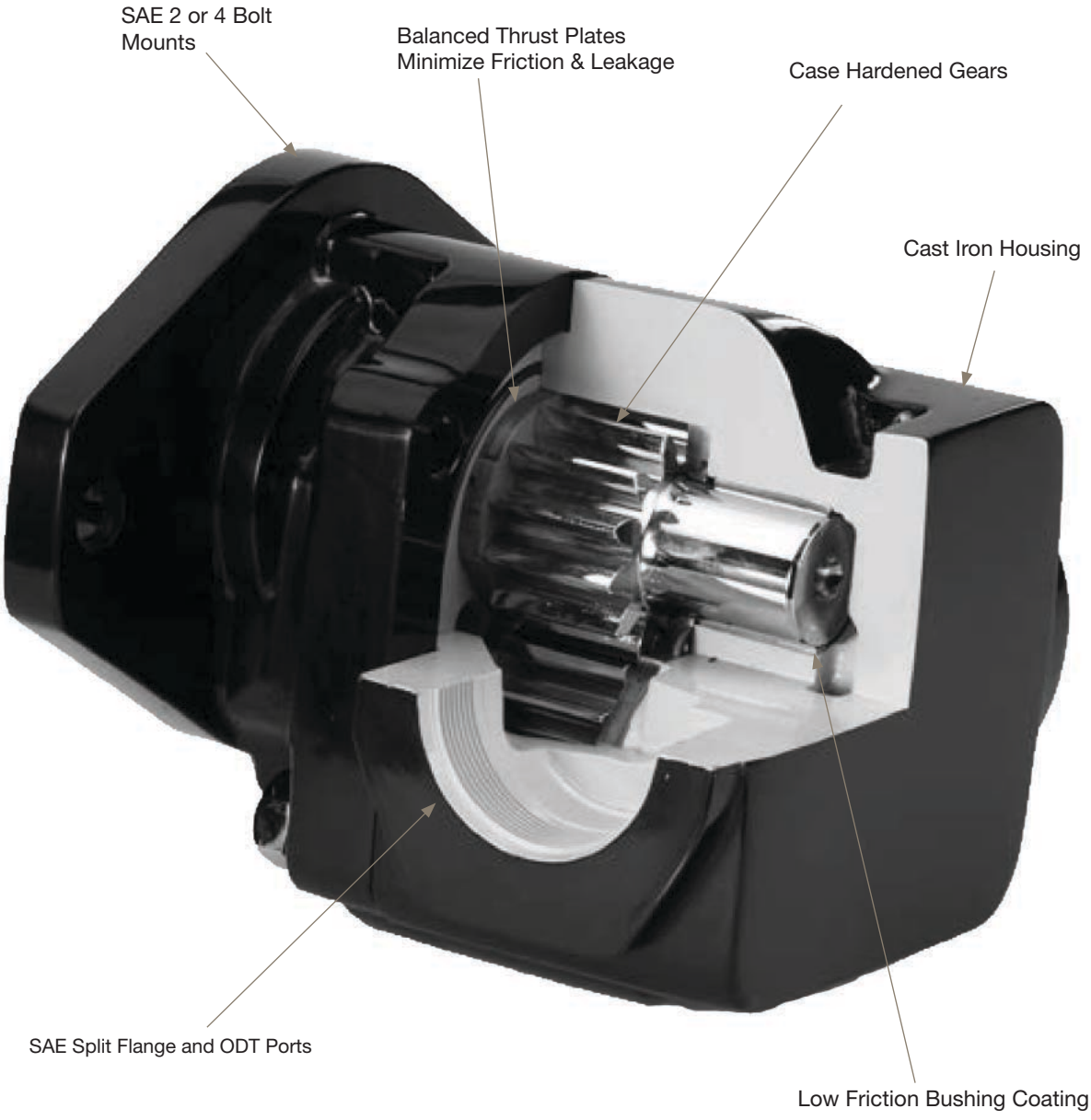
PGP 600 Series Cast Iron Pumps Service Manual

Parker

ENGINEERING YOUR SUCCESS.

Table of Contents

Single Pump



Use Genuine Parker Replacement Parts

These service instructions will familiarize you with Parker's single and multiple pumps, their component parts, the relative position of each part proper methods for assembly or disassembly of the units

To facilitate the repair of these units, and before any work is done, we suggest that you first read all of the steps used in disassembly and assembly.

Dirt is the enemy of any hydraulic system. The first requirement of good maintenance of hydraulic equipment is cleanliness. MAKE SURE YOU DISASSEMBLE AND ASSEMBLE YOUR HYDRAULIC EQUIPMENT IN A CLEAN AREA.

The pictures show Model PGP620. Notes in the text cover variations between this unit and the other models.

It is important to airblast all parts and wipe them with a clean, lintless cloth before assembly.

USE CAUTION IN GRIPPING ALL PARTS IN THE VISE TO AVOID DAMAGING MACHINED SURFACES

A pump must be driven in the direction of rotation for which it was built; otherwise, the pressure will blow the shaft seal. Check the exploded view and notes at right for proper direction of rotation.

Parker's Replacement Parts

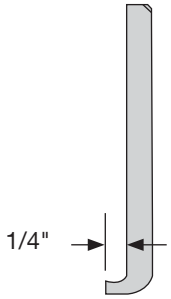
Parker's replacement parts are of original equipment standards. For assured quality of material and workmanship, and for compatibility in assembly, USE ONLY GENUINE PARTS.

Check all replacement parts before installing them to be certain that they were not damaged in shipment.

Tool List	
Arbor press	Bearing puller (Owatonna Tool Co. M D - 956 or equivalent)
Awl	Deburring tool (an old file with cutting teeth ground off)
1-1/2" Dia. steel ball	No. 3 non-hardening sealant or equivalent
Clean, lintless cloths	Permatex Aviation Form-A-Gasket™
Machinist's hammer	Medium grit carborundurn stone
Soft hammer	Scale (1/32" or 1/64" graduations)
Oil and grease	Vise with 6" minimum opening
Snap ring pliers	Seal removal tool (See A)
Prick punch	Bushing installation tool (See B)
Small screw driver	Special steel sleeve (See C)
Torque wrench	

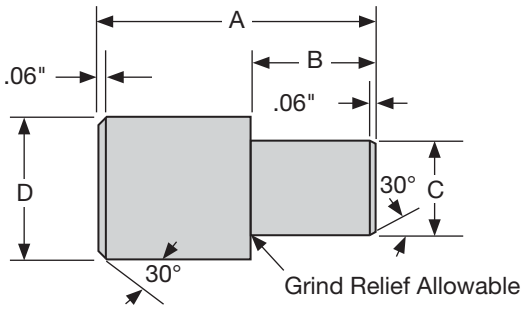
Bar for lip seal installation:	
PGP/PGM610 use 1-5/8" dia. x 2" bar (22mm x 50mm)	PGP/PGM640 use 2-1/2" dia. x 2" bar (32mm x 50mm)
PGP/PGM620 use 1-3/4" dia. x 2" bar (24mm x 50mm)	

A **Seal Removal Tool**
Easily made from an old screw driver. Heat the tip and bend as shown. Grind the tip to fit the notch behind the shaft seal.



WARNING: This product can expose you to chemicals including lead or DEHP which are known to the state of California to cause cancer, birth defects, and other reproductive harm. www.p65warnings.ca.gov

B **Bushing Installation Tool:** A.I.S.I 8620 Bearing Quality Steel Heat Treated

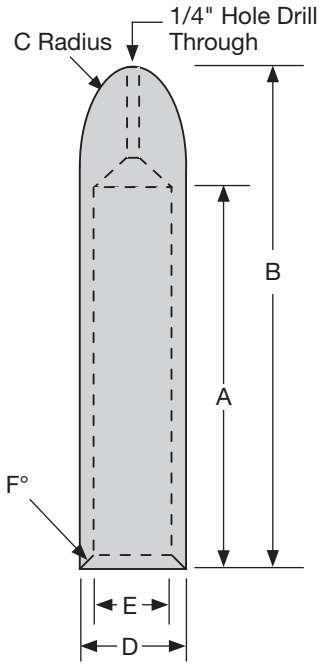


Pump/Motor	A	B	C Dia.	D Dia.
PGP/PGM610	3.000"	.854"	.854" +.000" -.002"	1.250
PGP/PGM620	3.000"	1.092"	1.172" +.000" -.002"	1.250
PGP/PGM640	3.000"	1.280"	1.280" +.000" -.002"	1.625

C **Special Steel Sleeve**
The special steel sleeve is used to insert the drive shaft through the lip seal without damage and can be made from bar stock:

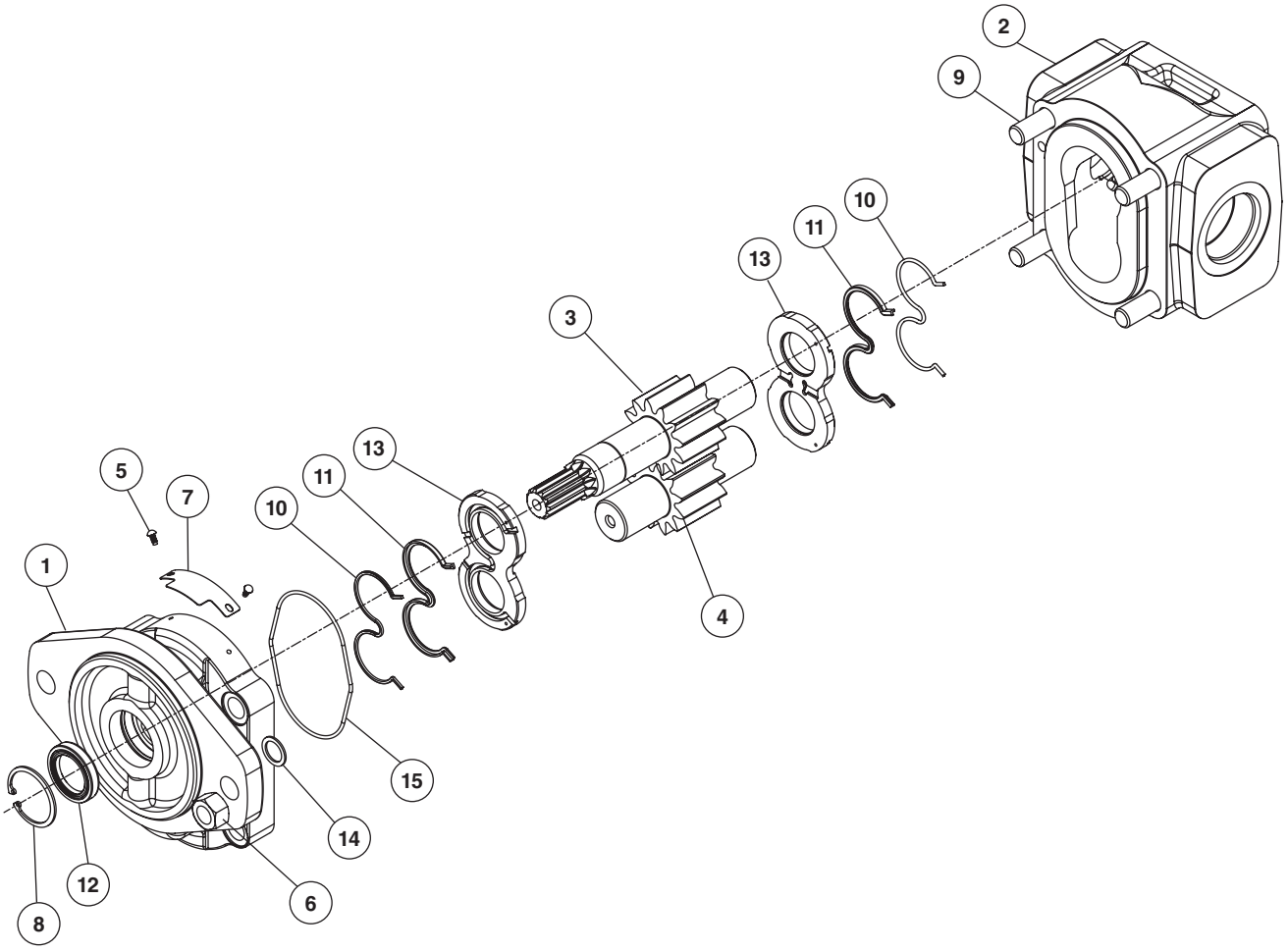
PGP/PGM610: Use a 1" dia. x 3-1/4" bar
PGP/PGM620: Use a 1-3/8" dia. x 4-5/8" bar
PGP/PGM640: Use a 1" dia. x 4-5/8" bar

The drawing and chart give details for making this special tool.



Pump/Motor	A	B	C Radius	D Dia.	E Dia.	F° Chamfer
PGP/PGM610	1-7/8"	3"	9/16"	.870" +.000" -.002"	.610" +.000" -.002"	.015" x 60°
PGP/PGM620	3-9/64"	4-21/64"	9/16"	.925" +.000" -.002"	.881" +.000 -.002"	.015" x 60°
PGP/PGM640	3-3/8"	4-1/2"	9/16"	1.290" +.000" -.002"	1.250" +.000" -.002"	.015" x 60°
PGP/PGM620 - Mylar Sleeve Part #8682-133-00G						

WARNING: This product can expose you to chemicals including lead or DEHP which are known to the state of California to cause cancer, birth defects, and other reproductive harm. www.p65warnings.ca.gov



ITEM	DESCRIPTION	QUANTITY
1	Shaft End Cover, Flange	1
2	Gear Housing, Body	1
3	Gear Shaft, Drive Gear	1
4	Driven Gear, Idler Gear	1
5	Drive Screw	2
6	Hex Nut	4
7	Name Plate	1
8	Snap Ring	1
9	Stud	4
10	Pump Seal Element	2
11	Pump Seal Energ	2
12	Lip Seal	1
13	Balance Plate	2
14	Washer	4
15	Section Seal	1

Start Disassembly

CAUTION:
1. If prying off sections becomes necessary, take extreme care not to mar or damage machined surfaces. Excessive force while prying can result in misalignment and seriously damage parts.
2. If parts are difficult to fit during assembly, tap gently with a soft hammer. (Never use an iron hammer.)
3. Gears are closely matched, therefore they must be kept together as sets, avoid touching gear journals when removed from a unit. Handle with care to avoid damage to the journals or teeth.
4. Never hammer bushings into bores. Use an arbor press.

1) Place the pump in a vise with the drive gear pointing up (**Fig. 1**). Match-mark all sections.

Be sure to align these marks when reassembling.

DO NOT GRIP ON OR NEAR ANY MACHINED SURFACES DURING ASSEMBLY OR DISASSEMBLY.

Figure 1

2) Remove four bolts and cap screws on single units or the 4 hex nuts, studs and washers of multiple units (**Fig. 2**).

Use a wrench to remove the 4 capscrews on single units or the 4 hex nuts, studs and washers of multiple units. The back bolts might need to be loosened and the shaft end cover slightly lifted to reach the back nuts all the way removed.

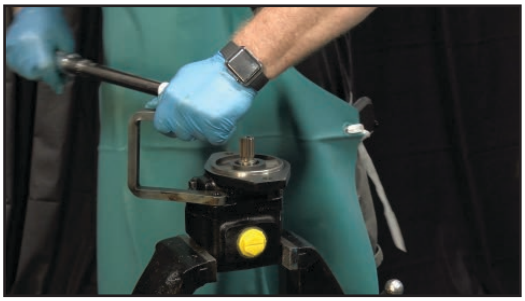


Figure 2

3) Place a seal guide over the seal before removing the shaft end cover (**Fig. 3**). This step will help avoid damaging the seal.

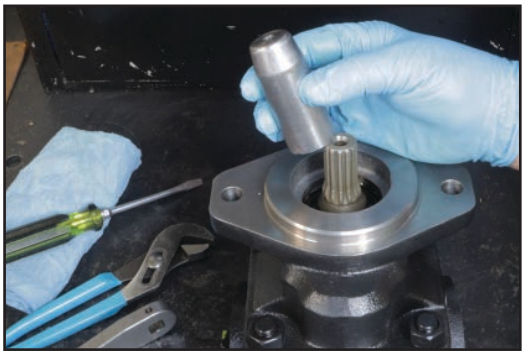


Figure 3

4) Lift off the shaft end cover. (**Fig. 4**). If prying with screw driver is necessary, be careful not to damage the machined surfaces.


Figure 4

5) Remove section seal if didn't come off with the shaft end cover (**Fig. 5**).

Replace with new seal. Install snugly back into bottom of shaft end cover for re-assembly.

Contact an authorized Parker Service Center to determine and order the proper seal kit for your pump.

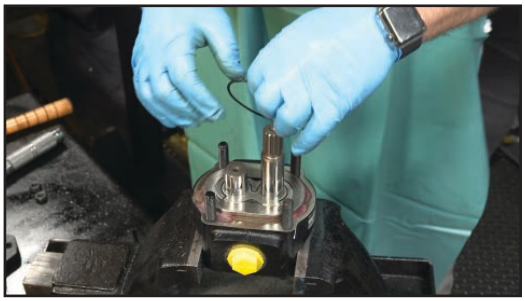


Figure 5

6) Remove the thrust plate (**Fig. 6**). Examine and replace if necessary. See Wear Guide (pages 18-19).

Below are some examples of damaged plates (**Fig. 6a, 6b, 6c, 6d**).


Figure 6

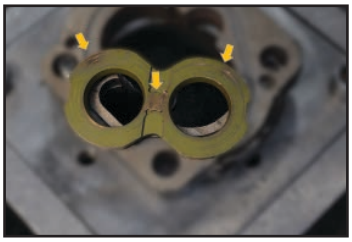


Figure 6a

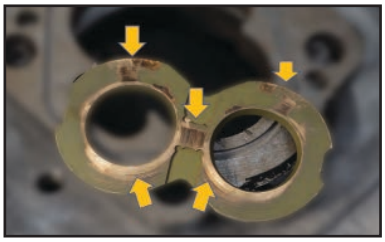


Figure 6b


Figure 6c

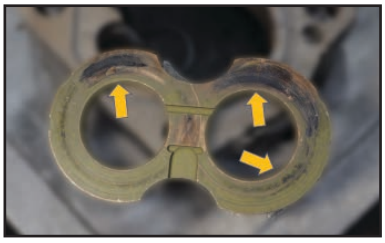


Figure 6d

WARNING: This product can expose you to chemicals including lead or DEHP which are known to the state of California to cause cancer, birth defects, and other reproductive harm. www.p65warnings.ca.gov

7) Place match marks on gears before removing (**Fig. 7**).

This will serve as a reference when reassembling the motor.

Figure 7

8) Carefully remove drive gear first (**Fig. 8**).

Avoid tapping the gear teeth together or against other hardened surfaces.

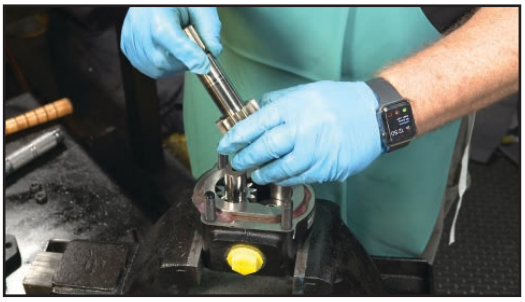


Figure 8

9) Next, remove the idler gear while holding down the bottom thrust plate (**Fig. 9**).

Keep these gears together because they are a matched set.

Examine each for wear and replace if necessary.(See Wear Guide pages 18-19.)

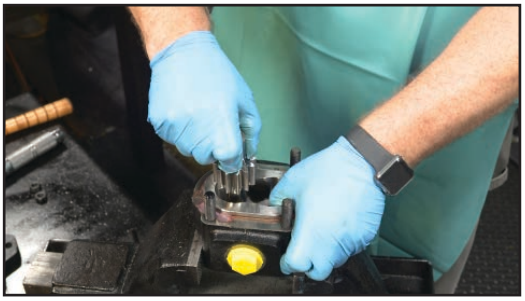


Figure 9

10) Carefully remove the thrust plate from the bottom of body (**Fig. 10**). Examine and replace if necessary. (See Wear Guide pages 18-19.)

Figure 10

11) Remove the snap ring (**Fig. 11**).

Snap ring is located in front of the shaft seal ring.

Figure 11

12) Remove the lip seal (**Fig. 12**).

Be careful not to damage seal bore in pump body. See tool list on page 3 for prying device.

Figure 12

13) Clean all faces of the body and mounting flange from sealant and dirt (**Fig. 13**).

Figure 13

Start Assembly

1) Before start, clean all machined surfaces and make sure are free of debris.

2) Prep new lip seal for replacement (**Fig. 1**).

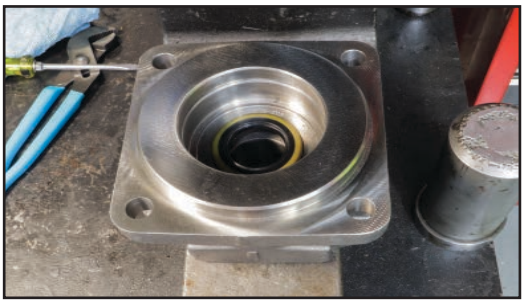


Figure 1

3) Grease new lip seal (**Fig. 2**). Coat the outer edge of the lip seal and its recess with non-hardening sealant or equivalent before replacing.

Figure 2

4) Replace lip seal (**Fig. 3 & 4**). With the metal side of the lip seal up, press it into the mounting flange side of the shaft end cover with an arbor press and bar (see Tool List on page 3). Be careful not to damage the lip of the seal.

Press in until flush with the recess. Wipe off excess sealant.

Figure 3

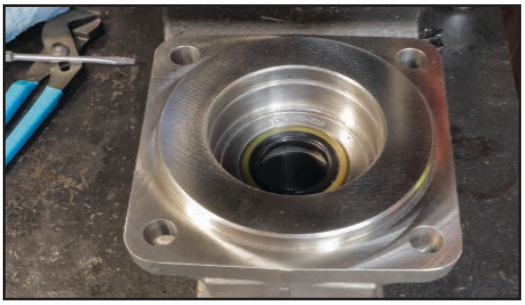


Figure 4

5) Replace bearing (**Fig. 5**). Place new bearing over lip seal for installation.

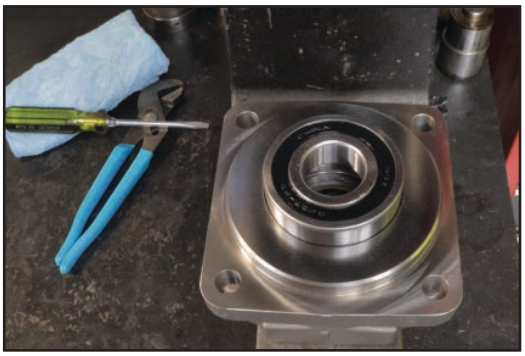


Figure 5

6) Press new bearing over lip seal (**Fig. 6 & 7**). Using arbor press, seat new bearing flush with lip seal.

Figure 6

Figure 7

7) Assemble the snap ring (**Fig. 8 & 9**). Using snap ring pliers, seat new snap ring on top of bearing and lip seal.

Figure 8

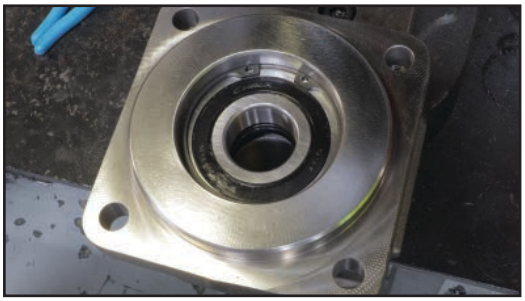


Figure 9

8) Mount shaft end cover facing down in a vise (**Fig. 10**).

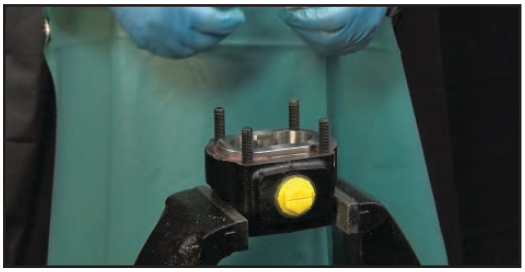


Figure 10

9) Re-affix or replace section seal (**Fig. 11**).

Verify both sides of the section seal are free of debris. If need to replace, grease the new section seal and insert firmly into the grooves in both sides of the gear housing.

Figure 11

10) Assemble new sealing parts in pressure plate and verify orientation.

The sealing parts can be fixed with grease. (see below for steps to install sealing parts correctly)

i. Turn the pressure plates so the seal groove faces up
ii. Place the soft black into the seal groove with the flat side down
iii. Place the hard nylon back-up seal, flat side up, into the groove on top of the rubber seal

Pump Thrust Block - Back Side (**Fig. 12a, 12b**)
Pump Thrust Block - Front Side (**Fig. 12c**)
Motor Thrust Block - Back Side (**Fig. 12d, 12e**)
Motor Thrust Block - Front Side (**Fig. 12f**)

Figure 12

Figure 12a
Pump Thrust Block - Back Side

Figure 12b
Pump Thrust Block - Back Side

Figure 12c
Pump Thrust Block - Front Side

Figure 12d
Motor Thrust Block - Back Side

Figure 12e
Motor Thrust Block - Back Side

Figure 12f
Motor Thrust Block - Front Side

The proper seal installation is very important. If these seals are assembled upside down, they will most likely fail in a short period of time under system pressure.

11) Assemble the lower thrust block into the motor body (**Fig. 13**), using grease if needed on sealing parts.

Orientation is rotation sensitive for pumps and the seals should be pointed down and facing the high pressure side of the pump, the pressure port. Push down until the thrust block is flush with the shaft end.

Figure 13

12) Insert drive gear (**Fig. 14**).

Insert shaft fully until seated firmly at the bottom of port end cover.

Figure 14

13) Insert idler gear (**Fig. 15**).

Gently turn gears until have lined up the match marks.

.

Figure 15

14) Insert upper thrust plate on top of gear set (**Fig. 16**).

The plate should be flush with motor body. Position is rotation sensitive.

.

Figure 16

15) Slide a lubricated steel shaft seal sleeve over the drive gear (**Fig. 17**).

This will protect the gear while installing the shaft end cover.

Figure 17

16) Verify section seal is free of debris and firmly on bottom of shaft end cover. Fit the shaft end cover careful from the top down to the body (**Fig. 18**).

Make sure the interlocking track is on correctly and line up match marks.

Figure 18

17) Thread the fasteners onto the body and tighten alternately or in an X pattern (**Fig. 19**).

To correctly insert the back nuts and washers, hold the shaft end cover up slightly until nuts can be hand tightened. Then push body down firmly to tighten front screws.

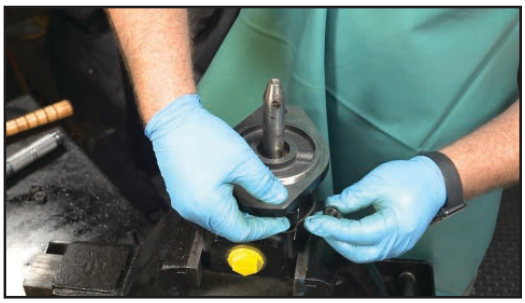


Figure 19

18) Tighten nuts (**Fig. 20**).

Begin hand tightening nuts in cross pattern, then finish with wrench. Torque diagonally opposed fasteners to correct torque.

Figure 20

19) Torque diagonally opposed fasteners to correct torque. (**Fig. 21**).

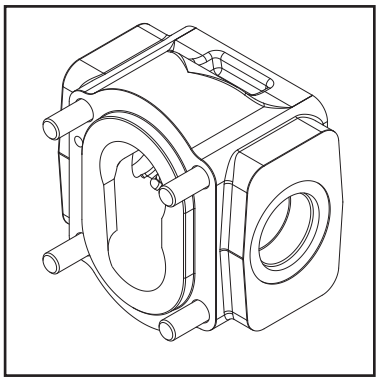
Do not lubricate fastener threads before assembly. Follow torque guide below.

Figure 21

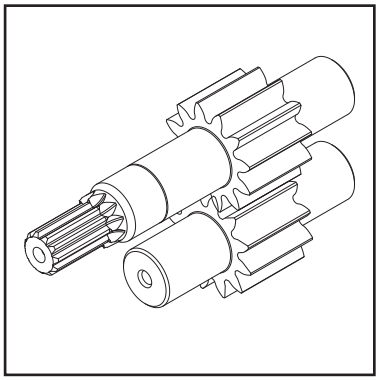
600 Series Torque Guide	
Series	**Lbs-ft**
PGP610/PGM610	43
PGP620/PGM620	70
PGP625/PGM625	70
PGP640/PGM640	103

Gear Housing
Wear in excess of .005" cut-out necessitates replacement of the gear housing body. Place a straight-edge across bore. If you can slip a .005" feeler gauge under the straight-edge in the cut-out area, replace the gear housing body.

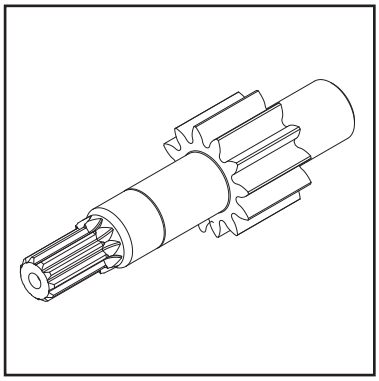
Pressure pushes the gears against the housing on the low pressure side. As the hubs and bushings wear, the cut-out becomes more pronounced. Excessive cut-out in a short period of time indicates excessive pressure or oil contamination. If the relief valve settings are within prescribed limits, check for shock pressures or tampering. When the cut-out is moderate, 005" or less, the gear housing body is in good condition and may be reused.



Gears
Any scoring on gear hubs necessitates replacement. Scoring, grooving, or burring of the outside diameter of the teeth requires replacement. Nicking, grooving, or fretting of teeth surfaces also necessitates replacement.



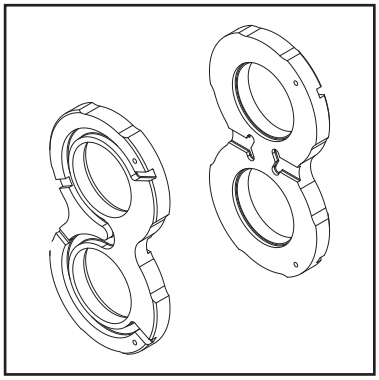
Drive Shafts
Replace if there is any wear detectable by touch in the seal area or at the drive coupling. The maximum allowable wear is .002". Wear in the shaft seal area indicates oil contamination. Wear or damage to splines, keys, or keyways necessitates replacement.



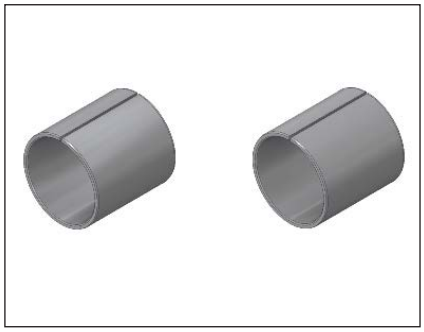
Balance Plates
The balance plates seal the gear section at the sides of the gears. Wear here will allow internal slippage, that is, oil will bypass within the pump.

A maximum of .002" wear is allowable. Replace balance plates if they are scored, eroded or pitted. Check center of thrust plates where the gears mesh. Erosion here indicates oil contamination.

Pitted balance plates indicate cavitation or oil aeration. Discolored balance plates indicate overheating, likely due to insufficient oil.

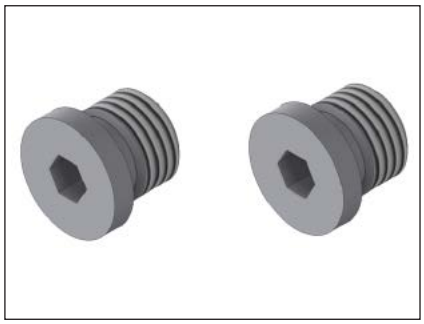


Bushings
Bushings must be replaced if PTFE coating is worn through or if scored or blackened. Bushings should fit into the bore with a heavy press fit



Seals and Gaskets
Replace all rubber and polymer seals, including all o-rings, thrust plate channel seals, shaft seal and gasket seals.

Checks
Examine the checks, if unit has them, in the mounting flange to make sure that they are tight, and free of contamination.



Hydraulic Oil Recommendations

When choosing your Hydraulic Oil, duty cycle and oil temperature must be factored in to optimize your system performance since hydraulic systems often work under extreme temperature changes, especially in moderate to severe duty cycles, the lubrication qualities of the oil in tight tolerance components is even more critical.

Viscosity choice is always a compromise; the fluid must be thin enough to flow easily but thick enough to seal and maintain a lubricating film between bearing and sealing surfaces. This film of oil helps to reduce friction and heat, which can ultimately lead to component damage.

Fluid temperature does affect viscosity. When choosing a fluid, it is important to consider the start-up and operating temperatures of the hydraulic system In general, as the fluid warms, it gets thinner and its viscosity decreases. At the highest temperatures, the fluid must be thick enough to provide lubrication and minimize internal leakage. Low viscosity leads to the following problems:

- Higher leakage across all sealing gaps in the pump leading to lower volumetric efficiencies and heat.
- Heat will cause loss of lubrication and will create severe wear because of metal to metal contact, causing premature failure of the gears, thrust plates and bearings.

The opposite is true when the fluid cools, its viscosity increases. At the lowest temperatures, the fluid must be thin enough to flow readily. High viscosity oil leads to the following problems:

- Sealing and lubrication gaps not being filled, loss of lubrication
- Filling losses occur which causes cavitation damage to the pump

Under normal operating temperatures it is recommended to keep the temperature of the hydraulic fluid in the range of 120°F to 140°F (49°C to 60°C). Fluids may break down or oxidize at high temperatures, which leads to varnish or sludge deposits in the system and also reduces lubricity and results in reduced life of the unit. As a rule of thumb, operating temperatures over 176°F (80°C) reduce the service life by half for every 50°F (10°C) temperature increase, and should be avoided.

Petroleum Oils (Mineral-based)

Viscosity Recommendations
Optimum operating viscosity is considered to be about 100 SUS (20 cSt).

Minimum approximately: 50 - 60 SUS (7.5 - 10 cSt)
Maximum at start up approximately: 7500 SUS (1600 cSt)

Recommended Viscosity Grades:

Grade	Viscosity at 100°F (40°C)	Viscosity at 210°F (100°C)
ISO 32	165 SUS (32 cSt)	44 SUS (5 cSt)
ISO 46	240 SUS (46 cSt)	49 SUS (7 cSt)
SAE 10	150 SUS (32 cSt)	41 SUS (4 cSt)
SAE 20	300 SUS (71 cSt)	51 SUS (7 cSt)

Other Desirable Properties	Additives Usually Recommended:
Viscosity Index: 90 minimum	Rust and Oxidation (R & O) Inhibitors
Aniline Point: 175 minimum	Foam Depressant

NOTE: Antiwear (AW) additives are not necessarily recommended. In some instances the presence of zinc compounds can actually be harmful to copper, bronze, or brass components used in the system. The use of AW oil is optional with our gear units.

General Recommendations
High quality hydraulic oils are essential for satisfactory performance and long life of any hydraulic system. Such oils are usually prepared from highly refined, turbine oil stocks with which select additives are compounded. We suggest following the manufacturer's specifications or the recommendations of a reputable oil supplier for the specific oil requirements on your machine.

A high viscosity oil will generally give better performance and life than a thin oil. Oil of around 100 SUS (20 cSt) will give optimum performance. Your selection should be as near to optimum as possible at operating temperature but not so heavy at start-up as to cause cavitation. Cold start-up procedures which allow the use of heavier oils should prove worthwhile by increasing pump life. The oil must be clean and contain less than 0.1% water.

Hydraulic Oil Recommendations (Continued)
Petroleum Oils (Mineral-based) (Continued)

Operating Temperature
The optimum oil operating temperature is in the range of 120°-140°F (49°-60°C). Oil operating temperature should not exceed 200°F (93°C) with a maximum of 180°F (82°C) generally recommended. If the oil temperature will be above 180°F (82°C) for significant periods of time, then Viton (FKM) seals should be used. High temperatures may result in rapid oil deterioration and may point out the need for an oil cooler or a larger reservoir. The nearer to optimum temperature, the longer the service life will be of the oil, pump and other components.

Cold Weather Operation
Oils for use in cold weather should have a viscosity not exceeding 7500 SUS (1620 cSt) at the minimum start-up temperature and a pour point of at least 20°F (0° C) below that temperature. Experience on the Alaskan North Slope has been satisfactory without using special oils or fluids. Start-up procedures must allow for a gradual warm-up and equipment should not be operated at full pressure until the oil reaches a reasonably fluid state.

Inlet Vacuum
Vacuum measured at the inlet port of the pump generally should not exceed 5 in. (13 cm) Hg. Higher vacuum can result in cavitation which may severely damage the pump. A usually acceptable rule of thumb is that the inlet line velocity should not exceed 8 fps (2.5 m/s). A long inlet line or the use of several fittings may necessitate increasing the line size. We suggest that each inlet port of a tandem pump have its own line from the reservoir.

Reservoir
Reservoir capacity in gallons should at least equal total pump output in GPM. When filling the reservoir, oil should pass through a 100-mesh screen. Pour only clean oil from clean containers into the reservoir. The reservoir should have a breather to allow air in or out. The filler cap and breather should be sealed to prevent moisture from entering. A hydraulic oil water content of as little as 0.1% can cause damage to hydraulic components.

Filtration
Good filtration assures improved service life at today's high operating pressures. System filtration is recommended that will maintain a contamination level according to ISO 4406:

ISO 4406	psi	bar
21/19/16	2000	140
19/17/14	3000	210
17/15/12	4000	275

The specific filter recommendation should come from your equipment manufacturer or filter supplier.

A 100 mesh screen should generally be used in the suction line leading to the pump. It should be of sufficient size to handle twice the pump capacity. The screen must be cleaned and checked regularly to avoid pump and system damage.

Oil and filters should be changed on a regular schedule and the system flushed in accordance with the original equipment manufacturer's recommendations. Reservoir air breather filters should be cleaned periodically.

Filtration is not a substitute for practicing cleanliness and proper preventive maintenance.

Hydraulic Oil Recommendations (Continued)

Water Base Fire Resistant Fluids

Two types of water base fluids (WBF) may be used with our gear pumps and motors. Both types of WBF come in various viscosity grades. Select the grade best suited to the equipment and its operation in terms of pressure, speed, temperature, duty cycle, etc. The fluid used should be recommended by the O.E.M. or a reputable fluid supplier.

Operations outside the range of 400 to 2000 rpm and over 3000 psi (2000/2500 psi in the wider gear widths) should be reviewed with your Parker sales representative.

Water-in Oil (60/40) invert Emulsions
Invert emulsions are approved for use with our bushing style pumps at pressures up to 3000 psi or 500 psi below catalog rated pressures, whichever is lower.

With roller bearing pumps, life may be reduced to 20% to 50% of that experienced with petroleum oil. Reducing the pressure and/or gear width can extend pump life appreciably.

Water Glycol Solutions
Water glycol solutions of the types normally used in hydrostatic systems are recommended for use with our bushing style pumps. These consist of about 60% glycol and about 40% water with additives to improve lubricity and other characteristics. Pressures up to 3000 psi are approved, depending on the gear width. Water glycol solutions are not approved for use with our roller bearing pumps.

WBF Filtration
Filtration that seems to give the best results consists of a 100-mesh inlet screen and a return line filter. For water base fluids, the inlet screen should be sized up three to four times the pump capacity. The return line filter should be of a rating and size recommended by the fluid and filter manufacturers to achieve a recommended ISO contamination level.

NOTE: Finer filtration may be required by other components in the system.

High Water Base Fluids (HWBF)
The use of 95/5 emulsion is not recommended.

Phosphate Ester
Phosphate ester does not appear to affect pump performance and service life, but Viton (FKM) seals should be used with this fluid. Viscosity characteristics of phosphate ester fluid limit the recommended ranges of operating and ambient temperatures. Questions on the use of fluids with our equipment should be discussed with a sales representative or Product Support Dept

Comments: Use of other oils and fluids

Biodegradable Oil (Vegetable-Based)
Oils of this type with properties similar to recommended petroleum oils may be used with our bushing style pumps only. These are not approved for use in our roller bearing pumps. Performance, pressure ratings and durability are not adversely affected in bushing style pumps.

Automatic Transmission Fluid (ATF)
In general, these oils have low viscosity and may be used only at reduced operating pressures and oil temperatures.

Diesel Fuel, Kerosene, Coal Oil
Although sometimes used as a dilutant for cold weather operations, their use is not recommended because they are insufficiently refined products.

Transformer Oil
Sometimes used for extremely cold weather operation. It is not generally recommended as it becomes too thin at normal operating temperatures. Oil to U.S. Military Spec MIL-H-5606 is in this category.

Operating Limits Generally Recommended with Various Fluids

Fluid	Max. Operating Temp.	Max. Inlet Line Velocity	Max. Inlet Vacuum
Petroleum Oil	180°F (82°C)	8 fps (2.5m/s)	5" (13cm) Hg
WIO Emulsion	150°F (65°C)	4 fps (1.2m/s)	0" (0cm) Hg
Water Glycol	150°F (65°C)	4 fps (1.2m/s)	0" (0cm) Hg

NOTE: These figures represent generally accepted maximums and will not prove satisfactory in all installations. For very severe duty cycles, it will likely be advantageous to design and operate the system at something less than these maximum limits.

- DO NOT USE ANY TYPE OF FLUID NOT RECOMMENDED IN THIS BULLETIN WITHOUT FIRST CONSULTING OUR PRODUCT SUPPORT DEPT
- OBTAIN YOUR FINAL FLUID RECOMMENDATION FROM YOUR FLUID SUPPLIER

Recommended Start-up Procedure for New or Rebuilt Pump

Before installing a new or rebuilt pump, back off the main relief valve until the spring tension on the adjusting screw is relieved. This will avoid the possibility of immediate damage to the replacement unit in the event that the relief valve setting had been increased beyond the recommended operating pressure, prior to removing the old unit.

Before connecting any lines to the pump, fill all ports with clean oil to provide initial lubrication. This is particularly important if the unit is located above the oil reservoir.

After connecting the lines and mounting the replacement unit, operate the pump at least two minutes at no load and at low rpm (400 min.) During this break-in period, the unit should run free and not develop an excessive amount of heat. If the unit operates properly, speed and pressure can then be increased to normal operating settings.

Reset the main relief valve to its proper setting while the pump is running at maximum operating engine (motor) speed for the vehicle.

ALWAYS USE AN ACCURATE GAUGE WHEN ADJUSTING THE RELIEF VALVE PRESSURE SETTING.

Recommended Test Procedure

Make certain that there is an adequate supply of oil for the pump; at least one gallon of oil for each gpm of pump capacity.

If one section of a tandem pump is being tested, make sure that all other sections not being tested are adequately supplied with oil. If any of the other sections run dry, or if plugs are left in ports, serious and permanent damage will result.

The oil should be a good quality hydraulic oil rated at 150 SSU at 100°F, with the oil temperature held at 120°F plus or minus 50°F. (Test procedures are described in detail in SAE handbooks; see Hydraulic Power Pump Test Procedure, SAE J745c.)

The feed line must be of adequate size with no more than 5" mercury vacuum adjacent to the pump inlet. As a rule, the feed line must provide a feed flow velocity not in excess of 8 feet per second.

Feeding hot oil into a cold pump may cause the pump to seize. Jog the pump by momentarily starting and stopping repeatedly the driving engine or motor to gradually equalize pump and oil temperatures.

Run the pump at least two minutes at no load and moderate speed (not over 1500 rpm). If the pump becomes excessively hot, shut down immediately and locate the problem source.

Gradually increase pressure on pump, in 500 psi increments until the desired test pressure has been reached. This should take about five minutes.

Delivery should run close to rated catalog performance figures, which are averaged from testing several pumps. A 5% lower reading may be used as a rated minimum if new or relatively new parts have been used. When rebuilding the pump with parts from the original pump, which, while worn, appear satisfactory for reuse, a 10% or 15% lower reading may be permitted, depending on the performance expected from the equipment. One's own experience will prove the best guide here.

Many repairmen measure the output at normal operating speed and at zero pressure, then again at 1000 psi (or the operating pressure of the equipment) and allow a volume decrease approximating the listing below. It is a suggested reference only which makes allowance for reused parts.

At test speeds other than 1800 rpm, gpm delivery will vary almost proportionately, but the same (drop-off) figures should be used.

Be sure to run the pump in the direction for which it was designed and built. Driving the pump in the wrong direction will build up pressure behind the shaft seal, damaging it and necessitating replacement.

After completing testing procedures, the pump is ready for installation and immediate duty operation on equipment. Again, it must be remembered that to prevent seizure, hot oil must not be fed into a cold pump.

GPM DELIVERY at 1800 rpm 100 psi	GPM DROP OFF AT...		
	1000 psi/70 bar	2000 psi/140 bar	3000 psi/210 bar
10-30	1-1/2 - 3	2 - 3-1/2	2-1/2 - 4
30-50	2 - 3	2-1/2 - 4	3 - 4-1/2
50-70	2-1/2 - 3-1/2	3-5	3-1/2 - 5-1/2

WARNING: This product can expose you to chemicals including lead or DEHP which are known to the state of California to cause cancer, birth defects, and other reproductive harm. www.p65warnings.ca.gov