ZEUS HYDRATECH LTD

Global Suppliers of Premium Hydraulic Components

Official UK Distributor for Oilgear Hydraulic Components

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OILGEAR TYPE “PVG” PUMPS
180 (SERIES A2)
SERVICE INSTRUCTIONS

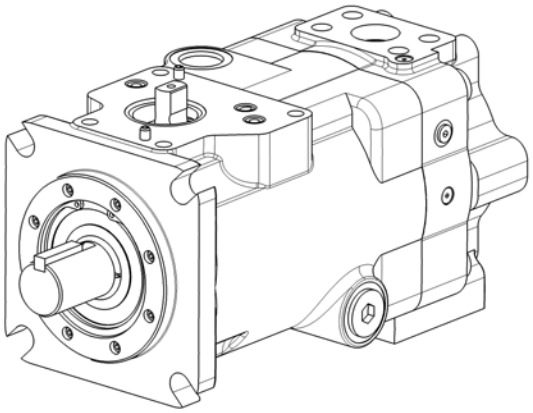


Figure 1. Typical Oilgear “PVG” Open Loop Pump

PURPOSE OF INSTRUCTIONS

These instructions will simplify the installation, operation, maintenance and troubleshooting of Oilgear type “PVG” pumps.

Become familiar with the construction, principle of operation and characteristics of your pump to help you attain satisfactory performance, reduce shut-down and increase the pump's service life. Some pumps have been modified from those described in this bulletin and other changes may be made without notice.

REFERENCE MATERIAL

Fluid Recommendations .....Bulletin 90000
Contamination Evaluation Guide.....Bulletin 90004
Filtration Recommendations .....Bulletin 90007
Piping Information .....Bulletin 90011
Installation of Vertically Mounted Axial Piston Units .....Bulletin 90014
PVG Open Loop Pumps, Sales..... Bulletin 47019-K

Pump Control Instructions, Series A1

“P-1NN” Single Pressure Compensator .....Bulletin 948675
“P-1NN/F” Single Pressure Compensator w/Load Sense .....Bulletin 948676
“P-1NN/H” Single Pressure Compensator w/H.P. Limiter....,.....Bulletin 948677
“P-1NN/G” Horsepower Limiter w/Load Sense.....Bulletin 948678
“P-1NN/K” Single Pressure w/Load Sense, Minimum Standby.....Bulletin 948683
“P-1NN/L” Single Pressure w/HP Limiter & Load Sense, Minimum Standby.....Bulletin 948684
“P-2” Dual Pressure Compensator.....Bulletin 948679
“P-C & P-K” Single Pressure - Soft Start. .....Bulletin 948680
“P-CNN/H & P-KNN/H” Single Pressure - Soft Start w/H.P. Limiter.....Bulletin 948681
“P-2NN/H” Dual Pressure Compensator w/H.P. Limiter.....Bulletin 948682
“P-E” Electronic Displacement Control.....Bulletin 948690
“P-E/F” Electronic Displacement Control w/Load Sense.....Bulletin 948691

Read and understand this entire instruction sheet before repairing or adjusting your Oilgear product.

Those who use and maintain this equipment must be thoroughly trained and familiar with the product. If incorrectly used or maintained, this product and its equipment can cause severe injury.

SAFETY SYMBOLS

The following signal words are used in this instruction sheet to identify areas of concern where your safety may be involved. Carefully read the text and observe any instructions provided to ensure your safety.

⚠ DANGER ⚠

THIS SIGNAL WORD INDICATES AN IMMINENTLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, WILL RESULT IN DEATH OR SERIOUS INJURY.

⚠ WARNING

This signal word indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

This signal word indicates that a potentially hazardous situation exists which, if not avoided, may result in damage to equipment or minor personal injury.

NOTE *While not directly relevant to the topic being discussed, the NOTE is used to emphasize information provided, or provide additional information which may be of benefit.*

⚠ WARNING

This service information is designed for the maintenance of your Oilgear product. It contains the information on the correct procedures determined by Oilgear for the safe manner of servicing. Always keep this instruction sheet in a location where it is readily available for the persons who use and maintain the product. Additional copies of this instruction sheet are available through the Oilgear Company. Or visit our website: www.oilgear.com. Please contact us if you have any questions regarding the information in this instruction bulletin.

NOTE *The cleanliness of working on this pump or the hydraulic system is extremely important to the safety and reliability of the pump and the system. Always make sure the fittings are clean on the outside before removing them from their connections, are capped and plugged when removed and placed in a clean rag or container until they are reinstalled.*

⚠ WARNING

Some service operations may require special tools or equipment. If you require information on these items, please contact Oilgear before attempting these repairs and service operations.

⚠ WARNING

Read, understand, and follow the safety guidelines, dangers, and warnings contained in this instruction sheet to promote reliable operation and prevent serious personal injury.

⚠ WARNING

DO NOT attempt to service this machinery in an environment where safety regulations are not established and in place.

⚠ WARNING

DO NOT operate the hydraulic system if a leak is present. Serious injury may result.

⚠ WARNING

Hydraulic systems operate under very high pressure. Hydraulic fluid escaping from a pressurized system can penetrate unprotected body tissue. DO NOT inspect for hydraulic leaks with bare hands or other exposed body parts. As a minimum, wear leather gloves prior to inspecting for leaks and use cardboard or wood. If leaks are present, relieve pressure and allow system to cool prior to servicing. If injured by escaping hydraulic oil, contact a physician immediately. Serious complications may arise if not treated immediately. If you have questions regarding inspecting for hydraulic leaks, please contact Oilgear prior to servicing.

⚠ WARNING

Hydraulic hoses and tubing must be inspected on a daily basis for leaks, cuts, abrasions, damage and improper clearance along any mounting frame for hidden damage before the unit is put into service. Replace damaged hoses or hoses you suspect are damaged before the system is returned to service! Hoses must be replaced every two years. Failure to properly inspect and maintain the system may result in serious injury.

⚠ WARNING

Hydraulic systems are hot. DO NOT TOUCH! Serious personal injury may result from hot oil. When you have completed working on the hydraulic system, thoroughly clean any spilled oil from the equipment. Do not spill any hydraulic fluids on the ground. Clean any hydraulic fluids from your skin as soon as you have completed maintenance and repairs. Dispose of used oil and system filters as required by law.

⚠ WARNING

Use correct hoses, fittings, and adapters with the correct SAE rating when replacing hoses to prevent possible serious injury. Always replace hoses, fittings, and adapters with replacements that have a proper, suitable, working pressure rating. Replacement hoses must be of the correct length and must comply with the hose manufacturer's and Oilgear's installation guidelines and recommendations.

⚠ WARNING

Hydraulic hoses have the SAE ratings marked on the hose to assist you in selecting the correct hose. The same manufacturer must supply any replacement hydraulic hoses and fitting assemblies. As an example: Brand "X" hose and brand "Y" fitting will not normally be compatible. No "Twist" is allowed in the hydraulic hoses. "Twist" may result in premature hose failure. This can cause serious injury. Please contact Oilgear for assistance when required.

⚠ WARNING

Hydraulic cylinders can be holding a function in a certain position when the pump is OFF. An example of this is a function being held in the lift or partial lift position by the cylinders. If a hydraulic line is removed or the hydraulic circuits or controls are being worked on, gravity may allow the function being held in position to drop. All workers and personnel must remain clear of these areas when working on or operating the hydraulic system. Block and secure all devices and functions which apply before beginning work or operation. Failure to comply with this can result in serious injury or death.

⚠ WARNING

Any hydraulic pipe which is replaced must conform to SAE J1065 specifications. If incorrect hydraulic pipe is installed, the hydraulic system may fail, causing serious injury. Damaged or leaking fittings, pipes or hoses must be replaced before the system is returned to service.

⚠ WARNING

DO NOT heat hydraulic pipe. The carbon content of this steel tube is such that if heated for bending, and either water or air quenched, the pipe may lose its ductility and thereby be subject to failure under high pressure conditions. Serious injury can result. Damaged or leaking pipes must be replaced before the system is returned to service. Please contact Oilgear if you require assistance or have questions.

⚠ WARNING

All hydraulic pressure must be relieved from the hydraulic system prior to removing any components from the system. To relieve the hydraulic pressure from the hydraulic system, turn off the motor and operate the control panel with the key in the ON position. Failure to comply can result in serious injury. If you have any questions concerning relieving the hydraulic pressure from the system, please contact Oilgear.

⚠ WARNING

Hydraulic components can be heavy. Use caution while lifting these components. Serious personal injury can be avoided with proper handling of the components.

⚠ WARNING

Please contact Oilgear if you require assistance, when performing hydraulic test procedures, use the proper hydraulic gauges. Installing an incorrect test gauge could result in serious injury if the gauge fails. Use properly rated hydraulic hoses to allow the test gauge to be read away from moving parts and functions.

⚠ WARNING

Increasing hydraulic pressure beyond the recommendations may result in serious damage to the pump and system or serious personal injury and may void the Oilgear Warranty. If you have questions concerning hydraulic pressures or testing procedures, please contact Oilgear before attempting the test procedures or making adjustments.

⚠ WARNING

An Oilgear pump must not be modified in any way without authorization from Oilgear. Modifications may not comply with safety standards, including ANSI safety standards, and may result in serious personal injury. Please contact Oilgear if you require assistance.

⚠ WARNING

DO NOT enter under hydraulic supported equipment unless they are fully supported or blocked. Failure to follow this procedure can result in serious injury or death.

⚠ WARNING

Any Oilgear pump safety decals must be replaced anytime they are damaged, missing, or cannot be read clearly. Failure to have proper decals in place can result in serious injury or death. (If you require safety decals, please contact Oilgear for replacement safety decals, at no charge.)

⚠ WARNING

Be sure everyone is clear of the area around the hydraulic system before operating after servicing. Remain attentive at all times when operating to check your work until you are completely sure it is safe to return to service. Failure to heed this warning may result in serious personal injury or death.

⚠ WARNING

Wear the proper protective clothing when operating, servicing or maintaining the hydraulic system or the Oilgear pump. Wear the correct protective gear, safety glasses, gloves, and safety shoes. Serious injury can result without proper protective gear.

⚠ WARNING

Make sure to keep hands and feet and other parts of your body clear of revolving or moving parts. Failure to comply can cause serious injury.

⚠ WARNING

DO NOT wear watches, rings, or jewelry while working with electrical and mechanical equipment. These items can be hazardous and can cause serious and painful injuries if they come into contact with electrical wires, moving parts, or hydraulic equipment.

PREPARATION AND INSTALLATION

MOUNTING

Pump Without Reservoir - The pump can be mounted in any position. But, the recommended mounting position is with the drive shaft on a horizontal plane and the case drain port 1 on the top side. Secure the pump to a rigid mounting surface. Refer to the referenced Oilgear Piping Information Bulletin 90011.

Pump With Reservoir - These pumps are usually fully piped and equipped. It may be necessary to connect to a super-charge circuit when used. Mount reservoir on level foundation with the reservoir bottom at least six inches above floor level to facilitate fluid changes.

PIPING AND FITTINGS

Refer to the referenced Oilgear Piping Information Bulletin 90011 and individual circuit diagram before connecting the pump to the system. Inlet velocity must not exceed 5 fps (1,5 mps). Inlet should be unrestricted and have a minimum of fittings.

NOTE *DO NOT use an inlet strainer.*

Arrange line from “case drain” so the case remains full of fluid (non-siphoning). Case pressure must be less than 25 psi (1,7 bar). For higher case pressures, special shaft seals are required; contact our Customer Service. Each drain line must be a separate line, unrestricted, full sized and connected directly to the reservoir below the lowest fluid level. Make provisions for opening this line without draining (siphoning) reservoir.

⚠ WARNING

Running the pump in NEUTRAL position (zero delivery) for extended periods without a supercharge circuit can damage the pump. The system and pump must be protected against overloads by separate high pressure relief valves. Install bleed valve(s) at the highest point(s) in system.

POWER

Power is required in proportion to volume and pressure used. Motor size recommendations for specific applications can be obtained from The Oilgear Company. Standard low starting torque motors are suitable for most applications.

CAUTION

DO NOT start or stop unit under load unless system is approved by Oilgear. It may be necessary to provide delivery bypass in some circuits.

DRIVE

Verify rotation direction plate on the pump's housing. Clockwise pumps must be driven clockwise and counterclockwise pumps must be driven counterclockwise. Use direct drive coupling. Size and install coupling per manufacturer's instructions.

CAUTION

DO NOT drive the coupling onto the pump drive shaft. If it is too tight, it may be necessary to heat coupling for installation. Refer to manufacturer's instructions.

Misalignment of pump shaft to driver's shaft should not exceed 0.005 inches (0,13 mm) Total Indicator Readout (TIR) in any plane.

FILTRATION

Keep the fluid clean at all times to ensure long life from your hydraulic system. Refer to the referenced Oilgear Filtration Recommendations bulletin 90007 and Oilgear Contamination Evaluation Guide Bulletin 90004. Oilgear recommends use of a filter in the pressure or return line. Replace filter element(s) when the filter condition indicator reaches change area at normal fluid temperature. Drain and thoroughly clean filter case. Use replacement element(s) of same beta 10 ratio (normally a ratio of 4 with hydraulic oils).

FLUID COOLING

When the pump is operated continuously at the rated pressure or frequently at peak load, auxiliary cooling of the fluid may be necessary. Fluid temperature should not exceed limits specified in the referenced Oilgear Fluid Recommendations Bulletin 90000.

AIR BREATHER

On most installations, an air breather is mounted on top of fluid reservoir. It is important for the breather to be the adequate size to allow air flow in and out of reservoir as fluid level changes. Keep the breather case filled to the “fluid level” mark. About once every six months, remove cover, wash screen in solvent and allow screen to dry, clean and refill case to level mark and install screen. Refer to the manufacturer's recommendations.

FLUID, FILLING AND STARTING RECOMMENDATIONS

Refer to instruction plate on the unit, reservoir, machine and/or reference, Fluid Recommendations bulletin. Fire resistant fluids and phosphate ester fluids can be used in accordance with fluid manufacturer's recommendations.

1. Pump all fluid into reservoir through a clean (beta 10 ratio of 4 or more) filter. Fill reservoir to, but not above, “high level” mark on the sight gauge.
2. **Remove case drain line and fill pump case with hydraulic fluid.**
3. Turn drive shaft a few times by hand with a spanner wrench to make sure parts rotate. Torque to turn drive shaft should be 9 to 24 ft•lb (12 to 32 N•m).

With pump under “no load” or with pump control at NEUTRAL:

4. Turn drive unit ON and OFF several times before allowing pump to reach full speed. The system can usually be filled by running the pump and operating the control.
5. The fluid level in the reservoir should decrease. Stop the pump. **DO NOT** allow the fluid level to go beyond the “low level.” If the level reaches “low level” mark, add fluid and repeat step.

NOTE *With differential (cylinder) systems, the fluid must not be above “high level” when the ram is retracted or below “low level” when extended. Bleed air from the system by loosening connections or opening petcocks at the highest point in the system. Close connections or petcocks tightly when solid stream of fluid appears.*

CONSTRUCTION

See **Figure 3**.

1. A drive shaft **(301)** runs through the center line of pump housing **(001)** and valve plate **(401)** with the pump cylinder barrel **(101)** splined to it.
2. A bearing **(306)** supports the outboard end of the drive shaft and a bushing supports the inboard end. (The bushing is part of valve plate assembly.)
3. The pump cylinder barrel is carried in a polymerous (journal type) Hydrodynamic bearing integral to housing **(001)**.
4. The valve plate **(401)** has two crescent shaped ports.
5. The pumping piston/shoe assemblies **(102)** in the cylinder barrel are held against a swashblock **(201)** by a shoe retainer **(104)**.
6. The shoe retainer is held in position by the fulcrum ball **(103)** which is forced outward by the shoe retainer spring **(105)**.
7. The spring acts against the pump cylinder barrel, forcing it against the valve plate while also forcing the piston shoes against the swashblock.
8. The semi-cylindrical shaped swashblock limits the piston stroke and can be swiveled in arc shaped saddle bearings **(204)**.
9. The swashblock is swiveled by a control (included in referenced material). Refer to **PRINCIPLE OF OPERATION**.

PRINCIPLE OF OPERATION

The illustrations show the pump driven counter-clockwise (left hand) from the top (plan) view.

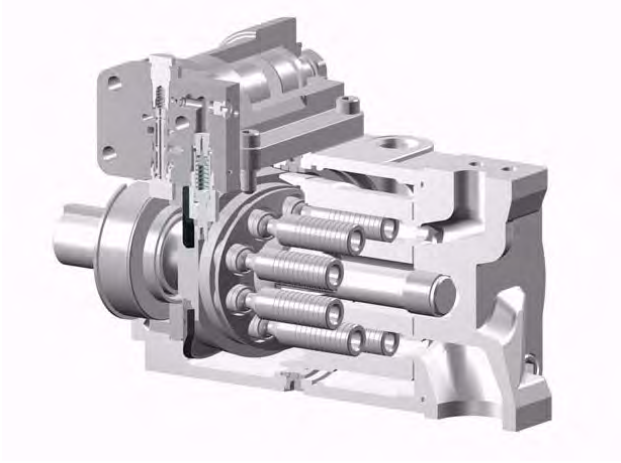


Figure 2. Cut-away of a Typical "PVG" Pump

Position B, Pump During Full Delivery From PORT B - Figure 3

Rotating the drive shaft **(301)** counter-clockwise turns the splined cylinder, which contains the pumping pistons **(102)**. When the cylinder rotates, the pistons move in and out within their bores as the shoes ride against the angled **(C)** swashblock **(201)**.

As the cylinder rotates, the individual piston bores are connected, alternately, to the crescent shaped port **A** and port **B** in the valve plate. While connected to the suction port **A**, each piston moves outward **(OUT)**, drawing fluid from port **A** into the piston bore until its outermost stroke **(D)** is reached. At this point, the piston bore passes from port **A** to port **B**.

While rotating across the crescent port **B**, each piston moves across the angled swashblock face and then each piston is forced inward **(IN)**. Each piston then displaces fluid through the crescent to port **B** until its innermost stroke **(D)** is reached. At this point, the piston bore passes from the **B** to the **A** crescent again and the cycle is repeated.

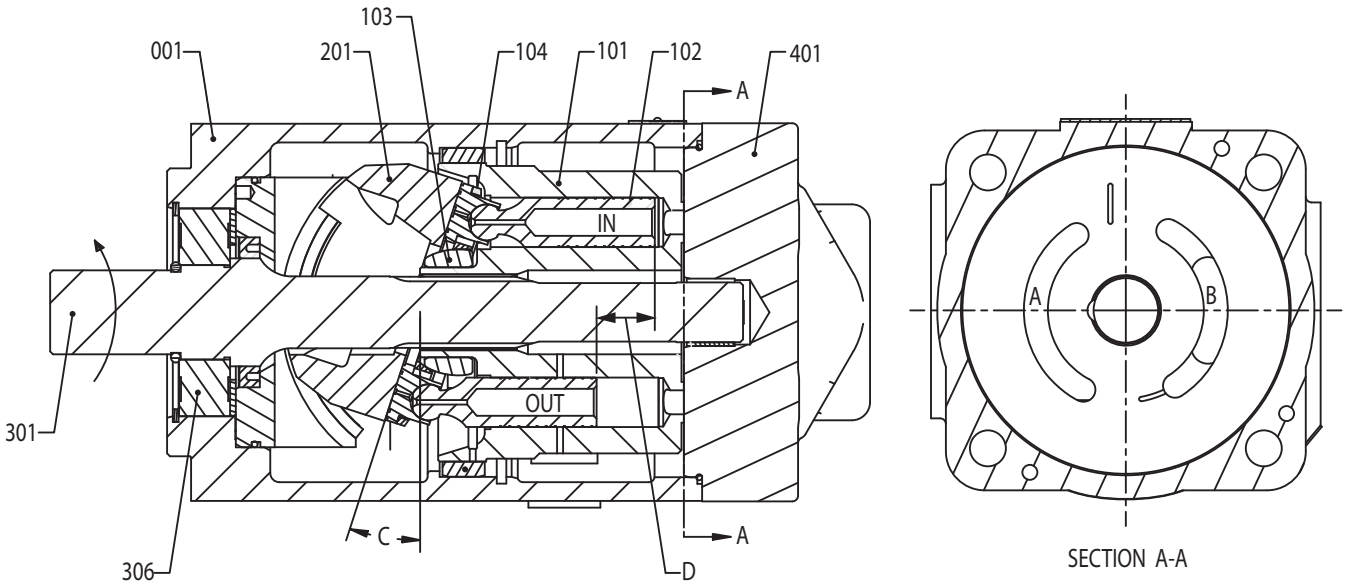


Figure 3. Position B, Pump During Full Delivery From Port B

Position B/2, Pump During One Half Delivery From PORT B - Figure 4

This illustration shows that the angle **(E)** of the swashblock determines the length of the piston stroke **(F)**, (the difference between outermost and innermost position) which determines the amount of delivery from the pump. In this case, the stroke angle **(E)** is one-half of the stroke, which means the piston stroke is one-half and the pump delivery is one-half.

Position N, Pump In Neutral, No Stroke, No Delivery - Figure 5

Neutral position results when the control centers the swashblock. The swashblock angle **(G)** is now zero and swashblock face is parallel to the cylinder face. There is no inward or outward motion of the pump pistons as piston shoes rotate around the swashblock face. With no inward and outward motion or no stroke **(H)**, **NEUTRAL** no fluid is being displaced from the piston bores to the crescents in the valve plate and there is no delivery from pump ports.

NOTE *Illustration reference numbers match the part item number in the parts list.*

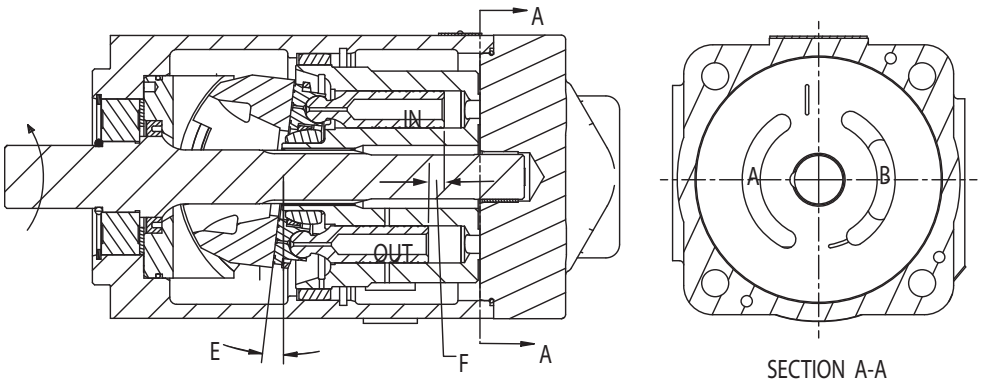


Figure 4. Position B/2, Pump During One Half Delivery From Port B

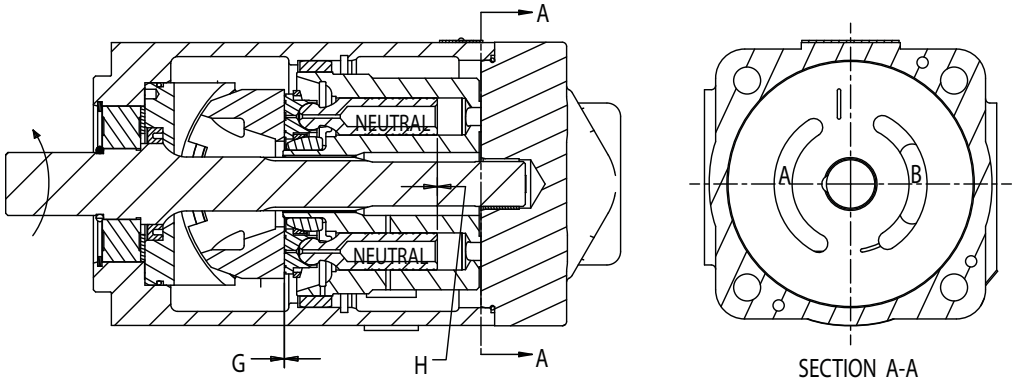


Figure 5. Position N, Pump In Neutral, No Stroke, No Delivery

Refer to **SPECIFICATIONS**

SPECIFICATIONS

NOTE *Refer to reference material, pump control material and individual application circuit for exceptions.*

Unit	THEORETICAL MAXIMUM DISPLACEMENT		RATED CONTINUOUS PRESSURE		PEAK PRESSURE		FLOW RATE at 1800 rpm rated continuous pressure and 14,7 psia (bar abs) inlet condition		MAXIMUM SPEED	POWER INPUT at rated continuous pressure & 1800 rpm	
	in 3/rev	ml/rev	psi	bar	psi	bar	gpm	l/mi	rpm	hp	kw
PVG 180	11.00	180,0	5000	344,8	5800	400,0	78.0	295,3	2400	260	193,9

Case pressure should be less than 25 psi (1,7 bar). For higher case pressure, consult factory.

Table 1. Nominal Performance Data with 150-300 SSU viscosity fluids.

Unit	Length		Width		Height		Weight		Face Mounting
	inches	mm	inches	mm	inches	mm	lbs.	kg	
PVG 180	15.1	383,3	8.4	213,4	8.9	226,1	197*	90	SAE “D” 4 bolt

All dimensions (without controls) are approximate. For detailed dimensions, contact your Oilgear Representative.
* Weight with "P-1NN" Control and thru shaft valve plate.

Table 2. Nominal Dimensions without controls.

Refer to installation drawings for more detailed dimensions and port configurations.

TROUBLESHOOTING

PROBLEM	CAUSES	REMEDY
Unresponsive or Sluggish Control	Swashblock saddle bearings **(204)** worn or damaged.	Refer to referenced control instruction material.
		Inspect bearings. Replace.
Insufficient Pump Volume	Delivery limited by faulty control	Refer to appropriate control instruction material.
	Obstructed suction circuit or insufficient supercharge volume.	Inspect for obstruction and verify supercharge.
	Insufficient drive motor speed.	Refer to appropriate power material.
	Worn or grooved cylinder barrel **(101)** and/or valve plate **(401)** mating surfaces.	Inspect components. Replace.
	Worn piston/shoe assemblies **(102)** or piston bores in cylinder **(101)**.	
	Worn or damaged piston shoe or swashblock **(201)**.	
Irregular or Unsteady Operation	Faulty control.	Inspect components. Replace. Refer to referenced pump control instruction materials.
	Fluid level in reservoir is low or supercharge is insufficient.	Verify fluid level and/or supercharge.
	Air entering hydraulic system.	Inspect system for leak.
	Worn axial piston pump.	Inspect components. Replace.
	Faulty output circuit components (cylinder, motors, valves or other related components).	Inspect components. Replace.
Loss of Pressure	Worn piston pump.	Inspect components. Replace.
	Worn or grooved cylinder barrel **(101)** and/or valve plate **(401)** mating surfaces.	
	Worn piston/shoe assemblies **(102)** or piston bores in cylinder.	
	Faulty output circuit components.	
Excessive or High Peak Pressure	Faulty output circuit components.	Check the relief valves.
Excessive Noise	Pump stopped or started incorrectly under load.	Verify operation procedure of pump.
	Low fluid level in reservoir or insufficient supercharge causing cavitation.	Verify fluid level and/or supercharge.
	Air entering hydraulic system.	Inspect system for leak.
	Fluid too cold or viscosity too high.	Verify fluid temperature and/or type.
	Suction line problem i.e.; obstructions in line, line too long, line diameter too small or too many bends and/or loops in line.	Inspect line for obstruction.
	Broken or worn piston/shoe assembly **(102)**.	Inspect components. Replace.
	Pump rotating in wrong direction.	Inspect operation direction of pump.
Excessive Heating	Operating pump above rated or peak pressure.	Verify pump limitations.
	Low fluid level in reservoir or insufficient supercharge.	Verify fluid level and/or supercharge.
	Air entering hydraulic system.	Inspect system for leak.
	Worn piston pump.	Inspect components. Replace.
	Worn or grooved cylinder barrel **(101)** and/or valve plate **(401)** mating surfaces.	
	Faulty output circuit components (continuous blowing relief valves or "slip" through valves, cylinder or other components.	
	Insufficient cooling provision or clogged coolers.	Inspect for obstruction.

TESTING AND ADJUSTING

⚠ WARNING

Shut the pump OFF and release pressure from the system before disassembling components. Failure to comply with these instructions could result in personal injury or death. Blocking the pressure line between the pump and the system (or pump) high pressure relief valve will result in damage and could result in serious personal injury.

PISTON PUMP

To check for a worn piston pump, make a leak measurement test from the case drain while the pump is under pressure. After the unit is warm, either install a flow meter in the drain line or have the flow from the drain line directed into a large container or reservoir. The pump case must remain full of fluid during this test.

CAUTION

DO NOT run a pump on stroke against a blocked output unless it is protected by a high pressure relief valve and then run no longer than necessary to check slip. Limit discharge to prevent dropping reservoir fluid below low level.

With an accurate high pressure gauge in the pressure line, start the pump and stall (or block) output device to raise system pressure to maximum (as set by system relief valve). Read the measurement on the flow meter or time and measure the case drain flow to fill a known size container and calculate the flow rate.

NOTE *Additional leakage indicates wear, but does not become critical until it impairs performance.*

DISASSEMBLY

NOTE *The cleanliness of working on this pump or the hydraulic system is extremely important to the safety and reliability of the pump and the system.*

When disassembling or assembling the pump, choose a clean, dry, dust and sand free area where no traces of abrasive particles are in the air which can damage the pump and system. DO NOT work near welding, sandblasting, grinding benches or similar conditions.

Always make sure the fittings are clean on the outside before removing them from their connections. Make sure they are capped and plugged when removed. Place them on a clean surface and in a clean rag or container until they are reinstalled. When cleaning parts which have been disassembled, it is important to use CLEAN cleaning solvents and parts are allowed to dry. All tools and gauges should be clean prior to working with the system and use new, CLEAN lint free rags to handle and dry parts.

⚠ WARNING

DO NOT attempt to remove or install any components or assembly while the pump and system is running. Always stop the pump, shut OFF the power and release pressure from the system before servicing or testing. Be sure provisions have been made so the case drain line can be disconnected from the unit without causing the line to drain (siphon) the reservoir.

(continued)

DISASSEMBLY (Continued)

1. Disconnect case drain line from port **1** or **1A**.
2. Drain pump case through the remaining (port **1** or **1A**) on the bottom of case. If plugs are inaccessible, it may be necessary to remove the pump from the mounting and drive motor before draining it.
3. After removing the pump from the mounting and before disassembly, cap or plug all ports and clean the outside of unit thoroughly to prevent dust from entering the system. See **Figures 12** and **13**.

NOTE *Depending on what part or parts are to be inspected, it may not be necessary to completely take apart all assemblies.*

CONTROL GROUP

Refer to the reference material for the information which applies to the control your pump is equipped with. Some force is required to remove the control housing.

1. Remove socket head cap screws.
2. Lift the control group assembly, with control pin, **(721)** straight up from the top of the pump assembly. The control pin may or may not remain in the swashblock **(201)**.
3. Remove control O-rings **(1228) (1015)** from the pump housing.

VALVE PLATE GROUP

If another pump is coupled to thru-shaft pumps, it will be necessary to remove coupling **(501)** before removing valve plate. See **Figures 14** and **15**

1. Block the pump on a bench with the drive shaft facing down.
2. Remove the valve plate **(401)** by removing four socket head cap screws **(403)** and lifting it straight up.
3. Remove valve plate O-ring **(1013)** and **(1261)**.

ROTATING GROUP

⚠ WARNING

The rotating group is heavy. Be careful not to damage cylinder wear surface which mates against the valve plate, bearing diameters or piston shoes. Use proper lifting techniques and assistance from others to prevent personal injury.

1. Place the pump in a horizontal position.
2. Remove the rotating group slowly by pulling the cylinder barrel **(101)** from the housing.
3. Identify (number) each pump piston shoe assembly **(102)** and its respective bore in the cylinder barrel **(101)** and shoe retainer **(104)** for easy reassembly.
4. See Figure 6. Lift out shoe retainer **(104)** with pistons **(102)** and remove the fulcrum ball **(103)** and shoe retainer springs **(105)**.

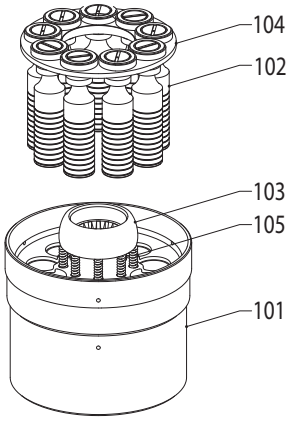


Figure 6. Rotating Group Disassembly

DRIVE SHAFT GROUP

1. Remove the drive key **(303)**, if used and the drive shaft bearing retainer ring **(305)**.
2. Grasp outboard end of drive shaft **(301)** and pull it out of the pump housing.
3. Remove the shaft seal retainer **(302)**.

SWASHBLOCK GROUP

Reach inside the case and remove the swashblock **(201)**

1. Remove screws **(225)**
2. Place pump in vertical position with valve plate down.
3. Tap on saddle (216) to loosen and remove.
4. Remove O-Ring (1253).

INSPECTION

Clean all parts thoroughly and allow them to dry. Inspect all seals and O-rings for hardening, cracking or deterioration. Replace if necessary or if you suspect damage. Check all locating pins for damage and springs for cracking or signs of wear.

⚠ WARNING

Wear proper protective gear when using solvents or compressed air, servicing or maintaining the hydraulic system or the Oilgear pump. Wear correct protective gear, safety glasses, gloves, and safety shoes. Serious injury can result without proper protective gear.

CONTROL GROUP

Refer to the reference material on pump controls. Be sure to carefully check the control pin for cracks and/or signs of fatigue. Check fit of the pin in the swashblock. It should be a slip-fit without side-play. Replace if necessary or if you suspect damage.

VALVE PLATE GROUP

Inspect the valveplate **(401)** surface which mates with the cylinder barrel **(101)** for excessive wear. Remove minor defects by lightly stoning the surface with a hard stone which is flat to within 0.001 inches (0,03 mm).

NOTE *Be sure to stone lightly. Any excessive stoning will remove the hardened surface. If wear or damage is extensive, replace the valve plate.*

ROTATING GROUP

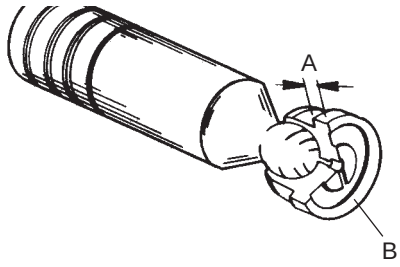
Inspect cylinder barrel **(101)** piston bores and the face which mate with the valve plate for wear. Remove minor defects on the face by lightly stoning or lapping the surface.

Check all piston and shoe assemblies **(102)** to be sure they ride properly on the swashblock.

NOTE *Be sure to stone lightly. Any excessive stoning will remove the hardened surface. If wear or damage is extensive and defects cannot be removed, replace the cylinder barrel.*

See **Figure 7**. Check each shoe face for nicks and scratches, and the shoe for smooth pivot action on the piston.

NOTE *If one or more piston/shoe assembly needs to be replaced, replace all the piston/shoe assemblies. When installing new piston/ shoe assemblies or the rotating group, make sure the pistons move freely in their respective bores.*



OILG-0005

Figure 7. Piston and Shoe Inspection

(A) All shoes must be equal within 0.002 inches (0,025 mm) at this dimension.

(B) All shoe faces must be free of nicks.

NOTE *End play should not exceed 0.002 inches (0,076 mm) when new or 0.006 inches (0,152 mm) when worn.*

SWASHBLOCK GROUP

Check the shaft seal **(007)** for deterioration or cracks. Replace is necessary (press-out). Inspect the swashblock **(201)** for wear. If defects are minor, stone the swashblock lightly. If damage is extensive, replace the swashblock.

Check the small holes in the face of the swashblock. The holes provide “porting” for the hydrostatic balance fluid of the piston/shoe assembly to be channeled through the swashblock to the face of the saddle bearing, providing pressure lubrication.

Check the mating surface of swashblock for cracks or excessive wear. The swashblock movement in the saddle bearings must be smooth. Check the saddle bearings for damage. Do Not Remove unless damaged.

NOTE *Be sure to stone lightly. Any excessive stoning will remove the hardened surface. If wear or damage is extensive and defects cannot be removed, replace if necessary or if you suspect them of being bad.*

HYDRODYNAMIC BEARING

Hydrodynamic bearing is integral press fit part of the pump case. Do not remove unless damaged.

To remove place pump housing on rigid surface with valve plate end up, See Figure 8. Locate a blunt object, such as a chisel or screw driver. On the edge of the bearing, adjacent to the split, use the blunt object to pound on the edge of the bearing until the bearing becomes loose. The bearing should be discarded once removed.

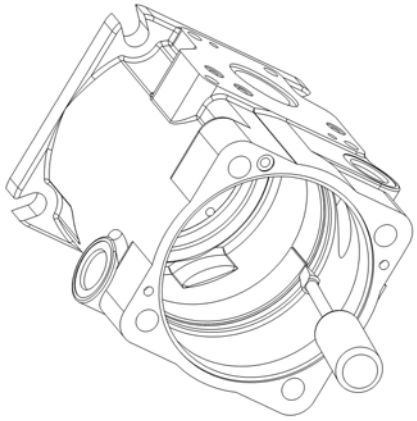


Figure 8. Hydrodynamic Bearing removal

DRIVE SHAFT GROUP

Check:

- the shaft bearing **(306)** for galling, pitting, binding or roughness.
- the rear shaft bushing in valve plate.
- the shaft and its splines for wear. Replace any parts necessary.

ASSEMBLY

See **Figures 12** and **13**. Follow the disassembly procedures in reverse for re-assembling the pump.

During assembly, install new seals and O-rings. Apply a thin film of CLEAN grease or hydraulic fluid to sealing components to ease assembly. If a new rotating group is used, lubricate thoroughly with CLEAN hydraulic fluid. Apply fluid generously to all wear surfaces.

Hydrodynamic Bearing

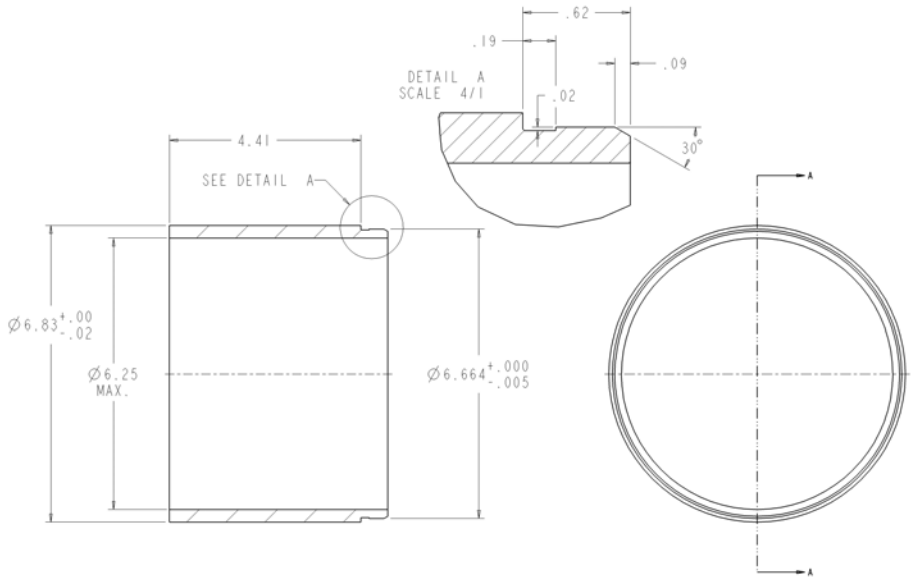
If the hydrodynamic bearing was removed, a new one will need to be pressed into the pump housing.

A special tool is required in order to press the bearing in correctly, See Figure 9. From the valve plate end, place the new bearing into the pump housing. Adjacent to where the bearing will be pressed is a slightly larger bore, with a lead-in chamfer, see Figure 11. In preparation for pressing, insert the bearing into this bore and verify it sits flush. Orient the bearing so that the split in the bearing is located 90 degrees clockwise from the control mounting face, See Figure 10. Insert the small diameter end of the pressing tool inside the pump housing and into the bearing. Press the bearing until the tool becomes flush with the valve plate mounting surface.

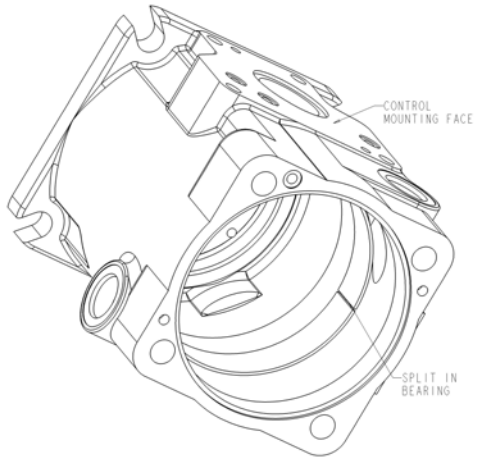
SWASHBLOCK GROUP

If removed,

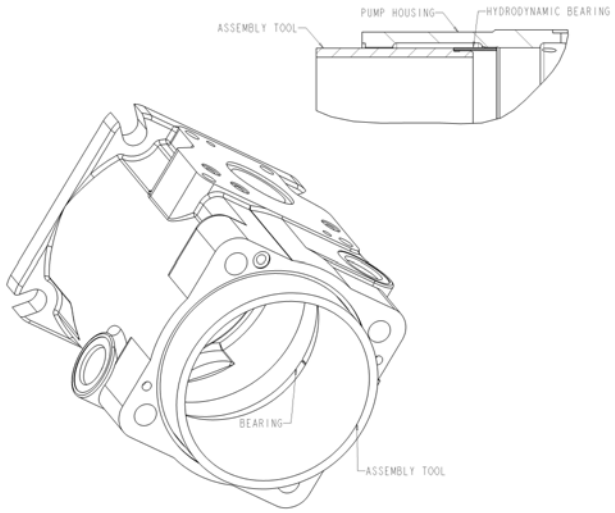
1. Press shaft seal **(007)** into the saddle **(216)**.
2. Align hole in bottom of saddle **(216)** with pin **(217)** in housing. Install saddle in housing and fasten with eight (8) screws **(225)**.
3. Place housing on a bench with the mounting flange side down.
4. Grease the back side of each saddle bearing **(204A** and **204B)** and install on the appropriate side of the saddle **(216)**.
5. The swashblock is inserted from the valve plate end. Insert swashblock **(201)** into the pump housing. Once in place, be sure the swashblock swivels in the saddle bearings. With new bearings, swiveling may be stiff and not always smooth.



FIGURURE 9. Hydrodynamic Bearing Installation Tool



FIGURURE 10. Hydrodynamic Bearing Seam Orientation



FIGURURE 11. Hydrodynamic Bearing Installation

DRIVE SHAFT GROUP

1. Place the housing on its side with the axis horizontal.
2. Install the seal retainer **(302)**.
3. Lubricate the shaft seal **(007)** and shaft.
4. Insert the drive shaft **(301)** and bearing assembly into the housing.
5. Lock in place with the drive shaft bearing retainer ring **(305)**.

ROTATING GROUP

See **Figure 6.**

1. Place the cylinder barrel **(101)**, wear surface down, on a clean cloth.
2. Place the nine (9) shoe retainer springs **(105)** in the spring pockets of the barrel with the fulcrum ball **(103)** on top of it.
3. Insert the identified pistons **(102)** into their corresponding identified holes of the shoe retainer **(104)**. As a unit, fit the pistons into their corresponding, identified bores in the cylinder barrel. **DO NOT FORCE.** When parts are aligned properly, the pistons will fit smoothly.

⚠ WARNING

The rotating group weight is heavy. Be careful not to damage cylinder wear surface which mates against the valve plate, bearing diameters or piston shoes. Use proper lifting techniques and assistance from others to prevent personal injury.

The rotating group can now be carefully installed over the end of the drive shaft **(301)** and into the pump housing **(001)**.

NOTE *When installing the rotating group, support the weight of the cylinder barrel **(101)**, as cylinder spline is passed over the tailshaft, to avoid scratching or damage.*

4. Push cylinder forward until the cylinder spline reaches the drive shaft spline and rotate slightly to engage shaft splines. Continue to slide cylinder forward until it encounters the Hydrodynamic bearing. Continue pushing the cylinder forward until the piston shoes contact the swashblock. The back of the cylinder should protrude approximately 0.25 inches (6 mm) from the back of the pump housing.

VALVE PLATE GROUP

1. Place the pump housing on a bench with the open end facing up.
2. Install new O-rings **(1013)** and **(1261)** on the housing.
3. Assemble the valve plate **(401)** onto the housing **(001)** making sure the screw holes are aligned.
4. Hand-tighten the socket head cap screw **(403)** closest to O-ring **(1013)** first, then alternately tighten the other cap screws. On thru-shaft units connected to another pump or device, install coupling **(501)**.

Refer to **PREPARATION** and **INSTALLATION** when pump is ready to be returned to service.

Fastener or Plug Item Number	Description	Head Type & Size	Tightening Torque
225	1/4-20 SHCS x 1.5" lg	3/16" Internal Hex	120 in-lbs (14 Nm)
403	3/4-10 SHCS x 3.25" lg	5/8" Internal Hex	244 ft-lbs (330 Nm)
503	3/8-16 HHCS x 1" lg	9/16" External Hex	183 in-lbs (20 Nm)
	1/2-13 HHCS x 1.25" lg	3/4" External Hex	37 ft-lbs (50 Nm)
	5/8-11 HHCS x 1.5" lg	15/16" External Hex	74 ft-lbs (100 Nm)
	3/4-10 HHCS x 2.25" lg	1 1/8" External Hex	132 ft-lbs (179 Nm)
507	3/8-16 SHCS x .63" lg	5/16" Internal Hex	45 ft-lbs (61 Nm)
	1/2-13 SHCS x 1.23" lg	3/8" Internal Hex	100 ft-lbs (136 Nm)
601	SAE #2 Plug	1/8" Internal Hex	45 in-lbs (5 Nm)
602	SAE #3 Plug	1/8" Internal Hex	45 in-lbs (5 Nm)
603	SAE #4 Plug	3/16" Internal Hex	120 in-lbs (14 Nm)
609	SAE #16 Plug	5/8" Internal Hex	135 ft-lbs (183 Nm)

Table 3. PVG Pump Torques

PARTS LIST

Parts used in these assemblies are per Oilgear specifications. Use only Oilgear parts to ensure compatibility with assembly requirements. When ordering replacement parts, be sure to include pump type and serial number, bulletin number and item number. Specify type of hydraulic fluid to assure seal and packing compatibility.

NOTE *Parts drawings may not be identical to Oilgear drawings referenced.*

PARTS LIST drawings on pages 23 through 26.

Item Number	Quantity	Description
Housing Assembly Group		
001	1	Pump Housing W/Hydrobearing
003	1	Nameplate
006	2	Pin
008	2	Screw
217	1	Pin
609	1	Plug
721	1	Control Pin
Rotating Group		
101	1	Cylinder Barrel
102	9	Piston/Shoe Assembly
103	1	Holddown Ball
104	1	Shoe Retainer
105	9	Spring
Swashblock Assembly Group		
007	1	Shaft Seal
201	1	Swashblock
204a	1	Saddle Bearing (Suction Side)
204b	1	Saddle Bearing (Pressure Side)
207	2	Pin
216	1	Saddle
225	8	Screw

Item Number	Quantity	Description
Drive Shaft Assembly		
301	1	Drive Shaft
302	1	Shaft Seal Retainer
303	1	Drive Shaft Key
304	1	Retaining Ring
305	1	Retaining Ring
306	1	Shaft Bearing
Valve Plate Assembly		
401	1	Valve Plate
403	4	Screw
601	1	Plug (RH units)
602	1	Plug (RH units)
	2	Plug (LH units)
603	1	Plug
Thru Drive Assembly		
501	1	Coupling
502	1	Adapter
503	2	Screw (SAE A,B,C 2 bolt)
	4	Screw (SAE 4 bolt, SAE D)
504	2	Washer (SAE A,B,C 2 bolt)
	4	Washer (SAE 4 bolt, SAE D)
507	4	Screw
508	1	Cover Plate

O-RING SEALS

Item Number	Quantity	ARP 568 Size Number / Shore A Durometer	
		Viton or Buna	EPR
1013	1	013/90	013/80
1015	3	015/90	015/80
1042	1	042/70	042/80
1049	1	049/70	049/80
1145	1	145/70	145/80
1153	1	153/70	153/80
1155	1	155/70	155/80
1158	1	158/70	158/80
1159	1	159/70	159/80
1163	1	163/70	163/80
1228	1	228/70	228/80
1253	1	253/70	253/80
1261	1	261/70	261/80
1902	1 (RH units)	902/90*	902/80
1903	1 (RH units)	903/90*	903/80
1903	2 (LH units)	903/90*	903/80
1904	1	904/90*	904/80
1916	1	916/90*	916/80

* Pumps with Buna seals use Viton for all SAE plugs

SERVICE KITS

Document Number: 520147-180SK

Revision: 1 (05-30-19)

Sheet 1 of 2

PVG 180 Pump Service Kits

SERVICE KIT Drawings on pages 23 through 26.

Description	Kit No.	Design Series	Items Included (quantity is 1 unless noted)
Shaft & Bearing Kits			
Viton/Buna Seals			
1.75" Dia Keyed Thru Shaft (Code Y)	K520218-318	A1,A2	301, 302, 303, 304, 305, 306
1.75" Dia Spline Thru Shaft (Code L)	K520218-218	A1,A2	301, 302, 304, 305, 306
EPR Seals			
1.75" Dia Keyed Thru Shaft (Code Y)	K520218-320	A1,A2	301, 302, 303, 304, 305, 306
1.75" Dia Spline Thru Shaft (Code L)	K520218-220	A1,A2	301, 302, 304, 305, 306
Swashblock			
All	514534-218	A1,A2	201
Control Pin			
All	250504-018	A1,A2	721
Saddle Bearings			
All	K520147-220	A1,A2	204A, 204B, 207(2)
Saddle &Saddle Bearings			
Viton Seals	K514533-D51	A1,A2	007, 204A, 204B, 207(2), 216, 225(8), 1253
Buna Seals	K514533-D52	A1,A2	007, 204A, 204B, 207(2), 216, 225(8), 1253
EPR Seals	K514533-D53	A1,A2	007, 204A, 204B, 207(2), 216, 225(8), 1253
Hydrodynamic Bearing Kit			
All	318358-031	A1,A2	Integral pressed in part of 001
Rotating Group Kit			
All	L514535-118	A1,A2*	101, 102(9), 103, 104, 105(9)
Valve Plate Kits			
Viton Seals			
LH (CCW), Thru Shaft	K520208-518	A1,A2	401, 403(4), 602(2), 603, 1013, 1261, 1903(2), 1904
RH (CW), Thru Shaft	K520208-618	A1,A2	401, 403(4), 601, 602, 603, 1013, 1261, 1902, 1903, 1904
Buna Seals			
LH (CCW), Thru Shaft	K520208-519	A1,A2	401, 403(4), 602(2), 603, 1013, 1261, 1903(2), 1904
RH (CW), Thru Shaft	K520208-619	A1,A2	401, 403(4), 601, 602, 603, 1013, 1261, 1902, 1903, 1904
EPR Seals			
LH (CCW), Thru Shaft	K520208-520	A1,A2	401, 403(4), 602(2), 603, 1013, 1261, 1903(2), 1904
RH (CW), Thru Shaft	K520208-620	A1,A2	401, 403(4), 601, 602, 603, 1013, 1261, 1902, 1903, 1904
Seal Kits			
Viton Seals	K516175-D01	A1,A2	007, 1013(4), 1015(3), 1042, 1145, 1153, 1155, 1158, 1159,
Buna Seals	K516175-D11	A1,A2	1163, 1228, 1253, 1261, 1902(2), 1903(2), 1906(2), 1904,
EPR Seals	K516175-D21	A1,A2	1916
Cover Plate Kits			
Viton Seals	K319076-101	A1,A2	
Buna Seals	K319076-201	A1,A2	507(4), 508, 1145
EPR Seals	K319076-301	A1,A2	
SAE A 2-Bolt Coupling & Adapter Kits			
Viton Seals	K319076-102	A1,A2	
Buna Seals	K319076-202	A1,A2	501, 502, 503(2),504(2), 507(4),1042, 1153
EPR Seals	K319076-302	A1,A2	
SAE B 2-Bolt Coupling & Adapter Kits			
Viton Seals	K319076-103	A1,A2	
Buna Seals	K319076-203	A1,A2	501, 502, 503(2),504(2), 1155, 1158
EPR Seals	K319076-303	A1,A2	

SERVICE KITS

Document Number: 520147-180SK
Revision: 1 (05-30-19)
Sheet 2 of 2

PVG 180 Pump Service Kits

SERVICE KIT Drawings on pages 23 through 26.

Description	Kit No.	Design Series	Items Included (quantity is 1 unless noted)
SAE C 2-Bolt Coupling & Adapter Kits			
Viton Seals	K319076-105	A1,A2	501, 503(2),504(2), 1049
Buna Seals	K319076-205	A1,A2	
EPR Seals	K319076-305	A1,A2	
SAE C 4-Bolt Coupling & Adapter Kits			
Viton Seals	K319076-106	A1,A2	501, 502, 503(4),504(4), 507(4), 1049, 1159
Buna Seals	K319076-206	A1,A2	
EPR Seals	K319076-306	A1,A2	
SAE D 4-Bolt Coupling & Adapter Kits			
Viton Seals	K319076-107	A1,A2	501, 502, 503(4),504(4), 507(4), 1049, 1163
Buna Seals	K319076-207	A1,A2	
EPR Seals	K319076-307	A1,A2	
Name Tag & Screws			
All	L50921	A1,A2	003, 008(2)

*** A2 Rotating Group Required for Operation above 1800 RPM**

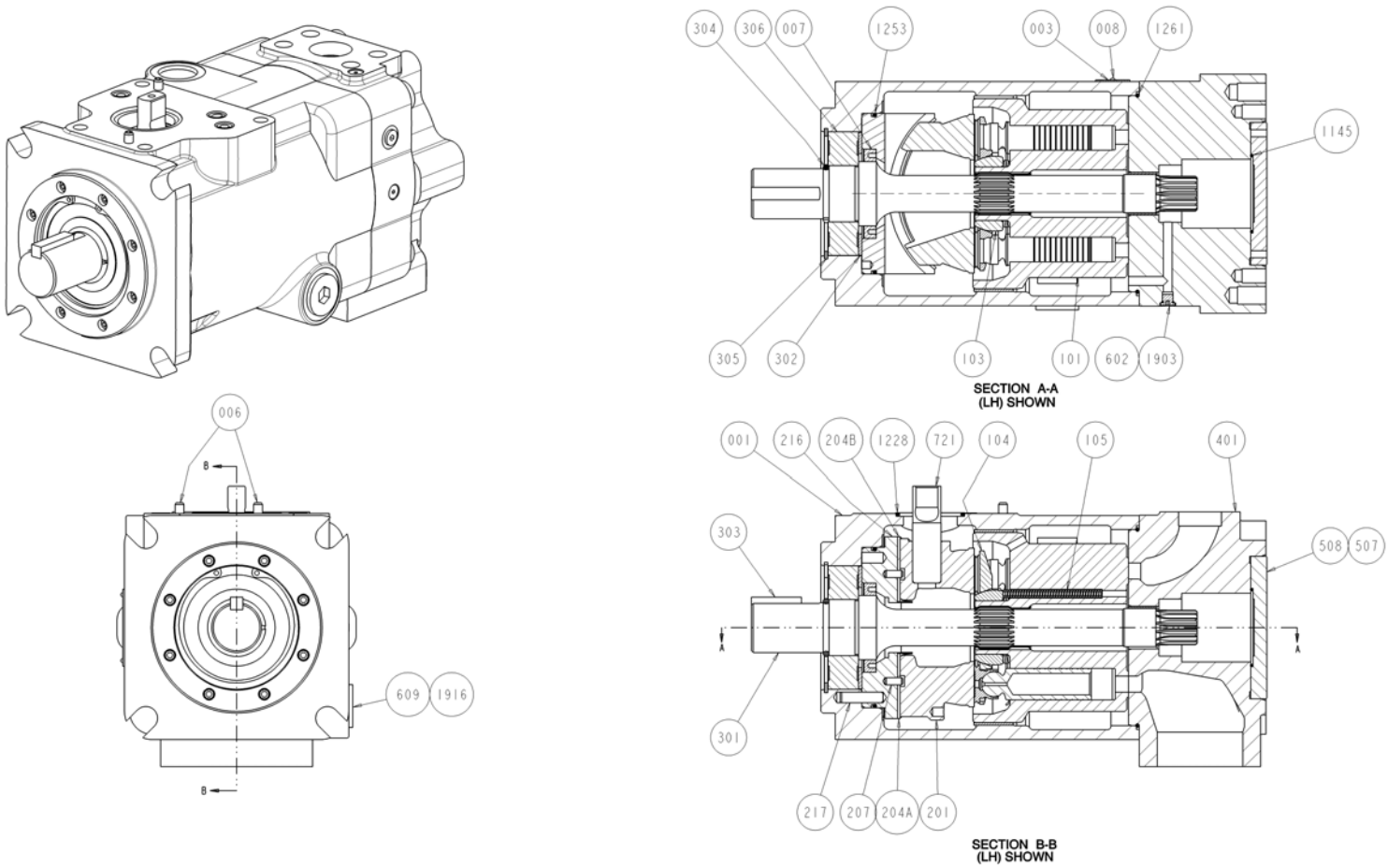


Figure 12. Cross Section and Exploded Parts Drawing for PVG 180 (520147-181 sheet 1 of 5)

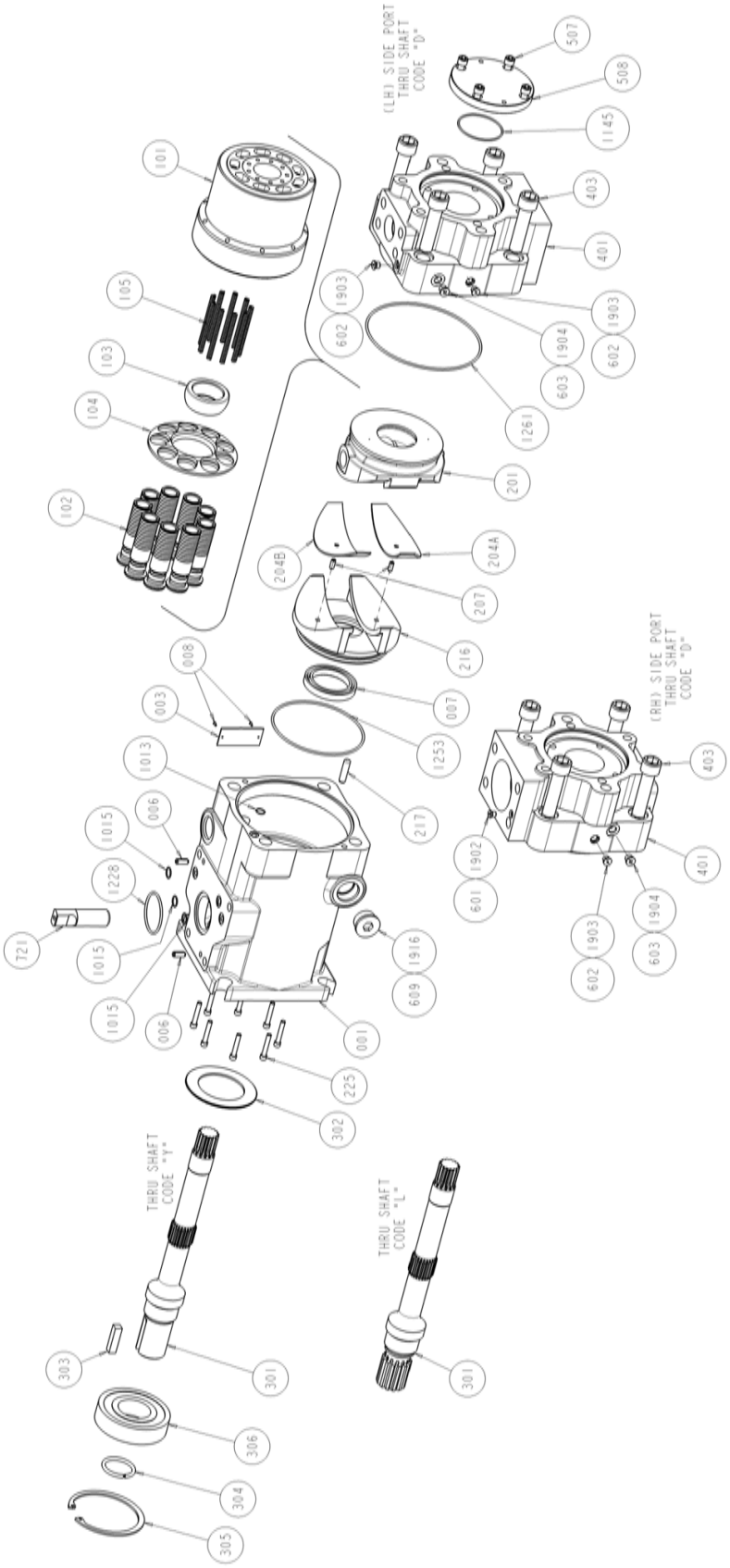


Figure 13. Exploded Parts Drawing for PVG 180 (520147-181 sheet 2 of 5)

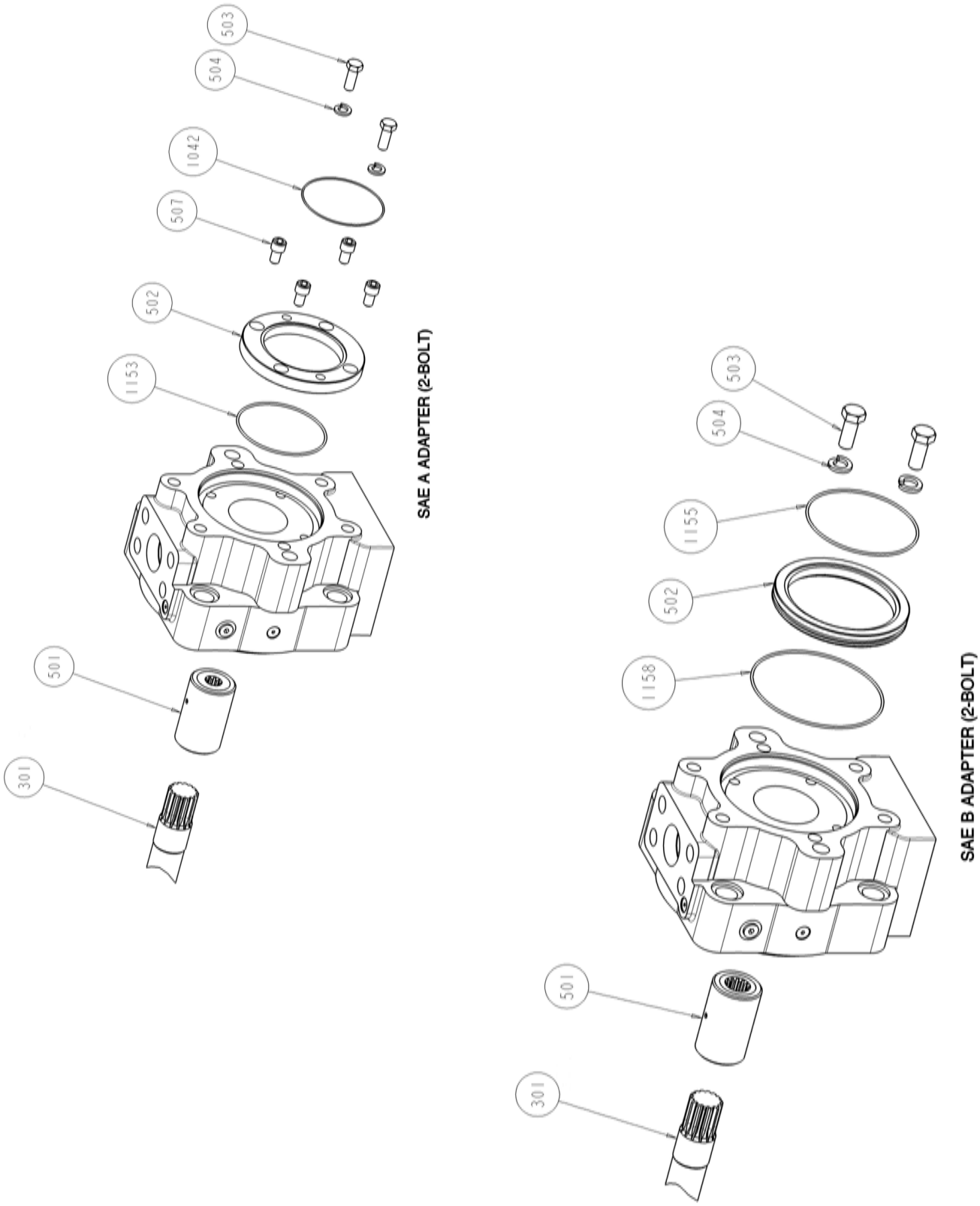


Figure 14. Exploded Parts Drawing for PVG 180 (520147-181 sheet 3 of 5)

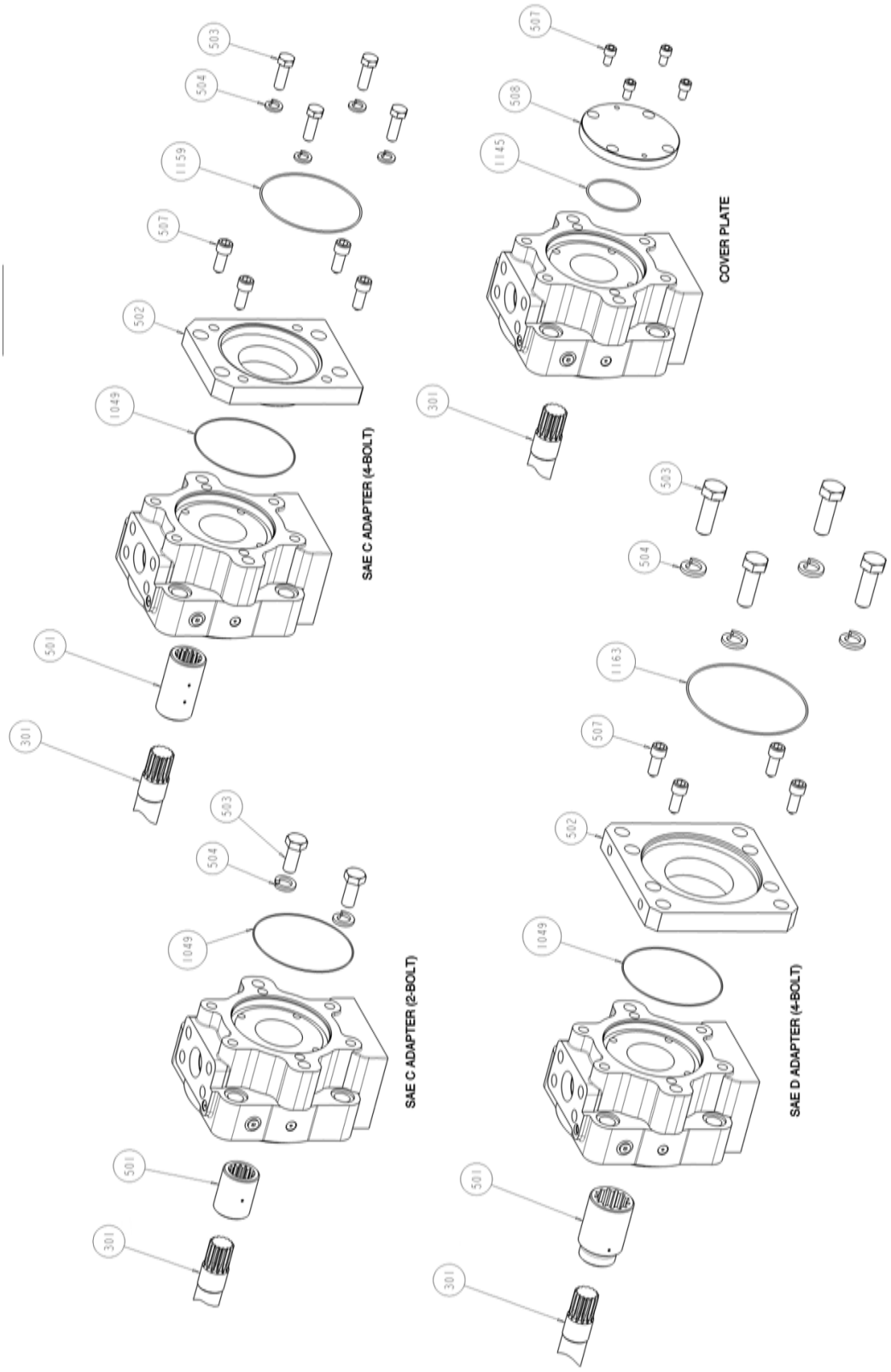


Figure 15. Cross Section and Exploded Parts Drawing for PVG 180 (520147-181 sheet 4 of 5)

NOTES

AFTER SALES SERVICES

At Oilgear we build products to last. It is the nature of this type of machinery to require proper maintenance regardless of the care we put into manufacturing. Oilgear has several service programs in place to help you.

STAY-ON-STREAM SERVICE

By signing up for Oilgear's Stay-On-Stream program, you can prepare for problems before they happen. Certain field tests such as fluid testing, slip testing and electronic profile recording comparisons can be performed by our field service people or your own factory trained personnel. These tests can indicate problems before they become “down-time” difficulties.

SERVICE SCHOOLS

Oilgear conducts training to train your maintenance personnel. “General” hydraulic or electronic training is conducted at our Milwaukee, Wisconsin plant on a regular basis. “Custom” training, specifically addressing your particular hydraulic and electro-hydraulic equipment can be conducted at your facilities.

SPARE PARTS AVAILABILITY

Prepare for your future needs by stocking Oilgear original factory parts. Having the correct parts and necessary skills “in-plant” enables you to minimize “down-time.” Oilgear has developed parts kits to cover likely future needs. Oilgear Field Service Technicians are also ready to assist you and your maintenance people in troubleshooting and repairing equipment.

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