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INTRODUCTION

The illustrations used in this manual are for identification purposes only and cannot be used for ordering parts. Obtain a parts list from the factory or a VICAN representative. Always give complete name of part, part number and material with model number and serial number of pump when ordering repair parts. The pump model number and serial number are on the nameplate.

In the VICAN model number system, basic size letters are combined with series number.

UNMOUNTED PUMP	UNITS
GG-190	Units are designated by the unmounted pump model numbers followed by "Arrangement" indicating drive style.
HJ-190	
HL-190	
AS-190	
AK-190	
	13-Direct Connected
	53-V-Belt
	70-Commercial Speed Reducer

This manual deals only with Series 190 Heavy Duty Pumps. Pump specifications and recommendations are listed in Catalog Section 3, series 190 Heavy Duty pumps.



GG-190



AK-190

DANGER

BEFORE OPENING ANY VICAN PUMP LIQUID CHAMBER (PUMPING CHAMBER, RESERVOIR, RELIEF VALVE ADJUSTING CAP FITTING ETC.) BE SURE:

1. THAT ANY PRESSURE IN CHAMBER HAS BEEN COMPLETELY VENTED THROUGH SUCTION OR DISCHARGE LINES OR OTHER APPROPRIATE OPENINGS OR CONNECTIONS.
2. THAT THE DRIVING MEANS (MOTOR, TURBINE, ENGINE, ETC.) HAS BEEN "LOCKED OUT" OR MADE NON-OPERATIONAL SO THAT IT CANNOT BE STARTED WHILE WORK IS BEING DONE ON PUMP.
3. THAT YOU KNOW WHAT LIQUID THE PUMP HAS BEEN HANDLING AND THE PRECAUTIONS NECESSARY TO SAFELY HANDLE THE LIQUID. OBTAIN A MATERIAL SAFETY DATA SHEET (MSDS) FOR THE LIQUID TO BE SURE THESE PRECAUTIONS ARE UNDERSTOOD.

FAILURE TO FOLLOW ABOVE LISTED PRECAUTIONARY MEASURES MAY RESULT IN SERIOUS INJURY OR DEATH.

ROTATION: Rotary gear pumps operate equally well in a clockwise or counterclockwise rotation. The shaft rotation determines which port is suction and which is discharge. Port in area where pumping elements (gear teeth) come out of mesh is suction port.

PRESSURE RELIEF VALVES:

1. Rotary gear pumps are positive displacement and must be provided with some sort of pressure protection. This may be a relief valve mounted directly on the pump, an inline pressure relief valve, or a torque limiting device or a rupture disk.
2. There are relief valve options available on pump models. Options may include a return to tank relief valve and a jacketed relief valve. Pumps equipped with a jacketed head are not available with a relief valve.
3. If pump rotation is reversed during operation, pressure protection must be provided on *both* sides of pump.
4. Relief valve bonnet (see page 12) must *always* point towards suction side of pump. If pump rotation is reversed, remove pressure relief valve and turn end for end. Figures 2 and 3 show 2 possible configurations, both have side suction and top discharge. A right-hand pump turns in the opposite direction to the left-hand pump.
5. Pressure relief valves cannot be used to control pump flow or regulate discharge pressure.

MAINTENANCE

Series 190 pumps are designed for long, trouble-free service life under a wide variety of application conditions with a minimum of maintenance. The points listed below will help provide long service life.

LUBRICATION: All 190 pumps have sealed ball bearings, and carbon bushings which do not require lubrication.

CLEANING PUMP: Keep pump as clean as possible. This will facilitate inspection, adjustment and repair work and help prevent overlooking a dirt covered grease fitting.

STORAGE: If pump is to be stored, or not used for six months or more, pump must be drained and a light coat of lubricant and rust preventative suitable to the application must be applied to all internal pump parts. Lubricate fittings and apply grease to pump shaft extension. Rotating the pump shaft by hand, one complete revolution every 30 days to circulate the oil.

SUGGESTED REPAIR TOOLS: The following tools must be available to properly repair Series 190 pumps. These tools are in addition to standard mechanics' tools such as open-end wrenches, pliers, screwdrivers, etc. Most of the items can be obtained from an industrial supply house.

1. Soft Headed hammer
2. Allen wrenches (some mechanical seals and set collars)
3. Internal and external snap ring pliers.



Figure 1,



Figure 2, Right Hand Pump



Figure 3, Left Hand Pump

4. Mechanical seal installation sleeve.
6. Spanner wrench, adjustable pin type for use on end caps (Source: #482 J. H. Williams & Co. or equal) or hammer and punch.
7. Brass bar.
8. Arbor press.

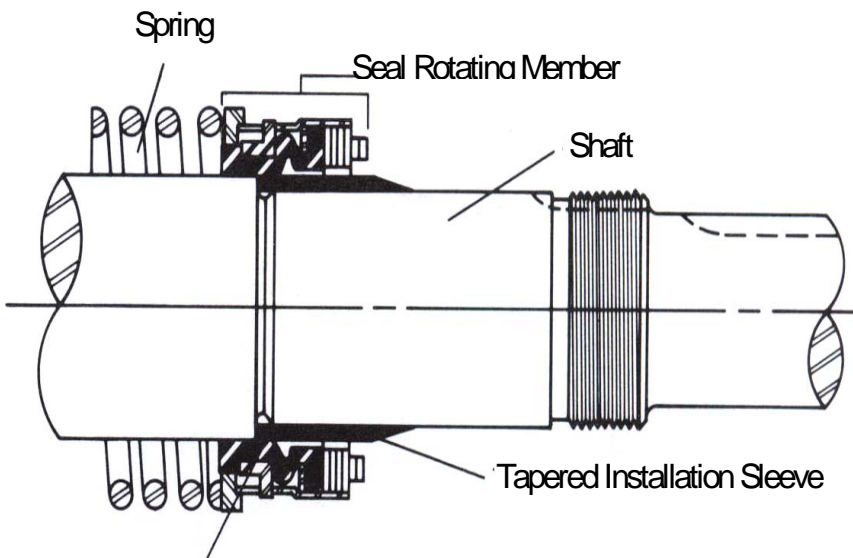
Strainers: Use a strainer on the suction side of the pump to prevent foreign material from entering the pump causing damage to the gears, and casing or lock-up the pump. Keep the strainer on the suction side of the pump clean and free of debris. A blocked strainer will not allow sufficient liquid to reach the pump. The lack of liquid reaching the pump will create cavitation. Cavitation is when the liquid vaporizes on its way to the pump, then returns to a liquid form on the surfaces of the pump. This is very noisy, damaging to a pump, and seriously affects the output.



Figure 4, Pressing idler bushing



Figure 5, Pressing the idler pin



Coat the shaft, tapered installation sleeve and inner diameter of mechanical seal with lubricant as recommended by your seal supplier.

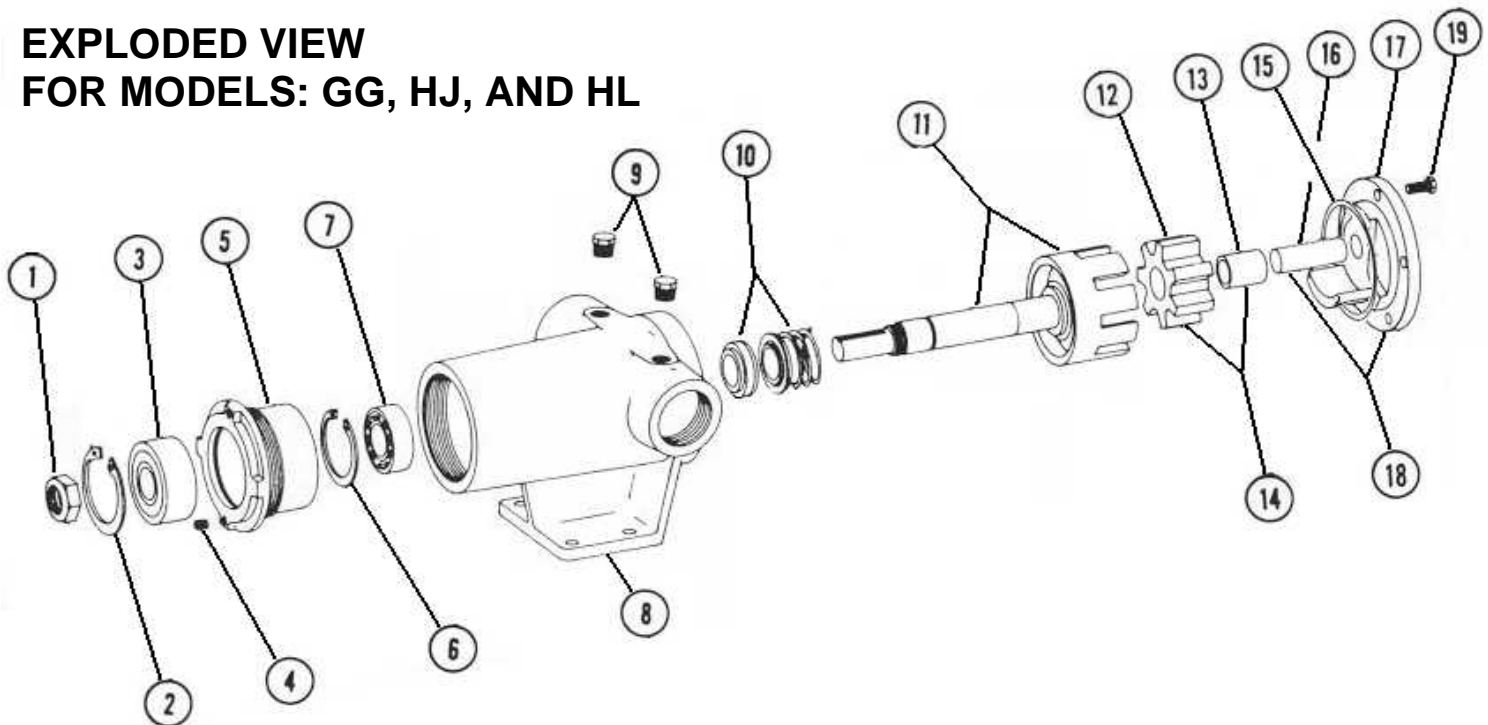


Figure 6, Inner bearing & snap ring



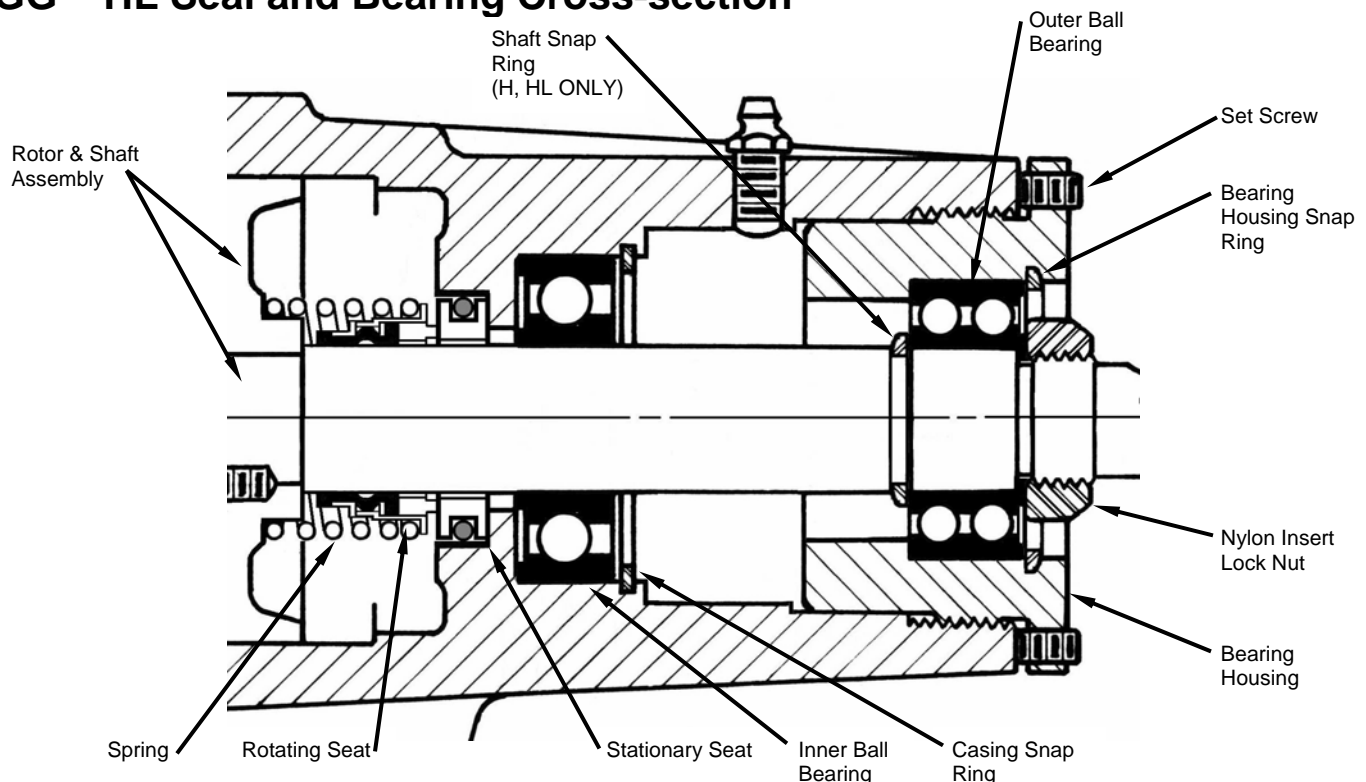
Figure 7, Bearing housing ass'y

EXPLODED VIEW FOR MODELS: GG, HJ, AND HL



ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART
1	Nylon lock nut	6	Inner snap ring	11	Rotor and shaft assembly	16	Idler pin
2	Internal snap ring	7	Ball bearing (inner)	12	Idler	17	Head
3	Ball bearing (outer)	8	Casing	13	Idler bushing	18	Head and pin assembly
4	Set screw	9	Pipe plug	14	Idler and bushing assembly	19	Head bolts
5	Bearing housing	10	Mechanical seal assembly	15	O-ring		

GG – HL Seal and Bearing Cross-section



DISASSEMBLY OF MODELS GG, HJ AND HL

Before disassembling a pump determine why it needs to be disassembled, with the aid of the troubleshooting chart on page 13. Do not disassemble further than necessary, and look for sign of wear or damage throughout the process.

1. Mark head and casing before disassembly to insure proper reassembly. The idler pin, which is offset in pump head, must be positioned toward and centered between the port connections to allow for proper flow of liquid through pump. Figure 1, page 2.

Remove head from pump. *Do not allow idler to fall from idler pin.* Tilt top of head back and down when removing this. If pump is furnished with pressure relief valve, remove it from the head and refer to Pressure Relief Valve Instructions, page 11.

Be careful not to damage the o-ring seal between the head and casing.

2. Remove idler and bushing assembly from the idler pin.
3. Insert a plate between rotor teeth to keep shaft from turning, Figure 12, page 6. Remove the lock nut from the shaft. Remove the plate from the rotor.
4. Loosen the setscrews in the casing at the shaft end, and in the end of the bearing housing. Figure 24 & 25, page 10.
5. Remove the bearing housing from the casing.
6. Remove the shaft snap ring and tap the shaft forward with a soft headed hammer. Then pull the shaft out of the inner ball bearing being careful not to damage the mechanical seal.
7. Remove the stationary element of the seal from the casing, and the rotating element from the rotor and shaft assembly.
8. Using snap ring pliers remove the inner snap ring through the shaft end of the casing.
9. To remove the inner ball bearing, support the casing on the shaft end and press the bearing out from the rotor side.
10. Remove the snap ring from the bearing housing and press the ball bearing out from the side opposite to the snap ring.
11. Clean all parts thoroughly and examine for wear and damage. Check idler bushing, idler pin, gears and head. Replace if necessary. Check all other parts for nicks, burrs, excessive wear and replace if necessary.
12. Check the ball bearing for signs of roughness. Roughness can be determined by turning the inner and outer race opposite directions by hand. Note if the motion is smooth and free or rough and stiff. Smooth and free is desired. Replace if necessary.
13. Check the casing for wear or damage. Most wear occurs between the suction and discharge ports at the topside of the bore where the rotor spins.



Figure 8, Stationary seal element



Figure 9, Installing the rotating element



Figure 10, shaft snap ring

ASSEMBLY OF MODELS GG, HJ AND HL

1. Coat the idler bushing with soapy water, and carefully press the idler bushing into the idler with an arbor press. Be sure to press the bushing straight and with constant force. Starting and stopping the operation will result in cracking. Figure 4, page 3.
2. Press the idler pin into the head, using the idler and bushing assembly for alignment. Figure 5, page 3.
3. Put the inner ball bearing into the casing, and install the inner snap ring. Figure 6, page 3.
4. For models HJ and HL only; install the shaft snap ring. Figure 10, page 5
5. Install the outer ball bearing, and the snap ring into the bearing housing. Figure 7, page 3.
6. Coat the counter bore in the casing and the stationary seal seat with a lubricant as recommended by your seal supplier.
7. Carefully press the stationary seal seat into the casing while protecting the seal face with a clean piece of cardboard. Figure 8, page 5.
8. Coat the shaft, installation sleeve, shaft and inside diameter of the rotating seal seat with seal lubricant.
9. Place the spring on the rotor hub, and with the seal installation sleeve carefully slide the seal seat onto the shaft and into the spring. Figure 9, page 5.
10. Remove the seal installation sleeve.
11. Start the end of shaft into the inner ball bearing, slowly push the shaft through the bearings. Continue until there is pressure applied to the seal spring.
12. Turn the bearing housing into the casing by hand until the flange is about 1/16 inch away from the casing. Because of the size of these threads and the minimum clearance allowed between these threads, the installation of this component may be difficult. To aid installation, tap the casing around the diameter of the bearing housing threads with a hammer while turning the bearing housing.
13. Place a plate into the rotor teeth to hold the rotor and shaft assembly from turning. Tighten the nylon lock nut onto the shaft. Figure 12, page 6.
14. Turn the bearing housing out until the head can be installed without applying pressure to the rotor teeth.
15. Install the head and idler assembly on the pump with the o-ring seal, on the head, figure 13, page 6. If the pump head and casing were marked before disassembly simply match up the markings. If not, be sure the idler pin, which is offset in pump head, is positioned directly above the center of the crescent on the head, figure 1, page 2. Tighten head capscrews evenly.
16. Adjust pump end clearance. Refer to "END CLEARANCE ADJUSTMENT", page 10.



Figure 11, Lock nut ready to tighten

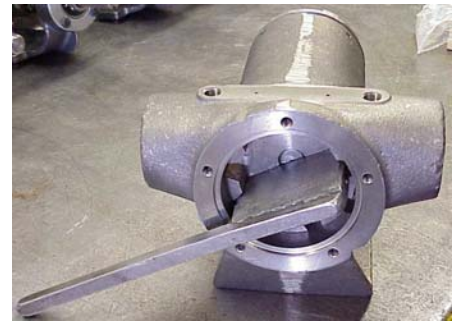


Figure 12, Locking the shaft for tightening

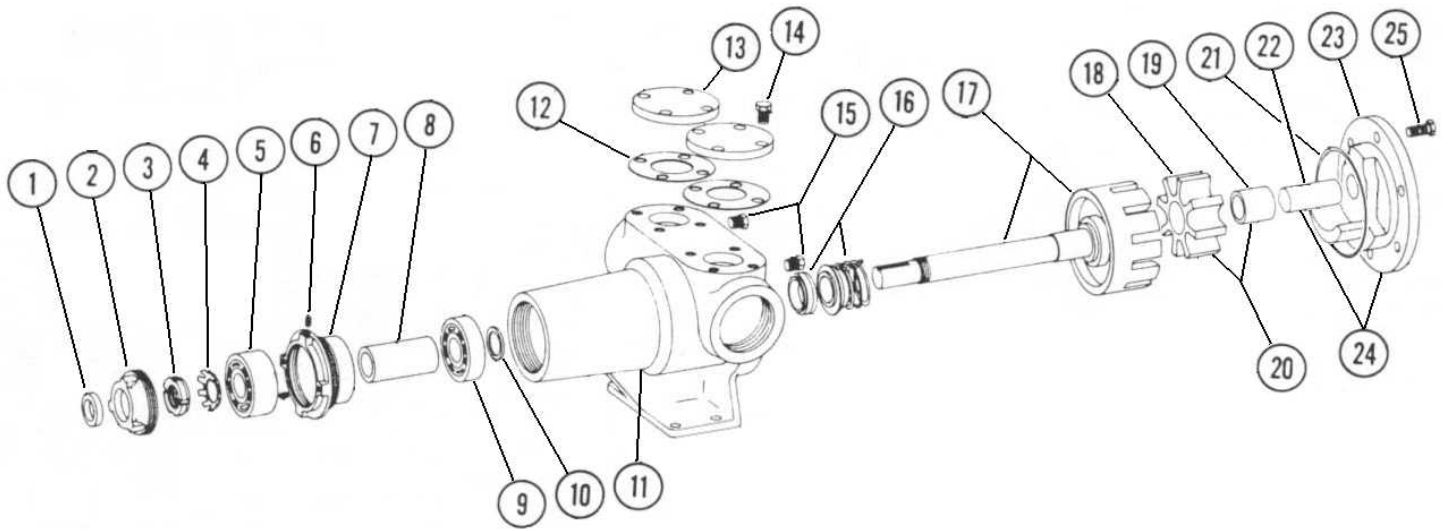


Figure 13, Head ass'y ready to install



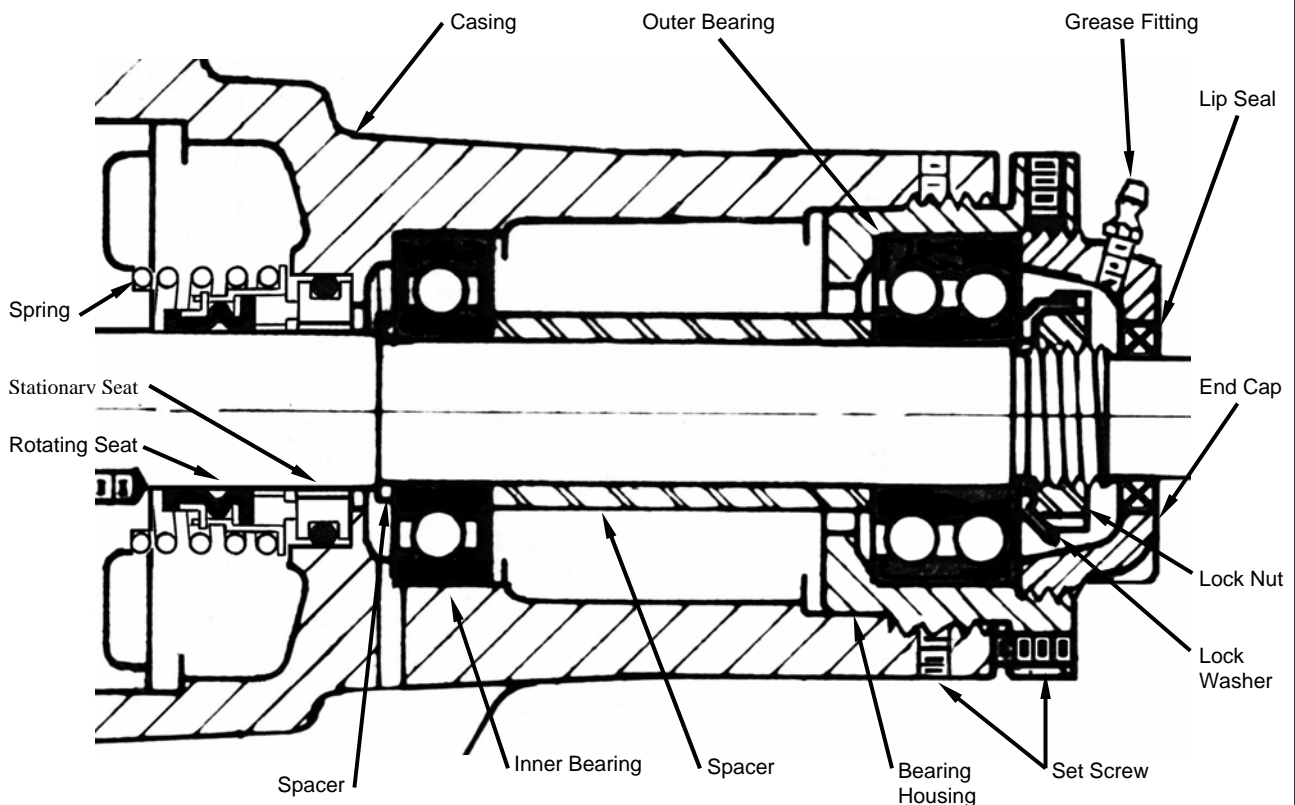
Figure 14, Pump ready for adjustment

EXPLODED VIEW FOR MODELS: AS and AK



ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART
1	Lip seal	8	Bearing spacer	15	Pipe plug	22	Idler pin
2	End cap	9	Ball bearing (Inner)	16	Mechanical Seal	23	Head
3	Nylon Lock nut	10	Shaft snap ring	17	Rotor and shaft assembly	24	Head and pin assembly
4	Lock washer	11	Casing	18	Idler	25	Head bolt
5	Ball Bearing	12	Relief valve port gasket	19	Idler bushing		
6	Set screw	13	Blanking plate	20	Idler and bushing assembly		
7	Bearing housing	14	R/V bolt	21	O-ring		

AS & AK Seal and Bearing Cross-Section



DISASSEMBLY OF MODELS AS AND AK

Before disassembling a pump determine why it needs to be disassembled, with the aid of the troubleshooting chart on page 13. Do not disassemble further than necessary, and look for sign of wear or damage throughout the process.

1. Mark head and casing before disassembly to insure proper reassembly. The idler pin, which is offset in pump head, must be positioned toward and centered between the port connections to allow for proper flow of liquid through pump. Figure 1, page 2.

Remove head from pump. *Do not allow idler to fall from idler pin.* Tilt top of head back and down when removing to prevent this. If pump is furnished with pressure relief valve, remove it from the head and refer to Pressure Relief Valve Instructions, page 11.

Be careful not to damage the o-ring seal between the head and casing.

2. Remove idler and bushing assembly from the idler pin.
3. Remove the end cap with the lip seal.
4. Bend the tab on the lock washer out of the notch in the lock nut.
5. Insert a plate between rotor teeth to keep shaft from turning, Figure 12, page 6. Remove the lock nut and lock washer from the shaft. Remove the plate from the rotor teeth.
6. Push the shaft out of the pump while supporting the casing on the head-mounting surface. Be careful not to damage the seal or let the rotor and shaft assembly drop.
7. Remove the stationary element of the seal from the casing, and the rotating element from the rotor and shaft assembly.
8. Loosen the setscrews in the casing at the shaft end, and in the end for the bearing housing. Figure 24 & 25, page 10.
9. Remove the bearing housing from the casing.
10. Remove the snap ring from the bearing housing and press the bearing out of the housing.
11. Remove the bearing spacer from the casing.
12. Stand the casing on the bearing end and press the inner bearing out.
13. Clean all parts thoroughly and examine for wear and damage. Check idler bushing, idler pin, gears and head. Replace if necessary. Check all other parts for nicks, burrs, excessive wear and replace if necessary.
14. Check the ball bearing for signs of roughness. Roughness can be determined by turning the inner and outer race in opposite directions by hand. Note if the motion is smooth and free, or rough and stiff. Smooth and free is desired. Replace if necessary.
15. Check the casing for wear or damage. Most wear occurs between the suction and discharge ports at the topside of the bore where the rotor spins.



Figure 15, Bearing washer



Figure 16, Inner ball bearing



Figure 17, Bearing spacer

ASSEMBLY OF MODELS AS AND AK

1. Press the lip seal into the endcap, figure 20 page 9 (lip facing away from the threads).
2. Coat the idler bushing with soapy water and carefully press the idler bushing into the idler with an arbor press. Be sure to press the bushing straight and with constant force. Starting and stopping the operation will result in cracking. Figure 4, page 3.
3. Press the idler pin into the head, using the idler and bushing assembly for alignment. Figure 5, page 3.
4. Coat the counter bore in the casing and the stationary seal seat with a lubricant as recommended by your seal supplier.
5. With the lapped face of the stationary seal seat facing out, carefully press the stationary seal into the casing while protecting the seal face with a clean piece of cardboard. Figure 8, page 5.
6. Coat the shaft, installation sleeve and inside diameter of the rotating seat with the seal lubricant.
7. Place the spring on the rotor hub, and with the seal installation sleeve carefully slide the rotating seat onto the shaft and into the spring. Figure 9, page 5.
8. Start the end of shaft into the stationary seat of the seal, slowly push the shaft through the casing. Continue until there is pressure applied to the seal spring.
9. Place the head and idler assembly in the casing temporarily, to support the rotor and shaft assembly while pressing the bearings into the casing.
10. Place the bearing washer on the shaft and press the inner ball bearing onto the shaft, and into the casing, figure 15 & 16, page 8.
11. Place the bearing spacer on the shaft, figure 17, page 8.
12. Turn the bearing housing into the casing until the flange is about 1/16 inch away from the casing.
13. Press the outer ball bearing into the bearing housing, and onto the shaft. Figure 18.
14. Remove the head and idler assembly from the casing and place a plate into the rotor teeth to hold the rotor and shaft assembly from turning. Figure 12, page 6.
15. Place the lock washer on the shaft and tighten down the lock nut. Bend the tab on the lock washer, into the closest notch in lock nut, and remove the plate from the rotor teeth. Figure 19.
16. Install the end cap into the bearing housing and tighten down.
17. Turn the bearing housing out so that the head and idler assembly can be installed without applying pressure to the rotor teeth.
18. Install the head and idler assembly on the pump with the o-ring seal on the head as shown in figure 13, page 6. If the pump head and casing were marked before disassembly simply match up the markings. If not, be sure the idler pin, which is offset in pump head, is positioned directly above the center of the crescent on the head, figure 1, page 2. Tighten head capscrews evenly.
19. Adjust pump end clearance. Refer to End Clearance Adjustment, page 10
20. Pneumatic test the pump.
21. Return the pump to service.



Figure 18, Outer ball bearing



Figure 19, Lock nut & lock washer



Figure 20, Lip seal instalation



Figure 21, End cap & lipseal

END CLEARANCE ADJUSTMENT

Note: Cone point setscrews are to be installed in the diameter of the casing. The cone does less damage to the threads than the cup point setscrews. Figure 23

1. Loosen setscrews in the face of the end cap and on the diameter of the casing. Figure 24 and 25.
2. Turn the bearing housing clockwise until the rotor and shaft assembly rubs the head when turned.
3. Turn the bearing housing counter clockwise about $\frac{1}{4}$ of a turn.
4. Check the shaft rotation for rubbing.
5. Turn each setscrew in until the tip touches the bottom.
6. Evenly tighten all setscrews, and check the shaft rotation for any rubbing or binding.
7. Re-adjust the setscrews until the shaft turns freely.

Note: If the setscrews are loose, the end clearance will change during operation. This will seize the pump or cause the pump to not move any liquid.

PNEUMATIC TESTING

1. Seal the ports with pipe plugs or plates and gaskets. Be sure to provide a male air line connection to one of the ports.
2. Apply air pressure to the pump.
3. Spray or brush the externals with soapy water and watch for growing air bubbles around the seal, fitting, and gaskets.
4. Relieve the pressure from the pump.
5. Carefully disconnect the air supply.
6. Remove the plugs or covers from the ports.
7. Return the pump to service.



Figure 22, Check rotation



Figure 23, Cone and cup point setscrews



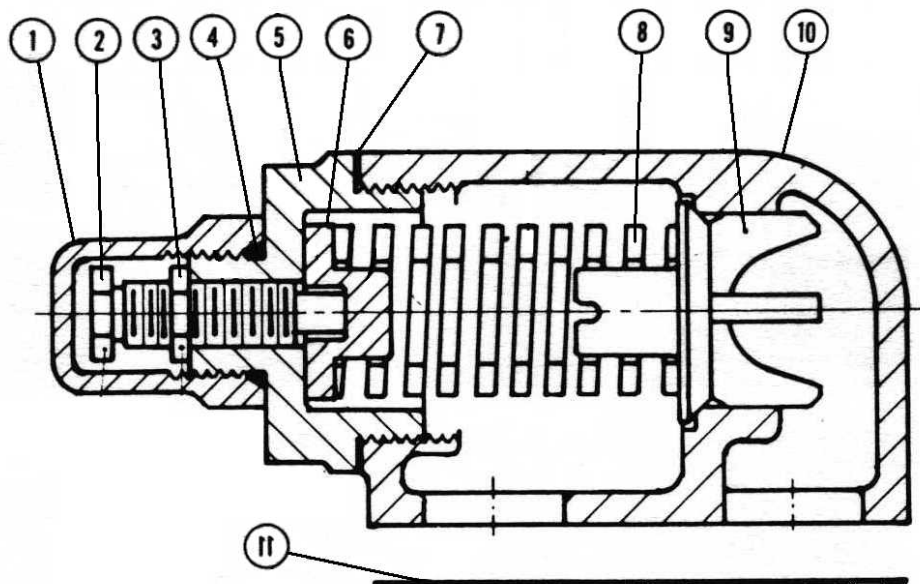
Figure 24, Tightening cone point setscrew



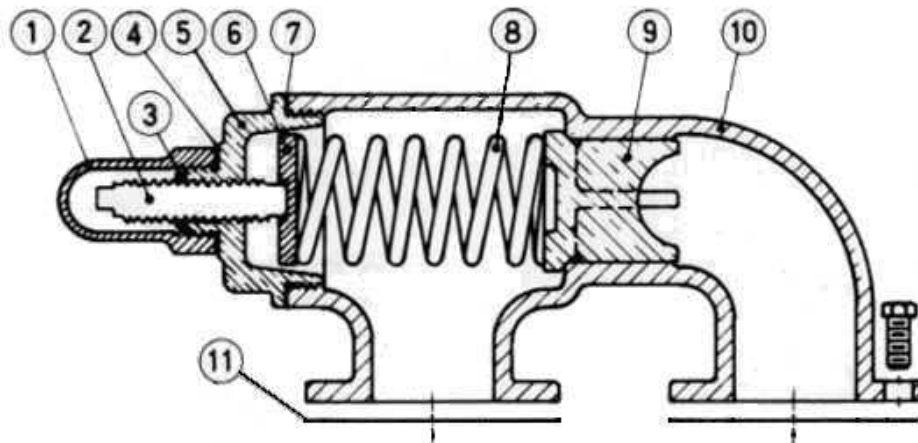
Figure 25, Tightening cup point setscrew

PRESSURE RELIEF VALVE INSTRUCTIONS

“G” & “A” Size



“B” Size



ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART
1	Bonnet	4	Bonnet o-ring	7	Cap Gasket	10	Poppet
2	Adjusting Screw	5	End cap	8	Spring	11	Relief valve port gasket
3	Lock nut	6	Spring Guide	9	Casing		

DISASSEMBLY

Mark valve and head before disassembly to insure proper reassembly.

1. Remove bonnet.
2. Measure and record length of adjusting screw protruding out of the end cap.
3. Loosen locknut and back out adjusting screw until spring pressure is released.
4. Remove relief valve cap, spring guide, spring and poppet from valve body. Clean and inspect all parts for wear or damage and replace as necessary.

ASSEMBLY

1. Place the poppet inside the relief valve body. The fingers should pass through the hole in the middle of the body.
2. Place the spring on the poppet.
3. Place the spring retainer on the spring with the protruding step inside the spring.
4. With 2 gaskets on the face of the body turn the cap into the body and tighten down.
5. Install the adjusting screw in the threaded hole in the endcap and turn in until the remainder of the screw sticking out is equal to the measurement taken during the disassembly.
6. Lock the adjusting screw into position by turning the locknut onto the adjusting screw and tightening it against the endcap.
7. Place the oring over the threads of the endcap.
8. Put the poppet on the endcap
9. Remount the relief valve onto the pump with 2 gaskets. Be sure to replace in the same position as it was removed from. The Bonnet must *always* point towards suction side of pump. If pump rotation is reversed, remove relief valve and turn end for end. Refer to Figures 2, 3, page 2.

PRESSURE ADJUSTMENT

If a new spring is installed or if pressure setting of pressure relief valve is to be changed from that which the factory has set, the following instructions must be carefully followed.

1. Carefully remove the bonnet, which covers the adjusting screw.
2. Loosen the locknut, which locks the adjusting screw so that the pressure setting will not change during operation of pump.
3. Install a pressure gauge in discharge line for actual adjustment operation.
4. Turn adjusting screw in to increase pressure and out to decrease pressure.
5. Closing a valve in the piping stopping all flow, the pressure gauge on the discharge port of the pump will show the maximum pressure that the relief valve will allow while pump is in operation.

IMPORTANT

In ordering parts for pressure relief valve, always give model number and serial number of pump as it appears on nameplate and name of part wanted. When ordering springs, be sure to give pressure setting desired.



Figure 21, Poppet, spring, & spring retainer



Figure 22, Spring & Retainer



Figure 23, End cap, screw, & nut



Figure 24, Bonnet

Troubleshooting

No Discharge:	Pump priming may be required
	Suction lift is too great
	Relief valve is stuck open
	Strainer needs cleaning
	Wrong direction of rotation
Insufficient Discharge Volume	Air leaks in suction
	Speed is too slow
	Relief valve is set too low
	Suction lift too high for liquid handled. This is very important on hot or volatile fluids
	Suction line is not submerged
	Suction piping too small in diameter, or foot valve is too small
	Wrong rotation
	Pump internals worn
	Air or gases in suction piping
Insufficient Pressure	Viscosity is higher than expected
	Relief valve set too low
	Air or gases in the fluid
	Pump internals are worn
	Insufficient volume being pumped
	Wrong rotation
Loss of suction after a period Of operation	Improper clearances in the internals
	Suction line is leaking (letting air into the pump)
	Packing is too loose or the mechanical seal is leaking
Excessive power requirement	Leaking Gaskets
	Viscosity too high
	Discharge pressure is too high
	Insufficient lubrication
Noisy operation with good Performance	Shaft or rotor bent, misalignment or packing gland is too tight
	Misalignment of coupling
Noisy operation with poor or No performance	Worn bearings
	Cavitation – Not enough fluid getting to the pump
Leaking around the shaft	Worn bearings or bushings
	Packing is loose, or needs replacement
	Mechanical seal is damaged or misaligned
	Shaft is scored
	Shaft is bent

PUMP INSPECTION REPORT

DATE: _____

PUMP MODEL: _____ SERIAL NUMBER: _____

CUSTOMER: _____

SALES ORDER NUMBER: _____ OTHER REFERENCE: _____

APPLICATION AND/OR PROBLEM: _____

DESCRIPTION	STANDARD DIMENSIONS	EX. CL. (IF ANY)	ACTUAL	WEAR
ROTOR O.D.				
ROTOR I.D.				
ROTOR TOOTH LENGTH				
IDLER O.D.				
IDLER (BUSHING) I.D.				
IDLER TOOTH LENGTH				
IDLER PIN O.D.				
SHAFT O.D.				
SHAFT BUSHING I.D.				
CRESCENT LENGTH				
CASING I.D.				
END CLEARANCE				

COMMENTS & RECOMMENDATIONS: _____

NOTES

[illegible]

VICAN PUMP

WARRANTY

The company warrants all products manufactured by it to be free from defects in workmanship or material for a period of one (1) year from date of startup, provided that in no event shall this warranty extend more than eighteen (18) months from the date of shipment from the company. If, during said warranty period, any products sold by the company prove to be defective in workmanship or material under normal use and service, and if such products are returned to the company, transportation charges prepaid, and if the products are found by the company to be defective in workmanship or material, they will be replaced or repaired free of charge, F.O.B. the company location.

The company assumes no liability for consequential damages of any kind and the purchaser by acceptance of delivery assumes all liability for the consequences of the use or misuse of the company products by the purchaser, his employees or others. The company will assume no field expense for service or parts unless authorized by it in advance.

Equipment and accessories purchased by the company from outside sources which are incorporated into any company product are warranted only to the extent of and by the original manufacturer's warranty or guarantee, if any.

THIS IS THE COMPANY'S SOLE WARRANTY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, WHICH ARE HEREBY EXCLUDED, INCLUDING IN PARTICULAR ALL WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

No officer or employee of IDEX Corporation or the company is authorized to alter this warranty.



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