# Instruction Manual

## Stokes Microvac
## 412H-11 Piston
## Vacuum Pump

idealvac.com

Ideal vacuum products
(505)872-0037
idealvac.com

**INSTRUCTIONS** **PART I**


| Section | Page |
|---|---|
| **1. DESCRIPTION** | |
| 1.1 General | 1-1 |
| 1.2 Gas Ballast | 1-1 |
| 1.3 Water System | 1-2 |
| 1.4 Electrical System | 1-2 |
| 1.5 Lubricants | 1-2 |
| 1.6 Guards | 1-2 |
| 1.7 Vacuum Break & Gage Ports | 1-2 |
| **2. INSTALLATION** | |
| 2.1 Locating and Mounting | 2-1 |
| 2.2 Vacuum Piping | 2-1 |
| 2.3 Exhaust Piping | 2-2 |
| 2.4 Electrical Connections | 2-2 |
| 2.5 Cooling | 2-3 |
| 2.6 Lubrication of Pump | 2-4 |
| **3. OPERATION** | |
| 3.1 Pre-Start Check | 3-1 |
| 3.2 Pump Start | 3-1 |
| 3.3 Checking Oil Level | 3-1 |
| 3.4 Operation of Gas Ballast | 3-2 |
| 3.5 Pump Stop | 3-3 |
| 3.6 Operating Notes | 3-3 |
| **4. CHECKING** | |
| 4.1 Poor Vacuum | 4-1 |
| 4.2 Localizing Leakage | 4-1 |
| 4.3 Repairing Small Leaks | 4-1 |
| 4.4 Pump Activity Record | 4-1 |
| **5. MAINTENANCE** | |
| 5.1 Initial Servicing | 5-1 |
| 5.2 Pump Disassembly | 5-3 |
| 5.3 Troubleshooting Guide | 5-11 |

6. MAJOR ATTENTION ITEMS BULLETIN AND MAINTENANCE CHECK LIST

7. PARTS LIST

8. STOKES SUPPLEMENTARY DATA

Parts Ordering Information
Recommended Replacement Parts Kit
Stokes Microvac 2-Year Warranty
Pumping Hazardous Gases Sheet
Pumping Fluids, Lubricants and Grease Bulletin

## ILLUSTRATIONS

| Figure | | Page |
|---|---|---|
| 1. | Pump Cross Section View | 1-1 |
| 2. | Vacuum Piping (Pump Below System) | 2-1 |
| 3. | Vacuum Piping (Pump Above System) | 2-1 |
| 4. | Exhaust Piping | 2-2 |
| 5. | Wiring Diagram | 2-3 |
| 6. | Gas Ballast Check Valve | 3-2 |
| 7. | Standard Vacuum System Piping | 4-1 |
| 8. | Exhaust Valve Assembly | 5-2 |
| 9. | Taper Lock Bushing, Installation | 5-3 |
| 10. | Rotary Oil Seal | 5-5 |
| 11. | Exploded View of Pump | |
| 12. | Specifications | |

## 1.0 DESCRIPTION

### 1.1 GENERAL (Principle of Operation)

The Stokes Model 412-11 Microvac Pump is a self-contained, rotary, oil sealed piston type unit. The piston is driven by an eccentric mounted on the drive shaft and the piston slided is guided by two floating hinge bars that are free to oscillate in the pump housing. Facing the drive end, the piston assembly rotates clockwise. Air enters the pump through the intake and then through the piston slide until the piston completes its stroke. At this point all air previously entrapped is in front of the piston as it begins another stroke. As the piston continues to rotate, the air in front of it is compressed and discharged through the exhaust valve and finally out the exhaust outlet. As the piston nears the top center position the intake port is closed, separating the system from the pump (See Figure l). The exhaust valves are of the corrosion-resistant, heavy duty, poppet type. When the pump is in operation, lubrication of the internal parts is completely automatic. Oil is forced by atmospheric pressure from the reservoir through the oil lines to the shaft bearings. The oil is then fed into the pump to provide the necessary piston-to-cylinder oil seal. Finally, the oil is forced out through the exhaust valve with the air and returns to the reservoir. A solenoid valve automatically prevents oil from flooding the pump in the event of a power failure, or when the pump is shutdown without vacuum being broken.

Fig 1

### 1.2 GAS BALLAST

The pump is provided with a manually operated gas ballast valve to overcome the adverse affect on vacuum resulting from oil contamination. Contamination occurs when water vapor or other gaseous components enter the pump and condense within the pump mixing with the oil as emulsified droplets. The condensate will mix with the oil and "flash" into vapor again as the oil circulates into high vacuum in the pump cylinder limiting the vacuum to the vapor pressure of the condensed water. Gas Ballast is a controlled bleed of air from the atmosphere. This air caries the water vapor through the compression cycle without it condensing to liquid and mixing with oil. Thus, the water vapors are exhausted without contaminating the pump oil. Other contaminates are also removed by ballasting except those that dissolve in the oil.

**NOTE: Never use gas ballast when pumping gases or gas mixtures that are explosive or flammable.**

## 1.3 WATER SYSTEM

A supply of cooling water at 85° F. and 2 G.P.M. maximum is needed at the water inlet for efficient performance. See Section 2.5 for additional information.

## 1.4 ELECTRICAL SYSTEM

The main power supply is 230/460V., 60 Cy., 3 Ph. and should be wired through a suitable fused motor starter. Power for the oil solenoid is taken from any two of the motor leads. Check both motor and solenoid nameplates to insure proper voltage.

## 1.5 LUBRICANTS

Refer to Section 2 for recommended high vacuum grease and pumping fluids.

## 1.6 GUARDS

The standard pump is with a totally enclosed belt guard to cover the motor pulley, pump pulley and belts.

## 1.7 VACUUM BREAK & GAGE PORTS

The pump is provided with a 1/2" FPT Vacuum Break & a 1/4" FPT Gage Port, as shown in Fig. 11.

**IMPORTANT:** **When using Gage Port, provided a 90° elbow and at least 12" of vertical pipe to the gage sensor.**

## 2.0 INSTALLATION

## 2.1 LOCATING AND MOUNTING

Locate the pump as near as possible to the equipment being evacuated so that the Vacuum, Water and Exhaust connections can be conveniently made. Provide for adequate space for convenient servicing where possible.

2.1.2 The pump should be mounted on a rigid foundation, such as a concrete floor, and made level by shimming or grouting, if necessary. Bolt pump to foundation without putting a strain or twist in the pump housing. See Figure 12 for foundation bolting dimensions.

2.1.3 Remove cap from exhaust and intake openings only when ready to make a pipe connection. Also remove the plastic plug (by unscrewing) from the Gas Ballast valve. When pump is to be subjected to temperatures below freezing, drain water jacket through the housing drain plug to prevent cracking the housing, then blow out water jacket. Follow this same procedure for storage.

## 2.2 VACUUM PIPING

All pipe lines should be as short as possible and should be no smaller than the inlet to the pump. (If it is absolutely necessary to run a long line, the pipe size should be increased 50% in diameter, or more, than the inlet to the pump.) Conductance of long lines must be checked and the line sized large enough or pumping speed of system will be seriously decreased. When connecting pump to the system, provide a vertical pipe at least 2 ft. long between the pump and the system, if the pump is below the system inlet. If the pump is above or level with the system inlet, provide an inverted "U" pipe to serve as a trap for dirt from the system and to prevent migration of pump oil toward the system inlet. Be sure all vacuum piping is tight. If an inline filter is being used it should be installed as noted below. It is advisable to install a flexible connection between pump intake and vacuum piping to eliminate vibration. (See Figures 2 &3).

A high vacuum valve (full opening type preferred) is recommended to facilitate start-up and for checking pump blank off pressure.

**CAUTION:** **Make sure the system to be evacuated and connecting lines are clean and free of weld splatter, dirt, or grit. Foreign matter entering the pump can cause failure and possibly damage the internal parts. To prevent this it is recommended that a 16 mesh wire screen be installed at the inlet connection. After 20 hours of operation the screen must be removed.**

### 2.2.1 TYPES OF PIPING JOINTS

A. Standard wrought piping with welded joints makes the best vacuum piping system.

B. Copper piping with sweated fittings and joints can also be made vacuum tight and has the advantage of providing a neat, clean vacuum installation.

C. Standard threaded piping, however, is satisfactory and more readily installed. The piping should be carefully hammered to loosen any scales or chips. Blow out the resultant with compressed air prior to installation. All male threaded joints should be carefully doped, screwed up tight and NEVER "backed-off" to make parts align - this is apt to cause a leak. Paint the joints while the system is under vacuum until the paint is no longer drawn in, G.E. 1201-B, Glyptal or equivalent is recommended for painting all connections.

### 2.2.2 LOCATION OF GAGE PORT

A vacuum gage connection is located at the upper left hand side of intake side of pump. (See Figure 12). The pipe plug found at this location should be replaced with a small vacuum ball valve to which the gage can be connected. When a Stokes McLeod Gage is used a synthetic, thick wall, smooth bore tubing, such as Tygon, makes a very satisfactory flexible connection.

## 2.3 EXHAUST PIPING

2.3.1 It is recommended that the exhaust be piped horizontally as short distance and tied into a vertical exhaust pipe. The vertical exhaust pipe must be at least 1 ft. long and the bottom end of the vertical exhaust pipe terminated with a plug or a drain cock to allow removal of moisture and contaminated oil before it can accumulate sufficiently to drain back into pump oil reservoir. See Figure 4.

*EXHAUST PIPING*
*Figure 4*

2.3.2 The exhaust pipe should be no smaller than the exhaust outlet and as short as possible. Run the pipe outside the building where the pump exhaust vapors will not be objectionable. Point the outside end of the exhaust pipe downward to prevent the entrance of rain water.

2.3.3 Closed circuit Oil Mist Separators are available from Stokes which can eliminate oil fog in the majority of applications. The separator will not remove noxious or toxic gases and must be run outside the building. For operating continually under conditions of higher pressure an electro-static precipitator is recommended. Contact Stokes for specifics.

**CAUTION: NEVER PLACE A VALVE IN THE EXHAUST LINE. IF A VALVE MUST BE INSTALLED IN THE LINE, A RELIEF VALVE MUST ALSO BE INSERTED IN THE LINE BETWEEN THE RESERVOIR AND THE VALVE. THE RELIEF VALVE SHOULD BE EQUAL IN SIZE TO THE LINE, AND SET TO OPEN AT 2 PSIG.**

## 2.4 ELECTRICAL CONNECTIONS (See Figure 5)

**CAUTION: BE SURE PUMP IS PROPERLY LUBRICATED BEFORE STARTING.**

2.4.1 Install a motor starter with safety device within easy reach of the operator.

2.4.2 Connect the solenoid valve as in Figure 5.

2.4.3 Connect motor so that pump shaft rotates clockwise when viewed from driven end. See 3.1 for Pre-Start Check.

**NOTE:** **MAKE SURE THE PROPER VOLTAGE, STARTERS AND OVERLOADS ARE SUPPLIED TO THE MOTOR. MAKE SURE THAT THE SOLENOID COIL LEADS ARE CONNECTED FOR PROPER VOLTAGE. BOTH MAY FAIL TO OPERATE IF VOLTAGE IS LESS THAN 90% OF RATED.**

*WIRING DIAGRAM*
*Figure 5*

## 2.5 COOLING

2.5.1 This pump is water cooled and must be connected to a water supply.

2.5.2 The 1/2" water inlet connection is located in the pump housing on the drive side near the bottom.

2.5.3 Insert a valve in the water inlet line and regulate the water flow so that the temperature of the oil in the reservoir is between 140 Deg. and 160 Deg. F. Oil temperature kits are available that automatically control the water flow to maintain the proper oil temperature (Consult factory). If pump is outside and subjected to freezing temperatures, water tank and circulating pump should be installed with anti-freeze in the water.

**CAUTION: DO NOT START PUMP WHEN OIL TEMPERATURE IS BELOW 55° F.**

2.5.4 The l/2" water outlet is located in the pump housing on the opposite side of the water inlet.

2.5.5 The water outlet **SHOULD** be connected to an open drain to permit the operator to check the flow and temperature of the outlet water periodically. There **SHOULD NOT** be a valve or back pressure in this line. In some cases, cooling water must be discharged to a pressure drain. In such cases, discharge pressure must not exceed 50 P.S.I.G. and no block valve should be placed in discharge line unless a 50# relief valve is provided to protect pump from high inlet pressure.

**NOTE: IF CONDENSABLES ARE PRESENT IN GAS BEING PUMPED AND GAS BALLAST IS USED THROTTLE THE COOLING WATER TO RAISE OPERATING TEMPERATURE TO THE LEVEL NEEDED FOR GAS BALLAST (SEE SECT. 3).**

## 2.6 LUBRICATION OF PUMP

The successful operation of this pump depends largely on the type of oil used. An initial charge of oil is included with each pump. This standard oil is V-Lube (Label F) which is recommended for general operating conditions in a relatively clean environment. The oil is a multigrade petroleum oil, fortified for oxidation protection, containing detergent dispersants, with excellent flow characteristics at low temperature. It has a viscosity of 430 SSU at l00 Deg. F., and 82 SSU at 210 Deg. F., with a vapor pressure of 0.000l mm Hg. at l45 Deg. F.

If the pump is to be operated at vacuum levels that cause the oil temperature to exceed 160 Deg. F. for extended periods of time, a heavier grade oil should be used, Stokes V-lube (Label G) is available for oil temperatures up to 200 Deg. F.

Special operating conditions may require the use of Special oils. We have listed the most used special lubricants on the back page of the Bulletin enclosed, Greasing and Pumping Fluids for Vacuum Components. Consult Stokes for specific recommendations when other than regular petroleum oils are being used.

### 2.6.1 INITIAL FILL

The microvac pump is shipped with an Initial charge of oil (12 gallons) in the reservoir. Before connecting the suction manifold slowly rotate the pump thru two revolutions. This will distribute the oil throughout the pump interior.

**NOTE: STARTING THE MICROVAC PUMP WHEN OIL TEMPERATURE IS BELOW 55 DEG. F., CAN RESULT IN EXCESSIVE WEAR AND GALLING DAMAGE TO THE MOVING PARTS.**

When changing oil, refer to Section 5, page 5-1 of manual, Service and Maintenance.

## 3.0 OPERATION

## 3.1 PRE-START CHECK

NOTE: **REMOVE BELT GUARD COVER. TURN PUMP OVER BY HAND AT LEAST TWO REVOLUTIONS.**

3.1.1 A. Jog the motor momentarily while observing pump rotation. If the pump does not rotate in a clockwise direction, interchange any two of the three-phase leads.

B. Make sure the oil solenoid valve operates properly by checking the oil flow indicator. The ball in the Oil Flow Indicator bowl should rise after system pressure is below 600 mm Hg. (6" Hg. Suction).

**NOTE: IF INDICATOR BALL DOES NOT RISE, STOP PUMP IMMEDIATELY. (1) CHECK OPERATION OF SOLENOID. (2) CHECK OIL LINES FOR BLOCKAGE**

3.1.2 **DRIVE BELT TENSION**

A. At approximately the center of the span, between drive and driven pulleys, apply 5 to 7 pounds pressure on the belt. If tension is correct, the resulting deflection should be 1/2".

B. Adjust, if necessary, by raising or lowering the location nuts on the motor support eyebolt (39). Tighten these nuts securely after adjustments.

**NOTE: MAINTENANCE OF PROPER BELT TENSION IS IMPORTANT. TOO TIGHT ANY ADJUSTMENT IS HARMFUL TO THE SHAFT BEARINGS. TOO LOOSE AN ADJUSTMENT ALLOWS THE BELT TO SLIP.**

## 3.2 PUMP START

3.2.1 Turn cooling water **ON.**

3.2.2 Depress "start" button and check solenoid valve for proper operation.

**CAUTION: DO NOT START PUMP WHEN OIL TEMPERATURE IS BELOW 55° F.**

3.2.3 Be sure the equipment being evacuated is properly cleaned and all openings closed. Open intake valve.

**NOTE: REMOVE PLASTIC PLUG FROM EXHAUST PORT BEFORE OPERATING PUMP**

## 3.3 CHECKING OIL LEVEL

3.3.1 Check oil level each day.

3.3.2 The oil level should be at center of sight glass or in lower half while pump is operating at high vacuum. Level will change depending on suction pressure. In most cases, oil is added after operating the pump for a short while.

3.3.3 To avoid blowing oil out the fill hole, do not add oil to the pump when in operation unless pump is at 1 torr or less without Gas Ballast.

**NOTE: When pumping gases that contain water vapor it may be necessary to remove the water that condenses in the pump reservoir sump. This can be done by opening the oil drain valve and draining out water, and closing valve when oil starts to flow. The interval for this must be determined for each specific operation and depends on the amount of water vapor and oil temperature. Operating the pump with the oil temperature in the 160 Deg. F., temperature range will tend to minimize formation of water, but will not eliminate it.**

## 3.4 OPERATION OF GAS BALLAST

3.4.1 Open the Gas Ballast valve fully for maximum efficiency. For a lesser degree of ballasting, turn valve toward close position. Full gas ballast will cause pump temperature to rise but this is normal. For maximum effect of gas ballast, pump should be run approximately at 160 Deg. F. Operating temperature can be raised by throttling cooling water. Oil Temperature Control Kits are available, consult factory.

**NOTE:** **Be sure to remove the plastic plug in the Gas Ballast air intake lines. This plug is used for shipping and storage purposes ONLY**

3.4.2 If pumping water vapor in excessive quantities and the oil has become contaminated, it can be purified by running the pump with Gas Ballast valve full open while the pump is shut-off from the system. When excessive contaminants are present, indicated by high oil level, or thinning, formation of varnish, etc., the oil should be replaced.

**NOTE:** **In dirty applications where condensable contaminants (asphalt, pitch, epoxies, etc.) other than water vapor are present, the pump should be operated in the range of 160 Deg. F.**

**CAUTION:** **Gas Ballast should never be used if vapors being pumped are explosive, e.g. Methane Gas, Hydrogen, and certain solvent vapors. When gases of an explosive nature are being handled, the safest procedure is to remove the gas ballast valve entirely and plug or cap the pipe to which the gas ballast valve is attached.**

Opening the gas ballast slightly will quiet valve noise when pump is blanked-off, but will prevent reaching the lowest final pressure.

3.4.3 The check valve used for Gas Ballast should be inspected at least every six months for wear or a broken spring when operating on an (8) hour a day basis; every 3 months for (24) hour a day operation.

*GAS BALLAST CHECK VALVE*
*Figure 6*

3.4.4 The gas ballast valve should be closed when the pump is stopped. If the valve is open, gas will be sucked into the pump through the valve and the vacuum manifold will be pressurized with atmospheric air. This air going through the pump will carry the oil in the pump cylinder system. A solenoid valve attached to the gas ballast piping and connected across the motor can be used to turn the gas ballast automatically on pump shutdown. Contact local Stokes representative for additional information.

3.4.5 When a pressurized gas is used to ballast the pump, the pressure must be reduced to 2 psi maximum. The used of higher pressures may damage the pump.

3.4.6 When pumping an explosive gas, (i.e. hydrogen, silane, methane) or corrosive gas, (cl, f, ccl4, etc.) the pump must be ballasted with an inert gas (nitrogen, argon). The used of air for ballasting under the above conditions can result in an explosion or excessive corrosion inside the pump.

## 3.5 PUMP STOP

3.5.1 Close intake valve to system.

3.5.2 Stop the motor and break vacuum unless system dictates otherwise.

**NOTE:** **The solenoid valve closes automatically when the pump is stopped or in case of power failure, thus preventing pump and vacuum system from being flooded with oil.**

## 3.6 OPERATING NOTES

3.6.1 If large amounts of air pass through the pump, it may become warm and under severe conditions may become hot. This does not indicate trouble. The pump is designated for high vacuum work and should not be operated at pressures above 600 mm Hg. for more than 15 minutes or at intermediate vacuums for periods which cause oil temperature to exceed 200 Deg. F. For optimum pump operation the oil temperature of the oil in the reservoir should be between 140 Deg. F. and 160 Deg. F. with the pump operating on the system or process. Oil temperature can be measured by inserting a thermometer in the fill hole or by contact pyrometer on oil line near the solenoid. If the pump is to be operated with oil temperature in excess of 160 Deg. F. the use of a heavier viscosity oil is recommended. (See Section 2.6.)

3.6.2 When starting the pump or when handling large amounts of air, oil vapor in the form of smoke will issue from the exhaust. Again this is no indication of trouble, as the volume of smoke will decrease as the vacuum in the system improves.

**NOTE: Stokes closed type oil mist separator is available to alleviate exhaust oil smog.**

3.6.3 If the pump has been shut down for an extended period, always turn over at least two (2) revolutions by hand before starting to insure free movement of parts.

3.6.4 Low oil temperature can cause overloading when starting the pump and possibly prevent the pump from sealing. Microvac pumps should not be started when the oil temperature is below 55 Deg. F.* Optimum operating oil temperature after starting is between 140 Deg. F. to 160 Deg. F. Opening the Gas Ballast valve will help warm-up the oil.

A Water Miser is recommended to automatically control the oil temperature.

***THIS APPLIES ONLY IF STOKES V-LUBE "F" IS USED. CONSULT FACTORY IF OTHER OILS ARE USED.**

## 4.0 CHECKING

## 4.1 POOR VACUUM

No pump will give good results on a poor vacuum system. If the vacuum in the system is unsatisfactory, the usual cause is leakage. To check for this condition, a methodical approach will usually resolve the problem in the least amount of time.

## 4.2 LOCALIZING LEAKAGE

A leak rate will help localize a vacuum leak. Such a test is easily made by successively isolating and evacuating each section of the system. The in-leakage rate of the isolated section is then noted.

4.2.1 A vacuum leak detector will speed up the process of the locating leaks.

*STANDARD VACUUM SYSTEM PIPING*

*Figure 7*

## 4.3 REPAIRING SMALL LEAKS

To repair small leaks or to close pores, use Sealing Compound, Stokes Part No. 4-927. When replacing plug type valves (if used) use Locktite Pipe Sealer No. 714-1 to help seal them. Gate, Ball or Butterfly type high vacuum valves are preferred for high vacuum service.

**NOTE:** **Use of Teflon Tape for sealing is not recommended. Material is often drawn into system, causing premature wear and damage to moving parts.**

## 4.4 PUMP ACTIVITY RECORD

A record of oil changes, work done on pump, and changes or additions to the system will be of value in checking for leaks or poor vacuum.

**NOTE: A sample mechanical vacuum pump preventive maintenance check list along with a summary of major attention items is enclosed for your review.**

# CAUTION

**WHEN REASSEMBLING PUMP BE CERTAIN ALL MOVING PARTS ARE CLEAN AND LUBRICATED.**

**BEFORE STARTING PUMP POUR 10% OF THE REQUIRED AMOUNT OF OIL INTO INLET WHILE SLOWLY ROTATING PUMP THRU TWO (2) REVOLUTIONS. POUR REMAINDER OF OIL INTO THE RESERVOIR.**

# NOTE:

**THE JOINT BETWEEN THE RESERVOIR AND HOUSING MAY BE SEALED BY THE FACTORY WITH A GASKET OR LOCTITE GASKET ELIMINATOR. CONTACT FACTORY IF NEED ARISES TO REMOVE RESERVOIR THAT HAS BEEN SEALED WITH GASKET ELIMINATOR.**

## 5.0 MAINTENANCE

The Stokes 412-11 Microvac Pump is of rugged construction and designed for trouble free performance. However, to insure efficient performance and minimum wear the following procedures are recommended:

## 5.1 INITIAL SERVICING

### 5.1.1 First Three Weeks of Operation

A. Check oil level daily and also its condition. (See Paragraph 5.1.3). Maintain oil level at center of sight glass with pump in operation.

B. Check belt tension weekly (See Paragraph 3.1.2).

C. Check the foundation bolts weekly.

### 5.1.2 After First Three Weeks of Operation

A. Check oil level daily.

B. Check "V" belts, tension and wear every 3 months

C. Tighten all flange side cover bolts and foundation bolts at regular intervals.

### 5.1.3 Changing Oil and Cleaning Pump Reservoir (See Figure 11)

Change oil every 300 hours of operation and clean reservoir every 600 to 900 hours of operation. For dirty applications decrease oil change intervals. Also if the oil becomes contaminated (indicated by darkening in color and/or poor pump performance) it should be drained. Drain the reservoir and exhaust valve chamber. Wipe the reservoir clean before filling with new oil. Milky appearance of oil indicates water contamination. Use Gas Ballast to clear oil, or change oil. Also most water can be removed by draining water from pump before starting pump.

To change oil and clean reservoir proceed as follows:

A. With pump running, close intake valve to system and open vacuum break valve to pump or open intake valve and admit atmosphere to the system so that atmospheric pressure forces oil from the pump interior up into the reservoir. Run pump for approximately 30 seconds, then turn pump OFF.

B. Drain oil by opening drain cock (51).

C. After oil has been drained remove oil reservoir cover (32) being careful not to damage gasket (31).

D. Thoroughly wipe out oil reservoir, **DO NOT** flush the reservoir with Kerosene, Gasoline or any other solvent that may, if not completely removed, contaminate the pump oil. Use only clean, dry, lint-free towels.

E. Replace gasket (31) and cover (32) and tighten securely.

### 5.1.4 Cleaning Exhaust Valve Assemblies and Chamber

When the oil is badly contaminated the exhaust valves and chamber should be cleaned. Referring to Figure 11 proceed as follows:

A. Repeat Steps 5.1.3, A to D.

B. Remove oil baffle (28) and valve cover plate gasket (27).

C. Drain the oil from the valve chamber by removing the plug on the dead end side of the pump housing. (See Figure 12)

*VALVE ASSEMBLY*
*Figure 8*

D. Remove valve assembly (26), by removing the six cap screws, and valve gasket (25).

**NOTE:** **To disassemble valve assembly (26), remove center cap screw, lift off valve cap (26 A), remove spring (26 B) and valve disc (26 C).**

E. Clean and inspect valve parts, and wipe out valve chamber with clean, dry lint-free towels.

F. Reassemble valve assemblies by reversing the disassembly steps described above. It is advisable to use a new valve gasket (31) when reinstalling valve assemblies.

G. Replace valve chamber plug.

### 5.1.5 Care of Exhaust Valves

The valves are the poppet type and corrosion resistant construction. These valves operate many millions of cycles per year in normal operation and should be inspected at least once every six months even though the pump is operating satisfactorily, and more frequently where duty on pump is severe. The valve should be disassembled and cleaned in accordance with Section 5.1.4. At the time of the inspection, it is advisable to replace the entire set of springs and valve discs. This procedure will increase the reliability of the pump, avoiding the possibility of additional spring failure.

### 5.1.6 Solenoid Valve

Check Solenoid Valve, which prevents oil from flooding the pump in case of a power failure, at regular intervals. See page 3-1 para. 3.1.B. In the event the solenoid valve stays closed, after the pump is started, the oil cannot circulate. This is indicated by poor performance and if the condition is allowed to continue for any length of time, the pump may suffer damage. The pump work-in period establishes the normal preventive maintenance checks according to the type of system (clean or dirty) being pumped down and the continuous pumping time (light of heavy).

In a clean and light pumping situation, the exhaust valve springs and discs should be replaced every six months. At this time the reservoir should be checked for sludge accumulation and foreign particles. Use a magnet to detect presence of foreign metal particles. The presence of sludge and/or foreign particles in the reservoir indicates the same condition exists in the oil solenoid valve. This condition will cause the solenoid valve to stick in the open or closed position. Disassemble and clean the solenoid valve. Replace any worn parts. If the pump is used in a dirty and heavy pumping situation, the preventive maintenance checks should be performed sooner.

It is strongly suggested that a spare oil solenoid valve be on hand at all times to keep pump downtime at an absolute minimum.
When operating with pump oils other than that supplied, special gasket material may be needed in the solenoid valve - consult factory. The visual flow indicator on latest pumps makes this check simple by indicating flow when pressure is below 600 mm Hg. (6" Hg. Suction)

## 5.2 PUMP DISASSEMBLY

### 5.2.1 Removal of Shaft Seal - Flywheel End (See Figures 10 & 11)

The shaft seal used on this pump are the mechanical face type. Since their efficiency depends on the highly finished surfaces, it is extremely important to handle them with care. They should require little or no attention, but if excessive leakage occurs, they can be removed for service as follows:

A. To remove the pulley.

1) Unclasp (4) hinge locks on belt guard.

2) Lower the adjusting nut on motor support eye bolt (39) to relieve all tensions on the drive belts.

3) Remove the belts.

4) Insert screw in hole that is threaded through bushing side (See Figure 9).

**NOTE:** One screw in each hub is left over and not used in loosening operation.

5) Tighten screws alternately until bushing is loosened in hub. If bushing does not loosen immediately, tap on hub.

*TAPER-LOCK BUSHING INSTALLATION*
*Figure 9*

**NOTE:** To assure proper seal assembly, check exploded view, Figure 11, for proper orientation.

B. Remove Key (14) from the shaft and remove any burrs around the keyway.

C. Remove (4) 5/16-18 Screws and Plastic washers which hold belt guard back plate in place.

D. Disconnect the oil line from the hub of side cover (12).

E. Take out screws that secure end cap (5) to the side cover and remove the end cap and "O" ring (6).

F. Inspect the face of seal port (7e) retained by the end cap.

**NOTE:** **The inner seal ring (7e) may be removed from the seal outer seal ring (7b) for inspection. (7b) is pressed in the end cap(s). Depress and rotate the seal ring (7e) releasing the bayonet lock, and remove from outer ring (7b). Inspect the "O" ring (7c) and spring (7d) for possible damage. Removal of the outer ring (7b) is not recommended unless replacing the entire oil seal.**

G. Remove the seal matting ring (7g) with a slight back and forth rocking motion. Earlier model pumps have a socket head cap screw in the ring, if so, loosen screw halfway then remove mating ring (7g).

H. Whenever the pump is disassembled and the rotary seal parts 7e & 7g are separated, it is advisable that these parts be lapped to a 2-lightband flatness or replaced. If the normal ridge on member (7e) is worn flat, replace this part. Always check bearing (ll) for wear and replace if necessary. Also, if a leaking seal is replaced, it is advisable to replace the bearing (11).

**IMPORTANT:** Before replacing the seal, lubricate the shaft and seal members and "O" ring with a thin coat of vacuum grease or pump oil. Replace the sealmating ring on the shaft using a slight back and forth motion. However, the seal mating ring should still maintain slight free movement on the shaft.

1. The seal is reassembled by reversing the disassembly procedure.

J. Replace the Pulley.

1. **CLEAN** the bushing, shaft, and bore of pulley.

2. Place bushing in hub and match half holes to make complete holes. Place the screws loosely in holes that are threaded on hub side. (see Figure 9).

3. Make sure bushing is free in hub and slip the assembly onto the shaft locating it in the position desired. **BE SURE** to counterweight is opposite the bushing keyway to avoid imbalance.

4. Tighten screws alternately and evenly until all are pulled up **VERY TIGHTLY.** Use a piece of pipe or wrench to increase leverage. (Wrench torque is 430 pounds - inches).

5. Hammer against large end of bushing being careful to use a block or sleeve to avoid damage to the bushing. The screws can now be turned a little more using the specified wrench torque. **REPEAT THIS ALTERNATE HAMMERING AND SCREW RE-TIGHTENING UNTIL THE SPECIFIED WRENCH TORQUE NO LONGER TURNS THE SCREWS.**

*ROTARY OIL SEAL*
*Figure 10*

## INSTALLATION NOTES

1. Remove existing seal from shaft and in counter bore of end cap.

2. After removing seal from package, make sure the spring fits freely inside carbon seal and over the lip on the spring retainer.

3. Make sure the "O" ring retainer (which fits between the "O" ring in the carbon seal and the spring) fits freely over the pump shaft.

4. Clean the counter bore of the end cap. This counter bore should be free of oil and all foreign matter.

5. Before inserting static seat, coat the back surface and approximately up 1/8" of the lower portion of the counter bore with Loctite 620, adhesive Loctite *Primer N to be used before applying the Loctite 620.

6. Clean static seat and polished surface of tool with a lint free cloth. Apply Primer "N" to back surface of the static seat. Gently press seat into end cap using finger pressure only. Make sure the polished surface is facing toward you. Take care to protect this surface since this forms the seal when in contact with the carbon face. Gently place the polished undercut end of the tool* on the static seat surface. (This surface must be flat within two light bands). Apply firm pressure, do not exceed 25 lbs. Hold for two minutes to set Loctite. The "O" ring on the static seat will keep the Loctite from oozing out and forming on the polished surface. The Loctite forms a vacuum seal between the static seat and end cap.

**** Tool can be purchased from Stokes Vacuum, Inc., part No. A-427-740-1 or made as per Figure 2.**

7. Slide the spring retainer, spring, and carbon seal with "O" Ring and "O" Ring retainer in place as shown, onto the pump shaft, making sure the "O" Ring passes over the taper on the shaft and the spring retainer rests against the threaded shoulder on the shaft. Be careful not to nick or scratch theshaft since this will affect the seal of the carbon "O" Ring.

8. Replace end cap with "O" Ring. Coat the "O" Ring in end cap only with vacuum grease.

**NOTE:** * It is very important the Primer "N" is used. The combination of 620 Adhesive and Primer N Gives a bond with a shear stress that permits the static seal to be pressed out. Also this combination will allow the Loctite to be removed from the parts when the bond is broken. Primer "N" to dry 2 to 5 minutes. Apply adhesive 620 to counter bore only. It is recommended that the static seat be installed within 10 minutes after adhesive 620 is applied over primer.

Fig.-1

NOTES-

1- MAT'L.-4140 H.R. STEEL, HEAT TREAT TO $R_C$ 52-55
2- 63 F.A.O. EXCEPT AS NOTED.
3- SURFACES MARKED ∨ MUST BE PARALLEL WITHIN .002.
4- SURFACES MARKED "A" TO BE FLAT WITHIN TWO LIGHT BANDS & FREE OF SCRATCHES.

Fig.-2

**FOR INSTALLING OIL SEAL # 085-029-600**

**THIS IS A REPLACEMENT FOR #085-037-799**
**085-038-766**
**A-427-121-002**

***900-212-11 & 412 MICROVAC PUMP***

**SEAL ASSEMBLY & MATING RING INSTALLATION**

**INSTALLATION NOTES**

1. Remove existing seal from shaft and in counter bore of end cap.

2. Clean the shaft and the counter bore of the end cap. Both the shaft and counter bore should be free of oil and *ALL FOREIGN MATTER.*.

3. Remove seal assembly and mating ring from package. The carbon seal face and polished mating ring face are lapped within 2 light bands and therefore, should be handled with extreme care.

4. Lubricate "O" Ring at O.D. of seal assembly with vacuum grease. Gently press seal into end cap using fingers. Handle at O.D. of seal housing assembly. ***DO NOT TOUCH CARBON FACE OR MAR THIS SURFACE.*** Place assembly tool* against seal housing assembly using an arbor press, gently press seal housing assembly into end cap until it is seated against the shoulder. ***DO NOT USE EXTREME FORCE AND CRUSH THE SEAL HOUSING.*** Verify visually that seal housing assembly is flush against the rear face of end cap. The carbon face can be cleaned with a lint free cloth or wipe.

5. Place the mating ring onto the shaft with the polished surface away from the shoulder. ***DO NOT OIL THE "O" RING. BE CAREFUL NOT TO NICK OR SCRATCH THE SHAFT SINCE THIS WILL AFFECT THE "O" RING SEAL.*** Push the mating ring gently until seated against the shaft shoulder. ***MAKE SURE THAT THE MATING RING IS NOT COCKED AND MUST BE SEATED AGAINST THE SHAFT SHOULDER 360 DEGREES.*** The polished and lapped surface can be cleaned with a lint free cloth, if required.

6. Install end cap with "O" Ring. Coat the "O" Ring in the end cap only with vacuum grease.

*** Tool can be purchased from Stokes Vacuum, Inc., part No. A-604-484-001 or made as per Figure 2.**

SEAL INSTALLATION

FIGURE 2

**FOR INSTALLING OIL SEAL** A-427-121-2
**THIS IS A REPLACEMENT FOR** #085-37-799 (Garlock)
085-29-600 (Gits)
085-38-766 (Rexnord)

900-212-41 MICROVAC PUMP, 900-412-41 MICROVAC PUMP
900-212-11 MICROVAC PUMP, 900-412-11 MICROVAC PUMP

## INSTALLATION NOTES

1. Remove existing seal from shaft and in counter bore of end cap.

2. After removing seal from package, make sure the "O" Ring Retainer Ring, Wave Springs Washer and Spacer Washer fits freely over pump shaft.

3. Clean the counter bore of the end cap. This counter bore should be free of oil and all foreign matter.

4. Before inserting static seat, coat the back surface and approximately up 1/8" of the lower portion of the counter bore with Loctite 620, adhesive Loctite ***Primer N** to be used before applying the Loctite 620.

5. Clean static seat and polished surface of tool with a lint free cloth. Apply Primer "N" to back surface of the static seat. Gently press seat into end cap using finger pressure only. Make sure the polished surface is facing toward you. Take care to protect this surface since this forms the seal when in contact with the carbon face. Gently place the polished undercut end of the tool* on the static seat surface. (This surface must be flat within two light bands). Apply firm pressure, do not exceed 25 lbs. Hold for two minutes to set Loctite. The "O" ring on the static seat will keep the Loctite from oozing out and forming on the polished surface. The Loctite forms a vacuum seal between the static seat and end cap.

   **** Tool can be purchased from Stokes Vacuum, Inc., part No. A-427-740-1 or made as per Figure 2.**

6. The Carbon Seal components should be palced on the shaft in the following order. Spacer Washer (.135" TK) Wave Spring, Washer (.060 TK), Wave Spring, Retainer Ring (Flat surface against Wave Spring), carbon with "O" Ring inserted inside. **"DO NOT OIL THE "O" RING. BE CAREFUL NOT TO NICK OR SCRATCH THE SHAFT SINCE THIS WILL AFFECT THE "O" RING SEAL."**

7. Replace end cap with "O" Ring. Coat the "O" Ring in end cap only with vacuum grease.

**NOTE:** * It is very important the Primer "N" is used. The combination of 620 Adhesive and Primer N Gives a bond with a shear stress that permits the static seal to be pressed out. Also this combination will allow the Loctite to be removed from the parts when the bond is broken. Primer "N" to dry 2 to 5 minutes. Apply adhesive 620 to counter bore only. It is recommended that the static seat be installed within 10 minutes after adhesive 620 is applied over primer.

5.2.2 **Removal of Piston Assembly - Driven End** (See Figures 11)

If the pump knocks or seizes, it will be necessary to remove and inspect its internal parts. This should be done as follows:

A. Lower the pulley and rotary oil seal as described in paragraph 5.2.1 of this section.

B. Remove the side cover (12) by taking out the screws securing the side cover to the pump housing.

C. Turn shaft (16), if possible, until piston (17) is at the bottom of its rotation.

D. Pull piston (17) out just enough to be able to remove hinge bars (18).

E. After hinge bars are removed, completely pull piston (17) being careful not to drop it on eccentric (19). Approximately a pint of oil will spill out. (Use a shallow tray to catch spilled oil.)

**NOTE:** **When reassembling piston and slide, be certain "V" shaped slots in slide are facing downward at intake of pump.**

F. Slide eccentric (19) over keys (15) and off the shaft.

G. Reach inside the pump housing and remove hinge bar spacer (20).

H. Clean all parts thoroughly being careful not to scratch or dent any of the surfaces.

**NOTE:** **DO NOT round any of the square corners such as the ends of the hinge bars. All of these parts are manufactured to close tolerances, and scratches or dents in some of these surfaces may allow the oil seal to break causing a blow-by of air and a resultant drop in vacuum. Any worn or damaged parts should be replaced.**

1. Before reinstalling the side cover, put a small (l/16" diameter maximum) bead of fresh sealant around the perimeter on the inside sealing surface, making sure the bead surrounds each bolt hole. We recommend sealer part number #085-038-301.

**NOTE:** **If the roller bearing (23) in the pump housing (44) ever needs replacing the following procedure is suggested:**

1. Remove bearing ring (22) by backing out six (6) nylock screws.

2. Remove the roller bearing (23) from the bearing ring (22) replace with a new one.

3. Replace bearing ring (22) in pump housing (44), being careful to position retaining pin (24) in corresponding hole in pump housing. Tighten six (6) nylock screws.

5.2.3 **Removal of Piston Assembly - Dead End** (See Figure 11)

A. Disconnect oil line from the hub side of side cover (l2).

B. Remove side cover (l2) from the pump housing.

C. Remove hinge bars (l8), piston (l7) eccentric (4l) and hinge bar spacer (20) as described in paragraph 5.2.2.

5.2.4 As long as your Microvac Pump produces a suitable vacuum level and is not excessively noisy in operation, the parts are satisfactory and can be reinstalled. However, the moving parts do wear and it is good practice to check the critical dimensions against the accompanying chart (Page 5-12) for excessive wear. If excessive wear is indicated, the life of the parts is limited and replacement should be considered.

## 5.3 TROUBLESHOOTING GUIDE

**Before attempting to locate the cause of poor vacuum ultimate pressure, check the accuracy of the vacuum gages on the system.**

### 5.3.1 Vacuum at Pump is Unsatisfactory

| Probable Cause | Possible Remedy |
|---|---|
| A. Contaminated or insufficient oil. | 1. Check oil level; utilize gas ballast.<br>2. Drain and wipe out reservoir and valve chamber. Refill with proper oil. See Section 5.1.3 & 5.1.4. |
| B. Solenoid oil valve not operating properly or inoperative. | 1. Check and, if necessary clean and or replace solenoid valve or coil. |
| C. Loose intake flange or cover bolts. | 1. Tighten flange and side cover bolts at regular intervals. |
| D. Oil line connections leaking. | 1. Tighten and paint connections with sealer. |
| E. Gage line leaking. | 1. Paint Connection. |
| F. Exhaust valve not sealing. | 1. Disassemble, clean and check all parts thoroughly.<br>2. Replace any damaged or worn parts. See Section 5.1.5. If spring is faulty it is advisable to replace all the springs. |
| G. Pump seizes or knocks excessively; internal parts badly worn or broken. | 1. Disassemble piston ass'y. Replace worn, broken or badly scored parts. See Section 5.2.3. Make sure oil solenoid valve is operating properly. |
| H. Leakage in vacuum system | 1. Check system as described in Section 4. |

### 5.3.2 Vacuum Pump Excessively Noisy

| Probable cause | Possible Remedy |
|---|---|
| A. Pump knocking. | 1. Check oil level, and oil solenoid valve for proper operation.<br>2. Broken parts or foreign material in the pump.<br>3. Disassemble and remove foreign material in the pump.<br>4. Replace broken parts as required. |
| B. Pump seizes due to lubrication, or presence of foreign material. | 1. Check solenoid valve for proper operation.<br>2. Disassemble and remove foreign material. Make sure oil lines are not clogged.<br>3. Smooth minor scoring with #500 emery cloth and wash thoroughly then oil before installing. (A certain amount of scoring to the piston and cylinder and other parts usually will not seriously affect the vacuum obtainable so long as scoring is not in a continuous gage around entire piston surface). |

### 5.3.3 Motor Stops or Will Not Start

| Probable Cause | Possible Remedy |
|---|---|
| A. Thermal overload units in motor starter cutting out. | 1. Check capacity of thermal overload units by comparing ampere rating on motor nameplate with overload table inside starter box. If necessary use 1 size larger than standard. |
| B. Possible internal seizure. | 1. Disassemble and correct. |

### 5.3.4 Pump Does Not Turn When Motor Pulls.

| Probable Cause | Possible Remedy |
|---|---|
| A. V-belts too loose. | 1. Tighten V-Belts. See Section 3.1.2 paragraph B. |
| B. Cylinder may be flooded with excessive oil due to defective solenoid valve, that is, the valve may have stuck in the open position at the moment of previous shut down, or foreign material may be in valve seat. | 1. Turn pump over by hand to remove excess oil. Disassemble valve, clean and replace any worn parts Check Solenoid Valve. |
| C. Oil temperature may be too low, or viscosity too high. | 1. Change to lighter grade oil, or warm oil before pouring into pump (especially with low ambient temperatures). Pump should not be started when oil temperature is less than 70 Deg. F. (when using V-Lube "F")<br>2. Turn pump over by hand before starting |

### 5.3.5 Pump turns backwards for several revolutions when motor is turned off.

| Probable Cause | Possible Remedy |
|---|---|
| A. Gas Ballast Valve in open position when pump was shut down. | 1. Close Gas Ballast Valve before shutting off pump. This prevents atmospheric air from reversing direction of pump piston when power is off. This procedure also prevents oil from being pushed into the inlet piping. |

## 900-412-11 MICROVAC PUMP

## DIMENSIONS & TOLERANCES

| | | |
|---|---|---|
| **Hollow Eccentric** | **C-278-575-1** | **Finished** |
| O.D | 6.000" + .000" - .001" | 63 |
| Bore | 2.0010" + .0005" - .0000" | 125 |
| Length | 12.988" + .000" - .004" | 63 |
| | | |
| **Solid Eccentric** | **C-252-459-1** | |
| O.D. | 6.000" + .000" - 0001" | 32 |
| Bore | 2.0010" + .0005" - .0000" | 125 |
| Length | 12.988" + .0000" - .004" | 63 |
| | | |
| **Piston & Slide** | **C-243-595-11** | |
| Piston I.D. | 6.003" + .002" - .000" | 63 |
| Piston O.D. | 6.986" + .000" - .003" | 125 |
| Slide Thickness | 1.498" + .001" - .001" | 63 |
| Length | 12.995" + .000" - .001" | 63 |
| | | |
| **Shaft** | **D-262-992-2** | |
| At Eccentric | 2.000" + .000" - .001" | 63 |
| At Pulley | 1.750" + .000" - .003" | 125 |
| At Seal | 1.812" + .000" - .002" | 8 |
| At Inside Bearing | 1.9680" + .0000 - .0006" | 32 |
| At Center Bearing | 2.1653" + .0000" - .0005" | 32 |
| | | |
| **Hinge Bars** | **B-243-597-4 & B-297-857-4** | |
| Diameter | 3.499" + .000" - .001" | 32 |
| Thickness - round to flat surface | .996" + .000" - .001" | 32 |
| Length | 12.995" + .000" - 004" | 63 |
| Hinge Bar Bore | 3.500" + .001 - .000" | 63 |

RE: Shaft Assembly Drawing E-263-002-4

## MICROVAC MODEL 412-H SPECIFICATIONS

| | |
|---|---|
| Ultimate Vacuum | 10 microns Hg. or less |
| Displacement - cubic feet | 300 cfm |
| Pump Speed | 490 rpm |
| Motor | 10 hp |
| Std. Electrical Specs. | 3-60-230/460 |
| Motor Speed | 1800 |
| Pipe Connections - | |
| Suction | 4" |
| Discharge | 3" |
| Water Inlet | 1/2" |
| Water Outlet | 1/2" |
| Oil Capacity | 12 gals. (45 liters) |
| Net Weight | 1750 lbs. (794 KG) |
| Shipping Weight | 1975 lbs. |
| Height | 51-9/16 |
| Floor Space | 40-1/8 by 22-1/2" |
| Cooling | Water Cooled<br>Requires 2 GPM(7.57 Liters/Min)<br>@ 85 degrees F. |

## SUMMARY

## MICROVAC PUMP MAJOR ATTENTION ITEMS

1. Check oil level, oil flow and condition of the pump oil periodically. If oil is contaminated, change it and if very ditry, clean the oil reservoir and exhaust valve chamber. Oil should be changed as often as necessary to maintain low blank-off and effective lubrication.

2. Replace exhaust valve springs and exhaust valve disc at least every 6 months when pump is operated 8 hours per day. Clean out any sludge accumulation in oil reservoir.

3. If the gas ballast feature is used regularly, replace the spring and "O" ring seal in the check valve at least every 6 months.

4. To insure for maximum gas ballast efficiency, check outlet water temperature on jacketed models to make sure the pump is running warm. Oil in the pump reservoir should be approximately 140 degrees to 160 degrees F. for best gas ballast efficiency.

5. If pump incorporates an external oil mist separator, periodically drain off any accumulated dirty oil and discard. This will maintain the efficiency of the unit and extend the life of the element.

6. Check oil solenoid valve periodically for sludge and/or foreign particles accumulation by disassembling and cleaning. If valve sticks in open position, oil can be sucked into pump at shutdown. If valve sticks in closed position, insufficient lubrication results and pump can be damaged. Disassemble valve, inspect and clean. Replace parts needing replacement.

**NOT A LOT OF CARE...JUST THE RIGHT KIND...AT THE RIGHT TIME.**

**USE STOKES PREVENTIVE MAINTENANCE CHECK LIST THAT FOLLOWS.**

## STOKES Mechanical Vacuum Pump Preventive Maintenance Check List

User_____

Pump Model No._____

Lot No._____ Serial No._____

Date Pump Installed_____

Please consult **Parts List** for correct Part Nos. of Maintenance Items.

| MAJOR ATTENTION ITEMS | Date Installed | First Inspection Due | Was M.A.I. Accomp. | Comments |
|---|---|---|---|---|
| 1. Check oil level, oil flow and condition of the pump oil. Schedule oil change to suit your application. | | | | |
| 2. Replace exhaust valve springs and exhaust valve discs. Clean out any sludge in oil reservoir. Every 6 Mos. | | | | |
| 3. Replace the spring and "O" ring seal in the gas ballast check valve. 6 months interval recommended. | | | | |
| 4. Check outlet water temperature on jacketed models to make sure the pump is running warm. (1400 - 160 deg. F.) | | | | |
| 5. If pump incorporates an external oil mist separator, drain off any accumulated dirty oil. | | | | |
| 6. Flush the pump periodically using a detergent type oil. 6 month interval recommended. | | | | |
| 7. Check valve for sludge and/or foreign particles accumlation. If solenoid valve sticks, disassemble, clean and replace worn parts. | | | | |

FIG. – 12

MODEL 412-H MICROVAC PUMP

## Recommended Replacement Parts Kit

## For Model 412-H-11

The following replacement parts kit is recommended for your maintenance inventory to minimize downtime, assure availability of critical parts when maintenance is scheduled and assure you of proper "new equipment" replacement parts when and if emergencies occur.

| Qty. | Part Number | Description |
|---|---|---|
| 2 | 085-019-755 | "O" Ring for End Caps |
| 1 | 085-029-600 | Rotary Oil Seal |
| 4 | 243-926-002 | Valve Plate Gasket |
| 8 | 274-172-001 | Valve Spring |
| 8 | 272-963-002 | Valve Clapper |
| 1 | 269-037-001 | Oil Separator Gasket |
| 1 | 269-043-001 | Housing Gasket |
| 1 | 248-411-006 | Cover Plate Gasket |
| 2 | 085-024-138 | Spring for Check Valve |
| 2 | 085-024-135 | "O" Ring Kit for Check Valve |
| 1 | 085-034-530 | Glass Dome and Gasket - Oil Flow Indicator |

## MODEL 900-412-11 MICROVAC PUMP

## LOT NO. SCC-79924 TO

| SYM. | QTY. | PART NO. | DESCRIPTION |
|---|---|---|---|
| 1 | 1 | F-408-867-4 | Belt Guard Assembly |
| 2 | 1 | B-408-306-6 | Bracket |
| 3 | 1 | B-408-306-5 | Bracket |
| 4 | 1+ | C-268-783-5 | Pulley W/Taper Lock Bushing 021-417 |
| 4A | 1+ | 085-012-593 | Motor Pulley, 4 Groves |
| 4B | 1*+ | 085-013-726 | "V" Belt Matched Set of 4 I.N.D B-105 |
| 5 | 1+ | C-262-315-5 | End Cap - Drive End |
| 6 | 1*+ | 085-019-755 | "O" Ring, 4 7/8" ID X 5 1/8" OD X .139" Sect. |
| 7 | 1*+ | 085-029-600 | Rotary Oil Seal |
| 8 | 2+ | 085-019-492 | Lock Nut |
| 9 | 2+ | 085-019-491 | Lock Washer |
| 11 | 2+ | 085-019-757 | Ball Bearing |
| 12 | 1+ | A-262-508-20 | Side Cover, Drive End |
| 12A | 1+ | A-262-508-21 | Side Cover, Dead End |
| 13 | 2+ | A-262-318-3 | Shaft Shoulder Ring |
| 14 | 1+ | A-264-524-1 | Woodruff Key, 3/8" X 1/2" X .375" Wide |
| 15 | 2+ | A-408-324-5 | Key Eccentric |
| 16 | 1+ | D-262-992-5 | Shaft |
| 17 | 2+ | C-243-595-11 | Piston & Slide |
| 18 | 4+ | B-297-857-4 | Hinge Bar |
| 19 | 1+ | C-252-459-1 | Solid Eccentric |
| 20 | 1+ | A-268-788-1 | Hinge Bar Spacer |
| 21 | 6+ | 085-021-745 | Nylock S.H. Cap Screw, 1/4" - 20" X 1 1/4" Long |
| 22 | 1+ | C-264-785-2 | Bearing Ring |
| 23 | 1+ | 085-033-232 | Roller Bearing |
| 24 | 1+ | A-270-231-1 | Retaining Pin |
| | 4*+ | A-243-926-2 | Valve Plate Gasket |
| 26 | 4+ | 263-840-004 | Valve Assembly Consists Of: |
| 26A | 4+ | B-403-626-3 | Valve Cap |
| 26B | 8*+ | A-274-172-1 | Spring |
| 26C | 8*+ | A-272-963-2 | Valve Clapper 304 SS |
| 26D | 4+ | B-403-636-2 | Valve Seat |
| 27 | 1*+ | B-269-037-1 | Oil Separator Gasket |
| 28 | 1+ | D-269-256-5 | Oil Separator |
| 29 | 1*+ | C-269-043-1 | Housing Gasket |
| 29A | 1*+ | 085-038-301 | Gasket Eliminator |
| 30 | 1 | F-299-66-24 | Oil Reservoir (Welded) |
| 31 | 1*+ | B-248-411-6 | Cover Plate Gasket |

* RECOMMENDED SPARE PART (WEAR ITEMS)
+ PARTS NORMALLY STOCKED

## MODEL 900-412-11 MICROVAC PUMP

### LOT NO. SCC-79924 TO

| SYM. | QTY. | PART NO. | DESCRIPTION |
|---|---|---|---|
| 32 | 1 | B-419-109-5 | Cover Plate |
| 33 | 1 | 085-036-101 | Oil Level Indicator |
| 34 | 2 | 085-035-996 | Motor Bracket Pin |
| 35 | 2 | B-287-950-3 | Swivel Block |
| 36 | 1 | C-288-202-5 | Motor Platform |
| 38 | 1 | B-263-249-4 | Eye Bolt Base |
| 39 | 1+ | B-263-250-7 | Motor Support Eyebolt |
| 41 | 1+ | C-278-575-1 | Hollow Eccentric |
| 42 | 1* | 085-019-755 | "O" Ring, 4 7/8" ID X 5 1/8" OD X .139" Sect. |
| 43 | 1 | C-264-789-03 | End Cap - Dead End |
| 44 | 1+ | F-262-712-25 | Pump Housing |

### OIL LINE COMPONENTS

| | | | |
|---|---|---|---|
| 45 | 2 | A-269-286-13 | Tubing, 5/8" OD X 16 1/8" Long |
| 46 | 1+ | 085-021-037 | Flow Indicator |
| 47 | 1 | 085-036-053 | Brass Pipe, 1/2" NPT X 8 1/4" Long |
| 48 | 1*+ | 085-035-837 | Solenoid Valve 1/2" IPS 220/240V |
| 48A | 1*+ | 085-029-430 | Solenoid Valve Coil 220/440V 50/60 CY. |
| 48B | 1*+ | 085-029-427 | Sol. Valve Coil 550V, 60 CY, |
| 48C | 1*+ | 085-029-431 | Sol. Valve Coil 110V 50/60 CY |
| 49 | 2+ | 085-021-811 | Ball Valve, 3/8" IPS |
| 50 | 2+ | 085-021-965 | Check Valve, 3/8 IPS |
| 50A | 2*+ | 085-024-138 | Spring |
| 50B | 2*+ | 085-024-135 | Dynamic "O" Ring |
| 50C | 2 | 085-024-136 | Static "O" Ring |
| 51 | 1 | 085-033-233 | Brass Cock, 1/2" MPT |
| | 2*+ | 254-539-002 | Stokes V-Lube Pump Oil, Label F, 5 Gal. Can |
| | 1*+ | 285-186-2 | Stokes V-Lube Pump Oil, Label F, 2 Gal. Can |
| | 1*+ | 085-034-530 | Glass Dome & Neo., Gasket |
| | 2+ | 085-025-325 | Expansion Plug, 2 1/2" Dia. X .083" Thk. |
| | 8+ | 085-021-873 | Expansion Plug, 1 7/8" Dia. X .083" Thk. |

### REFERENCE DRAWINGS

| | |
|---|---|
| A-O-261-A | Parts Drawing |

* RECOMMENDED SPARE PART (WEAR ITEMS)
\+ PARTS NORMALLY STOCKED
Revision 1.4 4-11-95 EC-35534
RJL:rfe