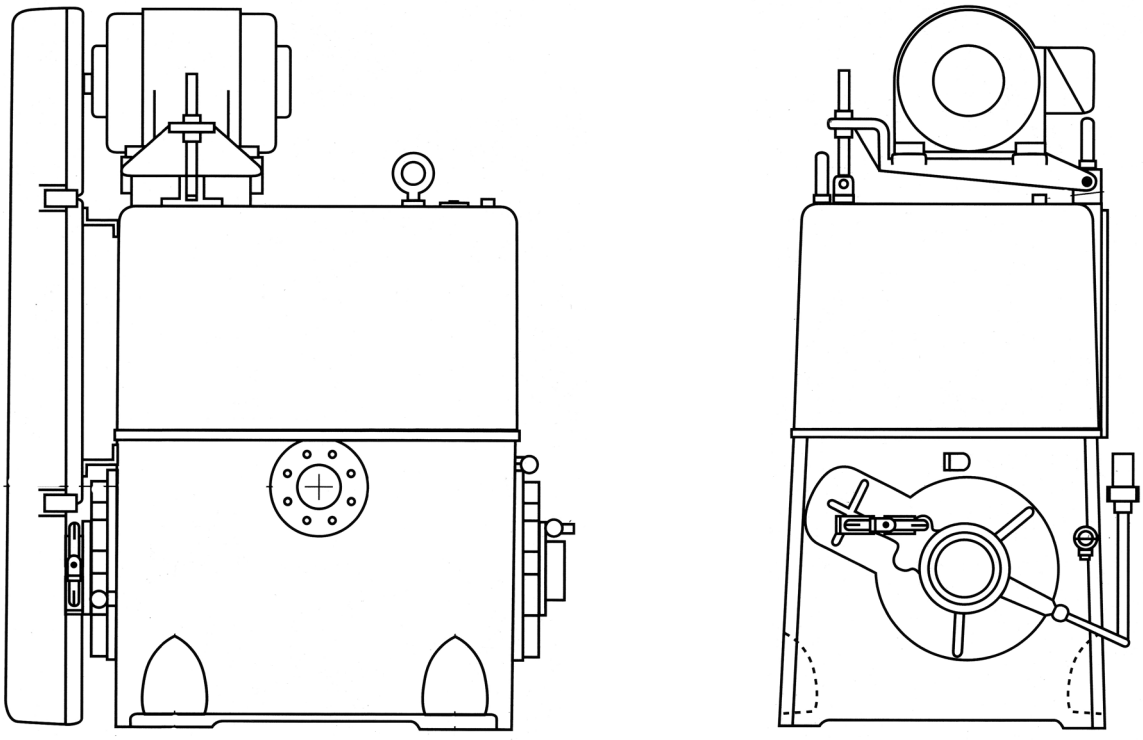
Uni-Vac 400 Series

Uni-Vac 200 Series

User Manual



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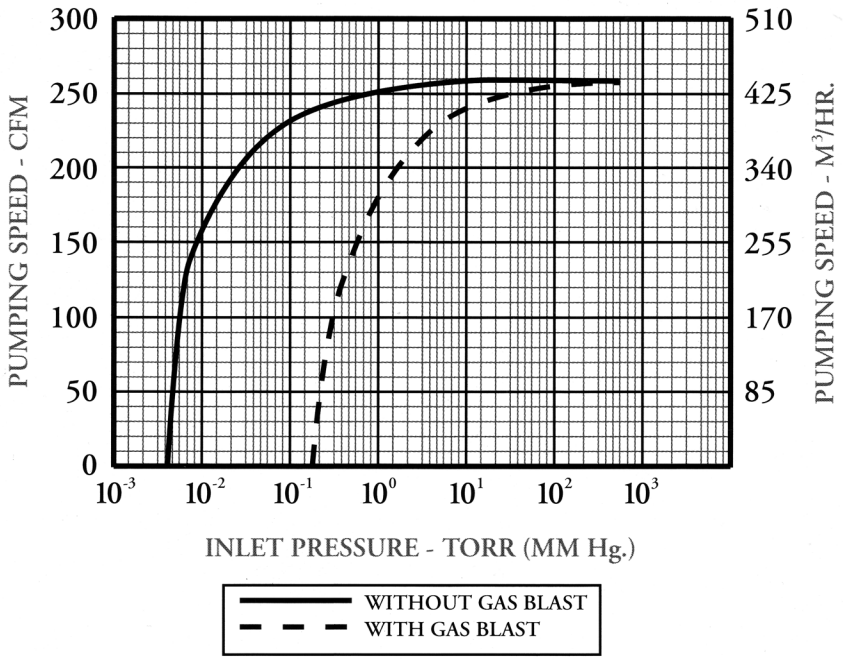
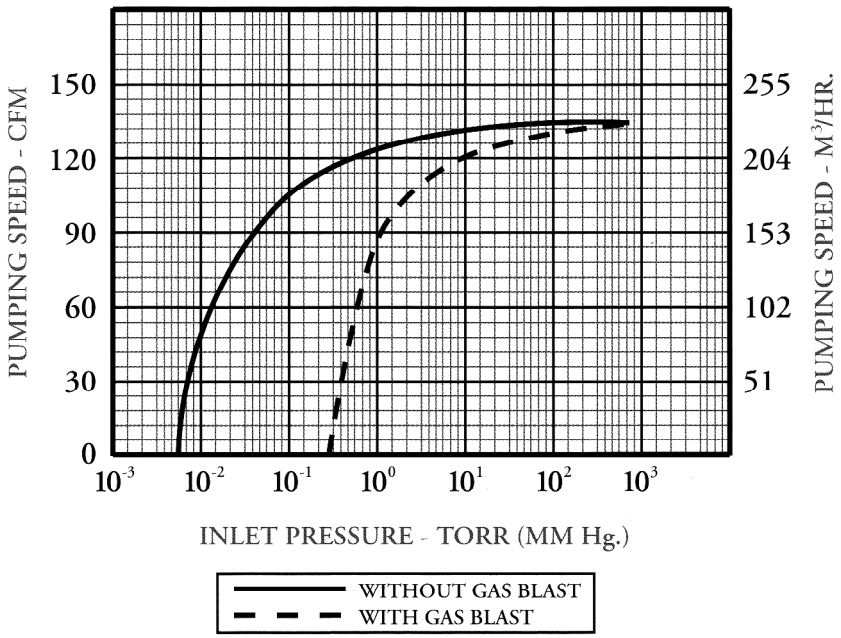


UNI-VAC 400 Series Specifications

Free Air Displacement	300 CFM
Vacuum Stages	One
Ultimate Pressure	0.01 Torr
Motor Rating	10 HP 208/230/460V
Pump Speed	490 RPM
Oil Capacity	12 Gals
Weight	1750 lbs
Inlet (ASA Flange)	4”
Outlet (Female NPT)	3”
Max Cooling Water 65 F	2 GPM
Cooling Water: Inlet:	1/2”
Outlet:	1/2”



UNI-VAC 200 Series Specifications

Free Air Displacement	150 CFM
Vacuum Stages	One
Ultimate Pressure	0.01 Torr
Motor Rating	7.5 HP 208/230/460V
Pump Speed	500 RPM
Oil Capacity	4 Gals
Weight	950 lbs
Inlet (ASA Flange)	3”
Outlet (Female NPT)	2”
Max Cooling Water 65 F	2 GPM
Cooling Water: Inlet:	1/2”

1.A General (Principal of Operation)

The UNI-VAC 200/400 Series Vacuum Pump is a self-contained, rotary, oil sealed piston type unit. The piston is driven by a an eccentric mounted on the drive shaft and the piston slide 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 beings 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 1). 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 bearing. 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.

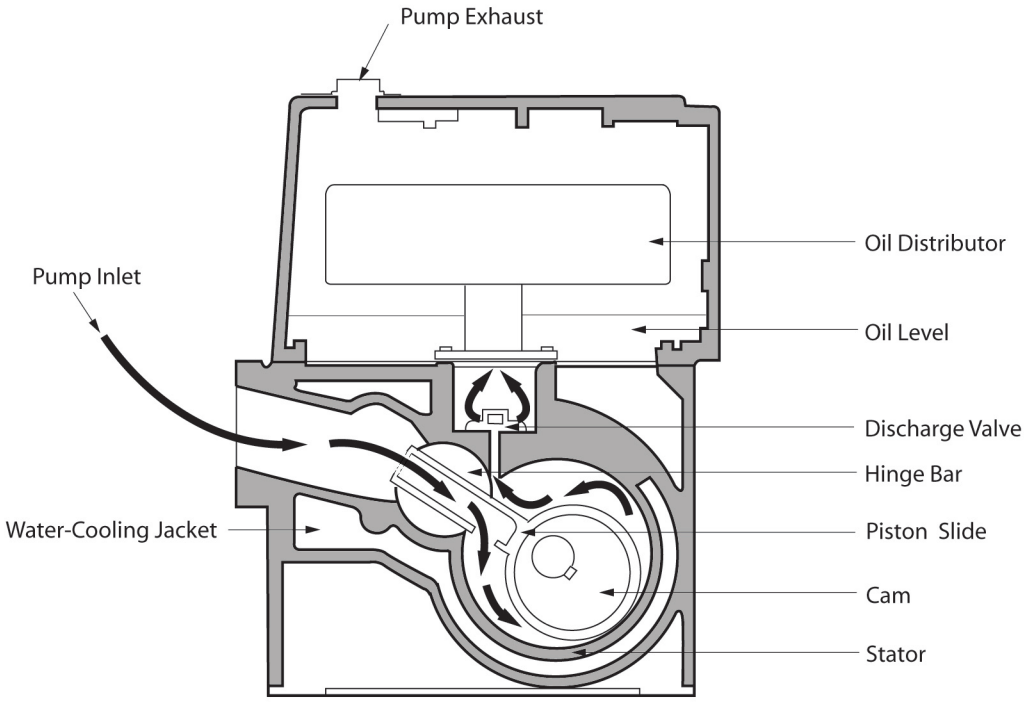


Fig. 1

1.B. GAS BALLAST

The pump is provided with manually operated gas ballast valves to overcome the adverse effect 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 the condensed water. Gas Ballast is controlled bleed of air from the atmosphere. This air carries the water vapor through the compression cycle without it condensing to liquid and mixing with the 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.C WATER SYSTEM

A supply of cooling water at 850° F and 2.G.P.M. maximum is needed at the water inlet for efficient performance. See Section 2.E for additional information.
DO NOT EXCEED 15 P.S.I.G. AT WATER DISCHARGE.

1.D 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.E LUBRICANTS

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

1.F GUARDS

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

1.G VACUUM BREAK AND GAUGE PORTS

The pump is provided with a Vz" FPT Vacuum Break Port and a % " FPT Gauge Port, as shown in Fig 1 1.

IMPORTANT : When using Gauge Port, providing a 90° elbow and at least 1 2 of vertical pipe to the gauge sensor.

2.A LOCATING AND MOUNTING

2.A1 Locating 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.A2 The pumping should be mounted on a rigid foundation, such as a concrete floor. The pump should be made level by shimming or grouting, if necessary. Blot pump to foundation without putting a strain or twist in the pump housing.

2.A3 Remove cap from exhaust and intake openings only when ready to make a pipe connection. When pump is to be subjected to low temperatures, prevent cracking the housing, then blow out water jacket. Follow this same procedure for storage.

2.B VACUUM PIPING

All pipelines 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 intakes and vacuum piping to eliminate vibration. See Figure 2-A and 2-B.

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

CAUTION: Make sure the system to be evacuated and all connecting lines are clean and free of weld splatter, dirt, or grit. Foreign matter entering the pump can cause failure and possible damage to the internal parts. To prevent this, it is recommended that a 16x16 mesh wire screen be installed at the inlet connection. After 20 hours of operation the screen must be removed.

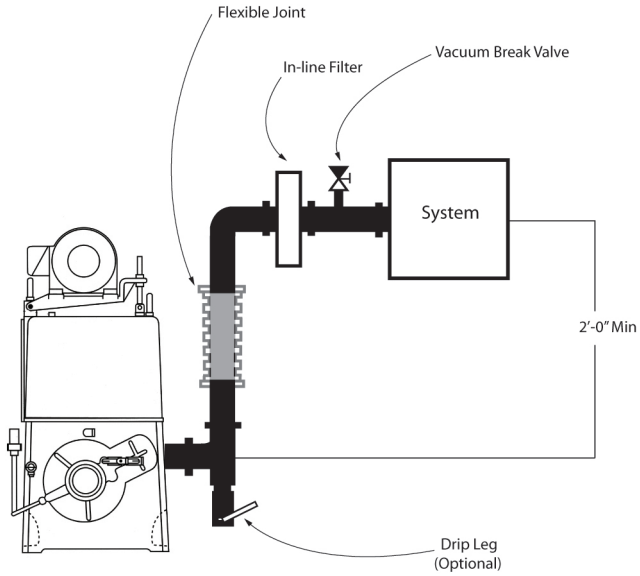


Fig. 2-A

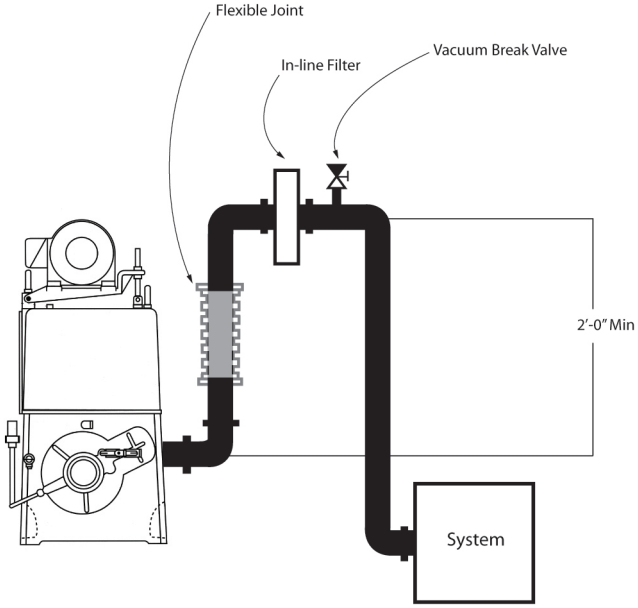


Fig. 2-B

2.B1 Type 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.B2 Location of Gauge 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 gauge can be connected.

2.C EXHAUST PIPING

2.C1 It is recommended that the exhaust be piped horizontally a 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 be 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 3.

2.C2 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 rainwater.

2.C3 Closed circuit oil mist separators are available from United Vacuum, which can eliminate oil mist in the majority of applications. The separator will not move noxious or toxic gases and must be run outside the building. For operating continually under conditions of higher pressure an electrostatic precipitator is recommend. Contact United Vacuum for specifics.

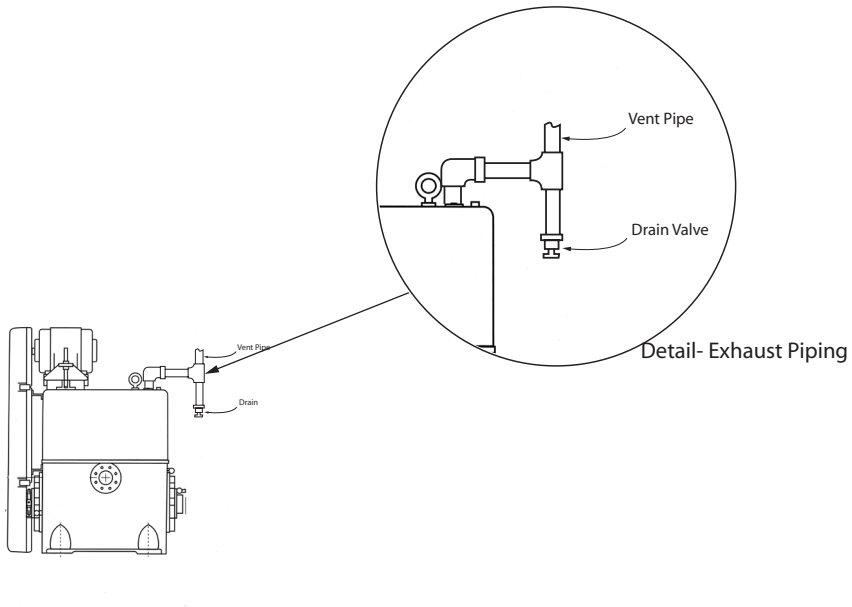


Fig. 3

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.D ELECTRICAL CONNECTIONS (See figure 5)

CAUTION: Be sure pump is properly lubricated before starting.

2.D1 Install a motor starter with safety device within easy reach of the operator.

2.D2 Connect the solenoid valve as in Figure 6.

2.D3 Connect motor so that pump shaft rotates clockwise when viewed from driven end. See

3.A for Pre-start check.

Note: Make sure the proper voltage, starters, and overloads are supplied to the motor. Also 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.

2.E COOLING

2.E1 This pump is water-cooled and must be connected to a water supply.

2.E2 The 1/2" water inlet connection is located in the pump housing on the drive side near the bottom.

2.E3 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° and 160°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.E4 The 1/2" water outlet is located in the pump housing on the opposite side of the water inlet.

2.E5 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 water pressure must not exceed 15 P.S.I.G. and no block valve should be placed in discharge line .

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 Section 3).

2.F LUBRICATION OF PUMP

The successful operation of this pump depends largely on the type of oil used. This standard oil is **UNIVAC-177,** which is recommended for general operating conditions in a relatively clean environment. The oil is a multi-grade petroleum oil, fortified for oxidation protection, containing detergent dispersants, with excellent flow characteristics at low temperature. It has a viscosity of 430 SSU at 100°F and 82 SSU at 210°F with a vapour pressure of 0.0001 mm Hg. at 145°F.

If the pump is to be operated at vacuum levels that cause the oil temperature to exceed 160°F for extended period of time, a heavier grade oil should be used, **UNIVAC-550** is available for oil temperatures up to 200°F

Special operating conditions may require the use of special oils. Consult United Vacuum for specific recommendations when other than regular petroleum oils are being used.

2.F1 Initial Fill

The 400 Series pump is shipped dry. A 12 gallon charge of **UNIVAC-177** is required before starting the pump. Before connecting the suction manifold, slowly rotate the pump through two revolutions. This will distribute the oil throughout the pump interior.

Note: Starting the UNI-VAC 400 Series pump when oil temperature is below 55°F can result in excessive wear and galling damage to the moving parts. When changing oil, refer to Section 5.A3

Note: Remove plastic plug from exhaust port before operating pump

3.A PRE-START CHECK

Note: Remove Belt Guard Cover. Turn pump over by hand at least two revolutions.

3.A1

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 mmHg. (6" Hg. Suction).

WARNING : If indicator ball does not rise. stop pump immediately!
(1) Check operation of solenoid.
(2) Check oil lines for blockage.

3.A2 Drive Belt Tension

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

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

Note: Maintenance of proper belt tension is important. Too tight and adjustment is harmful to the shaft bearings. Too loose and adjustment allows the belt to slip.

3.B PUMP START

3.B1 Turn cooling water ON. Do not exceed 15 PSI water pressure.

3.B2 Depress "start" button and check solenoid valve for proper operation.

CAUTION: Do not start pump when oil temperature is below 55°F

3.B3 Be sure the equipment being evacuated is properly cleaned and all openings are closed. Open intake valve.

3.C CHECKING OIL LEVEL

3.C1 Check oil level each day.

3.C2 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.C3 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 16PF. temperature range will tend to minimize formation of water, but will not eliminate it.

3.D OPERATION OF GAS BALLAST

3.D1 Open the gas ballast valves 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, pumps should be run approximately at 160°F Operating temperature can be raised by throttling cooling water. Oil temperature Control Kits are available at United Vacuum.

3.D2 If pumping water vapor in excessive quantities and the oil has become contaminated, it can be purified by running the pump with gas ballast valves fully open while the pump is shut-off from the system. When excessive contaminants are present, indicated by high oil level, or thinning, formation ofvarnish, 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°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 plua or cao the M e to which the gas ballast valve is attached. Opening the gas ballast valves slightly will quiet valve noise when pump is blanked -off, but will prevent reaching the lowest final pressure.

3.D3 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) hoursa day basis; every 3 months for (24) hour a day operation.

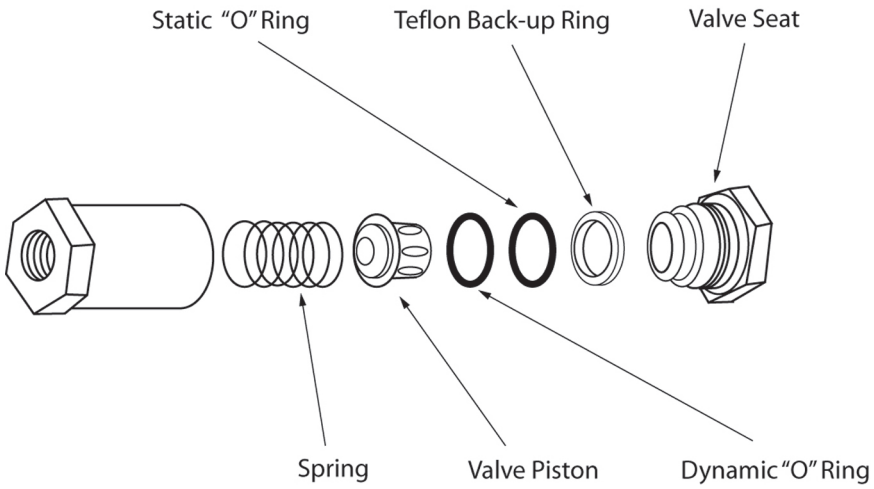


Fig. 4

3.D4 The gas ballast valve should be closed when the pump is stopped. If the valve is open, gas will be pulled 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 piping and connected across the motor can be used to turn the gas ballast automatically on pump shut-down. Contact United Vacuum for additional information.

3.D5 When a pressurized gas is used to ballast the pump, the pressure must be reduced to 2 PSI maximum. The use of higher pressures may damage the pump.

3.D6 When pumping an explosive gas, (i.e. hydrogen, silane, methane) or corrosive gas, (Cl, F, CC14, etc.) the pump must be ballasted with an inert gas (nitrogen, argon). The use of air for ballasting under the above conditions can result in an explosion or excessive corrosion inside the pump.

3.E PUMPSTOP

3.E1 Close intake valve to system.

3.E2 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.F OPERATING NOTES

3.F If large amounts of air pass through the pump, it may become warm. Under severe conditions it may become hot. This does not indicate trouble. The pump is designed for high vacuum work and should not be operated at pressures above 600 mmHg. for more than 15 minutes or at intermediate vacuums for periods which cause oil temperature to exceed 200°F. For optimum pump operation the temperature of the oil in the reservoir should be between 140° and 150°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 operated with oil temperature in excess of 160°F the use of heavier viscosity oil is recommended.
(See Section 2.F)

3.F2 When starting the pumping 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 : The United Vacuum 13-401/3 oil mist separator is available to greatly reduce oil mist vapor.

3.F3 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.F4 Low oil temperature can cause overloading when starting the pump and possible prevent the pump from sealing. UNI-VAC 400 Series vacuum pumps should not be started when the oil temperature is below 55°F.* Optimum operating oil temperature after starting is between 140° to 160°F Opening the Gas Ballast valve will help warm-up the oil.

Note: A water miser is recommended to automatically control the oil temperature.

* This applies only if UNIVAC-177 is used. Consult United Vacuum if other oils are used.

4.A POOR VACUUM

No pump will produce good vacuum 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.B LOCALIZING LEAKAGE

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

4.B1 A helium leak detector will speed up the process of locating leaks.

4.C REPAIRING SMALL LEAKS

To repair small leaks or to close pores, use sealing compound, UNI-VAC part No. **UV-085-038-301**. 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.D UNI-VAC 400 SERIES VACUUM 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 of 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 you to review.

The UNI-VAC 400 Series vacuum 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.A INITIAL SERVICING

5.A1 First Three Weeks of Operation

A. Check oil level daily and also condition. (See paragraph 5.A3). Maintain oil level at center of sight glass with pump in operation.

B. Check belt tension weekly (See Paragraph 3.A2).

C. Check the foundation bolts weekly.

5.A2 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.A3 Changing Oil and Cleaning Pump Reservoir (See Figure 8)

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 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 (48)

C. After oil has been drained remove oil reservoir cover plate (42), being careful not to damage gasket (43).

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 (43) and cover (42) and tighten securely

5.A4 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 :

1. Repeat steps 5.A3, A to D.

2. Remove oil distributor (34) and valve cover plate gasket (33).

3. Drain the oil from the valve chamber by removing the plug on the dead end side of the pump housing.

4. Remove valve assembly (32), by removing the six cap screws, and valve gasket.

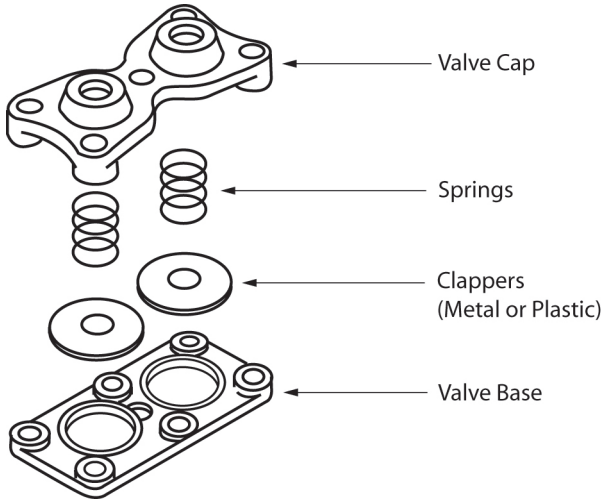


Fig. 5

Note: To disassemble valve assembly, remove center cap screw, lift off valve cap, remove spring and valve disc.

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

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

7. Replace valve chamber plug.

5.A5 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.A4. 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.A6 Solenoid Valve

Check Solenoid valve, which prevents oil from flooding the pump in case of a power failure, at regular intervals. (See Section 3.A1 Par. B). In the event when 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 or heavy).

In a clean, 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 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 as described in the ASCO valve instructions enclosed. Replace any worn parts. If the pump is used in a dirty and heavy pumping situation, the preventive maintenance checks should be performed sooner.

Note: 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 valve - consult factory. The visual flow indicator on latest pumps makes this check simple by indicating flow when pressure is below 600 mmHg. (6” Hg. Suction).

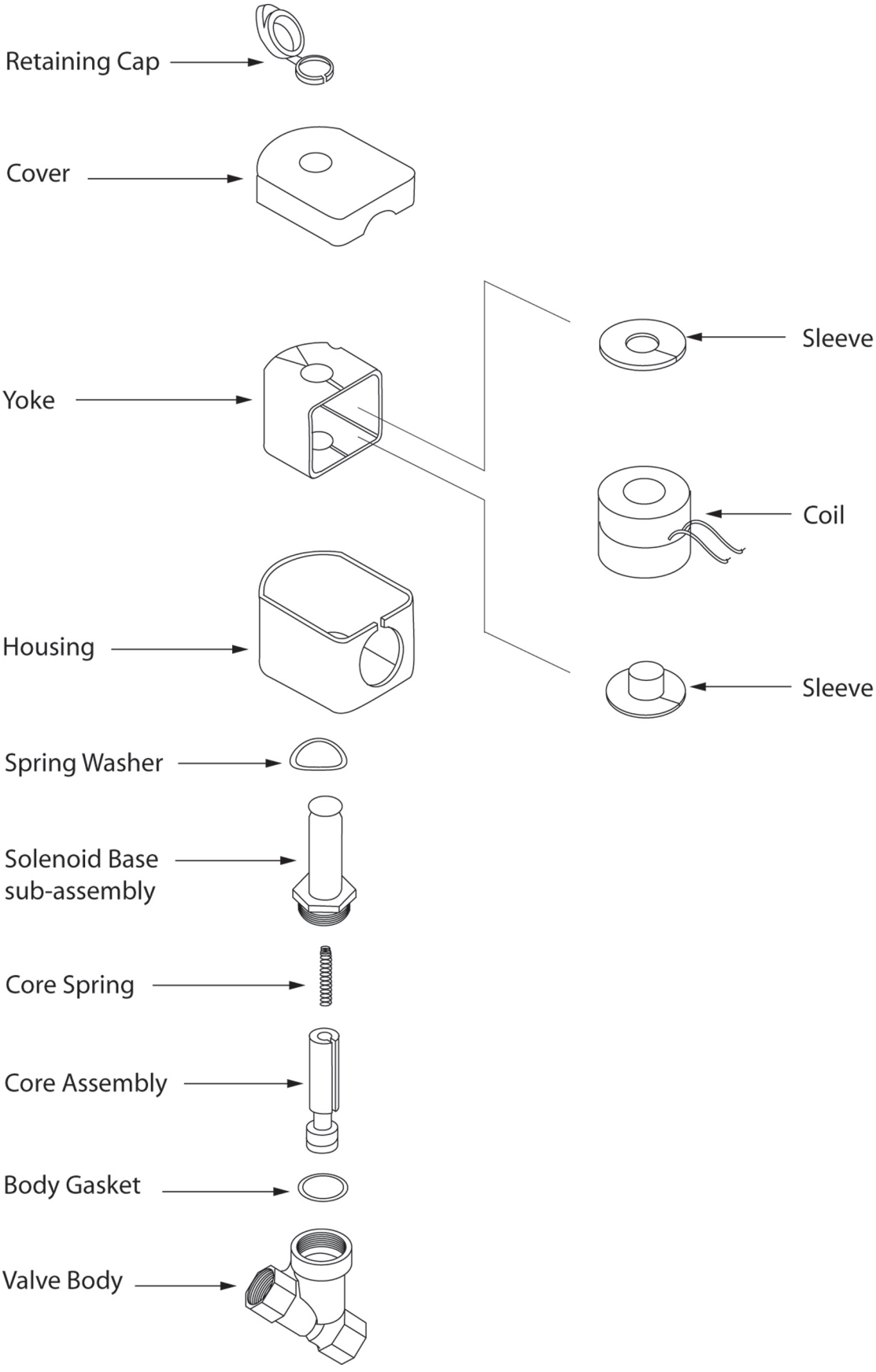

Retaining Cap
Cover
Yoke
Sleeve
Coil
Housing
Sleeve
Spring Washer
Solenoid Base
sub-assembly
Core Spring
Core Assembly
Body Gasket
Valve Body

Fig. 6

5.B UNI-VAC 400 SERIES PUMP DIASSEMBLY

5.B1 Removal of Shaft Seal - Driven End (See Figures 8)

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

1. To Remove Drive Pulley.

A. Unlatch (4) hinge locks on belt guard.

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

C. Remove the belts.

D. Insert screw in hole that is threaded through bushing side.

E. Tighten screw until bushing is loosened in the hub. If bushing does not loosen immediately, tap on hub.

Note: To assure proper seal assembly, check exploded view (Figure 8), for proper orientation.

2. Remove key (17) from the shaft and remove any burrs around the keyway.

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

4. Disconnect the oil line from the hub of side cover (15).

5. Take out screws that secure end cap (5) to the side cover and remove the end cap and “O” ring (*).

6. Inspect the face of seal (10) retained by the end cap.

7. Remove seal mating ring (7g) with a slight back and forth rocking motion

IMPORTANT: Before replacing the seal, lubricate the shaft and seal members and "0" ring with a thin coat of vacuum grease or pump oil. Replace the seal mating ring on the shaft using a slight back and forth rocking motion. However, the seal mating ring should still maintain slight free movement on the shaft.

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

10. Replace the drive pulley.

A. Clean the bushing, shaft, and bore of pulley.

B. Place bushing in hub and match half holes to make complete holes. Place the screws loosely in holes that are threaded on hub side.

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

D. 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).

E. 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 toque. REPEAT THIS ALTERNATE HAMMERING AND SCREW RETIGHTENING UNTIL THE SPECIFIED WRENCH TORQUE NO LONGER TURNS THE SCREWS.

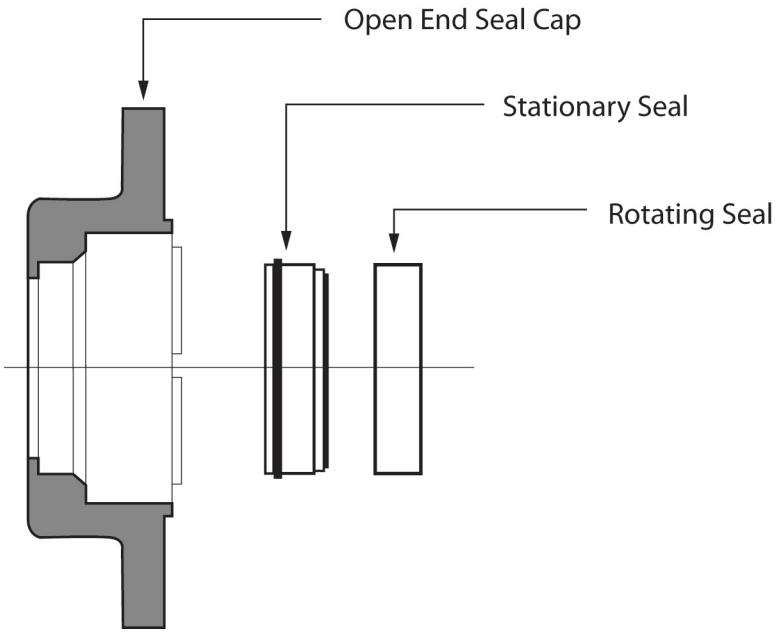


Fig. 7

INSTALLATION NOTES

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

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

C. Make sure the “0” Ring retainer (which fits between the “0” Ring in the carbon seal and the spring) fits freely over the pump shaft.

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

E. 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.

F. 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 it forms the seal when in contact with the carbon face. Gently place the polished undercut end of the tool** surface must be flat within two light bands.) Apply firm pressure, do not exceed 26 lbs. Hold for two minutes to set Loctite. The “0” 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 United Vacuum, Part No. **UV-427-740-001**

G. Slide the spring retainer, spring, and carbon seal with “O” Ring and “ 0 Ring retainer in place as shown, onto the pump shaft, making sure the “0” 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 the shaft since this will affect the seal of the carbon “0” Ring.

H. Replace end cap with “0” Ring. Coat the “0” 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.B2. Removal of Piston Assembly - Driven End (See Figure 8)

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

1. Remove the pulley and rotary oil seal ad described in paragraph 5.B1. of this section.

2. Remove side cover (15) by taking out the screws securing the side cover to the pump housings.

3. Turn shaft (18), if possible, until piston (21) is at the bottom of its rotation.

4. Pull piston (21) out just enough to be able to remove hinge bars (22).

5. After hinge bars are removed, completely pull piston (21) being careful not to drop it on the eccentric (23). 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 the slide are facing downward at intake side of pump.

6. Slide eccentric (23) over the keys (17) and off the shaft.

7. Reach inside the pump housing and remove hinge bar spacer (24).

8. 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, resulting in a decrease in vacuum.

9. Before reinstalling the side cover, put a small (1/16”s 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 # **UV-085-038-301.**

Note: If the roller bearing (27) in the pump housing (30) ever needs replacing the following procedure is suggested :

A. Remove bearing ring (26) by backing out six (6) nylock screws.

B. Remove the roller bearing (27) from the bearing ring (26). Replace with a new one.

C. Replace bearing ring (26) in pump housing (30), being careful to position retaining pin (28) in corresponding hole in pump housing. Tighten six (6) nylock screws.

5.B3. Removal of piston Assembly - Dead End (See Figure 11)

1. Disconnect oil line from the hub side of side cover plate(15).

2. Remove side cover plate (15) from the pump housing.

3. Remove hinge bars (22), piston (21), eccentric (23), and hinge bar spacer (24) as described in paragraph 5.B2.

5.B4. As long as your UNI-VAC 400 Series pump produces a suitable vacuum level and is not excessively noisy in operation, the parts are satisfactory and can be re-installed. However, the moving parts do wear and it is good practice to check the critical dimensions for excessive wear. If excessive wear is indicated, the life of the part is limited and replacement should be considered.

5.C. TROUBLESHOOTING GUIDE

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

5.C1. Vacuum at pump is unsatisfactory .

Probable Cause	Possible Remedy
1. Contaminated or insufficient oil.	**A.** Check oil level; utilize gas ballast. **B.** Drain and wipe our reservoir and valve chamber. Refill with proper oil. See Section 5.A3 and 5.A4.

Probable Cause	Possible Remedy
B. Solenoid oil valve not opening properly or inoperative	**1.** Check and, If necessary, clean and or replace solenoid valve or coil.
C. Loose intake flange or side 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. Gauge line leaking.	**1.** Paint connection
F. Exhaust valve not sealing	**1.** Disassemble, clean and check all parts thoroughly. **2.** Replace any damaged or worn parts. See Section 5.A5. 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 assembly. Replace worn, broken or badly scored parts. See Section 5.B3. Make sure oil solenoid valve isoperating properly.
H. Leakage in vacuum system.	**1.** Check system as described in Section 4.

5.C2. Vacuum Pump Excessively Noisy

Probable Cause	Possible Remedy
A. Pump knocking	**1.** Check oil level and solenoid valve for proper operation. **2.** Replace broken parts as required.

B. Pump seizes due to lack of lubrication, or presence of foreign material.	**1.** Check solenoid valve for proper operation. **2.** Disassemble and remove foreign material. Make sure oil lines are not clogged. **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 guage around entire piston surface).

5.C3 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.C4 Pump Does Not Turn When Motor Pulls

Probable Cause	Possible Remedy
A. V-belts too loose.	**1.** Tighten V-Belts. See Section 3.A2. Par. 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 excessive oil. **2.** Check Solenoid valve. Disassemble valve, clean and replace any worn parts.

C. Oil temperature may be tool low, or viscosity too high.	**1.** Change to lighter grade of oil, or warm oil before pouring into pump (especially with low ambient temperatures). Pump should not be started when oil temperature is less than 7O°F. **2.** Turn pump over by hand before starting.

5.C5 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.

UNI-VAC 400 SERIES VACUUM PUMP
DIMENSIONS AND TOLERANCES

Hollow Eccentric	**UV-278-575-001**	**Finished**
0. D.	6.000” + .0005 - .0000”	63
Bore	2.0010” + .0005” - .0000”	125
Length	12.988” + .000” - .004”	63
Solid Eccentric	**UV-252-459-001**	
O.D.	6.000” + .000” - .001”	32
Bore	2.0010” + .0005” - .0000”	125
Length	12.988” + .000” - .004”	63
Piston & Slide	**UV-243-595-011**	
Piston I.D.	6.003” + .002” - .000”	63
Piston O.D.	6.986” + .000” - .0003”	125
Slide Thickness	1.498” + .001” - .001	63
Length	12.995” + .000” - .001”	63
Shaft	**UV-262-992-002**	
At Eccentric	2.000” + 000.” - .001”	63
At Pulley	1.750” + .000” - .003”	125
At Seal	1.750” + .000” - .002”	8
At Inside Bearing	1.9680” + .0000” - .00006”	32
At Center Bearing	2.1653 + .0000” - .0005”	32
Hinge Bars	**UV-243-597-004** **UV-297-857-004**	
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

User _____
Pump Model No. _____
Lot No. _____
Serial No _____
Date Pump Install _____

Please consult parts list for correct Part No. 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 resevoir every 6 months.				
3	Replace the spring and "O" ring seal in the gas ballast check valve every 6 month interval is recommended.				
4	Check Outlet water temperature on jacketed models to make sure the pump is running warm (140°-160°F).				
5	If pump incorporates an external oil mist seperator, drain off any accumulated dirty oil.				
6	Flush the pump periodically using a detergent type oil every 6 month interval is recommended. Please call for pricing.				
7	Check valve for sludge and/or foreign particles accumulation. If solenoid valve sticks, disassemble, clean and replace worn parts.				

RECOMMENDED REPLACEMENT PARTS KIT FOR UNI-VAC 400 SERIES

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.

Quantity	Part Numbers	Description
1	**UV-085-013-726**	“V” Belts- Matched Set of 4
2	**UV-085-019-755**	“O” Ring for End Caps
1	**UV-085-013-726**	Rotary Oil Seal
4	**UV-243-019-755**	Valve Plate Gasket
8	**UV-274-172-001**	Valve Spring
8	**UV-276-781-002**	Valve Clapper
1	**UV-269-037-001**	Oil Seperaor Gasket
1	**UV-269-037-001**	Housing Gasket
1	**UV-248-411-006**	Cover Gasket
1	**UV-085-029-430**	Solenoid Coil
1	**UV-085-024-138**	Spring for Check Valve
2	**UV-085-024-135**	“O” Ring Kit for Check Valve
2	**UV-085-034-530**	Glass Dome and gasket
1	**UV-085-021-037**	Oil Flow Indicator

When completing the kit after parts have been used, the following breakdown is offered for your ordering information :

Kit containing all “0” rings, gaskets, valve clapper and springs noted above including Oil Flow Indicator Seals Check Valve Parts -

1 Rotary oil seal .....
1 Solenoid Coil .....
1 Matched Set, 4 “V” Belts. .....
2 Spring & “0” Ring Kits for Check Valves .....

400 Series Parts List

No	Qty.	Description	Part Number
1	1+	Belt Guard Assembly (Outer Piece)	**UV-408-867-004**
2	1+	taper lock bushing (motor)	**UV-085-017-105**
3	1+	Motor Pulley (4 Grooves)	**UV-085-012-593**
4	1+	Belt Guard Assembly (Inner Piece)	**UV-408-867-004**
5	1+	Bracket (upper)	**UV-408-306-005**
6	1+	Bracket (lower)	**UV-408-306-006**
7	1+	Taper Lock Bushing (Pulley)	**UV-268-021-417**
8	1+	Pulley	**UV-268-783-005**
9	1+	End Cap (Drive End)	**UV-262-315-005**
10	2*+	“O” Ring	**UV-085-019-755**
11	1*+	Mechanical Seal	**UV-085-029-600**
12	2+	Lock Nut	**UV-085-019-492**
13	2+	Lock Washer	**UV-085-019-491**
14	2+	Ball Bearing	**UV-085-019-757**
15	1+	Shaft Shoulder Ring	**UV-262-318-003**
16	1+	Side Plate (Drive End)	**UV-262-508-028**
17	1+	Woodruff Key	**UV-264-524-001**
18	2+	Key Eccentric	**UV-408-324-005**
19	1+	Shaft	**UV-262-992-005**
20	2+	Ball Valve	**UV-085-021-811**
21	2+	Check Valve	**UV-085-021-965**
22	2+	Piston & Slide	**UV-243-595-011**
23	4+	Hinge Bars	**UV-297-857-004**
24	1+	Solid Eccentric	**UV-252-459-001**
25	1+	Hinge Bar Spacer	**UV-268-788-001**
26	6+	Nylock S.H Cap Screw	**UV-085-021-745**
27	1+	Bearing Ring	**UV-264-785-002**
28	1+	Roller Bearing	**UV-085-033-232**
29	8+	Expansion Plug (1 7/8” Dia.)	**UV-085-021-873**

* Recommended Spare Part (Wear Item)
+ Parts Normally Stocked

400 Series Parts List

No.	Qty.	Description	Part Number
30	1+	Retaining Pin	**UV-270-231-001**
31	1+	Pump Housing	**UV-262-712-025**
32	4*+	Valve Assembly	**UV-403-636-003**
33	1*+	Oil Distributor Gasket	**UV-269-037-001**
34	1+	Oil Distributor	**UV-269-256-005**
35	1*+	Housing Gasket	**UV-269-043-001**
36	1	Oil Resevoir	**UV-299-066-024**
37	2	Tubing	**UV-269-286-013**
38	1	Steel Pipe	**UV-085-036-053**
39	1+	Flow Indicator	**UV-085-002-037**
40	1*+	Solenoid Valve	**UV-085-035-837**
41	1	Oil Level Indicator	**UV-085-036-101**
42	1	Cover Plate	**UV-419-109-005**
43	1*+	Cover Plate Gasket	**UV-248-411-006**
44	2	Motor Bracket Pin	**UV-085-035-996**
45	2	Swivel Block	**UV-287-950-003**
46	1	Motor Platform	**UV-288-202-005**
47	1	Eye Bolt & Base	**UV-263-249-004**
48	1	Brass Cock	**UV-085-033-233**
49	1+	Hollow Eccentric	**UV-278-575-001**
50	2+	Piston & Slide	**UV-243-595-011**
51	1+	Side Plate (Dead End)	**UV-262-508-021**
52	12+	Shaft Shoulder Ring	**UV-262-318-003**
53	2+	Ball Bearing	**UV-085-019-757**
54	2+	Lock Washer	**UV-085-019-491**
55	2+	Lock Nut	**UV-085-019-492**
56	2*+	“O” Ring	**UV-085-019-755**
57	1+	End Cap (Dead End)	**UV-262-315-005**
58	2+	Ball Valve	**UV-085-021-811**
59	2+	Check Valve	**UV-085-021-965**

* Recommended Spare Part (Wear Item)
+ Parts Normally Stocked

400 Series Parts List
(Items Not Pictured)

No.	Qty	Description	Part Number
60	4*+	“V” Belts	**UV-085-013-726**
61	4+	Valve Assembly	**UV-263-840-004**
62	4*+	Valve Plate Gasket	**UV-243-926-002**
63	8*+	Spring	**UV-274-172-001**
64	8*+	Valve Clapper	**UV-276-781-002**
65	1*+	Solenoid Valve Coil 220/440v 50/60 CY	**UV-085-029-430**
66	1*+	Solenoid Valve Coil 550v 60 CY	**UV-085-029-427**
67	1*+	Solenoid Valve Coil 110v 60 CY	**UV-085-029-431**
68	2*+	Spring	**UV-085-024-138**
69	2*+	Dynamic “O” Ring	**UV-085-024-135**
70	2	Static “O” Ring	**UV-085-024-136**
71	2*+	Stokes V Lube Pump Oil, Label F, 5 Gal. can	**UV-254-539-002**
72	1*+	Stokes V Lube Pump Oil, Label F, 2 Gal Can	**UV-285-186-002**
73	1*+	Glass Dome and Eno., Gasket	**UV-085-034-530**
74	2+	Expansion Plug, 2 1/2” Dia. x .083” Thk	**UV-085-025-325**
75	1*+	Sealing Compound	**UV-085-038-301**

* Recommended Spare Part (Wear Item)
+ Parts Normally Stocked

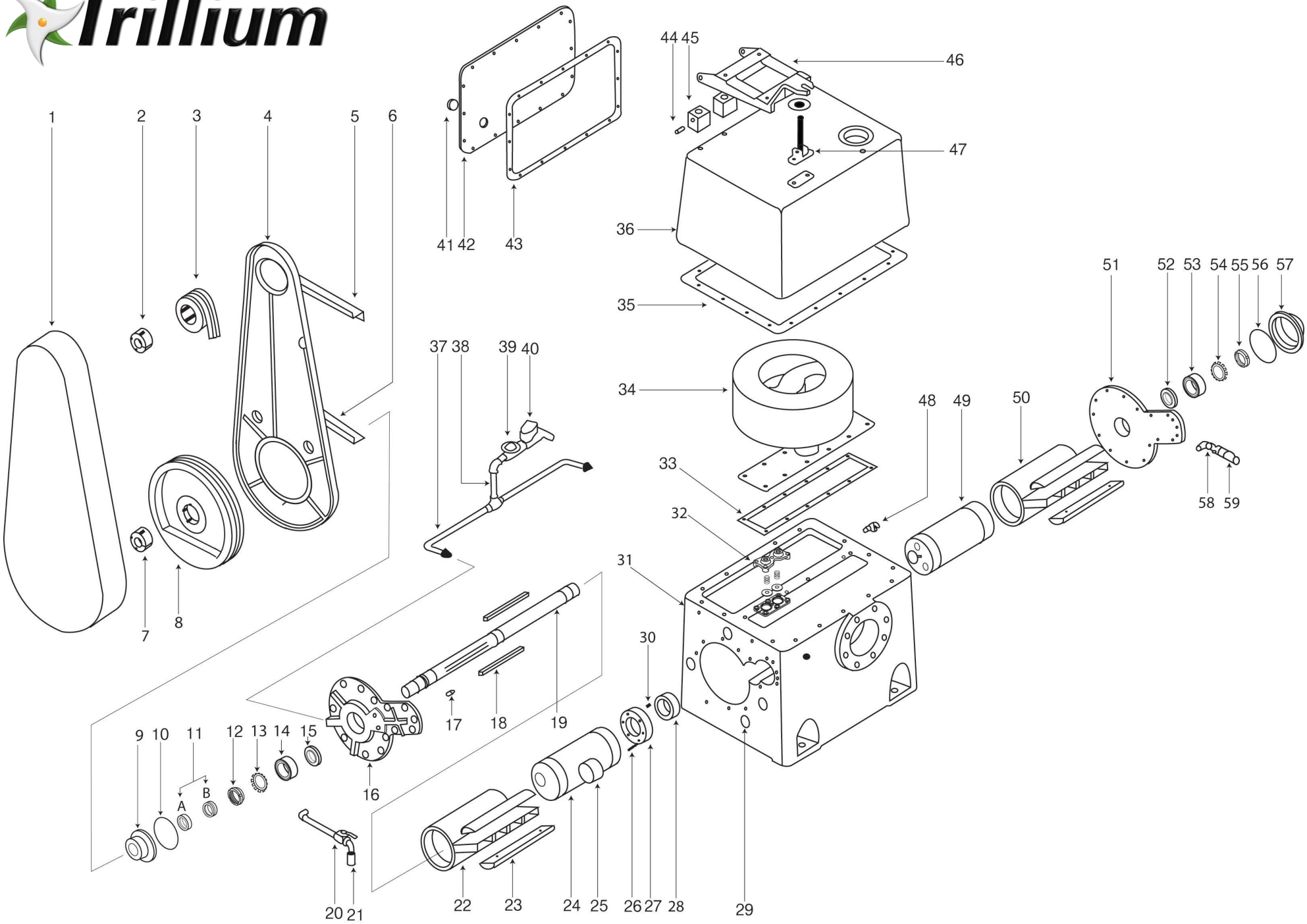


Fig. 8

Uni-Vac 400 Series

200 Series Parts List

No.	Qty.	Description	Part No.
1	1+	Belt Guard Assembly	**UV-411-381-002**
2	1+	Taper Lock Bushing (motor)	**UV-266-169-025**
3	1+	Taper Lock Bushing (drive shaft)	**UV-085-031-619**
4	1+	Drive Shaft Pulley	**UV-085-266-169-25**
5	1+	Motor Pulley	**UV-085-031-619**
6	1+	Belt Guard Assembly	**UV-411-381-002**
7	1+	Belt Guard Bracket	**UV-411-374-001**
8	1+	Sight Glass Level	**UV-085-036-101**
9	1+	Oil Resevoir Cover	**UV-419-109-012**
10	1+	Resevoir Cover Gasket	**UV-264-127-001**
11	4+	Dowel Pin	**UV-085-035-996**
12	2+	Swivel Block	**UV-286-122-006**
13	1+	Motor Platform	**UV-299-089-008**
14	1+	Shaft	**UV-252-616-012**
15	1+	Woodruff Key #G	**UV-264-524-001**
16	1+	Key Eccentric	**UV-408-324-005**
17	1+	Woodruff Key #G	**UV-264-524-001**
18	6+	Spacer Stud	**UV-298-799-001**
19	2+	Tubing	**UV-400-830-003**
20	1+	Steel Pipe	
21	1+	Oil Flow Indicator	**UV-417-251-002**
22	1+	Solenoid Valve (240v)	**UV-085-030-713**
22	1+	Solenoid Valve (480v)	**UV-085-030-713**
23	2+	End Cap	**UV-262-315-005**
24	2+	“O” Ring	**UV-085-019-755**
25	2+	Seal Assembly	**UV-085-038-766**
26	2+	Lock Nut	**UV-085-019-492**
27	2+	Lock Washer	**UV-085-019-491**

* Recommended Spare Part (Wear Item)
+ Parts Normally Stocked

200 Series Parts List

No.	Qty.	Description	Part No.
28	2+	Ball Bearing	**UV-085-019-757**
29	1+	Shaft Shoulder Ring	**UV-262-318-003**
30	1+	Side Cover (Drive End)	**UV-262-508-018**
31	2+	Motor Support Eyebolt	**UV-263-250-007**
32	1+	Oil Resevoir	**UV-404-521-013**
33	1+	Housing Gasket	**UV-246-765-002**
34	2+	Brass Cock	**UV-085-033-233**
35	1+	Oil Baffle	**UV-264-504-003**
36	2+	Valve Cover Plate Gasket	**UV-246-763-002**
37	2+	Valve Cap	**UV-403-626-003**
38	2+	Valve Seat	**UV-403-636-002**
39	1+	Pump Housing	**UV-263-842-011**
40	1+	Ball Valve	**UV-085-021-811**
41	1+	Check Valve	**UV-085-021-965**
42	1+	Eccentric	**UV-278-575-001**
43	1+	Piston Slide	**UV-243-595-011**
44	2+	Hinge Bar	**UV-297-857-004**
45	1+	Side Cover (Dead End)	**UV-262-508-019**
46	1+	Spacer Stud	**UV-298-799-001**
47	1+	Flywheel Guard Assembly	**UV-410-736-002**
48	1+	Flywheel	**UV-266-169-027**
47	1+	Taper Lock Bushing	**UV-085-031-619**
48	1+	Flywheel Guard Assembly	**UV-410-736-002**

* Recommended Spare Part (Wear Item)
+ Parts Normally Stocked

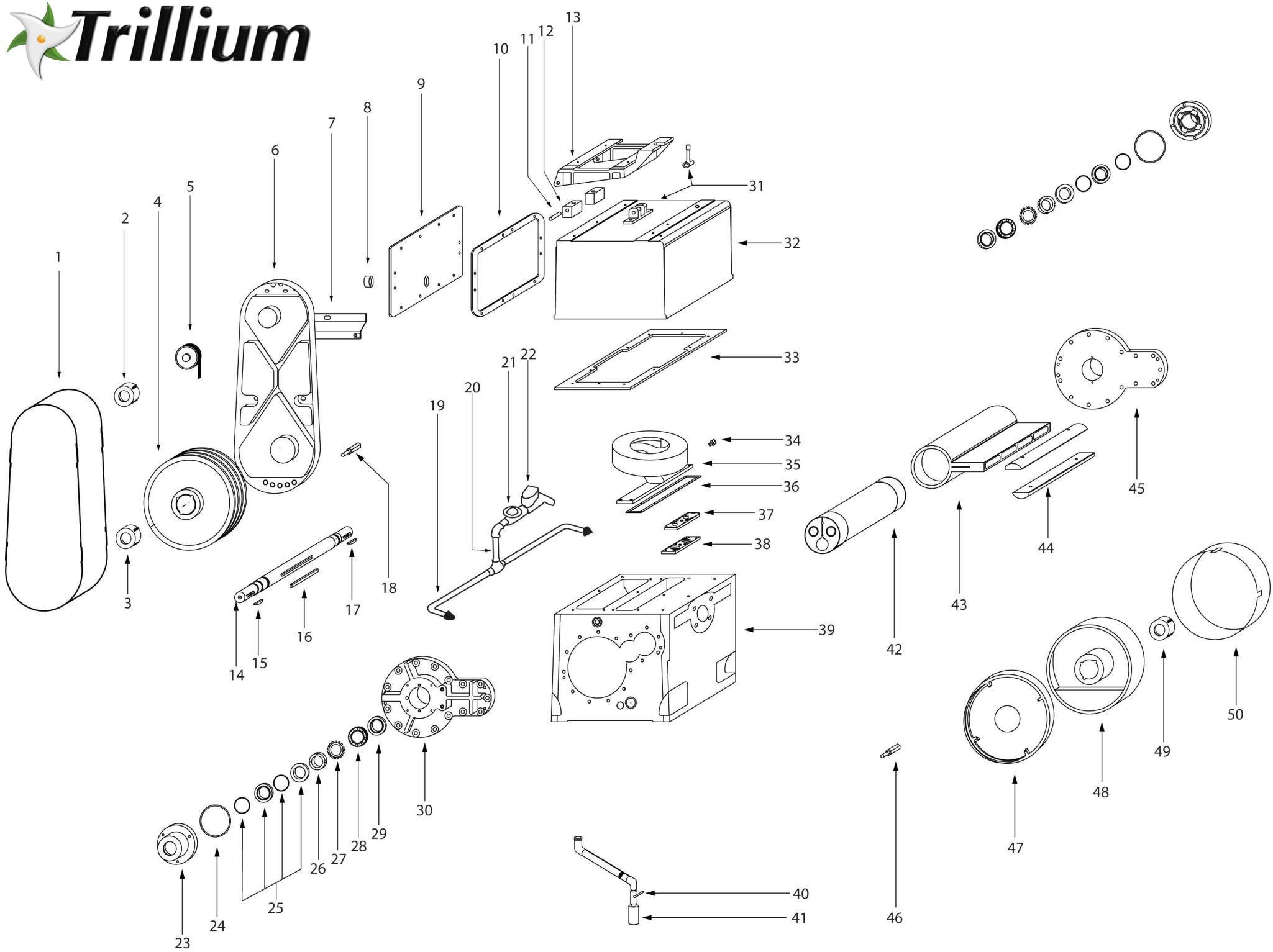
200 Series Parts List

Items Not Pictured

No.	Qty.	Description	Part No.
49	3*+	“V” Belts	**UV-085-013-669**
50	1*+	Solenoid Valve Coil (240/480v)	**UV-085-030-950**
51	1*+	Solenoid Valve Coil (550v)	**UV-085-030-958**
52	4*+	Valve Spring	**UV-274-172-001**
53	4*+	Valve Clapper (plastic)	
54	4*+	Valve Clapper (metal)	
55	2*+	Valve Plate Gasket	**UV-243-926-002**
56	1*+	Oil Flow Indicator Rebuild Kit	**UV-417-251-002**
57	1*+	Check Valve Rebuild Kit	

* Recommended Spare Part (Wear Item)
+ Parts Normally Stocked

Trillium



Uni-Vac 200 Series