



HEAVY-DUTY STATIONARY VACUUM SYSTEM

**INSTALLATION & OPERATING
MANUAL FOR**

Vacuum System Model Number

SHDP-540-1-0-3P

SHDP-360-1-0-2P

SHDP-180-1-0

INTRODUCTION

Congratulation on your purchase of a complete Vac-U-Lok vacuum workholding system. Vac-U-Lok's vacuum systems are engineered and manufactured to improve your company's performance and productivity in the short-term and in the long run. This installation and operating manual is designed to assist you in the installation and maintenance of your Vac-U-Lok vacuum workholding system.

Vac-U-Lok specializes in only vacuum workholding products. Vac-U-Lok manufactures vacuum chucks in almost any size or shape, custom or standard design. In addition, we offer a wide range of standard vacuum systems, from a small 7 CFM system to a very powerful 540 CFM system. Of course, Vac-U-Lok can custom design any vacuum system, large or small, to meet your specific needs.

Vac-U-Lok also has a wide range of vacuum workholding accessories and spare parts, including rotary unions, solenoid dump valves, manual dump valves, hose barbs, vacuum hose, and the special Vac-U-Seal vacuum gasket material.

Changing the Oil --- The Lifeblood of Your Vacuum System

Vac-U-Lok vacuum pumps will deliver years of excellent service if the oil is changed as recommend. The oil in the pump forms a micro-thin layer on all moving parts, which enables the pump to operate smoothly. The oil acts as a sealant, preventing the leakage of air past the rotor and vanes; assuring ultimate pressure on the intake.

In addition, the oil acts as a coolant, dissipating away unwanted heat in the pumping chamber. Over a period of time, intense heat inside the compression chamber will cause the oil to oxidize, diminishing its lubricating and sealing properties. The oil and filter help protect your vacuum pump from possible damage from particles that come from your machining process. The oil entraps these particles until they are filtered out through the oil filter or removed when changing the oil. The oil filter can become clogged if there are particles of dust, dirt, or coolant in the oil. Oil and oil filter changes are the most important maintenance items in an oil lubricated vacuum pump. Routine maintenance of the vacuum pump and drainage of the reservoir tank will extend the life of your pump.

INSTALLATION AND OPERATING MANUAL

FOR HEAVY DUTY STATIONARY VACUUM SYSTEM

SHDP Series Single Stage Rotary Vane Vacuum Pumps.

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Disclaimer

We reserve the right to change the product at any time without any form of notification. The information in this manual is accurate to the best of our ability at the time of printing. Vac-U-Lok will not be responsible for errors encountered when attempting to perform tasks outlined in this installation and operations manual.

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GENERAL

Identification

For model identification, see the nameplate mounted on the side of the exhaust box. This manual is written to cover the SHDP series of vacuum systems. When ordering parts, it is helpful to include the identification code stamped into the side of the cylinder as well as the serial number from the nameplate.

Operating Principles

All Single Stage, Rotary Vacuum Pumps are direct-driven, air-cooled, oil sealed rotary vane pumps which operate as positive displacement pumps. As Figure 1 shows, they consist of a rotor mounted concentrically on the drive shaft and positioned eccentrically in a cylindrical stator. The rotor has three radially sliding vanes, which divide the pump chamber into three segments. The gas (air) to be pumped enters at the inlet port (Ref. 260), passes through the inlet screen (Ref. 261) and the open anti-suck-back valve (Ref. 251) into the pump chamber. As the rotor rotates, the inlet aperture is closed, the gas (air) is compressed and forced out through one-way valves between the pump cylinder and the exhaust box. This operation is repeated three times each revolution.

All SHDP series pumps are designed to handle air. Vapor in the air stream can be tolerated when the pump is operated within certain operating parameters as defined by Vac-U-Lok Engineering. When you desire to use the pump on an air stream that contains other vapors, contact Vac-U-Lok Engineering for operating recommendations; otherwise, the warranty could be void.

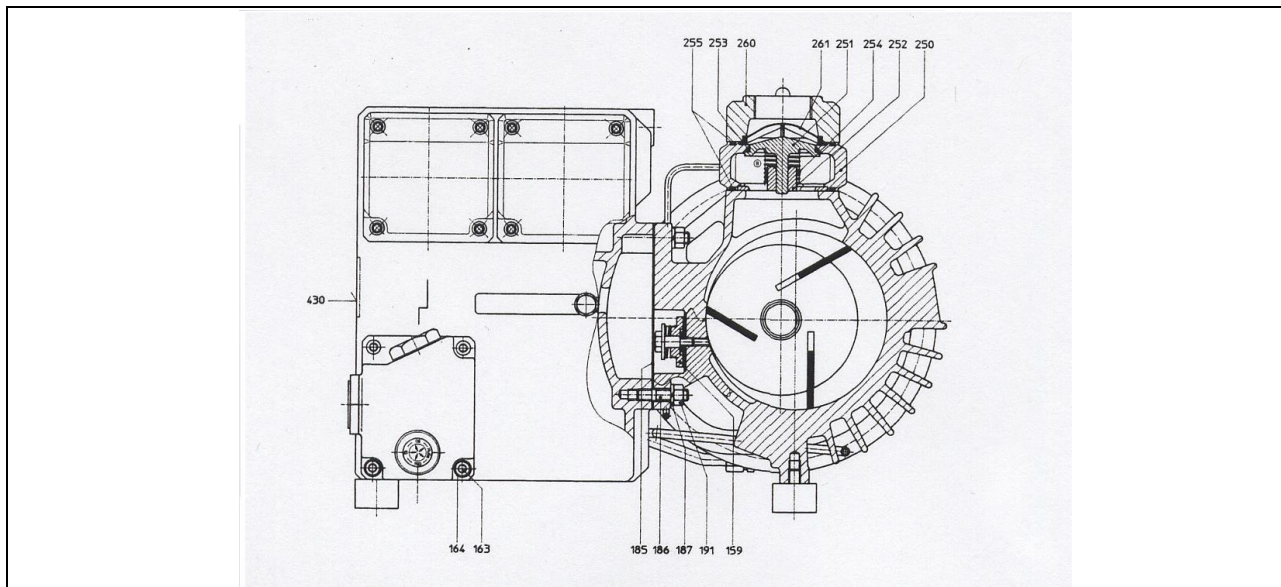


Figure 1 Module Cross Section

1.0 INSTALLATION

1.1 Unpacking

Inspect the crate and vacuum system carefully for any signs of damage incurred in transit. Since all vacuum systems are ordinarily shipped FOB, DeKalb, Illinois or Simpsonville, South Carolina, such damage is the normal responsibility of the carrier and should be reported to them *immediately*.

Remove the screws from the six (6) or eight (8) marked at the base of the crate. Then, remove the nuts from the screws coming up from the bottom of the pallet and pull the vacuum system out off of the pallet.

1.2 Location

The vacuum system must be installed in a horizontal position on a level surface so that the tank is evenly supported. Allow at least two (2) feet for the SHDP-7 and at least five (5) feet for the SHDP-180 (and larger models) for air space between the tank and any walls or other obstructions to the flow of cooling air. Also, adequate ventilation must be provided for the fans on the pump and the motor (i.e., do not locate the vacuum system in a stagnant air location).

After locating it but before operating the vacuum system, be sure to check the vacuum pump oil level prior to operation. Avoid inadequate oil levels because of possible vane breakage when starting the pump. In addition, do not tip the vacuum system (especially the pump) over if it is filled with oil.

Finally, locate the vacuum system in a location where you have easy access to the oil sight glass in order to inspect and control the oil level properly. Allow clearance at the exhaust flange area to provide service access to the exhaust filters.

1.3 Power Requirements

The schematic diagram for the electrical connection is located in the junction box or on the nameplate of the pump motor.

The motor must be connected according to the electrical codes governing the installation. The power supply must be routed through a fused switch to protect the motor against electrical or mechanical overloads. The motor starter has to be set consistent with the motor current listed on the motor nameplate.

The SHDP is supplied with a manual motor starter and is preset at the factory in accordance with the customer's specification. For other voltage requirements, contact the factory for motor and/or starter information.

NOTE: *See the motor manufacturer's manual on-line for start-up maintenance of the motor.*

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1.0 INSTALLATION (Continued)

1.3 Power Requirements (Continued)

The correct direction of rotation is marked by an arrow on the motor fan housing and is counterclockwise when looking at the motor from the motor's fan side.

CAUTION: After the electrical connection has been made and the pump is filled with oil, the rotation of the motor must be checked!!! Open the inlet port and jog the motor briefly to make sure rotation is correct. If it runs backwards and if it is wired three phase power, reverse any two leads of the three at the power connection.

1.4 Vacuum Connections

The following tank and thread sizes are provided on the outlets of the SHDP vacuum system series:

<u>Model #</u>	<u>Tank Size</u>	<u>Threaded outlet</u>
SHDP-180-1-0	No Tank	2" NPT

The appropriate hose barb should be installed on the ball valve provided on the vacuum system tank. Teflon tape or plumbers putty are necessary when making all connections between the vacuum system and the vacuum workholding devise (vacuum chuck in most instances).

If the gas that is pumped contains dust or other foreign solid particles, a suitable (five micron rating or less) inlet filter should be connected to the inlet port. Consult the factory for recommendations.

If using water-based coolants, Vac-U-Lok highly recommends purchasing an Automatic Coolant Return System (ACRS series) (Manual unit – MCRS-2 is also available). The ACRS-1 HD (Heavy Duty) drains up to 15 gallons per hour while the ACRS-2HD-2NPT handles up to 45 gallons per hour. The ACRS-3HD-3NPT collects and drains up to 70 gallons of coolant per hour. The Vac-U-Lok vacuum system warranty is void without a Coolant Return System from Vac-U-Lok.

If using flood-coolant, Vac-U-Lok recommends two procedures to ensure longer trouble-free operation. The first procedure is to crack open the oil drain (before you start the pump) and allow any water mist and/or condensation that may have built-up inside the oil sump to drain out. Never crack the oil drain while the vacuum pump motor is running. We recommend implementing this procedure on a daily basis. The frequency of this procedure can change to once a week if you find the water mist/condensation is very minimal on a daily basis.

In addition, we recommend turning on the vacuum system thirty (30) minutes prior to and thirty (30) after each usage. This procedure heats up the vacuum pump oil to approximately 200 degrees and helps evaporate some of the liquid that vaporizes past the ACRS in the oil filtering system. The oil needs to be changed more frequently when using coolant. In addition, the inlet filter glass jar and inlet filter need to be cleaned on a regular basis. The vacuum rotary vanes are a normal wear items.

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1.0 INSTALLATION (Continued)

1.5 Oil Filling

The vacuum system is generally shipped with oil in it. After level installation, and after correct rotation has been established, check the pump's oil level through the oil filling port, the "MAX" and "MIN" position at the oil sight glass.

Vac-U-Lok's VPO-40S synthetic vacuum pump non-detergent oil should be used whenever possible. Additives in detergent oil will plug exhaust filter elements and shorten their life.

The VPO-40S vacuum pump oil is a high quality oil that will give a longer running time between oil changes, provide better lubrication at high operating temperatures (Between 180 and 200 degrees), and prolong the life of the exhaust filter elements.

For general applications use VPO-40S. SAE 30 weight non-detergent motor oil can be used in place of VPO-40S but it will produce smoke out the exhaust (on a temporary basis only). New pumps are covered under the standard six (6) month warranty provisions when the approved weight and type oil is regularly used in them, VPO-40S. The warranty does not include normal wear parts.

The following table gives the approximate quantities of oil required for each pump:

<u>Model #</u>	<u>Oil Capacity (in quarts)</u>
SHDP-180	7.0
SHDP-360-1-0-2P	14.0
SHDP-540-1-0-3P	21.0

NOTE: *This table is for approximate values only. Use the sight glass oil level for the final oil level.*

WARNING: Keep the oil fill plug tight as pressure in the exhaust box could cause bodily injury if the plug is blown out. Do not add / fill oil with the pump running as the exhausting air pressure will not allow the oil to enter the pump. Do not add / fill the pump with oil through the exhaust / inlet ports as there is danger of breaking the vanes.

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1.0 INSTALLATION (Continued)

1.5 Oil Filling (Continued)

For ambient operating temperatures lower than 5 degrees C (41 degrees F), use Vac-U-Lok VPO-80 synthetic oil or a multi-purpose motor oil with lower viscosity. Do not use detergent motor oil! If this does not lower the viscosity sufficiently to permit starting, contact the factory. Oil detergent additives can cause the exhaust filters to become plugged, create smoky exhaust air, and shorten their service life.

2.0 OPERATION

2.1 Start-Up

Check rotation of the motor as described in paragraph 1.3 - Power Requirements.

Fill the pump with oil as described in paragraph 1.5 - Oil Filling.

Start the pump and immediately close the inlet at the ball valve on the tank. Run the vacuum system for a few minutes before checking the oil level. The oil level should be visible in the oil sight glass, between “MIN” and “MAX” mark.

Add oil, if necessary. Pump oil should only be added when the pump is *shut off* and circulating oil has had sufficient time to return to the oil pump.

WARNING: Do not add / fill oil with the pump running as the exhausting air pressure will not allow the oil to enter the pump. This cause bodily injury if the oil is blown out.

NOTE: The oil separated by the exhaust filter element forms droplets on the outside of the exhaust filter which collect at a low point in the upper half of the exhaust box. From there, collected oil is drained back to the oil sump via an oil return valve.

On SHDP standard model pumps, the collected oil is drawn continuously during the operation of the vacuum pump to the inlet flange via the oil return line. The oil return line is connected directly to the area of the exhaust box, downstream of the exhaust filter, which is at atmospheric pressure. Therefore, a constant amount of air, with the oil, is sucked into the pump.

2.2 Stopping Pump

To stop the pump, turn off the power. The pump has a built-in anti-suck-back valve to prevent the pump from rotating backwards when it is shut off.

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2.0 OPERATION (Continued)

2.2 Stopping Pump (Continued)

Install an automatic operated valve in front of the SHDP vacuum system, if more than one vacuum system is pumping on the same line or if there is a sufficient volume of vacuum in the system to cause the pump oil to be drawn into the piping when the pump is shut down.

All of Vac-U-Lok's SHDP series vacuum pumps are vented internally to atmospheric pressure through venting holes that are next to the exhaust valve assembly.

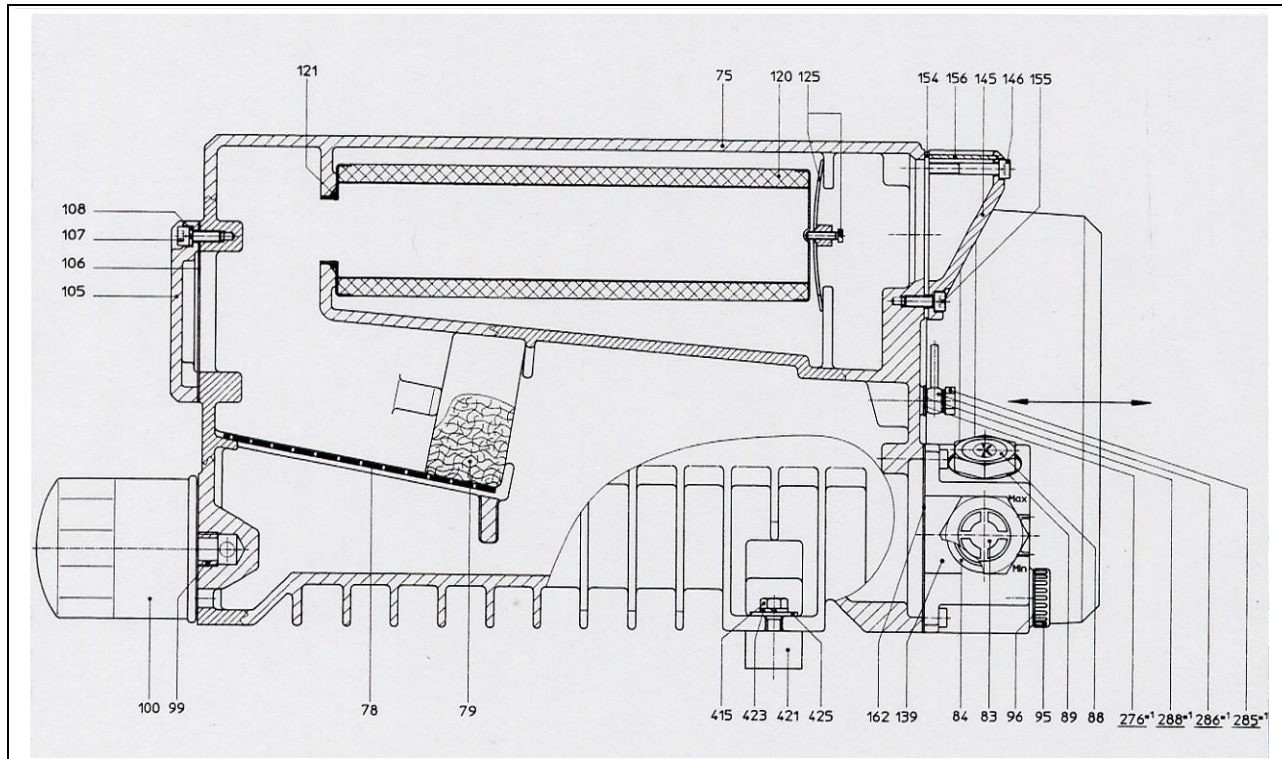


Figure 2 Typical Exhaust Box Cross Section

It is mandatory that these operating instructions be read and understood prior to vacuum system installation and start-up.

WARNING: Vac-U-Lok strongly recommends that all major repair operations be conducted at the factory. Improper handling of repairs could result in extreme danger to personnel operating the vacuum system.

Vac-U-Lok's SHDP series, single stage, rotary vane vacuum pumps require very little maintenance; however, to insure pump performance, it is recommended that the following steps be observed:

3.1 PUMP OIL

3.1.1 Oil Level

With the vacuum system shut off, make sure there is a sufficient amount of clean oil in the vacuum pump. The oil level should be observed on a daily basis. Replenish it if it drops below the "MAX" mark on the sight glass.

All oil level readings should be taken only when the pump is not running. Allow the oil to settle before adding any oil. The oil might appear to be foam that is a normal phenomenon with aerated oil.

Oil can be added to the oil fill port after the pump is shut off and the circulating oil has had sufficient time to return to the oil sump.

CAUTION: No oil should be added while the pump is running since hot unfiltered oil vapor may escape through the oil fill port. Improper use could result in extreme danger to personnel operating the vacuum system.

Under normal circumstances, it should not be necessary to add or drain oil from the pump between recommended oil changes. A significant drop in oil level means there is an oil leak or that an exhaust filter is broken; in which case, the pump should be smoking excessively. It is normal for the oil to be foamy and light colored in a operating pump. However, if the oil is milky or dark colored, it is contaminated or burned and must be changed.

3.1.2 Oil Type and Quantity

See Section 11.5 -- Oil Filling -- for detail on oil type and quantity

3.1.3 Oil and Filter Change

When using Vac-U-Lok's VPO-40S synthetic vacuum pump oil, it is recommended that oil the first oil change is made at 100 hours of usage. After that oil changes should be made every three (3) to four (4) months or 750 hours of operation, whichever come first (see 1.5 Oil Filling). Of course, if coolants are used in your machining process and drawn through the vacuum system to the pump, oil changes will need to be much more frequent. If coolant is used, daily shut off the pump and drain any excess liquid by cracking the drain spigot on the pump.

Do not using SAE motor oil. Only use Vac-U-Lok synthetic 40wt oil. To change the pump oil every three (3) month or 500 hours of operation, shut the pump off, loosen the oil drain handle, and drain the hot oil. At the same time, replace the oil filter.

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3.0 MAINTENANCE (Continued)

3.2 Auto-Type Oil Filter (Ref 100)

All of Vac-U-Lok's SHDP series, single stage, rotary vane vacuum pumps are equipped with an auto-type oil filter. Replace installed oil filters with the following or equivalent type filter:

Model	Vac-U-Lok Part Number	Use in case of Emergency
SHDP-180	SHDP-180-1-1-4	Mann W-712

3.3 Exhaust Filter

Every nine (9) to twelve (12) months or as necessary, replace the exhaust filter elements (Figure 120). The service life of the exhaust filters varies widely with each vacuum system application. It is necessary to change the filters before the elements become clogged with foreign material or burned oil. Indication of clogged filters are any one of the following:

- (1) Exhaust pressure gauge reads close to the red zone,
- (2) Smoke and oil mist are coming from the pump exhaust or,
- (3) Higher than normal motor current.

WARNING: If the gas entering this pump is a health hazard, use rubber gloves and all necessary personal protection equipment when performing the exhaust filter replacement operation.

WARNING: Wear safety glasses when installing or removing the spring retainers. The retainers can, if not secured correctly, slip off and slide out of the exhaust box.

3.3.1 Exhaust Filter Replacement

Remove the four (4) socket head cap screws retaining the exhaust port housing (see Figure 3). Pull the housing off the exhaust box and set it aside.

Use a slotted head screw driver to loosen the exhaust filter retaining spring, then rotate and remove the spring (see Figure 4). Pull the filter cartridge out of the exhaust box.

To field test an exhaust filter element, remove it from the pump, allow it to cool, clean the sealing end (or O-ring end), use compressed air, regulated at 5 psig to blow through the element; three (3) to six (6) psig is the maximum allowable operating pressure across the filter. *Note: Use a shop rag to seal off the connection between the air hose and the filter.*

If you can blow through it and element is good. If not, discard it and replace the filter. The filter cannot be cleaned successfully. Visually inspect the filter element for cracks.

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3.0 MAINTENANCE (Continued)

3.3.1 Exhaust Filter Replacement (Continued)

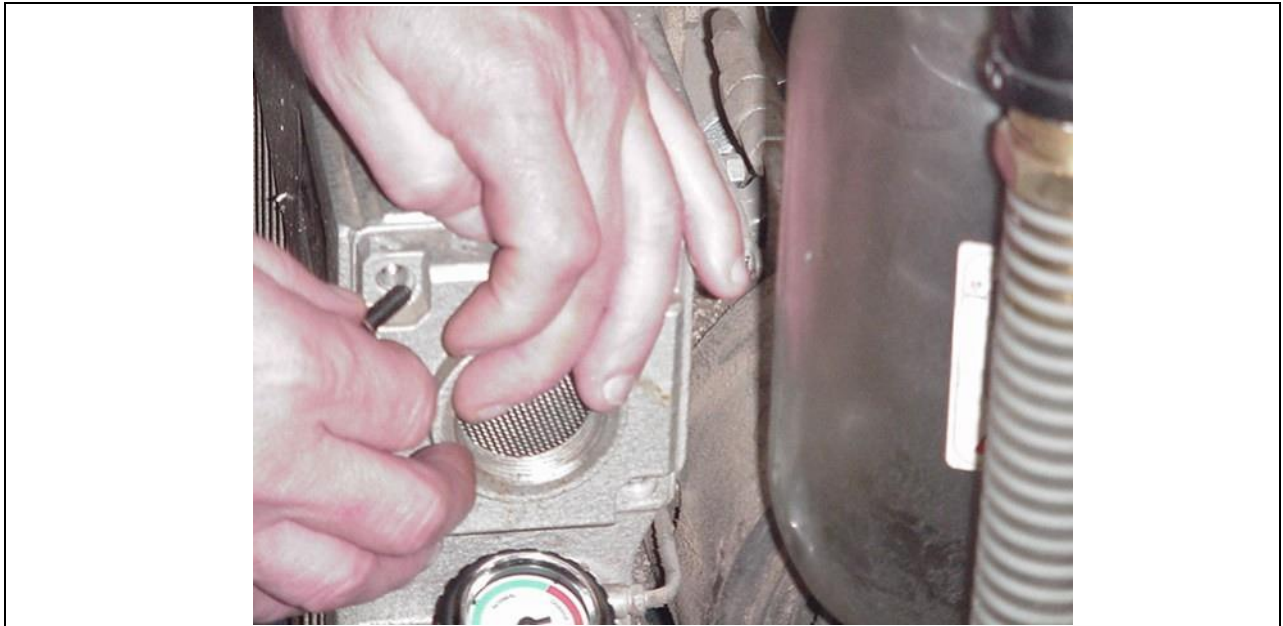


Figure 3 Removing Exhaust Housing

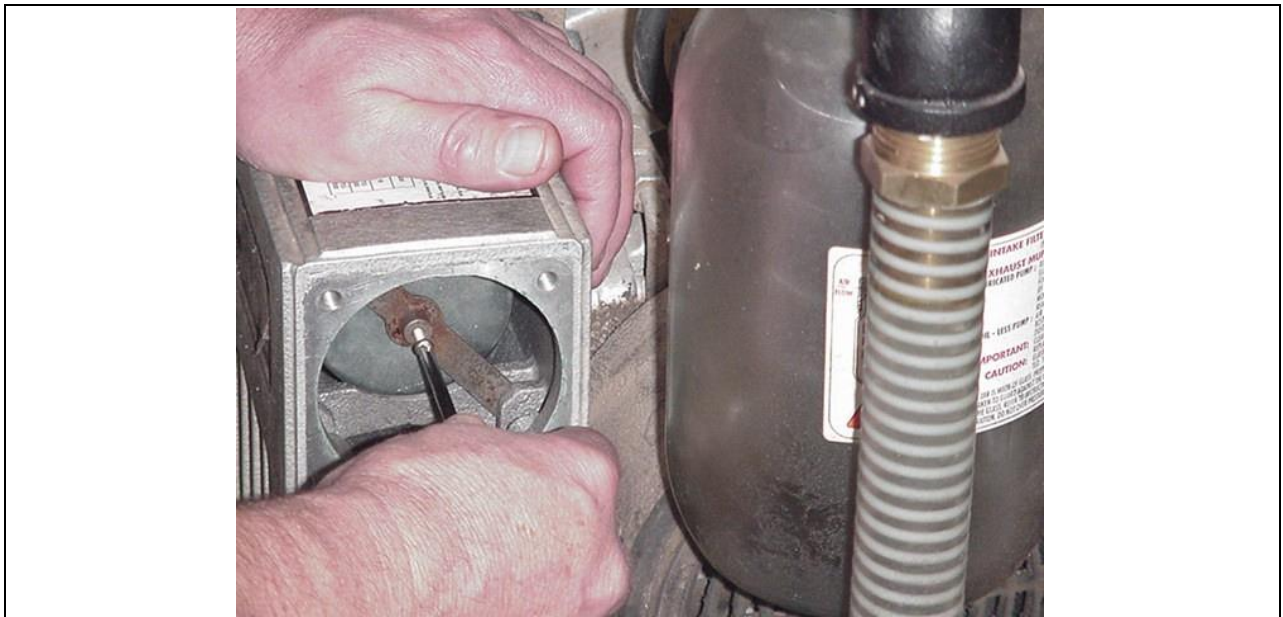


Figure 4 Removing Filter Spring

Reinstall the filter elements. Make sure the open end of the element is properly seated down in its recess in the exhaust box (see figure 4) with the O-ring correctly positioned. Retain the filter with the spring clip, tighten the tension screw until the filter is secure. Place the exhaust port gasket and housing in position on the exhaust box and retain with the cap screws.

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3.0 MAINTENANCE (Continued)

3.4 Vacuum Inlet Filter and Reservoir Tank

The vacuum system is equipped with a vacuum inlet filter assembly and a reservoir tank (optional feature). The filter is designed to collect powder, dust, or grit present in the air stream. The filter felt cartridge should be cleaned or exchanged on a weekly basis, depending on the amount of foreign particles to which the system is exposed.

The vacuum reservoir tank is designed collect larger particles and some of the coolant before it reaches the Automatic Coolant Return System and vacuum pump. If using the ACRS series coolant return systems, draining the tank may never have to be done again. The tank (optional feature) should be checked on a bi-weekly or monthly basis by the drain valve underneath the reservoir tank.

More aggressive contaminants or liquids in the air stream may require an extra, external inlet filter for collection before entering the vacuum reservoir.

3.5 Exhaust Coalescing Filters

Another optional feature available for a Vac-U-Lok vacuum system is an exhaust coalescing filter (Oil Mist Eliminator) for high flow vacuum applications such as MDF board / spoil board machining. Please note that all Vac-U-Lok vacuum pumps must be operated at a minimum vacuum level of 20 inches of mercury. If the vacuum pump is operated below 20 inches of mercury, the vacuum pump oil will exit the exhaust port and will saturate the Exhaust Coalescing Filter Element (optional feature). In addition, it will cause excessive wear on the vacuum pump and prematurely damage it. Operating any of Vac-U-Lok's vacuum pumps below 20 inches of mercury voids the vacuum system warranty.

3.6 Maintenance Chart

Daily:	Visually check oil level and condition of oil (see 3.1.1 and 3.1.2). Drain the vacuum reservoir tank.
Daily:	If using coolant, crack open the oil drain (before you start the pump) and allow any water mist and/or condensation that may have built-up inside the oil sump to drain out.
Weekly:	Inspect and clean or replace inlet filter felt (see 3.4).
First 100 hours	Change oil and oil filters after first 100 hours of operation--Very Important!
Every three (3) to four (4) months (500 hours to 750 hours of operation) or as necessary:	Drain and discard oil from the pump. Replace the automotive-type oil filter and refill with fresh oil through the fill plug (see 3.1.2 through 3.1.3 and 3.2).
Every nine (9) to eighteen (18) months, or as necessary:	Replace the exhaust filter elements (see 3.3).

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3.0 MAINTENANCE (Continued)

3.6 Overhaul Kit / Filter

An overhaul kit, which includes a set of gaskets, O-rings, vanes, bearings, bearing sleeves shaft seals, and taper pins, is available from Vac-U-Lok.

A pump filter kit containing oil drain plug, gaskets, auto-type oil filter, and exhaust filter, is also available from Vac-U-Lok. The inlet filter felt and glass jars are ordered separately from the pump filter kit.

When ordering, please specify the vacuum system model number and serial number on the vacuum system.

CAUTION: All remedies are to be performed with the vacuum system completely shut down!
Improper use could result in extreme danger to personnel operating the vacuum system.

4.1 Trouble: The pump does not reach “blank-off” pressure which is the lowest absolute pressure (best vacuum) when running with the inlet closed via a blank flange or a valve; or pump takes too long to evacuate the system. The “blank-off” pressure can be measured by using a good quality capsule gauge. Please note: All remedies are to be performed with the vacuum system completely shut down!

4.1.1 Possible Cause: Contaminated oil (including moisture/coolant) is by far the most common cause of not reaching the ultimate pressure.

Remedy: Shut off the vacuum system, after operating temperature has been reached, drain the warm oil from the pump and replace automotive-type oil filter, if necessary. Fill with new oil and take a new “blank-off” measurement after operating temperature is reached (at least 20 to 30 minutes).

4.1.2 Possible Cause: Vacuum system piping not leak tight due to shipment, hook-up, or usage over time.

Remedy: Check hose and pipe connections for possible leakage.

4.1.3 Possible Cause: Wire mesh inlet screen may be plugged.

Remedy: Clean wire mesh inlet screen by removing piping to inlet filter assembly.

4.1.4 Possible Cause: No oil or not enough oil in oil reservoir.

Remedy: Shut off the vacuum system, drain balance of the oil from the pump with the oil spigot handle, replace automotive oil filter, and refill with fresh oil.

4.1.5 Possible Cause: Auto-type oil filter is dirty or clogged.

Remedy: Replace auto-type oil filter, exchange oil, if necessary, and refill with fresh oil.

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4.0 TROUBLESHOOTING

CAUTION: All remedies are to be performed with the vacuum system completely shut down!
Improper use could result in extreme danger to personnel operating the vacuum system.

4.1 **Trouble (Continued):**

4.1.6 Possible Cause: Inlet valve plate stuck in closed or partially open position due to contamination.

Remedy: Disassemble inlet valve and screen. Clean as required.

4.1.7 Possible Cause: Oil tubing defect and/or leaking. Oil return line broken.

Remedy: Replace or re-tighten oil fittings or oil tubing. Replace only with same size tubing.

4.1.8 Possible Cause: Shaft seal leaking

Remedy: Check shaft seal and replace the shaft seal if necessary. It should have a spring installed inside and around the shaft sealing lip.

4.1.9 Possible Cause: Exhaust valve not properly seated or partially stuck open.

Remedy: Disassemble and replace exhaust valves.

4.1.10 Possible Cause: Vanes blocked in rotor or otherwise damaged.

Remedy: Free vanes or replace with new ones.

4.1.11 Possible Cause: Radial clearance between rotor and cylinder no longer adequate.

Remedy: Disassemble and clean rotor and cylinder with hone. Re-assembly and reset radial clearance correctly.

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4.0 TROUBLESHOOTING

CAUTION: All remedies are to be performed with the vacuum system completely shut down!
Improper use could result in extreme danger to personnel operating the vacuum system.

4.1 **Trouble (Continued):**

4.1.12 Possible Cause: Internal parts worn or damaged.

Remedy: Replace worn or damaged parts. A new modular may be necessary if too much worn or scoring has occurred.

4.1.13 Possible Cause: The oil return line is connected directly to atmospheric pressure in the exhaust area. On small model pumps, a fairly large amount of air is sucked through the oil return line, and it may not be possible to reach 15 torr or 29.4 inches Hg blank off on the inlet of the pump under these conditions.

Remedy: Blank-off of 29.4 inches Hg or 15 torr can be reached by temporarily disconnecting and closing the oil return line; also by squirting oil through the exhaust opening into the exhaust filter area. The oil will be sucked into the oil return line, and no air will reach the inlet, thus affecting the “blank-off” pressure

4.2 **Trouble:** Pump will not start.

4.2.1 Possible Cause: Motor does not have proper supply voltage or is overloaded; motor starter overload settings are too low or wrong setting; fuses are burned; or wire is too small or too long, causing a voltage drop at the pump.

Remedy: Check correct supply of voltage; check overload settings in motor starter for size and setting according to motor nameplate data; check fuses; and install proper size wire. If ambient temperature is high, use larger size overloads or adjust setting 5% above nominal motor nameplate value.

4.2.2 Possible Cause: Pump or motor is blocked.

Remedy: Remove fan cover and try to turn pump and motor by hand. If frozen, remove motor from pump and check motor and pump separately. If pump is frozen, disassemble and remove foreign objects in the pump or replace broken vanes.

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4.0 TROUBLESHOOTING

CAUTION: All remedies are to be performed with the vacuum system completely shut down!
Improper use could result in extreme danger to personnel operating the vacuum system.

4.3 **Trouble:** Pump starts, but labors and draws a very high current.

4.3.1 Possible Cause: Oil too heavy (viscosity too high) or ambient temperature below five (5) degrees C (41 degrees F).

Remedy: Change Vac-U-Lok VPO-40S synthetic vacuum pump oil - only use thinner viscosity oil if necessary as continued use may clog filter elements prematurely.

4.3.2 Possible Cause: Pump runs in the wrong direction.

Remedy: Check for correct rotation, which is counterclockwise when looking at the motor from the motor's fan side.

4.3.3 Possible Cause: Pump is overfilled with oil or the wrong kind of oil is used.

Remedy: Correct the oil level and quality per Section 1.5 and use recommended synthetic vacuum pump oil.

4.3.4 Possible Cause: Exhaust filters in exhaust chamber are clogged and appear burned black with pump oil.

Remedy: Replace exhaust filters, maintain proper oil condition, oil level, and use recommended Vac-U-Lok VPO-40S synthetic oil. (Non-detergent motor oil can be used but it is not recommended).

4.3.5 Possible Cause: Exhaust filter is clogged due to process material.

Remedy: Contact factory for recommendation or proper filter cartridge.

4.3.6 Possible Cause: Loose connection in motor terminal box; not all motor coils are properly connected. Motor operates on two phases only

Remedy: Check motor wiring diagram for proper hook-up, especially on motors with six internal motor windings, tighten and/or replace loose connections.

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4.0 TROUBLESHOOTING

CAUTION: All remedies are to be performed with the vacuum system completely shut down!
Improper use could result in extreme danger to personnel operating the vacuum system.

4.3 **Trouble:** (Continued)

4.3.7 Possible Cause: Foreign particle in pump, vanes broken, bearing seizing.

Remedy: Disassemble the modular and remove foreign parts. Replace vanes and bearings.

4.4 **Trouble:** Pump smokes at the exhaust side or expels oil droplets from the exhaust.

4.4.1 Possible Cause: Exhaust filter not properly seated in O-ring in filter base or filter material cracked.

Remedy: Check condition and placement of exhaust filters in filter base. Replace if necessary.

4.4.2 Possible Cause: Exhaust filter clogged with foreign particles.

Remedy: Replace exhaust filter. Install other factory recommended filter cartridges if pump application requires other filter cartridges.

4.4.3 Possible Cause: Oil recirculation valve not properly working or clogged. Proper function is that when blowing into check valve, it should close. When sucking on it, check valve should open.

WARNING: Do not inhale through or allow your mouth to come in direct contact with the oil recirculation valve and / or oil drain valve.

Remedy: Free or replace oil recirculation check valve.

4.4.5 Possible Cause: Oil return line on standard pump clogged or broken.

Remedy: Free clogged line, replace broken line, but only with proper size, and check that oil is pumped out of oil sump while vacuum pump is operating.

Note: An oil filling plug with pressure gauge is provided on all rotary vane series pumps, so that the pressure in front of the exhaust filters can be monitored. The green field (0 through 0.6 bar) is between 0 and 9 psi and indicates that the filters are still effective. Any back pressure close to 9 psi requires immediate change of the exhaust filter.

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4.0 TROUBLESHOOTING

CAUTION: All remedies are to be performed with the vacuum system completely shut down!
Improper use could result in extreme danger to personnel operating the vacuum system.

4.5 **Trouble:** Pump runs very noisy.

4.5.1 Possible Cause: Coupling insert worn.

Remedy: Replace coupling insert in motor/pump coupling.

4.5.2 Possible Cause: Bearing noise

Remedy: Disassemble and replace bearings with Overhaul Kit.

4.5.3 Possible Cause: Vanes stuck.

Remedy: Disassemble the vacuum pump and replace vanes. Use only recommended synthetic vacuum pump oil and change oil more frequently. This is a normal maintenance function.

4.6 **Trouble:** Pump runs very hot. See Technical Data for typical oil sump temperature.

4.6.1 Possible Cause: Not enough air ventilation to the pump.

Remedy: Clean motor and pump air grills. Do not install the pump in an enclosed cabinet unless a sufficient amount of fresh air is supplied to the pump. On pumps with oil cooling coils, clean outside fin assembly. Consult Vac-U-Lok Engineering for recommendations.

4.6.2 Possible Cause: Auto-type oil filter clogged and pump does not receive enough oil.

Remedy: Change oil filter.

CAUTION: All remedies are to be performed with the vacuum system completely shut down!
Improper use could result in extreme danger to personnel operating the vacuum system.

4.6 **Trouble:** (Continued)

4.6.3 Possible Cause: Not enough oil in oil reservoir or badly burned oil is used for pump lubrication.

Remedy: Drain and refill only with VPO-40S and increase oil change intervals.

Note: On some high temperature applications, it may be necessary to change to a high temperature oil. Contact the factory for recommendations.

4.7 **Trouble:** Pump is seized

4.7.1 Possible Cause: Pump operated without oil and vanes broke.

Remedy: Disassemble and exchange vanes.

4.7.2 Possible Cause: Pump was operated for an extended period of time in the wrong rotation.

Remedy: Inspect vanes and replace.

4.7.3 Possible Cause: Liquid carryover into the pump cylinder broke vanes while pump was running, or oil broke vanes on start-up.

Remedy:

- (a) Install Vac-U-Lok Automatic Coolant Return System.
- (b) Pump was overfilled with oil in oil reservoir. Follow oil filling procedure (see Section 1.5) and do not overfill.
- (c) Built-in anti-suck-back valve leaking while pump was shut down and vacuum was left in manifold. Clean valve seat and check that anti-suck-back valve holds vacuum on inlet when pump is shut down.
- (d) Two pumps or a receiver is on the same main line. Install a manual or automatic operated valve in front of each pump.

Vac-U-Lok

SHDP Series Vacuum Systems

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4.0 TROUBLESHOOTING

CAUTION: All remedies are to be performed with the vacuum system completely shut down!
Improper use could result in extreme danger to personnel operating the vacuum system.

4.8 **Trouble:** Auto-type oil filter does not get warm within two to five minutes when cold pump is started.

4.8.1 Possible Cause: Oil filter is clogged.

Remedy: Replace oil filter per Section 3.2 and exchange oil per Section 1.5.

4.8.2 Possible Cause: Wrong auto-type filter is used and/or oil lines leading to pump are clogged.

Remedy: Use only Vac-U-Lok's oil filter as listed in Section 3.2 and blow lines free.

5.0 TECHNICAL DATA "SHDP" SERIES

Type	SHDP-180-1-0
Theoretical Displacement	CFM 180
Typical oil sump temp	205 F
Vacuum level at pump	Torr 10
Maximum sound Level one meter from pump	dBA 74
Std. Electrical Operation - 3 Phase	VAC 230/460
Motor size	HP 10
Pump rotation speed	RPM 1725
Oil capacity	Quarts 7
Tank Size	Gallons 200 gallon (optional)
Shipping weight (approx.)	496

SHDP-180-1-0

