

VAC-U-LOK

HEAVY-DUTY STATIONARY VACUUM SYSTEM

INSTALLATION & OPERATING MANUAL FOR

Vacuum System Model Number

SHDP-7

SHDP-15

SHDP-20

SHDP-45

SHDP-70

SHDP-117

INSTALLATION & OPERATING MANUAL

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 1.3 CFM system to a very powerful 180 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.

TABLE OF CONTENTS

GENERAL

Identification

Operating Principles

1.0 INSTALLATION

1.1 Unpacking

1.2 Location

1.3 Power Requirements

1.4 Vacuum Connections

1.5 Oil Filling

2.0 OPERATION

2.1 Start-up

2.2 Stopping Pump

3.0 MAINTENANCE

3.1 Pump Oil

3.1.1 Oil Level

3.1.2 Oil Type and Quantity

3.1.3 Oil and Filter Change

3.2 Automotive-Type Oil Filter

3.3 Exhaust Filter

3.4 Vacuum Inlet Filter and Reservoir Tank

3.5 Maintenance Chart

3.6 Overhaul Kit / Filter

4.0 TROUBLESHOOTING

5.0 TECHNICAL DATA

6.0 PARTS BREAKDOWN

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.

Vac-U-Lok

SHDP Series Vacuum Systems

Page 3

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 reference numbers listed in the text (Ref#) and on illustrations throughout this manual relate to the drawings and parts listed at the end of this manual in Section 6.0 Parts Breakdown.

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.

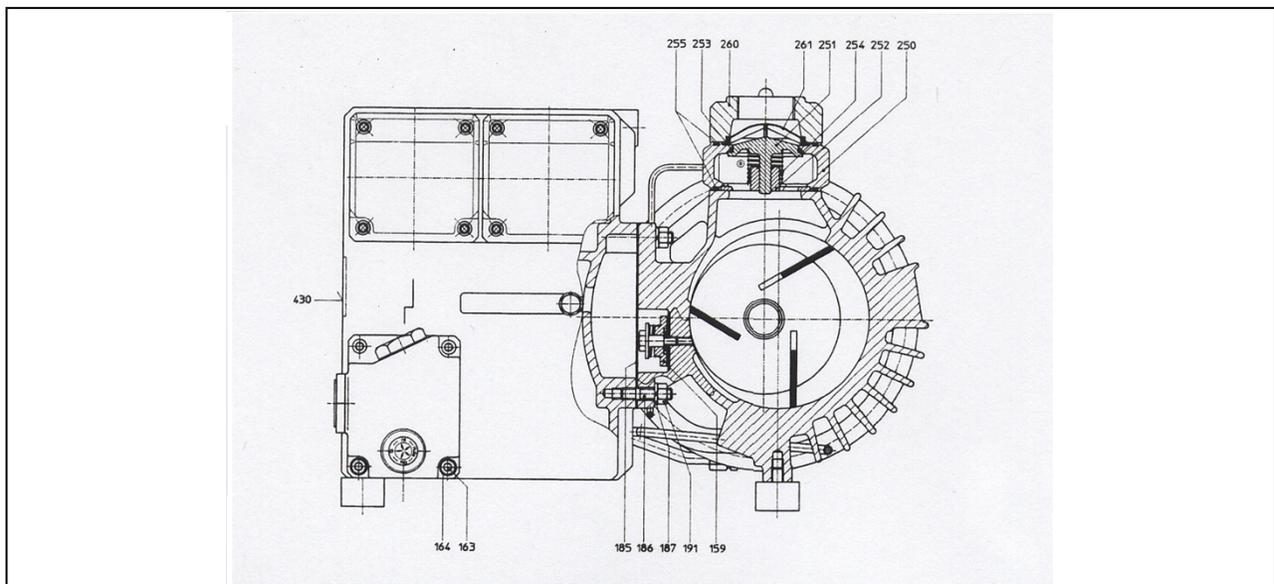


Figure 1 Module Cross Section

Vac-U-Lok
SHDP Series Vacuum Systems

Page 4

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, Rockford, Illinois, 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 one (1) foot for the SHDP-7 and at least five (5) feet for the SHDP-70 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 (Ref. 83) 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 for start-up maintenance of the motor.*

Vac-U-Lok

SHDP Series Vacuum Systems

Page 5

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:

Model #	Tank Size	Threaded outlet
SHDP-7	20 gallon	1/2" NPT
SHDP-15	30 gallon	3/4" NPT
SHDP-20	30 gallon	3/4" NPT
SHDP-45	60 gallon	1" NPT
SHDP-70	80 gallon	1-1/4" NPT
● SHDP-117	120 gallon	1-1/2" NPT
SHDP-180-1	No Tank	2" NPT

The appropriate hose barb should be installed on the ball valve provided on the vacuum system tank. Teflon tape and hose clamps 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 our Automatic Coolant Return System (ACRS) series (Manual – MCRS-2 is also available). The ACRS-1 will collect and drain up to 10 gallons of coolant per hour. The ACRS-1 HD (Heavy Duty) will drain up to 25 gallons per hour while the ACRS-3 HD will handle up to 55 gallons per hour. If using flood-coolant, the vacuum system warranty is void without a Coolant Return System from Vac-U-Lok. Additional recommendations for using with our vacuum system include turning it on twenty (20) minutes prior to and twenty (20) after each usage. This will heat up the vacuum pump oil to approximately 200 degrees and help evaporate some of the liquid that vaporizes past the ACRS in the oil filtering system. The oil will need to be changed more frequently when using coolant. In addition, the inlet filter glass jar and inlet filter will need to be cleaned on a regular basis. The vacuum rotary vanes are a normal wear item.

Vac-U-Lok

SHDP Series Vacuum Systems

Page 6

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 (Ref. 88), the "MAX" and "MIN" position at the oil sight glass (Ref. 83).

Vac-U-Lok's VPO-30 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-30 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-30 (with VPO-90 as an upgrade for severe duty and VPO-70 as an upgrade to a synthetic oil).

SAE 30 weight non-detergent motor oil can be used in place of VPO-30 (on a temporary basis). New pumps are covered under the standard six (6) month warranty provisions when the approved weight and type motor oil is regularly used in them, VPO-30. 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-7	.6
SHDP-15	.6
SHDP-20	1.1
SHDP-45	2.1
SHDP-70	2.1
SHDP-117	7.0
SHDP-180-1	7.0

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.

Vac-U-Lok

SHDP Series Vacuum Systems

Page 7

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 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 (Ref. 83), 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 (Ref. 275).

On SHDP standard model pumps, the collected oil is drawn continuously during the operation of the vacuum pump to the inlet flange (Ref. 260) via the oil return line (Ref. 290). 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 (Ref. 251 thru 255) to prevent the pump from rotating backwards when it is shut off.

Vac-U-Lok

SHDP Series Vacuum Systems

Page 8

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.

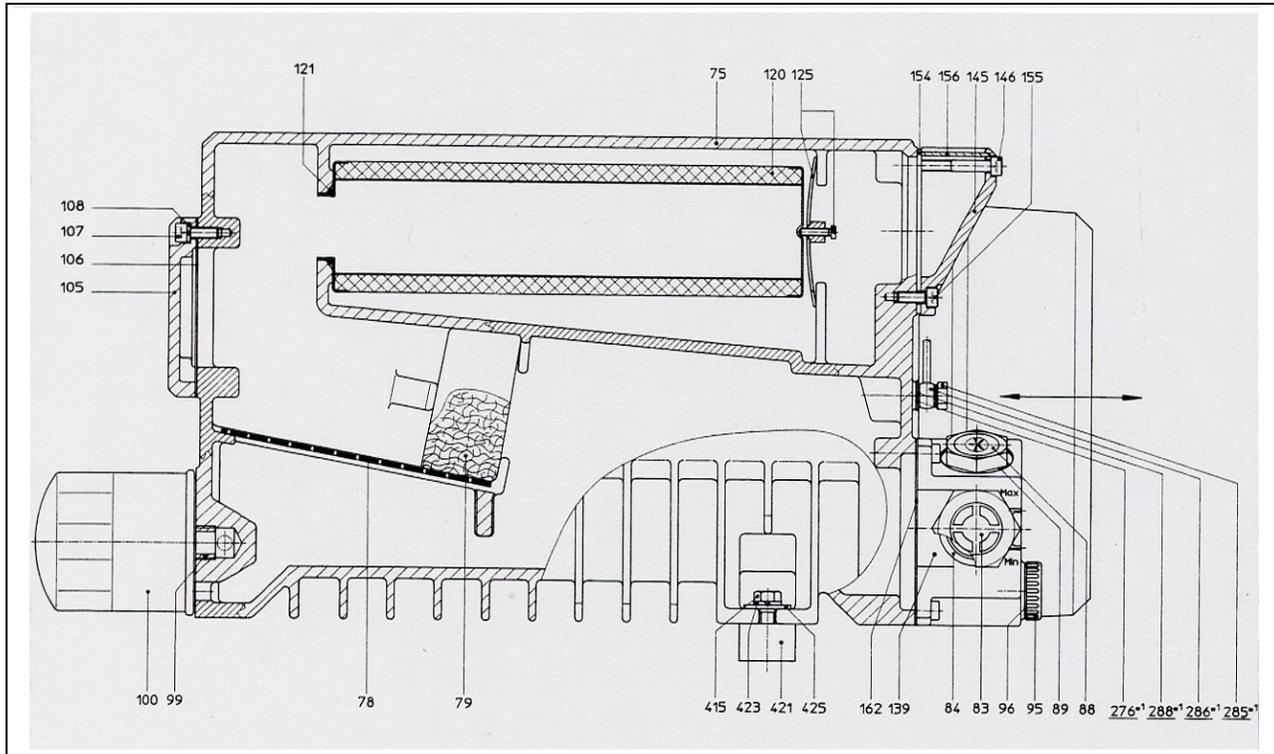


Figure 2 Typical Exhaust Box Cross Section

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

SHDP Series Vacuum Systems

Page 9

3.0 MAINTENANCE

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 (Ref. 88) 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 1.5 -- Oil Filling -- for detail on oil type and quantity

3.1.3 Oil and Filter Change

When using Vac-U-Lok’s VPO-30 vacuum pump oil, it is recommended that oil changes are made every 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.

When using SAE motor oil, 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.

Vac-U-Lok

SHDP Series Vacuum Systems

Page 10

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 (Ref. 100). Replace installed oil filters with the following or equivalent type filter:

Model	Vac-U-Lok Part Number	Use in case of Emergency
SHDP-20	SHDP-20-1-1-4	
SHDP-45	SHDP-45-1-1-4	Mann W-712
SHDP-70	SHDP-70-1-1-4	
SHDP-117	SHDP-117-1-1-4	

3.3 Exhaust Filter (Ref. 120)

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 (Ref. 155, 146) 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 (Ref. 120) 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.

Vac-U-Lok

SHDP Series Vacuum Systems

Page 11

3.0 MAINTENANCE (Continued)

3.3.1 Exhaust Filter Replacement (Continued)

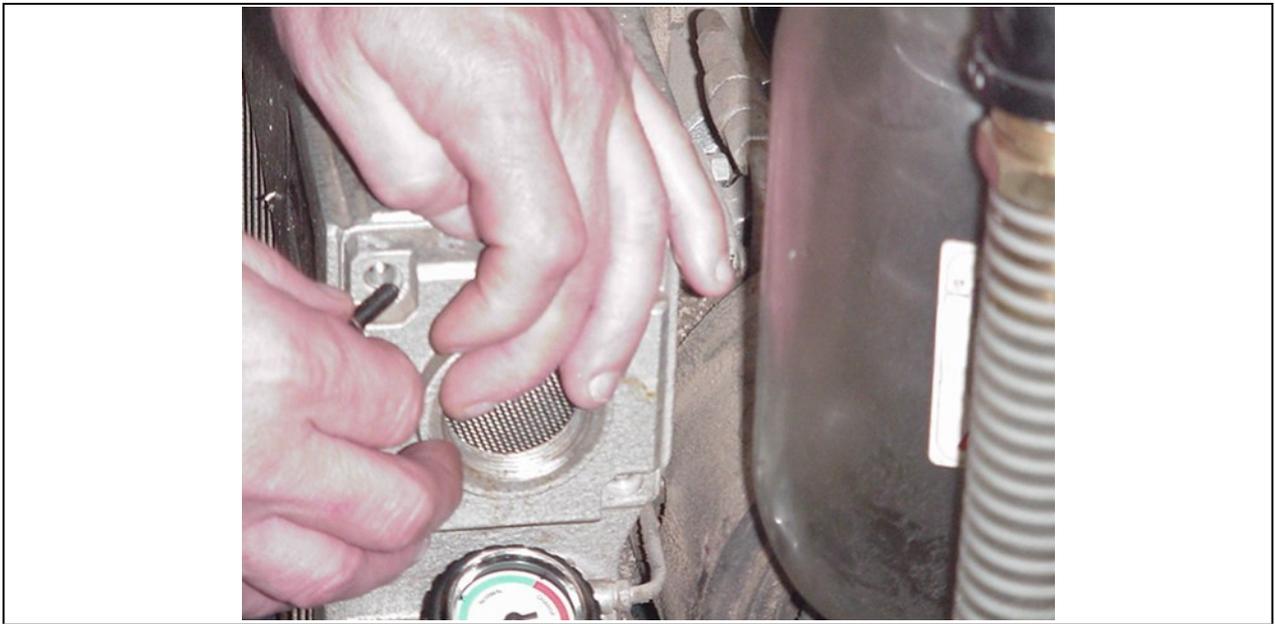


Figure 3 Removing Exhaust Housing

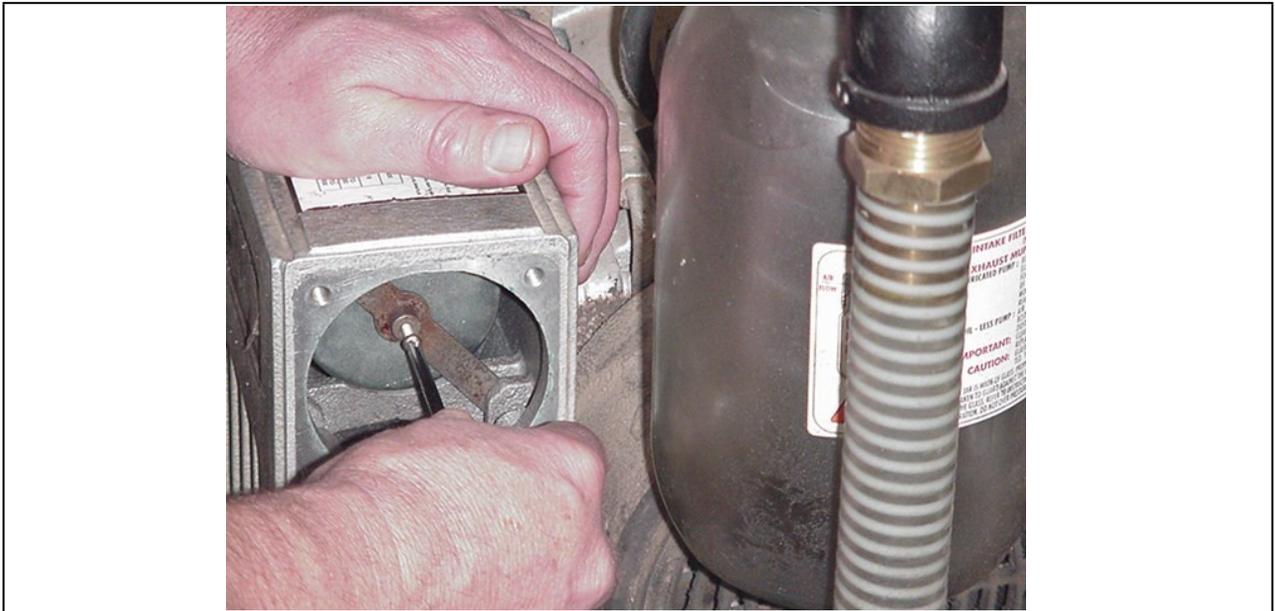


Figure 4 Removing Filter Spring

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 (Ref. 121) 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.

Vac-U-Lok
SHDP Series Vacuum Systems

Page 12

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. 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 should be checked on a bi-weekly or monthly basis by the drain valve underneath the reservoir tank.

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

3.5 Maintenance Chart

Daily: Visually check oil level and condition of oil (see 3.1.1 and 3.1.2).
Drain the vacuum reservoir tank.

Weekly: Inspect and clean or replace inlet filter felt (see 3.4).

Every three (3) to four (4) months (500 hours to 750 hours of operation) or as necessary:
Drain and discard oil from the hot 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).

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.

Vac-U-Lok

SHDP Series Vacuum Systems

Page 13

4.0 TROUBLESHOOTING

<p>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.</p>
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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 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 (Ref. 261).

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.

4.0 TROUBLESHOOTING

<p>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.</p>
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4.1 Trouble (Continued):

4.1.6 Possible Cause: Inlet valve plate (Ref. 251) 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 retighten oil fittings or oil tubing. Replace only with same size tubing.

4.1.8 Possible Cause: Shaft seal leaking

Remedy: Replace the shaft seal following disassembly and assembly steps outlined in the Maintenance and Repair Manual. Check the shaft seal. It should have a spring installed inside and around the shaft sealing lip.

4.1.9 Possible Cause: Exhaust valve (Ref. 159) not properly seated or partially stuck open.

Remedy: Follow disassembly and assembly steps outlined in the Maintenance and Repair Manual.

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

Remedy: Free vanes or replace with new ones following disassembly and assembly steps outlined in the Maintenance and Repair Manual.

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

Remedy: Follow disassembly and assembly steps outlined in the Maintenance and Repair Manual on resetting radial clearance correctly.

Vac-U-Lok

SHDP Series Vacuum Systems

Page 15

4.0 TROUBLESHOOTING

<p>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.</p>
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4.1 Trouble (Continued):

4.1.12 Possible Cause: Internal parts worn or damaged.

Remedy: Follow disassembly and assembly steps outlined in the Maintenance and Repair Manual and replace worn or damaged parts.

- 4.1.13 Possible Cause: The oil return line (Ref 290) 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

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- 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 completely per the Maintenance and Repair Manual and remove foreign objects in the pump or replace broken vanes.

Vac-U-Lok

SHDP Series Vacuum Systems

Page 16

4.0 TROUBLESHOOTING

<p>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.</p>
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- 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 to a 10W40 multi-purpose motor oil - only use when necessary since 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 motor 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 non-detergent motor oil.

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.

Vac-U-Lok

SHDP Series Vacuum Systems

Page 17

4.0 TROUBLESHOOTING

<p>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.</p>
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4.3 **Trouble:** (Continued)

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

Remedy: Follow disassembly and assembly steps outlined in the Maintenance and Repair Manual and remove foreign parts, and 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 (ref. 121) 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 (Ref. 275) 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 (Ref 290) 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 (Ref 120).

Vac-U-Lok

SHDP Series Vacuum Systems

Page 18

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: Follow disassembly and assembly steps outlined in the Maintenance and Repair Manual and replace bearings.

4.5.3 Possible Cause: Vanes stuck.

Remedy: Follow disassembly and assembly steps outlined in the Maintenance and Repair Manual and replace vanes. Use only recommended motor 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.

Vac-U-Lok

SHDP Series Vacuum Systems

Page 19

4.0 TROUBLESHOOTING

<p>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.</p>
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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-30 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 as outlined in the Maintenance and Repair Manual.

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 (Ref. 250 through 255) 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

Page 20

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 (Ref. 100) 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-7	SHDP-15	SHDP-20	SHDP-45
Theoretical Displacement	CFM	7	15	20	45
Typical oil sump temp		145 F	188 F	188 F	190 F
Vacuum level at pump	Torr	10	10	10	10
Maximum sound Level one meter from pump	dBA	59	62	67	70
Std. Electrical Operation - 3 Phase	VAC	230/460	230/460	230/460	230/460
Motor size	HP	.5	1.0	1.5	3
Pump rotation speed	RPM	1725	3600	1725	1725
Oil capacity	Quarts	.6	.6	1.1	2.1
Tank Size	Gallons	20	30	30	60
•Shipping weight (approx.)		180	295	315	425

Vac-U-Lok

SHDP Series Vacuum Systems

Page 21

5.0 TECHNICAL DATA “SHDP” SERIES (Continued)

	Type	SHDP-70	SHDP-117	SHDP-180-1
Theoretical Displacement	CFM	70	117	180
Typical oil sump temp		204 F	204 F	204 F
Vacuum level at pump	Torr	10	10	10
Maximum sound Level one meter from pump	dBA	70	79	80
Std. Electrical Operation - 3 Phase	VAC	230/460	230/460	230/460
Motor size	HP	5	7.5	10
Pump rotation speed	RPM	1725	1725	1725
Oil capacity	Quarts	2.1	7	7
Tank Size	Gallons	80	120	No Tank
•Shipping weight (approx.)		545	895	450

