# Rotary Piston Vacuum Pumps

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SHAFT SEALS

MAINTENANCE SCHEDULE

DURING FIRST MONTH OF OPERATION
DAILY
EVERY 3 MONTHS
EVERY YEAR / ANNUALLY
EVERY 10,000 HOURS OF OPERATION
EVERY 5 YEARS

ACCESSORIES (IF INCLUDED)

TROUBLESHOOTING

START-STOP PROBLEMS
UNIT WILL NOT START
VACUUM PROBLEMS
UNIT OPERATES, BUT DOES NOT ACHIEVE DESIRED VACUUM LEVEL
OVERHEATING PROBLEMS
UNIT OVERHEATS OR OPERATES ABOVE 180°F
UNIT OVERHEATS ON START-UP IN LOW AMBIENT TEMPERATURES
NOISE AND VIBRATION PROBLEMS
THE UNIT IS MAKING AN ABNORMAL NOISE OR SOUND
UNIT IS VIBRATING EXCESSIVELY
OIL PROBLEMS
UNIT USES EXCESSIVE OIL OR PRODUCES AN OIL-MIST
THIS INSTALLATION, OPERATION, AND MAINTENANCE MANUAL MUST STAY WITH EQUIPMENT.

PLEASE REGISTER YOUR EQUIPMENT WARRANTY AND START-UP RECORD ONLINE AT WWW.DEKKERVACUUM.COM
CUSTOMER SERVICE

Contact information

DEKKER
VACUUM TECHNOLOGIES, INC.
935 SOUTH WOODLAND AVENUE, MICHIGAN CITY, IN 46360-5672
Bus. Hours: 7:30 a.m. – 4:30 p.m. CST
Website: www.DEKKERvacuum.com

Order Information
When calling for service, parts or system information always have the pump or system model number and serial number(s) ready. Refer to the bill of lading or the gold-colored system information plate attached to the system (see image below).

Gold-colored system information plate

Parts should be purchased from the nearest authorized DEKKER Vacuum Technologies, Inc. (hereafter referred to as DEKKER) representative (visit www.dekkervacuum.com to find a distributor near you via the Distributor Locator) or from the vacuum pump system supplier. If, for any reason parts, cannot be obtained in this manner, contact the factory directly.
INTRODUCTION

The DEKKER HullVac™ rotary piston vacuum pump has been designed for safe, reliable, trouble-free service, provided the maintenance guidelines as set out in this manual are followed. Compared to other vacuum pump systems, the HullVac rotary piston vacuum pump offers the advantages of low blank off pressures, high pumping speeds at low pressures, and durability. These pumps are low maintenance and easy to use. However, a vacuum pump is a rotating piece of equipment and operators must exercise good judgment and follow proper safety procedures to avoid damage to the equipment or personal injury. Please review and follow all instructions in this manual before attempting to install, start or operate the equipment.

SAFETY

All vacuum pumps, systems and/or compressors (hereafter referred to as the Product) offered by DEKKER have been designed and manufactured for safe operation. However, the responsibility for safe operation rests with those who use and maintain these products. The safety department where the product is installed should establish a safety program based on OSHA, federal, state, and local codes. It is important that due consideration be given to hazards which arise from the presence of electrical power, hot liquids, harmful gases, and rotating equipment. Proper installation and care of protective devices is essential to safe system operation. These safety procedures are to be used in conjunction with the instructions contained in this manual.

WARNING: DO NOT PUMP OXYGEN or oxygen rich mixtures with these pumps - EXPLOSION HAZARDS!
THEORY OF OPERATION

The DEKKER HullVac rotary piston vacuum pump is designed and manufactured to achieve a high level of performance. These pumps create a vacuum with a piston that moves in a circular path. As it rotates, pressure is decreased on the inlet side and increased on the discharge side. The two sides are separated by a film of oil between the piston and the cylinder. Once the piston makes a complete cycle, the clearance volume is completely filled with oil, increasing the compression ratios within the pump. This design is what gives rotary piston pumps their deep vacuum levels and durability. Depending on the application and desired vacuum level, HullVac pumps are offered in single-stage or two-stage configurations. The two-stage pump can obtain a deeper vacuum level because it utilizes two piston chambers in series.

Intake Stroke

Discharge Stroke

Inlet

Discharge

Single Stage

Not suitable above 100 Torr

Inlet

Discharge

Two Stage

Not suitable above 10 Torr
**STORAGE**

Keep the system in a cool dry environment. Plug all open ports to keep out dirt and foreign objects. Every 2 - 3 months remove the belt guard and rotate the lower pulley 2 ¼ turns.

If the pump is to be stored in a location where freezing temperatures may be encountered, drain the water jacket if applicable. The water jacket drain plugs are typically located on the exhaust side of the pump. Refill with antifreeze for storage.

**INITIAL FREIGHT RECEIPT AND INSPECTION**

Before a system ships from DEKKER, it is thoroughly tested, and will not be released unless it passes our Quality Control standards. All pumps are thoroughly inspected and are not released unless they pass our Quality Control standards. Once the product is received and signed for in Good Condition, DEKKER cannot be held accountable for undiscovered, unclaimed damage that is a result of freight transit. It is the responsibility of the receiver to thoroughly inspect and test the product for functionality upon delivery. The customer should take photos of the product as it arrives and send to DEKKER and the freight carrier if there are any issues. The party who selected the shipper is responsible for filing the freight claim. Failure to report these issues within the freight carriers’ undiscovered damage window can result in non-acceptance of freight claims. DEKKER does keep photos of all systems, as shipped, to assist in freight claims. Report any damage immediately to the factory.

Key items to inspect:

- Is the product received as requested? Are all parts, accessories, and components delivered?
- Was the skid or crating received in good condition? Check for cosmetic damage.
- Check wiring inside of control panel. Are all wires should be terminated and connections tight? (If applicable)
- Check control panel components. Are they tight on DIN rail and/or other mounts/fasteners?
- Are there any leaks or puddles around the pump? Specify hose, piping or housing leak.

System must be given an initial startup test as soon as possible after delivery. This is to ensure that the motor has not shifted out of alignment during transit as well as to verify that electrical components are functioning without fault – Variable Frequency Drive (VFD), Programmable Logic Controllers (PLC), panel cooling fans, transducers.

**INSTALLATION**

**Overview**

The design of the piping system, foundation layout, and plant location are the responsibility of the purchaser. DEKKER Vacuum Technologies, Inc. and its representatives may offer advice, but cannot assume responsibility for operation and installation design.

Please consult the factory or a specialist skilled in the design of plant layout, system piping design, and foundation design. The installer should carefully read this manual before installing the equipment. DEKKER or your authorized dealer can provide start up assistance in most instances for a fee. Contact DEKKER for hourly/daily service rates.

**Unpacking**

Upon receipt of pump or system, immediately inspect for signs of damage. Carefully remove packing or crating from around pump or system. Be sure to keep equipment in upright position.

**Lifting**

Lift the equipment carefully and with weight evenly distributed. DEKKER is not responsible for equipment that has been damaged through mishandling or dropping.
**Location**

Install the unit in a well ventilated and dust free area. The pump or system should be a minimum distance of 3 feet from surrounding walls to allow for checking fluid level, temperatures, pressures and general servicing.

**Mounting**

The pump or system must be installed on a level surface in the horizontal position. The foundation must be designed to support the total unit weight, without any settlement or crushing, be rigid and substantial enough to absorb any equipment vibration, maintain true alignment with any drive mechanism, and must permanently support the system baseplate at all points. The vacuum system must be leveled and secured with anchor bolts. Anchor bolts must be of adequate size to withstand the mechanical stresses exerted on it.

Systems 50 HP and larger should also be grouted into position per local codes. The foundation should be constructed to allow for ¼ to 1-½ inch of grout. The baseplate is set on shims and the grout is poured between the foundation and the baseplate. To have the required body to support the baseplate, grout should be at least ¼ inch thick.

The number and location of shims will be determined by the design of the baseplate. Firm support should be provided at points where weight will be concentrated and at the anchor bolt locations. Use enough, and large enough, shims to provide rigid support. Baseplates are usually designed with openings to allow pouring grout. When the baseplate has been shimmed, leveled, and the anchor bolts have been snugly tightened, a dam is constructed around the foundation to contain the grout. The dam level should be at least ½ inch above the top surface of the shims. Grout should be poured inside and around the outside of the baseplate and leveled. Allow the grout to dry for a minimum of 48 hours before tightening the anchor bolts.

**Please note** that the pump/motor coupling and V-belt units will need to be realigned prior to start-up, with the exception of monoblock units.

**Ventilation**

Locate the unit in an area with sufficient airflow and accessibility. To prevent excessive ambient temperature rise, it is imperative to provide adequate ventilation. Cooling is an important aspect of reliable equipment operation and it is therefore important to install the unit in a reasonably cool area where the temperature does not exceed 104°F (40°C). For higher ambient temperatures contact the factory.

Typical system operating temperature is between 140°-185°F. Minimum oil temperature should not be below 45°F.

**Electrical Preparation**

All system wiring is performed at the factory if a control panel is supplied and installed on the skid. Check area classification to ensure all electrical enclosures comply with code. Required customer wiring is minimal, but should be done by a qualified electrician in compliance with OSHA, National Electric Code and any other applicable local electrical code concerning switches, fused disconnects, etc. DEKKER includes a wiring diagram in the control panel for use by the installer. DEKKER recommends a main disconnect switch be fitted between the vacuum system and the incoming power.

Check the line voltage to make sure it matches the vacuum system voltage. The voltage should be within the tolerance as specified by motor manufacturer or to local code.

All HullVac pumps are equipped with an oil flow solenoid valve that prevents oil from entering the pumping chamber when the pump is not in use. The oil flow solenoid coil voltage typically matches motor voltage. The solenoid valve coil is energized whenever the motor is energized. During initial operation, confirm valve operation by holding a screwdriver, or other metal object, close to but not touching the valve stem top. If the coil is energized, a gentle tugging or vibration will be detected. An oil stream will also be present on the oil level site port whenever the pump is in operation. If an oil stream or splash is not present, check the solenoid valve for proper operation.

Check the system for proper motor rotation by jogging the motor. The direction of rotation is marked by an arrow on the motor or pump housing. If the rotation is incorrect, switch any two of the three main power leads (three phase power) on the contactor inside the control panel. Failure to do so could result in serious equipment damage.
**WARNING:** Install, ground, and maintain equipment in accordance with the National Electrical Code and all applicable federal, state and local codes.

**Pipe Connection and Sizing**
Before installation, remove all protective inserts on the pump suction and discharge. Piping connected to the system must be installed without imposing any strain on the system components. Improperly installed piping can result in misalignment, general operating problems, and pump failure. Use flexible connectors and vibration isolators where necessary. Piping must be cleaned of debris before installation.

**Inlet Piping**
*Note:* Install a temporary screen at the pump inlet flange at first start-up to protect the unit against carryover of pipe debris and welding slag. The screen must be removed after the initial start-up period.

Inlet piping must be welded steel that is vacuum rated and should be at least the size of the pump inlet. Install the unit as close as possible to the process to minimize losses due to the length of the inlet piping. If the unit has to be installed further away from the process, be sure the inlet piping is properly sized to minimize the overall line pressure drop. For more information consult the factory.

If the inlet gases contain dust or foreign particles, a suitable 5 micron (or finer) inlet filter should be installed at the inlet port. For more information consult the factory. A vacuum rated isolation valve should be installed for routine blank-off performance testing and servicing.

**Discharge Piping**
DEKKER recommends, as a minimum, CPVC discharge piping as discharge temps may exceed +170°F. CPVC is rated for 200°F max, and PVC is only rated for 140°F max. Discharge piping must be at least the size of the pump exhaust port. Discharge piping should be routed outside or to a properly sized coalescing filter. Install a drip leg with a tee on the discharge line to prevent condensables from draining back into the pump. See the “Discharge Piping Diagram” as shown below. The drip leg volume should be such that it is unlikely to fill with condensate between routine draining.

No flow restriction should be present in the discharge piping. Discharge flow restrictions lead to excessive power consumption at high inlet pressure as well as overheating which may cause damage to the pump.

**Discharge Piping Diagram**
Cooling Water Piping

For water-cooled units, it is necessary to check cooling water supply. A proper, consistent water flow must be maintained for adequate cooling. Refer to the Cooling Capacities and Port Sizes table below for recommended cooling water capacities at 60°F based on standard operation. Water jacket pressure must not exceed 30 psig.

Normal operating temperature is between 140°-160°F as measured on the oil solenoid valve body located below the exhaust port. Unit casing temperature should not exceed 180°F. If excessive temperature is measured, increase the cooling water flow. Maximum cooling water supply temperature should not exceed 85°F.

Oil temperature should be maintained at 165°F. Minimum oil temperature should not be below 55°F. The increased sealing oil viscosity caused by low temperature can lead to internal galling and motor overload.

Water-cooled units require an adequate supply of cooling water at 60°F and a maximum supply pressure of 30 psig. If the cooling water temperature or available pressure is higher, consult your authorized dealer or the factory.

The cooling water outlet connection of the heat exchanger may be fitted with an optional water miser valve, which regulates the cooling water flow rate depending on pump operating temperature. To raise the operating temperature, turn the valve-adjusting screw counter-clockwise when viewed from the top. To lower operating temperature, turn clockwise.

Cooling Capacities and Port Sizes

<table>
<thead>
<tr>
<th>Pump</th>
<th>Pump CFM</th>
<th>HP</th>
<th>Air Cooled</th>
<th>Cooling Water Capacities (gpm)</th>
<th>Cooling Water Port Sizes (Inch – NPT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HV55A</td>
<td>52</td>
<td>3</td>
<td>X</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>HV140A</td>
<td>130</td>
<td>5</td>
<td>X</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>HV160</td>
<td>150</td>
<td>7.5</td>
<td>-</td>
<td>1.5</td>
<td>1/2</td>
</tr>
<tr>
<td>HV412XT</td>
<td>300/340</td>
<td>10/15</td>
<td>-</td>
<td>2.5</td>
<td>1/2</td>
</tr>
<tr>
<td>HV450</td>
<td>450</td>
<td>20</td>
<td>-</td>
<td>3.5</td>
<td>3/4</td>
</tr>
<tr>
<td>HV635</td>
<td>635</td>
<td>30</td>
<td>-</td>
<td>5</td>
<td>3/4</td>
</tr>
<tr>
<td>HV850</td>
<td>850</td>
<td>40</td>
<td>-</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>HVC35A</td>
<td>32</td>
<td>3</td>
<td>X</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>HVC65</td>
<td>65</td>
<td>5</td>
<td>-</td>
<td>1</td>
<td>1/2</td>
</tr>
<tr>
<td>HVC100A</td>
<td>95</td>
<td>5</td>
<td>X</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>HVC180</td>
<td>180</td>
<td>10</td>
<td>-</td>
<td>2</td>
<td>1/2</td>
</tr>
<tr>
<td>HVC340</td>
<td>340</td>
<td>20</td>
<td>-</td>
<td>2.5</td>
<td>1/2</td>
</tr>
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</table>
## START-UP PROCEDURES

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ensure all shipping plugs and/or paper covers are removed from the unit and tagging information is followed for successful startup.</td>
</tr>
</tbody>
</table>
| 2 | Remove the belt guard and rotate the pump two complete revolutions by hand in the counterclockwise direction. This will clear accumulated oil from the pump housing that can collect during long inactive periods. Reinstall the belt guard.  
*Rotation is clockwise on the HV412XT* |
| 3 | For units utilizing V-belt drives, make sure the sheaves are properly installed and aligned before attempting to tension the drive. The V-belts should be placed over the sheaves and in the grooves without forcing them over the sides of the grooves. The tensioning steps below can be used for all types of V-belts, all cross sections and number of belts and all types of construction.  
**Avoid excessive heat** (140°F and higher); belt life will be shortened. **Never switch or mix belts** from one groove to another on the sheaves. **Do not use belt dressing.** Sheaves should remain free of oil and grease. **When replacing belts install an identical set.**  
For more specific V-belt tensioning guidelines consult factory.  
Sheave alignment should be checked by placing a straight edge or tight cord across the sheave faces so that it touches all four points of contact. Ordinarily, a misalignment of more than one-half of one degree (one eighth inch in one foot) will adversely affect belt life. Improper sheave alignment produces uneven wear on one side of the belt, causes the belt to roll over in the sheaves or throws the entire load on one side of the belt, stretching or breaking the cords on that side.  
**Tensioning a Drive - General Rules of Tensioning**  
1. Ideal tension is the lowest tension at which the belt will not slip under peak load conditions.  
2. Check tension frequently during the first 24-48 hours of run-in operation.  
3. Over tensioning shortens belt and bearing life.  
4. Keep belts free from foreign material which may cause slip.  
5. Make V-Drive inspection on a periodic basis. Tension belt when slipping. Never apply belt dressing as this will damage the belt and cause early failure.  
If the unit is idle for an extended period of time, the tension on the belts should be removed. |

### Simple Tensioning Procedure

1. Measure the span length.  
2. At the center of the span apply a force (perpendicular to the span) large enough to deflect the belt 1/64", for every inch of span length. For example, one deflection of a 100 inch span would be 100/64 or 1-9/16 inches.  
3. Compare the force you have applied with the values given in Table 3.1 on the next page. If the force is between the values for normal tension, and 1-1/2 times normal tension, the drive tension should be satisfactory. A force below the value for normal tension indicates an under tensioned drive. If the force exceeds the value for 1-1/2 times normal tension, the drive is tighter than it needs to be.  
4. After the proper operating tension has been applied to the belts, double check the following: A) Parallel position of the sheave shafts. B) Correct alignment of sheave grooves.  

**Tensioning rules and procedure courtesy of Dodge PT Manual MN-4002**
### Tensioning Table

<table>
<thead>
<tr>
<th>V-Belt Section</th>
<th>Small Sheave</th>
<th>Deflection Force (lbs) For Drive Speed Ratios of:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Speed Range (RPM)</td>
<td>Diameter (in)</td>
</tr>
<tr>
<td>A</td>
<td>1800-3600</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>1800-3600</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td>1800-3600</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>1800-3600</td>
<td>7.0</td>
</tr>
<tr>
<td>B</td>
<td>1200-1800</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td>1200-1800</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>1200-1800</td>
<td>6.0</td>
</tr>
<tr>
<td></td>
<td>1200-1800</td>
<td>8.0</td>
</tr>
<tr>
<td>AX</td>
<td>1800-3600</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>1800-3600</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td>1800-3600</td>
<td>5.0</td>
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<td></td>
<td>1800-3600</td>
<td>7.0</td>
</tr>
<tr>
<td>BX</td>
<td>1200-1800</td>
<td>4.6</td>
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<tr>
<td></td>
<td>1200-1800</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>1200-1800</td>
<td>6.0</td>
</tr>
<tr>
<td></td>
<td>1200-1800</td>
<td>8.0</td>
</tr>
</tbody>
</table>

*Notes:*
1. Use approximately 130% of above values to tension a new set of belts.
2. Use closest sheave diameter for sizes not shown.
<table>
<thead>
<tr>
<th>Step</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Install a blank off flange to the inlet port or attach to a sealed vacuum chamber. Make certain the pump is attached to a closed system. The discharge must be open to atmosphere during startup. Excessive motor load characterized by low rotation speed can be experienced if the discharge is closed. Repeated efforts to start the pump when the discharge is not open to atmosphere may result in motor and/or control system damage.</td>
</tr>
<tr>
<td>5</td>
<td>Jog the motor briefly and check direction of rotation. The correct direction of rotation is marked by an arrow on the motor or pump housing. If direction is incorrect switch any two of the three leads at the power connection. The correct direction of rotation is counterclockwise facing the pump from the drive end and clockwise if viewed from the non-drive end. <em>Rotation is Clockwise on the HV412XT</em></td>
</tr>
<tr>
<td>6</td>
<td>Turn the cooling water on, if applicable.</td>
</tr>
</tbody>
</table>
7. Energize the motor – a slight belt slipping noise may be heard as oil is pushed from the pumping chamber through the valve deck. If the belt slip noise does not stop within the first few seconds:

1. Stop the pump.
2. **Disconnect the power.**
3. Remove the belt guard.
4. Rotate the pump once by hand.
5. Tighten the belts if needed.
6. Reinstall the belt guard.
7. Reconnect power.
8. Restart.

8. Confirm the oil solenoid valve is open. The valve’s solenoid coil is energized whenever the motor is energized. During initial operation, confirm valve operation by holding a screw driver or other metal object close to, but not touching the valve stem top. If the coil is energized, a gentle tugging or vibration will be detected. An oil stream will also be present on the oil level sight port whenever the pump is in operation. If an oil stream or splash is not present, check the solenoid valve for proper operation.

9. The oil level should be checked after the pump has been operating at an inlet pressure below 1 torr for 5 minutes. Proper oil fill is confirmed when the sight port oil level is at least ½ level. During initial evacuation, the oil level may rise but will fall as the pump operates below 1 torr.

During operation, oil should always be visible in the sight port. Normal oil fill level is mid to two-thirds of the sight port, throughout all operating conditions. An oil fill level above the sight port should be avoided as it will be difficult to verify correct fill level and could damage the pump.

10. Check the voltage and motor current. They should be within the specifications for the motor. Amperage should be checked at the Overload.

**Note:** This test should also be performed under normal system operating conditions.

**DANGER: HIGH VOLTAGE!**
Lethal shock hazard present.
USE EXTREME CAUTION!
After 15-30 minutes of operation, check pump operating temperature, which should be in the 140°-160°F range at the solenoid body. The casing temperature will rise faster and be warmer at higher suction pressures. During any operation, the casing should not rise above 180°F.

### SHUT DOWN PROCEDURES
To stop the vacuum pump follow the procedure as outlined below.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td>Close the system inlet isolation valve</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>Push the STOP button or turn switch to the OFF position.</td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>Open the gas ballast valves to vent the pump to atmosphere. If system is equipped with an automatic vent valve or an anti-suckback valve, no action is needed. Failure to vent the pump to atmosphere may cause oil to fill into the pumping chamber and travel back through the inlet manifold into the vacuum process chamber.</td>
</tr>
<tr>
<td><strong>4</strong></td>
<td>If water cooled, turn off the cooling water supply.</td>
</tr>
</tbody>
</table>
MAINTENANCE

WARNING: Before attempting any maintenance such as changing the fluid, disconnect all power from the system by switching off the main breaker, isolate all energy sources and allow system to cool.

Pump Bearing Lubrication
Internal pump components do not require preventative maintenance. Bearings are self-lubricating type.

Motor Bearing Lubrication (where required)
For information regarding motor bearing lubrication, refer to the motor maintenance and operation manual.

Inlet Filter (If Installed)
Check after first 8 hours of operation. Clean or replace inlet filter element every 1000 to 3000 hours depending on application or if excessive pressure drop is noticed. In some applications it may be necessary to clean inlet filter more often. Clean filters by gently knocking off into a dust bin. Brush filter free of debris and clean with a wet/dry vacuum cleaner. DO NOT USE COMPRESSED AIR TO CLEAN ANY FILTERS.

CAUTION: Be careful not to allow foreign material to fall in the pump suction opening when removing the filter cartridge. Horizontal filter installation is recommended to prevent this. Filters must be disposed of properly as they might contain toxic substances carried over from the process.

Seal Fluid
The units are shipped with DEKKER’s specially formulated HullVac seal fluid (hereafter referred to as oil). DEKKER recommends that this oil be used to obtain the optimal performance from the HullVac product and to maintain the warranty period.

Oil should be changed whenever it appears white or yellow, foams consistently, or when dirty. Oil change frequency depends on the materials being pumped. For clean applications, oil should be changed every 3000 operating hours or every 9 months, whichever comes first. For other applications, oil change could range from once or twice a week or less dependent upon the type of process.

The most common contamination is water in the oil and can be recognized by a milky appearance visible in the site port. Closing the pump inlet valve and operating the gas ballast valves for 2 to 4 hours can remove this water. If this does not clear the oil, proceed to change it. In applications with consistent water accumulation, draining the water from the reservoir prior to operation is recommended.

HullVac Oil

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Water-Cooled</th>
<th>Air-Cooled</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Gallon Container</td>
<td>5120-0010-002</td>
<td>-</td>
</tr>
<tr>
<td>5 Gallon Container</td>
<td>5120-0050-000</td>
<td>5120-0050-004</td>
</tr>
<tr>
<td>55 Gallon Drum</td>
<td>5120-0550-000</td>
<td>5120-0550-001</td>
</tr>
</tbody>
</table>

Safety Data Sheets (SDS) available upon request.
Oil Change Procedure

Run the pump until normal operating temperature is achieved. (140°-160°F as measured on the oil solenoid valve). Run the pump for at least 1 hour prior to draining the oil. This will warm the oil to facilitate faster and more complete draining. **CAUTION: OIL WILL BE HOT!**

Follow these steps to drain the oil:

- Disconnect main power to pump.
- Vent the inlet to atmosphere for 10 to 15 seconds. This will force the oil from the lower pumping chambers into the upper reservoir.
- Open the oil drain valve and allow the oil to drain completely.
- Rotate drive belts by hand with the inlet open to atmosphere for 5 – 10 rotations. This will force residual oil from the pumping chamber into the oil reservoir where it can be drained.

Follow these steps to fill with new oil:

- Close the oil drain valve and fill the reservoir to two-thirds of the sight port by pouring oil through the oil fill port located on top of the pump.
- Reconnect main power to pump.
- Close the inlet isolation valve so that the pump is blanked-off. Run the pump for 2-3 minutes. Check the oil level.
- Add oil until the sight port level is between mid to two-thirds level in the sight port. If overfilled, open drain to drain off excess and re-run unit to confirm oil level.

The approximate oil capacities are given in the Standard System Capacities table below.

**Standard System Capacities**

<table>
<thead>
<tr>
<th>System</th>
<th>Capacity (gal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HV55A</td>
<td>0.9</td>
</tr>
<tr>
<td>HV140A</td>
<td>3.3</td>
</tr>
<tr>
<td>HV160</td>
<td>4</td>
</tr>
<tr>
<td>HV340</td>
<td>10</td>
</tr>
<tr>
<td>HV412XT</td>
<td>12</td>
</tr>
<tr>
<td>HV450</td>
<td>13</td>
</tr>
<tr>
<td>HV635</td>
<td>15</td>
</tr>
<tr>
<td>HV850</td>
<td>25</td>
</tr>
<tr>
<td>HVC35A</td>
<td>0.9</td>
</tr>
<tr>
<td>HVC65</td>
<td>2.5</td>
</tr>
<tr>
<td>HVC100A</td>
<td>3.3</td>
</tr>
<tr>
<td>HVC180</td>
<td>6.5</td>
</tr>
<tr>
<td>HVC340</td>
<td>20</td>
</tr>
<tr>
<td>HVC960</td>
<td>48</td>
</tr>
</tbody>
</table>
Complimentary Oil Analysis

DEKKER offers oil analysis to customers, regardless of the age of their system, at no charge. Collect approximately 4 fluid ounces from the machine, and secure it in any type of clean bottle. On the bottle or a packing list, please include the following: system serial number, the type of oil, the run hours on the oil and machine, and note any problems you are having with the system if applicable.

Also make sure to include your contact information with email address. After the analysis is complete, DEKKER will provide a report of the condition of the oil, along with recommendations.

Send to:

DEKKER Vacuum Technologies, Inc.
935 S. Woodland Ave.
Michigan City, IN 46360
United States
ATTN: After Sales

Gas Ballast Valve(s)

The purpose of the gas ballast is to enable condensable vapors to be discharged through the pump in order to prevent oil contamination by allowing ballast gas to mix with condensable vapors. Properly applied, it works well with water vapor and reasonably well with some other condensable vapors. The drawback of using the gas ballast is that it will limit the ultimate vacuum the pump can attain.

To engage, open the valve(s) depending on the degree of ballasting required to clear the condensable contamination from the oil supply. There will be a slight change in the sound of the pump and the base pressure will rise slightly. Excessive heat can be generated when the valve(s) are open and care must be given to ensure adequate ventilation/cooling water flow. Be sure the pump body temperature does not exceed 180°F as measured on the casting surface below the sight port.

Oil Solenoid Valve

The oil solenoid valve is typically located under the exhaust port and prevents oil from filling into the pumping chamber when the pump is turned off or when there is a power failure. It is critical that this valve operates properly. If the valve malfunctions in an open position, oil will flow back into the pumping chamber when the pump is shut off. This will result in hard starting, excessive belt wear, and possible equipment damage.

If the valve is stuck in the closed position, poor vacuum performance will result. If the pump is operated for longer than a minute without oil, internal damage may occur. The condition of the solenoid valve interior will mirror the condition of the oil reservoir housing. If there is a buildup of sludge, varnish, or particulate in the oil reservoir, the solenoid valve body may be likewise contaminated.

Shaft Seals

The pumps are equipped with lip seals and do not require preventative maintenance.
MAINTENANCE SCHEDULE

To help ensure trouble free operation, a basic maintenance schedule consisting of the following system checks is recommended.

During First Month of Operation
- Check belt tension weekly.
- Verify tightness of pump mounting bolts weekly.
- Torque the side cover bolts at the end of first month of operation.

<table>
<thead>
<tr>
<th>Side Cover Bolt Torque Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOLT SIZE</td>
</tr>
<tr>
<td>M5</td>
</tr>
<tr>
<td>M6</td>
</tr>
<tr>
<td>M7</td>
</tr>
<tr>
<td>M8</td>
</tr>
<tr>
<td>M10</td>
</tr>
<tr>
<td>M12</td>
</tr>
<tr>
<td>M14</td>
</tr>
<tr>
<td>M16</td>
</tr>
</tbody>
</table>

Daily
- Check oil level daily - oil level should be between mid to two-thirds level in the sight port while in operation.
- Check pump temperature daily - casing temperature should not exceed 180°F.

Every 3 Months
- Check belt tension.
- Verify tightness of pump mounting bolts.

Every Year / Annually
- Remove the oil reservoir access plate. Clean and inspect the sump for signs of metal filings that may be an indication of excessive internal wear. Strain the oil through a mesh bag to inspect for particulates.
- Remove the oil / air separator and the valve deck cover. Verify the valves are intact and free to move up and down. Examine for signs of excessive wear.
- If needed, replace the valve deck springs and wear plates.
- Examine the belts for signs of excessive wear and replace as needed.
- Verify if motor lubrication is required for pump motor.

Every 10,000 Hours of Operation
- Check coupling element for wear, if applicable. Replace if worn.
- Clean strainer in seal fluid line.
- Check belt tension, if applicable.

Every 5 Years
- Replace the bearings, shaft seals, shaft seal wear sleeves, and o-rings.
- Replace the oil flow solenoid valve wear components.
- Replace the gas ballast valves.
ACCESSORIES (IF INCLUDED)

The following accessories are available for HullVac rotary piston vacuum pump systems:

- **Automatic Inlet Vent Valve (optional):** Includes a normally open solenoid valve and filter assembly mounted to the pump inlet port. When power is shut off, the pump inlet and manifold will be vented to atmosphere. This will prevent accidental oil backflow into the manifold and process chamber and will also vent the chamber up to atmosphere.
- **Automatic Inlet Isolation Valve (optional):** Consists of a pneumatically actuated ball valve mounted on the pump inlet that automatically closes whenever power is shut off. **NOTE:** This includes the automatic inlet vent valve.
- **Temperature Control Valve (optional):** Reduces cooling water flow by up to 90% while it controls pump operating temperature within the optimal range of 140°-160°F. This temperature optimizes water and solvent evaporation from the oil supply while preventing damage due to excessive heating.
- **Inlet Filter (optional):** Traps particulate larger than the internal clearances of the pump (5 micron). Must be installed horizontally.
- **Oil Mist Eliminators (optional):** Strips atomized oil droplets from the exhaust stream, reducing the appearance of smoke. The assembly comes complete with a ball valve on the canister drain and a 0 to 15 psig gauge to monitor filter element condition.
TROUBLESHOOTING

The following is a basic troubleshooting guide and not all options may be included. Service should be done by a DEKKER authorized distributor or a properly trained service technician. Each unit is tested and checked at the factory. Always indicate model and serial number when calling. The model and serial number is viewable on the gold-colored information plate attached to the unit.

WARNING: Before attempting any maintenance such as changing the fluid, disconnect all power from the unit by switching off the main breaker, isolate all energy sources and allow unit to cool. All electrical work should be done by a qualified electrician in compliance with OSHA, National Electric Code and any other applicable local electrical code.

Start-Stop Problems

Unit will not start
1. Check that the main AC power disconnect is ON and supplying power to the unit.
2. Check if the disconnect or circuit breaker is switched on.
3. Check the overload setting on the starter.
4. Ensure that the proper voltage is supplied and that the wire size is correct.
5. Check if the pump has seized by removing the belt guard and rotating the belts by hand (disconnect power first). If a rubbing noise or binding is observed, contact the factory.

Vacuum Problems

Unit operates, but does not achieve desired vacuum level
1. Stop unit and disconnect power.
2. Check if the inlet valve is open and inlet filter is clean.
3. Ensure that no lines are open to the atmosphere, causing loss of vacuum.
4. Check for leaks in piping systems using conventional leak detection methods.
5. Ensure that the oil level is correct.
6. Check if the oil solenoid valve is working.
7. Check if the motor rotation is correct. Rotation is marked by an arrow on the motor or pump housing. If incorrect, switch any two of the three main power leads to the vacuum pump motor.

Overheating Problems

Unit overheats or operates above 180°F
1. Stop unit and disconnect power.
2. Check if the oil solenoid valve is working.
3. Ensure that the oil level is correct.
4. Verify cooling water flow, if applicable.
5. Verify ambient air temperature is 104°F or below.

Unit overheats on start-up in low ambient temperatures
1. Stop system and disconnect power.
2. Verify oil temperature. Oil tends to thicken in temperatures of 55°F and below.
Noise and Vibration Problems

The unit is making an abnormal noise or sound
1. Stop unit and disconnect power.
2. Check belt tension and alignment.
3. Ensure that the oil level is correct.
4. Check the inlet filter and clean if necessary.
5. Check if the inlet valve is closed.

Unit is vibrating excessively
1. Stop unit and disconnect power.
2. Check belt tension and alignment.
3. Check if unit is properly supported. An uneven foundation can cause vibration problems.
4. Check that the mounting bolts of pump are not loose. Tighten as required.

Oil Problems

Unit uses excessive oil or produces an oil-mist
1. Ensure that the unit is pulling a deep vacuum level (deeper than 100 torr for single-stage and 10 torr for two-stage).
2. Stop unit and disconnect power.
3. Confirm oil level is not too high.
4. Confirm the unit is using factory recommended oil.
5. Ensure that discharge piping is arranged correctly.