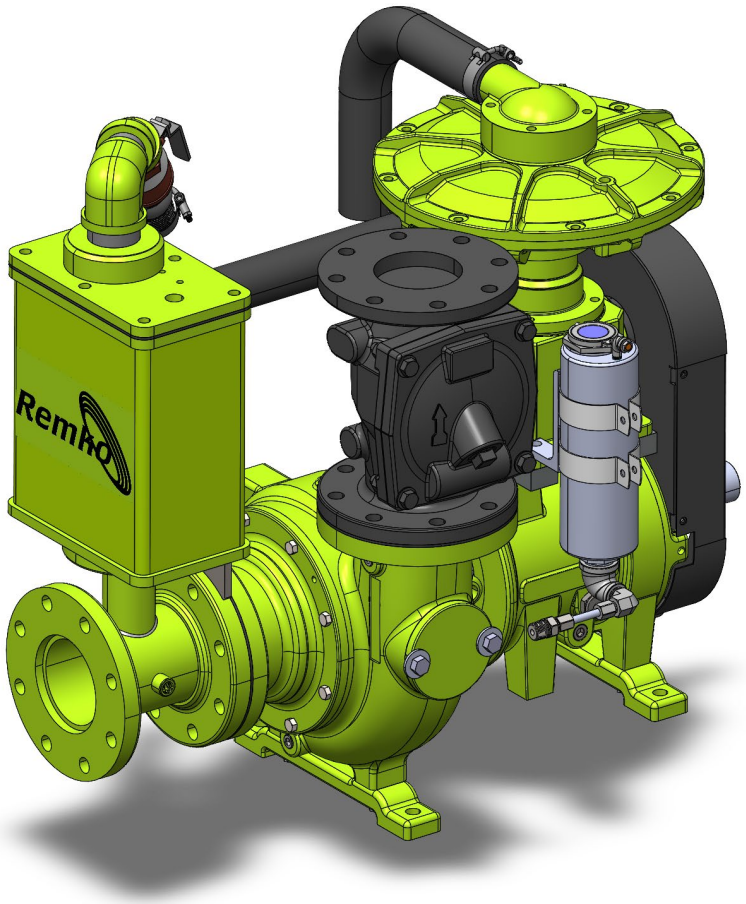
RA Series 3
Automatic Dry Priming Pumps

Operation & Maintenance Manual

Rev 1.0 (May 2025)



Remko Pumps - Australia's go-to pump solutions provider.

Corporate Office: 4 McHarry Place, Shepparton VIC 3630

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INSPECTION

All equipment is inspected at the factory prior to shipment. However, you should inspect all equipment upon arrival for shipping damage and item shortages from the packing slip. Report any damage or shortages to the carrier and **Remko Pump**.

RECORDING MODEL & SERIAL NUMBERS

Please record the model and serial number for your **Remko Pump** in the spaces provided below. The factory will need this information when you require parts or service.

Pump Model : _____

Pump Serial Number : _____

Engine/Motor Serial # : _____

Engine/Motor Model : _____

WARRANTY INFORMATION

LIMITED WARRANTY: The Seller warrants for one year from the date of shipment Seller's manufactured products to the extent that Seller will replace those having defects in materials or workmanship when used for the purpose and in the manner which Seller recommends. If Seller's examination shall disclose to its satisfaction that the products are defective, and an adjustment is required, the amount of such adjustment shall not exceed the net sales price of the defective products, and no allowance will be made for labor or expense of repairing or replacing defective products or workmanship or damage resulting from the same. Seller warrants the products which it sells from other manufacturers to the extent of the warranties of their respective makers. Where engineering design or fabrication work is supplied, buyer's acceptance of Seller's design or of delivery of work shall relieve Seller of all further obligation, other than as expressed in Seller's product warranty. **THIS IS SELLER'S SOLE WARRANTY. NO OTHER WARRANTIES, WRITTEN OR ORAL, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE AND MERCHANTABILITY, ARE MADE OR AUTHORIZED. NO AFFIRMATION OF FACT, PROMISE, DESCRIPTION OF PRODUCT OF USE OR SAMPLE OR MODEL SHALL CREATE ANY WARRANTY FROM MANUFACTURER, UNLESS SIGNED BY THE DIRECTOR OF THE MANUFACTURER.** Seller neither assumes, nor authorizes any person to assume for it, any other obligation in connection with the sale of its engineering designs or products. This warranty shall not apply to any products or parts of products which (a) have been repaired or altered outside of Seller's factory, in any manner; or (b) have been subjected to misuse, negligence or accidents; or (c) have been used in a manner contrary to Seller's instruction or recommendations. Seller shall not be responsible for design errors due to inaccurate or incomplete information supplied by Buyer or its representative.

SAFETY AND PRECAUTIONS

⚠ DANGER

This marking warns of an imminent hazard to the life and health of people.

Failure to observe these instructions will lead to death or serious injury.

⚠ WARNING

This marking warns of a potentially hazardous situation to the life and health of people.

Failure to observe these instructions can lead to death or serious injury.

⚠ CAUTION

This marking warns of a hazardous situation to the health of people.

Failure to observe these instructions can lead to minor or moderate injury.

NOTICE

This marking indicates potential property damage.

Failure to observe these instructions may cause property damage.

IMPORTANT: Identifies information that controls correct assembly and operation of the product.
NOTE: Identifies helpful or clarifying information.

This symbol alerts the user to the presence of dangerous voltage inside the product that might cause harm or electrical shock.

This symbol alerts the user to the presence of hot surfaces that might cause fire or personal injury.

This symbol alerts the user to the presence of heavy equipment that might cause personal injury.

Before Getting Started

This equipment should be installed and serviced by technically qualified personnel who are familiar with the correct selection and use of appropriate tools, equipment, and procedures. Failure to comply with national and local electrical and plumbing codes and within Remko Pump recommendations may result in electrical shock or fire hazard, unsatisfactory performance, or equipment failure.
Know the product's application, limitations, and potential hazards. Read and follow instructions carefully to avoid injury and property damage. Do not disassemble or repair unit unless described in this manual.

Failure to follow installation or operation procedures and all applicable codes may result in the following hazards:

DANGER

Risk of death, personal injury, or property damage due to explosion, fire, or electric shock.

- Do not use this product to pump flammable, combustible, or explosive fluids such as gasoline, fuel oil, kerosene, etc.
- If the liquid is hazardous, take all necessary precautions to avoid damage and injury before emptying the pump casing. If any external leaks are found while pumping hazardous products, immediately stop operations and repair.
- Do not use in explosive atmospheres or hazardous locations as classified by the NEC, ANSI/NFPA70.
- Never operate the pump for more than a short interval with the discharge valve closed as this can cause an explosion. The length of the interval depends on several factors including the type of fluid and its temperature. Contact Technical Support for additional support if required.
- When operating, the engine on this pump produces carbon monoxide, an odorless, colorless, poisonous gas that can cause asphyxiation and kill you in minutes. Breathing carbon monoxide can cause nausea, fainting, or death. Operate this pump ONLY outdoors in a well-ventilated area. Do not operate the pump inside any building, confined area such as a tunnel or trench, or enclosed area such as basement, garage, or similar locations, even if doors and windows are open.

WARNING

Risk of severe injury or death.

- To reduce risk of electrical shock, disconnect power before working on or around the system. More than one disconnect switch may be required to de-energize the equipment before servicing.
- If the pump is driven by an electric motor, check local electrical and building codes before installation. The installation must be in accordance with their regulations as well as the most recent National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA).
- Never start or operate a pump known or suspected to be damaged, defective or malfunctioning.
- When lifting or moving heavy components, use suitable lifting equipment, in good condition, rated for at least 5 times the weight of the materials being moved.
- Never stand under a load as it hangs in the sling or hoist.
- Do not attempt to start the engine with the spark plug removed. Unintentional sparking can result in fire or electric shock. Ensure that the spark plug, muffler, fuel cap, and air cleaner are in place.
- For diesel engines, if fuel is spilled, avoid starting engine or creating any source of ignition until the fuel evaporates or is cleaned up and any fuel vapors have dissipated.
- Excessive pump noise or vibration may indicate a dangerous operating condition. Shutdown the pump immediately.
- Handling must be carried out by specialized personnel to avoid damage to the pump and persons.

CAUTION

Risk of bodily injury, electric shock, or equipment damage.

- This equipment must not be used by children or persons with reduced physical, sensory or mental abilities, or lacking in experience and expertise, unless supervised or instructed. Children may not use the equipment, nor may they play with the unit or in the immediate vicinity.
- Operation of this equipment requires detailed installation and operation instructions provided in this manual for use with this product. Read the entire manual before starting installation and operation. End User should receive and retain manual for future use.
- Keep safety labels clean and in good condition.
- Never operate the pump without all safety devices correctly installed, including pump guards over the rotating parts.
- All components must be handled and transported securely by using suitable slings and/or lifting devices.
- Avoid hot exhaust gases and do not touch hot surfaces.
- Wear Personal Protective Equipment (PPE) while installing, operating or servicing this pump.

NOTICE

Risk of damage to pump or other equipment.

- Do not operate the pump and/or the system for an extended period of time below the recommended minimum flow.
- Do not attempt to start the engine before it has been filled properly with the recommended type and amount of oil. Failure to follow these instructions will void the warranty and cause damage to the engine. Refer to the engine manufacturer's instructions for oil type and proper procedure for adding oil. Check the engine oil level before every use and add as needed.
- If in an environment where the fluid in the system could freeze, never leave liquid in the pump. Drain the system completely.
- Incorrect rotation of the pump for even a short period of time can cause severe damage to the pumping assembly.
- If items are dropped, banged, or mistreated in any way, misalignment and malfunction can occur.

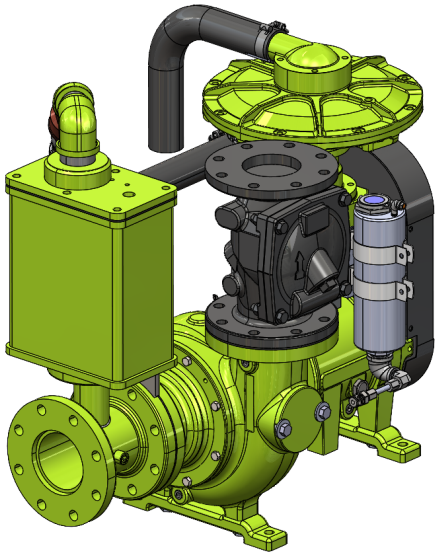
Product Specific Precautions

Remko pumps are designed for specific service and may not be suited for any other service without loss of performance or potential damage to equipment or personnel. This manual cannot possibly provide detailed instructions and precautions for each specific application. It is the owner's and installer's responsibility to ensure that applications not addressed in this manual are performed only after establishing that neither operator safety nor pump integrity are compromised. If there is any doubt about suitability for a specific purpose, contact Remko Pumps or your Remko Pump Distributor.

Rental companies and private owners: All persons to whom you rent or lend this pump must have access to and read the product's owner's manuals. Always keep the manuals with the pump and advise all operators to read them. You must also provide personal instruction on how to safely operate the pump, and you must be available to answer any questions the renter or borrower might have.

PRODUCT INFORMATION

Description



Remko Standard Centrifugal Pumps are designed to deliver outstanding performance in demanding applications such as high-pressure transfer, sewage, trash handling, and dewatering. Their large stainless-steel impeller eye ensures reduced Net Positive Suction Head required (NPSHr) and enhanced vapor-handling capability, making them a reliable choice for industrial, municipal, agricultural, mining, and oil & gas operations.

These pumps are offered in a variety of mounting options, including trailer-mounted, skid-mounted, conventional channel base-mounted configurations or bare shaft pumps may be mounted by a third party. They are available with either electric or diesel motors. For detailed guidance on startup, installation, and maintenance, refer to the corresponding engine and motor manuals.

The pumps feature a robust run-dry system at the pump end, allowing continuous operation without prime—without causing damage to the mechanical seal. This system consists of an oil reservoir and a specially engineered mechanical seal gland.

All standard models can be upgraded to Remko's vacuum-assisted, self-priming version for significantly higher flow rates, increased head capacity, and advanced priming capabilities.

Each unit is backed by a Limited Manufacturer's Warranty. Warranty durations vary depending on the product type. For complete details, please contact the Remko team.

SAE Housing & Couplings

- The SAE bracket provides a rigid connection between the pump and the driver (engine or motor).
- Brackets come in a variety of sizes determined by engine design. Refer to the engine specification sheet or contact technical support to identify the size on the pump.
- The optional rubber drive coupling provides alignment between the pump and the engine and dampens engine vibration transmitted through the engine crankshaft.
- For some systems with an electric motor, the SAE bracket is replaced with a bearing cap.

INSTALLATION

CAUTION

Risk of personal injury or damage to pump or other equipment.

- Make sure the pump is level.
- Use caution when positioning the skid-mounted unit to prevent damage to the fuel tank.
- For trailer mounted units, wheels should be properly chocked to prevent the trailer from rolling.
- For engine driven pumps, the reflective exhaust heat may damage the fuel tank, causing fire. Keep at least 1 meter of clearance on all sides of the pump for adequate cooling , maintenance, and servicing.
- For some systems with an electric motor, the SAE bracket is replaced with a bearing cap.

Package Leveling

Always make sure the package is level.

- For trailer-mounted units, use the tongue jack and blocking under the lower wheel.
  NOTE: Properly chock wheels of the trailer to prevent rolling.
- For skid-mounted packages, use blocks under the skid if the ground is not sufficiently level.
- For electric units with a motor stool, install on a solid, level foundation for adequate bearing lubrication.

Foundation

1. Locate the foundation as close as possible to the liquid to be pumped, allowing adequate space for operation, maintenance, and inspection of the pump and equipment.
2. Allow the foundation to completely dry and cure.
3. Use anchor bolts to attach the pump base to the foundation.
4. Use a machinist's level on the mounting pads for adjustments as the anchor bolts are tightened.
5. Provide leveling nuts or wedges for mounting the baseplate to the foundation.

Mounting the Pump

NOTE: Electric-driven pumps with a motor stool do not require alignment.

1. Remove all shipping protection.
2. Ensure all foreign material has been removed from the pump and system piping.
3. Mount the pump level, making sure the pump and its driver are aligned.
   IMPORTANT: Failure to align the pump driver and coupling will cause pump vibration and premature failure of the shaft, bearings, mechanical seal, and couplings.

Motor & Pump Alignment

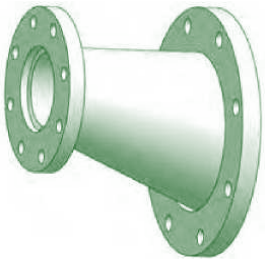
Precise alignment is necessary to achieve correct performance of the system. Every time a component is moved, check the alignment.

IMPORTANT: When utilizing a diesel engine-driven pump system with a transmission/gearbox component, it is essential to verify the alignment each time the equipment is relocated.

Piping Installation

Suction Piping Installation

Eccentric Reducer



1. Select suction piping.
   - Consider NPSHA, site altitude, and temperature.

   NOTE: Suction design must provide a margin of NPSH Available (NPSHA) over NPSH Required (NPSHR) of at least 0.5 mtr.

   NPSHA is the measure of energy in a liquid above the vapor pressure. Consider losses from the foot valve and other entrance losses when calculating NPSHA. NPSHR is given in the pump data sheet and performance curve.
   - Piping should be at least as large as the pump flange.
   - For diameters larger than the pump flange, install an eccentric reducer with the straight side up to avoid air pockets.
   - Use piping suitable for vacuum to avoid collapse during operation.
2. If long, level runs of piping cannot be avoided, slope up to the flange to prevent air pockets.
3. Position the pump at the highest point of the suction piping.
4. Slope the piping up to avoid air pockets.
5. If required, install a foot valve at least 4 times the pipe diameter away from the pump inlet.
6. Make sure the submergence of the suction pipe in the wet well, pond, etc. is at least 4 to 5 times the pipe diameter.

   NOTE: If this is not possible, provide a baffle or other device suitable for preventing vortex formation, causing air to enter the pump's suction. For best performance, use a bell mouth fitting. Refer to the Hydraulic Institute Handbooks or other hydraulic data books for detailed sump design information.
7. If a suction strainer is required, the open area should be at least 4 times the internal pipe diameter and rigid enough to prevent collapse if it becomes clogged.

Discharge Piping Installation

1. Use a concentric taper on the discharge side to increase from pump discharge flange size to a larger discharge pipe diameter, or maintain discharge piping the same size as the discharge size of the pump.

   Note: The decision of what size discharge pipe to use in an economic one, a balance between the higher cost of larger piping versus the higher energy requirements imposed by pipe friction. Otherwise, the only detrimental effects of discharge piping size choice is derived from the pump running too near shut off or too far out on its curve.
2. The discharge pipe size should be adequate to maintain reasonable velocities and reduce friction losses.
3. All valving and additional fittings should be the same size as the discharge line.

Screening

Make provisions for the installation of a suction screen or strainer to prevent any debris from clogging the impeller. The open area of the strainer should be equal to at least four (4) times the area of the pipe. The screen should be rigid enough to prevent collapse when flow is reduced due to clogging.

Sump Design

The submergence of the suction pipe into the liquid should be at least four (4) to five (5) times the pipe diameter. If this is not possible then provide a baffle or a floating board. This is to prevent any vortex action allowing air into the pipe. For best performance a bell mouth fitting is recommended. Refer to the Hydraulic Institute Handbooks or other Hydraulic Data books for detailed sump design information.

Lifting

Any lifting equipment is to be rated for at least five (5) times the weight of the item being lifted. Use only established methods when lifting or moving any heavy components.

Alignment of pump and motor

Precise alignment is necessary to achieve correct performance of the system. Every time a component is moved this alignment will have to be checked. The alignment can be checked with a straight edge and an outside calliper, taper thickness gauge, dial indicators or, for best results, use a laser alignment tool. Use the straight edge across the outside diameters of the coupling halves to ensure that they are concentric and parallel. The outside callipers or the taper thickness gauge is to correct for any angular misalignment and to verify the correct gap between the coupling flanges. Use a laser alignment tool or dial indicators to adjust for concentric and angular displacement. With dial indicators, rotate shafts together and take readings every ninety (90) degrees. Make adjustments by placing shims under the driver and be sure that the mounting bolts are properly tightened while taking readings and after final adjustment then install coupling guard.

If the pump is equipped with an SAE bracket and flywheel coupling for direct mounting of the pump to the engine bell housing, alignment between crankshaft and pump shaft is automatically attained due to the register fits between the bell housing and pump bracket.

Rotation

Before the pump is started, correct rotation must be confirmed. If the rotation is not correct, then interchange any two of the leads on a three (3) phase driver. For a single-phase driver refer to the wiring diagram. Engine rotation should be confirmed with the engine supplier.

OPERATION

WARNING

Risk of severe injury or property damage.

- Fuel and its vapours are extremely flammable and explosive. Fire or explosions can cause severe burns or death. Do not add fuel indoors. Do not add fuel when the engine is running or hot. Do not light cigarettes or smoke when adding fuel. Keep fuel away from furnaces, stoves, water heaters, clothes dryers, or other appliances that have a pilot light or other ignition source (heat, flame, sparks, lit cigarette, etc.) because they can ignite fuel vapours.
- When adding fuel, ensure that the pump is outdoors on a flat, level surface. Do not add fuel to pump while indoors. Turn the pump OFF and let it cool at least 2 minutes before removing the fuel cap. Loosen the cap slowly to relieve pressure in tank. Refer to the engine manufacturer's instructions for recommended fuel type and proper procedure for adding fuel.
- If fuel is spilled, avoid starting engine or creating any source of ignition until the fuel evaporates or is cleaned up and any fuel vapours have dissipated.
- Never operate the pump without all safety devices correctly installed, including pump guards over the rotating parts.

Priming

Remko pumps are available with a fully automatic vacuum priming system. If this priming device is not supplied on your pump model you will need either a flooded suction or a foot valve and some other means of evacuating air from the pump case and suction line. With a flooded suction use a bleed valve at the top of the volute to allow trapped air to escape. If you are using a foot valve, then fill the suction line and pump case with water and use a bleed valve for trapped gas as above. If a hand primer is to be used it will be necessary to have an airtight check valve or closeable control valve on the discharge line to prevent the entry of air from the discharge side. Rotating the pump shaft will release trapped gas in the impeller. If the pump is used with a flooded suction condition and your pump has a fully automatic vacuum priming system, you can close the isolation (failsafe) valve at the top of the priming chamber. This will isolate the vacuum pump inlet line from the pumpage and allow the vacuum pump to “coast” (extending the life of the vacuum pump and reducing the horsepower requirements on the driver).

Pre-Start Checklist

1. Verify that rotation is correct and that the shaft rotates freely.
2. Check all piping connections for tightness.
3. Inspect all accessories and make sure they are appropriate for your installation.
4. Verify that the driver and coupling are aligned correctly and that all guards are in place.
5. Ensure that all bearings and grease seals are lubricated.
6. If vacuum assisted, check the vacuum pump oil level as well as the oil level in the backplate/bracket reservoir.
7. Oil levels should also be checked and maintained during pump operation.
8. Follow the instructions on all tags, labels and decals attached to the equipment

Starting the System

DANGER

Risk of death, personal injury, or property damage due to explosion, fire, or electric shock.

- Never operate pump with both the suction and discharge valves closed as this could cause an explosion.
- Failure to open the discharge valve upon starting the driver could cause a dangerous buildup of heat and possibly an explosion.
- If the pump is operated in an enclosed space and the pumpage may contain potentially hazardous fumes make certain that an exhaust hose is securely connected to the vacuum pump exhaust nozzle and routed outside the enclosed space. Failure to do so may result in injury or death.
- If liquid pump contains solids that may cause downstream clogs, take special care the pump is not operating against a blocked discharge for a prolonged period. Do not loosen flanges or open valves if the pump is suspected of operating against a downstream clog, as the release of stored heat can result in severe injury or death.

CAUTION

Risk of bodily injury or property damage. A pressurized system can cause a pump to deadhead.

- Rapidly closing the discharge valve can cause a damaging pressure surge. A dampening arrangement should be provided in the piping.
- Do not operate the pump without guards in place over the rotating parts. Exposed rotating parts can catch clothing, fingers or tools, causing severe injury to personnel.
- Never use the suction valve to throttle the flow.
- Do not attempt to run the pump without water; this could result in permanent damage to the pump.

IMPORTANT: Precise alignment is necessary for correct performance.
IMPORTANT: Some components and lubricants have shelf lives of less than 12 months. Inspect and replace as necessary.

1. **If starting after storing the pump for more than one month:**
   - **Remove all rust preventive coating and drying agents, such as silica gel.**
   - **Clean the pump thoroughly to remove any foreign material that may have accumulated.**
2. **Confirm the pump rotates clockwise when viewed from the drive input end. If incorrect:**
   - **For a three-phase electric motor, interchange any two of the power leads.**
   - **For single-phase electric motors, refer to its wiring diagram.**
   - **For diesel engines, confirm engine rotation with the supplier.**
3. **Check all piping and fittings for foreign materials (rocks, bolts, wire, etc.) that could disrupt pump flow.**
4. **For suction lift applications, open the priming chamber ball valve.**
   - **For flooded suction applications, keep the priming chamber ball valve closed.**
5. **Check the run-dry mechanical seal lubrication system:**
   - **Make sure the oil level is not above half the length of the sight tube and the oil is clean.**
   - **Check fittings and oil level sight tube for leaks.**
   - **Ensure the mechanical seal oil drain plug is tight and not leaking.**
6. **If the bearing housing is oil lubricated:**
   - **Hold the pump level.**
   - **Clean around the oil level plug on the side of the bearing housing and then unscrew it.**
   - **For oil level sight gauge windows, make sure the oil level is near the centre.**
   - **Make sure the oil is at the level of the plug opening and the housing is not overfilled.**
7. **Close the vacuum pump water drain.**

8. **Check the tension of the vacuum pump drive belt.**
    - **The belt should be just tight enough to remove any slack. Do not over-tighten.**
9. **Verify the vacuum pump crankcase oil level is centred in the sight glass when the pump is level.**
10. **If applicable, make sure the Vacuum Assist System is functioning properly, and the pump is primed before startup.**
11. **Check all accessible hardware, piping, and fittings are tight, secure, and supported.**
12. **Refer to the diesel engine or electric motor manuals for pre-start instructions.**

13. **Close the discharge valve.**
14. **Start the pump and slowly open the discharge valve to fully open.**
    - **Avoid any abrupt changes in the discharge flow rate to prevent pressure surges in the piping.**
15. **If the design pressure is not achieved shut the pump down immediately.**
    - **Verify pump is adequately primed and restart.**
    - **Check all suction and discharge piping for leaks.**

Run Dry System

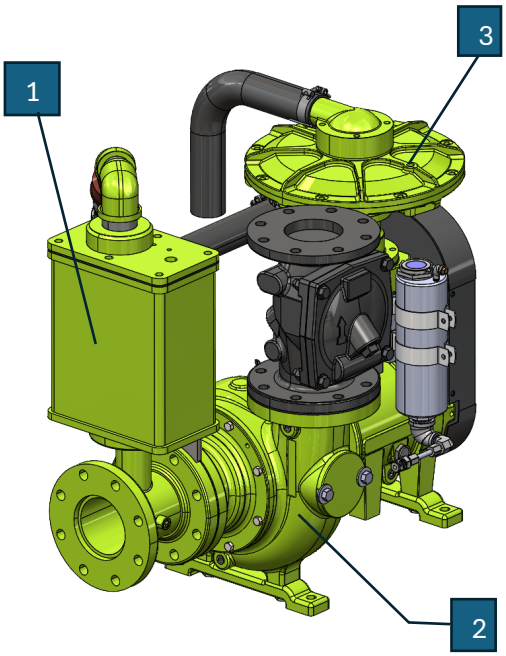
The run dry system in the pump end allows it to run indefinitely when it is not primed without damaging the mechanical seal. The system can be either enclosed in the pump backplate or external to the pump wet end.

Whether enclosed or external, both configurations work the same:

1. As the pump starts, the mechanical seal is fed a constant supply of lubricating oil from the inside of the stationary seat.
2. Due to the centrifugal force generated by the rotating seat, a small amount of oil is fed between the two seal surfaces and forced out of the seal and into the pumped liquid.
3. The oil cools and lubricates the seal surfaces, prolonging its life.

Vacuum Priming Assist System

Item	Description
1	Vacuum Priming System
2	Pump casing
3	Priming Chamber

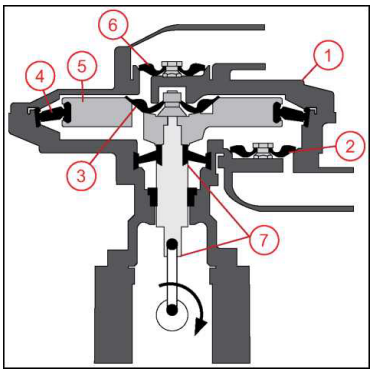


The Remko Pump Priming Vacuum Assist System is designed to allow the pump to prime without using a foot valve or manually adding water to the system:

1. The pump starts with the suction pipe in the water and the discharge check valve closed.
2. The vacuum pump then evacuates air from the suction pipe and pump end.
3. The resulting vacuum in the suction pipe causes water to rise in the pipe until it floods the pump end.
4. The pump primes.
5. Carryover (water transfer into the priming pump) is prevented when the float ball in the priming chamber rises with the water level, closing a valve.

Vacuum Priming Pump

Item	Description
1	Pump Casing
2	Inlet Valve
3	Actuator (piston) valve
4	Actuator seal
5	Actuator (piston)
6	Exhaust valve
7	Actuator (piston) rod assembly and crank



When viewed from the pulley, the vacuum pump rotates clockwise to evacuate air from the system:

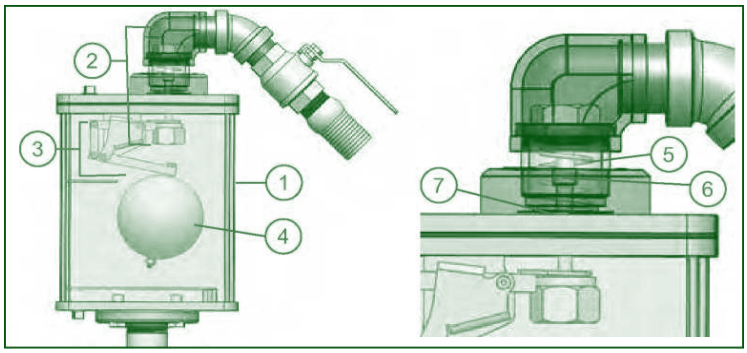
1. With the pump drive pulley operating from the 12 o'clock position, the piston rod and crank (7) force the piston (5) in a downward direction.
2. Increasing air pressure below the piston (5) closes the inlet valve and opens the actuator valve (3).
3. Air flows into the upper chamber of the pump casing (above the piston) until the drive pulley reaches the 6 o'clock position.
4. From the 6 o'clock position, the piston rod and crank (7) force the piston (5) in an upward direction.
5. Increasing air pressure above the piston (5) opens the exhaust valve (6) and forces the actuator valve (3) closed.
6. Air pushes the piston (5) upward and exits through the exhaust valve (6) until the drive pulley reaches the 12 o'clock position again.
    - At the same time, a vacuum is created in the lower chamber of the casing below the piston. This pulls the inlet valve (2) open and air flows into the pump.

This cycle repeats until the pump inlet is closed by the priming chamber valves or the ball valve on top of the priming chamber is closed.

- The inlet, piston, and exhaust valve close so air does not enter the vacuum pump.
- A minimal vacuum is created below the piston on its upstroke to keep the inlet valve closed.
- The pump can idle in this state indefinitely until it is needed again.

Priming Chamber (Compact)

The priming chamber and its associated valves control the priming system. The vacuum pump is either top-mounted or side-mounted on Remko RA series Auto Prime pumps.



Item	Description
1	Priming Chamber
2	Posi-Valve
3	Posi-Valve Linkage
4	Float ball
5	Valve spring
6	Valve poppet and O-ring
7	Valve seat

When the system is first primed or loses prime:

1. The lack of liquid in the priming chamber causes the float ball (4) to pull the valve stem in the Posi- Valve downward.
2. The spring (5) compresses and lifts the valve poppet and O-ring (6) off the valve seat, opening the Posi-Valve for air to flow from the priming chamber (1) to the vacuum pump.
3. The vacuum pump creates a vacuum in the priming chamber (1).
4. Liquid enters the priming chamber (1) and suction port of the centrifugal pump.
5. As the liquid level rises in the priming chamber (1) and the centrifugal pump casing, the ball (4) begins to float and move the linkage (3) and valve stem upward.
6. The linkage (3) decompresses the spring (5) and valve poppet (6) on the valve seat (7), closing the air path to the vacuum pump.
   - Liquid can no longer pass the Posi-Valve® and enter into the vacuum pump.
7. The vacuum pump stops pumping air and begins to coast.

Discharge Check Valve

1. When the pump begins to prime, the discharge check valve is closed to create a positive seal of the suction area.
   - The suction area includes the pump end, the suction manifold, and the priming chamber.
   - Without the seal, outside air would enter the priming system and disrupt the vacuum system.
2. When the pump is primed, the discharge flow opens the discharge check valve.
3. When the pump stops or loses prime, the weight of the flapper causes the valve to close.
   - This prevents reverse flow when the pump is stopped.

Disabling the Automatic Priming System

Remko RA series pumps are equipped with an automatic priming system that begins upon pump start-up as long as the suction pipe is immersed and the ball valve is open (parallel to the vacuum hose). Disabling the system will extend the life of the vacuum pump and reduce the engine's horsepower requirements.

To disable, close the ball valve at the top of the priming chamber. The priming system will then turn off and allow the vacuum pump to “coast”.

Shutting Down the Pump

For electric motor driven pumps, turn off the motor power supply. For engine driven pumps:

1. Slowly reduce the engine speed to idle.
2. Allow the engine to run at idle for four to five minutes.
3. Shut down the engine and turn it off at the control panel.

MAINTENANCE

WARNING

Risk of severe injury or property damage.

- To minimize risk of electrical shock, disconnect power before working on or around the system.
- When lifting or moving heavy components, use suitable lifting equipment, in good condition, rated for at least 5 times the weight of the materials being moved.
- Never stand under a load as it hangs in the sling or hoist.

CAUTION

Risk of bodily injury or property damage. A pressurized system can cause a pump to deadhead.

- Rapidly closing the discharge valve can cause a damaging pressure surge. A dampening arrangement should be provided in the piping.
- Never use the suction valve to throttle the flow.
- If items are dropped, banged, or mistreated in any way, misalignment and malfunction can occur.
- If the pump or components are hot, allow adequate cooling prior to servicing the unit.
- Store the pump in a well-ventilated area away from furnaces, stoves, water heaters, clothes dryers, or other appliances that have a pilot light or other ignition source (heat, flame, sparks, etc.) because they can ignite fuel vapours.
- Safety glasses, heat resistant welder's gloves, cut-resistant gloves, and safety boots should be worn. Use proper protective gloves and clothing when handling heated parts.

IMPORTANT: Precise alignment is necessary for correct performance.

Storage

If the pump is to be stored for more than one month:

1. If applicable, open the ball valve to drain the pump.
2. Drain the pump by removing the NPT plug on the volute drain.

   IMPORTANT: Drain the pump completely to avoid water freezing and cracking its case and reduce corrosion.
3. Store the unit off the ground on blocks.
4. Protect the pump from blowing sand and dirt.
5. Do not stack other items on top of the pump and its equipment.
6. Shield the pump from entry of animals.
7. Protect the pump with drying agents, like silica gel.
8. Use a rust preventive coating on all bare metal parts.
9. Every 30 days:
   - Inspect the pump.
   - Reapply the drying agents (silica gel).
   - Rotate the pump shaft.
   - Lubricate bearing and seals.
10. Keep inspection records showing inspection dates and the condition of the stored pump.

Periodic Service

Frequency	Service
Daily	• Check all piping connections, pipe supports, and equipment fasteners for tightness. • Verify the driver (engine or electric motor) is aligned correctly and all guards are in place. • Check all oil quality and levels. If contaminated, replace immediately. • Follow the instructions on all tags, labels, and decals attached to the equipment.
Monthly or every 500 hours	• Apply grease to the bearing housing.
Every 6 months or 1000 hours	• Ask your Remko Pump Distributor to check the wear rings for excessive wear. • For belt-driven pumps, recheck drive belt tension with a belt tension indicator. **NOTE:** The Vacuum Pump belt should only be tight enough to eliminate slack. Adjustment is made by adding or removing shims between the vacuum pump crankcase and support table.
Yearly or every 2000 hours	• Change all lubricating oils in the bearing housing (if applicable), mechanical seal, and priming pump.

Lubrication

Oil Lubrication

NOTICE

Risk of damage to pumps or other equipment.

- Over-filling of oil can result in premature failure of bearings.

To change the oil in the priming pump crankcase, bearing housing, and run dry reservoir:

1. Clean the area around the fill and drain plugs to reduce the possibility of contamination.
2. Remove the drain plugs.
3. Drain the oil.
4. Replace the drain plugs.
5. Remove the oil fill plug(s).
6. Fill the compartment with oil to the indicated correct levels on the oil level or sight gauge.
7. Replace the oil fill plug(s).

NOTE:

- **Grease lubricated bearing housing does not require any oil service.**

Oil Capacities

Compartment	Lube Specification	Capacity (Liters)
Priming Pump / Vacuum Pump	SAE30 ND	0.8
Bearing Frame Housing	ISO 32 Turbine Oil	2.0
Run-Dry Seal Gland and Reservoir		1.0

Grease Lubrication

Re-greasing recommendations:

- Use only one type of grease.
- Lithium or Lithium Complex greases are preferred.
- Do not mix Polyurea greases with Lithium types.

Recommended greases include:

- Texaco Starplex Moly 2
- Mobil Mobilux No. EP2
- Shell Alvana EP2
- Chevron SR1

To re-grease the bearings:

1. Clean the grease point.
2. Use a hand-operated grease gun with ball bearing grease.

   NOTE: Grease guns dispense widely varying amounts of grease per stroke. Test before using on the pump.
3. For a new pump or on bearing replacement, apply startup grease service for the pump:
   - Drive-end bearings: 40 grams
   - Pump-end bearings: 16 grams
4. To lubricate the ball bearings, remove the plastic covers from the zerk fittings.
   - Ensure the zerk fitting and the end of the grease gun are clean.

Grease Lubrication Intervals

Frame Size (AK Frame)	Hours		
	2200 RPM	1800 RPM	1200 RPM
8.5	500	2,500	10,000
12.4	2,500	3,500	5,000

NOTE: Lubrication intervals and quantities for the ball bearings depend on speed, load, ambient temperature, contamination, moisture, intermittent or continuous service and other factors. Contact your Remko distributor for details.

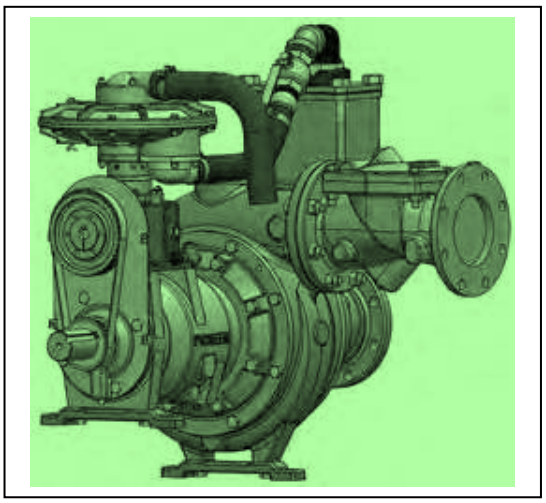
DISASSEMBLY

WARNING

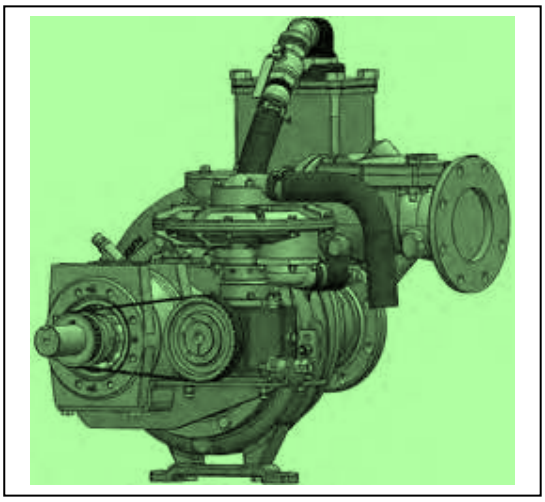
Risk of severe injury or property damage.

- To minimize risk of electrical shock, disconnect power before working on or around the system.
- When lifting or moving heavy components, use suitable lifting equipment, in good condition, rated for at least 5 times the weight of the materials being moved.
- Never stand under a load as it hangs in the sling or hoist.
- If items are dropped, banged, or mistreated in any way, misalignment and malfunction can occur.
- If the pump or components are hot, allow adequate cooling prior to servicing the unit.

Vacuum Assist System Disassembly



Top Mount Vacuum Pump



Side Mount Vacuum Pump

Removing the Vacuum Pump Drive System

The vacuum pump drive system consists of a drive pulley on the main pump drive shaft, a rubber drive belt, and a drive pulley attached to the vacuum pump drive shaft.

1. If the vacuum pump is top-mounted, remove the retaining cap screws and adjusting shims to release the drive belt tension.
2. If the vacuum pump is side-mounted, loosen the drive belt adjuster to release the drive belt tension.
3. Remove the centrifugal pump from the driver.
4. Pull off the drive coupling.
5. Remove the drive to access the vacuum drive pulley. Refer to “SAE Housing & Coupler Disassembly”.

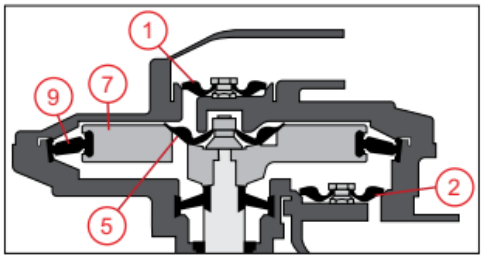
Removing the Vacuum Drive Pulley

1. Measure and record the distance between the face of the pulley to the end of the shaft.

NOTE: This measurement will be used for positioning during reassembly.

2. Remove two set screws in the pulley root.
3. Remove 1/2" bolt from the two-piece wedged key.
4. Use a 3/8" threaded bolt to drive the two parts of the two-piece wedged key apart.
5. Remove one half of the key.
6. Pull the pulley off of the shaft.
7. Remove the remaining part of the key from the shaft.

Valves and Actuator Seal Disassembly



1. To remove the exhaust valve:
   - Remove the cap screws securing the exhaust nozzle to the upper housing.
   - Lift the housing off to expose the exhaust valve.
   - Pull the exhaust valve off over the head of the valve stud.

   NOTE: It is not necessary to remove the valve stud when removing the exhaust valve.
2. To remove the inlet valve:
   - Remove the cap screws securing the inlet nozzle to the lower housing to expose the inlet valve.
   - Pull the inlet valve off over the head of the valve stud

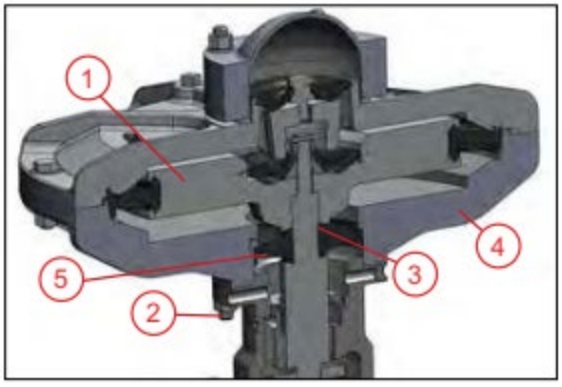
   NOTE: It is not necessary to remove the valve stud when replacing the inlet valve.
3. Remove the upper housing bolts, nuts, and washers, and lift the upper housing off to expose the actuator valve.
4. Remove the cotter pin and castle nut at the centre of the actuator valve.
5. Pull off the actuator valve over the head of the valve stud.
6. Rotate the crankshaft so the actuator moves to “top dead centre” position.
7. Clamp the actuator in a vice.
8. Cut the actuator seal with a utility knife.
9. Work the actuator seal out of the groove in the lower housing with a suitable puller.
   - The actuator has two 3/8"-16 UNC threaded holes on the top to enable attachment of a puller for removal.

Lower Housing Neck Seal Disassembly

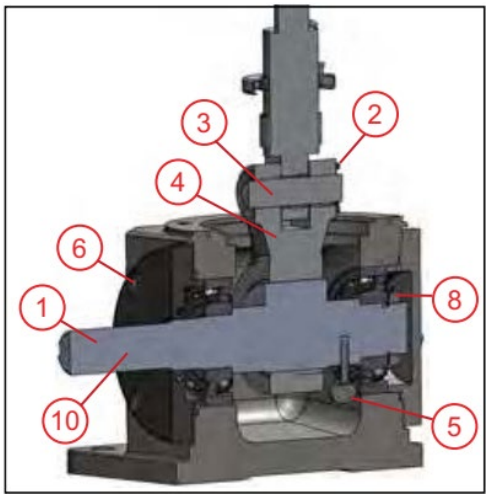
1. Remove the actuator. Refer to “Valves and Actuator Seal Disassembly”.
2. Unscrew the nuts and washers from the studs that secure the lower housing to the pedestal.
3. Apply a lubricant, such as petroleum jelly, to the exposed portion of the actuator shaft.
4. Lift the lower housing off the pedestal.

• The neck seal will remain with the lower housing.

5. Remove the neck seal from the counter-bore in the bottom of the lower housing.
6. To further disassemble, remove the cap screws securing the pedestal to the crankcase and lift the pedestal off over the actuator shaft.
   - Support the actuator shaft so it is not damaged by the crankcase.



Crankshaft Disassembly

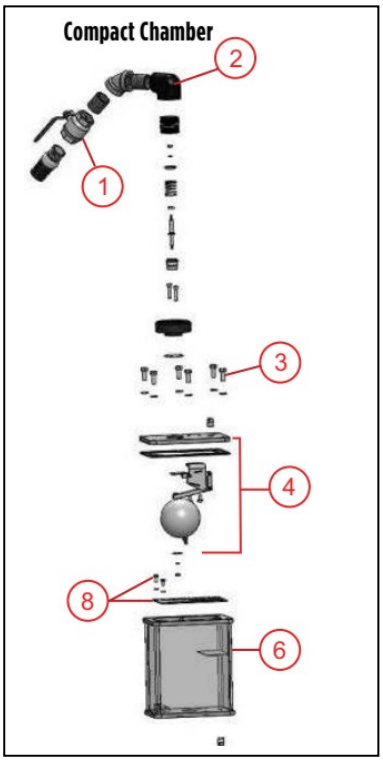


1. Rotate the crankshaft to bring the actuator shaft to its top, dead centre position.
2. Remove one of the retaining rings at one end of the fulcrum pin.
3. Remove the fulcrum pin, the connecting rod small-end bearings, and the actuator shaft bearing.
4. Slide the connecting rod as far as possible to one side of the crankshaft.
5. With a pair of pliers, remove the oil flinger from the crankshaft.
6. Remove the bearing cap fasteners from both ends.
7. Remove the shaft-end and opposite shaft-end bearing caps.
8. Push the crankshaft far enough out the drive-end to access the bearing locknut.
9. Remove the bearing locknut and bearing washer.
10. Pull the crankshaft out of the drive-end of the crankcase.
    - A gear puller may be used to remove the drive-end crankshaft roller.
    - The opposite drive-end crankshaft roller bearing should remain in the crankcase.

Crankshaft and Actuator Shaft Bearings Disassembly

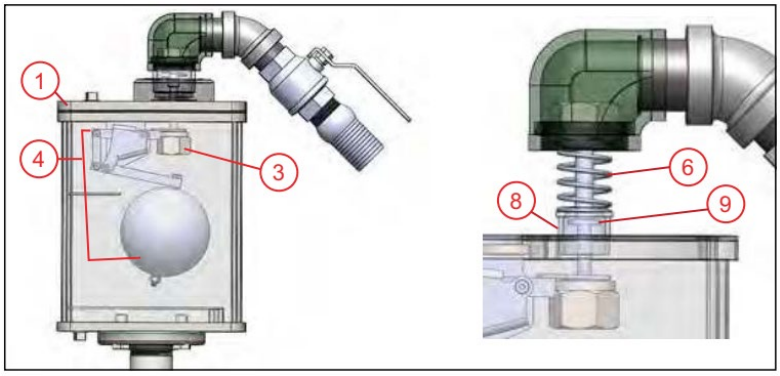
1. Lift the connecting rod out of the top of the crank-house.
2. Inspect the connecting rod small-end bearings and the actuator shaft bearing for uneven or excessive wear.
    - Replace the bearings if the inside diameter exceeds 0.628" (15.95 mm).
    - To remove the old bearing, press it out using a suitable mandrel.
    - Refer to “Crankshaft & Actuator Shaft Bearings Reassembly”.
3. Inspect the connecting rod large end bearing for excessive or uneven wear.
    - Replace if the inside diameter exceeds 2.007" (50.98 mm).
    - To remove the old bearing, press it out using a suitable mandrel.
4. Check the actuator shaft guide bearing for excessive or uneven wear.
    - Replace if the inside diameter exceeds 1.385" (35.18 mm).
5. If removing and reinstalling the actuator shaft guide bearing, remove the actuator shaft lip seal from the pedestal.

Priming Chamber Disassembly



1. Disconnect the hose leading from the priming chamber to the vacuum pump at the ball valve.
2. Remove the elbow from the close nipple that extends from the priming chamber cover.
3. Remove the cap screws that secure the priming chamber cover to the priming chamber.
4. Carefully lift the priming chamber cover and Valve assembly straight up.
    - Refer to "Prime Chamber Valve & Linkage Disassembly" section.
5. Remove the cap screws that secure the priming chamber to the priming spool.
6. Lift the priming chamber off the priming spool.
7. If applicable, make sure the spool O-ring is not damaged.
8. Remove the suction screen.
    - For the compact version of the priming chamber, remove the cap screws and lift the screen out.
    - Clean and check the suction screen for any damage

Priming Chamber Valve & Linkage Disassembly

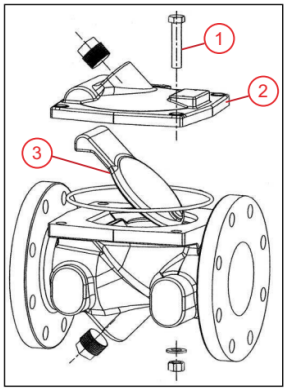


1. Clamp the priming chamber lid in a vice.
2. Remove the linkage by removing the two cap screws that secure the ball and linkage assembly to the priming chamber lid.
    - If there are shims under the securing cap screws, carefully store them for reassembly.
3. Carefully disengage the linkage fork from the Posi-Valve® stem.
4. Remove the ball and linkage assembly.
5. Remove the nyloc nut from the top of the valve.
6. Remove the valve spring retainer and valve spring.
7. Remove the valve assembly from the bottom of the valve.
8. Inspect the valve seat.
    - If damaged, remove it from the adapter flange.

    NOTE: The valve assembly has shims located just under the valve spring retainer.

9. Inspect the poppet O-ring for wear, damage, or cuts. Replace as needed.

Discharge Check Valve Disassembly



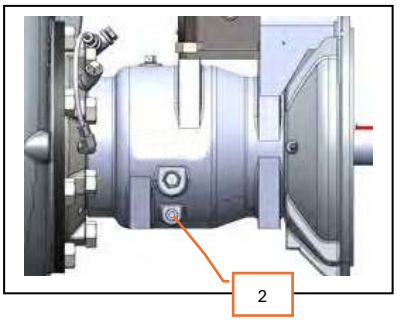
1. Remove the valve cover cap screws.
2. Carefully lift the cover off the body.
3. Inspect the valve flapper for any defects that prevent an airtight seal.
   - Replace if needed.
4. Inspect the discharge valve seat where the flapper valve closes.
   - Check for damage that could provide an air path through the valve when it is closed.
   - If there are defects, dress them with crocus cloth or replace.

SAE Housing & Coupler Disassembly

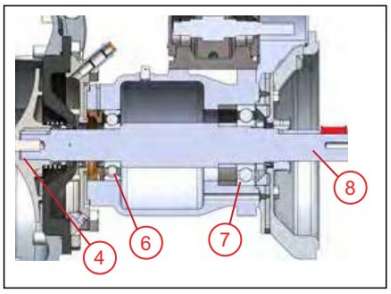
Before removing any bolts or fasteners, ensure the pump and engine are independently supported.

2. To separate the engine from the pump, remove the cap screws that secure the SAE housing to the engine.
3. Remove two set screws on the taper lock bushing.
4. Insert one set screw into the threaded hole on the taper lock bushing to press the taper lock bushing and rubber drive apart.
5. Slide the taper lock from the drive shaft.
6. Remove the key from the taper lock.
   - The key is machined to prevent the taper lock bushing from moving during installation.
7. Remove the rubber drive.
8. Refer to “Vacuum Assist System Disassembly” section.
9. Remove the eight bolts securing the SAE bracket to the bearing frame.
10. Lift the SAE bracket from the bearing frame.

Bearing Frame Disassembly



1. For pumps fitted with an SAE bracket, remove the eight securing caps and the bracket.
   - If applicable, remove the shims between the bracket and the bearing frame.
2. Drain the bearing frame of lubricants.
   - For oil-lubricated bearing frames, remove the drain plug at the bot- tom of the bearing frame.
   - In grease-lubricated bearing housings, rubber plugs are inserted in the oil passages, so the grease is directed to the double row angular contact bearings on the drive-end of the bearing frame.



3. Pry the bearing isolator(s) out of the bores.
   - The isolators are held in place by O-rings.
   - Oil-lubricated bearing frames have one bearing isolator at the pump end of the shaft.
   - Grease-lubricated bearing frames have two bearing isolators, one at each end of the shaft.
4. With a dead blow hammer, firmly tap on the pump-end of the shaft to remove the shaft and bearings.
5. Inspect the shaft bearings by rotating them by hand.
   - If there is roughness, wear, or discoloration, replace during reassembly.
6. Use a standard bearing puller to remove the pump-end bearing.
7. To remove the power input end bearing, flatten the tab on the retaining washer and unscrew the bearing retaining nut.
   - The bearing should slide off without the use of a puller.

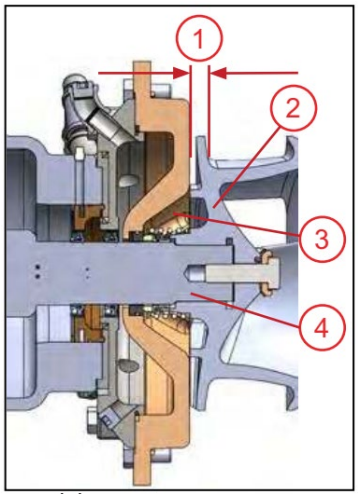
8. Inspect the shaft.
    - Check that the shaft is straight and not damaged.
    - Verify the bearing shoulders are clean, without burrs or deformities.
    - Make sure there is not metal discoloration or bluing.
9. Clean and properly store all parts until reassembly.
    - If reusing the bearings, store them in clean plastic cling wrap or a plastic bag until reassembly.

Pump End Disassembly

Suction Cover & Wear Ring Disassembly

1. If the pump is equipped with an external balance line, disconnect it from the suction cover, suction spool, or the back plate.
2. For enclosed run dry systems, drain the oil from the seal reservoir by removing the square drain plug at the bottom of the seal compartment.
3. For external run dry systems, drain the remote oil reservoir.
4. Support the suction cover using a suitable sling.
5. Remove the cap screws between the suction cover and volute.
6. Remove two cap screws from the suction cover.
7. Insert the two cap screws into the jackscrew holes, tightening them evenly to free the suction cover from the volute.
8. Inspect the wear ring inside the suction cover and behind the impeller on its hub (if equipped).
    - If the wear rings have minor irregularities, they can be dressed with a fine file and crocus cloth.
    - Excessive wear can be identified by measuring it.
    - Replace the wear rings if there is signs of grooves or wear or the pump performance falls below acceptable levels.
9. To remove the wear ring, drill two axial holes about 180° apart.
    - The ring will collapse. Remove it in two pieces.

Impeller Removal – Lock Screw



Parts:

1. Impeller back vane clearance
2. Impeller
3. Backplate shroud
4. Impeller bore

To disassemble:

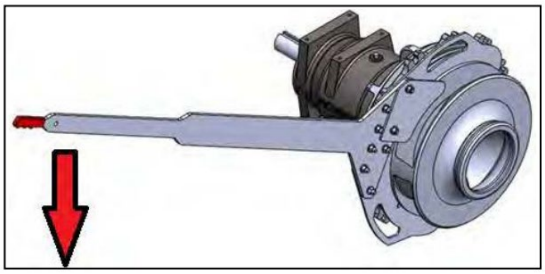
1. Restrain the impeller (2) or pump shaft.
2. Measure and record the clearance (1) between the impeller back vane and the backplate shroud (3) for reassembly.
3. Remove the impeller lock screw and washer.

NOTE: Each time the impeller screw is removed, replace it.

4. Use a properly sized gear puller to evenly pry between the impeller's back shroud (3) and the back plate.
    - As the impeller (2) slides off the pump shaft, be aware the impeller key, impeller shims, and the mechanical seal spring will become loose and could fall out. Do not lose any of these parts.
5. Inspect the impeller (2) for signs of uneven wear, cavitation erosion, or other irregularities that could compromise the normal operation or balance of the impeller. Replace as needed.

Impeller Removal – Threaded Shaft

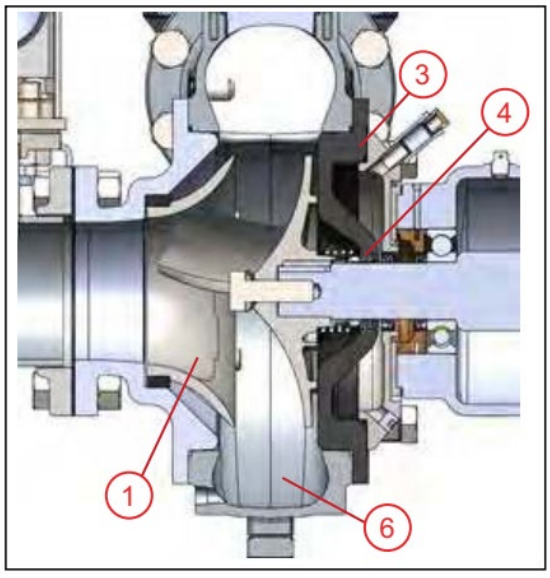
1. Loosen the impeller by using the impeller shaft tool on the pump drive shaft.
   - Make sure to engage the keyway on the shaft.
   - Verify the handle of the impeller shaft tool touches the work surface on the left side of the rotating assembly when facing the power input end of the rotating assembly.
   - Being careful of sharp edges, sharply turn the impeller counterclockwise so the handle of the impeller shaft tool impacts the work surface at the end of the rotation.
   - Repeat as many times as necessary to loosen the impeller.
2. If there are impeller adjusting shims on the pump shaft at the back of the impeller, remove, mark, and safely store them until reassembly.



Mechanical Seal, Backplate, & Volute Removal

1. Remove the impeller to expose the seal.
2. Slide the bellows, spring, and retainer off the pump shaft as a unit.
   - Apply a thin layer of oil to the pump shaft to help free the parts.
3. Remove the backplate straight off of the shaft, careful not to dam- age any parts.
   - Take out the screws between the backplate and the bearing housing.
4. Press the stationary seat of the seal out of its bore in the backplate.
5. Inspect the seal faces for uneven wear, cracks, or any other irregularities. Replace as needed.
   - If reusing the mechanical seal, clean with an electrical contact cleaner and a lint-free cloth.
6. Inspect the volute for excessive or unusual wear, signs of cavitation, and other irregularities.

NOTE: If welding to repair, use proper equipment and procedures based on the metallurgy of the volute.



REASSEMBLY

WARNING

Risk of severe injury or property damage.

- When lifting or moving heavy components, use suitable lifting equipment, in good condition, rated for at least 5 times the weight of the materials being moved.
- Never stand under a load as it hangs in the sling or hoist.
- If items are dropped, banged, or mistreated in any way, misalignment and malfunction can occur.
- If the pump or components are hot, allow adequate cooling prior to servicing the unit.
- Safety glasses, heat resistant welder's gloves, cut-resistant gloves, and safety boots should be worn. Use proper protective gloves and clothing when handling heated parts.

Torque Specifications

Follow this chart where the torque is not mentioned in the manual text. Remko uses SAE grade 5 hardware as standard. Grade 5 hardware can be distinguished by the three marks on the head of the cap screw.

Size UNC (inch)	Wrench (inch)	Bolt Torque ft-lb (Nm)		
		304 SS	Grade 5 Bolts	Grade 8 Bolts
1/4	7/16	3 (4)	9 (12)	13 (18)
5/16	1/2	7 (9)	19 (26)	27 (37)
3/8	9/16	13 (17)	34 (46)	48 (65)
7/16	5/8	20 (27)	54 (73)	77 (104)
1/2	3/4	31 (42)	83 (113)	117 (159)
9/16	13/16	45 (61)	120 (163)	170 (230)
5/8	15/16	63 (85)	165 (224)	234 (371)
3/4	1-1/8	112 (152)	293 (397)	415 (563)
7/8	1-5/16	180 (244)	474 (643)	670 (908)
1	1-1/2	270 (366)	710 (963)	1000 (1356)
1-1/4	1-7/8	540 (732)	1421 (1927)	2000 (2711)

Pump End Reassembly

WARNING

Risk of severe injury or property damage.

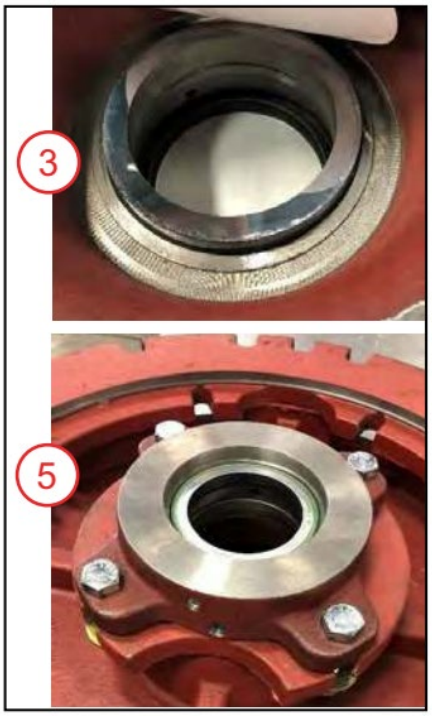
- When lifting or moving heavy components, use suitable lifting equipment, in good condition, rated for at least 5 times the weight of the materials being moved.
- Touching the seal face with your fingers can damage the seal face. Wear rubber gloves during assembly.

Backplate Assembly

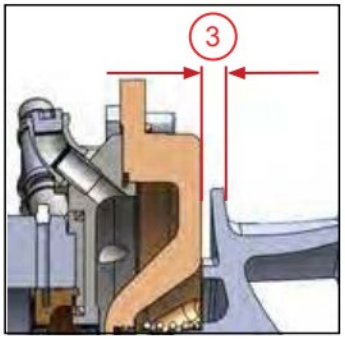
1. Install the backplate lip seals and the run dry lip seals in the backplate.
   - Orient the lip seals correctly.
2. Apply a coat of oil or grease to the lip seals and slide the backplate over the pump shaft.
   - Protect the lip seals from damage.
   - Make sure the backplate drain port is in the 6 o'clock position.
3. Secure the backplate to the bearing housing using the cap screws removed during disassembly.
   - Refer to "Torque Specifications" on earlier pages.
4. Using a hand-operated grease gun, apply two or three shots of grease between the lip seals.

Mechanical Seal Installation

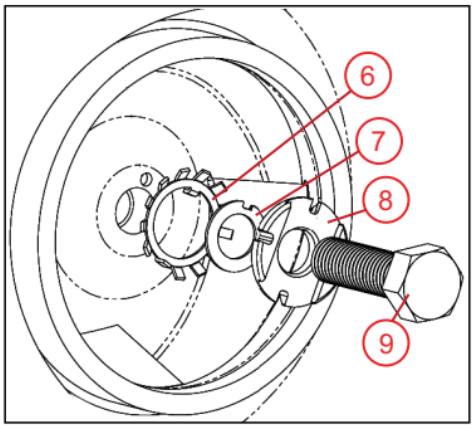
1. Use an abrasive cleaning cloth (such as Scotch-Brite™) to clean the surface around the seal location on the backplate and to break any sharp edges or burrs.
   - A good de-greaser or brake cleaner can be used on the seal location.
   - Use a lint-free cloth to wipe the area clean.
2. Inspect and repair the seal gland as needed.
   - Break any sharp or irregular edges and clean the part completely before contemplating assembly.
   - Any good light grease or engine oil additive can be used during assembly as long as it does not contain any silicone.
3. Install the mechanical seal stationary face into the seal gland.
4. Clean the seal gland with an electric contact cleaner (or similar) and a lint-free cloth.
5. Install the seal gland.
6. Clean the rotating seal face with an electric contact cleaner (or similar) and a lint-free cloth.
   - A light coating of ISO 32 oil can be used to coat both seal faces and the pump shaft.
7. Taking care to not cut any O-rings, slide the rotating seat along the pump shaft until it comes into contact with the stationary seat.
   - A soft plastic pipe can be used to gently tap the rotating face into contact with the stationary face.



Impeller Assembly - Lock Screw



1. Reinstall the shims that were in the impeller bore during disassembly.
2. Install the impeller key and impeller in the pump shaft.
3. Make sure the clearance between the impeller and the backplate shroud is correct.
   - The measurement should have been taken before removal during disassembly.
   - If necessary, adjust by adding or subtracting shims in the impeller bore.
4. Install the impeller on the pump shaft.
5. Clean the new impeller screw, including its threads, and apply a thread sealant, such as Loctite® 2760, entirely around the first two threads of the impeller screw.
   - Every time the screw is removed, install a new one.
6. Install the tong washer.
7. Install the impeller screw retaining washer.
8. Insert the centering washer.
9. Install the impeller screw so its head engages the impeller screw retaining washer.
10. Restrain the impeller or pump shaft and, using a wrench, tighten the impeller screw to the specified torque in the table below.



NOTE: Correct torque is essential to the wear and performance of the impeller screw.

11. Align the closest slot on the impeller screw retaining washer with a tong on the tong washer. Bend the tong into the slot.

Size UNC	Wrench (inch)	17-4 PH
3/8	9/16	40 (54)
1/2	3/4	90 (122)
5/8	15/16	180 (244)
3/4	1-1/8	330 (447)

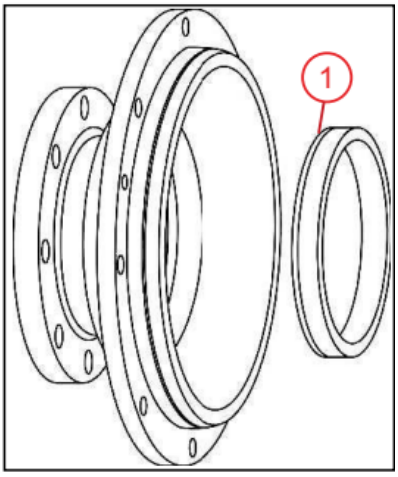
Impeller Assembly - Threaded Shaft

1. Reinstall any shims that were removed from the impeller during disassembly.
2. Use anti-seize compound on the shaft threads and tightly screw on the impeller.
3. Using a feeler gauge, make sure the clearance between the back vanes of the impeller and seal plate is between 0.20" (0.51 mm) and 0.040" (1.00 mm).
   - Adjust the clearance by placing shims between the hub face of the impeller and the end of the shaft sleeve in the mechanical seal assembly.

Volute Assembly

1. Apply grease to the O-ring to help avoid damage.
2. Install a new O-ring to the backplate.
3. Lift the volute into position on the backplate.
   - Making sure the volute discharge nozzle is in the correct position to connect with the pipes when the pump is installed.
4. Secure the volute using the hardware that was removed during disassembly.

Suction Cover & Wear Ring Assembly



1. To install a new wear ring inside the suction cover:
   - Fit the wear ring with the chamfered edge toward the suction flange.
   - Apply anti-seize lubricant around the outer diameter of the wear ring and tap it evenly into its bore using a non-metallic hammer.
   - Be sure the wear ring is all the way in and seated against the shoulder in the bore.
2. Apply grease to the suction cover O-ring to help avoid cutting or nicking.
3. Install a new O-ring to the suction cover.
4. Support the suction cover using a suitable sling.
5. Secure the suction cover to the volute using the same hardware that was removed during disassembly.
   - Insert the two cap screws into the suction cover.
   - Insert the cap screws that go between the suction cover and volute.
6. Lubricate the run dry system. Refer to "Lubrication" section.
7. If applicable, reconnect the external balance line to the suction cover, suction spool, or backplate.

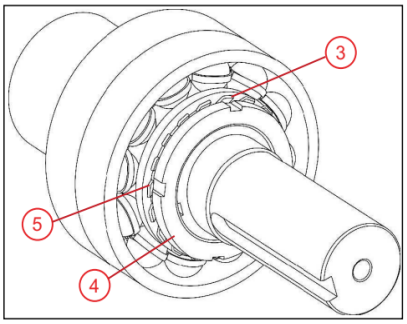
Bearing Frame Reassembly

WARNING

Risk of severe injury or property damage.

- When lifting or moving heavy components, use suitable lifting equipment, in good condition, rated for at least 5 times the weight of the materials being moved.
- Always follow the bearing manufacturer's instructions when handling and installing the bearing.
- Do not exceed 220°F (105°C) if heating bearings, as this will cause premature damage.

Bearings Assembly

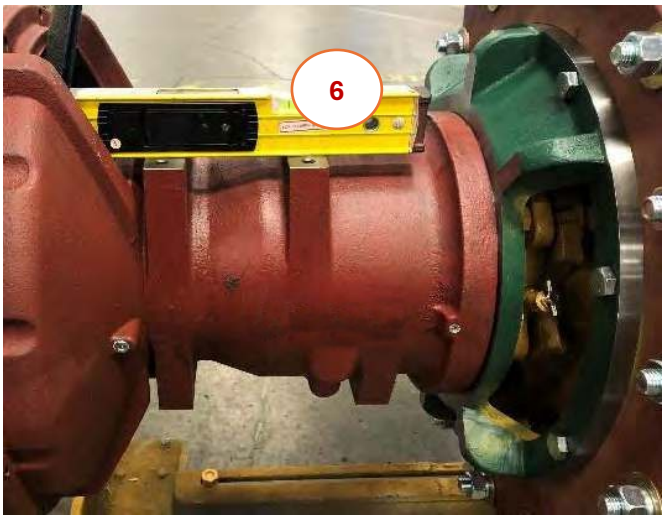


1. Use an electrical induction heater or hot plate to evenly preheat the pump-end bearing. While the pump-end bearing is hot, slide it into position on the shaft.
   - Alternatively, use a sleeve and hydraulic press on the inner race of the bearing.
   - Verify the bearing inner race is squarely and fully seated against the shoulder on the pump shaft.
   - Check the bearing at the pump end for a tight press fit.
2. Install the drive-end bearing.
   - Heating the bearings is recommended, but not necessary.
   - The bearing(s) inner race(s) must be seated squarely against the pump shaft shoulder.
   - For two angular contact bearings, ensure the "thin" sides of the inner races face each other.
3. With the tabs pointing away from the bearing, install the bearing washer at the opposite drive-end.
   - Make certain the tab on the inside diameter of the bearing washer engages the slot on the shaft.
4. Install the bearing nut with the bevelled side toward the bearing.
   - Tighten the nut until it is firmly in place and one of the washer tabs aligns with a slot in the nut.
5. Bend one of the tabs on the outside diameter of the bearing washer down into one of the slots on the outside diameter of the bearing locknut.

Bearing Frame Housing Reassembly

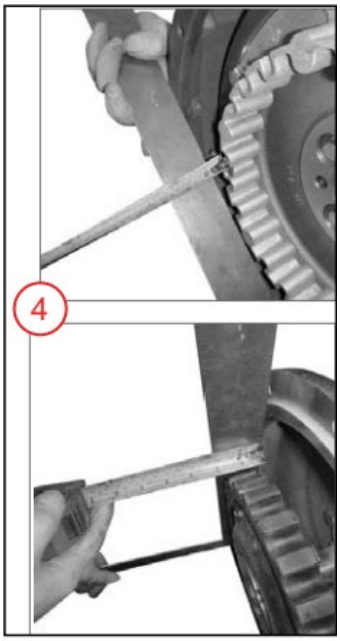
1. Be sure the bearings have cooled to room temperature, the housing is clean, and any burrs or irregularities have been removed.
2. For grease-lubricated bearings, pack with specified grease.
3. If the drive-end bearing has single-bearing configuration:
   - Insert the bearing spacer into the bearing frame housing.
   - Install the shaft/bearing assembly so the spacer sits squarely against the housing shoulder.
4. For double angular contact bearing configuration, install the shaft/bearing assembly directly into the bearing frame housing so the pump-end bearing completely engages its bearing bore.
5. Verify all bearings have a snug fit in the frame.
6. For pumps to be fitted with an SAE bracket or bearing cap:
   - Install the bearing shims that were removed during disassembly.
   - Use a dial indicator to make sure the shaft end play is between 0.002" (0.0508 mm) to 0.010" (0.254 mm). Adjust the shims between the SAE bracket/bearing cap and the housing if needed.
7. Before installing the SAE bracket on grease-lubricated frames, pump grease into the fitting to purge the passages of contamination.
8. For grease-lubricated frames, verify all four rubber plugs are in place on the bracket.
9. To install the SAE bracket, refer to “SAE Housing & Coupler Reassembly” section.
10. If applicable, install a bearing cap and tighten its cap screws.
    - For oil-lubricated designs, use lip seals in the cap.
11. Push in the bearing isolator at the pump-end of the bearing frame by hand so the weep hole (slot in the isolator) is at the bottom of the bore and the alignment mark is at the top (12 o'clock position).
    - If needed, use a non-metallic driver with a hammer to tap the isolator into the bore.

NOTE: Bearing isolators (also called labyrinth seals) prevent pumpage from entering the bearing frame, and, for oil-lubricated frames, oil from entering the housing. They are designed to leak when the pump is at a 7° angle or greater.



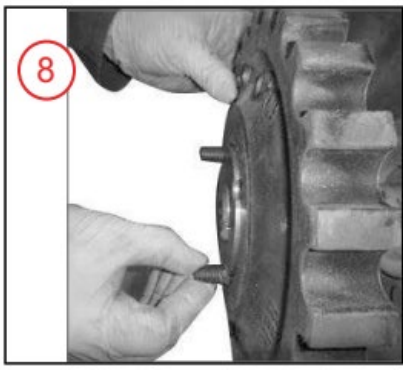
SAE Housing & Coupler Reassembly

1. Install the SAE bracket to the bearing frame and tighten the attaching cap screws.
    - For oil-lubricated designs, use lip seals in the bracket.
    - Refer to "Torque Specifications" section.
2. To reinstall the vacuum pump drive on Remko pumps, refer to "Vacuum Assist System Reassembly" section.
3. Use Loctite® 243 or similar on the attaching hardware and anti-seize on the outer (housing) bolts.
4. Centre the rubber inner spline to provide adequate engagement to drive the pump and maintain enough connection with the engine flywheel.
    - The distance from the engine block housing flange to the far edge of the metal spline is 5/8" (16 mm). This will be compared to the measurement from the SAE bracket flange (on the pump) to the inside edge of the rubber spline to ensure proper engagement between the two parts.
    - It is recommended to have the edge of the metal spline protruding as much as 1/8" (3 mm) beyond the rubber spline and not less than flush between the two parts.



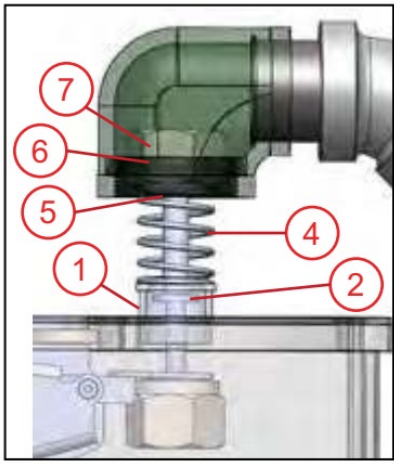
NOTE: The metal spline is attached to the flywheel.

5. Check the pump's drive shaft key and keyway for proper fit. Use a file to adjust if they are too tight.
6. Insert the metal hub into the rubber spline, using Loctite® 660 or similar to fix the two parts together.
7. Assemble the rubber spline and hub assembly to the pump shaft, making sure the pump side of the rubber spline and the SAE bracket are about 7/8" (23 mm) apart.
    - About 1/4" (6 mm) is added to the 5/8" (16 mm) distance to account for the lip on the housing that will protrude inside the engine bell housing.
8. Apply Loctite® 243 or similar to the set screws and install them in their hub holes.
    - The third hole is threaded and is used as a "jacking hole" during disassembly.
    - Tighten the set screws to 175 ft-lbs (237 Nm).



9. Support the pump and engine independently.
10. Align and assemble the engine and the pump.
    - Align and index the rubber spline with the metal spline.
    - If the SAE housing screw holes align, the pump to engine alignment will be correct.
11. Tighten the screws on the housing.

Priming Chamber & Linkage Reassembly



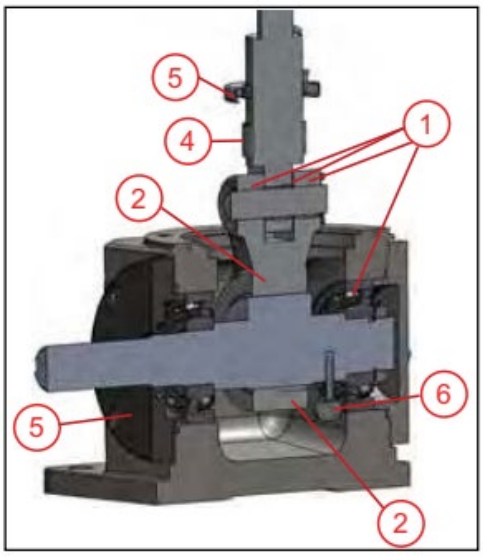
1. Install the valve seat in the adapter flange.
2. Make sure the poppet O-ring is installed properly between the two retaining lips on the valve stem.
3. Insert the valve stem into position from below the priming chamber cover.
4. Reinstall the valve spring.
5. Insert the valve shims.
6. Install the valve spring retainer.
7. Secure the Prime chamber assembly with its nyloc nut.
8. Tighten the nyloc nut until it is in firm contact with the valve spring retainer.
9. Reassemble the linkage to the priming chamber cover
    - Make sure any shims that were removed from the linkage bracket during disassembly are reinstalled.

Priming Chamber Valve Adjustment

1. Hold the ball and linkage straight up to verify the upper linkage arm is about parallel with the priming chamber lid.
2. Verify the fork, welded to the upper linkage arm, is about parallel with the washer on the bottom of the prime chamber stem.
3. Using a feeler gauge, measure the clearance between the washer and the fork.
    - The correct clearance should be 0.03" to 0.09" (0.75 mm to 2.0 mm).
4. To adjust the clearance, insert shims between the linkage bracket and the priming chamber cover.

Vacuum Assist System Reassembly

Crankshaft & Actuator Shaft Bearings Reassembly



NOTE: If the connecting rod is new, no machining or reaming will be required.

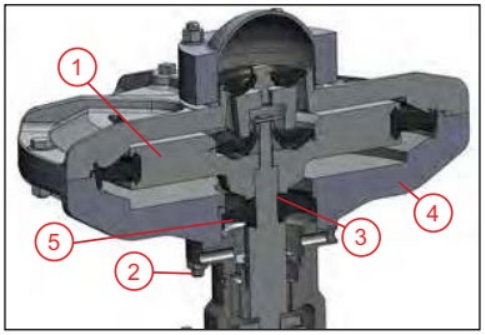
1. Press the connecting rod small-end bearings and the actuator shaft guide bearing into the crankshaft using a suitable mandrel.
    - Ream them to an inside diameter of 0.6255" to 0.6260" (15.88 to 15.90 mm).
2. To install a new connecting rod large-end bearing, press it in using a suitable mandrel.
    - Align the joint to the left or right side of the connecting rod bore.

NOTE: This bearing does not require finishing after machining.

3. If applicable, press the drive-end bearing cap lip seal into the counter-bore on the inside of the bearing cap with the lip pointing toward the crankcase.
4. Install the actuator shaft guide bearing.
5. Wipe the inside diameter of the actuator shaft lip seal with a thin layer of grease.
6. Insert the actuator shaft lip seal with the lip pointing downward.

Lower Housing Reassembly

1. Slide the shaft-end ball bearing on the crankshaft until it is securely up against the shaft shoulder.
    - If it does not slide on by hand, evenly heat it to approximately 200 °F (95 °C) using an oven or a hot plate.
2. Hold the connecting rod in the crankcase and slide the crank- shaft assembly through the drive-end opening of the crankcase through the connecting rod large-end bearing.
3. Install the opposite drive-end bearing onto the crankshaft through bore until it is securely up against the shaft shoulder.
    - If it does not slide on by hand, heat uniformly to approximately 200 °F (95 °C).
4. Assemble the bearings. Refer to “Bearings Assembly” section.
5. Reinstall the opposite drive-end bearing cap.
    - Ensure the bearing cap O-ring is on the bearing cap.
6. Reinstall the oil flinger in the crankshaft.
7. Slide the fulcrum pin through the bores in the connecting rod and the actuator shaft.
8. Install the fulcrum pin retaining rings on the fulcrum pin.
9. With its O-ring in place, reinstall the pedestal to the crankcase, tightening the cap screws.
    - Refer to “Torque Specifications”.
10. Lubricate the inside diameter of the neck seal and push the neck seal over the end of the actuator shaft.



Actuator Seal Installation

The actuator seal will normally be replaced once it has been removed. Installed it with the taper on the outside diameter parallel to the lower housing (the larger diameter at the top of the actuator).

1. With the actuator clamped in a vice, thoroughly lubricate the inside diameter of the actuator seal and the groove in the actuator.
2. Starting at the 12 o’clock position, work the seal into the groove one small section at a time using a blunt tool (such as a wrench handle).

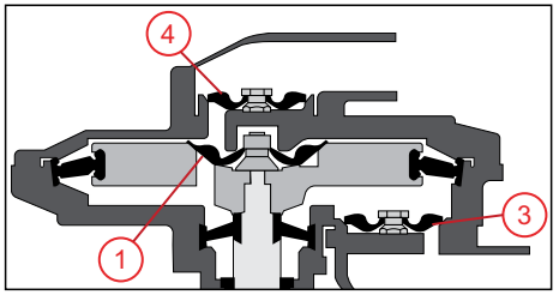
NOTE: To avoid bunching the seal in one location, work the seal onto the actuator in four sectors.

3. With the actuator clamped in a vice:
    - Apply heat directly to bore for 30 to 40 seconds.
    - Apply heat to top of actuator for 15 to 20 seconds.
    - Apply heat to bore again for 15 to 20 seconds.
4. Insert the heated actuator into the actuator shaft.
5. Apply Loctite® 262 or similar thread-locking fluid to the actuator shaft threads.
6. Install the castle nut, aligning one of its slots with the cotter pin hole through the actuator threads and tighten to 25 ft-lbs (34 Nm).
7. Insert the cotter pin.

Valves & Upper Housing Reassembly

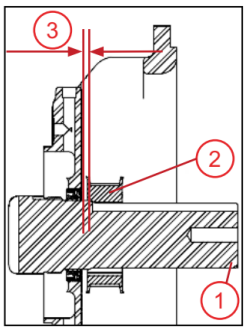
NOTE: For aluminium housings, be careful not to over-tighten parts, as the threads may be damaged.

1. To install a new actuator valve:
   - Lubricate the head of the valve stud and push the actuator valve over the head of the valve stud.
   - Apply thread-locking fluid (Loctite® or similar) to the threads.
   - Reinstall the castle nut, tightening it to 25 ft-lbs (34 Nm).
   - Insert the cotter pin.
2. Secure the upper housing to the lower housing.
   - Earlier aluminium versions used a blind hole arrangement.
   - Tighten the cap screws for aluminium torque.
   - Recent versions have a through hole with cap screw and nut arrangement. Tighten the cap screws for steel torque
   - Refer to “Torque Specifications” section.
3. To reinstall a new inlet valve:
   - Lubricate the head of the valve stud.
   - Push the exhaust valve on over the head of the valve stud.
   - Reattach the exhaust nozzle to the upper housing.
   - Snug the screws for aluminium settings, referring to “Torque Specifications” section.
   - Check the condition of its carrier gasket and replace if necessary.
4. To install a new exhaust valve, follow the same procedure as installing an inlet valve (3).



System Alignment

1. Make sure the drive belt is aligned between the pulley on the drive-end of the centrifugal pump shaft and the pulley on the vacuum pump.
2. Position the drive pulley on the centrifugal pump drive shaft.
3. Factory assembly of the vacuum pump drive shaft pulley on the main pump drive shaft is set at 3/16" (4.76 mm) from the SAE housing.



Belt Reassembly & Tension

NOTE: For aluminium housings, be careful not to over-tighten parts, as the threads may be damaged.

For top-mounted vacuum pumps, adjust by adding or subtracting shims at the vacuum pump base and at the mounting surface until the drive belt is just tight enough to eliminate slack.

For side-mounted vacuum pumps:

1. Remove the belt guard.
2. Loosen the four vacuum pump drive mounting screws.
3. Loosen the nut and locknut on the adjusting screw.
4. Relax or tighten the adjustment of the belt as needed.
5. Use a belt tension gauge. Tightness should be 5.6 lbs at 0.14" deflection (2.5 kg at 3.5 mm).
6. Tighten the locknut and mounting screws and replace the belt guard.

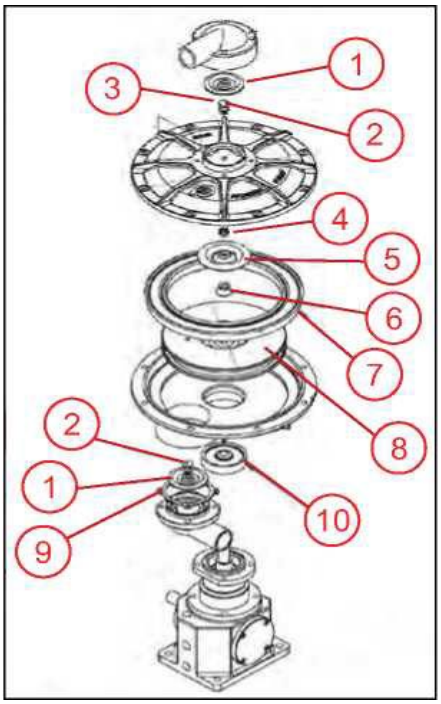
TROUBLESHOOTING

Problem	Probable Causes	Corrective Action
Pump will not prime	Blockages on suction pipe	Inspect strainers and other potential sources of blockage on suction piping. Open or, preferably, eliminate valves on suction piping.
	Priming chamber valve is closed	Open ball valve on top of priming chamber.
	System is leaking	Inspect suction piping, priming system, and discharge check valve for leaks. Tighten flanges as needed. Replace worn gaskets or piping as needed.
	Volute case drain ball valve open	Close the drain ball valve.
	Vac-assist system is not operating properly	Inspect the vacuum priming system, including pump and vacuum chamber. Use vacuum plate with gauge to verify proper operation of vacuum pump.
	Insufficient NPSHA (Noise may not be present)	Recalculate NPSH available. It must be greater than the NPSH required by pump at desired flow.
Pump is carrying over	Flooded suction	Close ball valve on top of priming chamber.
	Priming Valve is compromised	Inspect priming valve and linkage. Replace worn parts.
	Pump is running off curve	Replace with different pump or model or adjust flow to within limits.
Inadequate flow	Insufficient NPSHA (Noise may not be present)	Recalculate NPSH available. It must be greater than the NPSH required by pump at desired flow.
	System is leaking	Inspect suction piping, priming system, and discharge check valve for leaks. Tighten flanges as needed. Replace worn gaskets or piping as needed.
	Worn pump internals, such as cutwater, wear ring, etc.	Inspect pump volute cutwater and wear ring. Replace as needed.
	Blockage in the system	Inspect impeller for ragging, fouling, or blockage. Clean as needed.
	Impeller trim is wearing out	Replace impeller.
	Closed discharge valves	Check and open all valves completely.
Inadequate pressure	System is leaking	Repair or tighten piping.
	Wear ring is worn	Check wear ring clearance. Replace wear ring parts as necessary.
	Worn pump internals, such as cutwater, wear ring, etc.	Inspect pump volute cutwater and wear ring. Replace as needed.
	Insufficient NPSHA (Noise may not be present)	Recalculate NPSH available. It must be greater than the NPSH required by pump at desired flow.
	Impeller trim is wearing out	Replace impeller.
Pump is making strange noises	Pump is running off curve	Replace with different pump.
	Suction is blocked	Make sure water level is deep enough and strainer and piping is clean.
	Impeller and/or wear ring is rubbing	Inspect components for rub marks.
	Insufficient NPSHA	Recalculate NPSH available. It must be greater than the NPSH required by pump at desired flow.
Mechanical seal is failing	Fluid temperature is too high	Make sure pumped fluid is less than 350 °F (177 °C) for standard centrifugal pumps. Make sure pumped fluid is less than 200 °F (93 °C) for pumps with Remko Priming System.
	Fluid is incompatible with pump	Refer to the pump owner's manual for fluid compatibility.
	Casing pressure is too high	Make sure casing pressure is no more than 250 PSI (17.23 BAR).
	Fluid is too abrasive	Check fluid composition and percent of solids. Refer to the pump's specifications.

TECHNICAL REFERENCES

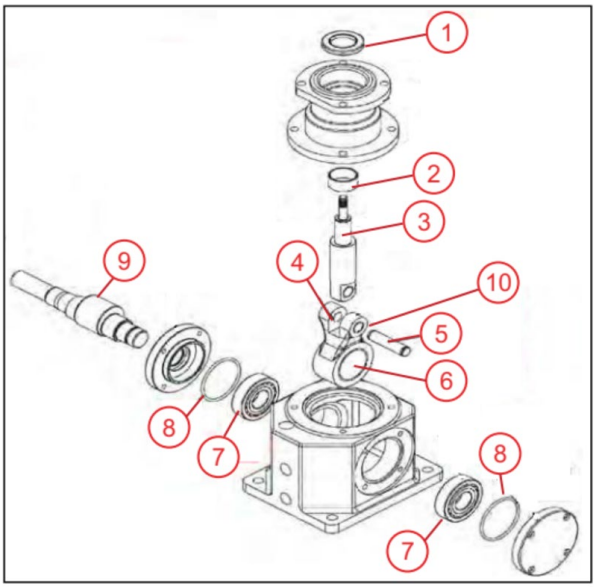
Vacuum Pump and Priming Chamber Parts

Upper Vacuum Pump Kit Parts



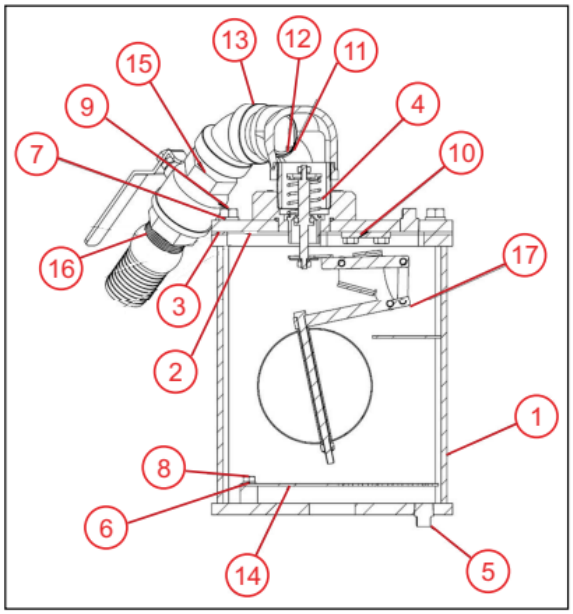
Item	Description	Qty
1	Inlet/exhaust valve	2
2	Inlet/exhaust valve stud	2
3	Cotter pin	1
4	Castle nut	1
5	Actuator valve	1
6	Actuator washer	1
7	Actuator seal	1
8	Actuator	1
9	Neck seal	1
10	Inlet nozzle gasket	1
-	Housing Fasteners	8
-	Flat Washer	1

Lower Vacuum Pump Kit Parts



Item	Description	Qty
1	Actuator Shaft Lip Seal	1
2	Guide busing, actuator shaft	1
3	Actuator shaft with bushing	1
4	Bushing, connecting rod, small end	2
5	Fulcrum pin	1
6	Bushing, connecting rod, large end	1
7	Bearings, shaft end	2
8	O-rings, bearing cap	2
9	Crank shaft	1
10	Retaining ring, fulcrum pin	1
-	Lock nut, bearing	1
-	Lock washer, bearing	1
-	Lip seal, bearing cap	1
-	O-ring, pedestal	1
-	Oil flinger	1
-	Stud Assembly (4 pack)	1

Compact Priming Chamber Subassembly Parts



Item	Description
1	Priming Chamber
2	Lid
3	Gasket, lid
4	Valve, priming, subassy
5	1/2 inch NPT pipe plug
6	Washer, split lock, 5/16 inch 304SS
7	Washer, split lock, ½ inch plated
8	Bolt, 5/16-18 x 0.75inch GR-5
9	Bolt, 1/2-13 x 1.25 inch GR 5
10	Bolt, 3/8-16 x 0.62 inch 304SS
11	Elbow, 2 inch x 1-1/2 inch NPT, 90°
12	Nipple, 1-1/2 inch NPT Close
13	Elbow, 1-1/2 inch NPT 45°
14	Strainer Plate
15	Ball valve, 1-1/2 inch, bronze
16	King nipple 1-1/2 inch NPT x 2 inch hose
17	Linkage assembly, GEN3 fixed ball

NOTES

Remko

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