

Owner/Operator Manual

For Pump Models: Titan, Sidewinder, Hydra and Cobra



Warning! This Manual includes important product safety information. Misuse of this product may result in severe injury or death. Read this manual carefully before attempting to use this product.



Record of Purchase

Serial Number: _____

Date Purchased: _____

Please carefully read the installation, operation and maintenance instructions for your Masport vacuum pump. These are provided to assist you and they assume users have a basic level of mechanical competence.

If you have any questions about the correct installation, operation or maintenance procedures, please ask Masport.

Masport Standard Limited Warranty

Limited Warranty:

THE LIMITED WARRANTY SET FORTH IN THIS SECTION (THIS “LIMITED WARRANTY”) GIVES YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS, WHICH VARY FROM STATE TO STATE.

SUBJECT TO THE TERMS SET FORTH HEREIN, MASPORT HEREBY WARRANTS THAT DURING THE WARRANTY PERIOD (DEFINED BELOW) THE PRODUCTS PURCHASED FROM MASPORT ON THE SITE OR OTHERWISE WILL, IN NORMAL AND INTENDED USE AND SERVICE, BE FREE FROM DEFECTS IN MATERIAL AND WORKMANSHIP.

OUR RESPONSIBILITY FOR DEFECTIVE PRODUCTS IS LIMITED TO REPAIR OR REPLACEMENT AS SET FORTH IN THIS LIMITED WARRANTY. NEITHER ANY PERFORMANCE OR OTHER CONDUCT, NOR ANY ORAL OR WRITTEN INFORMATION, STATEMENT, OR ADVICE PROVIDED BY US OR ANY OF OUR SUPPLIERS, AGENTS, OR EMPLOYEES WILL CREATE A WARRANTY, OR IN ANY WAY INCREASE THE SCOPE OR DURATION OF THIS LIMITED WARRANTY.

Who May Use This Limited Warranty?

This Limited Warranty extends only to the Customer and the original end-user (if such original end-user is someone other than the Customer). As such, this Limited Warranty does not extend to any subsequent or other owner, transferee, or beneficiary of the Products.

What Does This Limited Warranty Cover?

During the Warranty Period, this Limited Warranty covers defects in materials and workmanship in Products purchased from Masport on the Site or otherwise.

What Is The Period Of Coverage Under This Limited Warranty?

This Limited Warranty starts on the date set forth on the Order Confirmation to Customer for the warranted Products and lasts for twelve (12) months thereafter (the “Warranty Period”).

How Do You Obtain Warranty Service?

The Customer or original end-user must provide notice of covered defects in writing to Masport during the Warranty Period and within thirty (30) calendar days following the Customer’s or original end-user’s discovery of such defect (the “Notice Period”).

What Does This Limited Warranty Not Cover?

Notwithstanding anything herein to the contrary, this Limited Warranty does not cover any of the following, each of which are hereby expressly excluded therefrom:

- A. Defects that are not discovered during the Warranty Period;
- B. Defects that are not reported to Masport in writing within the Notice Period;
- C. Usual and customary deterioration or wear resulting from normal use, service, and exposure;

- D. Any Products that are transported outside of the United States;
- E. Any shortages or discrepancies, all of which shall be exclusively governed by the Inspection and Claims section of these Terms set forth above;
- F. Any claims for loss, damage, cost, or expense caused by any delay or damage in shipment or delivery damage, all of which shall be exclusively governed by the terms set forth in the Product Delivery section above;
- G. Shipping or other costs incurred to return the Products to Masport for warranty inspection;
- H. Damage to persons or property other than the Products, or for any incidental, consequential, or special damages.
- I. Any defect and/or any loss, damage, cost, or expense incurred by Customer, original end-user, or any third party to the extent the same arise out of, relate to or result, in whole or in part, from any one or more of the following:
 - 1. Theft, vandalism, accident, war, insurrection, fire or other casualty;
 - 2. Defects or damage caused by the Customer, original end-user, or any third party;
 - 3. Exposure to corrosive, chemical, ash, smoke, fumes, or the like;
 - 4. Any Products that have been altered, modified, or repaired by Customer, original end-user, or any third party without Masport's prior written consent;
 - 5. Failure to perform any preventative maintenance;
 - 6. Storage;
 - 7. Combination or use of the Products with any products, materials, processes, systems, or other matter not provided or authorized in writing by Masport;
 - 8. External causes such as accidents, abuse, or other actions or events beyond our reasonable control; or
 - 9. Any misuse of the products, including any use of the Products not in conformity with product manuals or contrary to product warnings.

Resolution of Warranty Claims:

In the event Masport is notified of a warranty claim in conformity with the notice requirements set forth above, Masport shall, with the full cooperation of Customer and/or original end-user (which shall include, without limitation, return of the Products for warranty inspection if requested by Masport), immediately undertake an investigation of such claim. To the extent Masport determines, in its sole discretion, that the warranty claim is covered by this Limited Warranty, Masport will, as Customer and original end-user's sole and exclusive remedy and at Masport's option, either:

- A. Ship replacement products to Customer or original end-user; or
- B. Ship repaired product(s) to Customer or original end-user.

Masport shall not be responsible to Customer or original end-user for the cost of dismantling any defective Products or installing replacement Products, all of which shall be and for all purposes remain the sole responsibility of Customer and original end-user.

Customer's Responsibility to Masport Concerning Original End-Users:

Customer warrants and represents that if it resells any Products or incorporates any Products into its own merchandise for the purpose of sale, Customer will:

- A. In all instances causes such purchaser to be bound by, and agree to, this Limited Warranty as set forth herein, including all terms and limitations thereof;
- B. Properly affix all warning labels to all Products;
- C. Provide the applicable Masport product manuals to such purchasers.

Disclaimer of Implied Warranties:

CUSTOMER EXPRESSLY ACKNOWLEDGES AND AGREES THAT: (I) THIS LIMITED WARRANTY SET FORTH HEREIN IS AN INTEGRAL PART OF THE AGREEMENT PURSUANT TO WHICH THE PRODUCTS WERE PURCHASED; (II) CUSTOMER (FOR ITSELF AND ON BEHALF OF THE ORIGINAL END-USER, IF APPLICABLE) HAS ACCEPTED THIS LIMITED WARRANTY AS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY MASPORT TO CUSTOMER AND ORIGINAL END-USER WITH RESPECT TO THE PRODUCTS; AND (III) THIS LIMITED WARRANTY IS REFLECTED IN THE PURCHASE PRICE FOR THE PRODUCTS. MASPORT MAKES NO OTHER REPRESENTATIONS OR WARRANTIES OF ANY KIND, WHETHER EXPRESS OR IMPLIED, BY OPERATION OF LAW OR OTHERWISE, WITH RESPECT TO ANY PRODUCTS, GOODS, OR SERVICES SOLD OR PROVIDED TO THE CUSTOMER PURSUANT TO THE AGREEMENT OR OTHERWISE, INCLUDING WITHOUT LIMITATION ANY REPRESENTATION OR WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE OR USE, ALL OF WHICH ARE EXPRESSLY HEREBY DISCLAIMED.

Limitation on Liabilities and Damages:

THE REMEDIES DESCRIBED ABOVE ARE YOUR SOLE AND EXCLUSIVE REMEDIES AND OUR ENTIRE OBLIGATION AND LIABILITY FOR ANY BREACH OF THIS LIMITED WARRANTY OR THE AGREEMENT. TO THE FULLEST EXTENT PERMITTED BY LAW, IN NO EVENT SHALL MASPORT BE LIABLE FOR ANY SPECIAL, INDIRECT, PUNITIVE, COVER, INCIDENTAL OR CONSEQUENTIAL DAMAGES, HOWEVER CAUSED, WHETHER IN CONTRACT OR TORT OR UNDER ANY OTHER THEORY OF LIABILITY, INCLUDING WITHOUT LIMITATION, LOSS OF REVENUE, ANTICIPATED PROFITS, BUSINESS OR SALES, ANY LOSS OF GOODWILL OR REPUTATION, OR THE COSTS OF SUBSTITUTE GOODS OR PRODUCTS, EVEN IF MASPORT OR AN AUTHORIZED REPRESENTATIVE THEREOF HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN ADDITION, TO THE EXTENT PERMITTED BY APPLICABLE LAW, WE (INCLUDING OUR PARENT, SUBSIDIARIES, AND AFFILIATES, AND OUR AND THEIR OFFICERS, DIRECTORS, MANAGERS, AGENTS, AND EMPLOYEES) ARE NOT LIABLE, AND YOU AGREE NOT TO HOLD US RESPONSIBLE, FOR ANY DAMAGES OR LOSSES RESULTING DIRECTLY OR INDIRECTLY FROM:

- A. YOUR USE OF OR YOUR INABILITY TO USE OUR PRODUCTS;
- B. SUSPENSION OR OTHER ACTION TAKEN WITH RESPECT TO THE PRODUCTS OR BREACH OF ANY OF THESE TERMS; OR
- C. YOUR NEED TO MODIFY PRACTICES, CONTENT OR BEHAVIOR OR YOUR LOSS OF OR INABILITY TO DO BUSINESS, AS A RESULT OF CHANGES TO THE AGREEMENT.

NOTWITHSTANDING ANYTHING CONTAINED HEREIN TO THE CONTRARY, IN NO EVENT SHALL THE TOTAL LIABILITY OF MASPORT TO YOU OR ANY THIRD PARTY FOR ALL DAMAGES, LOSSES, AND CAUSES OF ACTION (WHETHER IN CONTRACT OR TORT, INCLUDING, BUT NOT LIMITED TO, NEGLIGENCE, PRODUCT LIABILITY OR OTHERWISE) ARISING FROM THE AGREEMENT OR YOUR PURCHASE OR USE OF THE PRODUCTS EXCEED, IN THE AGGREGATE, THE LISTED PURCHASE PRICE PAID BY YOU FOR THE PRODUCTS YOU PURCHASED PURSUANT TO THE TERMS HEREUNDER.

Some jurisdictions do not allow the exclusion of damages, so such exclusions may not apply to you. The limitation of liability set forth above shall only apply to the extent permitted by applicable law.

Limitation on time to file claims:

TO THE FULLEST EXTENT PERMITTED BY LAW, ANY CAUSE OF ACTION OR CLAIM YOU MAY HAVE ARISING OUT OF OR RELATING TO THE AGREEMENT OR YOUR USE OF OUR PRODUCTS MUST BE COMMENCED WITHIN SIX (6) MONTHS AFTER THE CAUSE OF ACTION ACCRUES, OTHERWISE, SUCH CAUSE OF ACTION OR CLAIM IS PERMANENTLY BARRED.

Indemnification:

You agree to indemnify and hold harmless Masport, its affiliated companies and their respective officers, directors, employees, managers, agents, successors, and assigns ("Indemnified Parties") from and against any claim or demand (including reasonable attorneys' and experts' fees and costs) made by any party due to or arising out of your (a) breach of the Agreement, (b) improper use of the Products, (c) breach of any law or the rights of a third party, or (d) failure to strictly comply with your obligations to Masport concerning original end-users or any representations made by you to such original end-user. Masport shall promptly notify you in writing of any threatened or actual claim or demand and reasonably cooperate with you to facilitate the settlement or defense thereof. You shall have sole control of the defense or settlement of any claim or demand, provided that Masport, at our option and expense, may participate and appear on an equal footing with you. You shall not settle any claim or demand without the written consent of the Indemnified Parties, with such consent not to be unreasonably withheld or delayed.

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Introduction

Congratulations on your purchase of a Masport Pump. We are delighted you have chosen to join the community of satisfied customers using Masport equipment in daily professional operations.

Our products are backed by over 100 years of engineering excellence and are specifically designed and engineered to meet the needs of hard working pumpers around the world.

Our expert product development, manufacturing and distribution teams work to rigorous quality standards and a strict testing regime. To produce our precision pumps, we only use the finest quality components and materials to ensure the durability of your vacuum pump. Every pump is factory tested before shipping and is backed up with a one year warranty against all manufacturing defects. This system ensures you receive a quality product.

This manual provides all the information you will need to run your pump correctly to ensure a long and efficient service life. If you have any questions, please contact your local Masport representative or Masport directly.

Our History:

Masport designs, manufactures, and assembles vacuum pumps and associated products. The company was established by Harold Mason and Reuben Porter under the name City Engineering in Auckland, New Zealand, in 1910. Within a couple of years, the Mason and Porter business, or Masport as the company later became known, was manufacturing vacuum pumps and a range of engines to power all types of farm equipment.

Masport first looked to international markets with trial exports of vacuum pumps to the United States in 1956 – and has never looked back since. In 1991 the ownership of Masport’s vacuum pump division was transferred to Skellerup Holdings – an iconic New Zealand Company which also celebrated its centenary in 2010.

With Masport on board you have an efficient and reliable pump backed by the best service and support that has made Masport the #1 choice for pumpers worldwide.

Over 100 Years of Engineering Excellence



Intended Use

Masport Vacuum/Pressure Pumps are intended to be used for loading and unloading of liquid material. These pumps are commonly used for liquid waste transport, septic tank cleaning, oil field water trucks, car wash or grease trap cleaning and many other industrial applications.



Warning! Masport pumps must not be used to move flammable or highly caustic material. Use of this pump for moving hazardous material may result in machinery failure, bodily injury or even death.

Installation

Whatever the configuration of the vacuum system on your truck or trailer, all components and plumbing must be of adequate size or the system will not operate correctly.

The Titan, Sidewinder and Hydra require a minimum of 3" I.D diameter plumbing and corresponding 3" I.D Masport components.

The Cobra requires a minimum of 4" I.D diameter plumbing and corresponding 4" I.D Masport components.



Warning! Do not use a hose smaller than 3" I.D. for the Titan, Sidewinder and Hydra or 4" I.D for the Cobra or the airflow will be restricted and the pump may overheat and be damaged.

Ensure all pipes, hoses and fittings are thoroughly cleaned before fitting and free of any kind of dirt or debris. Any solid particles ingested by the pump may cause irreparable damage that will result in loss of performance and increased operating noise. Some form of pipe sealant should be used on all thread connections to prevent leaks.

Four-Way Valve:

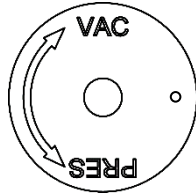
For pumps fitted with a valve, the four-way valve is used to change the pump operation from vacuum to pressure or pressure to vacuum by rotating the handle through 90 degrees. The centre position is neutral.

Either valve port can be plumbed to the inlet or the exhaust using 3" pipe for the Titan, Sidewinder and Hydra or 4" pipe for the Cobra.

The valve handle is mounted on a four-sided shaft. It can be repositioned through four different positions to suit the operator's needs and access requirements.

Indicator Washer:

All pumps that are fitted with a valve are supplied with an Indicator Washer. The Indicator washer secures the valve handle and shows the direction to turn the handle for pressure or vacuum operation. The Indicator Washer is reversible allowing the washer to be orientated to your specific setup and plumbing configuration.



Indicator Washer Side One



Indicator Washer Side Two

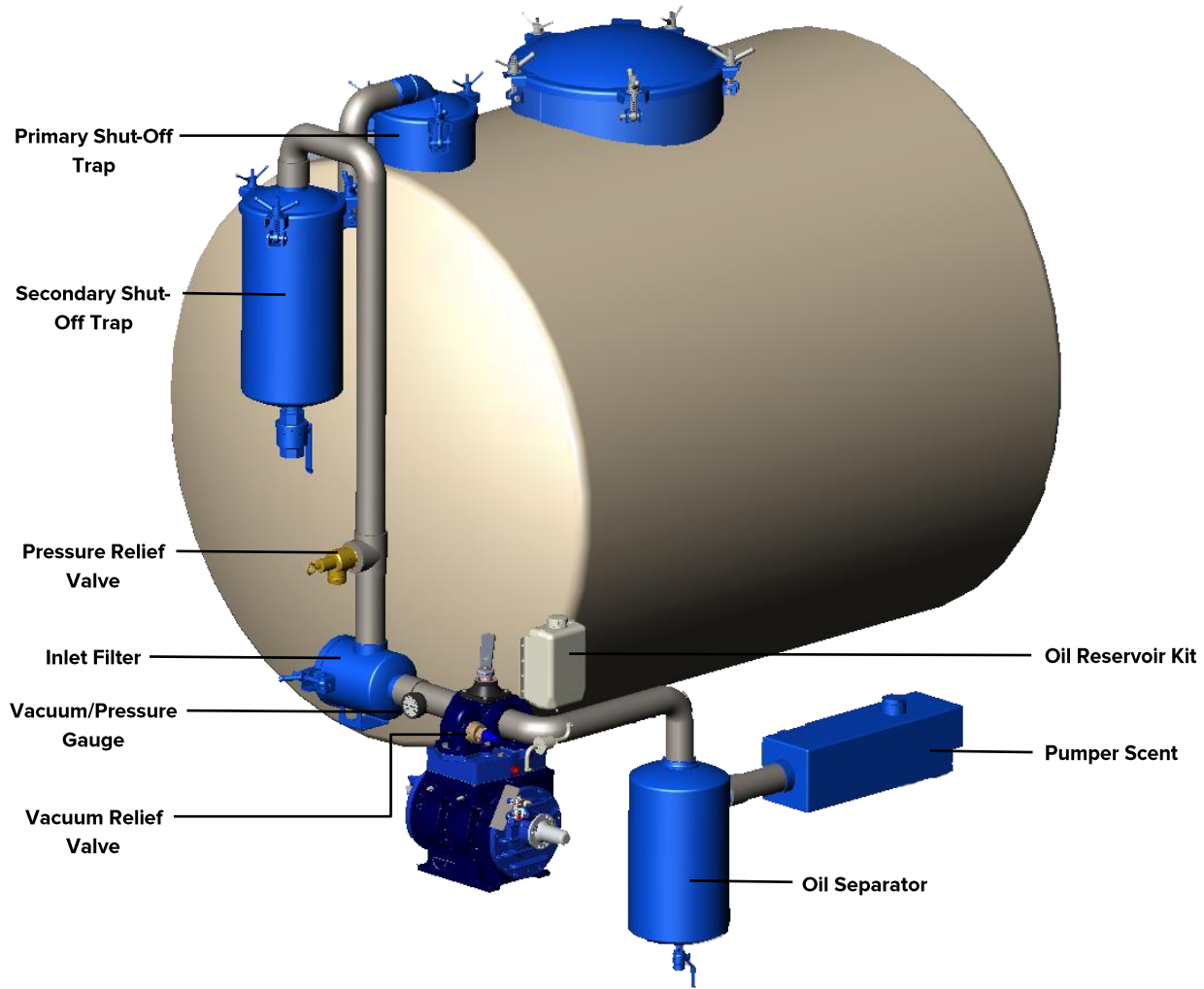


Warning! The installation of the Handle Indicator Washer is the responsibility of the installer. Incorrect orientation of the Handle Indicator Washer may result in unexpected vacuum or pressure that may result in machinery failure, bodily injury or even death.

Hose:

Any hose used in the system is to be rated for at least 28”Hg vacuum and 25 PSI pressure, and withstand air/oil temperatures up to 300 F. Hot-tar and asphalt hose is designed for use in this of environment.

Recommended System Components



Primary Shut-Off Trap:

A float ball shut-off that prevents liquid in the tank from overflowing into the system and entering the pump. Liquid entering the pump can damage or destroy the pump.

Secondary Moisture Trap (Scrubber):

Removes liquid still in the air steam after passing through the Primary Trap. The Scrubber should be drained after every load.

Inlet Filter:

Prevents small particulate matter from entering the pump. This filter should be checked and cleaned, or replaced regularly.

Vacuum/Pressure Gauge:

Required to properly monitor the performance of the system. It should be located between the Scrubber and the (the clean side) Pump to prevent gauge failure due to foreign material.

Vacuum Relief Valve:

Governs the operating vacuum level. It should be installed at the pump so that if a liquid level trap is activated or a hose collapses the pump is prevented from overheating.

Pressure Relief Valve:

Regulates the amount of pressure the system is exposed to. It should be located between the Scrubber and the Pump on the clean side of the system.



Warning! Operating your system without properly installed vacuum and pressure relief valves in good working order could lead to equipment damage or catastrophic failure resulting in severe injury.

Oil Separator (Muffler):

Removes oil from the pump exhaust. It is equipped with a ball valve at the bottom and should be drained at least twice daily.

Oil Reservoir Kit:

The oil reservoir kit supplies filtered lubricating oil to the pump.

Flushing Kit:

The flushing kit supplies a cleaning fluid to the pump. This extends pumps life by preventing the build-up of carry-over from liquid level traps causing contamination.

Pumper Scent (Optional):

The Pumper Scent box removes odor from the exhaust. Its use is recommended in environmentally sensitive areas.

Component Checklist

Below is a checklist of the components required to complete a Vacuum/Pressure system.

Titan, Sidewinder and Hydra:

Part Number	Description
16347	Primary Shut-Off Trap 3"
16450	Secondary Moisture Trap (Scrubber) 3"
15133	Inlet Filter 3"
21053	Vacuum/Pressure Gauge
569023	Vacuum Relief Valve
25038	Adjustable Pressure Relief Valve
15466	High Efficiency Oil Separator 3"
13023	Oil Reservoir Kit
13027	Flushing Kit
15611	Pumper Scent Chamber 3"

Cobra:

Part Number	Description
16341	Primary Shut-Off Trap 4"
16440	Secondary Moisture Trap (Scrubber) 4"
15137	Inlet Filter 4"
21053	Vacuum/Pressure Gauge
569023	Vacuum Relief Valve
25038	Adjustable Pressure Relief Valve
15467	High Efficiency Oil Separator 4"
13023	Oil Reservoir Kit
13027	Flushing Kit
15614	Pumper Scent Chamber 4"

Drive Systems

Whichever drive system is chosen (PTO, Hydraulic, Engine Drive or Pulley and Belts), ensure it is adequately sized to suit the pump requirements. The chosen motor needs to satisfy the horsepower and RPM requirements of the pump.

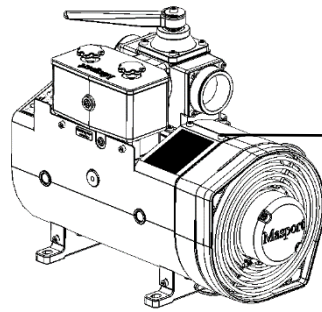
Alignment is important. If the vacuum pump is not aligned properly, it will cause excessive wear on the drive element and pump bearings.



Warning! Ensure that all moving parts are properly guarded.

Rotation of the Pump

The Titan, Sidewinder, Hydra and Cobra pumps are all single shaft pumps. They are available in both a clockwise or counter-clockwise configurations to accommodate either direction drive setup. There is an arrow printed onto the pump model tag indicating the proper pump rotation. Ensure that the drive system direction corresponds to the direction shown on the pump.



Warning! Never run the pump in the opposite direction to indicated.

Pump Speeds and Power Requirements

The table below provides the recommended speed and power requirements for each pump model for optimal pump life and performance.

Pump	RPM	Vacuum (" Hg)					Pressure (PSIG)		
		5	10	15	20	27	5	10	15
Titan	1,200	15 hp	15 hp	15 hp	15 hp	15 hp	20 hp	22 hp	26 hp
	1,400	19 hp	19 hp	19 hp	19 hp	19 hp	25 hp	27 hp	31 hp
Sidewinder	1,200	15 hp	15 hp	15 hp	15 hp	15 hp	20 hp	22 hp	26 hp
	1,400	19 hp	19 hp	19 hp	19 hp	19 hp	25 hp	27 hp	31 hp
Hydra	1,200	15 hp	15 hp	15 hp	15 hp	15 hp	20 hp	22 hp	26 hp
	1,400	19 hp	19 hp	19 hp	19 hp	19 hp	25 hp	27 hp	31 hp
Cobra	1,300	17 hp	17 hp	17 hp	17 hp	17 hp	22 hp	24 hp	28 hp
	1,500	19 hp	19 hp	19 hp	19 hp	19 hp	27 hp	29 hp	33 hp



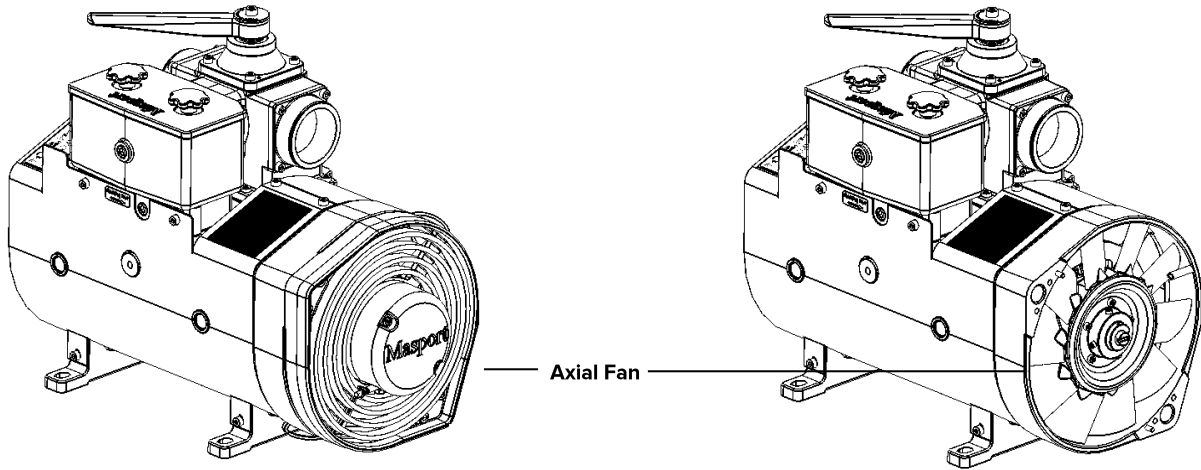
Note: Heat build-up is the limiting factor in the pumps performance. Operating above or below the recommended speed range will increase the heat produced and negatively impact the life of the pump.

Fan Cooled Models

Fan cooled models have a fan attached to the rotor shaft to cool the pump. On the Titan, Sidewinder and Cobra Pumps an axial fan is located inside the cast housing on the non-drive end of the pump and draws air through the fan guard between the cylinder and the cowling towards the drive end.

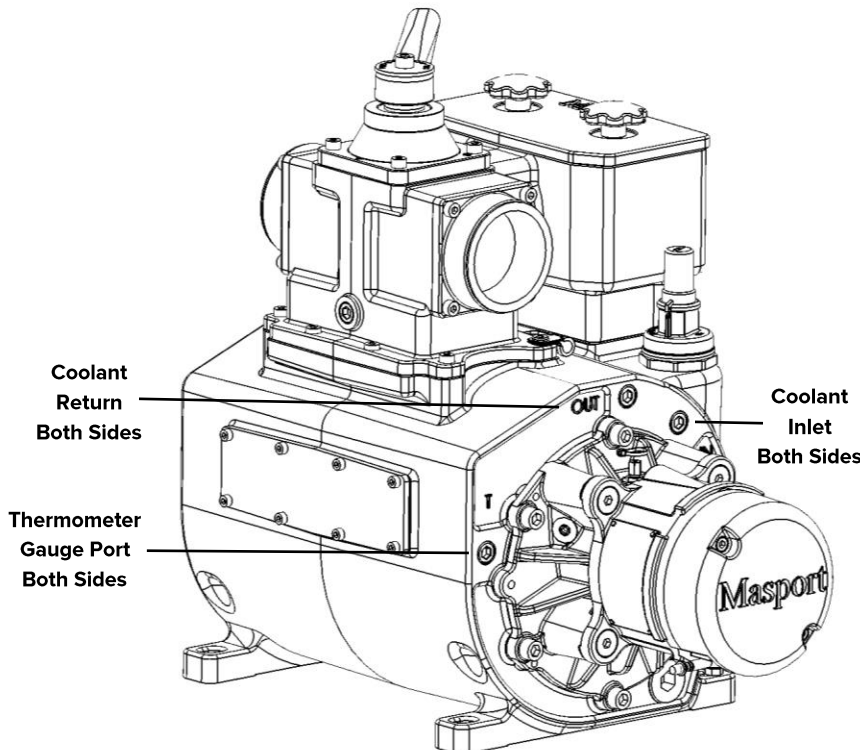
To prevent the pump from overheating, ensure:

- ▶ The fan guard is kept clear for air to flow freely;
- ▶ The drive end of the pump is open for the cooling air to escape; and
- ▶ Dirt does not build up inside the cowling between the cooling fins of the cylinder.



Liquid Cooled Models

Liquid cooled models have a water jacket built into the cylinder to cool the pump. On the Hydra Pump there are coolant inlet and return ports on either side of the cylinder housing. These are denoted by the 'IN' and 'OUT' cast inscriptions on the end faces of the cylinder.



A temperature gauge is supplied with liquid cooled pumps. On the Hydra Pump this should be installed in the temperature gauge port denoted by the 'T' cast inscription on the end faces of the cylinder. If the pump is connected to the cooling system of a truck engine, the gauges of the truck and the pump should show similar temperatures.



Warning! If the two temperature gauges show significantly different temperatures, coolant may not be flowing properly to the pump. Check for proper installation and possible obstruction of the coolant hoses.

Vacuum Relief Valve

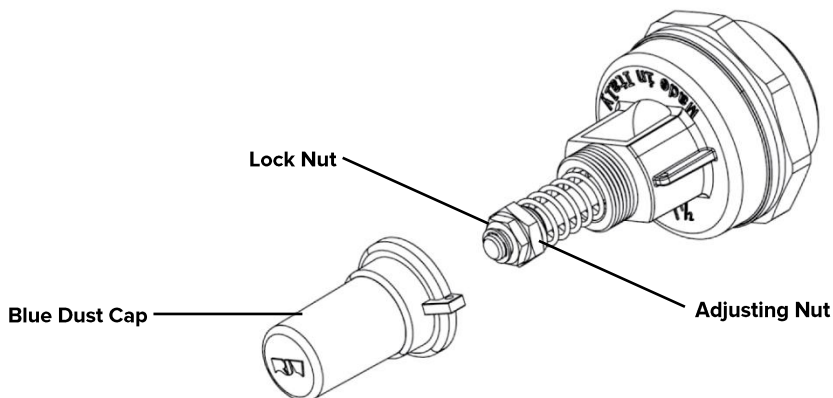
The vacuum relief valve should be set at a maximum continuous working vacuum level of 25" Hg at sea level for Liquid Cooled Pumps and 20" Hg at sea level for Air Cooled Pumps for optimum pump life and performance.

The working vacuum level should be decreased by 1" Hg for every 1,000ft of elevation.

To set the vacuum relief valve:

- ▶ Unscrew and remove the Blue Dust Cap;
- ▶ Loosen the Lock Nut and adjust the vacuum level by increasing or decreasing spring tension with the Adjusting Nut; and
- ▶ When the vacuum level is set retighten the Lock Nut and screw the Blue Dust Cap back on.

The vacuum relief valve setting should be verified by using a quality liquid filled vacuum gauge.



Warning! The vacuum relief valve is not set at the factory.

Pressure Relief Valve

It is recommended to set the pressure relief valve below 15 PSI. This level is adequate in majority of applications. For pressure settings above 15 PSI the tank manufacturer should be consulted for recommended operating pressures.

To set the pressure relief valve consult the manufacturers setup guide.

Pump Lubrication

Rotary Vane Vacuum Pumps require a high quality non-detergent Rotary Compressor Oil or Rotary Turbine Oil. Oil specifically formulated for Masport pumps is available from your local Masport representative or by contacting Masport Inc.

1 Gallon Bottles

- ▶ Part # 13980 – All Seasons Blend

6 Gallon Case

- ▶ Part # 13981 – All Seasons Blend



Warning! Do not use transmission fluid, automotive motor oil, power steering fluid, used oil, vegetable oil, brake fluid, hydraulic fluid, gear oil or scented oil in a Masport pump.

Substitute oils approved for temporary use in Masport pumps:

- ▶ Shell Turbo T Oil 32, 68, 100
Shell Oil Company – Houston, TX 800-231-6950
- ▶ Monolec Compressor Oil*
Lubrication Engineers – Fort Worth, TX 817-834-6321
- ▶ Mobil SHC 525 (Synthesized Hydrocarbon)
Mobil Oil Company – Fairfax, VA 800-662-4525
- ▶ Anderol 497
Anderol Inc – East Hanover, NJ 888-263-3765
- ▶ Chevron GST 32, 68
ChevronTexaco Corporation – San Ramon, CA 800-822-5823
- ▶ Regal Oil R & O 32, 68
ChevronTexaco Corporation – San Ramon, CA 800-822-5823

** Monolec Compressor Oil is colored red and should not be confused with transmission fluid.*

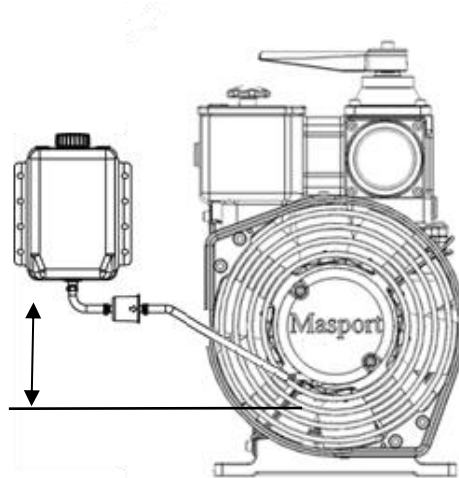


Note: Oils numbered 32 & 46 are for winter use. Check pour point to determine minimum temperature. Oils numbered 68 & 100 are for summer use.

The Masport Titan, Sidewinder, Hydra and Cobra pumps are equipped with an automatic gear-driven oil pump. This system utilizes a direct gear-driven oil pump which is pre-set to deliver the required amount of lubricating oil to the vacuum pump. The oil pump is maintenance free and requires no operator adjustment.

Oil Reservoir Mounting:

The oil pump must be connected to an oil reservoir tank. The oil reservoir tank must be mounted higher than the oil feed connection on the oil pump so that the oil will be fed by gravity.



Prior to Start-Up:

Before running the pump for the first time (and any time after pump teardown or if it has been out of service for some time) follow the below procedure:

- ▶ Ensure there is adequate pump oil in the oil reservoir and bleed the oil feed line from the oil reservoir to the oil pump.
- ▶ Pour 1 - 2 oz. of pump oil into the vacuum pump inlet and rotate the pump by hand several times to coat the cylinder with a fresh film of oil.
- ▶ After start-up, observe the transparent oil lines coming from the oil pump to confirm that oil is flowing from the oil pump to the cylinder ports.

Flushing Information

Masport vacuum pumps require little regular maintenance except for flushing the pump weekly or anytime liquid or solids have been allowed to enter the pump.

Masport vacuum pumps are best flushed by using a Masport Flushing Kit and specially formulated Flushing Fluid. These are available from your local Masport representative or by contacting Masport.

Plastic Flushing Kit

- ▶ Part # 13027

1 Gallon Flushing Fluid Bottle

- ▶ Part # 13989

Steel Flushing Kit

- ▶ Part # 13030

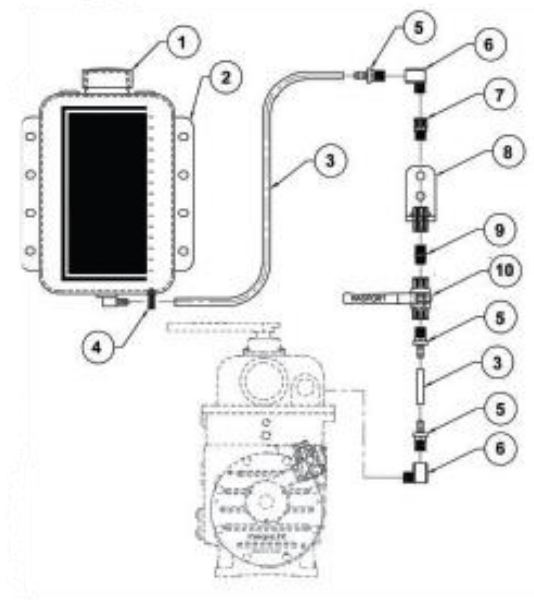
6 Gallon Case of Flushing Fluid Bottles

- ▶ Part # 13990

Flushing Procedure:

Flushing frequency: weekly, preferably at the end of a workday, more often if carry-over from traps contaminate the pump.

- ▶ Connect the Flushing Kit to the flushing port on the Masport vacuum pump



- ▶ Start the vacuum pump and bring vacuum to 15”Hg.
- ▶ Open the ball valve to begin flushing fluid flow.
- ▶ Continue to run the pump until the fluid level drops 1 graduation (approximately 7 fluid ounces).
- ▶ Close the ball valve.
- ▶ Continue to operate the pump for 3 additional minutes to ensure all fluid is purged from the pump.
- ▶ Stop the vacuum pump.
- ▶ Drain the oil separator and dispose of used fluid at an approved recycling site.

Maintenance and Important Operating Tips

To keep the pump in a workable condition operators should undertake regular maintenance and keep a written log of those checks.

Before Starting:

- ▶ Ensure a vacuum relief valve and a pressure relief valve are installed in the system and adjusted to recommended settings, taking into account the altitude of the job location.
- ▶ Always bleed the tank to atmospheric pressure before switching the valve from vacuum to pressure or from pressure to vacuum.

Every Load:

- ▶ Drain the scrubber after each tank load. If nothing drains when the ball valve is opened never assume it is empty, check for a blockage in the valve.
- ▶ Check the oil level in the oil reservoir, and fill as required.
- ▶ Monitor vacuum/pressure and temperature gauges to detect any irregularities or problems.

Daily:

- ▶ Add oil approximately every 10 hours of operation or when the oil reservoir shows the level is low. Only use approved lubricants.
- ▶ Drain the oil separator twice daily or every time switching the Vacuum Pump from vacuum to pressure mode. A brass ball valve is mounted at the bottom for easy draining.

Weekly:

- ▶ Flush the pump weekly with Masport Flushing Fluid, or anytime liquids or solids have been allowed to enter the pump.
- ▶ Check and clean the Inlet Filter. Ensure the filter is completely dry before refitting. This checking process must be done anytime contamination may have entered the system.
- ▶ Check to ensure the pump RPM is within the recommended range. Running the pump too fast or too slow may cause damage.
- ▶ Wash any dirt off the pump as it needs to be clean to allow heat to radiate and prevent it from overheating.

Annually:

- ▶ Check bolt mountings, drive coupling alignment and condition, and vane wear.

Storage:

- ▶ If the pump is to be sitting for an extended period of time it needs to be flushed prior to storage. After flushing, pour oil into all bearing lubrication ports to protect the bearing surfaces and oil injection points on the pump to eliminate rust formation on the rotor and cylinder.
- ▶ Rotate by hand monthly to distribute oil.

For Safe Operation:

- ▶ Never use the pump to move flammable or highly caustic material.
- ▶ Do not open any ball valve on any components when the tank is under vacuum, as this will cause foreign material to enter the pump.
- ▶ Do not over speed or under speed the pump as either will cause overheating.
- ▶ Do not engage power take off at high RPM. Only engage at idle.
- ▶ Always disengage the pump when driving to or between job sites.
- ▶ Do not reuse the oil drained from the oil separator. Take it to an appropriate recycling site.
- ▶ Never run the pump without oil.

- ▶ Never spin the pump backwards.
- ▶ Never remove the stub shafts from the rotor. The rotor has been machined as a complete unit for exact balance. Removing the stub shafts will destroy the factory-set clearances and balance.
- ▶ No maintenance should be undertaken, or parts be removed if there is either pressure or vacuum in the tank.

Troubleshooting

The Pump Overheats

Potential causes to check and resolve:

- ▶ Inadequate level of oil, or no oil in the pump.
- ▶ RPM in excess of recommended levels.
- ▶ Continued operation above recommended maximum vacuum and pressure levels.
- ▶ Blocked Inlet Filter.
- ▶ Pump is covered in mud and/or dirt.
- ▶ Plumbing diameter is of an insufficient size.

The Rotor does not Rotate

Potential causes to check and resolve:

- ▶ Damaged vane(s).
- ▶ Damaged bearing(s).
- ▶ Issue with the drive system.
- ▶ Ice frozen inside the pump.

The Pumps Performance is Impaired

Potential causes to check and resolve:

- ▶ Four-way valve is in the neutral position.
- ▶ Worn vanes.
- ▶ Worn shaft seals.
- ▶ Leaks in the tank.
- ▶ Plumbing diameter is of an insufficient size.
- ▶ Non-return valve is blocked and does not seal.
- ▶ Blocked Inlet Filter.
- ▶ RPM rate below recommended level.
- ▶ Collapsed hose in the system setup.

For further issues or additional information contact an authorized Masport distributor or Masport directly.

Pump Service

The following repair techniques are given for use on pumps that do not have damage to the cylinder or end covers to the extent that they need to be re-machined. These procedures are intended for use when the vanes and bearings of the pump require replacement. They should not be considered as total rebuild instructions.



Note: Any service or repair work on your pump should be performed by a qualified mechanic with the proper tools and experience working with vacuum pumps.

Installations requiring re-machining of the pump components should be done by an authorized Masport repair facility. For the nearest authorized rebuild center, contact Masport directly.

Replacement Parts Kit:

The Replacement Parts Kits contains all the necessary components to rebuild or service your pump. All Rebuild Kits contain the following items:

- ▶ Vane Pack
- ▶ Bearings
- ▶ Bearing Spacers
- ▶ Oil Seals
- ▶ End Cover Shims
- ▶ End Cover O-Rings
- ▶ Valve Gaskets
- ▶ Check Valve
- ▶ Oil Lines
- ▶ Oil Line Ferrules

The Replacement Parts Kit to use on each model are as follows:

Pump	Rebuild Kit Part Number
Titan	14636
Sidewinder	14636
Hydra	14636
Cobra	14661

Disassembly:

The following instructions are written, assuming that the pump being serviced has been removed from the base it was mounted on. It is possible to carry out installation of the parts kit with the pump mounted, but for best results it is recommended that it is removed from the stand.

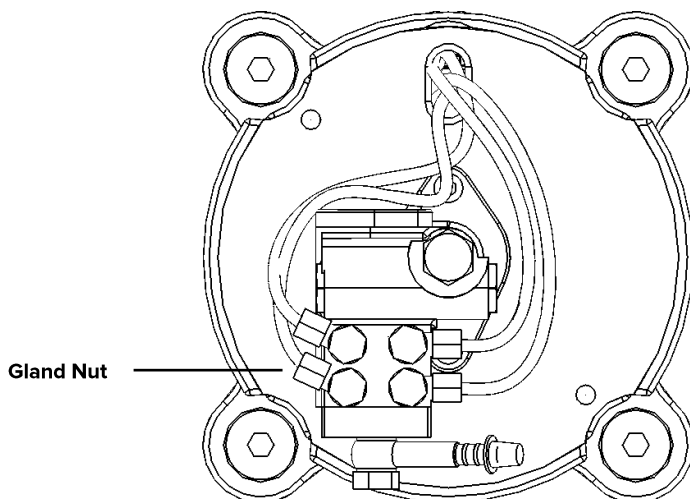


Warning! Disconnect the pump drive to ensure the pump cannot be accidentally started during service and to allow the shaft to be rotated by hand.

Before removing the cylinder end cover, clean the outside of the pump to prevent dirt and debris from getting into the cylinder.

Mark the drive side end cover and the corresponding end of the cylinder and rotor shaft, using a centre punch. Marking these will avoid the possibility of assembling the pump with the end covers on the wrong ends.

If working from the oil pump end of the pump, start by removing the oil pump guard then disconnect the oil pump lines at the outlet gland nuts.



Remove the oil pump mounting bolts and remove the oil pump.



Note: If a spacer shim is fitted behind the oil pump this must be fitted on reassembly to ensure correct engagement.

Cut the oil lines directly behind the gland nut and refit the gland nuts loosely onto the oil pump fittings to avoid misplacement. If the oil lines and fitting ferrules are to be reused, feed the oil lines with the fittings through the fan guard on the Titan, Sidewinder and Cobra pumps, and the bell-housing on the Hydra pump on removal.

Remove the fan guard mounting bolts. Loosely refit two opposing bolts to support the weight of fan guard on removal from its location dowels.

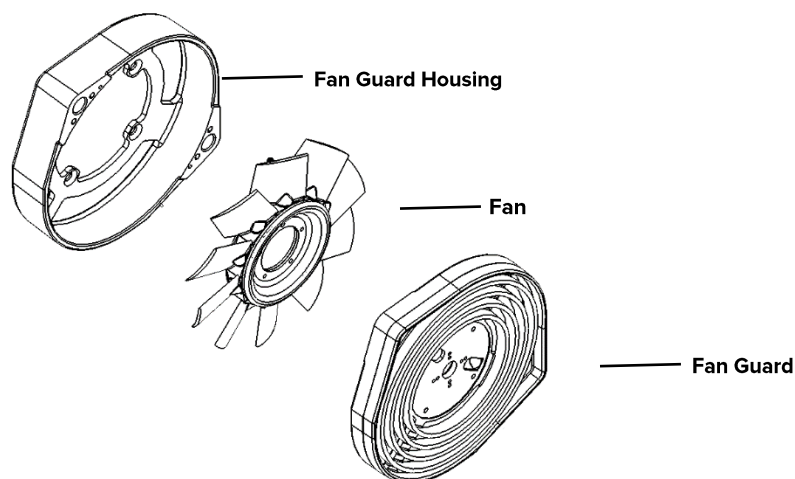


Note: The fan guard weighs approximately 20lbs. Avoid damaging the dowel pins on removal by evenly prying the fan guard off the location dowels.

Remove the fan assembly by releasing the retaining screws from the fan hub.

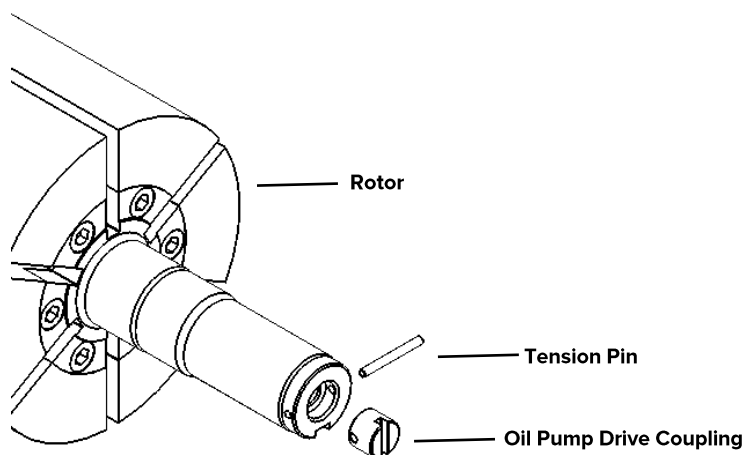
Mark one of the mounting points of the fan guard housing and the corresponding end cover pedestal to assist with the reassembly orientation, as this and the fan guard are not symmetrical.

Remove the fan guard housing mounting bolts. As per the removal of the fan guard, leave two bolts loosely fitted to enable tapping the fan guard housing off the location spigot without the risk of it dropping. Support the weight of the fan guard housing and remove the two remaining bolts.



All models:

Remove the oil pump drive coupling from the end of the rotor shaft by driving out the tension pin.



Support the end of the shaft so that the rotor will not drop when the end cover is pulled from the bearing. A notched piece of wood can be used to support it from below, or a long nipple can be screwed into the valve above the shaft and a strap can be hung from the nipple to support the shaft.

End Cover Removal:

Remove the bolts around the perimeter of the end cover.

In order to maintain factory set clearances avoid damaging the dowel pins during end cover removal. To properly remove the end cover, work evenly from each side of the cover, which will help to avoid misalignment of the end cover and bending of the dowel pins. As necessary use a rubber mallet to drive the rotor shaft back towards the end cover that is still bolted on to free the end cover from the bearing.



Warning! Under no circumstances should the end cover be pried or hammered off of the cylinder as this will potentially result in damage to the sealing surfaces.

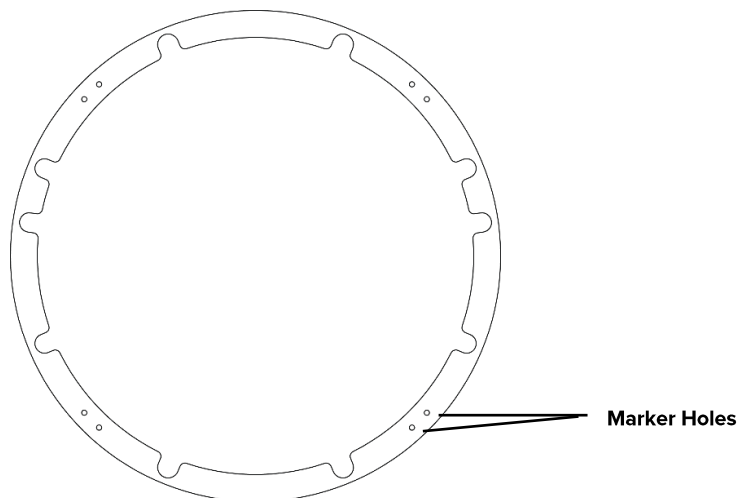
When the end cover is far enough away from the cylinder install a second shaft support behind the end cover and release the first. Slide the end cover completely off the rotor shaft.



Note: The outer bearing race will stay in the end cover while the inner race will remain on the rotor assembly.

The end clearance is adjusted by means of color coded shim gaskets between the end cover and the cylinder. Make note of the color and quantity of any shim gaskets when removing the end cover. The matching quantity and color will need to be used on reassembly.

The marker holes on the shim gaskets identify the thickness – i.e. two holes indicates a thickness of 0.002” and three holes indicates a thickness of 0.003”

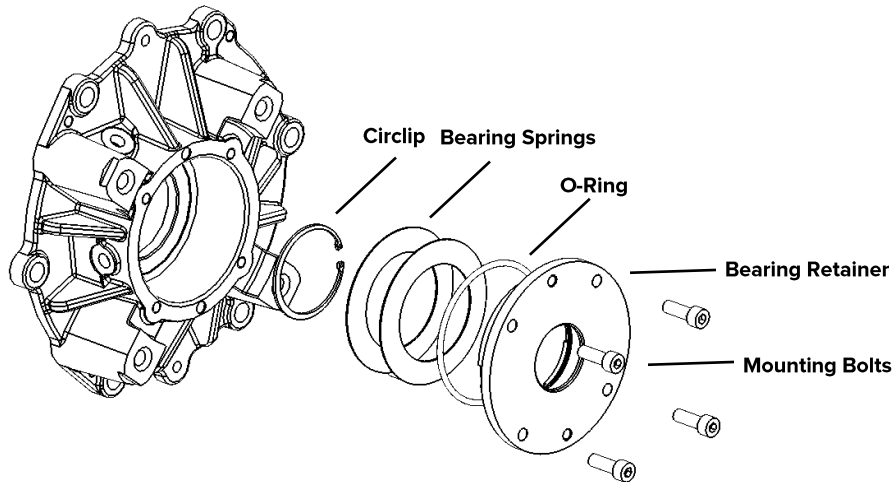




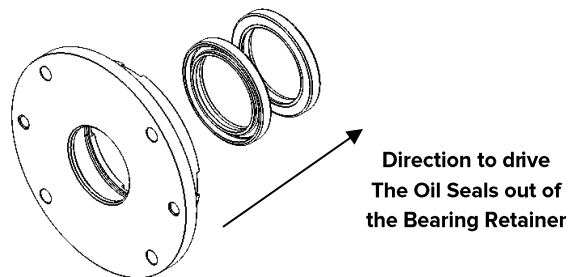
Note: If simply replacing the vanes only please skip to the Vane Wear Check section in Parts Inspection, Cleaning and Replacement.

End Cover Disassembly:

Remove the bearing retainer from one of the end covers by removing the four mounting bolts. Fit two of these bolts into the tapped holes of the bearing retainer and evenly tighten to remove from the end cover bores. From the bearing retainer remove the two bolts from the threads, the O-ring seal from the outer diameter and the internal circlip.



The oil seals can be removed by inserting a screwdriver or punch through the shaft bore of the bearing retainer and onto the oil seal to drive the seal out. Finally, remove the two bearing springs covering the bearings from the end cover bore.



Rotor Removal:

With the one end cover removed, the rotor can be pulled out of the cylinder.

Once the rotor has been removed, the remaining end cover can be removed, as required, by following the same procedure detailed above in the End Cover Removal and Disassembly section.

Parts Inspection, Cleaning and Replacement:

Vane Wear Check:

The pump should be inspected for vane wear at least once a year. If vane wear is not monitored, the vanes can become too short causing excessive rotor and cylinder wear and eventually result in vane breakage.

Measure the vanes to see if they are within the usable limit. If they are not they should be discarded and replaced. The vanes should be replaced when their height is below the usable limit detailed in the table below:

Pump	Vane Usable Height (“)
Titan	> 2 3/32”
Sidewinder	> 2 3/32”
Hydra	> 2 3/32”
Cobra	> 2 3/32”

Inspect the sides of the vanes to see if they are bent, out of parallel, worn to a concave shape on one side or have frayed edges. Any of these conditions require part replacement. These characteristics could indicate foreign material caught alongside the vane, a burr in the edge of the rotor slot or improper lubrication. Each of these possible causes should be investigated and corrected before the pump is reassembled.

Inspect the edge of the vane that contacts the cylinder for frayed edges. If detected this requires part replacement. Frayed edges can indicate improper lubrication or that the pump has been operated for extended periods of time beyond its rated limits. Each of these possible causes should be investigated and corrected before the pump is reassembled.



Note: If simply replacing the vanes only please skip to the Installing the Vanes section in Reassembly.

Cylinder Inspection:

With the end cover removed inspect the cylinder for damage or corrugation. Prior to inspection, the cylinder should be cleaned inside and out to allow a more thorough inspection.

Inspect the interior of the cylinder for cracks and deep gouges around the circumference and corrugation across the length of the bore. Cracks in the housing will require part replacement.

The detection of corrugation or gouges across the length of the cylinder can indicate inadequate horsepower transfer, operation below minimum recommended speeds, foreign material sticking the vanes in their slots, or operation beyond recommended vacuum limits. Each of these possible causes should be investigated and corrected before the pump is reassembled.



Note: If cylinder scoring is deeper than .005" or if corrugation can be felt the cylinder should be bored, honed and the seal gap reset.

Bearing Inspection:

It is difficult to visually determine the condition of a bearing. If there is obvious damage such as discoloration (bluing) of the bearing or the race, there is definite damage and the bearing should be replaced. If there is no discoloration and minimal amounts of carbon or oil sludge build-up on the bearing cage, it can probably be cleaned in solvent, blown out with an air hose, oiled and reused.



Note: There is no guarantee that the bearings are not damaged and with the pump disassembled to this point, it is advisable to replace them.

Bearing and Spacer Removal:

Before removing the bearing and spacer any burrs on the shaft should be removed with a flat file.



Note: The spacer behind the inner bearing race is sized on assembly to suit the end cover and rotor, and it must be returned to the corresponding end cover on reassembly. To identify on reassembly, mark the outside diameter of the drive side spacer with a centre punch, to match the previous drive end rotor marking.

Once the shaft is free of burrs, the bearing can be pulled by means of a bearing puller. Bearings should be removed only using the proper tools. A bearing puller is the only tool that will give satisfactory results.



Warning! Do not loosen the socket head screws that secure the shaft flange to the rotor.

Do not install new bearings and Spacers at this time. Follow the Rotor and End Cover Inspection and Cleaning instructions first.

Rotor Inspection and Cleaning:

Inspect the rotor carefully for any cracks - especially if disassembly was due to pump seizure. Any cracks in the rotor will require replacement of the part.

With the bearing inner races and spacers removed, lightly file with a flat file along all edges of the vane slots to remove any burrs or nicks that may have occurred from either contact or from foreign material.

Once all the burrs are removed, the ends and diameter of the rotor should be gone over lightly with 400 grit wet/dry sandpaper to remove any carbon or varnish deposits left by the oil.

End Cover Inspection and Cleaning:

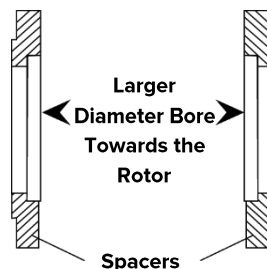
Each of the end covers should be inspected for surface damage from rotor-to-end cover contact and the bearing housing inspected for signs of spacer-to-bore contact.

If the end covers have been damaged by rotor-to-end cover contact and there are grooves worn in more than .005" deep, the face should be resurfaced. If there is no damage, or the damage is minor, the face of the end cover should be wiped clean with solvent and then lapped with the lapping compound against the other end cover. Once complete the covers should be wiped, cleaned, and dried off with an air hose to remove any traces of lapping compound that could cause damage during assembly or start-up.

If the bearing housing bore is damaged, it can be cleaned up with a small file or 400 grit wet/dry sandpaper to remove any burrs. If either of the bearings had seized and spun in the housing, the fit should be checked with a new bearing, to ensure that there is not excessive clearance.

Bearing and Spacer Replacement:

After confirming the end cover and spacer match to the corresponding rotor end, replacement can begin. Place the correct spacer on the shaft that it was removed from. Ensure that the spacer is installed on the rotor shaft with the large bore facing towards the rotor.



Remove the bearing inner race from the outer race. The bearing inner race can then be pressed onto the shaft using a bearing press. Ensure that the bearing inner race is installed on the rotor shaft with the shoulder side facing towards the rotor.

If a bearing press is unavailable a length of pipe can be used to drive the bearing onto the shaft. If this method is used ensure that the pipe diameter is equal to the bearing inner race, and any dirt or pipe scale is removed before use to prevent contamination.

Fit the bearing outer race to the corresponding end cover. Ensure that it is facing in the same orientation as the inner race. This can be confirmed by checking that the text markings on the inner and outer races are visible after fitment.

If all is correct the bearing outer race should be a firm slide fit in the end cover bore and should be free to move back and forward. If the fit is extremely tight, the end cover bore should be examined for burrs and cleaned up. The bearing outer race must be free to move slightly in and out of the cover bore without extreme force or damage to the pump will potentially occur.

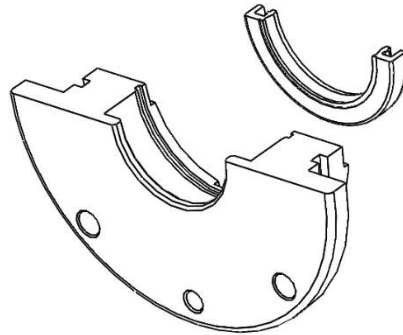
Repeat the process for the other end.

Oil Seal Replacement:

Place the first of the new oil seals into the seal bore of the bearing retainer. Ensure that the first oil seal is installed with the spring side of the seal facing away from the seal bore of the bearing retainer.



Note: Incorrect installation of the oil seal will potentially result in oil leaks around the shaft and bearing failure.

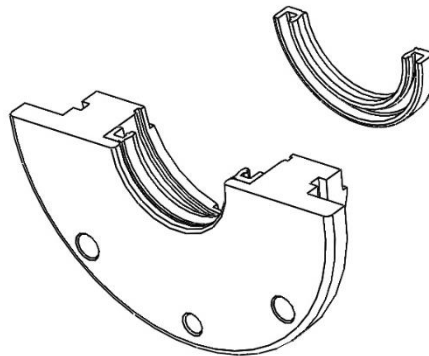


The oil seal should be pressed into the seal bore on the end cover using a seal press or a flat round disc approximately the same outside diameter as the oil seal. Care must be taken to press the oil seal into the bore evenly to prevent damage.

Place the second new oil seal into the seal bore of the bearing retainer on top of the first new oil seal. Ensure that the second oil seal is installed with the spring side of the seal facing into the seal bore of the bearing retainer.



Note: Incorrect installation of the oil seal will potentially result in oil leaks around the shaft and bearing failure.



Refit the circlip to bearing retainer bore and install the new O-rings to the groove in the bearing retainer outer diameter

Repeat the process for the other end.

Reassembly:

The area to be used for reassembly should be thoroughly cleaned to prevent contamination during the reassembly process.

Installing the First End Cover:

If both end covers have been removed from the cylinder the below procedure needs to be followed.

Spread a small amount of oil around the cylinder face to hold the end cover Shim Gaskets in place.

Place the new end cover Shim Gaskets (the correct quantity and color that were removed during the disassembly process) over the dowel pins and onto the oiled face of the cylinder.

Install the O-Ring in the end cover groove. Small dabs of grease will help retain the O-Ring in the groove.

Align the end cover dowel pin holes with the dowel pins in the cylinder face. Drive the cover on evenly with a rubber mallet working from side-to-side to prevent bending the dowel pins or distorting the holes in the end cover.

Install the end cover retaining bolts and torque them to 48ft/lbs. When tightening work across the cover, alternating from one side to the other to ensure even pressure.

Installing the Rotor Assembly:

Spread vacuum pump oil around the cylinder bore to avoid damage to the rotor and cylinder bore when refitting the rotor.

Inspect the ends of the rotor shaft to find the reference mark made during disassembly to ensure correct rotor-end cover-cylinder relationships. Once determined slip the rotor assembly into the cylinder and centralize the bearing inner race into the center of the cylindrical rollers in the outer race in the end cover.

Support the end of the shaft with the rotor support shaft used during disassembly.

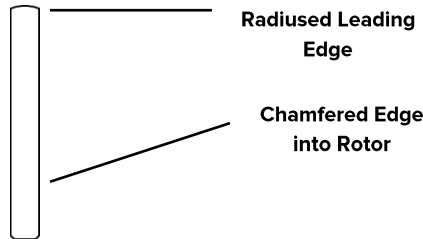
Installing the Vanes:

To install the vanes rotate the rotor so the free vane slot faces the bottom of the cylinder. Insert the new vane by sliding it along the cylinder wall. Be sure the vanes slide freely in the rotor.

Vanes for the Titan, Sidewinder, Hydra and Cobra pumps have a radiused edge. Install them with the radius in contact with the cylinder wall.

Install the vanes into the upper vane slots. Lift the rotor slightly to take the weight off the cylinder bore and rotate the rotor 180 degrees to allow fitment of remaining vanes.

Note: Make sure the vane is oriented correctly. The chamfered edges of the vane must be inserted into the rotor.



Installing the Second End Cover:

Repeat the procedure of installing the first end cover until the O-ring has been fitted into the groove.

Remove the shaft support and fit the end cover over the bearing inner race on the rotor shaft. Ensure to take care when engaging the inner and outer bearing races with each other. Again, support the rotor shaft to take the weight of the rotor and the end cover.

Lift the end cover and rotor assembly to align the dowel pins in the cylinder face and the end cover dowel pin holes. This procedure sets the seal gap between the rotor and the cylinder bore.



Note: When locating the cover on the dowel pins take the weight of the rotor assembly until the cover is located to at least 50% onto the dowel pins. This will reduce the possibility of loosening the location dowel pin holes in the cylinder.

Once the end cover is located onto the dowel pins fit the end cover retaining bolts and torque them to 48 ft/lbs. When tightening work across the cover, alternating from one side to the other to ensure even pressure.

During this process turn the shaft to ensure the vanes are free and square to the cylinder bore.

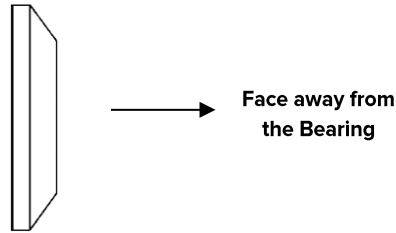


Note: If all is correct, you should be able to hear each vane drop and contact the cylinder

If at any point the shaft is tight to turn release the retaining bolts until the rotor is free to turn. Then progressively retighten while rotating shaft to ensure vanes are not jamming. If this does not cure the problem, disassemble the pump following the procedure for End Cover Removal detailed above.

Installing the Bearing Retainers:

Fit the two bearing springs to the end cover bearing bores. Ensure that both bearing springs are stacked with the conical profile the same way to each other, and that the raised side faces outwards away from the bearing.



Apply a small amount of grease to the lip of the oil seals and the O-ring fitted to the bearing retainer.



Note: Ensure no burrs remain on the end cover bearing bore or the rotor shaft diameter.

Fit the bearing retainer over the shaft, and take care not to damage the oil seals on the shaft keyway. Align the bearing retainer jacking screw holes with the shallow drilled holes on the end cover. Once located fit the retaining bolts and torque them to 20 ft/lbs.

Repeat the process for the other end.

Installing the Oil Pump Drive Coupling:

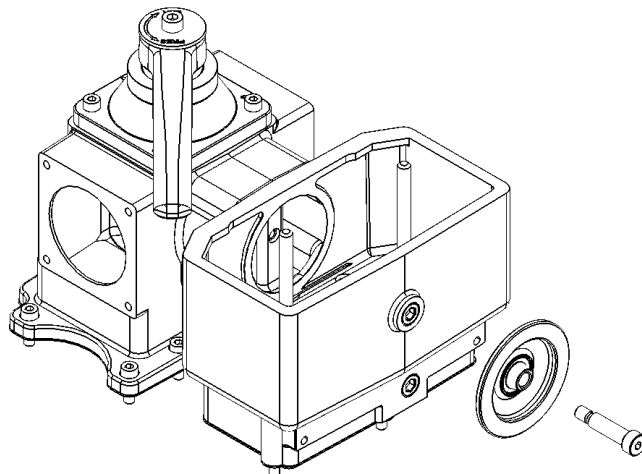
Fit the new oil pump drive coupling into the shaft recess and fix in place with the new tension pin. Ensure that the drive coupling is fitted to the non-drive end of the pump.

Manifold Valve Assembly:

Remove the shoulder bolt and check valve from the manifold valve assembly. Test that the new check valve slides freely on the shoulder bolt stem. As necessary polish the stem to remove any debris or buildup to ensure free movement. Apply thread locker to the shoulder bolt and reinstall.



Note: Ensure the check valve is installed with the correct orientation

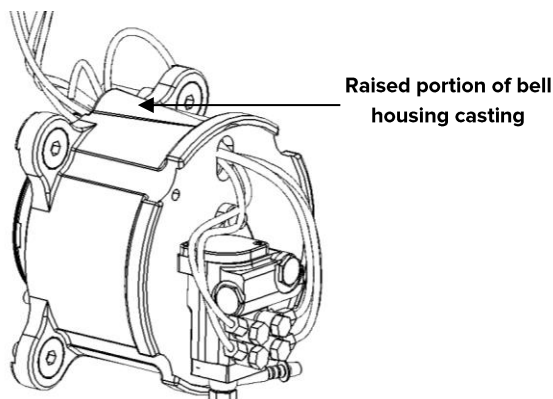


Hydra:

Feed the oil lines back through the bell housing. Refit the bell housing to the end cover with the raised portion of the casting facing upwards.



Warning: Ensure the oil lines are located within the raised portion of the bell housing casting to avoid crimping of the oil lines, limiting oil flow to the pump.



Fit and progressively tighten the retaining bolts ensuring correct engagement of the location spigots on the end cover pedestals.

Titan, Sidewinder and Cobra:

Refit the fan guard housing to the end cover. Ensure that the alignment and orientation marking from disassembly correspond. Fit and progressively tighten the retaining bolts ensuring correct engagement of the location spigots on the end cover pedestals.

Refit the fan assembly to the rotor shaft. Ensure the fan assembly is recessed onto rotor shaft until it bottoms out. Fit and tighten the retaining screws.



Note: This position of the fan boss is required to ensure adequate clearance for expansion whilst also reducing access for contamination entering to the oil pump drive coupling. Ensure that the fan boss is not protruding further than 3/16" from the front face.

Refit the fan guard onto the location dowel pins. Ensure the outside profile of the guard matches that of the fan guard housing for correct orientation. Fit and progressively tighten the retaining bolts.

All models:

Refit the oil pump with thread locker on the mounting bolt threads. If fitted, ensure that the shim spacer is replaced behind the oil pump to set the correct oil pump coupling clearance.

Prime the oil lines and reconnect the gland nuts to the oil pump fittings. Refit oil pump guard.



Note: Be sure to lubricate the pump before initial start-up to prevent damage in the first few seconds of operation. Pour oil into the intake of the pump valve or into the cylinder oiling fittings and rotate by hand to distribute.

Before refitting the pump to the vacuum truck it is recommended that all of the system filters and traps are thoroughly cleaned and dried before the vacuum pump is operated.

Rebuild Specifications:

Cylinder Remachining:

If the cylinder scoring is deeper than .005" or if corrugation can be felt the cylinder should be bored, honed and the seal gap reset. In reboring the cylinder the aim is to remove the minimum level of material to achieve the original manufactured finish. Therefore the cylinder should only be machined down to the deepest scoring/corrugation.



Note: If the scoring/corrugation is deeper than the maximum remachining boring depth then the cylinder or pump will need to be replaced.

The cylinder remachining for each of the pumps should meet the specifications in the table below:

Pump	Manufactured Diameter	Max Remachined Diameter	Honed Surface Finish
Titan	8.11"	8.15"	0.4 µm
Sidewinder	8.11"	8.15"	0.4 µm
Hydra	8.11"	8.15"	0.4 µm
Cobra	8.11"	8.15"	0.4 µm



Warning! Do not exceed the maximum remachined diameter. By exceeding the maximum diameter it presents the risk of compromising both structural integrity and durability of the vacuum pump. Increased bore diameter will reduce vane support therefore reducing vane life and increases risk of vane breakage.

Checking and Setting the Seal Gap Clearance:

If the cylinder has been rebored and/or honed the seal gap clearance needs to be checked and set as required.

The seal gap is the distance between the outer diameter of the rotor and the top of the inside of the cylinder bore. The seal gap is set at a certain specification to provide the maximum performance and efficiency.

The seal gap clearance for each of the pumps should meet the specifications in the table below:

Pump	Seal Gap	Tolerance
Titan	0.006"	+/-0.0005"
Sidewinder	0.006"	+/-0.0005"
Hydra	0.009"	+/-0.0005"
Cobra	0.006"	+/-0.0005"

This clearance can be checked by inserting the proper sized feeler gauge in the exhaust port of the pump across the top of the rotor to the inlet side of the pump.



Note: When checking the seal gap clearance the rotor should be turned so that none of the vane slots are at the top of the cylinder.

To accurately check the clearance this should be done at three points: in the center of the pump; and at each end of the rotor near the end cover. This will help ensure that the rotor is parallel with the cylinder bore.

If the clearance is within specification the dowel pins will not have to be refitted.

If the seal gap clearance needs to be reset the following technique can be used.



Note: In order to reset the seal gap clearance the dowel pins on the inlet side on both ends of the cylinder need to be removed.

- ▶ Place the correct sized feeler gauges in position in the cylinder
- ▶ Turn the pump upside down. For this to be possible the valve assembly will need to be removed to allow the cylinder to rest flat.
- ▶ Loosen the end cover bolts on both end covers
- ▶ Allow the end covers to pivot on the cylinders exhaust side dowel pins bringing the rotor into contact with the feeler gauges.
- ▶ Re-torque the end cover bolts evenly on both end covers
- ▶ Turn the pump over and re-check the seal gap clearance. Repeat the process if the seal gap clearance is still out of specification.
- ▶ If within specification drill and ream to fit either new oversized dowel pins or to reposition the original dowels pin.
- ▶ Clear swarf from the drilled holes and fit the dowel pins to secure the setting.

Checking and Setting the End Float Clearance:

The end float clearance is the distance of travel between the end faces of the rotor and the end covers. The end clearance is set at a certain specification to provide the maximum performance and efficiency.

The end float clearance for each of the pumps should meet the specifications detailed in the table below:

Pump	End Float Minimum	End Float Maximum
Titan	0.020"	0.021"
Sidewinder	0.020"	0.021"
Hydra	0.021"	0.022"
Cobra	0.020"	0.021"



Note: The end float clearances are the total clearance before the spring load is applied by the tightening of the bearing retainers

To set/check the end float clearance the following procedure should be used:

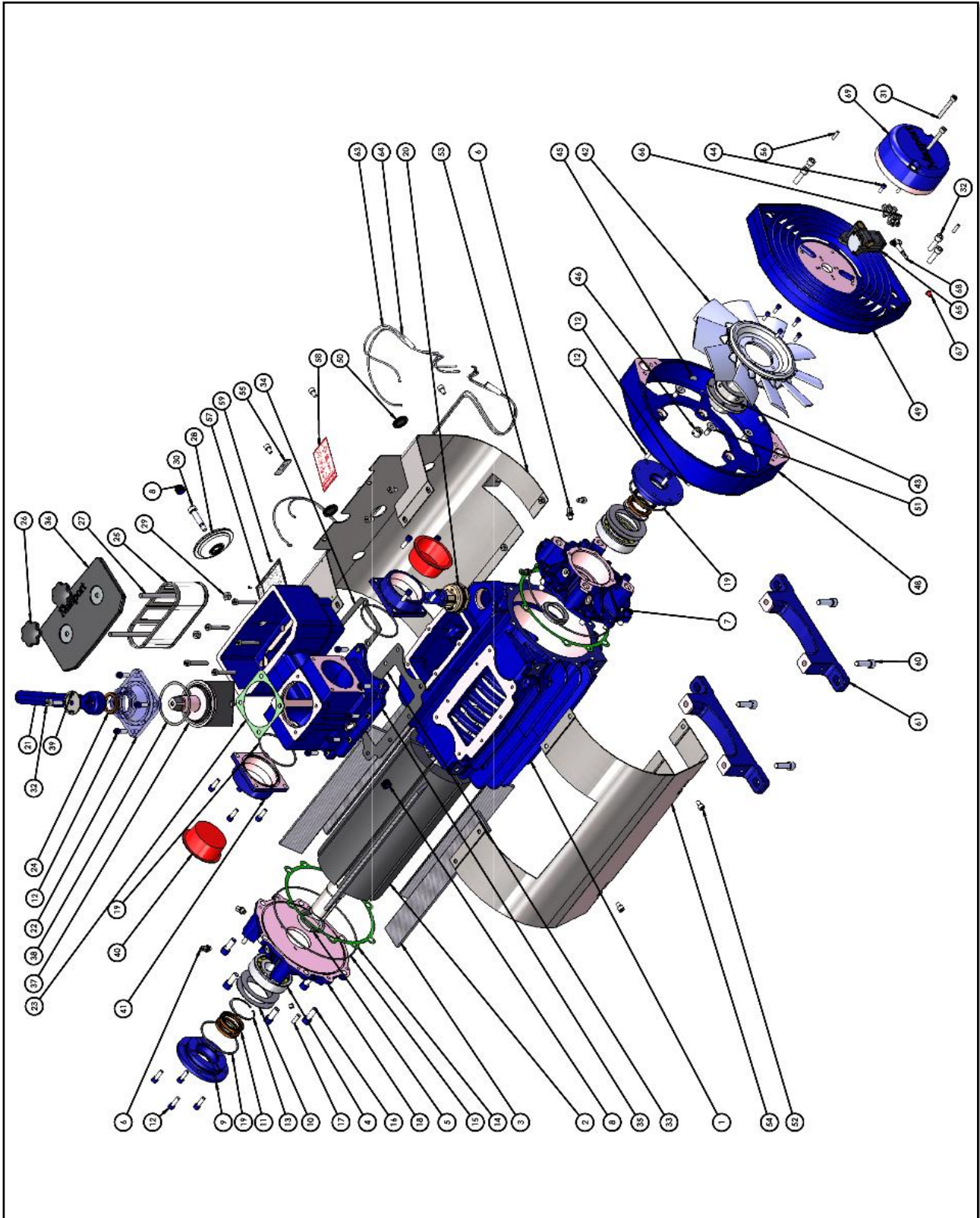


Note: The following procedure will require the use of a dial indicator and either a magnetic stand or a stand that can be bolted to one of the end cover bolts.

- ▶ Mount the dial indicator stand on the pump end cover and attach the Dial Indicator so that the end of the indicator is on the end of the pump shaft. The travel axis of the indicator must be on the same line as the axis of the pump shaft.
- ▶ Push the rotor firmly until it becomes tight against one end cover.
- ▶ Zero the Dial Indicator
- ▶ Push the rotor back firmly against the other end cover, and note the Dial Indicator reading
- ▶ The difference between the two readings is the total amount of end float. Check that the clearance value is within the range as specified in the table above.
- ▶ If the clearance is below the minimum an end cover will have to be removed and an end cover shim gaskets added to attain the proper clearance.
- ▶ If the clearance is above the maximum an end cover will have to be removed and an end cover shim gaskets removed to attain the proper clearance.
- ▶ If gaskets were added or subtracted, the above process will need to be repeated to changes made were correct and the pump is within specification.

Exploded Views

Titan:

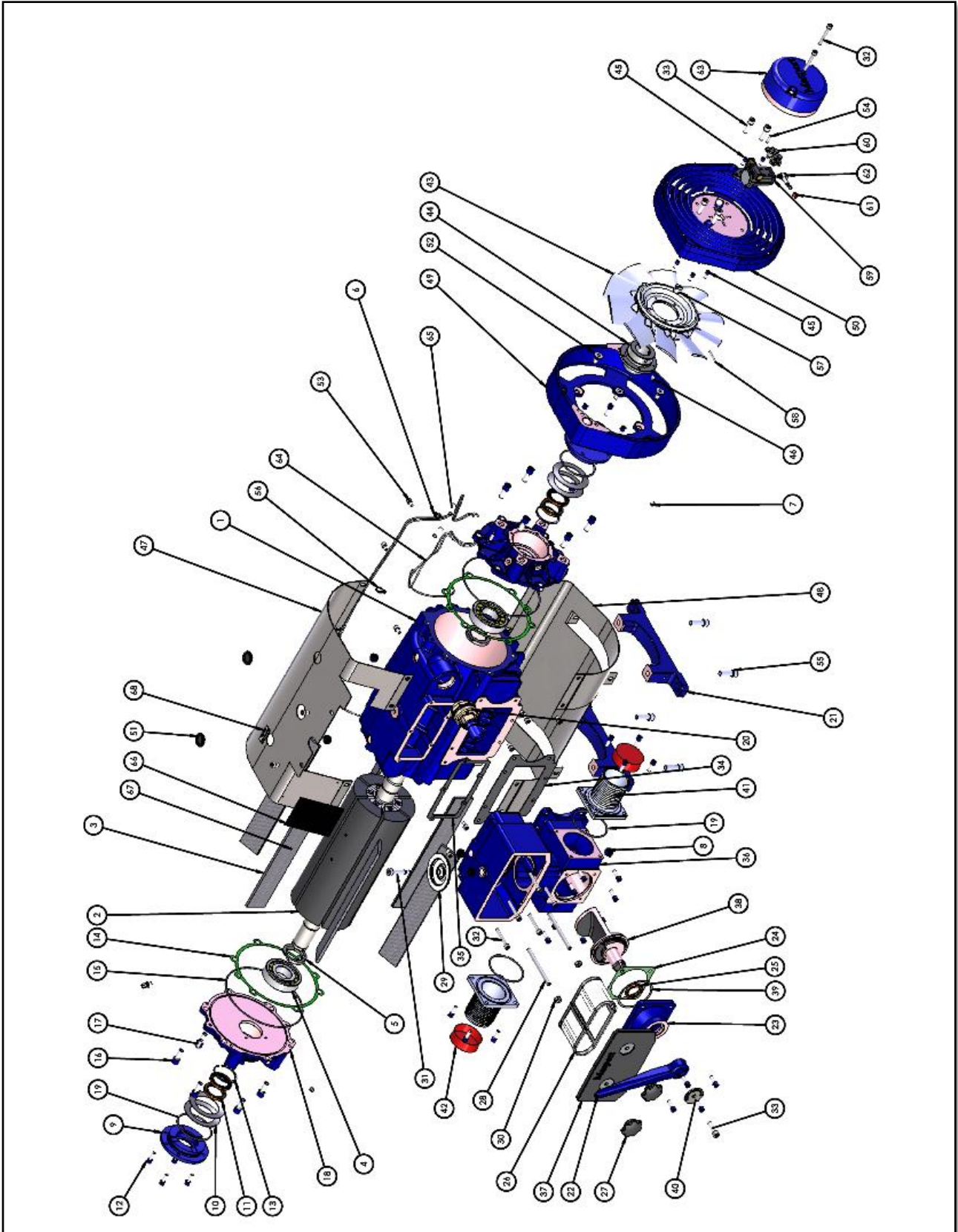


Item	Description	Part No.	Qty
1	Cylinder	969831	1
2	Rotor Assembly	969630	1
3	Vane Pack	969825	1
4	Bearing	569619	2
5	Spacer	569618	2
6	Fitting 1/8" to 4mm	569947	4
7	Plug 1/8"	569726	2
8	Plug 1/2"	569839	5
9	Bearing Retainer	969606	2
10	Bearing Spring	569613	4
11	Seal	569607	4
12	Screw M8 x 25	11063	28
13	Circlip	569682	2
14	Shim Gasket	569668	*
15	O-Ring	569683	2
16	Screw M12 x 30	569667	12
17	Dowel Pin	503259	4
18	End Cover	969605	2
19	O-Ring	568222	4
20	Vacuum Relief Valve	569023	1
21	Valve Handle	969827	1
22	Valve Cap	968035	1
23	Valve Gap Gasket	568044	1
24	Seal	501015	1
25	Inlet Filter	969821	1
26	Inlet Filter Cover Knob	969842	2
27	Stud M10	969822	2
28	Check Valve	969841	1
29	Nut M10	26066	2
30	Shoulder Screw M12 x 40	569851	1
31	Screw M8 x 60	569849	7
32	Screw M10 x 35	501966	5
33	Valve Exhaust Gasket	969832	1
34	Valve Inlet Gasket	969833	1
35	Valve Body	969838	1

Item	Description	Part No.	Qty
36	Inlet Filter Cover	969826	1
37	Valve Spool	969824	1
38	Wave Washer	569867	1
39	Indicator Washer	569724	1
40	Plug Plastic 3"	568030	2
41	Flange 3" NPT	969329	2
42	Fan for CCW Pump Fan for CW Pump	969854 969856	1 1
43	Fan Mounting Boss	569634	1
44	Screw M6 x 16	577711	7
45	Grub Screw M8 x 20	569669	2
46	Oil Pump Coupler	969829	1
47	Roll Pin	569666	1
48	Fan Case	969837	1
49	Fan Guard	969836	1
50	Rubber Plug	969834	2
51	Screw Countersunk 1/2" x 1	569663	4
52	Screw M8 x 12	569662	14
53	Cowling Inlet Side	969847	1
54	Cowling Exhaust Side	969846	1
55	Flushing Port Sticker	569866	1
56	Dowel Pin	575111	2
57	Pump Model Tag	569901	1
58	Warning Sticker	569903	1
59	Rivets	23061	4
60	Screw M12 x 40	569852	4
61	Foot	969823	2
62	Cable Tie	503054S	3
63	Oil Line	600293	*
64	PVC Tube	24294	2
65	Oil Pump	569636	1
66	Banjo Fitting M8 x 1 to 4mm	569409	4
67	Plug Plastic 1/16"	568008	1
68	Oil Pump Supply Fitting	569859	1
69	Oil Pump Cap	969828	1

* Quantity may vary pump to pump

Sidewinder:

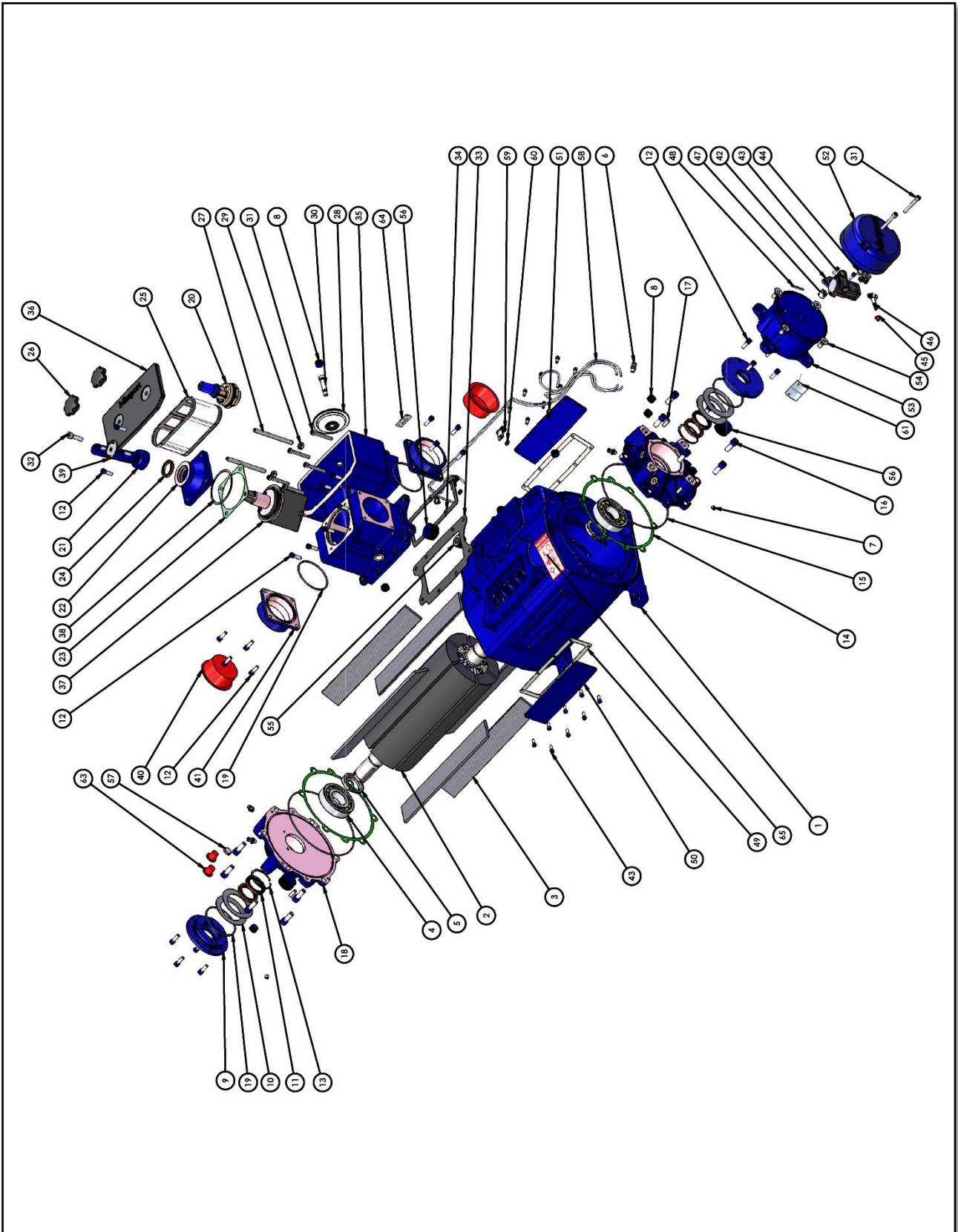


Item	Description	Part No.	Qty
1	Cylinder	969831	1
2	Rotor Assembly	969630	1
3	Vane Pack	969825	1
4	Bearing	569619	2
5	Spacer	569618	2
6	Fitting 1/8" to 4mm	569947	4
7	Plug 1/8"	569726	2
8	Plug 1/2"	569839	5
9	Bearing Retainer	969606	2
10	Bearing Spring	569613	4
11	Seal	569607	4
12	Screw M8 x 25	11063	28
13	Circlip	569682	2
14	Shim Gasket	569668	*
15	O-Ring	569683	2
16	Screw M12 x 30	569667	12
17	Dowel Pin	503259	4
18	End Cover	969605	2
19	O-Ring	568222	4
20	Vacuum Relief Valve	569023	1
21	Foot	969823	2
22	Valve Handle	969827	1
23	Valve Cap	968035	1
24	Valve Gap Gasket	568044	1
25	Seal	501015	1
26	Inlet Filter	969821	1
27	Inlet Filter Cover Knob	969842	2
28	Stud M10	969822	2
29	Check Valve	969841	1
30	Nut M10	26066	2
31	Shoulder Screw M12 x 40	569851	1
32	Screw M8 x 60	569849	7
33	Screw M10 x 35	501966	5
34	Valve Exhaust Gasket	969832	1
35	Valve Inlet Gasket	969833	1

* Quantity may vary pump to pump

Item	Description	Part No.	Qty
36	Valve Body	969838	1
37	Inlet Filter Cover	969826	1
38	Valve Spool	969824	1
39	Wave Washer	569867	1
40	Indicator Washer	569724	1
41	Flange Hose Tail	969868	2
42	Plug Plastic 3"	569918	2
43	Fan for CCW Pump	969854	1
44	Fan Mounting Boss	569634	1
45	Screw M6 x 16	577711	7
46	Grub Screw M8 x 20	569669	2
47	Cowling Top	969844	1
48	Cowling Bottom	969843	1
49	Fan Case	969837	1
50	Fan Guard	969836	1
51	Rubber Plug	969834	2
52	Screw Countersunk 1/2" x 1	569663	4
53	Screw M8 x 12	569662	14
54	Dowel Pin	575111	2
55	Screw M12 x 40	569852	4
56	Cable Tie	503054S	3
57	Oil Pump Coupler	969829	1
58	Roll Pin	569666	1
59	Oil Pump	569636	1
60	Banjo Fitting M8 x 1 to 4mm	569409	4
61	Plug Plastic 1/16"	568008	1
62	Oil Pump Supply Fitting	569859	1
63	Oil Pump Cap	969828	1
64	Oil Line	600293	*
65	PVC Tube	24294	2
66	Pump Model Tag CCW Pump	569857	1
67	Rivets	23061	4
68	Flushing Port Sticker	569866	1
69	Warning Sticker	569903	1

Hydra:

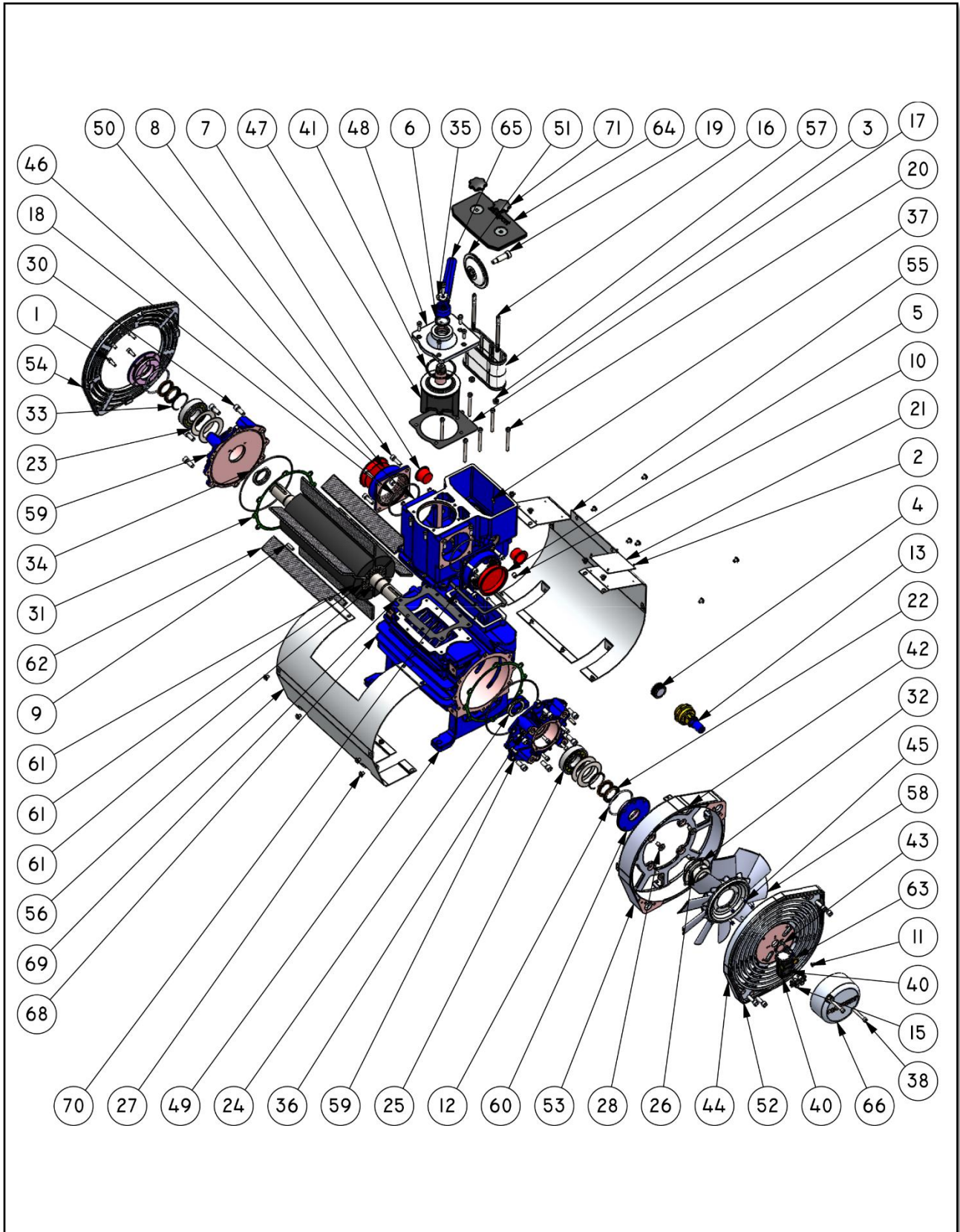


Item	Description	Part No.	Qty
1	Cylinder	969906	1
2	Rotor Assembly	969630	1
3	Vane Pack	969825	1
4	Bearing	569619	2
5	Spacer	569618	2
6	Fitting 1/8" to 4mm	569947	4
7	Plug 1/8"	569726	2
8	Plug 1/2"	569839	9
9	Bearing Retainer	969606	2
10	Bearing Spring	569613	4
11	Seal	569607	4
12	Screw M8 x 25	11063	28
13	Circlip	569682	2
14	Shim Gasket	569668	*
15	O-Ring	569683	2
16	Screw M12 x 30	569667	12
17	Dowel Pin	503259	4
18	End Cover	969605	2
19	O-Ring	568222	4
20	Vacuum Relief Valve	569023	1
21	Valve Handle	969827	1
22	Valve Cap	968035	1
23	Valve Gap Gasket	568044	1
24	Seal	501015	1
25	Inlet Filter	969821	1
26	Inlet Filter Cover Knob	969842	2
27	Stud M10	969822	2
28	Check Valve	969841	1
29	Nut M10	26066	2
30	Shoulder Screw M12 x 40	569851	1
31	Screw M8 x 60	569849	7
32	Screw M10 x 35	501966	1
33	Valve Exhaust Gasket	969832	1

Item	Description	Part No.	Qty
34	Valve Inlet Gasket	969833	1
35	Valve Body	969838	1
36	Inlet Filter Cover	969826	1
37	Valve Spool	969824	1
38	Wave Washer	569867	1
39	Indicator Washer	569724	1
40	Plug Plastic 3"	568030	2
41	Flange 3" NPT	969329	2
42	Oil Pump	569636	1
43	Screw M6 x 16	577711	18
44	Banjo Fitting M8 x 1 to 4mm	569409	4
45	Plug Plastic 1/16"	568008	1
46	Oil Pump Supply Fitting	569859	1
47	Oil Pump Coupler	969829	1
48	Roll Pin	569666	1
49	Side Plate Gasket	569909	2
50	Side Plate	569908	2
51	Cable Tie	503054S	2
52	Oil Pump Cap	969828	1
53	Bell Housing	969907	1
54	Screw Countersunk 1/2" x 1	501679	4
55	Plug 1"	501679	1
56	Plug 1 1/4"	569911	3
57	Frost Plug	569922	1
58	Oil Line	600293	*
59	P-Clip	568047	2
60	Spring Washer M8	501610	4
61	Pump Model Tag	569912	1
62	Drive Screw	500806	2
63	Plug Plastic 1/2"	501506	2
64	Flushing Port Sticker	569866	1
65	Warning Sticker	569903	1

* Quantity may vary pump to pump

Cobra:



Item	Description	Part No.	Qty
1	Screw M8 x 25	11063	19
2	Rivets	23061	4
3	Nut M10	26066	2
4	Plug 1 1/2"	27049	1
5	Plug Plastic	36152	2
6	Seal	501015	1
7	Plug Plastic	501505	2
8	Screw M10 x 35	501966	13
9	Dowel Pin	50328	4
10	Plug 1/4"	503416	2
11	Plug Plastic 1/16"	568008	1
12	O-Ring	568222	2
13	Vacuum Relief Valve	569023	1
14	Fitting 1/8" to 4mm	569947	4
15	Banjo Fitting M8 x 1 to 4mm	569409	4
16	Stud M10	569591	2
17	Valve Cap Gasket	569592	1
18	O-Ring	569593	2
19	Shoulder Screw M16 x 40	569594	1
20	Screw M8 x 90	569596	7
21	Pump Model Tag	569597	1
22	Seal	569607	4
23	Bearing Spring	569613	4
24	Spacer	569618	2
25	Bearing	569619	2
26	Fan Mounting Boss	569634	1
27	Screw M8 x 12	569662	18
28	Screw Countersunk 1/2" x 1	569663	4
29	Roll Pin	569666	1
30	Screw M12 x 30	569667	12
31	Shim Gasket	569668	*
32	Grub Screw M8 x 20	569669	2
33	Circlip	569682	1
34	O-Ring	569683	2
35	Indicator Washer	569724	1
36	Plug 1/8"	569726	2
37	Plug 1/2"	569839	1

Item	Description	Part No.	Qty
38	Screw M8 x 60	569849	2
39	Screw M12 x 40	569852	4
40	Oil Pump Supply Fitting	569859	1
41	Wave Washer	569867	1
42	Warning Sticker	569903	1
43	Oil Pump Shim	569926	1
44	Dowel Pin	575111	2
45	Screw M6 x 16	577711	7
46	Valve Body	969571	1
47	Valve Spool	969572	1
48	Valve Cap	969573	1
49	Foot	969574	2
50	Flange 4" NPT	969576	2
51	Check Valve	969578	1
52	Fan Case	969579	1
53	Fan Guard	969581	1
54	Drive Guard	969582	1
55	Cowling Inlet	969586	1
56	Cowling Exhaust	969587	1
57	Inlet Filter	969588	1
58	Fan for CCW Pump	969589	1
59	End Cover	969605	2
60	Bearing Retainer	969606	2
61	Rotor Assembly	969630	1
62	Vane Pack	969825	6
63	Oil Pump	569636	1
64	Inlet Filter Cover	969826	1
65	Valve Handle	969827	1
66	Oil Pump Cap	969828	1
67	Oil Pump Coupler	969829	1
68	Cylinder	969831	1
69	Valve Exhaust Gasket	969832	1
70	Valve Inlet Gasket	969833	1
71	Inlet Filter Cover Knob	969842	2
72	Oil Line (Not Shown)	600293	*
73	PVC Tube (Not Shown)	24294	2

* Quantity may vary pump to pump





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