



RCV-SERIES ROTARY CLAW VACUUM PUMPS

Installation & Operating Instructions



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Republic Claw Vacuum Pumps RCV-Series Installation Instructions & Operating Manual

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Working Principle

Rotary claw vacuum pumps are dry, positive displacement pumps that consist of a pumping chamber (2) and two counter-rotating, synchronized, non-contacting claws (3). The gas enters through the inlet (1) where the gas is filtered by the inlet screen. The gas enters the pumping chamber (2). The precisely-dimensioned claws (3) rotate. The small gap between the claws compresses the gas such that the inlet side has a lower pressure and the high pressure is on the discharge. The oil-free gas is then discharged through the silencer (4).

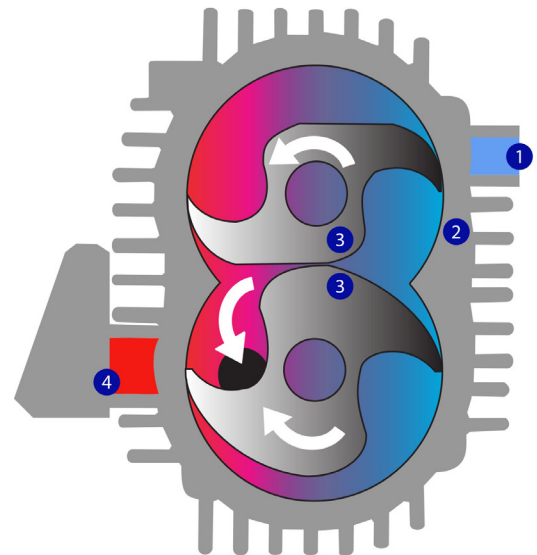


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Safety Instructions

To ensure safe operation, we have provided many important safety guidelines in this manual for the Republic Rotary Claw Vacuum Pumps. Please read this manual carefully and pay particular attention to instructions with the following signs:

DANGER: Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING: Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

DEFINITION: For the purpose of these instructions, “handling” the vacuum pump means the transport, storage, installation, commissioning, influence on operating conditions, maintenance, troubleshooting and overhaul of the pump.

1. Always use qualified electrical and mechanical personnel for installation and maintenance of Republic Rotary Claw Vacuum Pumps and motors.



2. Disconnect the electrical power at the motor starter, fuse box or circuit breaker before working on the system. Take special precautions to make sure the power cannot be turned on while you are working on the pump.

Use an approved lockout/tagout system.



3. Make sure the motor is electrically grounded, the pump is properly secured, and all covers are in place before start-up.
4. Wear safety glasses and earplugs when working on the blower or components within a Republic Vacuum system.
5. **Check the final installation for proper voltage and amp loads.**
6. Keep all tools, loose clothing and hands away from rotating or moving parts while the unit is running.
7. Inspect the pump at regular intervals for damaged or worn parts. **Replace damaged parts immediately! Do not operate or turn on a damaged pump!**
8. Inspect the inlet filter at regular intervals and replace when necessary. A dirty air filter can cause improper pump performance and lead to damage.
9. Use only genuine Republic Manufacturing brand replacement parts.
10. Refer to Troubleshooting section of manual.
11. Make sure to install all piping to pump inlet before starting the pump/motor.
12. Water, other liquids, aggressive or flammable gases and vapors may not be handled. Consult Republic Manufacturing for recommendations if flammable gases and vapors exist.
13. Improper use of the unit can result in serious or even fatal injuries. Only operate the pump for the purposes indicated under “Intended Use”, with the fluids indicated under “Intended Use”.
14. High temperatures of up to approximately 250 °F (121 °C) can occur on the surface of the pump. Allow to cool down after shut-down.

Safety

 **Protect Eyes and Ears**

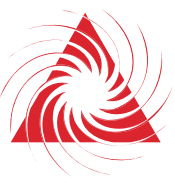


 **Danger, Warning, Caution**

 **Explosion Risk**

 **Hot Surface**

 **Risk of Electrical Shock**



Model Identification

Republic Vacuum Pumps have a nameplate containing the serial and model number located on the pump body. When placing a service call, please provide the Republic serial number. Call us at (800) 847-0380 or e-mail info@republic-mfg.com.

Equipment Arrival & Inspection

Inspect the pump at time of receipt to ensure that all components and accessories, as noted on the packing slip, were received and in good condition. Verify that the serial number on the packing slip matches the serial number shown on the pump nameplate. Inspect the pump and motor assembly to ensure that the motor horsepower and voltage are correct.

If any equipment was damaged in transit, you will need to make a claim against the freight carrier immediately.

If you have any shortages, discrepancies, or damage, please call your Republic Manufacturing Distributor or Republic Manufacturing at (800) 847-0380.



DANGER: Possible danger to health and or the environment. Personal protective equipment must be worn. Liquids must be disposed in compliance with applicable regulations.

Intended Use

This operating manual

- is intended for rotary claw vacuum pumps.
- contains instructions regarding transport and handling, installation, commissioning, operation, shut-down, storage, service, and disposal.
- must be completely read and understood by all operating and servicing personnel before beginning to work with or on the pumps.
- must be strictly observed.
- must be available at the site of operation.

The RCV Series

- are pump-motor units for generating deep vacuum.
- are used to extract, pump and compress the following gases:
 - Air.
 - Non-flammable, non-aggressive, non-toxic and non-explosive gases or gas-air mixtures.
 - For differing gases/gas-air mixtures, inquire with Republic Manufacturing.
- are equipped with 3-phase AC drive motor with a standard design.
- are intended for industrial applications and designed for continuous operation. Frequent starts in a short duration of time can cause damage to the pump. Do not exceed 12 cycles per hour.

Foreseeable Misuse

It is prohibited

- to use the RCV Rotary Claw Vacuum Pump in applications other than industrial applications unless the necessary protection is provided on the system, e.g. guards suitable for children's fingers;
- to use the device in areas in which explosive gases can occur if the pump is not expressly intended for this purpose;
- to extract, to deliver and to compress explosive, flammable, corrosive or toxic fluids, unless the pump is specifically designed for this purpose.

Any unauthorized modifications of the pump are prohibited for safety reasons. The operator is only permitted to perform the maintenance and service work described in these operating instructions. Maintenance and servicing work which goes beyond this may only be carried out by companies which have been authorized by Republic Manufacturing.

Product Description

Republic Rotary Claw Vacuum Pumps are industrial grade pumps made for continuous duty.

The vacuum pump is intended for the suction of air and other dry, non-aggressive, non-toxic and non-explosive gases. Conveying media with a higher density than air leads to an increased thermal and mechanical load on the vacuum pump and is permissible only after prior consultation with Republic Manufacturing.

The conveyance of vapors shall be agreed upon with Republic Manufacturing. The vacuum pump is intended for the placement in a non-potentially explosive environment. The vacuum pump is thermally suitable for continuous operation.

Cooling

The vacuum pump is cooled by:

- ambient air around the vacuum pump;
- air flow from the fan wheel on the drive of the vacuum pump;
- conveyed gas; and
- air flow from the fan wheels on the shaft of the vacuum pump.

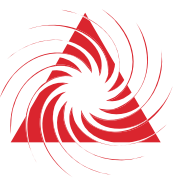
On/Off Switch

The vacuum pump comes without on/off switch. The control of the vacuum pump is to be provided in the course of installation.

Noise Emission



WARNING: The vacuum pump emits noise of high intensity. Risk of damage to hearing. Persons staying in the vicinity of a non-noise insulated vacuum pump over extended periods shall wear ear protection.



Transport

1. Attach lifting gear securely to the eyebolts on the pump body and motor.
2. Attach lifting gear to a crane hook with safety latch.
3. Lift the vacuum pump with a crane hook.



DANGER: Do not walk, work or stand under suspended loads.

WARNING: Check the weight of the vacuum pump before lifting. Use adequate lifting gear as needed.

ATTENTION: The position of the eyebolt fits to the center of gravity of the vacuum pump, including the drive motor. If a vacuum pump without a drive motor is to be lifted, attach another belt/rope at a suitable point.

Transport in Packaging

Packed on a pallet, the vacuum pump is to be transported with a forklift. Remove the stud bolts from the rubber feet. In the event the vacuum pump is bolted to a pallet or a base plate, remove the bolting between the vacuum pump and pallet/base plate.

Transport without Packaging

In the event the vacuum pump is bolted to a pallet or a base plate, remove the bolting between the vacuum pump and pallet/base plate.

Pump Handling

Only lift with lifting stud, not by hand - Republic Manufacturing recommends using lifting equipment.

Suitability & Environmental Conditions

- The units are suitable for use in the industrial field.
- Use only clean, dry air. **Do not use explosive gases or atmosphere that contains such gases.**
- **The ambient and suction temperatures must be > 32°F (0°C) <104°F (40°C).** For temperatures outside this range please contact your supplier.
- In all applications where an unplanned shut down of the pump could possibly cause harm to persons or installations, a corresponding safety backup system must be installed.
- Protect all surrounding items from exhausted air. **This exhausted air can be very hot.**
- When using the pump at a **high altitude** or **high temperatures**, please consult with Republic Manufacturing prior to use.
- Water, other liquids, aggressive or flammable gases and vapors may not be handled.
- Do not dispose of solid material directly into suction inlet or use filter before inlet. Doing so may cause damage to the vacuum pump.
- Do not dispose of acid, alkali or flammable gas. Doing so may cause an explosion or damage.
- Do not dispose of high temperature liquid or air.



DANGER: Possible danger to health and/or the environment. Personal protective equipment must be worn. Liquids must be disposed in compliance with applicable regulations.

Storage Conditions

- Store in original packaging.
- Must store pump in a place that meets the following conditions: dry, indoors, dust-free and low vibration (<2.8mm/s).
- The temperature during storage must be ambient temperature 35°F (1.66°C) <104°F (40°C)
- Store with the inlet and discharge plugged.
-

Conservation

Please contact Republic Manufacturing for questions regarding long-term storage.

Installation and Commissioning

Installation Prerequisites



DANGER: In case of non-compliance with the installation prerequisites, particularly in the case of insufficient cooling, risk of damage or destruction of the vacuum pump and adjoining plant components. Risk of injury. The installation prerequisites must be complied with.

Mounting Position & Space Required for Installation

- Upon installation, please check for and remove any obstruction around pump suction inlet and install under cover to avoid motor damage or electric shock caused by contact with water.
- To avoid overheating, ensure airflow to the pump is undisturbed.
- A distance of at least three 4 ft (1.2 meters) must be maintained between pump motor fan and wall to avoid overheating. Heat-resistant piping material is recommended within 4 ft (1.2 meters) of the pump.
- Ventilation screens and openings must remain clear so that discharge air of other units may not be directly sucked in again.
- Do not use the vacuum pump in areas where it would be exposed to high temperatures, excessive dust, smoke, rain, caustic air, or combustible air.
- Install the pump on a level, stable operating surface. The pump causes low vibration, but a special base is not required. If desired, the pump can be bolted down.
- Place the vacuum pump in such a way that the oil sight glass is easy to read.
- Make sure that the environment of the vacuum pump is not potentially explosive.
- Make sure that the ambient conditions will be complied with (see "Suitability & Environmental Conditions").
- Make sure that the environmental conditions comply with the protection class of the drive motor (according to the nameplate).
- Make sure that the vacuum pump will be placed or mounted horizontally.
- Make sure that the base for placement/mounting base is even.
- Make sure that the vacuum pump can neither inadvertently nor intentionally be stepped on and cannot be used as a support for heavy objects.
- Make sure that the vacuum pump cannot be hit by falling objects.
- Make sure that in order to supply a sufficient cooling there will a clearance of minimum 4 ft (1.2 meters) between the rear cover and nearby walls.
- Make sure that no temperature sensitive parts (plastics, wood, cardboard, paper, electronics) will touch the surface of the vacuum pump.
- Make sure that the installation space or location is vented such that a sufficient cooling of the vacuum pump is warranted.
- Make sure that the vacuum pump and silencer will not be touched inadvertently during operation. Provide a guard if appropriate.
- Make sure the motor fan, any installed gauges, and relief valve adjustment knob are easily accessible.
- If the oil change is meant to be performed on location, make sure that the oil drain port, the oil filter, and the oil fill port will remain easily accessible.



DANGER: Make sure the motor is electrically grounded, the mounting bolts are properly secured, and all guards are in place before start-up.



DANGER: During operation the surface of the vacuum pump may reach temperatures of more than 250°F (121°C). Risk of burns!



Plumbing & Accessories

- Remove any foreign material (e.g. burrs, chips, welding drops, pipe cuttings, excess sealant, etc.) from plumbing.
- Verify the motor is securely mounted and proper pump rotation before connecting to plumbing. The inlet and outlet port are not designed to support the plumbing without proper supporting elements.
- Connect the plumbing with properly sized fittings.
- Use integrated vacuum relief valve to draw in excess air when preset vacuum level is achieved.
- Install an intake filter to prevent foreign material from entering the pump. In applications where there is high humidity or liquids being used in the process, install a moisture separator with a drain valve.
- When the diameter of the main pipe must be reduced, a tapered pipe should be used.
- As filters become clogged, performance efficiency will be reduced. Filters should be checked periodically and replaced when necessary. The recommended check valves provide minimal pressure drop, positive sealing, and are resistant to the high discharge temperatures of the pumps.
- Recommended piping should be, at minimum, the same size as the inlet and outlet ports on pressure systems.



WARNING: Exhaust air temperature increases significantly above 18" Hg (162 mbar). Discharged air is typically too hot for most plastic piping, therefore metal piping is recommended. This piping must be guarded and marked "DANGER-HOT-DO-NOT TOUCH".

Suction Connection



DANGER: Do not put hands into the inlet opening on RV or pump inlet. Risk of bodily damage!

WARNING: Intruding foreign objects or liquids can destroy the vacuum pump.

If the inlet gas can contains dust or other foreign solid particles:

- Make sure that a suitable filter (5 micron or less) is installed upstream of the vacuum pump.
- Inlet filter should be installed between piping and check valve. Ensure check valve is installed and correctly oriented. Use PTFE thread tape or liquid thread sealant on all vacuum-side connections.

WARNING: Excessive tightening may damage pump; rely on sealant with hand-tight connections.

- Make sure that the suction line fits to the suction connection/gas inlet of the vacuum pump.
- Make sure that the gas will be sucked through a vacuum-tight flexible hose or a pipe.
- Make sure that the pipe will cause no stress on the vacuum pump's connection. If necessary use a flexible, vacuum-tight connection.
- Make sure that the line size of the suction line over the entire length is at least as large as the suction connection/gas inlet of the vacuum pump.

NOTE: In case of very long suction lines it is prudent to use larger line sizes in order to avoid a loss of efficiency. Seek advice from your Republic Manufacturing representative.

If the following conditions exist, provide a manual or automatic operated valve (non-return valve) in the suction line:

- Two or more vacuum pumps work on the same suction line.
- The volume of the vacuum system is large enough to cause reverse rotation.
- The vacuum shall be maintained after switching off the vacuum pump.

NOTE: The non-return valve that is installed alongside the suction connection is not meant to be used for this purpose! If the vacuum pump is planned to be used for the suction of gas that contains limited quantities of condensable vapor:

- Provide a shut-off valve, a drip-leg and a drain valve in the suction line, so that condensates can be drained from the suction line.
- Make sure that the suction line does not contain foreign objects, e.g. welding scales.

Discharge Connection



DANGER: Do not put hands into the inlet of the pump or relief valve. Risk of bodily damage!
The following guidelines for the discharge line do not apply if the aspirated air is discharged to the environment right at the vacuum pump.

- Make sure that the discharge line fits to the gas discharge connection of the vacuum pump.
- Attach exhaust piping to silencer discharge, if required.



DANGER: Exhaust gas is hot. Risk of bodily damage! Exhaust piping to exterior is recommended for confined spaces.

In case of using a pipe:

- Make sure that the pipe will cause no stress on the discharge connection. If necessary, use bellows or flexible connection.
- Make sure that the line size of the discharge line over the entire length is at least as large as the gas discharge connection of the vacuum pump.

Excessive back-pressure will cause the motor to over amp. Contact Republic Manufacturing for any operating questions.

NOTE: In case of very long discharge lines, it is prudent to use larger line sizes in order to avoid a loss of efficiency and an overload of the vacuum pump. Seek advice from your Republic Manufacturing representative.

To avoid liquids backing up into the vacuum pump:

- Make sure that the discharge line either slopes away from the vacuum pump; or
- Provide a liquid separator or a drip leg with a drain cock.

Vacuum Regulation & Relief Valve

- Relief valve adjustment knob may be turned either direction to adjust inlet vacuum level up or down. To increase vacuum, turn clockwise. To decrease vacuum, turn counterclockwise.

WARNING: Relief valve is factory set not to exceed maximum recommended vacuum. Do not disassemble relief valve! Tampering with valve internal stop will void warranty.

- The relief valve inlet filter is removable for cleaning or plumbing. Periodically check that relief valve inlet muffler screen is not blocked or dirty. Plumbing external air to the relief valve may offer sound level reduction at the point of use, and offers the opportunity to control relief air conditions.

Electrical Connection



DANGER: Malpractice can result in severe injuries and material damage. The electrical connection may be performed by trained and authorized electricians only.

ATTENTION: Before beginning work on the unit or system, the following measures must be carried out:

1. De-energize.
2. Perform proper lockout/tagout procedures such that electricity cannot be turned on again.
3. Confirm unit is de-energized.
4. Ground and short-circuit.
5. Cover or block-off adjacent energized parts.
6. Make sure the voltage and frequency of power supply fits the requested electrical condition marked on pump rating plate or label, otherwise injury or motor damage may occur due to incorrect voltage. Standard power supply for the vacuum pump motor is 230v/460v (60Hz, 3-Phase) or 190v/380v (50Hz, 3-Phase)
7. Install overload protection according to the voltage marked on rating plate or label and choose the appropriate overload device.
8. Make sure that the motor of the vacuum pump will not be affected by electric or electromagnetic disturbance from the mains; if necessary seek advice from Republic Manufacturing.
9. In case of mobile installation, provide the electrical connection with grommets that serve as strain-relief.



DANGER: Risk of electrical shock, risk of damage to equipment. Electrical installation work must only be executed by qualified personnel that knows and observes the following regulations: 1) IEC 364 or CENELEC HD 384 or DIN VDE 0100; 2) IEC-Report 664 or DIN VDE 0110; 3) BGV A2 (VGB 4) or corresponding national accident prevention regulation.



DANGER: Risk of damage to the drive motor. The inside of the terminal box shall be checked for drive motor connection instructions/schemes.

WARNING: Incorrect connection of the motor can lead to serious damage to the unit.



Electrical Power Supply

Observe the rating plate. It is imperative that the operating conditions correspond to the data given on the rating plate. Deviations permissible without reduction in performance include:

- +/- 5% voltage deviation
- +/- 2% frequency deviation



DANGER: There is danger of an electrical shock when a defective pump is touched. Mount motor circuit breaker. Have electrical equipment checked regularly by an electrician.



DANGER: Operation in the wrong direction of rotation can destroy the vacuum pump. Prior to starting-up it must be made sure that the vacuum pump is rotating in the proper directions.

DANGER: Risk of explosion!

Connection to Terminal Box

10. Remove the motor's terminal box cover.
11. Mount cable glands on the terminal box. Proceed as follows:
 - Select one cable gland in each case which is suitable for the cable diameter.
 - Insert this cable gland in the opening of the terminal box. Use a reducer if necessary.
 - Screw on the cable gland so that no moisture, dirt, etc. can penetrate into the terminal box.
12. Carry out the connection and arrangement of the jumpers in accordance with the wiring diagram on the motor nameplate. The electrical connection must be carried out as follows:
 - The electrical connection must be permanently safe.
 - The terminal box must be free from foreign bodies, dirt, and humidity. Terminal box cover and cable entries must be tightly closed so as to make them dust-proof and waterproof. Check for tightness at regular intervals.
 - There may be no protruding wire ends.
 - Clearance between bare live parts and ground: > 0.22 in. (5.5 mm) at a nominal voltage of UN < 690 V.
13. For motor overload protection, use motor circuit breakers and adjust to the specified nominal current as listed on the rating plate.
14. Determine the intended direction of rotation with the arrow.
15. "Bump" the drive motor, just enough to determine rotation of motor (less than 2 seconds).
16. Watch the fan wheel of the drive motor and determine the direction of rotation just before the fan wheel stops.
17. If the rotation must be changed, switch any two of the drive motor wires in the terminal box.

Installation and Mounting

Make sure that the "Installation Prerequisites" (pg. 9-12) are complied with. Set down and mount the vacuum pump at its location.

Connecting Lines/Pipes

- Connect the suction line.
- Connect the discharge line .
- Installation without discharge line:
- Make sure that the gas discharge is open.
- Make sure that all provided covers, guards, hoods etc. are mounted.
- Make sure that cooling air inlets and outlets are not covered or obstructed and that the cooling air flow is not affected adversely in any other way.

Filling Oil



DANGER: The vacuum pump is shipped with oil in the gearbox. Operation without oil will quickly ruin the vacuum pump. Prior to commissioning it must be validated that the oil is filled.

Please see aftermarket literature for gear oil specifications. Keep approximately 1 qt (946 ml) of oil ready.



ATTENTION: The amount given in these operating instructions is a guide. The actual amount of oil required is indicated by the oil sight glass.



WARNING: Before changing the oil type, compatibility shall be checked and, if necessary, the pump shall be flushed.



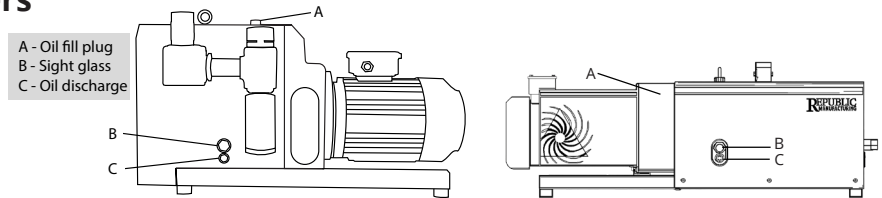
DANGER: In case the pressure pump has potentially been treated with conservation oil, pump must be flushed. Synthetic oils (except for oils based on poly-a-olefin) are incompatible with mineral oils and conservation oils. Risk of foaming leading to destruction of pressure pump.

1. Remove the oil fill plug.
 2. Using a funnel fill pour the oil directly into the fuel cap.
 3. Oil fill quantity is initially 1 qt (1 L). Oil level should be halfway up the sight glass window.
- NOTE:** Oil flows slowly; wait several minutes for sight glass to show oil level.
4. Make sure that the level is approximately in the middle of the oil sight glass.
 5. Make sure that the seal ring is inserted into the oil fill plug and undamaged. Replace if necessary.
 6. Firmly reinsert the oil fill plug together with the seal ring.
 7. In case the level has fallen below the MIN-marking of the oil sight glass, top off oil

Recording of Operational Parameters

As soon as the vacuum pump is operated under normal operating conditions:

- Measure the drive motor current and record it as reference for future maintenance and troubleshooting work.



Commissioning



DANGER: Improper use of the unit can result in serious or even fatal injuries. Do not proceed without reading "Safety Instructions".



DANGER: Danger from rotating parts cutting/cutting off extremities, grasping/winding up of hair and clothing.

DANGER: Danger due to vacuum and pressure, sudden escape of vapor (skin and eye injuries), sudden drawing in of hair and clothing, or burns.

Only start-up and operate under the following conditions:

- The pump must be completely assembled.
- Pay particular attention to the following components:
 - the pump cover,
 - a clean inlet filter, and
 - the fan guard.
- The pipes/hoses must be connected to inlet and discharge connections.
- Inlet and discharge connections and the connected pipes/hoses may not be closed, clogged or soiled.
- Check the mounting elements, connections of the pipe/hose, lines, fittings and containers for strength, leaks and firm seating at regular intervals.

Preparation



DANGER: Pump can overheat causing damage to the drive motor winding if intake or discharge connections are closed/soiled. Before start-up, make sure the inlet and discharge connections are not closed, clogged or soiled.

WARNING: Before starting up after a longer standstill, measure the insulation resistance of the motor. With values < 1 kΩ per volt of nominal voltage, the winding is too dry.

1. Check the direction of the rotation. The intended rotating direction of the shaft is marked with arrows on the motor.
2. The gas delivery direction is marked with arrows on the inlet connection.
3. Make sure the pipes/hoses on the inlet and discharge connections are properly connected.
4. Switch the pump on briefly and then off again, called "bumping," for less than 2 seconds to determine rotation.
5. Compare the actual rotating direction of the external fan with the intended shaft rotating direction indicated with the arrows shortly before the pump comes to a standstill.
6. If necessary, reverse the direction of the rotation of the motor.
7. Observe the operating speed specified on the rating plate. This may not be exceeded, as otherwise the noise radiation, vibration behavior, grease consumption duration and bearing change interval worsen. To prevent damage as a result of higher speeds, it may be necessary to inquire with Republic Manufacturing as to the maximum speed.



Start-Up

1. Open shut-off device in intake/discharge pipe.
2. Switch on power supply for drive motor.
3. Operate pump for an hour, and then check:
 - Ambient temperature - increased room temperatures may require stronger ventilation especially for larger pumps. Room temperature should not exceed 104°F (40°C).
 - Vacuum valves - adjust relief valve vacuum setting if needed.
 - Motor current - check that current supply matches recommended current rating on pump nameplate.
 - Electrical overload cutout - check that current matches rating on pump nameplate.

If motor fails to start or slows down significantly under load, shut off and disconnect from power supply. Check that the voltage is correct for the motor and that the motor is turning in the proper direction.

Shut Down

1. Switch off power supply for drive motor.
2. Close shut-off device in intake/discharge pipe, if applicable.

Preparing for a Long-Term Shutdown

If the vacuum pump will not be used for over three months, please contact Republic Manufacturing.

Commissioning After Long-Term Shutdown:

Before recommissioning after a longer standstill:

- Measure the insulation resistance of the drive motor. With values $< 1\text{k}\Omega$ per volt of nominal voltage, the winding is too dry.
- Remove all adhesive and packaging.
- Follow instructions for "Commissioning" and "Start-Up".

Operation



DANGER: Improper use of the unit can result in serious or even fatal injuries. Do not proceed without reading "Safety Instructions". The vacuum pump is designed for operation under the conditions described in this manual.



DANGER: Danger due to vacuum, sudden escape of vapors (skin and eye injuries), sudden drawing in of hair and clothing.



DANGER: Danger of overheating due to hot surface of pump. High temperatures of up to approximately 250°F (121°C) can occur on the surface of the pump. Risk of burns. Do not touch during operation. Allow to cool after shut-down. The vacuum pump shall be protected against contact during operation.



DANGER: Danger of overheating due to hot surface of pump. Temperature sensitive parts, such as lines or electronic components, may not come into contact with the surface of the pump.



DANGER: Danger of rusting due to collection of condensed water in drive motor area. On drive motors with closed condensed water openings, remove closures occasionally to allow any water which has collected to drain off.



DANGER: Danger of bearing damage. Heavy mechanical impacts must be avoided during operating and while at standstill.



DANGER: The vacuum pump emits noise of high intensity. Risk of damage to the hearing. Persons staying in the vicinity of a non-noise insulated vacuum pump over extended periods shall wear ear protection.

- Make sure that all provided covers, guards, hoods etc. are mounted.
- Make sure that protective devices will not be disabled.
- Make sure that cooling air inlets and outlets are not covered or obstructed and that the cooling air flow is not affected adversely in any other way.
- Make sure that the installation prerequisites are complied with and will remain complied with, particularly that sufficient cooling will be ensured.

Maintenance



DANGER: In case the vacuum pump conveyed gas that was contaminated with foreign materials which are dangerous to health, harmful material can reside in filters. Danger to health during inspection, cleaning or replacement of filters. Danger to the environment. Personal protective equipment must be worn during the handling of contaminated filters. Contaminated filters are special waste and must be disposed of separately in compliance with applicable regulations.



DANGER: During operation the surface of the vacuum pump may reach temperatures of more than 250°F (121°C). **Risk of burns:** Touching product while hot can lead to burns. Use approved lockout/tagout system. Replace damaged parts immediately. Do not turn on a damaged pump.

- Prior to action that requires touching the vacuum pump, let the vacuum pump cool down.
- When draining oil, ensure pump has cooled.
- Prior to disconnecting plumbing make sure that the connected pipes/lines are vented to atmospheric pressure.
- Conveying air with high moisture may shorten the pump's service life. Air with a high moisture content should be avoided. If unavoidable, inspect pump's parts periodically to prevent pump damage or injury caused by corrosion.
- Filters are consumable parts with limited life. Please inspect and replace periodically, especially in operations beyond normal ambient operating conditions.
- The inlet filter must be cleaned at regular intervals, depending on the amount of dust in the air being pumped. Blow out the filter cartridges with compressed air gun from the inside outwards.
- If the filter cartridge is too dirty to be cleaned, it must be replaced. The cartridges can be taken out after the removal of the filter cover.
- Cooling fan and motor should be inspected regularly for dirt. Dirt prevents cool air intake and may lead to overheating of the vacuum pump.

Maintenance Schedule

NOTE: The maintenance intervals depend very much on the individual operating conditions. The intervals given below shall be considered as starting values which should be shortened or extended as appropriate. Particularly heavy-duty operation, such as high dust loads in the environment or in the process gas, other contaminants or ingress of process material, can make it necessary to shorten the maintenance intervals significantly.

Monthly Maintenance

- Make sure that the vacuum pump is shut down and locked against inadvertent start up.
- In case an inlet air filter is installed, check the inlet air filter, if necessary clean (with compressed air) or replace.
- In case of operation in a dusty environment, make sure that the housing is free from dust and dirt, clean if necessary.

NOTE: The level of synchronizing gear oil should stay constant over the lifetime of the oil. If the level does fall, the gear is leaky and the vacuum pump requires repair.

Yearly

- Make sure that the vacuum pump is shut down and locked against inadvertent start up.
- In case an inlet air filter is installed, check the inlet air filter, if necessary clean (with compressed air) or replace.
- Check coupling spider for wear. Replace if necessary.



Changing Gear Oil

1. Make sure that the vacuum pump is shut down and locked against inadvertent start up.
2. Remove the oil cap.
3. Place a drain tray underneath the drain plug.
4. Open the drain plug and drain the oil.
5. Make sure that the seal ring on the drain plug is serviceable. Replace if necessary.
6. Firmly reinsert the drain plug with the seal ring.
7. Fill in new gear oil until the level is slightly above the middle of the sight glass.
8. Reinstall oil cap
9. Dispose of the used oil in compliance with applicable regulations.

Oil

Checking the oil level

1. Make sure that the vacuum pump is shut down and locked against inadvertent start up.
2. Make sure that the oil has collected at the bottom of the oil separator.
3. Read the level on the sight glass.
 - In case the level has dropped underneath the MIN-marking, top off oil (see “Maintenance, Oil, Topping off Oil”).

In case the level exceeds the MAX-marking:

4. Check the dilution with condensates.
5. Change the oil (see “Maintenance, Oil, and Oil Filter Change”).

Topping off Oil

NOTE: Under normal conditions there should be no need to top off oil during the recommended oil change intervals. A significant level drop indicates a malfunction (see “Troubleshooting”).

NOTE: During operation the exhaust filter gets saturated with oil. It is therefore normal that the oil level will drop slightly after replacement of the exhaust filter.



DANGER: Filling oil through the suction connection/gas inlet will result in breakage of the vanes and destruction of the vacuum pump. Oil may be filled only through the oil fill port.



DANGER: During operation the oil separator is filled with hot, pressurized oil mist. Risk of injury from hot oil mist with open oil inlet plug. Remove the oil inlet port, only when the vacuum pump is stopped. The vacuum pump must only be operated with the oil fill plug firmly inserted.

Checking the Color of the Oil

NOTE: The oil should be light, either transparent, a little foamy or a little tarnished. A milky discoloration that does not vanish after sedation of the oil indicates contamination with foreign material. Oil that is either contaminated with foreign material or burnt must be changed.

Changing the Oil

1. To maintain optimal performance of your pump, oil should be replaced on a regular schedule.
2. Run the vacuum pump to heat up the oil, which will help the oil drain faster.
3. Cut off power to the pump.
4. Slowly open the oil plug.
5. Check that no sealing rings are damaged or leaking.
6. Close the oil plug tightly.
7. Open oil plug, add oil up to the “Max” line and then tighten the plug.

Oil Life

The oil life depends very much on the operating conditions. A clean and dry air stream and operating temperatures below 212°F (100°C) are ideal. Under these conditions the oil and the oil filter shall be changed every 2000 operating hours or after half a year. Under very unfavorable operating conditions the oil life can be less than 500 operating hours. Extremely short life times indicate malfunctions (see “Troubleshooting”) or unsuitable operating conditions.

If there is no experience available with regard to the oil life under the prevailing operation conditions, it is recommended to have an oil analysis carried out every 500 operating hours and establish the change interval accordingly.

Oil and Oil Filter Change



DANGER: In case the vacuum pump conveyed gas that was contaminated with harmful foreign material the oil will be contaminated with harmful material. Danger to health during the changing of contaminated oil. Danger to the environment. Personal protective equipment must be worn during the changing of contaminated oil. Contaminated oil is special waste and must be disposed of separately in compliance with applicable regulations.

Draining Used Oil

NOTE: After switching off the vacuum pump at normal operating temperature wait no more than 20 minutes before the oil is drained.

1. Make sure that the vacuum pump is shut down and locked against inadvertent start up.
2. Make sure that the vacuum pump is vented to atmospheric pressure.
3. Put a drain tray underneath the oil drain port. Remove the oil drain plug.
4. Drain the oil.
5. When the oil stream dwindles, close the oil drain plug.
6. Switch the vacuum pump on for a few seconds.
7. Make sure that the vacuum pump is shut down and locked against inadvertent start up.
8. Remove the oil drain plug.
9. Make sure that the sealing seat on the oil drain plug is undamaged. If necessary, replace the oil drain plug.
10. Firmly reinsert the oil drain plug.
11. Dispose of the used oil in compliance with applicable regulations.

Flushing the Vacuum Pump



DANGER: Degraded oil can choke pipes and coolers. Risk of damage to the vacuum pump due to insufficient lubrication. Risk of explosion due to overheating. If there is a suspicion that deposits have gathered inside the vacuum pump the vacuum pump shall be flushed.

1. Make sure that all the used oil is drained.
2. Make sure that the used oil filter is still in place.
3. Refer to “Oil Fill Technical Spreadsheet” to determine amount of flushing agent required. Flushing agent should be from 50 percent oil and 50 percent paraffin or diesel fuel/fuel oil.
4. Make sure that the oil drain plug is reinserted correctly.
5. Remove the oil fill plug.
6. Fill in the flushing agent.
7. Firmly reinsert the oil fill plug with its sealing seat.
8. Close the suction line.
9. Run the vacuum pump for at least 30 minutes.
10. Drain the flushing agent and dispose of it in compliance with applicable regulations.

NOTE: Due to the use of paraffin and even more in case of using diesel fuel/fuel oil, unpleasant odor can occur after recommissioning. If this is a problem, diesel fuel/fuel oil should be avoided, and the vacuum pump be run at idle in a suitable place until the unpleasant odor vanishes.



Cleaning of the Float Valve

1. Make sure that all of the used oil is drained.
2. Unscrew the fixing screws of exhaust cover plate, take off the washers and remove the exhaust cover plate.
3. Check the seal and replace if necessary.
4. Unscrew the fixing screws and remove the float.
5. Check the O-ring and replace if necessary.
6. Check float for cleanliness and good operation. Blast clean with compressed air if necessary.
7. For reassembly, refit float to its support while taking care to fit it the correct way.

Replacing the Oil Filter

1. Make sure that all the used oil is drained.
2. Remove the oil filter.
3. Apply a drop of fresh oil on the seal ring of the new oil filter.
4. Mount the new oil filter and tighten it by hand.
5. Make sure that the oil outlet plug is firmly inserted.

NOTE: The amount given in these operating instructions is a guide. The oil sight glass indicates the actual amount to be filled.



DANGER: Filling oil through the suction connection/gas inlet will result in breakage of the vanes and destruction of the vacuum pump. Oil must be filled through the oil fill port only.

1. Remove the oil fill plug.
2. Fill oil.
3. Make sure that the level is between the MIN and the MAX-markings of the oil sight glass.
4. Make sure that the seal ring is inserted into the oil inlet plug and undamaged, replace if necessary.
5. Firmly reinsert the oil inlet plug together with the seal ring.

Exhaust Filter

Check During Operation

Republic Manufacturing recommends the use of a filter pressure gauge (available as accessory). Without filter pressure gauge the filter resistance shall be assessed on the basis of the drive motor current drawn.

- Make sure that the vacuum pump is running.

Version with filter pressure gauge:

- Check that the indication of the filter pressure gauge is in the usual range (< 0.6 bar).

Version without filter pressure gauge:

- Check that the drive motor current drawn is in the usual range (see nameplate).
- Check that the discharge air is free from oil.

Assessment

If the indication of the filter pressure gauge is in the red field, (> 17inHg [0.6 bar]) or the drive motor draws too much current and/or the pump flow rate has dropped, then the exhaust filters are clogged and must be replaced.

NOTE: Exhaust filters cannot be cleaned successfully. Clogged exhaust filters must be replaced with new ones. If the discharge air contains oil, the exhaust filters can be clogged or broken through and, if applicable, must be replaced.

Change the Exhaust Filters



DANGER: In case the vacuum pump conveyed gas that was contaminated with foreign materials which are dangerous to health, harmful material can reside in filters. Danger to health during inspection, cleaning or replacement of filters. Danger to the environment. Personal protective equipment must be worn during the handling of contaminated filters. Contaminated filters are special waste and must be disposed of separately in compliance with applicable regulations.

Removing the Exhaust Filters

1. Make sure that the vacuum pump is shut down and locked against inadvertent start up.
2. Prior to disconnecting pipes/lines make sure that the connected pipes/lines are vented to atmospheric pressure.
3. Remove the discharge line, if necessary.
4. Remove the discharge cover from the oil separator.
5. Remove the seal for the separator cover, if necessary.
6. Release the spring elements by unscrewing the screws and remove them.
7. Remove the exhaust filters and the O-rings.



DANGER: The non-OEM spares market offers exhaust filters that are geometrically compatible with Republic Manufacturing vacuum pumps but do not feature the high retention capacity of genuine Republic Manufacturing exhaust filters and deteriorate the service life and the efficiency of the vacuum pump due to their increased back pressure. In order to keep the emissions at the lowest possible level and to preserve efficiency and service life only genuine Republic Manufacturing filters shall be used.



DANGER: Increased risk of damage to health. Adverse effect on efficiency and service life.

8. Insert the new exhaust filters with the new O-rings into the oil separator. Be sure to fit the exhaust filters as indicated by the arrow at exhaust filters.
9. Mount spring elements and apply a tension to the spring elements by means of the tension screw.
10. Check the cover seal and replace it if necessary.
11. Mount the discharge cover.

NOTE: During operation the exhaust filters get saturated with oil. It is therefore normal that the oil level will drop slightly after replacement of the exhaust filters.

Replacing Exhaust Air Filter

We recommend changing the exhaust filter every other time you change the oil for optimal performance.

1. Stop the vacuum pump and check that there is no pressure in the system.
2. Remove the screw on the exhaust air lid.
3. Disassemble the top pieces.
4. Remove old filter.
5. Install new filter with new O-ring into oil separator, matching the direction of the arrow on the filter.
6. Reattach top pieces and lid.

The inlet air filter is a dry paper filter. It should be removed and cleaned every 1000 working hours. To clean the filter, blow low pressure air from the inside to the outside. The inlet valve cannot be used as a vacuum system check valve or the vane may rotate in the opposite direction after the machine is switched off.

Inlet flange

Check the inlet flange regularly. The maintenance interval of the inlet flange depends on the application. To clean the mesh screen at the inlet:

1. Remove the upper parts of the inlet flange.
2. Remove the flange.
3. Remove the mesh screen and clean it with compressed air.
4. Check the different seals and replace them if necessary.
5. Refit the mesh screen and the inlet flange.



Replacing Air Inlet Filter

1. Stop the vacuum pump and check that there is no pressure in the system.
2. Remove the three clips on the inlet air filter and open the inlet filter lid.
3. Remove the old filter and replace with the new filter.
4. Close the air filter lid and reattach the three clips on the inlet air filter lid.

Fan Cover

Check the fan cover regularly. Poor maintenance of the fan cover will affect the vacuum pump cooling and may lead to overheating of the vacuum pump.

Motor Cover

Check the motor cover regularly. Poor maintenance of the motor cover will affect the vacuum pump cooling and may lead to overheating of the vacuum pump.

Overhaul



DANGER: In order to achieve best efficiency and a long life the vacuum pump was assembled and adjusted with precisely defined tolerances. The adjustment will be lost during dismantling of the vacuum pump. It is therefore strictly recommended that **any dismantling of the vacuum pump that is beyond what is described in this manual shall be done by Republic Manufacturing.**



DANGER: Improper work on the vacuum pump puts the operating safety at risk. Risk of explosion! Approval for operation will be void! Any dismantling of the vacuum pump that is beyond what is described in this manual must be done by specially trained Republic Manufacturing service personnel only.



DANGER: In case the vacuum pump conveyed gas that was contaminated with foreign materials which are dangerous to health, harmful material can reside in oil and condensates. Danger to health during dismantling of the vacuum pump. Danger to the environment.



Removal from Service

Temporary Removal from Service

Prior to disconnecting pipes/lines make sure that all pipes/lines are vented to atmospheric pressure.

Recommissioning

After longer periods of standstill:

1. Make sure that the vacuum pump is shut down and locked against inadvertent start up.
2. Observe the chapter "Installation and Commissioning".

In the Event of a Breakdown

1. Use a lockout/tagout procedure to ensure the pump may be worked on safely.
2. Refer to the "Troubleshooting" section of the manual to determine the cause of the breakdown and the appropriate action to take.
3. If further assistance is needed, please call Republic Manufacturing at 800-847-0380.

When to Ship the Pump Back to Republic

If you cannot fix or troubleshoot your pump system using this manual then a skilled Republic Manufacturing professional is required. Please contact Republic Manufacturing to set up an RMA request and we will evaluate the situation from there.

Disabling, Dismantling, and Scrapping of Pump



DANGER: If the vacuum pump conveyed gas that was contaminated with harmful foreign material then the operating fluid and the exhaust filter(s) will be contaminated with harmful material. Harmful material can reside in pores, gaps, and internal spaces of the vacuum pump. Danger to health during dismantling of the vacuum pump. Danger to the environment. During dismantling of the vacuum pump personal protective equipment must be worn. The vacuum pump must be decontaminated prior to disposal. Dispose of the used oil and condensate according to applicable environmental protection regulations.



DANGER: Used oil is special waste and must be disposed of in compliance with applicable regulations.

1. Drain the oil.
2. Make sure that materials and components to be treated as special waste have been separated from the vacuum pump.
3. Make sure that the vacuum pump is not contaminated with harmful foreign material.
4. Dispose of the used oil in compliance with applicable regulations.
5. Dispose of special waste in compliance with applicable regulations.
6. Dispose of the vacuum pump as scrap metal.

According to the best knowledge at the time of printing of this manual the materials used for the manufacture of the vacuum pump involve no risk.

Warranty Terms and Conditions

- Republic Manufacturing warrants all finished Republic Manufacturing products to be free from functional defects in material and workmanship for a period of twelve (12) months from the date of installation, or no longer than eighteen (18) months from shipment.
- Wear parts such as filter elements, hoses and piping are not covered by the 12-to-18-month warranty.

DISASSEMBLY OF PUMP MAY VOID WARRANTY.

To obtain service within the warranty period, first contact your authorized Republic Manufacturing dealer or Republic Manufacturing Service Department. Republic's responsibility under this warranty shall be to provide an analysis of the pump, which will determine course of action. Any product found to be defective within the warranty period will merit either:

- a. A no charge repair of existing pump. Any freight charges will be the purchaser's responsibility.
- b. A replacement pump*. Any freight charges will be the purchaser's responsibility.

**This option would be a chargeable replacement until the original pump is received by Republic Manufacturing, and warranty is approved.*

Republic Manufacturing shall not be liable for incidental nor consequential damages resulting from the use of this product. There are no expressed nor implied warranties, which extend beyond the warranty of merchantability or fitness for a particular purpose to the equipment and/or its parts and components.



Troubleshooting



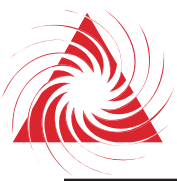
DANGER: Risk of electrical shock, risk of damage to equipment. Electrical installation work must only be executed by qualified personnel that knows and observes the following regulations: 1) IEC 364 or CENELEC HD 384 or DIN VDE 0100; 2) IEC-Report 664 or DIN VDE 0110; 3) BGV A2 (VBG 4) or equivalent national accident prevention regulation.



DANGER: During operation the surface of the vacuum pump may reach temperatures of more than 250°F (121°C). Risk of burns! Let the vacuum pump cool down prior to a required contact or wear heat protection gloves.

Problem	Possible Cause	Remedy
<p>The vacuum pump does not reach the rated vacuum.</p> <p>The drive motor draws too much current.</p> <p>Evacuation of the system takes too long.</p>	The vacuum system or suction line contains leaks.	Check the hose or pipe connections for possible leaks.
	In case a vacuum relief valve/regulating system is installed: The vacuum relief valve/regulating system is defective.	Adjust, repair, or replace.
	The screen in the suction connection is partially clogged.	Clean the screen. If cleaning is required too frequently, install a filter upstream
	In case a filter is installed on the suction connection: The filter on the suction connection is partially clogged.	Clean or replace the inlet air filter.
	Partial clogging in the suction, discharge or pressure line.	Remove the clogging.
	Long suction, discharge or pressure line with too small diameter.	Use larger diameter.
	The valve disk of the inlet non-return valve is stuck in the closed or partially open position.	Disassemble the inlet, clean the screen and the valve as required and reassemble.
	Internal parts worn or damaged.	Repair the vacuum pump.
The gas conveyed by the vacuum pump smells.	Process components evaporating under vacuum.	Check the process, if applicable.
The vacuum pump seizes up.	Solid, foreign matter has entered the vacuum pump.	Repair the vacuum pump. Make sure the suction line is equipped with a screen. If necessary, provide an additional filter.
	Corrosion in the vacuum pump from remaining condensate.	Repair the vacuum pump. Check the process. See "Conveying Condensable Steam".
	The vacuum pump was run in the wrong direction.	Repair the vacuum pump. When connecting the vacuum pump make sure the vacuum pump will run in the correct direction. (See "Installation".)
The drive motor is running, but the vacuum pump stands still.	The coupling between the drive motor and the vacuum pump is defective.	Replace the coupling element.

Problem	Possible Cause	Remedy
The vacuum pump does not start.	The drive motor is not supplied with the correct voltage or is overloaded.	Supply the drive motor with the correct voltage.
	The drive motor starter overload protection is too small or trip level is too low.	Compare the trip level of the drive motor starter overload protection with the data on the nameplate. Correct if necessary. In case of high ambient temperature: set the trip level of the drive motor starter overload protection 5 % above the nominal drive motor current.
	One of the fuses or power box has blown.	Check the fuses. Replace as necessary.
	The connection cable is too small or too long causing a voltage drop at the vacuum pump.	Use sufficiently dimensioned cable.
	The vacuum pump or the drive motor is locked up.	Make sure the drive motor is disconnected from the power supply. Remove the fan cover. Try to turn the drive motor with the vacuum pump by hand. If the unit is still frozen: remove the drive motor and check the drive motor and the vacuum pump separately. If the vacuum pump is locked up: Repair the vacuum pump.
	The drive motor is defective.	Replace the drive motor.
The vacuum pump starts but runs noisily or rattles. The drive motor draws too high current (compare with initial value after commissioning).	Loose connection(s) in the drive motor terminal box. Not all drive motor coils are properly connected. The drive motor operates on two phases only.	Check the proper connection of the wires against the connection diagram (particularly on motors with six coils). Tighten or replace loose connections.
	The vacuum pump runs in the wrong direction.	Verification and rectification. (See "Installation and Commissioning").
	Foreign objects in the vacuum pump. Defective bearings.	Repair the vacuum pump.
The vacuum pump runs very noisily.	Defective bearings.	Repair the vacuum pump.
	Worn coupling element.	Replace the coupling element.
	Low oil level in the synchronizing gear.	Repair the vacuum pump.
	Synchronizing gear damaged due to operation with low oil level.	Repair the vacuum pump.



Problem	Possible Cause	Remedy
The vacuum pump runs very hot.	Insufficient air ventilation.	Make sure that the cooling of the vacuum pump is not impeded by dust/dirt. Clean the fan, the fan wheels, the ventilation grilles, the cooling fins, and relief inlet muffler. Only install the vacuum pump in a narrow space if sufficient ventilation is ensured.
	Ambient temperature too high - above 104°F (40°C).	Observe the permitted ambient temperatures.
	Temperature of the inlet gas too high.	Observe the permitted temperatures for the inlet gas.
	Mains frequency or voltage outside tolerance range.	Provide a more stable power supply.
	Partial clogging of filters or screens. Partial clogging in the suction, discharge, or pressure line.	Remove the clogging.
	Long suction, discharge or pressure line with too small diameter.	Use larger diameter.

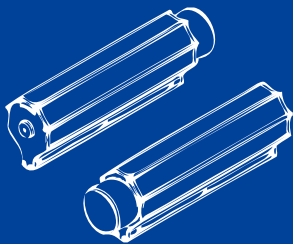
Oil Fill Technical Spreadsheet

The following table gives the approximate quantities of oil required for each model.

Republic PN	Capacity (liter)	ISO-VG	Part Number
RCV-62c	0.6	150	192-2597
RCV-60	0.9	220	190-2597
RCV-82	0.7	150	192-2597
RCV-80	0.9	220	190-2597
RCV-120	0.9	220	190-2597
RCV-160	0.9	220	190-2598
RCV-250	0.8	150	192-2597
RCV-300	0.8	150	192-2598
RCV-402	1.5	150	192-2599
RCV-502	1.5	150	192-2600
RCV-1002	2.8	150	192-2601



Air Knife Systems



Centrifugal Pumps



Regenerative Pumps



Vacuum Pumps



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