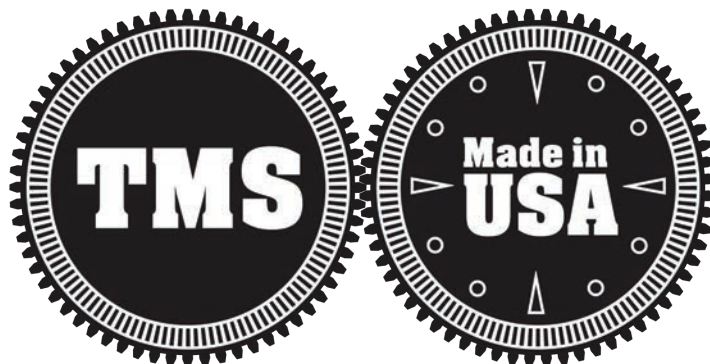


Total Maintenance Solutions



ROTARY VANE VACUUM PUMP OPERATOR'S MANUAL & MAINTENANCE GUIDE

TMSRV Series

Models 25, 40, 63, 100, 165, 205, 255, 305, 400, 630

Single Stage Rotary Vane Vacuum Pumps

July 2025

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NOTE: As a supplement to this maintenance manual, please take advantage of the "how-to" preventative maintenance videos available at <https://www.tmsvacuum.com/how-to-pm>



GENERAL

Vacuum Pump Identification

This manual is provided for owners of one or more TMSRV series vacuum pump models **25, 40, 63, 100, 165, 205, 255, 305, 400 and 630**. For model identification, see the nameplate mounted on the side of the vacuum pump's exhaust box.

The proper reference to these models is typically in the following text and numeric format:

TMSRV100 or TMSRV630

Reference numbers published in this manual correspond to the part drawings and lists at the end of this document.

This manual is provided to help optimize pump performance and eliminate downtime with preventative maintenance.

1.0 INSTALLATION

1.1 Oil Filling

WARNING: Keep the oil fill plug tight as pressure in the exhaust box could cause bodily injury if the plug is blown out. Do not fill/add the pump with oil through the exhaust/inlet ports as there is danger of breaking the vanes!

The pump is shipped without oil. After level installation, and after correct rotation has been established, fill the pump with the recommended vacuum oil through the oil filling port (Ref. 88), observing the "MAX" and "MIN" position at the oil sight glass (Ref. 83). On pumps with two sight glasses, fill the top glass up to the 3/4 mark. Non-detergent oil should be used. **Do not use detergent motor oil** as additives in detergent oil will plug exhaust filter elements and shorten their life.

It is recommended that TMSRV Series vacuum pump ISO 100, 30 wt. non-detergent or synthetic food grade oil be used to optimize the vacuum pump's top performance. TMSRV Series oil is a long life, low vapor pressure oil that will protect your equipment from wear and corrosion, and generate longer running periods between oil changes. Using TMSRV vacuum oil also provides optimal lubrication at high operating temperatures, and will prolong exhaust filter elements' service life. This oil can be obtained directly from TMS in Rock Island, Illinois.

The strict use of TMS provided oils and parts from the day of purchase can extend the Limited Standard Warranty. Contact TMS in Rock Island, Illinois for details.

For general applications, use OIL in all models covered by this manual. Use TMSRV synthetic vacuum oil in pumps that are operated in high ambient temperatures (above 90° F) or high operating pressure when the oil carbonizes (turns black) before the change interval.

The **TECHNICAL DATA** chart on page 12 provides the approximate oil quantities each pump series size requires.

The oil capacity amounts should be used only as a guide, because oil capacity could be slightly lower, depending on whether the pump was previously filled, and whether all components such as oil lines and filters were completely drained. For proper level readings, use only the sight glass.

Never overfill the vacuum pump with oil.

Replace the oil fill plug (Ref. 88), making sure that the gasket (Ref. 89) is in place and properly seated and secured. Some pumps are equipped with an exhaust pressure gauge as an integral part of the oil fill plug.

2.0 OPERATION

2.1 Start-up

Confirm the motor's proper rotation direction to ensure it is turning "counter-clockwise" when viewed from the rear of the motor.

Fill the pump with oil as described in Section 1.1 - Oil Filling.

Start the pump and quickly close the inlet. Operate the pump for five minutes, then shut the pump off and check the oil level again. With the pump not operating, the oil level should be visible in the oil sight glass (Ref. 83), between the "MIN" and "MAX" mark.

Add oil when necessary, but only when the pump has been turned off and the circulating oil has had adequate time to return to the oil sump.

2.2 Oil Level Float Valve

TMSRV Series vacuum pumps have incorporated into the exhaust box design a float valve mechanism (Ref. 585) An oil return line runs from the float support to the inlet of the pump. As oil drips from the exhaust filters and collects in the float cavity, the float rises opening the valve which allows the vacuum (suction) to draw the gathered oil through the oil return line back into the pump inlet. As the oil level drops in the float cavity, the valve closes "blanking off" the oil return line. This prevents losing critical vacuum and enables the pump to provide maximum pressure while running continuously.



2.3 Gas Ballast

An adjustable gas ballast is standard equipment for each of the TMSRV Series vacuum pumps. This gas ballast valve (Ref. 440) is positioned between the inlet port and the exhaust box.

Normally, the adjustable gas ballast valve should remain open. Its primary function is to prevent water vapor from condensing in the pump. Rotor seizure, loss of lubricity and/or oil emulsification can be caused by excess water vapor condensation.

2.4 Water-Cooled Pumps (optional)

Contact TMS to discuss a TMSRV Series water cooled option. The flow rate of the pump's cooling water supply will be the plant's water source pressure.

3.0 ROUTINE MAINTENANCE

TMSRV Series vacuum pumps require minimal routine maintenance. Ensuring optimal vacuum pump performance, requires the following recommendations.

3.1 Pump Oil

3.1.1 Oil Level

CAUTION: Do not add oil during pump operation. Doing so may allow hot oil vapor to escape via the oil fill port.

CAUTION: Under certain conditions, non-sufficient oil levels in the pump can lead to whatever oil is remaining in the pump to self-ignite.

Once the pump is installed relatively level, be certain there is adequate clean oil in the pump. Oil levels should be observed on a daily basis and/or after 8 hours of operation. If the level drops below the 1/4 mark on the sight glass, the oil should be replenished.

Read and measure the oil levels only when the pump is turned off. Oil can be added to the oil fill port (Ref. 88) when the pump is shut off allowing the circulating oil proper time to return to the oil sump. The oil could be foamy, which is normal for aerated oil.

Under standard circumstances, it should not be required to replenish or remove oil from the pump between recommended oil changes.

A substantial oil level reduction indicates there could be an oil leak or a broken exhaust filter, which would cause the pump to smoke excessively. It is standard for oil to be foamy and light in color in an operating vacuum pump.

Water being present in the oil is indicated when the oil is milky colored. Typically on TMSRV vacuum pumps, when running the pump for an extended period, while the inlet suction is blanked off and the gas ballast is open, the oil will purge the water. When the oil is dark colored, this means it is carbonized or contaminated, and must be changed. Depending on the contamination's severity, a thorough flushing may be required. See Section 3.1.4 for the flushing procedure.

3.1.2 Oil Type and Quantity

See Section 1.1 - Oil Filling for details on oil type and quantity.

3.1.3 Oil and Filter Change

Exposure conditions determine a pump's oil service life. Ideal conditions include oil operating temperature under 210°F and a clean, dry air stream. When using TMSRV non-detergent ISO 100 30wt vacuum oil, it is recommended that oil changes are done every three (3) to four (4) months or 500 to 750 hours of operation, or as necessary if high heat is contaminating the oil. The use of TMSRV synthetic or food-grade oil could extend the operating hours between oil changes under ideal conditions. Oil samples should be taken regularly when exceeding the 500-750 hour recommendation.

CAUTION: It may be required to flush the pump and remove build up of degraded oil from sumps, oil lines, radiators, etc. when changing oil and filters to assure proper pump oil flow. Reducing oil flow, especially through radiators and cooling coils, can cause mechanical damage or extreme overheating, which can cause oil vapors to ignite.

Excessive Heat

When the pump is operated in conditions that cause the oil temp to go above 235°F, the oil will carbonize and become contaminated after a relatively low number of operating hours. The higher the temperature, the quicker the oil becomes contaminated. If the oil temperature is too severe, TMSRV synthetic oil should be used to withstand the elevated temperatures. If synthetic oil is used, the pump should be flushed with TMSRV flushing oil as outlined in Section 3.1.4. Auxiliary oil cooling is the most practical approach to a severe heating problem.

Contaminated Air Stream

Oil must be changed more often when a pump's air stream contains a solid and/or liquid which can contaminate the oil. When the air stream has a small percentage of contaminants and/or slightly aggressive contaminants like



mild acids, using TMSRV synthetic or food grade vacuum oil will mitigate breakdown better than the standard oil. Another preventative maintenance measure is to install a filter or knock-out pot and keep the contaminants out of the pump.

Process air streams with a large percentage of contaminants and/or more than slightly aggressive contaminants should use a pump style other than a TMSRV Series.

Interval periods for changing the oil are best established with the pump operating in the actual conditions (see previous paragraph for some of the conditions). Establish the oil change schedule by periodically observing a pump's oil sample. When the oil sample is dark in color (from solids and carbonized particles) or is milky looking (from solids), it is time to remove and replace the oil. As mentioned before, a thorough flushing may be needed.

3.1.4 Oil Flushing Procedure

A TMSRV Series vacuum pump can be run in the production process while TMSRV Vacuum flushing oil is on board.

While oil flushing is required under certain contaminated conditions, some pumps may be damaged enough that flushing will not help, and the pump needs to be replaced, repaired, or rebuilt.

Observe the oil's condition as it is draining from the pump to ascertain if flushing is required. Is the oil black and tar-like or showing contamination signs? Did the motor overload shut the pump off? Was the pump noisy or overheating? How long ago was the oil changed last and when was the pump originally put into service?

If these conditions above are present, or the last oil change date is unknown, further investigation is needed.

All oil needs to be removed and replaced with TMSRV Vacuum flushing oil. Eventually the flushing oil will need to be replaced with TMSRV Vacuum non-detergent or synthetic/food-grade TMSRV Vacuum oil. It is optimal to have sufficient oil and oil filters available for at least two flushes in order to remove all contaminants. Please follow the instructions below for proper flushing procedure.

Power the pump off. Drain all the oil from the pump. Remove the access plates (Ref. 205) from the exhaust box (Ref. 075). Remove the metal baffle (Ref. 078) and inspect the internal walls of the oil sump very closely. If the sump walls have discoloration but show no material or contamination build, the oil flushing can proceed.

All congealed and/or burned oil material clinging to the walls must be scraped off and removed prior to flushing. Scrape away all the material possible from the exhaust box. The more debris removed now, the more effective the flushing will be.

Proceed with the flushing after reinstalling and covering the metal baffle. NOTE: Oil lines and oil cooler chamber could also be plugged enough that any amount of flushing will make no difference and a replacement or rebuilt pump may be the only option. The pump's oil contamination severity may render a flushing ineffective.

The more contaminated oil that is removed now, the more effective the oil flushing will be.

Remove the oil filter (Ref. 100) and install a new one. It is recommended that you do not change the exhaust filter or filters until after the flushing to prevent contamination of any new filters.

Fill the exhaust box with the proper amount of TMSRV Series vacuum flushing oil. Operate the vacuum pump normally as you would in production for at least 48 hours.

Drain a sample of the flushing oil into a clear container and examine it. If after 48 hours of flushing oil operation, the sample is clear to amber, drain the flushing oil from the pump. Fill with the TMSRV Vacuum oil and change the oil filter via section 3.2 below.

If after 48 hours of flushing oil operation the oil sample is not clear or amber and remains dark, black or discolored the pump may have so much contaminated oil in it to flush out adequately. It is likely there remains residue in the oil lines and oil cooler that will not flush out. A replacement or repair may be in order.

Upon refilling the pump with the TMSRV Vacuum oil suited to your application, monitor the operating conditions closely. Check for noise, overheating and oil condition until a regular oil change schedule can be established.

Do not allow your vacuum pump oil to turn black. Change and/or flush the oil, before it fails. Pumps will last for years with good oil conditions. Don't hesitate to flush the oil again if the new oil starts to turn black again. Maintaining strict oil change scheduling will prevent costly repairs.

A single six-hour oil flush is all that is required when changing from one oil type (non-detergent) to another type (synthetic). Always wait until after the flushing to change out the pump's oil and exhaust filters, not before.

3.2 Spin-On Type Oil Filter

To replace the spin-on type oil filter (Ref. 100), the pump needs to have been running for 15 minutes or more, to ensure warm oil. Switch off the pump, remove the oil drain plug (Ref. 95) and drain the oil. With the appropriate wrench, remove the spin-on type oil filter and replace it with a new TMS Vacuum oil filter. Cover the gasket (new filter) with oil and hand tighten until the gasket contacts the base. From there, tighten the filter two-thirds of a turn more, but do not over-tighten. Ensure the oil filter



is secure against the aluminum sealing surface, so that oil leaks do not happen. When replacing the spin-on type filter, use only a genuine TMS Vacuum oil filter. It is not recommended to use an oil filter manufactured for automobiles. Visit <https://www.tmsvacuum.com/filters/> for more information on how not all oil filters are created equally.

3.3 Exhaust Filter

WARNING: Wear safety glasses when changing out exhaust filters as precaution against an improperly secured filter retainer ejecting out of the exhaust box. Also, when changing out the exhaust filter in an environment where gas can enter the vacuum pump use rubber gloves and personal protection equipment to avoid a health hazard.

CAUTION: Lubricating oil can ignite under certain circumstances such as elevated pump temperatures due to excessively contaminated and/or clogged exhaust filters.

CAUTION: On the TMSRV 165-630 models, a high-temp switch safety device is mounted on the exhaust box cover side plate. This high-temp safety switch will shut the vacuum pump off when the pump's oil chamber overheats. To ensure when the switch reaches the set point and that power to the pump is discontinued properly, wire this normally closed switch into a starter control circuit.

Replace the exhaust filter elements as necessary or every nine (9) to twelve (12) months. Depending on the vacuum pump application, the exhaust filters' service life can vary widely. It is necessary to replace the exhaust filters when foreign matter or burned oil clog up the elements. Smoke and oil mist emanating from the pump exhaust, higher than normal motor current or oil leaking from the gas ballast valve are indicators of clogged exhaust filters.

As part of the oil fill plug, your TMSRV Vacuum pump is fitted with a pressure gauge (Ref. 90). This pressure gauge contains a green and red field or zone. Pressure reading within the green field indicates normal pressure. Pressure reading in the red field for a continuous time period indicates that an immediate change of the exhaust filter(s) is required.

To replace the exhaust filter, remove the screws securing the exhaust port cover plate. Remove the housing from the exhaust box and set it aside. Loosen the exhaust filter

retainer (Ref. 125). Remove the filter cartridge (Ref. 120) from the exhaust box.

Field test an exhaust filter element by allowing an element removed from the pump to cool first, then clean the sealing end (or O-ring end), and blow compressed air through the exhaust element. Pressure should not exceed 6 psi.

WARNING: Do not allow your mouth to come in direct contact with the exhaust filter or elements, and do not inhale through the filter.

Using a shop rag, seal off the connection between the air hose and the exhaust filter element. The element is not clogged if you can blow through it readily. Inspect the filter element visually for cracks. If it is plugged, the element cannot be cleaned and must be replaced with a new one.

Reinstall the filter elements. Make sure the open end of the element is properly seated down in its recess in the exhaust box with the O-ring (Ref. 121) correctly reinstall filter retainer and tighten the tension screw until filter is secure. Place the exhaust port gasket and cover in position on the exhaust box and retain with the cap screws.

3.4 Vacuum Inlet Filter

For vacuum pump applications where powder, dust or foreign matter is present, the pump can be equipped with a special vacuum inlet filter. This filter cartridge should be cleaned weekly, or as required, depending on the amount of foreign matter present in the vacuum pump application.

Clean the inlet filter by unsnapping the lid clamps or removing the knobs and lifting off the filter lid. Be certain to not knock any foreign debris inside the canister into the vacuum pump suction when removing the cartridge. With an air hose, clean foreign debris from the canister as well as carefully back flush the filter cartridge. If the filter cartridge has been exposed to moisture or is extremely dirty, it may need to be replaced.



3.5 Routine Maintenance Schedule

NOTE: TMSRV Series vacuum pumps are fitted with Baldor motors that have sealed bearings eliminating the need for outside lubrication.

Daily: Visually examine the vacuum pump's oil level (see 3.1.1).

Weekly: Examine oil sample for contamination (see 3.1.3). Inspect inlet filter (see 3.4).

Every three (3) or four (4) months, 500 to 750 hours of operation, or as necessary: See 3.1.3 and 1.5. Drain and discard oil from the hot pump. Replace the spin-on type oil filter and refill with fresh TMSRV Vacuum oil through the fill plug (see 3.1.2 through 3.1.3 and 3.2).

Every nine (9) to twelve (12) months, or as necessary: Replace exhaust filter elements (see 3.3).

3.6 Preventative Maintenance Filter Kit

TMS can provide a preventative maintenance kit for each vacuum pump type in the TMSRV series. These kits contain a gasket and O-rings set, new vanes, shaft seals, taper pins, bearings and bearing sleeves, TMS also provides replacement filter kits containing an oil drain plug, gaskets, spin-on type oil filter, exhaust filter, and synthetic baffle strainer (where applicable). When ordering, please specify pump size and model. Visit www.tmsvacuum.com/ for more info.

NOTE: TMSRV Series vacuum pumps are provided with an oil level float valve for continuous vacuum pump operation. With this feature there is no requirement to turn pump off in order to ensure proper module lubrication.

4.0 OIL LEVEL SWITCH INSTALLATION

Contact TMS.

5.0 TROUBLESHOOTING

5.1 Problem: Blank Off Not Reached

Description: The most optimal vacuum is when operating with the inlet covered via a blank flange or valve and the pump reaches its lowest absolute pressure or "blank-off" status. If the pump cannot reach blank-off status, or the pump takes too long to evacuate the system, then troubleshooting the problem is required. A well made capsule gauge can measure the blank-off pressure.

Possible Cause: The most frequent cause of not reaching ultimate pressure is contaminated oil.

Remedy: Once operating temperature has been reached, shut down the pump, drain the warm oil from the pump, and replace spin-on type oil filter, if necessary. Follow flushing oil procedure and fill pump with new TMSRV Vacuum oil. Run for at least 20-30 minutes before taking a new blank-off measurement.

Possible Cause: Vacuum system or vacuum piping is not leak-tight.

Remedy: Inspect all vacuum system hose and pipe connections for possible leaks. Repair or replace hose and piping where vacuum is leaking.

Possible Cause: Plugged wire mesh inlet screen (Ref. 261).

Remedy: Remove and thoroughly clean the wire mesh inlet screen. If the problem persists, install an inlet filter.

Possible Cause: No oil, or insufficient oil within the oil reservoir.

Remedy: Turn the pump off, replenish with adequate oil level. If oil seems contaminated, drain the balance of the oil from the pump, replace the spin-on type oil filter, and refill with new oil. Flush if necessary.

Possible Cause: The spin-on type oil filter is clogged or excessively dirty.

Remedy: Exchange the spin-on type oil filter with a new one, drain remaining oil, and refill with new oil if necessary.

Possible Cause: Due to contamination, the inlet's anti-suck-back valve plate (Ref. 251) is locked in a partially open or closed position.

Remedy: Disassemble and clean thoroughly the inlet valve and screen.

Possible Cause: Loose and/or leaking oil tube fittings.

Remedy: Tighten properly or where required replace oil tubing or fittings. Only replace with exact same size tubing.

Possible Cause: Leaking shaft seal.

Remedy: Contact your TMS support team.

Possible Cause: Pump exhaust valve (Ref. 159) is partially stuck open, or not fully seated



Remedy: Contact your TMS support team.

Possible Cause: Damaged vanes or vanes stuck inside the rotor.

Remedy: Contact your TMS support team.

Possible Cause: Inadequate radial clearance between rotor and cylinders.

Remedy: Contact your TMS support team.

Possible Cause: Worn and/or damaged internal parts.

Remedy: Contact your TMS support team.

5.2 Problem: The pump fails to start.

Possible Cause: Overloaded motor or motor has insufficient supply voltage; too low or wrong settings for the motor starter overload settings; burned out fuses; insufficient size or too long wire, generating pump voltage drop.

Remedy: Ensure proper supply voltage; inspect the overload settings in the motor starter for size and proper setting stated on the motor's nameplate data; inspect and replace burned fuses; replace improper sized wire. For high ambient temperature, utilize the next largest size overloads or modify the setting 5% beyond the nominal value stated on the motor nameplate.

Possible Cause: Seized motor or pump.

Remedy: Power pump off. After removing the fan cover, rotate the motor and pump by hand. If immovable, extract the motor from the pump and individually inspect the motor and pump. If the pump remains frozen, contact your TMS support team.

5.3 Problem: Pump will start, but is laboring and drawing a current that is too high.

Possible Cause: Pump is operating in the incorrect rotation.

Remedy: When viewing the motor from the motor fan side, inspect for accurate rotation which is counterclockwise.

Possible Cause: Improper oil type being used, or excessive oil filling.

Remedy: Adjust to proper oil level and ensure TMSRV Vacuum oil is being used.

Possible Cause: Clogged or burned with oil exhaust filters.

Remedy: Replace exhaust filters; maintain proper oil condition, oil level and use TMSRV Series vacuum oil.

Possible Cause: Clogged exhaust filter due to processed material.

Remedy: Contact TMS to secure optimal filter cartridge.

Possible Cause: Improperly connected motor coils or motor terminal box has a loose connection. Motor operates on two phases only.

Remedy: Inspect the motor's wiring diagram for correct hook-up, particularly on motors with six internal motor windings. Replace and/or tighten loose connections.

Possible Cause: Broken vane(s), seized bearing(s) or foreign matter inside pump.

Remedy: Contact your TMS support team.

5.4 Problem: Smoke emanating from exhaust side or oil droplets expelling from exhaust.

Possible Cause: Cracked filter material or improperly seated O-ring (Ref. 121) inside the filter base.

Remedy: Inspect the exhaust filters for proper seating, and ensure filter spring clips are tight and secure; if necessary replace exhaust filters.

Possible Cause: Foreign particles clogging the exhaust filter.

Remedy: Replace with a new exhaust filter.

Possible Cause: Oil float valve (Ref. 275) not operating correctly. Proper function is that when blowing compressed air into the float valve while float lifted off of seat to clear obstruction.

Remedy: Free oil float valve from obstruction, or if required, replace the oil float valve.

Possible Cause: Clogged or broken oil return line (Ref. 290).

Remedy: When the pump is stopped, inspect that oil float valve (Ref. 275) and return oil line is free and drains oil back into the exhaust box oil sump.



Remedy: Free the clogged line, replace the broken line, but only with the proper size, and check that the oil is pumped out of the oil sump while the vacuum pump is operating.

Note: An oil filling plug with pressure gauge is supplied as a standard item for all TMSRV Series pumps so that the pressure in front of the exhaust filters can be monitored. The green field indicates that the filters are still effective. Any back pressure in the red field requires immediate change of the exhaust filter (Ref. 120).

5.5 Problem: Noisy running pump.

Possible Cause: Worn out coupling insert.

Remedy: Replace coupling insert and/or the motor/pump coupling.

Possible Cause: Noisy bearings.

Remedy: Contact your TMS support team.

Possible Cause: Stuck vanes.

Remedy: Contact your TMS support team.

5.6 Problem: Pump is running too hot. .

Note: With a closed inlet, optimal oil temperature is approximately 185-225°F and can vary depending on pump type. These temperature values are sampled while operating at 68°F ambient temperature. 100°F is the recommended maximum ambient temperature while operating continuously. When operating a pump in ambient temperatures beyond this recommendation it is necessary to maintain careful oil monitoring and/or fit the vacuum pump with a water cooling options. Contact TMS for more details.

Possible Cause: Inadequate air ventilation to the vacuum pump.

Remedy: Lower ambient temperature within recommended levels. Thoroughly clean the pump air grills and motor. Without sufficient fresh air supply, do not install pump in an enclosed cabinet. Clean the outside fin assembly on vacuum pumps fitted with oil cooling coils.

Possible Cause: Clogged spin-on type oil filter (Ref. 100) resulting in insufficient oil supply.

Remedy: Replace the spin-on oil filter.

Possible Cause: Insufficient oil within oil reservoir, or pump lubrication being supplied with badly burned oil.

Remedy: Proceed with proper oil flush (see Section 3.1.4) and replace oil with only TMSRV Vacuum oil. Modify oil change intervals to be more frequent.

Note: For continually high temperature applications, it may be required to switch from non-detergent to synthetic oil. Contact your TMS support team for more details.

5.7 Problem: Seized pump.

Possible Cause: Broken vanes or no oil during while pump was operating.

Remedy: Contact your TMS support team.

Possible Cause:

Improper rotation while pump is operating for an extended period of time.

Possible Cause: Oil or liquid carryover into the pump cylinder damaged a vane(s) upon start up.

Remedy:

On the pump inlet, Install a new condensate trap. Relieve an overfilled oil reservoir. Perform oil filling properly (see Section 1.1) and do not overfill. Or, if the built-in anti-suck-back valve (Ref. 250 through 255) is leaking during pump shut down, vacuum could remain in the manifold. When pump is shut down, thoroughly clean valve seat and ensure the antisuck-back valve holds inlet vacuum. When two pumps or a receiver are operating on the same main line simultaneously, in front of each pump, install a manual or automatic operated valve. See your TMS Support team for more details.

5.8 Problem: Within two to five minutes of starting a cold pump, the spin-on type oil filter (Ref. 100) does not get warm.

Possible Cause: Clogged spin-on type oil filter.

Remedy: Exchange with proper TMSRV Vacuum oil filter and replace with TMSRV Vacuum oil.

Possible Cause: Incorrect spin-on type filter being used and/or clogged oil lines leading to pump.

Remedy: Blow oil lines free of poor oil and debris, and utilize TMSRV Vacuum oil filter.



TOTAL MAINTENANCE SOLUTIONS, LLC

LIMITED WARRANTY

Total Maintenance Solutions, LLC (“TMS”) offers the following limited warranties to the original purchaser (a “Customer”) of new TMS Vacuum Pumps or Booster Equipment (“New Equipment”) and used Vacuum Pumps and Booster Equipment reconditioned by TMS (“Reconditioned Equipment”):

1. **New Equipment Limited Warranty.** Except for the Exclusions (as described below), New Equipment is warranted to be free from defects in material and/or workmanship during the Warranty Period, all in accordance with the Terms and Conditions of the Limited Warranty.

2. **Reconditioned Equipment Limited Warranty.** Except for the Exclusions (as described below), Reconditioned Equipment provided by TMS is warranted to be free of defects in workmanship and materials provided by TMS during the Warranty Period, all in accordance with the Terms and Conditions of the Limited Warranty.

3. **Terms and Conditions of each Limited Warranty.** The following Terms and Conditions apply to each Limited Warranty hereby provided:

(a) **Warranty Period.** The “Warranty Period” shall be the period of 24 months from the date of invoice by TMS to the Customer for the New Equipment or the Reconditioned Equipment.

(b) **Timely Notice.** In order to obtain a Limited Warranty, a claim under the warranty must be submitted to TMS in writing within thirty (30) days from the date of failure. Information about the warranty claim requested by TMS shall be provided in a timely manner.

(c) **Remedy--Option to Repair or Replace.** TMS shall have the option to repair or replace the part or component acknowledged by TMS to be defective. Any such repair or replacement shall occur within a reasonable period of time. A customer’s primary remedy for breach of warranty is the repair or replacement of the defective component or part. If TMS is unable to provide a replacement component or part, Customer’s alternate remedy shall be, at the option of TMS, the replacement of the particular product or refund of Customer’s purchase price. These remedies are a Customer’s sole and exclusive remedies for breach of warranty.

(d) **Return of Defective Part.** If requested by TMS, the alleged defective part or component shall be shipped to TMS at its manufacturing facility, with freight PRE-PAID by the claimant, to allow TMS to inspect the part.

Claims that fail to comply with any of the above terms and conditions shall be denied.

4. **No Modifications of Limited Warranty.** Unless approved in writing by the General Manager of TMS, no salesperson or other representative of TMS or any other person, firm or corporation is authorized to modify the Limited Warranty provided herein or make any other representation, guarantee or warranty on behalf of TMS.

5. **Exclusions.** The following shall constitute “exclusions” not covered by any limited warranty:



- (a) Any vacuum pump or booster that is damaged as a result of improper installation by a person or firm other than TMS. Installation must follow TMS/manufacturer specifications.
- (b) Any vacuum pump or booster that is damaged as a result of a failure to service the pump or booster in accordance with the service instructions and recommendations of TMS and/or the manufacturer.
- (c) Any vacuum pump or booster that is damaged as a result of: (i) misuse or abuse; (ii) accident; (iii) improper electrical supply and/or wiring; or (iv) an electrical surge.
- (d) Any vacuum pump or booster that is damaged as a result of excessive foreign material (e.g. dirt, dust, metal, plastic, water, other fluids, etc.) infiltrating the pump or booster.
- (e) Any vacuum pump or booster that is modified or altered by any party, regardless of whether TMS has knowledge or is aware of such modification or alteration.
- (f) Any reconditioned vacuum pump or booster that fails or is damaged as the result of the failure of a part not provided by TMS that was not visibly damaged at the time of reconditioning.
- (g) Any vacuum pump or booster that is damaged or fails as the result of the failure of a part or component (e.g. motors, electrical components) supplied by a third party manufacturer, in which event the warranty, if any, of the third-party manufacturer shall apply.
- (h) Any vacuum pump or booster that is damaged or fails as the result of use for a purpose other than as intended or for which the pump or booster was designed (Le. a pump or booster too small for the actual work load).
- (i) Any normal wear parts, including but not limited to coupling discs, vanes, oil and air filters elements, etc.

6. **Disclaimers and Limitations.**

(a) EACH LIMITED WARRANTY IS IN LIEU OF ALL OTHER REPRESENTATIONS AND WARRANTIES, EXPRESS OR IMPLIED, WHICH ARE HEREBY EXPRESSLY DISCLAIMED, INCLUDING ANY WARRANTY OF: (i) MERCHANTABILITY, (ii) FITNESS FOR A PARTICULAR PURPOSE, (iii) COURSE OF DEALING OR USAGE OF TRADE AND (iv) NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

(b) NO OTHER REPRESENTATIONS, GUARANTEES OR WARRANTIES, EXPRESS OR IMPLIED, ARE MADE BY TMS.

(c) TMS shall have no responsibility for any particular application or use made of the TMS New or Reconditioned Equipment.

(d) In no event shall TMS be liable for any loss or claim other than the repair or replacement of the defective part or component, or, at the option of TMS, the replacement of the particular product or the refund of the purchase price.



(e) In no event shall TMS be liable for any direct, indirect, general, special, consequential, punitive, incidental or other damages, or for Customer's or any third party's attorneys' fees, resulting from or arising out of, or alleged to arise out of, the purchase or use of the TMS new or reconditioned equipment.

(f) In no event shall TMS be liable under any theory of liability for damages in excess of Customer's purchase price.

(g) TMS specifically does not warrant parts and components purchased by TMS from third party suppliers, including, but not limited to, such parts and components as motors, bearings and electrical components. Customer shall be limited in recourse for such parts and components to the terms of the warranty, if any, of that particular manufacturer.

(h) This limitation of liability applies irrespective of whether the claim is based on breach of contract, breach of warranty, negligence or other cause and whether the alleged defect is discoverable or latent.

(i) By accepting the new equipment and/or reconditioned equipment, Customer accepts the terms, conditions and limitations of the above limited warranty and waives any and all other or additional claims against TMS.

7. **Time For And Place Of Bringing Suit.** A Customer shall bring any action relating to any alleged breach of the Limited Warranty provided by TMS with respect to any New or Reconditioned Equipment sold by TMS **not later than two (2) years after the date of shipment by TMS.** Buyer agrees that any action brought after such date shall be barred as being untimely. Any action relating to the goods sold by TMS pursuant to this Sales Order or Invoice shall be brought in the Iowa District Court in and for Scott County, Iowa.

8. **Applicable Law.** The Limited Warranty provided herein, including matters of construction, validity and performance, shall be governed by the laws of the State of Iowa, without regard to any Iowa choice of law or other conflict-of-laws rules.

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TMS Rotary Vane Vacuum Pump Technical Data

TMSRV Series Model #	Units	25	40	63	100	165	205	255	305	400	630
Free Air Displacement	CFM	20	28	41	63	117	141	180	194	330	490
Nominal Pumping Speed	ACFM	18	26	36	36	112	141	177	212	305	455
Noise Level	dBA	70	70	70	71	72	74	74	76	79	85
Motor Size for 3 phase	HP	1.5	2	3	5	7.5	7.5	10	10	15	25
Motor Speed	RPM	1750	1750	1800	1800	1800	1800	1800	1800	1150	1150
Oil Capacity	Qt.	1.4	1.4	2.1	2.4	8	8	8.4	8.4	16	18
Approx. Weight	lbs	106	120	150	200	435	435	520	520	1316	1525
End Vacuum	torr	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Inlet Connection	NPT Inches	1.25"	1.25"	1.25"	1.25"	2"	2"	2"	2"	3"	3"



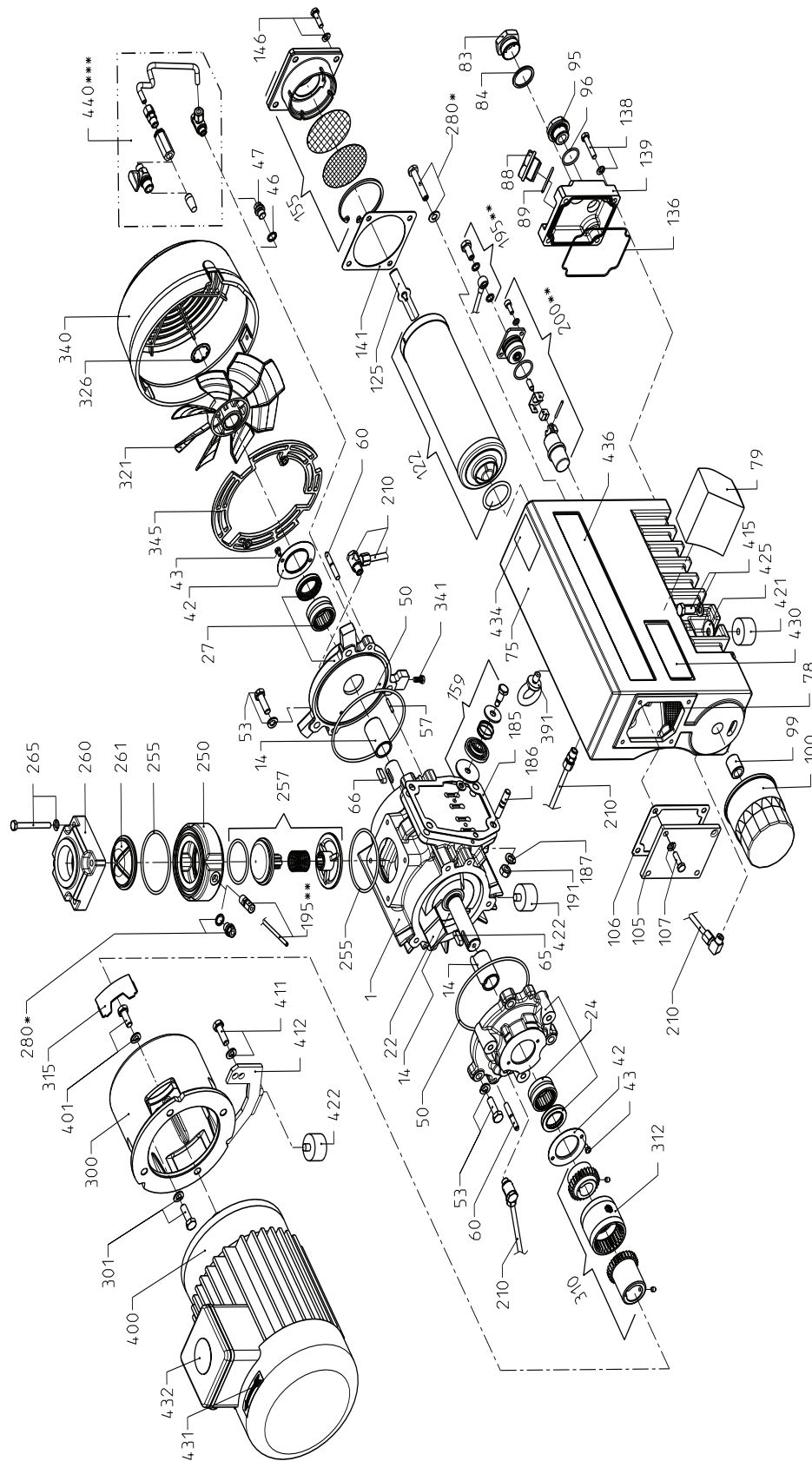


Fig. 1 - Parts Map for the TMSRV25 & TMSRV40 Vacuum Pump

Parts List Reference Numbers & Descriptions for the TMSRV25 & TMSRV40 Vacuum Pump

Ref	Description	Qty
0	MODULE, RV 0025 F w/G.B. (BMC)	1
1	CYLINDER, RV 0025 F w/GB	1
15	ROTOR, RV 0025 F w/SLEEVES	1
18	SLEEVE, BEARING 20 x 25 x 38.5	2
22	VANE, 0025 100 x 29.8 x 3.75	3
25	ENDPLATE, RV 025/040F G.B. "A"	1
26	ENDPLATE, RV 025/040F G.B. "B"	1
30	BEARING, ROLLER 0025-0055 B-F	2
35	SHAFT SEAL, VITON 25/37 x 6mm	2
42	PLATE, SHAFT SEAL RETAINING	2
43	SCREW, SELF TAPPING AM5 x 12	4
50	O-RING, VITON 108 x 3mm	2
53	SCREW, HX HD M8 x 25-8.8 A1P	5
57	SCREW, HX HD M8 x 40-8.8-1.7225	1
60	PIN, TAPER M6 x 40-5.8-St	3
65	SHAFT KEY, A6 x 6 x 20	1
66	SHAFT KEY, A6 x 6 x 20	1
75	EXHAUST BOX, 0025/040 F	1
83	OIL SIGHT GLASS, G3/4"	1
84	GASKET, SIGHT GLASS 26/32 x 2	1
88	PLUG, OIL FILL R3/4" w/1/8"HOLE	1
89	GASKET, VITON W/STEEL U-SEAL	1
90	ASSY, FILL PLUG G3/4" w/GAUGE	1
90.1	GAUGE, PRESSURE GREEN/RED FLD	1
95	PLUG, OIL DRAIN G1/2" NYLON	1
96	O-RING, VITON 22 x 2mm	1
99	NIPPLE, 3/4"-16 UNF x 20mm	1
100	FILTER, OIL RV 0025-0101	1
105	PLUG, DRUM R2" EXHAUST BOX	1
106	O-RING, VITON 55 x 3mm	1
120	FILTER, EXH 0025-0055 C/E/F	1
125	SPRING, EXH. FILTER 0025-0101	1
136	O-RING, 0025-0101 SVC BLOCK	1
138	SCREW, HX HD M6 x 30-8.8-A1P	4
139	SERVICE BLOCK, 0025-0101 C/E/F	1
141	GASKET, EXH COVER RV 0012-0101	1
144	RING, RETAINING 68 x 2.5	1
145	PLATE, EXH COVER 1-1/4"NPT	1
146	SCREW, HX HD M6 x 20-8.8-A1P	4
151	SCREEN, EXH. ROUND COARSE	1
152	SCREEN, EXH. ROUND FINE	1
159	VALVE, EXH. 0010-0101 PLASTIC	2
185	GASKET, CYL/EX BOX 0025-101C-F	1
186	STUD, M8 x 23-5.8-A1P	4
191	NUT, HEX HD M8-8-A1P	4
200	VALVE, OIL RET FLT 0025-0100 F	1
221	HYD. FITTING, BANJO HOUSING D8	1
222	HYD. FITTING, STRAIGHT GE8-LLR	1
223	HYD. FITTING, ELBOW WE8-LLR	1
227	SCREW, HOLLOW G1/8 BANJO FTTG	1
228	SCREW, HOLLOW G1/8 BANJO FTTG	1
231	TUBING, OIL 0025 E/F TO B-SIDE	1
232	TUBING, OIL 0025 E/F TO A-SIDE	1
233	HYD. FITTING, BANJO HOUSING D8	1
250	FLANGE, INLET LOWER RV/MM/MI	1
251/252/254	VALVE, ANTI SUCKBACK 1-1/4"	1
253	O-RING, VITON 44 x 3mm	1
255	O-RING, VITON 65 x 3mm	2
260	FLANGE, INLET UPPER 1-1/4"NPT	1
261	SCREEN, INLET 1-1/4" CONICAL	1
265	SCREW, HX HD M6 x 60-8.8-A1P	4
291/295	KIT, OIL RET. LINE 0025/0040 F	1
291	HYD. FITTING, STRAIGHT GE4 LLR	1

Ref	Description	Qty
0	MODULE, RV 0040 F w/G.B. (BMC)	1
1	CYLINDER, RV 0040 F w/GB	1
15	ROTOR, RV 0040 F w/SLEEVES	1
18	SLEEVE, BEARING 20 x 25 x 38.5	2
22	VANE, 0040 140 x 29.8 x 3.75	3
25	ENDPLATE, RV 025/040F G.B. "A"	1
26	ENDPLATE, RV 025/040F G.B. "B"	1
30	BEARING, ROLLER 0025-0055 B-F	2
35	SHAFT SEAL, VITON 25/37 x 6mm	2
42	PLATE, SHAFT SEAL RETAINING	2
43	SCREW, SELF TAPPING AM5 x 12	4
50	O-RING, VITON 108 x 3mm	2
53	SCREW, HX HD M8 x 25-8.8 A1P	5
57	SCREW, HX HD M8x40-8.8-1.7225	1
60	PIN, TAPER M6 x 40-5.8-St	3
65/66	SHAFT KEY, A6 x 6 x 20	2
75	EXHAUST BOX, 0025/0040 F	1
83	OIL SIGHT GLASS, G3/4"	1
84	GASKET, SIGHT GLASS 26/32 x 2	1
88	PLUG, OIL FILL R3/4" w/1/8"HOLE	1
89	GASKET, VITON W/STEEL U-SEAL	1
90	ASSY, FILL PLUG G3/4" w/GAUGE	1
90.1	GAUGE, PRESSURE GREEN/RED FLD	1
95	PLUG, OIL DRAIN G1/2" NYLON	1
96	O-RING, VITON 22 x 2mm	1
99	NIPPLE, 3/4"-16 UNF x 20mm	1
100	FILTER, OIL RV 0025-0101	1
105	PLUG, DRUM R2" EXHAUST BOX	1
106	O-RING, VITON 55 x 3mm	1
120	FILTER, EXH 0025-0055 C/E/F	1
125	SPRING, EXH. FILTER 0025-0101	1
136	O-RING, 0025-0101 SVC BLOCK	1
138	SCREW, HX HD M6 x 30-8.8-A1P	4
139	SERVICE BLOCK, 0025-0101 C/E/F	1
141	GASKET, EXH COVER RV 0012-0101	1
144	RING, RETAINING 68 x 2.5	1
145	PLATE, EXH COVER 1-1/4"NPT	1
146	SCREW, HX HD M6 x 20-8.8-A1P	4
151	SCREEN, EXH. ROUND COARSE	1
152	SCREEN, EXH. ROUND FINE	1
159	VALVE, EXH. 0010-0101 PLASTIC	2
185	GASKET, CYL/EX BOX 0025-101C-F	1
186	STUD, M8 x 23-5.8-A1P	4
191	NUT, HEX HD M8-8-A1P	4
200	VALVE, OIL RET FLT 0025-0100 F	1
221	HYD. FITTING, BANJO HOUSING D8	1
222	HYD. FITTING, STRAIGHT GE8-LLR	1
223	HYD. FITTING, ELBOW WE8-LLR	1
227	SCREW, HOLLOW G1/8 BANJO FTTG	1
228	SCREW, HOLLOW G1/8 BANJO FTTG	1
231	TUBING, OIL 0040 F TO B-SIDE	1
232	TUBING, OIL 0040 F TO A-SIDE	1
233	HYD. FITTING, BANJO HOUSING D8	1
250	FLANGE, INLET LOWER RV/MM/MI	1
251/252/254	VALVE, ANTI SUCKBACK 1-1/4"	1
253	O-RING, VITON 44 x 3mm	1
255	O-RING, VITON 65 x 3mm	2
260	FLANGE, INLET UPPER 1-1/4"NPT	1
261	SCREEN, INLET 1-1/4" CONICAL	1
265	SCREW, HX HD M6 x 60-8.8-A1P	4
291/295	KIT, OIL RET. LINE 0025/0040 F	1
291	HYD. FITTING, STRAIGHT GE4 LLR	1



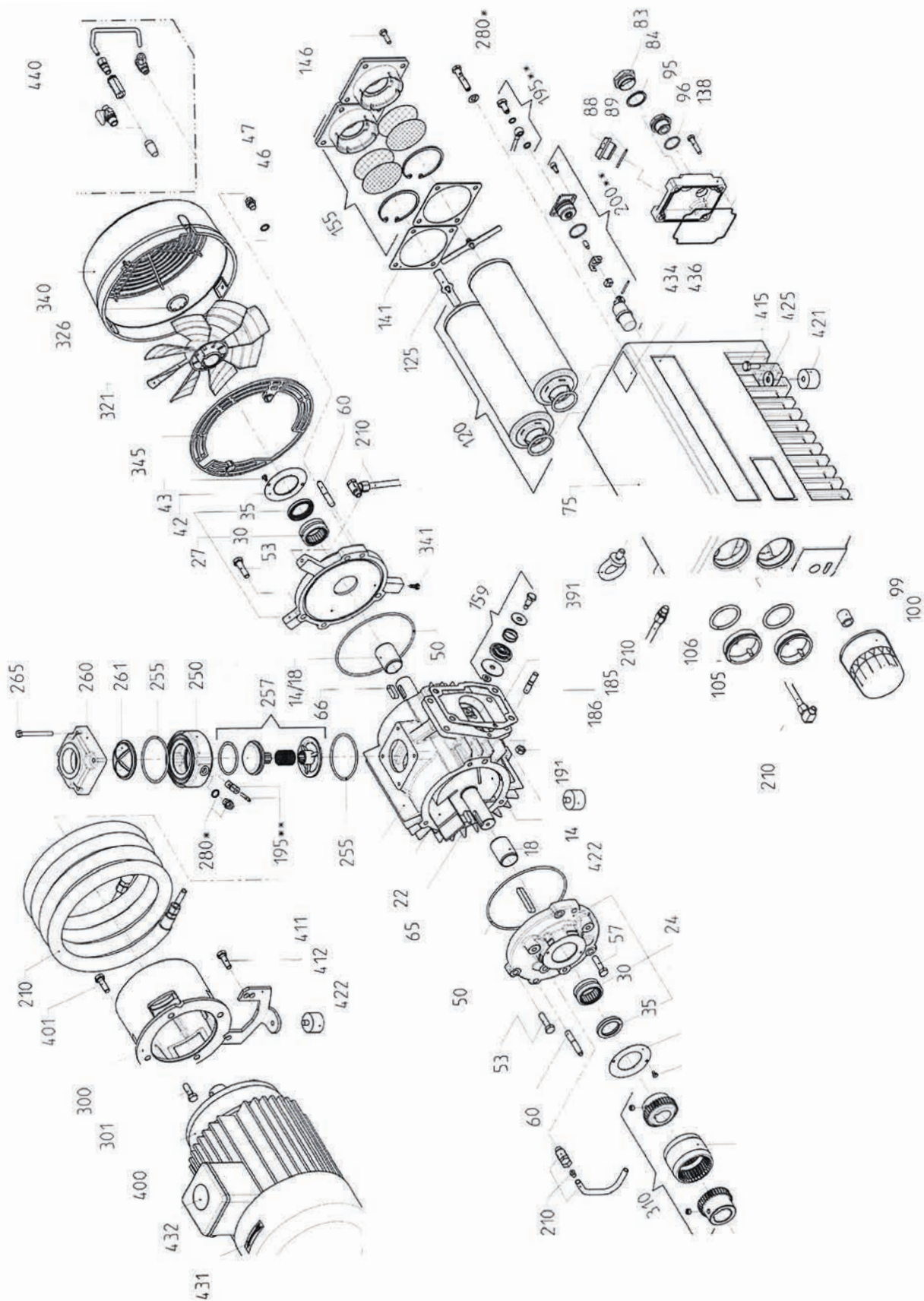


Fig. 2 - Parts Map for the TMSRV63 & TMSRV100 Vacuum Pump

Parts List Reference Numbers & Descriptions for the TMSRV63 & TMSRV100 Vacuum Pump

Ref	Description	Ref	Description	Ref	Description
001	Cylinder	152	Lockwasher	300	Motor mounting bracket
004	Stud	153	Exhaust silencer	302	Lockwasher
009	Stud	154	Gasket	303	Hex shoulder nut
015	Rotor	159	Exhaust valve	304	Socket hd. machine screw
018	Bearing sleeve	168	O-ring	305	Flat washer
022	Vane	169	Exh. valve cover plate	306	C-face adapter flange
025	Motor side endplate	175	Stud	307	Socket head screw
026	Opp. M.S. endplate	176	Lockwasher	311	Motor side coupling half
030	Needle bearing	177	Hex head nut	312	Coupling insert
031	Endplate spacer	180	Plug	313	Pump side coupling half
032	Pump spacer	185	Gasket	315	Protective screen
034	Slotted chs. hd. cap screw	186	Hex head cap screw	318	Protective screen
035	Shaft seal	187	Lockwasher	319	Spacer
040	Protective screen	189	Stud	321	Pump shaft fan
042	Shaft seal retaining plate	190	Lockwasher	322	Motor side fan
043	Hex head cap screw	191	Hex head nut	340	Fan Cover
046	Hex head plug	200	Drum exhaust box plug	341	Sheet metal screw
047	Copper ring gasket	201	O-ring	342	Plastic insert
050	O-ring	205	Cover side plate	390	Eyebolt adapter
053	Hex head cap screw	206	Gasket	391	Eyebolt
054	Lockwasher	207	Hex head cap screw	392	Lockwasher
056	Hex head cap nut	208	Lockwasher	393	Hex head cap screw
060	Tapered pin	220	Hydraulic fitting	400	Motor
065	Shaft key	222	Hydraulic fitting	401	Hex head cap screw
066	Shaft key	223	Hydraulic fitting	402	Lockwasher
075	Exhaust box	224	Hydraulic fitting	416	Stud
078	Sheet metal baffle	230	Oil tubing	417	Slotted set screw
079	Demister pad	231	Oil tubing	419	Foot spacer
083	Oil sight glass	232	Oil tubing	420	Flat washer
084	Ring gasket	240	Cooling coil	421	Rubber foot
088	Oil fill plug	250	Inlet flange	423	Washer
089	Oil fill plug gasket	251	Valve guide	424	Hex head cap nut
090	Pressure gauge	252	Valve plate	430	Nameplate
095	Oil drain plug	253	O-ring	431	Arrow label
096	O-ring	254	Inlet check valve spring	436	Maintenance label
099	Nipple	255	O-ring	470	Hydraulic fitting
100	Auto-type oil filter	260	Inlet flange	471	Teflon tubing
115	Filter bracket	261	Inlet screen	472	Check valve
120	Exhaust filter	265	Hex head cap screw	473	Bell reducer
121	O-ring	266	Lockwasher	474	Gas ballast filter
125	Filter spring assembly	270	Plug	475	Gas ballast valve bracket
126	Socket head cap screw	271	Ring gasket	476	Elbow fitting
130	Baffle strainer	275	Oil return valve	477	Pet cock valve
136	Baffle strainer frame	276	Ring gasket	478	Hex head cap screw
140	Exhaust cover plate	285	Oil recirc. screw	479	Lockwasher
141	Cover plate gasket	286	Banjo hydraulic fitting	480	Oil tube insert
142	Hex head cap screw	290	Oil return line tubing	9000	Steel socket plug
143	Lockwasher	291	Hydraulic fitting	9001	Hydraulic adapter
146	Hex head cap screw	292	Carburetor jet		



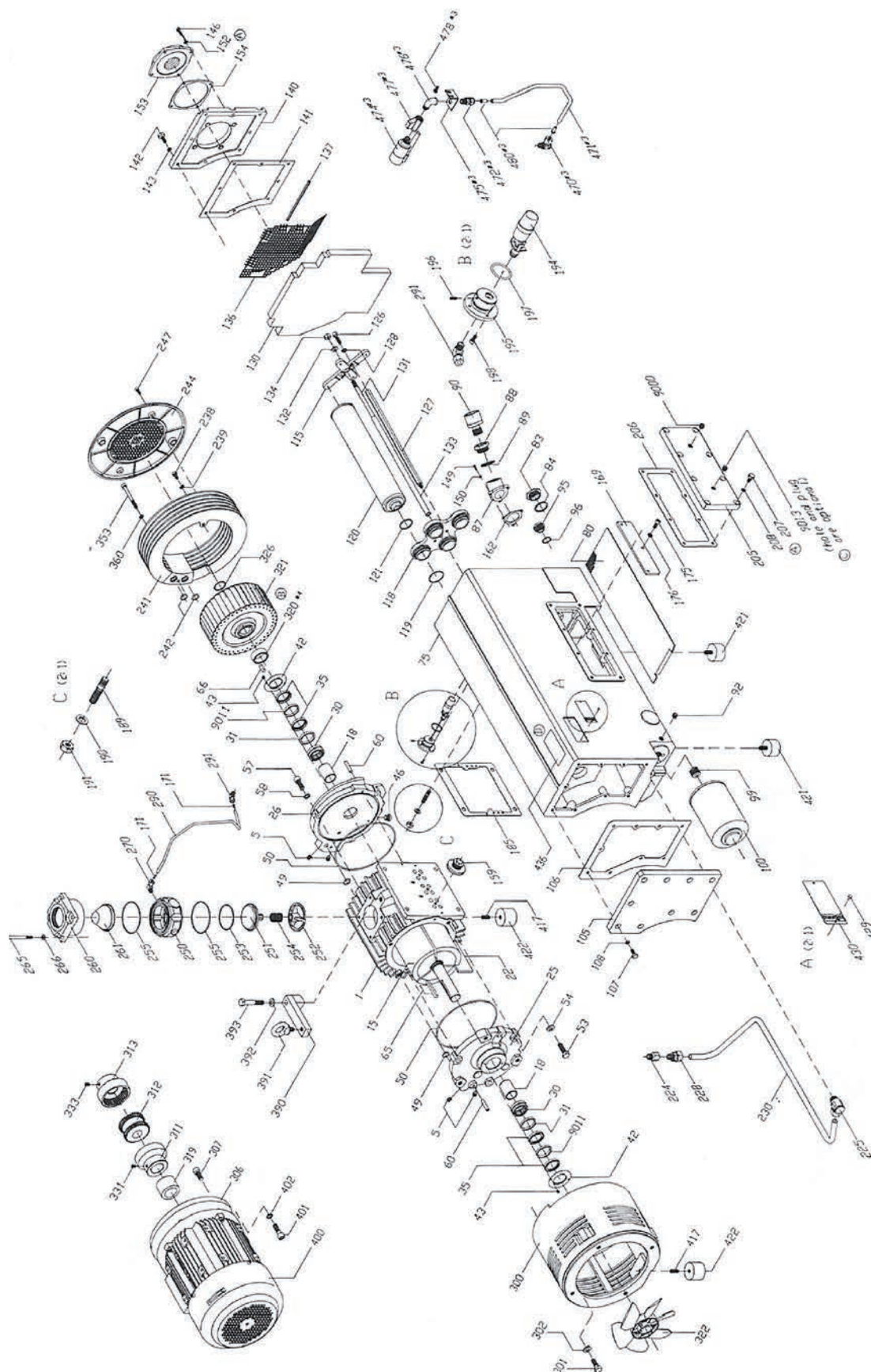


Fig. 3 - Parts Map for the TMSRV165, 205, 255 and 305 Vacuum Pump

Parts List Reference Numbers & Descriptions for TMSRV165, 205, 255 and 305 Vacuum Pump

Ref	Description	Ref	Description	Ref	Description
001	Cylinder	140	Exhaust cover plate	300	Motor mounting bracket
004	Stud	141	Cover plate gasket	302	Lockwasher
005	Set screw	142	Hex head cap screw	303	Hex shoulder nut
009	Stud	143	Lockwasher	306	C-face adapter flange
015	Rotor	146	Hex head cap screw	307	Socket head screw
018	Bearing sleeve	153	Cover plate exhaust screen	311	Motor side coupling half
019	Shaft seal sleeve	159	Exhaust valve	312	Coupling insert
022	Vane	168	O-ring	313	Pump side coupling half
025	Motor side endplate	169	Exh. valve cover plate	319	Spacer
026	Opp. M.S. endplate	175	Hex head cap screw	320	Fan and coupling spacer
030	Needle bearing	176	Lockwasher	321	Pump shaft fan
035	Shaft seal	184	Socket head cap screw	322	Motor side fan
040	Protective screen	185	Cylinder/Exhaust box gasket	327	Locking disk
041	Hex head nut	186	Hex head cap screw	328	Socket head cap screw
042	Shaft seal support ring	187	Lockwasher	329	Lockwasher
043	Hex head cap screw	200	Drum exhaust box plug	340	Fan Cover
046	Hex head plug	201	O-ring	341	Sheet metal screw
047	Copper ring gasket	205	Cover side plate	342	Plastic insert
050	O-ring	206	Gasket	391	Eyebolt
053	Hex head cap screw	207	Hex head cap screw	400	Motor
054	Lockwasher	215	Reducing nipple	401	Hex head cap screw
056	Hex head cap nut	216	Ring gasket	402	Lockwasher
060	Tapered pin	220	Hydraulic fitting	417	Slotted set screw
065	Shaft key	222	Hydraulic elbow fitting	418	Rubber foot
066	Shaft key	223	Hydraulic elbow fitting	419	Foot spacer
075	Exhaust box	224	Hydraulic banjo fitting	420	Stud
078	Sheet metal baffle	225	Hydraulic straight fitting	421	Rubber foot
079	Demister pad	226	Hydraulic banjo fitting	422	Rubber foot
080	Perforated sheet metal	230	Oil tubing	423	Lockwasher
083	Oil sight glass	231	Oil tubing	424	Hex head cap nut
084	Ring gasket	232	Oil tubing	430	Nameplate
088	Oil fill plug	233	Oil tubing	431	Arrow label
089	Oil fill plug gasket	240	Cooling coil	436	Maintenance label
090	Pressure gauge	250	Inlet flange	470	Hydraulic banjo fitting
095	Oil drain plug	251	Valve plate	471	Teflon tubing
096	O-ring	252	Valve inlet guide	472	Check valve
099	Nipple	253	O-ring	473	Bell reducer
100	Auto-type oil filter	254	Inlet check valve spring	474	Gas ballast filter
105	Cover plate	255	O-ring	475	Gas ballast valve bracket
106	Cover plate gasket	258	Ball, Viton	476	Elbow fitting
107	Socket head cap screw	260	Inlet flange	477	Pet cock valve
108	Lockwasher	261	Inlet screen	478	Hex head cap screw
115	Filter bracket	265	Hex head cap screw	479	Lockwasher
116	Filter bracket	266	Lockwasher	480	Oil tube insert
120	Exhaust filter	275	Oil return valve	9000	Steel socket plug
121	O-ring	276	Ring gasket	9001	Flat washer
125	Filter spring assembly	285	Oil recirc. screw	9002	Entrance elbow connector
126	Socket head cap screw	286	Banjo hydraulic fitting	9003	Fenwal temperature switch
130	Baffle strainer	290	Oil return line tubing	9004	Grounding washer
136	Perf. sheet metal screen	291	Hydraulic elbow fitting	9005	Plain washer
137	Hex head cap screw	297	Screen	9006	Socket head cap screw
138	Flat washer	298	Slot chs. head screw	9007	Hex head cap screw
139	Lockwasher	299	Rivet		



Parts List Reference Numbers & Descriptions for TMSRV400 Vacuum Pump

Ref	Description	Ref	Description	Ref	Description
1	Cylinder	141	Separator cover seal	261	Screen
4	Stud screw	142	Cylinder head screw	265	Hexagon head screw
8	Stud screw	146	Hexagon head screw	300	Motor lantern
9	Stud screw	149	Cylinder head screw	303	Hexagon nut
15	Rotor	153	Exhaust cover plate	304	Cylinder head screw
18	Inner ring	159	Exhaust valve	305	Washer
19	Inner ring	162	O-ring	311	Coupling hub
22	Vane	169	Valve cover plate	312	Coupling sleeve
25	Cylinder cover	175	Cylinder head screw	313	Coupling hub
26	Cylinder cover	184	Fit screw	317	Protective grid
30	Needle bearing	185	Flat gasket	319	Distance ring (*60Hz)
35	Shaft seal	186	Cylinder head screw	320	Distance ring
40	Protective grid	194	Float valve	321	Radial fan
41	Hexagon nut	195	Support	322	Radial Fan (*60Hz)
46	Screw plug	196	Set screw	327	Clamping washer
47	Sealing ring	197	O-ring	328	Hexagon head screw
50	O-ring	198	Hexagon head screw	331	Set screw
53	Hexagon head screw	200	Drum plug	333	Set screw
56	Hexagon nut	201	O-ring	340	Fan cover
60	Taper pin	202	Temperature switch	341	Hexagon head screw
61	Parallel pin	203	Screw plug	391	Lifting-eye nut
65	Parallel key	205	Cover	392	Washer
66	Parallel key	206	Separator cover seal	393	Hexagon head screw
75	Oil separator	207	Cylinder head screw	395	Plate
78	Expanded metal	215	Reducing nipple	400	Three-phase motor
79	Demister	215	Reducing nipple (*60Hz)	401	Cylinder head screw
80	Punched sheet metal	216	Sealing ring	417	Set screw
83	Sight glass	219	Straight male stud coupling (*60Hz)	419	Support
87	Oil filler neck	220	Straight male stud coupling (*60Hz)	420	Hexagon head screw
88	Screw plug	222	Male stud elbow	421	Anti-vibration buffer
95	Screw plug	223	Male stud elbow	424	Hexagon nut
96	O-ring	224	Swivelling screw fitting	425	Set screw
99	Nipple	225	Male stud elbow	488	Screw plug
100	Oil filter	225	Straight male stud coupling (*60Hz)	496	Screw plug
105	Cover	226	Male stud elbow	498	Screw plug
106	Separator cover seal	229	Swivelling screw fitting	586	Male stud elbow
107	Cylinder head screw	231	Conduit	590	Conduit
115	Filter support	232	Conduit	591	Male stud elbow
116	Filter holder	233	Conduit	698	Conduit (*60Hz)
120	Exhaust filter	240	Cooling coil (*60Hz)	699	Conduit (*60Hz)
125	Filter spring	250	Inlet flange (lower part)		
130	Filter material blank	251	Valve disk		
136	Punched sheet metal	252	Valve guide		
137	Cylinder head screw	253	O-ring		
138	Washer	254	Compression spring		
140	Exhaust cover plate	255	O-ring		
		258	Ball		
		260	Inlet flange (upper part)		



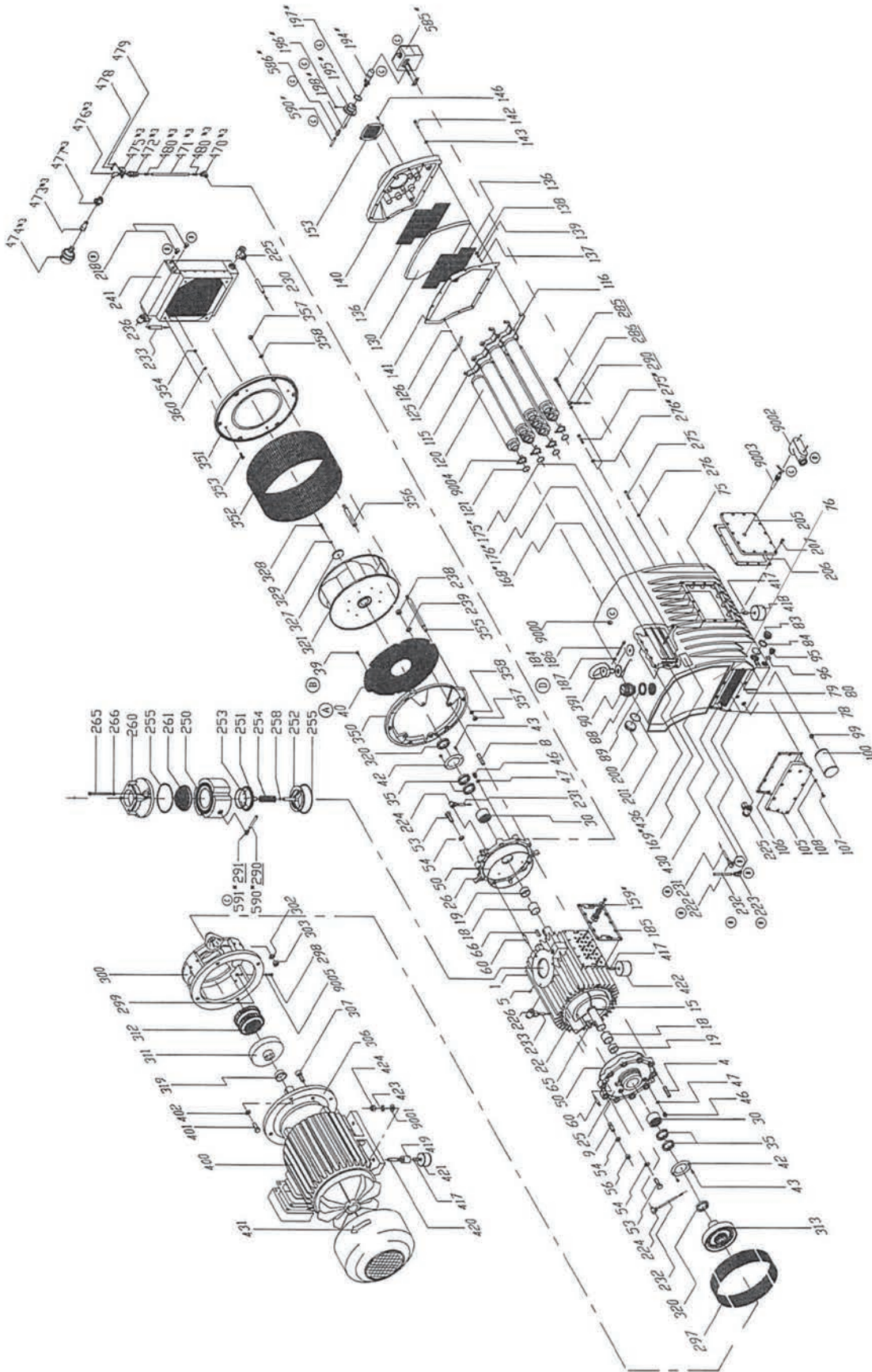
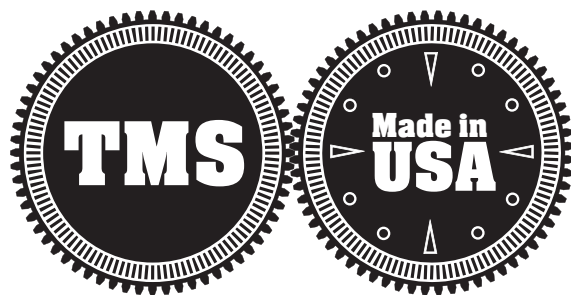


Fig. 5 - Parts Map for the TMSRV630 Vacuum Pump

Parts List Reference Numbers & Descriptions for TMSRV630 Vacuum Pump

Ref	Description	Ref	Description	Ref	Description
001	Cylinder	140	Exhaust cover plate	312	Coupling insert
004	Stud	141	Cover plate gasket	313	Pump side coupling half
005	Set screw	142	Hex head cap screw	319	Spacer
008	Stud	143	Lockwasher	320	Fan and coupling spacer
009	Stud	146	Hex head cap screw	321	Pump shaft fan
015	Rotor	153	Cover plate exhaust screen	327	Locking disk
018	Bearing sleeve	159	Exhaust valve	328	Socket head cap screw
019	Shaft seal sleeve	168	O-ring	329	Lockwasher
022	Vane	169	Exh. valve cover plate	350	Centering ring
025	Motor side endplate	175	Hex head cap screw	351	Centering ring
026	Opp. M.S. endplate	176	Lockwasher	352	Fan guard
030	Needle bearing	184	Socket head cap screw	353	Hex head cap screw
035	Shaft seal	185	Cylinder/Exhaust box gasket	354	Hex head nut
039	Socket head mach. screw	186	Hex head cap screw	355	Distance bolt
040	Protective screen	187	Lockwasher	356	Mounting bolt
041	Hex head nut	200	Drum exhaust box plug	357	Hex nut
042	Shaft seal support ring	201	O-ring	358	Lockwasher
043	Hex head cap screw	205	Cover side plate	360	Lockwasher
046	Hex head plug	206	Gasket	391	Eyebolt
047	Copper ring gasket	207	Hex head cap screw	400	Motor
050	O-ring	222	Hydraulic elbow fitting	401	Hex head cap screw
053	Hex head cap screw	223	Hydraulic elbow fitting	417	Slotted set screw
054	Lockwasher	224	Hydraulic banjo fitting	418	Rubber foot
056	Hex head cap nut	225	Hydraulic straight fitting	419	Foot spacer
060	Tapered pin	226	Hydraulic banjo fitting	420	Stud
065	Shaft key	230	Oil tubing	421	Rubber foot
066	Shaft key	231	Oil tubing	422	Rubber foot
075	Exhaust box	232	Oil tubing	423	Lockwasher
076	Exhaust box cover plate	233	Oil tubing	424	Hex head cap nut
078	Sheet metal baffle	236	Hydraulic fitting	430	Nameplate
079	Demister pad	238	Hex head nut	431	Arrow label
080	Perforated sheet metal	239	Lockwasher	436	Maintenance label
083	Oil sight glass	241	Oil cooler	470	Hydraulic banjo fitting
084	Ring gasket	250	Inlet flange	471	Teflon tubing
088	Oil fill plug	251	Valve plate	472	Check valve
089	Oil fill plug gasket	252	Valve inlet guide	473	Bell reducer
090	Pressure gauge	253	O-ring	474	Gas ballast filter
095	Oil drain plug	254	Inlet check valve spring	475	Gas ballast valve bracket
096	O-ring	255	O-ring	476	Elbow fitting
099	Nipple	258	Ball, Viton	477	Pet cock valve
100	Auto-type oil filter	260	Inlet flange	478	Hex head cap screw
105	Cover plate	261	Inlet screen	479	Lockwasher
106	Cover plate gasket	265	Hex head cap screw	480	Oil tube insert
107	Socket head cap screw	266	Lockwasher	585	Oil return float valve kit
108	Lockwasher	285	Oil recirc. screw	586	Hydraulic fitting
115	Filter bracket	286	Banjo hydraulic fitting	591	Hydraulic fitting
116	Filter bracket	290	Oil return line tubing	9000	Steel socket plug
120	Exhaust filter	297	Screen	9001	Flat washer
121	O-ring	298	Slot chs. head screw	9002	Entrance elbow connector
125	Filter spring assembly	299	Rivet	9003	Fenwal temperature switch
126	Socket head cap screw	300	Motor mounting bracket	9004	Grounding washer
130	Baffle strainer	302	Lockwasher	9005	Plain washer
136	Perf. sheet metal screen	303	Hex shoulder nut	9006	Socket head cap screw
137	Hex head cap screw	306	C-face adapter flange	9007	Hex head cap screw
138	Flat washer	307	Socket head screw		
139	Lockwasher	311	Motor side coupling half		





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