



Laboratory Vacuum Pumps
Owner's Manual
for Models:
79203-00/-05/-10/-20/-30/-40/-45/-50/-55

New and improved
inlet connection.
See Section 2.10
for details.



WARNING

Do not block the exhaust port. Pressure will build up with the potential of the oil case bursting with possible injury to personnel.



WARNING

Pumps being run continuously above 1 torr should use an exhaust oil recycler.



WARNING

Pumps not recommended for filtration, aspiration or drying electrophoresis gels

Cole-Parmer Instrument Company
625 East Bunker Court
Vernon Hills, IL 60061-1844
Phone: 1-800-323-4340
Fax: 847-247-2929
E-Mail: info@coleparmer.com
Web-Page: www.coleparmer.com

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**INSTRUCTION
WARNING AND CAUTION
PLEASE READ BEFORE OPERATION**

While reading your manual, please pay close attention to areas labeled **WARNING AND CAUTIONS**. The description of each is found below.

WARNING

Warnings are given where failure to observe instruction could result in injury or death to people

CAUTION

Cautions are found where failure to observe the instruction should result in damage to the equipment, associated equipment and process.

These units conform to the SI International system of units of measurement.

The following symbols (with recommendations of IEC1010) of warning will be found on the pump.

Caution - refer to accompanying documents



Caution - risk of electrical shock



Caution - hot surface



WARNING

Motor includes a self resetting thermal cut-out and the pump could restart without actuation under fault condition.

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Section 1: INSTALLATION

1.1 Unpacking

Carefully remove the pump from the shipping carton. Keep all paperwork and inspection tags for future reference. If shipping damage has occurred, a claim must be filed with the carrier immediately; keep the shipping container for inspection by the carrier.

1.2 Pump Mounting

Rubber bumpers are supplied with the pump base. They isolate noise and eliminate creeping. For more rigid mounting requirements the pump base can be bolted directly to a surface by removing the bumpers from the base and using the mounting holes and slots featured on the base.

1.3 Pump Location

The pump should be located in a clean and well-ventilated area and adequate space should be provided wherever possible for routine maintenance such as oil changes. For best performance, the pump should be located as closely as possible to its system. Determining factors for pump location should include length and size of connections, the number of bends, and the type of exhaust connections.

1.4 Exhaust Provisions

Exhaust connections will be determined by the type of system to be exhausted and the desired cleanliness of the air surrounding the pump. Under normal pumping conditions the optional exhaust filter will be adequate. Refer to Section 9, Accessories for available exhaust filters. Where extreme exhaust conditions are encountered, it is best to pipe the exhaust out of the building. Always use thick walled rubber vacuum hose, wire reinforced PVC tubing or metal pipe for exhaust lines to avoid the possibility of the line becoming crimped or collapsing resulting in dangerous exhaust line blockage.

The pumps' exhaust connection is a 1"-20 threaded port for Models 79203-10, 79203-20 and 79203-30. The port is located opposite the inlet port on top of the oil reservoir. The models 79203-10 and 79203-20 will accept Model 1417P Exhaust Filter. Model 79203-30 accepts Model 1417P-7 Exhaust Filter. If a hose nipple is preferred for the exhaust port, use part number 1393K for models 79203-10, 79203-20 and 79203-30. Call Cole-Parmer customer support 1-800-323-4340, prior to start-up if you have any questions.



WARNING

Never block or impede air flow from the exhaust port. High pressure can build up within the oil reservoir if the exhaust port is blocked. Check frequently, especially if exhaust is piped out of the building.

1.5 Electric Power

The voltage setting is permanently displayed in a small window on the pump motor electrical box. The window is located next to the power cord connection.



CAUTION

Make certain the power settings on the pump match your power source before attempting to operate the pump. (Additional information can be found in section 4: Motor Power).

1.6 Vacuum Connections

The pump inlet is equipped with a Unibarb, see table below. The inlet is located next to the pump handle. It contains a screen to collect any debris from getting into the pump. An extensive line of vacuum pump hoses, traps, etc. is available from Cole-Parmer to meet the requirements of most vacuum systems. For the best vacuum, use a hose clamp in conjunction with a vacuum hose to hose nipple connections. Cole-Parmer offers a number of different types of vacuum tubing and connectors.

See Section 9 - Accessories or call Cole-Parmer customer support 1-800-323-4340.

Pump Model	79203-00 /-05	79203-10	79203-20	79203-30	79203-40 /-45	79203-50 /-55
Unibarb Size	3/16" & 7/16"	7/16" & 13/16"	7/16" & 13/16"	7/16" & 13/16"	9/16" & 13/16"	9/16" & 13/16"

The choice of connections and fittings can have a very marked effect on the pumping speed at the vacuum chamber. Any connection placed between the pump and the chamber creates an impedance to the flow of gas. This is particularly true at low pressures in the millitorr range where the gas flow is substantially molecular in character. The gas flow is then dependent upon the kinetic activity of the molecules to bring it to the pump intake. This impedance is described by the term "conductance".

The conductance of a tube is proportional to the cube of its diameter and inversely proportional to its length. Therefore, connecting lines should be as large in diameter and as short in length as practical. For best results the diameter of the connecting tube should be at least as large as the diameter of the pump intake. To avoid a large reduction in pumping speed at the vacuum chamber, the conductance of the line must be considerably greater than the speed of the pump. Sharp bends in vacuum lines also contribute to conductance. To avoid reductions in pumping speed, minimize the number of 90° angles in the vacuum system.

1.7 Vacuum Gauges

The type of vacuum gauge to be used in a system is determined largely by the pressure range to be measured. A thermocouple or pirani gauge is recommended for measuring pressures in the range produced by these pumps. See Website or call for additional information.

1.8 Vacuum Pump Oil



WARNING

**The vacuum pump is shipped without oil inside to prevent possible spillage during shipment. Oil must be added prior to use.
Use only Cole-Parmer Vacuum Pump Oil Part No. 79201-74**

Filling with Fresh Oil

Be sure the pump is filled with oil to the level indicated on the oil fill window. When additional oil is required, use only Vacuum Pump Oil Part No. 79201-74; pump performance is not guaranteed with other brands of oil. Do not overfill the pump, and be sure to replace the oil fill plug. Remove the oil fill plug located on the top of the oil case and add the oil supplied in a bottle packaged with each pump. To ensure efficient operation and proper maintenance, and to minimize noise and oil vapors, it is important to use the correct type and quantity of Cole-Parmer Vacuum Pump Oil Part No. 79201-74 has been especially developed to have the proper viscosity, low vapor pressure, and chemical stability needed to produce peak pumping efficiency. A sufficient amount of vacuum pump oil, enough for one fill, is shipped with every pump.

Do not use oils designated Grade 18, 19 or 20.

Remove the fill plug located on the top of the oil case and add pump oil. It is best to check the oil window located on the front of the oil case for oil level when the pump is running. Do not over fill the pump, and be sure to replace the oil fill plug.



WARNING
Operating temperature of the oil is hot and can cause burns.
Avoid skin contact with the oil.

The fill plug has a raised middle section and a center slot for easy turning either by hand or with a screwdriver. After the pump has been running for at least 15 minutes, check the oil level again. The oil level should be maintained at the “full” mark on the oil level window while the pump is operating. Do not overfill; excess oil tends to be splashed out the pump exhaust.

Guidelines for the frequency of oil changes and the oil changing procedure can be found in Section 6-2: Oil Change.

1.9 Pumping Condensable Vapors

Liquids can collect in a vacuum pump by being ingested or sucked directly into the pump, or by its vapors condensing in the pump.

Never allow this pump to ingest liquids directly into the pump. If this should occur, drain the oil, replace with a fresh supply and prevent a recurrence.

To prevent condensable vapors from condensing in the vacuum pump, several measures should be taken. These include:

- 1) Use of the Gas Ballast: It is located at the top of the pump next to the inlet. Turning the gray cap clockwise opens the valve, letting a small amount of air into the pump.
- 2) Control of pressure in the system. Not all vacuum systems need to, or should be, operated at the lowest pressure possible for the pump.



WARNING
Cole-Parmer Vacuum Pumps should not be operated above 1 Torr
(10mm Hg) for extended periods of time, while unattended.
DO NOT use the pumps for FILTRATION or ASPIRATION.

- 3) Trap condensable vapors in a cold trap. IF the pressure of the system must be set at or near the ultimate pressure of the pump (ruling out the use of the gas ballast), or if the vapor load is high, use of a cold trap is recommended. There are dry ice traps (-75° C), liquid nitrogen traps (-100° C) and refrigerated traps (-25° C to -80° C). See Section 9, Accessories.

Section 2: PUMP FEATURES AND PRINCIPLES OF OPERATION

2.1 General Description

The Cole-Parmer Vacuum Pumps are two-stage, rotary-vane, oil sealed vacuum pumps. The three Cole-Parmer models 79203-10, 79203-20 and 79203-30 offer a range of free air displacements (FAD) from 70 L/min (2.6 CFM) to 173 L/min (6.1 CFM) at 60 Hz and from 58 L/min to 141 L/min (8.4 m³hr⁻¹) at 50 Hz. The ultimate vacuum of 79203-10, 79203-20 and 79203-30 Cole-Parmer models is 1×10^{-4} torr.

Cole-Parmer vacuum pumps offer a number of features that improve performance, or protect the pump or vacuum system under specific operating conditions. Some of these features are a gas ballast, an intake anti-suck-back isolation valve (or solenoid), and airflow cooling.

The pumps also offer features to enhance the flexibility of the pump and make it easier to use and maintain. These include an easy pour oil drain, and auxiliary vacuum port to power accessories.

2.2 Principles of Vacuum Pump Operation

The main purpose of a vacuum pump is to reduce the pressure in a vessel or a closed system. The degree of pressure reduction is dependent upon the requirements of the application and the type of vacuum pump employed.

A quantity of gas is removed from the system with each cycle of the pump. Therefore, the pressure of the gas remaining in the system is reduced with each pump cycle. Since the pump can remove only a small portion of the gas with each pump cycle, this method of evacuation can never completely remove all gas in the vessel. Also, all components of the system contain minute sources of gas leakage which are impossible to seal completely against atmospheric pressure. Out gassing of material within the system provides additional sources of gas.

As a result, after prolonged pumping, a state of equilibrium is reached in which the gas introduced from all of the leakage sources is balanced by the ability of the pump to remove gas from the system. This state of equilibrium is referred to as the ultimate pressure or blankoff pressure of the pump and its system.

2.3 Effects of Continued Pressure Reduction

The quantity of gas in the vessel is reduced with each evacuation cycle. The gas remaining in the vessel expands to fill the vessel and consequently with each cycle the pressure in the vessel is reduced. This is a manifestation of Boyle's Law which states that, for a constant temperature, the volume of a body of gas is inversely proportional to its pressure; i.e., if the volume is enlarged the pressure must be reduced.

As the amount of gas in the vessel is steadily diminished, its pressure is correspondingly reduced. The action of the pump must therefore compress a successively smaller quantity of gas with each cycle to something greater than atmospheric pressure in order to expel it from the pump.

At the beginning of an evacuation sequence, the compression ratio is very small. In the first cycle of operation the pump draws in a volume of gas at atmospheric pressure and expels it at approximately atmospheric pressure. In contrast, near its ultimate pressure, a pump draws in gas at (for example) 30 millitorr and must compress it to more than 760,000 millitorr (atmospheric pressure) in order to expel it from the pump. Since the exhaust valve is generally spring loaded to provide a good seal, the pressure required to open it is somewhat greater than atmospheric pressure. Therefore, at an ultimate pressure of 1.3×10^{-4} mbar 0.1 millitorr, (1×10^{-4} Torr) the compression ratio performed by the pump is greater than 1,000,000 to 1.

2.4 Ultimate Pressure.

As described previously, a quantity of gas is removed from the system with each cycle of the pump. Therefore, the pressure of the gas remaining in the system is reduced with each pump cycle. Since the pump can remove only a small portion of the gas with each pump cycle, it is obvious that this method of evacuation can never completely remove all the gas in the vessel. In addition to this, all the components of the system contain minute sources of gas leakage which are impossible to seal completely against atmospheric pressure. Outgassing of materials within the system provide additional sources of gas.

As a result, after prolonged pumping, a state of equilibrium is reached in which the gas introduced from all the leakage sources is balanced by the ability of the pump to remove gas from the system. This state of equilibrium is referred to as the ultimate pressure or blankoff pressure of the pump and its system. No matter how much additional pumping time is provided, no further reduction in system pressure will be accomplished once ultimate pressure is attained.

2.5 Pump Mechanism Description

The Cole-Parmer Vacuum Pumps incorporate two in-line rotary-vane stages with interconnecting ports. In operation, the intake stage is at a lower pressure and the exhaust stage is at a higher pressure relative to each other. Each stage contains a rotor assembly consisting of a rotor with two vanes and a stator. The pumps shaft turn the rotors, causing the vanes in each section to sweep the surface of their stators. The vanes are pressed against the stators by centrifugal force and/or springs.

2.6 Intake Antisuckback Isolation Valve.

When power to the pump is turned off, this valve closes automatically, maintaining vacuum in the system being evacuated, and vents the inside of the pump to atmospheric pressure. The solenoid is wired to the pump's on-off switch. When the pump is turned on, the solenoid plunger opens the valve to allow gas to flow into the pump intake.

2.7 Pump Lubrication.

To ensure efficient operation and proper maintenance, and to minimize noise and oil vapors, it is important to use the correct type and quantity of oil. Cole-Parmer Vacuum Pump Oil Part No.79201-74 has been especially developed to have the proper viscosity, low vapor pressure, and chemical stability needed to produce peak pumping efficiency. The ultimate vacuum guarantee on Cole-Parmer pumps applies only when this oil is used. Therefore, Cole-Parmer Vacuum Pump Oil Part No.79201-74 is the only oil recommended for use with these pumps. Each pump is supplied with a bottle of oil sufficient for filling. Additional oil is available. See Section 9: Accessories.

In Models 79203-10 and 79203-20, oil is fed into the pumping chamber by the differential pressures created by the rotation of the pump. Oil metered into the pump through a narrow opening is sufficient to lubricate and seal the moving parts, permitting the pumping of gas at relatively low pressure levels. Model 79203-30 uses a positive placement lubrication system which actively forces lubricating oil onto pumping surfaces.

2.8 Exhaust Filter.

Any oil-sealed vacuum pump tends to discharge oil mist from its exhaust port when the pump operates under high-flow conditions, such as when the pump's intake is at or near atmospheric pressure. Typically, oil mist in the form of a white puff of "smoke" can be seen from the exhaust port when no filter is used. Once the vacuum level and the corresponding air flow through the pump are reduced, very little, if any, oil mist will be emitted.

An optional exhaust filter is recommended for any vacuum pump installation where the pump operates at high intake pressures for a prolonged period of time. Oil droplets entrained in the pump's exhaust are removed by the exhaust filter element. Use of an exhaust filter typically reduces or baffles pump noise as well. Exhaust filters are sometimes referred to as Oil Mist Eliminators. See Section 9 - Accessories.

2.9 Gas Ballast Valve.

The Cole-Parmer Vacuum Pumps have a gas ballast valve that can increase the pump's water vapor tolerance. (The gas ballast valve is sometimes referred to as a vented exhaust valve.) In many vacuum pump applications the gases being pumped from a system are a combination of permanent gases and undesirable vapors such as water vapor. Under some conditions, the vapors condense in the second stage of the pump and contaminate the oil. The gas ballast valve reduces oil contamination by decreasing or eliminating vapor condensation.

Vapor condensation is most likely to take place when the gas compression ratio is high, i.e. when the pump compresses a relatively large volume of gas to a small volume. Whether or not condensation takes place is dependent upon several factors, including the proportion of permanent gases to vapors at the pump intake. If the gases being pumped consist entirely of vapors, condensation will definitely occur unless the gas ballast valve is opened. The gas ballast valve adds a small amount of air at atmospheric pressure to the gas being compressed in the second stage. This reduces the compression required to push the gas out past the exhaust valve (less reduction in volume is required), and therefore reduces or eliminates condensation.

When the gas ballast valve is open, the pump has to work a little harder, resulting in a slight increase in operating temperature. The increase in temperature is small, however, and is not harmful to the pump. Also, the pump is slightly noisier, and the pump's ultimate pressure is somewhat reduced. Therefore, the gas ballast valve should be kept closed when it is not needed. Note that the gas ballast is not equally effective on all vapors, so it does not always eliminate condensation completely.

2.10 Unibarb™ Intake Fitting - Simplifies Small Hose Connections

The Unibarb intake fitting allows the user to be able to use a wide range of ID hose to connect to the system. The choice of hose size can have a very marked difference on pumping speed. It is the best to have the largest connection I.D.(internal diameters) as possible. However, we recognize many lab appliances use hose barbs accepting small I.D. hose.

Pump Model	79203-00 /-05	79203-10	79203-20	79203-30	79203-40 /-45	79203-50 /-55
Unibarb Size	3/16" & 7/16"	7/16" & 13/16"	7/16" & 13/16"	7/16" & 13/16"	9/16" & 13/16"	9/16" & 13/16"

The conductance of a tube is proportional to the cube of its diameter and inversely proportional to its length. Therefore, connecting line should be as large in diameter and short in length as practical.

Included is a free hose clamp to hold the hose in place.

Section 3: PUMP SPECIFICATION

MODEL	79203-00	79203-05	79203-10	79203-20	79203-30	79203-40	79203-45	79203-50	79203-55
Free Air Displacement CFM (L/min)	1.8 (51)	1.5 (43)	2.6 (70)	3.8 (108)	6.1 (173)	7.7 (218)	6.4 (181)	11.3 (320)	9.3 (263)
Ultimate Pressure in Torr ⁻¹ (mbar)	2x10 ⁻³ (2.6x10 ⁻³)	2x10 ⁻³ (2.6x10 ⁻³)	1x10 ⁻⁴ (1.3x10 ⁻⁴)	1x10 ⁻⁴ (1.3x10 ⁻⁴)	1x10 ⁻⁴ (1.3x10 ⁻⁴)	3x10 ⁻⁴ (4x10 ⁻⁴)	3x10 ⁻⁴ (4x10 ⁻⁴)	4x10 ⁻⁴ (5x10 ⁻⁴)	4x10 ⁻⁴ (5x10 ⁻⁴)
Sound Level dBA	52	52	50	50	50	54	54	55	55
Motor/Pump Speed rpm @ 50Hz Motor/Pump Speed rpm @ 60Hz	- 3450	2830 -	1425 1725	1425 1725	1425 1725	1425 1725	1425 1725	1425 1725	1425 1725
Motor Horsepower	1/4	1/4	1/2	1/2	1/2	1/2	1/2	3/4	3/4
Electrical	115V/60Hz	230V/50Hz	115V/60Hz 230V/50Hz	115V/60Hz 230V/50Hz	115V/60Hz 230V/50Hz	115V/60Hz	230V/50Hz	115V/60Hz	230V/50Hz
Oil Capacity Liters	0.40	0.40	0.85	0.85	0.77	1.20	1.20	1.10	1.10
Unibarb Connection	3/16" & 7/16"	3/16" & 7/16"	7/16" & 13/16"	7/16" & 13/16"	7/16" & 13/16"	9/16" & 13/16"	9/16" & 13/16"	9/16" & 13/16"	9/16" & 13/16"
Exhaust Connection	Threaded 3/4"-20	Threaded 3/4"-20	Threaded 1"-20	Threaded 1"-20	Threaded 1"-20	Threaded 1"-20	Threaded 1"-20	Threaded 1"-20	Threaded 1"-20
Weight lbs. (Kg.)	24.5 (11.1)	24.5 (11.1)	40 (18)	40 (18)	48 (22)	58.5 (26.6)	58.5 (26.6)	69 (31.3)	69 (31.3)
Overall Dimensions Length: in (cm) Width: in (cm) Height: in (cm)	14.1 (35.9) 5.1 (13) 8.4 (21.3)	14.1 (35.9) 5.1 (13) 8.4 (21.3)	18.5 (47.1) 6.5 (16.5) 9.6 (24.3)	18.5 (47.1) 6.5 (16.5) 9.6 (24.3)	19.3 (49) 6.5 (16.5) 9.6 (24.3)	20.5 (52.1) 7.1 (17.9) 10.7 (27.2)	20.5 (52.1) 7.1 (17.9) 10.7 (27.2)	21.2 (53.8) 7.1 (17.9) 10.7 (27.2)	21.2 (53.8) 7.1 (17.9) 10.7 (27.2)
Shipping Weight lbs. (Kg.)	26 (11.8)	26 (11.8)	46 (21)	47 (21)	53 (24)	68 (30.8)	68 (30.8)	77 (34.6)	77 (34.6)
Shipping Carton Dimensions Length: in (cm) Width: in (cm) Height: in (cm)	21 (53.3) 6.5 (16.5) 11.2 (28.6)	21 (53.3) 6.5 (16.5) 11.2 (28.6)	28.9 (74) 10.7 (25.8) 13.6 (35)	28.9 (74) 10.7 (25.8) 13.6 (35)	28.9 (74) 10.7 (25.8) 13.6 (35)	29 (73.7) 11.5 (29.2) 15.5 (39.4)	29 (73.7) 11.5 (29.2) 15.5 (39.4)	29 (73.7) 11.5 (29.2) 15.5 (39.4)	29 (73.7) 11.5 (29.2) 15.5 (39.4)

Section 4: ELECTRICAL POWER SETTINGS

Model	79203-00	79203-05	79203-10	79203-20	79203-30	79203-40	79203-45	79203-50	79203-55
Horsepower	1/4	1/4	1/2	1/2	1/2	1/2	1/2	3/4	3/4
Electrical - Conversion - Voltage - Cycles	N/A LV 60Hz	N/A HV 50Hz	Simple Conversion between** LV & HV 50Hz & 60Hz	Simple Conversion between** LV & HV 50Hz & 60Hz	Simple Conversion between** LV & HV 50Hz & 60Hz	Simple Conversion between** LV & HV 50Hz & 60Hz	Simple Conversion between** LV & HV 50Hz & 60Hz	Simple Conversion between** LV & HV 50Hz & 60Hz	Simple Conversion between** LV & HV 50Hz & 60Hz
RPM @50Hz	-	2830	1425	1425	1425	1425	1425	1425	1425
RPM @60Hz	3450	-	1725	1725	1725	1725	1725	1725	1725

* See Section 4.1 General for details on the “global motor”.

** See Section 4.2 Changing the Voltage setting to see simple conversion between: LV and HV.

4.1 General

Models 79203-10, 79203-20, 79203-30, 79203-40, 79203-45, 79203-50 and 79203-55 include “global motors” to allow use with most electrical power systems around the world. The pumps may be set for low voltage (LV) allowing use in power systems within the voltage range, 100 to 120 volts and frequencies of 60 Hz or 50 Hz. They may also be set for high voltage (HV) allowing use in power systems within the voltage range 200 to 230 volts and frequencies of 60 Hz or 50 Hz.



CAUTION

Make certain that the voltage setting (LV or HV) is in the correct range for your power before plugging in.

4.2 Changing the Voltage Setting

The voltage setting is permanently displayed in a small window on the pump motor electrical box. The window is located next to the power cord connection and displays either LV for 100-120V or HV for 200-230V.

To change VOLTAGE setting:

1. Disconnect the electrical power cord.
2. Open the motor electrical box by removing the four screws and removing the cover.
3. Locate the voltage selection switch next to the external electrical power cord connector.
4. Remove the voltage marker (61-6071).
The switch is very tightly installed.
To remove, place index and middle finger along the top edge and pull backwards.
5. Change the voltage selection switch (61-1303) to the opposite position.
6. Rotate the voltage marker, 180° and insert into previous location. The voltage marker is keyed to the switch setting so that it can only display the correct setting. The selected voltage setting can be seen through the window in the electrical box.
7. Replace the electrical box cover before reconnection the power cord.

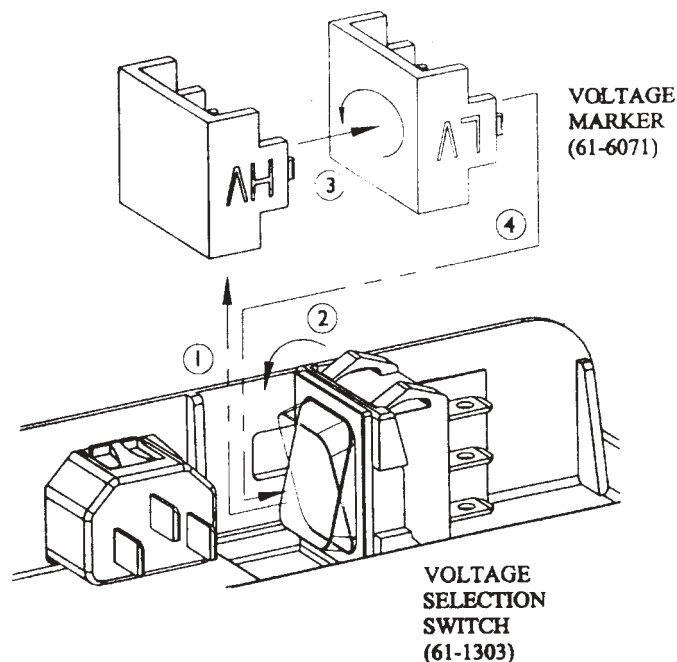


Figure 4.1

4.3 Choosing Electrical Power Cords

A universal electrical power connector is provided on the Models 79203-10, 79203-20, 79203-30, 79203-40, 79203-45, 79203-50 and 79203-55 on the motor electrical box. To change to a different wall plug simply choose the appropriate power cable from the list included below. All include a universal connector on the pump.



CAUTION:

When changing Power cords, always make certain that the motor voltage setting (LV or HV) is in the right range for the electrical power.

4.4 Other Electrical Configurations

Other electrical configurations of Cole-Parmer pumps may be available. Check with Cole-Parmer for 3-Phase, explosion-proof and other motor configurations.

Section 5: OPERATION

5.1 Starting Procedure.

Before using the pump for the first time, it is a good idea to spend a few minutes inspecting the pump and its electrical and vacuum connections. Review Section 1: Installation as required.

Check the AC power outlet to be sure that it is the same voltage and phase as the pump motor. Connect the power cord to the power outlet and recheck the oil level.

Close off the pump intake and the gas ballast valve, and run the pump at blankoff for a few minutes. The gurgling noise should go away after a few minutes of running; it is caused by the high volume of air that flows through the pump when the pump is first turned on. If the gurgling noise does not stop, check the oil level to see if it is low, and check the pump intake fitting to be sure that it is tight. Once proper pump operation has been verified, the pump intake can be opened to the vacuum system.

After running the pump for a few minutes, check the oil level again. If the level is too high or too low, stop the pump and add or remove oil as needed. Stop the pump and vent it to the atmosphere before adjusting the pump fluid level.

Before starting the pump when connection to the vacuum system, check all vacuum connections.

5.2 High Pressure Operation

The Cole-Parmer Vacuum Pumps are designed to be most efficient when operated at or near their ultimate blankoff pressure. When operated at elevated pressures for long periods of time, the pump will run hotter. Additional cooling may be required for both the pump and the motor. At elevated ambient temperatures under these conditions, the thermal protection switch may cut out. The oil may tend to thin out at these temperatures, losing its ability to lubricate effectively.

During operation at these pressures, oil mist may be generated at the exhaust port. The mist has the appearance of a small cloud of smoke. Use of an Exhaust Filter with coalescing element is required. An exhaust filter with an oil drain back feature is highly recommended. See Section 9: Accessories.

NOTE: If operating this pump for prolonged periods of time at or above 10 Torr, contact the Cole-Parmer Vacuum Technical Service Department 1-800-323-4340 for further information and precautions.

5.3 Shutdown Procedures.

A few simple precautions are necessary before performing a pump shutdown. If a gauge is connected to the system, first isolate the gauge, then turn off the power to the pump and open the system to the atmosphere.

NOTE: The intake isolation valve will automatically close when power to the pump is turned off. This will maintain vacuum in the system (if the pump remains connected to the rest of the system) and will vent the pump to atmosphere.

If the pump is disconnected from the system for any length of time, cover the pump intake with a rubber stopper or other suitable cover to protect the pump against contamination. An intake screen is furnished to prevent loose particles from entering.

If the exhaust port is open, that should also be covered. If the pump oil is contaminated and the pump is going to be stored for a prolonged period, the oil should be changed before the pump is stored. Even if a pump is stored for a long period with oil initially in good condition, check the oil when the pump is restarted, and change the oil if necessary.

Section 6: MAINTENANCE

6.1 Vacuum Problems.

Inability to attain sufficient vacuum in a system is usually due to leakage, contamination, or unusual outgassing. A system must be thoroughly clean and free from leaks to operate efficiently. If the system is found to be clean and leak-free, but vacuum problems still exist, the pump should be checked. A simple way to test the pump is to measure its ultimate pressure capability. This can be done by disconnecting the pump from the rest of the system and connecting a pressure gauge directly to the pump intake. (Be sure to seal the pump intake from the atmosphere, and be sure the gas ballast valve is closed.) The gauge can be any type that is suitable for the pressure levels expected. Run the pump until the gauge indicates no further reduction in pressure, and compare the pressure reading to the pump's ultimate pressure rating.

If the pump meets its ultimate pressure specifications only when disconnected from the rest of the system, the fault must be elsewhere in the system. If the pump's ultimate pressure is unusually high, the pump may be badly contaminated, low on oil, or mechanically defective. However, if the pressure is only slightly higher than the pump's guaranteed pressure, an oil change may be all that is needed to bring performance up to specifications. Be sure to use only Cole-Parmer Vacuum Pump Oil Part No. 79201-74 in Cole-Parmer Vacuum Pumps; the ultimate pressure guarantee does not apply if other types of oil are used.

The most common cause of efficiency loss in a vacuum pump is contamination of the oil, which is usually caused by foreign particles and/or condensed vapors. The condensate emulsifies with the oil, and when the oil is recirculated, the condensate evaporates. The resulting vapor then reduces the ultimate vacuum attainable in the system.

Some foreign particles and vapors form sludges with the oil. The presence of sludge in the oil impairs its sealing and lubricating properties, and eventually could cause pump seizure. Therefore, periodic oil changes are necessary to maintain efficient operation of the system. The interval at which oil changes are required is different for each set of operating conditions; experience will help you determine the proper interval for your system and process.

6.2 Oil Change

The best time to change the oil is when the pump is warm and the oil is less viscous. Before attempting an oil change, the pump must be disconnected from the power outlet.



WARNING

**The drain oil is hot and can cause burns.
Operating temperature of the oil is typically 140 degrees
Fahrenheit or higher. Avoid skin contact with the oil.**

Changing the Oil

To drain old oil, rotate the drain valve counter-clockwise until the handle will no longer turn. A 6-12 in. length of 3/8" I.D. tubing can be fitted on the oil drain nipple to direct the flow of oil neatly into a bottle or other container. When the old oil has been removed, close the drain valve by rotating it clockwise ¼ turn until the handle will no longer turn.

Frequency of Oil Changes

The oil change interval is completely dependent upon the running conditions of temperature, operating pressure, hours of daily operation, and upon the materials pumped. Clean, dry air at pressures below 50 torr are the most forgiving conditions. To determine your own oil change interval, visually monitor the pump oil conditions at regular intervals. If you suspect harsh operating conditions, daily visual checks are recommended. When the oil becomes cloudy, dark or includes particles of solids, it is time to change the oil.

Oil may be visually checked through the oil level window. However, a much better check is to use the drain to draw

out 20-50 ml into a small glass beaker and view the oil with a light behind it. Clean oil can be returned to the pump through the oil fill port.

When filling the pump with oil, be sure to use only Cole-Parmer Vacuum Pump Oil Part No. 79201-74
The ultimate pressure guarantee applies only if this oil is used.

6.3 Developing A Maintenance Schedule

Periodic inspection should be performed to monitor for any color change to the oil. Comparing a sample of new oil to what can be seen from the pump sight glass is the simplest test for oil condition. In addition, vacuum level degradation (for example from 5-millitorr to 20-millitorr using a thermocouple gage at blank-off) can be an indication that the oil has deteriorated or that it has become contaminated. Cloudy oil indicates that condensed vapors have been absorbed during pumping. Trapped condensable vapors can be removed by using the gas ballast (see section 1.9 and 2.9). Darkening of color, thickening of consistency or a “burnt” smell are all indications of deteriorated oil. Pump should be drained and flushed with new oil before refilling for service. The recommended oil change interval for pumps operating under normal conditions with clean gases and at below 1-torr should be no longer than three months. Please note however that each pumping application is different and oil change intervals need to be adapted to each specific operation. See Section 7 Troubleshooting and Section 9 Accessories for guides to better oil care.

6.4 Forced Oil Flushing

When you drain oil through the drain valve, you are not removing the oil and contaminants that are inside the pumping mechanism. You are removing oil only from the oil case. Cole-Parmer recommends that a forced oil flush of pumps be performed at the regular maintenance oil change. Follow this procedure:

1. Check The Oil Level

If the oil level is well **above** the full mark, this may indicate either the pump has been overfilled with oil, or has ingested a liquid or a large amount of vapor (water or organic solvents). Go to Step 2.

If the oil level is **even** with the full mark and you do NOT suspect corrosive gases or particulates (henceforth called contaminants) ingested have damaged the mechanism, before going to Step 2, run the pump for 15 minutes to allow the pump oil to warm up.

2. Drain the Oil

Turn off the motor for the vacuum pump. Drain the oil into a clear plastic container. A short length of hose attached to the drain nozzle will direct the oil flow neatly without splashing.

Look for contaminants settling to the bottom of container. Depending upon the amount of contaminants, you may need to repeat the following Steps 3 through 5 several times until the oil drains out clear.

3. Add Pump Oil

Flush the pump by adding approximately 150 ml of vacuum pump oil through the intake (IN) port while the pump is turned on for 15-20 seconds. While adding the pump oil, block the exhaust (OUT) port with the palm of your hand. Look for contaminated oil or other materials coming out of the drain. Turn off the pump.

4. Repeat Step 4

Repeat adding pump oil until only clean oil comes out of the drain hose.

5. Fill the Pump

Add the amount of Vacuum Pump Oil Part No. 79201-74 to the “Full” mark.

6. Run the Pump

Plug the intake (IN) port with a rubber stopper.

Turn the pump on and run it for 10 minutes. Close the gas ballast.

7. Check the Vacuum Reading

Connect a thermocouple or Pirani vacuum gauge to the pump's intake. If the pump is running nearly as well as when new, the total pressure reading of the gauge will be 10 microns or lower (1×10^{-2} torr, 1.33×10^{-2} mbar).

6.5 Lip Seal/Gasket Change

When the shaft seal in the mounting plate show signs of excess oil leakage, it should be replaced. Before attempting replacement of the seal, the pump must be disconnected from the vacuum system and from the power outlet.

Model	79203-10	79203-20	79203-30
Lip Seal	61-6042	61-6042	61-6042
Gasket	41-0643	41-0643	41-0643

MOTOR COUPLING

1. DRAIN OIL by turning the valve handle counter-clockwise in the horizontal position. The pump may be tilted to remove residual oil from the oil case.
2. Remove the handle of the pump by removing 2 M8 screws.
3. The top cover (located under the handle) and Side Panels can now be removed by removing two size M3 screws from each.
4. Remove the base by removing four M8 screws. Wipe up any oil in the base. If the Dip Pad is saturated with oil, replace it.
5. The Electrical Box Cover is removed by unscrewing four Philips-head screws.
6. Disconnect the green quick disconnect located in the electrical box.
7. Motor can be disconnected by removing four motor mounting screws.
8. Remove the coupling from the pump shaft (1 set screw)
9. Remove the three screws attaching lip seal housing.



CAUTION
Don't lose the woodruff key that sits in the key slot of the coupling; it can drop out. If the key has any burrs (caused by previous tightening of the coupling screws), sand it smooth. .

NOTE: If the lip seal gasket (under the lip seal in the lip seal housing) looks intact, there may be no need to replace it.

IMPORTANT: Note the position of the arrow and "UP" on the housing surface. After you replace the Lip Seal, be sure the arrow on this coupling again points in the same direction (so that other components will be properly aligned).

10. Replace the Lip Seal

- a) Place the lip seal housing in a vise (place a rag against the surfaces to protect against scratching). Gently hammer a screwdriver against the lip seal at opposite sides until it pops out.
- b) Before inserting the new lip seal, use your finger to add a thin coating of pump oil around its periphery.
- c) Place the new lip seal in the coupling. It is essential that it be positioned perfectly flat on the bottom inner flange. For best results, use a hand press. Place the coupling upright with the new seal on the hand press. Then place a block of wood or metal having a very flat surface on top of the Lip Seal. Turn the hand press lever until the Lip Seal is seated.
- d) To be sure the seal is completely seated, use a round tool having a slightly smaller diameter than the seal to hammer the seal completely down to the bottom.
- e) As for the lip seal gasket, even if you decide it's not necessary to replace it, clean the coupling surfaces that the gasket rests on.

11. Replace the Lip Seal Housing

- a) It is recommended that you use 3 lockwashers to secure the LIP SEAL HOUSING. Uniform tightness is important. Repeatedly finger-tight the 3 screws in sequence. Then lastly, turn them very tight.
- b) Replace the Woodruff Key in its slot. Use your small finger or a thin tool to hold it in place as you replace the motor coupling housing. Be sure the key *stays* in position. If it should fall even a little distance, use a screwdriver to push it back up in the key slot. Then tighten the set key screw—very tight.

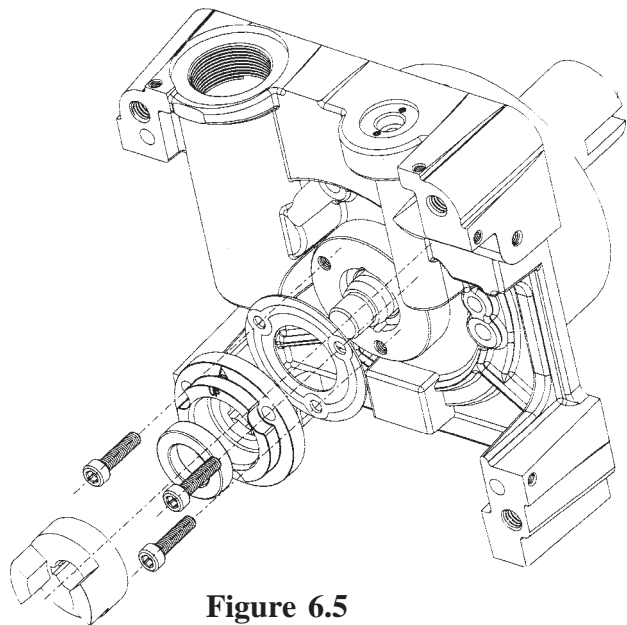


Figure 6.5

12. Replace Other Components

Reassemble the motor and other components.

Section 7 - TROUBLESHOOTING

7.1 Leak Detection

The importance of eliminating all leaks in a vacuum system is obvious when it is realized that a leak into the system, at atmospheric pressure, expands in volume by a factor of 750,000 to 10,000,000 or more. The pump must remove this added volume to maintain the desired vacuum. Fortunately a number of effective techniques for leak detection have been developed:

Large Leaks

Locate by pressurizing the system and painting the suspected area with a thick soap solution. Escaping air will produce soap bubbles.

Small Leaks

Locate by spraying a suspected area with acetone or gases rich in hydrogen, then observing a sudden change in pressure on an thermocouple gauge.



CAUTION:
Use extreme caution, as these materials are highly flammable.

The difference in calibration of these gauges, for air and other gases, will produce a distinct change in the pressure reading. To use this method of detection, the system must be under vacuum, and the gauge sensing tube must be located between the pump and the area to be probed.

Fine Leaks

Locate by using a helium-sensitive, mass-spectrometer leak detector. This instrument will locate leaks, which cannot be detected by any other method. Numerous fine leaks can have the total effect of a large leak.

7.2 Troubleshooting Guide

For Cole-Parmer Vacuum Pumps.

CONDITION	PROBABLE CAUSE	RECOMMENDED CORRECTIVE ACTION
Pump will not start	<ol style="list-style-type: none"> 1. Power off. 2. Coupling damaged or coupling set-screw loose. 3. Room is too cold. 4. Pump mechanism is seized. 	<p>Check switches and fuses.</p> <p>Check coupling.</p> <p>Drain and refill pump with warm oil.</p> <p>Try with intake open to atmosphere.</p> <p>Pump to be repaired.</p>
Pump does not reach ultimate pressure	<ol style="list-style-type: none"> 1. Pump oil is contaminated. 2. Pump is not filled with oil, or has low oil level. 3. Pump has wrong oil in it. 4. Leak in vacuum system. 5. Dirty foreline trap. 6. Gas ballast is open. 	<p>Flush and change pump oil.</p> <p>Use a foreline trap.</p> <p>Add recommended pump oil.</p> <p>Flush and refill with recommended oil.</p> <p>Locate and eliminate leak source.</p> <p>Clean out cold traps and replacement elements in coaxial and molecular sieve traps.</p> <p>Close gas ballast.</p>
Excessively noisy pump.	<ol style="list-style-type: none"> 1. Intake or exhaust lines are restricted 2. Coupling damaged. 3. Slapping noise at ultimate pressure is typical for some pumps. 4. Inside mechanism damaged. 	<p>Clear and straighten out lines. Check oil level.</p> <p>Examine coupling/replace.</p> <p>Clean orifice air passage.</p> <p>Pump to be repaired.</p>
Pump generates excessive smoke or oil mist from exhaust port.	<ol style="list-style-type: none"> 1. Pump overfilled with oil. 2. Pump operating continuously above its maximum operating pressure 	<p>Drain excess pump oil.</p> <p>Use a larger capacity pump or modify your vacuum system.</p>
Pump oil is dark, has an unusual color, or is dirty.	<ol style="list-style-type: none"> 1. Pump oil contaminated by process gases, or other foreign material ingested by pump. 2. Pump oil has degraded. 	<p>Flush and change oil. Use a foreline trap in future. Consider using an oil filtration system or inert pump oils.</p> <p>Pump was run too low on oil. The recommended oil was not used. Pump is running continuously above its maximum operating pressure.</p>
Pump does not achieve its rated pumping speed	<ol style="list-style-type: none"> 1. Pump is running too cold. 2. Exhaust or intake line is too narrow. 3. Pump oil is contaminated. 4. Very dirty trap or intake line. 	<p>Allow pump to run until it warms up to its operating temperature.</p> <p>Install larger inner diameter tubing.</p> <p>Flush and change pump oil.</p> <p>Use a foreline trap in future.</p> <p>Clean out cold traps and replacement elements in coaxial and molecular sieve traps. Clean or replace vacuum piping.</p>
Motor is excessively noisy	<ol style="list-style-type: none"> 1. Voltage selection is incorrect 	<p>Convert motor to be compatible with electrical supply. See Section 4.2 Changing the Voltage Setting.</p>

Section 8: REPAIR KITS

8.1 Shaft Seal Replacement.

When the shaft seal in the mounting plate shows signs of excessive oil leakage, it should be replaced. Before attempting replacement of the seal, the pump must be disconnected from the vacuum system and from the power outlet.

A seal replacement kit is available. This kit contains the outer lip seal assembly and gasket, which can be replaced in the field.

Pump Model	Shaft Seal Kit
79203-00/-05	8905K-03
79203-10	8917K-03
79203-20	8917K-03
79203-30	8917K-03
79203-40/-45	8915K-06
79203-50/-55	8925K-03

8.2 Minor Repair Kits.

A minor repair kit is available that provides a group of parts that can easily be replaced in the field.

Pump Model	Minor Repair Kit
79203-00/-05	8905K-02
79203-10	8917K-02
79203-20	8917K-02
79203-30	8917K-02
79203-40/-45	8915K-02
79203-50/-55	8925K-02

8.3 Major Factory Repair.

With proper care, Cole-Parmer Rotary Vane Pumps will give many years of service. The basic working parts of vacuum pumps are machined to close tolerances and require assembly on fixtures, with special tools, by mechanics who are highly skilled at this work. Should major repairs involving the pump mechanism become necessary, we strongly recommend that the pump be returned to the factory, or to the Cole-Parmer Repair Center, for repair. Obtain a Returned Goods Number from Cole-Parmer before returning any vacuum pump.

These facilities are well-equipped and staffed with experts to insure prompt reconditioning of all returned pumps. Broken, worn, scored or corroded parts are replaced with new parts, and the pump is thoroughly evaluated and tested to determine that it meets the performance requirements.

SECTION 9: ACCESSORIES

9.1 General

This section lists the accessories available for the Cole-Parmer Rotary Vane Vacuum Pumps.

9.2 Pump Oil

Description	Quantity	Part No.
Vacuum Pump Oil	1 Liter	A-79201-74

9.3 Exhaust Filters



Description	Free Air Capacity	Port Size	Part No.
Oil Mist Filter	4.5 CFM	4-1/2"x2-1/2"	A-79775-00
Oil Mist Filter	4.5 CFM	4-1/2"x2-1/2"	A-79775-02
Oil Mist Filter	7.0 CFM	5-1/2"x2-1/2"	A-79775-10
Oil Mist Filter	7.0 CFM	5-1/2"x2-1/2"	A-79775-12
Oil Mist Filter	24.0 CFM	NW25 Flange	A-79775-20

9.4 Cold Traps



Description	Low Temp.	Connection	Capacity	Part No.
Dry Ice Cold Trap	-79°C	NW16	3 qt	A-79209-00
Dry Ice Cold Trap	-79°C	NW25	3 qt	A-79209-10
Dry Ice Cold Trap	-79°C	1/2" O.D.	3 qt	A-79209-30
Liquid Nitrogen Cold Trap	-198°C	NW16	0.75 L	A-79209-60
Liquid Nitrogen Cold Trap	-198°C	NW25	0.75 L	A-79209-70

9.5 Coaxial Traps



Description	Capacity	Connection	Part No.
Coaxial Trap	4.0 CFM	NW 16	A-79208-00
Coaxial Trap	12.0 CFM	NW 25	A-79208-10

9.6 Molecular Sieve Traps



Description	Capacity	Connection	Part No.
Molecular Sieve Trap	8 CFM	NW 16	A-79208-30
Molecular Sieve Trap	8 CFM	NW 25	A-79208-40

NOTE:

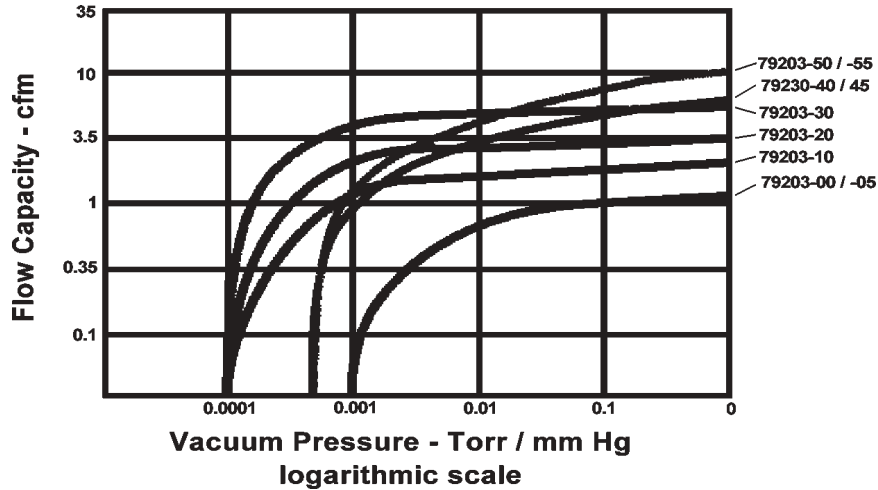
For additional information on Accessories, Parts or Products, please consult:
Cole-Parmer's Products Catalog

or

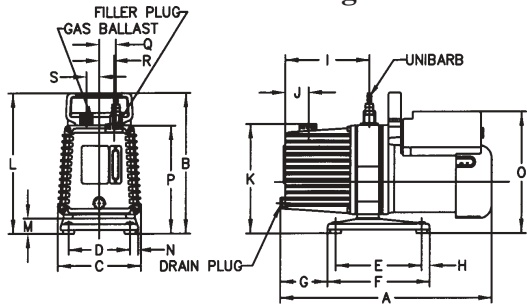
Cole-Parmer's website at www.coleparmer.com

SECTION 10: DIMENSIONAL DRAWINGS/SPEED CURVES

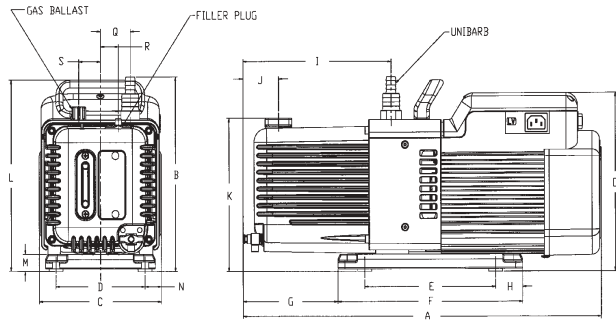
10.1 Pumping Speed Curves



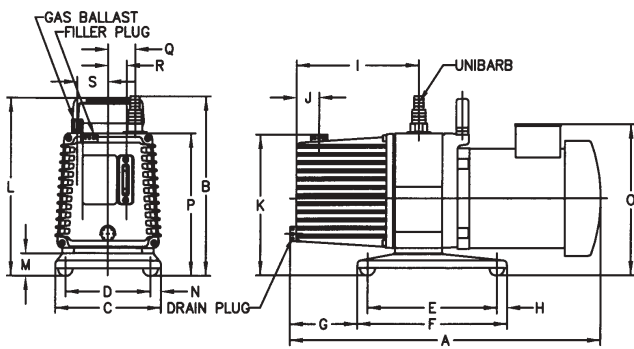
10.2 Dimensional Drawings



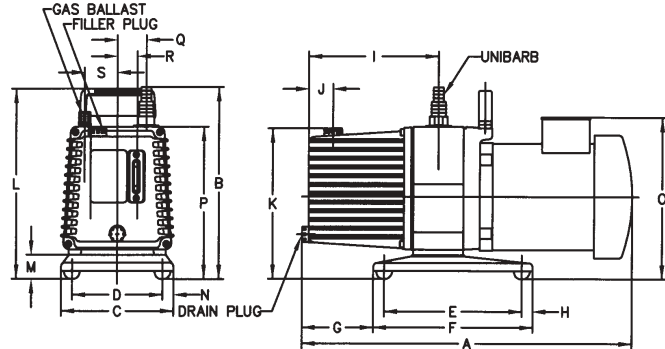
79203-00 / -05



79203-10 / -20 / -30

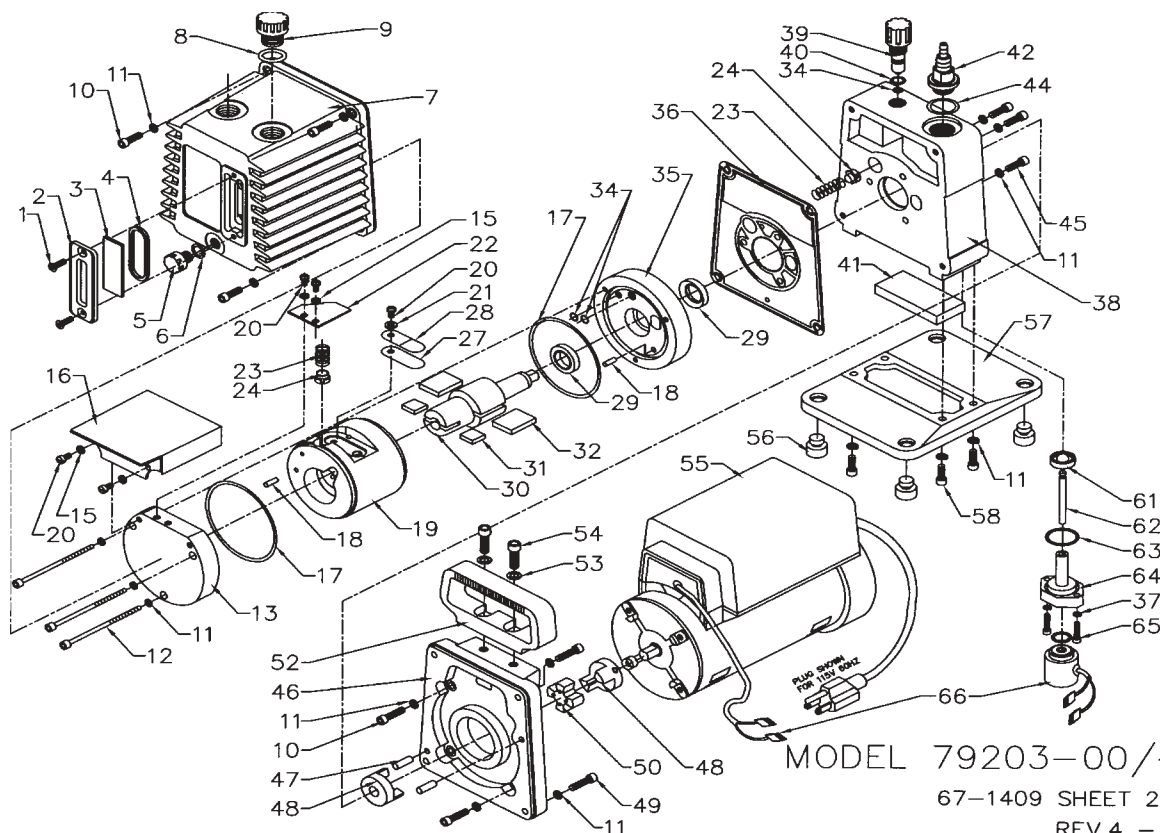


79203-40 / -45



79203-50 / -55

Pump Model	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
79203-00	14.13	8.70	5.52	4.07	5.73	6.81	3.16	0.54	5.58	1.56	6.76	8.70	0.95	0.54	7.50	6.68	1.10	0.98	0.85
79203-05	14.13	8.70	5.52	4.07	5.73	6.81	3.16	0.54	5.58	1.56	6.76	8.70	0.95	0.54	7.50	6.68	1.10	0.98	0.85
79203-10	18.90	9.60	6.54	4.76	7.00	9.88	5.05	1.44	7.92	1.90	7.60	9.45	0.87	0.89	8.78	-	1.61	0.94	1.18
79203-20	18.90	9.60	6.54	4.76	7.00	9.88	5.05	1.44	7.92	1.90	7.60	9.45	0.87	0.89	8.78	-	1.61	0.94	1.18
79203-30	18.90	9.60	6.54	4.76	7.00	9.88	5.05	1.44	7.92	1.90	7.60	9.45	0.87	0.89	8.78	-	1.61	0.94	1.18
79203-40	21.00	10.40	6.14	3.86	8.90	10.40	-	0.75	7.85	1.60	8.60	10.30	1.00	1.10	9.40	8.20	1.82	1.25	2.07
79203-45	21.00	10.40	6.14	3.86	8.90	10.40	-	0.75	7.85	1.60	8.60	10.30	1.00	1.10	9.40	8.20	1.82	1.25	2.07
79203-50	20.40	10.40	6.14	3.86	8.90	10.40	-	0.75	7.85	1.60	8.60	10.30	1.00	1.10	9.40	8.20	1.82	1.25	2.07
79203-55	20.40	10.40	6.14	3.86	8.90	10.40	-	0.75	7.85	1.60	8.60	10.30	1.00	1.10	9.40	8.20	1.82	1.25	2.07

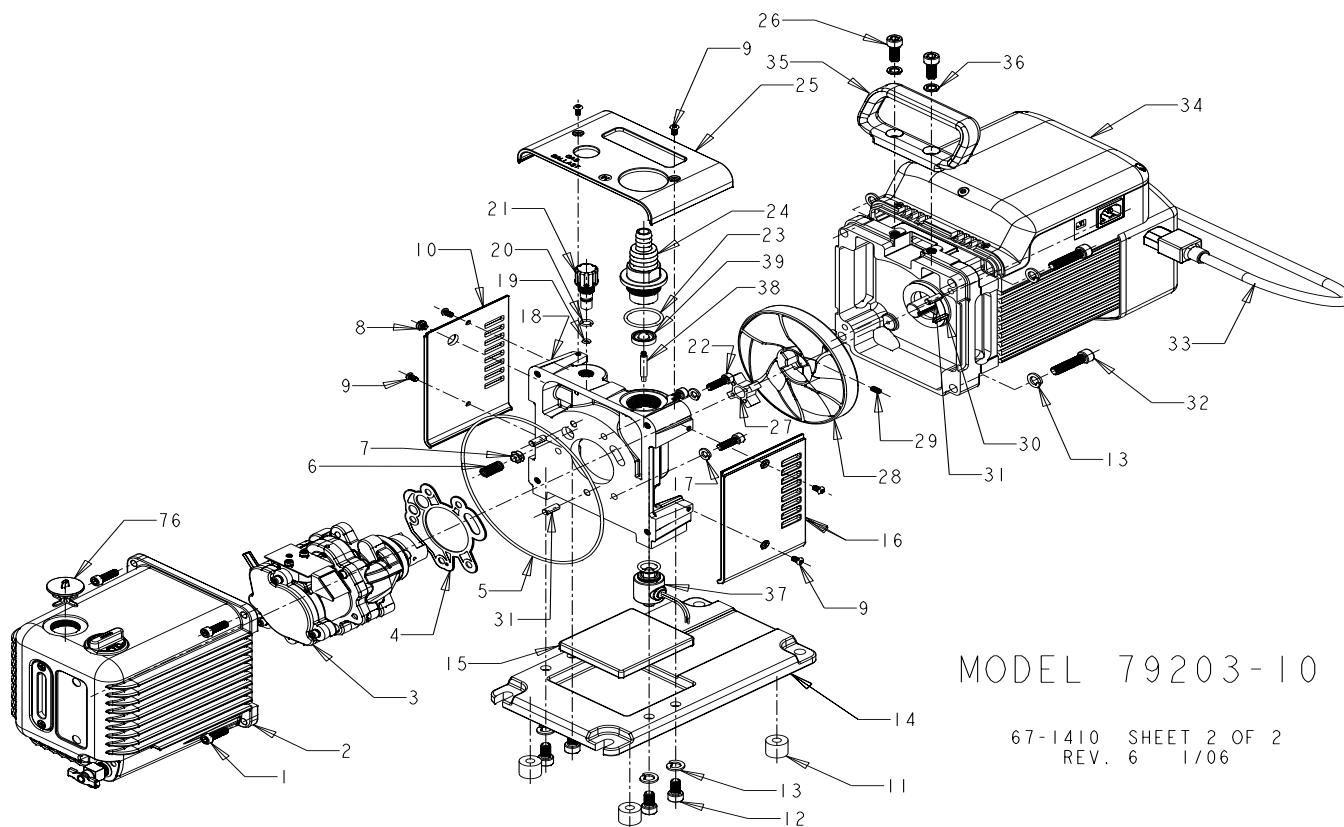


PARTS LIST 79203-00 /-05 VACUUM PUMP

ITEM	QTY	P/N	A*	B*	DESCRIPTION	ITEM	QTY	P/N	A*	B*	DESCRIPTION
01	2	62-1014			Flat Head Screw 8-32x3/8	35	1	61-2214B			Wear Plate
02	1	61-2370			Oil Window Cover	36	1	61-2149B	1		Pump Gasket
03	1	61-2229A			Oil Window Glass	37	2	2-62-0432			Lockwasher #6
04	1	66-0304	1		O-Ring, Fluoroelast. #127	38	1	61-2351			Mounting Plate
05	1	61-2413			Drain Plug	39	1	61-6324			Gas Ballast Valve Ass'y
06	1	61-2158A	1		O-Ring, Fluoroelast. #110	40	1	61-9282A	1		O-Ring, Fluoroelast. #011
07	1	61-2355			Oil Case	41	1	61-9479A	1		Drip Pad
08	1	61-2130A			O-Ring, Fluoroelast. #115	42	1	61-2358			Intake Adapter
09	1	61-2372			Filler Plug	44	1	61-2159A	1		O-Ring Fluoroelast. #116
10	8	2-00-6712			Socket Head Screw 10-32x3/4	45	3	2-00-6708			Socket Head Screw 10-32x1/2
11	22	2-62-0793			Lock Washer #10	46	1	61-2316			Motor Adapter Plate
12	3	62-0003			Socket Head Screw 10-32x3	47	2	4-21-5010			Dowel Pin 3/16x5/8
13	1	61-2417			End Plate	48	2	41-2693			Coupling Body
15	4	2-69-6108			Lock Washer #8	49	4	2-00-6716			Socket Head Screw 10-32x1
16	1	61-2415			Baffle Assembly	50	1	41-2694	1		Spider Coupling
17	2	61-2128A	2		O-Ring, Fluoroelast. #145	52	1	61-2377			Handle
18	2	4-21-3006			Dowel Pin 1/8x3/8	53	2	2-61-1165			Flat Washer 1/4
19	1	61-2416			Stator	54	2	2-01-6112			Socket Head Screw 1/4-20x3/4
20	5	2-10-2605			Round Head Screw 8-32x5/16	55	1	61-2039C			Motor Ass'y 1/4 H.P. (115V/60Hz)
21	1	2-68-5632			Flat Washer #8	55	1	61-9813			Motor 1/4 H.P. (100-120/200-240V)
22	1	61-2017A			Exhaust Valve Bracket Ass'y	56	4	61-2123A	4		Bumper
23	2	61-2119A	2		Valve Spring	57	1	61-2271C			Pump Base
24	2	61-2118A	2		Valve	58	4	2-00-6812			Socket Head Screw 10-32x5/8
27	1	61-1123A	1		Valve, Intake	61	1	61-2139A	1		Disk Ass'y, ISO Valve
28	1	61-1128A	1		Valve, Backer	62	1	61-2216A			Plunger
29	2	41-2988	2		Lip Seal, Fluoroelast.	63	1	61-2155A	1		O-Ring, Fluoroelast. #020
30	1	61-2177B			Rotor	64	1	61-2212A			Adapter, ISO Valve
31	2	61-2179A			Exhaust Vane	65	2	2-00-6410			Socket Head Screw 6-32x5/8
32	2	61-2178A			Intake Vane	66	1	61-2308			ISO Operator Ass'y, w/O-Ring
34	3	61-2157A	2		O-Ring, Fluoroelast. #007						

A*: MAJOR REPAIR KIT CAT # N/A

B*: MINOR REPAIR KIT CAT # 8905K-02



MODEL 79203-10

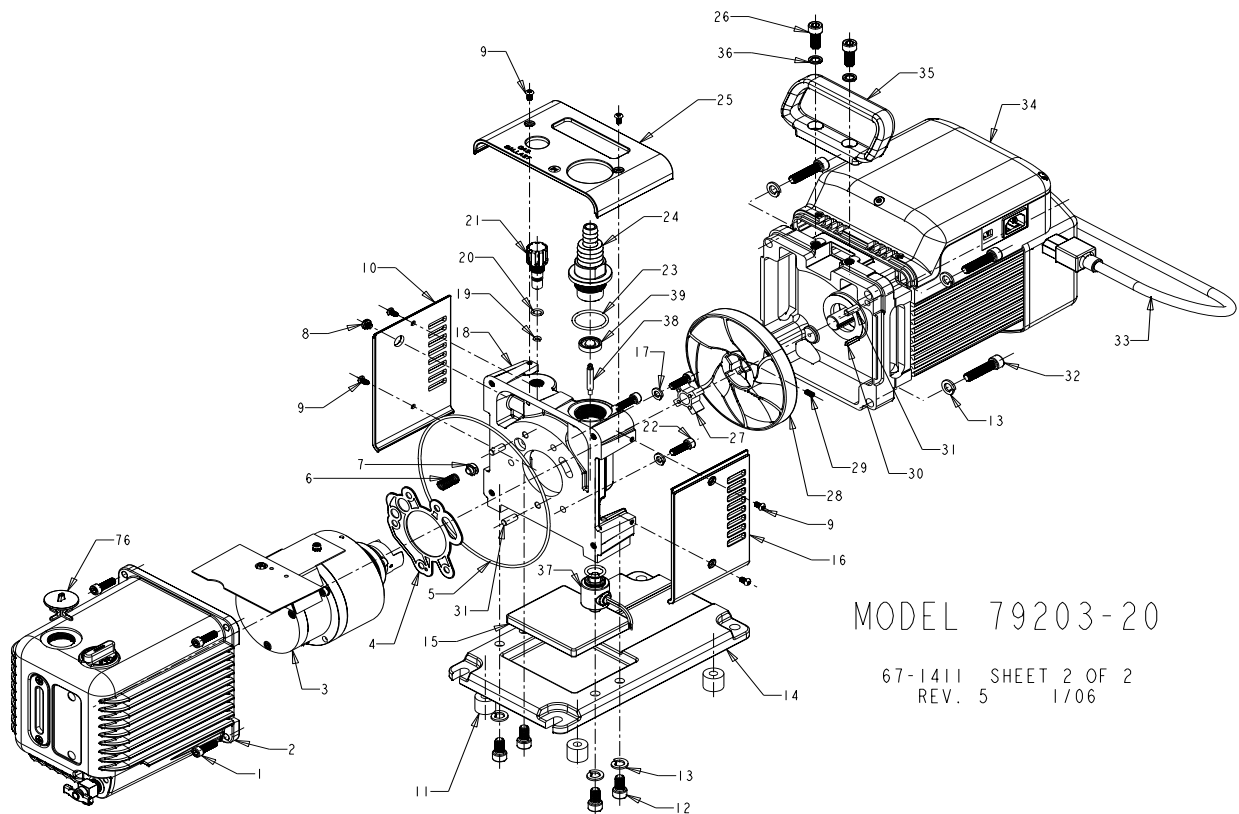
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PARTS LIST 79203-10 VACUUM PUMP

ITEM	QTY	PC.NO.	A*	B*	DESCRIPTION	ITEM	QTY	PC.NO.	A*	B*	DESCRIPTION
01	4	62-0325			Screw, Sockethead, M6x20 Blk.	21	1	61-6324			Gas Ballast Assembly
02	1	61-6443			Oil Case Assembly	22	3	62-0270			Screw, Sockethead, M6x20
03	1	61-6354			Pump Module	23	1	66-0200			O-Ring, Fluoroelast. #216
04	1	61-6385			Gasket	24	1	61-6325			Intake Fitting Assembly
05	1	66-0194			O-Ring, Fluoroelast. #164	25	1	61-6360			Cover, Top
06	1	61-2204A			Spring, Gas Ballast	26	2	62-0331			Screw, Sockethead, M8x20 Blk.
07	1	61-6305A			Valve, Gas Ballast	27	1	61-6038			Coupling, Rubber
08	1	61-9429			Screw w/ O-Ring	28	1	61-6024			Fan
09	6	62-0265			Screw, Buttonhead, M4x8 Blk.	29	1	62-0286			Set Screw, 10-32
10	1	61-5353			Cover, Left	30	1	61-6081			Key
11	4	66-0211			Rubber Feet	31	4	61-9280A			Dowel Pin, 1/4"
12	4	62-0349			Screw, Sockethead, M8x16	32	4	62-0346			Screw, Sockethead, M8x35
13	8	2-63-0356			Lock Washer 5/16	33	1	62-0344			Line Cord
14	1	61-6306			Base	34	1	61-6461			Motor Assembly 1/2 H.P.
15	1	61-6084			Drip Aid	35	1	61-6011			Handle
16	1	61-5352			Cover, Right	36	2	41-2363			Washer
17	3	2-63-0193			Lock Washer 1/4	37	1	61-6304			Solenoid Valve Assembly
18	1	61-6322			Mounting Plate	38	1	61-6279			Plunger
19	1	61-2157A			O-Ring, Fluoroelast. #007	39	1	61-9793			Isolator Disc
20	1	61-9282A			O-Ring, Fluoroelast. #011	76	1	61-6076			Exhaust Plug

A*: MAJOR REPAIR KIT CAT # N/A

B*: MINOR REPAIR KIT CAT # 8917K-02



MODEL 79203-20

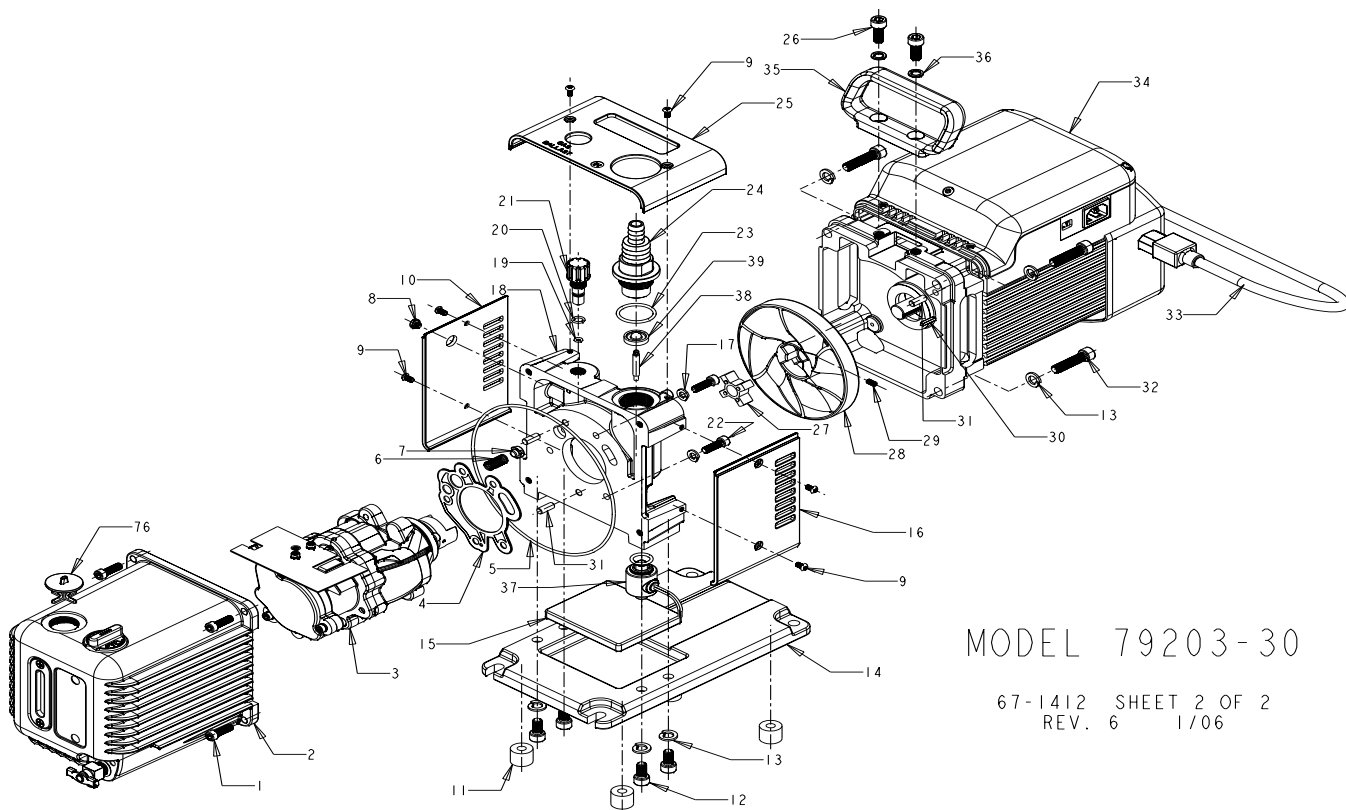
67-1411 SHEET 2 OF 2
REV. 5 1/06

PARTS LIST 79203-20 VACUUM PUMP

ITEM	QTY	PC.NO.	A*	B*	DESCRIPTION	ITEM	QTY	PC.NO.	A*	B*	DESCRIPTION
01	4	62-0325			Screw, Socket head, M6x20 Blk.	21	1	61-6324			Gas Ballast Assembly
02	1	61-6443			Oil Case Assembly	22	3	62-0270			Screw, Socket head, M6x20
03	1	61-6168			Pump Module	23	1	66-0200			O-Ring, Fluoroelast. #216
04	1	61-6385			Gasket	24	1	61-6325			Intake Fitting Assembly
05	1	66-0194			O-Ring, Fluoroelast. #164	25	1	61-6360			Cover, Top
06	1	61-6305A			Spring, Gas Ballast	26	2	62-0331			Screw, Sockethead, M8x20 Blk.
07	1	61-2118A			Valve, Gas Ballast	27	1	61-6038			Coupling, Rubber
08	1	61-9429			Screw w/ O-Ring	28	1	61-6024			Fan
09	6	62-0265			Screw, Button head, M4x8 Blk.	29	1	62-0286			Set Screw, 10-32
10	1	61-5353			Cover, Left	30	1	61-6081			Key
11	4	66-0211			Rubber Feet	31	4	61-9280A			Dowel Pin, 1/4"
12	4	62-0349			Screw, Socket head, M8x16	32	4	62-0346			Screw, Socket head, M8x35
13	8	2-63-0356			Lock Washer 5/16	33	1	62-0344			Line Cord
14	1	61-6306			Base	34	1	61-6461			Motor Assembly 1/2 H.P.
15	1	61-6084			Drip Aid	35	1	61-6011			Handle
16	1	61-5352			Cover, Right	36	2	41-2363			Washer
17	3	2-63-0193			Lock Washer 1/4	37	1	61-6304			Solenoid Valve
18	1	61-6322			Mounting Plate	38	1	61-6279			Plunger
19	1	61-2157A			O-Ring, Fluoroelast. #007	39	1	61-9793			Isolator Disc
20	1	61-9282A			O-Ring, Fluoroelast. #011	76	1	61-6076			Exhaust Plug

A*: MAJOR REPAIR KIT CAT # N/A

B*: MINOR REPAIR KIT CAT # 8917K-02



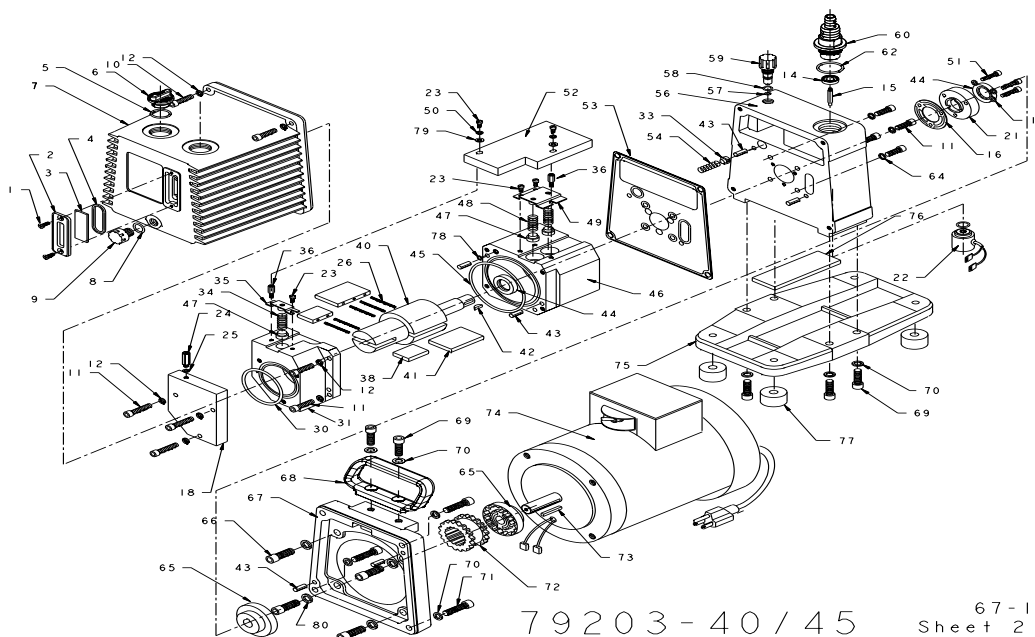
MODEL 79203-30

67-1412 SHEET 2 OF 2
REV. 6 1/06

PARTS LIST 79203-30 VACUUM PUMP

ITEM	QTY	PC.NO.	A*	B*	DESCRIPTION	ITEM	QTY	PC.NO.	A*	B*	DESCRIPTION
01	4	62-0325			Screw, Sockethead, M6x20 Blk.	21	1	61-6324			Gas Ballast Assembly
02	1	61-6443			Oil Case Assembly	22	3	62-0270			Screw, Sockethead, M6x20
03	1	61-6435			Pump Module	23	1	66-0200			O-Ring, Fluoroelast. #216
04	1	61-6385			Gasket	24	1	61-6325			Intake Fitting Assembly
05	1	66-0194			O-Ring, Fluoroelast. #164	25	1	61-6360			Cover, Top
06	1	61-6305A			Spring, Gas Ballast	26	2	62-0331			Screw, Sockethead, M8x20 Blk.
07	1	61-2118A			Valve, Gas Ballast	27	1	61-6038			Coupling, Rubber
08	1	61-9429			Screw w/ O-Ring	28	1	61-6024			Fan
09	6	62-0265			Screw, Buttonhead, M4x8 Blk.	29	1	62-0286			Set Screw, 10-32
10	1	61-5353			Cover, Left	30	1	61-6081			Key
11	4	66-0211			Rubber Feet	31	4	61-9280A			Dowel Pin, 1/4"
12	4	62-0349			Screw, Sockethead, M8x16	32	4	62-0346			Screw, Sockethead, M8x35
13	8	2-63-0356			Lock Washer 5/16	33	1	62-0344			Line Cord
14	1	61-6306			Base	34	1	61-6461			Motor Assembly 1/2 H.P.
15	1	61-6084			Drip Aid	35	1	61-6011			Handle
16	1	61-5352			Cover, Right	36	2	41-2363			Washer
17	3	2-63-0193			Lock Washer 1/4	37	1	61-6304			Solenoid Valve Assembly
18	1	61-6322			Mounting Plate	38	1	61-6279			Plunger
19	1	61-2157A			O-Ring, Fluoroelast. #007	39	1	61-9793			Isolator Disc
20	1	61-9282A			O-Ring, Fluoroelast. #011	76	1	61-6076			Exhaust Plug

A*: MAJOR REPAIR KIT CAT # N/A
B*: MINOR REPAIR KIT CAT # 8917K-02



79203-40/45

67-1413
Sheet 2 of 2
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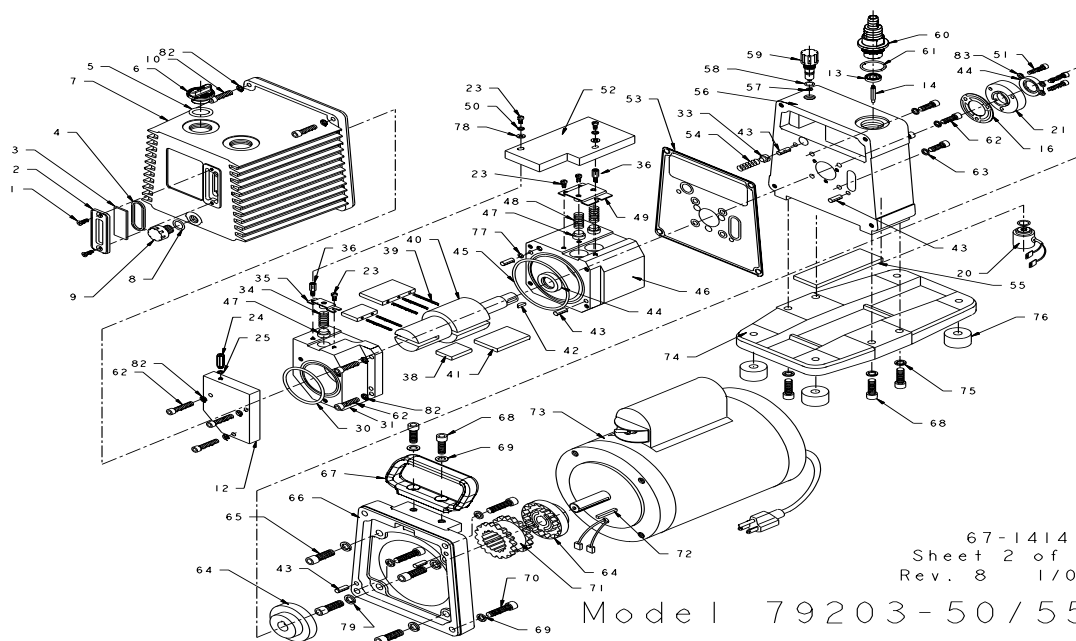
PARTS LIST 79203-40/-45 VACUUM PUMP

ITEM	QTY	P/N	A*	B*	DESCRIPTION	ITEM	QTY	P/N	A*	B*	DESCRIPTION
01	2	62-1014			Screw, Flathead, #8-32x3/8	44	2	41-3390			Lip Seal, 3/4"
02	1	61-2370			Window Holder	45	1	61-9526			O-Ring, Fluoroelast. #151
03	1	61-2229A			Window Glass	46	1	61-9597D			Intake Stage
04	1	66-0304			O-Ring, Fluoroelast. #127	47	3	61-9560A			Bypass Valve
05	1	66-0212			O-Ring, Fluoroelast. #119	48	2	61-9582A			Bypass Valve Spring
06	1	61-6020			Oil Fill Plug	49	1	61-9516A			Intake Valve Cover
07	1	61-5358			Oil Case	50	2	2-69-6108			Lock Washer #8
08	1	61-2130A			O-Ring, Fluoroelast. #115	51	3	2-00-6814			Screw, Sockethead, #10-32x7/8
09	1	61-2372			Drain Plug	52	1	61-9640A			Valve Cover Assembly
10	4	2-01-6116			Screw, Sockethead, 1/4-20x1	53	1	61-9609B			Gasket
11	11	2-01-6114			Screw, Sockethead, 1/4-20x7/8	54	1	61-6305A			Spring, Gas Ballast
12	11	2-63-0193			Lock Washer 1/4	56	1	61-5347			Mounting Plate
13	3	2-62-0793			Lock Washer #10	57	1	61-2157A			O-Ring, Fluoroelast. #007
14	1	61-9793			Isolator Disk	58	1	61-9282A			O-Ring, Fluoroelast. #011
15	1	61-6279			Plunger	59	1	61-6324			Gas Ballast Valve Assembly
16	1	41-0643			Gasket	60	1	61-5348			Intake Adapter Assembly
18	1	61-9539B			End Plate	62	1	66-0200			O-Ring, Fluoroelast. #216
21	1	61-8104A			Shaft Seal Housing	64	4	62-1071			Lock Washer 1/4 Small
22	1	61-9935			ISO Operator Assembly	65	2	41-3072			Flange Coupling
23	5	2-00-2604			Screw, Fillisterhead, #8-32x1/4	66	4	2-01-6516			Screw, Sockethead, 3/8-16x1
24	1	62-0274			Orifice .014"	67	1	61-5246			Motor Adapter Plate
25	1	41-3175			Gasket, Nylon	68	1	61-6011			Handle
26	5	41-2996			Vane, Spring	69	6	2-01-6316			Screw, Sockethead, 5/16-18x1
30	1	61-9527			O-Ring, Fluoroelast. #137	70	10	41-2363			Washer
31	1	61-9598D			Exhaust Stage	71	4	2-01-6320			Screw, Sockethead, 5/16-18x1-1/4
33	1	61-2118A			Valve, Gas Ballast	72	1	41-3073			Coupling Sleeve
34	1	61-9561A			Exhaust Valve Spring	73	1	41-2637			Motor Shaft Key (Suppl. w/Motor)
35	1	61-9580A			Exhaust Valve Cover	74	1	61-5359			Motor Assembly 3/4 H.P.*
36	2	61-9478			Stand Off Spacer	75	1	61-5245			Base
38	2	61-9615A			Exhaust Vane	76	1	61-9742			Drip Pad
40	1	61-9595C			Rotor	77	4	61-9607A			Rubber Bumper
41	2	61-9616B			Intake Vane	78	1	41-3005			O-Ring, Fluoroelast. #008
42	1	41-0624			Woodruff Key	79	2	2-68-5632			Washer #8
43	6	61-9280A			Dowel Pin, 1/4"	80	4	2-63-0593			Lock Washer 3/8

A*: MAJOR REPAIR KIT CAT. # N/A

B*: MINOR REPAIR KIT CAT. # 8915K-05

67-1413
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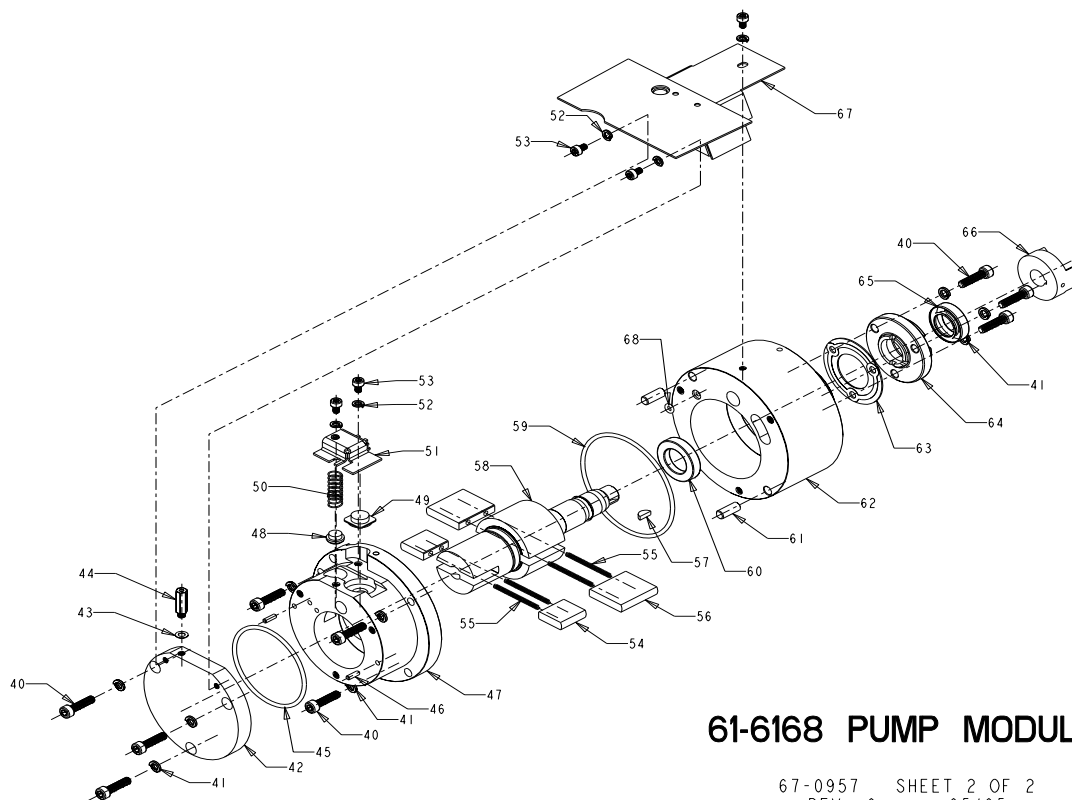


PARTS LIST 79203-50 /-55 VACUUM PUMP

ITEM	QTY	PC.NO.	A*	B*	DESCRIPTION	ITEM	QTY	PC.NO.	A*	B*	DESCRIPTION
1	2	62-1014			Screw, Flathead, #8-32x3/8	48	2	61-9582A			Bypass Valve Spring
2	1	61-2370			Window Cover	49	1	61-9686			Intake Valve Cover
3	1	61-2229A			Window Glass	50	2	2-69-6108			Lock Washer #8
4	1	66-0304			O-Ring, Fluoroelast. #127	51	3	2-00-6814			Screw, Sockethead, #10-32x7/8
5	1	66-0212			O-Ring, Fluoroelast. #119	52	1	61-9687			Valve Cover Assy
6	1	61-6020			Oil Fill Plug	53	1	61-9609B			Gasket
7	1	61-5358			Oil Case	54	1	61-6305A			Gas Ballast Spring
8	1	61-2130A			O-Ring, Fluoroelast. #115	55	1	61-9742			Drip Pad
9	1	61-2372			Drain Plug	56	1	61-5347			Mounting Plate
10	4	2-01-6116			Screw, Sockethead, 1/4-20x1	57	1	61-2157A			O-Ring, Fluoroelast. #007
12	1	61-9539B			Cover Plate	58	1	61-9282A			O-Ring, Fluoroelast. #011
13	1	61-9793			Isolator Disc	59	1	61-6324			Gas Ballast Valve Assy
14	1	61-6279			Plunger	60	1	61-5348			Intake Adapter Assy.
16	1	41-0643			Gasket	61	1	66-0200			O-Ring, Fluoroelast. #216
20	1	61-9935			Isolator Assembly	62	11	2-01-6114			Screw, Sockethead, 1/4-20x7/8
21	1	61-8104A			Shaft Seal Housing	63	4	62-1071			Lock Washer 1/4 Small
23	5	2-00-2604			Screw, Fillisterhead, #8-32x1/4	64	2	41-3072			Flange Coupling
24	1	62-0274			Orifice .014"	65	4	2-01-6516			Screw, Sockethead, 3/8-16x1
25	1	41-3175			Gasket, Nylon	66	1	61-5246			Motor Adapter Plate
30	1	61-9379			O-Ring, Fluoroelast. #139	67	1	61-6011			Handle
31	1	61-5307			Exhaust Stage	68	6	2-01-6316			Screw, Sockethead, 5/16-18x1
33	1	61-2118A			Valve, Gas Ballast	69	6	41-2363			Washer
34	1	61-9561A			Exhaust Valve Spring	70	4	2-01-6320			Screw, Sockethead, 5/16-18x1-1/4
35	1	61-9685			Exhaust Valve Cover	71	1	41-3073			Coupling Sleeve
36	2	61-9478			Stand Off Spacer	72	1	41-2637			Motor Shaft Key (Suppl. w/Motor)
38	2	61-9570A			Exhaust Vane	73	1	61-5359			Motor Assembly 3/4 H.P.*
39	5	41-2996			Vane, Spring	74	1	61-5245			Base
40	1	61-5304			Rotor	75	4	2-63-0356			Lock Washer 5/16
41	2	61-9571B			Intake Vane	76	4	61-9607A			Rubber Bumper
42	1	41-0624			Woodruff Key	77	1	41-3005			O-Ring, Fluoroelast. #008
43	6	61-9280A			Dowel Pin, 1/4	78	2	2-68-5632			Washer #8
44	2	41-3390			Lip Seal, 3/4	79	4	2-63-0593			Lock Washer 3/8
45	1	61-9378			O-Ring, Fluoroelast. #152	82	11	2-63-0193			Lock Washer 1/4
46	1	61-5305			Intake Stage	83	3	2-62-0793			Lock Washer #10
47	3	61-9560A			Bypass Valve						

A*: MAJOR REPAIR KIT CAT # N/A

B*: MINOR REPAIR KIT CAT # 8925K-02



61-6168 PUMP MODULE

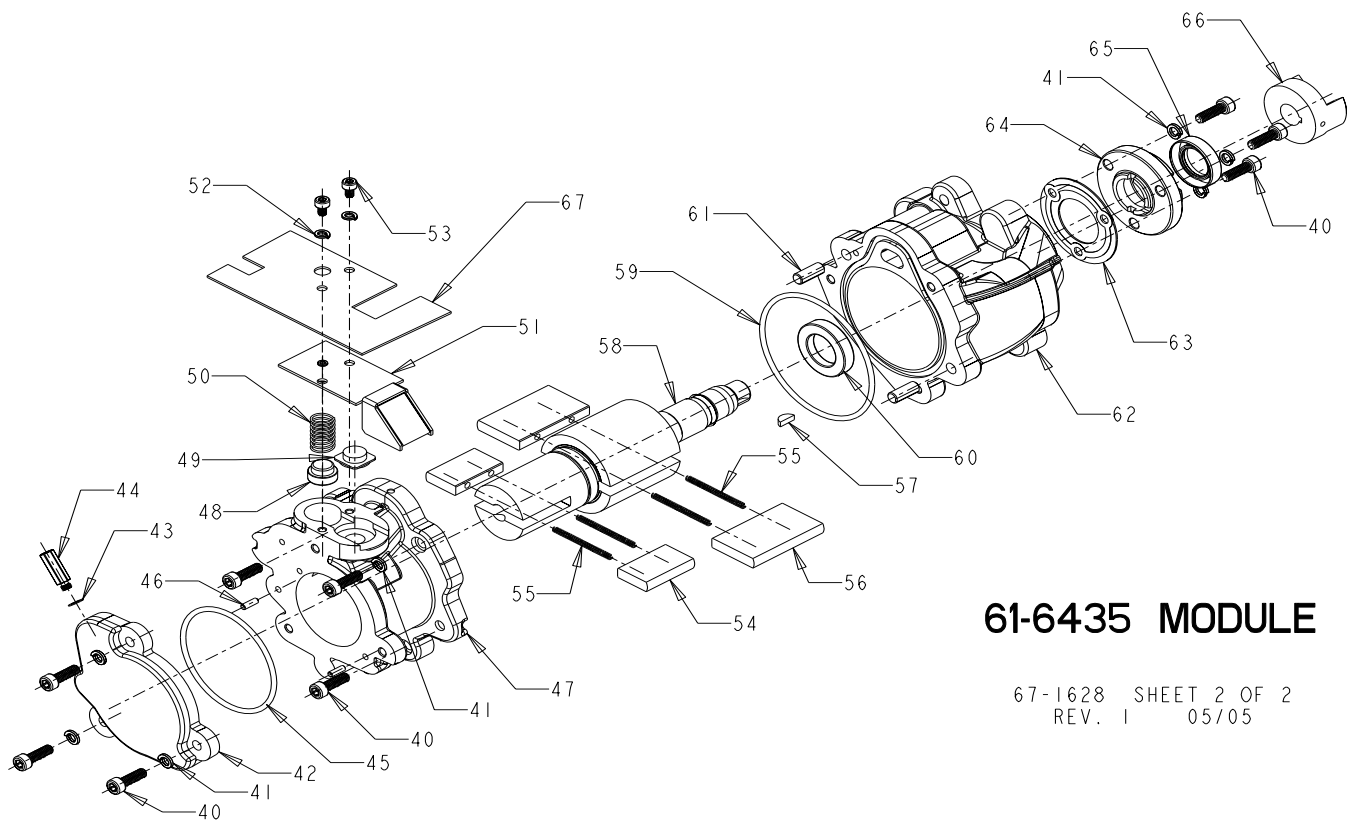
67-0957 SHEET 2 OF 2
REV. 6 05/05

PARTS LIST 61-6168 PUMP MODULE

ITEM	QTY	P/N	A*	B*	DESCRIPTION	ITEM	QTY	P/N	A*	B*	DESCRIPTION
40	6	62-0262			Screw, Sockethead, M5x20	55	4	41-2996			Vane Spring
41	9	2-62-0793			Lock Washer #10	56	2	61-6050			Vane, Intake
42	1	61-6165			Cover Plate	57	1	41-2732			Key Coupling
43	1	41-3175			Gasket, Nylon	58	1	61-6040			Rotor
44	1	62-0274			Orifice .014"	59	1	66-0203			O-Ring, Fluoroelast. #151
45	1	66-0204			O-Ring, Fluoroelast. #141	60	1	41-3390			Lip Seal, 3/4"
46	2	4-21-3006			Dowel Pin, 1/8"x3/8"	61	2	61-9280A			Dowel Pin, 1/4"
47	1	61-6167			Exhaust Stage	62	1	61-6166			Intake Stage
48	1	61-6058			Exhaust Valve	63	1	41-0643			Gasket
49	1	61-6057			Bypass Valve	64	1	61-6055			Lip Seal Housing
50	1	61-6305			Spring, Exhaust Valve	65	1	61-6042			Lip Seal .669"
51	1	61-6164			Holder, Exhaust Valve	66	1	41-2730			Coupling
52	5	2-69-6108			Lock Washer #8	67	1	61-6123			Cover
53	5	62-0271			Screw, Sockethead, M4x6	68	1	61-2157A			O-Ring, Fluoroelast. #007
54	2	61-6053			Exhaust Vane						

Used on:
- 79203-20

A*: MAJOR REPAIR KIT CAT # N/A
B*: MINOR REPAIR KIT CAT # N/A



61-6435 MODULE

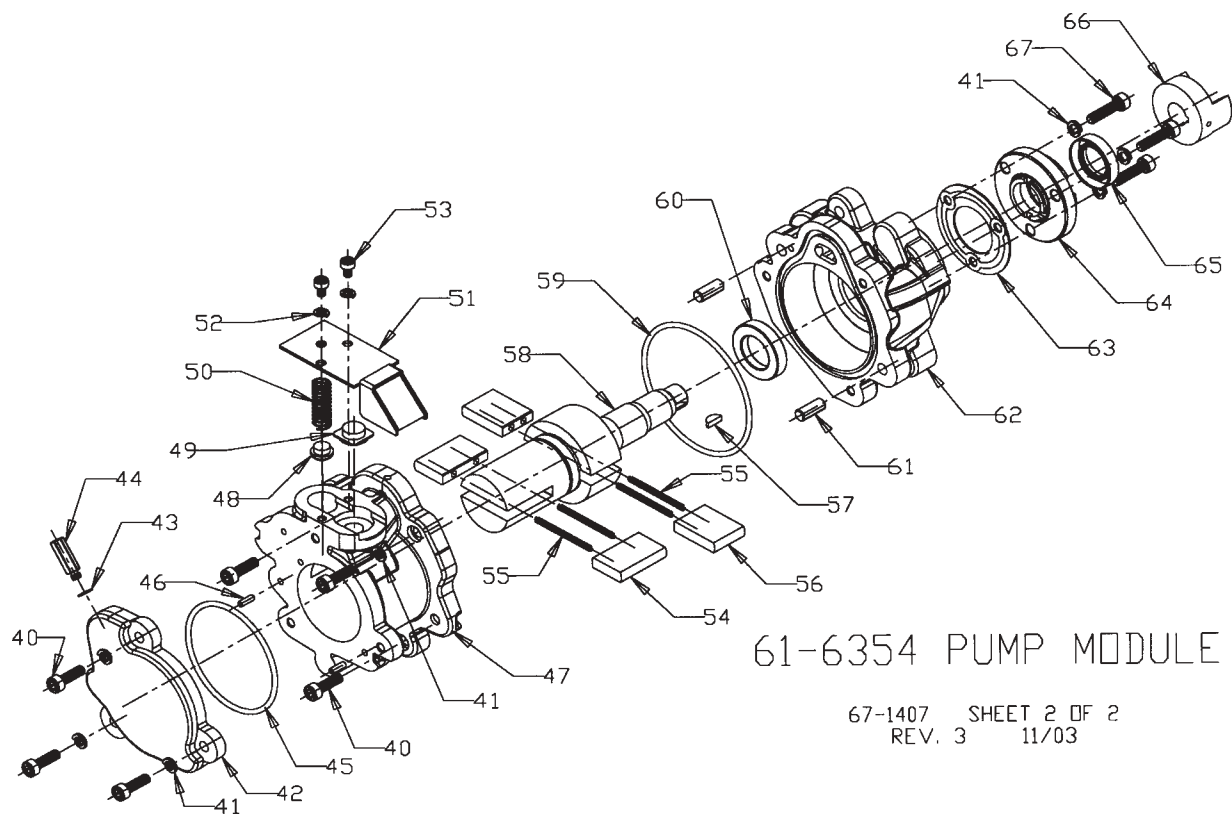
67-1628 SHEET 2 OF 2
REV. 1 05/05

PARTS LIST 61-6435 PUMP MODULE

ITEM	QTY	P/N	A*	B*	DESCRIPTION	ITEM	QTY	P/N	A*	B*	DESCRIPTION
40	9	62-0177			Screw, Sockethead, M5x16	54	2	61-6052			Vane, Exhaust
41	9	2-62-0793			Lock Washer #10	55	4	41-2996			Vane, Spring
42	1	61-6318			Cover Plate	56	2	61-6049			Vane, Intake
43	1	41-3175			Gasket, Nylon	57	1	41-2732			Key Coupling
44	1	62-0274			Orifice .014"	58	1	61-6426			Rotor
45	1	66-0204			O-Ring, Fluoroelast. #141	59	1	66-0207			O-Ring, Fluoroelast. #149
46	2	4-21-3006			Dowel Pin, 1/8"	60	1	41-3390			Lip Seal, 3/4"
47	1	61-6429			Exhaust Stage	61	2	61-9280A			Dowel Pin, 1/4"
48	1	61-9560A			Exhaust Valve	62	1	61-6427			Intake Stage
49	1	61-6057			Bypass Valve	63	1	41-0643			Gasket
50	1	61-9561A			Exhaust Valve Spring	64	1	61-6055			Lip Seal Housing
51	1	61-6432			Exhaust Valve Holder	65	1	61-6042			Lip Seal .669"
52	2	2-69-6108			Lock Washer #8	66	1	41-2730			Coupling
53	2	62-0271			Screw, Sockethead, M4x6	67	1	61-5351			Cover

Used on:
- 79203-30

A*: MAJOR REPAIR KIT CAT # N/A
B*: MINOR REPAIR KIT CAT # N/A



61-6354 PUMP MODULE

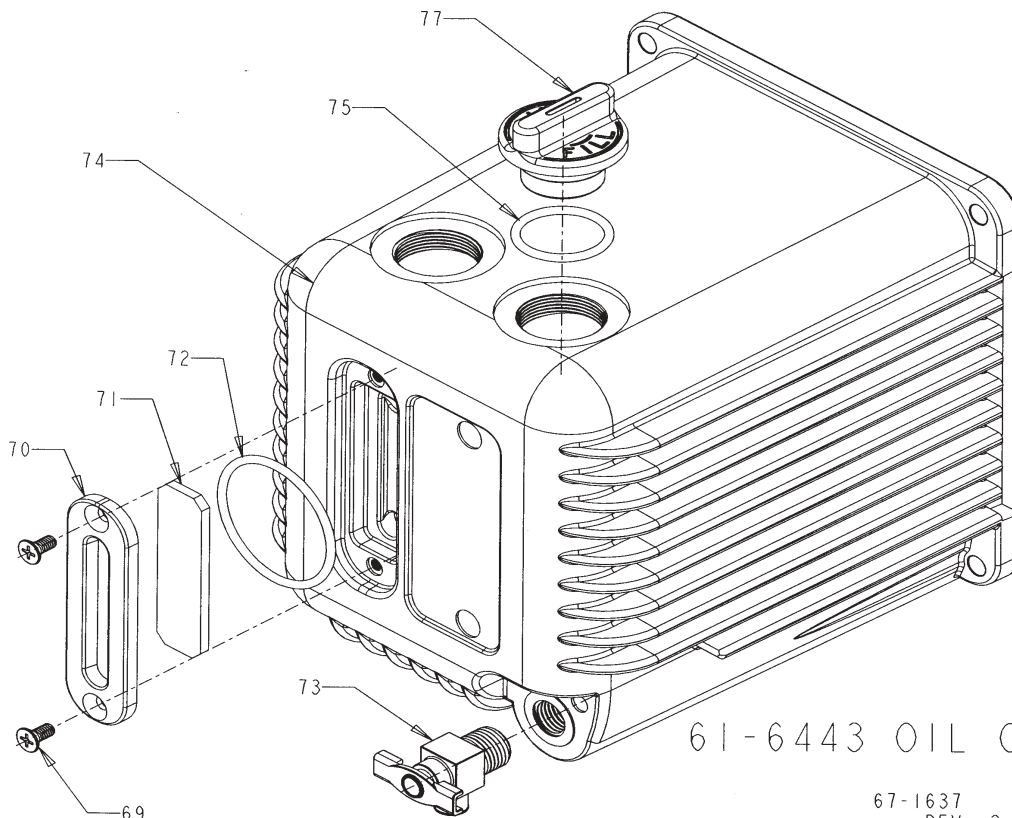
67-1407 SHEET 2 OF 2
REV. 3 11/03

PARTS LIST 61-6354 PUMP MODULE

ITEM	QTY	P/N	A*	B*	DESCRIPTION	ITEM	QTY	P/N	A*	B*	DESCRIPTION
40	6	62-0177			Screw, Sockethead, M5x16	54	2	61-6052			Vane, Exhaust
41	9	2-62-0793			Lock Washer #10	55	4	41-2996			Vane Spring
42	1	61-6318			Cover Plate	56	2	61-6051			Vane, Intake
43	1	41-3175			Gasket, Nylon	57	1	41-2732			Key Coupling
44	1	62-0274			Orifice	58	1	61-6039			Rotor
45	1	66-0204			O-Ring, Fluoroelast. #141	59	1	66-0207			O-Ring, Fluoroelast. #149
46	2	4-21-3006			Dowel Pin, 1/8"x3/8"	60	1	41-3390			Lip Seal, 3/4"
47	1	61-6350			Exhaust Stage	61	2	61-9280A			Dowel Pin, 1/4"
48	1	61-6058			Exhaust Valve	62	1	61-6316			Intake Stage
49	1	61-6057			Bypass Valve	63	1	41-0643			Gasket
50	1	61-6305			Spring, Exhaust Valve	64	1	61-6055			Lip Seal Housing
51	1	61-6348			Holder, Exhaust Valve	65	1	61-6042			Lip Seal .669"
52	2	2-69-6108			Lock Washer #8	66	1	41-2730			Coupling
53	2	62-0271			Screw, Sockethead, M4x6	67	3	62-0262			Screw, Sockethead, M5x20

Used on:
- 79203-10

A*: MAJOR REPAIR KIT CAT # N/A
B*: MINOR REPAIR KIT CAT # N/A



61-6443 OIL CASE ASSEMBLY

67-1637 SHEET 2 OF 2
REV. 2 6/04

PARTS LIST 61-6443 OIL CASE ASSEMBLY

ITEM	QTY	P/N	A*	B*	DESCRIPTION
69	2	62-1014			Screw, Countersunk, 8-32 x 3/8"
70	1	61-6009			Window Holder
71	1	61-6027			Window Glass
72	1	66-0305			O-Ring, Fluoroelast. #130
73	1	61-2278			Drain Valve
74	1	61-6442			Oil Case
75	1	62-0212			O-Ring, Fluoroelast. #119
77	1	61-6020			Oil Fill Plug

Used on:
- 79203-10
- 79203-20
- 79203-30

Section 11: WARRANTY

This Cole-Parmer product is warranted to be free from defects in material and workmanship. This liability of Cole-Parmer under this warranty is limited to servicing, adjusting, repairing or replacing any unit or component part which in the judgment of Cole-Parmer has not been misused, abused or altered in any way or damaged by ingestion of foreign material causing impaired performance or rendering it inoperative. Foreign material includes solids, liquids, corrosive gases and recondensed water or solvent vapor. No other warranties are expressed or implied. The method of executing this warranty: servicing, adjusting, repairing or replacing shall be at the discretion of Cole-Parmer Vacuum pumps that have been operated within a vacuum system, or other system, for any period, however short, will be repaired under this warranty rather than replaced.

The warranty is effective for one year from the date of original purchase when:

1. The warranty card has been completed and returned.
2. The product is returned to the factory or other designated service centers, freight prepaid.
3. The product in our judgment is defective through no action or fault of the user.

If the product has become defective through misuse, abuse, alteration or ingestion of foreign materials, repairs will be billed regardless of the age of the product. In this event, an estimate of the repair costs will be submitted and authorization of these charges will be required before the product is repaired and returned.



MATERIAL SAFETY DATA SHEET

79201-74 Vacuum Pump Oil

HMIS Rating: Health: 0 Flammability: 1 Reactivity: 0 Special: X

SECTION 1 - IDENTIFICATION

Chemical Name: Severely Hydrotreated Paraffinic Oil

Synonyms: Mechanical Vacuum Pump Oil (Improved)

Formula: N/A (Product is refined naturally occurring mixture)

Manufacturer's Name: Welch Rietschle Thomas
7301 North Central Ave.
Skokie, IL 60077

Date Prepared: February 10, 2004

Telephone Number for
General Information: (847) 676-8800

SECTION 2 - HAZARDOUS INGREDIENTS/IDENTITY

Exposure Limits in Air

<u>Component</u>	<u>CAS No.</u>	<u>OSHA PEL</u>	<u>ACGIH TVL</u>
Synthetic Hydrocarbon	64742-65-0	NO	NO

To the best of our knowledge, the above listed component is not hazardous according to OSHA (1910.1200) or one or more state right-to-know lists.

SECTION 3 - PHYSICAL AND CHEMICAL CHARACTERISTICS

Appearance and Odor: Light Yellow, Mild Odor

Specific Gravity @ 22°C (72°F) (Water = 1): 0.87

Vapor Pressure, Torr @ 25°C: 1x10⁻⁶

Vapor Density (Air = 1): N/A

Water Solubility: Insoluble

Boiling Point (ASTM D-86 Method): 445°F

Reactivity in Water: N/A

Melting Point: N/A

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SECTION 4 - FIRE AND EXPLOSION HAZARDS DATA

Flash Point:	475°F 245°C
Method Used:	COC
Flammable Limits:	Upper: N/D Lower: N/D
Extinguishing Media:	CO2, Dry Chemical, Foam and Water Fog.
Special Fire Fighting Procedures:	For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment. This may include self-contained breathing apparatus to protect against the hazardous effects of normal products of combusting and Oxygen deficiency.
Unusual Fire and Explosion Hazards:	Normal combustion forms Carbon Dioxide and water vapor. Incomplete Combustion can produce Carbon Monoxide.
CAUTION:	DO NOT USE PRESSURE TO EMPTY DRUM, OR EXPLOSION MAY RESULT.

SECTION 5 - PHYSICAL HAZARDS (REACTIVITY DATA)

Stability:	Product is stable under normal conditions.
Hazardous Polymerization:	Will not occur.
Conditions to Avoid:	None known at this time.
Incompatibility (Materials to Avoid):	May react with strong oxidizing agents such as Chlorates, Nitrates, Peroxides, etc...
Hazardous Decomposition Products:	Carbon Monoxide and other unidentified organic compounds may be formed upon combustion.

SECTION 6 - HEALTH HAZARD DATA

Eyes:	This substance is not expected to cause prolonged or significant eye irritation. This hazard evaluation is based on data from similar materials
Skin:	This substance is not expected to cause prolonged or significant skin irritation. This hazard evaluation is based on data from similar materials
Inhalation:	If inhalation, this substance is considered practically non-toxic to internal organs. This hazard evaluation is based on data from similar materials
Ingestion:	If swallowed, this substance is considered practically non-toxic to internal organs. This hazard evaluation is based on data from similar materials

Chemical Listed as Carcinogen or Potential Carcinogen:

IARC Monographs: No OSHA: No National Toxicology Program: No

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SIGNS AND SYMPTOMS OF EXPOSURE

Primary Routes of Exposure: Inhalation, skin or eye contact, and ingestion.

FIRST AID MEASURES

Inhalation: This material is not expected to be an immediate inhalation problem. No First Aid procedures are required.

Eyes: Immediately flush eyes with plenty of cool water for 15 minutes. Remove contact lenses if worn. Do not let victim rub eyes. No First Aid procedures are required.

Skin: No First Aid procedures are required. As precaution, wash skin thoroughly with soap. Remove and wash contaminated clothing.

Ingestion: If swallowed, give water or milk to drink and telephone Medical advice. Consult Medical Personnel before inducing vomiting. If Medical advice cannot be obtained, take person and product container to the nearest Medical Emergency Treatment Center or hospital.

SECTION 7 - PRECAUTIONS FOR SAFE HANDLING AND USE

Precaution to be taken in Handling and Storage: Minimum feasible handling temperatures should be maintained. Periods of exposure to high temperature should be minimized. Water contamination should be avoided.

Steps to be taken in Case of Release or Spill: Stop source of leak. Clean up as soon as possible. Contain liquid to prevent further soil, surface water, or ground water contamination. Clean-up small spills using appropriate techniques such as Sorbing materials or pumping. Where feasible and appropriate, remove contaminated soil. Follow prescribed procedures for larger releases.

Waste Disposal Method: It is the responsibility to the user of products to determine at the time of disposal whether product meets RCRA criteria for hazardous waste. This is because product uses, transformations, mixture, processes, etc. may render the resulting material hazardous.

SECTION 8 - CONTROL MEASURES

Respiratory Protection: None required if exposures are within permissible concentrations of 5.0mg/m³ of air for mineral oil mist average over an eight-hour daily exposure (ACGIH 1984-85). **Ventilation:** Normal.

Protective Gloves: Impervious gloves when prolonged contact cannot be avoided.

Eye Protection: Chemical type goggles/face shield.

Protective Clothing: Impervious gloves when prolonged contact cannot be avoided.

Other Protective Measures: None considered necessary at this time.

Work/Hygienic Practices: Employees should exercise reasonable personal cleanliness.

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SECTION 9 – ENVIROMENTAL DATA

Section 313 – Toxic Chemicals

This product does not contain toxic chemicals of Section 313 of Title III of Supervened Amendments and Reauthorization Act of 1986 (SARA) and 40 CFR Part 372.

Section 311 – Hazard Catagories

- | | | |
|----|-----------------------------------|-----|
| 1. | Not Applicable | Yes |
| 2. | Acute (Immediate Health Hazard) | No |
| 3. | Chronic (Delayed Health Hazard) | No |
| 4. | Fire Hazard | No |
| 5. | Sudden Release of Pressure Hazard | No |
| 6. | Reactive Hazard | No |

Section 302(A) – Extremely Hazardous Substances

(RQ = Reportable Quantity)

(TPQ = Threshold Planning Quantity)

This product does not contain extremely hazardous substances of Section 302(A)

Clean Water Act

Under Section 311(b)(4) of the Clean Water Act, discharges of crude oil and petroleum products in any kind or form to surface waters must be immediately reported to the National Response Center:

1-800-424-8802

Comprehensive Environmental Response Compensation & Liability (Act CERCLA)

Section 102 Hazardous Substances 42 U.S.C. 9602

Petroleum and petroleum fractions are excluded from the list of CERCLA hazardous substances by Section 101(14) of CERCLA.

Federal Regulations

Reported in TSCA Inventory

Product: Yes

Components: Not Applicable

Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user and **we expressly disclaim all warranties of every kind of nature, including warranties of merchantability and fitness for a particle purpose in respect to the use or suitability of the product.** Nothing is intended as a recommendation for uses which infringe valid patents or as extending license under valid patents. Appropriate warnings and safe-handling procedures should be provided to handlers and users.

ATTENTION: Misuse of empty containers can be hazardous. Empty containers can be hazardous if used

to store toxic, flammable, or reactive materials. Cutting or welding of empty containers might cause fire, explosion or toxic fumes from residues. Do not pressurize or expose to open flame or heat. Keep container closed and drum bungs in place.

REGULATION INFORMATION:	D.O.T. SHIPPING NAME:	N/A
	D.O.T. HAZARD CLASS:	N/A
	D.O.T. IDENTIFICATION NUMBER:	N/A

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Cole-Parmer Instrument Company
625 East Bunker Court
Vernon Hills, IL 60061-1844
Phone: 1-800-323-4340
Fax: 847-247-2929
E-Mail: info@coleparmer.com
Web-Page: www.coleparmer.com