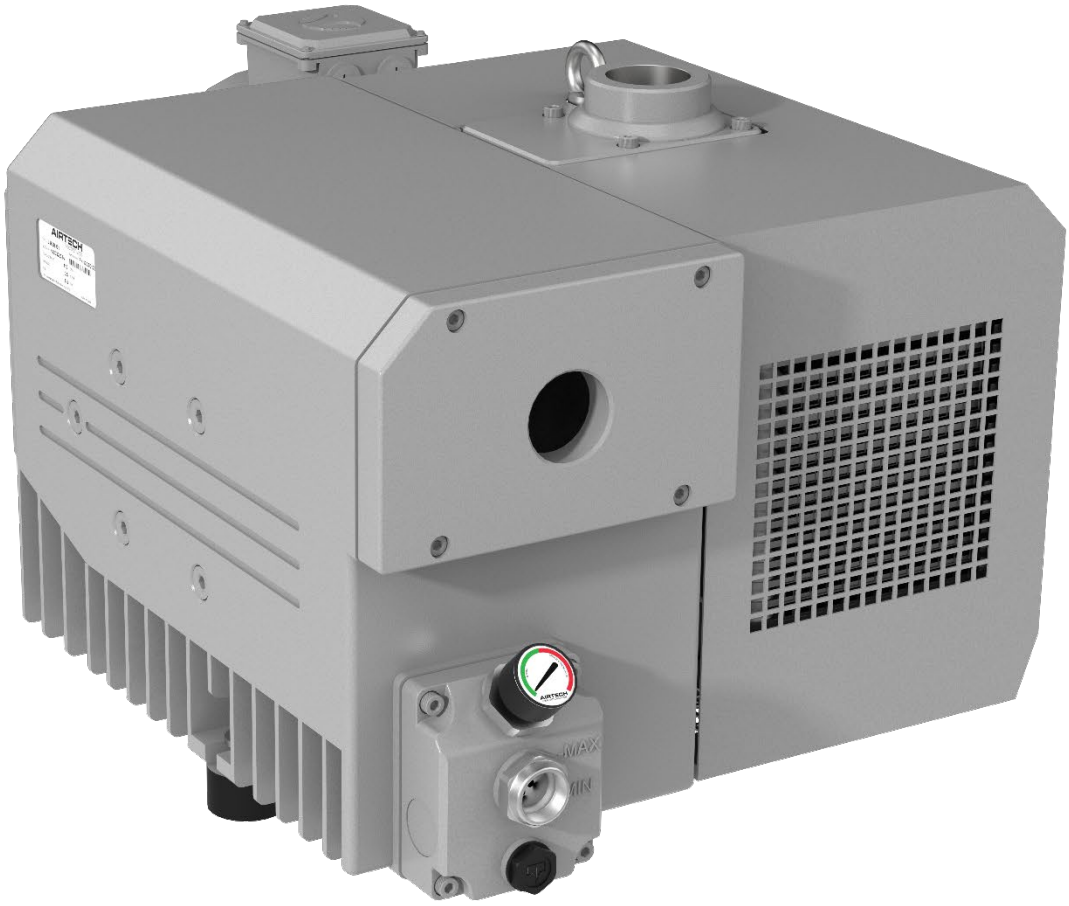
AIRTECH® VACUUM



L160B/L230B

OIL-FLOODED ROTARY VANE VACUUM PUMPS

INSTALLATION AND OPERATING MANUAL

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Version History

Version	Revised On	Author(s)	Description
1.0	07/10/2024	Airtech PDM	L160B (H)/L230B(H) Draft
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1 GENERAL INFORMATION



Important safety information regarding installation, operation, and maintenance is included in the manual. Read and follow all instructions before use and keep manual for future reference. Failure to comply with all AIRTECH's instructions, including improper installation or use of the product, alterations to the product, and/or failure to use the product in accordance with this manual can result in serious bodily injuries, property damage and/or damage to the pump. Please read carefully before proceeding.

1.1 PREFACE

This manual serves as a comprehensive guide to the operation and maintenance of L160B and L230B Oil-Flooded Rotary Vane Vacuum Pumps. It provides detailed instructions and information for all stages of the products' lifecycle, from initial delivery to safe dismantling and disposal. The manual covers the following key areas:

- Safety
- Product Description
- Transport & Storage
- Installation
- Commissioning
- Overhaul
- Maintenance
- Spare Parts
- Troubleshooting
- Dismantling and Disposal

By following the instructions and guidelines provided in this manual, you can ensure the safe and efficient operation of L160B and L230B Oil-Flooded Rotary Vane Vacuum Pumps throughout its lifetime. We recommend keeping this manual readily available for future reference and consulting it regularly for optimal performance and longevity. Throughout this manual, the term "pump" will be used to refer to the of L160B and/or L230B Oil-Flooded Rotary Vane Vacuum Pump.

The images shown throughout this manual are intended for illustrative purposes only and may not accurately reflect the final appearance of the actual product. The information contained within this manual supersedes any information conveyed by the images.

If anything remains to be clarified, please contact the manufacturer.

AIRTECH TIP

Depending on the design of the pump, other supplied documents must be observed in addition to this manual, e.g. the operating manuals and datasheets of the motor, motor starter etc.

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1.2 GENERAL TERMS OF BUSSINESS AND DISCLAIMERS

Manufacturer makes no warranties with respect to the product [other than those expressly set forth in the General Terms of Business and/or any applicable delivery contract]. Manufacturer disclaims any and all [other] express and implied warranties and representations of any kind, including but not limited to the implied warranties of merchantability or fitness for a particular purpose. To the maximum extent permitted by law, Manufacturer is not responsible for and will not be liable for any direct, indirect, special, incidental or consequential damages resulting from the use of this product, including but not limited to loss of use, loss of revenue, loss of actual or anticipated product, loss of business, loss of opportunity, loss of goodwill, loss of reputation or any other indirect or consequential loss or damages howsoever caused, whether asserted in tort, contract, warranty or under any other legal theory.

The product should only be used for the purposes and in the manner specified in the manual and that failure to follow all instructions for use and heed all safety warnings could result in improper product performance, potential personal injury or safety hazard or property damage.

The manufacturer expressly disclaims and will not be liable for any injury or damages resulting from:

- Failure to read and follow all instructions for use and safety warnings contained in this manual,
- Use of the product for any purpose other than its intended use, or in any manner inconsistent with the instructions for use, as set forth in this manual,
- Installation, maintenance of use of the product by untrained or unqualified persons or persons who have not read and fully understood the instructions for use and safety warnings in this manual
- Technical modifications, conversions, repair, disassembly, or other alteration of the product, unless performed by the manufacturer or its authorized service personnel,
- Use or installation of parts or materials other than those [recommended in this manual or elsewhere] that were supplied with the product by the manufacturer.

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2 SAFETY

The safety warnings, notes and symbols described in this manual are valid only for the original product as delivered by the manufacturer. Any modifications or alterations to the product by the customer may void the safety guidelines and render them inaccurate and may also create new or different safety risks not addressed in this manual.

Before handling the product:

- Thoroughly review and understand all safety information provided in this manual before use.
- Familiarize yourself with the meaning and significance of all safety symbols.
- Never attempt to operate the product without proper training and authorization.

2.1 SAFETY NOTES

There are potential safety risks inherent in the use of the pump. These operating instructions warn about potential hazards to inform the user of the need strategies to minimize the risk of bodily harm or property damage. Safety notes are tagged with one of the keywords DANGER, WARNING, CAUTION, AIRTECH TIP, and ATTENTION as follows:

DANGER!

This indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING!

This indicates potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION!

This indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

AIRTECH TIP

This provides valuable information for maximizing performance and minimizing potential problems.

NOTICE!

This highlights important information and best practices to help avoid potential problems or damage to property.

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In addition to the safety notes described above, you may encounter the following symbols within this manual depending on the specific situations described:

	Wear safety gloves		Warning of suspended load
	Wear safety shoes		Electrical voltage warning
	Wear ear protection		Warning of hot surface
	Wear respiratory protection		Warning of dangerous explosive material
	Disconnect before maintenance		Warning of toxic substances
	Read and understand operator's manual before using the product		Warning of biological hazard
	Connect an earth terminal to the ground		Watch out crushing hand
	Wear protective clothing		Crush and entanglement hazard

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3 PRODUCT DESCRIPTION

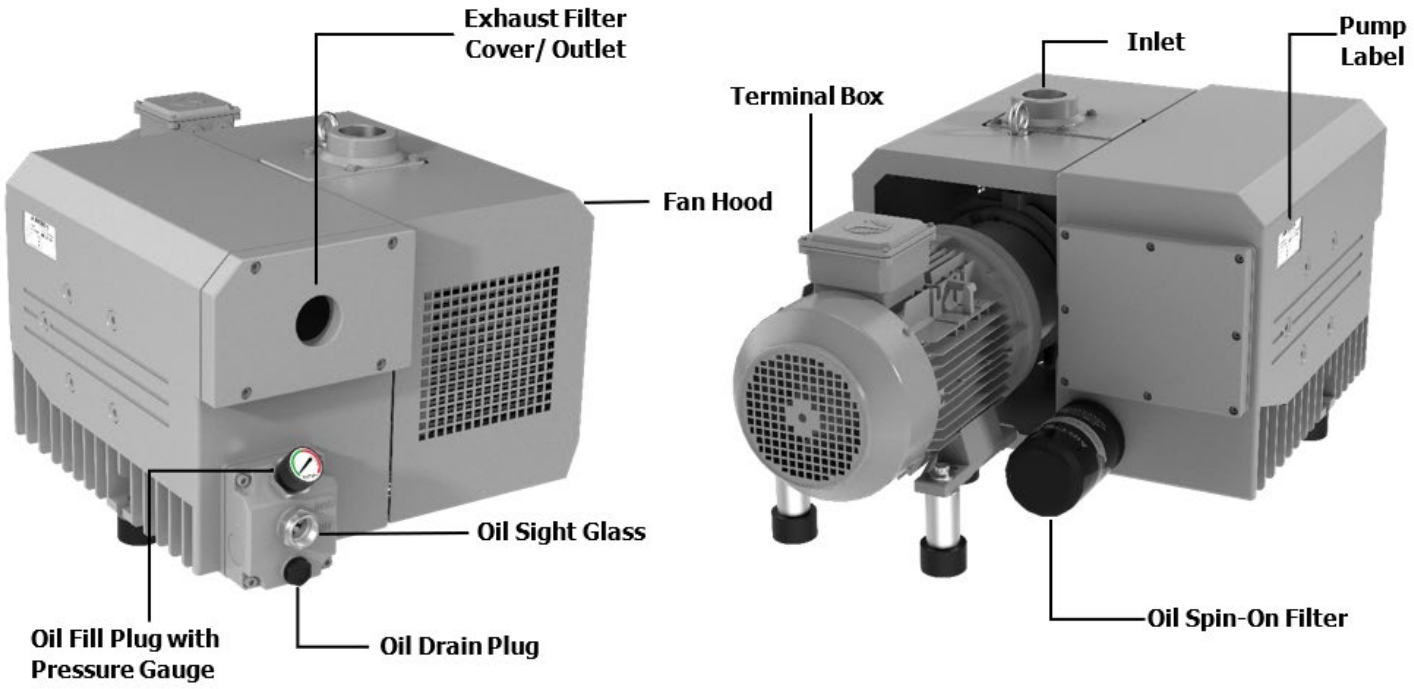


Figure 3-1 L160B/L230B-G1 Rotary Vane Pump

3.1 COOLING

The pump is cooled off by free convection of the components, airflow from the cooling fan of the pump, and fan wheel of the drive motor.

WARNING!

During operation, the surface of the pump can become hot, reaching temperatures exceeding 203 °F (95 °C).

Risk of burns!

Do not touch the surface of the pump during and directly after operation. Wait until cool down (approx. room temperature), or wear heat protection gloves prior to handling the pump. Touching the surface of the pump before it has cooled down can lead to serious bodily injuries including death and/or damage to the pump.

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3.2 PRINCIPLE OF OPERATION

The oil-flooded rotary vane vacuum pump operates using a series of vanes mounted to a rotor inside a cylindrical housing. As the rotor spins, centrifugal force extends these vanes from their slots, creating sealed pockets of air. The rotation of the rotor moves these air pockets from the inlet towards the outlet, compressing the air as the space between the vanes decreases. Oil is continuously injected into the pump chamber to provide sealing, cooling, and lubrication, which enhances the efficiency and longevity of the pump. The compressed air mixed with oil vapor is then directed through an exhaust filter at the outlet, which traps oil mist and allows cleaner air to be expelled. The oil collected by the filter is recirculated into the pump, ensuring efficient operation and minimal environmental impact. The principle of operation is demonstrated in *Figure 3-2*.

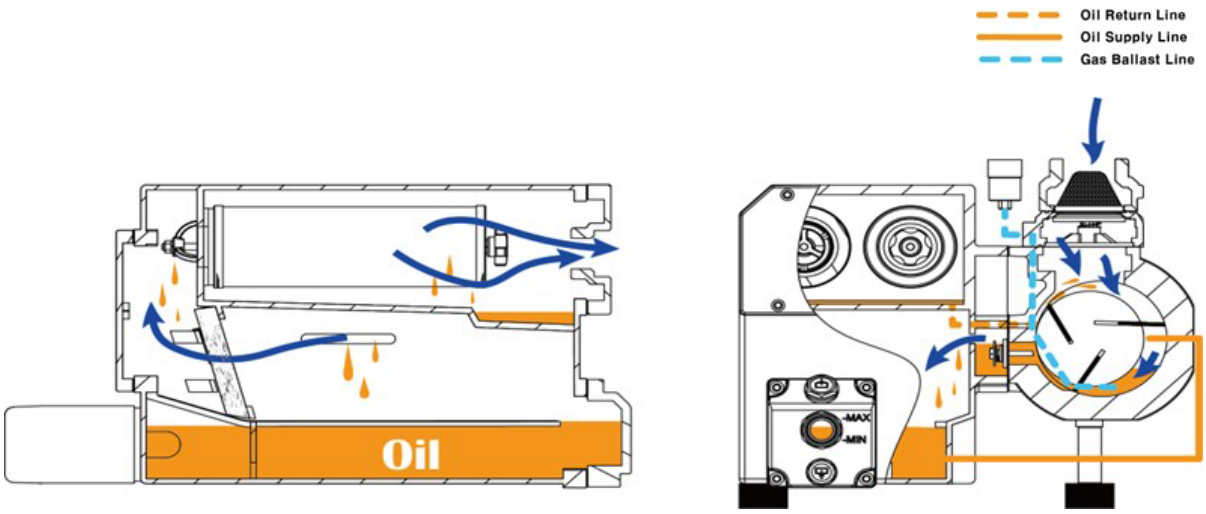


Figure 3-2 Principle of Operation

NOTICE!

Ensure that the pump always has an appropriate amount of oil and that the oil is changed according to the AIRTECH's recommendations or based on usage and environmental factors. See section *7.1 PUMP OIL* for details on oil changing.

Risk of premature failure!

Do not overfill the pump with oil!

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3.3 PUMP LABEL

Airflow volume, oil capacity, and vacuum level are given on the pump label or on a separate datasheet. *Figure 3-3* is an example L160B pump label that can be found on the L-Series rotary vane pumps. If you require more technical data, other available sizes or versions of the pump, additional accessories, and spare parts, please contact AIRTECH.

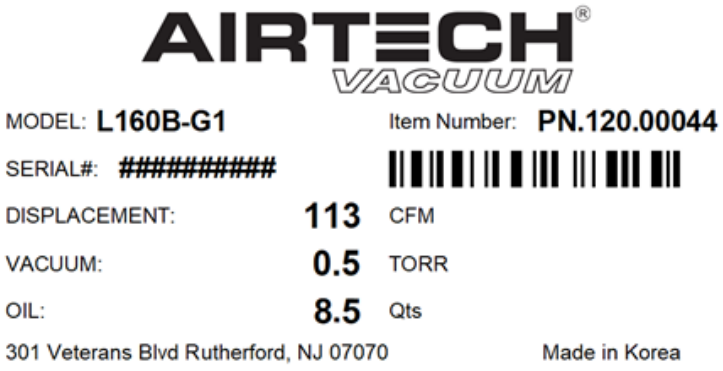


Figure 3-3 Pump Label

On the pump label are stated:

- Pump Model Name
- Serial Number
- Item Number
- Displacement Volume (CFM)
- End Vacuum Level (Torr)
- Oil Capacity

DO NOT remove or tamper with the pump label. Please contact AIRTECH if you have any further questions about the pump label or any other technical data.

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3.4 MOTOR NAMEPLATE

Nominal efficiency, rated horsepower and motor speed are given on the motor nameplate or on a separate motor datasheet. *Figure 3-4* is an example motor nameplate located on the motor.

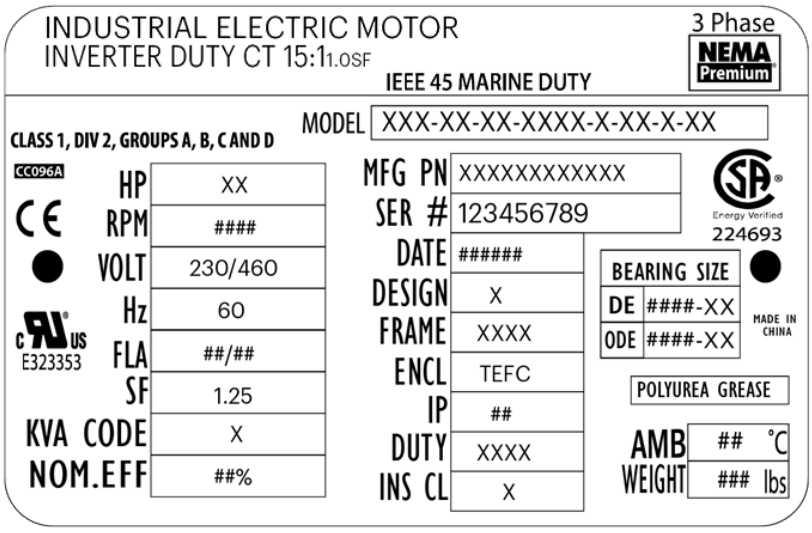


Figure 3-4 Motor Nameplate

On the motor nameplate are stated: Motor model number

- Phase
- Rated horse power (HP)
- Full load speed (RPM)
- Rated volts (VOLT)
- Rated frequency (Hz)
- Full load amps (FLA)
- Service Factor (SF)
- Locked rotor KVA code (KVA CODE)
- Nominal Efficiency (NOM.EFF)
- Manufacturer's part number (MFG PN)
- Serial number (SER #)
- Date
- Design
- Frame size
- Enclosure (ENCL)
- Index of protection (IP)
- Time rating (DUTY)
- Insulation class (INS CL)
- Drive end bearing size (DE)
- Opposite drive end bearing size (ODE)
- Maximum ambient temperature (AMB)
- Weight

Motors with a rating under 15 HP do not have the IEEE 45 Marine Duty standard indicated on their labels.

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4 TRANSPORT AND STORAGE

4.1 UPON RECEIPT

When the pump is first received, check the packaging to confirm it is intact and free from any signs of damage due to transport or storage conditions.

If damage to the packaging is observed, immediately inform the shipping agent and the manufacturer. Do not use the pump if the packaging is damaged.

4.2 TRANSPORT AND HANDLING



WARNING!

Crush injuries and cutting of body parts caused by tipping or falling loads.

Risk of severe injury!

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

The pump should be securely fastened to a pallet or base plate for transportation. It can be moved using a suitable lifting equipment. Before installation and start-up, remove the bolts that secure the pump to the base or pallet.

DO NOT attempt to lift the pump alone or without following guidelines when a crane is not available. Lifting it must be a team effort. Trained individuals must lift the pump and proper lifting equipment and techniques must be utilized.



NOTICE!

The pump is prefilled with oil by AIRTECH. Do not tip the pump over while filled with oil during transport.

Pump oil leakage and spill!



WARNING!

Failure to follow these instructions may result in serious injuries including death, property damaged and/or damage to the equipment.

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4.3 STORAGE

When the pump is not being used and powered off, close off gas suction connection and the gas discharge connection.

If the pump will not be used upon receipt, make sure that:

- The pump is stored in its original packaging, if possible,
- The pump is stored indoors where the ambient temperature is between 32°F and 104°F (0°C and 40°C),
- The pump is stored in a dry (<60% humidity), well ventilated, non-hazardous, dust and vibration free environment.

If the appropriate storage conditions cannot be maintained or adverse ambient conditions occur (e.g. aggressive atmospheric changes, frequent peaks in temperature) conserve the pump by:

1. Firmly closing off all ports,
2. Sealing any ports that are not closed off with PTFE tape,
3. Sealing any gaskets and O-rings with adhesive tape,
4. Airtight packing the whole pump with plastic foil,
5. Adding dehumidifying agent (e.g. granules) into packaging, if necessary.

AIRTECH TIP

If the pump was commissioned prior to being stored, it is recommended to replace the pump oil before recommissioning due to potential oil contamination.

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5 INSTALLATION

WARNING!

Installation must only take place under the following conditions:

- The pump must be completely assembled and intact (not damaged or tampered).
- The storage conditions are met.

Failure to follow these instructions may result in serious personal injuries, including death and/or damage to the equipment.

5.1 INSTALLATION CONDITIONS

Before installing the pump, make sure the that the operation environment is not hazardous and the ambient conditions are met as outlined on the motor nameplate and in this manual.

NOTICE!

If your application is in hazardous environments where flammable gases, dust or fibers present, AIRTECH may offer Division 1 Class 1 explosion proof motors with L-Series Oil-Flood Rotary Vane Vacuum Pumps. Contact AIRTECH for explosion proof motor selection for your application.

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5.2 MOUNTING POSITION AND SPACE



WARNING!

Crush injuries and cutting of body parts caused by tipping or falling loads.

Risk of severe injury!

Do not walk, stand, or work under suspended loads. Designate a location or a place for the pump prior to the receipt. Failure to follow these instructions may result in serious personal injuries, including death and/or damage to the equipment.

Mount the pump on an even and level surface away from any strong vibrations, supported by its rubber feet. To ensure proper ventilation and clear visibility of the oil sight glass, leave at least 1 foot of open space around the pump. The location must also allow the operator to easily change

Place the pump in a dry (<60% relative humidity), well-ventilated, non-hazardous, and dust-free environment. Ensure that no heat-sensitive materials, items, or parts (e.g., plastics, wood, cardboard, paper, electronics) touch the surface of the pump.

If the pump will be placed outdoors, make sure:

- The ambient temperature is between 32°F and 104°F (0°C and 40°C).
- The oil pump uses is the specific type recommended in this manual, suitable for the ambient and operating temperatures.
- The pumps is regularly cleaned of any dust or dirt.
- There is no direct sun exposure.

The terminal box cover and cable entries are tightly sealed to remain dustproof and waterproof.



NOTICE!

Do not tip the pump over if filled with oil.



WARNING!

Failure to follow these instructions may result in serious personal injuries, including death and/or damage to the equipment.

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5.3 ELECTRICAL CONNECTIONS



DANGER!

Lethal electric shock due to contact with live wires!

Risk of electric shock!

Electrical components must be executed only by a qualified and authorized personnel.

To prevent electrical shock and potential serious bodily injuries including death and/or damage to the pump:

- Maintain a minimum clearance of 0.217 inches (5.5 mm) between bare and live parts, as well as between these parts and earth. This applies to rated voltages of UN ≤690 V.
- Ensure no wires stick out when connecting cables to the pump.
- Seal both the terminal box lid, and cable duct openings to be dust-tight and watertight.
- Make sure that electrical and occupational safety directives, local or national regulations are complied with.
- Make sure that the power supply is compatible with the data on the motor nameplate.
- If a motor starter is being used, make sure that the amperage is compatible with the data on the motor starter datasheet.



WARNING!

Only a qualified and authorized personnel should carry out work and the unit should be stationary.

Risk of electric shock!

- Make sure the pump is powered off and cannot initiate a sudden start-up (this also applies to auxiliary circuits e.g.).
- Confirm there is no voltage!
- Establish a safe protective earth connection before starting work.

Failure to follow these instructions may result in serious bodily injury death and/or damage to the unit.

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Carefully follow these instructions to ensure safe operation of the unit:

1- Confirm motor of the pump will not be affected by electric or electromagnetic disturbance from the mains; if you have any questions, please contact the manufacturer.
2- Confirm there is a safe protective earth connection.
3- Confirm the power supply is capable of providing the motor with enough power as per the nameplate.
4- Confirm the wire size selected is rated to carry the full load amperage stated on the nameplate.

The schematic diagram for the electrical motor terminal connections is shown in the junction box of the motor or on the motor nameplate. *Figure 5-1* is an example of typical Three Phase Motor wiring diagram.

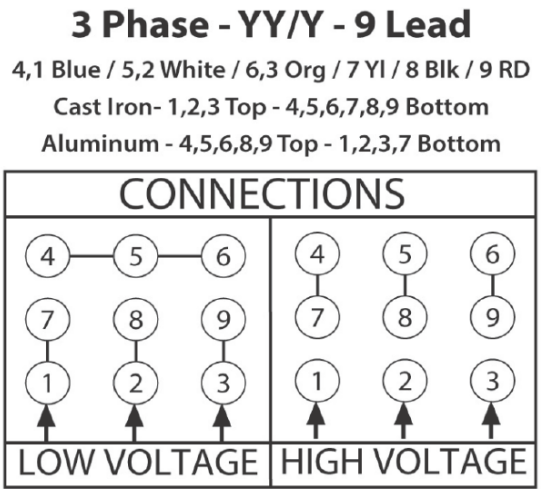


Figure 5-1 Wiring Diagram

The wiring, fusing, and grounding must comply with the National Electric Code (NEC) or IEC standards, as well as local regulations.

NOTICE!

After making the electrical connections and after filling the pump with oil, verify the motor's rotation direction. If the rotation is incorrect, reverse any two of the three power leads at the power connection. Correct direction of rotation is marked by a red arrow on the on the pump as shown below.



Do not check the rotation of the motor without oil present in the pump!

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5.4 PIPE CONNECTIONS

Use a pipe size that is at least the size of the pump inlet connections. Smaller lines result in reduced pump capacity.

Pumps operating in parallel on a common main line should have a check valve installed in the suction line to prevent oil suck back. The built-in anti-suck back valve should not be used as a shut-off valve for the vacuum system.



WARNING!

Operating the pump with exposed parts may result body parts, hair, jewelry, loose clothing or other worn accessories being sucked in (at the gas inlet) and particles being hurled out (at the gas outlet/discharge). This may result in serious bodily injuries, including death.

Risk of severe injury!

Do not power on the pump prior to finalizing pipe connections.



AIRTECH TIP

Even if the process gas is expected to be clean, a suitable inline (inlet) filter should be connected to the inlet port to protect against dust or other foreign particles. Please reach out to AIRTECH for filter recommendations for your application.



NOTICE!

If the discharge connection of the pump has been piped outside of the building, equip the pump with a suitable rain protection and a drip leg with drain valve. Failure to equip the pump with a suitable protection may result in damage to the pump.

The vacuum piping should be designed to ensure that no liquids such a condensate or liquid carried over from the process can reach the pump. If this possibility exists, a knock-out liquid separator should be installed. Please contact AIRTECH for recommendations.

Refer to the table below for the thread sizes of the AIRTECH L-Series L160B pump.

Pump Model	Inlet Size	Exhaust/Outlet Size
L160B	NPT 2”	NPT 2”



AIRTECH TIP

If an exhaust manifold is connected, install a drip leg with drain valve near the pump exhaust to prevent exhaust condensation from entering the exhaust box.

Ensure that the discharge is free from obstructions, as restrictions can cause back pressure in the pump, potentially leading to pump failure.

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5.5 OIL FILLING

The pump is pre-filled with AIRTECH ATO-2000 Semi-Synthetic Oil prior to shipping. Upon installation, verify that the oil level reaches ¾ mark on the oil sight glass. If additional oil is required, fill the pump with the specific oil type that is outlined in this manual through the oil fill port after ensuring that the installation is level and the rotation is correctly set

Pump Model	Oil Capacity
L160B and L230B	8.5 Quarts

NOTICE!

Do not use detergent oil in AIRTECH L-Series Oil-Flooded Rotary Vane Pumps.

Shortened service life!

Oil detergent additives can cause exhaust filters to become clogged and shorten their service life.

WARNING!

Do not add oil through the oil fill, inlet or exhaust ports while the pump is running and do not overfill the pump's oil reservoir.

We recommend using original AIRTECH oil, a high-quality vacuum oil series designed to extend the duration between oil changes, enhance lubrication at elevated operating temperatures, and prolong the life of the exhaust filter elements. Please refer to the table below for a list of oils offered by AIRTECH for the pump. Contact AIRTECH for further information on oil selection.

Product Name	Oil Type	Viscosity
ATO-1000-02	Mineral Oil	29 mm2/s @104°F (40°C) 6 mm2/s @212°F (100°C)
ATO-2000-02	Semi-Synthetic	90 – 110 mm2/s @104°F (40°C)
ATO-4000-02	Fully Synthetic	98.32 mm2/s @104°F (40°C) 14 mm2/s @212°F (100°C)
ATO-4000F-04	Food Grade	98.32 mm2/s @104°F (40°C) 14 mm2/s @212°F (100°C)

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6 COMMISSIONING

6.1 PRESTART-UP CHECKS

NOTICE!

Ensure that the pump always has an appropriate amount of oil and that the oil is changed according to the AIRTECH's recommendations or based on usage and environmental factors. See section *7.1 PUMP OIL* for details on oil changing.

Risk of premature failure!

Do not overfill the pump with oil, and do not add oil while the pumps is running!

- Check rotation of the motor as described in section *5.3 ELECTRICAL CONNECTIONS*.
- Fill the pump with oils as described in section *5.5 OIL FILLING*.
- Confirm all the installation conditions are met.
- Confirm the pipes, hoses and electrical connections are correctly established according to the manual.
- Confirm all the provided covers, guards, hoods etc. are mounted securely.
- Confirm cooling air inlets and outlets are clear of any covers or obstructions.
- Confirm the direction of rotation matches the indicated direction on the pump.

CAUTION

Only trained and/or qualified personnel should operate the pump. Do not allow any untrained and/or unqualified personnel to store, install, start-up, operate and/or dismantle the pump.

CAUTION

Noise from running pump can damage your hearing.

Risk of damage to hearing!

All persons in the vicinity of the pump for extended periods of time must always wear ear protection.

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6.2 START-UP

Start the pump with the inlet closed. Run the pump for a few minutes and then shut down. Check the oil level again and make sure the oil level is between the 3/4 marks and full on the upper oil sight glass.

Add oil if necessary. Pump oil should only be added when the pump is off and circulating oil has had sufficient time to return to the oil sump

6.3 OPERATION



WARNING!

During operation, the surface of the pump can become hot, reaching temperatures exceeding 203 °F (95 °C).

Risk of burns!

Do not touch the surface of the pump during and directly after operation. Wait until cool down (approx. room temperature), or wear heat protection gloves prior to handling the pump. Touching the surface of the pump before it has cooled down can lead to serious bodily injuries including death and/or damage to the pump.

While operating the pump, adhere to the following safety and operational guidelines:

- Ensure the ambient and suction air temperature is between 40 °F (5 °C) and 104 °F (40 °C).
- Do not use the standard versions of the pump in hazardous/explosive areas or applications. Contact AIRTECH for versions of the pump with explosion proof motors.
- Wear ear protection while working near the pump.

Ensure the pump is firmly fixed and secured in its location, away from strong vibrations.



CAUTION

Noise from running the pump can damage your hearing.

Risk of damage to hearing!

All persons in the vicinity of a non-noise insulated pump for extended periods of time must always wear ear protection!



NOTICE!

Non-compliance with the operational guidelines invalidates the warranty and may lead to accidents resulting in death, serious bodily injuries or irreparable damage to the pump.

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6.4 STOPPING

To stop the pump, turn off the power supply. A built in anti-suck back valve will prevent oil from the oil reservoir being sucked back into the cylinder after the pump is shutdown.

WARNING!

Do not utilize the anti-suck back valve as a check valve in the system. Consult AIRTECH for proper check valves.

6.5 GAS BALLAST

AIRTECH L-Series pumps are equipped with gas ballast. The gas ballast valve is located between the inlet port and the exhaust box. Its main function is to prevent water vapor from condensing in the pump that causes emulsification of the oil resulting in possible pump failure.

In applications, where the quantity of water vapor is moderate, it is recommended to run the pump for 10~30 minutes with the suction line closed and until the pump is about 167°F (75°C). The pump should also be run off process for 10 ~30 minutes prior to shut down and a slight air bleed (purge) is recommended during this 10~30 minute cycle to prevent the vapor from condensing in the pump.

6.6 CHECK VALVE

AIRTECH L-Series pumps are equipped with Built-in Check Valve which is located inside the inlet flange housing at the upper part of pump module and is there to prevent oil back to inlet side when the pump is turned off.

AIRTECH TIP

We recommend installing a separate external check valve if necessary. Contact AIRTECH for the right size check valves and options for your application.

6.7 EXHAUST PRESSURE GAUGE

A pressure gauge is pre-installed on the pump to monitor the condition of the exhaust filters.

NOTICE!

If the reading is 0.6 Bar or greater the exhaust filters will need replacing.

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7 MAINTENANCE



WARNING!

Work on the pump should only be performed by qualified and authorized personnel, and the pump must be stationary before any maintenance or repairs are carried out. Failure to follow these instructions may result in serious bodily injuries including death, property damage or damage to the pump.

Risk of electric shock!

Before starting work:

- Make sure the pump is powered off and cannot initiate a sudden start-up (this also applies to auxiliary circuits e.g., standstill heating).
- Confirm there is no voltage!
- Establish a safe protective earth connection before starting work.



WARNING!

During operation, the surface of the pump can become hot, reaching temperatures exceeding 203 °F (95 °C).

Risk of burns!

Do not touch the surface of the pump during and directly after operation. Wait until cool down (approx. room temperature), or wear heat protection gloves prior to handling the pump. Touching the surface of the pump before it has cooled down can lead to serious bodily injuries including death and/or damage to the unit.



WARNING!

Pumps contaminated with hazardous material pose risks of poisoning and infection!

Risk of poisoning!

Risk of infection!

If the pump is contaminated with hazardous material, always wear appropriate personal protective equipment (PPE) before handling the unit.

Do not attempt to clean or service the unit yourself unless you are properly trained and equipped for hazardous materials!



NOTICE!

Non-compliance with the maintenance and servicing obligations invalidates the conformity and may lead to accidents resulting in death or serious bodily injuries

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AIRTECH L-series Oil-Flooded Rotary Vane pumps require very little maintenance. To ensure optimum performance, the following maintenance steps should be followed:

- Regularly check connection tightness of the unit
- Avoid overloading the pump
- Check the pump for unusual noise and vibration
- Ensure the pump's surface is free of dust or clutter
- Ensure the pump has adequate amount of oil present during operation

Prior to starting maintenance:

1. Power off the pump and disconnect from all electrical connections.
2. Allow the pump to cool down.
3. Ensure all pipes and lines are vented to atmospheric pressure and isolated, especially if manifolded with other pressure and vacuum producing equipment.

AIRTECH TIP

The maintenance schedule listed in this manual is based on average operating conditions. For heavy duty operations, consider shortening the time between routine maintenance.

7.1 PUMP OIL

See section *5.5 OIL FILLING* for details on oil type and quantity.

7.1.1 OIL LEVEL

Under normal circumstances it should not be necessary to add oil between oil changes. A significant drop in oil level means there is an oil leak, exhaust filters are defective or the pumps is operating outside of rated operating parameter.

It is normal for the oil to be foamy or lightly colored in an operating pump. This may be normal aeration of the oil. If the oil appears milky or dark in color, it is most likely contaminated or burned and must be changed.

Check the oil level only when the pump is powered off. Replenish oil if it drops below the "MIN" mark on the side of oil sight glass(Service Cover). Consult AIRTECH for any further questions.

CAUTION

Do not add oil while the pump is running!

Risk of burns!

Hot oil can spray out from the oil fill port.

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7.1.2 OIL CHANGE

Oil life is dependent on the operating conditions. A clean and dry air stream and operating temperatures below 212°F (100 C) are ideal. We recommended that the oil is replaced every 500-1000 hours depending on application and conditions. In certain unfavorable conditions the oil may need replacement earlier than 500 hours. It is preferred that the oil is drained from the pump when warm.

WARNING!

Always change the oil when the pump is powered off. Do not change oil while the pump is powered on or while operating.

NOTICE!

When disposing of used oil, must observe the relevant environmental regulations and dispose of responsibly. Please contact an authorize AIRTECH representative if you have any questions or concerns regarding disposing of pump oil.

7.1.3 OIL SPIN-ON FILTER

Replace the spin-on filter at every oil change.

Item Name	Part Number	Catalog Number
L160B (SN:16XXXXXX and after) Exhaust Filter Kit	PN.600.00034	0320.505.A0
L160B (Before SN:16XXXXXX) Exhaust Filter Kit	PN.600.00027	0320.505.00
L230B (SN:16XXXXXX & After) Exhaust Filter	PN.600.00095	0430.505.01
L230 and L230B (Before SN:16XXXXXX) Exhaust Filter	PN.600.00035	0430.505.00
L160B and L230B Spin On Filter	PN.401.00050	0500.100.A0

See section *7.6 KITS AND SPARE PARTS* for further details about available parts and kits.

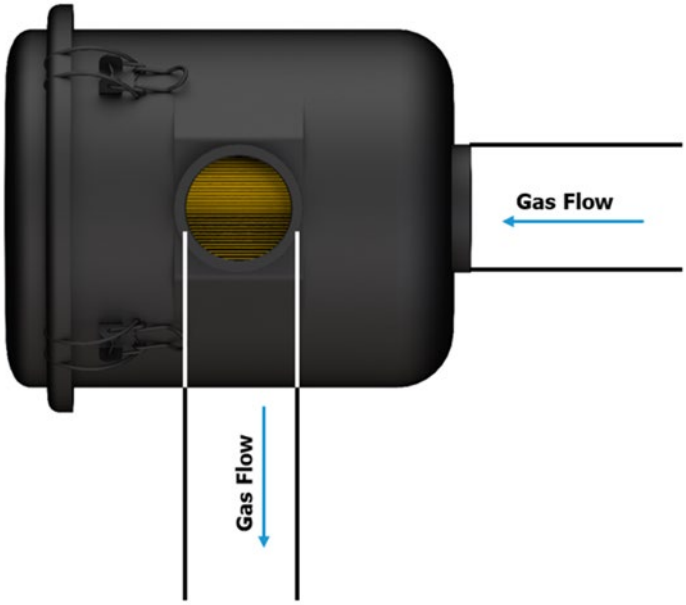
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7.2 INLINE (INLET) FILTER

Check inline (inlet) filter on a weekly basis. The filter cartridge should be cleaned or replaced when dirty. Please reach out to AIRTECH for replacement element information. Paper/Polyester filter cartridge(element) are available to the application.

NOTICE!

It is recommended that the inline air filters are mounted horizontally, as shown below, in order to prevent any filtered media from falling into the pump when cleaning or replacing the element. Contact AIRTECH for inlet and inline filter recommendations for your application.



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7.3 EXHAUST FILTER

Exhaust filters must be replaced every 9-18monts or if any of the following symptoms have been observed:

- High back pressure (0.6 bar or above)
- Exhaust filters start producing smoke
- Rated motor current is exceeded

Item Name	Part Number	Catalog Number
L160B (SN:16XXXXXX and after) Exhaust Filter Kit	PN.600.00034	0320.505.A0
L160B (Before SN:16XXXXXX) Exhaust Filter Kit	PN.600.00027	0320.505.00
L230B (SN:16XXXXXX & After) Exhaust Filter	PN.600.00095	0430.505.01
L230 and L230B (Before SN:16XXXXXX) Exhaust Filter	PN.600.00035	0430.505.00

NOTICE!

Do not clean or re-use exhaust filters. Filters must be disposed of in a proper way according to local and national environmental regulations as they might contain toxic substance carried over the process. Replace O-rings on filter when changing.

7.4 GAS BALLAST FILTER

L160B and L230B are equipped with a Gas Ballast and ball valve. It is essential replace the gas ballast filter or clean the sponge filter annually, or more frequently as required.

Item Name	Part Number	Catalog Number
L160B and L230B Gas Ballast Kit	PN.601.00007	0430.480.00

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7.5 MAINTENACE CHART

Table 7-1 details the recommended periodic maintenance schedule for the pump.

Table 7-1 Regular Maintenance Guide

Maintenance Intervals	Maintenance Actions
Daily	Visually check oil level and color.
Weekly	Inspect inline (inlet) filter and check for oil leaks.
Monthly	Check the exhaust filter's function.(if there is oil mist at exhaust, replace the exhaust filter.)
Every 750 Operating Hours	Drain and discard oil from the pump while warm. Refill with fresh oil.
Every 2000 Operating Hours	Replace exhaust filters and O-rings as well as gas ballast filter.
Every 500 ~ 2000 Operating Hours	Change the oil and oil filter. Check the float valve on the oil return line version.
For Motor	See the motor manufacture's manual for periodic motor maintenance.

AIRTECH TIP

The longevity of the pump is greatly improved if the oil condition is good, regularly refreshed, and the filters are maintained as described in this manual.

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7.6 KITS AND SPARE PARTS

Kits and parts that are available for maintenance and replacement that we offer for L160B and L230B:

Kit	Kit Contents	Part Number	Catalog Number	Pump Model
Gasket Kit	• Gaskets • O-rings • Shaft Seals	PN.305.00939	0320.490.03	L160B (SN:16XXXXXX & After)
		PN.305.00154	0320.490.00	L160 L160B (Before SN:16XXXXXX)
		PN.305.00246	0430.490.03	L230B (SN:16XXXXXX & After)
		PN.305.00155	0430.490.00	L230 L230B (Before SN:16XXXXXX)
Exhaust Filter Kit	• Exhaust Filters • Oil Drain Plug • Exhaust Cover Gasket • Oil Spin-On Filter • Strainer Baffle	PN.600.00034	0320.505.A0	L160B (SN:16XXXXXX & After)
		PN.600.00027	0320.505.00	L160 L160B (Before SN:16XXXXXX)
		PN.600.00095	0430.505.01	L230B (SN:16XXXXXX & After)
		PN.600.00035	0430.505.00	L230 L230B (Before SN:16XXXXXX)
Overhaul Kit	• Gasket Kit • Vanes • Bearings • Bearing Sleeves • Taper Pins • Oil Sight Glass • Pressure Gauge • Exhaust Valve Assembly • Rubber Feet • Oil Drain Plug	PN.601.00067	0320.500.03	L160B (SN:16XXXXXX & After)
		PN.601.00066	0320.500.00	L160 L160B (Before SN:16XXXXXX)
		PN.601.00062	0430.500.C0	L230B (SN:16XXXXXX & After)
		PN.601.00069	0430.500.00	L230 L230B (Before SN:16XXXXXX)
Combo Overhaul Kit	• Overhaul Kit • Exhaust Filter Kit	PN.601.00061	0320.509.C0	L160B (SN:16XXXXXX & After)
		PN.601.00068	0320.509.00	L160 L160B (Before SN:16XXXXXX)
		PN.601.00063	0430.509.C0	L230B (SN:16XXXXXX & After)
		PN.601.00070	0430.509.00	L230 L230B (Before SN:16XXXXXX)

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Kit	Kit Contents	Part Number	Catalog Number	Pump Model
Inlet Check Valve Kit	• Inlet Flange, Lower Housing • Check Valve Plate • Check Valve Plate O-ring • Check Valve Spring • Inlet Part O-ring • Inlet Flange, Upper Housing • Inlet Screen • Allen Bolt • Spring Lock Washer	PN.600.00110	0430.550.B1	L160B L230B
Exhaust Valve Assembly	• Exhaust Valve Fixed Bolt • Exhaust Valve Washer • Exhaust Valve Spring • Exhaust Valve Plate • Exhaust Valve Lock Nut • Exhaust Valve Seat Plate	PN.409.00054	0020.159.A0	L160B L230B
Coupling Set	• Pump Side Coupling • Motor Side Coupling • Coupling Sleeve	PN.210.00103	0320.612.A0	L160B
		PN.210.00104	0430.612.A0	L230B
Gas Ballast Kit	• BSLM Hydraulic Fitting • Sealing Rings • Oil Tube • Gas Ballast • Air Filter with Fitting	PN.601.00007	0430.480.00	L160B L230B
Float Valve Assembly Kit	• Float • Nozzle • O-rings • Bolts • Oil Return Line • Fittings	PN.409.00529	0430.541.00	L160B L230B

Please contact AIRTECH for all other available kits and spare parts you may require.

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8 TROUBLESHOOTING

8.1 REMEDIAL ACTIONS

While the troubleshooting guide offers valuable assistance in resolving system failures, it is critical for users to understand the entire pump. Only trained and qualified personnel should operate the pump.



WARNING!

All troubleshooting operations must be done by a qualified and/or trained personnel.

Risk of electrical shock!

Risk of serious damage to the property!

Avoid interfering with any of the electrical components of the pump while the pump is powered on or has an electrical connection to a power source.

If the troubleshooting guide does not resolve the issue with the pump, or the symptoms have worsened please contact AIRTECH for further assistance.

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Table 8-1 Troubleshooting Guide

Fault	Possible Cause	Remedy	Responsible Party
Pump does not reach end pressure.	Oil condition.	Drain oil from pump and refill with fresh oil. Run the pump for 15 minutes and compare.	Operator
	Clogged inlet screen.	Clean screen and check inlet filter element.	
	Shaft seal leak.	Replace shaft seal from Overhaul Kit, or contact AIRTECH for further assistance.	Operator / Authorized Service Personnel
	Vane stuck in rotor slot	Fill the pump with flushing oil. Run the pump for 15 minutes and drain. Replace fluid with fresh oil, and apply Exhaust Filter kit.	Operator
		Replace vanes from Overhaul Kit or contact AIRTECH for further assistance.	Operator / Authorized Service Personnel
	Anti-suck back valve stuck in closed position due to contamination.	Disassemble valve and screen, clean as required. Drain old oil and replace with fresh oil.	
	No oil or low oil level in reservoir.	Shut down pump, drain balance of oil and refill with fresh oil.	Operator
	Vacuum fitting or hose is not leak tight.	Check hose and pipe connections for leaks.	
	Radial clearance between rotor and cylinder are no longer adequate.	Overhaul the pump or contact AIRTECH for further assistance.	Operator / Authorized Service Personnel
	Float Valve does not shut off correctly.	Check the condition of float valve, and adjust the nozzle position or repair it.	Operator
Pump runs very noisy.	Coupling insert is worn.	Replace coupling insert in motor/pump coupling	
	Bearing noise	Replace bearings or contact AIRTECH for further assistance.	Operator / Authorized Service Personnel
	Vanes stuck.	Fill the pump with flushing oil. Run the pump for 15 minutes and drain. Replace fluid with fresh oil, and apply Exhaust Filter kit.	Operator
		Replace vanes from Overhaul Kit or contact AIRTECH for further assistance.	Operator / Authorized Service Personnel

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Fault	Possible Cause	Remedy	Responsible Party
Pump starts, but labors and draws high amperage.	Oil is too viscous.	Drain and change with fresh oil using with recommended viscosity.	Operator
	Exhaust filter is clogged.	Replace exhaust filters and maintain proper oil condition.	
		Make sure inlet filter is operational and that it is preventing particulate carryover	
	Loose connection in motor terminal box or wired for wrong voltage.	Check wiring diagram for proper connections; tighten or replace loose connections.	Electrician
	Foreign particles in pump. Broken vanes or seized bearings.	Overhaul the pump or contact AIRTECH for further assistance.	Operator / Authorized Service Personnel
	Pump is overfilled with oil or wrong kind of oil.	Drain oil; use correct type of Vacuum pump oil.	Operator
	Pump runs in wrong direction.	Check for correct rotation. If incorrect, switch any two leads.	Electrician
Pump will not start.	Supply voltage is not proper or is overloaded. Motor starter overload settings are too low or improper; fuses are burned; wire size is too small or too long causing a voltage drop.	check voltage supply; overload settings in motor starter for size and settings according to motor nameplate. Install proper size wire. If ambient temperature is high, use the next larger size overloads or adjust settings 5% above motor nameplate valve.	
		turn pump fan by hand. If it will not turn, remove motor from pump and check motor and pump separately. Repair or replace if needed or contact AIRTECH for further assistance.	
	Oil temperature is below 12°C or oil is too viscous due to contamination.	Heat the pump and oil, or change the oil.	Operator

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Fault	Possible Cause	Remedy	Responsible Party
Pump smokes at the exhaust side or expels oil droplets from the exhaust	Exhaust filters are not properly installed with O-ring	Check exhaust filter condition and replace if needed.	Operator
	Filter media is damaged.		
	Exhaust filters are clogged with foreign particles.	Replace filter and O-ring.	
	Oil is not re-circulating properly.	Check oil quality and make certain oil lines are clean.	
	Pump is operating at a too shallow vacuum level.	Check for leaks. Contact AIRTECH for further assistance.	Operator / Authorized Service Personnel
Pump is running too hot.	Not enough oil in the oil reservoir or oil is badly burned or carbonized.	Check upper part of oil sump (open the exhaust filter cover) if the oil has not been scavenged back into the pump, check that the float valve is not stuck or that the oil line is not blocked.	Operator
		Drain oil and refill with proper oil ; change oil more frequently.	
	Not enough air ventilation to pump.	Clean radiator and motor fins. Make sure that there is good ventilation.	
Pump will not operate (seized up).	Pump operated without oil and vanes broke.	Contact AIRTECH for further assistance.	Authorized Service Personnel
	Liquid carry over into pump cylinder broke vanes while pump was running.	Install knock-out pot at inlet of pump.	Operator

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9 DISMANTALING AND DISPOSAL



WARNING!

All troubleshooting operations must be done by a qualified and/or trained personnel.

Risk of electrical shock!

Risk of serious damage to the property!

Avoid interfering with any of the electrical components of the pump while the pump is powered on or has an electrical connection to a power source.

1. Power off the pump and disconnect from all electrical connections against unintended start-up
2. Allow the pump to cool down
3. Ensure all pipes and lines are vented to atmospheric pressure
4. Disconnect piping and hoses
5. Dismount pump from installation space
6. Separate components by recyclability and separate special waste
7. Dispose of materials according to local regulations.

If you are unsure about how to dismantle and dispose your pump, please contact AIRTECH for further assistance.

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10 TECHNICAL DATA

MODEL			L160B*
Displacement	CFM	60Hz	113
		50Hz	94
End- Vacuum	H Type	Torr	0.5
NEMA Premium Motor (3Ph)	HP	60Hz/50Hz	5
Motor Voltage	V	60Hz	230/460
		50Hz	190/380
Revolution	RPM	60Hz	1750
		50Hz	1445
Noise	dB(A)	60Hz	75
		50Hz	72
Water Vapor	Tolerance	mbar	40
	Capacity(L/Hr)	50/60Hz	3.0/3.6
Operating Temp.	°F	50/60Hz	176/181.4
Oil Capacity	Qts	8.5	
Connections	G(BSP) or NPT	Intake	2″
		Exhaust	2″
Approx. Weight	Lbs (with motor)	273	

*Contact AIRTECH for motor starter versions and datasheet.

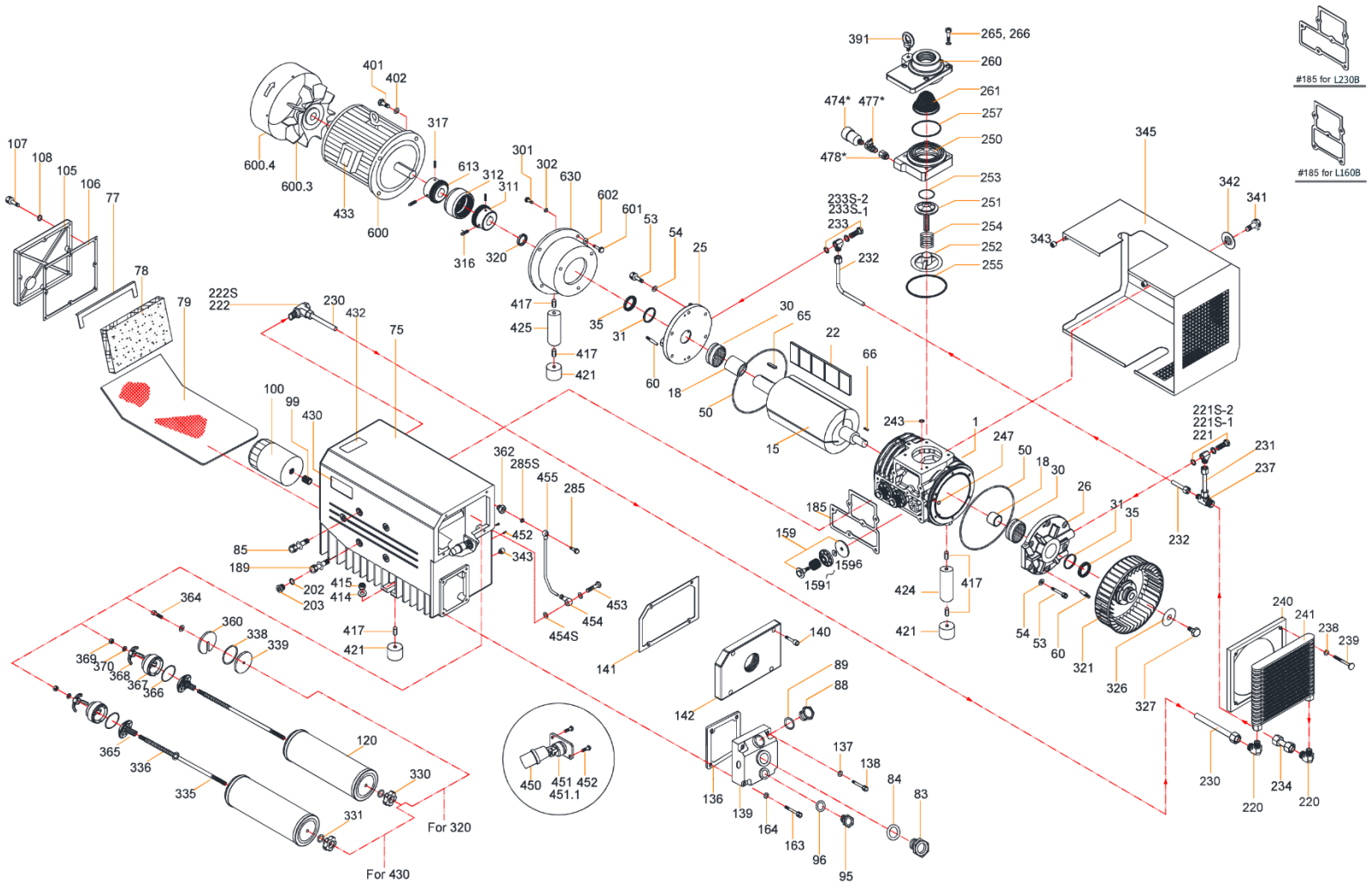
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MODEL			L230B*
Displacement	CFM	60Hz	152
		50Hz	127
End- Vacuum	H Type	Torr	0.5
NEMA Premium Motor (3Ph)	HP	60Hz/50Hz	7.5
Motor Voltage	V	60Hz	230/460
		50Hz	190/380
Revolution	RPM	60Hz	1765
		50Hz	1460
Noise	dB(A)	60Hz	77
		50Hz	74
Water Vapor	Tolerance	mbar	40
	Capacity(L/Hr)	50/60Hz	4.0/4.5
Operating Temp.	°F	50/60Hz	179.6/185
Oil Capacity	Qts	8.5	
Connections	G(BSP) or NPT	Intake	2″
		Exhaust	2″
Approx. Weight	Lbs (with motor)	274	

*Contact AIRTECH for motor starter versions and datasheet.

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AIRTECH VACUUM



L160B - L230B
ASSEMBLY

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AIRTECH® VACUUM

L160B

Pos. No.	Description	Qty	Pos. No.	Description	Qty	Pos. No.	Description	Qty	Pos. No.	Description	Qty
1	Cylinder	1	139	Service Cover	1	252	Check Valve Guide	1	368	Separator Valve Supporter	1
15	Rotor	1	140	Allen Bolt	4	253	O-Ring, Check Valve Plate	1	369	Hexagon Nut	3
18	Sleeve, Bearing	2	141	Gasket, Separator Cover	1	254	Check Valve Spring	1	370	Spring Lock Washer	2
22	Vane	3	142	Separator Cover Plate	1	255	O-Ring, Inlet Part	1	391	Eye Bolt	1
25	A-End Plate, Motor Side	1	159.1	Exhaust Valve Fixed Bolt	2	257	O-Ring, In-Let Part	1	401	Hexagon Head Screw	4
26	B-End Plate, Fan Side	1	159.2	Exhaust Valve Washer	2	260	Inlet Flange, Upper Housing	1	402	Spring Lock Washer	4
30	Bearing	2	159.3	Exhaust Valve Spring	2	261	Inlet Screen (Conical)	1	414	Washer	1
31	Sleeve(Spacer Ring)	2	159.4	Exhaust Valve Plate	2	265	Allen Bolt	4	415	Hex Nut	1
35	Shaft Seal	2	159.5	Exhaust Valve Lock Nut	2	266	Spring Lock Washer	4	417	Slotted Set Screw	5
50	O-Ring, End Plate	2	159.6	Exhaust Valve Seat Plate	2	285	Hollow-Core Screw	1	421	Rubber Foot	5
53	Allen Bolt	12	163	Allen Bolt	2	285S	Sealing Ring	1	424	Rubber Foot Support	1
54	Spring Lock Washer	12	164	Sealing Ring	2	301	Allen Bolt	3	425	Rubber Foot Support	1
60	Taper Pin	4	185	Gasket, Cylinder	1	302	Spring Lock Washer	3	430	Name Plate	1
65	A-Shaft Key	1	189	Allen Bolt	2	311	Coupling Half, Pump Side	1	432	Label, Maintenance	1
66	B-Shaft Key	1	202	O- Ring	5	312	Coupling, Sleeve	1	433	Terminal Board	1
75	Oil Sump	1	203	Locking Screw	5	316	Set Screw (Pump Side)	2	450	Float	1
77	Demister Holder	1	220	Blm Hydraulic Fitting	2	317	Set Screw (Motor Side)	2	451	Nozzle Assembly	1
78	Steal Demister	1	221	Bslm Hydraulic Fitting	1	320	Spacer For Coupling Haif, Pump Side	1	451.1	O-Ring For Nozzle Assy	1
79	Steel Metal Baffle	1	221S-1	Sealing Ring For 221	1	321	Fan, Pump Shaft End	1	452	Bolt	2
83	Oil Sight Glass	1	221S-2	Sealing Ring For 221	1	326	Washer	1	453	Bolt For Banjo Fitting	1
84	Gasket, Oil Sight Glass	1	222	Bslm Hydraulic Fitting	1	327	Hexagon Head Screw	1	454	Banjo Fitting	1
85	Allen Bolt	2	222S	Sealing Ring	2	330	Knob For Exhaust Filter	1	454S	Sealing Ring For 454	2
88	Plug, Oil Fill	1	230	Oil Tube(A-1)	1	331	Spring Lock Washer	1	455	Oil Return Tube With Banjo Fitting	1
89	O-Ring, Oil Fill Plug	1	231	Oil Tube(B-1)	1	335	Separator Valve Stud Bolt	1	474	Gas Ballast	1
90	Pressure Gage	1	232	Oil Tube(B-2)	1	336	Separator Valve Spring	1	474-1	Foam Filter Element, Gas Ballast	1
95	Plug, Oil Drain (Plastic Type)	1	233	Bslm Hydraulic Fitting	1	338	Separator Valve O-Ring	1	477	Ball Valve	1
96	O-Ring, Oil Drain Plug	1	233S-1	Sealing Ring For 233	1	339	Separator Valve Support	1	478	Adapter, Reducer	1
99	Threaded Fitting	1	233S-2	Sealing Ring For 233	1	341	Allen Bolt	1	600	Motor (NEMA)	1
100	Oil Filter	1	234	Oil Tube(A-2)	1	342	Cover Holder	1	600.3	Motor Fan(NEMA)	1
105	Oil Sump Cover	1	237	Blt Hydrauric Fitting	1	343	Rubber Buffer, Fan Hood	4	600.4	Motor Fan Cover(NEMA)	1
106	Gasket, Oil Sump Cover	1	238	Washer	4	345	Fan Hood	1	601	Hexagon Head Screw(NEMA)	4
107	Allen Bolt	8	239	Bolt	4	360	Washer	1	602	Spring Lock Washer(NEMA)	4
108	Sealing Ring	8	241	Radiator	1	362	Connecting Bolt For Oil Retrurn Line	1	613	Coupling, Motor Side(NEMA)	1
120	Exhaust Filter	1	243	O-Ring, Gas Ballast	1	364	Allen Bolt	1	630	Motor Mounting Bracket(NEMA)	1
136	Gasket, Service Cover	1	247	O-Ring, End Plate For Gas Ballast	1	365	Separator Valve Plate	1			
137	Sealing Ring	2	250	Inlet Flange, Lower Housing	1	366	O-Ring, Separator Valve Plate	1			
138	Allen Bolt	2	251	Check Valve Plate	1	367	Adapter, Separator Valve Plate	1			

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L230B

Pos. No.	Description	Qty	Pos. No.	Description	Qty	Pos. No.	Description	Qty	Pos. No.	Description	Qty
1	Cylinder	1	139	Service Cover	1	252	Check Valve Guide	1	368	Separator Valve Supporter	2
15	Rotor	1	140	Allen Bolt	4	253	O-Ring, Check Valve Plate	1	369	Hexagon Nut	4
18	Sleeve, Bearing	2	141	Gasket, Separator Cover	1	254	Check Valve Spring	1	370	Spring Lock Washer	2
22	Vane	3	142	Separator Cover Plate	1	255	O-Ring, Inlet Part	1	391	Eye Bolt	1
25	A-End Plate, Motor Side	1	159.1	Exhaust Valve Fixed Bolt	3	257	O-Ring, In-Let Part	1	401	Hexagon Head Screw	4
26	B-End Plate, Fan Side	1	159.2	Exhaust Valve Washer	3	260	Inlet Flange, Upper Housing	1	402	Spring Lock Washer	4
30	Bearing	2	159.3	Exhaust Valve Spring	3	261	Inlet Screen (Conical)	1	414	Washer	1
31	Sleeve(Spacer Ring)	2	159.4	Exhaust Valve Plate	3	265	Allen Bolt	4	415	Hex Nut	1
35	Shaft Seal	2	159.5	Exhaust Valve Lock Nut	3	266	Spring Lock Washer	4	417	Slotted Set Screw	5
50	O-Ring, End Plate	2	159.6	Exhaust Valve Seat Plate	3	285	Hollow-Core Screw	1	421	Rubber Foot	5
53	Allen Bolt	12	163	Allen Bolt	2	285S	Sealing Ring	1	424	Rubber Foot Support	1
54	Spring Lock Washer	12	164	Sealing Ring	2	301	Allen Bolt	3	425	Rubber Foot Support	1
60	Taper Pin	4	185	Gasket, Cylinder	1	302	Spring Lock Washer	3	432	Label, Maintenance	1
65	A-Shaft Key	1	189	Allen Bolt	3	311	Coupling Half, Pump Side	1	433	Terminal Board	1
66	B-Shaft Key	1	202	O- Ring	5	312	Coupling, Sleeve	1	450	Float	1
75	Oil Sump	1	203	Locking Screw	5	316	Set Screw (Pump Side)	2	451	Nozzle Assembly	1
77	Demister Holder	1	220	Blm Hydraulic Fitting	2	317	Set Screw (Motor Side)	2	451.1	O-Ring For Nozzle Assy	1
78	Steal Demister	1	221	Bslm Hydraulic Fitting	1	320	Spacer For Coupling Haif, Pump Side	1	452	Bolt	2
79	Steel Metal Baffle	1	221S-1	Sealing Ring For 221	1	321	Fan, Pump Shaft End	1	453	Bolt For Banjo Fitting	1
83	Oil Sight Glass	1	221S-2	Sealing Ring For 221	1	326	Washer	1	454	Banjo Fitting	1
84	Gasket, Oil Sight Glass	1	222	Bslm Hydraulic Fitting	1	327	Hexagon Head Screw	1	454S	Sealing Ring For 454	2
85	Allen Bolt	2	222S	Sealing Ring	2	330	Knob For Exhaust Filter	1	455	Oil Return Tube With Banjo Fitting	1
88	Plug, Oil Fill	1	230	Oil Tube(A-1)	1	331	Spring Lock Washer	1	474	Gas Ballast	1
89	O-Ring, Oil Fill Plug	1	231	Oil Tube(B-1)	1	335	Separator Valve Stud Bolt	1	474-1	Foam Filter Element, Gas Ballast	1
90	Pressure Gage	1	232	Oil Tube(B-2)	1	336	Separator Valve Spring	1	477	Ball Valve	1
95	Plug, Oil Drain (Plastic Type)	1	233	Bslm Hydraulic Fitting	1	338	Separator Valve O-Ring	1	478	Adapter, Reducer	1
96	O-Ring, Oil Drain Plug	1	233S-1	Sealing Ring For 233	1	339	Separator Valve Support	1	600	Motor (NEMA)	1
99	Threaded Fitting	1	233S-2	Sealing Ring For 233	1	341	Allen Bolt	1	600.3	Motor Fan(NEMA)	1
100	Oil Filter	1	234	Oil Tube(A-2)	1	342	Cover Holder	1	600.4	Motor Fan Cover(NEMA)	1
105	Oil Sump Cover	1	237	Blt Hydrauric Fitting	1	343	Rubber Buffer, Fan Hood	4	601	Hexagon Head Screw(NEMA)	4
106	Gasket, Oil Sump Cover	1	238	Washer	4	345	Fan Hood	1	602	Spring Lock Washer(NEMA)	4
107	Allen Bolt	8	239	Bolt	4	360	Washer	1	613	Coupling, Motor Side(NEMA)	1
108	Sealing Ring	8	241	Radiator	1	362	Connecting Bolt For Oil Retrurn Line	1	630	Motor Mounting Bracket(NEMA)	1
120	Exhaust Filter	2	243	O-Ring, Gas Ballast	1	364	Allen Bolt	1			
136	Gasket, Service Cover	1	247	O-Ring, End Plate For Gas Ballast	1	365	Separator Valve Plate	1			
137	Sealing Ring	2	250	Inlet Flange, Lower Housing	1	366	O-Ring, Separator Valve Plate	1			
138	Allen Bolt	2	251	Check Valve Plate	1	367	Adapter, Separator Valve Plate	1			

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