



Operation Manual

VSE Pumps

WDM Water Systems

1. Introduction.

This manual contains instructions for the installation and operation of your VSE pumps. Read these recommendations carefully before use. Keep this manual for future reference.

Congratulations! You have purchased a product developed with the latest technology from WDM Pumps, Inc. (referred to as “WDM”).

WDM designs and manufactures our products with the highest quality components. Our experience as a manufacturer and our special care and dedication in production result in products that meet the highest standards.

The information contained in this manual is important for the installation, operation and maintenance of your WDM VSE pumps. Read all instructions carefully before installing and using the product. Keep this manual for future reference.

Our products are factory tested to ensure proper operation. Inspect carefully and make sure there are no missing or damaged pieces from shipping. If, upon delivery, parts are damaged or missing, make a claim to the shipping company as soon as possible.

The design of this product, as well as the materials and processes used in its manufacture provide for proper operation. However product performance and lifespan depend on appropriate application, installation, periodic inspection and general preventive maintenance.



WARNING.

WDM is not responsible for any damage or accidents that occur when the instructions given in this manual have not been followed. The warranty is only valid when using WDM original spare parts. Failure to follow these guidelines in installing and starting your pump will void your warranty.

2. Safety Recommendations.

- WDM pumps are designed to operate safely when used and maintained according to this manual.
- Rotating parts of the pumps are dangerous and can cause injury. Operators and maintenance personnel should be aware of and follow safety recommendations.
- The pumps are considered heavy equipment. Handle them with care.
- Pumps should not pump hazardous material unless they have been designed and designated to do so.
- The pipes and pump should never be forced to fit if using the correct size. If you have to apply force, then get a different size.
- To reduce the risk of electrical shock, all wiring of pumps, motors, overload protection and control panels must be in accordance with the National Electric Code (NEC) or the Canadian Electrical Code (CEC) and all applicable state, province, local codes and ordinances. Requirements will vary depending on usage and location. Improper grounding will void the warranty.
- To reduce the risk of electrical shock, always disconnect the pump from the power source before handling or servicing. Cable should be inspected frequently.
- Never handle connected power cords with wet hands.
- If any product is to be returned, it must be cleaned, sanitized, or decontaminated as necessary according to any applicable laws and regulations prior to shipment, to protect employees from exposure to health hazards.
- Always wear eye protection when working on pumps.
- Loose fitting clothing can easily be caught by the impeller or other moving parts, therefore do not wear loose fitting clothing when doing maintenance or service work on the pump.
- Gloves should be worn whenever handling parts that have sharp edges.
- Wear safety shoes when handling heavy parts or tools.
- For any maintenance always disconnect power.
- Never place hands in the suction or discharge openings.
- Safety handles should always be fastened securely before attempting to lift the pump.

- The pump should not be operated without the proper safety devices in place. If such devices are removed during service and repair work, make sure they are replaced before operating the pump again.
- Do not operate the pump when holding the cable assembly.
- Blocking or restricting the discharge hose may cause it to whip under the pressure.
- Do not remove the drain plugs or valves if the pump is operating.
- The pump should be isolated from a pressurized system before it is removed.
- Allow pumps time to cool sufficiently before handling or servicing them as heat and pressure build up inside during operation.
- Never apply heat in disassembling a pump as doing so could cause an explosion.
- Do not exceed manufacturer's recommendation for maximum performance, as doing so could cause the motor to overheat.
- If the discharge valve is closed, do not continue operating the pump. Doing so will decrease the life expectancy of the bearings and mechanical seal. Also, the extreme heat from doing so can cause steam to build up creating a dangerous pressure situation. A temperature or pressure relief valve should be installed on the pump body.

For pumps coupled to combustion engines.

- Make sure combustion engines have adequate ventilation.
- Never operate combustion engines in an enclosed area where fumes can collect.
- Do not refuel the tank while the engine is running. Shut off engine and wait until it cools.

3. Installation.

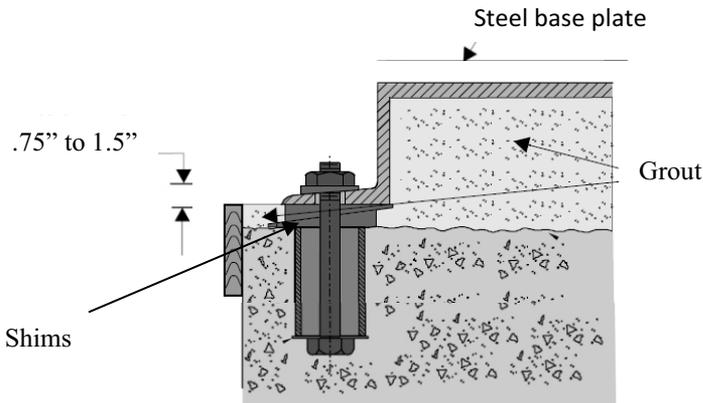
Location.

- Place the pump as close to the suction source as possible.
- Suction piping should be as short and direct as possible.
- Place the pump below the water level whenever possible. This will facilitate priming, ensures a constant flow of liquid, and provides a positive suction.
- Make sure the NPSH (Net Positive Suction Head) is accounted for at the suction end of pump relative to the whole system. Available NPSH must always exceed the required NPSH specified in the yield curve specifications of the pump.
- Always allow sufficient access for maintenance and inspection, plus space for the use of a crane strong enough to lift the unit.
- Be sure to have an adequate power supply for the pump motor. The electrical characteristics should fall within the range specified on the engine data plate.
- Protect the pump from exposure to extremely low temperatures to prevent fluid inside the pump from freezing.

The foundation for a horizontal pump.

- To absorb vibrations and prevent misalignment, horizontal pumps should be permanently installed on foundations of sufficient size, that are made of concrete or steel.
- The foundation may either be on springs or on a raised portion of the floor.
- Concrete foundations must be poured without interruption. All foundations must be between 3/4 to 1-1/2 inches below the elevation of the end pump.
- Anchor bolts should be in their designated positions along the pipe sleeves, and be long enough to go through grout, flange, nuts, and washers..
- As the foundation needs time to set, the pump should be installed several days after the foundation is laid.
- Once the foundation (if concrete) is poured and set, the

- pump's base plate should be placed on loose fitting wedges or shims located near each anchor bolt. Intervals between the wedges or shims should be less than 24" per side.
- Wedges or shims should raise the bottom of the pump about $\frac{3}{4}$ - $1\frac{1}{4}$ inches in order for there to be room for slurry. Wedges and shims should be adjusted to make the pump level using a spirit level.
 - Make sure that piping is aligned so as not to place stress on either flange.
 - Once the pump is aligned, putting on bolt nuts and tightening them will be sufficient to anchor the pump to the steel or concrete foundation.
 - Once any grout is completely hardened, tighten the foundation bolts as necessary. If tightening occurs then recheck pump alignment.



Suction (inlet) piping.

Suction piping must be selected and installed in such a way to minimize pressure loss and allow for a sufficient liquid flow during the starting and operation of the pump.

Many NPSH problems can be traced directly to improper sizing of suction piping systems.

The following precautions should be noted when installing suction piping:

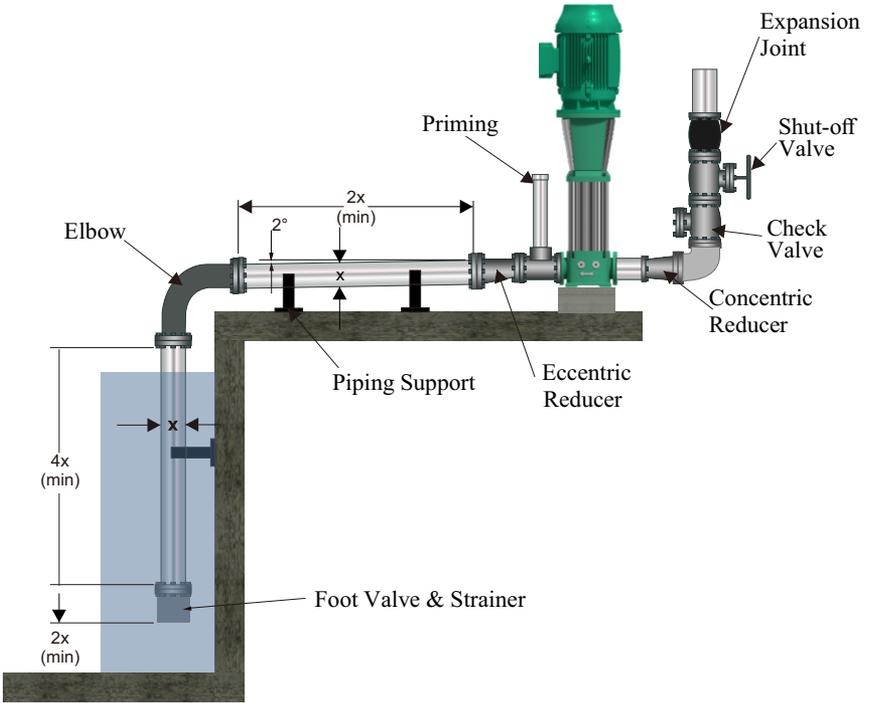
- Suction piping should be as direct as possible, and ideally the length should be at least ten times the pipe diameter.
- Short suction piping can be the same diameter as the suction opening.
- Depending on the length of a longer pipe, the diameter should be one or two sizes larger than the pump suction. Reduce the diameter of the pipe to match the diameter of the pump suction as it reaches pump suction opening.
- When required to reduce the pipe diameter, use an eccentric reducer with the eccentric side down.
- The pipe should never be smaller in diameter than the pump suction opening.
- For best results all horizontal suction lines should follow an even gradient. In suction lift conditions the gradient should be a gradual slope upward. For positive suction head, the gradient should be a gradual downward slope.
- In order to avoid air pockets that can throttle the system or cause erratic pumping, high points, such as pipe loops, should be avoided.

- In order to shut down the pump for maintenance or removal, a valve should be installed in the suction line. If more than one pump is on the same suction line, multiple valves should be placed in the line in order to shut down each pump individually.
- Gate valves should always be installed in positions that avoid air pockets. Globe valves should not be used.
- Valves along the suction line should always be fully open when the pump is in operation..
- Pressure gauges may be installed in gauge taps on pump nozzles (suction and discharge) if they are the correct size. These gauges will monitor the pump's performance, helping to determine if the performance of the pump lies within the parameters of the performance curve. When unstable operation conditions occur, these pressure gauges will indicate the wide fluctuation in pressure.

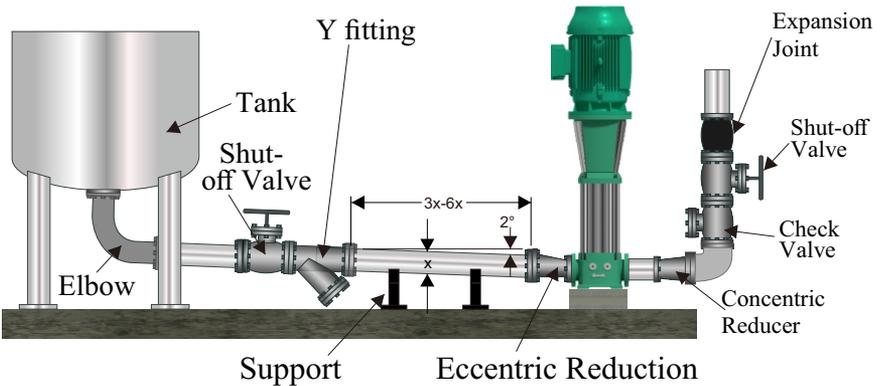
Discharge (outlet) piping.

- Discharge line should be at least the same diameter as discharge opening for short piping, for longer piping size should be 1 or 2 sizes larger according to piping length.
- For best results horizontal piping should have an even gradient.

Negative suction installation Diagram



Positive Suction installation Diagram



- Trap air in high points of discharge line can affect the pump operation.
- Avoid hydraulic shock by closing the valve near the discharge before the pump shutdown.
- The discharge pipe should be as short as possible and fitted with either a check or gate valve for each pump that uses the same line. This valve is used to prevent backflow into the pump which can cause excessive flooding and damage to the pump. The valve may also be used to stop flow into the pump to help with priming and starting, shutdown, maintenance, and pump removal.

Electrical connections.

Power and Cables Control: The cable assembly mounted to the pump should not be modified in any way except for shortening to a specific application. Any splice between the pump and the control panel must be in accordance with all applicable electrical standards. Do not leave the electrical wire exposed, as it may reach the motor and cause serious damage.

The black, white, and red wires are all energy carriers or conductors. The green wire is the grounding wire.



ATTENTION.

Always use the installed handle, never the cord, to lift the pump,



ATTENTION.

WDM does not supply all the accessories (valves, gauges, pipes, extensions, etc.) mentioned in this operation manual and installation.

Packing gland adjustment.

With the pump running, adjust the packing gland to permit 40 to 60 drops per minute leakage. This is necessary for shaft lubrication. After the initial startup, some additional adjustment may be required.



ATTENTION.

Pumps with mechanical seals require no adjustment. If the mechanical seal is altered or replaced with a packing gland, adjustments may become necessary.

All pumps on VSE line of WDM Pumps are equipped with mechanical seals matched to the specific conditions for which the pump was sold.

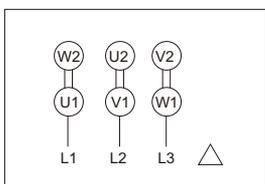
To avoid damage to the seal, and to maximize seal life observe the following precautions:

- Stay within the temperature or pressure limitations specified for the mechanical seal used.
- Do not run the pump dry or against a closed valve! Dry operation will cause seal failure within minutes.
- Clean and flush the suction piping before installing and operating pump. Abrasives including pipe scale, welding slag and others can rapidly cause seal failure.

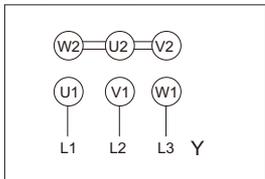
Electrical installation.

- A device that can disconnect both the controller and motor from their power sources should be installed. Such devices are typically circuit breakers or fusible disconnect switches. The motor starter should be seen from the disconnecting device, and the two should never be more than about 50 feet apart from each other.
- Short circuit and ground fault protection are usually provided by means of a circuit breaker or fusible disconnect switch.

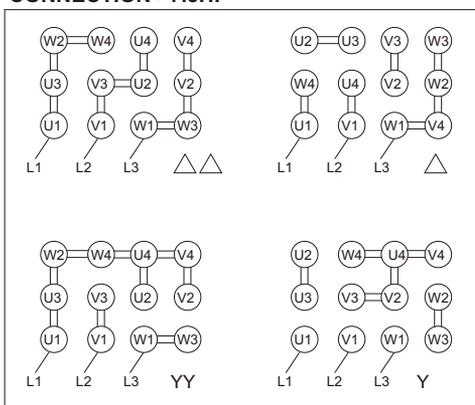
TRIANGLE CONNECTION



STAR CONNECTION



CONNECTION >7.5HP



Wiring installation.

- In order for there to be an ease of installation and convenient control, control panel or motor starter(s) should be placed in close proximity to the pump.
- Incoming power sources should be checked to ensure that they are the same voltage and phase as the motors.
- Based on the voltage and phase that is available, verify that the starter is able to operate the motor.

Priming.

- As WDM VSE pumps are not self-priming, they must be fully primed before starting. To prime the pump completely fill the suction line with liquid.
- If the suction head of the pump is positive, the suction valve should be opened allowing liquid to enter pump the casing. Then air vents should be opened, forcing all air out of the pump by liquid before closing the vents.
- If pump has a suction lift, priming may be accomplished by the use of foot valves or ejectors, or by manual filling of the pump casing and suction line.



CAUTION.

Operation of the pump while dry will result in serious damage.

Pre-start checklist.



WARNING.

The pump should be operated within the conditions on the name plate in order to protect the safety of the operator. If operated outside such conditions, the pump could fail causing injury to operating personal. In order to properly operate and maintain the pump and its components, an instruction book should be consulted.

Before starting the pump, the following inspections should be made:

- All wiring to the motor and starting device should match the wiring diagram. The motor should move in a clockwise rotation when looking at it from the back. If the motor has

been in storage for any length of time, whether used or new, then consult the motor instructions before starting. Use the motor data plate to check the voltage, phase, and line circuit frequency.

- In order to make sure it rotates freely, use your hands to turn the rotating element..
- All piping should be checked for leaks. Also all flange bolts should be checked to make sure they are tightened securely..
- Write down the serial number of the pump for future reference.
- Perform an insulation (or megger) test on the motor before putting the pump into service.
- Resistance values (ohms), voltage, and current (amps) should all be recorded and saved for future reference.

Motor rotation.



CAUTION.

To check the driver rotation, make sure pump and driver couplings are fully disconnected and separated physically. Serious damage will occur to both the pump and driver if the rotation is wrong.

Before checking motor rotation, make sure all components in the system are wired and properly connected. If so then check the motor rotation as follows::

If a 3 phase unit (only) – energize the motor briefly to make sure the rotation is going in the direction indicated by the arrow in the pump volute. If the rotation is not following the arrow, then switch the two wires from the motor starter's terminal.



CAUTION.

As pumps should not be operated while dry, be extremely cautious in making sure the motor is energized only momentarily, just long enough to determine if the rotation is proper.

4. Starting the pump.



WARNING.

If a pump is operated without an approved coupling guard in place, it may result in injury to personnel operating the pump. Coupling guard should be installed on flexible coupled units.

Once the pump is primed, start the pump by turning on the power to the motor as instructed in the motor manual and follow this recommendation:

- Check for pressure leaks, make an immediate visual inspection of the pump and suction piping.
- Upon the pump reaching full operating speed, begin to open the discharge gate valve slowly until complete system flow is achieved.
- The discharge pipe should also be checked for pressure leaks.
- If there are pressure gauges on the pump, record pressure readings to use as a reference in the future
- Also make sure the pump is falling within the parameters of the performance curve.
- Check and record Voltage, amperage per phase, and kilowatts.

Voltage regulation.

While the motor will operate satisfactorily under these voltage and frequency variations, such operation may not be in accordance with the standards established for operation in underrated conditions:

- Variation in the voltage may not exceed $\pm 10\%$ the rating specified on the motor data plate.
- Frequency variation may not exceed $\pm 5\%$ the rating specified on the motor data plate.
- The sum of the voltage and frequency variation may not exceed $\pm 10\%$ the motor rating while the frequency variation does not exceed $\pm 5\%$.

Pump shutdown.

The following shutdown procedures will apply in most normal shutdowns for the WDM pumps type VSE. If pump will be inoperative for an extended length of time, follow storage procedures:

- Close the discharge gate valve slowly to prevent hydraulic shock, and then cut power to the motor.
- Cut power to motor.

Short duration shutdown.

For temporary or overnight shutdowns in conditions above freezing, pumps may remain filled with liquid. Pumps should be primed again fully before restarting.

Extended period shutdown.

If the shutdown is for a longer period of time, or for pump maintenance, close the suction gate valve. If a suction gate valve is not used, but there is a positive suction head, proceed to drain all liquid from suction line in order to end the liquid flow to the suction nozzle. All plugs in drains and vent traps should be removed and all liquid drained from the pump casing.

Restart:

Any time the pump is restarted, but especially when the pump has been drained, you should check to make sure the pump is refilled back to the level required.

5. Disassembling the pump

Below are outlined instructions to completely disassemble the pump. In order to perform maintenance, only disassemble as far as required.

- Turn off power.
- Drain system, including flushing, if necessary.
- Closed coupled units and remove bolts that hold down the motor.
- Remove casing bolts.
- Remove back pull-out bearing frame assembly for casing.
- Unscrew impeller nut.



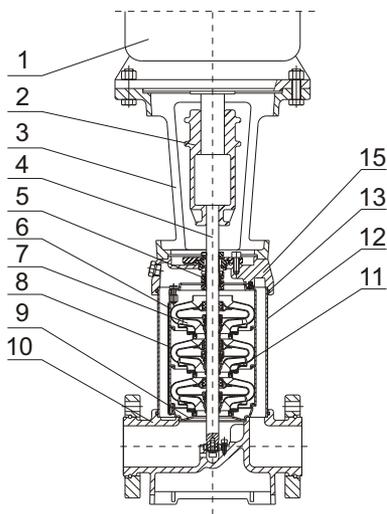
CAUTION.

Do not insert screwdriver between impeller vanes to prevent rotation. It may be necessary to use a strap wrench around the impeller or shaft to prevent rotation.

- To remove the impeller from the shaft, use the appropriate size gear puller aligned behind the impeller vanes..
- Remove impeller key.
- Remove the backplate bolts, backplate, and seal housing.
- Place seal housing on flat surface and press out seal seat (14A).
- To replace the shaft sleeve, heat evenly to about 350°F in order to loosen the Loctite and then twist the sleeve off.
- Remove Slinger.
- Remove grease seal.
- Remove bearing house retaining ring.
- Continue to press or tap on pump end of the bearing-shaft assembly until one bearing is out..
- Once one bearing is out, remove second retaining ring, and then remove complete assembly from bearing housing.
- Remove shaft retaining ring and press off bearings.
- When pressing on new bearings, only press on the inner race of the bearing
- Reassemble frame in the reverse procedure used for disassembly.

- Observe the following when reassembling the bearing frame.
- Replace lip seals if worn or damaged.
- Replace bearings if loose, rough or noisy when rotated.
- Check shaft for runout at the sleeve area.

Below is a chart with the specifications necessary for the identification of each of the pump parts listed above.



No.	Description	Material	EN/DIN	AISI/ASTM
1	Motor			
2	Shaft connector			
3	Pump head	Cast iron	EN-JL1030	ASTM25B
4	Shaft	S.S	1.4507	AISI431
5	Mechanical sea			
6	Outlet	S.S	1.4301	AISI304
7	Impeller	S.S	1.4301	AISI304
8	Hydraulic stack	S.S	1.4301	AISI304
9	Inlet	S.S	1.4301	AISI304
10	Pump body	Cast iron	EN-JL1030	ASTM25B
11	Neck ring	PTFE		
12	Outer sleeve	S.S	1.4301	AISI304
13	O-ring	EPDM/FKM		
14	Pump cover	Cast iron	EN-JL1030	ASTM25B

6. Reassembly of pumps.

- Before reassembly, all parts should be thoroughly cleaned.
- To identify required replacement items refer to the parts list. When ordering the parts, have the pump serial or catalog number available.
- To reassemble follow the reverse of the disassembly instructions.
- If all mechanical seal components are not in good condition, leakage may occur. In order to prevent leakage, completely replace the seal..
- New shaft sleeves are installed by bonding to shaft with hydraulic setting Loctite.

7. Trouble shooting.

Symptom	Possible cause(s)	Possible solution(s)
Pump does not start	Motor not connected	Revise that motor connections have been properly done.
Little or no discharge and unit will not prime.	1. Casing not filled with water.	1. Fill pump casing. Using a foot valve will extend pump life and facilitate immediate priming.
	2. Total head too high.	2. Shorten suction head.
	3. Suction head higher than pump designed for.	3. Lower suction head, install foot-valve and prime.
	4. Impeller partially or completely plugged.	4. Disassemble pump and clean out impeller.
	5. Hole or leak in suction line.	5. Repair or replace suction line.
	6. Foot-valve too small.	6. Match foot-valve to piping or install one size larger foot-valve.
	7. Impeller damaged.	7. Disassemble pump and replace impeller.
	8. Foot-valve or suction line not submerged deep enough in water; pulling air.	8. Submerge lower in water.
	9. Insufficient inlet pressure or suction head.	9. Increase inlet pressure by adding more water to tank or increasing back pressure by turning gate valve on discharge line to partially closed position.

	10. Suction piping too small	10. Increase pipe size to pump inlet size or larger.
	11. Casing gasket leaking	11. Replace.
	12. Suction or discharge line valves closed.	12. Open.
	13. Piping is fouled or damaged.	13. Clean or replace.
	14. Clogged strainer or foot valve.	14. Clean or replace.
Loss of suction after satisfactory operation.	1. Air leak in suction line.	1. Repair or replace suction line.
	2. When unit was last turned off, water siphoned out of pump casing.	2. Refill (reprime) pump casing before restarting.
	3. Suction head higher than pump designed for.	3. Lower suction head; install foot-valve and primer.
	4. Insufficient inlet pressure or suction head.	4. Increase inlet pressure by adding more water to tank or increasing back pressure by turning gate valve on discharge line to partially closed position.
	5. Clogged foot-valve, strainer, or pump.	5. Unclog, clear or replace as necessary.
Pump overloads driver.	1. Total head lower than pump rating, unit delivering too much water.	1. Increase back pressure on pump by turning gate valve on discharge line to partially closed position that will not overload motor.
	2. Specific gravity and viscosity of liquid being pumped different than the pump rating	2. Consult factory.
Pump vibrates and/ or makes excessive noise.	1. Mounting plate or foundation not rigid enough.	1. Reinforce.
	2. Foreign material in pump causing unbalance.	2. Disassemble pump and remove foreign material..
	3. Impeller bent.	3. Replace impeller
	4. Cavitation present	4. Check suction line for proper size and check valve in suction line if completely open, remove any sharp bends before pump and shorten suction line.
	5. Piping not supported to relieve any strain on pump assembly.	5. Make necessary adjustments.
Pump runs but no fluid.	1. Faulty suction piping (air leak)	1. Replace faulty suction piping
	2. Pump located too far from fluid source	2. Reposition.

	3. Gate valve closed.	3. Open
	4. Clogged strainer	4. Clean or replace
	6. Discharge height too great	6. Lower the height
	7. Fouled impeller.	7. Clean or replace.
	8. Faulty mechanical seal	8. Replace
Pump leaks at shaft	1. Worn mechanical seal.	1. Replace
	2. Replacement seal not installed properly.	2. Follow Maintenance instructions carefully

8. Warranty .

WDM guarantees its VSE Pumps for a period of 12 months from the date of delivery, against defects in material and workmanship, according the indicated in its general conditions of sale.

Failure to follow the suggestions and recommendations in this manual, as well as improper product use or handling, will completely invalidate the warranty.

The warranty excludes wear and tear, misuse, repair, or replacement of the defective part by the user or unskilled personnel without specific permission of WDM Pumps.



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