

PIONEER VORTEX

Instruction Sheet



VORTEX INSTRUCTION SHEET

This Instruction Sheet, in addition to the Pioneer Pump Owner's Manual (1101) and the Pioneer Pump Service Manual (8001), contains important recommendations necessary for correct and economical operation of Vortex pump models. Refer to the appropriate manufacturer's manual for engine or electric motor operation and maintenance.

Read and follow instructions carefully to avoid injury and property damage. Do not disassemble or repair unit unless described in these manuals.

This equipment should be installed and serviced by technically qualified personnel. Failure to comply with all national and local codes and within Pioneer Pump recommendations may result in personal injury, unsatisfactory performance, or equipment failure.

The pump nameplate indicates the model number and the serial number. It is important to provide this information when requesting repairs or support and for requesting spare parts.

PRODUCT INFORMATION

Pioneer Vortex Pumps are specifically designed for sewage and wastewater applications, offering large solids handling capacity, including large amounts of stringy solids and rags. The pump is capable of operating in suction lift applications using the Pioneer Prime vacuum assist priming system.

Application

Permitted Use – The pump is suitable for municipal, industrial, construction, and food and beverage water distribution systems. For example:

- | | |
|-------------------------|-----------------|
| • Sewage lift stations | Sewer bypass |
| • Paper and pulp mills | Coal processing |
| • Concrete slurry | Dewatering |
| • Bentonite mud pumping | Sugar waste |
| • Poultry waste | Brine pumping |

Prohibited Use – The pump is not suitable for:

- Pumping liquids not compatible with the product construction materials
- Pumping hazardous liquids (for example toxic, explosive, inflammable or corrosive liquids)
- Pumping food grade liquids other than water (for example wine or milk)
- Working outside of the rated capacity.

Theory of Operation

Vortex pumps are based on the principle of creating a vortex flow with a recessed impeller that is positioned away from the path of the liquid. It creates a circular churning motion around an axis that creates suction for the fluid to flow into the volute and out through discharge.

The impeller spins in an area of the volute that is partially out of the liquid flow path. The spinning creates a vortex like that found in a toilet bowl when it is flushed or a tornado. Since the impeller is not in the flow path of the volute, the pump is ideal for handling liquids that contain long stringy solids, large diameter solids, slurries or a combination of all of these without plugging up. Basically, whatever goes into the pump will be pumped out if the solids are smaller than the ports. This results in fewer clogs and fewer breakdowns.

In addition to allowing for the clear passage of solids, the vortex pumping action also offers other advantages over traditional pumping. Because only 15 to 20 percent of solids come into contact with the pump's impeller, erosion is greatly reduced allowing us to use ductile iron impellers. The design also allows for the handling of entrained air far beyond the capabilities of a standard centrifugal pump.

Key Differences from Standard Pioneer Centrifugal Pumps

Recessed Open Impeller – The vortex pump has an open, recessed impeller compared to the closed impeller on a standard pump. The open impeller is better suited for stringy, and most solids handling applications. Another advantage is the ease of cleaning or unclogging and the wide range of specific speed.

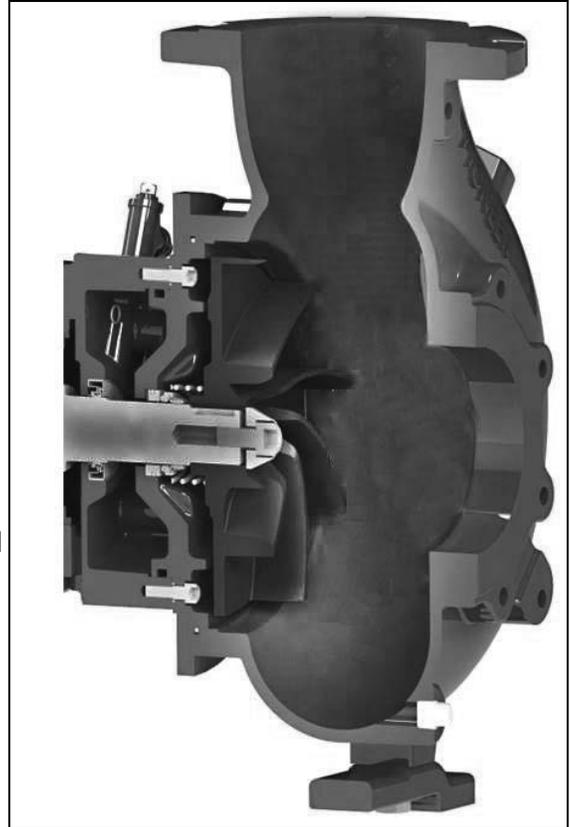
No Wear Rings – Due to the fact that the impeller is recessed on the far side of the volute, there is no need for wear rings. However, the clearance from the impeller to the backplate must be precise and can be adjusted with shims.

Top Centerline Discharge – The volute is designed with a centerline discharge which helps not only with venting trapped air, but it also reduces nozzle loading. Our Vortex pumps are built in a top vertical configuration which makes the case self-venting by design.

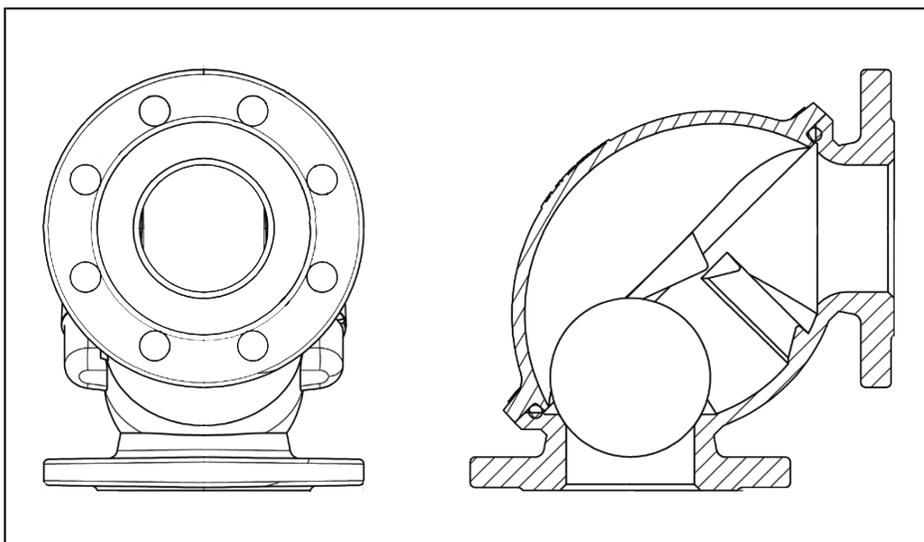
Ductile Iron Impeller – Due to the recessed impeller, particulates and solids in the pumpage rarely come into contact with the impeller, extending impeller life.

Ball-Style Check Valve – Ball check valves can handle a wider variety of solids compared to our typical flapper valves. Long, stringy solids rarely get hung up on the round ball and when pumping, the ball is forced into a position where the check valve can pass larger solids compared to the same sized flapper valve.

Off-Centered Priming Chamber – The Vortex pump uses the same priming chamber as the standard Pioneer Prime, but it is mounted off-center to make room for the ball check-valve. This design adds support brackets for the repositioned chamber, but the function is exactly the same.



Vortex Impeller



Ball-Style Check Valve

INSTALLATION

Pioneer Vortex pumps are available in trailer mounted, skid mounted or conventional channel base mounted configurations. In each case, it is critical that the pump be level while operating.

Be sure to remove all shipping protection prior to mounting the pump, and ensure that all foreign material has been removed from the pump and system piping. Be sure that the pump is mounted perfectly level, and that the pump and its driver are aligned. Failure to align the pump driver and coupling will cause pump vibration and premature failure of the shaft, bearing, mechanical seal, and couplings. Your Pioneer pump distributor will be able to help you with pump alignment.

Suction Piping General Guidelines:

- Suction Pipe should be selected with wall thicknesses sufficient to avoid collapse, when the pump is operated.
- If a rubber suction line is used, use reinforced material sufficient to avoid collapsing when the pump is operated.
- For best performance the suction piping should be at least as large as the pump flange, never smaller.
- If an eccentric reducer at the suction flange is required, install it with the straight side up, to avoid air pockets.
- All piping must be supported, braced, and lined up square before connecting it to the pump. Installing a flexible fitting between the pump and the pipe is recommended on both the suction and discharge lines. However, these flexible fittings must be restrained so that they do not transmit a load to the pump flanges during expansion.
- The use of a foot valve or other flow-retarding fittings in the suction line is to be avoided. If these fittings are used, they should never be placed closer to the pump suction than four (4) times the pipe diameter.
- When the source of the liquid being pumped is below the level of the pump, the pump should be at the highest point of the suction piping.

For more information, refer to the Pioneer Pump Owner's Manual (1101).

OPERATION

Pump Rotation

Before the pump is started, correct rotation must be confirmed. Correct pump rotation direction is clockwise, when viewed from the drive input end of the pump. For a three phase electric motor, it is possible that the phases may not be wired correctly. Incorrect wiring will cause the motor to rotate opposite to designed rotation direction. If the rotation direction is not correct, then interchange any two of the power leads. For a single-phase electric motor, refer to the electric motor wiring diagram.

Prestart Checklist and Starting the Pump

- Check fittings and oil levels.
- Check all hardware, pipe and fittings. Check to see that all pipes are correctly supported and secure.
- Check priming pump drive belt tension.
- Pump Priming Chamber Ball Valve leading to Vacuum Pump should be open.
- Priming Pump water drain – should be closed.

Refer to the appropriate manufacturer's manual for engine or electric motor pre-start procedures.

For more information, refer to the Pioneer Pump Owner's Manual (1101).

MAINTENANCE

Periodic Maintenance Guide

Maintain a running record of pump performance as a guide to when routine maintenance should be performed and to establish pump performance trends as an aid to troubleshooting and rectifying pump problems.

DAILY

- Check all piping connections, pipe supports, and equipment fasteners for tightness.
- Verify that the driver (engine or electric motor) is aligned correctly and that all guards are in place.
- Check all oil levels. If seen to be contaminated, oils should be replaced immediately.
- Follow the instructions on all tags, labels and decals attached to the equipment.

EVERY MONTH (OR 500 HOURS OF OPERATION)

- Apply grease to each grease point on the bearing housing.

EVERY 6 MONTHS OR 1000 HOURS

- Ask your Pioneer Pump Distributor to check the wear rings for excessive wear.
- The Vacuum Pump belt should only be tight enough to eliminate slack. Adjustment is made by adding or removing shims between the vacuum pump crankcase and support table.

EVERY 12 MONTH OR 2000 HOURS

- Change all lubricating oils. Oil should be changed in the bearing housing (if applicable), mechanical seal, and priming pump.

Lubrication and Capacities

| COMPARTMENT | LUBE SPECIFICATION | CAPACITY |
|----------------------------------|--------------------|---------------------|
| Priming Pump | SAE 30 ND | 27 fl oz (798ml) |
| Bearing Frame (8.5 and 12.5) | ISO 32 Turbine Oil | 68 fl oz (2 liters) |
| Run-Dry Seal Gland and Reservoir | ISO 32 Turbine Oil | 34 fl oz (1 liter) |

For more information, refer to the Pioneer Pump Owner's Manual (1101).

⚠ WARNING



Risk of severe injury, death, property damage, or malfunction.

- Shut Down and lock out electrical supply for electrical motors and disable any auto start features .
- If the pump components are hot, allow adequate time for them to cool down before doing any work on them. Disregarding this precaution can lead to serious burns, personal injury, and even death.
- Close Suction and Discharge Valves.
- Vent the Pump Slowly and drain it completely.
- Be aware that the pump may have been pumping hazardous liquids. Take adequate precautions.
- Do not operate the pump against a closed discharge valve for long periods of time. If the pump is operated against a closed discharge valve, the liquid inside the pump will become heated, build steam pressure, and possibly cause the pump casing to rupture or explode.
- If the pump is overheated, do not remove plates, covers, gauges, pipe plugs, or fittings from the pump. Vapor pressure from within the pump can cause the removed parts to be ejected with great force. Allow the pump to cool before servicing.

TROUBLESHOOTING

| SYMPTOM | POSSIBLE CAUSE |
|--|---|
| No Discharge | 1, 2, 3, 4, 5, 7, 8, 9, 10, 17, 18, 19, 20, 37 |
| Reduced Capacity | 2, 3, 4, 5, 7, 8, 9, 10, 17, 19, 20, 21, 38, 39, 40, 47 |
| Reduced Pressure | 5, 7, 8, 11, 13, 18, 19, 38, 39, 40, 47 |
| No Prime/Loss of Prime | 2, 3, 4, 7, 10, 11, 20, 21, 22, 23, 49 |
| Excessive Power Consumption, Hot Motor | 6, 12, 13, 17, 18, 19, 24, 33, 34, 35, 36, 37, 38, 41, 42, 43, 44 |

| SYMPTOM | POSSIBLE CAUSE |
|---|---|
| Vibration and Noise | 2, 4, 9, 10, 14, 15, 17, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 39, 40, 41, 42, 43, 44, 48 |
| Seal Failure, Short Life, Overheating | 22, 23, 25, 33, 34, 36, 41, 44, 45, 46 |
| Bearings Overheating | 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 41, 42, 43, 44 |
| Pump Overheats/Seizes | 1, 8, 9, 14, 33, 34, 35, 36, 41, 42, 43, 44 |
| Corrosion, Erosion, Pitting, Loss of Material | 7, 8, 11, 14, 15, 16 |

| | | | | | |
|----|--|----|--|----|--|
| 1 | Pump not primed. | 18 | Wrong rotational direction. | 34 | Temperature growth. |
| 2 | Suction line not filled. | 19 | Low speed. | 35 | Misalignment. |
| 3 | Air in suction line. | 20 | Air leak into suction line. | 36 | Coupling improperly installed. |
| 4 | Suction inlet blocked, insufficiently submerged, or too small. | 21 | Air leak through mechanical seal. | 37 | Impeller rotating backwards. |
| 5 | System head higher than pump design head. | 22 | Seal fluid contaminated, hot, or insufficient. | 38 | Worn wear rings. |
| 6 | System head lower than pump design head. | 23 | Seal fluid system not vented. | 39 | Impeller damage. |
| 7 | Insufficient NPSHA. | 24 | High speed. | 40 | Improper balance after repair. |
| 8 | Parallel pump application incorrect. | 25 | Mechanical seal insufficient. | 41 | Bent shaft. |
| 9 | Suction pressure to vapor pressure below minimum. | 26 | Bearing housing excessively cooled. | 42 | Excessive thrust. |
| 10 | Suction lift is too high. | 27 | Low oil pressure (oil lube bearings). | 43 | Rotational element dragging. |
| 11 | Excessive vapor in pumped liquid. | 28 | Improper or poor lubrication. | 44 | Worn or incorrectly installed bearings. |
| 12 | Specific gravity of liquid different from design. | 29 | Lubrication defective. | 45 | Mechanical seal not properly set; damaged or hardened O-rings. |
| 13 | Viscosity of liquid different from design. | 30 | Contaminated oil or bearings. | 46 | Shaft scored at seal. |
| 14 | Operation at lower than rated capacity. | 31 | Moisture in lubricant or bearing housing. | 47 | Volute O-ring |
| 15 | Cavitation | 32 | Excessive lubricant. | 48 | Foundation not rigid or settled. |
| 16 | Electrolysis | 33 | Pipe strain. | 49 | Failed, open, or missing discharge check valve. |
| 17 | Impeller obstructed with foreign material. | | | | |

SPECIFICATIONS

| Model | Size | Max Flow | Max Head | Solids Capacity |
|-------|------------------------------|------------------------------------|----------------|-------------------------|
| 44V10 | 4 x 4 Inches 100 x 100 mm | 1450 GPM 330 m ³ /hr | 150 ft 46 m | Suction Flange Diameter |
| 66V10 | 6 x 6 Inches 150 x 150 mm | 1600 GPM 363 m ³ /hr | 94 ft 29 m | Suction Flange Diameter |
| 66V12 | 6 x 6 Inches 150 x 150 mm | 2300 GPM 522 m ³ /hr | 130 ft 40 m | Suction Flange Diameter |
| 88V12 | 8 x 8 Inches 200 x 200 mm | 3600 GPM 818 m ³ /hr | 130 ft 40 m | Suction Flange Diameter |

WARNING



Risk of severe injury, death, property damage, or malfunction.

- For electric motor driven pumps, to reduce risk of electrical shock, disconnect power before working on or around the system. More than one disconnect switch may be required to de-energize the equipment before servicing
- Do not use to pump flammable or explosive fluids such as gasoline, fuel oil, kerosene, etc.
- Do not use in explosive atmospheres or hazardous locations as classified by the NEC, ANSI/NFPA70.
- If this pump is used to handle any hazardous materials that can cause illness, either directly or indirectly, take precautions by wearing approved protective clothing and use appropriate safety equipment.
- Use lifting and moving equipment in good repair and with adequate capacity to prevent injuries to personnel or damage to equipment.
- Any lifting equipment should be adequately rated for the weight of the item being lifted. Use only established methods when lifting or moving any heavy components.
- Do not operate the pump without guards in place over the rotating parts. Exposed rotating parts can catch clothing, fingers or tools, causing severe injury to personnel.

**Pioneer Pump
Sales Hotline
503-266-4115**

Other resources available at www.pioneerpump.com.

- Drawings
- Other manuals
- Spec sheets
- Terms & Conditions



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