Graymills®

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Multi-Stage Centrifugal MVP Pumps

Operations and Maintenance Instructions

WARNINGS/CAUTIONS
Read all these SAFETY INSTRUCTIONS BEFORE installing or using this equipment. Keep this manual handy for reference/training.

- Inspect unit for damage. Report any damage to carrier/dealer immediately.
- Pump may be heavy. If in doubt, take appropriate precautions.
- Motor must be grounded and suitable for the environment in which it is used. Do not use where explosion-proof motors are required.
- Do not allow liquids to come into contact with the motor, or any electrical components.
- Never attempt any service work while the unit is still connected to any electrical power source.
- This pump contains rotating parts. Use caution.
- When working on or around pump, be aware of what liquid is/has been pumped. If liquid is potentially harmful, take appropriate precautions.
- Never use any part of the wiring/electrical system to lift or move the equipment. This could cause a failure of the electrical system, resulting in severe shock or death.
- Do not operate this pump or allow others to operate it until the instructions and warnings have been read and are understood by all involved.

Never work with equipment you feel may be unsafe. Contact your Supervisor immediately.

DESCRIPTION/SPECIFICATIONS
The Graymills MVP Series pumps are multi-stage centrifugal pumps designed to handle clean, water and water-based coolants.

- Minimum and maximum liquid temperature range: -10^{0}C to 93^{0}C(50^{0}F to 200^0)
- Maximum Air Temperature 40^0 C (104^0 F)
- Maximum viscosity 500 SSU
- Maximum On/Off Cycles per hour: 100
- Maximum inlet pressure 100 psi.
- Pipe connections are 1" NPT for both inlet and discharge.
- Bypass kit is included and should be used for applications where low flow conditions can exist. See Installation Section, Page 2.
- Rotation: left hand, ie, COUNTERCLOCKWISE when viewed from motor end.

POWER SUPPLY, WIRING AND GROUNDING

⚠ **WARNING**
Install ground and wiring according to local and National Electrical Code requirements.

- Install a disconnect switch on all power legs near the pump.
- Disconnect and lockout electrical supply before installing or servicing pump.
- 230/460V, 3 phase, 60 cycle AC circuit rated for a minimum of 10 amps. Refer to motor nameplate for instructions.

- Electrical supply MUST match pump's name plate specifications. Incorrect voltage can cause fire and/or damage to the motor and voids warranty.
- Motor overload protection standard on three-phase motors.
- Use only stranded copper wire to motor and ground. The ground wire MUST be at least as large as the wire to the motor. Wires should be color coded for ease of maintenance.
- Follow motor manufacturer's wiring diagram on the motor nameplate or terminal cover carefully.

⚠ WARNING

Failure to permanently ground the pump, motor and controls before connecting to electrical power can cause shock, burns or death.

ROTATION

- Incorrect rotation may cause damage to pump in and will void the warranty.
- Correct rotation is left-hand, COUNTERCLOCKWISE when viewed from the motor end.
- Rotation can be verified by quickly energizing the pump for an instant with a quick on/off motion.
- To reverse three phase motor rotation interchange any two power supply leads.

PIPING

- Piping should be no smaller than the pump discharge. Piping should be kept as short as possible, avoiding unnecessary fittings to minimize friction losses.
- All piping MUST be independently supported and MUST NOT place any piping loads on the pump. It should "line up" naturally.
- All joints MUST be airtight. Use 3 - 4 wraps of Teflon™ tape to seal threaded connections.

⚠ CAUTION

Never draw piping into place by forcing the pump discharge connections.

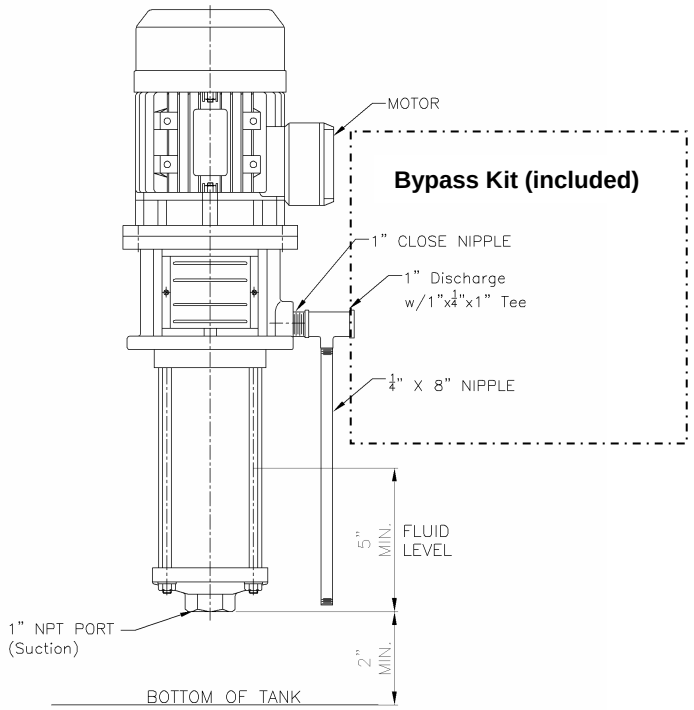


Figure 1

INSTALLATION

⚠ WARNING

Multi-stage pumps produce considerable shut-off pressure. Hoses and associated plumbing used with these pumps should be rated for a minimum working pressure of 350 PSI. Failure to heed this warning could result in ruptured lines and possible injury to personnel.

- Minimum and maximum liquid levels must be maintained for proper pump operation. *See Figure 1*.
- Allow adequate space for servicing and ventilation. Protect from freezing and flooding.
- The pump must be installed in a ventilated area, and the ambient temperature must not exceed 40^0 C (104^0 F)
- Before installation, verify that motor and pump are rotating well by rotating the motor fan.

⚠ WARNING

- Graymills recommends the use of an inlet strainer to minimize the size and amount of debris that enters the pump. Contamination drawn into the pump can cause internal damage and is not covered under warranty. Consult factory for recommendations as to the appropriate size and type of strainer to use.

- High Pressure Filters for keeping fluid clean should be used. Graymills can provide a filter to trap particles, scale and contaminants to prevent costly damage. Filter collects up to 20 cu. in. of material (HPFB20) without pressure drop. Available in 14" length single cartridge model (HPFB10) or 24" length dual cartridge model (HPFB20). All models are 304 stainless steel for use with water-soluble and corrosive liquids. Reusable stainless steel cartridges available in 10, 50, and 100 mesh.

OPERATION

⚠ CAUTION

Before starting, pump must be primed (free of air) and discharge valves partially open.

- Do not run pump dry; damage to mechanical seal will result.
- Use a Check valve on plumbing if pump is mounted horizontally or if the potential to lose prime can occur.
- On-Off Cycling must be limited to under 100 times per hour, because excessive starting cycles may harm the windings of the motor.
- Do not run against closed nozzles or damage to pump and piping will result. Use Bypass as described below.
- Do not operate at or near zero flow.
- If operating at or below 8 gpm or where valves may be opened and closed periodically, you must use a bypass. This kit (Bypass Kit C-39695),See Figure 1, installs in the side of the discharge head and provides a fluid bypass when the pump is operated against a closed discharge thus preventing excessive heat build-up which will damage the pump.
- After stabilizing the system at normal operating conditions, check the piping. If necessary, adjust the pipe supports.
- To ensure proper suction, fluid level should cover first two impellers *(5" from the suction end of the pump). See Figure 1.*
- Pump may be mounted horizontally with optional horizontal mounting bracket. However, care must be taken to ensure that prime is not lost.
- If pump is not generating enough pressure or flow, see “TROUBLESHOOTING GUIDE”.

MAINTENANCE

⚠ WARNING

Failure to disconnect and lockout electrical power before attempting any maintenance can cause shock, burns or death.

- Motors have permanently lubricated bearings. No lubrication is possible or necessary.
- Depending upon conditions and operating time, it is important to perform regular inspections of the pump. Items to inspect are as follows:
    - Performance-Head, Pressure and Flow
    - Noise Level and Leakage
    - Filter Cleanliness

- The mechanical seal used is cooled and lubricated using liquid within the pump. Separate lubrication is unnecessary
- To REMOVE pump from service, drain all fluid from pump and piping.
- To RETURN pump to service, replace all plugs and piping using Teflon™ tape or equivalent on male threads.

Disassembly

In most cases, the only maintenance necessary will be replacement of the mechanical seal on the shaft. The procedure below describes the process of disassembling the pump’s stages to replace the seal.

- Remove stay bolts on outside of pump column by removing nuts on bottom end of bolts. Bolts can then be unscrewed from motor bracket.
- Remove suction cover from bottom of pump. Remove O-Ring and Outer Chamber Sleeve. The sleeve may need to be tapped and rotated to break if free from the motor housing. There is an O-Ring on both top and bottom of Outer Chamber Sleeve. Inspect both after removal and replace if they show signs of deterioration.
- Remove nut and lock washer from shaft. The nut has a left-hand thread to prevent loosening during rotation of the pump. Each stage is a two-piece construction of impeller and bowl/diffuser. The first stage after the suction head will have a special seal. During re-assembly make sure it occupies the same position. The procedure should be the same regardless of the number of stages in your pump.
- Each stage is removed in the same manner as the first. A screwdriver blade and application of mild force might be needed to separate the sections. DO NOT DEFORM OR BEND THE STAGES. Note carefully the system of spacers. Each stage has a spacer that prevents the impeller from contacting the bowl/diffuser.
- Once the stages have been removed, take the circlip below the mechanical seal off the shaft. Slide the seal off the shaft. Examine the seal for damage or wear. If necessary, replace the seal.
- If necessary to remove entire shaft from pump, it will require the coupling guard, coupling and pin to be removed. Remove the two fasteners that hold the guard in place. Remove the four Allen-head

bolts, two on each side, from the coupling. The shaft pin should then be accessible and the shaft can be removed from the pump.

- The seal face is pressed into the pump housing. Inspect for damage. If necessary replace by prying out with a screwdriver. Inspect O-Ring that surrounds seal face. Replace O-Ring if damaged. Replace seal face by pressing in a new face in the housing.

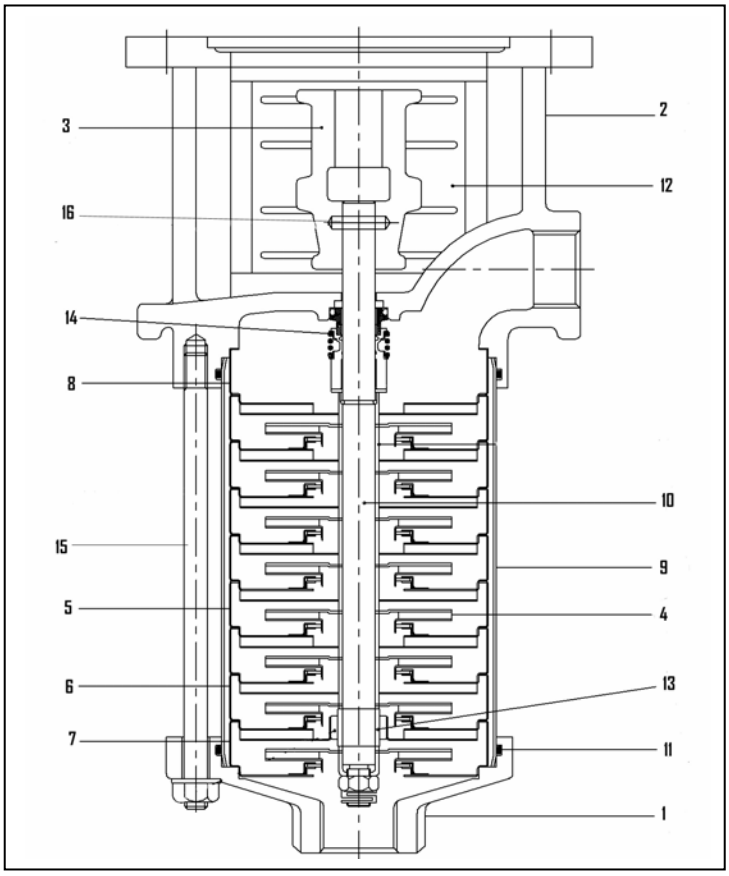
Reassembly

With new seal face installed in housing, replace shaft and pin and secure coupling with four Allen-head bolts. Replace coupling guard and screws.

- Replace mechanical seal on shaft. Replace circlip on shaft below seal.
- Reinstall stages in the reverse order of removal. Stages should not be warped, bent or damaged. Note carefully how spacers are used to prevent impeller from contacting the bowl/diffuser. Replace nut and lock washer on shaft to retain stages.
- Replace O-Ring in pump housing and fit intermediate chamber sleeve into pump housing.
- Install stay bolts into motor casing. Place O-Ring into suction cover and place suction cover over intermediate chamber cover. Thread nuts onto end of stay bolts and tighten to retain suction cover.

Troubleshooting Guide

Problem	**Probable Cause**
Pump Head Leakage	Mechanical Seal Wear; replace Mechanical Seal
Leakage between pump body, upper cover and/or casing	Damaged O-ring, replace the O-Ring
Overload protector frequently trips during operation	Low power during output during peak
	Unstable voltage supply
Odd noise and vibration	Pump cavitation
	Damaged motor bearing
	Pump and piping not anchored properly
Water is not coming out	Pump not primed properly
	Excessive head requirement from too much piping
	Check for restrictions in plumbing
Pump is operating, but not normally	Release air from, or reconfigure intake pipe
	Clean out clogged impeller
	Check motor rotation to verify if pump is operating properly



Replacement Parts

Ref	Description	Material	Part Number
1	Suction Cover	Stainless Steel	793-91748
2	Motor Bracket	Gray Cast Iron	793-91749
3	Coupling	Gray Cast Iron	793-91750
4	Impeller	Stainless Steel	793-91751
5	Intermediate Chamber	Stainless Steel	793-91752
6	Intermediate Chamber with Bearing	Stainless Steel	793-91753
7	Intermediate Chamber without guide vane	Stainless Steel	793-91754
8	Intermediate Chamber without neck ring	Stainless Steel	793-91755
9	Outer Sleeve-MVP4(95mm)	Stainless Steel	793-91727
9	Outer Sleeve-MVP6(135mm)	Stainless Steel	793-91728
9	Outer Sleeve-MVP8 (175mm)	Stainless Steel	793-91729
9	Outer Sleeve-MVP12 (255mm)	Stainless Steel	793-91730
9	Outer Sleeve-MVP16 (335mm)	Stainless Steel	793-91731
9	Outer Sleeve-MVP20 (415mm)	Stainless Steel	793-91732
10	Shaft-MVP4	Stainless Steel	793-91733
10	Shaft-MVP6	Stainless Steel	793-91734
10	Shaft-MVP8	Stainless Steel	793-91735
10	Shaft-MVP12	Stainless Steel	793-91736
10	Shaft-MVP16	Stainless Steel	793-91737
10	Shaft-MVP20	Stainless Steel	793-91738
11	O-Ring	Viton	793-91756
12	Coupling Guard	Stainless Steel	793-91757
13	Bearing sleeve	Tungsten Carbide	793-91758
14	Mechanical Seal	Viton	793-91759
15	Stay Bolt-MVP4	Stainless Steel	793-91763
15	Stay Bollt-MVP6	Stainless Steel	793-91764
15	Stay Bolt-MVP8	Stainless Steel	793-91765
15	Stay Bolt-MVP12	Stainless Steel	793-91766
15	Stay Bolt-MVP16	Stainless Steel	793-91767
15	Stay Bolt-MVP20	Stainless Steel	793-91768
16	Coupling Pin	Stainless Steel	793-91762

WARRANTY

Graymills Corporation warrants that the equipment manufactured and delivered hereunder when properly installed and maintained, shall be free from defects in workmanship.This warranty does not apply to damages or defects caused by operator carelessness, misuse, abuse, improper application, or abnormal use; the use of add-on parts or equipment which damages or impairs the proper function of the unit and modifications made by Buyer. Graymills' obligation under this Warranty shall be limited to: 1. Replacing or repairing tank and structural parts within one year from the date of installation or 13 months from the date of shipment whichever occurs first. The decision to replace rather than repair shall be made by Graymills Corporation; 2. Replacing or repairing components supplied but not manufactured by Graymills, such as pneumatic cylinders, controls, pneumatic systems, motors, heater controls and heaters to the extent such components are warranted by the original manufacturer's warranty, provided that Buyer gives Graymills prompt notice of any defect or failure and satisfactory proof thereof. Before Graymills can repair or replace a defective part under warranty, call Graymills for a Return Merchandise Authorization number (RMA number must appear on outside English of package or it will be refused and returned). Upon prepaid return to Graymills' factory, Graymills' examination must disclose such part to be defective. This warranty does not apply to expendable parts such as rollers, bearings, cylinder packings and any other parts which need replacement periodically due to normal wear nor to rusting of a mild steel heated unit used with aqueous (water) based cleaning solutions. A new warranty period shall not be established for repaired or replaced materials, or products. Such items shall remain under warranty for only the remainder of the warranty period of the original materials or products.

Graymills warrants that the equipment will function mechanically as quoted in the published specification. Graymills does not warrant process performance nor does Graymills assume liability for equipment selection, adaption or installation. The foregoing warranties are in lieu of all other warranties whether oral, written, expressed, implied or statutory. Implied warranties of fitness for a particular purpose and merchantability shall not apply. Graymills' warranty obligations and Buyer's remedies thereunder (except as to title) are solely and exclusively as stated herein. In no case will Graymills be liable for consequential damages, loss of production or any other loss incurred because of interruption of service.

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