MBH® PUMPS

Instruction, Installation, Operation and Maintenance Manual

AUTO PRIME PUMPS

ISO 9001
Certified Company

A Mark of Quality

QUICKSTART GUIDE

This Quickstart Guide contains important steps necessary for correct setup of systems with electrical motors. Refer to the appropriate manufacturer's manual for more detailed installation, operation, maintenance, and hazards.

Read and follow instructions carefully to avoid injury and property damage. Do not disassemble or repair unit unless described in the appropriate manual(s).

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

PRE-INSTALLATION VERIFICATIONS

Pump System and Lubricant Verifications

1. There is no sign of improper equipment storage or mishandling.
2. The package is securely fastened with proper supports to allow pump / base to be non-load bearing.
3. Condition, tightness, and alignment (where applicable) of:
   - Panel box grommets
   - Pump shaft
   - Belts, belt guards, and hardware
   - Discharge check valve(s)
   - Coupling and coupling guard
   - Oil Connections
   - Impellers
   - Hydraulic hoses
   - Float ball and linkage
4. All Oil reservoirs are filled within acceptable ranges.

ELECTRICAL VERIFICATIONS

Refer to the owner's manual for detailed installation instructions.

1. All motor components and field wiring terminations have been inspected for disturbance during transit and re-adjust to the correct torque as needed.
2. There is a sufficient supply voltage present (+/- 5% of the motor nameplate voltage) at the motor starter.
3. There is enough effective KVA transformer available that feeds the motor.
4. Grounding:
   - The service entrance ground rod is properly installed and connected.
   - An input ground wire from the panel is connected to the motor.
   - Motor and ground wires are bundled together.

   NOTE: Motor surge protection is strongly recommended.
5. Wiring complies with manufacturers requirements and applicable regulations for:
   - Control panel(s)
   - Transducer
   - Alarms and sensors
   - Motors and engines
   - Lights and heater.
6. Wiring is routed in a manner that protects insulation from being stretched, burned, chaffed, or other- wise damaged.
7. For 3 phase motors, all three motor winding resistance readings are equal.
   - A reading out of range could indicate a high resistance connection or termination.
8. Verify the MEGER readings of the motor prior to start-up.

Rotation Check

Notice : Risk of damage to pump or other equipment.

- Improper impeller rotation will result in damage to the pump. Rotation must be checked at installation.
- The pump must rotate counter-clockwise when viewed from the suction side of the pump facing the impeller.
- Operate the motor while observing the director of the motor shaft or cooling fan.
- If necessary, check the connection to the power source.
- For three-phase power, interchange two leads to switch rotation.

PIPING SYSTEM VERIFICATIONS

1. Suction pipes are supported and completely sealed.
2. Float switches are properly supported.
3. The system flanges meet squarely.
4. Proper supports are in place for all piping to allow the pump/base to be non-load bearing.
5. Strainer is correctly sized and fitted on the system.
6. For horizontal pumps, the alignment of the driver to pump is correct.
7. All system valves are clear and open.
8. The system is free of foreign matter that could damage the pump upon startup.

START-UP PROCEDURE

1. Confirm the package is still aligned.

   NOTE: Motor drive coupling misalignment tolerance decreases by 50% when a VFD is applied.

2. Make sure all discharge valves upstream are open before startup.
   - The discharge throttling valve should be opened to delivered system requirements.
   - Engine RPM can vary due to changing performance requirements.
3. Verify all fluid connections are tight
4. Check pump system components are installed properly and in good condition, including:
   - Belt(s) tension and condition, belt guards, and applicable hardware
   - Coupling and coupling guard
   - Float valve, float ball, and linkage
   - Impeller
   - Pump vacuum
   - Vacuum box strainer
5. Observe the system sound during startup and re-prime, making sure it does not shake or vibrate.
6. Measure and record electrical conditions:

- The earth driven ground rod size and depth.
- The amperage of all three legs of motor. Verify measurements against the motor nameplate.
- The voltage while the motor is loaded under normal operating conditions.

  NOTE: Motor voltage can be affected by other pumps or machinery starting simultaneously on the same power feed.

- The current balance out under normal operating conditions.

  NOTE: The recommended current unbalance limit is 5% whenever possible.

7. Verify system requirements for normal conditions:
   - Piping diameters and total piping system length, including valves and bends, are correct.
   - Discharge pressure is sufficient and within the pump curve.
   - Flow rate is at the Total Dynamic Head.
   - The vertical suction lift height is not greater than the NPSHr.
8. Test and record system measurements.

   NOTE: Shut down the system if excessive vibration or noise occurs.

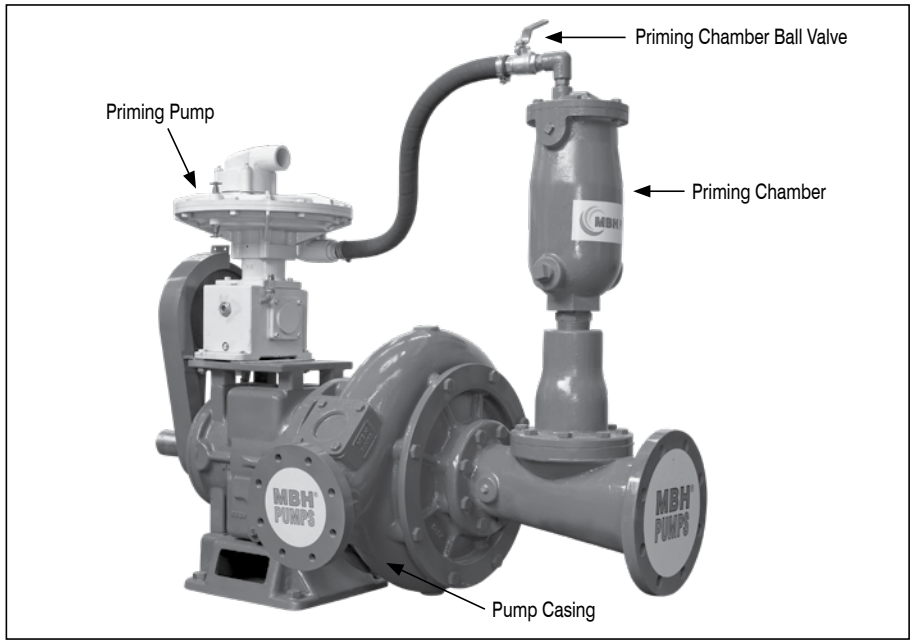
RECOMMENDED SERVICE INTERVALS

Mechanical Seal Oil : 250Hrs
Bearing Frame : 250Hrs
Vacuum Pump : 250Hrs

VACUUM SYSTEM

The MBH Pro-Prime Series Pumps Priming System is designed to allow the pump to prime without using a foot valve and without manually adding water to the system. The Pro-Prime system uses a positive-sealing float box and a diaphragm vacuum pump to provide fully automatic priming and re-priming of the pump. There is absolutely no water carry-over to contaminate the environment.

Main Components
The main components of the priming system are shown in the following drawing:



Main Components of the Priming System
The pump starts with the suction pipe in the water and the discharge check valve closed. The priming pump begins to evacuate air from the suction pipe and pump end. The resulting vacuum in the suction pipe causes water to rise in the pipe until it floods the pump end. Then the pump primes. Carryover (water transfer to the priming pump) is prevented when a float ball in the priming chamber rises with the water level, closing a valve.

VACUUM PRIMING VALVE

INTRODUCTION

This manual will provide you with the information to properly install and maintain the valve to ensure a long service life. The MBH Vacuum Priming Valve has been designed with stainless steel trim to give years of trouble-free operation. The MBH Vacuum Priming Valve is used in conjunction with a central vacuum priming system to prime (fill with water) a MBH Auto Prime pumps. The valve is typically mounted on the suction piping or pump volute.

The valve is a float-operated, resilient-seated valve designed to handle clean water. The Size, Maximum Working Pressure and Model No. are stamped on the nameplate for reference.

OPERATION PRINCIPAL

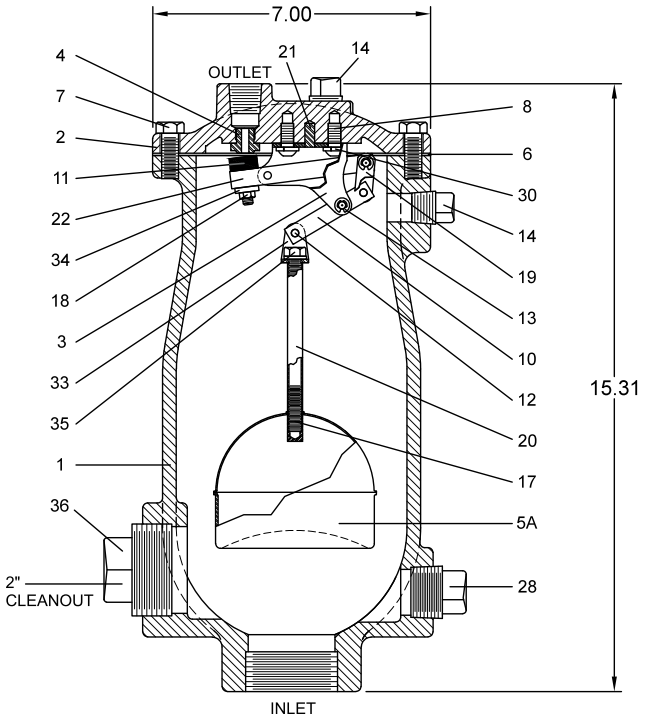
The purpose of the Vacuum Priming Valve is to automatically allow air to be drawn out of the pumping system until the pump fills with water. Then, when the water reaches the priming valve, the float rises and closes the priming valve to prevent fluid from flowing to the vacuum priming system. The priming valve will continue to release air while the pump is running.

VALVE CONSTRUCTION

The standard Vacuum Priming Valve body and cover are cast iron. All internal components are stainless steel with the exception of the orifice button, which is resilient.

The lever mechanism provides mechanical advantage for the float. During system operation, the vacuum pressure exerts a strong upward force on the sealing component, the orifice button. The lever mechanism magnifies the weight of the float so that the orifice will open under high pressures and release air. Additional ports are provided for flushing, testing and draining purposes. The general details of construction are illustrated in Figure 2. The body (1) is threaded for connection to the pipeline. The seat (4) is threaded into the cast cover (2).

CROSS SECTION DRAWING



NO.	DESCRIPTION
1	BODY
2	COVER
3	LEVERAGE FRAME
4	SEAT
5A	FLOAT
6	GASKET
7	COVER BOLT
8	RETAINING SCREW
10	FLOAT ARM
11	ORIFICE BUTTON
12	PIVOT PIN
13	RETAINING RING
14	PIPE PLUG

NO.	DESCRIPTION
17	FLOAT RETAINER
18	LOCK NUT
19	LINK
20	EXTENSION SHAFT
21	LOCATING PIN
22	ORIFICE BUTTON ARM
28	PIPE PLUG
30	WASHER
33	CLEVIS
34	LOCK WASHER
35	RETAINING SCREW
36	PIPE PLUG

MAINTENANCE
The Vacuum Priming Valve requires no scheduled lubrication or maintenance.

Inspection: Periodic inspection to verify operation can be performed. The valve should not leak fluid at any connection or through the outlet. If there is leakage through the outlet, check for wear on the orifice button .

Lubrication: The valve is a self-contained automatic valve and does not require and lubrication to enhance its operation.

Tools: No special tools are needed to maintain or repair the valve.

TROUBLE SHOOTING
Several problems and solutions are presented below to assist you in troubleshooting the valve assembly in an efficient manner.

- Leakage at Bottom Connection: Tighten valve threaded connection. If leak persists, remove valve and seal threads with Teflon* sealant.
- Leakage at Cover: Tighten bolts per Table 2, replace gasket (6).
- Valve Leaks when Closed: Disassemble and inspect orifice button (11), and float (5).
- Valve not Venting Air: Check that operating pressure does not exceed Working Pressure.

DISASSEMBLY
The valve can be disassembled without removing it from the pipeline. Or for convenience, the valve can be removed from the line. All work on the valve should be performed by a skilled mechanic with proper tools. No special tools are required.

WARNING: Wear safety glasses to look into the valve outlet after installation. Released fluid can cause injury.

1. Close inlet shut-off valve. Open drain valve or remove drain plug. Remove the cover bolts (7) on the top cover.
2. Pry cover (2) loose and lift off valve body.
3. Remove the 2 retainer rings (13) and pivot pins (12) that pass through the lever frame (3). The float (5) and linkage will be free from the cover. Disconnect float from lever (10).
4. To remove lever frame (3), remove two round-head fasteners (8). Rotate seat (4) counter-clockwise to remove.
5. Remove locknut (18) and orifice button (11) from orifice button arm (22).
6. Clean and inspect parts. Note: some floats contain sand for extra weight; if water is detected, replace float. Replace worn parts as necessary and lubricate parts with grease.

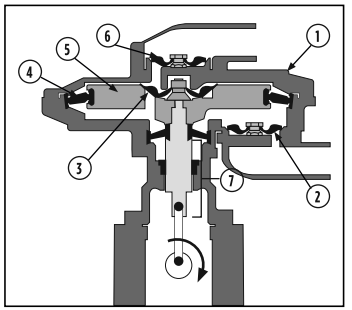
REASSEMBLY
All parts must be cleaned and gasket surfaces should be cleaned with a stiff wire brush in the direction of the serrations or machine marks. Worn parts, gaskets and seals should be replaced during reassembly. Refer to Figure 2.

1. assemble to cover with maximum torque of 20 ft- lbs; DO NOT OVER-TORQUE.
2. Assemble lever frame (3) to cover over locating pin (21) in cover. Secure with screws (8) and washers (30).
3. Install new orifice button (11) flush to arm (22). Assemble lockwasher (34) and locknut (18) over orifice button but do not tighten.
4. Connect arms (10 & 22) and assemble to lever frame (3) with four pivot pins (12) and retaining rings (13); rings should snap over pins.
5. Adjust orifice button (11) so that orifice button arm (22) slopes away from cover about 1/16” when resting gently against seat (4). Secure button by tightening lockwasher (34) and nut (18).
6. Attach float (5) and guide shaft (20) by installing last pivot pin (12) into lever frame (3). Float should.
7. Lay new cover gasket on clean surface. Assemble gasket (6) and cover (2) over bolt holes in body (1).
8. Insert lubricated bolts (7) and tighten to the torques listed in Table 2.

VACUUM ASSIST SYSTEM

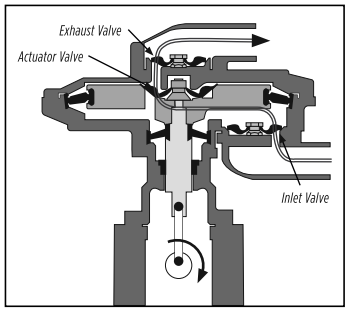
Theory of Operation
The vacuum pump is a key part of the priming system. Its function is to remove air and create a vacuum at the pump suction port while the centrifugal pump input shaft is rotating.

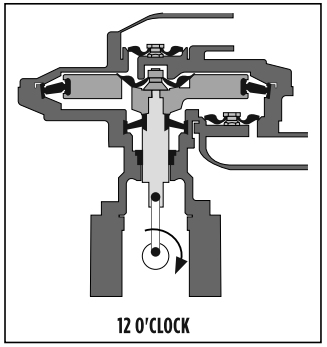
From the diagram, the key functional parts of the vacuum pump are:
1. Pump casing
2. Inlet valve
3. Actuator (piston) valve
4. Actuator seal
5. Actuator (piston)
6. Exhaust valve
7. Actuator (piston) rod assembly and crank

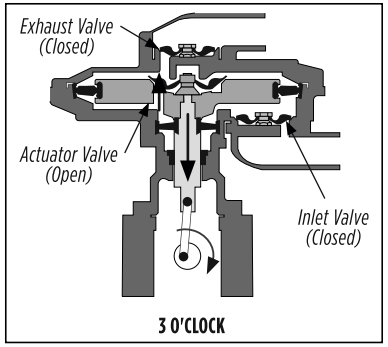


As viewed from its drive pulley, the vacuum pump rotates in a clockwise direction in order to evacuate air from the vacuum pump system.

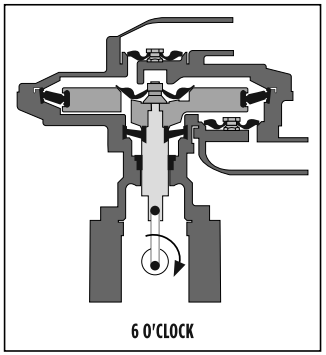
The air flow through the pump is through the inlet nozzle, passing the inlet valve, past the actuator (piston) valve at the center of the piston, through the exhaust valve, and out the exhaust nozzle.

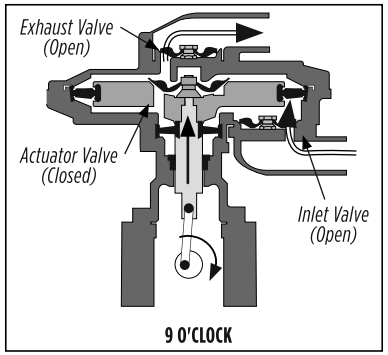






With the pump drive pulley operating from the 12 o'clock position, the piston rod and crank force the piston in a downward direction. Increasing air pressure below the piston closes the inlet valve and opens the actuator valve. Air is allowed to flow into the upper chamber of the pump casing (above the piston) until the drive pulley reaches the 6 o'clock position.





From the six o'clock position, the piston rod and crank force the piston in an upward direction. Increasing air pressure above the piston opens the exhaust valve and forces the actuator valve closed. Air is then pushed out of the area above the piston and through the exhaust valve until the drive pulley again reaches the 12 o'clock position.

At the same time, as the piston is pushed upward, a vacuum is created in the lower chamber of the pump casing (below the piston). The vacuum pulls the inlet valve open, and air flows into the pump past the inlet valve.

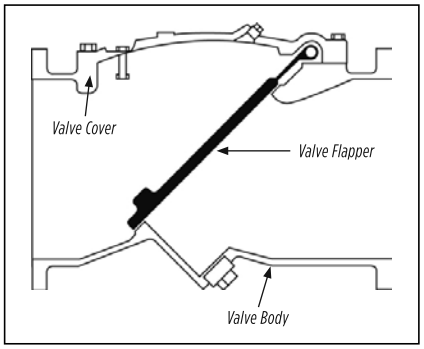
This cycle repeats itself until the inlet of the pump is closed either by the valves in the priming chamber or by closing the ball valve on top of the priming chamber. In the "closed" condition, no air enters the vacuum pump. The inlet valve, the piston valve, and the exhaust valve all remain closed. Without air entering the pump, minimal vacuum is created below the piston on its upstroke, so the inlet valve remains closed. Air flow is stopped through the pump. The pump can idle in this manner indefinitely or until a demand is made on it to again evacuate the system.

The vacuum pump is either top-mounted or side-mounted on MBH RPD series pumps. The pump can be serviced in either configuration, whether mounted to the centrifugal pump or removed.

DISCHARGE CHECK VALVE

Theory of Operation

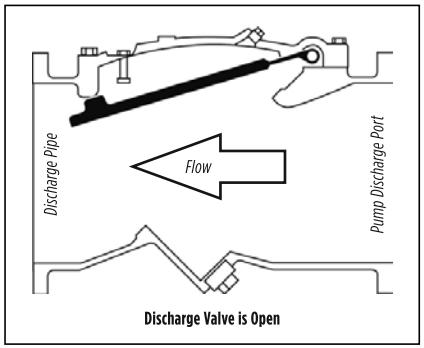
The function of the discharge check valve is twofold. One function is to provide a positive seal for the suction area of the centrifugal pump.



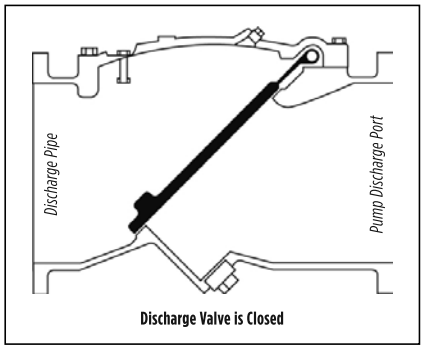
This is required when the centrifugal pump is priming. Outside air entering the priming system during priming will disrupt the vacuum system and prevent the centrifugal pump from priming. The other function is to prevent reverse flow through the pump when the pump is stopped.

When the pump begins to prime, the discharge check valve is closed. A positive seal of the suction area, including the pump end, the suction manifold, and the priming chamber is created. This positive seal is essential in order for the centrifugal pump to prime.

- When the pump is primed, discharge flow opens the discharge check valve.
- When the pump stops, or loses prime, the weight of the flapper inside the valve causes the valve to close again.



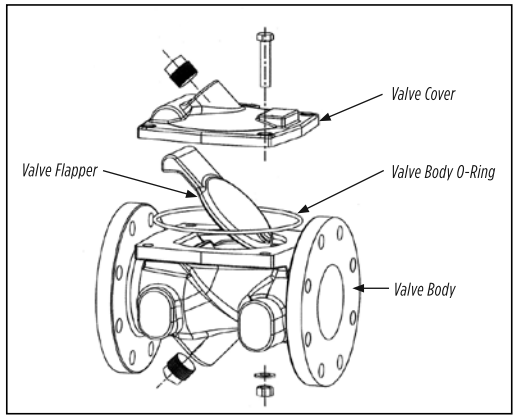
Discharge Valve is Open



Discharge Valve is Closed

Key Parts

The discharge check valve has few serviceable parts. All of them are easily accessed by removing the discharge check valve cover.



Disassembly

1. Remove the discharge check valve cover by removing the cap screws on the cover. Carefully lift the cover off the body of the discharge check valve.
2. Inspect the valve flapper for any defects, such as wear, cuts, or nicks that would prevent the flapper from making an airtight seal when it is closed. If there are defects, replace the flapper.
3. Inspect the discharge valve seat where the flapper valve closes. Check the seat for wear, cuts, grooves, or any other defect that could provide an air path through the discharge check valve when the valve is closed. If there are defects, either dress them with crocus cloth or replace the valve body.

Reassembly

1. Install the flapper valve.
2. Using a new valve body O-ring, carefully install the discharge check valve cover.
3. Install the cap screws and tighten them.

TROUBLE SHOOTING GUIDE

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
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.				

MBH® PUMPS

WARRANTY

AUTO PRIME PUMPS

The pump is warranty against defects in material and workmanship under normal use and service for the period of 15 months from the date of purchase or 12 months from the date of commissioning, whichever is less.

The General terms and conditions for above warranty are :

1. This warranty is valid only if the pump is operated strictly as per the Instructions given in the user guide attached herewith.
2. Our obligation shall be limited to rectifying; repairing or replacing defective items, ex-works/service station/Authorized Service Center, provided the purchaser has given immediate written notice. The equipment for repairs should be returned to us duly packed, on prepaid freight basis.

Model : _____ Pump Sr. No. _____

Customer Name : _____

Address : _____

Date of Purchase / Bill No.: _____

Dealers Name : _____

Signature : _____ Date : _____

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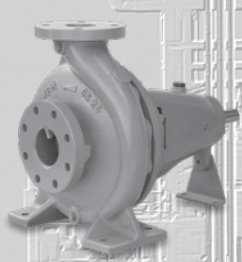
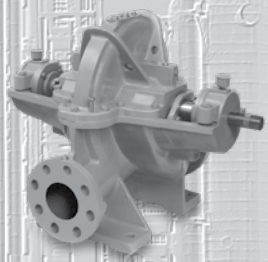
NOTE:

OTHER PRODUCTS



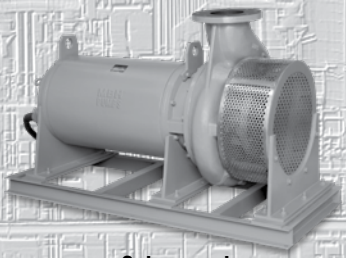
Centrifugal
Backpull Out Pump



Horizontal
Split Casing Pump

Submersible
Sewage Pump

Portable
Submersible Pump



Submerged
Centrifugal Pump

Polder
Pump

ISO 9001
Certified Company

MBH® PUMPS

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