Product & Chemical Disclaimer

The user must take responsibility in the selection of the products materials of construction. Empire Pumps Ltd will act in an advisory role and offer recommendations; however, the user is liable for the product selection in line with solutions and temperatures in which the equipment is operated.

Safety Precautions

WARNING: Prior to operating the pump read and understand the operating and maintenance instructions.

WARNING: Ensure the pump is compatible with the fluids and temperatures being transferred. Always consult Empire Pumps Ltd if there is any change in chemical concentrations or solution temperatures.

WARNING: Wear protective eye and personal equipment at all times when operating the pump. Follow standard safety procedures when handling corrosive or harmful solutions.

WARNING: Ensure all operators of this equipment have been trained for safe working practices, understand its limitations and wear safety goggles and equipment at all times.

WARNING: Correct procedures must be followed to drain the pump of all chemistries prior to physical inspection of the pump.

WARNING: Ensure air compressor discharge line is bled and relieved of all pressure prior to connecting to the pump.

WARNING: **Excessive Pressure.** Can result in serious injury or equipment damage. Do not service or clean the pump whilst the system is pressurised. Disconnect air supply line and relieve pressure from the system prior to disassembly.

WARNING: Never operate the pump above the specified maximum operating pressure of the pump.

WARNING: Suction and discharge connections must be compatible with the solutions being pumped and the maximum pressure capability of the pump.

WARNING: Maximum temperatures are based on mechanical stress only. Certain chemicals will significantly reduce the maximum operating temperature of the pump materials. Consult with the chemical manufacturer and Empire Pumps Ltd for solution compatibility and temperature limitations.

WARNING: The pump must not be used as structural support to the piping system. Ensure suction and discharge pipe-work are independently supported preventing stress on the pump parts.

WARNING: Use only Empire Pumps Ltd genuine spare parts to assure compatible pressure rating and longest service life.

WARNING: Re-torque all fasteners before operation. Excessive torque is unnecessary and may cause damage to the pump.

WARNING: Upon receipt of the pump, inspect for any signs of shipping damage. If damage has occurred contact Empire Pumps Ltd.

Important Checks

WARNING: **Static Spark.** Pumping of flammable solutions can cause explosion resulting in severe injury or death. Ground pump and pumping system.

Sparks can ignite flammable materials and vapours.

WARNING: Ground the pump and pumping system. The pumping system and object being transferred must be grounded when it is pumping, flushing, recirculating flammable materials such as paints, solvents, lacquers, etc. or used in a hazardous area where the surrounding atmosphere is conductive to spontaneous combustion. Ground the pump and any object to which material is being pumped.

Periodically check electric path and secure grounding points to avoid vibrations and the generation of contact or static spark.

Use correct ventilation.

Keep containers closed when not in use.

WARNING: **Diaphragm Rupture.** The pump exhaust may contain solution chemistry and contaminants. In the event of a diaphragm rupture solution may enter the pump exhaust. The pump exhaust must be piped to a safe location, away from the work area and personnel.

WARNING: Cold Environments. The pump must be drained of solution when installed outside or in an environment where temperatures will drop below freezing point.

WARNING: Stop the pump once the solution has been transferred. Operating the pump with high inlet air pressure and no solution will cause premature fail of the pump parts.

WARNING: It is recommended the pump is operated with low air inlet pressure on initial start-up. Once the pump chamber is filled with solution, the pressure can be increased to reach the desired flow rates.

WARNING: Suction: Pumps should be restricted to a maximum positive suction pressure of 0.4 bar otherwise premature diaphragm failure may occur.

Installation

- Re-torque all fasteners before operation.
- The pump-unit should be securely fastened to a solid foundation which will enable the support of the entire pump-unit.
- Locate the pump as close to the fluid supply as possible.

- Suction and Discharge pipe-work must be independently supported preventing potential strain on the pump plastic parts.
- Do not use metallic piping with plastic pumps.
- The suction and discharge pipe-work must be aligned to avoid placing stress on the pump casing.
- Use minimal number of bends at the suction and discharge of the pump.
- Pump suction. If bends cannot be avoided ensure bends are kept a minimum of 10x the pipe diameter away from the suction.
- The suction line must be clean of impurities and foreign particles.
- Inlet and outlet connections are the responsibility of the end user. The bore sizes of the connections should be the same or larger than the pump inlet and outlet.
- When transferring solutions containing solids above the recommended size suitable for the specific pump size. It is recommended a suction strainer is used. It is imperative the suction strainer is periodically maintained, and the pump is never starved of solution. The strainer only acts to prevent solids entering the pump inlet.
- The accumulative clearance of the holes in the strainer must be 5 to 10 times of the pump inlet diameter.
- Air exhaust lines must be the same size or larger than the specified pump size
- A clean lube free airline is required.
- An inlet filter should be used to provide a clean air supply below retention of 50um.
- Disconnect air inlet supply from the pump if it is left idle for a few hours.
- Pumps must be installed in the upright position.
- Keep the suction line to a minimum.
- Secure the Air Operated Diaphragm Pump feet to a suitable surface to insure against damage and vibration.
- Suction: Pumps should be restricted to a maximum positive suction pressure of 0.4 bar otherwise premature diaphragm failure may occur.

Start Up:

1. Check the pump is installed to operating manual recommendations.
2. Open the suction valve and allow the pump to fill with liquid (if flooded suction)
3. Open the discharge valve.
4. Partially close the discharge valve to 75% closed and 25% open.
5. Start the pump slowly by regulating the compressed air entering the pump.
6. Once the pump is operating gradually open the discharge valve and increase the air inlet pressure until the desired flow is achieved.
7. Stop the pump once the solution has been transferred. Operating the pump with high inlet air pressure and no solution will cause premature fail of the pump parts.

Shutdown:

1. Slowly close the suction valve and allow the pump chamber to be pumped empty of solution.
2. Turn off the air supply to the pump.
3. Close the discharge valve.

Maintenance

During the warranty period of the equipment, disassembly and assembly of the pump are allowed only by Empire Pumps Ltd personnel or personnel authorized by Empire Pumps Ltd. All of the operations below must be done exclusively by qualified staff and in full accordance with the detailed procedure.

Inspection

Periodic inspections are recommended to substantiate the condition of the internal parts. It is advisable the pump is flushed and neutralised a minimum of once in every 12 months. If a problem has occurred see below procedures ‘prior to disassembly’ and ‘disassembly’.

Procedure prior to disassembly

Prior to maintenance ensure the pump has cooled from hot liquids before disassembly procedure. It is possible the pump has transferred toxic liquids, so it is necessary to wear personal protective equipment at all times.

After the initial visual, non-contact examination of the pump it is recommend that the pump be removed from service as follows:

1. Use antistatic equipment to clean the external surface of the pump.
2. The pump has rotating parts when in operation. Follow safety standards for locking out the motor from the power supply during maintenance.
3. Disconnect the air supply. Every operation on the equipment has to be done after disconnection of the air supply.
4. Caution some internal liquids can have dangerous reactions in contact with water
5. Prior to pump disassembly, make sure the internal liquids have been removed and the pump has been fully flushed and neutralised. The pump must be drained and decontaminated. The liquid has to be collected and eliminated according to environmental laws.
6. Prior to opening the pump all internal pressure must be relieved.

Diaphragm Service Kit

1. Remove manifolds and pump outer chambers. With manifolds and outer chambers removed, remove diaphragm assemblies from diaphragm rod.

2. Not all inner diaphragm plates are threaded. Some models utilise a connecting hole positioned in the inner diaphragm plate. To separate a diaphragm assembly, grip the inner plate and turn the outer plate counter clockwise to separate the assembly.

   Inspect diaphragms, inner and outer plates, diaphragm rod for wear, chemical attack or deformities. Clean or replace any components which have excessive wear, deformities or dirt build-up

3. Reassembly. There are two different types of diaphragm plate assemblies.

   a. Threaded stud outer plate, diaphragm and a threaded inner plate.
   b. Outer plate with a threaded stud, diaphragm and an inner plate with a through hole.

   Secure inner plate vice and ensure the plates are installed with the outer radius against the diaphragm.

4. Lubricate the inner faces of both the outer and inner diaphragms with lithium grease or equivalent O-ring lubricant. PTFE overlays do not require lubricant.

5. Push the threaded outer diaphragm plate through the centre hole of the diaphragm. As standard, most diaphragms are installed with the curved side of the diaphragm facing towards the fluid side (see schematic exploded view detailed on the parts list). ½'' & 1'' non-metallic pumps are installed with the curve side of the diaphragm facing the air side.

6. Thread or place the outer plate stud into the inner plate. Tighten the plates on both sides to 39nm. Ensure both sides are correctly tightened.

7. Utilise the sealing washer (when used) and bumper to fix the assembly onto the diaphragm rod.

8. Position the diaphragm rod assembly into the pump and tighten the outer chamber in place using the capscrews.

9. On the opposite pump side, thread and tighten the assembly onto the diaphragm rod to 39nm. Note. Loosen assembly and rotate the diaphragms if alignment cannot be achieved – reassemble as previous.

Air Valve Disassembly:

1. Remove the four cap screws from the air valve body.

2. Remove the end cap and retainer and inspect the parts for deformities or excessive wear. Replace if necessary.

3. Push the sleeve and spool set out of the air valve body.

4. Clean parts or replace if damaged.

Air Valve Assembly:

1. Prior to reinstalling it is recommended the components are lubricated.

2. Re-install the spool set into the air valve body.

3. Check O-rings are in position and not pinched.
4. Re-install end cap and retainer.

Pilot Sleeve Disassembly:

1. Remove the four cap screws from the cap air inlet assembly.
2. Remove the gasket air inlet cap.
3. Remove the pilot valve assembly.

Pilot Sleeve Assembly:

1. Prior to reinstalling it is recommended the components are lubricated.
2. Assemble O-rings onto pilot sleeve spool. Note. The items must be installed in line with the schematic exploded view shown in the parts list.
3. Insert the assembly into valve body.
4. Re-install the pilot valve assembly.
5. Re-install the gasket air inlet cap.
6. Tighten four cap screws.

Pump Performance Characteristics

1. It is recommended the pump is operated at its optimum conditions and not within the first or last 15% of the pump performance curve. This is related to both flow and pressure characteristics of the pump.
2. The maximum flow, pressure and duty points of the pump are calculated when using water. Solutions with increased specific gravities or viscosities will decrease the performance of the pump.
3. Installation piping arrangements will affect the pump performance. Elbows and pipe reductions will significantly reduce the pump flow.
4. Assistance with pump selection and guaranteed flow rates is available when contacting Empire Pumps Ltd.

Warranty

Empire Pumps Ltd warrants this pump product to be free of defects in materials and workmanship for a period of two years from the purchase date.

It does not cover installation or system design faults, pumps seized due to deposits or damaged packaging and Empire Pumps Ltd is not liable for consequential losses.

If a warranted defect, which is determined after inspection by Empire Pumps Ltd, occurs within the 24 month warranty period, it will be repaired or replaced as per the manufacturer's decision. Proof of purchase is required, along with a manufacturing serial number, data code and date of purchase.

This warranty does not apply to any other equipment used or purchased in combination with this product. The manufacturer accepts no responsibility for product damage or personal injuries sustained when the product is modified in anyway. This warranty shall not apply to products which have been used other than for their intended use, misuse, negligence or accident.

Empire Pumps Ltd shall not be liable for damage or delays caused by defective material, nor shall be liable for incidental or consequential damages, process down time, loss of production, loss of production costs, transportation costs, labour costs, product installation or removal costs, or loss of profit. On any and all events, the manufacturer liability shall not exceed the purchase price of the product and/ or accessories.

De-contamination of Hazardous Solutions

Prior to returning equipment to Empire Pumps Ltd for refurbishment or inspection, the equipment must be fully flushed, cleaned and neutralised in accordance with the chemical hazard, safety packaging regulations and Health & Safety at Work Act 1974.

The equipment must be decontaminated and must be flushed of all dangerous chemicals in accordance with environmental laws.

Declaration of conformity

Manufacturer: **Empire Pumps Ltd**

Unit 4, Guide Bridge Trading Estate, South Street, Ashton-Under-Lyne, OL7 0HU, United Kingdom

This declaration of conformity is issued under the sole responsibility of Empire Pumps Ltd. This declaration certifies that Air-Operated Diaphragm Pump EPA series, Magnetic Driven Pump EPM series, Drum Pump EPD series, Self-priming Pump EPS series comply with the European Community Directive 2006/42/EC on Machinery, according to Annex VIII. This product has used Harmonized Standard EN809:1998+A1:2009, Pumps and Pump Units for Liquids - Common Safety Requirements, to verify conformance.

The conformance is valid only if the pump is used for the liquids communicated by the customer and for the pump characteristics required with regard to the quotation. Empire Pumps Ltd does not take any responsibility for its pumps unless the customer operates the equipment strictly in accordance with the operation and instruction manual.

Signed for and on behalf of Empire Pumps Ltd

Peter Zhang, Director of Operations: .....

Ashton-Under-Lyne, November 2019

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