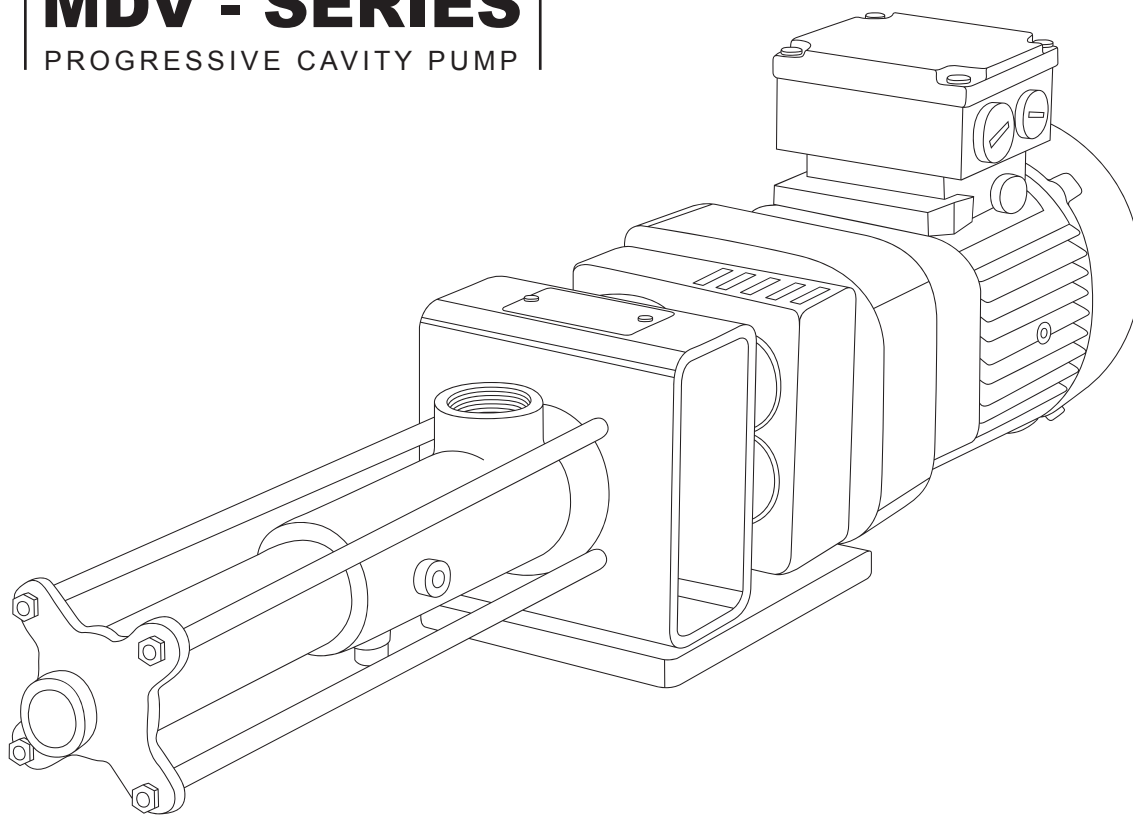


INSTALLATION, OPERATION & MAINTENANCE MANUAL



MDV - SERIES

PROGRESSIVE CAVITY PUMP



! Read and understand this manual prior to installing, operating or maintaining this pump !

DATE OF PURCHASE: _____

SERIAL #: _____

CONTACT #: _____

P.O. #: _____

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 2



CHAPTER NO.	INDEX	PAGE NO.
1.0	GENERAL	3
2.0	SAFETY	5
3.0	TRANSPORTATION, HANDLING & STORAGE	8
4.0	MOUNTING & INSTALLATION	10
5.0	START- UP / SHUT-DOWN	15
6.0	DISMANTLING	18
7.0	RE-ASSEMBLY	20
8.0	SECTIONAL DRAWINGS	24
9.0	MAINTENANCE	28
10.0	TROUBLESHOOTING	31

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 3



1.0 GENERAL

1.1 APPLICATION ,WORKING PRINCIPLE AND RANGE OF UTILIZATION

Liberty Process Equipment, Inc. MDV series pumps are developed for low flow applications that demand high accuracies and repeatability. These pumps can handle wide variety of fluids ranging from clean and clear liquids to abrasive, viscous and solid laden media. The repeatability accuracy has less than 1 % fluctuation. Available in 6 capacities and 3 pressure ranges, flow rates from 0.003- 2.2 US GPM (0.68-500 l/h) at 87, 174 & 348 psi (6,12 and 24 bar) differential pressure.

WORKING PRINCIPLE OF PROGRESSIVE CAVITY PUMP

The pumping element comprises of a precision-machined single external helix metallic rotor, and a double internal helix elastomer stator. Due to the special profile of the rotor and stator set, a sealing line is formed along the axis of the rotor which is maintained at both static and dynamic conditions. As the rotor turns within the stator, these cavities progress from the suction to the discharge end of the pump carrying the fluid.

Attention: The range of utilization and other fluid parameters are to be taken from the Pump Technical data sheet.

1.2. GENERAL INSTRUCTIONS

A requirement for the reliable operation of any pump is service & maintenance in compliance with these instructions. The instructions, described herein, in the current and subsequent sections of this manual cover the general installation, operation, maintenance and troubleshooting of the pump/pump unit. Follow-up of these instructions and recommendations will ensure both safety of attending personnel as well as satisfactory operation of the pump/pump unit.

Maintenance personnel, should, therefore, have access to these operating and maintenance instructions and strict adherence to the same be followed. Liberty Process Equipment, Inc. Pumps is not liable for the damages, of any kind, arising through non-observance of the instructions laid down in this manual.

WARNING! Non-observance or proper follow-up of the installation, operation and maintenance instructions may result in to either injury to the attending personnel or could even cause catastrophic failure of the pump/equipment.

NOTE: Individual contract jobs may have some specific provisions that vary from this manual. For detailed information and technical assistance to queries not described/replied in this manual, kindly refer to Liberty Process Equipment, Inc. Pumps.

1.3. MANUFACTURER

The pump has been manufactured by Liberty Process Equipment, Inc.

1.4. PERFORMANCE DATA

The performance data, e.g., pressure, speed, temperature & recommended power of the pump are to be taken from the order data sheet.

1.5. ABBREVIATION

The abbreviation i.e, range, size & model code of the Progressive Cavity pump is stated in the order data sheet.

1.6. SERIAL NO.& YEAR OF CONSTRUCTION

The commissioning number/serial number & the year of construction of the pump/equipment is stated on the nameplate fitted to the pump.

1.7. RELEASE NUMBER & DATE OF OPERATING INSTRUCTIONS

The release number and date of the operating instructions is stated on the cover page of this manual.

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 4



1.8. MODIFICATION NOTIFICATION

In case any modification in the pump/equipment is done either by Liberty Process Equipment, Inc. or carried out in agreement with Liberty Process Equipment, Inc., an amended set of operating instructions will be provided or the existing operating instructions will be supplemented by an additional set of sheets, along with a new cover sheet. The date of modification and modification index will be mentioned on the new cover sheet of the revised manual.

1.9. WARRANTY

Liberty Process Equipment's liability for any shortcomings in the supply is clearly mentioned in the conditions of delivery. Liberty Process Equipment, Inc. is not liable for any damages occurred/caused by non-compliance with the operating and maintenance conditions.

In case of any change in the operating parameters e.g., different fluid pumped, speed, viscosity, temperature or pressure conditions, the same must always be carried out in prior agreement with Liberty Process Equipment, Inc., i.e., it must be checked by Liberty Process Equipment, Inc. from case to case and confirmed, if necessary, whether the pump is suitable for the changed parameters. In case no special agreements were made by Liberty Process Equipment, Inc., pump/equipment supplied, may, during the warranty period, be de-commissioned/serviced only by Liberty Process Equipment's authorized personnel, otherwise, our liability for any defects will cease.

1.10. TESTING

Prior to leaving the manufacturing facilities, all pumps are subjected to a leakage and performance tests. Pumps, which operate properly and acquire the performance parameters, as assured by Liberty Process Equipment, Inc., only leave the factory. Thus, compliance with the following operating instructions ensures proper operation.

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 5



2.0 SAFETY

This instruction manual contains the basic instructions which are to be observed during installation, operation and maintenance of the pump/equipment. All personnel involved with installation, handling, lifting, operation or maintenance must, therefore, be well informed and updated concerning standards and principles that govern the work & carefully follow them. It is also recommended that a copy of this manual must always be available at the place of installation of the pump/equipment.

Not only the general safety rules listed in this main section “**SAFETY**” are to be observed but also the special safety rules included in the other sections of this manual, which are intended for private use.

2.1 SAFETY SYMBOLS

The safety symbols given below are printed in the manual as general hazard/danger symbols to mark the operating instructions contained in different sections of the manual which, in case of non-observance, may cause danger to the personnel or to the machine equipment.

User is instructed to follow the instructions given on the warning plates located on the pump/equipment, for e.g., the direction of rotation or signs for fluid connections used must always be observed and maintained under all conditions.



Danger to personnel/Hazardous situation



Danger from suspended loads



Risk of electric shock/Electrical hazard



Risk of injury from hot surface

2.2 PERSONNEL QUALIFICATION & TRAINING

Liberty Process Equipment, Inc. recommends that only qualified personnel carry out the operation, maintenance, inspection & mounting work of the pump/equipment. Areas of responsibility, scope of authority and staff supervision must also be exactly defined by the user. Proper training & instructions, if necessary, must be given to the personnel who do not acquire necessary knowledge. The user must also ensure that the contents of the instruction manual are fully understood by the concerned personnel involved.

The responsibility for carrying out the pump/equipment operations are broadly defined as, Any person responsible for or in charge of:

- Working with lifting gear
- Transportation
- Mounting a drive
- Setting up installations/assembly work in the plant
- Doing work on start-up, operation & maintenance
- Doing servicing

2.3 DANGERS IN CASE OF NONCOMPLIANCE WITH THE SAFETY INSTRUCTIONS

Non-observance of the safety instructions may result in both, danger to the personnel as well as to the environment and the equipment. Non-Observance of these instructions may also lead to the loss of any claims for damages.

Serious injuries and damage to equipment/property may result from:

- Improper use
- Unauthorized removal of necessary protection covers or the housing parts.

Following are the consequences which may result from non-observance of the safety instructions:

- Failure of essential functions of the machine/equipment.
- Danger to the personnel from electrical, mechanical & chemical influences.
- Danger to the environment & personnel from leakage of hazardous substances.
- Failure of specified methods for maintenance and servicing.

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 6



2.4 SAFETY WORKING

In addition to the safety instructions as listed in this manual, it is mandatory to observe the national rules for prevention of accidents currently in force and any other interval regulations as laid by the user for safe working.

2.5 SAFETY INSTRUCTIONS FOR THE USER / OPERATOR

- If there is a risk of danger from any hot or cold machine component, the user must fit protective guards to prevent such components from being touched.
- Protective guards to prevent accidental contact with moving parts must not be removed while the machine/equipment is in operation.
- All possible dangers from electricity must be eliminated (for details, kindly refer regulations in force, e.g. the regulations laid down by local energy supply associations).
- Leakages (e.g. from a shaft seal) of hazardous materials (for e.g. of explosives, toxic of hot nature) must be discharged in such a way so as not to result any risk to the personnel or to the surroundings/environment. Legal stipulations are to be observed.

2.6 SAFETY INSTRUCTIONS FOR INSTALLATION, MAINTENANCE & INSPECTION

- The user must ensure that only authorized & qualified personnel who has thoroughly read & understood the operating instructions and are adequately trained to operate the pump equipment carry out all installation, maintenance, inspection and service related tasks.
- It is instructed that the pump equipment should be brought to a standstill i.e., electrical power supply turned off before work is carried out.
- The pump/equipment must not be under any pressure and must have cooled off. It is to be ensured that before the dismantling of the pump takes place, the pipes are free from any kind of residual pressures and are empty or isolated by proper valving. All procedures mentioned in the operating instructions of this manual for decommissioning of the pump/equipment should be adhered to.
- Pump/equipment which convey harmful media must be decontaminated.
- Immediately after the maintenance work is finished, all safety devices and protection guards must be reinstalled, in position and, wherever applicable, re-activated.
- The pump must not be started until it is being properly secured to the foundation/base.
- It is instructed to integrate the pump unit in an emergency stop system, i.e., the start system of the drive motor is provided with a direction inverter, stop-go button and emergency stop button (together with the pump), in such a way that the pump can be operated safely.
- A Progressive Cavity pump is a positive displacement pump capable of generating high pressures. Therefore, for preventing the possible overload of pressures, e.g., due to accidental closure of a valve, it is advisable to fit a safety device such as a safety relief valve or other pressure-limiting device in the discharge piping.



Starting a pump with a blocked delivery line and without adequate relief protection may cause a catastrophic failure of the pump and possible injury to the operating personnel.

2.7 UNAUTHORIZED MODIFICATIONS AND MANUFACTURE OF REPLACEMENT PARTS

Reconstructions, modifications or charges to the pump/equipment are only admissible with the prior agreement of the manufacturer. Original manufacturer replacement parts and manufacturer-approved accessories enhance the operational safety of the pump/equipment. Liberty Process Equipment, Inc. does not undertake any liability for the consequences resulting from the use of unauthorized parts.

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 7



2.8 PROHIBITED MODE OF OPERATION

- The operational safety of the machine/equipment supplied is warranted only for employment in accordance with the intended use.
- The machine/equipment has been designed in accordance with the prescribed conditions of use.
- The limit values for use are laid down in the conditions of use and it is therefore instructed to never allow these values to exceed.

2.9 POINTS FOR USE OF LIBERTY PROCESS EQUIPMENT MDV SERIES PROGRESSIVE CAVITY PUMP

Liberty Process Equipment, Inc. recommend that the pump/equipment must be used for the purpose only for which it was sold. It is, therefore, advised that in case of any change in the operating parameters, for e.g., temperature, viscosity, percentage of solids, liquid composition etc., the user must consult with the supplier or original manufacturer for the suitability or original of the pump/equipment in the new process/medium. This is more important when dealing with highly aggressive, chemically reactive or otherwise hazardous substances.

The criteria for safe usage of pump include:

1. Compatibility with the medium.
2. Suitability for seal design/material, especially the shaft seal.
3. Resistance to pressure & temperature of the medium.

A blockage or closure of a valve in the discharge line can cause a pressure rise as high as cannot be tolerated by the installation. This can even result in the bursting of the pipes, which must be avoided especially in case of hazardous media. It is, therefore recommended to use safety equipment, for e.g., an emergency stop button, cut- off device, a pressure relief valve with return pipe or a bursting disc. These devices are generally supplied by the system supplier or the user.

During the servicing/maintenance or de-commissioning of the pump/equipment, kindly note the following:

- Ensure that while the pump is being opened, all necessary instructions for handling the medium (e.g., protective clothing, safety gloves, safety shoes, no smoking etc.) should be followed.
- Ensure that the pump drive cannot be turned on without the consent of the authorized personnel.
- Ensure that all safety devices and protection guards (e.g., safety relief valves etc.) are properly reinstalled, in place, before the pump is being put back in to operation.

2.10 MDV SERIES INSPECTION & REPAIR

The legal regulations for safety at work such as regulations for the workplace governance of hazardous materials accidental prevention, environmental protection for e.g., regulations concerning disposal of worn-out components of the pump/equipment and water balance comply to all commercial business to protect their employees and or other concerned personnel and the environment from adverse effects caused by contact from the hazardous materials.

All necessary information must be given in the section “**MAINTENANCE**” for careful emptying & cleaning of machine/equipment and to follow special safety whenever necessary.

The safety conformity certificate is a part of the inspection/servicing activity to be carried by the user from time to time. However, the manufacturer reserves all rights to reject acceptance of this order / services for other reasons.

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 8



3.0 TRANSPORTATION, HANDLING & STORAGE

3.1 TRANSPORTATION & HANDLING

Depending on weight, *Liberty Process Equipment, Inc.* Progressive Cavity pumps must be transported with appropriate transport modes. Always comply with the transportation instructions mentioned on the packaging. The symbols applied to the packaging must be observed.

During transportation & storage, the suction and outlet ports and auxiliary connections of the pump must be closed with plugs. However, during installation of the pump accessories, the plugs are to be removed. Place equipment under adequate protection immediately upon receipt. Improper storage can damage the equipment which would result in a non-warranty situation. Upon receipt of shipment, carefully inspect the pump, driver assembly and other devices (safety, monitoring etc.) to ensure that none of the components are missing or damaged. Any damage must be reported promptly to the carrier and to Liberty Process Equipment, Inc. or its authorised distributor, from where the equipment has been purchased. Claims against damage/loss should be made at the time of receipt.

The pump/pump unit (with driver assembly) should be lifted with appropriate lifting devices securely attached to the pump/pump unit.



Rough handling and incorrect selection of lifting points can cause permanent distortion of the pump/pump unit base and/or casing which will affect the close operating clearance between the rotor and stator.

For safe handling during installation and maintenance, the following four points must be taken care of to avoid any damage to the component or personnel injury:

- The position of slings will depend on specific pump model and mounted accessories.
- If eyebolts are provided, they should be used for lifting.
- Experienced personnel should carry out handling.



The eyebolts are only designed for the weight of the pump/pump unit. Do not attach any additional loads!



Avoid suspension of the pump unit with eyebolts of the motor or gearbox. These eyebolts should only be used for lifting of the motor/gearbox.

Since there are variety of pump designs and applications, the instructions covered under the manual are general instructions only. However, these instructions are sufficient & understandable for the operator/user. In case of any doubts in the same, please confirm from Liberty Process Equipment, Inc. for clarifications.

3.2 STORAGE

Unless otherwise indicated in the Pump Technical data sheet, Liberty Process Equipment, Inc. are supplied with preservation only for the duration of transport. The standard preservation is for a period of 90 days. Before installation, the external and internal preservations should be removed.

3.2.1 SHORT TERM STORAGE

When a pump/pump unit is not to be installed immediately or the pump is not under operating condition for some time after being installed, the following points should be taken care of:

1. The pump should be kept in clean and moisture-free area preferably, with protective covering.
2. Pump should be kept after draining out the pumping liquid and preferably after flushing it a compatible fluid media.
3. Anti rusting oil or suitable agent must be applied on metallic parts and also on those exterior, unpainted surfaces subjected to corrosion.
4. Ensure that the openings through suction and discharge ports are covered with special rubber cups.
5. Refer original manufacturer instructions for storage of other items like drive motor, gearbox etc.
6. Protect the pump and driver assembly with plastic or canvas covering.
7. Fill Cast iron or Cast iron fitted pumps with oil or a suitable preservative.
8. Stator of the pump has to be removed and kept separately in a clean, cool and dry environment. This is done to avoid occurrence of break away torque which may develop as the elastomer line between the rotor & stator become permanently distorted compression-set.

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 9



3.2.2 LONG - TERM STORAGE

If the pump/pump unit is to be stored for more than six months, then the following procedures are to be done on a regular basis (e.g., after every 2-3 weeks), in addition to the points discussed above:

1. Always fill the pump with fluid and give one or two rotations to the pump to avoid the rotor setting in the stator.



Never give more than two rotations at a time to the pump when stored for a prolonged duration as it may cause damage to the rotor/stator elements.

3.2.3 GENERAL INSTRUCTIONS FOR STORAGE OF ELASTOMER COMPONENTS

1. Most of the rubber-made products, e.g., stator, O-rings, gaskets, water thrower etc. may change their physical properties under non- favourable conditions or if not treated properly, which might result in a shorter lifetime.
2. These rubber products may also become unusable through excessive hardening, ageing, regenerating or permanent deformation, also because of blistering, cracking or any other damages appearing of the surfaces.
3. Properties of these components may also get changed if these are under the influence of oxygen, heat, light, humidity, solvent, and ozone or because of prolonged storage under tension. If the rubber products are stored and treated properly, their properties can be maintained for a longer duration (some years) almost unchanged. This does, however, not apply to any uncured rubber components.

3.2.4 INSTRUCTIONS FOR STORAGE SPACE

Following instructions should be followed while storing the pump or its components in a storage space:

1. The storage space/room should not be damp. Ensure there is no condensation taking place inside the room (most favourable condition for storage is an environment with under 65% R.H.).
2. Any solvents, oils, greases, lubricants or chemicals should not be kept in the room where pump, or its components are stored.
3. Any equipment which is likely to produce ozone e.g., electric motors or other equipment which might generate sparks of any other electrical discharges. The same should not be stored in the storage room as ozone is highly aggressive and harmful.
4. Elastomer components must be protected against light, particularly from direct sunlight or artificial light with high UV content. These components should also be kept away from ventilation (e.g., draught) by wrapping them up.
5. The environment for storage of rubber components should be dry, dust-free, cool and well ventilated. These components must not be stored in open environment (e.g., in a weather sheltered space).

3.2.5 INSTRUCTIONS FOR STORAGE OF OTHER PUMP PARTS



Support the rotor with wooden blocks and cover up against harm from mechanical impact.

1. Pump parts in Stainless steel - No grease coating necessary.
2. Other Pump Parts (Non-coated) - Protection with grease is necessary.

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 10



4.0 MOUNTING & INSTALLATION

4.1 INSTALLATION & MOUNTING OF THE PUMP UNIT

4.1.1 PRECAUTIONS TO BE TAKEN DURING INSTALLATION OF THE PUMP/EQUIPMENT

It is advised to leave space around the pump good enough to carry out maintenance and adjustments.

Avoid mounting the pump at places where the ambient temperature is not within the pump operating temperature limits (Refer Technical data sheet of the pump). In case the pump/equipment is installed in open environment, it is recommended that the pump/equipment should be protected from frost or other climatic effects (e.g., rain, thunderstorm, dust etc.). A discharge pressure relief valve will protect the pump & installation.

NOTE: The grease normally applied on the rotors for protection against rust, etc., should be removed before installing the stator. The rotor must be thoroughly cleaned in order to avoid unsuitability of the grease with the material of the stator and conveying fluid media.

It is advisable locating the pump as near as possible to the liquid supply source & using short and straight inlet pipelines, wherever possible, to ensure adequate flow of liquid to the suction port of the pump. The suction piping should be perfectly airtight. Even in case of discharge piping, it is always recommended to use shortest and straightest piping, as near as possible, to reduce the power requirements of the pump.

The installation of a withdrawal space element between the discharge flange and the piping (i.e., discharge piping) is recommended to enable both the stator and the rotor to be dismantled with ease without dismantling the complete pump unit from its support.

DISMANTLING LENGTH (in inches)

ELEMENT SIZE	STAGE		
	L	2	4
01	-	-	4.7244"
03	-	-	4.7244"
07	-	4.7244"	5.1181"
14	-	4.7244"	7.874"
30	-	4.7244"	9.4488"
80	4.7244"	-	-

4.1.2 PIPING CONNECTIONS

4.1.2.1 GENERAL INSTRUCTIONS

- The suction as well as pressure (i.e., discharge) piping should be arranged in such a manner that when the pump is not running, the fluid media is still present before and after pump operation. This fluid media, in a sufficient quantity, is required to remain inside the pump to ensure its lubrication during restart.
- If the installation is dry at standstill for process reasons, it must be ensured that the fluid media to be conveyed through the pump, is present at the delivery elements for the lubrication of these parts.
- The suction pipe should be perfectly airtight and made of suitable material so that it does not collapse due to the internal vacuum.

4.1.2.2 PIPING LAYOUT

Once the pump unit is installed on the foundation, the connection of the pipelines is to be done.

The following points are to be taken care of while the piping layout is being done:

- Pipe adaptors should be short and direct.
- All pipes should be fixed independently from the pump flanges.
- Bends should be laid out with largest possible radius.

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 11



- Pipelines, subjected to withstand elevated temperatures, must be provided with expansion joints, to absorb pipe expansion. Tensile or compressive loads on the pump may result in to distortions causing wear or seizure.
- For correct alignment of the piping connections, the mounting bolts should be inserted through the locating holes of the pipe flange and the pump flange. If the bolting is done by hand (hand push) and the flanges are parallel to each other, the piping connections are stress – free. However, it is recommended to maintain some clearance between the two mating flanges (of the pipe and pump) for allowing space for flange gaskets.

The nominal diameters of the suction and discharge flanges at pipelines should be designed according to the nominal diameters of suction and discharge flange of the pump.

Errors in the layout of the pipeline, e.g., excessively long or short diameter suction lines, too many bends, valves and elevated parts etc. are difficult to overcome in a pump, as the atmospheric pressure, which is the only limiting factor in this case and is a physical phenomena which is independent of any type of pump. These errors may lead to numerous operating faults such as cavitation, noise, vibration and faulty operation.

If the pump has a suction lift, the suction-side pipeline should be properly designed and adequately sized to reduce friction losses.

4.1.2.3 PIPING SUPPORTS

Piping connected to the pump by way of the flange connections, must be independently supported and stress-free. They must be supported close to the pump and should allow of easy screwing avoiding deformations of flanges. Any thermal stresses likely to occur at the pipelines must be kept away from the pump by following appropriate measures, e.g., installing compensating devices.

These should, in no case, be allowed to impose strains on the pump casing and must provide required expansion and contraction allowances, due to pressure and temperature changes in the equipment.



Pipe strain will lead to failure, malfunctioning or even distortion of the pump!

4.1.2.4 CLEANING OF THE PIPELINES

It is required that suction pipelines and valves, must, by all means, be carefully and thoroughly cleaned, rinsed and/or flushed, before the piping connections are made.

4.1.2.5 AUXILIARY PIPING

All auxiliary piping, used, as supply lines for shaft sealing arrangement and for the pump casing for heating and/or cooling of the pump should be stress-free.

In case of double mechanical seal, the sealing liquid lines must have largest possible cross-sectional area for flow. The outlet piping of the sealing liquid is at the highest connection of the mechanical seal housing. For automatic ventilation, it must be ensured that the pipelines should be continuously ascending, short and promoting easy flow, when laid down.

To prevent the formation of foam, gas bubbles and air entrainment, all return pipelines in recirculating systems should end well below the liquid surface in the tank/reservoir. Bypass liquid from safety relief valves and flow control valves should return back to the source, e.g., tank, reservoir and not to the pump suction line. If required, ventilation connections to these pipelines must also be provided.

The outlet piping of the heating/cooling liquid should be connected at the highest connection of the pump casing.



Return pipelines connected back to the pump suction can cause excessive temperature rise at the pump which could result in severe pump failure!

4.1.2.6 PIPING ACCESSORIES A. SUCTION STRAINER

Liberty Process Equipment, Inc. recommends the use of a strainer at the suction side, to ensure that no dirt, large contaminants or welding beads enter in to the system. The strainer provides a primary protection to all internal pumping elements and thus improves life of the pump. The strainer should be installed immediately before the inlet port (suction port). This specific location is highly advisable as it ensures easy cleaning or replacement of strainer element.

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 12



NOTE: Appropriate gauges or suitable monitoring devices must be provided for monitoring the pump pressure.

As a thumb rule, the total free flow area of the strainer must be 4 to 5 times larger than the cross-sectional free flow area of the suction pipeline. But at the same time, in case the fluid media bears a viscosity which is greater than 20 cSt, this free flow area in the strainer should be enlarged to 5 or even 6 times the size of the suction piping. The pressure loss over the strainer should be not more than 5 in. of mercury (5 in. Hg).

In addition, it is to be ensured by the user that the size and capacity of the strainer is adequate to avoid frequent cleaning or replacement of the strainer element.

In general, the suction strainers are to be used for any type of liquid media except for those fluids whose viscosity is very high. In such cases, the use of a strainer should be eliminated and instead a careful and proper flushing of the suction line is advised to remove all foreign particles.



Ensure that all debris and foreign particles which have accumulated either during fabrication, storage or installation, have been thoroughly flushed from the system piping before connecting the pump to the system. Even a single, large and hard particle may cause heavy internal damage to the pump, resulting in to a complete pump overhaul.

Particular attention should, therefore, be paid, to check and ensure that the suction piping between the suction strainer and the pump is properly cleaned.

NOTE: Manometers should be used in the suction piping, before and after the strainer to check when cleaning of the strainer is to be carried out.

B. CHECK VALVE (NON-RETURN VALVE)

Where the discharge head is high and the viscosity of the liquid is low, it is always advisable to install a check valve in the discharge pipeline. This valve protects the pump against reverse rotation in the event of backflow when the pump is shut-down and also allowing parallel operation of another pump running in the system.

C. SAFETY RELIEF VALVE

The safety relief valve is connected between the discharge and suction end of the pump and is to be connected to the discharge lines as close to the pumps as possible and with no other valving between the pump and the safety relief valve. The safety valve is used to protect the pump against over pressure as well as to minimize the starting torque of the pump.

However, the relief valve is only a safety valve and is never to be used as a control valve.



Liberty Process Equipment, Inc. Progressive Cavity Pump are a positive displacement type of pump and will deliver/ attempt to deliver the flow regardless of back pressure on the pump unit. Failure to provide overpressure protection to the pump can cause malfunctioning or rupturing or even seizing of the pump/pump unit and/or piping connections.



Starting against a closed discharge valve must be avoided so as to prevent excessive overheating of the recirculating medium, e.g., throttling effect.



Never set RV pressure (Relief Valve pressure) higher than the maximum pressure rating of the pump (including the pressure accumulation at 100% bypass).



Always remember not to connect the suction lines to the pump with the relief valve return lines, as these might cause overheating of the pump due to the formation of a closed loop.

D. MONITORING DEVICES

Pressure and Temperature gauges, Leak detection devices and other applicable monitoring devices are recommended for monitoring the pump's operating conditions. These gauges should be duly calibrated and easily readable. The pressure and temperature gauges needs to be placed as close as possible to the pump's suction and discharge flanges.

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 13



4.1.3 DIRECTION OF ROTATION

The direction of rotation of the pump is given on the type plate/model plate and in the order, as confirmed. The delivery direction of the pump is a function of the direction of rotation. In case any changes in the direction of rotation of the pump are to be made, the same must be done only in agreement with Liberty Process Equipment, Inc..



Operating the pump in the reverse direction may cause pump damage!

The direction of rotation is clearly marked by a directional arrow cast on the pump casing and is not to be confused with other directional arrows, i.e, suction & discharge.

4.1.4 ELECTRICAL CONNECTIONS

Before making any connections, ensure that the electrical supply corresponds to the specifications mentioned on the type plate of the motor/drive unit. However, the circuit diagram is located in the motor terminal box and is to be followed. The connections are to be done as given in the electrical equipment manufacturer's instruction manual. However, it is recommended to observe the safety regulations valid at the site of installation.



Always ensure that the Terminal box is not left opened before running the drive motor.

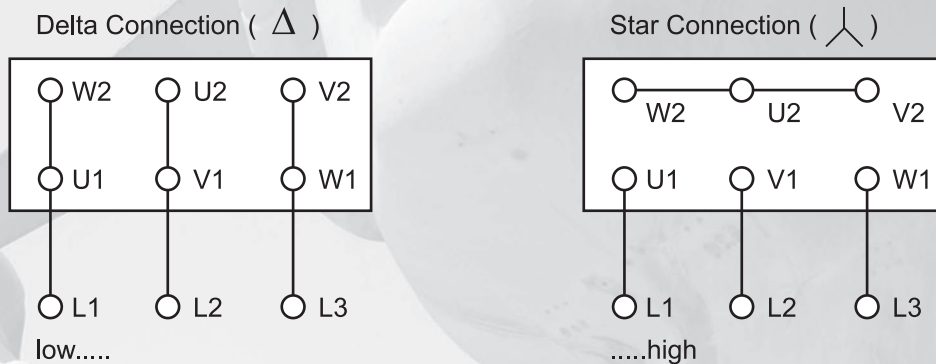


Check the insulation of the power cable sheaths before running the drive motor.



Do not run the drive motor if the insulation is poor.

Electrical connections should only be made using equipment suitable for both rating and environment. Normally, *Liberty Process Equipment* Progressive Cavity Pumps should be installed with starting equipment arranged to give direct on line starting (D.O.L.) to ensure maximum starting torque. When the motor is being wired and checked for the direction of rotation, ensure that the motor is not coupled with the pump. If any wiring or control device is to be fitted on the electrical equipment, they must be set in accordance with their specific instructions.



....Voltage indicating on rating plate

All work related to electricity shall be made by authorized and qualified personnel and the same should be in compliance with the requirements of relevant VDE and national regulations.

NOTE: Protection of all electrical equipment should be ensured for minimum safety requirement as per the environment and fluid being pumped in accordance with applicable safety rules.



Do not forget to connect the earthing points (grounds) of the pump!

Earthing points of electrical equipment should be connected when the pump is fitted with electrical drives and it is necessary that these be correctly connected as per the electrical equipment manufacturer's recommendations.

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 14



4.1.5 MOUNTING TOOLS & HOISTS

For mounting and installation of the pump/equipment, no special tools are required. However, the user is advised to keep the following tools near the installation site of the pump/equipment as may be necessary for installing, mounting, dismantling, re-assembling or repair:

- Set of spanners
- Torque wrench
- Mounting device
- Shims and distance rings, if necessary
- Bolt adhesive, e.g., Loctite® 243
- **Preformed clamping tool**

However, the user is advised to check the dimensions and weight of the Liberty Process Equipment, Inc. Progressive Cavity Pump to ascertain whether the available hoisting apparatus is safe for the assembly and fitting of the pump.

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 15



5.0 START- UP/SHUT -DOWN

5.1 INITIAL COMMISSIONING

5.1.1 BEFORE START - UP

The pump must not run unless all protective guards supplied with the equipment are in position.

POINTS TO BE TAKEN CARE OF BEFORE START-UP OF THE PUMP UNIT

Before the equipment is started, the following points should be taken care of:

- All the electrical connections comply with applicable safety rules.
- Remove any transportation fixtures.
- All mounting connections and fittings are properly tightened.
- Never reach in to the pump's suction port.
- Protection against frost or other climatic effects is done.
- Protection against presence of solid particle deposit is done.
- All parts in contact with carrying fluid media protected against corrosion.
- Inspect all piping and check for any leakage or stress in the system. Clean all pipelines, valves, reservoirs and strainer filters to ensure that all debris and foreign materials have been removed.
- Check to ensure that the pump's driving pump shaft can rotate without difficulty. If not, find the cause of blockage or friction and correct the problem. Although each pump is properly tested before it leaves our factory, the transportation and handling may cause some error or problem.
- Pumps fitted with mechanical seals may create some resistance on the pump shaft while the later is being turned/rotated.
- Pumps fitted with mechanical seals should always be filled either with the pumped liquid or with a neutral compatible liquid before the pump is put in to operation. This is required to protect the seal faces from running dry.
- The pumping medium must cover the pump suction flange completely, so as to avoid air access in to the pump when the later is in operation.
- Suction and discharge valves are open.
- Direction of rotation of the shaft is in accordance with the desired circulation direction of the product. Check the direction of rotation by switching on the pump motor and ensure that the motor is rotating in the same direction as indicated by the arrow marked on the type plate of the pump.
- In case the pump has a suction lift, the de-aeration valve in the discharge piping should be opened and liquid in the pipeline is to be filled. However, this is to be done only in the cases whenever a new installation or reinstallation of the pump/pump unit is there.
- The user must wear all protective clothing, (see **SAFETY INSTRUCTIONS 2.10** for details) while pumping hazardous liquids.

5.1.2 START - UP



Never operate the pump dry! Even few rotations of the pump in dry condition will damage the stator.

The dry running of the pump increases the friction between the stator and rotor, generating an unacceptably high temperature which develop on the inner surface of the stator. The overheating generated due to this leads to the burning of the stator material and the total failure of the pump.

For this reason, the pump must always be filled with liquid before starting (A threaded plug has been provided on the top of the pump housing for this purpose). The initial filling is not for priming purpose, but to provide the necessary lubrication of the stator until the pump primes itself. When the pump is stopped, sufficient liquid is normally trapped between the pumping elements to provide the necessary lubrication for restarting. If, however, the pump has been left standing for a long time or has been dismantled, it must be refilled with the conveying fluid and given a few turns before starting, to get sufficient lubrication between the rotor and stator.

NOTE: In case a continuous flow cannot be guaranteed in the plant, it is always advisable to install a Dry Running Protection Device, available as an optional accessory.

During the initial few minutes of operation, the following points are to be observed:

- Pumped fluid discharges from the delivery pipe.
- No vibration in the pump.
- No abnormal noises.
- No leaks from the sealing system.
- If a pressure gauge is installed, check the pressure to stabilize.
- No abnormal heating at the stator and shaft sealing.

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 16



In addition, the following instructions must also be followed at the time of start-up:

- The absorbed power as well as the suction and discharge pressure should be checked from the Pump Technical data sheet.
- Close the safety relief valve as soon as the pump has reached its rated speed.

It is also recommended that the following parameters be checked:

- Speed of the pump
- Pressure
- Viscosity of the conveying fluid
- Temperature of the conveying fluid
- Flow rate

These must correspond to the parameters (Refer Pump Technical data sheet) for which the pump was designed.

The Progressive Cavity Pump manufactured by Liberty Process Equipment, Inc. is capable of generating excessive pressures that may even result to bursting of the piping or vessels.

NOTE: Precautions must be taken when venting air in the system using hazardous liquids.

5.2 NORMAL OPERATION

5.2.1 PROCEDURE FOR START-UP

- Every time when the pump starts up, always ensure –
 - The conveying product to be pumped is present.
 - Suction and discharge valves are open.
 - Temperature of the conveying product to be pumped.

5.2.2 GENERAL OPERATING REQUIREMENTS

It should be ensured that for normal operation of the pump, the following conditions are met:

- Constant supply of the conveying fluid and electricity is there.
- Delivery pressure of the conveying fluid is stable and lower than the rated capacity of the pump model.
- Process operating requirements are met properly.
- Temperature of the conveying fluid is within the operating limits (as given in the Pump Technical data sheet).
- In case the Progressive Cavity pump is a part of the closed system, the discharge piping should be free from any trapped air (de-aerated) during operation.
- Once the pump is in running mode for some hours, check the tightening torque of the bolts and nuts after every 24 hours. (Kindly refer to the **MAINTENANCE** section of this manual). Repeat this check after every one week of pump operation.

5.2.3 CLEANING OF THE PUMP

The following points should strictly be adhered to, while the pump is under cleaning:

- Remove all dust and dirt which might corrode the pump body and/or its components.
- The procedures to be adopted for cleaning will depend upon the specific pump use and the conveying fluid media to be pumped.
- Put the pump in operating condition and use the suction port to supply the cleaning product. Ensure that the cleaning product is compatible with the fluid media to be pumped and the materials from which the pump is made.
- However, the cleaning time will depend on the process time of the pump. The pump needs to be stopped once the cleaning time is up.
- The piping at suction and discharge flange side has to be drained or blocked directly behind the pump connections.
- Residual liquid in the pump casing has to be drained through the taper plug in the pump housing.
- Residual liquid which may penetrate in transit or during pump disassembly always remain in the Rotor Stator Chambers.



Safety Clothing (hand gloves, apron, shoes etc.) must be worn during cleaning of the pump when aggressive or dangerous media are handled.

NOTE: In case of a fluid media that decants, the pump must be cleaned to allow a start-up without damage.

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 17



5.2.4 SHUT-DOWN PROCEDURE

Similar to what has been discussed before, regarding the start-up of the pump, the shut-down process in the pump is also dependent on the type of the fluid media being pumped. The process therefore defines the shutdown procedure. However, stopping the pump and then closing the suction and discharge valves constitutes the minimum procedure.

The following points must be taken care of in case the pump is kept idle, i.e, in non-running mode for a very long period:

- The pump should not remain unused for long periods. It is advisable that the pump should be operated at least once in a week, if possible. In case the pump remain idle/unused for longer periods, it is advisable to rotate the pump shafts, by hand, if possible, once in every two weeks.
- Any contact between the internal components of the pump may be detected by rotating the pump shaft by hand.
- In case the pump is put in to operation after a long period of time, it is advised to run the pump for a short period of time without any pressure to allow proper wetting of all rotating parts.

5.3 PROCEDURE TO BE FOLLOWED IN CASE OF ABNORMAL PUMP OPERATION

In case of any operating anomalies that occur in the pump during its operation such as:

- Pump does not start.
- Pump does not prime.
- Pump stops.
- Irregular or too low flow.
- Pump gives no flow.
- Pump creates abnormal noise and/or vibration.
- Pump overloads primer.
- Pump does not develop rated pressure.
- Pump stalls at start-up.

Proceed as under:

- Stop the pump in accordance with the shut-down procedure, mentioned above in Section 5.2.4.
- Isolate the pump from all piping connections (e.g., at suction, discharge).
- Refer Section 9 – “**TROUBLESHOOTING**” given in the operating manual and take remedial action accordingly.

5.4 AUTOMATIC CONTROL

The use of safety devices that automatically authorize or prohibit the pump in its operation is always recommended (e.g., Safety Relief Valves etc.).

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 18



6.0 DISMANTLING

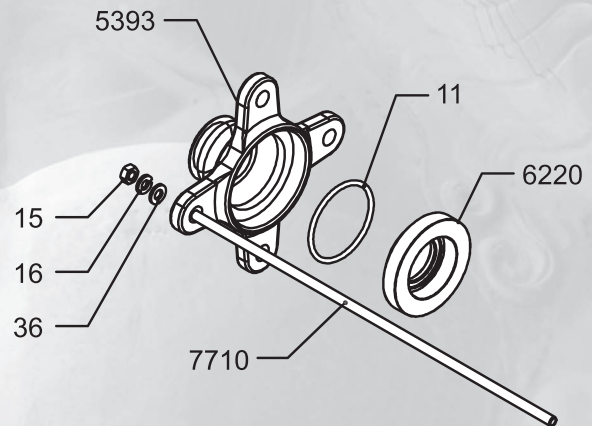
6.1 GENERAL INSTRUCTIONS BEFORE CARRYING OUT DISMANTLING OF THE PUMP / EQUIPMENT

- Before disassembling, isolate all electrical circuits.
- Close all isolation valves on the suction and discharge lines to the pumps for prevention of liquid escaping from the pipe work system.
- The persons carrying out the work should be adequately trained in general workshop practice, relevant to the class of work involved & taking care of safety measures.

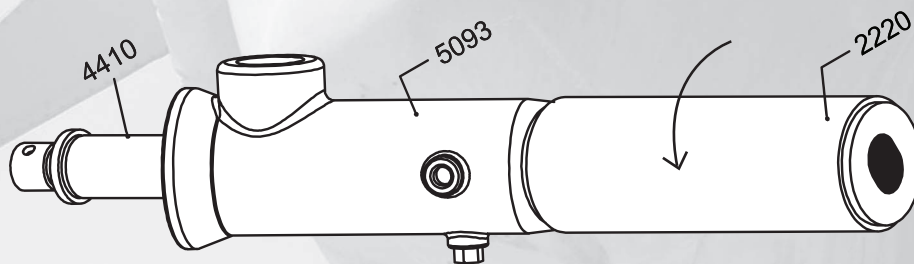
Described below is a step-by-step procedure for disassembly.

6.2 DISMANTLING INSTRUCTIONS OF THE PUMP

1.) Unscrew the Hex Nuts (15) fitted to the Tie Rods (7710) and remove the Spring Washers (16), Punched Washers (36), End Cover (5393) and Tie Rods (7710). Remove O-Ring (11) and Stator Support Ring (6220).



2.) To remove the Bonded Stator (2220) from the Pump Housing (5093), hold the Stub Shaft (4410) stationary and rotate the Bonded Stator (2220) in clockwise direction looking from the drive end. Move out the Bonded Stator (2220) from the Rotor (2511), away from the Pump Housing (5093). Now remove the Stator Support Ring (6220) and O-Ring (11), from the Pump Housing (5093).



3.) For dismantling the Rotor (2511) from the Coupling Rod (2610), proceed as follows:

- Remove the Holding Band (37) by cutting its through loop with the help of a metal saw. Drag out the Boot Seal (1511). Slip out the Pin Retainer Sleeve (2820). Remove Coupling Rod Pin (2910) from the joint. Collect the grease from the joint.



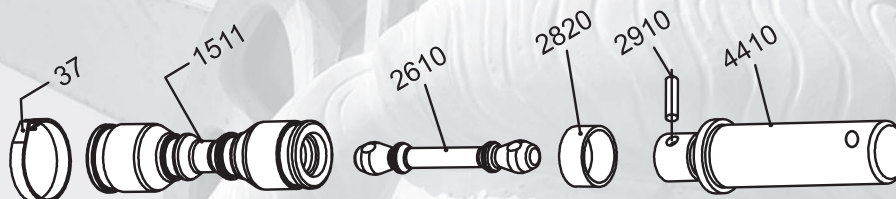
INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 19

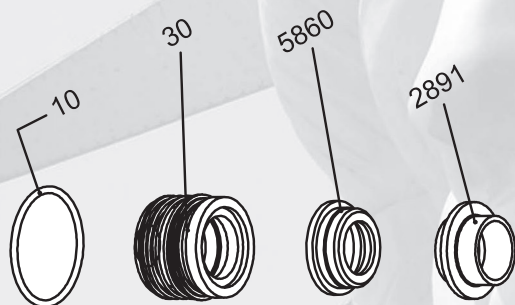


4.) Repeat Step 3 for the other Joint, connecting Coupling Rod (2610) and Stub Shaft (4410).

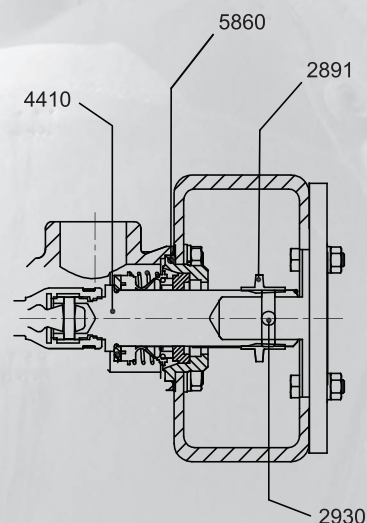


5.) For dismantling the Mechanical seal (30), proceed as follows:

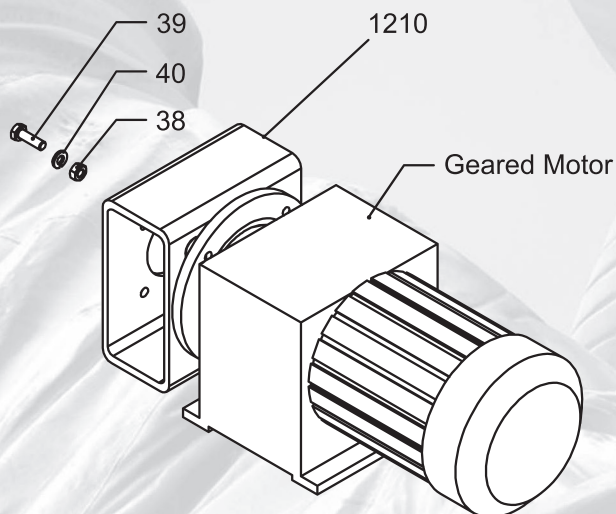
- Remove O-Ring (10).
- Remove Mechanical Seal Spacer (8590).
- Remove the Mechanical Seal Housing (5860) and take out Mechanical seal (30).



6.) Slide out Dowel pin Retainer (2891) and knockout Dowel pin (2930), connecting Stub Shaft (4410) to the Motor Shaft. Pull out the Stub Shaft (4410) from the Motor Shaft.



7.) Unscrew Hex Head Nuts, Hex Head Screws and Spring Washers (38, 39, 40) to detach Geared Motor from the Pump Lantern (1210).



INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 20



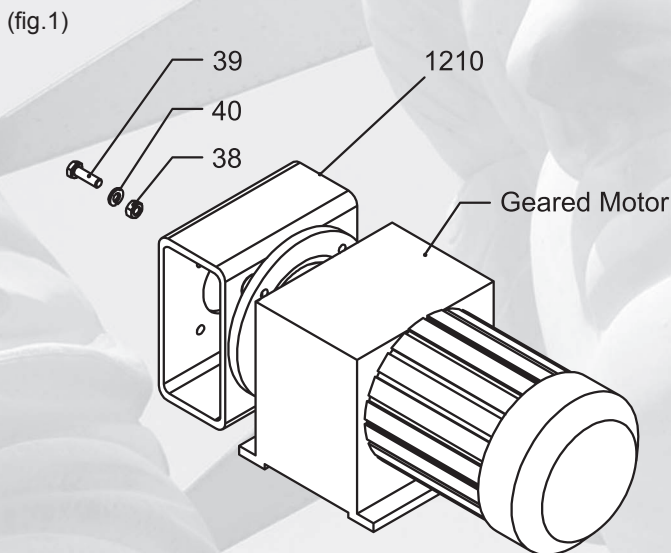
7.0 ASSEMBLY INSTRUCTIONS

(Assembly is recommended to be done vertically – motor side down)

7.1 GENERAL INSTRUCTIONS BEFORE CARRYING OUT ASSEMBLY OF THE PUMP / EQUIPMENT

- Clean all the parts and check them for wear/damage. The worn out/damaged parts should be replaced with original Liberty Process Equipment, Inc. Spares. It is always suggested to replace the old O-rings and gaskets of the pump with new ones.
- In order to store dismantled parts, use suitable antirust compound on the metallic surfaces of component.

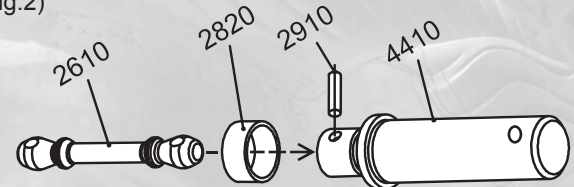
1.) Assemble Pump Lantern (1210) to the Geared Motor with Hex. Nuts (38), Hex. Head Screws (39) and Washers (40) (fig.1).



2.) For assembling the Coupling Rod (2610) with the Stub Shaft (4410) proceed as follows:

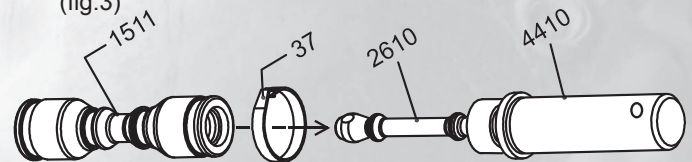
- Insert the Coupling Rod Pin (2910) after aligning the holes in the Coupling Rod (2610) and Stub Shaft (4410). Slide the Pin Retainer Sleeve (2820) over Coupling Rod Pin (2910) and secure it tightly. (fig.2)

(fig.2)



- Drag the Boot Seal (1511) in its position at End Cover (5393) side towards Coupling Rod (2610) and position it in the respective grooves. Pack grease inside the joint. (fig.3)

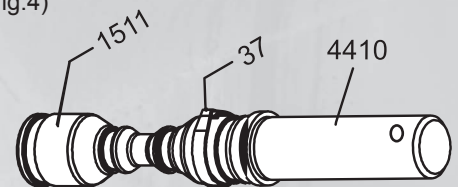
(fig.3)



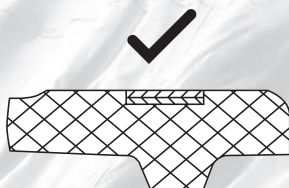
(For Qty. of grease to be filled, please Refer JOINT LUBRICATION in MAINTENANCE section of this Manual pg.29)

- Insert Holding Band*(37) in the preformed clamp tool. - Hold free end of Holding Band* (37) with the control lever, until the Holding Band gap is properly contracted and fitted against the holding band loop. Contract Holding Band*(37) carefully until it fits inside the circular groove of the Boot Seal (1511). (fig.4)

(fig.4)

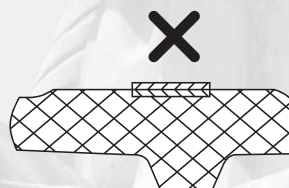


HOLDING BAND TENSION



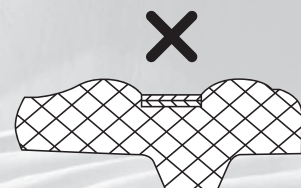
CORRECT

Holding Band (37) has slightly contracted outer form of the Boot Seal (1511) and sucked properly inside the groove.



INCORRECT

Too much slackness in the Holding Band (37); slippage may occur.



INCORRECT

Too much tightening; Boot Seal (1511) may get damaged or shear out.

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

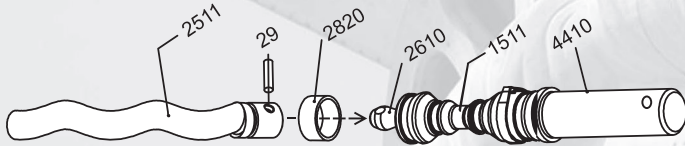
Pump Model: MDV - SERIES

pg. 21



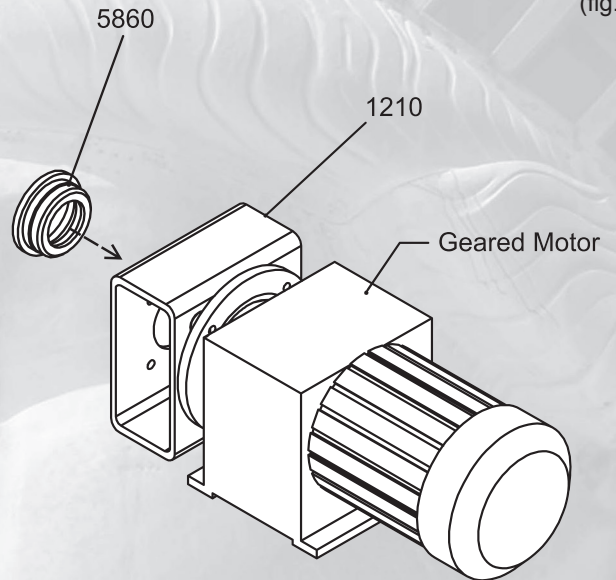
3.) Repeat the same for the other joint connecting the Coupling Rod (2610) and Rotor (2511) (fig. 5).

(fig.5)



4.) Insert Mechanical Seal Housing (5860) into the Pump Lantern (1210) (fig. 6).

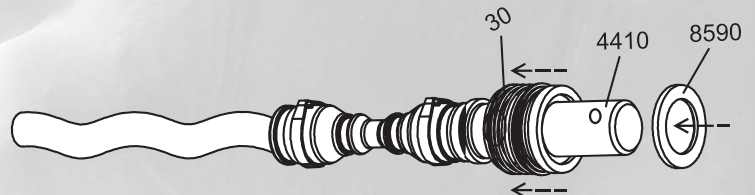
(fig.6)



5.) For assembling the Mechanical Seal (30) with the Stub Shaft (4410) proceed as follows:

- Slide the Mechanical Seal (30) onto the Stub Shaft (4410), taking extreme care to not damage any part of the Mechanical Seal (30).
- Place the Mechanical Seal Spacer (8590) on to the Stub Shaft until flush with the Mechanical Seal (30). (fig.7)

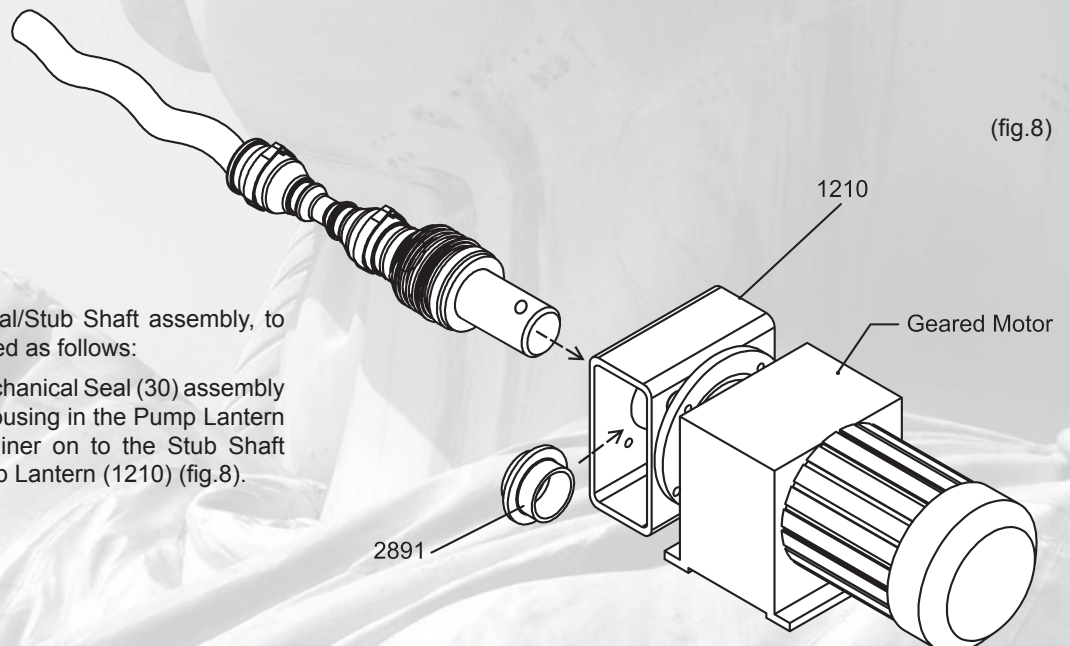
(fig.7)



6.) For securing the Mechanical Seal/Stub Shaft assembly, to the shaft of the Geared Motor proceed as follows:

- Insert Stub Shaft (4410) and Mechanical Seal (30) assembly through the Mechanical Seal Housing in the Pump Lantern and place the Dowel Pin Retainer on to the Stub Shaft (4410) on the inside of the Pump Lantern (1210) (fig.8).

(fig.8)



Continued on page 22

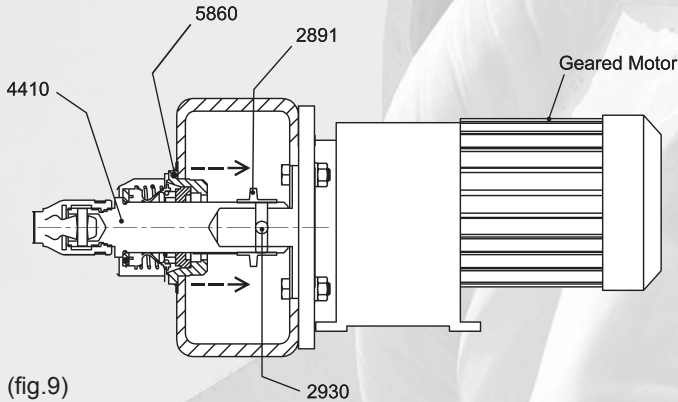
INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

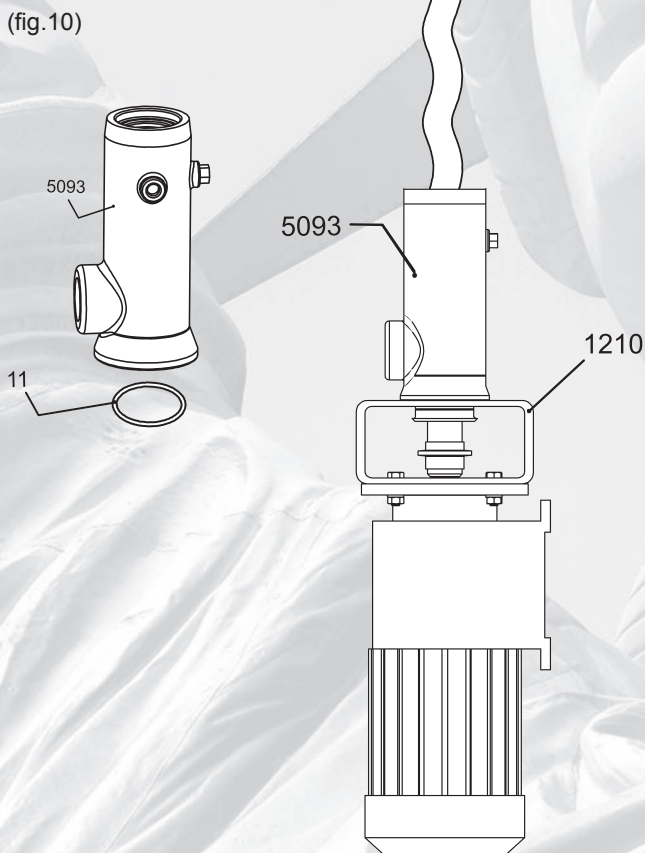
pg. 22



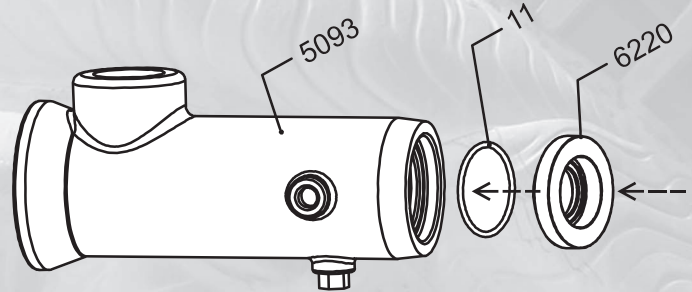
- Slide the Stub Shaft (4410) on to the drive shaft of the Geared Motor and align the hole in the Stub Shaft (4410) with the Hole in the motor shaft and insert the Dowel Pin (2930).
- Slide Dowel Pin Retainer (2891) over the Dowel Pin (2930) and secure it tightly. (fig.9)



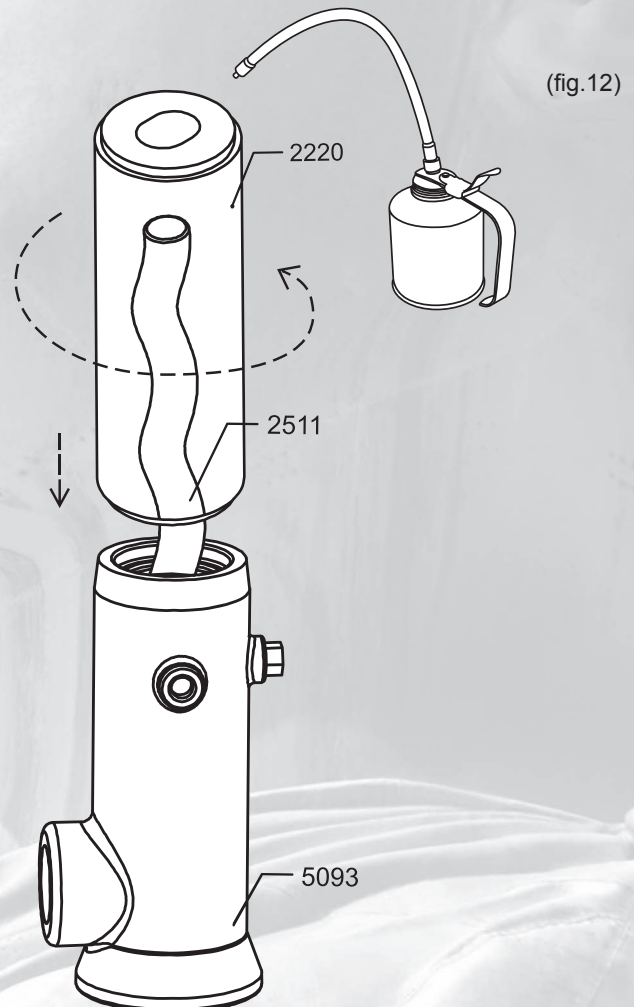
- 7.) Place O-Ring (11) on the Pump Housing (5093) with the O-Ring between the Pump Housing and Lantern (1210) then carefully place the Pump Housing (5093) onto the pump assembly. (fig.10)



- 8.) Place O-Ring (11) and Stator Support Ring (6220), on the Pump Housing (5093) with the O-Ring between the Stator Support Ring (6220) and the Pump Housing (5093). (fig.11)



- 9.) To assemble the Bonded Stator (2220), apply lubrication to the Rotor and Stator, then hold the Stub Shaft/Rotor assembly stationary and rotate the Stator (2220) in counter-clockwise direction over the Rotor (2511) and at the same time pushing the Stator (2220) towards the Pump Housing (5093), till it is flush with the Pump Housing (5093). (fig.12)



INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

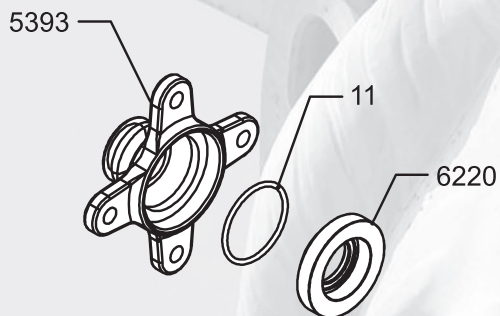
Pump Model: MDV - SERIES

pg. 23

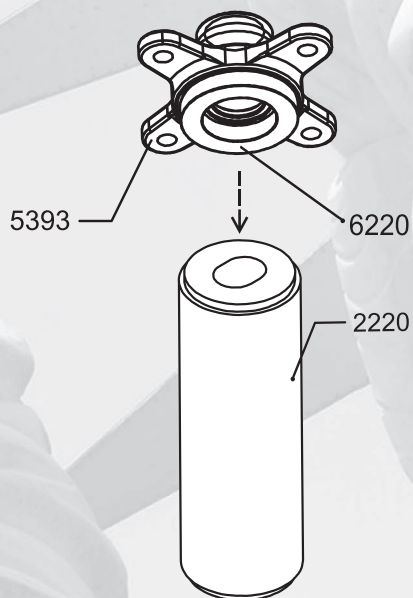


10.) For securing the Bonded Stator (2220) to the Pump Housing (5093) proceed as follows:

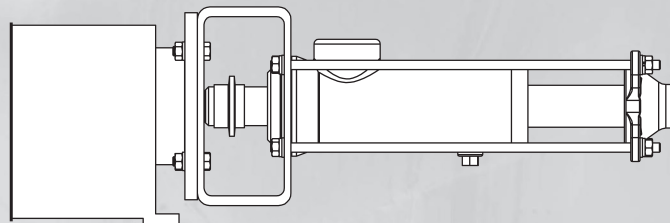
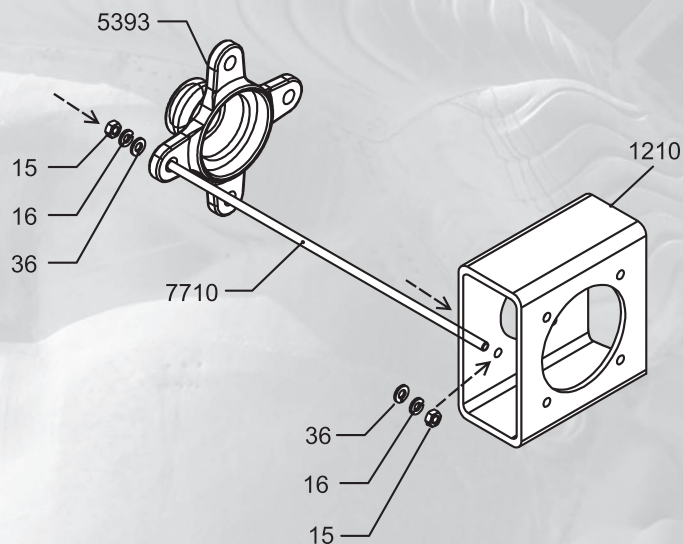
- Place Stator Support Ring (6220) and O-Ring (11), on the End Cover (5393) with the O-Ring between the End Cover and the Stator Support Ring.



- Place the End Cover (5393) and Stator Support Ring assembly onto Bonded Stator (2220).



- Insert the four Tie Rods (7710) through the End Cover (5393) and their corresponding holes in the Pump Lantern (1210) then thread up Hex. Nuts, Spring Washers and Punched Washers (15, 16, 36), one each on the four Tie Rods (7710).



NOTE FOR *

- It is advised to use only prefabricated double-band Holding Band(37).
- Check the diameter and width of the Holding Band(37).The same should be matchable to the Boot Seal (1511) groove provided.

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 24



8.0 SECTIONAL DRAWINGS

S.No.	DRAWING NAME
1	Dimensional Drawing
2	Cross Sectional Drawing
3	Exploded View of Pump

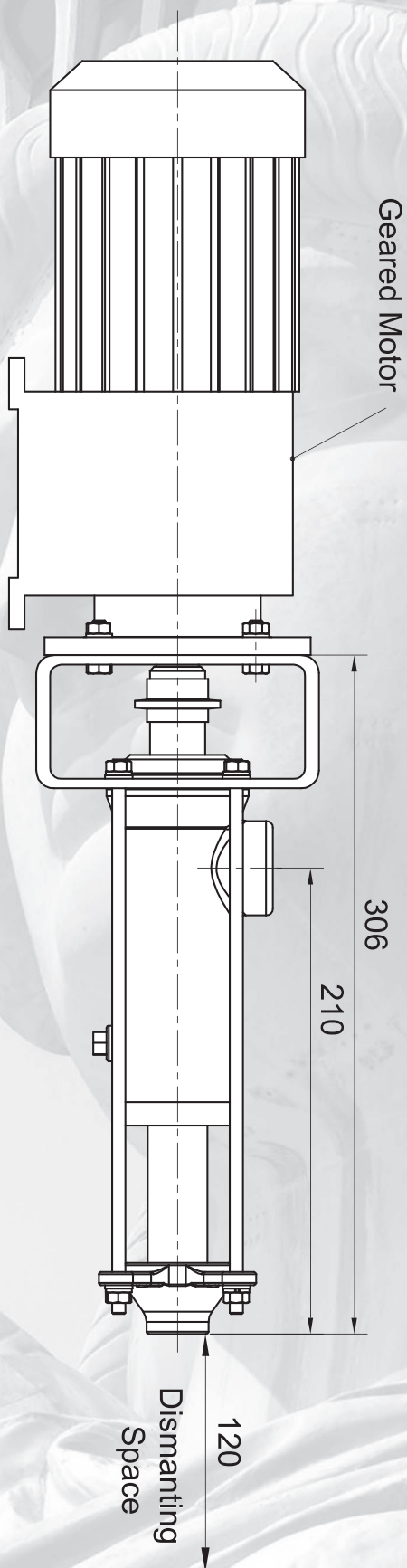
INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 25



Pump Dimensional Drawing For MDV - 034



Note:
1. Refer STD. NO. - RN-10-275 For Geared Motor

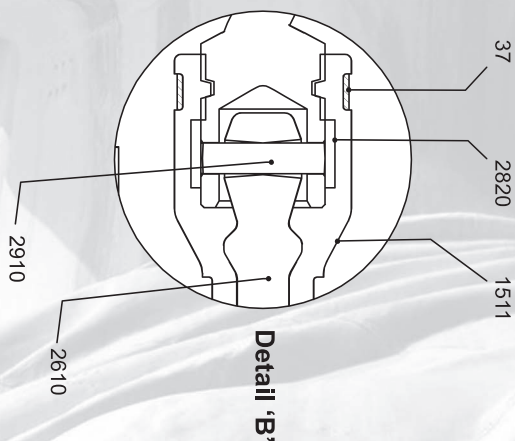
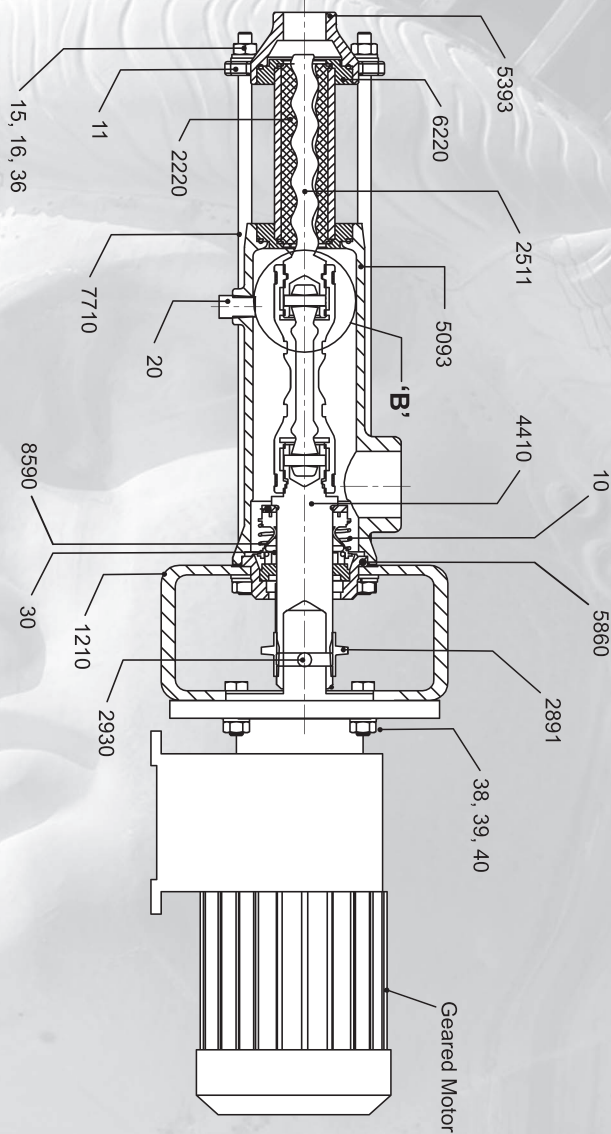
INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 26



Pump Cross Sectional Drawing For MDV - 034



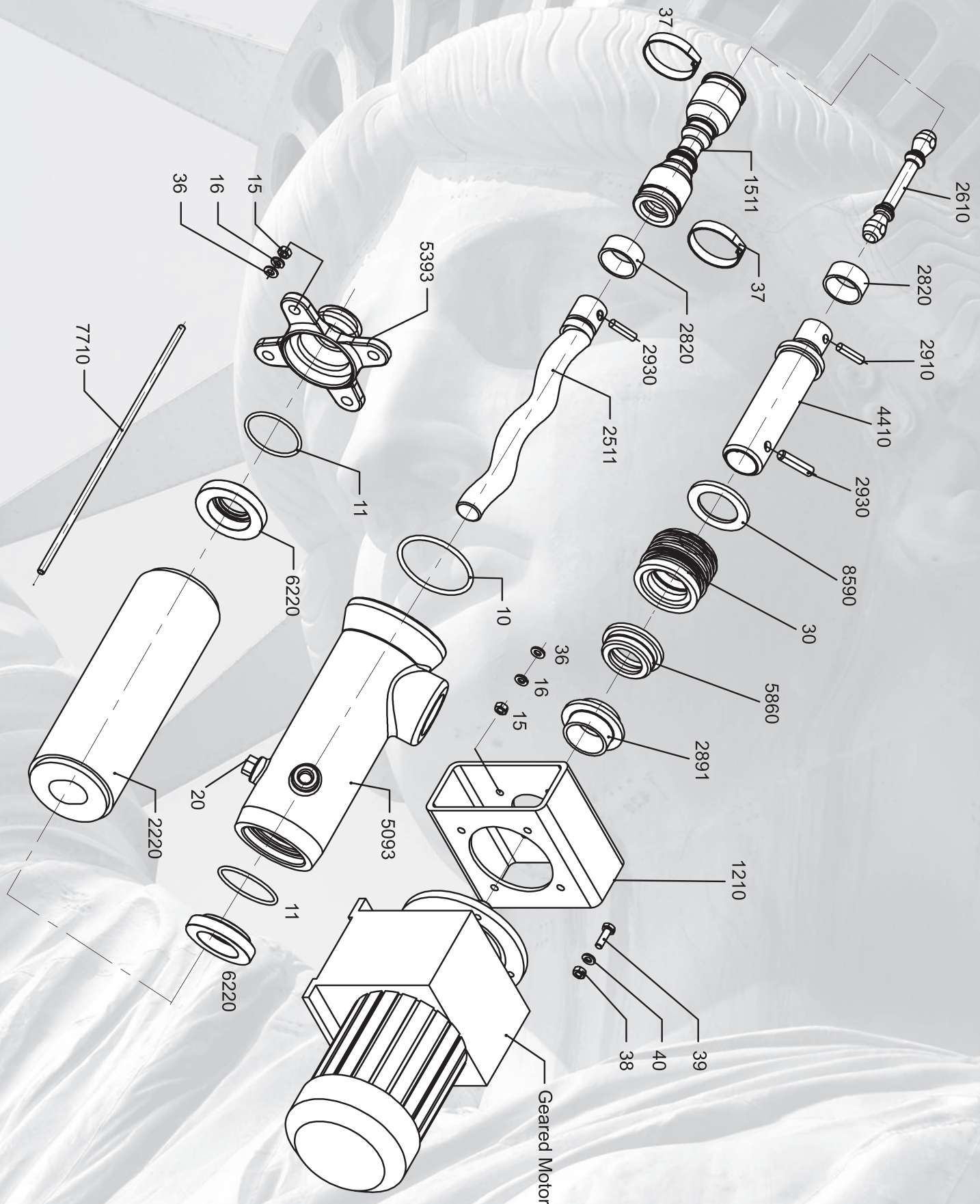
Part No.	Part Name	No. Off	Part No.	Part Name	No. Off
8590	Mechanical Seal	01	2220	Bonded Stator	01
7951	Rotational Plate	01	1511	Boot Seal	01
7910	Name Plate	01	1210	Pump Lantern	01
7710	Tie Rod	04	40	Spring Washer (for geared motor)	04
6220	Stator Support Ring	02	39	Hex. Head (for geared motor)	04
5860	Mechanical Seal Housing	01	38	Hex. Nut (for geared motor)	04
5393	End Cover	01	37	Holding Band	02
5093	Pump Housing	01	36	Punched Washer (for part No. 5393 & 1210)	08
4410	Stub Shaft	01	30	Mechanical Seal	01
2930	Dowel Pin	01	25	Drive Screw	06
2910	Coupling Rod Pin	02	20	Taper Plug	01
2891	Dowel Pin Retainer	01	16	Spring Washer (for part No. 5393 & 1210)	08
2820	Pin Retainer Sleeve	02	15	Hex. Nut (for part No. 5393 & 1210)	08
2610	Coupling Rod	01	11	O-Ring (for part No. 6220)	02
2511	Rotor	01	10	O-Ring (for part No. 5860)	01

NOTE:
1. Name Plate, Rotational Plate
& Drive Screw Now Shown

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 27



INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 28



9.0 MAINTENANCE

9.1 GENERAL POINTS TO REMEMBER



Always ensure that the pump and its drive arrangement are switched off properly and cannot open even if turned on accidentally before the pump is to be opened for necessary servicing/repair.

When a pump unit is dismantled and reassembled, it has to be ensured that the correct alignment of pump and driver is done.

It is recommended that the pump should be rinsed or cleaned regularly when the conveying fluid media has a tendency to solidify (deposits of the fluid media likely to build up and settle out in the form of solids). The pump can be cleaned through either of the following procedures, as applicable:

- By means of cleaning ports provided in the pump housing
- Manual cleaning after the pump is being dismantled

However, the cleaning procedure will depend upon the fluid media and operating method of the specific pump model.

9.2 PUMP PREVENTIVE MAINTENANCE

It is instructed that all the maintenance operations must be performed by trained and qualified personnel only and the same should be in strict accordance with the instructions given in this operating manual. Liberty Process Equipment, Inc. does not undertake any responsibility in case any breaching of the instructions given in the manual follows.

Before carrying out any service/repair on the pump, check that all the necessary precautions have been taken, e.g.,

- Suction and discharge valves are closed,
- Piping thoroughly cleaned and purged,
- Electrical supply disconnected and blocked.

All the methods adopted to carry out the maintenance work, should therefore be implemented in accordance with regulations in force relating to safety of the personnel involved.

9.2.1 PERIODIC INSPECTION

If the pump is operated intermittently or for less than five hours a day, testing once in a month is sufficient enough. However, in case the pump is operated for five or more hours in a day, then it is mandatory to check the following points on weekly basis:

- Sealing at suction and discharge connections of the pump
- Sealing between pump body and drive arrangement
- Lubricant level of the drive motor, if applicable
- Anchoring to floor, if applicable
- Condition of power cable sheaths
- Tightness of all assembly fixing screws, i.e., nuts, bolts etc. (for piping, stator, pump housing, spacer, drive)
- Drive output and cleanliness of the ventilation grills of the drive.

9.3 MAINTENANCE OF WEARING COMPONENTS

9.3.1 ROTOR AND STATOR

The wear rate of rotor and stator depends on many factors, such as abrasiveness of the fluid media, speed, discharge pressure etc. One or possibly both the components (i.e., rotor and stator) need replacement, when the pump performance goes down beyond an acceptable level.

9.3.2 SHAFT SEALING

SINGLE MECHANICAL SEAL

There are various constructions of mechanical seals. The standard mechanical seals (as per DIN 24960) are most commonly used. These seals, irrespective of their make, have similar dimensions which allow them to be interchangeable. Special Single Coil Elastomer Bellow Seal, Bi-directional Mechanical Seals are normally applicable as per process requirements.

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 29



9.3.3 PIN JOINT

The Pin joints are filled with special grease and lubricated for the expected duration of service. Only specified grease should be used for any required maintenance work.

9.3.3.1 JOINTS LUBRICATION

Joints should be examined when the pump is dismantled for any reason or for routine maintenance during periods of regular scheduled equipment down time. The joints should be cleaned and renewed with fresh grease before assembly.

It is always recommended to replace the joint components with genuine **Liberty Process Equipment, Inc.** parts to ensure maximum life. Please contact Liberty Process Equipment for grease information.

Ensure that Joint should be packed by **0.076** Litres of grease.

Use one of the following recommended or equivalent grease for joint lubrication:

OPERATING TEMPERATURE	'GREASE' MAKE
-70 Deg. C to 260 Deg.	C PTFE Grease
-70 Deg. C to 260 Deg.	C Bearing Grease LGET-2

Whenever Boot Seal of EPDM material is recommended or being used, kindly ensure that only the following Silicon Grease compound is used for such applications:

- OKS 1140/1144 or UNISILKON L50/2 or Tribocore TC-18.

9.4 DISPOSAL

DISPOSAL OF WORN-OUT COMPONENTS:

Always dispose of the following materials in accordance with the regulations in force:

- Steel scrap
 - i. Housing Components
 - ii. Stub Shaft

NOTE: When replacing worn out components of the pump/equipment, kindly ensure that the disposal of such components is carried out in strict compliance with local environmental legislation rules. Utmost care should also be taken when disposing of lubricants.

Whenever the pump is returned to service, indicate whether the pump is free of substances damaging to health or whether it is contaminated. If it is contaminated, also indicate the nature of hazard. Any pump, sent to service without a "**Declaration of Contamination**", will be sent back to the sender's address, on the account of the sender.

DISPOSAL OF WASTE OIL/GREASE: Anyone in possession of used oil/grease is responsible for its proper disposal, in accordance with the local acting regulations.

Used oil/grease taken out from Progressive Cavity pumps must not be mixed with other substances.

Used oil/grease from these pumps (on the basis of mineral oils) having been affected by normal contamination due to oxygen from the ambient air, increases in temperature and mechanical wear, must be disposed of as used oil in accordance with the regulations.

Used oil/grease from pumps that have been contaminated by other substances must be labelled, stored and disposed of as special waste with reference to the kind of contamination.

In many countries, a proof of where the oil/grease has been finally disposed of is required under law and often shipping of such contaminated waste requires permission by the authorities.



When storing and disposing of used oil/grease, please observe the safety regulations that are valid in your country.

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 30



9.5 TIGHTENING TORQUE FOR FIXING SCREWS

The general tightening torque for the fixing screws is defined in the table below:

TORQUE SETTING FOR FASTENERS

BOLT SIZE MAX.	TIGHTENING TORQUE (KG - M)
M6	0.47

9.6 RECOMMENDED SPARE PARTS

For operating safety reasons, Liberty Process Equipment, Inc. always recommend stocking and installing of original and genuine spare parts, as per the parts list specifications.

To reduce the maintenance downtime of the pump, it is advisable to keep the following pump parts and other items in stock:

- Rotor
- Stator
- Coupling Rod
- Coupling Rod Pin
- Stub Shaft
- Pin Retainer Sleeve
- One set of Gaskets, Stator Support Rings and O-Rings
- One set of Holding Band
- One set of Mechanical Seal

In addition, the following greases are also advised to be kept as a part of your stock as are needed for lubrication purpose for the pump parts mentioned as under:

- Joint Grease

However, the following details must be quoted in your purchase order, while ordering the pump spare parts:

- Pump Serial Number (See Pump Name Plate)
- Pump Series (See Pump Name Plate)
- Identity No. / Code No. and Quantity of the Spare parts, as mentioned in the Spare parts list.

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 31



10.0 TROUBLESHOOTING CHART

Applicable For Progressive Cavity Pumps	Type of Failure		Remedial Action	Failure To Deliver Liquid	Pump Does Not Develop Rated Pressure	Pump Loses Liquid After Starting	Pump Overloads Primer	Vibration	Motor Heating Up	Seized Pump	Irregular Delivery	Pump Does Not Prime	Noisy Pump	Early Wear-out of Rotor/ Stator or Both	Excessive Power Absorbed By Pump	Excessive Seal Wear	Pump Stalls At Start Up	Pump Has No Suction
	Sr. No.	Reason for Failure																
	1	Wrong direction of rotation	Check rotational direction of the pump as per data sheet and type plate. In case of wrong direction, change the drive motor wiring connections.															
	2	Air vapor pocket in suction line	Ensure that the suction lines are full of liquid and the pump is vented. Check the level of the tank/reservoir and fill, if necessary. In case of negative suction, open the air vent till air remove then prim the pump. Check all lines, flanges, joints and connections for leakage and repair, if needed.															
	3	Inlet or suction pipe insufficiently submerged	Check liquid level in the reservoir and correct, as required. Clean up/replace Strainer or Filter element. Remove obstructions from the suction line, if any.															
	4	Suction pipe blocked	Clean suction pipeline.															
	5	N.P.S.H. available too low	Increase suction line diameter. Increase suction head. Reduce Pump Speed. Simplify suction line configuration and reduce length. Reduce pump speed.															
	6	Pump not up to rated speed	Correct pump speed as per data sheet.															
	7	Delivery pressure higher than rated	Check pressure head with a pressure gauge. Reduce the pressure head by increasing the diameter of the pipe. Use pressure relief valve on delivery line. Simplify discharge line to reduce pressure.															
	8	Air leak in the line or stuffing box	Check flange & valve connections.															
	9	Viscosity lower than rated	Check and accommodate as per Pump data/performance sheet.															
	10	Viscosity greater than rated	Check and accommodate as per data sheet.															
	11	Gas or vapour in liquid	Make an arrangement to flooded suction. Avoid inclusion of gas or vapour in liquid.															
	12	Pump speed to high	Reduce the pump speed when the conveying fluid media to be pumped is highly viscous - danger of cavitation.															
	13	Pump speed to low	Increase the speed of the pump when high suction performances are required and when the conveying fluid media is very thin (less viscous).															
	14	Specific gravity higher than rated	Check and accommodate as per data sheet.															

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Pump Model: MDV - SERIES

pg. 32



10.0 TROUBLESHOOTING CHART

Applicable For Progressive Cavity Pumps			Type of Failure																
Sr. No.	Reason for Failure	Remedial Action	Failure To Deliver Liquid	Pump Does Not Deliver Rated Capacity	Pump Does Not Develop Rated Pressure	Pump Loses Liquid After Starting	Pump Overloads Primer	Vibration	Motor Heating Up	Seized Pump	Irregular Delivery	Pump Does Not Prime	Noisy Pump	Early Wear-out of Rotor/ Stator or Both	Excessive Power Absorbed By Pump	Excessive Seal Wear	Pump Stalls At Start Up	Pump Has No Suction	
15	Defective mechanical seal	Check seal faces and O-rings. If necessary, replace corresponding defective parts (in case of Mechanical Seal).																	
16	Worn Mechanical Seal	Replace Mechanical Seal																	
17	Lack of lubrication	Ensure grease quantity as per maintenance schedule in IOM.																	
18	Wrong grade of oil	Ensure grease grade as per maintenance schedule in IOM.																	
19	Excessive thrust	Ensure proper bearing as per instruction given in IOM.																	
20	Pipes exert forces on pump	Ensure proper flange connection.																	
21	Relief valve spring badly adjusted	Re-adjust spring compression.																	
22	Relief valve jammed	Clean relief valve & re-adjust.																	
23	Relief valve chatter	Check the condition of the valve. If necessary, replace the valve with new one.																	
24	Improper location of safety valve	Use the safety valve after discharge line of the pump.																	
25	Stator swelling	Select a suitable stator material. Else use a rotor with diameter smaller than specified.																	
26	Excessive interference between rotor and stator	Provide lubrication (e.g., through soft soap solution) between rotor and stator. Then give one or two rotations to the pump shaft.																	
27	Worn pump element	Dismantle the pump and replace defective parts.																	
28	Strainer obstructed or blocked	Clean/replace the strainer																	
29	Low voltage	Maintain the voltage as per data sheet.																	
30	Fluid temperature higher than rated	Check temperature and install rotor with diameter smaller than specified (consult Liberty Process Equipment, Inc. for details).																	
31	Size of solid particle/ solid content higher than rated	Reduce the pump speed and install a strainer with suitable meshes. Increase fluid share.																	
32	Conveying product solidifies	Clear and flush the pump immediately. Else heat the pump.																	
33	Negative or very low delivery head	Check the strainer and clean it. Also check the stator & rotor condition and replace (if required).																	
34	Pump runs partially or completely dry	Check flow of fluid media in the suction chamber. Install dry running protection device (DRP).																	
35	Foreign particles inclusion in the pump	Dismantle the pump, remove foreign particles and replace the worn out components of the pump.																	
36	Joint components worn-out	Replace the worn out parts.																	
37	Drive H.P. not as per rated specifications	Ensure drive as per data sheet																	
38	Type of starter	Ensure starter (DOL connection) as per data sheet																	