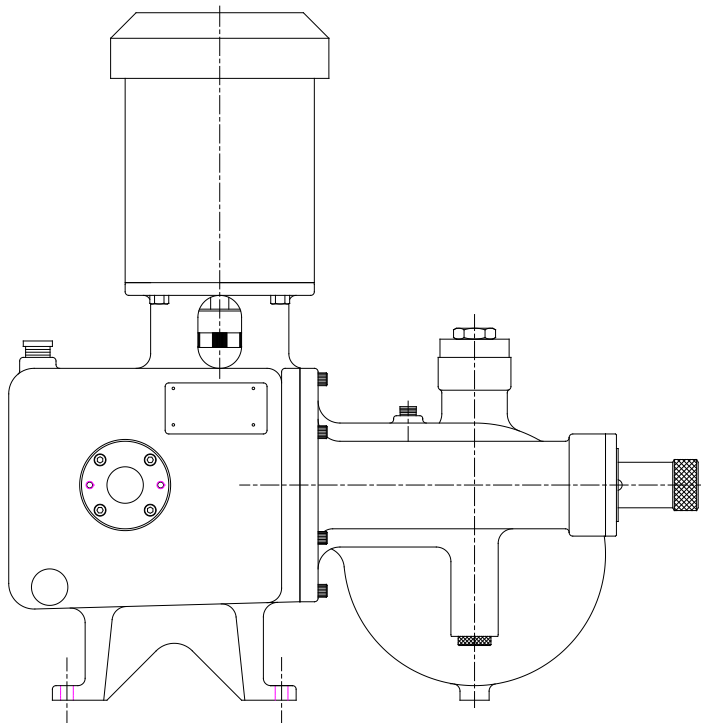




# INSTALLATION OPERATION & MAINTENANCE

## NEPTUNE 600 Series Hydraulic Metering Pumps



NEP-ZL105648

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# WARNING

LOCKOUTS ARE REQUIRED BEFORE  
SERVICING THIS EQUIPMENT.

## SAFETY INSTRUCTIONS:

Shut off/Lockout pump Power before Servicing.

Be certain pump isolation valves are  
Closed and chemical is shut off.

Bleed pressure before servicing.

In case of emergency, shut pump down completely  
by disconnecting motor power supply.

To prevent unexpected start-up, disconnect motor  
from power supply when power outage happens.

## **WARNING**

**Please read thoroughly before installation, operation or maintenance of any Neptune pump**

### **EQUIPMENT MISUSE HAZARD**

Equipment misuse can cause the equipment to rupture, malfunction and result in serious injury.

- This equipment is for professional use only.
- Read all instruction manuals, tags, and labels before operating the equipment.
- Use the equipment only for its intended use.
- Do not alter or modify this equipment.
- Be certain all operators of this equipment have been trained for safe working practices, understand its limitations, and wear safety goggles and or equipments when required.
- Do not exceed the maximum working pressure of the system as mentioned on the pump tag.
- Do not use the pump head or the suction or discharge piping to pull the equipment.
- Do not move pressurized pump.
- Use fluids or cleaning agents for cleaning that are compatible with the pump parts. Read the fluid and cleaning agent manufactures warnings and also refer to the material compatibility chart.
- Comply with all applicable local, state and national safety regulation.
- Do not allow pump to run dry.

### **PRESSURIZED EQUIPMENT HAZARD**

Spray from leaks, ruptured components can splash fluid in the eyes or on the skin and cause serious injury.

- Shut off the pump and depressurize before performing any maintenance.
- Do not tamper with or perform unspecified alteration of this device.
- Operate only at rated pressure. Excessive pressure during normal operation can cause leakage and rupture to the pump head joint and/or pipes. Rated pressure can be found on pump name tag.
- Use only pipe, hose, and hose fittings rated for maximum rated pressure of the pump or the pressure at which the pressure relief valve is set at.
- Always wear protective clothing, face shield, safety glasses and gloves when working on or near your metering pump.
- Additional precautions should be taken depending on the solution being pumped. Refer to SDS precautions from your solution supplier.
- Do not stop or deflect fluid leaks with your hand, body, glove, or rag.
- Tighten all fluid connections before operating the equipment.
- Replace worn, damaged, or loose parts immediately.
- Before performing any maintenance requiring pump head and or valve (wetted parts) disassembly, be sure to relieve pressure from the piping system and where hazardous process chemicals are present.
- Make the pump safe to handle for the personal and the environment by cleaning and chemically neutralizing the pump as appropriate.
- Wear protective clothing and use proper tools as appropriate to avoid any injury.
- If the diaphragm has failed, process chemical may have contaminated the pump hydraulic oil. Handle with appropriate care. Clean the pump and replace oil as necessary. Discard the contaminated oil as per the local code.
- After the diaphragm failure in a double diaphragm pump, pressurized process chemical can be present in the Neptune leak detection vacuum system. Take proper care to clean and handle them.

## **FIRE AND EXPLOSION HAZARD**

Improper grounding, poor air ventilation, open flames, or sparks can cause a hazardous condition and result in fire or explosion and serious injury.

- Ground the equipment. See motor installation instruction for grounding procedure.
- Do not pump non recommended flammable or explosive fluids.
- Static electricity may generate by fluid moving through pipes and hoses. A static spark could be produced by high fluid flow rate. Earthing of the pump is a must.
- Provide fresh air ventilation to avoid the possible build up of flammable fumes from the process chemicals.
- Keep the pump area free of debris, including cleaning agent, rags, and any flammable material.
- Follow the cleaning agent and other cleaning recommendations as mentioned in the operation and instruction manuals.
- Use cleaning agent with the highest possible flash point to clean the pump parts if needed.
- If there is any static sparking while using the equipment, stop operation at once. Identify and correct the problem before starting up the pump.

## **TOXIC FLUID HAZARD**

Hazardous fluids or toxic fumes can cause serious injury or death if splashed in eyes or on the skin, swallowed, or inhaled.

- Know the specific hazards of the fluid you are using. Read the fluid manufactures warnings.
- Consider chemical compatibility when selecting pump material. Reference Neptune chemical resistance guide in: <https://www.psgdover.com/neptune/download-library/guides> or contact Neptune Sales for recommendation.
- Store hazardous fluid in an approved container. Dispose of hazardous fluid according to all local, state and national guidelines.
- Wear the appropriate protective clothing, gloves, eyewear and respirator.
- Pipe and dispose of the exhaust air safely. If diaphragm fails, the fluid may be exhausted along with the air in mechanical diaphragm pump. Also oil vapor may breathe out of the air breather installed on the gear box.

## **SOUND HAZARD**

The sound pressure level of the pump may exceed 80dBA in some of the pumps.

- Observe all safety precautions when operating the pump within close proximity for extended periods by wearing hearing protectors.
- Extended exposure to elevated sound levels will result in permanent loss of hearing acuteness, tinnitus, tiredness, stress, and other effects such as loss of balance and awareness.

## **MECHANICAL HAZARD**

The pump may shake or vibrate during operation.

- Vibration could occur due to loose mechanical component and foundation bolts, causing piping rupture and leakage of chemical to cause bodily injury. The pump should be bolted down to the base during operation.
- Spills or drips of oil may occur during maintenance of pump, causing the operator to slip or fall. Clean and neutralize the area as soon as possible with an appropriate cleaning agent. Always wear protective clothing and gears.
- Pump may overturn when being transported if the motor is too heavy. Secure the pump on its base before transportation.

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## SECTION I GENERAL DESCRIPTION

The Neptune Series 600 “dia-PUMP” is a reliable metering pump of the high-pressure diaphragm type. Under constant conditions of temperature, pressure, and capacity adjustment settings, a plus or minus range of 1% metered discharge volume is maintained.

A plunger reciprocating at a fixed stroke displaces hydraulic fluid, which actuates a flexible, chemically inert, Teflon® diaphragm to create pumping action. The capacity of the pump is regulated by controlling the volume of hydraulic fluid, which bypasses the diaphragm cavity.

Metering accuracy is maintained by a control rod, which allows hydraulic fluid replacement and air venting automatically with each stroke, while also taking into account temperature changes of the hydraulic fluid. Metering accuracy is also insured by the use of double ball check valves on the suction and discharge of the pump.

**PLEASE READ THE INSTRUCTION MANUAL COMPLETELY BEFORE INSTALLING THE PUMP.**



**SERIES 630 “dia-PUMP”  
316SS (N3) HEAD**

## LIMITED WARRANTY

All Neptune Pumps are tested at the factory prior to shipment. Each part used in their construction has been carefully checked for workmanship.

If the pump is installed properly, Neptune Chemical Pump Company warrants to the purchaser of this product for a period of thirty six months from the date of first use or eighteen months from shipment, whichever occurs first, this product shall be free of defects in material and/or workmanship, as follows:

1. Neptune Chemical Pump Company will replace, at no charge, any part that fails due to a defect in material and/or workmanship during the warranty period, FOB our factory, North Wales, Pennsylvania. To obtain warranty service, you must get an RMA number to return the defective parts to the factory for examination, freight pre-paid.
2. This warranty period does not cover any product or product part, which has been subject to accident, misuse, abuse or negligence. Neptune Chemical Pump Company shall only be liable under this warranty if the product is used in the manner intended by the manufacturer as specified in the written instructions furnished with this product.

Any express warranty not provided in this warranty document, and any remedy for breach of contract that, but for this provision, might arise by implication or operation of law, is hereby excluded and disclaimed. Under no circumstances shall Neptune Chemical Pump Company be liable to purchaser or any other person for any charge for labor, repairs, or parts, performed or furnished by others, nor for any incidental consequential damages, whether arising out of breach of warranty, express or implied, a breach of contract or otherwise. Except to the extent prohibited by applicable law, any implied warranty of merchantability and fitness for a particular purpose are expressly limited in duration to the duration of this limited warranty.

Some states do not allow the exclusion or limitation of incidental or consequential damages, or allow limitations on how long any implied warranty lasts, so the above limitations may not apply to you. This warranty gives you specific legal rights, and you may have other rights, which may vary from state to state.

## IMPORTANT

SHOULD IT BE NECESSARY TO SEND THE PUMP TO THE FACTORY FOR REPAIR OR MAINTENANCE REBUILDING; DRAIN ALL OIL AND CHEMICAL FROM PUMP BEFORE SHIPPING. FAILURE TO DO SO CAN CAUSE EXTENSIVE DAMAGE TO THE MOTOR.

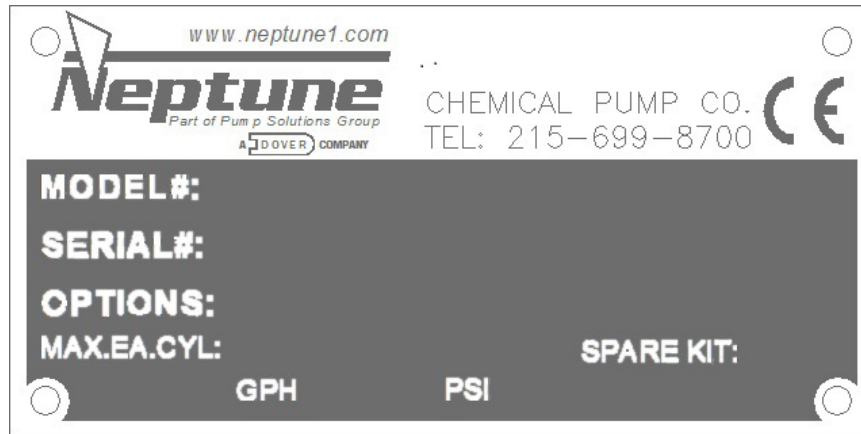
<sup>1</sup>SEE IMPORTANT NOTICE -RETURN GOODS AUTHORIZATION

### **IMPORTANT NOTICE RETURN GOODS AUTHORIZATION**

- (1) All equipment returned to Neptune Chemical Pump Company requires proper Returned Goods Authorization Number (RGA) and tags.
- (2) All equipment returned to the factory for repair or service must first be thoroughly flushed and have all chemical contact areas neutralized.
- (3) All equipment which has been in contact with chemicals must be accompanied by a copy of the chemical product material Safety Data Sheet (SDS).
- (4) Failure to comply with the above instructions will result in equipment being returned to sender, freight collect, without service.

## PARTS ORDERING INSTRUCTIONS

The complete model number and serial number of the pump must be furnished to insure prompt and accurate parts service. These numbers are found on the name plate (sample below) located on the side of the pump. Refer to Section VII for complete parts lists.



**Send all orders or inquiries for parts to:**

Email: [order.neptune@psgdover.com](mailto:order.neptune@psgdover.com)

Website: [www.psgdover.com/neptune.com](http://www.psgdover.com/neptune.com)

**NOTE: PLEASE SUPPLY BOTH MODEL AND SERIAL NUMBERS.**



## **SECTION II**

### **INSTALLATION INSTRUCTIONS**

#### **1.0 GENERAL**

##### **1.0.1 UNPACKING & INSPECTION**

When unpacking a pump or chemical feed system, be certain that no parts are thrown away. Examine the equipment for possible damage. If damage has occurred, file claim with the common carrier within 24 hours. Neptune will assist in estimating the repair costs.

1.0.2 The "dia-Pump" should be located on a level surface. Four mounting holes are provided to anchor the pump securely to the mounting surface. All piping to the pump should be supported to prevent stress on the pump input and output fittings.

1.0.3 Before connecting the pump, make sure that all fittings are completely clean by flushing thoroughly. Any foreign matter entering the pump can damage the internal parts and severely limit the life of the pump.

1.0.4 A "Y" STRAINER (AT LEAST ONE PIPE SIZE LARGER THAN SUCTION INLET SIZE OF THE PUMP) MUST BE INSTALLED IN THE SUCTION LINE OF THE PUMP TO INSURE AGAINST FOREIGN MATTER ENTERING THE PUMP.

1.0.5 It is recommended that shut-off valves and unions be placed in the suction and discharge lines if possible. Such an arrangement will facilitate servicing the pump.

1.0.6 The electrical supply to the pump must match the motor nameplate characteristics. The motor rotation is counter clockwise when viewed from the top of the motor or looking down on the pump. (See Figure 1)

1.0.7 All fittings and connections must be airtight. Otherwise, pump suction capability will be reduced or lost.

#### **IMPORTANT**

On single phase units, the rotation is set at the factory and must not be changed.

On all units, motor rotation may be viewed through the coupling access points just below the motor.

Please note Figure 1, indicating the correct rotation. Operation with the incorrect rotation will damage the pump and motor.

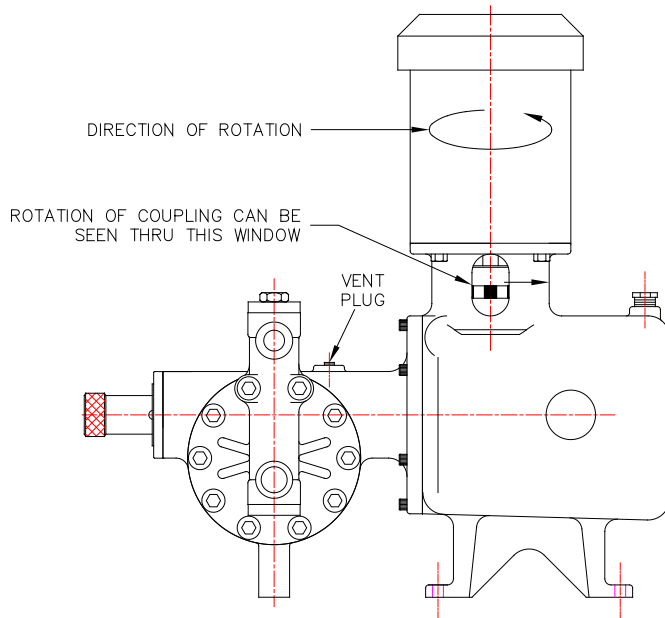


FIGURE I

- 1.0.8 Please note, that some items in the parts list have more than one part number for an individual figure number. These different part numbers insure unique identification of parts which are available in more than one material construction, or as in the case of gears, more than one speed. Please use the **part number**, not the figure number when ordering.
- 1.0.9 Fill gear box and pump by pouring the hydraulic fluid (drive lubricant) supplied through the fill opening at the rear of the pump. Pour fluid in slowly until the level is within 2" from the fill hole. The control knob should be in the zero position during the filling. PLEASE NOTE: TO VENT THE AIR, REMOVE A VENT PLUG LOCATED ON TOP OF THE OIL HEAD.

Allow 30 minutes for hydraulic fluid to make its way into pump chamber and then recheck fluid level.

The hydraulic fluid supplied by Neptune is EP SAE 90, Neptune P/N 100225 (1 QT bottle)

Common sources for hydraulic fluid are:

MobilOil	Mobil Gear #629
Sun Oil	Sun Oil #220
Texaco	Meropa #220

## 2.0 SUCTION PIPING

- 2.0.1 The suction piping to the pump must be absolutely airtight and one size larger than suction inlet size of the pump. It is suggested that the suction piping be tested with low air pressure and a soap solution to assure that no leaks exist. Limit the total length of the suction line to 3-4 feet suction lift or 6-7 feet flooded suction. Minimize bends, elbows, or other restrictions.
- 2.0.2 NEPTUNE RECOMMENDS THAT THE "dia-PUMP" BE OPERATED WITH A FLOODED SUCTION, AS THIS WILL FACILITATE START UP AND INCREASE THE SERVICE LIFE OF THE PUMP.
- 2.0.3 It is highly recommended that all solution tanks be furnished with a low level cut off switch or low level alarm and cut off switch to prevent the pump from running dry. OPERATION AGAINST A DRY SYSTEM WILL CAUSE DAMAGE TO THE PUMP DIAPHRAGM AND REDUCE THE OPERATING LIFE OF THE PUMP.

### 3.0 DISCHARGE PIPING

- 3.0.1 It is recommended that the "dia-Pump" operate against a minimum discharge pressure of 50 psig.
- 3.0.2 All Neptune Series 600 "dia-Pumps" are supplied with an internally pre-set relief valve. This relief valve is set approximately 25% above the actual rated discharge pressure of the pump and is designed to protect the pump should a discharge pressure beyond the rated limit of the pump occur.
- 3.0.3 To protect the piping system, it is recommended that an external relief valve as manufactured by Neptune Chemical Pump Company, or equal, be placed in the discharge line of the pump.
- 3.0.4 Discharge piping should equal discharge port size.

### 4.0 ADJUSTMENT OF INTERNAL RELIEF VALVE

- 4.0.1 All Neptune Series 600 "dia-Pumps" are supplied with an internally pre-set relief valve. The internal relief valve is set as follows:

Model	INTERNAL RELIEF VALVE SETTING (PSI)				
	1/2 HP	3/4 HIP	1 HIP	1-1/2 HP	2HP
635	-	300	350	550	750
637	-	300	350	550	750
637 PVC	-	250	-	-	-
647	-	-	-	-	300
647 PVC	-	-	-	-	250

The internal relief valve is designed to protect the pump itself should a discharge pressure beyond the relief valve setting occur.

If a customer order specifies a relief valve setting above those indicated above, the specified setting will be set at the factory. All pumps are tagged with the relief valve setting used by the factory.

To protect the external piping system, it is recommended that a relief valve as manufactured by Neptune Chemical or equal be placed in the discharge line of the pump. It is further recommended that this relief valve be piped into return of the tank with clear PVC tubing so that it can be determined if the solution is bypassing through the valve and returning to the tank, indicating a line blockage.

Drawing on page 18 illustrates the locations of the internal relief valve for Models 610 and 615 (FIG. #1435, #1411, #0145, #0119, #0146, #0120).

Drawing on page 20 illustrates the locations of the internal relief valve for Models 620 and 625 (FIG. #2335, #2311, #0145, #0119, #0146, #0120).

Drawing on page 22 illustrates the locations of the internal relief valve for Models 635 and 637 (FIG. #3235, #3211, #0145, #0119, #0146, #0120).

Drawing on page 24 illustrates the locations of the internal relief valve for Model 647 (FIG. #3235, #3211, #0145, #0119, #0146, #0120).

The drawing shows a passage connecting the hydraulic fluid reservoir with the hydraulic fluid side of the diaphragm.

The passage is interrupted by the relief valve ball (FIG. #1435, #2335, #3235) which is backed up by a relief valve spring (FIG. #0145).

If, during the pump operation, the pressure on the hydraulic fluid side of the pump exceeds the set pressure of the internal relief valve, the ball is forced from its seat allowing the hydraulic fluid to flow back to the reservoir.

- 4.0.2 To reset the relief valve to a higher pressure (the relief valve setting cannot be reduced because of design considerations), instructions are as follows:
- 4.0.21 Connect a test set-up as shown in Figure IV below. **NOTE:** All parts must have a working pressure rating above the required set pressure.
  - 4.0.22 Start and run the pump until all air is relieved from the discharge liquid (hand valve open).
  - 4.0.23 Remove relief valve cap (FIG. #0120).
  - 4.0.24 Close hand valve; pressure gauge should read between 250 and 4500 psi depending on pump model.
  - 4.0.25 Use 5/16" Allen wrench to adjust spring tension by turning relief valve adjusting screw (FIG. #0119).
    - (1) To increase pressure, turn relief valve adjusting screw (FIG. #0119) in.
    - (2) To decrease pressure, turn relief valve adjusting screw (FIG. #0119) out.
  - 4.0.26 After resetting or adjusting pressure, replace relief valve cap (FIG. #0120).

### CAUTION

Never turn relief valve adjusting screw (FIG. #0119) completely in.

Do not attempt to set the internal relief valve more than 25% in excess of name plate rating.

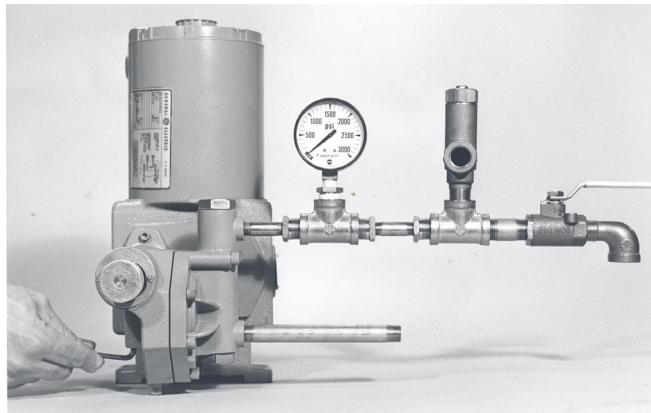


FIGURE IV

## 5.0 INSTALLATION OUTDOORS

The "dia-Pump" is a totally enclosed pump which can be used outdoors or indoors. When installed outdoors, make sure that the pump is protected against extremes of nature as follows:

5.0.1 Running of the pump when exposed to tropical sunshine with ambient temperature above 90°F (32°C) would cause excessive oil and motor temperatures. The pump should be shaded and located in such a way as to permit an ample degree of air circulation.

5.0.2 Under cold conditions, the pump should be insulated and a heater should be supplied in order to maintain the hydraulic fluid at an ambient temperature above 30°F (-1°C.)

## 6.0 START UP PROCEDURE

The following start up procedure is complete and does repeat instructions on filling the gear box and pump.

6.0.1 Remove back pressure spring (anti-siphon spring) for start up. Reinstall after pump is operational if needed.

6.0.2 Flooded Suction: Refer to Section II, Paragraph 1.0.9, for instructions on filling gear box with hydraulic fluid.

6.0.3 After having let pump stand for 30 minutes and having rechecked fluid level, set pump capacity indicator at approximately 30%. Be certain that pump suction and discharge lines are open.

6.0.4 Make certain that pumping chamber is flooded by loosening vent plug (FIG. #1412 for Models 610 & 615, FIG. #2314 for Models 620 & 625, FIG. #3214 for Models 635 & 637) and allowing solution to appear. Then tighten discharge vent plug. This procedure will also allow air to vent from pumping chamber. THE "dia-PUMP" WILL NOT FUNCTION IF AIR IS TRAPPED IN THE HYDRAULIC FLUID OR LIQUID PUMP CHAMBERS. Start pump.

6.0.5 On initial start ups: Check for proper motor rotation (Refer to Paragraph 1.0.9). Run the pump for 10-20 seconds, then stop for 20-30 seconds. Repeat approximately 15 times in order to fill the diaphragm oil cavity. During these short runs, listen for any abnormal motor or crank noises, and if present, refer to trouble shooting chart.

### **WARNING**

BEWARE APPLICATIONS WHERE WATER IS NOT COMPATIBLE WITH CHEMICAL TO BE PUMPED. EXAMPLE: NEVER FORCE PRIME WHEN PUMPING ACID OR OIL BASED PRODUCTS.

**SECTION III**  
**PUMP MODELS 635, 637**  
**NORMAL MAINTENANCE**

**TO VIEW FIGURE NUMBERS:**

For Models 635 & 637 refer to Drawing on page 22.

**7.2 MAINTENANCE**

Under normal conditions, the "dia-Pump" should not require any significant amount of maintenance. It is advised that periodic visual observations be made of the oil level; make sure that it is no more than 2" from the top of oil fill hole. The liquid end of the pump should also be inspected for leakage. These observations should be made regularly.

The hydraulic fluid should be drained and replaced twice a year, using the drain plug (FIG. #0130) at the back of the pump. This change can be scheduled with the normal factory maintenance at seasonal periods.

**7.2.1 Check Valves: Removing, cleaning, replacing.**

The "dia-Pump" incorporates a unique check valve design whereas the discharge and suction piping **NEED NOT** be disturbed in order to service the valves.

Should the valves need cleaning, remove as follows:

7.2.11 Remove vent plug (FIG. #3214) with anti-siphon spring (FIG. #3218) if installed.

7.2.12 Remove eight valve cap screws (FIG. #3236) on suction and discharge caps.

7.2.13 Remove discharge cap (FIG. #3212) along with retaining screen (FIG. #3216). Remove suction cap (FIG. #3228).

7.2.14 With heavy wood dowel or bar of soft material, tap and push complete valve stack out of pump from top through to bottom. The valve stack consists of:

4 Valve Balls (FIG. #3240)

4 Valve Seats (FIG. #3222)

2 Ball Retainers (FIG. #3224)

3 Stack Spacers (FIG. #3226)

1 Valve Ball Spacer Retainer (FIG. #3220)

4 Valve Seat "O" Rings (FIG. #3242)

NOTE: Valve seats are *seated* both sides and may be reversed.

7.2.15 Clean valve stack parts with suitable solvent. Replace in same order as removed from top to bottom, putting suction valve cap (FIG. #3228) in place with "O" ring first.

**SECTION III**  
**PUMP MODEL 647**  
**NORMAL MAINTENANCE**

**TO VIEW FIGURE NUMBERS:**

For Model 647 refer to Drawing on page 24.

7.2.2 MAINTENANCE

CAUTION - Ensure all operators are properly trained and employ safe operating and maintenance practices. Operator error may cause process liquid to expel through the head joints and/ or piping.

Under normal conditions, the "dia-Pump" should not require any significant amount of maintenance. It is advised that periodic visual observations be made of the oil level; make sure that it is no more than 2" from the top of oil fill hole. The liquid end of the pump should also be inspected for leakage. These observations should be made regularly.

The hydraulic fluid should be drained and replaced twice a year, using the drain plug (FIG. #0130) at the back of the pump. This change can be scheduled with the normal factory maintenance at seasonal periods.

7.2.2.1 Check Valves: Removing, cleaning, replacing.

Should the valves need cleaning, remove as follows:

7.2.2.2 Remove eight valve cap screws (FIG. #3236) on suction and discharge caps.

7.2.2.3 Remove suction and discharge ports (FIG. #3250).

7.2.2.4 With heavy wood dowel or bar of soft material, tap and push complete valve stack out of pump from top through to bottom. The valve stack consists of:

- 4 Valve Balls (FIG. #3255)
- 4 Valve Seats (FIG. #3252)
- 1 Suction Spacer (FIG. #3256)
- 3 Stack Spacers (FIG. #3254)
- 2 Ball Retainers (FIG. #3253)
- 1 Spacer Retainer (FIG. #3251)
- 1 Ball Guide Retainer (FIG. #3257)

Replace with new:

- 4 Valve Seat "O" Rings (FIG. #3242)
- 2 Suction and Discharge Port "O" Rings (FIG. #3243)

NOTE: Valve seats are *seated* both sides and may be reversed.

7.2.2.5 Clean valve stack parts with suitable solvent. Replace in same order as removed from top to bottom, putting suction port (FIG. #3250) in place with "O" Ring (FIG. #3243) first.

- 7.3.1 Procedure for replacing CONTROL ROD "O" RING (FIG. #1434 for Models 610 & 615, FIG. #2334 for Models 620 & 625, FIG. #3234 for Models 635, 637 & 647) and SEALING PLATE "O" Ring (FIG. #2333 for Models 620 & 625, FIG. #3233 for Models 635, 637 & 647).
  - 7.3.11 Remove hydraulic fluid from gear box.
  - 7.3.12 Remove indicator plate (FIG. #0118) by removing two indicator plate screws (FIG. #0143).
  - 7.3.13 Remove control rod assembly with control rod attached (FIG. #0117 for all pumps; #1406 and #1408 for Models 610 & 615, #2306 and #2308 for Models 620 & 625, #3206 and #3208 for Models 635, 637 & 647) by turning counter clockwise until threads are disengaged, then pulling out.
  - 7.3.14 Remove four sealing nut retaining screws (FIG. #0144).
  - 7.3.15 Remove seal plate retainer (FIG. #0166) and sealing nut (FIG. #0115).
  - 7.3.16 Remove seal plate (FIG. #1407 for Models 610 & 615, FIG. #2307 for Models 620 & 625, FIG. #3207 for Models 635, 637 & 647) using small brass hook to pry loose.
  - 7.3.17 Replace control rod "O" ring (FIG. #1434 & 1465 [BACKUP RINGS] for Models 610 & 615, FIG. #2334 for Models 620 & 625, FIG. #3234 for Models 635, 637 & 647) and/or sealing plate "O" ring (FIG. #1433 for Models 610 & 615, FIG. #2333 for Models 620 & 625, FIG. #3233 for Models 635, 637 & 647).
  - 7.3.18 When replacing sealing plate, take care so as to not shear the sealing plate "O" ring (FIG. #1433 for Models 610 & 615, FIG. #2333 for Models 620 & 625, FIG. #3233 for Models 635, 637 & 647). Apply grease to "O" ring before assembly.
  - 7.3.19 Replace balance of parts and fill pump with hydraulic fluid per previous instructions.
  - 7.3.20 Follow start up procedure as if starting a new pump. Refer to Section II, Paragraph 1.0.9 and 6.0.
- 7.4.1 Removal of pump head and replacement of diaphragm.
  - 7.4.11 Remove drain plug (FIG. #0130), and drain hydraulic fluid.
  - 7.4.12 Remove long and short pump head bolts (FIG. #1438 and #1444 for Models 610 & 615, FIG. #2338 and #2344 for Models 620 & 625, FIG. #3238 and #3244 for Models 635,637 & 647). Lift pump head (FIG. #1402 for Models 610 & 615, FIG. #2302 for Models 620 & 625, FIG. #3202 for Models 635, 637 & 647) away from pump.
  - 7.4.13 Remove and examine Teflon diaphragm (FIG. #1410 for Models 610 & 615, FIG. #2310 for Models 620 & 625, FIG. #3210 for Models 635,637 & 647). Remove and examine the liquid side diaphragm backup plate (FIG. #1430 for Models 610 & 615, FIG. #2330 for Models 620 & 625, FIG. #3230 for Models 635, 637 & 647). Replace with new pump, if required. When replacing the Teflon diaphragm, be certain to line it up properly with the sealing grooves.
  - 7.4.14 To reassemble, reverse the above procedure. Reassembly is facilitated by laying the pump on its side. Be certain to tighten all bolts evenly.  
 N3 & N4 (316SS & C-20) PUMPS; Tighten to 100 ft. lbs.  
 N5 & N8 (PVC & KYNAR) PUMPS; Tighten to 25 ft. lbs.



## SECTION IV

### MOTOR OPERATING CONDITIONS

- 8.0 The normal temperature rise for standard motors is 40°C above ambient temperature and, thus, it might appear that the motor is operating at a higher than normal temperature. This situation is normal and should not cause concern.

Due to the high motor surface temperature (80°C), as a precaution to avoid burning skin, it is recommended to avoid touching the pump during operation. After shutting off pump, let the pump rest for 5 minutes before touching the motor.

As a precaution against motor overheating, it is recommended that the pump be located where adequate ventilation is available. It is also recommended that a MOTOR STARTER WITH THE PROPER OVERLOAD PROTECTION BE SUPPLIED AS AN ADDITIONAL SAFETY DEVICE.

## SECTION V TROUBLESHOOTING CHART

SYMPTOM	CAUSE	REMEDY
1. Pump Motor Will Not Operate.	A. Blown Fuse.	Check for short circuit or overload.
	B. Open thermal overload device in starter.	Reset.
	C. Low liquid level in tank (where low level cut-off is used).	Fill tank.
	D. Broken wire.	Locate and repair.
	E. Low voltage.	Check for too light wiring.
	F. Oil "frozen" in pump.	Thaw out.
2. Pump Does Not Deliver Rated Capacity	A. Starved suction.	Replace suction piping with larger size.
	B. Leaky suction piping.	Pressure test, repair or replace defective piping.
	C. Excessive suction lift.	Rearrange equipment location to reduce suction lift.
	D. Liquid too close to boiling point.	Lower temperature or increase suction pressure slightly.
	E. Air or gas trapped in oil or chemical solution.	Decrease capacity to 20% for 7 mins., then increase to 100% for 7 mins. Bleed air from valve system.
	F. Worn or dirty valves or seats, or both.	Clean or replace.
	G. Viscosity of liquid too high.	(1) Reduce viscosity by heating or other means. (2) Increase size of suction piping. (3) Increase suction pressure slightly.
	H. Insoluble materials, crystallization or solids settling.	Limit solution strength to 5% By weight. Flush and clean Solution tank periodically. Suction connection should Be 2 to 4" from bottom of Solution tank.
	I. Low discharge pressure.	A minimum discharge pressure of 50 psi is required to insure proper capacity control.

SYMPTOM	CAUSE	REMEDY
3. Pump delivers erratically.	<p>A. Leaky suction line.</p> <p>B. Worn or dirty valves or seats, or both.</p> <p>C. Excessive excursion of ball Valves from seats (indicated by ball chatter).</p> <p>D. Insufficient suction pressure.</p> <p>E. Liquid too close to boiling point.</p> <p>F. Leaky system relief valve.</p> <p>G. Low hydraulic fluid level.</p>	<p>Repair or replace piping.</p> <p>Clean or replace valve assembly.</p> <p>Increase back pressure.</p> <p>Increase suction pressure.</p> <p>Reduce temperature or raise suction pressure.</p> <p>Repair or replace relief valve.</p> <p>Add hydraulic fluid.</p>
4. Motor Overheats Thermal Overload Activates	<p>A. Power supply does not match motor.</p> <p>B. Overload caused by operating pump beyond rated capacity.</p>	<p>Check power supply against Motor nameplate data.</p> <p>Check operating pressure against pump manufacturer data plate maximum rating.</p>
5. Noisy Operation		
1. In Pump	A. Pump Valves.	<p>Valves must move to open and close, and they will make a clicking noise as they operate. These noises are sometimes amplified by natural resonances in piping system. They are usually indications of normal valve functioning.</p>
2. In Gear Reducer	A. Pounding noise at high discharge pressure.	<p>Fluid compressibility causes reversal of load on gears at end of pressure stroke. Not considered detrimental.</p>
6. Oil level overflows reservoir.	A. Flexible diaphragm punctured.	<p>Replace diaphragm and hydraulic fluid (drive lubricant) if contaminated.</p>

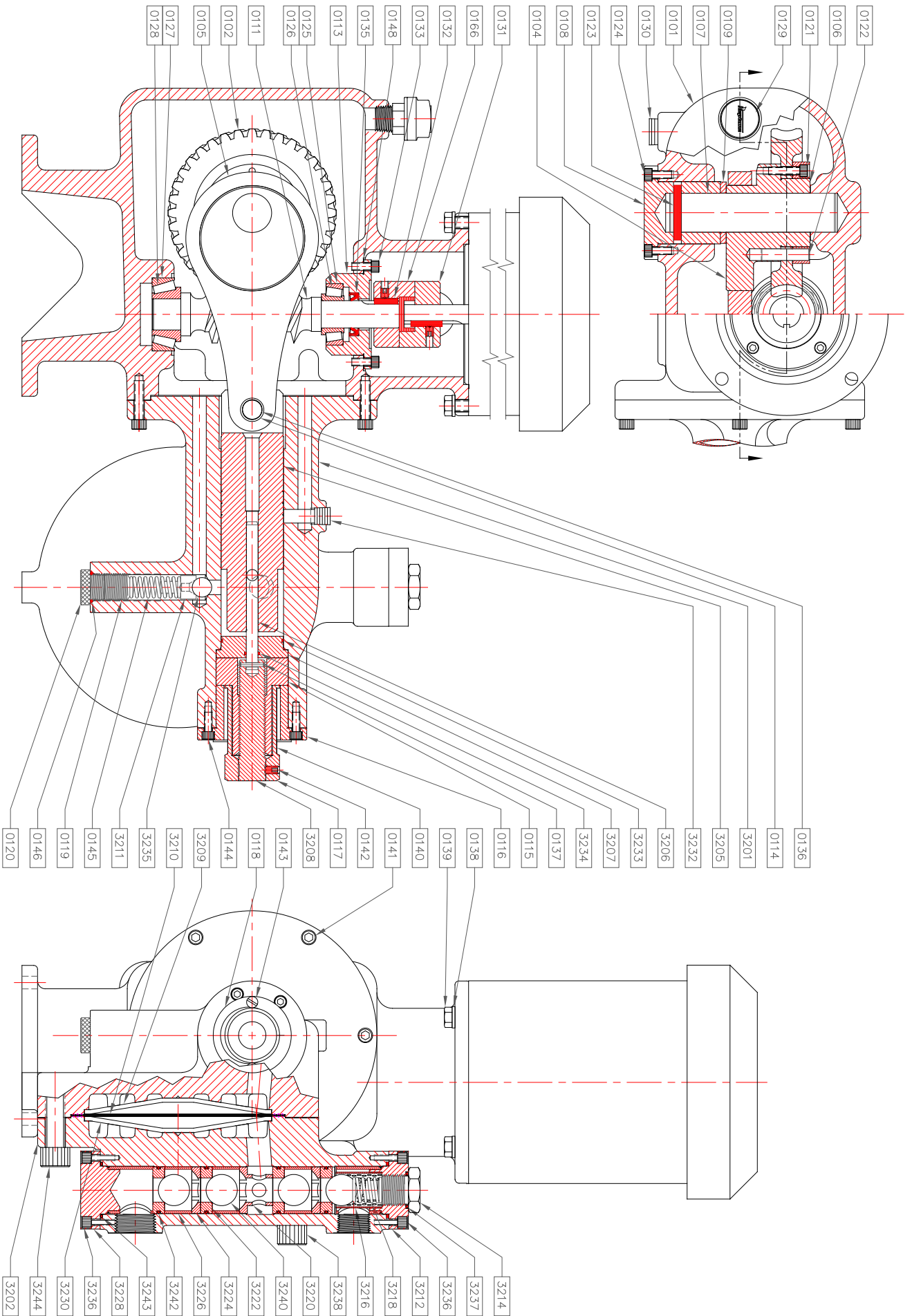
## SECTION VI

### PARTS LIST FOR PUMP MODELS 630, 635 & 637 (REFER TO DRAWING NO. 6300, PAGE 22)

NOTE: N-3 PUMPS HAVE 316SS PUMP HEAD AND 316SS TRIM.  
N-4 PUMPS HAVE C-20 PUMP HEAD AND C-20 TRIM.

FIG. NO.	DESCRIPTION	QTY.	PART NO.
0101	Gearbox	1	000349
0102	Worm Gear 58 SPM	1	000350
	Worm Gear 117 SPM	1	000351
	Worm Gear 144 SPM	1	003101
0104	Eccentric	1	000352
0105	Connecting Rod	1	000353
0106	Eccentric Collar	1	000354
0107	Gear Shaft	1	000355
0108	Gear Shaft Retainer	1	000356
0109	Thrust Washer	1	000357
0111	Worm 58 SPM	1	100291
	Worm 117 SPM	1	100292
	Worm 144 SPM	1	106550
0113	Bearing Retainer	1	000358
0114	Connecting Rod Sleeve	1	000359
0115	Sealing Nut	1	000360
0116	Sealing Nut Retainer	1	000361
0117	Control Knob	1	000362
0118	Indicator Plate	1	000363
0119	Relief Valve Adjusting Screw	1	000364
0120	Relief Valve Cap	1	000365
0121	Screw 1/4-20 x 1" LG	3	100293
0122	Dowel Pin 3/8" x 1-1/2" LG	3	100294
0123	Spring Pin 1/4" x 1-3/4" LG	1	100295
0124	Screw 1/4-20 x 5/8" LG	4	100211
0125	Upper Bearing Cup	1	100296
0126	Upper Bearing Cone	1	100297
0127	Lower Bearing Cup	1	100298
0128	Lower Bearing Cone	1	100299
0129	Fill Plug/Vent	1	000191
0130	1/2" Pipe Plug	1	100300
0131	Motor Coupling	1	100098
0132	Motor Coupling Key	1	100218
0133	Screw 1/4-20 x 5/8" LG	4	100211
0135	Oil Seal	1	100303
0136	Dowel Pin 5/8" x 2" LG	1	100304
0137	Spring Pin 1/8" x 3/4" LG	1	100305
0138	3/8" Lock Washer	4	100217
0139	Screw 3/8-16 x 1" LG	4	100216
0140	Indicator Scale	1	100307
0141	Screw 5/16-18 x 1-1/4" LG	6	100205
0142	Set Screw 1/4-20 x 3/8" LG	1	100308
0143	Screw #10-32 x 3/8" LG	2	100309
0144	Screw 1/4-20 x 5/8" LG	4	100211
0145	Relief Valve Spring	1	100310
0146	"0" Ring, Relief Valve Cap	1	100200
0148	Shim .005 Thick	A/R	100312

FIG. NO.	DESCRIPTION	QTY.	PART NO.
3201	Pump Body	1	000414
3202	Pump Head (N3)	1	000416
	Pump Head (N4)	1	000417
3205	Piston	1	000418
3206	Control Rod	1	000419
3207	Sealing Plate	1	000420
3208	Control Rod Screw	1	000377
3209	Pump Body Side, Backup Plate	1	000421
3210	Teflon Diaphragm	1	000422
3211	Relief Valve Ball Guide	1	000423
3212	Discharge Cap (N3)	1	000424
	Discharge Cap (N4)	1	000425
3214	Vent Plug (N3)	1	000426
	Vent Plug (N4)	1	000427
3216	Retainer Screen (N3)	1	000428
	Retainer Screen (N4)	1	000429
3218	Anti-Siphon Spring (N3)	1	002384
	Anti-Siphon Spring (N4)	1	002426
3220	Spacer-Retainer (N3)	1	000430
	Spacer-Retainer (N4)	1	000431
3222	Valve Seat (N3)	4	000432
	Valve Seat (N4)	4	000433
3224	Ball Retainer (N3)	2	000434
	Ball Retainer (N4)	2	000435
3226	Stack Spacer (N3)	3	000436
	Stack Spacer (N4)	3	000437
3228	Suction Cap (N3)	1	000438
	Suction Cap (N4)	1	000439
3230	Pump Head Backup Plate (N3)	1	000440
	Pump Head Backup Plate (N4)	1	000441
3232	1/4" Pipe Plug	1	100332
3233	"0" Ring, Sealing Plate	1	100092
3234	"0" Ring, Control Rod	1	100184
3235	5/8" Dia. Ball	1	100074
3236	Screw 5/16-18 x 3/4" LG	8	100344
3237	"0" Ring, Vent Plug	1	100335
3238	Screw 5/8-11 x 4" LG	2	100337
3240	1" Dia. Ball (N3)	4	100338
	1" Dia. Ball (N4)	4	100339
3242	"0" Ring, Valve Seat	4	100340
3243	"0" Ring, Valve Cap	2	100341
3244	Screw 5/8-11 x 2" LG	8	100343



**PARTS FOR MODELS 635 & 637 – METAL HEAD**

DRAWING NO. 6300

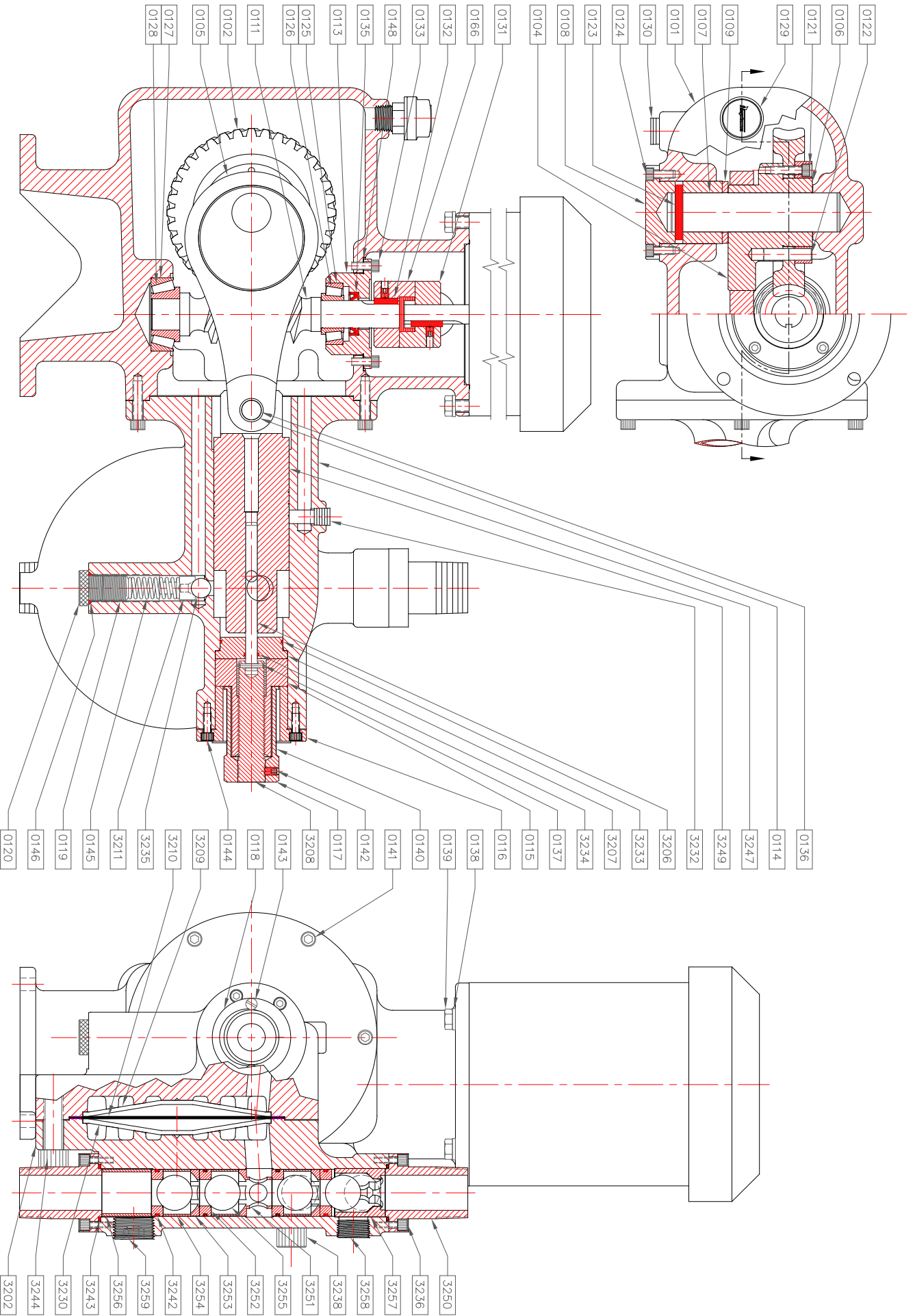
## SECTION VI

### PARTS LIST FOR PUMP MODELS 647 (REFER TO DRAWING NO. 6347, PAGE 24)

NOTE: N-3 PUMPS HAVE 316SS PUMP HEAD AND 316SS TRIM.  
N-4 PUMPS HAVE C-20 PUMP HEAD AND C-20 TRIM.

FIG. NO.	DESCRIPTION	QTY.	PART NO.
0101	Gearbox	1	000349
0102	Worm Gear 144 SPM	1	003101
0104	Eccentric	1	000352
0105	Connecting Rod	1	000353
0106	Eccentric Collar	1	000354
0107	Gear Shaft	1	000355
0108	Gear Shaft Retainer	1	000356
0109	Thrust Washer	1	000357
0111	Worm 144 SPM	1	106550
0113	Bearing Retainer	1	000358
0114	Connecting Rod Sleeve	1	000359
0115	Sealing Nut	1	000360
0116	Sealing Nut Retainer	1	000361
0117	Control Knob	1	000362
0118	Indicator Plate	1	000363
0119	Relief Valve Adjustment Screw	1	000364
0120	Relief Valve Cap	1	000365
0121	Screw 1/4-20 x 1" lg.	3	100293
0122	Dowel Pin 3/8" x 1-1/2" lg.	3	100294
0123	Spring Pin 1/4" x 1-3/4" lg.	1	100295
0124	Screw 1/4-20 x 5/8" lg.	4	100211
0125	Upper Bearing Cup	1	100296
0126	Upper Bearing Cone	1	100297
0127	Lower Bearing Cup	1	100298
0128	Lower Bearing Cone	1	100299
0129	Fill Plug/Vent	1	000191
0130	1/2" Pipe Plug	1	100300
0131	Motor Coupling	1	100098
0132	Motor Coupling Key	1	100218
0133	Screw 1/4-20 x 5/8" lg.	4	100211
0135	Oil Seal	1	100303
0136	Dowel Pin 5/8" x 2" lg.	1	100304
0137	Spring Pin 1/8" x 3/4" lg.	1	100305
0138	3/8" Lock Washer	4	100217
0139	Screw 3/8-16 x 1" lg.	4	100216
0140	Indicator Scale	1	100307
0141	Screw 5/16-18 x 1-1/4" lg.	6	100205
0142	Set Screw 1/4-20 x 3/8" lg.	1	100308
0143	Screw #10-32 x 3/8" lg.	2	100309
0144	Screw 1/4-20 x 5/8" lg.	4	100211
0145	Relief Valve Spring	1	100310
0148	Shim .005 Thick	A/R	100312

FIG. NO.	DESCRIPTION	QTY.	PART NO.
0146	O-Ring, Relief Valve Cap	1	100200
0166	Motor Coupling, 7/8"	1	100301
3202	Pump Head (N3)	1	000416
	Pump Head (N4)	1	000417
3206	Control Rod	1	000419
3207	Sealing Plate	1	000420
3208	Control Rod Screw	1	000377
3209	Pump Body Side, Backup Plate	1	000421
3210	Teflon Diaphragm	1	000422
3211	Relief Valve Ball Guide	1	000423
3230	Pump Head Backup Plate (N3)	1	000440
	Pump Head Backup Plate (N4)	1	000441
3232	1/4" Pipe Plug	1	100332
3233	O-Ring, Sealing Plate	1	100092
3234	O-Ring, Control Rod	1	100184
3235	5/8" Dia. Ball	1	100074
3236	Screw 5/16-18 x 3/4" lg.	8	100344
3238	Screw 5/8-11 x 4" lg.	2	100337
3242	O-Ring, Valve Seat	4	100340
3243	O-Ring, Connection Ports	2	100341
3244	Screw 5/8-11 x 2" lg.	8	100343
3247	Pump Body	1	003724
3249	Piston 2.4 Dia.	1	003723
3250	Suction/Discharge Port (N3)	2	003718
	Suction/Discharge Port (N4)	2	003728
3251	Spacer-Retainer (N3)	1	003720
	Spacer-Retainer (N4)	1	003730
3252	Valve Seat (N3)	4	003717
	Valve Seat (N4)	4	003727
3253	Ball Retainer (N3)	2	003722
	Ball Retainer (N4)	2	003732
3254	Stack Spacer (N3)	3	003719
	Stack Spacer (N4)	3	003729
3255	1-1/8" Dia. Ball (N3)	4	107229
	1-1/8" Dia. Ball (N4)	4	107230
3256	Suction Spacer (N3)	1	003721
	Suction Spacer (N4)	1	003731
3257	Ball Guide & Retainer (N3)	1	003716
	Ball Guide & Retainer (N4)	1	003726
3258	3/4" Pipe Plug, 316SS (N3)	1	004085
	3/4" Pipe Plug, C-20 (N4)	1	004209
3259	1" Pipe Plug, 316SS (N3)	1	004086
	1" Pipe Plug, C-20 (N4)	1	004210



**PARTS FOR MODELS 647 – METAL HEAD**

## ADDENDUM

### 600 SERIES PVC PUMP

#### THEORY OF OPERATION

The NEPTUNE 600 PVC "dia-Pump" is a double diaphragm pump employing the basic drive unit of the Neptune series 600 "dia-Pump".

All drive, stroke control parts and oil head are common to the original flat diaphragm models. An Intermediate plate and all parts in the liquid side are different from the basic pump.

Hydraulic oil displaces a flat diaphragm, which displaces "an intermediate fluid" which, in turn, flexes the second flat diaphragm.

- Note:
1. Valves may be removed for cleaning or replacement without disturbing the sealed portion Containing the intermediate fluid.
  2. All Neptune 600 PVC pumps are furnished with the intermediate fluid installed and factory sealed. Do not attempt to add additional fluid. Follow the instructions below only if the head has lost fluid due to the diaphragm failure.

#### DISASSEMBLY OF LIQUID HEAD:

- 1.0.0 Shut pump off and disconnect suction and discharge piping. Remove drain plug in lower left hand side of gear box and drain hydraulic oil from gearbox.
- 1.0.1 Remove (12) 3/8-16 screws and remove steel plate and liquid head. Process liquid and intermediate fluid will spill out when liquid head is removed.
- 1.0.2 Remove (10) 5/8-11 screws and remove intermediate plate. Some intermediate fluid and some hydraulic oil will spill out when intermediate plate is removed.
- 1.0.3 All parts should be inspected for any deficiency or wear and replaced if necessary. Both diaphragms should be replaced with new diaphragms.
- 1.0.4 To reassemble, reverse above procedure. Be certain that parts align properly and fill up hole on intermediate plate facing up. Tighten bolts evenly. Torque to 25 Ft lbs.

#### REFILLING INTERMEDIATE PLATE:

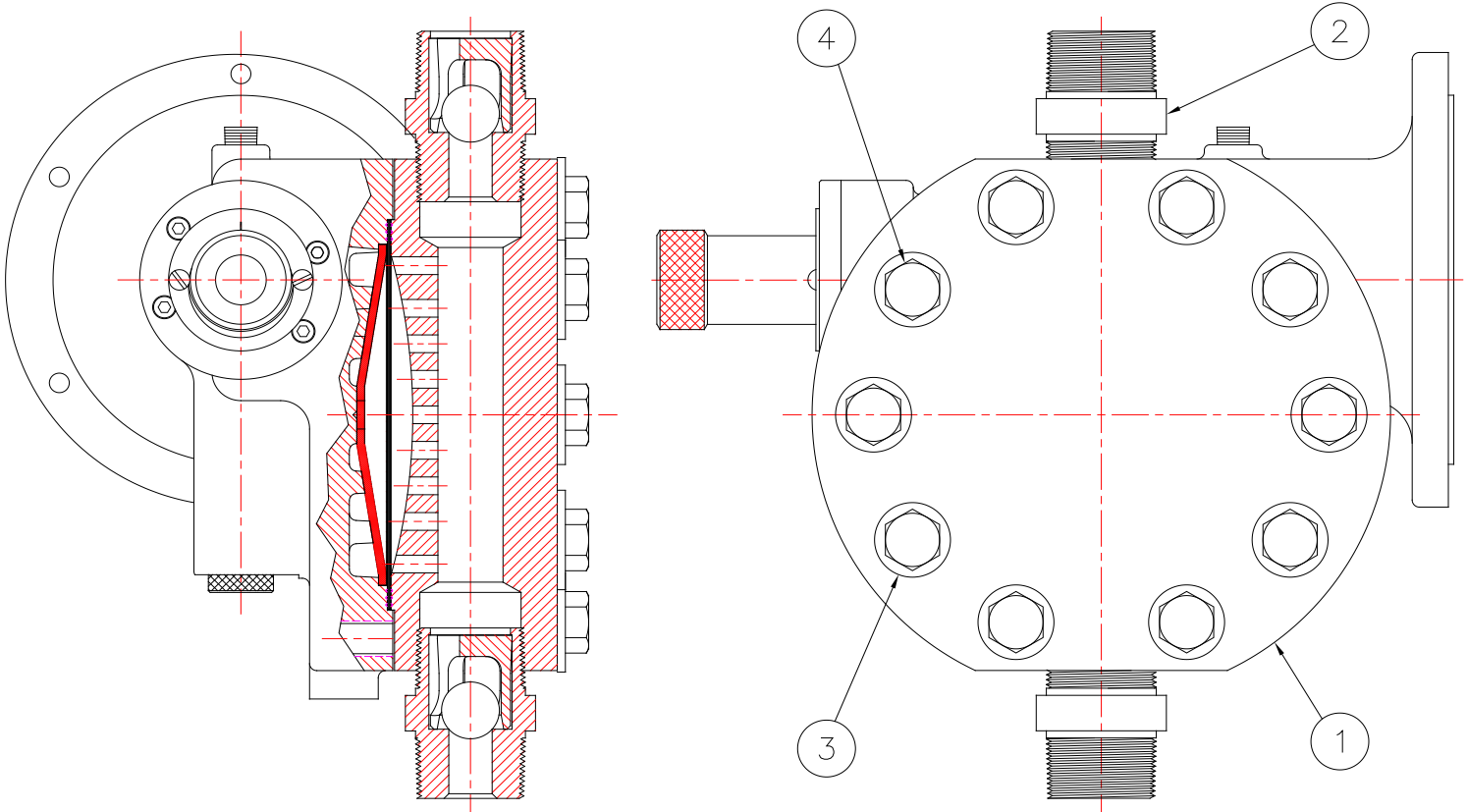
- 1.0.6 Remove fill plug in the top of intermediate plate.
- 1.0.7 Slowly pour contents of premeasured intermediate fluid into fill hole. Pour slowly and gently rock pump to help air escape from chamber during filling.
- 1.0.8 Fill intermediate chamber with exactly 165ml of intermediate fluid. When the solution reaches top of fill hole, install fill plug. Do not overfill the intermediate liquid chamber, collapse of the diaphragm is not acceptable and could result in difficult start-up and in lost Pump capacity.
- 1.0.9 Reinstall pump. Follow procedure in NEPTUNE STANDARD OPERATING AND INSTRUCTION MANUAL for initial pump start up.
- 1.0.10 Recommended Spare Parts for 600 PVC Head (addition to standard spare parts list). It is recommended that the following parts be kept in stock for a pump:

PART NUMBER	DESCRIPTION	QUANTITY
003014	Teflon Diaphragm	1
106693	Valve Seat "O" Ring	6
003080	Ball Seat	6
003172	Plate Gasket	2
003708	Backup Plate	1



# ADDENDUM

## 635-647 SERIES "dia-PUMP" PUMPS WITH N5 (PVC) AND N8 (KYNAR) HEAD OPTIONS



ITEM	DESCRIPTION	QTY.	N5 PART NO.	N8 PART NO.
1	PUMP HEAD	1	004169	004170
2	CHECK VALVE ASS'Y.	2	004175	004176
3	5/8-11 X 4" LG. SCREWS	10	107603	107603
4	FLAT WASHERS	10	107857	107857

### Recommended Spare Parts

It is recommended that the following parts be kept in stock for a pump:

ITEM FIG. NO.	DESCRIPTION	QTY.	N5 PART NO.	N8 PART NO.
3210	DIAPHRAGM	1	000422	000422
2	CHECK VALVE ASS'Y.	2	004175	004176
3233	SEALING PLATE O-RING	2	100092	100092
3234	CONTROL ROD O-RING	2	100184	100184

### PARTS ORDERING INSTRUCTIONS

Note: For prompt entry of orders for these pumps; your order must include both model number and serial number.

## SECTION VI

### 10.0 SPARE PARTS

10.0.1 Important-When ordering spare parts, please show MODEL NUMBER AND SERIAL NUMBER of pump for which parts are being ordered. This information can be found on a stainless steel nameplate riveted to the side of the pump.

#### 10.0.2 Recommended Spare Parts for **PUMP MODELS 630, 635 AND 637**

It is recommended that the following parts be kept in stock for a pump:

FIG.NO.	PART NO/	DESCRIPTION	QUANTITY
3210	000422	Teflon Diaphragm	1
3222	000432	Valve Seat (N3)	4
	000433	Valve Seat (N4)	4
3233	100092	Sealing Plate "O" Ring	2
3234	100184	Control Rod "O" Ring	2
3237	100335	Vent Plug "O" Ring	2
3240	100338	Valve Ball (N3)	4
	100339	Valve Ball (N4)	4
3242	100340	Valve Seat "O" Ring	8
3243	100341	Discharge & Suction Cap "O" Ring	4

#### 10.0.3 Recommended Spare Parts for **PUMP MODEL 647**

It is recommended that the following parts be kept in stock for a pump:

FIG. NO.	PART NO/	DESCRIPTION	QUANTITY
3210	000422	Teflon Diaphragm	1
3233	100092	Sealing Plate "O" Ring	2
3234	100184	Control Rod "O" Ring	2
3242	100340	Valve Seat "O" Ring	8
3243	100341	Discharge & Suction Cap "O" Ring	4
3252	003717	Valve Seat (N3)	4
	003727	Valve Seat (N4)	4
3255	107229	Valve Ball (N3)	4
	107230	Valve Ball (N4)	4

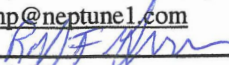
### PARTS ORDERING INSTRUCTIONS

Note: For prompt entry of orders for this pump; your order must include both model number and serial number.



# EC Declarations for Diaphragm Metering Pumps

NEPTUNE Diaphragm Metering Pumps are **not** declared in accordance with the ATEX Directive and should not be ordered for use in a potentially explosive environment, as NEPTUNE Diaphragm Metering Pumps are **not** supplied in accordance with the ATEX Directive.

Manufacturer: Neptune Chemical Pump Company  
 Address: 295, DeKalb Pike, North Wales, PA 19454 USA  
 Telephone and FAX.: (215) 699-8700, FAX- (215)-688-0370  
 E Mail: pump@neptune1.com  
 Signature:  Date: February 27, 2012  
 Full Name: Ralph Gessner  
 Position: VP/GM  
 Product: Type: Neptune Diaphragm Metering Pump Models Series 400, 500, 600, 6000, and 7000  
 Serial Number: As applicable

### EC directives:

Neptune Chemical Pump Company declares compliance with the Machinery Directive (98/37/EC) by meeting the requirements of Parts 1 and 2 of the European Standard EN ISO 12100. As stated in ANNEX ZB of EN ISO 12100 Neptune Chemical Pump Company declares that the product(s) listed above complies with the essential health and safety requirements relevant to the specific product as outlined below:

- 2006/42 EC The Machinery Directive
- 2004/108/EC The EMC Directive (*only applies for pumps supplied with a motor and the compliance exists from the motor manufacturer*)
- 2006/95/EC The Low Voltage Directive (*only applies for pumps supplied with a motor and the compliance exists from the motor manufacturer*)



**Pumps will have CE mark on the tags and the box they are packaged in.**

Neptune Pumps delivered by Neptune Chemical Pump Company, **without motors** may only be used when the motor supplied by the end user and the connection between the motor and the pump comply with the above directives.

### EC Declaration of Conformity

Neptune Chemical Pump Company declares that the products listed above comply with the essential health and safety requirements relevant to the specific product as outlined below:

All Neptune products listed above conform to the Machinery Directive 2006/42 EC: Part 1 of Annex I and comply with the relevant requirements of EN ISO 12100 Parts 1 and 2, : Safety of machinery - Basic concepts, general principles for design. Additional standards met:

- DIN EN 60524-1 EN-Direct-current resistive volt ratio boxes (IEC 60524:1975 + A1:1981)
- DIN EN 61000-4-2,4-3,4-4,4-5,4-6 Electromagnetic compatibility (EMC) - Part 4: Test and measuring methods
- DIN EN 809 Pumps and pump units for liquids - Common safety requirements
- DIN EN ISO 4871 Declaration and verification of noise emission values of machinery and equipment

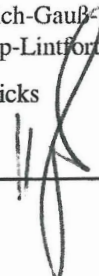
It is declared that the product **may not be taken into use** in an explosive environment.

**There will be CE mark on electric motor if supplied as well as pump tag and on the boxes they are packaged in.**

Authorized Representative: ALMATEC Maschinenbau GmbH

Address: Carl-Friedrich-Gauß-Straße 5  
47475 Kamp-Lintfort, Germany.

Managing Director: Bernhard Dicks

Signature: 

Date February 17, 2012

ZL104584 Rev 3

