

OPERATION AND INSTRUCTION MANUAL

FOR

DIAPHRAGM TYPE METERING PUMP



Always think ^{of} Positive

MANUFACTURED BY



POSITIVE METERING PUMPS (I) PVT. LTD.

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An ISO 9001 : 2008 COMPANY



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GUARANTEE

THE DOSING PUMPS SUPPLIED TO M/S.....

.....VIDE THEIR P.O. NO.....

DATE..... & OUR INVOICE NO..... DATE.....

ARE GUARANTEED AGAINST ANY INHERENT MANUFACTURING DEFECT FOR A PERIOD OF EIGHTEEN MONTHS FROM DATE OF SUPPLY OR TWELVE MONTHS FROM DATE OF INSTALLATION WHICHEVER IS EARLIER.

THE GUARANTEE IS LIMITED ONLY TO FREE REPLACEMENT OF PART OF THE PUMP DUE TO ANY INHERENT MANUFACTURING DEFECT PROVIDED THE PUMP IS CORRECTLY INSTALLED AND OPERATED IN ACCORDANCE WITH OUR INSTRUCTIONS. THE GUARANTEE DOES NOT COVER MISUSE OR NEGLECT IN THE INSTALLATION. THE GUARANTEE ALSO DOES NOT COVER ANY CLAIM ARISING OUT OF FIRE, ACCIDENT, WILLFUL DAMAGE TRANSIT DAMAGE OR NORMAL WEAR AND TEAR OR ANY OTHER FOR CD MAJOR CONDITION.

THE LIABILITY IS LIMITED TO FREE REPLACEMENT OF ONLY SUCH PARTS OF THE PUMP AS ARE MANUFACTURED BY US AT OUT WORKS. THE GUARANTEE DOES NOT COVER BOUGHT OUT ITEMS SUCH AS BALL BEARING, GASKET, OIL SEALS, ETC. THE GUARANTEE IS LIMITED ONLY TO THE FREE REPLACEMENT OF PARTS OF PUMP FOUND TO BE INHERENTLY DEFECTIVE. NO OTHER LIABILITY IS IMPOSED BY THE GUARANTEE.

THE DEFECTIVE PARTS SHOULD BE DESPATCHED TO US SECURELY PACKED AND FREIGHT PAID AND INSURED. FREE REPLACE PART WILL BE MADE IMMEDIATELY ON OUR RECEIVING THE DEFECTIVE PARTS.

(Stamp & Signature)



OPERATION

PRINCIPLES OF OPERATION

POSITIVE make Metering Pumps are controlled volume positive displacement reciprocating pumps, consisting of two basic mechanisms viz, the drive system and the liquid end. The drive mechanism is essentially a modified crank mechanism by a worm gear reduction rotating about its axis in vertical plane. An Eccentric is linked to the slider by a guide pin which also rotates along with the eccentric in a fixed horizontal plane. The cylindrical end of the guide pin is fitted in the Eccentric and the rectangular end is free to slide in the slider slot. At zero stroke the axis of rotation of the Eccentric and the slider coincides. By rotating the control barrel, the slider can be moved up or down resulting in the shift of the slider pin in the slider slot away from the axis. Thus the desired Eccentricity is achieved, which in turn is converted into the reciprocating motion of the plunger with the help of eccentric strap and cross head. Stroke length can be set from 0 to 100% by rotating the control Barrel the required graduations on the scale.

INSTALLATION

When installing, operating and maintaining metering pumps, keep safety considerations foremost. Use proper tools, protective clothing and eye protection when working on the equipment. Take additional safety measures appropriate to the liquid being pumped. Be extremely careful in the presence of hazardous substances. Install the equipment with a view towards ensuring safe operation.

PRE-OPERATIONAL INSPECTION

After the pump is installed, but before it is started for the first time, a number of checks should be made

- a. Bolts and fitting: Be sure all tie down bolts are tight.
- b. Piping is installed properly.
- c. See correct oil level of recommended lubricant is maintained in the gearbox.
- d. The stroke adjustment of the pump is at minimum setting.
- e. All shut-off valves(isolating valve) are opened.
- f. Make sure the suction lines are fitted with system fluid.
- g. Check Pressure Relief Valve is mounted on the discharge line before first isolation valves.



CAPACITY ADJUSTMENT

With the help of the Control Barrel the capacity of the pump can be changed. The direction of the rotation for increase/decrease is indicated on the control Barrel. By rotating the Control Barrel in the clock wise direction, the stroke length can be increased / decreased and in turn the capacity can be changed. The stroke scale has graduations from 0 to-100% of stroke. For setting the desired stroke length, first loosen the screw of Control Barrel, turn the barrel and bring the indicator to the desired position and re-lock the lock nut.

START UP INSPECTION

a. General :

All pumps are thoroughly tested under simulated operation conditions before they leave the factory to verify the pump capacity and to check the drive motor for satisfactory operation at maximum rated condition. With the pump housing filled proper oil to the required level and all piping and electrical connections made, the pump is now ready for start-up.

b. WARNING :

1. Do not run pump without oil.
2. Use only approved oils.
3. Do not remove back plate of main housing while pump is running.
4. Do not run pump with the coupling guard removed.
5. Do not put hands or fingers in gear box when pump is running.

New packing installed and shipped from the factory in a complete pump or liquid end, have been “set” and “run in” during production/quality assurance testing; and require no further adjustment for start-up.

Initial running

1. Start the pump for a moment and ensure the preferred direction of rotation as marked on the blank end cover.
2. On initial start-up, run the pump for 30 to 40 seconds. Repeat approximately 10 times, During these start runs listen for any abnormal noise and if you notice any, refer to trouble shooting chart for remedy.
3. Set stroke adjustment to maximum capacity and run pump for 30 minutes without any discharge pressure. Check discharge line for indication of flow.



CALIBRATION

- I. General: The metering pumps are calibrated on our test stands under the following conditions:

Suction lift 0.3 M/positive suction head of 2.5 M.

- A) Discharge Pressure as specified by the customer.
B) The required pressure is obtained by an adjustable throttle valve on the discharge side.

The final Calibration must be done under actual conditions at site.

II. Capacity calibration :

After the initial running of the pump and adjustment of the packing, test runs should be made to determine the exact capacity of the controlled volume pump under the specific operation conditions for various stroke length settings. It is necessary to calibrate the pump at only four stroke length settings to determine its characteristics throughout the entire range. The settings normally used are 100%, 75%, 50%, and 25% stroke length. Two methods of measuring the capacity in a given time can be used.

- (1) Measure the drop of liquid level from calibrated vessel on suction side. This is preferred to any other method.
- (2) Measure the quantity collected from the discharge side of the pump. Check the capacity several times at four different stroke length settings. Record the readings on linear graph paper. For all stable conditions these points should describe a straight line.

Precautions :

It is essential that the suction lines of controlled volume pumps be absolutely free of entrapped air vapour, to prevent gas entrapment into liquid end. Liquid ends are designed to rapidly discharge any small bubbles which may enter. However large amount of gas in the liquid end is alternatively compressed and expanded with each plunger stroke and causes inaccuracies in pumping. In severe cases the liquid end may become vapour bound and cease pumping altogether.

When the pump has to be started frequently against full system pressure it is necessary to have the system piping layout as shown in illustration. When starting the pump against full system pressure first the bypass valve is fully open and then it is gradually closed to load the pump to bring it to system pressure. This is absolutely necessary to protect the pump from shock loading.



PIPING

A. General Information

1. Use piping material that are resistant to corrosion by the pumped media. Connection to the pump liquid end should be carefully selected.
2. Use piping to withstand maximum working pressure.
3. Provide for pipe expansion when hot fluids are to be pumped. Support piping to make connections.
4. Piping should be as short as possible and slopped in a manner to prevent trapping of vapour in pockets. Vapour present in liquid end will cause inaccurate pump delivery.
5. Install full flow type shut off valves with union/ flanges on the suction and discharged side to facilitate servicing

B. Suction Piping

1. If Possible, use metal or plastic tubing for the suction line because tubing has a smooth inner surface and can be formed into long sweeping bends : thus decreasing frictional flow losses.
2. Suction piping must be absolutely air tight to ensure accurate pumping, After installtion, test suction piping with compressed air and soap solution for leaks.
3. A strainer should be used in the suction line to prevent foreign particles from entering the liquid end.
4. If is preferable to have the suction of the pump flooded by having the liquid end located below the lowest level of the fluid in the supply tank.
5. Sealed piping, sufficient suction pressure, and properly adjusted packing are absolutely necessary for accurate and stable pump operation.

C. Discharge Piping

1. A pressure relief valve must always provided immediately after the discharge post. Pipe the outlet of the relief valve back to the suction tank.(do not pipe back into pump suction line)
2. To maintain a smooth flow, a pulsation dampner chamber should be installed immediately after the discharge port. Contact us for correct sizing and location.
3. The pump will not deliver a controlled flow if the discharge pressure is less than the suction pressure. To guarantee proper functioning the pump, the back pressure at the discharge end must be at least 0.5 kg/cm² (7 psi) higher than the suction pressure, if these pressureconditions can not be attained by installed on the discharge side. The pump produces the required pressure to overcome the discharge side.The pupm produces the required pressure to overcome the discharge side. The pump produces the required pressure to overcome the back pressure or discharge pressure in the discharge pressure.



D. Precaution about piping layout

When planning pipe installation the following precautions must be taken

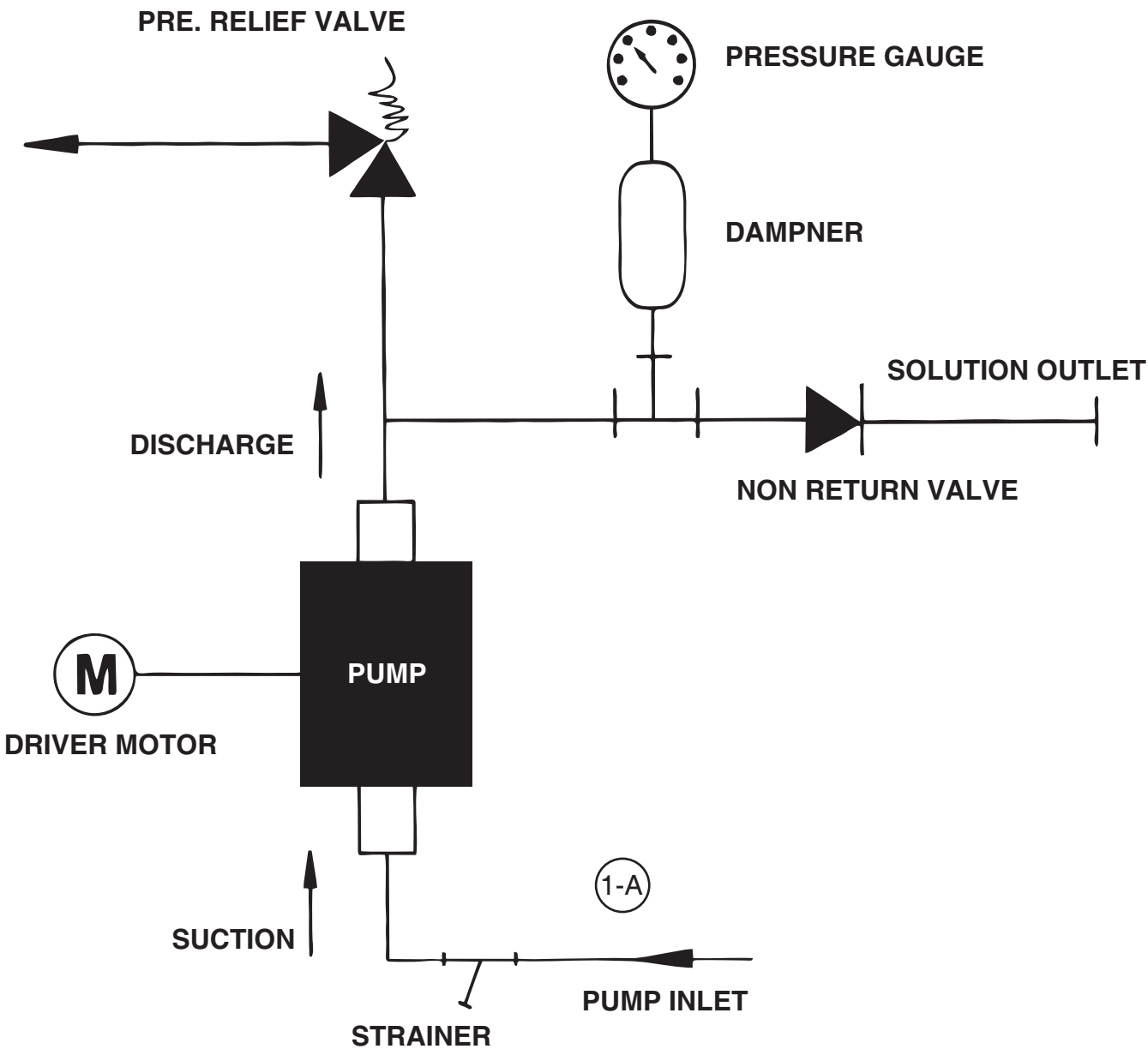
1. Avoid lengthy pipelines of small diameter and sharp bends.
2. Avoid use of thin walled suction hoses without reinforcement. They collapse during suction stroke.
3. Avoid suction lines drawn from the lowest point of a reservoir.
4. Avoid filters whose elements cannot be changed or cleaned.
5. Avoid shut off valves (isolating valves) in the delivery line, unless a safety valve is installed before the shut off valve to prevent excess pressure build line.
6. Avoid Pressure relief valve discharge back to suction line.
7. Pipe line must be free of tension when filled.
8. Pumps head must not be subjected to any strain by the weight or vibration of the pipe line system.
9. Pipe line and pumps must not be installed that inspection overhaul or repairs can be easily carried out.

PRECAUTIONS

It is essential that the suction lines of controlled volume pumps be absolutely free of entrapped air vapour, to prevent gas entrapment into liquid end. Liquid ends are designed to rapidly discharge any small bubbles which may enter. However large amount of gas in the liquid end is alternatively compressed and expanded with each plunger stroke and causes inaccuracies in pumping. In severe cases the liquid end may become vapour bound and cease pumping altogether. When the pump has to be started frequently against full system pressure it is necessary to have the system piping layout as shown in illustration. When starting the pump against full system pressure first the bypass valve is fully open and then it is gradually closed to load the pump to bring it to system pressure. This is absolutely necessary to protect the pump from shock loading.



TYPICAL INSTALLATION DIAGRAM





MAINTENANCE

Accurate records in the early stages of pump operation will reveal the type and amount of maintenance that will be required. A preventive maintenance program based on these record will ensure trouble free operation. It is not possible in these instructions to forecast the life of such parts as the valves, gland packing and other contact parts with the product you are handling. Corrosion rates and conditions of operations effect the useful life of these materials so an individual metering must be gauged according to particular service conditions.

LUBRICATION

Accurate records in the early stages of pump operation will reveal the type and amount of maintenance that will be required. A preventive maintenance program based on these record will ensure trouble free operation. It is not possible in these instructions to forecast the life of such parts as the valves and other contact parts with the product you are handling. Corrosion rates and conditions of operations effect the useful life of these materials so an individual metering must be gauged according to particular service conditions.

Remove the breather plug and with the help of funnel fill the oil in the gear reservoir main housing, with recommended gear lubricant to the oil level mark. Make use of the OIL LEVEL INDICATOR. The oil should be changed every 500 hours of operation or every 3 months- whichever is earlier. Use only recommended oil. Do not overfill.

OIL CAPACITIES FOR DIFFERENT PUMP MODELS ARE GIVEN BELOW.

Sr. No.	PUMP MODEL	OIL CAPACITY
1.	HD1011 / Sz.'O', HD 1011 / Sz.'1'	0.250 Ltr.
2.	HD2017 / Sz.'1', HD2017 / Sz.'2'	0.45 Ltr.
3.	HD 3530 / Sz '2', HD 3530 / Sz '3'	1.1 Ltr.
4.	HD 6040 / Sz '2', HD 6040 / Sz '3'	8.5 Ltr.s

LIST OF RECOMMENDED OILS

Sr. No.	Name of Manufacturer	Grade
1.	Indian Oil	Sen/o system / Seromesh - 460
2.	Hindustan Petroleum.	Enkic - 460
3.	Bharat Petroleum.	Bharat Petroleum - 460
4.	Castrol	Hyspin Aws - 460
5.	Gulf	Harmonv - 460
6.	Veedol	Avalon - 460

Hydraulic Oil used for oil chamber - SHE 20w40



CHECK EVERY 48 HOURS

1. Oil Level in the gear box.
2. Inspect the liquid end for indication of leakage. Glands to be tightened as gently as possible.
3. Grease/oil all lubricating points.
4. Oil the cross head every 48 hours.

HYDRAULIC OIL CAPACITIES FOR DIFFERENT MODELS

Sr No.	Model	Hydraulic oil qty(ltrs)	Grade
1.	HD1011/SZ0	0.25	SHE 20w40
2.	HD1011/SZ1	1.2	
3.	HD2017/SZ1 &SZ2	1.2	
4.	HD3530/SZ1 & SZ2	1.2	
5.	HD3530/SZ3	4.5	
6.	HD6040/SZ3	4.5	
7	HD6040/SZ4	6.5	



METERING PUMPS WITH DIAPHRAGM HEADS

DESIGN AND PRINCIPLE OF OPERATION

These heads are added on to our POSITIVE Metering Pump Drive Ends. Variable stroke mechanism of POSITIVE metering pumps is used for varying the flow rate of the pump for variable stroke models. This “variable stroke mechanism” moves a piston in closely guided bush. This piston, displaces hydraulic fluid which acts on the diaphragm to deflect it. Displaced volume of hydraulic fluid is changed by change of piston stroke. Volume of hydraulic fluid displaced by piston is same as volume of the hydraulic fluid trapped between the piston and diaphragm has to be maintained. This is achieved by vacuum system in combination with Refill System. The replenishment of hydraulic fluid to compensate for losses around piston, air bleed valve, and other places, is carried out only when following conditions are met :

- 1) Refill Gate is pressed back by diaphragm so that vacuum system can communicate with piston chamber.
- 2) Vacuum in piston chamber is adequate to open up vacuum system. The main advantage of this system is that system can not overfill the piston chamber even if high vacuum is created due to clogged or blocked suction on process fluid side. Vacuum System can fill up the piston chamber only in the retracted condition of diaphragm. Diaphragm heads are superior to plunger heads due to the inherent advantage of “No Leak Pumping of the Product”. Diaphragm Heads also have a built-in safety valve on hydraulic fluid side- This safety valve is designed to protect the pump against excessive back pressure. If the pressure in the pump head rises above the set pressure the safety valve opens and the hydraulic fluid displaced by the plunger flows back into the oil chamber. The pump must not be run in this condition for a long time. Air bleed valve is fitted either integrally with safety valve or independently. A small leakage flow is set through it to eliminate any gas present in the piston chamber on a continuous basis.

HYDRAULIC FLUID

The recommended hydraulic fluid is SAE 20W4Q OIL for general purposes. For specific recommendations; where operating conditions are different from normal ambient conditions; lease contact us for recommendation of Hydraulic Fluid.

COMMISSIONING AND MAINTENANCE

Every pump is thoroughly checked before despatch. Hydraulic vacuum system and safety relief valves are set. Vacuum system spring is so set that it would open if the piston chamber pressure drops below 0.4 kg/cm². Safety valve is generally set at 1.4 times system or operating pressure.

INSTALLATION

Sizes of all connections should be taken from pump data sheet. All joints must be made so that no stress is imposed on the pump head. Piping and joints must be thoroughly cleaned. Support and secure the pump to the foundation as per foundation plan given in GA Drawing. Before starting pump, check that electrical connections are proper as per data sheet.



COMMISSIONING PROCEDURE

I) FOR METERING PUMPS

Fill up the recommended hydraulic fluid in the Hydraulic Chamber [60-41-0] upto the oil level mark- Turn the pump drive shaft and see that pump is free to turn by hand. Set the stroke at 10% setting, open the Pump isolation Valve on the Suction side and start the pump. Increase the stroke and top up the oil level in hydraulic chamber if it drops below level mark. Slowly all the air from the diaphragm chamber would be bled off and the pump would eventually reach rated Capacity. In extreme cases if the piston chamber gets air locked adopt following procedure. Disconnect power supply to pump motor. Set the pump at about 50% to 62% stroke setting. Unscrew and remove the safety relief valve assembly from the Actuator Body. Move the piston backward and forward by hand and pour hydraulic fluid in the safety relief valve fixing port. During suction stroke of piston the oil would be sucked in, fill up the entire piston chamber by hydraulic fluid by pouring it in safety relief valve damaged during reassembly. **DO NOT START THE PUMP AT THIS STROKE SETTING. THIS MAY CAUSE SERIOUS DAMAGE TO THE DIAPHRAGM.** Change the stroke setting to 100% and start the pump. Initially the pump may discharge excess oil through the Air Bleed Value. Pump would start pumping and within few minutes would reach rated capacity.

II) FOR NON-METERING PUMPS (FIXED STROKE MODELS)

First loosen the PRV-cum-Air Bleed Valve. (Charge the oil chamber fully). Open Pump isolation Valve on the Suction side, start the pump top up the Hydraulic chamber to maintain the oil level, if necessary. After a few strokes, tighten PRV fully. In case Pump does not deliver rated capacity, loosen PRV and use compressed air in pump suction line to deflect the Diaphragm towards piston side then tighten the PRV, disconnect Air Line and start the pump.

SERVICING

Check hydraulic fluid level in Hydraulic chamber at fortnightly intervals. It is recommended-2 that diaphragm should be changed after 3000 running hours.

INSTRUCTION FOR DISMANTLING AND ASSEMBLY

1. Dismantling the Diaphragm head

- 1.1 Dismantle all piping connections;
- 1.2 Carefully remove pump non-return valve, do not damage teflon washers;
- 1-3 To remove diaphragm, first drain off the hydraulic fluid from hydraulic chamber. Unscrew Diaphragm head fixing bolts and Dis-manllc Diaphragm Head.
- 1.4 For removal of Actuator body unscrew Actuator body fixing screw for hydraulic chamber and slide out Actuator body over the piston;
- 1.5 Unscrew vacuum system assembly
- 1.6 Unscrew safety relief valve assembly taking care not to disturb the setting of the valve.



ASSEMBLY

Assembling sequence is in reverse order of that of dismantling. Following points should be carefully noted before reassembly :-

- 1) Clean all parts thoroughly and check that their condition is satisfactory.
- 2) Re lap carefully PRV Seats, replace worn-out pump NRVs.
- 3) When tightening Diaphragm head screws tightening torque should be reached in steps. Tightening should be done to diagonally opposite bolts in alternate sequence Tightening Torque for M10 Bolts should be 20 Nm tightening torque.
- 4) When fitting pump valves note that direction of flow through the pump NRVs.
- 5) Protect all screw threads from seizing by lubricating them with grease or liquid paraffin.
- 6) Check the setting of the hydraulic vacuum system as per procedure given below.

For vacuum system initial compression on the spring is given in the following table. This setting is checked by placing a weight on the back stem of valve or more simply by pressing the valve stem against single pan balance. The force required by the valve to just lift off from the seat is the force given in table.

Type of HYD. Snift Valve	Initial Spring Compression Force kgf
Sz3	0.5 to 0.4
Sz2	0.2 to 0.15

7) PRESSURE RELIEF VALVE SETTING

Release the tension on the spring of the PRV. Set the pump to zero stroke, run it against closed discharge. Tension the PRV Spring very gradually and increase the stroke to 20%. The pressure at which the pressure relief valve opens should be read on the pressure gauge on the outlet of the pump. Gradually increase the tension on the Spring till the desired pressure level is reached on the gauge. Tighten the Lock Nut to secure the PRV setting. Now open the discharge valve and increase the stroke setting the desired level.



METERING PUMP WITH SANDWICH (Double) DIAPHRAGM

HEAD DESIGN AND PRINCIPLE OF OPERATION

Sandwich Diaphragm Heads are improvement over conventional double diaphragm heads. There are essentially two diaphragms which are in physical contact with each other while maintaining very fine gap in between to sense any leakage past the diaphragm due to rupture of the Diaphragm. In the normal operation of the intermediate cavity between the two diaphragms is under atmospheric pressure and both the Diaphragms act together as if they are mechanically coupled. If there is any rupture or a pin hole to any of the Diaphragms, pressure in the intermediate chamber rises to the System Pressure and this rise in pressure is sensed by the pressure sensor/pressure gauge through the non-return valve which is at the upper side of the actuator body. Intermediate chamber is in connection with this pressure sensor / pressure gauge through a small orifice. The only difference between diaphragm heads with single diaphragm and sandwich diaphragm heads is the additional diaphragm intermediate chamber and the sensing elements which are extra- The entire operation of the sandwich diaphragm head is identical to the single diaphragm heads. Please refer to section Metering Pumps with diaphragm heads for further details.

I. Intermediate Fluid

It is possible to run these pumps without any intermediate liquid. However, it is recommended to use distilled water as intermediate fluid. If it is compatible with the process fluid. Any other compatible liquid also can be used in the intermediate chamber.

II. Commissioning Procedure

1. Fill up the recommended intermediate fluid in the space between the two diaphragms. The reservoir containing intermediate fluid can be kept at the height, (to give a positive head of about 1m) or pressurized with compressed air (0.1 to 0.2 bar) and connected to lower nipple via a flexible tube. Do not use higher pressure than 0-2 bar and ensure top nipple is loosened before connecting tube to bottom nipple to avoid stretching of diaphragms.
2. For the filling operation both nipple must be slackened off, the top one by at least four turns. Intermediate fluid issues from the upper nipple. Bleed off the intermediate fluid till all the air has come out. Now first the lower and then the upper connections must be tightened down. Cavity between two diaphragms is now full with intermediate fluid.
3. Pour hydraulic fluid into hydraulic chamber. Run the pump at full stroke. Pressure gauge / Pressure sensor will sense some pressure. Release this pressure by opening upper nipple. Retighten the nipple.
4. Run the pump for about 10 minutes.
5. Change and vent the intermediate chamber as described above, when the pump is run against the back pressure. Excess intermediate fluid with air issues from the upper nipple connection of the Sandwich Diaphragm when we slacken the top nipple slightly. Reduce the pressure in intermediate chamber by removing excess fluid out through top nipple.



III Assembly procedure with Sandwich Diaphragm Pump Heads.

1. Degrease the diaphragms before assembly. See that the mesh between the two diaphragms is intact. Insert two diaphragms in centre ring since the pitch of the holes for the retaining bolts is uniform, make sure that the centre ring is turned to that the hydraulic diaphragm leak monitoring holes are aligned with the leak monitoring passage in the Actuator Body. Follow same procedure as given for Single Diaphragm Pump assembly.



TROUBLE SHOOTING CHART

<u>DIFFICULTY</u>	<u>PROBABLE CAUSE</u>	<u>REMEDY</u>
Pump does not start.	1. Coupling disconnected 2. Faulty power source 3. Blown fuse 4. Broken wire 5. Wired improperly	Connect and align Check power source Replace Locate and repair Check diagram
No delivery	1. Motor not running 2. Supply tank empty 3. Lines clogged 4. Closed line valves 5. Suction or discharge NRV's held open with solids 6. Vapour Lock, cavitation 7. Strainer clogged 8. Prime lost 9. Pipeline Blockage 10. Shut off valve closed	Check Power Source Check wiring diagram Fill the liquid Clean and Flush Open pipeline valves Clean and inspect Increase suction Pressure Remove mesh & clean Check for suction pipe line leak. Locate & clear pipelines Open valves
Low Delivery wiring	1. Motor speed too low 2. Discharge and suction check valves 3. Pressure Safety valve open each stroke. 4. Calibration system error 5. Product viscosity too high 6. Pump cavitating	Check voltages, frequency, & terminal connections Clean, replace if damaged worn or dirty Reset PSV. Evaluates correct Lower viscosity by increasing product temperature Increase pump size. Increase suction pressure Cool product as necessary



<u>DIFFICULTY</u>	<u>PROBABLE CAUSE</u>	<u>REMEDY</u>
Delivery Gradually	7. Heavy gland leakage	Inspects replace if deteriorated
	8. Bypass leakage	Correct for by-pass valve leakage.
	1. Suction/discharge NRV leakage	Clean & Replace, if damaged
	2. Leak in suction line	Locates Correct
	3. PSV set too low	Readjust
	4. Stroke adjustment creeping	Consult Factory
	5. Strainer Fouled	Clean, replace mesh
	6. Product Change	Check viscosity
Delivery erratic	7. Bypass leakage	Correct for by-pass valve leakage
	8. Gland Leakage	Inspects replace if damaged
	1. Leak in suction line	Locates Correct
	2. Pump cavitating	Increase suction pressure
	3. Entrained air or gas in product	Consult Factory for suggested venting
	4. Motor speed erratic	Check voltage, frequency
	5. Fouled Suction/delivery NRV	Clean, Replace if necessary
	1. Suction pressure higher than discharge pressure	Install back pressure valve or consult Factory for piping recommendations
Delivery higher than rated	2. Back pressure valve set too low	Increase setting
	1. Leaky oil seal	Replace
Pump loses oil	2. Leaky gasket	Replace
	3. Gear box over filled	Remove excess oil
	4. Leaky grub screws on drive end cover	Replace, use Teflon tape or drive bush



<u>DIFFICULTY</u>	<u>PROBABLE CAUSE</u>	<u>REMEDY</u>
Noisy gearing knocking	1. Discharge pressure too high	Reduce pressure
	2. Water hammer	Install dampner
	3. Worn bearing, gear	Replace
	4. End play in worm shaft	Correct for shaft play by shims
	5. Play in plunger	Tighten cross head nut
	6. Loose Thrust plate	Tighten control bush screws
Noisy Piping	1. Pipe size too small	Increase size
	2. Pipe runs too long	Install dampner
	3. No dampner used	Install dampner
	4. Dampner full of liquid	Recharge with air
	5. Pipe support inadequate	Properly install pipe
Noisy overheats	1. Motor overloaded	Check operating conditions against pump design
	2. Low voltage	Check power supply
	3. Loose wire	Trace & correct
	4. Over tightened gland	correct by loosening gland nut
Pump over heats	1. Oil level too low	fill oil in gear box
	2. Gear box over filled	Remove excess oil
	3. Wrong shaft rotation	correct shaft rotation
	4. Thrust plate over tightened	correct thrust plate play by tightening & proper shims

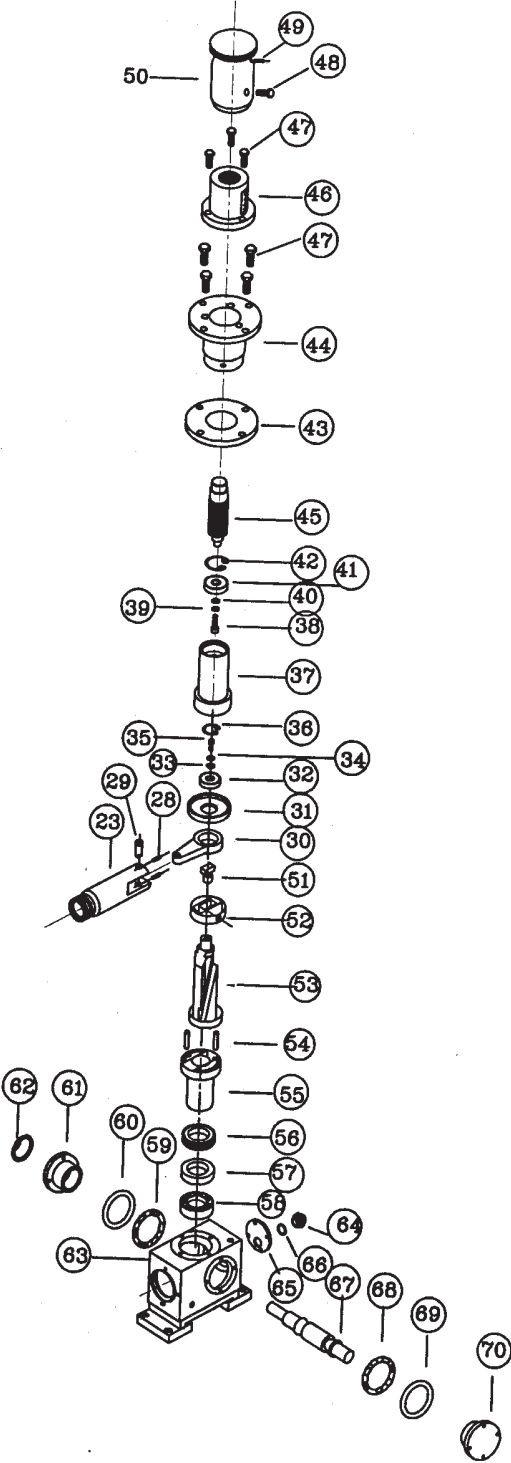


RECOMMENDED LIST OF SPARE PARTS:

Guide Pin	1 No.
Gudgeon Pin	1 No.
Shear Pin	2 No.
Oil Seal for Worm Shaft	1 No.
Oil Seal for Yoke	1 No.
Ball Bearing for screw	2 No.
Ball Bearing for Worm Shaft	2 No.
Ball Bearing for Crank Housing	1 No.
Ball Bearing for SL guide	1 No.
Gasket set	1Set.
Spider for coupling	1 No.
Valve Set (Seat & Ball)	2 Set.
Sealing Rings(valve)	6 No.



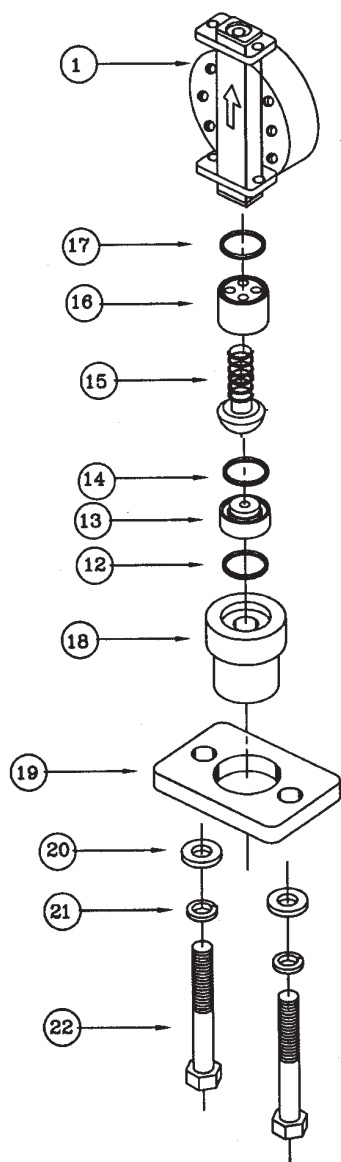
POSITIVE METERING PUMPS



DRIVE END ASSEMBLY FOR DIAPHRAGM TYPE PUMP

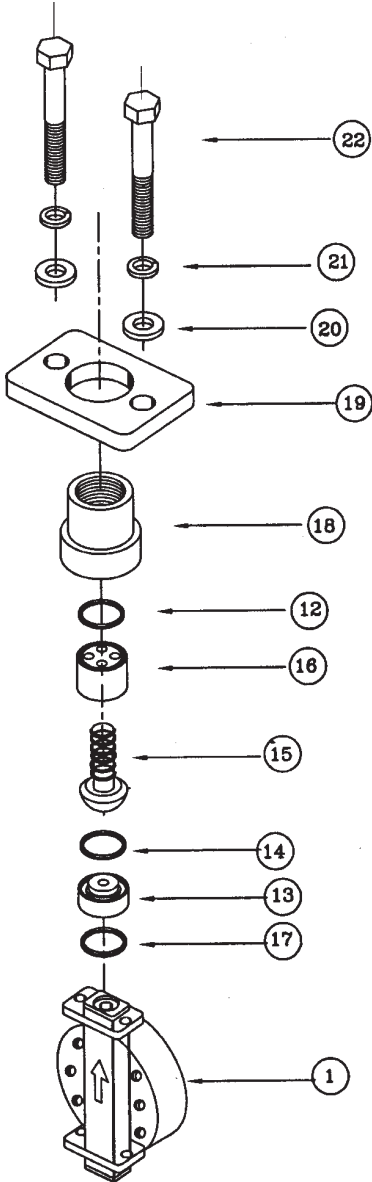


POSITIVE METERING PUMPS



SUCTION SIDE VALVE ASSEMBLY

ITEM NO.	DESCRIPTION
1	LIQUID HEAD
12,14,17	SEALING RING
16	VALVE CAGE
15	POPPET WITH SPRING
13	VALVE SEAT



DISCHARGE SIDE VALVE ASSEMBLY

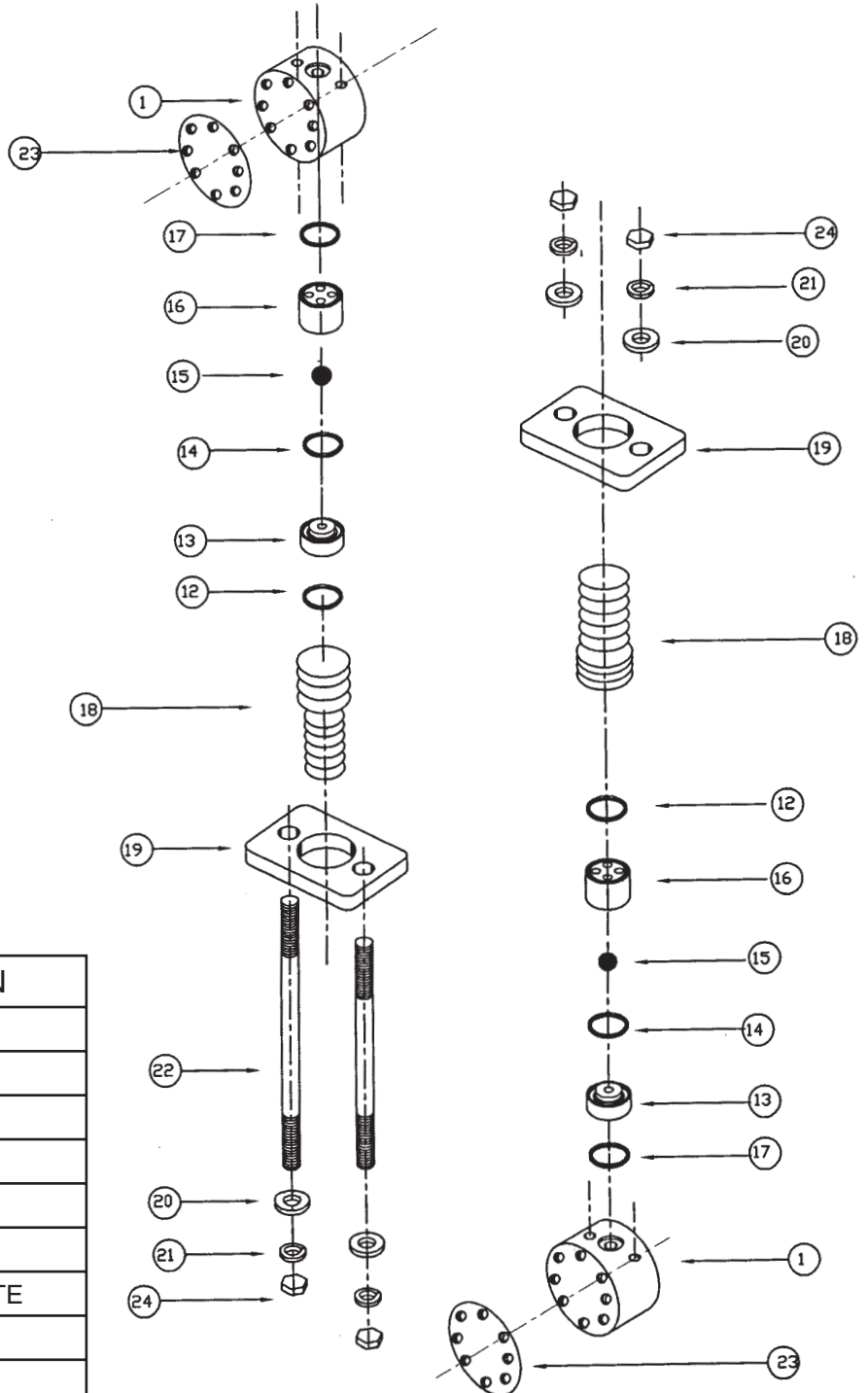
ITEM NO.	DESCRIPTION
18.	VALVE HOLDER
19.	VALVE HOLDER PLATE
20.	PLAIN WASHER
21.	SPRING WASHER
22.	HEX. BOLT



Liquid End For PP / PIFE

SUCTION SIDE VALVE ASSEMBLY

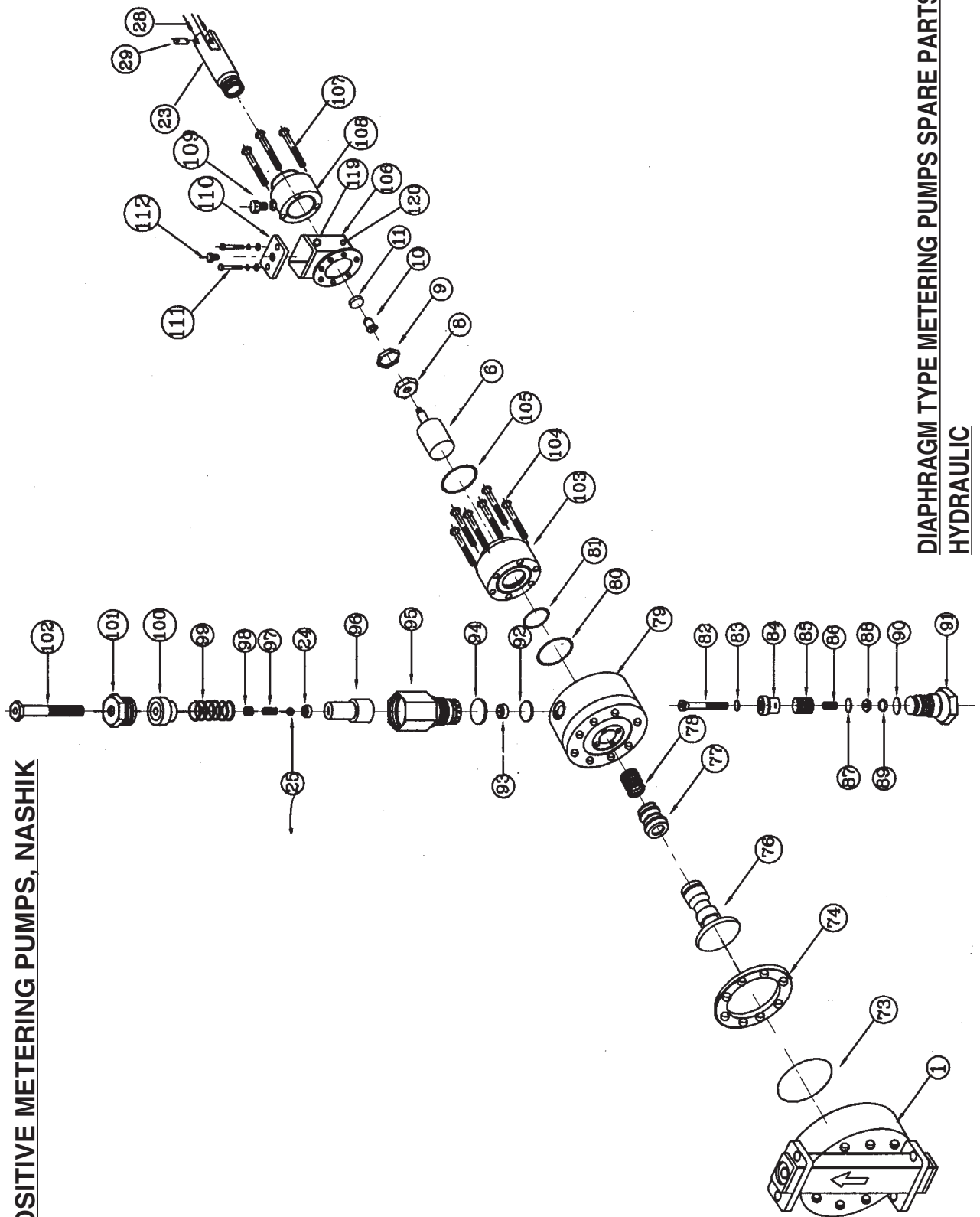
DISCHARGE SIDE VALVE ASSEMBLY



Item No.	DESCRIPTION
1.	LIQUID HEAD
12,14,17	SEALING RING
16.	VALVE GAGE
15	BALL
13	VALVE SEAT
18	HOSE NIPPLE
19	VALVE HOLDER PLATE
20	PLAIN WASHER
21	SPRING WASHER
22	STUD
23	SUPPORT PLATE
24	NUT



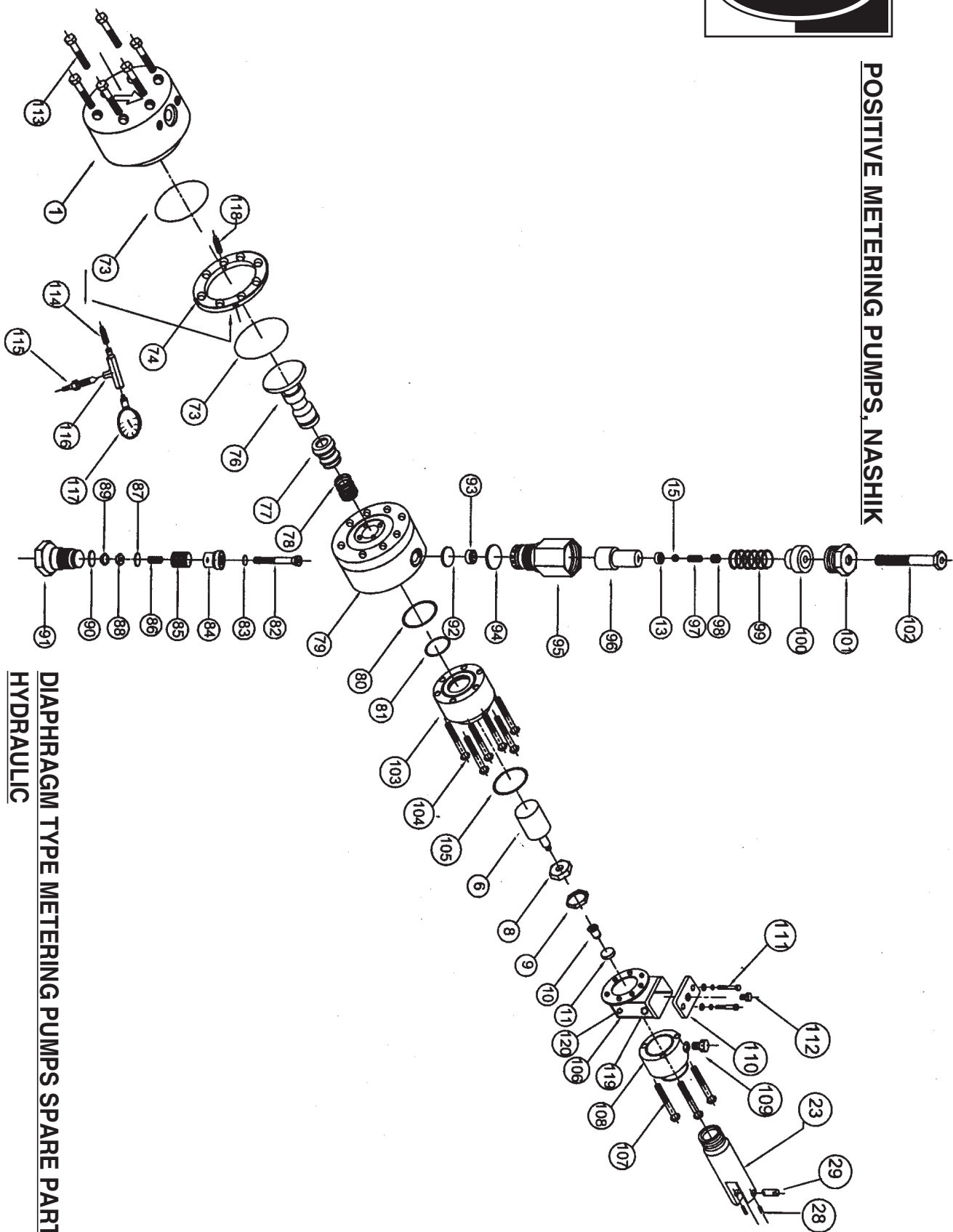
POSITIVE METERING PUMPS, NASHIK



**DIAPHRAGM TYPE METERING PUMPS SPARE PARTS
HYDRAULIC**



POSITIVE METERING PUMPS, NASHIK

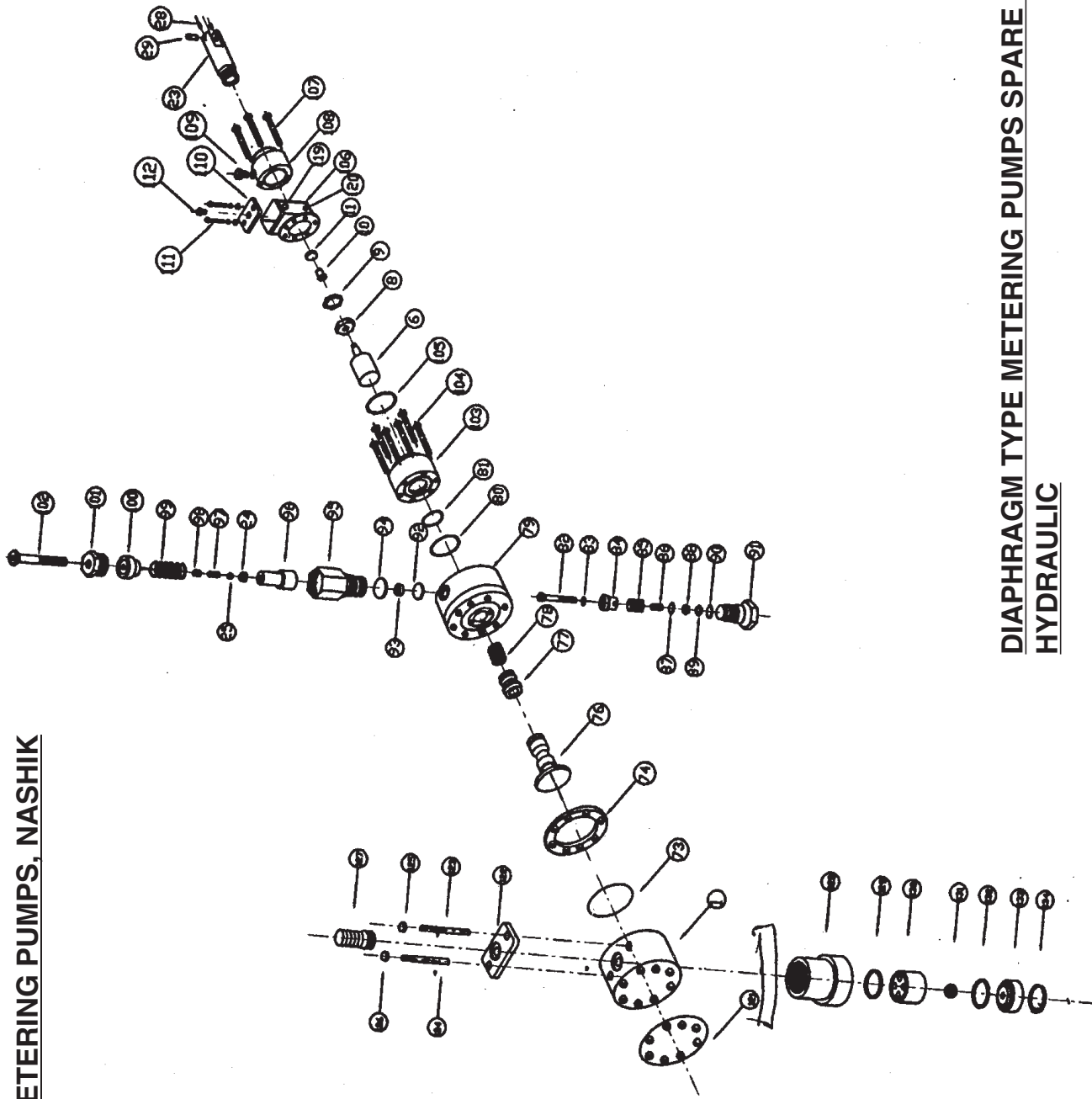


**DIAPHRAGM TYPE METERING PUMPS SPARE PARTS
HYDRAULIC**



POSITIVE METERING PUMPS, NASHIK

**DIAPHRAGM TYPE METERING PUMPS SPARE PARTS
HYDRAULIC**



POSITIVE METERING PUMPS



SANDWITCH DIAPHRAGM PUMPS SPARE PARTS

SR.NO	NAME OF PARTS	QTY.	SR.NO.	NAME OF PARTS	QTY.
1	LIQUID HEAD	1 NO	54	SPRING DOWEL PIN	2 NOS
6	PLUNGER	1 NO	55	SLIDER HOUSING	1 NO.
8	PLUNGER RETAINER	1 NO	56	BUSH	1 NO
9	LOCK NUT	1 NO	57	WORM WHEEL	1 NO
10	PLUNGER SEAT	1 NO	58	BOTTOM BEARING	1 NO
11	DISC	1 NO	59	SIDE BEARING	1 NO
23	CROSS HEAD	1 NO.	60	GASKET	2 NOS
24	BALL SEAT FOR POPPET	1 NO	61	SIDE COVER (OPEN)	1 NO
25	BALL FOR POPPET	1 NO	62	OIL SEAL	1 NO
28	GRUBS SCREW	2 NOS	63	HOUSING	1 NO
29	GUDGEN PIN	1 NO	64	OIL LEVEL INDICATOR	1 NO
30	ECCENTRIC STRAP	1 NO	65	BACK SIDE COVER	1 NO
31	THRUST PLATE	1 NO	66	RUBBER GASKET	1 NO
32	SLIDER BEARING	1 NO	67	WORM SHAFT	1 NO
33	PLAIN WASHER	1 NO	68	BEARING	1 NO
34	PLAIN WASHER	1 NO	69	GASKET	2NOS
35	ALLEN BOLT	1 NO	70	SIDE COVER	1 NO
36	CIRCLIP	1 NO	73	DIAPHRAGM	2 NOS
37	SL GUIDE	1 NO	74	CENTER RING	1 NO
38	ALLEN BOLT	1 NO	76	REFILL GATE	1 NO
39	WASHER (PLAIN)	1 NO	77	REFILL GUIDE	1 NO
40	PLAIN WASHER	1 NO	78	SPRING	1 NO
41	BEARING	1 NO	79	ACTUATOR BODY	1 NO
42	CIRCLIP	1 NO	80	'O' RING	1 NO
43	GASKET	1 NO	81	'O' RING	1 NO
44	TOP COVER	1 NO	82	HEXAGONAL BOLT	1 NO
45	SL SCREW	1 NO	83	'O' RING	1 NO
46	SL INDICATOR	1 NO	84	VACUUM SEAT	1 NO
47	HEX. BOLT	7 NOS	85	VACUUM MESH	1 NO
48	HEX. BOLT	1 NO	86	VACUUM SPRING	1 NO
49	GRUBS SCREW	2 NOS	87	'O' RING	1 NO
50	BARREL	1 NO	88	HEX. NUT	1 NO
51	GUIDE PIN	1 NO	89	HEX. LOCK NUT	1 NO

POSITIVE METERING PUMPS



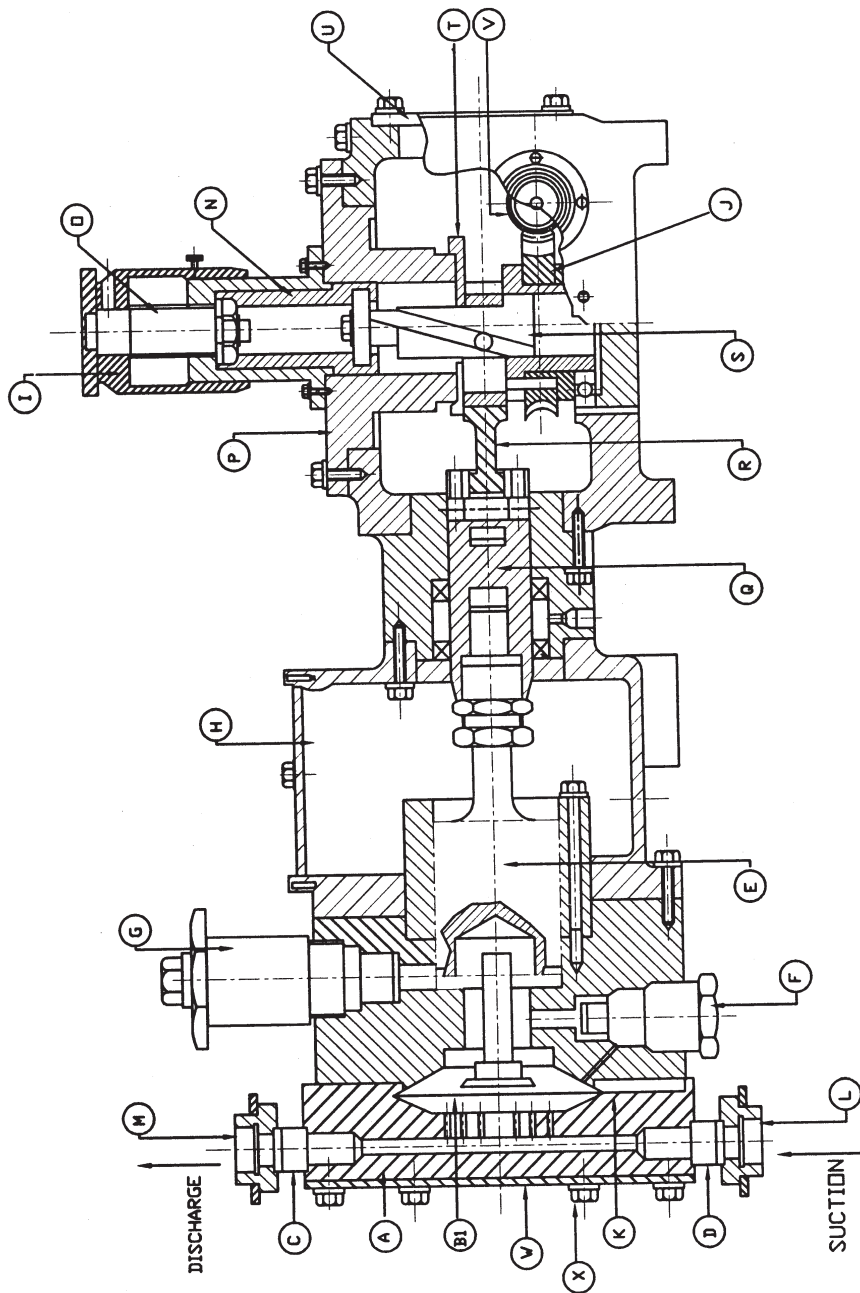
52	ECCENTRIC	1 NO	90	WASHER	1 NO
53	SLIDER	1 NO	91	VACUUM BODY	1 NO

SR.NO	NAME OF PARTS	QTY.		NAME OF PARTS	QTY.
92	'O' RING	1 NO	109	BREATHER PLUG	1 NO
93	PRV SEAT	1 NO	110	TOP PLATE-OIL CHAMBER	1 NO
94	'O' RING	1 NO	111	HEXAGONAL BOLT	2 NOS
95	PRV BODY	1 NO	112	BREATHER PLUG	1 NO
96	POPPET	1 NO	113	HEXAGONAL BOLT	6 NOS
97	PRV SPRING	1 NO	114 - 18	SENSING UNIT	1 NO.
98	ALLEN SCREW	1 NO	119	OIL LEVEL INDICATOR	1 NO
99	SPRING	1 NO	120	OIL FILLER	1 NO
100	BUSH	1 NO	121	SUPPORT PLATE	1 NO
101	RETAINER	1 NO	122	VALVE HOLDER PLATE	2 NOS
102	HEXAGONAL BOLT	1 NO	124/124	STUD	2 NOS
103	PLUNGER GUIDE	1 NO	125/126	NUT	4 NOS
104	HEXAGONAL BOLT	6 NOS	127/128	HOSE NIPPLE	2 NOS
105	'O' RING	1 NO	129/132/ 134	SEALING RING	6 NOS
106	OIL CHEMBER	1 NO	130	VALVE CAGE	2 NOS
107	HEXAGONAL BOLT	4 NOS	131	NRV BALL	2 NOS
108	YOKE	1 NO	133	NRV SEAT	2 NOS





X	Bolt
W	Support Plate
V	Worm Shaft
U	Back Plate
T	Thrust Plate
S	Slider
R	Ecc. Strap
Q	Cross Head
P	Top Cover
O	SL Screw
N	SL Guide
L/M	End Conne. Suction & Dist.
K	Center Ring
J	Worm Wheel
I	Stroke Adju.
H	Oil Chamber
G	Inbuilt Pre.
F	Safety Valve
E	Vacuum Asst.
D	Plunger
C	Non Return Valve (Suc.)
B1	Non Return Valve (Dis.)
A	Oil Side Diaphragm
Sr.	Liquid Head
No.	Description



POSITIVE METERING PUMPS (I) PVT. LTD. AMBAD MIDC-POOT NO. MB, NASHIK-10				
DRN.	SSA	TITLE :-		
CHD.	RBS	C/S DRG FOR		
APPPD.	RBS	HYDRAULIC PUJMP		
SCALE	NTS	DRG. NO.		
DATE	23.05.11			

Customer :-	
Title :-	
Project :-	
Tag No. :-	