

ENCHLOR ^{INC.}

Producing Solutions



E2000 CHEMICAL METERING PUMP

MODEL: _____
CAPACITY: _____
PRESSURE: _____
SERIAL #: _____

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METERING PUMPS 2000 SERIES

1. SAFETY

1.1 General

Please read and familiarise yourself with all sections of this and other equipment manuals before proceeding with installation.

- Observe all standard precautions which apply to moving machinery.
- Observe all standard precautions which apply to electrical equipment, drives and controls.
- Pay particular attention to special safety 'cautions' and 'notes' in this manual.

1.2 Mechanical Precautions

- Prior to undertaking any mechanical maintenance repair, installation, etc. **SWITH OFF**, and disconnect power before proceeding.
- Personnel must wear the appropriate protective safety attire and remove loose clothing, jewellery etc.

1.3 Electrical Precautions

- Before undertaking work on the electrical controls or drives, disconnect power and place a notice to advise others of the type of work in process.
- Ensure all necessary grounds are in place and solid.
- Do not disconnect or disable ground connections

CAUTION Follow all electrical regulations where required by electrical engineering trades.

2. INTRODUCTION

Enchlor metering pumps are designed and manufactured for long, low maintenance service life and when properly applied, will give many years of consistent accurate metering and trouble free operation.

The following instructions should be read and followed to correctly install and operate the pump and ensure optimum pump life and performance.

Sectional arrangement drawings and Part Lists are enclosed at the end of this manual.

3. INSTALLATION

3.1 It is desirable to locate the pump as close as possible to the supply source (eg tank) in order to minimise friction losses in the suction line.

3.2 The pump should be located with sufficient free space provided around the pump to allow access for:

- Adjustment of the manual capacity adjustment advice;
- To facilitate ease of routine and breakdown maintenance.

3.3 The mounting surface should be even and level. The pump base (mounting plate) is provided with four (4) holes for mounting bolts.

4. PIPING

4.1 General

4.1.1 The pump suction valve is located at the bottom of the pump head and the discharge valve on top. The pump cannot operate without these valves and for correct operation, valves must be vertical.

4.1.2 Discharge pressure should be more than 20 kPa greater than suction pressure to prevent over feeding or syphoning and to maintain metering accuracy.

NOTE: When the difference is less than 20 kPa, a back pressure valve and pulsation dampener should be installed in the discharge line. The pulsation dampener should be located between pump and valve, as close to the pump as possible.

4.1.3 A characteristic of reciprocating pump performance is pulsating flow. Piping should be sized for flow rates at least 3.5 times greater than maximum capacity of pumps.

NOTE: Small diameter piping will produce unpredictable flow rates and system pressures.

- 4.1.4 Piping should be as short and straight as possible and arranged to avoid loops or pockets where gas may accumulate.
- 4.1.5 All piping should be separately supported close to the pump to avoid imposing pipe loads on the pump. When handling high or low temperature liquids, measures should be taken to prevent distortion of piping imposing loads on the pump.
- 4.1.6 All pipe work should be flushed clean of any solids, which may be present in the pipe work (i.e. weld slag, dirt following construction or repair) before final connection to the pump and start-up.
- 4.1.7 Make provision in discharge piping where necessary to facilitate initial priming of pumps against reduced pressure.
- 4.1.8 Capacity adjustment range for accuracy of metering, avoid over sizing of metering pumps. Flow rates of less than 10% of pump maximum capacity may produce unacceptable accuracy.
- 4.1.9 Where lengthy suction and discharge pipelines are involved or there is limitation on size, install pulsation dampeners close to the pump to:
 - Avoid cavitation – maintain metering accuracy.
 - Reduce amplitude of pulsations
- 4.1.10 Ensure that the drain line from any pressure relief valve in the system is:
 - Suitably sized to ensure correct operation of the relief valve.
 - Returns to the suction tank.
 - Is fitted with a sight glass for visual indication.

4.2 **Suction**

- 4.2.1 Piping must be air tight.
- 4.2.2 For ease of maintenance an isolating valve should be located near the pump inlet.
- 4.2.3 Solids should be prevented from entering low volume pumps or pumps used for high accuracy metering. A strainer of 150-200 mesh is recommended and should be of adequate size to prevent restriction of flow.
- 4.2.4 Suction pipe entrance should be at least 75 mm from the bottom of solution tank to allow settlement of larger solids in the tank.
- 4.2.5 Make provision in suction piping where necessary to facilitate automatic venting of any gases likely to accumulate.

4.3 **Discharge**

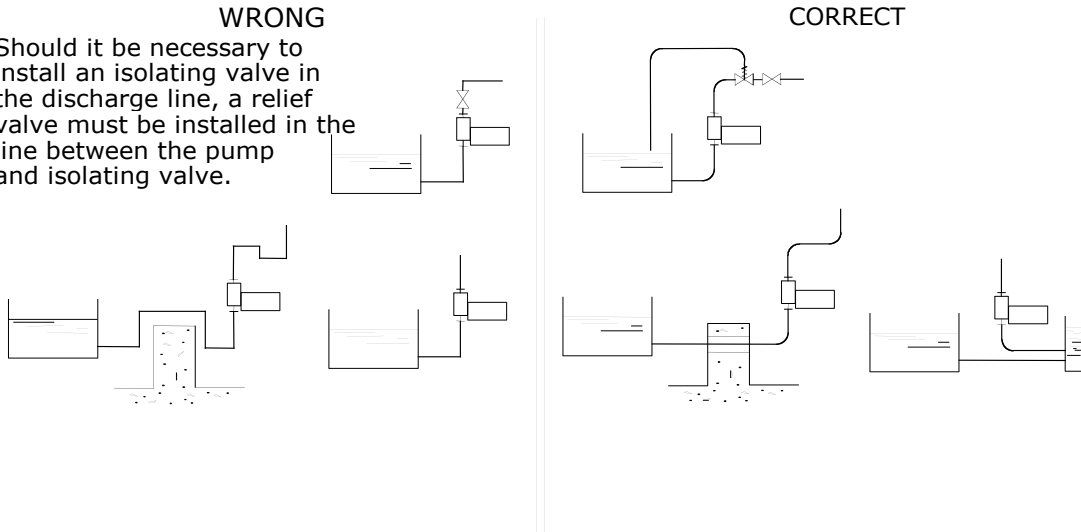
- 4.3.1 Should it be necessary to install an isolating valve in the discharge line, a relief valve must be installed between the pump and isolating valve.
- 4.3.2 The 2000 Series Metering Pump, being a positive displacement pump, will be damaged if operated against a closed valve.

<u>NOTE:</u>	The relief valve should be set to operate at the maximum rated pump discharge pressure or maximum system operating pressure, whichever is lower.
<u>CAUTION:</u>	When pumping hazardous liquids the relief valve discharge should be piped back to the supply source.
<u>NOTE:</u>	Where relief valve is likely to operate frequently, to ensure correct operation and maximise valve life, a pulsation dampener should be installed between valve and pump

- 4.3.3 A pressure gauge with gauge protector should be installed to check if the pump is not operating at too great a discharge pressure. Gauge should be provided with petcock for isolation from system when not required.
- 4.3.4 When pumping into a high pressure system, a non return valve should be installed as a safety precaution at the injection point.
- 4.3.5 Make provision in pipe work to facilitate priming against reduced pressure.

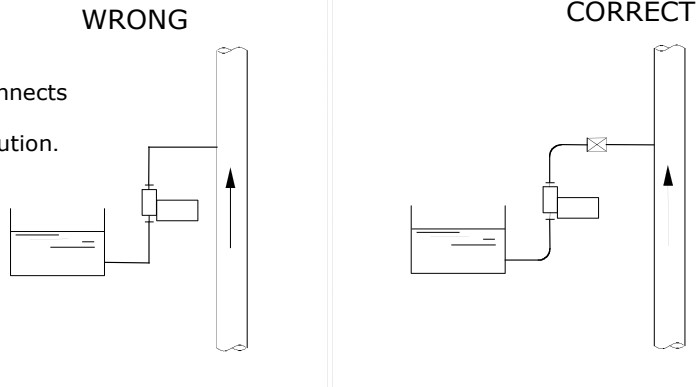
4.4 Piping Arrangement

WRONG
Should it be necessary to install an isolating valve in the discharge line, a relief valve must be installed in the line between the pump and isolating valve.

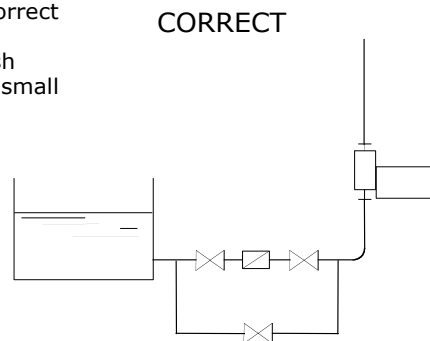


Metering pumps are positive displacement pumps and produce pulsating flow. Consequently there is considerable line pressure loss and suction piping should be sized to ensure adequate NPSHA. If piping extends for a considerable distance a suitable break tank or pulsation dampener should be installed near the pump.
Avoid pockets or loops in piping where gas may accumulate.

WRONG
Where the pump discharge line connects with a high pressure line, install a non return valve as a safety precaution.



The presence of solids in the pumped liquid can cause incorrect pump valve operation and affect metering accuracy. If solids are present install a strainer with 150 to 200 mesh and large mesh surface in order to keep pressure drop as small as possible and ensure that strainer does not become quickly clogged.



5. OPERATION

5.1 Before Starting

- 5.1.1 Ensure the pump will be operated within its specification.
- 5.1.2 Check gearbox oil level. Prior to leaving factory, each pump is filled to the correct level with the recommended grade of oil (see maintenance section).
- 5.1.3 Check direction of rotation. Correct direction is clockwise when viewing pump from top of motor.
- 5.1.4 Ensure system control of isolating valves in discharge line is open.

5.2 After Starting

- 5.2.1 Pump will normally prime automatically. However, it may be necessary to run the pump at maximum capacity to clear air. If this is unsuccessful install a return line from discharge pipe to supply tank with valve to facilitate priming at reduced pressure and/or air release.

<u>CAUTION:</u> If pumped liquid is hazardous do not disconnect discharge pipe work.

- 5.2.2 Check that pump is operating correctly against discharge pressure.
- 5.2.3 Ensure that any problems are noted and appropriate corrective or preventative action is taken.

6. CAPACITY ADJUSTMENT

- 6.1 Standard manual capacity adjustment is by means of a control knob located on the side of the pump.
- 6.2 Adjustment should be made whilst the pump is running. To adjust whilst stopped will cause damage to the pump mechanism.

7. MAINTENANCE

7.1 Pre Maintenance Cleaning

- Flush pump liquid head internals to remove all chemical residue.
- Clean the pump's exterior to ensure chemical free surface.
- Check that appropriate chemical handling and cleaning standards have been met.

CAUTION: Enchlor (AUST) PTY LTD IS UNABLE TO ACCEPT ANY METERING PUMP RETURNED FOR MAINTENANCE THAT HAS NOT BEEN SUITABLY CLEANED.

It is an Enchlor Quality Assurance policy that all equipment returned for repair or service be supplied with a completed copy of the 'Equipment Decontamination Advice' form, as shown on page 39 of this manual.

7.2 Lubrication

- 7.2.1 Change oil after 750 hours of operation and at 4,500 hours intervals thereafter.

The following are recommended grades:

SHELL	:	OMALA 320
BP	:	GR-XP-320 ISO
MOBIL	:	MOBIL GEAR 632
CASTROL	:	ALPHA SP 320

- 7.2.2 Fill oil until oil starts to overflow from the filler port.
Oil volume : 450 ml

7.3 Suction & Discharge Valves

- 7.3.1 During routine maintenance, valves should be dismantled and checked. Replace worn ball checks and valve seats. When pumping clean liquids of moderate viscosity, valves will give many years of trouble free service. However, valve life can be reduced in applications where discharge pressure is high, liquid viscosity low or solids are present.

NOTE: Should it be necessary to service the valves, cleanliness is essential and care should be taken to avoid damaging components. Refer to valve drawing at end of manual prior to dismantling.

- 7.3.2 When reassembling, ensure that all O-Rings, ball checks and ball stops are in the correct position. Failure to fit ball stops can result in closed head situation and severe pump damage.

7.4 Diaphragm

- 7.4.1 When fitting a new diaphragm, the diaphragm bolt should be tightened firmly with the correct spanner available from Enchlor.
- 7.4.2 Before tightening the diaphragm bolt, capacity adjustment should be set at 0% eg stroke length should be in the extreme forward position.
- 7.4.3 Place diaphragm in position ensuring holes line up and screw in two (2) solution head bolts (opposing each other) through diaphragm bolt holes into solution head adaptor. This is to ensure that diaphragm does not rotate when tightening diaphragm bolt.
- 7.4.4 Having tightened diaphragm bolt, remove solution head bolts and fit solution head.

NOTE: Excessive tightening of solution head bolts should be avoided as this will result in early diaphragm failure.

- 7.4.5 After the new diaphragm has been fitted, calibration should be checked and monitored until diaphragm has stabilised.

All major mechanical repairs should be undertaken by Enchlor's specialist servicing workshop in Silverdale. In most cases a pump can be repaired and despatched in one day.

8. TROUBLESHOOTING

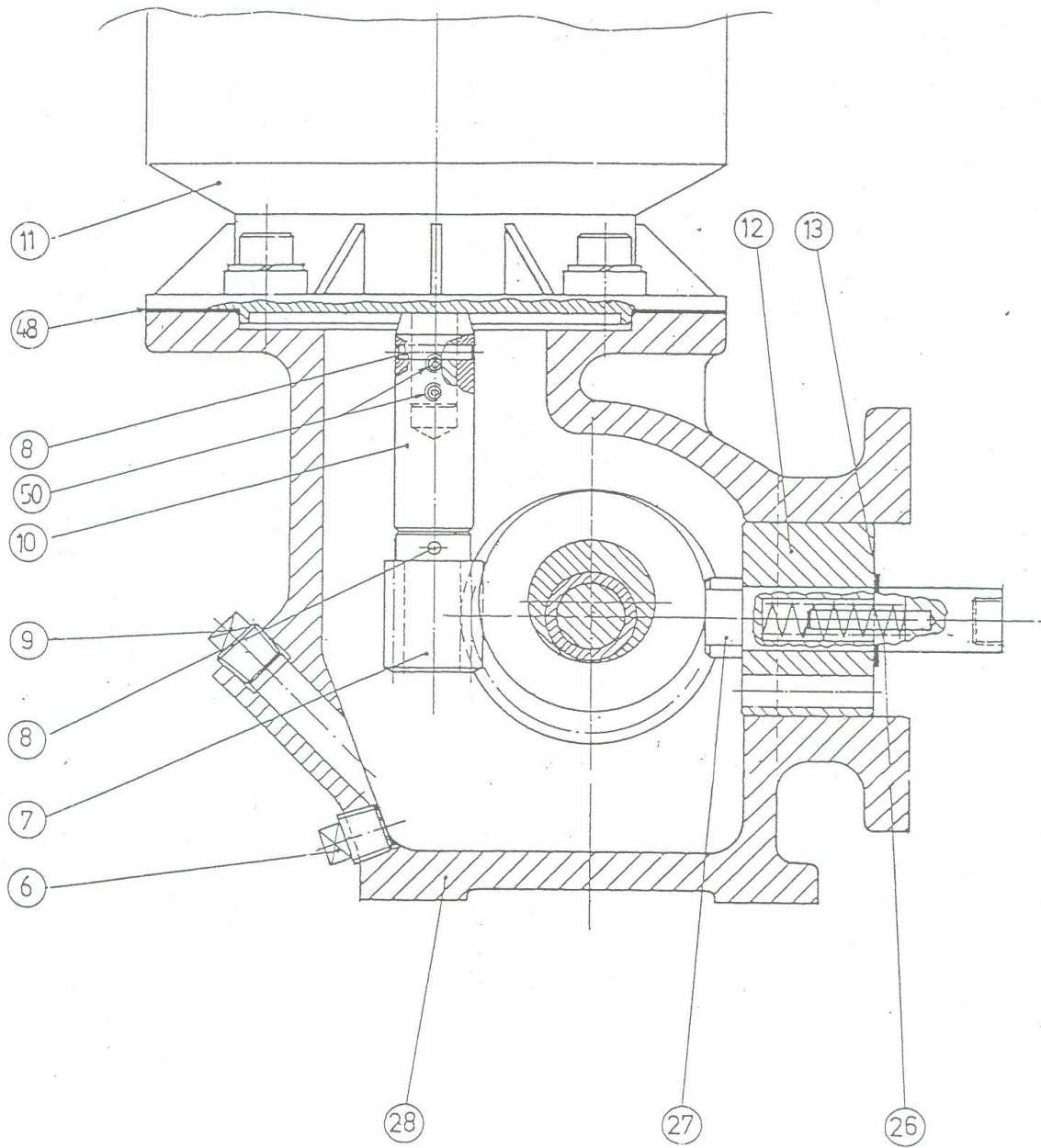
Trouble	Cause	Corrections
(A) Pump does not start.	Blown electrical. Fuse.	Check cause and change to suitable capacity fuse
	Electrical overload relay trips.	Change relay capacity to correct value.
	Electrical wiring breakdown or defective contact.	Change or reconnect.
	Low voltage. Difference in supply voltage and rated voltage of motor.	Find cause and correct.
	Defective motor.	Check and replace.
	Excessive pressure in discharge line.	Reduce pressure.
	Valve in discharge line closed.	Open valve
	Pump discharge valve incorrectly reassembled during maintenance. Ball stop cushion missing	Reassemble correctly.
(B) No Flow	Air in liquid end.	Relieve pressure in discharge line.
	Valve in discharge line closed.	Open valve.
	Pump discharge valve incorrectly reassembled during maintenance. Ball stop cushion missing.	Reassemble correctly.
(C) Pump does not work after operating normally	Overload relay	Reset the switch after checking the cause and correcting.
	Discharge pipe clogged.	Clear the pipe.
	Valve in discharge line closed.	Open valve.
	Pump discharge valve incorrectly reassembled during maintenance. Ball stop cushion missing.	Reassemble correctly

Trouble	Cause	Corrections
(D) Reduced pump flow rate or unstable rate.	Valve clogged.	Clean.
	Worn valve seat.	Replace seat or valve.
	Flow meter incorrect.	Inspect meter, repair or change.
	Leakage from relief valve.	Inspect, repair or change.
	Air leaking into suction piping	Check for leak source and repair.
	Air lock in suction line.	Review suction pipework layout to eradicate air pockets.
	Change in pump rpm	Correct electric power sources, speed control etc.
(E) Reduced pump flow rate. Unstable flow rate. Flow rate does not increase as stroke length is increased. Cavitation noise may be apparent.	Insufficient NPSH available: (a) Suction pipe diameter too small. (b) Suction lift too great.	Enlarge suction pipe, or install accumulator in the line close to pump or raise level of tank. Raise liquid level.
	Viscosity of liquid too high.	1. Heat or lower viscosity by other means. 2. Increase suction pipe diameter. 3. Increase suction pressure.
	Vapour pressure high.	1. Lower liquid temperature at inlet port. 2. Raise liquid level.
	Suction piping and/or valve clogged	Clean
	Suction strainer clogged or too small	Clean or replace with larger unit.

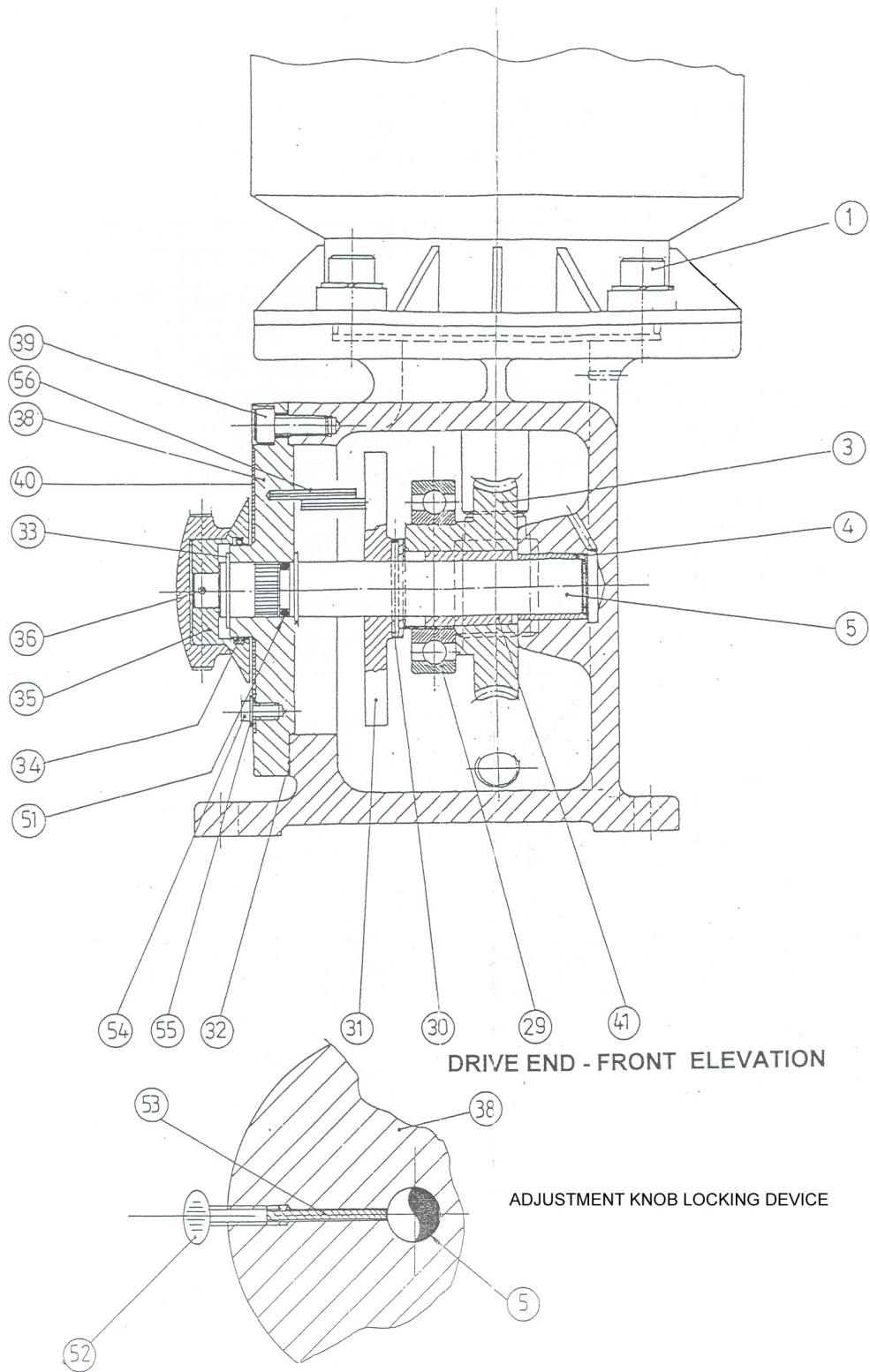
Trouble	Cause	Correction
(F) Excessive pump flow rate. Flow continues after pump has stopped.	Pressure difference across pump less than 20 KPa	Increase pressure difference (ie install back pressure valve).
	Discharge line too long or diameter too small	Reduce length and/or increase diameter. Install accumulator in discharge line.
(G) Liquid leakage from pump adaptor drain	Ruptured diaphragm.	Check/replace diaphragm.
(H) Knocking sound in gearbox	Excessive discharge pressure	Check discharge pressure.
(I) Liquid end noise	Rhythmic noise of pump valves	Normal
	Clogged discharge or suction valve	Clean
(J) Overheating of motor	Improper voltage	Adjust voltage to motor specification.
	Overload	(Refer to Section K).
	Inadequate ventilation	Change motor or relocate
(K) Overload	Improper Oil	Change
	Discharge pressure too high	Lower to permissible pressure
	Erratic noise of pump valves	1. Clean valves. 2. Increase pressure difference (ie install back pressure valve).

9. 2000 SERIES METERING PUMP

9.1 Drive End - Side Elevation



9.2 **Drive End - Front Elevation and Adjustment Knob Locking Device**



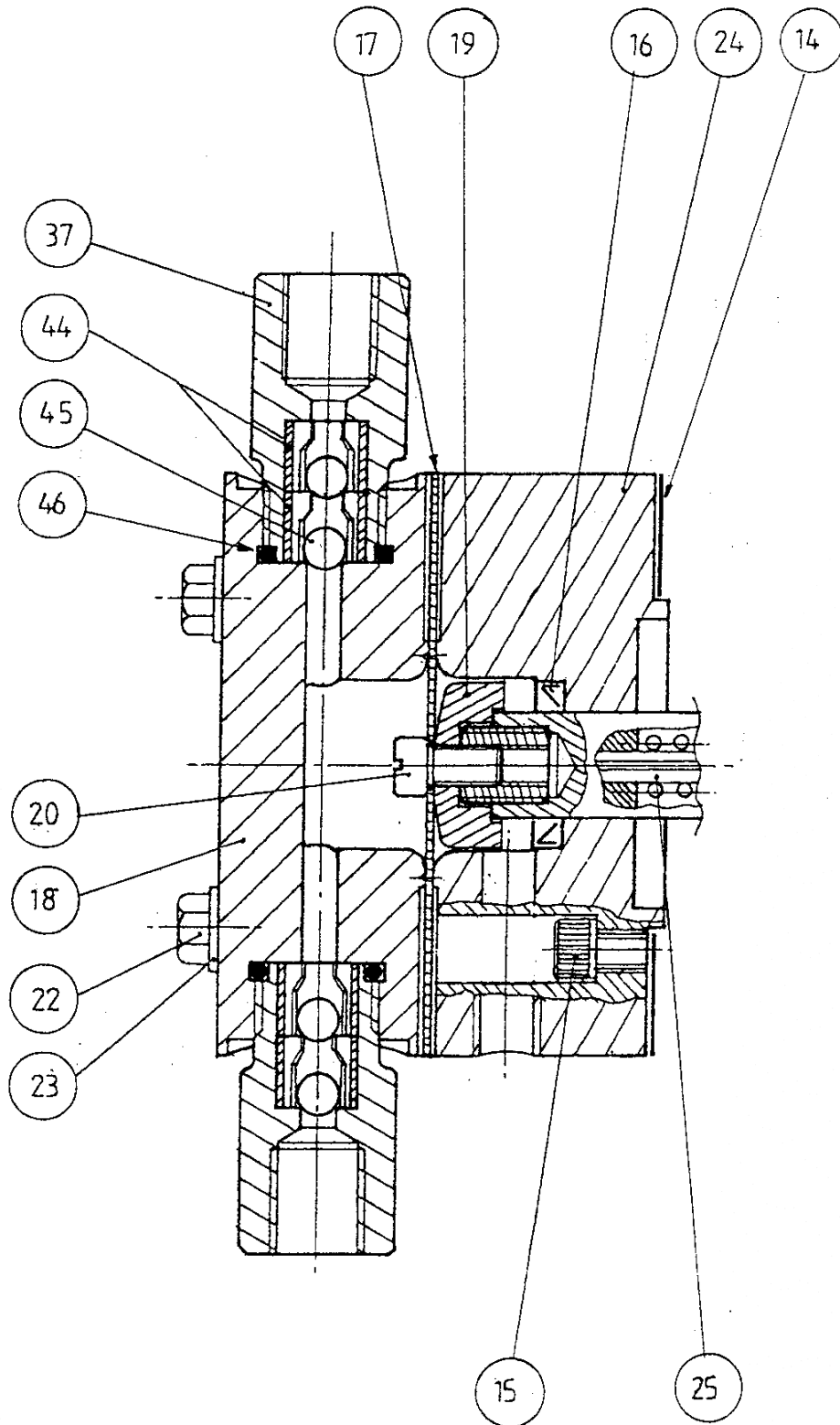
9.3 **Drive End – Parts List**

ITEM	PART NO	DESCRIPTION	QTY	NOTES
1	08/01/114	SCREW (MOTOR)	4	
3	10312	WORM WHEEL	1	⊠
4	06/04/07	BUSH (MAIN SHAFT)	1	
5	10301	MAIN SHAFT	1	
6	08/12/02	DRAIN PLUG	1	
7	E-42	WORM	1	⊠
8	10/01/11	PIN (DRIVE MOTOR)	2	
9	08/12/03	OIL FILL PLUG	1	
10	10261-063	WORM EXTENSION SHAFT	1	□
11	SPECIFICATION	DRIVE MOTOR	1	
12	10302	PRIMARY PISTON	1	
13	11/01/21	CIRCLIP (STRIKER SHAFT)	1	
26	10311	SPRING RETURN	2	
27	10303	STRIKER SHAFT	1	
28A	10304 (- 015)	PUMP BODY	1	
28B	10321 (1-5)	PUMP BODY	1	
29	06/01/33	BEARING ECCENTRIC	1	
30	10/01/19	PIN (MAIN SHAFT)	1	
31	10305	CAM	1	◇
32	10306	GASKET (END COVER)	1	
33	11/01/21	CIRCLIP (MAIN SHAFT)	2	
34	07/03/47	'O'-RING (ADJUSTMENT KNOB)	1	
35	A10307	KNOB - ADJUSTMENT	1	
36	10/01/17	PIN (ADJUSTMENT KNOB)	1	
38	10308	END COVER	1	
39	08/01/87	SCREW (END COVER)	4	
40	10309	DIAL PLATE	1	
41	06/05/03	INNER RING	1	
48	10314	GASKET (MOTOR FLANGE)	1	
50	08/13/16	GRUB SCREW	2	
51	07/03/46	'O'-RING	1	
52	08/08/10	THUMB SCREW	1	
53	10323	COMPRESSION PAD	1	
54	08/05/25	SCREW (DIAL PLATE)	1	
55	09/01/30	WASHER (DIAL PLATE)	1	
56	10/01/22	SELOC PIN	2	

Notes:

- ⊠ State Head Size
- ◇ State Stroking Rate (SPM)
- State Drive Motor Frame Size

9.4 **Solution End 2000-001 - PVC**



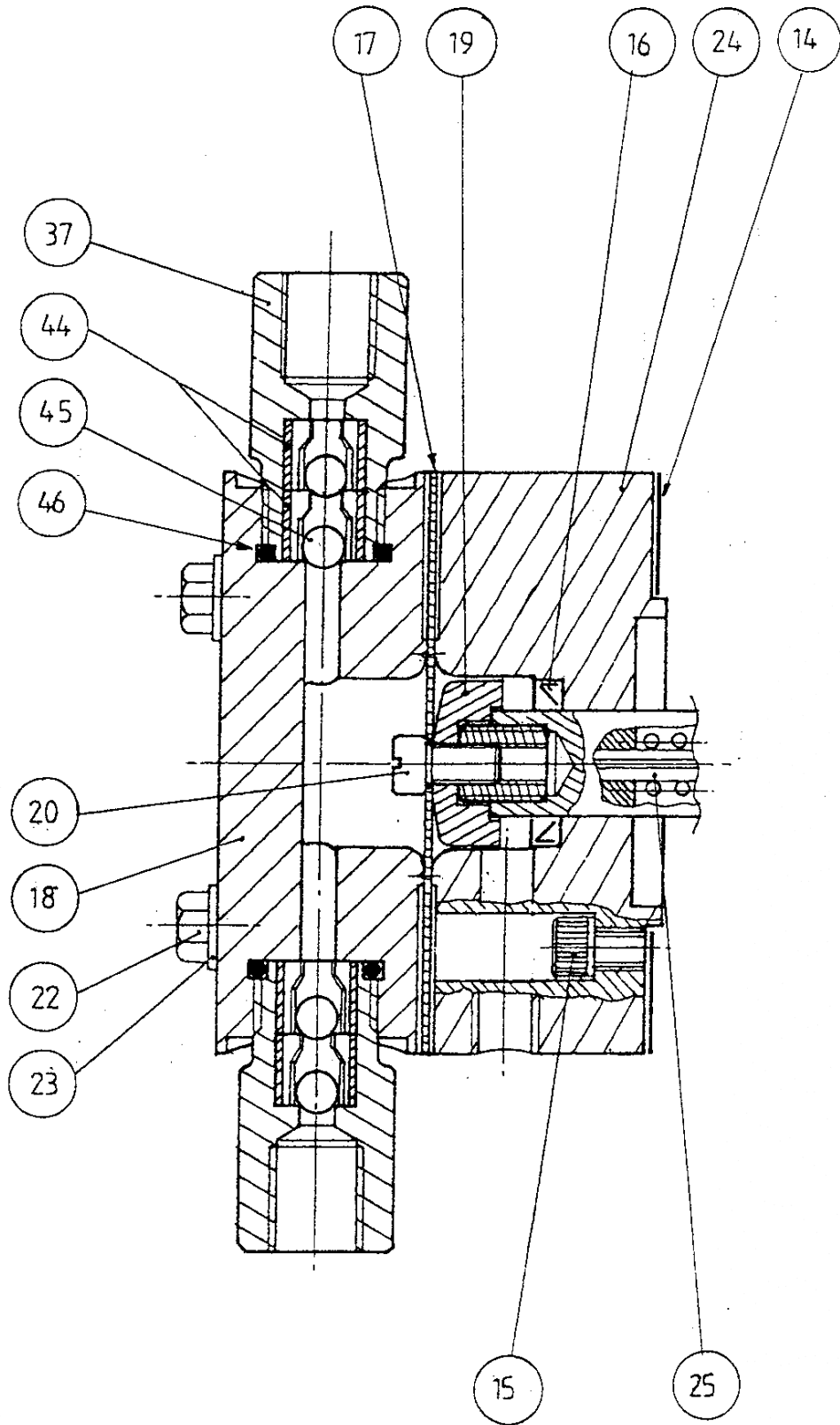
9.5 **Solution End 2000-001 - PVC Parts List**

ITEM	PART NO	DESCRIPTION	QTY	NOTES
14	10313	GASKET (ADAPTOR)	1	
15	08/01/77	CAP SCREW (ADAPTOR)	2	
16	07/01/26	OIL SEAL	1	★
17	S-094-1	DIAPHRAGM	1	★
18	S-080-1W PVC	SOLUTION HEAD	1	
19	S-099-1W	SECONDARY PISTON	1	
20	AS-096-1 PVC	DIAPHRAGM BOLT ASSEMBLY	1	
22	08/02/103	BOLT (SOLUTION HEAD)	4	
23	09/01/28	WASHER (SOLUTION HEAD)	4	
24	S-097-1W	ADAPTOR	1	
25	10/01/18	SPRING PIN	2	
45	14/01/01	316SS BALL CHECKS ¼"	4	★
	14/01/02	HASTELLOY C BALL CHECKS ¼"	4	★
	14/01/04	CERAMIC BALL CHECKS ¼"	4	★
	14/01/25	TEFLON BALL CHECKS ¼"	4	★
	KVD-1-D-PVC	DISCHARGE VALVE ASSEMBLY	1	★
37	S-083-1W PVC	VALVE BODY	1	
44	S-088-1-3W PVC	VALVE INSERT	2	
46	07/03/73	'O'-RING	1	
	KVS-1-D-PVC	SUCTION VALVE ASSEMBLY	1	★
37	S-083-1W PVC	VALVE BODY	1	
44	S-088-1-3W PVC	VALVE INSERT	2	
46	07/03/73	'O'-RING	1	

Notes:

- ★ Recommended Spare Part

9.6 **Solution End 2000-001 - SS**



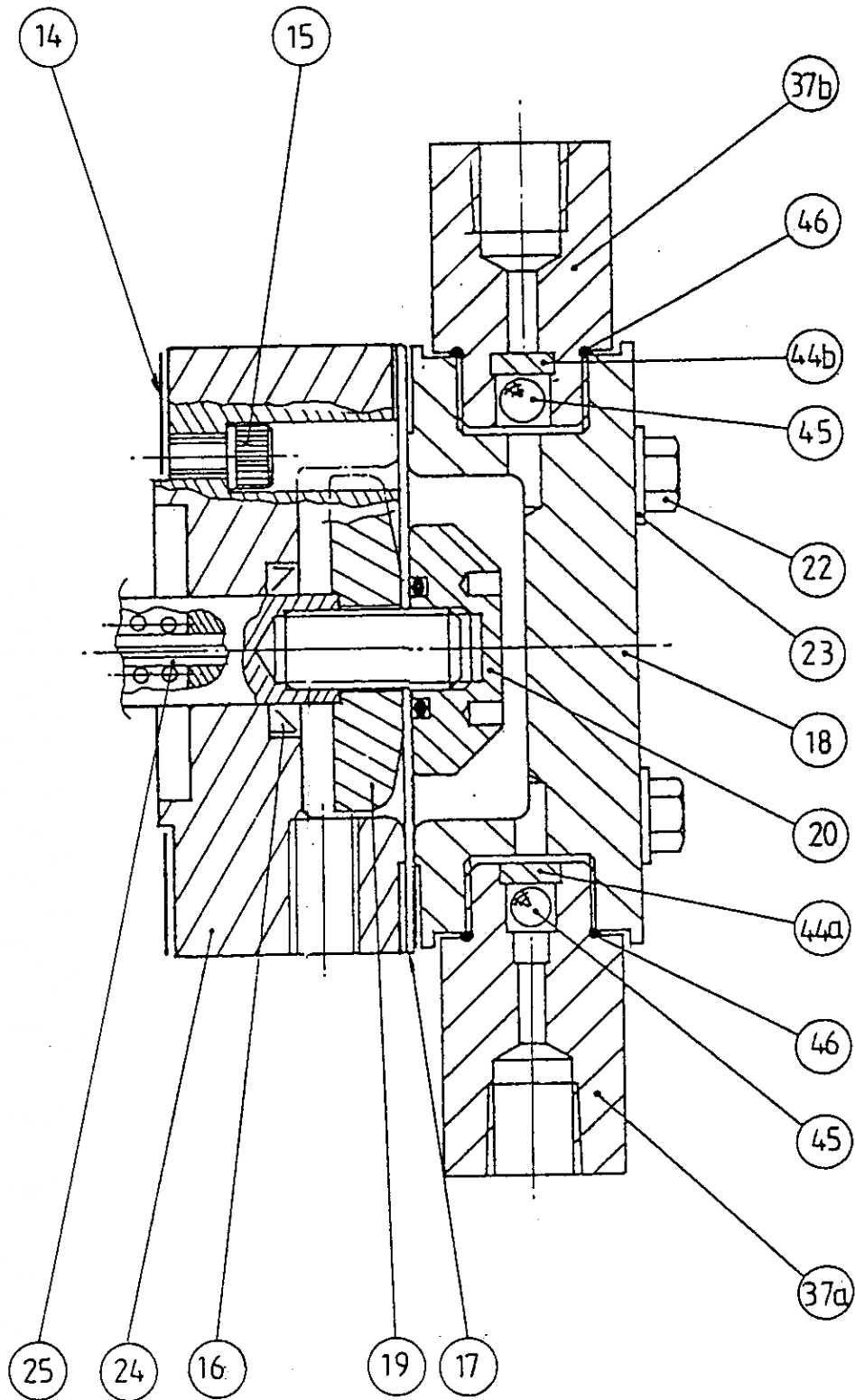
9.7 **Solution End 2000-001 - Stainless Steel Parts List**

ITEM	PART NO	DESCRIPTION	QTY	NOTES
14	10313	GASKET (ADAPTOR)	1	
15	08/01/77	CAP SCREW (ADAPTOR)	2	
16	07/01/26	OIL SEAL	1	★
17	S-094-1	DIAPHRAGM	1	★
18	S-080-1W SS	SOLUTION HEAD	1	
19	S-099-1W	SECONDARY PISTON	1	
20	AS-096-1 SS	DIAPHRAGM BOLT ASSEMBLY	1	
22	08/02/103	BOLT (SOLUTION HEAD)	4	
23	09/01/28	WASHER (SOLUTION HEAD)	4	
24	S-097-1W	ADAPTOR	1	
25	10/01/18	SPRING PIN	2	
45	14/01/01	316SS BALL CHECKS ¼"	4	★
	KVD-1-D-SS	DISCHARGE VALVE ASSEMBLY	1	★
37	S-083-1-3W SS	VALVE BODY	1	
44	S-088-1W PTFE	VALVE INSERT	2	
46	07/03/73	'O'-RING	1	
	KVS-1-D-SS	SUCTION VALVE ASSEMBLY	1	★
37	S-083-1-3W SS	VALVE BODY	1	
44	S-088-1-3W PTFE	VALVE INSERT	2	
46	07/03/73	'O'-RING	1	

Notes:

- ★ Recommended Spare Part

9.8 **Solution End 2000-002 - PVC**



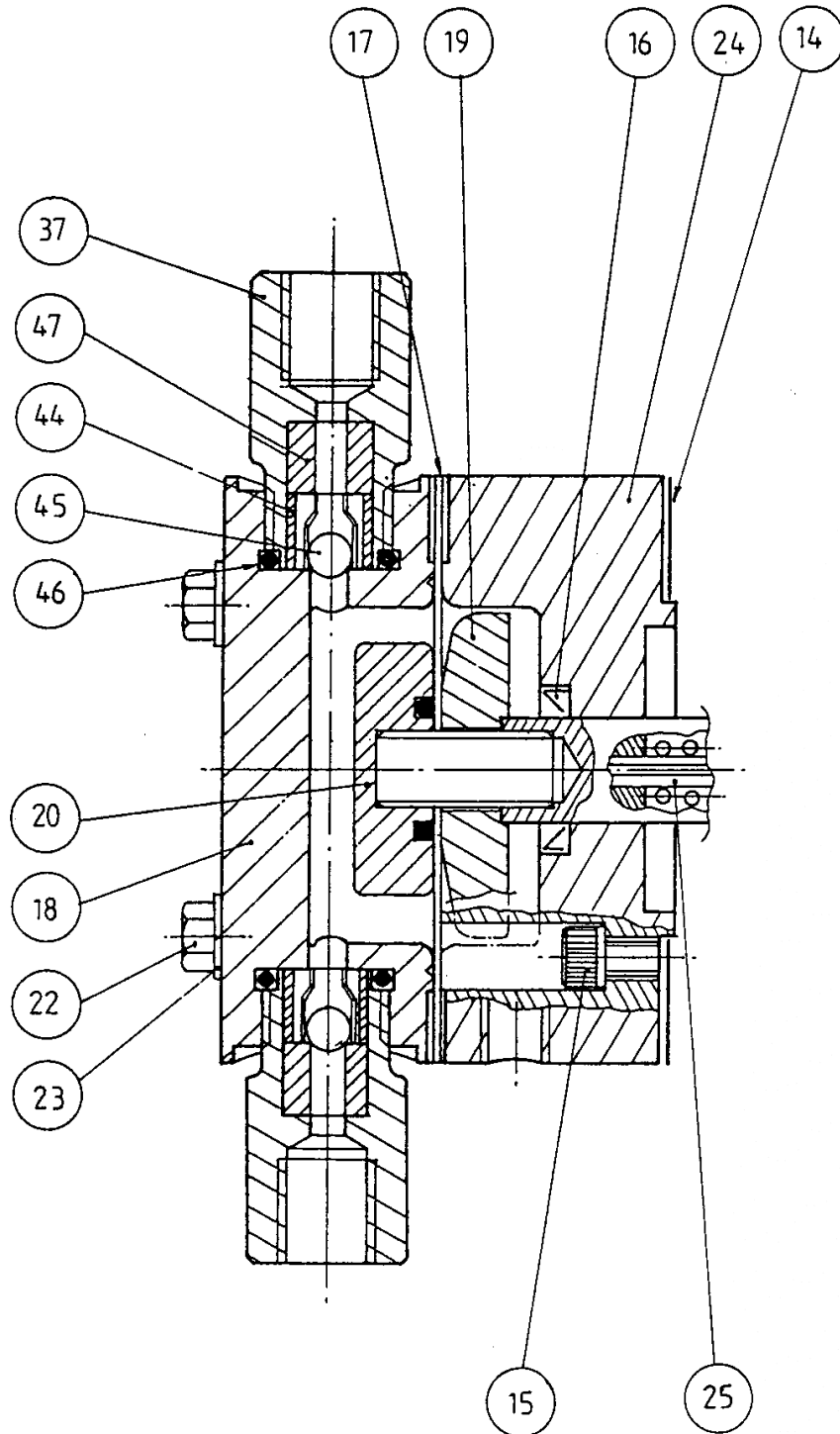
9.9 **Solution End 2000-002 - PVC Parts List**

ITEM	PART NO	DESCRIPTION	QTY	NOTES
14	10313	GASKET (ADAPTOR)	1	
15	08/01/77	CAP SCREW (ADAPTOR)	2	
16	07/01/26	OIL SEAL	1	★
17	S-094-2-3	DIAPHRAGM	1	★
18	S-080-2 PVC	SOLUTION HEAD	1	
19	S-099-2W	SECONDARY PISTON	1	
20	AS-096-2 PVC	DIAPHRAGM BOLT ASSEMBLY	1	
22	08/02/103	BOLT (SOLUTION HEAD)	4	
23	09/01/28	WASHER (SOLUTION HEAD)	4	
24	S-097-2W	ADAPTOR	1	
25	10/01/18	SPRING PIN	2	
45	14/01/01	316SS BALL CHECKS ¼"	2	★
	14/01/02	HASTELLOY C BALL CHECKS ¼"	2	★
	14/01/04	CERAMIC BALL CHECKS ¼"	2	★
	14/01/25	TEFLON BALL CHECKS ¼"	2	★
	KVD-2-3-S-PVC	DISCHARGE VALVE ASSEMBLY	1	★
37	S-084-2-3W PVC	VALVE BODY	1	
44	E-16 PVC	STOP BALL CHECK (DISCHARGE)	1	
46	07/03/03	'O'-RING	1	
	KVS-2-3-S-PVC	SUCTION VALVE ASSEMBLY	1	★
37	S-083-2-3W PVC	VALVE BODY	1	
44	E-16 PVC	STOP BALL CHECK (SUCTION)	1	
46	07/03/03	'O'-RING	1	

Notes:

- ★ Recommended Spare Part

9.10 **Solution End 2000-002 SS**



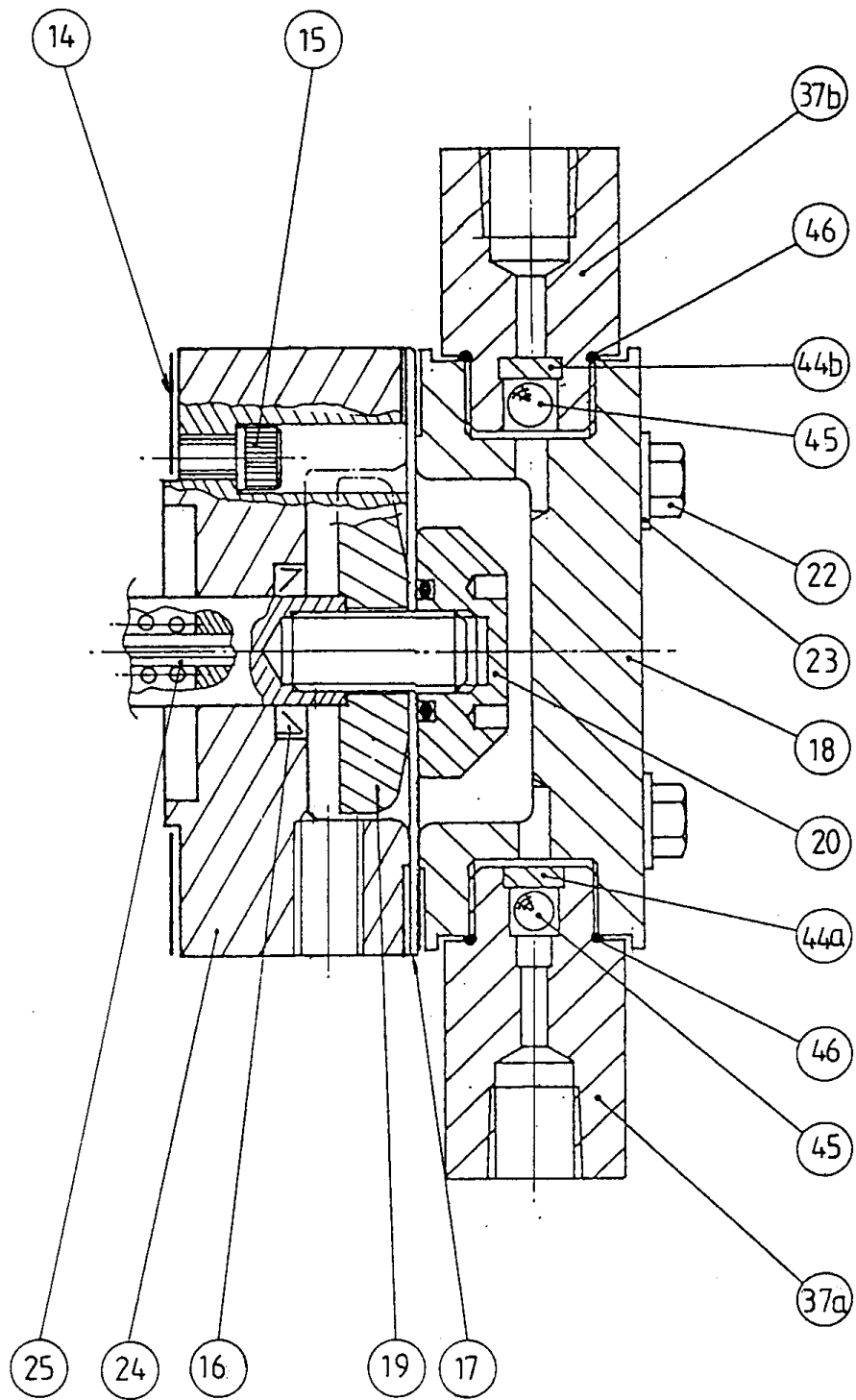
9.11 **Solution End 2000-002 - Stainless Steel Parts List**

ITEM	PART NO	DESCRIPTION	QTY	NOTES
14	10313	GASKET (ADAPTOR)	1	
15	08/01/77	CAP SCREW (ADAPTOR)	2	
16	07/01/26	OIL SEAL	1	★
17	S-094-2-3	DIAPHRAGM	1	★
18	S-080-2W SS	SOLUTION HEAD	1	
19	S-099-2W	SECONDARY PISTON	1	
20	AS-096-2 SS	DIAPHRAGM BOLT ASSEMBLY	1	
22	08/02/103	BOLT (SOLUTION HEAD)	4	
23	09/01/28	WASHER (SOLUTION HEAD)	4	
24	S-097-2W	ADAPTOR	1	
25	10/01/18	SPRING PIN	2	
45	14/01/01	316SS BALL CHECKS ¼"	2	★
	KVD-2-3-S-SS	DISCHARGE VALVE ASSEMBLY	1	★
37	S-083-1-3W SS	VALVE BODY	1	
44	S-088-1-3W PTFE	VALVE INSERT	1	
46	07/03/03	'O'-RING	1	
47	S-089-2-3W PTFE	SPACER - VALVE INSERT	1	
	KVS-2-3-S-SS	SUCTION VALVE ASSEMBLY	1	★
37	S-083-1-3W SS	VALVE BODY	1	
44	S-088-1-3W PTFE	VALVE INSERT	1	
46	07/03/03	'O'-RING	1	
47	S-089-2-3W PTFE	SPACER - VALVE INSERT	1	

Notes:

- ★ Recommended Spare Part

9.12 **Solution End 2000-005 PVC**



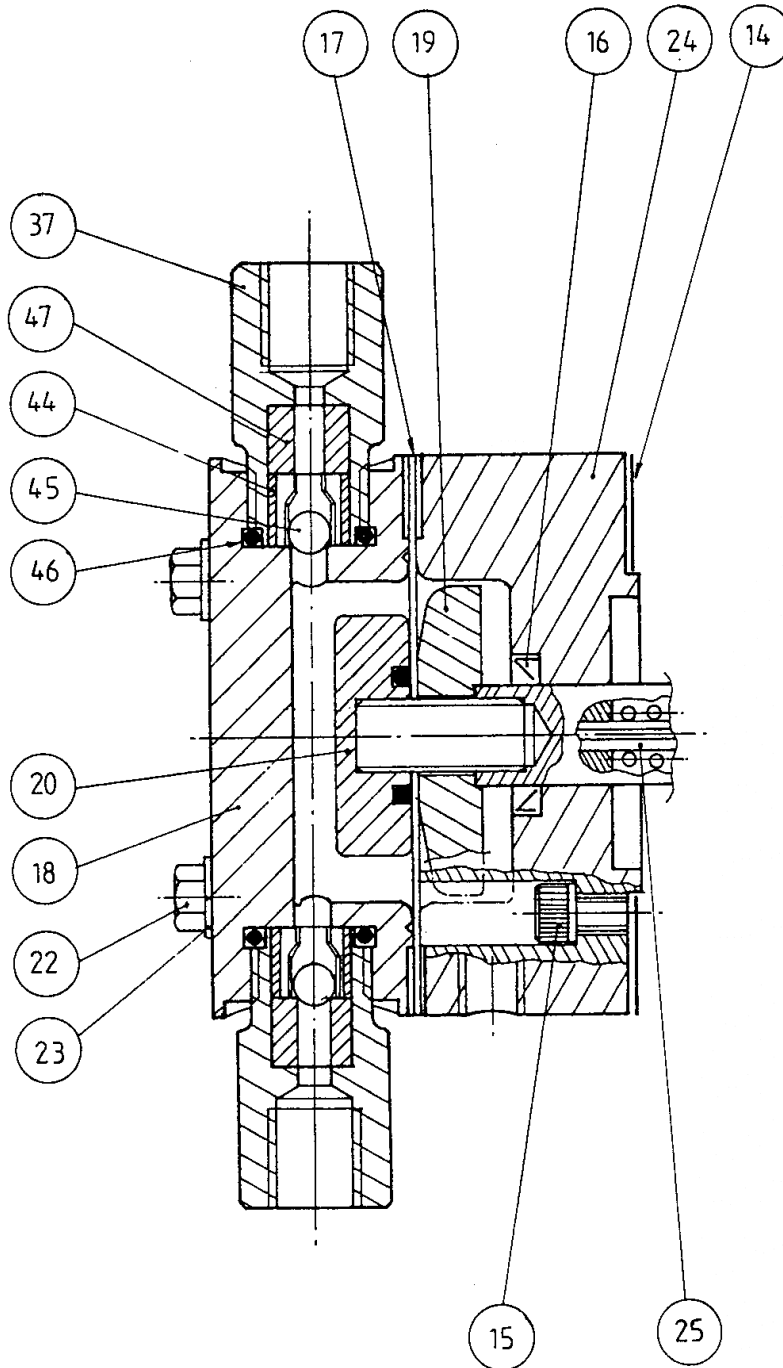
9.13 **Solution End 2000-005 - PVC Parts List**

ITEM	PART NO	DESCRIPTION	QTY	NOTES
14	10313	GASKET (ADAPTOR)	1	
15	08/01/77	CAP SCREW (ADAPTOR)	2	
16	07/01/26	OIL SEAL	1	★
17	S-094-2-3	DIAPHRAGM	1	★
18	S-080-3 PVC	SOLUTION HEAD	1	
19	S-099-3W	SECONDARY PISTON	1	
20	AS-096-3 PVC	DIAPHRAGM BOLT ASSEMBLY	1	
22	08/02/103	BOLT (SOLUTION HEAD)	4	
23	09/01/28	WASHER (SOLUTION HEAD)	4	
24	S-097-3W	ADAPTOR	1	
25	10/01/18	SPRING PIN	2	
45	14/01/01	316SS BALL CHECKS ¼"	2	★
	14/01/02	HASTELLOY C BALL CHECKS ¼"	2	★
	14/01/04	CERAMIC BALL CHECKS ¼"	2	★
	14/01/25	TEFLON BALL CHECKS ¼"	2	★
	KVD-2-3-S-PVC	DISCHARGE VALVE ASSEMBLY	1	★
37	S-084-2-3W PVC	VALVE BODY	1	
44	E-16 PVC	STOP BALL CHECK (DISCHARGE)	1	
46	07/03/03	'O'-RING	1	
	KVS-2-3-S-PVC	SUCTION VALVE ASSEMBLY	1	★
37	S-083-2-3W PVC	VALVE BODY	1	
44	E-16 PVC	STOP BALL CHECK (SUCTION)	1	
46	07/03/03	'O'-RING	1	

Notes:

- ★ Recommended Spare Part

9.14 **Solution End 2000-005 SS**



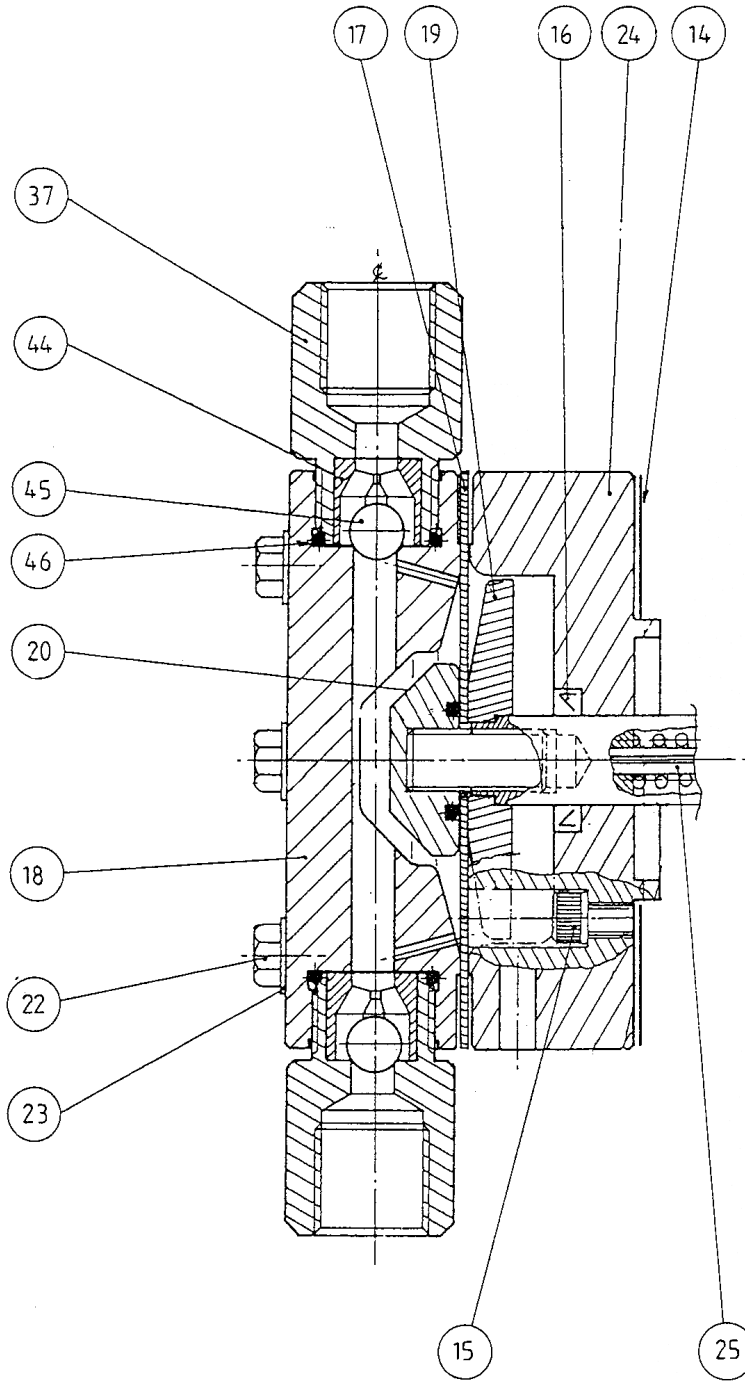
9.15 **Solution End 2000-005 - Stainless Steel Parts List**

ITEM	PART NO	DESCRIPTION	QTY	NOTES
14	10313	GASKET (ADAPTOR)	1	
15	08/01/77	CAP SCREW (ADAPTOR)	2	
16	07/01/26	OIL SEAL	1	★
17	S-094-2-3	DIAPHRAGM	1	★
18	S-080-2W SS	SOLUTION HEAD	1	
19	S-099-3W	SECONDARY PISTON	1	
20	AS-096-3 SS	DIAPHRAGM BOLT ASSEMBLY	1	
22	AS-096-3 SS	BOLT (SOLUTION HEAD)	4	
23	09/01/28	WASHER (SOLUTION HEAD)	4	
24	S-097-3W	ADAPTOR	1	
25	10/01/18	SPRING PIN	2	
45	14/01/01	316SS BALL CHECKS ¼"	2	★
	KVD-2-3-S-SS	DISCHARGE VALVE ASSEMBLY	1	★
37	S-083-1-3W SS	VALVE BODY	1	
44	S-088-1-3W PTFE	VALVE INSERT	1	
46	07/03/03	'O'-RING	1	
47	S-089-2-3W PTFE	SPACER - VALVE INSERT	1	
	KVS-2-3-S-SS	SUCTION VALVE ASSEMBLY	1	★
37	S-083-1-3W SS	VALVE BODY	1	
44	S-088-1-3W PTFE	VALVE INSERT	1	
46	07/03/03	'O'-RING	1	
47	S-089-2-3W PTFE	SPACER - VALVE INSERT	1	

Notes:

- ★ Recommended Spare Part

9.16 **Solution End 2000-015 PVC**



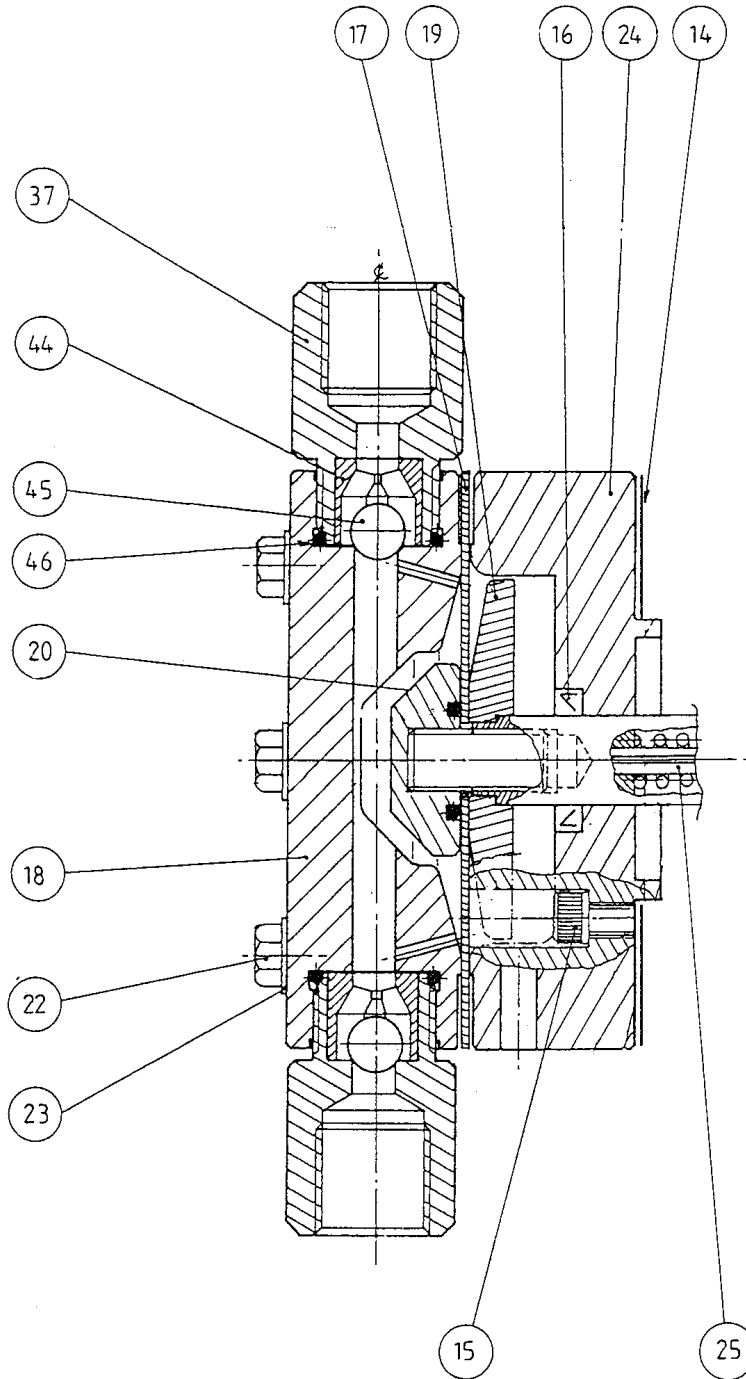
9.17 **Solution End 2000-015 - PVC Parts List**

ITEM	PART NO	DESCRIPTION	QTY	NOTES
14	10310	GASKET (ADAPTOR)	1	
15	08/01/77	CAP SCREW (ADAPTOR)	4	
16	07/01/26	OIL SEAL	1	★
17	S-094-4	DIAPHRAGM	1	★
18	S-080-4W PVC	SOLUTION HEAD	1	
19	S-099-4W	SECONDARY PISTON	1	
20	AS-096-4 PVC	DIAPHRAGM BOLT ASSEMBLY	1	
22	08/02/103	BOLT (SOLUTION HEAD)	6	
23	09/01/28	WASHER (SOLUTION HEAD)	6	
24	S-097-4W	ADAPTOR	1	
25	10/01/18	SPRING PIN	2	
45	14/01/18	316SS BALL CHECKS 3/8"	2	★
	14/01/19	HASTELLOY C BALL CHECKS 3/8"	2	★
	14/01/21	CERAMIC BALL CHECKS 3/8"	2	★
	KVD-4-S-PVC	DISCHARGE VALVE ASSEMBLY	1	★
37	S-083-4W PVC	VALVE BODY	1	
44	S-088-4W PVC	VALVE INSERT	1	
46	07/03/44	'O'-RING	1	
	KVS-4-S-PVC	SUCTION VALVE ASSEMBLY	1	★
37	S-083-4W PVC	VALVE BODY	1	
44	S-088-4W PVC	VALVE INSERT	1	
46	07/03/44	'O'-RING	1	

Notes:

- ★ Recommended Spare Part

9.18 **Solution End 2000-015 SS**



9.19 **Solution End 2000-015 - Stainless Steel Parts List**

ITEM	PART NO	DESCRIPTION	QTY	NOTES
14	10310	GASKET (ADAPTOR)	1	
15	08/01/77	CAP SCREW (ADAPTOR)	4	
16	07/01/26	OIL SEAL	1	★
17	S-094-4	DIAPHRAGM	1	★
18	S-080-4W SS	SOLUTION HEAD	1	
19	S-099-4W	SECONDARY PISTON	1	
20	AS-096-4 SS	DIAPHRAGM BOLT ASSEMBLY	1	
22	08/02/103	BOLT (SOLUTION HEAD)	6	
23	09/01/28	WASHER (SOLUTION HEAD)	6	
24	S-097-4W	ADAPTOR	1	
25	10/01/18	SPRING PIN	2	
45	14/01/18	316SS BALL CHECKS 3/8"	2	★
	14/01/19	HASTELLOY C BALL CHECKS 3/8"	2	★
	14/01/21	CERAMIC BALL CHECKS 3/8"	2	★
	KVD-4-S-SS	DISCHARGE VALVE ASSEMBLY	1	★
37	S-083-4W SS	VALVE BODY	1	
44	S-088-4W PTFE	VALVE INSERT	1	
46	07/03/44	'O'-RING	1	
	KVS-4-S-SS	SUCTION VALVE ASSEMBLY	1	★
37	S-083-4W SS	VALVE BODY	1	
44	S-088-4W PTFE	VALVE INSERT	1	
46	07/03/44	'O'-RING	1	

Notes:

- ★ Recommended Spare Part

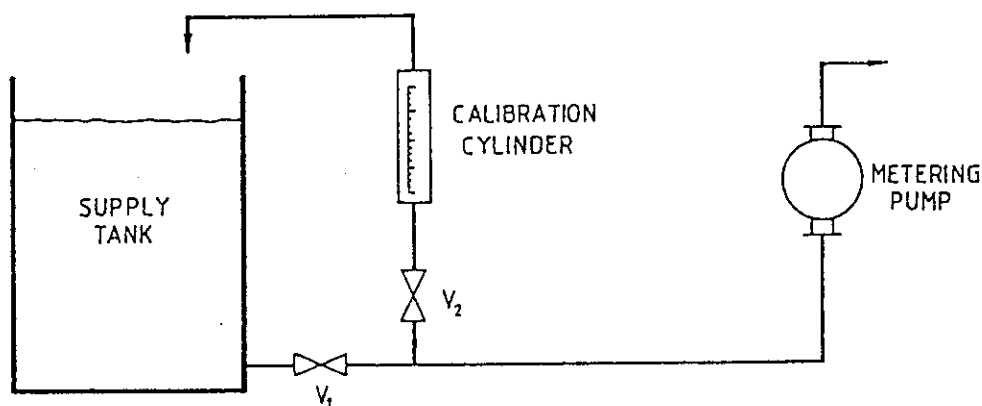
10. CALIBRATION OF A METERING PUMP

To perform a calibration test on the delivery rate you will require a stop watch and materials necessary to perform a series of simple calculations.

To utilise this system efficiently, the following procedure should be followed whilst the pump is operating.

1. Valve V1 must remain open except when the user is testing the deliver rate.
2. To test the delivery rate, open valve V2 and flood the calibration cylinder well above the top graduation mark.
3. Close valve V1.
4. At the moment when the fluid level reaches the top graduation mark, begin timing the test.
5. When the liquid reaches the desired lower graduation, stop your watch and note down the time and calibration discharge quantity. Open valve V1 quickly and close V2 to avoid air being drawn into the system via the calibration cylinder.
6. Should another calibration test be required, then proceed to Item 2.

FIG. 1



EXAMPLE OF TYPICAL CALIBRATION TEST:

Test volume recorded	:	1190 millilitres
Test time taken	:	63 seconds
Flow Rate (L/H)	=	$\frac{\text{volume recorded (ml)}}{\text{time taken (sec)}} \times 3.6$
	=	$\underline{1190} \times 3.6 = 68 \text{ litre/hour}$

CALIBRATION CYLINDER – INSTALLATION GUIDE

LOCATION:

Install the calibration cylinder as shown in Figure 1. The cylinders must be installed in the suction piping in a vertical position and as close as possible to the suction tank.

Remember the location should make allowance for sufficient free space around the calibration cylinder for easy reading of graduations.

PIPING:

It is essential that the size of the pipe to the calibration cylinder be the same size as the suction piping and cylinder inlet connection. Under-sized pipe work will cause suction losses and, hence, affect calibration accuracy.

We strongly recommend that the use of full-flow ball valves to give consistent system throughput and rapid open and shut operation – an important feature when checking calibrations.

Piping should be air-tight and suitably supported at regular intervals.

An overflow/venting line should be connected between the top of the calibration cylinder and the supply tank.

CAUTION: NEVER USE THE CYLINDER ON THE DISCHARGE SIDE OF ANY PUMP.

11. PULSATION VALVE INSTRUCTIONS

INSTALLATION:

We recommend installation of a pulsation dampener between valve and pump for both applications to provide smoother, more accurate valve operation and maximise valve life.

Coat pipe fittings with suitable thread sealant such as PTFE tape before connecting to prevent leakage.

CAUTION: Do not over-tighten screwed connection. Should leakage occur during operation, unfasten connection and recoat threads with sealant.

ADJUSTMENT:

Valve operating pressure is controlled by the spring (8) and can be increased or decreased by varying the spring preload.

At date of purchase, Enchlor will adjust the valve to meet customer's requirements.

To alter or set operating pressure at site, it is necessary for a pressure gauge with snubber to be installed in the line between the valve and the pump and with pump operating:-

For Back Pressure: Unfasten locknut (5). Unscrew adjustment screw (4) to decrease pressure or screw in to increase pressure. When required pressure is achieved, retighten locknut.

For Pressure Relief: Unfasten locknut. Unscrew adjustment screw to decrease pressure or screw in to increase pressure. When full flow through valve at required relief pressure is achieved, retighten locknut.

MAINTENANCE:

The valve and its components should be inspected annually or when incorrect operation is suspected.

Disassembly is relatively simple. Unfasten locknut and unscrew adjustment screw to remove spring preload. Unfasten the three main bolts (3). These bolts hold the upper and lower halves together. Separate body halves and remove internals.

Carefully inspect and clean all components. Worn or damaged parts should be replaced. Smear the outer surface of the plunger and the bore of the upper body with grease to prevent plunger sticking in bore during operation.

Assembly procedure is reverse of disassembly.

After reinstalling, adjust valve operating pressure as previously described.

INSTALLATION LAYOUT

