Pub # 1672-00

EBSRAY PUMPS

INSTALLATION, OPERATION & MAINTENANCE
INSTRUCTIONS

V SERIES
MODEL V6000

EBSRAY AUSTRALIA

SECTION 1 INTRODUCTION

This publication is intended to assist those involved with the installation, operation and maintenance of Ebsray Model V6000 Rotary Sliding Vane Pump.

1.1 CAUTION

INSTALLATION AND SERVICING OF THIS EQUIPMENT SHOULD BE PERFORMED BY QUALIFIED COMPETENT PERSONNEL IN ACCORDANCE WITH RELEVANT STATUTORY REGULATIONS OR CODES, IN CONJUNCTION WITH THESE INSTRUCTIONS.

When the equipment supplied utilises components other than those manufactured by EBSRAY e.g. couplings, speed reducers, electric motors etc, reference should be made to the original manufacturer's data before installation or servicing is commenced. Failure to observe these details may void the warranty.

1.2 WARNING

The pump must be operated within the original selected design parameters of product, viscosity, temperature, speed and pressure. Should any change be contemplated, please confer with EBSRAY in order to verify the suitability of such a change.

1.3 TRANSPORTATION AND PACKING

Standard domestic packing is suitable for shipment in covered transports. Ports must be sealed to exclude ingress of solids. When received on site the pump should be stored in a dry covered area. If storage is required for other than a short period prior to installation, special preservatives and protective wrappings will be required.

1.4 INSPECTION ON RECEIPT

On receipt of equipment, check all items against the dispatch documents and inspect for damage. Any damage or shortage incurred during transit should be noted on the packing note and on both your own and the carrier's copy of the consignment note and a claim should be made immediately on the transport company. Should a shortage be evident on receipt, notify EBSRAY immediately giving full details and packing note number.

1.5 HANDLING

Care must be taken when moving pumps. A sling should be placed under or around a bare shaft pump to minimise stress on the shaft or pump flanges. Baseplate mounted units should be lifted from under the baseplate below both the pump and driver ensuring compliance with the relevant lifting codes.

SECTION 2 - INSTALLATION

2.1 LOCATION

The pumping unit should be placed as close as practicable to the source of supply remembering to keep within the NPSH requirement of the pump. Ensure floor area and headroom allotted are sufficient for inspection and maintenance. Allow sufficient space and ventilation for motor cooling requirements. Be sure to allow for crane or hoist access if required.

2.2 FOUNDATIONS

Baseplate units should be accurately installed. When on a concrete foundation, ensure that it has been poured on a solid footing. NOTE: Position foundation bolts to match baseplate foundation plan.

2.3 PUMP PIPING CONNECTIONS

All piping should be supported independently of and line up accurately with the pump ports.

NEVER DRAW PIPING INTO PLACE BY USE OF FORCE AT THE PORT CONNECTIONS OF THE PUMP.

2.4 STRAINER PROTECTION

The pump suction should always be protected by an efficient suction strainer of adequate size to accommodate the liquid viscosity conditions without causing excessive suction resistance.

2.5 ALIGNMENT

Alignment of the pump and driver is of extreme importance for trouble free mechanical operation. Baseplate mounted units are accurately aligned at the factory. To ensure this has been maintained during transit, alignment MUST BE checked once before startup and again after the unit has been run under actual operating conditions. NOTE: The following procedures are typical only and reference should be made to data for specific coupling types.

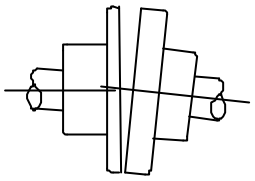


Figure 1

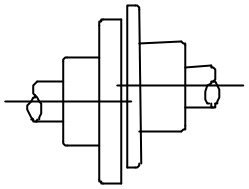


Figure 2

ANGULAR MISALIGNMENT as shown in Fig.1 should be corrected before eccentricity. Refer Fig.3; use feeler gauge reading at 90° intervals, the amount of correction necessary can be easily determined to bring shaft axes in line.

Misalignment due to ECCENTRICITY as shown in Fig.2 can now be corrected. Refer Fig.4; adjustment by use of shims under the driver or

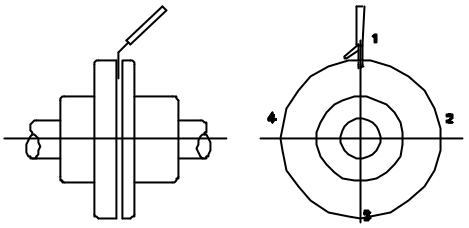


Figure 3

pump will effectively correct error in the vertical plane. Movement of one of the ends horizontally will correct error in the horizontal plane. NOTE: If both coupling halves are of identical diameter, concentricity may be checked with a straight edge at 90° intervals.

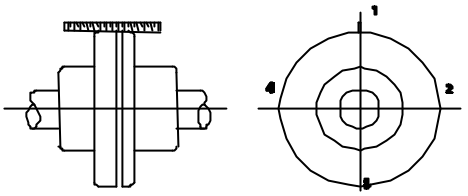


Figure 4

SECTION 3 - OPERATION

3.1 DESCRIPTION

The EBSRAY Model V6000 is a positive displacement Sliding Vane Pump, primarily intended for the transfer of low to medium viscosity liquids. The Rotor/Shaft assembly rotates within a cam-form Liner and between two replaceable wearplates. Two mechanical seals, located outside the wearplates, isolate the Bearings from the pumpage. These grease packed or oil lubricated spherical roller bearings provide positive axial positioning of the pump rotor. The pump may be protected from overpressure by an optional adjustable bypass or pressure relief valve. The pump has a 180° porting configuration with optional 90° porting (Top Discharge).

3.2 LUBRICATION

Grease packed bearings require periodic lubrication via grease nipples fitted to the bearing housings. Use only a small quantity of high quality lithium based grease. Replacement of grease is recommended every 5000 hours of operation.
Oil lubricated bearings must have the oil level maintained at 64mm below the centreline of the shaft. An automatic oiler system is recommended for oil level maintenance. Replace oil every 12 months using a high quality compressor oil ISO VG 46 - ISO VG 68.

3.3 START-UP CHECKLIST

WARNING: DO NOT RUN PUMP DRY.

_ Lubricate as required.

_ Check alignment of couplings.

_ Ensure freedom of rotation of shaft.

_ Check direction of rotation.
WARNING: To prevent damage to pumpset or system, disengage coupling before checking direction of rotation.

_ Do not start pump against closed discharge valve or with inlet valve throttled.

3.4 OPERATIONAL CHECKS

Inspect pump frequently during the first few hours of operation for such conditions as excessive heating of bearings, vibration or unusual noises etc.

SECTION 4 - MAINTENANCE

PRIOR TO ANY DISASSEMBLY OR SERVICE VERIFY THAT ALL REQUIREMENTS OF STATUTORY REGULATIONS OR CODES ARE MET AND THAT SPECIFIC SITE REQUIREMENTS ETC. ARE SATISFIED.

Some inspections and maintenance tasks can be performed with the pump 'in line' if complete isolation, depressurising and purging procedures have been completed. However for major maintenance, it is recommended that the pump be removed from the installation.

The following instructions regarding disassembly and reassembly are relative to major maintenance.

4.1 SPARE PARTS

When ordering spare parts, to ensure a minimum delay and correct replacement to original specification, always quote the pump serial number which is located on the nameplate of the pump.
Advise the name, cat # and quantity required.
Refer Drawing CMP082
Advise complete delivery instructions, transport detail

4.2 PREPARATION FOR DISASSEMBLY

1. Obtain the appropriate work permit if required.

2. Isolate the pump from liquids in suction and discharge lines, depressurise and purge out any toxic, flammable, corrosive or air-hardening liquids.

3. Isolate power supply to motor.

4. Note driveshaft and porting orientation to ensure correct reassembly.

5. Disconnect porting connections.

6. Remove pump from installation.

4.3 DISASSEMBLY

1 Remove lubrication harnesses and drain oil from bearing housings (if oil lubricated).

2 Remove any plugs, vents etc. which may hinder access to Bearing Housing nuts.

3 Remove Dustcaps from both ends of pump.

4 Unlock Lockwashers and Using a suitable 'C' spanner, remove Shaft Locknuts (both sides).

5 Loosen Sleeve Locknuts enough to just clear the end of the sleeve. With a suitable drift and hammer, sharply tap the faces of the Sleeve Locknuts to release the Sleeves from the Bearings.

6 Remove Bearing Housing Setscrews.

CAUTION
Place a support under Bearing Housings which will allow Bearing Housings to be removed from Pump without dropping as it comes clear of the shaft where the locknut thread begins. If the Bearing Housing does not remain centred during removal the Stationary Seal Face is likely to be chipped by the thread on the shaft. Lubricate shaft before removing Bearing Housing.

7 Screw two of the Bearing Housing Setscrews (M20) into the extraction holes in each Bearing Housing, tighten evenly to remove bearing housing assembly. (It may be necessary to tap the faces of the Sleeve Locknuts again to fully release the Sleeves from the Bearings)

8 Remove Sleeve Locknuts and remove Sleeves from Bearings. If required, remove Bearings from Bearing Housings.

9 Loosen the 6 grubscrews from each Mechanical Seal Assembly. Carefully remove Mechanical Seal Assemblies from shaft.

10 Remove Cover setscrews, remove Cover from inspection end.

11 Place a 37mm diameter x 120 mm long bar inside Liner (this is to support Rotor during removal - see Figure 5)

12 Partially withdraw Rotor/Shaft Assembly from inspection end far enough to allow string or tape to be wrapped around the rotor to retain the vanes and pushrods in position.

13 Remove Rotor/Shaft Assembly.

14 Release grubscrews and remove Seal Spacers from Shaft.

15 Remove Vanes and Pushrods from Rotor (note orientation for correct reassembly)

16 Remove Cover setscrews, remove Cover from drive end.

17 Remove Liner

18 If required, remove Wearplates from covers.

4.4 INSPECTION

1. Inspect Rotor/Shaft assembly and Liner. If damage or excessive wear is evident, it is recommended to replace both components.

2. Note: The Rotor is permanently attached to the Shaft.

3. Inspect Vanes for wear or damage - Refer Table

4. Inspect Pushrods for wear, damage and straightness. Replace as required

5. Inspect both Mechanical Seals. Replace worn or damaged components.

6. Inspect both Wearplates for damage or excessive wear. Replace or reverse as required.

NOTE: If Wearplates are to be reversed, they will have to be swapped to opposite ends also to keep relief grooves on discharge side.

4. It is recommended that all 'O' Rings and Oil Seals be replaced at every overhaul.

5. Inspect roller Bearings for wear. It is recommended on major overhauls that roller bearings be replaced.

V6000 PUMP TABLE I

STANDARD GENERAL CLEARANCES AND SIZES FOR TEMPERATURES O°- 100°C
(All dimensions are in millimetres)

Total axial clearance (i.e. Liner length minus Rotor length measured along axis)	0.6 – 0.8 mm (0.3 – 0.4 mm/side)
Total Vane clearance (i.e. Liner length minus Vane length)	0.6 – 0.9 mm
Minimum worn Vane height	60 mm

Notes:

1. Dimensions stated are design parameters.

2. Efficient suction and discharge performances are achieved when the pump is maintained within these dimensions, however adequate performance may still be achieved with clearances and dimensions outside those stated if application parameters allow.

3. If installing new Vanes or Liner, check their lengths to comply with the clearances as stated.

4.5 REASSEMBLY

NOTE: the following instructions assume that the pump has been entirely dismantled. Reassembly will be carried out in a slightly different order If the Wearplates have not been removed from the Covers, or if Bearings have not been removed from Bearing Housings.

1. Fit Key to Body and fasten with M10 x 30 setscrews.

2. Fit Liner to Body ensuring correct orientation i.e. inlet and outlet ports must be oriented correctly for the desired direction of rotation. (IN – OUT marked on liner)

3. Place a 37mm diameter x 120 mm long bar inside Liner (this is to support Rotor during insertion)

4. Determine correct orientation of vanes in Rotor (Slots in Vanes must be on the leading side of the Vanes when assembly is rotating)

5. Insert three Vanes in the Rotor and secure in place with insulating tape or thin string.

6. Turn Rotor so that vanes are at the bottom.

7. Insert 6 Pushrods into pushrod holes in Rotor.

8. Insert the Rotor/Shaft/Pushrod assembly onto the liner so that it rests on the bar between two of the vanes. Refer Figure 5

Figure 5

9. Position a Wearplate at the Non-Drive end **ensuring that the relief groove is oriented toward the discharge port** and then fit and fasten the Seal Spacer at the same end. (Grubscrews for the Seal Sleeve should be locked using Loctite 243 or equivalent)

10. Ensure that the Wearplate is inside the Body to a depth of about 10 mm.

11. Support the weight of the Shaft drive end and remove the tape (or string) from the rotor to release the vanes. Rest the rotor back on the bar.

12. Using a suitable tool ensure that the vanes are extended as far as possible and that the pushrods are seated against the vanes.

13. Insert the other three Vanes into the Rotor ensuring the correct orientation.

14. Place the other Wearplate over the Drive end shaft **ensuring that the relief groove is oriented toward the discharge port** then support the weight of the shaft to allow the bar to be removed from the liner. Remove the bar and position wearplate inside liner. (take care not to push wear plate too far as opposite wearplate must remain inside liner)

15. Fit Drive End Seal Spacer to Shaft fasten with grubscrews (Grubscrews for the Seal Sleeve should be locked using Loctite 243 or equivalent)

16. Fit 'O' rings to Body Covers, lubricate 'O' rings then fit Body Covers (position Body Covers with cast 'EBSRAY' logo to top)

17. Fasten Body Covers with M20 x 2.5 x 70 bolts.

18. Fasten Wearplates to Body Covers with M10 x 1.5 x 25 socket head capscrews.

19. Lubricate Shaft and fit Mechanical Seal Assemblies. Ensure Seal Assembly is seated against Seal Spacer and firmly tighten the 6 grubscrews to fasten the Seal Assembly. (using Loctite 243 or equivalent)

NOTE: Take care to avoid damaging the seal faces when fitting and securing.

20. Lubricate Bearing Housing bores. Press Oil Seals into Bearing Housings with lips toward bearing bore. Ensure Oil Seal is seated squarely in bottom of bore.

21. Press Throttle Bush into Bearing Housing.

22. Face, mark position of Stationary Seal Face Location Pin on Throttle Bush and Bearing Housing. Mark position of location pin hole on the bore of the Stationary Seal Face.

23. Fit 'O'rings to Stationary Seal Faces, lubricate and press into bearing housings ensuring that location holes are accurately located over the Location Pins.

24. NOTE: Take care to avoid damaging the seal faces when fitting.

25. Ensure that seal faces are clean.

26. Fit 'O'rings to Bearing Housings, lubricate 'O'rings and Seal Faces.

27. Carefully fit Bearing Housings with the vent and oiler tappings in the 6 o'clock and 12 o'clock positions.

28. NOTE: Take extreme care to ensure that Seal Faces are not damaged by shaft thread or shoulder during fitting.

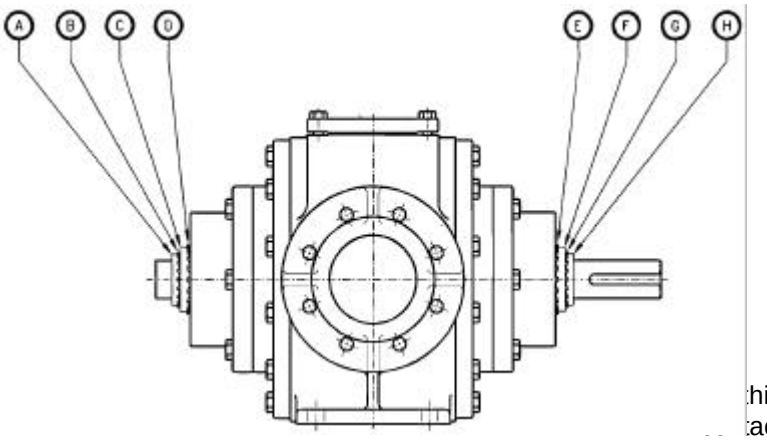
29. Fasten Bearing Housings with M20 x 2.5 x 70 bolts.

30. Position Bearing Sleeves on Shaft

31. Fit Bearings to Bearing Housings ensuring that bearing outer races are square with Bearing Housing. Gently and evenly tap Bearings into Bearing Housings.

32. Fit Lockwashers and Bearing Sleeve Locknuts, tighten until just firm to ensure that the Shafts are centred in the Bearings.

33. Fit Shaft Lockwashers and Shaft Locknuts but do not tighten.



Setting Axial Clearance

Adjustment and setting of axial clearance of Rotor from Wearplates requires that the Rotor/Shaft assembly be drawn to one side to establish zero axial clearance and then drawn back a fixed distance as follows:

1. Attach a suitable handle to the drive end of the Shaft to assist in rotation of the Rotor/Shaft Assembly.

2. Firmly tighten Sleeve Locknuts **(C & F)**

3. Locate and mark slots in **C & F** which are in line with tabs on Sleeve Lockwashers **(D & E)**.

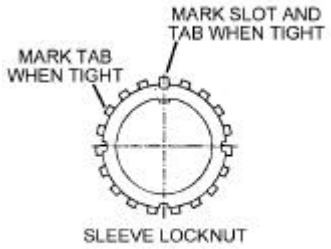


Figure 7

4. Mark the tabs on **D & E** which are three tabs back from the first one marked.

5. Loosen **C & F** until the marked slots line up with the second marked tabs.

6. Tighten Shaft Locknuts **(A & H)** firmly to release the Sleeves from inside the Bearings. When Sleeves are correctly released, **D & E** become firmly held between **C & F** and the respective Bearings.

7. Release **A** and then tighten **H** while rotating the Rotor/Shaft assembly until Rotor/Shaft assembly locks. This tightening procedure may require tapping **H** and then re-tightening.

his stage Rotor has been drawn into tact with Wearplate.

9. Locate a slot in **H** which is in line with a tab on Shaft Lockwasher **(G)** and mark mark both.

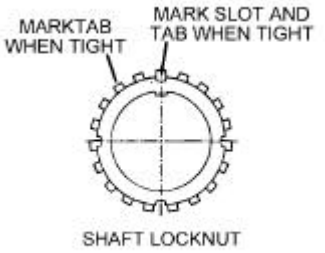


Figure 8

10. Mark the tab on **G** which is two tabs back from the first one marked.

11. Loosen **H** until the marked slot lines up with the second marked tab.

12. Tighten **A** until Rotor Shaft Assembly becomes hard to turn.

13. Loosen **A** then tighten **C** back to original marked position. Lock **D**.

14. Tighten **A** firmly. Lock **B**.

15. Release **H**. Retighten **F** to original position and lock **E**.

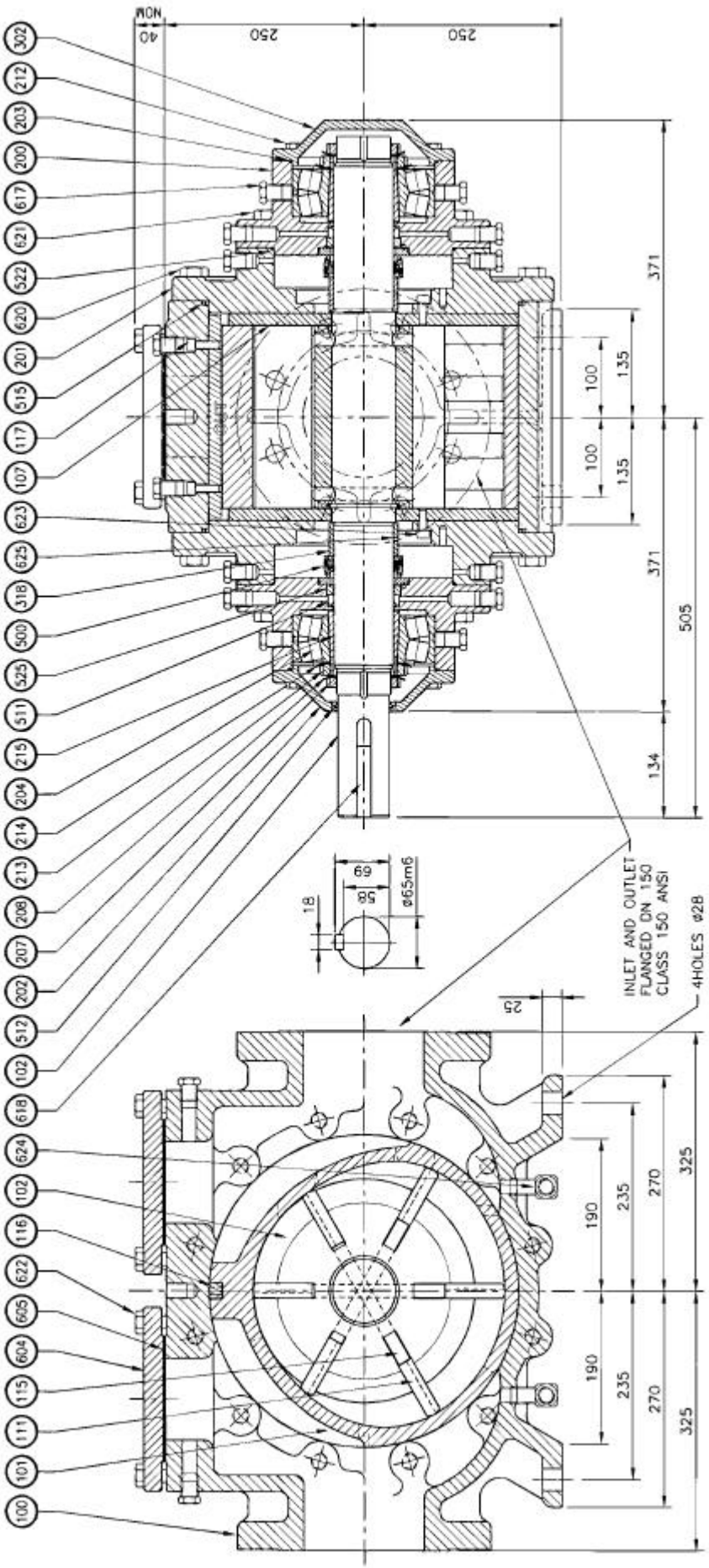
16. Tighten **H** firmly and lock **G**.

17. Check for freedom of rotation, if shaft will not rotate freely, repeat adjustment from step 1

18. Fit Oil Seal to Drive End Dust Cap

19. Lubricate Shaft, fit and fasten Dust Caps to both ends.

SECTION 5 - PARTS DESIGNATION



Drawing No CMP082
Parts Designation V6000

Refer to Drawing No: CMP082

CAT #	DESCRIPTION	Quantity
100	BODY	1
101	LINER	1
102	ROTOR ON SHAFT	1
107	WEARPLATE	2
111	VANE	6
115	PUSH ROD	6
116	BODY KEY	1
117	BOLT (BODY KEY)	2
200	BEARING HOUSING	2
201	BODY COVER	2
202	DUST CAP-D.E.	1
203	O-RING (DUST CAP)	2
204	ROLLER BEARING	2
207	LOCKNUT	2
208	LOCKWASHER	2
212	BOLT (DUST CAP)	12
213	LOCKNUT (ADAPTOR SLEEVE)	2
214	LOCKWASHER (ADAPTOR SLEEVE)	2
215	ADAPTOR SLEEVE	2
302	DUST CAP-I.E.	1
318	SPACER-SEAL	2
500	MECHANICAL SEAL ASSEMBLY	2
511	OIL SEAL (BRG HSG)	2
512	OIL SEAL	1
515	O-RING (BODY COVER)	2
522	O-RING (BRG HSG)	2
525	THROTTLE BUSH	2
604	BLANKING PLATE	2
605	GASKET (BLANKING PLATE)	2
617	PLUG	20
618	COUPLING KEY	1
620	BOLT (BODY COVER)	24
621	BOLT (BRG HSG)	12
622	BOLT (BLANKING PLATE)	16
623	BOLT (WEARPLATE)	12
624	ELBOW (DRAIN)	2
625	SET SCREW (SEAL SPACER)	4

SECTION 6 - TROUBLE SHOOTING

6.1 FAILURE TO DELIVER LIQUID

1 Incorrect direction of rotation.

2 Suction filter/strainer blocked or leaking air.

3 Liquid too viscous.

4 No liquid in tank.

5 High static discharge on pump combined with air/vapour in suction pipe.

6 Valves closed or air leaks in suction system.

7 Excess internal clearances.

8 Pump vapour locked

6.2 LOW OUTPUT

9 Pump speed too low.

10 Cavitation or vaporisation on suction side of pump.

11 Obstruction in suction or discharge pipe.

12 Air leakage in suction pipes or fittings.

13 Bypass valve pressure setting too low - adjust bypass valve - DO NOT exceed system design pressure or overload driver.

14 System differential pressure higher than specified duty point.

15 Viscosity of liquid lower than specified duty point.

16 Pump parts worn - have pump reconditioned or replace worn parts.

6.3 EXCESSIVE POWER CONSUMPTION

17 Obstruction in discharge line.

18 Pump operating outside the specified duty point (i.e. high differential pressure, viscosity and/or speed)

19 Rotating parts binding - disassemble pump and inspect.

20 Misalignment between pump and driver - check coupling and realign as required.

21 Inherent pipe stresses causing distortion of pump and casing - rectify and realign before reassembling.

22 Bearings worn - inspect and replace as required.

6.4 PUMP IS NOISY

23 Air leakage in suction piping.

24 Cavitation due to insufficient NPSH available i.e. suction conditions extreme - reduce suction losses.

25 Pump running dry - remove blockages in suction line/strainer.

26 Pump and driver misaligned - check coupling and realign as required.

27 Rotating elements binding or broken - disassemble and inspect.

28 Bearings worn - inspect and replace as required.

6.5 LEAKAGE

29 From covers and flanges:

a) Set screws not tight - retighten.

b) Damaged 'O' ring seals or gaskets - replace.

c) Check for thermal expansion of product when locked between valves either side of pump. Remove hydraulic lock potential.

30 From mechanical seal:

a) Mechanical seals incorrectly installed, worn or damaged - replace.

b) Misalignment between pump and driver causing excessive shaft distortion - check coupling and realign as required.

c) Worn or damaged shaft in seal zone - replace rotor/shaft.

d) Excess system pressure - check for obstructions in discharge line and check as in 1c) above.