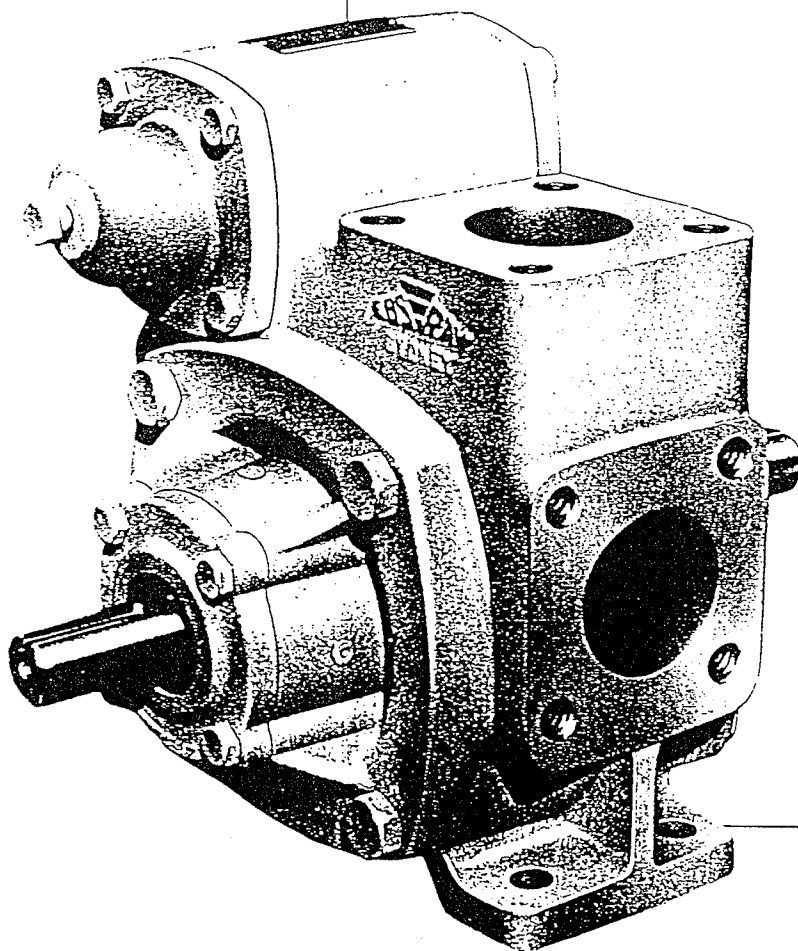


# EBSRAY PUMPS

## INSTALLATION OPERATION AND MAINTENANCE INSTRUCTIONS



*V Series  
Models V25  
Types 63 & 64*

**EBSRAY**  
AUSTRALIA

## 1 - GENERAL

### INTRODUCTION

This publication is intended to assist those involved with the installation, operation and maintenance of EBSRAY Model V25 Rotary Sliding Vane Pumps. The design, materials and workmanship incorporated in the manufacture of EBSRAY pumps make them capable of reliable operation over a long working life. Correct installation is essential. Service life is enhanced by periodic inspection and careful maintenance.

#### 1-A 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-B WARNING

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

### 1-C 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-D INSPECTION ON RECEIPT - SHORTAGES

On receipt of equipment, check all items against the despatch 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-E HANDLING

Care should be used in 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.

## 2 - INSTALLATION

### 2-A 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.

### **IMPORTANT**

The Bearing Housings on both ends of the pump are fitted with 4 dust plugs each to prevent the ingress of foreign matter. When the pump is mounted with the shaft horizontal, the plugs in the 6 O'clock position may be removed to provide a weep hole for early indication of seal failure. When the pump is mounted with the shaft vertical, particularly on trucks etc. which may be cleaned with high pressure water, all plugs should be left in position and their location and condition checked regularly to ensure that no water or other foreign matter can enter the bearing area.

### 2-B 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-C PUMP PIPING CONNECTIONS

All piping should be supported independently and line up accurately with the pump ports. NOTE: Pumps with screwed connections should employ a pipe joint close to both the suction and discharge ports to facilitate ease of maintenance.

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

### 2-D 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-E 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.

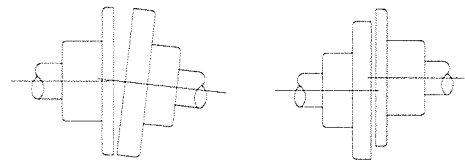


Fig. 1

Fig. 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.

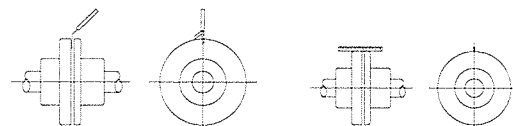


Fig. 3

Fig. 4

Refer Fig.4; adjustment by use of shims under the driver or 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.

### 3 - OPERATION

#### 3-A DESCRIPTION

The Ebsray Model V25 is a positive displacement sliding vane pump, primarily intended for the transfer of low to medium viscosity liquids. The pump features a double-ended drive shaft thereby facilitating drive connection to either end.

From the basic V2 and V6 configurations, 8 different configurations can be made. By changing the position of the blanking plate and/or the shaft cap, a V2 pump becomes a V1, V7 or V8, and a V6 pump becomes a V3, V4 or V5.

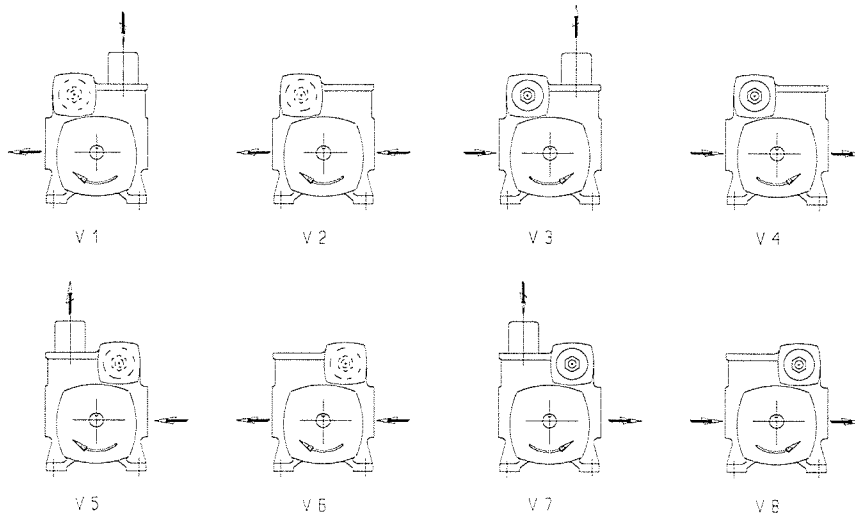


Fig. 5

The V25 rotor/shaft assembly rotates within a cam form liner. Lip seals located in the bearing housings isolate the bearings from the pumpage. One of these sealed grease packed ball bearings provides positive axial positioning of the pump rotor. An identification groove on one end of the drive shaft identifies the located end of the shaft.

Lip seals are fitted to the end covers to minimise ingress of dust/dirt along the shaft. A shaft cap is fitted to the non-drive end for safety. The pump is protected from excessive differential pressure rise by an adjustable bypass valve. A blanking plate is fitted to the spare port.

#### 3-B LUBRICATION

No 'in service' lubrication is required on EBSRAY Model V25 pumps.

#### 3-C START-UP CHECKLIST

- ✓ Direction of rotation **NOTE Disengage coupling before testing motor rotation**
- ✓ Alignment of couplings
- ✓ Freedom of rotation of shaft
- ✓ Do not start pump against closed discharge valve or with suction valve throttled.

#### **DO NOT RUN PUMP DRY**

#### 3-D 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.

## 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', so long as 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 / reassembly are relative to major maintenance.

### 4-A SPARE PARTS

- 1 When ordering spare parts, to ensure a minimum of delay and correct replacement to original specification, always quote the pump Serial Number which is located on the nameplate of the pump.
- 2 Advise the name, item number and quantity required. Refer to Drg No. CMP016
- 3 Advise complete delivery instructions, transportation, etc.

### 4-B 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 pump and bypass valve orientation relative to direction of pump rotation.
- 5 Disconnect porting connections.
- 6 Remove pump from installation.

### 4-C DISASSEMBLY

Note: Items required to aid Disassembly/Reassembly :

Two M10 x 1.5 x 50 setscrews

**CAUTION:** TAKE CARE NOT TO DAMAGE COMPONENTS BY PRISING OR LEVERING IN ORDER TO RELEASE FITS.

#### Section I - Bypass Valve

- 1 Unlock locknut, remove adjusting screw and locknut from bypass valve cover.
- 2 Remove bypass valve cover and 'O' ring together with valve spring and retaining washer with its 'O' ring.
- 3 Remove valve spring, retaining washer and 'O' rings from cover.
- 4 Remove cartridge and 'O' ring together with valve.
- 5 Remove 'O' ring and valve from cartridge.

#### Section II - Pump

- 1 Remove pump coupling half from shaft.
- 2 Remove shaft cap.
- 3 Remove bearing cap from non-located end. (i.e. end without identification groove in drive shaft.)
- 4 Remove lip seal and gasket from bearing cap.
- 5 Remove locknut and tabwasher from shaft.
- 6 Remove cap bolts from non-located end bearing housing.
- 7 Remove bearing housing from pump body. (Screw 2 M10 x 1.5 x 50 setscrews into extraction holes in bearing housing, tighten evenly until housing is free.)
- 8 Remove bearing, spacer and shims from bearing housing.
- 9 Remove lip seal from bearing housing.
- 10 Remove cap bolts from located end bearing housing.

- 11 Withdraw bearing housing/rotor/shaft assembly cradling vanes in rotor. Note orientation of vanes in relation to pump rotation then remove vanes and pushrods from rotor. If bearing housing is tight in body screw two M10 x 1.5 x 50 setscrews into extraction holes in bearing housing, tighten until assembly is free. Assembly comprises bearing housing, bearing cap, bearing and rotor/shaft assembly.
- 12 With assembly on a suitable bench, remove bearing cap.
- 13 Remove lip seal from bearing cap.
- 14 Remove locknut and tabwasher from shaft.
- 15 Tap grooved end of shaft towards bearing housing to release bearing.
- 16 Remove bearing, shims, spacer and lip seal from bearing housing.
- 17 If required, remove liner from body. Note orientation.
- 18 If required, remove port blanking plate and gasket.

#### 4-D INSPECTION

- 1 Inspect rotor/shaft assembly and liner. If damage or excessive wear is evident, it is recommended to replace both components. Note: The rotor is a shrink fit on the shaft and is pinned for positive axial location.
- 2 Inspect vanes for wear or damage - Refer Table I.
- 3 Inspect vane pushrods for wear, damage and straightness. Replace as required.
- 4 Inspect bypass valve assembly and components for wear or damage. Replace or refurbish as required.
- 5 It is recommended that all 'O' rings and lip seals be replaced at every overhaul.
- 6 Inspect both ball bearings for wear. It is recommended on major overhauls that Ball Bearings be replaced.
- 7 Ensure pressure relief ducts in bearing housings are not obstructed.

#### STANDARD GENERAL CLEARANCES AND SIZES FOR TEMPERATURES 0 - 100 C

Measurement	Dimension (in millimetres)
Rotor to liner clearance measured radially at 12 o'clock position	0.010 - 0.045
<b>Total</b> axial clearance Liner minus rotor length (measured along axis)	0.15 - 0.20
<b>Total</b> vane clearance Liner minus vane length measured along axis	0.25 - 0.30
Standard vane height (not including vane plate)	31.45 - 31.50
Recommended maximum wear on vane height	2.5

**TABLE I**

#### NOTES:

- 1 Dimensions stated are design parameters.
- 2 High suction lift capability and optimum performance 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-E REASSEMBLY - PRELIMINARY (Refer Drawing No. CMP016)

- 1 Ensure all parts are clean and free from sharp edges, burrs etc.
- 2 Lightly smear all 'O' rings and lip seals with a compatible good quality lubricant before assembling.
- 3 Ensure correct orientation of components:

##### **Bypass valve:**

For **clockwise** pump rotation, adjusting screw position is opposite drive end.

For **anti-clockwise** pump rotation, adjusting screw position is at drive end.

- 4 Lightly lap bypass valve into seat of cartridge, (Valve should only be lapped until contact is achieved right around the seat. Excessive lapping of the valve will increase the seat width and prevent the valve from functioning correctly) . Ensure no lapping compound residue remains on components after lapping.
- 5 Tap the two location pins into the liner until they seat in their holes.
- 6 Press fit lip seals into both bearing covers and both bearing caps ensuring the sealing lips face inwards.

#### 4-F REASSEMBLY Section I - Pump

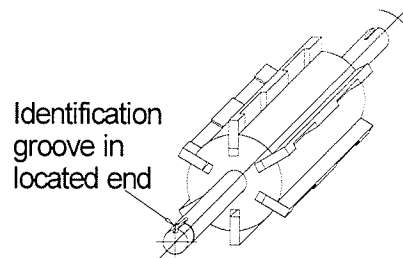
- 1 Place rotor/shaft assembly on workbench and support so that grooved end of shaft faces upwards.
- 2 Fit bearing housing to rotor/shaft assembly taking care to avoid damaging lip seal. (use a thin shim wrapped around the shaft or a suitable tapered tube to protect lip seal from sharp edges of shaft shoulders and threads)

##### **Setting axial clearance**

Clearance between located end bearing housing and rotor is set by using shims of the correct thickness between the located end bearing and the spacer. This clearance should be 0.04 - 0.06 mm and is usually obtained with shims of about .35 mm total thickness.

- 3 Fit spacer and required shim/s.
- 4 Fit bearing to shaft and ensure that it is seated against shims.
- 5 Fit lockwasher and locknut to shaft, tighten locknut.
- 6 Fit bearing cap to bearing housing and secure with 4x M10cap screws.
- 7 Check clearance between rotor and bearing housing using two feeler gauges opposite each other. If clearance is not correct, reverse procedures 3-6 and add or remove shims to obtain correct clearance.
- 8 When clearance is correct remove bearing cap and bend lockwasher tab to lock locknut onto shaft, replace bearing cap.
- 9 Direction of pump rotation must be determined before fitting liner. Fit liner to pump body with 'S' casting on liner on suction side, and location dowels on discharge side, with thick section (seal zone) of liner to top of pump. Allow liner to protrude from body about 10 mm to aid engagement of location dowel.
- 10 Locate pump body upside down on work bench and support in this position. (i.e. with Bypass Valve Body below pump foot.)
- 11 Fit 'O' ring to bearing housing .
- 12 Fit three vane pushrods and six vanes to rotor as follows:

**Note:** THE HYDRAULIC RELIEF SLOTS IN VANE MUST LEAD THE DIRECTION OF ROTATION AND VANE PLATES MUST FACE THE PUSHRODS. (Refer Fig. 6)



**Fig. 6**

With the shaft horizontal, insert three vanes

into top slots of rotor. Turn Rotor 180 degrees whilst supporting vanes in the rotor. Insert the three Pushrods followed by the other three vanes.

13 Using hands to cradle the vanes in the rotor, insert the assembly into the protruding end of the Liner. Once the vanes are partially engaged in the liner bore, rotate bearing housing to ensure location dowel will engage location hole in bearing housing and push assembly home.

14 Fasten bearing housing in position using four M16 x 40 setscrews.

15 Fit 'O' ring to non located end bearing housing Fit bearing housing to shaft taking care to protect lip seal from damage. (see 2) Ensure correct orientation using locating dowel.

16 Fasten Bearing Housing in position using four M16 x 40 setscrews.

17 Fit spacer to shaft.

**NOTE:** Before fitting bearing, shims may have to be fitted over spacer to provide correct clearance between bearing outer ring and bottom of bearing housing bore. Measure position of top of spacer 'A' relative to bottom of bearing housing bore 'B'. (see fig 7) The measurement 'X' should be between 0.1 mm and 0.2 mm less than the depth of the bearing housing bore. If required add shims to obtain the correct measurement.

An air gap each side of the bearing outer ring allows for movement of the bearing due to expansion and contraction of the rotor/shaft assembly. A gasket between the bearing housing and bearing cap provides adequate clearance for the outer face of the bearing outer ring.

18 Fit bearing to shaft and press down until it seats against spacer/shims.

19 Fit lockwasher and locknut to Shaft. Tighten securely and lock in place with lockwasher tab.

20 Fit bearing cap and gasket, secure using four M10 x 30 capscrews.

21 Fit shaft cap to non-drive end.

22 Bearing housings have four holes drilled into the zone between the seal and the bearing, one of these holes must be left open in each bearing housing to detect leaks from the seals. If the pump is mounted in the normal horizontal position the hole in the six O'clock position should be left open and the other holes sealed with plastic dust plugs. For pumps mounted vertically or in any other position the hole to be left open should be the one which is least likely to allow the ingress of dust, water or other foreign matter.

## Section II - Bypass Valve

Note: Ensure correct orientation with reference to pump rotation.

1 Fit 'O' ring to cartridge.

2 Position bypass valve in cartridge.

3 Fit cartridge assembly into body.

4 Fit 'O' ring to retaining washer, lubricate bore and slide retaining washer into cover.

5 Position spring over retaining washer and fit cover assembly to body so that end of spring locates on top of valve.

6 Fit adjusting screw with locknut and spring washer to cover.

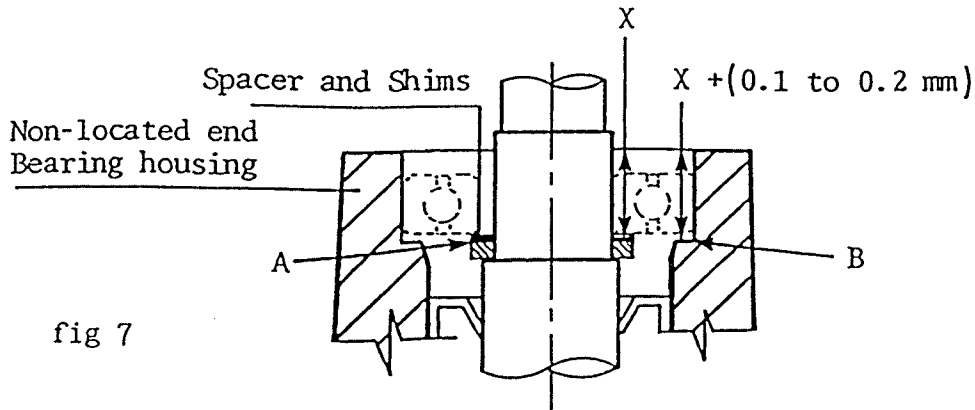
**Note** The bypass valve will require setting when the pump is recommissioned.

For increased bypass pressure, rotate adjusting screw in clockwise direction (i.e. screw in). For decreased bypass pressure, rotate adjusting screw anticlockwise (i.e. screw out).

Always lock locknut after any adjustment is made and rewire seal if required.

9 Fit two plugs to top of body (gauge tappings) with an approved thread sealant.





## 5 - TROUBLE SHOOTING

### 5-A 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 in suction pipe.
- 6 Valves closed or air leaks in suction system.
- 7 Excess internal clearances.
- 8 Bypass valve jammed in open position.

### 5-B LOW OUTPUT

- 1 Pump speed too low.
- 2 Cavitation or vapourisation on suction side of pump.
- 3 Obstruction in suction or discharge pipe.
- 4 Air leakage in suction pipes or fittings.
- 5 Bypass valve setting too low - increase pressure by screwing in adjusting screw. **DO NOT** exceed system design pressure or overload driver.
- 6 Differential pressure higher than specified duty point.
- 7 Viscosity of liquid lower than specified duty point.

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

### 5-C EXCESSIVE POWER CONSUMPTION

- 1 Obstruction in discharge line.
- 2 Pump operating outside the specified duty point (i.e. high pressure or viscosity)
- 3 Rotating parts binding - disassemble pump and inspect.
- 4 Misalignment between pump and driver - check coupling and realign as required.
- 5 Inherent pipe stresses causing distortion of pump and casing - rectify and realign before reassembling.
- 6 Bearings worn - inspect and replace as required.

### 5-D PUMP IS NOISY

- 1 Air leakage in suction piping.
- 2 Cavitation due to insufficient NPSH available i.e. suction conditions extreme - reduce suction losses.
- 3 Pump running dry - remove blockages in suction line/strainer.
- 4 Pump and driver misaligned - check coupling and realign as required.
- 5 Rotating elements binding or broken - disassemble and inspect.
- 6 Bearings worn - inspect and replace as required.

disassemble and inspect.

6 Bearings worn - inspect and replace as required.

### 5-E LEAKAGE

1 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.

2 From lip seal:

- a) Lip 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 -
  - i) check for obstructions in discharge line.
  - ii) check for thermal expansion of product when locked between valves either side of pump. Remove hydraulic lock potential.

### 7 - V25 TYPE 64 PUMP

Additional information for pumps fitted with FPC (flow and pressure control) valve.

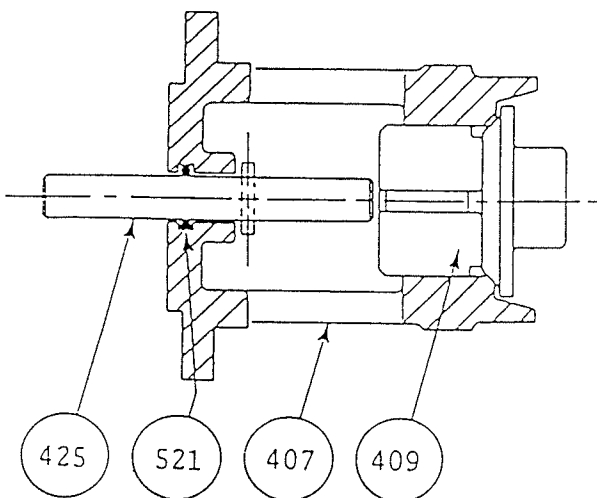
The V25 type 64 pump is fitted with a sliding spindle to enable mechanical override of the bypass valve for reduced flow. Assembly and disassembly of the type 64 pump is identical to the procedure outlined in this manual except for fitting of 'O' ring and valve spindle to the bypass valve cartridge.

DISASSEMBLY : After removing cartridge (4-C, SECTION I, 4.) remove spindle and spindle 'O'ring.

REASSEMBLY : Before fitting cartridge (4-F, SECTION II, 1.) fit spindle 'O' ring to cartridge, lubricate and fit spindle assembly from inside cartridge with long end of spindle projecting from cartridge.

Dwg No CMP 018

Parts designation for FPC valve



#### ITEM DESCRIPTION

- 425 SPINDLE
- 521 SPINDLE "O" RING
- 407 CARTRIDGE
- 409 BYPASS VALVE



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## 6 - PARTS DESIGNATION

Refer Dwg No CMP016A

ITEM	DESCRIPTION	ITEM	DESCRIPTION
100	BODY	317	SHAFT CAP
101	LINER	400	COVER B.P.V. HOUSING
102	ROTOR/SHAFT ASSY	401	ADJUSTING SCREW B.P.V.
111	VANE	402	LOCKNUT B.P.V. ADJUSTING SCREW
115	VANE PUSH ROD	407	CARTRIDGE B.P.V.
200	D.E. BEARING HOUSING	409	BYPASS VALVE
202	CAP D.E. BEARING HOUSING	415	SPRING B.P.V.
204	D.E. BEARING	416	RETAINING WASHER B.P.V. SPRING
205	SPACER D.E. BEARING	511	OIL SEAL D.E. BEARING HOUSING
206	SHIMS D.E. BEARING	513	OIL SEAL D.E. BRG' HOUSING CAP
207	LOCKNUT D.E. BEARING	515	"O" RING BODY
208	LOCKWASHER D.E. BEARING	516	"O" RING B.P.V. CAP
300	I.E. BEARING HOUSING	517	"O" RING RETAINING WASHER
302	CAP I.E. BEARING HOUSING	522	OIL SEAL I.E. BEARING HOUSING
303	GASKET I.E. BEARING HOUSING CAP	523	OIL SEAL I.E. BRG HOUSING CAP
304	I.E. BEARING	619	DUST PLUG
305	SPACER I.E. BEARING		
306	SHIMS I.E. BEARING		
307	LOCKNUT I.E. BEARING		
308	LOCKWASHER I.E. BEARING		

B.P.V.	Bypass valve
I.E.	Inspection end
D.E.	Drive end

