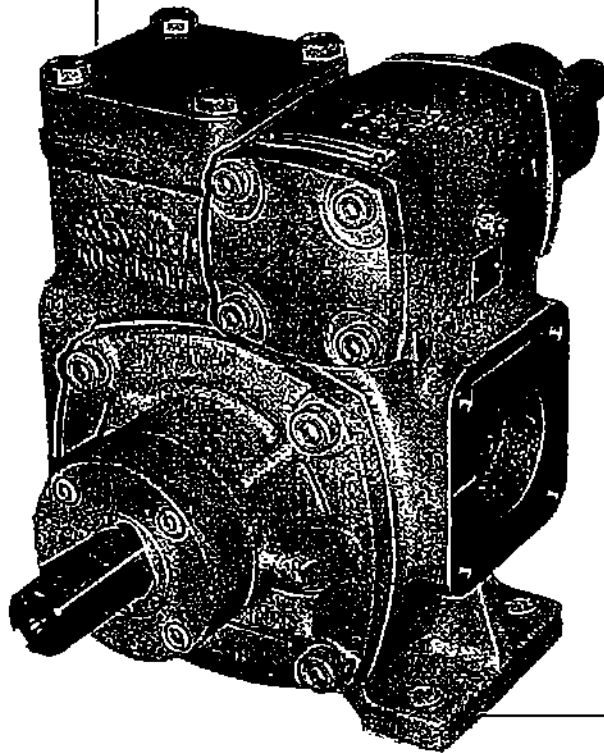


# EBSRAY PUMPS

## INSTALLATION OPERATION AND MAINTENANCE INSTRUCTIONS



*V Series*  
*Model V15*  
*Type 86*

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## **SECTION 1 - GENERAL**

### **INTRODUCTION**

This publication is intended to assist those involved with the installation, operation and maintenance of EBSRAY Model V15 Type 86 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.

#### **1.1 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 warranty.

#### **1.2 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.

### **1.3 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 - SHORTAGES**

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 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.

## **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.

**NOTE: 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.

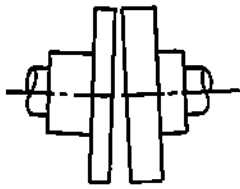


Figure 3

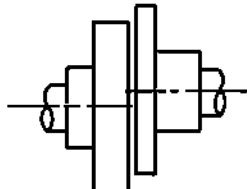


Figure 4

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.

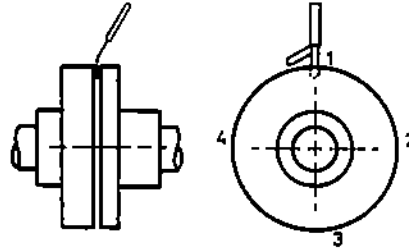


Figure 1

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 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.

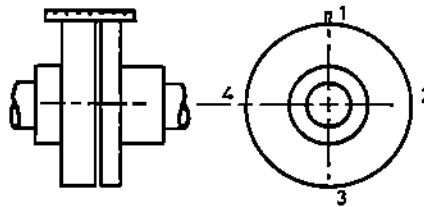


Figure 2

## SECTION 3 - OPERATION

### 3.1 DESCRIPTION

The Ebsray Model V15 Type 86 is a positive displacement sliding vane pump, primarily intended for the transfer of low to medium viscosity liquids. The pump is of a multi-port design allowing for either 90° or 180° porting options. A blanking plate covers the unused port. An optional double-ended drive shaft is available facilitating drive connection to either end.

The V15 rotor/shaft assembly rotates within a cam form liner. Mechanical seals located in the bearing housings isolate the bearings from the pumpage. These sealed grease packed ball bearings are equipped with eccentric locking

collars thus providing positive axial positioning of the pump rotor.

Lip seals are fitted to the end covers to minimise ingress of dust/dirt along the shaft. With the double ended shaft option, a cap is fitted to the non-drive end for safety. The pump is protected from excessive differential pressure rise by an adjustable bypass valve. System design must prevent sudden/excessive pressure rise, or shock due to thermal expansion.

### 3.2 LUBRICATION

No 'in service' lubrication is required on EBSRAY Model V15 pumps.

### 3.3 STARTUP 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', 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.

#### 4.1 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 Cat #, description, and quantity required. Ref to Drg No. CMP094
3. Advise complete delivery instructions, transportation, etc.

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

#### 4.3 DISASSEMBLY

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

##### PART I - Bypass Valve

1. Unlock locknut, remove adjusting screw and locknut from bypass valve cover.
2. Remove bypass valve housing cover and 'O' ring together with valve, spring and retaining washer.
3. Remove 'O' ring from cover.

## PART II - Pump

1. Remove pump coupling half from shaft.
2. Remove shaft cap if fitted.
3. Remove bearing cap from inspection end.
4. Remove lip seal and gasket from bearing cap.
5. Release grubscrew from bearing locking collar, release locking collar by turning *in* the direction *opposite* to the direction of pump rotation (providing collar has been previously tightened *in* direction of rotation).  
**NOTE:** Bearings are locked to shaft using an eccentric locking collar which can be locked in either direction, the manufacturer recommends locking the collar in the direction of rotation.
6. Remove cap screws from inspection end bearing housing and drive end bearing housing.
7. Remove drive end bearing housing assembly including rotor/shaft, vanes etc. by pressure applied to inspection end of shaft. During this procedure cradle vanes in rotor by hand. *Note orientation of vanes in relation to pump rotation* then remove vanes and pushrods from rotor.
8. Remove drive end bearing housing cap and remove lip seal from cap.
9. Release grubscrew from bearing locking collar then release locking collar by turning opposite to direction of pump rotation (providing collar has been previously tightened *in* direction of rotation). See note at step 5.
10. Withdraw rotor/shaft assembly from bearing housing and remove inspection end bearing housing.

11. Remove bearings, Stationary seal faces and 'O'rings from bearing housings.
12. Loosen grubscrews and remove rotating seal assemblies from rotor-on shaft assembly.
13. If required, remove liner from body. Note orientation.
14. If required, remove port blanking plate and gasket.
15. If bypass valve seat is damaged or pump rotation is to be reversed the seat will need to be removed. Using an appropriate tool, unscrew the seat locknut, remove the acorn nut and seat grubscrew, then remove the seat.

### 4.4 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 major overhaul.
6. Inspect both ball bearings for wear. It is recommended on major overhauls that Ball Bearings be replaced.
7. Ensure weep hole in bearing housing cap is not obstructed.

**TABLE 1 - STANDARD GENERAL CLEARANCES AND SIZES FOR TEMPERATURES 0°- 100°C**

Rotor to liner clearance measured radially at 12 o'clock position.	0.03 - 0.08 mm
Total axial clearance - liner minus rotor length measured along axis.	0.08 - 0.15 mm
Total vane height - liner length minus vane length measured along axis.	0.07 - 0.15 mm
Standard vane height.	21.8 - 22.0 mm
Recommended maximum wear on vane height.	2.0 mm

**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, check their lengths to comply with clearances stated. NOTE: New parts from EBSRAY should be the correct size. As vanes are made from a hygroscopic material which may swell during storage, some length adjustment may be required.

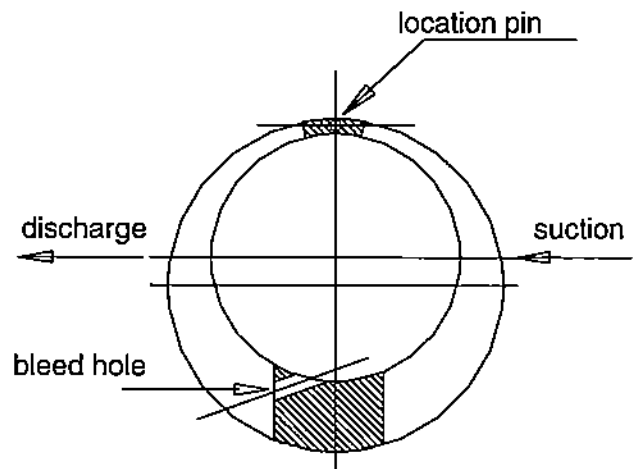
**4.5 REASSEMBLY - PRELIMINARY**  
(Refer Drawing No. CMP094)

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.

**Liner:** After determining direction of rotation, liner orientation can be determined. The flow of pumpage through the pump follows the direction of movement of the bottom of the rotor. The liner must be installed with the cast "S" towards the suction side and the cast "D" towards the discharge side. The thick section of the liner must be towards the bottom. Refer Fig 5.

4. Using a suitable tool, (thread in bypass valve is 1/4" BSW) lightly lap bypass valve into seat, valve should only be lapped until continuous contact is achieved 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.

**Figure 5**

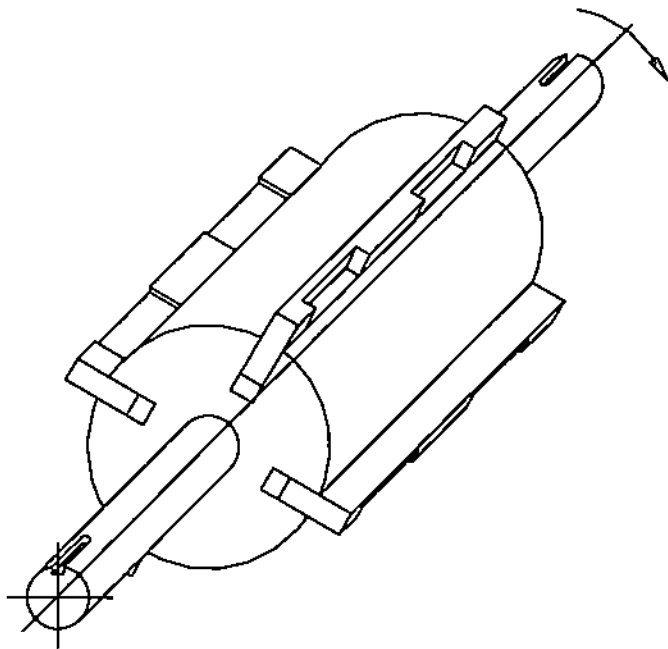
5. Tap the two location pins into the bearing housings until they seat in their holes.
6. Using a new O'ring, and with a suitable lubricant, fit a stationary seal face to each bearing housing. take care to avoid damaging seal faces.
7. Press fit a lip seal to each bearing housing cap with the lips facing outwards.

**4.6 REASSEMBLY PART I - Pump**

1. Insert liner half way into drive end of body ensuring correct orientation (see 4.5)
2. Using a suitable jig, stand rotor/shaft assembly with drive end up and, using a new O'ring, fit rotating seal assembly to shaft. Hold assembly firmly against rotor while

tightening the two grub screws .

3. Fit 'O'ring to drive end bearing housing.
4. Place two 0.05mm feeler gauges on top of rotor. Lubricate seal faces then fit drive end bearing housing to rotor/shaft assembly taking care to avoid damaging the seal faces.
5. Fit bearing to shaft and ensure that it is seated against the bottom of the bearing housing bore.
6. Fit locking collar to bearing and tighten in direction of rotation, tighten grub screw to secure locking collar.
7. Remove feeler gauges.
8. Fit bearing cap and gasket to bearing housing and secure with cap screws.
9. Fit two vane pushrods and four vanes to rotor as follows: THE HYDRAULIC RELIEF SLOTS IN VANE MUST LEAD THE DIRECTION OF ROTATION AND THE VANE PLATES MUST FACE THE PUSHRODS. (Refer Fig. 6)



**Figure 6**

With the shaft horizontal, insert two vanes into top slots of rotor. Turn rotor 180 degrees whilst supporting vanes in the rotor. Insert the two pushrods followed by the other two vanes.

10. 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 liner and push assembly home. Fasten bearing housing in position using four cap screws.
11. Fit rotating seal assembly to inspection end of shaft. Hold assembly firmly against rotor while tightening the two grub screws .
12. Fit 'O' ring to inspection end bearing housing.
13. Lubricate seal faces then fit inspection end bearing housing taking care to avoid damaging the seal faces. Ensure correct orientation using locating dowel.
14. Fasten bearing housing in position using four cap screws.
15. Fit bearing to shaft and ensure that it is seated against the bottom of the bearing housing bore.
16. Fit locking collar to bearing and tighten in direction of rotation, tighten grub screw to secure locking collar.
17. Check pump for freedom of rotation.
18. Fit bearing housing cap and gasket, secure using four cap screws.
19. Fit two plug screws and fibre washers to each bearing housing as follows:  
Fit one long plug screw (M6 x 20) and fibre washer to each bearing housing in the tapped hole that is towards the discharge side.
20. If double ended shaft is fitted, fit shaft cap to non-drive end.



## PART II-Bypass Valve

**Note:** Ensure correct orientation with reference to pump rotation.  
(see section 4.5, 3.)

1. If valve seat has been removed: Fit valve seat to pump body, screw seat locknut onto seat and tighten with a suitable tool. Lock in position with grubscrew then lock grubscrew with acorn nut and fibre washer.
2. Position bypass valve in seat.
3. Fit 'O'ring to bypass valve cover then fit spring, retaining washer and cover to body. Fasten with four cap screws.
4. Fit valve blanking cover to body with "O"ring, fasten with four cap screws.
5. Fit adjusting screw with cap and fibre 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 adjusting screw cap after any adjustment is made.

Refit pump coupling half

**NOTE: DO NOT USE EXCESSIVE FORCE TO FIT COUPLING AS THIS MAY DISTURB AXIAL POSITIONING OF ROTOR/SHAFT.**

Re-install pump into system.

**BEFORE STARTING PUMP RUN THROUGH STARTUP CHECKLIST IN SECTION 3**

## SECTION 5 - INSTRUCTIONS FOR REVERSING DIRECTION OF ROTATION

The Ebsray Model V15 pump has its direction of rotation handed upon assembly (either clockwise or anti-clockwise when looking at the shaft

from the shaft end which is the drive end). Figure 7 shows the flow path of the liquid and the orientation of the bypass valve for the different configurations.

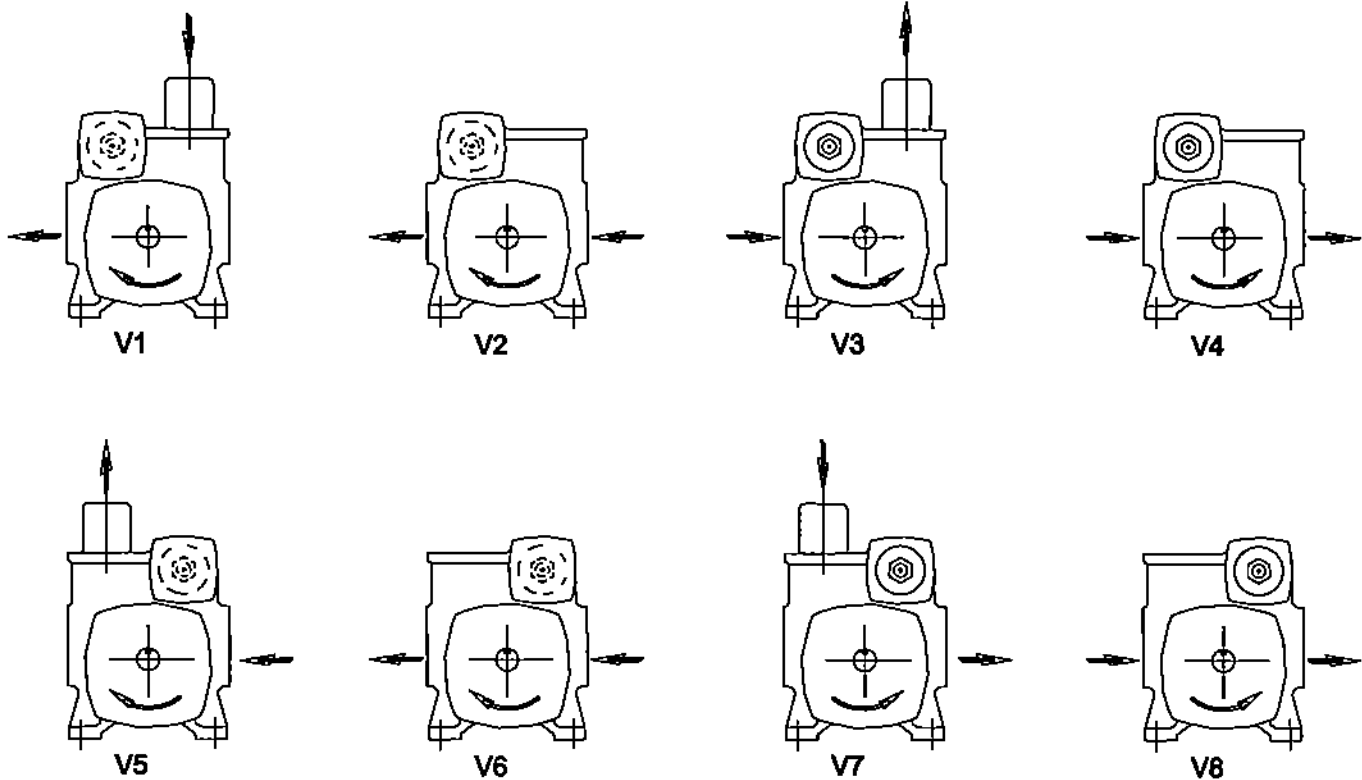


Figure 7

### CLOCKWISE ROTATION PUMP:

- a. Inlet RH side, Outlet LH side.
- b. Bypass valve adjusting screw located on pump opposite drive end.

### ANTI-CLOCKWISE PUMP:

- a. Inlet LH side, Outlet RH side
- b. Bypass valve adjusting screw located on pump at drive end.

To reverse the direction of rotation three conditions must be met :

1. The bypass valve must be turned 180° in order to maintain bypass protection in the new direction. i.e. adjusting screw must be at the opposite end to where it was originally relative to the drive shaft.
2. The hydraulic relief grooves in the vanes must lead the direction of rotation.
3. The cast "S" on the liner must be towards the suction port and the cast "D" must be towards the discharge port.

### **Procedure for Reversing Direction of rotation of Pump:**

**NOTE:** Before starting this procedure carefully read SECTION 4 and follow any relevant preparation instructions.

1. Follow disassembly procedure steps 1, 2, 3, 5, 6 & 7
2. Remove drive end bearing housing, assembly including rotor/shaft, vanes etc. by pressure applied to inspection end of shaft. During this procedure cradle vanes in rotor by hand.

**Note orientation of vanes in relation to pump rotation.**

3. Depending on which configuration is required either:
  - a. Rotate body through 180° with liner still in its original position.or
  - b. Remove liner from body and rotate liner through 180° i.e. the thick section of the liner is still at the bottom and the cast "S" & "D" are opposite their original positions.
4. Reverse vanes in their respective rotor slots in order to have the relief grooves leading the new direction of rotation.
5. Reassemble the removed components taking care not to damage the 'O'rings or lip seals. The complete drive end housing assembly should be fitted first, followed by the inspection end housing.  
Care should be exercised to ensure the location pins in the covers engage in their holes before tightening the cover cap screws. The pump shaft should now rotate freely. Should this not occur, check for binding of components and/or foreign matter in pump.

6. Remove D.E. bearing housing cover and lock bearing locking collar in new direction of rotation, replace cover.
8. If procedure 3 a. has been followed the pump is now ready for re-commissioning. If only the liner has been rotated (3.b) the bypass valve must now be re-oriented to provide protection in the new direction of flow:
  1. Follow the procedure in SECTION 4.3 PART 1 - Bypass Valve.
  2. Using an appropriate tool, unscrew the bypass valve seat locknut, remove the acorn nut and seat grubscrew then remove the seat.
  3. Replace the seat from the opposite end of the body then follow the procedure in SECTION 4.6 PART II Bypass Valve.

Should further assistance or guidance be required please contact your supplier or EBSRAY PUMPS direct.

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

### 6.2 LOW OUTPUT

1. Pump speed too low.
2. Cavitation or vaporisation 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.

### 6.3 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.

### 6.4 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.

### 6.5 LEAKAGE

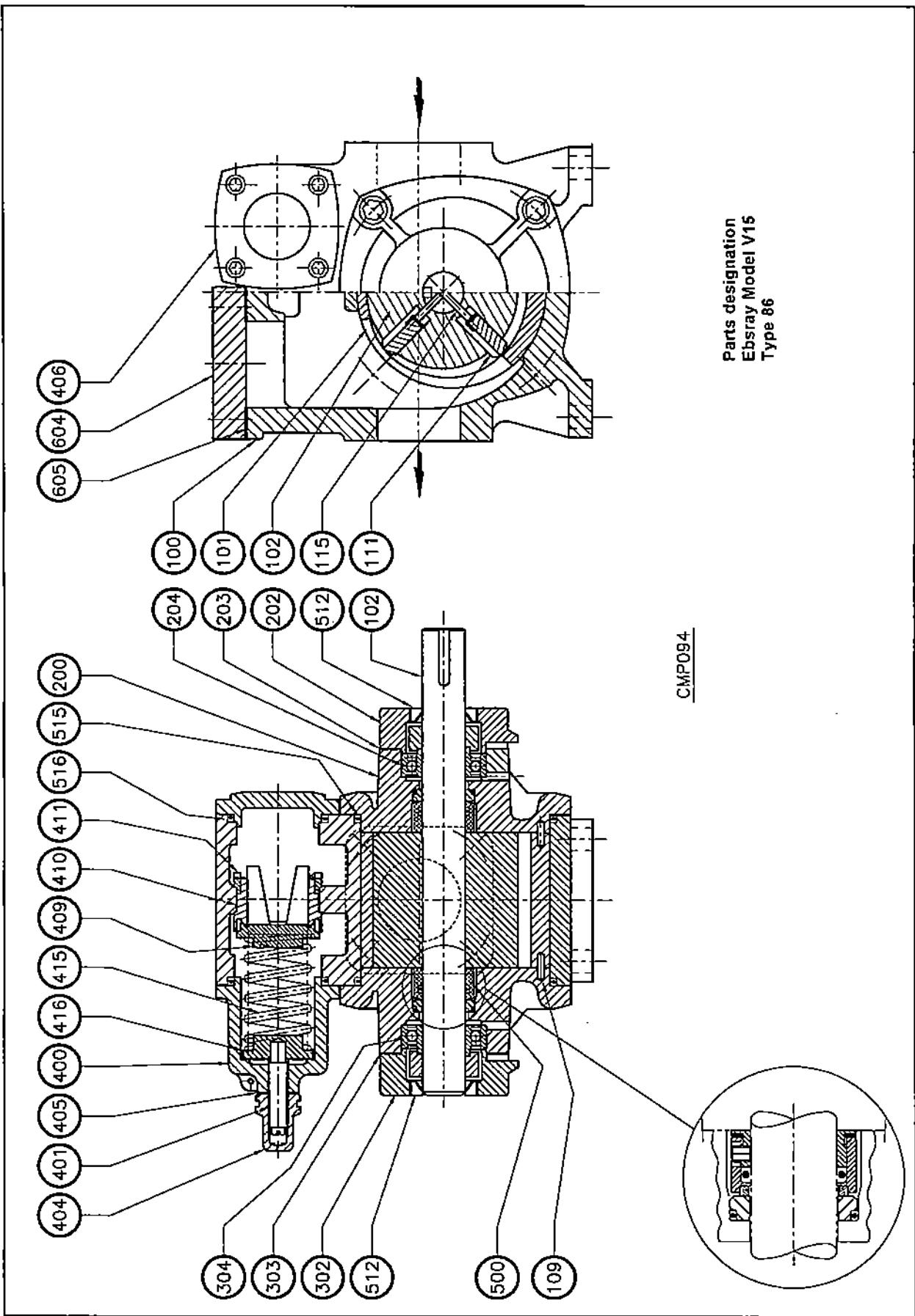
1. From covers and flanges:
  - a) Set screws not tight - retighten.
  - b) Damaged 'O' ring seals or gaskets - replace.
  - c) Check for thermal expansion of product when locked between valves either side of pump. Remove hydraulic lock potential.
2. From lip seal:
  - a) Lip seals incorrectly installed, 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.

## SECTION 7 - PARTS DESIGNATION

EBSRAY MODEL: V15 Type 86 Rotary Sliding Vane pump.

REFER TO DRAWING N°: CMP094

Cat#	Description	Qty
100	Body	1
101	Liner	1
102	Rotor/Shaft assembly	1
109	Location pin - Liner/Bearing housing	2
111	Vane	4
115	Vane Pushrod	2
200	Bearing Housing	2
202	Bearing Housing Cap	2
203	Gasket - Bearing Housing Cap	2
204	Bearing	2
400	Cover - Bypass Valve	1
401	Adjusting Screw - Bypass Valve	1
404	Cap - Bypass Valve Adjusting Screw	1
405	Fibre Washer - Bypass Valve Adjusting Screw Cap	1
406	Blanking cover - Bypass Valve Housing	1
409	Bypass Valve	1
410	Seat - Bypass Valve	1
411	Locknut - Bypass Valve Seat	1
412	Grubscrew - Bypass Valve Seat	1
413	Acorn Nut - Bypass Valve Seat	1
414	Fibre Washer - Acorn Nut	1
415	Spring -Bypass Valve	1
416	Retaining Washer - Bypass Valve Spring	1
500	Mechanical Seal assembly	2
512	Lip Seal - Bearing Housing Cap	2
515	'O'ring – Body	2
516	'O'ring - Bypass Valve Cover	2
604	Port Blanking plate	1
605	Gasket - Port Blanking Plate	1



Parts designation  
 Ebsray Model V15  
 Type 86

CMP094