

# EBSRAY PUMPS

## INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS



### **V SERIES MODEL V2000 ROTARY SLIDING VANE PUMP**



Quality  
Endorsed  
Company  
ISO 9001  
Lic 3332

Standards Australia

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# SECTION 1 - GENERAL

## INTRODUCTION

This publication is intended to assist those involved with the installation, operation and maintenance of the EBSRAY Model V2000 Rotary Sliding Vane Pump. 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 in accordance with this installation, operation and maintenance manual.

### 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.

### 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 STORAGE

If storage is required for other than a short period prior to installation, special preservatives and protective wrappings will be required.

### 1.6 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 keeping within the NPSHR 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.

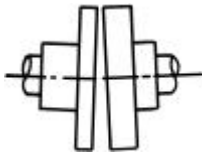


Figure 1

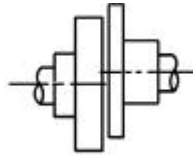


Figure 2

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.

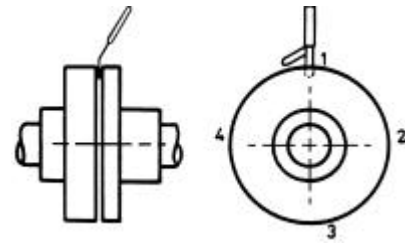


Figure 3

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.

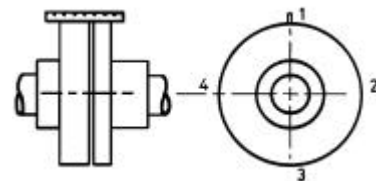


Figure 4

## SECTION 3 - OPERATION

### 3.1 DESCRIPTION

The EBSRAY Model V2000 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 Drive End and Inspection End Bearings from the pumpage. These grease packed heavy duty Deep Groove Ball Bearings provide positive axial positioning of the pump rotor. A lip seal is fitted to the Drive End Cover to minimise the ingress of dust/dirt along the shaft. The pump is protected from excessive pressure rise by an adjustable poppet type bypass valve. The pump has a 90° porting configuration.

### 3.2 LUBRICATION

Periodic bearing lubrication is required via grease nipples fitted to the bearing housings at approximately every 500 hours of operation.

### 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 PUMP 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

### CAUTION

**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 name, Cat# and quantity required. Refer Parts Designation Section 6 of this publication.
3. Advise complete delivery instructions, transportation, etc. with a written order.

### 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 (if present).
3. Isolate power supply to motor.
4. Note driveshaft and porting orientation to ensure correct reassembly to original build.
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 1 - Pressure Relief Valve

- 1 Remove flush plug from valve cover.
- 2 Using a 6mm allen wrench, turn the adjusting screw clockwise to **reduce** spring tension.  
**NOTE: CLOCKWISE MOVEMENT OF THE ADJUSTING SCREW REDUCES SPRING TENSION THUS REDUCING DIFFERENTIAL BYPASS PRESSURE. ANTICLOCKWISE MOVEMENT OF THE ADJUSTING SCREW INCREASES SPRING PRESSURE THUS INCREASING DIFFERENTIAL BYPASS PRESSURE. NEVER SET DIFFERENTIAL BYPASS PRESSURE ABOVE 1050 kPa (150psi)**
- 3 Remove bypass valve cover and 'O' ring together with spring cap, spring and valve.
- 4 Remove spring cap from valve cover and remove 'O'ring from spring cap.

#### Part 2 - Pump

- 5 Remove dust caps from drive end and inspection end bearing housings.
- 6 Remove lockwashers and locknuts from both inspection end and drive end of shaft.

#### **WARNING**

**LOCKWASHERS MUST NOT BE REUSED AS BENDING THE TABS MORE THAN ONCE MAY CAUSE FATIGUE WHICH COULD RESULT IN FAILURE AND/OR MAJOR PUMP DAMAGE. ONLY REASSEMBLE WITH NEW LOCKWASHERS OF THE CORRECT THICKNESS (REFER PARTS LIST)**

- 7 Remove both bearing housings. (To remove bearing housing, screw two of the bearing housing setscrews into the tapped holes provided in the bearing housing. Evenly tighten the setscrews to withdraw the bearing housing.) Take care not to damage the mechanical seal faces.
- 8 Press out the bearings from the bearing housings.
- 9 Remove the bearing dampening Orings from the shaft then carefully remove the mechanical seal components from both the bearing housings and from the rotor/shaft assembly.

- 10 Remove body covers and wearplates (To remove body cover, screw four of the bearing housing setscrews into the tapped extraction holes provided in the body cover. Evenly tighten the setscrews to withdraw the body cover.)
- 11 Withdraw the rotor/shaft/vane assembly from the body taking care to support the vanes as the assembly is withdrawn.
- 12 Remove vanes and pushrods from the rotor (note the orientation of the vanes relative to the direction of rotation)
- 13 Remove liner from body (note the orientation of the liner relative to the inlet and discharge ports of the body.
- 14 Remove grease nipples and pressure release plugs from the bearing housings.
- 15 Remove oil seal from drive end dust cap.

#### 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 permanently attached to the shaft.

- 2 Inspect vanes for wear or damage - Refer Table 1.
- 3 Inspect vane pushrods for wear, damage and straightness. Replace as required
- 4 Inspect both mechanical seals. Replace worn or damaged components.
- 5 Inspect both wearplates for damage or excessive wear. Replace or reverse as required. **Note:** Wearplates can be reversed.
- 6 Inspect bypass valve assembly and components for wear or damage. Replace or refurbish as required. If valve seat replacement is required for an aluminium bodied pump, old seat will have to be removed by machining and a new seat fitted using loctite 620 or equivalent.
- 7 It is recommended that all 'O' Rings, lockwashers and the lip seal be replaced at every overhaul.
- 8 Inspect both ball bearings for wear. It is recommended on major overhauls that ball bearings be replaced.

#### **V2000 PUMP TABLE 1**

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

(All dimensions are in millimetres)

Total axial clearance (i.e. liner length minus rotor length measured along axis)	0.19 - 0.25 mm
Total vane clearance (i.e. liner length minus vane length)	0.19 - 0.27 mm
Minimum worn vane height	27.00 mm
Minimum worn pushrod length	87.00 mm

Recommended tightening torques for fastenings:

M10: 40 NM      M12: 70 NM

#### **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 - PRELIMINARY**

(Refer Drawings at back of this manual)

- 1 Ensure all parts are clean and free from sharp

edges, burrs etc.

- 2 Lightly smear all 'O'rings and lapped faces of mechanical seals with a compatible good quality lubricant before assembling.
- 3 Ensure correct orientation of components.

#### **4.6 REASSEMBLY Part 1 - Pump**

- 1 Fit liner to body ensuring correct orientation. (Liner is located using the key which is pinned to the body, the word "OUT" is cast into the liner and this must be towards the discharge port area. The vertical slots in the liner are oriented toward the inlet port.
- 2 Fit one wearplate to one end of the body ensuring body key locates in slot in wearplate. Fit body cover with new 'O' ring to secure wearplate.
- 3 Assemble three lower vanes in the rotor and whilst

cradling these to prevent them dropping out, insert the three pushrods into the rotor.

**NOTE:** Vanes must be correctly oriented i.e. the rounded ends of the vanes contact the liner and the slots in the face of the vanes **must lead** the direction of rotation.

4 Insert the rotor/shaft/vane/pushrod assembly into the body and then insert the other three vanes ensuring correct orientation.

5 Fit wearplate to other end of body, ensuring body key locates in slot in wearplate.

6 Fit body cover with new 'O' ring.

7 Fit rotating components of mechanical seal assemblies to each end of shaft.

**NOTE:** ensure mechanical seal components are clean prior to assembly, lubricate before fitting and ensure that 'O'rings locate correctly on shaft and that slots in seal assembly locate over drivepins in shaft.

8 Fit 'O'rings to stationary seal faces, lubricate and fit stationary seal faces to bearing housings taking care to ensure that location pins locate in holes provided in bearing housings. Place seal failure 'O'rings in bearing housings inside stationary seal faces.

9 Fit 'O'rings to bearing housings.

10 Carefully fit bearing housings over shaft and fasten to body covers. **NOTE:** when fitting bearing housings, ensure that seal failure 'O'rings are not dislodged. Seal failure 'O'rings must remain captive between bearing housing and stationary seal face.

11 Fit bearing dampening 'O'ring to each end of shaft and slide along shaft until seated in groove.

12 Pack bearings with a suitable grease, fit bearings over shaft and into bearing housings.

13 Fit lockwashers and locknuts to shaft **NOTE:** Do not tighten locknuts at this stage.

### **WARNING**

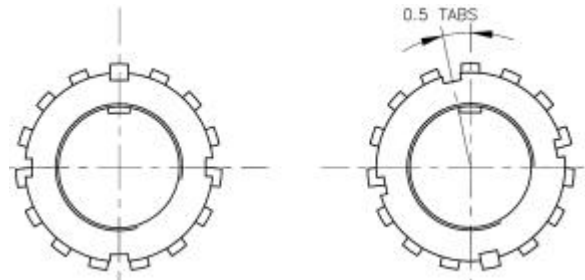
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### **TO SET AXIAL CLEARANCES IN PUMP:**

14 While rotating shaft by hand using a suitable handle, tighten inspection end locknut until rotor/shaft assembly locks. At this point, the end of

the rotor should be hard against the wearplate.

15 Back off the inspection end locknut 0.5 (one half) tab – (see diagram) then, if necessary back it off slightly further (**only as far as required to align a locking tab**). Lock in this position with tab of lockwasher



16 While turning shaft, tighten drive end locknut until an increase in drag is felt (pre-loading), indicating that bearings are tightly clamped.

17 Back off drive end locknut just enough to allow free pump rotation while maintaining some pre-loading on drive end bearing. Then if necessary back it off slightly further (**only as far as required to align a locking tab**) Lock in this position with tab of lockwasher.

18 Fit dust covers to both ends of pump with new seal in drive end dust cover.

19 Fit grease nipples and pressure release plugs to the bearing housings.

### **Part 2-Pressure Relief Valve**

20 Screw adjusting screw fully into spring cap and fit 'O'rings to spring cap and valve cover.

21 Lubricate bore of valve cover and insert spring cap partially into valve cover.

22 Fit valve, spring and valve cover assembly to body and fasten into position.

23 Use a 6mm allen wrench to adjust bypass valve pressure setting.

**NOTE: CLOCKWISE MOVEMENT OF THE ADJUSTING SCREW REDUCES SPRING TENSION THUS REDUCING DIFFERENTIAL BYPASS PRESSURE. ANTICLOCKWISE MOVEMENT OF THE ADJUSTING SCREW INCREASES SPRING PRESSURE THUS INCREASING DIFFERENTIAL BYPASS PRESSURE.**

**NEVER SET DIFFERENTIAL BYPASS PRESSURE ABOVE 1050 kPa (150psi)**

24 After adjustment, replace flush plug in valve cover.

# SECTION 5 - TROUBLE SHOOTING

## 5.1 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

## 5.2 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 pressure setting too low - adjust bypass valve - DO NOT exceed system design pressure or overload driver.
- 6 System 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.

## 5.3 EXCESSIVE POWER CONSUMPTION

- 1 Obstruction in discharge line.
- 2 Pump operating outside the specified duty point (i.e. high differential pressure, viscosity and/or speed)
- 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.

## 5.4 PUMP IS NOISY

- 1 Air leakage in inlet 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.

## 5.5 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 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.

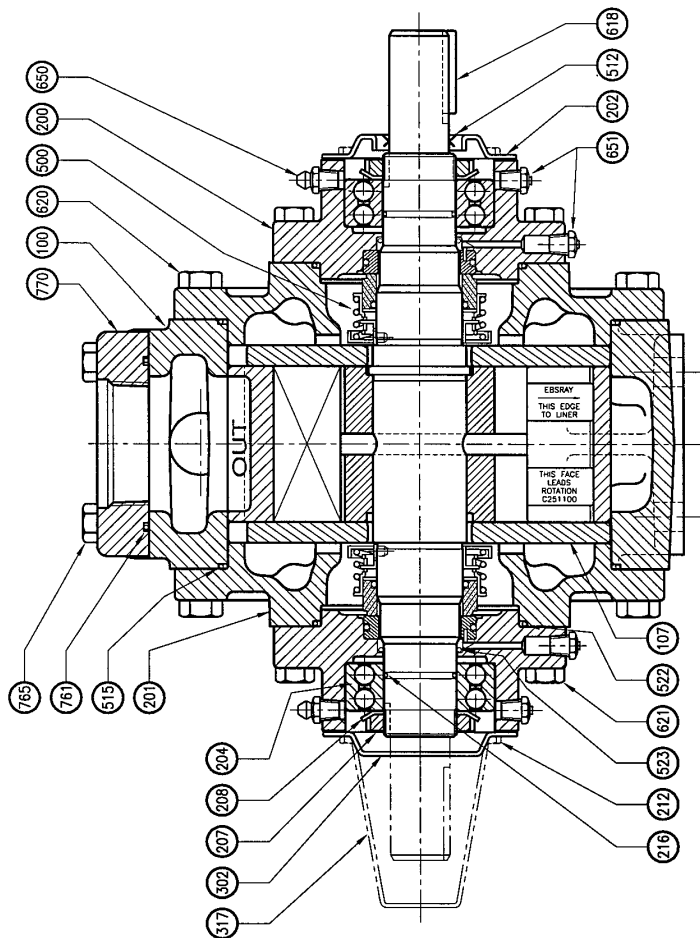
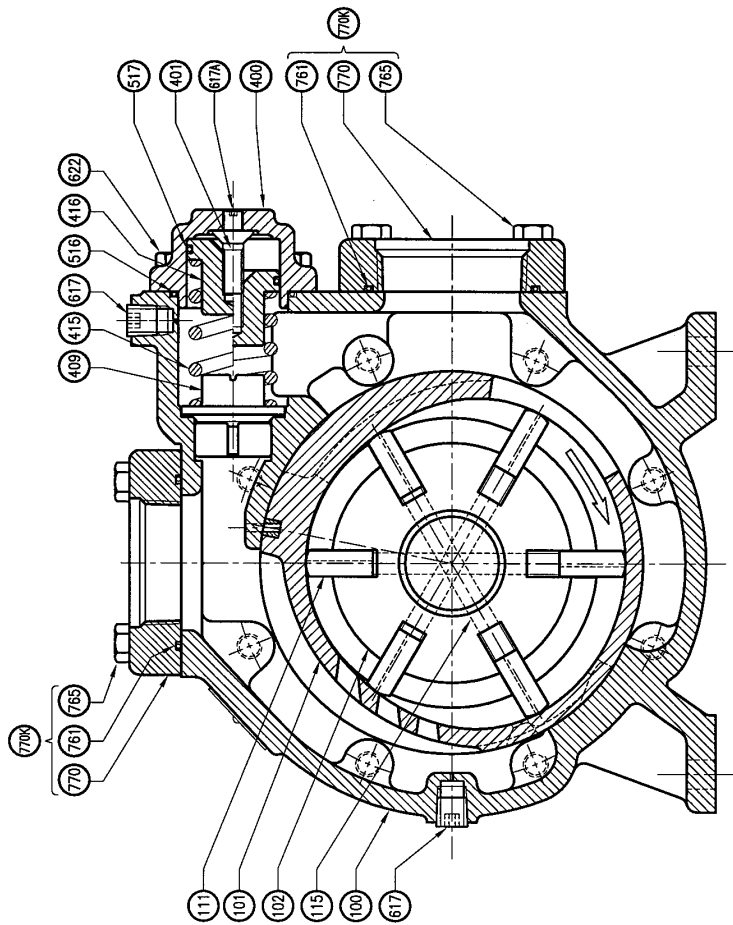
## SECTION 6 - PARTS DESIGNATION

EBSRAY MODEL: V2000 Rotary Sliding Vane pump.

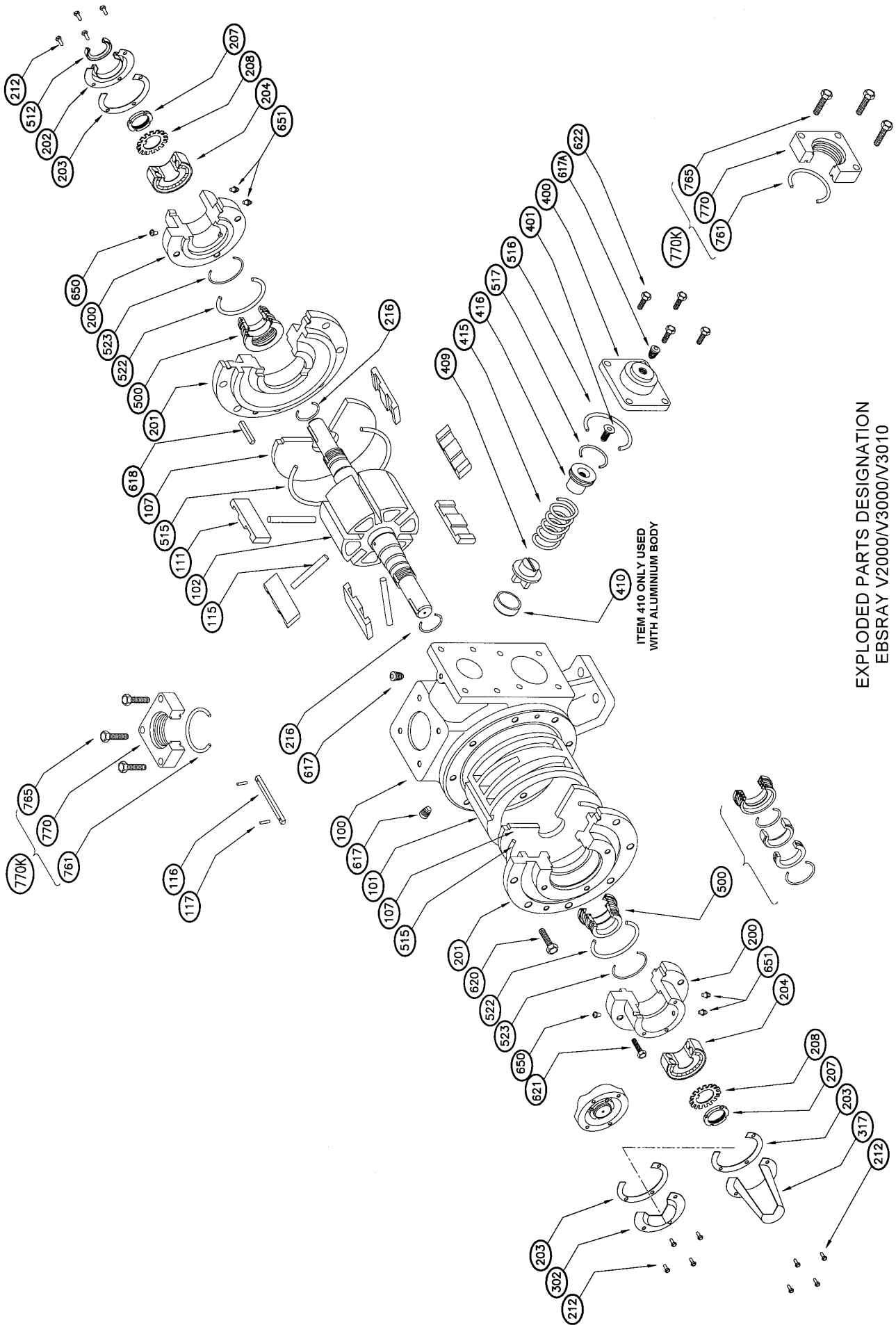
REFER TO PARTS DESIGNATION DRAWINGS ON FOLLOWING PAGES

Cat#	Description	Qty	Cat#	Description	Qty
100	Body	1	512	Oil Seal	1
101	Liner	1	515	'O'ring - Body Cover	2
102	Rotor/Shaft assembly	1	516	'O'ring - Valve Cover	1
107	Wearplate	2	517	'O'ring - Spring Cap	1
111	Vane	6	522	'O'ring - Bearing Housing	2
115	Vane Pushrod	3	523	'O'ring - Seal Failure	2
116	Body Key	1	617	Plug	2
200	Bearing Housing	2	617A	Plug	1
201	Body Cover	2	618	Coupling Key	1
202	Dust Cap - Drive End	1	620	Bolt - Body Cover	16
204	Double Row Deep Groove Ball Bearing	2	621	Bolt - Bearing Housing	8
207	Locknut	2	622	Bolt - Valve Cover	4
208	Lockwasher (1.8mm thickness)	2	640	Dowel	2
216	Bearing dampening 'O'ring	2	650	Grease Nipple	2
302 or 317	Dust Cap - Inspection End or Shaft Cap - Inspection End	1	651	Grease Pressure Relief	4
400	Valve Cover	1	761	'O'ring - Adaptor Flange	2
401	Adjusting Screw - Bypass Valve	1	765	Bolt - Adaptor Flange	8
409	Valve	1	770	Adaptor Flange - 2" NPT or Adaptor Flange - 2 1/2" NPT	2
410	Valve Seat (for aluminium body only)	1			
415	Spring - Bypass Valve	1			
416	Spring Cap	1			
500	Mechanical Seal Assembly	2			





PARTS DESIGNATION  
EBSRAY V2000



ITEM 410 ONLY USED  
WITH ALUMINIUM BODY

EXPLODED PARTS DESIGNATION  
EBSRAY V2000/V3000/V3010