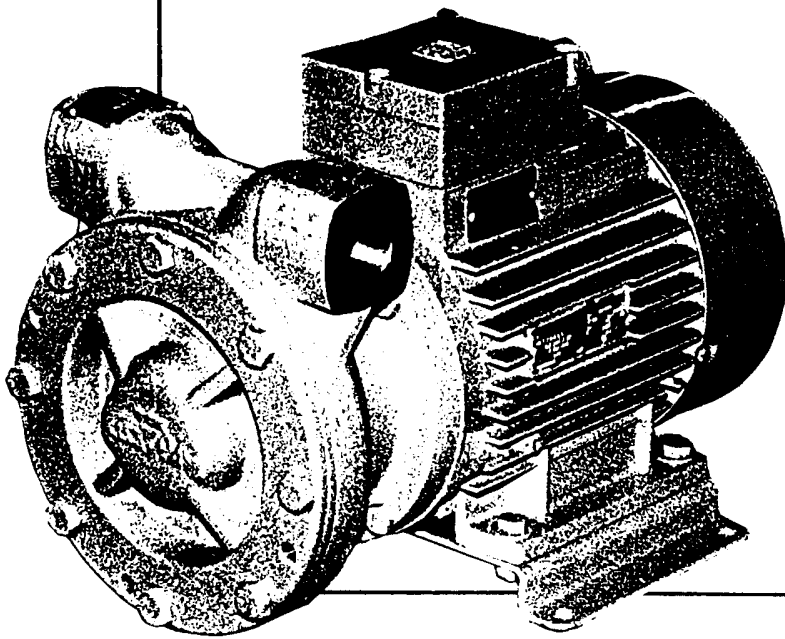


# EBSRAY PUMPS

## Installation, Operation and Maintenance Instructions



### ***R Series***

### ***Model***

### ***R11***

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## SECTION I - GENERAL

### INTRODUCTION

This publication is intended to assist those involved with the installation, operation and maintenance of EBSRAY Model R11 Regenerative Turbine 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.

### I-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. 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.

### I-B WARNING

The pump must be operated within the original selected design parameters of speed, temperature, pressure and viscosity with the nominated product. Should any change be contemplated,

please confer with EBSRAY in order to verify the suitability of such a change.

### I-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.

### I-D 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.

### I-E HANDLING

Care should be used in moving pumps. A sling should be placed under or around a close-coupled pump to minimise stress on the shaft or pump ports and the units should be lifted from under both the pump and motor ensuring compliance with the relevant lifting codes.

## SECTION II - INSTALLATION

### II-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 is sufficient for inspection and maintenance. The pump-motor unit should be installed horizontally with the pump ports at the 10 and 2 O'clock positions.

### II-B FOUNDATIONS

Ensure base for mounting of electric motor is level, as motor footings are cast and tightening down on an uneven surface could result in cracking of the metal. Note that the bottom of the pump is lower than the base of the motor, so that the motor footings must be raised by a suitable baseplate to provide clearance. Provide a minimum clearance of 100mm from the end of the fan cowl to allow adequate cooling air flow for

the electric motor.

When mounted on a concrete foundation, ensure that it has been poured on a solid footing. Position foundation bolts to match holes in baseplate footings.

### II-C PUMP PIPING CONNECTIONS

All piping must be supported independently and line up accurately with the pump ports. NOTE: It is extremely important that no piping stresses be transferred to the pump. 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.**

### II-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.

## SECTION III - OPERATION

### III-A DESCRIPTION

The EBSRAY Model R11 pump is a compact close-coupled pump-motor unit, designed for pumping L.P.G. and other similar products. The pump utilises an axially self aligning regenerative turbine type impeller. An EBSRAY balanced mechanical seal with an industry accepted safety throttle bush are fitted as standard. The rugged Ductile Iron casing is 'O' ring sealed.

The Pump meets the requirements of Australian Standard LPG Code AS1596.

The Motor is designed to meet the requirements of Australian Standard AS2380.6 for Class I Zone 1 Group II Hazardous Locations and is classified as Ex 'e' Protection.

### III-B LUBRICATION

No 'in service' lubrication is required on EBSRAY's Model R11 pump.

### III-C STARTUP CHECKLIST

- Check for leak free installation at pump and pipe connections.
- Direction of rotation - Viewed from the motor fan.
- Ensure freeness of shaft - by turning the motor fan.

- Do not start pump against closed discharge valve or with suction valve throttled
- DO NOT RUN PUMP DRY.
- Ensure voltage is correct and that wiring is adequate to deliver full locked rotor current.

### III-D OPERATIONAL CHECKS

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

### III-E BYPASS VALVE

To protect the pump from overpressure due to inadvertent shutting of discharge system, a bypass valve capable of circulating the entire pump output is available from EBSRAY. This valve is installed in the pump discharge line and normally returns to the supply tank of the pump. The EBSRAY Model V18 or RV18 bypass valve is recommended.

On commissioning, the bypass valve should be set in accordance with the predetermined pump differential pressure required.

Refer separate instructions for details.

## SECTION IV - 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 minor maintenance tasks and inspections 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 unit be removed from the installation.

### IV-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, Cat # and quantity required. Refer to Drg No.CMP027 (see page 9)
3. Advise complete delivery instructions, transportation, etc.

### IV-B PREPARATION FOR DISASSEMBLY

1. Obtain the appropriate Work Permit if required.
2. Isolate power supply to motor and disconnect if required.
3. Isolate pump from product in suction and discharge lines, depressurise and purge out any toxic or flammable liquids and/or gases.
4. Disconnect porting connections.
5. Remove pump unit from installation.

### IV-C DISASSEMBLY

1. Remove Cover and accompanying 'O' Ring. **Note:** Two extraction holes, tapped M10 x 1.5 are provided to facilitate removal. (Cover bolts suit.)

2. Withdraw Impeller and remove Key. **Note:** Two extraction holes, tapped M6 x 1.0 are provided to facilitate removal.

3. Release two Grub Screws on Seal Sleeve sufficiently to clear Shaft, which enables withdrawal of Seal Sleeve and Rotary Seal Face assembly. Remove accompanying 'O' Rings.

**Note:** Two extraction holes in the Seal Sleeve, tapped M6 x 1.0 are provided to facilitate removal.

4. Unbolt Body from Motor and remove with accompanying Seal Seat and Throttle Bush.
5. Remove Throttle Bush and press out Seal Seat and 'O' Ring from Body.

### IV-D INSPECTION

1. Check Impeller and seal zone of Body for damage or wear. Refer Fig.1. Replace Impeller if blades have been broken or wear is excessive.

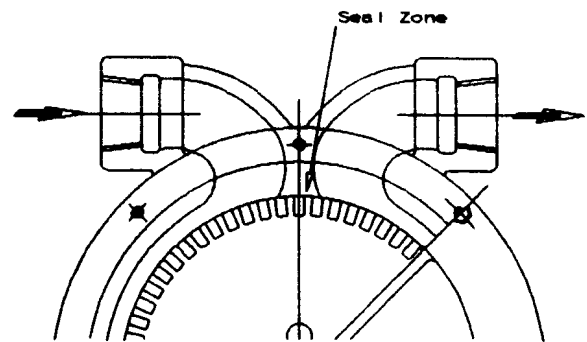


Figure 1

2. Check Shaft for run-out if Impeller has been damaged.
3. Check Mechanical Seal Faces for wear or damage. Replace as required.
4. Check Throttle Bush for wear or damage. Replace as required.

Table 1.

Standard Impeller Sizes in mm		
	Minimum	Maximum
Diameter	129.935	129.960
Width	7.940	7.960

5. It is recommended that 'O' Rings be replaced at every overhaul.
6. Electric Motor should be inspected by qualified electrical personnel in conjunction with Motor manufacturer's recommendations.

#### IV-E REASSEMBLY - PRELIMINARY

1. Ensure all parts are clean before assembly. Remove any burrs.
2. Ensure Impeller maintains an accurate sliding fit on Shaft and Key.

**CAUTION:** AT ALL TIMES WHEN HANDLING AND INSTALLING MECHANICAL SEALS, CARE MUST BE TAKEN TO ENSURE LAPPED FACES, SEATS AND 'O' RINGS ARE NOT DAMAGED. PARTICULAR ATTENTION MUST BE GIVEN TO CARBON SEATS TO PREVENT MARKING OR CHIPPING.

**NOTE:** Lightly smear all 'O' Rings with a compatible good quality lubricant before assembly. A dab of compatible grease on each Spring will assist in keeping the Springs in position during assembly of the Seal.

3. Assemble Rotary Seal Face to Seal Sleeve i.e. fit two 'O' Rings to grooves, position six Springs in holes and ensure Drive Pin location. Rotating Face MUST be free to follow axially by spring pressure.

#### IV-F REASSEMBLY (Refer Drg No.CMP027)

1. Fit Throttle Bush (28) into Body (1)
2. Fit 'O' Ring (48) to Seal Seat (40) and fit Seal Seat into Body (1).
3. Fit Body (1) to Motor (30) ensuring Seal Seat (40) is not

damaged, locating Body so that ports are at 10 and 2 o'clock positions.

4. Lightly lubricate Rotary Seal Face (41) and Seal Seat (40) with a compatible good quality lubricant.
5. Apply a medium strength thread locking adhesive to the Seal Grub Screws (43) and position in Seal Sleeve (42).
6. Push Seal sub-assembly (41,42) onto Motor Shaft until positive location is felt. Lock Grub Screws (43) tightly onto Motor Shaft checking that axial position has been maintained. Refer Fig. 2

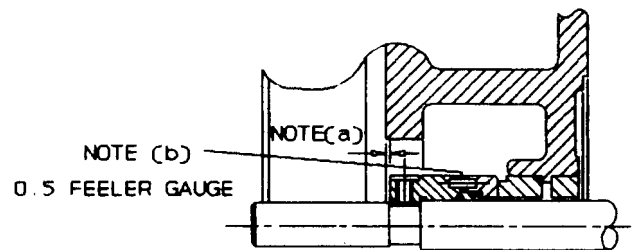


Figure 2

#### Notes:

- (a) Check that there is clearance between inspection end of Seal Sleeve (42) and Body (1) face. The Seal Sleeve MUST NOT project beyond the Body Face.
- (b) Check that a gap of approximately 0,5mm exists between Seal Sleeve (42) and Rotary Seal Face (41).
7. Remove Motor fan cowl and turn fan by hand to ensure Shaft rotates freely.
8. Fit Key (8) to Motor Shaft and slide Impeller (3) onto Motor Shaft. Ensure Impeller maintains an accurate sliding fit on Shaft and Key.
9. Fit Location Pin to matching hole in Body flange.
10. Fit 'O' Ring (4) on Cover (2) and assemble Cover (2) onto Body (1). Ensure Location Pin is engaged. Tighten Cover bolts.
11. Check assembled unit for freeness by turning Motor fan by hand. If

tightening Cover prevents fan from being turned, remove Cover and check for burrs on Impeller or incorrect axial position of

Mechanical Seal Sleeve.

12. Refit fan cowl to Motor (30).

## SECTION V - TROUBLE SHOOTING

### VI-A FAILURE TO DELIVER LIQUID

1. Incorrect direction of rotation.
2. Pump not properly primed - check that casing and suction pipe are completely filled with liquid.
3. Speed too low - check motor speed and line voltage.
4. System discharge head too high - check system head, friction losses and bypass valve setting.
5. Excessive suction restrictions - check NPSH available (inadequately sized suction piping may cause high friction losses, vapour pressure of liquid may be too high). Check with compound gauge.
6. Leaks and/or vapour pockets in suction line - check suction piping.
7. Bypass valve open due to obstruction under seat of valve or setting too low.
8. Suction filter/strainer blocked.

### VI-B LOW OUTPUT

1. Discharge head too high.
2. Entrained gases in liquid pumped.
3. Strainer offering excess resistance to flow.
4. Suction and/or discharge pipes of insufficient diameter, causing excessive friction loss.
5. Bypass valve setting too low - Increase pressure by screwing in adjusting screw. DO NOT exceed system design pressure or overload driver.
6. Impeller damaged. Repair or

replace as required.

7. Pump clearances incorrect.

### VI-C EXCESSIVE POWER CONSUMPTION

1. Differential pressure/head higher than rating - check for obstruction.
2. Liquid properties not as specified - check specific gravity and viscosity.
3. Rotating parts bind - check for proper clearances or foreign matter in pump.
4. Shaft bent - replace as required.
5. Motor requires servicing.

### VI-D PUMP IS NOISY

1. Cavitation is taking place - increase NPSH by:
  - (a) Removing suction line restrictions created by:
    - (i) Inadequate pipe sizes.
    - (ii) Incorrect selection of valves.
    - (iii) Strainer not permitting free flow of liquid to pump.
  - (b) Increasing static head in suction vessel.
  - (c) Reducing temperature and thus vapour pressure of liquid pumped.
2. Rotating parts bind - check for proper clearances.

### VI-E LEAKAGE

1. Leakage from Casing - check 'O' Rings.
2. Leakage from Mechanical Seal - evident by product leaking from "tell-tale" hole. (Cast relief hole at

six o'clock position under Body.)

- (a) Check axial movement of Mechanical Seal Rotating Face.
- (b) Mechanical Seal Faces not properly in contact - check gap between Seal Sleeve and Rotary Seal Face and readjust to ensure 0.5mm clearance.  
  
Refer Fig.2.
- (c) Mechanical Seal is cracked or worn - inspect and replace as required.

- Check voltage with motor requirements at the motor.  
**IMPORTANT** - Voltage in electrical system must be within the requirements of AS3000.

- 2. Foreign object/s jammed in impeller - Test for freedom of rotation by turning the motor fan. Remove cover and/or impeller to clear if required.
- 3. Incorrect clearances or distorted casing causing impeller to contact body/cover - Check clearances and shaft/casing alignment. Ensure pipe and/or mounting stresses are completely removed from pump after installation.

**VI-F PUMP MOTOR FAILS TO START**

- 1. Insufficient line voltage at the motor during starting current inrush. (particularly single phase installations)

**SECTION VI - PARTS DESIGNATION**

**EBSRAY Model: R11 Regenerative Turbine Pump**

Refer Drg No.: CMP027

Cat #	DESCRIPTION	QTY	Cat #	DESCRIPTION	QTY
1	Body	1	41	Rotary Seal Face	1
2	Cover	1	42	Seal Sleeve	1
3	Impeller	1	43	Grub Screw - Seal Sleeve	2
4	'O' Ring - Cover	1	44	Drive Pin - Seal Sleeve	1
8	Impeller Key	1	45	Seal Spring	6
28	Throttle Bush	1	46	'O' Ring - Shaft	1
30	Motor	1	47	'O' Ring - Seal Sleeve	1
40	Seal Seat	1	48	'O' Ring - Seal Seat	1



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PARTS DESIGNATION FOR  
REGENERATIVE TURBINE PUMP  
MODEL R11  
DRAWING No CMP027

