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EBSRAY PUMPS

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

R SERIES
MODEL R10
.... For LPG APPLICATIONS

EBSRAY AUSTRALIA

SECTION 1 – GENERAL

INTRODUCTION
This publication is intended to assist those involved with the installation, operation and maintenance of EBSRAY Model R10 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.

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 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 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 is sufficient for inspection and maintenance. 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: 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.

2.4 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 start-up 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.

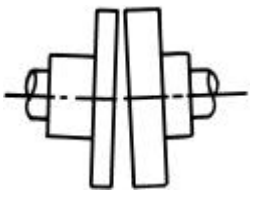


Fig 1

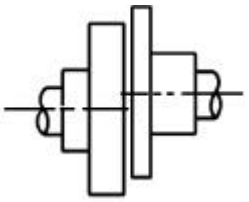


Fig 2

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

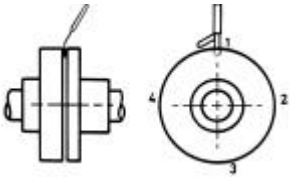


Fig 3

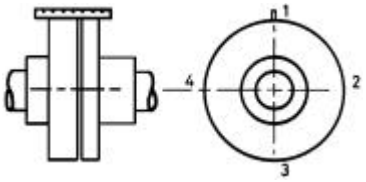


Fig 4

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 plant. NOTE: If both coupling halves are of identical diameter, concentricity may be checked with a straight edge at 90° intervals.

SECTION 3 – OPERATION

3.1 DESCRIPTION

The EBSRAY Model R10 pump is of the regenerative turbine principle utilising an axially free floating impeller. 'Sealed for life' double row angular contact bearings are isolated outside the pumpage – normally by an EBSRAY balanced mechanical seal. The casing is 'O' ring sealed.
NOTE: If other brand mechanical seal is fitted, refer to EBSRAY.

3.2 LUBRICATION

No 'in service' lubrication is required on EBSRAY's Model R10 pump.

3.3 STARTUP CHECKLIST

- Alignment of couplings.
- Direction of rotation.
- Freeness of shaft.
- Do not start pump against closed discharge valve or with suction valved throttled.
- DO NOT RUN PUMP DRY.

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.

3.5 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 normally supplied with each pump. This is installed in the pump discharge line and normally returns to the supply tank of the pump.

For LPG service the EBSRAY Model 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 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 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 be removed from the installation.

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 located on the nameplate of the pump.

2. Advise the name, item number and quantity required. Refer to Drg N° CMP120 on page 7.

3. Advise complete delivery instructions, transportation, etc.

4.2 PREPARATION FOR DISASSEMBLY

1. Obtain the appropriate Work Permit if required.

2. Isolate 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. Disconnect porting connections.

5. Remove pump from installation.

4.3 DISASSEMBLY

1. Remove pump coupling half.

2. Remove cover and accompanying 'O' ring. NOTE: Two extraction holes, tapped M10 x 1.5 are provided to facilitate removal. (Cover bolts suit.)

3. Withdraw impeller and remove key. NOTE: Two extraction holes, tapped M6 x 1.0 are provided to facilitate removal.

4. Release two grub screws on seal sleeve sufficiently to clear shaft, which enables withdrawal of seal sleeve and rotary seal face assembly. NOTE: Two extraction holes

in the seal sleeve, tapped M6 x 1.0 are provided to facilitate removal.

5. Remove body and accompanying seal seat.

6. Press out bearings and shaft assembly from bracket, which also removes throttle bush and 'O' ring.

7. Remove circlip and press bearings off shaft.

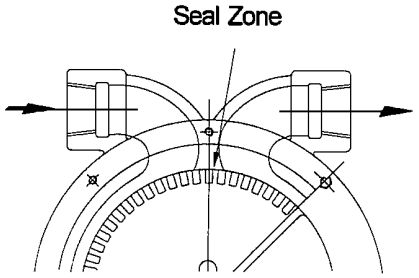
4.4 INSPECTION

1. Check impeller, seal zone and faces of body and cover for damage or wear. Refer Fig.5. Replace impeller if blades have been broken or wear is excessive.

Dimensions:

Impeller standard width:	8.94-8.96 mm
Minimum Impeller width:	8.86 mm
Impeller standard diameter:	129.935-129.96 mm
Minimum Impeller Diameter:	129.86 mm

Fig 5



2. If impeller has been damaged, check shaft for run-out.

3. Inspect bearings for wear. It is recommended on major overhauls that bearings be replaced.

4. Check mechanical seal faces for wear or damage. Replace as required.

5. It is recommended that 'O' rings be replaced at every overhaul.

4.5 REASSEMBLY – PRELIMINARY

1. Ensure all parts are clean before assembly. Remove any burrs.

2. Ensure impeller maintains an accurate free sliding fit on shaft and key.

CAUTION: AT ALL TIMES WHEN HANDLING AND INSTALLING MECHANICAL SEALS, CARE MUST BE TAKEN TO ENSURE LAPPED FACES AND SEATS 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 positioned in the holes during assembly.

3. Assemble rotary seal face to seal sleeve ie 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.

4.6 REASSEMBLY (Refer Drg No. CMP 120)

1. Fit bearings (24,23) to shaft (21) – small bearing (24) to drive end of shaft. Press home and fit circlip (25) to groove adjacent to inspection end bearing.

2. Fit bearings and shaft assembly into bracket (20) and press home.

3. Fit 'O' ring (26) into bracket (20).

4. Fit throttle bush (28) into bracket (20) with drain hole in six o'clock position and facing out i.e. towards inspection end.

5. Fit 'O'ring (48) to seal seat (40) and fit seal seat into body (1).

6. Fit body (1) to bracket (20) ensuring seal seat (40) is not damaged.

7. Lightly lubricate seal face (41) and seal seat (40) with a compatible good quality lubricant.

8. Apply a medium strength thread locking adhesive to the seal grub screws (43) and position in seal sleeve (42)

9. Push seal sub-assembly (42,41) onto shaft (21) until positive location is felt. Lock grub screws (43) tightly onto shaft (21) checking that axial position has been maintained.

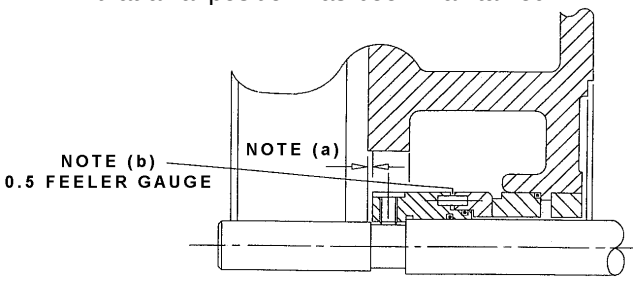


Fig 6

NOTE: Refer Fig.6.

a) Check that there is clearance between inspection end of seal sleeve (42) and body (1) face.

b) Check that a gap of approximately 0.5mm exists between seal sleeve (42) and rotary seal face (41)

10. Fit key (8) to shaft (21) and slide impeller (3) onto shaft (21).

11. Fit 'O' ring (4) on cover (2) and assemble cover (2) onto body (1). Ensure seal zone on cover faces seal zone on body by matching dowel holes in cover and body.

12. Fit pump coupling half to shaft.

NOTE: Shaft should turn freely after tightening cover. If tightening cover prevents shaft from being turned, check for burrs on impeller or mechanical seal sleeve position.

SECTION 5 – TROUBLE SHOOTING

5.1 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.
   a) If motor driven, check speed and line voltage.

   b) If engine driven, check governor setting and engine speed.

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 vacuum or 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.

5.2 LOW OUTPUT

1. Discharge head too high.

2. Entrained air or 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.

5.3 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. Bearings worn – inspect and replace as required.

5. Shaft bent – replace as required.

5.4 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.

3. Shaft bent – replace as required.

4. Pump and driver misaligned – check coupling and realign as required.

5. Bearings worn – inspect and replace as required.

5.5 LEAKAGE

1. Leakage from casing – check 'O' rings.

2. Leakage from mechanical seal – evident by witness coming from telltale. (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.6.

   c) Mechanical seal is cracked or worn – inspect and replace as required.

SECTION 6 – PARTS DESIGNATION

EBSRAY MODEL: R10 Regenerative Turbine Pump

Refer Drawing No. CMP120

Cat#	Description	Qty
1	Body	1
2	Cover	1
3	Impeller	1
4	O Ring – Cover	1
8	Impeller Key	1
20	Bracket	1
21	Shaft	1
23	Bearing – Inspection End	1
24	Bearing – Drive End	1
25	Circlip	1
26	O Ring – Bracket	1
28	Throttle Bush	1
40	Seal Seat	1
41	Rotary Seal Face	1
42	Seal Sleeve	1
43	Grub Screw – Seal Sleeve	2
44	Drive Pin – Seal Sleeve	3
45	Seal Spring	6
46	O Ring – Shaft	1
47	O Ring – Seal Sleeve	1
48	O Ring – Seal Seat	1

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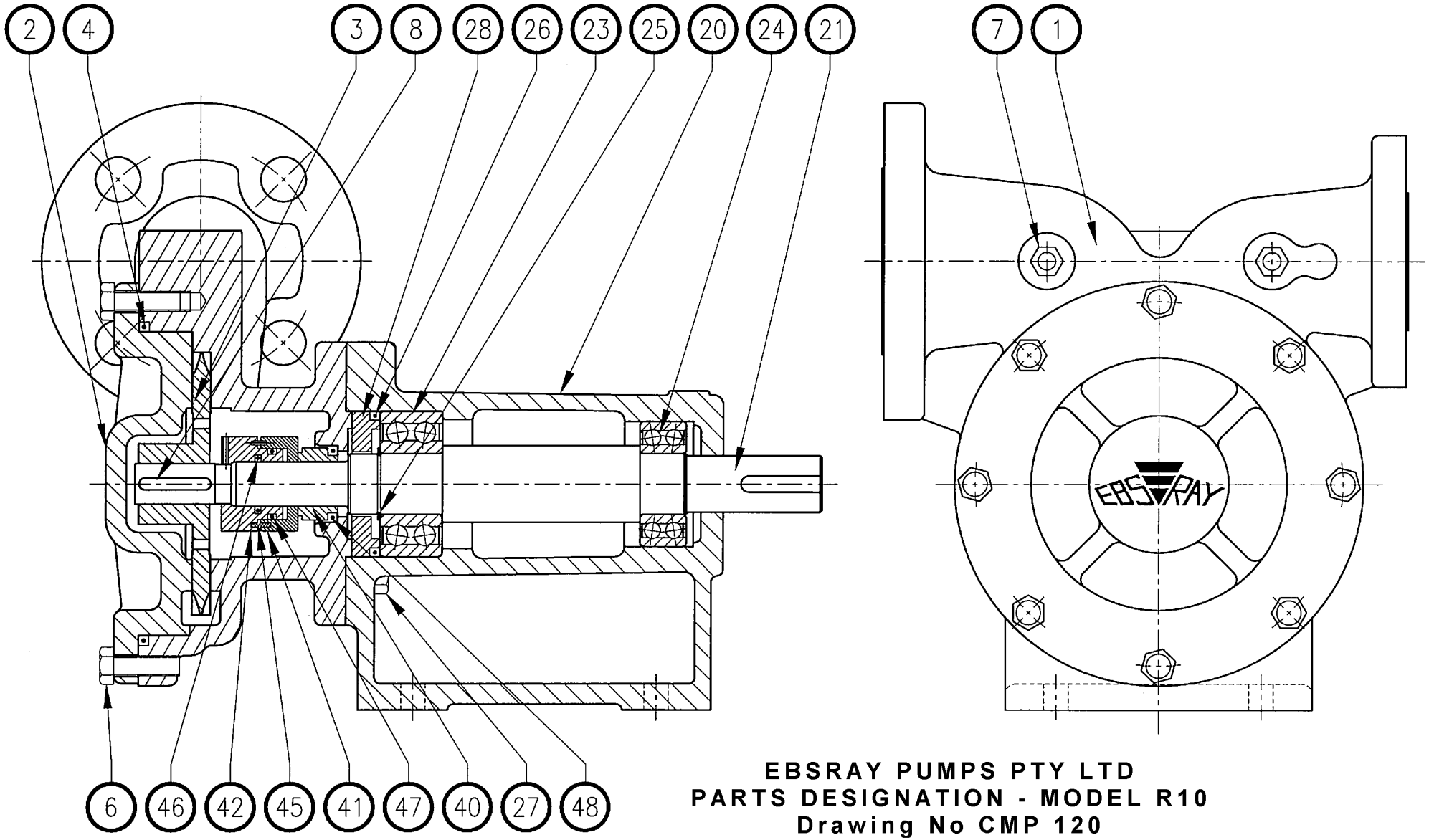

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PARTS DESIGNATION - MODEL R10
Drawing No CMP 120