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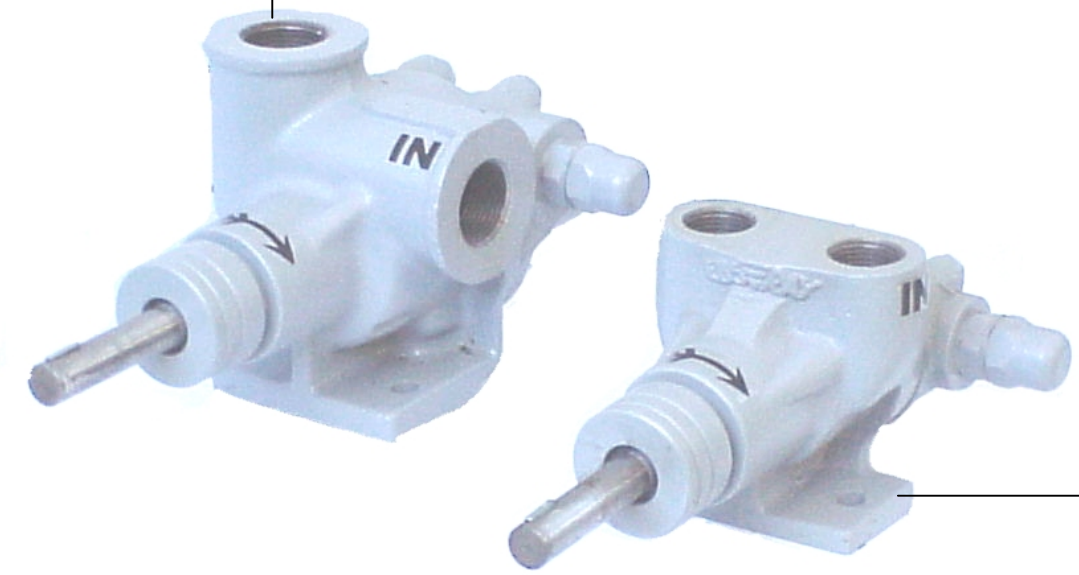
EBSRAY PUMPS

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS



Z SERIES

MODELS ZB120 & Z580

EBSRAY AUSTRALIA

CONTENTS

EBS-RAY PUMPS Pty. Limited
628 Pittwater Road
Brookvale NSW 2100 Australia
Phone: +612 9905 0234
Fax: +612 9938 3828
www.ebsraypumps.com.au

or **Contact Ebsray Representative:**

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SECTION 1 – GENERAL

INTRODUCTION

This publication is intended to assist those involved with the installation, operation and maintenance of EBSRAY Models ZB120 and Z580 Internal Gear 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. Do not drop pumps and do not expose pumps to excessive heat or corrosive materials. Baseplate mounted units should be lifted from under the baseplate below both the pump and driver ensuring compliance with the relevant lifting codes.

DETERMINATION OF MAINTENANCE REQUIREMENTS

EBSRAY Z Series Pumps are used for a wide range of applications and as such, maintenance requirements will vary between applications. Under ideal/good operating conditions, providing pump is not run dry, internal inspection is generally not required unless either performance drops off or unusual noises, vibrations or leaks occur. During inspection, check bearings and other components for wear or damage.
Any reduction in performance (either flow, differential pressure or efficiency) will indicate either a system, Pumpset or pump anomaly. Regular observation during operation will quickly identify symptoms such as leaking seals. Development of unusual noises or vibration may indicate system/hydraulic problems, excessive wear, mechanical damage or foreign objects I the pump

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. Allow sufficient space and ventilation for motor cooling requirements.

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.

The threaded port connections have parallel BSP threads (ZB120 – ½"BSP & Z580 ¾"BSP) and EBSRAY recommends using parallel threaded hydraulic fittings which seal via an O-Ring against the machined top of the pump body.

CAUTION: If using tapered thread pipe/fittings or if using PTFE thread sealing tape, extreme care is required to ensure that fittings are not over tightened. Over tightening tapered connections may cause body to fracture.

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.

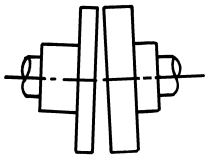


Fig 1

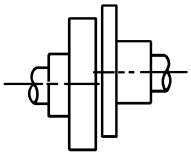


Fig 2

ANGULAR MISALIGNMENT - Refer Fig.1 should be corrected before ECCENTRICITY - Refer Fig.2.
Using feeler gauge readings at 90° intervals as shown in Fig 3, the amount of correction necessary can be easily determined to bring shaft axes in line.

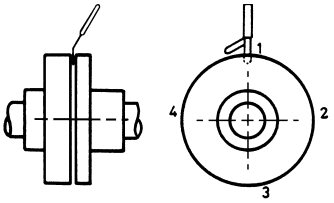


Fig 3

Misalignment due to ECCENTRICITY as shown in Fig.2 can now be corrected. 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 as shown in Fig 4

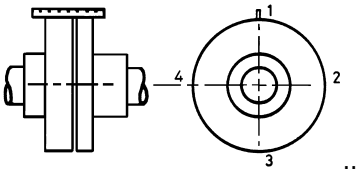


Fig 4

SECTION 3 – OPERATION

3.1 DESCRIPTION

The EBSRAY Z Series range pumps uses the Internal Gear Principle to handle many kinds of liquids over a wide range of capacities and pressures, associated with viscous or non-viscous, hot or cold and corrosive and non-corrosive applications. Accordingly material, speed and power specifications vary and it is important to use such equipment strictly adhering to the manufacturers' recommendations.

3.2 PUMPING PRINCIPLE

The EBSRAY internal gear principle is based upon the use of an Outer Rotor 'A', idler gear, termed Inner Rotor 'B' and a crescent shaped spacer 'C' which is cast integral with the Cover. Thus only two moving parts fulfill this efficient displacement cycle. Power is applied to the Outer Rotor 'A' and transmitted to the meshing Inner Rotor 'B'. The rotor teeth cells which are not involved in the meshing cycle are sealed by the crescent 'C', Body and Cover – Refer Fig5

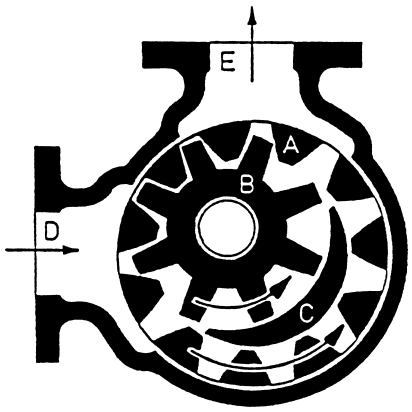


Fig 5

When rotation is started there is an increase in cell volume as the teeth come out of mesh. This creates a partial vacuum and the pressure differential thus created initiates movement of the liquid through the suction port 'D', filling the teeth cells of the two displacement rotors. When the tooth meshing withdrawl cycle is complete and the tooth cell volume is filled with liquid, transfer to the pressure or discharge side is effected as the liquid is carried past the crescent sealing member 'C'. This sealing crescent establishes a labyrinth between the high and low pressure sides, minimizing fluid slip. When the teeth mesh on the pressure side, the liquid is forced from the teeth cells and flows through the discharge port 'E'. A noteworthy feature of this simple principle is the absence of high tooth contact pressures when compared with conventional gear pumps, many of which employ costly external timing gears to minimize tooth wear.
The Inner Rotor 'B', remains in almost hydraulic balance requiring only minimal torsional load to effectively follow the Outer Rotor 'A'.

3.3 LUBRICATION

No 'in service' lubrication is required on EBSRAY's Z Series pumps.

3.4 STARTUP CHECKLIST

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

3.5 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 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 Quantity required, Description and Cat No . Refer to Section 5.
3. Advise complete delivery instructions, transportation, etc

Note: *Model No. Suffixe**s***
No suffix indicates fitted with Mechanical Seal
'P' fitted with Packed Gland
'V' fitted with Bypass Valve
'PV' fitted with Packed Gland and Bypass Valve

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. Note pump and Bypass Valve orientation relative to direction of 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.

1. If fitted, remove Bypass Valve Adjusting Screw Cap, Gaskets, Locknut, Adjusting Screw, Spring and Bypass Valve.
2. Remove Gland Nut.
3. If fitted with packed gland, remove Gland. If fitted with mechanical seal, carefully remove Gland complete with Locating Pin, O-Ring and Seal Seat. Take care to avoid damage to the Seal Seat.
4. Remove Cover and Cover Gasket.
5. Push Rotor on Shaft assembly through body.
6. a. If fitted with packed gland – remove packing.

   b. If fitted with mechanical seal – remove remaining mechanical seal components from Body.

4.4 INSPECTION

Inspect components for damage or excessive wear. Note that the typical wear pattern of components in EBSRAY's Rotary Internal Gear pumps tends to compensate each other and working clearances are to some extent maintained by this compensation. If pump performance has been satisfactory, existing components, although worn may still have adequate life and could be used provided any burrs or sharp edges are removed prior to reassembly.

Major refurbishing of the pump should be done in line with reconditioning to an 'as new' status as replacing or repairing one component will have an effect on other components and the working clearances of the pump.

Table of Standard 'A' Clearances (mm)

Std Running Clearances	**ZB120**	**Z580**
Diametral – Outer Rotor to Body	0.013-0.038	0.069-0.101
Axial – Rotors to Cover	0.026-0.050	0.026-0.076
Diametral – Shaft to Bearing	0.008-0.025	0.008-0.030
Diametral – Rotor Pin to Bearing	0.013-0.033	0.013-0.035
Carbon Bearing Clearances when fitted		
Diametral – Shaft to Carbon Bearing	0.008-0.025	0.008-0.025
Diametral – Rotor Pin to Carbon Bearing	0.010-0.020	0.026-0.050

Notes:
1. Dimensions stated are design parameters.
2. Efficient suction and discharge performance are achieved when the pump is maintained within these dimensions, however adequate performance may still be achieved with the clearances and dimensions outside those stated if application parameters allow.

4.5 REASSEMBLY – PRELIMINARY

1. Ensure all parts are clean and free from burrs, etc. Do not round off sharp edges of rotors as this may affect performance.
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

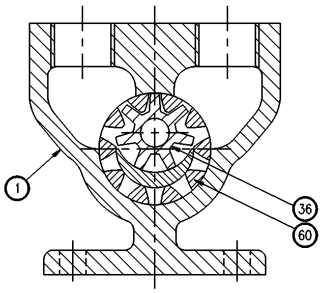
Note: Factory fitted carbon bearings (when used) are a press fit – post machined to ensure concentricity and correct sizing to achieve correct running clearances. If replacing carbon bearings ensure proper fitting techniques are employed.

1. Position Rotor on Shaft assembly in Body
2. Measure depth from Body face to Rotor tooth.
3. Measure the depth of Cover step.
4. Determine the gasket thickness required to obtain the correct running clearance.
5. Fit Inner Rotor over Inner Rotor Pin in Cover and with the required Gaskets, fit Cover assembly to Body.
6. If fitting Packed Gland:
   Fit required packing ensuring that gaps in each ring are staggered. Fit Gland and Gland Nut.
   Note: Do not overtighten Gland. Gland should be adjusted on commissioning to allow a small amount of seepage.
5. If fitting Mechanical Seal:
   a. Slide Circlip onto Shaft, slide Circlip Retainer along shaft and push on until the Circlip locates in the circlip groove.
   b. Slide the remaining seal components along the shaft in the following order: Spring, Drive Washer, O-Ring and Seal Face.
   c. Fit the O-Ring to the Seal Seat then fit the Gland to the Seal Seat ensuring it seats correctly over the O-Ring and that the Locating Pin is correctly engaged.
   d. Fit the gasket to the Gland then slide the Seal Seat/Gland assembly along the Shaft and lock into position with the Gland Nut.
6. Ensure freedom of rotation of shaft.
7. If fitted with Bypass Valve
   a. Insert Bypass Valve into housing in Cover.
   b. Insert Spring into housing
   c. Screw Bypass Valve Adjusting Screw into housing
   d. After adjusting Bypass Valve pressure setting, lock and seal Adjusting Screw by fitting, in the following order, Gasket, Locknut, Gasket and Adjusting Screw Cap.

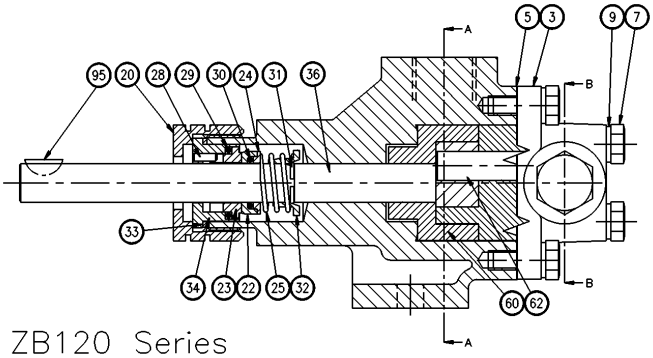
Note:
To increase bypass pressure screw Bypass Valve Adjusting Screw IN

To decrease bypass pressure screw Bypass Valve Adjusting Screw OUT

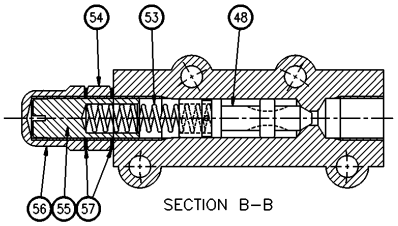
CAUTION: Do not exceed specified pump/system design pressures.



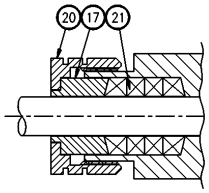
SECTION A–A



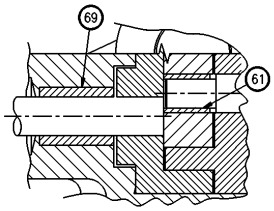
ZB120 Series



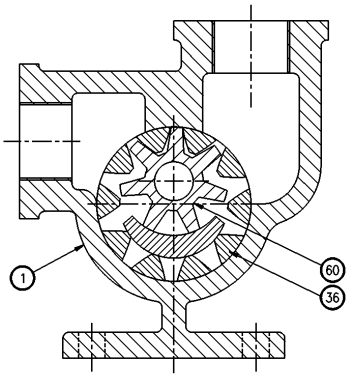
SECTION B–B
BYPASS VALVE



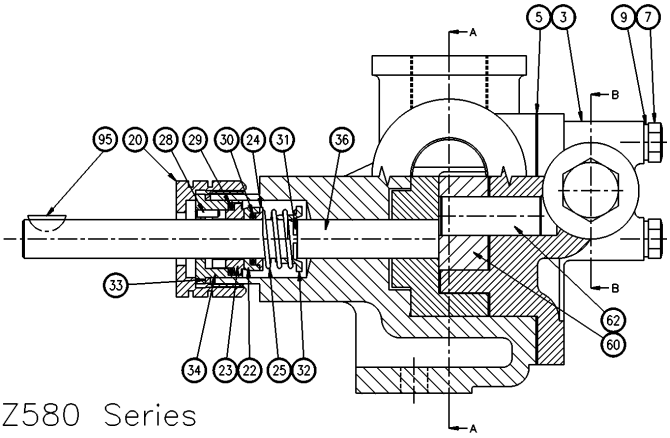
PACKED GLAND OPTION



SLEEVE BEARING OPTION



SECTION A–A



Z580 Series

CAT No	DESCRIPTION	QTY	CAT No	DESCRIPTION	QTY
1	BODY	1	32	CIRCLIP RETAINER	1
3	COVER (Plain or Bypass)	1	33	GASKET-Mechanical Seal	1
5	GASKET-Cover	1 Set	34	SEAL SLEEVE	1
7	SETSCREW- Cover	1 Set	36	ROTOR ON SHAFT	1
9	SPRING WASHER- Cover	6	48	VALVE	1
17	GLAND-Packed	1	53	SPRING-Bypass	1
20	GLAND NUT	1	54	LOCKNUT-Bypass	1
21	PACKING SET	1 Set	55	ADJUSTING SCREW	1
22	SEAL FACE	1	56	ADJUSTING CAP	1
23	SEAL SEAT	1	57	GASKET-Adjusting Cap	2
24	SEAL WASHER	1	60	INNER ROTOR	1
25	SPRING-Seal	1	61	INNER ROTOR BEARING	1
28	LOCATING PIN	1	62	INNER ROTOR PIN	1
29	O-RING-Seal Seat	1	69	ROTOR BEARING	1
30	O-RING-Seal Face	1	95	WOODRUFF KEY	1
31	CIRCLIP	1			

SECTION 6 – TROUBLE SHOOTING

6.1 PUMP FAILS TO PRIME OR DELIVER LIQUID

1. No liquid in tank
2. Pump not rotating
3. Incorrect direction of rotation
4. Excessive suction restrictions
5. Blocked suction pipe
6. System discharge head too high – check system head, friction losses and Bypass Valve setting.
7. Air leaks and/or pockets in suction line.
8. Viscosity of liquid not within specified duty points.
9. Excess internal clearances

6.2 LOW OUTPUT

1. Incorrect pump speed.
2. Cavitation or vaporization on suction side of pump.
3. Obstruction is suction or discharge pipe.
4. Air leaks and/or pockets in suction line.
5. Bypass Valve pressure setting too low
6. Differential pressure higher than specified duty point.
7. Viscosity of liquid lower than specified duty point.
8. Excess internal clearances.

6.3 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 binding.
4. Misalignment between pump and driver
5. Obstruction in pipelines, clogged strainers, partially open valves.

6.4 PUMP IS NOISY

1. Cavitation due to insufficient NPSH available
2. Air leakage in suction piping
3. Rotating parts binding or damaged
4. Misalignment between pump and driver
5. Pump running dry
6. Obstruction in suction line

6.5 LEAKAGE

1. Along shaft – Mechanical Seal Fitted
   a. Mechanical Seal damaged or worn
   b. Gland Nut not sealing correctly against seal gasket
2. Along Shaft – Packed Gland fitted
   a. Hydraulic packing old, worn or lost resiliency.
   b. Gland Nut too loose – Note: Do NOT overtighten, some seepage is required
   c. Damaged shaft in packing zone
3. From Cover
   a. Cover screws not tight
   b. Damaged Gaskets between faces.
4. From Bypass Valve
   a. Bypass Valve Adjusting Screw Cap loose
   b. Damaged gaskets between faces.