CUSTOMER

ORDER NO

DATE

PUMP IDENTIFICATION NO.

PUMP SERIES

SERIAL NO.

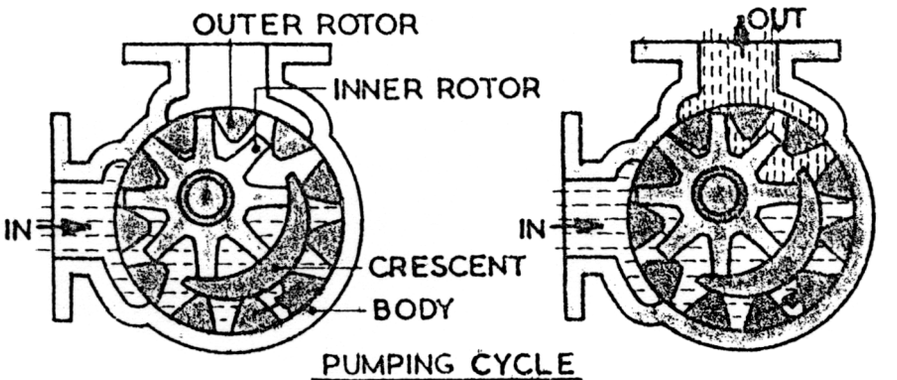
EBSRAY JOB NO

EBS-RAY ROTARY POSITIVE DISPLACEMENT PUMP

BASIC PRINCIPLES OF OPERATION AND MECHANICAL DETAILS OF THE EBS-RAY MEDIUM DUTY INTERNAL GEAR PUMPS SERIES LD100 - LD400

The EBS-RAY internal-gear principle is based upon the use of a rotor, idler gear, termed inner rotor and a crescent shaped spacer which is cast integral with the body end cover. Thus only two moving parts fulfil this efficient displacement cycle. Power is applied to the rotor and transmitted to the meshing idler or inner rotor. The rotor tooth cells which are not involved in the meshing cycle are sealed by the crescent.

Pumping Principle.



PUMPING CYCLE

When the pump is started there is an increase in cell volume as the teeth come out of mesh. This creates a partial vacuum and the following pressure differential iniciates movement of the liquid through the suction port filling the tooth cells of the two displacement rotors. When the tooth meshing withdrawal 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. This sealing crescent establishes a labyrinth seal between the high and low pressure conditions and considerably reduces the fluid slip. When the tooth mesh on the pressure side the liquid is forced from the teeth cells and flows out through the discharge port. A noteworthy feature of this simple principle is the absence of high tooth contact pressure when compared with the conventional gear pumps of which many employ costly external timing gears to minimise tooth wear.

The inner rotor, or idler gear so styled as it remains in almost hydraulic balance, requires only limited torsional load to effectively follow the outer drive rotor.

Applications.

The field of applications for the various types of rotary positive displacement pumps is extensive. These pumps are used to handle many kinds of liquids apart from bitumen over a wide variety of capacities and pressures, associated with viscous and non - viscous, hot or cold, and corrosive and non-corrosive conditions. Accordingly material, speed and power specifications vary and it is important to use such equipment in keeping with the manufacturers recommendations.

Mechanical Details.

The EBS-RAY Positive Rotary Medium Duty Series 300 Bitumen Pumps are available for pressure to 75 P.S.I.G. and Series 100 to 400 may be assembled with specific components for tanker mounting, depot distribution or processing. Capacities range from 5 to 300 gallons per minute.

WARRANTY. All pumps carry the EBS-RAY comprehensive warranty of twelve months against defective materials or workmanship. (Refer to warranty conditions available upon request.)

SERVICE DATA

EBS-RAY LIGHT DUTY SERIES ROTARY PUMPS.

SERIES	340	100	114	112	200	212	300
Normal RPM Range	200-800	200-800	200-400	200-450	200-450	200-450	200-400
Capacity GPM Normal Range Free Flow	1.5-6	3 - 12	9 - 12	18 - 42	24 - 52	40 - 90	85 - 170
R.P.M Maximum	800	800	450	450	450	450	400
Max. Pressure for good Lubricating Liquids - PSIG	100	100	100	100	100	100	100
Max. Viscosity at Peak RPM.	750 SSU	750	750	750	750	750	750
Viscosity Range	30-20000 SSU.	R.P.M. Determined on maximum viscosity at pumping temperature.					

Example: At 5000 SSU reduce pump speed by 25% of rated R.P.M.

EBSRAY Standard Series Pumps are suited for operating temperatures up to 160°F. For temperatures between 160°F and 600°F special clearances are necessary and in the higher temperature range some variations from standard materials are necessary. Ebsray will be pleased to meet your special requirements.

TO DISMANTLE THE PUMP.

Remove end cover setscrews and withdraw cover and rotor drive shaft assembly and examine all components. The inner rotor width dimension coincides very closely with cover crescent width together with the tooth depth dimension of the main drive rotor.

The close matching of these three dimensions has a very important bearing of the pump efficiency. Any variation in these dimensions exceeding .005" requires attention, refer clearance chart. Clearances between the inner rotor bush and the inner rotor pin must be carefully observed; should this clearance exceed the maximum set down in the clearance chart renew the bush or pin, or both, if worn.

For standard applications where the pump is handling non lubricating liquids, provision is made to retain the grease in the inner rotor bush by the insertion of a seal disc which is a press fit in the inner rotor bore. This disc must be flush with the inner rotor face after insertion. In special cases where the pumpage is extremely soluble with the bush grease a change in the rotor bush material is effected.

For light duties carbon graphite bushes are employed, however for medium to heavy duties a resin bonded fabric ("Ferrobestos") material is used. When using Ferrobestos care must be taken to feed a copious supply of the fluid pumped to this bush. This supply is normally made by using a pressure tube extending from the pump body discharge port to the inner rotor pin tapped greaser hole.

When so fitted the inner rotor seal disc is removed to allow free flow of the fluid supply.

INSTALLING THE PUMP.

The pump base plate or mounting pads must be machined accurately to offer a flat surface for aligning and bolting down.

The base plate rigidity is important to ensure correct alignment of the main rotor within the body. Emphasis is made particularly in regard to mounting on mobile units as twisting or weaving of the vehicle chassis may alter the position of the shaft outer end bearing and thereby change the rotor concentricity within the pump casing. This should yield radial clearance between .006 - .010" in the vertical C/L and .007 in the horizontal centre line. .008"

Procedure to Check Rotor Concentricity.

1. Remove the pump end cover and check the main drive rotor concentricity within the body by inserting the appropriate size feeler gauge at four equal points between the drive rotor and body.

2. Locate the pump body securely on the baseplate and alter the pedestal bearing position by shim, packing or side movement to gain the required concentric location of the drive rotor within the pump body; when correct securely fasten down both pump and pedestal.

3. CAUTION: Before replacing cover make sure the rotor concentricity has not been affected when coupling the suction and discharge pipes. The pipes must be adequately supported and should not impose misalignment stresses on the pump body.

REPAIR.

4. For satisfactory servicing, the main body must be free from major scoring caused generally through solids entering the pump suction or from wear accelerated by the misalignment of main drive shaft. When practicable always fit an efficient suction strainer.

   The body bearing or stuffing box bush is a press fit and may be inserted with a draw bolt if a press is not available. Machine or ream bush to effect precise clearance in accordance with clearance chart. Concentricity and squareness within stuffing box is VITAL.

   The inner rotor bearing or bush is also press fitted within the rotor. To obtain the precise running clearances stated in the clearance chart machine finely with rotor carefully set in chuck of lathe to obtain squareness and concentricity.

   Main Displacement Rotor Thrust.
   Provision has been embodied in the pump design for receiving the rotor thrust by employing one hardened and ground thrust disc and one bronze thrust disc. These discs are pegged to the stuffing box inner face and the rotor boss respectively. The bronze disc final thickness controls the pump rotor end clearance. Later reference re end clearance adjustment refers to this thrust disc.

   Inner Rotor Pin, Inner Rotor and Cover Assembly.
   The inner rotor pin is a light press fit within the cover. The lubrication groove on the pin should be centrally placed between the cover crescent ends.

   Remove all foreign matter from cover face and pin seating shoulder before insertion secure pin firmly with lock nut.

   Inner rotor and bush having the correct clearances may now be fitted after grease application on pin.

   For hot bitumen applications the inner rotor seal disc is omitted as the bitumen offers reasonable lubrication and the grease equipment is normally used only in the initial daily starting cycle, or after solvent flushing.

   The inner rotor width and the cover crescent width must be closely matched therefore should a new rotor be fitted at any later time care must be taken to match the inner and outer tooth width with the cover crescent, All new parts are closely toleranced however fitting one new part to other worn but servicable parts requires width matching to ensure maximum pump efficiency.

ASSEMBLY OF BY PASS RELIEF VALVE.

The by pass relief valve is of a balanced design and the valve must move freely within the body and body cap.

Adjustment is effected by the adjusting screw: clockwise rotation increases pressure and anticlock rotation decreases by pass pressure.

CAUTION: When handling hot bitumen it is necessary to flush pump before shutting down, however to remove accumulated bitumen from within the valve operate valve several times by closing pump discharge when flushing with solvent.

Should this routine flushing be neglected it may be necessary to heat the by pass cap to free the valve for operation.

Assemble by pass valve unit to pump cover with adjustment end adjacent to suction port of pump body.

GENERAL ASSEMBLY.

Fit steel thrust to outer rotor boss with oil grooves to stuffing box - secure on drive dowell.

Insert drive shaft, thrust disc and rotor within body.

The cover assembly is fitted to the body with the crescent located directly opposite (180°) the body seal which divides the suction core from the discharge coring. This seal provides the narrow land separating the body coring in the internal diameter.

Only ONE gasket 1/64" thick of heat resistant asbestos base material is used. Do not alter or change this recommendation.

The assembly of these heavy components may be easily effected by placing cover in a vyce and holding same by the pin boss, or on two metal strips; fit gasket and inner rotor and then lower outer rotor into mesh with inner rotor and cover. Fit rotor thrust on drive dowel then slide body over rotor shaft and position as outlined. Tighten cover nuts uniformly to 60-70 lbs foot torque. With the drive shaft in the vertical position the clearances between the cover and rotors will be zero therefore to effect the recommended end clearance affix the bronze thrust disc to the stuffing box dowel and slide this assembly down the drive shaft omitting for this check the sealing gaskets.

Whilst holding stuffing box squarely and firmly in position check the gap clearances between the body face and stuffing box with feeler gauges. As the recommended single heat resisting gasket will occupy .014" compressed and the total end clearance required is .016" a clearance of .002" between the faces of the stuffing box and body is required; this could be toleranced to .002" to .004" gap clearance before insertion of the .014" gasket. Should the gap clearance exceed this tolerance face machine the required amount from the back of the bronze thrust disc; for a lesser clearance machine accurately the stuffing box to body face.

The above procedure might never be necessary, however where pumps are operating in remote areas we offer these recommendations.

Finally tighten all stuffing studs and then check rotor shaft for free rotation.

Gland.

Pack with $\frac{3}{8}$" square approved packing, cut turns accurately using mitre or butt joints

Do not tighten packing excessively when hard, replace with new packing.

Grease gland thoroughly.

Grease inner rotor bush end body bush with heat resistant grease.

SERVICE DIFFICULTIES.

Pump fails to prime:	Blocked suction. Air leak on suction. Obstruction under relief valve.
Pump capacity low:	Increase relief valve pressure. Check clearances. Check air leak or obstruction. R.P.M. Low.
Pump overloads engine:	Bitumen temperature too low. Obstruction on discharge. Relief valve setting too high. Incorrect alignment of pump causing rotor binding.
Pump rated capacity:	170 G.P.M. @ 400 R.P.M. 25 P.S.I.G. 70 - 100 C/S viscosity.

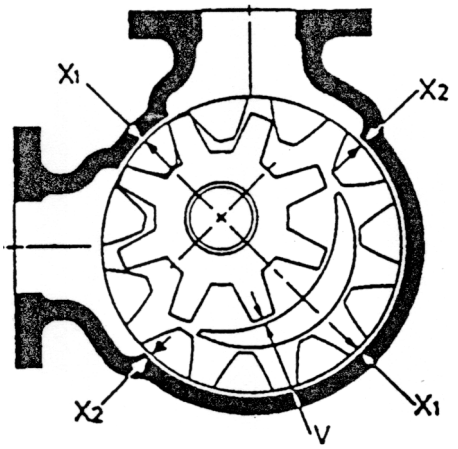
Spares: When ordering spares pump serial number must be quoted.

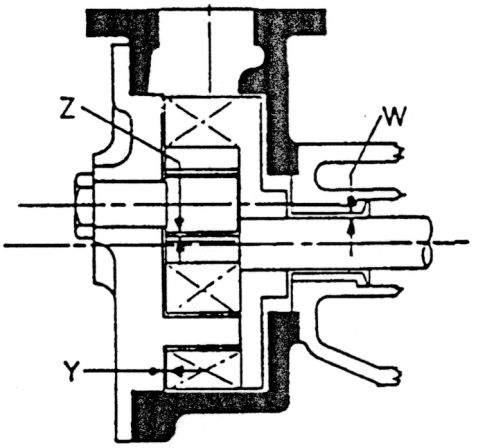
Telegram: EBS-RAY, Sydney.

Ebs-Ray Pumps Pty. Ltd.,
628 Pittwater Road,
BROOKVALE. N.S.W.

Table of Clearances – All sizes in millimetres (Running Clearances)

Clearance	GRADE	LD100	LD114	LD112	LD200	LD212	LD300	LD400
		Size						
X Diametral - Outer Rotor to Body	A	0.08 - 0.14	0.11 - 0.17	0.13 - 0.20	0.15 - 0.22	0.16 - 0.25	0.20 - 0.30	0.25 - 0.35
Y Axial - Rotors to Cover	A	0.04 - 0.06	0.04 - 0.07	0.05 - 0.08	0.05 - 0.08	0.06 - 0.10	0.10 - 0.15	0.10 - 0.15
Z Diametral - Rotor Pin to Bearing	A	0.06 - 0.09	0.06 - 0.09	0.06 - 0.09	0.06 - 0.09	0.07 - 0.10	0.12 - 0.16	0.12 - 0.16
W Diametral - Shaft to Bearing	A	0.04 - 0.06	0.04 - 0.06	0.04 - 0.06	0.04 - 0.06	0.05 - 0.08	0.09 - 0.12	0.10 - 0.14
V Radial - Inner Rotor to Crescent	A	0.03 - 0.06	0.03 - 0.06	0.03 - 0.06	0.04 - 0.07	0.04 - 0.07	0.04 - 0.07	0.04 - 0.07





NOTE:

Thrust disc fitted to Series 300 and 400 pumps ONLY.

The above clearances are for optimum performance however a satisfactory performance is assured for lengthy period with clearances well beyond the figres cited due to normal usage.

NOTE: 1 only Heat Resisting Gasket used. 1/64" Thick between faces.

Installation.
Correct alignment of the pedestal bearing adjacent to the drive pulley is vital.

To accurately locate the bearing remove pump end cover and position pedestal to yield concentricity of the driving rotor within the pump body; shim pedestal if necessary.