Publication # 1783-02

EBSRAY PUMPS

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

MD SERIES
MODELS MD100 – MD212
& HD100 & HD114
INTERNAL GEAR PUMPS
(Cartridge Seal Types)

Quality System
Quality Endorsed Company ISO 9001 Lic 3332
HEAD OFFICE & WORKS

EBSRAY AUSTRALIA

SECTION 1 – GENERAL

INTRODUCTION

This leaflet is intended to assist those involved with the installation, operation and maintenance of EBSRAY Models MD100 to MD212, and HD100 & HD114 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

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 pumpsets 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 pumpset 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. Be sure to allow for crane or hoist access if required.

2.2 FOUNDATIONS

Baseplate pumpsets 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 pumpsets 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.

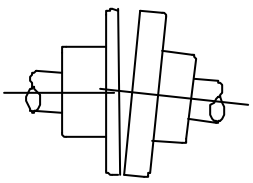


Figure 1

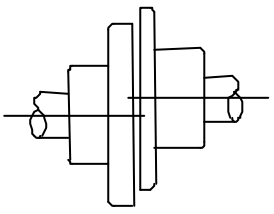


Figure 2

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.

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

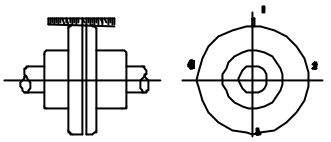


Figure 4

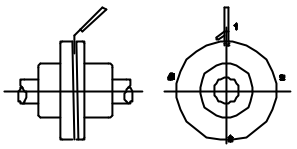


Figure 3

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.

SECTION 3 - OPERATION

3.1 DESCRIPTION

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 fulfil this efficient displacement cycle. Power is applied to the outer rotor 'A' and transmitted to the meshing idler or 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 Fig.5)

3.2 PUMPING PRINCIPLE

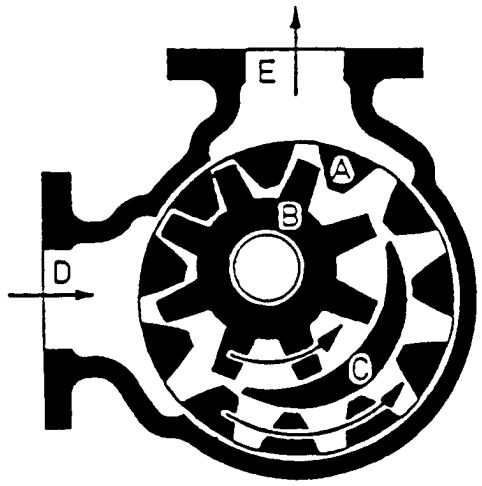


Figure 5

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 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 'C'. This sealing crescent establishes a labyrinth between the high and low pressure sides, minimising 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 minimise tooth wear.

The inner rotor 'B', or idler remains in almost hydraulic balance requiring only minimal torsional load to effectively follow the outer drive rotor.

3.3 APPLICATIONS

The field of applications for Internal Gear rotary positive displacement pumps is extensive. These pumps are used 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 or non-corrosive conditions. Accordingly material, speed and power specifications vary and it is important to use such equipment strictly adhering to the manufacturers' recommendations.

3.4 LUBRICATION

Lubrication of the inner rotor bearing and bracket bearing is dependent on the pumpage's lubricating qualities/material selection of the bearing. The ball bearing is lubricated at the time of assembly with a high quality grease. Replacement of this grease is normally only necessary when major maintenance is carried out.

3.5 STARTUP 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 pumpset or system, disengage coupling before checking direction of rotation.

_ Do not start pump against closed discharge valve or with inlet valve throttled.

3.6 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.

3.7 RELIEF VALVE

To protect the pump from overpressure due to inadvertent shutting of discharge system, an 'Integral' or 'Inline Type' bypass valve capable of circulating the entire pump output is available.

The inline valve is installed in the pump discharge line and normally returns to the suction side of the pump. With either type of bypass valve fluid temperature will rise if differential pressure is high and bypass conditions are maintained for extended periods. On commissioning, the bypass valve should be set in accordance with the predetermined pump differential pressure required.

Refer Section V for integral types or separate instructions for in-line types

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 which is located on the nameplate of the pump.

2. Advise the name, item number and quantity required.

   Refer to Drg No. CMP090

3. Advise complete delivery instructions.

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

NOTE: These instructions should be followed in conjunction with manufacturers seal assembly / disassembly instructions.

1 Rotate pump shaft until mechanical seal locking/centreing device/s can be attached or rotated into locking position. Lock device into position.

2 Release grubscrews from mechanical seal drive collar. (**NOTE:** do not re-use grubscrews)

3 Remove pump coupling half.

4 Release grubscrew locking race carrier in bracket.

5 Unscrew race carrier assembly from bracket complete with outer spacer, outer Lockring, bearing, and lipseals.

6 Remove grubscrew locking outer Lockring into race carrier, unscrew outer Lockring and remove bearing from race carrier.

7 Remove lip seals from race carrier and outer Lockring.

8 Remove inner spacer from shaft.

9 Remove circulation harness and any piping connections from seal plate body.

10 Release mechanical seal setscrews and withdraw seal assembly from bracket.

11 Remove cover assembly complete with inner rotor Note: Due to the weight of the cover assembly, provision should be made to adequately support the assembly during withdrawal and care taken to ensure that the inner rotor does not slide off the inner rotor pin.

12 The rotor/shaft assembly can now be driven through the pump from the drive end ensuring care is taken to support the rotor end when withdrawing the assembly.

13 Disassemble cover assembly if required.
Note: removal of inner rotor pin is not required unless replacement is necessary or jacket gasket (if fitted with jacket) is leaking.

14 Remove body from bracket if required.

15 Press out inner rotor and bracket bearings if replacement is required.

4.4 INSPECTION

Inspect components for damage or excessive wear. Note that typical wear of components in EBSRAY's rotary internal gear positive displacement pumps tend 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 service life and could be used provided any burrs or sharp edges are removed prior to reassembly.

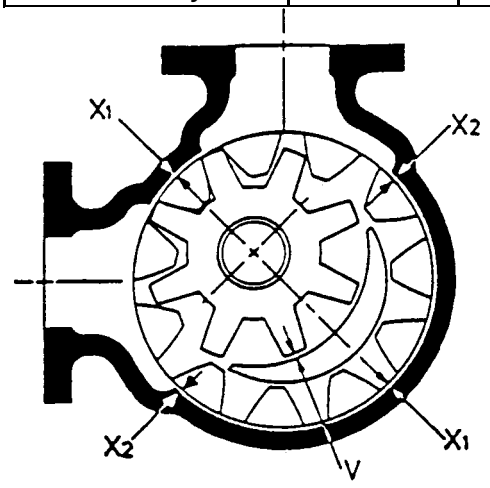
Major refurbishing of the pump should be done in line with reconditioning to an 'as new' status as replacing or repairing one component will have an effect on other components and the working clearances of the pump.

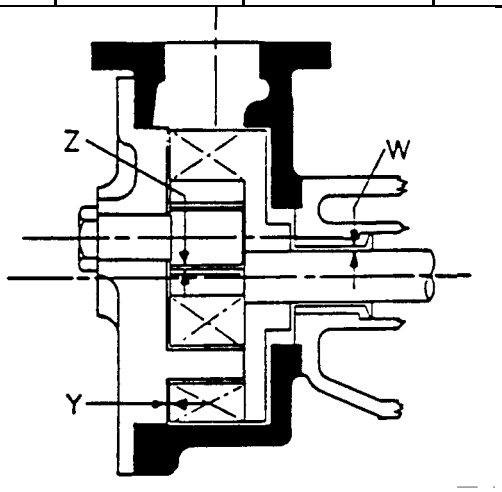
Table of Clearances – All sizes in millimetres (Running Clearances)

Clearance	GRADE	MD100 HD100	MD114 HD114	MD112	MD200	MD212
		Size				
X Diametral - Outer Rotor to Body	A	0.10 - 0.16	0.11 - 0.17	0.13 - 0.20	0.15 - 0.22	0.16 - 0.25
	B	0.18 - 0.24	0.19 - 0.25	0.21 - 0.28	0.23 - 0.30	0.25 - 0.35
	C	0.27 - 0.34	0.28 - 0.35	0.30 - 0.38	0.33 - 0.42	0.37 - 0.48
Y Axial - Rotors to Cover	A	0.04 - 0.07	0.04 - 0.07	0.05 - 0.08	0.05 - 0.08	0.06 - 0.10
	B	0.08 - 0.10	0.08 - 0.10	0.09 - 0.12	0.09 - 0.12	0.12 - 0.14
	C	0.16 - 0.19	0.16 - 0.19	0.17 - 0.22	0.17 - 0.22	0.20 - 0.28
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
	B	0.06 - 0.09	0.06 - 0.09	0.06 - 0.09	0.06 - 0.09	0.07 - 0.10
	C	0.06 - 0.09	0.06 - 0.09	0.06 - 0.09	0.06 - 0.09	0.07 - 0.10
W Diametral - Shaft to Bearing	A	0.05 - 0.08	0.05 - 0.08	0.05 - 0.08	0.05 - 0.08	0.05 - 0.08
	B	0.07 - 0.10	0.07 - 0.10	0.07 - 0.10	0.07 - 0.10	0.07 - 0.10
	C	0.07 - 0.10	0.07 - 0.10	0.07 - 0.10	0.07 - 0.10	0.07 - 0.10
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
	B	0.03 - 0.06	0.03 - 0.06	0.03 - 0.06	0.04 - 0.07	0.04 - 0.07
	C	0.03 - 0.06	0.03 - 0.06	0.03 - 0.06	0.04 - 0.07	0.04 - 0.07

Torque Wrench Settings

Body to Bracket	44NM	44NM	44NM	44NM	44NM
Cover to Body	18NM	18NM	28NM	28NM	28NM





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

2 Ensure free running fit of outer Lockring in race carrier.

3 Fit lip seals to race carrier and outer Lockring, positioning sealing lips towards bearing.

Note: The following instructions apply to the fitting of metallic bearings, for carbon

bearings the recommended method is 'shrink fitting'.

4 If replacing bracket bearing:

Press in ensuring lubrication groove in bearing is adjacent to greaser hole in bracket. Machine or ream to achieve required clearance on shaft ensuring squareness and concentricity with locating spigot.

5 If replacing inner rotor bearing:

Press in. Machine or ream to achieve required clearance on inner rotor pin ensuring squareness and concentricity with inner rotor O.D.

6 Carry out preliminary sizing checks:

a) Outer rotor in body diametral clearance Note: If checking by feeler gauge method allowance or compensation must be made for eccentricity caused by:

i) Weight of rotor.

ii) Clearances between shaft and bracket bearing.

iii) Lack of bearing support at drive end

To measure clearance insert feeler gauge at two opposite measurement points 'X_1'. Add the two clearances together. This will give the diametral clearance 'X' for the two points. Repeat this procedure for the other two measurement points 'X_2'. (refer fig 6)

b) Inner rotor width, outer rotor tooth depth and cover crescent length must be a matched dimension.

c) Clearance between inner rotor and cover crescent remembering to make allowance for inner rotor pin to bearing clearance.

4.5 REASSEMBLY

(Refer Drg No. CMP090)

Note: Whilst the application of this pump requires no 'in service' lubrication to either the bracket bearing or the inner rotor bearing, the standard fitment on this model provides for lubrication therefore all assembly instructions are made with reference to standard fitment.

1 Using a new gasket, locate the cover plate (if applicable) on the cover with the inner rotor pin bores in alignment. Fit two temporary bolts and nuts in holes on opposite sides of cover assembly to ensure correct alignment whilst fitting the inner rotor pin, do not tighten. Fit copper gasket to inner rotor pin and press inner rotor pin into cover assembly ensuring lubrication groove points centrally towards crescent and adequate support is given around the rotor pin bore boss when pressure is applied.

2 Place inner rotor pin washer over inner rotor pin and tighten inner rotor pin nut securely whilst maintaining lubrication groove location. Note: Use of a split clamp will aid this operation. When rotor pin nut is secure, remove the temporary bolts and nuts.

3 Fit body to bracket with sealing gasket between faces, maintaining correct suction and discharge port orientation, Tighten fastenings evenly to specified torque (see torque wrench settings Page 7).

4 Carefully Insert rotor/shaft assembly ensuring rotor bearing is lubricated.

5 Fit inner rotor over inner rotor pin in cover assembly with flush side towards cover, ensuring bearing is lubricated.

6 Fit cover assembly to body with sealing gasket between faces and making sure the seal land of the cover matches with the seal land in the pump body. Note: This seal land is diagonally opposite the centre of the cover crescent. Tighten fastenings evenly to specified torque (see torque wrench settings Page 7). Lubricate pump elements through pump port and check that rotor/shaft assembly turns

freely.

7 Fit mechanical seal to bracket and secure in place using setscrews. (Refer to seal manufacturers instructions)

8 Fit inner spacer to shaft.

9 Fit bearing into race carrier and lock into position with outer Lockring, secure Lockring with grubscrew through Lockring.

10 Lubricate outer diameter of bearing race carrier and lipseals in bearing carrier and Lockring with grease.

11 Slide bearing carrier along shaft, and using a suitable cylindrical drift, tap bearing inner ring along shaft whilst simultaneously rotating race carrier to engage thread. Continue to "tap and turn" until inner spacer is firmly located against shaft shoulder and inner ring of bearing is firmly located against inner spacer.
NOTE: Outside diameter of drift should be less than or equal to outside diameter of outer spacer, and outer surface of drift should have a finish that will not damage the lipseal.

12 Fit outer spacer to shaft and then fit pump coupling half to shaft.

13 Fit washer and setscrew to shaft and tighten securely.

14 - **AXIAL CLEARANCE ADJUSTMENT**

The bearing carrier when finally positioned determines the ball bearing location within the bracket. As the ball bearing is firmly locked to the shaft by the locknut, the positioning of the ball bearing will control the rotor axial clearance. To adjust axial clearance:

a) A suitable handle should be affixed to the coupling to facilitate rotating of assembly.

b) Slowly screw race carrier into bracket whilst simultaneously rotating assembly. This enables sensing the Rotor-Cover point of contact ie. a slight drag is felt by hand.

c) Mark race carrier position relative to bracket (mark bracket and race carrier close to periphery of race carrier) i.e. establish a datum point for setting axial clearance.

d) Back off race carrier 180◦ to eliminate any backlash

e) Retighten race carrier to a point measured radially from previously marked datum, equivalent to the amount of desired axial clearance.

Note: 19mm radial movement on the O.D. of the race carrier is equal to 0.1mm axial movement of the rotor shaft assembly. Refer table of clearances.

f) Lock race carrier into position using grubscrew in bracket. Axial clearance should now be established.

g) Lock mechanical seal drive collar onto shaft using new grubscrews.

h) Unlock mechanical seal locking devices (Refer to seal manufacturers instructions)

SECTION 5 - INTEGRAL BYPASS VALVES

5.1 PREPARATION FOR DISASSEMBLY

Isolate pump from liquids in suction and discharge lines, depressurise and purge out any toxic, flammable, corrosive or air hardening liquids.

5.2 DISASSEMBLY

1 Remove adjusting screw cap.

2 Unscrew adjusting screw locknut and remove adjusting screw to relieve spring tension.

3 Unscrew bypass valve housing cap and withdraw internal components.

4 Remove bypass valve housing from pump cover if required.

5.3 INSPECTION:

Inspect all components for damage or excessive wear. Repair or replace components as required.

5.4 REASSEMBLY - PRELIMINARY

1 Lap valve into valve seat. Ensure no lapping compound remains as this may damage pump. Ensure bleed holes (if present) in valve and pressure pin are unobstructed.

2 EBSRAY recommend replacement of gaskets during every overhaul.

5.5 REASSEMBLY

POPPET TYPE
As fitted to MD100 & MD114 and HD100 & HD114.

1 Screw locknut onto adjusting screw and screw the adjusting screw partially into the housing cap.

2 Fit valve in housing, ensuring freedom of movement.

3 Fit spring on top of valve.

4 Fit washer on top of spring.

5 Fit gasket to cap and screw cap into housing, taking care not to dislodge spring or washer. Tighten firmly then fit adjusting screw cap and gasket.

6 Fasten valve housing to pump. The adjusting screw is oriented towards the suction port.

BALANCED TYPE
As fitted to MD112, MD200 & MD212.

7 Screw locknut onto adjusting screw and screw latter fully into housing cap.(this is to aid location of pressure pin during assembly) Fit gasket to housing cap.

8 Fit valve in housing, ensuring freedom of movement.

9 Assemble pressure pin, washers and spring as shown in drawing CMP 007 and hold the assembly in position on top of valve.

10 Whilst using a suitable tool to maintain position of pressure pin assembly, fit housing cap assembly over housing,locate pressure pin in adjusting screw. Gradually unscrew adjusting screw until housing cap can be screwed into housing. Firmly tighten cap then fit adjusting screw cap and gasket.

11 Fasten valve housing to pump. The adjusting screw is oriented towards the suction port.

5.6 BYPASS VALVE ADJUSTMENT AND OPERATION

WARNING
Serious injury to personnel and/or damage to equipment may occur if system or component design pressure is exceeded. Should there be any doubt as to the pressures likely to be generated in the system with an inoperative or incorrectly set bypass valve, please contact EBSRAY for more information.

NOTE: In order to set the bypass valve, a throttling valve must be located in the discharge line downstream of the bypass valve. A pressure gauge must be installed in the discharge line between the pump and the throttling valve.

ADJUSTMENT PROCEDURE

1. First open the throttling valve and any other valves in the discharge line in order to minimise the discharge pressure as much as possible.

2. Before starting the pump, loosen the locknut on the bypass valve adjusting screw and screw the adjusting screw fully in (clockwise). This increases the tension on the spring and is the maximum pressure setting for the particular spring as fitted. [A number of springs are available to give different pressure ranges]

3. Start the pump and slowly close the throttling valve (ensuring maximum operating pressure is not exceeded) until the pressure gauge shows expected bypass valve ***cracking pressure***.

   Now turn the adjusting screw out (anticlockwise) until the gauge registers a slight drop in pressure - At this point the bypass valve has begun to open ie. ***cracking***. Screw in the adjusting screw one turn (clockwise) and then tighten the locknut. Stop the pump.

VERIFICATION OF ADJUSTMENT

Re-open the throttling valve. Restart the pump. Observe the pressure gauge whilst again slowly and cautiously closing the throttling valve. The gauge should register a levelling off (or reduction) in the characteristic pressure rise once the bypass valve cracking pressure has been reached.

NOTE: Any pressure rise (or fall) after the cracking point may depend upon:

a. Flow rate through the bypass valve. (Excessive pressure rise may signify restrictions in pipework, fittings etc.)

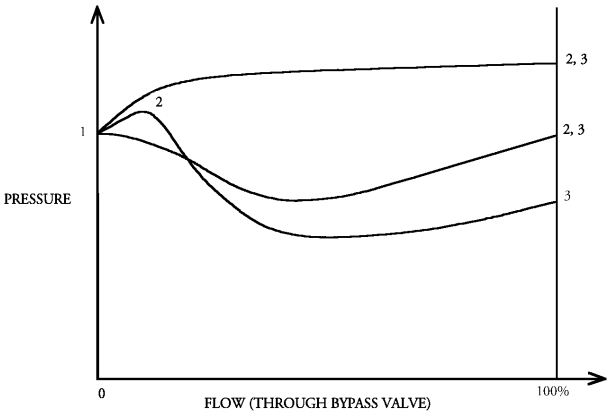
b. Viscosity of product at pumping temperature.

c. Specific bypass valve design and size.

Typical Bypass Valve Characteristics

1 Cracking pressure
2 Maximum pressure
3 Full flow (bypass) pressure

The above graph represents various typical bypass valve characteristics. Actual

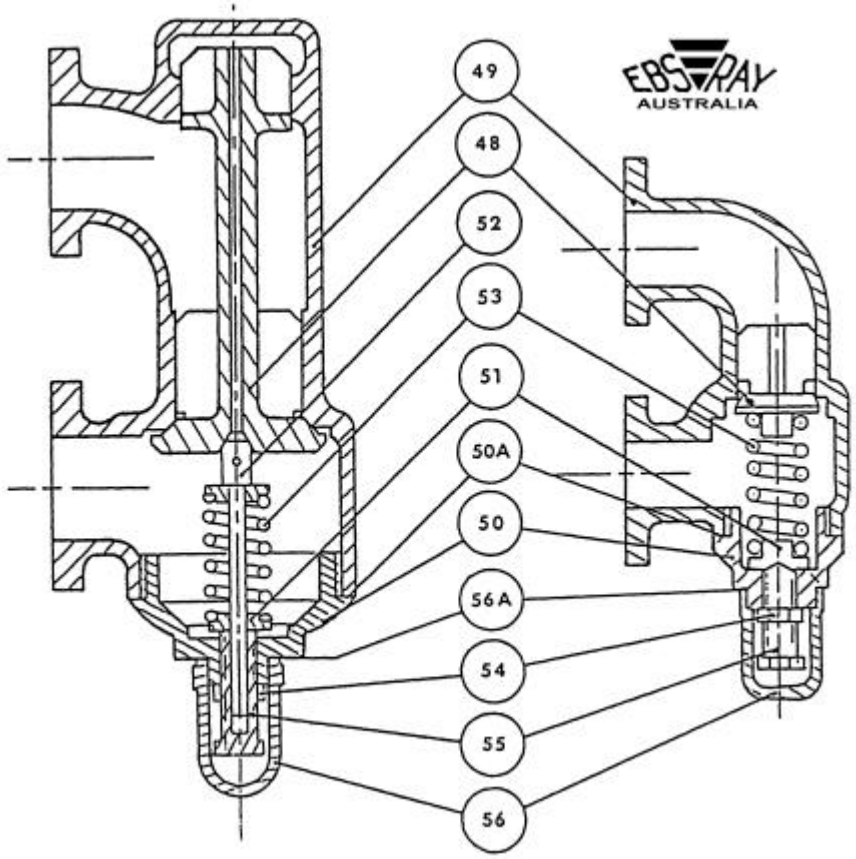


performance during operation will depend on bypass valve and system design and may also be affected by the parameters (a. b. & c.) as listed above.

PARTS DESIGNATION – BYPASS VALVES

REFER DRG No : CMP007

ITEM NO.	DESCRIPTION	To Suit MD112, MD200 & MD212 QTY	To Suit MD100 & MD114 and HD100 & HD114 QTY
48	BYPASS VALVE	1	1
49	HOUSING - BYPASS VALVE	1	1
50	CAP - BYPASS VALVE HOUSING	1	1
50A	GASKET - BYPASS CAP	1	1
51	SPRING RETAINING WASHER	2	1
52	PRESSURE PIN	1	0
53	SPRING	1	1
54	LOCKNUT - ADJUSTING SCREW	1	1
55	ADJUSTING SCREW	1	1
56	CAP - ADJUSTING SCREW	1	1
56A	GASKET - BYPASS SCREW CAP	1	1



Drawing #: CMP007

SECTION 6- TROUBLE SHOOTING

6.1 PUMP FAILS TO PRIME OR DELIVER LIQUID

1 Incorrect direction of rotation.

2 Speed too low:

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

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

3 System discharge head too high - check system head, friction losses and bypass valve setting.

4 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.

5 Air leaks and/or air pockets in suction line - check suction piping.

6 Bypass valve open due to obstruction under seat of valve or setting too low.

7 Suction filter/strainer blocked or leaking air.

6.2 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.

6 Suction lift too high, i.e. static lift excessive, air leak in suction line.

7 Excess end clearance setting of rotor to cover.

8 Excess clearances in pump due to wear.

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 bind - check for proper clearances or foreign matter in pump.

4 Bearings worn - inspect and replace as required.

5 Obstructions in pipe lines, clogged strainers, partially open valves.

6.4 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) Reduce product viscosity.

2 Rotating parts bind - check for proper clearances.

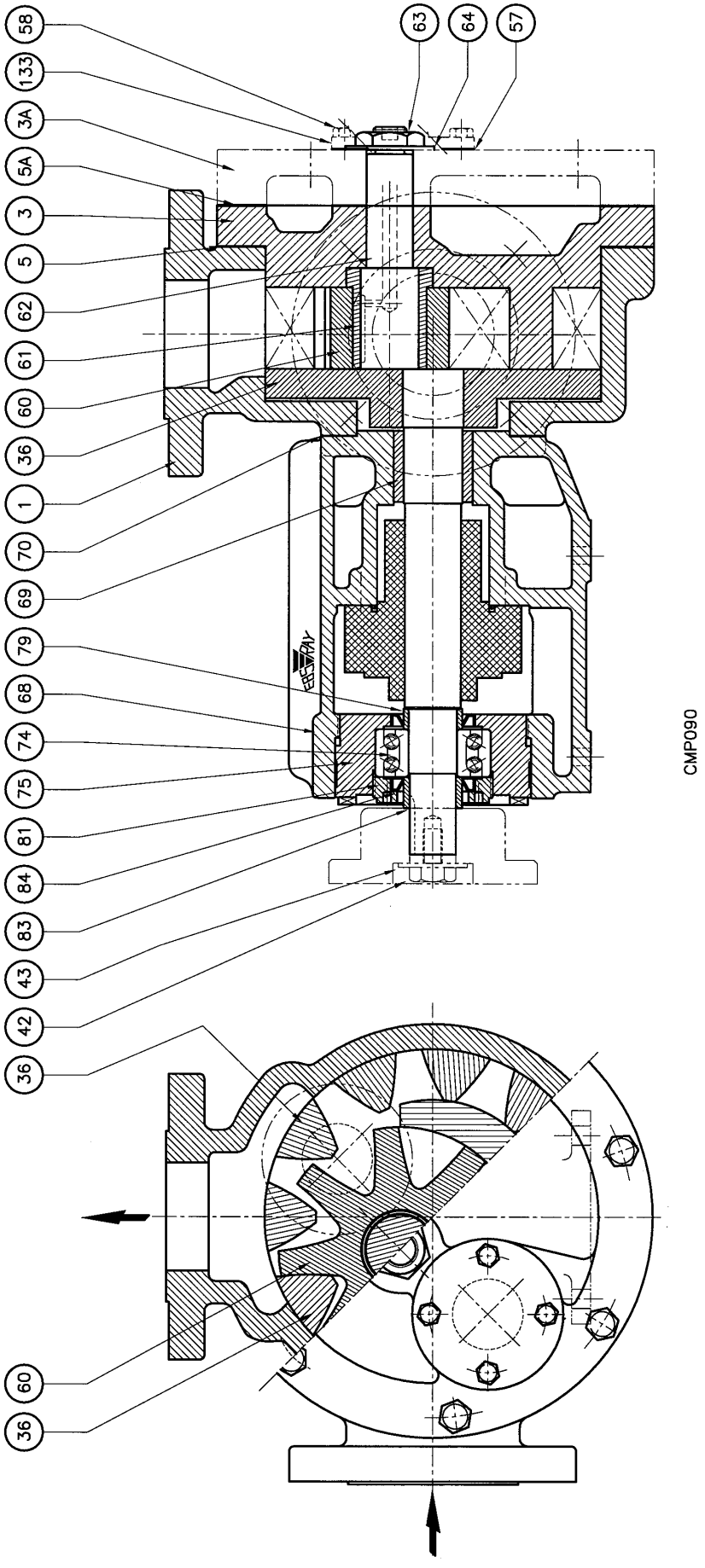
3 Pump and driver misaligned - check coupling and realign as required.

SECTION 7 - PARTS DESIGNATION MD112

REFER DRG No : CMP090

Item No.	Item	Qty	
1	Body	1	
3	Cover	1	
5	Gasket - Cover	1	
36	Rotor/Shaft Assembly	1	
42	Setscrew - Shaft		1
43	Washer - Shaft	1	
60	Inner Rotor	1	
61	Bearing - Inner Rotor	1	
62	Inner Rotor Pin	1	
63	Nut - Inner Rotor Pin	1	
64	Washer - Inner Rotor Pin	1	
68	Bracket	1	
69	Rotor Bearing	1	
70	Gasket	1	
74	Ball Bearing	1	
75	Race Carrier	1	
79	Spacer Inner	1	
80	Lip Seal	1	
81	Lockring - Outer	1	
83	Spacer - Outer	1	
84	Lip Seal	2	

EBSRAY PUMPS Pty. Ltd. ABN 52 000 061 003
628 PITTWATER ROAD
BROOKVALE NSW 2100 AUSTRALIA
www.ebsraypumps.com.au
PHONE: (61) (2) (9905 0234)
FAX: (61) (2) (9938 3825)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