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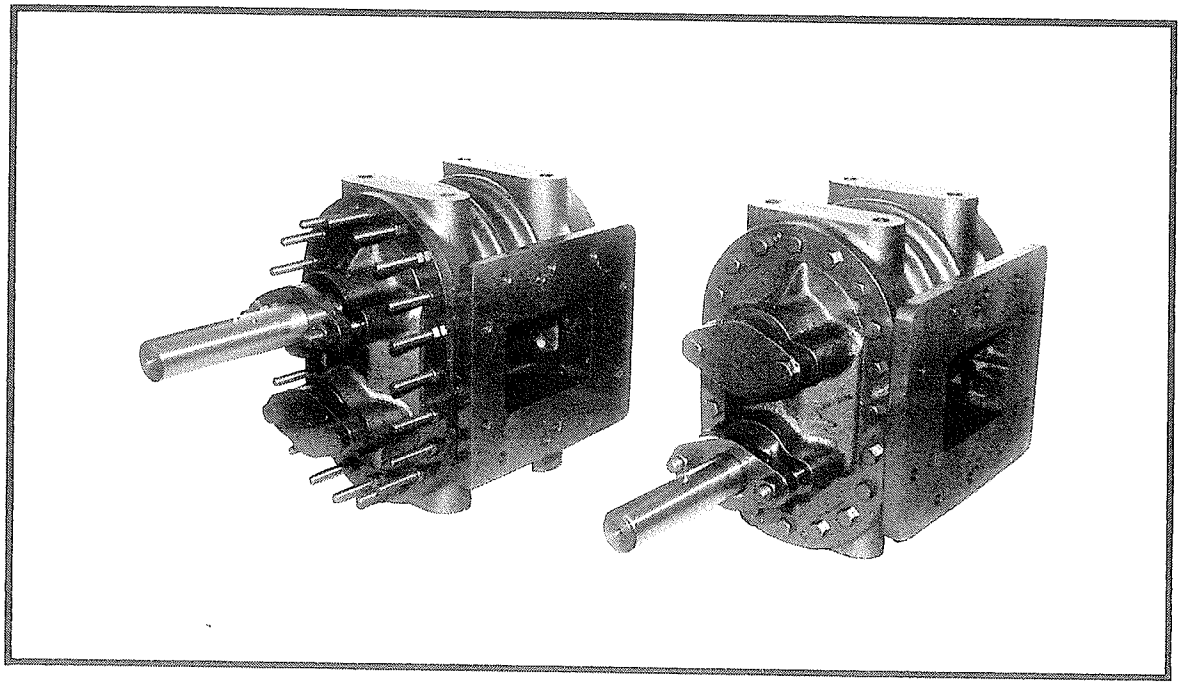
EBSRAY PUMPS

EBSRAY AUSTRALIA

Installation, Operation and Maintenance Instructions

G SERIES – MODELS G14, G22, G25

Helical Gear Pumps



SECTION 1 - GENERAL

INTRODUCTION

This publication is intended to assist those involved with the installation, operation and maintenance of EBSRAY Models G14, G22, G25 Helical 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 those 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 despatch 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 are 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 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: 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 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.

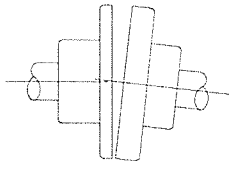


Figure 1

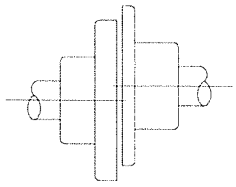


Figure 2

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.

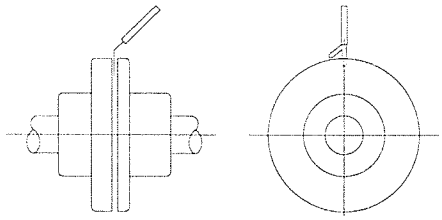


Figure 3

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

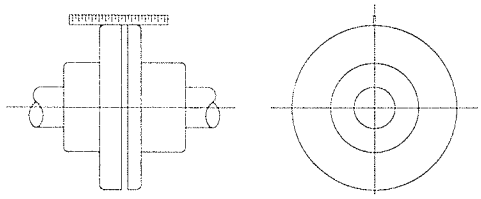


Figure 4

SECTION 3 - OPERATION

3.1 DESCRIPTION

The EBSRAY Models G14, G22 and G25 are positive displacement Helical Gear Pumps, comprising four separate gears per pump. One left hand and one right hand drive gear keyed to the drive shaft, separated by the divider plate, intermesh respectively with a right hand and left hand idler gear mounted on the idler shaft, also separated by the divider plate. The left hand drive gear and its intermeshing right hand idler gear are both taper-pinned to the drive and idler shafts repectively. Plain bearings located in the end covers support both shafts, with a conventional packed gland providing the necessary seal to the drive end of the shaft.

The intermeshing action of the two sets of gears provides the positive pumping action.

These pumps are available to suit internally mounted tank applications as well as convential truck and land based mountings. For the internally mounted tank applications, longer studs (3/8"BSW x 2 3/4") are fitted to the drive end cover to permit bolting to the inside of the tank whilst the nuts on the inspection end cover and the set screws on the corresponding bearing covers are wired together or tabbed to prevent the possibility of loosening.

3.2 LUBRICATION

No 'in service' lubrication is required as the bearings and gears are lubricated by the product pumped. It is therefore imperative that no abrasive or solid materials enter the pump as accelerated bearing and shaft wear would follow. Non-lubricating products of low viscosity, especially when pumped at high pressures, would also accelerate bearing and shaft wear.

3.3 STARTUP CHECKLIST

- ✓ Alignment of couplings.
- ✓ Direction of rotation.
- ✓ Freedom of rotation of shaft.
- ✓ Do not start pump against closed discharge valve or with suction valve throttled
- ✓ **DO NOT RUN PUMP DRY.**
- ✓ Pump speed, product viscosity and temperature as specified.

3.4 OPERATIONAL CHECKS

Inspect pump frequently during the first few hours of operation for such conditions as vibration, unusal noises or excessive gland leakage 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 installed, e.g. tightening or repacking of glands, providing complete isolation, depressurising and purging procedures have been completed. For internal tank mounted pumps, the tank should be emptied and the pump flushed out with a suitable liquid.

For major maintenance, it is recommended that the pump be removed from the installation.

NOTE: Due to the similiar nature of EBSRAY's Models G14, G22, G25 Helical Gear Pumps the one set of instructions applies, however axial clearances must be determined with respect to the individual model. (Refer Table I).

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.CMP056.
3. Advise complete delivery instructions, transportation, etc.

4.2 PREPARATION FOR DISASSEMBLY

1. Obtain the appropriate Work Permit if required.
2. After complete isolation and depressurising, flush out any residual product from the pump.
3. Isolate power supply and disconnect pump from system.
4. Remove pump from installation.

4.3 DISASSEMBLY

1. Stamp/identify adjoining surfaces of body and covers. Important: record position of drive shaft relative to porting and cover position to ensure that on reassembly, correct flow direction is maintained. (Refer Fig. 5)
2. Remove pump coupling half from drive shaft.

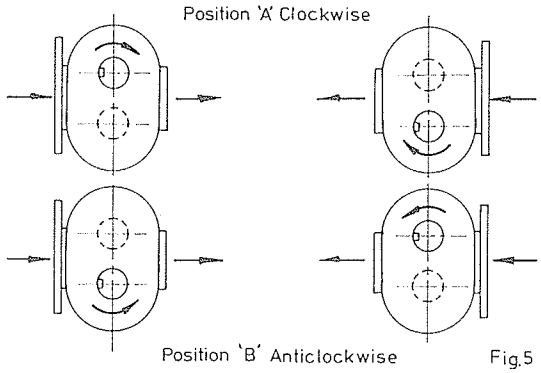


Fig.5

3. Remove inspection end cover.
4. Remove drive end cover and rotating gear assemblies.
5. Remove rotating gear assemblies from drive end cover.
6. Slide inspection end gears from their shafts.
7. Remove divider plate and spacers from their shafts.
8. Remove bearings and neck ring if worn (Refer Table I)

TABLE 1 - STANDARD CLEARANCES AND SIZES (FOR TEMPERATURES 0°C - 200°C)
REFER TO Fig 6. All sizes in millimetres

MODEL	BODY LENGTH (NOM)	DIAMETRAL CLEARANCES (3)				AXIAL CLEARANCE	
		BODY TO GEARS (2X)		BEARING TO SHAFT (2Y)		BODY TO GEARS (Z)	
		DESIGN	MAX	DESIGN	MAX	DESIGN	MAX
G14	133.35	0.14 - 0.21	0.30	0.09 - 0.13	0.30	0.18 - 0.28	0.35
G22	205.60	0.14 - 0.21	0.30	0.09 - 0.13	0.30	0.10 - 0.22	0.30
G25	224.66	0.14 - 0.21	0.30	0.09 - 0.13	0.30	0.10 - 0.22	0.30

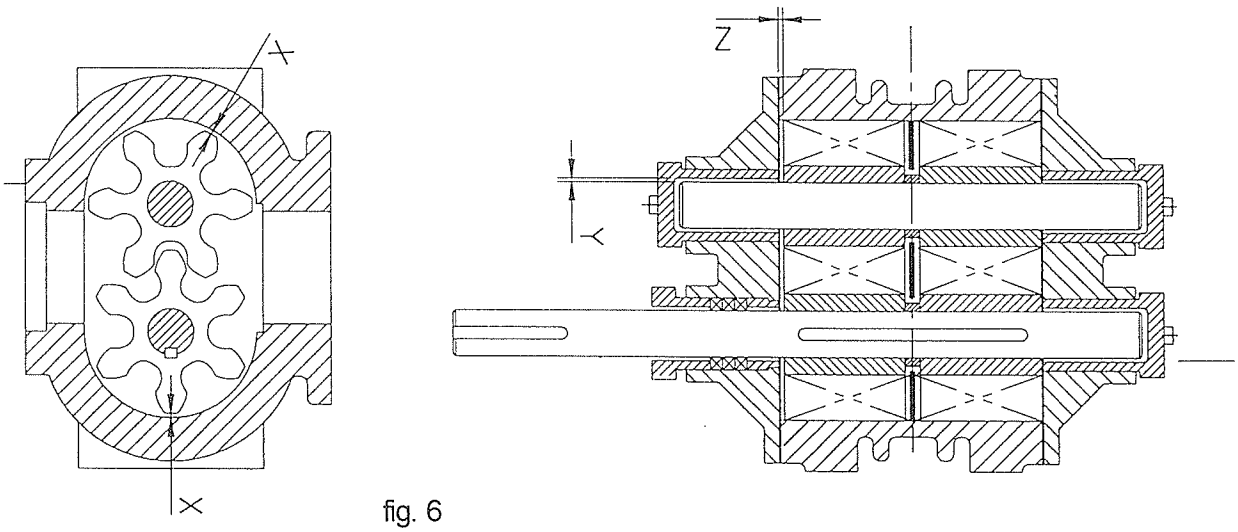


fig. 6

NOTES:

1. Maximum clearances assessed as being acceptable for "reasonable" pump performance when pump is worn.

2. Axial clearances comprise body length minus "stack height" of gears plus spacer plus gaskets. This result can be altered by using different thickness gaskets.

3. Feeler gauge readings (i.e. radial clearances) = diametral clearances divided by two.

4.4 INSPECTION

1. Measure body bore length (note size for later assembly).

2. Inspect gear teeth for signs of excessive wear, replace as required. Measure gear lengths (note dimensions).

3. Inspect cover faces for wear. If necessary machine flat.

4. Inspect divider plate and spacers. Replace if worn.

5. Check bearing/shaft clearances (Refer Table I).

6. Measure diametral clearances between gears and body (Refer Table I).

7. Add "stack height" of gears to achieve correct running clearances at each end (Refer Table I) Note: Centre clearances are set by centre spacers.

4.5 REASSEMBLY - PRELIMINARY

NOTE: THE FOLLOWING PROCEDURES ARE PREPARED FOR THE PUMP OVERHAULED TO STANDARD CLEARANCES. REASSEMBLY WITH WORN COMPONENTS NECESSITATES ADOPTING SPECIAL PROCEDURES TO ACHIEVE CORRECT ALIGNMENT OF PUMP ELEMENTS.

1. Ensure all parts are clean and free from sharp edges, burrs etc.

2. Refit bearings and and neck ring, replacing if required. Ensure that two bearings are fitted to the inspection end cover and that one bearing and the neck ring are fitted to the drive end cover with the neck ring being positioned to accomodate the drive shaft. Lubricate bearings and neck ring with a good quality suitable lubricant for initial startup of pump.

3. Should the left hand drive gear and its intermeshing right hand gear require replacement, note that both these gears are pinned to their respective shafts by steel pins. As removal of the pins may be difficult, shaft can be pressed from the rotor which will shear the pins. Before removal, measure the exact position of the gear from the end of the shaft. When refitting the replacement gears, repinning at the correct locations on each shaft will be required. Position new pin toward opposite end of rotor from previous pin (when in position) and at approximately 90° to original pin in shaft.
   NOTE: Replacement sub-assemblies as well as complete servicing facilities are available at EBSRAY.

4.6 REASSEMBLY (Refer Drg No. CMP056)

NOTE: In the reassembly instructions, it is assumed that both the left hand drive gear and right hand idler gear have been pinned to their respective shafts

1. Bolt drive end cover (2) to body (1) using correct thickness gasket (13) between faces, (gasket thickness being determined by step 7 of

INSPECTION procedure) matching positions of cover dowel holes with those in body.

2. Fit drive shaft (6) through neck ring (9) in drive cover so that left hand gear (5) is located correctly inside body (1).

3. Fit the end of the idler shaft (7) into the bearing (8) in drive end cover (2), meshing the attached right hand gear (4) with the left hand drive gear (5). Lubricate gears with a suitable lubricating oil.

4. Slide divider plate (11) into position and fit spacers (12) on to the respective shafts.

5. Install right hand drive gear (4) on drive shaft (6) over key (20) and out of pitch by half a tooth with the left hand drive gear (5). Should no "mismatch" occur, remove right hand gear, invert and replace correctly.

6. Install left hand gear (5) on idler shaft (7) to mesh with right hand gear (4) on drive shaft (6). Ensure gears are meshing correctly. Apply suitable lubricating oil to the four gears.

7. Fit inspection end cover (3) to body (1), matching positions of cover dowel holes with those in body and using correct thickness gasket (13) to give design end clearance.

8. Turn drive shaft (6) and check to ensure that pump is free to rotate. Should binding be evident, recheck axial (end) clearances and adjust with gaskets if necessary.

9. Drive two dowels into each cover, in the location holes provided before securing all bolts and studs.

Note: For internally tank-mounted pumps, all nuts or setscrews that will be located inside the tank must be secured (wired or tabbed) to ensure there is no possibility of inadvertent loosening or removal by vibration etc.

10. Fit hydraulic packing (19) into stuffing box. Cut each ring of packing to the circumference of the drive shaft (6), the ends cut at a 45 degree angle. Install so that each joint is staggered 90° from the adjacent one. Seat each individual ring firmly with a tamping tool. Fit sufficient rings to enable the gland nuts to be finger tightened against the gland (10), the full width of the nut.

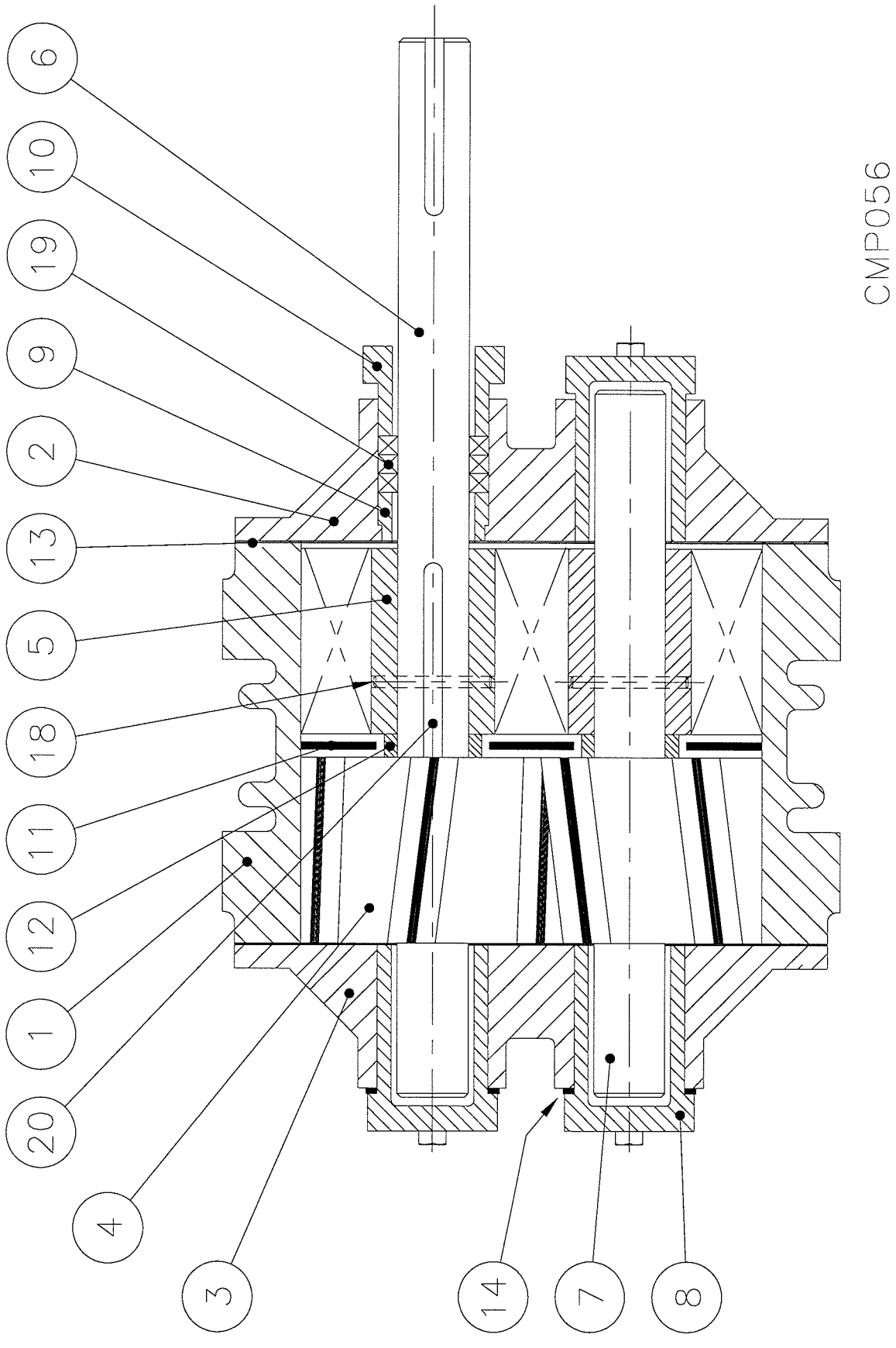
11. Turn drive shaft again to check for binding. If shaft is difficult to turn packing is too tight and should be adjusted until shaft turns freely.

12. Fit pump coupling half to drive shaft.

SECTION 5 - PARTS DESIGNATION

EBSRAY MODELS: G14, G22, G25 HELICAL GEAR PUMPS (Refer Drg No.: CMP056)

Cat#	DESCRIPTION	QUANTITY
1	Body	1
2	Drive End Cover	1
3	Inspection End Cover	1
4	Right Hand Gear	2
5	Left Hand Gear	2
6	Drive Shaft	1
7	Idler Shaft	1
8	Bearing	3
9	Neck Ring	1
10	Gland	1
11	Divider Plate	1
12	Spacer	2
13	Gasket - Body	2
14	Gasket - Bearing	3
18	Pin	2
19	Packing	600mm x 8mm Sq
20	Key - Gear	1


6
10
19
9
2
13
5
18
11
12
1
20
4
3
14
7
8
CMP056

SECTION 6 - TROUBLE SHOOTING

6.1 FAILURE TO DELIVER LIQUID

1. Incorrect direction of rotation.
2. Suction filter/strainer blocked or leaking air.
3. Liquid too viscous.
4. Suction pipe not immersed in liquid or no liquid in tank.

6.2 LOW OUTPUT

1. Pump speed too low.
2. Liquid too viscous for pump speed - reduce pump speed.
3. Air leakage in suction piping - tighten and seal all joints.
4. Obstruction in suction or discharge pipe.
5. Discharge head excessive and beyond the pump rating.
6. Pump parts worn - have pump reconditioned or replace worn parts.

6.3 EXCESSIVE POWER CONSUMPTION

1. Obstruction in discharge line.
2. Pump operating outside the specified duty point i.e. high pressure or viscosity.
3. Stuffing box packed too tightly - repack and adjust.
4. Rotating parts binding - disassemble pump and inspect.
5. Misalignment between pump and driver - check coupling and realign as required.
6. Inherent pipe stresses causing distortion of pump and casing - disassemble and realign before reassembling.
7. Bearings worn - inspect and replace as required.

6.4 PUMP IS NOISY

1. Air leakage in suction piping.
2. Cavitation due to suction lift too high - reduce suction lift.
3. Suction line sized too small - increase suction piping size.
4. Pump and driver misaligned - check coupling and realign as required.
5. Rotating elements binding - disassemble and inspect.
6. Bearings worn - Inspect and replace as required.

6.5 LEAKAGE

1. Leakage from covers:
   a) Cover set screws or nuts not tight - retighten.
   b) Damaged gaskets between faces - replace.
2. Excessive gland leakage:
   a) Take up gland nuts gradually, 1/6 turn (i.e one flat) every 5-10 minutes, until leakage stabilizes at about 3-5 drops per minute.
   b) Replace packing when leakage cannot be controlled by further take up of gland.
   c) Misalignment between pump and driver - check coupling and realign as required.
   d) Excessive system pressure - check for obstructions in discharge line.
   e) Worn or damaged shaft in packing zone - replace shaft.

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