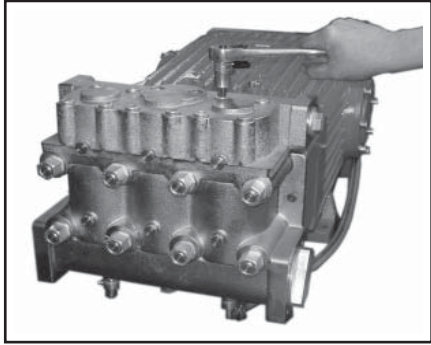
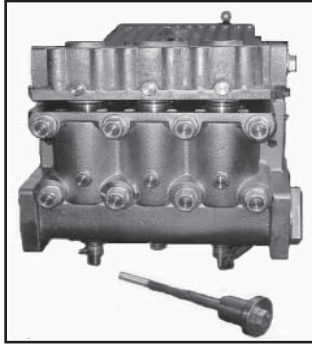


GP8155-R, GP8160-R and GP8165-R PUMP REPAIR INSTRUCTIONS

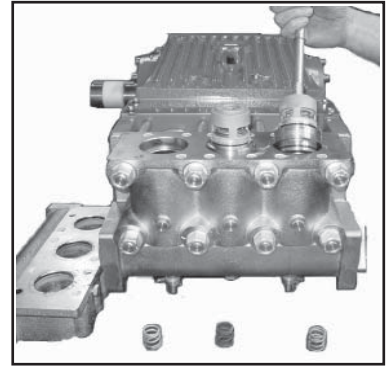
Valve Inspection and Repair



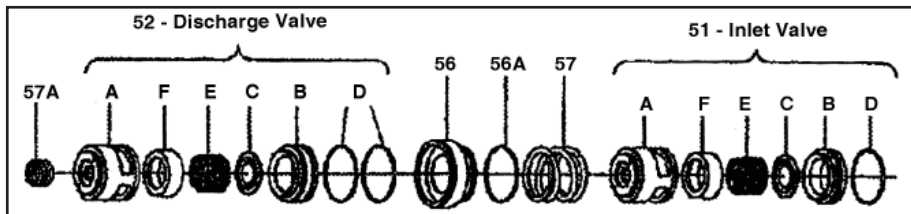
1) Remove socket head cap screws (58)



2) Lift discharge casing (50B) up and away.

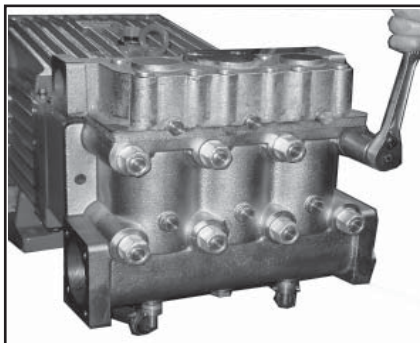


3) Take out pressure springs (57A). Pull out assembled valves (51 & 52) with valve puller.



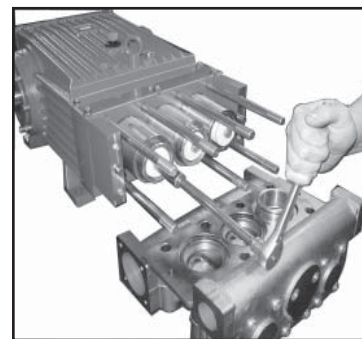
4) Remove valve assembly (52) from discharge valve adapter (56) by gently twisting apart. The spring tension cap (51A, 52A) is screwed together with the valve seat (51B or 52B). Remove spring tension cap. Takeout springs (51E, 52E) and valve plate (51C, 52C). Check sealing surfaces of valve plates (51C & 52C) and valve seats (51B & 52B) and O-rings (51D, 52D). Replace worn parts. Coat threads of valve seat with silicon grease or molycote anti-seize Cu-7439 when reassembling. Before refitting the valves, clean the sealing surfaces in the casing and check for any damage. Coat o-rings (51D, 52D & 56A) with silicone grease to help with re-assembly. Replace valve assembly (51) and pressure spring (57). Assemble valve assembly (52) to discharge valve adapter (56) by tapping together lightly with rubber mallet. While replacing the valve assemblies use a rubber mallet to tap the top of the valve puller lightly. This insures proper seating. Replace pressure spring (57A) and the discharge casing (50B). Tighten caps (58) at 132 Ft-lbs. (180 Nm); check torque tension after 8-10 operating hours.

To Check Seals and Plunger Pipe



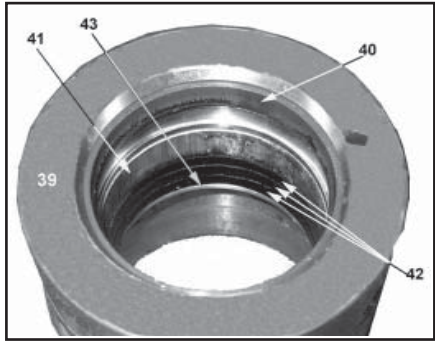
5) Remove hexagon nuts (49A) and valve casing together with seal case (38) from crankcase (1). If necessary, carefully tap the valve casing (50) past the centering stud (50A) using a rubber hammer.

IMPORTANT! If necessary, support the valve casing by resting it on wooden blocks or by using a pulley.

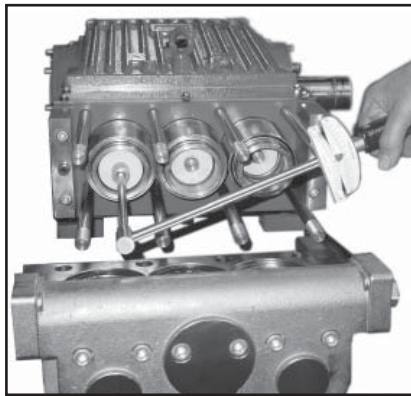


6) Remove tension screw (36C) and take seal sleeve (39) together with all mounted parts out of the drive. Pull plunger pipe (36B) out of the seal assembly and check for any damage. Carefully, remove seal rings (40) and sleeves (42) with a screwdriver.

GP8155-R, GP8160-R and GP8165-R PUMP REPAIR INSTRUCTIONS

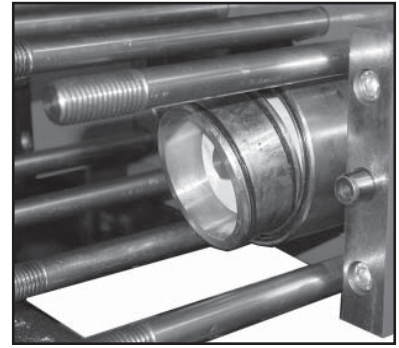


7) **Important!** Be careful not to damage the seal sleeve (39) and pressure ring (41). Check the inner diameter of the pressure ring for wear and if necessary replace together with seals (40) and (42). Clean all parts. New parts should be lightly coated with silicon grease before installation. Insert the seal unit (40, 41, 42 43) into the sleeve. Push the ceramic plunger carefully through the seals from the crankcase side. If necessary, the seals can be held tightly using a suitable pipe support held on the other side of the seal sleeve.



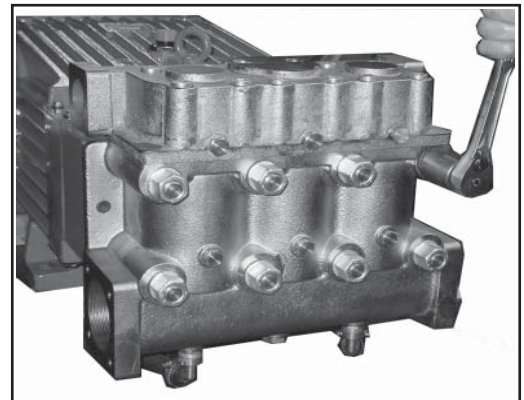
9) Coat the seal sleeve(39) lightly with anti-corrosive grease (e.g. molycote no.Cu-7439) in its fitted area towards the crankcase. Insert the seal sleeves in to their crankcase fittings. Coat the threads of the tension screw (36C) lightly with thread glue and insert it together with a new copper ring (36D) through the ceramic pipe. Turn the pump by hand until the plunger (25) rests against the plunger pipe. Tighten the tension screw at 30 Ft-lbs. (40 NM)

Important! Thread glue must never come between the plunger pipe (36B) and centering sleeve (36E). Overtensioning of the plunger pipe by excessive tightening of the tension screw and/or dirt or damage on the mounting surfaces can lead to plunger pipe breakage. Insert the seal tension spring (45) and o-ring (39A) in to the seal sleeve (39).



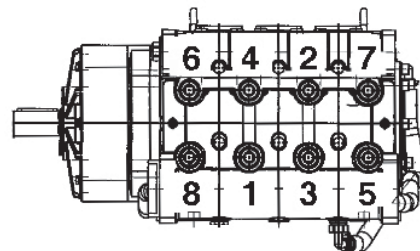
8) Take out the seal case (38) from the valve casing (50) and check o-rings (38A) (if necessary secure two screwdrivers in the front o-ring groove to extract seal casing from valve casing). Coat seals with silicon grease before installing.

Important! Mounting surfaces of the crankcase and the valve casing must be clean and free of damage. The components must lie exactly and evenly on one another. The same exactness applies for all centering positions in the crankcase, pressure and valve casing.



Replacing Valve Casing:

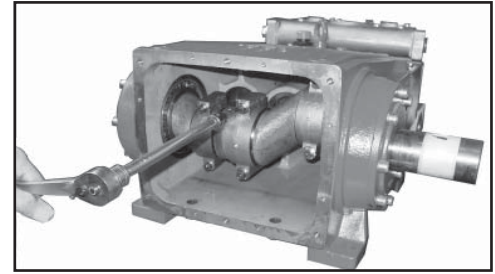
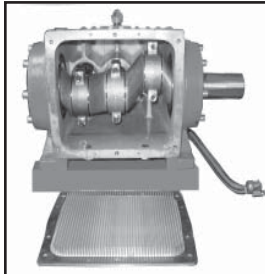
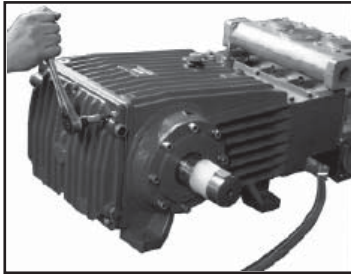
10) Put seal cases (38) in the centering holes of the valve casing, then push valve casing carefully on to centering studs (50A). Tighten hexagon screws (49A) evenly and crosswise at 265 Ft.-lbs. (360 NM). Follow pattern below.



Important! The torque tension on the screws (49A) must be checked after 8-10 operating hours; the pump must be at zero pressure. Thereafter, the tension is to be checked every 200 operating hours.

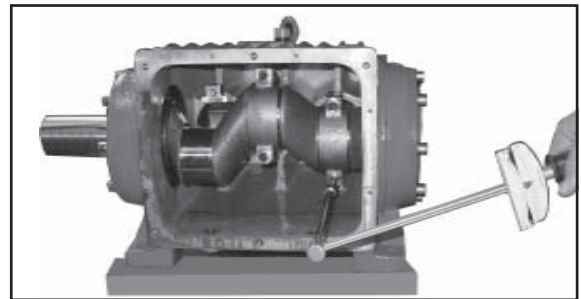
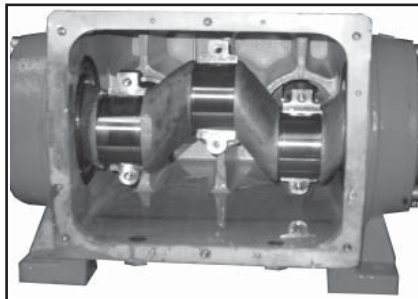
GP8155-R, GP8160-R and GP8165-R PUMP REPAIR INSTRUCTIONS

To Dismantle Crankcase Gear



11) Take out plungers and seal sleeves as described above. Drain the oil by taking off the plug (12). After removing the clip ring (33B), lever out the seal retainer (33) and radial shaft seal (32) with a screwdriver. Open hose adapter (K11) and remove gear cover (K3) by removing the socket head cap screws (K5). Remove the cooling vane plate (K1) by removing the screws (K4)

12) Remove the connecting rod screws (24). **Important!** Connecting rods are marked 1 to 3 for identification. Do not rotate connecting rod halves or interchange them. When re-assembling, the connecting rod must be fitted in their exact original position on the crankshaft journals.



13) Push connecting rod halves together with the crosshead as far as possible into the crosshead guide. Remove bearing cover (14). Begin dismantling of the reduction gear by removing screws (67). Press off gear cover (66) by screwing two screws into both threaded bores. Remove screw (72) and take off fitting disc (69). Remove cogwheel from shaft with a removal tool and take the crankshaft (22) out of the crankcase (1) by gently tapping it with a rubber mallet. Remove connecting rod (24) and crosshead (25) from crankcase. Remember that this assembly must be re-assembled exactly as it was removed. Check surfaces on connecting rods (24), crankshaft (22) and crosshead (25). Check the surfaces of the crosshead guides in the crankcase for any unevenness.

14) Reassemble in reverse order. Replace the connecting rod and crosshead exactly as they were removed. Press the bearing ring (21) past the clip ring groove. Replace the shims (21C). Snap in the clip ring (19) and insert crankshaft from other side, then press in the roller bearing (20). Mount bearing cover (14) and tighten screws (17) to 64 Ft-lbs. (87 NM). Adjust axial play (clearance) on the crankshaft to minimum 0.1mm / 0.15mm using shims (21A/B). Connecting rods must sit exactly in the middle of the crankshaft journal. Mount connecting rod halves in the exact, original position and tighten to 37 Ft-lbs. (50 NM). The shaft should turn easily. **Important!** Connecting rods must be able to move slightly sideways on the stroke journals.

GP8155-R, GP8160-R and GP8165-R PUMP REPAIR INSTRUCTIONS

15) Replace seal retainer (33), radial shaft seal (32) and clip ring (33B). Seal (32) must always be installed so the seal lip on the inside diameter faces the oil. Possible axial float of the seal retainer (33) is compensated by using shims (33C). Re-assemble the seal sleeves (39) and plunger pipes (36B). Tighten the tension screw (36C) to 30 Ft-lbs. Replace valve casing and tighten hexagon nuts (49A) evenly and cross-wise to 265 Ft-lbs. (360 Nm).

16) Mount cooling plate (K1) and gear cover (K3) with their respective seals (K2). When assembling the cooling circuit line, make sure that the oil cooler connection (K7) is always joined to the **upper** connection (K3) of the gear cover.

Heat ball bearings (74 and 75) first before pressing them on to the pinion. Press the cogwheel slightly on to the crankshaft (22) so that the pinion (69) together with the bearing (74) can be inserted.

Move the pinion (69) against the cogwheel and make them mate perfectly when mounting. Then carefully tap the cogwheel and the pinion simultaneously on to the crankshaft and into the bearing seat. Fit fitting disc (69) and secure screw (72) with Loctite. Fit the seal (76) on to the cylindrical pins (68).

Push the gear cover (66) carefully onto the bearing (75). Make sure that the radial shaft seal (73) does not get damaged during fitting onto the pinion.

Important! Before putting into operation again, turn the reduction gear shaft by hand at least four full turns to make sure the gear is correctly aligned.

For Repair or Inspection of Reduction Gear

Remove screws (67). Pull off gear cover (66) by screwing two (2) screws into both thread bores. Remove screw (72) and take off fitting disc (69). Remove cogwheel from shaft with a removal tool and take the crankshaft out of the crankcase by gently tapping it with a rubber hammer.

Check the surfaces of the conn-rods (24), crankshaft (22) and crossheads (25). Check the surfaces of the crosshead guides in the crankcase for any unevenness.

Reassemble in reverse order. Adjust axial play (clearance) on the crankshaft to a minimum of 0.004" (0.1mm) / max. .006" (0.15mm) using shims (20C). Press the bearing ring (21) past the clip ring groove. Assemble in the clip ring and insert the crankshaft from the other side, then press in the roller bearing (20). The shaft should turn easily with little clearance. Replace the bearing cover (14) and tighten the screws (17) at 64 Lb-ft (87 Nm). Mount conn-rod halves into their exact original position and tighten to 37 Lb-ft (50 Nm).