SERCK

SERVICING INSTRUCTIONS FOR

HYDROSTATIC DRIVE PUMPS & MOTORS

PUBLICATION 1014

Plant required for Overhaul and Test

1 small surface grinder with magnetic table
1 Demagnetiser
1 Hand Press
1 Dial Indicator

Items which are most likely to require replacing

(a) Piston assembly
(b) Retaining collar
(c) Retaining plates
(d) Spring cups
(e) Spring
(f) Oil seals
(g) Running bushes

When ordering spares the correct part No. should be obtained from the spare parts list and it should be noted that units have been supplied with two lengths of parallel shaft and taper shafts, also there have been design changes.
Size 25:- Early design having a twelve bolt casing and a control cone with 72 x 2 mm threaded portion, and revised design from and including Serial No. 43040, having a six bolt casing and control cone with 65 x 2 mm threaded portion.

Size 32:- A modification to the thrust and main bearing was introduced effective from and including Serial Nos. as follows:-

78412 Standard Shaft 130 mm (5.118″)
78539 Short Shaft 85 mm (3.346″)
78772 Taper Shaft

Pumps and motors should be stripped and inspected after 200,000/250,000 miles for Locos and Railcars, and 15,000 running hours for Shunting Locos and Stationary Sets.

Note:

IT IS ESSENTIAL THAT SCRUPULOUS CLEANLINESS SHOULD BE MAINTAINED DURING THE STRIPPING AND SERVICING OPERATIONS.

Running bushes should be replaced if at all grooved by the seal lip, no attempt should be made to restore the running surface by grinding. If replacement bushes are not readily available at the time of servicing, it is better to use the existing running bush with new seals, until new bushes are available.

Note:

It is not necessary to dismantle the unit completely to replace shaft seals and running bushes.
On most units an "O" ring shaft seal is fitted to prevent oil leaks at the running bush. This seal should be replaced. Pistons should be replaced when the leakage exceeds that given in Section 4 of Publication 697 issue 3. New pistons and cylinder bores are manufactured to extremely close tolerances and must be assembled selectively.
New retaining collars should be fitted to piston rod ends if the play in the socket is in excess of .008″ (.2 mm) refer to Fig. 1.

Note:

When changing long pistons for short, or pinned type for swaged, all seven must be changed to preserve the dynamic balance.
Play at the piston rod to piston securing ring is permissible up to the following limits:-

Size	Inches	mm
12	.016	.4
16	.016	.4
20	.024	.6
25	.040	1.0
32	.040	1.0

If there is excessive play at the piston rod to piston securing ring, the piston and rod assembly will have to be replaced **complete** — (see note). Complete piston assemblies are obtainable from Serck Radiators.

Note:

Where **identical** units are in use as pump and motor and the pump piston play is in excess of the above limits, the pump may be used as a motor for a further period of running time, say another 50% of its present life.
If excessive play develops between piston rod and piston during first 15,000 hours it is usually due to dirty oil. Inspection of the cylinder bores, which should have a glass-like finish, will indicate the presence of any dirt.

Bearings

Bearings usually have a life of 15,000/20,000 running hours. Dullness on the running faces of ball bearings is a sign of wear and indicates replacement.

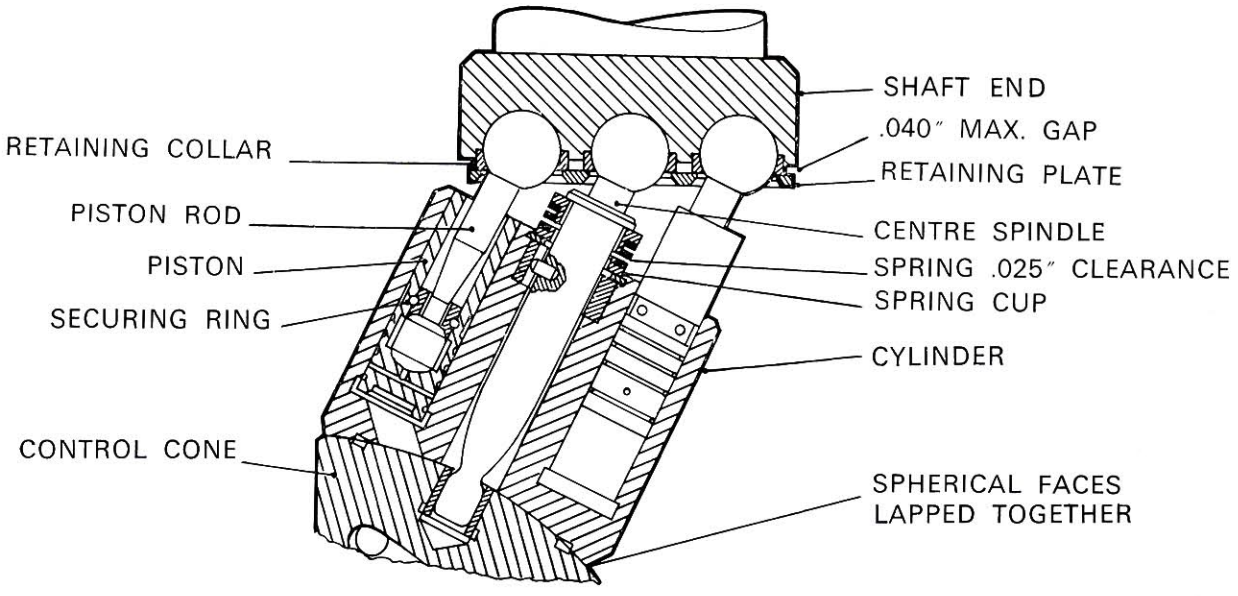


FIG. 1 CYLINDER ASSEMBLY

Cylinder and Control Cone

Score marks on the spherical port faces of the cylinder and control cone are caused by dirty oil.
During stripping, it should be noted that original cylinders and control cones are always matched and numbered, and are not interchangeable.

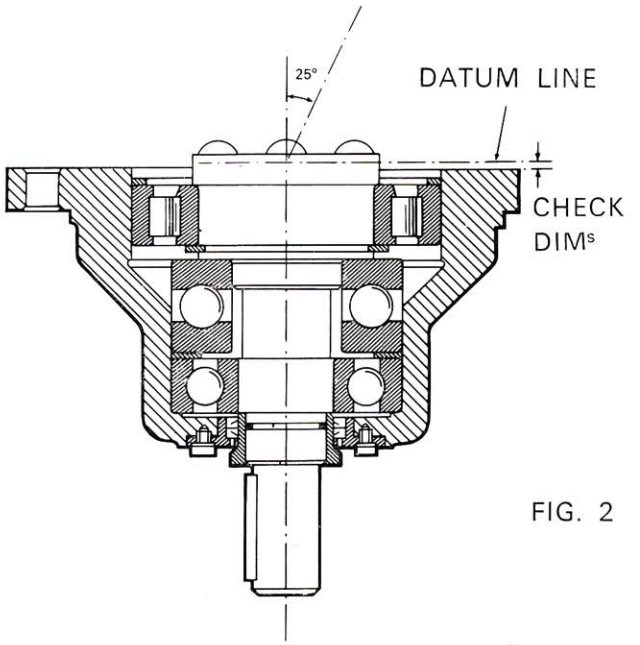


FIG. 2

DATUM LINE CHECK

When a new cylinder is lapped into an original control cone, it must be marked with the cone number and the pair matched together on re-assembly.

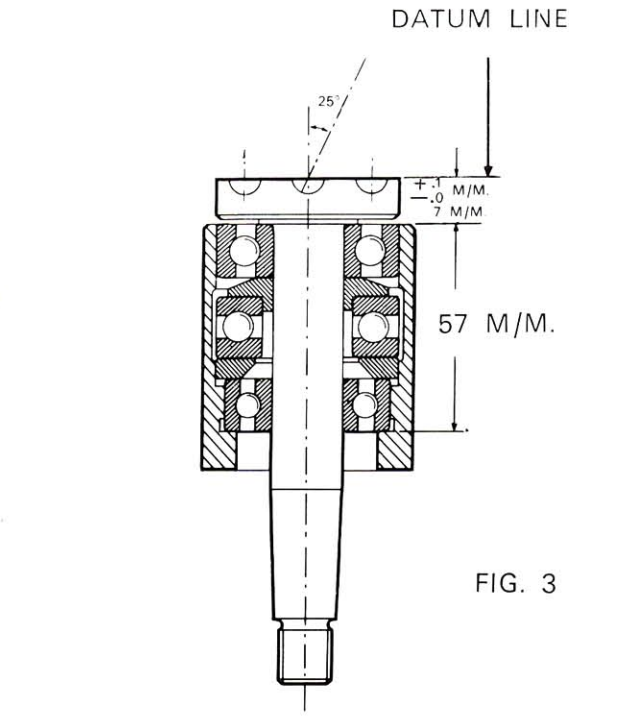


FIG. 3

CHECK DIMENSIONS FOR S/12 UNIT

IT IS ESSENTIAL THAT CARE BE TAKEN TO MAINTAIN ALL ITEMS SCRUPULOUSLY CLEAN THROUGHOUT.

1. Assembly of Bearings and Shaft General

The bearings are assembled on to the shaft in the following sequence.

(a) Large journal bearing. The inner face of this bearing is a push fit on the shaft.
(b) Circlip. This retains the bearing axially on the shaft.
(c) Thrust bearing. The inner half is a push fit on the shaft.
(d) Spacer. In some instances a Belleville washer follows the spacer.
(e) The outer journal bearing.

The outer faces of the journal bearing are not usually a tight fit in the housing.

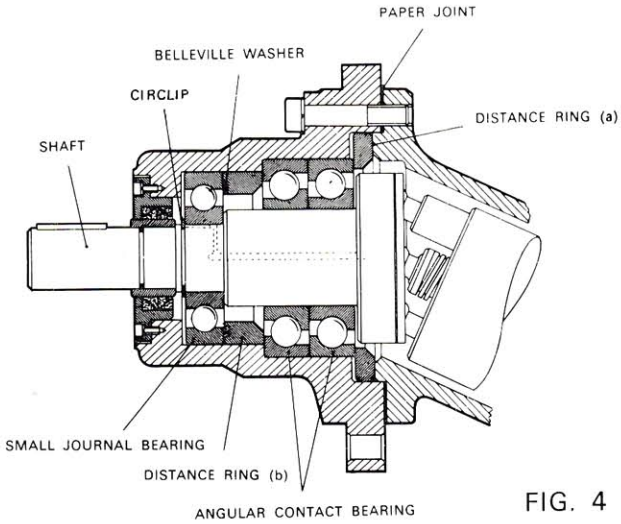


FIG. 4

2. Fitting of Shaft into Flange Housing and Checking of Datum Line (Fig. 2)

Once the bearings have been assembled on the shaft, this is then inserted into the flange housing and a measurement taken to ensure that the drive assembly will operate in the correct plane.
The datum line of the unit is the centre line that passes through the centre socket of the drive shaft and is at right angles to the drive axis. This datum line is checked with a height gauge by inserting a steel ball of the same diameter as the spherical end of the piston rod into the centre socket of the shaft and then measuring the depth to the face of the flange housing. See Fig. 2.
For sizes '12', '16' and '20' units this datum line should be + .1 + .05 mm (.004″ + .002″)
− .00 mm (− .00″)
For sizes '25' and '32' this datum line should be + 4.1 + .05 mm (.164″ + .002″)
− .00 mm (− .00″)
relative to the face of the flange housing. Any discrepancy in the datum line, can be adjusted by the spacer.
For the S/12 unit this procedure is somewhat different as the unit has a one piece housing. In that case the overall lateral dimension over the three bearings is checked. See Fig. 3.
Care must be taken when assembling the journal-bearings not to overload the thrust bearing. This should be able to rotate freely.

Modified Pump/Motor Bearings

A modification to the thrust and main bearing and the method of mounting has recently been introduced and is effective in size 32 pumps/motors from and including serial numbers as follows :-

	Serial No.	Shaft Length
Standard Shaft	78412	130 mm (5.118″)
Short Shaft	78539	85 mm (3.346″)
Taper Shaft	78772	

The bearing housing, see Fig. 4, contains two angular contact ball bearings which replace the original main bearing and thrust bearing, the small journal bearing is retained but is now secured to the shaft by a circlip to enable a preload of **200 k.grms.** (Via the Belleville washer) to be applied on the angular contact bearings.
Distance rings are fitted to enable end location to be maintained to close limits.
It may be necessary to machine the faces of new rings on assembly to ensure that the angular contact ball races are clamped when the two halves of the casing are bolted together with the .004″ paper joint fitted.

1. Assembly of Bearing and Shaft Angular Contact

The angular contact bearings which should be of the selected class denoted by the part number having the suffix "Bu" — are first pressed on to the shaft. Next the distance ring (b) together with the correctly rated Belleville washer is placed over the shaft to abutt the outer of the front angular contact bearing. The front journal is now mounted and secured by the circlip. This final operation preloads all the bearings.

Note:
Use of pairs of bearings or single bearings marked "B" suffix instead of "Bu" will result in early failure.
The distance ring (b) should be free to slide radially under finger pressure, but should not have more than .004″ end float — new rings may be adjusted by machining the faces. Old rings must be replaced if undersize. **Do not fit shims.**

2. Fitting of Shaft into Housing

The complete assembly is inserted into the flange housing followed by the distance ring (a), the thickness of which may be adjusted by machining to ensure that the housing joint faces (with paper jointing between) are oil tight when bolted up, at the same time not more than .004″ end float of the distance ring (a) is permissible.

Note:
In this type of unit no datum line check is required.

3. Assembly of Pistons and Retaining Collars to Sockets of Drive Shaft

This is the most precise part of the assembly and **great care** must be exercised during the whole of this operation.
A retaining collar is slid over the piston rod end and then put into the socket on the drive shaft and the piston rod checked for turning movement and up and down play.
Should the piston rod end be loose in its socket it is necessary to grind the under side of the retaining collar (approx. .001″ at a time), until the piston rod end is just a nice fit in its socket. The retaining collar should not move when turning the piston. When this has been done for each piston, all the retaining collars are ground to the same height on their top face. It is also important that **no** oil should be used, as this would affect the fitting of the rod end in the socket. Once all the pistons have been fitted into their respective sockets onthe shaft, the retaining plate is put on and the screws tightened.

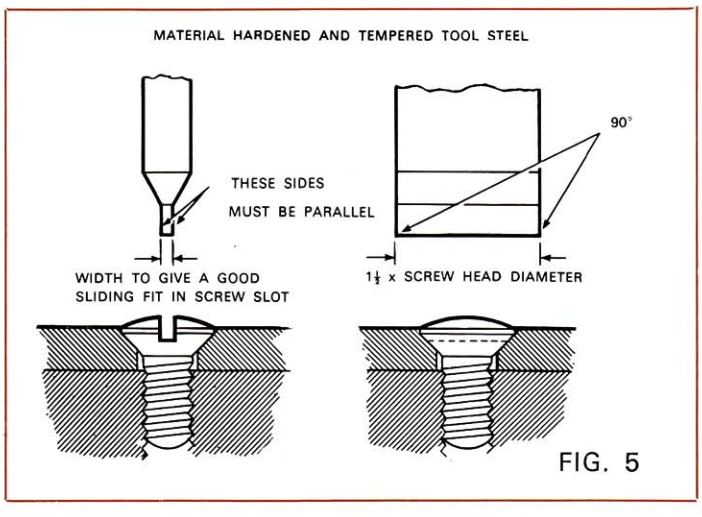


FIG. 5

Note:
NEW SCREWS, COATED WITH "LOCTITE A", MUST ALWAYS BE USED FOR THE ABOVE OPERATION.
Each piston assembly should move freely in a wide arc without endplay at the socket. Slight play is permissible onthe centre spindle. The maximum distance between the underside of the retaining plate and the shaft end should not be more than — .040″. See Fig. 1. When finally fitting the retaining plate smear all ball joints with **moly-grease.**
On units up to size 20 it is likely in the near future that no spare retaining collars will be available as the design is changing to a one piece retaining plate, one for each 8 collars ordered, which are interchangeable.
A special fitting technique has to be used for these one piece plates, as no grinding adjustment or shimming is permissible. This technique can only be learned by experience and cannot be described verbally.
Some units now use hexagon head screws to retain this plate.
When fitting new countersunk screws they must be peened as well as coated with "Loctite A" and the peening tool should be of the correct **shape.** See Fig. 5. Screws should be tightened strongly using a 6″ - 8″ lever on screwdriver.

4. Lapping of Cylinder to Control Cone

This process may be done on a lapping machine or by hand. Three grades of paste are used; coarse, medium and fine. Overlapping is possible; this is indicated by dark patches on the cylinder and indicates that paste has become impregnated in the surface. Should this occur, further lapping is necessary to remove this condition. Scores and scratches of up to .010″ on the cone and up to .010″ depth on the cylinder can be lapped out. Final polishing is effected with jewellers rouge. The desired finish is a mirror surface.

5. Fitting of New Pistons to Cylinder

All pistons should be tried in their respective bores in the cylinder and should produce a vacuum when the end of the bore is sealed off. Once this has been done they should be numbered against the cylinder. It is desirable that when original pistons are retained with the original cylinder barrel the numbers should be matched on re-assembly.

6. Cylinder Barrels

Spare cylinders when received are finish machined and do not require honing.

7. Assembly of Housing (Angle)

After the cylinder has been fitted over the pistons the angle housing is put on. This, in the first place, is done without fitting a joint. When the angle housing is fitted there should be .3 mm (.012″) clearance between the end of the spacer and the spigot of the angle housing. Therefore, when the joint is fitted which may be .012″ thick or .004″ (for modified size 32 units), the spring on the central guide rod has a clearance of about .025″. This spring should always be renewed during servicing.
Springs are made oversize and have to be ground to fit the unit so that the cylinder barrel has the correct amount of end float when assembled.
Too little float will cause seizure on control plate and too much can give bad starting characteristics.

For units size '25' and '32' this clearance check must of course, be carried out with the Belleville washer fully depressed.

8. Final Assembly of Unit for Test

The angle housing is taken off and the appropriate joint placed into position, all the internal working parts are well oiled before final assembly. Tab washers on the screws which hold the retaining plate in position are not yet turned over, nor are the screws peened over which hold the retaining plate in position. This is done after the unit has completed its test run and is dismantled for final check up. After the test run has been completed which should be 2/3 hours duration, the unit is dismantled again and the piston assembly checked. Then the retaining screws are peened over, assembly completed and the tab washer for the control cone screw bent over. The position of the control cone vis-a-vis housing is also marked.

Note:
UNIT SHOULD NOT BE STRIPPED COMPLETELY AS SCREWS ARE LOCTITED AND SHOULD NOT BE DISMANTLED.

Testing of Units

A simple test rig would comprise the following.

An electric motor of suitable rating, say 40-50 h.p. 920 r.p.m. with pulleys and belts to enable the units under test to be run at their optimum speed.

The unit should be suitably mounted by its flange.

A tank similar to the one in the drive system should be provided to supply the oil.

A stop valve inserted in the delivery pipe will enable a load to be applied by throttling the oil flow.

Heat will be generated in the oil by this method, so it will be necessary to install an oil cooler in the circuit, for test purposes the oil temperatures should be maintained at 140 deg. F. and the pressure at 1425 p.s.i.

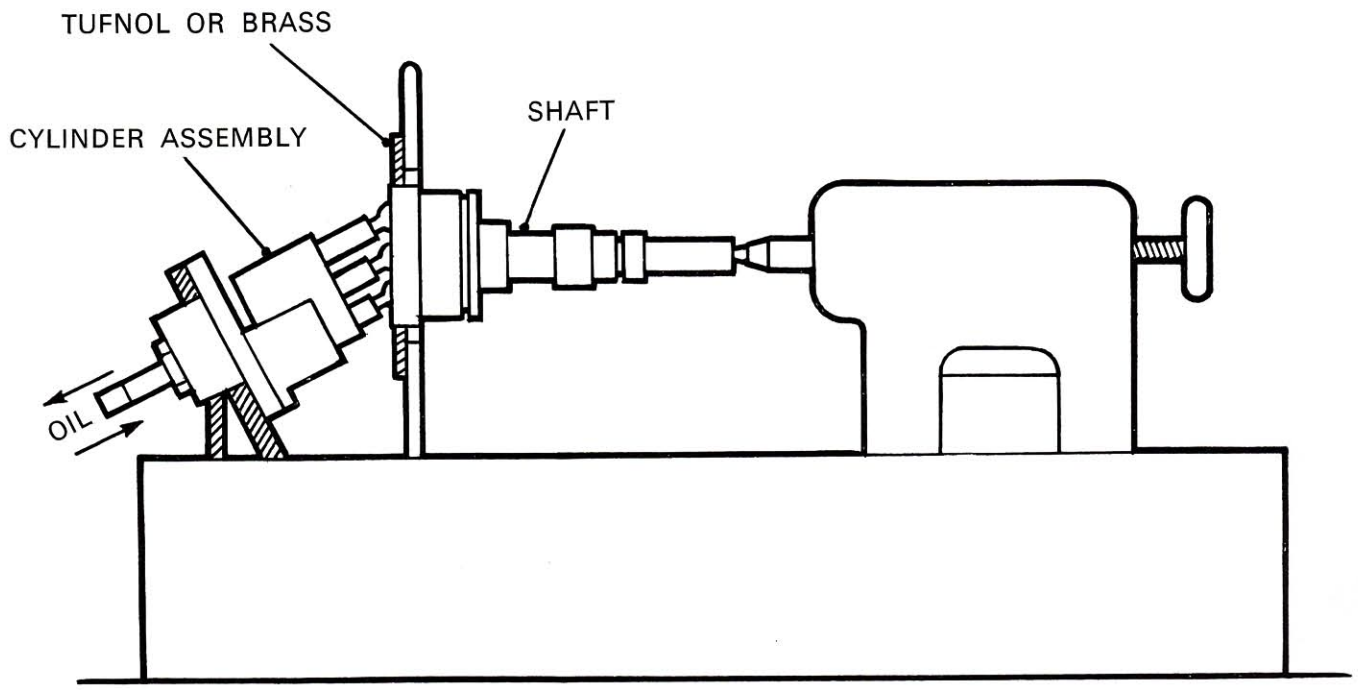
During the test run a leakage check should be taken as described under Section 4 of Instruction Manual P.697 Issue No. 3.

When a new shaft is fitted with pistons it may be necessary to lap in the piston rod ball ends and sockets, this can be done on a lapping fixture as shown in Fig. 6. This is comprised of a lathe tail stock (preferable with ball bearing centre) a vertical guide plate and a 25° angle bracket on which to mount the control cone and cylinder barrel with pistons.

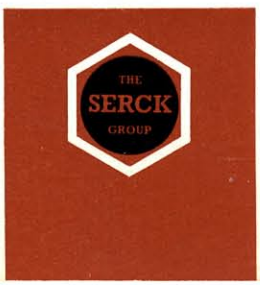
The ball ends of the piston rods are placed loosely in the shaft sockets without retaining plate or collars.

The assembly is rotated at approximately 120 r.p.m. by oil pressure at the control cone port, this oil pressure also serves to retain the piston ball ends in the shaft socket during the lapping process.

Fine lapping paste is applied to the sockets and care should be taken to see that it is kept away from the pistons and cylinder bores.



LAPPING JIG FOR NEW SHAFTS FIG. 6



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