GENERAL PUMP

KV

Repair Manual

KV12 - KV14

General Pump
is a member of
the Interpump Group

Ref 310084 Rev. A
08-17

INDEX

1. INTRODUCTION

This manual describes the instructions for repairing KV Series pumps, and must be carefully read and understood before performing any repair intervention on the pump. Correct use and adequate maintenance is fundamental for the pump's regular operation and long wear. General Pump declines any responsibility for damage caused by the misuse or the non-observance of the instructions described in this manual.

2. REPAIR INSTRUCTIONS

2.1 Crank Mechanism Repair

Crank mechanism repair operations must be carried out after draining the oil from the crankcase. To drain the oil, remove the oil dipstick, 1, Fig. 1, and then the draining plug (2, fig. 1).

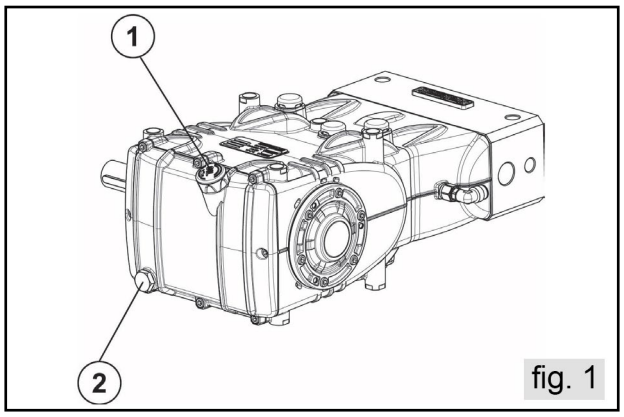


fig. 1

Exhausted oil must be collected in an appropriate receptacle and disposed of in designated locations. In absolutely no case may it be disposed of in the environment.

2.1.1 Crank Mechanism Disassembly

The operations described must be performed after removing the hydraulic part, ceramic pistons and splash guards from the pump (par. 2.2.3, 2.2.4).

The correct sequence is the following

Disassemble:

- Pump shaft key
- Rear cover
- The con-rod as follows: unscrew the cap fixing screws, remove the con-rod caps with their lower half-bearings (fig. 2) paying attention to the numbered sequence during disassembly.

To avoid possible errors, caps and con-rod shanks have been numbered on one side (1, fig. 2/a)

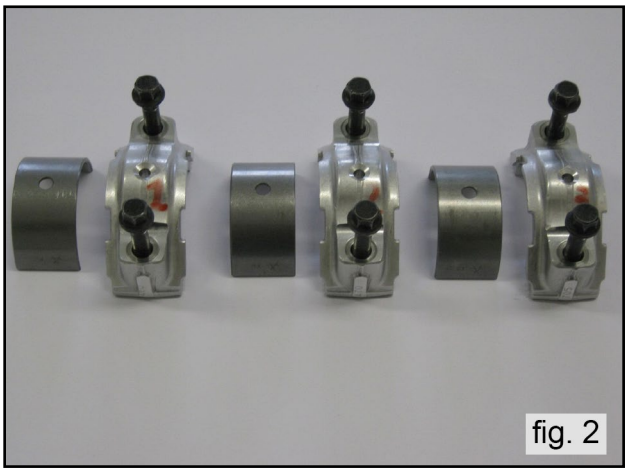


fig. 2

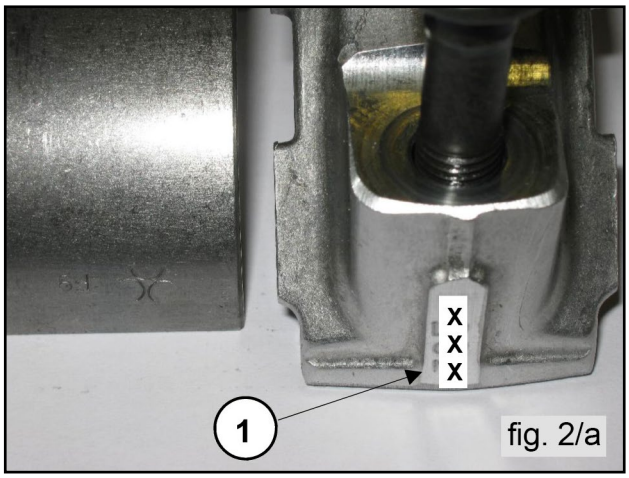


fig. 2/a

- Side covers using 3 fully threaded M6 x 50 screws, inserting them in the threaded holes as indicated in fig. 3.

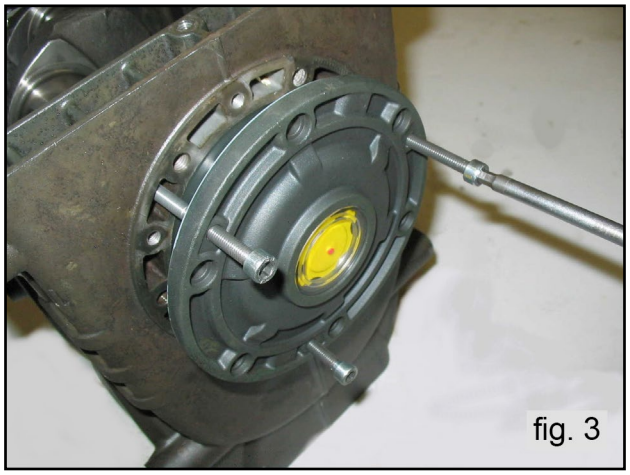


fig. 3

• Push the plunger guides forward with their con-rods to facilitate side extraction of the pump shaft as shown in fig. 4.

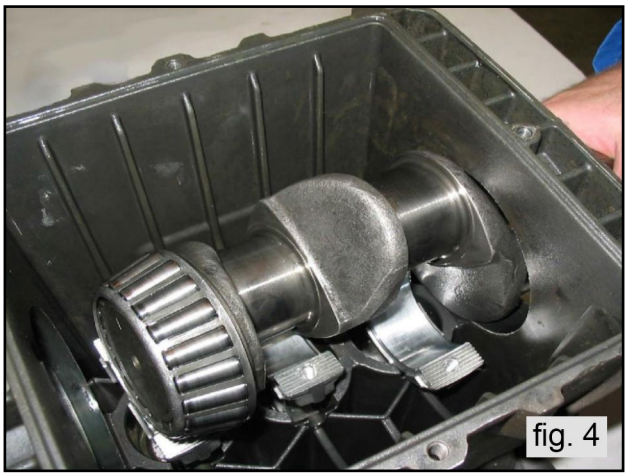


fig. 4

• Remove the pump shaft
• Complete disassembly of the con-rod units by removing them from the crankcase and removing the plunger guilde pins.
• Remove the pump shaft seal rings using standard tools.
• Remove the plunger guide seal rings as described below:
Use the extractor hammer (#F26019400) (1, fig.5) and the pliers (#F27503800) (2, fig. 5). Insert the gripper as far as possible onto the seal ring with the aid of a hammer(fig. 5/a), sub sequently screwing the extractor to the gipper, and use the extractor hammer (fig. 5/b) until the ring to be replaced is removed (fig. 5/c).

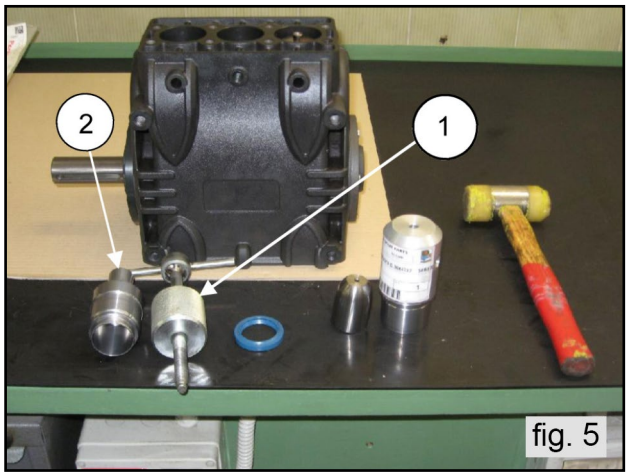


fig. 5

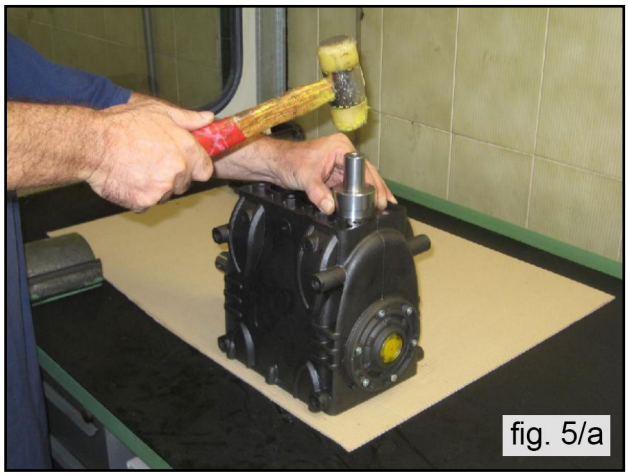


fig. 5/a

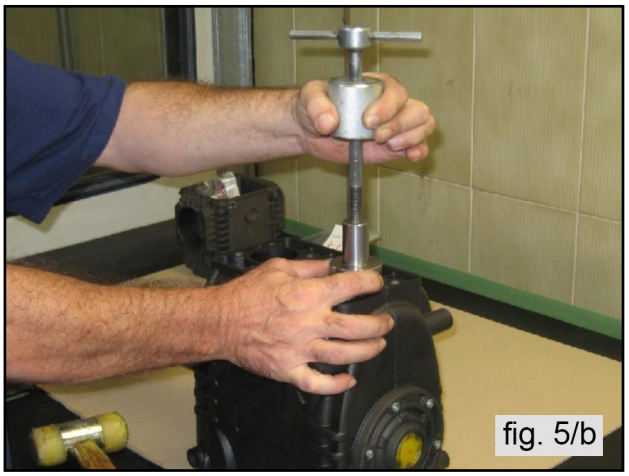


fig. 5/b

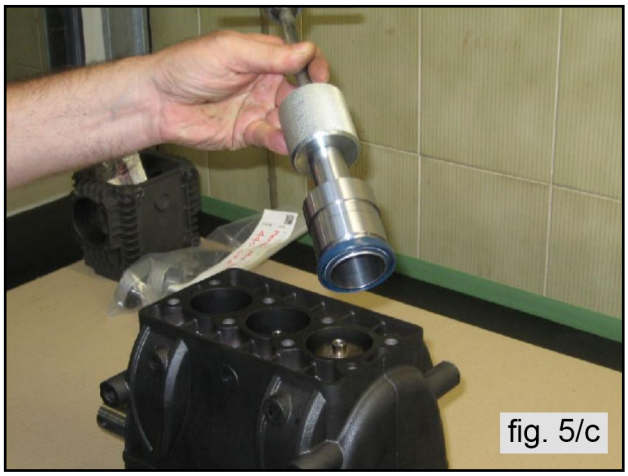


fig. 5/c

2.1.2 Crank Mechanism Assembly

After cleaning the crankcase, reassemble the crankcase mechanism as follows:

• Assemble the upper and lower half-bearings in their seats in the con-rods and caps. **Make sure that the reference marks on the upper half- bearings (1, fig. 6) and lower half-bearing (2, fig. 6/a) are positioned in their respective seats in the con-rod and cap.**

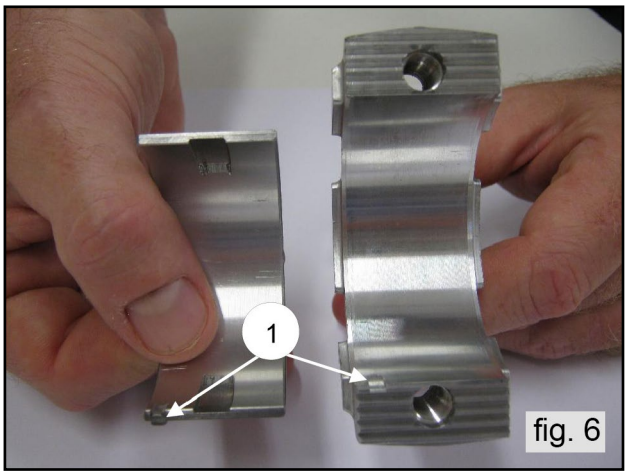


fig. 6

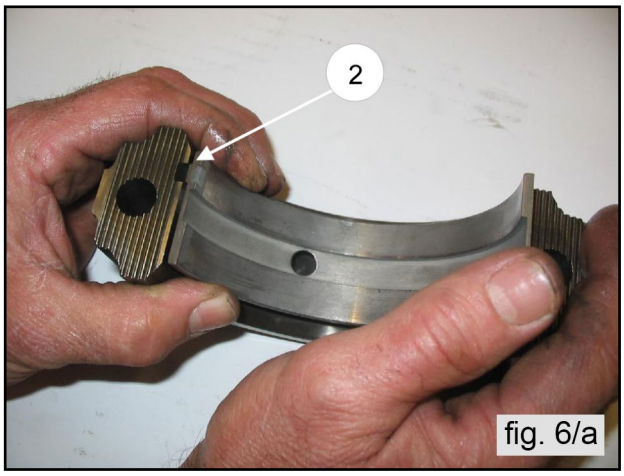


fig. 6/a

• Insert the plunger/con-rod guide units into the crankcase, directing the numbering on the con-rod shank towards the top of the casting.

To facilitate pump shaft insertion (without the key), it is essential to repeat the operation performed during disassembly, pushing the plunger/con-rod guide units as far down as possible (paragraph. 2.1.1).

• Before assembling the side cover on the PTO side, check the conditions of the radial ring lip seal and relative contact area on the shaft.

If replacement is necessary, position the new ring using a tool (#F27904500) as shown in fig. 7

If the pump shaft shows diametrical wear in the area of contact with the lip seal, in order to prevent the grinding operation, it is possible to reposition the ring in abutment with the cover as shown in fig. 7.

Before assembling the side covers, make sure there are O-rings on both of them and shim rings on the indicator side cover only.

To facilitate filling of the first section and relative press fitting of the covers on the crankcase, we recommend using 3 partially-threaded M6 x 40 screws (1, fig. 8), then completing the operation with screws supplied (M6 x 16).

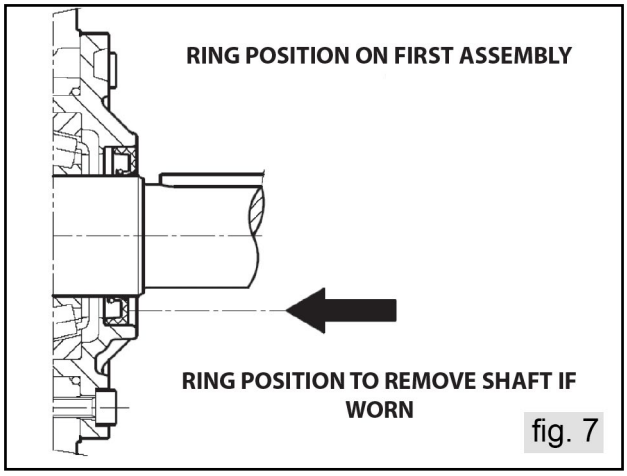


fig. 7

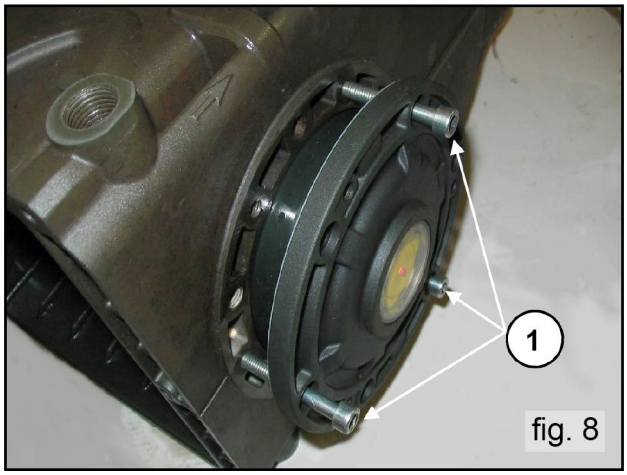


fig. 8

• Couple the con-rod caps to their shanks, referring to the numbering (1, fig. 9).
Not the correct assembly direction of the caps.

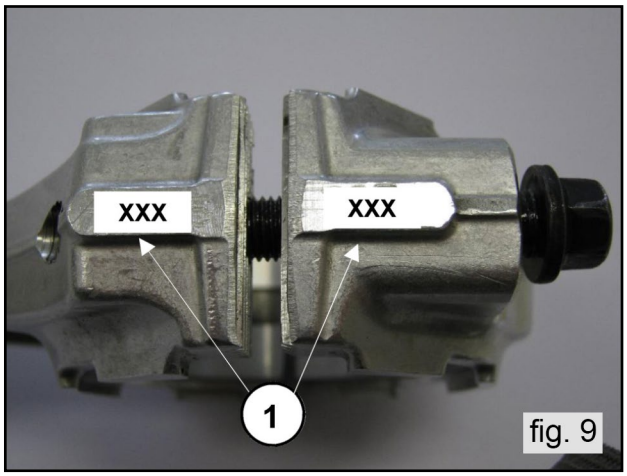


fig. 9

• Fasten the caps to their repective con-rod shanks by means of M8 x 1 x 48 screws (fig. 10) lubricating both the underhead and the threaded shank, proceeding in two different stages:
1. Manually turn the screws until they begin to tighten.
2. Tightening torque 22.13 ft lbs (30 Nm)

Alternatively, ensure:
1. Pre-tightening torque 7.38-11.06 ft lbs (10-15 Nm)
2. Tightening torque 22.13 ft lbs (30 Nm)

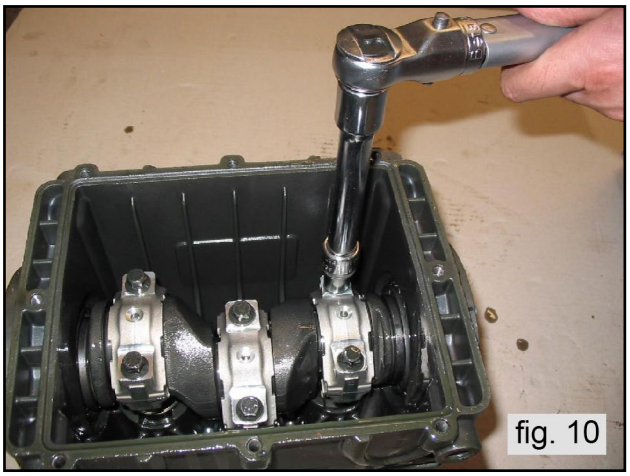


fig. 10

• After having completed tightening operations, check that the con-rod head has a side clearance in both directions.

• Insert the new plunger guide seal rings as far as possible into the relative seat on the crankcase (fig. 11), following the procedure described:
Use tool (#F27904200) composed of a tapered bush and buffer. Screw the tapered bush into the hole in the plunger guide (fig. 11/a), insert the new seal ring on the buffer as far as it will go (determined by the height of the buffer) into its seat on the crankcase (fig. 11/b), remove the tapered bush (fig. 11/c).

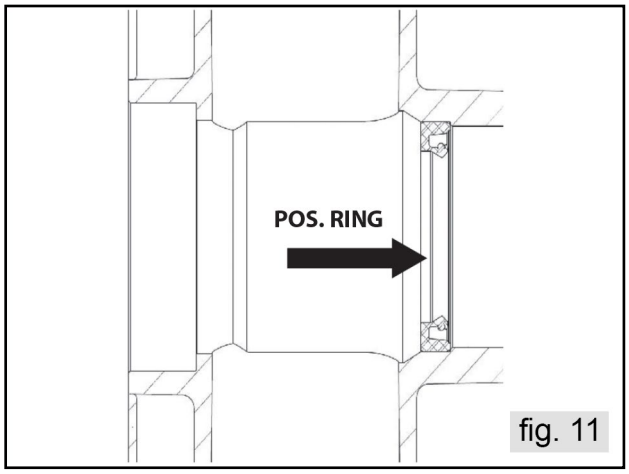


fig. 11

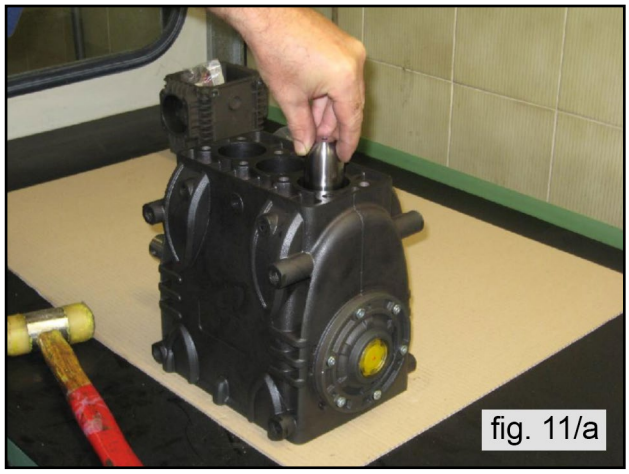


fig. 11/a

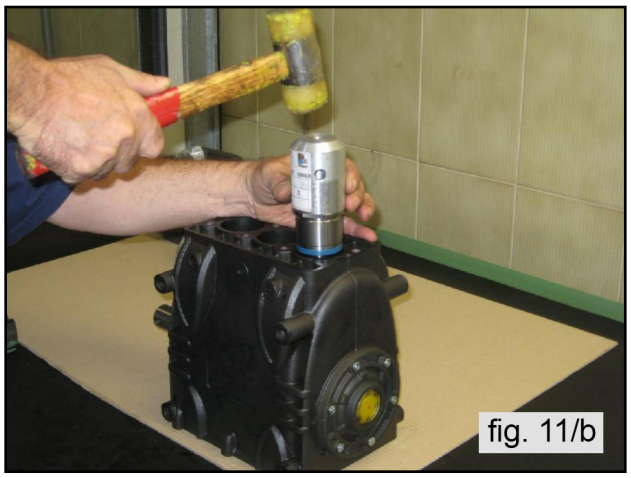


fig. 11/b

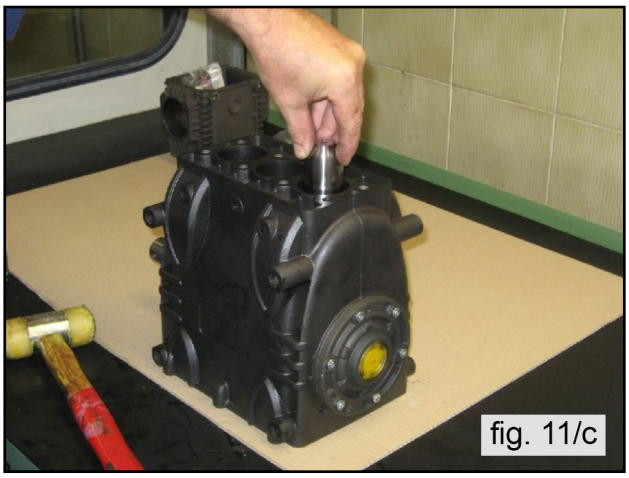


fig. 11/c

• Mount the rear cover complete with O-ring, positioning the dipstick hole upward.
• Insert oil in the casing as indicated in the **Owner's manual**.

2.1.3 Reduction Classes

TABLE OF REDUCTION FOR CRANKSHAFT AND CON-ROD HALF-BEARINGS			
Recovery classes (mm)	**Upper half-bearing code**	**Lower half-bearing code**	**Grinding on the shaft pin diameter (mm)**
0.25	F90922100	F90922400	Ø39.75 0/-0.02 Ra 0.4 Rt3.5
0.50	F90922200	F90922500	Ø39.50 0/-0.02 Ra 0.4 Rt 3.5

2.1.4 Assembly / Disassembly of bearings and shims

The type of bearings (taper roller) ensures the absence of axial clearance on the crankshaft. The shims are defined to meet this necessity. For disassembly / reassembly and for any replacements, carefully observe the following directions:

A) Assembly / Disassembly of the crankshaft without replacing the bearings

After removing the side covers, as indicated in paragraph 2.1.1, check the rollers and their races for wear; if all parts are in good condition, fully clean the components with a suitable degreaser and grease them again evenly using the same oil in the crankcase. The same shims can be used again, being careful to insert them only under the indicator side cover. After installing the complete unit (sight glass side flange, shaft and engine side flange), check that the shaft's rolling torque - with the connecting rods free - is at least 3 Ft. Lbs. (4 Nm), Max 4.5 Ft. Lbs. (6 Nm). To position the two side covers on the crankcase, initially use 3 M6 x 40 screws as shown in fig. 8, and then the fastening screws. The shafts rolling torque (with connecting rods coupled must not exceed 6 Ft. Lbs. (8 Nm).

B) Disassembly / Assembly of the Crankshaft With Bearings Replacement

After disassembling the side covers as indicated in paragraph 2.1.1, remove the outer ring nut on the bearings from its seat on the covers, using an appropriate exctrator as shown in (fig. 12 and 12/a). Remove the inner ring nut on the bearings from the two ends of the shaft, again using an appropriate extractor or, alternatively, a simple "pin punch" as shown in fig. 13.

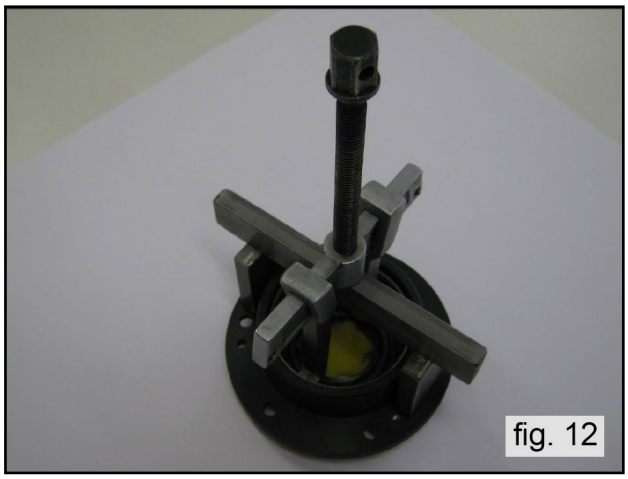


fig. 12

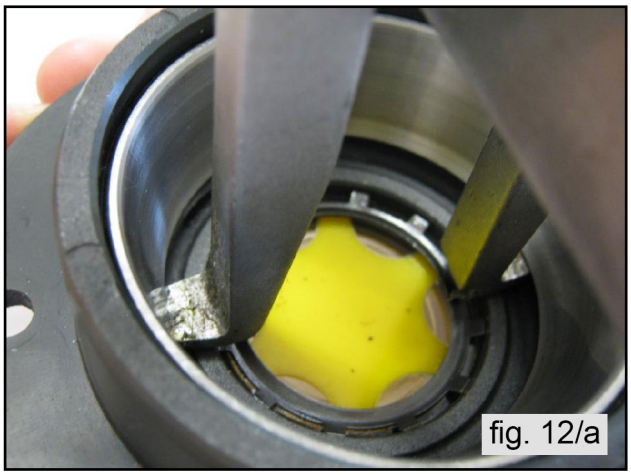


fig. 12/a


fig. 13

The new bearings can be mounted cold with a press or rocker, supporting it on the lateral surface of the ring nuts involved in press fitting with the rings. The press fitting operation can be assisted by heating the involved parts to a temperature between 250°F - 300°F (120°C - 150°C), ensuring that the ring nuts fit fully into their seats.

Never exchange the parts of the two bearings.

Determining the shim pack:

Perform the operation with the plunger/con-rod guide units are assembled, the con-rod caps are disconnected and the con-rods are pushed backwards.

• Insert the crankshaft without tab into the crankcase, making sure that the P.T.O. shank comes out of the correct side.

• Secure the P.T.O. side flange to the crankcase, making sure the lip seal as described previously and tighten the screws to the recommended torque.

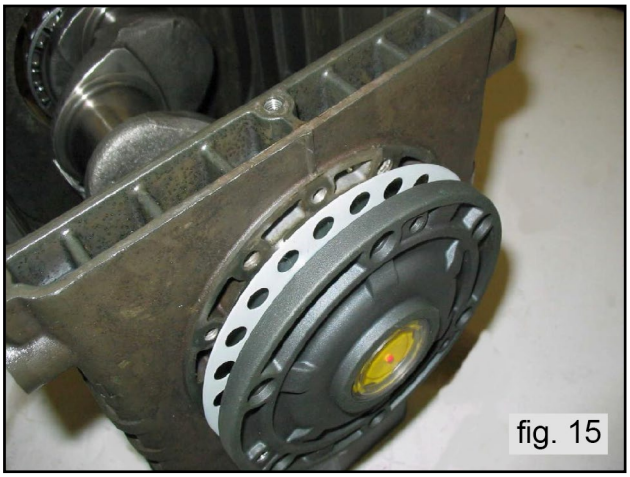
• Feed the flange on the indicator side without shims in the cover and start to move it closer, manually screwing the M6 x 40 service screws in equally, with small rotations to move the cover in slowly and correctly. At the same time check that the crankshaft rotates freely by turning it manually.

• Continue tightening screws until hardness in crankshaft rotations is experienced. At this point loosen the screws completely.

• Use a thickness gauge to measure the clearance between the side cover and crankcase (see fig. 14).

Determine the shim pack as indicated in the table below:

Measurement	Shim Type	No. of Pieces
From: 0.05 to 0.10	-	-
From: 0.11 to 0.20	0.1	1
From: 0.21 to 0.30	0.1	2
From: 0.31 to 0.35	0.25	1
From: 0.36 to 0.45	0.35	1
From: 0.46 to 0.55	0.35 0.10	1 1
From: 0.56 to 0.60	0.25	2
From 0.61 to 0.70	0.35 0.25	1 1



• Insert the shims under the cover on the sight glass side (see fig. 15), secure the cover to the crankcase, following the procedure in paragraph 2.1.2, and tighten the screws to the recommended torque. Verify that the shaft rotation stall torque is between 3-4.5 ft lbs (4-6 Nm).
• If the torque is correct, connect con-rods to the crankshaft, if torque is not correct reposition the shims again repeating the operations.

2.2 Fluid End Repair

2.2.1 Disassembly of the Head - Valve Units

The head dose not require any routine maintenance. Operations are limited to inspections or replacement of valves, if necessary.
Proceed as follows to extract the vlave units:

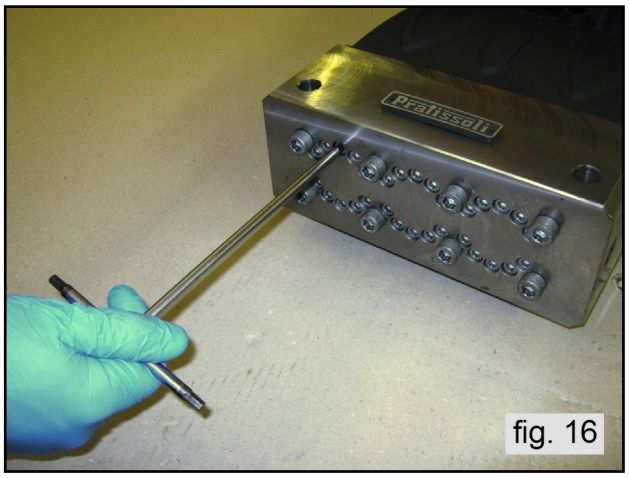


fig. 16

Loosen but do not remove the M16 x 75 screws fastening the liners to the head, as shown in fig. 16, so as to free them.

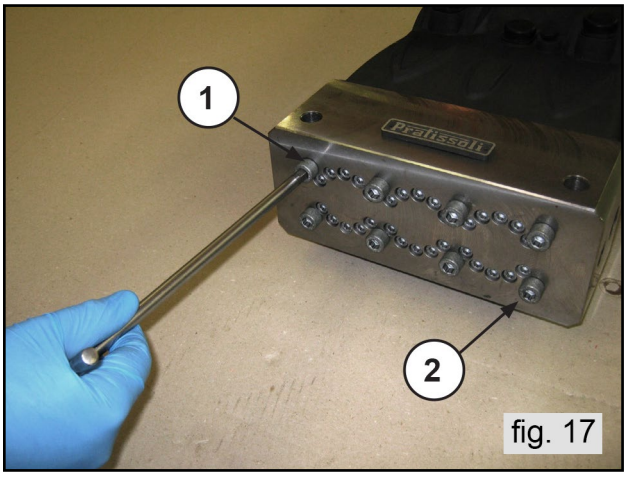


fig. 17

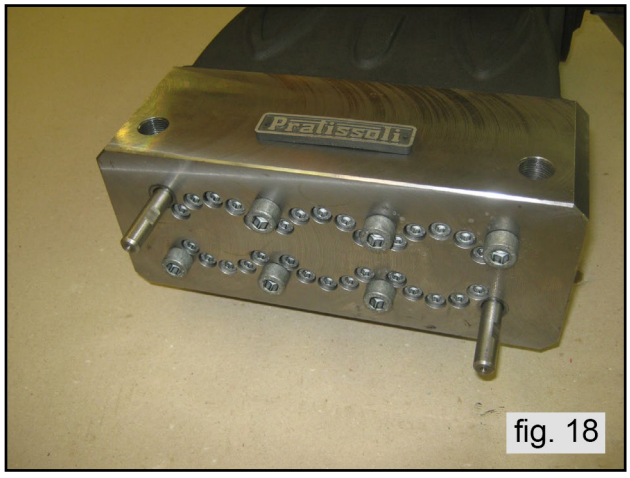


fig. 18

Unscrew the M10 x 210 head fixing screws No. 1 and No. 2 as shown in fig. 17 replacing them with two service pinscrews (#F27840000) as shown in fig. 18. Then take out the remaining screws.

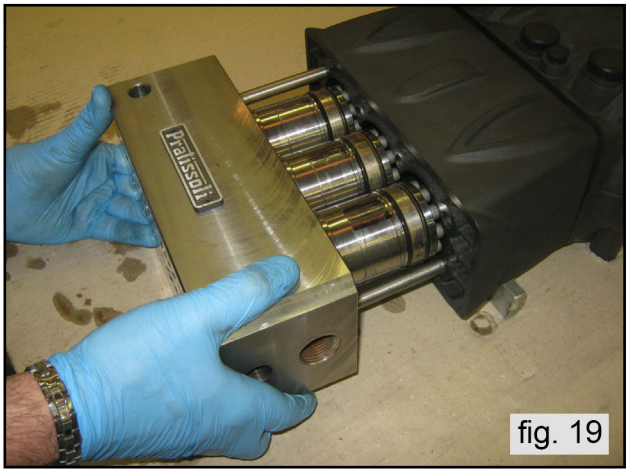


fig. 19

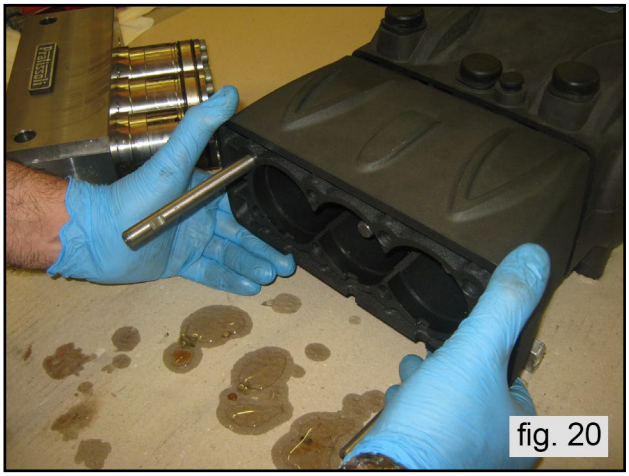


fig. 20

Separate the head and the spacer for the liners from the crankcase as shown in fig. 19 and fig. 20.

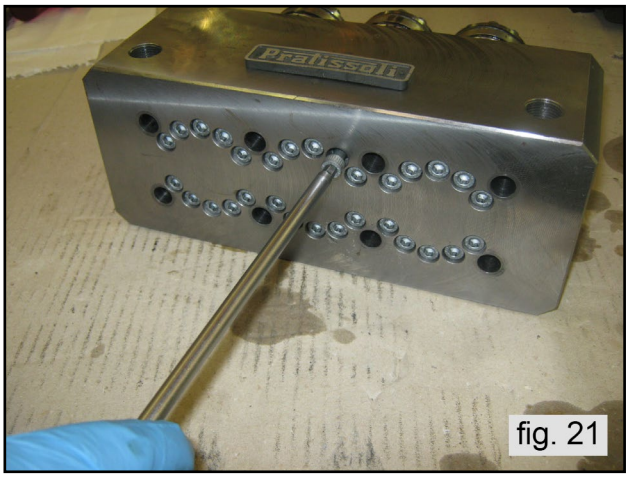


fig. 21

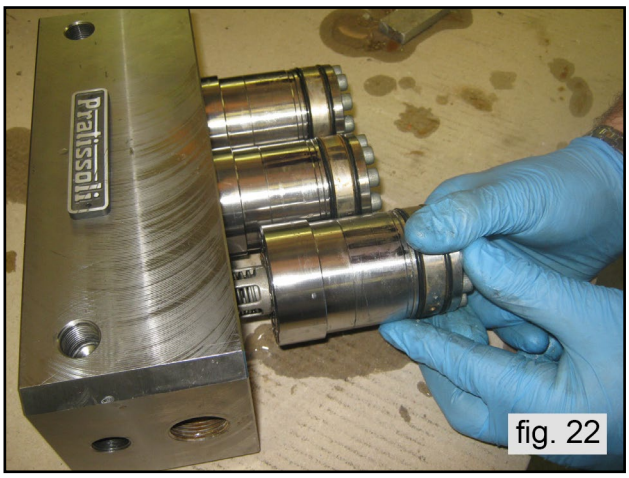


fig. 22

Take out the m6 x 75 screws fastening the liners to the head as shown in fig. 21 and proceed as shown in fig. 22.

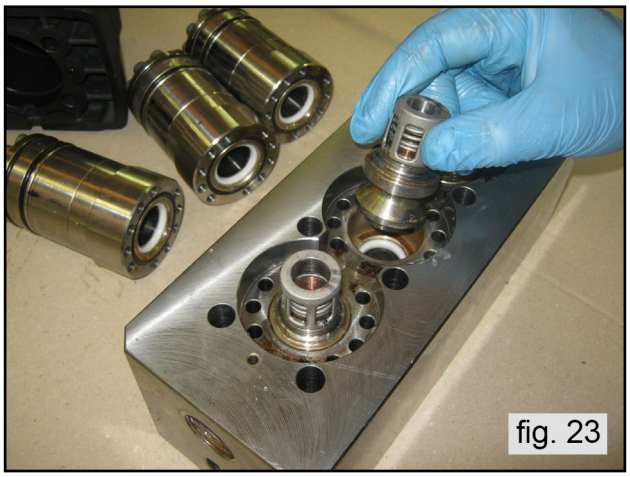
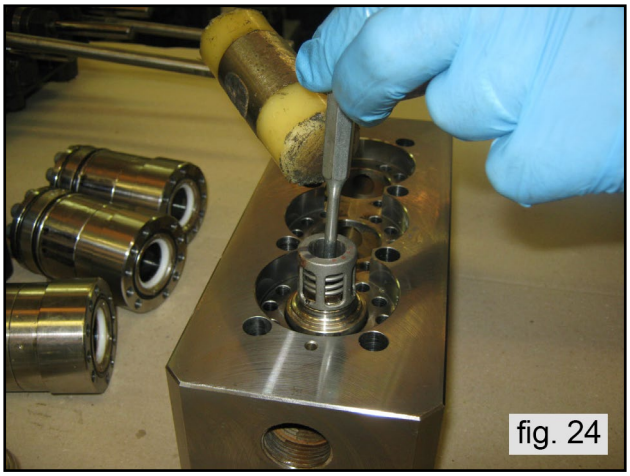
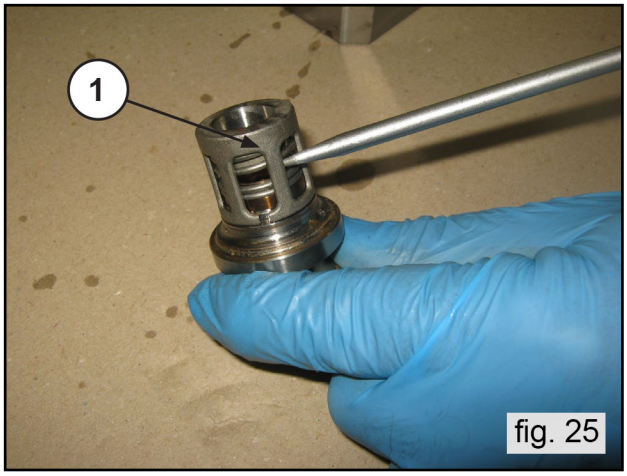


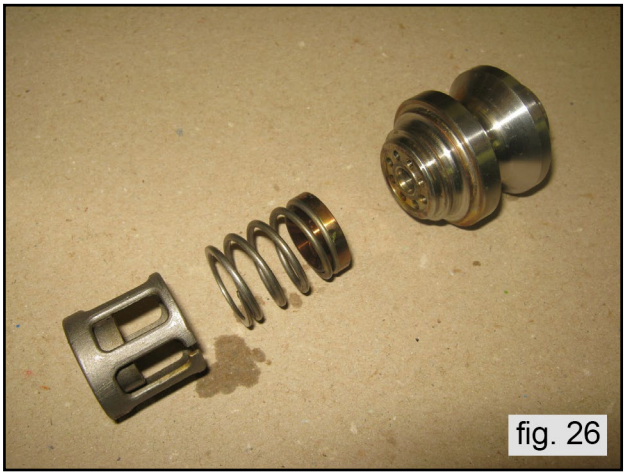
fig. 23

Remove the complete valve assemblies as indicated in fig. 23



If the valve seats are blocked on the head due to the formation of scale or oxide, they must be freed by inserting the tool (#F27508000) into the suction hole and operating as in fig. 24.





Extract the valve seat (1, fig. 25) check the various components for wear and replace them if necessary, see fig. 26.

At every valve inspection, always replace all the sealing rings and the O-rings between the liner and the head, between the head and the liner spacer in the area of the recirculation hole. Before reassembly, clean and dry off components and all their seats inside the head.

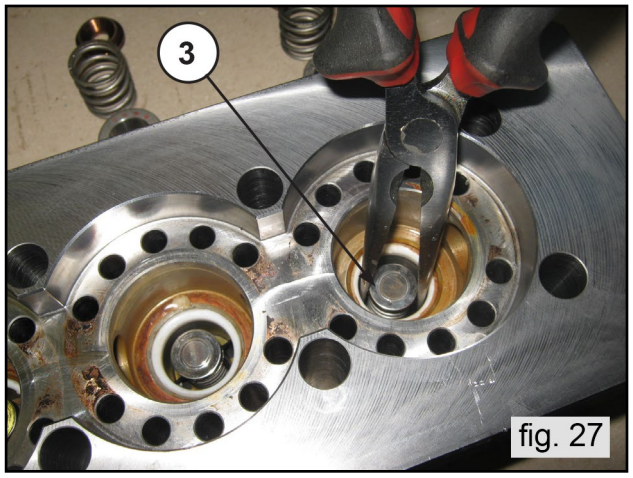


fig. 27

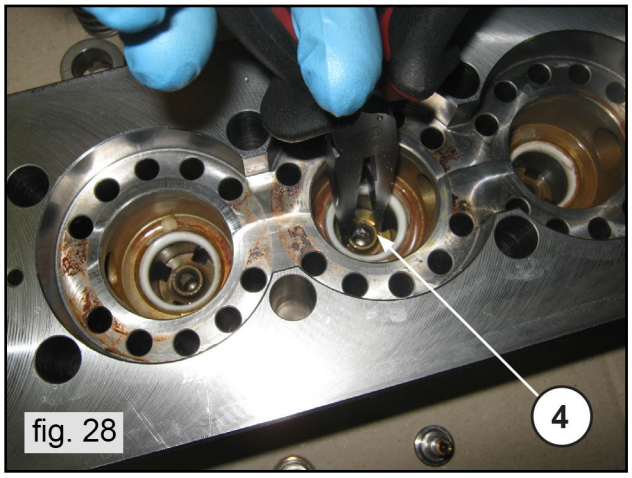


fig. 28

Extract the outlet plates (pos. 3) and their guides (pos. 4) with the springs, as shown in fig. 27 and fig. 28, check for wear and replace if necessary, and in any case within the times indicated in the “PREVENTIVE MAINTENCE” table of chapter 11 in the **Owner’s Manual.**

2.2.2 Reassembling the head - liners - valves

To reassemble the components, reverse the previously listed operations, paying attention to the correct assembly of the liner spacer: when the component is mounted, the two rough casting exhausts present on one of the side must be oriented towards the lower part of the crankcase (pump bracket side).
Heads - liners: proceed with assembly and head screw calibration, and then continue with the calibration of the liner fastening screws.
For the tightening torques and the various phases, follow the instructions in chapter 3.

2.2.3 Disassembly of the plunger unit - supports - seals

The plunger unit does not require any routine maintenance. Service operations are limited to the visual inspection of the cooling circuit’s draining. In case of anomalies / oscillations on the delivery pressure gauge, or pulsating of the cooling circuit’s draining hose (if flexible), seal packings must be inspected and replaced if necessary.

Proceed as follows to remove the plunger units:
Separate the head and the spacer for the liners from the crankcase as shown in par. 2.2.1 (fig. 19 and fig. 20).

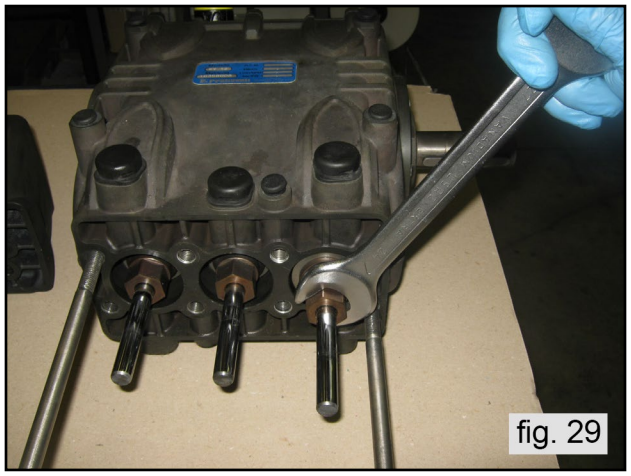


fig. 29

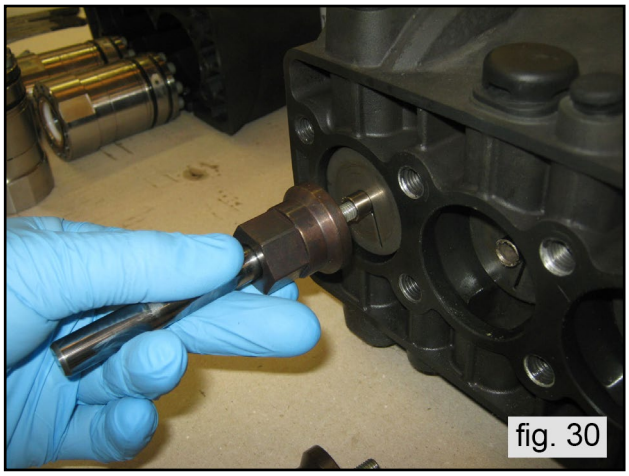


fig. 30

Remove the pumping element with a fork wrench and check for wear as indicated in fig. 29 and fig. 30, replace them if necessary.

Remove the M6 x 65 screws that fix the LP seals supports, HP seals support and liner as shown in fig. 31, and proceed to the separation of all the components as indicated in fig. 32 and fig. 33.

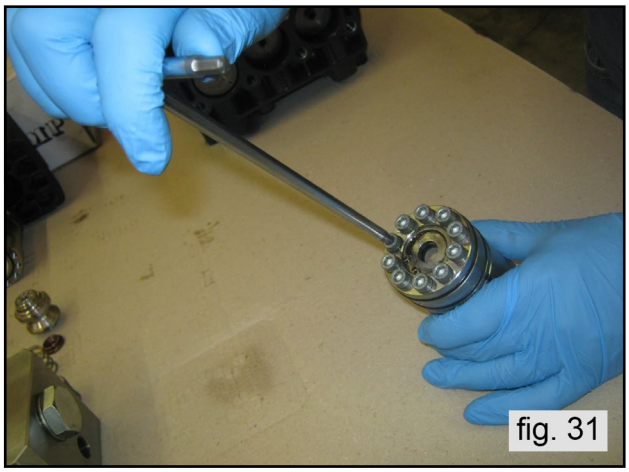


fig. 31


fig. 32


fig. 33

Remove the seeger ring and the seal retainer ring as shown in fig. 34, and using a special plastice pin extract the LP (low pressure) seal (5, fig. 35).

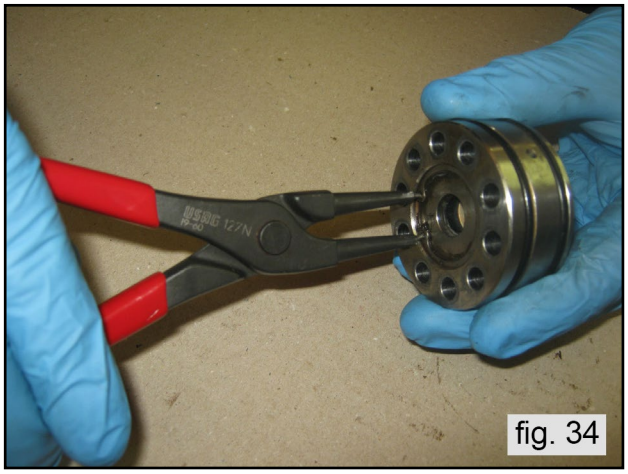


fig. 34

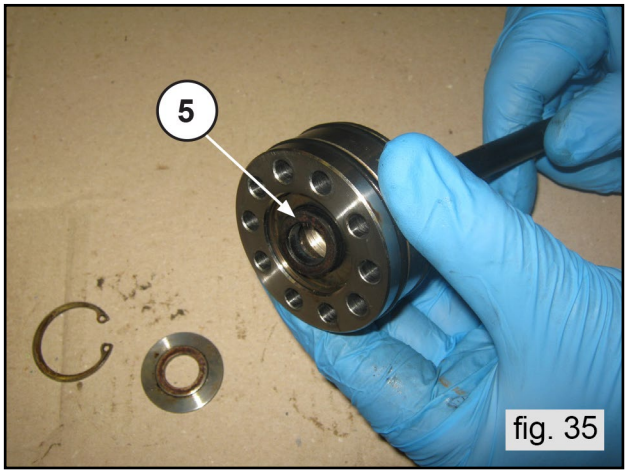


fig. 35

At each disassembly, the low pressure seals and all the O-rings must be replaced.

With separate HP seal support and special pin (6, fig. 36) make the H.P. pack come out pack (high pressure) (7, fig. 37), finally extract the head ring (fig. 38).

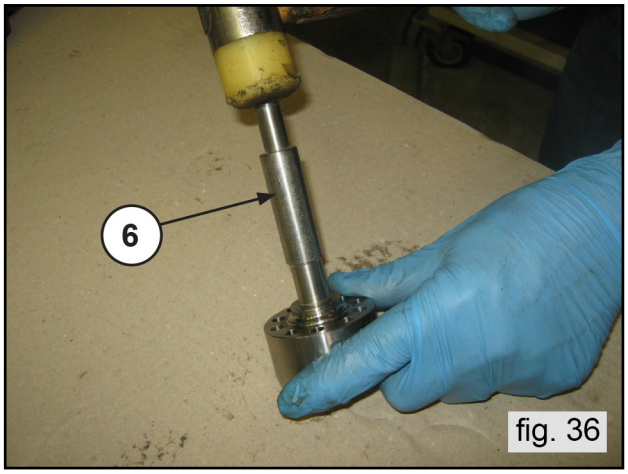


fig. 36

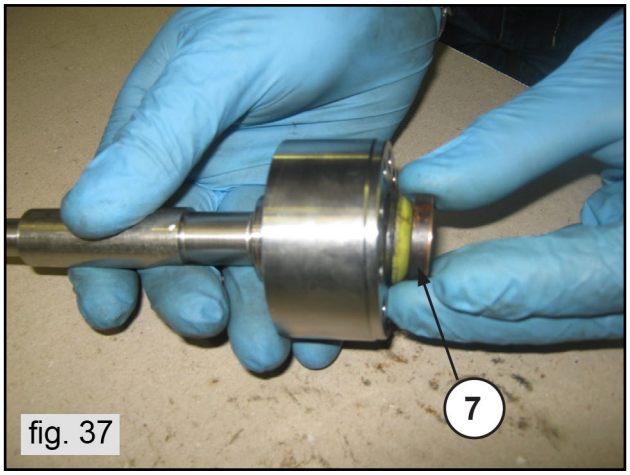


fig. 37

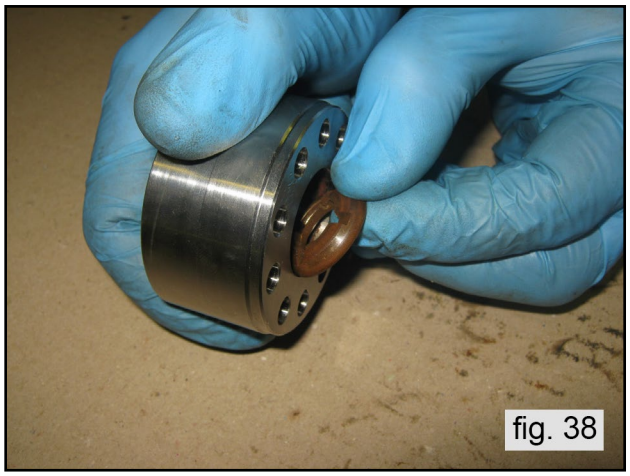


fig. 38

At each disassembly, the HP packing (fig. 39) must be replaced.

fig. 39

2.2.4 Reassembly of the plunger unit - support - seals

To reassemble the components, reverse the operations described above, paying attention to the sequences listed below; for the fastening torque values and phases, observe the instructions given in paragraph 3.

Introduce in the H.P. (high pressure) packing; considering the slight interference between the seal and the H.P. seals support, to avoid damage we advise using a plastic pad (1, fig. 41 and fig. 42).

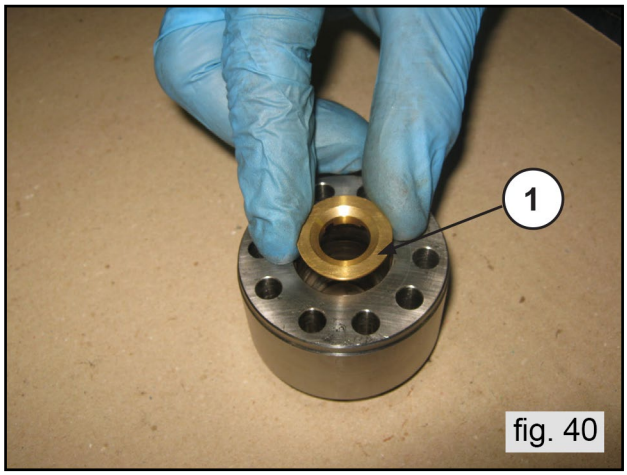


fig. 40

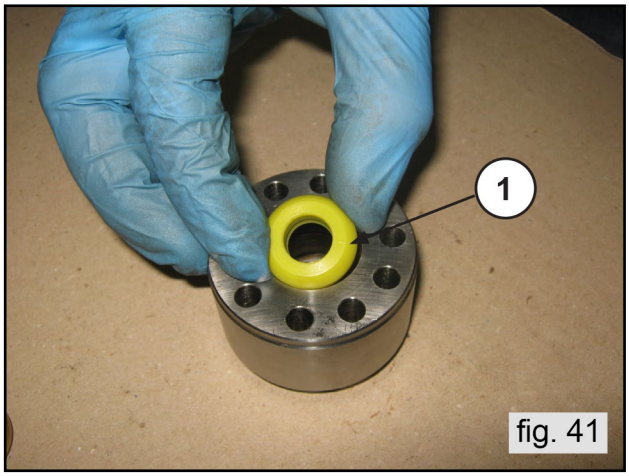


fig. 41

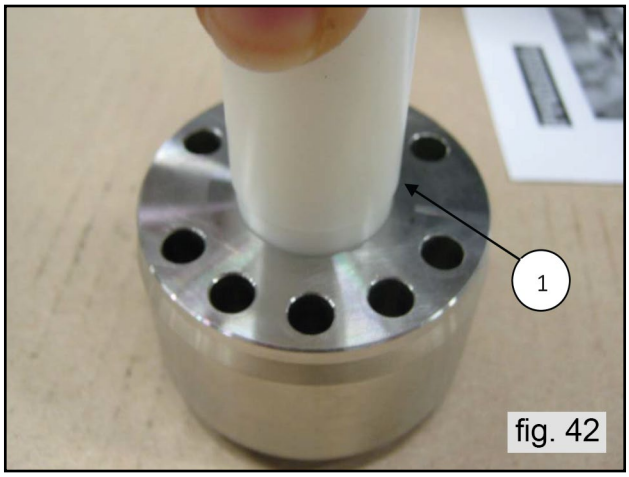


fig. 42

The H.P. seal must be placed in the support as indicated in fig. 41 and Fig. 43.

Before inserting them into their seats, the H.P. seals must be lubricated with silicone grease Type OKS 1110, following the operations listed below:
A) The external diameter must only be slightly greased;
B) On the internal diameter, grease must be applied paying great attention to filling all the pockets between the sealing lips as shown in fig. 45.

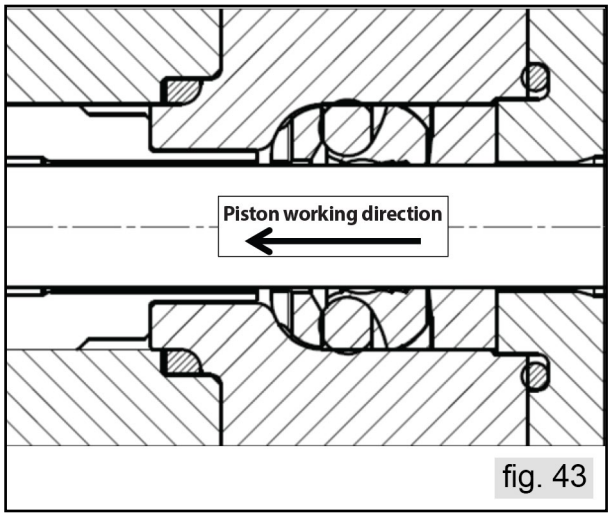


fig. 43

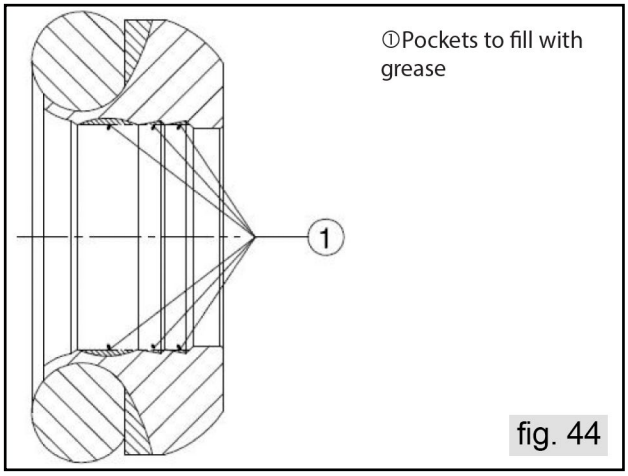


fig. 44

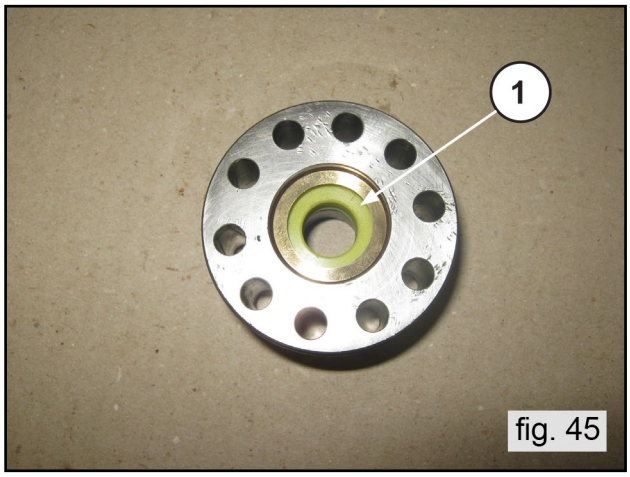


fig. 45

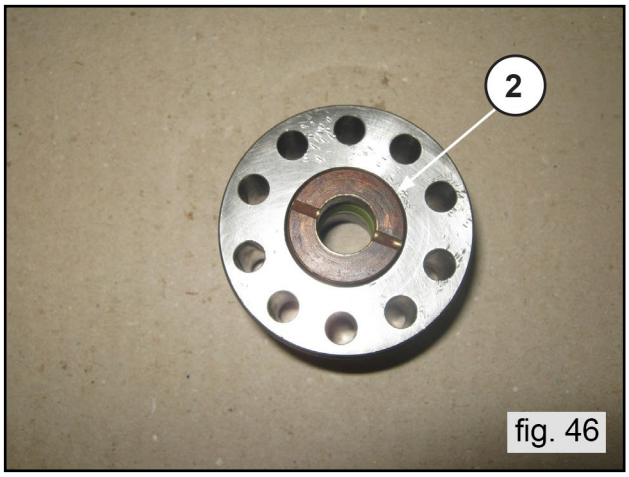


fig. 46

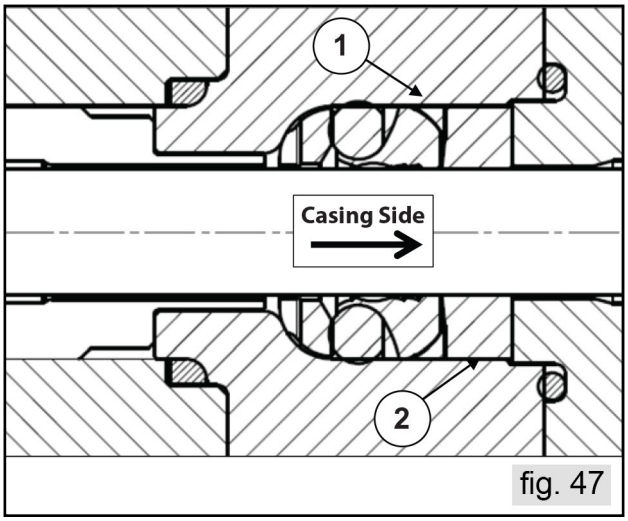


fig. 47

Insert the anti-extrusion ring (pos. 1) and the gasket bushing (pos. 2) arranged as shown in fig. 45. fig. 46, and fig. 47.

The gasket bushing (pos. 2) must be introducted into the support with outlets facing outwards (casing side) as shown in fig. 46 and in fig. 47.

The L.P. seal must be inserted into the support with the sealing lip in the plunger working direction as shown in fig. 48 and fig. 49, slightly lubricating the external diameter with silicone grease tyoe OKS 1110.

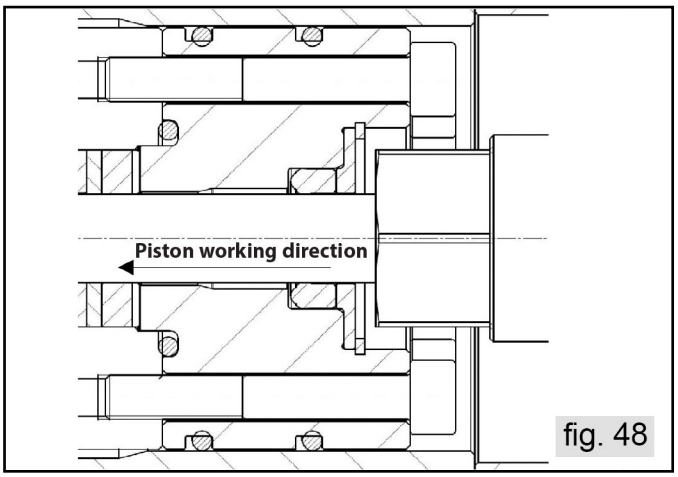


fig. 48


fig. 49

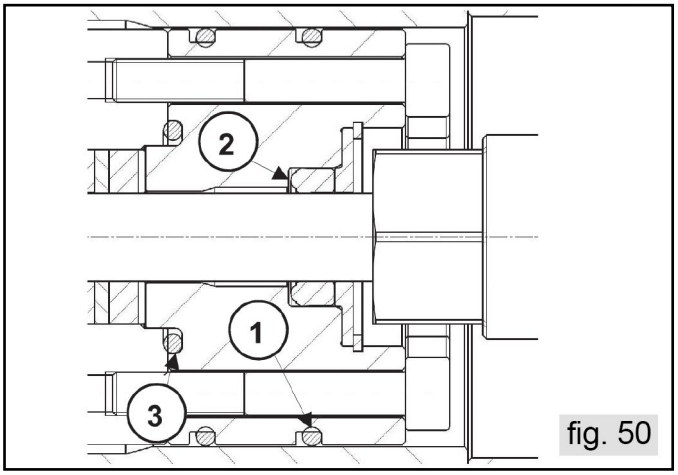


fig. 50

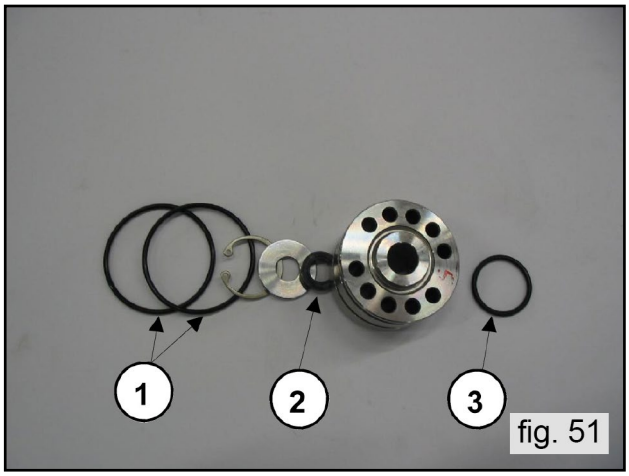


fig. 51

Reassemble the seal support unit as shown in fig. 50 and fig. 51 replacing pos. 1, 2, 3.

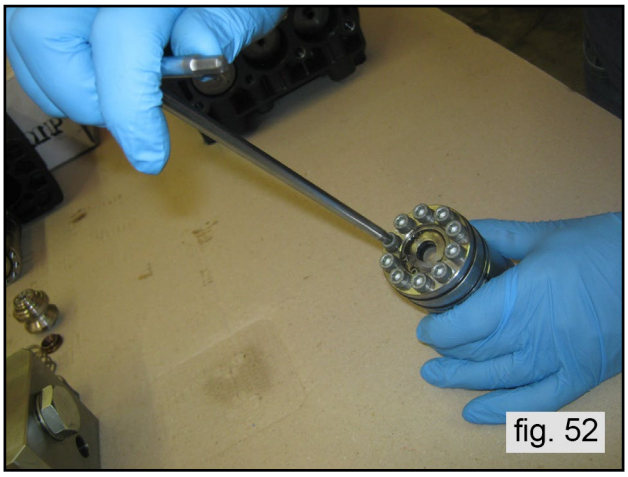


fig. 52

Assemble the L.P. and H.P. seals support units. Liner manually screwing the screws M6 x 65 as indicated in fig. 52. Then proceed with calibration using a torque wrench as indicated in chapter 3.

3. SCREW CALIBRATION

Screw calibration by means of a torque wrench only.

Description	Exploded View Position (From Owner's Manual)	Fastening Torque (Ft. Lbs.)	Fastening Torque (Nm)
Cover fastening screws	30	7.4	10
Oil drain plug	15	29.5	40
Con-rod cap fastening screw	18	22.1*	30*
Plunger fastening	48	14.8	20
Plunger guide fastening screw	36	7.4	10
Choke fitting	68	7.4	10
Support fastening screw	46	12.5****	17****
Head fastening screw	66	36.9**	50**
Liner fastening screw	47	12.5***	17***

* The con-rod caps fastening screws must be tightened respecting the phases indicated on page 19.

** The head fastening screws must be tightened respecting the phases and order shown in the diagram in fig. 54.

*** The liner fastening screws must be tightened respecting the phases and order shown in the diagram in fig. 54.

**** The support diagram fixing screws fig. 53 must be tightened in two steps:
1st step = 12.5 Ft. Lbs. (17 Nm) according to the sequence indicated;
2nd step = 12.5 Ft. Lbs. (17 Nm)(calibration check repeating the sequence indicated).

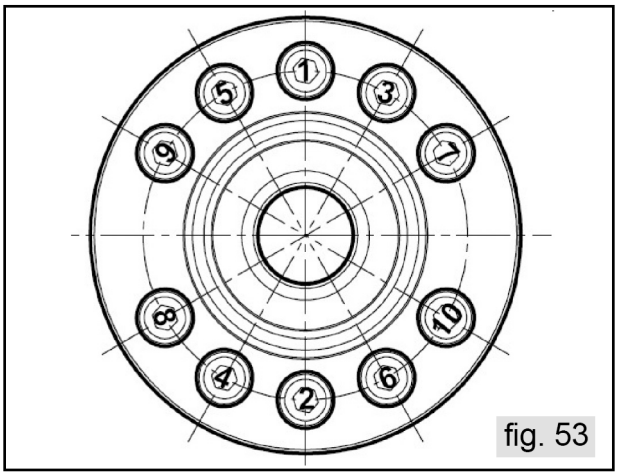


fig. 53

The screws - pos. 44-56 - must be tightened by means of a torque wrench after lubricating the thread. It is recommended to use Molybdenum Disulfide grease code #F12001500.

Head and liner screw fastening

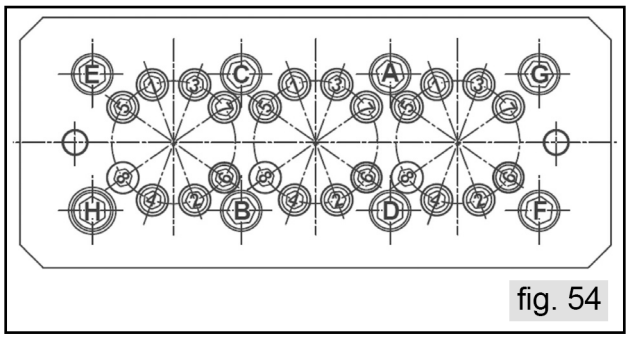


fig. 54

Operation 1: Tightening M10 x 210 screws (pos. 66) in two phases observing the sequence indicated in figure: (A-B-C-D-E-F-G-H)
Phase 1 = 22.1 Ft. Lbs. (30 Nm)
Phase 2 = 36.9 Ft. Lbs. (50 Nm)

Operation 2: Tightening M6 x 75 screws (pos. 47) in four phases observing the sequence indicated in figure: (1-2-3-4-5-6-7-8)
Phase 1 = 7.4 Ft. Lbs. (10 Nm)
Phase 2 = 10.3 Ft. Lbs. (14 Nm)
Phase 3 = 12.5 Ft. Lbs. (17 Nm)
Phase 4 = 12.5 Ft. Lbs. (17 Nm)

4. Repair Tools

Pump repaires can be facilitated by special tools coded as follows:

For assembly phases:

Head assembly stud (2 pieces)	F27840000
Buffer for pump shaft oil seal	F27904800
Buffer for plunger guide oil seal	F27904900

For disassembly phases:

Valve seats	F27508000
Head assembly stud (2 pieces)	F27840000
Plunger guide oil seal	F27503900 F26019400

MAINTENANCE LOG

HOURS & DATE

OIL CHANGE							
GREASE							
PACKING REPLACEMENT							
PLUNGER REPLACEMENT							
VALVE REPLACEMENT							

GENERAL PUMP

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