



# VKH

# Repair Manual



General Pump is a  
member of the  
Interpump Group



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05-16

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## 1. INTRODUCTION

This manual describes the instructions for repairing VKH Series pumps, and must be carefully read and understood before performing any repair intervention on the pump. Proper pump operation and longevity depend on the correct use and maintenance. General Pump declines any responsibility for damage caused by the misuse or the non-observance of the instructions described in this manual.



Warning Sign



Read contents carefully



Wear protective goggles



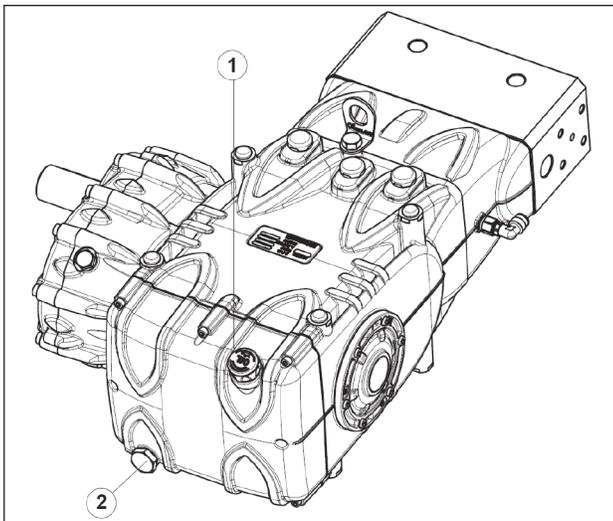
Wear protective gloves

## 2. REPAIR INSTRUCTIONS



### 2.1 Repairing Mechanical Parts

Mechanical parts repair must be performed after removal of oil from the casing. To drain the oil, remove the oil dipstick, (1, fig. 1) and then the draining plug (2, fig. 1).



### 2.1.1 Dismantling the mechanical part

The operations described must be performed after removing the hydraulic part, ceramic plungers and splash guards from the pump (paragraph 2.2.3 and 2.2.4):

Remove in the following order:

- the pump shaft tab
- the rear cover
- the con-rod cap 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. 2a).

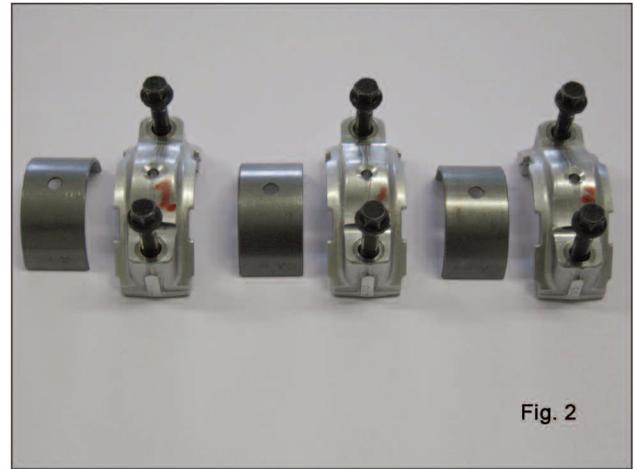


Fig. 2

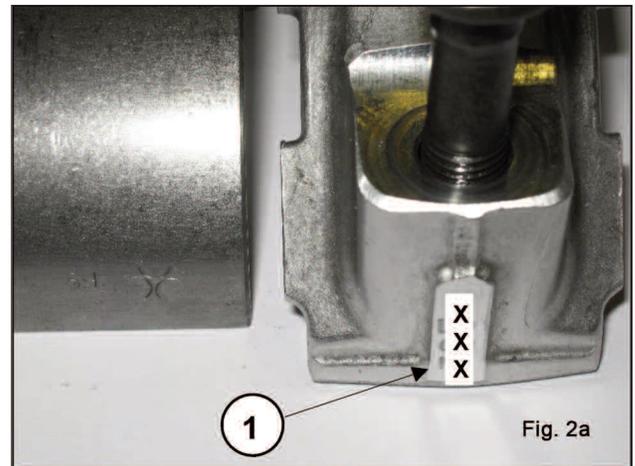


Fig. 2a

The used oil must be poured into a suitable container and consigned to an authorized recycle center.



**DO NOT RELEASE USED OIL INTO THE ENVIRONMENT UNDER ANY CIRCUMSTANCES.**

- the side covers using - for extraction 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. There are two reference points visible on the shaft (indicated with 1 in fig. 4 and in fig. 4a). These must be turned toward the operator to facilitate extraction.

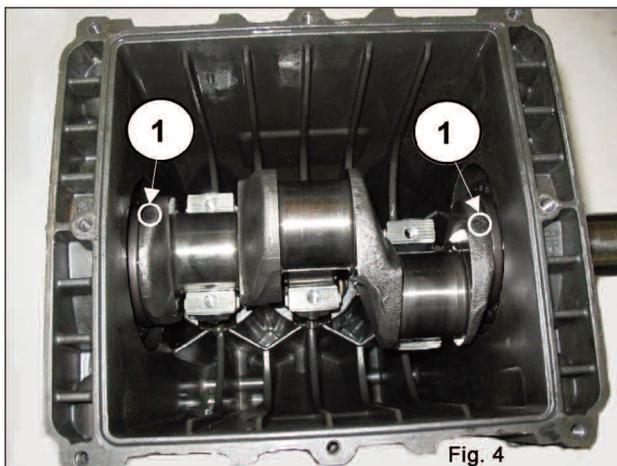


Fig. 4

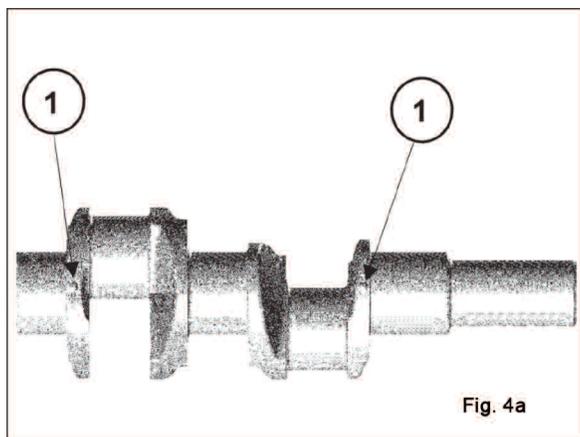


Fig. 4a

- Remove the pump shaft.
- Complete disassembly of the con-rod units by removing them from the pump casing and removing the plunger guide pins
- Remove the pump shaft seal rings using common tools.
- Remove the plunger guide seal rings as described below:

Use the extractor p/n F26019400 (1, fig. 5) and the gripper p/n F27503900 (2, fig. 5). Insert the gripper as far as possible onto the seal ring with the aid of a hammer (fig. 5a), subsequently screwing the extractor to the gripper, and use extractor hammer (fig. 5b) until the ring to be replaced is removed (fig. 5c).

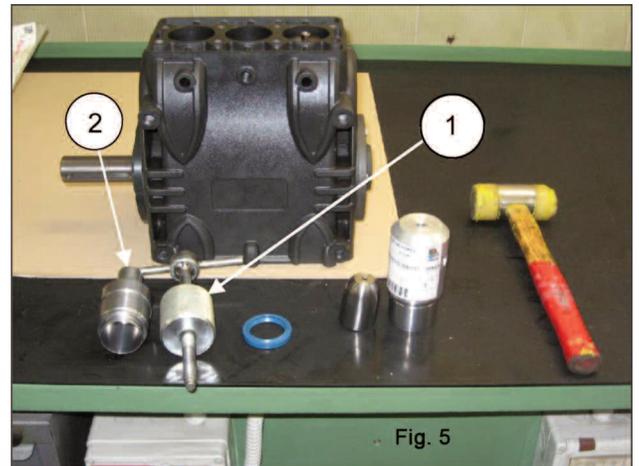


Fig. 5



Fig. 5a

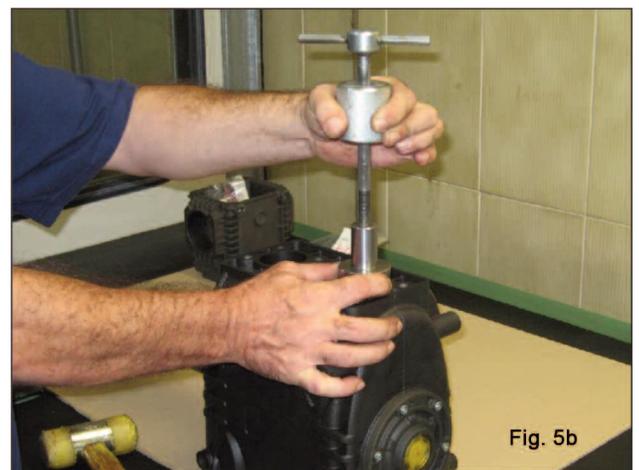


Fig. 5b



Fig. 5c

When disassembling the con-rod groups check the wear status of the plunger guide rods (1, fig. 5d), if necessary replace them removing the 2 fixing M6 screws (2, fig. 5d).

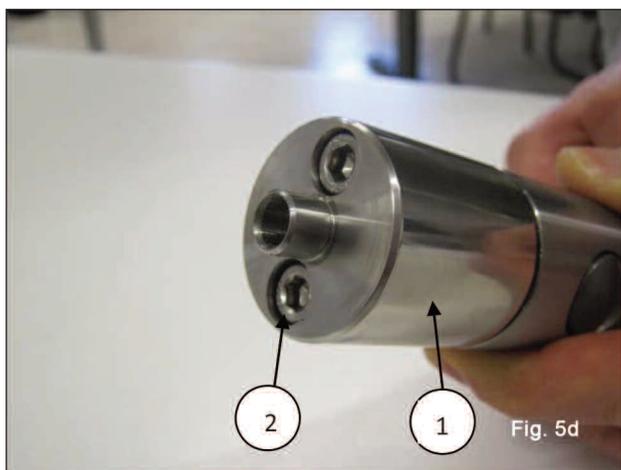


Fig. 5d

### 2.1.2 Reassembly of Mechanical Parts

After having checked that the casing is clean, proceed with assembly of the mechanical part as described below:

- 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-bearings are positioned in their respective seats in the con-rod and cap.**

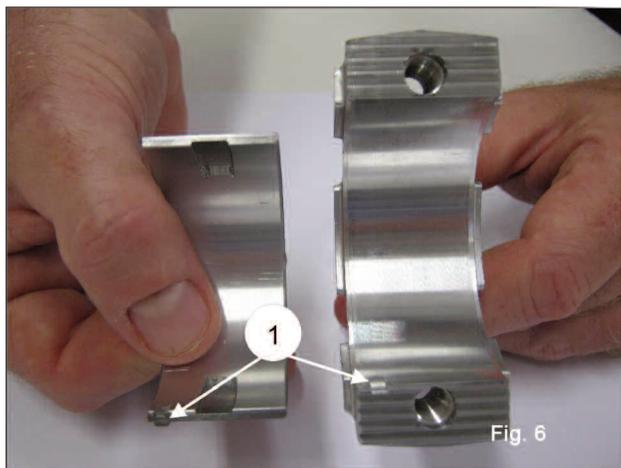


Fig. 6

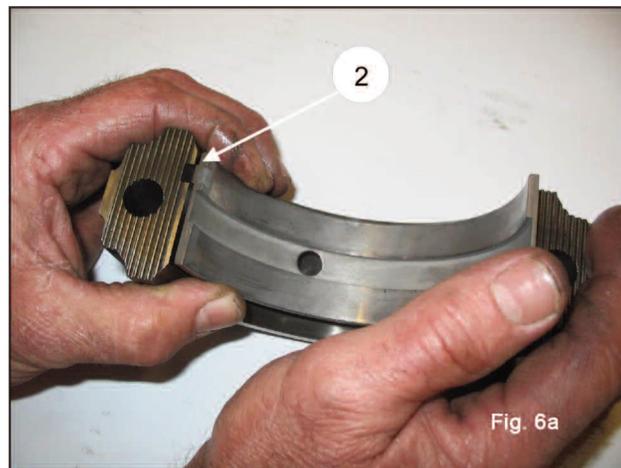


Fig. 6a

If the plunger guide rods have been disassembled, before reassembling them check the correct positioning of the sealing O-rings (1, fig. 6b) replace them if necessary. Tighten the plunger guide rods through the respective two M6 screws to the tightening torque indicated in chapter 3.



Fig. 6b

- Insert the plunger/con-rod guide units into the pump casing, directing the numbering on the con-rod shank towards the top of the casing.

To facilitate pump shaft insertion (without the tab), it is essential to repeat the operation performed during disassembly, pushing the plunger/con-rod guide units as far down as possible (2.2.1).

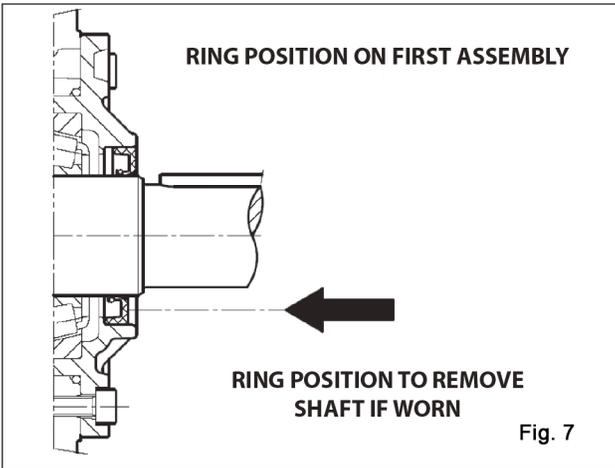
- Before assembling the side cover on the PTO side, check the conditions of the radial ring lip seal and relative contact area on the shaft.

If replacement is necessary, position the new ring using a tool (p/n F27904800) as shown in fig. 7.

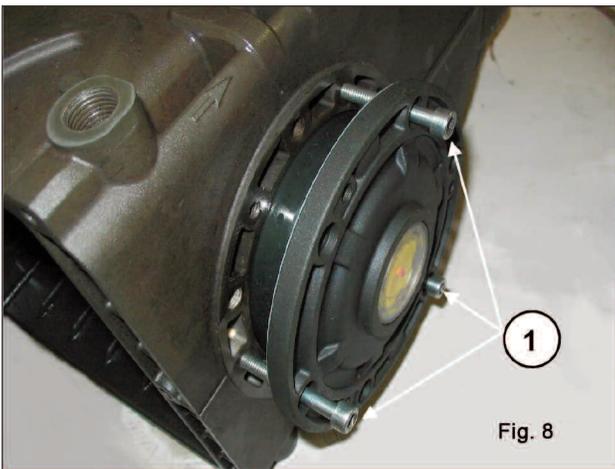


**If the pump shaft shows diametrical wear in the area of contact with the lip seal, in order to prevent the grinding operation, it is possible to reposition the ring in abutment with the cover as shown in fig. 7.**

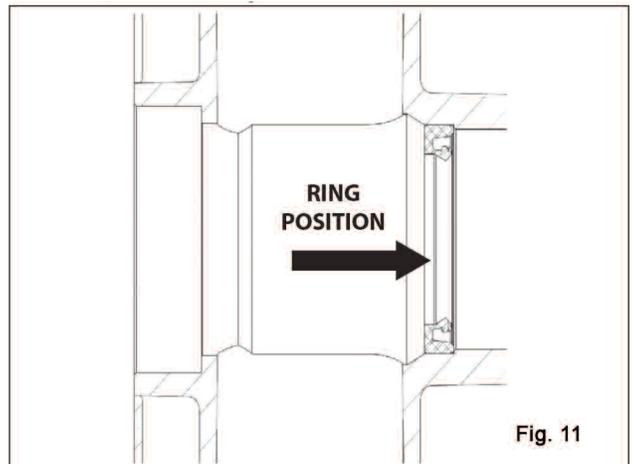
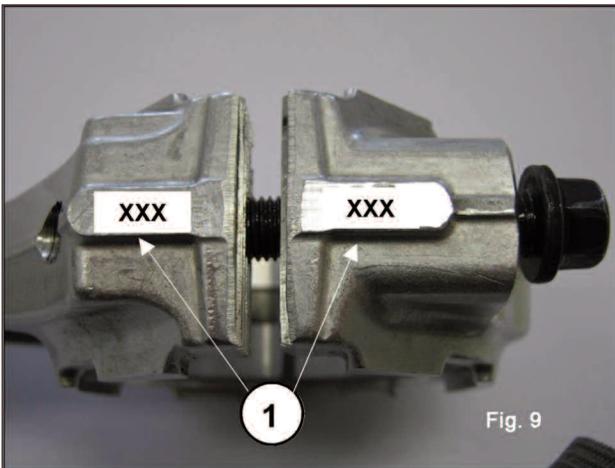
Before assembling the side covers, make sure there are O-rings on both of them and shim rings on the indicator side cover only. To facilitate filing of the first section and relative press fitting of the covers on the casing, we recommend using 3 partially-threaded M6 x 40 screws (1, fig. 8), then completing the operation with the screws supplied (M6 x 18).



- 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 pump casing (fig. 11), following the procedure described:  
use the p/n F27904900 composed of a tapered bushing and a buffer. Screw the tapered bushing into the hole in the plunger guide (fig. 11a), 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 pump casing (fig. 11b), remove the tapered bushing (fig. 11c).



- Couple the con-rod caps to their shanks, referring to the numbering (1, fig. 9).  
**Note the correct assembly direction of the caps.**



- Fasten the caps to their respective 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 Tighten torque to 22 ft. lbs. (30 Nm)  
Alternately, ensure:  
1 Pre-tightening torque 7-11 ft. lbs. (10-15 Nm)  
2 Tightening torque 22 ft. lbs. (30 Nm)



After removing the side covers, as described above, remove the outer ring nut on the bearings from its seat on the covers, using an appropriate extractor as shown in fig. 12 and fig. 12a. 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. 11b



Fig. 11c

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

**2.1.3 Disassembly / Reassembly of Bearings and Shims**

The type of bearings (tapered 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) Disassembly / Reassembly of the Crankshaft Without Replacement of the Bearings**

After having removed the side covers as indicated in 2.1.1, check the conditions of the rollers and their relative tracks. If all parts are in good condition, clean the components carefully with a degreaser and redistribute lubricant oil uniformly. The previous shims can be reused, taking care to insert them only under the indicator side cover. Once the complete unit (indicator side flange + shaft + motor side flange) is assembled and the cover screws have been tightened to the recommended torque, check that the rotation torque of the con-rod shaft - with the con-rod disconnected - is between 3-4.5 ft. lbs. (4-6 Nm).

To transition the two side covers closer to the casing, it is possible to use 3 M6 x 40 screws for the first positioning phase, as indicated above, and the screws provided for final fastening. The shaft rotation torque (with the con-rods connected) should not exceed 6 ft. lbs. (8 Nm).

**B) Disassembly / reassembly of the Crankshaft with Replacement of the Bearings.**



Fig. 12

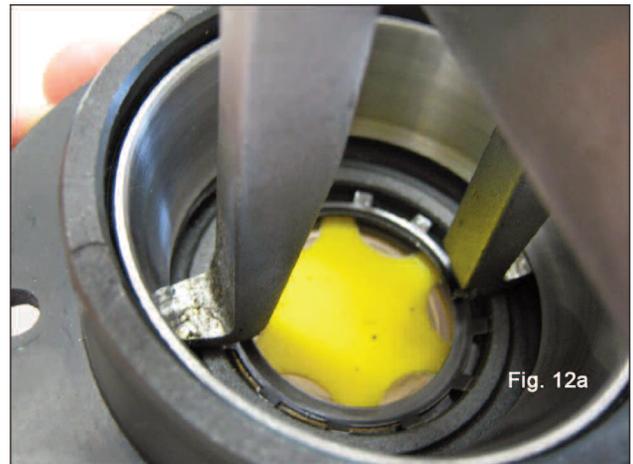


Fig. 12a



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 facilitated by heating the involved parts to a temperature between 250°F-300°F (120°C-150°C), ensuring that the ring nuts fit into their seats.



**Never exchange the parts of the two bearings.**

**Determining the shim pack:**

Perform the operation while the plunger/con-rod guide units are assembled, the con-rod caps are disconnected and the con-rods are pushed downwards. Insert the pump shaft without tab into the casing, making sure the PTO shank comes out of the correct side.

Secure the PTO side flange to the casing, taking care with the lip seal as described previously and tighten the fixing screws to the recommended torque. Then feed the flange on the indicator side without shims in the case and start to move it closer, manually screwing the M6 x 40 service screws in equally, with small rotations such as to move the cover in slowly and correctly. Continuing the procedure in this way, a sudden increase in hardness during shaft rotation will soon be experienced. At this point, halt the forward movement of the cover and loosen the fixing screws completely. With the aid of a feeler gauge, measure the clearance between the sid cover and pump casing (see fig. 14).



Fig. 14

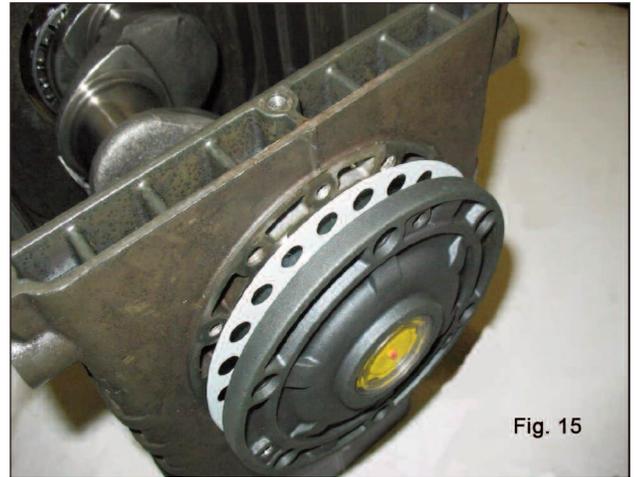


Fig. 15

Once the type and number of shims have been determined using the table, check the following: assemble the shim pack on the indicator side cover centering (fig. 15), secure the cover to the casing, following the procedure in 2.1.2 and tighten the screws to their recommended torque.

Check that the shaft rotation is between 3-4.5 ft. lbs. (4-6 Nm). If this torque is correct, connect the con-rods to the crankshaft and to the next stages. If it is not, redefine the shim pack, and repeat the operation.

**2.1.4 Dismantling the Reduction Unit**

- Remove the reduction gearbox fixing screws.
- Screw into the holes 3 grub screws or threaded screws of size M8 (1, fig. 16) acting as extractors while striking on the pinion so that the bearing remains on it while removing the cover (fig. 17).



Fig. 16

Detected Measurement	Shim Type	# 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	1
	0.10	1
From: 0.56 to: 0.60	0.25	2
From 0.61 to: 0.70	0.35	1
	0.25	1



Fig. 17

- Remove the reduction gearbox cover and extract the bearing from the pinion with common tools (fig. 18).
- Take out the screw fixing the crown wheel along with the washer and extract the crown wheel. If necessary, it is possible to use an extractor hammer to be applied on the two M8 holes (1, fig. 19) or a common extractor tool (fig. 19).

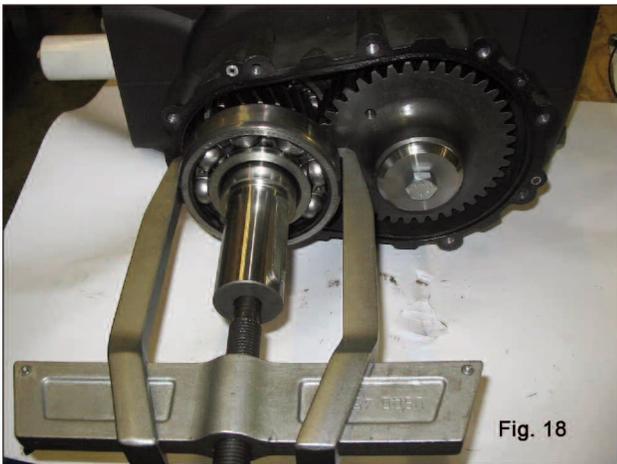


Fig. 18

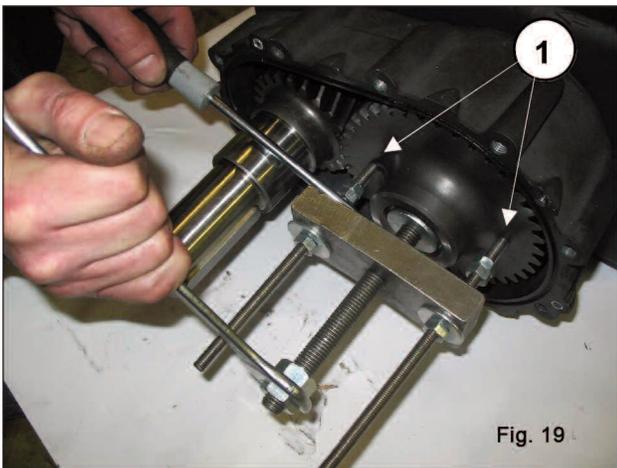


Fig. 19

- Remove the pinion using an extractor hammer to be applied on the M12 hole (fig. 20).
- Unscrew the bolts fastening the reduction gearbox, then remove it (fig. 21).

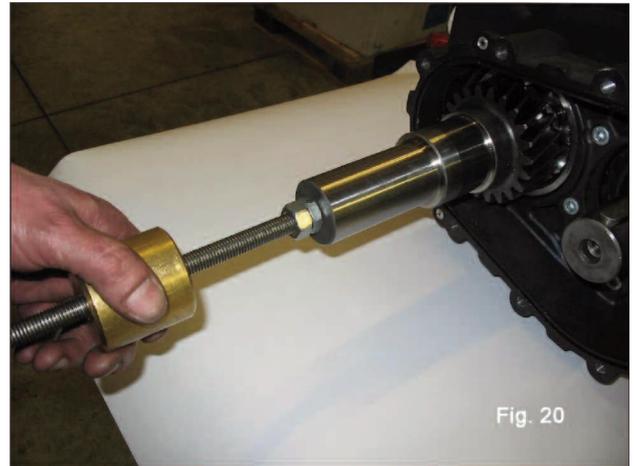


Fig. 20



Fig. 21

### 2.1.5 Reassembling the Reduction Unit

- Pre-assemble the reduction gearbox bearing using ordinary tools.
- Position the gasket (fig. 22) and mount the reduction gearbox, taking care to enter the hole in the reduction gearbox with the reference pin on the casing (1, fig. 23).



Fig. 22

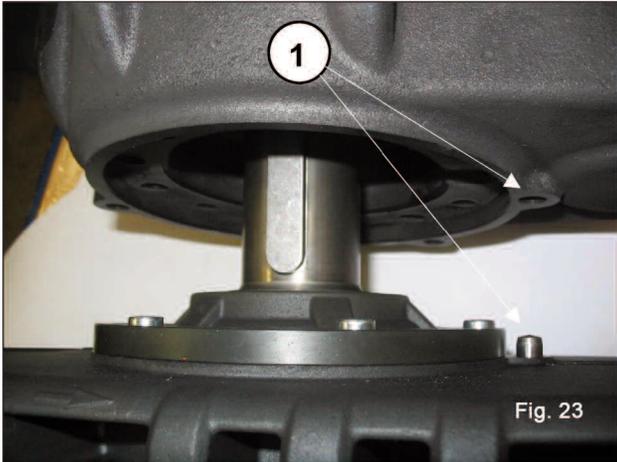


Fig. 23

- Secure the reduction gearbox with the 6 M8 x 50 screws and calibrate the screws with a torque wrench (fig. 24) as indicated in Chapter 3.
- Insert the crown wheel on the shaft, place the washer in between and tighten the fixing screw with a torque wrench (fig. 25) to the torque setting indicated in Chapter 3.



Fig. 24



Fig. 25

- Apply the two pins Ø5 on the reduction gearbox (1, fig. 26) Pre-assemble the bearing on the pinion and insert it fully into its seat in the reduction gearbox with a hammer (fig. 27).

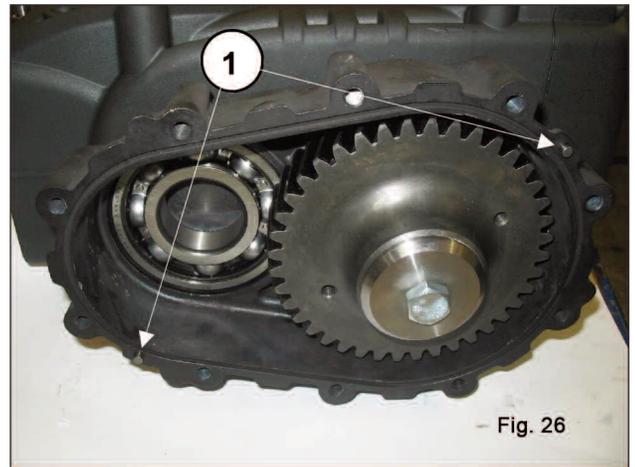


Fig. 26



Fig. 27

The bearings and crown wheel can be mounted cold. The press fitting operation can be facilitated by heating the involved parts to a temperature between 250°F and 300°F (120°C and 150°C), ensuring that the ring nuts fit fully into their seats.

- Insert the O-ring into the reduction gearbox seat (fig. 28).
- Fit the cover onto the pinion bearing using two M8 grub screws or screws to hold it in position during assembly (1, fig. 29).
- Mount the reduction gearbox cover by pressing a buffer on the face of the cover or using the special tool p/v F27517400 (fig. 30).
- Make this easier by simultaneously screwing in some fixing screws (1, fig. 29).



Fig. 28

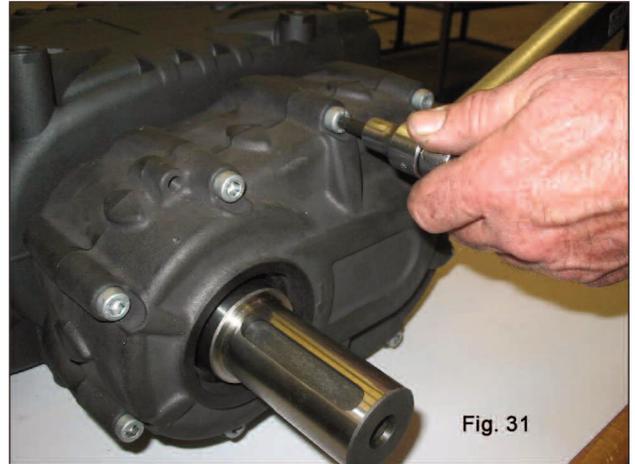


Fig. 31

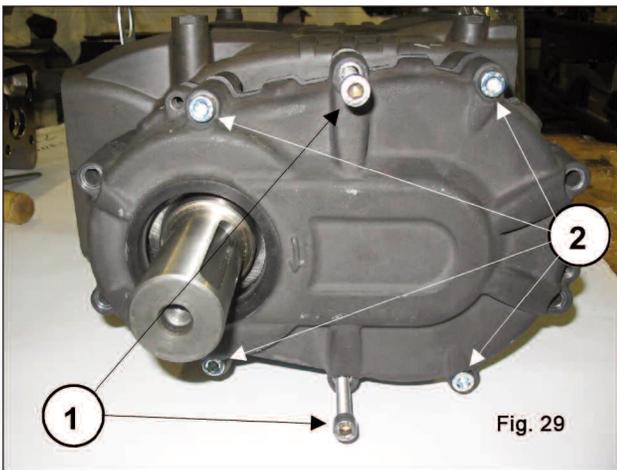


Fig. 29

- Secure the reduction gearbox cover with the 10 M8 x 50 screws and calibrate the screws with a torque wrench (fig. 31) as indicated in Chapter 3.



Fig. 30

- Check the conditions of the pinion oil seal lip; if it needs replacing, position a new pinion oil seal ring using the tool p/n F27904800.



**If the shaft should present a diameter wear corresponding to the lip seal, to prevent grinding, position the ring in the second stroke as indicated in fig. 32.**



**After fitting the reduction unit check the pinion rolling.**

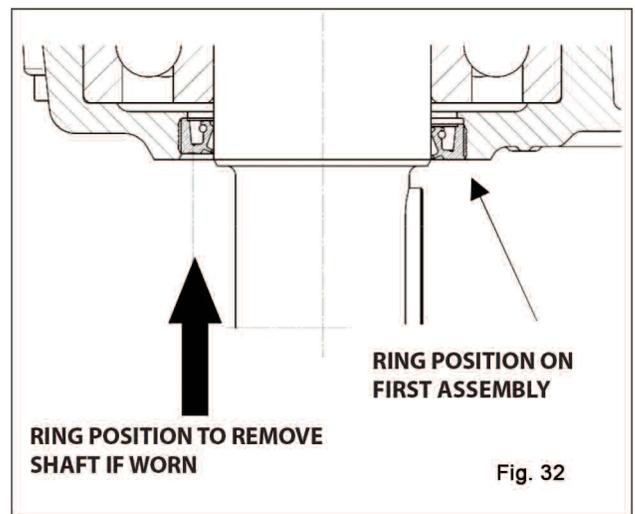


Fig. 32

**2.1.6 Changing Version - Fitting/removing the Reduction Unit**

To modify the version, fitting the reduction unit where it has not been contemplated, you need to remove the shaft oil seal (1, fig. 33) and insert on the casing the reduction gearbox reference pin Ø8 (2, fig. 33). Then proceed with the operations specified in 2.1.4. When modifying the version, removing the reduction unit where it has been contemplated, you need to insert the shaft oil seal ring in its seat on the side cover using the tool p/n F27904800 (1, fig. 33).



Fig. 33



Failing to carry out the steps described in 2.1.5 will impair pump operation and jeopardize operator safety.

**2.2 REPAIRING HYDRAULIC PARTS**

**2.2.1 Reassembling the Head-Liners-Valves**

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

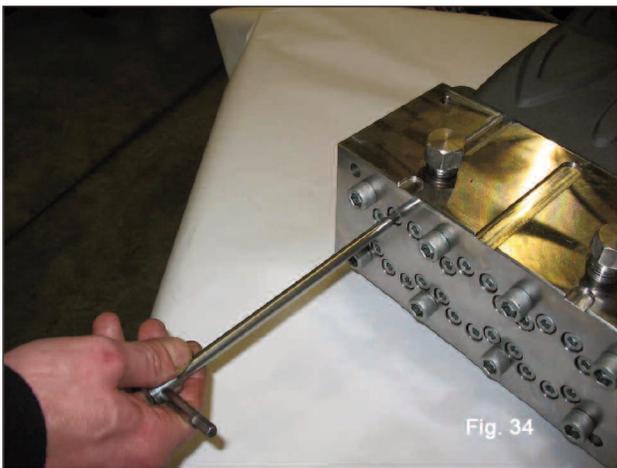


Fig. 34



Loosen but do not remove the M8 x 100 screws fastening the liners to the head, as shown in fig. 34, so as to free them.

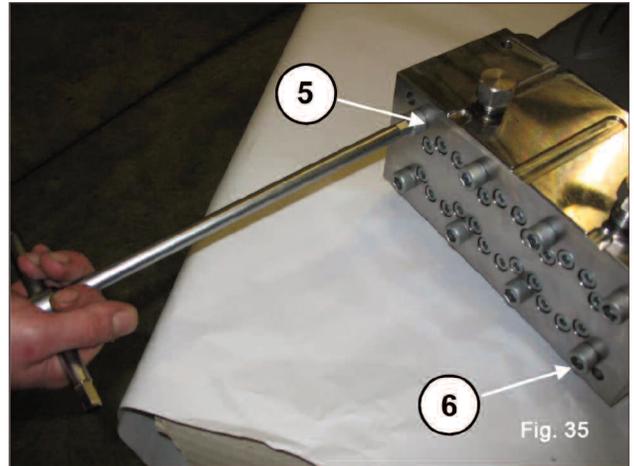


Fig. 35

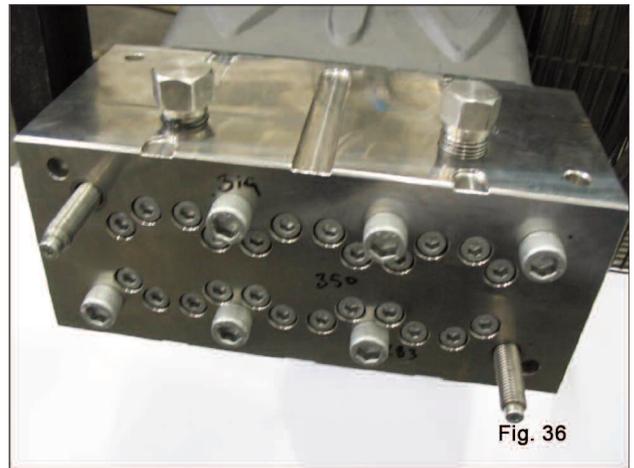


Fig. 36

- Unscrew the M12 x 60 head fixing screws No. 5 and No. 6 as shown in fig. 35 replacing them with two service pins (p/n F27508200) as shown in fig. 36, then remove the remaining screws.



Fig. 37

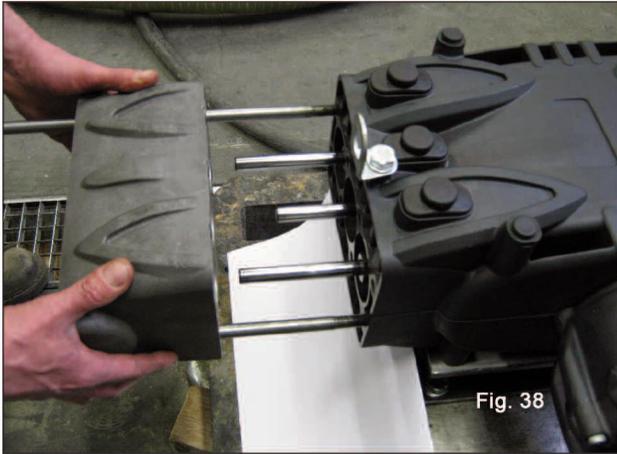


Fig. 38

- Separate the head and the spacer for the liners from the pump casing as shown in fig. 37 and fig. 38.

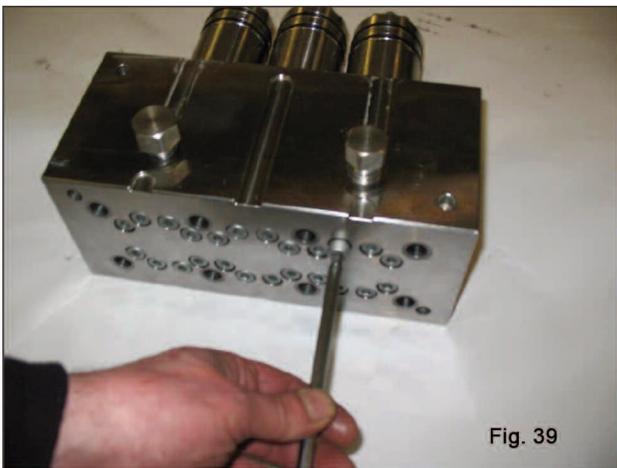


Fig. 39

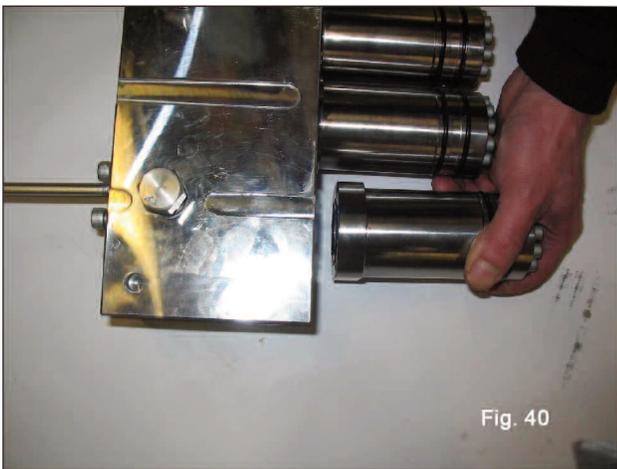


Fig. 40

- Take out the M8 x 100 screws fastening the liners to the head as shown in fig. 39 and proceed as shown in fig. 40.

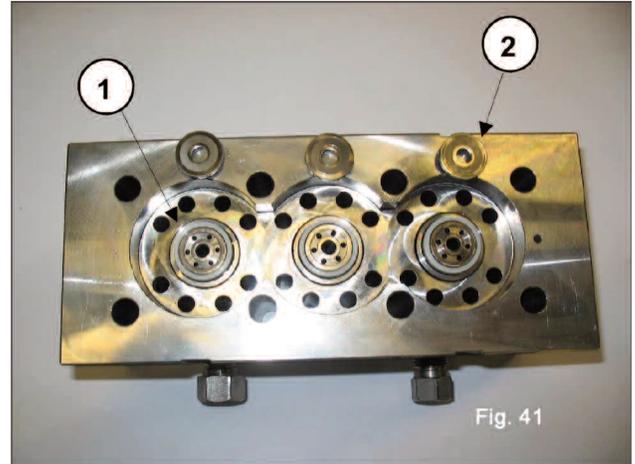


Fig. 41



When removing the liners, take care not to lose the valve seats, 1, and the flat valves, 2, as shown in fig. 41 which, being only laid down, could fall.

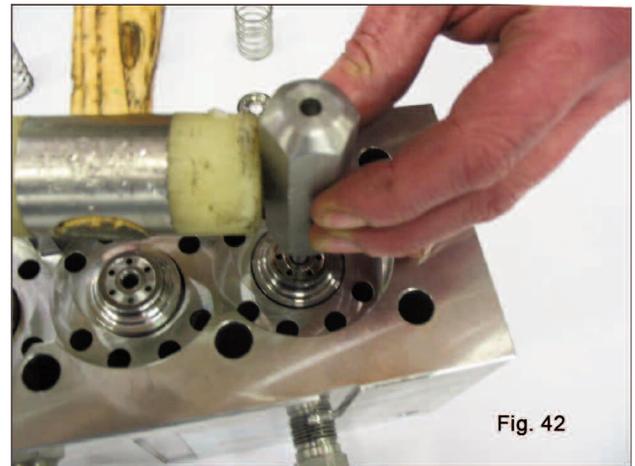


Fig. 42



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 (p/n F27508000) into the inlet hole and operating as in fig. 42.

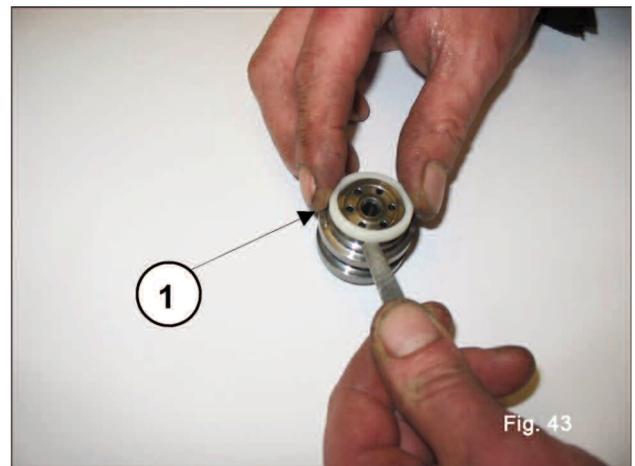


Fig. 43

- Extract the valve seats, 1, as shown in fig. 43, check the various components for wear and replace them if needed.



At every valve inspection, always replace off 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 assembly, clean and dry the components and all their seats inside the head.

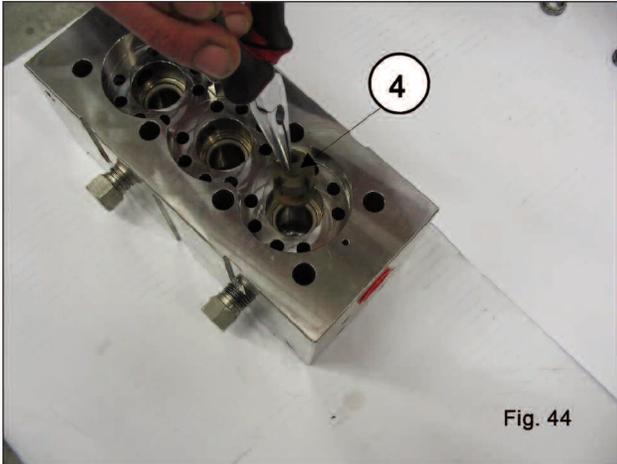


Fig. 44

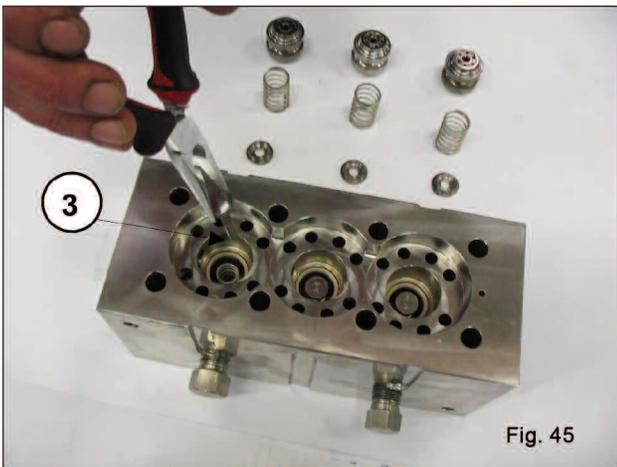


Fig. 45

- Extract the outlet plates, 3, and their guides, 4, with the springs, as shown in fig 44 and fig. 45, check for wear and replace if necessary, and in any case within the times indicated in the "Preventive Maintenance" table of Chapter 11 in the Owner's Manual.

### 2.2.2 Reassembling the Head - Liners - Valves



To reassemble the components, invert the previously listed operations, paying attention to the correct assembly of the liner spacer: when the component is mounted, the two rough castings exhausts present on one of the sides must be oriented toward the lower part of the casing (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 extract plunger units:

- Separate the head and the spacer for the liners from the pump casing as shown in 2.2.1 fig. 37 and fig. 38.

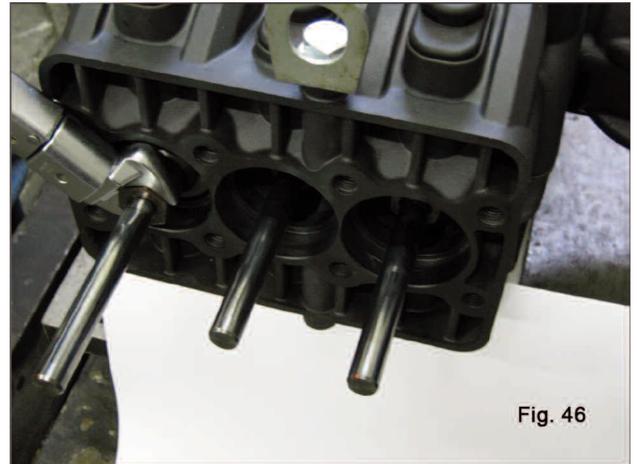


Fig. 46

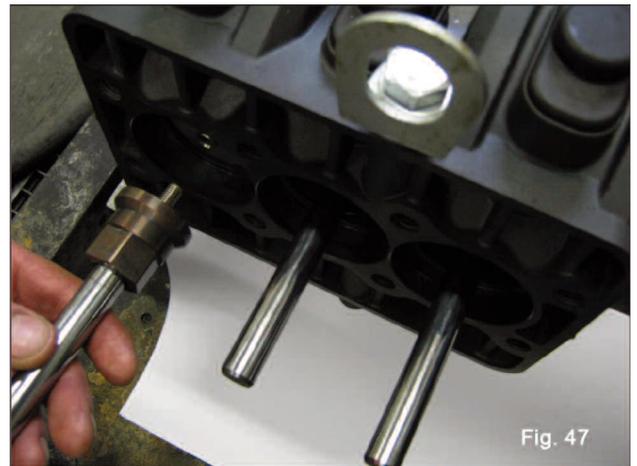
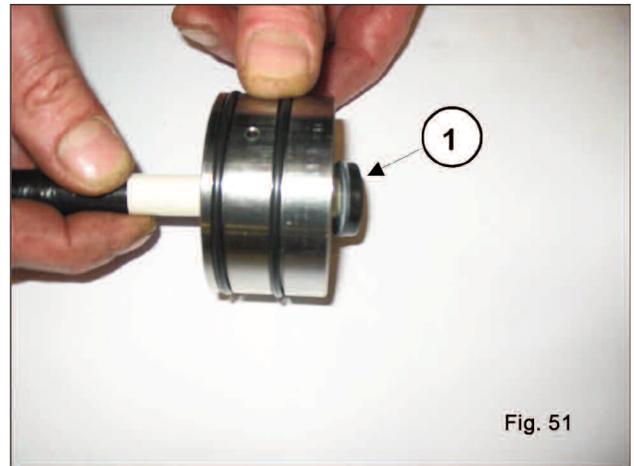
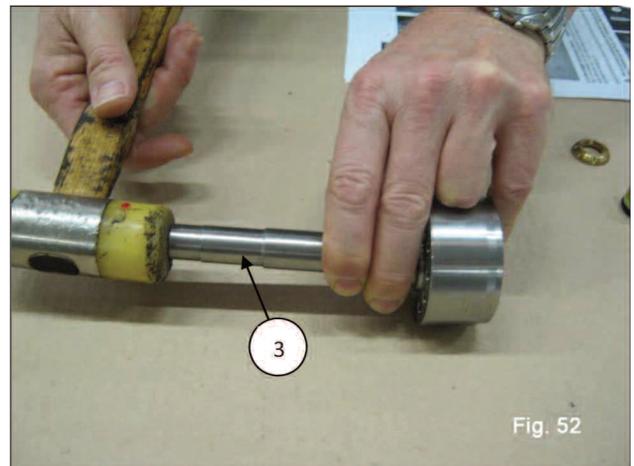


Fig. 47

- Remove the pumping elements with a fork wrench and check of wear as indicated in fig. 46 and fig. 47, replace them if necessary.
- Remove the M6 x 80 screws that fix the LP seals supports, HP seals support and liner as shown in fig. 48 and proceed to the separation of all the components as indicated in fig. 49 and 49a.



- Remove the seeger ring and the seal retainer ring as shown in fig. 50, and using a special plastic pin extract the LP (low pressure) seal, 1, as shown in fig. 51.



### 2.2.4 Reassembly of the Plunger Unit - Supports - Seals

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

- Insert the bushing for plunger and seal in the liner (1, fig. 56, fig. 57 and fig. 58).

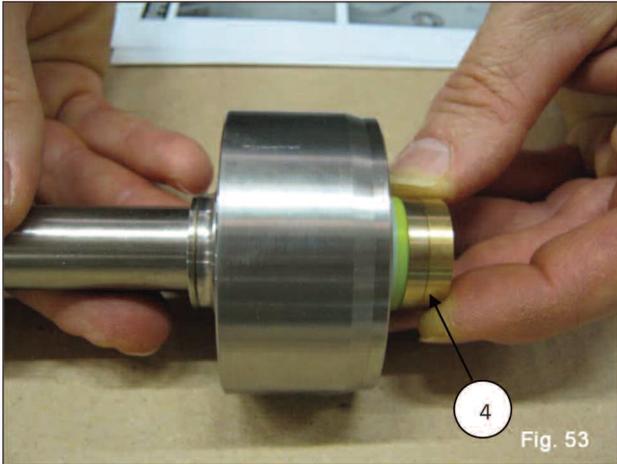


Fig. 53

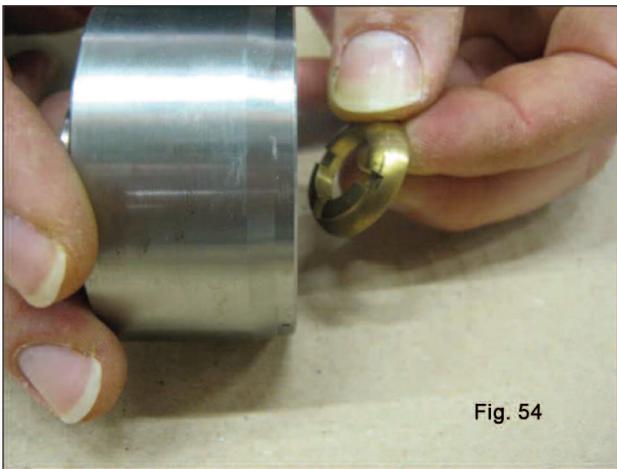


Fig. 54

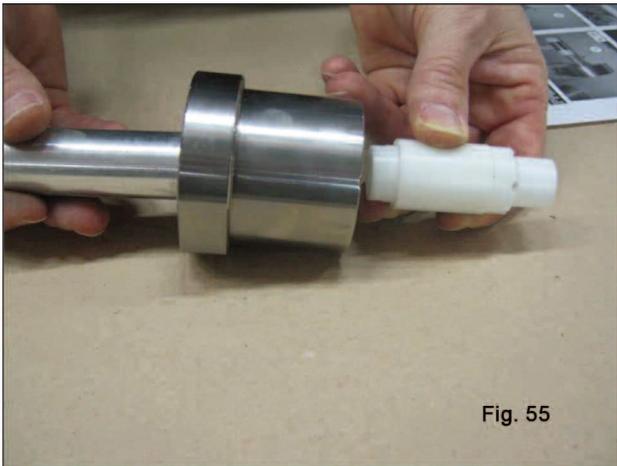


Fig. 55



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

- With separate HP seals support and a special pin (3, fig. 52) make the HP pack come out, pack (high pressure), 4, fig. 53, finally extract the head ring (fig. 54). The bushing for plunger, if replaced, is extracted from the liner with a special pin (fig. 55).



**At each disassembly, the HP packing, 4, fig. 53, must be replaced.**

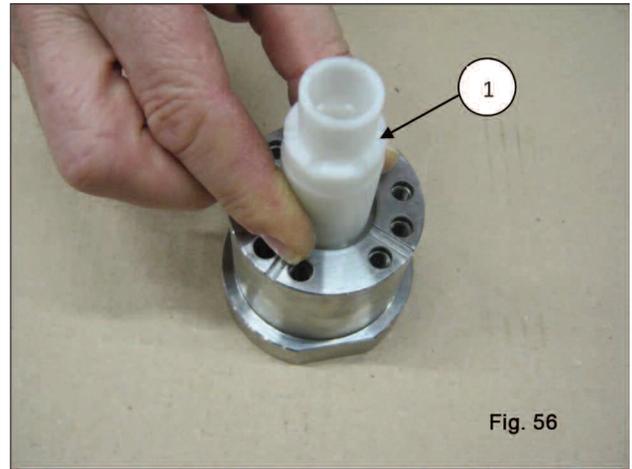


Fig. 56

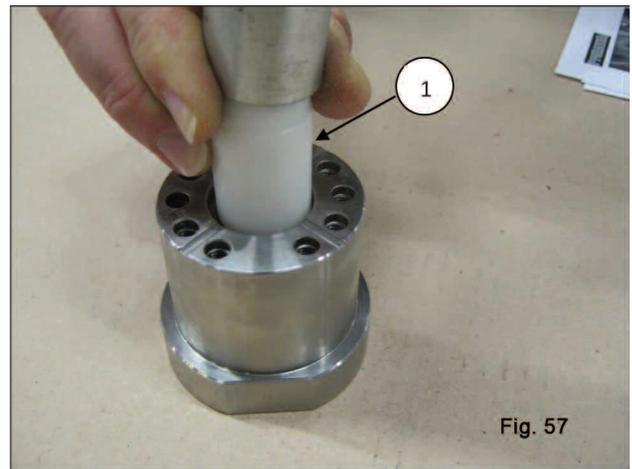


Fig. 57

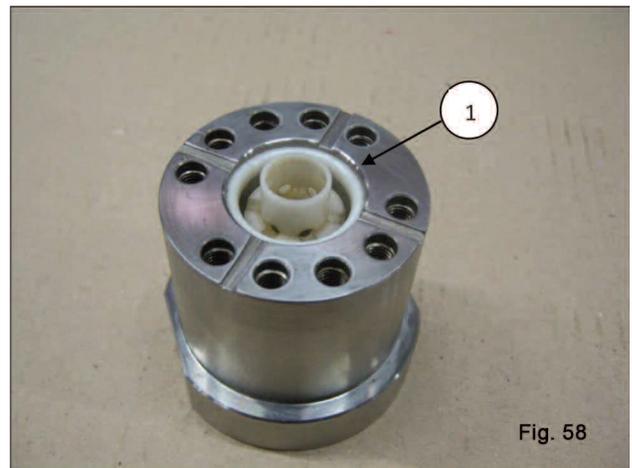


Fig. 58

**!** For the correct axial positioning of the bushing, use the special tool (p/n F27931000).

- Introduce in the HP seals support, the head ring (1, fig 59) and then the HP packing; considering the slight interference between the seal and the HP seals support, to avoid damage we advise using a plastic pad (1, fig. 60 and 61).

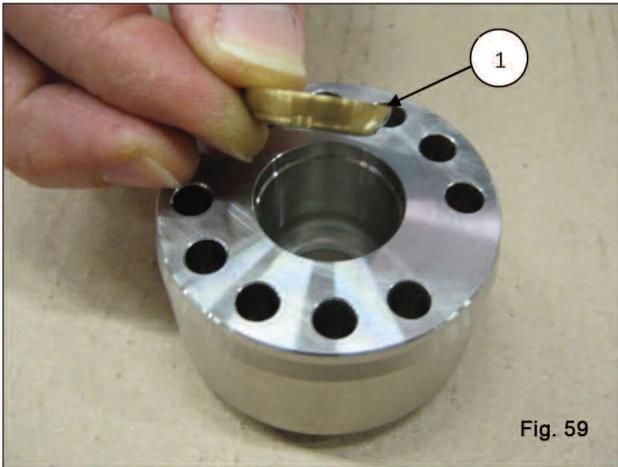


Fig. 59

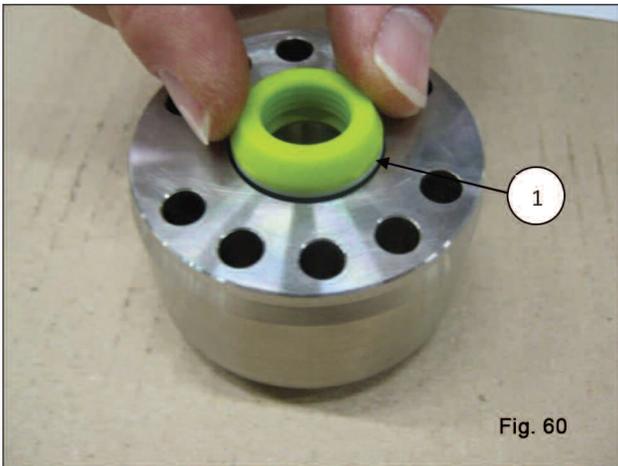


Fig. 60

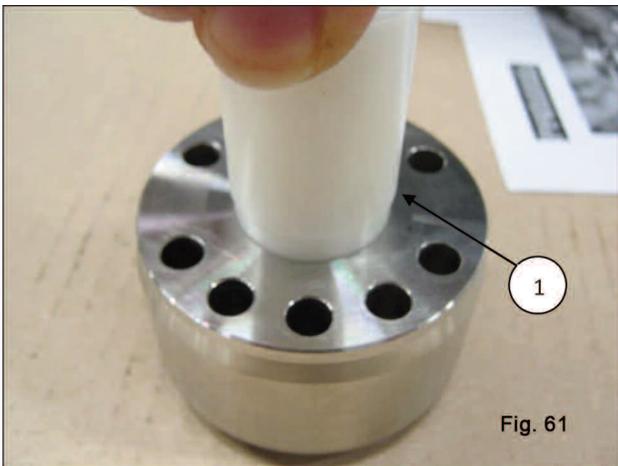


Fig. 61

**!** The HP seal must be inserted into the liner with the energizing O-ring in the working direction of the plunger as shown in fig. 60 and fig. 62.

**!** Before inserting them into their seats, the HP seals must be lubricated with silicone grease Type OKS 1110, following the operations listed below:

- The external diameter must only be slightly greased;
- On the internal diameter, grease must be applied paying great attention to filling all the pockets between the sealing lips as shown in fig. 62a.

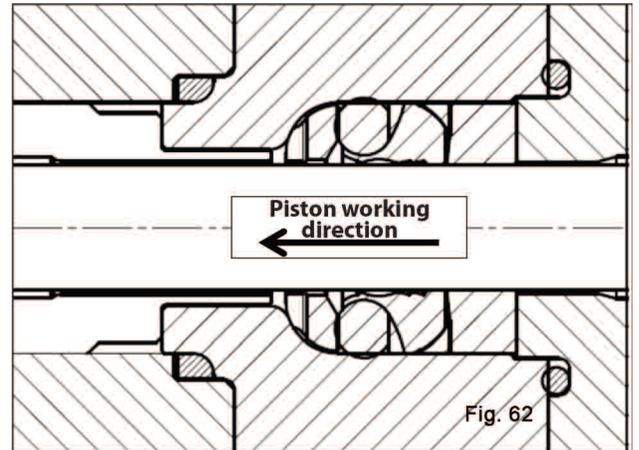


Fig. 62

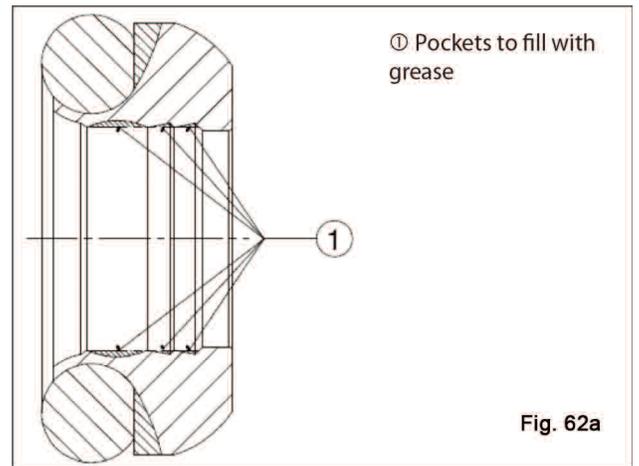


Fig. 62a

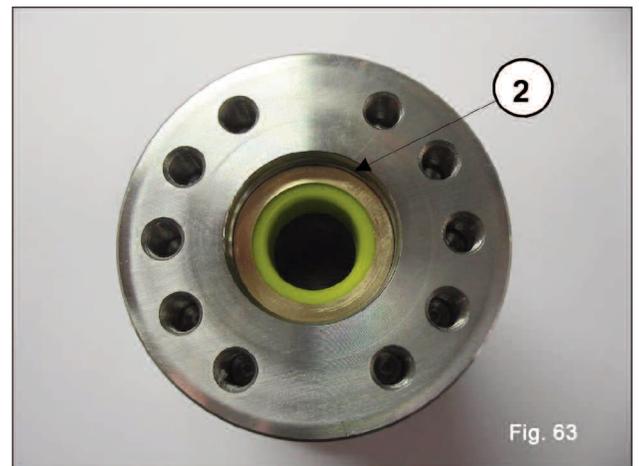


Fig. 63

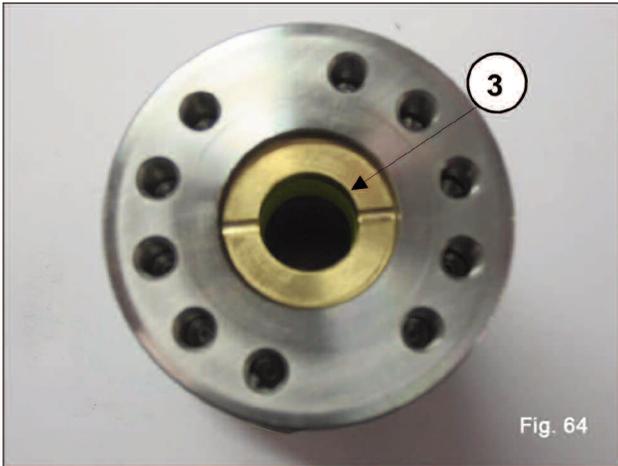


Fig. 64

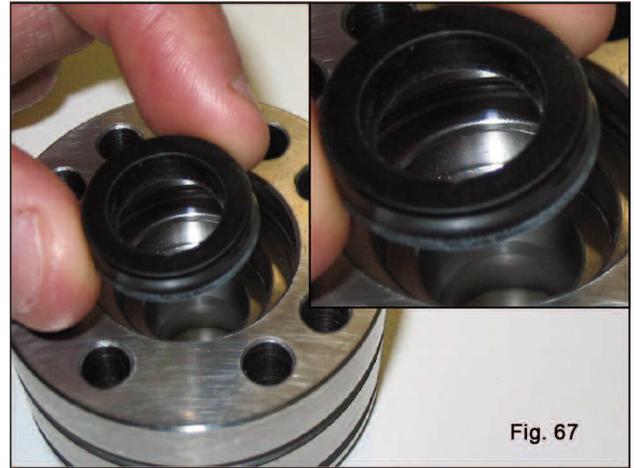


Fig. 67

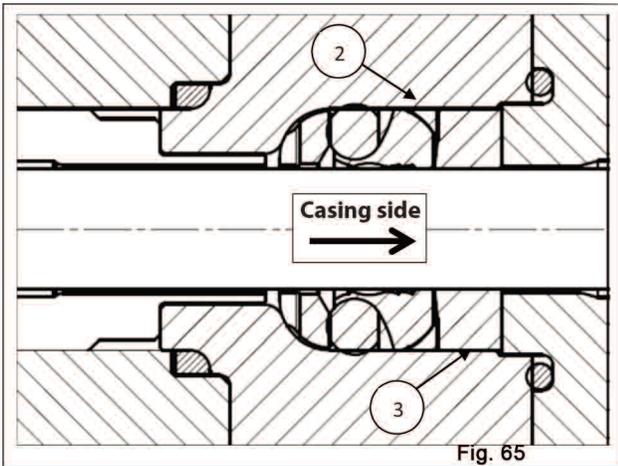


Fig. 65

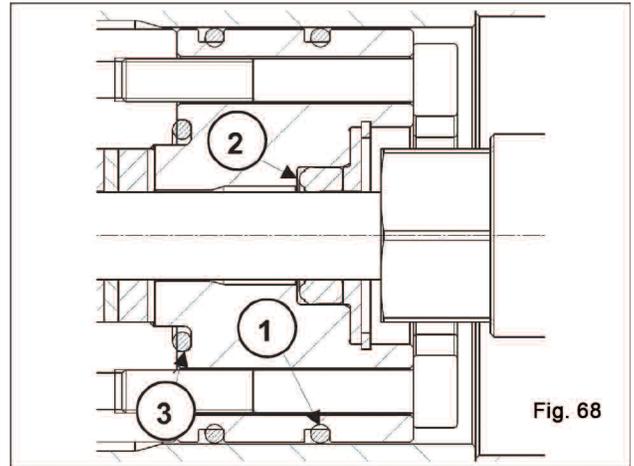


Fig. 68

**!** The gasket bushing (3) must be introduced into the liner with the outlets facing outwards (casing side) as shown in fig. 64 and in fig. 65.

**!** The LP seal must be inserted into the liner with the sealing lip in the plunger working direction as shown in fig. 66 and fig. 67, slightly lubricating the external diameter with silicone grease Type OKS 1110.

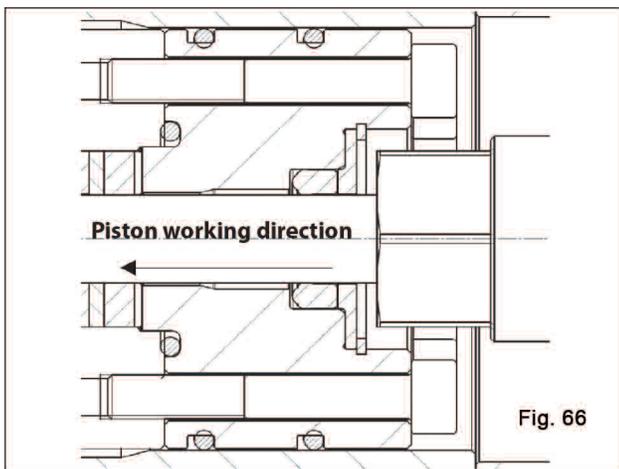


Fig. 66

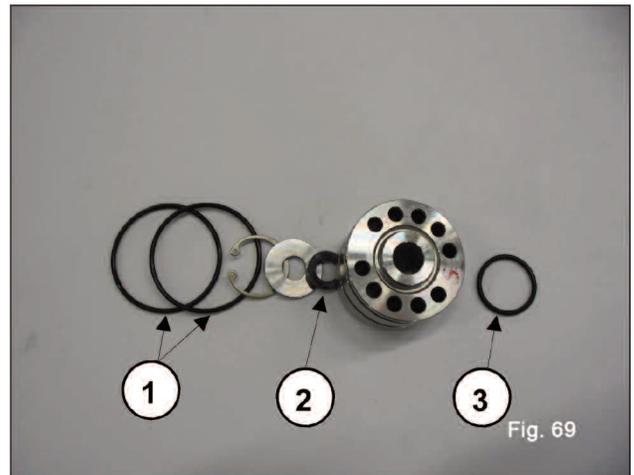


Fig. 69

- Reassemble the seals support unit as shown in fig. 68 and fig. 69, replacing components 1, 2, and 3.



- Assemble the LP and HP seals support units - liner manually screwing the screws M6 x 80 as indicated in fig. 70. Then proceed with calibration using a torque wrench as indicated in Chapter 3.

### 3. SCREW CALIBRATION

Screws are to be fastened exclusively using a torque wrench.

Description	Exploded View Position (From Owner's Manual)	Tightening Ft. Lbs.	Tightening Nm
Cover Fixing Screw	9 and 12	7.4	10
Oil Discharge Plug	11 and 79	29.5	40
Lifting Bracket Fixing Screw	20	29.5	40
Con-rod Cap Fixing Screw	21	28	38*
Plunger Fixing Screw	29	14.8	20
Head Fixing Screw	48	59	80**
Liner Fixing Screw	47	25.8	35***
Support Fixing Screw	60	11	15****
Reduction Gear Cover and Box Fixing Screw	74	29.5	40
Ring Gear Fixing Screw	69	51.6	70

- \* The con-rod cap fixing screws must be tightened at the same time respecting the phases indicated on page 6.
- \*\* The head fixing screws (exploded position 48) must be tightened with a torque wrench respecting the sequence shown in the diagram in fig. 72.
- \*\*\* The liner fixing screws (exploded position 47) must be tightened in a single phase, respecting the sequence shown in the diagram in fig. 72.
- \*\*\*\*The support fixing screws must be tightened in a single phase respecting the sequence shown in fig. 71.

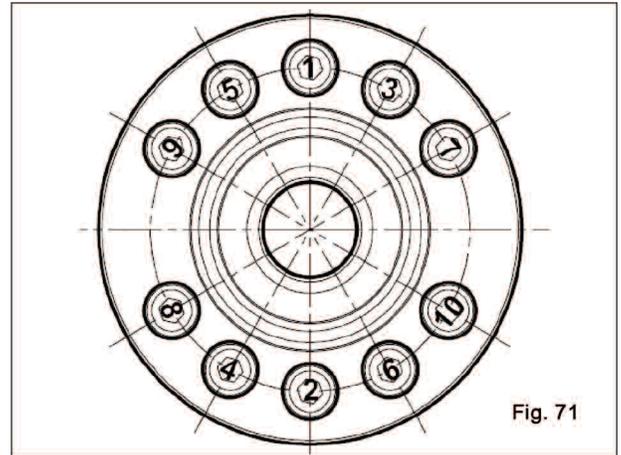


Fig. 71

**Screws - positions 47 and 60 must be tightened with a torque wrench, lubricating the threaded shank. (We recommend the use of Molybdenum Bisulphide grease part #F12001500.**

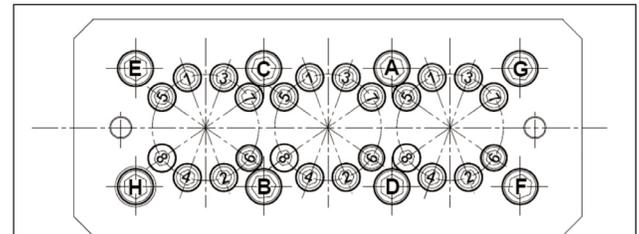


Fig. 72

**OPERATION 1:** Tightening M12x260 screws (pos. 48) in two phases observing the sequence indicated in figure: (A-B-C-D-E-F-G-H)

**Phase 1 = 40 Nm**

**Phase 2 = 80 Nm**

**OPERATION 2:** Tightening M8x100 screws (pos. 47) in four phases observing the sequence indicated in figure: (1-2-3-4-5-6-7-8)

**Phase 1 = 20 Nm**

**Phase 2 = 30 Nm**

**Phase 3 = 35 Nm**

**Phase 4 = 35 Nm**

### 4. REPAIR TOOLS

Pump repairs can be facilitated by special tools. Part numbers are as follows:

For Assembling Part:	Tool Part Number
Head assembly stud (2 pcs)	F27508200
Bush for plunger Ø12-Ø14	F27931000
Buffer for pump shaft oil seal	F27904800
Buffer for plunger shaft oil seal	F27904900

For Disassembling Part:	Tool Part Number
Valve seats	F27508000
Heads/Liner Spacer	F27508200
Plunger Guide Oil Seal	F27503900
	F26019400

## 5. MAINTENANCE LOG

### HOURS & DATE

<b>OIL CHANGE</b>							
<b>GREASE</b>							
<b>PACKING REPLACEMENT</b>							
<b>PLUNGER REPLACEMENT</b>							
<b>VALVE REPLACEMENT</b>							



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