

# Repair Manual



General Pump is a  
member of the  
Interpump Group



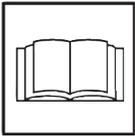
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## 1. INTRODUCTION

This manual describes the instructions for repairing VK 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.

## 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).

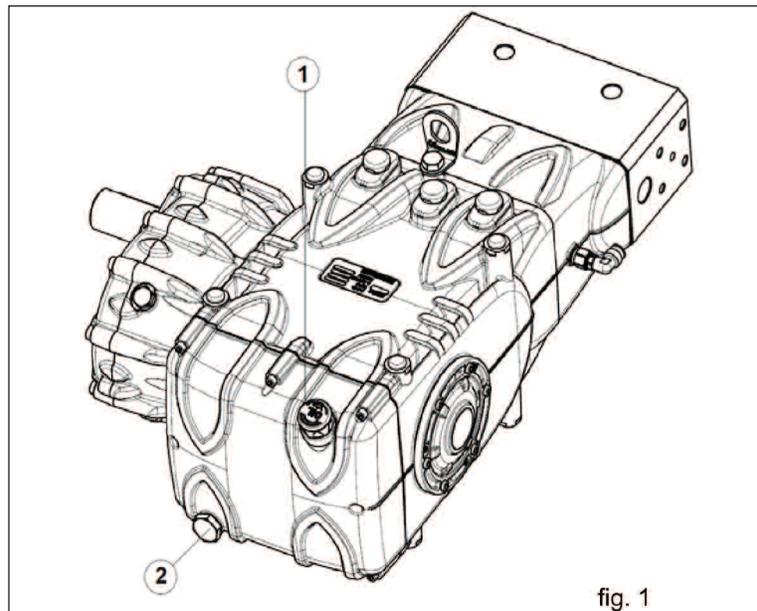


fig. 1



**The oil must be placed in a suitable container and disposed of in special centers. It absolutely must not be discarded into the environment.**

## 2.1.1 Disassembly of Mechanical Parts

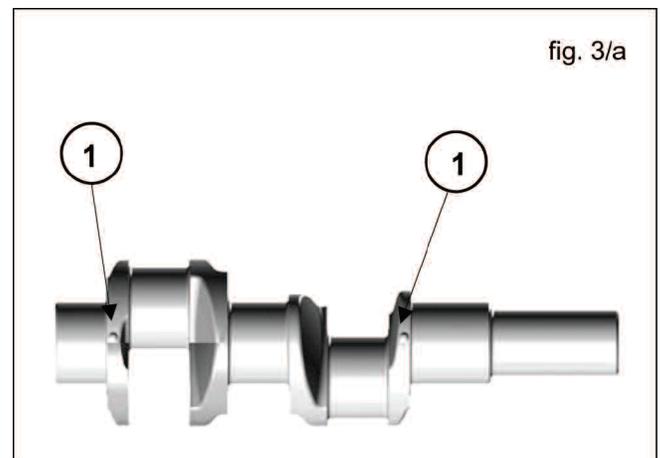
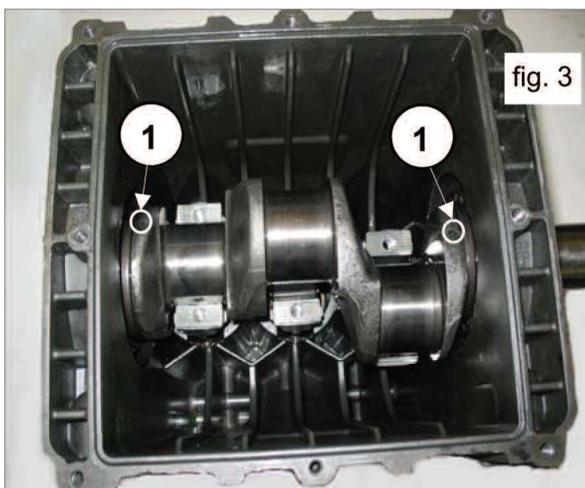
The correct sequence is the following:

- The pump shaft tab
- The rear cover
- The connecting rod cap
- The side covers using for extraction 3 fully threaded M6x50 screws, inserting them in the threaded holes as indicated in fig. 2.



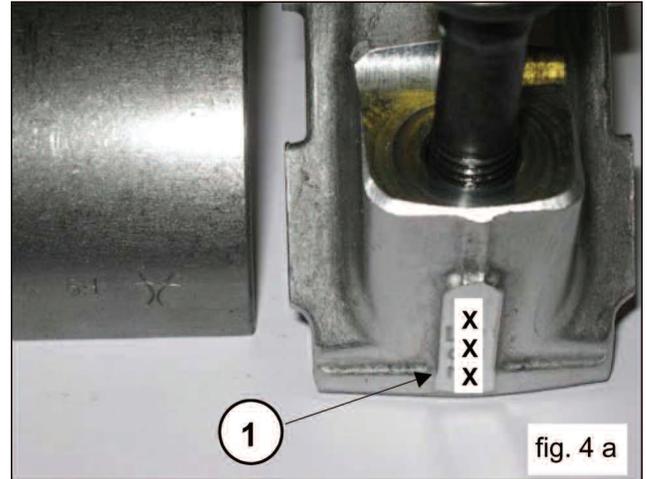
Push the plunger guides forward with their con-rods to facilitate side extraction of the pump. there are two reference points visible on the shaft, 1, as shown in fig. 3 and in fig. 3a. These must be turned toward the operator to facilitate extraction.

**Note:** Extraction of the plunger guides depends on prior removal the ceramic plunger and the relative spray hood.



- Disassemble the con-rod units:
  1. Unscrew the con-rod cap fixing screws.
  2. Extract the con-rod caps with their relative semi-bearings (fig. 4), taking special care of the disassembly sequence during disassembly.

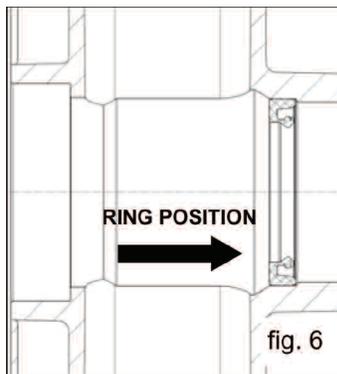
To avoid possible errors, caps and con-rod shanks have been numbered on one side (1, fig. 4a).



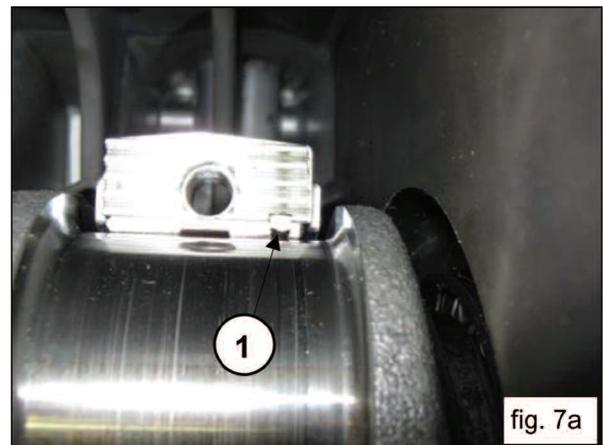
- Perform Plug Pin - Plunger Guide disassembly.
- Proceed with disassembly of the shaft seal rings and plunger guides with common tools.

**2.1.2 Reassembly of Mechanical Parts**

After having checked casing cleaning, proceed with assembly of the mechanical part in the following steps: Position the plunger guide seal rings with the relative housings on the casing as indicated in fig. 6, using tool #F27904900.



Insert the preassembled plunger guides/con-rod unit with its upper half-bearings mounted in their housing. **Ensure that the reference notches are positioned on the correct con-rod shank housings (1, fig. 7a).** To facilitate the following tightening of the con-rod cap, it is best to position the con-rod with the number easily visible. To facilitate shaft insertion without the tab, it is best to push the plunger guide/con-rod unit as far down as possible, as indicated in fig. 7

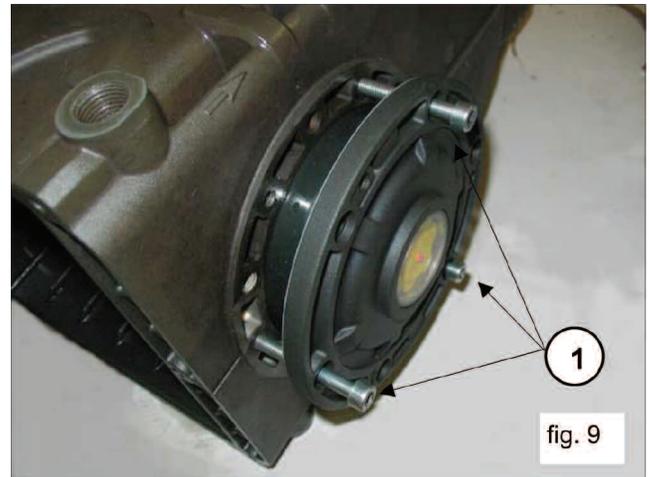
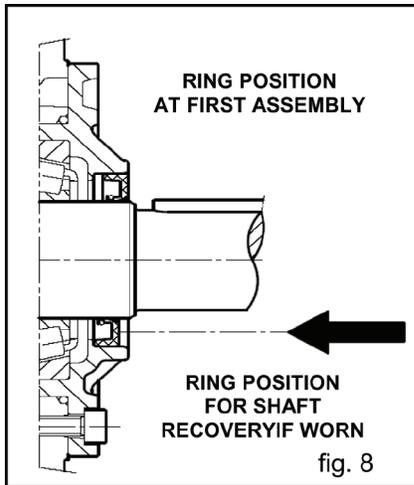


Before proceeding with side cover assembly, check lip seal conditions on the radial ring. If replacement is necessary, position the new ring using tool #F27904800 as indicated in fig. 8.

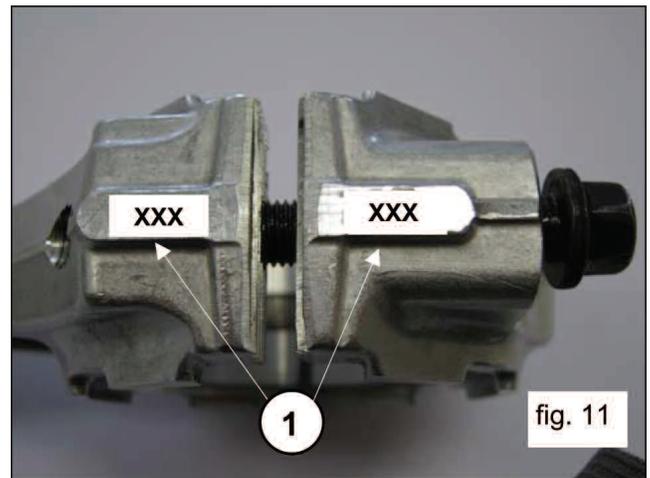
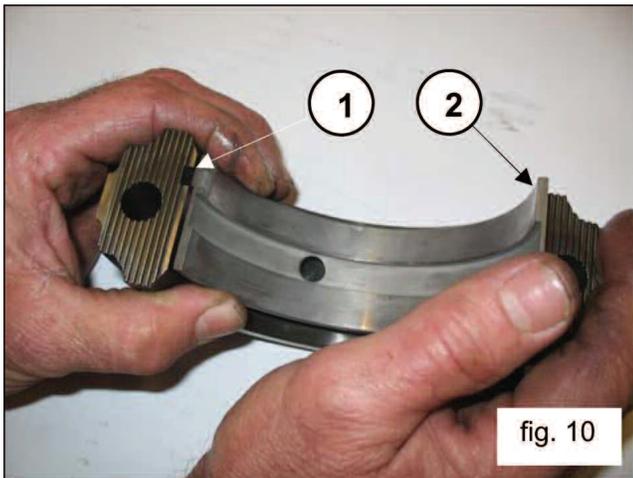


**If the shaft should present a diameter wear corresponding to the lip seal, to prevent grinding, position the ring in the second stroke as indicated in fig. 8.**

Before assembling the indicator side cover, ensure the presence of shim rings. To facilitate filling of the first section and relative press fitting of the covers on the casings, we recommend using 3 M6x40 screws, (1, fig. 9), then complete the operation with supplied screws (M6x18).



Apply the lower half-bearings to the con-rod caps (1, fig. 10) ensuring that the reference notches are positioned in their housing on the cap (2, fig. 10).



Couple the shanks to the previously disassembled con-rod caps, referring to the numbering (1, fig. 11).



**Note the correct assembly of the caps. Numbering must be turned upward.**

Fasten the caps to their respective con-rod shanks by means of M8x1x48 screws (fig. 12) lubricating both the underhead and the threaded shank, proceeding in three different steps:



1. Transition torque: 4.3-6 Ft.Lb. (6-8 Nm)
2. Pre-tightening torque: 18.4-20 Ft.Lbs. (25-28 Nm)
3. Tightening torque: 28 Ft.Lbs. (38 Nm)



Mount the rear cover, positioning the dipstick hole upward. Insert oil in the casing as indicated in the Owner's Manual point 7.4.

**2.1.3 Reduction Classes**

TABLE OF REDUCTIONS FOR BEND SHAFTS AND CON-ROD HALF-BEARINGS			
Recovery Classes (mm)	Part Number Half-bearing Upper	Part Number Half-bearing Lower	Correction on the Shaft Pin Diameter (mm)
0.25	F90924100	F90924400	Ø49.75 0/-0.02 Ra 0.4 Rt 3.5
0.50	F90924200	F90824500	Ø49.50 0/-0.02 Ra 0.4 Rt 3.5

**2.1.4 Disassembly/Reassembly of Bearing and Shims**

The type of bearings (taper roller) ensures the absence of axial clearance on the bend shaft. 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 bend shaft without bearings replacement**

After having removed the side covers as indicated in point 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 is mounted (indicator side flange and motor side flange), check that the rotation torque of the shaft - with the con-rod disconnected - is a minimum 3 Ft.Lbs. (4 Nm), max. 5 Ft.Lbs (7 Nm). To transition the two side covers closer to the casing, it is possible to use 3 M6x40 screws for the first positioning phase as indicated in fig. 9 and the screws provide for final fastening.

Shaft rotation torque (with the con-rod connected) should not exceed 6 Ft.Lb. (6-8 Nm).

**A) Disassembly/Reassembly of the bend shaft without bearings replacement**

After having removed the side covers as indicated in point 2.1.1, remove the outer ring nut of the bearings from the relative covers and the inner ring nut with the remaining part of the bearing from the two ends of the shaft by means of a normal “pin punch” or a similar tool as indicated in fig. 13 and 14).



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°-300° (F) 120°-300° (C), ensuring that the ring nuts go down to end stroke in their housings.



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

The shim pack must be redefined as follows:

Insert the bend shaft in the casing, checking that the PTO shank comes out from the provided side. Fasten the PTO side flange to the casing, taking care to set the lip seal as indicated in point 2.1.2. Bring the indicator side flange closer as in point 2.1.2, fig 9, with the help of a thickness gauge (see fig. 15).



Determine the shim packs as indicated in the following table:

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 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



fig. 16

Insert the shims under the indicator side cover (fig. 16), fastening it to the cover with the respective screws, checking that the resistant torque is between 3 Ft.lbs. (4 Nm) and 5 Ft.lbs. (7 Nm). If the torque is correct, proceed with connecting the con-rods to the bend shaft. otherwise redefine the shims repeating the operations.

### 2.1.5 Disassembling the Reduction Gear Unit

Remove the reduction gear box cover fixing screws. Position the holes and screw in 3 grub screws or M8 threaded screws (1, fig. 17) with the function of extractors and simultaneously tap on the pinion in such a way that the bearing remains on during cover extraction (fig. 18).

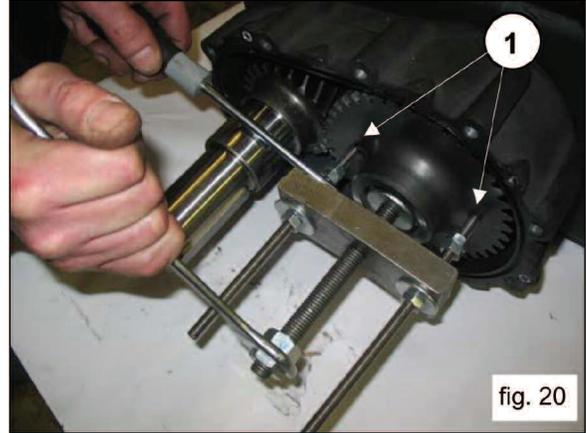


fig. 17

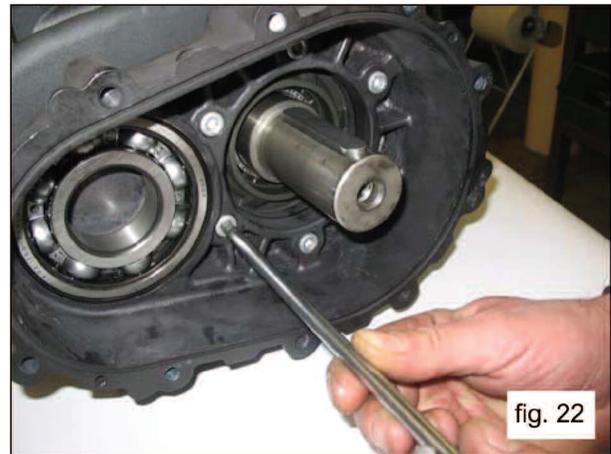
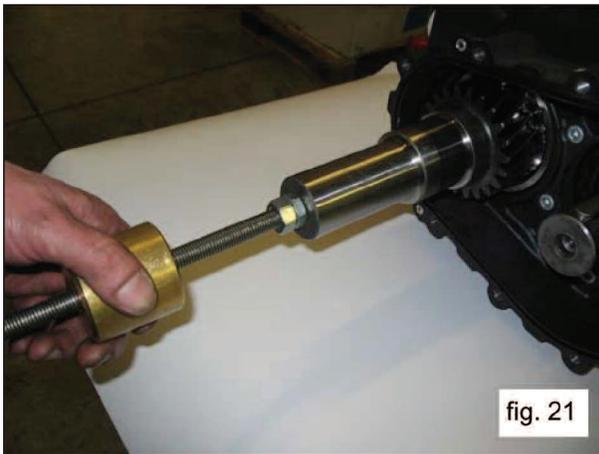


fig. 18

Remove the reduction gear box cover and extract the bearing from the pinion with common tools (fig 19). Remove the ring gear fixing screws with their relative washer and extract the ring gear. Where necessary, it is possible to utilize an extractor hammer to be applied on the two M8 holes (1, fig. 20) or a common extractor tool (fig. 20).

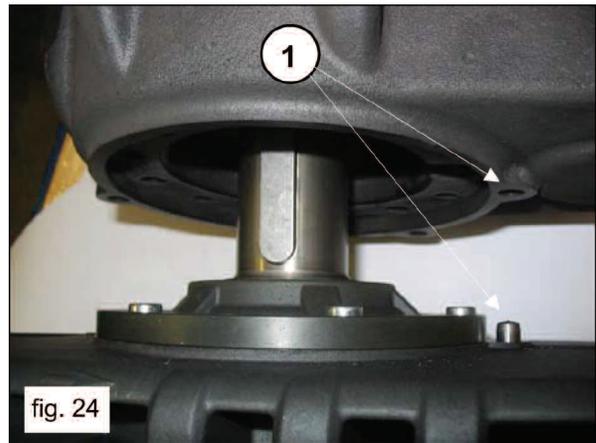


Remove the pinion using an extractor hammer to be applied on the M12 hole (fig. 21). Unscrew the reduction gear box fixing screws, then remove the box (fig. 22).

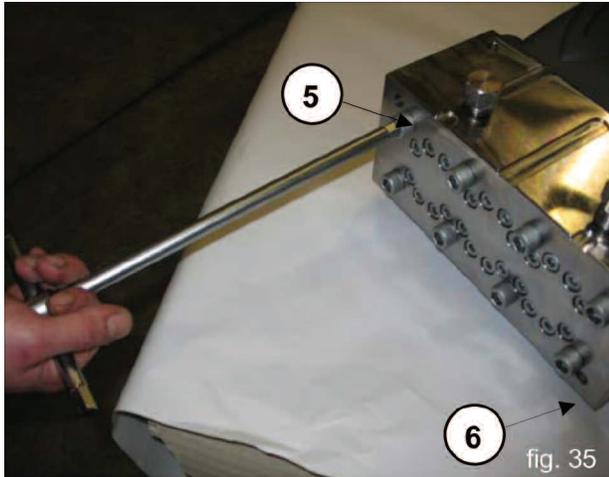


### 2.1.6 Reassembling the Reduction Gear Unit

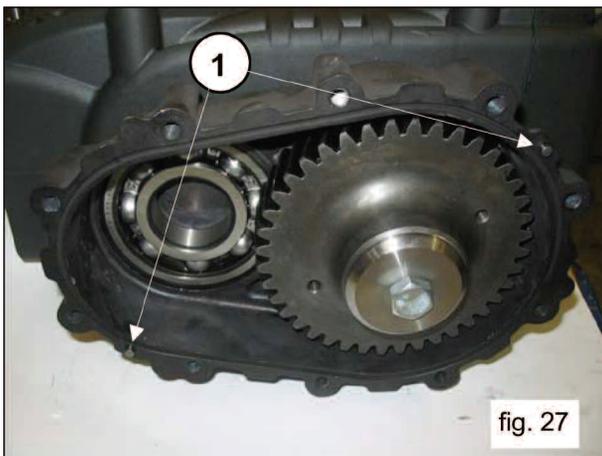
Preassemble the reduction gear box using common tools. Position the seal (fig. 23) and assemble the reduction gear box, taking care to match the reduction gear box hole with the reference pin on the casing (1, fig. 24).



Fasten the reduction gear box with 6 M8x50 screws and calibrate the screws with a torque wrench (fig. 25) as indicated in section 3. Insert the ring gear on the shaft, interpose the washer and tighten the fixing screws (fig 26) with a torque wrench to the torque indicated in section 3.



Apply the two pins  $\varnothing 5$  to the reduction gear box (1, fig. 27). Preset the bearing on the pinion and insert it down to the bottom of its housing on the reduction gear box by means of a striking hammer (fig. 28).



The bearings and the ring gear can be mounted cold. The press fitting operation can be facilitated by heating the involved parts to a temperature between 250° - 300° F (120° - 150° F), ensuring that the ring nuts go down to end stroke in their housings.

Insert the O-ring seal in the reduction gear box housing (fig. 29). Enter the reduction gear cover on the pinion head. Use two screws or two M8 grub screws to keep the cover in position during the following assemble operations (1, fig. 30). Assemble the reduction gear box cover by means of a buffer, pressing on the cover surface, or use a special part #F27517400 (fig. 30a). Facilitate the operation by simultaneously tightening some fixing screws (2, fig. 30).



fig. 29

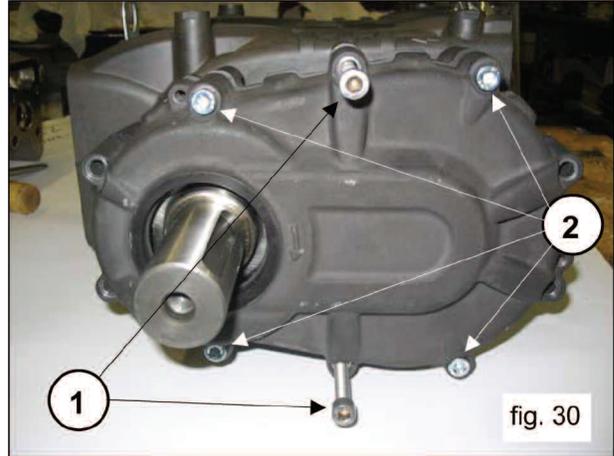


fig. 30

Fasten the reduction gear box with 10 M8x50 screws and calibrate the screws with a torque wrench (fig. 31) as indicated in section 3.

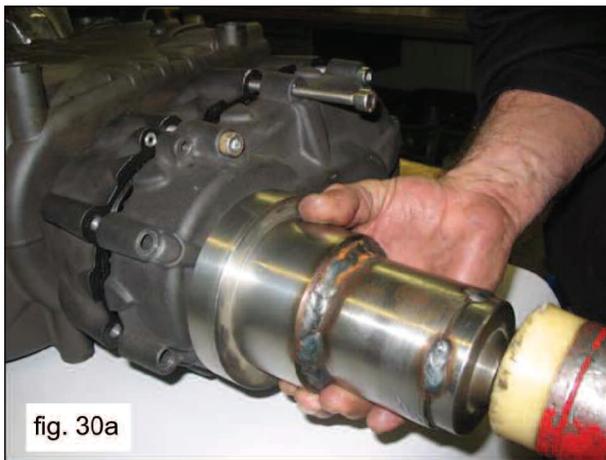


fig. 30a



fig. 31

Verify pinion oil seal ring lip seal conditions. If replacement is necessary, position a new pinion oil seal ring using too #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.



Once the reduction gear unit has been completely assembled, check pinion rotation.

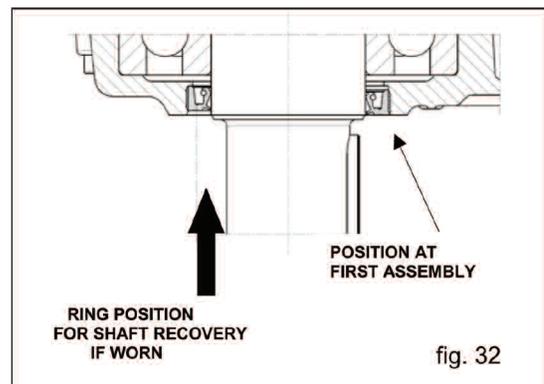
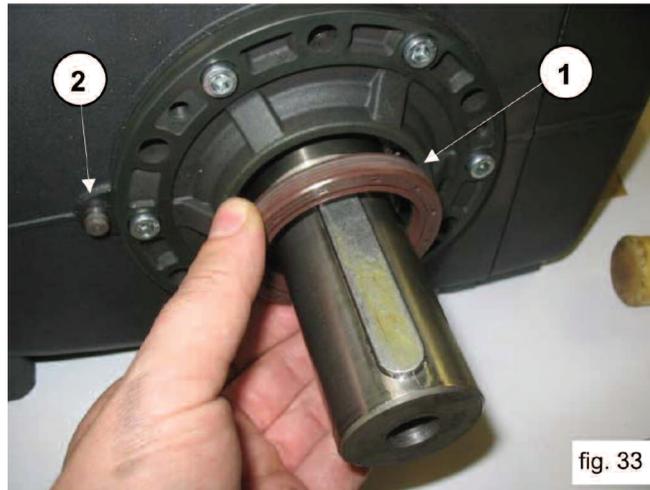


fig. 32

### 2.1.7 Version Change - Application / Removal of the Reduction Gear Unit

To modify the version applying a reduction gear unit where not provided, the shaft oil seal must be removed (1. fig. 33) and the reduction gear box reference pin  $\varnothing 8$  must be inserted on the casing (1, fig. 33). Then proceed with operations as specified in point 2.1.6.

To modify the version removing the reduction gear unit where provided, introduce a shaft oil seal ring using tool #F27904800 (1, fig. 33).



Failure to perform operations described in section 2.1.7 compromises the functionality of the pump and operator safety.

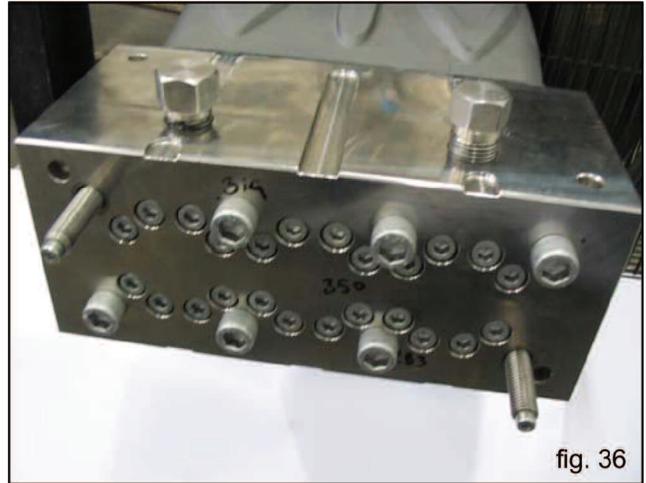
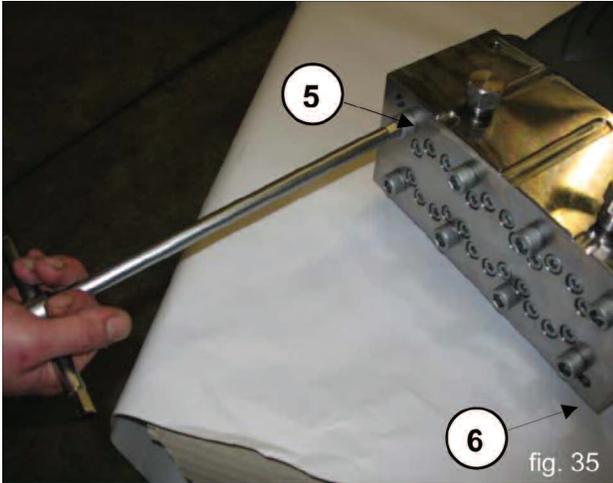
## 2.2 Repairing Hydraulic Parts

### 2.2.1 Dismantling the Head - Liner - Valves

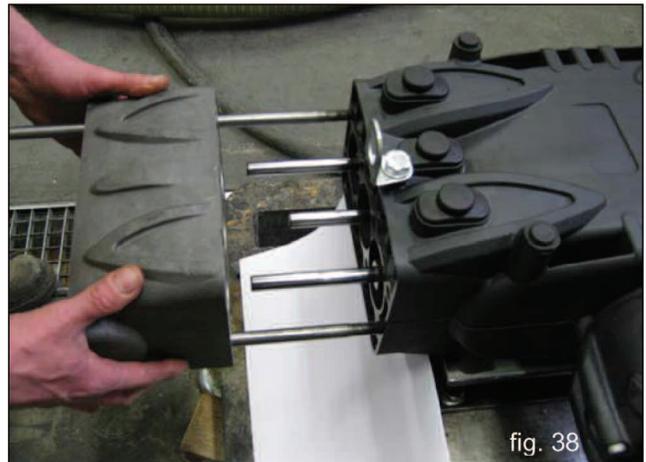
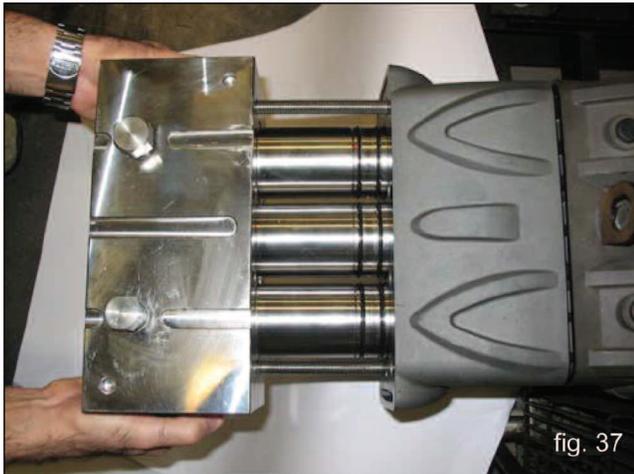
The head does not require any routing maintenance. Operations are limited to inspection or replacement valves, if necessary. Proceed as follows to extract valve groups:



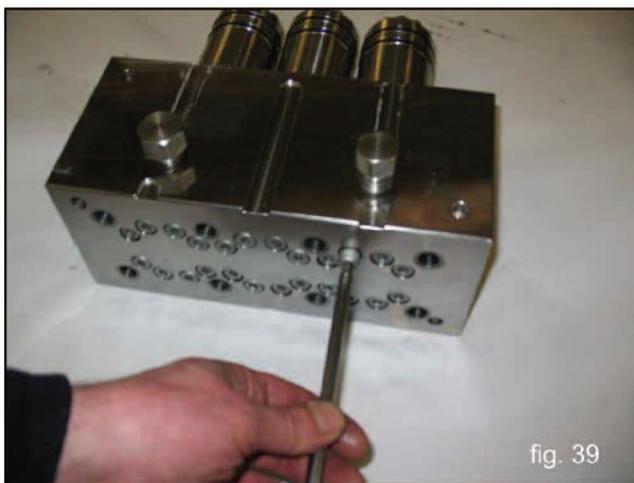
A) Unscrew the head liner M8x100 fixing screws without removing them, as indicated in fig. 34, in such a way to free them.



B) Unscrew the M12x260 head fixing screws number 5 and number 6 as indicated in fig. 35, replacing them with two screws - slave pin #G27508200 as indicated in fig. 36, then continue with the remaining screws.



C) Separate the head and the spacer for the pump casing liners as indicated in fig. 37-38.



D) Remove the M8x100 head liner fixing screws as indicated in fig. 39 and proceed as indicated in fig. 40.

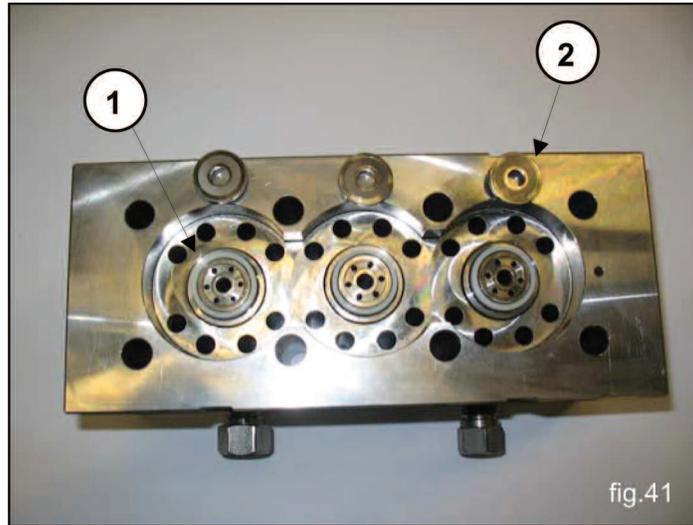


fig.41



During assembly of the liners, take care not to disperse the valve seats (1) and the flat valves (2) as indicated in fig. 41 as these, being positioned at stroke, could fall.

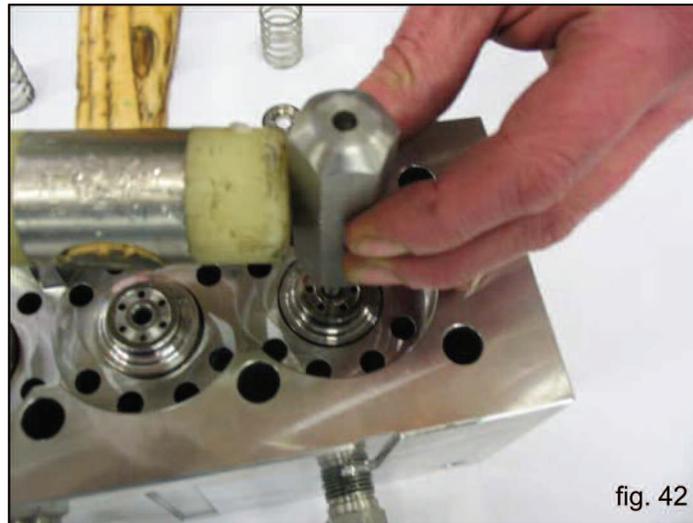


fig. 42



If the valve housings should become blocked on the head due to the forming of limestone or oxide, they must be unblocked by inserting a special tool, part #F27508000, in the suction inlet, operating as seen in fig. 42.

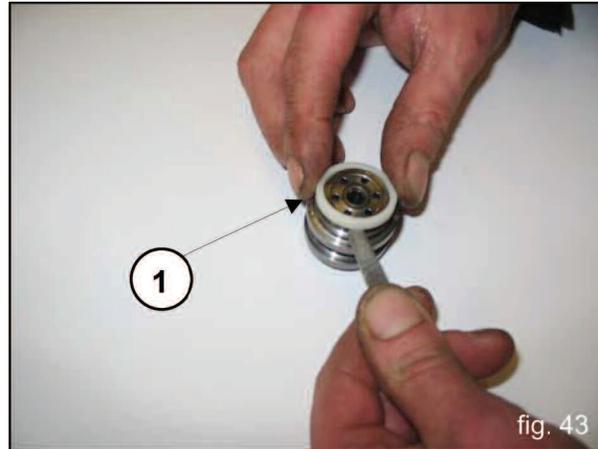


fig. 43

E) Extract the valve housings (1) as indicated in fig. 43. Check the conditions of the various components and replace if necessary.



**At every valve inspection, always replace all seal rings and relative front O-rings between the liner and head, between the head and liner spacer in the recirculation inlet area. Clean and dry components and all relative housings inside the head before replacing.**

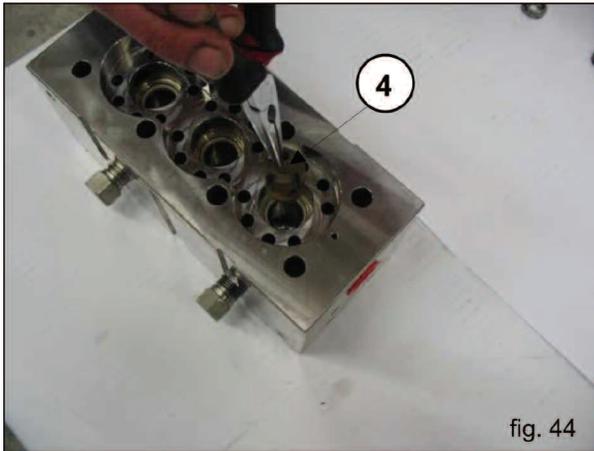


fig. 44

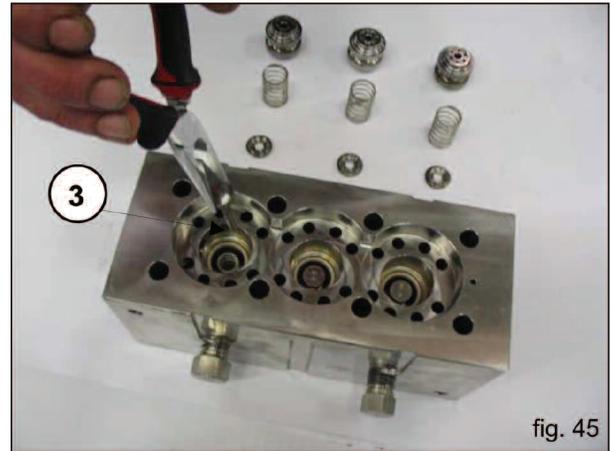


fig. 45

F) Extract the outlet plates (3) and their respective guides (4) with their springs, as indicated in fig. 44-45, check their conditions, replace if necessary and at the intervals indicated in section 11 (fig. 17) of the Owner's Manual.

### 2.2.2 Reassembling the Head - Liners - Valves

To reassemble the various components, follow the reverse operations listed above, taking particular **care**



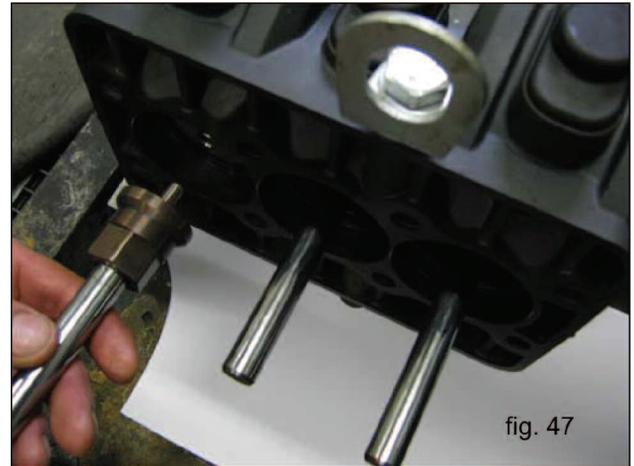
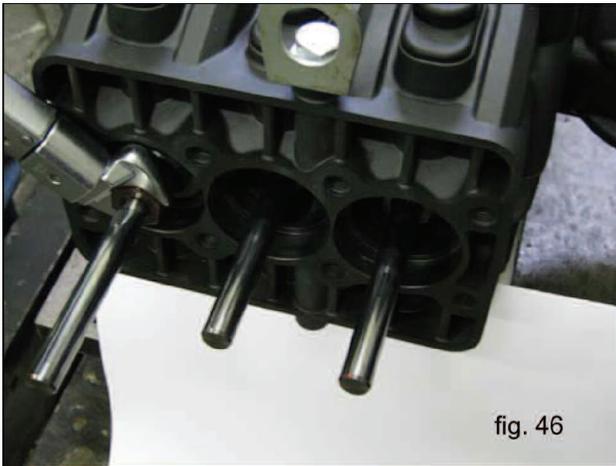
**when assembling the liner spacer: the two raw fusion exhausts present on one of the two sides on the component must be turned toward the lower part of the casing (pump bracket side).**

Heads - liners: proceed with assembly and calibration of the head fixing screws and then with calibration of the liner fixing screws. For the values of the tightening torques and sequences follow the instructions contained in section 3.

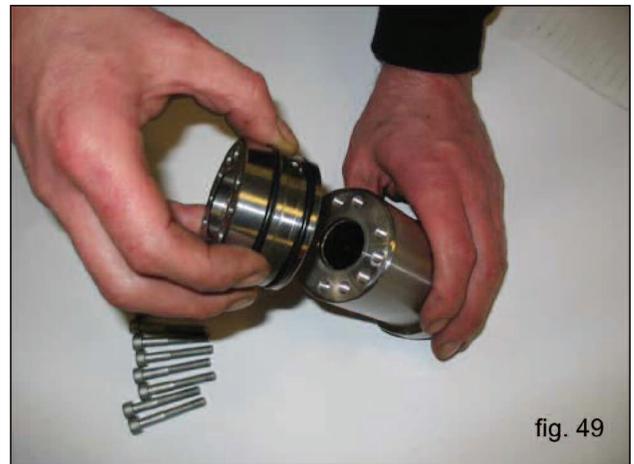
### 2.2.3 Dismantling the Plunger Unit - Supports - Seals

The plunger unit does not require any routine maintenance. Maintenance is limited to visual inspection of cooling circuit drainage. If abnormalities / variations on the outlet pressure gauge or cooling circuit draining hose pulsing (if flexible) are detected, the seal pack will have to be checked and replaced. Proceed as follows to extract plunger units:

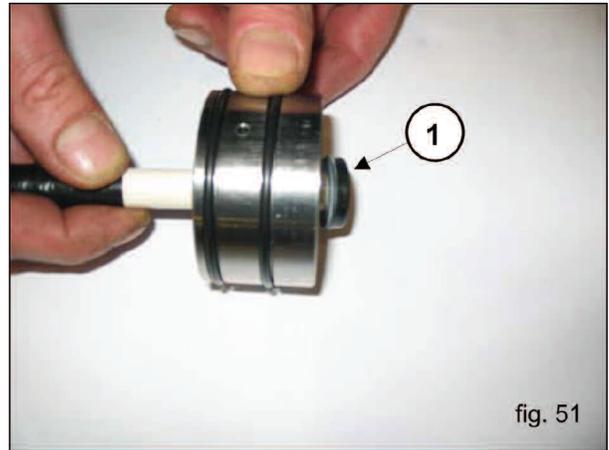
- A) Separate the head and the spacer for the pump casing liners as indicated in paragraph 2.2.1, point C (fig. 37 and 38).



- B) Remove the pumps with a fork spanner and check conditions as indicated in fig. 46 and 47. Replace if necessary.



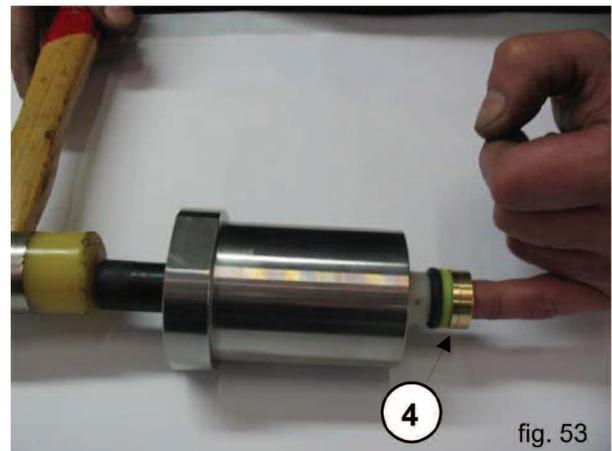
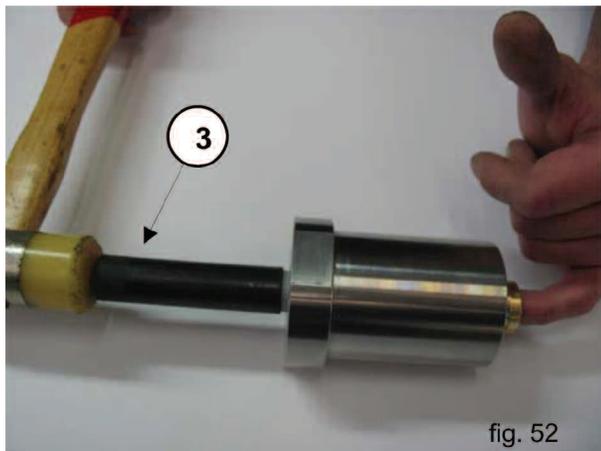
- C) Remove the M6x40 liner support fixing screws as indicated in fig. 48 and proceed with separating the support as indicated in fig. 49.



C) Remove the Seeger ring and the seal ring as indicated in fig. 50 and, with a special plastic pin, remove the LP (low pressure) ring seal (1) as indicated in fig. 51.



**The O-rings and the low pressure seals must be replaced at each disassembly.**



C) With the liner separate from the seal support and with the special plastic pin (3) as indicated in fig. 52, have the HP (high pressure) packing come out (4) operating as in fig. 53.



**The HP packing (4) in fig. 53 will have to be replaced at each disassembly.**

## 2.2.4 Reassembling the Plunger Unit - Supports - Seals

To reassemble the various components, reverse the operations paying special attention to the various sequences listed below. For tightening torque values and sequences, follow the instructions contained in Chapter 3.

A) Insert the upper bushing in the liner.



fig. 54

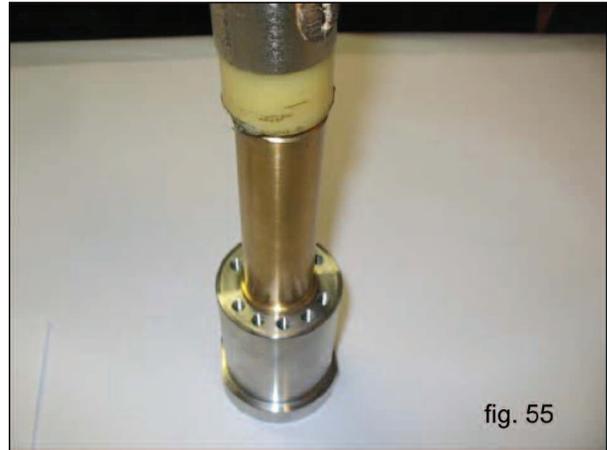


fig. 55



For proper axial positioning of the bushing, use the special tool #F27508300 valid for pump type VK-VF12 and #F27508500 valid for VK-VF14 as indicated in fig. 54 and 55.



fig. 56

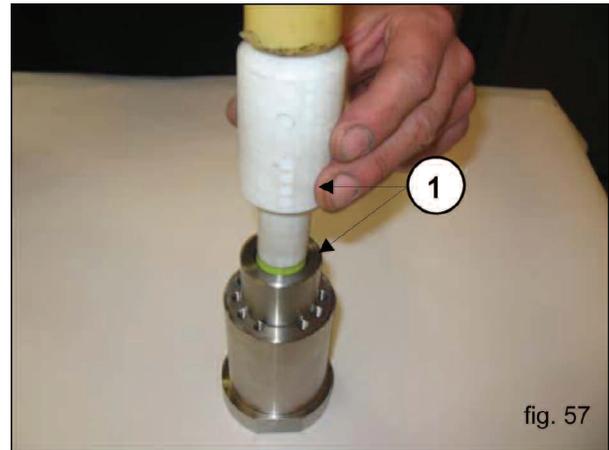
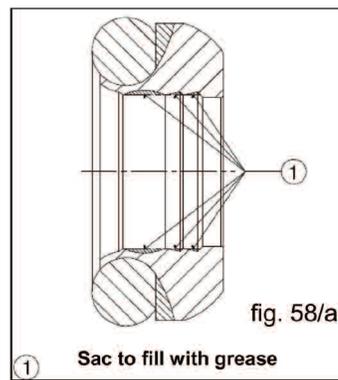
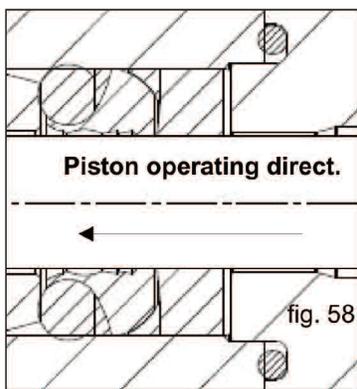


fig. 57

B) Insert the HP (high pressure) packing. Given the slight interference between the seal and the liner, use the special tools (1) #F27508400 and F27365300 as indicated in fig. 56 and 57 to prevent damage.

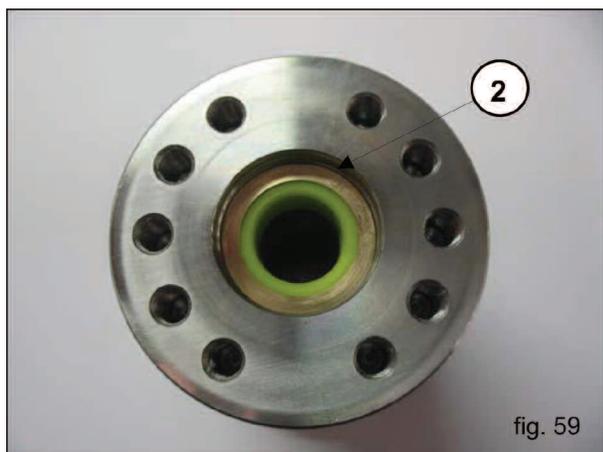


The HP seal must be placed in the liner with an O-ring energized seal in the operating direction of the plunger as indicated in fig. 56 and 58.

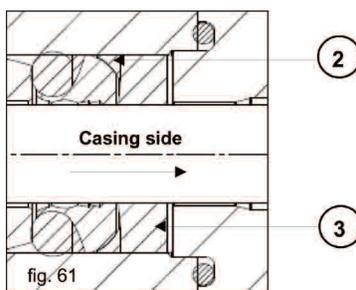


Before mounting the HP seals in their housing, they must be lubricated with OKS 1110 silicone grease following the steps below:

- a) The external diameter must be slightly lubricated.
- b) The grease must be carefully applied on the inner diameter, paying special attention to filling all sacs including between the lip seals as indicated in fig. 58a.

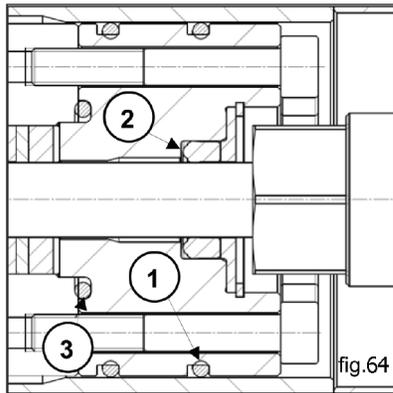
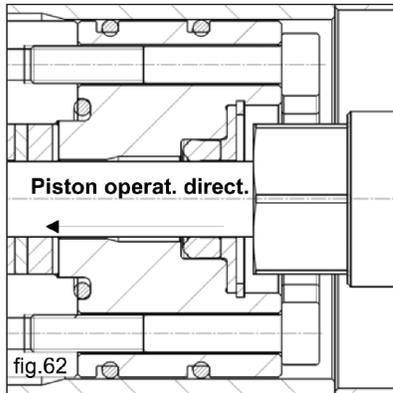


C) Insert the anti-extrusion ring (2) and the seal bushing (3) positioned as per figs. 59, 60 and 61.



The seals bushing (3) must be inserted in the liner with the discharges turned outward (casing side) as indicated in fig. 60 and fig. 61.

The LP seal must be inserted in the liner with the lip seal in the direction of plunger operation as indicated in fig. 62 and in fig 63, slightly lubricating the external diameter with OKS silicone grease.



D) Replace the seal support unit as indicated in fig. 64 and 65 replacing components 1,2 and 3.



E) Assemble the support unit - liner, manually screwing in the M6x40 screws as indicated in fig. 66, then proceed with calibration with a torque wrench as indicated in Chapter 3.

**3. SCREW CALIBRATION**

Screws are to be fastened exclusively using a torque wrench.

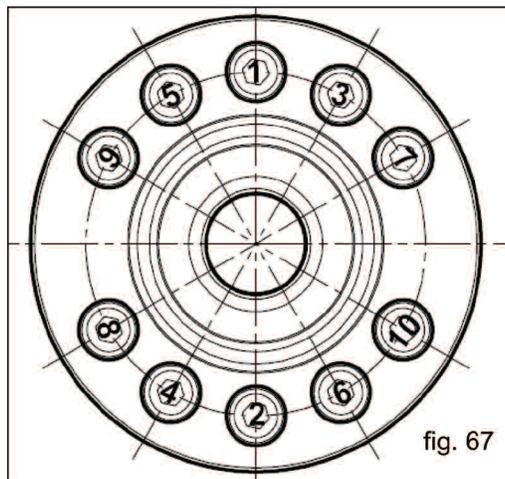
Description	Exploded View Position (From Owner's Manual)	Fastening Ft. Lbs.	Fastening Nm
Cover Fixing Screw	9 and 12	7.4	10
Oil Discharge Plug	11 and 79	29.5	40
Lifting Bracket Fixing Screw	20	29.5	40
Con-rod Cap Fixing Screw	21	28	38*
Plunger Fixing Screw	29	14.8	20
Head Fixing Screw	48	59	80**
Liner 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	71	51.6	70

\* The con-rod cap fixing screws must be tightened at the same time respecting the phases indicated on page 7.

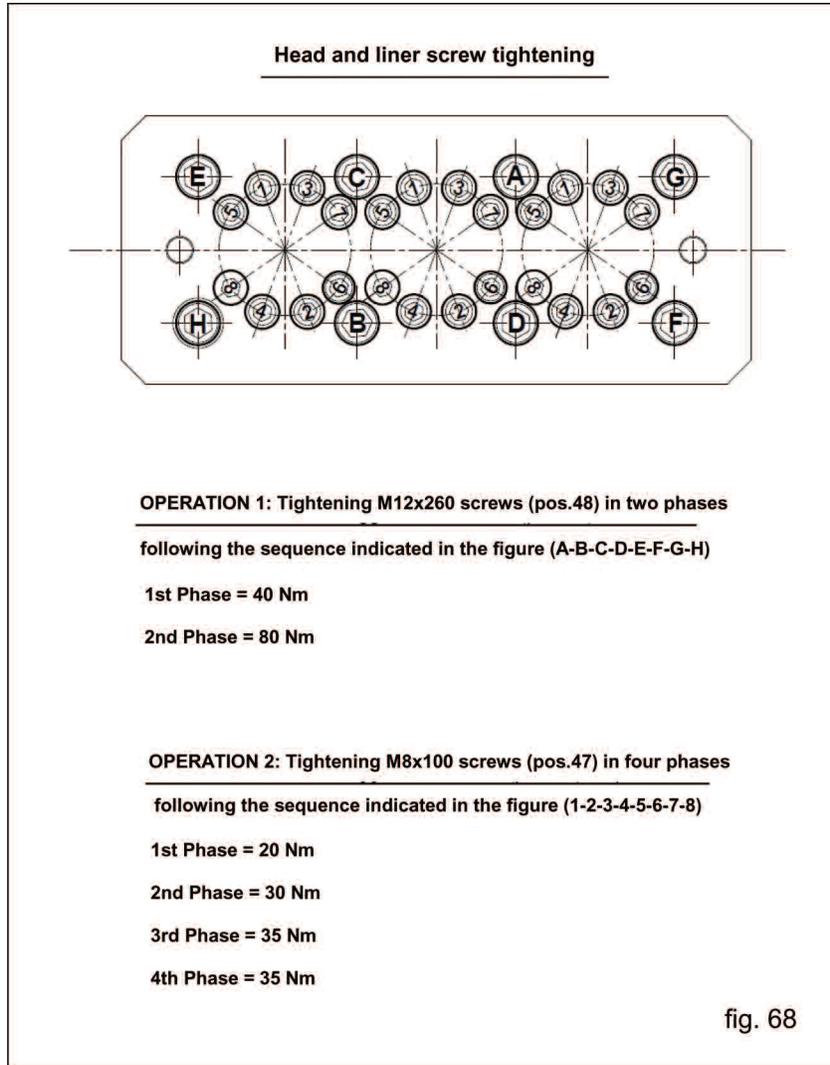
\*\* The head fixing screws (exploded position 48) must be tightened with a torque wrench respecting the sequence shown in the diagram in fig. 68.

\*\*\* The liner fixing screws (exploded position 47) must be tightened in a single phase, respecting the sequence shown in the diagram in fig. 68.

\*\*\*\*The support fixing screws must be tightened in a single phase respecting the sequence shown in fig. 67.



**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.**



**4. REPAIR TOOLS**

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

**For assembly:**

For Assembling Part:	Tool Part Number
Seals VK12 and VF 12	F27508300
Seals VK14 and VK14	F27508500
HP Seal Packings	F27365300 F27508400
Heads/Liner Spacer	F27508200
Pump Shaft Seal Ring/ Reduction Gear Pinion	F27904800
Plunger Guide Oil Seal	F27904900
Reduction Gear Box Cover	F27517400

**For Disassembly:**

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

## 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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