GENERAL PUMP

VF

Repair Manual

INDEX

1. INTRODUCTION

This manual describes the instructions for Repairing VF 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).

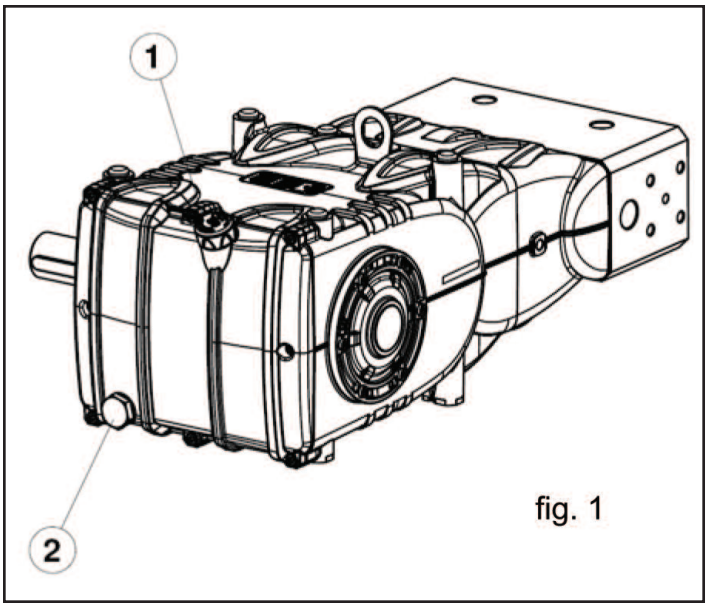


fig. 1

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 correct sequence is the following

A) Drain oil and then remove:
- pump shaft key
- connecting rod cap
- side covers using 3 wholly threaded M6 x 50 screws, inserting them in the opposite holes as shown in fig. 2

fig. 2

B) Push the plunger guides and connecting rods forward in order to facilitate the lateral extraction of the pump shaft. Two marks are visible on the crankshaft, as shown in fig. 3; they must be turned towards the operator in order to facilitate extraction. **NOTE:** to extract the plunger guide it is necessary to remove the ceramic plunger and wiper first.

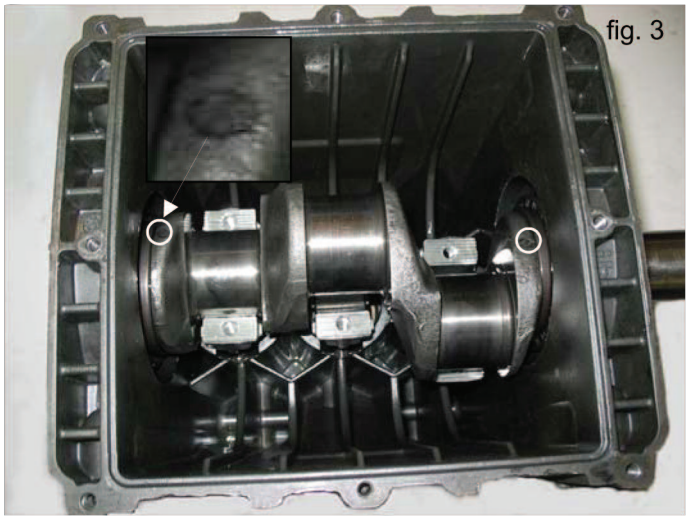


fig. 3

C) Disassemble the crankshaft oil seals and the plunger guides using standard tools.

2.1.2 Crank Mechanism Assembly

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

A) Thoroughly fit the plunger guide seals into their seat on the crankcase as shown in fig. 5a, using the appropriate tool (p/n 27904900).

B) Introduce the pre-assembled plunger guide/connecting rod units into their seats; to facilitate tightening of the connecting rod cap, we advise to position the connecting rod so you can easily read the number. To easily introduce the crankshaft, without the key, fully push the plunger guide/connecting rod unit, as indicated in paragraph 2.1.2, Section B as shown in fig. 4.


fig. 4

C) Before assembly of the side covers, check the seal lips for wear. If replacement is necessary, position the new ring using the appropriate tool (p/n 27904800) as shown in fig. 5.

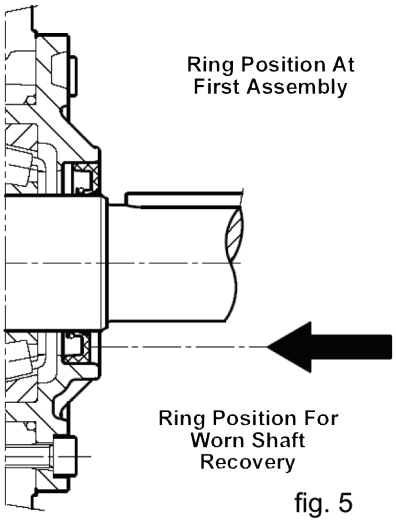


fig. 5

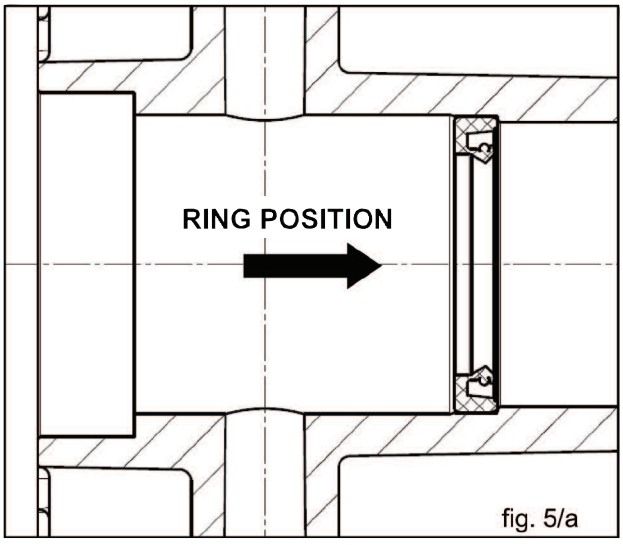


fig. 5/a

If the shaft presents diameter wear corresponding to the sealing lip, to avoid the need for grinding it's possible to position the ring as indicated in fig. 5.

Before assembling the cover (sight glass side), be sure that the shim rings have been inserted. To help the covers fit onto the crankcase, we advise to use 3 screws M6 x 40, and then finish the operation with the screws supplied (M6 x 18) as shown in fig. 6.

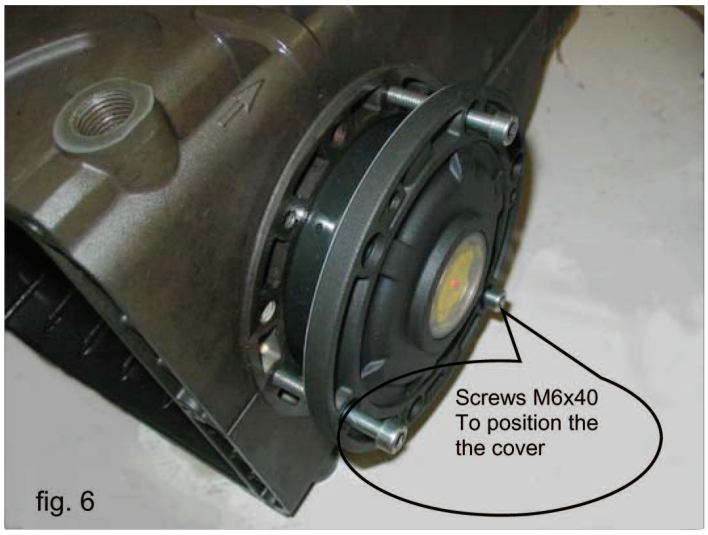


fig. 6

D) Install the connecting rod cap respecting numbering, and fasten the relevant bolts (lubricating both the head and the threaded stem with the same oil used for the crankcase) proceeding in three different steps. see fig. 7:

1. Approaching torque 4.3-7 Ft. Lbs. (6-8 Nm)
2. Pre fastening torque 18.4-21 Ft. Lbs. (25-28 Nm)
3. Fastening torque 28 Ft. Lbs. (38 Nm)

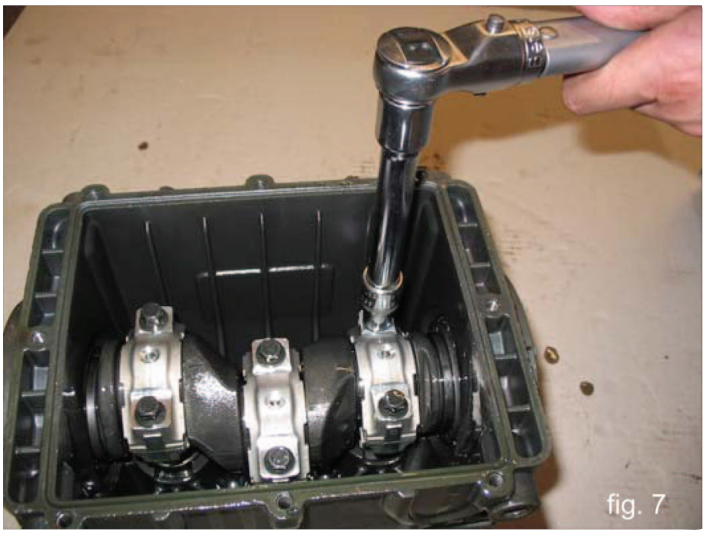


fig. 7

E) Install the rear cover positioning the oil dipstick hole upward.

F) Fill the crankcase with oil as indicated in the use and maintenance manual in paragraph 7.4.

2.1.3 Disassembly / Assembly of Bearings and Shims

The type of bearings used (tapered roller bearings), ensures the absence of axial play on the crankshaft; the shims are to be determined to reach this purpose. To assemble / disassemble, or to replace them if needed, carefully follow the indications below:

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

After removing the side covers, as indicated in paragraph 2.1.2, 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 fit them under the cover on the site glass side. After installing the complete unit (sight glass side flange 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 5 Ft. Lbs. (7 Nm). To position the two side covers on the crankcase, initially use 3 M6 x 40 screws as shown in fig. 6, 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 2.1.2, remove the outer ring nut of the bearings from their covers and the inner ring nut, with the remaining part of the bearing, from the two shaft extremities using a standard pin extractor or similar tool as indicated in figures 8 and 9.

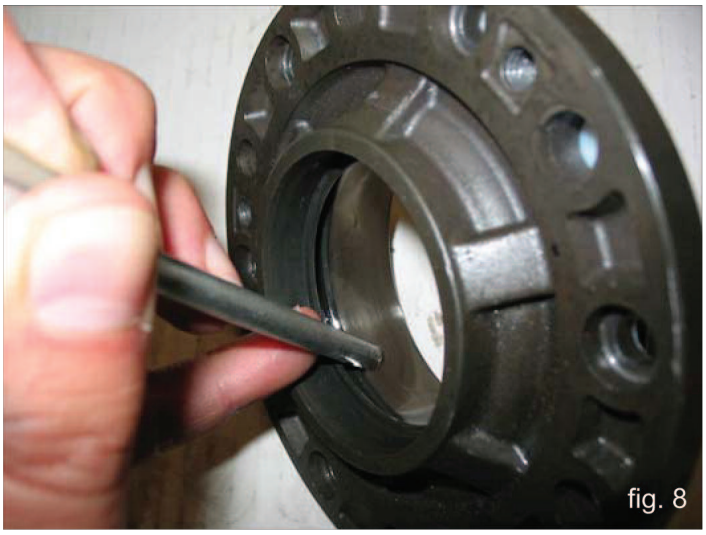


fig. 8


fig. 9

The new roller bearing can be mounted at room temperature with press; it is necessary to lay them on the lateral side of the relevant ring nuts with opposite rings. The driving operation can be facilitated by heating the relevant parts to a temperature ranging between 250^0 - 300^0 F, (120^0 - 150^0 C), making sure that the ring nuts are correctly fitted in their seats.

Never invert the parts of the two bearings.

The shim pack must be reassembled as follows:

A) Insert the crankshaft in the crankcase, being sure that the P.T.O. shank comes out of the correct side.

B) Fit the P.T.O. side flange to the crankcase paying great attention to the seal lip as indicated in paragraph 2.1.3, section C.

C) Position the flange on the sight glass side as indicated in paragraph 2.1.3.

D) Use a thickness gauge (see fig. 10).


fig. 10

to determine the shim pack as indicated in the table below:

Measurement	Shim Type	No. of Pieces
From: 0.05 to 0.010	-	-
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. 11

E) Insert the shims under the cover on the sight glass side (see fig. 11), fixing it to the crankcase using the appropriate screws, and verifying that the stall torque is between 3-5 Ft. Lbs. (4-7 Nm).

F) If the torque value is correct, connect the rods to the crankshaft; otherwise, reposition the shims again repeating the operations from point C.

2.2 Fluid End Repair

2.2.1 Disassembly of the Head - Liners - Valves

The pump head does not require periodic maintenance. Service operations are limited to valve inspection or replacement if needed. To extract the valve units proceed as follows:

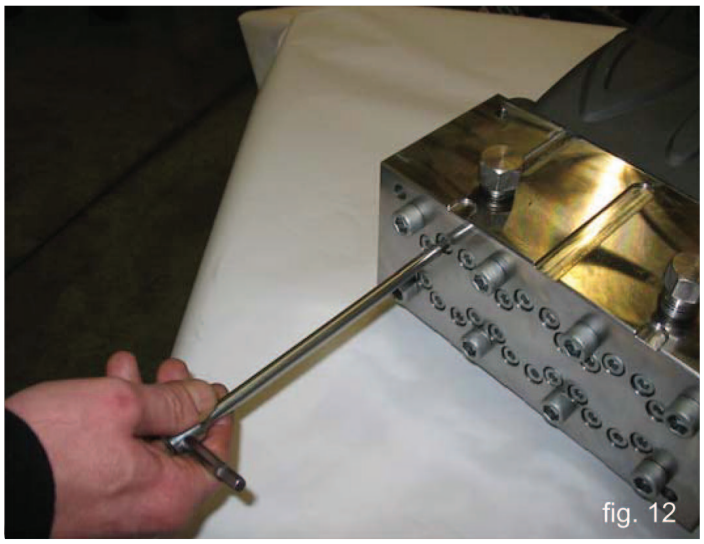


fig. 12

A) Loosen the M8 x 100 screws that fix the liners to the head as shown in fig. 12.

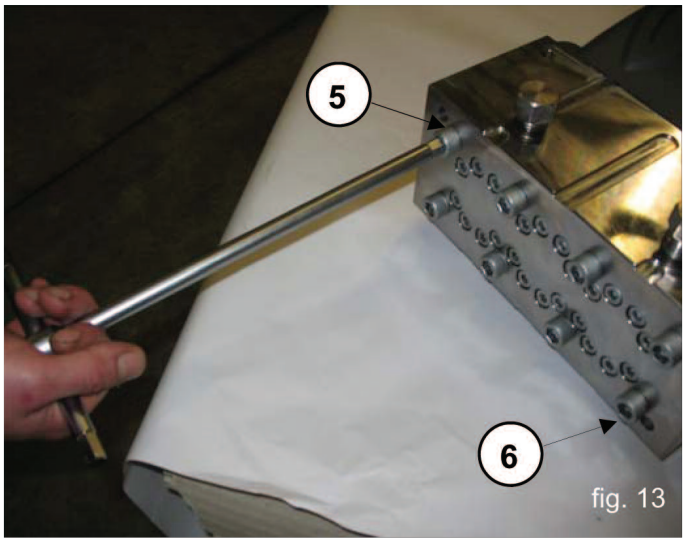


fig. 13

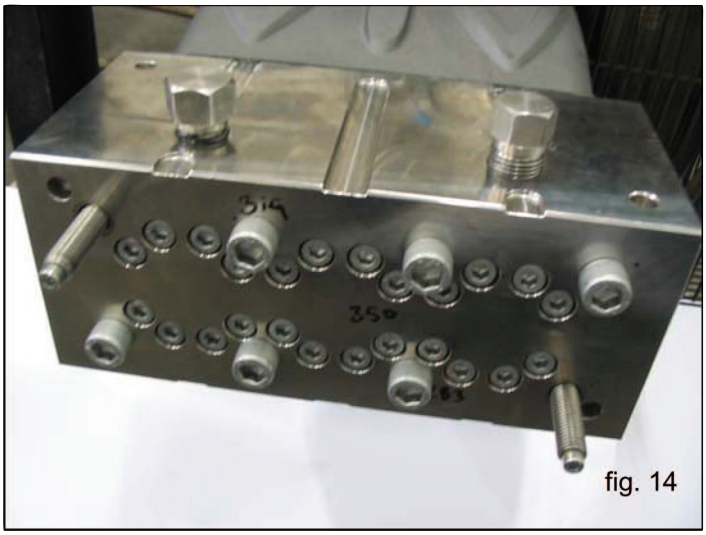


fig. 14

B) Unfasten the head screws M12 x 260, #5 and #6 as shown in fig. 13, replacing them with two auxiliary screws (p/n 27508200) as shown in fig. 14; then remove the remailing screws.

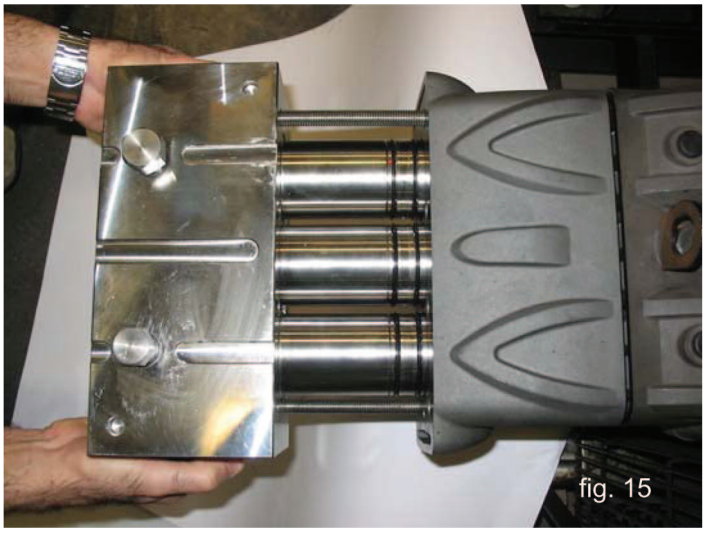


fig. 15

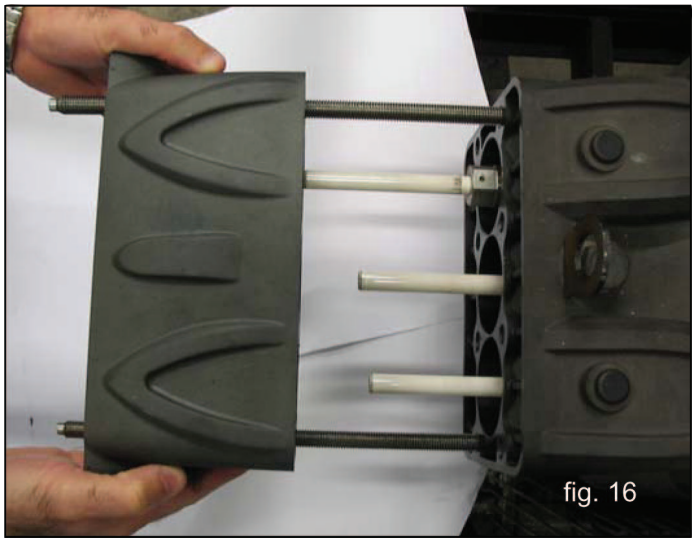


fig. 16

C) Separate the head and the liner manifold from the pump crankcase as shown in fig 15-16.

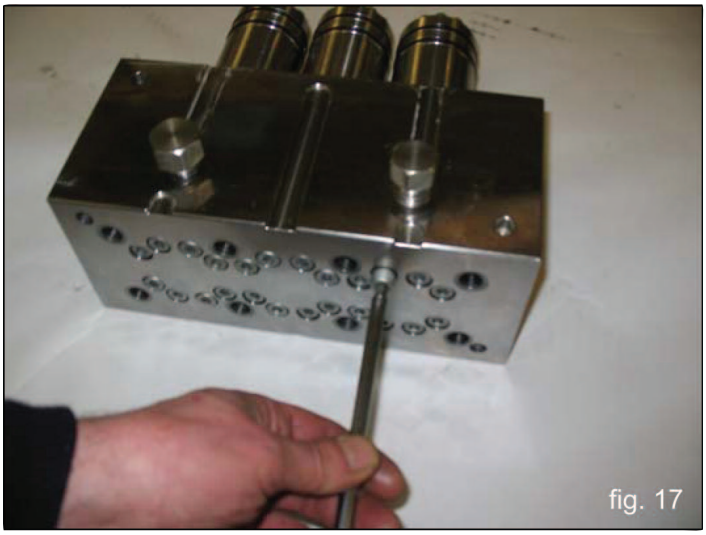


fig. 17


fig. 18

D) Remove the M8 x 100 screws that fasten the liners to the head as shown in fig. 17 and proceed as indicated in fig. 18.

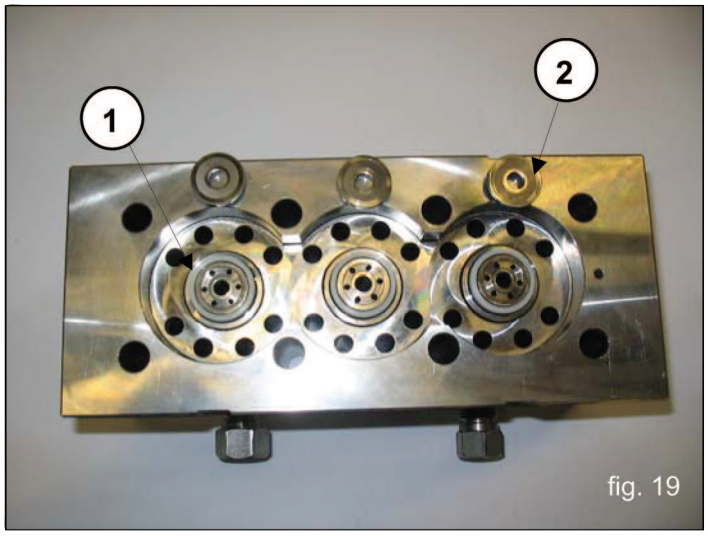


fig. 19

When disassembling the liners, be careful not to lose the valve seats #1 and the flat valves #2 as shown in fig. 19; in fact, they may fall since they are only laid down.

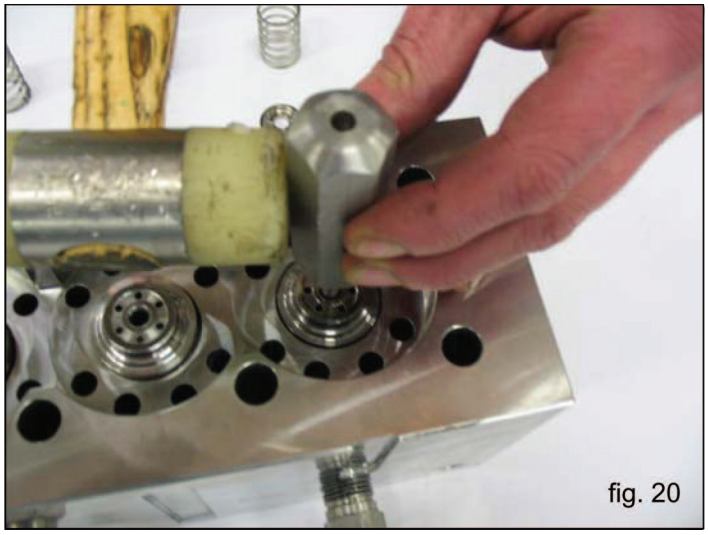


fig. 20

If the valve seats are blocked on the head due to the formation of limestone or oxide, they must be freed by inserting the appropriate tool (p/n 27508000 “VF12-“VF14) in the suction hole and operating as in fig. 20.)

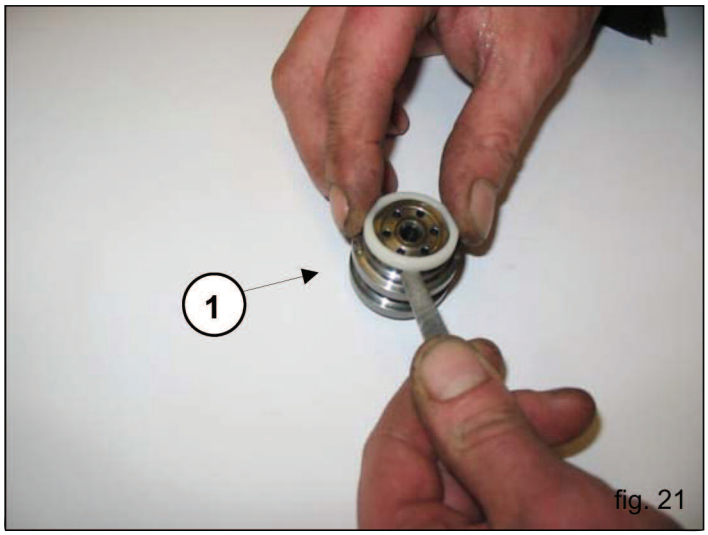


fig. 21

E) Extract the valve seat, #1, as shown in fig. 21; check components for wear and replace them if necessary.

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 manifold in the area of the recirculation hole. Before reassembly, clean and dry off the components and all their seats inside the head.

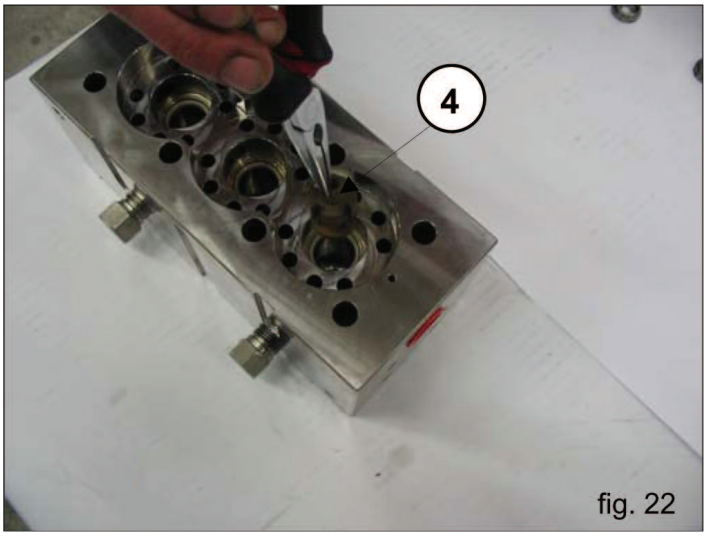


fig. 22

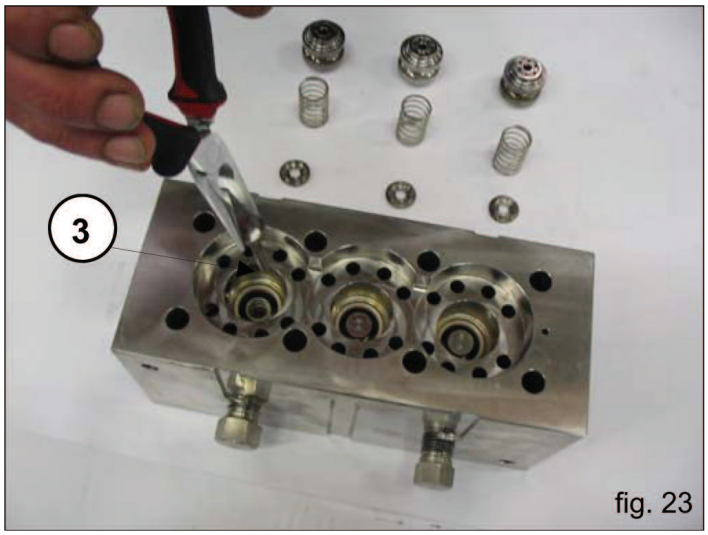


fig. 23

F) Extract the delivery pads, #3, and the related guides, #4, and springs as shown in fig. 22-23; check for wear and replace components as necessary.

2.2.2 Assembly of the Head - Liners - Valves

To reassemble the components, invert the previously listed operations, paying attention to the correct assembly of the liner manifold; when the component is mounted, the two rough casting exhausts present on one of the sides 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 fastening torque values, please follow the recommendations in paragraph 3.

2.2.3 Disassembly of the Plunger Unit - Supports - Seals

The plunger unit does not require periodic 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 pipe (if flexible), seal packings must be inspected and replaced if necessary. To extract the plunger unit operate as follows:

A) Separate the head and the liner manifold from the pump crankcase as indicated in paragraph 2.2.1, point C (fig. 15-16).

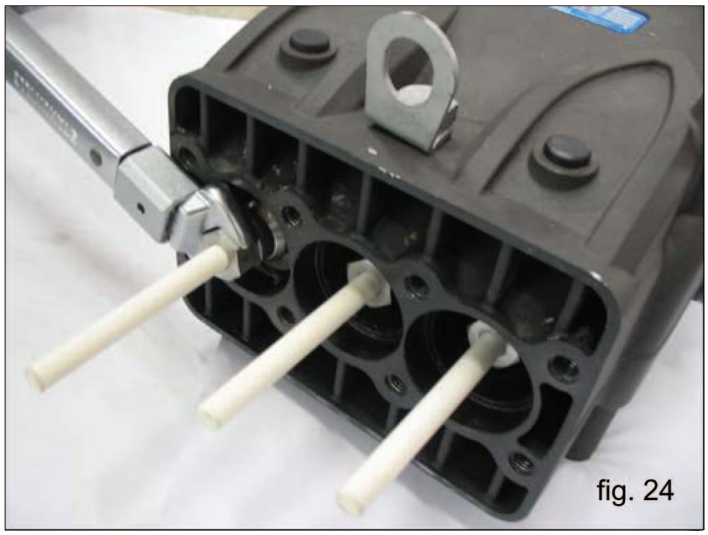


fig. 24

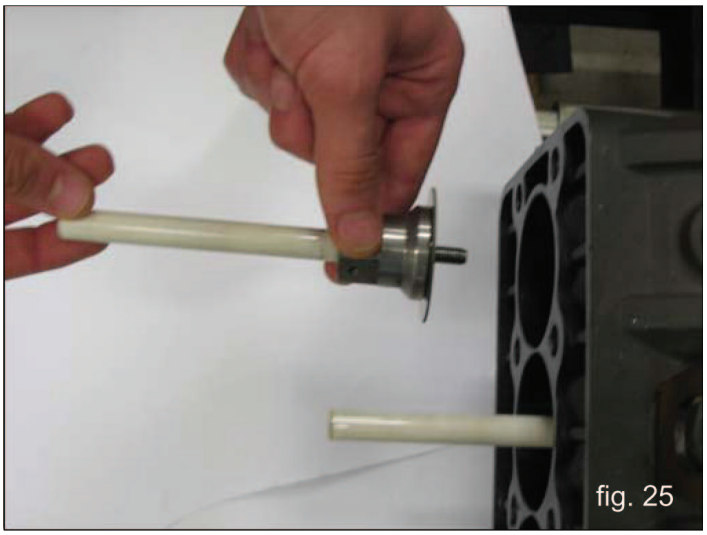


fig. 25

B) Remove the pumping assembly with a fork wrench and check for wear as indicated in fig. 24-25; replace if necessary.


fig. 26

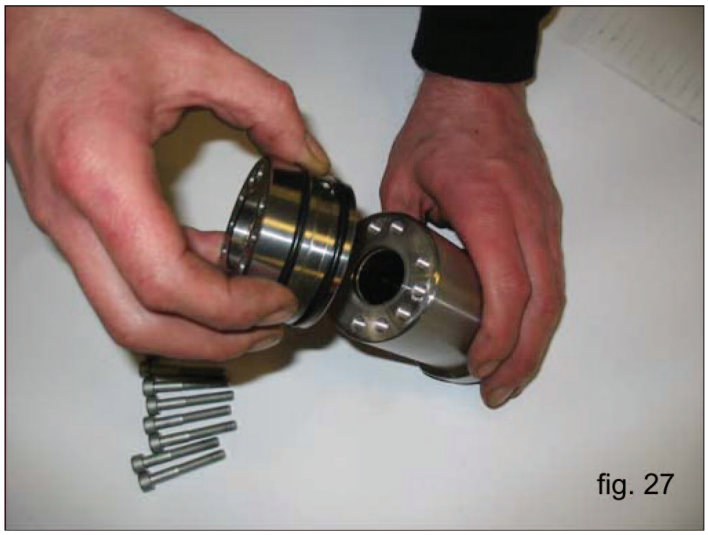


fig. 27

B) Remove the M6 x 40 screws of the liner support as indicated in fig. 26, and separate as Shown in Fig. 27


fig. 28

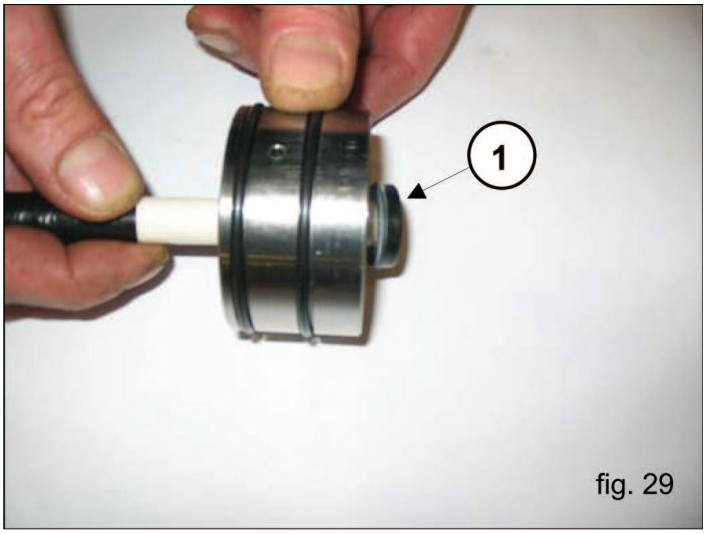


fig. 29

B) Remove the seeger ring and the seal retainer ring as shown in fig. 28, and with an opposite pin extract the L.P. (low pressure) gasket, #1 as shown in fig. 29.

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

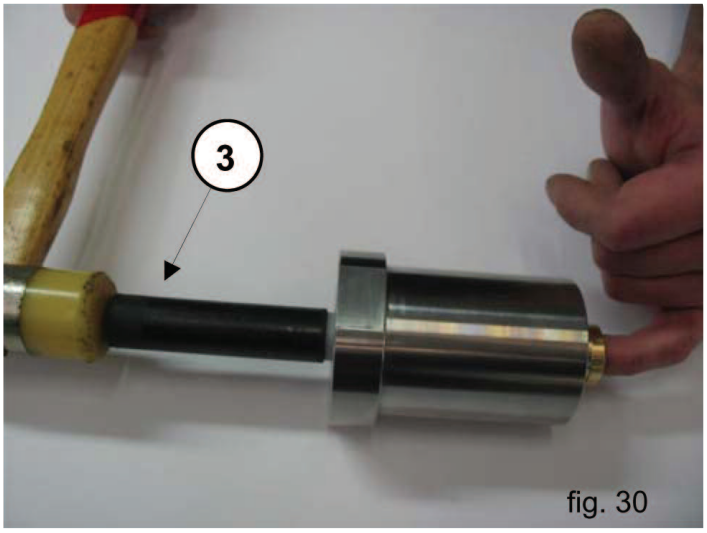


fig. 30

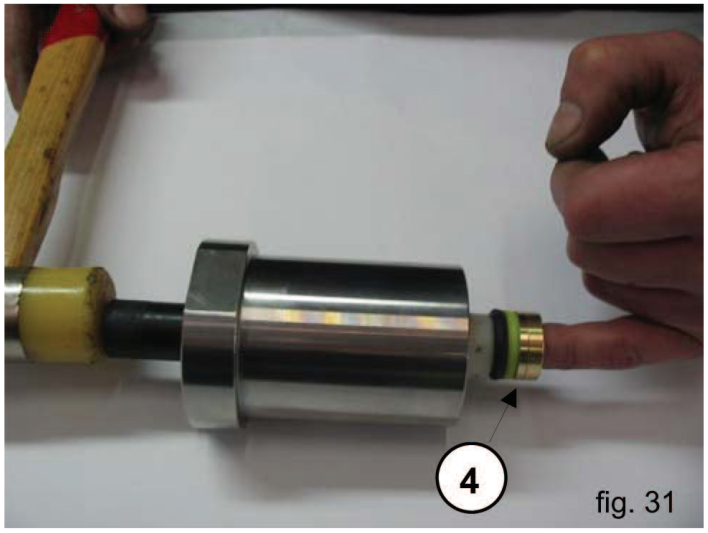


fig. 31

E) With the liner separated from the support, and with an opposite plastic pin, #3 as shown in fig. 30, push out the H.P. (high pressure) packing, #4< by operating as in fig. 31.

At each disassembly, the HP packing, #4 fig. 31, must be replaced.

2.2.4 Assembly of the Plunger Unit - Supports - Seals

To reassemble the components, invert the operations paying attention to the sequences listed below; for fastening torque values and phases, please refer to the values in paragraph 3.

A) Insert the upper bush into the liner.

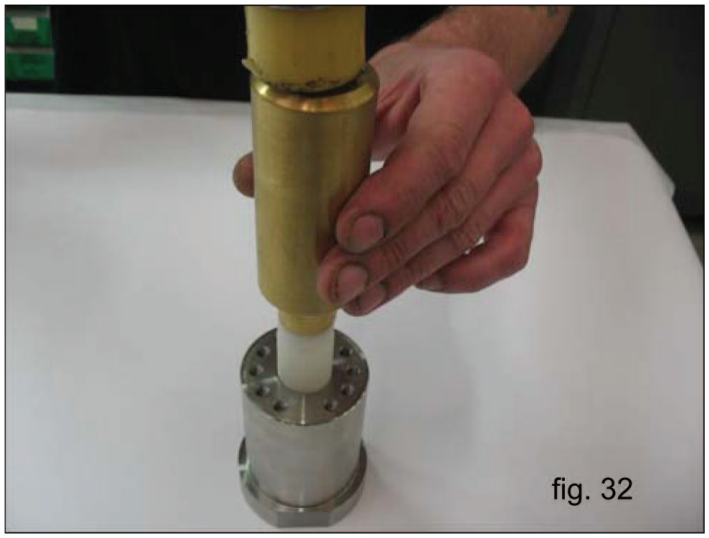


fig. 32

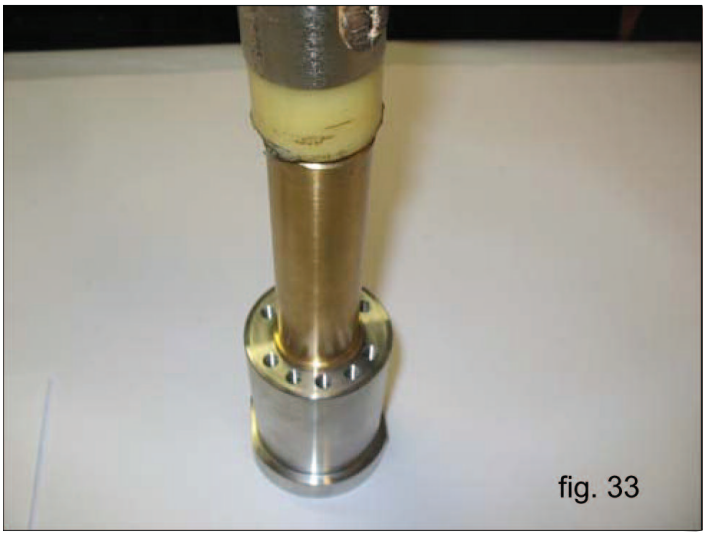


fig. 33

For the correct axial positioning of the bushing, use the appropriate tool (p/n 27508300 valid for VF12 type pumps, and p/n 27508500 valid for VF14 type pumps) as shown in fig. 32 and 33.

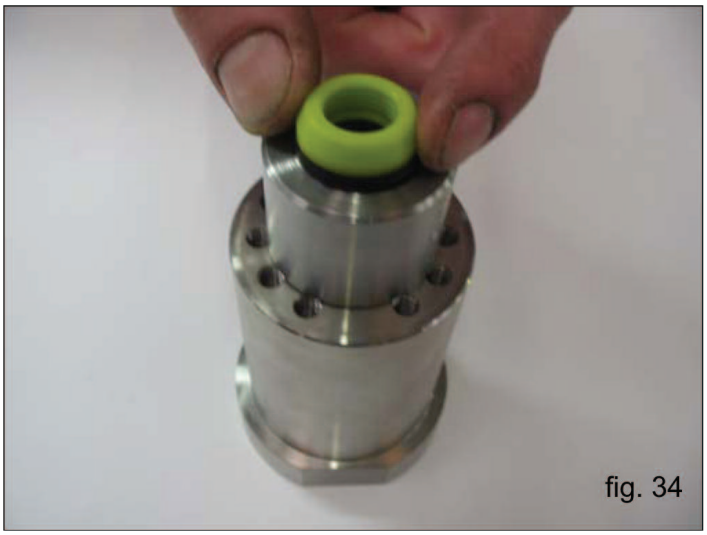


fig. 34

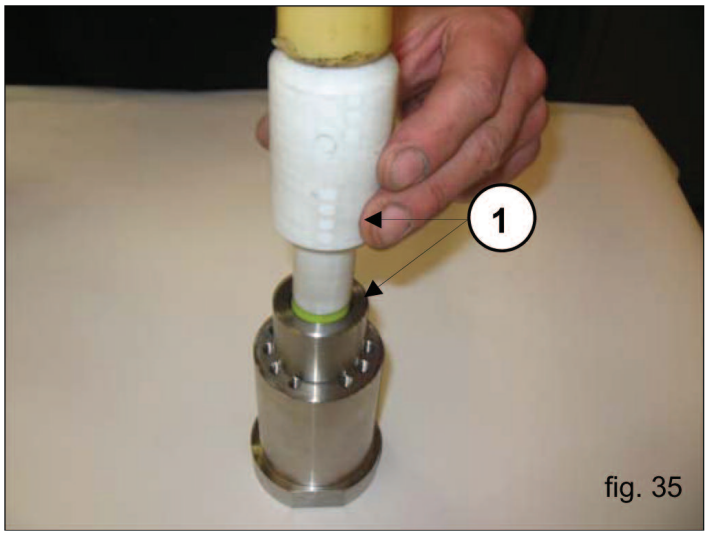


fig. 35

F) Insert the H.P. packing; considered the slight interference between the seal and the liner, to avoid damage we advise using the appropriate tool (p/n 27508400 and p/n 27365300) as shown in fig. 34 and 35.

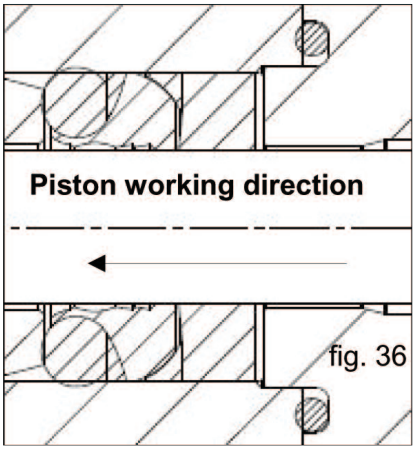


fig. 36

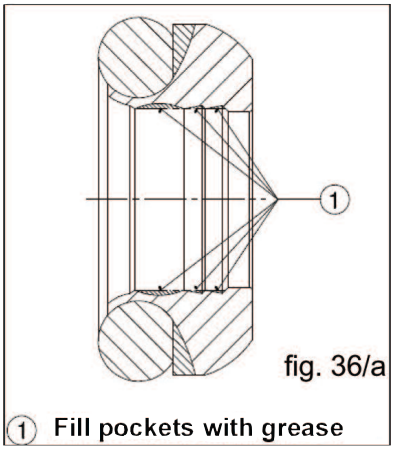


fig. 36/a

The H.P. seal must be inserted into the liner with the o-ring in the plunger working direction as shown in fig. 34 and 36.

Before inserting them into their seats, the H.P. seals must be lubricated with silicone grease, type OKS1110, 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. 36a.

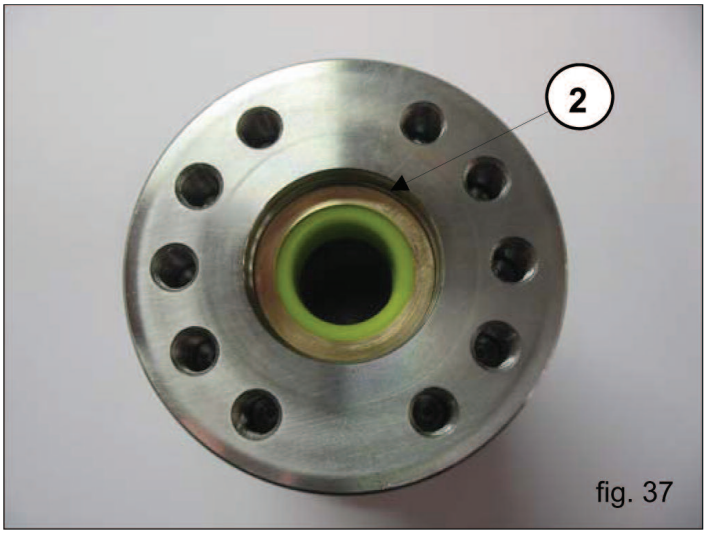


fig. 37

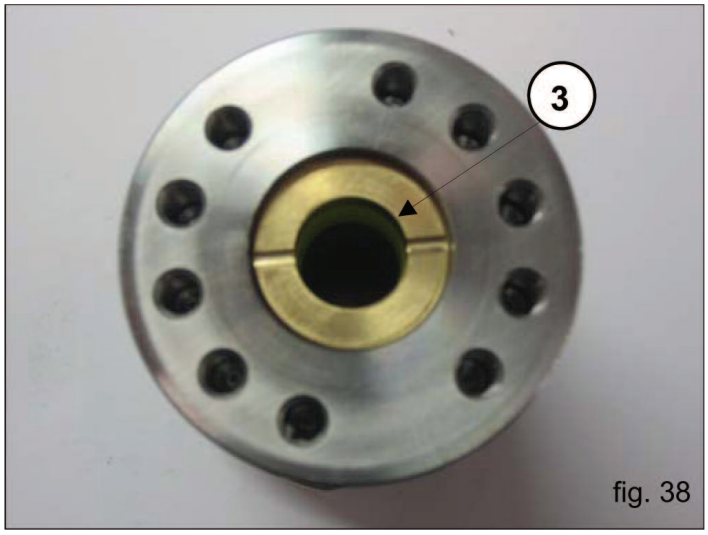


fig. 38

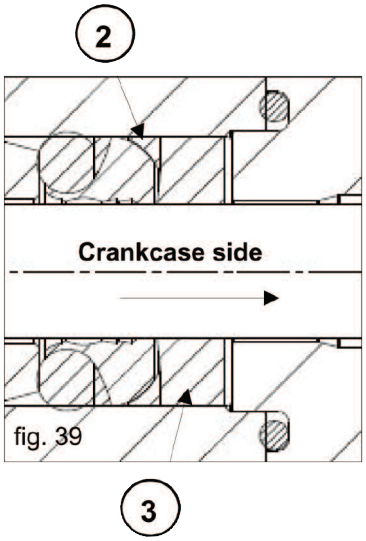


fig. 39

C) Insert the anti-extrusion ring, #2, and the gasket bushing, #3, arranged as shown in fig. 37 - 38 - 39.

The gasket bushing, #3, must be introduced into the liner with the outlets facing outward (crankcase side) as shown in fig. 38 and in fig. 39.

The L.P. seal must be inserted into the liner with the sealing lip in the plunger working direction as shown in fig. 40 and fig. 41, slightly lubricating the external diameter with silicone grease type OKS1110.

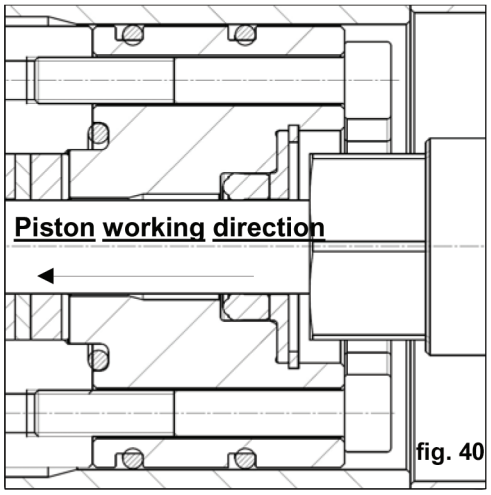


fig. 40

fig. 41

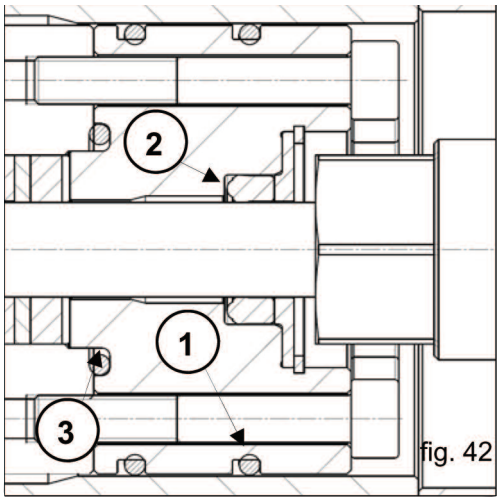


fig. 42

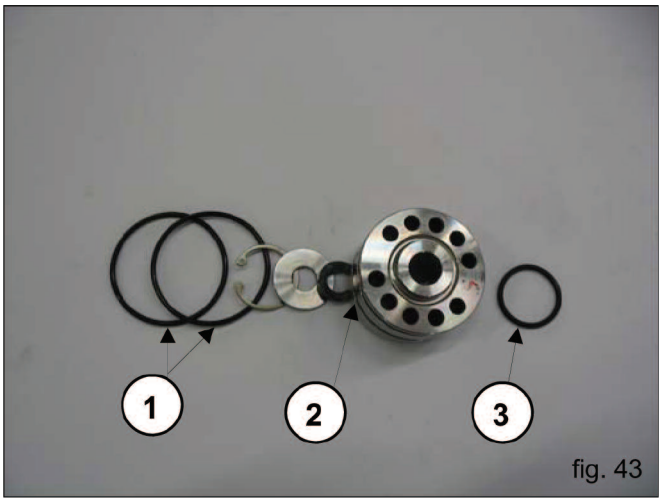


fig. 43

D) Reassemble the seals support unit as shown in Fig. 42 and fig. 43, replacing #1, #2 and #3.

fig. 44

E) Assemble the support-liner unit by manually screwing the M6 x 40 screws as shown in fig. 44, then proceed with calibrations using a torque wrench as indicated in 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	19	7.4	10
Oil discharge plug	11	29.5	40
Lifting bracket fastening screw	17	73.8	100
Conrod caps fastening screw	18	28	38*
Plunger fastening	28	14.8	20
Choke	31	7.4	10
Support fastening screw	44	11	15****
Head fastening screw	56	59	80**
Liner fastening screw	57	25.8	35***
Hydraulic motor flange screw	59	29.5	40

* The conrod caps fastening screws must be tighteded respecting the phases indicated in "Point D" of page 6

** The head fastening screws must be tightened respecting the phases and the order indicated in fig. 45

*** The liner fastening screws must be tightened respecting the phases and the order indicated in fig. 45

****The support fastening screws must be tightened in a single step, respecting the order indicated in fig. 44

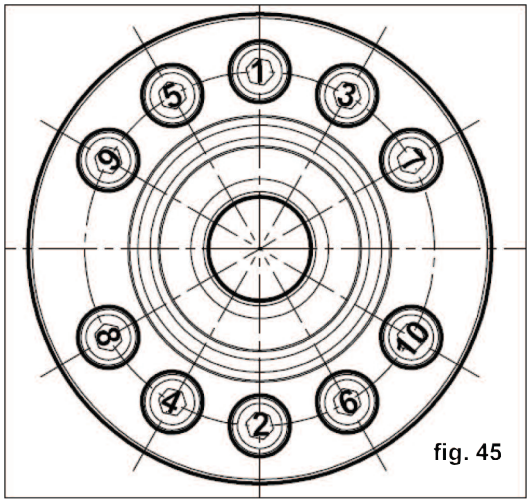
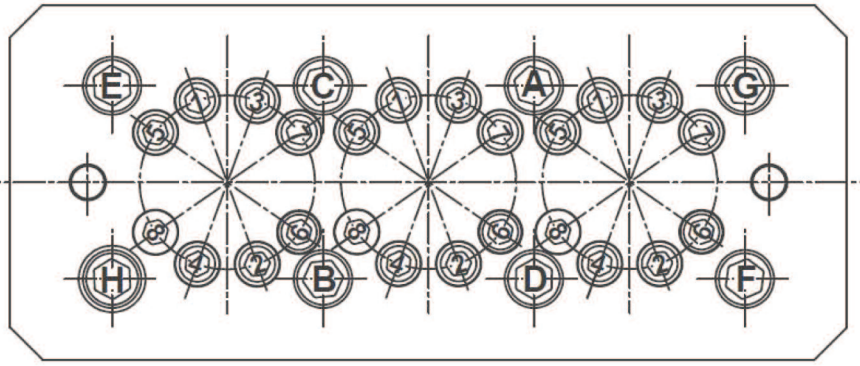


fig. 45

Screw 44 and 57 of the exploded view, should be greased before being tightened by means of a torque wrench.

Head and Liner Screw Fastening



OPERATION 1: M12 x 260 screws fastened (#56) in two phases

Respecting the sequence indicated in fig (A-B-C-D-E-F-G-H)

1ST Phase: = 29.5 Ft. Lbs. (40 Nm)

2ND Phase: = 59 Ft. Lbs. (80 Nm)

OPERATION 2: M8 x 100 screws fastened (#57) in four phases.

Respecting the sequence indicated in fig (1-2-3-4-5-6-7-8)

1ST Phase: = 14.8 Ft. Lbs. (20 Nm)

2ND Phase: = 22 Ft. Lbs. (30 Nm)

3RD Phase: = 25.8 Ft. Lbs. (35 Nm)

4TH Phase: = 25.8 Ft. Lbs. (35 Nm)

fig. 46

4. REPAIR TOOLS

Pump maintenance may be carried out using simple tools for assembling and disassembling components. The following tools are available:

For Assembly:

- Gasket Bushing VF12. . . . . p/n 27508300
- Gasket Bushing VF14. . . . . p/n 27508500
- HP Seal Packing . . . . . p/n 27516000 & 27508400
- Plunger Guide Oil Seal . . . . . p/n 27904900
- Pump Shaft Oil Seal . . . . . p/n 27904800
- Heads / Liner Manifold . . . . . p/n 27508200

For Disassembly:

- Valve Seats VF12 - VF14 . . . . . p/n 27508000
- Heads / Liner Manifold . . . . . p/n 27508200
- Plunger Guide Oil Seal . . . . . p/n 27503900

MAINTENANCE LOG

	HOURS & DATE						
OIL CHANGE							
GREASE							
PACKING REPLACEMENT							
PLUNGER REPLACEMENT							
VALVE REPLACEMENT							

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