

Repair Manual



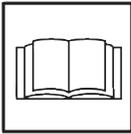
INDEX

1.	INTRODUCTION	Page 3
2.	REPAIR INSTRUCTIONS	Page 3
	2.1 Crank mechanism repair	Page 3
	2.1.1 Crank mechanism disassembly	Page 4
	2.1.2 Crank mechanism assembly	Page 6
	2.1.3 Disassembly / Assembly of bearings and shims	Page 8
	2.2 Fluid end repair	Page 11
	2.2.1 Disassembly of the Head-Valve Units	Page 11
	2.2.2 Head Assembly - Valve Units	Page 12
	2.2.3 Disassembly of the head - Seals	Page 13
	2.2.4 Plunger Unit Disassembly	Page 14
	2.2.5 Head Assembly - Seals - Plunger Unit	Page 14
3.	SCREW CALIBRATION	Page 15
4.	REPAIR TOOLS	Page 16
5.	KFR PUMP VERSION	Page 17
	5.1 KFR Pump	Page 17
	5.1.1 Disassembling the support - Seal Unit	Page 17
	5.1.2 Assembling the support - Seal Unit	Page 17
6.	MAINTENANCE LOG	Page 20

1. INTRODUCTION

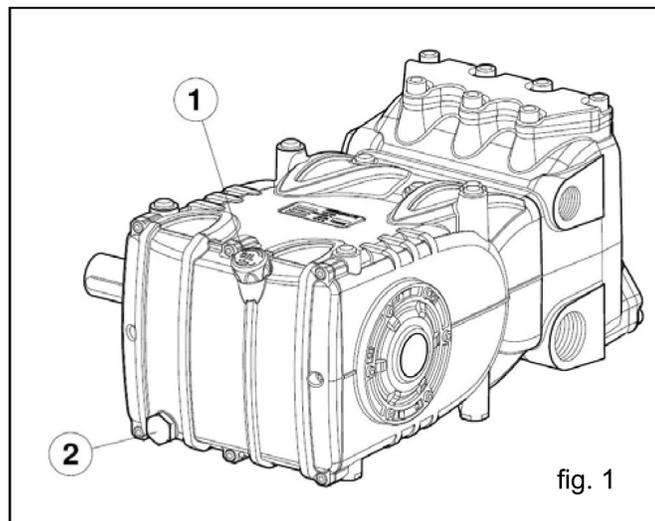
This manual describes the instructions for repairing KF Series pumps, and must be carefully read and understood before performing any repair intervention on the pump. Proper pump operation and longevity depend on the correct use and maintenance. General Pump declines any responsibility for damage caused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

2. REPAIR INSTRUCTIONS



2.1 Crank Mechanism Repair

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



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

2.1.1 Crank mechanism disassembly

The correct sequence is the following:

Disassemble:

- The pump shaft key
- The rear cover
- The connecting rod cap as follows: Unscrew the cap fixing screws, remove the connecting rod caps with their lower half-bearings fig. 2 paying attention to the number sequence during disassembly.

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



Fig. 2

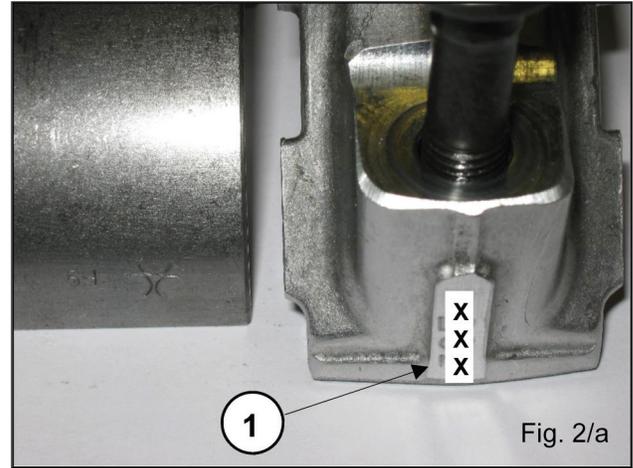


Fig. 2/a



Fig. 3

- The side cover using - for extraction 3 fully threaded M6 x 50 screws, inserting them in the threaded holes as indicated in fig. 3.
- Push the plunger guides and connecting rods forward to facilitate lateral extraction of the pump shaft. Two marks are visible on the crankshaft (fig. 4 and 4a); they must be turned towards the operator in order to facilitate extraction.

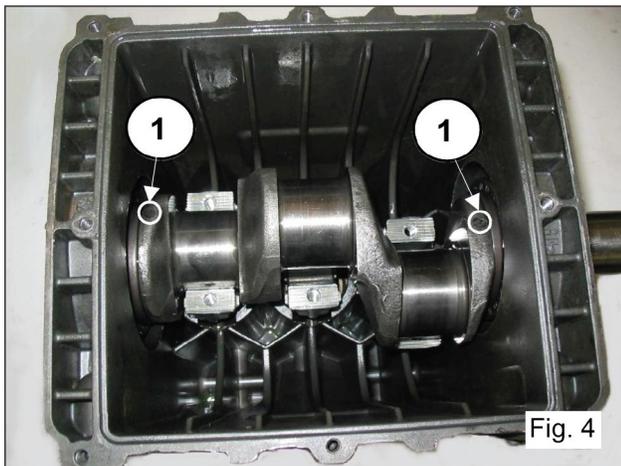


Fig. 4

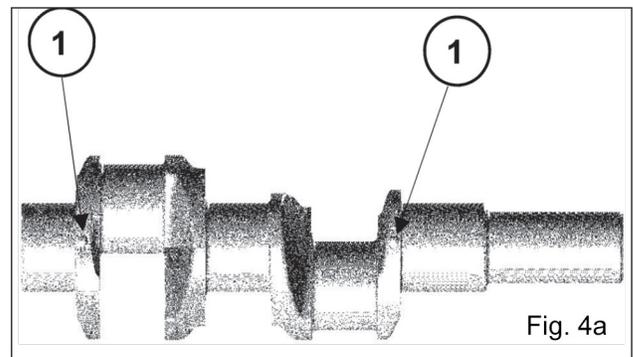
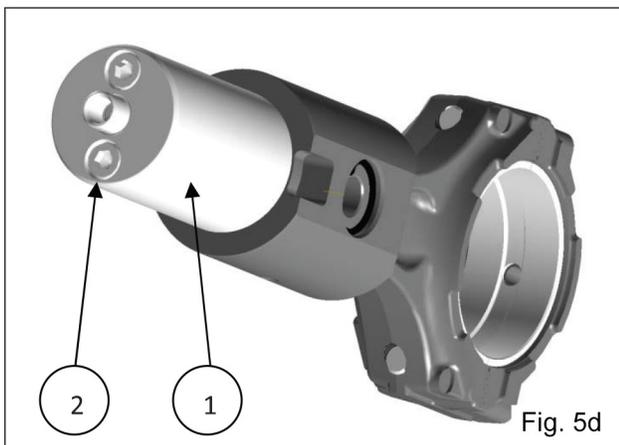
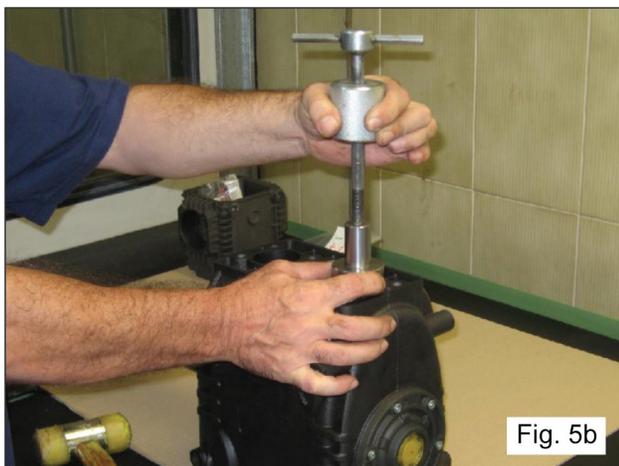
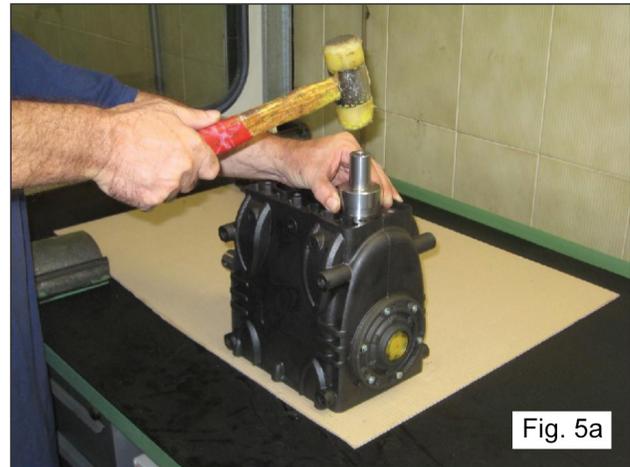
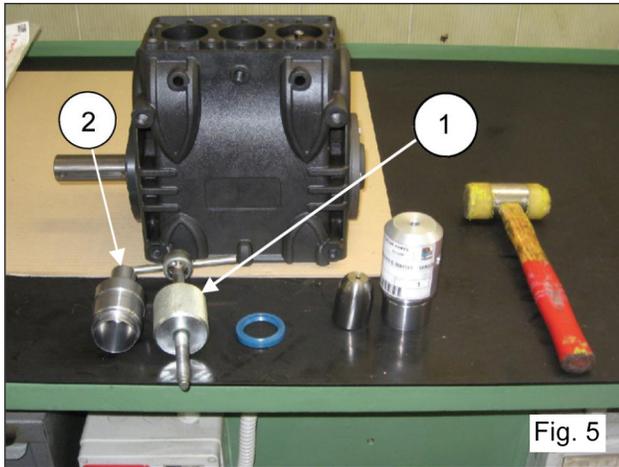


Fig. 4a

- Remove the crankshaft
- Complete disassembly of the con-rods units by removing them from the crankcase and removing the plunger guides
- Remove the crankshaft seal rings using common tools

Ref 300917 Rev. B
06-19

- Remove the plunger guide seals rings as described in the following: Use the extractor #26019400 (fig. 5, pos. 1) and pliers part #27503900 (fig. 5, pos. 2). Insert the gripper as far as possible onto the seal ring with a hammer (fig. 5/a), screw the extractor into the gripper, and use the extractor hammer (fig. 5/b) until the ring to be replaced is removed (fig. 5/c).



- When disassembling the connecting rods check the wear status of the plunger guide rods (fig. 5/d, pos. 1), if necessary replace them by removing the two screws (fig. 5/d, pos. 2).

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 (fig. 6, pos.1) and lower half-bearings (fig. 6/a, pos. 2) are positioned in their respective seats in the con-rod and cap.

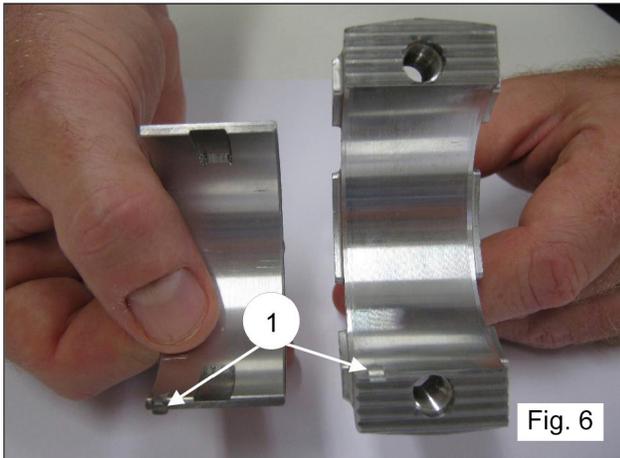


Fig. 6

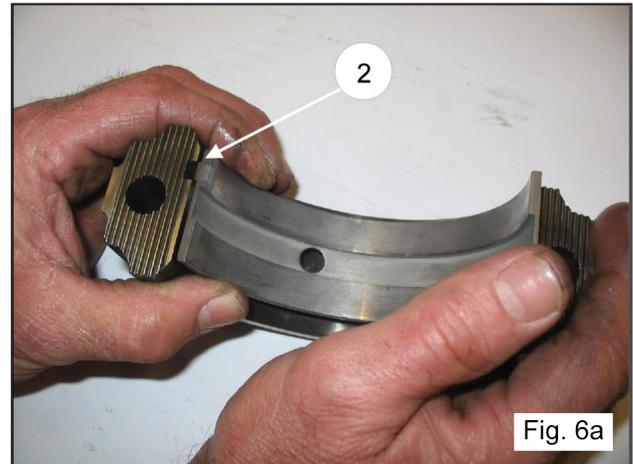


Fig. 6a

If the plunger guide rods have been disassembled, before reassembling them check the correct positioning of the sealing O-rings, (fig. 6/b, pos. 1) replace them if necessary. Tighten the plunger guide rods through the respective two M6 screws to the torque specs indicated in the table on page 24.

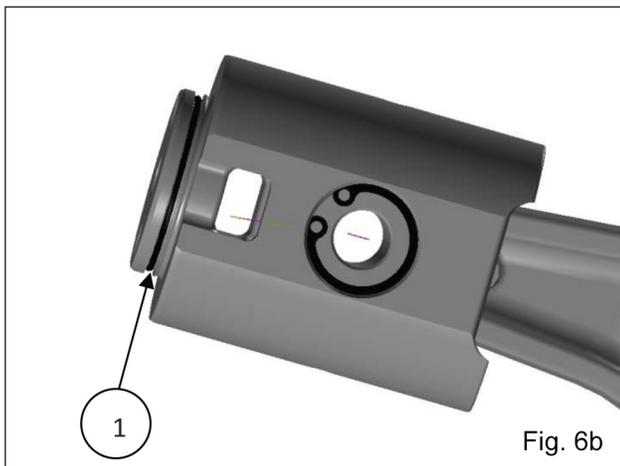


Fig. 6b

- Insert the plunger/con-rod guide units into the pump casing, directing the numbering on the con-rod shank towards the top of the crankcase. To facilitate crankshaft insertion (without the key), it is essential to repeat the operation performed during the disassembly, pushing the plunger/con-rod guide units as far down as possible (par. 2.1.1).

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

If replacement is necessary, position the new ring using tool (part #27904800) and shown in fig. 7.



If the pump shaft shows 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 the covers on the crankcase, we recommend using 3 partially threaded M6 x 40 screws (fig. 8, pos. 1) to then complete the operation with the screws supplied

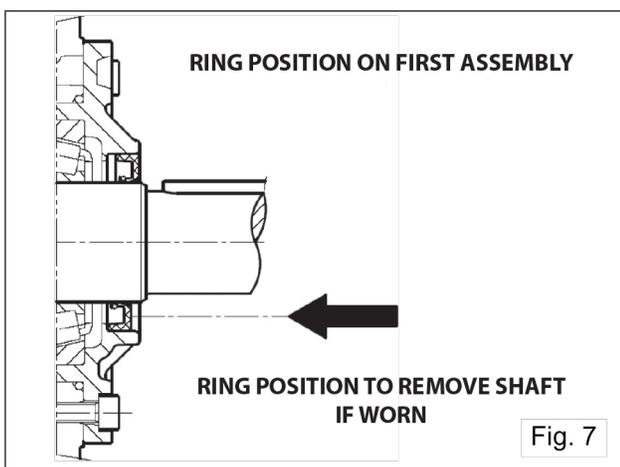


Fig. 7

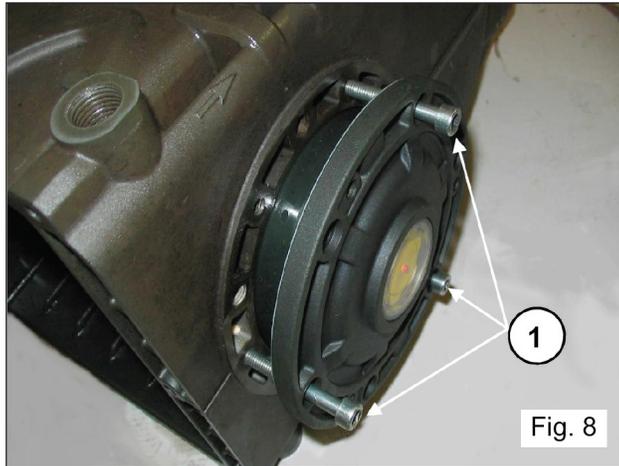


Fig. 8



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

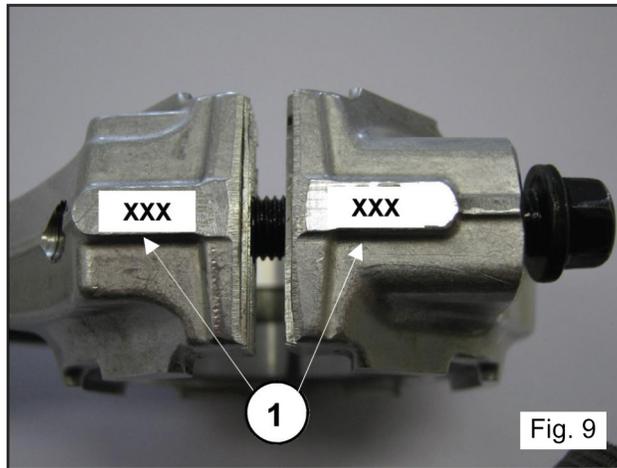


Fig. 9

- Fasten the caps to their respective con-rod shanks using M8 x 1 x 48 screws (fig. 10) lubricating both the underhead and the threaded shank, producing in two different stages:

1. Manually turn screws until they are had tight.

2. Tightening torque: 22 ft. lbs. (30 Nm)

Alternatively, ensure

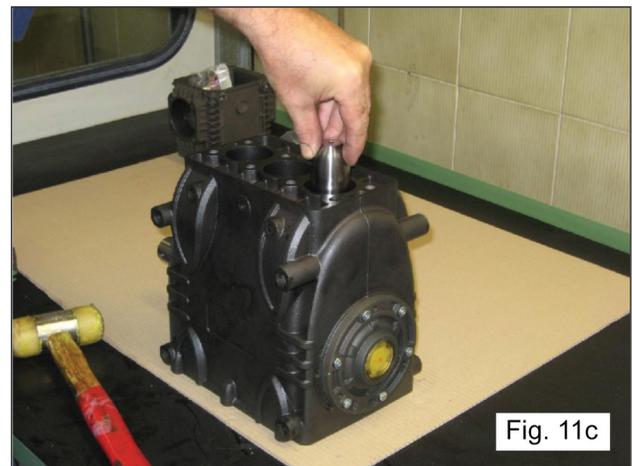
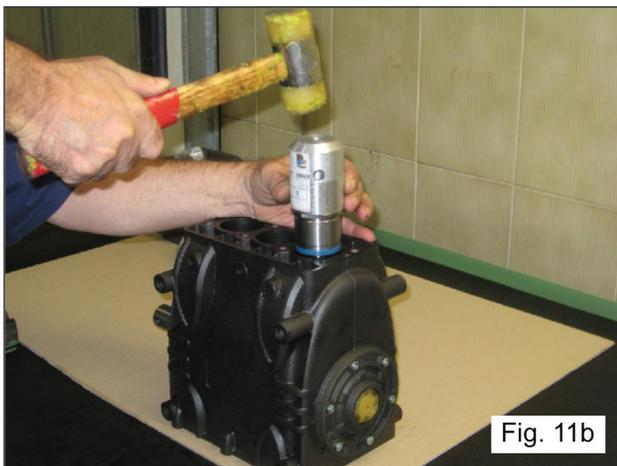
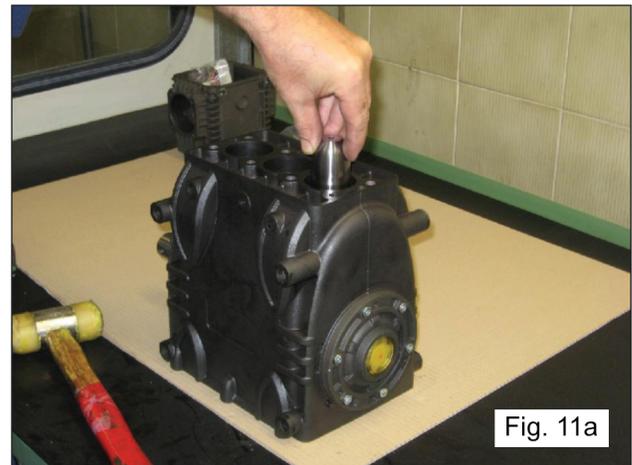
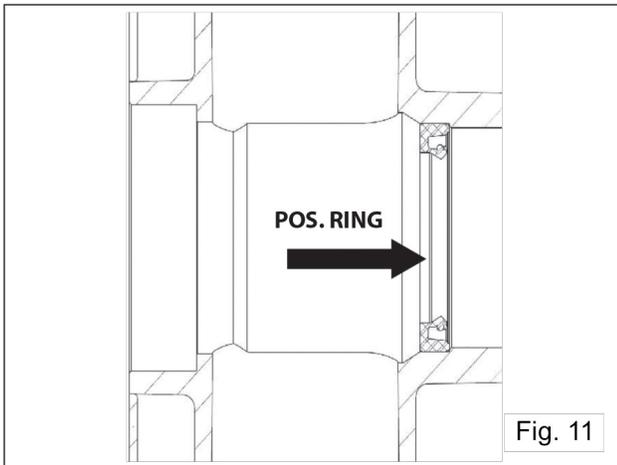
1. Pre-tightening torque: 7.5 - 11 ft. lbs (10-15 Nm)

2. Tightening Torque: 22 ft. lbs. (30 Nm)



Fig. 10

- After completing torque procedures, 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 crankcase (fig. 11), following the procedure described: Use tool (part #27904900) 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 pump crankcase. (fig. 11/b), remove the tapered bush (fig. 11/c).



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

2.1.3 Disassembly/Assembly of Bearing and Shims

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

A) Disassembly/Assembly 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, thoroughly clean the components with a suitable degreaser and grease them again evenly using the same oil used in the crankcase.

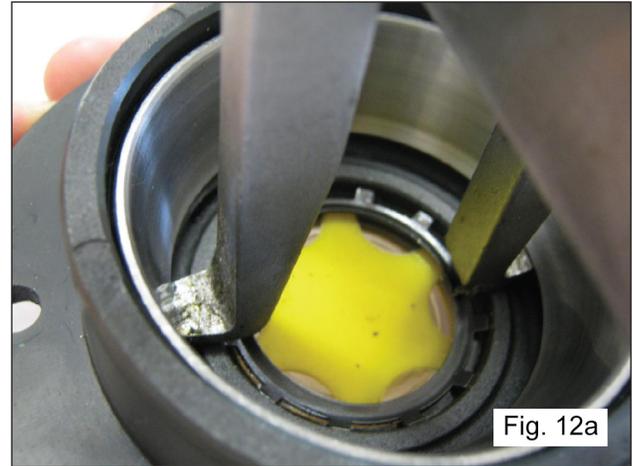
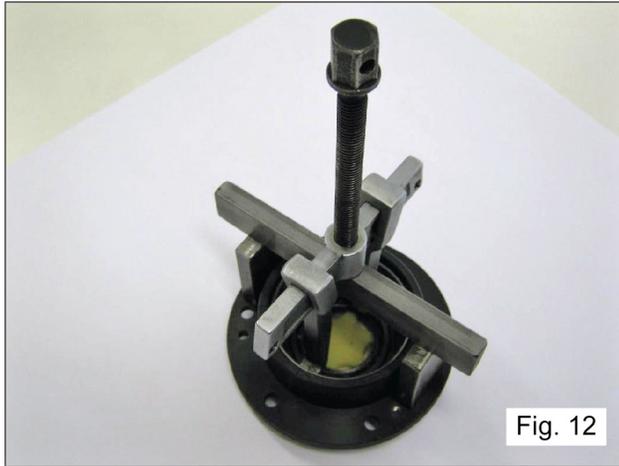
The same shims can be used again, being careful to fit them under the cover on the sight glass side. After installing the complete unit (sight glass flange + shaft + engine side flange), check that the shaft's rolling torque - with the connection rods free - is at least 3 ft. lbs (4 Nm), max 5 ft. lbs (7 Nm).

To position the two side covers on the crankcase, initially use 3 M6x40 screws as shown in fig. 8, and then the fastening screws.

The shaft's rolling torque (with connecting rods coupled) must not exceed 6 ft. lbs (8 Nm).

B) Disassembly/Assembly of the crankshaft with bearing replacement

After disassembling the side covers as indicated in paragraph 2.1.1, 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 8-9.



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



Never invert 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 crankshaft without key into the crankcase, making sure the PTO shank comes out the correct side.

Secure the PTO side flange to the casing, taking care with the lip seal as described previously and tighten the screws to the recommended torque.

Then feed the flange on the indicator side without shims in the carter and start to move it closer, manually screwing the M6 x 40 service screws in equally, with small rotations.

At the same time, check that the shaft rotates freely by turning in manually.

Continuing the procedure in this way, an increase in hardness during shaft rotation will so be experienced.

At this point, halt the forward moment of the cover and loosen the fixing screws completely.

With the aid of a feeler gauge, measure the clearance between the side cover and pump crankcase (fig. 14).



Fig. 14

Determine the shim pack, using the table below:

Detected Measurements	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	1
	0.10	1
From: 0.56 to: 0.60	0.25	2
From: 0.61 to: 70	0.35	1
	0.25	1



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 crankcase, following the procedure in par. 2.1.2 and tighten the screws to their recommended torque.

Check that the shaft rotation stall torque is between 3 ft. lbs. (4 Nm) and 4.5 ft. lbs. (6 Nm).

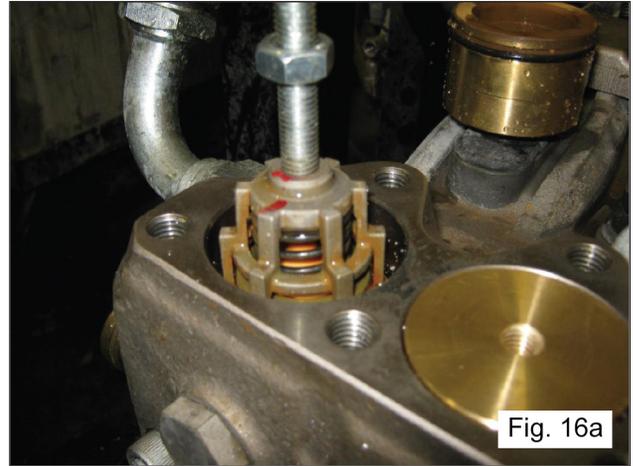
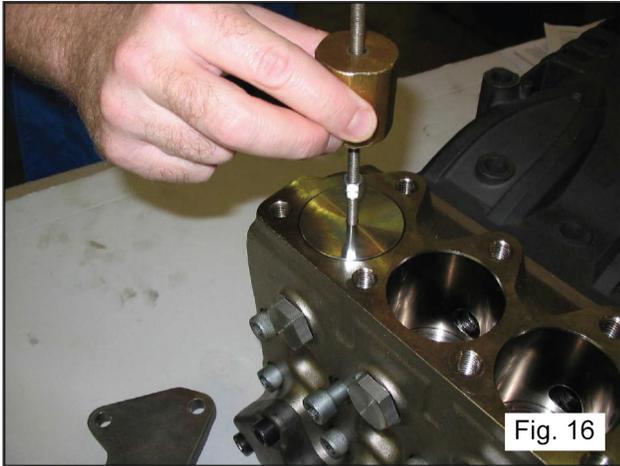
If the torque is correct, connect the con-rods to the crankshaft and to the next stages. If its not, redefine the shim pack, repeating the operations.

2.2 Fluid End Repair

2.2.1 Disassembly of the head - valve units

Service operations are limited to valve inspection or replacement if needed

To extract the valve units proceed as follows:



Unfasten the (7) M12 x 35 valve cover screws, and remove the cover, fig. 16.

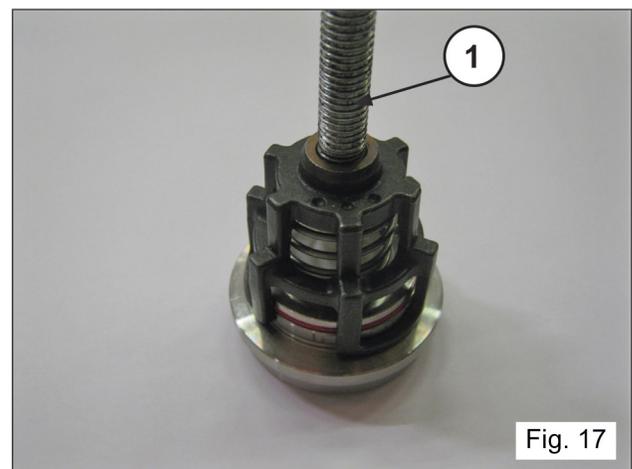
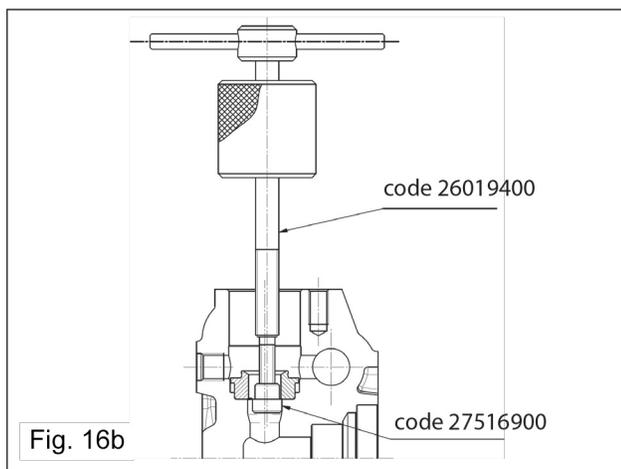
Extract the valve plugs using a slide hammer (part #F26019400) with tool (part #27513600), fig. 16.

Extract the valve units using the same slide hammer used for the valve plugs (part #F26019400): it is applied to the M10 hole of the valve guide



If the extraction of the delivery and suction valve units is particularly difficult (for example due to incrustations caused by prolonged pump inactivity), use the exaction tool (part #27516900 combined with part #F26019400) Fig. 16/b.

Disassemble the suction and delivery valve units by screwing on an M10 screw long enough to act on the valve and extract the valve guide from the salve seat (fig. 17, pos. 1).



2.2.2 Head assembly - valve units

Pay careful attention to state of wear of the various components; replace them when necessary, and in any case within the intervals indicated in the table in chapter 11 of the **Owner's Manual**. At each valve inspection, replace all valve plugs, O-rings and anti-extrusion rings.



Before positioning the valve units, clean and perfectly dry the relevant seats in the head as indicated in fig. 18.

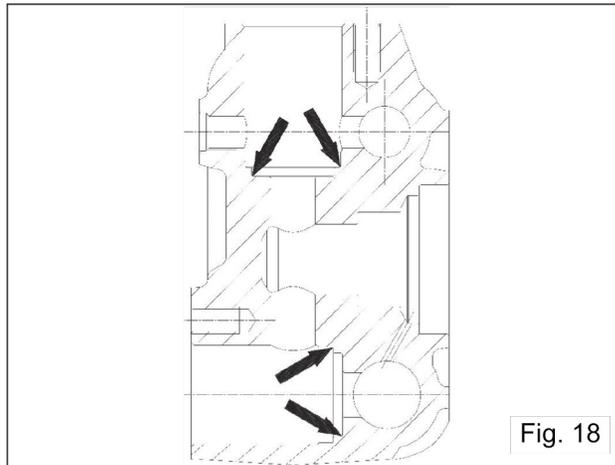


Fig. 18

Proceed with reassembly by inverting the procedure indicated in paragraph 2.2.1. To facilitate the insertion of the valve guide into its seat, use a pipe that lays on the horizontal shoulders of the guide and use a hammer acting on the entire circumference. (fig. 19 and fig. 19/a).



During the assembly of the suction and delivery valves (fig. 15 - fig. 16) do not invert the springs with the previously disassembled delivery springs:

- a) Suction spring "white"
- b) Delivery spring "black"

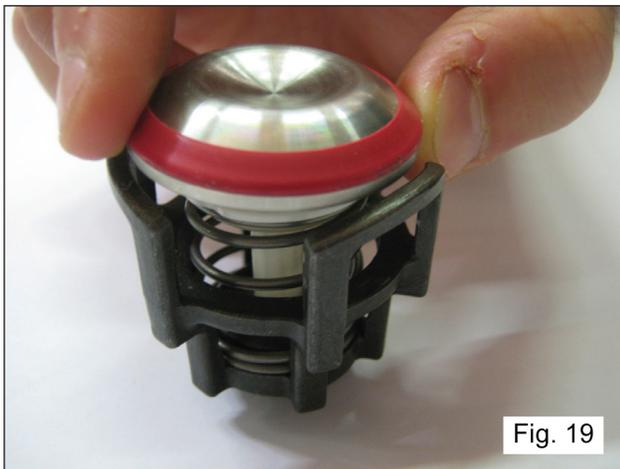


Fig. 19

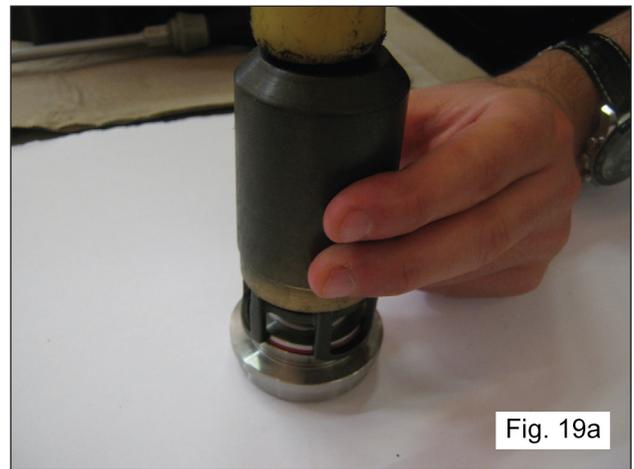


Fig. 19a



Insert the inlet and outlet valve units, checking that they are fully inserted in the head seat.

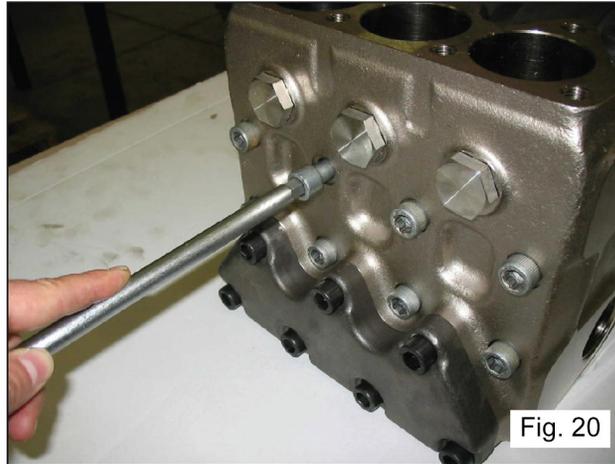
Then apply the valve cover and calibrate the respective M12 x 35 screws at the required tightening torque.

Insert the suction and delivery valve units checking that they are thoroughly inserted in the head seat. Therefore apply the valve covers and proceed with calibrating the related M12 x 35 screws with a torque wrench as indicated in Chapter 3.

2.2.3 Disassembly of the head - seals

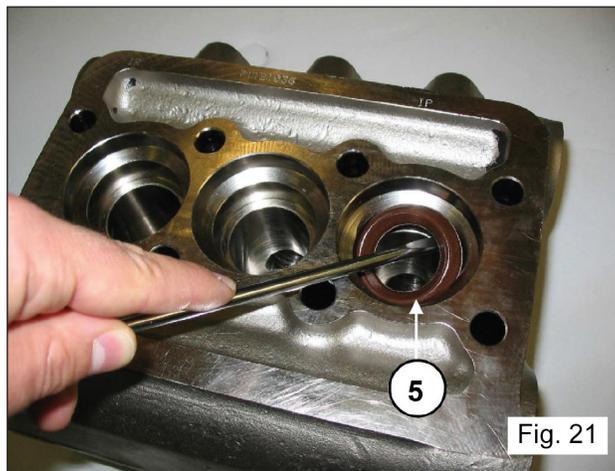
The replacement of the seals is necessary if water leaks are detected from the draining holes located at the rear of the crankcase, and in any case within the intervals indicated in the table in Chapter 11 of the Owner's Manual.

A) Unfasten the M12 x 150 head screws as shown in fig. 20.



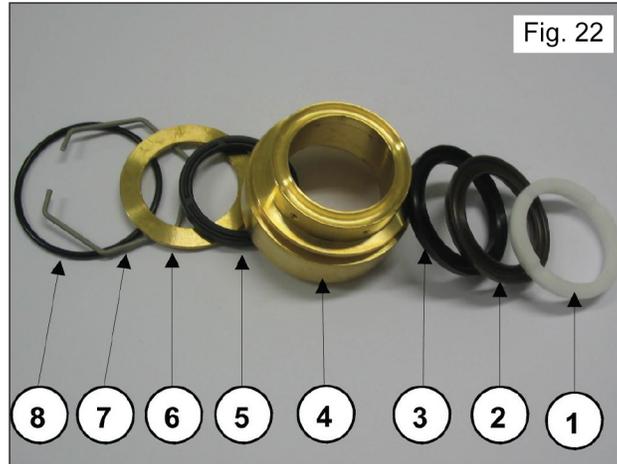
B) Remove the head from the crankcase.

C) Extract the high pressure seals from the head, and the low pressure seals from their related support by using standard tools as shown in (fig. 21, pos. 5); be careful not to damage the seats.



Pay careful attention to the order of sealing pack disassembly as shown in fig. 22, composed of:

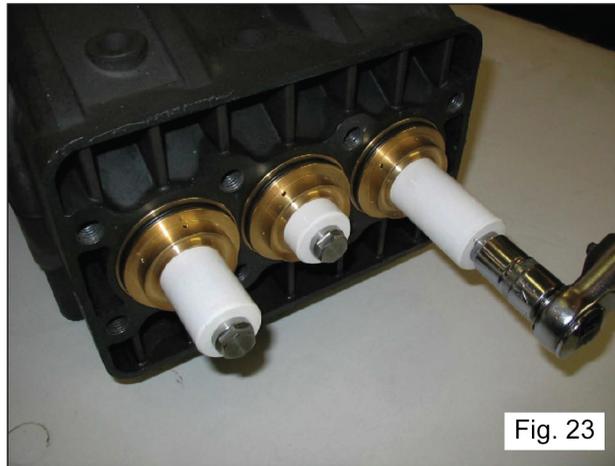
1. Head ring
2. HP seal
3. Re-stop ring
4. Packings support
5. LP seal
6. Sealing ring
7. Circlip
8. O-ring



2.2.4 Plunger unit disassembly

The plunger unit does not require periodical maintenance. Service interventions are limited to visual inspections only. For plunger unit extraction, operate as follows:

- A) Unfasten the plunger screws as shown in fig. 23.
- B) Check for wear, and replace if necessary.



At every disassembly, all O-rings on the plunger unit must be replaced.

2.2.5 Head assembly - seals - plunger unit

Reassemble the various components by inverting the previously listed operations as indicated in paragraph 2.2.3, paying particular attention to the following:

- A) The sealing packs: respect the same order of disassembly.
- B) Lubricate the components (2,3 and 5) with OCILIS type silicone grease part #F12001600; this operation is also considered necessary to facilitate the settling of the sealing lips on the plunger.
- C) For correctly assembling the HP seals in their related seats on the head without damaging the lips, use the appropriate tools depending on the pumping assembly diameters as indicated in Chapter 4.
- D) Reassemble the plungers by fastening the screws with an appropriate torque wrench, respecting the fastening torque value indicated in Chapter 3.
- E) Assemble the head: for fastening torque values and fastening sequences, respect the indications of Chapter 3.

3. SCREW CALIBRATION

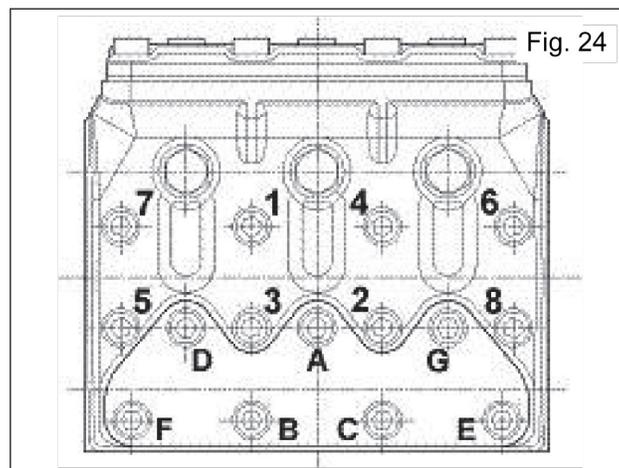
Screws are to be fastened exclusively using a torque wrench.

Description	KF Exploded View Position (Owner's Manual)	KFR Exploded View Position (Owner's Manual)	Fastening Ft. Lbs.	Fastening Nm
Cover Fastening Screws	9	20	7.5	10
Plunger Guide Screws	99	35	7.5	10
Plunger Fixing Screws	29	60	14.75	20
Connecting Rod Screws	16	13	22.25	30*
Manifold Fastening Screws	39	65	59	80**
Valve Cover Screws	40	61	88.5	120***
Lifting Bracket Screw	57	33	29.5	40
Oil Drain Plug	11	11	29.5	40
Valve Plug	59	64	29.5	40

* The connecting rod fastening screws must be fastened simultaneously respecting the phases indicated on page 6.

** The head fastening screws, exploded view position (KF 39), (KFR 65), must be tightened with a torque wrench, lubricating the threaded stem with molybdenum disulphide grease part #F12001500, respecting the order shown in the scheme in fig. 24.

*** The valve cover cover screws, exploded view position (KF 40), (KFR 61), must be tightened with a torque wrench, lubricating the threaded stem with molybdenum disulphide grease part #F12001500, respecting the order indicated in the scheme in fig. 24.



4. REPAIR TOOLS

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

For assembly:

For Assembling Part	Tool Part Number
Gasket Bushing Øe 45; H.P. alternative sealing ring Ø28 x 45 x 5.5/5	F27473000
	F27385400
Gasket Bushing Øe 45; H.P. alternative seal ring Ø30 x 45 x 7.5/4.4	F27473000
	F27385400
Gasket Bushing Øe 48; H.P. alternative seal ring Ø36 x 48 x 6/3.5	F27473300
	F26406300
Gasket Bushing Øe 55; H.P. alternative seal ring Ø40 x 55 x 7.5/4.5	F27473100
	F27356300
Gasket Bushing Øe 36; L.P. alternative seal ring Ø28 x 36 x 5.5	F27470900
	F26134600
Gasket Bushing Øe 38; L.P. alternative seal ring Ø30 x 38 x 5	F27471000
	F27385400
Gasket Bushing Øe 44; L.P. alternative seal ring Ø36 x 44 x 5.5	F2747100
	F27385400
Gasket Bushing Øe 48; L.P. alternative seal ring Ø40 x 48 x 5.5	F27471300
	F26406300
Pump Shaft Oil Seal Stopper	F27904800
Plunger Guide Oil Seal Stopper	F27904900

For Disassembly:

For Disassembling Part:	Tool Part Number
Inlet / Outlet Valves	F27513600
	F26019400
Inlet / Outlet Valve Seat	F27516900
	F26019400
Inlet and Outlet Valve Plug	F26019400
Plunger Guide Oil Seal	F27503900
	F26019400

5. KFR PUMP VERSION

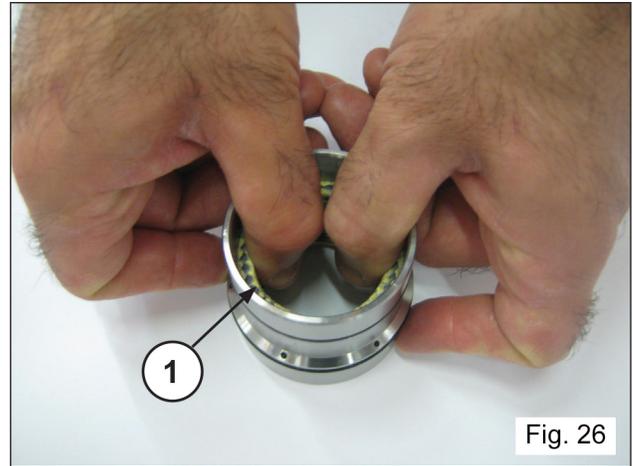
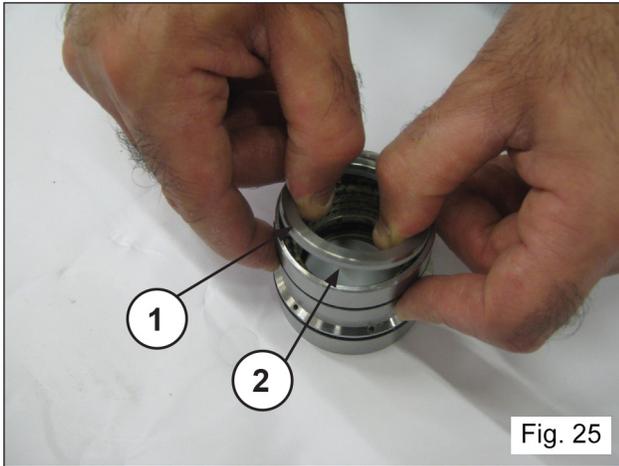
Unless specified otherwise, refer to the information above for the standard KF pump.

- KFR pumps: for repair, follow the instructions for the standard KF pump with the exception of the pressure seals, for which it is necessary to follow the instructions below.

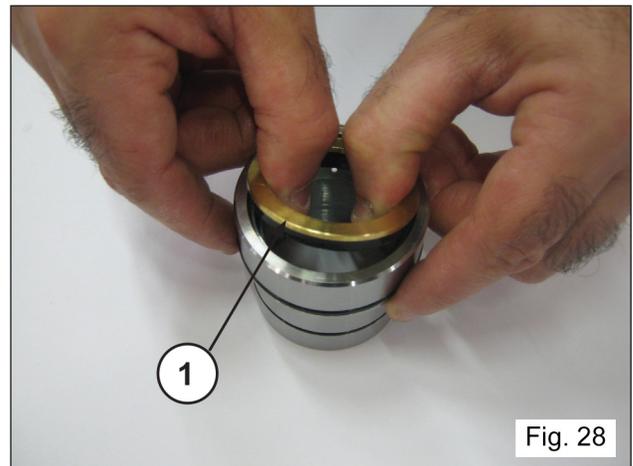
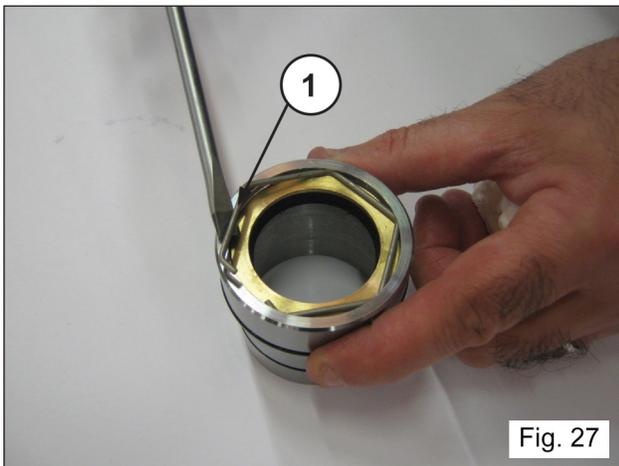
5.1 KFR Pump

5.1.1 Disassembling the support - seal unit.

Separate the seal support from the liner, remove spring ring and scraper ring (fig. 25, pos. 1,2) to access the pressure seals (fig. 26, pos. 1).



To remove the low pressure seal, remove the retaining ring (fig. 27, pos. 1), and the seal ring (fig. 28, pos. 1).



5.1.2 Assembling the support - seal unit.

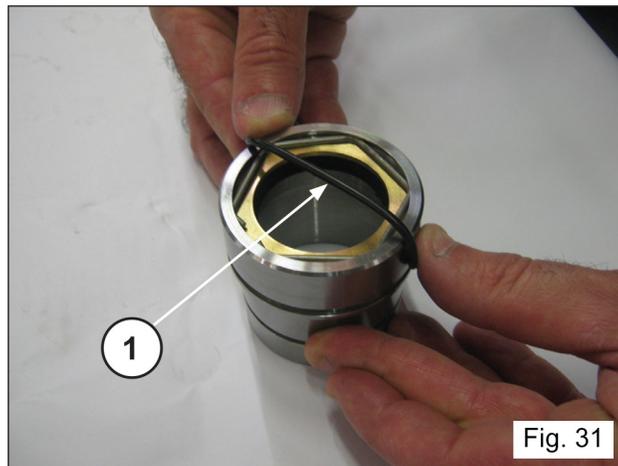
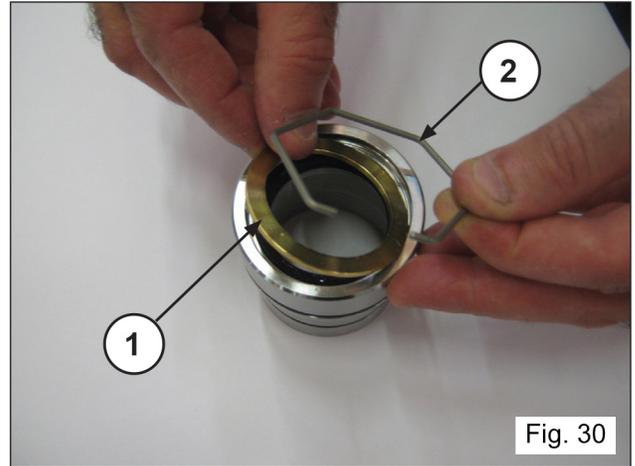
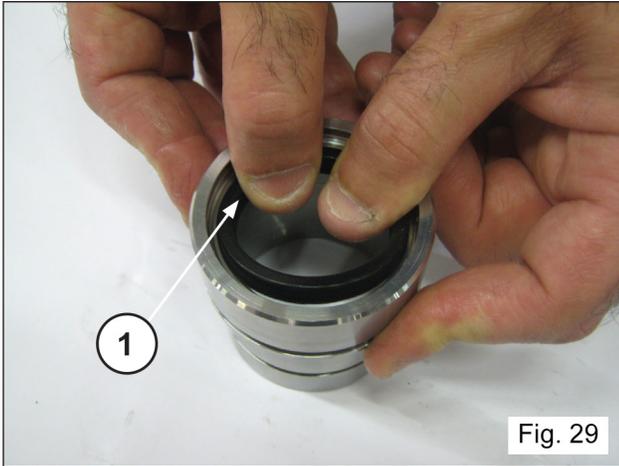
Proceed with reassembly following the reverse order indicated in par. 2.2.3.



Replace the pressure seals lubricating the lips with silicone grease (without spreading it), making sure not to damage them during liner insertion.

The O-rings are the pressure seals must be replaced at each disassembly.

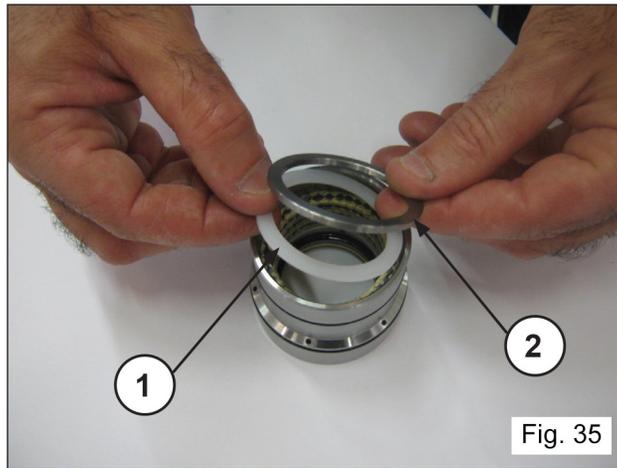
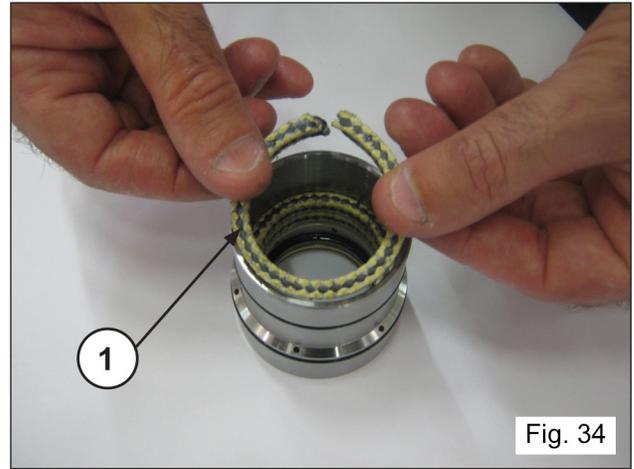
Insert the low pressure seal in the packing support (fig. 29, pos.1) paying attention to the mounting direction which requires that the sealing lip be set forward (towards the manifold). Then insert the seal ring, retaining ring (fig. 30, pos. 1, 2) and the O-ring (fig. 31, pos. 1).



Install the O-ring on the seal support.



Install the back-up ring (fig. 33, pos. 1), the tree packings, making sure the notches are at 120° from each other (fig. 34, pos. 1), the packing scraper ring and the spring ring (fig. 35, pos. 1, 2).



6. MAINTENANCE LOG

HOURS & DATE

OIL CHANGE							
GREASE							
PACKING REPLACEMENT							
PLUNGER REPLACEMENT							
VALVE REPLACEMENT							



GP Companies, Inc.
1174 Northland Drive
Mendota Heights, MN 55120
Phone: 651.686.2199 Fax: 800.535.1745
www.generalpump.com email: sales@gpcompanies.com