

HF Series



Repair Manual

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1. INTRODUCTION

This manual describes the instructions for repairing **HF 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 duration.

The Interpump Group declines any responsibility for damage caused by misuse or the non-observance of the instructions described in this manual.

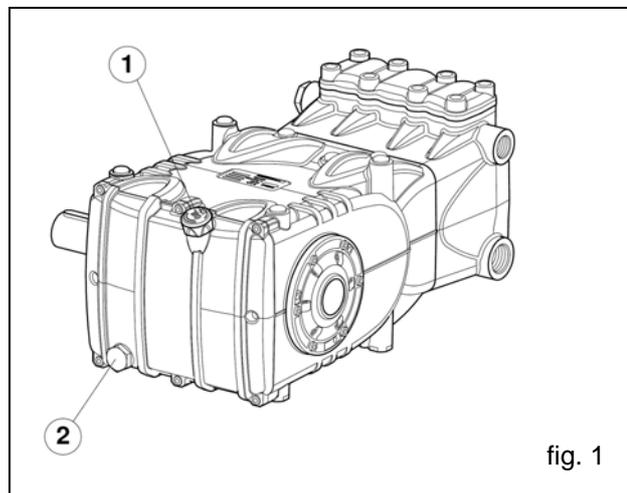
2. REPAIR INSTRUCTIONS



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 pos. ①, and then the plug, pos. ②, fig.1.



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

2.1.1 Crank mechanism disassembly

The correct sequence is the following:

Disassemble:

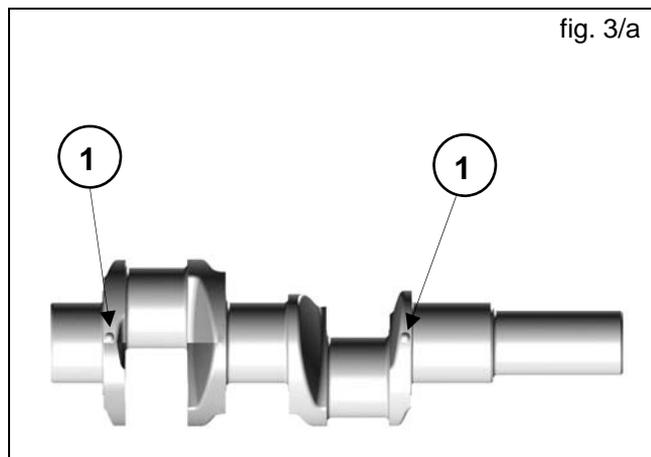
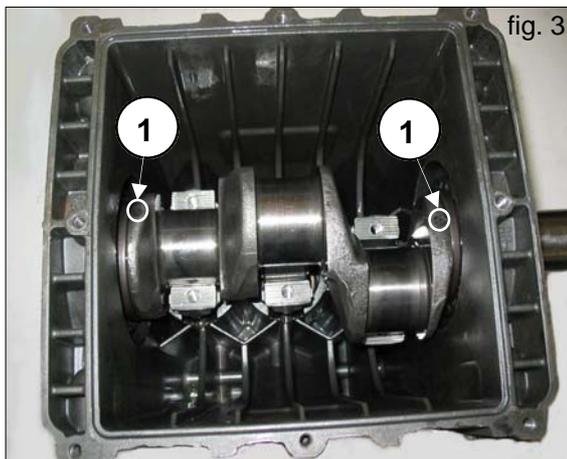
- pump shaft key
- rear cover
- connecting rod cap
- side covers, using n° 3 wholly threaded M6x 50 screws, inserting them in the apposite holes as shown in fig. 2



Push the piston guides and connecting rods forward in order to facilitate the lateral extraction of the pump shaft.

Two marks are visible on the crank shaft 1, as shown in fig. 3 and in fig. 3/a; they must be turned towards the operator in order to facilitate extraction.

N.W.: to extract the piston guide it is necessary to remove the ceramic piston and wiper first.



- 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 (pos.1, fig. 4a) .



Fig.4

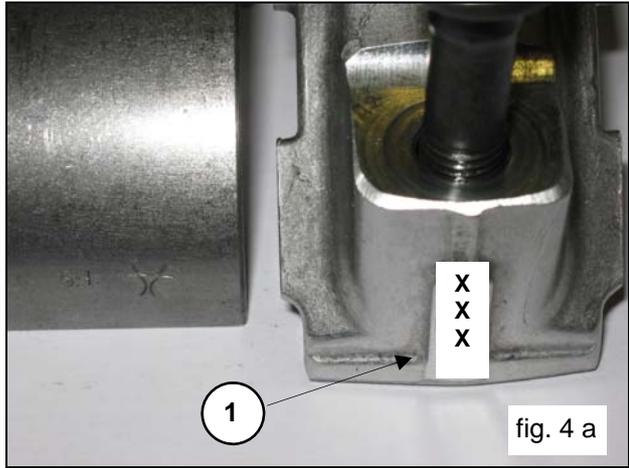


fig. 4 a

- Perform Spindle - piston guide disassembly
- Disassemble the crankshaft oil seals and the piston guides using standard tools.

2.1.2 Crank mechanism assembly

After cleaning the crankcase, reassemble the crankcase mechanism as follows:
Thoroughly fit the piston guide seals into their seat on the crankcase as shown in fig. 6, using the apposite tool (cod.27904900).

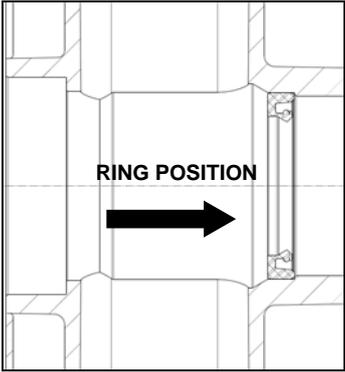


fig. 6

Introduce the pre-assembled piston guide / connecting rod units with relative upper half bearings into their seat.



Ensure that the reference notches are positioned on the correct con-rod shank housings (pos.1, fig. 7a) .

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 in the piston guide / connecting rod unit as shown in fig. 7.



fig. 7

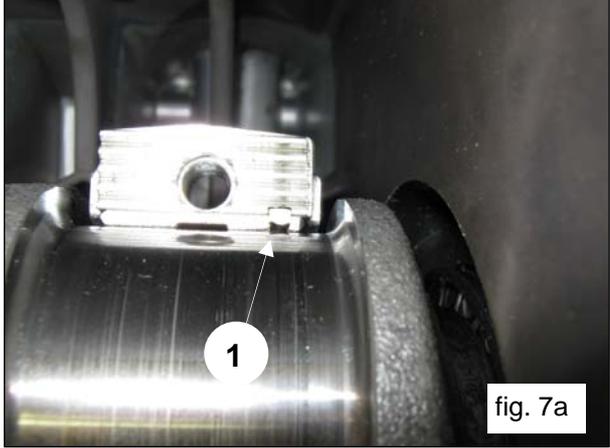
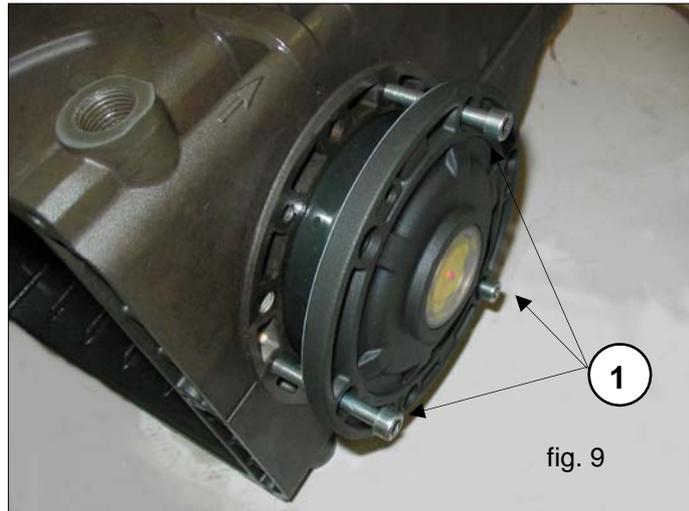
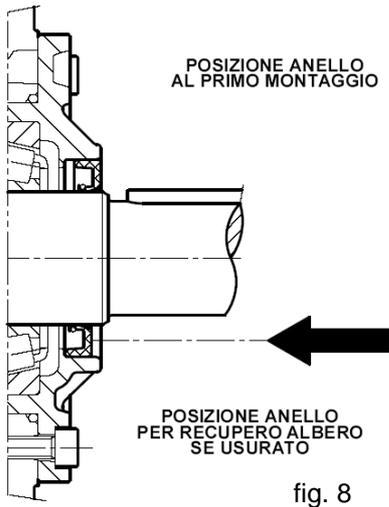


fig. 7a

Before reassembly of the side covers, check the seal lips for wear. If replacement is necessary, position the new ring using the apposite tool (cod. 27904800) as shown in fig.8.

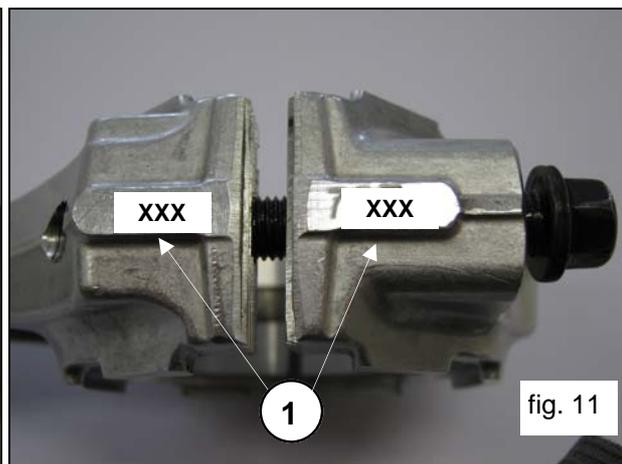
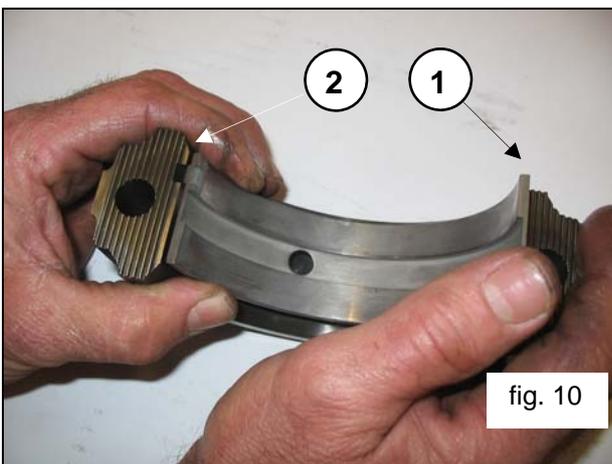
! If the shaft presents diameter wear corresponding to the sealing lip, to avoid the need for grinding it's possible to position the ring as shown in fig. 8

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 N°3 screws M6 x 40, and then finish the operation with the screws supplied (M6x18) as shown in fig. 9.



| | |
|---|---------------------------------------|
| Posizione anello al primo montaggio | Ring position at first assembly |
| Posizione anello per recupero albero se usurato | Ring position for worn shaft recovery |

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



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

! Note the correct assembly direction of the caps. Numbering must be upward.

Fasten the caps to their respective con-rod shanks by means of M 8x1x48 screws (fig.12) lubricating both the underhead and the threaded shank, proceeding in three different steps:



1. Approaching torque 6 - 8 Nm
2. Pre-fastening torque 25 - 28 Nm
3. Fastening torque 38 Nm

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 N°3 screws M6 x 40, and then finish the operation with the screws supplied (M6x18) as shown in fig. 6.



Install the rear cover positioning the oil dipstick hole upward.
Fill the crankcase with oil as indicated in the use and maintenance manual in paragraph 7.4.

2.1.3 Reduction classes

| TABLE OF REDUCTIONS FOR BEND SHAFTS AND CON-ROD HALF-BEARINGS | | | |
|---|-------------------------|-------------------------|---|
| Recovery classes (mm) | Upper Half Bearing Code | Lower Half Bearing Code | Correction on the shaft pin diameter (mm) |
| 0.25 | 90924100 | 90924400 | Ø49.75 0/-0.02 Ra 0.4 Rt 3.5 |
| 0.50 | 90924200 | 90824500 | Ø49.50 0/-0.02 Ra 0.4 Rt 3.5 |

2.1.4 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 disassemble / assemble, or to replace them if needed, carefully follow the indications 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 ware; if all parts are in good conditions, accurately clean the components with a suitable degreaser and grease them again evenly using lubricant oil.

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 side flange + shaft + engine side flange), check that the shaft's rolling torque - with the connecting rods free - is at least 4 Nm, Max 7 Nm.

To position the two side covers on the crankcase, initially use N°3 screws M6x40 as shown in fig. 9, and then the fastening screws.

The shaft's rolling torque (with connecting rods coupled) must not exceed 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 shown in figures 13-14.



fig. 13



fig. 14

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 apposite rings. The driving operation can be facilitated by heating the relevant parts at a temperature ranging between 120° - 150° C (250° - 300° F), making sure that the ring nuts are correctly fitted into their seats.



Never invert the parts of the two bearings.

The shim pack must be redefined as follows:

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

Fit the P.T.O. side flange to the crankcase paying great attention to the seal lip as indicated in paragraph 2.1.2.

Position the flange on the sight glass side as indicated in paragraph 2.1.2 (fig.9).

Use a thickness gauge (see fig. 15).



fig. 15

Determine the shim pack as indicated in the table below:

| Measurement | Shim type | N° 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 cover on the sight glass side (see fig. 16), fixing it to the crankcase using the appropriate screws, and verifying that the stall torque is between 4 Nm and 7 Nm. If the torque value is correct, connect the rods to the crankshaft; otherwise, redefine the shims again 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, and in any case within the intervals indicated in the table in fig. 14, Chapter 11 of the use and maintenance manual. The valve units are assembled inside the head in a vertical position.

For their extraction proceed as follows:

unfasten the 8 M14x40 valve cover screws (fig. 17);
using a slide hammer cod. 26019400 extract:

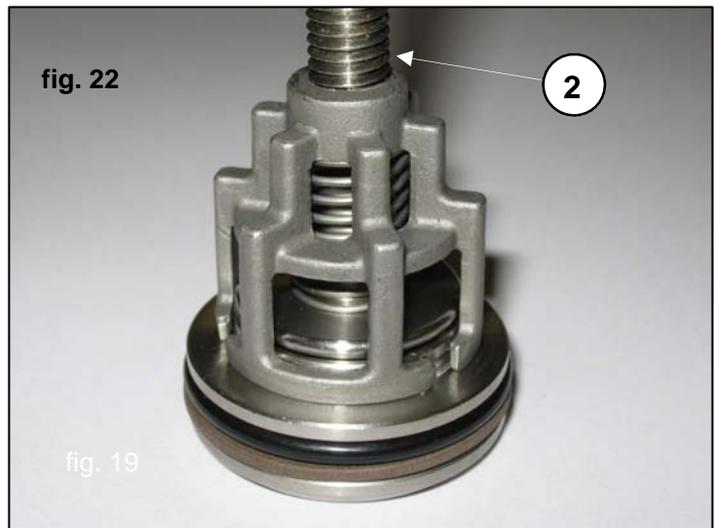
- A) the valve plugs (fig. 18);
- B) the delivery valve units (fig. 19);
- C) the valve bushes (fig. 20), also using the tool cod. 27513600
- E) the suction valve units (fig. 21).



fig. 17



fig. 18



Disassemble the suction and delivery valve units by screwing on an M8 screw long enough to act on the valve and extract the valve guide from the valve seat, pos. 2 (fig. 22).



If the suction valve seats remain glued to the head (for ex. due to incrustations caused by prolonged pump inactivity), operate as follows:

For versions HF18, use the tools cod. 26019400; cod. 27513500; cod. 27513400; (fig. 23).

For versions HF 20-22-HF25 use the tools cod. 26019400; cod. 27513500; cod. 27513400; (fig. 23 - fig. 24).

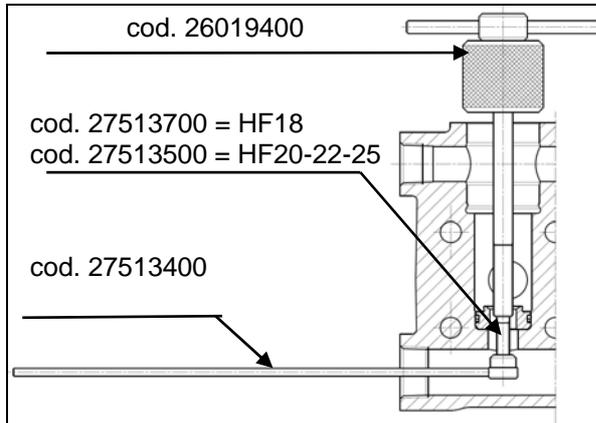


fig. 23

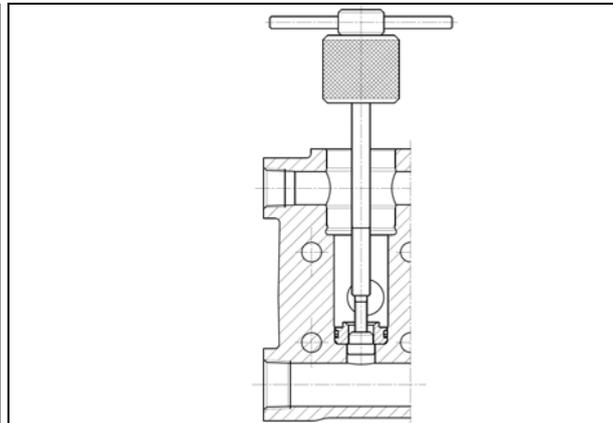


fig. 24

N.W. Always slip off the handle cod. 27513400 before extracting the seats.

2.2.2 Head assembly - valve units



Pay careful attention to the state of wear of the various components; replace them when necessary, and in any case within the intervals indicated in the table in fig.14, Chapter 11 of the use and maintenance manual.

At each valve inspection, replace all valve unit and valve plug OR rings and anti-extrusion rings.



Before repositioning the valve units, clean and perfectly dry the relevant seats in the head as indicated in fig. 25.

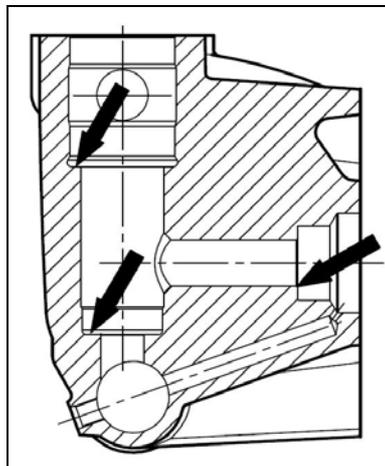


fig. 25

Proceed with reassembly by inverting the procedure indicated in paragraph 2.2.1, paying particular attention to:

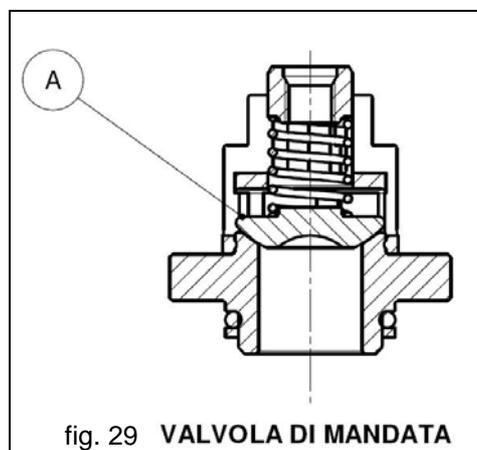
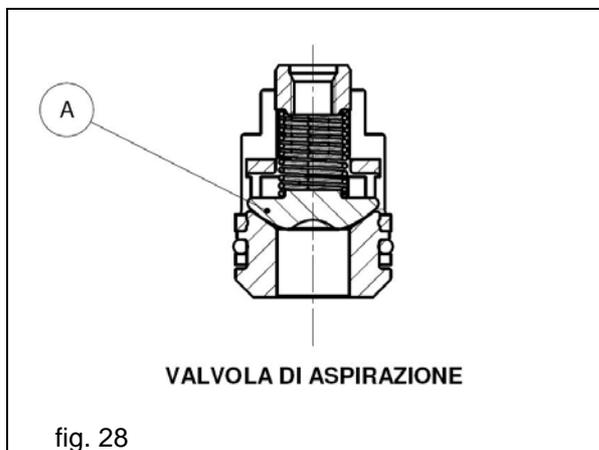


1. During the assembly of the suction and delivery valve units (fig. 26 - fig. 27) do not invert the suction springs with the previously disassembled delivery springs:

- a) Suction springs “white “.
- b) Delivery springs “black“.



2. Furthermore, for the HF18 version be careful not to invert the spherical suction valves with the “A” delivery valve (fig. 28 - fig. 29), exploded view pos. 46, as indicated in Chapter 16 of the use and maintenance manual.



| | |
|-------------------------------|-----------------------|
| Valvola di aspirazione | Suction valve |
| Valvola di mandata | Delivery valve |

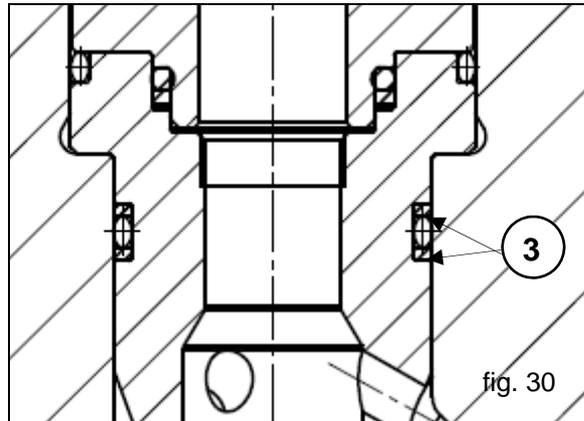


Insert the suction and delivery valve units with their related bushes checking that they are thoroughly inserted in their seat on the head.

Make sure not to damage the anti-extrusion rings of the bushes (see pos.3, fig.30).

For the correct installation of the rings in their respective seats please comply with the following instructions:

- fit the bushes in the head after greasing them all around the rings with silicone grease type OCILIS p/n 12001600.
- once in place take them out again to check the anti-extrusion rings and O’rings for the correct position in the bushes. These rings adapt immediately, so, if they seat correctly, no sign of extrusion or damage should be visible and you can fit them back in place sure of a correct mount.



- Therefore apply the valve covers and proceed with calibrating the related M14x40 screws; see the indications in Chapter 3 for fastening torque values and sequences.

2.2.3 Disassembly of the head - seals

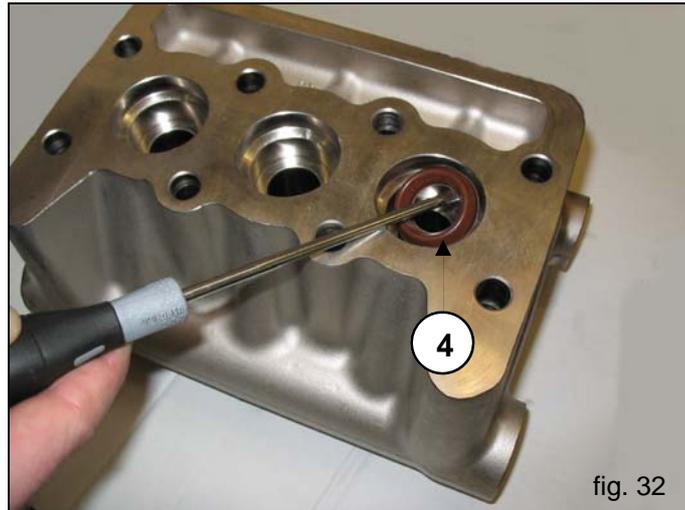
The replacement of the seals is necessary if water leaks are detected from the draining holes located at the rear of the crankcase, and in any case within the intervals indicated in the table in fig.14, Chapter 11 of the use and maintenance manual.

A) Unfasten the M12x150 head screws as shown in fig. 31.



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. 32 pos.4; be careful not to damage the seats.



Pay careful attention to the order of sealing pack disassembly as shown in fig. 27 for HF20-22-25 version pumps, and fig. 27/a for HF18 version pump, composed of:

1. Head ring
2. HP seal
3. Restop ring
4. Packings support
5. LP seal
6. Sealing ring
7. Circlip
8. OR ring

Sealing pack, version HF 20-22-25



Sealing pack, version HF 18



2.2.4 Piston unit disassembly

The piston unit does not require periodical maintenance. Service interventions are limited to visual inspections only.

For piston unit extraction, operate as follows:

Unfasten the M 7x1 piston screws as shown in fig. 34.



Check for wear; replace them if necessary.

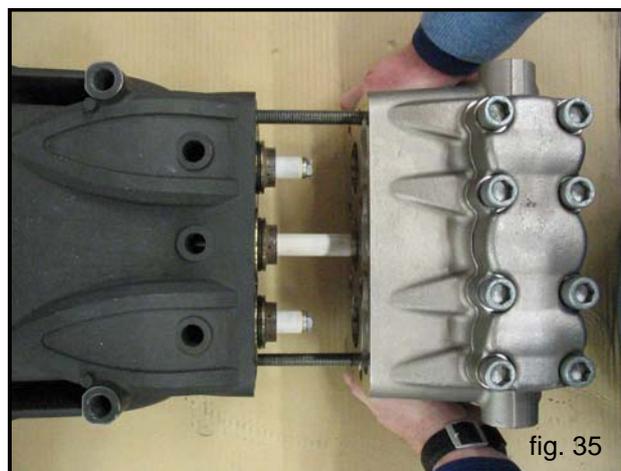


At each disassembly, all the OR rings of the piston unit must be replaced.

2.2.5 Head assembly - seals - piston unit

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

- A) Sealing pack: respect the same order followed during disassembly.
- B) Lubricate components ②③⑤ with silicone grease type OCILIS cod. 12001600; this operation is also considered necessary in order to facilitate the settling of the seal lip on the piston.
- C) For correctly assembling the HP seals in their related seats on the head without damaging the lips, use the apposite tools depending on the pumping assembly diameters as indicated in Chapter 4.
- D) Reassemble the pistons by fastening the screws with an apposite torque wrench, respecting the fastening torque value indicated in Chapter 3.
- E) Reassemble the head proceeding as follows:
 - 1. Position the seal supports in their respective seats on the crankcase;
 - 2. Using two screws - auxiliary pin (cod. 27508200) fastened to the crankcase as indicated in fig. 35, position the complete head, being sure that it is centred on the central piston only.
 - 3. Complete the operations by following the fastening procedures; for fastening torque values and sequences, respect what indicated in Chapter 3.



3. SCREW CALIBRATION

Screw tightening should be carried out with a torque wrench only.

| Description | Exploded view position | Fastening Torque Nm |
|----------------------------------|------------------------|---------------------|
| Cover fastening screws | 9 | 10 |
| Oil discharge plug | 11 | 40 |
| Lifting bracket fastening screws | 63 | 40 |
| Conrod caps fastening screws | 16 | 38* |
| Piston fastening | 29 | 20 |
| Head fastening screws | 39 | 80* * |
| Valve cover screws | 41 | 180* * * |

* The conrod caps fastening screws must be tightened respecting the phases indicated on page 7

** The head screws, exploded position 39, must be fastened using a torque wrench, lubricating the threaded stem and respecting the order of the scheme in fig.36

***The valve cover screws, exploded position 41, must be fastened using a torque wrench, lubricating the threaded stem and respecting the order of the scheme in fig.36

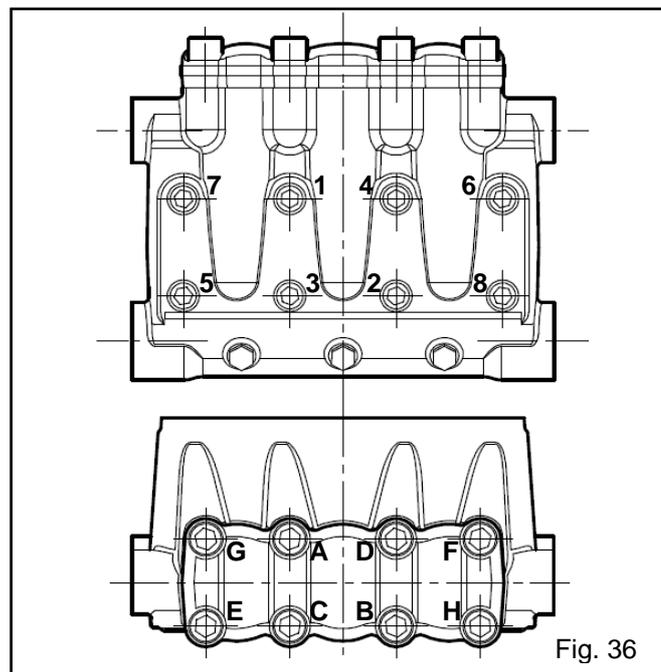


Fig. 36

4. REPAIR TOOLS

Pump repair may be facilitated by using the apposite tools codified as follows:

For assembly:

| | | |
|-----------------------|---|---------------|
| Gasket bush | Øe 32 ; H.P. alternative sealing ring Ø 18x32x7/4.5 | cod. 27472700 |
| Gasket bush | Øe 35 ; H.P. alternative sealing ring Ø 20x35x7.5/4.5 | cod. 27472800 |
| Gasket bush | Øe 35 ; H.P. alternative sealing ring Ø 22x35x7/4.5 | cod. 27472800 |
| Gasket bush | Øe 38 ; H.P. alternative sealing ring Ø 25x38x7/4.6 | cod. 27472900 |
| Gasket bush | Øe 26 ; L.P. alternative sealing ring Ø 18x26x5.5 | cod. 27470600 |
| Gasket bush | Øe 28 ; L.P. alternative sealing ring Ø 20x28x5.5 | cod. 27531500 |
| Gasket bush | Øe 30 ; L.P. alternative sealing ring Ø 22x30x5.5 | cod. 27470700 |
| Gasket bush | Øe 33 ; L.P. alternative sealing ring Ø 25x33x5.5 | cod. 27470800 |
| Pump shaft oil seal | | cod. 27904800 |
| Piston guide oil seal | | cod. 27904900 |
| Head assembly | | cod. 27508200 |

For disassembly:

| | | |
|--|---|---------------|
| Valve bushes | | cod. 26019400 |
| | | cod. 27513600 |
| Suction valves, HF18 version pumps | } | cod. 26019400 |
| | | cod. 27513700 |
| | | cod. 27513400 |
| Suction valves, HF20 – HF22 – HF25 version pumps | } | cod. 26019400 |
| | | cod. 27513500 |
| | | cod. 27513400 |
| Delivery valve | | cod. 26019400 |
| Valve plugs | | cod. 26019400 |
| Piston guide oil seal | | cod. 27503900 |

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