VK Series

Repair manual

INDEX

1. INTRODUCTION 3

2. REPAIR GUIDELINES 3

2.1 Repairing mechanical parts....3
2.1.1 Disassembly of mechanical parts....4
2.1.2 Reassembly of mechanical parts....5
2.1.3 Reduction classes....7
2.1.4 Disassembly / Reassembly of bearings and shims....7
2.1.5 Dismantling the reduction gear unit....9
2.1.6 Dismantling the reduction gear unit....10
2.1.7 Version change - Application / Removal of the reduction gear unit....13
2.2 Repairing hydraulic parts....13
2.2.1 Dismantling the head – liner – valves....13
2.2.2 Dismantling the head – liners – valves....16
2.2.3 Dismantling the piston unit – supports – seals....17
2.2.4 Dismantling the piston unit – supports – seals....19

3. SCREW TIGHTENING CALIBRATION 22

4. REPAIR TOOLS 23

1. INTRODUCTION

This manual describes the instructions for repair of the VK pump family and should be carefully read and understood before any intervention on the pump.
Proper pump operation and duration depend on the correct use and maintenance.
Interpump Group disclaims any responsibility for damage caused by negligence or failure to observe with the standards described in this manual.

2. REPAIR GUIDELINES

2.1 Repairing mechanical parts

Mechanical parts repair must be performed after removal of oil from the casing.
To take out oil, remove: the oil dipstick pos.① and then that plug pos.② , fig. 1.

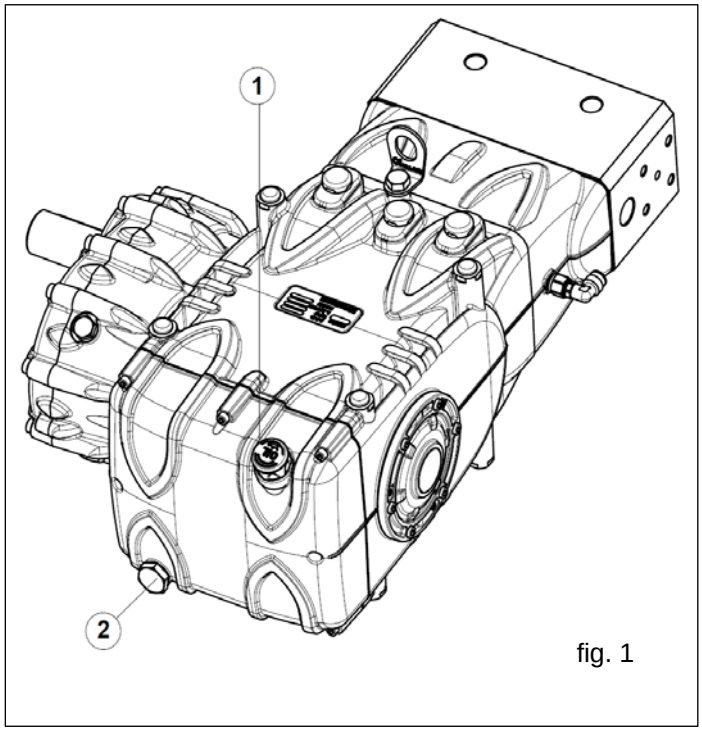


fig. 1

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

2.1.1 Disassembly of mechanical parts

The proper sequence is as follows:

Remove:

- the pump shaft tab
- the rear cover
- the con-rod cap
- the side covers using - for extraction 3 fully threaded M6 x 50 screws, inserting them in the threaded holes as indicated in fig. 2

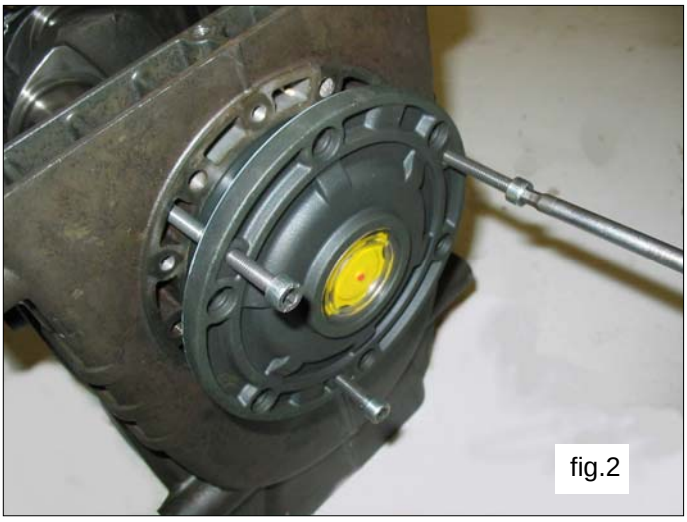


fig.2

Push the piston 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. 3/a. These must be turned toward the operator to facilitate extraction.

Note: extraction of the piston guides depends on prior removal of the ceramic piston and the relative spray hood.

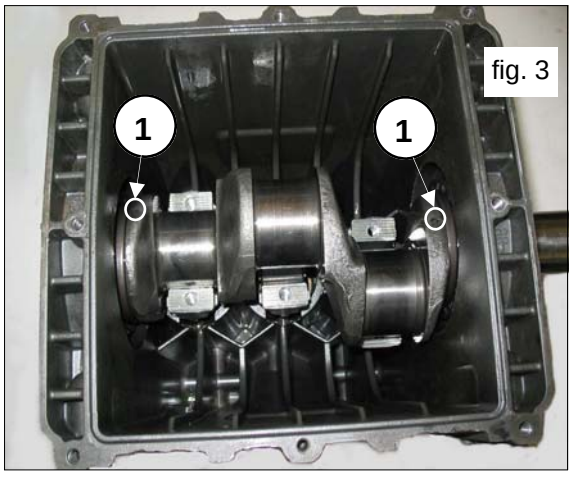


fig. 3

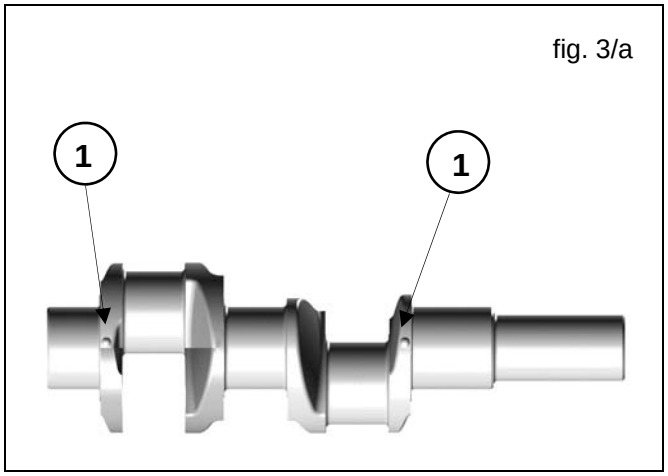


fig. 3/a

- 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) .

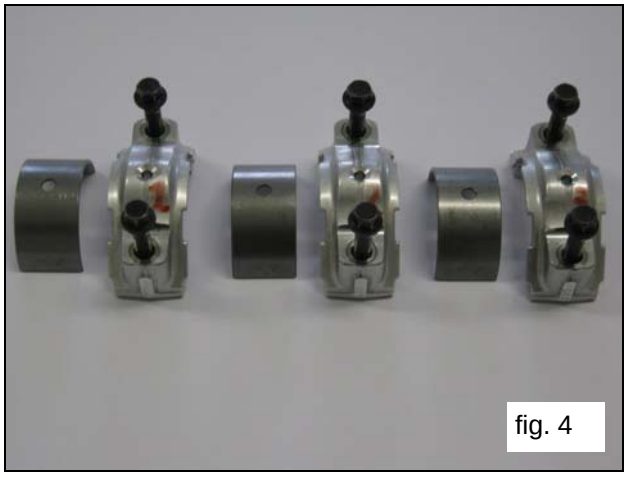


fig. 4

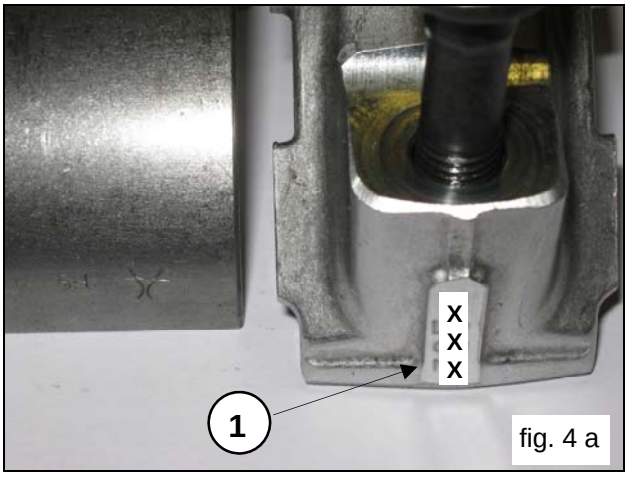


fig. 4 a

- Perform Plug pin - piston guide disassembly.
- Proceed with disassembly of the shaft seal rings and piston 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 piston guide seal rings with the relative housings on the casing as indicated in fig. 6, using tool code 27904900 .

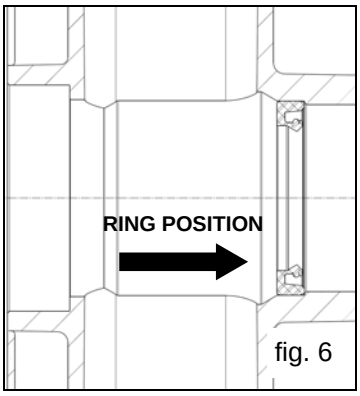


fig. 6

Insert the preassembled piston guide/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 (pos.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 piston guide/con-rod unit as far down as possible, as indicated in fig. 7.


fig. 7

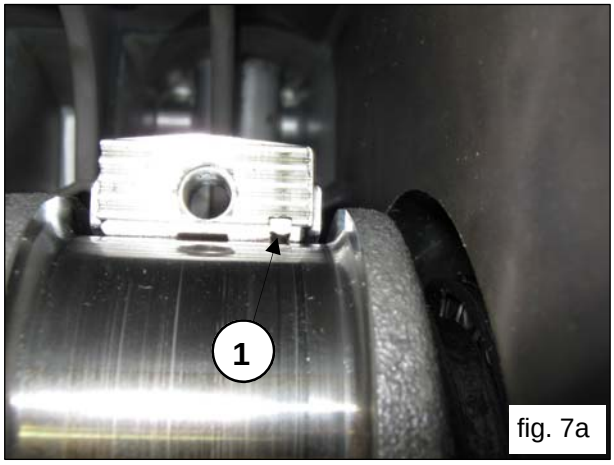


fig. 7a

Before proceeding with side cover assembly, check lip seal conditions on the radial ring. If replacement is necessary, position the new ring using a tool code 27904800 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 M6 x 40 screws, (pos.①, fig. 9), then complete the operation with supplied screws (M6x18)

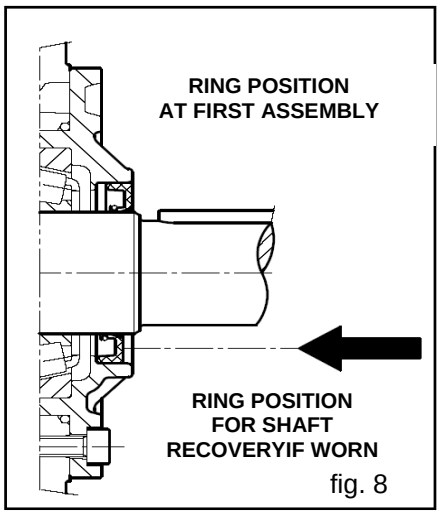


fig. 8

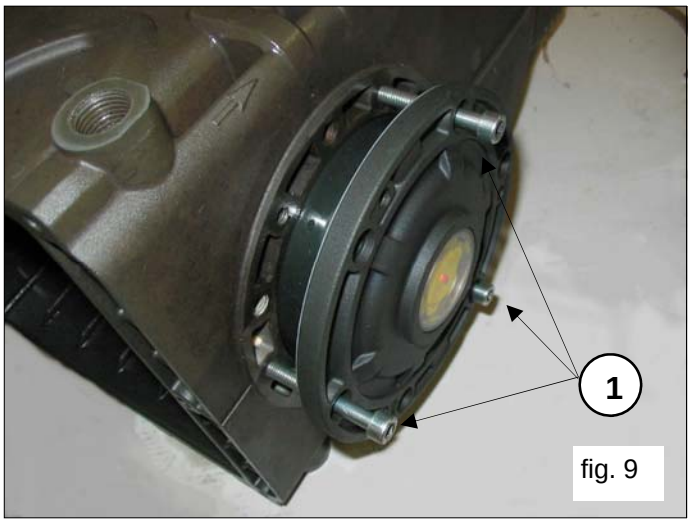


fig. 9

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).

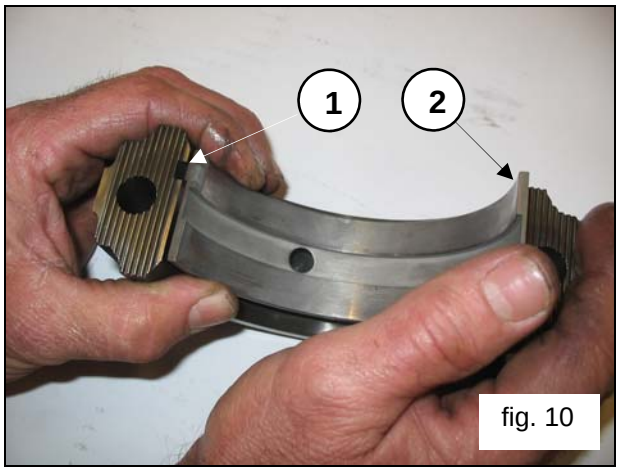


fig. 10

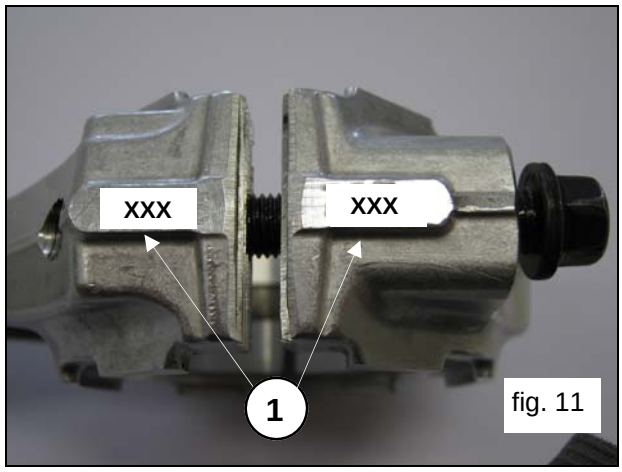


fig. 11

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 turned 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. **Transition torque 6 - 8 Nm**
2. **Pre-tightening torque 25 - 28 Nm**
3. **Tightening torque 38 Nm**

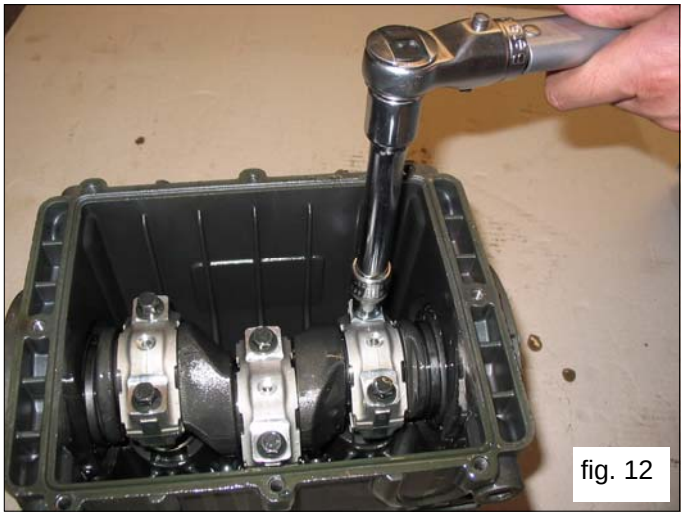


fig. 12

Mount the rear cover, positioning the dipstick hole upward.
Insert oil in the casing as indicated in the use and maintenance manual point 7.4

2.1.3 Reduction classes

TABLE OF REDUCTIONS FOR BEND SHAFTS AND CON-ROD HALF-BEARINGS			
Recovery classes (mm)	**Code Half-bearing Upper**	**Code Half-bearing Lower**	**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 / Reassembly of bearings 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 + motor side flange), check that the rotation torque of the shaft - with the con-rod disconnected **-** is a minimum 4 Nm, max. 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 provided for final fastening.
Shaft rotation torque (with the con-rod connected) should not exceed 8 Nm.

B) 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 - 14.

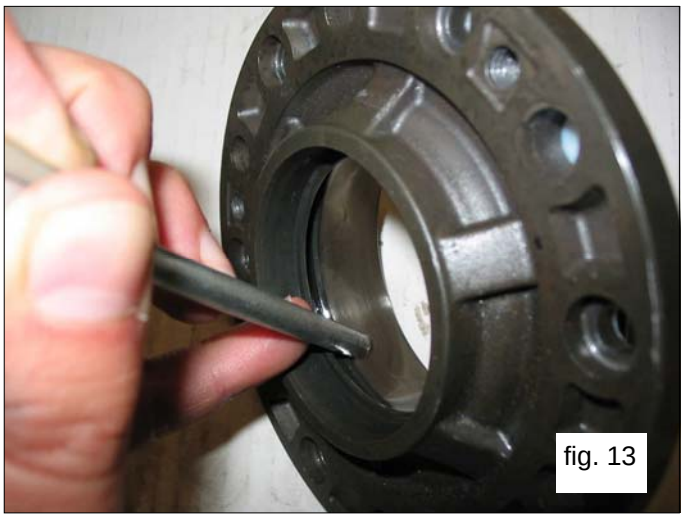


fig. 13

fig. 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 120° - 150° (250° - 300°), 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):

fig. 15

determine the shim pack 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 shims under the indicator side cover (fig. 16), fastening it to the cover with the respective screws, checking that the resistant torque is between 4 Nm and 7Nm
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 Dismantling 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 (pos.①, fig.17) with the function of extractors and simultaneously beat on the pinion in such a way that the bearing remains on during cover extraction (fig.18).

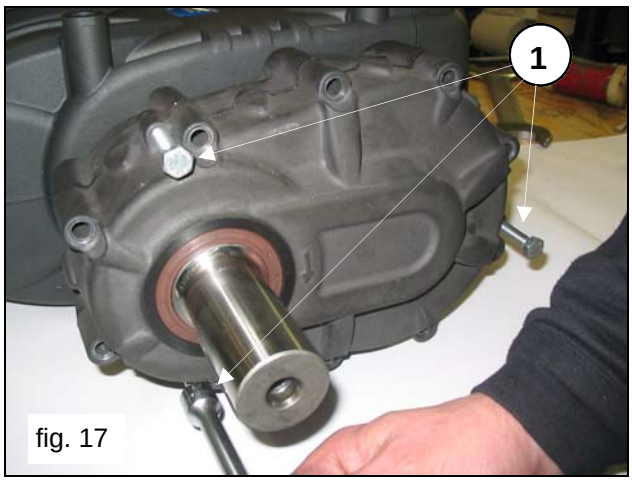


fig. 17

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 utilise an extractor hammer to be applied on the two M 8 holes (pos.①, fig.20) or a common extractor tool (fig.20).


fig. 19

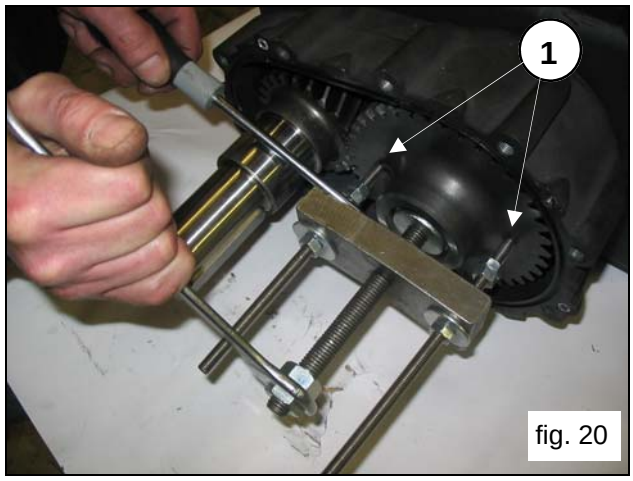


fig. 20

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).


fig. 21

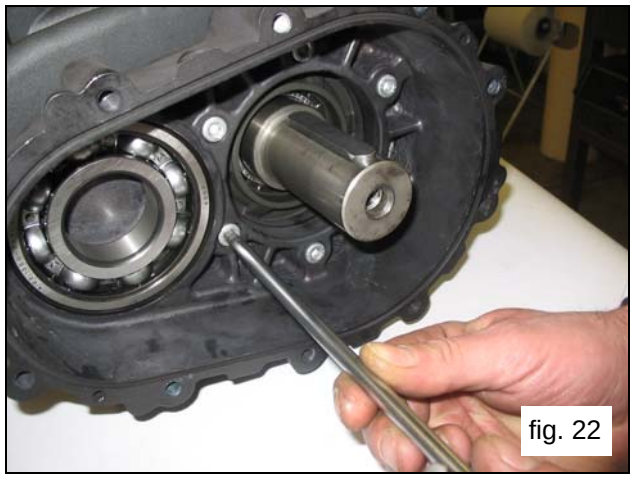


fig. 22

2.1.6 Dismantling the reduction gear unit
Preassemble the reduction gear box bearing 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 (pos.①, fig.24)


fig. 23

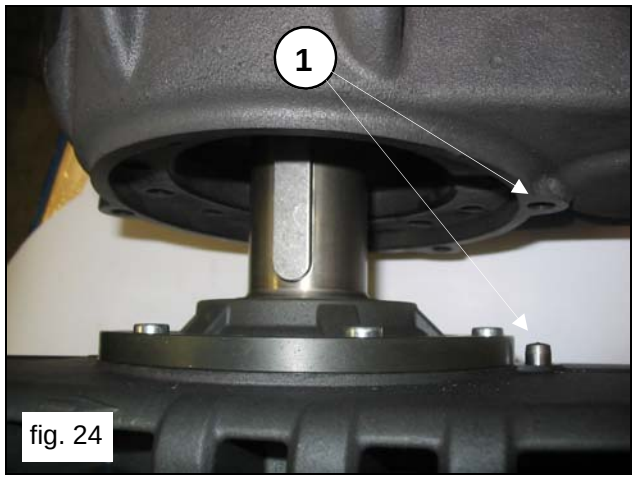


fig. 24

Fasten the reduction gear box with 6 M8x50 screws and calibrate the screws with a torque wrench (fig.25) as indicated in paragraph 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 paragraph 3.


fig. 25


fig. 26

Apply the two pins ∅5 to the reduction gear box (pos.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)

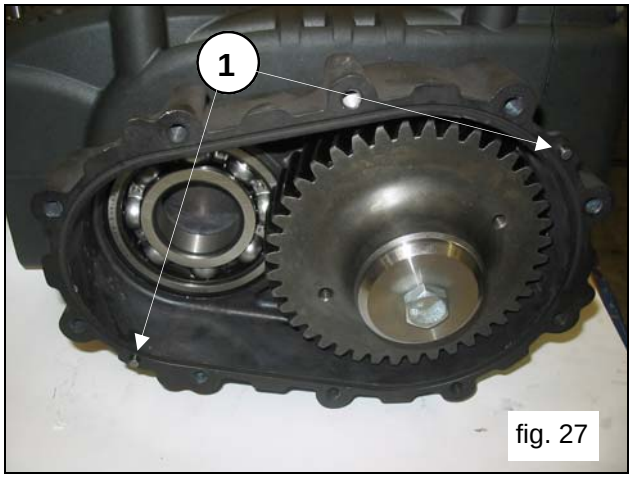


fig. 27


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 120° - 150° (250° - 300°), ensuring that the ring nuts go down to end stroke in their housings.

Insert the OR seal in the reduction gear box housing (fig.29).
Enter the reduction gear cover on the pinion bearing. Use two screws or two M8 grub screws to keep the cover in position during the following assembly operations (pos.①, fig.30).
Assemble the reduction gear box cover by means of a buffer, pressing on the cover surface, or use a special tool code 27517400 (fig.30a).
Facilitate the operation by simultaneously tightening some fixing screws. (pos.②, fig.30)


fig. 29

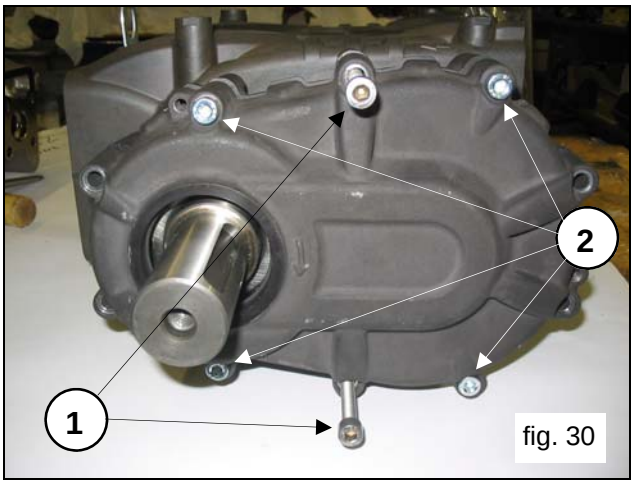


fig. 30

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


fig. 30a

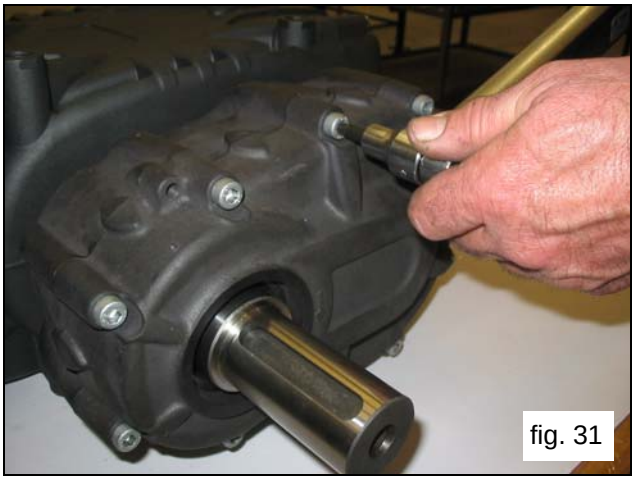


fig. 31

Verify pinion oil seal ring lip seal conditions. If replacement is necessary, position a new pinion oil seal ring using tool code 27904800.

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

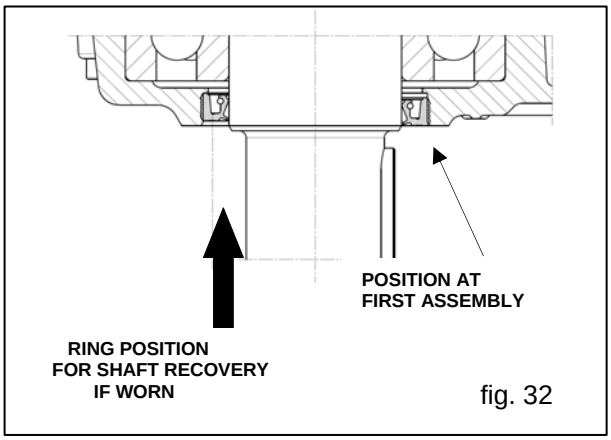


fig. 32

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 (pos.① fig.33) and the reduction gear box reference pin ∅8 must be inserted on the casing (pos.② 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 code 27904800 (pos.①, fig.33) .

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 routine maintenance.
Operations are limited to inspection or replacement of valves, if necessary.
Proceed as follows to extract valve groups:

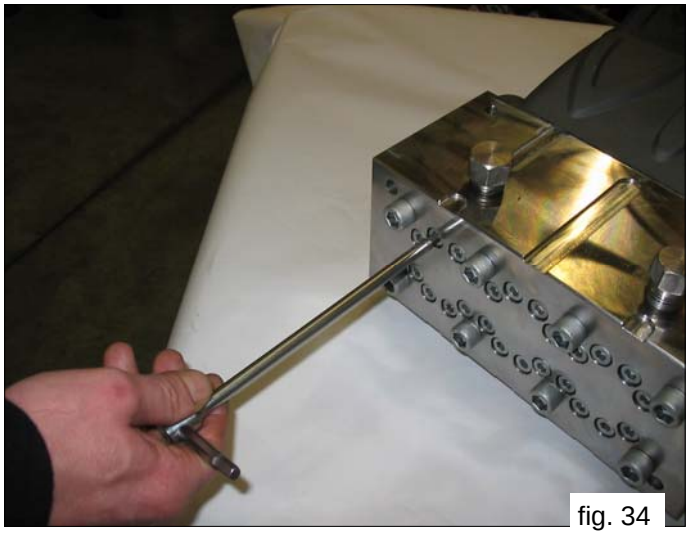


fig. 34

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

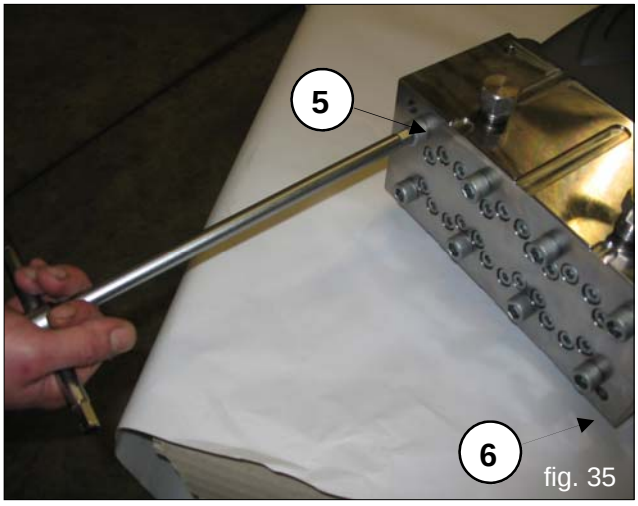


fig. 35

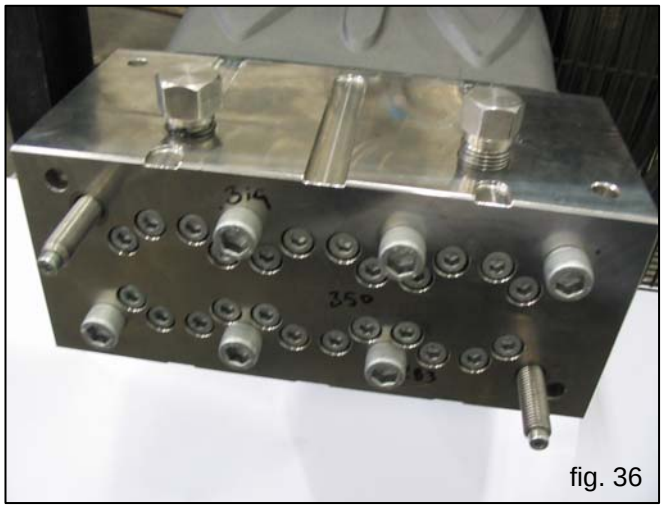


fig. 36

B) Unscrew the M12x260 head fixing screws N. 5 and N. 6 as indicated in fig. 35, replacing them with two screws – slave pin (cod.27508200) as indicated in fig.36, then continue with removing the remaining screws.

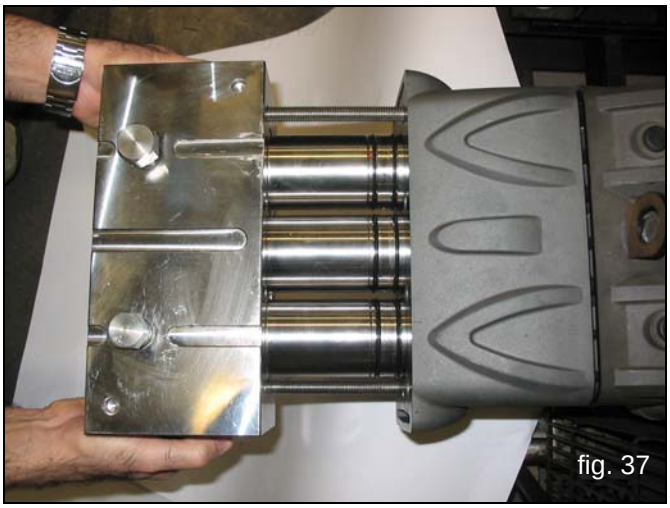


fig. 37

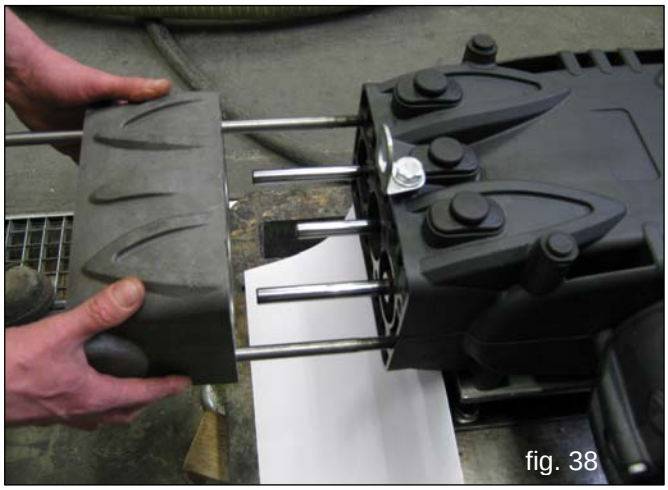


fig. 38

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

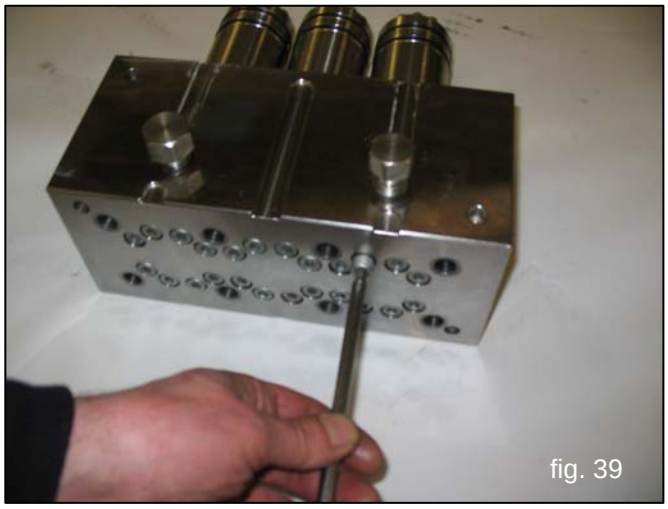


fig. 39

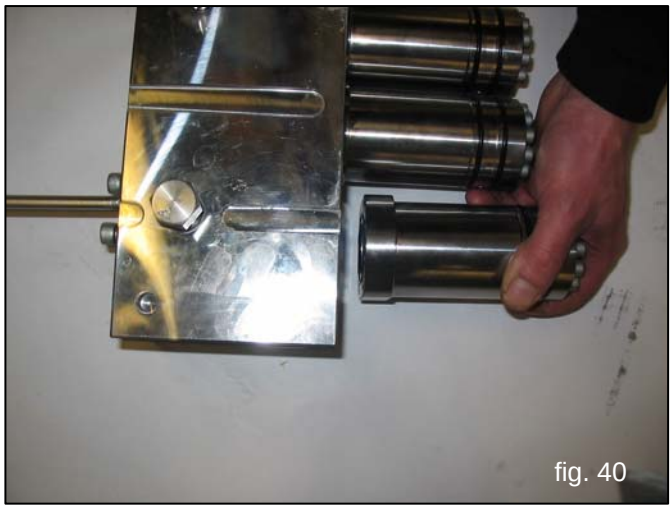


fig. 40

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

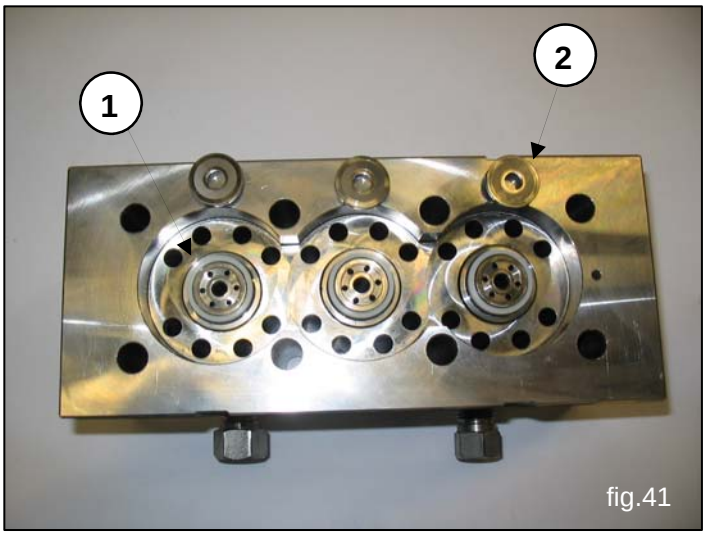


fig.41

During disassembly 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.

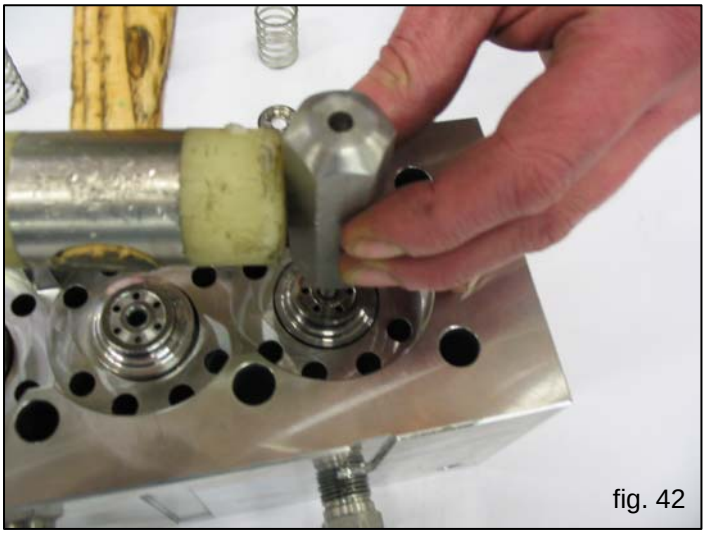


fig. 42

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 (code 27508000) in the suction inlet, operating as seen in fig. 42.

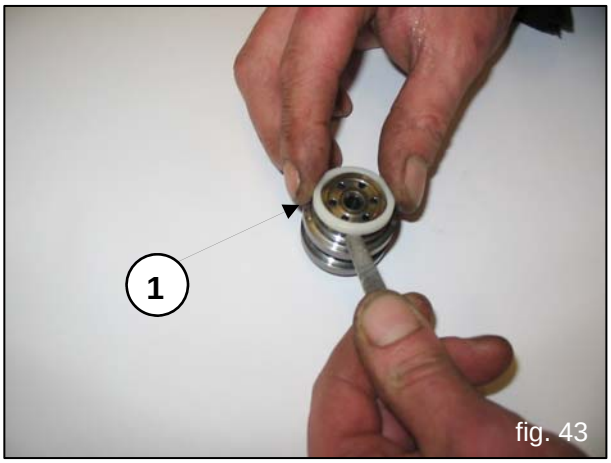


fig. 43

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 OR 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.

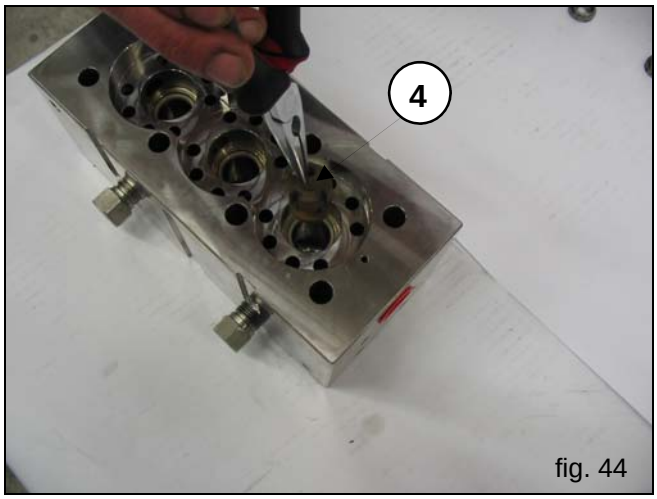


fig. 44

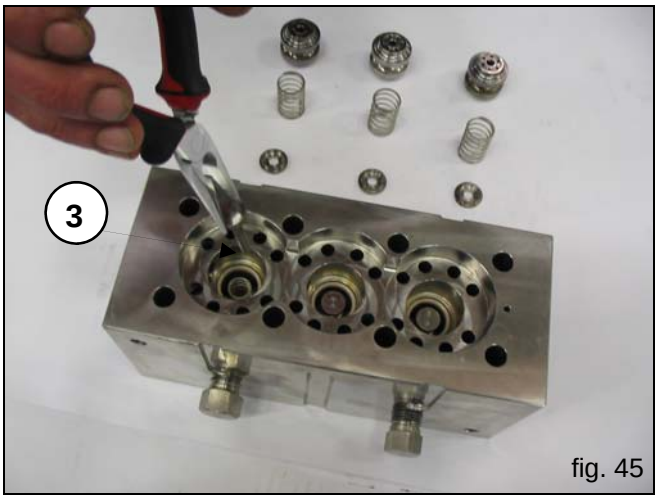


fig. 45

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 necessary as indicated in chapter 11 (fig.17) of the use and maintenance manual.

2.2.2 Dismantling 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 chapter 3.

2.2.3 Dismantling the piston unit – supports – seals

The piston 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 pipe pulsing (if flexible) are detected, the seal pack will have to be checked and replaced. Proceed as follows to extract piston units:

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

fig. 46

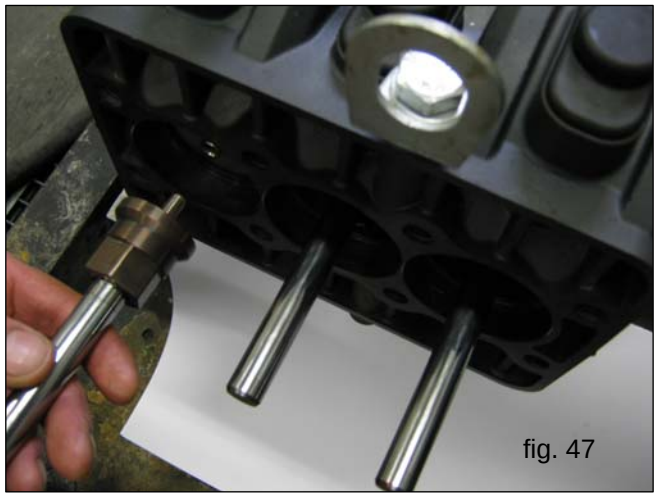


fig. 47

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

fig. 48

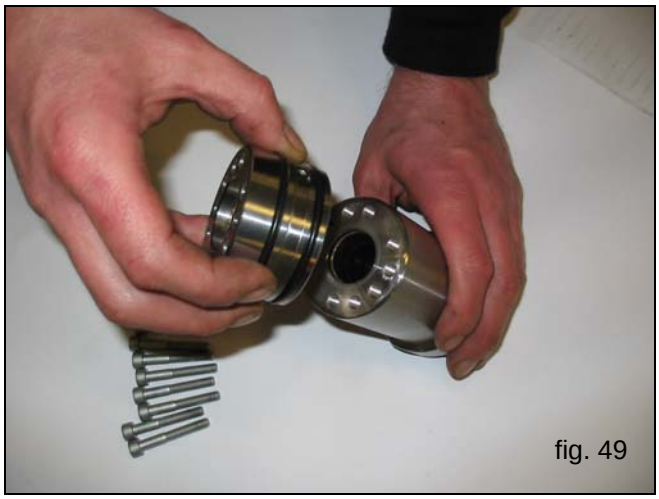


fig. 49

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

fig. 50

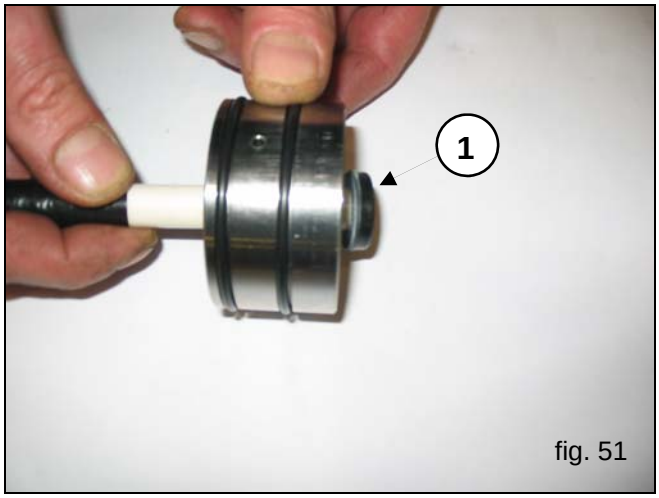


fig. 51

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 OR rings and the low pressure seals must be replaced at each disassembly .

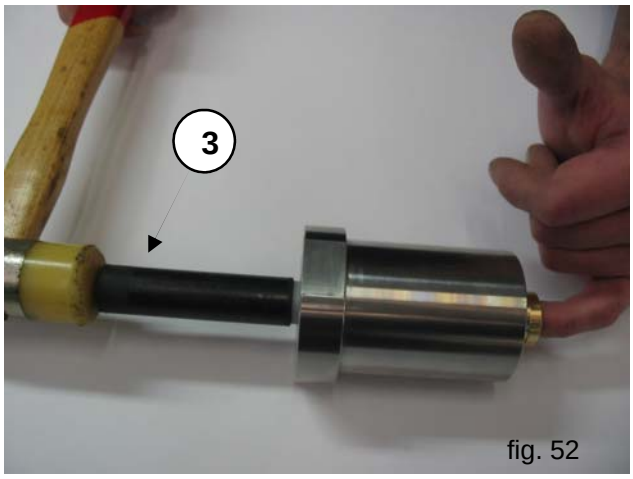


fig. 52

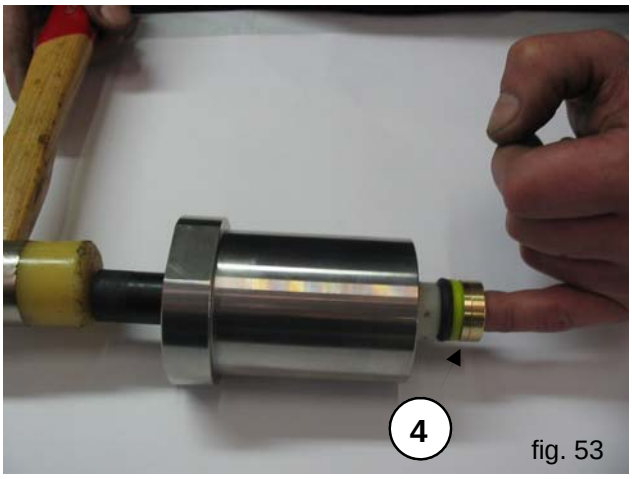


fig. 53

E) With the liner separate from the seal support and with the special plastic pin③ as indicated in fig. 52, have the HP (high pressure) pack come out ④ operating as in fig. 53 .

The HP pack ④ fig. 53 will have to be replaced at each disassembly.

2.2.4 Dismantling the piston unit – supports – seals

To reassemble the various components, invert 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 bush in the liner.

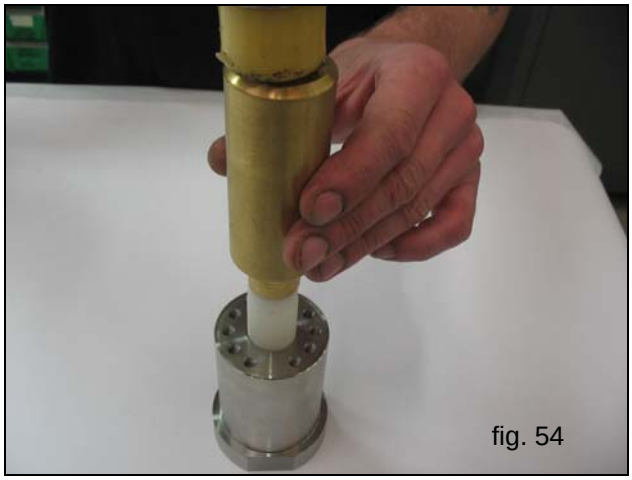


fig. 54

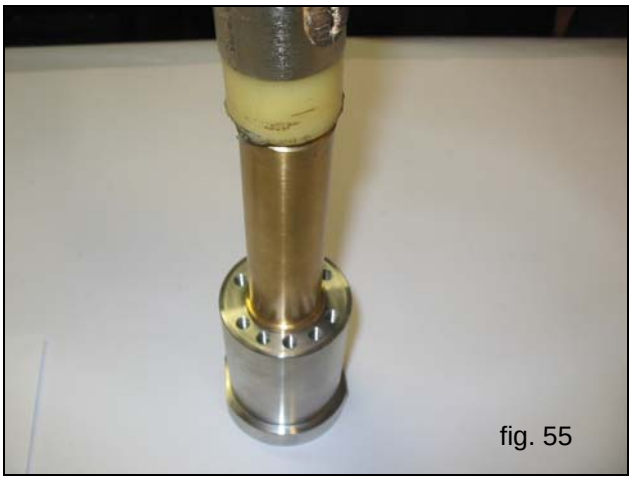


fig. 55

For proper axial positioning of the bush, use the special tool (code 27508300 valid for pump type VK-VF12 and code 27508500 valid for pump type VK-VF14) as indicated in fig. 54 and 55 .

fig. 56

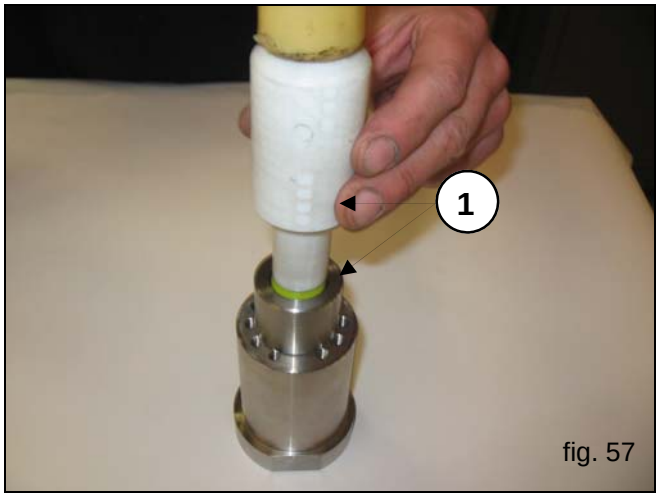


fig. 57

B) Insert the H.P. (high pressure) pack. Given the slight interference between the seal and the liner, use a special tool ① (code 27508400 and code 27365300) as indicated in fig. 56 and 57 to prevent damage.

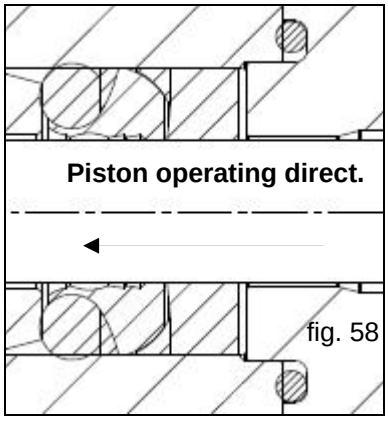


fig. 58

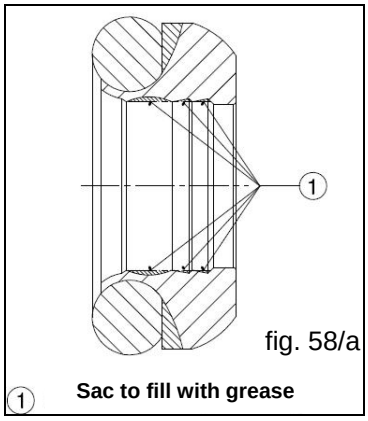


fig. 58/a

The H.P. seal must be placed in the liner with an OR energised seal in the operating direction of the piston as indicated in fig. 56 and 58.

Before mounting the H.P. seals in their housing, they must be lubricated with OKS 1110 silicone ase 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. 58/a.

fig. 59

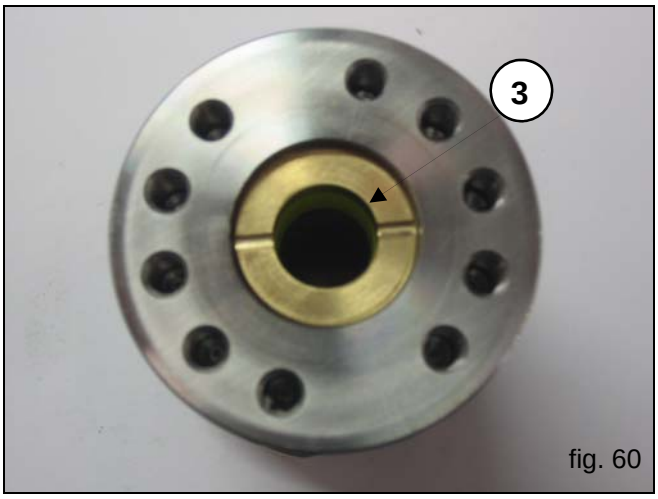


fig. 60

C) Insert the anti-extrusion ring ② and the seals bush ③ positioned as per figs. 59 – 60 – 61

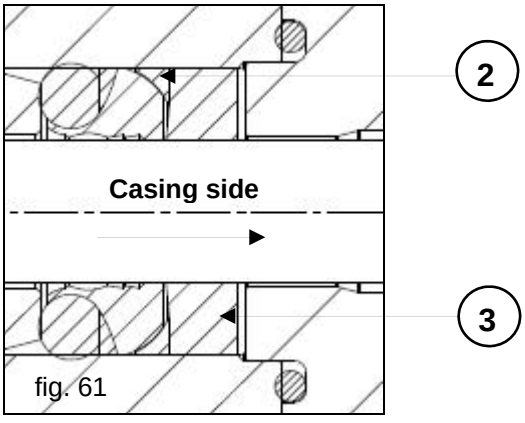


fig. 61

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

The L.P. seal must be inserted in the liner with the lip seal in the direction of piston operation as indicated in fig. 62 and in fig. 63, slightly lubricating the external diameter with OKS 1110 silicone grease.

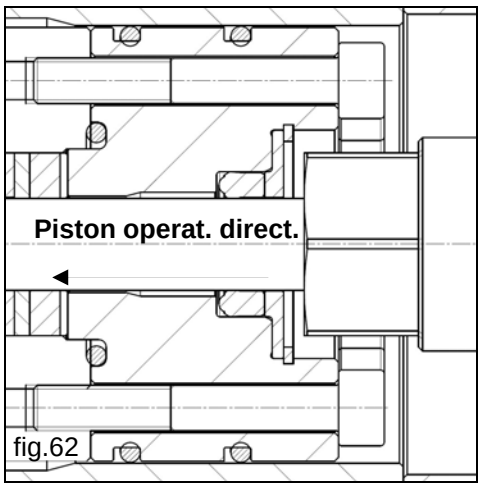


fig.62


fig. 63

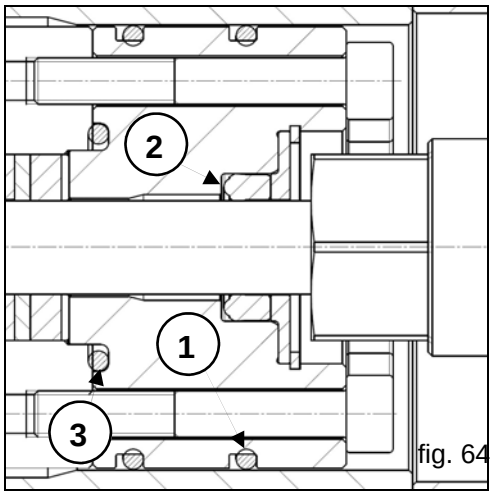


fig. 64

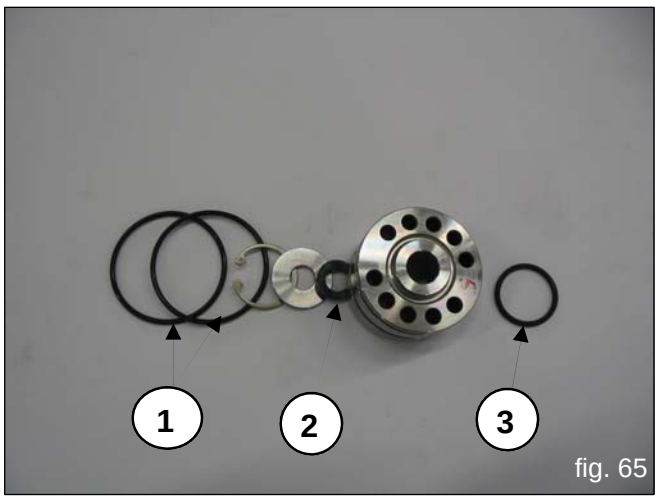


fig. 65

D) Replace the seal support unit as indicated in fig. 64 – 65 replacing components① ② ③.


fig. 66

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 TIGHTENING CALIBRATION

Screw tightening must only be performed with a torque wrench.

DESCRIPTION	EXPLOD. POSITION	TIGHTENING TORQUE Nm
Cover fixing screw	9 -12	10
Oil discharge plug	11-79	40
Lifting bracket fixing screw	20	40
Con-rod cap fixing screw	21	38 *
Piston fixing	29	20
Head fixing screw	48	80 * *
Liner fixing screw	47	35 * * *
Support fixing screw	60	15 * * * *
Reduction gear cover and box fixing screw	74	40
Ring gear fixing screw	71	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 explod. Pos. 48 must be tightened with a torque wrench respecting the order shown in the diagram in fig.68

*** The liner fixing screws explod. pos. 47 must be tightened in a single phase, respecting the order shown in the diagram in fig.68.

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

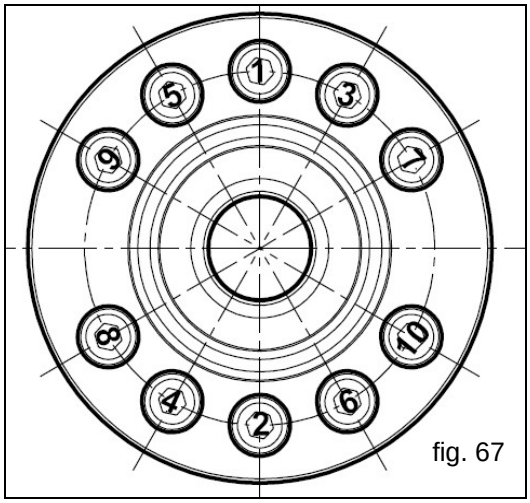
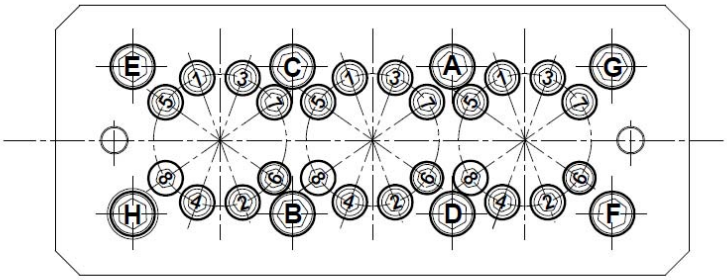


fig. 67

Screws – pos. 47- 60 must be tightened with a torque wrench, lubricating the threaded shank . (We recommend use of Molybdenum Bisulphide grease code 12001500) .

Head and liner screw tightening



OPERATION 1: Tightening M12x260 screws (pos.48) in two phases

following the sequence indicated in the figure (A-B-C-D-E-F-G-H)

1st Phase = 40 Nm

2nd Phase = 80 Nm

OPERATION 2: Tightening M8x100 screws (pos.47) in four phases

following the sequence indicated in the figure (1-2-3-4-5-6-7-8)

1st Phase = 20 Nm

2nd Phase = 30 Nm

3rd Phase = 35 Nm

4th Phase = 35 Nm

fig. 68

4. REPAIR TOOLS

Pump repairs can be facilitated by special tools coded as follows:

For assembly:

Seals VK12 - VF12	cod.27508300
Seals VK14 - VF14	cod.27508500
H.P. seal pack	cod. 27365300 cod. 27508400
Heads / Liner spacer	cod. 27508200
Pump shaft seal ring / reduction gear pinion	cod. 27904800
Piston guide oil seal	cod. 27904900
Reduction gear box cover	cod. 27517400

For disassembly:

Valve housings	cod. 27508000
Heads / Liner spacer	cod. 27508200
Piston guide oil seal	cod. 27503900

Code 72980303 - Cod.IE 2860000080 – 16/04/2010
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