

2.2 Fluid End Repair

2.2.1 Head Disassembly - Valve Units

The head requires preventive maintenance as indicated in the use and maintenance manual. Interventions may be limited to valve inspection, or replacement as needed. To extract the valve units operate as follows:

Unfasten the 8 M16 x 55 screws of the valve cover (1, fig. 78) and remove the cover (1, fig. 79).

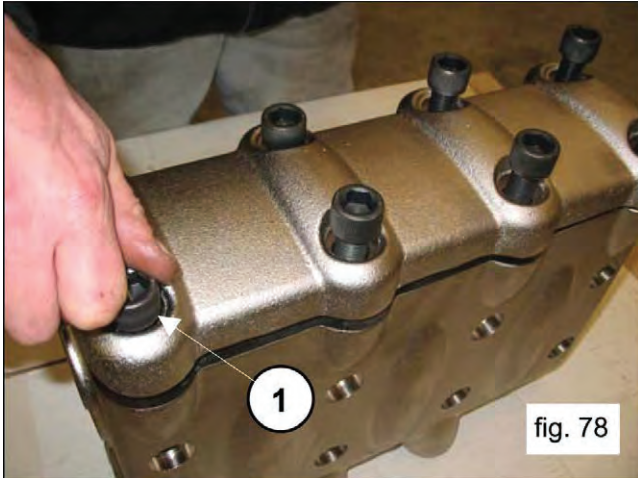


fig. 78

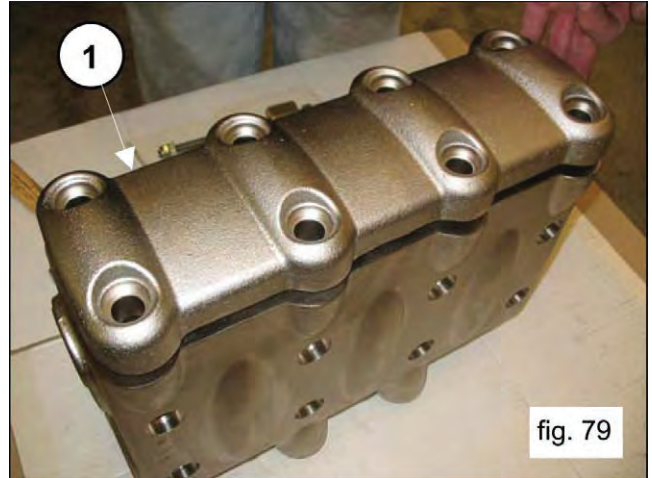


fig. 79

Extract the valve plug using a slide hammer applied to the M10 hole of the valve plug (1, fig. 80).

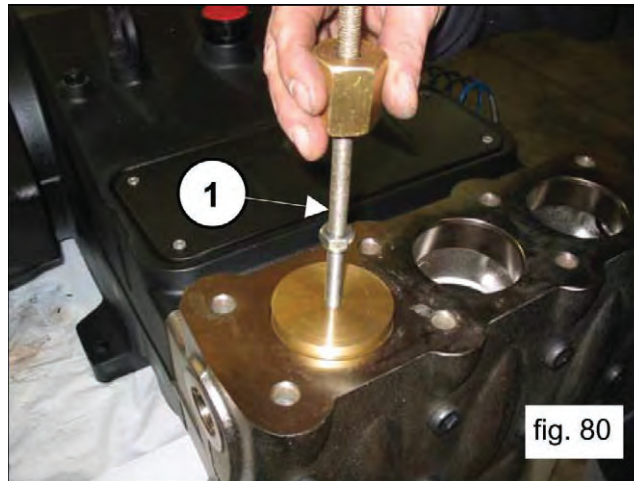


fig. 80

Remove the spring (1, fig. 81).

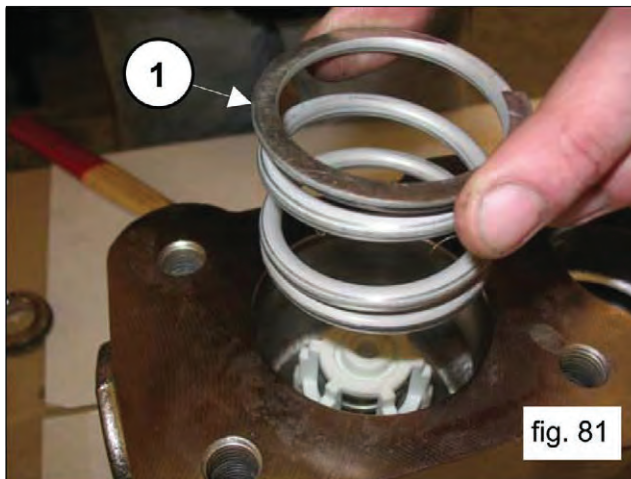
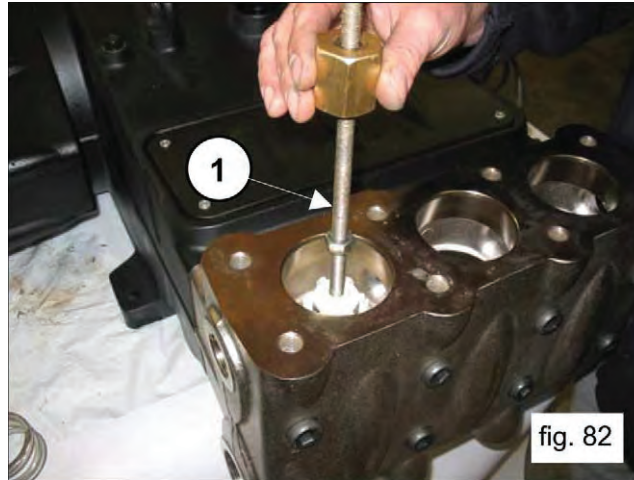


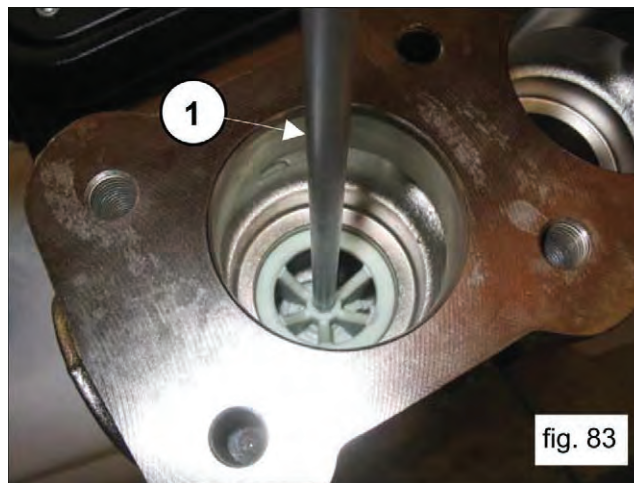
fig. 81

Extract the delivery valve unit using a slide hammer applied to the M10 hole of the valve guide (1, fig. 82)

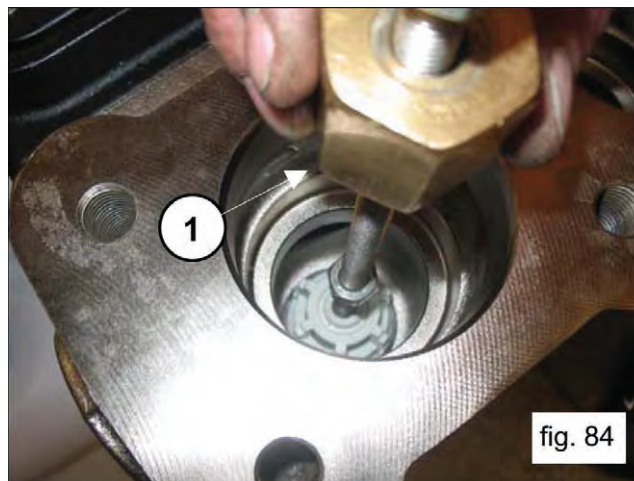


If the extraction of the delivery valve unit is particularly difficult (for ex. due to incrustations caused by prolonged pump inactivity) use the extraction tool, p/n 27516400

Unfasten the valve guide spacer using an 8 mm allen wrench (1, fig. 83).



Remove the suction valve unit using a slide hammer applied to the M10 hole of the valve guide (1, fig. 84).





If the extraction of the of the suction valve unit is particularly difficult (for ex. due to incrustations caused by prolonged pump inactivity) use the extraction tool p/n 27516200 (for MK40A, MK45A, MK50A) or p/n 27516300 (for MK55A, MK60A and MK65A) (1, fig. 85) and act as indicated.

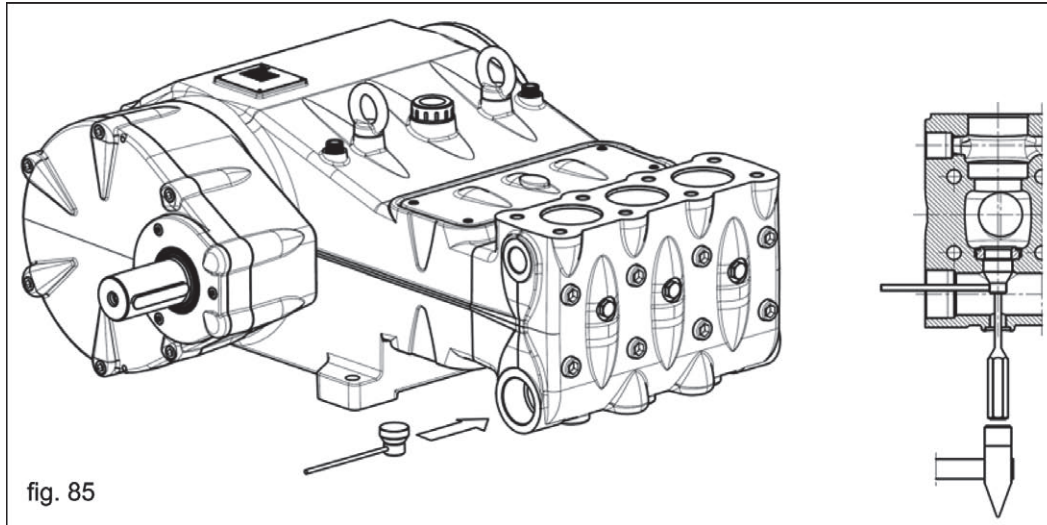


fig. 85

Unscrew the valve opening device using a 30 mm wrench (1, fig. 86).

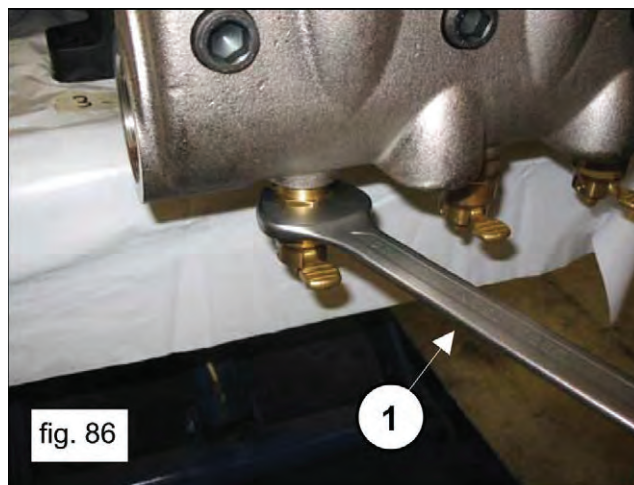


fig. 86

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 valve seat (1, fig. 87).

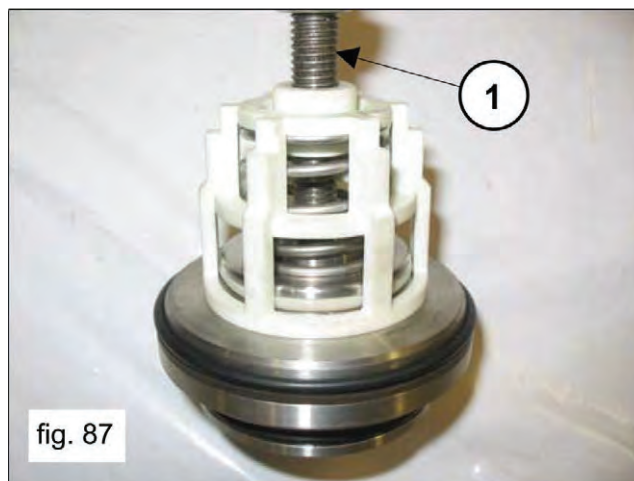


fig. 87

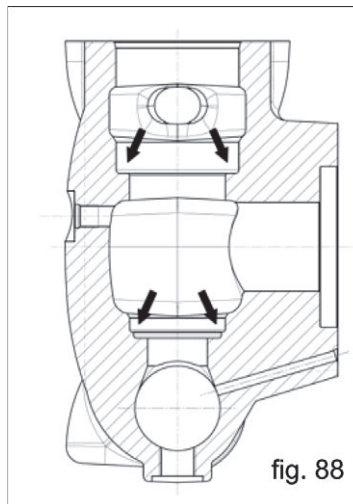
2.2.2 Head Assembly - Valve Units



Pay careful attention to state of wear of the various components; replace them if necessary. At each valve inspection, replace all valve units and valve plug O-rings.



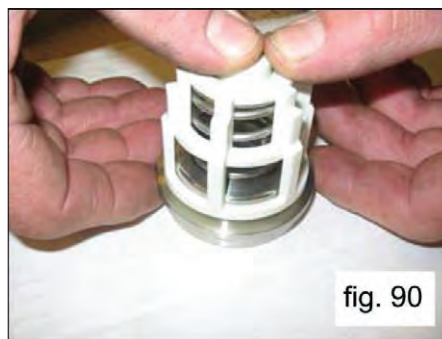
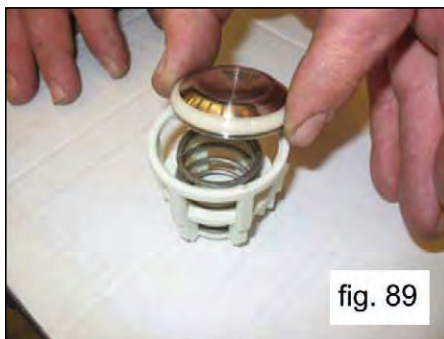
Before repositioning the valve units, clean and perfectly dry the relevant seats in the head indicated by the arrows (1, fig. 88).



Proceed with reassembly by inverting the procedure indicated in paragraph 2.2.1.

Assemble the suction and delivery valve units (fig. 89 and fig. 90) paying attention not to invert the previously disassembled springs.

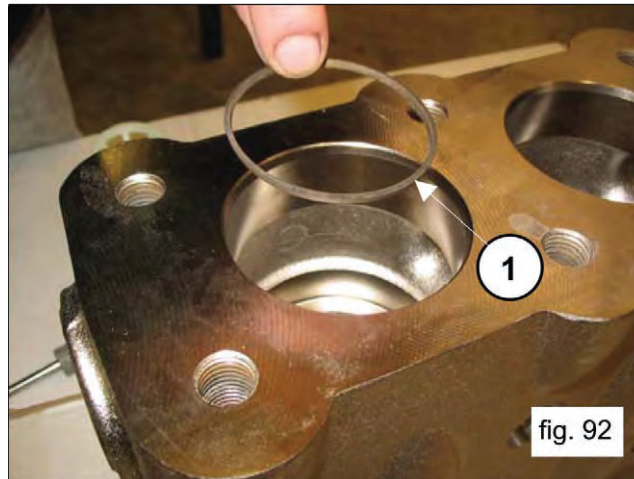
To facilitate the insertion of the valve guide in its seat, use a pipe that lays on the horizontal shoulders of the guide (fig. 90a), and use a hammer acting on the entire circumference.



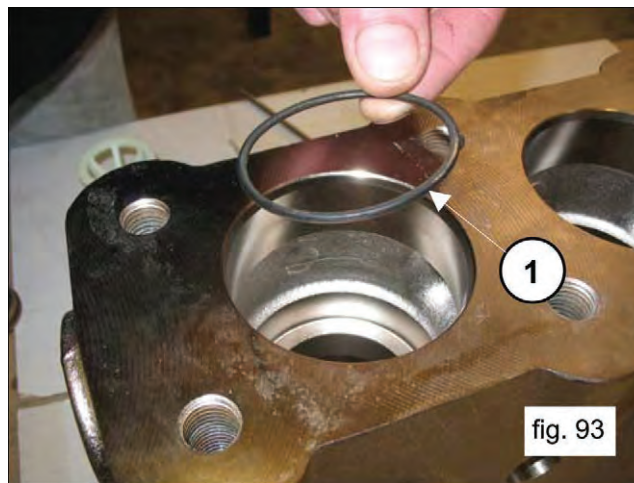


Proceed with the insertion of the valve units (suction and delivery) into the head, paying attention to the correct insertion sequence of the O-rings and anti-extrusion rings.

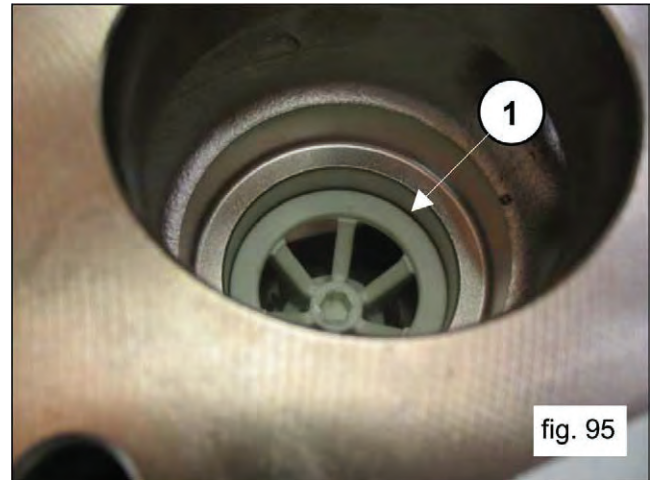
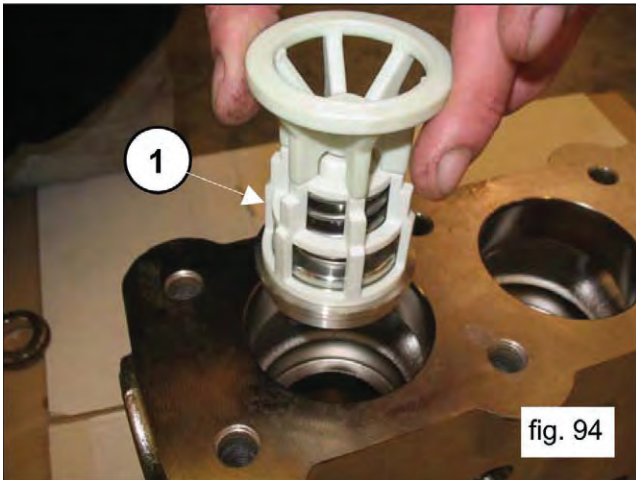
The correct assembly sequence of the valve units in the head is the following:
Insert the anti-extrusion ring, exploded view item 4 from Owner's Manual (1, fig. 92).



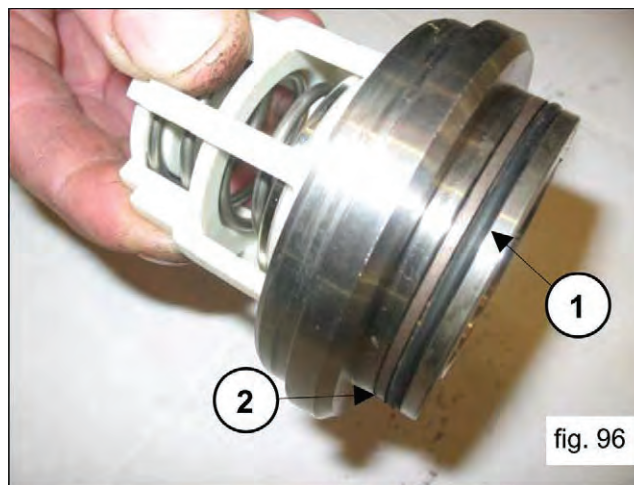
Insert the O-ring, exploded view item 5 from Owner's Manual (1, fig. 93).



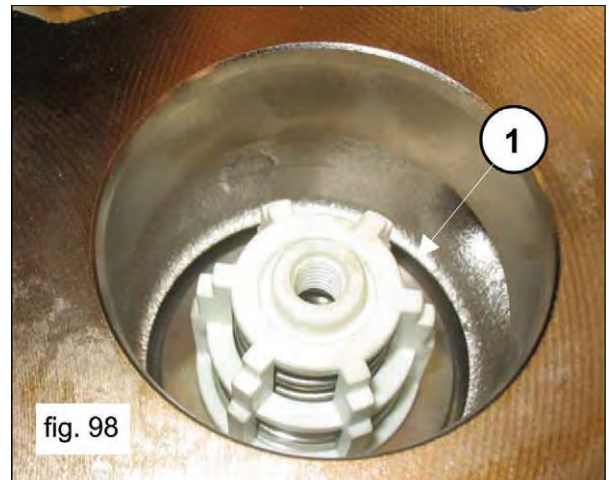
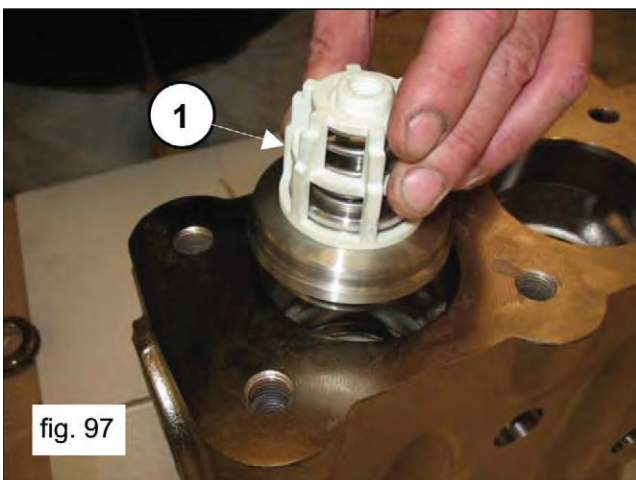
Be sure that the O-ring and the anti-extrusion ring are perfectly fit into their seats. Insert the suction valve unit together with the spacer (1, fig. 94). The valve unit must be fully inserted, as shown in 1, fig. 95.



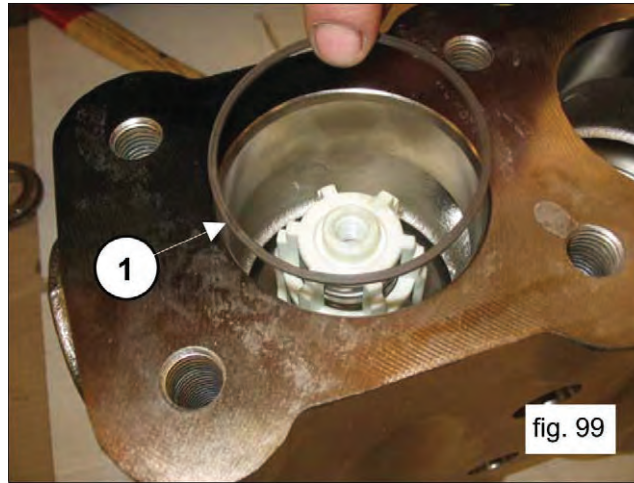
Mount the O-ring, exploded view item 5 from Owner's Manual (1, fig. 96) and the anti-extrusion ring, exploded view item 15 from Owner's Manual (2, fig. 96) on the delivery valve seat.



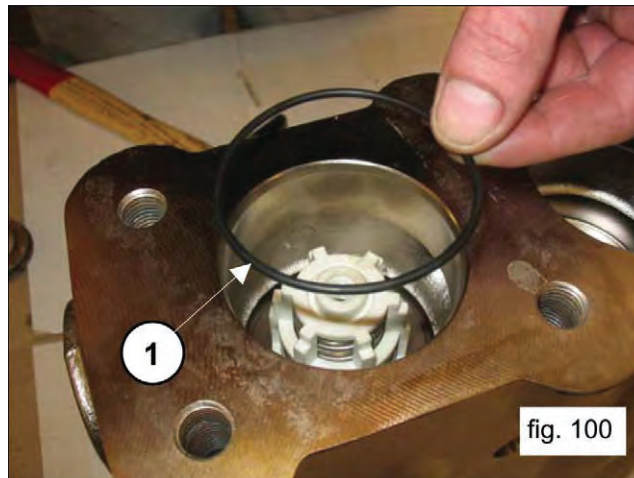
Insert the delivery valve unit (1, fig. 97). The valve unit must be fully inserted as shown in 1, fig. 98.



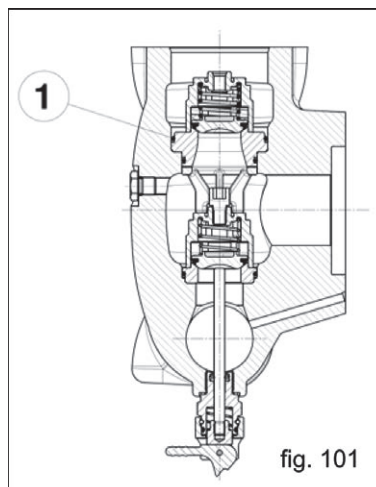
Insert the anti-extrusion ring, exploded view item 16 in Owner's Manual (1, fig. 99).



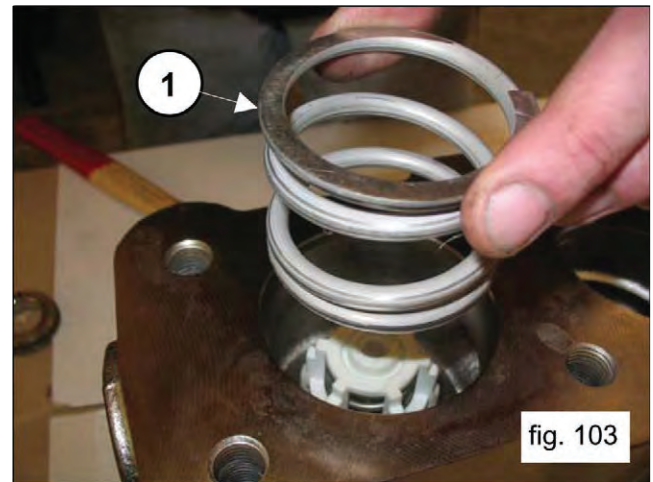
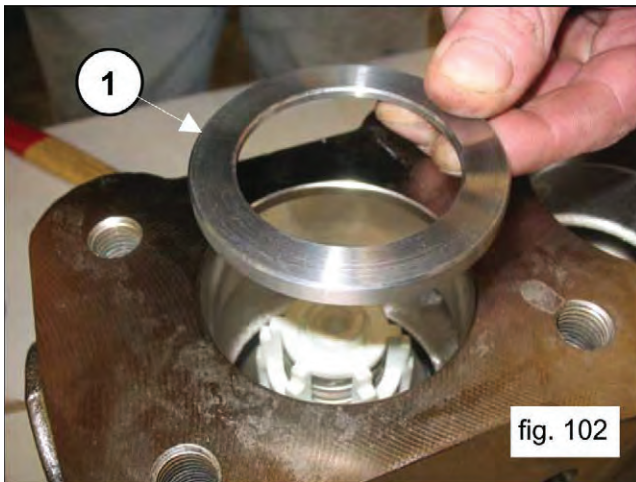
Insert the O-ring, exploded view item 17 in Owner's Manual, (1, fig. 100).



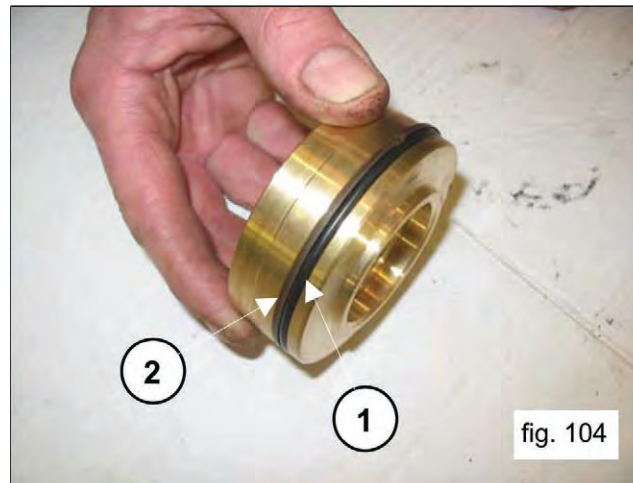
Pay particular attention when inserting the O-ring indicated in 1, fig. 101. We advise to use the correct tool p/n 27516000 (for MK40A, MK45A and MK50A) or p/n 27516100 (for MK55A, MK60A and MK65A) in order to avoid cutting the O-ring during insertion.



Insert the valve seat ring (1, fig 102) and the spring (1, fig. 103).

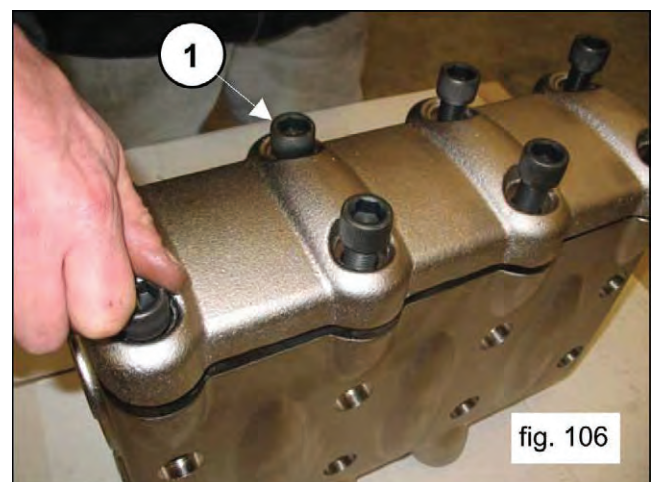
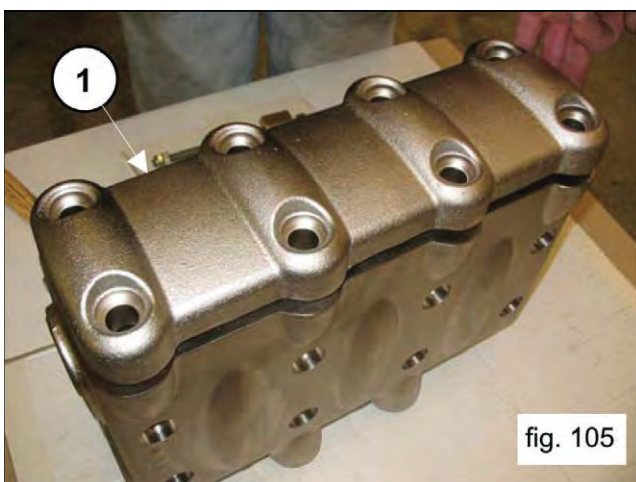


Assemble the O-ring, exploded view item 17 in Owner's Manual, (1, fig. 104) and the anti-extrusion ring, exploded view item 21 in Owner's Manual (2, fig. 104) on the delivery valve plug.

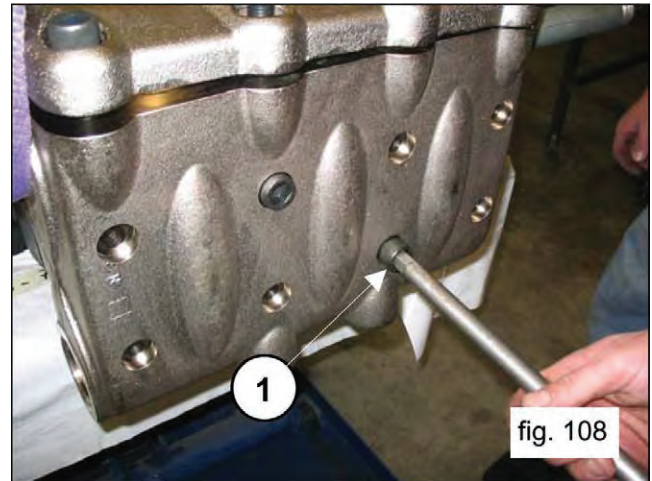
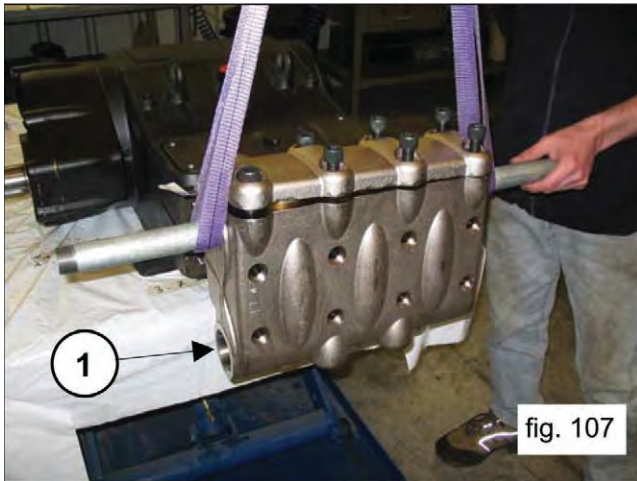


Insert the valve plug complete with O-rings and anti-extrusion ring.

After assembling the valve unit and the valve plug, apply the valve cover (1, fig. 105) and screw on the 8 M16 x 55 screws (1, fig. 106).



Assemble the head on the pump casing (1, fig. 107) being careful not to bump against the plungers, and fasten the 8 M16 x 180 screws (1, fig. 108).



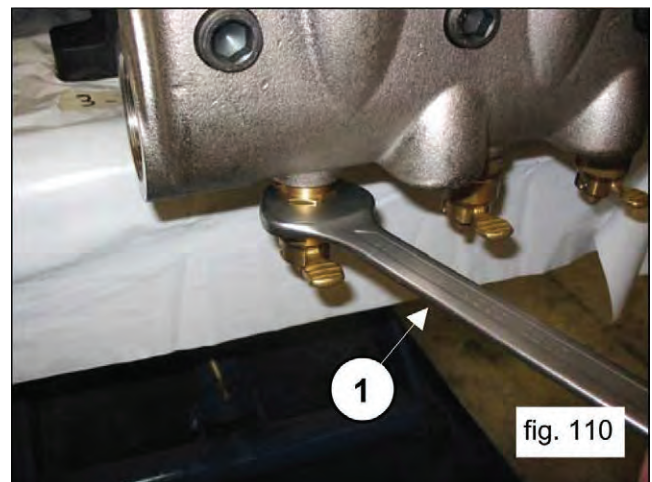
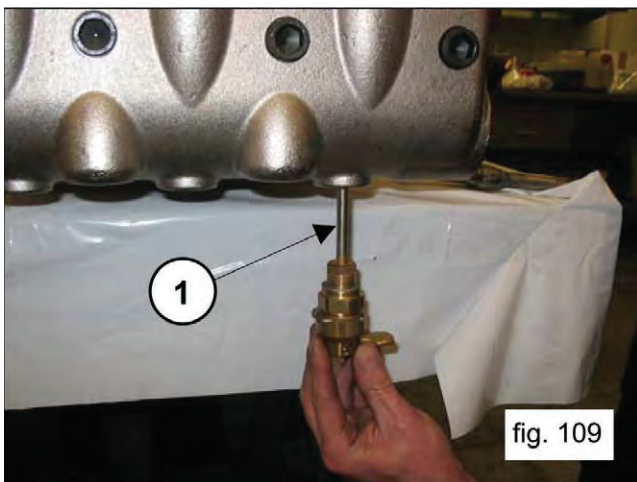
Proceed with calibrating the M16 by 180 screws with the torque wrench as indicated in paragraph 3. "SCREW CALIBRATION"



Fasten the 8 M16 x 180 screws starting from the 4 internal screws cross-wise (see fig. 107), and then proceed with the 4 external screws, again fastening cross-wise.

Calibrate the M16 x 55 cover screws with the torque wrench as indicated in paragraph 3. "SCREW CALIBRATION"

Apply the valve opening devices (1, fig. 109) and fasten them using a 30 mm wrench (1, fig. 110).



2.2.3 Disassembling the Plunger Unit - Supports - Seals

The plunger unit requires a periodical inspection as indicated in the preventive maintenance table of the Owner's Manual. Interventions only require visual inspections of the draining from the hole in the lower cover. In case of anomalies/oscillations on the delivery pressure gauge, or leaking from the drain hole, proceed with seal inspection and replacement if necessary. Operate as follows to extract the plunger units:

To access the plunger unit, unscrew the M16 x 180 screws and disassemble the head.



Remove the head with great care in order to avoid bumping against the plungers.

Disassemble the plungers by unfastening the screws (1, fig. 111). Remove the plunger from the packing support and check that there are no scratches, or signs of wear or cavitation.

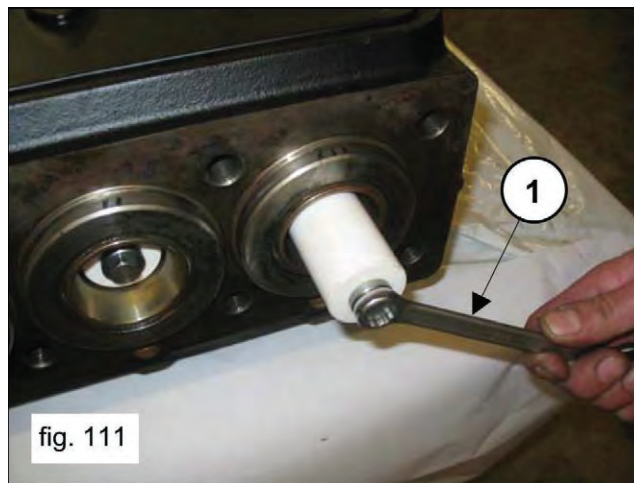


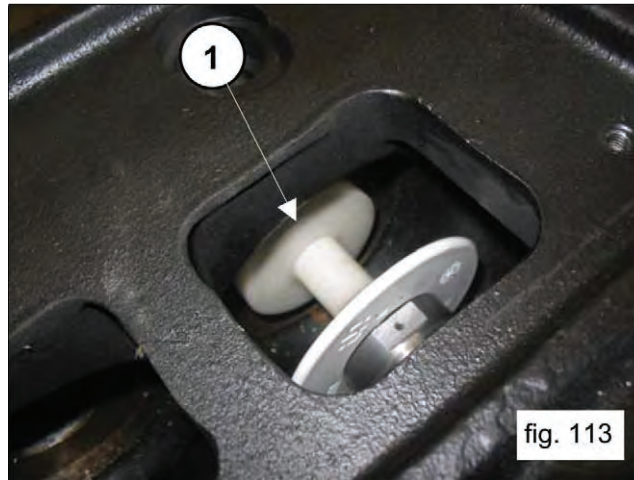
fig. 111

Remove the upper inspection cover by unscrewing the 4 fastening screws (1, fig. 112).

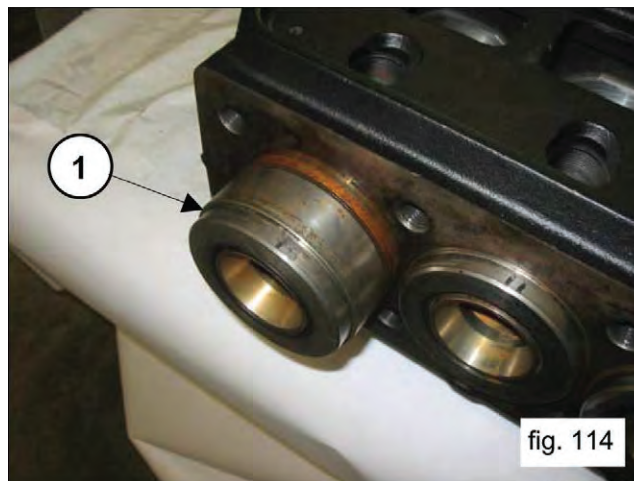


fig. 112

Manually rotate the shaft so that the 3 plungers are in the top dead center position.
Insert the stopper tool p/n 27516600 between the plunger guide and the plunger (1, fig 113).

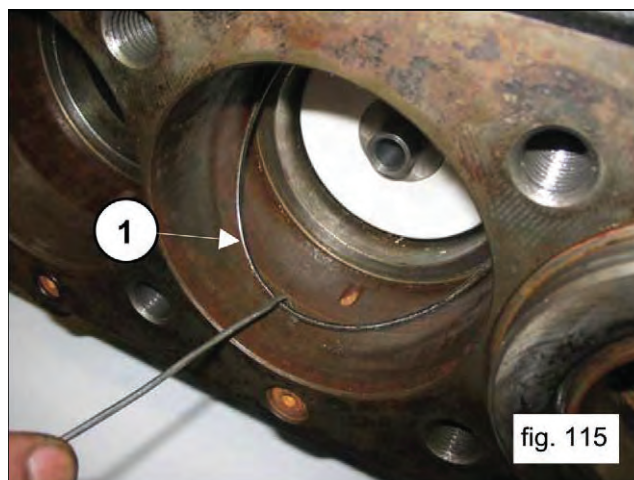


Turning the shaft, move the plunger forward so that the stopper, moving forward itself, can push out the packing support and the entire plunger unit (1, fig. 114).

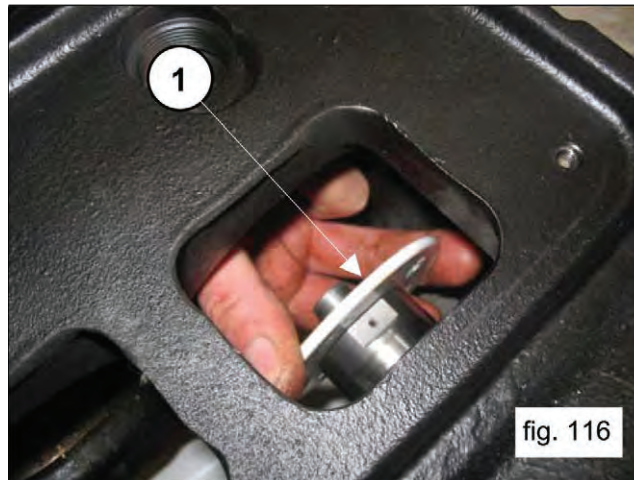


Extract the packing support and the stopper tool.

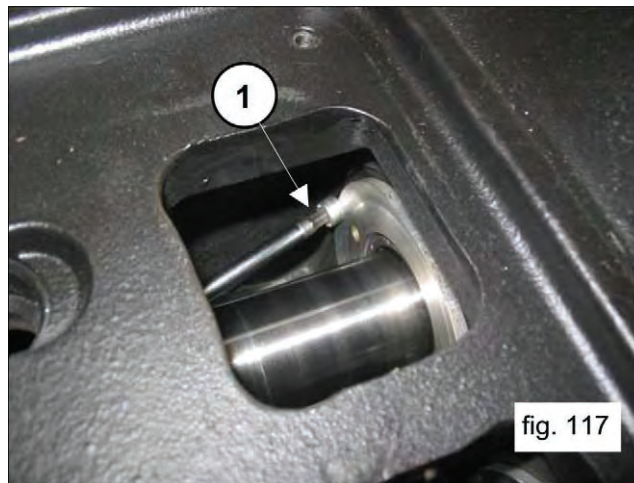
Remove the packing support O-ring if it remains inside the pump case (1, fig. 115)



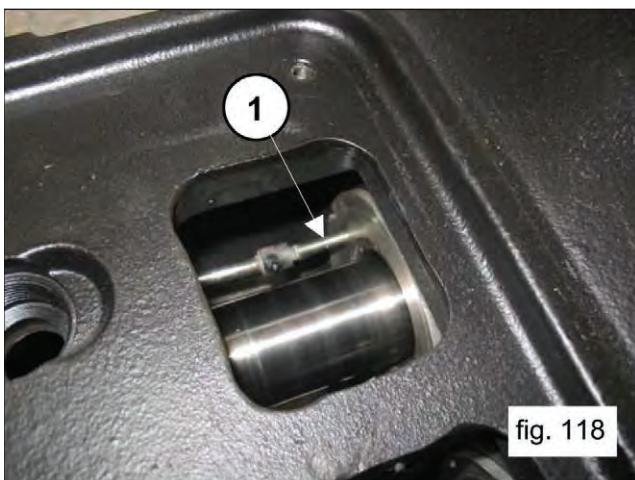
Remove the wiper rings from the plunger guides (1, fig. 116).



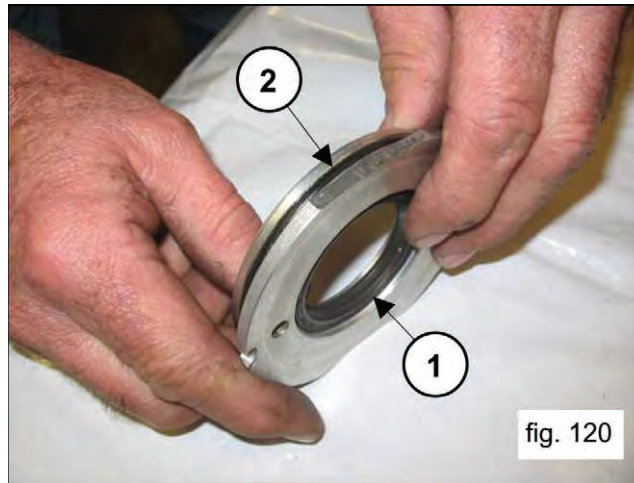
If replacement of the plunger guide oil seal is needed, disassemble the oil seal cover by operating as follows: Unfasten the two screws of the oil seal cover (1, fig. 117).



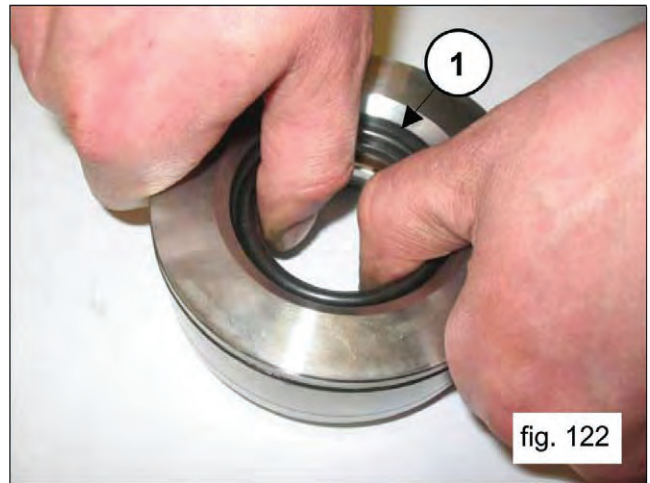
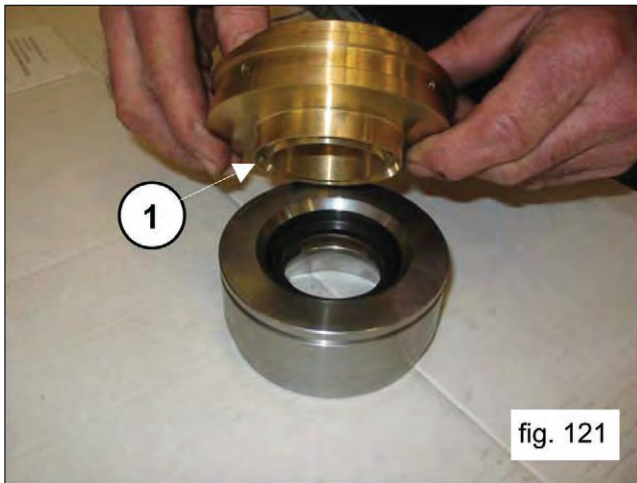
Extract the oil seal cover by screwing a threaded M5 bar or screw into the correct holes on the cover (1 fig. 118); extract the oil seal cover from the pump unit (1, fig. 119).



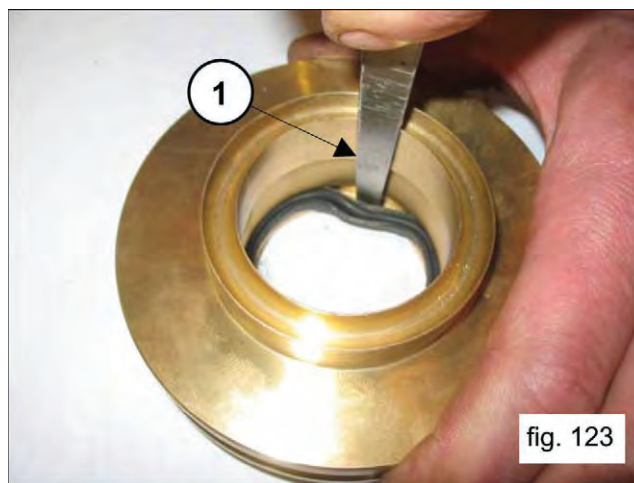
Replace the oil seal (1, fig. 120) and the external O-ring (2, fig. 120).



Separate the packing support from the liner (1, fig. 121) to access the pressure packings (1, fig 122).



To remove the low pressure packing, use a shim or another tool that doesn't damage the seat of the packing support (1, fig. 123).



2.2.4 Assembly of the Plunger Unit - Support - Seals

Proceed with reassembly by inverting the disassembly procedure indicated in paragraph 2.2.3.

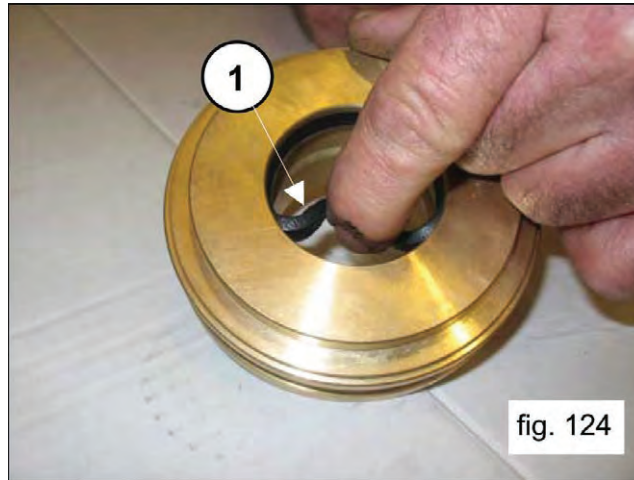


Replace the pressure packings by applying a small amount of silicone grease to the lips, being careful not to damage them when inserting the liner.

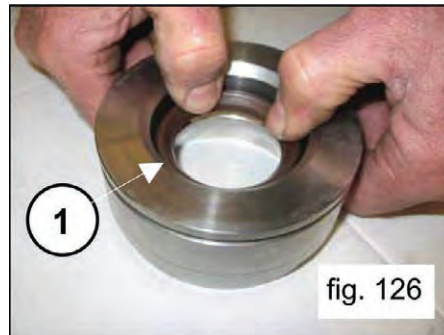


At each disassembly, the pressure packings must always be replaced together with all the O-rings.

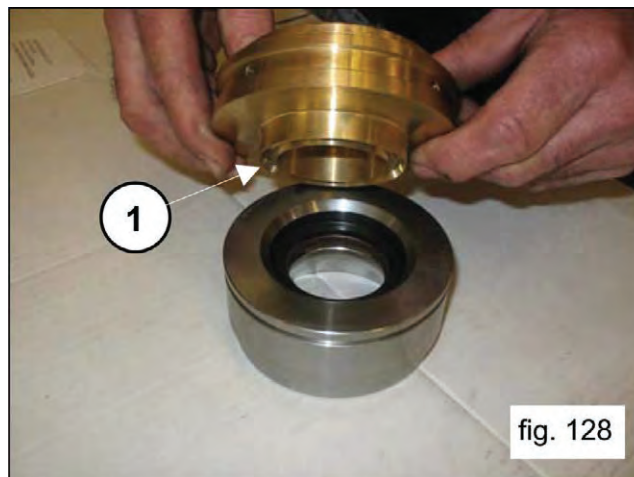
Insert the low pressure packings in the packing support (1, fig 124), being careful that the sealing lips are facing frontwards (toward the head).



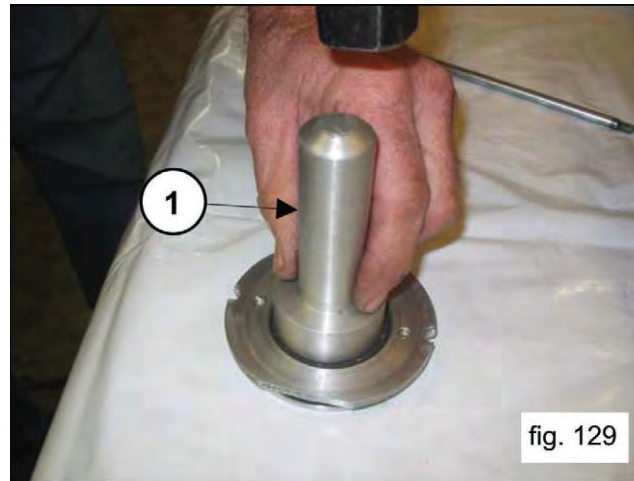
Assemble the head ring (1, fig. 125), the high pressure packing (1, fig. 126) and the restop ring (1, fig. 127).



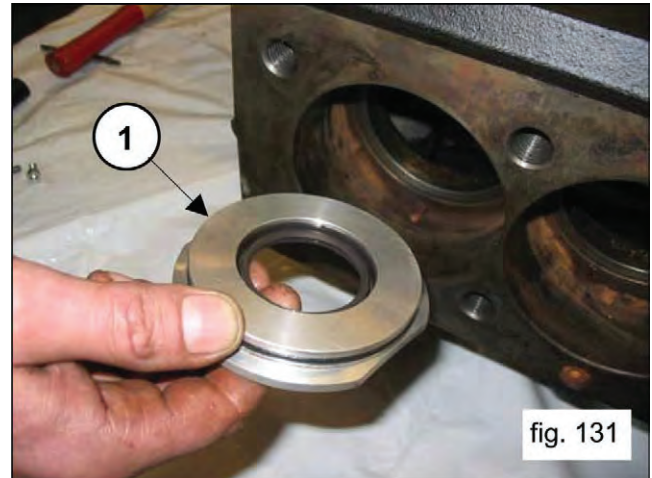
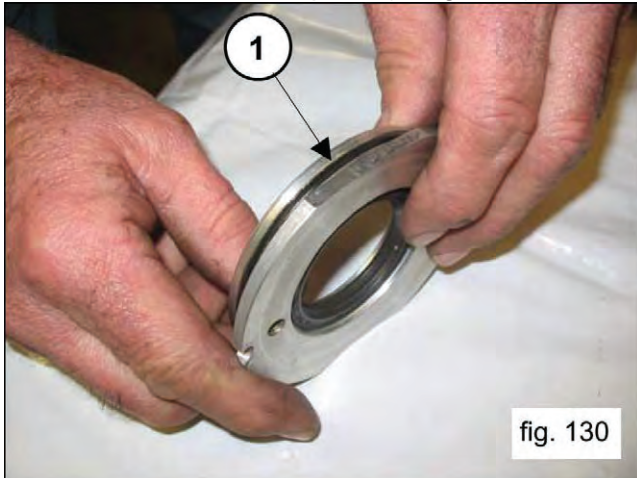
Couple the packing support to the liner (1, fig. 128).



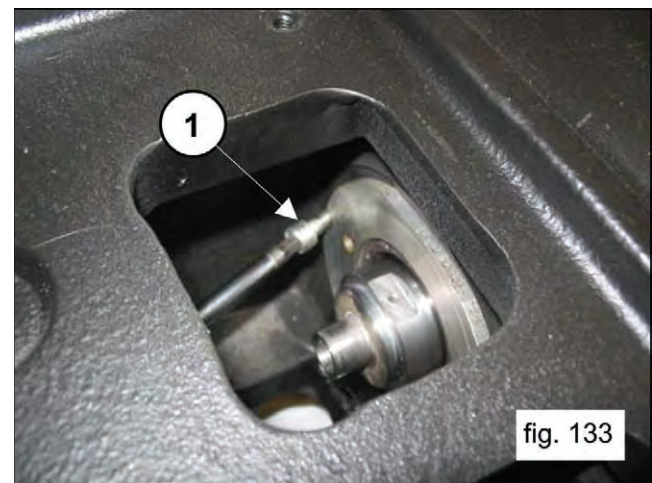
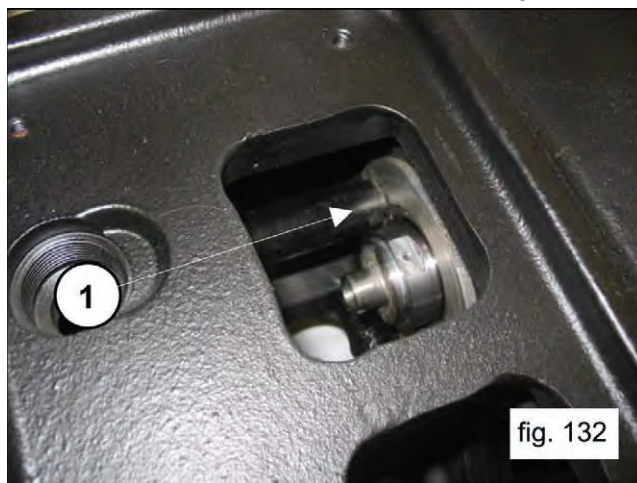
Insert the oil seal in its cover (1, fig. 129) using a stopper p/n 27515800.



Position the O-ring (1, fig. 130) in its seat on the oil seal cover, and insert the assembled unit inside the crankcase in the correct space (1, fig. 131).

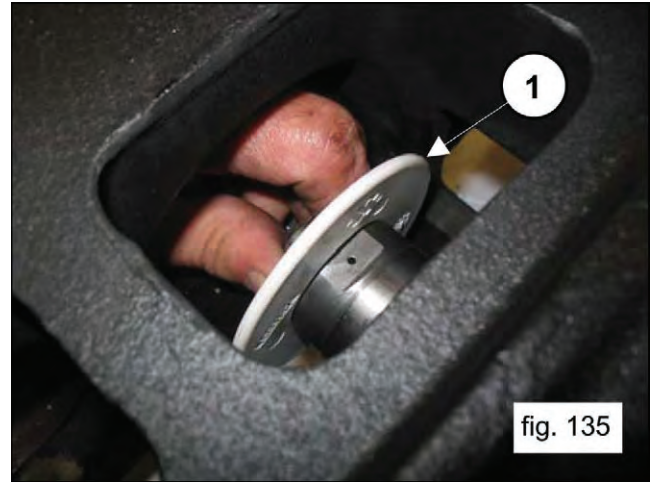
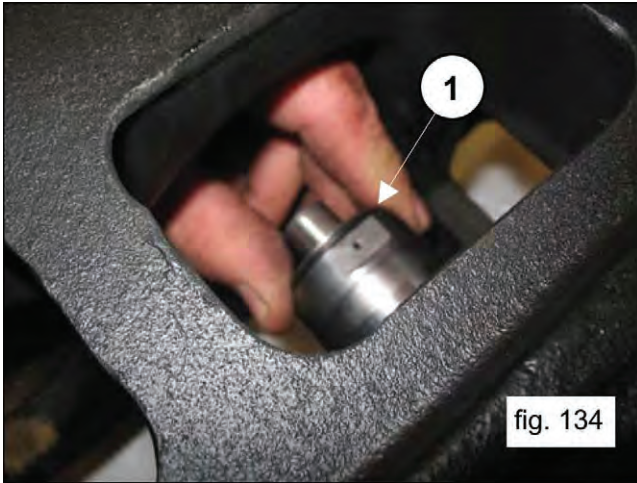


Perfectly insert the cover into its seat (1, fig. 132) being careful not to damage the oil seal lip. Fasten the oil seal cover with 2 M6 x 14 screws (1, fig. 133).

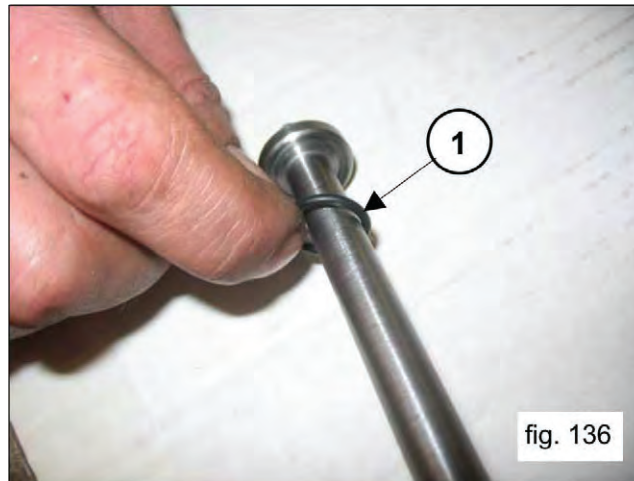


Calibrate the screws using a torque wrench as indicated in paragraph 3. "SCREW CALIBRATION"

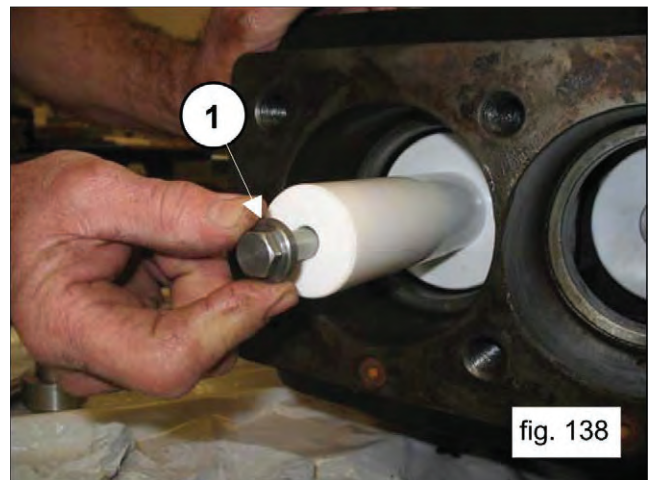
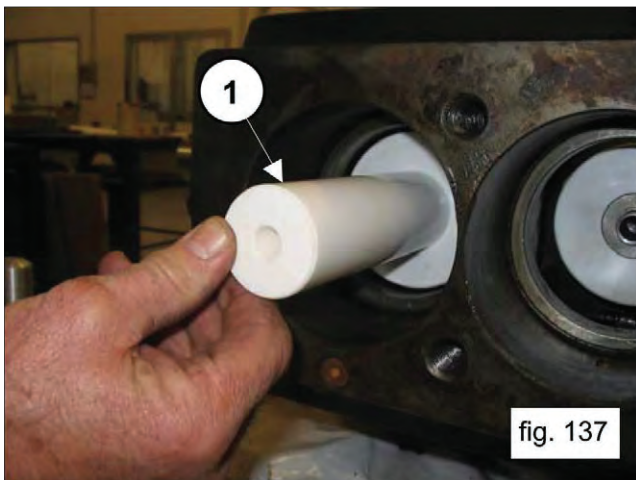
Position the wiper complete with its O-rings in its seat on the plunger guide (1, fig. 134 and fig. 135).



Insert the 14 x 2 O-ring in its correct seat on the plunger bolt (1, fig. 136).

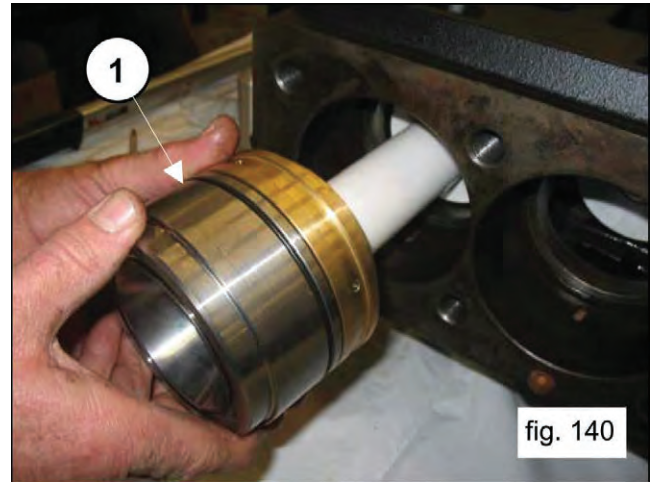
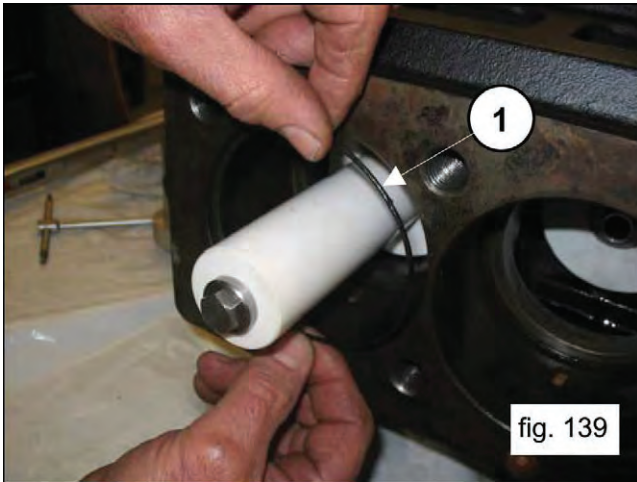


Assemble the plungers on their respective guides (1, fig. 137) and fasten them as in 1, fig. 138).

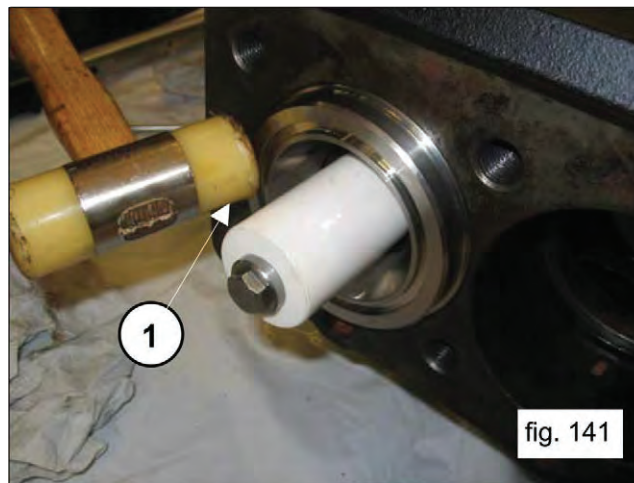


Calibrate the screws using the torque wrench as indicated in paragraph 3. "SCREW CALIBRATION"

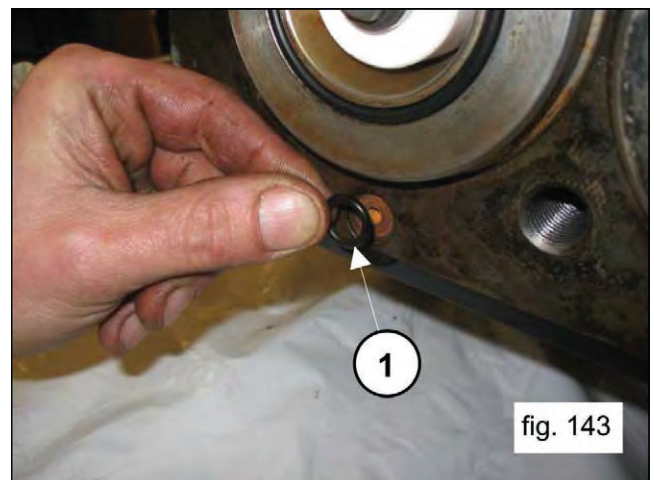
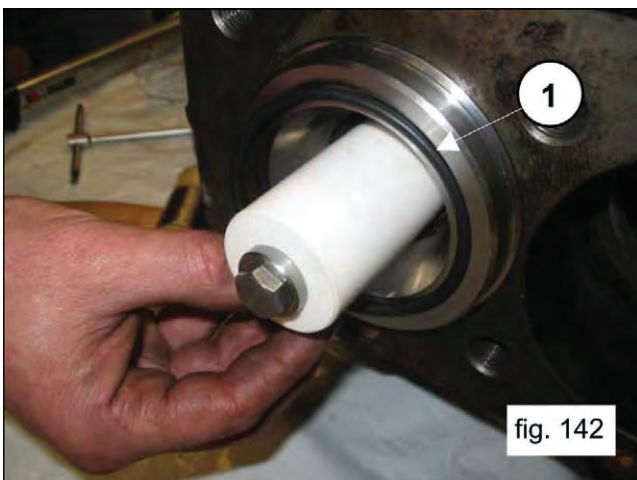
Insert the O-ring inside the pump case (1, fig. 139), followed by the previously assembled liner-packing support unit (complete with the O-ring), (1, fig. 140).



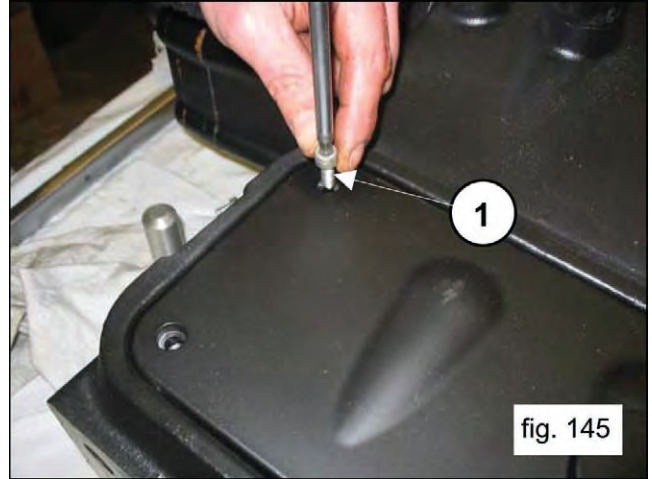
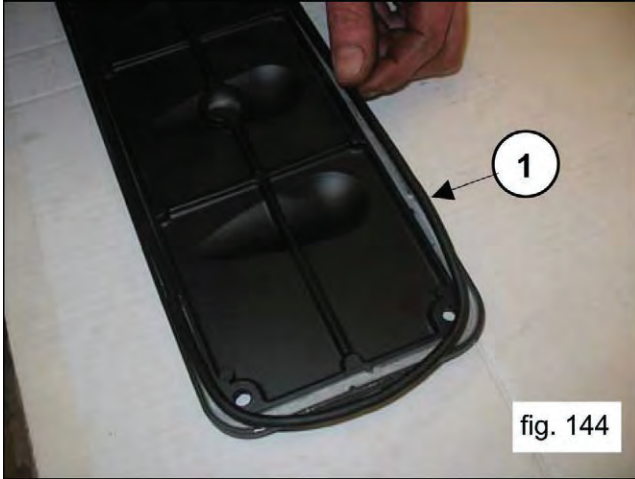
Be sure that the liner-support unit is correctly positioned in its seat (1, fig. 141).



Assemble the liner's front O-ring (1, fig. 142) and the O-ring of the recirculation hole (1, fig. 143).



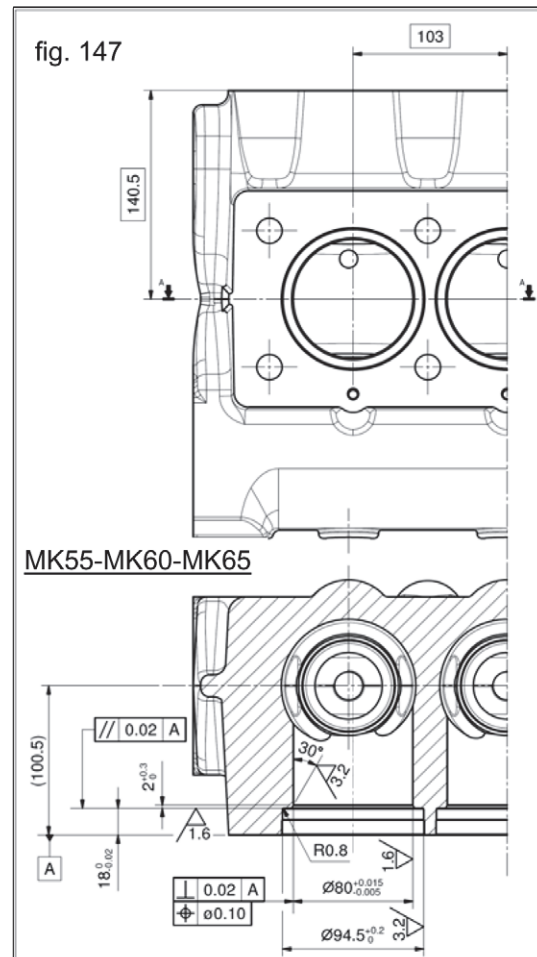
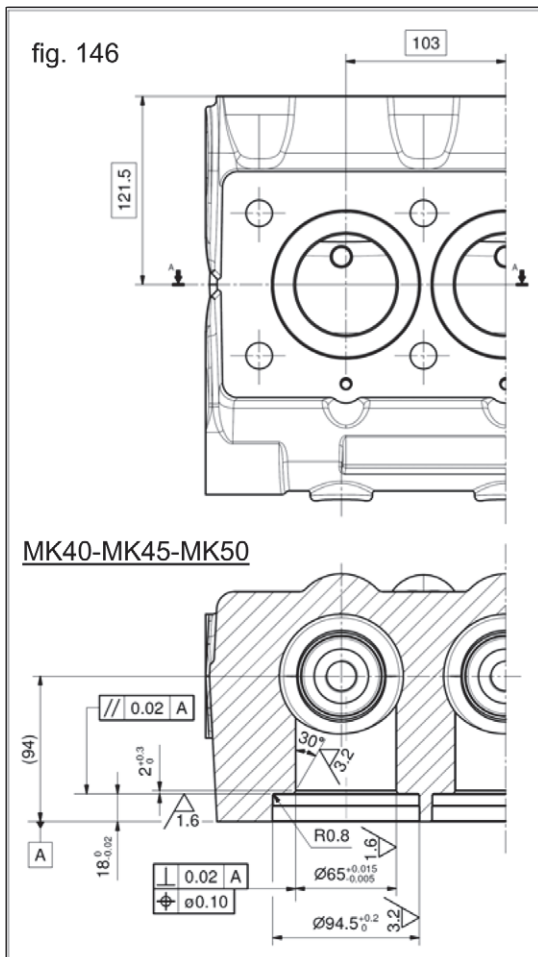
Insert the O-ring on the inspection covers (1, fig. 144) and mount the covers using 4 + 4 M6 x 14 screws (1, fig. 145).



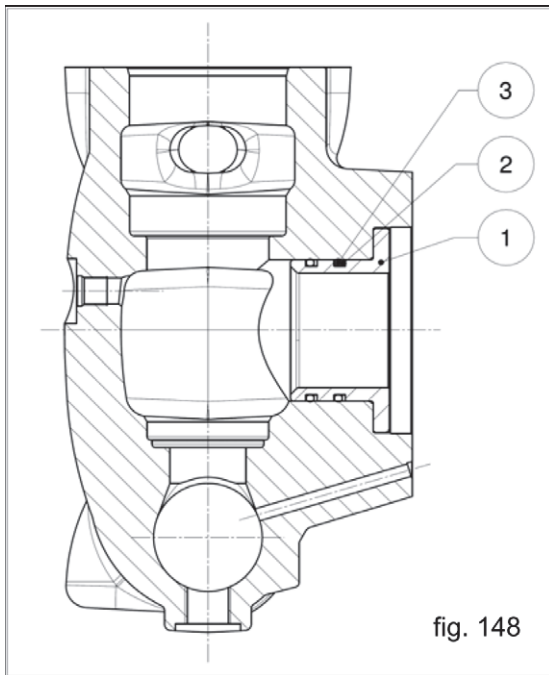
Calibrate the screws with the torque wrench as indicated in paragraph 3. "SCREW CALIBRATION"

2.2.5 Manifold Refurbishment

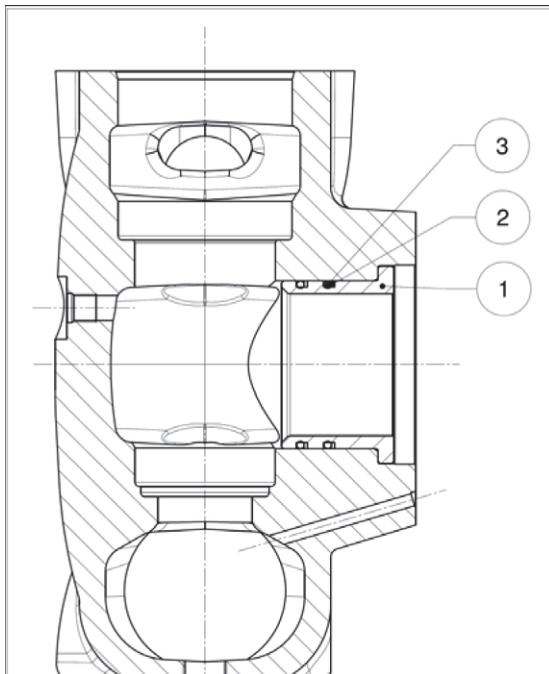
Manifold cavitation damages around the three cylinder bores can be fixed by re-tooling the damaged bores to a larger diameter (see fig. 146 for MK40A, 45A-50A and fig. 148 for MK55A-60A-65A).



After re-tooling, three steel bushings designed to restore the original bores have to be driven in the manifold along with relevant O-rings and anti-extrusion rings as shown in fig. 148 and 149.



1. 3 pcs. x p/n F74215156 bushings MK40A-45A-50A
2. 6 pcs. x p/n F90526880 anti-extrusion rings
3. 6 pcs. x p/n F90410200 O-rings



1. 3 pcs. x p/n F74215056 bushings MK55A-60A-65A
2. 6 pcs. x p/n F90528500 anti-extrusion rings
3. 6 pcs. x p/n F90412900 O-rings

3. SCREW CALIBRATION

Screws are to be fastened exclusively using a torque wrench.

Description	Exploded View Position (From Owner's Manual)	Fastening Ft. Lbs.	Fastening Nm
Crankcase cover screws M8x18	54	14.8	20
Crankcase plug G1/2x13	55	29.5	40
Reducer flange screw M8x18	54	14.8	20
Reducer cover screw M10x50	70	33.2	45
Ring gear stopper screw M10 x 25	65	33.2	45
Reducer case screw M12x40	75	54.2	73.5
Reducer case screw M12x50	64	54.2	73.5
Upper and lower cover screw M6x14	41	7.4	10
Bearing cover screw m12x30	90	29.5	40
Connecting rod screw M12x1.25x87	53	55.3*	75*
Plunger guide screw M10x35	50	44.3	60
Oil seal cover screw M6x14	41	7.4	10
Plunger screw M10x160	27	29.5	40
M16x55 Valve cover screw	26	245.6**	333**
Head plug G1/4"x13	13	29.5	40
Head screw M16x180	25	245.6	333
Valve opening device	2	29.5	40

* Screws should be tightened at intermediate incremental values

** Tightening sequence always cross-wise starting from the 4 internal screws then the 4 external screws (see fig. 108)

4. REPAIR TOOLS

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

For Assembly:

KIT For Assembly:

- Plunger guide oil seal. F27910900
- Pinion oil seal. F27515900 & F27548200
- A • Delivery valve O-ring seat (MK40A, MK45A, MK50A). F27516000
- B • Delivery valve O-ring seat (MK55A, MK60A, MK65A). F27516100

KIT For Disassembly:

- A • Suction valve seat (MK40A, MK45A, MK50A). F27516200
- B • Suction valve seat (MK55A, MK60A, MK65A). F27516300
- A/B • Slide hammer F27516400
- C • Liner + packings support unit. F27516600
- Reducer cover F27516700
- Shaft (connecting rod blocking) F27566200
- A/B • 10 mm threaded bushing 800049
- A/B • Valve Cage Adapter 520426

RECOMMENDED REPAIR KITS

FKITMKVHP - MK40A, MK45A, MK50A Valve removal / Installation Tool Kit A

- | | | | |
|-----------|-----------|---|--------|
| Includes: | F27516000 | Valve O-ring install. | Qty. 1 |
| | F27516200 | F27513400 handle + F27627700 seat pusher..... | Qty. 1 |
| | F27516400 | Slide hammer..... | Qty. 1 |
| | 800049 | 10 mm threaded bushing..... | Qty. 1 |
| | 520426 | Valve Cage Adapter..... | Qty. 1 |

FKITMKVLP - MK55A, MK60A, MK65A Valve Removal / Installation Tool Kit B

- | | | | |
|-----------|-----------|---|--------|
| Includes: | F27516100 | Outlet valve O-ring assembly tool | Qty. 1 |
| | F27516300 | F27513400 handle + F27627800 seat pusher. | Qty. 1 |
| | F27516400 | Slide hammer. | Qty. 1 |
| | 800049 | 10 mm threaded bushing. | Qty. 1 |
| | 520426 | Valve Cage Adapter..... | Qty. 1 |

F27516600 - Cylinder Removal Tool with Handle - MK - Tool Kit C

- 530078 - Splined Dummy Shaft Tool - 14 TPI Qty. 1**
2500 RPM Gear Box Only

MAINTENANCE LOG

HOURS & DATE

OIL CHANGE							
GREASE							
PACKING REPLACEMENT							
PLUNGER REPLACEMENT							
VALVE REPLACEMENT							



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Ref 300679 Rev.F
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