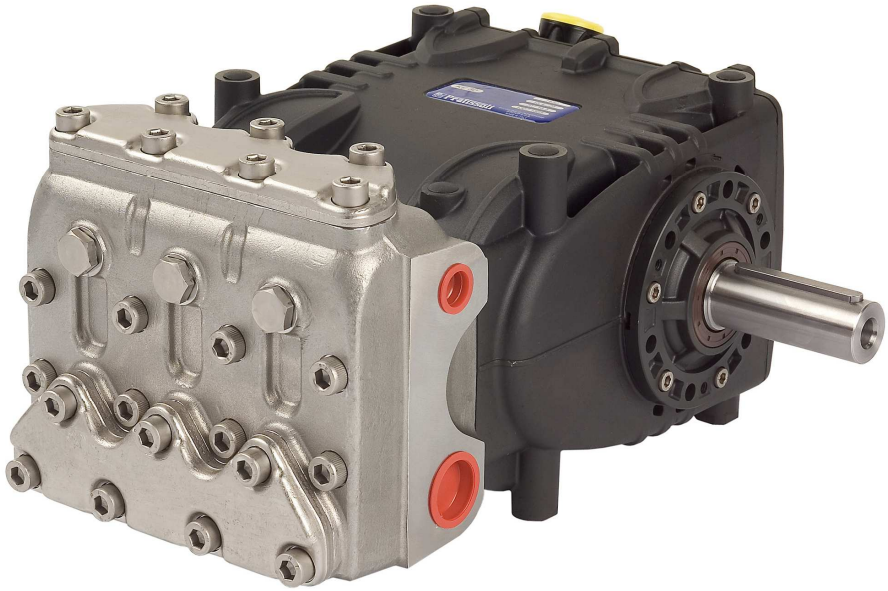
Pratissoli

KE

# *KE Series*



# Repair Manual

## SUMMARY

# 1. INTRODUCTION

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

# 2. REPAIR GUIDELINES

### 2.1 REPAIRING MECHANICAL PARTS

Mechanical parts must be repaired after the oil has been removing from the casing.
To remove the oil, take out: the oil dipstick pos. ① and then the cap pos. ② , fig. 1.

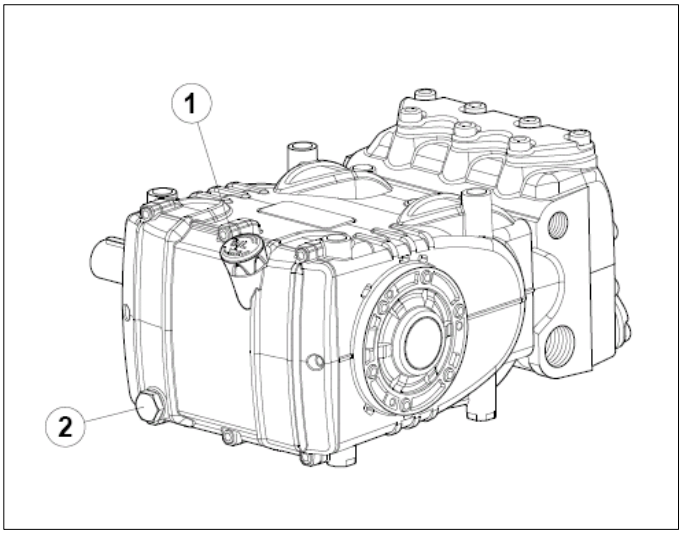



fig. 1

The used 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 operations described must be performed after removing the hydraulic part, ceramic pistons and splash guards from the pump (para. 2.2.3, 2.2.4).**

Remove in the following order:

- the pump shaft tab
- the rear cover
- the con-rod cap as follows:
  unscrew the cap fixing screws, remove the con-rod caps with their lower half-bearings (fig. 2) paying attention to the numbered 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

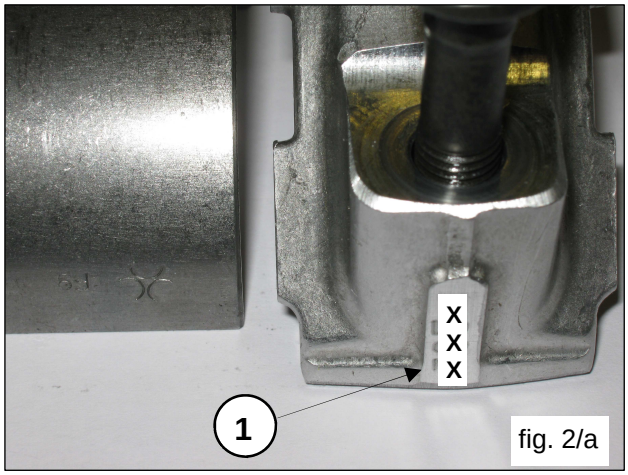



fig. 2/a

- the side covers using for extraction 3 fully threaded M6 x 50 screws, inserting them in the threaded holes as shown in fig. 3

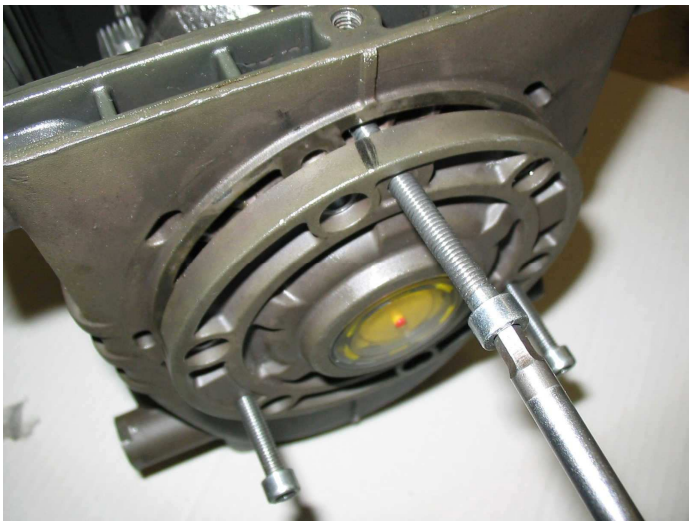


fig. 3

- Push the piston guides forward with their con-rods to facilitate side extraction of the pump shaft as shown fig. 4

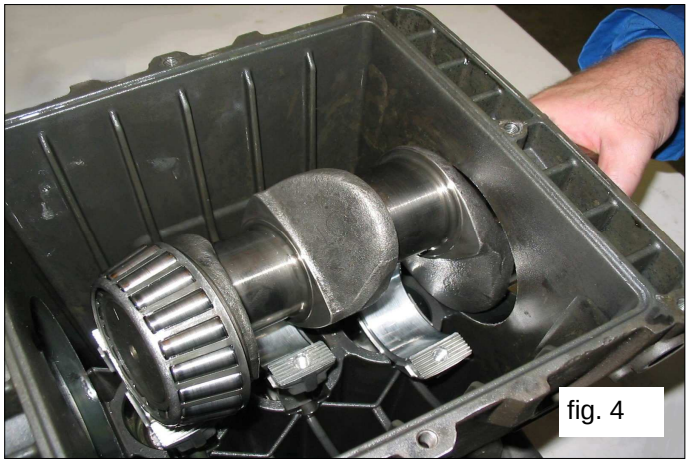


fig. 4

- Remove the pump shaft
- Complete disassembly of the con-rod units by removing them from the pump casing and removing the piston guide pins.
- Remove the pump shaft seal rings using common tools.
- Remove the piston guide seal rings as described below:

Use the extractor, code 26019400 (fig. 5, pos. 1) and the gripper, code 27503800 (fig. 5, pos. 2). Insert the gripper as far as possible onto the seal ring with the aid of a hammer (fig. 5/a), subsequently screwing the extractor to the gripper, and use the extractor hammer (fig. 5/b) until the ring to be replaced is removed (fig. 5/c).

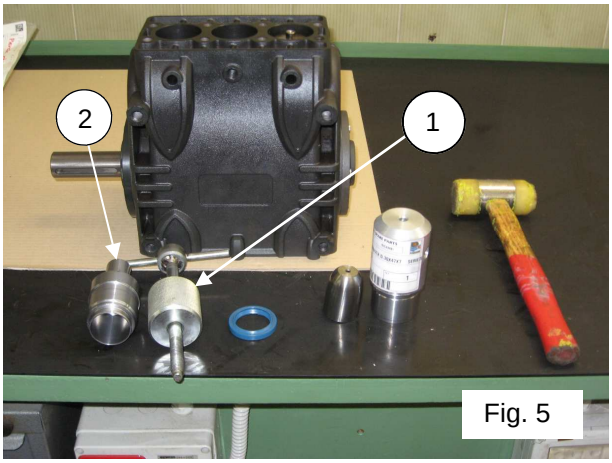


Fig. 5

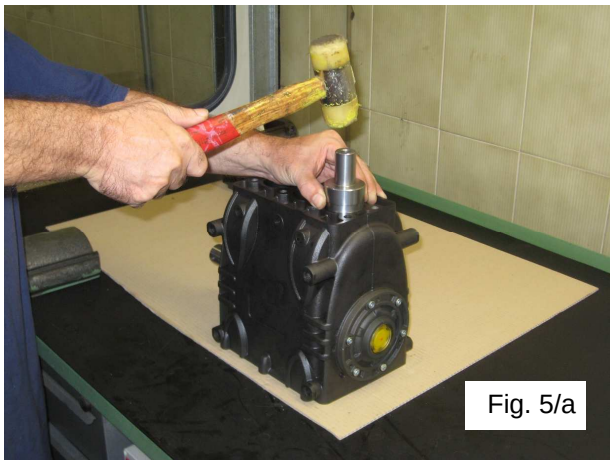


Fig. 5/a

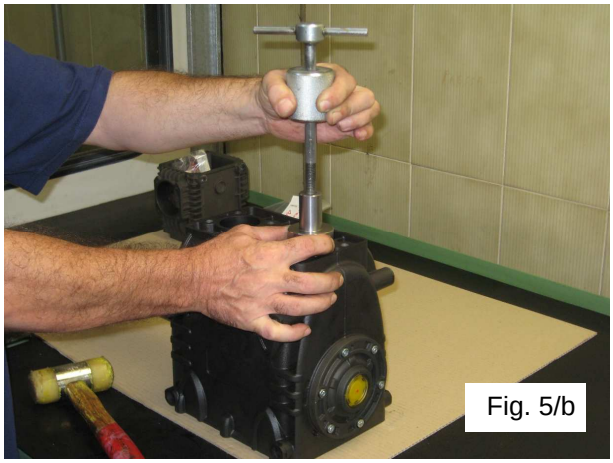


Fig. 5/b

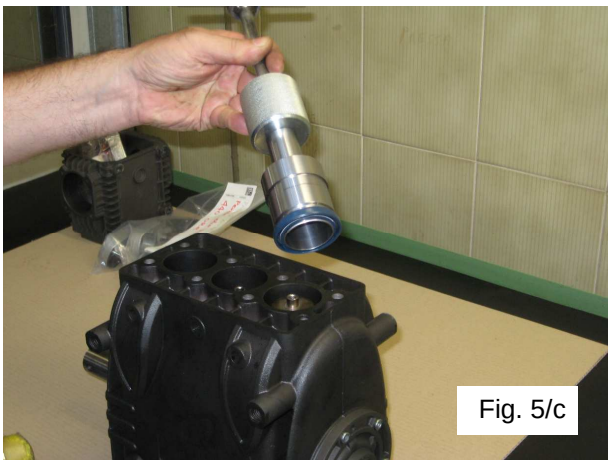


Fig. 5/c

## 2.1.2 REASSEMBLY OF MECHANICAL PARTS

After having checked that the casing is clean, proceed with assembly of the mechanical part as described below:

- 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.**

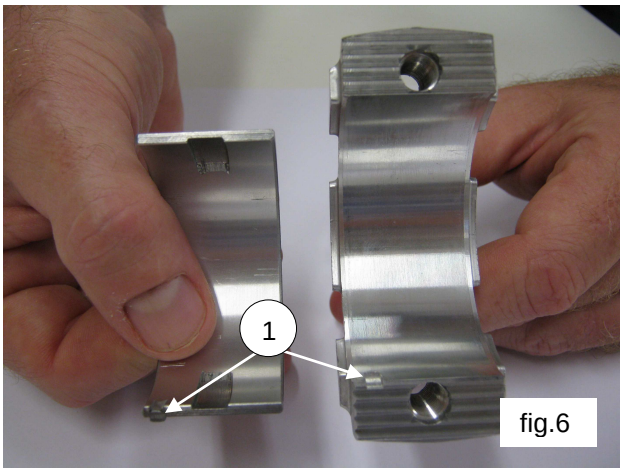


fig.6

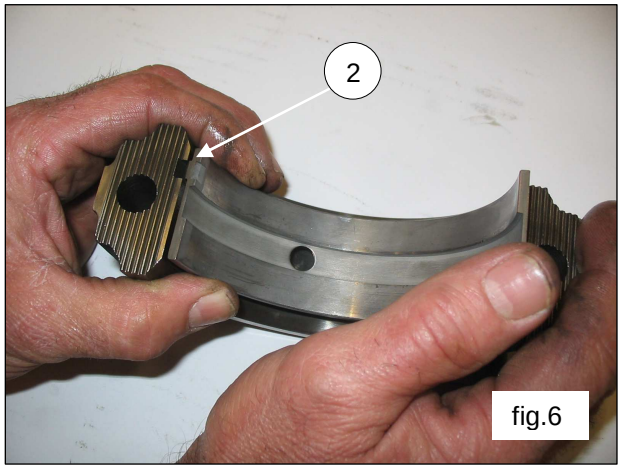


fig.6

- Insert the piston/con-rod guide units into the pump casing, directing the numbering on the con-rod shank towards the top of the casing, taking care not to damage the piston guide seal rings.

To facilitate pump shaft insertion (without the tab), it is essential to repeat the operation performed during disassembly, pushing the piston/con-rod guide units as far down as possible (para. 2.1.1).

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

If replacement is necessary, position the new ring using a tool (code 27904500) as shown in fig. 7.

**If the pump shaft shows diametrical 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 insertion of the covers on the casing, we recommend using three partially-threaded M6 x 40 screws (fig. 8, pos. 1), then completing the operation with the screws supplied ( M6x16 )

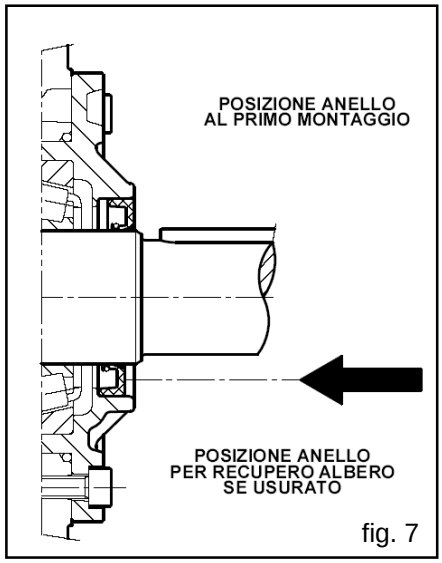


fig. 7

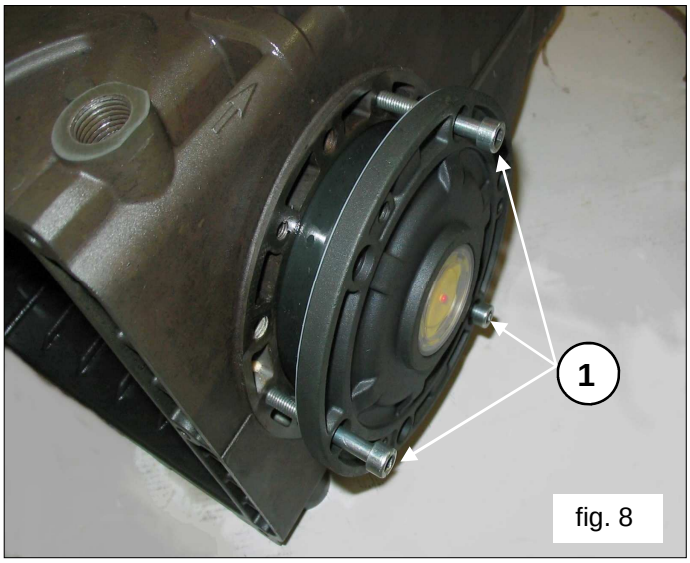


fig. 8

- Couple the con-rod caps to their shanks, referring to the numbering (fig. 9, pos. 1).

**Note the correct assembly direction of the caps.**

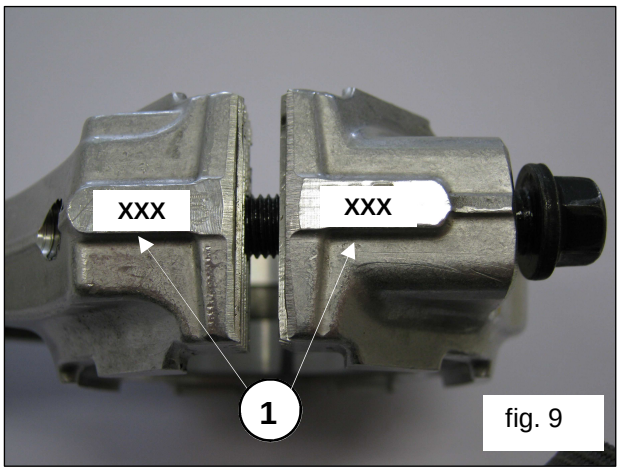


fig. 9

-Fasten the caps to their respective con-rod shanks by means of M8x1x42 screws (fig. 10) lubricating both the underhead and the threaded shank, proceeding in two different stages:

1. **Manually turn the screws until they begin to tighten**
2. **Tightening torque 30 Nm**

**Alternatively, ensure:**

1. **Pre-tightening torque 10 - 15 Nm**
2. **Tightening torque 30 Nm**

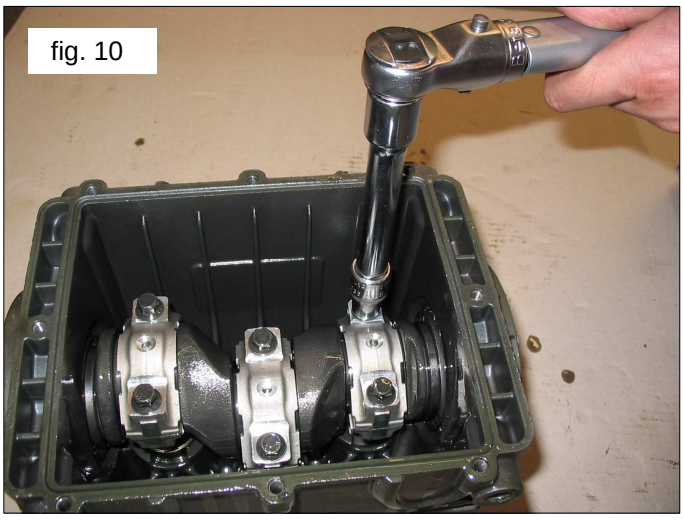


fig. 10

-After having completed tightening operations, check that the con-rod head has a side clearance in both directions.

- Insert the new piston guide seal rings as far as possible into the relative seat on the pump casing (fig. 11), following the procedure described:

use the tool code 27904200, composed of a tapered bush and buffer. Screw the tapered bush into the hole in the piston 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 casing (fig. 11/b), remove the tapered bush (fig. 11/c).

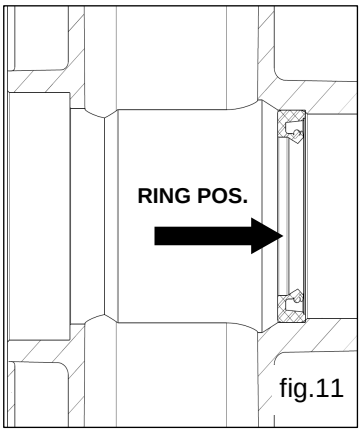


fig.11

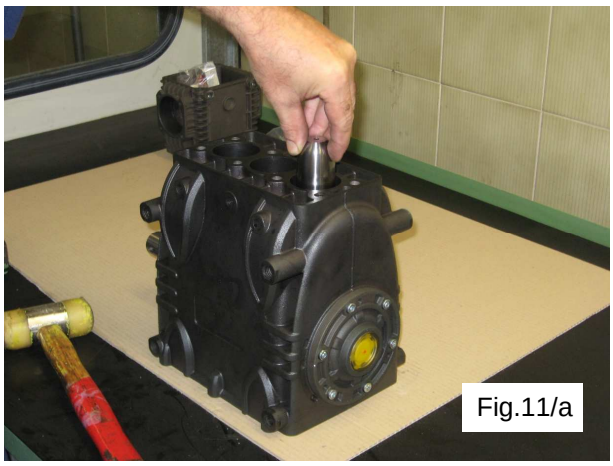


Fig.11/a

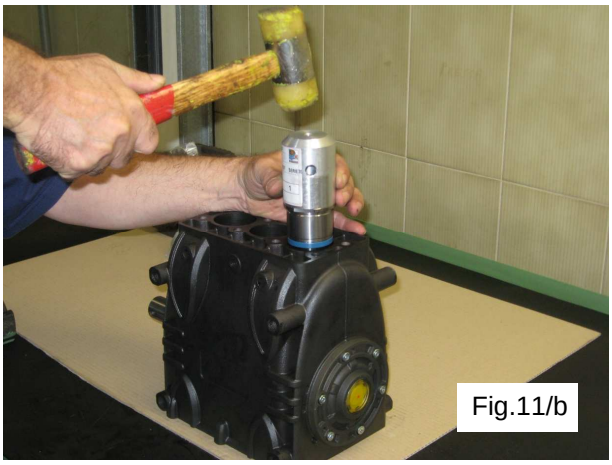


Fig.11/b

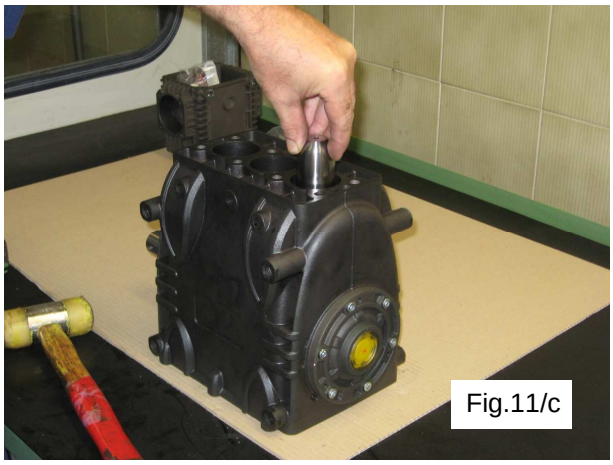


Fig.11/c

- Mount the rear cover complete with the O-ring, positioning the dipstick hole upward.
- Insert oil in the casing as indicated in the use and maintenance manual.

## 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** | **Grinding on the shaft pin diameter (mm)** |
| 0.25 | 90922100 | 90922400 | Ø 39.75 0/-0.02 Ra 0.4 Rt 3.5 |
| 0.50 | 90922200 | 90922500 | Ø 39.50 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 replacement of the bearings

After having removed the side covers as described 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 (indicator side flange + shaft + motor side flange) is assembled and the cover screws have been tightened to the recommended torque, check that the rotation torque of the con-rod shaft - with the con-rod disconnected - is between 4 and 6 Nm.
To bring the two side covers closer to the casing, it is possible to use three M6x40 screws for the first positioning stage as described previously, and the screws provided for final fastening.
The shaft rotation torque (with the con-rod connected) should not exceed 8 Nm.

### B) Disassembly / Reassembly of the bend shaft with replacement of the bearings

After removing the side covers, as described above, remove the outer ring nut on the bearings from its seat on the covers, using an appropriate extractor as shown in fig. 12 and 12/a.
Remove the inner ring nut on the bearings from the two ends of the shaft, again using an appropriate extractor or, alternatively, a simple “pin punch” as shown in fig. 13.

fig.12

fig.12/a

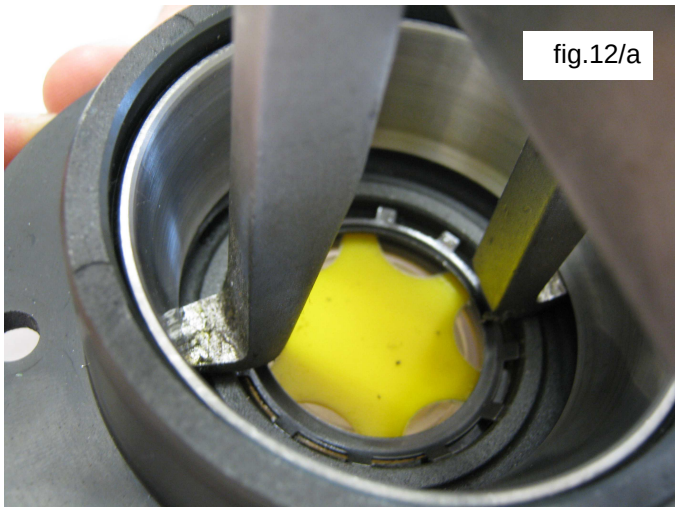


fig.13

The new bearings can be mounted cold with a press or rocker, supporting them on the side 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° F), ensuring that the ring nuts fit fully into their seats.

**Never exchange the parts of the two bearings.**

**Determining the shim pack:**
Perform the operation while the piston/con-rod guide units are assembled, the con-rod caps are disconnected and the con-rods are pushed downwards. Insert the pump shaft without tab into the casing, making sure the PTO shank comes out of the correct side.
Secure the PTO side flange to the casing, taking care with the lip seal as described previously and tighten the fixing screws to the recommended torque.
Then fit the indicator side flange without shims into the casing and start to move it closer, tightening the M6x40 service screws equally by hand, with small rotations that ensure a slow, correct forward movement for the cover.
At the same time, check that the shaft rotates freely by turning it manually.
Continuing the procedure in this way, a sudden increase in hardness during shaft rotation will soon be experienced.
At this point, halt the forward movement 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 casing (see fig. 14).


fig. 14

Proceed to determine the shim pack, using the table below:

| Detected 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<br>0.10 | 1<br>1 |
| From: 0.56 to: 0.60 | 0.25 | 2 |
| From: 0.61 to: 0.70 | 0.35<br>0.25 | 1<br>1 |

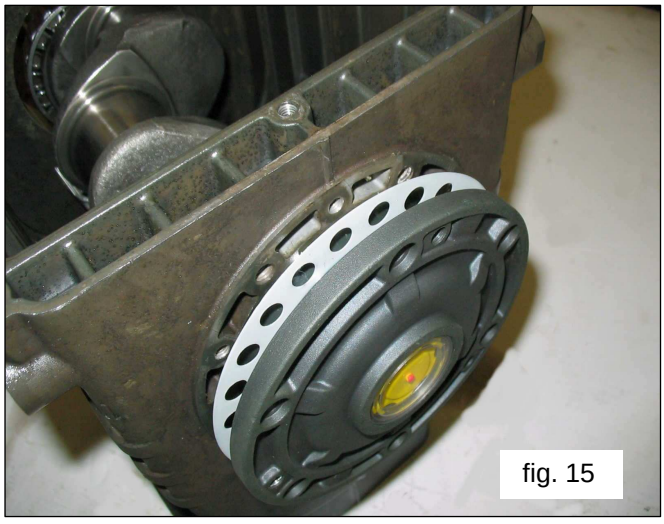


fig. 15

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 centring (fig. 15), secure the cover to the casing, following the procedure in para. 2.1.2 and tighten the screws to their recommended torque.
Check that the shaft rotation stall torque is between 4 Nm and 6 Nm.
If this torque is correct, connect the con-rods to the bend shaft and to the next stages. If it is not, redefine the shim pack, repeating the operations.

## 2.2 REPAIRING HYDRAULIC PARTS

### 2.2.1 DISMANTLING THE HEAD - VALVE UNITS

Operations are limited to inspection or replacement of valves, if necessary.
Proceed as follows to remove the valve units:

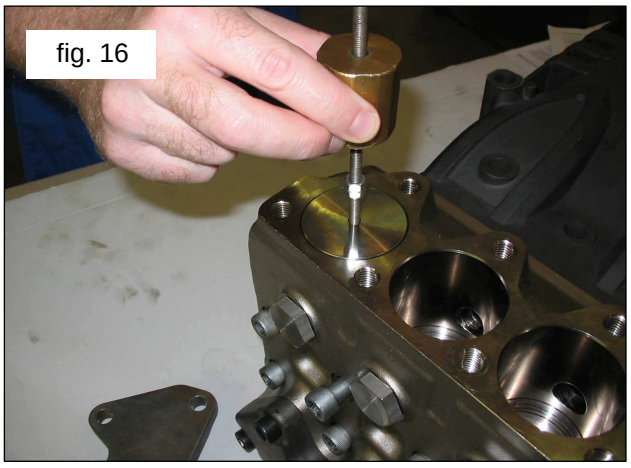


fig. 16

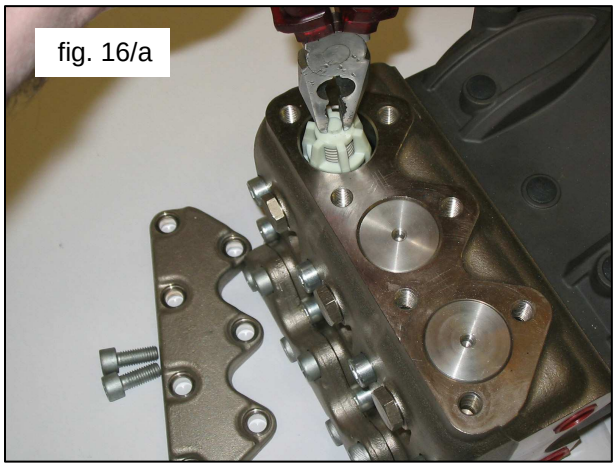


fig. 16/a

- Unscrew the seven M12x35 valve cover fixing screws and remove the covers (fig. 16, 16/a)
- Remove the valve plugs by means of an extractor hammer (code 26019400, fig. 16).
- Remove the valve units using a gripper (fig. 16/a ).

**If the suction and outlet valve seats remain stuck on the head (for example because of incrustations due to prolonged lack of use of the pump), proceed as follows:**
- use the extractor hammer used for the valve plugs (code 26019400 combined with the tool code 27513700); as shown in fig. 16/b.

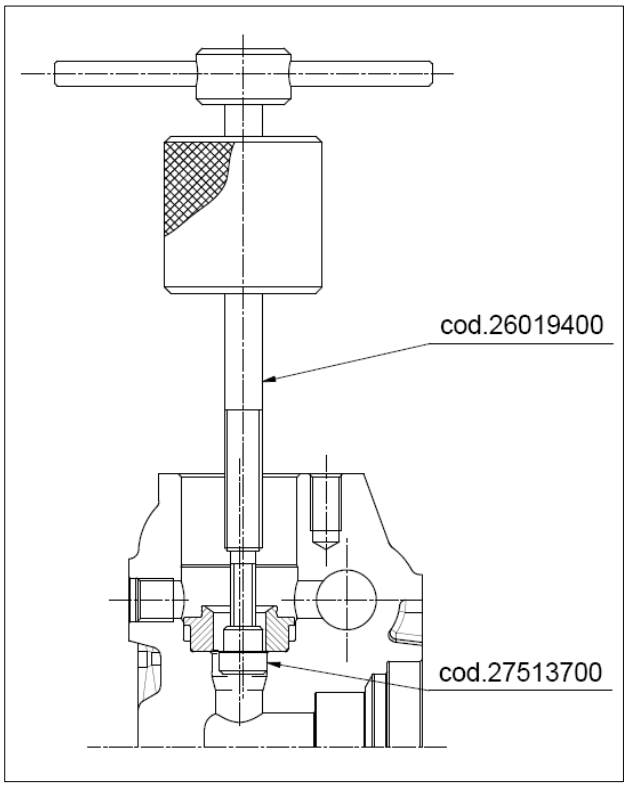


Fig.16/b

Disassemble the suction and outlet valve units, screwing a sufficiently long M8 screw in such a way as to be able to reach the valve plate and extract the valve guide from the valve seat (fig. 17, pos. 1)

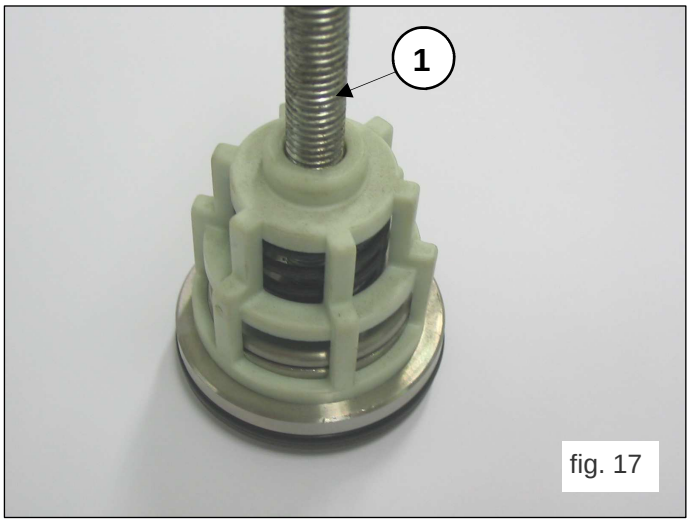



fig. 17

## 2.2.2 REASSEMBLING THE HEAD – VALVE UNITS

**Do not invert the springs on the suction valve units with those on the exhaust valve units as in some models these are not interchangeable.**

Pay particular attention to the conditions of the various components and replace if necessary, and at the intervals indicated in the “PREVENTIVE MAINTENANCE” table in chapter 11 of the use and maintenance manual.
**At every valve inspection, replace all O-rings and all anti-extrusion rings, both in the valve units and on the valve plugs.**

Before repositioning the valve units, thoroughly clean and dry the relative seats in the head as shown in fig 18.

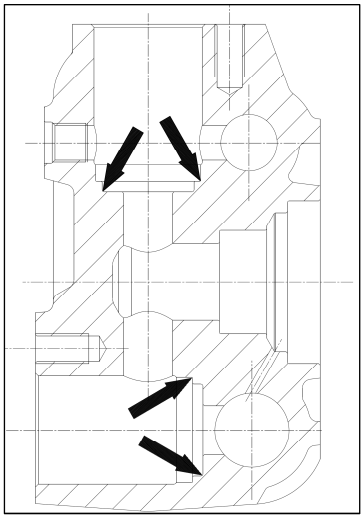


fig. 18

To reassemble the various components, perform the operations listed above described in point. 2.2.1 in reverse order. To facilitate insertion of the valve guide in its seat, you can use a bush resting on the horizontal guide planes and use a hammer acting on the whole circumference (fig. 19/a).

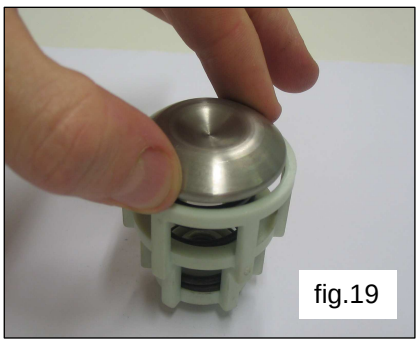


fig.19

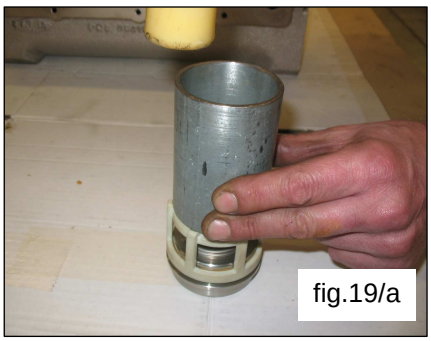


fig.19/a

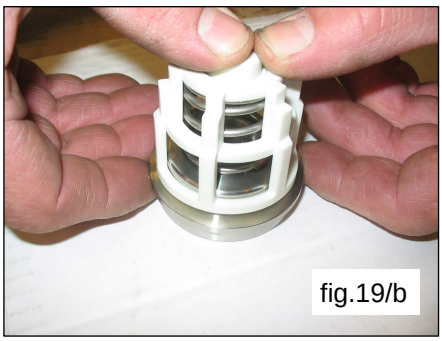


fig.19/b

**Insert the suction and outlet valve units, checking that they are fully inserted in the head seat.**
**Then apply the valve covers and calibrate the respective M10x25 screws with a torque wrench at the specified torque.**

## 2.2.3 DISMANTLING THE HEAD - SEALS

Replacement of the seals is necessary from the moment you begin to detect water leaks from the drainage holes provided on the back of the pump casing, and at the intervals indicated in the “PREVENTIVE MAINTENANCE” table in chapter 11 of the use and maintenance manual.

A) Unscrew the M10x110 head fixing screws as indicated in fig. 20.

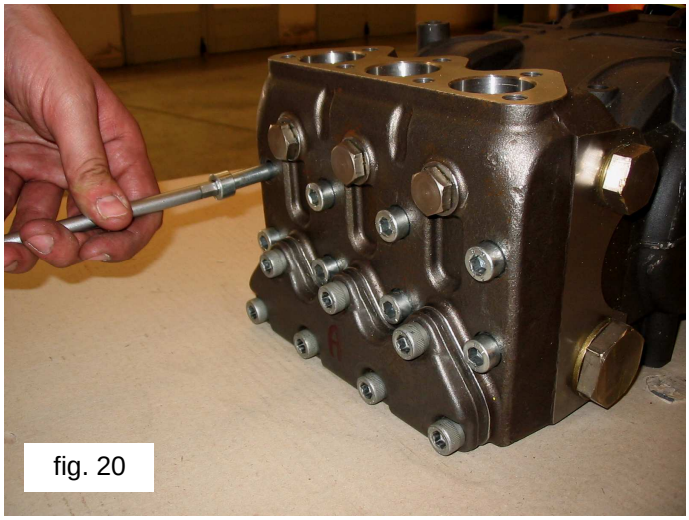


fig. 20

B) Separate the head from the pump casing.
C) Extract the high pressure seals from the head and the low pressure ones from the support, using simple tools as indicated in fig. 21, being careful not to damage the respective seats.

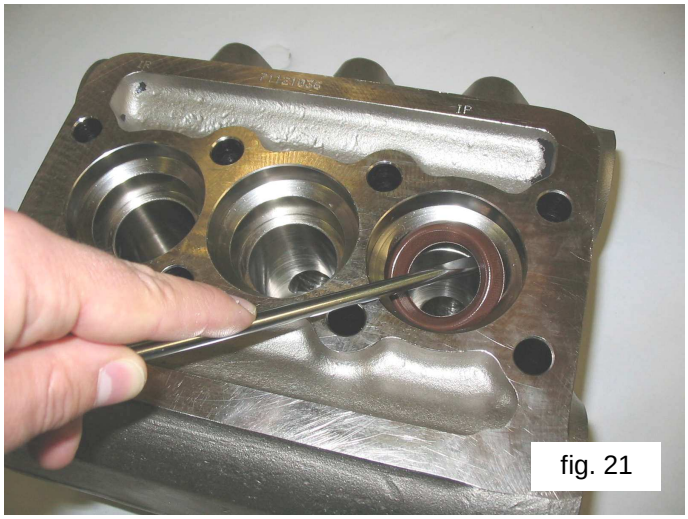


fig. 21

**Pay attention to the order of seal pack disassembly as indicated in fig. 22 composed of:**

1. Head ring
2. HP seal
3. Restop ring
4. Seal support
5. LP Seal
6. Seal ring
7. O-ring

fig. 22

**2.2.4 DISMANTLING THE PISTON UNIT**

The piston unit does not require any routine maintenance. Maintenance is limited to visual checks only. Proceed as follows to remove the piston units:

A) Unscrew the piston fixing screws as indicated in fig. 23.

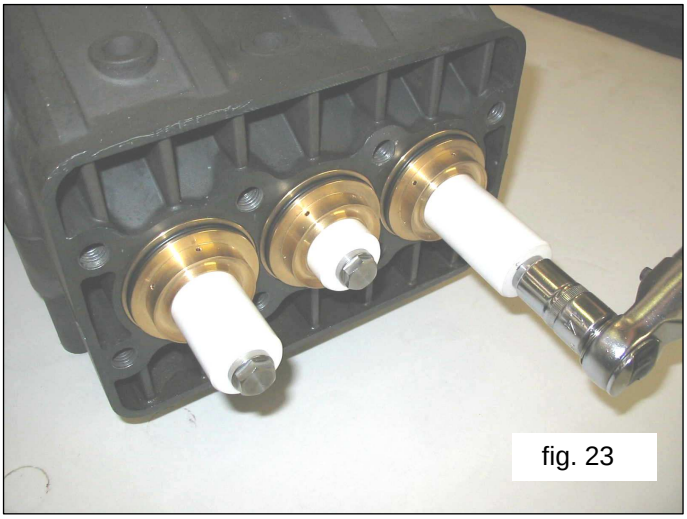


fig. 23

B) Check and verify their conditions, replace if necessary.

**At every disassembly, all O-rings on the piston unit must be replaced**

## 2.2.5 REPLACING THE HEAD - SEALS - PISTON UNIT

To reassemble the various components, perform the operations listed above described in point 2.2.3 in reverse order, taking particular care with the following:

A ) Seal pack: respect the same order used during disassembly operations.

B ) Lubricate components ②③⑤ with OCILIS silicone grease code 12001600. This operation is also deemed necessary to facilitate adjustment of the lip seal on the piston.

C ) For correct assembly of HP seals in their seats on the head without causing any damage to lip seals, use suitable tools according to the pump diameters as indicated in chapter 5.

D ) Replace the pistons, tightening the screws with a torque wrench, respecting the tightening torque value as indicated in chapter 3.

E ) Assemble the head: for the values of the torques and tightening sequences follow the instructions in chapter 3.

# 3. SCREW TIGHTENING CALIBRATION

| Description | Exploded draw. position | Tightening torque Nm |
|---|---|---|
| Cover fix. screw | 9 | 10 |
| Piston fix. screw | 28 | 20 |
| Con-rod cap fix. screw | 16 | 30* |
| Valve cover fix. screw | 38 | 80** |
| Head fix. screw | 37 | 40*** |
| Type "A" flange fix. screw | 62 | 22 |
| SAE B camp. fix. screw | 64 | 40 |
| PTO 2nd flange fix. screw | 72 | 145**** |
| | | |

* The con-rod cap fixing screws must be tightened respecting the stages indicated on page 7

** The head fixing screws must be tightened with a torque wrench, lubricating the underhead, respecting the order in fig. 24

*** The valve cover fixing screws must be tightened with a torque wrench, lubricating the underhead, respecting the order in fig. 24

**** The 2nd flange PTO fixing screw must be tightened with a torque wrench, using Loctite 243 Blue

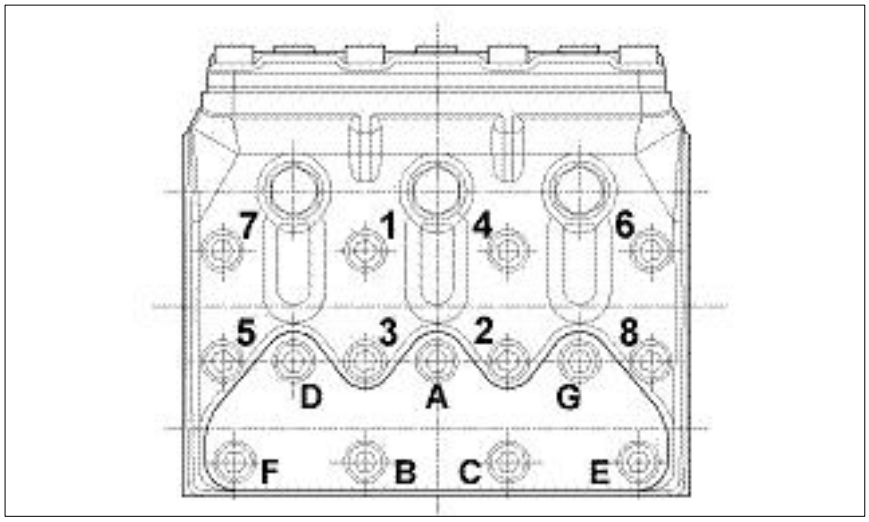



fig. 24

# 4. REPLACING THE CON-ROD FOOT BUSH

During maintenance, if it becomes necessary to replace the con-rod foot bush, proceed as follows:

**When removing the worn bushing, take great care not to damage or scratch the seat on the con-rod.**

Perform cold press fitting of the new bush. During this operation, ensure that:

- the lubrication hole coincides with the corresponding hole on the con-rod;
- the cutting junction is directed as shown in fig. 25.

Then perform mechanical processing. The dimensions and tolerances shown in fig. 25 MUST be respected.

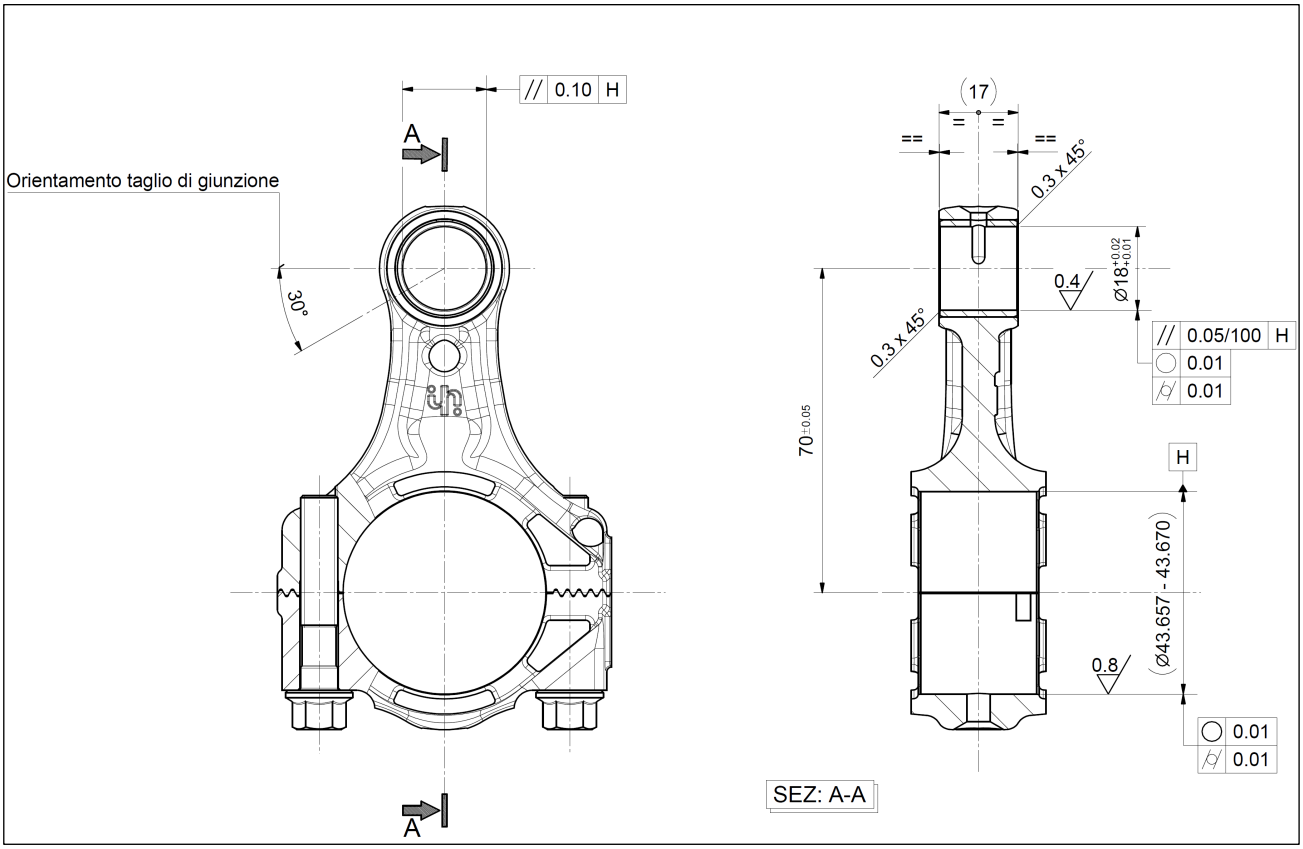



fig. 25

# 5. REPAIR TOOLS

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

**For the assembly stages:**

| | |
|---|---|
| Seal bush Øe 35 ; HP alternative seal ring Ø 20x35x7.5/4. 5 | code 26134600<br>code 27465600 |
| Seal bush Øe 35 ; HP alternative seal ring Ø 22x35x7/4.5 | code 26134600<br>code 27465600 |
| Seal bush Øe 35 ; HP alternative seal ring Ø 24x35x6/4 | code 26134600<br>code 27465600 |
| Seal bush Øe 45 ; HP alternative seal ring Ø 28x45x5.5/5 | code 26406300<br>code 27465700 |
| Seal bush Øe 45 ; HP alternative seal ring Ø 30x45x7.5/4.5 | code 26406300<br>code 27465700 |
| Seal bush Øe 48 ; HP alternative seal ring Ø 36x48x6/3.5 | code 26406300<br>code 27465800 |
| Buffer for pump shaft oil seal | code 27904500 |
| Buffer for piston guide oil seal | code 27904200 |

**For the disassembly stages:**

| | |
|---|---|
| Seal gripper Øe 35 ; HP alternative seal ring Ø 20x35x7.5/4. 5 | code 26019400<br>code 26093400 |
| Seal gripper Øe 35 ; HP alternative seal ring Ø 22x35x7/4.5 | code 26019400<br>code 26093500 |
| Seal gripper Øe 35 ; HP alternative seal ring Ø 24x35x6/4 | code 26019400<br>code 26093600 |
| Suction/outlet valves | code 26019400 |
| Suction/outlet valve seats | code 26019400<br>code 27513700 |
| Suction and outlet valve plug | code 26019400 |
| Piston guide oil seal extraction gripper | code 26019400<br>code 27503800 |

**Code 70980503/1 - Code IE 2860000024/1 – 13/10/2011**
**Data contained in this document may change without notice.**

**PRATISSOLI a brand of INTERPUMP GROUP SPA**
42049 S.ILARIO - REGGIO EMILIA ( ITALY )
Tel. ***+39 - 0522 - 904311*** Fax ***+39 - 0522 - 904444***
E-mail: info@pratissolipompe.com
http://www.pratissolipompe.com