KS Series

Repair manual

INDEX

1. INTRODUCTION

This manual describes the instructions for repairing KS 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.

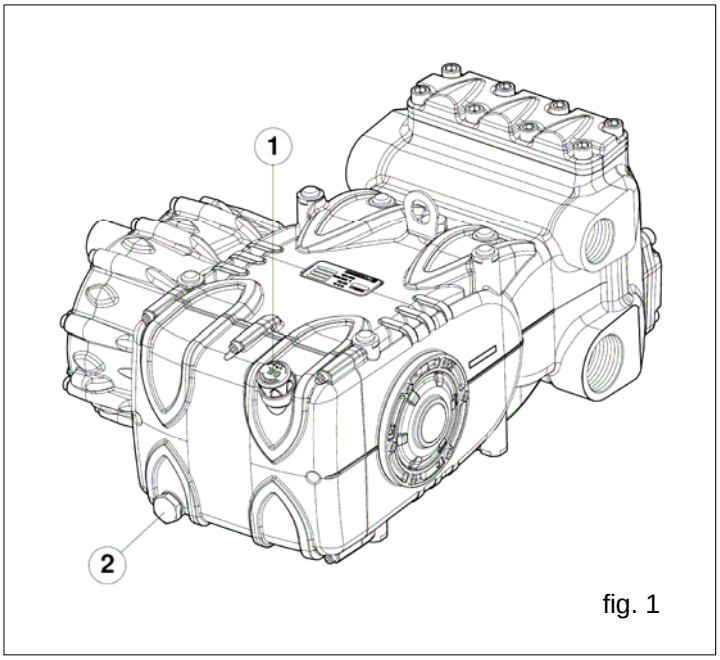


fig. 1

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 M6x50 screws, inserting them in the apposite holes as shown in fig. 2

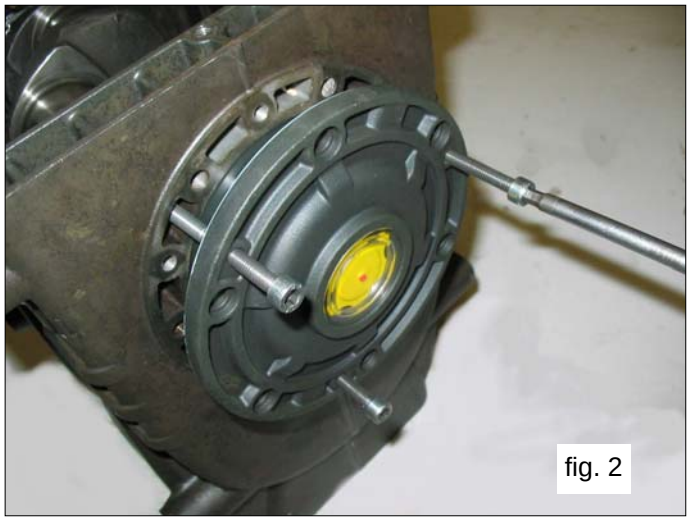


fig. 2

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.

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

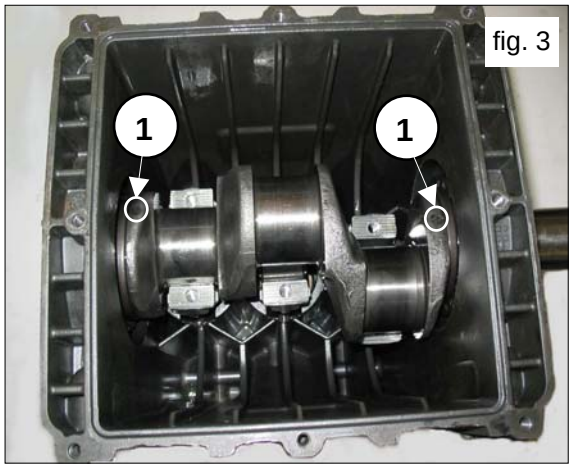


fig. 3

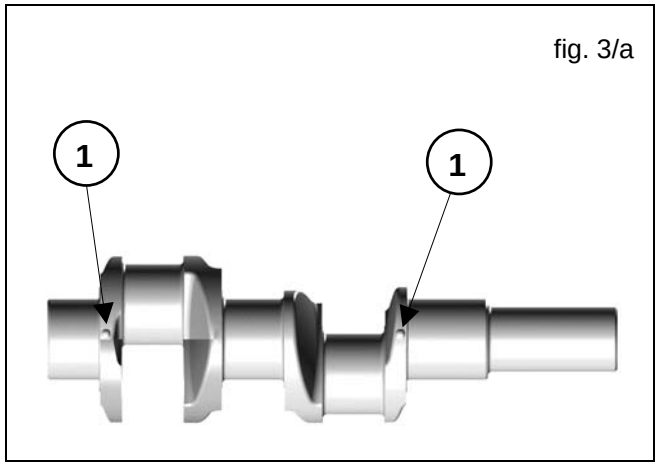


fig. 3/a

Disassemble the connecting rod unit - pin - piston guide.
Proceed with disassembly of 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. 4, using the apposite tool (cod.27904900).

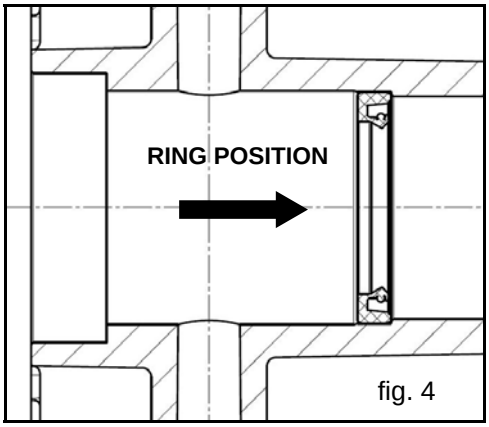


fig. 4

Introduce the pre-assembled piston guide / connecting rod units into their seat; 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 indicated in fig. 5.


fig. 5

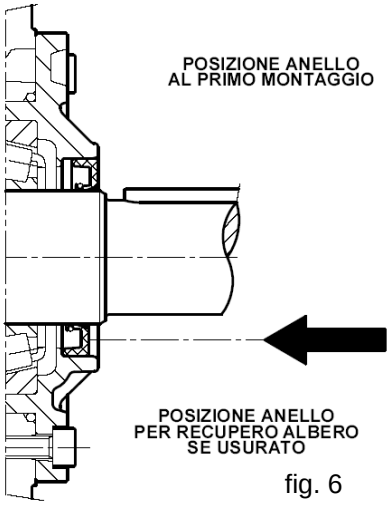


fig. 6

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

Before reassembly of the side covers, check the conditions of the radial ring lips. If replacement is needed, position the new ring using the tool cod. 27904800 as shown in fig. 6.

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. 6.

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 M6x40, and then finish the operation with the screws supplied (M6x18) as shown in pos.①, fig. 7.

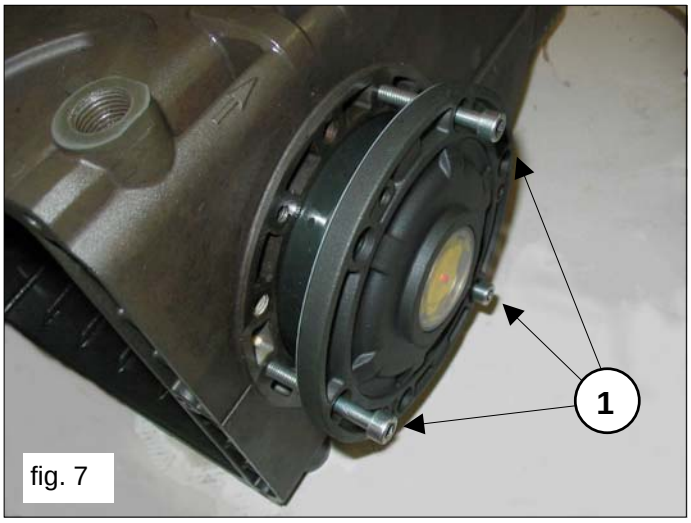


fig. 7

Install the connecting rod cap respecting numbering, and fasten the relevant bolts (lubricating both the head and the threaded stem) proceeding in three different steps, see fig. 8:

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

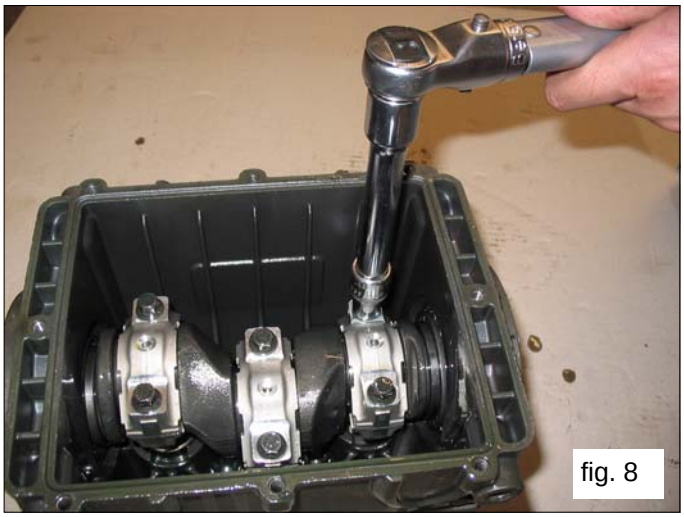


fig. 8

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 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. 7, 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 indicated in figures 9 - 10.

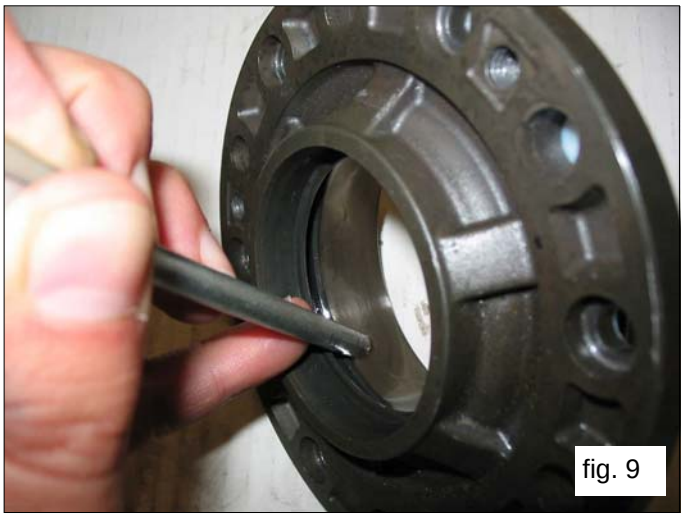


fig. 9

fig. 10

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 using a thickness gauge (see fig. 11).

fig. 11

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. 12

Insert the shims under the cover on the sight glass side (see fig. 12), 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.

2.1.4 Disassembly of the reducer unit

Remove the fastening screws of the reducer case cover.

In the apposite holes, position and screw on n.3 threaded dowels or M8 screws (pos.①, fig.13) having the function of extractors; simultaneously, hammer on the pinion so that the bearing remains attached when extracting the cover (fig.14).

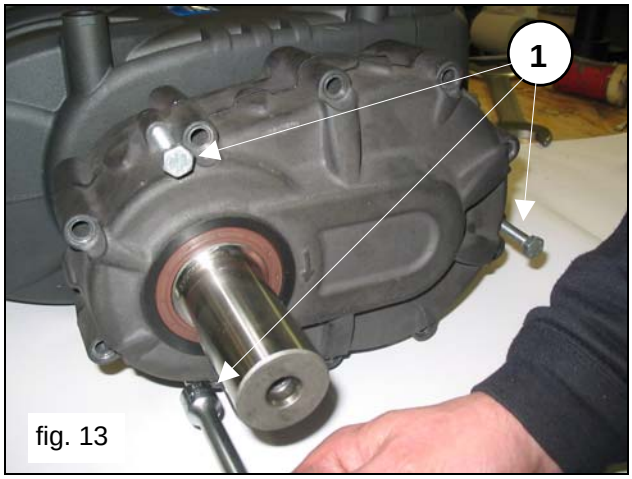


fig. 13


fig. 14

Remove the reducer case cover and extract the bearing from the pinion using standard tools (fig.15)

Remove the ring gear fastening screws with the related washer, and extract the ring gear.

If necessary, use a slide hammer applying it to two M8 holes (pos.①, fig.16), or a standard extraction tool (fig.16).


fig. 15

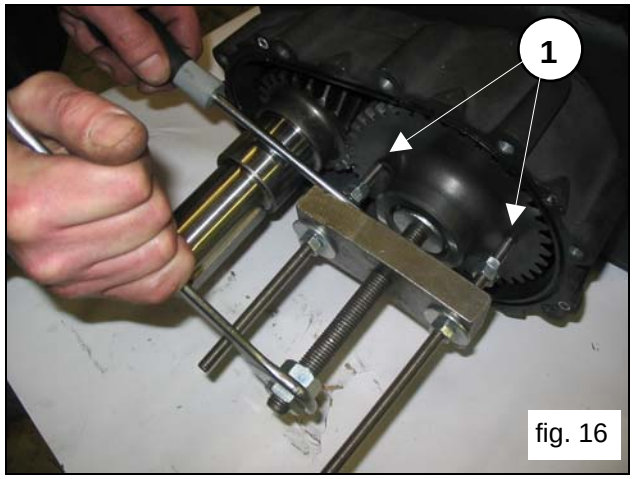


fig. 16

Remove the pinion using a slide hammer applying it to the M12 hole (fig.17).

Unfasten the reducer case screws; then remove the reducer case (fig.18).

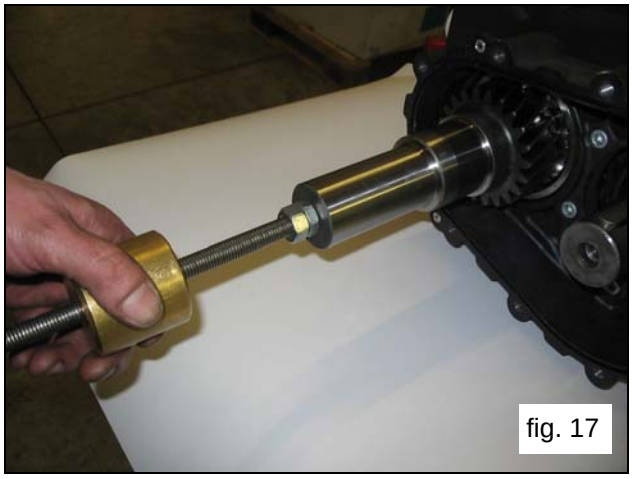


fig. 17

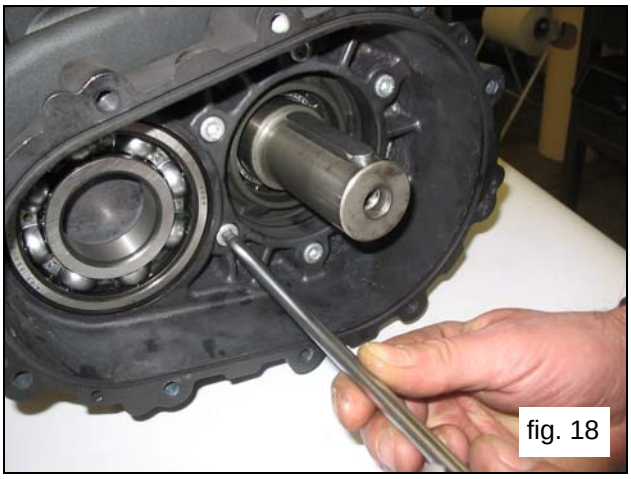


fig. 18

2.1.5 Reassembly of the reducer unit
Pre-assemble the reducer case bearing using standard tools.
Position the gasket (fig.19) and assemble the reducer case being careful to align the hole on the reducer case with the reference pin present on the crankcase (pos.①, fig.20)


fig. 19

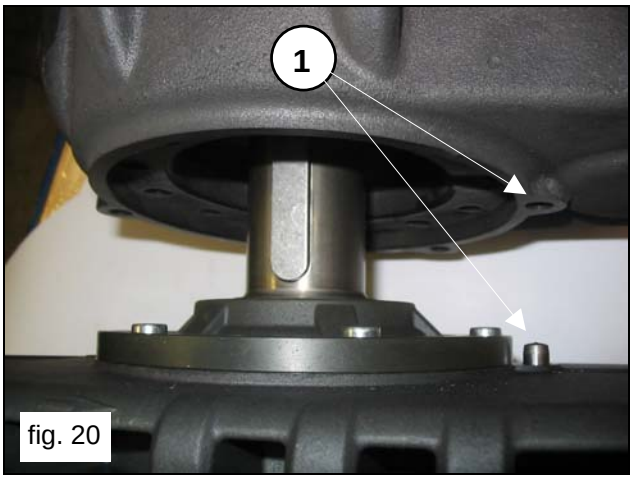


fig. 20

Fasten the reducer case with the 6 M8x50 screws, and calibrate the screws with the torque wrench (fig.21) as indicated in paragraph 3.
Insert the ring gear on the shaft, insert the washer, and use a torque wrench to tighten the screw to the value indicated in paragraph 3 (fig.22).


fig. 21


fig. 22

Apply the two ∅5 pins to the reducer case (pos.①, fig.23). Preassemble the bearing on the pinion and insert it thoroughly in the seat on the reducer case using a slide hammer (fig.24).

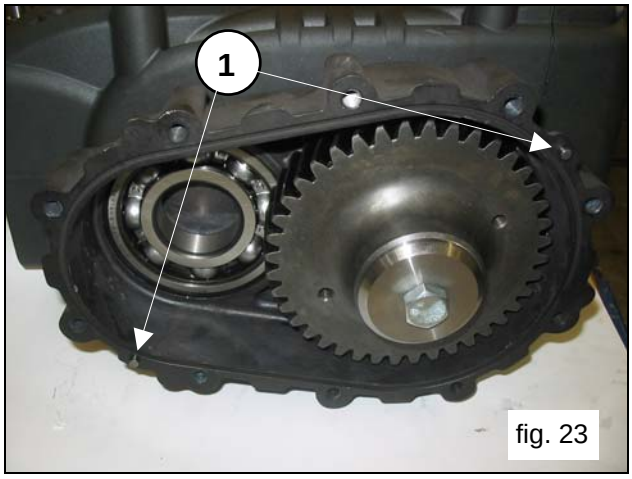


fig. 23


fig. 24

The bearings and the ring gear may be mounted at room temperature. The driving operation could be facilitated by heating the interested parts to a temperature ranging between 120° - 150°C (250° - 300° F), being sure that the ring nuts fit thoroughly into their seats.

Insert the OR gasket in the apposite seat of the reducer case (fig.25).
Position the reducer case on the pinion bearing; use two screws or two M8 threaded dowels to maintain the cover in position during the subsequent assembly operation (pos.①, fig.26).
Assemble the reducer case cover using a stopper pressing against the surface of the cover, or use the apposite tool cod. 27517400 (fig.26a).
Facilitate the operation by simultaneously fastening some of the screws (pos.②, fig.26).


fig. 25

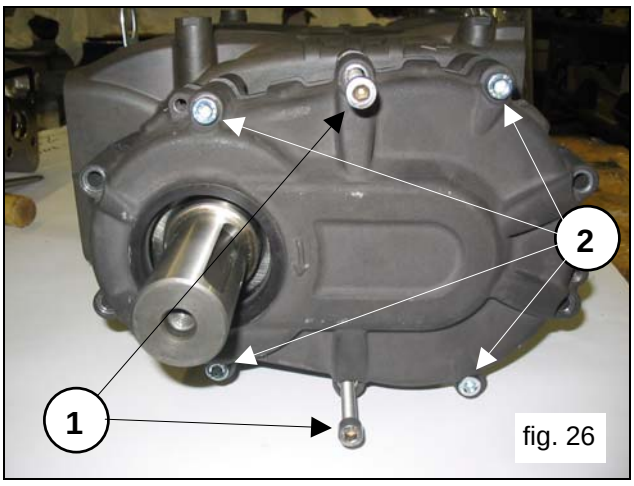


fig. 26

Fasten the reducer case cover with the 10 screws M8x50 and calibrate the screws using a torque wrench (fig.27) as indicated in paragraph 3.


fig. 26a

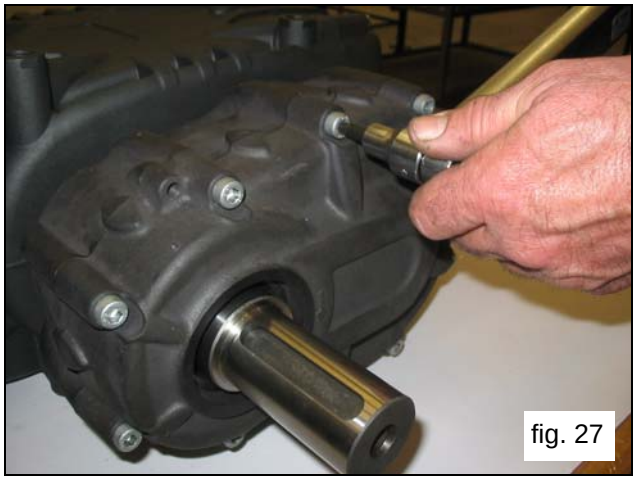
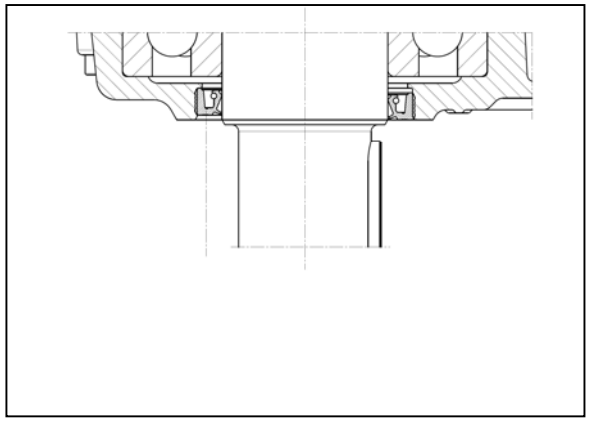


fig. 27

Verify the conditions of the sealing lip of the pinion oil wiper; replace if necessary using the tool cod. 27904800.

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 indicated in fig. 28.

After completely assembling the reducer unit, verify the rolling of the pinion.



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

2.1.6 Version change - Application / Removal of the reducer unit

To change the version and apply the reducer unit where not foreseen, it's necessary to remove the shaft oil wiper (pos.① fig.29) and insert the reducer unit ∅8 reference pin on the crank shaft (pos.② fig.29). Therefore proceed with the operations specified in paragraph 2.1.5.

To change the version and remove the reducer unit where expected, it's necessary to insert the shaft oil wiper using the tool cod. 27904800 (pos.①, fig.29).

fig. 29

Skipping the operations described in paragraph 2.1.6 will jeopardise the correct operation of the pump and the operator's safety.

2.2 Fluid End Repair

2.2.1 Disassembly of the head - valve units

The head requires preventive maintenance as indicated in the use and maintenance manual.
Service operations are limited to valve inspection or replacement if needed.
To extract the valve units proceed as follows:

Unfasten the 8 M12x35 valve cover screws, and remove the covers (fig.30).

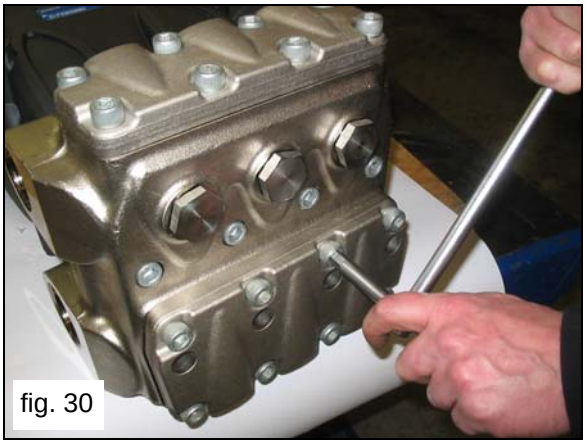


fig. 30

Extract the valve plugs using a slide hammer cod. 26019400 combined with the tool cod. 27513600 (fig.31).
Extract the valve units using the same slide hammer used for the valve plugs; it is applied to the M10 hole of the valve guide (fig.32).


fig. 31


fig. 32

If the extraction of the delivery and suction valve units is particularly difficult (for example due to incrustations caused by prolonged pump inactivity), use the extraction tool (cod. 27516900 combined with the tool cod. 26019400).

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 (pos. ④ fig. 33).

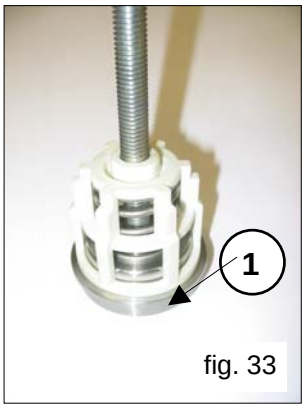


fig. 33

2.2.2 Head assembly - valve units

Pay careful attention to state of wear of the various components; replace them when necessary, and in any case within the intervals indicated in the table in 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. 34.

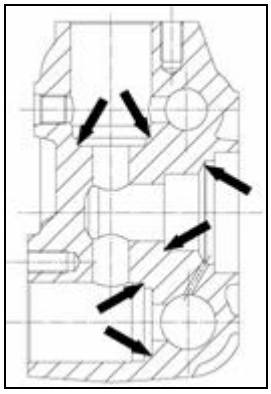


fig. 34

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

During the assembly of the suction and delivery valve units (fig. 35 - fig. 36 - fig. 36a) do not invert the suction springs with the previously disassembled delivery springs:

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

To facilitate the insertion of the valve guide into its seat, use a pipe that lays on the horizontal shoulders of the guide (fig. 36a) and use a hammer acting on the entire circumference.

fig. 35

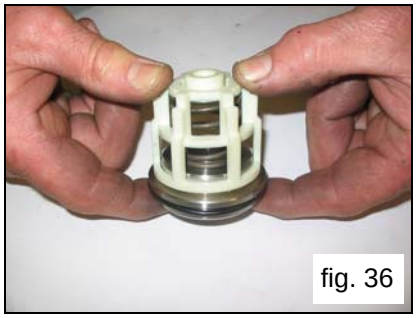


fig. 36

fig. 36a

Insert the suction and delivery valve units checking that are thoroughly inserted in the head seat. Therefore apply the valve covers and proceed with calibrating the related M12x35 screws with a torque wrench as indicated in Chapter 3 .

2.2.3 Disassembly of the head - seals

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

Remove the 4 closing plugs for the holes on the suction valve cover (fig. 37).
Unfasten the two external head screws M12x160, replacing them with two threaded bars M12 (pos.①, fig. 38) to avoid damaging the pistons; then proceed with removing the rest of the screws.

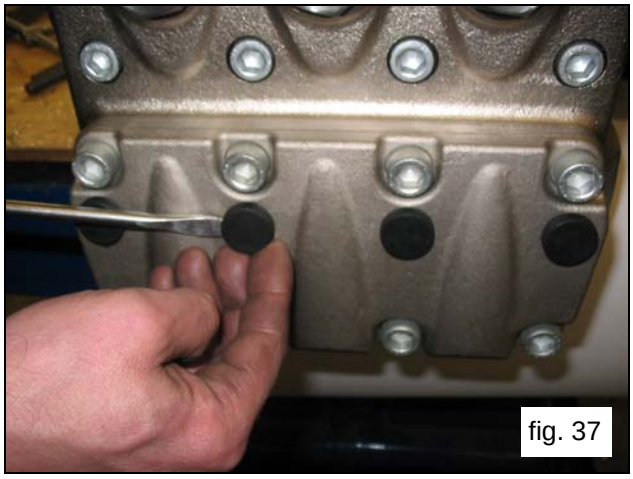


fig. 37

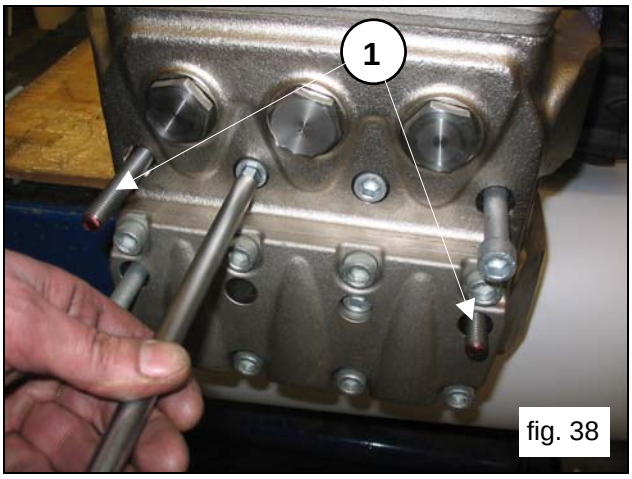


fig. 38

Remove the head from the crankcase.
Extract the high pressure seals from the head, and the low pressure seals from their related support; be careful not to damage the seats (fig. 39).


fig. 39

Pay careful attention to the order of sealing pack disassembly as shown in fig. 40, 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

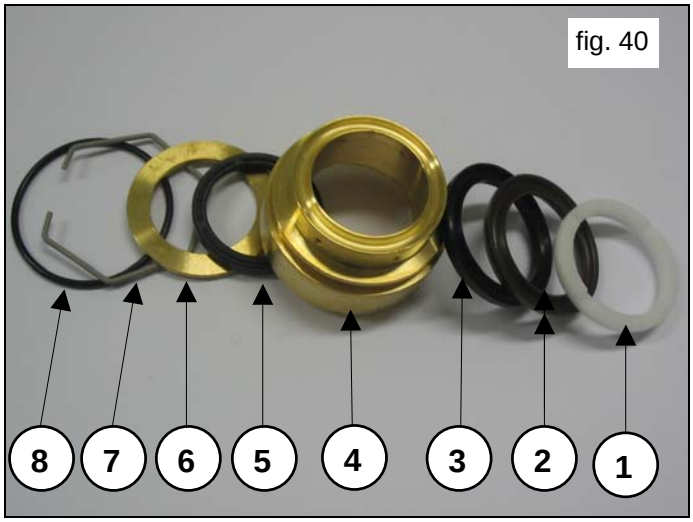


fig. 40

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 M7x1 piston screws as shown in fig. 41.


fig. 41

Check for wear; replace them if necessary.

At each disassembly, all the OR rings of the piston unit must be replaced (pos.①, fig. 42).

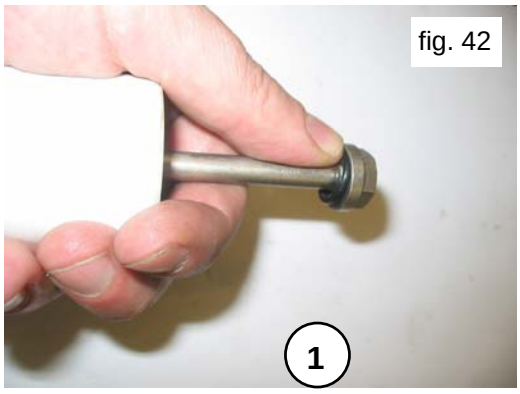


fig. 42

2.2.5 Head assembly - seals - piston unit

To reassemble the various components, invert the previously listed operations as indicated in paragraph 2.2.3, paying particular attention to:

The sealing packs: respect the same order of disassembly.

Lubricate the components ②③⑤ (fig. 40) with OCILIS type silicone grease cod. 12001600; this operation is considered necessary to facilitate the settling of the sealing lips on the piston.

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.

Reassemble the pistons by fastening the screws with an apposite torque wrench, respecting the fastening torque value indicated in Chapter 3.

Assemble the head: for fastening torque values and fastening sequences, respect the indications of Chapter 3.

3. SCREW CALIBRATION

DESCRIPTION	Exploded view position	Fastening Torque Nm
Cover fastening screws	9 – 10	10
Piston fastening screws	33	20
Conrod cap fastening screws	21	38 *
Head fastening screws	43	120 * *
Valve cover screws	45	120 * * *
Lifting bracket fastening screws	20	100
Oil discharge plug	11	40
Delivery duct plug	57	40
Reducer case and cover fastening screw	68	40
Ring gear fastening screw	71	70

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

* * The head fastening screws, exploded view position 43, must be tightened with a torque wrench, lubricating the threaded stem.

* * * The valve cover fastening screws, exploded view position 45, must be tightened with a torque wrench, lubricating the threaded stem and respecting the order indicated in the scheme in fig. 43.

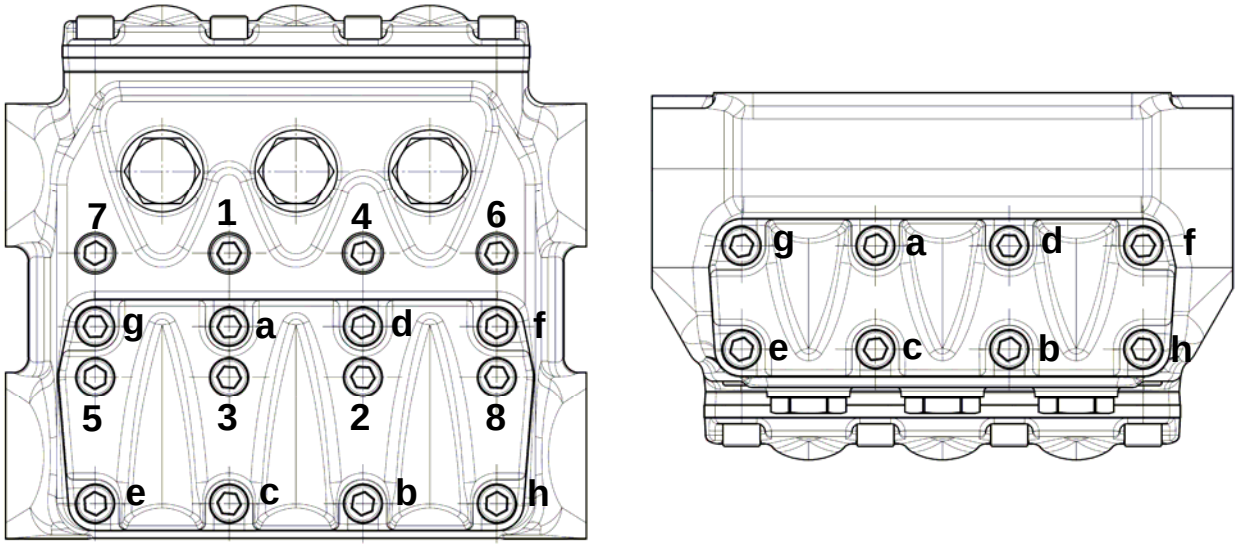


fig. 43

4. REPAIR TOOLS

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

For assembly:

Gasket bush	Øe 45 ; H.P. alternative sealing ring Ø 28x45x8.5/5	cod. 27473000
Gasket bush	Øe 44 ; H.P. alternative sealing ring Ø 32x44x6/3.5	cod. 27517200
Gasket bush	Øe 48 ; H.P. alternative sealing ring Ø 36x48x6/3.5	cod. 27473300
Gasket bush	Øe 55 ; H.P. alternative sealing ring Ø 40x55x7.5/4.5	cod. 27473100
Gasket bush	Øe 36 ; L..P. alternative sealing ring Ø 28x36x5.5	cod. 27470900
Gasket bush	Øe 40 ; L..P. alternative sealing ring Ø 32x40x5.5	cod. 27517300
Gasket bush	Øe 44 ; L..P. alternative sealing ring Ø 36x44x5.5	cod. 27471100
Gasket bush	Øe 48 ; L..P. alternative sealing ring Ø 40x48x5.5	cod. 27471300
Stopper for pump shaft oil wiper / pinion reducer		cod. 27904800
Piston guide oil seal stopper		cod. 27904900
Stopper for reducer case cover		cod. 27517400

For disassembly:

Suction / Delivery valves	cod. 26019400 cod. 27516900
Suction and delivery valve plug	cod. 26019400 cod. 27513600
Piston guide oil seal	cod. 27503900

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Cod. 72980103 - Cod.IE 2860000014 – 20/11/2007
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