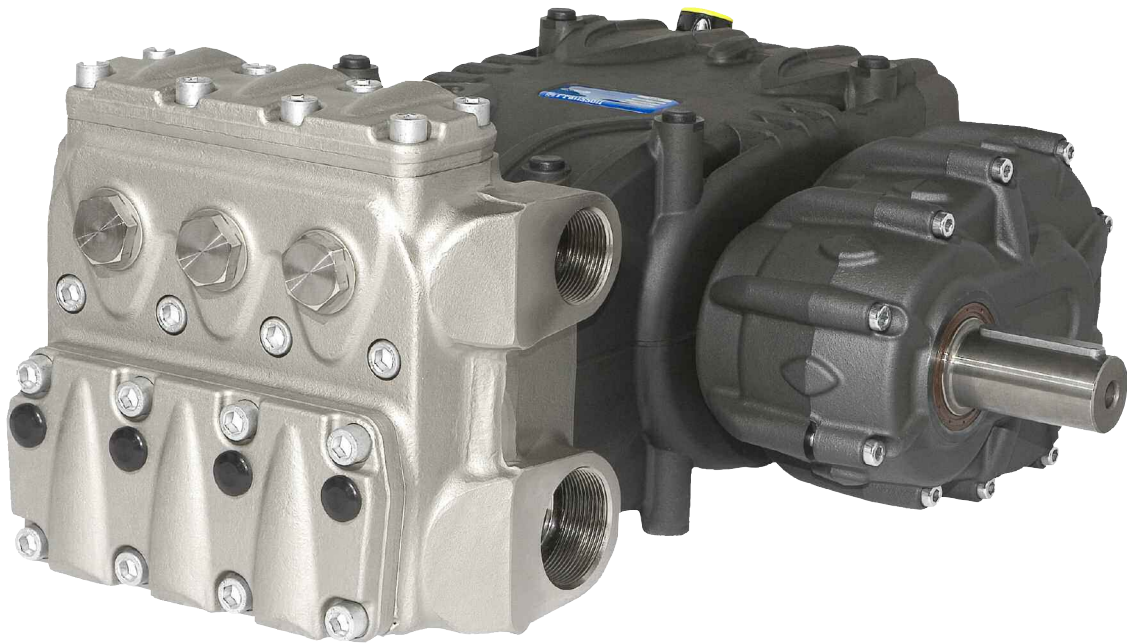


Repair Manual



General Pump is a
member of the
Interpump Group



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1. INTRODUCTION

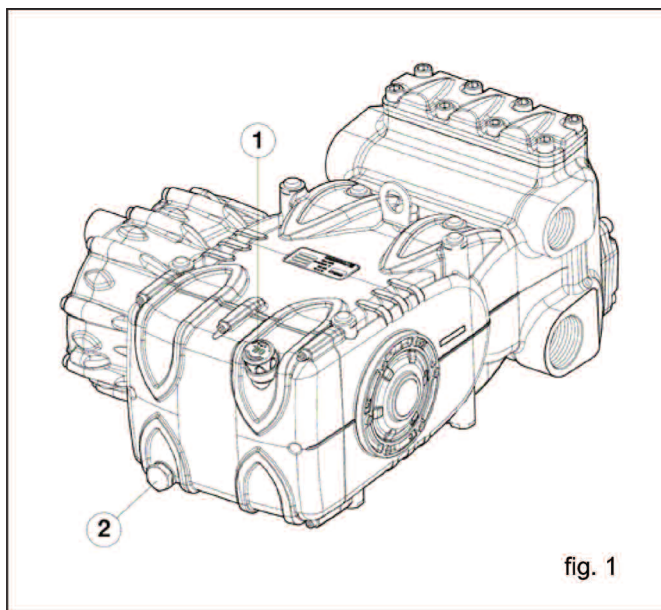
This manual describes the instructions for repairing KS Series pumps, and must be carefully read and understood before performing any repair intervention on the pump. Proper pump operation and longevity depend on the correct use and maintenance. General Pump declines any responsibility for damage caused by the 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 performed after removal of oil from the casing. To drain the oil, remove the oil dipstick, (1, fig. 1) and then the draining plug (2, fig. 1).



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

2.1.1 Crank mechanism disassembly

The correct sequence is the following:

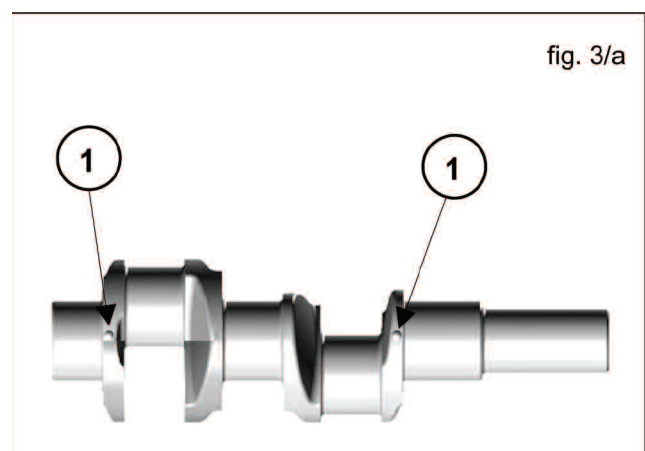
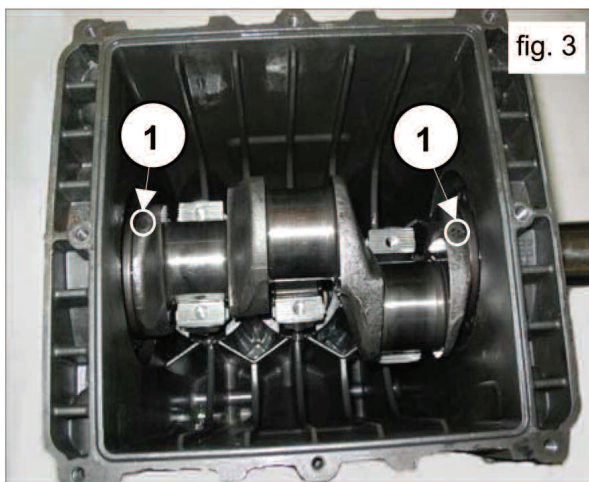
Disassemble:

- The pump shaft key
- The rear cover
- The connecting rod cap
- The side covers using for extraction 3 fully threaded M6x50 screws, inserting them in the threaded holes as indicated in fig. 2.



Push the plunger guides and connecting rods forward to facilitate lateral extraction of the pump shaft. Two marks are visible on the crankshaft (1, fig. 3 and 3a); they must be turned towards the operator in order to facilitate extraction.

Note: To extract the plunger guide it is necessary to remove the ceramic plunger and wiper first.

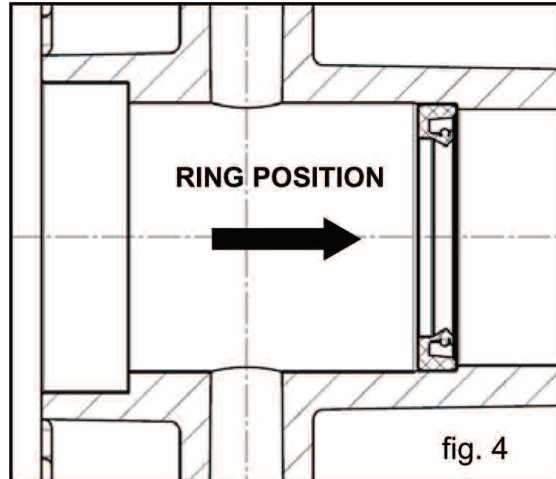


Disassemble the connecting rod unit - pin - plunger guide. Proceed with disassembly of the crankshaft and the plunger guides using standard tools.

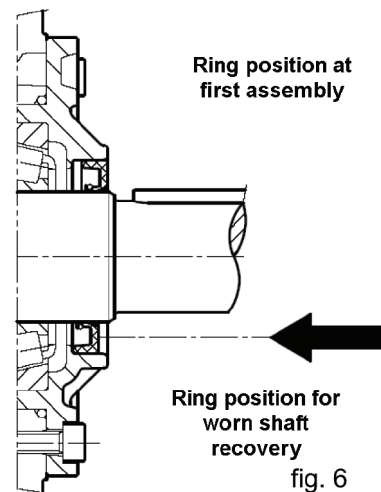
2.1.2 Crank mechanism assembly

After cleaning the crankcase, reassemble the crankcase mechanism as follows:

Thoroughly fit the plunger guide seals into their seat on the crankcase as shown in fig 4, using the appropriate tool, part #F27904900.



Introduce the pre-assembled plunger 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 plunger guide / connecting rod unit, as indicated in fig. 5.

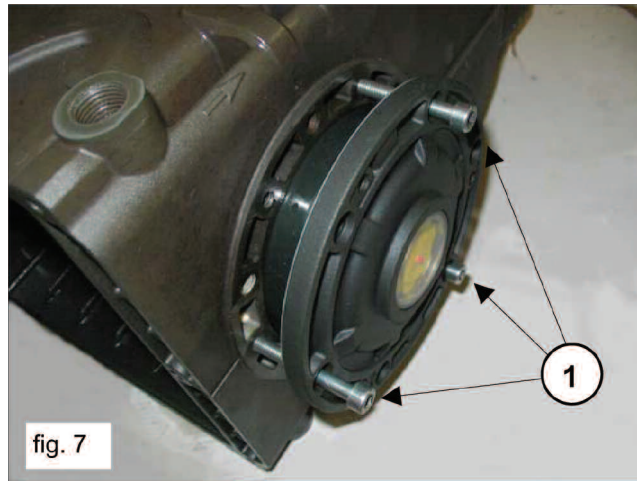


Before reassembly of the side covers, check the condition on the radial ring lips. If replacement is needed, position the new ring using the too part #F27904800 as shown in fig. 6.



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 3 screws M6x40, and then finish the operation with the screws supplied (M6x18) as shown in 1, 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 4.4-6 ft. lbs. (6-8 Nm)
2. Pre-fastening torque 18.4-20.6 ft. lbs. (25-28 Nm)
3. Fastening torque 28 ft. lbs. (38 Nm)



Install the rear cover positioning the oil dipstick hole upward. Fill the crankcase with oil as indicated in the Owner's Manual in Section 7.4.

2.1.3 Disassembly/Assembly of Bearing and Shims

The type of bearings (taper roller) ensures the absence of axial clearance 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 instructions 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 wear; if all parts are in good condition, thoroughly clean the components with a suitable degreaser and grease them again evenly using lubricating oil.

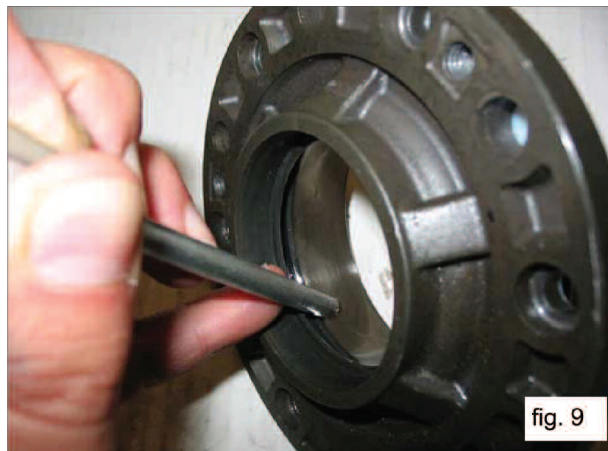
The same shims can be used again, being careful to fit them under the cover on the sight glass side. After installing the complete unit (sight glass flange+ shaft + engine side flange), check that the shaft's rolling torque - with the connection rods free - is at least 3 ft. lbs (4 Nm), max 5 ft. lbs (7 Nm).

To position the two side covers on the crankcase, initially use 3 M6x40 screws as shown in fig. 7, and then the fastening screws.

The shaft's rolling torque (with connecting rods coupled) must not exceed 6 ft. lbs (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.



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 appropriate rings. The driving operation can be facilitated by heating the relevant parts at a temperature ranging between 250°-300° F (120°-150° C), 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 PTO shank comes out of the correct side. Fit the PTO 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).



Determine the shim pack as indicated in the table below:

Measurement	Shim Type	No. of 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



Insert the shims of 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 3-5 ft. lbs. (4-7 Nm).

If the torque value is correct, connect the rods to the crankshaft; otherwise, redefine the shims again repeating operations.

2.1.4 Disassembly of the reducer unit

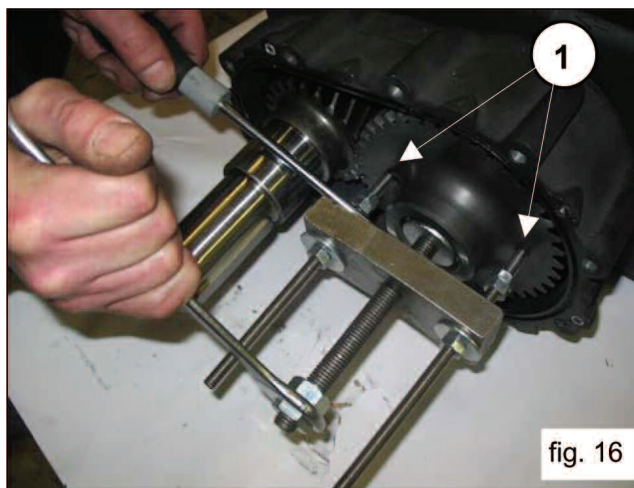
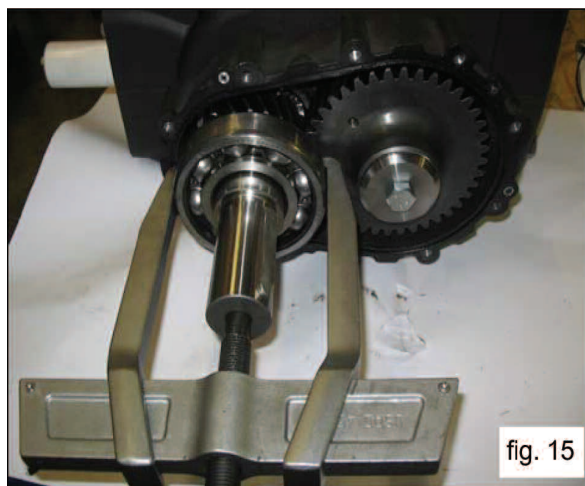
Remove the fastening screws of the reducer case cover.

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



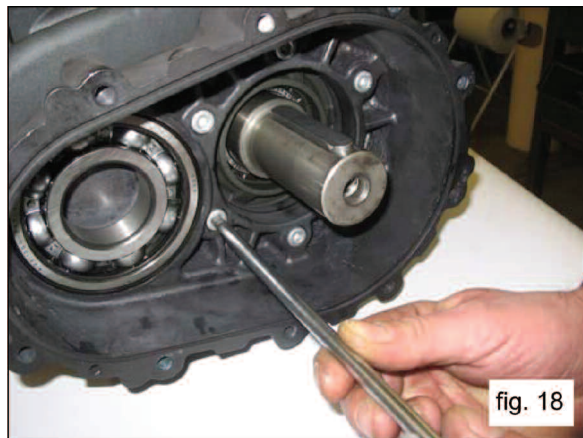
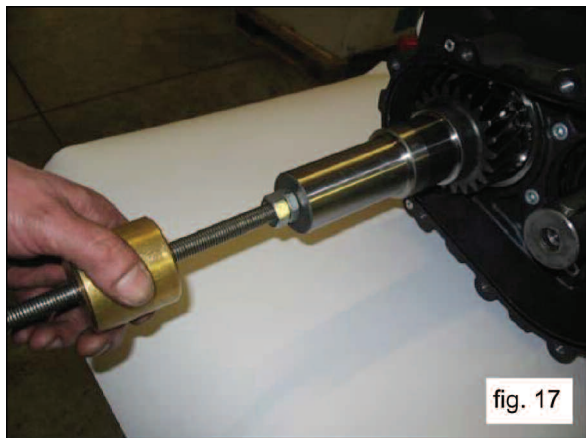
Remove the reducer case cover and extract the bearing from the pinion using standard tools (fig. 15).

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 (1, fig. 16) or standard extraction tool (fig. 16).



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

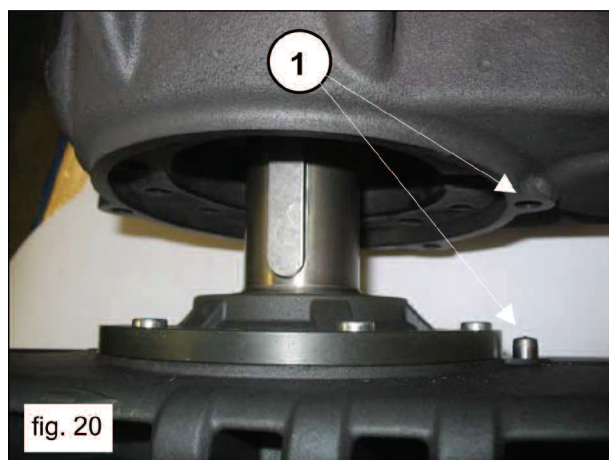
Unfasten the reducer case screws; then remove the reducer case (fig. 18).



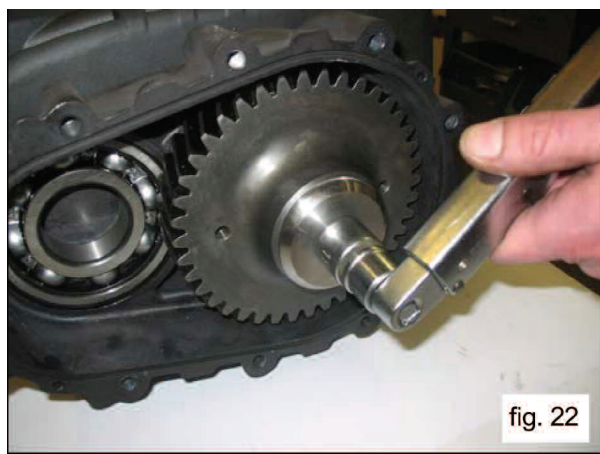
2.1.5 Reassembly of the reducer unit

Pre-assemble the reducer case using standard tools.

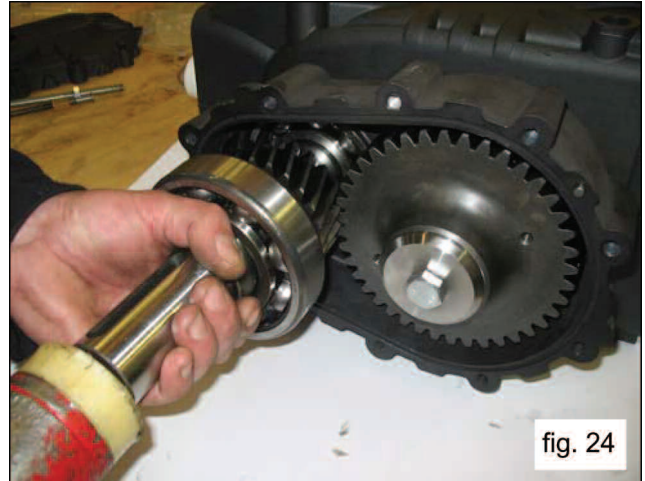
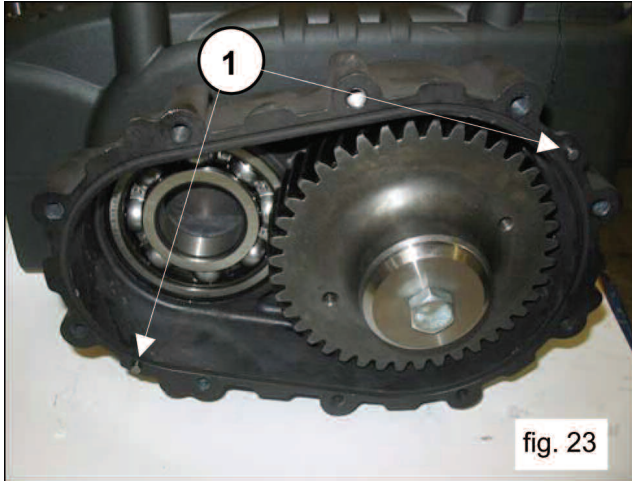
Position the gasket (fig. 19) and assemble the reducer case being careful to align the hole on the reducer case with the reference pin present on the crankcase (1, fig. 20).



Fasten the reducer case with the 6 M8x50 screws, and calibrate the screws with a 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).



Apply the Ø5 pins to the reducer case (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).

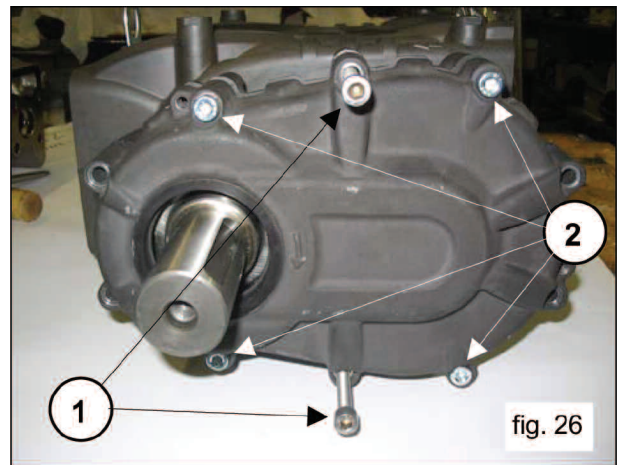


The bearings and the ring gear may be mounted at room temperature. The driving operation could be facilitated by heating the interested parts to a temperature ranging between 250°-300° F (120°-150° C), being sure that the ring nuts fit thoroughly into their seats.

Insert the O-ring gasket in the appropriate 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 (1, fig. 26).

Assemble the reducer case cover using a stopper pressing against the surface of the cover, or use the appropriate tool part #F27517400 (fig. 26a). Facilitate the operation by simultaneously fastening some of the screws (2, 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 part #F27904800.



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.

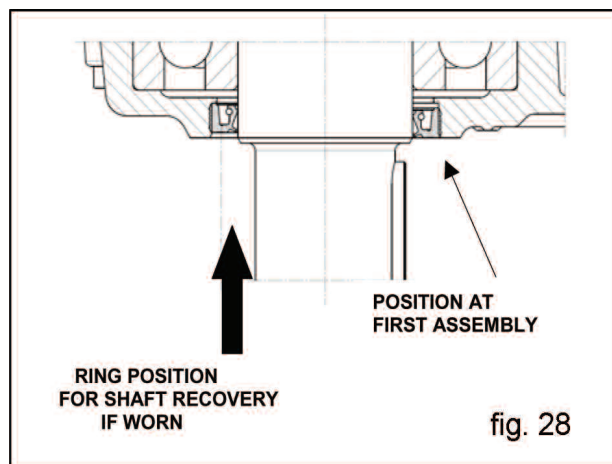
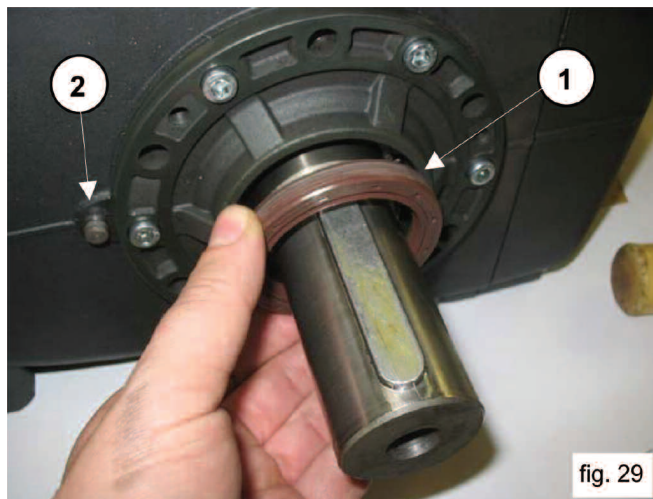


fig. 28

2.1.3 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 (1, fig. 29) and insert the reducer unit $\varnothing 8$ reference pin on the crankshaft (1, 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 part #F27904800 (1, fig. 29).



Failure to perform operations described in section 2.1.6 compromises the functionality of the pump and operator safety.

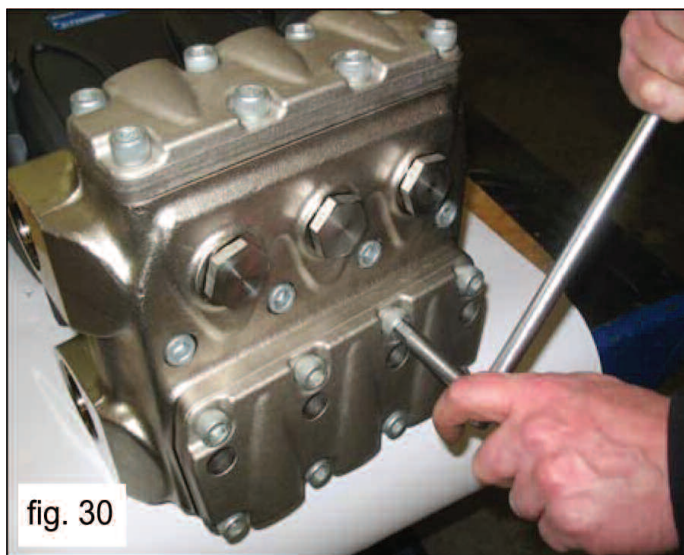
2.2 Fluid End Repair

2.2.1 Disassembly of the head - valve units

The head requires preventive maintenance as indicated in the Owner's Manual. Service operations are limited to valve inspections or replacement if needed.

To extract the valve units proceed as follows:

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



Extract the valve plugs using a slide hammer part #F26019400 combined with tool part #F27513600 (fig. 31). Extract the valve units using the same slide hammer used for the valve plugs; it is applied to the M10 holes of the valve guide (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 part #F27516900 combined with the tool part #F26019400.

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. 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 Owner's Manual. At each valve inspection, replace all valve plugs, O-rings and anti-extrusion rings.



Before positioning the valve units, clean and perfectly dry the relevant seats in the head as indicated in fig. 34.

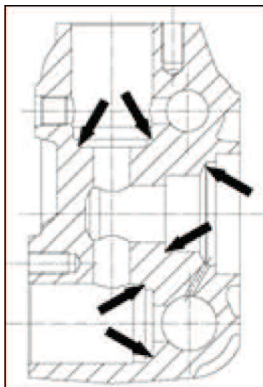


fig. 34

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.

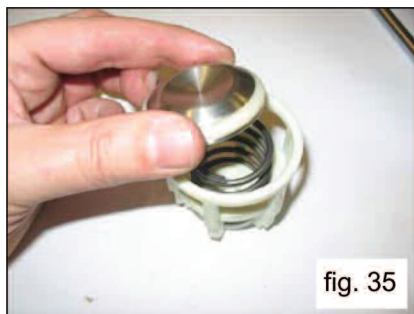


fig. 35

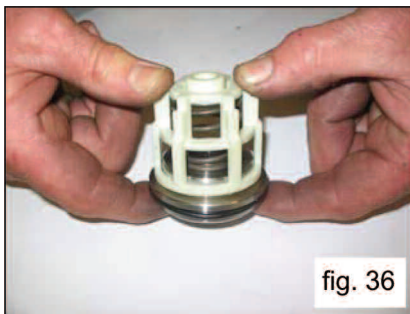


fig. 36



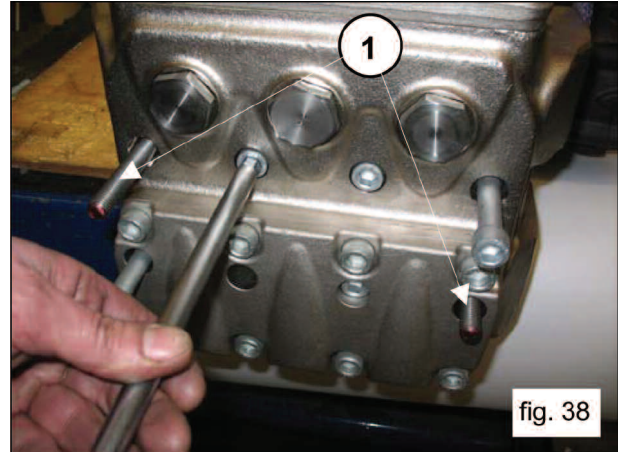
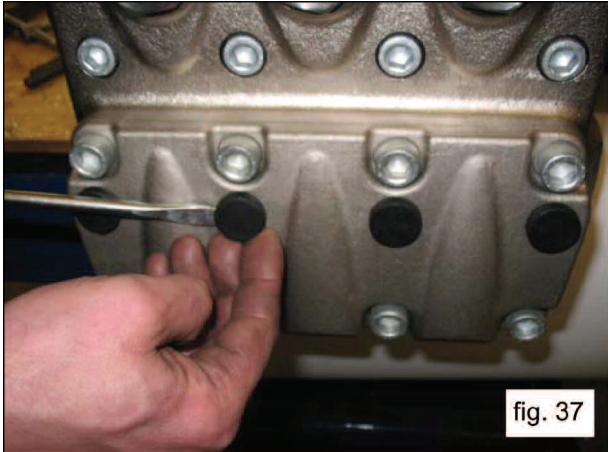
fig. 36a

Insert the suction and delivery valve units checking that they 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 Owner's 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 (1, fig. 38) to avoid damaging the plungers, then proceed with removing the rest of the screws.

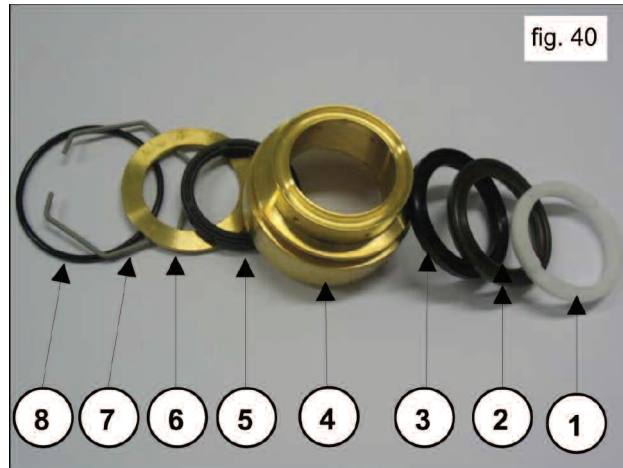


Remove the head from the crankcase. Extract the high pressure seals from the head, and the low pressure seals from their related support; be careful not to damage the seats (fig. 39).



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

1. Head ring
2. HP seal
3. Re-stop ring
4. Packings support
5. LP seal
6. Sealing ring
7. Circlip
8. O-ring



2.2.4 Plunger unit disassembly

The plunger unit does not require periodical maintenance. Service interventions are limited to visual inspections only. For plunger unit extraction, operate as follows:

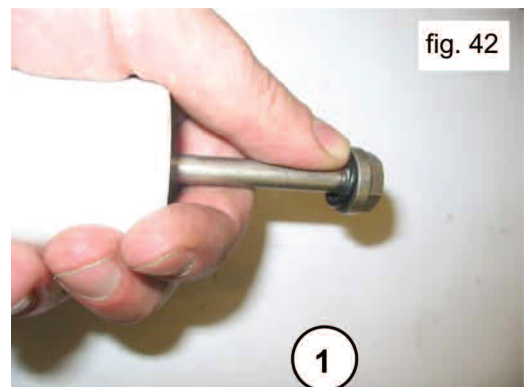
Unfasten the M7x1 plunger screws as shown in fig. 41.



Check for wear; replace them if necessary.



At each disassembly, all the o-rings of the plunger unit must be replaced (1, fig. 42).



2.2.5 Head assembly - seals - plunger 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 (2,3 and 5, fig. 40) with OCILIS type silicone grease part #F12001600; this operation is considered necessary to facilitate the settling of the sealing lips on the plunger.

For correctly assembling the HP seals in their related seats on the head without damaging the lips, use the appropriate tools depending on the pumping assembly diameters as indicated in Chapter 4.

Reassemble the plungers by fastening the screws with an appropriate 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

Screws are to be fastened exclusively using a torque wrench.

Description	Exploded View Position (From Owner's Manual)	Fastening Ft. Lbs.	Fastening Nm
Cover Fastening Screws	9 and 10	7.4	10
Plunger Fastening Screws	33	14.8	20
Connecting Rod Fastening Screws	21	28	38*
Head Fastening Screws	43	88.5	120**
Valve Cover Screws	45	88.5	120***
Lifting Bracket Fastening Screws	20	73.8	100
Oil Discharge Plug	11	29.5	40
Delivery Duct Plug	57	29.5	40
Reducer Case and Cover Fastening Screw	68	29.5	40
Ring Gear Fastening Screw	71	51.6	70

- * The connecting rod 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

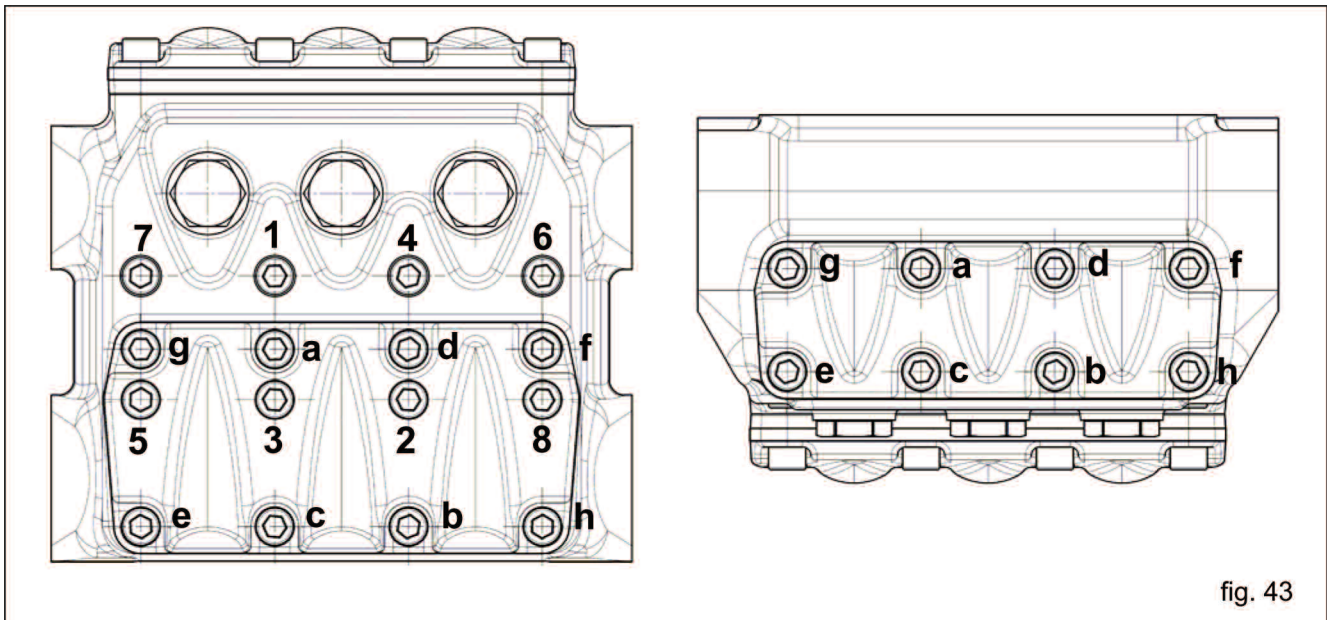


fig. 43

4. REPAIR TOOLS

Pump repairs can be facilitated by special tools. Part numbers are as follows:

For assembly:

For Assembling Part:	Tool Part Number
Gasket Bushing Øe 45; H.P. alternative sealing ring Ø 28x45x8.5/5	F27473000
Gasket Bushing Øe 44: H.P. alternative sealing ring Ø 32x44x6/3.5	F27517200
Gasket Bushing Øe 48: H.P. alternative sealing ring Ø 36x48x6/3.5	F27473300
Gasket Bushing Øe 55: H.P. alternative sealing ring Ø 40x55x7.5/4.5	F27473100
Gasket Bushing Øe 36: L.P. alternative sealing ring Ø 28x36x5.5	F27470900
Gasket Bushing Øe 40: L.P. alternative sealing ring Ø 32x40x5.5	F27517300
Gasket Bushing Øe 44: L.P. alternative sealing ring Ø 36x44x5.5	F27471100
Gasket Bushing Øe 48: L.P. alternative sealing ring Ø 40x48x5.5	F27471300
Stopper For Pump Shaft Oil Wiper / Pinion Reducer	F27904800
Plunger Guide Oil Seal Stopper	F27904900
Stopper For Reducer Case Cover	F27517400

For Disassembly:

For Disassembling Part:	Tool Part Number
Suction / Delivery Valves	F26019400 F27516900
Suction and Delivery Valve Plug	F26019400 F27513600
Plunger Guide Oil Seal	F27503900

5. MAINTENANCE LOG

HOURS & DATE

OIL CHANGE							
GREASE							
PACKING REPLACEMENT							
PLUNGER REPLACEMENT							
VALVE REPLACEMENT							



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