

HF 18 E -Brukermanual

Beskrivelse av typer og komponenter

Generelt

Maskinen har et maksimum arbeidstrykk på 400 bar 38 liter pr.min. Tilkobles strøm 400 volt 50 Hz 63 A. Tilkobles 1" vannslange minimums trykk 2,5 bar. Maskinen benyttes til høytrykksspyling av rør.

Beskrivelse av komponentene.

Høytrykkspumpe

- Høytrykkspumpen er en 3-sylindret stempelpumpe
 - Pumpen har keramiske stempel, rustfrie ventiler og carbon trykkhode
 - Pumpen er solid og vedlikeholdet er enkelt.
- (for teknisk informasjon, se egen manual for pumpen ")

Motoren

- Maskinen har en ABB elektromotor og ABB frekvensomformer 30 kw . Motoren driver høytrykkspumpen. Trinnløs justering av vanntrykk og vannmengde skjer ved å justere motorens turtall med potmeter.
- Se for øvrig manual fra fabrikk.

Beskyttelse

- Maskinen har sikkerhetsventil som åpner ved for høyt trykk.

Vanntilførsel

- Ved oppstart må pumpen mates med minimum 40 liter pr. min. Ved fare for frost fylles systemet med frostveske eller tømmes for vann med trykkluft..

Filter

- Det er montert et TTP – 5 vannfilter før innløp til pumpen.

Ramme

- Rammen er laget av stål, som er lakkert.
- Deksler i aluminium materiale

Betjeningspanel

Kjøring uten fjernstyring

Elektroskap

- Hovedbryter vri på bryter for start
- Sjekk at nødstop er uttrukket
- Vent til lys slutter å blinke – mindre enn 1 minutt, hvis ikke hold inne stopp knapp i 30 sekunder. Sjekk at lys slutter å blinke. Evt. gjenta samme prosedyre.
- Trykk grønn knapp 1 for start
- Speed Control reguleres for ønsket trykk – maks 400 bar.
- Stopp av pumpe – trykk 0 knapp

Kjøring med fjernstyring

- Monter fjernstyringskabel på maskin og kabeltrommel – Se merke inn og trommel.
- Hovedbryter vri på bryter for start
- Sjekk at nødstop er uttrukket
- Trykk inn 1 og stop (på el.skap) samtidig til lys slutter å blinke.
- Trykk grønn knapp 1 gang på fjernpanel
- Speed Control reguleres for ønsket trykk – maks 400 bar.
- Start– trykk grønn knapp, knapp vil da lyse
- Bruk pil høyre venstre for å endre speed og trykk
- Stopp – trykk grønn knapp

Hoved Reset – trykk inn stopp knapp

Manometer

- Manometeret viser vanntrykket på pumpen.
- Manometeret brukes når trykket justeres til ønsket arbeidstrykk. Maks 400 bar.

Reguleringsventil

- Trykkreguleringsventil er beregnet kun for små justeringer av trykk. Vannet går i by-pass til pumpe. Trykket bør justeres med potmeter.

Vannfilter

Filter sjekkes og rengjøres med jevne mellomrom.

Sikkerhet

Høytrykksstrålen.

Bruk som ikke er i henhold til beskrivelsene kan forårsake stor skade. Full kjennskap til denne manualen er nødvendig for å unngå skade på seg selv og andre.

Generelt

- Bruk vann av drikkevannskvalitet
- Bruk aldri væsker som inneholder løsemiddel, bensin, olje eller fortynningsmiddel. Asbest- eller andre materialer som kan skade din helse skal ikke rengjøres.
- Maskinen skal ikke brukes av ukyndig personell.
- Blokker aldri høytrykks utløp når det er i bruk.
- Når maskinen brukes i "farlige" omgivelser må en forholde seg til sikkerhetsreglene som gjelder.
- Maskinen skal ikke forlates uten tilsyn.
- Slinger og kabler må beskyttes hvis de legges over trafikkert ferdsel.

Forsiktighetsregler

- Maskinen må plasseres på jevnt horisontalt underlag.
- Tilkoblingene på alle slangene skal skrues fast til navngitte koblinger i front av maskinen.
- Høytrykksslangene må ikke ha skader (være sprukket, krøllet eller klempt).
- En skadet høytrykksslange må straks skiftes ut for å unngå at slangen sprekker.
- Start aldri maskinen før dysen er godt inne i røret som skal spyles.
- NB- For stengt vannstrøm ut av dyse må det benyttes en fotventil- Ekstrauststyr.

Sikkerhet før bruk

- Kontroller allmenntilstanden på maskinen.
- Fjern alle løse gjenstander fra et avgrenset område.
- Merk godt av det avgrensede området.
- Skaff et eget oppsamlingssystem for avrenningsvannet.
- Arbeid aldri på ustabilt underlag.
- Rengjøring i kunstig lys: tilpass lysarmatur (vanntett).
- Området må ha god ventilasjon.

Rengjør aldri dersom:

- Slinger er skadet.
- Elektriske koblinger eller tilkobling er skadet.

Sikkerhet under bruk

- Det er strengt forbudt å foreta vedlikehold eller reparasjoner når motoren er i gang.

Forebyggende tiltak

- Bruk hjelm, visir, hørselsvern, hansker, vernesko.
- Flytt ikke maskinen når den er i bruk.
- Hold maskinen borte fra barn og dyr.
- Rett aldri vannstrålen mot personer eller dyr.
- Sprøyt aldri direkte på huden (hold aldri en finger foran dysen).
- Ved skade på huden: kontakt lege straks, oppgi at det er en høytrykksskade
- Spyl aldri mot elektriske deler.

Arbeidsområde

- Merk godt av arbeidsområdet.
- Minimum avstand: "sprøytesone/ytre grense": 10 mtr.
- Fjern alle løse gjenstander fra arbeidsområdet.
- Arbeid aldri på ustabilt underlag.
- Ved rengjøring i kunstig lys: tilpass lysarmatur (vanntett)

Drain - Vannavløp

- Sørg for godt avløp for vannet.

Pause i arbeidet (forlater arbeidsområdet kort tid)

- Skru av hovedbryteren.

Skifte av dyse

- Stopp motoren.
- Steng vannkrane – vann inn
- Skift dyse
- Skru dyse godt fast til slangen
- Sjekk koblingen med jevne mellomrom under bruk.

Sikkerhet etter bruk

- Skru av maskinen.
- Steng vann inn
- Skru av hovedbryter
- Ta bort alle løse gjenstander fra arbeidsområdet.

Vedlikehold av maskinen

- Reparere eventuelle skader snarest mulig.
- Ta vare på brukermanualen og ha den for hånden.
- Oppbevar maskinen frostfritt. Ved fare for frost må det fylles frostveske i systemet.

Transport

Vekt av maskin: 450 kg

Generelt

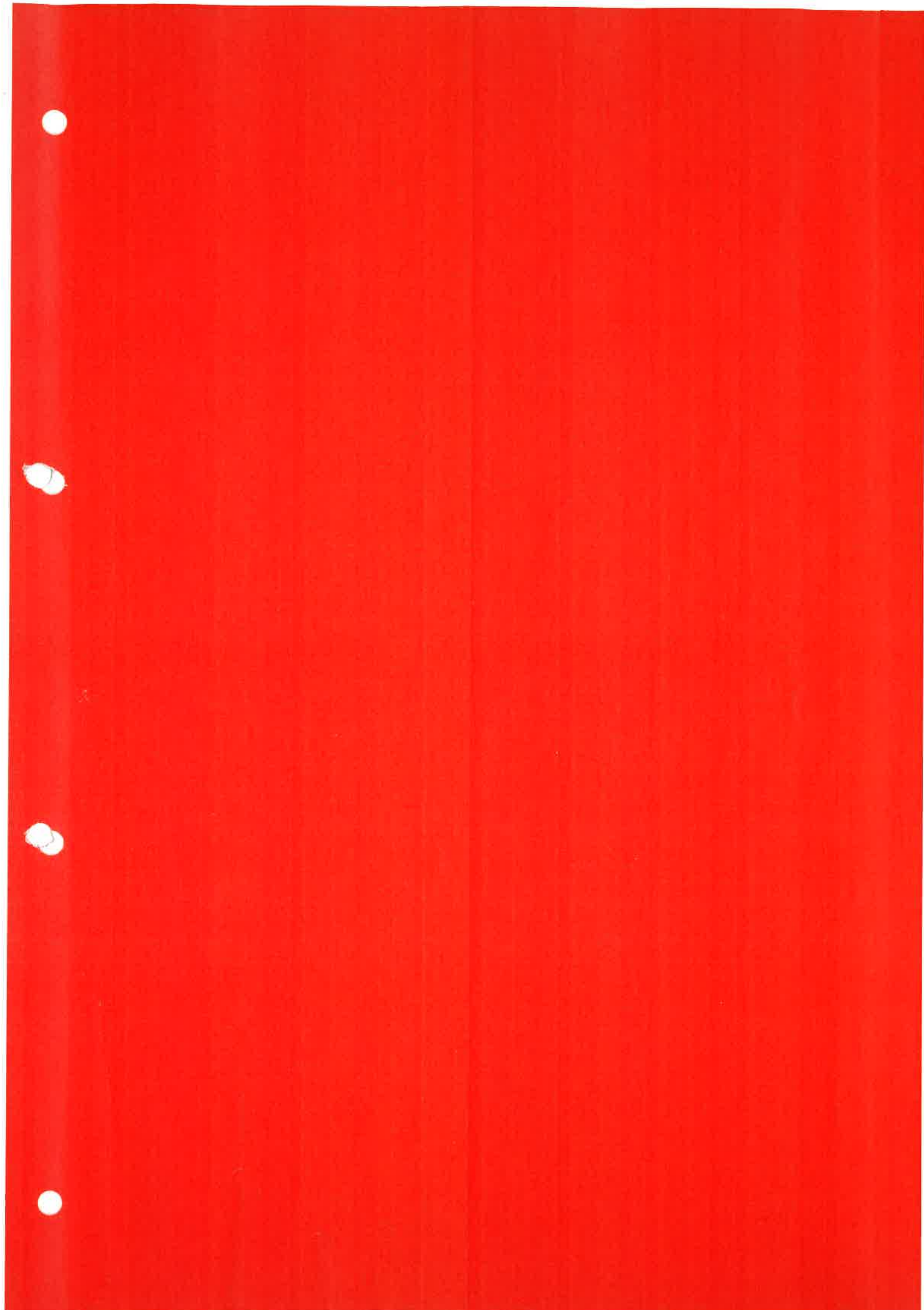
- Fest slanger og kabler.

Transport ved frost

- Tøm pumpen og slanger for vann.
- Tilsett frostvæske.
- Start maskinen og hold pistolen åpen til det kommer ut vann blandet med frostvæske.
- Stopp maskinen.

Lagring av maskinen

- Oppbevar maskinen på et tørt og frostfritt sted.



WATECH AS

CE DECLARATION OF CONFORMITY FOR MACHINERY (Directive 89/392EEC)

Manufacturer: Watech AS
Address: Kvernevik Ring 177, 4048 Hafslsfjord

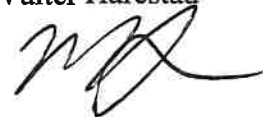
Herewith declares that:

Make, type: HF 18 nr 32010

- is in conformity with the provisions of the Machinery Directive (Directive 89/392EEC), as amended, and with national implementing legislation:
- is in conformity with the provisions of the following other EEC directives
- the following (parts/clauses of) harmonised standards have been applied
- the following (parts/clauses of) national technical standards and specifications have been used:

Stavanger 04-03.2010.

Valter Harestad




TESTCERTIFICATE HIGH PRESSURE WATER UNIT

Object to certificate: Pump init

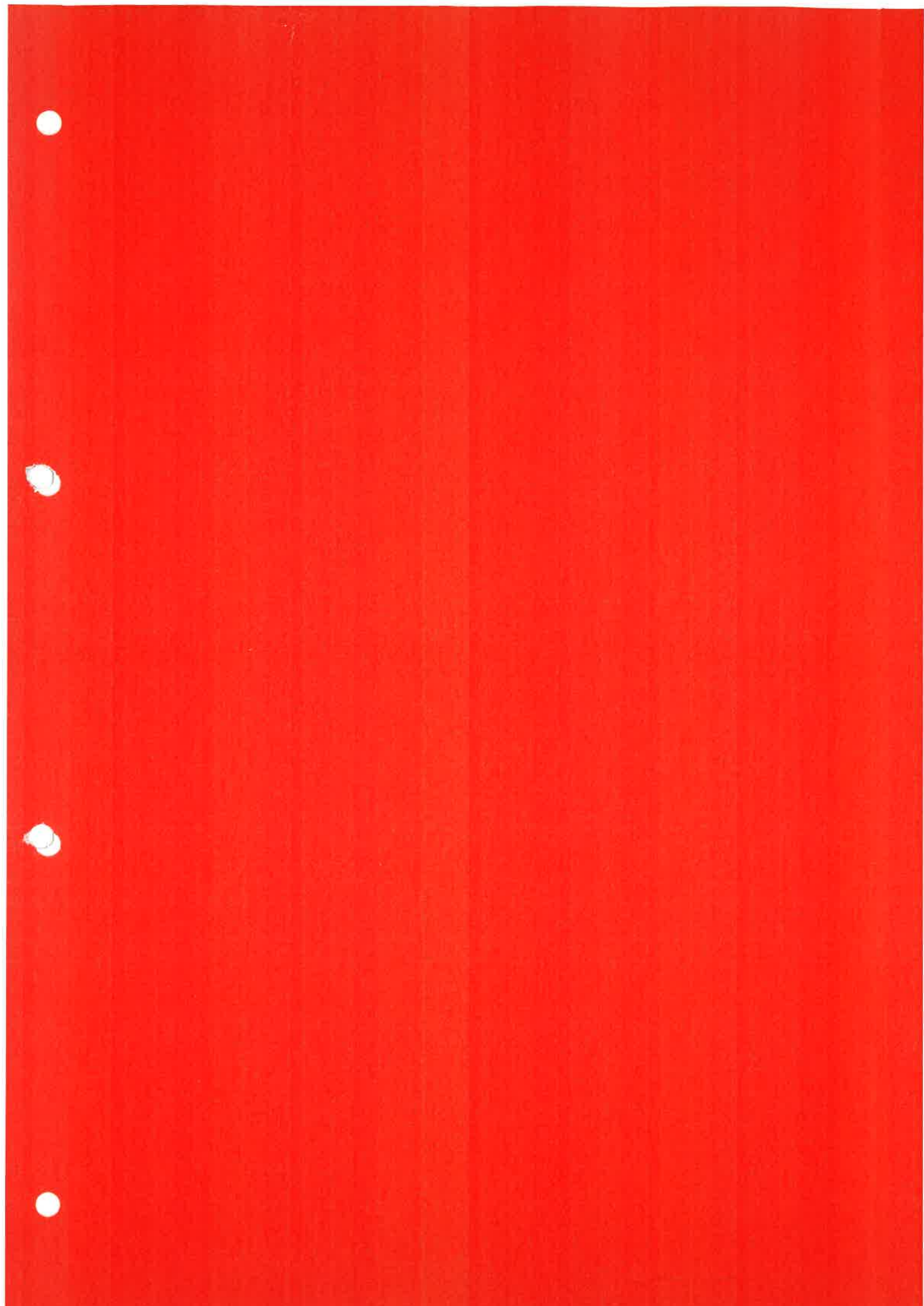
CUSTOMERS DATA		OBJECT	High pressure
Customer	Høytrykksteknikk	Manufacturer	Watech as
Zip code/ City	Bodø	Type	HF 18 E
		Serial number	32010
Registration no.		Year of manufacture	2010
		Inside diameter*	
		Lenght	
		Connection outlet	3/8"

		STATUS	TEST PRESSURE
Temperature range	0 -60°C		
Working pressure	400 bar	OK	400 bar
Test pressure	450 bar	OK	450bar
RPM	0-1450	OK	
Visual inspection		OK	
Thread inspection		OK	
Flange inspection			
Details:			
.....			
.....			
.....			
.....			

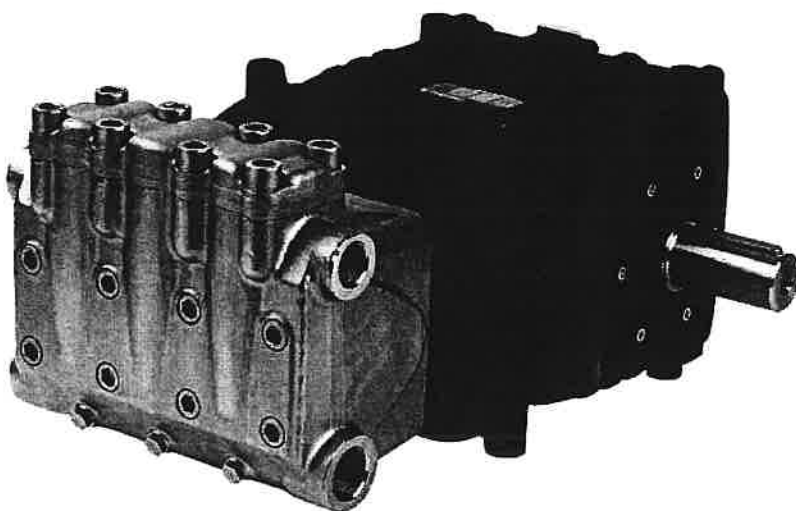
* fill in if necessary

TESTRESULTS	correct / incorrect		
Date of testing	05.03.2010	Date of validity	
Test person	Valter Harestad	Signature	

Certificatenummer	WA914
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HF Series



Use and Maintenance Manual

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1. INTRODUCTION

This manual describes the use and maintenance instructions of the HF pump, and should be carefully read and understood before pump operation.

Correct use and adequate maintenance will guarantee the pump's trouble-free operation for a long time.

The Interpump Group declines any responsibility for damage caused by misuse or the non-observance of the instructions indicated in this manual.

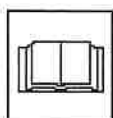
Upon receiving the pump, check that it is complete and in perfect conditions.

Should anything be found out of order, please contact us before installing and starting the pump.

2. SYMBOL DESCRIPTION



Warning Signal



Carefully read the indications in this manual before operating the pump.



Danger Signal
Electrocution danger



Danger Signal
Use a face guard



Danger Signal
Use protective glasses



Danger Signal
Use adequate hand protection before operating the pump



Danger Signal
Use appropriate boots

3. SAFETY

3.1 General safety indications

The misuse of pumps and high pressure units, and the non-observance of installation and maintenance instructions may cause severe injury to people and/or damage to property. Anyone requested to assemble or use high pressure units must possess the necessary competence to do so, should be aware of the characteristics of the components assembled/used, and must adopt all the necessary precautions in order to guarantee maximum safety in any operating condition. In the interest of safety, no precaution that is reasonably feasible must be neglected, both by the Installer and the Operator.

3.2 High pressure unit safety requirements

1. The pressure line must always be equipped with a safety valve.
2. High pressure unit components, in particular for those units working outside, must be adequately protected against rain, frost and heat.
3. The unit's electrical parts must be adequately protected from water spray, and must comply with the specific norms in force.
4. High pressure pipes must be correctly sized for the unit's maximum operating pressure, and must only be used within the pressure range indicated by the pipe Manufacturer.
The same conditions apply for all other unit accessories where high pressure is involved.
5. The extremities of high pressure pipes must be sheathed and fastened to a steady structure in order to avoid dangerous whiplashes should they burst or should their connections break.
6. Appropriate safety guards must be provided for the pump transmission systems (joints, pulleys and belts, auxiliary drives).



3.3 Safety during operation

The working area of a high pressure system must be clearly signalled. Access must be prohibited to non-authorised personnel and, if possible, the area must be fenced in.

The personnel authorised to access this area must be previously trained, and informed about the risks that may arise from failures or malfunctions of the high pressure unit.

Before starting the unit, the Operator must check:

1. That the high pressure unit is correctly fed (see Chapter 9, paragraph 9.5).
 2. That pump intake filters are perfectly clean; we advise to use a device that indicates the filter's clogging level.
 3. That electrical parts are adequately protected and in perfect conditions.
 4. That high pressure pipes do not show apparent signs of abrasion, and that fittings are in perfect shape.
- Any anomaly or reasonable doubt that may arise before or during operation must be promptly reported, and verified by competent personnel. In these cases, pressure must be immediately released and the high pressure unit stopped.



3.4 General procedures for using nozzles

1. The Operator must always place his own and other worker's safety before any other interest; his actions should always be governed by good sense and responsibility.
2. The Operator must always wear a helmet with a protective visor, waterproof clothing, and appropriate boots capable of guaranteeing grip on wet pavements.

Note: appropriate clothing will effectively protect against water spray, but it may not offer adequate protection against the direct impact of water jets or sprays from a close distance. Some circumstances may require further protection.

3. We advise to employ a team of at least two Operators, able to provide mutual and immediate assistance if needed, and rotate their duties in case of long and heavy work.

4. Access to the work area that is within the water jet's range must be absolutely forbidden; the area must be free of objects that may be unintentionally hit by the pressurised jet, causing damage or dangerous situations.
5. The water jet must only and always be directed towards the work area, even during testing or preliminary inspections.
6. The Operator must always pay attention to the trajectory of the debris removed by the water jet. If necessary, adequate side guards must be provided by the Operator in order to protect anything that may be accidentally exposed.
7. For no reason must the Operator be distracted during operation. The personnel that needs to access the working area must wait for the Operator to suspend his work, and then immediately make his presence known.
8. For safety reasons, it is important that each member of the team is perfectly aware of the intentions and actions of other team members in order to avoid dangerous misunderstandings.
9. The high pressure unit must not be started and brought up to pressure unless each member of the team is in his designated position, and the Operator has already directed the nozzle towards the work area.

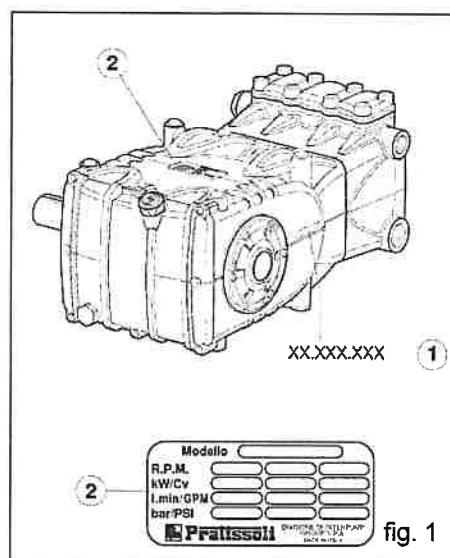
3.5 Safety during unit maintenance

1. The maintenance of the high pressure unit must be done within the time intervals indicated by the Manufacturer, who is responsible for the entire unit's compliance with the norms in force.
2. Maintenance must always be carried out by specialised and authorised personnel.
3. Assembly and disassembly of the pump and its various components must be performed exclusively by authorised personnel, using appropriate tools in order to avoid damage to components and connections.
4. To guarantee total reliability and safety, always use original spare parts.

4. PUMP IDENTIFICATION

Each pump (fig. 1) has its own serial number XX.XXX.XXX (see point ①) and a rating plate (see point ②) that indicates:

Pump model and version
Maximum rpm
Power absorbed Hp - kW
Flow rate l/min - G.P.M.



Modello	Model
R.P.M.	R.P.M.
Kw/Cv	Kw/Cv
l.min/GPM	l.min/GPM
Bar/PSI	Bar/PSI



Pump model, version and serial number must always be specified when ordering spare parts.

5. TECHNICAL DATA

Versions HF 22-25

Model	RPM	Flow rate		Pressure		Power	
		l/min	Gpm	bar	psi	kW	Hp
HF 22	800	45	12.05	400	5800	35.3	48
HF 25	1000	74	19.44	280	4060	39	53

Versions HF 18

Model	RPM	Flow rate		Pressure		Power	
		l/min	Gpm	bar	psi	kW	Hp
HF 18	1000	38	10.08	500	7250	36.8	50
HF 18	800	30	8.06	600	8700	35.3	48

6. DIMENSIONS AND WEIGHT

For dimensions and weight of Standard Version pumps, please refer to fig. 2;

For dimensions and weight of pumps with a type "A" Flange, please refer to fig. 2/a.

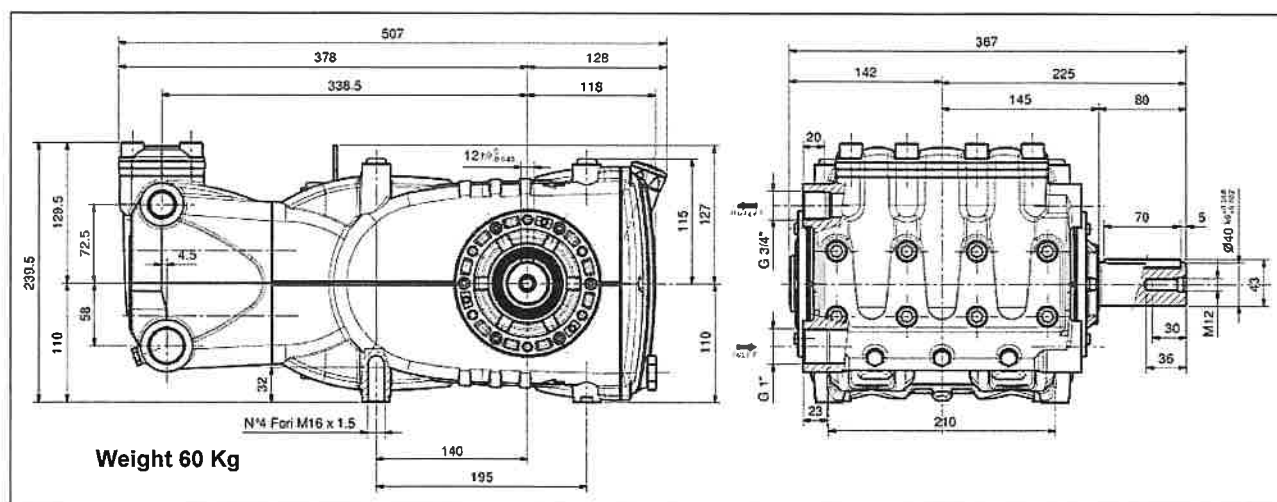
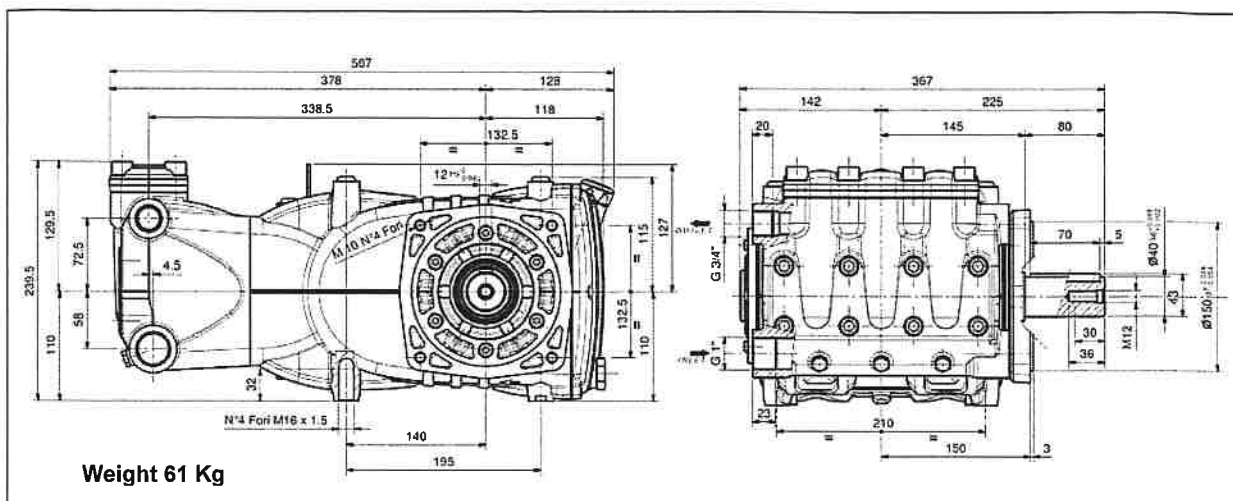


fig. 2



N°4 Fori M16 x 1,5

N°4 Holes M16x1.5

fig. 2/a

7. INFORMATION REGARDING PUMP USE



The HF pump has been designed to operate with filtered water (see paragraph 9.7) and at a maximum temperature of 40°C.

Other fluids may be used only upon the approval of the **Technical Department or Customer Assistance Service**.

7.1 Water temperature



The maximum water temperature allowed is 40°C. Nonetheless, for short periods of time it is possible to operate the pump with water at a temperature of 60°C. In this case, we advise to contact the **Technical Department or Customer Assistance Service**.

7.2 Maximum flow rate and pressure values

The performance values indicated in the catalogue refer to the maximum performance of the pump.















Regardless of the power used, pressure and maximum rpm values indicated on the plate may not be exceeded unless expressly authorised by the **Technical Department or Customer Assistance Service**.

7.3 Lowest rpm

Any rpm value different from what indicated in the performance table (see Chapter 5) must be expressly authorised by the **Technical Department or Customer Assistance Service**.

7.4 Recommended lubricant oil types and Manufactures

The pump is delivered with lubricant oil compliant with room temperatures ranging from 0°C to 30°C. Some recommended lubricant types are indicated in the table below; these lubricants are treated with additives in order to increase corrosion protection and resistance to fatigue (according to DIN 51517 part 2). As an alternative, Automotive SAE 85W-90 gearing lubricants may also be used.

Hersteller Manufacturer Producteur	Schmieröl Lubricant Lubrifiant	Hersteller Manufacturer Producteur	Schmieröl Lubricant Lubrifiant	Hersteller Manufacturer Producteur	Schmieröl Lubricant Lubrifiant
 Agip	AGIP ACER 220	 elf	ELF POLYTELIS 220, REDUCTELF SP 220	 Shell	Shell Tellus Öl C 220
 ARAL	Aral Degol BG 220	 Esso	NUTO 220, TERESSO 220	 SRS	Wintershall Ersolan 220, Wintershall Violan CN 220
 BP	BP Energol HLP 220	 FINA	FINA CIRKAN 220	 TEXACO	RANDO HD 220
 Castrol	CASTROL HYSPIN VG 220, CASTROL MAGNA 220	 FUCHS	RENOLIN 212, RENOLIN DTA 220	 TOTAL	TOTAL Cortis 220
 DEA	Falcon CL 220	 Mobil	Mobil DTE Oil BB		

Check the oil level using the oil level dipstick pos. ① fig.3; refill if necessary.

Correct oil level inspection is done with the pump at room temperature; oil is changed with the pump at working temperature, by removing the oil dipstick pos. ①, and then the plug pos. ②, fig.3.

Oil inspection and changing is to be carried out as indicated in the table in fig.14, Chapter 11.

The amount required is ~3.8 litres

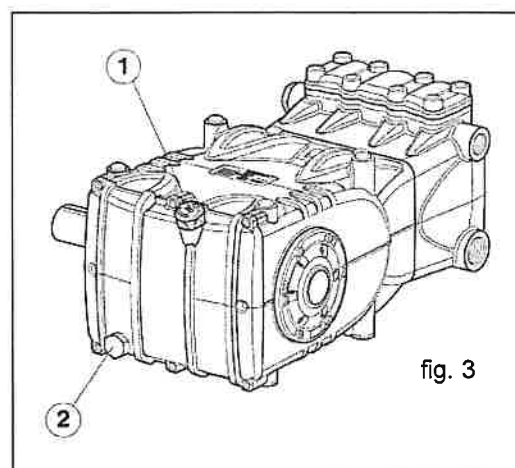


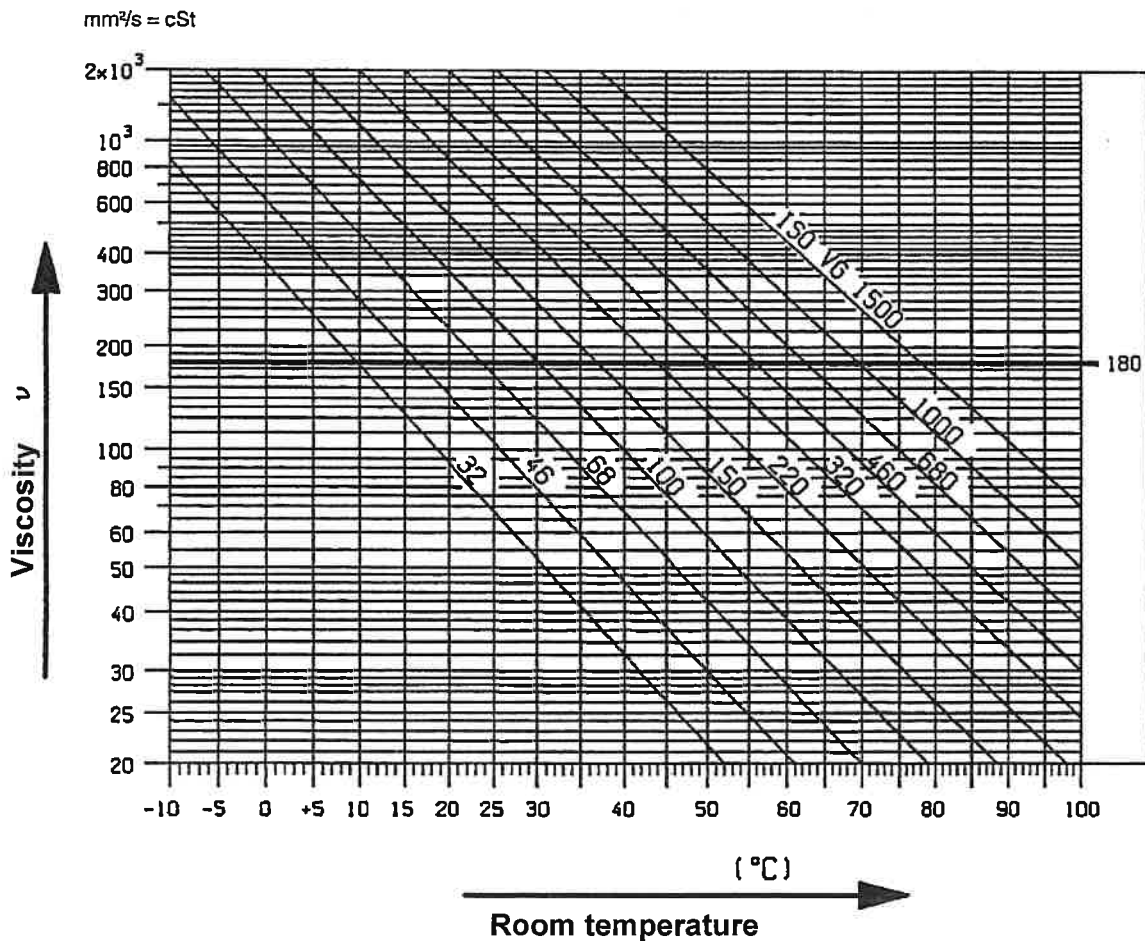
fig. 3



In any case, oil must be changed at least once a year since it may deteriorate by oxidation

For room temperatures that differ from 0°C to 30°C, follow the indications contained in the diagram below, keeping in mind that the oil must have a minimum viscosity of 180 cSt.

Viscosity / Room Temperature Diagram



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.

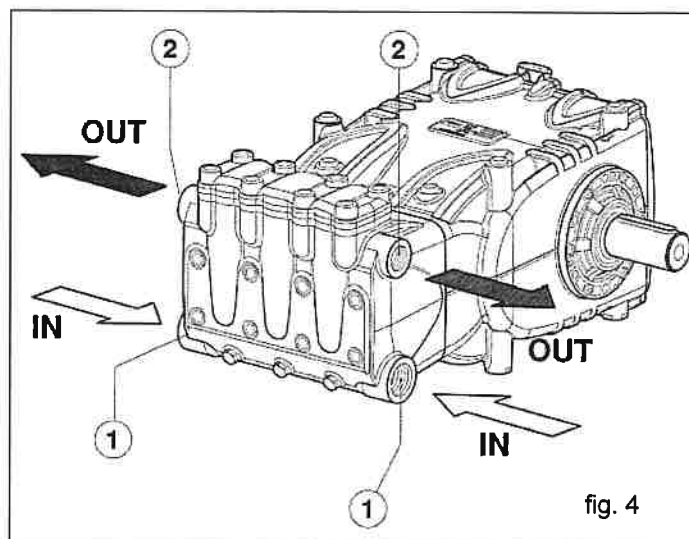
8. PORTS AND CONNECTIONS

HF series pumps (see figure 4) are provided with:

① N°2 inlet ports "IN", 1" Gas.

The line can be connected to either of the two inlet ports; the one not being used must be hermetically sealed.

② N°2 outlet ports "OUT", 3/4" Gas.



9. PUMP INSTALLATION

9.1 Installation

The pump must be installed in a horizontal position using the apposite threaded feet M 16x1,5; fasten the screws with a torque value of 210 Nm.

The base must be perfectly flat and sufficiently rigid in order to avoid bending and misalignments on the pump / transmission coupling axis due to the torque applied during operation.

The unit must not be rigidly fixed to the pavement, but requires the use of anti-vibration elements.

For special applications, please contact the **Technical Department or Customer Assistance Service**.

The pump is equipped with a lifting bracket to facilitate installation as shown in the following figure.



In case of disassembly, to avoid letting filth inside the front part of the crankcase, close the threaded hole with the supplied cap.



Replace the oil cap (red), located on the rear crankcase cover, with the oil dipstick and check oil level.

The oil dipstick must always be accessible, even when the unit is assembled.



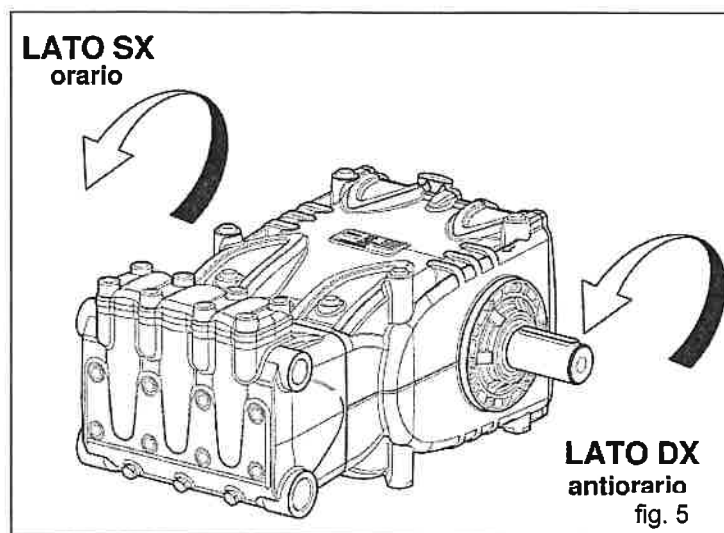
The pump's shaft (PTO) must not be rigidly connected to the motor unit

The following transmission types are suggested:

- hydraulic by means of a flange; for correct application, please contact the **Technical Department or Customer Assistance Service**
- V-belts
- Cardan joint (please respect the maximum working angles indicated by the manufacturers)
- Flexible joint

9.2 Sense of rotation

An arrow situated on the crankcase near the shaft indicates the correct sense of rotation. Standing in front of the pump head, the sense of rotation must be as shown in fig.5.



Lato Dx	Right Side
Lato Sx	Left Side
orario	clockwise
antiorario	counter-clockwise

9.3 Version change

A right version pump is defined when:

Observing the pump from the head side, the PTO shank of the pump shaft is on the right side.

A left version pump is defined when:

Observing the pump from the head side, the PTO shank of the pump shaft is on the left side.

N.W. Fig. 5 shows a right version.



The version may be changed only by specialised and authorised personnel by carefully following the instructions that follow:

1. Separate the hydraulic part from the mechanical part as indicated in Chapter 2, paragraph 2.2.1 of the repair manual.
2. Rotate the mechanical part by 180°, and reposition the rear crankcase cover so that the oil dipstick is facing upwards; reposition the lifting bracket and the related closing caps in the upper part of the crankcase; finally, correctly reposition the identification plate in its apposite seat on the crankcase.



Be sure that the lower draining holes on the crankcase near the pistons are open, and not closed by the apposite plastic caps as required for the previous version.

3. Join the hydraulic part with the mechanical part as indicated in Chapter 2, paragraph 2.2.5 of the repair manual.

9.4 Hydraulic Connections

In order to isolate the system from the vibrations produced by the pump, we advise to build the first section of the duct near the pump (both for intake and delivery) with flexible tubes. The consistency of the intake section must allow to avoid deformation caused by the depressurisation produced by the pump.

9.5 Pump feeding

To obtain the best volumetric efficiency, a minimum positive head of 0.20 metres is required.



For negative head values, please contact the *Technical Department or Customer Assistance Service*.

9.6 Suction line

For the pump's correct operation, the suction line must have the following characteristics:

1. Minimum internal diameter as indicated in the diagram in paragraph 9.9, and in any case equal or greater than the pump head's value.



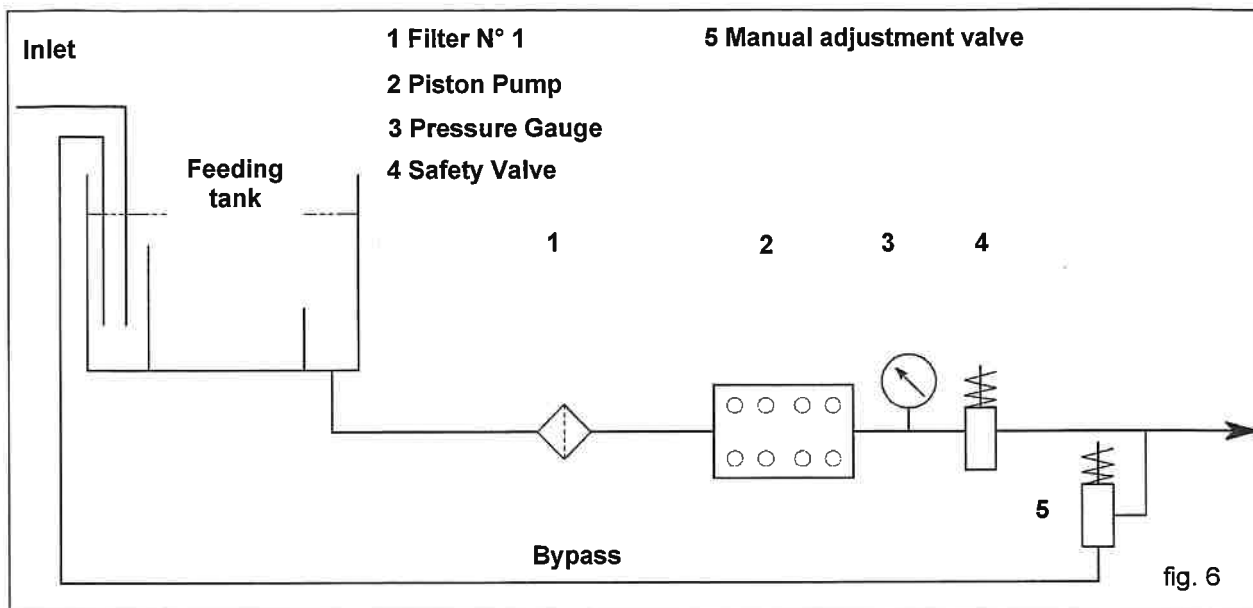
Along the duct, avoid localised diameter reductions that may cause pressure drops with subsequent cavitation. Absolutely avoid 90° elbows, connections with other pipes, bottlenecks, counter-slopes, upside-down "U" shaped curves, "T" connections.

2. The selected lay-out must allow to avoid cavitation.
3. It should be perfectly airtight, and built in a way that guarantees perfect sealing over time.
4. Avoid pump emptying when stopping (even partial emptying).
5. Do not use hydraulic-type fittings, 3 or 4 way fittings, adaptors, etc... since they may hinder the pump's performance.
6. Do not install Venturi tubes or injectors for detergent intake.
7. Avoid the use of standing valves, check valves, or any other type of one-way valves.
8. Do not connect the by-pass line from the valve directly to the pump suction line.
9. Provide appropriate baffle plates inside the tank in order to avoid that water flows coming from both the by-pass and feeding lines may create turbulence near the tank's outlet port.
10. Make sure that the suction line is perfectly clean inside before connecting it to the pump.

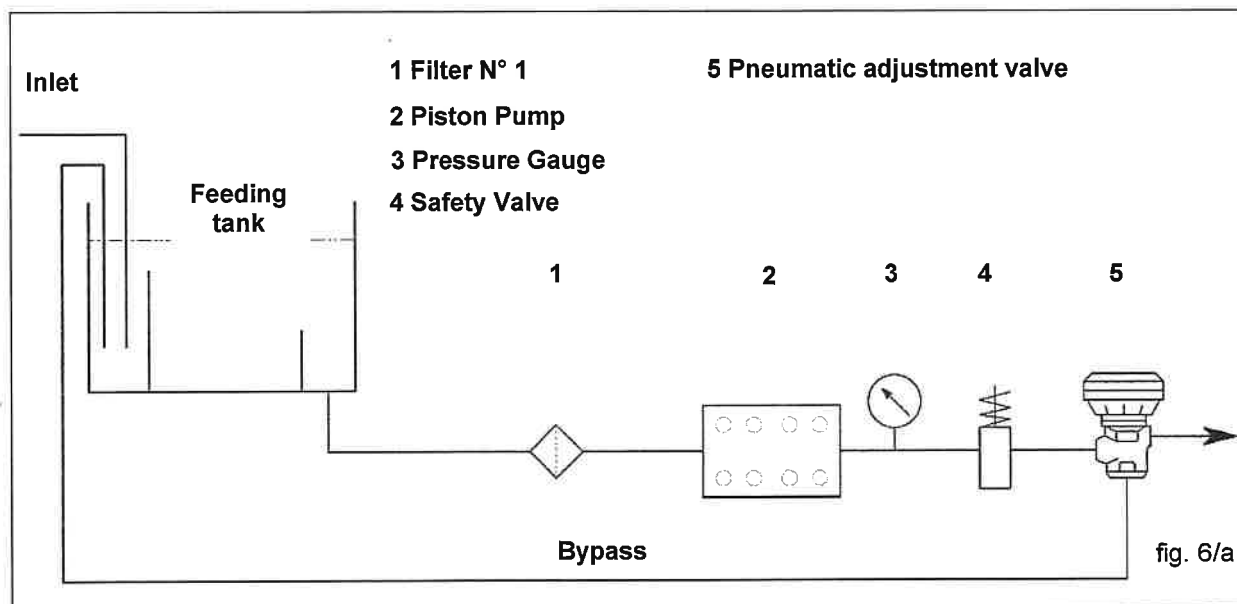
9.7 Filtering

On the pump suction line, install 1 filter arranged as shown in fig. 6 and fig.6/a.

With the manual adjustment valve



With the pneumatic adjustment valve



The filter must be installed as close as possible to the pump, should allow easy inspection and have the following characteristics:

1. Minimum capacity 3 times greater than the pump's rated flow value
2. Filter port diameters must not be smaller than the pump inlet ports
3. Filtration degree ranging between 200 and 360 μm



In order to guarantee correct pump operation, it is important to plan periodical cleaning of the filter depending on actual pump usage, water quality and real clogging conditions.

9.8 Delivery line

To obtain a correct delivery line, please comply with the following installation instructions:

1. The internal diameter of the pump must allow to guarantee correct fluid speed; see diagram in paragraph 9.9.
2. The first section of the pipe connected to the pump must be flexible in order to isolate pump vibrations from the rest of the system.
3. Use high pressure pipes and fittings that guarantee wide safety margins in any working condition.
4. Install a safety valve on the delivery line.
5. Use pressure switches suitable for the pulsating loads typical of piston pumps.
6. In the design phase, take into proper account the pressure drop along the line, since this causes a reduction in usage pressure with respect to the value measured at the pump
7. If the pump pulsations are harmful for particular applications, install an appropriately sized pulsation damper on the delivery line.

9.9 Internal diameter of the pipeline

To determine the internal diameter of the piping, please refer to the diagram below.

Suction pipe

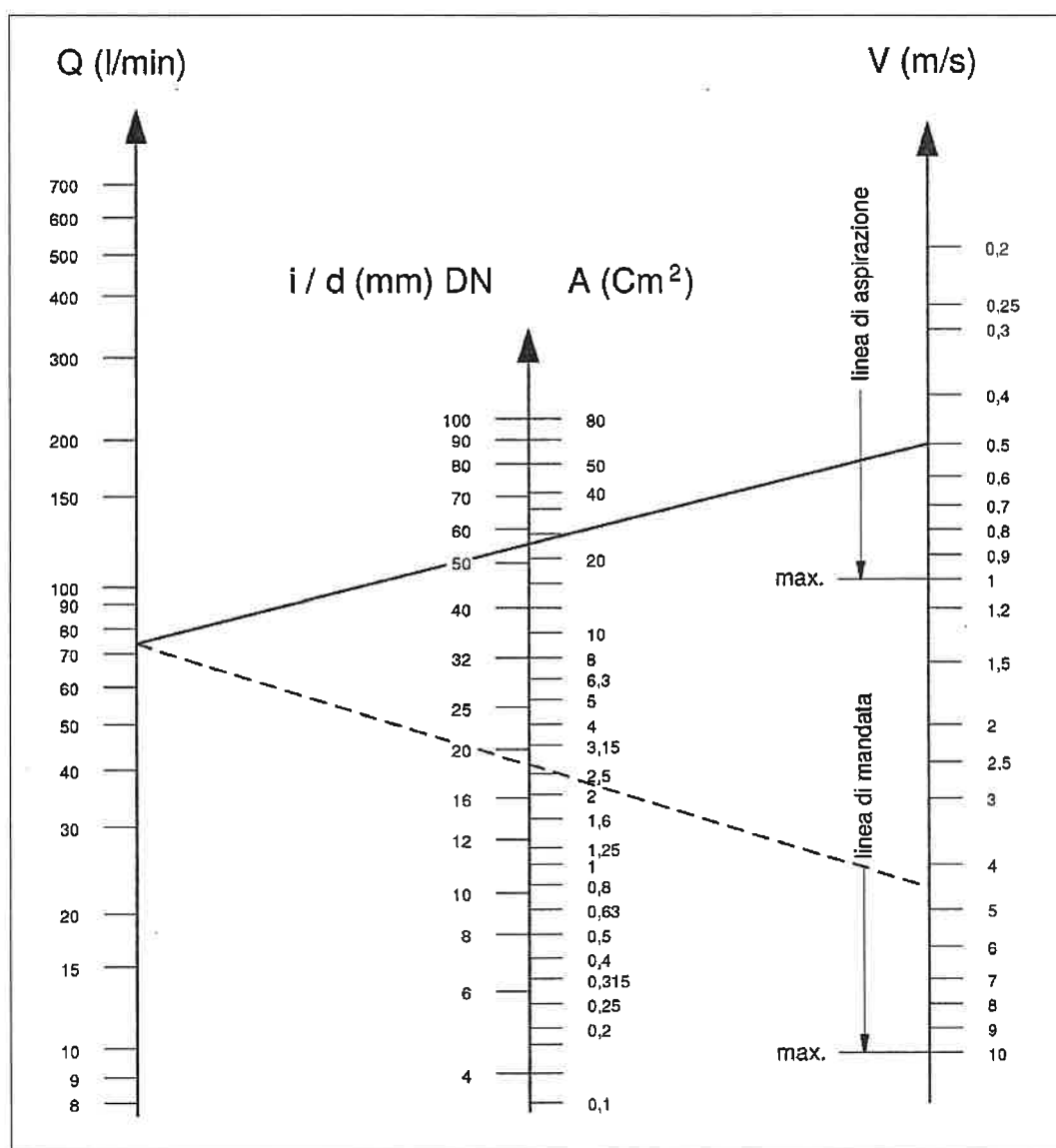
With a flow rate of ~ 74 L/min and water speed of 0.5 m/sec. The diagram line that connects the two scales intersects the central scale, indicating the diameters, at a value of ~ 55 mm.

Delivery pipe

With a flow rate of ~ 74 L/min and water speed of 5.5 m/sec. The diagram line that connects the two scales intersects the central scale, indicating the diameters, at a value of ~ 19 mm.

Optimum speed values:

- Suction: ≤ 0.5 m/sec.
- Delivery: ≤ 5.5 m/sec.



Linea di aspirazione	Suction line
Linea di mandata	Delivery line



The diagram does not take into consideration the pipe and valve resistance, the pressure drop due to the pipe length, the viscosity and the temperature of the pumped fluid.
If necessary, contact our **Technical Department or Customer Assistance Service**.

9.10 V-belt transmission

The pump may be driven by a v-belt system.

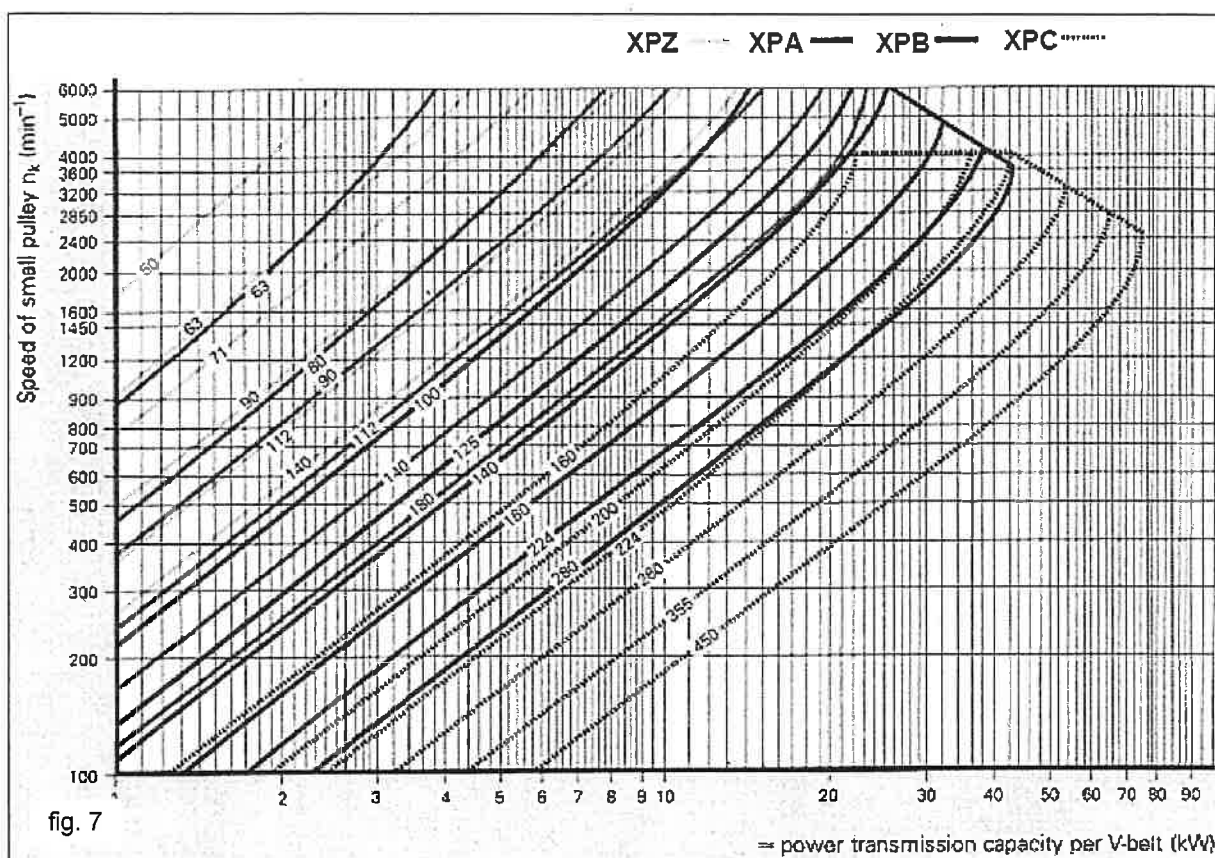
For this pump model, we suggest to use N° 4 XPB belts (16.5x13 cogged); only for long durations, use the XPC profile; both the characteristics and the power transmission capacity of each belt can be verified on the diagram in fig. 7, in function of the N° of rotations normally declared by the Manufacturer.

Minimum diameter of the driven pulley (on the pump shaft): ≥ 250 mm.

The radial load on the shaft must not be greater than 7500 N (value required for the definition of the Lay-out).
The transmission is considered adequate if this load is applied at a maximum distance of $a=40$ mm from the shaft shoulder (P.T.O) as indicated in fig. 10.



For sizing that differs from what indicated above, please contact our **Technical Department or Customer Assistance Service**.



9.11 Transmission definition

To avoid abnormal radial loads on the shaft and its related bearing, please comply with the following indications:

- Use pulleys for v-belts with race dimensions prescribed / recommended by the belt Manufacturer.
Should no indications be supplied, please see fig. 8 and the table in fig. 9.

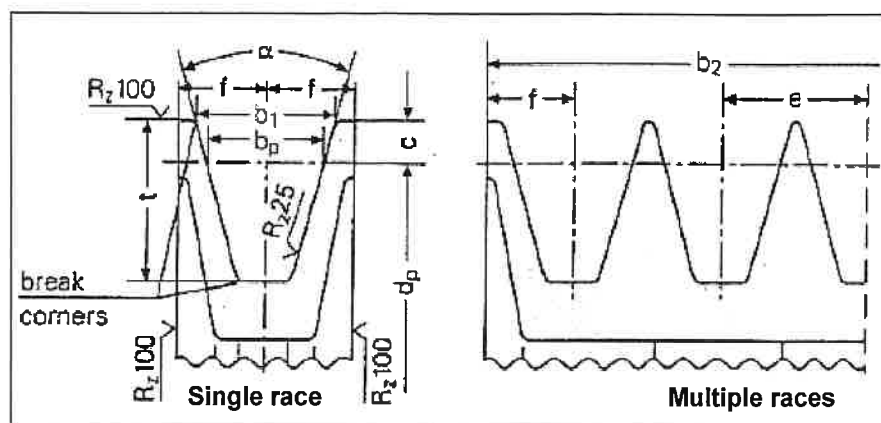


fig. 8

Dimensions (in mm)

Belt section as indicated in DIN 7753 part 1 and B.S. 3790			symbol DIN symbol B.S./ISO	XPB/SPB SPB	XPC/SPC SPC
Belt section as indicated in DIN 2215 and B.S. 3790			symbol DIN symbol B.S./ISO	17 B	22 C
Pitch width			b_w	14.0	19.0
Increased race width $b_1 \approx$			$\alpha = 34^\circ$	18.9	26.3
			$\alpha = 38^\circ$	19.5	27.3
			c	8.0	12.0
Distance between races			e	23 ± 0.4	31 ± 0.5
			f	14.5 ± 0.8	20.0 ± 1.0
Increased race depth			t_{min}	22.5	31.5
α	34°	For a primitive diameter narrow section v-belt DIN 7753 part 1	d_w	from 140 to 190	from 224 to 315
	38°			> 190	> 315
α	34°	For a primitive diameter classical section v-belt DIN 2215	d_w	from 112 to 190	from 180 to 315
	38°			> 190	> 315
Tolerance for $\alpha = 34^\circ\text{--}38^\circ$				$\pm 1^\circ$	$\pm 30'$
Pulleys per b_2 per Number of races z $b_2 = (z-1)e + 2f$			1	29	40
			2	52	71
			3	75	102
			4	98	133
			5	121	164
			6	144	195
			7	167	226
			8	190	257
			9	213	288
			10	236	319
			11	259	350
			12	282	381

The pulley's minimum diameter must be respected.
Do not use for banded v-belts.

fig. 9

- b) Use high efficiency belts – for example **XPB** instead of **SPB**; this will allow to use a lower number of belts to transmit the same power, and consequently a minor distance of the resultant from the shaft shoulder (P.T.O.) "a" in fig. 10

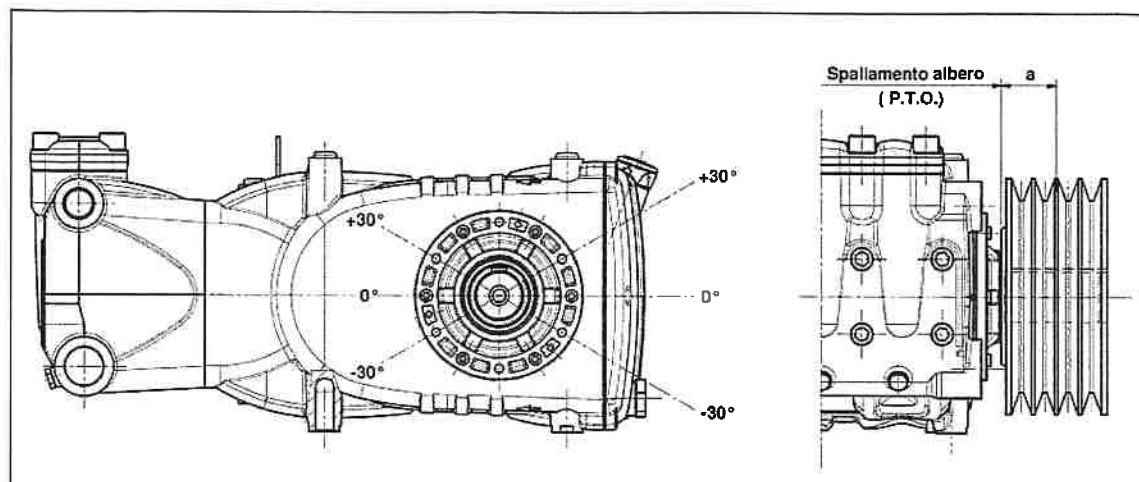


fig. 10

Spallamento albero

Shaft shoulder

- c) Set belt tension according to the Manufacturer's prescriptions; an excessive value will abnormally stress the bearing, reduce its duration, and cause premature wear of the pulley. The tension value depends on different variables as indicated in paragraph 9.12.
- d) Belt length has a natural tolerance $\geq \pm 0.75\%$; for this reason the three belts must be purchased in pairs.
- e) Follow the belt tension direction as indicated in fig. 9; for different needs, please contact **the Technical Department or Customer Assistance Service**
- f) Carefully align driver pulley and driven pulley races.

9.12 Definition of belt static tension values

Static tension depends on:

- a) The centre distance between the two pulleys (belt length).
- b) The load due to the belt's static tension
- c) The number of belts
- d) The angle of wrap of the smallest pulley
- e) Average speed
- f) Etc.

For belts with an XPB profile, the diagram in fig. 11 allows to obtain the values of the static tension that must be applied vs. the centre distance between pulleys.

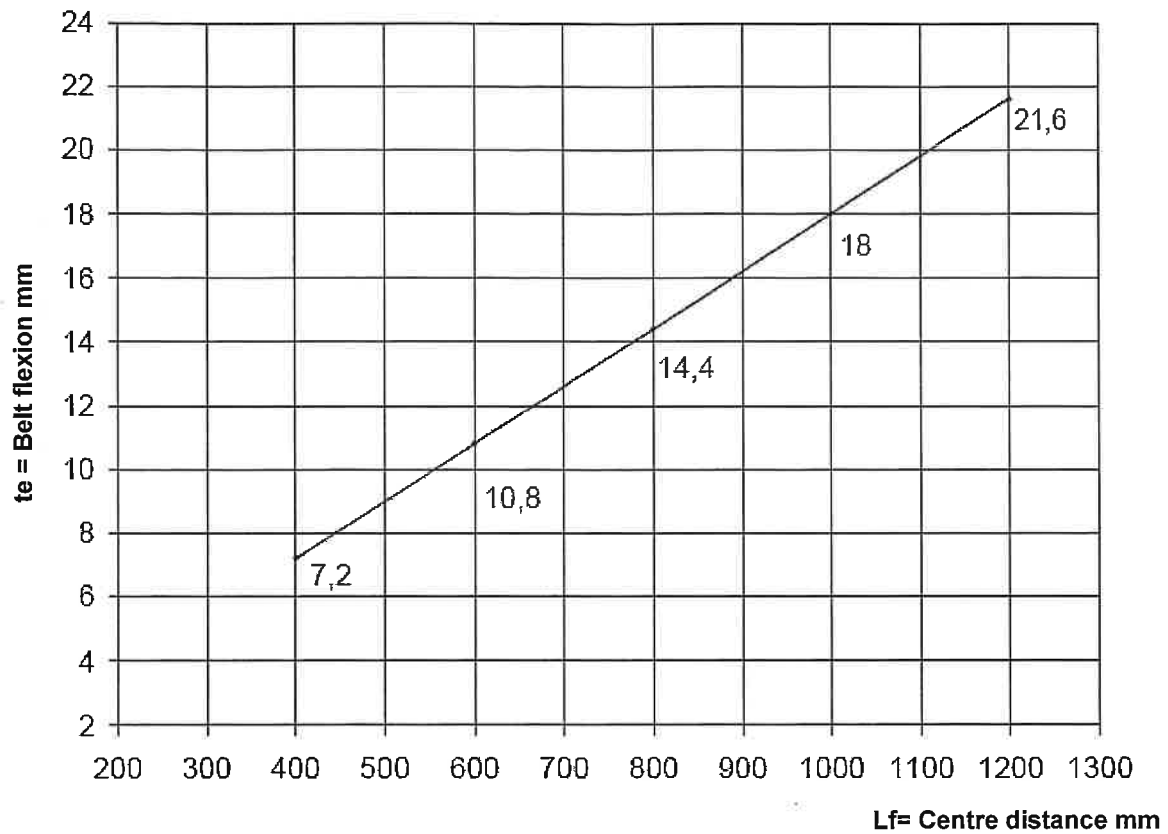
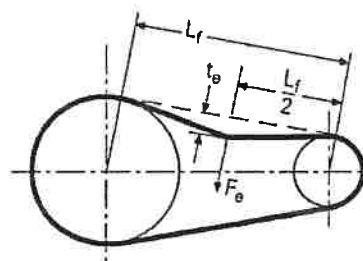
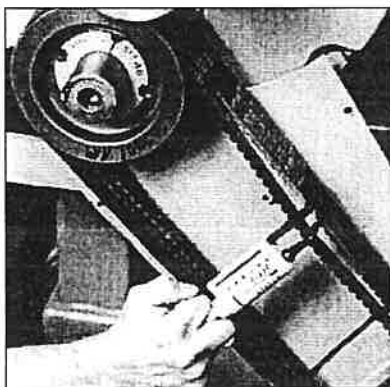


fig. 11

Conclusion: using a dynamometer, by loading the belt with 75 N as indicated in fig. 12, you will obtain a flexion value "te" of about 10.8 mm.



L_f = Centre distance

t_e = Belt flexion

F_e = 75 N Dynamometer load

fig. 12

N.W₁. If not differently indicated by the belt Manufacturer, the inspection of the correct tension value, and the related tension adjustment if needed, is to be carried out after at least 30 minutes of operation in order to obtain belt settling. The best efficiency and maximum duration is obtained with the correct tension value.

N.W₂. If required, or during normal maintenance, never replace a single belt but the entire set.

10. START-UP AND OPERATION

10.1 Preliminary inspections

Before start-up, be sure that:



The suction line is connected and up to pressure (see paragraphs 9.4 – 9.5 – 9.6) the pump must never run dry.

1. The suction line must be perfectly airtight.
2. All the On-Off valves between the pump and the feeding source are completely open. The delivery line must discharge freely in order to allow the air in the pump to be expelled easily, thus facilitating pump priming.
3. All suction / delivery connections and fittings must be correctly tightened.
4. Coupling tolerances on the pump / transmission axis (half-joint misalignment, Cardan inclination, belt tightening, etc.) must remain within the limits indicated by the transmission Manufacturer.
5. The oil level in the pump must be verified using the apposite dipsticks (position 1 fig. 13), and exceptionally by means of the oil sight glass (position 2 fig. 13).

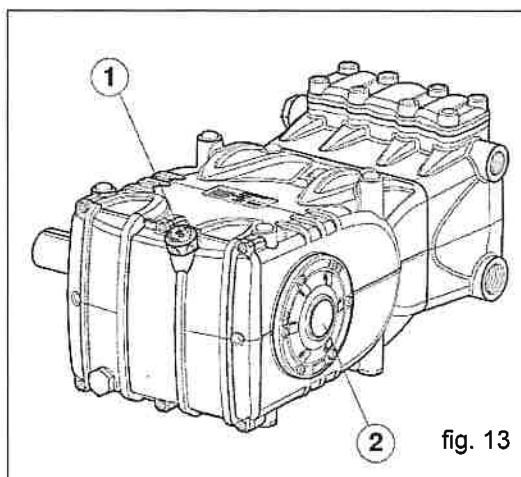


fig. 13



In case the pump has not run for a long period of time, verify the correct operation of the suction and delivery valves.

10.2 Start-up

1. When starting the pump for the first time, check for the correct sense of rotation
2. The pump must be started off-load
3. Verify correct feeding pressure
4. During operation check that the rotating speed does not exceed the rated value
5. Before putting the pump under pressure let it run for at least 3 minutes
6. Before stopping the pump, release the pressure by acting on the adjustment valve or on any discharging device, and reduce rpm (diesel applications)

11. PREVENTIVE MAINTENANCE

To guarantee pump reliability and efficiency, respect the maintenance intervals as indicated in the table in fig. 14.

PREVENTIVE MAINTENANCE	
Every 500 hours	Every 1000 hours
Check oil level	Change oil
	Check / Replace: <ul style="list-style-type: none">- Valves- Valves seats- Valve springs- Valve guides
	Check / Replace: <ul style="list-style-type: none">- H.P. packings- L.P. packings

fig. 14

12. STOPPING THE PUMP FOR LONG PERIODS

12.1 Inactivity for long periods



If the pump is started up for the first time after a long period from the shipment date, before starting operation check the oil level, check the valves as indicated in Chapter 10, and therefore follow the start-up procedures described.

12.2 Filling the pump with an anti-corrosion emulsion or anti-freeze solution by using an external diaphragm pump as in the layout shown in paragraph 9.7, fig. 6

- a) Close the filter draining, if open.
- b) Be sure that the connecting pipe is clean and spread with grease, and connect it to the high pressure outlet port.
- c) Fit a suction hose to the membrane pump. Open the pump suction connection and fit hose between it and the membrane pump.
- d) Fill the container with the solution / emulsion.
- e) Put the free extremities of the suction pipe and the high pressure outlet pipe inside the container
- f) Start up the diaphragm pump
- g) Pump the emulsion until it comes out of the high pressure outlet pipe
- h) Continue pumping for at least another minute; if needed, the emulsion can be re-enforced by adding for example Shell Donax
- i) Stop the pump, remove the pipe from the suction connection and close it with a plug
- j) Remove the pipe from the high pressure outlet port. Clean, grease and plug both connections and the pipes.

12.3 Pipes

- a) Before greasing and protecting the pipes according the previously described procedure, dry the connections using compressed air
- b) Cover with polyethylene
- c) Do not wrap them too tightly; be sure there is no folding

13. PRECAUTIONS AGAINST FREEZING



In areas and periods of the year where there is risk of freezing, follow the instructions indicated in Chapter 12 (see paragraph 12.2).



In the presence of ice, in no case must the pump be started until the entire circuit has been perfectly thawed out; not complying with this indication may cause serious damage to the pump.

14. WARRANTY TERMS

The duration and the terms of the warranty are contained in the purchase contract.

The warranty is void if:

- a) The pump has been used for purposes that differ from what agreed.
- b) The pump has been fit with an electric or diesel engine with performance greater than what indicated in the table.
- c) The required safety devices were un-adjusted or disconnected.
- d) The pump was used with accessories or spare parts not supplied by the Interpump Group.
- e) Damage was caused by:
 - 1) improper use
 - 2) the non-observance of maintenance instructions
 - 3) use not compliant with operating instructions
 - 4) insufficient flow rate

- 5) faulty installation
- 6) incorrect positioning or sizing of the pipes
- 7) non authorised design changes
- 8) cavitation

15. TROUBLESHOOTING



The pump does not produce any noise at start-up:

- The pump is not primed and is running dry
- There is no water in the inlet line
- The valves are blocked
- The delivery line is closed and does not allow the air in the pump to be discharged



The pump pulses irregularly (knocking):

- Air suction
- Insufficient feeding
- Bends, elbows, fittings along the suction line obstruct the fluid's passage
- The inlet filter is dirty or too small
- The booster pump, where provided, supplies insufficient pressure or flow rate
- The pump is not primed due to insufficient head or the delivery line is closed during priming
- The pump is not primed due to valve seizing
- Worn valves
- Worn pressure packings
- Incorrect operation of the pressure adjustment valve
- Transmission problems



The pump does not deliver the rated flow / is noisy:

- Insufficient feeding (see the causes listed above)
- RPM are less than the rated value
- Excessive amount of water by-passed by the pressure adjustment valve
- Worn valves



- Leakage from the pressure packings
- Cavitation due to:
 - 1) Wrong sizing of the suction pipe / undersized diameters
 - 2) Insufficient flow rate
 - 3) High water temperature



Insufficient pump pressure:

- The nozzle is (or has become) too large
- Insufficient RPM
- Leakage from the pressure packings
- Incorrect operation of the pressure adjustment valve
- Worn valves



Overheated pump:

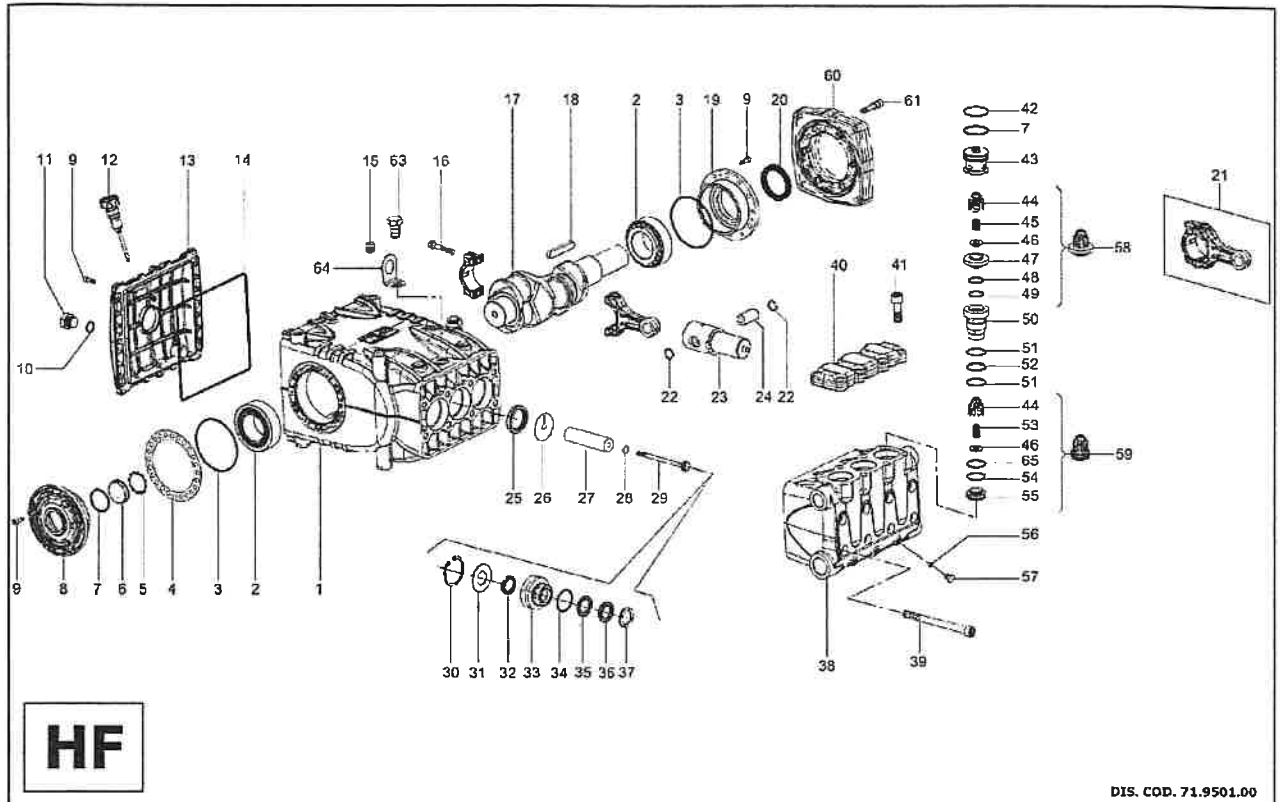
- The pump is overloaded (pressure or rpm exceed the rated values)
- Oil level is too low, or the oil is not of a suitable type, indicated in Chapter 11 (see paragraph 11.1.1).
- Excessive belt tension or incorrect alignment of the joint or the pulleys
- Excessive inclination of the pump during operation



Pipe Vibrations or Knocking:

- Air suction
- Incorrect operation of the pressure adjustment valve
- Valve malfunction
- Irregular drive transmission motion

16. EXPLODED VIEW AND PART LIST



DIS. COD. 71.9501.00

KIT RICAMBIO – SPARE KIT		HF18	HF22	HF25
A	Kit tenute pompanti – Plunger packing kit	KIT 2024	KIT 2026	KIT 2028
B	Kit valvole aspirazione – Inlet valves kit	KIT 2031	KIT 2022	
C	Kit valvole mandata – Outlet valves kit		KIT 2023	
D	Kit tenute complete – Complete seals kit	KIT 2025	KIT 2027	KIT 2029

Pratissoli	
HF18 – HF22	HF25

POS	CODE CODICE	DESCRIZIONE	KIT	NR. PCS	POS	CODE CODICE	DESCRIZIONE	KIT	NR. PCS
1	71.0100.22	Carter pompa		1	35	90.2687.00	Anello Restop D.18	A - D	3
2	91.6590.00	Cuscinetto a rulli conici 33210/Q		2		90.2730.00	Anello Restop D.22	A - D	3
3	90.3818.00	OR D.94,82x2,62 (3375)	D	2		90.2748.00	Anello Restop D.25	A - D	3
4	71.2200.51	Spessore		1		90.2686.00	Anello ten. alt. D.18 H.P.	A - D	3
5	71.2203.81	Spessore		1	36	90.2725.00	Anello ten. alt. D.22 H.P.	A - D	3
6	90.0756.00	Anello Z145	D	1		90.2749.00	Anello ten. alt. D.25 H.P.	A - D	3
7	70.2118.01	Spia livello olio		1		71.1000.51	Anello di testa D.18	D	3
8	90.3877.00	OR D.39,34x2,62 (3156)	D	4	37	70.1001.51	Anello di testa D.22	D	3
9	71.1501.22	Coperchio cuscinetto lato spia		1		71.1001.51	Anello di testa D.25	D	3
10	99.1867.00	Vite M6x18 UNI931 Z.		20		71.1205.36	Testata per pistone D.18		1
11	90.3841.00	OR D.17,13x2,62 (3068)	D	1	38	71.1201.36	Testata per pistone D.22		1
12	98.2183.00	Tappo G1/2x13 NICKEL		1		71.1202.36	Testata per pistone D.25		1
13	98.2120.00	Tappo con asta		1	39	99.4480.00	Vite M12x150 UNI5931 DACROMET		8
14	71.1600.22	Coperchio carter		1	40	71.2100.36	Coperchio valvole		1
15	90.4000.00	OR D.215x3	D	1	41	99.4850.00	Vite M14x40 UNI5931 DACROMET		8
16	98.2060.00	Tappo per foro D.15		7	42	90.5220.00	Anello antiest. D.40,9x45x1,5	D	3
17	99.3138.00	Vite serraggio biella		6	43	71.2110.70	Tappo valvole		3
18	71.0200.35	Albero		1	44	36.2040.51	Guida valvola		6
19	91.5000.00	Linguetta		1	45	94.7401.00	Molla Dm.12x17		3
20	71.1506.22	Coperchio cuscinetto lato PTO		1	46	36.2039.66	Valvola sferica		3
21	90.1700.00	Anello rad. D.50x65x8 VITON	D	1	47	36.2043.66	Sede valvola		3
22	71.0300.01	Biella completa		2	48	90.2851.00	OR D.21,89x2,62 (3087) – 90SH.	D	3
23	90.0606.00	Anello D.20 UNI7437		6	49	90.5145.00	Anello antiest. D.22,9x27x1,5	D	3
24	71.0500.15	Guida pistone		3	50	71.2115.66	Bussole valvole		3
25	97.7430.00	Spinotto D.20x38		3	51	90.5179.00	Anello antiest. D.31,4x35,5x1,5	D	6
26	90.1678.00	Anello rad. D.38x52x7	D	3	52	90.3866.00	OR D.29,82x2,62 (3118) – 90SH.	D	3
	96.7140.00	Rosetta D.10x50x1		3	53	94.7397.00	Molla Dm.11,4x20		3
27	71.0400.09	Pistone D.18		3	54	90.5177.00	Anello antiest. D.30x34,5x1,5	D	3
	71.0401.09	Pistone D.22		3	55	36.2042.66	Sede valvola		3
	71.0402.09	Pistone D.25		3	56	90.3578.00	OR D.6,75x1,78 (106)		3
28	90.3674.00	OR D.11x2 (11020) 90SH.	D	3	57	98.1972.00	Tappo G1/8"x8		3
29	71.2195.66	Vite fissaggio pistone		3	58	36.7139.01	Gruppo valvola mandata	C	3
30	90.0797.00	Anello D.52 UNI7437		3	59	36.7138.01	Gruppo valvola aspirazione	B	3
	71.2170.70	Anello per tenuta D.18		3	60	10.0677.20	Flangia motore idraulico		1
31	71.2172.70	Anello per tenuta D.22		3	61	99.3099.00	Vite M8x35 UNI931 Z.		6
	71.2174.70	Anello per tenuta D.25		3	63	99.5120.00	Vite M16x1,5x25 UNI5740 8.8 Z.		1
32	90.2648.00	Anello ten. alt. D.18 L.P.	A - D	3	64	71.2230.74	Staffa di sollevamento		1
	90.2713.00	Anello ten. alt. D.22 L.P.	A - D	3	65	90.3866.00	OR D.29,82x2,62 (3118) 90SH.	D	3
	90.2746.00	Anello ten. alt. D.25 L.P.	A - D	3					
33	71.2140.70	Supporto guarnizioni D.18		3			VARIANTI HF18 - VARIANTS FOR HF18		
	71.2151.70	Supporto guarnizioni D.22		3	46	36.2050.66	Valvola sferica		3
	71.2152.70	Supporto guarnizioni D.25		3	54	90.5155.00	Anello antiest. D. 23,9x28x2	D	3
34	90.3875.00	OR D.37,77x2,62 (3150)	A - D	3	55	36.2049.66	Sede valvola		3
					59	36.7144.01	Gruppo valvola aspirazione	B	3
					65	90.3856.00	OR D.23,47x2,62 (3093) 90SH.	D	3

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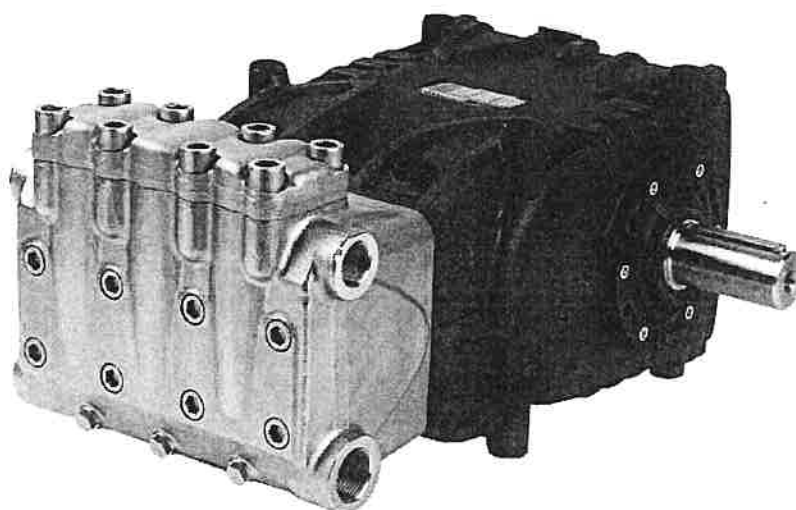
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Pratissoli

HF

HF Series



Repair Manual

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1. INTRODUCTION

This manual describes the instructions for repairing HF 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.

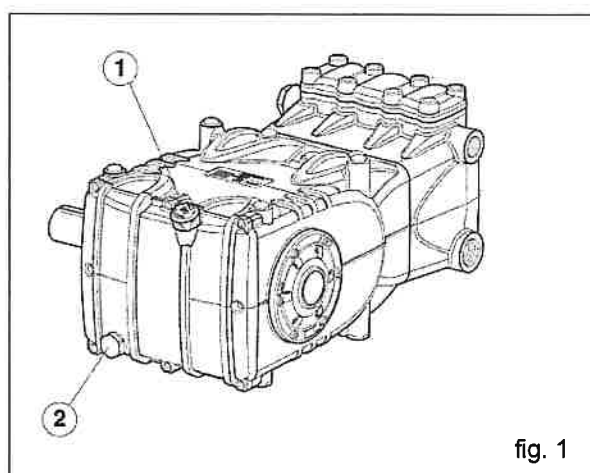
2. REPAIR INSTRUCTIONS



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.



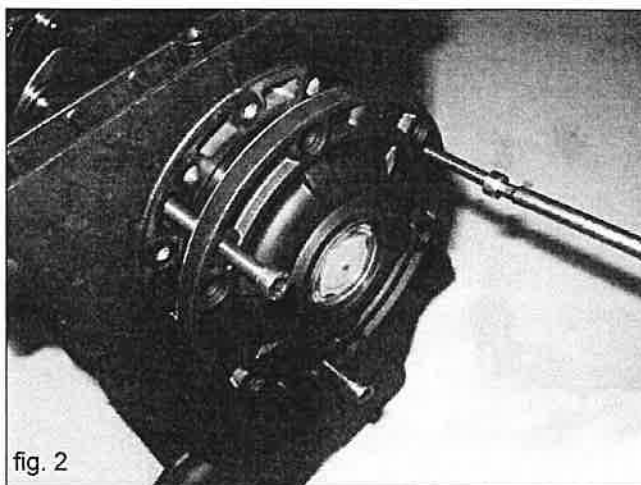
Exhausted oil must be collected in an appropriate recipient and disposed of in apposite locations. In absolutely no case may it be dispersed in the environment.

2.1.1 Crank mechanism disassembly

The correct sequence is the following:

A) Disassemble:

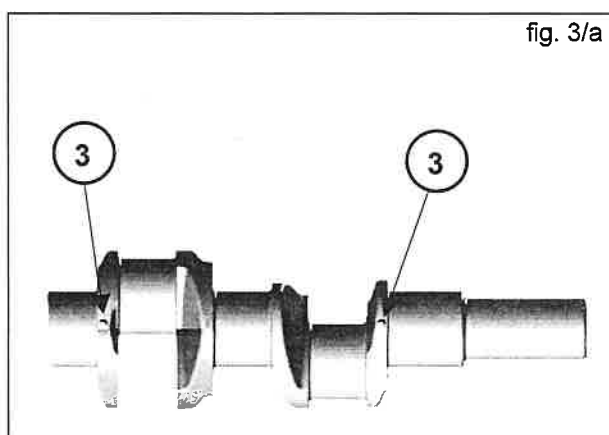
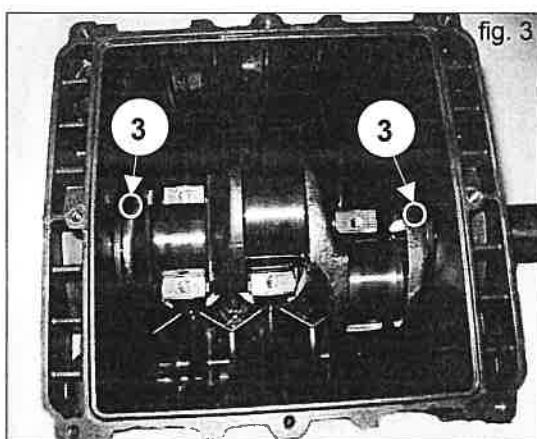
- pump shaft key
- rear cover
- connecting rod cap
- side covers, using n° 3 wholly threaded M6x 50 screws, inserting them in the apposite holes as shown in fig. 2



B) 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 ③, as shown in fig. 3 and in fig. 3/a; they must be turned towards the operator in order to facilitate extraction.

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



C) Disassemble 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. 5/a, using the apposite tool (cod.27904900).
- 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 section B of paragraph 2.1.1, and shown in fig. 4.

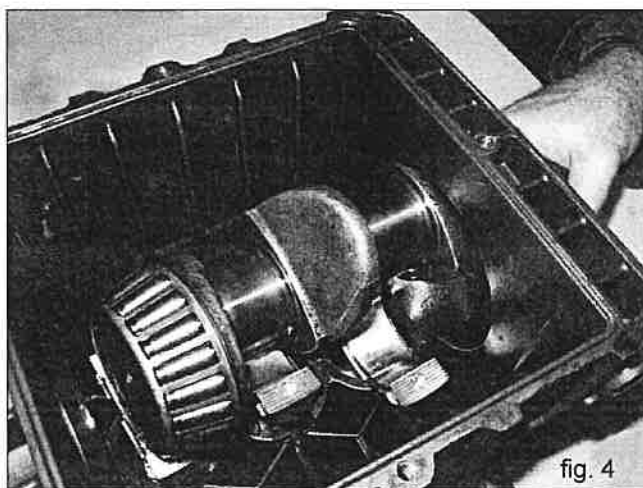


fig. 4

- Before reassembly of the side covers, check the seal lips for wear. If replacement is necessary, position the new ring using the apposite tool (cod. 27904800) as shown in fig. 5.

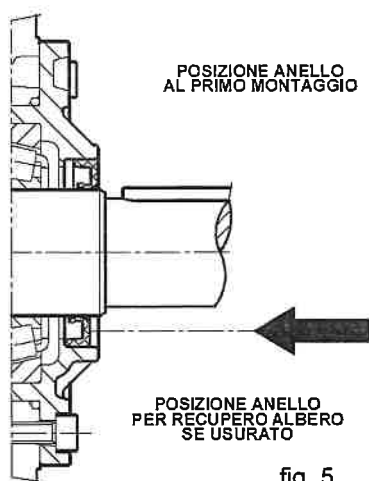


fig. 5

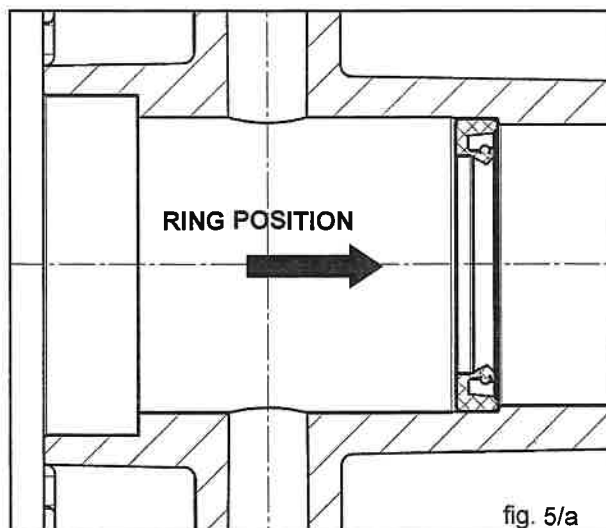


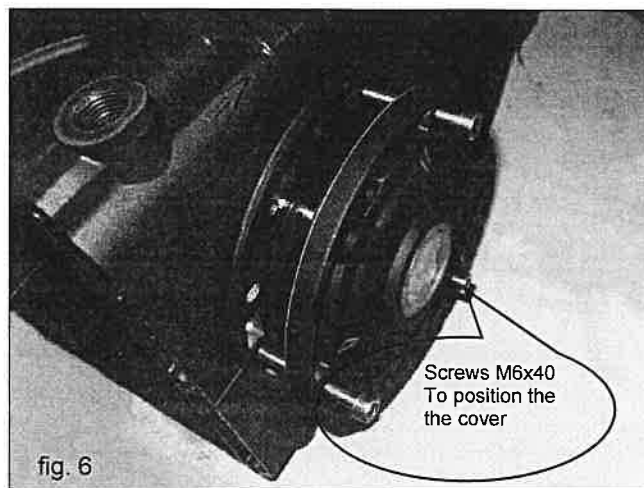
fig. 5/a

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



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. 5.

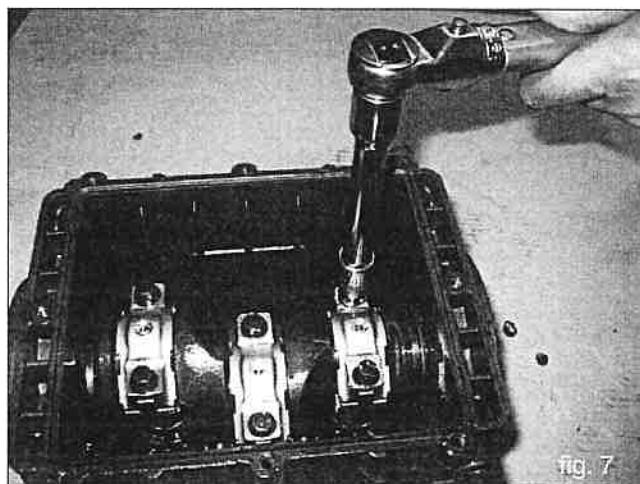
Before assembling the cover (sight glass side), be sure that the shim rings have been inserted. To help the covers fit onto the crankcase, we advise to use N°3 screws M6 x 40, and then finish the operation with the screws supplied (M6x18) as shown in fig. 6.



D) 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. 7:



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



E) Install the rear cover positioning the oil dipstick hole upward.

F) 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 wear; 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. 6, 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 shown in figures 8 - 9.

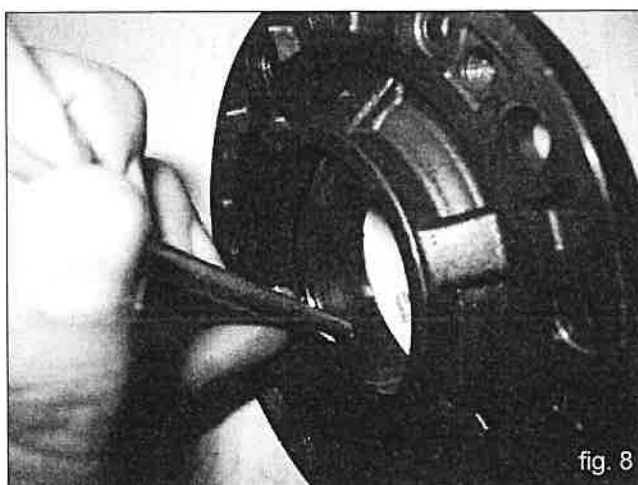


fig. 8

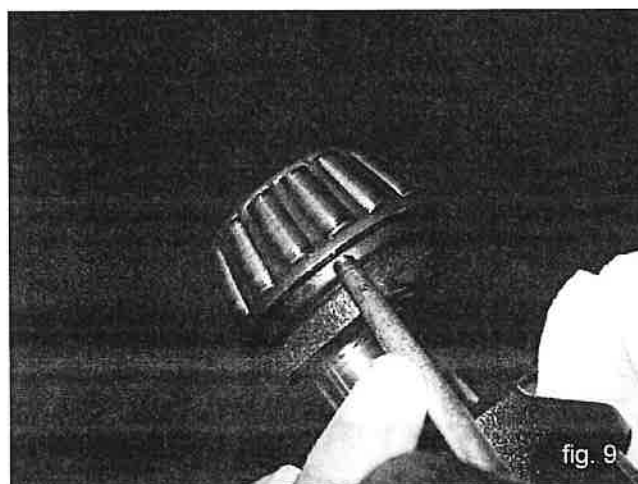


fig. 9

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:

- A) Insert the crankshaft in the crankcase, being sure that the P.T.O. shank comes out of the correct side.
- B) Fit the P.T.O. side flange to the crankcase paying great attention to the seal lip as indicated in paragraph 2.1.2, section C.
- C) Position the flange on the sight glass side as indicated in paragraph 2.1.2.
- D) Use a thickness gauge (see fig. 10)

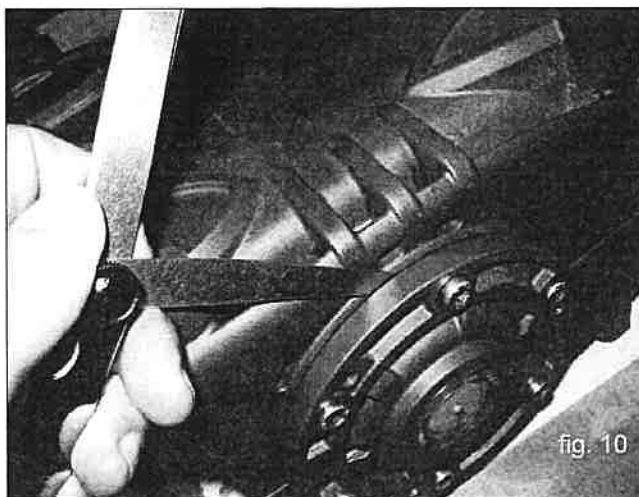


fig. 10

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

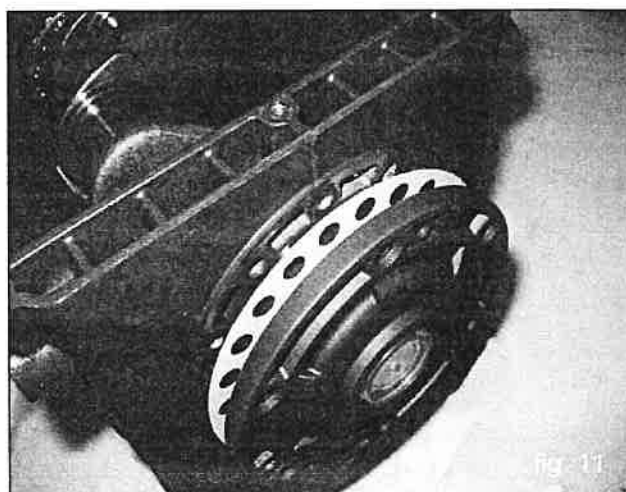


fig. 11

E) Insert the shims under the cover on the sight glass side (see fig. 11), fixing it to the crankcase using the appropriate screws, and verifying that the stall torque is between 4 Nm and 7 Nm.

F) If the torque value is correct, connect the rods to the crankshaft; otherwise, redefine the shims again repeating the operations from point "C".

2.2 Fluid End Repair

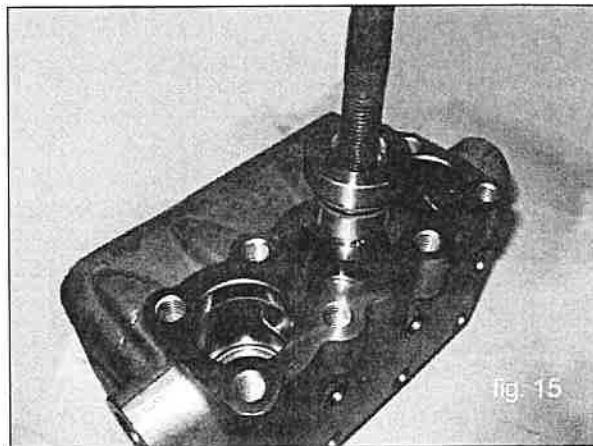
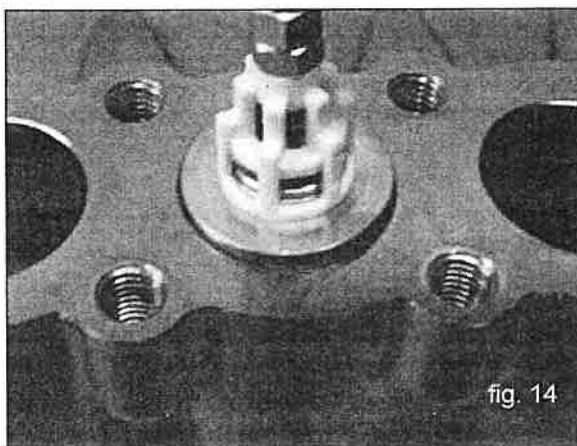
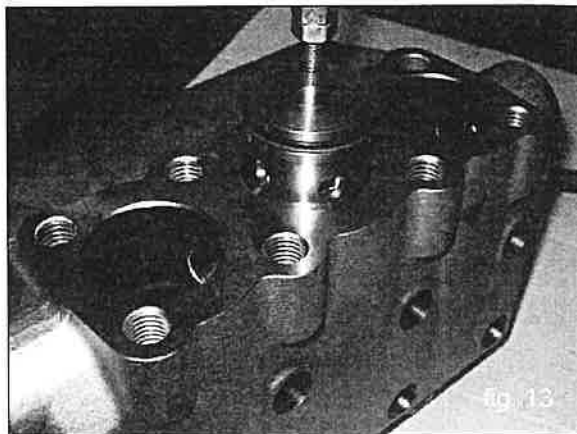
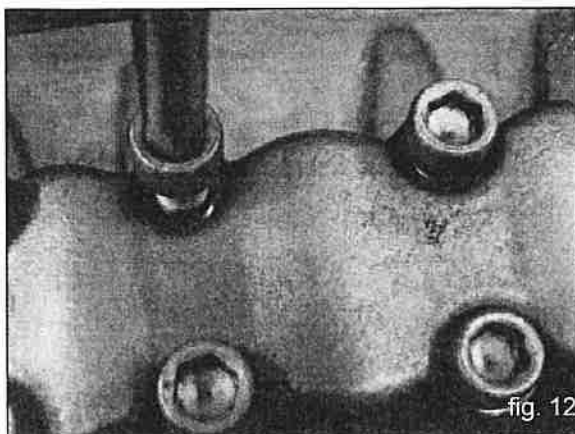
2.2.1 Disassembly of the head - valve units

Service operations are limited to valve inspection or replacement if needed, and in any case within the intervals indicated in the table in fig. 14, Chapter 11 of the use and maintenance manual.

The valve units are assembled inside the head in a vertical position.

For their extraction proceed as follows:
unfasten the 8 M14x40 valve cover screws (fig. 12);
using a slide hammer cod. 26019400 extract:

- A) the valve plugs (fig. 13);
- B) the delivery valve units (fig. 14);
- C) the valve bushes (fig. 15), also using the tool cod. 27513600
- E) the suction valve units (fig. 16).



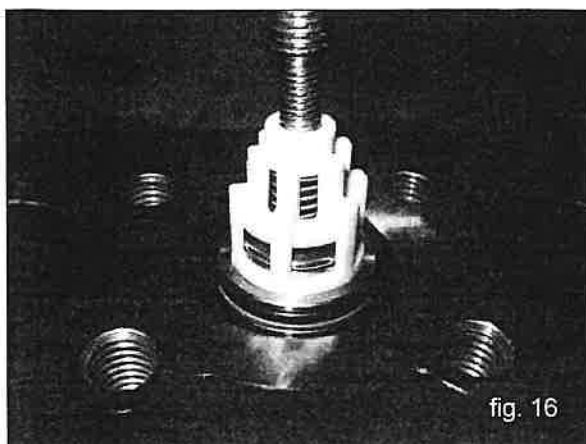


fig. 16

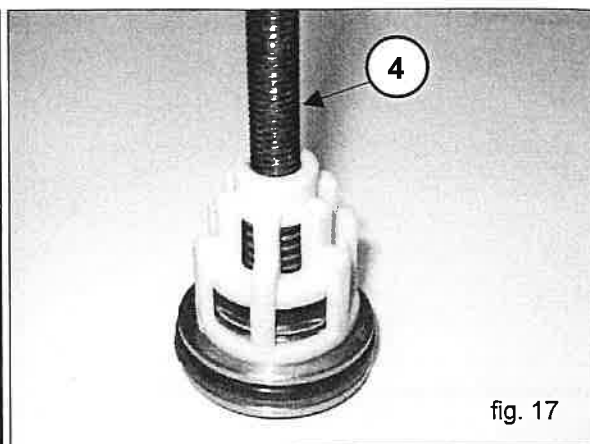


fig. 17

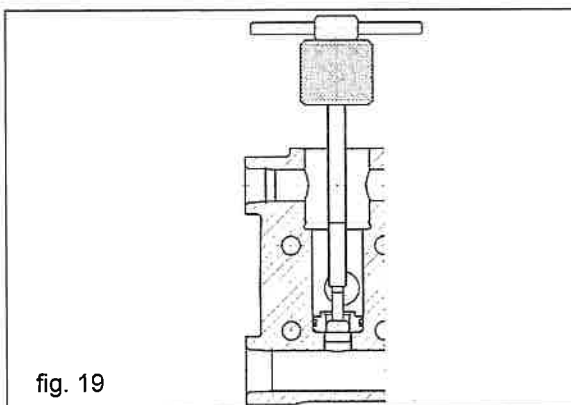
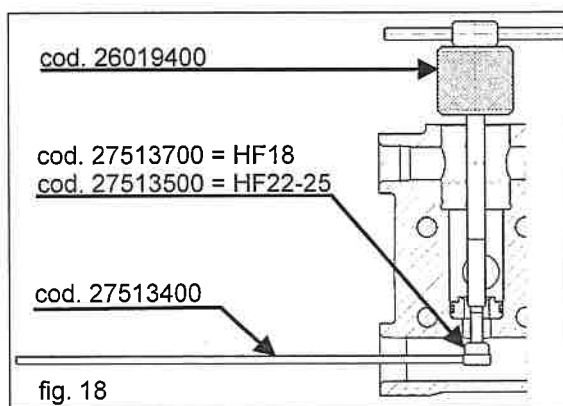
Disassemble the suction and delivery valve units by screwing on an M8 screw long enough to act on the valve and extract the valve guide from the valve seat, pos. ④ (fig. 17).



If the suction valve seats remain glued to the head (for ex. due to incrustations caused by prolonged pump inactivity), operate as follows:

For versions HF18, use the tools cod. 26019400; cod. 27513700; cod. 27513400;
(fig. 18 - fig. 19).

For versions HF22-HF25 use the tools cod. 26019400; cod. 27513700; cod. 27513400;
(fig. 18 - fig. 19).



N.W. Always slip off the handle cod. 27513400 before extracting the seats.

2.2.2 Head assembly - valve units



Pay careful attention to the 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. 20.

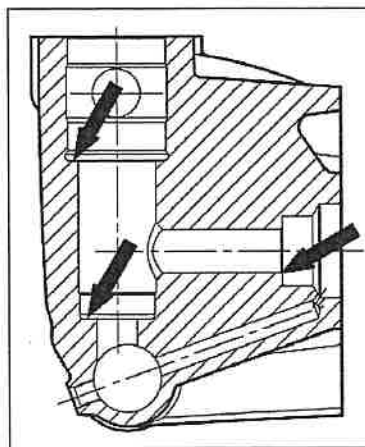


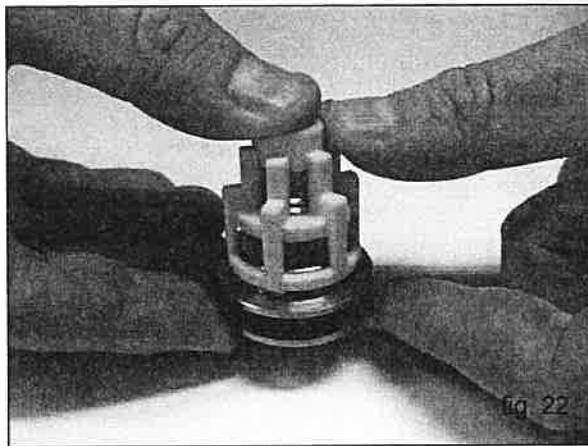
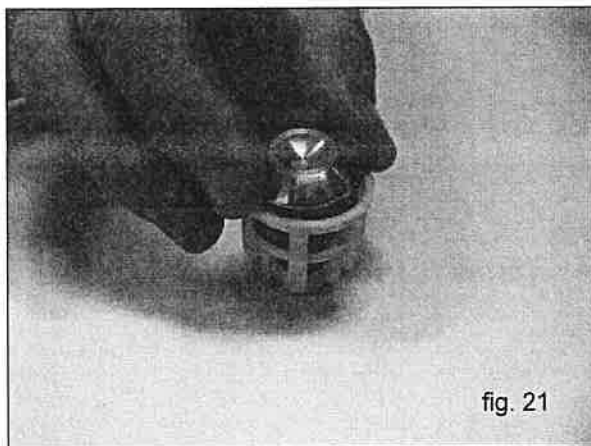
fig. 20

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



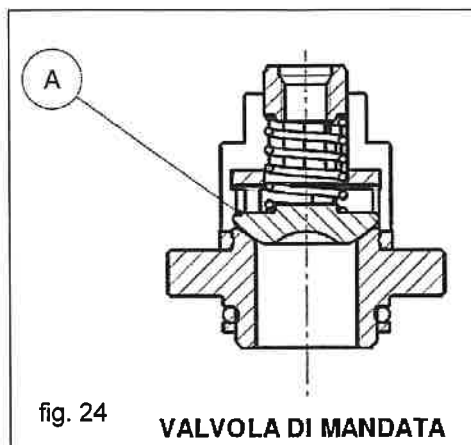
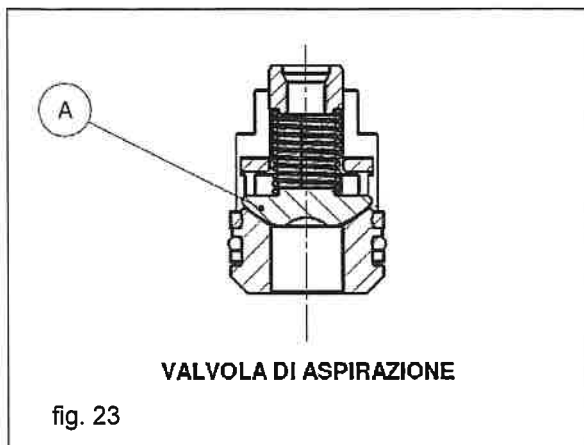
1. During the assembly of the suction and delivery valve units (fig. 21 - fig. 22) do not invert the suction springs with the previously disassembled delivery springs:

- a) Suction springs "white".
- b) Delivery springs "black".





2. Furthermore, for the HF18 version be careful not to invert the spherical suction valves with the "A" delivery valve (fig. 23 - fig. 24), exploded view pos. 46, as indicated in Chapter 16 of the use and maintenance manual.



Valvola di aspirazione	Suction valve
Valvola di mandata	Delivery valve

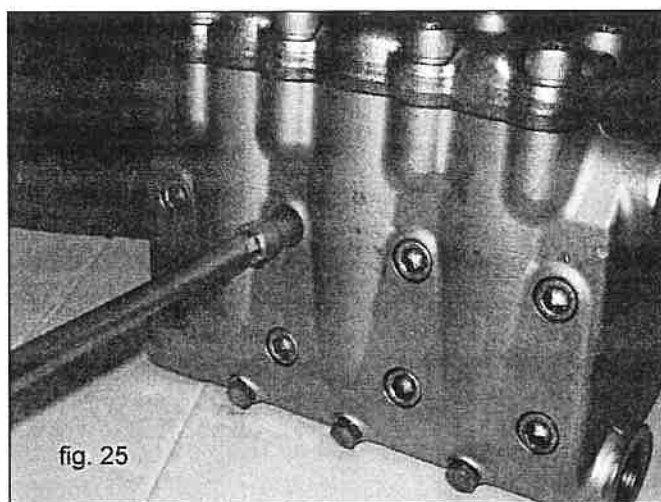
Insert the suction and delivery valve units with their related bushes checking that they are thoroughly inserted in their seat on the head.

Therefore apply the valve covers and proceed with calibrating the related M14x40 screws; see the indications in Chapter 3 for fastening torque values and sequences.

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 table in fig.14, Chapter 11 of the use and maintenance manual.

- A) Unfasten the M12x150 head screws as shown in fig. 25.



- B) Remove the head from the crankcase

C) Extract the high pressure seals from the head, and the low pressure seals from their related support by using standard tools as shown in fig. 26 pos. ⑤; be careful not to damage the seats.

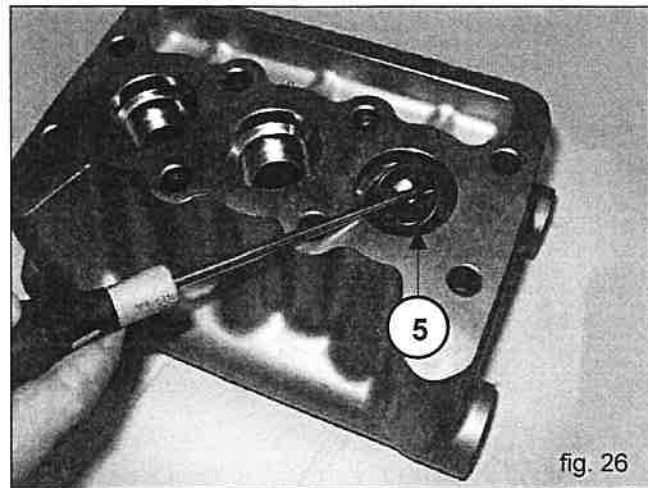


fig. 26



Pay careful attention to the order of sealing pack disassembly as shown in fig. 27 for HF22-25 version pumps, and fig. 27/a for HF18 version pumps, 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

Sealing pack, version HF22-25

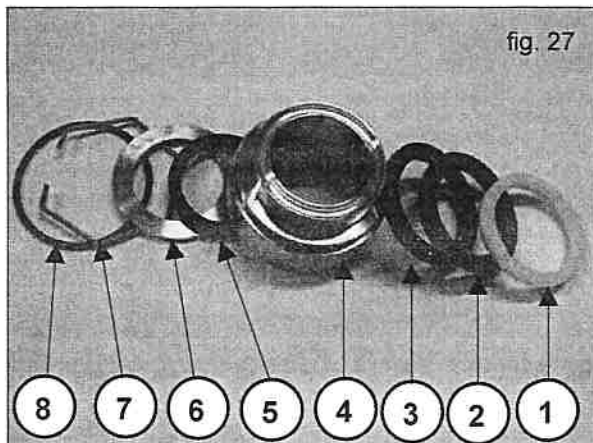


fig. 27

Sealing pack, version HF22-25

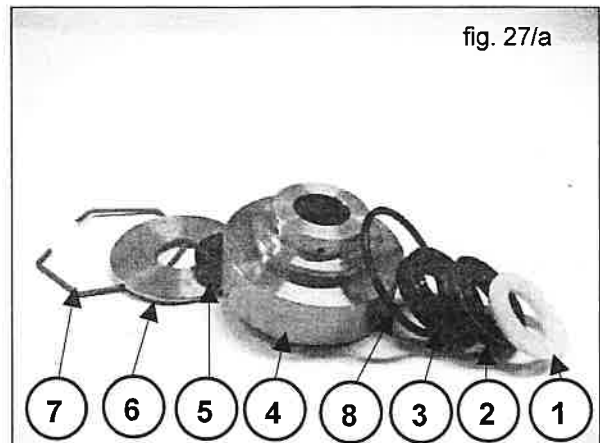


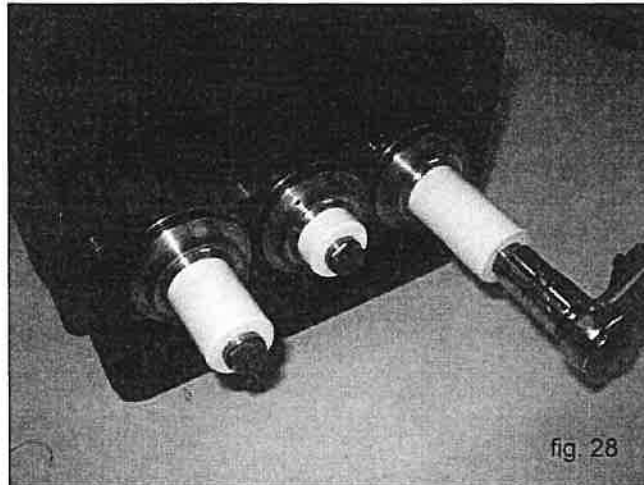
fig. 27/a

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 M 7x1 piston screws as shown in fig. 28



Check for wear; replace them if necessary.



At each disassembly, all the OR rings of the piston unit must be replaced

2.2.5 Head assembly - seals - piston unit

Reassemble the various components by inverting the operations previously listed in paragraph 2.2.3, paying careful attention to the following:

A) Sealing pack: respect the same order followed during disassembly.

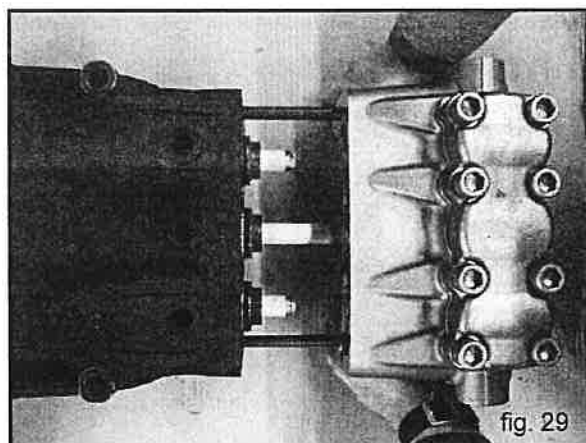
B) Lubricate components ②③⑤ with silicone grease type OCILIS cod. 12001600; this operation is also considered necessary in order to facilitate the settling of the seal lip on the piston.

C) 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.

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

E) Reassemble the head proceeding as follows:

1. Position the seal supports in their respective seats on the crankcase;
2. Using two screws - auxiliary pin (cod. 27508200) fastened to the crankcase as indicated in fig. 29, position the complete head, being sure that it is centred on the central piston only.
3. Complete the operations by following the fastening procedures; for fastening torque values and sequences, respect what indicated in Chapter 3.



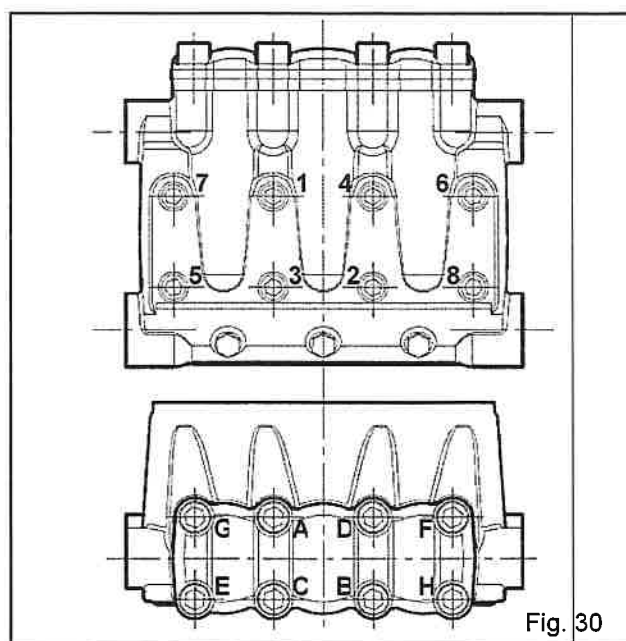
3. SCREW CALIBRATION

Description	Exploded view position		Fastening Torque Nm
Cover fastening screws	9		10
Piston fastening	29		20
Conrod caps fastening screws	16		38*
Head fastening screws	39		80**
Valve cover screws	41		180***
Lifting bracket fastening screws	63		100
Oil discharge plug	11		40

* The conrod caps fastening screws must be tightened respecting the phases indicated in "Point D" of page 6

** The head screws, exploded position 39, must be fastened using a torque wrench, lubricating the threaded stem and respecting the order of the scheme in fig.30.

*** The valve cover screws, exploded position 41, must be fastened using a torque wrench, lubricating the threaded stem and respecting the order of the scheme in fig.30.



4. REPAIR TOOLS

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

For assembly:

Gasket bush	Øe 32 ; H.P. alternative sealing ring Ø 18x32x7/4.5	cod. 27472700
Gasket bush	Øe 35 ; H.P. alternative sealing ring Ø 22x35x7/4.5	cod. 27472800
Gasket bush	Øe 38 ; H.P. alternative sealing ring Ø 25x38x7/4.6	cod. 27472900
Gasket bush	Øe 26 ; L.P. alternative sealing ring Ø 18x26x5.5	cod. 27470600
Gasket bush	Øe 30 ; L.P. alternative sealing ring Ø 22x30x5.5	cod. 27470700
Gasket bush	Øe 33 ; L.P. alternative sealing ring Ø 25x33x5.5	cod. 27470800
Pump shaft oil seal stopper		cod. 27904800
Piston guide oil seal stopper		cod. 27904900
Head assembly		cod. 27508200

For disassembly:

Valve bushes	cod. 26019400
	cod. 27513600
Suction valves, HF18 version pumps	cod. 26019400
	cod. 27513700
	cod. 27513400
Suction valves, HF22 – HF25 version pumps	cod. 26019400
	cod. 27513500
	cod. 27513400
Delivery valve	cod. 26019400
Valve plugs	cod. 26019400
Piston guide oil seal	cod. 27503900

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