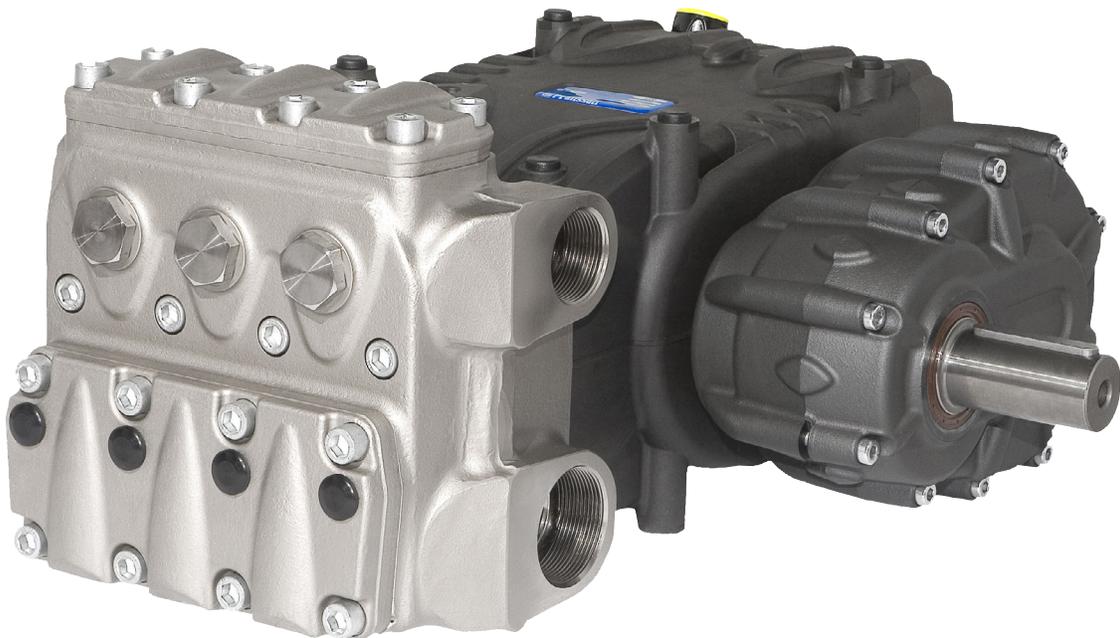


Owner's Manual

- *Installation*
- *Use*
- *Maintenance*



INDEX

1.	INTRODUCTION	Page 3
2.	SYMBOL DESCRIPTIONS	Page 3
3.	SAFETY	Page 3
	3.1 General safety warnings	Page 3
	3.2 High pressure unit safety requirements	Page 4
	3.3 Safety during operation	Page 4
	3.4 General procedures for nozzles	Page 4
	3.5 Safety during unit maintenance	Page 4
4.	PUMP IDENTIFICATION	Page 5
5.	TECHNICAL DATA	Page 5
6.	DIMENSIONS AND WEIGHT	Page 5
7.	GENERAL INFORMATION REGARDING PUMP USE	Page 6
	7.1 Water temperature	Page 6
	7.2 Maximum flow rate and pressure values	Page 6
	7.3 Lowest operating RPM	Page 6
	7.4 Recommended lubricant oil types	Page 6
8.	PORTS AND CONNECTIONS	Page 8
9.	PUMP INSTALLATION	Page 8
	9.1 Installation	Page 8
	9.2 Direction of rotation	Page 9
	9.3 Version change	Page 9
	9.4 Hydraulic connections	Page 9
	9.5 Pump feeding	Page 9
	9.6 Suction line	Page 9
	9.7 Filtering	Page 10
	9.8 Delivery line	Page 10
	9.9 Internal diameter of the hose	Page 10
	9.10 V-belt transmission	Page 12
	9.11 Transmission definition	Page 13
	9.12 Definition of belt static tension values	Page 14
10.	START UP AND OPERATION	Page 16
	10.1 Preliminary operations	Page 16
	10.2 Start up	Page 16
11.	PREVENTATIVE MAINTENANCE	Page 16
12.	STOPPING THE PUMP FOR LONG PERIODS	Page 17
	12.2 Pipes	Page 17
13.	PRECAUTIONS AGAINST FREEZING	Page 17
14.	WARRANTY TERMS	Page 17
15.	TROUBLESHOOTING	Page 18
16.	EXPLODED VIEW AND PARTS LIST	Page 19
20.	MAINTENANCE LOG	Page 25

1. INTRODUCTION

This manual describes the use and maintenance instructions of the KS pump, and should be carefully read and understood before pump operation. Correct use and adequate maintenance will guarantee the pumps trouble-free operation for a long time.

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

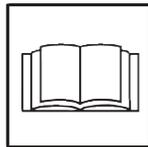
Upon receiving the pump, check that it is complete and in perfect condition. Should anything be found out of order, please contact us before installing and starting the pump.

2. SYMBOL DESCRIPTIONS



Warning

Potential Danger



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



Danger

Electrocution Danger



Danger

Use a face guard



Danger

Use protective glasses



Danger Signal

Use adequate hand protection before operating the pump



Danger

Wear protective 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. A safety valve should be installed in any delivery line and should be sized to discharge or by-pass the entire pump flow rate
2. High pressure unit components, with particular regard for those units working outside, should be adequately protected against rain, frost and heat.
3. Electric components and wiring should be provided with an adequate degree of protection, able to protect them against spray coming from any direction. They should also be suitable for working in a wet environment.
4. High pressure hoses and any other accessory under pressure should be sized in accordance with the maximum unit working pressure and must always work within the safety margins indicated by the hose/accessory Manufacturer.
5. High pressure hose ends should be fastened to a steady object in order to prevent them from dangerous sweeping around, should they burst or come off their end fittings.
6. Proper safety guards should be provided to adequately cover transmission joints, pulleys, belts or auxiliary drives.



3.3 Safety of operation

The access into the area when a high pressure unit is working should be strictly prohibited to unauthorized personnel. The area should be suitably enclosed and its perimeter, so far as is reasonably practical, cordoned off and proper warning notices displayed in prominent positions.

Personnel authorized to enter that area should have been previously trained to do so and informed of the risks arising from failures, misuse and any foreseeable circumstance which may occur during operation. Before starting the pump unit and bringing it up to pressure the Operator is requested to carry out the following checks:

1. Make sure that a correct water supply to the pump is provided.
2. Make sure that water inlet filters are properly clean.
3. Electrical components and wiring, with special emphasis on connections, junction boxes, switches and supply cables should be free from external damage (i.e. exposed and broken wires) and adequately protected against water.
4. High pressure hose should not show apparent external wear and the fittings at both ends should be free from signs of erosion or corrosion.
5. Make sure that all fluids (lubricating oil for pump and engine, cooling water, hydraulic fluids) are at proper levels and in good condition.
6. Make sure the safety guards are in good condition.

The work should stop immediately and the pressure must be released in the event that leakage becomes apparent or if any person becomes aware of a change in condition or any hazard existing or being introduced. Any failure must be promptly reported and then checked personnel.



3.4 General procedures for using nozzles

1. The Operator should take reasonable care for the safety of himself and of other persons who may be affected by his acts or omission at work. His actions should always be governed by his good sense and responsibility.
2. The Operator should wear suitable waterproof protective clothing, having regard to the type of work being undertaken. The clothing set should include adequate hand protection, suitable boots able to ensure proper grip on wet floors, helmet provided with full face shield, waterproof garment providing full cover to the Operator, including his arms.

NOTE: it must be emphasized that whereas protective clothing provides adequate protection against spray and flying particles, it does not constitute complete protection against the direct impact of the water jet. Additional protections in the form of suitable metal shields or barriers may be necessary for certain jetting operation.

3. In most jetting operations it is an accepted practice to employ a team of Operators consisting of two members at least, in order to provide mutual assistance in case of need and to rotate their duties in case of long and heavy work. While the first Operator holds the gun, the second Operator attends the pump unit, keeping close watch on the first Operator for signs of difficulty or fatigue, and watching the surrounding area for intrusion by other persons or unsafe situations. If required, he will shut off the pressure unit until it is safe to continue.
4. The area in which the work is to proceed should be clear of loose items and debris to prevent tripping and slipping hazards.
5. The water jet should be directed only and always against the workpiece even during preliminary operating tests prior to starting work.
6. Where applicable, proper side shields should be suitable placed to safeguard personnel and equipment against contact with grit or particles removed by the water jet.
7. On no account must the Operator be distracted during operation until the jet has been stopped. Personnel having reason to enter the water jetting area should wait until the jet is stopped and his presence known.
8. Each team member must always be aware of the actions and intentions of other team members in order to prevent any dangerous misunderstanding occurring during jetting operation.
9. The pump unit should not be started and brought up to pressure unless each team member is in his designated position, the nozzle directed to the workpiece and the lance or gun securely held.

3.5 Safety during unit maintenance

Apart from the working pressure regulation no attempt should be made to adjust any nut, hose, fitting, etc., while that part of the system is under pressure. The pump should be stopped and any pressure in the line released prior to making any adjustments.

1. The high pressure water unit should be maintained in accordance with the Manufacturer's instructions.
2. The unit should be maintained only by competent personnel
3. Service and maintenance should be carried out with proper tools in order to prevent any damage on high pressure connections and fittings.
4. Use of other than original spare parts is strictly forbidden.

4. PUMP IDENTIFICATION

Each pump is fitted with a rating plate (see Fig. 1) containing the following information:

1. Serial number
2. Pump model and version
Max RPM
Power absorbed
Max flow rate (l/min) and pressure (bar)

Pump model, pump version and serial number should be specified when ordering spare parts. Should the pump be modified (i.e. by changing the original version) than any change should be mentioned on the rating plate for future reference.

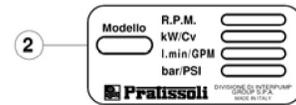
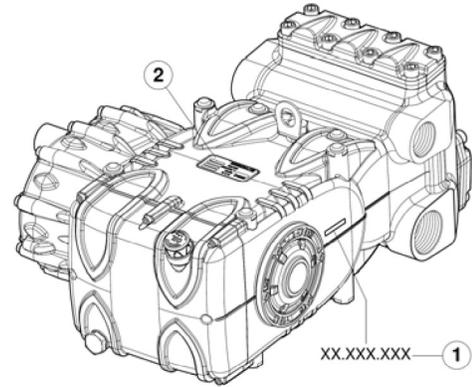
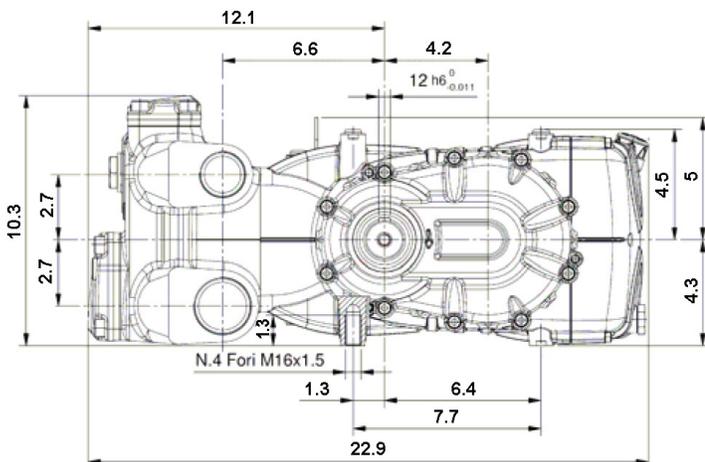


fig. 1

5. TECHNICAL DATA

MODEL		RPM	Flow Rate		Pressure		Power	
			GPM	L/min	PSI	Bar	HP	Kw
KS28SA	No Reducer	1000	24.0 GPM	91 l/m	4000 PSI	250	66	50.0
	No Reducer	1200	29.1	110	3625	250	71.4	52.5
KS28A	With Reducer	1500						
	With Reducer	1800						
	With Reducer	2200						
KS32A	No Reducer	1200	38.3	145	2900	200	75.3	55.4
	With Reducer	1500						
		1800						
		2200						
KS36A	No Reducer	1200	48.3	183	2320	160	76.0	55.9
	With Reducer	1500						
		1800						
		2200						
KS40A	No Reducer	1200	59.7	226	2000	138	81.0	59.5
	With Reducer	1500						
		1800						
		2200						

6. DIMENSIONS AND WEIGHT



Weight: 194 lbs.

Figure 2a refers to pump with reducer

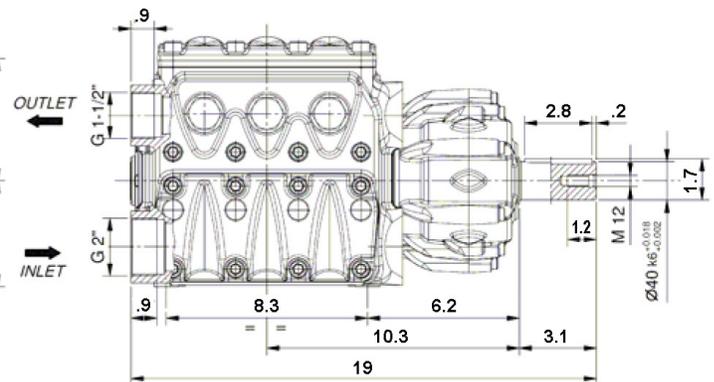
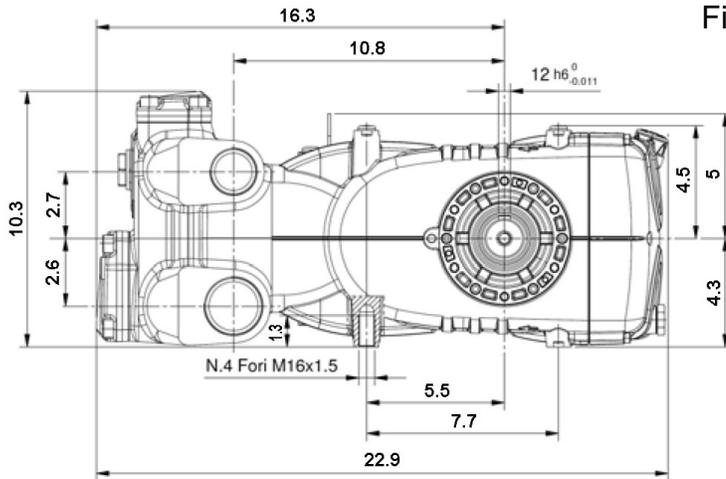


fig. 2

6. DIMENSIONS AND WEIGHT (continued)



Weight: 165 lbs

Figure 2b refers to pump without reducer

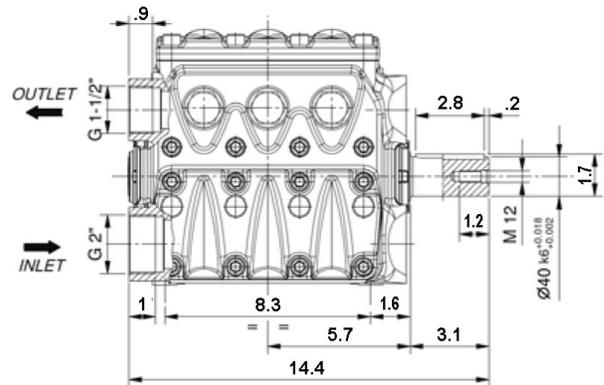


fig. 2a

7. INFORMATION ABOUT PUMP USE



The KS pump has been designed to pump fresh filtered (360 micron max) water at room temperature (104° F max).

7.1 Water temperature

The maximum water temperature allowed is 104° F. Nonetheless, for short periods of time it is possible to operate the pump with a water temperature of 140° F. In this case, we advise to contact the Technical or Customer Service Department.

7.2 Max. flow rate and pressure values

The performance values indicated in this manual 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 authorized by the Technical Department or Customer Service Department.

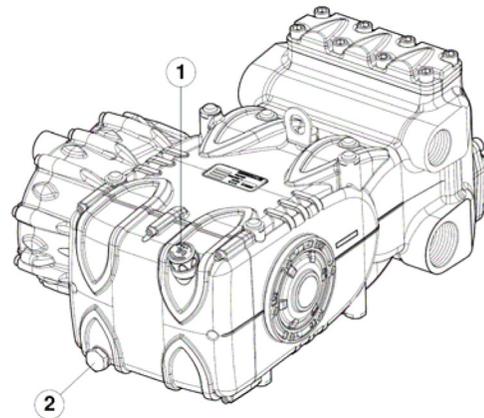
7.3 Lowest RPM

Any RPM value different from what is indicated in the performance table (see Section 5) must be expressly authorized by the Technical or Customer Service Department.

7.4 Recommended Lubricant Oil Types

The pump is delivered with lubricant oil compliant with room temperatures ranging from 32° to 86°F. Some recommended lubricant types are listed in the table below; these lubricants are treated with additives in order to increase corrosion protection and resistance to fatigue. As an alternative, Automotive SAE 85W-90 gearing lubricants may also be used.

MANUFACTURER	TYPE
GENERAL PUMP	SERIES 220
AGIP	AGIP ACER 220
BP	BP ENERGOL HLP 220
CASTROL	MAGNA 220
ELF	ELF POLYTELIS 220
ESSO	TERESSO 220
TEXACO	RANDO HD 220
FINA	FINA CIRKAN 220
MOBIL	MOBIL DTE Oil 88
SHELL	SHELL TELLUS C 220
TOTAL	TOTAL CORTIS 220



Check the oil level dipstick (pos. 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 plug (pos. 2), fig 3. Oil inspection and changing is to be carried out as indicated in Section 11.

The amount required is:

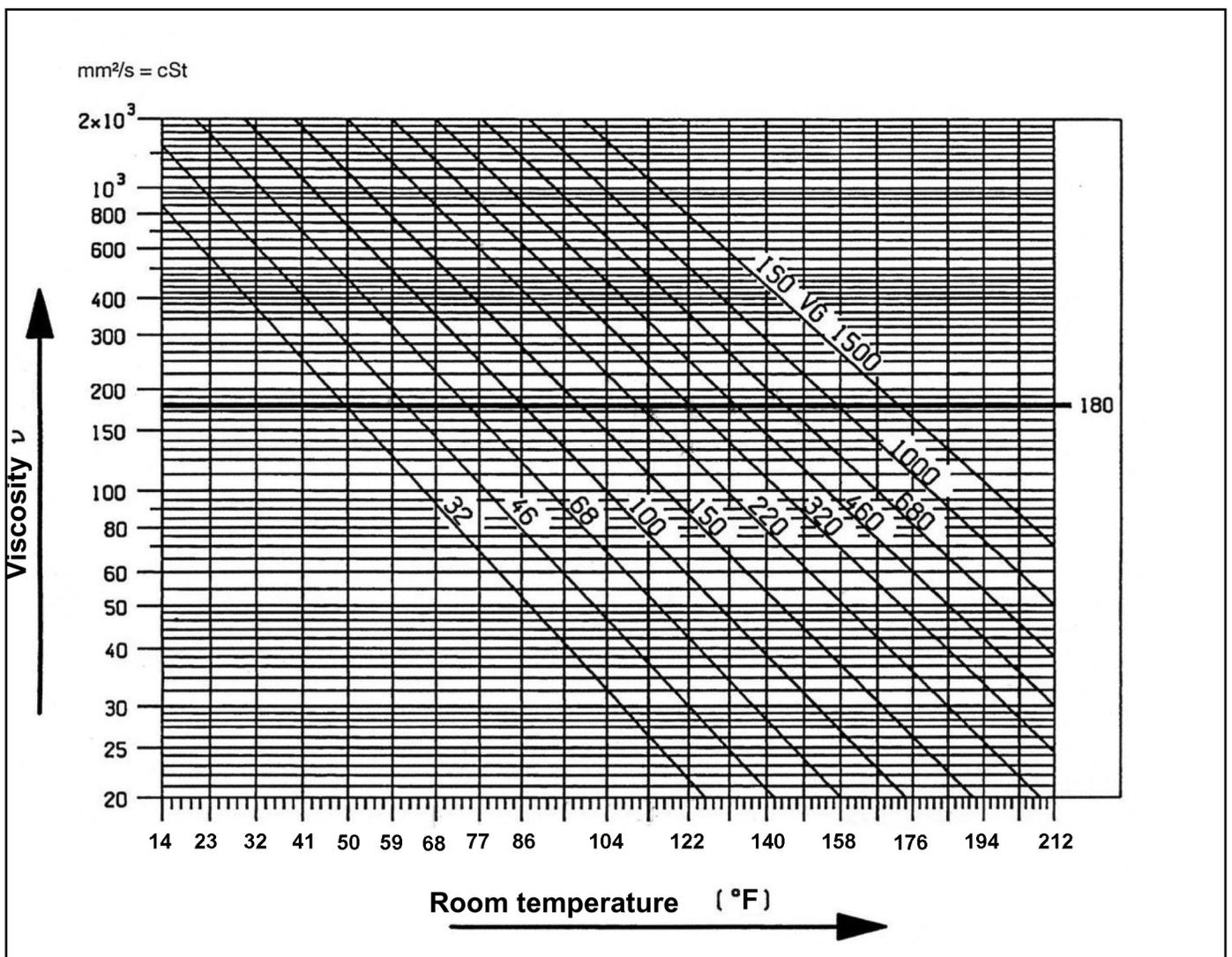
- 5 quarts for versions with the reducer in positions 1 and 4 (see fig. 6). This amount will be slightly lower for positions 2 and 3.
- 4.6 quarts for versions without a reducer.



IN ANY CASE, OIL MUST BE CHANGED ONCE A YEAR SINCE IT MAY DETERIORATE BY OXIDATION.

For room temperatures that differ from 32° to 86° F, 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 container and disposed on in authorized locations. In absolutely no case may it be disposed of into the environment.

8. PORTS AND CONNECTIONS

KS Series pumps are provided with (fig 4):

- 1 - 2 inlet ports IN Ø 2" NPT-F
Either inlet port can be used; the one not used must be hermetically plugged.
- 2 - 2 outlet ports OUT Ø 1-1/2" NPT-F
- 3 - 3 auxiliary ports, 3/4" Gas; used for the pressure gauge only, and for verifying correct priming.

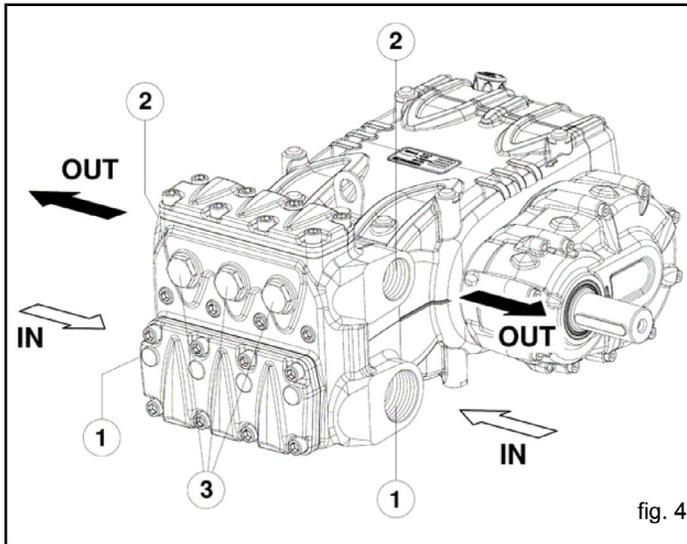


fig. 4

The pumps shaft (PTO) must not be rigidly connected to the motor unit. The following transmission types are suggested:

- Flexible joint
- Cardan joint (within the max working angles indicated by the manufacturer).
- V-belts; allowed only for the versions without a reducer unit.
- Hydraulic by means of a flange; for correct application, please contact the Technical or Customer Service Departments.

9.2 Direction of rotation

An arrow situated on the crankcase near the shaft indicates the correct direction of rotation. Standing in front of the pump head, the direction of rotations must be:

- as shown in fig. 5 for versions with a reducer unit
- as shown in fig. 5a for versions without a reducer unit

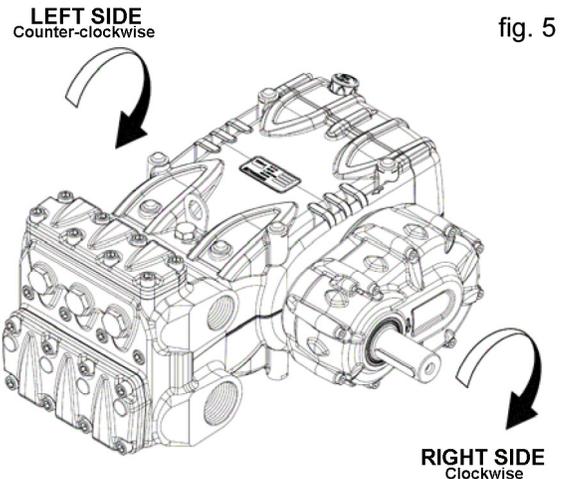


fig. 5

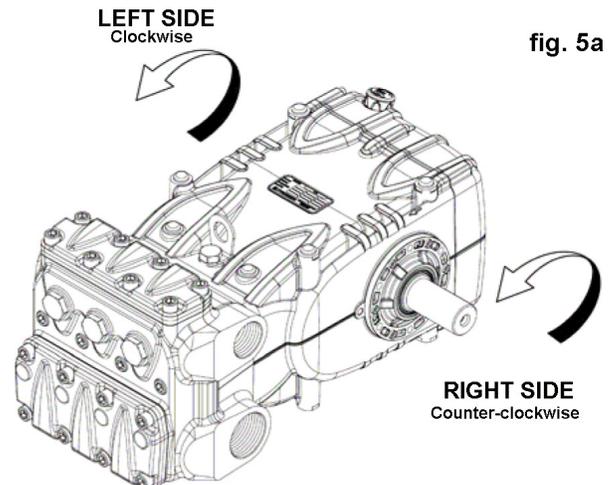


fig. 5a

9. PUMP INSTALLATION

9.1 Installation

The pump must be installed on a rigid and perfectly flat and horizontal base by means of the proper four M16 x 1.5 threaded feet. The base should be rigid enough to avoid any misalignment or flexing on the pump/transmission coupling axis due to the torque involved during operation. The unit should not be rigidly fixed on the floor but be installed upon vibration dampeners. For special applications contact our technical department.

An eye-bolt is provided on top of the crankcase for easy handling of the pump. (below). The eye bolt can be replaced with a plastic cap (see below), in order to protect the thread in the crankcase. The plastic cap is provided with the pump.



The oil plug must absolutely be replaced by the oil stick and the oil level checked. Make sure that you can easily reach the oil stick even after the unit has been assembled.

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

NOTE: Figures 5 and 5a show right versions.

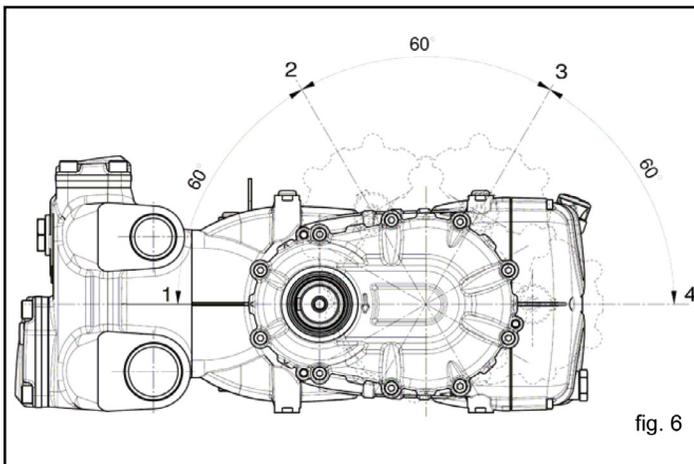
The version may be changed only by specialized and authorized personnel by carefully following the instructions that follow:

1. Separate the hydraulic part from the mechanical part.
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 appropriate seat on the crankcase.

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

3. Join the hydraulic part with the mechanical part.

It is furthermore possible to set the reducer in 4 different positions as shown in fig. 6.



The reducer's position may be changed only by specialized and authorized personnel by carefully following the above directions.

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 depressurization produced by the pump.

9.5 Pump Feeding

KS pumps require a minimum positive head (NPSH_r), measured on the head intake flange, indicated in the following table (obtainable by the means of a booster pump):

	KS28A	KS32A	KS36A	KS40A
NPSH _r (m)	2.0	2.5	3.0	4.0

The booster pump must have the following characteristics:

- Flow rate of at least twice the value of the plunger pump's rated flow value, with a minimum pressure sufficient for the required NPSH_r and max 87 PSI.

These feeding conditions must be respected in all running conditions. Booster activation must be independent from that of the plunger pump.



Booster start-up must always precede plunger pump start-up. In order to protect the pump, we advise to install a pressure switch on the feeding line after the filters.



For feeding conditions that differ from that specified above, please **contact the Technical or Customer Service Department.**

9.4 Suction line

For the pumps 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.



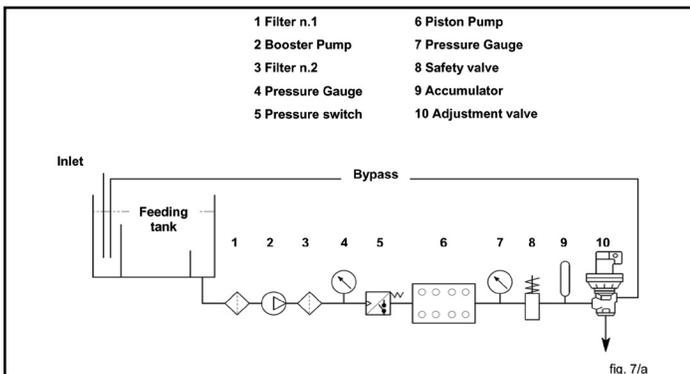
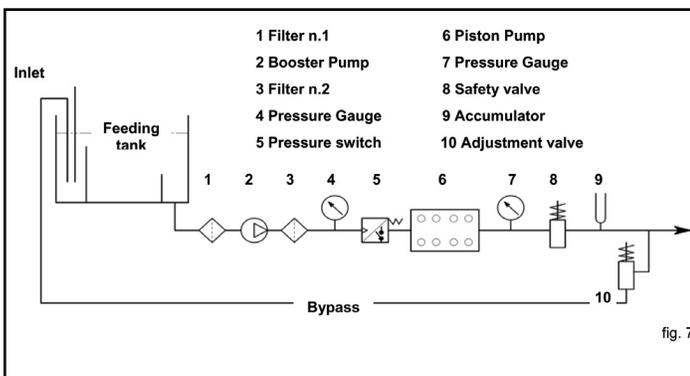
Along the duct, avoid localized diameter reduction that may cause pressure drops with subsequent cavitation. Absolutely avoid 90° elbows, with other tubes, pipes, bottlenecks, counter-slopes, upside-down "U" shaped curved and "T" connections.

2. The selection position must 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, adapters, 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 tanks 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 2 filters arranged as shown in fig 7 and fig. 7a.



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

For a correct delivery line comply with the following instructions:

1. The internal diameter of the pump must allow to guarantee correct fluid speed; see diagram in paragraph 9.9.
2. The first length of delivery hose should be flexible in order to isolate the pump vibrations from the rest of the system.
3. Use only high pressure hoses and fittings able to guarantee the largest possible safety margins in any working conditions.
4. A suitable relief valve should be installed in the delivery line.
5. Use pressure switches suitable for the pulsating loads typical of plunger pumps.
6. When designing the delivery line, take into proper account the unavoidable drop in pressure, due to its length and size.
7. If necessary, the effects of the pump pulsations can be reduced by installing a proper pulsation dampener in the pressure line.

9.9 Internal Diameter of the Piping

To determine the internal diameter of the piping, please refer to the diagram on the next page.

Suction Pipe

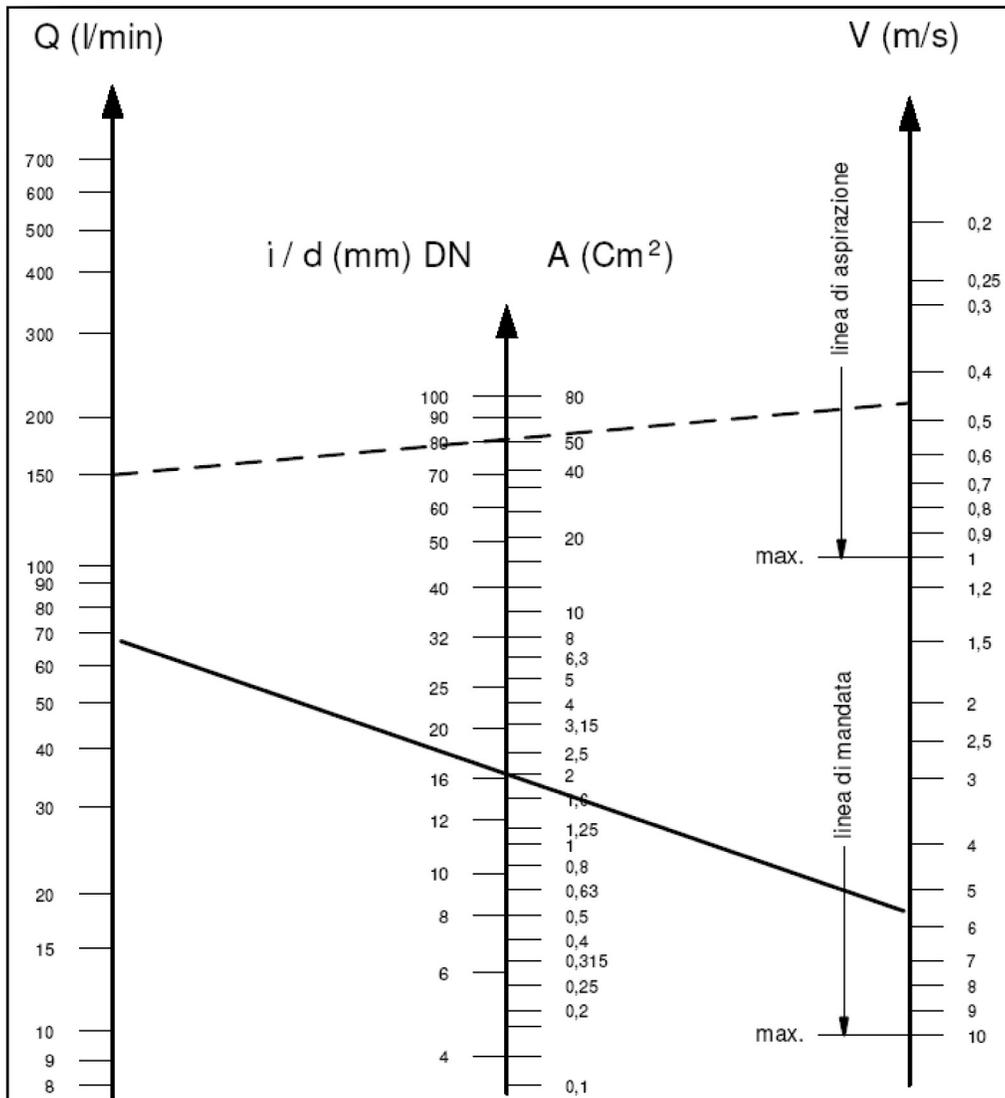
With a flow rate of ~ 226 l/min (60 GPM) and water speed of 1 m/sec (3.3 ft./sec). The diagram line that connects the two scales intersects the central scale, indicating the diameters, at a value of ~ 70 mm (2.76 in.).

Delivery Pipe

With a flow rate of ~ 226 l/min (60 GPM) and water speed of 5.5 m/sec (18 ft./sec). The diagram line that connects the two scales intersects the central scale, indicating the diameters, at a value of ~ 30 mm (1.2 in.).

Optimum Speed Values

- Suction: ≤ 1 m/sec (3.3 ft./sec)
- Delivery: ≤ 5.5 m/sec (18 ft./sec)



Linea di aspirazione	Suction line
Linea di mandata	Delivery line



The diagram does not take into consideration the pipe and valve resistance, drop in pressure due to the pipe length, the viscosity of the pumped fluid, its temperature, etc.

If necessary, contact our technical department.

9.10 V-belt Transmission



A v-belt transmission is allowed only for versions without a reducer unit.

For this pump model, we suggest to use 4 XPB belts (16.5 x 13 cogged); only for long durations, use the XPC profile; both the characteristics and the power transmission capacity for each belt can be verified on the diagram in fig. 8, in function of the number 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. 11.



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

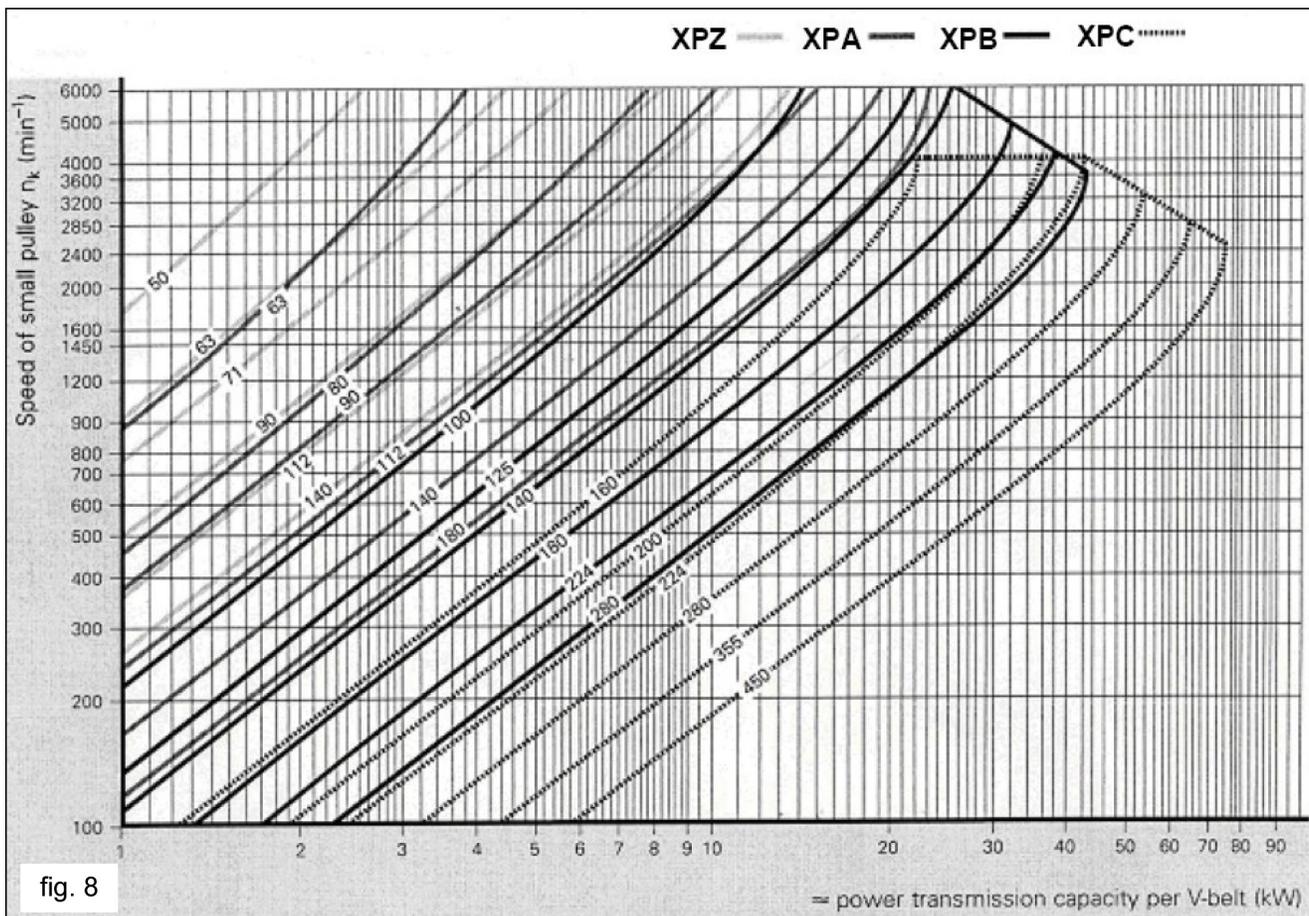


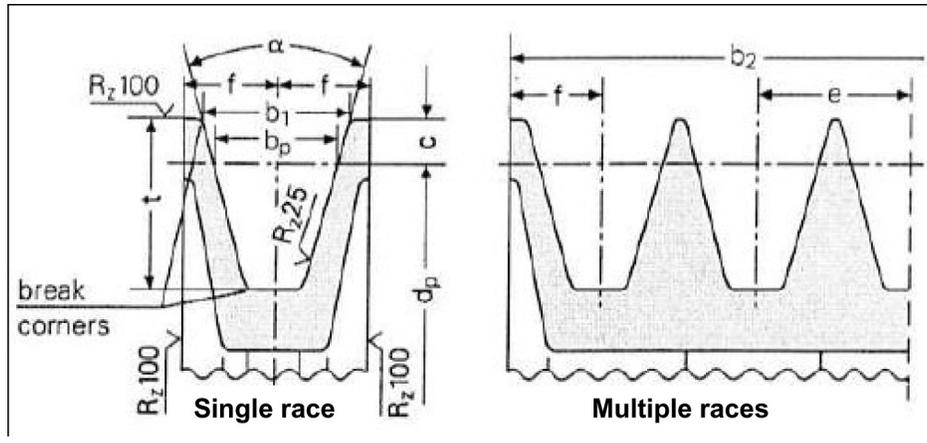
fig. 8

= power transmission capacity per V-belt (kW)

9.11 Transmission Definition

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

- a) Use pulleys for v-belts with race dimensions prescribed / recommended by the belt Manufacturer. Should no indications be supplied, please see fig. 9 and the table in fig. 10.



Dimensions (in mm)

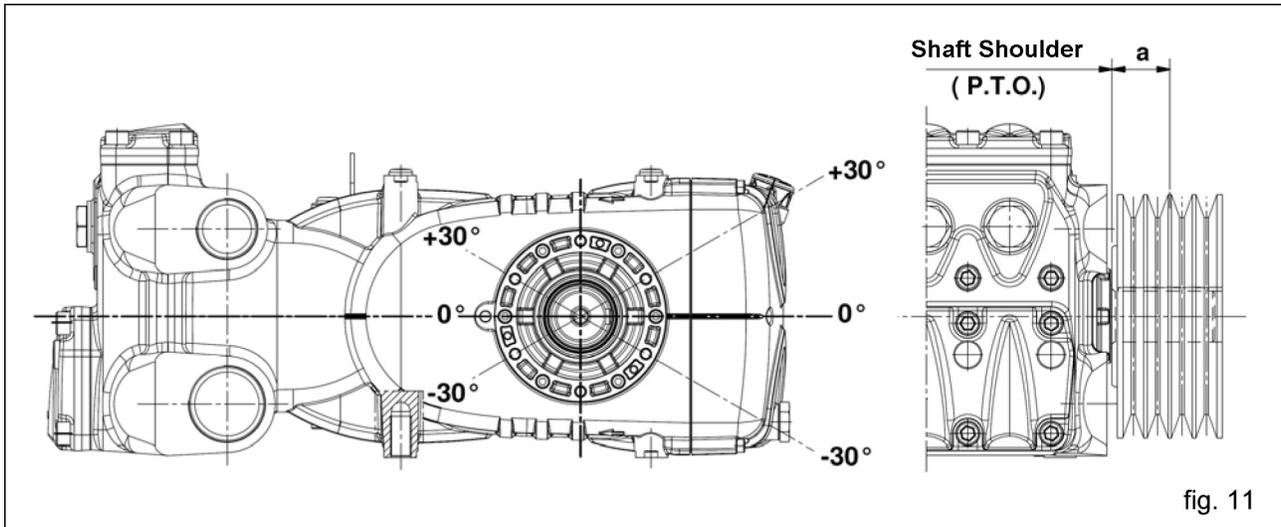
fig. 9

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	
Increased race depth		c	8.0	12.0	
Increased race depth		e	23 ± 0.4	31 ± 0.5	
Increased race depth		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 $\alpha = 34^\circ-38^\circ$			$\pm 1^\circ$	$\pm 30'$	
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. 10

- b) Use high efficiency belts - for example XPB instead of SPB; this will 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 11.



- c) Set belt tension according to the Manufacturer's specifications; and 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 $\leq \pm 0.75\%$; for this reason the three belts must be purchased in pairs.
- e) Follow the belt tension direction as indicated in fig. 10; for different needs, please contact the **Technical or Customer Service Department**.
- f) Carefully align driver pulley and driven pulley races.

9.12 Definition of Belt Static Tension Values

Static tension depends on:

- a) The center 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. 12 allows to obtain values of the static tension that must be applied vs. the center distance between pulleys.

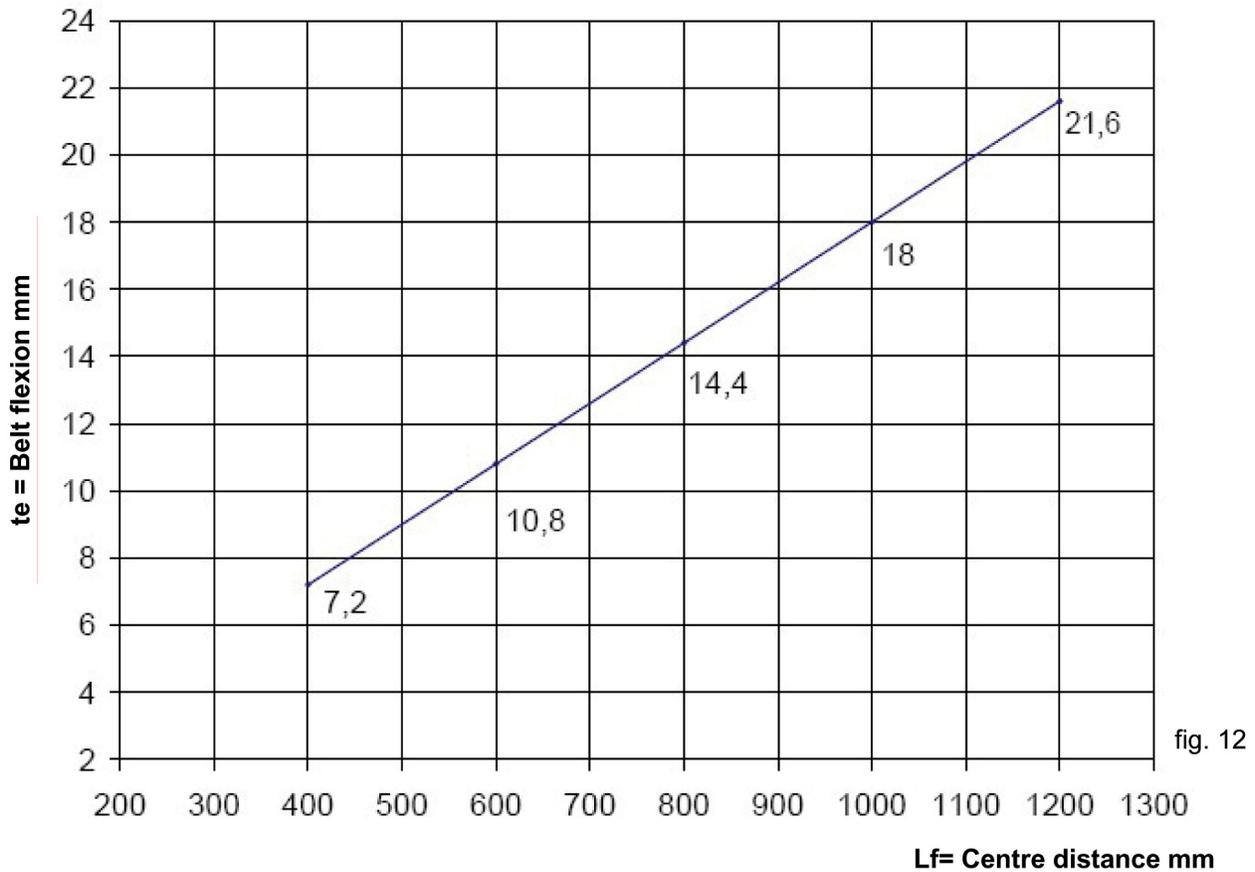


fig. 12

Conclusion: using a dynamometer, by loading the belt with 75 N as indicated in fig. 13, you will obtain a flexion value “te” of about 10.8 mm.

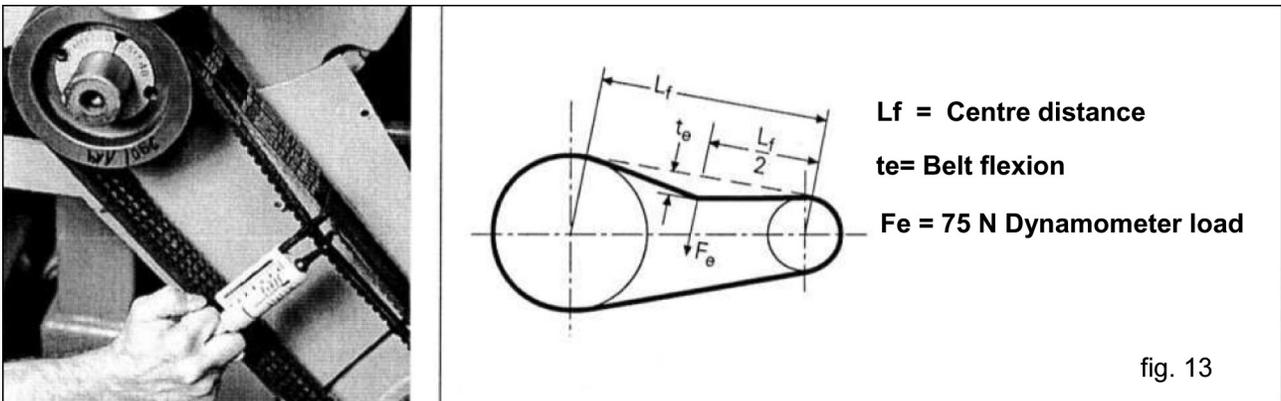


fig. 13

Note 1. 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.

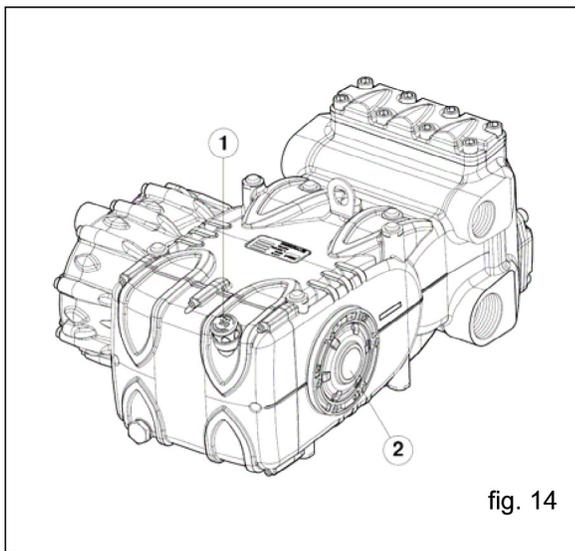
Note 2. If required, or during normal maintenance, never replace a single belt, rather the entire set.

10. START UP AND RUNNING PROCEDURES

10.1 Preliminary inspections

Before start up make sure that the following conditions have been complied with:

1. Suction line should be connected: **the pump must never run dry.**
2. Suction line must be perfectly air-tight.
3. Any ON-OFF valve in between the pump and water source should be open and make sure the water gets into the pump freely.
4. Make sure all suction/delivery line connections are fully tightened.
5. 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.
6. The oil level in the pump must be verified using the appropriate dipsticks (position 1, fig 14), and also by means of the oil sight glass (position 2, fig 14).



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 up for the first time check for proper direction of rotation.
2. Pump and motor/engine must start offload: set the regulating valve to “zero” or set the pressure line in dump mode by means of proper dumping devices.
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 from the system by operating the dump device or by releasing the regulating valve and reduce RPM to a minimum (diesel applications).

Note: in case of feeding by a centrifugal pump, make sure that the plunger pump starts only when the correct inlet pressure is provided.

11. PREVENTIVE MAINTENANCE

PREVENTIVE MAINTENANCE	
Every 500 hours	Every 1000 hours
Check oil level	Change oil
	Check / Replace - Valve - Valve Seats - Valve springs
	Check / Replace - H.P. packings - L.P. packings

12. STOPPING THE PUMP FOR LONG PERIODS

12.1 Filling the pump with an anti-corrosion emulsion or anti-freeze solution as in the layout shown in paragraph 9.7

- a) Close the filter drain 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.

12.2 Pipes

- a) Before greasing and protecting the pipes according to the previous 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



Where and when there is a risk of freezing the following precautions should be taken:



If a pump is frozen or appears frozen ON NO ACCOUNT SHOULD THE PUMP BE OPERATED until the entire system has been thawed out.

14. WARRANTY TERMS

The pumps are guaranteed for a duration of 12 months from the supply date, or 1000 working hours.

Please consult the purchase contract for other warranty conditions. The warranty is void if:

- a) The pump has been used for purposes that differ from that agreed.
- b) The pump has been fit with an electric or diesel engine with performance greater than what is indicated in the table.
- c) The required safety devices were unadjusted or disconnected.
- d) The pump was used with accessories or spare not supplied by General Pump or Interpump
- e) Damage was caused by:
 - 1) improper use
 - 2) the non-observance of maintenance instructions
 - 3) insufficient flow rate
 - 4) use not compliant with operating instructions
 - 5) faulty installation
 - 6) incorrect positioning or sizing of the pipes
 - 7) non authorized design changes
 - 8) cavitation

15. TROUBLE SHOOTING**THE PUMP DOES NOT PRODUCE ANY NOISE:**

- The pump is not primed and is running dry!
- No water in the inlet line
- The valves are blocked
- The pressure line is closed and does not allow the air to get out the fluid end.

**INSUFFICIENT PUMP PRESSURE:**

- The nozzle is (or has become) too large.
- RPM are less than rated
- Excessive leakage from pressure packings
- Excessive amount of water by-passed by the pressure regulating valve or faulty valve operation.
- Worn out valves.

**THE PUMP KNOCKS:**

- Air suction.
- Insufficient feeding:
 - bends, elbows and fittings along the suction line throttle the amount of water which passed through.
 - too small inlet filter.
 - dirty inlet filter.
 - the feeding pump, where provided is not of the suitable type or provides insufficient pressure or volume.
- The pump is not primed due to insufficient feeding or the delivery line is closed during start up.
- The pump is not primed because some valves are stuck (i.e pump inactivity for long time).
- Jammed or worn out valves.
- Worn out pressure packings.
- The pressure regulating valve does not work properly.
- Clearance in the drive system.
- RPM are higher than rated.

**EXCESSIVE WATER LEAKAGE FROM THE PUMP:**

- Pressure packing are excessively worn out (due to normal wear or excessive cavitation).
- Worn out plungers

**OVERHEATED PUMP:**

- The direction of rotation is not correct.
- Pump is overloaded (pressure or RPM over the rated values).
- The oil level is too low or the oil is not of a suitable type or fully used
- Water in the oil
- Excessive belt tension or incorrect alignment of the joint (where provided).
- Excessive inclination of the pump during operation.

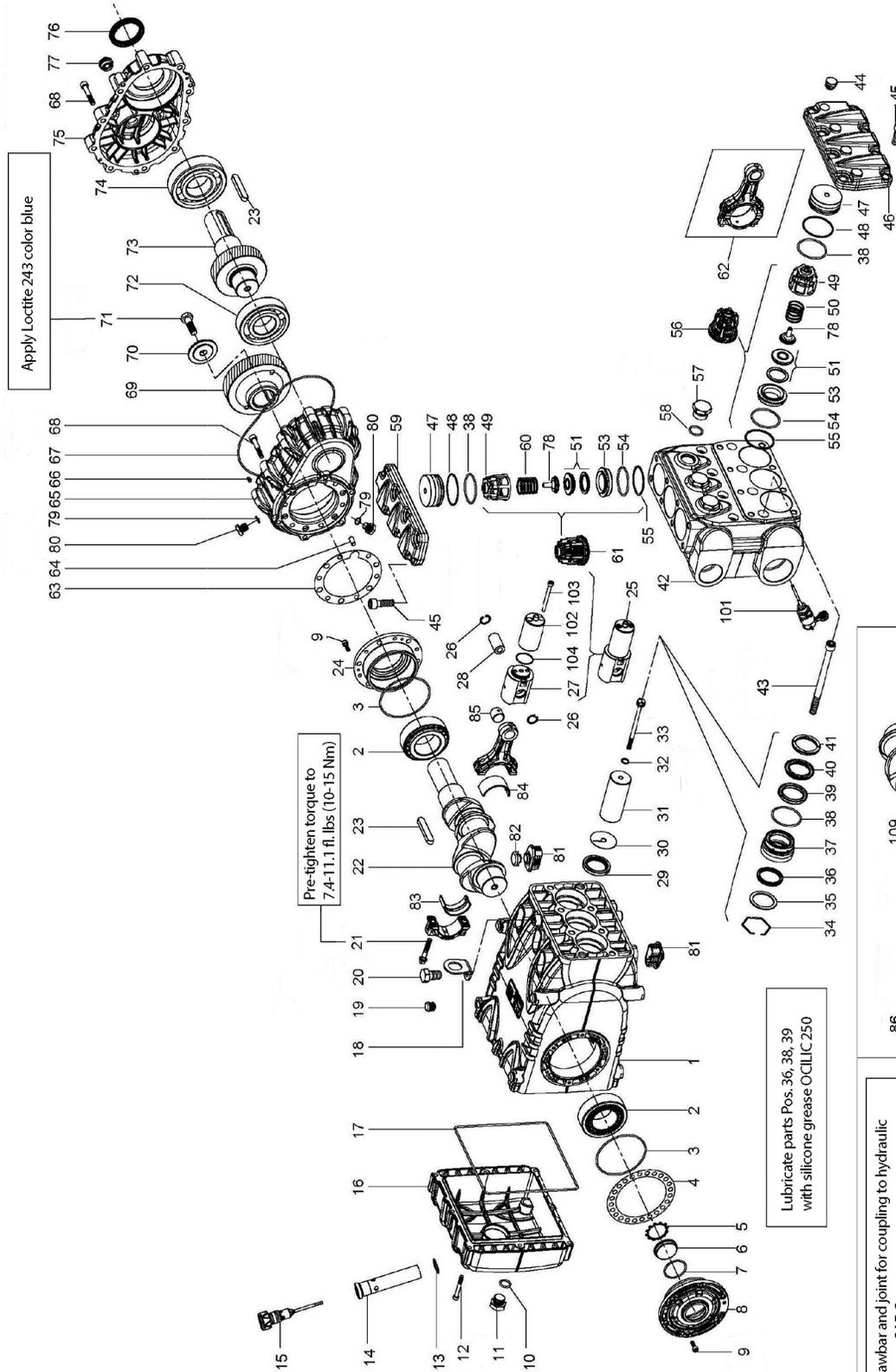
**THE PUMP DOES NOT DELIVER THE RATED VOLUME:**

- Insufficient feeding (due to the cause listed above).
- RPM are less than rated.
- Excessive amount of water by-passed by the pressure regulating valve.
- Worn out valves
- Excessive leakage from pressure packings

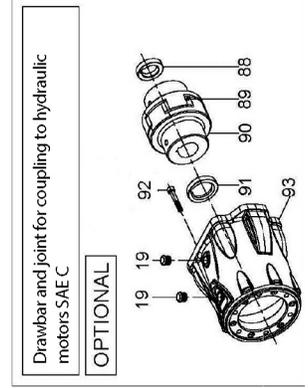
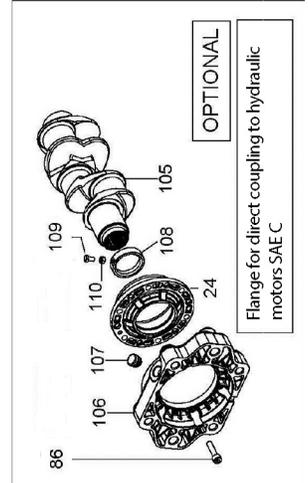
**PIPE VIBRATIONS OR KNOCKING:**

- Air suction.
- The pressure regulating valve does not work properly.
- The by-pass line is undersized.
- Jammed up valves.
- Drive transmission motion is irregular.

16. EXPLODED VIEW AND PARTS LIST



KS - LP KS36A & KS40A



KS36A & KS40A Parts List

Item	Part No.	Description	QTY.
1	F71010022	Pump Crankcase	1
2	F91859000	Roller Bearing	2
3	F90391800	O-ring, Ø 94.92 x 2.62	2
4	F71220081	Shim, 0.1 mm	1
	F71220381	Shim, 0.25 mm	1
5	F90075600	Ring	1
6	F70211801	Oil Level Indicator	1
7	F90387700	O-ring, Ø 39.34 x 2.62	1
8	F71150122	Oil Level Indicator, Side Bearing Cover	1
9	F99186700	Screw, M6 x 18	12
10	F90384100	O-ring, Ø 17.13 x 2.62	1
11	F98218700	Plug, G 1/2 x 10, Nickel	1
12	F99196800	Screw, M6 x 50	8
13	F90360400	O-ring, Ø 25.12 x 1.78	1
14	F72210695	Tube for Oil Dipstick	1
15	F98212000	Dipstick	1
16	F72160022	Crankcase Cover	1
17	F90400000	O-ring, Ø 21.5 x 3	1
18	F71223074	Lifting Eye Bolt	1
19	F98206000	Plug for Ø 15 Port	7
20	F99426600	Screw, M12 x 25	1
21	F99313800	Connecting Rod Screw	6
22	F71020035	Crankshaft	1
23	F91500000	Crankshaft Key, 12 x 70 x 8	2
24	F71150022	Motor Side Bearing Cover	1
25	F71606601	Plunger Guide, Complete	3
26	F90060600	Ring, Ø 20	6
27	F71050715	Plunger Guide	3
28	F97743000	Pin, Ø 20 x 38	3
29	F90167800	Seal, Ø 38 x 52 x 7	3
30	F96714000	Wiper	3
31	F71040409	Plunger, KS36A	3
	F71040509	Plunger, KS40A	3
32	F90367100	O-ring, Ø 11 x 2	3
33	F71219566	Plunger Bolt	3
34	F90079700	Ring, Ø 52	3
35	F71218070	Packing Ring, KS36A	3
	F71216270	Packing Ring, KS40A	3
36	F90279800	L.P. Packing, KS36A	3
	F90282800	L.P. Packing, KS40A	3
37	F71215470	Packing Support, KS36A	3
	F71215570	Packing Support, KS40A	3
38	F90389100	O-ring, Ø 52.07 x 2.62	9
39	F90281800	Restop Ring, KS36A	3
	F90283800	Restop Ring, KS40A	3
40	F90282000	H.P. Packing, KS36A	3
	F90283200	H.P. Packing, KS40A	3
41	F71100251	Front Ring, KS36A	3
	F71100351	Front Ring, KS40A	3
42	F72120636	Manifold, KS36A	1
	F72120736	Manifold, KS40A	1
43	F99449000	Screw, M12 x 160	8
44	F98214200	Plug, Ø 19	4
45	F99429500	Screw, M12 x 35	16
46	F72210036	Valve Cover	1
47	F72210270	Valve Plug	6
48	F90526800	Back-up Ring, Ø 55.9 x 60 x 1.5	6
49	F36206101	Suction/delivery Valve Guide	6
50	F94760000	Suction Valve Spring	6

Item	Part No.	Description	QTY.
51	F36208801	Ball Valve	6
53	F36206766	Suction/Delivery Valve Seat	6
54	F90389000	O-ring, Ø 50.47 x 2.62	6
55	F90526000	Back-up Ring, Ø 51.5 x 56 x 1.5	6
56	F36715101	Suction Valve Assembly	3
57	F98226600	Plug, G 3/4" x 16	3
58	F90385000	O-ring, Ø 21.89 x 2.62	3
59	F72210136	Valve Cover	1
60	F94760500	Delivery Valve Spring	3
61	F36207701	Delivery Valve Assembly	3
62	F71030701	Connecting Rod, Complete	3
63	F72210784	Gasket, Cover, Gear	1
64	F97618500	Spine, Ø 8 x 18	1
65	F72210820	Housing, Gear Box	1
66	F97615200	Spine, Ø 5 x 10	2
67	F90394800	O-ring, Ø 209.22 x 2.62	1
68	F99314600	Screw, M8 x 50	16
69	F10071135	Bearing, 1500, Z34	1
	F10071235	Bearing, 1800, Z37	1
	F10071335	Bearing, 2200, Z40	1
70	F72211055	Washer, Lock	1
71	F99430700	Bolt, M12 x 40	1
72	F91587700	Bearing, Ø 45 x 100 x 25	1
73	F10070835	Gear, 1500, Z27	1
	F10070935	Gear, 1800, Z25	1
	F10071035	Gear, 2200, Z22	1
74	F91859300	Bearing, Ø 50 x 110 x 27	1
75	F72210920	Cover, Gear Box	1
76	F90170000	Ring, Ø 50 x 65 x 8	1
77	F97594000	Oil Level Indicator	1
78	F36209051	Internal Valve Guide	6
79	F90358500	O-ring, Ø 10.82 x 1.78	2
80	F98204250	Plug, G1/4" x 13	2
81	F71225851	Crankcase Plug	6
82	F71225951	Crankcase Plug Cap	3
83	F90924000	Babbitt, Upper	3
84	F90924300	Babbitt, Lower	3
85	F90911000	Connecting Rod Bushing	3
86	F99309800	Screw, M8 x 35	6
88	F10074570	Spacer, Ø 31.75 x 10.50	1
89	F10074947	Flex Coupler	1
90	F10742801	Flex Coupler, Ø 40 x 31.75	1
91	F10074670	Spacer, Ø 40 x 40	1
92	F99314600	Screw, M8 x 50	6
93	F10075020	Hydraulic Motor Flange SAE-C	1
101	F10744601	Valve Drain	3
102	F71050866	Plunger Guide Rod	3
103	F99199400	Screw, M6 x 65	6
104	F90352800	O-ring, Ø 29 x 1.5	3
105	F99309800	Crankshaft, C. 50, HYP, SAE-C	1
106	F10085422	Hydraulic Motor Flange SAE-C	1
107	F90206500	Plug, Ø 17	1
108	F71228971	Ring, Ø 40	1
109	F70227034	Screw, M6 x 12	1
110	F92202500	Nut, M6 x 5	1
	200082	Bolt, M16-1.5 x 40	4
	200083	Lock Washer, M16	4

REPAIR KITS

Kit Number	F2018 (KS36A)	F2020 (KS40A)	F2061	F2062	K2135	F2063 (KS36A)	F2064 (KS40A)
Items Included in Kit	36, 38, 39, 40	36, 38, 39, 40	54, 55, 56	54, 55, 61	83, 84	3, 5, 7, 10, 13, 17, 29, 32, 36, 38, 39, 40, 48, 54, 55, 58, 63, 67, 76, 79, 104	3, 5, 7, 10, 13, 17, 29, 32, 36, 38, 39, 40, 48, 54, 55, 58, 63, 67, 76, 79, 104
Number of Assemblies	3	3	3	3	1	1	1

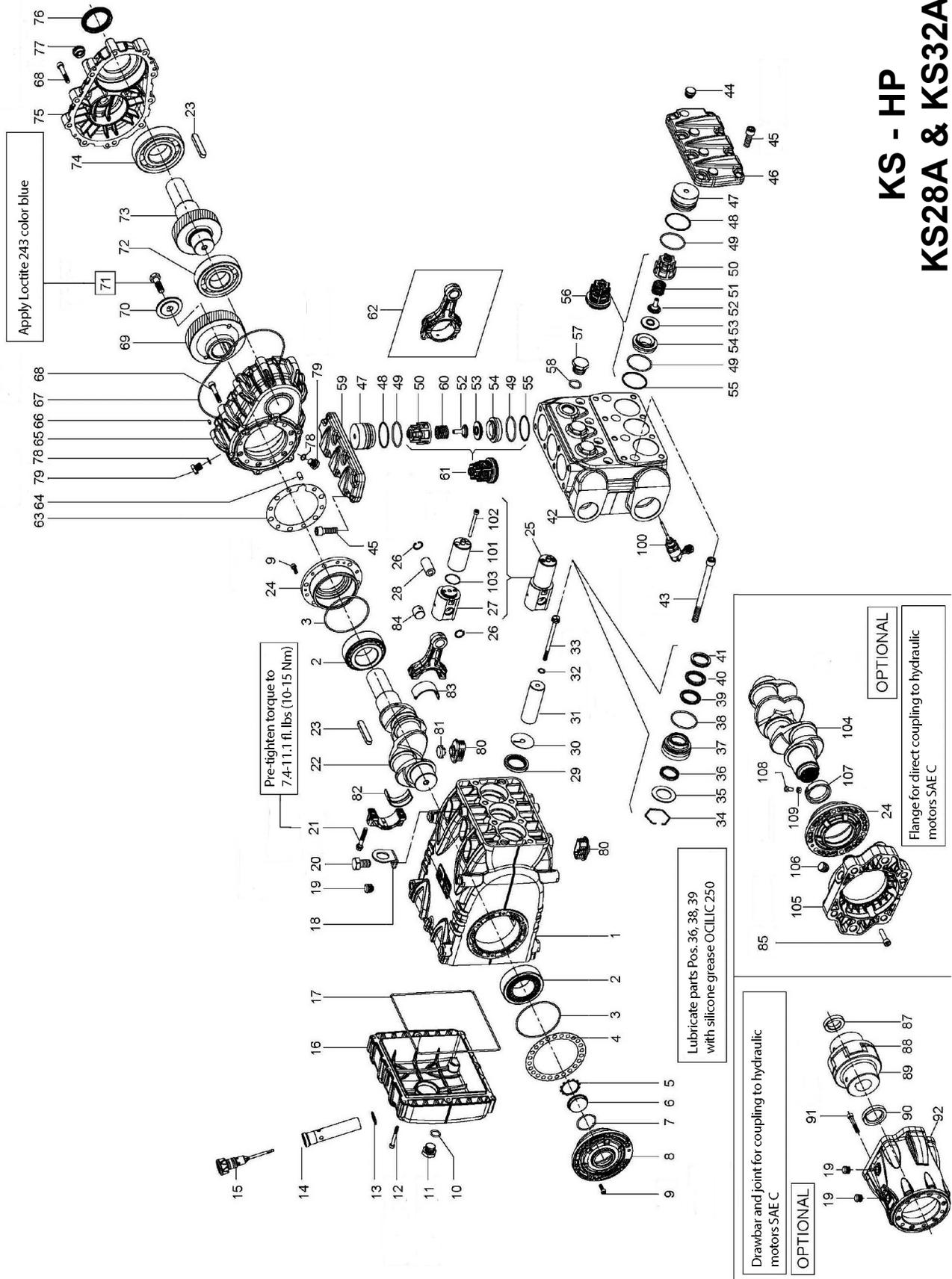
TORQUE SPECS*

Position	Ft.-Lbs.	Nm.
9	7.4	10
11	29.5	40
12	7.4	10
20	29.5	40
21	22	30
33	14.75	20
43	88.5	120
45	99.6	135
57	29.5	40
68	29.5	40
71***	51.6	70
77	56.8	10
80	29.5	40
86	29.5	40
92	29.5	40
103	7.4	10
109	7.4	10

*Decrease torque by 20% if threads are lubricated.

***Use Loctite 243.

16. EXPLODED VIEW AND PARTS LIST



KS - HP
KS28A & KS32A

KS28A & KS32A Parts List

Item	Part No.	Description	QTY.
1	F71010022	Pump Crankcase	1
2	F91859000	Roller Bearing	2
3	F90391800	O-ring, Ø 94.92 x 2.62	2
4	F71220081	Shim, 0.1 mm	1
	F71220381	Shim, 0.25 mm	1
5	F90075600	Stop Ring	1
6	F70211801	Oil Level Indicator	1
7	F90387700	O-ring, Ø 39.34 x 2.62	1
8	F71150122	Oil Level Indicator, Side Bearing Cover	1
9	F99186700	Screw, M6 x 18	12
10	F90384100	O-ring, Ø 17.13 x 2.62	1
11	F98218700	Plug, G 1/2 x 10	1
12	F99196800	Screw, M6 x 50	8
13	F90360400	O-ring, Ø 25.12 x 1.78	1
14	F72210695	Tube for Oil Dipstick	1
15	F98212000	Dipstick	1
16	F72160022	Crankcase Cover	1
17	F90400000	O-ring, Ø 21.5 x 3	1
18	F71223074	Lifting Eye Bolt	1
19	F98206000	Plug for Ø 15 Port	7
20	F99426600	Screw, M16 x 25	1
21	F99313800	Connecting Rod Screw	6
22	F71020035	Crankshaft	1
23	F91500000	Crankshaft Key, 12 x 70 x 8	2
24	F71150022	Motor Side Bearing Cover	1
25	F71606601	Plunger Guide, Complete	3
26	F90060600	Ring, Ø 20	6
27	F71050015	Plunger Guide	3
28	F97743000	Pin, Ø 20 x 38	3
29	F90167800	Seal, Ø 38 x 52 x 7	3
30	F96714000	Wiper	3
31	F71040609	Plunger, KS28A	3
	F72040009	Plunger, KS32A	3
32	F90367100	O-ring, Ø 11 x 2	3
33	F71219566	Plunger Bolt	3
34	F90079700	Ring, Ø 52	3
35	F71217670	Packing Ring, KS28A	3
	F72210570	Packing Ring, KS32A	3
36	F90275000	L.P. Packing, KS28A	3
	F90278000	L.P. Packing, KS32A	3
37	F71215670	Packing Support, KS286A	3
	F72210470	Packing Support, KS32A	3
38	F90389100	O-ring, Ø 52.07 x 2.62	9
39	F90275500	Restop Ring, KS28A	3
	F90278400	Restop Ring, KS32A	3
40	F90275800	H.P. Packing, KS28A	3
	F90278800	H.P. Packing, KS32A	3
41	F71100351	Front Ring, KS28A	3
	F72100051	Front Ring, KS32A	3
42	F72120436	Manifold, KS28A	1
	F72120536	Manifold, KS32A	1
43	F99449000	Screw, M12 x 160	8
44	F98214200	Plug, Ø 19	4
45	F99429500	Screw, M12 x 35	16
46	F72210036	Valve Cover	1
47	F72210370	Valve Plug	6
48	F90525000	Back-up Ring, Ø 55.9 x 55 x 1.5	6
49	F90388900	O-ring, Ø 48.89 x 2.62	6
50	F36204505	Suction/delivery Valve Guide	6

Item	Part No.	Description	QTY.
51	F94754000	Suction Valve Spring	3
52	F36208651	Internal Valve Guide	6
53	F36208502	Ball Valve	6
54	F36204156	Suction/Delivery Valve Seat	6
55	F90524000	Back-up Ring, Ø 49.5 x 54 x 1.5	6
56	F36713601	Suction Valve Assembly	3
57	F98226600	Plug, G 3/4" x 16	3
58	F90385000	O-ring, Ø 21.89 x 2.62	3
59	F72210136	Valve Cover	1
60	F94755000	Delivery Valve Spring	3
61	F36713701	Delivery Valve Assembly	3
62	F71030701	Connecting Rod, Complete	3
63	F72210784	Gasket, Cover, Gear	1
64	F97618500	Pin, Ø 8 x 18	1
65	F72210820	Housing, Gear Box	1
66	F97615200	Pin, Ø 5 x 10	2
67	F90394800	O-ring, Ø 209.22 x 2.62	1
68	F99314600	Screw, M8 x 50	16
69	F10071135	Bearing, 1500, Z34	1
	F10071235	Bearing, 1800, Z37	1
	F10071335	Bearing, 2200, Z40	1
70	F72211055	Washer, Lock	1
71	F99430700	Bolt, M12 x 40	1
72	F91857700	Bearing, Ø 45 x 100 x 25	1
73	F10071035	Gear, 2200, Z22	1
	F10070935	Gear, 1800, Z25	1
	F10070835	Gear, 1500, Z27	1
74	F91859300	Bearing, Ø 50 x 110 x 27	1
75	F72210920	Cover, Gear Box	1
76	F90170000	Ring, Ø 50 x 65 x 8	1
77	F97594000	Oil Level Indicator, G 1/2"	1
78	F90358500	O-ring, Ø 10.82 x 1.78	2
79	F98204250	Plug, G 1/4" x 13	2
80	F71225851	Crankcase Plug	6
81	F71225951	Crankcase Plug Top	3
82	F90924000	Babbit Bearing, Upper	3
83	F90924300	Babbit Bearing, Lower	3
84	F90911000	Connecting Rod Bushing	3
86	F99309800	Screw, M8 x 35	6
87	F10074570	Spacer, Ø 31.75 x 10.50	1
88	F10074947	Flex Coupler	1
89	F10472801	Flex Coupler, Ø 40 x 31.75	1
90	F10074670	Spacer, Ø 40 x 10	1
91	F99314600	Screw, M8 x 50	6
92	F10075020	Hydraulic Motor Flange SAE-C	1
100	F70744601	Valve Drain	3
101	F71050866	Plunger Guide Rod	3
102	F99199400	Screw, M6 x 65	6
103	F90352800	O-ring, Ø 29 x 1.5	3
104	F71020835	Crankshaft, Ø 50 HYP, SAE-C	1
105	F10085422	Hydraulic Motor Flange SAE-C	1
105	F90206500	Plug, Ø 17	1
107	F71228971	Ring, Ø 40	1
108	F70227034	Screw, M6 x 12	1
109	F92202500	Nut, M6 x 5	1
	200082	Bolt, M16-1.5 x 40	4
	200083	Lock Washer, M16	4

REPAIR KITS

Kit Number	F2014 (KS28A)	F2066 (KS32A)	F2012	F2068	F2135	F2069 (KS28A)	F2070 (KS32A)
Items Included in Kit	36, 38, 39, 40	36, 38, 39, 40	49, 55 56	49, 55, 61	82, 83	3, 5, 7, 10, 13, 17, 29, 32, 36, 38, 39, 40, 48, 49, 55, 58, 63, 67, 76, 78, 103	3, 5, 7, 10, 13, 17, 29, 32, 36, 38, 39, 40, 48, 49, 55, 58, 63, 67, 76, 78, 103
Number of Assemblies	3	3	3	3	1	1	1

TORQUE SPECS*

Position	Ft.-Lbs.	Nm.
9	7.4	10
11	29.5	40
12	7.4	10
20	29.5	40
21	22	30
33	14.75	20
43	88.5	120
45	99.6	135
57	29.5	40
68	29.5	40
71***	51.6	70
77	56.8	10
79	29.5	40
85	29.5	40
91	29.5	40
102	7.4	10
108	7.4	10

*Decrease torque by 20% if threads are lubricated.

***Use Loctite 243.

MAINTENANCE LOG

HOURS & DATE

OIL CHANGE							
GREASE							
PACKING REPLACEMENT							
PLUNGER REPLACEMENT							
VALVE REPLACEMENT							



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