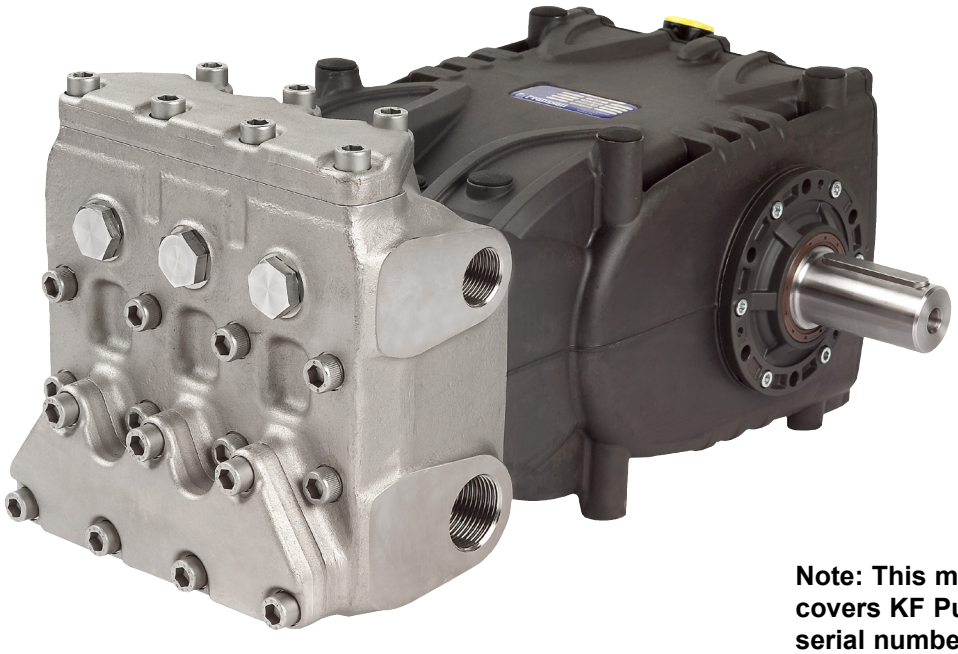
KF

Serial #10127003 and later

Owner's Manual

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



Note: This manual covers KF Pumps with serial numbers starting at 10127003.

General Pump
is a member of
the Interpump Group

QUALITY SYSTEM CERTIFICATION DNV·GL ISO 9001

Ref 300763 Rev. J
12-24

GP® GENERAL PUMP

INDEX

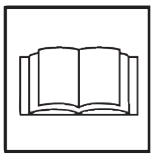
INDEX (continued)

1. INTRODUCTION

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



Read carefully and understand the manual before operating the pump

Danger
High Voltage-Electrocution Danger

Danger
Wear protective mask

Danger
Wear goggles

Danger
Wear protective gloves

Danger
Wear protective boots

Danger
Defines special safety requirements for the use of the pumps in areas identified in accordance with the ATEX Directive.

When pumps are ordered in the ATEX configuration because they are going to work in areas with a potentially explosive atmosphere, you must **STRICTLY comply with the notes given under the headings marked with this symbol and the instructions in the Owner's Manual "ATEX EXPLOSION PROTECTION".**

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 Manufacturer 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 units electrical parts must be adequately protected from water spray, and must comply with the specific norms in force.
4. High pressure hoses must be correctly sized for the unit's maximum operating pressure, and must only be used within the pressure range indicated by the hose manufacturer. The same conditions apply to all other unit accessories where high pressure is involved.
5. The extremities of high pressure hoses 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 signaled. Access must be prohibited to non-authorized personnel and, if possible, the area must be fenced in. The personnel authorized 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 paragraph 9.5).
2. That pump intake filters are perfectly clean; we advise to use a device that indicates the filters clogging level.
3. That electrical parts are adequately protected and in perfect condition.
4. That high pressure hoses do not show apparent signs of abrasion, and that fittings are in perfect shape.
5. Attention: In relation to the application, use and environmental Conditions, during the operation the outer surfaces of the pump may reach high temperatures. We recommend to take precautions to avoid contact with hot parts.

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 their own and other worker's safety before any other interest; their 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 pavement.

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 to rotate their duties in case of long and heavy work.
4. Access to the work area that is within the water jets' range must be absolutely forbidden; the area must be free of objects that may be unintentionally hit by the pressurized 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 specialized and authorized personnel.
3. Assembly and disassembly of the pump and its various components must be performed exclusively by authorized 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 has its own serial number XX.XXX.XXX (see point 1) and an identification plate (see point 2) which shows:

Pump model and version
Maximum RPM
Power absorbed Hp-kW
Flow Rate l/mn - GPM
Pressure bar/PSI

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

Pump model, with the ATEX configuration. Point 3 specific ATEX making for explosion protection. Point 4 ground screw location,

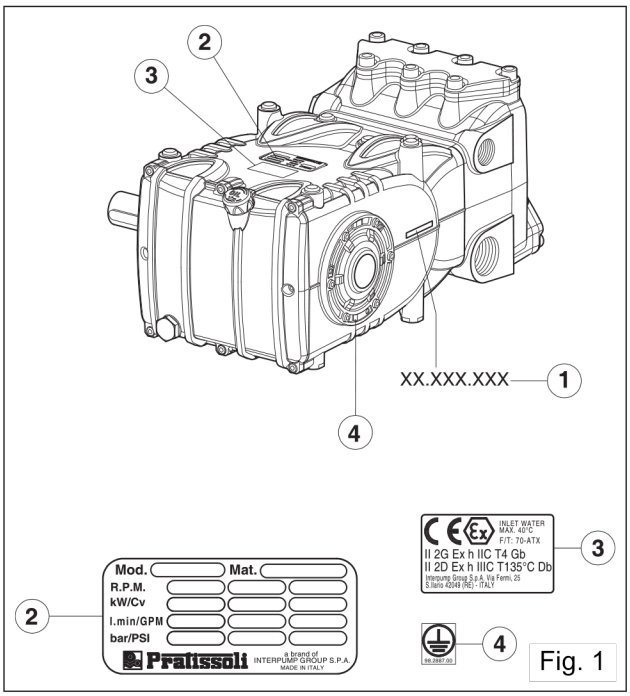


Fig. 1

5. TECHNICAL FEATURES

MODEL	RPM	FLOW RATE		PRESSURE		POWER
		GPM	l/min	PSI	Bar	EBHP
KF28A	1000	24.5	93	3000	207	50
KF30A	1000	28.0	106	2900	200	55
KF32A	1000	31.7	120	2610	180	56
KF36A	800	32.2	122	2300	160	50
KF36A	900	36.2	137	2050	140	50
KF36A	1000	40.0	153	1900	130	52
KF40A	900	45.0	170	1600	110	49

6. DIMENSIONS AND WEIGHT

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

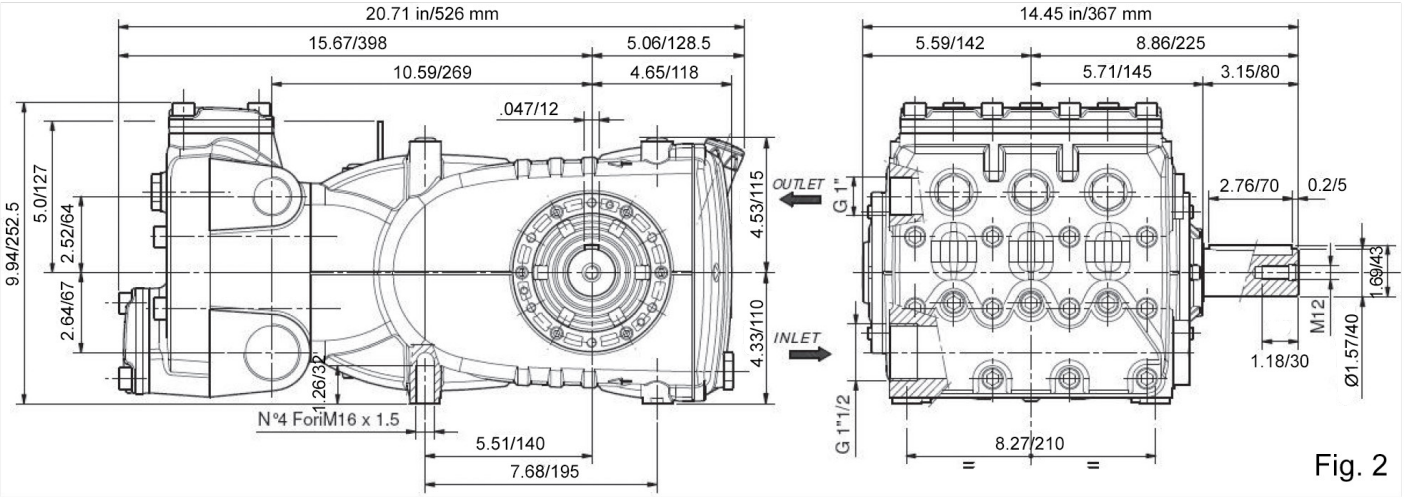


Fig. 2

Weight: 150 Lbs./68 Kg.

7.INFORMATION ABOUT PUMP USE

The KF pump has been designed to operate with filtered water (see paragraph 9.7) and at maximum temperature of 104° F (40° C).

Other fluids may be used only upon the approval of The Customer Service Department .

7.1 Water Temperature

The max water temperature is 104° F (40° C). Nonetheless, it is possible to use the pump at temperatures of up to 185° F (85° C) for short periods of time. In this case we advise consulting the Customer Service Department.

7.2 Max Flow Rate and Pressure Values

The performance values indicated in the catalog 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 **Customer Service Department**.

7.3 Lowest RPM

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

7.4 Recommended Lubricant Oil Types & Manufacturers

The pump is delivered with lubricant oil compliant with room temperatures ranging between 32° and 86° F (0° and 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. As an alternative, Automotive SAE 85W-90 gearing lubricants may also be used.

BRAND	TYPE
GENERAL PUMP	**SERIES 220**
ARAL	Aral Degol BG220
BP	ENERGOL HLP 220
CASTROL	Hyspin VG 220, Magna 220
ELF	POLYTELIS 220
ESSO	NUTO 220
FINA	Cirkan 220
FUCHS	RENOLIN DTA 220
MOBIL	DTE OIL BB
SHELL	TELLUS C 220
TEXACO	RANDO HD 220
TOTAL	CORTIS 220

Check the oil level by using the oil level dipstick with minimum and maximum value notches (1), fig. 3. Refill if needed. 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 (2), fig 3. Checking and changing oil is to be carried out as indicated in Chapter 11. The amount required is 128.5 oz. (3.85 liters).

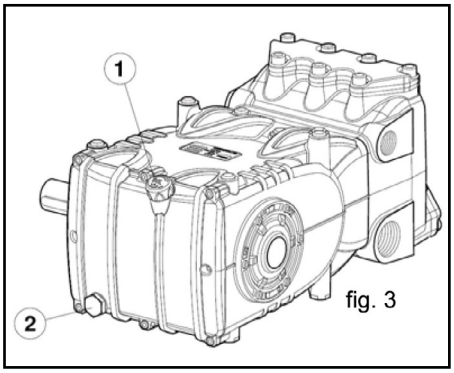


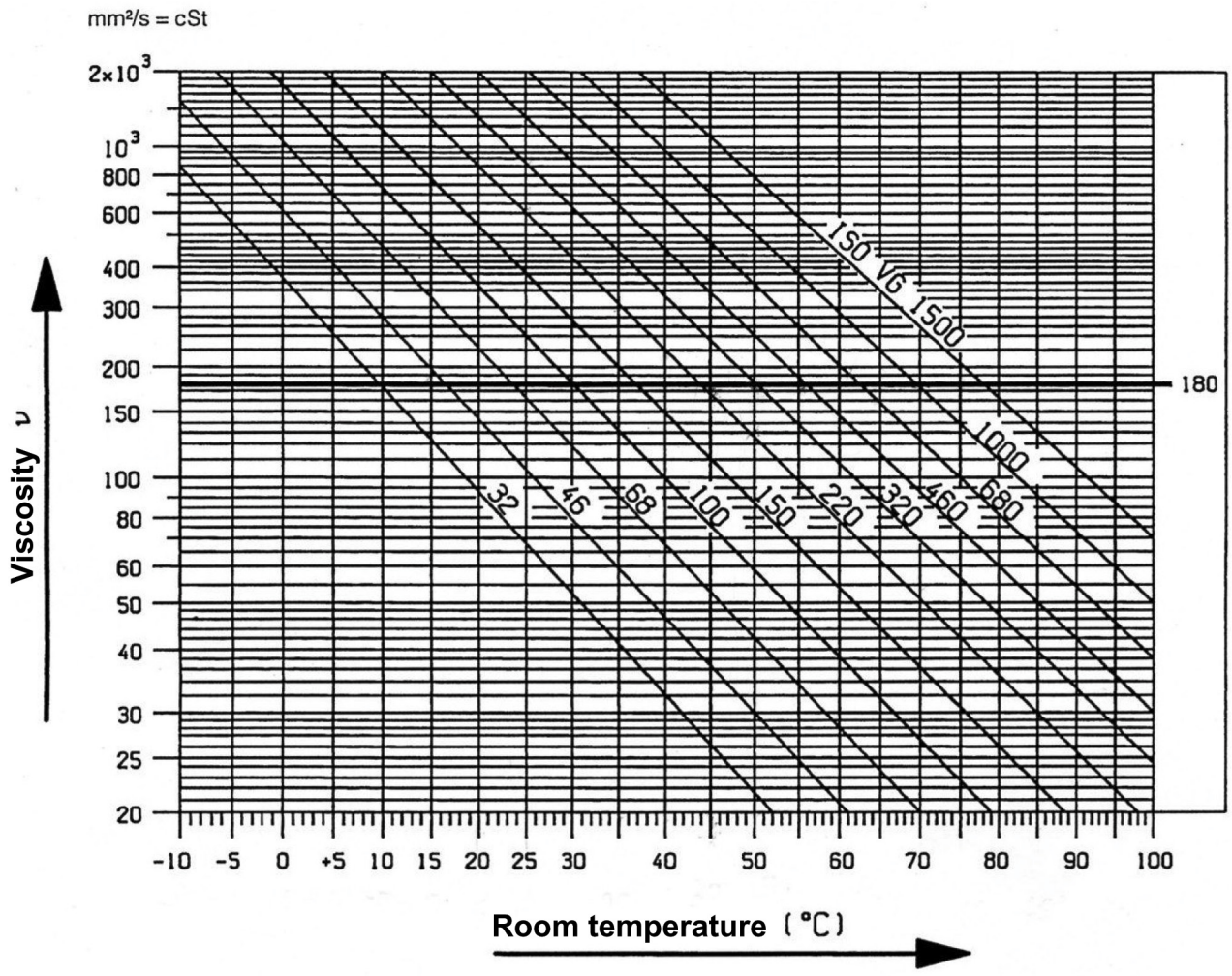
fig. 3

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

For room temperatures that differ from that mentioned earlier, follow the indications contained in the diagram below, keeping in mind that the oil must have a minimum viscosity of 180 cSt.

Set up the pumping system so that oil temperatures do not exceed in exceed 212° F (100° C) during pump operation.
Use a temperature probe to be inserted into to oil drain plug, (Pos. 2 Fig. 3).
See “ATEX EXPLOSION PROTECTION” manual. ATTENTION: Use only oil with a flash point higher than 392° F (200° C).

VISCOSITY/ROOM TEMPERATURE DIAGRAM



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

8. PORTS AND CONNECTIONS

KF Series pumps (see fig. 4) are provided with:

1. 2 inlet ports “IN”, 1” NPT-F
   The line can be connected to either of the two inlet ports; the one not being used must be hermetically sealed.
2. 2 outlet ports “OUT”, Ø 1/2” NPT-F
3. 3 auxiliary ports; used for the pressure gauge only

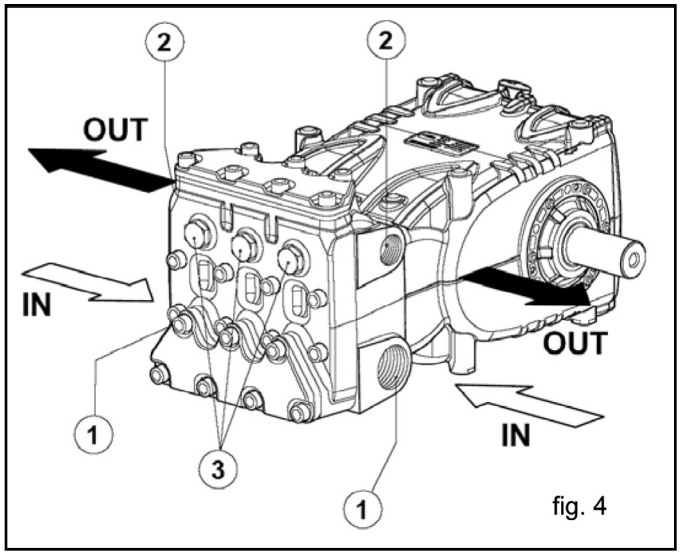


fig. 4

9. PUMP INSTALLATION

9.1 Installation

The pump must be installed in a horizontal position using the correct threaded feet M 16 x 1.5; fasten the screws with a torque value of 154.8 ft. lbs. (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 contact the **Customer Service Department**.

The pump is equipped with two lifting eyebolts to facilitate installation, as shown in the following figure.

In case of disassembly, to avoid allowing debris inside the front part of the crankcase, close the threaded hole with the threaded cap.

Grounding: The pump must be connected to the grounding conductor using the stainless steel M6 screw and stainless steel serrated washer marked with a YELLOW label. See “ATEX EXPLOSION PROTECTION” manual.

Replace the oil cap, 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 **Customer Service Department**
- V-belts
- Cardan Joint (please respect the maximum working angles indicated by the manufacturer)
- Flexible joint

The transmission must be assembled correctly to avoid incorrect or harsh operation of the connection parts and to prevent excessive wear, temperature rise, and/or hazardous breakages that may create potential sources of ignition and explosion. See “ATEX EXPLOSION PROTECTION” manual.

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 rotation must be as shown in fig. 5.

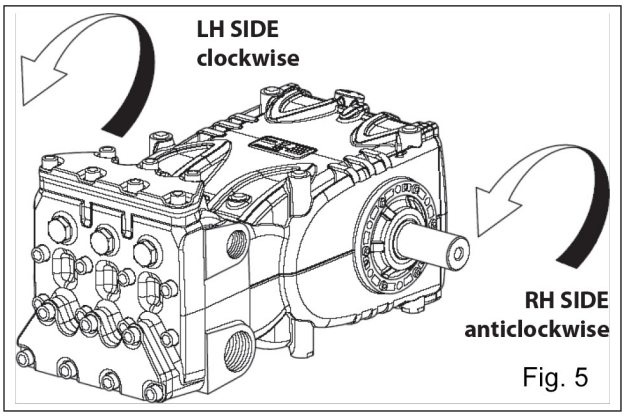


Fig. 5

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 is on the left side.

NOTE: Fig. 5 shows a right version

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 as indicated in Chapter 2, paragraph 2.2.1 of the repair manual.

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

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 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 hose. The consistency of the intake section must allow to avoid deformation caused by the de-pressurization produced by the pump.

9.5 Pump Feeding

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

For negative prevalence contact Customer Service Department

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 localized diameter reductions that may cause pressure drops with subsequent cavitation. Absolutely avoid 90^0 elbows, connections with other hoses, 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, 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 bypass line from the valve directly to the pump suction line.
9. Provide appropriate baffle plates inside the tank in order to avoid water flows coming from both the bypass 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 one filter as indicated in fig. 6 and fig.6/a.

With a manually activated control valve

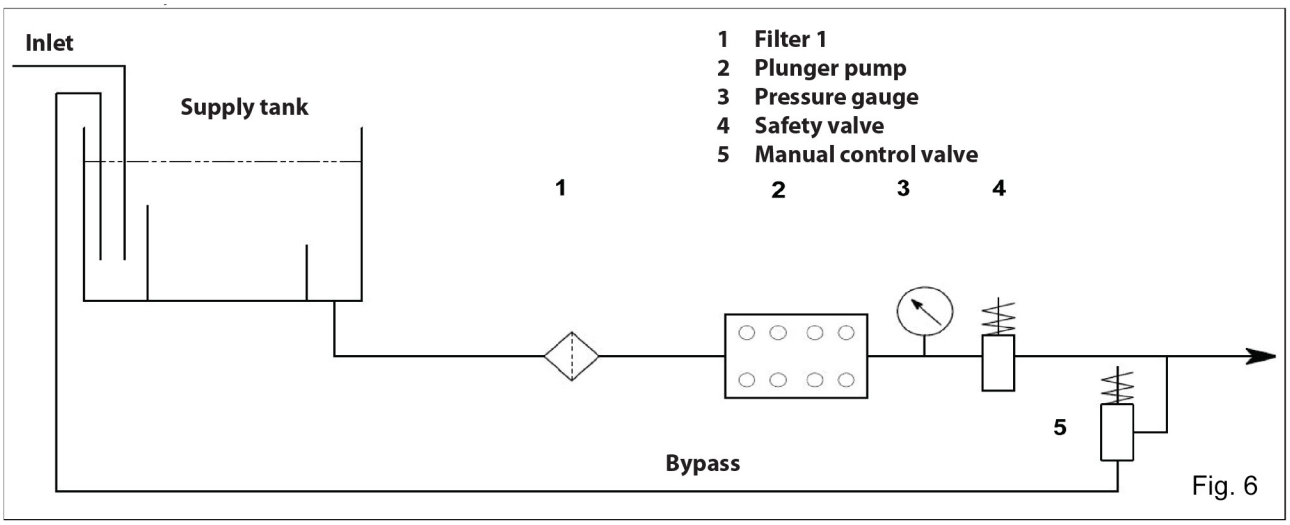


Fig. 6

With pneumatic control valve

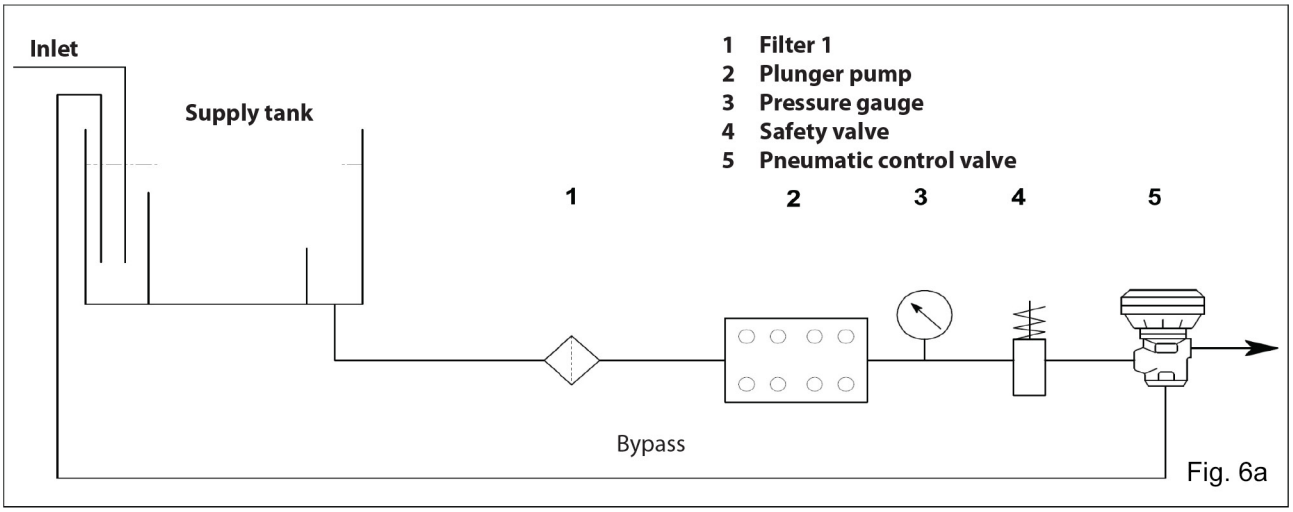


Fig. 6a

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 hose connected to the pump must be flexible in order to isolate pump vibrations from the rest of the system.
3. Use high pressure hoses 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 plunger 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 dampener on the delivery line.

9.9 Internal Diameter of the Hose Line

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

Suction Hose

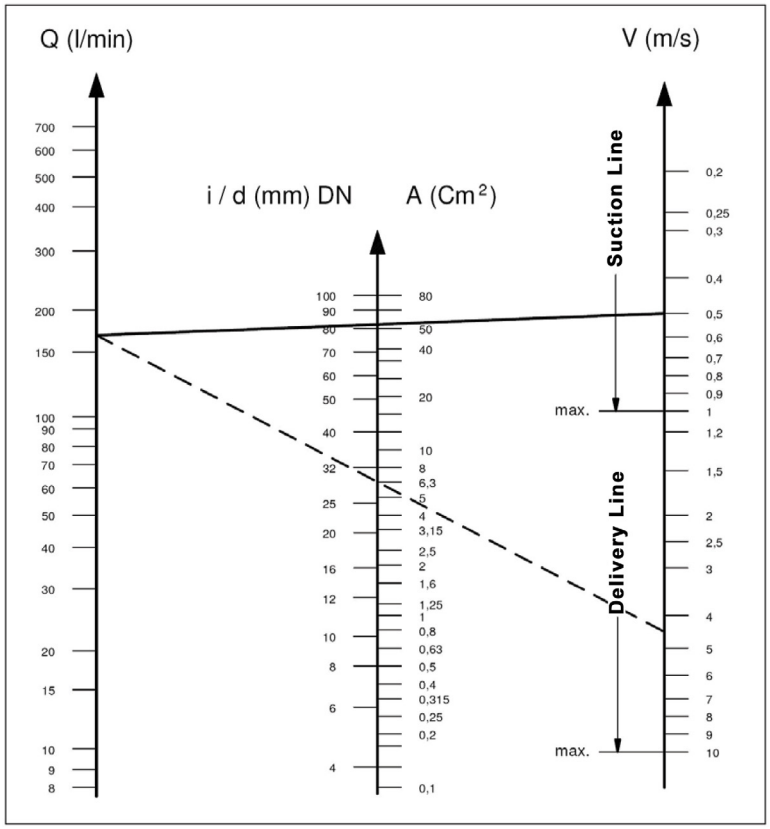
With a flow rate of ~45 GPM (170 l/mn) and water speed of 0.5 m/sec. the diagram line that connects the two scales intersects the central scale, indicating the diameters, at a value of ~ 3.15 inch (80 mm).

Delivery Hose

With a flow rate of ~45 GPM (170 l/mn) and water speed of 4.5 m/sec. The diagram line that connects the two scales intersects the central scale, indicating the diameters at a value of ~ 1.2 inch (30 mm).

Optimum speed values:

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



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

9.10 V-belt Transmission

The pump may be driven by a v-belt system. For this pump model, we suggest using 4 XPB belts (16.5x13 cogged); 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 number of rotations normally declared by the manufacturer. Minimum diameter of the driven pulley (on the pump shaft) ≥ 9.8 in. (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 (PTO) as indicated in fig. 10.

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

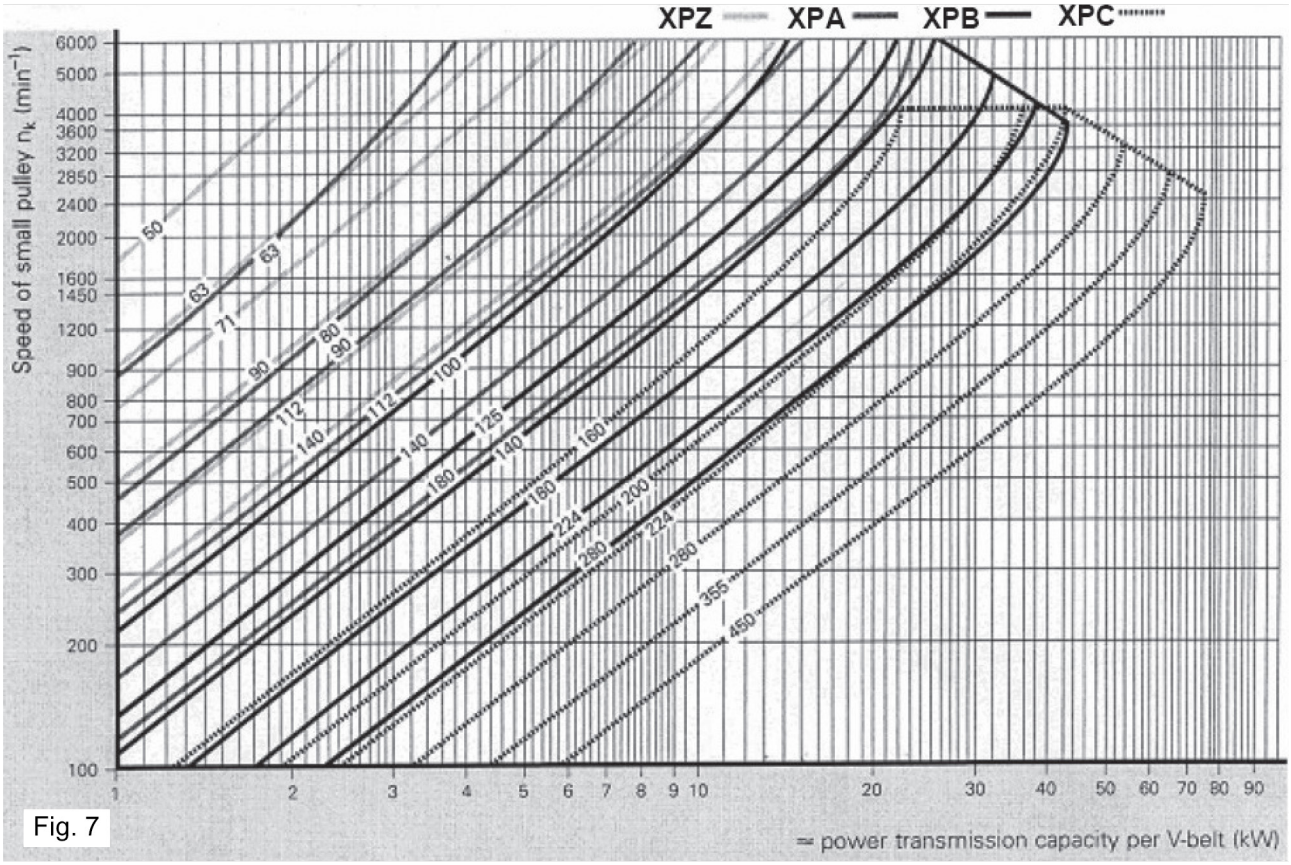


Fig. 7

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 with race dimensions prescribed / recommended by the belt manufacturer. Should no indications be supplied, please see **fig. 9** and the table in **fig. 10**.

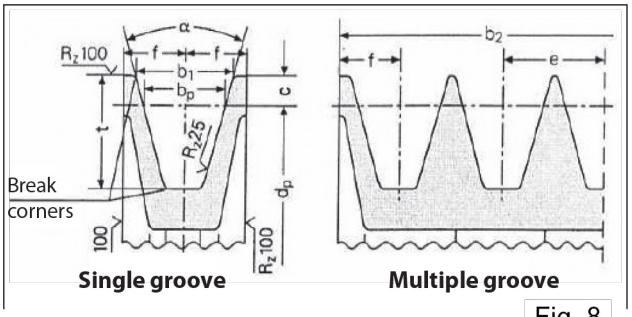


Fig. 8

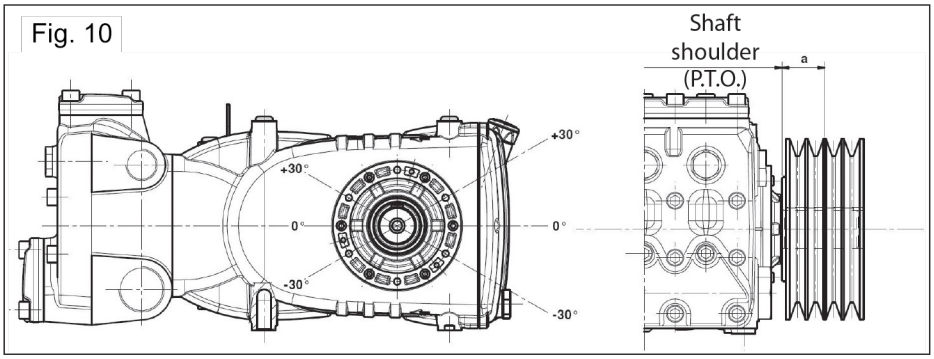
Dimensions (in mm)

Belt section as per DIN 7753 part 1 and B.S. 3790 / DIN symbol / symbol B.S./ISO				XPB/SPB SPB	XPC/SPC SPC
Belt section as per DIN 2215 and B.S. 3790 / DIN symbol / symbol B.S./ISO				17 B	22 C
Pitch width			b_w	14.0	19.0
Increased grooving width $b_1 \approx$		α = 34°		18.9	26.3
		α = 38°		19.5	27.3
			c	8.0	12.0
Distance between grooving			and	23 ± 0.4	31 ± 0.5
			f	14.5 ± 0.8	20.0 ± 1.0
Increased grooving depth			t_{min}	22.5	31.5
α	34°	by primitive diameter narrow-section V-belts DIN 7753 part 1	d_w	from 140 to 190	from 224 to 315
	38°			> 190	> 315
α	34°	by primitive diameter classic section V-belts DIN 2215	d_w	from 112 to 190	from 180 to 315
	38°			> 190	> 315
Tolerance for α = 34°-38°				± 1°	± 30′
Pulleys for b2 by grooving number z b2 = (z-1) e + 2 f			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
Minimum pulley diameter must be respected. Do not use laminated 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 (PTO), “a” in **fig. 10**.

Fig. 10



c) Set belt tension according to the Manufacturer's suggestions; 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 ≥ ± 0.75%; for this reason the 4 belts must be purchased in pairs
e) Follow the belt tension directions as indicated in **fig. 9**; for different needs, please contact the **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. 11** allows to obtain the values of the static tension that must be applied vs. the center distance between pulleys.

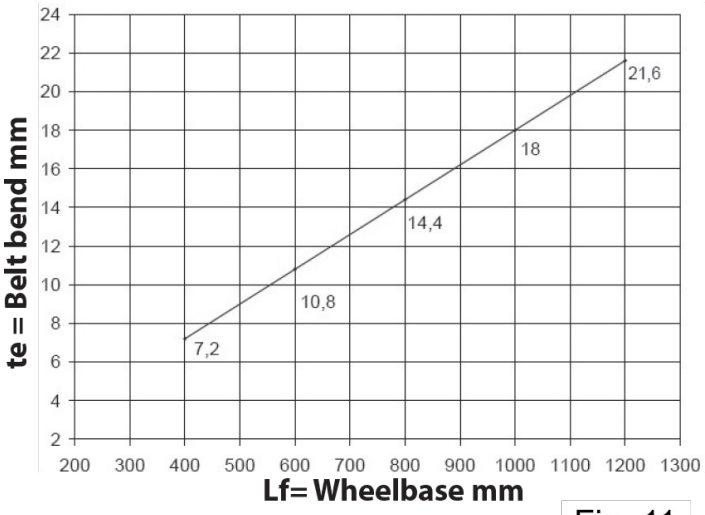


Fig. 11

Finally, given a distance between pulley centers of 23.6 inches (600 mm) and a load of 75 N at the middle of the distance, a belt flexion “te” of around .425 inch (10.8 mm) will confirm the correct belt tension as shown in **fig. 12**.

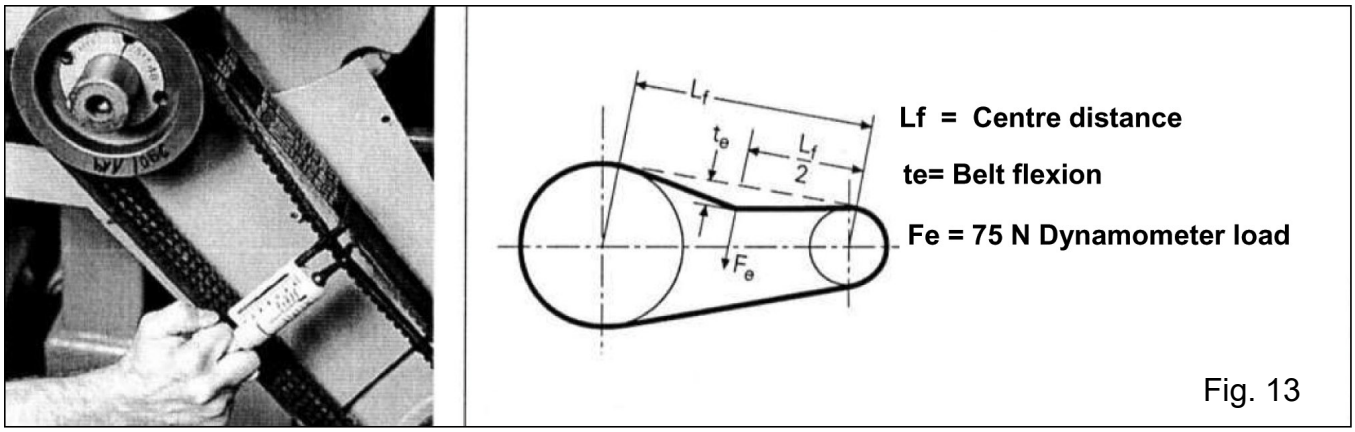


Fig. 13

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 setting. The best efficiency and maximum belt life is obtained with the correct tension value.

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

9.13 Transmission of power from the second PTO

Upon request, KF series pumps can be supplied with an auxiliary PTO on the opposite side to the drive (Transmission of power from the second PTO).
Transmission can be carried out:
- By means of the V-belt.
- By means of the joint.

By means of the V-Belt, withdrawable max torque is:
48 ft. lbs. (65 Nm) which corresponds to:
7 HP at 750 rpm;
7.4 HP at 800 rpm;
8.3 HP at 900 rpm;
9.3 HP at 1000 rpm;
11.1 HP at 1200 rpm.

By means of the V-Belt, with drawable max torque is:
98 ft. lbs. (130 Nm) which corresponds to:
14 HP at 750 rpm;
14.8 HP at 800 rpm;
16.6 HP at 900 rpm;
18.6 HP at 1000 rpm;
22.2 HP at 1200 rpm.

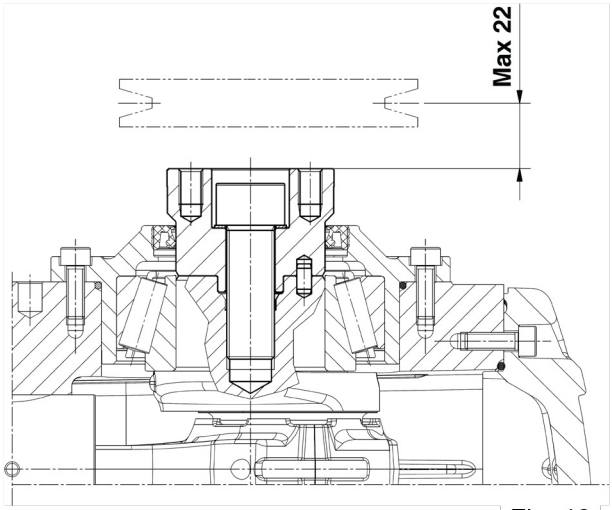


Fig. 13

By the means of the V-belt, the transmission is considered suitable if: belt pull is applies at a max distance of 0.87 in. (22 mm) from the bend shaft shoulder fig. 13. Min diameter of pulley to be used = Ø 3.94 (100).

With transmission by means of the joint, make sure it is perfectly aligned so that to transverse forces are generated on the pump shaft.

For applications different from those specified above, please contact our Technical or Customer Service Department.

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 Chapter 9) 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 ex-pulsed 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 pump's oil level must be verified using the correct dipsticks (position 1, fig 14), and especially by means of the oil sight glass (position 2, fig. 14).

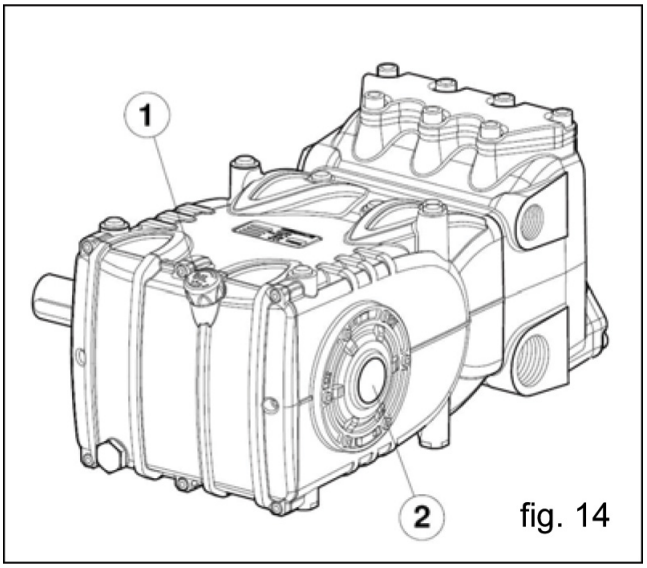


fig. 14

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 for the first time, check for the correct direction 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.

11. PREVENTIVE MAINTENANCE

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

PREVENTIVE MAINTENANCE	
EVERY 500 HOURS	**EVERY 1500 HOURS**
Check oil level	Change oil
	Check / Replace: • Valves • Valve seats • Valve springs • Valve guides
	Check / Replace: • H.P packings • L.P. packings

ATTENTION: Replace the bearings and the related seal rings every 8000 hours of operation.
Preform periodical checks on cleaning and maintenance on the pump. See “ATEX EXPLOSION PROTECTION” manual.

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 11, and follow the start-up procedures described.

12.2 Filling the Pump With An Anti-Corrosion Emulsion or Antifreeze By Using An External Diaphragm Pump As In The Layout Shown in Paragraph 9.7, between pos. 1 and pos. 2 of fig. 6 and fig. 6/a.

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

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 completely 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 that agreed.
b) The pump has been fit with an electric or engine with performance greater than that indicated in the table.
c) The required safety devices were not adjusted or disconnected.
d) The pump was used with accessories or spare parts not supplied by General Pump.
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 hoses
   7) non-authorized 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

15. TROUBLESHOOTING (cont)

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 hose/ undersized diameters
  2) Insufficient flow rate
  3) High water temperature

Insufficient pump pressure:

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

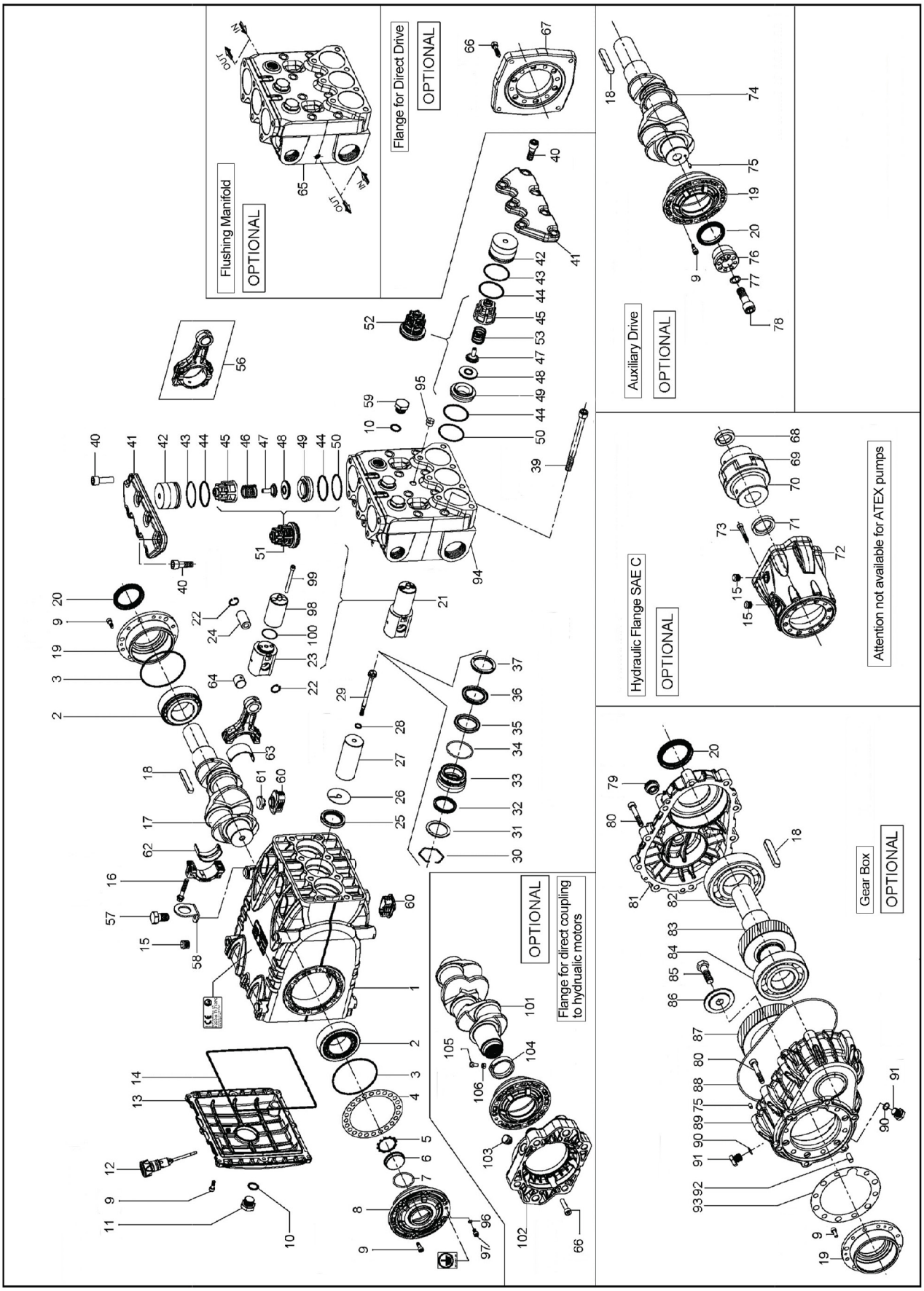
Overheated pump:

- 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 7 (see paragraph 7.4)
- Incorrect alignment of the joint or pulleys
- Excessive inclination of the pump during operation

Pump vibrations or knocking:

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

16. KF EXPLODED VIEW AND PARTS LIST



KF PARTS LIST

Item	Part No.	Description	QTY.
1	71010022	Crankcase	1
2	91859000	Bearing, Taper Roller	2
3	90391800	O-ring, Ø94.92 x 2.62	3
4	F71220081	Spacer, 0.1 mm	1
	F71220381	Spacer, 0.25 mm	1
5	90075600	Retainer Clip	1
	90075500	Retainer Clip, ATEX	1
6	70211801	Oil Sight Glass	1
7	90387700	O-ring, Ø39.34 x 2.62	1
8	F71150122	Cover, Bearing	1
	F71150522	Cover, Bearing, ATEX	1
9	F99186700	Screw, M6 x 18	20
10	F90384100	O-ring, Ø17.13 x 2.62	4
11	F98218700	Plug, G 1/2"x13, Zinc	4
	F98218150	Plug, G 1/2"x13, SS, ATEX	4
12	98212000	Oil Dipstick	1
	98212100	Oil Dipstick, ATEX	1
13	F71160022	Cover, Crankcase	1
14	F90400000	O-ring, Ø21.5 x 3	1
15	98206000	Plug, Black Rubber Ø15	4
16	F99313800	Screw, Connecting Rod, M8 x 1 x 48	6
17	F71020035	Crankshaft	1
18	F91500000	Key, 12 x 8 x 70	1
19	F71150022	Cover, Bearing, PTO	1
20	90170000	Seal, Oil Crankshaft, Ø50 x 65 x 8	1
21	71606601	Plunger Guide, Complete	3
22	F90060600	Ring	6
23	71050015	Plunger Guide	3
24	F97743000	Pin, Plunger, Ø20 x 38	3
25	90167800	Seal, Oil, Plunger, Rod Ø38 x 52 x 7	3
26	96714000	Washer, Flinger	3
27	F71040609	Plunger, Ø28x95	3
	F71040309	Plunger, Ø30x95	3
	F72040009	Plunger, Ø32x95	3
	F71040409	Plunger, Ø36x95	3
	F71040509	Plunger, Ø40x95	3
28	90367100	O-ring, Ø11 x 2	3
29	F71219566	Plunger Screw	3
30	F90079700	Circlip, 52 mm	3
31	F71217670	Ring, Seal, Ø28	3
	F71217770	Ring, Seal, Ø30	3
	F72210570	Ring, Seal, Ø32	3
	F71218070	Ring, Seal, Ø36	3
	F71218270	Ring, Seal, Ø40	3
32	90275000	Seal, L.P., Ø28x36x5.5	3
	90276000	Seal, L.P., Ø30x38x5.5	3
	90278000	Seal, L.P., Ø32x40x5.5	3
	90279800	Seal, L.P., Ø36x44x5.5	3
	90282800	Seal, L.P., Ø40x48x5.5	3
33	F71215670	Support, Gasket, Ø28	3
	F71215370	Support, Gasket, Ø30	3
	F72210470	Support, Gasket, Ø32	3
	F71215470	Support, Gasket, Ø36	3
	F71215570	Support, Gasket, Ø40	3
34	90389100	O-ring, Ø52.07x2.62	3
35	F90275500	Ring, Restop, Ø28x45x8.5/4.0	3
	F90277400	Ring, Restop, Ø30x45x8.0/4.5	3
	F90278400	Ring, Restop, Ø32x44x5.5/3.0	3
	F90281800	Ring, Restop, Ø36x45x6.0/3.0	3
	F90283800	Ring, Restop, Ø40x55x8.0/4.5	3
36	F90275800	Packing, H.P., Ø28x45x8.5/5.0	3
	F90277000	Packing, H.P., Ø30s45x7.5/4.5	3
	F90278800	Packing, H.P., Ø32x44x6.0/3.5	3
	F90282000	Packing, H.P., Ø36x48x6.0/3.5	3
	F90283200	Packing, H.P., Ø40x55x7.5/4.5	3
37	F70100351	Ring, Front, Ø28	3
	F70100451	Ring, Front, Ø30	3
	F72100051	Ring, Front, Ø32	3
	F71100251	Ring, Front, Ø36	3
	F71100351	Ring, Front, Ø40	3
39	F99448000	Screw, M12x150	8
40	F99429500	Screw, M12x35	14
41	F71210136	Cover, Valves	2

Item	Part No	Description	QTY.
42	F72210370	Valve Plug	6
43	F90525000	Anti-extrusion Ring, Ø50.9x55x1.5	6
44	90388900	O-ring, Ø48.89x2.62	12
45	36204505	Guide, Valve	6
46	F94755000	Spring, Ø25.2x26	3
47	F36208651	Internal Valve Guide	6
48	F36208502	Poppet Valve	6
49	F36204156	Valve Seat	6
50	F90524000	Anti-extrusion Ring, Ø49.5x54x1.5	6
51	F36713701	Outlet Valve Packing	3
52	F36713601	Inlet Valve Packing	3
53	F94754000	Spring, Ø24.7x27	3
56	F71030701	Connecting Rod	3
57	F99426600	Bolt, M12x25	1
58	F71223074	Eyebolt	1
59	F98218100	Plug, Valve G 1/2"x13	3
60	F71225851	Plug, Drain	6
61	F71225951	Cap, Vented	3
62	F90924300	Babbitt Bearing, Non Load side	3
63	F90924000	Babbitt Bearing, Load side	3
64	F90911000	Bronze Bushing	3
65	-	Manifold, Flushing	1
66	F99309800	Screw, M8x35	
67	F10067720	Flange, Direct Drive	1
68	F10074570	Spacer, Ø31.75x10.50	1
69	F10074947	Flex Coupler, Ø55	1
70	F10742801	Flex Coupler, Ø40x31.75	1
71	F10074670	Spacer, Ø40x10	6
72	F10075020	Hydraulic Flange, SAE C	1
73	F99314600	Screw, M8x50	1
74	F71020735	Crankshaft, Ø50, PTO	1
75	F97615200	Pin Guide. 5x10	1
76	F71226554	Auxiliary Power Take-off	1
77	F96737800	Washer, Ø17x24x10	1
78	F99514200	Screw, M16x45	1
79	F97594000	Oil Sight Glass	1
80	F99314600	Screw, M8x50	16
81	F72210920	Cover, Gearbox	1
82	F91859300	Bearing	1
83	F10070835	Pinion, Z27, 1.250	1
	F10070935	Pinion, Z25, 1.500	1
	F10071035	Pinion, Z22, 1.830	2
84	F91857700	Bearing	1
85	F99430700	Screw, M12x40	1
86	F72211055	Gear Mounting Washer	1
87	F10071135	Ring Gear, Z34, 1.250	1
	F10071235	Ring Gear, Z37, 1.500	1
	F10071335	Ring Gear, Z40, 1.830	1
88	F90394800	O-ring, Ø209.22x2.62	1
89	F72210820	Housing, Gear	1
90	F90358500	O-ring, Ø10.82x1.78	2
91	F98204250	Plug, G 1/4"x13	2
92	F97618500	Pin, Ø8x18	1
93	F72210784	Gasket, Reducer Box	1
94	F71125036	Manifold, Ø28-30, NPT	1
	F71128936	Manifold, Ø32, NPT	1
	F71125136	Manifold, Ø36, NPT	1
	F71125236	Manifold, Ø40, NPT	1
95	F98209800	Plug, G 3/8"x10	1
96	F96693950	Washer, Ø6.4x11x0.7, ATEX	1
97	F99180900	Screw, M06x10, ATEX	1
98	F71050866	Plunger Guide	3
99	F99199400	Screw, M6x65	6
100	F90352800	O-ring, Ø29x1.5	3
101	F71020835	Crankcase, Ø50 SAE-C	1
102	F10085422	Flange, Hydraulic	1
103	F90206500	Plug, Plastic	1
104	F71228971	Ring, Ø40	1
105	F70227034	Screw, M6x12	1
106	F92202500	Nut, M6x5	1
	200082	Bolt, M16/1.5x40	4
	200083	Lock Washer, M16	4

REPAIR KITS

KIT NUMBER	F2014 Plunger Packing Kit KF28A	F2016 Plunger Packing Kit KF30A	F2066 Plunger Packing Kit KF32A	F2018 Plunger Packing Kit KF36A	F2020 Plunger Packing Kit KF40A
Positions Included	32, 34, 35, 36	32, 34, 35, 36	32, 34, 35, 36	32, 34, 35, 36	32, 34, 35, 36

KIT NUMBER	F2012 Suction Valve Kit
Positions Included	44, 50, 52

KIT NUMBER	F2013 Outlet Valve Kit
Positions Included	44, 50, 51

KIT NUMBER	F2015 Complete Seals Kit KF28A	F2017 Complete Seals Kit KF30A	F2222 Complete Seals Kit KF32A	F2019 Complete Seals Kit KF36A	F2021 Complete Seals Kit KF40A
Positions Included	3, 5, 7, 10, 14, 20, 25, 28, 32, 34, 35, 36, 37, 43, 50, 100	3, 5, 7, 10, 14, 20, 25, 28, 32, 34, 35, 36, 37, 43, 50, 100	3, 5, 7, 10, 14, 20, 25, 28, 32, 34, 35, 36, 37, 43, 50, 100	3, 5, 7, 10, 14, 20, 25, 28, 32, 34, 35, 36, 37, 43, 50, 100	3, 5, 7, 10, 14, 20, 25, 28, 32, 34, 35, 36, 37, 43, 44, 50

KIT NUMBER	F2135 Connecting Rod Bushing Kit (Standard)	F2154 Connecting Rod Bushing Kit (+0.25)	F2155 Connecting Rod Bushing Kit (+0.50)
Positions Included	62, 63	62, 63	62, 63

Torque Specifications

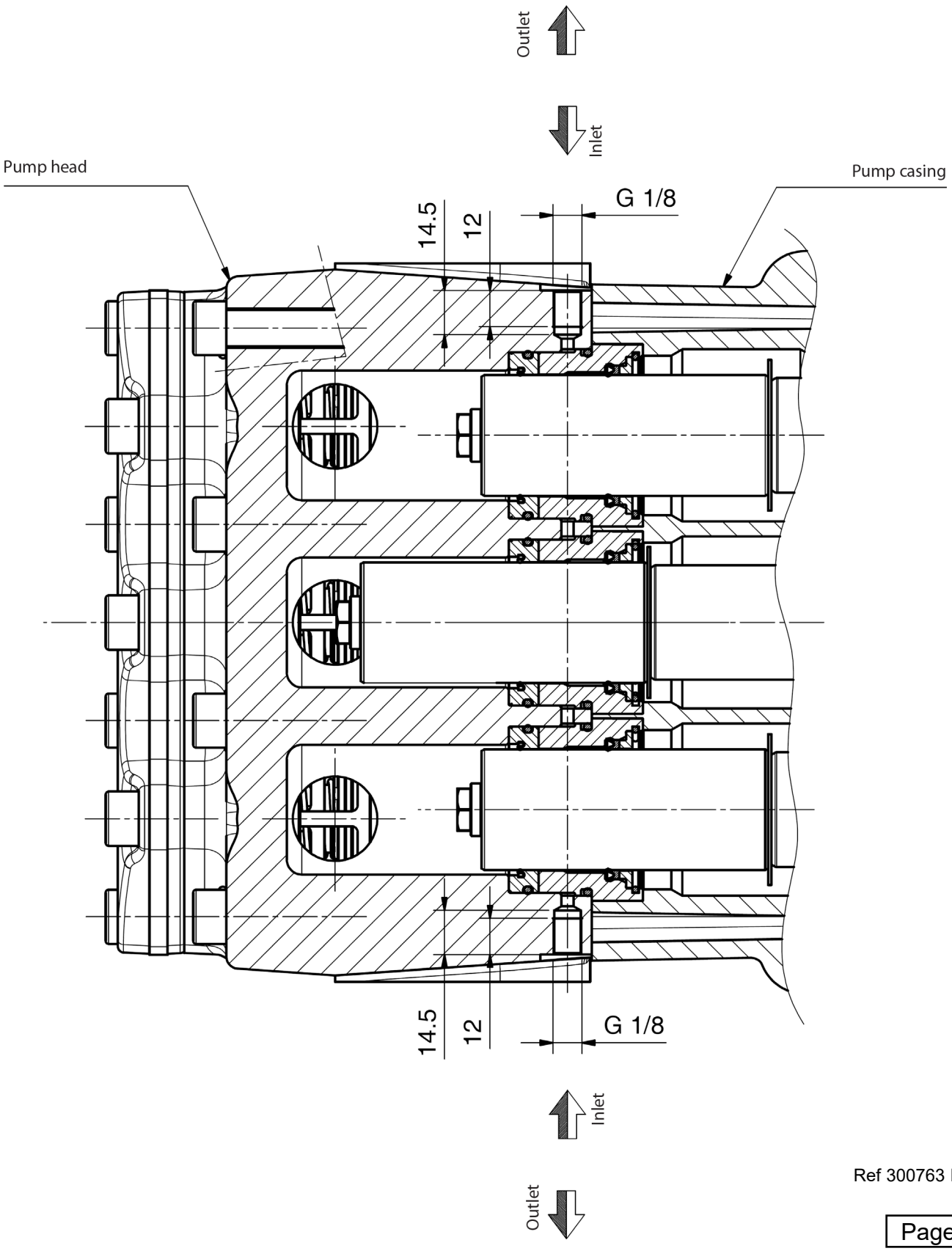
Position	Torque
9	7.5 ft. lbs. (10 Nm)
11	29.5 ft. lbs. (40 Nm)
16	22 ft. lbs. (30 Nm)
29	14.75 ft. lbs. (20 Nm)
39	59 ft. lbs. (80 Nm)
40	88.5 ft. lbs. (120 Nm)
57	29.5 ft. lbs. (40 Nm)
59	29.5 ft. lbs. (40 Nm)
66	29.5 ft. lbs. (40 Nm)
73	29.5 ft. lbs. (40 Nm)
78	265.5 ft. lbs. (360 Nm)
79	7.5 ft. lbs. (10 Nm)
80	29.5 ft. lbs. (40 Nm)
85	51.75 ft. lbs. (70 Nm)
91	29.5 ft. lbs. (40 Nm)
95	22 ft. lbs. (30 Nm)

Thread Lock Requirements

Position	Thread Lock
78	Loctite 243 Part #12006400
85	Loctite 243 Part #12006400
95	Loctite 542 Part #12006200

17. FLUSHING CIRCUIT DIAGRAM OF USE

Adhere to the following valves for proper system operations:
Minimum circuit flow rate 1.06 GPM (4 l/min), max fluid pressure 87.02 PSI (6 bar)



18. SPECIAL VERSIONS

The KF pump is also available in the special Version:
- KFR

The following information is helpful in deciding how to choose and use this pump version.
Unless specified, observe the above instructions for the standard KF pump.

18.1 KFR Pump

18.1 KFR Pump

18.1.1 Operating Instructions

The KFR series pump has been designed to operate in environments with atmospheres that are not potentially explosive and for using water rich in particulate, therefore it is considered ideal for system with fluid recirculation. The durability of the piston seal is directly in relation to the percentage of the presence of solids in the fluid as regards both their size and their density.
For a long seal life we recommend a particulate grain size of no more than 200 micron and 20% max. in volume.
For more information and general system layout see par. 9.7.

18.1.2 Water Temperature

The maximum water temperature is 104° F (40° C). However, the pump can be used with water temperatures up to 140° F (60° C), but only for short periods. In this case it is best to contact our **Technical or Customer Service Department.**

18.1.3 Maximum Pressure and Flow Rate

The rated specifications stated in our catalog are the maximum that can be obtained by the pump. Independently of the power used, the maximum pressure and RPM indicated on the specification label can never be exceeded unless prior authorization given by our **Technical or Customer Service Department.**

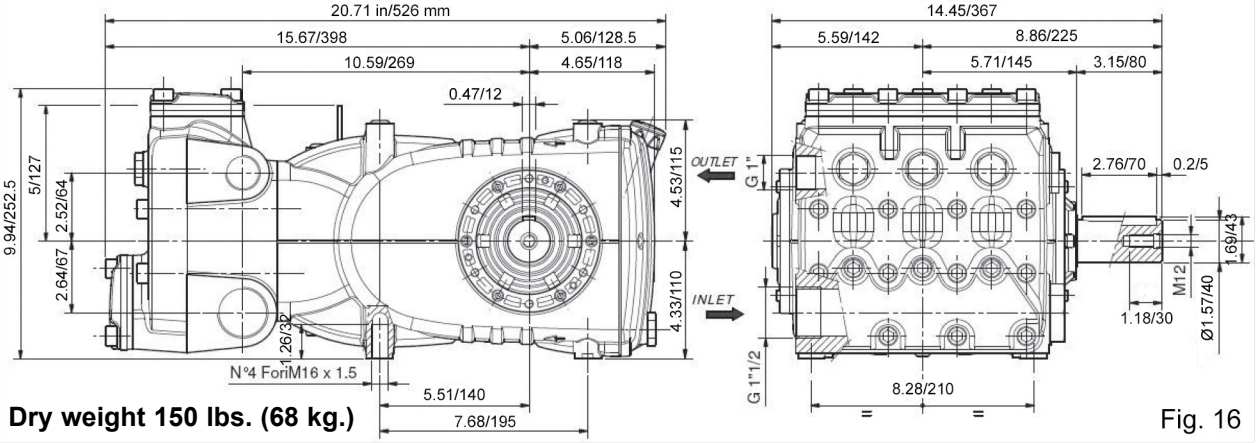
18.1.4 Minimum Operating Speed

The minimum permissible speed of the crankshaft for these types of pumps is 100 RPM; any RPM other than as shown in the performance table (see par. 18.1.5) must be authorized by our **Technical or Customer Service Department.**

18.1.5 Technical Features

Model	RPM	Flow Rate		Pressure		Power	
		GPM	l/min	PSI	bar	HP	kW
KFR28A	1000	24.5	93	3045	210	50	37
KFR30A	1000	28	106	2900	200	55	40
KFR32A	1000	31.7	120	2610	180	56	41.2
KFR36A	800	32.2	122	2300	160	50	37
	900	36.2	137	2050	140	50	37
	1000	40	153	1900	130	52	38.2
KFR40A	900	45	170	1595	110	49	36

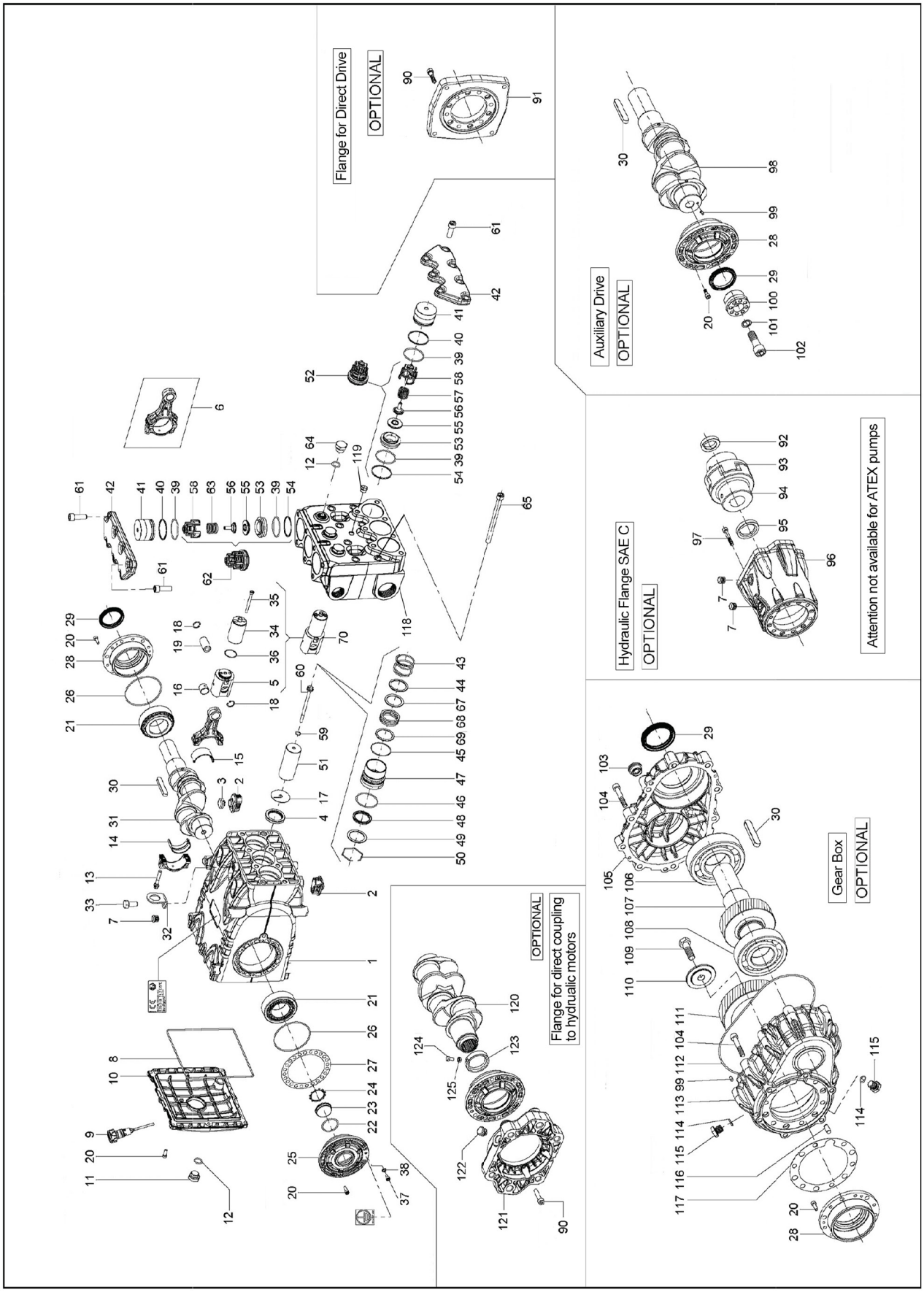
18.1.6 Dimensions and Weight



Dry weight 150 lbs. (68 kg.)

Fig. 16

19. KFR EXPLODED VIEW AND PARTS LIST



KFR PARTS LIST

Item	Part No.	Description	QTY.
1	71010022	Crankcase	1
2	F71225851	Plug, Drain	6
3	F71225951	Cap, Vented	3
4	90167800	Seal, Oil, Ø38 x 52 x 7.0/8.5	3
5	71050866	Plunger Guide	3
6	F71030701	Connecting Rod	3
7	98206000	Plug	4
8	F90400000	O-ring, Ø215.0 x 3.0	1
9	98212000	Dipstick, Ø21.5x91	1
	98212100	Dipstick, Ø21.5 x 91, ATEX	1
10	F71160022	Cover, Crankcase	1
11	F98218700	Plug, G1/2" x 13, Zinc	1
	F98218150	Plug, G1/2" x 13, SS, ATEX	1
12	F90384100	O-ring, Ø17.13 x 2.62	4
13	F99313800	Connecting Rod Screw	6
14	F90924300	Babbitt Bearing, Non load side	3
15	F90924000	Babbitt Bearing, Load Side	3
16	F90911000	Bronze Bushing	3
17	96714000	Washer, Flinger, Ø10 x 50 x 1	3
18	F90060600	Ring	6
19	F97743000	Pin, Plunger Ø20 x 30	3
20	F99186700	Screw, M6 x 18	20
21	91859000	Bearing, Taper Roller	2
22	90387700	O-ring, Ø39.34 x 2.62	1
23	70212801	Oil Sight Glass	1
24	90075600	Retainer Ring	1
	90075500	Retainer Ring, ATEX	1
25	71150122	Cover, Bearing	1
	71150522	Cover, Bearing, ATEX	1
26	90391800	O-ring, Ø94.92x2.62	2
27	F71220081	Spacer, 0.10 mm	1
	F71220381	Spacer, 0.25 mm	1
28	F71150022	Cover, Bearing	1
29	90170000	Seal, Oil Crankshaft, Ø38 x 52 x 8	1
30	F91500000	Key	1
31	F71020035	Crankshaft	1
32	F71223074	Eyebolt	1
33	F99426600	Screw, M12 x 25	1
34	71050715	Plunger Guide	3
35	99199400	Screw, M6x65	6
36	90352800	O-ring, Ø29 x 1.5	3
37	99180900	Screw, M6x10 ATEX	1
38	96693950	Washer, Ø6.4 x 11 x 0.7 ATEX	1
39	90388900	O-ring, Ø48.89 x 2.62	12
40	F90525000	Anti-extrusion Ring, Ø50.9 x 55 x 1.5	6
41	F72210370	Valve Plug	6
42	F71210136	Cover, Valve	2
43	94766800	Spring, Ø35.4 x 36, KFR28A, KFR30A	3
	94769000	Spring, Ø39 x 36, KFR32A	3
	94771100	Spring, Ø43 x 35.5, KFR36A	3
	94771500	Spring, Ø46.8 x 36, KFR40A	3
44	71213056	Spring Ring, Ø28	3
	71213156	Spring Ring, Ø30	3
	71229956	Spring Ring, Ø32	3
	71229656	Spring Ring, Ø36	3
	71229356	Spring Ring, Ø40	3
45	90362300	O-Ring, Ø44.17 x 1.78, KFR28-30-32	3
	90362600	O-Ring, Ø50.52 x 1.78, KFR36-40	3
46	90389100	O-Ring, Ø52.07 x 2.62	3
	90389300	O-Ring, Ø53.65 x 2.62	3
47	F71213456	Support Gasket, Ø28	3
	F71213556	Support Gasket, Ø30	3
	F71229856	Support Gasket, Ø32	3
	F71229556	Support Gasket, Ø36	3
	F71229256	Support Gasket, Ø40	3
48	F90275050	Seal, Ø28 x 36 x 5.5, L.P.	3
	F90276050	Seal, Ø30 x 38 x 5.5, L.P.	3
	F90278050	Seal, Ø32 x 40 x 5.5, L.P.	3
	F90279900	Seal, Ø36 x 44 x 5.5, L.P.	3
	F90282700	Seal, Ø40 x 48 x 5.5, L.P.	3
49	F71217670	Ring, Seal, Ø28	3
	F71217770	Ring, Seal, Ø30	3
	F72210570	Ring, Seal, Ø32	3
	F71218070	Ring, Seal, Ø36	3
	F71218270	Ring, Seal, Ø40	3
50	F90079700	Circlip, Ø52	3
51	F71040609	Plunger, Ø28 x 95	3
	F71040309	Plunger, Ø30 x 95	3
	F72040009	Plunger, Ø32 x 95	3
	F71040409	Plunger, Ø36 x 95	3
	F71040509	Plunger, Ø40 x 95	3

Item	Part No.	Description	QTY.
52	F36713601	Inlet Valve Packing	3
53	F36204156	Valve Seat	6
54	F90524000	Anti-extrusion Ring, Ø49.5 x 54 x 1.5	6
55	F36208502	Poppet Valve	6
56	F36208651	Internal Valve Guide	6
57	F94754000	Spring, Ø24.7 x 27	3
58	36204505	Valve Guide	6
59	90367100	O-Ring, Ø11 x 2	3
60	71219566	Plunger Screw	3
61	F99429500	Screw, M12 x 35	14
62	F36713701	Outlet Valve Packing	3
63	F94755000	Spring, Ø25.2 x 26	3
64	F98218100	Valve Plug, G1/2" x 13	3
65	F99448000	Screw, M12 x 150	8
67	F71212482	Ring, Scraper, Ø28	3
	F71212582	Ring, Scraper, Ø30	3
	F71212682	Ring, Scraper, Ø32	3
	F71229782	Ring, Scraper, Ø36	3
	F71229482	Ring, Scraper, Ø40	3
68	F90559000	Ring, Ø28 x 28 x 15	3
	F90559500	Ring, Ø30 x 40 x 15	3
	F90559900	Ring, Ø32 x 42 x 15	3
	F90562400	Ring, Ø36 x 46 x 15	3
	F90564500	Ring, Ø40 x 50 x 15	3
69	F90517100	Anti-extrusion Ring, Ø28 x 38 x 2	3
	F90517730	Anti-extrusion Ring, Ø30 x 40 x 2	3
	F90517985	Anti-extrusion Ring, Ø32 x 42 x 2	3
	F90520100	Anti-extrusion Ring, Ø36 x 46 x 1.5	3
	F90520700	Anti-extrusion Ring, Ø40 x 50 x 1.5	3
70	71606601	Plunger Guide	3
90	F99309800	Screw, M8 x 35	6
91	F10067720	Flange, Direct Drive	1
92	F10074570	Spacer, Ø31.75 x 10.50	1
93	F10074947	Flex Coupler	1
94	F10742801	Flex Coupler, Ø40 x 35.75	1
95	F10074670	Spacer, Ø40 x 10	1
96	F10075020	Hydraulic Flange, SAE C	1
97	F99314600	Screw, M8 x 50	6
98	F71020735	Crankshaft Ø50, PTO	1
99	F97615200	Pin Guide, 5 x 10	1
100	F71226554	Auxiliary Power Take-off	1
101	F96737800	Washer, Ø17 x 24 x 10	1
102	F99514200	Screw, M16 x 45	1
103	F97594000	Oil Sight Glass	1
104	F99314600	Screw, M8 x 50	16
105	F72210920	Cover, Gearbox	1
106	F91859300	Bearing	1
107	F10070835	Pinion, Z27, 1.250	1
	F10070935	Pinion, Z25, 1.500	1
	F10071035	Pinion, Z22, 1.830	1
108	F91857700	Bearing	1
109	F99430700	Screw, M12 x 40	1
110	F72211055	Gear Mounting Washer	1
111	F10071135	Ring Gear, Z34, 1.250	1
	F10071235	Ring Gear, Z37, 1.500	1
	F10071335	Ring Gear, Z40, 1.830	1
112	F90394800	O-Ring, Ø209.22 x 2.62	1
113	F72210820	Housing, Gear	1
114	701013	O-Ring, Ø10.82 x 1.78	2
115	F98204250	Plug, G1/4" x 13	2
116	F97618500	Pin, Ø8x18	1
117	F72210784	Reducer Box Gasket	1
118	F71120936	Manifold, Ø28-30	1
	F71122636	Manifold, Ø32	1
	F71122736	Manifold, Ø36	1
	F71120736	Manifold, Ø40	1
119	F98209800	Plug, G3/8" x 10	1
120	F71020835	Crankshaft, Ø50 SAE-C	1
121	F10085422	Flange, Hydraulic	1
122	F90206500	Plug, Plastic	1
123	F71228971	Ring, Ø40	1
124	F70227034	Screw, M6 x 12	1
125	F92202500	Nut, M6x5	1
	200082	Bolt, M16/1.5x40	4
	200083	Lock Washer, M16	4

REPAIR KITS

KIT NUMBER	F2399 Plunger Packing Kit KFR28A	F2400 Plunger Packing Kit KFR30A	F2401 Plunger Packing Kit KFR32A	F2402 Plunger Packing Kit KFR36A	F2393 Plunger Packing Kit KF40A
Positions Included	45, 46, 48, 67, 68, 69	45, 46, 48, 67, 68, 69	45, 46, 48, 67, 68, 69	45, 46, 48, 67, 68, 69	45, 46, 48, 67, 68, 69

KIT NUMBER	F2012 Suction Valve Kit
Positions Included	39, 52, 54

KIT NUMBER	F2013 Outlet Valve Kit
Positions Included	39, 54, 62

KIT NUMBER	F2403 Complete Seals Kit KFR28A	F2404 Complete Seals Kit KFR30A	F2405 Complete Seals Kit KFR32A	F2406 Complete Seals Kit KFR36A	F2393 Complete Seals Kit KFR40A
Positions Included	4, 8, 12, 22, 24, 26 26, 29, 36, 39, 40, 45, 46, 48, 54, 59, 67, 68, 59	4, 8, 12, 22, 24, 26 26, 29, 36, 39, 40, 45, 46, 48, 54, 59, 67, 68, 59	4, 8, 12, 22, 24, 26 26, 29, 36, 39, 40, 45, 46, 48, 54, 59, 67, 68, 59	4, 8, 12, 22, 24, 26 26, 29, 36, 39, 40, 45, 46, 48, 54, 59, 67, 68, 59	4, 8, 12, 22, 24, 26 26, 29, 36, 39, 40, 45, 46, 48, 54, 59, 67, 68, 59

KIT NUMBER	F2135 Connecting Rod Bushing Kit (Standard)
Positions Included	14, 15

Torque Specifications

Position	Torque
11	29.5 ft. lbs. (40 Nm)
13	22 ft. lbs (30 Nm)
20	7.5 ft. lbs (10 Nm)
33	29.50 ft. lbs. (40 Nm)
35	7.5 ft. lbs. (10 Nm)
60	14.75 ft. lbs. (20 Nm)
61	88.5 ft. lbs. (120 Nm)
64	47.25 ft. lbs. (64 Nm)
65	59 ft. lbs. (80 Nm)
90	29.5 ft. lbs. (40 Nm)
97	29.5 ft. lbs. (40 Nm)
102	265.5 ft. lbs. (360 Nm)
103	7.5 ft. lbs. (10 Nm)
104	29.5 ft. lbs. (40 Nm)
109	51.75 ft. lbs. (70 Nm)
115	29.5 ft. lbs. (40 Nm)
119	22 ft. lbs. (30 Nm)
124	7.5 ft. lbs. (10 Nm)

Thread Lock Requirements

Position	Thread Lock
102	Loctite 243 Part #12006400
109	Loctite 243 Part #12006400
119	Loctite 542 Part #12006200

MAINTENANCE LOG

	HOURS & DATE						
OIL CHANGE							
GREASE							
PACKING REPLACEMENT							
PLUNGER REPLACEMENT							
VALVE REPLACEMENT							

GENERAL PUMP

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