GENERAL PUMP

KV

Owner's Manual

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

KV12 - KV14

General Pump
is a member of
the Interpump Group

QUALITY SYSTEM CERTIFICATION DNV·GL ISO 9001

Ref 310086 Rev. C
11-22

INDEX

1. INTRODUCTION

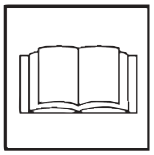
This manual describes the use and maintenance instructions of the KV Series pump, and should be carefully read and understood before using the pump.

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

Danger
Wear protective mask

Danger
Wear goggles

Danger
Wear protective gloves

Danger
Wear protective boots

3. SAFETY

3.1 General Safety Indications

Improper use of pumps and high pressure systems, and the non-compliance with installation and maintenance instructions may cause severe injury to people and/or damage to property. Anyone assembling or using high pressure systems must possess the necessary competence to do so, should be aware of the characteristics of the components assembled/used, and must take all precautions necessary to ensure maximum safety in any operating condition. In the interest of safety, both for the Installer and the Operator, no reasonably applicable should be omitted.

3.2 High pressure unit safety requirements

1. The pressure line must always be equipped with a safety valve.
2. High pressure system components, in particular for those units working outside, must be adequately protected against rain, frost and heat.
3. The electrical control system must be adequately protected from water spray, and must comply with the specific regulations in force.
4. High pressure hoses must be properly sized for maximum operating pressure of the system and always and only used within the operating pressure range specified by the hose manufacturer. The same rules should be observed for all other auxiliary systems affected by high pressure.
5. The ends of high pressure hoses must be sheathed and secured to a solid structure to prevent dangerous whiplash in case of bursting or broken connections.
6. Appropriate safety guards must be provided for the pump transmission systems (couplings, pulleys and belts, auxiliary drives).

3.3 Safety During Operation

The working area of a high pressure system must be clearly marked. Access must be prohibited to un-authorized personnel and, wherever possible, the area should restricted or fenced. The personnel authorized to access this area should first be 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 system is correctly fed with a min. pressure of 72.5-101.5 PSI (5-7 Bar)(measured in the head flange).
2. That pump intake filters are perfectly clean; we advise the use of a device that indicates the filters clogging level.
3. Electrical parts are adequately protected and in perfect condition.
4. The high pressure hoses do not show apparent signs of abrasion, and that fittings are in perfect shape.
5. **Attention:** during operation the outer surfaces may reach high tempatures. Try to take percautions to avoid contact with hot parts.

Any fault or reasonable doubt that may arise before or during operation should be promptly reported and verified by competent personnel. In these cases, pressure should immediately be released and the high pressure system stopped.

3.4 General Procedures For Using Nozzles

1. The Operator must always place his/her safety and security first, as well as that of others that may be directly affected by his/her actions, or any other assessments or interests. The operator's work must be dictated by common 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. It is generally best to organize personnel into teams of at least two people capable of giving mutual and immediate assistance in case of necessity and of taking turns during long and demanding operation.
4. Access to the work area that is within the water jets' range must be absolutely prohibited to and free from objects that, inadvertently under a pressure jet, can be damaged and or create dangerous situations.
5. The water jet must only and always be directed in the direction of the work area, including during testing or preliminary tests or checks..
6. The Operator must always pay attention to the trajectory of the debris removed by the water jet. If necessary, suitable guards must be provided by the Operator to protect anything that may be accidentally exposed.
7. The Operator should not be distracted for any reason during operation. Workers needing to access the operating area must wait for the Operator to stop work, and then immediately make their presence known.
8. For safety reasons, it is important that each member of the team is fully aware of the intentions and actions of other team members in order to avoid dangerous misunderstandings.
9. The high pressure system must not be started up and run under pressure without all team members in position and without the Operator having already directed his/her lance toward the work area.

3.5 Safety During System Maintenance

1. The pressure system maintenance must be carried out in the time intervals set by the manufacturer who is responsible for the whole group according to law.
2. Maintenance should always be carried out by trained and authorized personnel.
3. Assembly and disassembly of the pump and its various components must be performed exclusively by authorized personnel, using appropriate equipment in order to avoid damage to components and connections.
4. Always use original spare parts to ensure total reliability and safety.

4. PUMP IDENTIFICATION

Each pump has its own Serial No. XX.XXX.XXX see (1, fig 1) and a specific label (2, fig. 1) which contains:

- Pump model and version
- Maximum RPM
- Power Hp - kW
- Presure - P.S.I.
- Flow Rate - GPM

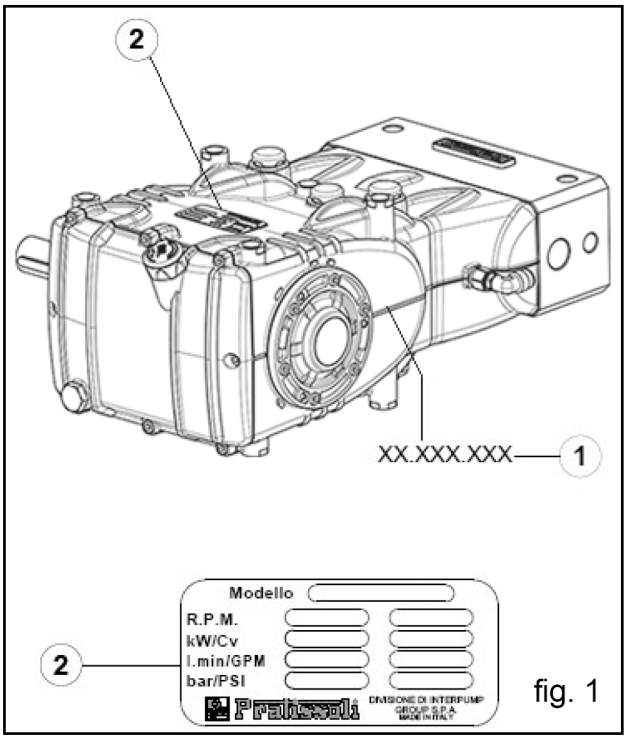


fig. 1

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

5. TECHNICAL FEATURES

MODEL	RPM	FLOW RATE		PRESSURE		POWER	
		l/min	GPM	PSI	Bar	Hp	kW
KV 12	1450	12.8	3.4	16000	1100	36.5	26.9
	1750	15.4	4.1	16000	1100	44	32.4
KV 14	1450	17.4	4.6	11600	800	36.1	26.6
	1750	21	5.5	11600	800	43.6	32

6. DIMENSIONS AND WEIGHT

For standard version pump dimensions and weight, refer to fig. 2.

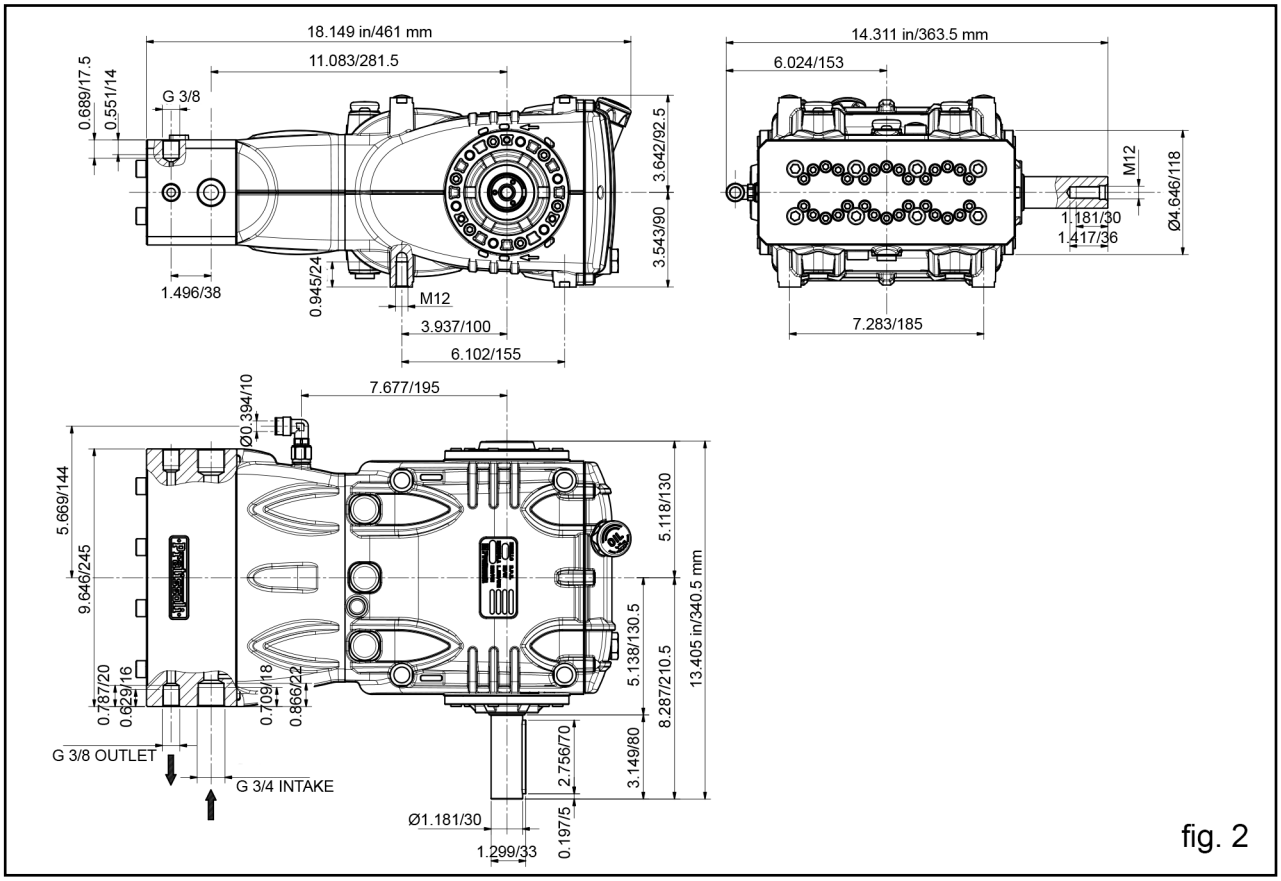


fig. 2

Dry weight 63.93 lbs (29 kg).

7.OPERATING INSTRUCTIONS

The KV pump, is designed to operate in environments with atmospheres that are not potentially explosive, and with filtered water (see par. 9.7) and at ambient temperature.

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

7.1 Water Temperature

The maximum water temperature is 86° F (30° C).

7.2 Max Pressure and Flow Rate

The rated specifications stated in our catalog are the max, 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 authorization is given by the **Customer Service Department.**

7.3 Minimum Operating Speed

The minimum speed of the crankshaft for these types of pumps is 100 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 32^0 and 89.6^0 F (0^0 and 30^0C). 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 BG 220
BP	ENERGOL HLP 220
CASTROL	Hyspin VG 220, Magna 220
ELF	POLYTELIS 220
ESSO	NUTO 220
FINA	Cirkan 220
FUCHS	RENOLIN 220
MOBIL	DTE OIL BB
SHELL	TELLUS C 220
TEXACO	RANDO HD 220
TOTAL	CORTIS 220

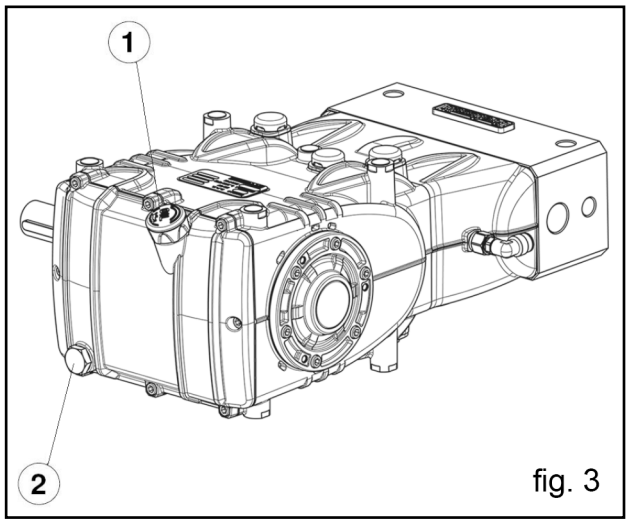


fig. 3

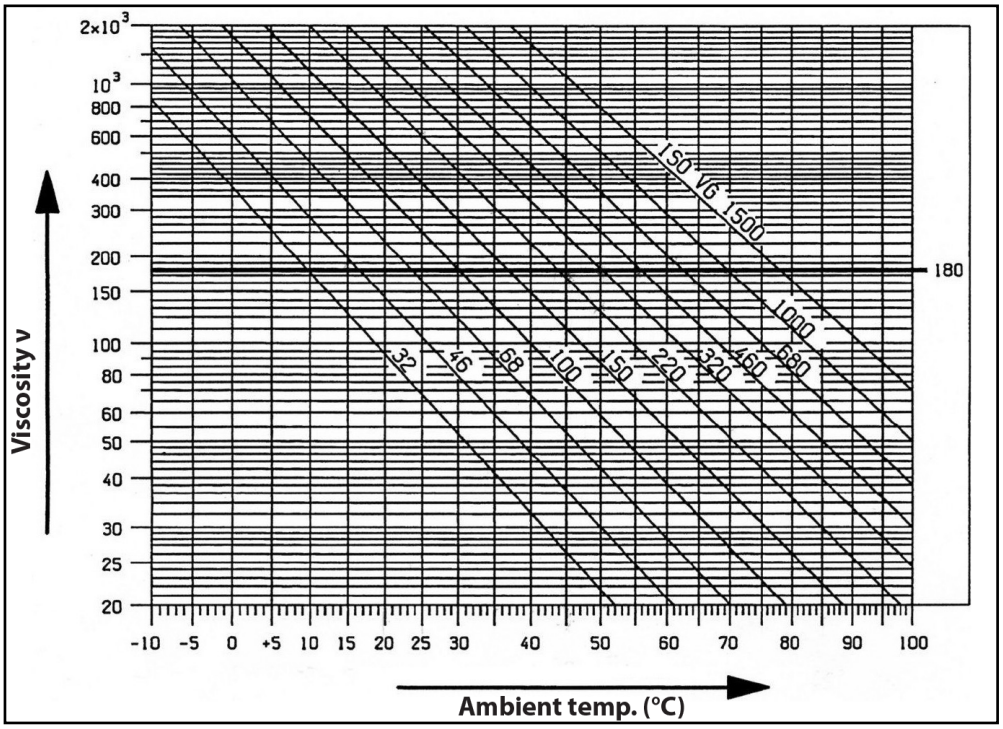
Check the oil level by using the oil level dipstick (1, fig. 3). Refill if necessary to top off level. Correct oil level inspection is done with the pump at room temperature; oil is changed with the pump at working temperature, by removing the dipstick (1, fig. 3) and the oil plug (2, fig. 3). Checking and changing oil is to be carried out as indicated in fig. 16 Chapter 11. The amount required is 67.63 oz (2 liters).

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.

VISCOSITY/ROOM TEMPERATURE DIAGRAM

$mm^2/s = cSt$



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

8. PORTS AND CONNECTIONS

KV series pumps are equipped with (see fig. 4):

1. 2 “IN” inlet ports 3/4” Gas.

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

2. 2 “OUT” outlet ports 3/8” Gas.

3. 2 service ports 3/8” Gas; they can be used for the pressure gauge and the safety valve.

4. 1 drain port “DRAIN” supplied with an adjustable 90° rapid fitting for Ø10 mm polyamide hoses. It is needed to recover the fluid drained from the packing cooling circuit, and must be connected to the outlet port making sure to avoid counter-pressure.

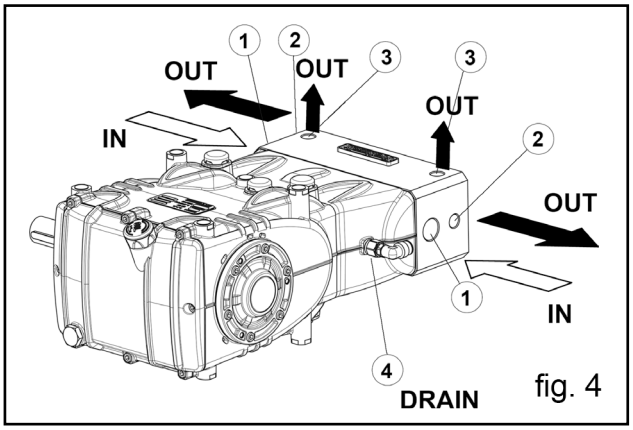


fig. 4

8.1 Conic Sealing Pads

The KV pumps are equipped with 4 conic steel pads to be used in correspondence with the pump’s delivery ports (see fig.5) or in the optional fitting flanges. Their function is to guarantee the sealing of the connection. The seat of the pump’s delivery port is already machined in order to hold the conic pad; if necessary, the connections for the delivery fitting or the closing plug must be specially machined as indicated in fig. 5/a.

At each disassembly, the conic pad must be replaced.

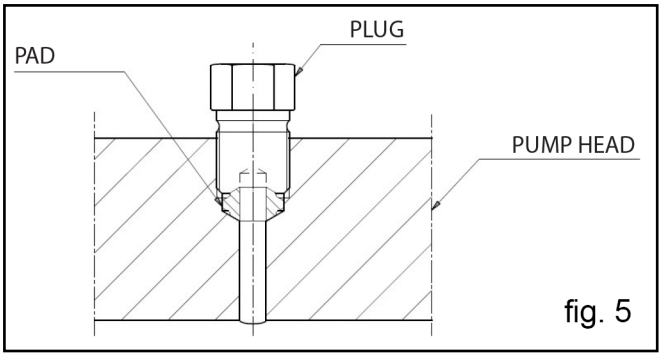


fig. 5

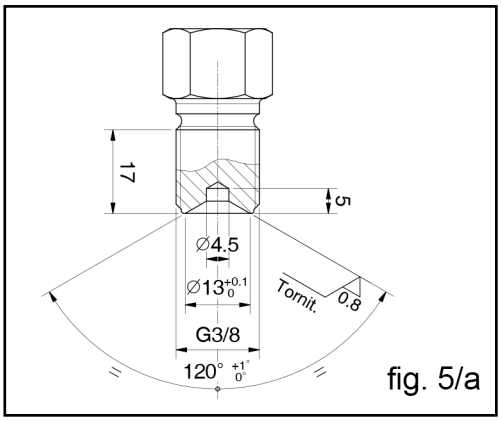


fig. 5/a

9. PUMP INSTALLATION

9.1 Installation

The pump must be installed in a horizontal position using theM12 x 1.5 threaded support feet. Tighten the screws with a torque of 59 Ft. Lbs. (80 Nm).

The base must be perfectly flat and rigid enough as not to allow bending or misalignment on the pump coupling and axis/transmission due to torque transmitted during operation.

The unit cannot be fixed rigidly to the floor but must installed with vibration dampers. For special applications contact the **Customer Service Department.**

A lifting bracket is mounted on the pump for easy installation, as per the figure below.

Should it be necessary to disassemble it, to avoid the entrance of dirt in the front part of the casing, close the threaded hole with the cap provided.

Replace the oil filling hole closing service plug (red) positioned on the rear crankcase cover. Check the correct quantity with the oil dipstick. The oil dipstick must always be reachable, even when the unit is assembled.

The pumps shaft (PTO) must not be rigidly connected to the drive unit.

The following types of transmission are recommended:

- Hydraulics by flange, for proper application consult with **Customer Service Departments.**
- Belts
- Universal joint (comply with the maximum working angles recommend by the manufacturer).
- Flexible coupling

9.2 Direction of rotation
The rotation direction is indicated by an arrow located on the casing near the drive shaft.

From a position facing the pump head, the rotation direction will be as in fig. 6.

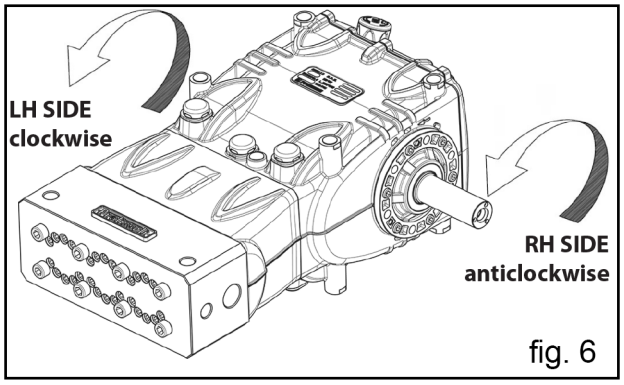


fig. 6

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:** The version shown in fig. 6 is right.

The version can only be modified by trained and authorized personnel and carefully following the instructions below:

1. Separate the hydraulic part from the mechanical part as indicated in Chapter 2 in points 2.2.1 of the **Repair Manual.**

2. Turn the mechanical part 180º and reposition the rear casing cover in such a way that the oil dipstick is turned upward. Reposition the lifting bracket and relative hole closing plugs in the upper part of the casing. Finally, properly reposition the specification label in its housing on the casing.

Make sure that the lower crankcase draining holes in correspondence with the plungers are open and not closed by the plastic plugs provided.

3. Reassemble the hydraulic part to the mechanical part as indicated in Chapter 2 in points 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 Supply

KV pumps require a positive suction head (NPSHr) of between 72.5-101.5 PSI (5-7 Bar) measured at the head intake. The booster supply pump must have the following features: at least twice the flow rate of the plunger pump's rated flow rate with a minimum pressure of 72.5 PSI (5 Bar).
These supply conditions must be observed at all operating speeds. The operation of the booster pump must be indepennet from that of the plunger pump.

The booster pump must always be started before the plunger pump. It is advisable to install a pressure switch on the supply line downstream of the filters protecting the pump.

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. With a layout that is set in such a way to prevent 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 fittings, 3 or 4 way fittings, adapters, swivel joints, 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 base values 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 bentonite flows coming from both the by-pass and feeding lines which 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.
11. Install the pressure gauge for checking the booster pressure near the plunger pump suction port and always down stream from the filters.

9.7 Filtering

The permissible filtration for this series of pumps must be max. 20 µ (micron). It is normally obtained with a bank of at least three filters, positioned as shown in fig. 7.

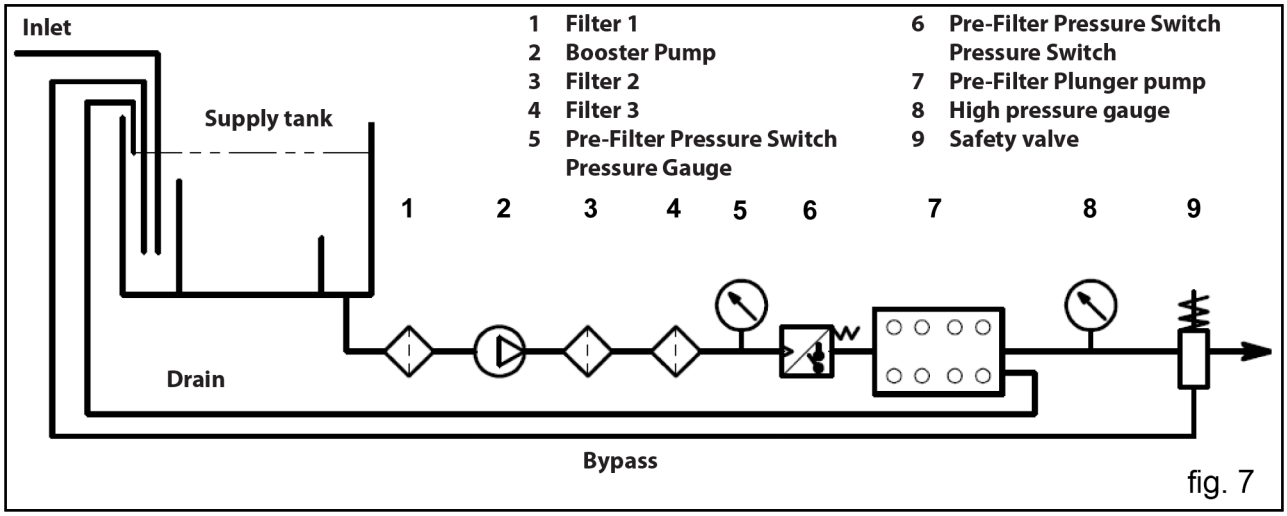


fig. 7

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. Intake/outlet port diameters no smaller than the inlet port.
3. Degree of filtration:
   Filter: 250 µ
   Filter: 100 µ
   Filter: 20 µ

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 actual clogging conditions. In order to ensure the required supply pressure (see par. 9.5) make provision for a pressure switch.

9.8 Outlet Line

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

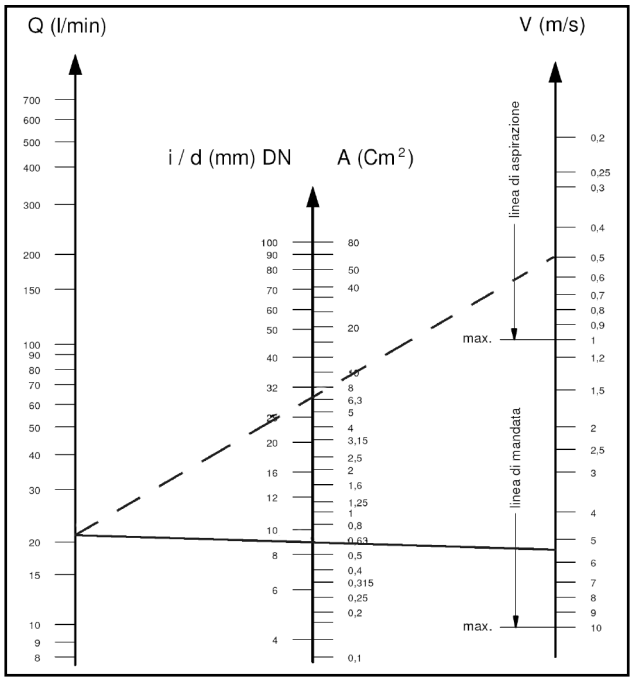
1. The internal diameter of the hose must allow to guarantee correct fluid speed; see diagram in paragraph 9.9.
2. The first section of the hose connected to the pump must be flexible in order to isolate pump vibrations from the rest of the system.
3. Use high pressure hoses and fittings that guarantee wide safety margins in any working condition.
4. The outlet line must always be provided with a max. pressure valve.
5. Use a pressure gauges capable of withstanding 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 outlet line.

9.9 Internal Diameter of the Hose Line
To determine the internal diameter of the hose, please refer to the following diagram.

Suction Hose
With a flow rate of ~5.55 GPM (21 l/min) and water speed of 0.5 m/sec. The diagram line that connects the two scales intersects the central scale, indicating the diameters, at a value of ~1.69 in. (43 mm).

Delivery Hose
With a flow rate of ~5.55 GPM (21 l/min) and water speed of 5.5 m/sec. The diagram line that connects the two scales intersect the central scale, indicating the diameters at a value of ~0.33 in. (8.5 mm).

Optimal speed to be obtained with the booster pump:
- Suction: ≤ 0.5 m/sec.
- Delivery: ≤ 5.5 m/sec.



The graph does not take into account hose resistance, valves, load loss produced by the length of the ducts, the viscosity of the liquid pumped or temperature itself. If necessary, contact the **Customer Service Departments.**

9.10 V-belt Transmission

The pump can be controlled by a V-belt system. For this pump model, we recommend use of 3 XPB belts (16.5 x 13 serrated). Use an XPC profile only for long durations. Both the characteristics and transmissible power of each belt can be verified in the diagram in fig. 8, in relation to the number of rpm normally declared by the manufacture. Minimum duct pulley diameter (on pump shaft): ≥ 6.30 In. (160 mm). The radial load on the shaft must not exceed 1011.64 Lbs (4500 N)(value necessary for layout definition). The transmission is considered adequate if the load is applied to a maximum distance a=1.97 in (50 mm) from the shaft shoulder (PTO) as shown in fig. 11.

For dimensions differing from those specified about contact the **Customer Service Departments.**

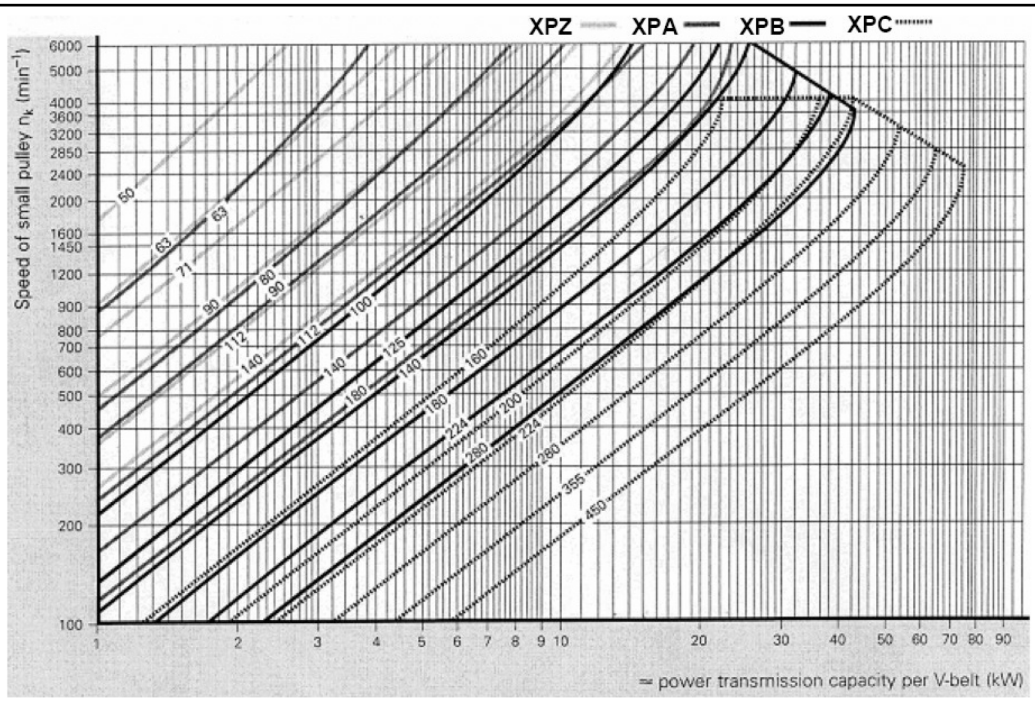


fig. 8

9.11 Transmission Definition

To prevent irregular radial loads on the shaft and the relative bearing, follow these directions:

A) Use pulleys with V-belts with the size of the groove required/recommended by the manufacture of belt used. In the absence of directions, follow fig. 9 and the table in fig. 10.

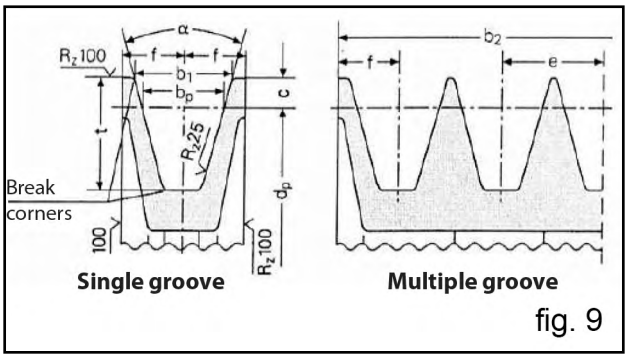


fig. 9

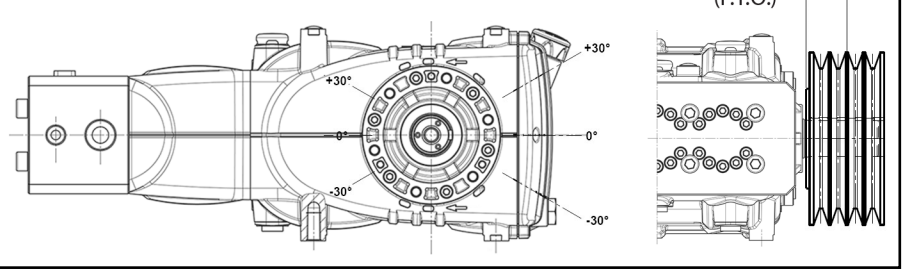
Dimensions in mm

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. 10

B) Use high performance belts - for example **XPB** instead of **SPB** - as a lower quantity of belts for the same transmitted power may be necessary and a consequent shorter resulting distance compared to the shaft shoulder (PTO) “a” of fig. 11.

fig. 11



C) Pull the belts according to manufacturer instructions. Excessive pulling can cause reduced bearing life and wear out the pulley prematurely. Pulling 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 as a pair.

E) Follow the direction of the belt pull as shown in fig. 11 for other needs contact the **Customer Service Department.**

F) Take care of the alignment of the driving pulley and driven pulley grooves.

9.12 Definition of Static Pull to Apply on Belts

Static pull depends on:
A) The wheelbase between the two pulleys (belt length).
B) The load due to static pull of the belt.
C) The number of belts
D) The winding angle of the smallest pulley
E) Average speed

Values of the static pull to be applied can be obtained from the diagram in fig. 12 for belts with an XPB profile in relation to the wheelbase.

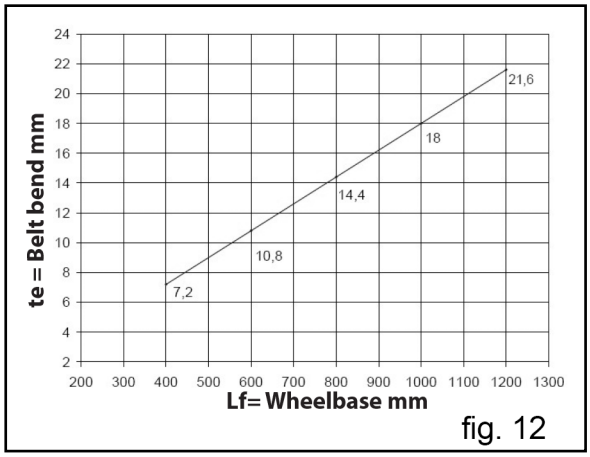


fig. 12

Conclusion: with a wheelbase of 23.62 in. (600 mm) and with a dynamometer, loading the belt branch with 16.86 lbs (75 N) as indicated in fig. 13 a “te” bend of approximately .43 in (10.8 mm) is obtained.

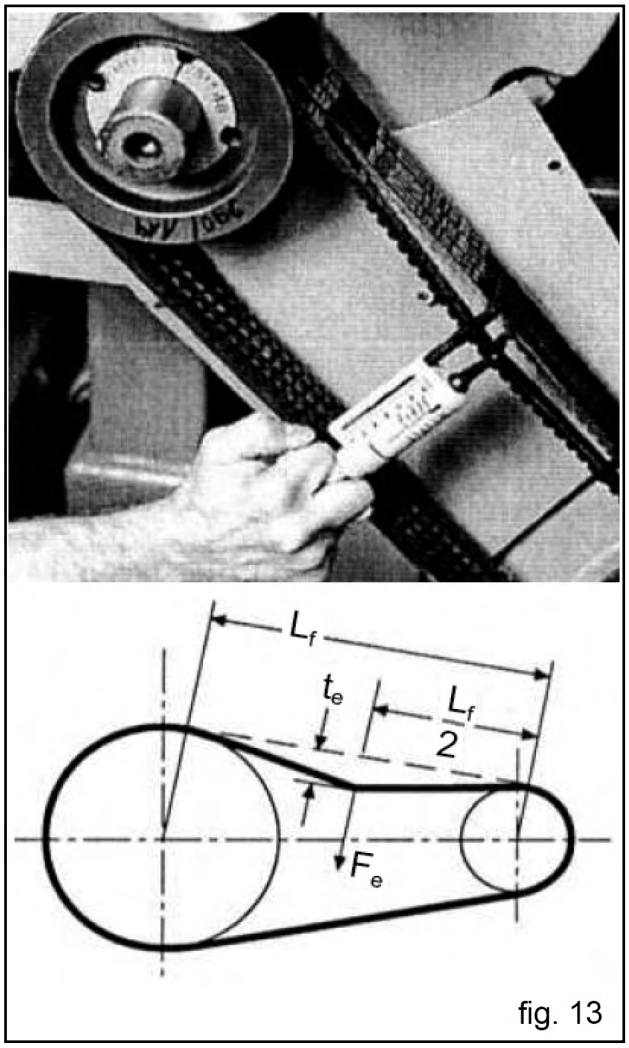


fig. 13

Lf = Wheelbase
te = Belt bend
Fe = 75 N Dynamometer load

Note 1: Unless otherwise stated by the supplier of the belts, control of proper pull and its relative re-tensioning should be performed after no less than 30 minutes of motion necessary for the normal adjustment of the belts. Best performance and durability will be achieved with proper tensioning.

Note 2: In case of necessity or for routine maintenance, never replace a single belt but the complete set.

9.13 Transmission of Power from the Second PTO

Upon request KV series pumps can be supplied with an auxiliary PTO on the opposite side to the driver (transmission of power from the second PTO).

Transmission can be carried out:
- By means of the V-belts.
- By means of the joint.

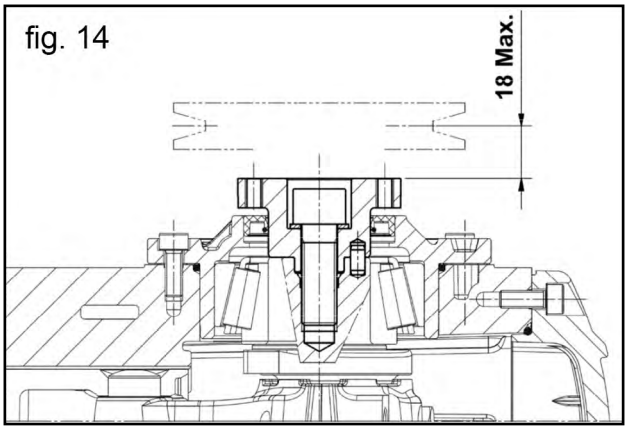
By means of the V-belt, with drawable Mat Torque is:
14.75 lbs (20 Nm) which corresponds to:
4.1 HP at 1450 RPMs
5.0 HP at 1750 RPMs

By means of the joint, with drawable Max Torque is:
29.50 lbs (40 Nm) which corresponds to:
8.2 HP at 1450 RPMs
10 HP at 1750 RPMs

By means of the V-belt, the transmission is considered suitable if: belt pull is applied at a max distance of 0.71 in. (18 mm) from the crankcase shoulder fig. 14 Minimum diameter of pulley to be used = Ø 3.94 (100 mm).

With transmission by means of the joint, pay close attention to align so that no transverse forces are generated on the pump shaft.

fig. 14



For applications differing from those specified above, contact **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 paragraph 9.4 - 9.5 - 9.6) the pump must never run dry.

1. The suction line must be perfectly airtight.
2. All the On-Off valves between the pump and the feeding source are completely open. The delivery line must discharge freely in order to allow the air in the pump to be 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 joint tilt 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 (1, fig. 15) and with the lever indicator (2, fig.15)

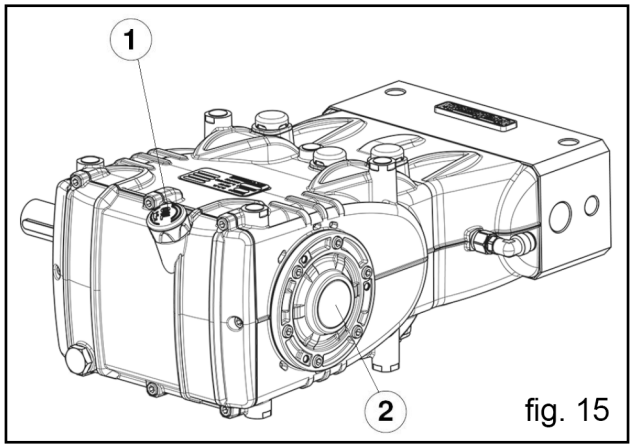


fig. 15

In case of prolonged storage or long-term inactivity, check proper functioning of the inlet and outlet 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 and reduce to a minimum RPM (activation with combustion motors).

10.3 Seal Packing Cooling Circuit

During operation, a certain amount of water coming from the seal packing cooling circuit is discharged from the orifice 4. The draining of this circuit must be sent back to the suction line before the booster pump (fig. 16), or to a tank for collection.

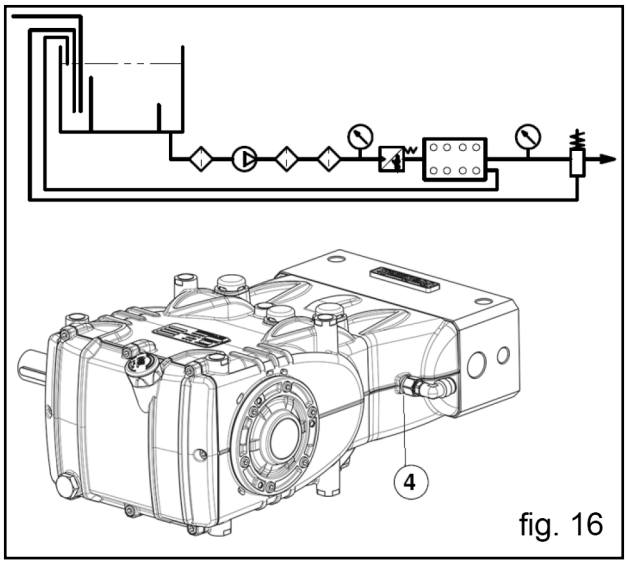


fig. 16

11. PREVENTIVE MAINTENANCE

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

PREVENTIVE MAINTENANCE	
EVERY 500 HOURS	**EVERY 1000 HOURS**
Check oil level	Change oil
	Check / Replace: Valves Valve seat Valve springs Valve guides
	Check / Replace: H.P. packings L.P. packings

12. PUMP STORAGE

12.1 Long Term Inactivity

After long term inactivity of pump, before operation check oil level, inspect valves as specified in chapter 10, then follow described start-up procedures.

12.2 Filling the Pump With An Anti-Corrosion Emulsion or Anit-freeze solution

Method for filling pump with anti-corrosion emulsion or anti-freeze solution using an external diaphragm pump based on the layout shown in paragraph 9.7 in fig. 7.

A) In place of the 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 diaphragm pump. Open the pump suction connection and fit hose between it and the diaphragm pump.
E) Fill container with the solution/emulsion.
F) Put the free extremeties of the suction line and the 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, Sell Donax.
J) Stop the pump, remove the hose from the solution 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, do not start the pump for any reason until the circuit has been fully defrosted, otherwise there can be serious damage to the pump.

14. WARRANTY TERMS

The guarantee period and conditions are contained in the purchase agreement.
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 that indicated in the table.
c) The required safety devices were un-adjusted or disconnected.
d) The pump was used with accessories or spare parts not supplied by 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, RPM is too high, see par. 9.8.
- No suction water
- 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
- Suction filter is dirty or too small
- The booster pump, where installed, is supplying insufficient pressure or flow rate.
- The pump is not primed due to insufficient head or the delivery line is closed during priming
- The pump is not primed due to valve seizing
- Worn valves
- Worn pressure packings
- Incorrect operation of the pressure adjustment valve
- Transmission problems

The pump does not deliver the rated flow / is noisy:
- Insufficient feeding (see the causes listed above)
- RPM are less than the rated flow
- 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

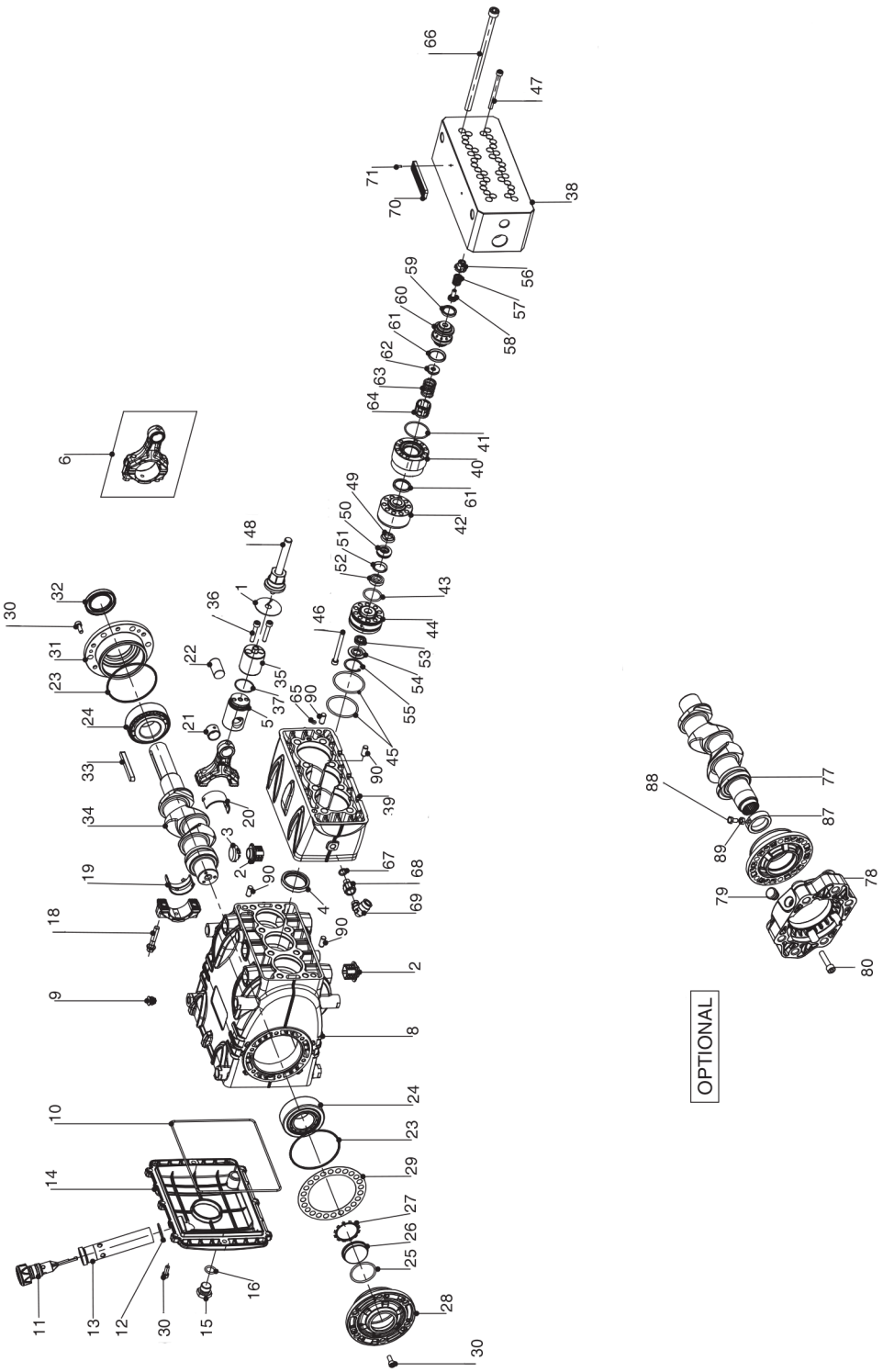
Insufficient pump pressure:
- The nozzle (or has become)too large
- Insufficient RPM
- Leakage from the pressure packings
- Incorrect operation of the pressure adjustment valve
- Worn valves

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 7.6)
- Excess belt tension or Incorrect alignment of the joint or pulleys
- Excessive tilt 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. EXPLODED VIEW AND PARTS LIST

KV



PARTS LIST

Item	Part No.	Description	QTY.
1	F96709900	WIPER 10.0X45.0X1.0	3
2	F70222551	PLUG HOUSING	6
3	F71225951	CAP PLUG	3
4	F90167700	RING Ø 36.0X47.0X6.0/7.5	3
5	F70050115	PLUNGER GUIDE	3
6	F70030501	CONNECTING ROD	1
8	F70010022	PUMP CRANKCASE	1
9	F98200500	PLUG Ø 15	5
10	F90394200	OR Ø 190.17X2.62	1
11	F98211500	DIPSTICK	1
12	F90360400	OR Ø 25.12X1.78	1
13	F72210695	DIPSTICK TUBE	1
14	F70160622	HOUSING COVER	1
15	F98210050	PLUG G 3/8"X13	1
16	F90383300	OR Ø 13.95X2.62	8
18	F99312300	CON-ROD CLAMPING SCREW	6
19	F90922300	CON-ROD HEAD SEMI-BUSHING LOWER	3
20	F90922000	CON-ROD HEAD SEMI-BUSHING UPPER	3
21	F90910000	CON-ROD BUSHING	3
22	F97742000	PIN Ø 18X36	3
23	F90391500	OR Ø 80.60X2.62	2
24	F91847700	ROLLER BEARING	2
25	F90387700	OR Ø 39.34X2.62	2
26	F70211801	OIL LEVEL INDICATOR	1
27	F90075600	STOP RING	1
28	F70150122	BEARING COVER	1
29	F70220081 F70220381	SHIM 0.10 MM SHIM 0.25 MM	1
30	F90060600	SCREW M6X16	20
31	F70150022	BEARING COVER PTO	1
32	F90166800	RING Ø 35.0X52.0X7.0	1
33	F91490000	TAB 8.0X7.0X70.0	1
34	F70020635	CRANKSHAFT	1
35	F70050266	PLUNGER STEM GUIDE	3
36	F99192500	SCREW M6X35	6
37	F90352800	OR Ø 29.00X1.50	3
38	F70127456	PUMP HEAD	1
39	F70226520	SPACER	1
40	F70060656	LINER	3
41	F90370200	OR Ø 38.00x2.00	3
42	F70226456	INTERMEDIATE SUPPORT	3
43	F90386100	OR Ø 26.65X2.62	3
44	F70226256 F70226356	SUPPORT SEAL Ø 12 SUPPORT SEAL Ø 14	3
45	F90388900	OR Ø 48.89X2.62	6
46	F99199500	SCREW M6X65	30
47	F99199800	SCREW M6X75	30
48	F70041602 F70041702	PLUNGER COMPLETE Ø 12 PLUNGER COMPLETE Ø 14	3
49	F71101160 F70100560	HEAD RING Ø 12 HEAD RING Ø 14	3

Item	Part No.	Description	QTY.
50	F90259000 F90260600	RING Ø 12.0X24.0X11.0 RING Ø 14.0X24.0X11.0	3
51	F71224368 F71224668	ANTI-EXTRUDER RING Ø 12 ANTI-EXTRUDER RING Ø 14	3
52	F70226670 F71211470	BUSHING SEAL Ø 12 BUSHING SEAL Ø 14	3
53	F90258800 F90260400	RING Ø 12.0X19.0X6.0 RING Ø 14.0X22.0X6.0	3
54	F71216766 F71216866	SEALING RING Ø 12 SEALING RING Ø 14	3
55	F90067200	STOP RING	3
56	F36215570	DELIVERY VALVE GUIDE	3
57	F94710750	SPRING Ø 12.5X14.5	3
58	F36215666	DELIVERY VALVE	3
59	F93186000	SEAL Ø 20.0X25.0X3.8	3
60	F36215266	VALVE SEAT	3
61	F93186800	SEAL Ø 24.5X29.5X3.8	6
62	F36215366	FLAT VALVE	3
63	F94749100	SPRING Ø 19.0X25.3	3
64	F36215405	INLET VALVE GUIDE	3
65	F90366300	OR Ø 4.00X2.00	1
66	F99386800	SCREW M10X210	8
67	F96710000	RING Ø 10.0X14.0X1.5	1
68	F71223566	FITTING Ø 2.5 1/8"-1/4"	1
69	F96416000	FITTING 90° Ø 10 G1/4"	1
70	F97827500	PUMP LABEL	1
71	F91570300	RIVET Ø 2.5X8.0	2
77	F70020935	CRANKSHAFT	1
78	F10085322	MOTOR FLANGE	1
79	F98206500	PLUG Ø 17	1
80	F99308400	SCREW M8X30	6
87	F70226771	SHAFT RING Ø 30	1
88	F70227034	SCREW M6X12	1
89	F92202500	NUT M06X5	1
90	F97618500	PLUG Ø 8h5x18	4
	99426600	BOLTS, M12-1.75X25	4
	96719500	SERRATED WASHER, M12	4

REPAIR KITS

KIT NUMBER	**F2359 KV12 (D.12)** Plunger Pack.	**F2360 KV14 (D.14)** Plunger Pack.	**F2361 Valve Seal Kit**	**F2362 (KV12)** Complete Seals	**F2363 (KV14)** Complete Seals	**F2364 Suction & Outlet Valve Kit**	**F2156 Conrod Bushing Kit**
Positions Included	41, 43, 45, 50, 51, 52, 53, 65	41, 43, 45, 50, 51, 52, 53, 65	59, 61	4, 10, 12, 16, 23, 25, 32, 37, 41, 43, 45, 50, 51, 52, 53, 59, 61, 65	4, 10, 12, 16, 23, 25, 32, 37, 41, 43, 45, 50, 51, 52, 53, 59, 61, 65	56, 57, 58, 59, 60, 61, 62, 63, 64	19, 20

17. Maintenance Log

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

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