GENERAL PUMP

VS

Owner's Manual

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

INSTALLATION AND MAINTENANCE LOG

Record Installation Information Here.

Pump Model		**Motor Model**	
Serial Number		**Motor Voltage**	
Installation Date		**Motor Horsepower**	
Design Flow		**Motor RPM**	
Design Pressure		**Motor Pulley Dimension**	
Design RPM		**Pump Pulley Dimension**	

Record Date and Hours of Service or Maintenance Here.

Oil Change	**Break-in change** **50 hours** Date: Initials:			
Grease	**initial Greasing** **50 hours** Date: Initials:			
Packing Replacement				
Plunger Replacement				
Valve Replacement				
Drive System Maintenance	**Break-in Inspection** Date: Initials			
Filter Inspection/Cleaning	**Initial Inspection** **50 hours** Date: Initials:			
General Inspection	**Start-up Inspection** Date: Initials:			

Pump is shipped with break-in oil. Oil change is required after first 50 hours of use. Consult manual for recommended intervals.

GENERAL PUMP

INDEX **page**

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FEATURES

- Double Pressure Packings
- Pressure Packing Cooling System
- High Resistance Stainless Steel Construction
- Solid Ceramic Plungers
- Self Aligning Bearings
- Optional Gearbox Available in 5 Positions
- Also available in “L” left-handed versions

PERFORMANCE

Model	Volume (*)	Gearbox			Pressure		Power			
		A 2200 rpm 1:3.04	B 1800 rpm 1:2.417	C 1500 rpm 1:2.037				A 2200 rpm	B 1800 rpm	C 1500 rpm
VS16	gpm lpm	6.9 26	7.1 27	7.1 27	psi bar	21750 1500	HP kW	101 74.3	105 77.2	105 77.2
VS18	gpm lpm	8.7 33	9.0 34	9.0 34	psi bar	17400 1200	HP kW	103 75.6	106 77.9	106 77.9
VS20	gpm lpm	10.8 41	11.1 42	11.1 42	psi bar	13050 900	HP kW	96 70.6	99 72.8	99 72.8
VS22	gpm lpm	12.9 49	13.5 51	13.2 50	psi bar	10800 750	HP kW	96 70.6	100 73.5	100 73.5
VS24	gpm lpm	15.6 59	16.1 61	15.8 60	psi bar	8700 600	HP kW	92 67.6	95 69.9	94 69.1

Crankshaft Speed - A 2200 = 723 rpm, B 1800 = 745 rpm, C 1500 = 736 rpm

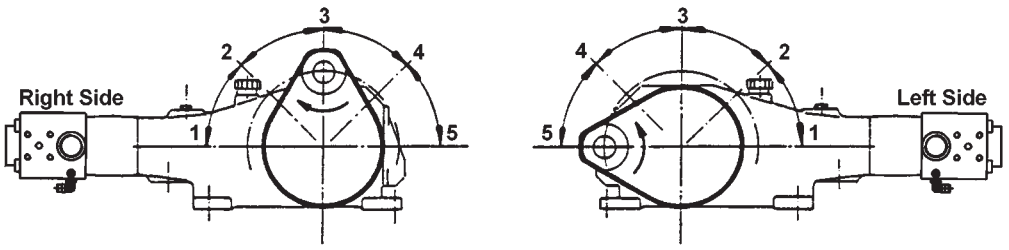
*** Volumes listed are at 100% volumetric efficiency. Actual performance varies with inlet conditions. Typical performance exceeds 85%VE**

SPECIFICATIONS

Model	VS16	VS18	VS20	VS22	VS24
Bore	16 mm	18 mm	20 mm	22 mm	24 mm
Stroke	2.36 in / 60 mm				
Inlet Pressure Min/Max	45 psi / 75 psi 3 bar / 5 bar				
Oil Capacity	10.5 Quarts / 10 Liters				
Max Temp	85ºF / 30ºC				

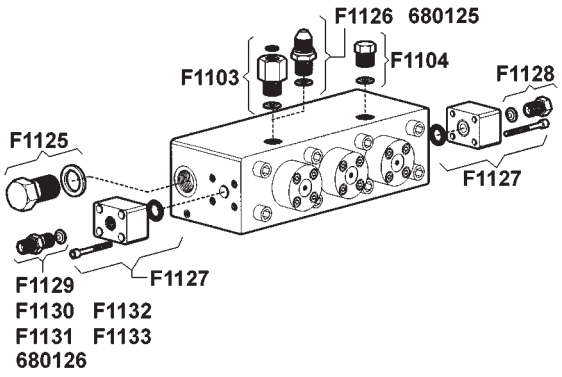
GENERAL PUMP

GEARBOX CONFIGURATION



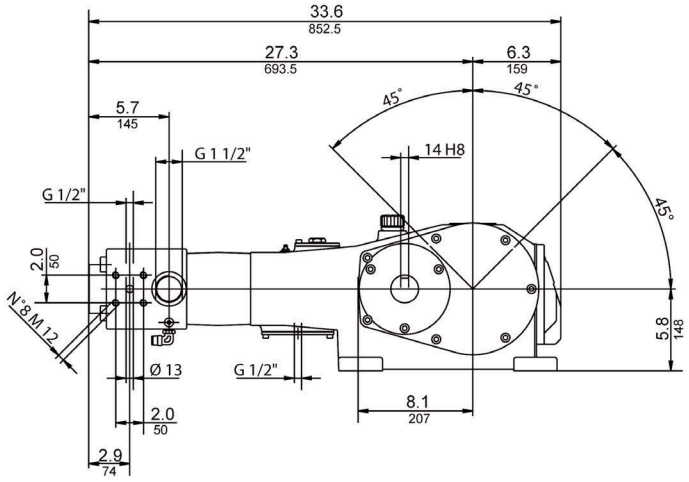
Specify Gearbox position when ordering.
Example: Righthand shown is R3, Lefthand shown is L5

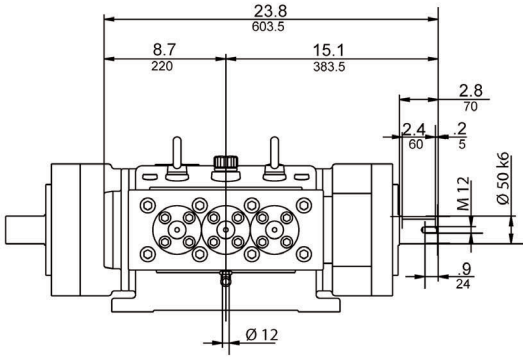
PORTS AND CONNECTION KITS

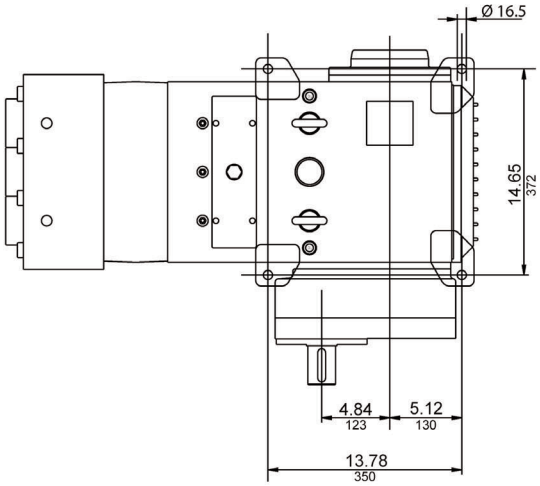


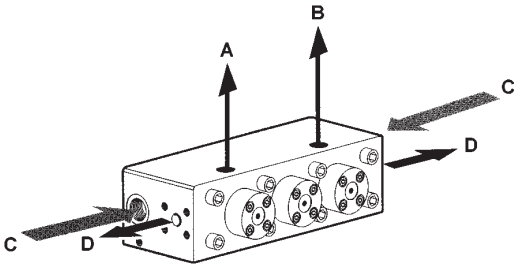
KIT	DESCRIPTION	PORT	KIT	DESCRIPTION	PORT
F1103	G 1/2” HP - G 1/2”	OUTLET	F1129	G 3/4” HP - G 3/8”	OUTLET
F1104	G 1/2” HP		F1130	G 3/4” HP - M20X1.5	
F1125	G 1-1/2” HP	INLET	F1131	G 3/4” HP - M22X1.5	
F1126	G 1/2” HP - 9/16UNF	OUTLET	F1132	G 3/4” HP - M24X1.5	
F1127	G 3/4” HP		F1133	G 3/4” - M36X2.0	
F1128	G 3/4” HP		680125	G 1/2” - LF9	
Fitting kits are not included with pump			680126	G 3/4” - LF9	

DIMENSIONAL DRAWING









PORTS				
	A	B	C	D
INLET			G 1-1/2	
OUTLET	G 1/2” HP	G 1/2” HP		F1127

INDUSTRIAL

1. INTRODUCTION

The **General Pump VS** series of high pressure plunger pumps have been designed for long life. They will provide a long period of trouble free operation if they are correctly installed and maintained.

Read this manual carefully before using your pump. It contains necessary information for correct installation, use and maintenance, and practical trouble shooting suggestions.

2. GENERAL WARNINGS FOR SAFE OPERATION

WARNING: The misuse of a high pressure water unit and improper pump installation and maintenance increases the risk of personal injury and serious damage to the equipment.

WARNING: High pressure spray can cause serious injury. For professional use only. Observe all warnings.

WARNING: Read and understand all instruction manuals before operating equipment.

2a. Fluid injection hazard

General safety

This pump generates very high fluid pressure. Spray from a gun, leaks or ruptured components can inject fluid through your skin and into your body and cause extremely serious bodily injury including the need for amputation. Also, fluid injected or splashed into the eyes or on the skin can cause serious damage.

- **Never** point the spray gun or wand at anyone or at any part of the body. Never put hand or fingers over the spray tip.
- **Always** relieve system pressure before cleaning or servicing any part of the system.
- **Never** try to stop or deflect leaks with your hand or body.
- **Be sure** all equipment safety devices are operating properly before each use.
- **Always** install a pressure relief valve sized to discharge (bypass) 110% of the maximum pump flow rate.
- **Protect** all components from environmental damage and high pressure water spray.
- **Always** restrict access to the area to properly trained and required personnel.
- **Keep** the area clear of debris and loose items.
- **Always** use only genuine General Pump replacement parts when servicing the pump.

Medical treatment

If any fluid appears to penetrate your skin, **GET EMERGENCY MEDICAL TREATMENT AT ONCE. DO NOT TREAT AS A SIMPLE CUT.** Tell the doctor exactly what fluid was injected.

NOTE TO PHYSICIAN: Injection in the skin is a traumatic injury. It is important to treat the injury surgically as soon as possible. Do not delay treatment to research toxicity. Toxicity is a concern with some exotic coatings injected directly into the bloodstream. Consultation with a plastic surgeon or reconstructive surgeon may be advisable.

Pressure relief procedure
To reduce the risk of serious bodily injury, including fluid injection and splashing in the eyes or on the skin, always follow this procedure whenever you stop spraying for more than 10 minutes, when shutting down, and before checking or repairing any part of the system.

1. Engage the trigger safety latch.
2. Turn the system off.
3. Disconnect the power supply.
4. Shut off the water supply.
5. Disengage the trigger safety latch and trigger the gun to relieve pressure, and then engage the trigger safety latch again.
6. Before long-term (overnight) storage, disconnect the water supply and disconnect the power supply.

Spray gun safety devices
Be sure all gun safety devices are operating properly before each use. Do not remove or modify any part of the gun; this can cause a malfunction and result in serious bodily injury.

Safety latch: Whenever you stop spraying for a moment, always set the gun safety latch in the engaged or “safe” position, making the gun inoperative. Failure to properly set the safety latch can result in accidental triggering of the gun.

Spray tip safety: Use extreme caution when cleaning or changing spray tips. If a spray tip clogs while spraying, engage the gun safety latch immediately. Always relieve system pressure before removing the spray tip to clean it.

2b. Fuel and emission hazards: engine driven products
Never fill the fuel tank while the unit is running or hot. The fuel used in this unit is combustible and when spill on a hot surface can ignite and cause a fire. Always fill tank slowly to avoid spilling. Never operate the unit in a closed building. The exhaust contains carbon monoxide, a poisonous, odorless, invisible gas which can cause serious injury or death if inhaled. Never alter the maximum throttle setting, which is factory set. Tampering with this adjustment can damage the pressure washer and will void the warranty.

2c. Grounding instructions: motor driven products
This product must be grounded. If it should malfunction or break down, grounding provides a path of least resistance for electric current to reduce the risk of electric shock. If the equipment is equipped with a cord having an equipment-grounding conductor and a grounding plug, the plug must be plugged into an appropriate outlet that is properly installed and grounded in accordance with all local codes and ordinances.

DANGER: Improper connection of the equipment-grounding conductor can result in the risk of electrocu tion. Check with a qualified electrician or service person if you are in doubt as to whether an outlet is properly grounded. Do not modify any plug provided with the product – if it will not fit the outlet, have a proper outlet installed by a qualified electrician.

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2d. Extension cords: motor driven products

Use only 4-wire extension cords that have 4-prong grounding-type plugs and 4-pole cord connectors that accept the plug from the product. Use only extension cords that are intended for outdoor use. These extension cords are identified by a marking, “Acceptable for use with outdoor appliances; store indoors while not in use.” Use only extension cords having an electrical rating not less than the rating of the product. Do not use damaged extension cords. Examine extension cord before using and replace if damaged. Do not abuse extension cord and do not yank or pull on any cord to disconnect. Keep cord away from heat and sharp edges. Always disconnect the extension cord from the receptacle before disconnecting the product from the extension cord.

WARNING: To reduce the risk of electrocution, keep all connections dry and off the ground. Do not touch plug with wet hands.

2e. Equipment misuse hazard

General safety
Any misuse of the pump or accessories, such as overpressurizing, modifying parts, using incompatible chemicals and fluids, or using worn or damaged parts, can cause them to rupture and result in fluid injection, splashing in the eyes or on the skin, or other serious bodily injury, fire, explosion or property damage.

Never alter or modify any part of this equipment; doing so could cause it to malfunction.

Check all equipment regularly and repair or replace worn or damaged parts immediately.

Always wear protective eyewear, hearing protection and appropriate clothing. If using a chemical, read and follow the chemical manufacturer’s literature for recommendations on additional protective equipment, such as a respirator.

System pressure
This pump can develop high operating pressure. Be sure that all equipment and accessories are rated to withstand the maximum working pressure of this system. Do not exceed the maximum working pressure of any component or accessory used in the system.

Chemical compatibility
Be sure that all chemicals used are compatible with the wetted parts as given in the Technical Data. Always read the chemical manufacturer’s literature before using any chemical.

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2f. Hose safety

High pressure fluid in the hoses can be very dangerous. If the hose develops a leak, split or rupture due to any kind of wear, damage or misuse, the high pressure spray emitted form it can cause a fluid injection injury or other serious bodily injury or property damage.

ALL FLUID HOSES MUST HAVE STRAIN RELIEFS ON BOTH ENDS. The strain reliefs help protect the hose from kinks or bends at or close to the coupling, which can result in hose rupture.

Tighten all fluid connections securely before each use. High pressure fluid can dislodge a loose coupling or allow high pressure spray to be emitted from the coupling.

Never use a damaged hose. Before each use, check entire hose for cuts, leaks, abrasion, bulging cover, or damage or movement of the hose couplings. If any of these conditions exist, replace the hose immediately.

Do not try to recouple high pressure hose or mend it with tape or any other device. A repaired hose cannot contain the high pressure fluid.

HANDLE AND ROUTE HOSES CAREFULLY. Do not pull on hoses. Do not use chemicals which are not compatible with the inner tube and cover of the hose. Do not expose hose to temperatures above 200° F (93°C) or below –40°F (–40°C).

2g. Moving parts hazard
Moving parts can pinch or amputate fingers or other body parts. Keep clear of moving parts when starting or operating the system.

Never operate the system without all guards and interlocks installed and functioning. Always relieve system pressure before cleaning or servicing any part of the system to prevent discharging high pressure fluid from the gun.

2h. Terms

WARNING or DANGER: Alerts user to avoid or correct conditions that could cause bodily injury.

CAUTION: Alerts user to avoid or correct conditions that could cause damage to the equipment.

NOTE: Identifies helpful procedures and information.

IMPORTANT: United States Government safety standards have been adopted under the Occupational Safety and Health Act. These standards – particularly the General Standards, Part 1910, and the Construction Standards, Part 1926 – should be consulted.

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3. PUMP IDENTIFICATION

Each pump is fitted with a rating plate. The specifications stamped on it are as follows:

- pump model and version
- maximum rpm
- maximum pressure and volume
- crankcase oil capacity and specification
- serial number

The pump model, pump version and serial number data must be specified when ordering spare parts. If the pump is modified, any change should be mentioned on the rating plate for future reference.

4. TECHNICAL FEATURES

The pump features:

- three horizontal plungers and three different bore sizes
- in-line horizontally-arranged valves
- double V-shaped pressure packings with special cooling system
- splash lubricated crank mechanism
- pulley, hydraulic, flexible joint or cardan shaft drive capabilities

PUMP MODELS

Model	Volume (*)	Gearbox			Pressure		Power			
		A 2200 rpm 1:3.04	B 1800 rpm 1:2.417	C 1500 rpm 1:2.037				A 2200 rpm	B 1800 rpm	C 1500 rpm
VS16	gpm lpm	6.9 26	7.1 27	7.1 27	psi bar	21750 1500	HP kW	101 74.3	105 77.2	105 77.2
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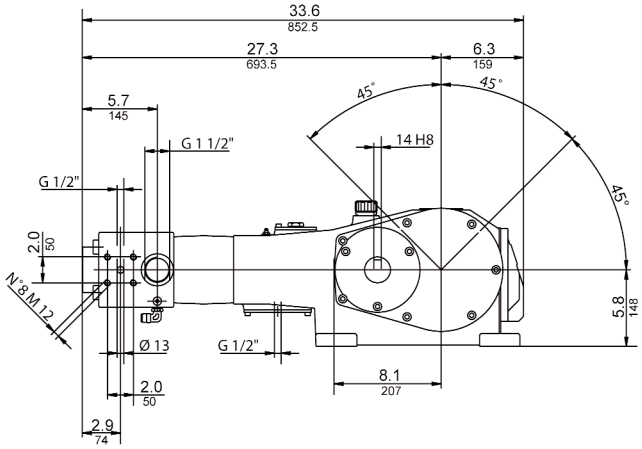
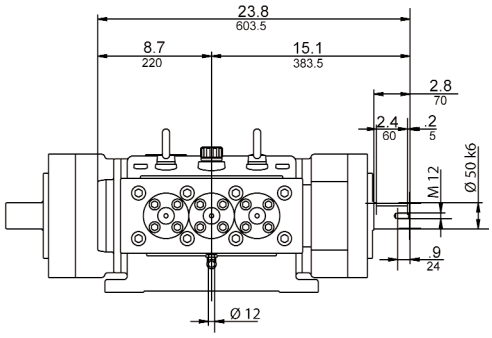
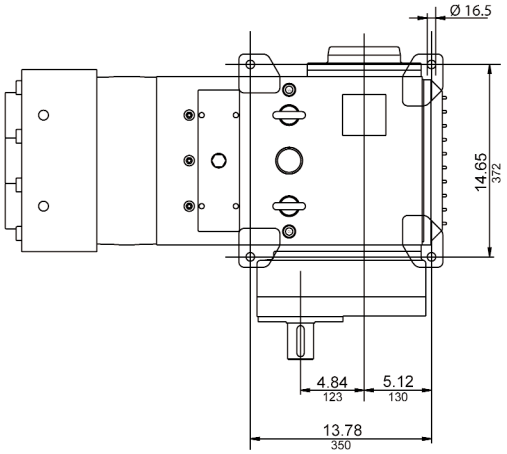
VS20	gpm lpm	10.8 41	11.1 42	11.1 42	psi bar	13050 900	HP kW	96 70.6	99 72.8	99 72.8
VS22	gpm lpm	12.9 49	13.5 51	13.2 50	psi bar	10800 750	HP kW	96 70.6	100 73.5	100 73.5
VS24	gpm lpm	15.6 59	16.1 61	15.8 60	psi bar	8700 600	HP kW	92 67.6	95 69.9	94 69.1

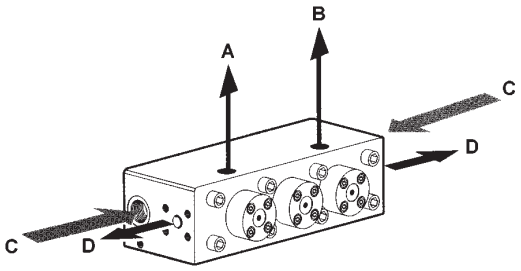
*** Volumes listed are at 100% volumetric efficiency. Actual performance varies with inlet conditions. Typical performance exceeds 85%VE**

Model	VS16	VS18	VS20	VS22	VS24
Bore	16 mm	18 mm	20 mm	22 mm	24 mm
Stroke	2.36 in / 60 mm				
Inlet Pressure Mind/Max	45 psi / 75 psi 3 bar / 5 bar				
Oil Capacity	10.5 Quarts / 10 Liters				
Max Temp	85ºF / 30ºC				









PORTS				
	A	B	C	D
INLET			G 1-1/2	
OUTLET	G 1/2" HP	G 1/2" HP		F1127

5. CONSTRUCTION FEATURES

The main components of the pump consist of:
A. crank mechanism
B. plunger and packing system
C. manifold

A. CRANK MECHANISM Includes the crankcase containing the drive system components:
- gas-nitrided, hardened and tempered alloy steel crankshaft mounted on self-adjusting double roller shaft bearings.
- forged split connecting rods with special anti-friction bearings.
- surface-treated steel piston guides.
- splash lubricated by the pump crankcase oil.

B. PLUNGER AND PACKING SYSTEM Primarily composed of plungers and pressure packings with packing supports and cylinders. The pumping system is also provided with a cooling system to further improve the life of pressure packings and plungers.

C. MANIFOLD Contains the suction and high pressure valves, made of stainless steel.

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6. GENERAL INFORMATION ON PUMP USE

The **VS pump** has been designed to pump, at room temperature, fresh, filtered water or other liquids of similar viscosity that are compatible with the wetted materials (for questionable liquids contact GP Companies Inc. Technical Department at 1-888-474-5487).

6a. Water temperature
The maximum inlet water temperature is 85ºF / 30ºC.

6b. Pump performance
Never exceed the maximum pump flow rate or pressure.

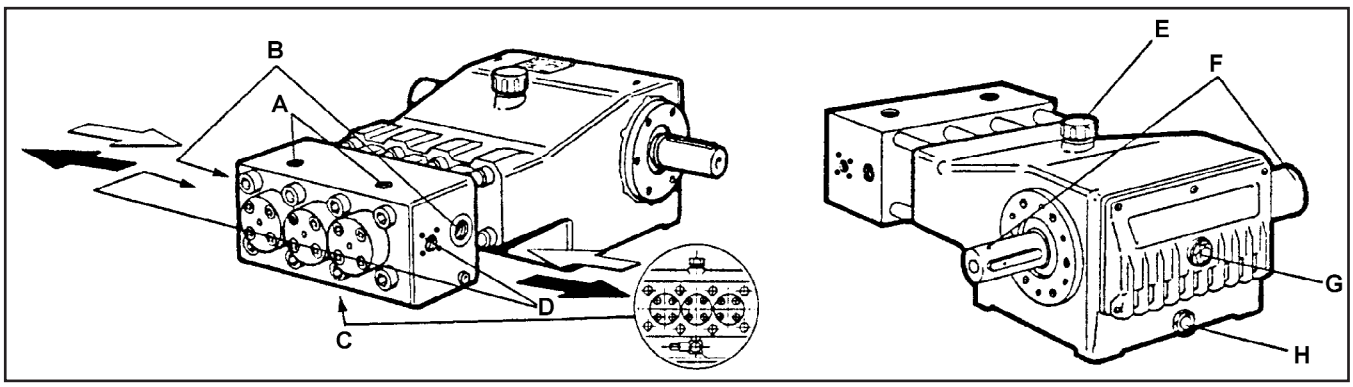
7. CONNECTIONS AND PLUGS

The **VS pump** has:

A. 1/2" G HP Discharge Ports (2) - Both ports can be connected to the delivery line, depending on the accessories to be installed and delivery line characteristics. Any port not being used must be sealed.

B. 1-1/2" G Inlet Ports (2) - Water supply connection to either or both inlet ports is acceptable.

C. Cooling System Throttle (1) - Threaded 3/8-BSPP for draining the water flow of the cooling system. This throttle is set before shipment and does not require adjustment during installation; be sure it is connected to the suction line BEFORE the feed pump (see section 9c.).



D. Flanged Outlet Ports (2) - Provided for the pressure gauge and pressure relief valve.

E. Oil Fill Plug / Oil Level Dipstick (1) (position 45) For oil level monitoring.

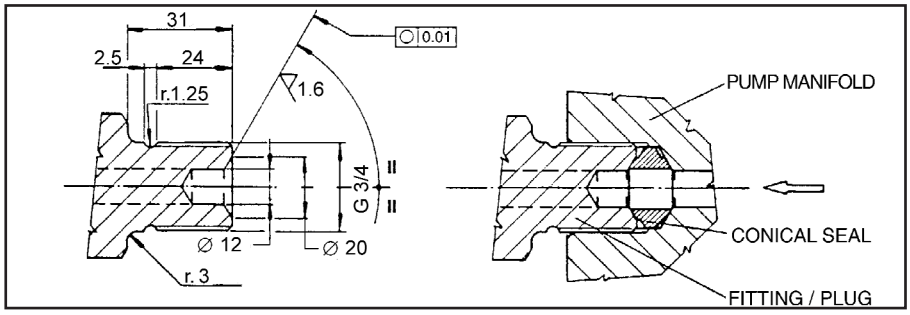
F. Crankshaft (Gearbox not shown)

H. Oil Drain Plug (1) (position 36)* Used to empty the crankcase during oil changes. It includes a magnet to collect metal impurities inside the crankcase.

*All positions are referenced as shown on the parts breakdown on page 19

The pump is supplied with four conical seals made of stainless steel to be inserted in the outlet ports to provide complete sealing of the outlet connection.

The outlet port is already machined to accept this seal. Be sure the outlet line fitting is machined according to the following drawing:

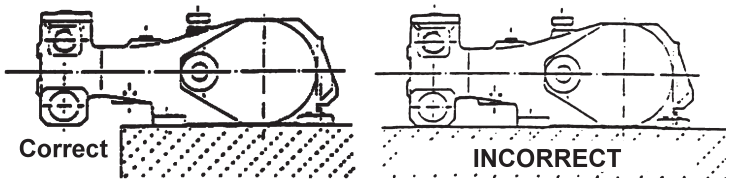


NOTE: The conical seal must be replaced each time the pump is disassembled.

8. PUMP INSTALLATION

8a. Positioning

The pump must be mounted to a rigid and flat base using the four threaded feet in the crankcase. **Do not permit the manifold to bear any weight.**



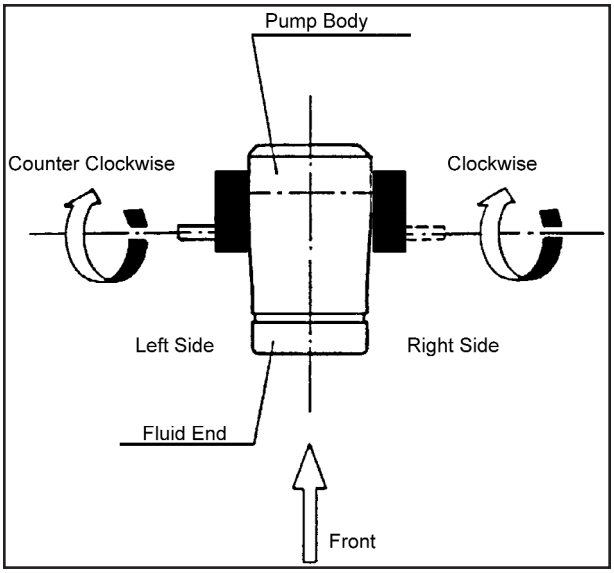
Be sure maximum pump inclination during operation does not exceed 5° in order to guarantee the correct splash lubrication.

The base must not permit any misalignment or flexing of the pump/transmission coupling.

8b. Direction of rotation

The diagram below shows the correct direction of rotation looking at the pump from the fluid end side:

- clockwise with shaft projecting on the left side
- counterclockwise with shaft projecting on the right side



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8c. Hydraulic connections
In order to isolate the pump vibration, use flexible hoses for both suction and pressure line.

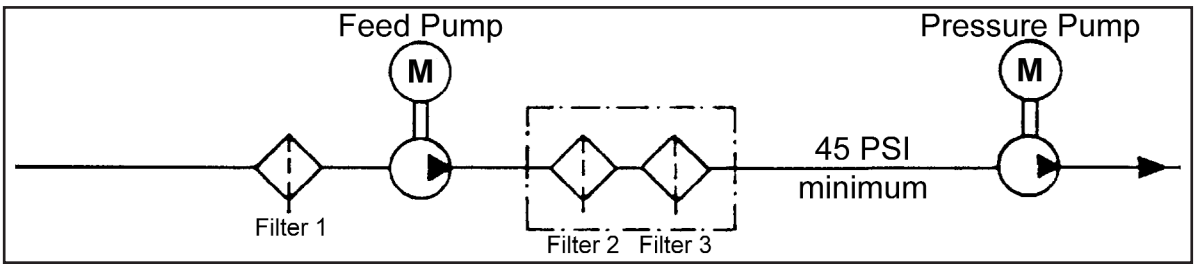
8d. Pump feeding
VS pumps require an inlet pressure at the suction port between 45 psi and 75 psi.
The feed pump (centrifugal type) must: (1) supply at least twice the plunger pump volume at the required pressure, (2) operate independently and (3) supply its full rated performance even if the plunger pump is run below its rated performances. We recommend a pressure switch in the inlet line (after the filters) to prevent the VS pump from starting until the inlet pressure has reached 45-75 psi. This pressure switch will also stop the pump in case of filter clogging.

8e. Suction line
THE SUCTION LINE MUST HAVE THE FOLLOWING CHARACTERISTICS:
- Minimum internal diameter of 30 mm.
- No bends or changes in diameter within 12 inches of the suction port.
- Be airtight.

RECOMMENDATIONS:
- Install the inlet pressure gauge after the filters and as close as possible to the pump inlet port.
- Be sure that the feed pump tank dimensions and the minimum water level do not create turbulence at the pump inlet port.
- Connect the by-pass directly to the feed tank and be sure that both the by-pass and feed tank flows do not create turbulence at the pump inlet port. Baffle plates should be inside the tank.
- Before connecting the suction line to the pump inlet port be sure the line is clean inside.

8f. Filtration
VS pumps require 10 to 20 micron filtration.

For a correct filtration system three different filters should be provided and positioned as indicated in the diagram below:



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

- The capacity of each filter must be at least 3 times the rated pump volume.
- Filter port diameters should not be smaller than the pump inlet ports.
- Filtration should be as follows:
  - filter 1: 250 microns
  - filter 2: from 100 to 70 microns
  - filter 3: from 20 to 10 microns

IMPORTANT NOTE: Clean the filters daily, more often in poor water conditions, to prevent premature pump wear and damage.

8g. Delivery line

To ensure the delivery line is correctly installed:

- A suitable safety valve is fitted on the delivery line.
- Use only high pressure hoses and fittings that exceed the working pressure of the system.
- Use glycerine filled pressure gauges.

9. START-UP AND RUNNING PROCEDURES

9a. Start-up checks

Before starting the pump, be sure that the following conditions have been met:

- Suction line must be connected, and tight: **the pump must never run dry.**
- All ON-OFF valves in between the pump and water supply must be open. Be sure water flows into the pump.
- Set the pressure line into the dump mode, to prime the pump.
- Be sure joint alignment, belt tension or U-joint angle is within Manufacturer's specification.
- Check oil level.

9b. Start-up and operation

- Do not start pump and motor (or engine) under load. Set the regulating valve to zero or set the pressure line into the dump mode.
- Be sure that the correct inlet pressure is provided.
- Check for proper direction of pump rotation.
- Be sure the rotating speed does not exceed the rated speed.
- Before stopping the pump, relieve the pressure from the system.

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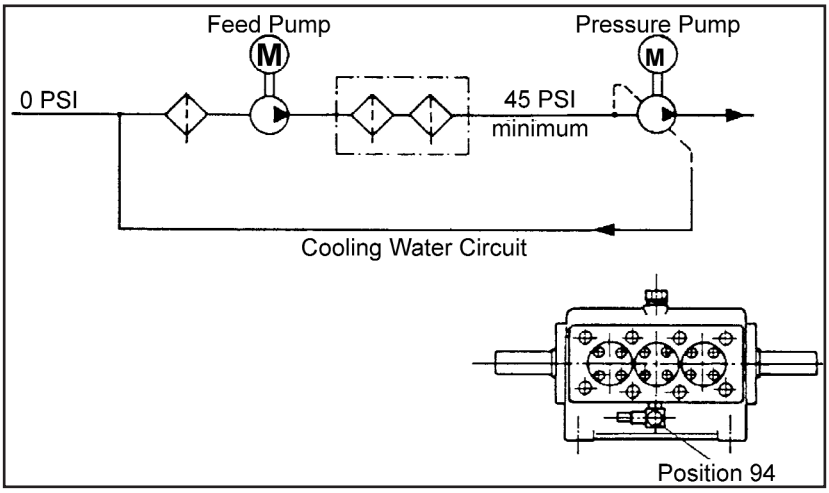
9c. Cooling system

During operation a small amount of water drains from the pump fluid end through the throttle (position 94). This is designed to provide lubrication for the pressure packings and plungers; it must flow back in the inlet line BEFORE the feed pump (see diagram below):



10. MAINTENANCE INSTRUCTIONS

10a. Crank mechanism maintenance

Check the oil level (position 41)* frequently. It should be checked on a daily basis. Stop the pump and provide immediate service if water gets into the oil. Before filling the pump with new oil, wash the crankcase and crank mechanism with a solvent and allow to dry completely. To ease the replacement of the oil seals (position 62) we recommend the use of maintenance tool (p/n - Call Technical Services). Oil seals (position 62) should be replaced every three years.

Change oil after 50 working hours and every 500 working hours thereafter. Depending on conditions this schedule may be modified. Pumps installed in areas of high humidity, high dust concentrations, corrosive vapors, and/or other contaminants may require a shorter oil change interval. If the oil maintains a cloudy appearance after the pump has been at rest for eight hours the oil may be contaminated and need to be changed.

At a minimum the oil must be changed at least once a year.

We recommend you use General Pump oil or its equivalent. (If working at normal room temperature – from 32° to 113° F – use oil grade ISO 220 (15°F/50°C).)

Oil pump capacity is 10.5 quarts.

During oil changes, the pump oil should be at working temperature; be sure to clean the magnetic plug (position 36).

*All positions are referenced as shown on the parts breakdown on page 19.

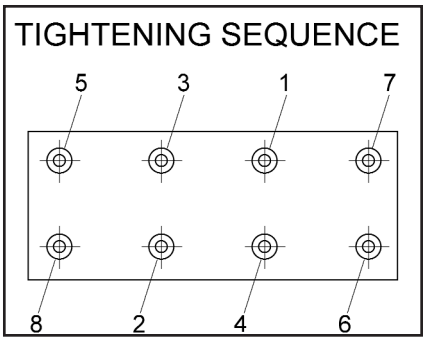
10b. Fluid end maintenance
The fluid end **does not** require periodic maintenance.

Service operations are limited to valve inspection and/or replacement, when necessary:

Step 1. Loosen the four screws (position 97)* and remove the cover (position 96).
Step 2. Remove the valve guide (position 90), the spring (position 89) and the disk (position 88).
Step 3. Loosen the eight screws (position 95) and separate the fluid end (position 100) from the pump body.
Step 4. Check the valve disk, seat and springs for wear and replace if necessary.

IMPORTANT NOTE: BEFORE REPOSITIONING THE VALVE UNITS, CLEAN AND DRY ALL VALVE HOUSINGS INSIDE THE MANIFOLD.

Step 5. Fit the spring (position 83), the disk (position 84) and the valve seat (position 86) back in place. To ease reassembly, put the pump in a vertical position: you will need to prevent the valve seat (position 86) housed between pump body and fluid end from falling down during reassembly (see diagram at right).
Step 6. Fit the manifold (position 100) in place and tighten the eight screws (position 95) to 144 ft/lbs (see diagram at right).
Step 7. Fit into the manifold the disk (position 88), the spring (position 89) and the valve guide (position 90).
Step 8. Replace the rings (positions 99 & 98), fit the cover (position 96) and tighten the screws (position 97) using a torque wrench set for 54 ft/lbs.



10c. Pressure packings and plungers maintenance
The packing and plunger system **does not** require routine maintenance.

The only operation required for the pumping system is a periodic check of the amount of water drained out through the throttle (position 94). Should surging and vibration occur, check packings and plungers for wear. Follow the following procedure:

Step 1. Remove manifold and valves as described in section 10b.
Step 2. Remove the cylinders (position 76). Mark each cylinder to replace them in their original positions.
Step 3. Loosen the nut (position 74).
Step 4. Remove the scraper (position 72) from its seat on the packing support (position 71).
Step 5. To take out the packings, insert a pin from the back side of the packing support and push them out.
Step 6. Loosen the plunger (position 68) with a box-end wrench.
Step 7. Check packings and plungers for wear and replace, if necessary.

Note: Always replace packings when replacing the plungers.

*All positions are referenced as shown on the parts breakdown on page 19.

INDUSTRIAL

Step 8. Replace all manifold O-rings.
Step 9. Fit the new ring nut packing (position 72)* in the packing support, the ring nut is provided on its internal diameter with a small lip. Fit it with the lip towards the fluid end.
Step 10. Tighten the ring nut (position 72).
Step 11. Fit the rear packing in the cylinder (position 76) with its flat side facing the bottom, then insert the two pressure packings.
Step 12. Fit the plunger (position 68) back in place paying attention to the correct position of the spacer (position 71) and wiper (position 72); tighten the plunger using a torque wrench set for 29 ft/lbs.
Step 13. Fit the cylinder in the pump body paying attention to the correct position of the O-rings (position 77).
Step 14. Fit the bushing (position 81) in the cylinder with its larger diameter facing the pressure packings, then the spring (position 83), the disk (position 84), the ring (position 85), the valve seat (position 86) – see section 10b – and the ring (position 87).
Step 15. Re-assemble fluid end parts as described in section 10b.

10d. Fastener torque values
Always use a torque wrench:

POSITION*	DESCRIPTION	Kgm	Nm	Ft/lb
95	Head bolts			
97	Valve Cap Screws			
68	Plungers			
23	Connecting Rod Screws			

11. PUMP STOPPED FOR LONG PERIOD

Before starting the pump after a long period of inactivity: (1) check for correct oil level, (2) check the valves as indicated in section 10b and (3) use the starting procedures indicated in section 9.
When a long period of inactivity is scheduled, drain the entire suction and delivery line and run the pump for a few seconds to drain out all water.

12. FROST PRECAUTIONS

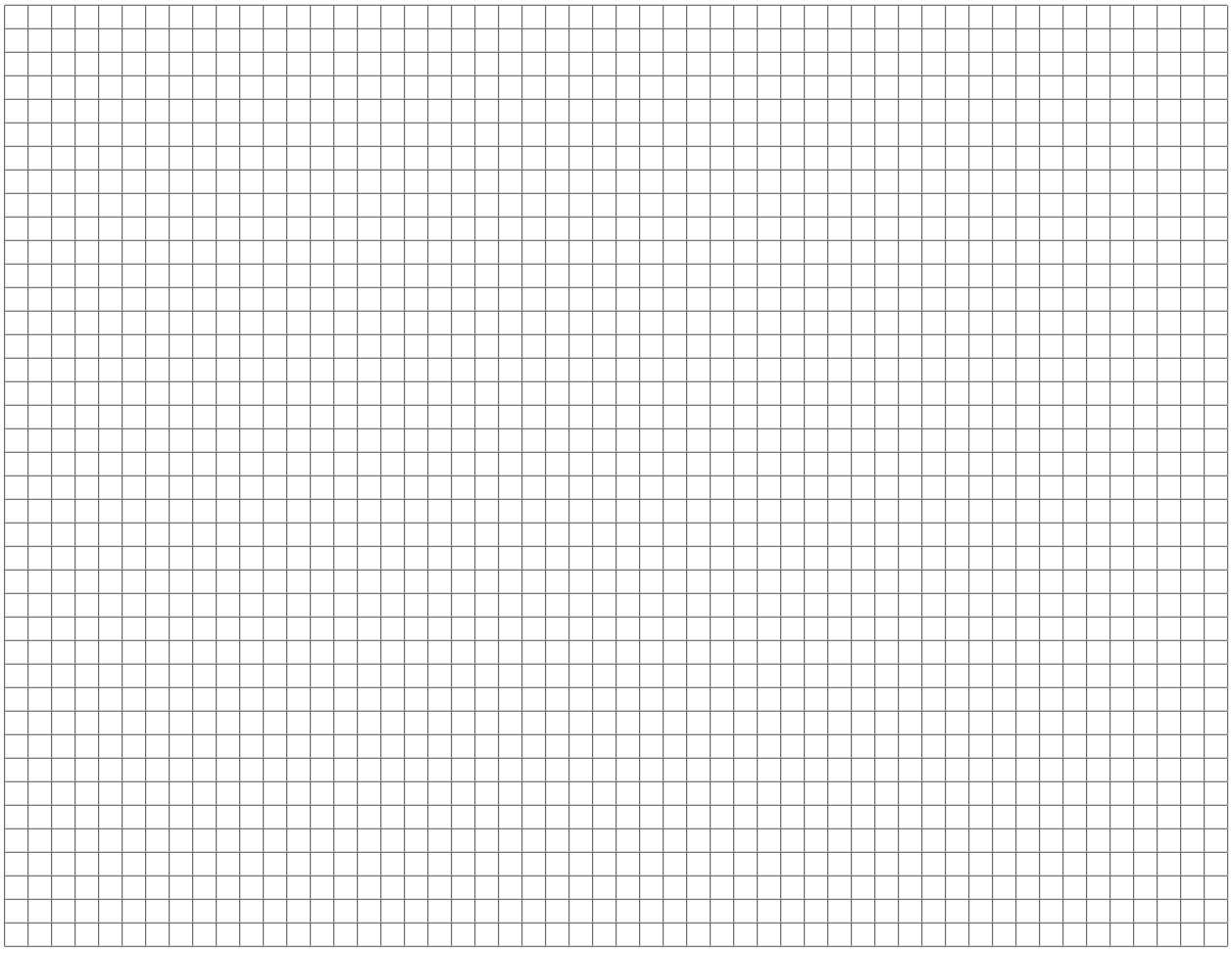
When there is risk of freezing:
- Drain all suction and delivery lines (filter included).
- Run the pump for a few seconds to drain the water collected inside the manifold. Flush the system with a 50-percent solution of anti-freeze until the anti-freeze works throughout the system.

WARNING: If a pump is frozen or appears frozen **DO NOT OPERATE THE PUMP** until the entire system has been thawed.

*All positions are referenced as shown on the parts breakdown on page 19.

Contact Information:

Pump Supplier:	Name	_____
	Contact	_____
	Phone Number	_____
	Fax Number	_____
	E-mail	_____
Motor Supplier:	Name	_____
	Contact	_____
	Phone Number	_____
	Fax Number	_____
	E-mail	_____
Filter Supplier:	Name	_____
	Contact	_____
	Phone Number	_____
	Fax Number	_____
	E-mail	_____



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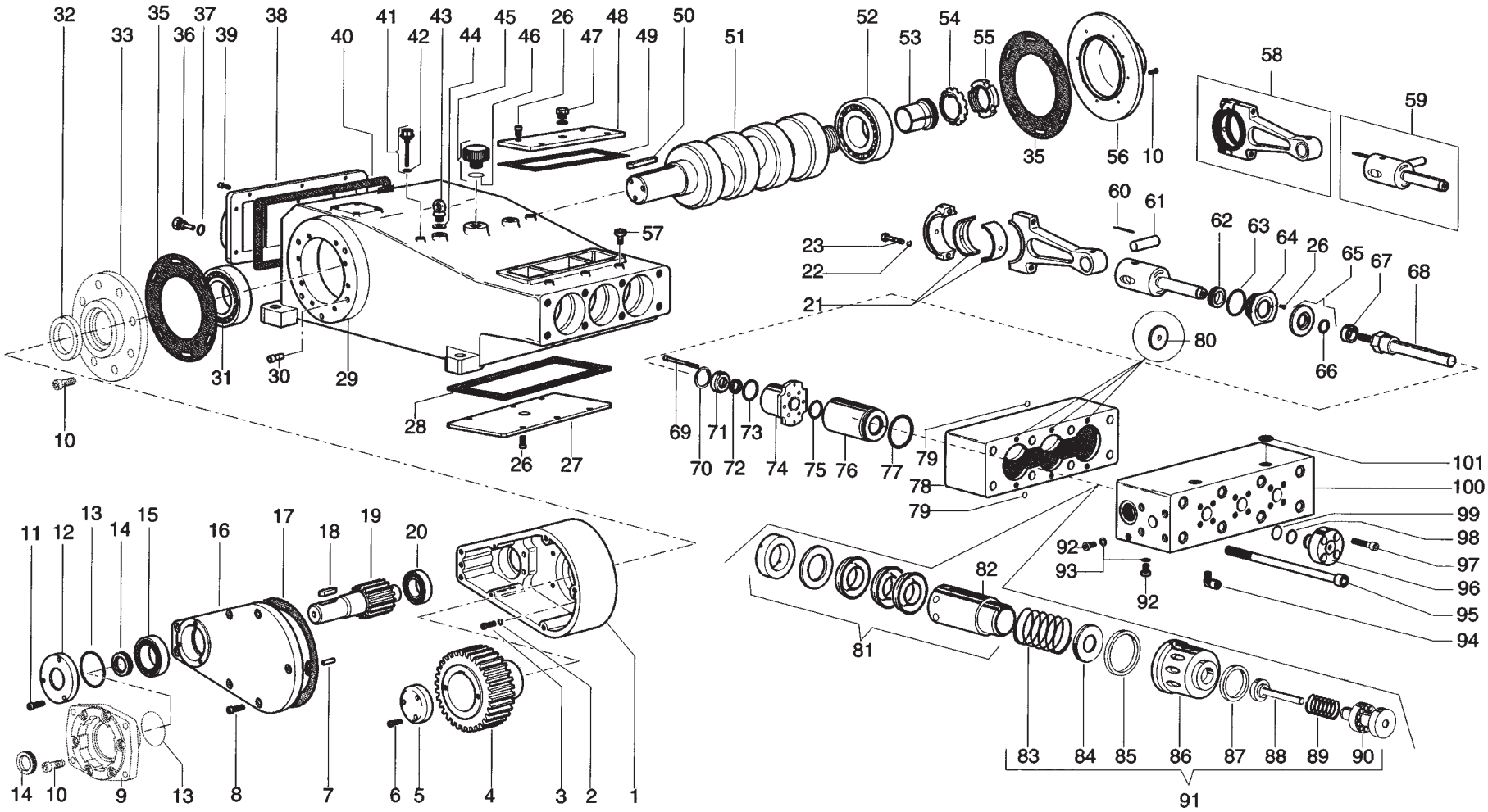


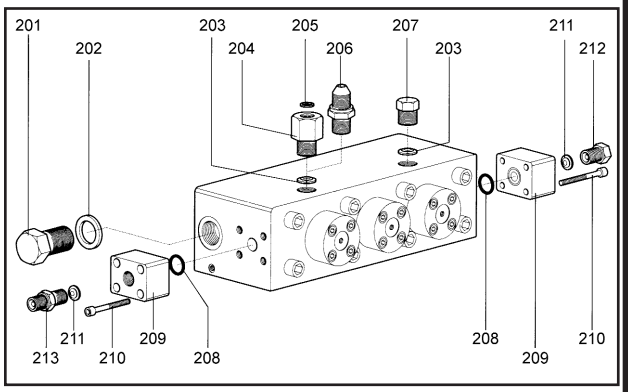
VS Kits						
	POSITIONS	**VS 16**	**VS 18**	**VS 20**	**VS 22**	**VS 24**
A	66-72-73-75-77-79-80-81-98-99	F1277	F1278	F1279	F1280	F1281
B	85-87-98-99	F1117				
C	2-13-14-17-22-28-35-37-40-4246-49-54-60-62-63-66-72-73-7577-79-80-81-85-87-93-98-99	F1282	F1283	F1284	F1285	F1286

Item	Part Number	Kit	Description	Qty.
1	F060100240		Body, Gearbox	1
2	F872047005	C	Washer, split Ø 10	8
3	F871125108		Screw TCEI M 10x40	8
4	F052000100		Gear 1500 rpm (Z 55)	1
	F052000120		Gear 1800 rpm (Z 58)	1
	F052000280		Gear 2200 rpm (Z 67)	1
5	F030000090		Flange, Gear	1
6	F871125105		Screw TCEI M 10x25	3
7	F872126004		Pin, Cover Ø 12x40	2
8	F871125110		Screw TCEI M 10x50	7
9	F010100100		Flange, Hydraulic	1
10	F871125154		Screw TCEI M 10x30	8-14-16
11	F871125153		Screw TCEI M 10x25	3
12	F063100190		Flange, Shaft	1
13	F881010131	C	O-ring Ø 113.97x2.62	1
14	F881080026	C	Oil Seal Ø 55x75x10	1
15	F811110010		Bearing - 21311 - CC	1
16	F063100150		Cover, Gearbox	1
17	F080600140	C	Gasket, Gearbox	1
18	F872097009		Key, Pinion	1
	F872097013		Key, Pinion Ø 48	1
19	F052000110		Pinion 1500 rpm (Z 27)	1
	F052000130		Pinion 1800 rpm (Z 24)	1
	F052000180		Pinion 1500 rpm (Z 27) Ø 48	1
	F052000210		Pinion 1800 rpm (Z 24) Ø 48	1
	F052000270		Pinion 2200 rpm (Z 22)	1
20	F811110002		Bearing 22208	1
21	F812000001		Bearing, Conn Rod, Bronze	3
22	F872046006	C	Washer, split Ø 12	6
23	F035000070		Bolt, Special	6
26	F871115152		Screw TCEI M 6x14	16
27	F040000070		Cover, Bottom	1
28	F080600130	C	Gasket, Cover, Bottom	1
29	F060100220		Crankcase	1
30	F034000010		Pin, Alignment	1
31	F811110016		Bearing - 21314-CC	1
32	F881080032		Oil Seal Ø 70x90x10	1
33	F063400640		Cover, Direct Drive Only	1
35	F080600110	C	Gasket, Side Cover	2
36	F801057002		Plug Magnetic G 1/2"	1
37	F872043002	C	Washer, Aluminum Ø 1/2"	1
38	F063400540		Cover, Back	1
39	F871121152		Screw TCEI M 8x20	6
40	F080600100	C	Gasket, Cover, Back	1
41	F001000010		Dipstick	2
42	F872041501	C	Washer Ø 3/8"	2
43	F872026003		Lifting Eye M 16	2
44	F030000030		Spacer, Lifting Eye	2-4
45	F801054027		Plug, Oil Fill, G 1"	1
46	F881010116	C	O-ring Ø 29.82x2.62	1
47	F801056002		Plug, vent G 1/2"	1
48	F040000050		Cover, Top	1
49	F080600120	C	Gasket, Cover, Top	1
50	F872100005		Key	1
51	F050000100		Crankshaft	1
52	F811111008		Bearing - 21314 CCK	1
53	F811920004		compression Bushing AH 314	1
54	F872069012	C	Washer MB 12	1
55	F872020012		Clutch nut KM 12	1
56	F063400580		Cover, Closed	1
57	F821204051		Plug M10x1	3
58	F250000020		Connecting Rod, Complete	3
59	F250001060		Piston Guide, Complete	3
60	F872142015	C	Roll Pin Ø 5x36	3

Item	Part Number	Kit	Description	Qty.
61	F071000060		Wrist Pin Ø 28	3
62	F881081000		Oil Seal Ø 32x45x6.5 - Spec.	3
63	F881010127	C	O-ring Ø 64.77x2.62	3
64	F063400560		Oil Seal Cover, Pluger Rod	3
65	F205000000		Flinger	3
66	F881012115	A-C	O-ring Ø 26.65x2.62	3
67	F031200470		Spacer, Flinger	3
68	F124200550		Plunger VS 16	3
	F124200560		Plunger VS 18	3
	F124200570		Plunger VS 20	3
	F124200580		Plunger VS 22	3
	F124200590		Plunger VS 24	3
69	F871111512		Screw TCEI M5x65 SS	18
70	F872071530		Clip Ø 52 Inox	3
71	F031300240		Support Ring, Retainer VS 16	3
	F031300230		Support Ring, Retainer VS 18	3
	F031300170		Support Ring, Retainer VS 20	3
	F031300180		Support Ring, Retainer VS 22	3
	F031300220		Support Ring, Retainer VS 24	3
72	F881030007	A-C	Support Ring VS 16	3
	F881030008	A-C	Support Ring VS 18	3
	F881030009	A-C	Support Ring VS 20	3
	F881030010	A-C	Support Ring VS 22	3
	F881030040	A-C	Support Ring VS 24	3
73	F881010140	A-C	O-ring Ø 52.07x2.62	3
74	F022200140		Seal Support VS 16	3
	F022200150		Seal Support VS 18	3
	F022200160		Seal Support VS 20	3
	F022200170		Seal Support VS 22	3
	F022200180		Seal Support VS 24	3
75	F881010120	A-C	O-ring Ø 42,52x2,62	3
76	F062200540		Cylinder	3
77	F881010142	A-C	O-ring Ø 75,87x2,62	3
78	F064400040		Collar	1
79	F881010109	A-C	O-ring Ø 5,32x2,62	9
80	F083500040	A-C	Cooling restrictor	3
81	F205000130	A-C	Packing Ass'y, Complete VS 16	3
	F205000140	A-C	Packing Ass'y, Complete VS 18	3
	F205000150	A-C	Packing Ass'y, Complete VS 20	3
	F205000160	A-C	Packing Ass'y, Complete VS 22	3
	F205000170	A-C	Packing Ass'y, Complete VS 24	3
82	F031500250		Packing Support VS 16	3
	F031500260		Packing Support VS 18	3
	F031500270		Packing Support VS 20	3
	F031500280		Packing Support VS 22	3
	F031500290		Packing Support VS 24	3
83	F090200260		Valve Spring, Inlet	3
84	F082200230		Valve Poppet, Inlet	3
85	F080500170	B-C	Gasket, Valve Seat, Inlet	3
86	F081200570		Valve Seat	3
87	F080500160	B-C	Gasket, Valve Seat, Discharge	3
88	F082200220		Valve Poppet, Discharge	3
89	F090200170		Valve Spring, Discharge	3
90	F021300390		Valve Guide, Discharge	3
91	F208007000		Valve Assembly	3
92	F821203100		Plug G 1/8"	4
93	F872042000	C	Washer, Aluminum Ø 10	4
94	F801203033		Throttle G 3/8"	1
95	F871145324		Screw TCEI M18x300 - Spec.	8
96	F063200190		Valve Cover	3
97	F871135302		Screw TCEI M14x40 - Spec.	12
98	F010500050	A-B-C	Anti-Ext Ring for O-ring	3
99	F881010207	A-B-C	O-ring Ø 28.17x3.53	3
100	F064200330		Manifold VS	1
101	F083200210		Conical Gasket G 1/2"	2

VS Fittings

Item	Part Number	Description	Kit	Qty.
201	F084200070	Plug G 1-1/2" SS	F1125	1
202	F881110105	Seal Washer Ø 1-1/2"	F1125	1
203	F083200210	Conical Gasket G 1/2"	F1103/1104/1126	1
204	F084200100	Fitting, HP (SH 22-24)	F1103	1
205	F872040100	Gasket	F1103	1
206	F084200430	Fitting, HP (SH 20)	F1126	1
207	F084200220	Plug G 1/2" SS	F1104	1
208	F881010200	O-ring Ø 18.64x3.53	F1127	1
209	F073200260	Flange, Disch G 3/4"	F1127	1
210	F871131308	Screw M12x55 spec.	F1127	4
211	F083200310	Conical Gasket G 3/4"	F1128/29/30/31/32/33	1
212	F084200380	Plug G 3/4" SS	F1128	1
213	F084200610	Nipple G 3/8"	F1129	1
	F084200620	Nipple M 20x1.5	F1130	1
	F084200630	Nipple M 22x1.5	F1131	1
	F084200370	Nipple M 24x1.5	F1132	1
	F084200640	Nipple M 36x2	F1133	1



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05-03

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