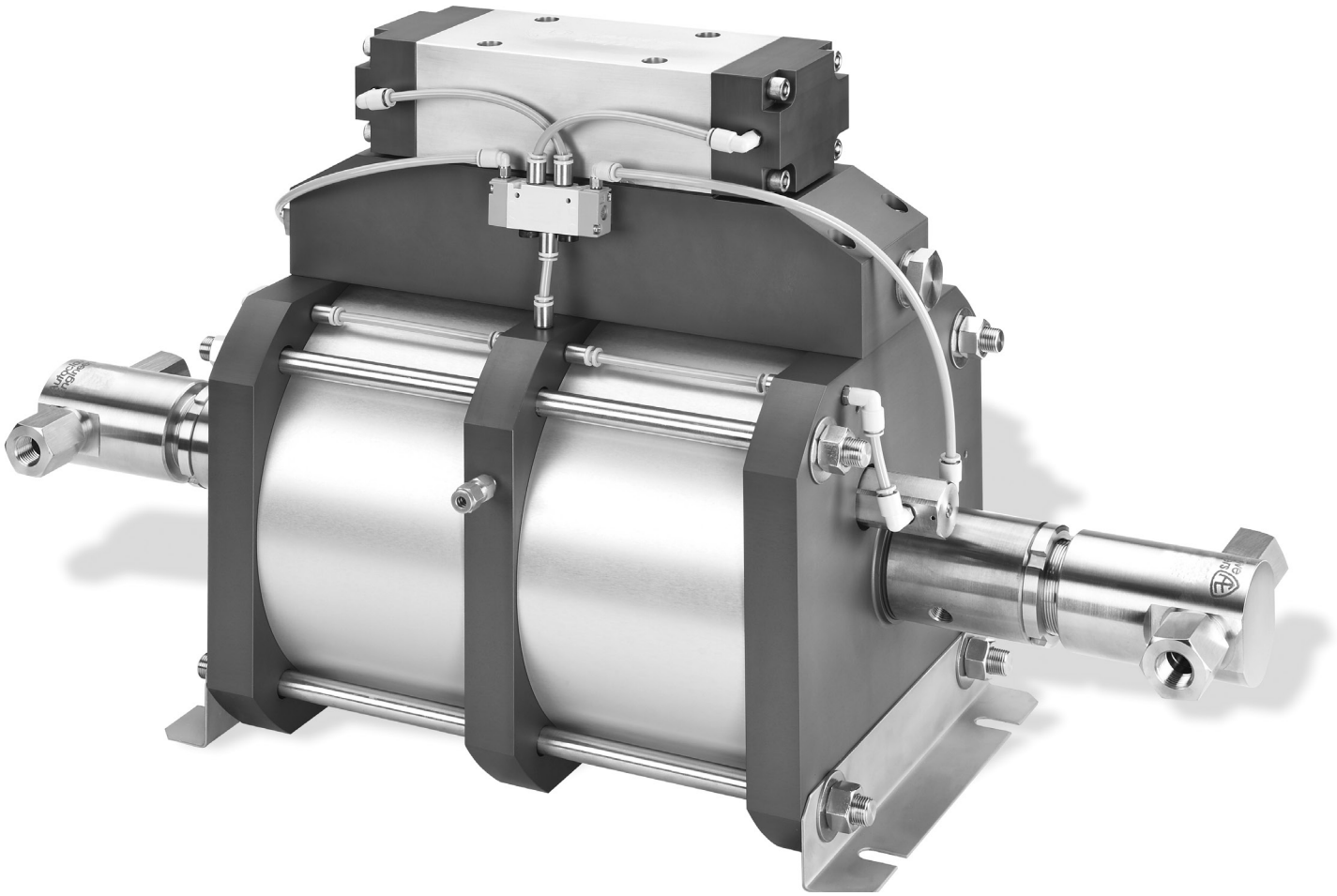

AHL Series Pump

Operation and Maintenance Manual

Air Driven, High Pressure Liquid Pump

Catalog: 02-9242ME **August 2014**

aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
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Parker

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Model # _____

Serial # _____

Drawing # _____

Order # _____

Mfg. Date _____

Table of Contents

Parker Autoclave Engineers
Instrumentation Products Division
Erie, PA USA
www.autoclave.com | Cat. 02-9242ME

Section 1.0
Introduction

The Parker Autoclave Engineers pump discussed in this manual is operated using compressed air up to 110 psi (7.6 bar) max, however maximum inlet air pressure is limited by the maximum liquid output pressure. Autoclave Engineers AHL Series pumps are used for pumping oil, water, and oil/water mixtures. Special seals are also available for chemical service. Please contact Parker Autoclave Engineers to discuss availability of special seals. The pump operates using a pressure ratio of the air piston surface area to the liquid plunger surface area.

(Output liquid pressure = actual pump pressure ratio x input air pressure). Refer to the product literature for each pump model's actual air pressure ratio.

Section 2.0
Meaning of Safety Words

A safety related message is identified by a safety alert symbol and a signal word to indicate the level of risk involved with a particular hazard. The definitions of the three signal words are as follows:

⚠ WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Special notes intended to bring attention to procedures that must be followed to ensure proper installation and performance will be placed in a box labeled **NOTICE**.

Section 3.0
Product Specification

See assembly drawing for product specifications:

- Pump Geometry
- Pump Materials of Construction
- Maximum Allowable Working Pressure
- Maximum Working Temperature
- Pressure Ratio
- Displacement
- Repair Kit Part Numbers
- Torque Information
- Weights

Section 4.0
Unpacking

The pump has been assembled and pressure tested at Parker Autoclave Engineers and is ready to be put into service. The shipping carton should be opened and the contents carefully examined upon receipt from the carrier. Make sure there is no obvious damage to the contents. **DO NOT** use the equipment if any damage is evident. If damage has occurred, file a claim with the shipper before contacting Parker Autoclave Engineers Service Department.

Examine all material within the container and check against the packing list to be sure all items are accounted for and are not damaged. Verify that the equipment model number supplied agrees with what was ordered.

Section 5.0
Tools

At minimum, the tools required for installation of the pump include a torque wrench, an open end wrench adapter (crows foot adapter) and an open end adjustable wrench.

Refer to the Tools, Maintenance and Installation Manual provided with the Data Book for information on torque wrenches and torque values for Parker Autoclave Engineers tubing and fittings.

Section 6.0
Installation

The pump will attach to the mounting location using (4) 7/16" bolts. There are 4 holes provided on each pump for mounting.

⚠ WARNING

Please read this manual in its entirety before attempting to operate an Parker Autoclave Engineers high pressure liquid pump

⚠ WARNING

Installation to be performed only by properly trained individuals.

⚠ WARNING

Proper protective safety gear must be worn while installing and operating the pump.

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⚠ WARNING

Always bolt the pump to a substantially solid surface using the slotted holes provided.

⚠ CAUTION

AHL Pumps have a maximum sound level of 90 dBA. Wear hearing protection while working with or near the pump.

Section 6.1
Compressed Air Supply

NOTICE

Unless otherwise noted, all air line accessories for the pump air drive should have, at minimum, a 1/2" FNPT connection. The tubing/piping used to connect the components should have the maximum ID the pressure rating will allow. Reducing the size before the air inlet will reduce air pressure flow and reduce flow rate of the pump.

The main air drive connection port on the pump is a female 1" FNPT and is located in the spool base housing. An additional female 1/8" FNPT air pilot valve connection port is located in the middle plate at the opposite side of the 1" NPT air inlet. This pilot connection must be plumbed to an unregulated and filtered air source. The purpose of this connection is to aid in low pressure differential start-up and restart of the pump while providing a more accurate pressure control. The pump will not function if this unregulated air supply is not connected to the pilot valve supply port.

NOTICE

The use of an air line lubricator is not required and is not recommended. The oil in the air lubricator will cause the factory installed grease to be purged from the pump. Once an air lubricator is used the pump can never again be operated without an air lubricator.

An air line filter with a minimum 5 microns filtration rating must be used on the supply line. If the air supply is not dry, a mist separator must be used to remove moisture in the air line.

Parker Autoclave Engineers can supply a complete air control package that includes a filter, air pressure regulator, air pressure gage and shutoff valve. Mist separators are also available. Contact the factory for more details on these options.

The pump is designed to function from 20 psi to 110 psi (1.4 to 7.6 bar) air input pressure, however maximum inlet air pressure is limited by the maximum liquid output pressure.

Section 6.2
Liquid Section

All AHL series pumps have high pressure liquid outlet ports located on the side of the pump head's. The suction inlet ports on all AHL series pumps are positioned opposite of the inlet checks.

Inlet: A liquid filter with at least a 100 mesh size must be installed before the suction port inlet to prevent damage to the check valves and high pressure seals due to debris.

NOTICE

For best performance, a liquid supply reservoir should be located higher than the inlet gland on the pump to create a small pressure head. Be sure to make an air tight seal between the reservoir and the pump inlet connection. The connections between the reservoir and pump inlet should not be reduced from the FNPT connection size.

Refer to product literature for inlet connection details for each pump. The tubing or piping should be made from a corrosion resistant material and sized with a maximum ID to fit the inlet pipe connections.

NOTICE

Restricting flow at the liquid inlet will cause problems with check valve performance and reduce output flow.

Outlet: The outlet tubing ID must, at minimum, match the same size of the pump check valve gland port. Refer to product literature for outlet connections details for each pump. Reducing outlet tubing or connection will reduce output liquid flow capacity.

NOTICE

In order for the pump to flow properly, both outlets must be plumbed together into a tee to one single outlet.

⚠ WARNING

The high pressure tubing must be rated to at least the maximum pump output pressure.

⚠ WARNING

Verify liquid pressure system is protected with an over pressure relief device.

Section 7.0
Pump Start-Up

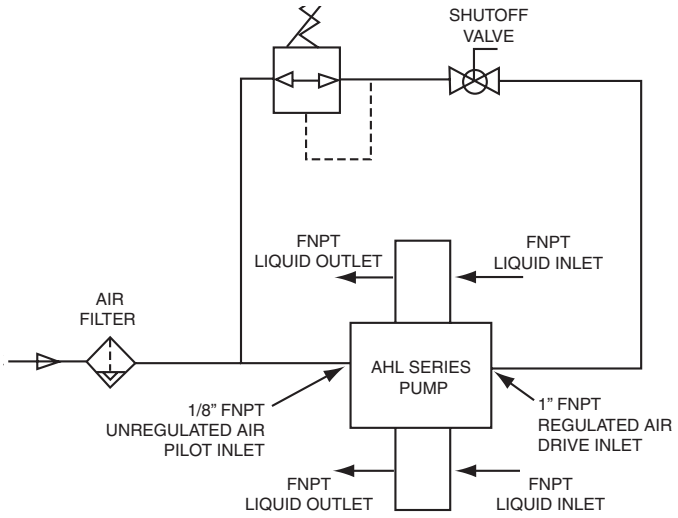

Fig. 7.0 Air Line Schematic

As shown above, a filtered main air supply line is required. The air line then must be split through a tee. One line will attach to the 1/8" FNPT pilot valve connection in the middle plate of the pump. The air pressure on this connection must be higher than the regulated main air supply on the air drive section. The second line out of the tee will go to a pressure regulator which can be set to achieve the desired output liquid pressure according to the pressure ratio of the pump.

⚠ WARNING

Use an air pressure regulator to assure maximum air drive pressure listed on the pump label is not exceeded. An air pressure regulator must also be used to assure the pump will not exceed maximum liquid output pressure listed on the pump label.

⚠ WARNING

The pump and high pressure liquid system must be vented prior to installation and start-up.

The pumps unique design allows for self priming. To prime, regulate the air pressure to between 5-15 psi or use an air flow regulator to reduce to a slow stroke frequency. With the high pressure side connected to a vented system, allow the pump to cycle till a consistent flow of liquid is achieved. Let the pump flow freely to purge any air in the liquid system. Loosening the outlet gland or pipe can also assist in priming the pump.

⚠ WARNING

Be sure to securely tighten high pressure tube, pipe or gland with the appropriate torque after the priming has been achieved. Reference Tools, Installation, Operation and Maintenance Manual for tube gland torque value.

Increase the air pressure using the air pressure regulator until you achieve your desired output liquid pressure. At this point the pump will stall. You can calculate the output pressure by multiplying the input air supply by the actual pressure ratio of the pump. The pump will automatically restart if there is a drop in downstream high pressure.

⚠ WARNING

DO NOT exceed the maximum liquid pressure and temperature rating specified on the assembly drawing and label for your pump. It is recommended to use a liquid relief valve or rupture disk to prevent over pressurization of your high pressure system.
DO NOT exceed the maximum air drive pressure listed on your pump label.

Section 8.0
Process Media

Parker Autoclave Engineers pumps discussed in this manual are used for pumping oil, water and oil/water mixtures. Special seals are also available for chemical service. Please contact Parker Autoclave Engineers to discuss availability of special seals.

⚠ WARNING

While testing has shown o-rings to provide satisfactory service life, actual life will vary widely with differing service conditions, properties of reactants, pressure and temperature cycling and age of the o-ring.
FREQUENT INSPECTIONS SHOULD BE MADE to detect any deterioration and o-rings replaced as required.

⚠ WARNING

The user is required to verify material compatibility with fluid based on corrosion resistance. A material list is provided on the assembly drawing to aid you in the evaluation.

Pumps are not designed to run for long periods of time without liquid process media. Short, dry pumping cycles should not be a cause for concern. However, pumps are built using lubricant in the seal areas and **pumping without fluid will wear away lubricant and compromise the seal.**

The operating temperatures of the pump are between 0°F to 140°F (18°F to 60°F).

Section 9.0
Pump Functionality

When the pump is installed, maximum system air is connected to 1/8" FNPT pilot air inlet and is sealed off by pilot valve assembly in the top end cap and does not enter the spool housing. Regulated air is connected to the spool housing at the 1" FNPT pump inlet.

1) Regulated inlet air pressure enters the spool housing and is diverted to the air cylinders and their pistons, which causes one plunger to build pressure in one of the hydraulic pump heads while the second plunger performs a suction stroke that will pull liquid into the second hydraulic pump head.

2) When a hydraulic pump head is in the suction stroke, the plunger is moving away from the head causing the inlet check valve to open, which allows liquid to be drawn into the head while the outlet check valve is forced closed.

3) When the hydraulic pump head is building pressure, the plunger is moving toward the head compressing the fluid and forcing the inlet check valve to close and the outlet check valve to open.

4) The air pistons continue to move until a piston hits the pilot valve assembly in the end cap.

5) The pilot control valve shifts allowing max system air pressure to shift the spool valve so that it now directs air drive pressure through to the opposite side of the pistons in the air cylinders and pushes the air piston and liquid plunger in the opposite direction.

6) While the air drive pressure is acting on the pressure side of the piston, the opposing area of the piston's are vented through the exhaust mufflers.

7) This action causes the reverse action of step #1 (the suction head will change to a compression stroke, while the pressurized head will change to a suction stroke).

8) The air pistons continue to move until a piston hits the pilot valve assembly in the second end cap which will again cause the spool to shift and divert air to move the pump in the opposite direction.

9) This alternating action of steps #1 to step #8 continues until the maximum outlet hydraulic pressure is reached based on the pressure ratio of the pump.

Section 10.0
Suggested Maintenance

WARNING

All pumps must be inspected periodically in order to assure proper and safe operating condition.
Failure to inspect pump can result in serious and catastrophic harm to personnel and the surrounding facility.

A. Before each pump use, a quick inspection should be performed to insure there are no loose bolts, nuts, set screws or check valve glands. Tighten any lose bolts and fittings according to the torque values listed on the pump assembly drawing. A visual inspection should also be made before each use and at startup to make sure there is no evidence of fluid leaks from isolation chamber drain ports, check valves connections and muffler. If liquid mists out of the muffler for more than 5 strokes, it is time to replace your hydraulic high pressure seals. Refer to the troubleshooting guide for solutions to these fluid leaks.

B. The maintenance schedule of the pump depends on the frequency of use, cleanliness of media, type of media, cycle rates, output pressures, cleanliness of air or any other conditions that may be damaging to seal integrity. Once a clear pattern develops of how long a pump is in service before pump performance declines, it is recommended to perform maintenance in advance of this time frame. At minimum, perform maintenance on the pump once a year as described below.

   Maintenance would include:
   - Re-lubrication or replacement of spool valve o-ring
   - Re-lubrication or replacement of air drive seals
   - Re-lubrication or replacement of pilot valve o-rings and gaskets
   - Replace check valve components
   - Replace high pressure hydraulic seals

C. Maintenance instructions are supplied with appropriate rebuild kits. Kit part numbers are listed on the assembly drawing.

WARNING

Before attempting to disassemble the pump or loosen fittings in a pressure system, be sure that liquid pressure has been totally vented.

⚠ WARNING

Before attempting to perform maintenance on the pump, assure that air supply pressure is shut off and vented from the pump.

Section 11.0
Trouble Shooting - Pneumatic Section

Problem: Pump will not operate with low air pressure.

Cause: Excessive friction of seals on the spool valve has increased the pressure required to move spool.

Solution: Replace and lubricate the seals on spool

Problem: Pump can only be actuated at high air pressure.

Cause:
a) Air is leaking through the seal in the isolation chamber.
b) Air is leaking through the o-rings between the top end plates and air cylinders.

Solution:
a) Replace and lubricate seals in isolation chamber.
b) Replace and lubricate o-ring on lip of end caps.

Problem: Pump will not run and air escaped through the exhaust muffler.

Cause:
a) Spool valve seals are leaking.
b) Outside o-ring(s) on air piston(s) is leaking.
c) Seal between air piston and liquid plunger is leaking.
d) Seal in the middle plate is leaking.

Solution:
a) Replace and lubricate spool valve seals.
b) Replace and lubricate air piston o-ring(s).
c) Replace o-ring(s) on plunger(s) and connecting rod.
d) Replace seal and wear bands in the middle plate.

Problem: Pump will not run and air escapes through the gasket between the spool valve and housing and spool base.

Cause: Gasket is leaking.

Solution: Inspect or replace gasket and re-torque bolts.

Problem: Pump will not run and air escapes through the pilot valve vent in the end plates.

Cause: Pilot valve spindle is not sealing in the pilot valve.

Solution: Replace and lubricate o-rings. If necessary, also replace the tappet rod.

Problem: Pump operates at a high frequency and short strokes.

Cause: The pilot valves are defective.

Solution: Replace and lubricate pilot valve o-rings. If necessary also replace the pilot valve rods.

Problem: Pump functions slowly or doesn't operate at all.

Cause:
a) Condensation from air supply is freezing the spool valve.
b) Air muffler is clogged.

Solution:
a) Stop pump for a short period to thaw and replace or add a mist separator in the air line.
c) Clean or replace air muffler.

Problem: When air is applied to pump the spool will not actuate.

Cause: Unregulated air pilot feed line pressure was shut off at the same time as regulated main air drive pressure. This caused the Pilot Control Valve to stop in an incorrect position at shutdown.

Solution: Assure unregulated pilot air, regulated air drive and shutoff valve are arranged as shown in Fig. 7.0.Turn off regulated air drive pressure. Pressure should now only be supplied to the unregulated pilot connec tion. Press the manual push button switch on either end of Pilot Control Valve (see Figure 11.0, page 6). This will shift the Pilot Control Valve and then the spool to the position required for restart. Now supply pump with main regulated air pressure.

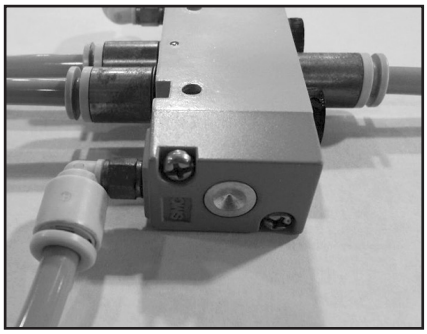

Fig. 11.0 Pilot Control Valve Switch

Section 12.0
Trouble Shooting - High Pressure Liquid Section

Problem: Pump does not produce liquid flow, operates irregularly or does not maintain pressure.

Cause:
a) Air in the hydraulic system.
b) Suction line excessively long.
c) Suction tubing sized too small.
d) Failure of one of the check valves.
e) Liquid inlet filter is blocked.
f) High pressure seal excessively worn.

Solution:
a) Check inlet suction line and connections for leaks and allow pump to flow freely downstream so as to remove any air.
b) Shorten liquid supply line.
c) Increase tubing ID size between reservoir and pump inlet.
d) Clean or replace both inlet and outlet check valve assemblies.
e) Clean or replace liquid inlet filter.
f) Replace high pressure seal assembly.

Section 13 .0
Service

Contact Parker Autoclave Engineers for service. Pumps can be sent directly to Parker Autoclave Engineers for service. Pumps returned for service should be accompanied with the model number, serial number, manufacture date and problems you are experiencing.

⚠ WARNING

Use only originally specified parts when installing or maintaining high-pressure equipment and follow all Parker Autoclave Engineers maintenance and assembly procedures. Do not use any parts from other equipment to make repairs or modifications. Contact Parker Autoclave Engineers with any questions or if sufficient information to complete the installation, maintenance and operation of the equipment has not been included.

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