

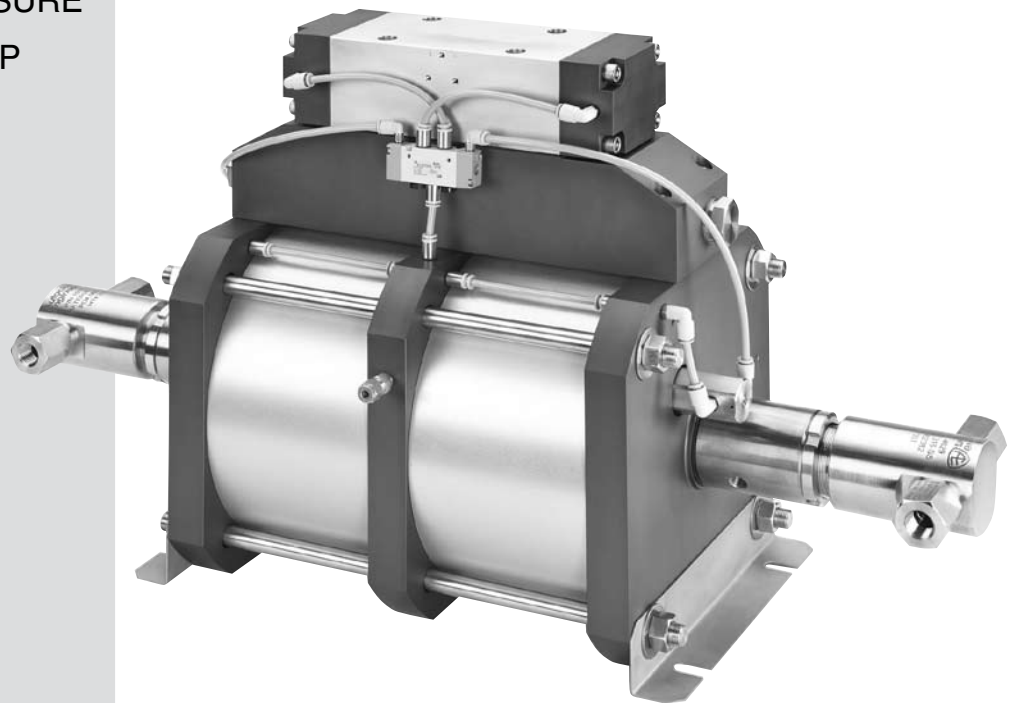
**Autoclave
Engineers** 

Fluid Components
Division of Snap-tite, Inc.

OPERATION AND MAINTENANCE MANUAL

AIR DRIVEN
HIGH PRESSURE
LIQUID PUMP

AHL
SERIES
PUMP



prepared by:
Autoclave Engineers
Fluid Components
Division of Snap-tite, Inc.
8325 Hessinger Dr.
Erie, PA 16509-4679
Tel: 814-860-5700
Fax: 814-860-5811

ISO-9001 Certified

Model # _____

Serial # _____

Date _____

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SECTION 1.0 Introduction

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

Pump mounting requires (4) 7/16" bolts. There are 4 slotted holes provided on each pump for mounting.

SECTION 2.1 Compressed Air Supply

Unless otherwise noted, all air line accessories for the pump air drive should have, at minimum, a 1" 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.

The use of an air line lubricator is not required and is not recommended. The pump is assembled at the factory using permanent synthetic grease in the air drive moving parts. The oil in the air lubricator will actually 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.

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 2.2 Liquid Section

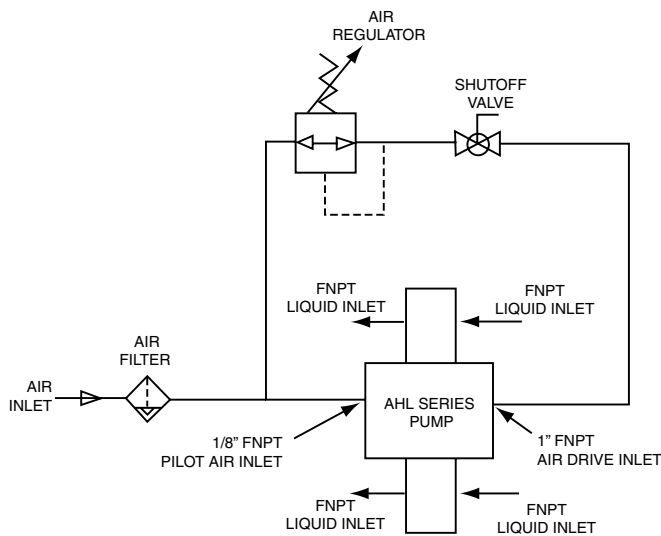
All AHL series pumps have high pressure liquid outlet ports located on the side of the pump head's. The suction inlet ports on all AHL series pumps are positioned opposite of the inlet checks.

Inlet: A liquid filter with at least a 100 micron rating must be installed before the suction port inlet to prevent damage to the check valves and high pressure seals due to debris. For best performance, a liquid supply should be placed in a reservoir higher than the inlet gland on the pump to create a pressure head. Be sure to make an air tight seal between the media supply and the pump inlet connection. The connections between the reservoir and pump inlet should not be reduced from the inlet 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. 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.

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

SECTION 3.0 Pump Start-Up



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.

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. Be sure to securely tighten the high pressure tube or gland with the appropriate torque after the priming has been achieved. 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 pressure ratio of the pump. The pump will automatically restart if there is a drop in downstream high pressure.

SECTION 4.0 Process Media

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 Autoclave Engineers to discuss availability of special seals.

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 a 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°C to 60°F).

SECTION 5.0 Pump Functionality

When the pump is installed, maximum system air is connected to 1/8" FNPT pilot air inlet and is used to operate the pilot control valve located on the front of the pump.

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 6.0 Suggested Maintenance

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.

Maintenance would include:

- Re-lubrication or replacement of spool valve o-ring
- Re-lubrication or replacement of tappet o-rings and gaskets
- Replace check valve components
- Replace high pressure seals
- Replace air drive seals

Before each pump use, a quick inspection should be performed to insure there are no loose bolts, nuts, set screws or check valve glands. A visual inspection should also be made to make sure there is no evidence of fluid leaks from drain ports or check valves.

SECTION 7.0 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 escapes 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 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.

SECTION 8.0

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 9.0

Service

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

For service information: 814-860-5729

! WARNING !

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS
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Industrial Estate
Whitemill-Wexford
Republic of Ireland
PH: 353 53 914 1566 FAX: 353 53 914 1582
e-mail: ste_sales@snap-tite.com
www.snap-tite.com



Fluid Components
Division of Snap-tite, Inc.

8325 Hessinger Drive
Erie, Pennsylvania 16509-4679 USA
PH: 814-860-5700 FAX: 814-860-5811
e-mail: ae_sales@snap-tite.com
www.autoclave.com

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