

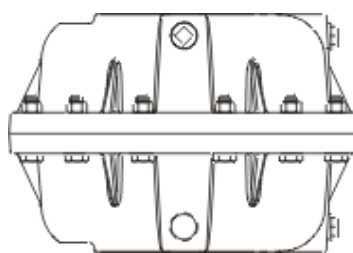


PT-104 Pumping Trap Installation and Maintenance

This bulletin should be used by experienced personnel as a guide to the installation and maintenance of the Pumping Trap or Pumping Trap Package. Selection or installation of equipment should always be accompanied by competent technical assistance. We encourage you to contact Armstrong or your local Representative if further information is required.

The maximum operating pressure for Armstrong Model PT-100 Series pumping traps is 100 psig (7 bar). The maximum design pressure for PT-100 models is 150 psig at 450°F (10 bar @ 232°C). The PT-100 Series pumping traps weigh 140 lb (64 kg).

Figure 1



PT-100 Series Pump Trap

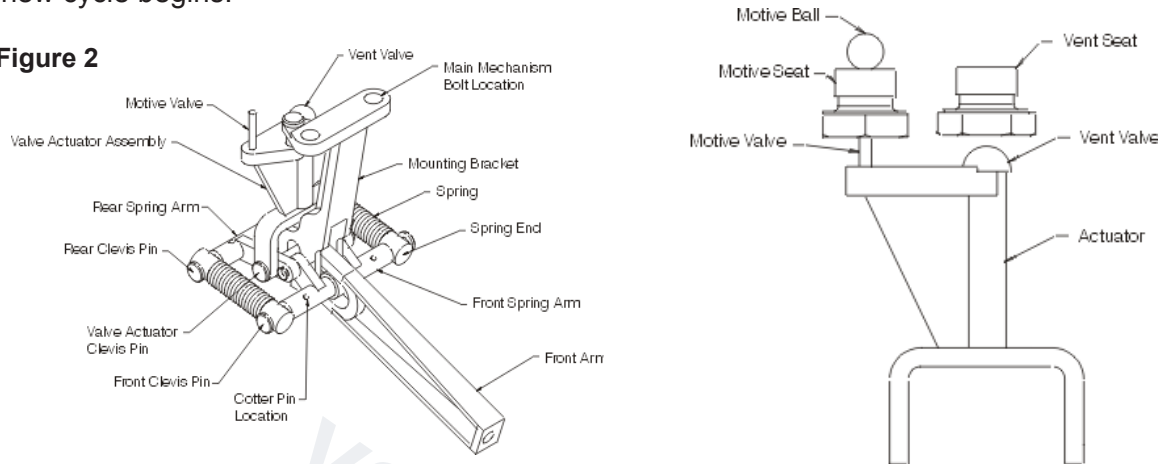
Note: Although the maximum operating pressure is 100 psi (7 bar), it is highly recommended that the motive be set only 15 - 20 psi (1.0 - 1.4 bar) above the discharge pressure. Applications with greater than 18" of filling head or condensate temperature less than 185°F, it is recommended that the motive pressure be set 25-35 psi above the backpressure. Air is the preferred motive for condensate temperatures less than 180°F (82°C). This will provide optimum performance and reduce venting time between cycles.

Pumping Trap Operation

1. At start-up, the float lies at its lowest position in the bottom of the body. The motive inlet valve is closed and the vent valve is open.
2. Liquid enters the pump body by gravity through the inlet swing check valve. Back pressure (typically) holds the discharge stainless steel check valve closed. The float becomes buoyant and begins rising.
3. Continued rising of the float, through linkage, increases spring tension until the float reaches its upper tripping point. Energy is then released instantly from the springs, causing the linkage to snap upwards over center. This upward motion opens the motive inlet valve and closes the vent valve simultaneously. See Figure 2 on Page 2.
4. Steam, air, or inert gas enters the inlet valve and builds pressure inside the Pumping Trap. This pressure will close the inlet check valve and force liquid out through the discharge check valve.

5. The discharge cycle will lower the float level and, through linkage, increase spring tension until the float reaches its lower tripping point. Energy is then released instantly from the springs, causing the linkage to snap over center downward. This downward motion closes the motive inlet valve and opens the vent valve.
6. Venting of pressure from the body opens the inlet check valve and closes the discharge check valve. Liquid now flows by gravity through the inlet check valve into the pumping trap body as a new cycle begins.

Figure 2



Suggested Installation of Accessories

The bronze gauge glass assembly will have male NPT connections.

Two (2) 1" x 1/2" Bushings will be needed for installation.

Cycle Counter:

There are two (2) 1" connections on the cap of the pumping trap where the cycle counter may be mounted. Various fittings will be required to reduce from 1" female NPT to 1/4" NPT. It is very important that a steel siphon or "pig tail" be used prior to the cycle counter to avoid any damage to the cycle counter. See Figure 3 below.

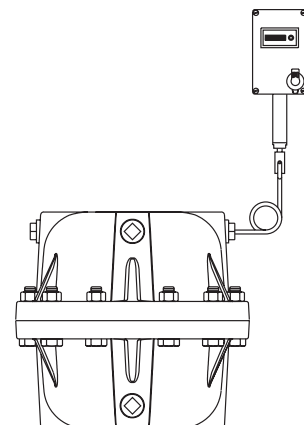
Cycle Counter Installation

Note: On pre-piped packaged units, inspect and tighten all threaded fittings (such as unions, etc.) that may have loosened during shipment.

Filling Head:

Install the pumping trap below the equipment being drained. A recommended filling head of 6" (152 mm) is recommended for the Model PT-104. Filling head is the distance between the bottom of a vented receiver or reservoir pipe and the top of the pumping trap cap. See typical hook-up on Page 7 for an example. All inlet fittings must be fully ported and match the pump's liquid inlet connection size. Greater fill heads increase the capacity of the pump trap, however, it is not recommended to have a filling head greater than 24 inches. Reference capacity chart for multiplying factors for other filling heads in Cat. 326.

Figure 3



Liquid Reservoir:

Liquid flowing from the equipment being drained must be stored during the pump's discharge cycle. A liquid reservoir (pipe reservoir) or vented receiver should be installed in a horizontal plane to prevent flooding of equipment. Please contact your local Armstrong representative for questions regarding reservoir pipe sizing or reference reservoir sizing data in catalog 326. Also see typical hook-ups on Page 7.

Check Valves:

NOTE: The pumping trap will not function without inlet and discharge check valves.

Connect the Armstrong supplied check valves to the pump. The swing check is the inlet check valve and the spring assisted valve is used at the pump discharge. **The use of Armstrong supplied check valves is necessary to ensure the pump will attain published capacities.**

Stainless steel in-line spring type check valves are recommended for applications where the differential pressure between the motive pressure and back pressure is greater than 25 psi. For air or 40 psi steam, stainless steel check valves are also a good choice for critical applications where the extended life of the stainless steel check valve would be of great value.

The following guidelines apply if the Pumping Trap is installed without Armstrong supplied check valves.

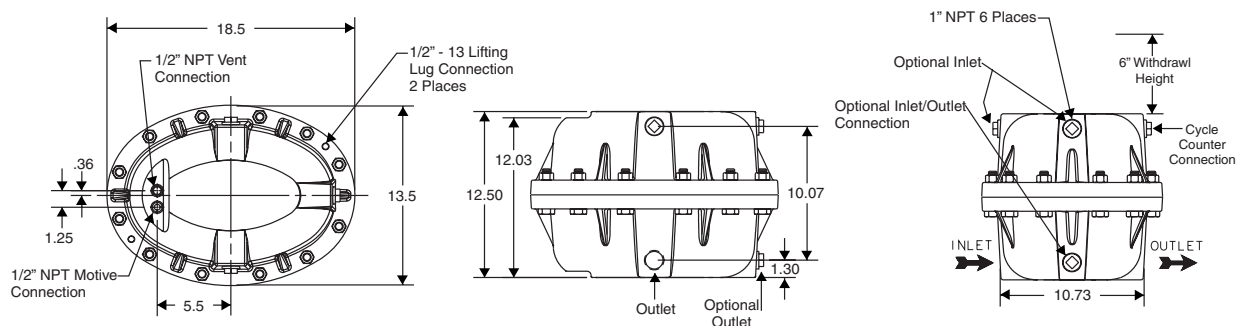
- Inlet check valves should be bronze swing type with teflon disc, Class 150 (minimum). Pipe size of the check valve must match the size of the pump's liquid inlet connection.
- Discharge check valve should be in-line spring assist type, Class 150 (minimum) and match the size of the pump's liquid discharge connection.

Motive Inlet Piping:

Connect the motive force piping (steam, air or inert gas) to the inlet connection on the pump cap. Proper piping and trapping of the motive supply line must include a strainer, check valve, properly sized drip leg with mud pocket, and drip trap (for steam motive). The drip trap discharge line should be connected to the reservoir piping or vented receiver when practical. See Figure 5 and 6 on Page 7. It is recommended to install a union near the motive inlet.

Note: To visually determine the location of the **motive** connection for Series PT-104, see Figure 4 below.

Figure 4



Maximum operating pressures for the pump trap 100 psi (7 bar). A pressure reducing valve must be used when the motive pressure exceeds 100 psi (7 bar). It is also recommended that motive pressure be set between 15-20 psi (1.0 - 1.4 bar) above the total discharge pressure (total discharge pressure = vertical lift in psi plus return line pressure). This pressure setting keeps venting time to a minimum and, when using steam, reduces the temperature differential. The PRV should be installed as far from the pump trap as possible. A good rule is to use a minimum of 10' of 1" pipe between PRV and pump inlet.

Installation of a safety relief valve and pressure gauge is recommended in the motive force supply line. The relief valve should be set for 125 psig (9 bar).

Vent Connection ("Open System" - vented to atmosphere):

Piping from the pump's cap connection labeled "Vent" should be installed vertically upward when possible and unrestricted. If piping travels greater than three feet, the piping should be expanded to one inch or greater. If a horizontal run is required, this line should be pitched toward the pump trap in order to be self draining. It is recommended to install a union near the vent connection.

Note: To visually determine the location of the **vent** connection for Series PT-104, see Figure 4 on page 3.

Vent Connection (Closed loop system):

From the pump cap connection labeled "Vent", the equalizing line should be routed to the top of the reservoir piping or the outlet piping immediately after the heat exchange equipment. An Armstrong thermostatic air vent is recommended (for steam) at the high point of the exhaust line. (See Figure 8 on Page 7.) Piping of the equalizing line should be a minimum 3/4" (20 mm) diameter and must be pitched in order to be self draining.

If pressure from the equipment being drained could ever exceed back pressure, a properly sized inverted bucket steam trap with a large vent or a float and thermostatic trap must be installed between the pump and discharge check valve. See Figure 8 on Page 7.

Packaged Receiver Vent Connections: The receiver vent must be unrestricted and atmospherically vented unless an ASME coded tank in a closed loop arrangement is specified.

Packaged Pump Trap Vent Connections: Piping from the pump's cap connection labeled "vent" should be installed upward to connect with the receiver vent line, and be a minimum of one 3/4" (20 mm) diameter.

NOTE: Replace any temporary plastic plugs in these connections with permanent steel plugs or appropriate fittings before start-up.

START-UP

1. Slowly open motive force (steam, air or inert gas) supply to Pumping Trap providing pressure to the inlet valve. Check for proper operation of drip trap on the motive line if using steam.
2. Open isolation valves leading to pump liquid inlet and discharge lines.
3. Open any additional valves upstream allowing liquid to enter Pumping Trap from the equipment being drained. Pump will begin discharging when body is nearly full.
4. Proper operation includes an audible exhaust after each pump cycle. If operation doesn't seem proper, recheck the installation and start-up procedure. Contact Armstrong or your local Armstrong Representative if necessary.
5. Armstrong strongly recommends the use of overflow piping on receiver tanks in open condensate return systems, on ALL pump trap skids. Properly installed overflow piping increases the efficiency of the system, while addressing potential safety issues involved with the unintentional escape of hot condensate. One suggestion would be the use of a "P"-trap to form a sufficient water seal. Be sure to check that a water seal has formed to prevent venting of steam through the overflow connection during operation.

Maintenance - Replacing the Valve Actuator Assembly

1. Close the valves in the motive supply, vent, condensate supply and discharge lines. Also close the shut-off valve to the receiver for packaged units. **Make sure that the pumping trap is completely relieved of pressure before breaking any connections.**
2. Break motive inlet and vent (all cap) connections. Remove bolts and lift the cap. A 6 inch (152 mm) withdrawal distance is required in order to remove the mechanism assembly with float for the Armstrong PT-100 Pumping Trap.
3. Remove the cap from the body and place on a sturdy workbench.
4. Remove the entire mechanism from the cap by loosening the two bolts on each side of the mounting bracket (see Page 2, Figure 2).
5. Remove the cotter pins from the front clevis pins that hold the springs in place. Front clevis pins are the ones closest to the float. The springs will then drop down.
6. Remove the (1) cotter pin holding the valve actuator clevis pin in place and pull the clevis pin out.
7. Remove the valve actuator assembly (see Page 2, Figure 2).
8. Place new valve actuator assembly in position.

Note: When bolting the mechanism back on the cap it is critical to follow the proper steps below. Operational problems can occur with improper valve settings.

1. Place the complete mechanism back on the cap; however, only hand tighten the main mechanism bolts. (See Page 2, Figure 2 for drawing of the complete mechanism assembly.)

2. Holding the vent valve tightly to the seat pull down (toward the cap) on the rear spring arm. See Page 2 Figure 2 for rear spring arm. This will push the vent valve tightly into the seat.
3. Holding the valve and springs in the above position tighten the main mechanism bolts all the way down until they are snug.
4. Actuate the mechanism a few times by hand to make sure the operation is smooth and both the motive and vent valves are seating properly.
5. Replace the cap on the body with a new body gasket.

TYPICAL HOOK-UPS

NOTE: Hook-up sketches depict the Pumping Trap for clarity. However, the cap inlet and vent connections are actually located closer to each other than shown.

Vented System

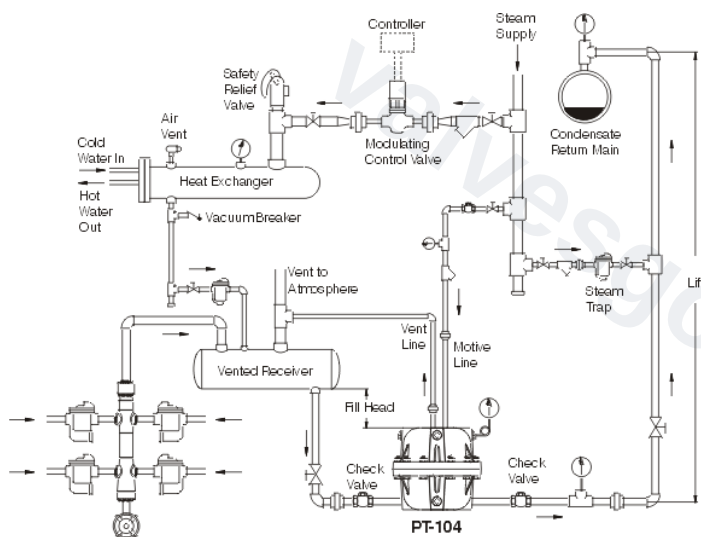


FIGURE 5: Pumping of condensate from vented receiver handling single or multiple steam trap discharges. Motive force of steam is depicted.

Closed Loop Systems

A closed loop system must be installed with caution and if any questions arise, contact Armstrong Fluid Handling's Application Engineering Department.

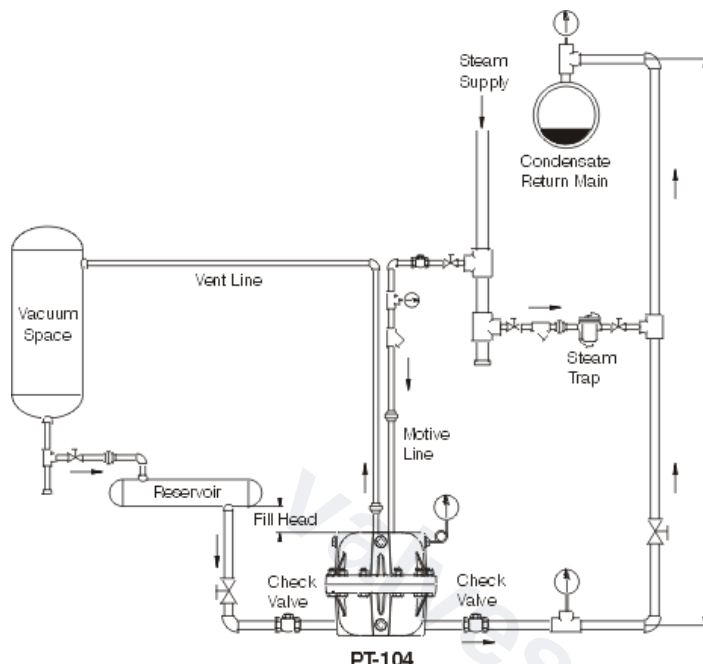


FIGURE 7: Draining liquid from equipment under vacuum. The Pumping Trap provides drainage assistance whether liquid discharge is to gravity or overhead.

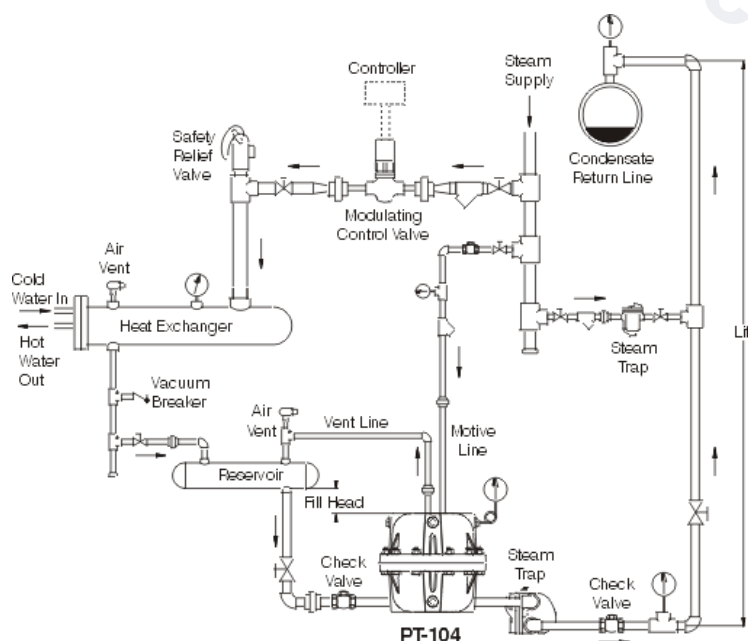
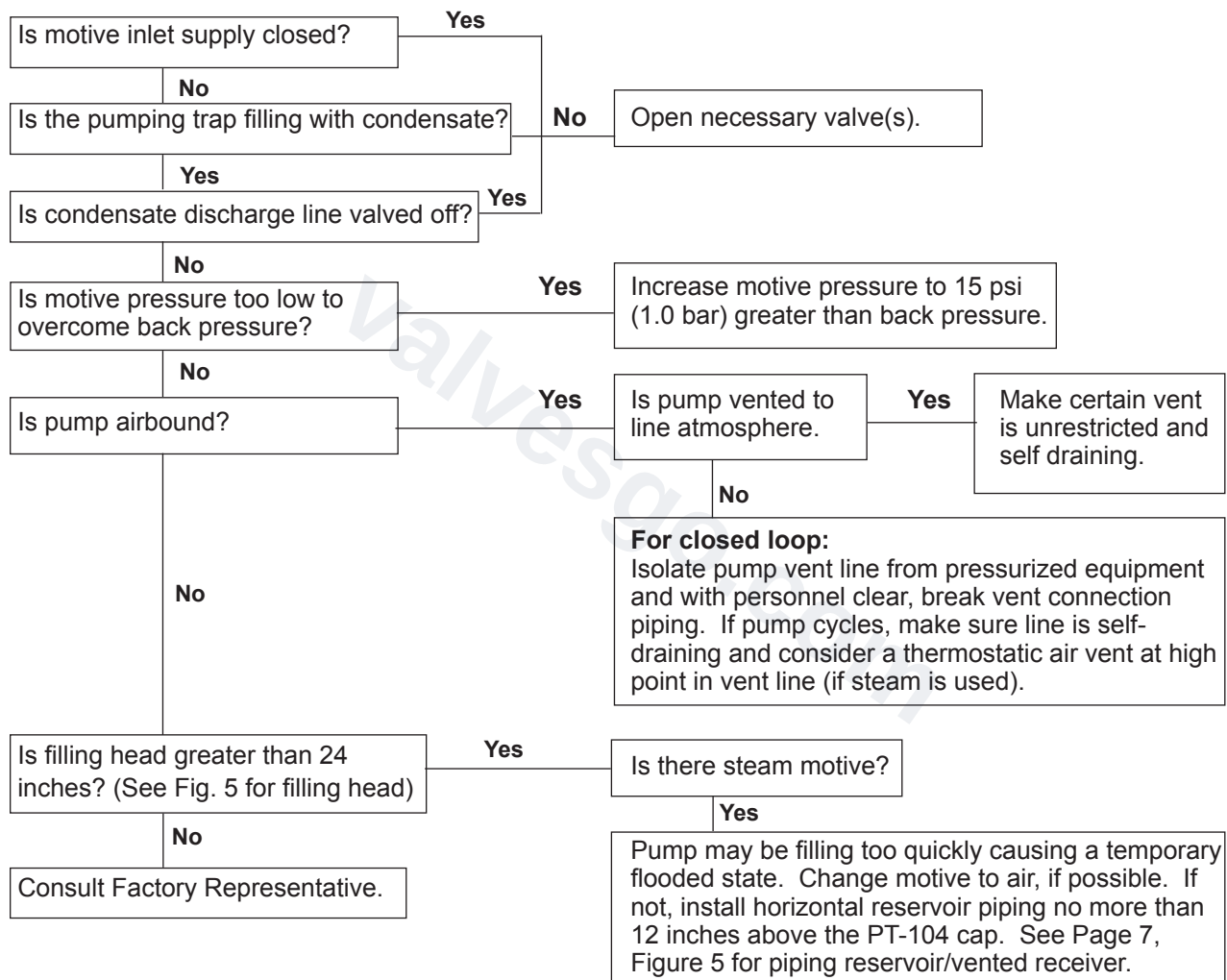


FIGURE 8: Drainage from a heat exchanger in a closed-loop system where the supply pressure may be higher or lower than the back pressure. If the heat exchanger pressure exceeds the back pressure the pumping trap will be idle and the steam trap will prevent the steam from "blowing through" into the return line. Motive force of steam is depicted. **NOTE: It is suggested that Armstrong Fluid Handling's Application Engineering Department be contacted prior to installation.**

TROUBLESHOOTING FLOW CHARTS

For Safety of Personnel - Motive line piping should be isolated from equipment and pump pressure should be relieved prior to breaking connections. **WARNING: WATER MAY RUN OUT OF THE VENT CONNECTION WHEN PIPING IS BROKEN. CARE SHOULD BE TAKEN TO AVOID DANGER TO PERSONNEL OR DAMAGE TO NEARBY EQUIPMENT.**

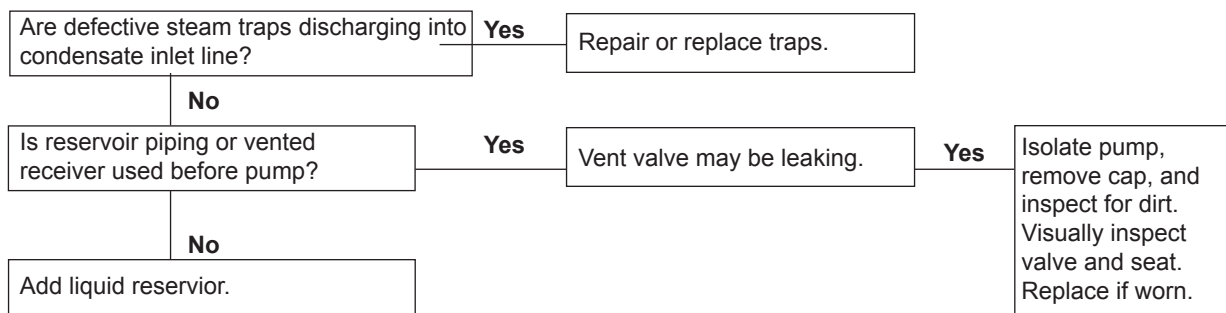
1. Pump Does Not Cycle During Start-Up



TROUBLESHOOTING FLOW CHARTS--Continued...

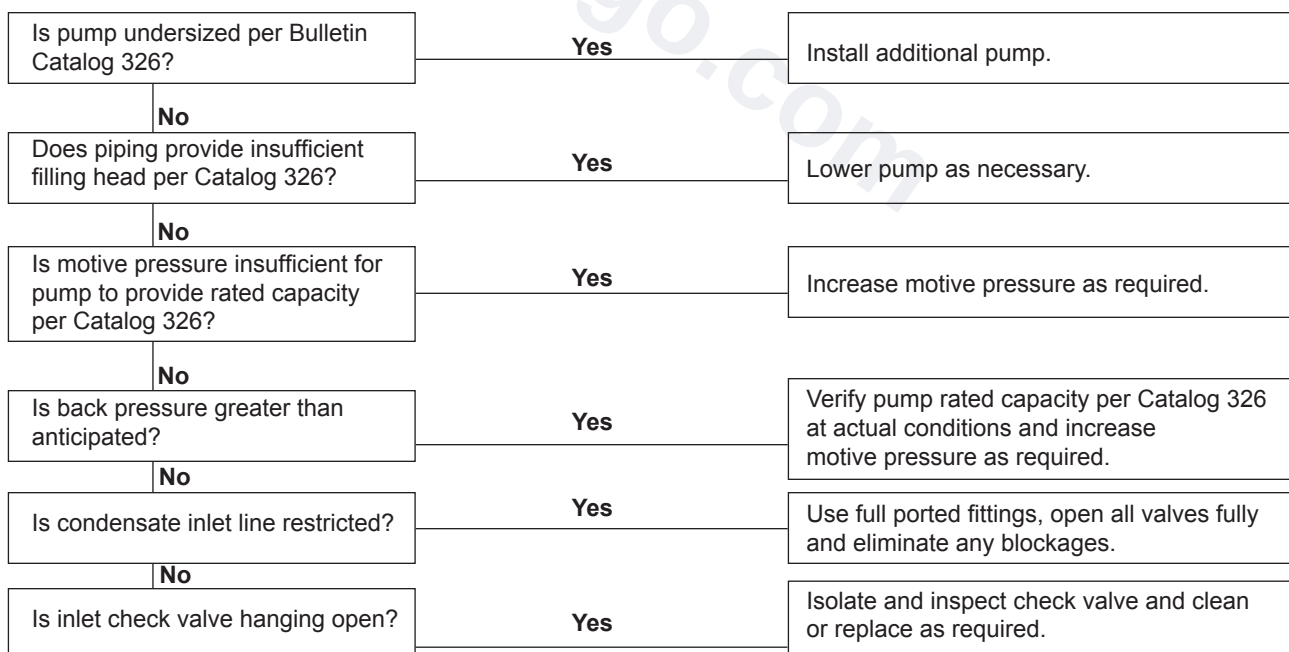
For Safety of Personnel - Motive line piping should be isolated from equipment and pump pressure should be relieved prior to breaking connections. **WARNING: WATER MAY RUN OUT OF THE VENT CONNECTION WHEN PIPING IS BROKEN. CARE SHOULD BE TAKEN TO AVOID DANGER TO PERSONNEL OR DAMAGE TO NEARBY EQUIPMENT.**

2. Excessive flash steam passed through vent



3. Pump cycles but equipment or piping is flooded

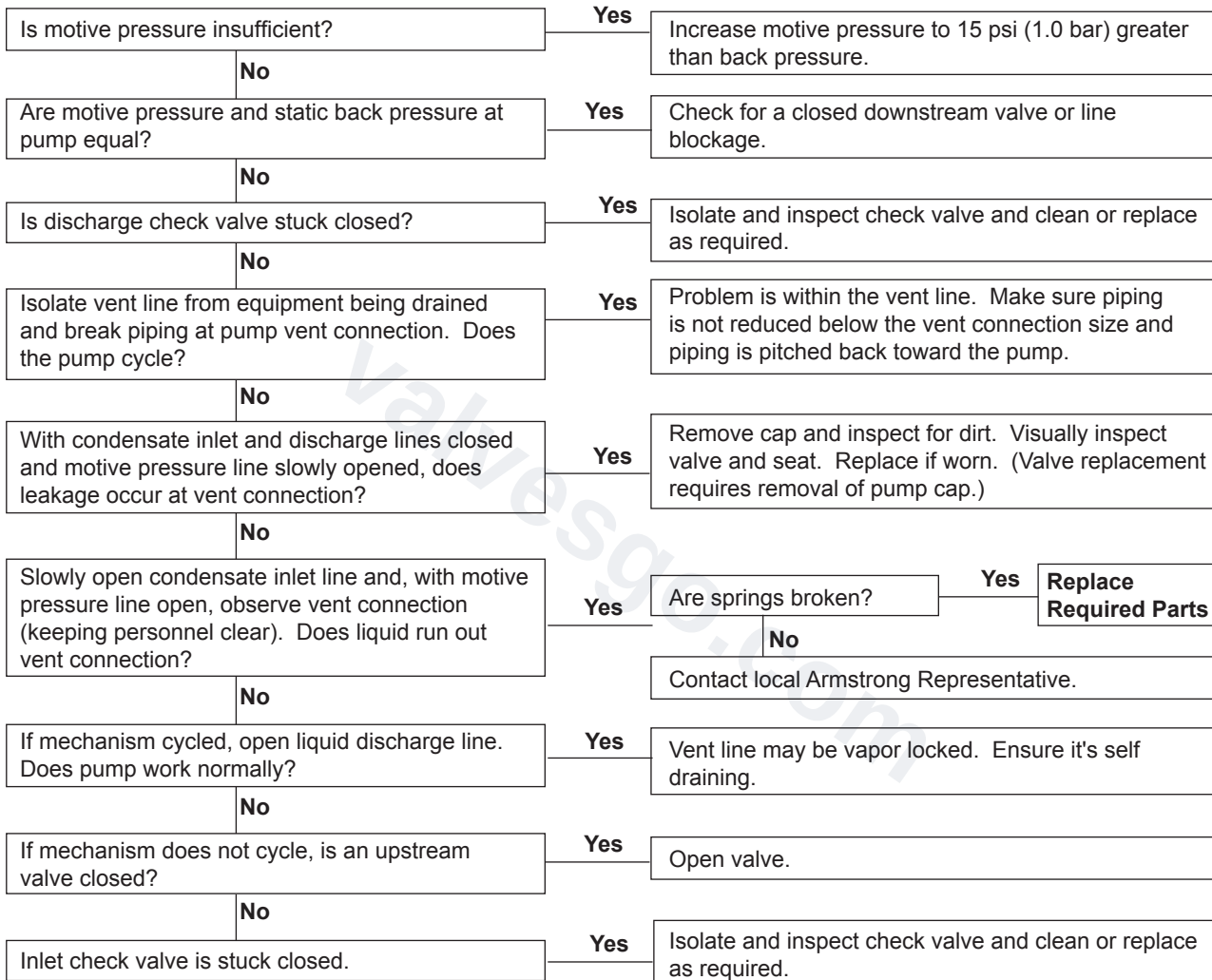
NOTE: See catalog 326 for sizing.



TROUBLESHOOTING FLOW CHARTS--Continued...

For Safety of Personnel - Motive line piping should be isolated from equipment and pump pressure should be relieved prior to breaking connections. **WARNING: WATER MAY RUN OUT OF THE VENT CONNECTION WHEN PIPING IS BROKEN. CARE SHOULD BE TAKEN TO AVOID DANGER TO PERSONNEL OR DAMAGE TO NEARBY EQUIPMENT.**

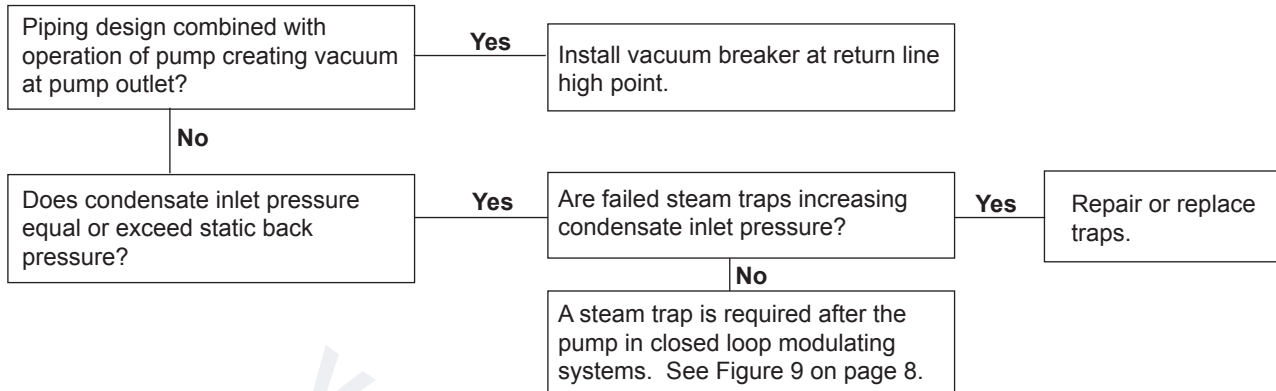
4. Pump stops cycling and equipment is flooded



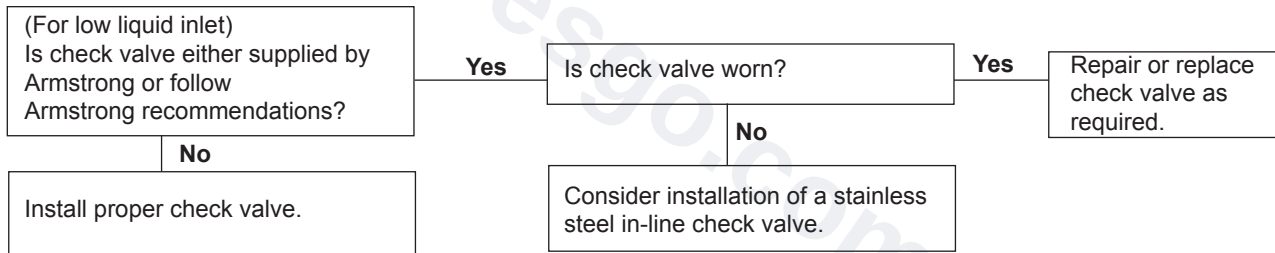
TROUBLESHOOTING FLOW CHARTS--Continued...

For Safety of Personnel - Vent line piping should be isolated from equipment and pump pressure should be relieved prior to breaking connections. **WARNING: WATER MAY RUN OUT OF THE VENT CONNECTION WHEN PIPING IS BROKEN. CARE SHOULD BE TAKEN TO AVOID DANGER TO PERSONNEL OR DAMAGE TO NEARBY EQUIPMENT.**

5. Chattering or knocking in return line after discharge



6. Excessive chatter from inlet check valve



For additional information on Pumping Traps, contact your Armstrong Representative and request Catalog 326.

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Special Warranty Periods are as follows:

Three (3) years after installation, but in no event longer than 39 months after shipment from Armstrong's factory.

PT100, 200, 300, 3500 and 400 Series Standard Pumping Traps.

PT100, 200, 300, 3500 and 400 Series Replacement Cap Assemblies and Rescue Cap ®.

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