

## INSTALLATION & MAINTENANCE INSTRUCTIONS

IM-5-203-US

October 2017

# Standard Pressure Powered Pump Packaged Units to Size 3" x 2"

Type PPEC, PTC & PTF with vented and ASME coded receivers

### Safety Information

Safe operation of these products can only be guaranteed if they are properly installed, commissioned, used and maintained by qualified personnel (see Section 1.11) in compliance with the operating instructions. General installation and safety instructions for pipeline and plant construction, as well as the proper use of tools and safety equipment must also be complied with.

### 1.1 Intended use

Referring to the Installation and Maintenance Instructions, name-plate and Technical Information Sheet, check that the product is suitable for the intended use/application.

- i) The products have been specifically designed for use on steam, air or water/condensate. The products' use on other fluids may be possible but, if this is contemplated, Spirax Sarco should be contacted to confirm the suitability of the product for the application being considered.
- ii) Check material suitability, pressure and temperature and their maximum and minimum values. If the maximum operating limits of the product are lower than those of the system in which it is being fitted, or if malfunction of the product could result in a dangerous overpressure or overtemperature occurrence, ensure a safety device is included in the system to prevent such over-limit situations.
- iii) Determine the correct installation situation and direction of fluid flow.
- iv) Spirax Sarco products are not intended to withstand external stresses that may be induced by any system to which they are fitted. It is the responsibility of the installer to consider these stresses and take adequate precautions to minimise them.
- v) Remove protection covers from all connections and protective film from all name-plates, where appropriate, before installation on steam or other high temperature applications.

### 1.2 Access

Ensure safe access and if necessary a safe working platform (suitably guarded) before attempting to work on the product. Arrange suitable lifting gear if required.

### 1.3 Lighting

Ensure adequate lighting, particularly where detailed or intricate work is required.

### 1.4 Hazardous liquids or gases in the pipeline

Consider what is in the pipeline or what may have been in the pipeline at some previous time. Consider: flammable materials, substances hazardous to health, extremes of temperature.

### 1.5 Hazardous environment around the product

Consider: explosion risk areas, lack of oxygen (e.g. tanks, pits), dangerous gases, extremes of temperature, hot surfaces, fire hazard (e.g. during welding), excessive noise, moving machinery.

### 1.6 The system

Consider the effect on the complete system of the work proposed. Will any proposed action (e.g. closing isolation valves, electrical isolation) put any other part of the system or any personnel at risk?

Dangers might include isolation of vents or protective devices or the rendering ineffective of controls or alarms. Ensure isolation valves are turned on and off in a gradual way to avoid system shocks.

### 1.7 Pressure systems

Ensure that any pressure is isolated and safely vented to atmospheric pressure. Consider double isolation (double block and bleed) and the locking or labelling of closed valves. Do not assume that the system has depressurised even when the pressure gauge indicates zero.

### 1.8 Temperature

Allow time for temperature to normalise after isolation to avoid danger of burns.

### 1.9 Tools and consumables

Before starting work ensure that you have suitable tools and/or consumables available. Use only genuine Spirax Sarco replacement parts.

### 1.10 Protective clothing

Consider whether you and/or others in the vicinity require any protective clothing to protect against the hazards of, for example, chemicals, high/low temperature, radiation, noise, falling objects, and dangers to eyes and face.

### 1.11 Permits to work

All work must be carried out or be supervised by a suitably competent person. Installation and operating personnel should be trained in the correct use of the product according to the Installation and Maintenance Instructions.

Where a formal 'permit to work' system is in force it must be complied with. Where there is no such system, it is recommended that a responsible person should know what work is going on and, where necessary, arrange to have an assistant whose primary responsibility is safety.

Post 'warning notices' if necessary.

### 1.12 Handling

Manual handling of large and/or heavy products may present a risk of injury. Lifting, pushing, pulling, carrying or supporting a load by bodily force can cause injury particularly to the back. You are advised to assess the risks taking into account the task, the individual, the load and the working environment and use the appropriate handling method depending on the circumstances of the work being done.

### 1.13 Residual hazards

In normal use the external surface of the product may be very hot. If used at the maximum permitted operating conditions the surface temperature of some products may reach temperatures in excess of 300°C (572°F).

Many products are not self-draining. Take due care when dismantling or removing the product from an installation (refer to 'Maintenance instructions').

### 1.14 Freezing

Provision must be made to protect products which are not self-draining against frost damage in environments where they may be exposed to temperatures below freezing point.

### 1.15 Disposal

Unless otherwise stated in the Installation and Maintenance Instructions, this product is recyclable and no ecological hazard is anticipated with its disposal providing due care is taken.

### 1.16 Returning products

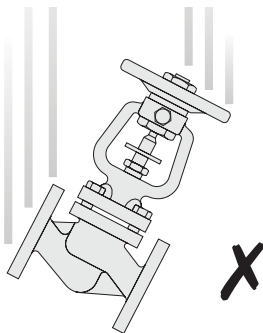
Customers and stockists are reminded that under EC Health, Safety and Environment Law, when returning products to Spirax Sarco they must provide information on any hazards and the precautions to be taken due to contamination residues or mechanical damage which may present a health, safety or environmental risk. This information must be provided in writing including Health and Safety data sheets relating to any substances identified as hazardous or potentially hazardous.

### 1.17 Working safely with cast iron products on steam

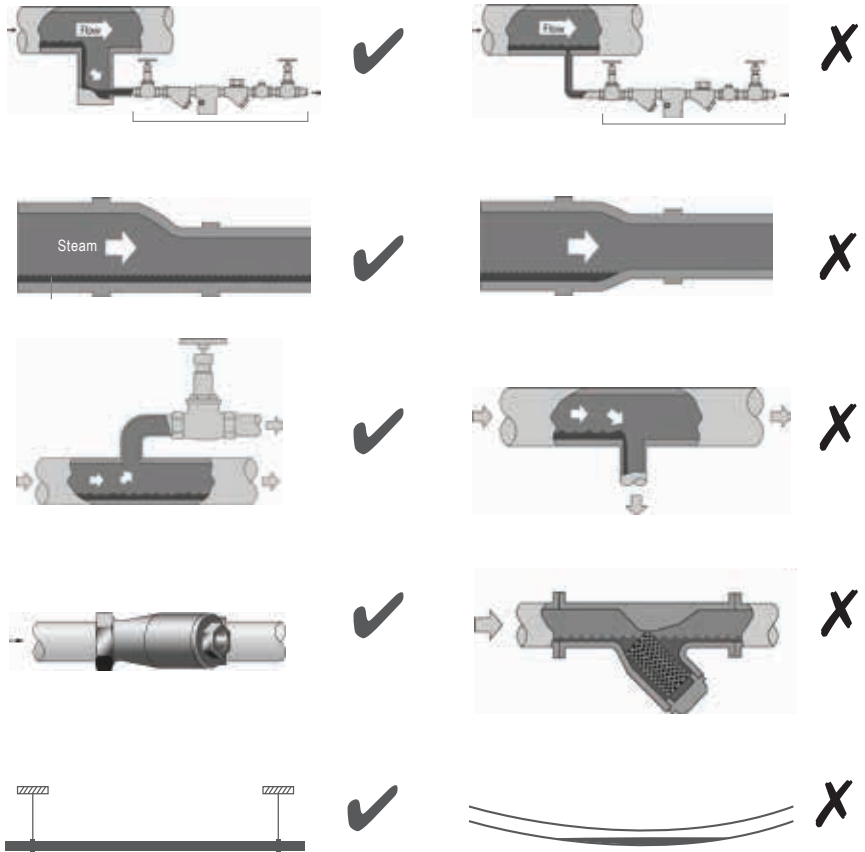
Cast iron products are commonly found on steam and condensate systems. If installed correctly using good steam engineering practices, it is perfectly safe. However, because of its mechanical properties, it is less forgiving compared to other materials such as SG iron or carbon steel. The following are the good engineering practices required to prevent waterhammer and ensure safe working conditions on a steam system.

### Safe Handling

Cast Iron is a brittle material. If the product is dropped during installation and there is any risk of damage the product should not be used unless it is fully inspected and pressure tested by the manufacturer.



### Steam Mains - Do's and Dont's:



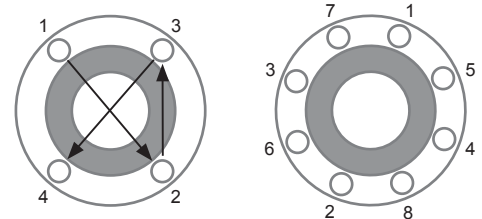
### Prevention of tensile stressing

Pipe misalignment:

Installing products or re-assembling after maintenance:



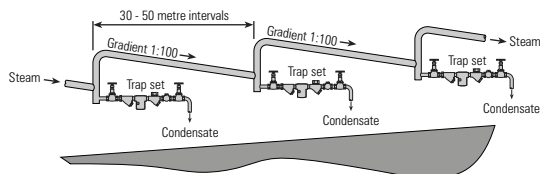
Do not over tighten.  
Use correct torque figures.



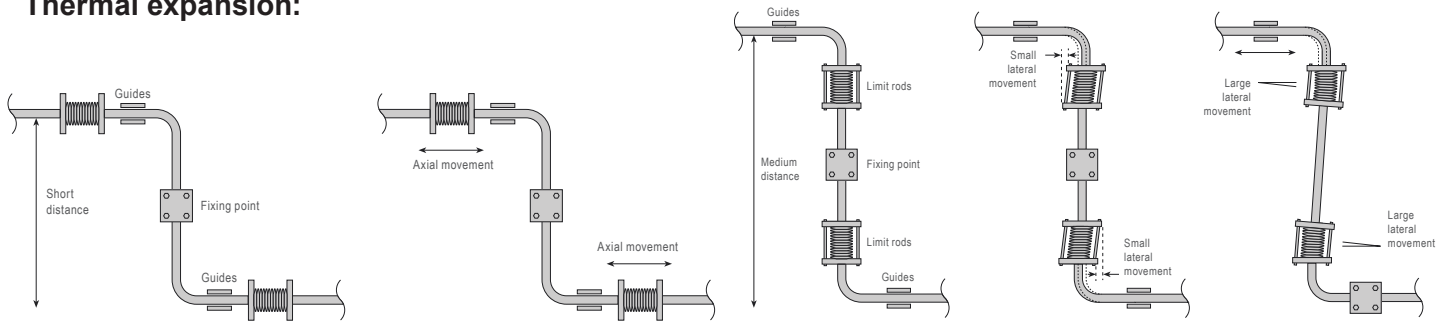
Flange bolts should be gradually tightened across diameters to ensure even load and alignment.

### Prevention of water hammer

Steam trapping on steam mains:



## Thermal expansion:



## Unit Configuration

Spirax Sarco Packaged Pressure Powered Pump units consist of an integral pump and receiver assembly, prepped to form an easily installed, readily serviceable pumping station. The Pump/Receiver packages allow separation of the liquid condensate from flash steam and any noncondensable gas. The receiver also provides a reservoir for condensate discharged from the traps during the discharge portion of the pump cycle when the pump inlet check valve is closed.

Type PTC vented receiver packaged units are used where the flash steam is discharged to atmosphere along with any noncondensables. The PTC package contains an iron pump body and fabricated steel receiver which must be properly vented.

The receiver may be purchased with an ASME code stamped receiver. This must be used when the packaged unit is to be used for flash steam recovery. Commonly a PTF, an ASME code stamped pump, will also be used for an ASME coded package unit.

Both the Type PTC and Type PTF units may be equipped with either one (simplex) or two (duplex or standby) Pressure Powered Pumps™ for handling condensate or other fluids of specific gravities down to 0.65. Order must specify when liquids of S.G. less than 0.9 are to be pumped. All pressure powered pumps™ used on packaged units operate using steam, air or other compressed gas from 5 to 200 psig as the motive force. For information on pump operation and service, Installation and Maintenance Instructions, IM-5-200, are enclosed with each pump. These should be reviewed prior to installation of any packaged unit.

## Supply Scope

As a standard this module includes the Spirax Sarco Pressure Powered Pump(s) with condensate inlet and outlet check valves. Also included is a condensate receiver that is piped with a valve and fitted to the inlet of the pump. Other items that may be included as an option are as follows:

1. Pump condensate discharge line valve
2. Pump inlet Strainer
3. Pump motive steam inlet line piping with valve(s) and motive steam line drip piping to the receiver with trap and valves (2)
4. Pump exhaust line piping to the receiver with valve(s)
5. Level gauge on pump and/or condensate receiver
6. Overflow pipe providing a water seal
7. Drain piping from the pump with valve
8. Cycle or pressure gage on pump

Note - If not purchased as an option, items 1, 3, 4 and 6 above need to be installed in the field for proper operation of the pump. These instructions are based on these items being installed.

Spare parts for component products are available. For full details and fitting/maintenance instructions see separate relevant Installation and Maintenance Instructions.

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## Receiver Connections:

Condensate Inlets - Each packaged unit is fitted with a condensate inlet on top of the receiver. Unless a strainer is included in the package a strainer should be fitted ahead of the receiver.

Vent/Low Pressure Steam Delivery - Each packaged unit contains a connection on the top to be used for an atmospheric vent; or on the packages with ASME coded vessels and pumps, it may be used as a steam delivery connection to a low pressure main or process. The receiver vent, unless ASME coded, must be piped unreduced and unrestricted to atmosphere. The vent line should be vertical. If a horizontal run is required the line must be pitched so that it is self draining to the reservoir.

Receiver Drain - All receivers contain a drain connection on the tank bottom. Each pump also has a drain connection that can have an isolation valve fitted to ensure the entire unit from the vessel to the pump can be drained when necessary.

Auxiliary Connections - All receivers contain three (3) ancillary connections which have been included as standard for the addition of: receiver gauge glass, motive steam trap station return, pressure gauge, pump exhaust connection to the vent, overflow connection for the addition of an overflow pipe required on all vented packaged systems.

Overflow Connection — Overflow piping must be used on a vented system. The overflow piping must be a 'U' bend water seal which has a 12" minimum depth. Once primed on start-up the water seal is self-filling and should be piped to a suitable drain. The addition of the overflow provides a safety mechanism ensuring the pressure within the receiver does not increase. The overflow is also a tool to diagnose system problems. In the event of the overflow spilling fluid the operator is immediately made aware of a system problem. This could include failed traps feeding the package failed pump and changes in system loads and overloaded receiver.

## Pressure Powered Pump Connections:

Motive Pressure Supply - Both the PTC and PTF have a 1/2" NPT motive pressure inlet connection. When pumping with steam, a strainer and drip trap should be installed immediately ahead of the pump(s).

Exhaust - The 1" NPT exhaust on both types should be connected unrestricted to the receiver vent line or low pressure steam delivery line. All horizontal piping must self-drain back to the receiver.

## Preparation of Installation

### Pipe line cleaning

To perform the efficient operation and to prevent any damage, the condensate return line from the process to the condensate receiver and the motive steam line must be cleaned to remove all dirt, slag and debris. Failure to clean the pipe may result in damage to the package components.

### Foundation

The foundation to which the skid is to be installed must be sound and level. The skid base should be set in non-shrink grout to support all surfaces of the structural base. Four (4) anchor bolt holes provided at the base frame (see drawing for location) to protect the skid movement by any possible external force.

## Vented Receiver Installation: (See Fig. 1)

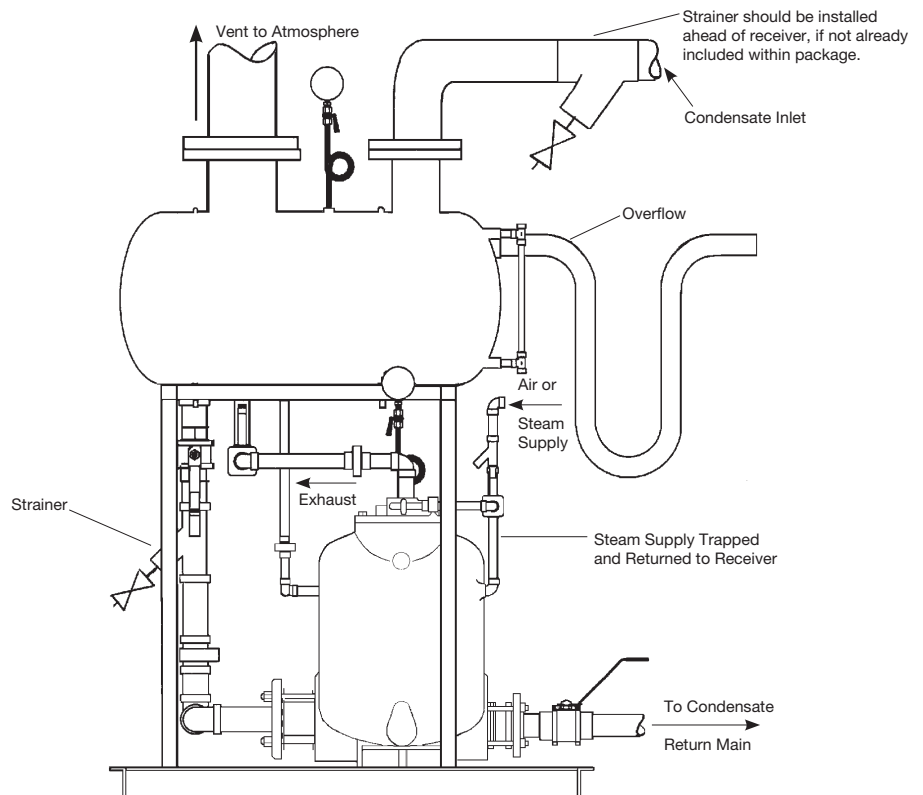
**Caution:** Before installation or any maintenance is performed, ensure that all steam, air or gas lines are closed to prevent personnel injury. Allow internal pressure to depressurize to atmospheric pressure and its surface to cool to room temperature before removal or disassembly.

1. Locate Packaged unit physically below equipment to be drained. Four (4) 5/8" dia. mounting holes are provided in the base for stud mounting.
2. Connect condensate inlet line to receiver connections. A strainer should be installed immediately ahead of the receiver if the strainer is not already included in the Pump Package. The strainer will protect the pump(s) and check valves against inline entrainment.
3. Pipe the atmospheric vent line to the connection shown in Fig. 1, making provision for also connecting the pump(s) exhaust line to the vent. To ensure full venting of the receiver the vent diameter should not be reduced between the receiver and the atmosphere. Reduction in the vent diameter will reduce the amount of flash vented and can increase the pressure in the receiver.

**Note:** Receiver vent connections are sized to keep flash steam within reasonable vent piping velocities. When noise is a consideration, a velocity of 0 to 50 ft/sec. is recommended and heavily loaded larger pumps may require larger size vent piping.

4. Connect the operating medium (steam, air or gas) supply to the 1/2" NPT pressure powered pump™ inlet connection. The motive pressure supply should have a strainer and a drip trap (steam service) or drain trap (air or gas service) ahead of the pumps(s). A 1/2" NPT tapping has been provided in the end of the receiver for the trap discharge as shown in Fig. 1. When condensate is pumped with compressed air, a check valve should be installed at the pump inlet to prevent back flow should motive pressure be lost.

**Figure 1**  
**Packaged Pressure**  
**Powered Pump Unit Venting**  
**Flash Steam to Atmosphere**

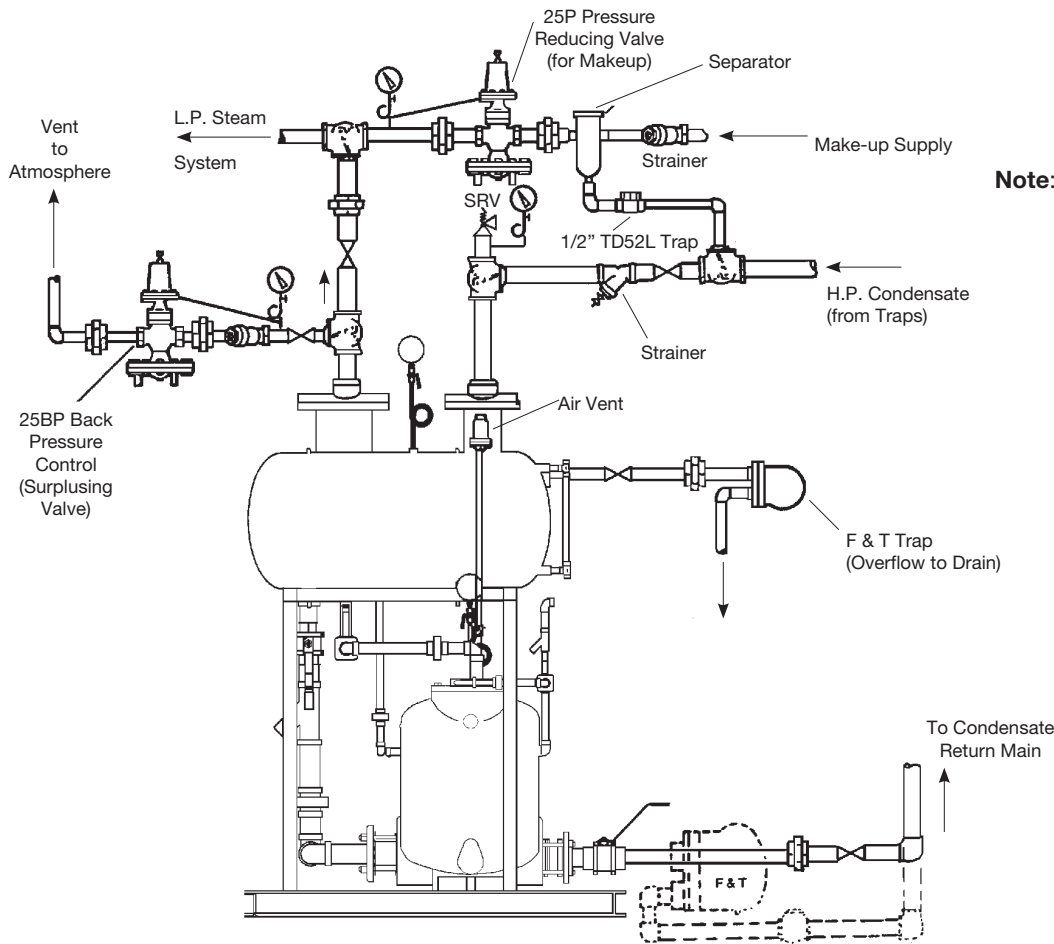


**Note:** When available steam or air pressure exceeds 125 psig, a pressure reducing valve is required to reduce the motive pressure supply to the pump. For best operation, motive pressure should be reduced to the minimum amount required to overcome back pressure maintain pumping capacity, this is usually between 15 and 20 psig above the back pressure. The P.R.V. (if fitted) should be located as far from the pump as possible.

5. Connect the 1" NPT pump exhaust line to the receiver vent line. Be sure this piping is self-draining back to the receiver and contains no obstructions, or reductions in pipe diameter.
6. Connect pump outlet to the condensate return main. It is recommended that a union a pressure gauge connection and fully ported shutoff valve be installed after the pump to facilitate maintenance and monitoring of the unit.
7. The receiver overflow piping must be used on a vented system. The overflow piping should be provided and piped to a suitable drain. The addition of the overflow provides a safety mechanism ensuring the pressure within the receiver does not increase. In addition the overflow is a tool to diagnose system problems. In the event of the overflow spilling fluid the operator is immediately made aware of a system problem This could include failed traps upstream feeding the package, failed pump, changes in system requirements overloading the package.
8. Prior to start-up, carefully check the receiver and pump and plug any unused connections. Installation of a thermometer and pressure gauge after the pump will be useful to check systems operation.

## Vented Unit Start-up Procedure:

1. Slowly open supply (steam, air or gas) to provide pressure at the P.P. pump inlet valve. Check that the trap is operational.
2. Open gate valves in the P.P. pump inlet and discharge lines.
3. Open valve(s) ahead of the unit allowing condensate to enter the receiver and fill the pressure power pump™ body. Pump will discharge when full.
4. Observe operation for any abnormalities. Pressure powered pump(s)™ should cycle periodically with an audible exhaust at the end of the pumping cycle. If any irregularities are observed, recheck installation instructions for proper hook-up. Consult factory if necessary.
5. Check that flash steam and pump exhaust are freely vented from the receiver vent piping. If quantity of flash suddenly increases, check condensate system for leaking bypass valves, steam traps or other similar problems requiring maintenance.
6. The overflow requires a water seal, 12 inches minimum, to prevent any steam from being vented in normal operation. Prime piping if necessary.



**Figure 2**  
Type PTF Packaged Unit  
Pressurized for Flash  
Steam Recovery

**Note:** Type PTF pump and receiver are ASME code stamped for 200 psig service. Return main back pressure must always exceed receiver pressure or a combination pump/trap is required as shown in dashed lines.

## Type PTF Pressurized Receiver Installation: (See Fig 2)

**Caution:** Before installation or any maintenance is performed, ensure that all steam, air or gas lines are closed to prevent personnel injury.

1. Locate unit physically below equipment to be drained. Four (4) 5/8" dia. mounting holes are provided in the base for stud mounting.
2. Connect condensate inlet line to receiver connections. A strainer should be installed immediately ahead of the receiver if the strainer is not already included in the Pump Package. The strainer will protect the pump(s) and check valves against inline entrainment.
3. Connect the low pressure flash steam system to the appropriate top connection using an isolating valve as shown in Fig. 2. Depending upon the quantity of flash steam produced and how it is utilized in the plant, additional equipment may be required to control the low pressure.
4. **Auxiliary Low Pressure Systems Controls.** When low pressure steam is always required and at times insufficient flash steam is produced, a Spirax Sarco 25P pressure reducing valve is needed to supply makeup steam from the high pressure system. This valve should be set to open when the desired L.P. (flash) supply drops 2 psig or more. When the quantity of flash steam produced at times exceeds the demand load, a Spirax Sarco 25BP back pressure control is recommended. The 25BP acts as a surplusing valve, venting only any excess steam from the receiver to atmosphere.
5. A suitably sized safety relief valve should be installed as shown in Fig 2. **Note:** A 25BP back pressure control is not a safety valve and should never be used for this purpose.
6. Connect the operating supply medium to the pump(s) at the 1/2" NPT pump inlet valve connection. For pressurized condensate systems, only steam is recommended. The supply main should have a strainer and be dripped with a steam trap ahead of the pump(s) inlet. For convenience, a 1/2" NPT connection has been provided in the end of the receiver for the drip trap discharge.

**Note:** When available steam or air pressure exceeds 125 psig, a pressure reducing valve is required to reduce the motive pressure supply to the pump. For best operation and to increase longevity of the pump, the motive pressure should be reduced to the minimum amount requires to overcome the back pressure and maintain pumping capacity, this is usually between 15 and 20 psig above the back pressure. The P.R.V. (if fitted) should be located as far from the pump as possible.

7. Connect the exhaust/equalizer line from the pump(s) back to the receiver top with a thermostatic air vent installed at a high point above the receiver as shown in Fig 2. These lines will equalize the pressure between the receiver and pump body.

8. Connect pump discharge outlet to the condensate return main. A union and a fully ported shutoff valve facilitate safe servicing and maintenance of the unit.

**Note:** If a condition could ever occur whereby the receiver tank pressure could exceed the static pressure in the condensate return piping, a suitably sized float and thermostatic trap should be fitted before the pump outlet check valve (see Fig. 2, dashed lines). The trap will prevent steam blow-by into the return main. For further information on pump/trap combinations, please consult the factory.

9. When it is desired to protect the unit from flooding due to pump malfunction, install a steam trap on the receiver side condensate overflow connection, or from a takeoff above the receiver at the maximum allowable water level. Pipe to a drain where any discharge will be noticed and the fault quickly corrected.

10. Prior to start-up, carefully inspect the receiver and pump, and plug any unused connections. Installation of thermometers and pressure gauges throughout the system will be useful to check operation.

### Pressurized Receiver Start-up Procedure:

1. Slowly open operating (steam) supply valve to provide motive pressure to the P.P. pump.
2. Open all gate valves in the P.P. pump condensate inlet and discharge lines.
3. Slowly open valve(s) allowing condensate and flash steam from high pressure system to enter the receiver. At start-up, air will be vented and flash steam will gradually pressurize the receiver. Liquid condensate falls to the P.P. pump and will be discharged when liquid level trips the float mechanism.

4. If a back pressure surplusing valve is fitted, it should now be pressurized and set to begin opening when the maximum desired receiver pressure is reached. This pressure should be determined with forethought.

**Note:** The 25BP control setting (receiver maximum operating pressure) may be greater than that normally desired in the L.P. main but must not exceed the pressure rating of the L.P. equipment being supplied. Also, it is recommended that the setting should not exceed 50% of the high pressure system steam traps. This is most important when H.P. equipment is supplied by modulating control valves. The back pressure control setting should also be at least 2 to 5 psig below the safety relief valve pressure setting. These recommendations allow maximum recovery of flash steam, and will prevent excessive back pressure from interfering with operation of the H.P. system traps and equipment.

5. In systems with a lower static pressure in the condensate return main, the float-thermostatic trap (Fig. 2, dashed lines) retains the flash steam in the unit.

6. The auxiliary 25P pressure reducing valve used for steam makeup should be set to open when the L.P. system pressure falls below the desired setting. It will then open only when there is not enough flash steam available and the L.P. system pressure tends to drop.

7. When the receiver pressure has been established, slowly open valve allowing flash steam to enter the low pressure main or equipment. Observe operation for any abnormalities. Pump(s) should cycle periodically with an audible exhaust. If any irregularities are observed, recheck installation instructions for proper hookup. Consult factory if necessary.

### Packing and Shipping

- Some components may be shipped loose. These items should be clearly identified and all hardware required for installation on the package is included.
- Skids with base dimensions of 48" x 96" or more than 1500 lbs are to be handled by a crane, (4) Lift lugs are provided at the corners of the skid.
- A suitable spreader bar should be used for proper lift and cables should not be over 25° from base. Please note that the center of gravity on each package may be offset from center.
- Be sure load is properly balanced and secure before moving. Do not lift higher than needed to move the unit from point to point.

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