Series VS1000

Vaporizing, Steam Heated,

Single Stage Pressure Regulator

INSTALLATION AND OPERATION MANUAL

Part Number 00-15000009

Revision 0

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1. DESCRIPTION

This installation and operation manual covers the Series VS1000 vaporizing, steam heated, single stage pressure regulator. The VS1000 is primarily used to ensure that a sample of the process fluid is supplied in the vapor phase at a regulated pressure to an analytical instrument. Steam flows through the inside of a 1/2 inch (12.7 mm) outside diameter tube inserted into the regulator body. Process fluid enters the body and flows around the outside of the tube. Energy is transferred from the steam, though the tube walls, to the process fluid. The steam is isolated from the process fluid by the tube wall. The process fluid is then regulated to a lower pressure—typically less than 100 psig (6.9 bar) to supply the analytical instrument.

Refer to the catalog data sheet or contact factory for a complete list of options and specifications. A typical VS1000 regulator is shown in Figure 1.

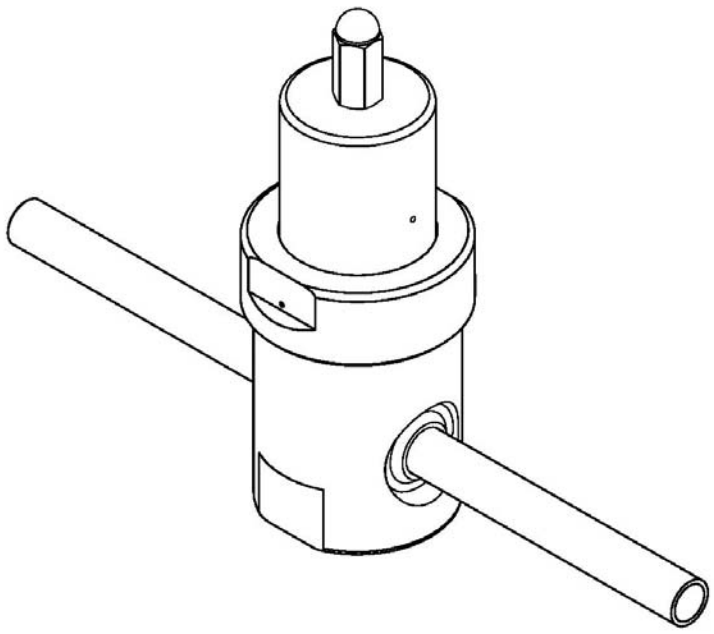

Figure 1. VS1000 Pressure Regulator

2. SAFETY

The user is strongly recommended to carefully read this section covering safety information and to adhere to specific safety information located throughout this manual. This section is NOT intended to cover all safety considerations with regard to equipment usage.

2.1. General Safety

All technicians that install, operate, or maintain this equipment should be trained in the use and hazards of the process fluids being delivered. These hazards can include high pressure, asphyxiation, toxicity, flammability, corrosivity, etc. Material safety data sheets are available that provide detailed information on the hazards associated with a particular media and emergency exposure procedures.

Appropriate personal protective equipment should be worn at all times as recommended by the material safety data sheet for the particular process fluid. Personal protective equipment may include safety glasses, safety face shield, rubber gloves, aprons, etc.

Never exceed the maximum working pressure of the equipment. An overpressure relief device should be installed on the low-pressure side of the regulator. The outlet of the relief device should be plumbed to an appropriate location.

Equipment shall be installed in a manner that meets local, state, and federal regulations and safety guidelines.

Prior to disassembling or removing equipment, the system may need to be purged using an inert gas to remove any hazardous fluids. Purging capability and procedures are the responsibility of the user.

The equipment should be inspected for leaks upon installation and periodically during operation.

2.2. VS1000 Specific Safety

Warning: Hot Surfaces. The external surfaces of the VS1000 will likely reach temperatures over 212˚F (100˚C) during normal operation. Do not touch without suitable protection or first measuring surface temperature.

Steam systems contain high-pressure, high temperature water that can leak and cause severe burns and scalding. Technicians should be trained in the proper use and operation of steam systems and be aware of potential hazards.

3. TECHNICAL SPECIFICATIONS

3.1.1. Marking

The VS1000 is marked with the following information:

Model number

Maximum inlet pressure

Maximum outlet pressure

Serial number

"HP" at high-pressure (inlet) ports

"LP" at low-pressure (outlet) ports

Note: Arrows are sometimes used to point from the "HP" or "LP" text to designate more than one high-pressure or low-pressure port.

3.1.2. Physical (refer to catalog data sheet or contact AP Tech for more detailed information)

- Standard regulator body dimensions are approximately 2 inch (51 mm) diameter by 6 inch (152 mm) high. Standard steam tube dimensions are 9 inch (229 mm) long and located 1 inch (25.4 mm) above the base of the regulator.
- Weight is approximately 2.5 lbs (1.13 kg).
- Standard mounting of regulator is by 2 each 10-32 threaded, 0.25 inch (6.3 mm) deep holes located in the bottom of the regulator on either side of the standard inlet port. Alternately, the inlet and outlet connections can be used to secure the regulator if the connections are of appropriate size and strength, and properly supported.

3.1.3. Porting

- Standard inlet: 1/8-27 NPT female
- Standard outlet: 1/4-18 NPT female
- Optional porting configurations available

3.1.4. Standard Pressure Ratings

- 3500 psig (241 bar) maximum inlet pressure
- 30 psig (2.1 bar), 100 psig (6.9 bar), 250 psig (17.2 bar), and 500 psig (34.5 bar) maximum outlet pressure options (specified when ordered)
- Optional pressure ranges available

3.2. Facility Requirements

The following is needed to install the VS1000 at the users facility.

- Steam supply and return lines
- Mounting brackets
- Appropriate pipe or tube fittings
- Teflon® thread tape (pipe dope sealants are not recommended as some types can leach impurities into the process fluid lines or may react with the process fluid)
- Various tools

4. INSTALLATION

This section describes how to install the equipment at a user facility.

4.1. General

Review all pertinent safety information before proceeding with installation.

Do not drop the Series VS1000 regulator because damage may result.

Inspect the equipment before installation. If any damage is observed, contact factory for repair.

4.2. VS1000 Mounting

Mount the regulator using the two 10-32 threaded holes, located 1.50 inch (38.1 mm) apart, on the base of the regulator and on either side of the inlet port using appropriate mounting brackets. For non-standard models, consult the factory for mounting location.

4.3. VS1000 Pipe Connections

Standard connections are female NPT (internal taper pipe thread type). The inlet port is marked “HP”. The outlet port is marked “LP”.

Use Teflon pipe thread tape on NPT connections. On 316 stainless steel connections, it is recommended that Teflon tape is applied to the first NPT thread to prevent galling upon assembly. Use care not to apply Teflon tape such that loose tape will come free and enter the flow path.

Connect the process fluid supply line to the HP port on the regulator.

Connect a process fluid delivery line from the LP port to the intended point of use. Some installations will supply an analytical instrument with a low flow and supply a higher flow to a vent or return line to improve analyzer response time.

Verify the VS1000 is fully closed by removing the acorn nut and turning the stem fully counterclockwise using a 5/32-inch hex key until no load is being exerted on the range spring. Reinstall the acorn nut over the stem finger tight.

Label the process fluid lines with the fluid name, flow direction, operating pressure, temperature warning label, etc. as appropriate.

4.4. VS1000 Steam Connections

The VS1000 steam tube is a 1/2 inch (12.7 mm) outside diameter, 0.049 inch (1.24 mm) wall thickness 316L stainless steel tube. Connect supply and return steam lines using compression type tube fittings, automatic tube welding, or other appropriate assembly technique. Either side of the steam tube on the VS1000 can be connected to the steam supply.

Label the steam lines with the fluid name, flow direction, operating pressure, temperature warning label, etc. as appropriate.

4.5. Leak Test

It is recommended that before introduction of the process fluid that a system leak test be performed using nitrogen or clean dry air. Slowly pressurize system and use soap solution to check connections for leaks. Once operating pressure has been reached, shut off the source pressure and monitor for a pressure decay for a minimum of 4 hours.

5. OPERATION

This section describes operation of the equipment.

5.1. VS1000 Pressure Adjustment

WARNING: If steam is being supplied to the regulator, then use appropriate protection from heat sources.

It is recommended that the pressure be adjusted with steam heating the process fluid under flowing conditions. This will prevent liquid from condensing in the low-pressure delivery line.

- Apply supply pressure to the VS1000.
- Remove the acorn nut from the stem.
- The outlet pressure is adjusted by rotating the stem with a 5/32 inch hex key. Turning the stem clockwise will increase the outlet pressure. Turning the stem counterclockwise, while a downstream vent valve is open, will decrease the outlet pressure. Final adjustment should be made while fluid is flowing and in the clockwise direction to obtain the most accurate set point.
- Once the outlet pressure has been set, reinstall the acorn nut and tighten acorn nut against cap to prevent inadvertent adjustment.

6. TROUBLESHOOTING

The most common problem conditions and possible causes/corrections are described below. Please contact the factory for assistance with other problem conditions.

6.1. Leak

Possible causes:

Connection not assembled properly with Teflon tape.

Connection not tightened properly.

Inspect equipment to determine the source of the leak. If the leak is from the bonnet of the regulator, then AP Tech recommends that the regulator be sent back to the factory for repair. Repair other leaks by disassembling the connection, inspecting parts, and reassembling using good shop practice.

6.2. Process fluid is not being vaporized

Possible causes:

Steam supply is shut off.

Steam heat is not sufficient to vaporize the process fluid or process gas flow rate is too high for heat transfer rate from steam tube.

A number of factors can contribute to this problem such as inlet pressure, delivery pressure, regulator insulation, process line insulation, and process gas thermodynamic properties that are too complex to describe in this manual. Please contact the factory to discuss a particular application.

6.3. Loss of outlet pressure

Possible causes:

Process fluid source is shut off.

Regulator stem is adjusted fully counterclockwise.

Contamination is restricting the process fluid flow.

6.4. Unstable outlet pressure

Possible causes:

Contamination is on the regulator internal parts (poppet or seat).

Equipment being supplied by regulator is starting and stopping flow.

6.5. High outlet pressure

Possible causes:

Contamination is on the regulator internal parts (poppet or seat).

Liquid is forming in process delivery line and vaporizing.