SCVH Series
Quick Installation Guide

Using This Guide

The purpose of this guide is to highlight external factors to the conditioning valve that should be taken into consideration prior to installation and commissioning of the SCVH Series Steam Conditioning Valve. These are only guidelines and each system should be carefully assessed prior to installation. A full installation and maintenance instruction set is supplied with each bespoke unit.

Disclaimer

This guide is available for the customer solely to assist in the design, installation and testing of the system. It is assumed that the person(s) using this guide already have a high level of understanding in the safe operation and maintenance of mechanical and electrical systems used within the pressurized steam system.

These guidelines do not cover all aspects of any installation and must be used in parallel with the relevant installation and maintenance instructions for the selected SCVH, and any equipment(s) pertaining to the safe operation of the system.

Should further information be required, please contact Spirax Sarco directly.

Orientation

The Spirax Sarco Hiter SCVH can be installed in almost any orientation, however it is recommended that the stem travel be in the vertical position for optimum performance, and minimizing disruption during scheduled maintenance procedures.

For SCVH installation in the horizontal plane, please consult Spirax Sarco reference support. Larger actuators, or those that operate with very short travel times could require additional support.

The SCVH must never be installed with the actuator mounted vertically below the valve. Sudden steam emission from failed gland seals could result in safety concerns and contamination of the positioning equipment suspended below.

Installation

The SCVH must never be designed as a pipeline anchor point or load bearing structure. The pipework both feeding in and feeding out from the SCVH must be adequately supported and secured. The SCVH should never be at the low point of a steam system (see drainage section).

Maintenance

Installation must take into consideration all maintenance aspects of the SCVH and its accessories. Depending upon valve size and location, a suitable railed access platform and crane should be made available for these procedures.

All maintenance procedures should be undertaken by a minimum of two trained and experienced maintenance personnel. Steam systems can be dangerous especially at the elevated temperatures and pressures that the SCVH typically operate within.

Cooling Medium

The cooling medium (or spray water) must be of a suitable quality and temperature. This information must be confirmed prior to the selection of any SCVH steam conditioning valve.

A 100 mesh strainer must be installed prior to the temperature control valve. A regular inspection plan should be implemented in order to maintain optimal performance of temperature control valve, and the SCVH. Failure to install a strainer can lead to premature failure of either of these devices.

For SCVH installations that utilize a secondary injection system on the outlet of the valve, a 100mesh strainer must be installed in line at the distribution collar in order to prevent any scale or debris from blocking the spring assisted nozzles.

Cooling medium pressure should be a minimum of 7.0 bar (101.5 psi) above the operating steam pressure. The steam assisted atomization helps reduce pump head requirement compared to typical nozzle only type arrangements, as well as improving the rate of atomization and droplet dispersion. For installation using a secondary nozzle arrangement, please contact Spirax Sarco by Hiter for guidance.

A high cooling medium temperature is usually beneficial to desuperheating performance since the water droplets are closer to vaporization temperature and have a lower surface tension. However for low pressure applications, vapor pressure must be checked in order not to generate flashing within the atomization chamber which can lead to both valve damage and restriction of cooling medium flow.

A check valve must be installed between the SCVH and the temperature control valve in order to prevent reverse flow through the control loop in case of failure.

Pre-Heating

Pre-heating is not a requirement of all systems. Pre-heating reduces the risk of thermal stress and helps prevent the build-up of condensate. It is recommended that any critical, intermittent use valve (e.g. those used as a bypass) have a pre-heat system installed to minimize thermal shock and maximize valve life. Pre-heating also helps protect the downstream piping that may be fabricated to a lower pressure and temperature rating.

Insulation

All SCVH valves must be insulated. Access to bonnet and gland studs must be maintained in order for inspection and routine maintenance procedures. All pipework, both upstream and downstream should also be thermally insulated.

The insulation should not be used as a means of attenuating noise to the environment. The SCVH should be properly selected in order to minimize the environmental impact and the propagation of noise (vibration) to downstream equipment(s).

Pipework

Upstream and downstream pipe sizes are determined by a combination of the process conditions and the requirement for a turbulent flow regime to optimize the absorption of the cooling medium into the steam flow with zero overspray and accurate control of set point. The final calculated size if provided during the selection process, once all of the in-service parameters have been pre-determined.

Wall thickness and material will be determined by the relevant pressure class and temperature, and should, for connection to the valve at least be of similar material to the selected valve.

Upstream pipework must rise toward the inlet of the steam conditioning valve body. It is recommended that the minimum rise be at least 1-1.5° of elevation. This assists gravity to prevent the build-up of condensate at the inlet to the pressure reduction stages of the valve when closed.

Downstream pipework must have a fall away from the steam conditioning valve. Because the mass of condensate and cooling medium is likely to be greater, the fall should be a minimum of 1.5-2° of elevation away from the valve exit.

All bends should be swept in order to minimize pressure drop and reduce the potential for erosion. Also, for the mixed vapor downstream of the desuperheater, bends can act as a separator, assisting the fall out of the water droplets before they have had the chance to vaporize. For the cooling medium supply pipework, please consider the pressure drop through long runs of pipe with a tortuous path. Sometimes local pressure boosting may be required.

Pipework material should match the valve body pipework, especially for welded units.

Pipe	Number of Diameters	Minimum Length m (ft.)
Steam inlet	>5 x Ø	At least 2-5 m (6-16 ft.)
Steam Outlet	>10 x Ø	At least 3-5 m (10-16 ft.)

Drainage

Drainage of the downstream pipes is critical to safety and plant operation. Uncontrolled build-up of condensate or over-spray can lead to water hammer, erosion and poor loop control, and should be avoided at all cost. The SCVH should never be installed at the low point of a steam system in order to facilitate adequate drainage and prevent deterioration of the valve or system.

For steam inlet pipes, provision for drainage should be made on the nearest riser or 5m (16.4 ft) upstream of the SCVH inlet (whichever is nearer). For installations with the steam inlet pipe feeding from above the valve, the drainage point should be at the base of the fall, or 5m (16.4 ft) upstream of the SCVH inlet (again, whichever is nearer).

It is recommeded that upstream drainage points should be at least DIA.1" NB. Steam traps sould be sized in line with normal line drainage applications, however a bypass is also recommended. Please consult Spirax Sarco for more information.

For SCVH applications that are not direct in-line to a condenser, correct drainage of the downstream pipework is again imperative to plant performance and safety. Drainage points should be made at the first rise or fall of the downstream steam pipework or 12m downstream (whichever is nearer). The drainage point should be a maximum of ¾ of the distance between SCVH and temperature sensor.

Downstream drainage points should be of the full diameter dirt pocket type, with the ability to blowdown and inspect up to a maximum of DN200 (DIA. 8”).

Steam traps should be sized depending on the control loop employed. Feed forward control loops provide the lowest risk of overspray and therefore the steam traps can be sized at a maximum of 10% of Maximum or Design cooling medium requirement. A trap selected on this measure will not only remove condensate build-up but also remove any cooling medium build-up as a result of a passing temperature control valve.

For installations controlled by a temperature feedback loop, with an approach temperature of TSAT +20°C (68°F) the steam trap should be sized to remove 25% of Maximum or Design cooling medium requirement. For installations where the apporach tempertaure is lower (down to the minumum recommended +8°C (46.4°F), the steam trap should be increased to take in to account 35-50% of available spray water. These increases in capacity take into account the reduced level of control available through a feedback loop and the resultant increased likelihood of overspray.

Downstream Temperature Transmitters

Temperature transmitters are installed downstream on feedback systems as the sole reference for the control loop, and on feed forward systems as a means of checking and trimming the main control loop.

It is recommeded that 3 temperature transmitters are used, inserted into the pipe at 120° intervals, with the first transmitter mounted in the top of the pipe. The reading should be averaged and this average used by the DCS to modulate the yemperature control loop accordingly.

The temperature transmitters must be located at a point where the vapourisation of the cooling water is complete. This is determined by a number of factors including approach temperature, cooling water temperature and cooling water ratio. Each application is calculated but the following distances can be used as a guide.

Degrees of superheat	Number of Diameters	Minimum Length m (ft.)
>100°C (212°F)	>10 x Ø	At least 5 m (16 ft.)
<100°C (212°F)	>10 x Ø	At least 10 m (33 ft.)

If there is insufficient downstream distance to fit the temperature sensors, the steam conditioning valve must be controlled using a feedforward architecture.

Downstream Pressure Transmitters

Pressure measurement mustbe taken once pressure hs fully recovered after the valve. It is recommended that the pressure transmitter is placed at least 5 x Ø downstream of the valve exit or any bend in the pipework. The pressure transmitter must be protected with a suitable buffer or snubber that it cannot be damaged by the elevated steam temperatures. If using a water barrier, ensure that there is enough column of water to mitigate the risk of flashing this column away during periods of flow, pressure and temperature oscillation.

Temperature Control

The type of control methodology used to operate the SCVH is determined by the most critical operating scenario. Whichever method is selected, the pressure control valve must open before the temperature control valve in order not to generate a build-up of water that could be propelled downstream at a considerable velocity.

Feed Back Control – Temperature

The majority of applications used feedback control. A DCS or controller monitors the recorded temperature from a downstream temperature sensor set and adjusts the mass of spray water entering the system by modulation of the temperature control valve. There is always a lag in the system since the control output is based upon an event that has already occurred.

Feed Forward Control –Temperature

For instantaneous loads, or installations without the physical distance to install temperature monitoring several meters downstream, feed forward control should be considered. This method uses a heat balance equation within the DCS to prescribe the correct mass of cooling medium to the measured superheated steam flow in order to de-superheat the steam to the desired set point.

A feedback loop can be used to trim the temperature if required once the steam flow or system stabilizes.

Pressure Control

Feedback control for pressure is the only means available and due to the fast loop speed, accuracy can be maintained. lation.

System Blowdown and Purging

Prior to commisioning of a new valve, careful consideration for the removal of debris from the line must be taken. Flushing through the system and repeat cleaning of the straineers may be required.

Failure to remove debris from the system could result in the failure of the valve in service, sometime even during the commsioing phase itself.

It is recommended that prior to commissioning, a steam Blowdown Device is installed into the valve in place of the standard trim. This fixture allows the nomal plant blowdown procedures to be undertaken without risk of damage to the valve trim.

Blowdown must only be understaken by competent, trained individuals, and all safety interlocks and procedures must be thoroughly assesed and inspected prior to undertaking the routine.

Start-Up and Commissioning

Plant using steam conditioning valves will have a start up routine. For high temperature applications, or those that are of intermittent duty, ensure that the pre-heat of the system is undertaken before any on-load movements are made.

Steam systems should be warmed and pressurized slowly in order to mitgate the risk of water hammer, thermal fracture or pressure safety valves lifting unnecassarily.

Commissioning Spares

A full set of commissioning spares should be available on site at all times. These will be routinely quoted with every SCVH, and are detailed in the Installation and Maintenance instructions, and consist of a full set of soft spares (i.e. seals and gaskets).

It is recommended that a blowdown device is available for the valve, and for valves installed in a system with a history of mechanical damage from debris, it is recommended that a spare valve trim be held on site also.

Spares must always be sourced from Spirax Sarco Hiter, and must never be reused once removed from a valve, even if un-used.