

Spray Rinse & Steam Handling



SchuFI 

The Fetterolf Spray rinse valve Type 27 SR was developed to wash residue from large tank or reactor walls without having to open or enter a vessel.

This feature has two key benefits: safety of personnel for applications with toxic fluids and to reduce cleaning time in batch processes.

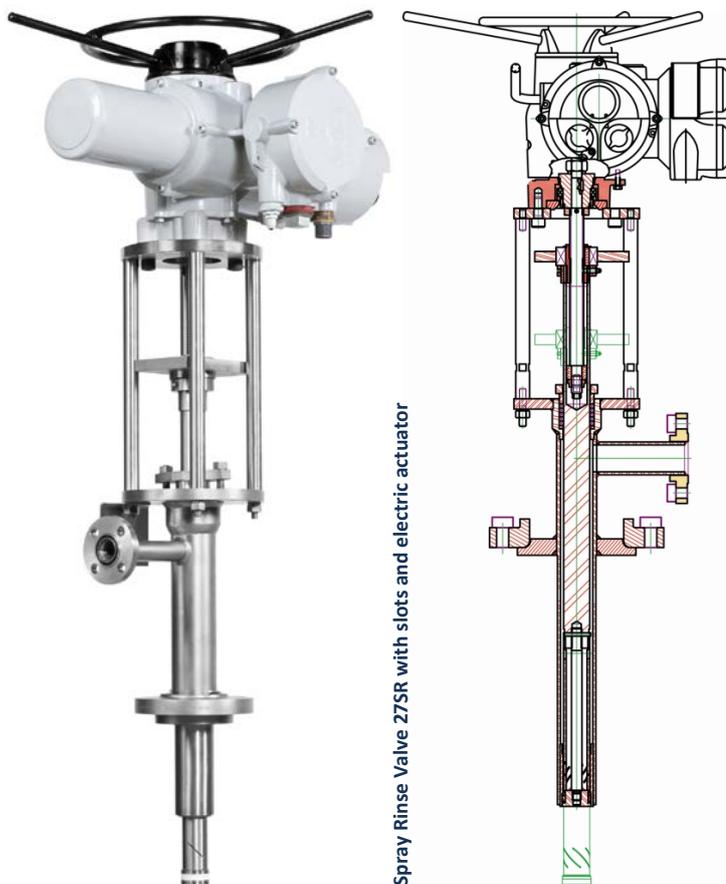
Spray rinse valves are frequently found in the Plastics & Polymer (especially PVC), Fine Chemicals and Pharmaceutical industries. It ensures a **unique two stage** efficient spray pattern, while maintaining a simple, rugged design, utilizing the famous **SchuF** metal-to-metal shut-off, first developed in the 1920's.

Application

Spray rinse valves can be used to clean vessels after each batch operation. Water, steam, solvents and anti-sticking agents can be injected and are sprayed in a distinct and efficient pattern into the vessel. This leads to longer uninterrupted reactor production cycles and the most cost efficient use of cleaning agents. They are also used in vessel rinsing applications with toxic media in order to ensure personnel safety.

Operation:

In operation, the spray tube assembly is moved out of the valve body to initiate the spray and retracts back into the valve body after the washing cycle. In the closed position the valve disc is flush with the end of the valve body and the spray head is tightly sealed off from the process – and remains clog free.



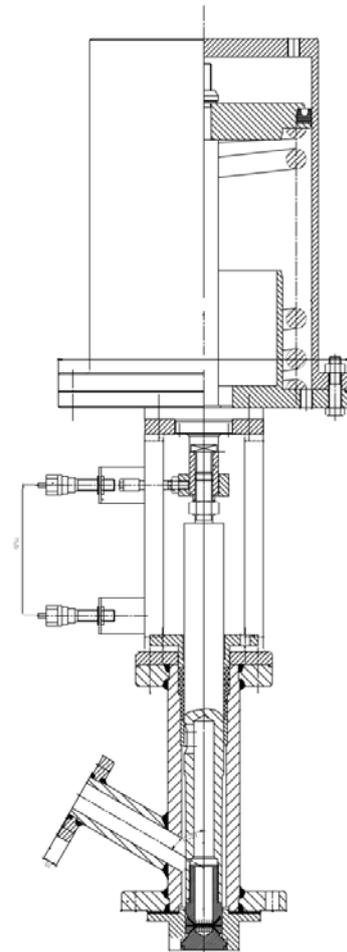
As the valve opens, water is initially concentrated at the vessel bottom, gushing between the spray head and the seat. Only after the residue at the bottom of the reactor has been dislodged are the spray slots allowed to emerge. These ensure a 360° spray pattern as it fans out to spray sideways and, increasingly, backwards. To ensure full pressure and concentrated flow the straight down direction is now closed off. At the end of the stroke the distribution of spray apertures ensures a 360° spray pattern, directed principally at the top of the vessel as required by, for example, the PVC industry. As the valve closes a continuing flow of water prevents clogging until the positive metal-to-metal shut-off guarantees leak-free, bubble-tight shut-off.

The device efficiently performs the dual functions of:

- Shut-off and control of the spray water
- Direction of the spray in a varying pattern to attain complete wash-down of the residue. The valve can also be used to distribute anti-sticking agent.

Key Features:

- Standard sizes 3/4" up to 2" (DN 50) and ASME 900#
- positive metal-to-metal shut-off
- Customised spray pattern, pressure & volume
- Zero leakage to atmosphere and process—dual Ram seal design
- Exchangeable seat and spray head
- No clogging guaranteed, due to pre-designed "leakage" path
- Rotating or linear spray head
- Electric or pneumatic actuation
- Optional position switches
- Easily retrofitted to existing reactors



Spray Rinse Valve 27SR with nozzles and pneumatic actuator

Benefits

- Increased batch process productivity and Reduced maintenance, e.g. eliminates the need for vessel opening and closing between batches
- Protection against toxic emissions
- Optimised water & solvent consumption
- Directing the use of water, steam, solvents and anti-sticking agents

Steam injection valves are primarily used in the chemical, pharmaceutical and petrochemical industries. They are used to inject steam or any gas into a reactor or vessel.

Application

There are two common applications:

1. Direct and quick pre-heating of media and/or vessels
2. Steam stripping and sanitisation to remove monomers or impurities in polymerisation processes. The choice of a piston or disc injection valve design is process and media driven:
 - A solid piston design is suitable for full bore, high flow rate applications with vibrations.
 - Disc style injection valves are more suitable where space is limited, the required flow rate is low or where low or zero emissions to atmosphere are important.

Key Features:

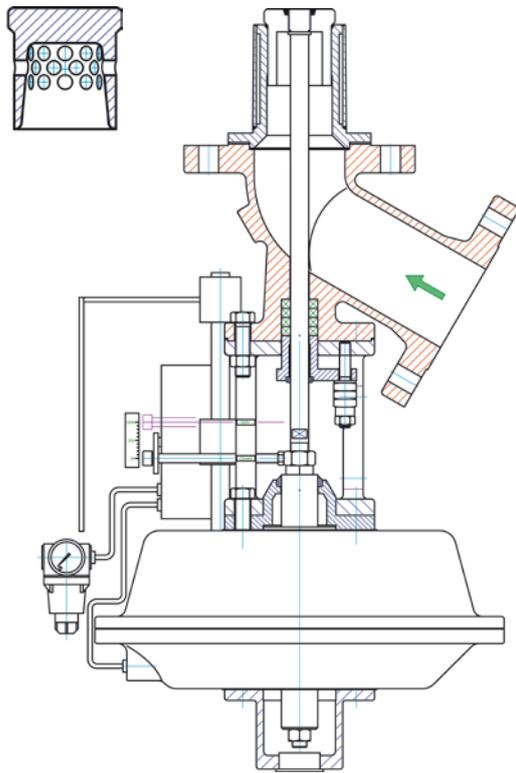
- Piston or disc valve design
- Metal to metal sealing
- Replaceable seat and injection head
- Customised arrangement of holes for any required gas or vapor injection
- Non clogging

Operation

The valve is typically installed at the bottom of a vessel. Steam is injected into the inlet, flows through the hollow injection stem and exits through up to 2000 dispersion holes. Constant steam pressure ensures that there is no back-flow and keeps the dispersion holes free of sediment build up. The valve operates according to a linear step control curve characteristic. This allows a pre-determined number of hole rings to be exposed as required by the process.

Most batch polymer processes begin as endothermic reactions and require heat to get started. This can be accomplished by heating the vessel either through a jacket or by inner coils. An alternative method gaining more and more acceptance is that of direct steam injection. Here steam is injected at the bottom of the reactor using SchuF's patented steam injection valve, the type 27SE.





A piston rising valve, it features a variable number of holes arranged in a stepped linear manner along the piston. A positioner allows you to control the flow of steam into the reactor. The different distribution angles of the injection holes ensure an even steam distribution throughout reactor, thus ensuring maximum thermal efficiency with minimal dilution effect.

This valve is also used for the stripping or desoderizing of the batch at the end of reaction. Here steam is injected and allowed to bubble up through the batch removing or stripping away the free monomers, as well as residues and impurities.

Benefits

- Time saving vessel pre-heating
- Evenly distributed steam pattern
- Step-linear flow rate control
- Optimised steam usage
- Avoids steam hammer effects

Desuperheater (Temperature Control) Valve

While superheated steam is often available as an energy source, the use of saturated steam is actually more desirable and efficient. This steam conditioning valve's function is to lower and maintain the steam's temperature down to saturation by adding varying amounts of water. Also useable for any other application that involves adding a cold liquid to a hot gas, the valve was developed from the SchuF steam injection valve. Spray nozzles are designed to atomise the liquid to optimise the heat transfer. The quantity of injected water is varied by varying the amount of injection nozzles through which the water passes by positioning the spindle. This eliminates the need for an additional in line control and maintains a maximum pressure drop through each individual nozzle, optimising the atomisation and minimizing droplet size.

Features:

- Counterflow nozzles designed to ensure atomisation with a delta P as low as one bar.
- Valve C_v from 0,05 to 15 with 3,4,6,8,9 or 12 nozzles in the spray head.
- Nozzles are staggered, so that almost perfectly linear control is achieved.
- Piston sealing rings titanium nitrided for better sealing and smoother running.
- Graphite packing and nitrided spindle ensures perfect, leak-free sealing to the outside while maintaining the low packing friction important for good control.
- Special materials available for non water/steam applications.
- Available with pneumatic diaphragm or piston actuator, air motor, hydraulic or electric actuators. Intelligent or standard positioners as per customer preference.

Also available as a **steam assisted desuperheater** for applications with lower cooling water pressures and higher steam speeds (5 bar > $P_w \geq 3$ bar, $v_s \geq 15$ m/s).

Sizing

$$M_w (h_o - h_w) = M_s (h_i - h_o)$$

where M_s is the mass flowrate of the steam (kg/h)

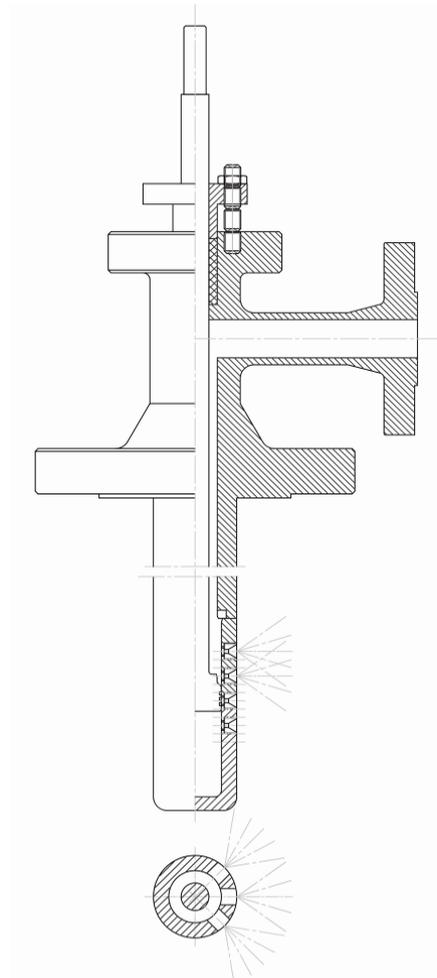
M_w is the mass flowrate of the injected water (kg/h)

h_i is the enthalpy of the inlet steam

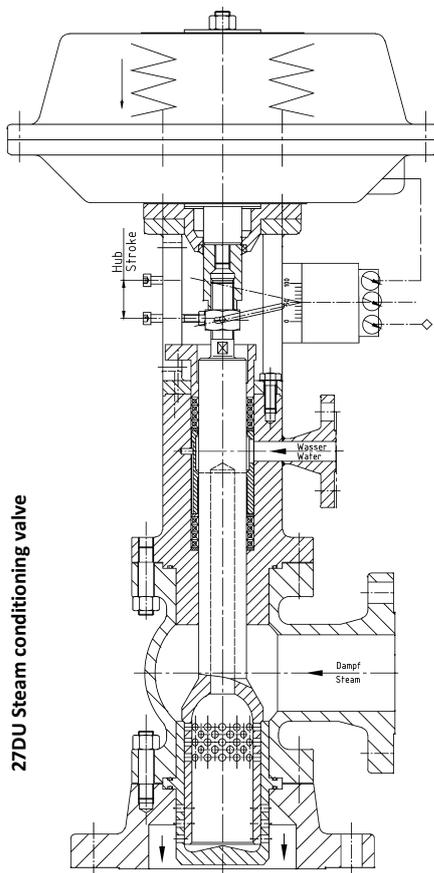
h_o is the enthalpy of the outlet steam

h_w is the enthalpy of the injected water

The maximum water to steam ratio ($100 \cdot M_w / M_s$ %) should not exceed 10% at low pressures, 20% at medium pressures. The temperature sensor should be at least 12m from the desuperheater, the minimum straight pipe length at least 4m.



These valves reduce and control the pressure and temperature of steam. Steam is generally generated at high temperatures and pressures to ensure high turbine efficiencies. Other steam users in steam heating, heat exchangers use low pressure and temperature steam. A steam conditioning valve produces this steam. A steam control valve is often used as a boiler feed control valve, to control the flow of steam into the boiler.



Features:

- In contrast to the control valve, for steam conditioning cooling water is injected through the spindle in proportion to the stroke and therefore the steam flow through the valve.
- A two stage pressure drop is standard but up to two more stages can be added in the seat area and up to three fixed silencer plates can be fixed in the widened outlet.
- This multi stage reduction splits the pressure drop across each stage and reduces noise.
- Wear, erosion and corrosion are minimised by the choice of special cage and seat materials, as well stellite or Colmonoy treating.
- The valve disc is pressure relieved so the actuators can be relatively small.
- Graphite packing and metallic, specially hardened sealing surfaces.
- Special materials available for non water/steam applications.
- Available with standard PM actuator but also with piston actuator, air motor or electric actuators.
- Intelligent or standard positioners as per customer preference.

27DR

Steam Control Valve

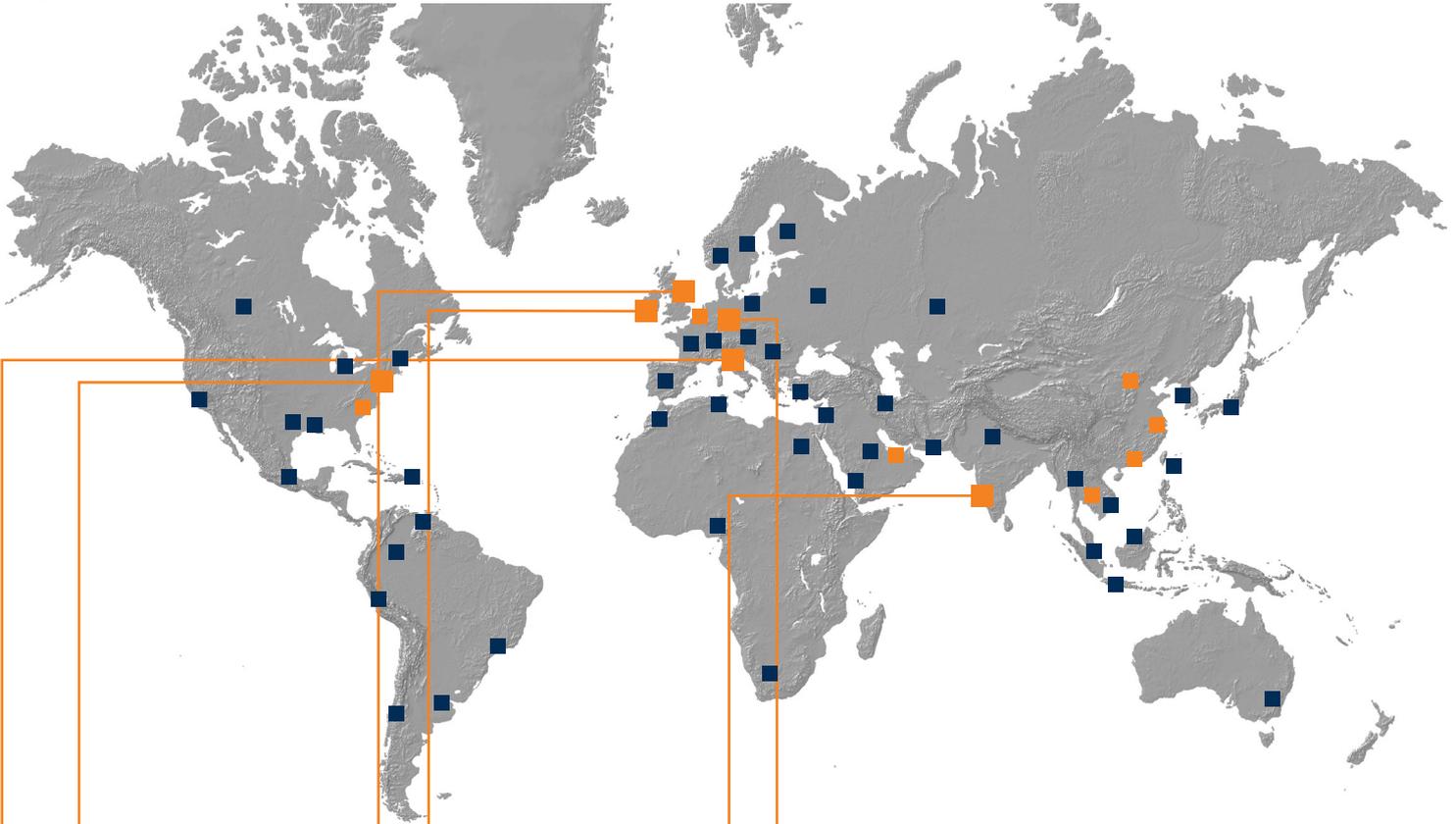
controls the flow through the valve and thus the pressure into, say, the boiler. No cooling function. With 2-4 stage cage and up to 3 fixed noise reducers.

27DU

Steam Conditioning Valve

Combines a control and cooling function. The further the valve opens the greater the product through put and the more cooling water is added.

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