VST-SE for Steam Conditioning Applications

CCI - The leader in innovative steam conditioning solutions for over 70 years.

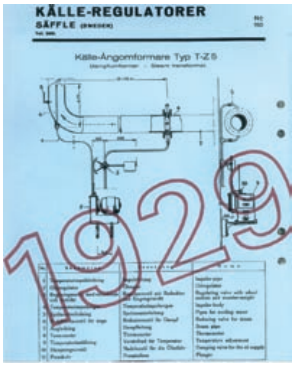


Figure 1: In 1929, Kalle-Regulatorer/Eur-Control/BTG (now CCI) invented the first steam conditioning valve designed for pulp and paper industry. This led to the installation of turbine bypass valves in the 1950's.

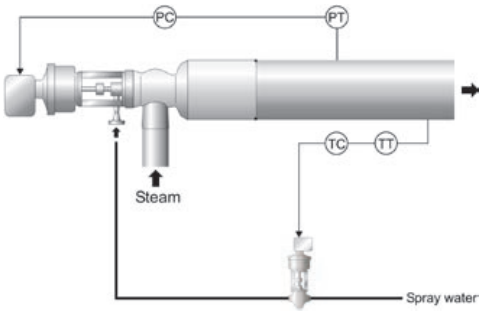


Figure 2: CHP steam conditioning system performance is critical for plant efficiency.

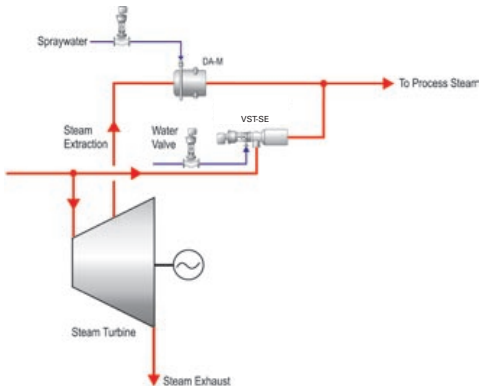


Figure 3: CHP process application with CCI desuperheating systems are designed for maximum performance and reliability.

What Is a Steam Conditioning Valve?

A steam conditioning valve converts steam from an incoming state (pressure and temperature) to a predetermined required outlet state (pressure and temperature).

Pressure reduction is carried out with a pressure reducing trim within the valve body, usually multi stage pressure reduction. The pressure is controlled by an upstream or downstream pressure controller, signaling the valve to modulate to maintain the pressure at the required set point.

Temperature is controlled by adding water to the steam in such away that it will get fully evaporated in the steam (termed desuperheating). A separate water valve supplies the correct amount of water to the desuperheating nozzles or desuperheating mechanism within the steam conditioning valve. A downstream temperature transmitter and a controller dictate the amount of water mixed with the steam.

Combined Pressure Reduction and Desuperheating Ensure Maximum Performance and Reliability

The VST range of valves are primarily used in industrial (CHP) and utility power plants for conditioning of auxiliary and process steam.

Availability of the VST-SE in the turbine bypass application for steam supply to the process is critical. Reliability and performance are paramount to the operation of the plant. The CCI VST-SE design with its unique features stands alone in the industry for steam conditioning applications.

Requirements for Steam Conditioning

Many industries such as pulp & paper, refineries, sugar and petro-chemical facilities require steam at a temperature very close to saturation. If the steam is supplied at a temperature too high, the product or equipment can be damaged. If the temperature is too low there will be excess water. If the required control is lost, severe damage to piping and downstream equipment occur, resulting in expensive maintenance cycles and loss of production (refer to figure 2.)

CCI's VST-SE Designs Resist Thermal Shock and Fatigue

Steam turbine bypass valves are closed for long periods, therefore subjecting the valve and the piping to temperatures approaching saturation. In some cases valves will have to withstand temperature changes (thermal shock) greater than 200 C (393 F) in less than 2 seconds. The CCI VST-SE valves are designed specifically to operate reliably in these conditions (with repeatable tight shutoff and no distortion.) A special two piece seat design provides extra thermal flexibility to ensure reliable shutoff.

CCI's VST-SE design provides high reliability and performance in one steam condition valve.

Figure 4: CHP in pulp and paper application using VST-SE steam conditioning valve

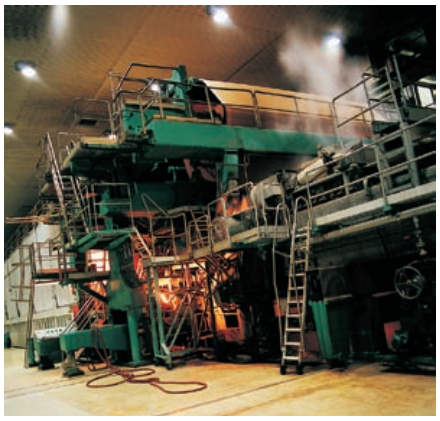


Figure 5: VST-SE for paper making using low pressure steam for paper making

Figure 6: VST-SE for more reliable and efficient operation at petrochemical facilities.

High Rangeability Designs Maximize Output

Steam conditioning applications require high turndown of desuperheated steam flow to maximize system output and provide for higher system reliability. Typically high pressure to process turbine bypass systems require 50 to 1 or greater turndown with respect to desuperheated steam flow. The CCI VST-SE valves are designed to achieve higher MW and heat generation outputs by minimizing the controllable steam flow to meet process demand. Immediate improvements in the performance of the plant can be realized.

In-built Water Proportional System Manages Flow and Temperature Transients

Owing to process demand, there are often system transients. Typically, when there is a sudden change in flow, for example from 100% flow to 50%, then there must be a corresponding change in water flow to maintain downstream temperature. The problem with conventional valves is that the Pressure reducing element of the valve will change the steam flow, but there will be no change in water flow until the temperature control system reacts and sends a signal to appropriately adjust the spraywater flow. However in reducing steam flow there will be overspray resulting in wetting of temperature sensor and causing system instability and water fall out. Likewise, when flow is increasing, there will be overheating of the process steam until the system responds, by which time the downstream equipment or process causing the system to possibly trip. The solution is to proportion the water with the steam as the transients occur.

Modulated Steam Atomization Designs Provide Advanced Desuperheating Capabilities

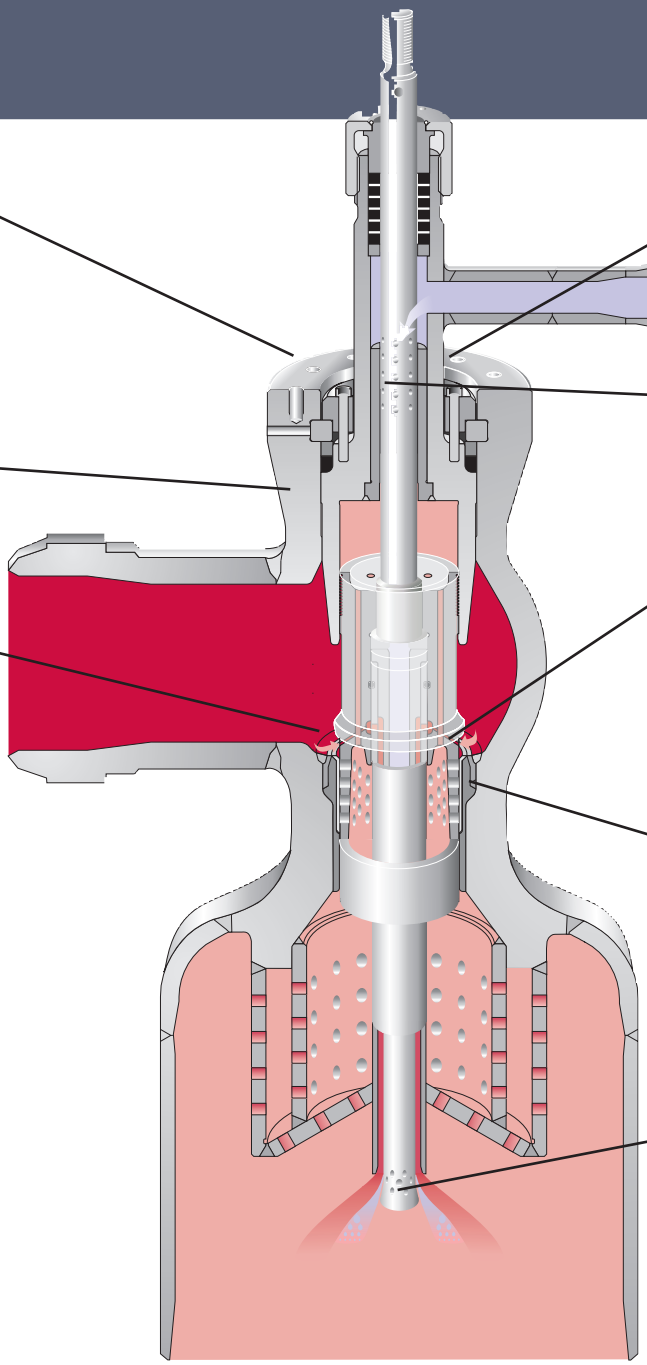
The CCI BTG VST-SE valve injects water with the steam as the flow transients occur (termed steam atomization desuperheating). Spraywater for desuperheating is only introduced after final pressure reduction. The final pressure reducing elements are specifically designed to optimize the flow pattern for desuperheating.

Modified Linear Trim Characteristics Provide Extra Fine Control at Low Flow Conditions

Steam is passed through the center of the valve steam to steam atomize the spraywater. At higher flow requirements of above 5% steam flow (above 15% stroke) the main cage is exposed and the steam flow modulates normally through the control section, providing a linear flow characteristic, maximizing steam flow at high flows.

For low flow requirements of 0-5% steam flow (0-15% stroke) the steam flow is only passed through the steam atomizing channel in the plug, and is controlled by the position of the main plug, uncovering sequential holes leading to the atomizing channel as the stroke increases. Greater steam atomization at low flows is realized.

CCI's BTG VST-SE design provides high reliability and performance in one steam condition valve.



Pressure Seal Bonnet

Maintains tightness regardless of thermal transients.

Forged Fully Machined Body

Handles thermal fatigue critical for reliable service.

Two-piece Seat

Special two piece seat resists damage from thermal transients.

Gasket Minimized

Gaskets are a leak source when valve is subject to thermal transients.

Top Entry Design

In-line repairable for ease of inspection and maintenance.

Built-in Water Proportioning System

Unique design manages flow and thermal transients.

Low Flow Steam Atomizing Channel

Allows for a high turndown with respect to desuperheated steam flow of greater than 50 to 1.

Protected Seat Design

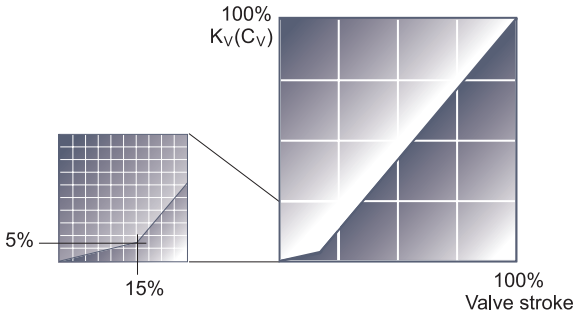
Throttling happens across the cage holes in the inlet cage plug and therefore the seat is protected from high velocity steam.

Steam Atomized Desuperheating

Provides superior desuperheating capabilities.

Valve Performance Characteristics

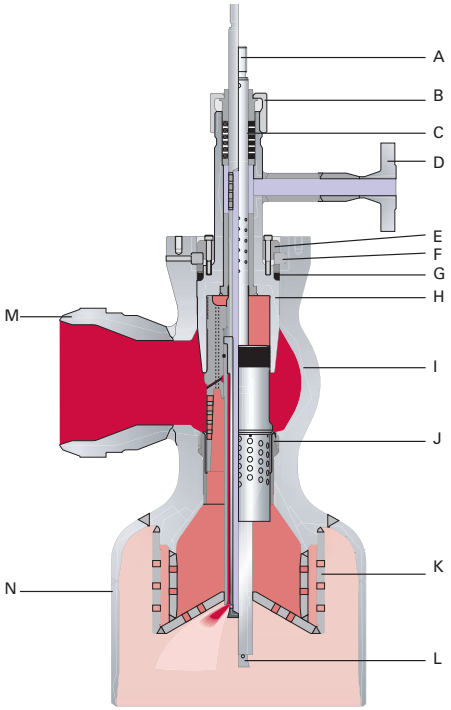
The VST-SE control curve is customized for superior performance.



Use this checklist to evaluate the benefits of CCI's BTG VST-SE steam conditioning valve.

	Benefits	VST-SE	Competitors
1	**Improves Plant Performance.** Turndown: Provides unequalled control of downstream pressure and temperature.	✓	
2	**Increases MW Output and Optimizes Plant Flexibility.** High turndown maximizes the steam flow and therefore MW from the steam turbine.	✓	
3	**Provides Better Reliability.** Valve is designed specifically to handle severe thermal shock conditions normally associated with turbine bypass applications.	✓	
4	**Lower Installation Costs.** Steam atomization provides quicker evaporation of water allowing closer location of bends and temperature transmitters.	✓	
5	**Lower Maintenance Costs.** Valve designed specifically to provide longer intervals between maintenance and to allow easy access to all components for shortened downtime.	✓	
6	**Reduced System Cost.** Each valve is custom engineered for the application, with connections to suit selected piping and ensure the ease of installation.	✓	
7	**Lower Noise.** The VST-SE will be custom designed with sufficient pressure reducing stages to meet most noise requirements.	✓	
8	**Lower Operating Cost.** Owing to special plug and seat design: - repeatable and reliable seat tightness is achieved.	✓	
9	**Extended Seat Tightness Life.** No wear on seat while throttling, as it is only active at shutoff.	✓	
10	**Reliable Smooth Operation.** The valve is guided in two areas, with long guiding surfaces and not subject to distortion.	✓	
11	**Extra Fine Control at Low Flows.** All of the steam flow below 5% flow (15% stroke) is steam modulated atomized flow, inducing fine flow control.	✓	
12	**Very High Actuating Forces Can be Accepted.** The actuating force is transferred from the plug to a shoulder on the valve body via the seat, thereby preventing distortion of the valve seat.	✓	

Technical specification and materials of construction.

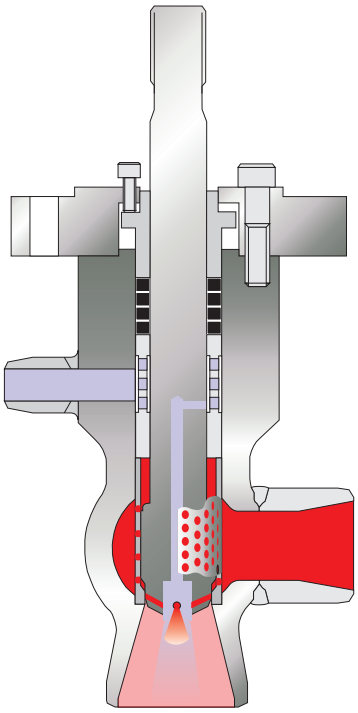


VST-SE Valve for Steam Conditioning

Table 1: Materials of Construction

	Description	European Material Standard	ASTM Material Standard	Comments
A	Stem/Plug	X19CrMoVNbN11-1	~AISI 616	Surface Hardened
B	Gland Bush / Nut	X20Cr13	~AISI 420	Bush Surface Hardened
C	Stem Packing	Graphite	Graphite	
D	Water Conn. /Flange	PG245GH/13CrMo4-5	A105/A182-F12	
E	Cover Plate	PG245GH	A105	
F	Spacer & Segment Ring	X10CrMoVNb91	A182-F91	
G	Pressure Seal Gasket	Graphite	Graphite	
H	Bonnet	11CrMo9-10	A182-F22	Surface Hardened
I	Valve Body	PG245GH/13CrMo4-5/11CrMo9-11/ X10CrMoVNb91	A105/A182-F12,-F22/ A182-F91	
J	Seat	11CrMo9-10/ X10CrMoVNb91	A182-F22/ A182-F91	Seat HS25 Hard faced
K	Pressure Reduction Unit	St35.8/13CrMo44/ 10CrMo910/ X10CrMoVNb91	A106/A335-P12,-P22/A335-P91	
L	Nozzle	X19CrMoVNbN11-1	~AISI 616	Surface Hardened
M	Inlet	PG245GH/13CrMo4-5/11CrMo9-11/ X10CrMoVNb91	A105/A182-F12,-F22/ A182-F91	
N	Outlet	St35.8/13CrMo44/ 10CrMo910/ X10CrMoVNb91	A106/A335-P12,-P22/A335-P91	
	Drain	PG245GH/13CrMo4-5/11CrMo9-11/ X10CrMoVNb91	A105/A182-F12,-F22/ A182-F91	

Technical information and variances.



VST-SE Mini

This valve is designed to provide all the benefits of the VST-SE i.e., designed to handle thermal shock, provide water proportioning, steam atomizing and in-line repair. The valve should be considered when the application requirement is such that it is too small for the VST-SE. This valve can be used on such applications as:

- Auxiliary steam
- Small high turndown applications
- Sootblower

The VST-SE mini utilizes the inlet steam to atomize the cooling water. The steam atomizing principal provides a cooling system that is independent of the steam flow turbulence downstream of the water injection point. High turndown is achieved down to only a few kg/hr.

Table 2: Valve Selection, Specification and Features

Spec/Feature	VST-SE	VST-Mini	Comments
Steam Atomizing	Yes	Yes	Integral
Water Proportioning	Yes	Yes	Mechanical
Material of Construction	To suit application	To suit application	Depends on pipe, temperature and pressure
Shutoff Class	III, IV or V	V	ANSI FCI 70-2 Class
In-line Repair	Yes	Yes	
Plug Size	56 - 400 mm 2.2 - 16 inches	20, 28, 40 mm 0.79, 1.1, 1.57 inches	
Characteristic	Modified linear	Modified linear	
Stem Guiding, 2 Positions	Yes	Yes	Allows horizontal installation
Turndown > 50 to 1	Yes	Yes	Water valve T/D is limited
Equivalent Rating	To Cl 2500 (PN420)	To Cl 2500 (PN420)	
Max Temperature	Up to 600 C	Up to 600 C	For higher check with CCI
Pressure Reducing Stages	Multi greater than 2	1	

Throughout the world, companies rely on CCI to solve their severe service control valve problems. CCI has provided custom solutions for these and other industry applications for more than 80 years.

Sales and service locations worldwide.

CCI World Headquarters—California
Telephone: (949) 858-1877
Fax: (949) 858-1878
22591 Avenida Empresa
Rancho Santa Margarita,
California 92688
USA

CCI Austria
(Spectris Components GmbH)
Telephone: 43 1 869 27 40
Fax: 43 1 865 36 03
Carlbergergasse 38/Pf.19
AT-1233 Vienna
Austria

CCI China
Telephone: 86 10 6501 0350
Fax: 86 10 6501 0286
Room 567/569
Office Tower, Poly Plaza
14 Dongzhimen South Avenue
Beijing 100027
China

CCI FK
(Fluid Kinetics)
Telephone: 805 644 5587
Fax: 805 644 1080
2368 Eastman Avenue, Suite 8
Ventura
California 93003
USA

CCI Italy
(STI)
Telephone: 39 035 29282
Fax: 39 035 2928247
Via G. Pascoli 10 A-B
24020 Gorle, Bergamo
Italy

CCI Japan
Telephone: 81 726 41 7197
Fax: 81 726 41 7198
194-2, Shukunosho
Ibaraki-City, Osaka 567-0051
Japan

CCI Korea
Telephone: 82 31 980 9800
Fax: 82 31 985 0552
26-17, Pungmu-Dong
Gimpo City
Kyunggi-Do 415-070
Republic of Korea

CCI Sweden
(BTG Valves)
Telephone: 46 533 689 600
Fax: 46 533 689 601
Box 603
SE-661 29 Säffle
Sweden

CCI Switzerland
(Sulzer Valves)
Telephone: 41 52 262 11 66
Fax: 41 52 262 01 65
Hegifeldstrasse 10
CH-8404 Winterthur
Switzerland

Contact us at:
info@ccivalve.com

Visit us online at:
www.ccivalve.com

We Solve Control Valve Problems

DRAG® CONTROL VALVES

SULZER Valves

BTG Valves