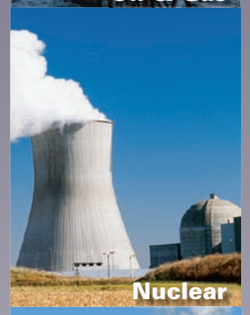
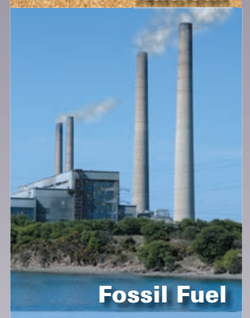
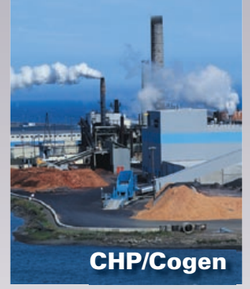




**Throughout the world, companies rely on CCI to solve their severe service control valve problems. CCI has provided custom solutions for these and other industry applications for more than 80 years.**

## CCI 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
Lemböckgasse 63, 1230 Wien
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
4-15-20 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 52 264 95 00
Fax: 41 52 264 95 01
Im Link 11
P.O. Box 65
8404 Winterthur
Switzerland

**Contact us at:**
**info@ccivalve.com**

**Visit us online for sales and service locations at:**
**www.ccivalve.com**

We Solve Control Valve Problems©

# VLB – Premium Steam Conditioning for Turbine Bypass Applications

 741 ■ 02/05 5K

# The VLB incorporates engineering knowledge gained from more than 70 years of steam conditioning solutions

- **Lower Installed Cost**
- **Reliable Operation**
- **Fine Control at Low Flow**
- **Lower Noise**
- **Lower Maintenance**

### CCI – World Leader in Steam Conditioning

The VLB (Valve Angle Bypass) series of valves has been the solution for the most challenging steam conditioning applications for more than 20 years.

CCI provides reliable solutions for the most severe steam conditioning applications (like turbine bypass) in the world's largest utility plants. By offering the most comprehensive selection of steam conditioning valves for CHP and fossil applications, CCI valves are designed to meet most international standards and comply with the European Pressure Equipment Directive (PED).

### 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). This is carried out by combining pressure reduction and desuperheating within the confines of one valve.

Pressure is regulated by an upstream or downstream pressure controller and the valve with multi-stage pressure reducing trim modulates to maintain the pressure at the required set point.

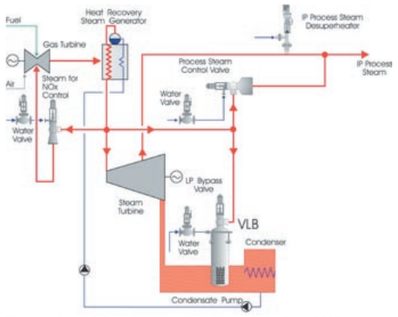
Temperature is controlled by atomizing spraywater in the steam. A separate water valve introduces water to the desuperheating nozzles or desuperheating mechanism within the steam conditioning valve. Temperature feedback controls the amount of spraywater and keeps downstream temperature at the required set point. Of course, temperature can also be controlled by other means, such as enthalpy control.

A steam conditioning valve that bypasses a steam turbine in a utility or industrial process is called a turbine bypass valve.

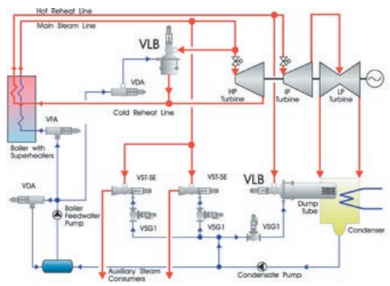
### Requirements for Steam Conditioning

Many industries require steam to be at a temperature close to saturation. Steam that is too hot may damage the product or equipment. On the other hand, a temperature that is too low will result in excess water and loss of control, and damage piping and downstream equipment. Although a desuperheater in conjunction with the turbine exhaust or extraction steam can control steam temperature. During startup or in the event of a trip, the bypass valve must mirror the outlet conditions quickly and accurately (typically less than two seconds).

Sometimes steam will be bypassed to a condenser, particularly in a utility power station. In this event, CCI provides the bypass valve, condenser dump tube, spraywater control valve, and the spraywater control algorithm as a package. In this case, the bypass valve must open quickly (less than two seconds) to prevent boiler safety valves from lifting.



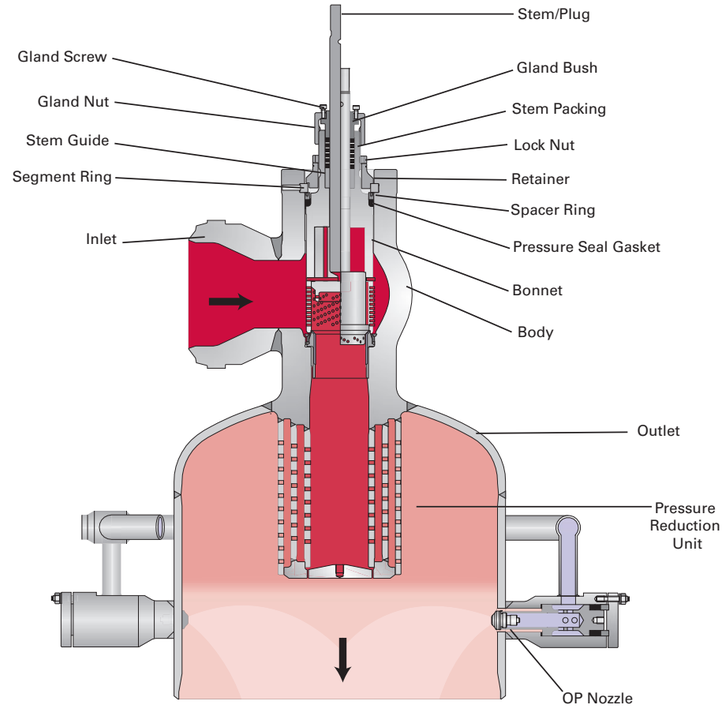

**Typical turbine bypass schematic for CHP/ Cogen power plant.**




**Typical turbine bypass schematic for conventional power plant.**

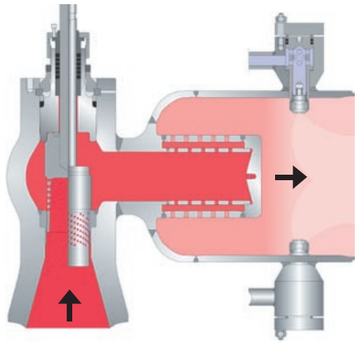







| Description | European Material Std. | ASTM Material Std. | Comments |
|---|---|---|---|
| Seat | 11CrMo9-10/ X10CrMoVNb91 / | A182-F22/ A182-F91 | Seat HS25 hard faced |
| Pressure Reduction Unit | St35.8/13CrMo44/10CrMo910/ X10CrMoVNb91 | A106/A335-P12,-P22/A335-P91 | |
| Outlet | St35.8/13CrMo44/10CrMo910/ X10CrMoVNb91 | A106/A335-P12,-P22/A335-P91 | |
| Drain | PG245GH/13CrMo4-5/11CrMo9-11/ X10CrMoVNb91 | A105/A182-F12,-F22/ A182-F91 | |
| Inlet | PG245GH/13CrMo4-5/11CrMo9-11/ X10CrMoVNb91 | A105/A182-F12,-F22/ A182-F91 | |
| Valve Body | PG245GH/13CrMo4-5/11CrMo9-11/ X10CrMoVNb91 | A105/A182-F12,-F22/ A182-F91 | |
| Stem/Plug | X19CrMoVNbN11-1 | ~AISI 616 | Surface hardened |
| Water Seat | 10CrMo910 | A182-F22 | Surface hardened |
| Water Conn. /Flange | PG245GH/13CrMo4-5 | A105/A182-F12 | |
| Bonnet | 11CrMo9-10 | A182-F22 | Surface hardened |
| Pressure Seal Gasket | Graphite | Graphite | |
| Spacer & Segment Ring | X10CrMoVNb91 | A182-F91 | |
| Cover Plate | PG245GH | A105 | |
| Stem Packing | Graphite | Graphite | |
| Gland Bush / Nut | X20Cr13 | ~AISI 420 | Bush surface hardened |
| Nozzle | X19CrMoVNbN11-1 | ~AISI 616 | Surface hardened |

## The VLB features flexible performance and reliability



**CCI's VLBO design for TRD421 code compliance will include an integral strainer**

### VLB

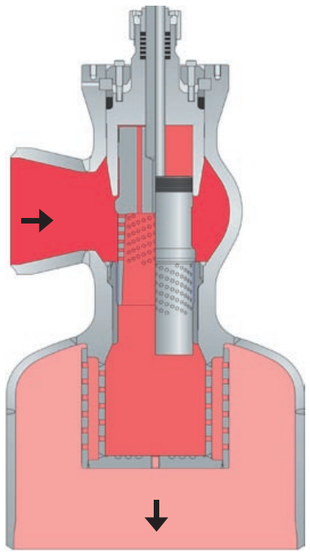
The standard VLB flow is over the plug. In certain circumstances, such as high pressure to cold reheat bypass and reheat to atmospheric vent, the valve design is specified to be flow under the plug.

Another derivative is the VLRO, which is the same valve without the desuperheating function, designed for use when desuperheating is not required when venting.

The VLBO and VLRO have the turbine bypass features of the VLB.

### VLR

The VLR is identical to the VLB but does not include the desuperheating function. It can be used in applications where desuperheating separated from the pressure-reducing valve is preferred for venting, or where there is a requirement for reducing or throttling the steam pressure under arduous conditions like steam turbine bypass and emergency steam venting.



**VLR design incorporates all the features and benefits of the VLB but excludes the external desuperheating**

### VLB Family of Valves

The BTG turbine bypass valves are available in several designs, all derived from the VLB configuration. All designs are available with fast-acting pneumatic, hydraulic or electric actuation.

| | |
|---|---|
| **VLB-TC** | Unbalanced tight design with leakage tightness according to ANSI B16.104 Class V or MSS-SP61 |
| **VLB-BTC** | Balanced tight design with leakage tightness according to ANSI B16.104 Class V or MSS-SP61 |
| **VLB-BC** | Unbalanced tight design with leakage tightness according to ANSI B16.104 Class III or IV (piston rings) |
| **VLBL** | Cast body up to Class 300 in limited trim sizes |
| **VLBS** | Combined bypass and stop valve within one valve body- available in unbalanced version only with hydraulic actuation |
| **VLR** | Available in all the above configurations but excludes desuperheating function |
| **VLBO** | Available in all the above configurations |
| **VLRO** | Available in all the above configurations but excludes desuperheating function |

### Materials of Construction

The valve body is available in ASTM, ASME, DIN, and other internationally recognized materials. Materials are provided to suit piping and or pressure/temperature design requirements, i.e. carbon steel, chrome-moly, and high-temperature materials such as P91.

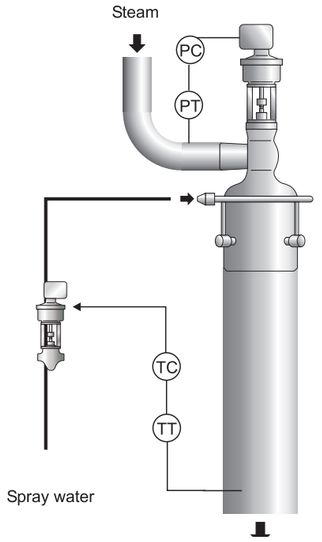




## The VLB design is built on a long history of BTG technological innovation

**CCI offers a full array of services including:**

- **On-time delivery**
- **Commissioning and start-up assistance**
- **Guidelines for installation, drainage and line flushing**
- **Global service network**
- **24-hour parts ordering**




**Typical installation for turbine bypass valve**

### Application

The VLB range of valves is primarily used as steam turbine bypass in industrial (combined heat and power) and utility power plants either to process or more often, to condenser. In utility plants, the VLB is often used to bypass steam from high pressure to cold reheat and also from hot reheat to condenser. The VLB was designed specifically to meet a bypass system's strict operational and performance requirements.

Availability of the VLB in the turbine bypass application for steam supply to the process or condenser is critical. Reliability and performance are paramount to the plant's operation. CCI not only provides the correct product for the application, but also offers 70 years of know-how and experience to ensure correct installation of the equipment for maximum performance and reliability.

### CCI's Turbine Bypass System Provides a Reliable/High-Performance Solution to Common Concerns

***Resistance to Thermal Shock and Fatigue***

A bypass valve is subjected to severe thermal shock. CCI's VLB body and trim is designed to withstand the thermal gradients that bypass valves typically experience.

***System Integrity***

CCI's VLB design incorporates a pressure-seal bonnet which relies on system pressure to maintain tightness and is therefore not affected by thermal transients, unlike the traditional bolted bonnet designs.

***Maximum Power Output and Reduced Maintenance***

Repeatable seat tightness is required to prevent the leakage of steam that could be used to generate electricity and therefore revenue. Excessive seat leakage also results in excessive maintenance and plant shutdown. The VLB offers a simple in-line repairable valve design with fewer components which facilitates less upkeep and ease of inspection.

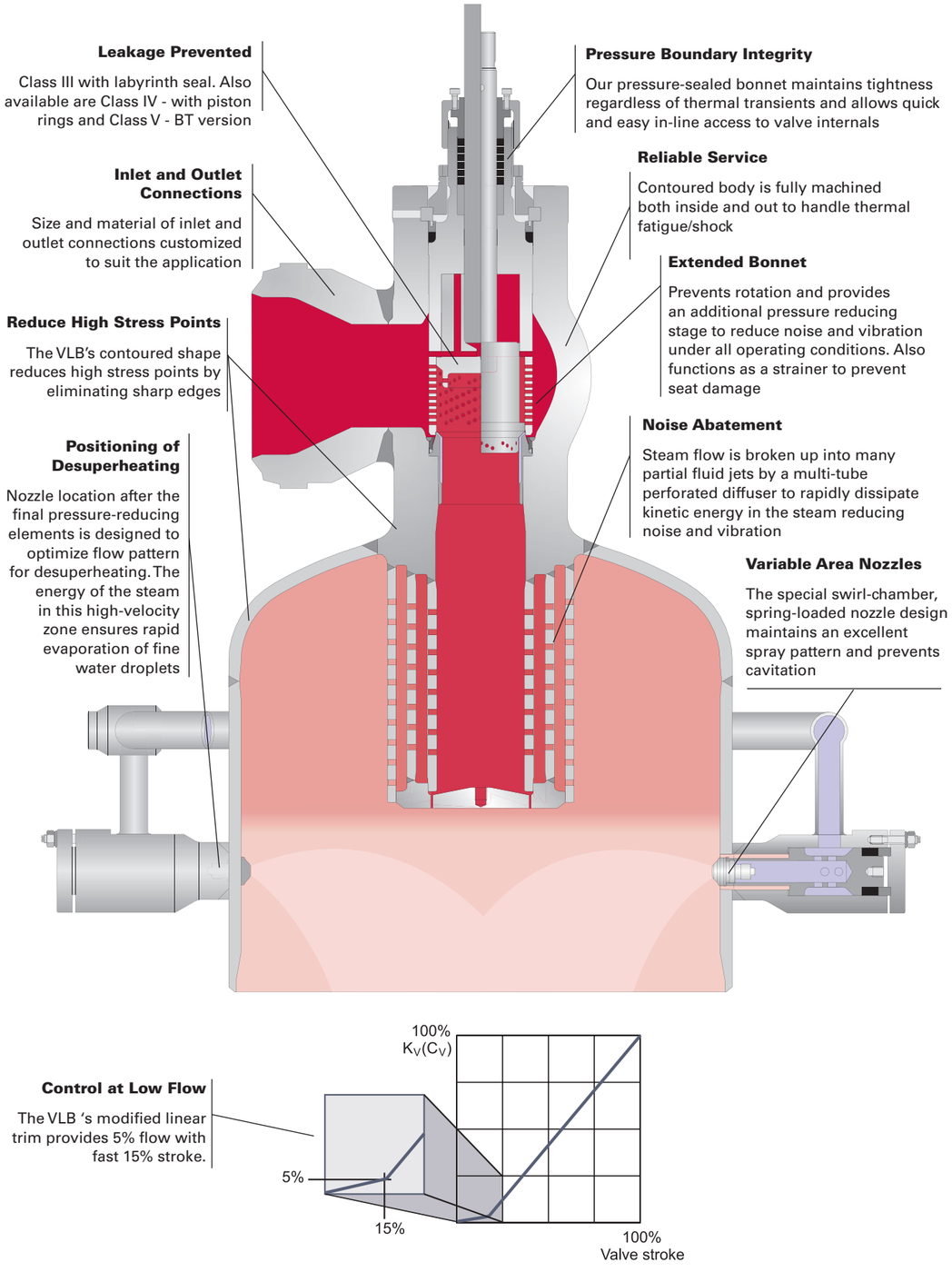
***Severe Pressure Drops Controlled***

In many cases, the bypass valve will have to throttle or control pressure drops greater than 100 bar (2500 psi). The VLB valve trim has sufficient pressure-reducing stages to prevent premature erosion, excessive vibration, and noise.

***Valve Inlet/Outlet Connections Suit Application***

The provided VLB valve inlet and outlet connections suit customer's piping and maintain inlet and exit steam velocities at reasonable levels (<250 ft/s / 80 m/s).

## VLB design features and benefits.




**Control at Low Flow**

The VLB 's modified linear trim provides 5% flow with fast 15% stroke.








## Use this checklist to evaluate the benefits VLB design offers

| | Benefits | CCI VLB | Competitors |
|---|---|---|---|
| 1 | Improved plant performance: valve provides unequalled control of downstream pressure and temperature/enthalpy for maximum efficiency. | ✓ | |
| 2 | VLB's special seat arrangement ensures repeatable tight shutoff and maximizes steam turbine MW, reducing maintenance costs and limiting plant downtime. | ✓ | |
| 3 | Prevents cracking and distortion: fully machined circular section body handles severe thermal shock conditions normally associated with turbine bypass applications. | ✓ | |
| 4 | Lower installation costs: inlet and outlet connections are customized to suit application/customer requirements and the valve can be installed horizontally without the risk of misaligned trim. | ✓ | |
| 5 | Lower maintenance costs: VLB's design provides longer intervals between maintenance and allows easy access to all components. | ✓ | |
| 6 | Lower noise: the VLB is custom-designed with pressure-reducing stages to meet strict noise requirements. | ✓ | |
| 7 | Lower operating cost: unique plug and seat design allows for repeatable, reliable extended seat tightness, high thermal shock capability, and zero wear on seat while throttling. | ✓ | |
| 8 | Long term reliable performance: angle pattern configuration provides long guiding surfaces not subject to distortion and no gaskets to lose elasticity in thermal conditions. | ✓ | |
| 9 | The VLB design transfers the actuating force from the plug to a shoulder on the valve body, preventing distortion of the valve seat. | ✓ | |
| 10 | Multiple nozzles strategically placed in the high velocity steam maximizes the energy available, atomizes the spraywater and provides an even distribution across total steam flow for excellent control even at small flow rates. | ✓ | |
| 11 | Reduced plug/seat erosion, noise and vibration: second control stage of pressure reduction extended from valve plug. | ✓ | |
| 12 | Trim suitable for thermal transients: cage integral with bonnet and allowed to expand thereby eliminating the need of troublesome gaskets. | ✓ | |