# Process Automation

## IMI CCI

VLR
Pressure Reducing Valve

Breakthrough
engineering for
a better world

# VLR

# Pressure Reducing Valve

The VLR is a steam pressure reducing valve used in high and/or low pressure steam turbine systems. The most common application for the VLR is in venting to atmosphere. Here, the VLR is placed in a steam pipe branching from the pipe connecting the boiler and the turbine, providing a controllable conduit between the boiler and the atmosphere. During load rejection, the steam flow rate is too high for the system until the firing rate has been reduced, vent valves located at the main and reheat lines are used to handle the excess flow.

The large pressure differential between the boiler and the atmosphere can cause high noise levels that require attenuation. To reduce the noise potential in the steam pipe, the pressure drop is split between the valve and a downstream diffuser or silencer. The VLR itself is equipped with a pressure reducing stage at the spindle, and often a secondary stage at the valve outlet. The VLR is also used in general pressure control applications where desuperheating is required. The VLR can be combined with a downstream desuperheater to emulate the functionality of a steam conditioning valve in situations where using a VLB proves difficult.

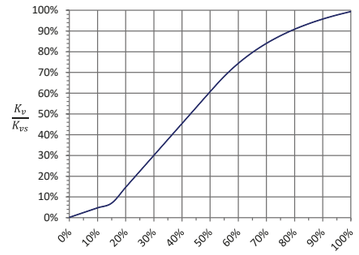
## Key features

Steam passes through the extended drilled bonnet before being throttled though a cage type plug with multiple drilled holes which provides optimum characteristics for control of steam pressure.

- The extended bonnet prevents possible rotation forces caused by the steam flow, and acts as an extra pressure reducing stage.
- The extended bonnet also works as a strainer, protecting the valve seat and the bonnet from damage.
- The plug slides in a surface hardened bonnet, covering/uncovering throttling holes, regulating the flow through the valve. In the closed position, the plug sits on the hard-faced seat, isolating the inlet from the outlet. Pressure reduction continues in the outlet, through the pressure reducing pipes, engineered for each application.
- The pressure seal bonnet provides a tight.
- seal in the valve neck while allowing easy access during maintenance.
- Homogenous forged body minimises thermal stress.
- Fully customisable inlet and outlet connections.
- Available in balanced tight design which reduces the required opening forces.

## Benefits

- Accurate steam pressure control at severe operating conditions
- Resistant against thermal stress and requires no additional preheating beyond the demand for superheated steam in the inlet
- Cage plug for flow control that results in a protected seat area and high rangeability
- Pressure reducing pipes in the outlet to create a multistep pressure reduction, minimising noise and vibrations
- Reduced maintenance cost and downtime
- Complies with the following standards: SIL, ASME, PED, IBR, CRN, FaMA, MoM, Gost, ISO 9001/14001/18001



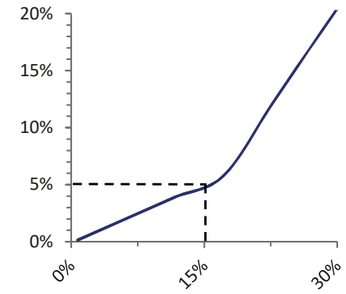

Example of what a VLR flow curve may look like. Individual valves may vary in linearity

## Applications

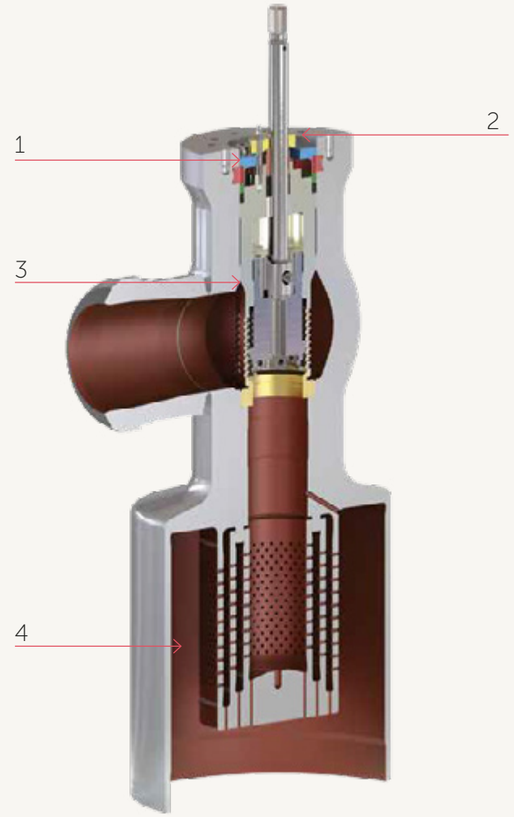
High pressure system
- Vent to atmosphere, normally together with a silencer installed downstream.
- Pressure control where no desuperheating is needed.
- Steam conditioning applications where desuperheating cannot be integrated into the same.

Low pressure system
- The VLR mainly designed for high pressure systems, but can also be used in low pressure systems.

Process industry
- IMI CCI recommends the VST-SE or the VLB for these applications.




The image shows how at the first ~15% of the valve stroke, the change in flow coefficient increases only by 5%. After this point, it becomes linear.




1. Pressure seal bonnet
2. Gland / stuffing box
3. Plug / cage
4. Pressure reducing pipes

## Design

**Pressure reduction and noise abatement**
The VLR features pressure reduction with single-stage controllability. Through-put is controlled by a modulating plug. The initial pressure reduction takes place at the drilled bonnet cage. A second stage can be integrated in the outlet, where the level of pressure reduction is finalised. Pressure reduction in both stages is achieved using perforated cylinders, where small holes are breaking the steam up into smaller fluid jets. This results in reduced noise.

**Construction**
The VLR features a fully forged valve body, designed to withstand rapid temperature changes. Inlets and outlets are circular in order to prevent asymmetrical stress patterns. The seat facing is made of a tough material with excellent sealing properties and good resistance against corrosion. As these valves are typically used during startup or plant trip situations, they must remain tightly shut during normal operation to avoid steam loss. Plug and stem are made of heat and corrosion resistant material, hardened in a unique process. Both inlet and outlet pipe diameters are flexibly designed to fit the connecting steam pipes. The valve features a vacuum tight pressure seal bonnet, that allows easy maintenance and avoids the need for tightening using screws.

**Actuation**
The actuator is installed on top of the valve and fastened using a yoke. The yoke provides both rotation stop and a place for mounting limit switches. IMI can supply pneumatic, hydraulic or electrical actuators sized to handle the forces needed to open and close the valve at the required stroke time, and to compensate for the forces caused by the system pressure pushing against the plug.

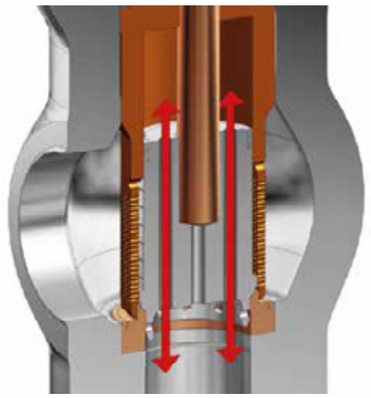
**Design options**
IMI CCI has developed a series of design options for the VLR, described in more detail on page 4. Other customisations can also be accommodated based on customer demand.

## Configurations

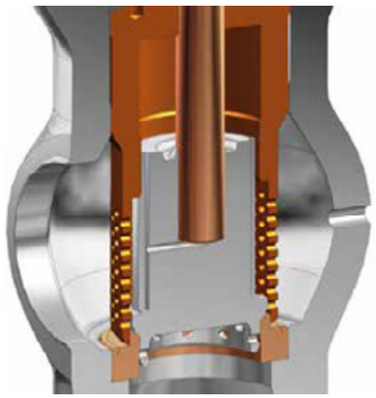
**Balanced design (BC)**
Selected together with pneumatic, hydraulic or electric actuators where the leakage tightness according to ANSI FCI 70-2/EN 1349 class III or IV is acceptable.

**Tight plug (TC)**
Selected when leakage tightness according to ANSI FCI 70-2 / EN 1349 class V is required. No pilot plug or pressure normalising.

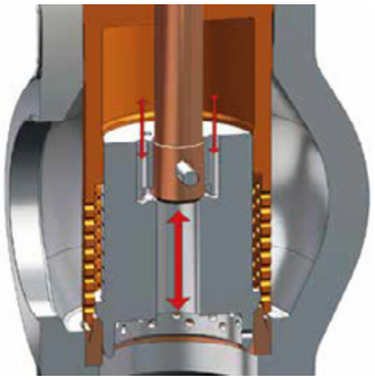
**Balanced Tight design (BTC)**
Selected when leakage tightness according to ANSI FCI 70-2/EN 1349 class V is required and pneumatic actuators preferred. Excellent selection also together with hydraulic and electric actuators. The pilot plug design makes it possible to reduce the actuating force by normalising the pressure in the valve and bonnet.



VLR-BC



VLR-TC



VLR-BTC

## Product specification

**Valve sizes**
20 - 400 mm seat diameter
(other sizes available on request)

**Leakage class**
BTC / TC:
ANSI Class V FCI 70-2 /
EN 1349

B:
ANSI Class IV FCI 70-2 /
EN 1349

**Process industry**
50:1

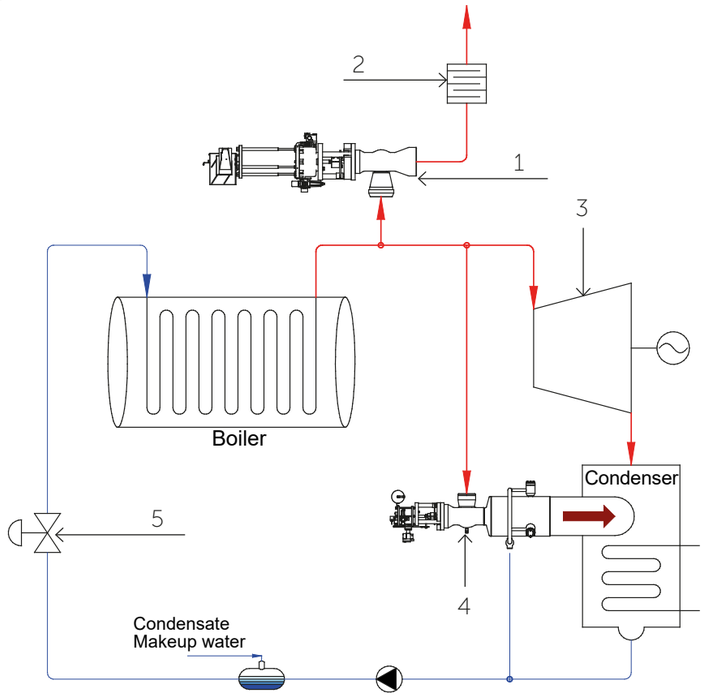
**Regulatory standards**
ASME, PED, IBR, CRN, FaMA, MoM, Gost, ISO 9001/14001/18001, SIL.

**SIL classification**
SIL level up to 3 achievable for both quick open and quick. close depending on system configuration.

**Materials**
Forged material adapted to connecting pipe material.

## Example

1. VLR
2. Silencer
3. Steam turbine
4. Bypass valve with dump tube
5. Feedwater control valve



# Process Automation



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