

# BVT-TB

## Steam conditioning valve



## About us

BVT Sweden was started with the ambition of becoming world leading in critical applications in process steam and thermal power plant turbine bypass. Based in Säfte, BVT Sweden employs experts with over 30 years experience in turbine bypass, steam conditioning, temperature control, design and manufacturing processes. We design turbine bypass valves, select actuation to fit our customer's requirements. Our products are optimized on a per-order basis, and we have the experience necessary to design special solutions. These products cover steam conditioning valves, pressure reduction valves, stop valves, desuperheaters and spray water control valves.

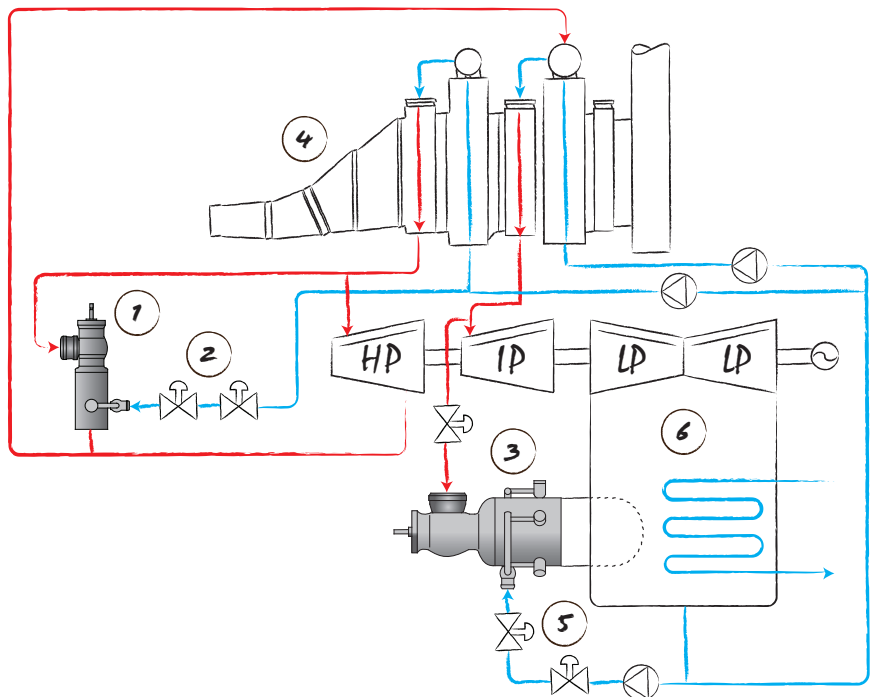
## The turbine bypass system

The turbine bypass system consists of both pressure reduction and steam desuperheating. Turbine bypass valves are installed in parallel with the turbine's pressure stages and provide a secondary conduit for the superheated steam. The valves may be used for controlling the downstream pressure and temperature during turbine operation or during a turbine trip.

## Bypass to condenser

The illustration on the right shows an example of a steam turbine with three pressure stages (HP, IP and LP) connected to a HRSG (4). The HP steam conditioning valve (1) is connected in parallel with the high pressure stage of the turbine, and is fed water from a spray water control valve (2). A second steam conditioning valve (3) is connected to a downstream dump tube, which dumps steam to the condenser (6). Condensate is pumped from the condenser and passed to the HRSG and to the spray water control valves.

1. HP STEAM CONDITIONING VALVE
2. HP WATER CONTROL / STOP VALVE
3. IP STEAM CONDITIONING VALVE
4. HRSG
5. IP WATER CONTROL VALVE
6. WATER COOLED CONDENSER

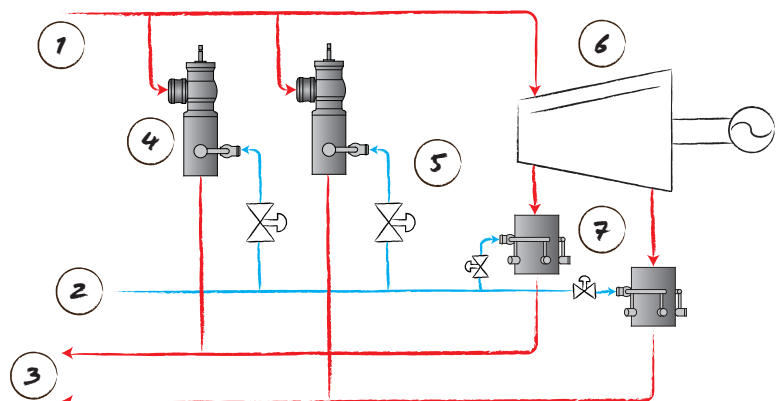


**BVT-TB TURBINE BYPASS VALVES WITH HRSG AND CONDENSER**

## Bypass to process

In this example, two BVT-TB valves (4) are installed in parallel to a turbine (6) and two BVT-DLP desuperheaters (7). Steam is desuperheated by both valves and desuperheaters and output to process. Water is controlled by external spray water control valves (5).

1. INPUT SUPERHEATED STEAM
2. SPRAY WATER / CONDENSATE
3. OUTPUT PROCESS STEAM
4. BVT-TB STEAM CONDITIONING VALVE
5. WATER CONTROL / STOP VALVE
6. STEAM TURBINE
7. BVT-DLP MULTI NOZZLE DESUPERHEATER



**BVT-TB AND BVT-DLP IN BYPASS TO PROCESS APPLICATION**

## BVT-TB turbine bypass valve

The BVT-TB is an angle-style steam conditioning valve, used for both process and turbine bypass applications. It is designed to reduce temperature and pressure of steam to match downstream requirements. Pressure is controlled using a proven trim technology which reveals a series of perforations in the valve cage as the plug moves. Steam is then passed to the outlet through a series of pressure reduction stages, selected specifically for the operating conditions on a case-by-case basis in order to reduce noise. Valve Plug design is optimized for low actuating forces, allowing for smaller and pneumatic actuators. Control of temperature takes place in the outlet, where a number of spring-loaded spray water atomizing nozzles are installed perpendicular to the steam flow. The selection, placement and design of these are chosen to match the desuperheating requirements of the system as well as reducing risk of free water being injected into the downstream piping.

## Specifications

Valve sizes

**Up to 500 mm seat diameter**

Pressure class

**Up to ANSI 4500 (higher rating on request)**

Design temperature

**620 °C as standard (650 °C on request)**

Leakage class

**ANSI Class III, IV, V, MSS SP 61**

Rangeability

**Up to 25:1 for the complete valve**

Regulatory requirements

**ASME, PED, IBR, CRN, ISO 9001/14001**

Materials

**Forged material adapted to connecting pipe material**

Actuation

**Pneumatic, hydraulic or electrical**

Options

- Quick change type seat
- Erosion resistant trim with long cage
- Expanded outlet
- Live load gland seal packings

## Key features

- ✓ Fully customizable inlet, outlet connections
- ✓ Complies with the following standards: ASME, EN, PED
- ✓ Forged valve body with uniform thickness and trim design optimized to withstand thermal cycling
- ✓ High shut-off class
- ✓ Great rangeability
- ✓ Pressure reduction stages and spray nozzle arrangements optimized for operating conditions, and for reduced noise. The pressure reduction pipes also create a flow profile that improves atomization.
- ✓ Balanced plug design requires smaller actuating forces, and so allows for smaller and pneumatic actuators
- ✓ Pressure seal bonnet for simpler and quicker maintenance. No special tools necessary
- ✓ Compatible with pneumatic, hydraulic and electrical actuation
- ✓ Easily exchangeable seat as option for further reduced maintenance downtime
- ✓ Optional expanded outlet design optimized in order to improve secondary atomization through an increased steam velocity over the nozzles. The outlet design also improves the tertiary atomization, and increases rangeability.
- ✓ Optimized packing design
- ✓ Long cage design reduces wear on trim internals caused by wet steam or particles by moving the critical pressure drop
- ✓ Spring loaded nozzles designed to avoid thermal cracks in outlet pipe, and are quickly and easily replaced

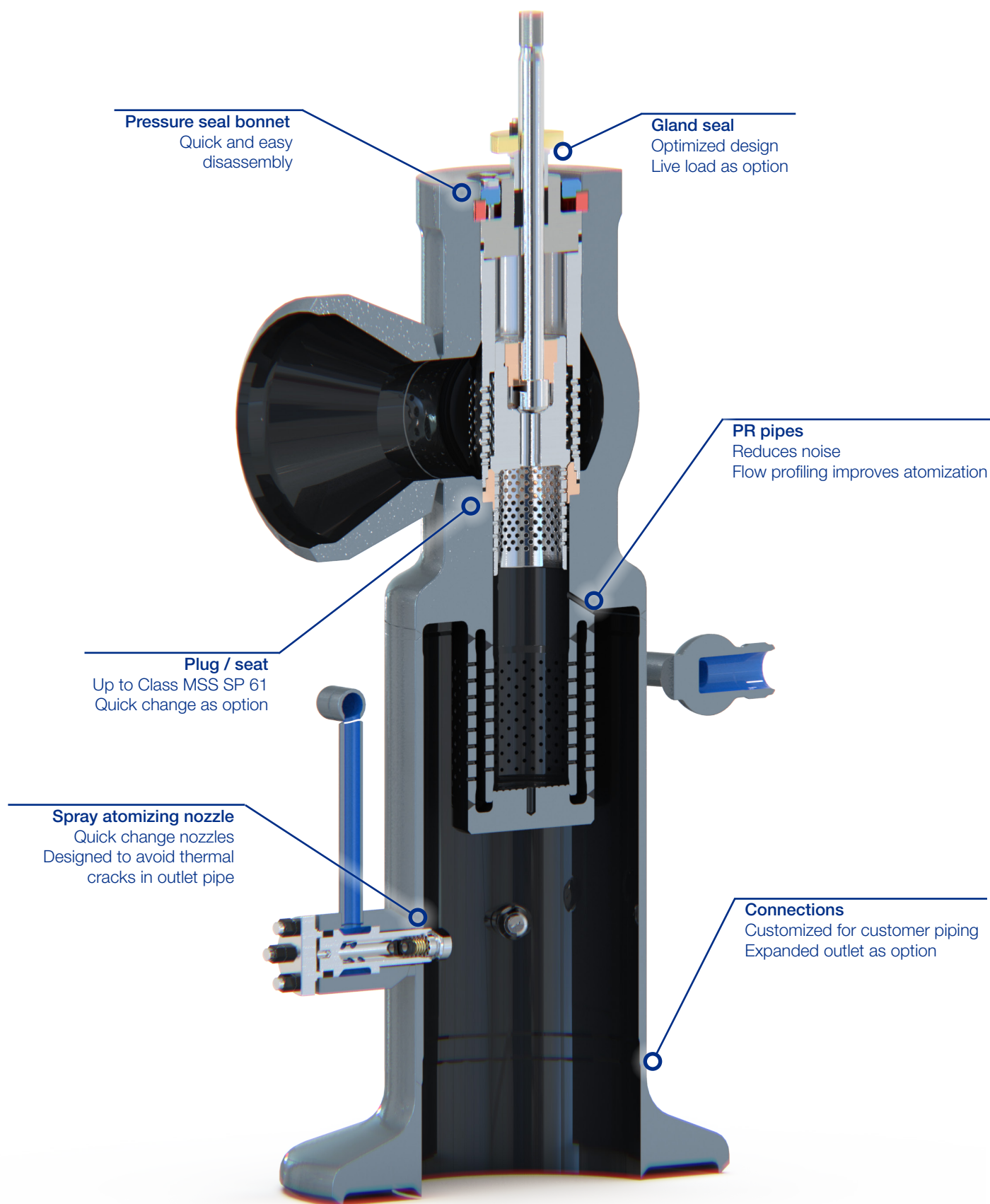
BVT	-	TB	-	90	B T C	-	Z1	-	SE
Turbine Bypass									
Seat size				56 - 500 [mm]					
Trim options				B: Balanced plug T: Tight seal C: Cage design					
Seat options				(blank): Welded seat Z1: eZ change seat Z2: eZ change seat with stellite coating ZP: eZ change seat with long plug					
SE: Steam assisted evaporation nozzle (option)									

**BVT-TB PRODUCT CODE**

# BVT-TB

Steam conditioning valve

## Overview



**BVT-TB HP BYPASS VALVE**

## Water valves

BVT provides a multitude of spray water control valves, selected and designed to match operating conditions and customer requirements. The trims are chosen to prevent cavitation and flashing and prevent aerated liquids from corroding or eroding valve parts. They are equipped with quick exchange trims for more convenient inspection replacement. Among the options of trim designs are contour plugs, multi-step plugs, multi-cage and labyrinth disc stacks.

## Trim types

PT (Plug throttling)

**Cv Range: 1.4 ~ 9930**

**Rangeability: 25 to 1**

**Leakage class: IV / V**

HSC (Micro High Step Cascade)

**Cv Range: 0.24 ~ 406**

**Rangeability: 100 to 1**

**Leakage class: V**

HST (Single seat, drilled cage)

**Cv Range: 38 ~ 8900**

**Rangeability: Varies**

**Leakage class: IV / V**



LEFT: ANGLE-STYLE VALVE BODY  
RIGHT: GLOBE STYLE VALVE BODY

## Pneumatic actuation

BVT valves can be equipped with pneumatic piston actuators. The cylinders are chosen to overcome the forces created by steam flow, and the accessories are chosen to handle the required stroke speeds and functionality.

## Features and options

Cylinder types

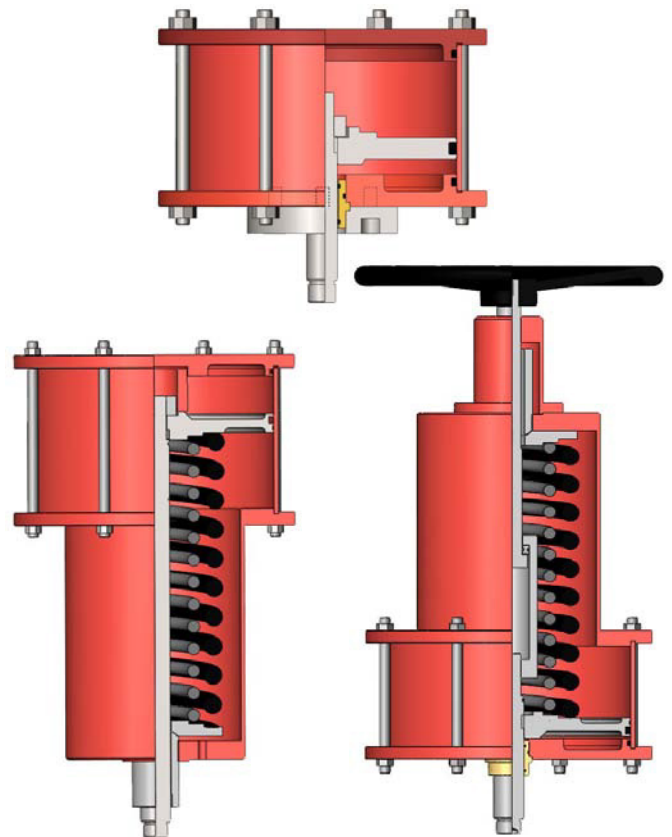
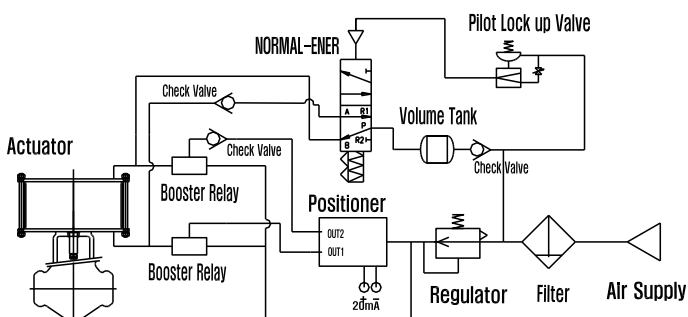
- Double Acting, Single Acting
- Spring Open, Spring Close
- Top mounted hand wheel, side mounted hand wheel

Air supply

4 - 10 bar

Accessories and options

- Air filter regulator as standard
- 3-way valves (quick open/close)
- Limit switches (open/close position)
- Position transmitters, air locks, boosters as option



TOP: DIFFERENT CYLINDER SOLUTIONS AVAILABLE  
LEFT: PNEUMATIC SCHEMATIC OF MODULATING ACTUATOR WITH AIR LOCK AND BOOSTERS



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## Hydraulics

As an alternative to pneumatic actuation, BVT can also provide our valves with electro-hydraulic actuators. To power and control these actuators, BVT also supply Hydraulic Control Panel (HCP) and Hydraulic Power Generator (HPG). Pump control in the HPG is by default handled by the Intelligent Power Manager (IPM). The IPM monitors oil level, temperature and pressures and warns the DCS of any issues. Positioning is by default is handled by the Intelligent Actuator Control (IAC), which can control two modulating and two on/off actuators.

Commissioning tools and hydraulic pipes, fittings and hoses are also available.

## Features

Hydraulic Linear Actuator

- C4 RAL7003 painting as standard, C5M as option
- Double rod seals & metal scrapers
- Precise movement and positioning
- No programming of transmitter required
- 2x Limit switches DPDT
- Spring and cylinder mounted valve block (HCB) as option

Hydraulic Control Panel

- Dual gain proportional valve for quick open/close
- Roof and floor stand as option
- Local accumulator as option
- Intelligent Actuator Control positioner as standard

Hydraulic Power Generator

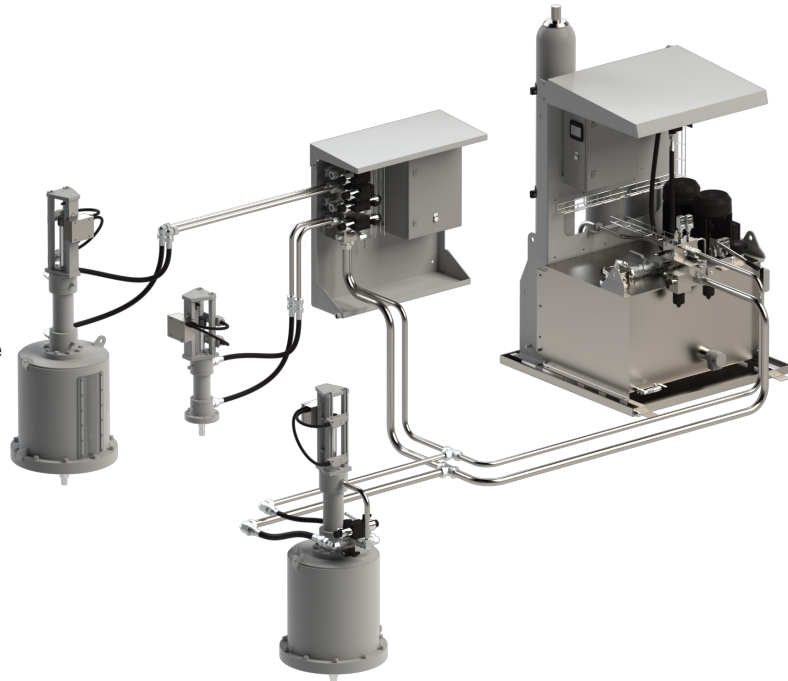
- Intelligent Power Manager pump controller as standard
- Dual pumps, accumulators, spill tray
- Analog pressure, temperature and level transmitters as standard

Intelligent Actuator Control

- 2x modulating + 2x on/off control
- Smooth movement and accurate positioning
- One-click calibration of transmitters
- IP66, -20° to +55°C ambient temperature
- PC based service tool for setup
- S shaped ramps for smooth movement

Intelligent Power Manager

- HMI display as standard
- IP66, -20° to +55°C ambient temperature
- Automated pipe flushing function
- Local / remote control
- Redundancy as option
- Different bus protocols as option



**HPG, HCP AND THREE HYDRAULIC CYLINDERS**



### Certificate of Approval

This is to certify that the Management System of:

**BVT Sweden AB**

Körkarlsvägen 8, 653 46 Karlstad, Sweden

has been approved by LRQA to the following standards:

ISO 14001:2015 | ISO 9001:2015

P.G. Cornelissen - Area Manager North Europe

Issued by: LRQA Sverige AB

for and on behalf of: Lloyd's Register Quality Assurance Limited

Current issue date: 1 February 2019  
Expiry date: 31 January 2022  
Certificate identity number: 10169985

Original approval(s):  
ISO 14001 – 1 February 2019  
ISO 9001 – 1 February 2019

Approval number(s): ISO 14001 – 00002108 / ISO 9001 – 00002109

The scope of this approval is applicable to:

Sales, development, engineering, service and upgrades of valves and accessories for power and process applications.



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Page 1 of 1

**BVT SWEDEN IS ISO 9001 / 14001 CERTIFIED**