

Product overview



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BVT-TB

Turbine bypass 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 Sjöfjärde, 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.

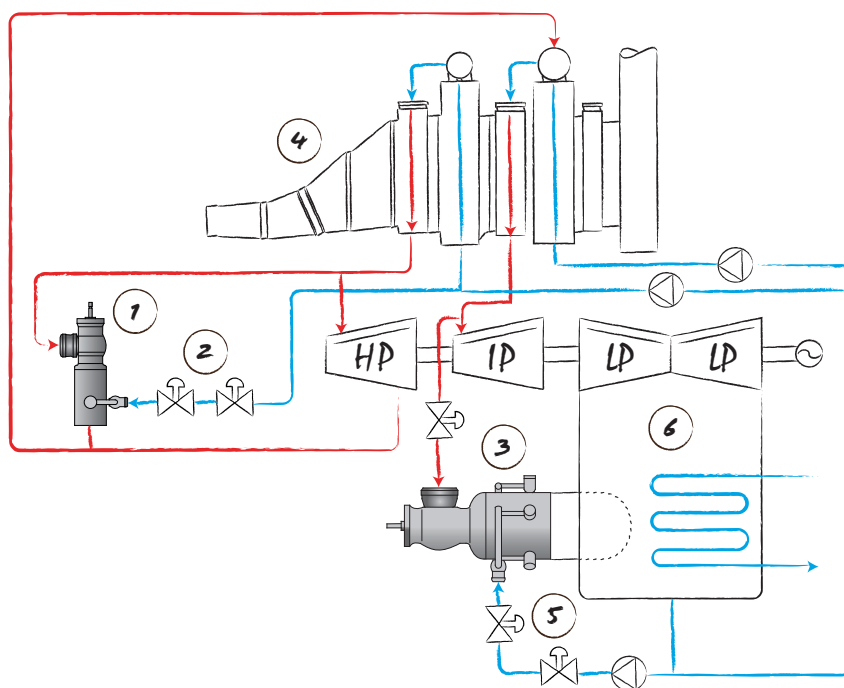
The turbine bypass system

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

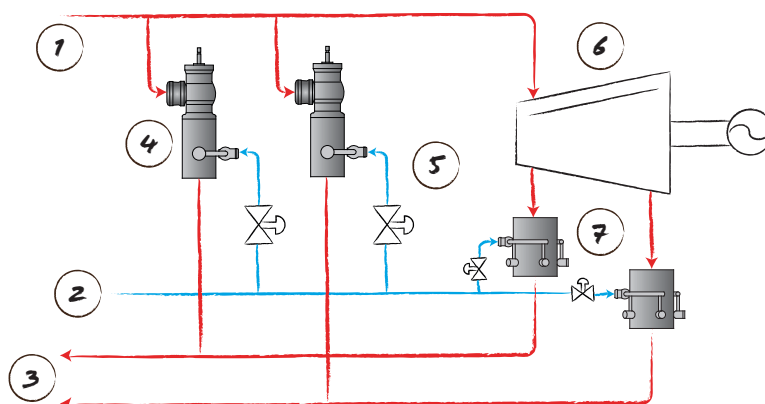


BVT-TB TURBINE BYPASS VALVES WITH HRSG AND CONDENSER

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

Steam conditioning valve



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

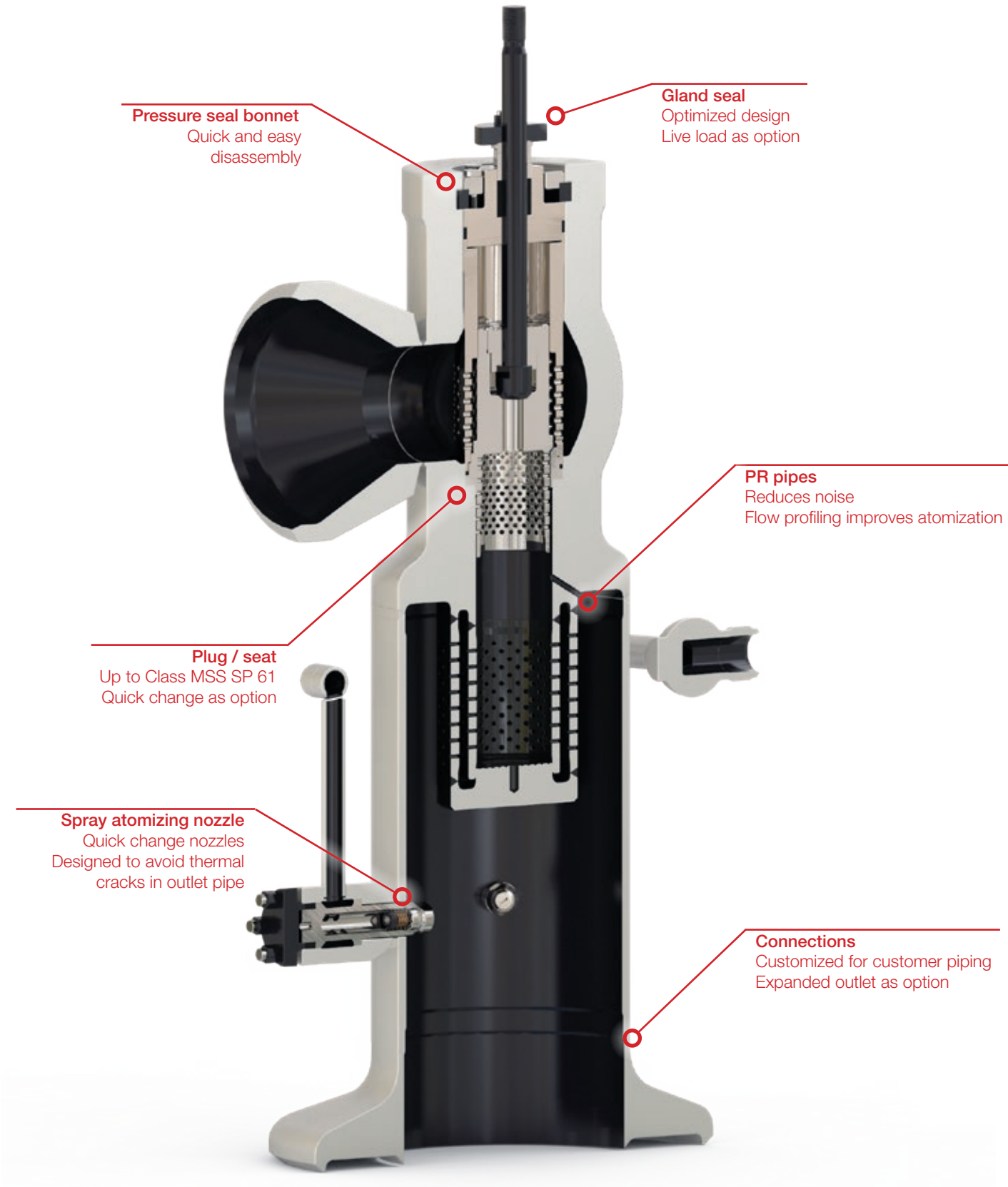
BVT	-	TB	-	90	B T C	-	Z1	-	SE
		Turbine Bypass							
		Seat size		56 - 500 [mm]					
		Trim options		B: Balanced plug T: Tight seal C: Cage design					
		Seat options		(blank): Welded seat Z1: eZ change seat Z2: eZ change seat with stellite coating ZP: eZ change seat with long plug					
								SE: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

BVT-TB PRODUCT CODE

BVT-TB

Steam conditioning valve

Overview



BVT-TB HP BYPASS VALVE

BVT-PB

Process bypass valve



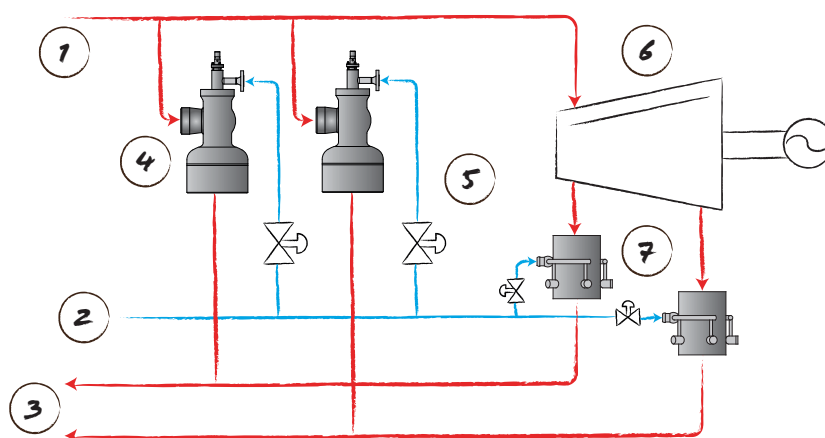
BVT-PB process bypass valve

The BVT-PB is a steam conditioning valve optimized for auxiliary and process steam. The application for process steam may range from petrochemical plants to pulp and paper, where the valve is typically installed in parallel to a steam turbine and controls the downstream pressure and temperature. Pressure reduction takes place in the valve trim as well as the outlet, where several pressure-reducing pipes are installed.

Application example

In this example, two BVT-PB 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-PB STEAM CONDITIONING VALVE
5. WATER CONTROL / STOP VALVE
6. STEAM TURBINE
7. BVT-DLP MULTI NOZZLE DESUPERHEATER

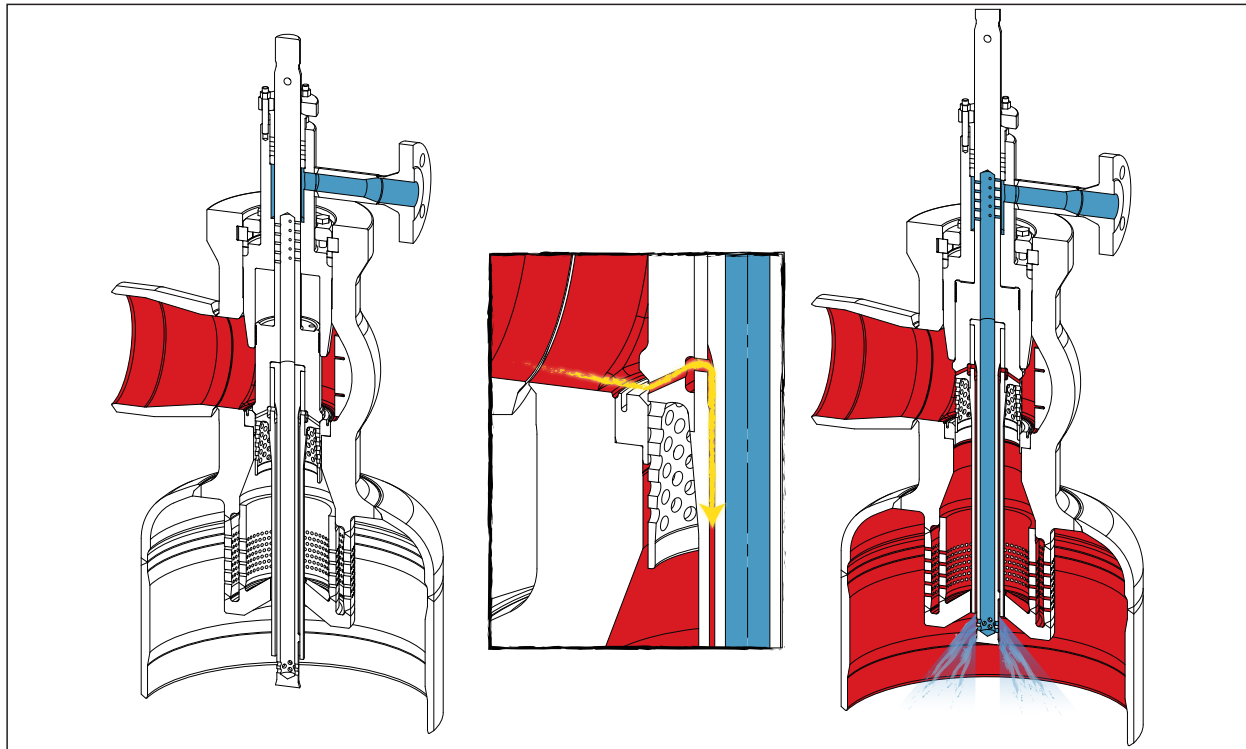


BVT-PB AND BVT-DLP IN BYPASS TO PROCESS APPLICATION

Temperature control

Spray water is introduced in the plug, and carried together with the superheated steam through the spray water atomization pipe. The increased velocity, reduced pressure and increased turbulence of the fluid in this pipe hastens the evaporation of the spray water droplets and improves the valves desuperheating performance. This design is not

dependent on high steam velocity in the outlet, which is what gives the valve its high rangeability. Water proportioning is handled at the top of the hollow stem.



0% - 15% - 100% OPENING

Key features

- ✓ Excellent rangeability of at least 50 to 1
- ✓ 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
- ✓ Pressure reduction stages optimized for operating conditions, and for reduced noise
- ✓ Balanced plug design requires smaller actuating forces
- ✓ Pressure seal bonnet for simpler and quicker maintenance. No special tools necessary
- ✓ Compatible with pneumatic, hydraulic and electrical actuation
- ✓ Optimized packing design
- ✓ Long cage design reduces wear on trim internals caused by wet steam or particles

Specifications

Valve sizes

Up to 225 mm seat diameter

Larger seat sizes upon request

Pressure class

Up to ANSI 1500 (higher rating on request)

Design temperature

575 °C as standard (620 °C on request)

Leakage class

ANSI Class III

Regulatory requirements

ASME, EN, PED, IBR, CRN

Materials

Forged material adapted to connecting pipe material

Actuation

Pneumatic, hydraulic or electrical

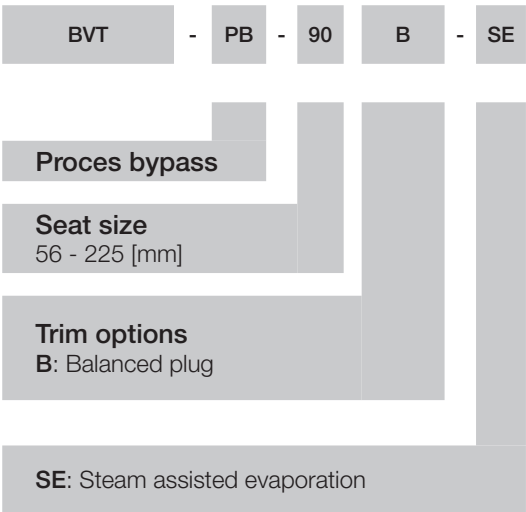
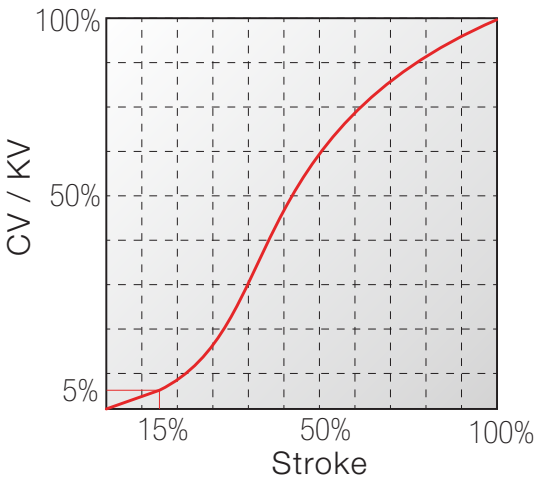
Options

Live load

BT-design

Modified linear characteristics

Allows for greater rangeability and flow control at lower flow rates. The graph shows how at the first ~15% of the stroke, the change in flow coefficient increases by only 5%.

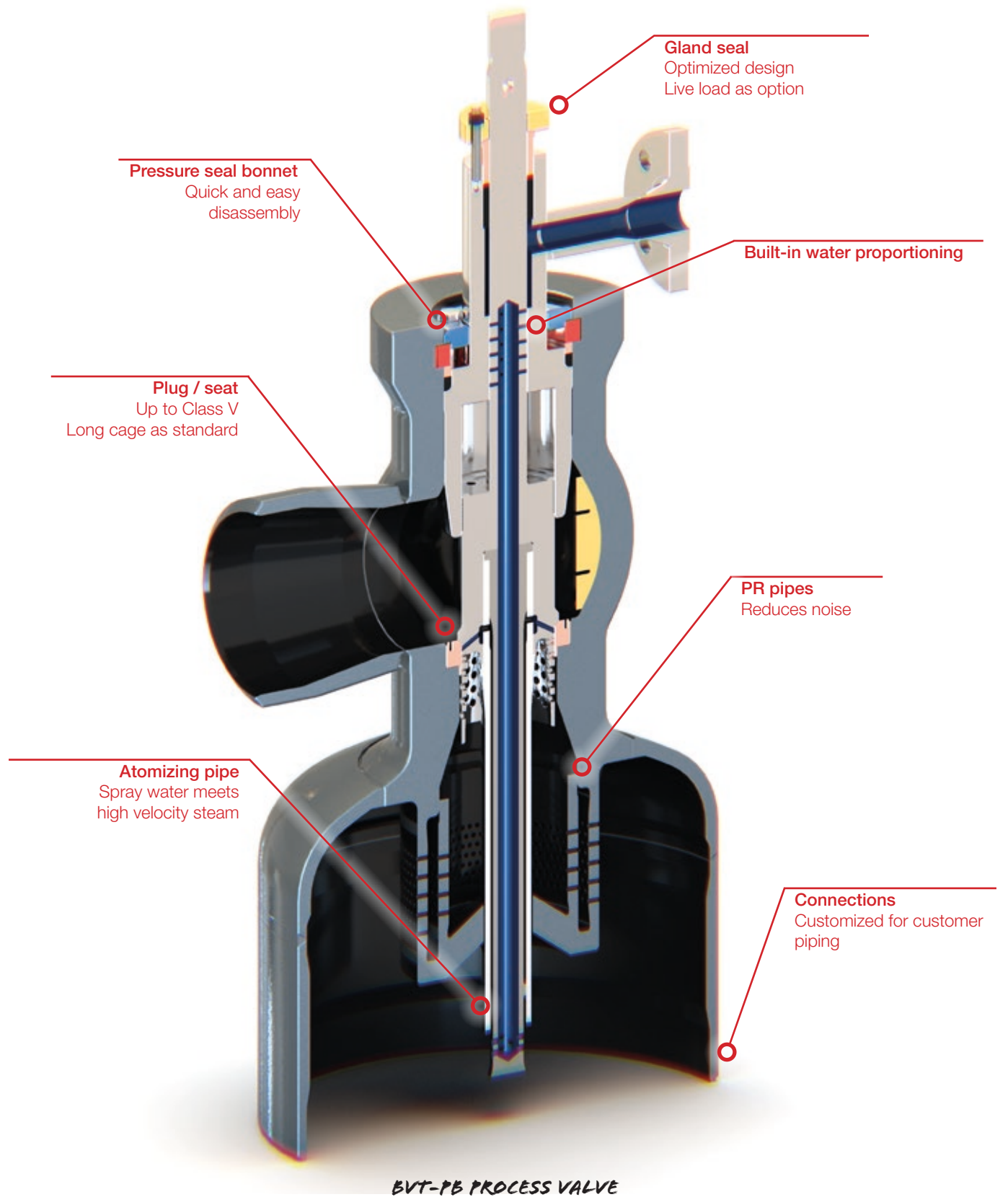


BVT-PB PRODUCT CODE

BVT-PB

Proces bypass valve

Overview



BVT-SC

Pressure reduction valve



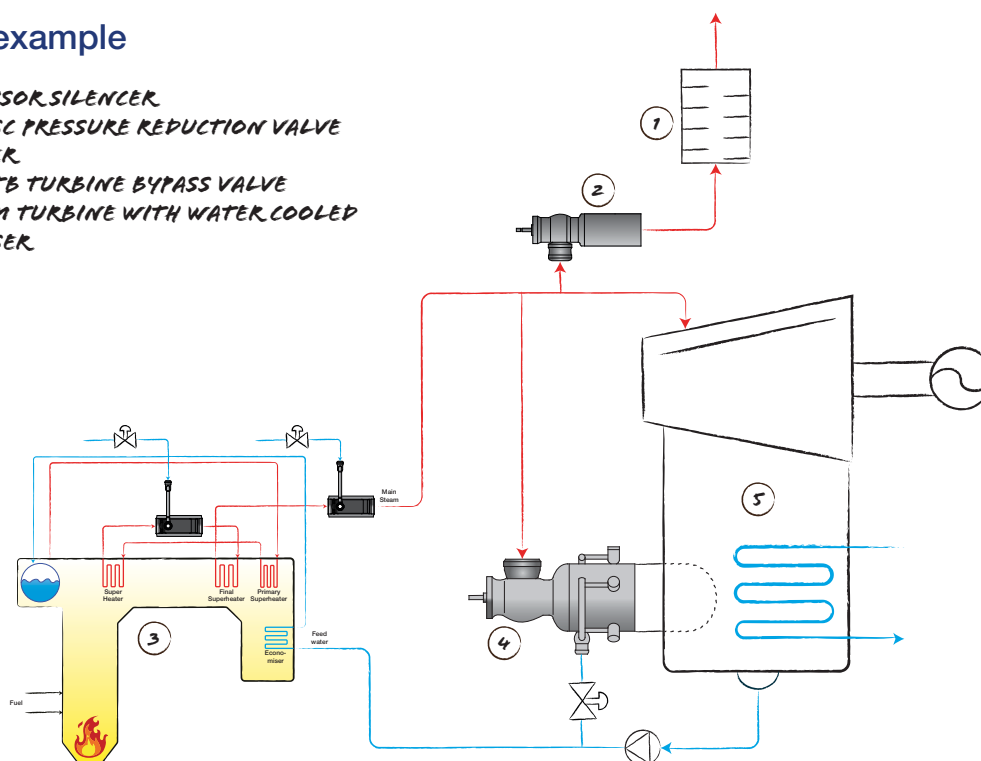
BVT-SC pressure reduction valve

The BVT-SC is a pressure reducing valve used in steam turbine systems, typically used in vent to atmosphere applications. In this application, the valve is placed in a steam pipe branched from the connection between boiler and turbine allowing the steam to be vented to atmosphere in case of a turbine trip. Pressure regulation is taken place in the valve trim where a plug reveals a series of perforations in the valve cage. A set of static pressure reduction pipes may also be installed in the outlet, depending on the pressure drop, providing noise reduction.

The BVT-SC can also be combined with a downstream desuperheater such as the BVT-DLP to perform steam conditioning in installations where downstream straight pipe lengths do not allow for desuperheating in the pressure reducing valve.

Application example

1. DIFFUSOR SILENCER
2. BVT-SC PRESSURE REDUCTION VALVE
3. BOILER
4. BVT-TB TURBINE BYPASS VALVE
5. STEAM TURBINE WITH WATER COOLED CONDENSER



BVT-SC IN A VENT TO ATMOSPHERE APPLICATION

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
- 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, PED, ISO 9001/14001
- ✓ Forged valve body with uniform thickness and trim design optimized to withstand thermal cycling
- ✓ High shut-off class
- ✓ Pressure reduction stages optimized for operating conditions, and for reduced noise.
- ✓ 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
- ✓ Optimized packing design
- ✓ Long cage design reduces wear on trim internals caused by wet steam or particles by moving the critical pressure drop

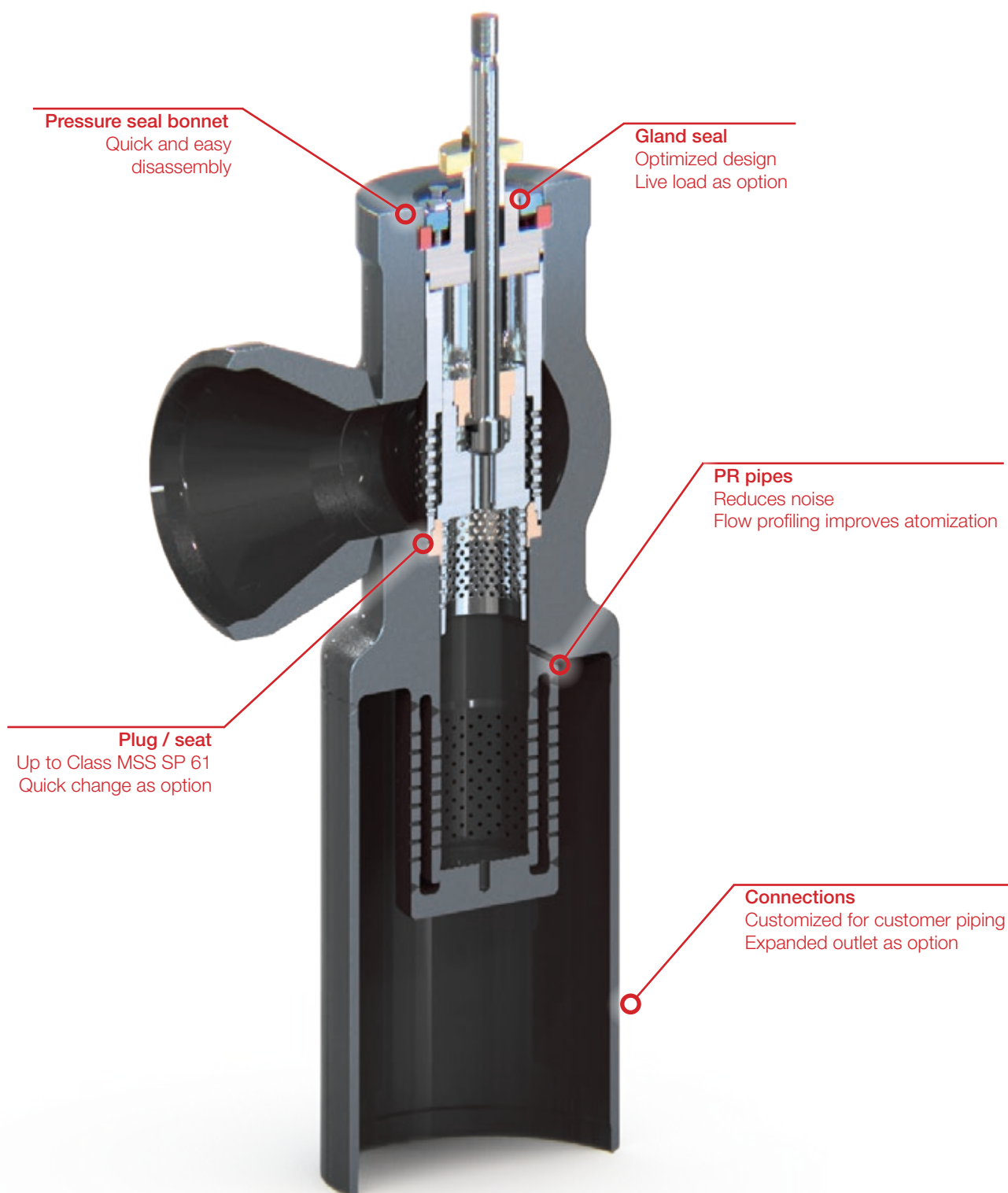
BVT	-	SC	-	90	BTC	-	Z1
Steam Conditioning							
Seat size 56 - 500 [mm]							
Trim options B: Balanced plug T: Tight seal C: Cage design							
Seat options (blank): Welded seat Z1: eZ change seat Z2: eZ change seat with stellite coating ZP: eZ change seat with long plug							

BVT-TB PRODUCT CODE

BVT-SC

Pressure reduction valve

Overview



BVT-TB HP BYPASS VALVE

BVT-SV

Stop valve

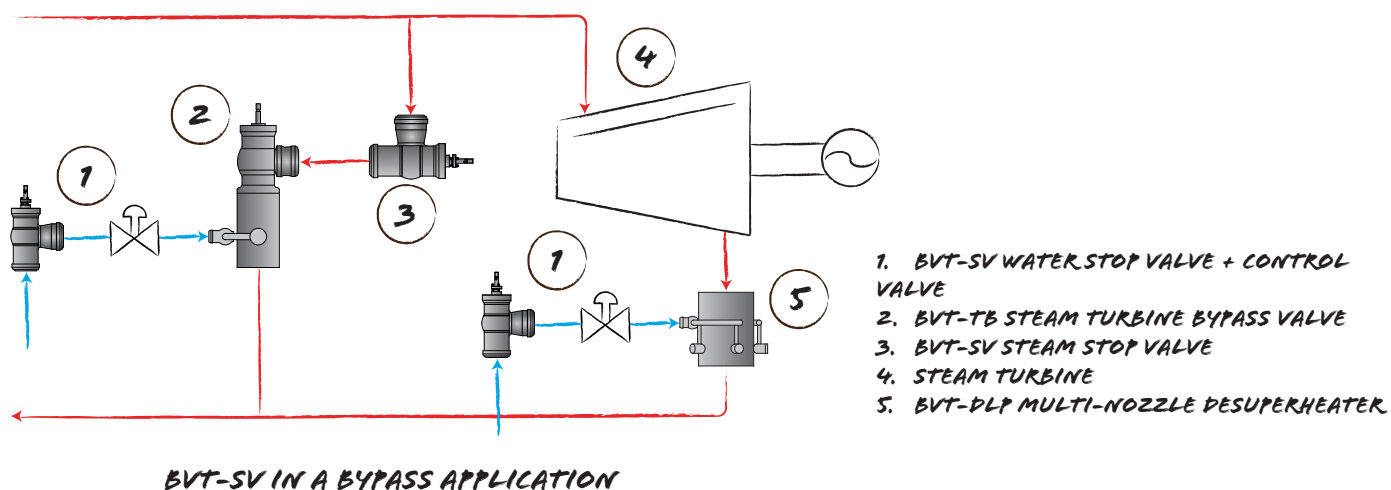


BVT-SV stop valve

The BVT-SV is an angle-body stop valve designed for the harsh environment of a modern fossil-fueled power plant. It can be used on both the water line or the steam line wherever a tight shut off is required and is typically placed upstream of a turbine bypass valve or a spray water control valve.

The homogeneous wall thickness minimizes material stress, and the corrosion resistant alloy on the plug and stem are surface treated to provide sufficient hardness. Maintenance is safe and easy thanks to the pressure seal bonnet. The balanced plug design reduces the required actuating forces, allowing for smaller and pneumatic actuators, and the outlet pressure recovery cone reduces the pressure drop over the valve.

Application example

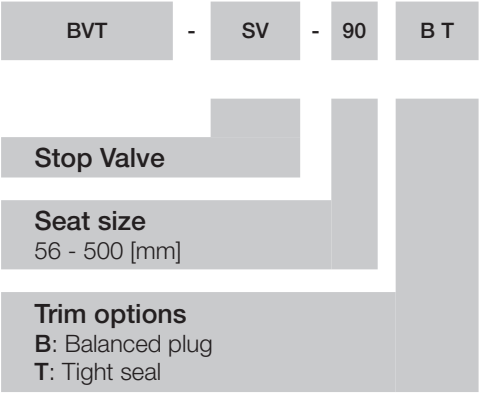


Specifications

- 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 V, MSS SP 61
- Regulatory requirements
ASME, PED, IBR, CRN, ISO 9001/14001
- Materials
Forged material adapted to connecting pipe material
- Actuation
Pneumatic, hydraulic or electrical
- Options
- Live load gland seal packings

Key features

- ✓ Fully customizable inlet, outlet connections
- ✓ Complies with the following standards: ASME, PED, ISO 9001/14001
- ✓ Forged valve body with uniform thickness and trim design optimized to withstand thermal cycling
- ✓ Tight shut off class according up to Class MSS SP 61
- ✓ 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
- ✓ Optimized packing design

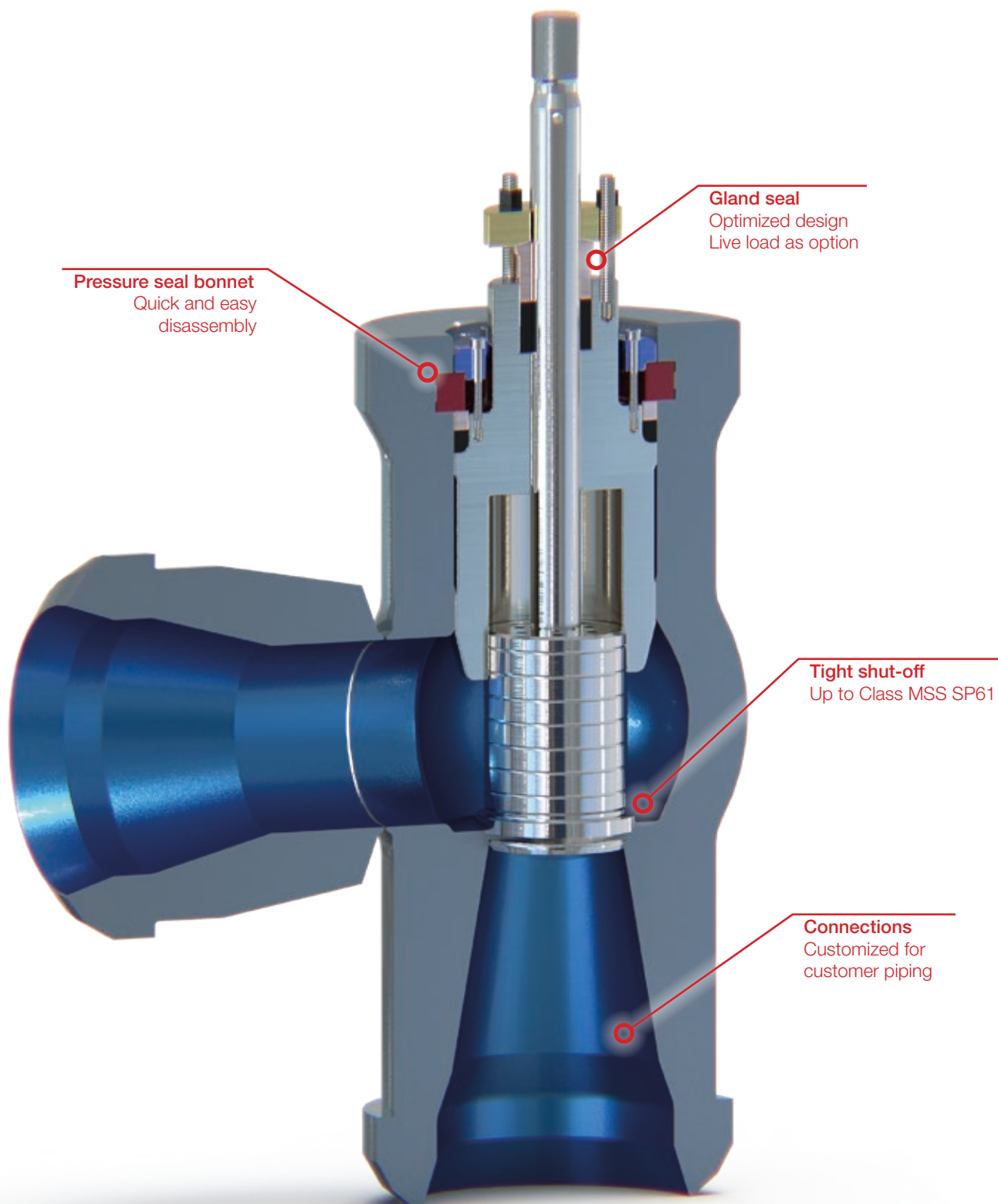


BVT-SV PRODUCT CODE

BVT-SV

Stop valve

Overview



BVT-SV STOP VALVE

BVT-DLP

Ring-style desuperheater



BVT-DLP process desuperheater

A steam desuperheater is used for reducing the temperature of superheated to steam close its saturation point, where thermal efficiency is highest. This is performed by injecting spray water into the steam flow. Spray water flow is controlled by an external water control valve and injected perpendicular to the steam flow using a series of spring-loaded spray water atomizing nozzles. The steam pipe is protected from thermal stresses by a welded liner which also acts as a flow profiler, increasing the relative steam velocity near the nozzles and improving evaporation.

The number of nozzles are chosen based on the steam pipe diameter, in order to improve the spread of injected water over its cross section, and the nozzle springs are chosen / preloaded to avoid flashing in the nozzle opening.

Specifications

Rangeability

Determined by spray water valve

Pressure class

EN PN 16-320

ASME 150-2500

Design temperature

Steam - 630 °C

Water - 250 °C

Materials

Nozzle body / plug

X19CrMoVNb11.1, AISI 616

Spring

Heat resistant spring steel

Steam pipe / liner

Adapted to connecting pipe materials

Water pipes

X10CrMoVNb91, A-182 F91

13CrMo44, A335-P11 or

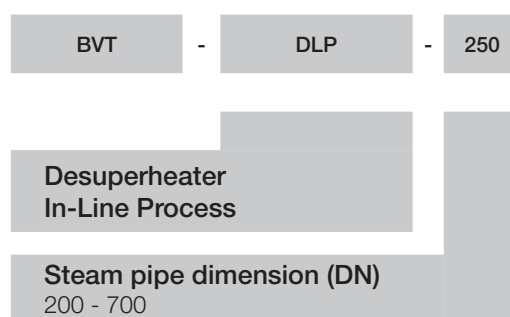
St35.8, A105 or

10CrMo9-10, A-335 P22

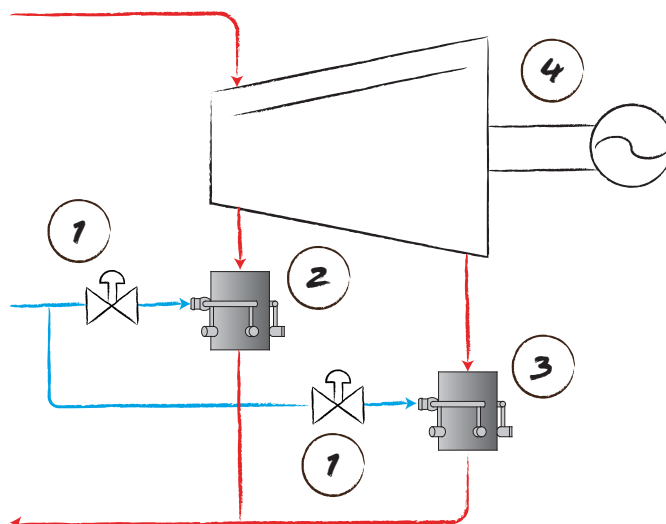
Nozzles and springs are also available in Inconel for high temperature applications or conditions without water injection.

Key features

- ✓ Very high reliability due to being able to handle thermal cycling
- ✓ Flow profiling liner as standard
- ✓ Designed to handle large spray water flow
- ✓ Nozzles resistant to flashing
- ✓ Water atomization pressure is maintained at each nozzle at any flow condition
- ✓ Even distribution of spray water in the steam pipe
- ✓ Negligable pressure drop in the steam line



BVT-DLP PRODUCT CODE



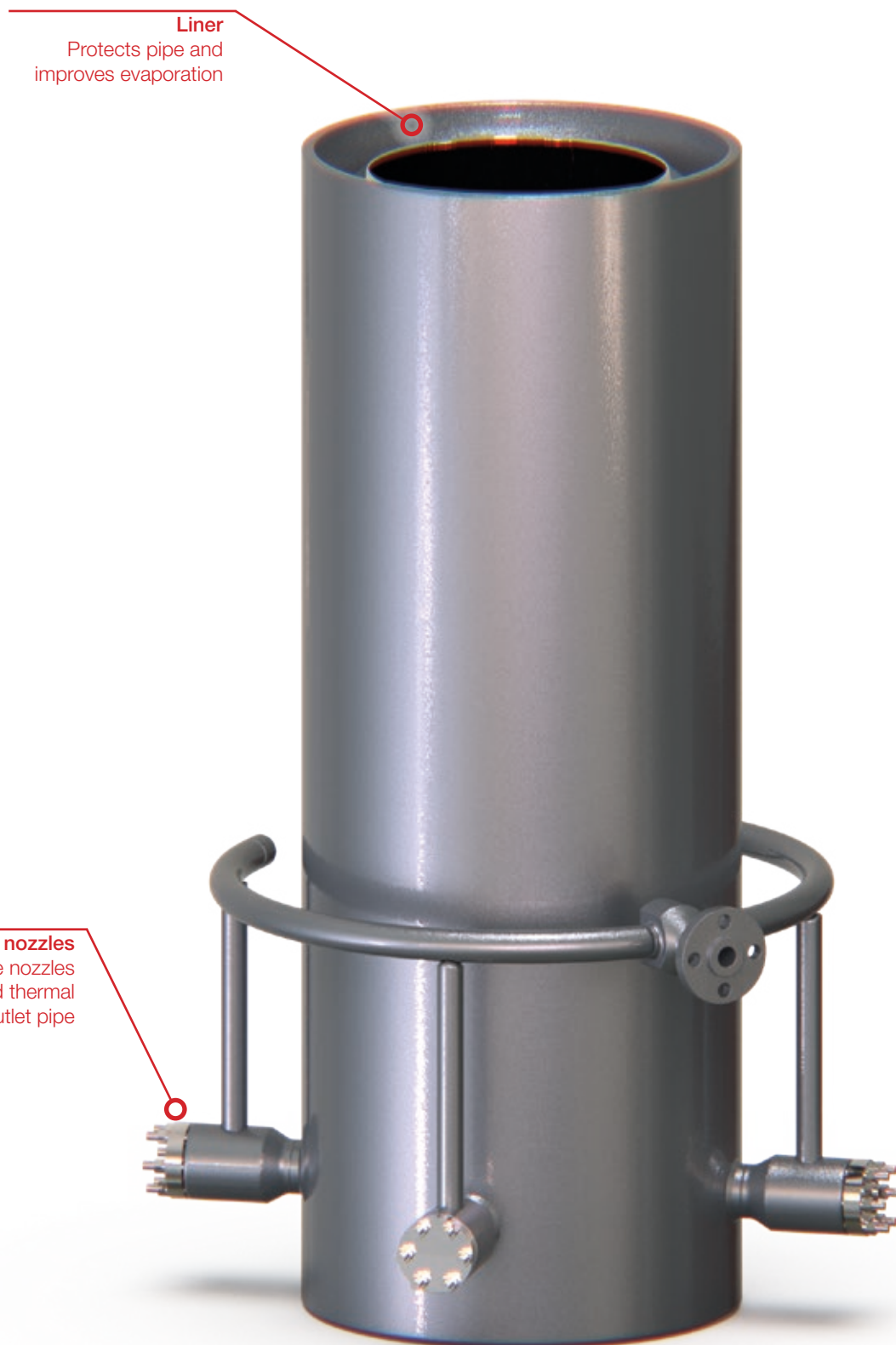
BVT-DLP IN BYPASS TO PROCESS APPLICATION

1. SPRAY WATER CONTROL VALVE
2. BVT-DLP EXTRACTION DESUPERHEATER
3. BVT-DLP EXHAUST DESUPERHEATER
4. STEAM TURBINE

BVT-DLP

Ring-style desuperheater

Overview



BVT-DLP DESUPERHEATER

BVT-DLB

Ring-style attenuator



BVT-DLB steam attemperator

Attemperation is used for controlling the degree of superheat in a Heat Recovery Steam Generator (HRSG) or a boiler. Water is injected into the steam pipe using a series of spring loaded atomizing nozzles. Attemperators are installed between the superheater stages in order to protect any secondary superheater pipes from damage owing to excessive heat, called "inter-stage". Another attemperator is often placed after the boiler / HRSG to regulate the output temperature of the boiler / HRSG or to ensure that the temperature upstream the turbine does not rise too quickly.

The BVT-DLB has a welded flow profiling liner for superior evaporation and performance.

Key features

- ✓ Very high reliability due to being able to handle thermal cycling
- ✓ Flow profiling liner as standard
- ✓ Designed to handle large spray water flow
- ✓ Nozzles resistant to flashing
- ✓ Water atomization pressure is maintained at each nozzle at any flow condition
- ✓ Even distribution of spray water in the steam pipe
- ✓ Negligable pressure drop in the steam line

Specifications

Rangeability

Determined by spray water valve

Pressure class

EN PN 16-320

ASME 150-2500

Design temperature

Steam - 630 °C

Water - 250 °C

Materials

Nozzle body / plug

Inconel 718

Spring

Heat resistant spring steel

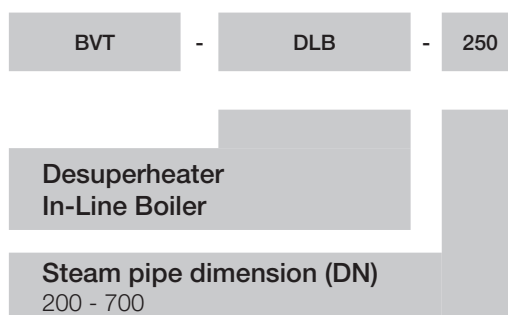
Steam pipe / liner

Adapted to connecting pipe materials

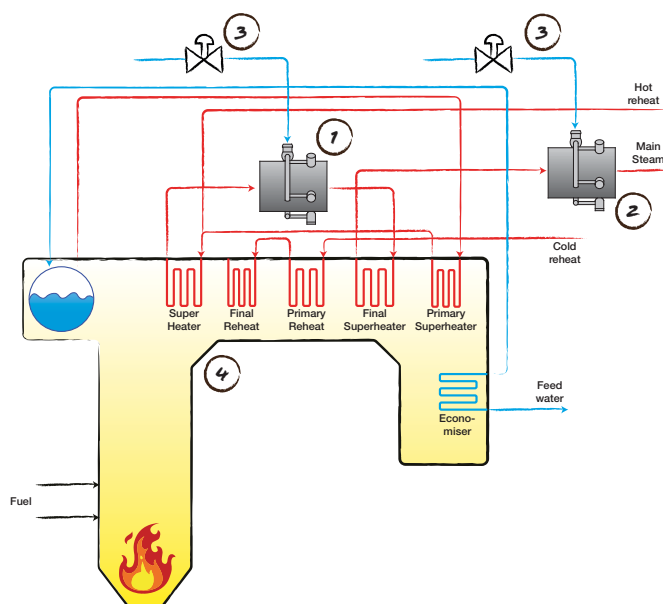
Water pipes

**X10CrMoVNb91, A-182 F91
13CrMo44, A335-P11 or
St35.8, A105 or
10CrMo9-10, A-335 P22**

Nozzles and springs are also available in Inconel for high temperature applications or conditions without water injection.



BVT-DLB PRODUCT CODE



BVT-DLB IN BOILER ATTEMPERATOR APPLICATION

1. INTER-STAGE ATTEMPERATOR
2. FINAL STAGE ATTEMPERATOR
3. SPRAY WATER CONTROL VALVE
4. BOILER

BVT-DLB

Ring-style attemperator

Overview



BVT-DLB ATTEMPEATOR

BVT-DLH

Steam attemperator with floating liner



BVT-DLH

Steam attemperators with floating liner

BVT-DLH Steam Attemperator

Attemperation is the process of controlling the amount of superheat in a boiler or a Heat Recovery Steam Generator (HRSG). Spray water is injected into the superheated steam, reducing its temperature. Spray water flow is controlled by an external water control valve and injected perpendicular to the steam flow using a series of spring-loaded spray water atomizing nozzles. The steam pipe is protected from thermal stresses by a floating liner which also acts as a flow profiler, increasing the relative steam velocity near the nozzles and improving evaporation.

The floating liner is installed without any welding, allowing it to move with the expansion of the material, making it more resistant to cycling.

Key features

- ✓ Very high reliability due to being able to handle thermal cycling
- ✓ Unwelded flow profiling liner
- ✓ Designed to handle large spray water flow
- ✓ Nozzles resistant to flashing
- ✓ Even distribution of spray water in the steam pipe
- ✓ Negligible pressure drop in the steam line

Specifications

Nozzle material

Inconel 718

Rangeability

Determined by spray water valve

Design pressure

Steam - 200 bar(g)

Water - 320 bar(g)

Design temperature

Steam - 630 °C

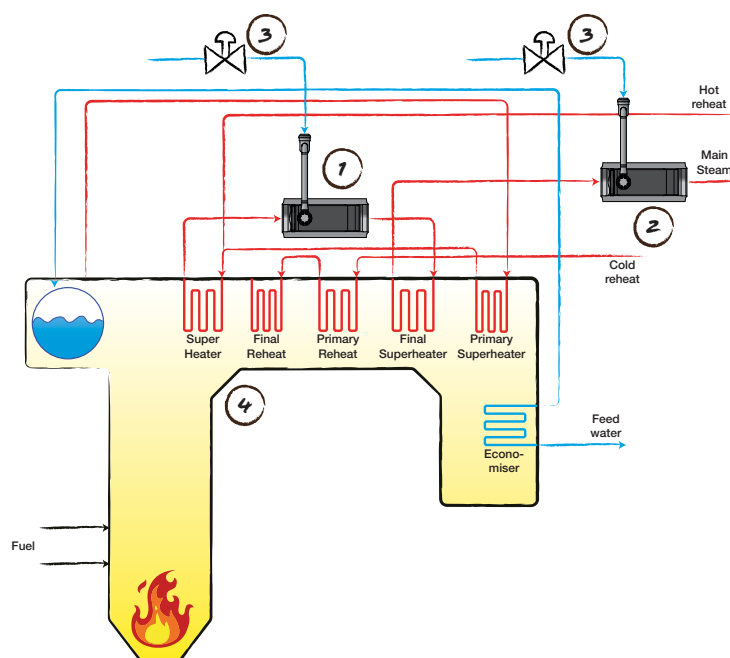
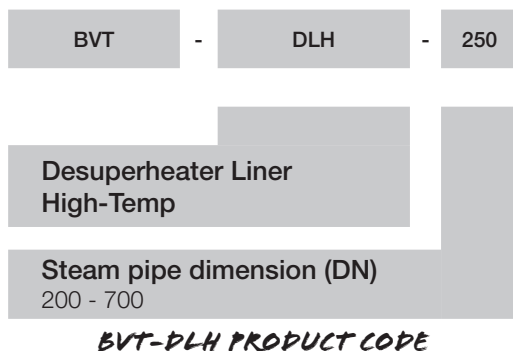
Water - 250 °C

Cycling

Up to 6300 cycles / 25 years

Installation

Horizontal installation or vertical with steam flowing upwards is recommended.



1. INTER-STAGE ATTEMPERATOR
2. FINAL STAGE ATTEMPERATOR
3. SPRAY WATER CONTROL VALVE
4. BOILER

BVT-DLH

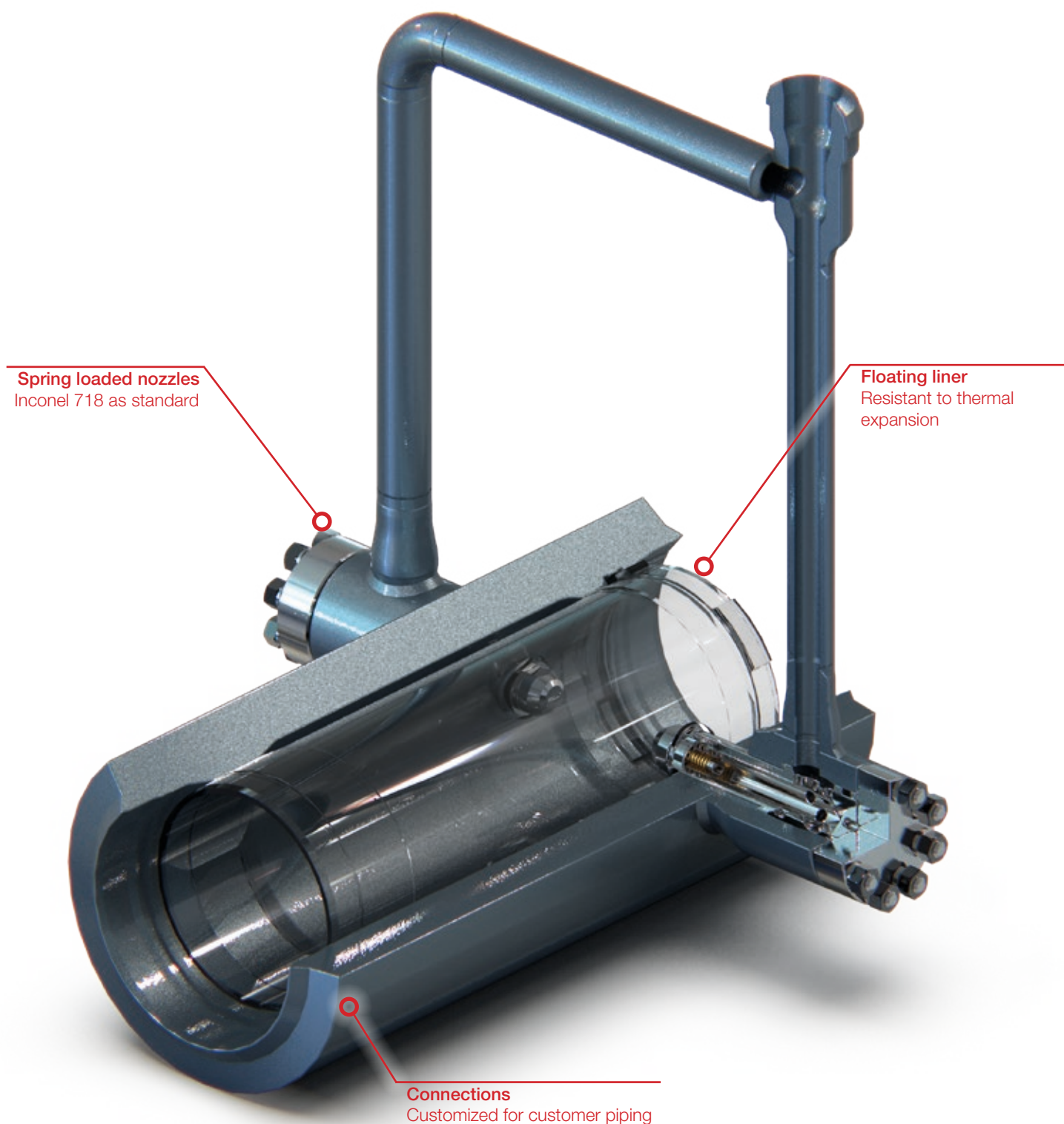
Steam attemperator with floating liner

BVT

SWEDEN

VALVE SOLUTIONS

Overview



BVT-DLH ATTEMPERATOR

BVT-DLBS

Steam attemperator with
floating liner



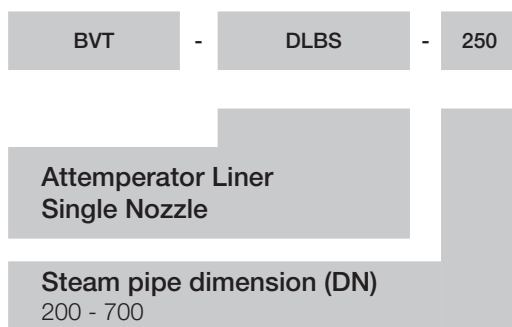
BVT-DLBS

Steam attemperator with floating liner

BVT-DLBS Steam Attemperator

Attemperation is the process of controlling the amount of superheat in a boiler or a Heat Recovery Steam Generator (HRSG). Spray water is injected into the superheated steam, reducing its temperature. Spray water flow is controlled by an external water control valve and injected perpendicular to the steam flow using a spring-loaded spray water atomizing nozzle. The steam pipe is protected from thermal stresses by a floating liner which also acts as a flow profiler, increasing the relative steam velocity near the nozzles and improving evaporation.

The floating liner is installed without any welding, allowing it to move with the expansion of the material, making it more resistant to cycling.



BVT-DLBS PRODUCT CODE

Key features

- ✓ Unwelded flow profiling liner
- ✓ Nozzles resistant to flashing
- ✓ Even distribution of spray water in the steam pipe
- ✓ Negligible pressure drop in the steam line

Specifications

Nozzle material
Inconel 718

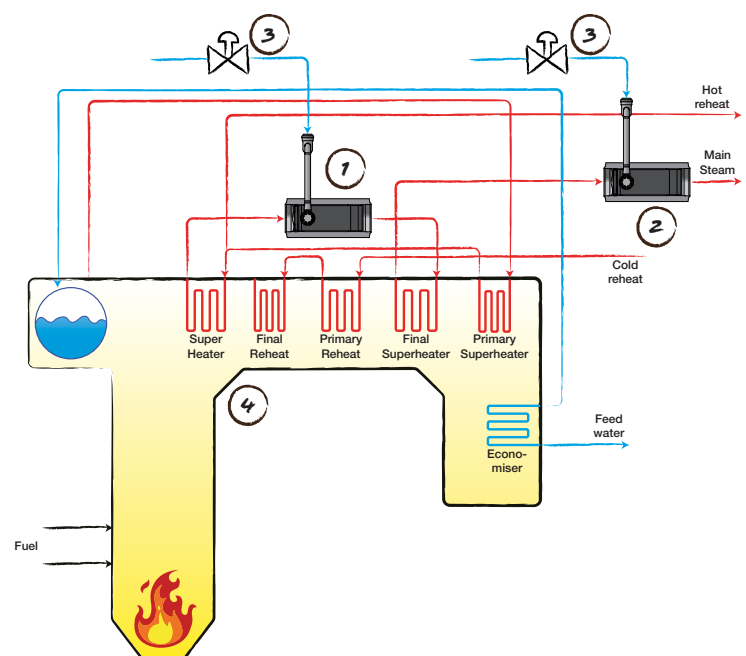
Rangeability
Determined by spray water valve

Design pressure
Steam - 200 bar(g)
Water - 320 bar(g)

Design temperature
Steam - 630 °C
Water - 250 °C

Cycling
Up to 6300 cycles / 25 years

Installation
Horizontal installation or vertical with steam flowing upwards is recommended.

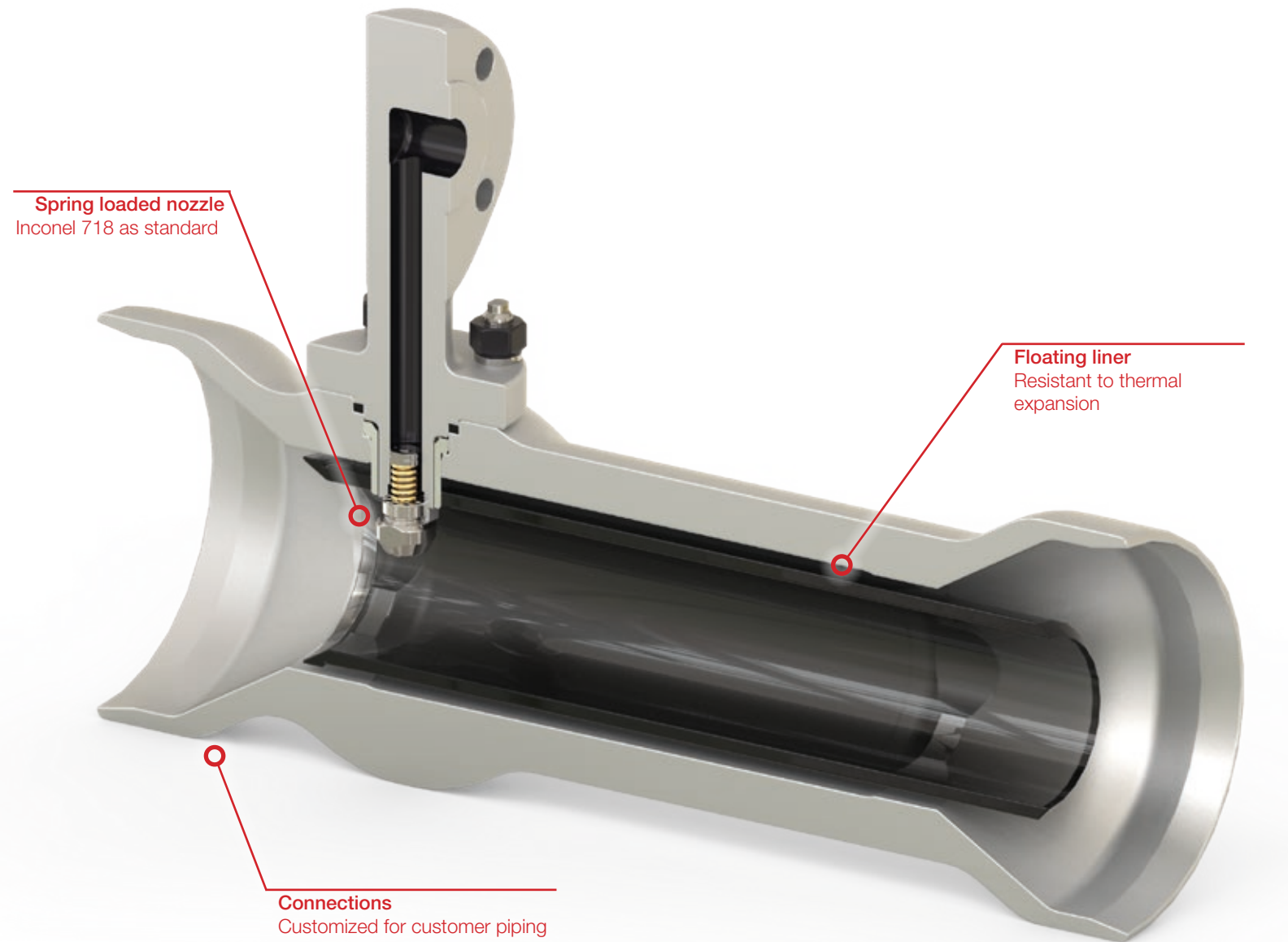


1. INTER-STAGE ATTEMPERATOR
2. FINAL STAGE ATTEMPERATOR
3. SPRAY WATER CONTROL VALVE
4. BOILER

BVT-DLBS

Steam attemperator with floating liner

Overview



BVT-DLBS ATTEMPERATOR

BVT-DP2

Probe-style desuperheater



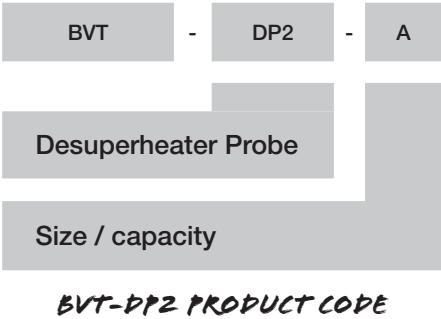
BVT-DP2

Probe-style desuperheater

BVT-DP2 desuperheater

The BVT-DP2 probe-style desuperheater is a combination of injection nozzle and water control valve, designed for precise and economical control of steam temperature. Water enters through the flanged water connection, and is passed through the desuperheater body installed in the steam pipe at an 45° angle. The nozzle at the end of the desuperheater is equipped with individual feed holes. Water enters the chamber behind the orifice plate through these openings where it is rotated before being injected into the steam flow. This rotational flow as well as the cone shaped mist the nozzle creates at the injection point reduces evaporation time, and thus improves desuperheating.

Water injection is controlled by a diaphragm actuator based on measured downstream temperature.



Key features

- ✓ Injection nozzle with rotational injection
- ✓ High rangeability and cooling efficiency
- ✓ Few moving parts and hard-faced control plug and injection nozzle resulting in high reliability and resistance against wear
- ✓ Simple installation

Specifications

Capacity
Multiple options based on customer needs

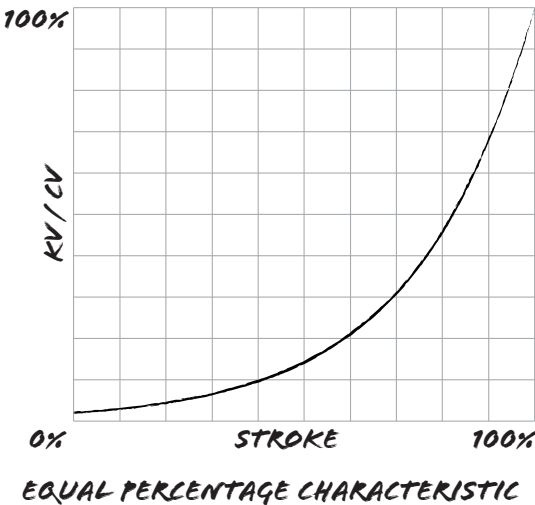
Characteristics
Equal percentage

Control range (water)
up to 50:1

Pressure class
EN PN up to 400
ASME up to 2500

Materials
Body 11CrMo9-10
Plug X20/X19
Atomizer X20/X19
Nozzle head X90CrMoV18
Stuffing box Valveset

Installation
Horizontal installation recommended. In case of other installations, contact BVT Sweden AB.



BVT-DP2

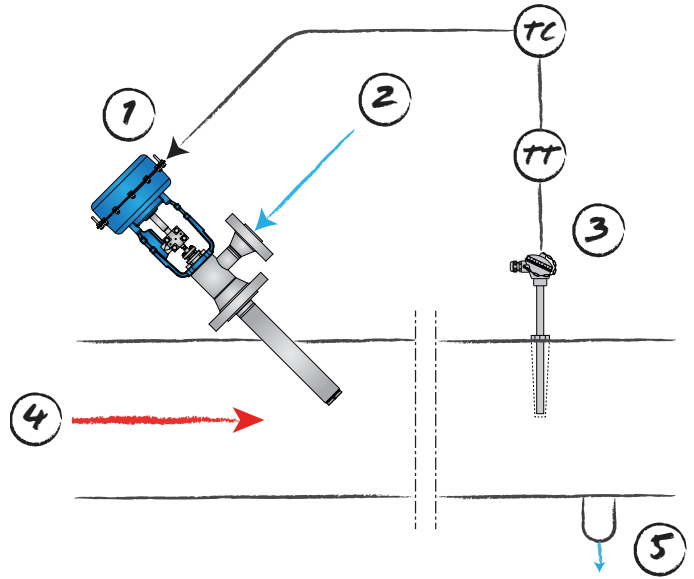
Probe-style desuperheater

Overview



BVT-DP2 DESUPERHEATER

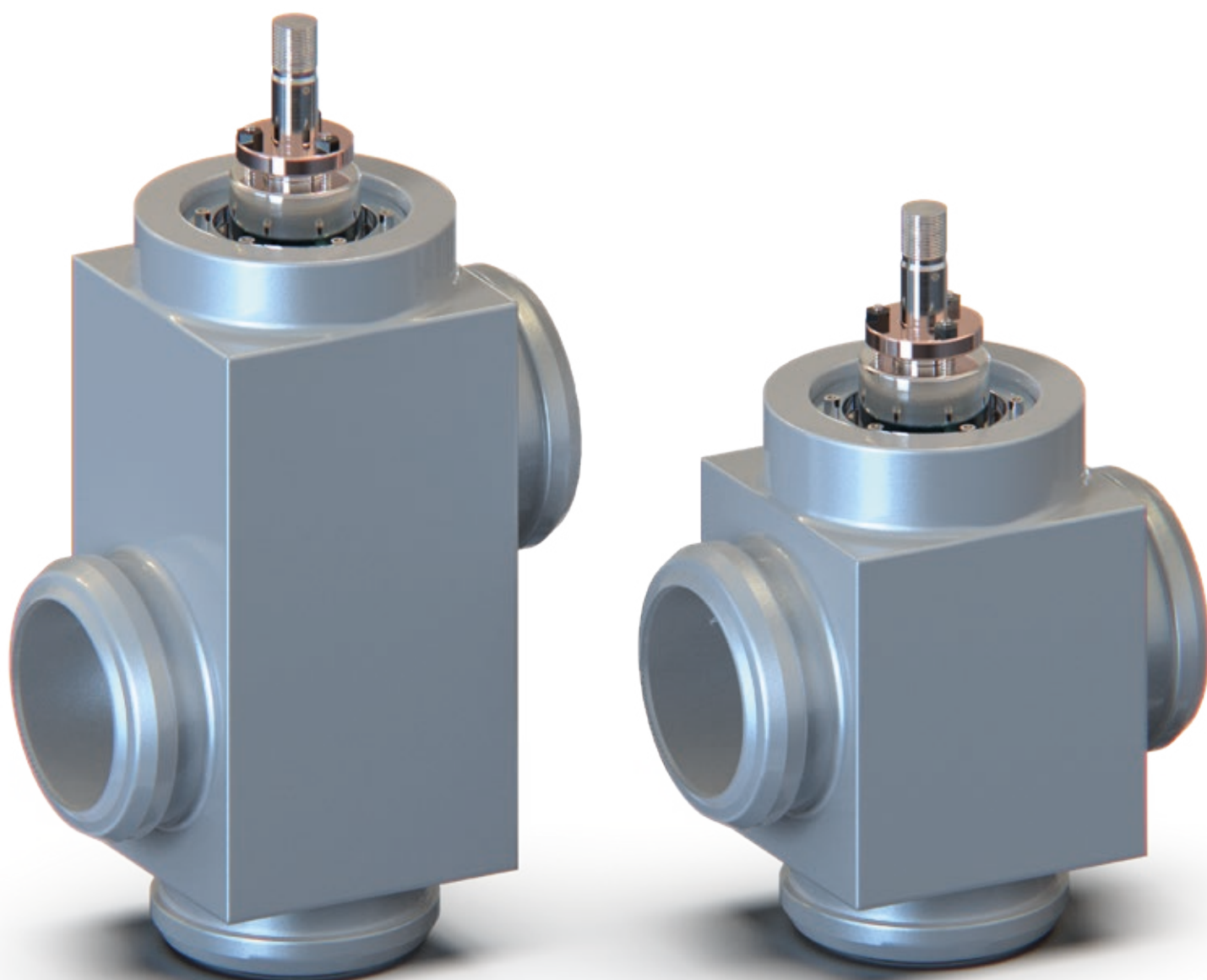
Installation



- 1. DP2 DESUPERHEATER
- 2. SPRAY WATER / CONDENSATE
- 3. TEMPERATURE SENSOR
- 4. SUPERHEATED STEAM
- 5. DRAINAGE
- TT. TEMPERATURE SENSOR
- TC. TEMPERATURE CONTROL

BVT-HB/HBS

Feedwater heater bypass valves



BVT-HB

Feedwater heater bypass valves

Feedwater bypass

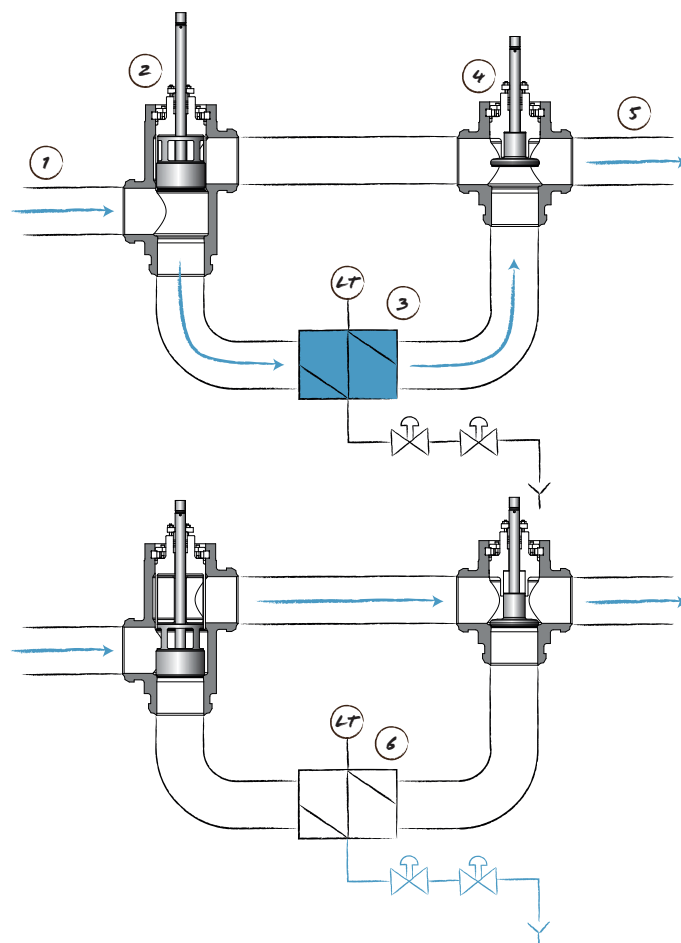
Feedwater heaters are used in power generation to pre-heat the feedwater coming from the feedwater pump before being fed to the boiler in order to improve steam generator efficiency. The bypass system consists of two 3-way isolation valves, the HB is installed upstream from the heater, and the HBS is installed downstream. In normal operation both valves are opened, allowing water to flow through the heater.

Bypass mode

In case maintenance is required for the preheater, water needs to be bypassed around it, and it needs to be isolated. A quick shutoff prevents further damage to the preheater, and maintains feedwater supply to the boiler. The heater bypass system can be automatically controlled by measuring the water level in the heater jacket. If the level is too high, or if the pressure in steam heating line increases, the HB and HBS valves can be closed, isolating the heater and allowing the feedwater to pass through the bypass line. The internal pressure caused by the water forces the plug against the seat and provides a tight shutoff.

Normal operation

When the level in the feedwater jacket has returned to normal, or any maintenance work is done and the heater is to be put into operation, both valves are opened and feedwater is passed through the heater. Actuation is performed by an external actuator as standard.



ABOVE: IN NORMAL MODE
BELOW: IN BYPASS MODE

1. FROM FEEDWATER PUMP
2. HB FEEDWATER BYPASS VALVE
3. FEEDWATER HEATER IN NORMAL OPERATION
4. HBS FEEDWATER STOP VALVE
5. TO BOILER
6. BYPASS WATER PIPE
7. ISOLATED FEEDWATER HEATER

BVT-HB

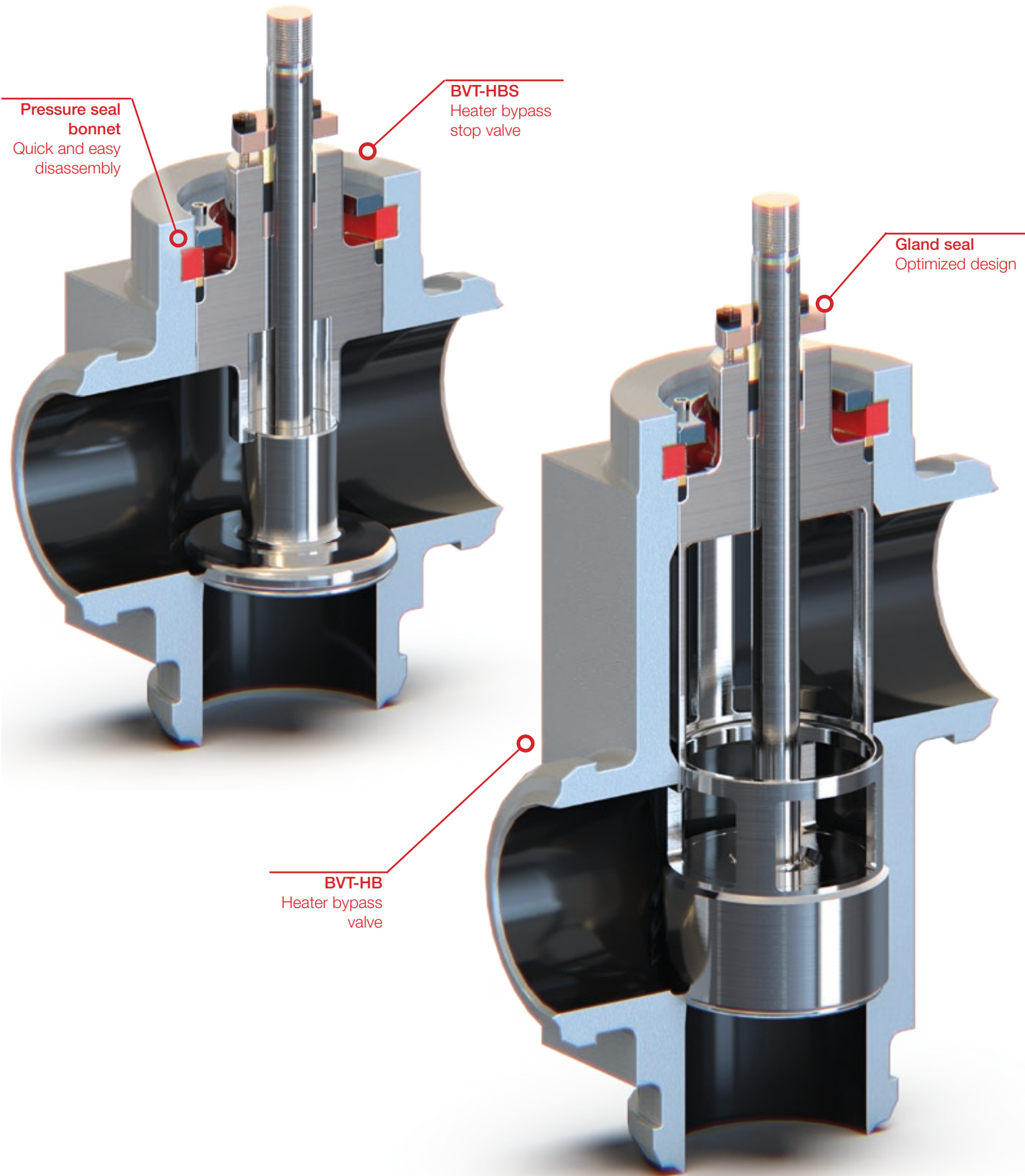
Feedwater heater bypass valves

BVT

SWEDEN

VALVE SOLUTIONS

Overview



BVT-HB

Feedwater heater bypass valves

Key features

- ✓ Protects feedwater heater steam jacket against rupture and leakage
- ✓ Protects turbine extraction from excessive back pressure
- ✓ Allows bypass of feedwater heater to be isolated without disrupting the water circulation
- ✓ Can bypass the feedwater heater during plant start-up and during low turbine load
- ✓ Allows bypassing of the heater at peak loads in order to increase power output from the turbine and improve overall plant efficiency
- ✓ Easy maintenance

Design

The HB and HBS valves are designed and manufactured for reliable function and long service life. The body is manufactured from a fully machined forging, with circular connections in order to reduce asymmetrical stress patterns. Connections are selected based on connected pipings, valve sizes are selected to reduce pressure drop. Pressure seal bonnets are used as standard, allowing for easy maintenance and safe and tight connection at valve neck. Plugs are contoured and designed to reduce pressure drop over the trim. Seats are stellited and integrated with the valve body.

Specifications

Actuator type

Electrical as standard, other on request

Pressure class

Up to ANSI-4500

Leakage class

ANSI class III against bypass line

ANSI class V against feedwater heater

Regulatory standards

PED, ASME

BVT-NS

Spray water atomizing nozzle

Spray water nozzles

The BVT-NS atomizing spray nozzle is inserted into the steam outlet pipe, injecting spray water into the superheated steam. The design and selection of this nozzle is crucial for producing optimal evaporation of the spray water, without which could result in free spray water in the steam pipe or suboptimal temperature control. Diameter of the spray water opening, adjustment of the spring, pressure drop over the nozzle, number of nozzles and their insertion lengths are some of the factors determining nozzle performance.

BVT can provide spray nozzles as replacement for the BTG OP nozzle. These come in a range of sizes and spring pre-load strengths tailored to the customer's desuperheating needs. With over 30 years experience in desuperheating, BVT can also provide support in questions regarding application and temperature control, and can provide alternatives in situations where the existing nozzles are unsuitable. BVT atomizing nozzles are available for the BTG VLB steam conditioning valve and the BTG DAM desuperheater.

Key features

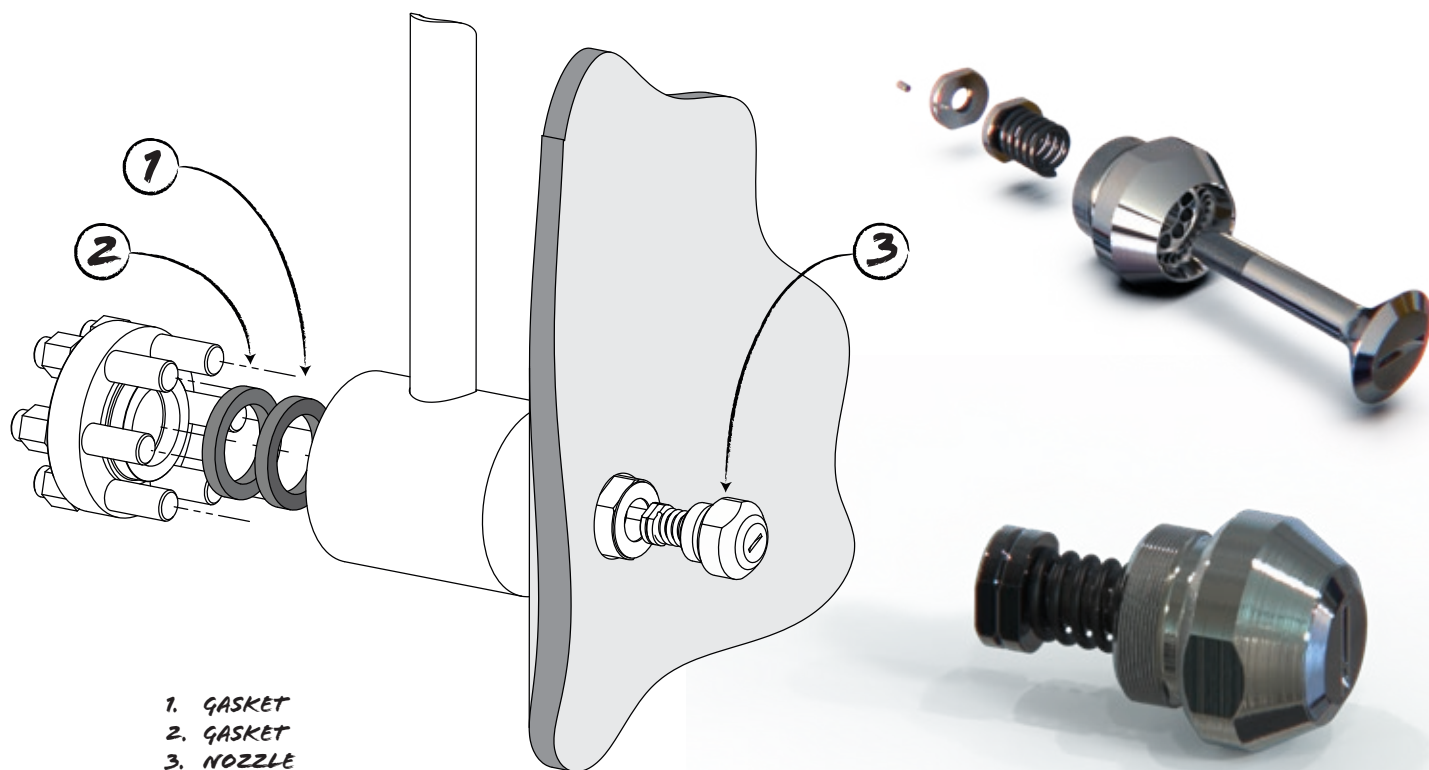
- ✓ 100% compatible replacement of BTG OP nozzles
- ✓ Available in multiple designs and capacities, chosen to fit application
- ✓ Calibrated and tested prior to delivery

When should nozzles be replaced?

If damage to this opening is observed or if the nozzle does not close completely when depressurized, this is a sign that the nozzle needs to be replaced. Nozzles and gaskets should also be replaced at every outage.

Causes of nozzle damages

Spray atomizing nozzles require clean water or condensate for optimal performance. BVT recommends that strainers are installed upstream from the injection point, with a maximum particle size at 200 microns (mesh - 70). Larger particles and other contaminants can cause wear on the nozzle trim and particles can clog up the nozzle opening, preventing it from closing properly. The spray nozzles opening should produce a thin high velocity jet sprayed evenly along its circumference in operation, and close shut when depressurized.



Quick change seat and trim

Wet steam and particles result in erosion on trim parts. If erosion affects sealing surfaces, this might result in valve leakage and overheating of downstream piping. This is most common after supercritical pressure drops, where particles and steam have very high velocity. It is also more common when the valve is operating at a small opening degree. The Z1 quick change seat design allows for quick and easy replacement of worn seats, and the Z2 variant provides added erosion resistance with Stellite 6 coating. A seat packing ring is placed under the seat to stop leakage.

Z1 and Z2 options

The Z1 quick change seat design allows for quick and easy replacement of worn seats. Seat removal and trim compression tools used during seat replacement are provided with the upgrade.

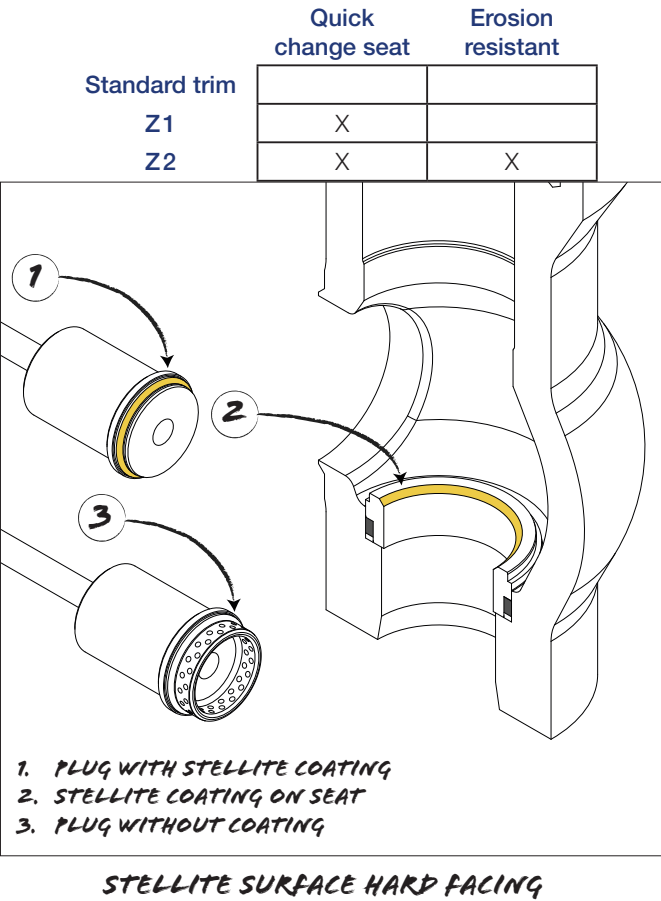
The Z2 variant provides added erosion resistance with Stellite 6 coating. The stellite coating combines excellent mechanical wear resistance, especially at high temperatures, with very good corrosion resistance. The Stellite™ alloys are mostly cobalt based with additions of Cr, C, W, and/or Mo. They are resistant to cavitation, corrosion, erosion, abrasion, and galling.

Key features

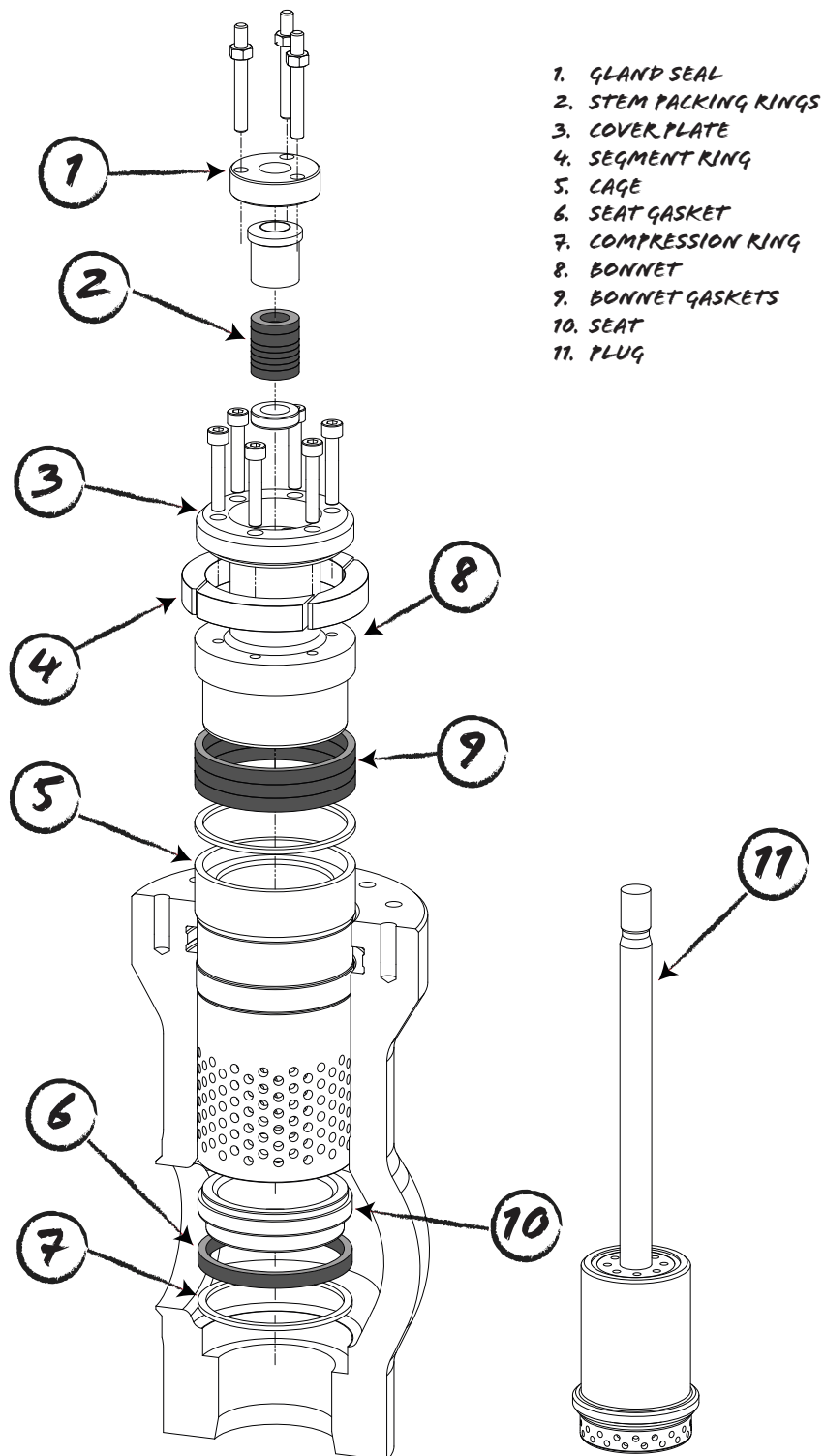
- ✓ Quicker and easier seat exchange
- ✓ Reduced MTTR and longer service lifetime
- ✓ Reduced downtime and maintenance cost



High velocity jets have caused erosion damage on a valve seat, with leakage as a result.



Parts included in upgrade

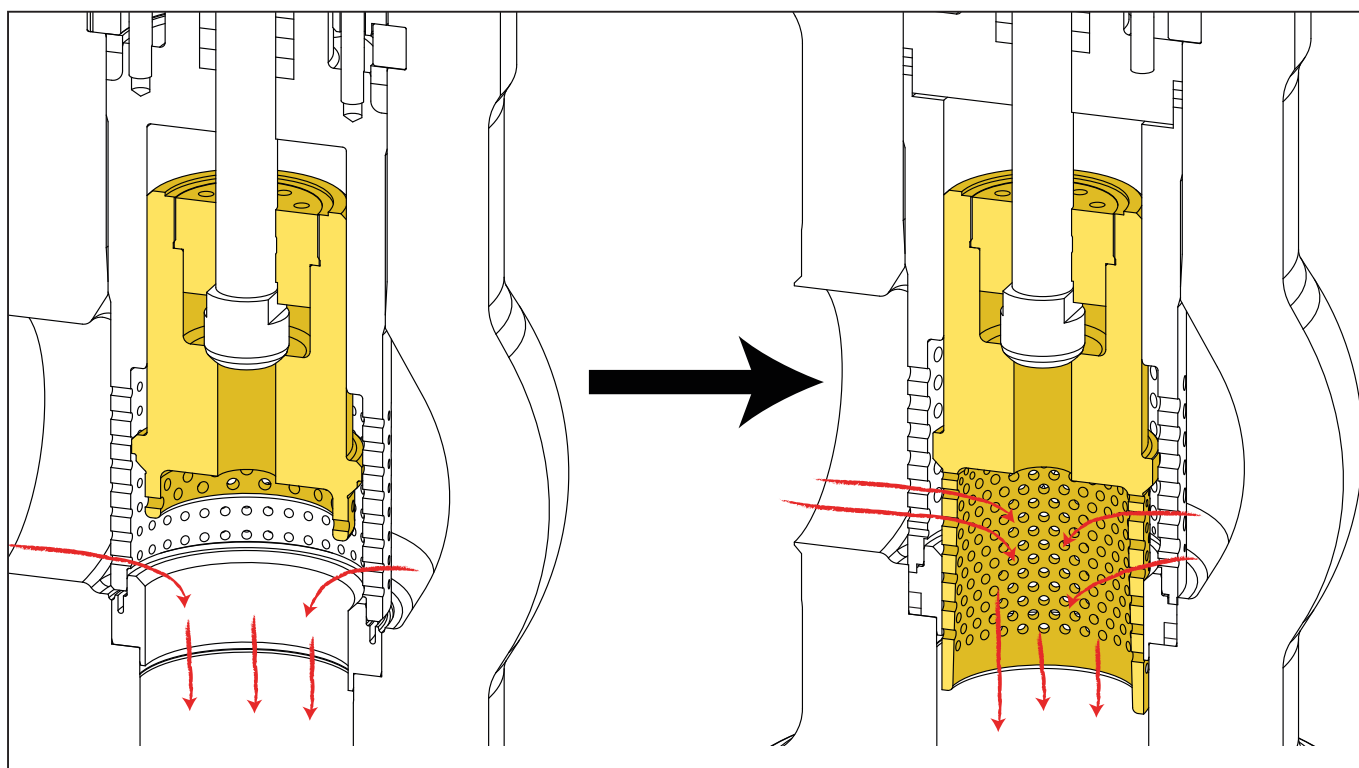


Quick change seat and trim

Wet steam and particles result in erosion on trim parts. If erosion affects sealing surfaces, this might result in leakage and overheating of downstream piping. This is especially common after supercritical pressure drops, where particles and steam have very high velocity. It is also more common when the valve is operating at a small opening degree. The quick change seat trim design reduces this problem by moving the super critical pressure drop from the seat area and bonnet cage. The critical pressure drop is taken over the plugs cage. A seat packing ring is placed under the seat to stop leakage.

Key features

- ✓ Quicker and easier seat exchange
- ✓ Reduced MTTR and longer service lifetime
- ✓ Reduced downtime and maintenance cost
- ✓ Reduced damage to valve seat



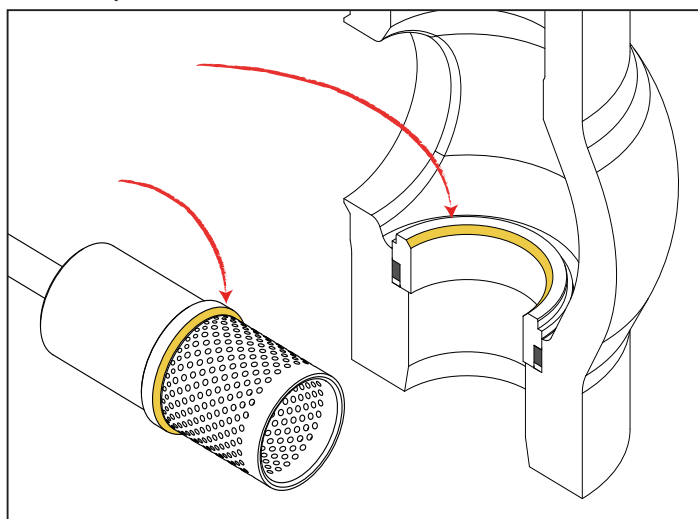
STEAM FLOW THROUGH TRIM

Hard facing

The plug and seat also have stellite 6 hard facing as standard, further improving the sealing surfaces resistant to erosion.

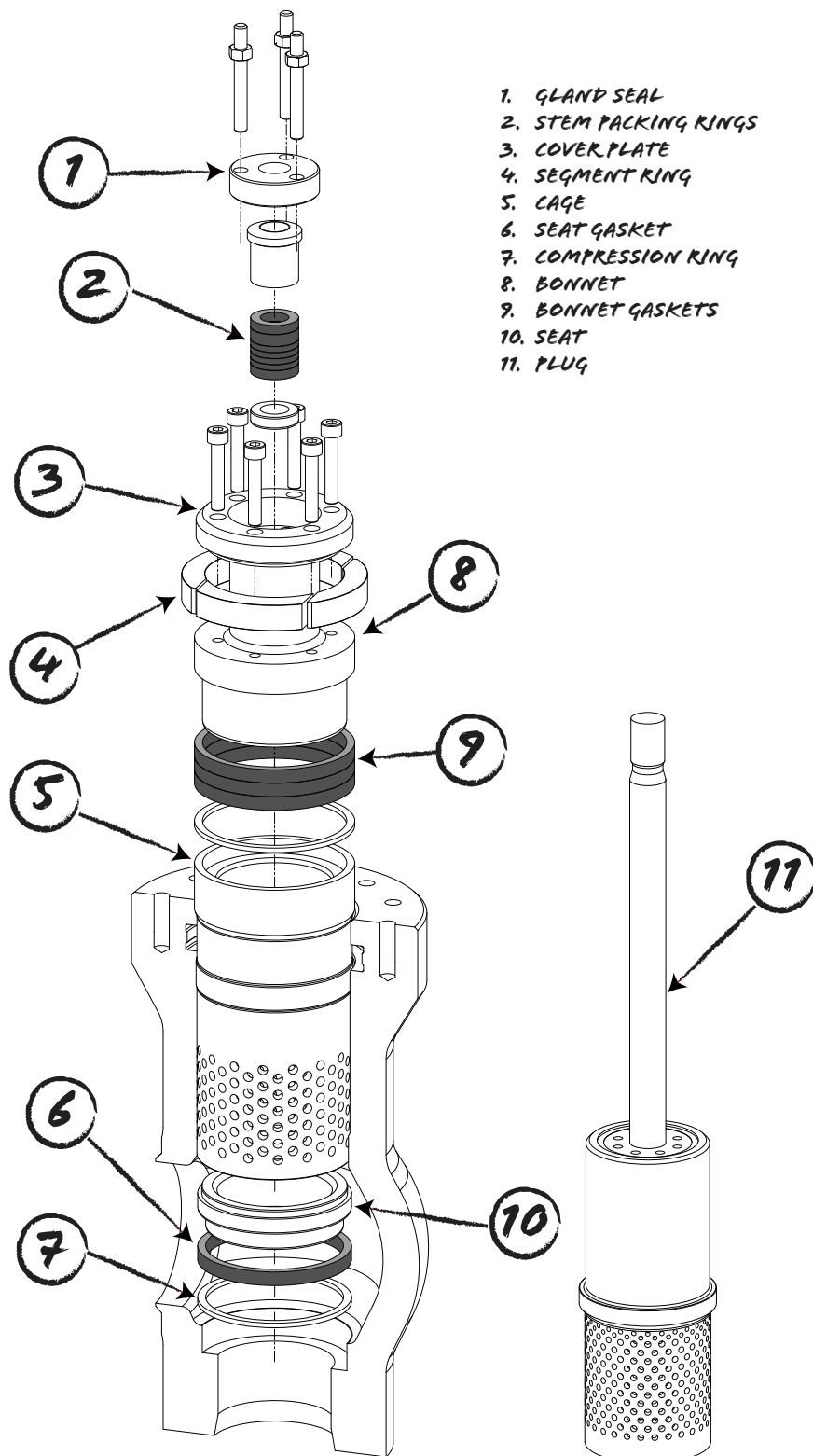
The plugs cage decreases the capacity of the valve, so it might be necessary to move to a larger seat size.

The seat is not welded to the valve body, and thus does not need to be cut out. Seat removal and trim compression tools are included for quick and easy seat replacement



STELLITE SURFACE HARD FACING

Parts included in upgrade



Water valves

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.



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.

Our actuators and accompanying control elements are designed to provide superior linearity with minimum hysteresis.

Features and options

Cylinder types

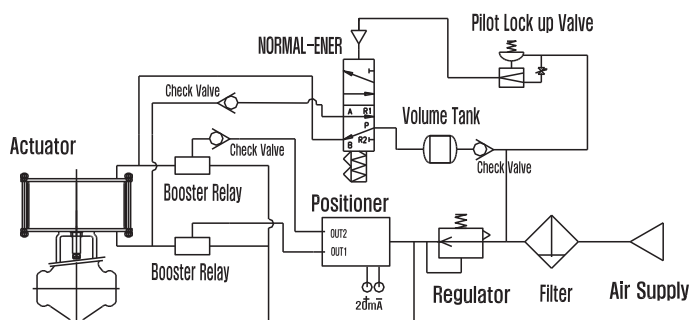
- **Double Acting, Single Acting**
- **Spring Open, Spring Close**
- **Top mounted hand wheel, side mounted hand wheel**

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**



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

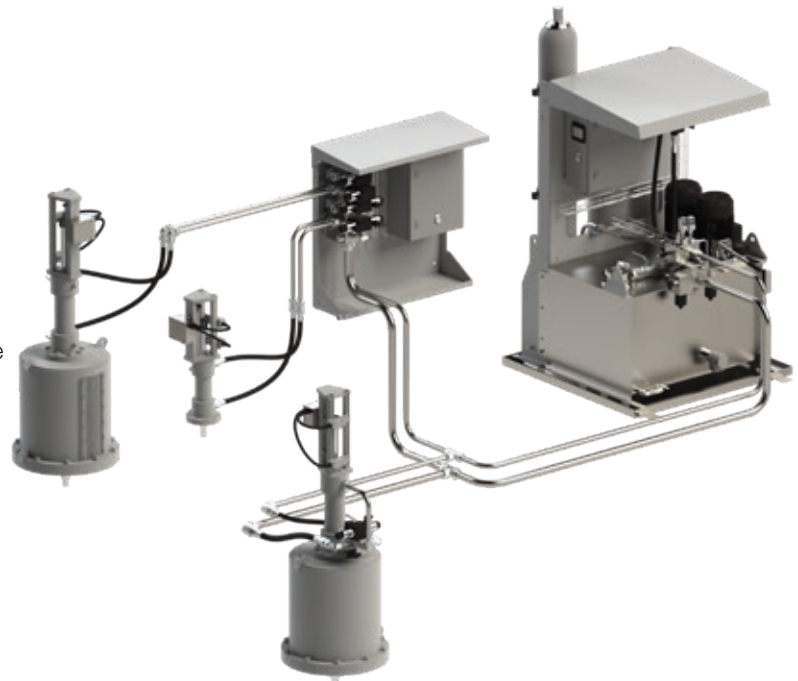
- Intelligent Power Manager pump controller as standard
- Dual pumps, accumulators, spill tray
- Analog pressure, temperature and level transmitters as standard

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

Certificates

 Certificate No. / Zertifikat Nr.: 50329/1

CERTIFICATE
in accordance with the requirements of the Pressure Equipment Directive 2014/68/EU

ZERTIFIKAT
in Übereinstimmung mit den Anforderungen der Druckgeräterichtlinie 2014/68/EU

This is to certify that the quality assurance system of
Hiermit wird bescheinigt, dass das Qualitätssicherungssystem des Unternehmens

BVT Sweden AB
SE-653 46 Karlstad
Sweden / Schweden

has been assessed by LR Deutschland GmbH in accordance with the requirements of Annex III
durch die LR Deutschland GmbH entsprechend den Forderungen des Anhangs III

Module H

to the Pressure Equipment Directive 2014/68/EU and
conforms to the requirements for the products shown below:
der Druckgeräterichtlinie 2014/68/EU geprüft und bewertet wurde und für die folgenden Produkte die Anforderungen erfüllt:

**Valves and accessories for power and process applications,
for details see Annex 1 to this certificate.**
Ventile und Ausrüstungsteile für Anwendungen in der Wärme- und Verfahrenstechnik,
Einzelheiten siehe Anhang 1 dieses Zertifikates.

Approval is subject to continued maintenance of the quality assurance system
in accordance with the requirements of the above-mentioned directive.
Die Zulassung gilt unter der Voraussetzung, dass das Qualitätssicherungssystem fortlaufend aufrechterhalten wird und
die Forderungen oben genannter Richtlinie erfüllt.

Authorisation is hereby given to use the below-mentioned Notified Body Identification Number
of LR Deutschland GmbH in accordance with the requirements of the specified directive
in relation to the products as named above:
Hiermit wird die Genehmigung erteilt, folgende Kennnummer der LR Deutschland GmbH als Notifizierte Stelle
in Übereinstimmung mit der angegebenen Richtlinie in Bezug auf die oben genannten Produkte zu verwenden:

CE 0525

Certificate expiry date / Zertifikatsgültigkeit bis: **31.01.2022**

Hamburg, 01.11.2019
Place and Date
Ort und Datum

K. Wolf
Name, Signature, Certifier
Name, Unterschrift, Zertifizierer

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ZE-1110 en Rev. 3, (08/19) Lloyd's Register Deutschland GmbH, Übersenallee 10, D-20457 Hamburg, Deutschland T: +49 349 700 10-100, F: +49 350 69 2025, Email: PressureSystems.Germany@lr.org Seite 1 von 1

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MODULE H

 **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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Issued by: LRQA Sverige AB, Box 2127, Carlssonsgatan 74 42202 Skövde, Sweden for and on behalf of: Lloyd's Register Quality Assurance Limited, 1 Trinity Park, Broomfield Lane, Birmingham B37 7YD, United Kingdom

ISO 14001 AND ISO 9001

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