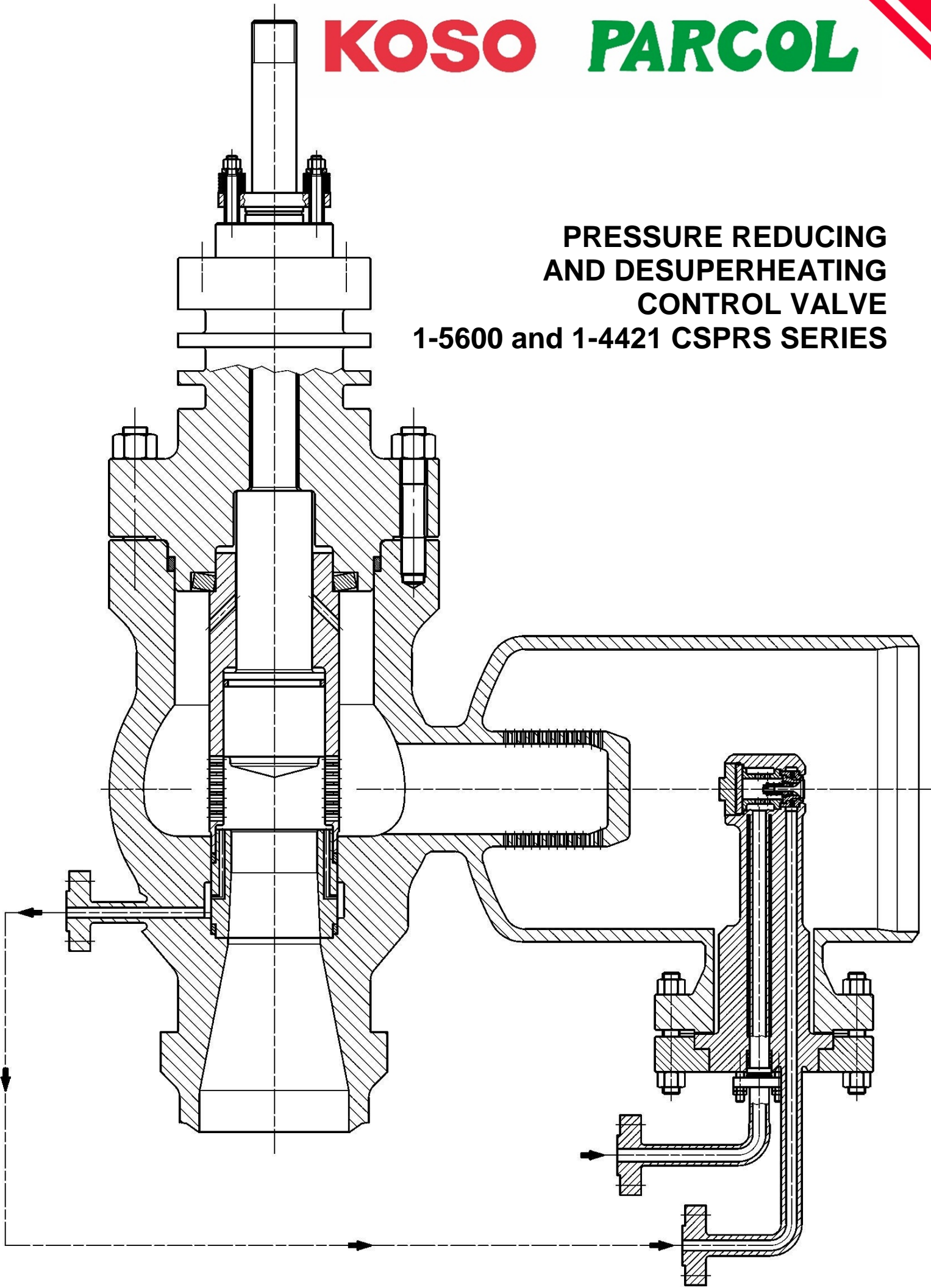


KOSO **PARCOL**

**PRESSURE REDUCING
AND DESUPERHEATING
CONTROL VALVE**

1-5600 and 1-4421 CSPRS SERIES



1-5600 CSPRS SERIES PRESSURE REDUCING AND DESUPERHEATING CONTROL VALVE

DESCRIPTION

1-5600 CSPRS angle body series control valve is a Parcol pressure reducing and desuperheating control valve with integrated water injection specially designed for CSPRS function.

The valve design has been simplified and optimized to comply with CSPRS requirements by minimizing the friction and maximizing the fluid thrusts lifting the plug during valve opening, so to warrant the free self-movement of the plug up to full open position.

In order to reduce noise and to limit valve body dimension, a second stage acting as silencer can be installed at valve body outlet without affecting valve discharge capacity.

The control stage has a modified linear flow characteristic that allows an excellent control also at minimum flow conditions.

The *pressure reduction* is performed through one or two stages, depending on process conditions and noise requirements.

The first stage of pressure reduction is performed by a cage with fluid inlet under the plug, the second stage of pressure reduction, if any, is performed by a single-stage drilled basked, with fixed area, directly connected to the body outlet connection.

Both stages are designed with appropriate flow pattern section in order to exclude the clogging while minimizing produced noise and vibration.

Due to fixed section of second stage, its acoustic benefit decreases with the flow rate reduction, nevertheless the noise generated by the first stage is also absorbed and dissipated, hence its designation as "silencer".

The *desuperheating section* is located just downstream valve outlet, or silencer if any, and includes a chamber provided with Parcol well experienced desuperheaters for water injection.

A full integrated water injection system based on Parcol LVA nozzle, with self-generation of atomizing steam, is available.

In Cv's table max flow coefficients and discharge capacity coefficient $K_d \cdot A$ are reported, reduced capacity trim are available on request.

APPLICATIONS

1-5600 CSPRS valve has been specifically designed for high pressure to CRH steam turbine bypass applications where safety function is required.

Simplified valve design based on long period Parcol's experience on steam turbine bypass applications, combined with high quality construction materials allows warranting reliability and high performance flow control with reduced noise generation and high efficiency integrated steam desuperheating.

The high experienced trim materials and downstream injection of water, allow minimizing wear effects also for continuous or frequent services requiring minimum maintenance.

A wide range of Parcol desuperheaters can be installed allowing a proper steam conditioning also with high water to steam flow rates and high turndown ratio.

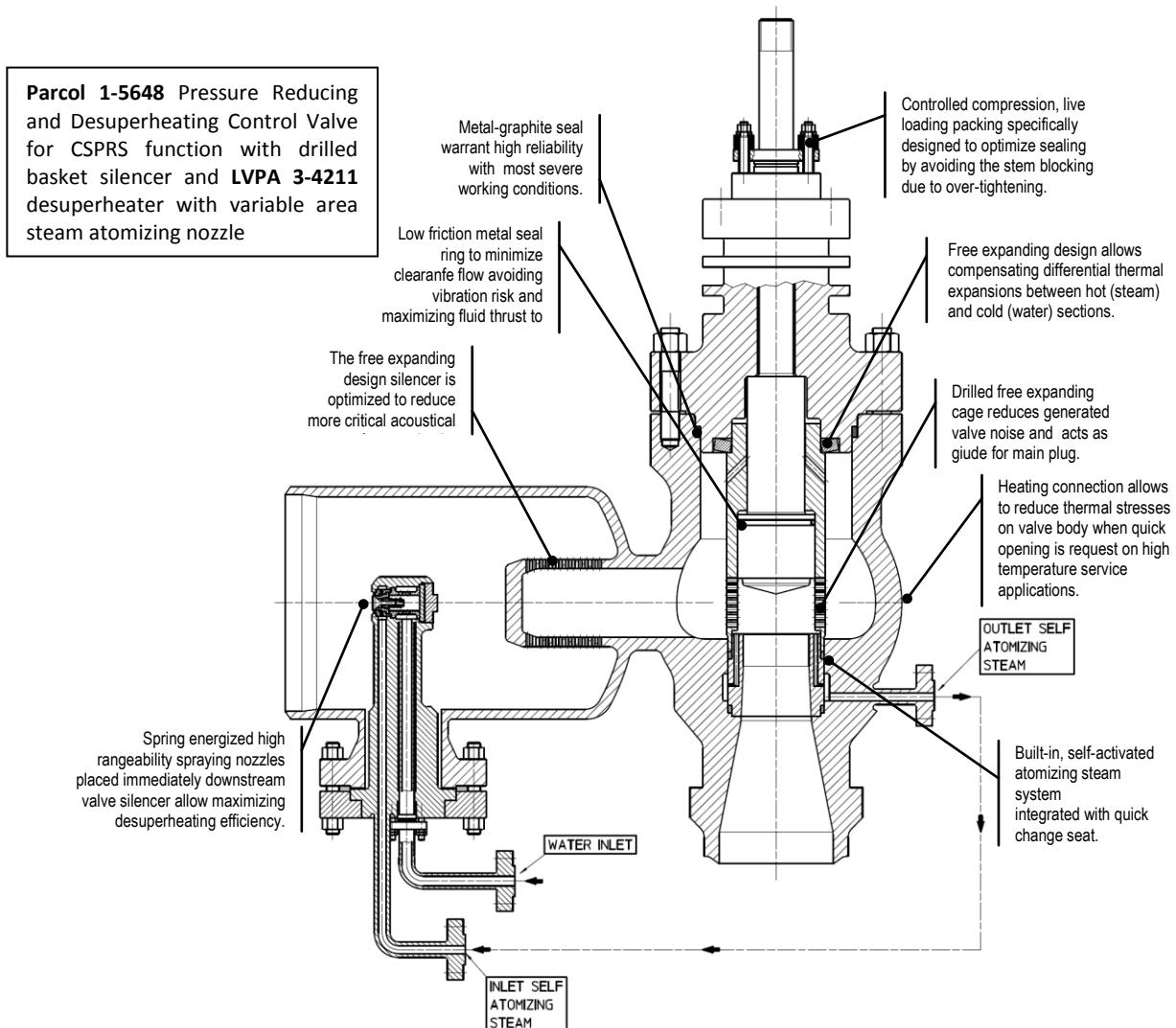
For continuous service with high water to steam temperature differential the injection chamber is provided with built in protective lining to avoid piping damages. See Parcol Bulletin 1-XI for further details.

Standard actuator is spring to open hydraulic piston equipped with positioner and other certified and redundant accessories for emergency actuation.

Single effect, spring to open, pneumatic diaphragm type actuators and systems can be supplied on request.

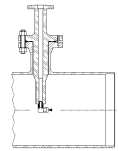
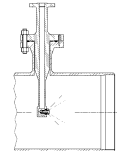
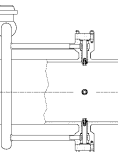
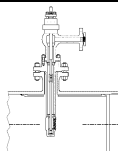
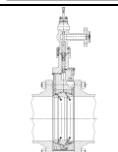
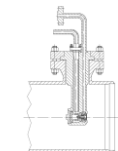
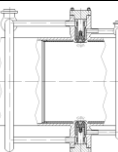
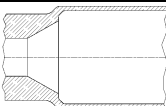
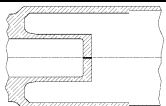
DESIGN FEATURES

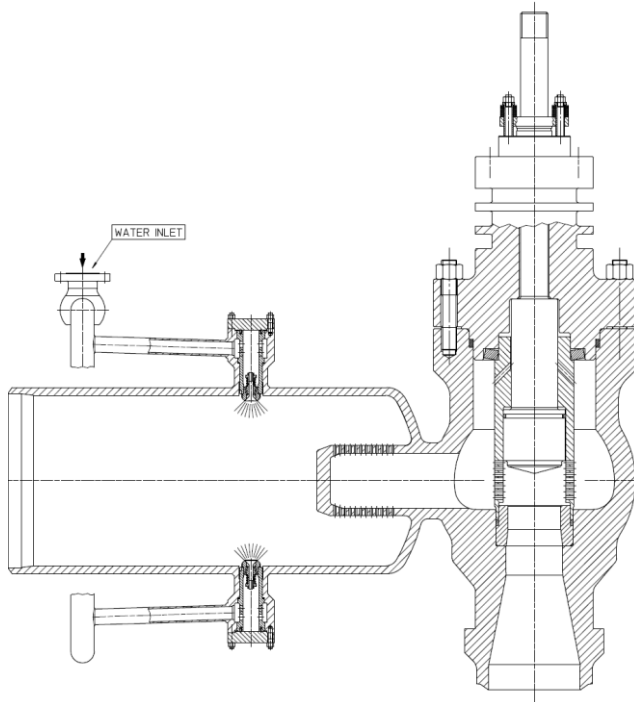
- body**
- spherical shaped, angle body design, typically BW.
 - Wrought fabricated construction
 - size: port 64 to 242 mm. Body connections according to process condition within noise and kinetic energy limitations.
 - ratings: custom design up to 300 bar, 620 °C.
- trim**
- throttling stage consists of a single drilled cage with modified linear flow characteristic and appropriate holes diameter in order to reduce noise by avoiding clogging.
 - quick change seat and plug
- silencer**
- single drilled basket with appropriate holes diameter in order to reduce noise by avoiding clogging.
 - the silencer is directly connected to body outlet connection
- construction materials**
- body and bonnet are usually made of carbon steel or Cr-Mo steel according to steam inlet pressure and temperature
 - trim parts are made of 13-4 Cr steel (F6NM or CA6NM) hard faced with CoCr-A or with nitriding process.
- leakage class**
- IEC 60534-4 leakage class V or better



NUMBERING SYSTEM

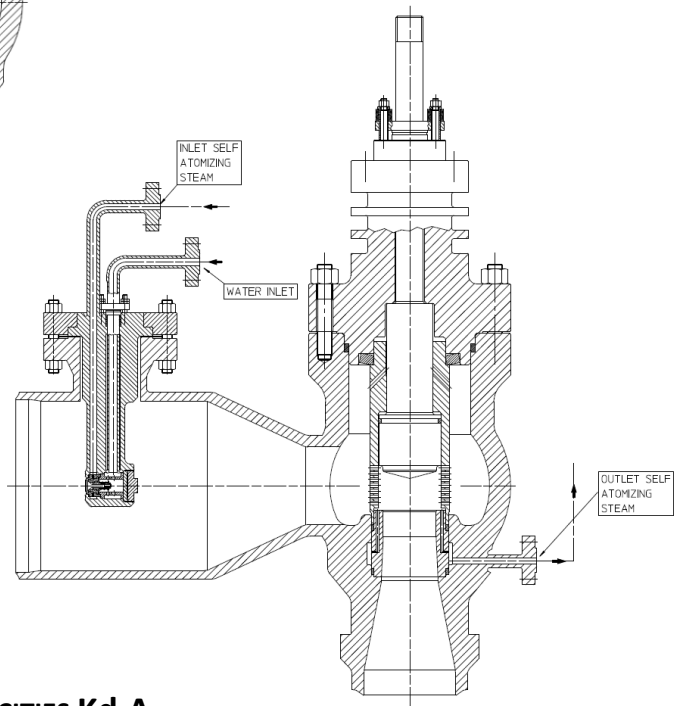
| | | | | | | |
|---|---|---|---|---|---|-------|
| 1 | - | 5 | 6 | X | X | CSPRS |
|---|---|---|---|---|---|-------|

| | | <i>DESUPERHEATER TYPE</i> | |
|---|--|--|----|
| 0 | undefined | | -- |
| 3 | LFP 3-4511 fixed area nozzle |  | |
| 4 | LVP 3-4111 variable area nozzle |  | |
| 5 | LVM 3-4121 multiple nozzle |  | |
| 6 | SpraySat 1-4442 multi nozzles |  | |
| 7 | SprayRing 1-4443 multi nozzles ring |  | |
| 8 | LVPA 3-4211 variable area steam atomizing nozzle |  | |
| 9 | LVMA 3-4221 variable area steam atomizing multi nozzles |  | |
| | | <i>DOWNSTREAM SILENCER TYPE</i> | |
| 0 | undefined | | -- |
| 1 | without silencer |  | |
| 4 | with drilled basket type silencer |  | |



Parcol 1-5618 Pressure Reducing and Desuperheating Control Valve for CSPRS function with single stage and LVPA 3-4211 desuperheater with variable area steam atomizing nozzle

Parcol 1-5645 Pressure Reducing and Desuperheating Control Valve for CSPRS function with drilled basket silencer and LVM 3-4121 desuperheater with multiple nozzles



FLOW COEFFICIENTS Cv AND DISCHARGE CAPACITIES Kd·A

| | Port in | Din mm | Dseat mm | Dcage mm | Stroke mm | 1-5610 | | | 1-5640 | | |
|----|---------|--------|----------|----------|-----------|--------|-------|------------------------------------|--------|-------|------------------------------------|
| | | | | | | Cv | x_T | $Kd \cdot A$ $\alpha_w \cdot A$ | Cv | x_T | $Kd \cdot A$ $\alpha_w \cdot A$ |
| 1 | 2 | 73.0 | 64.0 | 69.5 | 45 | 128 | 0.720 | 2 506 | 115 | 0.900 | 2 506 |
| 2 | 3 | 83.0 | 73.5 | 79 | 60 | 179 | 0.720 | 3 505 | 160 | 0.900 | 3 505 |
| 3 | 3+ | 93.0 | 82 | 87.8 | 60 | 213 | 0.720 | 4 169 | 191 | 0.900 | 4 169 |
| 4 | 4 | 106.0 | 93 | 99.6 | 60 | 256 | 0.720 | 5 004 | 229 | 0.900 | 5 004 |
| 5 | 4+ | 118.0 | 103.5 | 110 | 76 | 340 | 0.720 | 6 644 | 304 | 0.900 | 6 644 |
| 6 | 5 | 124.0 | 110.5 | 116.8 | 76 | 371 | 0.720 | 7 256 | 332 | 0.900 | 7 256 |
| 7 | 6 | 140.0 | 125.5 | 132 | 76 | 443 | 0.720 | 8 661 | 396 | 0.900 | 8 661 |
| 8 | 7 | 162.0 | 145.5 | 152.25 | 100 | 630 | 0.720 | 12 317 | 564 | 0.900 | 12 317 |
| 9 | 8 | 178.0 | 160.5 | 167.55 | 100 | 731 | 0.720 | 14 284 | 653 | 0.900 | 14 284 |
| 10 | 9 | 206.0 | 184.5 | 192.55 | 120 | 978 | 0.720 | 19 117 | 875 | 0.900 | 19 117 |
| 11 | 10 | 238.0 | 214.5 | 222.65 | 150 | 1 349 | 0.720 | 26 373 | 1 207 | 0.900 | 26 374 |
| 12 | 12 | 270.0 | 242.5 | 250.9 | 150 | 1 610 | 0.720 | 31 474 | 1 440 | 0.900 | 31 475 |

NOTE

The Cv coefficient of 2nd stage (silencer) is nearly twice the 1st stage one.
 The increment of the total x_T coefficient, produced by the silencer counter-pressure effect, compensates the slight reduction of whole Cv, leaving the final overall discharge capacity Kd·A practically unchanged.

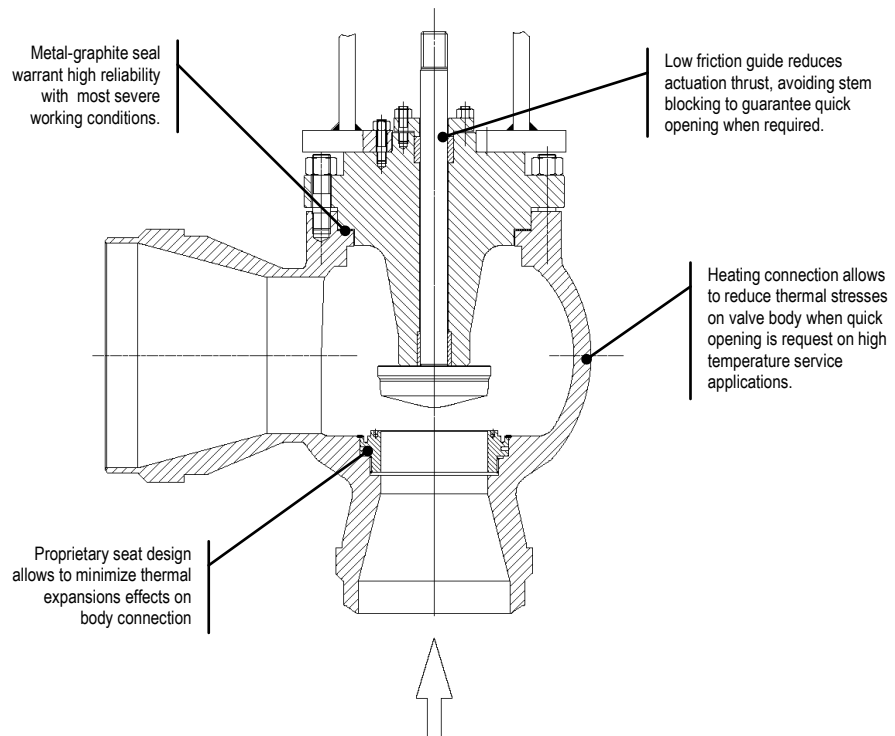
1-4421 CSPRS SERIES REHEATER SAFETY VALVE

DESCRIPTION

1-4421 CSPRS Series valves are angle body control valves dedicated to boiler protection, bleeding off excess steam within the reheater system, specially designed for CSPRS function.

The trim of the valve is composed by the free expanding seat and the flatted plug, to guarantee large flow passages and avoid valve clogging.

Valve outlet is directly connected to vent, so the stem has controlled compression guide with low friction and low emissions and no packing, to prevent stem blocking.



FLOW COEFFICIENTS Cv AND DISCHARGE CAPACITIES Kd·A

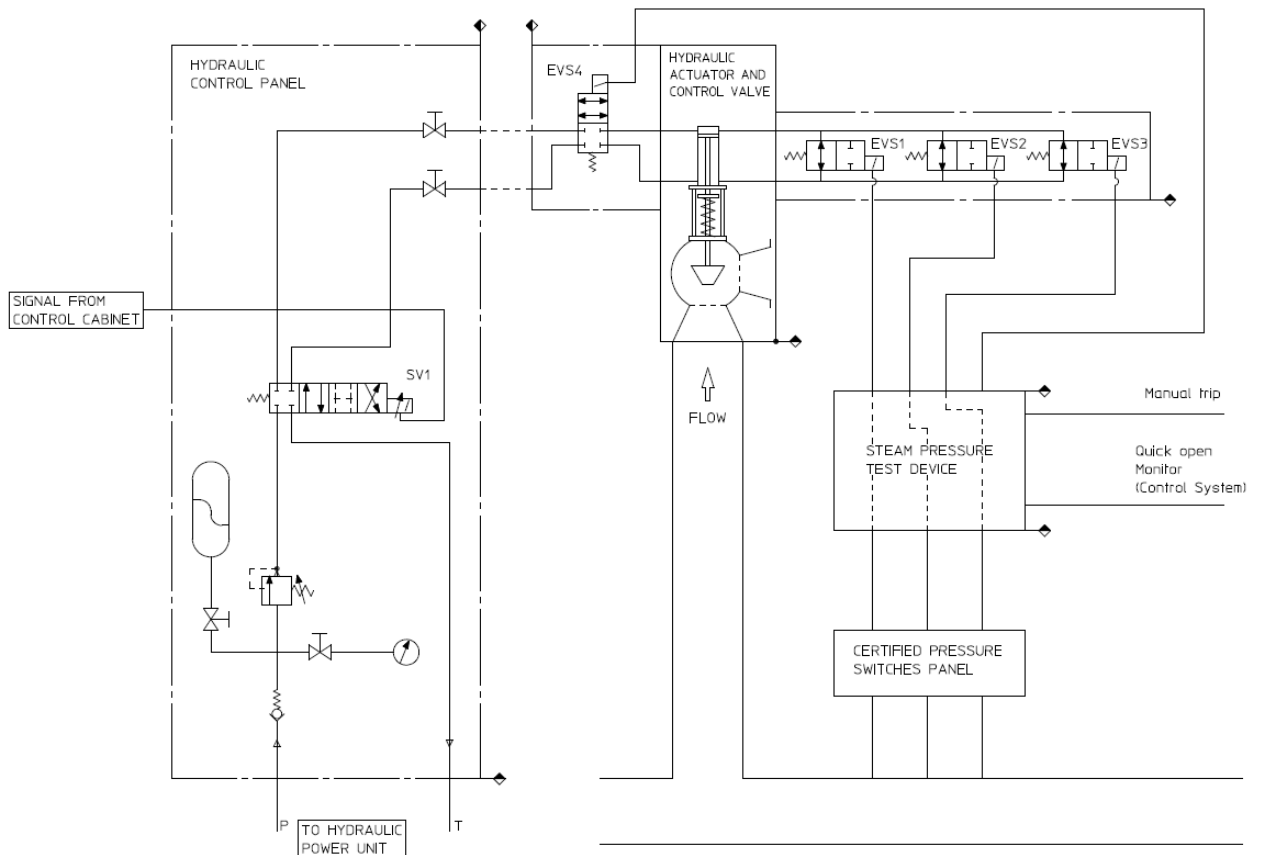
| | Port in | Din mm | Dseat mm | Dout mm | Stroke mm | 1-4421 | | |
|---|------------|-----------|-------------|------------|--------------|--------|----------------|---------------------------------------|
| | | | | | | Cv | x _T | $\frac{Kd \cdot A}{\alpha_w \cdot A}$ |
| 1 | 8 | 178.0 | 160.5 | 238.0 | 50 | 1 055 | 0.700 | 20 335 |
| 2 | 9 | 206.0 | 184.5 | 270.0 | 58 | 1 389 | 0.700 | 26 775 |
| 3 | 10 | 238.0 | 214.5 | 294.0 | 67 | 1 839 | 0.700 | 35 458 |
| 4 | 12 | 270.0 | 242.5 | 324.0 | 75 | 2 329 | 0.700 | 44 902 |
| 5 | 13 | 294.0 | 264.5 | 400.0 | 83 | 2 879 | 0.700 | 55 507 |
| 6 | 14 | 324.0 | 292.5 | 430.0 | 91 | 3 495 | 0.700 | 67 381 |

SAFETY SYSTEM

Equipped with a hydraulic actuator and the necessary safety control devices, 1-5600 CSPRS valve can operate as combined turbine steam bypass and superheater safety valve according to TRD 421 Standard. The system includes 3 set of safety switches, each coupled with a solenoid valve. When steam pressure rises up to the set value of one switch, it de-energize the corresponding solenoid valve, which opens a duct connecting the two chambers of the actuator, causing the bypass valve opening under the combined steam pressure and spring thrust to open.

The redundancy of pressure switches and solenoid valves guarantees the safety of the system, also permitting the check of the components by isolating each switch individually.

When normal plant operations require keeping the valve closed, the hydraulic actuator provides the force to guarantee a tight sealing.



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