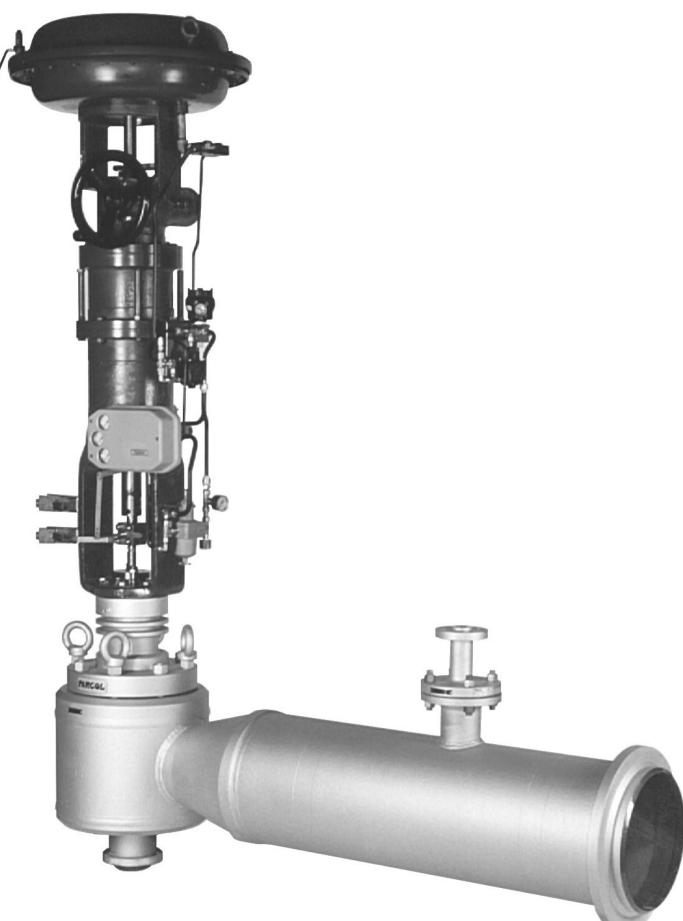


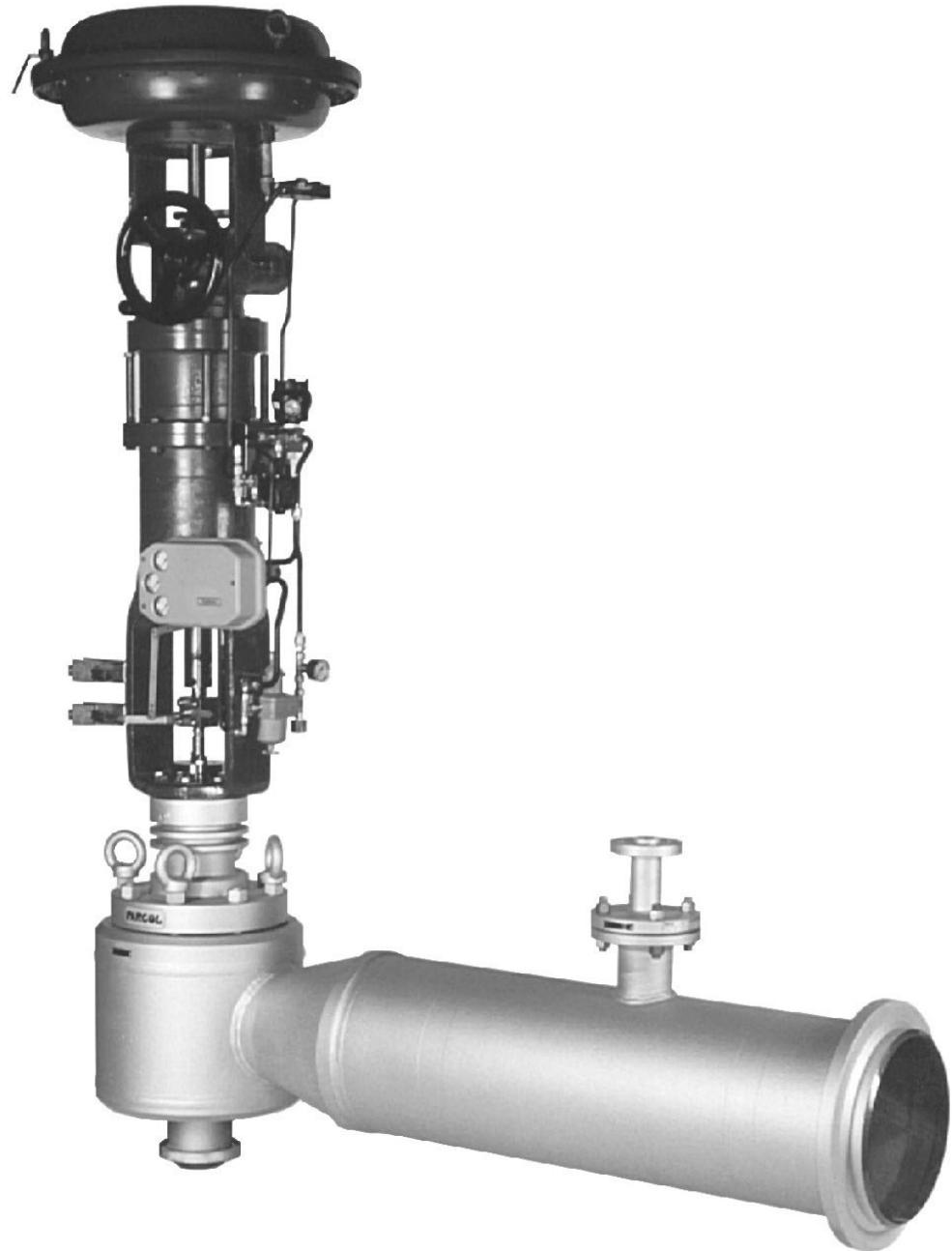


## DESUPERHEATING CONTROL VALVE ANGLE BODY 1-5600 SERIES





## DESUPERHEATING CONTROL VALVE ANGLE BODY - 1-5600 SERIES



### **description**

The *pressure reduction* is performed through two stages.

The first stage is performed by an angle cage valve having different inlet/outlet ports and fluid inlet under the plug, while the second one is a fixed restriction mounted on the outlet connection consisting of a 1, 2, or 3 stages drilled basket or a Limiphon disk stack.



The controlling trim of the first stage is a single or double cage or GBR / GBRS low noise type. The second stage has the double function to reduce the noise generated by the first one and to limit the dimension of the body outlet connection, especially for high  $p_1/p_2$  ratios.

Due to fixed section, its acoustic benefit decreases with the flow rate reduction. Nevertheless in multiple cage configurations, the noise generated by the first stage is also absorbed, hence its designation as "silencer". This absorption is outstandingly completed by the HAS design, and even better by Limiphon disc stack. Also, its efficiency is nearly independent from the flow rate.

The *desuperheating section* is located just downstream the silencer and includes a chamber provided with a Parcol device for water injection. Performances of desuperheating system and required piping lay-out (probe distance, straight lengths, steam velocity, etc.) depend only on desuperheater characteristics.

## applications

The broad variety of available components both for pressure reduction and steam desuperheating make this valve suitable for a very wide application range.

It is ideal where the process lay-out imposes bottom inlet and side outlet. As a matter of fact by this arrangement the 1-5600 model has two advantages:

the actuator is in vertical position and the self-draining design prevents slags and condensate to accumulate in closed position.

Typical applications:

- low, medium and high pressure turbine by-pass; no particular limitations both for capacity and noise

Limitations:

- difficult to obtain best leakage class in closed position especially where high Cv and  $\Delta p$  values are involved
- the flow-to-close mode may be obtained only with balanced plugs whose operation limits (leakage, temperature, etc.) must be taken into account

## codification

1 - 5 6 X X

Desuperheater type	
0	undefined
3	LFP fixed area nozzle
4	LVL or LVP spring type nozzle
5	LVM multiple
6	Spraysat
7	steam-assisted fixed nozzle

Downstream silencer type	
0	undefined
1	without silencer
4	disk or drilled basket type silencer (max 3 stages)
5	HAS reactive adsorption silencer (max 3+1 stages)
6	Limiphon silencer (5 to about 20 stages)



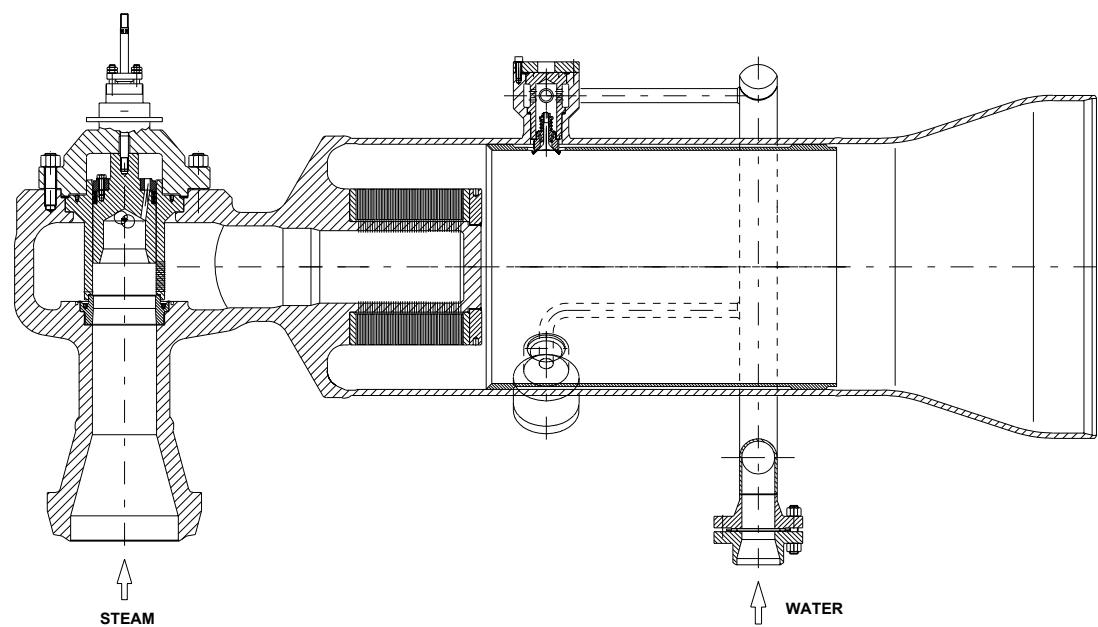
## design features

- body**
- globe type, angle design, flanged or BW, cast or wrought construction
  - size: in addition to required Cv it is selected as a function of kinetic energy (otherwise called velocity head) and allowed noise pressure level
  - ratings: up to ANSI 2500 for valve inlet and ANSI 900 for the outlet
- trim**
- the first stage consists of a single drilled cage (std., GBR or GBRS) or double - linear intrinsic characteristic
  - quick change seat and plug are the same used for 1-6933 series
- silencer**
- consisting of a single or multi stage (max 3) drilled basket as per 1-5640 model or of a solid Limiphon disk stack as per 1-5660 model
  - for DN 12" outlet size and over the high acoustic efficiency HAS type is available
  - the silencer is directly welded to body outlet connection
- construction materials**
- body and bonnet are usually made of carbon steel and Cr-Mo alloy steel according to steam inlet pressure and temperature
  - trim parts are usually made of stellited or nitrided F6NM alloy steel and 17-4 PH for temperature up to 350°C
  - silencer is normally made of Cr-Mo alloy steel, while Limiphon disk stack is available in X19 CrMoVNbN11.1 or AISI 430 for temperatures up to 400°C
- leakage class**  
(IEC 60534-4)
- unbalanced plug: V class or better
  - teflon balanced plug: V class
  - plug balanced by graphite inserts: IV S1class - class V available only with special pneumatic, electric or hydraulic actuators



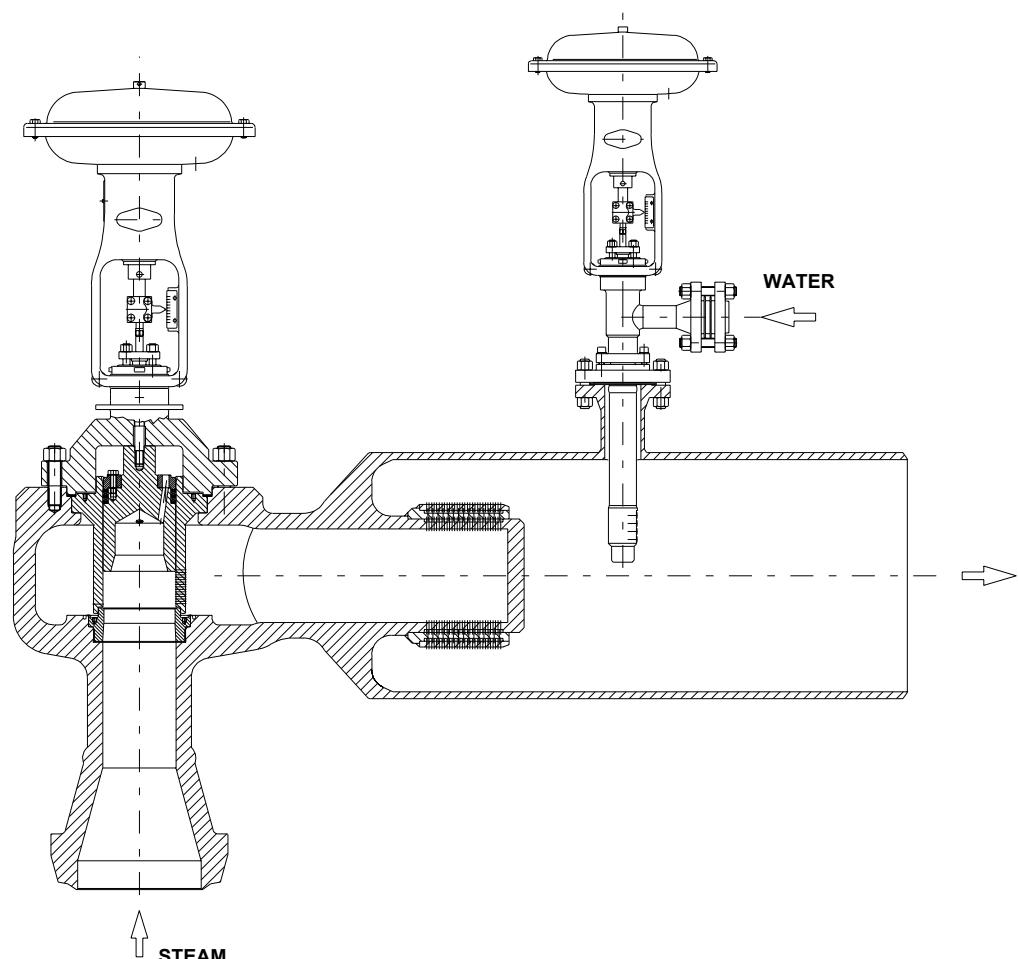
## selection

- 1-5610** suitable for low  $\Delta p$ , very high flow rate and when allowable noise pressure level is not very low (below 90dBA)
- 1-5640** mainly suitable for low/medium pressure even for large flow rates - some limitations under very high pressures (>100 bar) where allowable noise pressure levels are severe
- 1-5650** where HAS 3+1 silencer is provided the maximum acoustic efficiency is obtained under high  $p_1/p_2$  values - applicable for big outlet valves ( $DN_2 > 16"$ )
- 1-5660** the downstream Limiphon disk stack can take over a high pressure drop only at maximum flow rate - at low flow rate the first stage has the attitude to operate as a conventional cage valve and therefore, under high operation pressure drop, vibration and noise problems may occur, in spite of high acoustic efficiency of Limiphon stack.  
The 1-5660 series valve is therefore mainly convenient only where, under very high pressure drops, load changes are not too significant (max turndown about 15:1).  
To face simultaneously high turn-down under very large flow rates, high pressure drops and severe allowable pressure levels it is necessary to control the flow in the first stage directly in a Limiphon stack, by adopting 1-9400 series valves.  
In this case valve performances (noise, vibrations, characteristic curve, etc.) are not significantly affected by load changes.



**1-5665 series valve**

- single cage - plug balanced with graphite inserts
- Limiphon silencer and LVM type multiple spring- type nozzle



**1-5646 series valve**

- plug balanced with graphite inserts - three cage silencer
- Spraysat desuperheater



## sizing

IEC equations may be used with a good accuracy for models provided only with cages in 1<sup>st</sup> and 2<sup>nd</sup> stage, by assuming Cv values of single cage 1<sup>st</sup> stage listed in the table.

The outlet diameter of valve body is bigger than the inlet one and its dimension is selected according to operation conditions.

Valves provided with downstream Limiphon stack (1-5660) or HAS silencer (1-5650) are sized according to widely validated Parcol proprietary methods, which take into account the particular configuration of valve+desuperheater assembly.

Also for noise level prediction of 1-5600 series valve Parcol uses the general principles of IEC 60534-8-3, but adopts its own calculation procedures.

For example the acoustic benefit of downstream water injection is taken into account by means of a correction factor which is a function both of injector type and of ratio w between water and steam flow rate. The best acoustic benefit is obtained by using LVM type multiple spring type nozzles; it may be calculated by the equation:

$$\Delta L_w = 38 \cdot w^{1.5}$$

FLOW COEFFICIENTS															
1-5610 and 1-5640 series - linear standard single cage															
seat Φ	38	47.5	73.5	95	112	127	147	162	186	216	244	266	293	323	343
travel	34	34	45	60	76	76	100	100	100	100	100	150	150	200	200
1 <sup>st</sup> stage Cv	47	80	154	245	320	470	580	750	970	1180	1330	1750	2000	2250	2500

### Note

Cv coefficient of 2<sup>nd</sup> stage (silencer) is nearly equal to the 1<sup>st</sup> stage one; the apparent overall Cv of 1-5640 valve is therefore nearly equal to 70% of the one listed in the table.



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