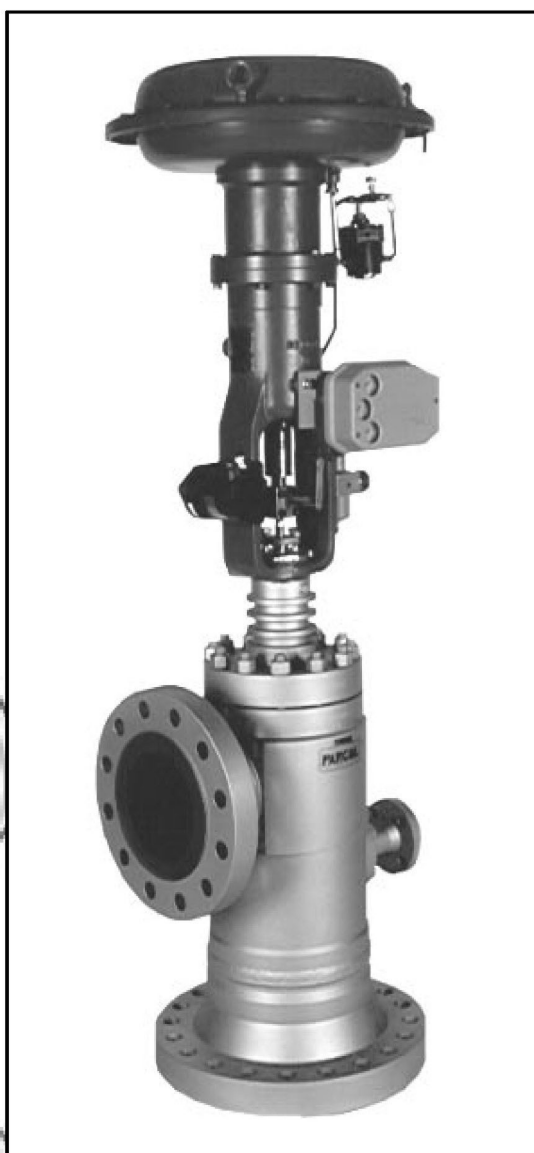


PARCOL

**DESUPERHEATING
CONTROL VALVE
ANGLE STYLE
SIDE INLET
1-5840 SERIES**





DESUPERHEATING CONTROL VALVE ANGLE STYLE - SIDE INLET 1-5840 SERIES

description

Pressure reduction and flow rate adjustment take place together in the first stage of the valve, which may consist either of a plug provided with a drilled skirt and directly guided in the seat or of a trim provided with one or two drilled cages derived from standard series 1-6933. In both cases the low noise GBR version is also available.

Water is injected downstream the first stage in a high turbulence zone, which enhances the evaporation efficiency, thus reducing to a minimum the residual water fraction entering the second stage.

The second stage (improperly called *silencer*) consists of one, two or three drilled cylinders, serving the double purpose to complete the desuperheating process and to limit the sound pressure level generated by the valve. The acoustic benefit produced by the silencer is maximum at the highest flow rate, because, since its section is fixed, the higher is the flow rate, the higher is the backpressure in the first stage.

In spite of the low intrinsic rangeability (3:1 max) of constant section injector nozzles, the special water injection system and the presence of the downstream silencer increase the overall valve rangeability, thus making it suitable for variable flow rate and pressure conditions.

Although the desuperheated steam temperature is very close to the saturation one, the thermodynamic balance can be reached at few meters from valve outlet. Turn-down is usually higher than 50:1 and high steam velocity is not necessary in the piping.

Compact and rugged construction and side inlet design (which reduces thermal gradients in the body when the valve is closed) grant the equipment liability even under thermal shocks caused by fast and frequent valve openings.





applications

Reducing/desuperheating stations on turbine by-pass from high to low or from high to medium pressure, where frequent start and stop transitions are required.

Also available for low and medium pressure by-pass and medium capacity.

Suitable for process lines where design and developed length of downstream piping lay-out are unsuitable for conventional desuperheaters.

1-5840 series valve is also suitable for cogeneration processes and combined cycles, where continuous flow rate control is often required and high turn-down values are necessary.

Due to limited stage number (max two controlling stages + two fixed), the use of 1-5840 valve has some limitations where very low noise pressure levels are allowed (e.g. 90 dB(A) for bare pipe) in high capacity processes and under high p_1/p_2 ratios.

available models

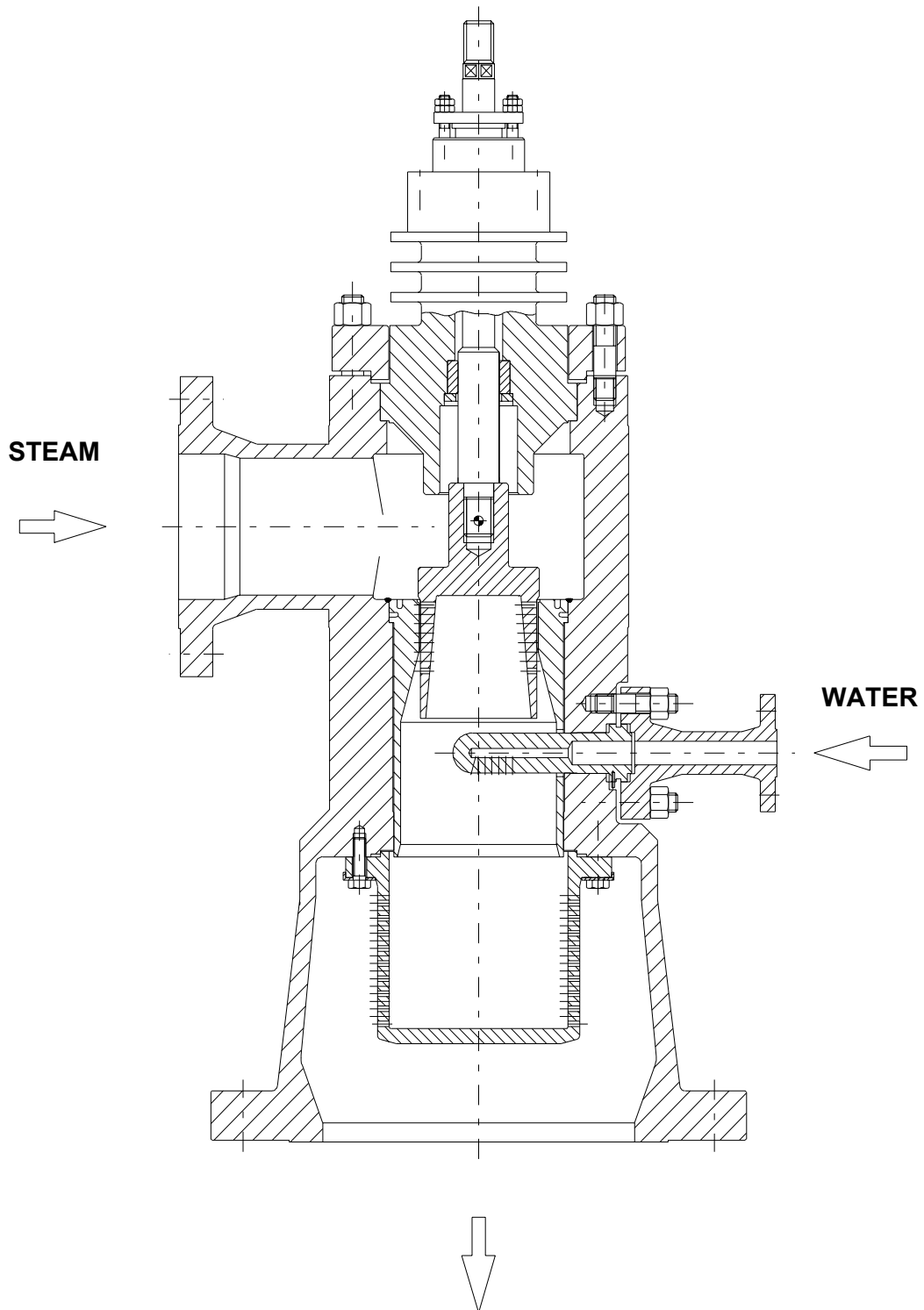
- 1-5841** - The first stage reduction is obtained by means of an unbalanced drilled skirt plug guided in the seat ring which is welded to the body by a lip-seal.
- 1-5842** - The first stage consists of components similar to the ones of 1-6933 series valve, provided with one or more cages (max 3). The plug may be either balanced by inserts or internally piloted.
The seat is welded to the body by lip-seal or, on request, fixed by a flanged coupling accessible through the top body opening.

selection

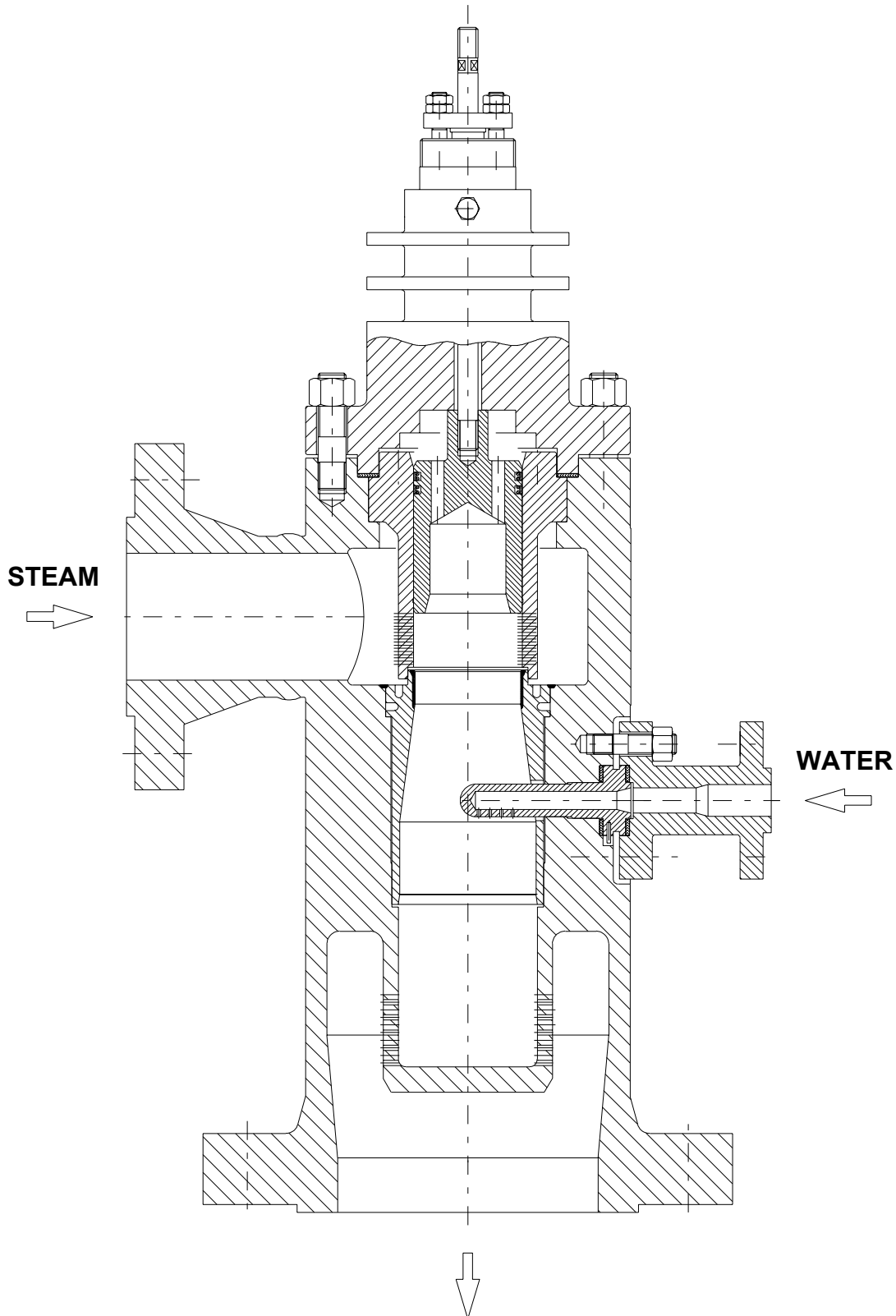
1-5841 series valve provided with drilled plug is an economically profitable alternate, compared with the universal series 1-5842 and is preferred when:

- required Cv is relatively low (about 150 max)
- simplified design of trim and silencer is compatible with allowable noise pressure level
- actuators are hydraulic or electrical type - conventional pneumatic type are excluded

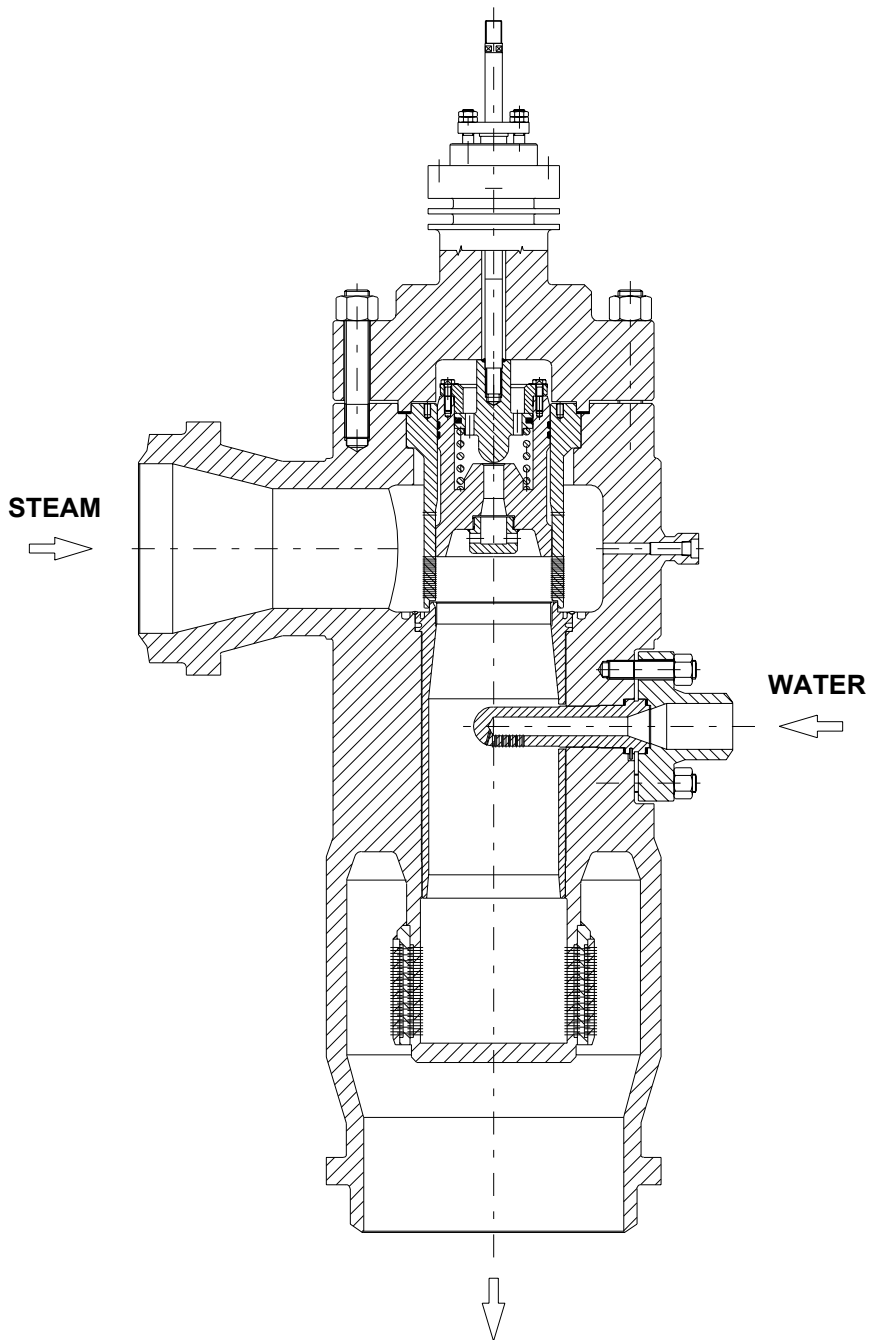
The flanged seat design, available on request for 1-5842 valve, is recommended for continuous service under high differential pressure, mostly for welding-end bodies



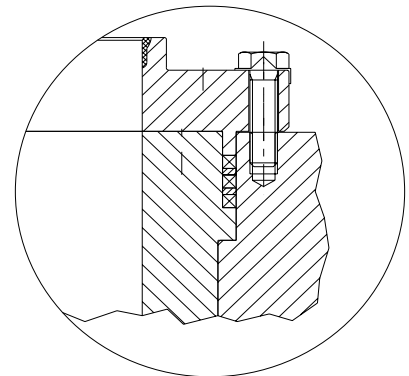
1-5841 model - flanged ody and silencer for steam inlet temperature lower than 350°C



- 1-5842 model - flanged body, balanced plug with graphite inserts
- seat and silencer both welded
 - first stage and silencer equipped with single cage
 - design suitable for high temperature pressure.



- 1-5842 model - welding socket body*
- seat and silencer both welded*
- piloted plug*
- design suitable for heaviest p/T services*



alternate assembly with flanged seat ring



design features

- body**
- wrought construction provided with welded inlet and outlet branches
 - bonnet normally flanged to the body - also pressure sealed for high sizes and/or pressure
 - size: depending on operation data
 - ratings: inlet up to ANSI 2500 and outlet up to ANSI 900
water inlet up to ANSI 1500
- trim**
- drilled skirt type plug for 1-5841 model and piston type plug for model 1-5842, balanced design either provided with inserts or piloted
 - first stage of 1-5842 model consisting of single or double drilled cage
 - seat welded to the body by means of easily removable lip-seal
 - seats of 125 mm dia. and over also available in flanged design
- water injector**
- multiple fixed nozzle construction, flanged body connection provided with orientation pin
- silencer**
- consisting of a single or multistage (max 3 steps) drilled basket, normally welded to the body - flanged design only where body outlet is flanged as well and steam inlet temperature is lower than 350°C
- materials**
- body and bonnet are normally in carbon or chrome-molybdenum steel according to steam inlet temperature and pressure
 - inside components are usually in stellited or nitrided F6NM or 17-4-PH for temperature up to 350°C
 - injector in Inconel 718
 - silencer normally in chrome-molybdenum steel - 17-4-PH construction used only for flanged design and temperature lower than 350°C
- seat leakage**
- (IEC classes 60534-4)
 - unbalanced and piloted plug: V class
 - balanced plug provided with graphite inserts: IV S1 class -V class available only with electric or hydraulic actuators

operation limits

No practical limit exist for temperature, pressure and flow rate of steam to be desuperheated. The following general limits must be met for water injection:

- 1) max injector $C_v = 5$
- 2) max injector $\Delta p = 40$ bar
- 3) max water/steam ratio = 0.25
- 4) min available water pressure = $0.7 \cdot p_1 + 6$ bar

Limits 1) and 2) for 1-5842 valve would lead approximately to a max flow rate $q_{max} = 30$ m³/h. Extensions of such limits are possible only after careful examination of operation conditions



sizing

The sizing procedure of steam flow rate is based on the analysis of each valve stage calculated by IEC equations and on the knowledge of water evaporation process inside the valve body.

Laboratory tests enabled to identify with sufficient accuracy the thermodynamic steam conditions in the section downstream the injection, thus making possible to size the second stage.

Parcol uses IEC 60534-8-3 equations_criteria also to calculate the noise pressure level of 1-5840 valve, by adapting them to specific valve design.

The reduction of the acoustic power, generated by the first stage due to water injection, has been specially investigated. The value of the above acoustic benefit was obtained by experimental tests as a function of the ratio between water and steam flow rates:

$$\Delta L_w \text{ (dB)} = 32 \cdot G_w/G_1 \text{ (validity limit: } G_w/G_1 = 0.25)$$

FLOW COEFFICIENT Cv									
1-5841 series									
seat Φ	54	65	80	105	127				
travel	34	45	60	76	76				
Cv of 1° stage	35	48	98	156	230				

1-5842 series									
seat Φ	47.5	73.5	95	112	127	147	162	186	216
travel	34	45	60	76	76	100	100	100	100
Cv of 1° stage	63	148	235	305	460	560	750	980	1180

Note - The Cv of second stage (silencer) is about equal to the one of the first stage, no matter how many cages compose it.

The global apparent Cv of valves may therefore be considered more or less equal to 70% of the one listed in the above tables.

Anyway only Parcol stage-by-stage method can grant sufficiently accurate results of valve sizing and noise level prediction.

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