Valution DH - series Desuperheater

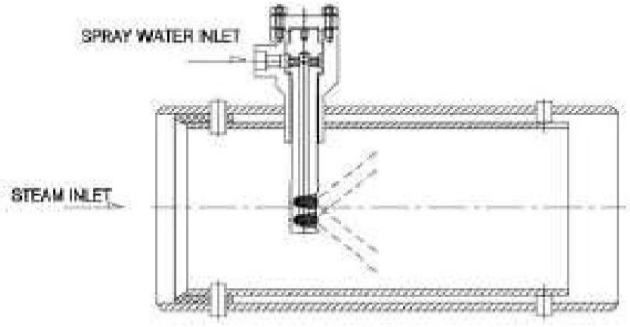
Valution`s DH series is a desuperheating device equipped with nozzles of spring-loaded type with high rangeability. This model refers to a device that spray water into the flow of steam to reduce the temperature of superheated steam, and is installed with a temperature control system that detects the temperature of the de-superheated steam and controls the amount of water injection.

The fundamental purpose of creating saturated steam by using de-superheaters to reduce the overheating of super heaters is that steam used for important process heating is more economical and efficient to use saturated steam.

This is because condensation must occur in order to use latent heat of steam, and saturation steam must occur in order for condensation.

This model changes the water flow area needed to achieve the fine droplet size needed for atomization, with an integ ral spring water injection nozzle optimizing water injection over a wide range of flow rates at low pressure.

Spring-equipped water injection nozzle design provides the smallest possible droplet size without steam assist.



1. Numbering System

XX	-	DH	MN	1

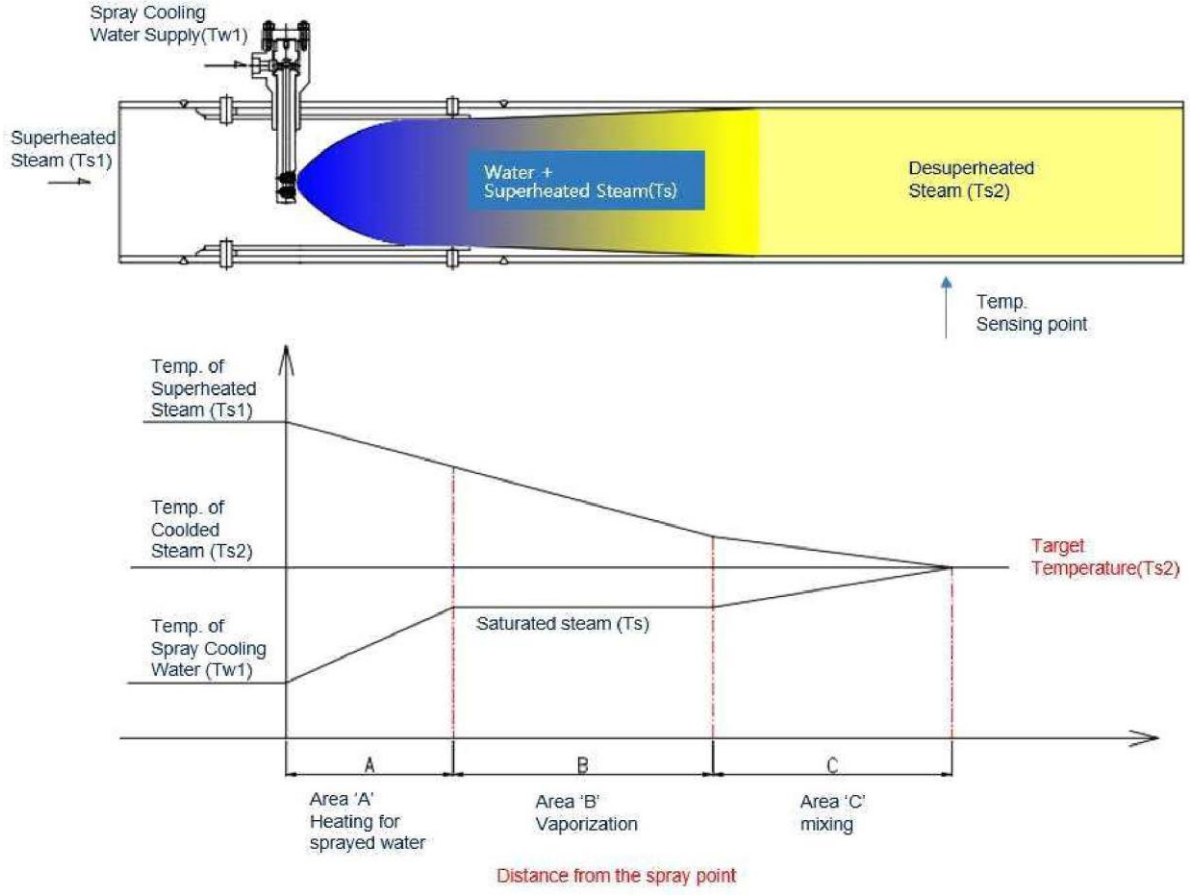
Actuator Type	Body Type	Body Pattern	Option
V10. Spring-Diaphragm, Single acting V20. Spring-Cylinder, Sigle acting V30. Springless-Cylinder, Double acting V90. Electric Motor XX. Without Actuator	DH : Desuperheater TVDH : TCV & Desuperheater PRDS : Pressure Reducing & Desuperheater	MN : Straight AG : Angle	1. Liner 2. H/W 3. Lim. Stopper 4. Other

Desuperheating

Desuperheating refers to the process of lowering the temperature of the superheating steam that maintains the perfect gas state to the desired degree of overheating.

The degree of overheating than the saturation temperature is indicated by the temperature difference between the overh eating temperature and the saturation temperature. A high temperature means that the temperature is much higher tha n the saturation temperature.

Desuperheater is used to reduce the overheating of the superheating steam. If the condensate with low temp erature is supplied to the superheating steam is mixed, the Boiler Feed Water evaporates, and the superheati ng steam decreases the overheating level, resulting in low-heating steam. BFW has a large evaporation latent heat, s o even a small amount can significantly reduce the temperature.



There are four basic steps,

Appropriate spray injection

Atomization Penetration & Mixing

Evaporation

Injection of the correct amount of spray flow is the most essential condition in the system that requires the desuperheating process. This requires careful and accurate selection of the spray flow.

For this control valve, shall be capable of providing good control over the entire required spray flow range. For lon g-term reliability, a multistage pressure drop is required for high-pressure drops.
The amount of coolant required is determined by heat balance and mass balance.
The principle of mass balance can be induced as follows:

$$Qw = Qs \frac{h1 - h2}{h2 - hw}$$

Qw : Required water quantity, kg/hr
Qs : Steam flow rate, kg/hr
h1 : Enthalpy of inlet Steam, kj/kg
h2 : Enthalpy of outlet Steam, kj/kg
hw : Enthalpy of spray water, kj/kg

Atomizing

Spraying sprayed spray water with water drops increases the surface area for heat transfer with surrounding steam. S mall droplets are desirable because the surface area of the spray water increases and evaporates more easily.

The most important parameters governing atomization are the follows below:

$$We = \frac{\rho u^2 l}{\sigma}$$

We : Weber number
σ : Surface tension of water, N/m
ρ : Density of steam, kg/m^3
u : Relative velocity of steam, m/sec.
l : Droplet diameter, m

When the Weber number is generally below the threshold at around 12-16, the droplet is known as a stable ran ge. The spray will depend on the spray nozzle design that can maximize pressure drop.
Small drops of water evaporate quickly, which is beneficial to desuperheating.
Efficient atomizing is a very important process in desuperheating, and Valution aims to be less than 200 μm in siz e to produce fine drops of water.

Selection Guide Line

STEAM INLET PIPE	STEAM NOZZLE CONNECTION		WATER NOZZLE CONNECTION	
Size	Size	Class	Size	Class
4" - 12"(100-300)	3"(80)	150 - 600	1", 1.5", 2"(25-50)	150 - 600
14" - 48"(350-1200)	4"(100)	150 - 600	1", 1.5", 2"(25-50)	150 - 600
	6"(150)	150 - 300		

***. Note**
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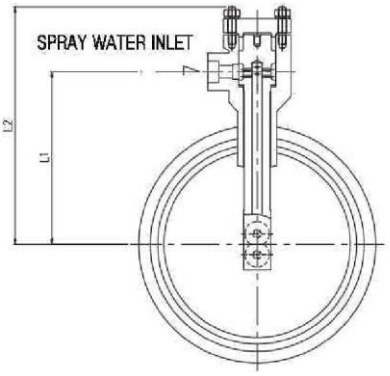
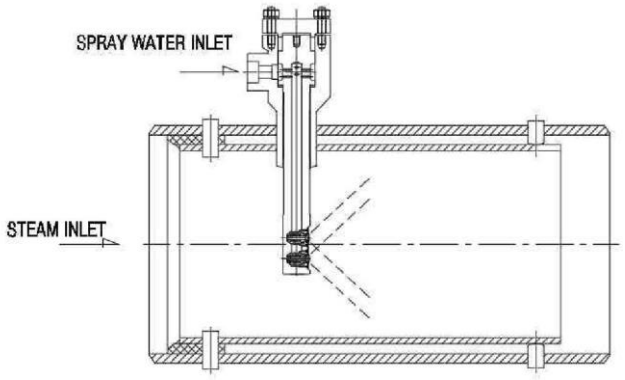
Dimensions





(mm)

STEAM PIPE	DIMENSIONS (mm)		NUMBER OF NOZZLE (EA)		MATERIAL
			STANDARD	SPECIAL	
Size	L1	L2	1	-	A106 Gr.B A335 P11 A335 P51 A335 P91 A105 A182 F11 A182 F22 A182 F91
4" (100)	200	310	1	-	
6" (150)	220	330	1	-	
8" (200)	250	360	1	-	
10" (250)	270	390	1	-	
12" (300)	290	400	1	-	
14" (350)	300	410	2	4	
16" (400)	350	460	4	6	
18" (450)	400	510	4	8	
20" (500)	450	560	6	10	
24" (600)	500	610	8	12	
28" (700)	550	660	10	14	
32" (800)	600	710	12	16	
36" (900)	660	760	14	18	
40" (1000)	700	810	16	20	

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er specification.

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Turndown Ratio

The turndown ratio is used to describe the flow range of the unit to which the de-superheater is applied, as shown in the equation be low.

Turndown Ratio = Maximum Flow / Minimum Flow

This value is an important parameter because a change in inlet pressure, temperature, or flow rate causes a change i n the requirements of the cooling water.

In general, two turndown values may be specified for a particular superheater:

- Steam Turnover - Reflects the range of steam flow that the unit can effectively eliminate overheating.
- Coolant Turndown Ratio - Reflects the range of cooling water flow available.

This directly affects the steam turndown ratio, but the relationship depends on the temperature of the overheated stea m, the cooling water, and the resulting de-superheated steam.

Relationship between Turndown Ratio & Supply Water Pressure

Turndown Ratio	Max. Supply Water Pressure (bar)
Turndown Ratio 1.5:1 ~ 3:1	Steam Pr. + 5 bar
Turndown Ratio 1.5:1 ~ 4:1	Steam Pr. + 8 bar
Turndown Ratio 1.5:1 ~ 5:1	Steam Pr. + 13 bar

*. Recommended Min. Water Pr : Steam +1.0 bar

Recommended distance

- Recommended distance of straight upstream pipe: Min. 4 pipe sizes or 1.3m
- Recommended distance of straight downstream pipe: Min. 25 pipe sizes
- Recommended downstream distance to pipe part change: Min. 20 pipe sizes
- Recommended downstream distance to temperature sensor: 30~50 pipe sizes, Min. 12m

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