KOMOTO

Technical Bulletin B-900

Series 900
Desuperheaters

Series 900 Features

Application

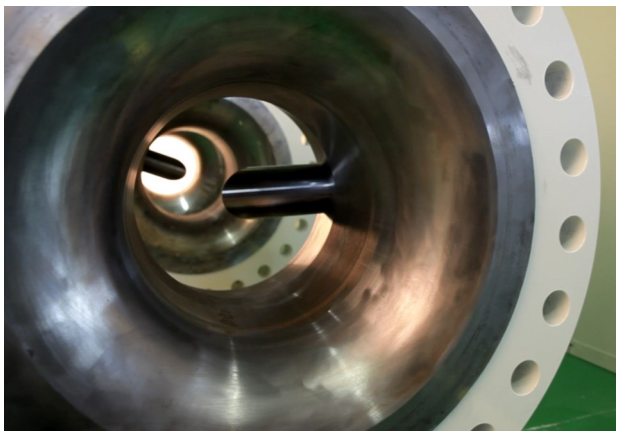
Save fuel with optimized process control. In a situation where the controlled outlet temperature is higher than the saturation temperature and steam is to be used for heating application. It is absolutely necessary that for such applications the outlet steam temperature should be as close as possible to its saturation temperature. The sole reason for this is the saturated steam is the best conductor of heat and as the degree of Superheat increases, the heat transfers become inefficient. Superheated steam contains a large amount of heat energy, this energy is in three forms; 25% of enthalpy of water, 66% of enthalpy of evaporation (latent heat) and 9% of enthalpy of superheat. The coefficient of heat transfer when using superheated steam as the heating medium is variable, low and difficult to quantify accurately. This makes accurate sizing and control of heat transfer equipment difficult, and will also result in a larger and more expensive heat exchanger. KOMOTO's desuperheater can help you to optimize your process control can save fuel and in turn save investment cost.

Desuperheating

To ensure temperature stability of the conditioned steam and to prevent thermal shock in downstream lines, the cooling water should ideally be fully atomized. There should also be a correct mix of superheated steam and cooling water.

1. Venturi Type Desuperheater - Model No. 901

KOMOTO venture desuperheater makes cooling water enters through a special streamlined spray nozzle. On the surface of this special spray nozzle a thin film of water will be created. The dynamic energy of the steam flow breaks the surface tension of the film, creating a conical shaped spray of atomized water. Ideal mixing is achieved by high steam flow turbulence, caused by the interaction of the venturi effect and the special shaped spray nozzle. Fast and total evaporation of the cooling water is now accomplished which means that rapid adjustments are possible, and also avoiding the need for any protective liners in downstream piping.



Advantages

● Custom designing
For any size, standard or range.
● Simple installation
In any position, short straight pipe runs. Limited control loops.
● Easy maintenance
No moving parts, no pipe liners and no welding in the construction. Large spray apertures avoids the spray nozzle becoming choked.
● Energy saving
No need for water supply pressure significantly higher than operational steam pressure and no need
for atomizing steam.
● Large desuperheating range
It is possible to handle extremely large differences in enthalpy between inlet an outlet steam flows.

Technical Data

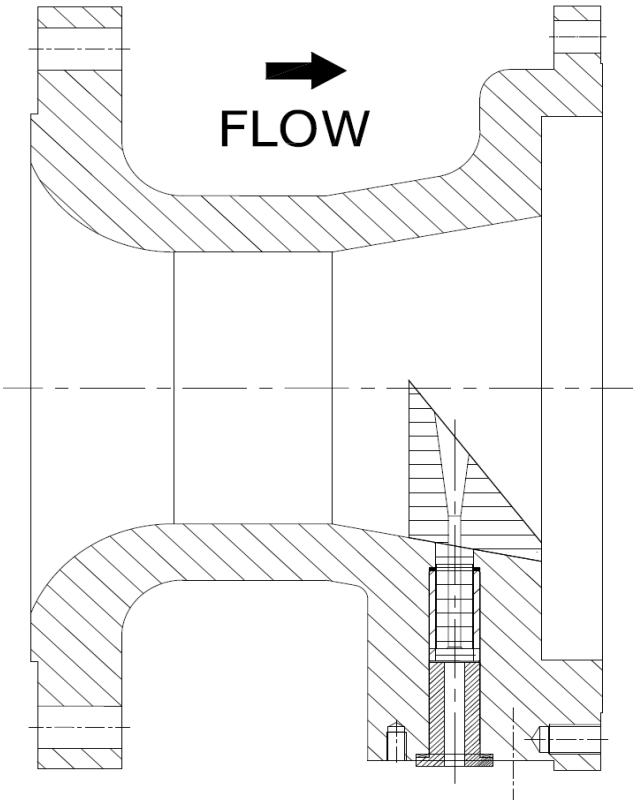
● Size: Steam 1½"to 50"
Water 1½"to 2"
● Forged/Casting construction
● Venturi nozzle type
● Low pressure loss over the desuperheater station
● Water pressure marginally above steam pressure
It is possible to handle extremely large differences in enthalpy between inlet an outlet steam flows.

Applicable Codes

● ASME / ANSI B16.34 class 150 to 2500
● DIN 2401 class PN 25 to 400
● Butt-weld connections to ANSI B16.25 or DIN 2559

Materials of Construction

● ASTM SA 105, SA 182F11 or SA 182 F22F (Forged)
● ASTM A217 Gr WC6 (Casting)
● DIN C22.8, 1.7335 or 1.7380
● Other materials upon request



2. Variable Nozzle Type Desuperheater - Model No. 902

Variable Multiple nozzle spray type desuperheater regulates the amount of injection water by varying the number of injection nozzles in operation. Control of nozzle opening is achieved by the positioning of a piston that is operated directly by an actuator mounted on the valve. This simple design means no separate water injection control.
This feature enables the desuperheater to be a wide range of Cv values which is customized to specific requirements.

Advantages

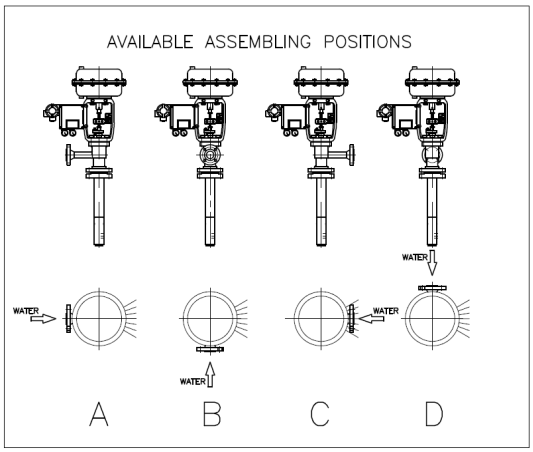
● No steam side pressure drop
A negligible steam side pressure drop makes this type
suitable for those applications where steam side pressure
drop is limited, as in turbine exhausts.

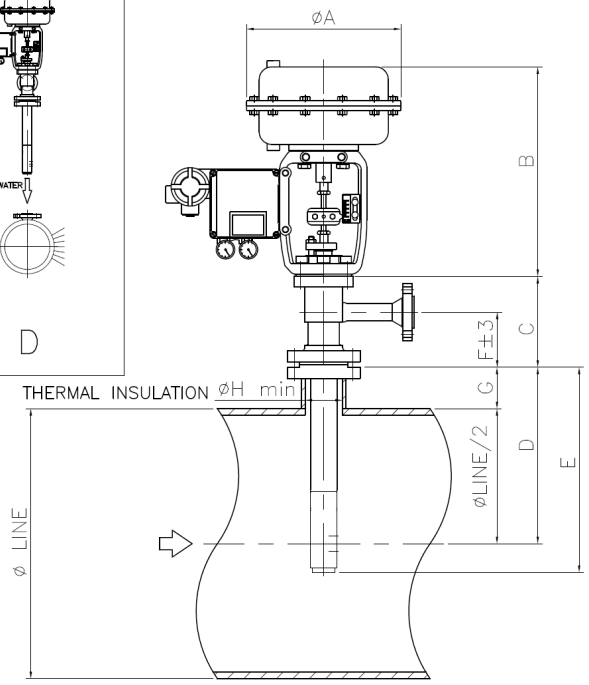
● No need for a separate water control water
Due to an integrated and directly actuated water injection
control valve no separated valve is required.

● High-tech nozzles
The spray nozzles, equipped with a special designed
swirl disk, are constructed using the most up to date
technology available, resulting in a fine symmetrical hollow cone spray.

● Reliability
Injection spray nozzles are sealed by a vacuum brazing process, maintaining the integrity of these components under the most extreme conditions.

Reference Dimensions





Inlet Size (Water Side)	OutletSize (Steam Side)	Steam Line □	A	B	C	D	E	F	H
Inches	Inches	inches	mm	mm	mm	mm	mm	mm	mm
1-1.1/2	3	6-12	414	633	290	315	378	200	70
		8-12				330	394		
		46-16				355			
		10-14				360	436		
		16-18				410			
1.1/2	4	12-22			362	450	533	250	95
		24				475			
		14-22			350	465	557		
		24-26				500			
2"	4	12-22			362	450	533		
		24				475			
		14-22			350	465	557		
		24-26				500			
2"	6	16-26			470	530	630	300	140
		28				555			
		20-28				560	680		
		30-32				610			
3"	6	16-26				530	630		
		28				555			
		20-28				560	680		
		30-32				610			

Note: Dimensions may be subject to change without prior notification.
Reference only. Please contact KOMOTO for detail dimension.

3. Fixed Nozzle Type Desuperheater - Model No. 903

KOMOTO's mechanical fixed nozzle type of desuperheater is designed primarily for use in low capacity superheated steam systems where the load is fairly constant. The design provides a simple, cost conscious but effective method of steam temperature control.

Nozzle Capacity

Size	Nozzle No.	Capacity	Nozzle No.	Capacity
½"(16mm)	6A	Cv = 0.075	9A	Cv = 0.112
	6B	Cv = 0.158	9B	Cv = 0.238
	6C	Cv = 0.300	9C	Cv = 0.451
	6D	Cv = 0.586	9D	Cv = 0.879
	6Dx	Cv = 1.160	9Dx	Cv = 1.740
1"(25mm)	6E	Cv = 1.902	9E	Cv = 2.853
	6F	Cv = 2.839	9F	Cv = 4.259
	6G	Cv = 6.032	9G	Cv = 9.048
	6H	Cv = 9.396	9H	Cv = 14.094
	6K	Cv = 13.488	9K	Cv = 20.232

Note: Cv can be customized for the optimize performance

Flange connections

- Size: Steam 1½"to 50"
  Water 1½"to 2"
- Forged/Casting construction
- Venturi nozzle type
- Low pressure loss over the desuperheater station
- Water pressure marginally above steam pressure

It is possible to handle extremely large differences in enthalpy between inlet an outlet steam flows.

Steam flange	3"	Class 900	4"	Class 900
		Class 1500		Class 1500
		Class 2500		Class 2500
	DN80-	PN 160	DN100-	PN 160
		PN 250		PN 250
		PN 320		PN 320
		PN 400		PN 400
Water flange	**1" - 1½"**		**1½" – 2" – 3"**	
	DN 25-40 Pressure classes as per Water data requirements		DN 40–50–80 Pressure classes as per Water data requirements	

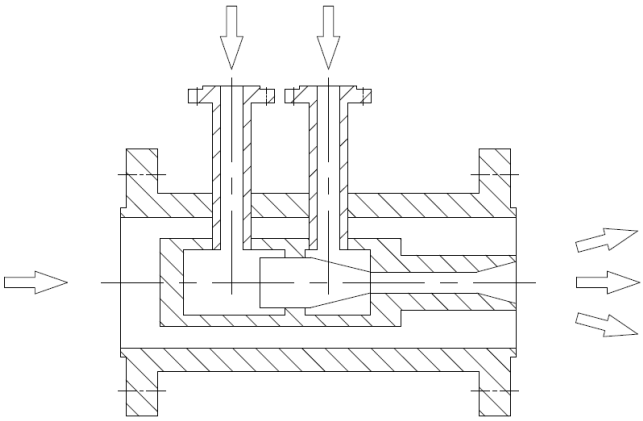
Applicable Codes

- ASME / ANSI B16.34 class 150 to 2500
- DIN 2401 class PN 25 to 400
- Butt-weld connections to ANSI B16.25 or DIN 2559

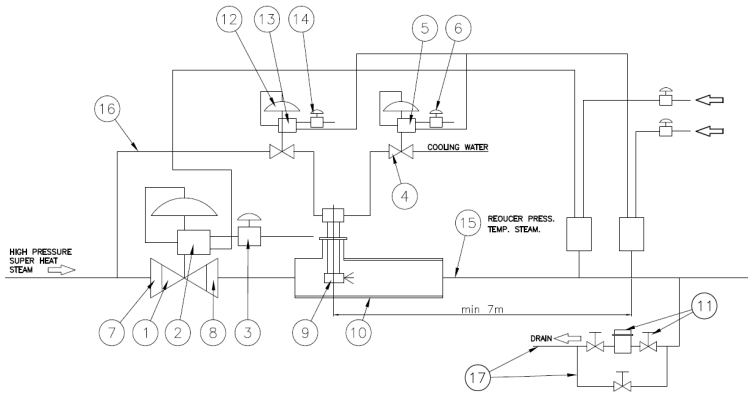
4. Steam Atomizing Type Desuperheater - Model No. 904

KOMOTO's steam atomizing type of desuperheater is designed for high steam turndown situation. A steam atomizing nozzle allows a small amount of steam (1~2 mass% of the main steam flow is recommended) to enter the nozzle upstream of the cooling water.

The atomizing steam breaks up the cooling water and provides decent quality of water drop for better evaporation.

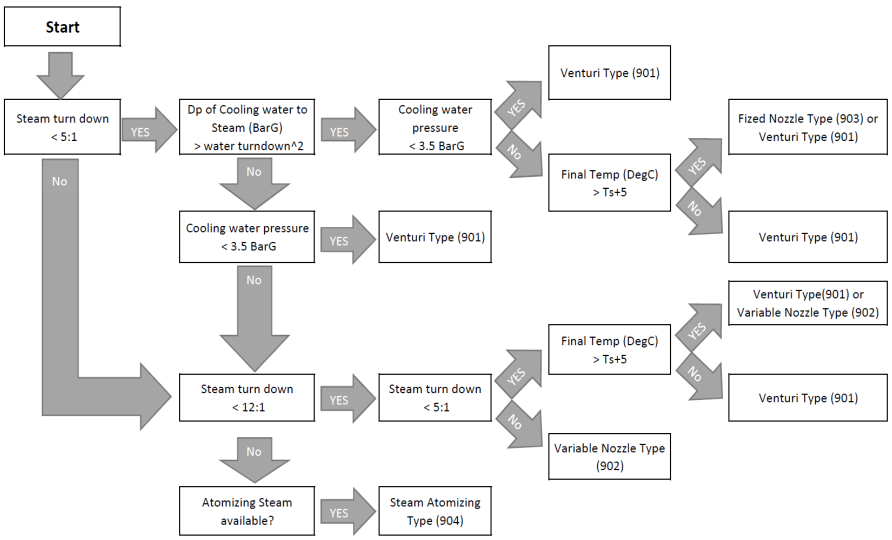


Typical configuration of Steam Atomizing Type Desuperheater



No.	NAME OF PARTS
17	PIPING FOR TRAP SYSTEM
16	ATOMIZING STEAM PIPE
15	DESUPER HEATER PIPE(STRAIGHT PIPE)
14	AIR SET
13	POSITIONER
12	ATOMIZING CONTROL VALVES
11	TRAP & BY-PASS VALVES
10	THERMAL SLEEVE
9	DESUPER HEATER
8	OUTLET SIDE REDUCER
7	INLET SIDE REDUCER
6	AIR SET
5	POSITIONER
4	COOLING WATER CONTROL VALVE
3	AIR SET
2	POSITIONER
1	PRESSUER REDUCING VALVE

Desuperheater selection guide



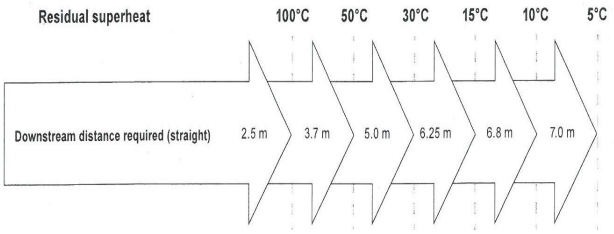
Comparison of desuperheater types

Model	Type	Steam Turndown Ration	Minimum Temperature Above Ts (°C)	Minimum Cooling water Pressure (bar)	Velocity at Minimum Flow (m/s)	Pipeline sizes (mm)	
						Minimum	Maxi-mum
901	Venturi	5:1	3.0	1.0	6	50	1250
902	Variable Nozzle	12:1	5.0	3.5	6	150	1500
903	Fixed Nozzle	5:1	5.0	4.0	6	150	1500
904	Steam Atomiz-ing	50:1	3.0	Greater than steam pressure (Note1)	1.5	100	1500

Straight Pipe Run

1. Upstream pipe straight run

The upstream straight run is to ensure that the steam is in consistent and homogeneous state and not swirling or cork-screwing when the spray water is injected. It is usually recommended as typically 5 steam pipe diameters or 1.5 meter which is bigger.



2. Downstream pipe straight run

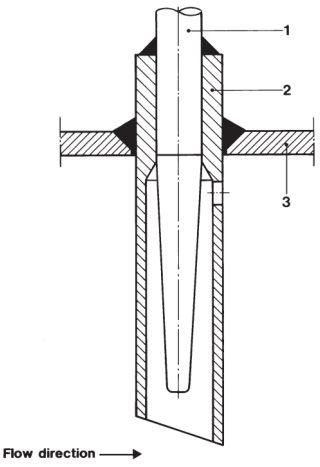
The downstream straight run is to ensure that the water droplets have evaporated before coming into contact with an elbow and becoming recombined into a pool of water. Pipe should be straight, free of bends and contain no restrictions. We recommend a minimum straight length distance of 2.5 to 7.5 m depending on the amount of residual superheat required (specified in table below). The greater the amount of residual superheat required, the faster the water droplets are evaporated and the shorter the distance required.

Temperature Sensor Pipe Length Requirements

If the water has not completely vaporized, the resulting input control data will be inaccurate due to moisture contacting the sensing temperature element. We recommend a minimum distance from the desuperheater to the temperature sensor to be 12m to 17m, but it should be at least 7.5m with thermowell sleeve.

Thermowell sleeve

The temperature sensor protection is recommended whenever the distance to the injection point is close to the minimum value and whenever one or more bends are present between water injection point and temperature sensor.
Such a layout in fact can produce separation of atomized water generating droplets that can hit thermometer well affecting measured temperature value. Minimum upstream piping length shall be not less than 6 DN. The protection may be manufactured as shown below and its purpose is to avoid sensor wetting by not evaporated water.



Thermowell sleeve < 1. Thermowell 2. Sleeve 3. Pipe wall >

Set point of temperature controller

There is a need for controlling the steam temperature as close to saturation as possible. The inherent problem with this is that the closer the temperature gets to saturation the more likely the steam flow will have residual water droplets. This is due to the fact that the temperature profile of a steam flow is uneven, often with cooler temperatures in the center and progressively hotter temperatures moving outwards. The set point is recommended to be not less than 6 DegC above the steam saturation point. Very minimum possible set point is shown in the above 'Comparison of desuperheater types' table.

Strainer

In order to protect both the cooling water and steam valves as well as to prevent the small bores within the Desuperheater from becoming blocked, installing strainers in BFW line is required. KOMOTO requests a strainer with a mesh size of approx.. 100 μm in the water supply line to project desuperheater from clogging.

Nozzle Capacity

Size	Nozzle No.	Capacity	Nozzle No.	Capacity
½"(16mm)	6A	Cv = 0.075	9A	Cv = 0.112
	6B	Cv = 0.158	9B	Cv = 0.238
	6C	Cv = 0.300	9C	Cv = 0.451
	6D	Cv = 0.586	9D	Cv = 0.879
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Note: Cv can be customized for the optimize performance

Warranty / Remedy

Korea Motoyama Inc. warrants goods of its manufacture as being free of defective materials and faulty workmanship for 12 months from the date of shipment, unless otherwise specified. In this period, all of our products claimed by original defects may be returned to our factory after notice and authorization by us. If warranted goods are returned to Korea Motoyama Inc. during the period of coverage, it will be repaired or replaced without charge for those items it finds defective. Such defects shall be exclusive of the effects of corrosion, erosion, normal wear or improper handling and storage. In case our engineers have field service, the user shall detach and install valves by his cost. Determination of the suitability of the Products for the use contemplated by the buyer or buyer's customer(s) is the sole responsibility of the buyer in connection therewith. The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.

Specifications are subject to change without notices.

KOMOTO

VALVES & CONTROLS

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