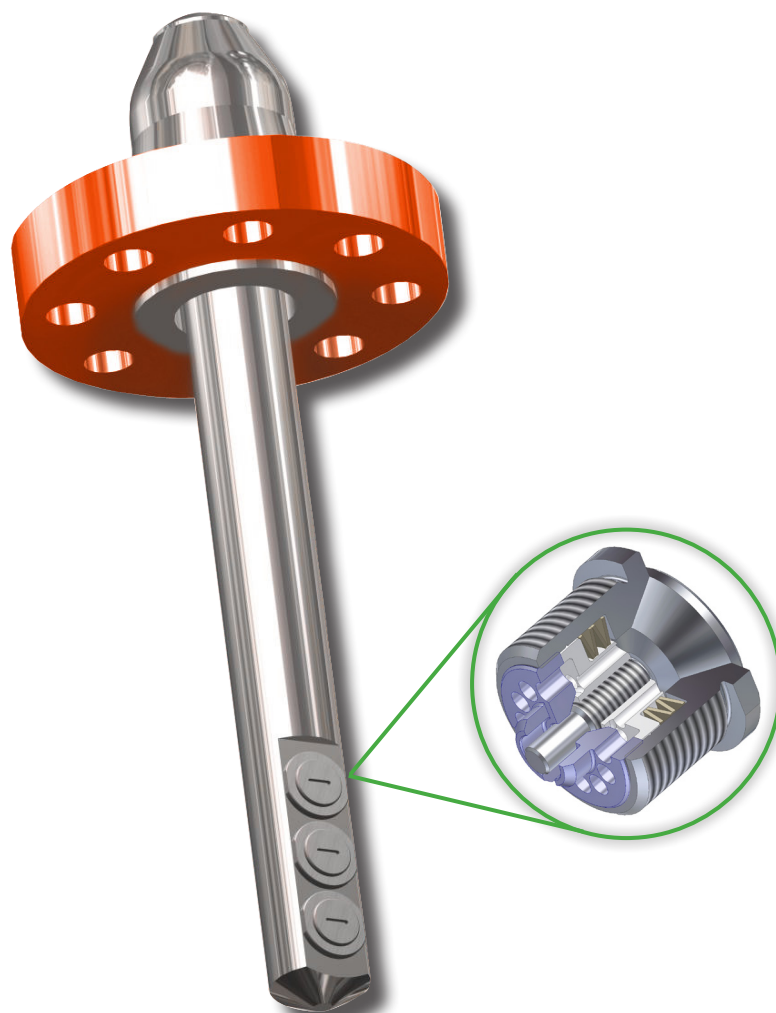


# MA-III & MA-IIIU

MECHANICAL ATOMIZING DESUPERHEATER



Copes-Vulcan has been providing control valves and desuperheaters for the power and process industries since 1903 and been supplying nuclear valves for over 40 years. SPX provides a wide range of valves for the control of pressure, temperature and flow-induced noise in all types of power plants. Products include severe service and general service control valves, variable orifice desuperheaters, Raven™ trim, steam-conditioning valves and nuclear control valves, as well as custom designed specialty valves. Copes-Vulcan is recognized worldwide as a leader in valves for severe and critical service applications. Our strength lies in our ability to provide innovative valve solutions for our customers' application needs.

Finding innovative ways to help the world meet its ever growing demand for power is a key focus for SPX. SPX provides creative solutions that serve global energy markets in a myriad of ways. Our ideas are helping build more efficient power plants and renovate older existing facilities. SPX supplies a wide range of components - from air preheaters to filter systems for nuclear, coal-fired, combined cycle, solar, thermal and geothermal power plants.

With operations in over 35 countries, SPX has the global experience and regional presence, products and powerful ideas it takes to help our customers compete more effectively, and more efficiently deliver power to almost any part of the world.

## MA-III & MA-IIIU Mechanical Atomizing Desuperheater

The MA-III/MA-IIIU is a multi nozzle mechanical atomizing desuperheater that reduces steam or gas temperatures by introducing cooling liquids directly into the hot fluid. The MA-III/MA-IIIU is a probe style direct contact heat exchanger. The liquid passes through the main tube of the desuperheater to the spray nozzles and discharges into the steam header.

The MA-III/MA-IIIU is generally used for applications which feature steady and transient loads. The primary use is for interstage attenuation of high pressure and temperature superheated steam and is specially designed for intermittent use. It is well suited for applications where limited differential pressure is available for injection purposes. The MA-III/MA-IIIU is also designed for higher capacities than the MA-I and SAMN at the same time supporting wider range of the liquid flows.

### TWO MOUNTING OPTIONS

This model is available in two mounting options. The MA-III is designed for welding to the pipe line and the MA-IIIU is flange mounted. The MA-IIIU also offers mounting commonality with other 'U'-series desuperheaters (MA-IU, MA-IIU MNSD-V and SAMN-U).

### FEATURES

The standard MA-IIIU unit is flange mounted. The Injection tube is machined from a single forged bar. A uniquely designed cap is welded to the tube and to a specially machined 3" raised face weld neck flange. This design is better suited for thermal expansion and accommodates flanged header mounting, (universal bolted connection).

There are no special supports or adapters required for installation. The fitting material used for the header connection should be ASME SA-182 GR. F22/ASTM A182 GR. F22, which will match application requirements for high temperatures, minimize variations of field welds, and result in section I compliant materials.

A series of injection nozzles are fitted to the end of the injection tube and it is inserted through the header connection. The minimum bore diameter for a 3" connection is 2.90" for installation clearance.

The standard water connection is a 2" socket or butt weld preparation. The butt weld connecting pipe schedule must match customer requirements to ensure proper end preparation. A separate cooling liquid control valve is required. The controllability of the water is directly related to the nozzle performance. The nozzles operate between 30 and 500 psi differential pressure with full capacity of all nozzles being at 230 psi.

## Typical product applications

### PRINCIPLE OF OPERATION

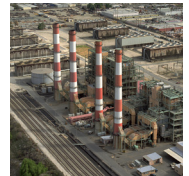
The Copes-Vulcan MA Desuperheaters reduce steam or gas temperatures by introducing cooling liquids directly into the hot fluid. Temperature reduction is essentially a matter of heat transfer, where the cooling liquid is placed in direct contact with the hot fluid and receives the necessary heat for evaporation. After sufficient time, all of the liquid is vaporized, resulting in final fluid flow at the desired lower temperature.

The operation is quite simple. A Copes-Vulcan control valve, SD-Severe Duty or GS-General Service valve controls the cooling liquid flow. This valve responds to changes received from the temperature controller or temperature control system. This liquid then passes through the main tube of the desuperheater to the spray nozzle and discharges into the header as a fine spray. By controlling the flow through the spray nozzle and maintaining proper header velocities, good reliable temperature control is obtained. Speed of response is optimized by:

- (1) Proper range selection of the temperature controller
- (2) Placement of controller as close to the valve as possible
- (3) Use of a valve positioner
- (4) Precise throttling of cooling liquid valve

The MA-III/MA-IIIU is a mechanical atomizing desuperheater that is generally used for applications which feature steady loads and attemporating applications.

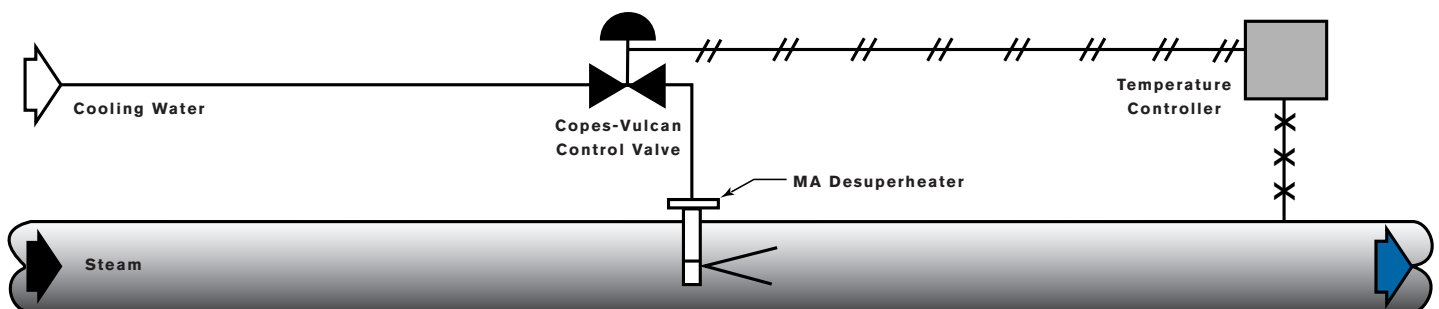
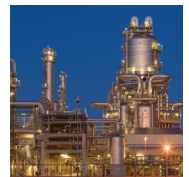
#### Chemical



#### Power



#### Pulp & Paper

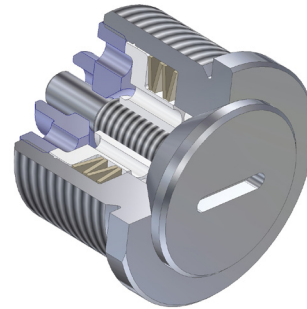
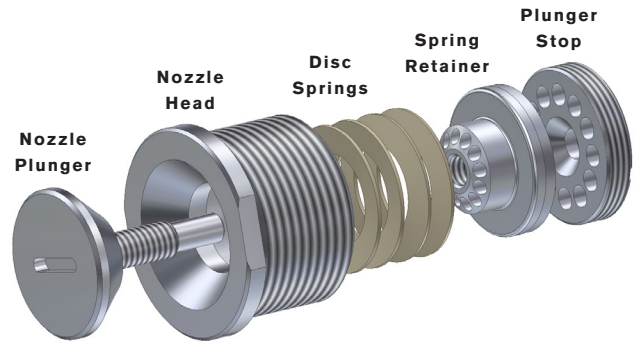


Temperature Controller sends signal to cooling water control valve, which in turn regulates flow of water to mechanical atomizing desuperheater.

## FUNCTION

The MA's tube is designed to minimize problems of mechanical vibration associated with compressible fluid flow. For example, as the main fluid flows past the desuperheater, vortices are formed and dissipated at a frequency dependent on the velocity, viscosity, and diameter of pipe. The desuperheater has been designed to minimize problems associated with vibration so that tube failure will not occur.

The outstanding performance is achieved by unique spring-loaded nozzle design, which provides excellent atomization over a wide range of spray flows. If the liquid was merely pumped into the line without a spray, control problems and liquid fall-out might occur. If liquid falls out of the main fluid and settles on the pipe, thermal stress and cracking might occur. The MA-III nozzle design optimizes the cooling liquid particle size so that quick evaporation can take place. By utilizing different springs in each nozzle, a better control at low flows can be achieved and the turndown of the liquid control valve can be reduced. Therefore the MA-III/MA-IIIU Desuperheaters produce rapid absorption of the liquid by mechanically producing fine droplets. The surface area per unit volume of liquid exposed to the hot fluid is large, thereby providing quick evaporation.



## Materials of Construction

<b>INJECTION TUBE (PROBE)</b>	ASME SA-182 GR. F91/ASTM A182 GR. F91
<b>NOZZLE HEAD</b>	ASME SA-182 GR. F91/ASTM A182 GR. F91
<b>PLUNGER STOP</b>	ASME SA-182 GR. F91/ASTM A182 GR. F91
<b>NOZZLE PLUNGER</b>	422 SST ASTM A565 GR. 616 UNS S42200 COND HT PLASMA NITRIDED (ref CVI Procedure 1.3.190)
<b>SPRING RETAINER</b>	422 SST ASTM A565 GR. 616 UNS S42200 COND HT (ref CVI Procedure 1.3.188)
<b>DISC SPRINGS</b>	INCONEL 718 (Heat treated and aged)
<b>GROOVE PIN (ANSI TYPE A)</b>	INCONEL 718 (Heat treated and aged)
<b>THERMAL SLEEVE</b>	ASME SA-335 GR. P91/ASTM A335 GR. P91
<b>MOUNTING FLANGE</b>	ASME SA-182 GR. F22/ASTM A182 GR. F22
<b>WELDING CAP</b>	ASME SA-182 GR. F91/ASTM A182 GR. F91
<b>SOCKET WELD COUPLING</b>	ASME SA-182 GR. F91/ASTM A182 GR. F91

# Nozzles

The MA-IIIU can be furnished for installations in line sizes from 8" through 30".

## NOZZLE CAPACITY

<b>2 NOZZLE</b>		<b>MINIMUM INSIDE DIAMETER OF HEADER PIPE OR LINER 6.81"</b>									
<b>psi</b>	<b>32</b>	<b>40</b>	<b>60</b>	<b>75</b>	<b>100</b>	<b>120</b>	<b>140</b>	<b>160</b>	<b>180</b>	<b>200</b>	<b>230</b>
A	0.5	0.8	1.0	1.3	1.8	2.0	2.3	2.6	2.8	3.0	3.3
B	0.0	0.7	1.2	1.5	1.9	2.1	2.3	2.7	3.0	3.2	3.3
max Cv											6.6
Turndown											13

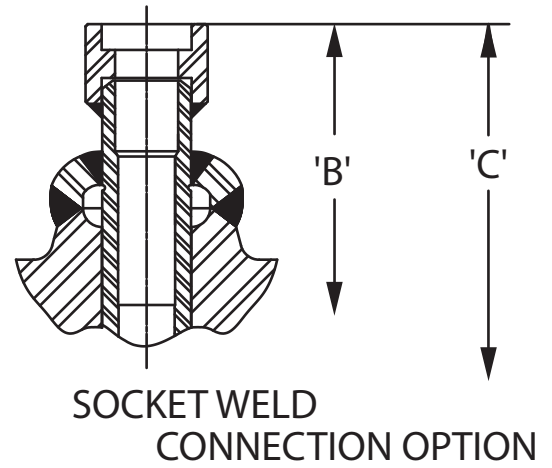
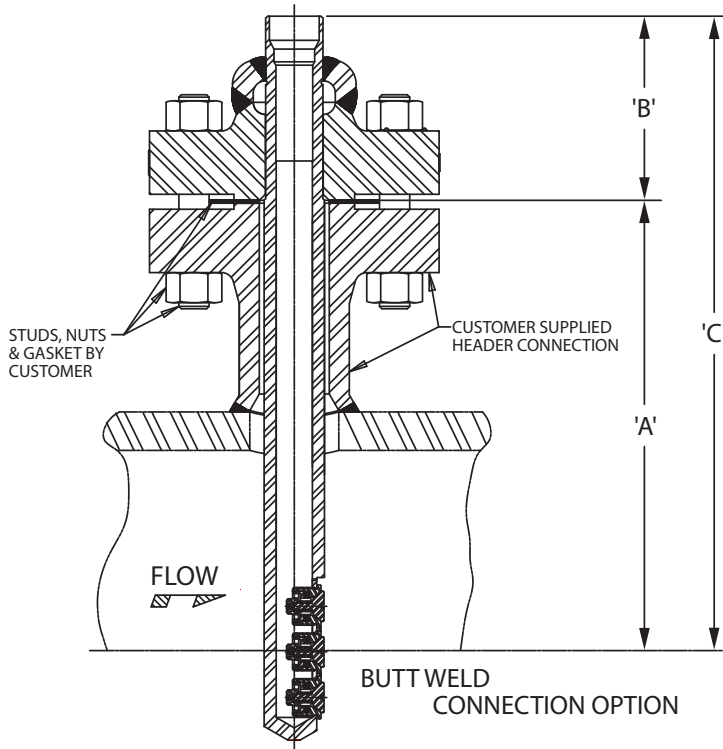
<b>3 NOZZLE</b>		<b>MINIMUM INSIDE DIAMETER OF HEADER PIPE OR LINER 8.50"</b>									
<b>psi</b>	<b>32</b>	<b>40</b>	<b>60</b>	<b>75</b>	<b>100</b>	<b>120</b>	<b>140</b>	<b>160</b>	<b>180</b>	<b>200</b>	<b>230</b>
A	0.5	0.8	1.0	1.3	1.8	2.0	2.3	2.6	2.8	3.0	3.3
B	0.0	0.7	1.2	1.5	1.9	2.1	2.3	2.7	3.0	3.2	3.3
C	0.0	0.0	0.9	1.8	2.4	2.5	2.8	3.2	3.3	3.4	3.3
max Cv											9.9
Turndown											20

<b>4 NOZZLE</b>		<b>MINIMUM INSIDE DIAMETER OF HEADER PIPE OR LINER 11.00"</b>									
<b>psi</b>	<b>32</b>	<b>40</b>	<b>60</b>	<b>75ok</b>	<b>100</b>	<b>120</b>	<b>140</b>	<b>160</b>	<b>180</b>	<b>200</b>	<b>230</b>
A	0.5	0.8	1.0	1.3	1.8	2.0	2.3	2.6	2.8	3.0	3.3
B	0.0	0.7	1.2	1.5	1.9	2.1	2.3	2.7	3.0	3.2	3.3
C	0.0	0.0	0.9	1.8	2.4	2.5	2.8	3.2	3.3	3.4	3.3
B	0.0	0.7	1.2	1.5	1.9	2.1	2.3	2.7	3.0	3.2	3.3
max Cv											13.2
Turndown											26

<b>5 NOZZLE</b>		<b>MINIMUM INSIDE DIAMETER OF HEADER PIPE OR LINER 14.00"</b>									
<b>psi</b>	<b>32</b>	<b>40</b>	<b>60</b>	<b>75</b>	<b>100</b>	<b>120</b>	<b>140</b>	<b>160</b>	<b>180</b>	<b>200</b>	<b>230</b>
A	0.5	0.8	1.0	1.3	1.8	2.0	2.3	2.6	2.8	3.0	3.3
B	0.0	0.7	1.2	1.5	1.9	2.1	2.3	2.7	3.0	3.2	3.3
C	0.0	0.0	0.9	1.8	2.4	2.5	2.8	3.2	3.3	3.4	3.3
B	0.0	0.7	1.2	1.5	1.9	2.1	2.3	2.7	3.0	3.2	3.3
C	0.0	0.0	0.9	1.8	2.4	2.5	2.8	3.2	3.3	3.4	3.3
max Cv											16.5
Turndown											33

# Dimensions

## MA-III-U



### BUTTWELD CONNECTIONS

HEADER SIZE	A	PRESSURE CLASS					
		900		1500		2500	
		B	C	B	C	B	C
<b>16"</b> (400mm)	<b>16.75</b> 425.45	<b>7.56</b> 192.02	<b>24.31</b> 617.47	<b>7.56</b> 192.02	<b>24.31</b> 617.47	<b>7.56</b> 192.02	<b>24.31</b> 617.47
<b>18"</b> (450mm)	<b>17.75</b> 450.85	<b>7.56</b> 192.02	<b>25.31</b> 642.87	<b>7.56</b> 192.02	<b>25.31</b> 642.87	<b>7.56</b> 192.02	<b>25.31</b> 642.87
<b>20"</b> (500mm)	<b>18.75</b> 476.25	<b>7.56</b> 192.02	<b>26.31</b> 668.27	<b>7.56</b> 192.02	<b>26.31</b> 668.27	<b>7.56</b> 192.02	<b>26.31</b> 668.27
<b>22"</b> (550mm)	<b>19.75</b> 501.65	<b>7.56</b> 192.02	<b>27.31</b> 693.67	<b>7.56</b> 192.02	<b>27.31</b> 693.67	<b>7.56</b> 192.02	<b>27.31</b> 693.67
<b>24"</b> (600mm)	<b>20.75</b> 527.05	<b>7.56</b> 192.02	<b>28.31</b> 719.07	<b>7.56</b> 192.02	<b>28.31</b> 719.07	<b>7.56</b> 192.02	<b>28.31</b> 719.07
<b>30"</b> (750mm)	<b>23.75</b> 603.25	<b>7.56</b> 192.02	<b>31.31</b> 795.27	<b>7.56</b> 192.02	<b>31.31</b> 795.27	<b>7.56</b> 192.02	<b>31.31</b> 795.27

Inch  
(Millimeter)

### SOCKETWELD CONNECTIONS

HEADER SIZE	A	PRESSURE CLASS					
		900		1500		2500	
		B	C	B	C	B	C
<b>16"</b> (400mm)	<b>16.75</b> 425.45	<b>7.56</b> 192.02	<b>24.31</b> 617.47	<b>7.56</b> 192.02	<b>24.31</b> 617.47	<b>7.56</b> 192.02	<b>24.31</b> 617.47
<b>18"</b> (450mm)	<b>17.75</b> 450.85	<b>7.56</b> 192.02	<b>25.31</b> 642.87	<b>7.56</b> 192.02	<b>25.31</b> 642.87	<b>7.56</b> 192.02	<b>25.31</b> 642.87
<b>20"</b> (500mm)	<b>18.75</b> 476.25	<b>7.56</b> 192.02	<b>26.31</b> 668.27	<b>7.56</b> 192.02	<b>26.31</b> 668.27	<b>7.56</b> 192.02	<b>26.31</b> 668.27
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<b>24"</b> (600mm)	<b>20.75</b> 527.05	<b>7.56</b> 192.02	<b>28.31</b> 719.07	<b>7.56</b> 192.02	<b>28.31</b> 719.07	<b>7.56</b> 192.02	<b>28.31</b> 719.07
<b>30"</b> (750mm)	<b>23.75</b> 603.25	<b>7.56</b> 192.02	<b>31.31</b> 795.27	<b>7.56</b> 192.02	<b>31.31</b> 795.27	<b>7.56</b> 192.02	<b>31.31</b> 795.27

Inch  
(Millimeter)



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