

# VAD

VARIABLE ANNULUS DESUPERHEATER



Copes-Vulcan has been providing control valves and desuperheaters for the power, process and nuclear industries since 1903. 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 and 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.

## VAD Variable Annulus Desuperheater

### DESCRIPTION

The VAD is a cost effective, line size desuperheater. Produced from stock materials it is readily available to satisfy general desuperheating and gas cooling applications. Essentially a dynamically contoured, stainless steel spray head concentrically located within a short section of pipe (body). The pipe acts as the desuperheater's outer body and pressure boundary. It fits into the main vapor line via either line size flanged or butt weld end connections for easy installation.

### FEATURES

- Temperature control to within 10°F (5°C) of saturation
- Horizontal or vertical installation
- High rangeability 15:1
- Coolant pressure need only be 7 psi (48 kPa) superior to vapor
- Self-regulating 360° coolant annulus for uniform distribution
- No spray nozzles to introduce blockage concerns
- Full atomization over entire operating range
- Minimal vapor side pressure drop
- No thermal liners required
- Butt weld or flanged to ANSI 150, 300, 600 or DIN PN10, 16, 40, 64, 100

### STANDARD MATERIALS:

Body ASTM A106 Gr. B carbon steel, Spray head ASTM A312 TP316 stainless steel



## Typical product applications

### PRINCIPLE OF OPERATION

The approach contour of the spray head guides and accelerates the superheated vapor to a restricted area between the spray head and the inner wall of the pipe. This restricted area causes an increase in velocity accompanied by a slight reduction in pressure. The coolant is introduced at this point and undergoes an instant increase in velocity and simultaneous decrease in pressure that is instrumental in causing the coolant to vaporize into a micron thin layer which is stripped off the edge of the spray head by the high velocity vapor and propelled downstream. Stripping action by the accelerated vapor acts as a barrier preventing impingement of the vaporized coolant against the inner wall of the pipe.

The contoured shape of the downstream face of the spray head results in a vortex zone being created into which any unabsorbed coolant is drawn. Here it experiences a further reduction in pressure and an extremely turbulent flow regime inducing an additional evaporation mechanism.

The desuperheated vapor velocity then rapidly decreases and, due to the venturi principle, its pressure virtually returns to that upstream of the spray head.

As the coolant is introduced into the vapor at a low pressure zone, there is no requirement with this device for excessive superior pressure. Unlike other fixed area Venturi desuperheaters, the VAD's coolant injection annulus is infinitely variable. A self-regulating feature guarantees a full 360° circumferential introduction of coolant into the vapor stream even at low flow conditions.

The VAD Variable Annulus Desuperheater is available to satisfy general desuperheating and gas cooling applications

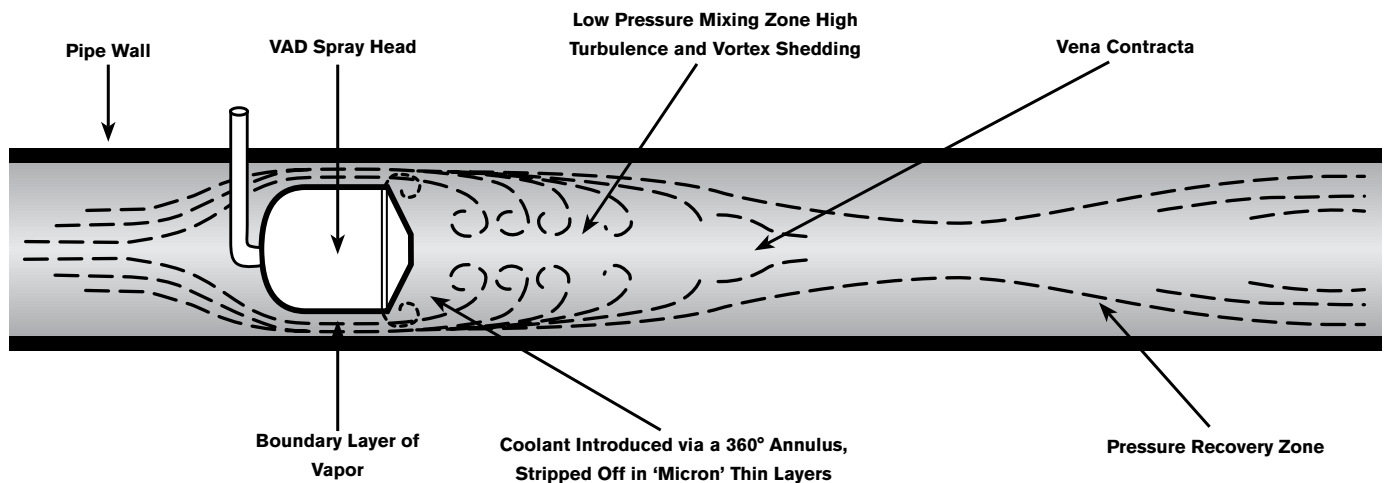
#### Chemical



#### Power



#### Pulp & Paper



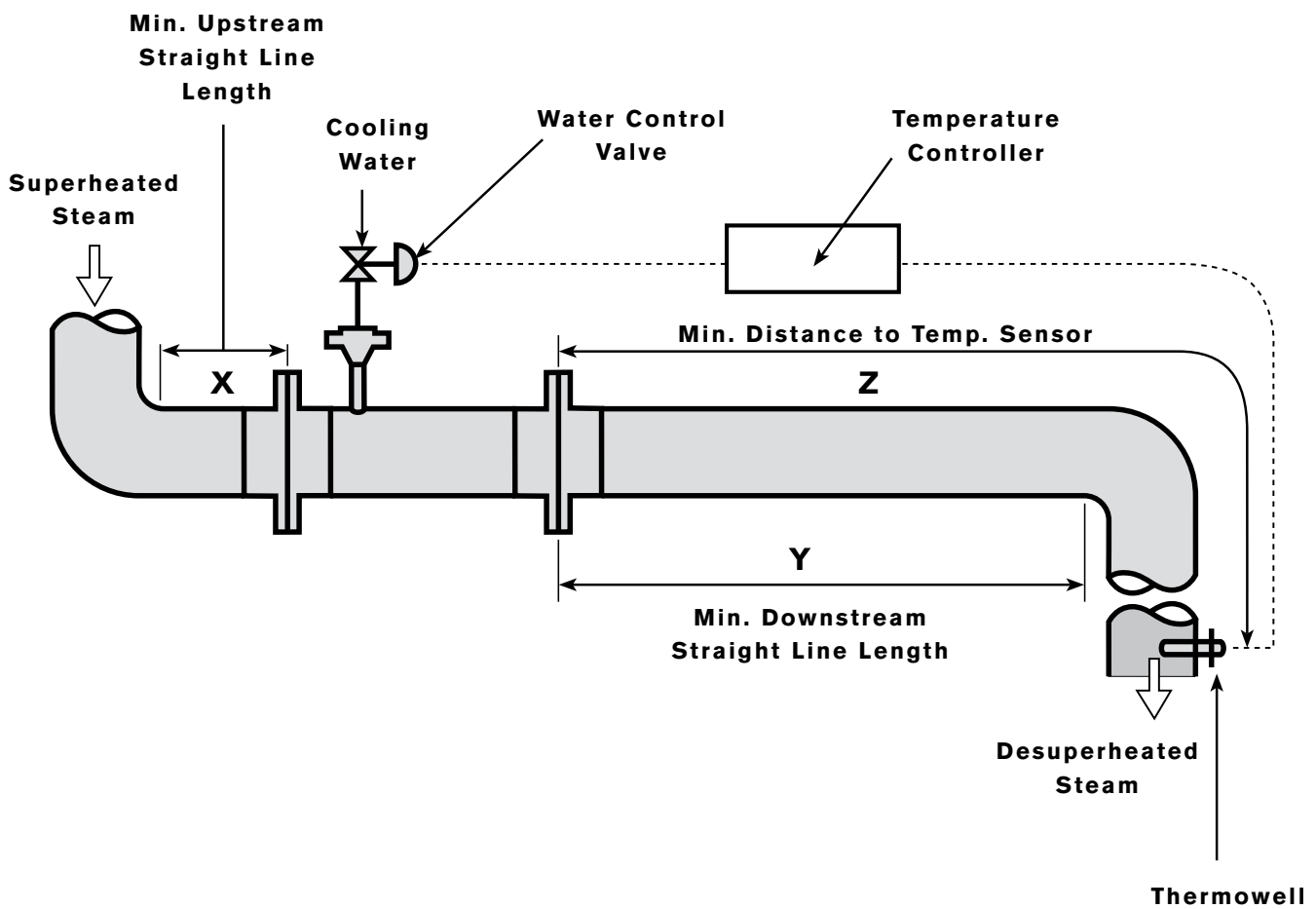
## INSTALLATION AND OPERATION

The VAD can be installed in either horizontal or vertical lines. For straight pipe line lengths and distance to temperature sensing elements, refer to the typical installation diagram.

The coolant pressure needs to be only 7 psi (48 kPa) superior to the vapor line pressure. The coolant flow is regulated by the Copes-Vulcan performance matched control valve and can be fitted with our unique Cascade trim, specifically designed to meet the precise control and rangeability of desuperheating and gas cooling applications.

No thermal liners are required as the coolant is aspirated into the vapor stream rather than sprayed, and the high velocity vapor provides an effective thermal boundary layer to the pipe wall.

## TYPICAL INSTALLATION



<b>SIZE</b>	<b>MINIMUM UPSTREAM STRAIGHT LINE LENGTH (X)</b>	<b>MINIMUM DOWNSTREAM STRAIGHT LINE LENGTH (Y)</b>	<b>MINIMUM DISTANCE TO TEMPERATURE SENSOR (Z)</b>
<b><u>1.00"</u></b> 25mm	<b><u>.75'</u></b> 0.2m	<b><u>10'</u></b> 3m	<b><u>20'</u></b> 6m
<b><u>1.25"</u></b> 32mm	<b><u>.75'</u></b> 0.2m	<b><u>10'</u></b> 3m	<b><u>20'</u></b> 6m
<b><u>1.50"</u></b> 40mm	<b><u>.75'</u></b> 0.2m	<b><u>10'</u></b> 3m	<b><u>20'</u></b> 6m
<b><u>2.00"</u></b> 50mm	<b><u>1'</u></b> 0.3m	<b><u>10'</u></b> 3m	<b><u>20'</u></b> 6m
<b><u>2.50"</u></b> 65mm	<b><u>1.5'</u></b> 0.4m	<b><u>10'</u></b> 3m	<b><u>20'</u></b> 6m
<b><u>3.00"</u></b> 80mm	<b><u>1.5'</u></b> 0.4m	<b><u>13'</u></b> 4m	<b><u>26'</u></b> 8m
<b><u>4.00"</u></b> 100mm	<b><u>1.75'</u></b> 0.5m	<b><u>13'</u></b> 4m	<b><u>26'</u></b> 8m
<b><u>5.00"</u></b> 125mm	<b><u>2.5'</u></b> 0.7m	<b><u>13'</u></b> 4m	<b><u>26'</u></b> 8m
<b><u>6.00"</u></b> 150mm	<b><u>2.75'</u></b> 0.8m	<b><u>13'</u></b> 4m	<b><u>26'</u></b> 8m
<b><u>8.00"</u></b> 200mm	<b><u>3.25'</u></b> 1.0m	<b><u>16.5'</u></b> 5m	<b><u>33'</u></b> 10m
<b><u>10.00"</u></b> 250mm	<b><u>4'</u></b> 1.2m	<b><u>16.5'</u></b> 5m	<b><u>33'</u></b> 10m
<b><u>12.00"</u></b> 300mm	<b><u>5'</u></b> 1.5m	<b><u>16.5'</u></b> 5m	<b><u>33'</u></b> 10m
<b><u>14.00"</u></b> 350mm	<b><u>6'</u></b> 1.8m	<b><u>16.5'</u></b> 5m	<b><u>33'</u></b> 10m
<b><u>16.00"</u></b> 400mm	<b><u>6.5'</u></b> 2.0m	<b><u>16.5'</u></b> 5m	<b><u>33'</u></b> 10m

## WEIGHTS

### Flanged

SIZE	LBS/KG		
	ANSI 150 PN10/PN16	ANSI 300 PN40/PN64	ANSI 600 PN100
<b>1.00"</b> 25mm	<b>4</b> 2	<b>7</b> 3	<b>9</b> 4
<b>1.25"</b> 32mm	<b>7</b> 3	<b>9</b> 4	<b>11</b> 5
<b>1.50"</b> 40mm	<b>9</b> 4	<b>13</b> 6	<b>15</b> 7
<b>2.00"</b> 50mm	<b>13</b> 6	<b>18</b> 8	<b>20</b> 9
<b>2.50"</b> 65mm	<b>20</b> 9	<b>26</b> 12	<b>29</b> 13
<b>3.00"</b> 80mm	<b>26</b> 12	<b>37</b> 17	<b>42</b> 19
<b>4.00"</b> 100mm	<b>40</b> 18	<b>60</b> 27	<b>82</b> 37
<b>5.00"</b> 125mm	<b>51</b> 23	<b>79</b> 36	<b>135</b> 61
<b>6.00"</b> 150mm	<b>71</b> 32	<b>110</b> 50	<b>170</b> 77
<b>8.00"</b> 200mm	<b>132</b> 60	<b>187</b> 85	<b>276</b> 125
<b>10.00"</b> 250mm	<b>198</b> 90	<b>287</b> 130	<b>441</b> 200
<b>12.00"</b> 300mm	<b>298</b> 135	<b>397</b> 180	<b>551</b> 250
<b>14.00"</b> 350mm	<b>474</b> 215	<b>639</b> 290	<b>772</b> 350
<b>16.00"</b> 400mm	<b>662</b> 300	<b>860</b> 390	<b>1103</b> 500

### Butt Weld

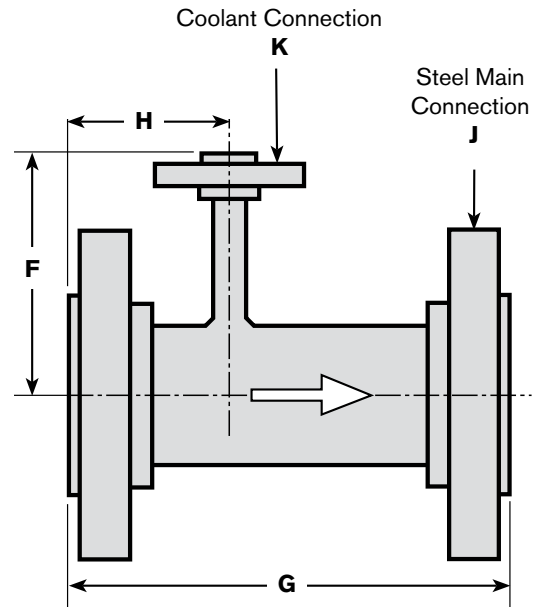
SIZE	LBS/KG
<b>1.00"</b> 25mm	<b>1</b> 0.4
<b>1.25"</b> 32mm	<b>1</b> 0.6
<b>1.50"</b> 40mm	<b>2</b> 1.0
<b>2.00"</b> 50mm	<b>4</b> 1.6
<b>2.50"</b> 65mm	<b>6</b> 2.5
<b>3.00"</b> 80mm	<b>9</b> 4.0
<b>4.00"</b> 100mm	<b>13</b> 6.0
<b>5.00"</b> 125mm	<b>22</b> 10.0
<b>6.00"</b> 150mm	<b>35</b> 16.0
<b>8.00"</b> 200mm	<b>75</b> 34.0
<b>10.00"</b> 250mm	<b>119</b> 54.0
<b>12.00"</b> <b>300mm</b>	<b>170</b> 77.0
<b>14.00"</b> 350mm	<b>309</b> 140.0
<b>16.00"</b> 400mm	<b>463</b> 210.0



## DIMENSIONS

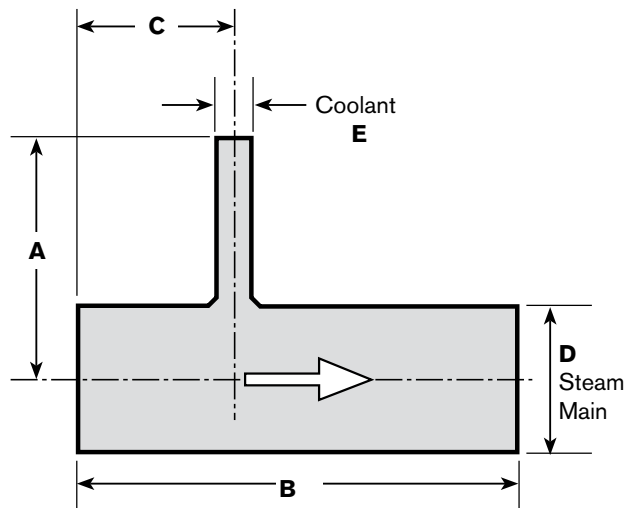
### Flanged

SIZE	F	G	H	J FLANGE ANSI (IN) DN	K FLANGE ANSI (IN) DN
1.00" 25mm	3.00" 76mm	6.00" 152mm	2.50" 64mm	1.00" 25mm	1/8 NPT
1.25" 32mm	3.25" 83mm	6.00" 152mm	2.50" 64mm	1.25" 32mm	1/4 NPT
1.50" 40mm	3.69" 94mm	7.00" 178mm	3.50" 89mm	1.50" 40mm	3/8 NPT
2.00" 50mm	3.88" 99mm	8.00" 203mm	3.50" 89mm	2.00" 50mm	3/8 NPT
2.50" 65mm	4.00" 102mm	8.00" 203mm	3.50" 89mm	2.50" 65mm	3/8 NPT
3.00" 80mm	6.00" 152mm	10.00" 254mm	4.00" 102mm	3.00" 80mm	.5" 15mm
4.00" 100mm	7.50" 191mm	11.00" 279mm	5.00" 128mm	4.00" 100mm	.75" 20mm
5.00" 125mm	8.00" 203mm	13.00" 330mm	6.00" 153mm	5.00" 125mm	.75" 20mm
6.00" 150mm	9.00" 229mm	15.00" 381mm	6.00" 153mm	6.00" 150mm	1.00" 25mm
8.00" 200mm	10.00" 254mm	16.00" 406mm	6.00" 153mm	8.00" 200mm	1.00" 25mm
10.00" 250mm	13.00" 330mm	19.00" 483mm	8.00" 204mm	10.00" 250mm	1.50" 40mm
12.00" 300mm	14.00" 356mm	21.00" 533mm	8.50" 217mm	12.00" 300mm	1.50" 40mm
14.00" 350mm	16.00" 406mm	24.00" 610mm	9.00" 230mm	14.00" 350mm	1.50" 40mm
16.00" 400mm	17.00" 432mm	27.00" 686mm	10.00" 255mm	16.00" 400mm	1.50" 40mm



### Butt Weld

SIZE	D	A	B	C	E	
					SIZE	SCHED.
1.00" 25mm	40	3.00" 76mm	5.50" 140mm	2.25" 57mm	0.12" 6mm	40
1.25" 32mm	40	3.25" 83mm	5.50" 140mm	2.25" 57mm	0.25" 8mm	40
1.50" 40mm	40	3.69" 94mm	6.50" 165mm	3.25" 83mm	0.38" 10mm	40
2.00" 50mm	40	3.88" 99mm	7.50" 191mm	3.25" 83mm	0.38" 10mm	40
2.50" 65mm	40	4.00" 102mm	7.50" 191mm	3.25" 83mm	0.38" 10mm	40
3.00" 80mm	40	5.75" 146mm	9.50" 241mm	3.75" 96mm	0.50" 15mm	40
4.00" 100mm	40	7.25" 184mm	10.50" 267mm	4.75" 121mm	0.75" 20mm	40
5.00" 125mm	40	7.75" 197mm	12.50" 318mm	5.75" 147mm	0.75" 20mm	40
6.00" 150mm	40	8.75" 222mm	14.50" 368mm	5.75" 147mm	1.00" 25mm	40
8.00" 200mm	80	9.75" 248mm	15.00" 381mm	5.75" 147mm	1.00" 25mm	40
10.00" 250mm	80	12.75" 324mm	18.00" 457mm	7.50" 191mm	1.50" 40mm	40
12.00" 300mm	80	13.75" 349mm	19.50" 495mm	7.75" 198mm	1.50" 40mm	40
14.00" 350mm	80	15.75" 400mm	22.50" 572mm	8.25" 210mm	1.50" 40mm	40
16.00" 400mm	80	16.75" 425mm	25.50" 648mm	9.25" 236mm	1.50" 40mm	40



VAD

Variable Annulus  
Desuperheater



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