

COPES-VULCAN
AN SPX BRAND

VAD

Variable Annulus Desuperheater



SPX[®]

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.

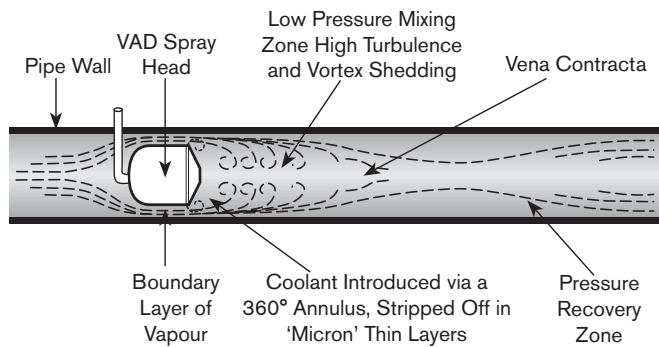
Principle of Operation

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.

Principle of Operation



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

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 on page 4.

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.

Weights

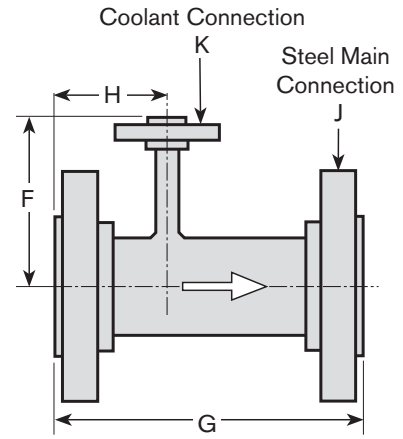
Flanged

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

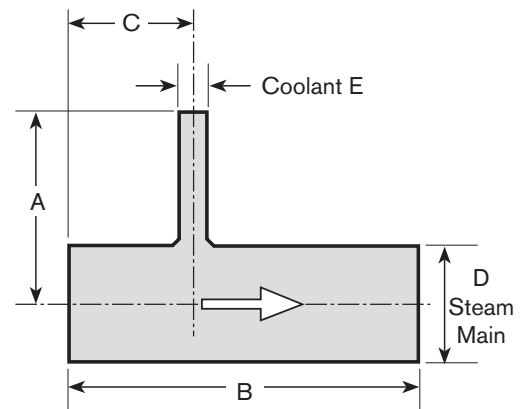
Butt Weld

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

Flanged



Butt Weld



Dimensions

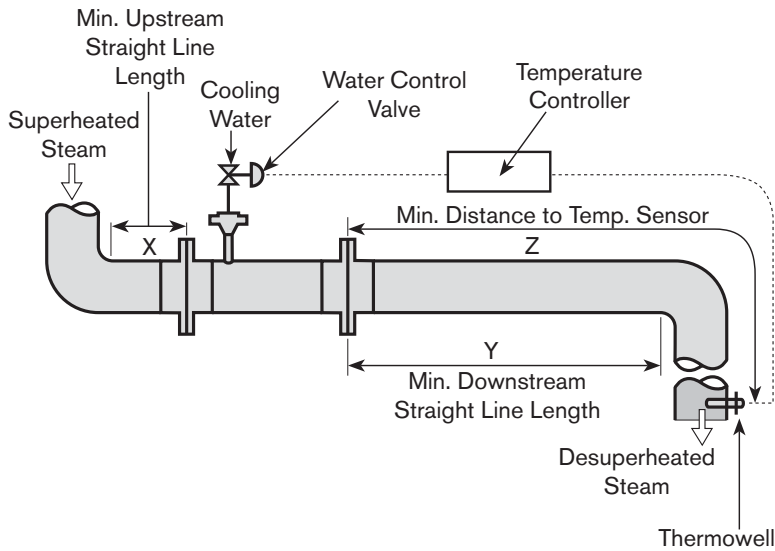
Flanged

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

Typical Installation



Size	Minimum Upstream Straight Line Length (X)	Minimum Downstream Straight Line Length (Y)	Minimum Distance to Temperature Sensor (Z)
1.00" 25mm	.75' 0.2m	10' 3m	20' 6m
1.25" 32mm	.75' 0.2m	10' 3m	20' 6m
1.50" 40mm	.75' 0.2m	10' 3m	20' 6m
2.00" 50mm	1' 0.3m	10' 3m	20' 6m
2.50" 65mm	1.5' 0.4m	10' 3m	20' 6m
3.00" 80mm	1.5' 0.4m	13' 4m	26' 8m
4.00" 100mm	1.75' 0.5m	13' 4m	26' 8m
5.00" 125mm	2.5' 0.7m	13' 4m	26' 8m
6.00" 150mm	2.75' 0.8m	13' 4m	26' 8m
8.00" 200mm	3.25' 1.0m	16.5' 5m	33' 10m
10.00" 250mm	4' 1.2m	16.5' 5m	33' 10m
12.00" 300mm	5' 1.5m	16.5' 5m	33' 10m
14.00" 350mm	6' 1.8m	16.5' 5m	33' 10m
16.00" 400mm	6.5' 2.0m	16.5' 5m	33' 10m

SPX®

FLOW CONTROL

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