

DeZURIK
COPEES-VULCAN
A unit of **SPX** Corporation

**SA-35 STEAM
ATOMIZING
DESUPERHEATER**

DeZURIK/COPEES-VULCAN



The SA-35 was developed to obtain a more uniform spray pattern under varying load conditions where no pressure drop in the steam header can be tolerated. Steam atomizing allows for higher turndown (up to 25:1) with varying load conditions.

Operational Features

Cooling liquid is introduced into the steam header through a stainless steel nozzle assembly, which uniquely divides one large jet of liquid into many small jets. Just prior to entrance into the main header, each jet is bombarded by a higher pressure steam jet, creating a fine mist which enters the stream flow without the need of a thermal liner inside the main header.

The SA-35 Desuperheater thus reduces the size of the liquid particles so that the droplets can be quickly and efficiently evaporated. Downstream temperatures can be controlled to within 15°F (9°C) of saturation.

The stainless steel nozzle is machined from one piece and shoulders into the nozzle head so that it becomes completely trapped after assembly of the nozzle clamp which is screwed and seal welded to the nozzle head. Hard faced overlay in the nozzle head minimizes erosion wear.

The thermal sleeve around the liquid tube insures uniform expansion with the steam tube, thereby minimizing thermal stresses due to unequal elongation of the liquid and atomizing steam tubes.

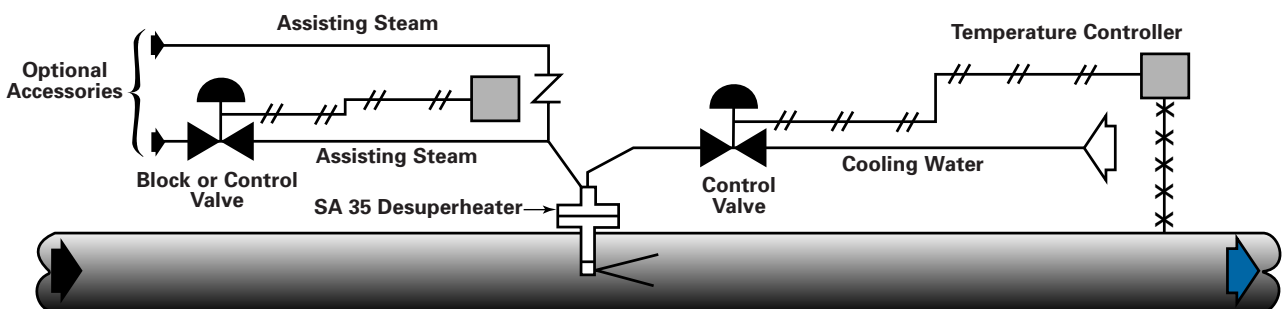
Due to its narrow silhouette, the SA-35 Desuperheater causes no appreciable restriction in the header.

This desuperheater is made in four sizes, in pressures classes up to and including class 1500. The cooling liquid is introduced through a series of small orifices which are drilled circumferentially into the nozzle. Small rectangular slots are milled ninety (90) degrees to the drilled holes. Atomizing steam passes through each of the slots and blasts each of the cooling liquid jets. Liquid pressure of only 10–40 psi (70–280 kPa) above header pressure is all that is necessary to introduce the cooling medium.

Atomizing steam flow is constant as the flow in the header decreases from maximum rate, until only atomizing steam is flowing. This results in improved atomization at low flows to offset the decreasing benefit obtained from the mixing and transporting capacity of the steam in the header at a reduced rate of flow.

This characteristic is unique, and is the reverse of most other types of desuperheaters.

Principle of Operation



Temperature impulse signal from controller actuates cooling water valve flow to desuperheater. Atomizing steam may require a pressure reducing valve and pressure controller or check valve only, depending upon atomizing steam source conditions.

Specifications

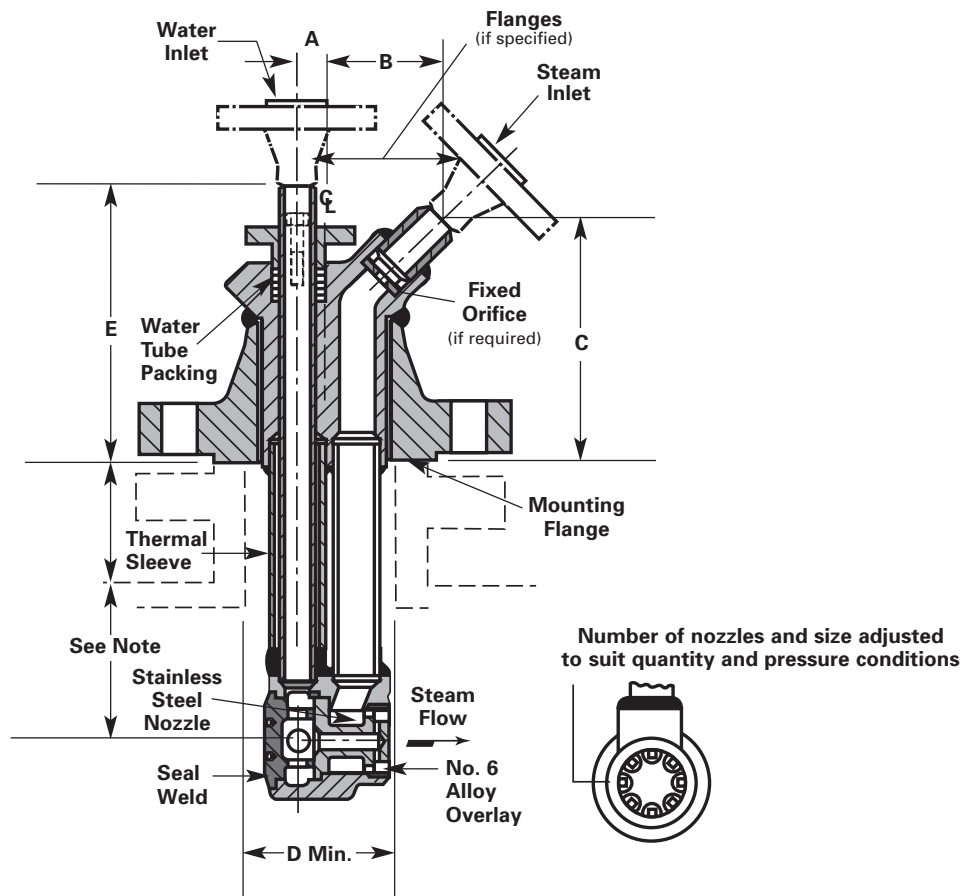
Desuperheater Size	Dimensions (Inches) — All Header Sizes																
	Mounting Flange	Water Conn.	Steam Conn.	A	B	C				D	To 600 Std.			900 & 1500 Std.			
						150	300	400	600		Min.	E	H	Conn. Pipes Schedule	C	E	H
3-4	3	.5	.5	.5	3.875	6.25	6.625	-	7	3	7	6	80	7	8	7	-
4-6	4	.75	1	.8125	4.25	6.75	7	7.5	8	4	9	6	80	8	10	7	160
6-8	6	1.25	1.5	1.125	5	7.875	8.25	8.75	9.25	6	10	6.5	80	10	11	8.5	160
8-10	8	2	2	1.375	6	8.5	8.875	9.375	10	8	11	7	80	11	13	9	160

NOTE: Any size desuperheater may be mounted on any header size larger than minimum size listed below.

Extension pipe lengths are varied to locate sprayhead at center of header up to maximum size listed. No increase is made for larger headers causing head to be slightly off center.

Desuperheater Size	Header Size
3-4	4-16" (100-400mm)
4-6	6-18" (150-450mm)
6-8	8-20" (200-500mm)
8-10	10-24" (250-600mm)

Dimensions



Products

Maxum™ Rotary Control Valves — Sizes 1–12" (25–300mm) for highly erosive services. Features high throttling accuracy and four flow capacity ranges.

Eccentric Plug Valves — Sizes 0.5–72" (15–1800mm) in a wide choice of materials and resilient plug facings.

HP Butterfly Valves — Sizes 2–48" (50–1200mm) for applications to 740 psi (5100 kPa), plus Intelli-Seal™ extra-tight metal, fire tested and PTFE seated models.

V-Port Ball Valves — Sizes 1–20" (25–500mm), pressures to 740 psi (5100 kPa) and temperature ratings to 1000°F (537°C). Flanged and flangeless designs.

Resilient Seated Butterfly Valves — Sizes 2–36" (50–900mm) in two styles with 175 and 225 psi (1210 and 1550 kPa) pressure ratings and wafer and lugged body styles.

AWWA Butterfly Valves — Sizes 3–120" (80–3000mm). Meets AWWA C504 standards.

3- and 4-Way Plug Valves — Sizes 3–16" (80–400mm) for shutoff and switching applications, plus a variety of body materials.

Metal Seated Full Port Ball Valves — Sizes 2–12" (50–300mm) are designed for trouble-free operation in digester blow-down applications and for handling corrosive liquids, gases and abrasive slurries.

Precision Electric Control Valves — Unmatched control accuracy provides up to 16,000 discrete repeatable throttling positions in 90° plug rotation. Accepts analog or digital signals. Sizes 4–20" (100–500mm).

Permaseal® Plug Valves — Sizes 0.5–6" (15–150mm) in ANSI Class 150 and 300 ratings. Body styles include 2-way, 3-way, jacketed, double block and bleed and flush through for corrosive and high temperature applications.

Knife Gate Valves — Rugged designs for corrosive and abrasive service on liquids, slurries and dry materials. Pressures to 150 psi (1030 kPa) and sizes 2–72" (50–1800mm).

Consistency Transmitters — Rotating sensor, AccuTrax™ blade sensor, open type and pan type chambers for pulp and paper consistency control applications.

Unival Ported Gate Valves — Sizes 2–48" (50–1200mm) for scaling, corrosive and abrasive services. Reinforced elastomer sleeve forms bubble-tight seal flush with the wall of the pipe.

Regulators and Pump Governors — FW-1, BI and D-O Flomatic regulators for direct control of boiler feedwater level. Sizes 1–3" (25–80mm). SDS-2 steam governor for use in automatic steam pressure control up to 200 psig (1380 kPa). Sizes 1.5–4" (40–100mm), pressure class ANSI 250–600.

General Service and Severe Duty Linear Control Valves — Sizes 0.5–24" (15–600mm) with pressure class ratings from ANSI 125–4500. Top Guided, Cage Guided, Balanced, Unbalanced and Tandem construction with quick-change trim. Wide variety of body styles to meet the exact application requirements. Low noise, tight shutoff, low flow and anticavitation trim options to meet the most demanding requirements. Available in straight, angle, fabricated and 3-way globe body styles. Manual, pneumatic, hydraulic or electric actuation.

Steam and Gas Desuperheaters — For line sizes from 1–36" (25–900mm) and larger. Pressure classes ANSI 150–4500. Wide range of products including Mechanical Atomizing, Spring Assisted Multiple Nozzle, Variable Annulus, Steam Atomizing, Variable Orifice and Multiple Nozzle with Integral Control Valve designs. Temperatures to 1200°F (650°C).

Steam Conditioning Equipment — Preconfigured Pressure Reducing and Desuperheating Stations (PRDS) are cast products in sizes 1x2", 2x4", 3x6", 4x8" and 6x12" (25x50, 50x100, 80x150, 100x200 and 150x300mm) angle style bodies with pressure class ratings from ANSI 600–2500. Fabricated Direct Steam Conditioning Valves (DSCV) are fabricated in pressure classes ANSI 150–4500 for sizes 8–36" (200–900mm) angle construction. Widely used in process steam and turbine bypass applications. Manual, pneumatic, hydraulic or electric actuation.

Actuators — Pneumatic Spring and Diaphragm and Piston Actuators for linear control valves. Rotary spring diaphragm, PowerRac® rack and pinion style, G-Series and Compak spring return and double acting actuators. A wide variety of manual and electric motor actuator options.

Control Accessories — Smart, Digital, Electro-Pneumatic and Pneumatic positioners. Other devices including limit switches, position transmitters, transducers, filter regulators, solenoid valves, fail in place devices, booster relays, quick release valves and other accessories available to customize equipment to meet system requirements.

Sales and Service

DeZURIK/Copes-Vulcan representatives are located in major cities throughout the world. For the name of the representative nearest you, contact:

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DeZURIK
COPES-VULCAN
A unit of **SPX** Corporation

**SAMN-U
SPRING ASSISTED
MULTIPLE NOZZLE
DESUPERHEATER**

DeZURIK/COPES-VULCAN



Operational Features

- Rangeability as high as 9:1
- Temperature control to within 15°F (8°C) of saturation with the ability to hold set point within a tolerance of 10°F (6°C)
- Standard maximum available Cv of 2.50 (Kv of 2.16); higher capacity available
- Available in standard classes 150, 300, 600, 900, 1500 and 2500 per ANSI B16.5
- Cooling water pressure minimum of 225 psi (1550 kPa) to a maximum of 1000 psi (6900 kPa) above the steam header pressure at the inlet
- Mounting commonality with 'U'-Series desuperheaters

Description

The spring assisted multiple nozzle desuperheater reduces steam or gas temperatures by introducing cooling liquids directly into the hot fluid.

SAMN-U has six nozzles which can be opened or closed to vary the coolant flow. This provides a higher turndown than single nozzle units where the amount of coolant flow is dependent only on the ability to vary the pressure drop across the nozzle.

SAMN-U contains an integral spring loaded flow plug which moves in response to a change in pressure differential between the coolant inlet pressure and the main header pressure. As the plug moves, more or less nozzles are uncovered introducing more or less coolant into the main header. The varying inlet coolant pressure is controlled by a separate water or coolant control valve (usually supplied by DeZURIK/Copes-Vulcan).

The coolant enters the unit and passes through the center of the spring spacer, spring and plug. Unbalanced forces created by the coolant over line pressure differential cause the plug to move, exposing more or fewer flow nozzles. The coolant is atomized as it passes under pressure through the spray nozzles which further assist in evaporation of the coolant.

Discharge Nozzles

The multiple nozzle arrangement located near the end of the nozzle tube is typically comprised of six individual nozzles. While in a standard unit, the six nozzles are all of the same size, seven nozzle size options are available. The nozzle size selected for a given application will maximize controller and turndown.

Coolant Water Pressure

Coolant water pressure should be a minimum of 225 psi (1550 kPa) and a maximum of 1000 psi (6900 kPa) above the steam pressure during operation. Flow through the unit varies with water pressure. The plug begins to lift at approximately 60 psi (410 kPa) and reaches full travel at approximately 225 psi (1550 kPa) exposing all of the nozzles.

Installation Recommendations

The SAMN-U can be furnished for installation in main stream line size 6–24" (150–600mm) and larger. It is recommended that the unit be installed in a header with a minimum of five pipe diameters [not less than 4' (1.2m)] of straight pipe upstream and 16' (5m) of straight pipe downstream.

The unit can be installed in either horizontal or vertical pipe run. For vertical pipe runs, it is recommended that flow is upward and a drain pot is placed at the bottom of the pipe run. All units must be installed such that the discharge nozzles face directly downstream. The recommended location of the temperature sensing point is 25' (8m) downstream.

The mounting interface is a standard 3" (80mm) flange per ANSI B16.5 at the rated pressure class. A 2.9" (74mm) minimum diameter bore is required for insertion into the header. The SAMN-U can be attached to the header by using a standard weld-on-let and weld neck flange for pressure classes 150–900. The mounting is usually supplied by others. Special fittings for mounting are available from DeZURIK/Copes-Vulcan for pressure classes 1500 and 2500 since weld reinforcement is required. Mounting gasket, studs and nuts are usually supplied by others.

Dimensions

150 Pressure Class

Header Size	A	B	C	D
6" 150mm	12.06 306	7.69 195	6.19 157	8.69 221
8" 200mm	13.06 332	6.69 170	5.19 132	7.69 195
10" 250mm	14.12 359	5.62 143	4.12 105	6.62 168
12" 300mm	15.12 384	9.94 253	8.44 214	10.94 278
14" 350mm	15.75 400	9.31 237	7.81 198	10.31 262
16" 400mm	16.75 425	8.31 211	6.81 173	9.31 237
18" 450mm	17.75 451	7.31 186	5.81 148	8.31 211
20" 500mm	18.75 476	6.31 160	4.81 122	7.31 186
22" 550mm	19.75 502	5.31 135	3.81 97	6.31 160
24" 600mm	20.75 527	6.31 160	4.81 122	7.31 186

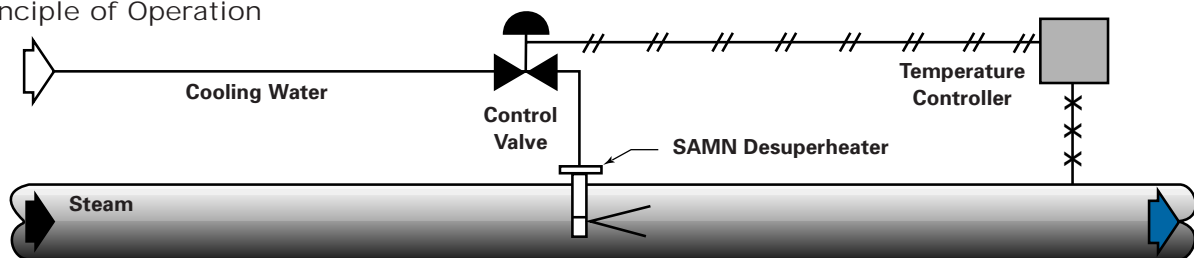
Inch
Millimeter

300 Pressure Class

Header Size	A	B	C	D
6" 150mm	12.06 306	8 203	6 152	8.69 221
8" 200mm	13.06 332	7 178	5 127	7.69 195
10" 250mm	14.12 359	5.94 151	3.94 100	6.62 168
12" 300mm	15.12 384	10.25 260	8.25 210	10.94 278
14" 350mm	15.75 400	9.62 244	7.62 194	10.31 262
16" 400mm	16.75 425	8.62 219	6.62 168	9.31 237
18" 450mm	17.75 451	7.62 194	5.62 143	8.31 211
20" 500mm	18.75 476	6.62 168	4.62 117	7.31 186
22" 550mm	19.75 502	5.62 143	3.62 92	6.31 160
24" 600mm	20.75 527	6.62 168	4.62 117	7.31 186

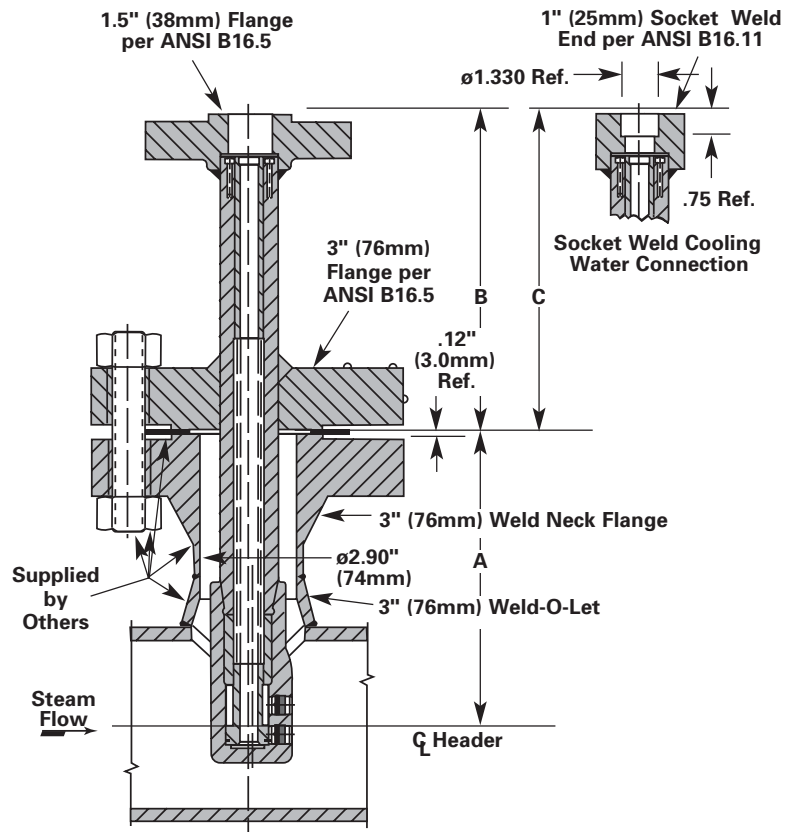
Inch
Millimeter

Principle of Operation



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

SAMN-U*



* Low temperature configuration.

Dimensions

600 Pressure Class

Header Size	A	B	C	D
6" 150mm	12.06 306	8.31 211	5.62 143	8.69 221
8" 200mm	13.06 332	7.31 186	4.62 117	7.69 195
10" 250mm	14.12 359	6.25 159	3.56 90	6.62 168
12" 300mm	15.12 384	10.56 268	7.88 200	10.94 278
14" 350mm	15.75 400	9.94 253	7.25 184	10.31 262
16" 400mm	16.75 425	8.94 227	6.25 159	9.31 237
18" 450mm	17.75 451	7.94 202	5.25 133	8.31 211
20" 500mm	18.75 476	6.94 176	4.25 108	7.31 186
22" 550mm	19.75 502	7.94 202	5.25 133	6.31 160
24" 600mm	20.75 527	6.94 176	4.25 108	7.31 186

Inch
Millimeter

1500 Pressure Class

Header Size	A	B	C	D
6" 150mm	12.06 306	8.81 224	5 127	8.69 221
8" 200mm	13.06 332	7.81 198	4 102	7.69 195
10" 250mm	14.12 359	6.75 171	2.94 75	6.62 168
12" 300mm	15.12 384	11.06 281	7.25 184	10.94 278
14" 350mm	15.75 400	10.44 265	6.62 168	10.31 262
16" 400mm	16.75 425	9.44 240	5.62 143	9.31 237
18" 450mm	17.75 451	8.44 214	4.62 117	8.31 211
20" 500mm	18.75 476	7.44 189	3.62 92	7.31 186
22" 550mm	19.75 502	8.44 214	4.62 117	8.31 211
24" 600mm	20.75 527	7.44 189	3.62 92	7.31 186

Inch
Millimeter

900 Pressure Class

Header Size	A	B	C	D
6" 150mm	12.06 306	8.75 222	5.31 135	8.62 219
8" 200mm	13.06 332	7.81 198	4.38 111	7.69 195
10" 250mm	14.12 359	6.25 171	3.31 84	6.62 168
12" 300mm	15.12 384	11.06 281	7.62 194	10.94 278
14" 350mm	15.75 400	10.44 265	7 178	10.31 262
16" 400mm	16.75 425	9.44 240	6 152	9.31 237
18" 450mm	17.75 451	8.44 214	5 127	8.31 211
20" 500mm	18.75 476	7.44 189	4 102	7.31 186
22" 550mm	19.75 502	8.44 214	5 127	8.31 211
24" 600mm	20.75 527	7.44 189	4 102	7.31 186

Inch
Millimeter

2500 Pressure Class

Header Size	A	B	C	D
6" 150mm	12.06 306	14.75 375	9.56 243	14.25 362
8" 200mm	13.06 332	13.75 349	8.56 217	13.25 337
10" 250mm	14.12 359	12.69 322	7.5 191	12.19 310
12" 300mm	15.12 384	11.69 297	6.5 165	11.19 284
14" 350mm	15.75 400	11.06 281	5.88 149	10.56 268
16" 400mm	16.75 425	10.06 256	4.88 124	9.56 243

Inch
Millimeter



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A unit of **SPX** Corporation

**MNSD-V
MULTIPLE NOZZLE
SPRAY
DESUPERHEATER**

DeZURIK/COPES-VULCAN



Multiple Nozzle Spray Desuperheater

Offers High Temperature Capabilities and Low Class V Leakage Rating

The Multiple Nozzle Spray Desuperheater offers optimum performance and rangeability in a variable spray tube design. The Model MNSD-V fills the performance gap between the limited capability of a simple mechanical spray type desuperheater and the virtually unlimited capability of DeZURIK/Copes-Vulcan's Variable Orifice Desuperheater (Model VO). And, the new MNSD-V offers high temperature capabilities and low class V leakage rating.

Features

- Temperature control to within 15°F (8°C) of saturation with the ability to hold set point within a tolerance of 10°F (6°C)
- Standard maximum available Cv of 10.5 (Kv of 8.9)
- Waterflow turndown of 150:1 or higher
- User friendly design — nozzles and trim assembly can be removed without disconnecting actuator
- No need for separate cooling water control valve
- Designed for applications with temperatures up to 1150°F (620°C)
- Available in standard classes 600, 900, 1500 and 2500 per ANSI B16.5
- Cooling water inlet pressures up to 3500 psig (24 MPag) allowable standard (higher pressures allowable per application)
- FCI 70-2/ANSI Class V tight shutoff capability
- Suitable for vertical or horizontal installation
- Standard ANSI connections:
 - 3" (80mm) raised face flange (steam)
 - 1.5" (40mm) raised face flange (water)
- Designed for high thermal fatigue life

Many applications require turndowns in excess of that offered by a simple mechanical spray desuperheater but do not necessarily warrant the expense or require the additional refinements offered by the Variable Orifice Desuperheater. Many of these intermediate duties can be met with a steam atomizing type desuperheater (SA-35), but atomizing steam is often not available, or the additional installation and operational expense is not economically justified. The Multiple Nozzle Spray Desuperheater has been designed for these applications.



The MNSD-V Desuperheater automatically controls the cooling water flow with the ability to modulate and shutoff. A separate cooling water control valve is not required as the unit itself controls variations in required coolant flow. Unlike competitive models that can only operate with relatively low water inlet pressures, the MNSD-V can be supplied to accept cooling water inlet pressures to 3500 psig (24 MPag). This eliminates the need for a cooling water pressure reducing valve often required by competitive models and also allows for much higher flow rates for a given Cv/Kv rating.



Closed



Open

Discharge Nozzles

The multiple nozzle arrangement located near the end of the nozzle tube is composed of up to 22 uniquely designed discharge nozzles arranged in an overlapping manner to offer an extremely smooth flow characteristic. The quantity, individual sizes and placement of the discharge nozzles are selected for each application to optimize capacity and maximize controllability and rangeability.

Design and Principle of Operation

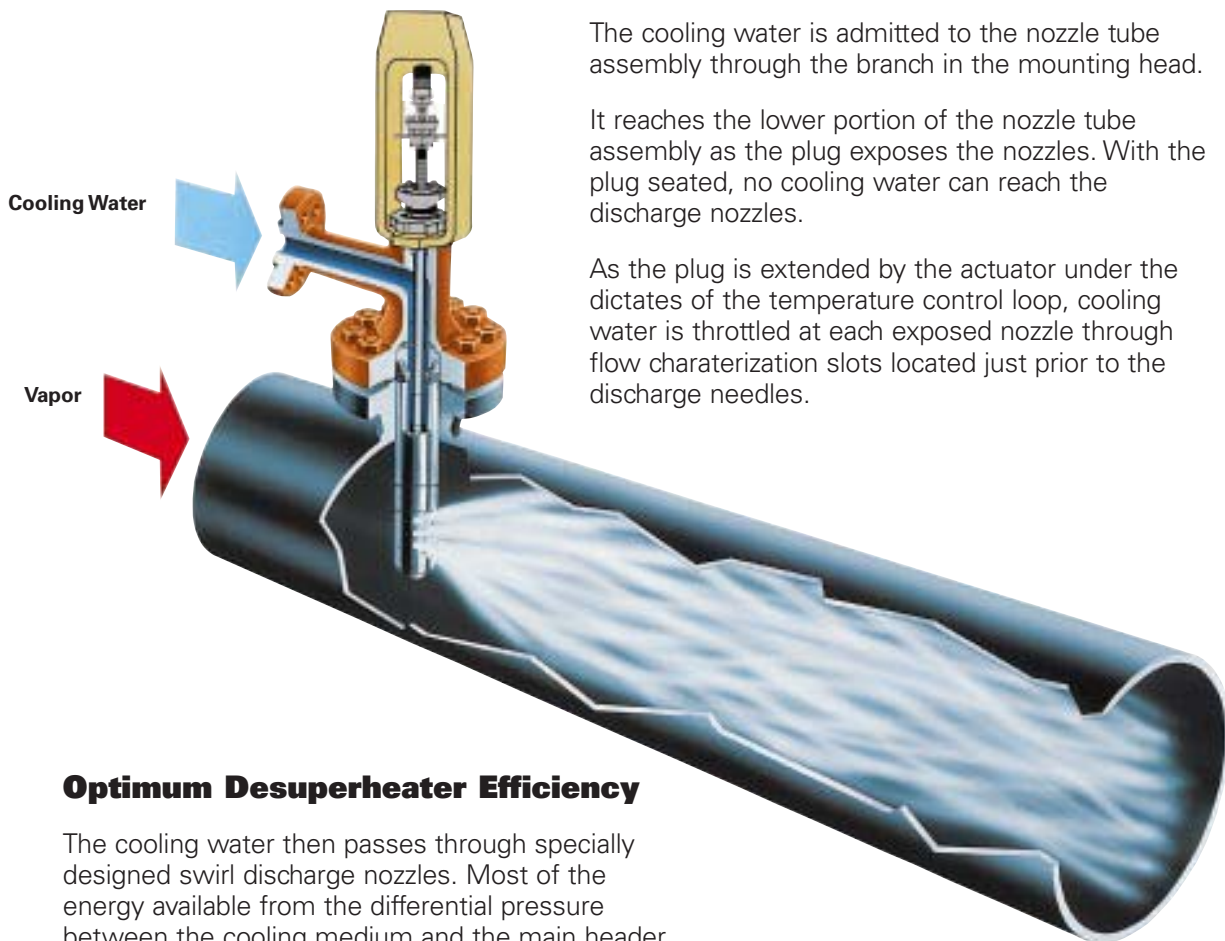
The MNSD-V Multiple Nozzle Spray Desuperheater consists essentially of a cage-guided plug situated within the nozzle tube just behind the discharge nozzles.

The nozzle tube assembly fits up into the bore of the mounting flange and is locked in place with a threaded ring. This junction enables the cooling water inlet connection to orient in any direction relative to the position of the discharge nozzle spray at time of assembly.* Field alteration of this orientation is also quite easy.

The MNSD-V Desuperheater head offers a means of mounting the unit to a companion flange on the main header. It also provides an inlet connection for the cooling water, a gland assembly for stem sealing and a mounting arrangement for the dependable DeZURIK/Copes-Vulcan Model 700 Diaphragm Actuator.

*Standard orientation is cooling water inlet directly opposite spray outlet.





Cooling Water

The cooling water is admitted to the nozzle tube assembly through the branch in the mounting head.

It reaches the lower portion of the nozzle tube assembly as the plug exposes the nozzles. With the plug seated, no cooling water can reach the discharge nozzles.

As the plug is extended by the actuator under the dictates of the temperature control loop, cooling water is throttled at each exposed nozzle through flow characterization slots located just prior to the discharge needles.

Optimum Desuperheater Efficiency

The cooling water then passes through specially designed swirl discharge nozzles. Most of the energy available from the differential pressure between the cooling medium and the main header is expended while expanded through the nozzles which intensifies mechanical atomization. The resulting soft, misty spray has a very low exit velocity. This promotes rapid absorption and optimum desuperheater efficiency, even at very low flow rates.

The spray from the first discharge nozzle, and typically the smallest, is quickly dispersed within an average of 3' (1m) from the point of discharge. As the plug continues to modulate open, a swirling interaction of the various discharge nozzle sprays maintains a narrow cone shaped pattern. This keeps the water particles in the center of the header where the line turbulence is the greatest allowing for faster, more complete absorption of the cooling medium.

Materials of Construction

Item	Material
Body Casting	ASTM A217, Grade WC6 ASTM A217, Grade WC9 ASTM A217, Grade C12A ASTM A351, Grade CF8M
Cage & Torque Ring	ASTM A565, Grade 616, Type 422, Hardened
Extension Leg	ASTM A182, Grade F22 ASTM A565, Grade 616, Type 422, Hardened
Retaining Ring: (For SprayTube Assembly)	ASTM A479, Type 410, Hardened
Plug and Guide Bushing	ASTM A565, Grade 616, Type 422, Hardened
Plug C-Seal	Inconel X-750 with Silver Plating
Orifice Disc	ASTM A276, Type 420, Hardened
Swirl Disc	300 Series Stainless Steel
Spacer	ASTM A479, Type 304
Seal Rings	Graphite Grade JP-1000
Roll Pin	300 Series Stainless Steel
Seal (Body/Extension Leg) (Cage/Extension Leg)	Graphite with 316 SS
Seat	UNS R3006 Stellite 6
Stem and Stem Nut	ASTM A276, Type 316, Cond. B

Installation Recommendations

For optimum control and performance, apply the following guidelines:

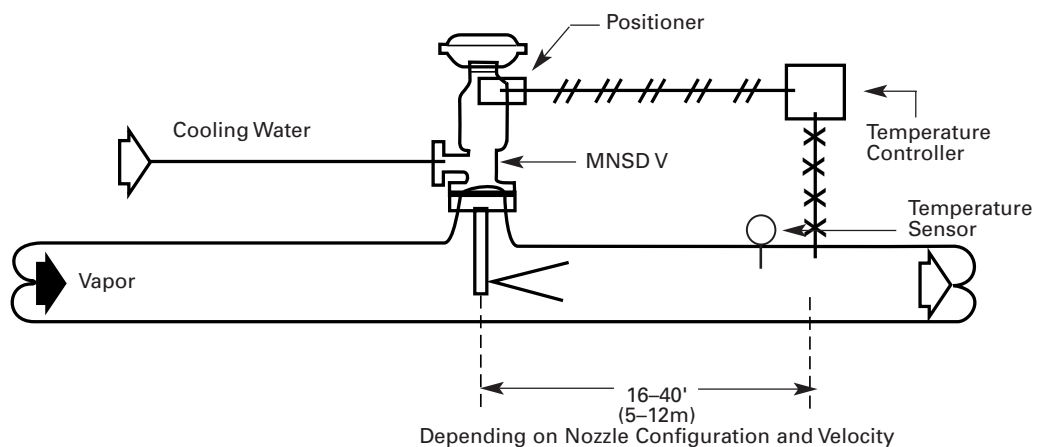
- If the difference between the cooling medium and the header vapor temperature is greater than 450°F (250°C), and if the main header wall thickness is greater than .5" (12mm), a thermal liner is recommended.
- For applications where unfiltered cooling medium is used, a 30 mesh strainer is recommended for installation upstream of the cooling medium inlet.

Sizing Selection

The MNSD-V and all DeZURIK/Copes-Vulcan desuperheaters can be sized by DeZURIK/Copes-Vulcan or an authorized sales representative using SmartSize computer sizing program to assure correct application.

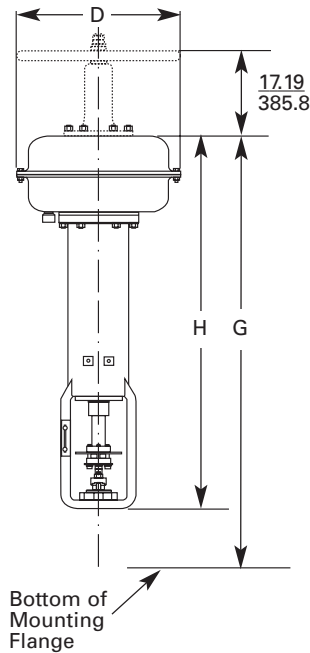
Typical Information Required to Size:

- Process steam flow rates
- Process steam pressure
- Process steam temperature (superheated)
- Desired process steam temperature (desuperheated)
- Available cooling water pressure
- Available cooling water temperature
- Process steam line size and schedule

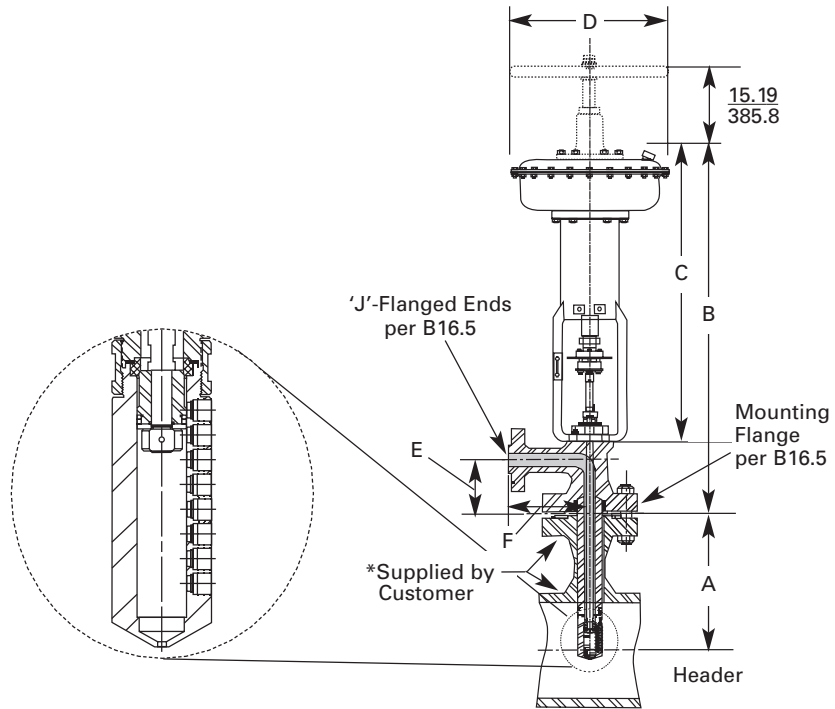


Dimensions

**Reverse Acting
(Spring-To-Open)**



**Direct Acting
(Spring-To-Close)**



3" (80mm) Mounting Flange Size

Main Header Size	A
6" 150mm	12.06 306
8" 200mm	13.06 332
10" 250mm	14.12 358
12" 300mm	15.12 384
14" 350mm	15.75 400
16" 400mm	16.75 425.4
18" 450mm	17.5 451
20" 500mm	18.75 477
22" 550mm	19.75 502
24" 600mm	20.75 527
30" 750mm	23.63 600

3" (80mm) Model 700 Class 150 through 1500

Actuator Size	Dimensions								J Flange
	B	C	D	E	F	G	H		
160	39.31 998.5	31.31 795	18.00 457	6 152	9 229	39.31 998	32.38 822	1.5 40	
160L	40.37 1025.4	39.75 1010	18.00 457	6 152	9 229	47.75 1213	40.81 1037	1.5 40	

3" (80mm) Model 700 Class 2500

Actuator Size	Dimensions								J Flange
	B	C	D	E	F	G	H		
160	40.31 10245	31.31 795	18.00 457	7 178	9.5 241	41.37 1051	32.38 822	1.5 40	
160L	41.37 1051	39.75 1010	18.00 457	7 178	9.5 241	49.81 1265	40.81 1037	1.5 40	



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DeZURIK/Copes-Vulcan reserves the right to incorporate our latest design and material changes without notice or obligation. Design features, materials of construction and dimensional data, as described in this bulletin, are provided for your information only and should not be relied upon unless confirmed in writing by DeZURIK/Copes-Vulcan. Certified drawings are available upon request.

DeZURiK
COPES-VULCAN
A unit of **SPX** Corporation

**VO-II AND VO-76
VARIABLE ORIFICE
DESUPERHEATER**

DeZURiK/COPES-VULCAN



Description and Principle of Operation

The Variable Orifice Desuperheater consists of a body which houses the desuperheater internals. The body incorporates a screwed-in seat over which a cage is located in such a manner that a coolant annulus is created around the seat.

The coolant enters this annulus by means of a branch on the desuperheater body. The plug is free floating but incorporates a spring-loaded button which provides stability to the plug under light load conditions. Incorporated in the top of the cage is a plug stop to limit the amount of travel of the plug.

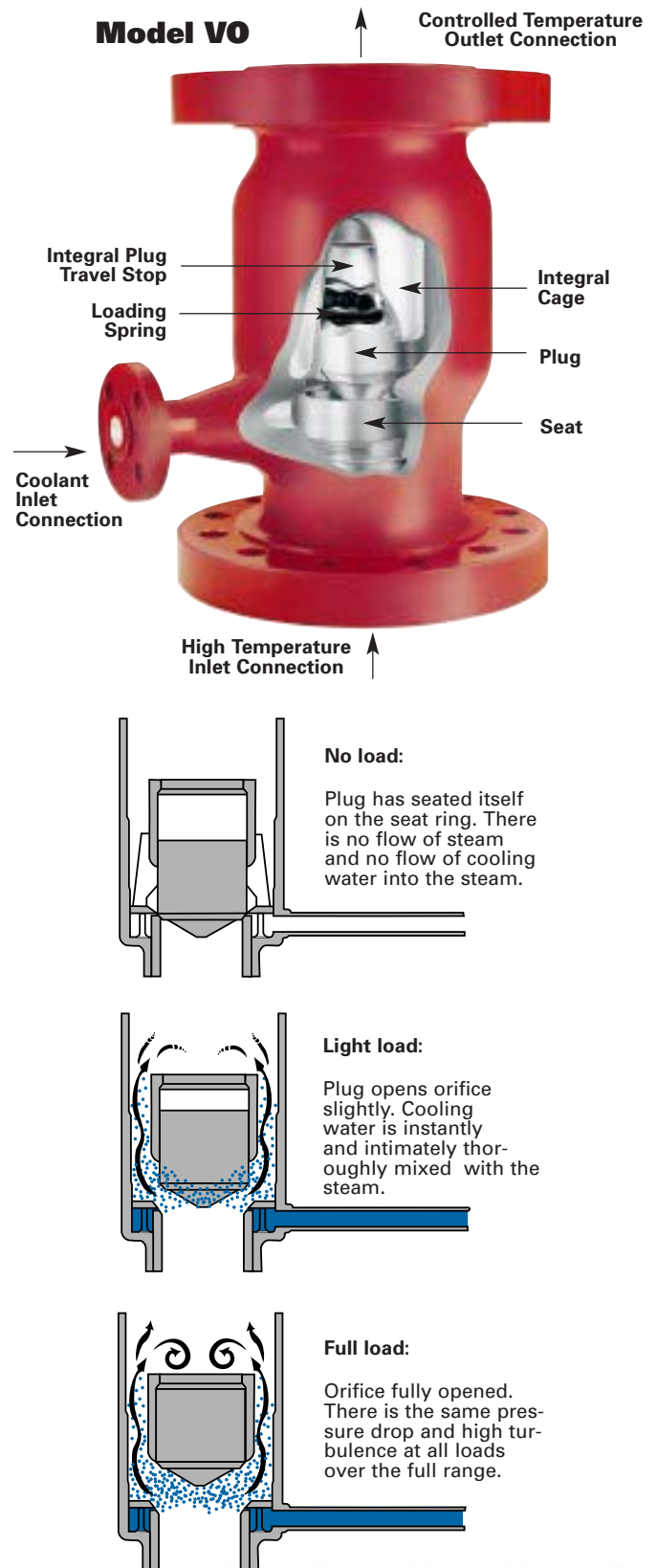
In service, incoming vapor acts on the underside of the plug, which is weighted in such a manner that a certain amount of the energy in the vapor is used to lift the plug. As more vapor flows through the desuperheater, the higher the plug is lifted, thus creating a variable orifice for the vapor flow. The energy used in lifting the plug creates a pressure drop across the seat which is quite constant regardless of the vapor flow. This pressure drop creates a relatively high velocity across the seat area, and it is at this point of low pressure constant velocity that the coolant is admitted into the vapor flow.

Coolant enters the annulus under the dictates of a control valve responsive to a temperature controller sensing the downstream vapor temperature. The coolant is admitted into the vapor flow through a peripheral gap between the underside of the cage and the top of the seat. Coolant is admitted all around the seat, thus ensuring that unequal cooling does not occur.

The coolant is picked up by the vapor flow as it discharges from the seat, and the low pressure zone that exists at this point is instrumental in atomizing the coolant into fine particles. In the turbulence which ensues as a result of the change in direction and velocity of the vapor, intimate mixing of the vapor and coolant takes place.

Above the plug, as the vapor attempts to return to laminar flow, a vortex is created and any particles of coolant not completely absorbed by the vapor are drawn into this vortex where they suffer a further pressure reduction which again speeds up the atomizing process.

As virtually all of the desuperheating occurs within the desuperheater body itself, and as no coolant impinges on either the desuperheater or associated piping, no protective thermal liners are required.



Variable Orifice Desuperheater

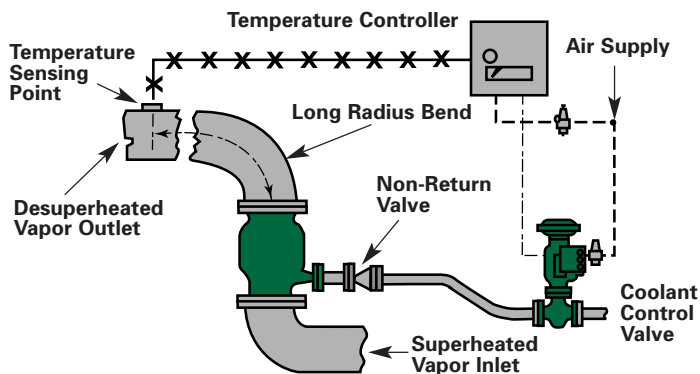
DeZURIK/Copes-Vulcan's VO Variable Orifice Desuperheater is recognized industry wide as the most versatile desuperheater available. It is easily capable of meeting the most demanding needs for desuperheating in both the power and process industries.

The VO offers extremely fine control and exceptional turndown that is limited only by the rangeability of the coolant control valve itself.

With excellent mixing of vapor and coolant, control is possible throughout the entire operating range to within $\pm 5^\circ\text{F}$ ($\pm 2.5^\circ\text{C}$) of the set point which can be as close as 10°F (5°C) above saturation.

The coolant pressure which is required at the inlet to the VO need only be 5 psi (35 kPa) above the pressure of the vapor being desuperheated.

Because virtually all of the desuperheating occurs within the VO body itself, the temperature sensing element can be as close as 14–20' (4–6m) from the desuperheater outlet.



Installation

The desuperheater is designed for installation in a vertical run of pipe with flow upwards. There are no requirements for straight pipe upstream or downstream of the unit, however, if a bend is located immediately at the outlet, it should be a long radius elbow.

Model VO-II Design

The basic design of the pressure retaining part of the VO-II is in accordance with ANSI B16.5 (B.S.1560).

Sizes

The VO-II is currently available in sizes 3" (80mm) through 20" (500mm).

Materials of Construction

Carbon steel ASTM A216-WCB
Low alloy steel ASTM A217-WC6
Other castable materials available on request.

Pressure Ratings

VO-II desuperheaters are available in ANSI pressure classes 150, 300, 600 and 900. For additional sizes, pressure classes, and configurations, refer to Model VO-76.

End Connections

VO-II desuperheaters are normally supplied with flanged connections to ANSI (BS 1560) DIN (BS 4540) or BS10. For additional sizes, end connections, and configurations, refer to Model VO-76.

Sizing/Selection

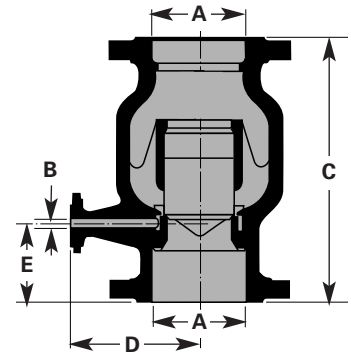
The VO-II and all DeZURIK/Copes-Vulcan desuperheaters can be sized by DeZURIK/Copes-Vulcan or an authorized Sales Representative using the SmartSize for Steam Conditioning Equipment computer sizing program to assure correct application.

Typical information required to size:

- Process steam flow rates
- Process steam pressure
- Process steam temperature (superheated)
- Desired process steam temperature (desuperheated)
- Available cooling water pressure
- Available cooling water temperature
- Process steam line size and schedule

VO-II Dimensions 150/900 Class Rating

Unit Size	Nom. Bore		150/300 Rating			600 Rating			900 Rating		
	A	B	C	D	E	C	D	E	C	D	E
3 80	3 80	1 25	13 330	7 178	5 127	13.75 349	7.25 184	5.38 137	14.25 362	7.63 194	5.63 143
4 100	4 100	1 25	14 356	7.5 191	5 127	15 381	7.75 197	5.5 140	15.5 394	8.13 206	5.75 146
6 150	6 150	1 25	18 457	9.63 244	6 152	19.25 489	9.88 251	6.63 168	20 508	10.25 260	7 178
8 200	8 200	1 25	22 559	10.75 273	6.5 165	23.75 603	11 279	7.38 187	24.25 616	11.38 289	7.63 194
10 250	10 250	1.5 40	27.75 705	12.75 324	7.75 197	29.5 749	13 330	8.63 219	30 762	13.38 340	8.88 225
12 300	12 300	1.5 40	34 864	15 381	8.75 222	35.75 908	15.25 387	9.63 244	36.75 933	15.63 397	10.13 257
14 350	14 350	1.5 40	39.5 1003	17 432	9 229	41.25 1048	17.25 438	9.88 251	42.5 1079	17.63 448	10.5 267
16 400	16 400	1.5 40	43 1092	20 508	10 254	44.5 1130	20.25 514	10.75 273	46 1168	20.63 524	11.5 292
18 450	18 450	1.5 40	50 1422	21 533	11 279	55.25 1480	21.25 540	12.13 303	59.75 1518	21.63 549	12.88 327
20 500	20 500	2 50	-	-	-	-	-	-	-	-	-



Inch
Millimeter

Model VO-76

While virtually identical in operation and performance to the VO-II, the VO-76 is offered by DeZURIK/Copes-Vulcan as an alternate when existing piping requires a custom fit, where pressure ratings exceed class 900, or where size requirements exceed those offered in the VO-II.

As "Arrangement #1," the VO-76 housing is supplied as a cast unit with integral inlet flange and butt weld outlet. "Arrangement #2" welds a reducer to the above description. The standard reducer results in a butt weld outlet the same nominal size as the flanged inlet, but non-standard sizes are also available.

As "Arrangement #3," a weld neck flange is added to the combination of housing and reducer. Again, the standard arrangement has the same size inlet and outlet flanges.

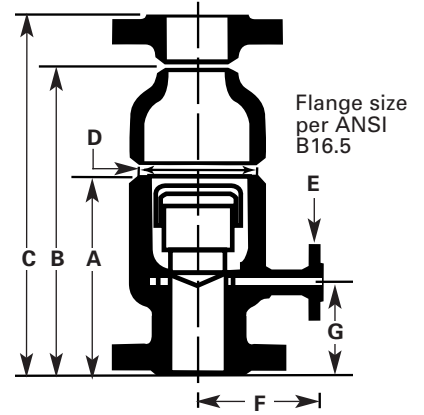
By using various sized reducers/expanders and/or flanges, an almost endless variation of dimensions and end connections can be achieved.

The VO-76 is also available with a housing fabricated from forged and wrought piping components when technical specifications and/or N.D.T. requirements preclude the use of castings. Again, reducers and flanges can be added as required, but unlike the cast VO-76, this applies to both inlet and outlet on the fabricated version of the VO-76.

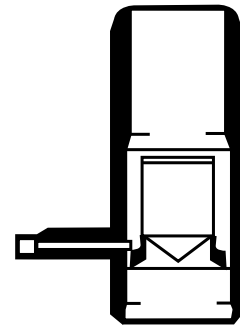


VO-76 Dimensions ANSI Pressure Classes 150-1500

Size	ANSI Class	A Housing	B Housing w/ Reducer	C Housing w/ Reducer and Outlet Flange	D Housing and Reducer I.D.	E Coolant Flange Size	F and G
2 50	150	10.75 273	15.75 400	18.25 464	5 127	.75 19	
	300	10.75 273	15.75 400	18.5 470			
	400	10.75 273	15.75 400	18.88 479			
	600	10.75 273	15.75 400	18.88 479			
	900	11.5 292	16.5 419	20.75 527			
	1500	11.5 292	16.5 419	20.75 527			
3 75	150	10.75 273	16.25 413	19 483	6 152	.75 19	
	300	10.75 273	16.25 413	19.38 492			
	400	10.75 273	16.25 413	19.75 502			
	600	10.75 273	16.25 413	19.75 502			
	900	10.75 273	16.25 413	20.5 521			
	1500	12.38 314	17.88 454	22.75 578			
	2500	14 356	19.5 495	26.38 670			
4 100	150	14 356	21 533	24 610	10 254	1 25.4	
	300	14 356	21 533	24.38 619			
	400	14 356	21 533	24.75 629			
	600	14 356	21 533	25.25 641			
	900	14.5 368	21.5 546	26.25 667			
	1500	15.5 394	22.5 571	27.63 702			
6 150	150	16.5 419	24.5 622	28 711	12 305	1.5 38.1	
	300	16.5 419	24.5 622	28.38 721			
	400	16.5 419	24.5 622	28.81 732			
	600	16.5 419	24.5 622	29.38 746			
	900	16.5 419	24.5 622	30.25 768			
	1500	19.25 489	27.25 692	34.25 870			
	2500	22.88 581	30.88 784	39.19 995			
8 200	150	20.25 514	29.38 746	33.38 848	14 356	2 50.8	
	300	20.25 514	29.38 746	33.75 857			
	400	20.25 514	29.69 754	34.56 878			
	600	20.25 514	29.69 754	35.19 894			
	900	20.25 514	29.63 752	36.25 921			
	1500	23.25 591	33.38 848	42 1069			



Typical Fabricated Arrangement



Please contact DeZURIK/Copes-Vulcan for F and G dimensions.

A VO-76 typically will be one nominal size smaller than the equivalent VO-II. Both will have the same size plug and internal components.

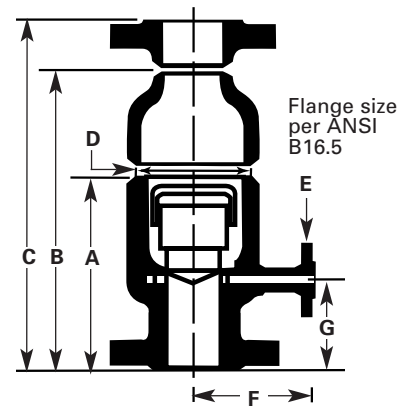
Request available pressure/temperature ratings and dimensions.

Note: All dimensions are subject to change without notice. Request certified drawings.

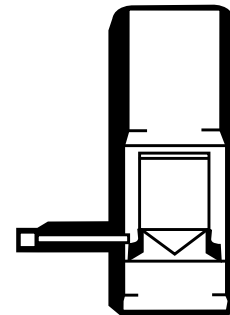
Inch
Millimeter

VO-76 Dimensions (Cont.) ANSI Pressure Classes 150-1500

Size	ANSI Class	A Housing	B Housing w/ Reducer	C Housing w/ Reducer and Outlet Flange	D Housing and Reducer I.D.	E Coolant Flange Size	F and G
10 250	150	25.25 641	35.19 894	39.19 995	16 406	2.5 63.5	
	300	25.25 641	35.19 894	39.81 1011			
	400	25.25 641	35.63 905	40.75 1035			
	600	25.25 641	35.63 905	41.88 1064			
12 300	150	29.88 759	42.19 1071	46.75 1187	20 508	3 76.2	
	300	29.88 759	42.19 1071	47.38 1203			
	400	29.88 759	42.69 1084	48.38 1229			
	600	29.88 759	42.69 1084	49.13 1248			
14 350	150	34.13 867	47.81 1214	52.81 1341	24 610	3 76.2	
	300	34.13 867	47.81 1214	53.44 1357			
	400	34.13 867	48.69 1237	55.56 1411			
	600	34.13 867	49.44 1256	56.19 1427			
16 400	150	37.63 956	52.94 1344	57.94 1472	26 660	3.5 88.9	
	300	37.63 956	53.25 1352	59 1499			
	400	37.63 956	53.5 1359	59.75 1518			
	600	37.63 956	53.5 1359	60.75 1543			
	900	38.13 968	55.25 1403	64 1626		4 101.6	
18 450	150	36.75 933	53.13 1349	58.63 1489	28 711	4 101.6	
	300	36.75 933	53.13 1349	59.38 1508			
	400	36.75 933	53.75 1365	60.5 1537			
	600	36.75 933	54.75 1391	62.25 1581			
20 500	150	38.13 968	54.63 1387	60.31 1532	30 762	4 101.6	
	300	38.13 968	55.38 1406	61.75 1568			
	400	38.13 968	56.13 1425	63 1600			
	600	38.13 968	54.69 1389	62.44 1586			
24 600	150	40.38 1026	59.88 1521	65.88 1673	36 914	3 76.2	
	300	41.63 1057	62.5 1587	69.13 1756			
	400	43.5 1105	65 1651	72.13 1832			
	600	44.75 1137	66.25 1683	74.5 1892			



Typical Fabricated Arrangement



A VO-76 typically will be one nominal size smaller than the equivalent VO-II. Both will have the same size plug and internal components.

Request available pressure/temperature ratings and dimensions.

Note: All dimensions are subject to change without notice. Request certified drawings.

Please contact DeZURIK/Copes-Vulcan for F and G dimensions.

Inch
Millimeter



DeZURIK
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