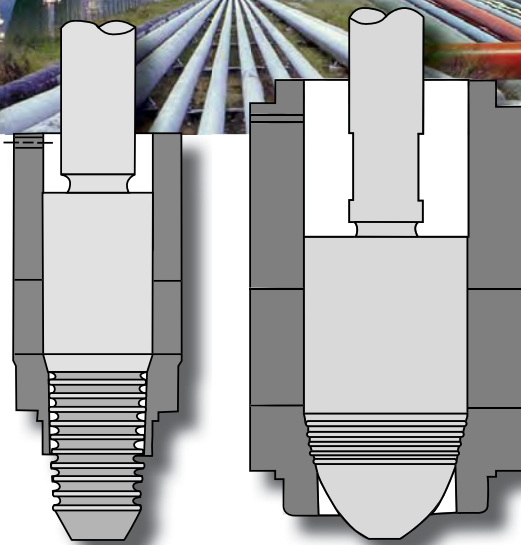


COPES-VULCAN
AN SPX BRAND

Cascade and Super Cascade Trims



SPX[®]

Application

Copes-Vulcan's Cascade Trim solves the problems of short life and high replacement costs for valve trim in high pressure drop service.

This single-seated trim is designed primarily for high pressure modulating drop liquid applications such as pump recirculation or bypass; high pressure desuperheater-cooling water control; supercritical boiler start-up reheat; super-heat spray control; gas; fuel oil; continuous and intermittent blowdown and chemical injection. Due to the single seat design, it is equally applicable for on-off service, as is often the case in pump recirculation.

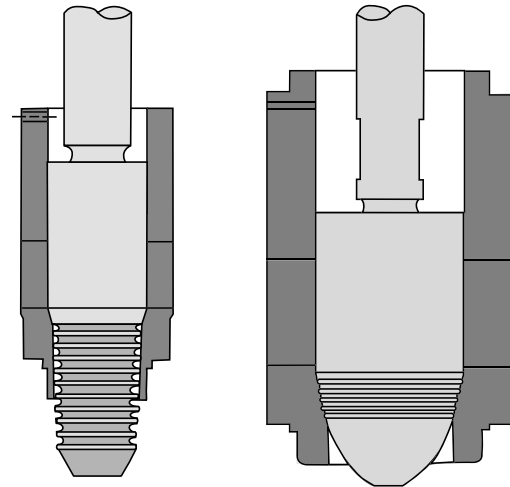
This trim is not suited for non-deaerated liquid applications. In these cases, multiple pressure breakdown HUSH® or RAVEN® Trim is recommended. Designed for differential pressures up to and including 5000 psi (34,450 kPa). Consult Copes-Vulcan for special applications.

Features

Caging guiding, a Copes-Vulcan standard, includes a seating angle of 30° on the plug and 32° in the cage seat. Seat contact width is approximately .025" (.635mm). The valve actuator is selected to produce exceptionally tight seating under actual operating conditions. The high force produces a slight deformation of the seating surfaces, ensuring tight shutoff. The cage and plug are made of ASTM A-276, Type 420 stainless steel with Rockwell C-43 to C-47 hardness, ASTM A-351 Type 316 stainless steel with optional hardfacing and 17-4PH.

This material is highly resistant to erosion and has proven most suitable for the service. Tolerance controlled machining and well defined quality control measures ensure consistent conformance to Copes-Vulcan engineering specifications.

Cascade Trim has been fully tested and has many years of proven and successful service. On one test, conducted in a test loop of a major utility, it was operating only .05" (1.3mm) off the seat, with 300–350°F (149–177°C) water and 4400 psi (30,320 kPa) differential, for over one year. Upon inspection, the seating surfaces were still undamaged and the trim was kept in service. Other manufacturers' designs utilizing the same Type 420 stainless steel were also sampled under the same conditions. Maximum service gained from the other designs ranged from a few days to three months.



**Super
Cascade Trim**

Cascade Trim

Function

The most difficult service for a valve generally occurs at low flow when the plug is just off the seat. At these positions, seating surfaces are subjected to the greatest forces of erosion and cavitation. Cavitation will occur when the liquid pressure drops to or below the vapor pressure; at which point small bubbles are formed. As recovery progresses, the external pressure acting on the bubbles increases to a point where the bubbles' internal pressure can't support the increase. The bubbles then collapse or implode, causing pressure shock waves which, if directed against valve trim or body, can cause erosion damage. Therefore, it is essential that a trim design which minimizes these problems is selected. Cascade Trim is one such design.

Cascade Trim features a series of labyrinth grooves, machined into the plug along its throttling surface. This series of grooves provides a cascading effect, so that pressure drop is divided equally among the grooves, thus reducing the amount of inner valve pressure recovery and subsequent vapor formation. Cascade Trim therefore is ideally suited for applications where cavitation can exist.

The plug and cage are designed so that metal-to-metal contact is made on beveled seating surfaces and the clearance between plug and cage tapers in the labyrinth groove section is held to .001" (.0254mm) on Super Cascade and .003" (.0762mm) on "inch" size for proper cascading effect. For those applications where valve pressure decreases with increased flow, Cascade Trim is ideal. At light loads when pressure drop is maximum, the plug is close to the seat and cascading has its optimum effect.

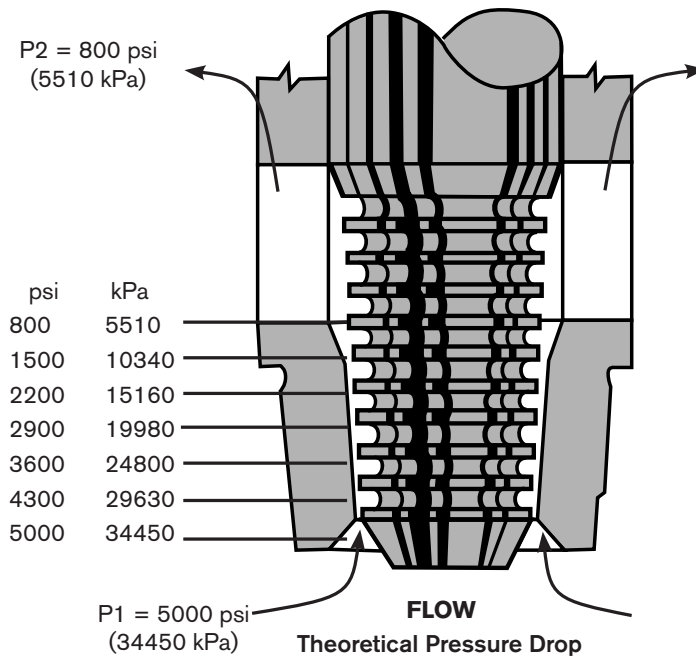
As load increases and pressure drop decreases, the need for cascading diminishes. In those cases where valve pressure drop is high throughout the load range, Super Cascade Trim utilizes cascading through the full travel of the plug. Because the total pressure drop is broken down into stages and because the pressure is prevented from reaching the vapor pressure, vapor bubbles are virtually eliminated. Erosion is held to a minimum, assuring this type of trim to be most economical in this type service.

Cv/Kv Factors

(For Estimating Purposes Only)

Valve Size	Trim Size							
	1" 25mm	1.5" 40mm	2" 50mm	2.5" 65mm	3" 80mm	4" 100mm	5" 125mm	6" 150mm
1" 25mm	14 12							
1.5" 40mm	15.4 13.3	22 19	Not Available					
2" 50mm	16 14.0	24.2 20.9	36.6 31.7					
2.5" 65mm	16.2 14.0	25.1 21.7	40.3 34.9	63.6 55.0				
3" 80mm	16.2 14.0	25.5 22.1	41.8 36.2	70 60.6	86.9 75.2			
4" 100mm	16.2 14.0	25.5 22.1	42.5 36.8	72.3 62.5	95.6 82.7	149 129		
5" 125mm	16.2 14.0	25.5 22.1	42.5 36.8	73.5 63.6	99 86	164 142	265 229	
6" 150mm			42.5 36.8	73.5 63.6	101 87	169 146	292 253	387 335
8" 200mm			42.5 36.8	73.5 63.6	101 87	172 149	301 260	425 368
10" 300mm			73.5 63.6	73.5 63.6	101 87	172 149	307 266	442 382
12" 350mm					101 87	172 149	307 266	449 388
Full Travel	1" 25mm	1.5" 40mm	1.5" 40mm	2" 50mm	2" 50mm	2.5" 65mm	3" 80mm	3" 80mm




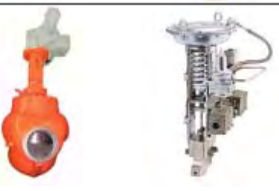

Area in bold lines indicates product within standard delivery cycle.



Super Cascade Trim

Trim Size	.75 20	.875 25	1 25	1.125 30	1.125 30	1.5 40	1.75 45	2 50	2.25 60	2.5 65	3 75	3.5 90
Min. Body Size	1 25				1.5 40		2 50	2.5 65		3 75	4 100	
Cv Kv	2.5 2.2	3.1 2.7	3.7 3.2	4.2 3.6	4.7 4.1	5.6 4.8	6.8 5.9	11.5 9.9	13.1 11.3	20 17	23 20	27 23
Trim Size	.9375 25						1.8125 45			1.875 50		

Inches
Millimeters

	<p style="text-align: center;">SPECIAL APPLICATION GLOBE STYLE CONTROL VALVES</p> <ul style="list-style-type: none"> ▪ General Service application ▪ Severe Duty application ▪ High turndown ▪ .75 - 24" Sizes ▪ 150 - 4500 ANSI Ratings ▪ Special ANSI Ratings ▪ Meets ASTM/ASME Standards ▪ Threaded, Butt/Socket Weld, Flanged Ends
	<p style="text-align: center;">STEAM CONDITIONING EQUIPMENT (DESUPERHEATERS)</p> <ul style="list-style-type: none"> ▪ 7 Styles ▪ Mechanical Atomizing ▪ Variable Orifice ▪ Integral Cooling Water function available ▪ High turndowns ▪ 150 - 2500 ANSI Ratings ▪ Special ANSI Ratings ▪ Meets ASTM/ASME Standards
	<p style="text-align: center;">TRIM TYPES</p> <ul style="list-style-type: none"> ▪ 13 types ▪ RAVEN™ ▪ HUSH™ ▪ CAV B9© ▪ One Stage Hush© ▪ Noise control ▪ Cavitation elimination ▪ Velocity & Erosion control
	<p style="text-align: center;">ACTUATORS</p> <ul style="list-style-type: none"> ▪ Diaphragm Style. Model 700 ▪ Diaphragm Style. Model 1000 ▪ Manual Style 820 ▪ Electric available ▪ Electro/Hydraulic available ▪ Piston ▪ Reverse acting ▪ Direct acting
	<p style="text-align: center;">NUCLEAR CONTROL VALVES</p> <ul style="list-style-type: none"> ▪ Pneumatic, Motor, Manual Operators ▪ Metal & Resilient Seats ▪ Widest Selection of Trim in the Industry ▪ Size Range: 3/8" - 20" class 150 - 2500 ▪ Globe, Angle, Isolation & Three Way Body Configurations ▪ ASME Section III "N" & "NPT" Stamp Certified
	<p style="text-align: center;">NUCLEAR HIGH PERFORMANCE BUTTERFLY AND BALL VALVES</p> <ul style="list-style-type: none"> ▪ Bi-Directional Class VI Shut off ▪ Metal & Resilient Seats ▪ Pneumatic, Motor, Manual Operators ▪ Modulating or Isolation ▪ Two & Three Piece Ball Valve design ▪ Torque Seated/Position Seated (Butterfly only) ▪ ASME Section III "N" & "NPT" Stamp Certified
	<p style="text-align: center;">AFTERMARKETS AND REFURBISHMENTS</p> <ul style="list-style-type: none"> ▪ Reduce Outage Cycle Times ▪ Maximize Years/Life Cycle ▪ Recondition the OEM parts, while minimizing lead times and costs.

Common Applications: Power, Pulp & Paper, Water, Oil & Gas, Petrochemical.
 Manufacturing Standards: Certifications - ISO-9001, ASME SECTION III "N" & "NPT" Stamps, ASME SECTION I "S" Stamp, CSA-Z299.2, .3 & .4, 97/23/EC-PED-CE



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