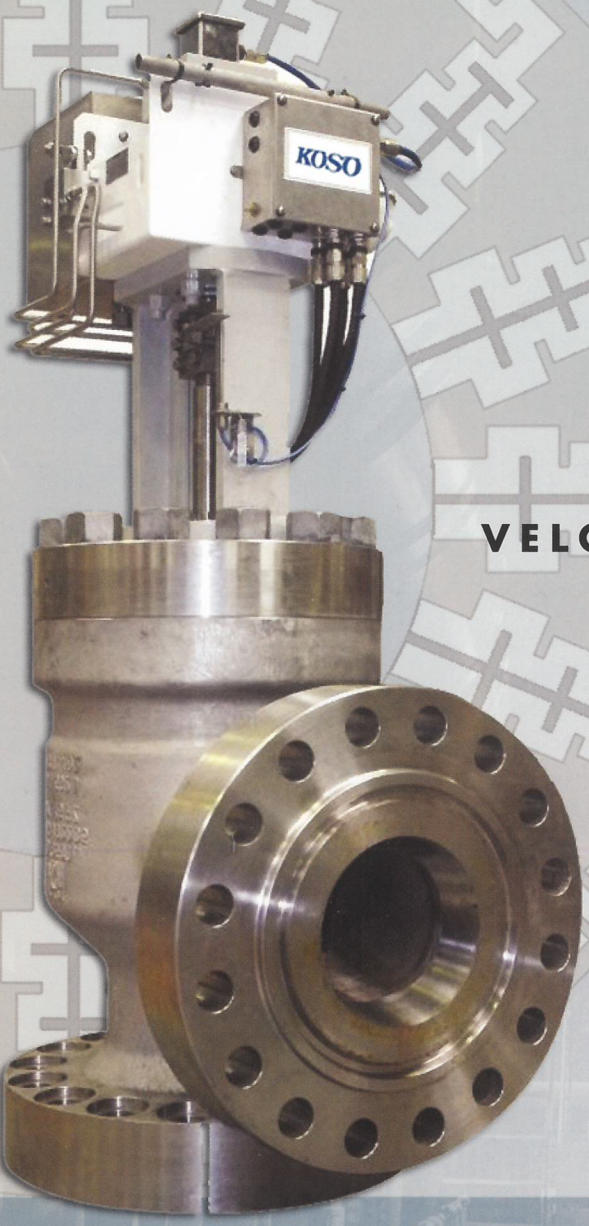


VECTOR™
VELOCITY CONTROL TECHNOLOGY

VELOCITY CONTROL TECHNOLOGY

VECTOR™ CHOKES FOR WELLHEADS

KOSO

VECTOR™ Choke for Wellheads

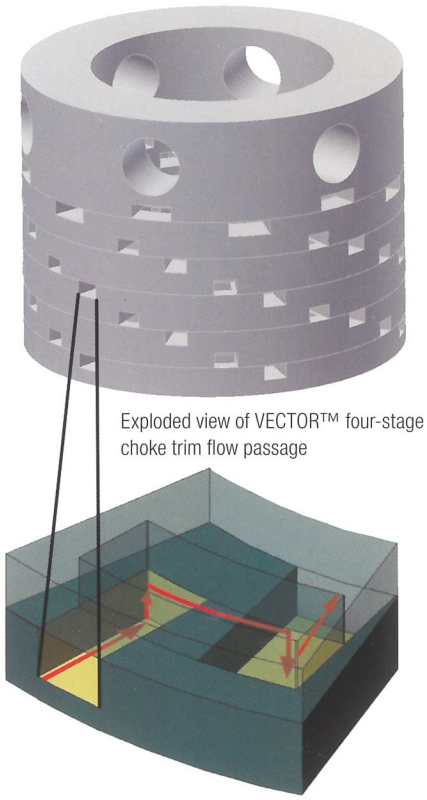
VECTOR™ Technology is Unsurpassed for Controlling Fluid Velocities

VECTOR™ offers a wide variety of choke trims to match any service requirements - always with the customers' benefit in mind: improving well production time, reducing maintenance time and costs and accommodating changes in well operating conditions.

Trim and body erosion, noise, vibration and poor process control are eliminated with superior velocity control. The VECTOR™ choke disk stack controls flowing velocities by forcing the process fluid to flow through a tortuous path of right angle turns. The resistance to flow provided by these turns (or stages) limits the trim exit velocity to a safe level, regardless of the pressure drop.

The fluid velocities within the trim of Koso's VECTOR™ choke valves are typically one third to one quarter that of conventional single stage chokes. This increased velocity control protects the trim from erosion and can increase the life of the trim exponentially. The benefit: longer intervals between maintenance.

The rate of erosion has been shown to be proportional to the velocity of the fluid by the third to fifth power, which suggests that the erosion rate would be reduced by eight times if the fluid velocity is reduced by half based on a proportionality to the third power.



Exploded view of VECTOR™ four-stage choke trim flow passage

Table 1. Trim sizes and capacities

Nominal Valve Sizes, inches				Nominal Sizes, mm (in.)		Trim Type	% Stroke and Min Cntl Cv	% Stroke and Cummulative Cv			
ASME Class 1500	ASME Class 2500	API 5000	API 10000	Trim	Stroke			Turns/Stages			
								6	4	2	Cage
2 3 4	3 4	2 1/16 2 9/16 3 1/8	2 1/16 2 9/16 3 1/16	38 / (1.5)	70 / (2.8)	Full	10%		48%	70%	100%
							0.4		14	26	40
						Reduced	10%	52%	100%		
							0.4	9	22		
2 3 4 6	3 4 6	2 9/10 3 1/8 4 1/16 5 1/8	2 9/16 3 1/16 4 1/16	63 / (2.5)	70 / (2.8)	Full	10%		48%	70%	100%
							1.1		25	50	100
						Reduced	10%	52%	100%		
							1.1	16	40		
6 8	6 8	5 1/8 7 1/16	5 1/8 7 1/16	95 / (3.75)	95 / (3.7)	Full	7%		54%	70%	100%
							2.2		50	90	235
						Reduced	7%	62%	100%		
							2.2	30.0	62.0		
6 8 10	8 10	5 1/8 7 1/16 9	5 1/8 7 1/16 9	115 / (4.5)	115 / (4.5)	Full	7%		46%	75%	100%
							2.5		56	150	300
						Reduced	7%	58%	100%		
							2.5	50	100		
6 8 10	8 10	7 1/16 9	7 1/16 9	140 / (5.5)	145 / (5.7)	Full	5%		47%	80%	100%
							3.4		100	245	430
						Reduced	5%	57%	100%		
							3.4	100	190		

Table 2. Typical Materials of Construction

Component	Materials
Body[1]	WCB, LCC, AISI 4130, ASTM A487 Gr 4C, F22, Alloy 625, Duplex's
Bonnet	AISI 4120 A350-LF2 F51/S31803
Plug	Solid Tungsten Carbide
Disk stack	Solid Tungsten Carbide
Seat housing/insert[2]	17-4/Solid Tungsten Carbide
Stem[2]	17-4 PH
Seals	PTFE

1. WCB, LCC and AISI 4130 are available with or without an Inconel 625 inlay for corrosion resistance

2. Replace 17-4 PH with Inconel 718 when API material classes FF or HH is specified

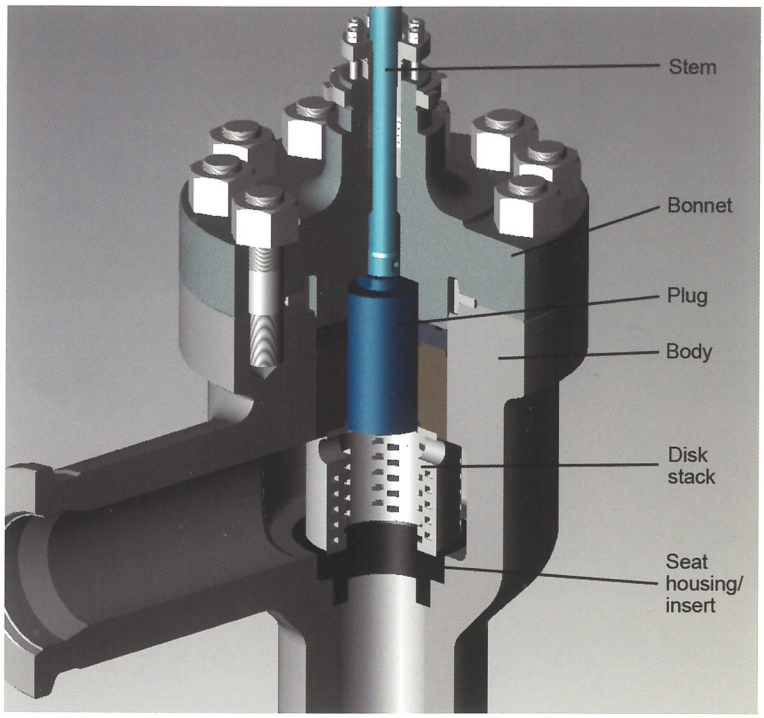


Table 3. Available Features

Component	Materials
Pressure rating	ANSI 1500-2500, API 5000-10000
Actuator type	Manual handwheel, pneumatic diaphragm or piston, stepper motor, electric, hydraulic
Standard quality level	API 6A PSL1
Optional quality levels	PSL2, PSL3 and NACE MR0175
Standard temperature ratings	-45 to +120 °C (-50 to +250 °F)
Valve characteristics	Modified equal percent
Standard shut-off class	ANSI/FCI Class IV
Optional shut-off class	ANSI/Class V



Competitors stellited cage guided trim after only two weeks operation

Available Actuators



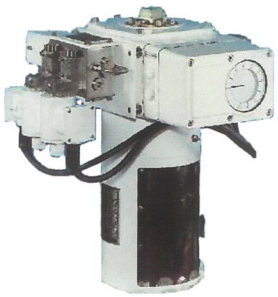
Pneumatic piston



Pneumatic diaphragm



Electro-hydraulic



Stepper motor



Manual gear operator

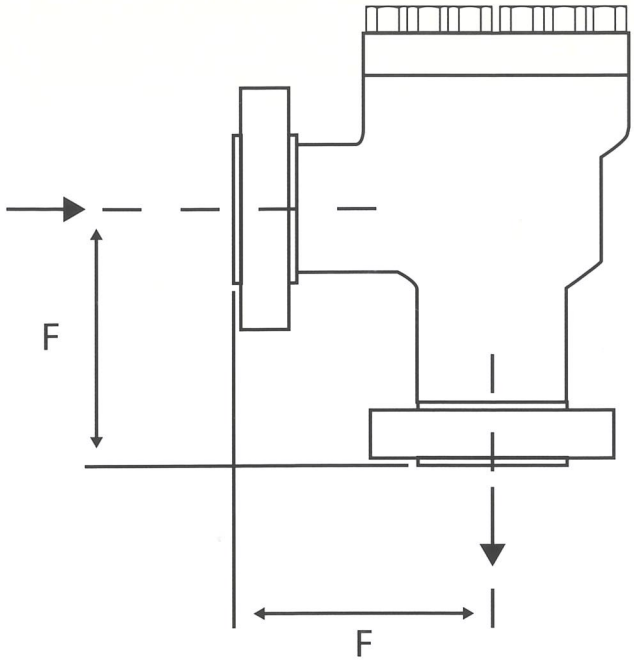


Table 4. Dimensions - mm (inch)

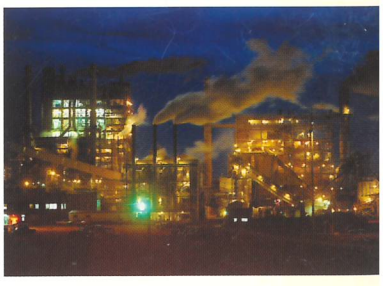
Dimension	ASME class	50 mm (2")	80 mm (3")	100 mm (4")	150 mm (6")	200 mm (8")	250 mm (10")
F	1500	184 (7.25)	235 (9.25)	273 (10.75)	352 (13.88)	416 (16.38)	495 (19.50)
	2500	225 (8.88)	289 (11.38)	337 (13.25)	457 (18.00)	511 (20.12)	635 (25.00)

Special center to face dimensions available on request

RTJ flanges will have slightly longer center to face dimensions

API 6A center to face dimensions available upon request



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