530D
540D

KOSO

VELOCITY CONTROL VECTOR™ TRIM CONTROL VALVE

Standard Specifications

Gain Competitive Edge with KOSO

KOSO is a leading industrial customized control valve manufacturer with strong in-house R&D capabilities. Committed to delivering high-quality, ISO-9001 certified valve systems, KOSO offers a wide range of products designed to meet evolving industry needs.

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1M+
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Overview

The 530D (Globe) / 540D (Angle) series control valves meet low noise and anti-cavitation requirements by incorporating a customized disk-stack, instead of ported or drilled hole cages. It gives the benefits of velocity control for severe duty applications with custom-built valves and disk stack design.

Key Features & Benefits

Customized Design	Customized valve design with high capacity from large gallery area and stacked-up disk-stack, having multi-turn flow path typically ensuring rangeabilty upto 150:1 with larger strokes than standard globe valves.
Multiple Stages of Pressure Reduction	Up to 30 turns can be provided subjected to the requirements of Low-Noise, Anti–Cavitation and Severe Service applications.
Quick Change Trim	The quick-change trim design has a clamped-in seat ring using valve bonnet. It allows the trim parts to be removed and re-installed while the valve body is still in the pipeline. This results in quicker maintenance and inspection.
High Flow Capacity	High flow capacity with better controllability. Streamlined flow passages to optimize capacity and stable flow control with high rangeability.
Characterization	Inherently characterized trims are available with linear & Modified Equal percentage. Special Cv options are available on request.
Fine Flow Control	Disk Stack design are characterized to provide fine flow control and high rangeability as well as velocity control. Further customization can be made to meet specific application requirements.
Fluid Velocity Control	Fluid velocity control at trim exit addresses problems at their sources, resulting into vibration free operation, reduces velocity-induced erosion, eliminates cavitation caused trim damages, longer cycles between maintenances, low noise operation and eliminates costly additional equipment like baffle plates, silencers, acoustic lagging etc.

Pressure Drop and Capacity Needs	Designed to meet the pressure drop and capacity needs of the applications while improving reliability, efficiency and plant output. Wide control rangeability eliminates the need for a secondary valve for low range flow control.
“Edge” Contact Seating	“Edge” contact seating with extra shut-off force provides repeatable tight shut-off, eliminating leakage losses, recurring maintenance cost and unplanned system shutdowns.

▶ Product specifications

Design Standard & Material Standard	• Valve design - ASME B16.34 • Flange design - ASME B16.5 & ASME B16.47 • Butt weld end connection - ASME B16.25 • Socket weld end connection – ASME B16.11 (EN,API, ISO designs are optional) • Materials comply to ASME, ASTM, EN or Custom standards
Industry Served	• Power, Oil & Gas, FPSO, Onshore, Offshore, LNG, Fertilizer, Steel, Refinery, Petrochemical.
Quality Standard Compliance	• Quality management system as per ISO 9001 • Quality management system as per API Spec Q1 • PED/CE as per 2014/68/EU & ATEX 2014/34/EU
Type of Actuation	• Pneumatic actuator, Hydraulic actuator, Electrical actuator.
Key Applications	• Anti-surge valve, Pump minimum recirculation valve, Blow - off valve, Gas to flare letdown valve, Spray water valve, Soot blower valve, Cryogenic valve/High temperature valve, Gland seal valve.
Certification	• IBR, SIL, PED/CE Marking, ATEX, CRN, TRCU

Comparison Between Vector™ Valve Profile & Conventional Valve Profile

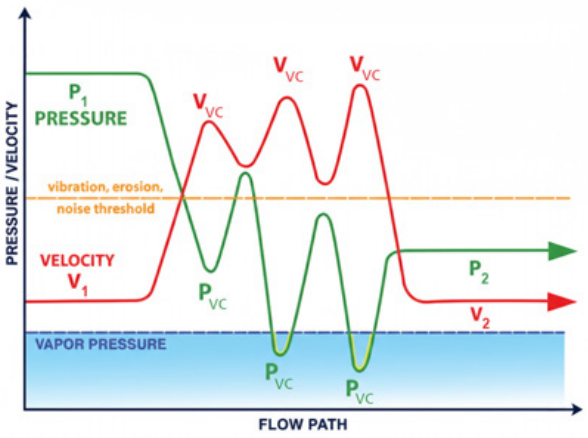


Figure 1.1 : Conventional Multi-hole cage design leads to insufficient velocity control

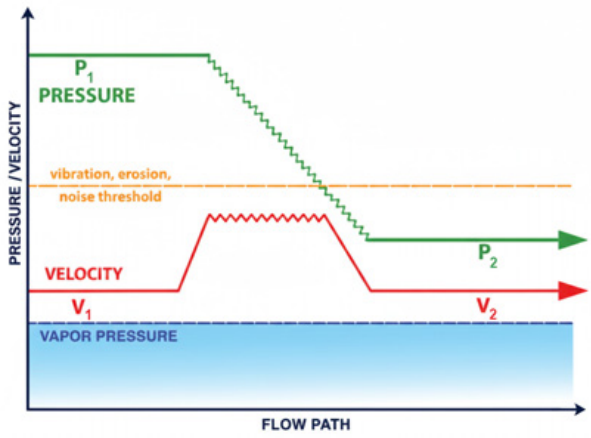


Figure 1.2: Vector™ Multi-path, Multi-turn path control the velocity appropriately

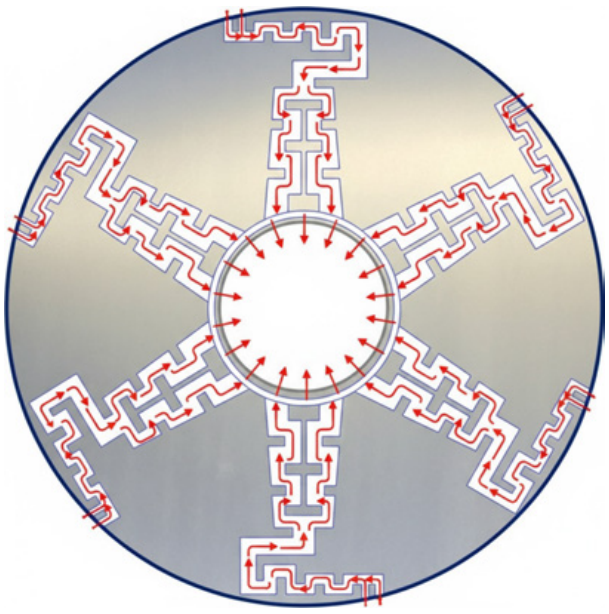


Figure 2.1 : Vector™ disk flow paths, Over the plug

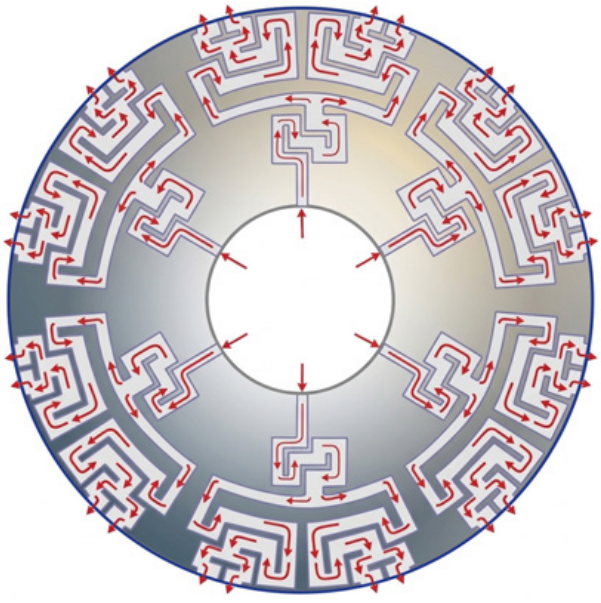


Figure 2.2 : Vector™ disk flow paths, Under the plug

▶ Where Vector™ Stands Out

Severe service valves are often associated with challenges such as vibration, noise, cavitation and erosion.

In Vector™ valves, the pressure reduction is achieved through a disk stack composed of multiple disks and each disk contain numerous right-angled flow passages. As the fluid flows through these tortuous paths, each stage contributes to a gradual reduction in pressure.

It thus permits a gradual pressure recovery without allowing the fluid to exceed the acceptable velocity limit. This controlled process prevents excessive fluid velocity, thereby minimizing vibration & cavitation.

In applications that generate high exit noise (SPL), the conventional approach is to mitigate noise along the flow path by installing a series of orifice plates downstream of the valve. However, this method compromises the controllability of the final control element, as orifice plates function as static Cv devices. The KOSO Vector™ trim addresses this issue by controlling noise at the source by limiting fluid velocity through a, multi path letdown design.

Another common challenge with conventional multi-stage valves are to achieve high rangeability or a high rated Cv due to the inherent flow restrictions in their design. This is usually seen in applications like Anti-Surge Valve, Combined Feedwater Regulating valve (Startup + Normal Operation) etc.

Due to the advanced disk stack design, long stroke and superior flow characteristics, the Vector™ trim combines low-load flow and full-load flow functions into a single, efficient control valve. This design delivers exceptional rangeability—far exceeding the typical 30:1 limit of standard valves. Vector™ trims can be designed with bi-linear characteristics with tortuous path on the lower stroke and drilled holes at the top, suitable for Anti-surge valve applications.

Higher the Sizing indices like $F_{L,}$ X_T & $K_{C,}$ better the noise abatement, lower the vibration and lower the chance of cavitation or erosion.

Sizing Indices comparison with conventional valve:

Description	F_L	X_T	K_C
Conventional Valves	0.94	0.74	0.85
Vector Valves	~ 1	~ 1	~ 1

With its unique flow control and energy dissipation characteristics, Vector™ valves became the choice of plant engineers for most challenging and severe duty applications.

▶ Engineered to Perfection

KOSO is an engineering solutions company specialized in severe service control valve applications. Our expertise lies in developing highly engineered, tailor made valve solutions refined and perfected over decades. To centralize our engineering knowledge and experience, KOSO has a dedicated team focused exclusively on the design of Vector™ valves.

Standard Specification

Velocity Control Vector™ Trim Control Valve 530D/540D

Series	530D - Globe / 540D - Angle
Body Size	1" ~ 32" (DN25 ~ DN800) (For higher sizes, consult with factory)
Plug Form	Unbalanced, Pressure Balanced and Pressurized seat
Characteristics	Linear, EQ%, Modified Linear, Modified EQ%
Trim Material & Treatment	300 Series, 400 Series,17-4 PH, Alloy steels, Duplex SS, Alloy 625, Alloy 825, Monel, Hastelloy C, Special Hardening treatment - Stellite overlay, (Stellite Seat - SS / Stellite Face - SF)
Body Rating	ASME Class 150, 300, 600, 900, 1500, 2500,4500 & Job Rated as per ASME BPVC Section VIII , DIV 1 (For EN Class or PN Class consult with factory)
Body Connections	Flanged (RF, FF, RTJ), Weld ends (Socket weld end : 2″ and below, Butt weld end : 3″ and above)
Face to Face Dimension	KOSO Standard / Special (Consult with factory)
Body & Bonnet Material	WCB, WCC, WC6, WC9, C5, C12A, LCC, LCB, CF8, CF8M, CF3M, CF8C, Duplex SS, Alloy 625, Alloy 825, Monel, Hastelloy C and Copper alloy Steels. Cladding on body internal is available upon request.
NACE (as applicable)	NACE MR0175, NACE MR0103
Bonnet Types	Standard type: -17 °C ~ +620 °C, Long-Extension type: -196 °C ~ -45 °C Option: Bellow seal bonnet (Note : The above temperature limits are based on operating conditions)
Gland Packing	TFE V-ring, TFE carbon fiber, Grafoil and more.
Gaskets	Spiral wound metal, with Grafoil or TFE filler.
Leakage Class	ANSI / FCI 70-2 Class IV, V or VI and MSS-SP-61
Special Testing Requirements (Optional upon request)	FE Prototype testing as per ISO 15848-1, Class A, B, C FE Production testing as per ISO 15848-2, Class A, B, C CV Testing, Helium Leak Testing, High Pressure Testing Low temperature test, Cryogenic test, Vacuum test , Dynamic response testing (DRT) .
Marking	As per KOSO standard practices / MSS-SP-25
Options	Forging Body/Bonnet, Steam jacketing, Silencer, Expanders/Diffuser and baffles.

Body & Trim Sectional View

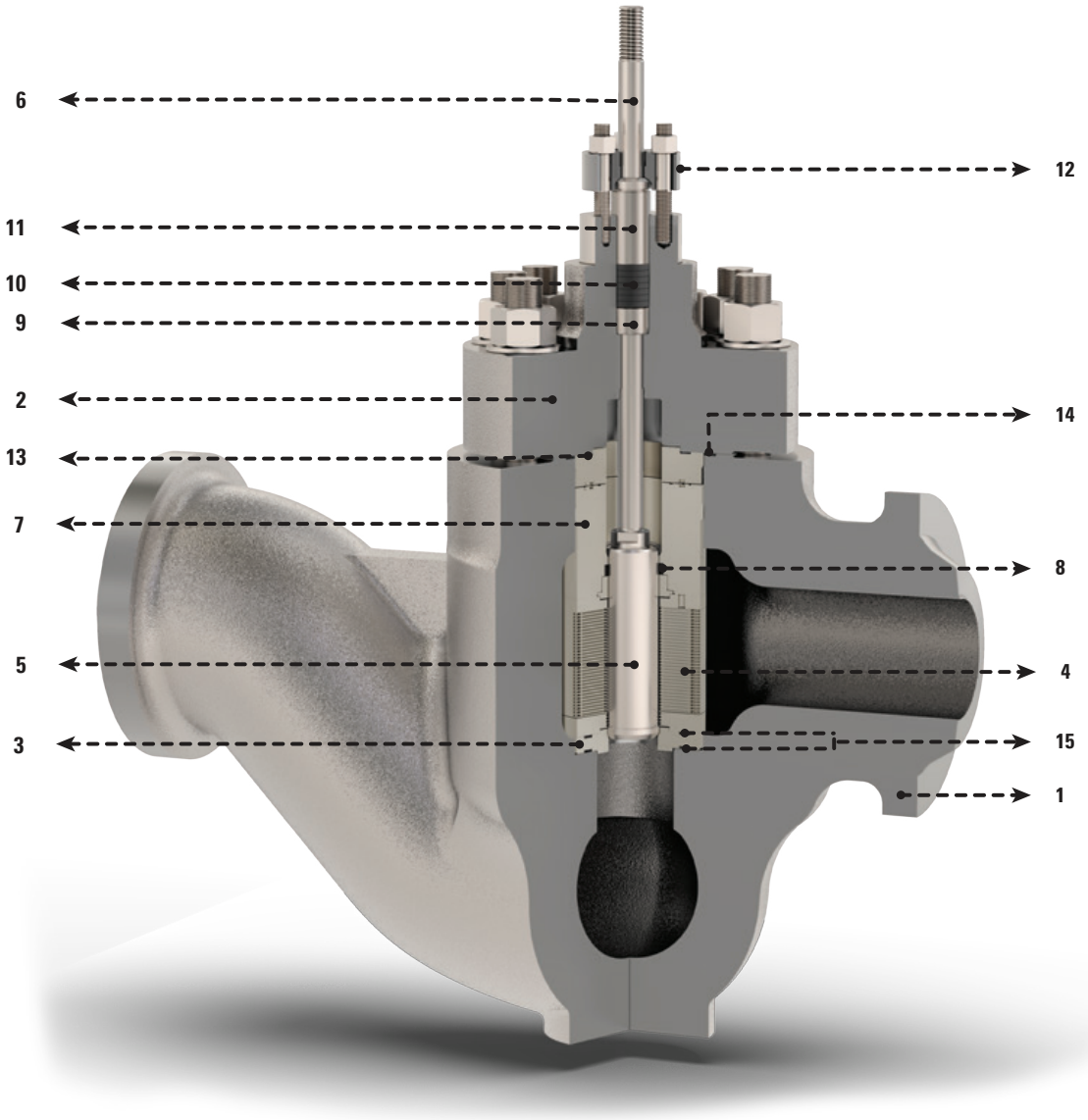
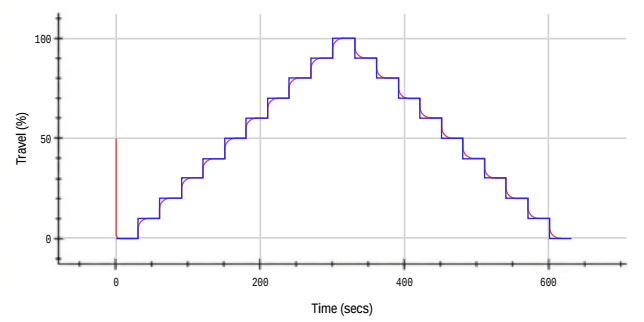


Figure 1: 530D - Control Globe Valve Body Trim Sectional View

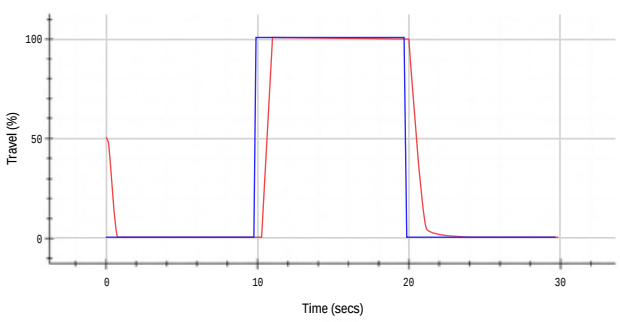
SR.NO.	LABEL
1	BODY
2	BONNET
3	SEAT RING
4	DISK STACK
5	PLUG
6	STEM
7	BALANCE CYLINDER
8	BALANCE SEAL

SR.NO.	LABEL
9	PACKING SEAT
10	GLAND PACKING
11	GLAND RING
12	GLAND FLANGE
13	PRESSURE BOUNDARY GASKET
14	PRESSURE BALANCE GASKET
15	SEAT RING GASKET

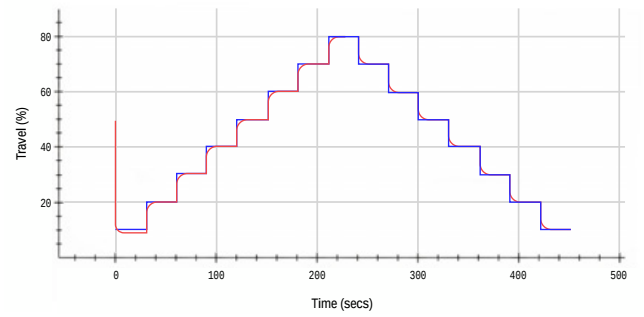
PERFORMANCE & TESTING: DYNAMIC RESPONSE COMPLIANCE



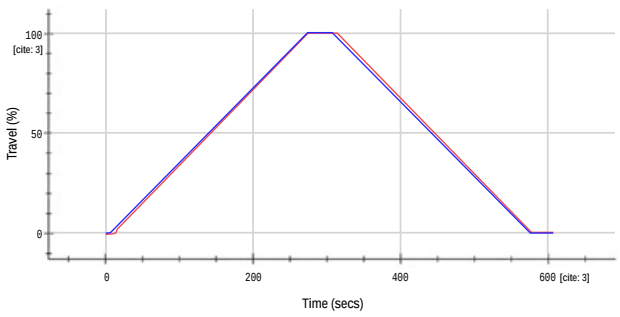
TERMINAL BASED LINEARITY



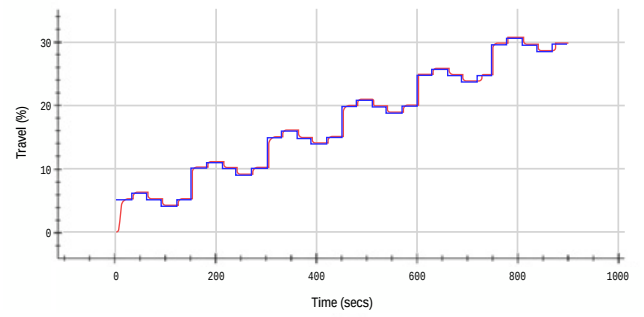
STROKE TIME TEST



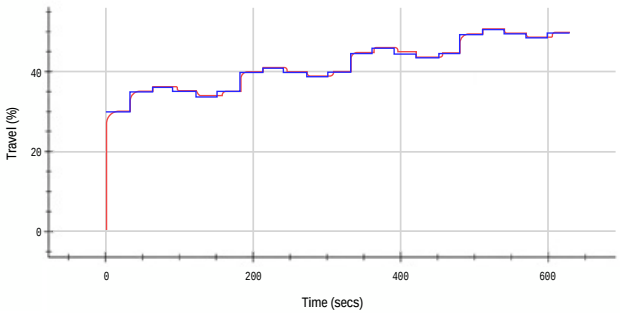
10% to 80% STEP RESPONSE



RAMP TEST



5% to 30 % STEP



30% to 50% STROKE

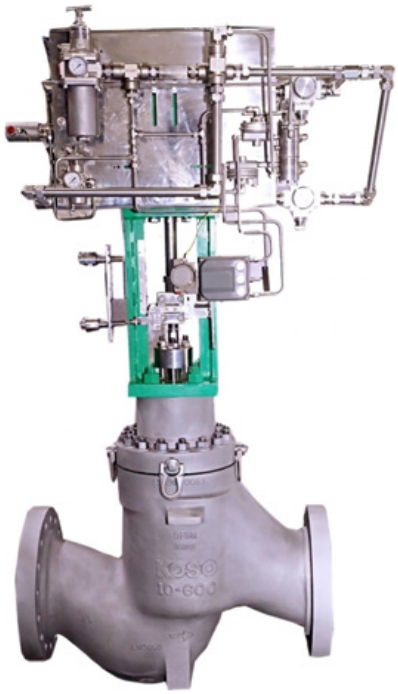


Figure 2: Anti-Surge Valve: Globe Valve (530D)

Figure 3: Anti-Surge Valve: Angle Valve (540D)

Figure 4: Vector™ Disk Stack arrangement for Characterization

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