

840-3D | 860-3D

Limitless opportunities with
flexible, built-to-fit technology



840-3D | 860-3D

The 840-3D (globe) and 860-3D (angle) control valve utilizes some of the most advanced manufacturing techniques as it benefits from a highly customized 3D printed trim. It brings multi-path, multi-stage, low noise and anti-cavitation DRAG® technology to the next level by providing the best control with great rangeability. It comfortably delivers process performance while minimizing losses caused by valve leakage.

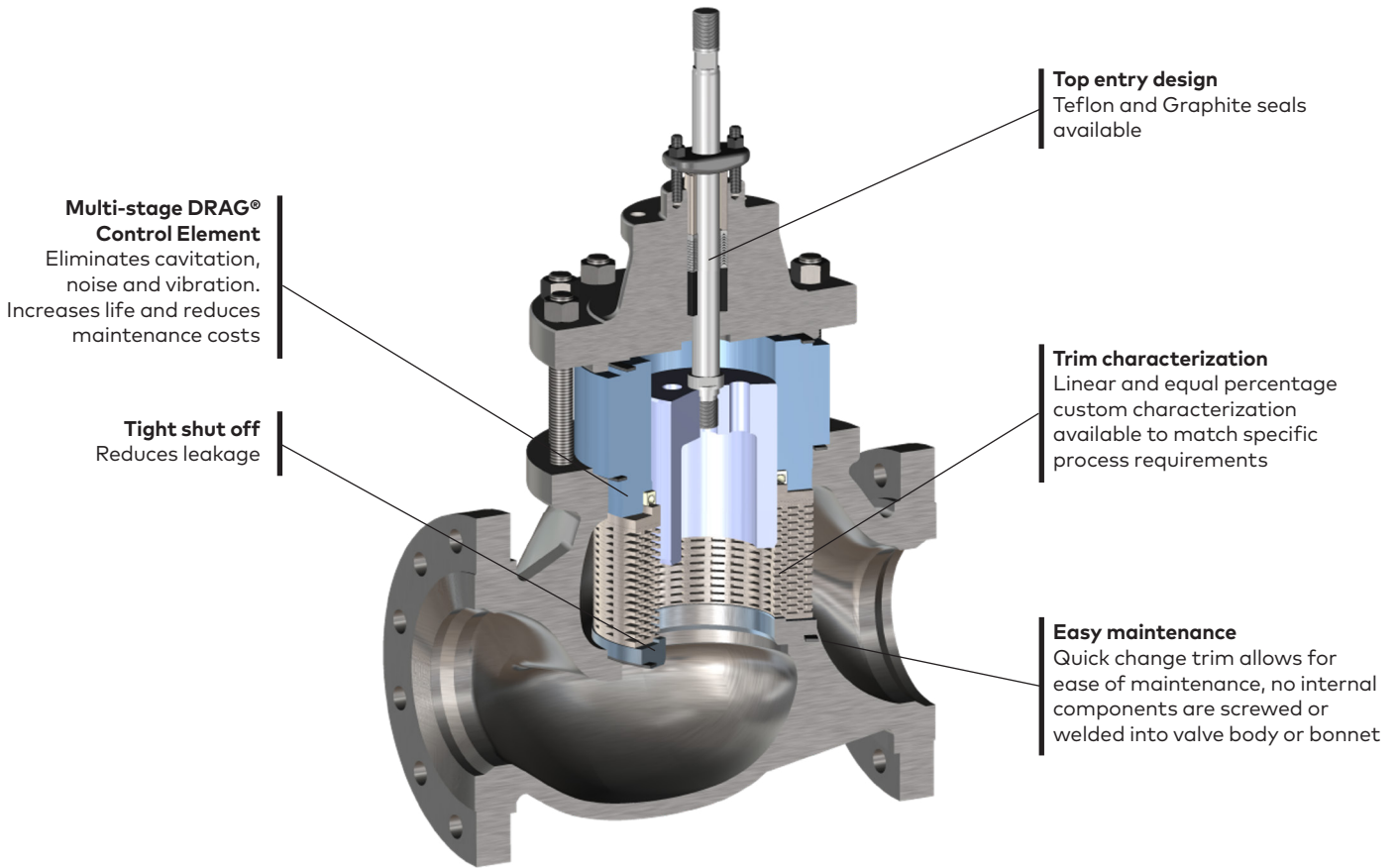


Figure 1 840-3D cutaway view

Key Features

■ DRAG® Technology

Trim is engineered and customized to each specific application and process.

The guiding principles of the design remain the same as those of DRAG® technology, which is to provide a tailored solution to your process condition, so you can produce more efficiently for longer.

The multi-stage, multi-path DRAG® trim directs fluid through a tortuous path to reduce the differential pressure incrementally. The DRAG® trim limits the velocity head at the trim to eliminate erosion, vibration, and noise problems.

■ Characteristics

Customizable flow characterizations to match process requirements of multi-stage DRAG® disk stack technology:

- Limits trim fluid exit velocity and kinetic energy.
- Multi-stage pressure drop.
- Eliminates cavitation, noise, and vibration.
- Extends valve life and reduces maintenance costs.

■ Failure Modes

- Fail-to-close on the loss of air.
- Fail-to-open on the loss of air.

■ Quick Change Trim

- All internal parts including top-entry design and a cage-retained seat ring can be inspected easily by removing the bonnet.
- Internal parts are easily accessible for modification or replacement.
- Quick-change design allows convenient repair and easy trim maintenance.

Benefits

■ Simple to change capacity and flexible trim design

Over time, your process conditions may change. With the use of additive manufacturing and its compact design characteristics, new internals can be redesigned or modified to suit your new process conditions.

■ Tight Shutoff

- Shut off classes from ANSI IV through VI are available.

■ Easy maintenance

- Top entry design allows for quick inspection or trim change.

■ Actuation

- A wide selection of actuation is available including pneumatic, electric, and top-mounted manual options.

Product Specification

Valve size	Flow characterisation	Temperature range
1" through 16"	Linear, modified equal percentage or equal percentage	-60 ~ 580°C
Ratings	End connection**	Seat leakage
150# - 2500# ASME B16.34 standard pressure rating*	Flanged ends (FF, RF, RTJ) Weld ends (BW, SW)	ANSI/FCI 70.2 Leakage class IV, V, VI
		Noise level
		Typically, <85 dBA

* Ratings – DIN and JIS are available upon request.
** End connection types meet ISA S75.08 face-to-face dimensions.

Applications

■ Oil & Gas (non NACE rated)

- Extraction Steam Control
- Fire Water Pump Recirculation
- Fire Water Pump Discharge
- Gas Injection
- Gas Withdrawal (clean)
- Emergency and Service Vents
- Fuel Gas Regulation Valves
- Compressor Anti-surge
- Hot gas Bypass
- Process Gas to Flare
- Expander Bypass (JT Valves) (non-cryogenic)
- Feedstock Flow / Pressure Control
- Passivation Valve
- Feedgas Regulator
- Lean Amine
- Recirculation Control
- Produced Water Injection

■ Power Application

- High Pressure Heater Emergency
- Feedwater Regulators
- Startup Feed Regulators
- Soot Blowing
- General
- Condensate Pump Recirculation
- Supercritical Startup Valve
- Deaerator Level Control
- DA Pegging
- Auxiliary Steam PVC
- Spray Water Valves

■ Nuclear (commercial)

- Atmospheric Dump Non-Code
- Feedwater Pump Recirculation
- Auxiliary Steam to Deaerator
- Blow Down
- Condensate Drain
- Deaerator Level Control
- Steam Bypass
- Condensate Dump (Turbine Bypass)
- Condensate Pump Recirculation

Cavitation in Control Valves

Cavitation in control valves is damaging, resulting in loss of control and frequent replacement of spare parts. It can create excessive air borne noise, erosion of metal parts, and pressure transients that result in valve and/or piping vibration and potentially fatigue failure.

840-3D | 860-3D (or 840/860-3D) have been designed to eliminate the root cause of cavitation through a custom made valves trim which controls the pressure drop letdown of your particular conditions so that fluid velocities and pressure recovery are minimized.

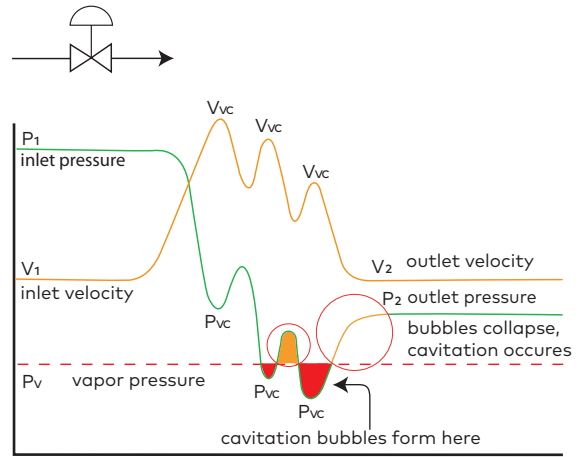


Figure 2 Interstage cavitation damage from insufficient staging

Technical Details

Control and Reliability

The 840/860-3D continues IMI CCI's tradition of customizing valve performance to meet the exact requirements of your application. In addition to linear and equal percentage characterization, the 840/860-3D can be custom built for applications that require critical control.

Figure 3 is an example of a pump application that has a pressure drop that varies with flow. This example shows how pressure drops are highest at start-up, and then decrease as the required flow rate increases.

Figure 4 shows how an 840/860-3D custom-made trim improves control and reliability by applying the appropriate number of pressure-reducing stages through the entire range of flow conditions.

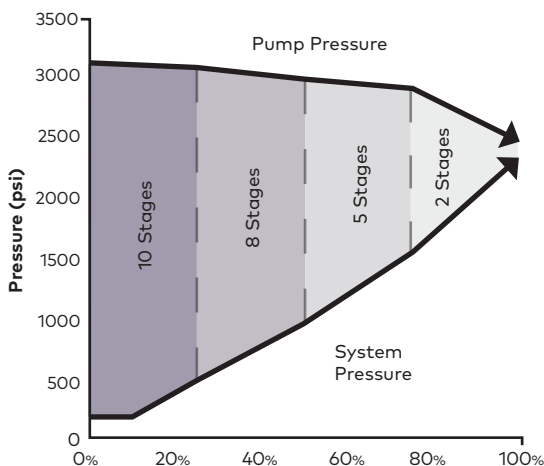


Figure 3 Typical pump application curve

The result, as shown in Figure 5, is extremely consistent acceleration throughout entire range of the valve.

Uncontrolled trim exit velocities can lead to excessive trim damage as shown in Figure 6. The 840/860-3D provides superior control and reliability, thereby significantly extending the operating life of the valve whether it's for liquids or gas. The 840/860-3D delivers:

- Control that improves plant efficiencies.
- Reliable performance.
- Reduced damage and decreased maintenance frequency.
- Consistent energy control across all flow conditions.

The ability to be custom characterized enables the DRAG® disk stack to have variable staging throughout the entire stroke.

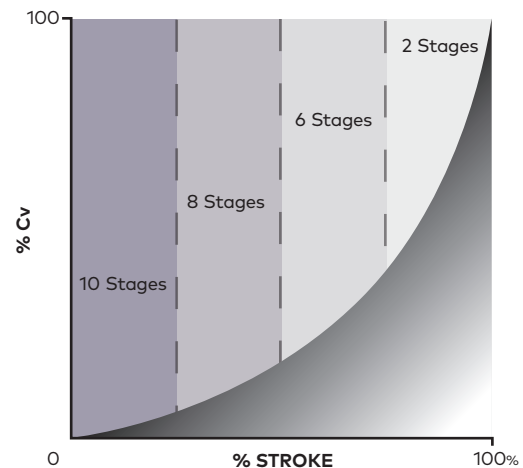


Figure 4 Customized characterization to meet the application requirements

Reliable Solution to Cavitation



Figure 5 Cavitation damage on internal parts

With its fit for purpose trim, the 840/860-3D is designed with custom made multi-path, multi-stage channels, allowing compact trim design with high number of stages to reduce exit velocity. This improves the reliability of valve internals by reducing damage at start up and when throttling at low stroke.

Figure 5 shows an example of trim damage resulting in leakage that reduces plant efficiency and increases operating costs.

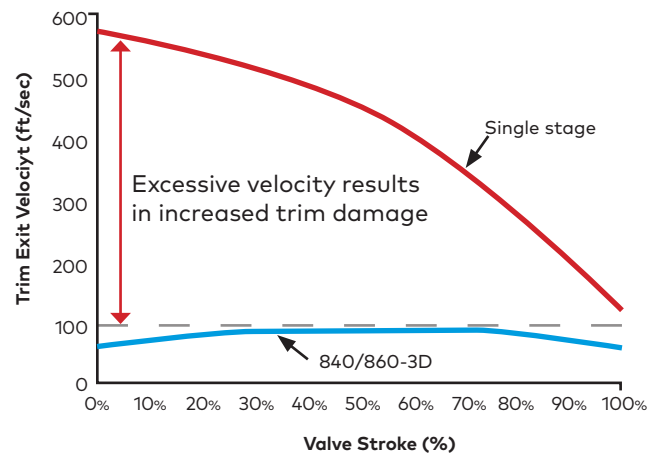


Figure 6 Trim exit velocities and valve stroke

How 840/860-3D Solves Cavitation

- Maintaining the fluid velocity at minimum levels so that local pressures are unlikely to drop below the fluids vapour pressure.
- Should gas bubbles form, DRAG® reduces the energy to a safe level by dividing the flow into many small channels. Consistent energy control across all flow conditions.
- The 840/860-3D adheres to ISA guidelines on trim exit velocity.

The definition of sigma corresponding to the ISA Recommended Practice is:

$$\sigma = \frac{P_1 - P_v}{P_1 - P_2}$$

Figure 7 shows a graph of acceleration versus ISA sigma cavitation index. For a multi-path, multi stage trim like 840/860-3D, the curve remains essentially flat, indicating that there is no cavitation taking place and the valve cavitation index is approaching one.

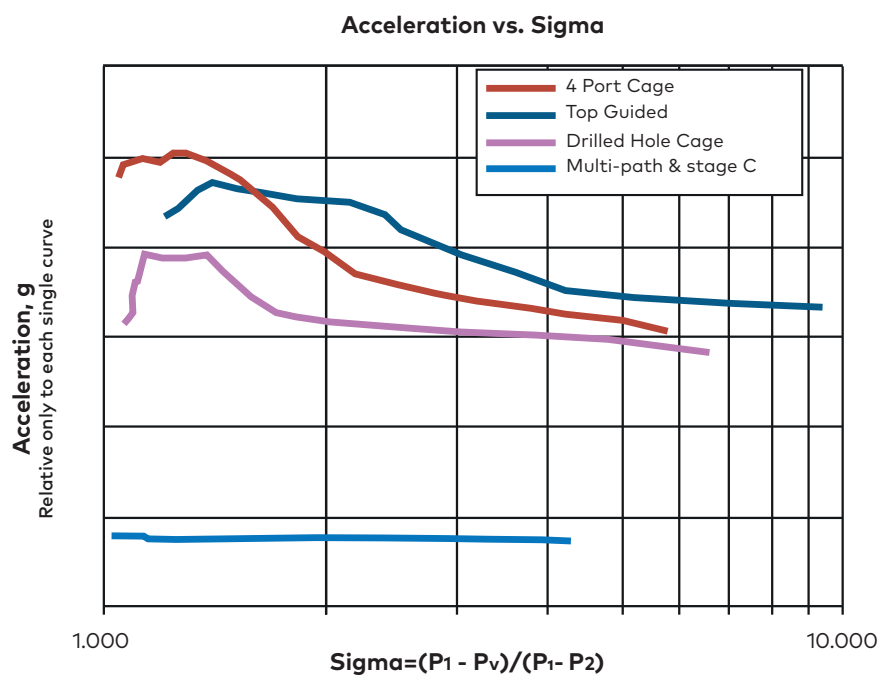


Figure 7 Acceleration vs. Cavitation potential as per ISA

Additively Manufactured Components

Through state-of-the-art 3D printing, the 840/860-3D flow control elements are customized to your specific needs.

It's a streamlined production process that uses fewer materials and produces less waste. It also improves delivery time of spares as parts can be manufactured faster than with conventional methods.

The 840/860-3D uses the Powder Bed Fusion process, which consists of printing thin layers of metal powder at selected points to form a fully formed monolithic piece of metal.

This technology enables parts with intricate designs and geometries allowing our engineers to design components for some of the most challenging process conditions that traditional manufacturing would not be able to withstand.

Several materials are available, including NO7718, NO6625, and 316 Stainless steel.

For other materials, please contact us.

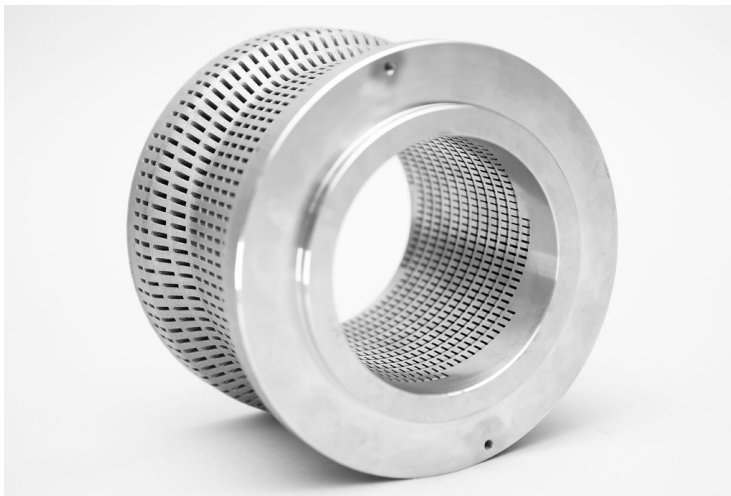


Figure 8 Additive manufactured DRAG® disk stack

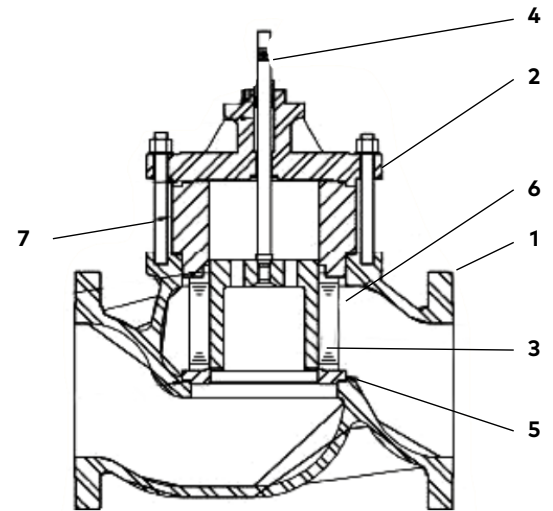


Figure 9 Additive manufactured seat basket



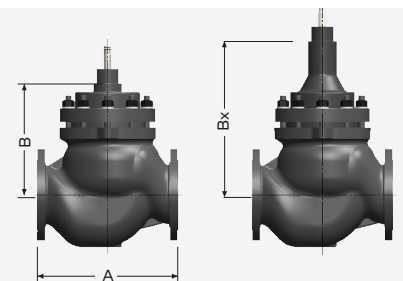
Materials

Component	Item no.	Material Options
Body	1	Carbon steel, chrom-moly steel, stainless steel, other
Bonnet	2	
Plug	3	316SS ChrPit or Stellite, 410 SS HT, N06625, UNS Stellite
Stem	4	316SS ChrPit, UNS SS Heat Treated, N07718, 17-4PH
Seat	5	316SS, 316SS with Stellite, 410 SS HT, N07718, UNS Stellite
Disk stack	6	316SS, N07718
Balance cylinder	7	Carbon steel, chrom-moly steel, stainless steel, other



Soft Parts	
Gasket	Spiral wound: 304 or 316SS with teflon, grafoil Flat: Teflon ^(TM) , Grafoil ^(TM) , soft filters
Balance Seal	Glass filled TFE, EPDM, Vilton ^(TM) , Graphite ^(TM) , inconel, carbon
Packing	V-TFE, glass filled Teflon ^(TM) , Graphite ^(TM) , bellows seal
Balance cylinder	Carbon steel, chrom-moly steel, stainless steel, other

Product Dimensions



Dimensions in mm
 Face-to-face (A)
 Height with standard bonnet (B)
 Height with extended bonnet (Bx)
 * IMI CCI Standard

Rating	150#					300#					600#					900#					1500#					2500#								
	A			B	Bx	A			B	Bx	A			B	Bx	A			B	Bx	A			B	Bx									
End connection	RF	BW	SW			RF	BW	SW			RF	BW	SW			RF	BW	SW			RF	BW	SW			RF	BW	SW	RF	BW	SW			
1	184	210	210	191	291	197	210	210	191	291	210	210	191	291	273	279	279	169	269	273	279	279	169	269	318	318	318	300	400					
1.5	222	251	251	201	311	235	251	251	201	311	251	251	201	311	333	330	330	189	299	333	330	330	189	299	410*	410*	410*	330	430					
2	254	286	286	211	321	267	286	286	211	321	286	286	211	321	375	375	375	263	373	375	375	375	263	373	565.5*	565.5*	565.5*	400	450					
2.5	276	311	x	234	354	292	311	x	234	354	311	311	x	237	357	410	375	x	306	426	410	375	x	306	426	x	x	x	x	x				
3	298	318	x	255	375	318	318	x	255	375	337	337	x	272	392	441	460	x	306	426	460	460	x	306	426	498	498	x	400	450				
4	352	368	x	295	425	368	368	x	295	425	394	394	x	313	443	511	530	x	350	480	530	530	x	350	480	575	575	x	450	500				
6	451	451	x	340	470	473	451	x	340	470	508	508	x	373	503	714	768	x	441	571	768	768	x	441	571	819	819	x	550	650				
8	543	543	x	387	527	568	543	x	387	527	610	610	x	423	563	914	832	x	590	730	972	832	x	590	730	1080*	1080*	x	550	700				
10	673	673	x	440	580	708	673	x	440	580	752	752	x	478	618	991	991	x	687	827	1067	991	x	687	827	1270	1270	x	710	x				
12	737	737	x	443	593	775	737	x	443	593	819	819	x	540	690	1130	1130	x	830	980	1219	1130	x	830	980	1610*	1610*	x	850	x				
14	889	851	x	700	850	927	851	x	700	850	972	1029	x	800	950	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				
16	1016	1108	x	714	x	1057	1108	x	714	x	1108	1108	x	821	x	x	x	x	x	x	x	x	x	x	x	1422*	1422*	x	900	x	x	x	x	x

- The above dimensions are for reference purposes. Actual dimensions may differ depending on requirements.
- Custom design is available. Please contact us for unlisted dimensions.
- Please contact us for dimensions of the 860-3D - angle body type valve.

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