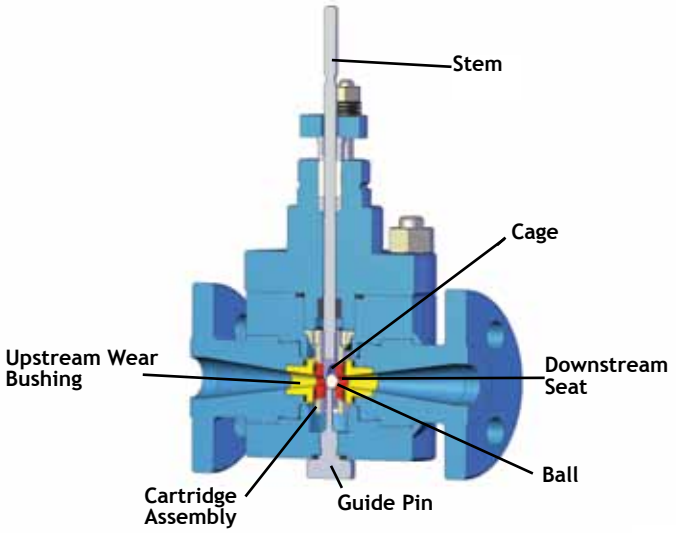
DFT® HI-100®

The **HI-100 Control Valve** features an in-line straight-thru venturi flow design. The control element, a spherical ball, is contained by a cage that positions it relative to the downstream seat by means of linear stem travel. There are no close clearances between the moving parts (i.e. cage, ball and seat). These features enable the valve to operate smoothly and efficiently at high or low temperatures and/or in fluids carrying suspended particles such as slurries. The Quick Change Trim feature permits in-line replacement of the internal trim (ball, stem, cage, seats, seat retainer cartridge and wear bushings). Interchangeability of the upstream and downstream seats and wear bushings extends the life of the valve at no extra cost. Class V shutoff is standard.

FEATURES:

- Straight-thru design
- ¼" to 8" *
- ANSI 150 to 4500 and special High Pressure
- Carbon Steel, Alloy Steel Stainless and High Alloys
- Weld End, Flanged, or Custom End Prep
- Linear Characteristic
- Temperatures: -425° F to 1900° F
- In-line Repair
- Quick Change Trim
- Top or Bottom Entry
- Low Operating Thrust
- Manual, Pneumatic, Electric or Hydraulic Actuation



HI-100 Maximum Valve Flow Coefficient							
Size NPS	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2
SizeDN	8	10	15	20	25	32	40
Cv (Kv)	1 (0.9)	2.5 (2.2)	4.5 (3.9)	10 (8.6)	20 (17)	31 (27)	45 (39)
Size NPS	2	2 1/2	3	4	6	8	
SizeDN	50	65	80	100	150	200	
Cv (Kv)	80 (69)	125 (108)	180 (155)	320 (275)	720 (621)	1280 (1103)	

DFT® and HI-100® are Registered Trademarks of DFT Inc.
* Larger sizes consult factory.

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DFT® HI-100®

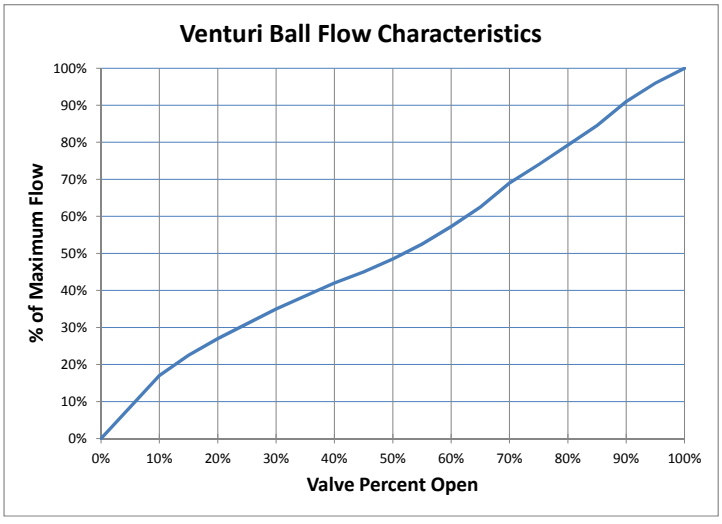
MATERIALS OF CONSTRUCTION*			
COMPONENT	**CARBON STEEL**	**ALLOY STEEL**	**STAINLESS STEEL**
Body	A105	A182 F22 or F11	A479 316
Bonnet/Bottom Cover	A105	A182 F22 or F11	A479 316
Stem	410SS Heat Treated & Hardened		17-4PH
Cage - 1/4" to 2"	Stellite® #6		
2-1/2" & Larger	Valve Body Base Material w/ Stellite® #6 Hardfacing		
Cartridge	316 SS		
Guide Pin	A193 B7		A193 B8M
Gland	303 SS		
Follower	Carbon Steel		316 SS
TRIM STYLE			
	Standard	Feedwater	Steam
Ball - 1/4" to 4"	440C	Ultra-Loy™ Ceramic	Stellite®
6" & Larger	Stellite®		
Seat - 1/4" to 2"	422 SS Heat Treated & Hardened		Stellite®
2-1/2" & Larger			316 SS/Stellite®
Wear Bushing	422 SS Heat Treated & Hardened		17-4PH
SEALS			
	Low Temperature <350° F (177° C)		350 - 1000° F (177 - 538° C)
Packing	Teflon Chevron Style		Graphite
Bonnet or Bottom Cover and Guide Pin Seal	Spiral Wound Gasket 304/Graphite		
Seat Seal	Spiral Wound Gasket 304/Graphite		
Wear Bushing Seal			
MANUAL VALVES			
Yoke	Carbon Steel		Stainless Steel
Handwheel	Cast Iron		
Stem Nut	Bronze		

*Standard materials of construction are shown. These materials can be modified for special applications. Contact the factory for more information. DFT® and HI-100 are Registered Trademarks of DFT Inc. All other trademarks are the properties of their respective owners and are used for purposes of identification only.

Flow Characteristics

HI-100®/MSV-100™/Ultra-Trol™ Flow Characteristics

The classic DFT design has a linear flow characteristic. This characteristic gives the best flow control over the widest range. DFT's venturi-ball design is the only design that actually works with the physics of the fluid flow. Incoming flow enters through the nozzle to the control area. The smoothly converging nozzle lowers turbulence as the flow moves around the curved control path. Note that only rounded surfaces and cones are used for the control function. As the flow exits the valve, the diverging nozzle controls expansion and recovery so that no turbulence is added to the flow stream. This design provides a superior, smooth flow control. The preferred operating range of the valve is between 10% and 90% open.



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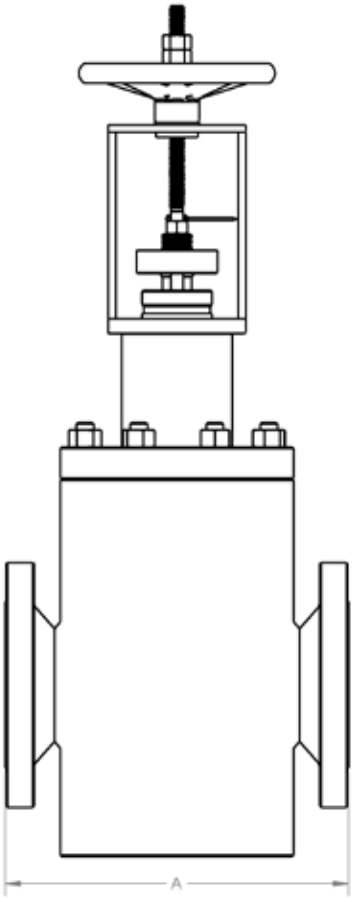
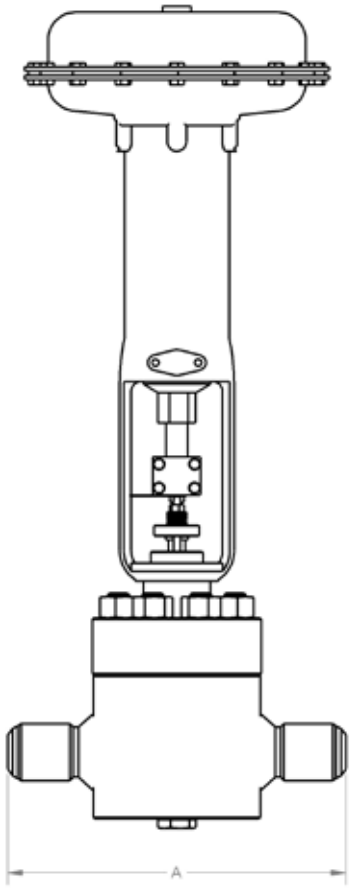
DFT® HI-100®

Face to Face Dimensions



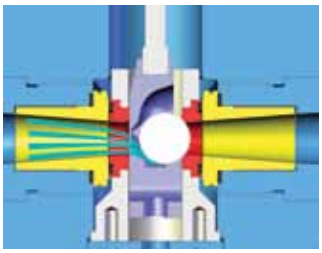
OPTIONAL MANUAL VALVE SHOWN



Nominal Valve Size		HI-100 Face to Face Dimensions*											
		ANSI Class 150		ANSI Class 300		ANSI Class 600		ANSI Class 900		ANSI Class 1500		ANSI Class 2500	
NPS	DN	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
1/4	8	4.00	102										
3/8	10	4.00	102										
1/2	15	4.25	108	6.00	152	6.50	165	8.50	216	8.50	216	10.38	264
3/4	20	4.62	117	7.00	178	7.50	190	9.00	229	9.00	229	10.75	273
1	25	5.00	127	8.00	203	8.50	216	10.00	254	10.00	254	12.12	308
1 1/4	32	5.50	140	8.50	216	9.00	229	11.00	279	11.00	279	13.75	349
1 1/2	40	6.50	165	9.00	229	9.50	241	12.00	305	12.00	305	15.12	384
2	50	8.00	203	10.50	267	11.50	292	14.50	368	14.50	368	17.75	451
2 1/2	65	8.50	216	11.50	292	13.00	330	16.50	419	16.50	419	20.00	508
3	80	9.50	241	12.50	318	14.00	356	15.00	381	18.50	470	22.75	578
4	100	11.50	292	14.00	356	17.00	432	18.00	457	21.50	546	26.50	673
6	150	16.00	406	17.50	445	22.00	559	24.00	610	27.75	705	36.00	914
8	200	19.50	495	22.00	559	26.00	660	29.00	737	32.75	832	40.25	1022

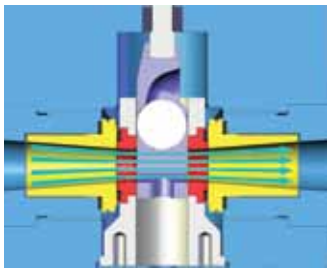
* Dimensions per ANSI B16.10. Valves can be supplied to meet end user requirements
Class 4500 and higher pressure valves are supplied to meet end user requirements

DFT® Control Valve Operation



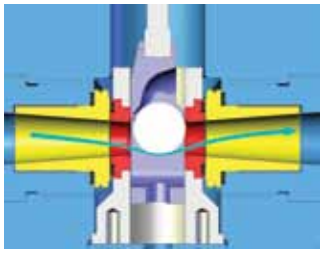
Closed Position

In the closed position, the ball is compressed into the conical seating surface by the system pressure. Line contact between the ball and the seat loads the seating surface producing tight closure. As pressure increases, the seat load increases and the seal improves. During each valve stroke, the ball rotates and repositions itself presenting a new sealing surface to the seat, prolonging the tight shutoff capability. Temperature changes do not affect the tight shutoff since there is freedom of movement between the ball and the seat. The ball cannot become wedged into the seat. The guide pin is used to set the valve position, but has no function during normal operations.



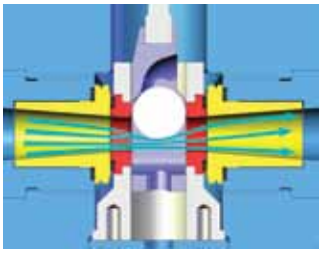
Full Open Position

In the full open position a straight-thru flowpath exists and the valve operates with the inherently high flow capacity of a venturi. The ball is mechanically held out of the flow stream by four inclined pads on the cage which oppose the pressure differential force. The Bernoulli effect moves the suspended particles towards the center of the fluid stream, preventing them from settling out into the body. This keeps the valve clean and free of material deposits in all positions during the valve stroke.



Close Throttling Position

As the valve opens, it operates in the close throttling position. In this position, the ball is supported by the two forward inclined pads on the cage and the seat surface which oppose the pressure differential force caused by the Bernoulli effect. The ball is supported and stable throughout the valve stroke and does not pinwheel or chatter.



Intermediate Throttling Position

In the intermediate throttling position, the ball rests on the four cage pads and is opposed by the same differential pressure force. The stable suspension of the ball throughout the valve stroke permits extremely close and repeatable control throughout the entire valve stroke.

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Bernoulli

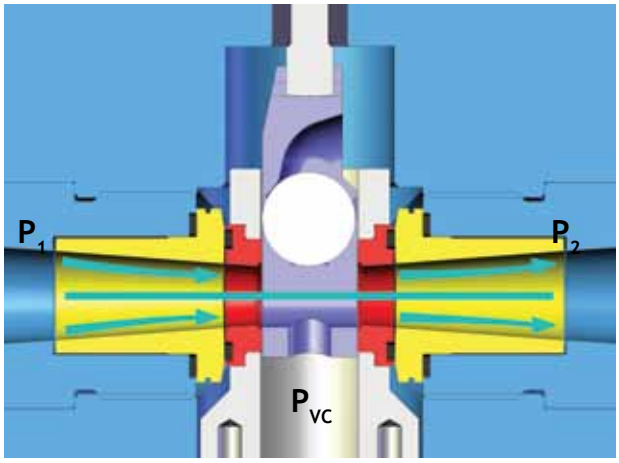
The Bernoulli Principle

Energy per unit volume at inlet = Energy per unit volume at outlet

$P_1 + 1/2\,\rho\, v_1^2 + \rho\, g h_1 = P_2 + 1/2\,\rho\, v_2^2 + \rho\, g h_2$

Where:
P = Pressure Energy; $1/2\,\rho\, v^2$ = Kinetic Energy; $\rho\, g h_1$ = Potential Energy

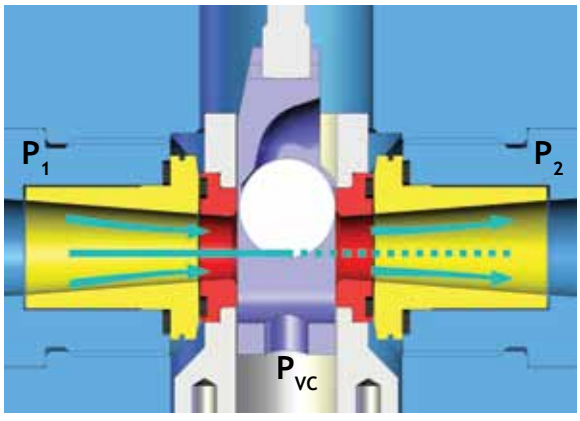
The best example of the Bernoulli Principle is often called the "Bernoulli Effect" which states that fluid pressure decreases as fluid velocity increases.



The illustration shows the typical change in pressure as the fluid moves through the valve. At inlet, the pressure is P_1. Velocity increases through the valve to a maximum as it moves through the valve port. At the valve port, the pressure drops to P_{VC} (pressure at the vena contracta), which is the lowest pressure in the valve. As the fluid exits the valve, pressure recovers to P_2 which is lower than P_1.

Cavitation Control

At P_1 the fluid stream is all liquid. Liquid flashes at the valve port when the pressure at the vena contracta (P_{VC}) drops below the liquid vapor pressure. As the velocity decreases in the exit nozzle, the pressure increases (or recovers) to P_2 and the vapor bubbles collapse. This is known as the potentially damaging phenomena called cavitation. Unlike tortuous path valves, our control valves manage cavitation. Bubbles form at the lowest pressure (highest velocity) which is at the center of the fluid stream. The subsequent collapse is within the hydraulic barrier, not on metal surfaces. Our nozzle design provides a smooth recovery prior to the fluid exiting the valve.



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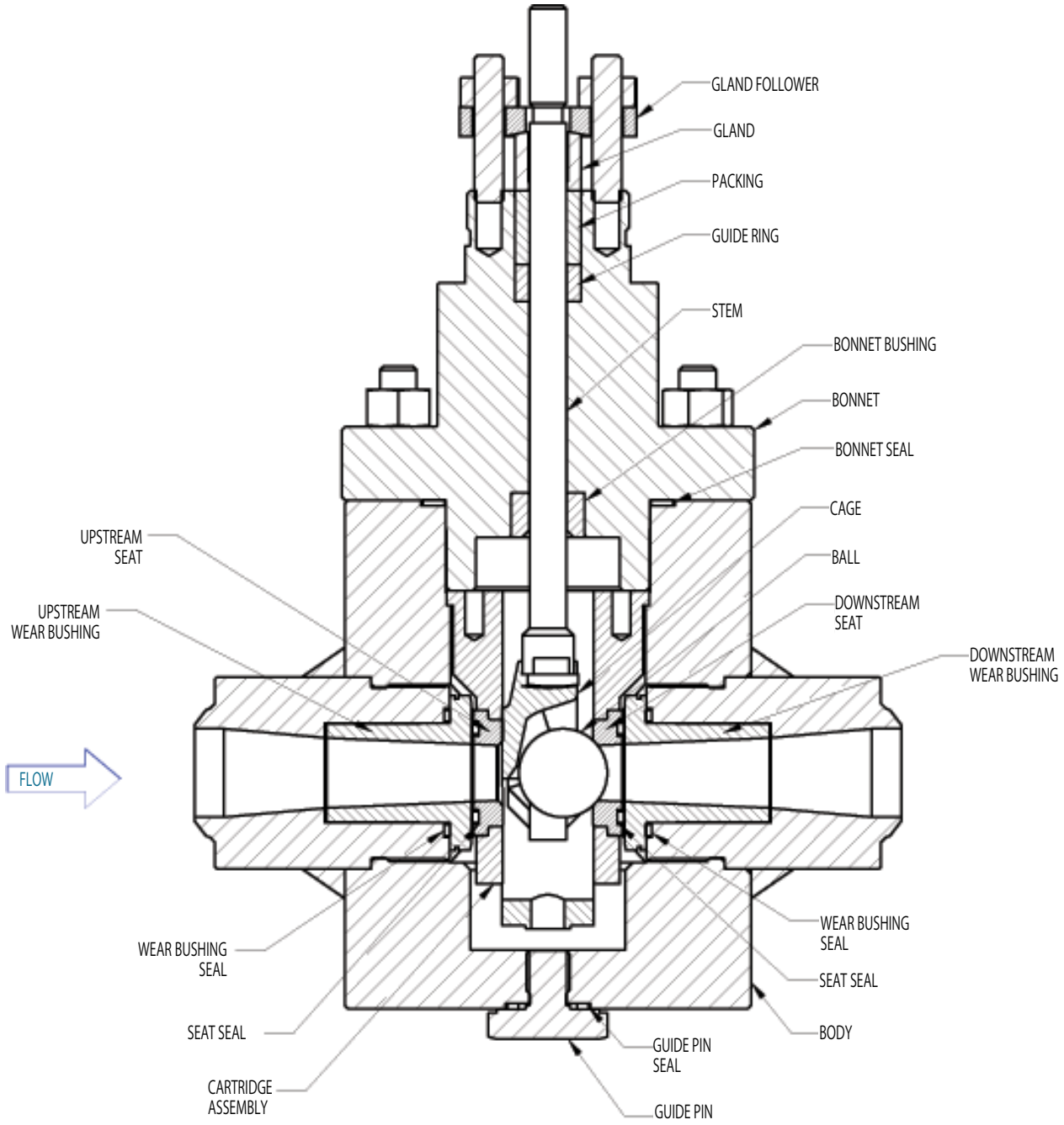
Nomenclature

HI-100® Control Valve



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Our Unique Venturi-Cage Valve

- **Straight-thru Design- solves your performance problems**
  1. Eliminates Damage: Our unique nozzle design smoothes turbulence which eliminates body, trim and piping damage caused by high velocity fluid impingement in your system.
  2. Handles Greater Flow: Since we have no tortuous path through our valve, our valves have a higher Cv than that of the same size valve made by competitors, often saving you money.
  3. Precision Modulation & Control: Our 200:1 turndown ratio and linear flow characteristic gives you precise control over the entire operating range.

- **Unique Trim Design – lowers your cost of ownership**
  1. In-Line Repair: All styles can be repaired in-line without the need for expensive special tools saving you time and money.
  2. Long Life: Our trim design uses wear components at the critical places along the flow path maximizing design life for the application.
  3. Low Replacement Costs: Our unique ball, cage and wear bushing design allows you the flexibility to replace only the worn parts, lowering your cost of repair significantly when compared to our competition.

- **Wide Application Range- can be used in nearly any service**
  1. ANSI 150 to 4500: Handles all ANSI applications, pressures up to 16,000psi and temperatures from -425°F to 1900°F.
  2. Liquid, Gas, Steam, Slurry: Our non-tortuous path design handles liquids, gases, steam (including mixed phase flow), abrasives and many slurry applications.
  3. Materials: Standard body materials are Carbon, Alloy and Stainless Steel. High nickel and exotic alloys are also available – any weldable alloy that is available as a forged material can be used.

- **Venturi Nozzle Design – reduces turbulence in your piping system**
  1. Cavitation Control: Our nozzle design controls cavitation and reduces the associated noise and vibration.
  2. Particulate and Mixed Phase Flow: Our nozzle design moves particles and water droplets to the middle of the flowstream avoiding costly damage.
  3. Prevents Erosion: Our nozzle design smoothes the flow and reduces the potential for valve body and pipe erosion.

- **Class V Shutoff**

- **Actuation** – The actuator (Linear: pneumatic, hydraulic, electric etc.) and accessories (positioners, limit switches, manual over-rides, etc.) of your choice can be mounted on the valve.

DFT® HI-100® Applications

Aerospace
- Air
- Fuel Oil
- Gas
- High Pressure Water with fines
- Methane Vapor

Chemical
- Abrasive Slurry Control
- Hot Hydrogen Gas
- Pitch Blend Control
- Powerhouse Applications
- Super Critical Water Oxidation

Government/Military Test
- Air
- Cryogenic
- Nitrogen Gas
- Steam
- High Pressure Water

Power
- Bottom Ash
- Condensate Drain
- Drum Emergency Blowdown
- Drum Level Control
- Feedwater Control
- Feedwater Recirculation
- Fuel Oil Control
- Geothermal Water Injection
- Power Operated Relief
- Soot Blower Control
- Spray Control (Attemperator, Reheat/Superheat)
- Steam PRV
- Thermal Drain
- Turbine Bypass
- Turbine Steam Extraction

Refinery
- Abrasive Slurry Control
- Amine Service
- Butadiene
- DEA
- Desulphurization Sour Water
- H2S, NH3, Hydrocarbon
- Hydrocarbon Sluicing
- Level Control
- Pitch Blending Control
- Platinum Catalyst Slurry
- Quench Water to Coker
- Sour Water
- Sulfur Recovery Throttling Valve

Pipeline
- Gas Plant Pigging
- Pipeline Control

Petrochemical
- Heavy Oil Upgrading

Pulp & Paper
- Powerhouse
- Steam Control

Steel
- Powerhouse

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Codes & Standards

ANSI B16.5 – Pipe Flanges & Flanged Fittings
ANSI B16.10 – Face to Face & End to End Dimensions of Valves
ANSI B16.34 – Valves – Flanged, Threaded & Welding Ends
ANSI/FCI 70-2 – Control Valve Seat Leakage – HI-100® & Ultra-Trol® seat test
ANSI/ISA 75.01 – Flow Equations for Sizing Control Valves
ANSI/ISA 75.08.01 Face-to-Face Dimensions for Flanged Globe-Style Control Valve Bodies - LSV-100™
API 598 – Valve Inspection & Testing – Uniflo® seat test
MSS-SP 25 – Standard Marking System for Valves, Fittings, Flanges & Unions

Sizing DFT Control Valves

DFT® Control Valves are sized using standard ISA sizing formulae for liquid, gas and steam applications.

Please complete the Application Data Sheet on page 10 so that we can specify the proper valve for your application. Additional information concerning any valve that is being replaced by our valve such as the Cv of that valve and the original data sheet can be used to effectively specify the proper valve as well

Accessories

The following accessories are available for the DFT® Control Valves			
ACTUATORS	**ACTUATOR ACCESSORIES**	**PACKING**	**SPECIAL TRIM**
Pneumatic Diaphragm	Air Filter Regulator	Graphite	Feedwater
Pneumatic Piston	Air Set	Teflon® (CVH)	Steam
Electric	Limit Switches	Live Loaded	Catalyst
Electro-Hydraulic	Manual Override	Emission Compliant	Slurry
Hydraulic	Positioner		
Manual	Solenoid		
	Transducer		

FAX OR SCAN AND EMAIL THIS COMPLETED FORM TO THE FACTORY

SEVERE SERVICE CONTROL VALVES
APPLICATION DATA SHEET

DFT Rep:		DFT Quote #:	

Highlighted items are required information

CUSTOMER:		CUSTOMER REFERENCE #:	
ADDRESS:		RESPONSE DUE DATE	
		REQUIRED DELIVERY:	
CONTACT:		PHONE:	
EMAIL:		FAX:	

General

1	End User		
2	Application		
3	Tag Number		
4	Inlet Pipe		Size/schedule
5	Outlet Pipe		Size/schedule
6	Pipe Material		

	Valve Type		Choose From:
7	Style		Hi-100™, Ultra-Trol™, UniFlo™
8	Material		A105,F22,316, * other
9	End Connections		RF, RTJ, BW, SW, * other
10	Pressure Class		
11	Entry		Top or Bottom
12	Orientation		Horizontal, Vertical, * other
12.1	Flow Direction		Right-Left; Left-Right

	Trim		Choose From:
13	Type		Std, Steam, Feedwater, *other
14	Packing		Teflon®, Graphite, *other
			Live Load, Emission Compliant
15	Seals		Spiral Wound; O-ring; *other

Process Data

18	Fluid (water/steam etc)				
		Operating Conditions			
		Min	Normal	Max	Units
19	Inlet Pressure				
20	Outlet Pressure				
21	Flow Rate				
22	Temperature				
	Fluid properties (if known)				Units
23	Specific Volume				
24	Specific Gravity				
25	Density				
26	Vapor Pressure				
27	Viscosity				

	Valve Design Conditions		Units
28	Pressure		
29	Temperature		
30	Max Differential Press.		

Process Notes

31	Service Type		Modulating; On/Off
32	Cycles per day		

	Actuator		
16	Choose Type		Model Required
16.1	Air		
	Min psig avail.		
16.2	Electric		
	Volts AC/DC		
16.3	Hydraulic		
	psig		
	Capacity (gpm)		
16.4	Manual		
17	Failure Mode		Open/Close/In Place

	Actuator Accessories		
33	Manual Override		Top; Side; * special
34	Positioner		Digital/EP/Type
	Signal		3-15 psig; 4-20 mA
35	Solenoid		Type/Model/Voltage
36	Limitswitch		Quantity/Location
	*Notes		Type/Model/Voltage
37	Air Filter Regulator		
38	Gages		
39	Special		Add to notes

	Notes

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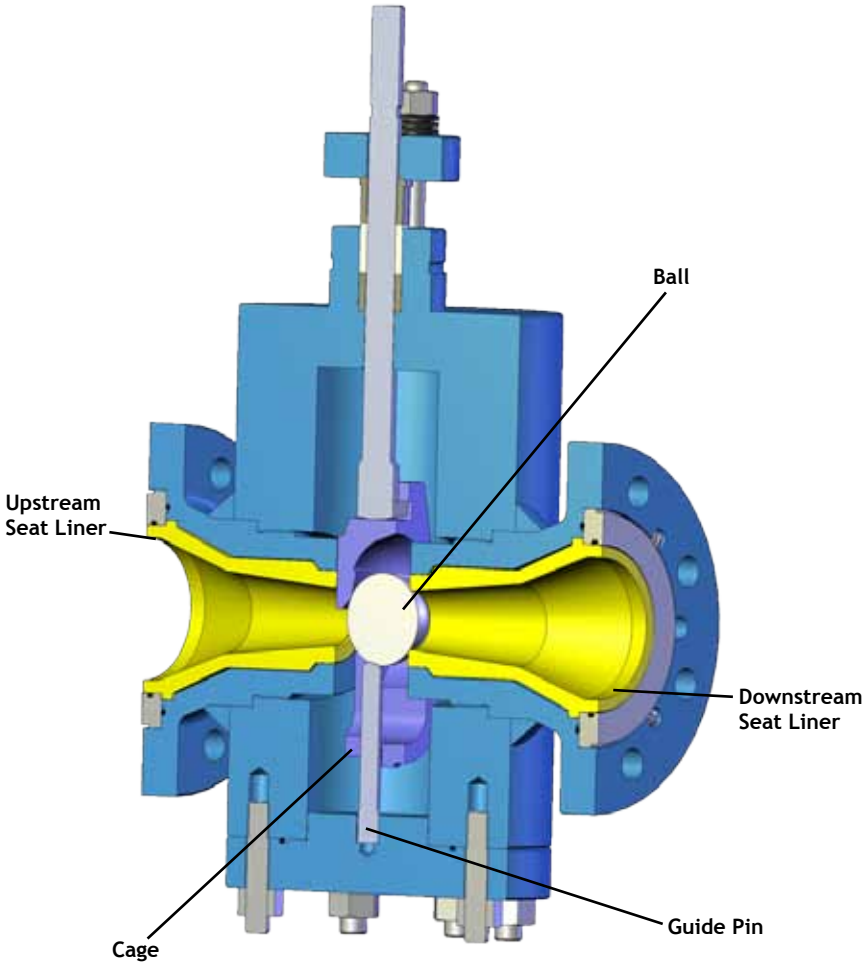
DFT® ULTRA-TROL®

The DFT ULTRA-TROL features hardened sleeves for slurry applications. This style valve is designed for flanged end applications and bench replacement of the seat insert. The internal design is the same in-line venturi flow design used for the Hi-100. The control element, a spherical ball, is contained by a cage which positions it relative to the downstream seat. Stem travel is linear and operating thrusts are low. The result is excellent control in tough environments. The ball, cage and stem can be replaced in-line through the bottom cover.



FEATURES:

- Straight-thru design
- 1/2" to 6"
- Carbon Steel, Alloy Steel Stainless and High Alloys
- ANSI RF, RTJ or DIN Ends
- Linear Characteristic
- Hardened Sleeves
- Temperatures: -425° F to 1000° F
- Bench Repair
- Manual, Pneumatic, or Electric
- Low Operating Thrust
- Bottom Entry

Ultra-Trol Maximum Flow Coefficient										
Size NPS	1/2	3/4	1	1 1/4	1 1/2	2	2.5	3	4	6
Size DN	15	20	25	32	40	50	65	80	100	150
Cv (Kv)	4.5(3.9)	10(8.6)	20(17)	31(27)	45(39)	80(69)	125(108)	180(155)	320(275)	720(621)

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Trim Type		Description	Service	Leakage	Trim characteristic
LSV-100™ Top Guided Trim		Top guided, unbalanced, single seat trim. This style trim is suitable for pressure drops up to 600 psi in a non-cavitating environment. Your most economic choice for standard control applications.	Up to 6" Standard Class 150 Class 300	Class IV	Fast Opening Linear Equal %
LSV-200™ Cage Guided Trim		Cage guided balanced and unbalanced trim. This is the preferred trim style for modulating control when moderate flow rates exist. The balanced trim is used for sizes over 2" to reduce actuator force requirements.	Up to 6" Standard Class 125/150 Class 250/300 Class 600	Class IV, Class VI Optional	Linear Equal %
MSV-100™ Venturi Ball Design		Our unique venturi ball design provides superior control, long life and low maintenance costs for moderate pressure drop applications. The MSV-100 is designed for flanged applications. Seat replacement is accomplished on the bench.	Up to 8" Moderate Class 600 Class 900 Class 1500	Class V	Linear
Hi-100® Venturi Ball Design		This unique venturi ball design provides superior control, long life and low maintenance costs for severe pressure drop applications. The Hi-100 is designed for in-line repair using quick change trim.	Up to 12" Severe All Classes	Class V	Linear

Warranty

Each DFT ®Inc. product is warranted against defects in material and workmanship for a period of one year after being placed in service, but not exceeding 18 months after shipment, when these products are properly installed, maintained and used within the service and temperature and pressure ranges for which they were designed and manufactured, and provided they have not been subject to accident, negligence, alteration, abuse, misuse or the like. This warranty extends to the first purchaser only. All defective material must be returned to the person from whom you purchased the product, transportation prepaid, free of any liens or encumbrances and if found to be defective will be repaired free of charge or replaced, at the warrantor's or DFT's option.

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