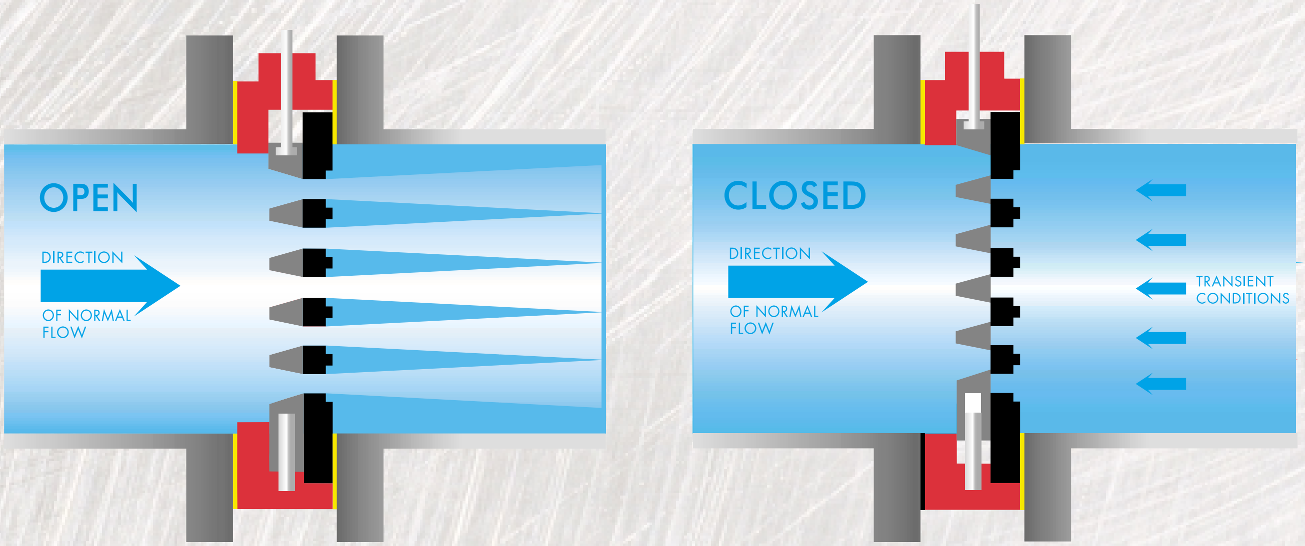
ESTABLISHED 1991

STEALTH INTERNATIONAL INC.

The "Application Solution" Company®

SONICFLOWVALVE

ENERGY DISSIPATING VALVE



MODEL IBC (WAFER)

HIGH VELOCITY • HIGH DELTA P

DESIGN ADVANTAGES

The **Stealth Sonic Flow Valve Model IBC** manual, hydraulically or electrically operated flow control valves are specially designed for extremely high velocity and high pressure drop applications. Their effectiveness is due to the large number of engineered orifices into which the flowing media is divided creating a specified throttling effect. These jets are evenly distributed over the entire face of the upstream valve plate. The uniform, venturi-jet configuration suppresses unwanted operating hazards such as vibration, cavitation, pressure fluctuations and noise.

OPERATING PRINCIPLE (Bi-Directional)

The simplicity of the **Stealth Sonic Flow Valve Model IBC** is described and illustrated in **Figure A**. Valve plates are fixed (2) and linear (3).

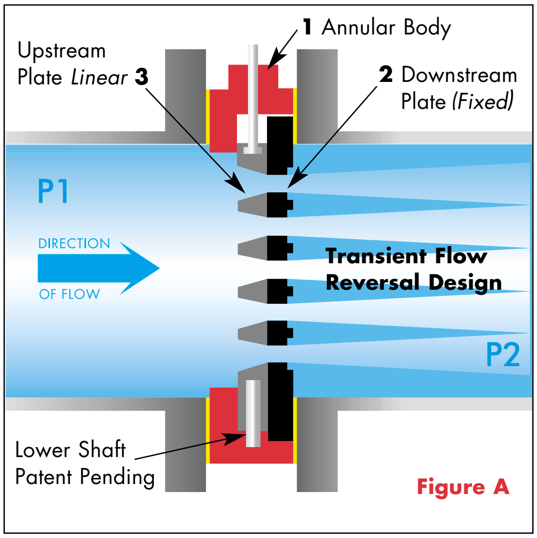


Figure A

Both plates are perforated.

1. An annular body is mounted between pipe flanges.
2. Down Stream Plate is fixed and locked into position.
3. Linear Upstream Plate slides and is guided top and bottom.

In the fully open position, the orifices in the plates are inline. The fully closed position is obtained by displacing the upstream plate. The upstream plate moves vertically the full travel equal to one full orifice diameter. Upward operation is to close the valve.Under specified flow control conditions, the position is intermediate, with the orifices in the fixed plate only partially blocked off by those of the mobile P1 plate. The valve is automated by a control device per the customer's specifications.

FUNCTION

The high velocity dissipation design prevents typical disturbances in the flow. Typically, large fluctuations in flow and Delta P cause vibration of the pipe work, create damaging cavitation (i.e. fluid vapour bubbles), and noise. Noise is caused by the sudden, explosive collapse of cavitation or bubbles.

In **Stealth Sonic Flow Valves**, energy dissipation is controlled by multiple, evenly distributed jets into which perforated plates divide the flow equally. Uncontrolled fluctuations of flow are reduced due to the jet induction port design.

The distance in which the energy is dissipated is linear in a short distance and controlled relative to positioning in the downstream pipe.

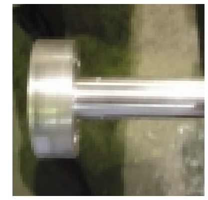
Stealth Sonic Flow Valves have cavitation inception figures which are more desirable than conventional control valves.

Cavitation does not create a hazard within the valve or downstream. This condition exceeds the typical performance of conventional control valves where cavitation is frequently observed within the body or downstream. Vapour cavities are not created when **Stealth Sonic Flow Valves** are properly sized, eliminating pressure oscillation risks.

Stealth Sonic Flow Valves do not have a tendency to open or close under flowing conditions typically found in butterfly valves, due to the unique Stealth Anti-Hydraulic lift design in the lower shaft.

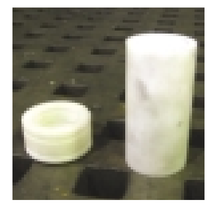
FEATURES	BENEFITS
1. Capable of transient conditions and reversal of flow (Patent Pending)	1. No damage to the upstream plate or actuator
2. Guided P1 plate (lower shaft)	2. No possibility of misalignment (Bi-directional)
3. Eliminates cavitation	3. No damage to pipe or valve internals
4. Short operation of travel and reduced thrust	4. Smaller actuation package
5. Low co-efficient of friction barrier on both mating surfaces	5. Lower torque, reduced wear on mating surfaces
6. Thicker plate construction coated and hardened	6. Reduced plate deflection and reduced wear with lower frictional thrust required
7. Blow-out-proof stems (upper and lower)	7. Shafts are locked in place and maintain their full diameter
8. Manual or automated control	8. Full control packages
9. Anti-corrosion ring	9. Ease of removal of the fixed plate
10. Taper ring	10. Noise reduction during bi-directional conditions
11. Valve shafts can be mounted vertically or horizontally due to lower shaft guiding	11. Accommodates all piping configurations
12. Stainless steel bearing Journals	12. Corrosion free surface for seals and packing
13. Lower shaft	13. Prevents disc shift, allows for horizontal mounting and intermittent bi–directional flow
14. Fixed plate dielectric link	14. Allows for ease of disassembly of the fixed plate. Eliminates corrosion and fixed plate seizure
15. Visual Indication	15. Independent adjustable manual indication in the event of actuator adjustment or removal
16. Retained chevron packaging	16. 'O'-Ring seals are replaceable under pressure
17. Non–metallic bearings	17. No corrosion in the upper body or the linear plate lower shaft bore
18. Taper ring	18. The taper ring incorporates a dielectric link with a low coefficient of friction with the linear plate. The design allows for intermittent bi–directional flow or transient conditions. This taper ring also eliminates corrosion or seizure during long periods of valve inactivity
19. Removable O–Ring seals	19. 'O'-Ring seals are removable in the upper and lower shafts without valve removal or system depressurization
20. Disc lifting holes	20. For ease of disassembly and assembly
21. Asymmetric design	21. Ease of assembly to ensure proper orientation of the upper and lower plates
22. Double T–shaft design	22. Allows for horizontal mounting and operation

Stainless Steel Bearing Journal

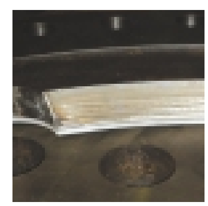


Lower Shaft

Fixed Plate Dielectric Link



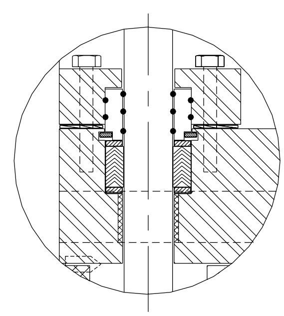
Non-Metallic Bearings



Taper Ring

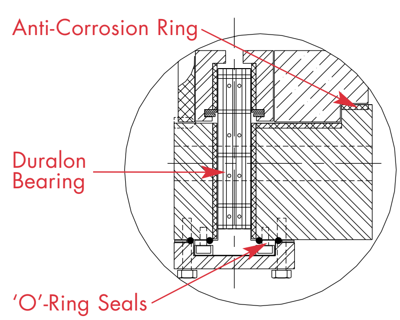
Top Stem Packing and Seal Detail (Patented)

The patented stem seal allows for bushing and 'O'-Ring replacement, while under pressure. The self-adjusting chevron packing is live loaded and internally retained. Adjustment is not required and the chevron packing is maintenance free. No lubrication is required. The 'O'-Ring seals are self contained, dynamic and static, housed in a non-corrosive, non-metallic bushing that also maintains the loading on the chevron packing.



Bottom Stem and Seal Detail (Patent Pending)

The lower stem maintains the moving linear plate in any position during intermittent bi-directional conditions. The unique stem design incorporates relief ports, eliminating hydraulic lift or position lock. The stem is guided in a Duralon bearing, eliminating shaft journal corrosion. Sealing is maintained with static 'O'-Ring seals with the stem bolted in place. A secondary security cap is bolted and sealed to ensure a positive seal, requiring no adjustment. The body retaining step for the fixed plate incorporates an anti-corrosion ring that permits easy removal of the fixed plate should disassembly be required.



TYPICAL REQUIRED FEATURES

Feature	Stealth Sonic Flow Valve
Double Plate Design	Yes
Upward Operation to Close	Yes
Hardened Plates	Yes (standard)
Manufactured in Canada	Yes
Obsolete Designs	None
Standard Design – All Sizes	Yes
Bi-Directional Capabilities Flow Reversal	**Yes
Lower Shaft and Seals	*Yes
Replaceable Seals Under Pressure	*Yes
RTFE Taper Rings – Carbon Steel Delron Backed	Yes
Patented Rotary Seal System	Yes
Anti-Hydraulic Lift	**Yes
Body Coatings to NSF	Standard
1st Plate Anti-Corrosion Ring for Field Replacement or Inspection in Body	Yes
Backup 'O'Ring Shaft Seals – Replaceable Under Pressure	*Yes
Optional Materials – (316SS, 42OSS, 17-4PH)	Yes

*Patented **Patent Pending

SUGGESTED SPECIFICATIONS

Body: All bodies shall be cast Ductile Iron 65-45-12 or fabricated Carbon steel. MTR's shall be submitted at time of shipment. All bodies shall be epoxy coated internally and externally per the paint specification as indicated. All bodies shall incorporate identification plates in Brass or stainless steel indicating the maximum pressure, temperature, date of manufacture, and SO number for full traceability. All bodies shall incorporate lifting lugs for vertical and horizontal lift. The lifting lugs shall not penetrate the diameter or radius of the valve body. All lifting ears shall be cast in the body. Cast mounting ears for actuators is unacceptable. All mounting pad surfaces shall incorporate a machined or milled surface to ensure mounting concentricity. All bodies shall incorporate 316 stainless steel packing and seal body journals. Bodies shall be available in wafer, lug and full-flanged configurations.

Fixed Discs: All fixed discs shall incorporate a dielectric link between the body and disc to prevent corrosion. All fixed discs shall be recessed in the body and supported by the disc step in the body and downstream flange. All discs shall be capable of horizontal mounting when specified and incorporate non-corrosive dowels to prevent rotation allowing for field disassembly when required. All discs shall be designed with zero deflection under maximum pressure. The fixed disc shall be 420 stainless steel with a Rockwell of 45-55. The fixed disc shall incorporate an asymmetric located groove to ensure accurate placement of the holes relative to the linear disc and dual shafts. All discs shall be surface ground for the mating linear disc with tolerances not exceeding three thousands of an inch. Fixed discs shall incorporate lifting holes to permit field disassembly and assembly.

Linear Discs: All discs shall be surface ground for the mating fixed disc with tolerances not exceeding three thousands of an inch. All linear discs shall incorporate a T shaft connection designed with zero tensile deflection for lift or thrust under full pressure. All lower shaft bores shall incorporate non-metallic non-corrosive bearings the full length of the bore for shaft engagement. All linear discs shall incorporate the anti-hydraulic lift mechanism in the lower shaft. All discs shall be capable of horizontal mounting when specified with Lower T shafts. The disc or body shall incorporate non- corrosive, non-metallic guides to support the disc in the horizontal position when required. The disc shall be 420 stainless steel with a Rockwell of 45-55. Linear discs shall incorporate lifting holes to permit field disassembly and assembly. All linear discs shall operate within a machined groove in the body and travel in the fully open and closed position aligning with all holes in the fixed disc. The disc shall not contact the upstream side of the body groove. All linear discs shall incorporate a taper ring incorporating a non-corrosive non-metallic friction plate and capable of intermittent bi-directional flow.

Shafts: All shafts shall be of solid one-piece construction. Material shall be 316 stainless Steel ground and polished. Lower shafts shall incorporate milled grooves to prevent hydraulic lift of the disc.

Lower Shafts: All lower shafts shall be ground and milled incorporating an O-Ring seal with a solid thrust hub bolted to the body of the valve. All lower shafts shall incorporate an outer thrust Cap with an O-Ring and seals capable of field replacement without shaft removal or depressurizing the piping system. The lower cap seal and O-Ring shall be field replaceable under flowing conditions without taking the valve out of service.

Upper Packing & Seals: All upper shaft packing shall be chevron housed in a 316 stainless steel chevron body journal. The chevron shall be retained by a floating internal C-Clip and live loaded by a floating ring and upper seal bearing. The O-Ring seals shall be housed in a non-metallic non-corrosive bearing. The bearing shall house two dynamic and two static O-Ring seals. Both static O-Rings shall be in full contact with the 316 stainless steel journal housing. The bearing and O-Rings shall be field replaceable under flowing conditions without valve removal or system depressurization. The upper bearing will also live load the packing under normal operational conditions and be retained by a 316 stainless steel bearing cap.

Indication: All valves shall have manual visual indication on the mounting housing for the actuator. A scale shall be provided for 10 percent increments from the fully open and closed position. The indicator shall be adjustable for re calibration should the valve be field adjusted.

Shaft Adjustment: The valve shaft shall be full adjustable with a actuator or shaft extension coupling. The coupling shall incorporate an indicator that will operate in any orientation and be tamper proof.

All removable components and hardware shall be 316 stainless steel. All valves shall be manufactured in Canada. Patent designs will be considered and infringements on designs will not be accepted. All valves shall be manufactured by Stealth International Inc or reviewed equivalent.

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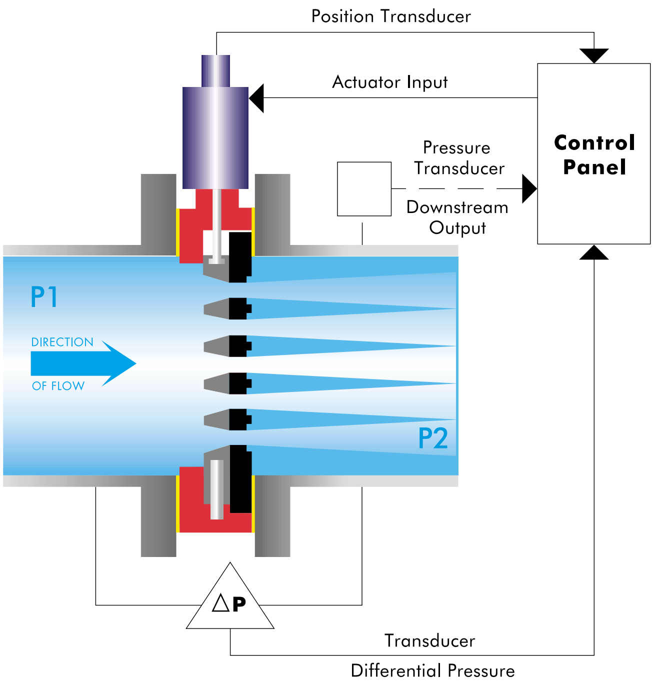
IBC Cv VALUES											
	Percent of Valve Opening										
Size	**100%**	**90%**	**80%**	**70%**	**60%**	**50%**	**40%**	**30%**	**20%**	**10%**	**5%**
4	170	160	130	90	60	50	30	20	10	5	1
6	390	370	280	210	105	140	70	50	30	10	5
8	680	660	495	380	250	190	125	80	50	15	10
10	1070	1020	790	610	400	400	190	130	70	30	12
12	1540	1470	1090	840	565	430	280	190	100	40	15
14	2180	2080	1480	1150	770	590	380	250	140	60	20
16	2670	2560	1980	1520	990	760	495	320	180	70	30
18	3270	3110	2530	1910	1270	970	630	410	230	80	35
20	4260	4060	3170	2425	1590	1200	770	500	275	130	50
24	6140	5860	4560	3460	2230	1690	1090	730	420	175	65
30	9650	9200	7230	5200	3565	2525	1760	1150	650	250	90
36	13860	13210	9900	8180	5050	3740	2525	1620	910	380	150
42	18320	17475	13360	9700	6830	5050	3370	2220	1240	490	180
48	24750	23530	17820	12730	9110	6670	4455	2830	1680	670	250
54	30690	29190	22770	16160	11390	8490	5740	3740	2180	810	300
60	37920	36160	27720	19700	14160	10400	6930	4650	2580	1070	400

REQUIRED INFORMATION

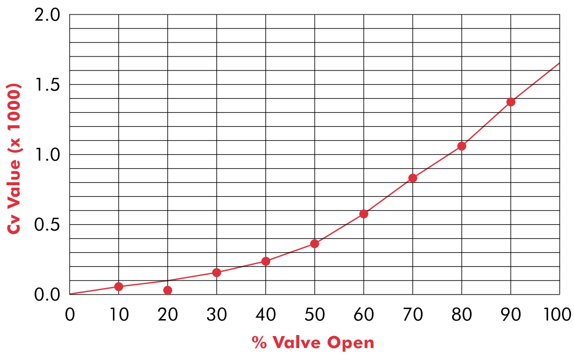
For Application calculations of IBC Valve and Actuator Sizing, allowable cavitation factor, the following information is required:

- Upstream pressure and downstream pressure at minimum flow
- Maximum and minimum upstream pressure
- Sketch of pipe system at the valve
- Type of actuator and power available
- Control signals and feedback requirements



CV vs. PERCENTAGE OPEN

Cv = Flow in GPM with a 1 PSI pressure drop



HYDRAULIC CHARACTERISTICS

CAVITATION

The tendency of a valve to cavitate is usually characterized by a cavitation number defined as:

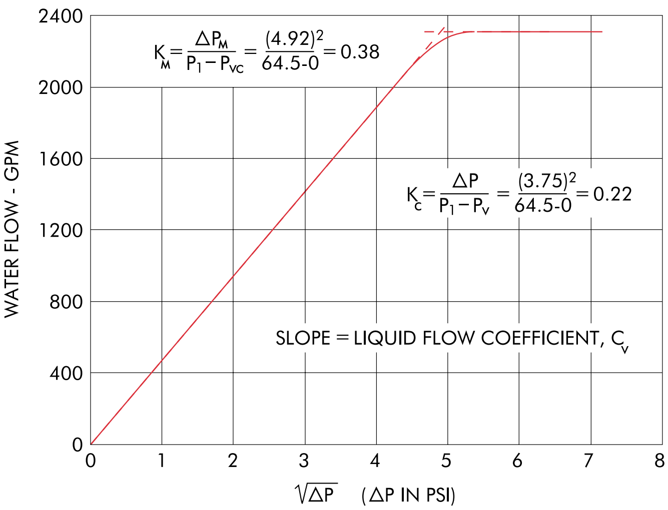
Where,

- **P_1** = absolute upstream pressure measured in practice one pipe diameter above the valve, valve inlet pressure in PSIA
- **P_2** = absolute pressure measured 10 pipe diameters below the valve and corrected for friction losses between points 1 and 2, valve outlet pressure in PSIA
- **P_v** = vapour pressure of the liquid at the operating temperature at the valve inlet in PSIA
- **K_c** = cavitation index or dimensionless

These pressure values are generally expressed as liquid metres of head. Some valve manufacturers utilize a cavitation number defined as:

$$K_c = \frac{P_1 - P_2}{P_1 - P_2} \quad \textbf{OR} \quad K_c = \frac{\Delta P}{P_1 - P_v}$$

CAVITATIONAL INDEX



Typical Test Curve showing **K_c** and **K_m** points.

Cavitation is the implosion of vapour bubbles which form in a flowing liquid when the pipeline pressure at some point decreases to below the vapour pressure of the liquid. The implosion is caused by a subsequent increase in pipeline pressure point to a value exceeding the vapour pressure of the liquid. Valves located in pipelines are a common cause of cavitation due to the increased velocities and lowered pressures caused by their effect on the flowing fluid.

CAVITATION (continued)

Cavitation caused by valves is mathematically predictable via the equation:

$$\Delta P_{MAX} = F_1^2 (P_1 - F_F P_V)$$

Reference Material: ISA (Instrument Society of America) Handbook Second Edition

- **ΔP_{MAX}** = pressure drop at which damaging cavitation occurs
- **F_1** = liquid pressure recovery factor based upon valve type and travel
- **P_1** = inlet pressure - (PSIA)
- **F_f** = liquid critical pressure ratio – dimensionless
- **P_v** = liquid vapor pressure – PSIA

WATER HAMMER

$$T_m = \frac{LV}{18\Delta P}$$

- **T_m** = minimum closing time in seconds
- **L** = pipe length in feet from the tank or closure upstream to the automated valve in question
- **V** = velocity at inlet in ft/sec under normal conditions
- **P** = maximum pressure rating of valve in PSI in the closed positions

HEAD LOSS

The pressure drop caused by flow through **Stealth Sonic Flow Valves** is written as:

$$\Delta H = k_c \frac{V_2}{2g}$$

Where,

- **ΔH** = the pressure drop in water column metres at a given valve opening,
- **k_c** = the (dimensionless) head loss co-efficient at the same valve opening,
- **V** = the velocity of the liquid in metres per second computed on the basis of the nominal flow section of the valve,
- **g** = gravitational acceleration in metres per second squared.

SPECIFIC FLOW

Specific flow is defined as the flow passing through a one-metre diameter **Stealth Sonic Flow Valve** which causes a head loss equal to one metre head of flowing liquid. Specific flow q11 may be written in terms of head loss as:

$$q = \frac{Q}{D^2 \sqrt{\Delta H}}$$

Where,

- **q** = specific flow in m3/s at a given valve opening, the total flow passing through the valve in m3/s,
- **Q** = the total flow passing through the valve in m3/s,
- **ΔH** = the head loss in water column metres liquid at the same valve opening,
- **D** = is the nominal **IBC** diameter in metres.

In the fully open position, the specific **q** of a **Stealth Sonic Flow Valve** with maximum perforated area installed in a pipe whose diameter is equal to the nominal diameter of the valve is 1.3 m3/s. The specific flow value drops to 0.95 m3/s for an end-mounted valve.

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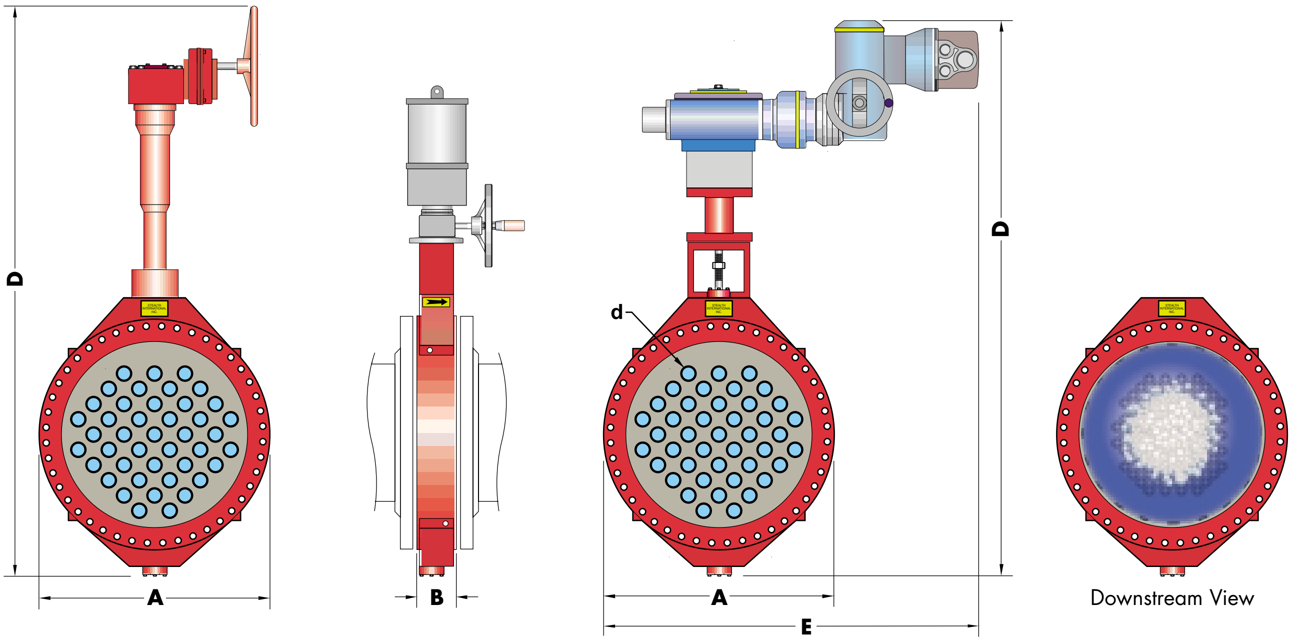

(M) Manual **Hydraulic/Pneumatic** **(E) Electric**

NOTE: All Dimensions are approximate and subject to design modifications

MODEL IBC Dimension & Weights										
									WEIGHT	
Size	DN	Act.	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	d	KG	LBS
4″	100	M	228	100	250	390	–	7	13	28
4″	100	E	228	100	383	480	290	7	31	68
6″	150	M	279	100	250	516	–	11	23	51
6″	150	E	279	100	383	580	320	11	44	97
8″	200	M	342	100	250	587	–	15	40	88
8″	200	E	342	100	383	645	350	15	53	117
10″	250	M	406	100	315	727	–	18	64	142
10″	250	E	406	100	475	795	377	18	92	203
12″	300	M	482	150	400	757	–	22	91	200
12″	300	E	482	150	475	850	400	22	228	503
14″	350	E	533	150	500	920	400	25	137	300
14″	350	M	533	150	500	920	400	25	181	398
16″	400	M	596	150	500	943	–	29	170	375
16″	400	E	596	150	400	1160	602	29	247	545
18″	450	E/M	635	150	500	1440	845	33	394	865
20″	500	E/M	698	150	580	1720	900	36	552	1217
24″	600	E/M	812	200	580	1840	960	43	644	1420
28″	700	E/M	927	200	580	1920	1010	50	690	1521
30″	750	E/M	984	200	580	1990	1170	54	729	1603
32″	800	E/M	1060	200	580	2040	1060	58	805	1775
36″	900	E/M	1168	200	580	2150	1120	65	920	2029
40″	1000	E/M	1289	200	580	2280	1170	72	1035	2282
42″	1050	E/M	1346	200	580	2350	1280	79	1105	2431
48″	1200	E/M	1511	200	580	2460	1280	87	1265	2789
54″	1350	E/M	1682	250	580	2670	1380	102	1610	3550
60″	1500	E/M	2032	250	580	2770	1440	109	1955	4311

Dimensions and weights are approximate and for reference only, subject to change.
Please request certified drawings once actuation has been determined.
Dimensions based on 150 lb flanges in sizes 4″ (100mm) through 28″ (700mm) and 32″ (800mm) through 60 (1500mm) AWWA Table 3 Class E steel hub flanges

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SONICFLOWVALVE – Model IBC

STANDARD MATERIALS OF CONSTRUCTION

Body:	A-36 Carbon Steel/Ductile Iron
Fixed Plate:	AISI 420
Moving Plate:	AISI 420
Support:	A-36
Stem:	316 Stainless Steel
Flange and Stem Seals:	70 Shore-hardness, BUNA-N or Viton®

OPTIONAL

Ductile Iron, 316SS
17-4PH, 316SS

All 420 material is hardened to a Rockwell hardness of between R40 to R50. Other materials can be hardened.

MOUNTING

Stealth Sonic Flow Valves are designed to be mounted between all pipe flanges. Stealth ensures alignment with locating lugs on the valve body. Dead end mounting is achieved with the use of a mandatory downstream flange.

TEMPERATURE	°C	°F
MINIMUM:	-20	-4
MAXIMUM:	500	932
OPERATING:	0–250	32–482

OTHER RELATED PRODUCTS AND SERVICES

- **Ross**® Valve WaterTamer
- **Crispin**® Air and Vacuum Release Valves
- Stealth Damper Valves
- Stealth Deflector Valves
- **Crispin**® Check Valves
- Stealth Pedestals and Shaft Extensions
- Stealth Torque Tubes
- Stealth Priming Systems
- Stealth Rod Extensions
- Automation and Mounting
- Self-cleaning Automatic Strainers
- Stealth Knife Gate Valves
- **Pratt**® AWWA Valves

INSTALLATION

The valves may be installed in both vertical and horizontal pipes. In vertical pipes the flow should preferably be downward. Valves mounted horizontally should be placed with the actuator at the 12 o'clock position. Valves will operate with the shafts mounted vertically or in the horizontal position. Horizontal mounting must be specified prior to manufacturing. Plate shoes must be incorporated.

RATING

150 PSIG/300 PSIG

APPLICATIONS

Primary control variables include flow rate, inlet pressure, temperature, elevation and specific gravity.

- **Water supply systems**
- **Industrial flow, cooling and mixing systems**
- **Head works of water treatment plant**
- **Flow relief for pump and turbine units**
- **Water intake at the foot of a dam**
- **Laboratory test-rigs**
- **Tank discharge free flow conditions**

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