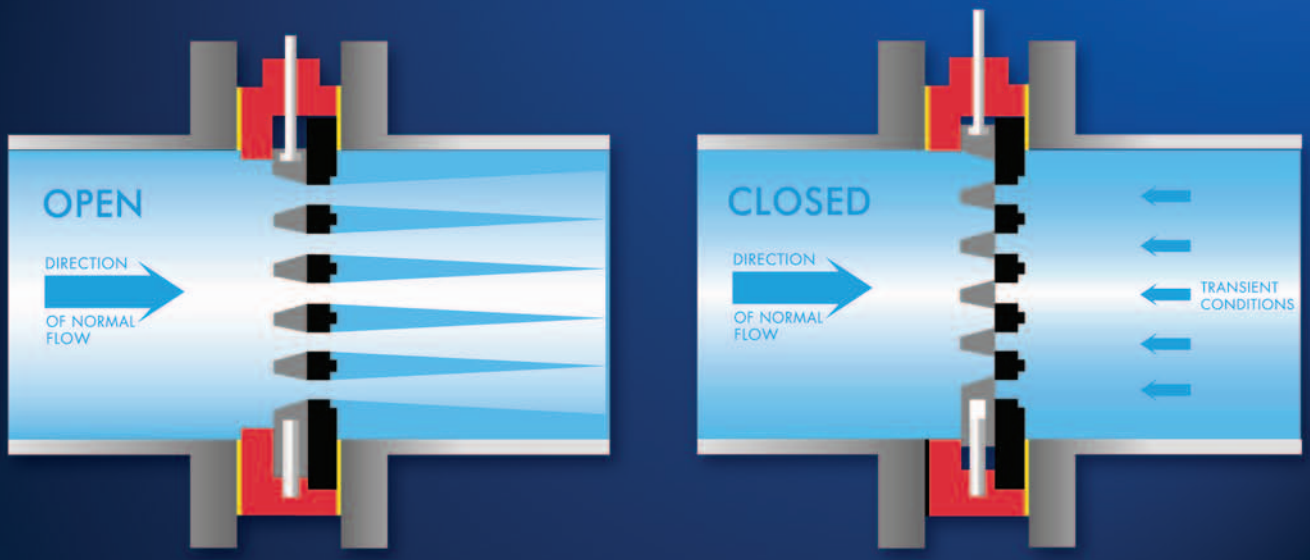
PRATT

Henry Pratt Company

Compact Controllable Energy Dissipater (CCED)



Valves for the 21st Century

Since 1901
PRATT

A Tradition of Excellence

With the development of the first rubber seated butterfly valve more than 70 years ago, the Henry Pratt Company became a trusted name in the flow control industry, setting the standard for product quality and customer service. Today Pratt provides the following range of superior products to the water, waste water and power generation industries.

Butterfly Valves: from 3" to 162"

Rectangular Valves: 1' x 1' to 14' x 16'

Ball Valves —
Rubber Seated: from 4" to 60"
Metal Seated: from 6" to 48"

Plug Valves: from 1/2" to 36", 3 ways

Hydraulic Control Systems

Valve Controls

Energy Dissipating Valves and Fixed Energy Dissipaters

Cone Valves

Check Valves

A Commitment to Meeting The Customers' Needs

Henry Pratt valves represent a long-term commitment to both the customer and to a tradition of product excellence. This commitment is evident in the number of innovations we have brought to the industries we serve. In fact, the Henry Pratt Company was the first to introduce many of the flow control products in use today, including the first rubber seated butterfly valve, one of the first nuclear N-Stamp valves, and the bonded seat butterfly valve.

Innovative Products For Unique Applications

Though many of the standard valves we produce are used in water filtration and distribution applications, Pratt has built a reputation on the ability to develop specialized products that help customers to meet their individual operational challenges.

Creative Engineering for Fluid Systems

Pratt's ability to provide practical solutions to complex issues is demonstrated by the following case histories:

■ Earthquake Proof Valves

Pratt designed and manufactured hydraulically actuated valves for a water storage application so that the valves would automatically operate in the event of earthquakes. This lead to the development of a valve that will withstand forces of up to 6g's.

■ Custom Actuation/Isolation Valves

Pratt designed and manufactured valves that would isolate a working chamber in the event of a nuclear emergency during the decommissioning of armed nuclear warheads. The valves were able to close in a millisecond using specially designed Pratt electro-pneumatic actuators.

■ Valves Designed for Harsh Environments

Pratt designed and manufactured a 144" diameter butterfly valve for the emergency cooling system at a jet engine test facility. The valve was designed to supply water to help dissipate the tremendous heat generated by the engines during testing.

PRATT
Henry Pratt Company

Through experience, commitment and creative engineering, Pratt is uniquely suited to provide superior products for our customers' special needs.
For more information, contact our corporate headquarters in Aurora, Illinois.

PRATT
Henry Pratt Company

401 South Highland Avenue
Aurora, Illinois 60506-5563
www.henrypratt.com
phone: 630.844.4000
fax: 630.844.4160
toll free: 877.436.7977

Table Of Contents

Scope of Line 2

Features & Benefits 3

Design Detail 4

Suggested Specifications 5

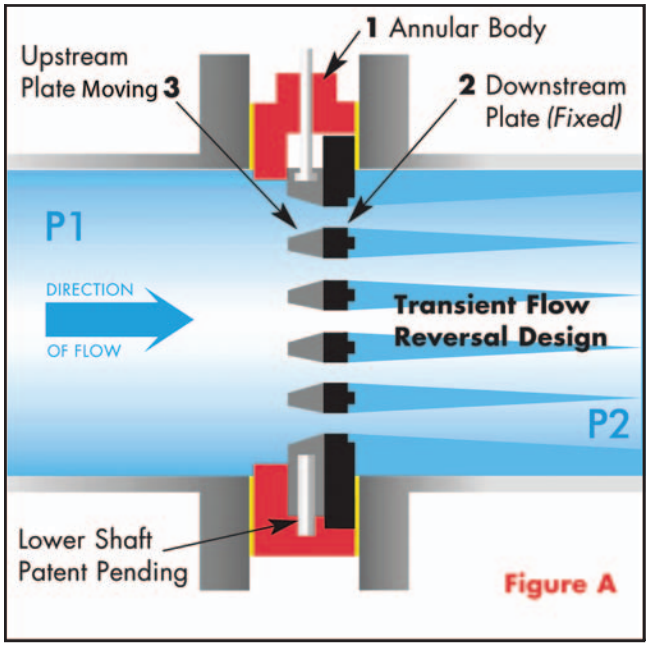
CCED Cv Values 6

Hydraulic Characteristics 7

Dimensions & Weights 8

Scope of Line:
Compact Controllable Energy Dissipater (CCED)

Design Advantages
The Pratt Compact Controllable Energy Dissipater (CCED) is a manual, hydraulically or electrically operated flow control valve is 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 excessive vibration, cavitation, pressure fluctuations and noise.



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

Operating Principal (Bi-Directional)
The simplicity of the Pratt CCED valve is described and illustrated in Figure A. There are two plates – fixed(2) and moving(3). Both plates have perforations that line up when the valve is full open.

The valve is fully closed when the moving plate moves one perforation diameter upward. Under specified flow control conditions the valve open position can be intermediate, with the orifices in the fixed plate only partially open. The valve position is controlled by a valve position feedback device per the customer's specification.

Function
The high velocity dissipation design prevents typical disturbances in the flow. Typically, large fluctuations in flow and headloss cause vibration of the pipe work, create damaging cavitations (i.e. fluid vapor bubbles), and noise. Cavitation is caused by the sudden, explosive collapse of bubbles.

In the Pratt CCED valve, 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, with recovery taking place in a short distance and controlled relative to positioning in the downstream pipe. Pratt CCED valves provide cavitation 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. Vapor cavities are not created when Pratt CCED valves are properly sized, preventing pressure oscillation risks.

Features & Benefits of Pratt Compact Controllable Energy Dissipater (CCED)

Feature	Benefit
■ Capable of transient conditions and reversal of flow (Patented)	■ No damage to the upstream plate or actuator, eliminating linear plate lockup
■ Guided P1 plate (lower shaft)	■ No possibility of misalignment (Bi-directional), allows for horizontal mounting when specified
■ Eliminates cavitation	■ No damage to pipe or valve internals
■ Short operation of travel and reduced thrust	■ Smaller actuation package and overall dimensions
■ Low co-efficient of friction barrier on both mating surfaces	■ Lower thrust, reduced wear on mating surfaces
■ Thicker plate construction coated and hardened	■ Reduced plate deflection and reduced wear with lower frictional thrust required
■ Blow-out-proof stems (upper and lower)	■ Shafts are locked in place and maintain their full diameter
■ Manual or automated control	■ Full control packages, fail safe modulating
■ Anti-corrosion ring	■ Ease of removal of the fixed plate and all components
■ Valve shafts can be mounted vertically or horizontally due to lower shaft guiding	■ Accommodates all piping configurations including submerged service
■ 316 stainless steel bearing Journals	■ Corrosion free surface for seals and packing (Patented)
■ Lower shaft	■ Prevents disc shift, allows for horizontal mounting and intermittent bi-directional flow
■ Fixed plate dielectric links	■ Allows for ease of disassembly of the fixed plate. Eliminates corrosion and fixed plate seizure
■ High visability valve position indication	■ Indicates valve position directly on valve
■ Retained chevron packaging	■ 'O'-Ring seals are replaceable under pressure
■ Non-metallic bearings	■ No corrosive materials in the upper body, non metallic linear bore and lower shaft journal
■ Taper ring	■ The taper ring incorporates a dielectric link with a low coefficient of friction with the linear plate. The design permits intermittent bi-directional flow or transient conditions. This taper ring incorporates a retained di-electric surface, eliminating corrosion or seizure during long periods of valve inactivity
■ Removable O-Ring seals (Patented)	■ 'O'-Ring seals are removable in the upper and lower shafts without valve removal or system depressurization
■ Disc lifting holes	■ For ease of disassembly and assembly
■ Asymmetric design	■ Ease of assembly to ensure proper orientation of the upper and lower plates
■ Double T-shaft design	■ Allows for vertical and horizontal mounting and operation

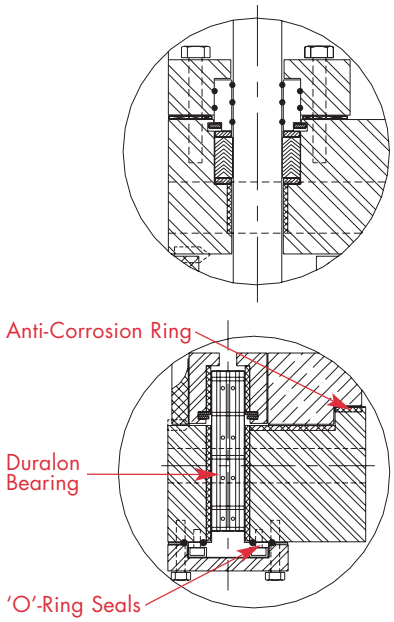
Design Detail

Top Stem Packing and Seal Detail

The 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

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.



ANSI 150/300 Drilling

NOTABLE FEATURES	
Feature	**Pratt CCED**
Double Plate Design	Yes
Upward Operation to Close	Yes
Hardened Plates	Yes (standard)
Bi-Directional Capabilities on Reversal of Flow	Yes
Lower Shaft and Seals	Yes
Field Replaceable O-Rings	Yes
RTFE Taper Rings – Carbon Steel Delron Backed	Yes
Anti-Hydraulic Lift	Yes
Body Coatings to NSF	Standard
Fixed Plate Anti-Corrosion Ring for Field Replacement or Inspection in Body	Yes
Backup Static and Dynamic 'O' Ring Shaft Seals – Replaceable Under Pressure	Yes
Optional Materials – 316 SS (plates), 17-4PH (shaft)	Yes
Horizontal Shaft Mounting	Yes

The above features become a benefit to the end user in terms of performance, ease of maintenance and long design life of the valve.

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 stainless steel indicating the maximum pressure, temperature, date of manufacture, and SO number for full traceability. All bodies shall incorporate lifting pads and hoist rings for vertical and horizontal lifting. The hoist rings 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 are 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 operating 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 moving disc and dual shafts. Fixed discs shall incorporate tapped lifting holes to permit field disassembly and assembly.

Moving Discs: All discs shall be surface ground with the mating disc with tolerances not exceeding three thousands of an inch. All linear discs shall incorporate a T shaft connection designed with zero tensile deflection under full thrust load. All lower shaft bores shall incorporate non-metallic non-corrosive bearings the full length of the bore for shaft engagement. All moving discs shall incorporate the anti-hydraulic lift mechanism in the lower shaft. All discs shall be capable of horizontal mounting. 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 tapped 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 an upstream taper ring incorporating a non-corrosive non-metallic friction plate on the face and perimeter 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 multiple milled linear or spiral 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 high visibility 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 fully compatible with an 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 by Henry Pratt Inc. or reviewed equivalent.

Size (in)	CCED Cv VALUES								
	Percent of Valve Opening								
	100	90	80	70	60	50	40	30	20
6	223	210	177	127	80.5	48.5	27.8	13.0	3.60
8	396	373	314	226	143	86.2	49.3	23.2	6.40
10	618	583	490	353	224	135	77.1	36.2	10.0
12	890	840	706	509	322	194	111	52.1	14.4
14	1,211	1,143	961	693	438	264	151	70.9	19.6
16	1,582	1,493	1,255	905	572	345	197	92.6	25.6
18	2,003	1,890	1,589	1,145	725	437	250	117	32.4
20	2,472	2,333	1,961	1,414	894	539	308	145	40.0
24	4,652	3,897	3,298	2,325	1,541	1,125	712	380	114
30	7,268	6,090	5,153	3,633	2,408	1,758	1,112	594	178
36	10,466	8,769	7,420	5,231	3,467	2,532	1,601	856	256
42	14,245	11,936	10,099	7,120	4,719	3,446	2,179	1,165	348
48	18,606	15,589	13,191	9,300	6,164	4,501	2,846	1,522	455
54	23,549	19,730	16,695	11,770	7,801	5,697	3,602	1,926	576
60	29,072	24,358	20,611	14,531	9,631	7,033	4,447	2,378	711

REQUIRED INFORMATION FOR SIZING

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

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

CCED Applications

RESERVOIR DISCHARGE

Pratt CCED valves are used to control flow and dissipate excess energy from a reservoir outlet. Commonly used in areas with high pressure drop, the CCED can discharge to atmosphere, or to a stilling well to minimize the effects of flow erosion.

TURBINE BYPASS

Where the CCED shows the most benefit is in applications where energy shedding is required. In turbine bypass applications the elimination of pressure sures typically associated with turbine shut down can be achieved with the CCED valve. Also, the compact design makes this valve the most applicable where installation footprints need to be minimized.

PRESSURE REGULATION

In lieu of traditional pressure reducing valves, the CCED benefits the user through higher flow rates at greater pressure drops, and the elimination of maintenance issues related to most globe style PRV's.

TANK LEVEL CONTROL

When used for water level control, the compact design of the CCED valve allows designers to place storage tanks in closer proximity thus minimizing land requirements.

Hydraulic Characteristics

CAVITATION

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

P_1 = Upstream head; PSI

P_2 = Downstream head; PSI

ΔP = $P_1 - P_2$ = Headloss across valve; PSI

P_v = Adjusted water vapor pressure (-14.2 PSI) at sea level

C = Cavitation constant; dimensionless

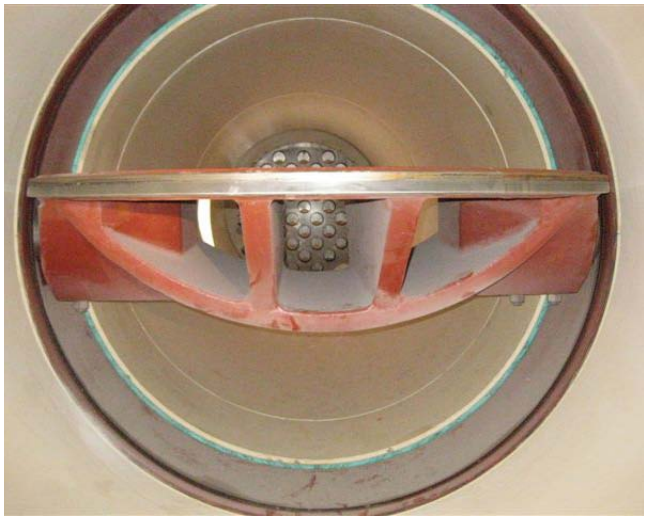
C_{cr} = .15 to .25

To determine the cavitation constant, use the below formula:

$$C = \frac{P_2 - P_v}{P_1 - P_2} \text{ or } C = \frac{P_2 + 14.2}{\Delta P}$$

If $C \leq C_{cr}$ serious cavitation can occur.

Cl Cavitation is the implosion of vapor bubbles which form in a flowing liquid when the pipeline pressure at some point decreases to below the vapor pressure of the liquid. The implosion is caused by an abrupt 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.



HEAD LOSS

The pressure drop caused by flow through the CCED Valve is written as:

$$\Delta H = K \frac{V_2}{2_g}$$

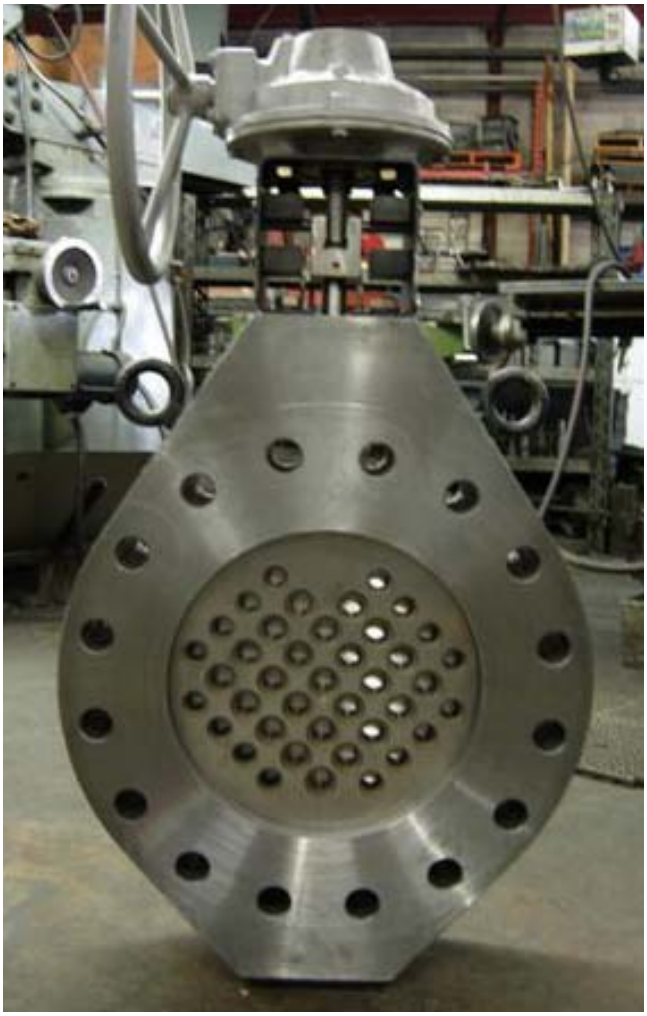
Where,

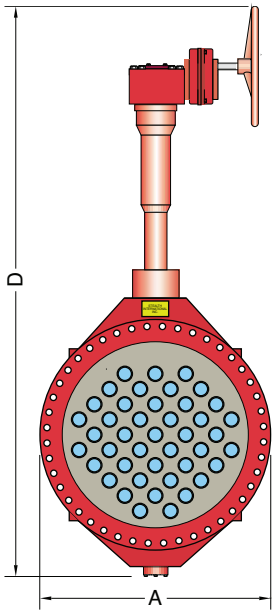
ΔH = headloss in feet of water;

K = flow coefficient in terms of velocity head;

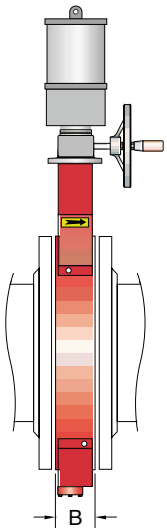
V = the velocity of the liquid in feet per second;

G = gravitational constant of 32.17 feet per second.

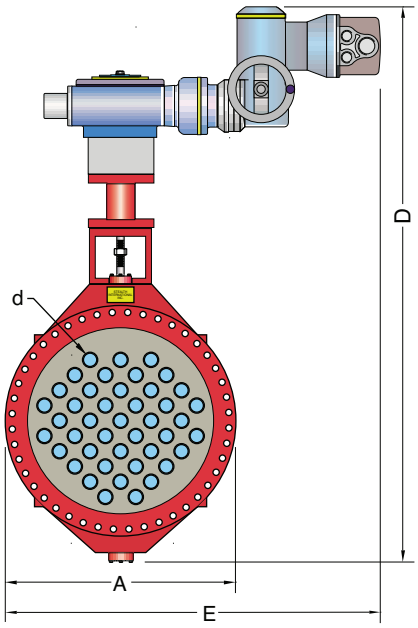




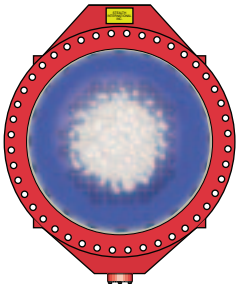
(M) Manual



Hydraulic/Pneumatic



(E) Electric



Downstream View

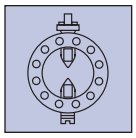
NOTE: All Dimensions are approximate and subject to design modifications

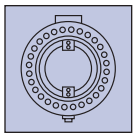
Dimensions & Weights								
Size	Act.	A (In.)	B (In.)	C (In.)	D (In.)	E (In.)	d	Weight (Lbs)
4"	M	11.339	3.937	9.843	15.354		7	28
4"	E	11.339	3.937	15.079	18.898	11.417	7	68
6"	M	10.984	3.937	9.843	20.315		11	51
6"	E	10.984	3.937	15.079	22.835	12.598	11	97
8"	M	13.465	3.937	9.843	23.110		15	88
8"	E	13.465	3.937	15.079	25.394	13.780	15	117
10"	M	15.984	3.937	12.402	28.622		18	142
10"	E	15.984	3.937	18.701	31.299	14.843	18	203
12"	M	18.976	5.906	15.748	29.803		22	200
12"	EM	18.976	5.906	18.701	33.465	15.748	22	503
14"	E	20.984	5.906	19.685	36.220	15.748	25	300
14"	M	20.984	5.906	19.685	36.220	15.748	25	398
16"	M	23.465	5.906	19.685	37.126		29	375
16"	E	23.465	5.906	15.748	45.669	23.701	29	545
18"	E/M	25.000	5.906	19.685	56.693	33.268	33	865
20"	E/M	27.480	5.906	22.835	67.717	35.433	36	1217
24"	E/M	31.969	7.874	22.835	72.441	37.795	43	1420
28"	E/M	36.496	7.874	22.835	75.591	39.764	50	1521
30"	E/M	38.740	7.874	22.835	78.346	46.063	54	1603
32"	E/M	41.732	7.874	22.835	80.315	41.732	58	1775
36"	E/M	45.984	7.874	22.835	84.646	44.094	65	2029
40"	E/M	50.748	7.874	22.835	89.764	46.063	72	2282
42"	E/M	52.992	7.874	22.835	92.520	50.394	79	2431
48"	E/M	59.488	7.874	22.835	96.850	50.394	87	2789
54"	E/M	66.220	9.843	22.835	105.118	54.331	102	3550
60"	E/M	80.000	9.843	22.835	109.055	56.693	109	4311

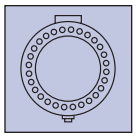
Dimensions and weights are approximate and for reference only, subject to change.
Please request certified drawings once actuation has been determined.
Dimensions based on 150 lb flanges in sizes 4" (100mm) through 28" (700mm) and 32" (800mm) through 60 (1500mm) AWWA Table 3 Class E steel hub flanges

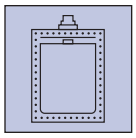
Notes

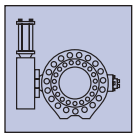
PRATT PRODUCT GUIDE

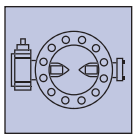

Model
2FII

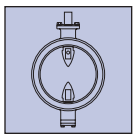

Triton®
XR70

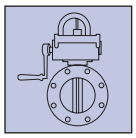

Triton®
XL

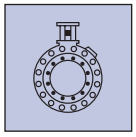

Rectangular

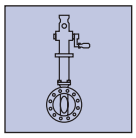

Rubber Seated
Ball Valve

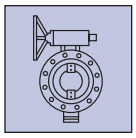

Groundhog®
Valve


Monoflange
MKII

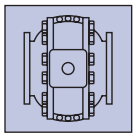

Indicating
Butterfly Valve
UL & FM approved

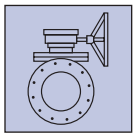

N-Stamp Nuclear
Butterfly Valve

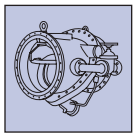

PIVA Post Indicating
Valve Assembly
UL & FM approved

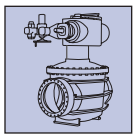

Triton®
HP250

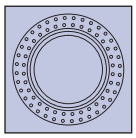
Control
Systems

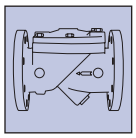

Metal Seated
Ball Valve

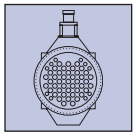

Plug
Valve


Tilting Disc
Check Valve


Cone Valve


Sleeve Valve


Check Valve


Compact Controllable
Energy Dissipater

PRATT

Henry Pratt Company
401 South Highland Avenue
Aurora, Illinois 60506-5563
Toll Free 877-436-7977
630-844-4000
Fax 630-844-4160
www.henrypratt.com
ISO 9001: 2000 Certified

CED0109