INDUSTRIAL PRODUCT GUIDE

HAYWARD®

HAYWARD INDUSTRIAL PRODUCTS, INC.

HAYWARD

Engineering and Sales Catalog

Hayward Corrosion-Resistant All Plastic Valves, Actuators, and Filters

The Hayward Story

Hayward Flow Control Systems, a division of Hayward Industrial Products, Inc., has been manufacturing industrial thermoplastic valves and process control products since the inception of the thermoplastic valve industry. For more than 40 years we have remained committed to producing the highest quality products while providing outstanding service that exceeds customer expectations. Hayward has earned an unsurpassed reputation for product design, manufacturing precision, quality assurance, experience and know-how, and total commitment to customer satisfaction and support.

Hayward Industries was formed in 1923 by Irving M. Hayward. It was a small company, located in Brooklyn, NY, making specialty metal valves and industrial flow control products. When Mr. Hayward retired in 1964 the company was acquired by its present management. With that, a new period of growth and diversification began, one that continues to this day. Management realized an opportunity existed for plastic, rather than metal swimming pool filters and accessories, and diversified into the swimming pool market. Rapid growth in the pool business resulted in the creation of Hayward Pool Products, Inc. At the same time, through a combination of acquisitions, modernization of the manufacturing facilities and product innovations, the industrial plastic valve and pipeline strainer business grew as well – and became Hayward Flow Control Systems.

When selecting plastic valves and process control products, consider the following:

Reliable by Design

Hayward valves are designed using the latest state-of-the-art equipment. Our Computer Aided Design (CAD) system, linked to finite element software, provides accurate and essential stress analysis. Hayward valves are designed to be strong – with material where it counts. Pressure and prolonged operation will not fatigue Hayward valves. Thus, Hayward products provide years of maintenance-free service.

Dependability

Valve parts twist and turn in operation, and must fit precisely with a perfect seal.

At Hayward, valve components are precision molded. However, when required, critical dimension valve parts are precision machined in areas such as o-ring grooves, seats, and ball surfaces. In either case, fine tolerances are maintained and, as a result, Hayward valves seal bubble tight and provide years of dependable service.

Quality

As an ISO 9001:2000 certified company, Hayward adheres to the strictest guidelines relative to component manufacture, assembly, and testing.

Hayward valves are 100% tested with the latest state-of-the-art testing equipment. Every Hayward product must pass pneumatic/hydrostatic tests before it is released for shipment. Our reputation for quality and reliability is unsurpassed.

Hayward has been manufacturing thermoplastic valves since the beginning of the industry. Our commitment to, and support of, the industry is strong. In addition to a tradition of experience and know-how, Hayward also has a highly qualified field sales organization that provides customer assistance, training, and field support.

Commitment

Hayward remains committed to new product developments and innovative process technology that produces high quality, reliable products and to total customer satisfaction. We will continue to advance fluid process technology as the leading American manufacturer of industrial plastic valves and process control products.

Millions of swimming pool filters such as this have been sold

Hayward Pool Products

Hayward Pool Products, Inc. forms the major component of Hayward Industries. As the largest manufacturer of swimming pool equipment in the world it manufactures and distributes products that move, clean, heat, light, and control the flow of water in commercial and residential swimming pools throughout the world.

The swimming pool equipment manufactured includes pool filters used to continuously clean the pool water, pumps which circulate the water and fittings such as skimmers, automatic vacuum cleaners, chlorinators, heaters, and underwater lights – which also include fiber optic systems.

Hayward Pool Products is headquartered in Elizabeth, NJ and can be contacted by phone at (908) 351-5400 or by fax at (908) 351-5675.

The Benefits of Hayward Plastic Valves and Process Control Products

Since the introduction of PVC in the U.S. during the 1940's, thermoplastic valves, pipe, and fittings have gained broad acceptance. Plastic valves, pipe and fittings are often the material of choice for systems that were traditionally designed in metal. Unlike metal, plastic valves and piping components have a high resistance to corrosion, will not scale or rust, and will not contaminate sensitive fluids.

Hayward manufactures products from compounds of PVC, CPVC, natural PPL, glass fiber reinforced PPL, PVDF, and polyetherimide. These materials are nonconductors and, as such, are immune to electrolytic and galvanic corrosion. Equally important, they contain nothing to leach out and contaminate sensitive fluids.

Benefits of Hayward plastic valves and process control products include:

Nontoxic

Hayward PVC and CPVC products are suitable for use with potable water and are consistent with the National Sanitation Foundation (NSF) and Canadian Standards Association (CSA) standards.

Corrosion Resistance

Hayward plastic valves and process control products are immune from corrosion. They are dielectric, meaning they will not support a charge and will remain free from the ionization and corrosion that occurs with metal valves.

Extended Service Life

Hayward plastic valves will outlast most metal valves and are not affected by normal weather conditions. They will provide years of maintenance-free service.

Low Thermal Conductivity

Hayward plastic valves have much less thermal conductivity than metal valves so that heat gain or loss is greatly reduced. Pipe insulation is rarely required.

Improved Flow Rates

Hayward plastic valves have a high flow coefficient and, as compared to metal, will absolutely not pit, rust or corrode. Their interior walls are molded with an ultra-smooth finish that will remain smooth throughout the valve's service life – resulting in a more consistent flow rate over time.

High Temperature

Hayward process control products are capable of handling corrosive chemicals at elevated temperatures – up to 250°F with glass fiber reinforced PPL.

Easy Installation

Hayward plastic valves and process control products are generally 1/3 to 1/2 the weight of similar size and type metal valves. They are simple to install and result in reduced handling, labor, and installation costs.

Conservation

Hayward plastic valves are energy efficient. It takes about half the energy to produce a comparative size Hayward plastic valve as a metal one.

Economics

When evaluating the economics of Hayward plastic valves over metal valves, consider not only the initial cost savings of the product, but the reduced freight, lower installation and maintenance costs, and the extended service life of the valves. Hayward plastic valves are a cost effective alternative to metal valves.

The new, modern 600,000 sq. ft. manufacturing plant in Clemmons, North Carolina.

True Union Ball Valves

1/4″ to 6″ - PVC, Corzan® CPVC, PPL

Features

- Full Port Design
- Reversible PTFE Seats
- Easy Maintenance
- FPM or EPDM Seals
- Easily Automated
- Double O-Ring Stem Seals
- Adjustable Seat Retainer

Corzan® is a registered trademark of Noveon, Inc.

Options

- Stem Extensions
- Lockouts
- Spring Return Handle
- Pneumatic Actuators
- Electric Actuators
- 2″ Square Operating Nuts
- Drilled Balls for Sodium Hypochlorite Service

Rugged, Heavy Wall Plastic Construction

Stands up to the most aggressive of applications. Hayward True Union Ball Valves can take the day to day abuse of industrial service and continue to function.

True Union Design

This makes these valves very easy to maintain by allowing for easy removal from a piping system without breaking down piping connections. Just unscrew the two assembly nuts and lift the valve body out of the line.

Advanced Design Features

Hayward True Union Ball Valves are superior performers. A fine-pitch seal retainer thread allows for accurate compensation for seat wear. Reversible seats make it easy to get a damaged valve back in service. Should the seats become damaged they need only to be removed, turned over, and reinstalled to put the valve back on line. These valves feature a double o-ring stem seal for twice the leakage protection of valves with only a single stem seal.

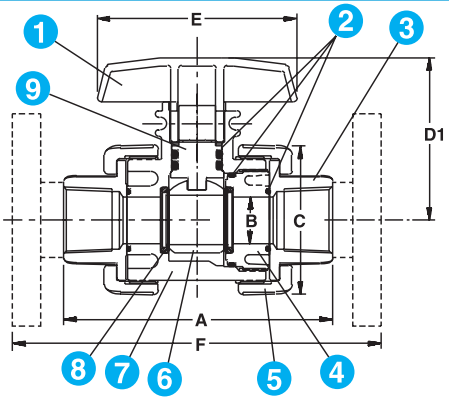
Solid Actuator Mounting Design

For rock-solid actuator mounting, the valve incorporates a unique design that allows the actuator mounting bracket to mount directly to the valve without the need for glued or clamped-on mounting pads. This assures proper alignment of the actuator to the valve without creating any damaging side loads to cause premature stem seal failure. With this design, the valve can easily be adapted to manual operation – should the need ever arise.

Never a Problem with Corrosion

Because of the valves' all plastic construction, they will never rust or corrode – and they can survive corrosive environments without the need for painting or expensive epoxy coating.

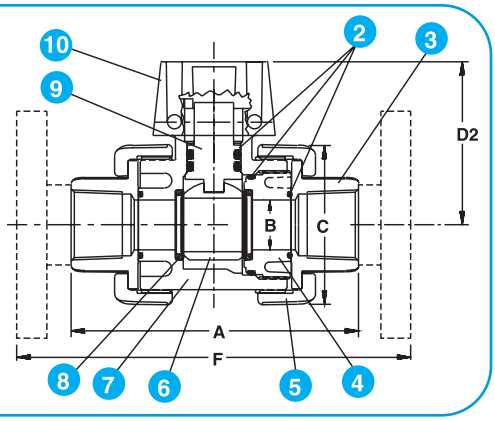
Technical Information



Parts List
True Union Valve

1. Handle
2. O-ring seals
3. End connector
4. Seal retainer
5. Union nut
6. Ball
7. Body
8. Teflon seat*
9. Stem
10. Actuator Mounting Pad

* O-Ring Backed Seats on 3″ & 4″ Sizes



Dimensions - Inches / Millimeters

Size	A	B	C	D1	D2	F	Weight (lb / kg) Soc / Thd	Weight (lb / kg) Flanged
1/4	4.63 / 117	0.37 / 13	2.25 / 57	3.00 / 76	2.63 / 67	N/A	0.75 / 0.34	N/A
3/8	4.63 / 117	0.50 / 13	2.25 / 57	3.00 / 76	2.63 / 67	N/A	0.75 / 0.34	N/A
1/2 / 20*	4.63 / 117	0.50 / 13	2.25 / 57	3.00 / 76	2.63 / 67	6.75 / 171	0.75 / 0.34	1.00 / 0.45
3/4 / 25*	4.75 / 120	0.75 / 19	2.63 / 67	3.02 / 77	2.81 / 72	7.13 / 181	0.75 / 0.34	1.00 / 0.45
1 / 32*	5.25 / 133	1.00 / 25	3.00 / 76	3.32 / 84	3.05 / 77	8.00 / 203	1.15 / 0.52	2.15 / 0.98
1-1/4 / 40*	6.30 / 160	1.25 / 32	4.00 / 102	3.92/ 100	3.48 / 88	9.19 / 233	2.15 / 0.98	3.50 / 1.6
1-1/2 / 50*	6.75 / 171	1.50 / 38	4.00 / 102	3.92/ 100	3.48 / 88	9.88 / 249	2.15 / 0.98	3.75 / 1.7
2 / 63*	8.00 / 203	2.00 / 51	4.75 / 121	4.43/ 113	4.00 / 101	11.4 / 289	3.80 / 1.7	6.30 / 2.9
2-1/2	10.68 / 271	3.00 / 76	6.40 / 163	5.50 / 140	5.50 / 140	14.38 / 365	10.50 / 4.8	14.50 / 6.6
3 / 90*	10.56 / 268	3.00 / 76	6.40 / 163	5.50 / 140	5.50 / 140	14.44 / 367	10.50 / 4.8	14.50 / 6.6
4 / 110*	12.30 / 329	3.81 / 97	8.56 / 217	6.50 / 165	6.50 / 165	17.13 / 435	17.60 / 8.0	24.80 / 11.3
6	N/A	3.81 / 97	8.56 / 217	6.50 / 165	6.50 / 165	19.19 / 487	N/A	30.75 / 14.0

* **Metric End Connections Available in:** BSP – Straight Thread, BSP TR – Tapered Thread and Metric Socket

Selection Chart

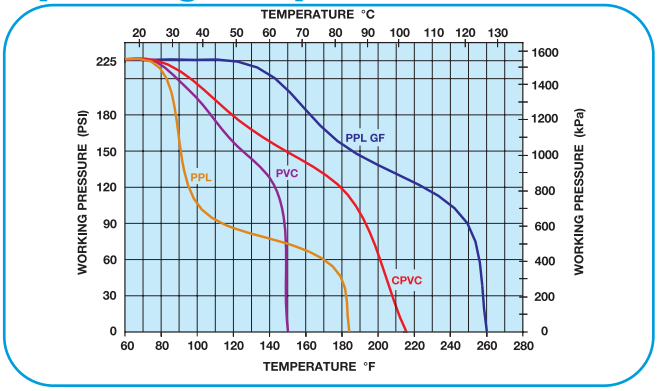
Size	Material	End. Conn	Seals	Pressure Rating
1/4″ - 3/8″	PVC	Socket or Threaded	FPM or EPDM	225 PSI @70°F Non-Shock
1/2″ - 4″	PVC or CPVC	Socket, Threaded or Flanged		
1/2″ - 2″	PPL*	Threaded		
6″**	PVC or CPVC	Flanged		

* natural PPL - 1/2" to 1-1/2" rated at 150PSI, 2" = 120PSI ** 4″ Valve venturied to 6″

Cv Factors

Size	Factor	Size	Factor
1/4″	1.0	1-1/2″	90
3/8″	2.8	2″	150
1/2″	8.0	2-1/2″	340
3/4″	16.0	3″	490
1″	29.0	4″	600
1-1/4″	75.0	6″	550

Operating Temperature/Pressure



Pressure Loss Calculation Formula

$$\Delta P = \left[\frac{Q}{Cv}\right]^2$$

ΔP = Pressure Drop
Q = Flow in GPM
Cv = Flow Coefficient

True Union "Z-Ball" Valves for Sodium Hypochlorite Applications

1/2″ to 6″ - PVC, Corzan® CPVC, PPL

Specially drilled "Z-Ball" design for Sodium Hypochlorite service keeps inner valve surfaces constantly vented to eliminate gas accumulation, and wetted to prevent crystallization of salts which can "freeze" the valve and make it inoperable.

Ball Valves and Sodium Hypochlorite

Sodium hypochlorite is inherently an unstable compound. As it decomposes, the resulting crystalline salts and oxygen gas can cause operational and safety issues with conventional ball valves.

Hayward addresses the issues of sodium hypochlorite applications with the "Z-Ball" design true union ball valve. The "Z-Ball" Valve effectively vents the gases while keeping inner valve surfaces constantly wetted, ensuring problem free use. This effectively eliminates the conditions required for gas accumulation and salt crystallization.

The new "Z-Ball" valves are readily identifiable by the black handle and special label identifying the direction of liquid flow. The hole is always positioned on the upstream side of the ball.

Rugged, Heavy Wall Plastic Construction

Stands up to the most aggressive sodium hypochlorite applications. Hayward True Union "Z-Ball" Valves can take the day-to-day abuse of industrial service and continue to function.

True Union Design

This makes these valves very easy to maintain by allowing for easy removal from a piping system without breaking down piping connections. Just unscrew the two assembly nuts and lift the valve body from the line.

Advanced Design Features

Hayward True Union "Z-Ball" Valves are superior performers. A fine-pitch seal retainer thread allows accurate compensation for seat wear. Reversible seats make it easy to get a damaged valve back in service. Should the seats become damaged they need only to be removed, turned over, and reinstalled to put the valve back on line. These valves feature a double O-ring stem seal for twice the leakage protection of valves with only a single stem seal.

Solid Actuator Mounting Design

For rock-solid actuator mounting, the valve incorporates a unique design that allows the actuator mounting bracket to mount directly to the valve without the need for glued or clamped-on mounting pads. This assures proper alignment of the actuator to the valve without creating any damaging side loads to cause premature stem seal failure. With this design, the valve can easily be adapted to manual operation – should the need ever arise.

Never a Problem with Corrosion

Because of the valves' all plastic construction, they will never rust or corrode – and they can survive corrosive environments without the need for painting or expensive epoxy coating.

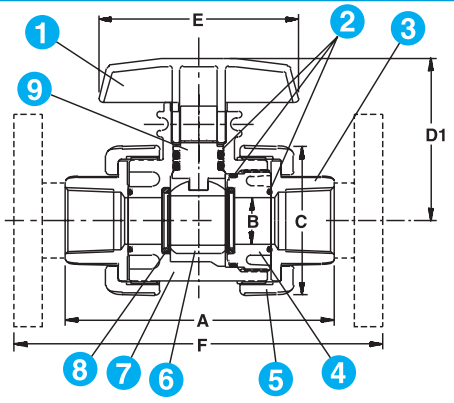
Features

- Full Port Design
- Reversible PTFE Seats
- Easy Maintenance
- FPM Seals
- Easily Automated
- Double O-Ring Stem Seals
- Adjustable Seat Retainer

Options

- Stem Extensions
- Lockouts
- Spring Return Handle
- Pneumatic Actuators
- Electric Actuators
- 2″ Square Operating Nuts

Technical Information

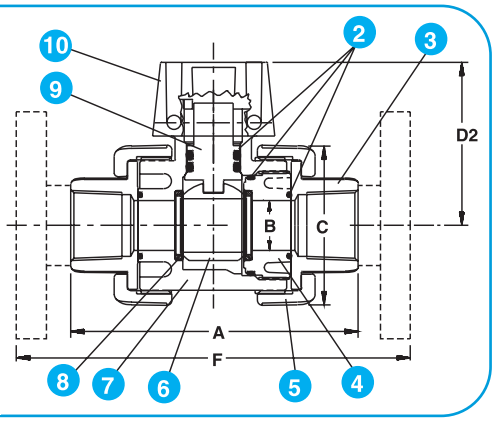


Parts List

True Union ″Z-Ball″ Valve

1. Handle
2. O-ring seals
3. End connector
4. Seal retainer
5. Union nut
6. Drilled ″Z-Ball″
7. Body
8. Teflon® seat*
9. Stem
10. Actuator

* O-Ring Backed Seats on 3″ & 4″ Sizes



Dimensions - Inches / Millimeters

Size	A	B	C	D1	D2	F	Weight (lb / kg) Soc / Thd	Weight (lb / kg) Flanged
1/4	4.63 / 117	0.37 / 13	2.25 / 57	3.00 / 76	2.63 / 67	N/A	0.75 / 0.34	N/A
3/8	4.63 / 117	0.50 / 13	2.25 / 57	3.00 / 76	2.63 / 67	N/A	0.75 / 0.34	N/A
1/2 / 20*	4.63 / 117	0.50 / 13	2.25 / 57	3.00 / 76	2.63 / 67	6.75 / 171	0.75 / 0.34	1.00 / 0.45
3/4 / 25*	4.75 / 120	0.75 / 19	2.63 / 67	3.02 / 77	2.81 / 72	7.13 / 181	0.75 / 0.34	1.00 / 0.45
1 / 32*	5.25 / 133	1.00 / 25	3.00 / 76	3.32 / 84	3.05 / 77	8.00 / 203	1.15 / 0.52	2.15 / 0.98
1-1/4 / 40*	6.30 / 160	1.25 / 32	4.00 / 102	3.92/ 100	3.48 / 88	9.19 / 233	2.15 / 0.98	3.50 / 1.6
1-1/2 / 50*	6.75 / 171	1.50 / 38	4.00 / 102	3.92/ 100	3.48 / 88	9.88 / 249	2.15 / 0.98	3.75 / 1.7
2 / 63*	8.00 / 203	2.00 / 51	4.75 / 121	4.43/ 113	4.00 / 101	11.4 / 289	3.80 / 1.7	6.30 / 2.9
2-1/2	10.68 / 271	3.00 / 76	6.40 / 163	5.50 / 140	5.50 / 140	14.38 / 365	10.50 / 4.8	14.50 / 6.6
3 / 90*	10.56 / 268	3.00 / 76	6.40 / 163	5.50 / 140	5.50 / 140	14.44 / 367	10.50 / 4.8	14.50 / 6.6
4 / 110*	12.30 / 329	3.81 / 97	8.56 / 217	6.50 / 165	6.50 / 165	17.13 / 435	17.60 / 8.0	24.80 / 11.3
6	N/A	3.81 / 97	8.56 / 217	6.50 / 165	6.50 / 165	19.19 / 487	N/A	30.75 / 14.0

* **Metric End Connections Available in:** BSP – Straight Thread, BSP TR – Tapered Thread and Metric Socket

Selection Chart

Size	Material	End. Conn	Seals	Pressure Rating
1/4″ - 3/8″	PVC	Socket or Threaded	FPM ONLY	250 PSI @70°F Non-Shock
1/2″- 4″	PVC, CPVC, or PPL	Socket, Threaded, or Flanged		
6″*	PVC or CPVC	Flanged		

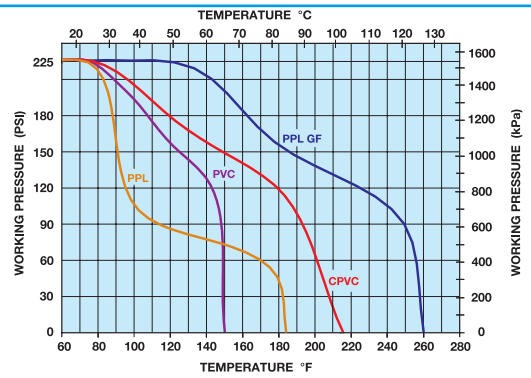
* 4″ valve venturied to 6″ 4″ and 6″ valves 150 PSI @70°F Non-Shock

Cv Factors

Size	Factor	Size	Factor
1/4″	1.0	1-1/2″	90
3/8″	2.8	2″	150
1/2″	8.0	2-1/2″	340
3/4″	16.0	3″	490
1″	29.0	4″	600
1-1/4″	75.0	6″	550

Teflon® is a registered trademark of Du Pont

Operating Temperature/Pressure



Pressure Loss Calculation Formula

$$\Delta P = \left[\frac{Q}{Cv}\right]^2$$

ΔP = Pressure Drop
Q = Flow in GPM
Cv = Flow Coefficient

Three-Way Ball Valves

1/2″ to 6″ - PVC & Corzan® CPVC

Manual Valve

Valve Ready for Actuator Mounting

Features

- Integrally Molded Mounting Saddle
- PTFE Seats
- FPM Seals
- True Union End Connections
- 150 PSI @70°F - Non-Shock

Options

- Valve Safe Lockout
- Electric Actuators
- Pneumatic Actuators
- EPDM Seals

Corzan® is a registered trademark of Noveon, Inc.

Flow Patterns

Hayward Manual Three-Way Ball Valves come standard with a two port ″TW″ ball allowing for three flow configurations within 180° of rotation. With the bottom port as the inlet, the flow can be directed out the left port, out the right port, or shutoff. Hayward Actuated Three-Way Ball Valves come standard with a three port ″NT″ ball allowing for two flow configurations within 90° of rotation. With the bottom port as the inlet, the flow can be directed out the left port or right port, there is no shutoff position. A ″TW″ ball, used with the proper electric actuator, adds what is typically called a ″center off position″ to the ″NT″ flow pattern of actuated valves. An optional ″TP″ ball, used with either manual or actuated valves, allows flow through all ports at the same time or flow shutoff.

True Union Design

This makes these valves very easy to maintain by allowing for easy removal from a piping system without breaking down piping connections. Just unscrew the three assembly nuts and lift the valve body out of the line.

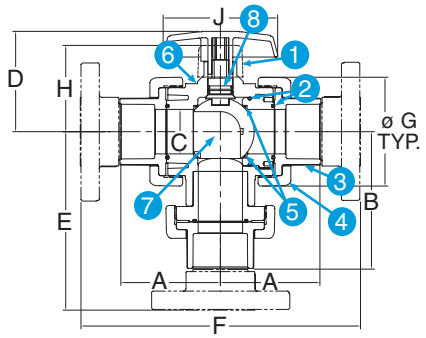
Solid Actuator Mounting Design

A manual valve can be easily automated. Just remove the handle and install the Actuator/Mounting Kit. The mounting saddle is integrally molded into the valve body. For rock-solid actuator mounting, the valve incorporates a unique design whereby the mounting bracket mounts directly to the valve body. This assures proper alignment of the actuator to the valve without creating any damaging side loads to cause premature stem seal failure.

No Metal, No Corrosion

Hayward all-plastic Three-Way Valves contain no metal parts. The valves will never fail because of corrosion and they do not require painting or epoxy coating to stand up to aggressive environments.

Technical Information



Parts List - Three-Way Valves

1. Mounting Kit (Optional)
2. O-Ring Seals
3. End Connector
4. Assembly Nut
5. Teflon Seats
6. Body
7. Ball
8. Stem

Valve Dimensions - Inches / Millimeters

Size	A	B	C	D	E	F	G	H	J
1/2″	2.30 / 58	3.29 / 84	0.50 / 13	2.94 / 75	3.87 / 98	6.72 / 171	2.25 / 57	2.53 / 64	3.50 / 89
3/4″	2.56 / 65	3.57 / 91	0.75 / 19	2.97 / 75	4.60 / 117	7.50 / 191	2.63 / 67	2.82 / 72	3.50 / 89
1″	2.98 / 76	4.14 / 105	1.00 / 25	3.21 / 82	4.77 / 121	8.50 / 216	3.00 / 76	3.08 / 78	4.00 / 102
1-1/4″	4.39 / 112	5.94 / 151	2.00 / 51	3.63 / 92	5.19 / 132	11.54 / 293	4.00 / 102	3.50 / 89	4.00 / 102
1-1/2″	4.30 / 109	5.87 / 149	2.00 / 51	3.63 / 92	6.00 / 152	11.85 / 301	4.00 / 102	3.50 / 89	4.00 / 102
2″	4.38 / 111	6.00 / 152	2.00 / 51	4.31 / 109	6.75 / 171	12.25 / 311	4.75 / 121	3.95 / 100	5.00 / 127
2-1/2″	5.90 / 150	7.59 / 193	3.00 / 76	7.02 / 178	8.68 / 220	15.92 / 404	6.40 / 163	5.88 / 149	10.50 / 267
3″	5.90 / 150	7.59 / 193	3.00 / 76	7.02 / 178	8.72 / 221	16.00 / 406	6.40 / 163	5.88 / 149	10.50 / 267
4″	7.00 / 178	9.33 / 237	4.00 / 102	8.02 / 204	10.44 / 265	18.88 / 480	8.56 / 217	8.88 / 226	10.50 / 267
6″	n/a	n/a	4.00 / 102	8.02 / 204	11.25 / 286	20.25 / 514	8.56 / 217	8.88 / 226	10.50 / 267

Selection Chart

Size	Material	End Conn.	Seals	Pressure Rating
1/2″-4″	PVC/CPVC	Socket, Threaded or Flanged	FPM or EPDM	150 PSI @ 70°F
6″*	PVC/CPVC	Flanged	FPM or EPDM	Non-Shock

* 4″ Valve venturied to 6″

Cv Factors

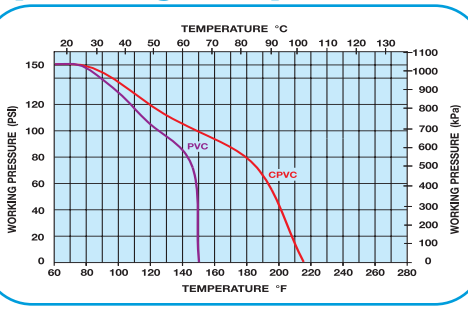
Size	Value	Size	Value
1/2″	3.0	2″	58
3/4″	7.0	3″	190
1″	10	4″	450
1-1/2″	30	6″	340

Pressure Loss Calculation Formula

$$\Delta P = \left[\frac{Q}{Cv}\right]^2$$

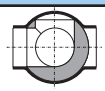
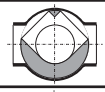
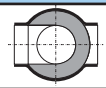
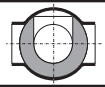
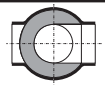
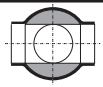
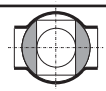
ΔP = Pressure Drop
Q = Flow in GPM
Cv = Flow Coefficient

Operating Temp/Pressure



Flow Schematics

Top View

Flow At	NT Ball		
0°	Port A		Port B
45° No Deadhead	Port A		Port B
90°	Port A		Port B
Flow At	**TW Ball**		
0°	Port A		Port B
90° Center-Off	Port A		Port B
180°	Port A		Port B
Flow At	**TP Ball**		
0°	Port A		Port B
90°	Port A		Port B

Three-Way Lateral Ball Valves

1/2″ to 6″ - PVC & Corzan® CPVC

Lateral Flow Patterns

Hayward Lateral Valves come standard with a ball that permits the flow to be diverted from the center port to either the left or right ports: there is no Off position.

Solid Actuator Mounting Design

For rock-solid actuator mounting, the valve incorporates a unique design whereby the mounting bracket mounts directly to the valve body. This assures proper alignment of the actuator to the valve without creating any damaging side loads to cause premature stem seal failure.

No Metal, No Corrosion

Hayward all-plastic Lateral Valves contain no metal parts. The valves will never fail because of corrosion and they do not require painting or epoxy coating to stand up to aggressive environments.

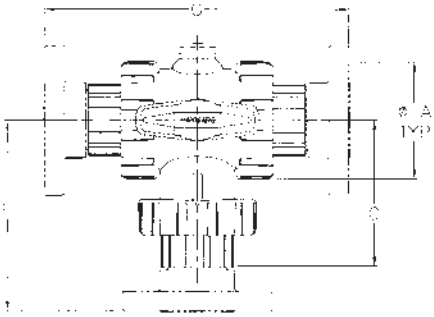
Features

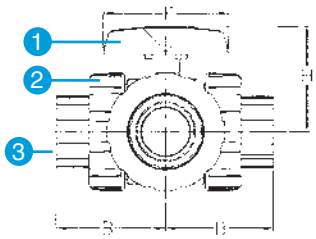
- Simplifies Lateral Connections
- Replaces Valve/Tee Connection Combinations
- Quick, Easy to Install
- True Union End Connections
- Replacement for Zero Dead-leg Valves
- PTFE Seats, FPM Seals

Options

- Valve Safe Lockout
- EPDM Seals

Technical Information





Parts List - Three-Way Lateral Valves

1. Handle
2. Assembly Nut
3. End Connector

Dimensions - Inches / Millimeters

Valve Size	A	B	C	E	F	G	H
1/2″	2.25 / 57.15	2.30 / 58.42	3.29 / 83.57	3.50 / 96.52	3.87 / 98.3	6.72 / 170.69	1.70 / 43.18
3/4″	2.63 / 66.8	2.56 / 65.02	3.57 / 90.68	3.50 / 96.52	4.60 / 116.84	7.50 / 190.5	2.93 / 74.42
1″	3.00 / 76.2	2.98 / 75.69	4.14 / 105.16	4.00 / 101.6	4.77 / 121.16	8.50 / 215.9	3.23 / 82.04
1-1/4″	4.75 / 120.65	4.39 / 111.51	5.94 / 150.88	4.00 / 101.6	5.19 / 131.83	11.54 / 293.12	4.19 / 106.43
1-1/2″	4.75 / 120.65	4.30 / 109.22	5.87 / 149.10	4.00 / 101.6	6.00 / 152.4	11.85 / 300.99	4.19 / 106.43
2″	4.75 / 120.65	4.38 / 111.25	6.00 / 152.40	5.00 / 127	6.75 / 171.45	12.25 / 311.15	4.19 / 106.43
2-1/2″	6.40 / 162.56	5.90 / 149.86	7.59 / 192.79	10.50 / 266.7	8.68 / 220.47	15.92 / 404.37	5.35 / 135.89
3″	6.40 / 162.56	5.90 / 149.86	7.59 / 192.79	10.50 / 266.7	8.72 / 221.49	16.00 / 406.4	5.35 / 135.89
4″	8.56 / 217.42	7.00 / 177.8	9.33 / 236.98	10.50 / 266.7	10.44 / 265.18	18.88 / 217.42	6.85 / 173.99
6″	8.56 / 217.42	n/a	n/a	10.50 / 266.7	11.25 / 285.75	20.25 / 514.35	6.85 / 173.99

Selection Chart

Size	Material	End Conn.	Seals	Pressure Rating
1/2″-4″	PVC/CPVC	Socket, Threaded or Flanged	FPM or EPDM	150 PSI @ 70°F Non-Shock
6″*	PVC/CPVC	Flanged	FPM or EPDM	

* 4″ Valve venturied to 6″

Cv Factors

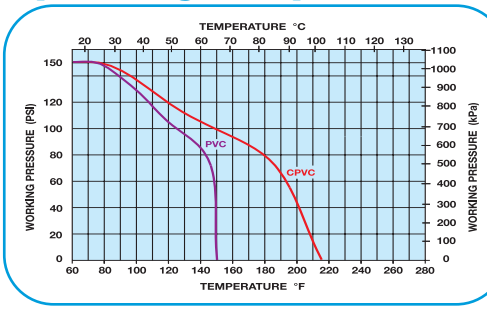
Size	Value	Size	Value
1/2″	3.0	2″	58
3/4″	7.0	3″	190
1″	10	4″	450
1-1/2″	30	6″	340

Pressure Loss Calculation Formula

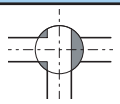
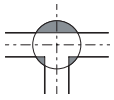
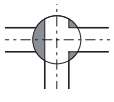
$$\Delta P = \left[\frac{Q}{Cv}\right]^2$$

ΔP = Pressure Drop
Q = Flow in GPM
Cv = Flow Coefficient

Operating Temp/Pressure



Flow Schematics

Top View		
Flow At	**NT Ball – Standard**	
0°	Port A  Port B Port C	
90°	Port A  Port B Port C	Top drawing rotated 90° to left
180°	Port A  Port B Port C	Top drawing rotated 180°

Low Cost QIC2™ Ball Valves

1/2″ to 2″ - PVC

Features

- Rated at a Full 150 PSI
- PTFE Seats
- EPDM Seals
- No Internal Parts to Replace
- Easy 1/4-Turn Operation
- Perfect for OEM Applications
- Socket or Threaded Pipe Connections

Teflon® is a registered trademark of DuPont

Rugged, Compact Design

Hayward's rugged, low cost QIC2 all-plastic PVC ball valves incorporate many design features found only on higher cost ball valves. Features such as Teflon® seats, full porting and a 150 PSI pressure rating are all standard on every size of QIC2 ball valve.

Cost-Sensitive Applications

The QIC2 ball valve is perfect for OEM and other applications that require a reliable ball valve at an economical price. The QIC2 valve has been designed and tested to make certain it will perform year in and year out in the most demanding applications without leakage or failure. The internal components of a QIC2 valve are completely encapsulated within the valve body in a one-step manufacturing process. There is absolutely no danger of leakage through assembled parts. This also means that the valve never requires adjustment since all internal components are sealed inside the one-piece valve body. The QIC2 valve is ready to be put into service right out of the box.

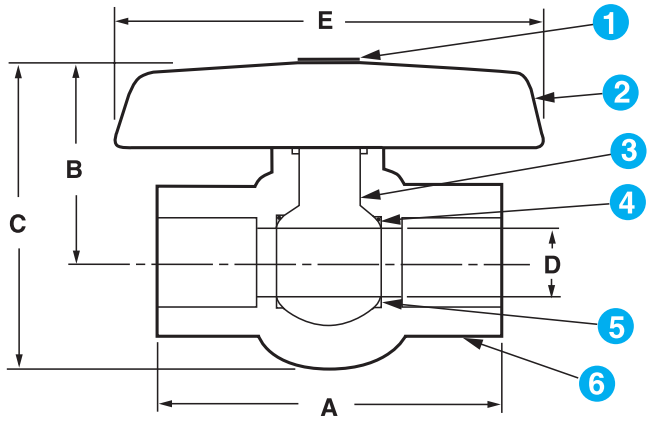
Lightweight and Compact

QIC2 low cost ball valves are designed to fit into spaces too small for other valves. They are about 1/3 the overall size of a plastic true union valve and they weigh an average of 50% less. This makes them ideal for skid-mounted and other applications where space and weight are critical considerations.

Can't Rust, Won't Corrode

Their all-plastic construction means they will never fail, stick, or jam because of rusted or corroded parts. And they'll work in places and environments where metal valves must be painted or coated just to survive.

Technical Information



Parts List
QIC2 Ball Valves

Component	Material
1. Cap	ABS
2. Handle	ABS
3. Stem and Ball	PVC
4. O-Ring	EPDM
5. Seat	PTFE
6. Body	PVC

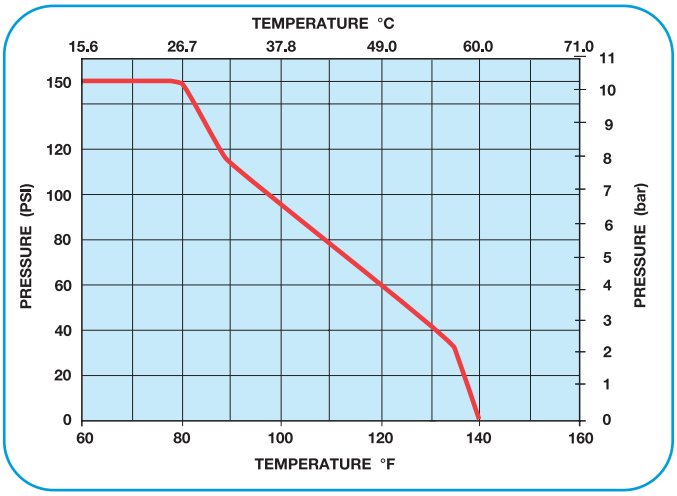
Dimensions - Inches / Millimeters

Size	A	B	C	D	E	Weight (lb / kg)
1/2″	3.10 / 79	1.61 / 40.9	2.58 / 65.5	0.591 / 15	2.83 / 72	0.22 / 0.10
3/4″	3.57 / 90	1.93 / 49	3.11 / 79	0.787 / 20	3.14 / 80	0.44 / 0.20
1″	4.16 / 105	2.21 / 56.1	3.46 / 87.9	0.984 / 25	3.73 / 95	0.69 / 0.31
1-1/4″	4.83 / 121	2.60 / 66	3.86 / 98	1.260 / 32	4.36 / 111	0.90 / 0.41
1 1/2″	5.09 / 127	2.85 / 72.4	4.34 / 110.2	1.535 / 39	4.63 / 118	1.19 / 0.54
2″	5.90 / 149	3.45 / 87.6	5.29 / 134.4	1.969 / 50	5.49 / 139	1.86 / 0.85

Selection Chart

Size	Material	End Conn.	Seals	Rating
1/2″ - 2	PVC	Socket or Threaded	EPDM	150 PSI @ 70°F

Operating Temperature/Pressure



C_V Factors

Size	Factor	Size	Factor
1/2″	8	1-1/4″	75
3/4″	16	1-1/2″	90
1″	30	2″	150

Pressure Loss Calculation Formula

$$\Delta P = \left[\frac{Q}{Cv}\right]^2$$

ΔP = Pressure Drop
Q = Flow in GPM
Cv = Flow Coefficient

Butterfly Valves

1-1/2″ to 12″ • Bodies - PVC, Corzan® CPVC, PPL Disks - PVC, Corzan® CPVC, PPL, PVDF

Features

- Rated at 150 PSI
- Stainless Steel Shaft
- Fully Supported Flange Bolt Holes
- Full Body, V-Notch Liner
- Blowout-Proof Shaft
- Viton®, EPDM or Nitrile Liners
- Wafer Body Design
- Conforms to ANSI B16.10 Face-to-Face Dimensions

Options

- Stem Extensions
- Lug Body Design
- Gear Operators
- Electric Actuators
- Pneumatic Actuators
- Titanium Shaft
- 2″ Square Operating Nut
- PVDF Discs
- Actuator Mounts

Corzan® is a registered trademark of Noveon, Inc.
Viton® is a registered trademark of DuPont

A Better Butterfly Valve

Hayward 1-1/2″ through 12″ all-Plastic Butterfly Valves are rated at a full 150 PSI. Unlike other plastic butterfly valves, Hayward valves are constructed from a one piece body that incorporates fully supported flanged bolt holes to prevent stressing of the mating pipe flanges. Their heavy duty construction stands up to the most demanding applications. The rock solid integral mounting pad ensures that the valve operator will function reliably – whichever operator is used, lever handle, gear box or actuator.

Extra Features, No Extra Cost

Hayward Butterfly Valves feature a blowout-proof stainless steel stem and a unique, full body liner that has a V-notch retention design. This assures positive sealing of the liner to the valve body. An integrally molded face seal provides positive sealing against the mating flange without the need for additional gaskets. The lever handle has a built in lockout feature and every Hayward valve is ready for actuation.

Better Sealing

Other plastic butterfly valves have only a thin o-ring on the disk to seal the valve, but Hayward valves feature a full body liner seal. This means that the process media never contacts the valve body. And you can count on the full liner seal to perform reliably, year after year.

Easy Retrofit

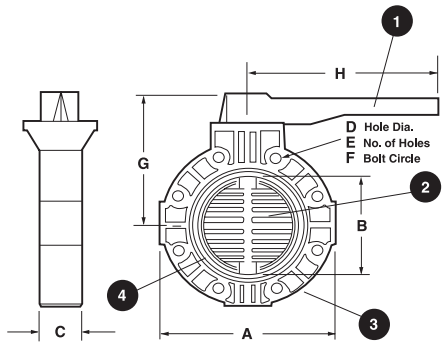
Hayward Butterfly Valves can be easily fitted into a metal piping system. All valve sizes meet industry face-to-face standards – allowing simple retrofit.

No Metal, No Corrosion

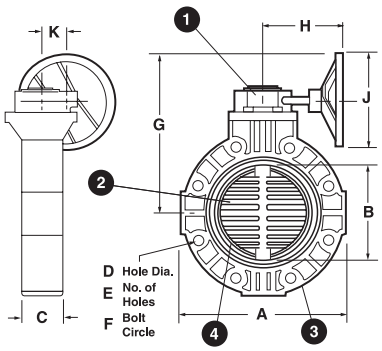
These valves have no metal in contact with the process media. They cannot corrode or rust – nor will they contaminate sensitive fluids flowing through them.

Technical Information

Lever Handle Operator



Gear Box Operator



Parts List Butterfly Valves

1. Operator (Lever or Gear Box)
2. Disc
3. Body
4. Liner

Dimensions - Inches / Millimeters

Size	A	B	C	D	E	F	G		H		J	K	Wt. Lb / Kg
							Gear Box	Lever	Gear Box	Lever			
1-1/2 / 50	6.00 / 152	1.75 / 44	1.50 / 38	.63 / 16	4	3.88 / 99	9.31 / 236	6.25 / 159	7.13 / 181	10.50 / 267	8.00 / 203	1.88 / 48	10.5 / 4.8
2 / 63	6.00 / 152	1.75 / 44	1.50 / 38	.75 / 19	4	4.75 / 121	9.31 / 236	6.25 / 159	7.13 / 181	10.50 / 267	8.00 / 203	1.88 / 48	10.5 / 4.8
3 / 90	7.75 / 197	3.13 / 80	2.00 / 51	.75 / 19	4	6.00 / 152	9.75 / 248	6.69 / 170	7.13 / 181	10.50 / 267	8.00 / 203	1.88 / 48	11.6 / 5.3
4 / 110	9.25 / 235	3.94 / 100	2.19 / 56	.75 / 19	8	7.50 / 191	10.19 / 259	7.94 / 202	7.13 / 181	12.00 / 305	8.00 / 203	1.88 / 48	14.3 / 6.5
6 / 160	11.25 / 286	5.81 / 148	2.31 / 59	.88 / 22	8	9.50 / 241	12.38 / 314	9.50 / 241	7.13 / 181	14.00 / 356	8.00 / 203	1.88 / 48	15.4 / 7.0
8 / 225	13.75 / 349	7.75 / 197	2.50 / 64	.88 / 22	8	11.75 / 298	13.50 / 343	10.63 / 270	7.13 / 181	16.00 / 406	8.00 / 203	1.88 / 48	23.5 / 10.7
10 / 280	16.00 / 406	9.76 / 248	3.00 / 76	1.00 / 25	12	14.25 / 362	16.00 / 406	N/A	8.09 / 205	N/A	8.00 / 203	2.36 / 59	39.0 / 17.7
12 / 315	19.00 / 483	11.50 / 292	3.18 / 81	1.00 / 25	12	17.00 / 432	17.50 / 445	N/A	8.09 / 205	N/A	8.00 / 203	2.36 / 59	51.0 / 23.1

DIN metric flanges available

Cv Factors

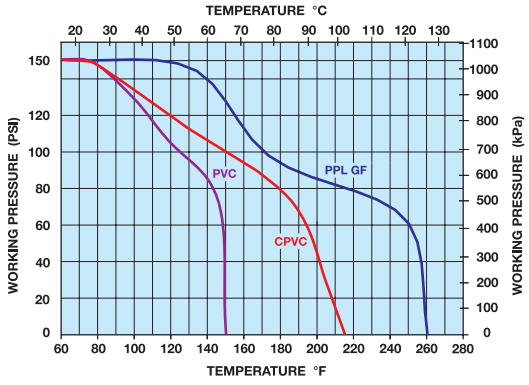
Size	Factor	Size	Factor
1-1/2″	90	6″	1100
2″	125	8″	2500
3″	280	10″	4700
4″	675	12″	7100

Pressure Loss Calculation Formula

$$\Delta P = \left[\frac{Q}{Cv}\right]^2$$

ΔP = Pressure Drop
Q = Flow in GPM
Cv = Flow Coefficient

Operating Temperature/Pressure



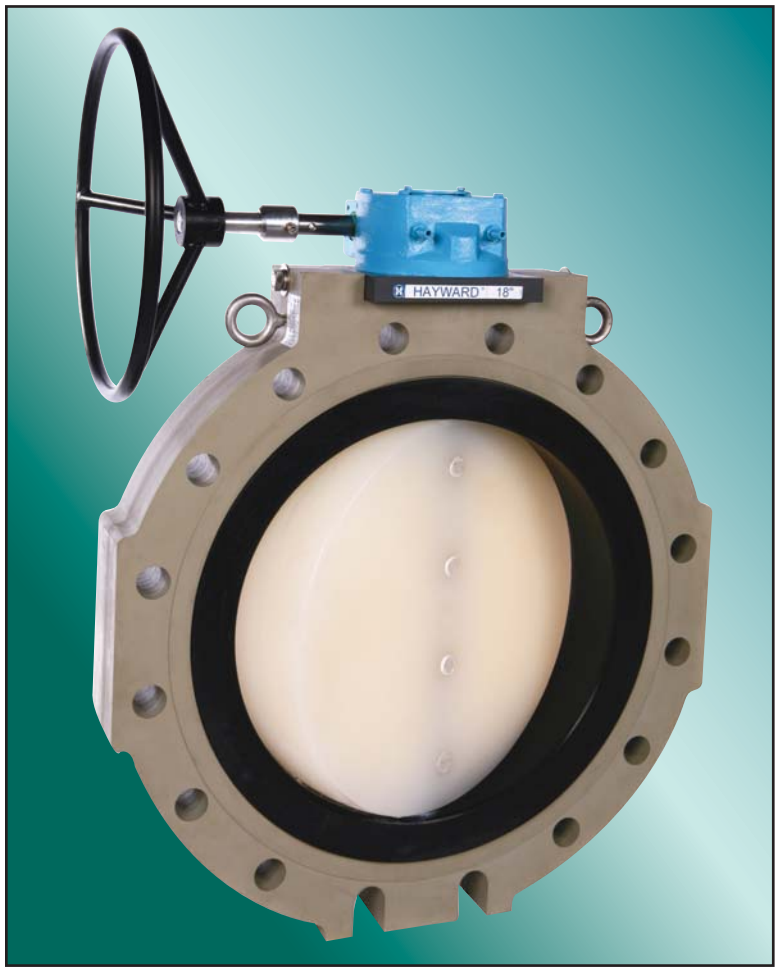
Selection Chart

Size	Body Material	Disc Material	Shaft Material	Liner	Operator	Pressure Rating
*1-1/2″ to 8″	CPVC	CPVC	316 SSTL	FPM, EPDM or Nitrile	Lever or Gear Box	150 PSI @70°F Non-Shock
1-1/2″ to 8″	PVC	PVC, PPL, or PVDF				
1-1/2″ to 12″	PPL	PPL				

* **CPVC/CPVC 8″** gear operated only

Large Size Butterfly Valves

14″ to 24″ - Natural PPL Bodies and Discs



Features

- Stress-Relieved Natural PPL Construction or PVC
- Type 316 Stainless Steel Stem
- Choice of FPM, EPDM or Nitrile Liner and Seals
- Sphered Disc for Positive Shut Off
- High Torque Gear Box
- Dual Lifting Lug/Handles
- Slotted Bottom Bolt Holes
- Easily Modified for Unique Applications
- Replaces Metal Valves

Options

- Pneumatic or Electric Actuation
- Type 316 Stainless Steel Lugs
- Zinc Plated Lugs

Designed for Performance and Flexibility

Larger size butterfly valves from Hayward are specially designed to take into account application parameters encountered in larger size piping systems. The rugged, one piece, all natural polypropylene body stands up to high flow rates and elevated stress conditions. The valve features a full face liner that eliminates the need for expensive flange gaskets. The valve itself is fully lined and the standard Type 316 stainless steel stem is completely isolated from the process media. A unique ″sphered″ disc makes it easy to seal the valve bubble tight with a minimum of operating torque.
The valve's fabricated design makes for exceptional application flexibility. This type of design makes it easy and cost effective to modify the valve to conform to the requirements of special, demanding applications. For example, the need for expensive and clumsy flange adapters can be eliminated by providing a 14″ size valve with a 16″ bolt circle, an easy modification for a Hayward Large Size Butterfly Valve.

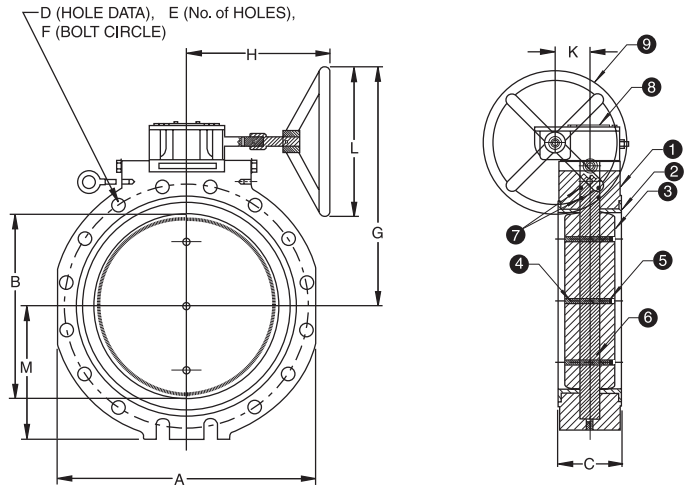
Easy Installation, Easy Operation

Each Valve comes standard with two lifting lug/handles, as well as slotted bottom bolt holes. These valve features coupled with its light weight permit a single person to position and install even the largest size valve, reducing installation costs. After installation easy, positive manual valve operation is ensured by the heavy duty, high torque output gear box. If automation is required there is a wide range of electric and pneumatic actuation to choose from. Actuators mount to a corrosion resistant plate and are then coupled to the valve with two easy to access bolts. In most cases no additional spacers or adapters are required.

Replacement for Metal Valves

All plastic construction means the valves will never stick, fail, or jam due to rust or corrosion – making them an excellent alternative to metal valves in many applications.

Technical Information



Parts List
Gear-Operated Butterfly Valve

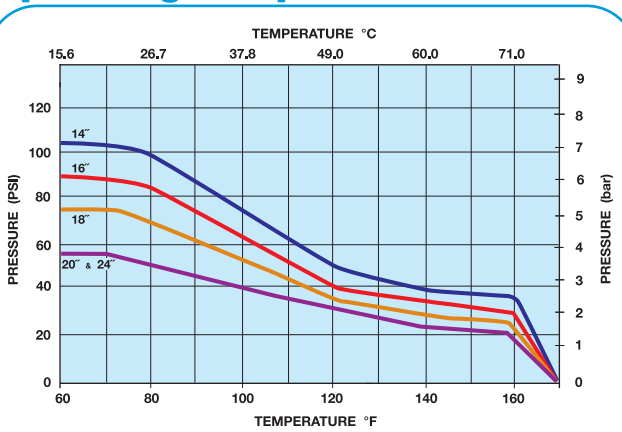
1. Body	Polypropylene
2. Liner (Seat)	EPDM/FPM/NITRILE
3. Disc	Polypropylene
4. Disc Pin	Stainless Steel
5. Disc Pin Seals	EPDM/FPM/NITRILE
6. Stem	316 Stainless Steel
7. Stem O-rings	EPDM/FPM/NITRILE
8. Gear Box	Cast Iron Primed
9. Hand Wheel	Fabricated Steel Primed

Dimensions – Inches / Millimeters

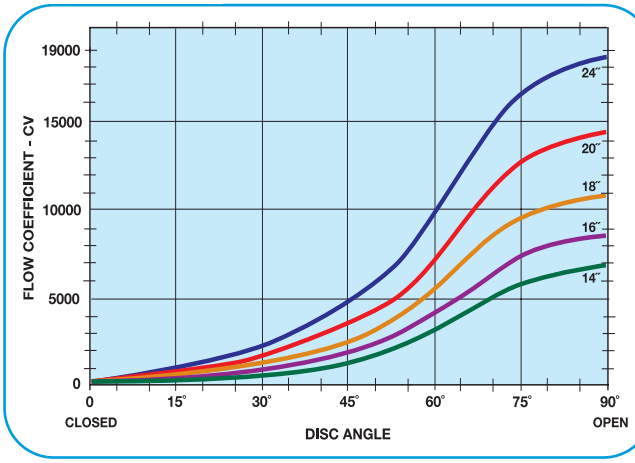
Valve Size	A	B	C	D	E	F	G	H	K	L	M	Weight (lb / kg)
14	20.54 / 522	13.18 / 335	4.00 / 102	1.09 / 28	12	18.75 / 476	20.59 / 523	12.31 / 313	2.63 / 67	14.00 / 356	10.27 / 261	110 / 50
16	24.00 / 610	15.00 / 381	4.00 / 102	1.12 / 28	16	21.25 / 540	21.12 / 536	12.31 / 313	2.63 / 67	14.00 / 356	11.00 / 279	150 / 68
18	24.00 / 610	17.30 / 439	4.00 / 102	1.25 / 32	16	22.75 / 578	22.38 / 568	13.31 / 338	3.38 / 86	14.00 / 356	12.50 / 318	180 / 82
20	28.00 / 711	19.25 / 489	5.00 / 127	1.25 / 32	20	25.00 / 635	24.70 / 627	13.31 / 338	3.38 / 86	14.00 / 356	14.37 / 365	210 / 95
24	32.00 / 813	23.25 / 591	6.00 / 152	1.38 / 35	20	29.50 / 749	27.38 / 695	10.50 / 267	3.38 / 86	14.00 / 356	16.75 / 425	300 / 136

DIN metric flanges available

Operating Temperature/Pressure



Cv Factors



Selection Chart

Size	Body Material	Disc Material	Seals	Operators	Pressure Rating
14, 16, 18 20, 24″	PPL	PPL	EPDM, FPM or Nitrile	Gearbox Electric Actuator Pneumatic Actuator	* PSI @ 70°F Non-Shock

*14″ = 105 PSI, 16″ =-90 PSI, 18″ = 75 PSI, 20″ and 24″ = 56 PSI

Butterfly Valves - 1 1/2″ to 24″ Sizes

Special Features and Options

Hayward Butterfly Valves are used for throttling or quick quarter-turn on-off control. They are simple, lightweight and compact – and are ideal for use where either space is limited or service and maintenance must be performed quickly. Because they require only 90° to fully open or close, Hayward butterfly valves are easily automated and are widely used as efficient throttling or flow regulating valves. Additionally, they are excellent for handling abrasive or slurry-type fluids.

Corrosion Resistant, No Contamination

Hayward plastic butterfly valves are installed for many reasons, including: resistance to corrosion and/or freedom from contamination. Hayward plastic butterfly valves do not have any metal in contact with the process media. There is none of the rusting or corrosion associated with metal valves, even those made from so-called ″higher″ alloys. PVC, CPVC and polypropylene are electrically non-conductive. Therefore, galvanic corrosion is completely unknown in Hayward plastic butterfly valves.

Equally important, there is nothing to leach out and contaminate the most sensitive liquids. Such difficult fluids as de-ionized water and delicate chemical solutions cannot pick up traces of metal or other foreign matter from a Hayward butterfly valve. The all-plastic construction makes them entirely inert. Hayward butterfly valves will outperform metal butterfly valves in many places. The applications are limited only by the imagination of the user.

Hayward Modular Design

Hayward Modular Series butterfly valves have been specifically designed as a rugged component-matched system. They offer a versatile range of operators, including hand levers, gear operators, electric and pneumatic actuators.

At left: 3″ butterfly valve with supported aluminum stem extension.

At right: 6″ butterfly valve with unsupported stem extension

The unique modular mounting design takes the difficulty and guesswork out of installation or service. The valves can be installed or removed in minutes – regardless of which valve trim or accessories are used.

The rugged one-piece body incorporates fully supported flange bolt holes. This prevents stressing of the mating pipe flanges, ensuring long service life and enhanced system integrity. Additionally, all sizes meet industry face-to-face standards – allowing simple retrofit to replace most metal butterfly valves.

Unique Liner Assures Positive Seal

The tough, abrasion resistant, elastomeric liner incorporates a unique retention design which assures positive sealing of the liner to the valve body. Thus, liner replacements can be made simply and quickly. Further, each liner has an integrally molded face seal which provides positive sealing against any mating flange without the use of additional gaskets.

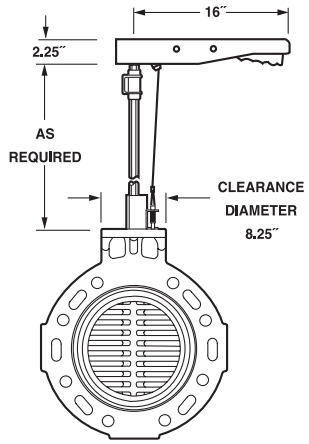
The primary seal between the disc and liner is factory tested to bubble-tight shut-off. This seal is self adjusting and will remain tight even beyond the design working pressure of the valve. The design provides for uniform wear on all contact surfaces for extended service life. The stainless steel shaft is completely sealed from the process media, is positively secured, and is blowout proof.

Trouble-Free Service

Designed for both the quality and cost conscious user, the Hayward Modular Series Plastic Butterfly Valves provide trouble-free service for highly corrosive or high purity liquids at elevated temperatures. They will neither corrode nor contaminate the fluids passing through them.

Butterfly Valve Options

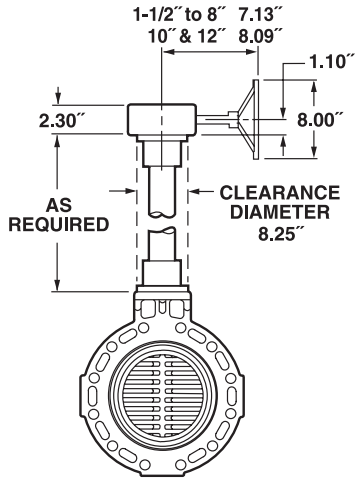
1 1/2″ to 8″ Lever Operated Butterfly Valve Stem Extension



Standard lengths available from 24″ to 120″ in 6″ increments only. Other lengths available as special order.

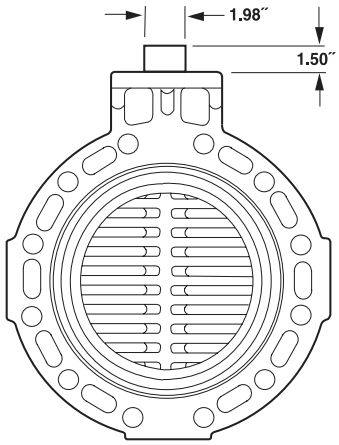
Recommended for extension lengths:
36″ to 60″ One Bearing Support Bracket
60″ to 96″ Two Bearing Support Brackets
96″ to 120″ Three Bearing Support Brackets

1 1/2″ to 12″* Gear Operated Butterfly Valve Stem Extension with PVC Housing

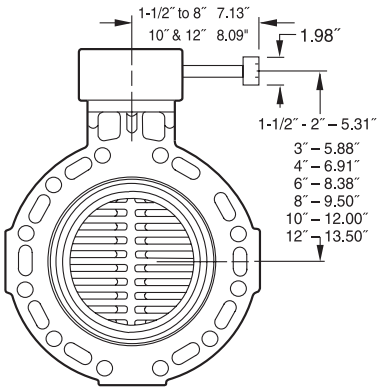


Standard lengths available from 24″ to 120″ in 6″ increments only. Other lengths available as special order.

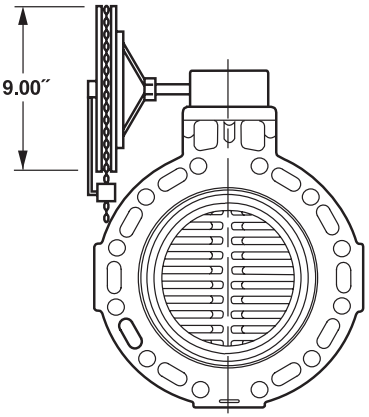
1 1/2″ to 8″ Butterfly Valve with Non-Locking 2″ Square Operating Nut



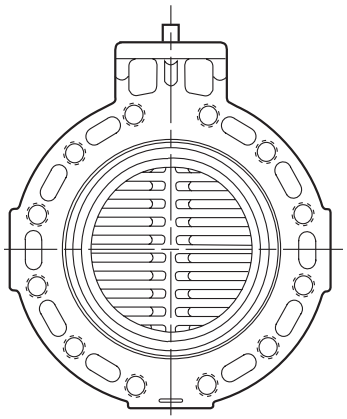
1 1/2″ to 12″* Gear Operated Butterfly Valve with 2″-Square Operating Nut



1 1/2″ to 12″* Chain Operated Butterfly Valve



1 1/2″ to 12″* Butterfly Valve with Lug Mounts



Lug Sizes
3″, 4″ – 5/8″ 11 NC
6″, 8″ – 3/4″ 10 NC
10″, 12″ – 7/8″ 9 NC

*Consult factory for option drawings for 14″ to 24″ size butterfly valves.

True Union Ball Check Valves

1/4″ to 6″ PVC, Corzan® CPVC, PPL

Backflow Prevention

Hayward True Union Ball Check Valves prevent reversal of flow in piping systems. They are ideal where backflow could potentially cause damage to pumps, filters, or process equipment.

Automatic Operation

Hayward True Union Ball Check Valves operate without the need for any adjustments or settings. Line pressure moves the solid plastic ball off the elastomer seat, opening the valve. When the inlet flow stops, back pressure moves the ball back onto the seat – stopping the flow. Additionally, this valve features a unique square-cut elastomer seat to seal at low back pressures.

True Union Design

Sizes 1/2″ to 6″ feature a true union design. This allows for easy removal from a piping system without breaking down piping connections. Just unscrew the two assembly nuts and lift the valve body out of the line. A Trim Check design is used for the 1/4″ and 3/8″ sizes. While not true union, the valves are fully repairable, unlike some other smaller check valves.

No Corrosion Failures

Because of their all-plastic construction, these valves will never jam or stick as a result of rust or corrosion. Also they will not contaminate sensitive fluids that come into contact with them.

Features

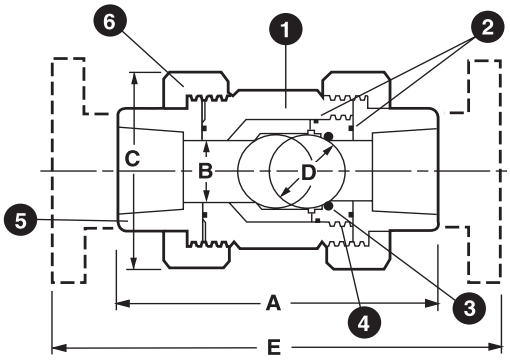
- Full Port Design to 4″
- True Union Design
- Easy Maintenance
- FPM or EPDM Seals
- Unique Square Cut Seat
- Works in Any Position Except Downflow

Options

- Foot Valve Screens

Technical Information

True Check with foot valve screen installed



Parts List
True Union Ball Check Valves

1. Body
2. O-Ring Seals
3. Square Cut O-Ring Seat
4. Seal Retainer
5. End Connector
6. Union Nut

Dimensions - Inches / Millimeters

Size	A	B	C	D	E	F	G	Weight - (lb / kg) Socket/ Threaded	Weight - (lb / kg) Flanged
1/4″	3.06 / 78	0.31 / 8	1.38 / 35	0.50 / 13	N/A	N/A	N/A	0.13 / .06	N/A
3/8″	3.06 / 78	0.31 / 8	1.38 / 35	0.50 / 13	N/A	N/A	N/A	0.13 / .06	N/A
1/2″ / 20*	4.63 / 118	0.50 / 13	2.25 / 57	0.75 / 19	6.75 / 171	4.88 / 124	2.32 / 59	0.75 / .34	1.00 / .45
3/4″ / 25*	4.75 / 121	0.75 / 19	2.63 / 67	1.0 / 25	7.13 / 181	5.00 / 127	2.60 / 66	0.75 / .34	1.38 / .63
1″ / 32*	5.25 / 133	1.00 / 25	3.00 / 76	1.25 / 32	7.75 / 197	5.88 / 14	2.88 / 73	1.25 / .57	2.13 / .97
1-1/4″ / 40*	6.30 / 160	1.25 / 32	4.00 / 102	1.75 / 44	9.19 / 233	6.94 / 17	3.75 / 95	2.00 / .90	3.75 / 1.70
1-1/2″ / 50*	6.75 / 171	1.50 / 38	4.00 / 102	1.75 / 44	9.75 / 248	7.06 / 17	3.75 / 95	2.00 / .90	3.75 / 1.70
2″ / 63*	8.00 / 203	1.94 / 49	4.75 / 121	2.25 / 57	11.25 / 286	8.56 / 217	4.50 / 114	3.75 / 1.70	5.75 / 2.60
2-1/2″	10.68 / 271	2.88 / 73	6.56 / 167	3.25 / 83	14.38 / 365	11.25 / 286	2.50 / 64	10.00 / 4.54	14.00 / 6.36
3″ / 90*	10.56 / 268	2.88 / 73	6.56 / 167	3.25 / 83	14.38 / 365	11.25 / 286	2.50 / 64	10.00 / 4.54	14.00 / 6.36
4″ / 110*	12.94 / 329	4.00 / 102	8.56 / 217	4.25 / 108	17.00 / 432	14.63 / 372	4.25 / 108	17.00 / 7.72	25.00 / 11.36
6″	N/A	4.00 / 102	N/A	4.25 / 108	19.19 / 487	N/A	N/A	N/A	30.20 / 13.73

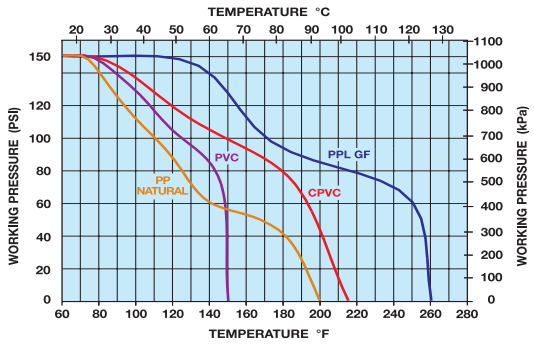
*** Metric End Connections Available in:** BSP – Straight Thread, BSP TR – Tapered Thread and Metric Socket

Selection Chart

Size	Material	End. Conn.	Seals	Pressure Rating
1/4″ - 3/8″*	PVC	Socket or Threaded	FPM	150 PSI @70°F Non-Shock
1/2″ - 4″	PVC or CPVC	Socket, Threaded, or Flanged	FPM or EPDM	
1/2″ - 2″	NAT. PPL***	Threaded	FPM	
6″**	PVC or CPVC	Flanged		

*Trim Check Design
** 4″ Valve Venturied to 6″
*** 2″ Rated at 100 PSI

Operating Temperature/Pressure



Pressure Loss Calculation Formula

$$\Delta P = \left[\frac{Q}{Cv}\right]^2$$

ΔP = Pressure Drop
Q = Flow in GPM
Cv = Flow Coefficient

Cv Factors

Size	Factor	Size	Factor
1/4″	1.0	1-1/2″	45
3/8″	3.0	2″	130
1/2″	4.8	2-1/2″	170
3/4″	7.7	3″	250
1″	11	4″	400
1-1/4″	25	6″	340

Y Check Valves

1/2″ to 4″ - PVC and Corzan® CPVC

Backflow Prevention

Hayward Y Check Valves prevent reversal of flow in piping systems. They are ideal where backflow could potentially cause damage to pumps, filters or process equipment.

Reliable Operation

Hayward Y Check Valves operate without the need for any adjustments or settings. A plastic coil (not a spring) supports the disc inside the valve body. When the inlet flow stops, backpressure (a minimum of 2 PSI is required) moves the disc with its elastomer o-ring onto a plastic seat – shutting off the flow. The plastic coil reliably guides the disc onto the seat.

Easy Maintenance

Hayward Y Check Valves are easily serviced without disconnection from the piping system. Just remove the heavy-duty hex cap for quick access to the internal valve components.

No Corrosion Failures

Because of their all-plastic construction, these valves will never jam or stick because of rust or corrosion. Also they will not contaminate sensitive fluids that come into contact with them. And, they require no painting or coating to stand up to corrosive environments.

Features

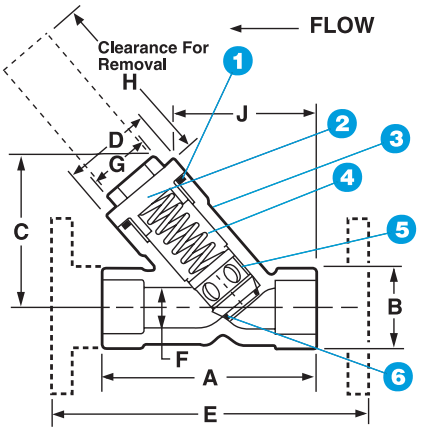
- Full Flow Design
- All-Plastic Construction
- Easy Maintenance
- FPM Seals
- Work in Any Position

Options

- True Union Connections Available

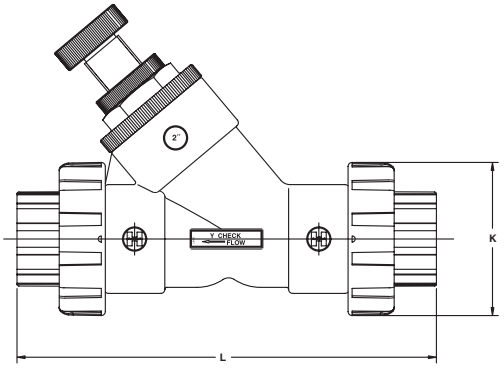
Corzan® is a registered trademark of Noveon, Inc.

Technical Information



Parts List
Y Check Valves

1. O-Ring Seal
2. Hex Cap
3. Body
4. PVC Coil
5. Disc
6. O-Ring Disc Seal



Dimensions – Inches / Millimeters

Size	A	B	C	D	E	F	G	H	J	K	L	Weight (lb / kg) Socket/ Threaded	Weight (lb / kg) Flanged
1/2″	3.38 / 83	1.38 / 35	2.25 / 57	1.50 / 38	N/A	0.56 / 14	1.00 / 25	1.50 / 38	2.50 / 64	2.25 / 57	6.64 / 169	0.25 / 0.1	N/A
3/4″	4.18 / 106	1.69 / 43	2.88 / 73	2.00 / 51	N/A	0.81 / 21	1.25/ 32	1.75 / 44	3.00 / 76	2.63 / 67	7.42 / 188	0.63 / 0.29	N/A
1″	5.19 / 132	2.00 / 51	3.63 / 92	2.16 / 55	N/A	1.00 / 25	1.50 / 38	2.25 / 57	3.32 / 84	3.00 / 76	8.97 / 228	0.88 / 0.40	N/A
1-1/4″	6.63 / 168	2.63 / 67	4.50 / 114	2.94 / 75	N/A	1.25 / 32	2.00 / 51	3.00 / 76	4.45 / 113	4.75 / 120	13.01 / 330	1.75 / 0.80	N/A
1-1/2″	6.63 / 168	2.63 / 67	4.50 / 114	2.94 / 75	N/A	1.56 / 40	2.00 / 51	3.00 / 76	4.45 / 113	4.75 / 120	12.07 / 307	1.63 / .74	N/A
2″	7.63 / 194	3.38 / 86	5.38 / 137	3.75 / 95	11.00 / 279	2.00 / 51	2.38 / 60	3.25 / 83	4.88 / 124	4.75 / 120	13.05 / 331	3.00 / 1.36	5.00 / 2.2
2-1/2″	10.31 / 262	4.69 / 119	7.25 / 184	5.50 / 140	N/A	2.90 / 74	3.50 / 89	4.25 / 108	6.54 / 166	6.40 / 163	16.77 / 426	7.75 / 3.52	N/A
3″	10.31 / 262	4.69 / 119	7.25 / 184	5.50 / 140	14.37 / 365	2.90 / 74	3.50 / 89	4.25 / 108	6.54 / 166	6.40 / 163	16.77 / 426	7.50 / 3.41	12.50 / 5.68
4″	12.81 / 325	5.75 / 146	8.88 / 224	6.18 / 157	17.73 / 450	3.78 / 96	4.25 / 108	5.00 / 127	8.58 / 218	8.56 / 217	21.23 / 539	9.50 / 4.32	17.50 / 7.95

Selection Chart

Size	Material	End. Conn	Seals	Rating
1/2″ - 4″	PVC CPVC	Socket, Threaded or Flanged	FPM	150 PSI@ 70°F

Cv Factors

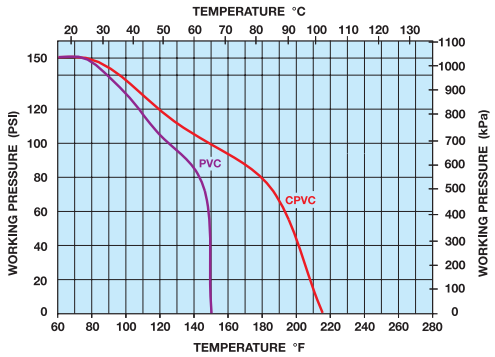
Size	Factor	Size	Factor
1/2″	0.8	2″	65
3/4″	3.0	2-1/2″	75
1″	9.0	3″	110
1-1/4″	26	4″	240
1-1/2″	45		

Pressure Loss Calculation Formula

$$\Delta P = \left[\frac{Q}{Cv}\right]^2$$

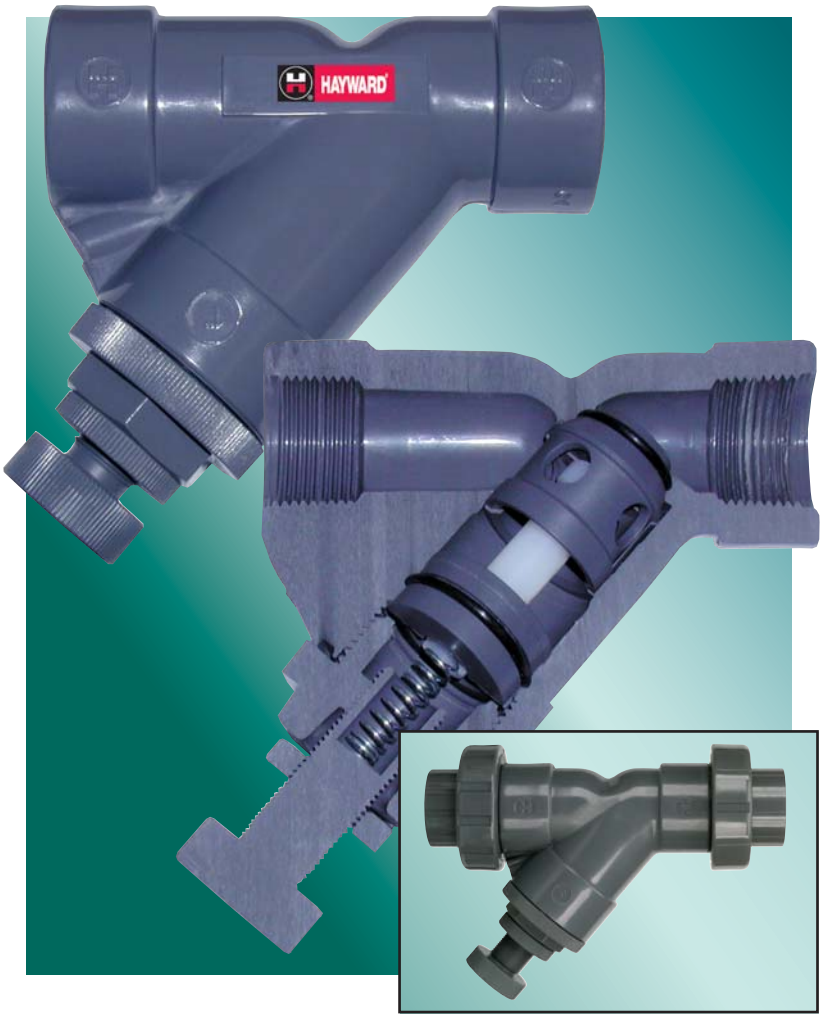
ΔP = Pressure Drop
Q = Flow in GPM
Cv = Flow Coefficient

Operating Temperature/Pressure



Spring-Loaded Y Check Valves

1/2″ to 4″ - PVC



Features

- Full Flow Design
- Easy Maintenance
- Closes with No Back Pressure
- Adjustable – Opens from 2 to 15 PSI
- Works in Any Position
- FPM or EPDM Seals

Options

- True Union Connections Available

Backflow Prevention

Hayward's Spring Loaded Y Check valves give positive protection against reversal of flow in a piping system – even in the absence of back pressure. Check valves that are not spring loaded require fluid back pressure to seal. If an application cannot produce enough back pressure, the standard check valve can't seal. Hayward's Spring Loaded Check Valves do not require system generated back pressure to work.

Applications

Installed downstream of a pump, these valves prevent unwanted flow of the process fluid once the pump has been turned off – even if there is no back pressure. For process vessels located inside a secondary containment area, this prevents siphoning of the vessel. For open distribution lines, Hayward's Spring Loaded Check Valves optimize operational efficiencies by preventing unwanted loss of process fluid. And by retaining the process fluid downstream of the pump, Hayward Spring Loaded Check Valves greatly reduce the likelihood of water hammer that can occur if a pump is started in an empty, open line.

Reliable, Flexible Operation

Hayward Spring Loaded Check Valves are hand adjustable and can be set to open the valve at pressures from 2 to 15 PSI….a real advantage over other types of spring loaded check valves that require a separate spring for each setting. A lock ring reliably holds the adjustment after it has been set. The double seal design of the valve ensures seal integrity and long life.

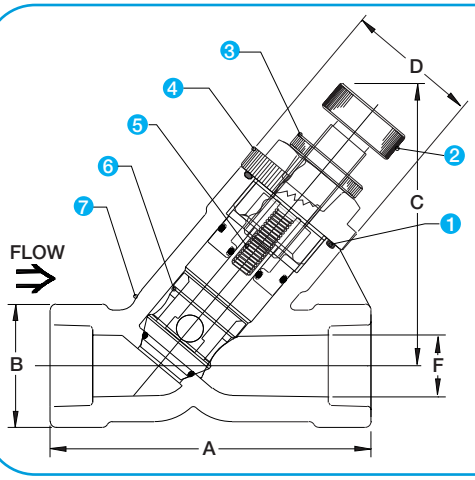
Easy Maintenance

There is no need to remove Hayward's Spring Loaded Check Valve from the piping system for service. Just remove the heavy-duty hex cap for quick access to the internal valve components.

No Corrosion Failures

Because of their all-plastic construction, these valves will never jam or stick due to rust or corrosion. Also they will not contaminate sensitive fluids that come into contact with them. And, they require no painting or coating to withstand corrosive environments.

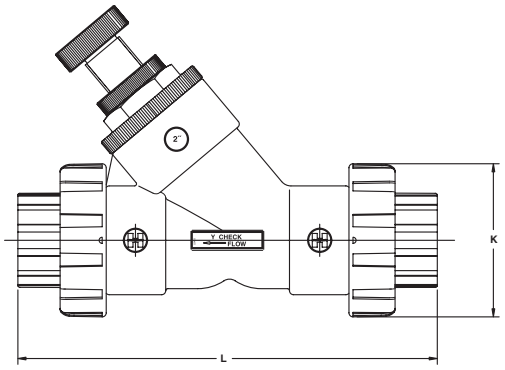
Technical Information



Parts List

Spring-Loaded Y Check Valves

1. O-Ring Seal
2. Adjustment Screw
3. Lock Nut
4. Hex Cap
5. Stainless Steel Spring
6. Cartridge Assembly
7. Body



Dimensions – Inches / Millimeters

Size	A	B	C	D	F	K	L	Weight (lb / kg) Socket/Threaded
1/2″	6.19 / 158	2.00 / 51	4.58 / 116	2.13 / 54	1.00 / 25	2.25 / 57	6.64 / 169	0.88 / 0.40
3/4″	6.19 / 158	2.00 / 51	4.58 / 116	2.13 / 54	1.00 / 25	2.63 / 67	7.42 / 188	0.88 / 0.40
1″	5.19 / 132	2.00 / 51	4.58 / 116	2.13 / 54	1.00 / 25	3.00 / 76	8.97 / 228	0.88 / 0.40
1-1/2″	8.63 / 220	3.38 / 86	7.28 / 185	3.75 / 95	2.00 / 51	4.75 / 120	12.07 / 307	3.00 / 1.36
2″	7.63 / 194	3.38 / 86	7.28 / 185	3.75 / 95	2.00 / 51	4.75 / 120	13.05 / 331	3.00 / 1.36
3″	10.31 / 262	4.69 / 119	8.88 / 225	5.25 / 133	2.94 / 75	6.40 / 163	16.77 / 426	7.50 / 3.41
4″	12.75 / 324	5.75 / 146	10.08 / 256	6.00 / 152	3.81 / 97	8.56 / 217	21.23 / 539	9.50 / 4.32

Selection Chart

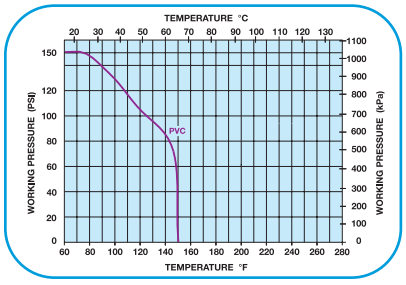
Size	Material	End. Conn	Seals	Rating
1/2″ - 4″	PVC	Threaded	FPM or EPDM	150 PSI @ 70°F

Pressure Loss Calculation Formula

$$\Delta P = \left[\frac{Q}{Cv}\right]^2$$

ΔP = Pressure Drop
Q = Flow in GPM
Cv = Flow Coefficient

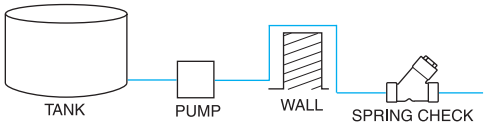
Operating Temperature/ Pressure



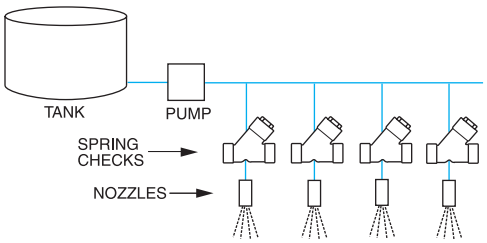
Cv Factors

Size	Factor	Size	Factor
1/2″	0.8	2″	65
3/4″	3.0	3″	110
1″	9.0	4″	240
1-1/2″	45		

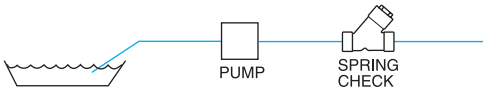
Typical Applications



PREVENT SIPHONING OF TANK WHEN PUMP SHUTS OFF



PREVENT LOSS OF PROCESS FLUID WHEN PROCESS FLOW IS STOPPED



MINIMIZE RISK OF WATER HAMMER RESULTING FROM STARTING PUMP IN AN OPEN LINE

All-Plastic Swing Check Valves

3″, 4″, 6″ and 8″ - PVC, PPL and Corzan® CPVC

Features

- FPM or EPDM Seals
- Flanged Connections
- Two Drain Ports
- Horizontal or Vertical Installation (counterweight recommended)
- No Flange Gaskets Required

Options

- Counterweight for Closing Assistance
- Limit Switch for Position Indication
- Spring Assist Closure

Corzan® is a registered trademark of Noveon, Inc.

Twice The Temperature/Pressure Rating Of Other Plastic Swing Check Valves

Hayward swing check valves have up to twice the temperature/pressure rating of other plastic swing check valves…and can often replace metal valves in many applications. Compare the temperature/pressure rating of Hayward Swing Check Valves to others – and see the difference.

Unique Two-In-One Seat™ Design

Swing check valves are often used with slurries or other liquids that can damage the valve seat. A damaged seat in an ordinary swing check results in a useless, destroyed valve. But not with Hayward Swing Check Valves. They feature a unique *Two-In-One Seat* ™ design that doubles the valve's service life. The valve body is constructed from two identical halves. If one seat is damaged, simply re-position the clapper so that it seats against the other body seat. Then, reverse the valve in the pipeline. The valve is again ready for service.

Built-In O-Ring Flange Seals

Hayward Swing Check Valves are furnished ready for installation with two built-in O-ring flange seals. There is no need to purchase additional, expensive flange gaskets.

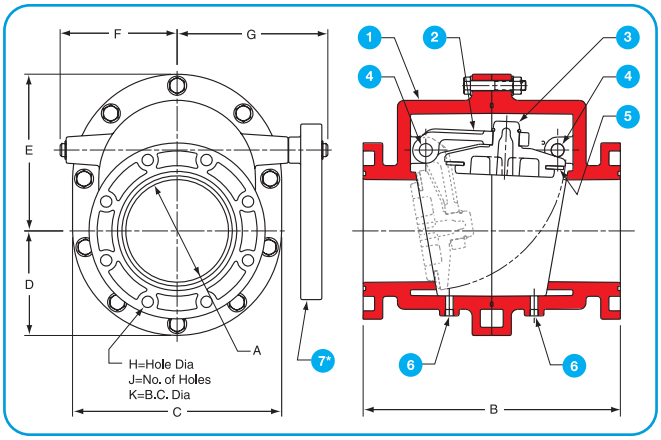
Self-Aligning Clapper Seal

Bubble-tight checking, with a minimum of only 3 PSI back pressure, is assured with Hayward's rugged, self-aligning clapper seal design.

No Corrosion – Ever!

Because of their all-plastic construction, Hayward Swing Check Valves will never stick or jam as a result of rust or corrosion. And they can survive corrosive environments and harsh weather conditions, places where a metal check valve has to be painted or epoxy-coated just to survive.

Technical Information



Parts List

1. Body
2. Swing Arm
3. Clapper
4. Shaft*
5. Seal
6. Drain Plug (2)
7. Counter Weight (Optional)

*PVC with PVC valves
PVDF with PPL valves
CPVC with CPVC valves

Selection Chart

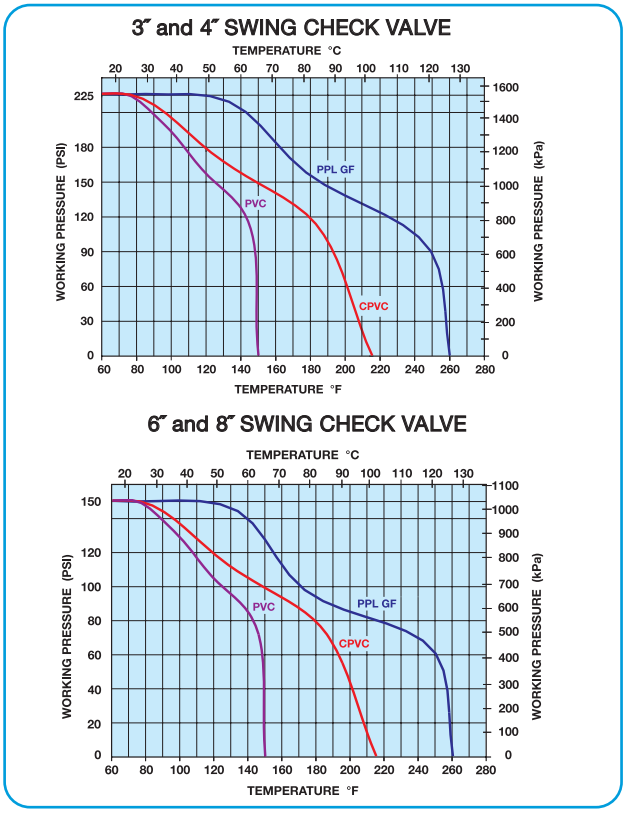
Sizes	Material	End Conn.	Seals	Pressure Rating
3″ and 4″	PVC, Glass Reinforced PPL or CPVC	Flanged	Viton® or EPDM	225 PSI @ 70°F
6″ and 8″				150 PSI @ 70°F

Dimensions - Inches / Millimeters

Size	A	B	C	D	E	F	G	H	J	K	Minimum Back Pressure To Close - PSI	Weight (lb / kg)
3 / 75	3.00 / 76	10.24 / 260	7.50 / 190	3.75 / 95	5.21 / 132	3.90 / 99	4.91 / 48	0.625 / M16	4	6.00 / 150	3	10 / 4.5
4 / 100	3.90 / 99	11.81 / 300	9.25 / 235	4.63 / 117	6.75 / 171	4.80 / 122	6.15 / 156	0.625 / M16	8	7.50 / 180	3	21 / 9.5
6 / 150	5.91 / 150	15.75 / 400	12.75 / 323	6.38 / 162	9.25 / 235	6.47 / 164	8.30 / 210	0.75 / M20	8	9.50 / 240	3	47 / 21.4
8 / 200	7.87 / 199	19.69 / 500	16.00 / 406	8.00 / 203	12.00 / 304	8.96 / 227	11.54 / 293	0.75 / M20	8	11.75 / 295	3	90 / 41.0

DIN metric flange standard

Operating Temperature/Pressure



Cv Factors

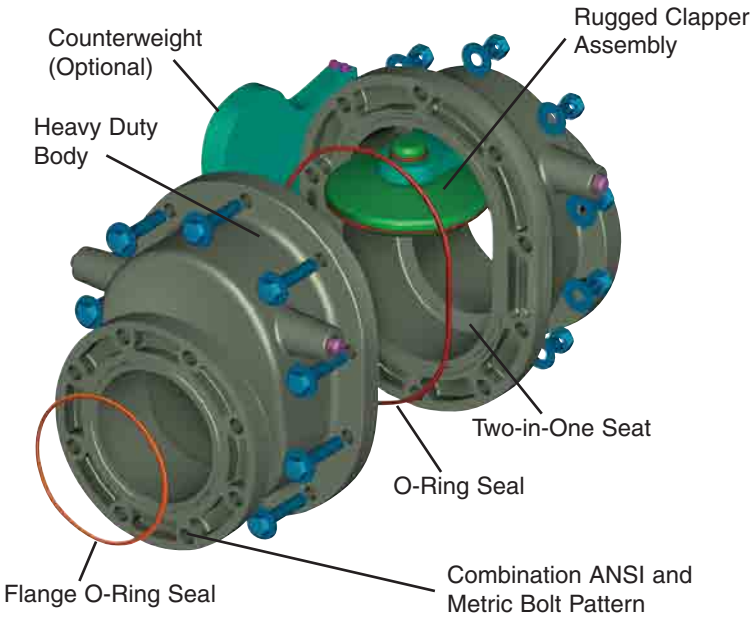
Valve Size	Factor
3″	328
4″	514
6″	1278
8″	2549

Pressure Loss Calculation Formula

$$\Delta P = \left[\frac{Q}{Cv}\right]^2$$

ΔP = Pressure drop
Q = Flow in GPM
Cv = Flow coefficient

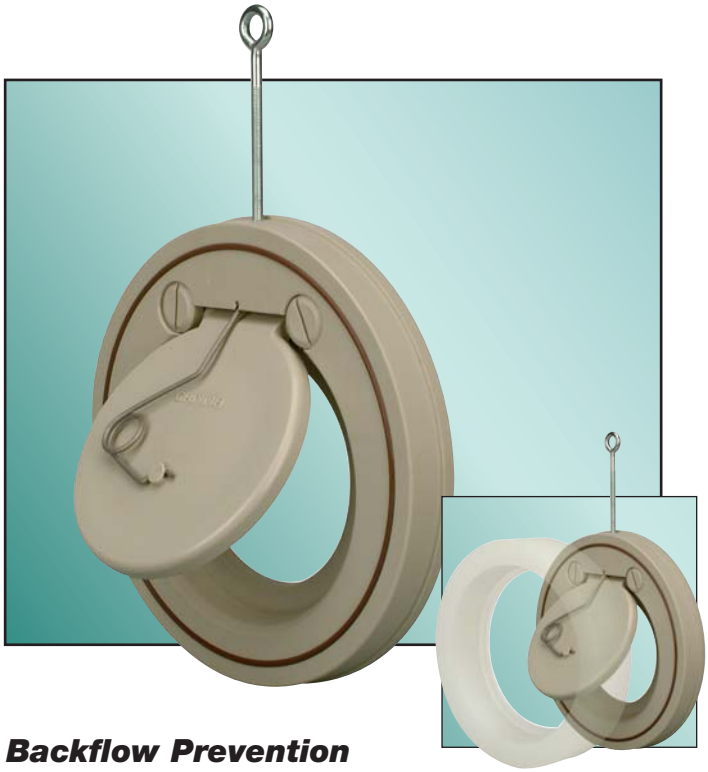
Features



Viton® is a registered trademark of DuPont

Wafer Check Valves

2″ to 20″ - PVC, PPL and PVDF



Backflow Prevention

Hayward Wafer Check Valves are an economical way to prevent reversal of flow in piping systems. They are ideal for limited space and larger size pipe installations.

Reliable Operation

Hayward Wafer Check Valves operate without the need for any adjustments or settings. The valve's hinged plastic disc, with replaceable O-ring seal, is designed to provide a bubble-tight flow shutoff. When inlet flow stops, back pressure* moves the disc with its O-ring seal into the valve's plastic body – shutting off the flow.

Two Available Models

Hayward Wafer Check Valves are available in two types. A lower cost version without a disc spring is available for applications where it is not desirable for the process stream to come in contact with metals. A version with disc spring is recommended for pulsating flow and horizontal piping applications where faster disc closure is required to reduce the amount of backflow and possible water hammer.

Easy Installation

Hayward Wafer Check Valves are light weight and designed for easy installation. The valve's wafer body slips between standard flanges and can be used in either vertical or horizontal operation**.

No Corrosion

All-plastic construction of Hayward Wafer Check Valves ensures these valves will never jam or stick because of rust or corrosion. They will not contaminate sensitive process fluids they come in contact with, and require no painting or coating to stand up to corrosive environments.

Features

- Low Cost
- Compact and Light Weight
- All-Plastic Construction
- Easy Installation
- EPDM O-Ring/Seat
- Stainless Steel or Hastelloy® Disc Springs
- Vertical or Horizontal Operation

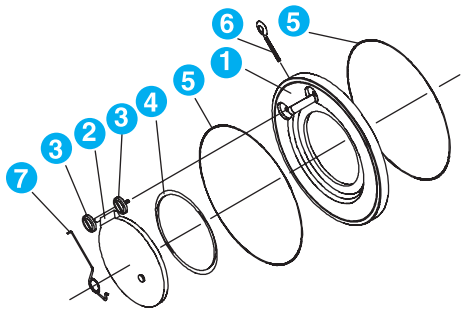
Options

- Spacers
- FPM O-Ring/Seat

*Back pressure required is dependent on valve installed position and size. Consult factory for details.

**Disc spring version should be used for horizontal piping.

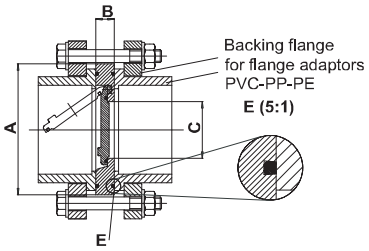
Technical Information

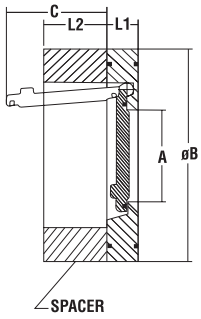


Parts List

Wafer Check Valve

1. Body
2. Valve Disc
3. Screw
4. O-Ring/Seat
5. O-Ring
6. Support Ring
7. Spring





Dimensions - Inches

Size	L1	L2	A	B	C
2″	0.8	1.0	1.3	4.1	1.8
2-1/2″	0.8	1.5	1.6	4.8	2.0
3″	0.8	1.6	2.0	5.4	2.9
4″	0.9	2.0	2.8	6.9	3.6
6″	1.0	2.0	4.4	8.7	5.8
8″	1.4	3.5	5.9	10.9	7.5
10″	1.6	3.9	7.5	13.0	9.0
12″	1.8	5.9	8.5	15.7	10.2

Pressure Loss Calculation Formula

$$\Delta P = \left[\frac{Q}{Cv}\right]^2$$

ΔP = Pressure Drop
Q = Flow in GPM
Cv = Flow Coefficient

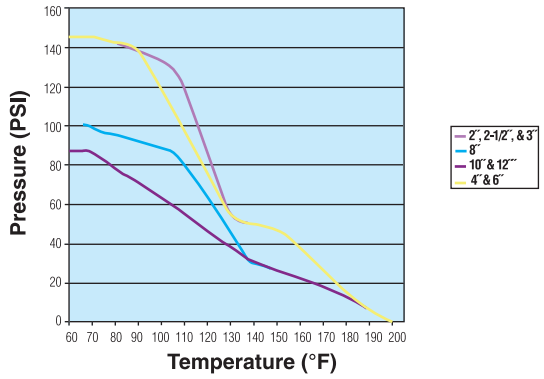
Selection Chart

Size	Material	End Conn.	O-Ring	Spring	Screw
2″-20″	PVC, PP, PVDF	Flanged	EPDM FPM Teflon® Encapsulated FPM	316 SS, Hastelloy® (2.4610)	PPL, PVDF

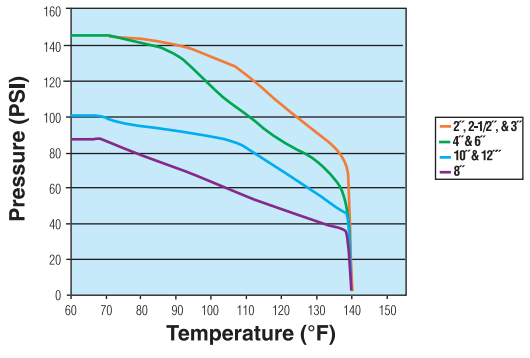
Cv Factors

Size	Sch 40 Without Spacer	Sch 80 With Spacer
2″	58	74
2-1/2″	77	108
3″	105	203
4″	224	300
6″	718	949
8″	980	1175
10″	1880	2050
12″	2520	2940

Pressure vs. Temperature–PPL



Pressure vs. Temperature–PVC



Hastelloy® is a registered trademark of Haynes International, Inc.
Teflon® is a registered trademark of DuPont

Contact factory for PVDF material

ProFile2™ Proportional Control All-Plastic Ball Valves

1″ to 6″ - PVC, Corzan® CPVC

Features

- All-Plastic Construction
- Precise Flow Control
- True Union Design
- Integrally Molded Stem Support and Mounting Platform for Proper Alignment and Actuator Mounting
- Fully Serviceable Internals can be Inspected and Serviced

Options

- Positioners for Automated Modulating Service Applications
- EPDM Seals
- Manual Handle

Two Proportional Flow Control Rates with One Valve

Hayward ProFile2 corrosion resistant, proportional control ball valves provide two linear flow curves – one for fast opening, one for slow opening. The percentage of flow through the valves with either flow curve is equal to the degree of opening. As the valves are opened or closed, the flow varies in direct proportion to the valve opening. This permits predictable, accurate control of the downstream flow rate with a 1/4-turn valve.

Unique-Design "Characterized" Ball

These valves utilize a unique, patented ball with a special "characterized" opening that results in the linear flow rate change. Valves are shipped with the ball installed so that the smaller opening enters the flow first, creating the slow open rate. To switch to the fast opening rate, simply reverse the ball in the valve. Then the larger opening will enter the flow first – creating a large opening with slower changes.

Perfect with Positioners

Hayward ProFile2 Proportional Control True Union Ball Valves can be supplied with optional electric or pneumatic actuators with positioners for automated modulating service applications.

Never a Problem with Corrosion

Because of their all-plastic construction, Hayward ProFile2 ball valves will never rust or corrode – and they can survive corrosive environments and harsh weather conditions without the need for painting or expensive epoxy coating.

Applications

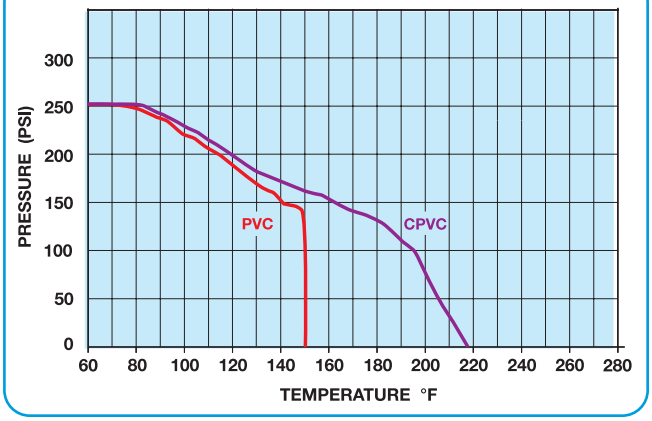
- Methane Gas Recovery
- Fill Station Lines
- Lateral Take Off Line Flow Control
- Flow Reduction in Systems with Oversize Pumps
- Control Flow from Tanks

Technical Information

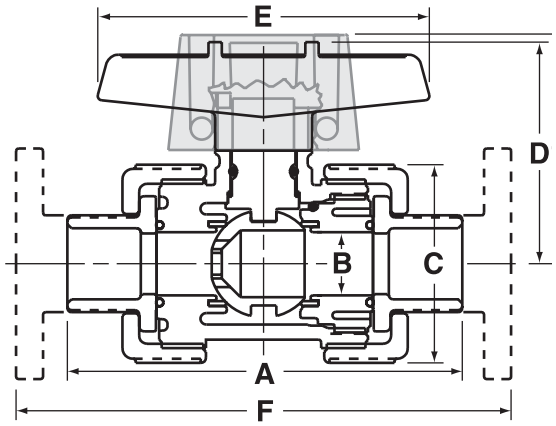
Selection Chart

Size	Material	End Conn.	Seals	Pressure Rating
1, 2, 3, 4″	PVC or CPVC	Socket, Threaded or Flanged	FPM or EPDM	250 PSI @ 70°F Non-Shock
6″*	PVC or CPVC	Flanged		

Temperature/Pressure Chart



Dimensions



Dimensions

Size	A	B	C	D1	D2	E	F
1″	5.25	1.00	3.00	3.32	3.05	4.00	8.00
2″	8.00	1.83	4.75	4.43	4.00	5.00	11.38
3″	10.56	3.00	6.40	5.50	5.50	10.50	14.44
4″	12.94	3.75	8.56	6.50	6.50	10.50	17.13

Pressure Loss Determination

The charts below are used to determine the flow coefficients for ProFile2 Proportional Control Ball valves. The flow coefficient can be used to calculate the pressure loss across the valve at any angular degree of opening using the formula: **Pressure Loss = (Flow in GPM / Flow Coefficient)$_2$**. For example a 1″ valve with a ″slow open″ configuration that is 60° open has a flow coefficient of 8. If the valve were to be installed in a system with a flow rate of 16 gpm, the **Pressure Loss** would be **$(16 / 8)^2 = 4$**. The flow coefficients for standard, full flow valves are shown for comparison.

1″ ProFile2 Proportional Valve Flow Coefficients

Angular Deg of Opening	Slow Open	Fast Open	Full Port Valve
15°	0.5	1.0	1.2
30°	1.9	3.4	3.5
45°	3.7	7.0	7.5
60°	8.0	13.0	15.3
75°	14.7	18.8	27.8
90°	21.0	21.0	29.0

2″ ProFile2 Proportional Valve Flow Coefficients

Angular Deg of Opening	Slow Open	Fast Open	Full Port Valve
15°	1	2.5	10
30°	4	11	16
45°	11	25	35
60°	21	44	72
75°	37	54	117
90°	56	56	150

Pressure Loss Calculation Formula

$$\Delta P = \left[\frac{Q}{C_V}\right]^2$$

ΔP = Pressure drop
Q = Flow in GPM
C_V = Flow coefficient

3″ ProFile2 Proportional Valve Flow Coefficients

Angular Deg of Opening	Slow Open	Fast Open	Full Port Valve
15°	3	10	10
30°	12	26	26
45°	30	50	55
60°	60	79	110
75°	89	112	212
90°	128	128	490

4″ ProFile2 Proportional Valve Flow Coefficients

Angular Deg of Opening	Slow Open	Fast Open	Full Port Valve
15°	5	18	38
30°	30	55	90
45°	65	114	165
60°	120	183	250
75°	185	200	458
90°	215	215	600

Diaphragm Valves

1/2″ to 2″ - PVC, Corzan® CPVC, PPL

Superior Design Means Superior Performance

Hayward all-plastic diaphragm valves have been specifically designed to perform in the most demanding liquid, gas, and slurry applications in both on/off and modulating service.

Diaphragm Saver™

The Diaphragm Saver travel stop is a standard feature on all sizes of Hayward Diaphragm Valves. Its special design prevents overcompression of the diaphragm and prolongs its service life.

Positive, Visual Position Indication

Hayward's standard highly visible, beacon-type position indicator will always give positive position indication, unlike rising stem indicators that can be inaccurate because of misadjusted stems. Sight panels are made from clear Eastar®.

True Union Design

Hayward Diaphragm Valves with socket or threaded connections have a true union design so that they can be removed from the line without having to disconnect piping connections.

No Metal, No Corrosion

These valves have no wetted metal components. The valves will never fail because of corrosion and they do not require painting or epoxy coating to stand up to aggressive environments.

Features

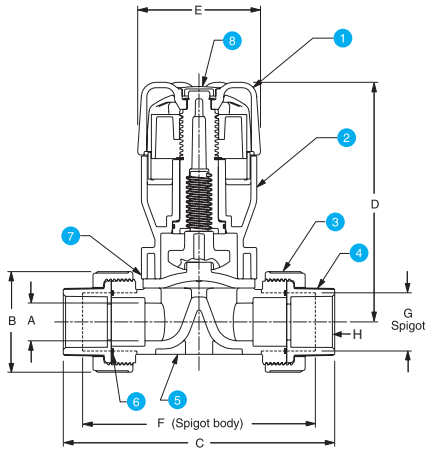
- Double Stem Seals
- Rated to 225 PSI
- Position Indicator
- Diaphragm Saver™
- Choice of EPDM, FPM or PTFE Lined Diaphragms

Options

- Automatic, Pneumatic Operation

Eastar® is a registered trademark of Eastman
Corzan® is a registered trademark of Noveon, Inc.

Technical Information



Parts List
Diaphragm Valves

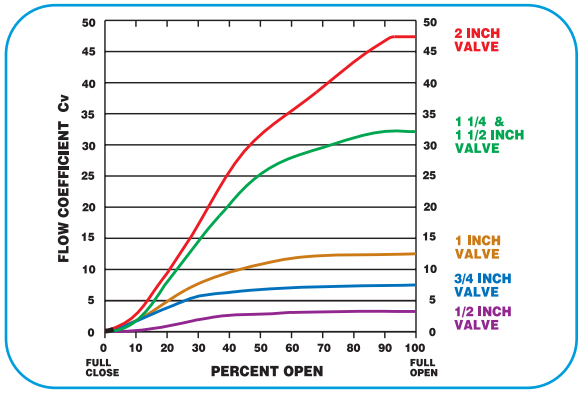
1. Handle
2. Bonnet
3. Assembly Nut
4. End Connector
5. Body
6. O-Ring Seal
7. Diaphragm
8. Bezel

Dimensions – Inches / Millimeters

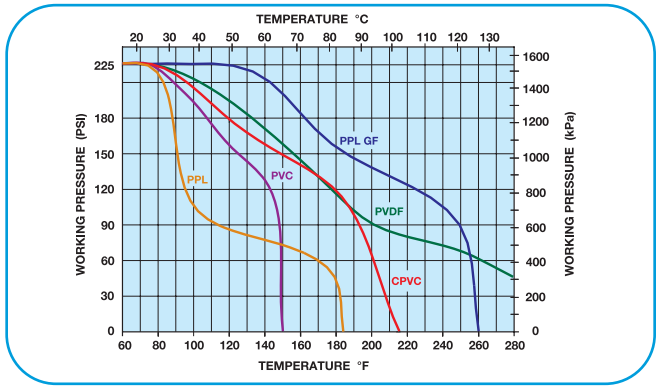
Size	A	B	C	D	E	F	G - PPL	H (Flange)	Weight (lb / kg)
1/2 / 20*	0.59 / 15	2.25 / 57	5.79 / 147	5.46 / 139	2.50 / 64	4.88 / 124	0.840″	7.91	1.5 / .68
3/4 / 25*	0.79 / 20	2.25 / 57	6.50 / 165	5.55 / 140	2.50 / 64	5.67 / 144	1.050″	8.88	2.0 / .90
1 / 32*	0.98 / 25	2.62 / 67	7.07 / 180	6.24 / 158	3.19 / 81	6.06 / 154	1.314″	9.82	3.3 / .90
1-1/4 / 40*	1.58 / 40	3.56 / 90	9.33 / 237	8.40 / 213	4.00 / 102	n/a	n/a	12.22	5.7 / 2.6
1-1/2 / 50*	1.58 / 40	3.56 / 90	9.89 / 251	8.40 / 213	4.00 / 102	7.64 / 194	1.900″	13.02	5.7 / 2.6
2 / 63*	1.97 / 50	4.00 / 102	11.15 / 283	8.71 / 221	4.00 / 102	8.82 / 224	2.375″	14.55	8.6 / 3.9

* **Metric End Connections Available in:** BSP – Straight Thread, BSP TR – Tapered Thread and Metric Socket

Flow Rates



Operating Temperature/Pressure



Note: Valves with PTFE diaphragms rated at 150 PSI only.

Selection Chart

Size	Material	End Conn.	Diaphragm	Rating
1/2″ - 2″	PVC/CPVC	Socket/Threaded	FPM, EPDM, PFTE	225 PSI manual 150 PSI actuated @ 70°F non-shock
1/2″ - 2″	PPL*	Spigot**	FPM, EPDM	

* No 1-1/4″ in PPL ** Spigot Not True Union **Note:** Valves with PTFE diaphragms rated at 150 PSI only.

Pressure Loss Calculation Formula

$$\Delta P = \left[\frac{Q}{Cv}\right]^2$$

ΔP = Pressure Drop
Q = Flow in GPM
Cv = Flow Coefficient

Large Size Diaphragm Valves

3″, 4″ and 6″ - PVC, 3″ and 4″ Corzan® CPVC

Features

- Choice of PVC or CPVC Construction
- EPDM or PTFE Diaphragms (CPVC only)
- Flanged End Connections
- Plastic Construction
- Position Indicator

Corzan® is a registered trademark of Noveon, Inc.

Rugged Design

Hayward Large Size Diaphragm Valves are not just “scaled-up” versions of smaller size valves, but have been especially designed for use in the demanding applications that these types of valves typically see: liquid, gas and slurry applications, in both on/off and modulating services.

Application Versatility

Available with either EPDM or PTFE diaphragms, Hayward Large Size Diaphragm Valves will work in a wide variety of applications. And, you have your choice of PVC, or for higher temperature applications, CPVC.

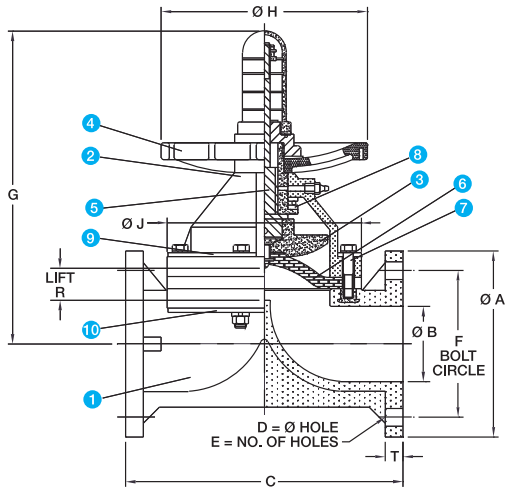
Easy Operation

A rugged, sure-grip hand wheel makes it easy to open or close the valve with a minimal amount of effort. In modulating service, the hand wheel permits precise adjustment of the desired flow rate. A highly visible stem position indicator shows, at a glance, the position of the valve – open, closed, or any position in between.

No Metal, No Corrosion

The plastic construction of these valves means that they will never fail, jam, stick, or freeze in position because of rust or corrosion. They will never contaminate sensitive process fluids as a metal valve can. Another benefit of the plastic construction is that the valves never need to be painted or coated. They will withstand corrosive applications as supplied. Installation is easy, too, due to the lighter weight of plastic in relation to metal.

Technical Information



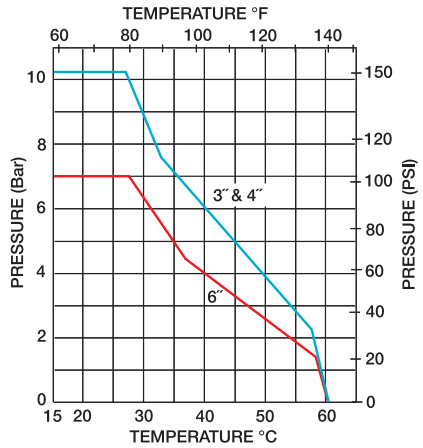
Parts List
Diaphragm Valves

1. Body
2. Bonnet
3. Compressor
4. Hand Wheel
5. Stem
6. Diaphragm
7. Stud Bolt
8. Thrust Bearing
9. Upper Backing Ring
10. Lower Backing Ring

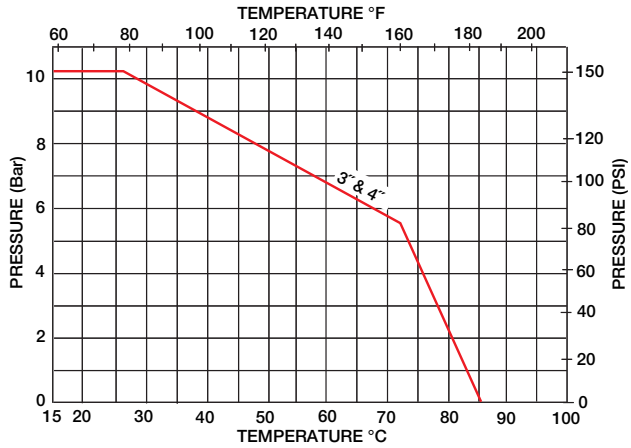
Dimensions – Inches / Millimeters

Size	A	B	C	D Bolt Hole	E No. Holes	F	G	H	J	T	R Lift
3 / 80	7.52 / 190	3.07 / 78	10.40 / 264	0.75 / 19	4	6.00 / 152	11.54 / 293	7.95 / 202	8.46 / 215	0.79 / 20	1.34 / 34
4 / 100	9.02 / 230	3.94 / 100	12.95 / 330	0.75 / 19	8	7.50 / 190	14.57 / 370	9.49 / 240	10.04 / 250	1.10 / 28	2.13 / 54
6 / 150	10.98 / 280	5.83 / 148	18.90 / 480	0.87 / 22	8	9.51 / 242	18.54 / 470	15.55 / 400	15.16 / 385	1.26 / 32	2.83 / 72

Operating Temperatures/Pressures



PVC Diaphragm Valve



CPVC Diaphragm Valve

Cv Factors

Size	Factor
3″	160
4″	280
6″	700

Pressure Loss Calculation Formula

$$\Delta P = \left[\frac{Q}{Cv}\right]^2$$

ΔP = Pressure Drop
Q = Flow in GPM
Cv = Flow Coefficient

Selection Chart

Size	Material	End Conn.	Diaphragm	Rating
3″, 4″, 6″	PVC	Flanged	EPDM or PTFE	3″ & 4″ – 125 PSI 6″ – 90 PSI @ 70°F, Non-Shock
3″, 4″	CPVC			90 PSI @ 70°F, Non-Shock

Pressure Relief Valves

1/2″ to 2″ - PVC and Corzan® CPVC

Features

- No Metal Parts to Stick or Jam
- Hand Adjustable
- Molded Gauge Port
- Relieves Pressures from 5 to 75 PSI
- All Plastic, No Rust or Corrosion
- FPM or EPDM Seals

Options

- Pressure Gauges
  0 to 30 PSI
  0 to 60 PSI
  0 to 160 PSI
- Gauge Guards
- Low Pressure Springs

Corzan® is a registered trademark of Noveon, Inc.

Reliable Pressure Relief

Hayward Pressure Relief Valves protect piping system components from damage due to overpressurization. The valves work by sensing system pressure. When the system pressure exceeds the set pressure, the force of the excess pressure moves the valve piston off its seat to relieve the excess pressure and diverts some of the flow out the discharge port.

Easy to Set Pressure

Hayward Pressure Relief Valves can be set by hand – no tools are needed – to relieve pressures from 5 to 75 PSI. Each size of relief valve is designed to cover this complete pressure range with just one, non-wetted, plastic-coated spring. There's no need to change springs for different pressure ranges as with ordinary relief valves.

Molded Gauge Port

An integrally-molded 1/4″ NPT gauge port on the valve body makes installation of a gauge to monitor the relief pressure easy. No drilling or extra fittings are needed.

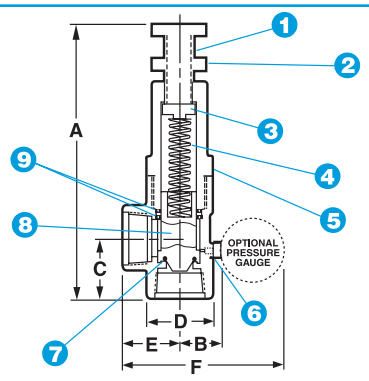
No Corrosion Failure

These all-plastic relief valves have no metal parts and will never fail, jam, or stick because of rusted or corroded components. They also require no painting or epoxy coatings to survive corrosive environments.

Spring Options

The 1½″ and 2″ sizes have an optional low pressure spring. The use of this spring changes the adjustment range to 2 through 20 PSI.

Technical Information



Parts List
Relief Valves

1. Stem
2. Locknut
3. Spring Retainer
4. Spring (Plastic Coated)
5. Body
6. Gauge Port
7. O-Ring Seal
8. Piston
9. U-Cup Seal

Dimensions - Inches / Millimeters

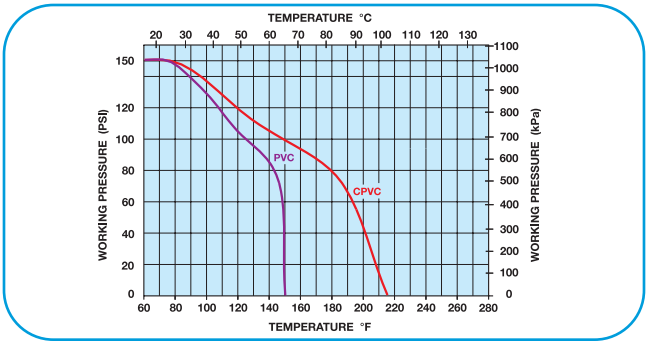
Size	A	B	C	D	E	F	Weight (lb / kg)
1/2″	6.75 / 171	1.38 / 35	1.50 / 38	1.38 / 35	1.38 / 35	5.19 / 132	0.50 / .23
3/4″	6.88 / 175	1.50 / 38	1.75 / 44`	1.56 / 40	1.63 / 41	5.44 / 138	0.75 / .34
1″	8.75 / 222	1.63 / 41	2.06 / 53	1.88 / 48	1.88 / 48	5.75 / 146	1.00 / .45
1-1/2″	13.25 / 337	1.88 / 48	2.63 / 67	2.63 / 67	2.44 / 62	6.25 / 159	2.50 / 1.14
2″	15.50 / 394	2.13 / 54	3.00 / 76	3.13 / 80	2.88 / 73	6.69 / 170	3.50 / 1.59

Selection Chart

Size	Material	End Conn.	Seals	Pressure Setting	Pressure Rating
1/2″ to 2″	PVC or CPVC	Threaded	FPM or EPDM	5 to 75 PSI*	150 PSI** @ 70°F Non-Shock

* Optional 2-20 PSI for 1½″, and 2″ valves with low pressure spring
** Inlet pressure over 75 PSI cannot be regulated

Operating Temperature/Pressure



Relief Valve Flow Chart

The chart below shows the flow rate out of the relief valve discharge port at a given set pressure and overpressure. For example, a 1″ relief valve set to relieve at 30 PSI would have a flow rate of 20 GPM out of the discharge port at 10 PSI of overpressure (system pressure at 40 PSI).

Set Relief Pressure (PSI)	Relief Valve Sizes (NPT)													
	1/2″			3/4″			1″			1-1/2″			2″	
	Overpressure (PSI)			Overpressure (PSI)			Overpressure (PSI)			Overpressure (PSI)			Overpressure (PSI)	
	+5	+10	+20	+5	+10	+20	+5	+10	+20	+2* +5	+5* +10	+20	+2* +10	+5* +20
	Flow Rate (gpm)			Flow Rate (gpm)			Flow Rate (gpm)			Flow Rate (gpm)			Flow Rate (gpm)	
10	.5	2.0	6.0	3.0	4.0	9.0	7.0	11.0	18.0	1.0	15.0	20.0	22.5	110.0
20	1.0	3.0	7.0	4.0	6.0	15.0	8.0	14.0	24.0	1.5	30.0	33.0	40.0	125.0
30	1.0	3.0	8.0	5.5	9.0	17.5	8.0	20.0	27.0	5.0	40.0	45.0	55.0	147.0
40	1.0	3.0	8.0	9.0	13.0	19.0	8.0	27.5	30.0	8.0	47.5	51.0	75.0	160.0
50	–	–	–	9.0	15.0	21.0	8.0	33.0	36.0	10.0	69.0	72.0	83.0	180.0
75	–	–	–	9.0	18.0	20.0	8.0	40.0	48.0	10.0	90.0	96.0	92.0	180.0

* With optional low pressure spring

Pressure Regulators

1/4″ to 1 1/2″ - PVC and Corzan® CPVC

Reliable Pressure Regulation

Hayward Pressure Regulators prevent downstream pressure from exceeding a preset pressure. When the upstream pressure increases beyond the set pressure of the regulator, the regulator prevents the downstream pressure from exceeding the set pressure.

Easy to Set Pressure

Hayward Pressure Regulators can be set by hand, no tools are needed, to control downstream pressures from 5 to 75 PSI. Each size regulator is designed to cover this complete pressure range with just one, non-wetted, plastic coated spring. There's no need to change springs for different pressure ranges as with ordinary regulators.

Molded Gauge Port

An integral molded 1/4″ NPT gauge port on the valve body makes installation of a gauge to monitor downstream pressure easy. No drilling, or extra fittings are needed.

No Corrosion Failure

These all plastic regulators have no metal parts and will never fail, jam, or stick because of rusted or corroded components. They also require no painting or epoxy coatings to survive corrosive environments.

Features

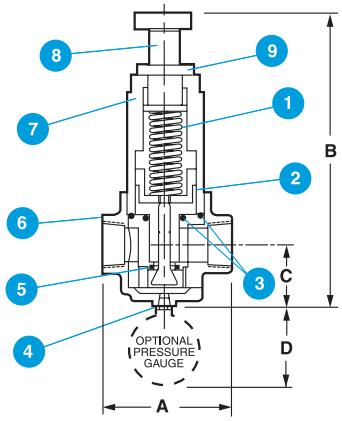
- No Metal Parts to Stick or Jam
- Hand Adjustable
- Molded Gauge Port
- Regulates from 5 to 75 PSI
- All Plastic, No Rust or Corrosion
- FPM Seals

Options

- Pressure Gauges
  - 0 to 30 PSI
  - 0 to 60 PSI
  - 0 to 160 PSI
- Gauge Guards

Corzan® is a registered trademark of Noveon, Inc.

Technical Information



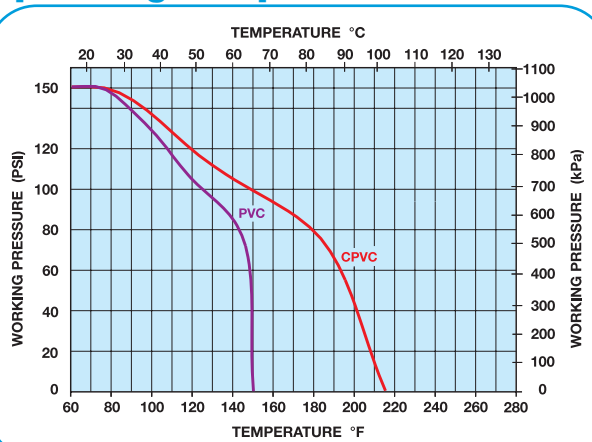
Parts List
Pressure Regulators

1. Spring (Plastic Coated)
2. Diaphragm Assembly
3. O-Ring Seals
4. Gauge Port
5. Square Cut Seal
6. Body
7. Bonnet
8. Stem
9. Locknut

Dimensions - Inches / Millimeters

Size	A	B	C	D	Weight (lb / kg)
1/4″	4.13 / 105	9.25 / 235	2.13 / 54	2.38 / 60	1.38 / .63
1/2″	4.13 / 105	9.25 / 235	2.13 / 54	2.38 / 60	1.38 / .63
3/4″	4.13 / 105	9.25 / 235	2.13 / 54	2.38 / 60	1.38 / .63
1″	5.50 / 140	14.00 / 356	3.00 / 76	2.38 / 60	4.75 / 2.16
1-1/2″	5.50 / 140	14.00 / 356	3.00 / 76	2.38 / 60	4.75 / 2.16

Operating Temperature/Pressure



Selection Chart

Size	Material	End Conn.	Seals	Pressure Setting	Pressure Rating
1/4″ to 1-1/2″	PVC or CPVC	Threaded	FPM	5 to 75 PSI	150 PSI @ 70°F Non-Shock

How to Size a Pressure Regulator

Pressure regulator selection is based on the desired flow, inlet pressure and the desired outlet pressure.

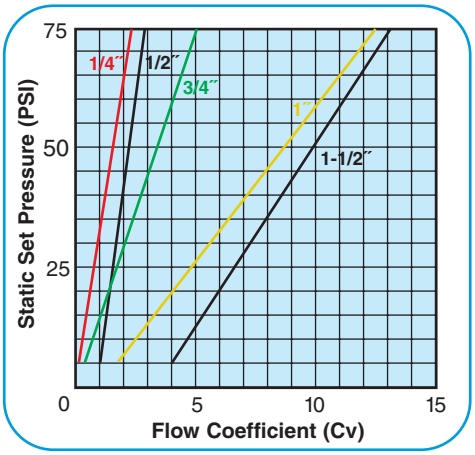
Example: A system requires a flow rate of 10 gpm at a set pressure of 30 PSI, and the inlet pressure is 50 PSI. From the graph at right, a 1″ regulator has a flow coefficient of 5.5 at a 30 PSI set pressure.

$\Delta P = (Q \div Cv)^2$ ΔP = Pressure Drop
$\Delta P = (10 \div 5.5)^2$ Q = Flow in GPM
$\Delta P = 3.3$ PSI Cv = Flow Coefficient

The 1″ regulator will meet the requirements because 3.3 PSI is less than the required pressure drop of 20 PSI (50 PSI inlet pressure less 30 PSI set pressure). The maximum flow rate in this example is:

$Q = Cv \sqrt{\Delta P}$
$Q = 5.5 \sqrt{20}$
$Q = 24.6$ gpm

Flow Coefficients



Control Valves

Universal StopCocks™ - 1/4″ PVC

For on/off, restricted flow or sampling applications, the Hayward StopCock is easily adaptable to any piping connection. Furnished with the valve is a 1/4″ NPT female pipe thread, 1/4″ NPT male pipe thread and hose barb end connectors for 1/4″ through 7/16″ I.D. tubing. These allow the valve to be fitted with up to six different end connection combinations. Simply attach the end connections you need – they are all supplied with each valve.

Features

- Six Different End Connections
- All Plastic, No Rust, No Corrosion
- EPDM Seats and Seals
- Hex Wrench Included
- Rated to 150 PSI @ 70°F
- Ideal for Labs & Sampling
- End Connection Combinations

  FPT X FPT, FPT X MPT, FPT X Hose, MPT X MPT, MPT X Hose, Hose X Hose

Needle Valves - 1/4″, 3/8″ and 1/2″ - PVC or PPL

Needle Valves are used for accurate metering of fluids. Turning the thumbwheel moves a tapered piston into the PTFE seat to control the flow down to a few drops per minute. Precision-molded, fine-pitched stem threads permit this very fine metering flow control.

Features

- Lugs for Panel Mounting
- Adjustable Without Tools
- Fine Pitch Stem Thread
- Rated at 150 PSI @ 70°F
- PVC or PPL Construction
- FPM Seals
- PTFE Seats
- All Plastic, No Rust or Corrosion
- Threaded NPT Connections

Angle Valves - 1/4″ to 2″ - PVC

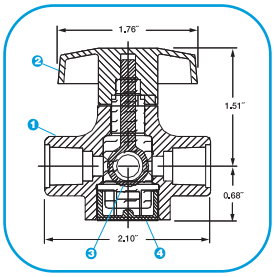
Hayward Angle Valves are used in tight spaces where a 90° change in flow direction is needed and there is insufficient room for extra fittings. Since they are globe valves, they are ideal for sampling and throttling applications.

Features

- All Plastic, No Rust or Corrosion
- No Required Adjustments
- FPM Seat and Seals
- Threaded NPT Connections
- Space Saving 90° Design
- Fine Pitch Stem Threads
- Mounting Lugs on 1/4″ Valve
- Rated at 150 PSI @ 70°F

Technical Information

Universal StopCock™



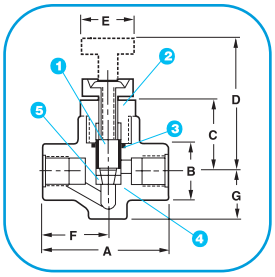
Parts List

1. StopCock Body
2. Handle
3. Plug
4. Retainer Cap

Dimensions - Inches / Millimeters

End Conn.	Length
FPT X FPT	2.10 / 53
FPT X MPT	2.82 / 72
FPT X Hose	3.11 / 79
MPT X MPT	3.54 / 90
MPT X Hose	3.83 / 97
Hose X Hose	4.11 / 104

Needle Valves



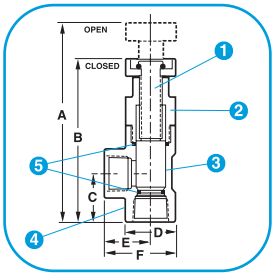
Parts List

1. Stem
2. Bonnet
3. O-Ring
4. Body
5. TFE Seat

Dimensions - Inches / Millimeters

Size	A	B	C	D	E	F	G	Weight (lb / kg)
1/4″	2.50 / 64	0.88 / 22	1.44 / 37	2.50 / 64	1.06 / 27	1.25 / 32	0.81 / 21	0.20 / .06
3/8″	2.50 / 64	1.19 / 30	1.44 / 37	2.50 / 64	1.06 / 27	1.25 / 32	0.81 / 21	0.22 / .06
1/2″	2.50 / 64	1.19 / 30	1.44 / 37	2.50 / 64	1.06 / 27	1.25 / 32	0.81 / 21	0.25 / .06

Angle Valves



Parts List

1. Stem
2. Bonnet
3. Piston
4. Body
5. O-Ring

Dimensions - Inches / Millimeters

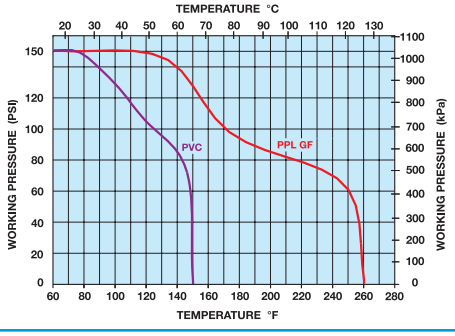
Size	A	B	C	D	E	F	Weight (lb / kg)	Cv
1/4″	3.63 / 92	3.19 / 81	1.06 / 27	1.00 / 25	0.88 / 22	1.38 / 35	.13 / .06	1.0
1/2″	5.88 / 149	4.94 / 125	1.50 / 38	1.38 / 35	1.44 / 37	2.06 / 52	.38 / .17	5.0
3/4″	6.38 / 162	5.19 / 132	1.88 / 48	1.56 / 40	1.63 / 41	2.44 / 62	.50 / .20	10.0
1″	7.44 / 189	6.19 / 157	2.06 / 52	1.94 / 49	1.94 / 49	2.75 / 70	.63 / .29	16.0
1-1/2″	10.25 / 260	8.31 / 211	2.63 / 67	2.63 / 67	2.44 / 62	3.75 / 95	1.75 / .80	45.0
2″	11.81 / 300	9.44 / 240	3.00 / 76	3.13 / 80	2.8 8/ 73	4.44 / 113	2.63 / 1.20	70.0

Pressure Loss Calculation Formula

$$\Delta P = \left[\frac{Q}{Cv}\right]^2$$

ΔP = Pressure Drop
Q = Flow in GPM
Cv = Flow Coefficient

Operating Temperature/Pressure



True Union Air Release Valves

3/4″ PVC

Features

- Closes at 0 PSI
- True Union Design
- FPM Seals
- Screen Standard

Options

- EPDM Seals

Tank, Container and Vessel Protection

Emptying or filling a closed tank requires that it be vented to allow the passage of air into or out of the tank in order to prevent damage to the tank. This is the function of Hayward's True Union Air Release Valve. It prevents overflow of the process fluid as a tank is being filled while allowing air to escape, minimizing the risk of the tank expanding as the result of compressing trapped air.

Automatic Operation

The Hayward True Union Air Release Valve operates without the need for any adjustments or settings. As the liquid in the tank rises to the valve level, the ball floats against the elastomer seat, automatically preventing unwanted flow out of the tank. When the liquid level falls below that of the valve, gravity opens the valve to allow air into the tank, eliminating the risk of the tank collapsIng from vacuum pressure. The valve will vent a tank with flows in excess of 150 gpm. This is the equivalent of a 3 inch fill line flowing at up to 10 feet per second. For tank installations that use a 4 inch or 6 inch fill line, two Air Release Valves can be used.

Easy Installation

The Hayward True Union Air Release Valve is supplied with both threaded and socket end connections in order to accommodate most applications. A screen cover is also included.

True Union Design

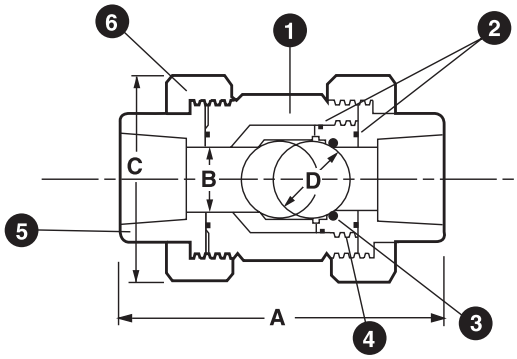
This permits easy removal from a piping system without breaking down piping connections. Just unscrew the assembly nut and lift the valve body out of the line. Maintenance couldn't be easier.

No Corrosion Failures

Hayward True Union Air Release Valves will never fail, jam, stick or freeze in position because of rust or corrosion. And they will not contaminate sensitive fluids that come into contact with them.

Technical Information

Screen installed

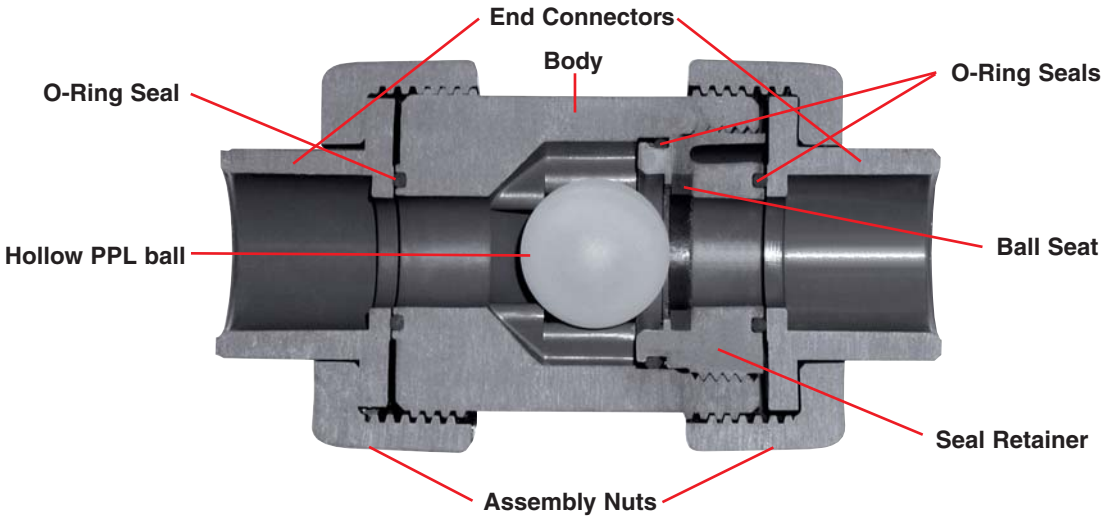


Parts List
True Union Air Release Valves

1. Body
2. O-Ring Seals
3. Square Cut O-Ring Seat
4. Seal Retainer
5. End Connector
6. Union Nut

Dimensions - Inches / Millimeters

Size	A	B	C	D	F	G	Weight - (lb / kg) Socket/ Threaded
3/4″ / 25	4.75 / 121	0.75 / 19	2.63 / 67	1.0 / 25	5.00 / 127	2.60 / 66	0.75 / .34



Cutaway of Air Release Valve

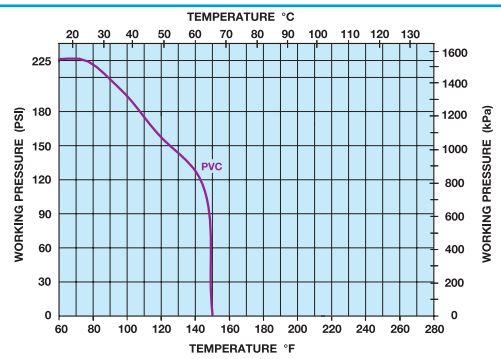
Selection Chart

Size	Material	End. Conn.	Seals	Pressure Rating
3/4″	PVC Body PPL Ball	Socket or Threaded	FPM	225 PSI @ 70°F Non-Shock

Venting Specifications

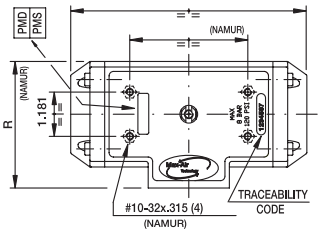
One Air Release Valve will vent a tank with flows of up to 150 gpm (either in or out). For higher flow rates, use additional Air Release Valves.

Operating Temperature/Pressure

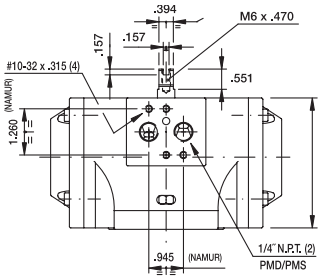


PMD Series Pneumatic Actuators

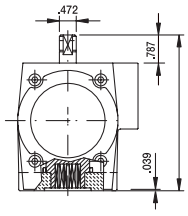
Double Acting



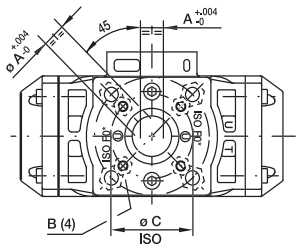
TOP



FRONT



SIDE

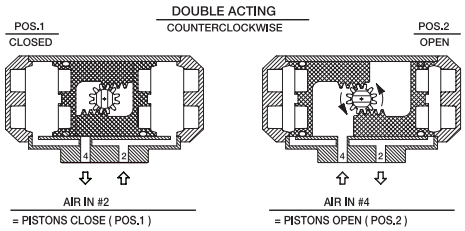


BOTTOM

Overview

Low cost, heavy duty air-to-air (double acting) quarter-turn actuator for use with ball valves up to 2″ in size. Corrosion-resistant construction is designed to stand up to harsh conditions without the need for epoxy coatings.

Actuator Operating Systems



Features

- Plastic Housing
- Two-Piston Rack & Pinion Design
- Manual Override
- Position Indicator
- Permanent Lubrication
- Light Weight
- Stainless Steel Output Shaft
- Namur-Style Mounting

Options

- Solenoid Valves
- Solenoid Voltages
- Limit Switch
- Cycle Speed Controls

Dimensions–Inches

Model	øA	B	C	L	P	R
PMD	0.433 ISO F04	10-32x0.400 UNF-ISO F04	ø1.654 ISO F04	4.685	3.583	2.638

Actuator Specifications

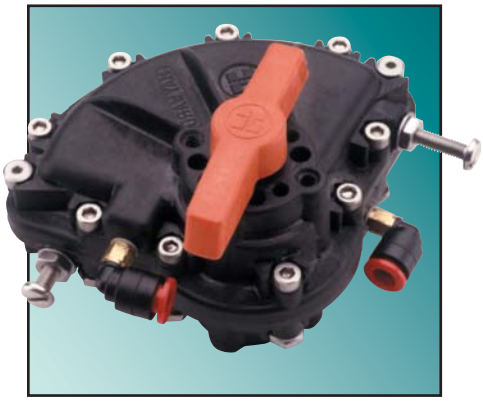
Model	PMD10
Torque Output (in-lbs) @ 80 PSI	125
Enclosure Material	Polyarylamide
Output Shaft	Stainless Steel
Air Port Connections	1/4″ NPT
Air Consumption (cu. in.)	13.5
Air Transfer	Internal
Stroke Time (seconds)	.5
Cycle Time	1/2 second
Minimum Air Pressure	80 PSI
Maximum Air Pressure	120 PSI
Operation	Rack and Pinion
Weight (lbs/kg)	1.3/.6

Valve Selection Chart

Size	True Union Ball Valve	Three-Way Ball Valve
1/4″ – 2″	PMD10	PMD10

PAD Series Pneumatic Actuators

Double Acting



Overview

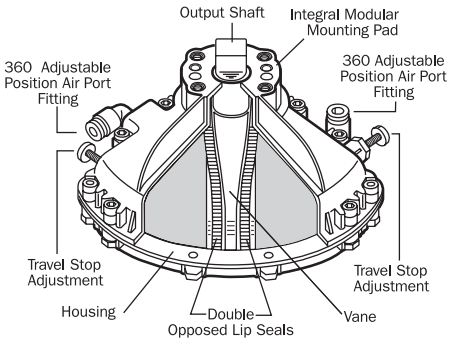
Corrosion-resistant air-to-air (double acting) quarter-turn actuator for use with ball valves up to 2″ in size. A modular mounting system allows selection of options to suit application-specific requirements or mounting of options in the field. Air to air actuators require air pressure for both actuation cycles, open and closed.

Features

- Plastic Housing
- Proven Vane Design
- Manual Override
- Position Indicator
- High Torque Output
- Very Light Weight
- Permanent Lubrication

Options

- Solenoid Valves
- Solenoid Voltages
- Limit Switch
- Cycle Speed Control
- Adjustable Travel Stops

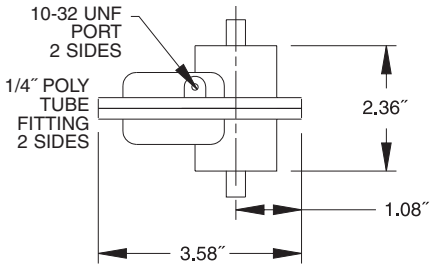


Pneumatic Actuator Interior Detail

Actuator Specifications

Model	PAD3
Torque Output (in-lbs) @ 80 PSI	170
Enclosure Material	Polyetherimide
Output Shaft	Stainless Steel
Air Port Connections	1/4″ Poly Tube
Air Consumption (cu. in.)	3.66
Air Transfer	Internal
Stroke Time (seconds)	.5
Cycle Time	Depends Upon Solenoid
Minimum Air Pressure	80 PSI
Maximum Air Pressure	120 PSI
Operation	Compact Vane
Weight (lbs/kg)	1/.5

Dimensions–Inches



Torque Output of 170 in-lb. @ 80 PSI

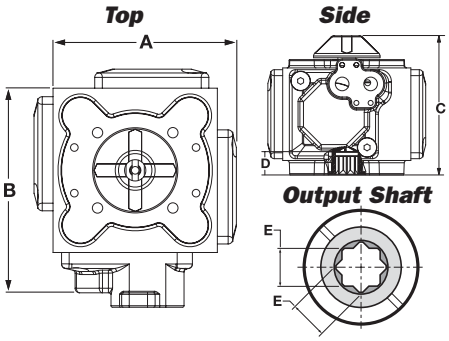
Valve Selection Chart*

Size	True Union Ball Valve	Three-Way Valve
1/4″ – 2″	PAD3	PAD3

* Actuator size selections based on clean water at 70°F.

PCD Series Pneumatic Actuators

Double Acting



Overview

Air-to-air (double acting) quarter-turn actuator is the best choice for pneumatically-actuated true union ball valves, three-way ball valves and butterfly valves. Lightweight and compact, the actuator provides appropriate torque outputs for valves from 1/4″ – 24″ in size.

Dimensions–Inches

Model	A in.	B in.	C in.	D in.	E in.	ISO 5211 Mount	Air Consumption cu. in.
PCD 15	3.39	3.85	3.50	0.53	0.35	F05 (1.97)	5.5
PCD 20	4.03	4.60	3.96	0.59	0.43	F05 (1.97)	9.2
PCD 25	5.24	5.79	4.61	0.77	0.55	F07 (2.76)	20
PCD 30	5.94	6.64	5.37	0.87	0.67	F07 (2.76)	33
PCD 35	7.15	7.94	6.10	1.02	0.87	F10 (4.02)	49
PCD 45	8.70	–	7.64	1.30	1.06	F12 (4.92)	81
PCD 60	11.22	–	9.76	1.69	1.42	F14 (5.51)	195
PCD 75	13.46	–	11.81	1.69	1.42	F16 (6.50)	351

Features

- Four Piston Rack & Pinion Design
- Manual Override
- Position Indicator
- High Torque Output
- Permanent Lubrication
- Adjustable Travel Stops
- NAMUR Solenoid Mounting
- ISO 5211 Mounting Base

Options

- Solenoid Valves
- AC and DC Solenoid Voltages
- Positioners (3-15 PSI or 4-20 mA)
- Position Transmitter
- Limit Switch
- Speed Control

Actuator Specifications

Model	PCD15	PCD20	PCD25	PCD30	PCD35	PCD45	PCD60	PCD75
Torque Output (in-lbs) @ 80 PSI	172	311	639	1052	1848	3622	8585	15856
Enclosure Material	Epoxy-Coated Aluminum							
Output Shaft	Plated Steel							
Air Port Connections	1/4″ NPT							
Air Consumption (cu. in.)	3	6	13	25	49	81	195	351
Air Transfer	Internal							
Stroke Time (seconds)	.5	.5	.7	.8	.5	1.5	2.5	4.0
Cycle Time	Under 1 Second Typical–Depends on Solenoid							
Minimum Air Pressure	80 PSI							
Maximum Air Pressure	120 PSI							
Operation	Rack and Pinion							
Weight (lbs/kg)	1.5/.7	2/.9	4.3/2	6.8/3.1	16/7.3	22/10	57/26	112/51

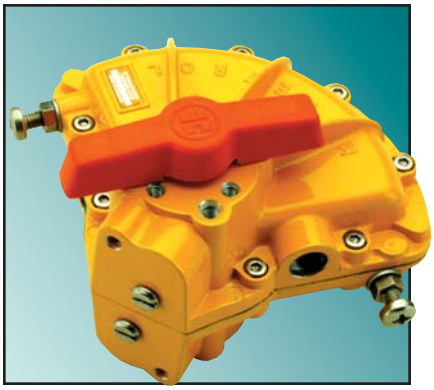
Valve Selection Chart*

Size	True Union Ball Valve	Butterfly Valve	Three-Way Ball Valve
1/4″ – 1 1/4″	PCD15	N/A	PCD15
1 1/2″ – 2″	PCD15	PCD20	PCD15
2 1/2″	PCD20	N/A	PCD20
3″	PCD20	PCD20	PCD20
4″	PCD20	PCD25	PCD20
6″	PCD20	PCD25	PCD20
8″	N/A	PCD35	N/A
10″ – 12″	N/A	PCD45	N/A
14″ and 16″	N/A	PCD60	N/A
18″, 20″ and 24″	N/A	PCD75	N/A

* Actuator size selections based on clean water at 70°F.

PKD Series Pneumatic Actuators

Double Acting



Overview

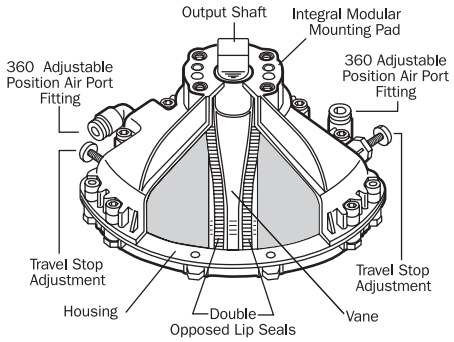
Air-to-air (double acting) quarter-turn actuator for use with all size ball valves and butterfly valves up to 8″ in size. Only one moving part (a vane) provides highly reliable service with minimum maintenance. A modular mounting option makes it easy to add options in the field. Air to air actuators require air pressure for both actuation cycles, open and closed.

Features

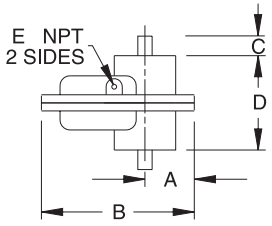
- Proven Vane Design
- Manual Override
- Position Indicator
- Epoxy-Coated Housing
- High Torque Output
- Lightweight, Compact
- Permanent Lubrication
- Adjustable Travel Stops

Options

- Solenoid Valves
- Solenoid Voltages
- Positioners
- Position Transmitter
- Limit Switch
- Cycle Speed Control



Pneumatic Actuator Interior Detail



Actuator Specifications

Model	PKD2	PKD3	PKD5	PKD7
Torque Output (in-lbs) @ 80 PSI	82	173	346	850
Enclosure Material	Epoxy-Coated Zinc and Titanium Alloy			
Output Shaft	Stainless or Plated Steel			
Air Port Connections	1/4″ Poly Tube			
Air Consumption (cu. in.)	2	4	7	18
Air Transfer	Internal			
Stroke Time (seconds)	.5			
Cycle Time	1/2 Second			
Minimum Air Pressure	80 PSI			
Maximum Air Pressure	120 PSI			
Operation	Compact Vane			
Weight (lbs/kg)	1.5/.7	2/.9	4.3/2	6.8/3.1

Dimensions–Inches

Model Number	A	B	C	D	E NPT
PDK2	.95	3.00	.39	1.97	1/8″
PDK3	1.10	3.58	.47	2.36	1/8″
PDK5	1.30	4.40	.51	2.64	1/8″
PDK7	1.71	5.75	.79	3.94	1/4″

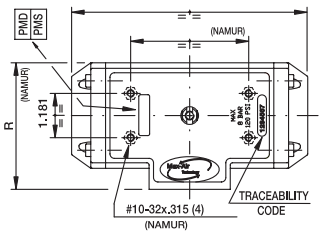
Valve Selection Chart*

Size	True Union Ball Valve	Butterfly Valve	Three-Way Ball Valve
1/4″ – 1 1/4″	PKD3	N/A	PKD3
1 1/2″ – 2″	PKD3	PKD5	PKD3
2 1/2″	PKD5	N/A	PKD5
3″	PKD5	PKD5	PKD5
4″	PKD5	PKD5	PKD5
6″	PKD5	PKD7	PKD7
8″	N/A	PKD7	N/A

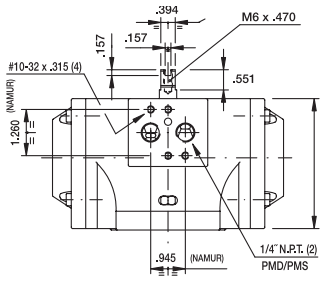
* Actuator size selections based on clean water at 70°F.

PMS Series Pneumatic Actuators

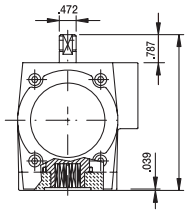
Spring Return



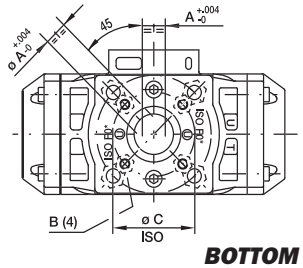
TOP



FRONT



SIDE



BOTTOM

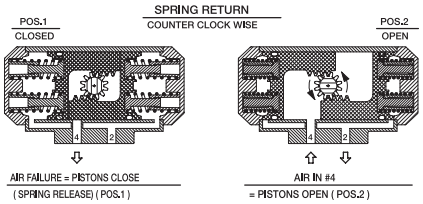
Overview

Lower cost, air-to-spring (fail-safe) quarter-turn actuator for use with all ball valves up to 2″ in size. Heavy duty corrosion resistant plastic construction stands up to harsh conditions and a Namur-style modular mounting system makes it easy to add application-specific options.

Features

- Two-Piston Rack & Pinion Design
- Manual Override
- Position Indicator
- Permanent Lubrication
- Light Weight

Actuator Operating Systems



Options

- Solenoid Valves
- Solenoid Voltages
- Limit Switch
- Cycle Speed Controls

Dimensions–Inches

Model	øA	B	C	L	P	R
PMS15	0.551 ISO F04	10-32x0.400 UNF-ISO F04	ø1.654 ISO F04	6.299	4.370	3.386

Actuator Specifications

Model	PMS15
Torque Output (in-lbs) @ 80 PSI	107
Enclosure Material	Polyarylamide
Output Shaft	Stainless Steel
Air Port Connections	1/4″ NPT
Air Consumption (cu. in.)	10.8
Air Transfer	Internal
Stroke Time (seconds)	.5
Cycle Time	1/2 second
Minimum Air Pressure	80 PSI
Maximum Air Pressure	120 PSI
Operation	Rack and Pinion
Weight (lbs/kg)	3.1/1.4

Valve Selection Chart

Size	True Union Ball Valve	Three-Way Ball Valve
1/4″- 2″	PMS15	PMS15

PAS Series Pneumatic Actuators

Spring Return

Overview

Air-to-spring (fail-safe) quarter-turn actuator for use with all ball valves up to 2″ in size. Durable corrosion resistant plastic construction and only one moving part (a vane) provide highly reliable operation. A modular mounting system allows addition of options to meet specific application requirements. Air to spring actuators utilize a mechanical spring return unit, enclosed in a plastic housing, to operate one of the actuation cycles. Modular mounting also means you can add options to the actuator in the field. Both PAD and PAS actuators can be operated manually in the event of air or electrical failure.

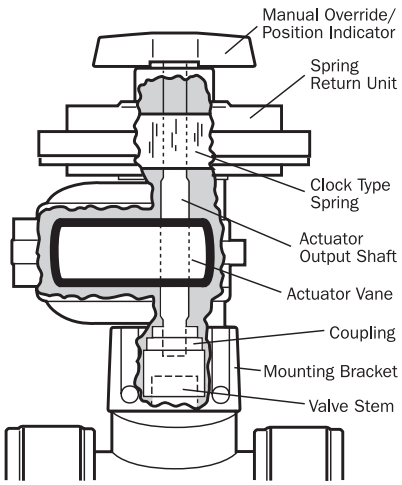
Features

- Plastic Housing
- Proven Vane Design
- Manual Override
- Position Indicator
- High Torque Output
- Very Light Weight
- Permanent Lubrication

Options

- Solenoid Valves
- Solenoid Voltages
- Limit Switch
- Cycle Speed Control
- Adjustable Travel Stops

Typical Valve/ Actuator Mounting

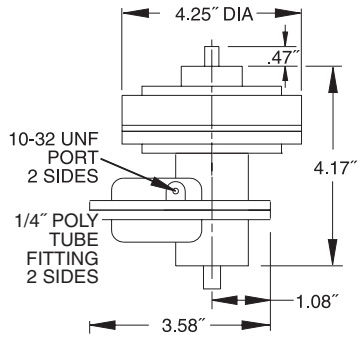


Interior Detail of Pneumatically Actuated Valve with Position Indicator and Spring Return Unit

Actuator Specifications

Model	PAS3
Torque Output (in-lbs) @ 80 PSI	77
Enclosure Material	Polyetherimide
Output Shaft	Stainless Steel
Air Port Connections	1/4″ Poly Tube
Air Consumption (cu. in.)	3.66
Air Transfer	Internal
Stroke Time (seconds)	.5
Cycle Time	Depends on Solenoid
Minimum Air Pressure	80 PSI
Maximum Air Pressure	120 PSI
Operation	Compact Vane
Weight (lbs/kg)	4/1.8

Dimensions–Inches



Torque Output of 91 Start, 77 Finish in-lb @ 80 PSI

Valve Selection Chart*

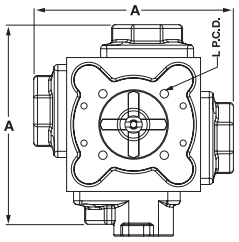
Size	True Union Ball Valve	Three-Way Ball Valve
1/4″ – 2″	PAS3	PAS3

* Actuator size selections based on clean water at 70°F.

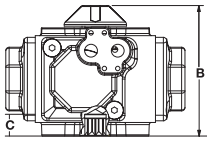
PCS Series Pneumatic Actuators

Spring Return

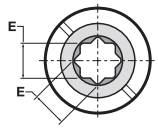
Top



Side



Output Shaft



Overview

Air-to-spring (fail safe) quarter-turn actuator is ideal for use with pneumatically-actuated true union ball valves, three-way ball valves, and butterfly valves. Lightweight and compact, the actuator provides high torque outputs suitable for valves from 1/4″ – 24″ in size.

Dimensions–Inches

Model	A in.	B in.	C in.	E in.	ISO 5211 Mount in.	Air Consumption cu. in.
PCS 15	4.31	3.50	0.53	0.35	F05 (1.97)	4.3
PCS 20	5.17	3.96	0.59	0.43	F05 (1.97)	7.3
PCS 25	6.34	4.61	0.77	0.55	F07 (2.76)	15
PCS 30	7.33	5.37	0.87	0.67	F07 (2.76)	27
PCS 35	8.74	6.10	1.02	0.87	F10 (4.02)	45
PCS 45	10.59	7.64	1.30	1.06	F12 (4.92)	81
PCS 60	14.17	9.76	1.69	1.42	F14 (5.51)	195
PCS 75	17.20	11.81	1.69	1.42	F16 (6.50)	351

Features

- Four Piston Rack & Pinion Design
- Manual Override
- Position Indicator
- Epoxy-Coated Housing
- Permanent Lubrication
- Adjustable Travel Stops
- NAMUR Solenoid Mounting
- ISO 5211 Mounting Base

Options

- Solenoid Valves
- AC and DC Solenoid Voltages
- Positioners (3-15 PSI or 4-20 mA)
- Position Transmitter
- Limit Switch
- Speed Control

Actuator Specifications

Model	PCS15	PCS20	PCS25	PCS30	PCS35	PCS45	PCS60	PCS75
Torque Output (in-lbs) @ 80 PSI	61	85	217	345	607	1218	2857	5166
Enclosure Material	Epoxy-Coated Aluminum							
Output Shaft	Plated Steel							
Air Port Connections	1/4″ NPT							
Air Consumption (cu. in.)	3	9.2	13	25	41	81	195	351
Air Transfer	Internal							
Stroke Time (seconds)	.5	0.4	.7	.8	.8	1.5	1.5	1.5
Cycle Time	Under 1 Second Typical–Depends on Solenoid							
Minimum Air Pressure	80 PSI							
Maximum Air Pressure	120 PSI							
Operation	Rack and Pinion							
Weight (lbs/kg)	1.8/.8	4/1.9	5.7/2.6	9.2/4.2	17.4/7.9	27.5/12.5	27.5/12.5	27.5/12.5

Valve Selection Chart*

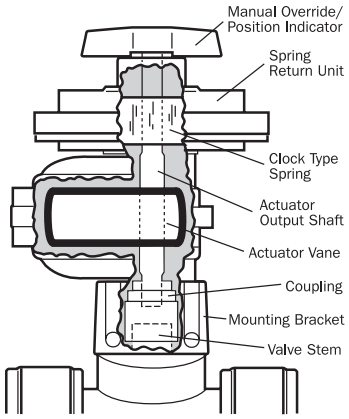
Size	True Union Ball Valve	Butterfly Valve	Three-Way Ball Valve
1/4″ – 1 1/4″	PCS15	N/A	PCS15
1 1/2″ – 2″	PCS20	PCS25	PCS20
2 1/2″	PCS25	N/A	PCS25
3″	PCS25	PCS25	PCS25
4″	PCS25	PCS30	PCS30
6″	PCS25	PCS35	PCS30
8″	N/A	PCS45	N/A
10″ – 12″	N/A	PCS60	N/A
14″ and 16″	N/A	PCS75	N/A
18″, 20″ and 24″	N/A	PCS75	N/A

* Actuator size selections based on clean water at 70°F.

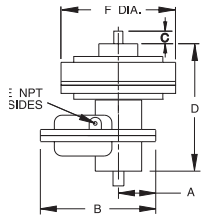
PKS Series Pneumatic Actuators

Spring Return

Typical Valve/ Actuator Mounting



Interior Detail of Pneumatically Actuated Valve with Position Indicator and Spring Return Unit



Dimensions–Inches

Model Number	A	B	C	D	E	F
PKS2	.95	3.00	.39	3.54	1/8″	2.87″
PKS3	1.10	3.58	.47	4.21	1/8″	4.25″
PKS5	1.30	4.40	.51	4.49	1/8″	4.25″
PKS7	1.10	5.75	.79	7.17	1/4″	6.00″
PKS9	1.71	7.32	1.02	8.58	1/4″	7.90″

Overview

Air-to-spring (fail-safe) quarter-turn actuator for use with all size ball valves and butterfly valves up to 8″ in size. Only one moving part (a vane with integral output shaft) delivers reliable service with minimal maintenance. A modular mounting system makes it easy to add application-specific options. The actuator body is constructed from an aluminum alloy and is epoxy coated. Air to Spring actuators utilitize a mechanical spring return unit to operate one of the actuation cycles. This type of actuator can be set to have the spring, rather than air pressure, either open or close the valve.

Features

- Proven Vane Design
- Manual Override
- Position Indicator
- Epoxy-Coated Housing
- High Torque Output
- Lightweight, Compact
- Permanent Lubrication
- Adjustable Travel Stops

Options

- Solenoid Valves
- Solenoid Voltages
- Positioners
- Position Transmitter
- Limit Switch
- Cycle Speed Control

Actuator Specifications

Model	PKS2	PKS3	PKS5	PKS7	PKS9
Torque Output (in-lbs) @ 80 PSI	33	77	155	375	830
Enclosure Material	Epoxy-Coated Zinc and Titanium Alloy				
Output Shaft	Stainless or Plated Steel				
Air Port Connections	See Drawing				
Air Consumption (cu. in.)	2	4	7	18	39
Air Transfer	Internal				
Stroke Time (seconds)	.5	.5	.5	.6	.8
Cycle Time	1/2 Second Typical–Depends on Solenoid				
Minimum Air Pressure	80 PSI				
Maximum Air Pressure	120 PSI				
Operation	Compact Vane				
Weight (lb/kg)	1.9/.9	4.6/2.1	5.8/2.6	16/7.3	33/15

Actuator Selection Chart*

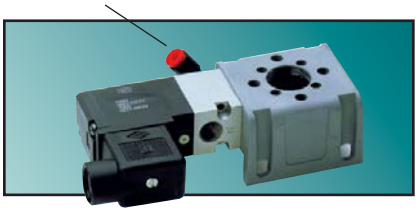
Size	True Union Ball Valve	Butterfly Valve	Three Way Ball Valve
1/4″ – 1 1/4″	PKS3	N/A	PKS3
1 1/2″ – 2″	PKS3	PKS5	PKS3
2 1/2″	PKS7	N/A	PKS7
3″	PKS7	PKS5	PKS7
4″	PKS7	PKS7	PKS7
6″	PKS7	PKS7	PKS7
8″	N/A	PKS9	N/A

* Actuator size selections based on clean water at 70°F.

Pneumatic Actuator Accessories

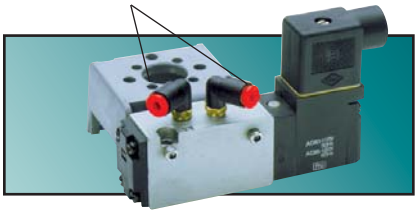
Extended Descriptions

Air connections to actuator



Suffix A3

Air connections to actuator



Suffix A2

Solenoid Valves

A solenoid valve is used to control the inflow and outflow of compressed air using an electrical signal to operate a pneumatic actuator.

All descriptions as to function of solenoid valves assumes valve to be fail-closed. Both four-way and three-way solenoids can be specified to fail the valve open or closed.

Discrete, NEMA 4, Four-Way Air/Air

Suffix A2

(For PAD3 & PKD2 actuators)

Features:

- P-port or high pressure air inlet port is 1/8˝ NPT
- 100% duty cycle
- Standard input voltage is 115 VAC/ 60 Hz, other voltages available
- Plug-in DIN connector with SJ connector
- Non-locking manual override
- Aluminum die cast body with epoxy paint
- Maximum operating pressure 100 PSI
- C_v of 0.16
- Weight is 1 lb.

Discrete, NEMA 4, Three-Way Air/Spring

Suffix A3

(For PAS3 & PKS2 actuators)

Features:

- P-port or high pressure air inlet port is 1/8˝ NPT
- 100% duty cycle
- Standard input voltage is 115 VAC/ 60 Hz, other voltages available
- Plug-in DIN connector with SJ connector
- Non-locking manual override
- Aluminum die cast body with epoxy paint
- Maximum operating pressure 100 PSI
- C_v of 0.08
- Weight is 1 lb.

Integral, NEMA 4, Four-Way Air/Air

Suffix A8

(For PKD3, PKD5, PKD7, & PKD9 actuators)

Features:

- P-port or high pressure air inlet port is 1/8˝ NPT
- 100% duty cycle
- Standard input voltage is 115 VAC/ 60 Hz, other voltages available
- 1/2˝ conduit connection (rotatable 180º)
- Non-locking manual override
- Zinc die cast body with corrosion resistant coating
- Maximum operating pressure 100 PSI
- Finger adjustable needle valves for speed controls in both directions
- Sintered bronze exhaust muffler
- C_v of 0.2
- Weight is 1 lb.

(For all PCD actuators & PMD10)

Features:

- P-port or high pressure air inlet port is 1/8˝ NPT
- 100% duty cycle
- Standard input voltage is 115 VAC/ 60 Hz, other voltages available
- 1/2˝ conduit connection (rotatable 180º)
- Non-locking manual override
- Aluminum die cast body with corrosion resistant coating
- Maximum operating pressure 120 PSI
- Integral speed controls for opening and closing cycle
- Namur style mount
- C_v of 0.15
- Weight is 1 lb.

Pneumatic Actuator Accessories

Extended Descriptions

Suffix A8/A9 *Solenoid Valve for PKD/PKS Actuators*

Suffix A8/A9 *Solenoid Valve for PCD/PCS and PMD/PMS Actuators*

Suffix AA8/AA9 *Solenoid Valve for PCD/PCS and PMD/PMS Actuators*

Integral, NEMA 7, Four-Way Air/Air

Suffix AA8

(For all PCD actuators)

Features:

- P-port or high pressure air inlet port is 1/4″ NPT
- 100% duty cycle
- Standard input voltage is 115 VAC/ 60 Hz, other voltages available
- 1/2″ conduit connection (rotatable 180º)
- Non-locking manual override
- Aluminum die cast body with corrosion resistant coating
- Maximum operating pressure 120 PSI
- Namur style mount
- C_v of 0.2
- Weight is 1 lb.

Integral, NEMA 4, Three-Way Air/Spring

Suffix A9

(For PKS3, PKS5, PKS7, & PKS9 actuators)

Features:

- P-port or high pressure air inlet port is 1/8″ NPT
- 100% duty cycle
- Standard input voltage is 115 VAC/ 60 Hz, other voltages available
- 1/2″ conduit connection (rotatable 180º)
- Non-locking manual override
- Zinc die cast body with corrosion resistant coating
- Maximum operating pressure 100 PSI
- Finger adjustable needle valves for speed controls in both directions
- Sintered bronze exhaust muffler
- C_v of 0.2
- Weight is 1 lb.

(For all PCS actuators & PMS15)

Features:

- P-port or high pressure air inlet port is 1/8″ NPT
- 100% duty cycle
- Standard input voltage is 115 VAC/ 60 Hz, other voltages available
- 1/2″ conduit connection (rotatable 180º)
- Non-locking manual override
- Aluminum die cast body with corrosion resistant coating
- Maximum operating pressure 120 PSI
- Integral speed controls for opening and closing cycle
- Namur style mount
- C_v of 0.15
- Weight is 1 lb.

Integral, NEMA 7, Three-Way Air/Spring

Suffix AA9

(For all PCS actuators)

Features:

- P-port or high pressure air inlet port is 1/4″ NPT
- 100% duty cycle
- Standard input voltage is 115 VAC/ 60 Hz, other voltages available
- 1/2″ conduit connection (rotatable 180º)
- Non-locking manual override
- Aluminum die cast body with corrosion resistant coating
- Maximum operating pressure 120 PSI
- Namur style mount
- C_v of 0.2
- Weight is 1 lb.

Pneumatic Actuator Accessories

Extended Descriptions

Pneumatic Filter-Regulator, with Gauge

Suffix A10

(For all pneumatic actuators)

Pneumatic Filter-Regulator with bracket and gauge mounts to the actuator. For removal of moisture and miniscule debris such as scale from compressed air lines. Eliminates buildup of corrosion that can affect actuator and solenoid operation. Features include: 1/4″ NPT inlet connection, piston operated, 25 micron sintered brass filter, 0-160 PSI gauge, and 1-2 oz. clear polycarbonate collection bowl. Maximum operating pressure 100 PSI (optimum 80 PSI). Weight 0.79 lb.

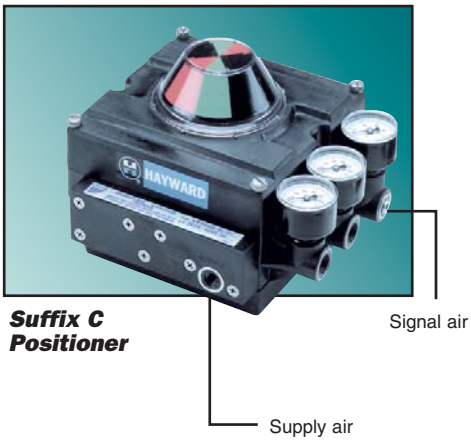
Suffix A10 Pneumatic Filter-Regulator with Gauge

Pneumatic Positioner, (Ryton®)

Suffix C

3-15 PSI Input, Air/Air & Air/Spring

(For PCD, PCS, PKD & PKS series actuators)



Suffix C Positioner

Note: All NPT air ports must be sealed with Teflon® paste, non-hardening type. Never use Teflon tape. Maximum applied torque to air fittings is 12 ft-lbs. for 1/4″ NPT and 6 ft-lbs. for 1/8″ NPT.

This pneumatic positioner is mounted on the top of either the double acting or spring return pneumatic actuator, with low profile mounting hardware specifically designed to minimize hysteresis.

Features of this positioner include: precise performance for economical operation, standard flat lens position indicator for 90° and 0° – 180° indication, color coded proportional sections to improve interpretation over single-color indicators. Both the flat lens and beacon lens indicators are field adjustable. Indicator colors are red and green, beacon lenses are clear Lexan®, NEMA 4, 4X, dust-tight, corrosion resistant in hostile process and outdoor environments, high strength, (pps) polyphenylene sulfide-(Ryton) enclosure with 300 stainless captive hardware, NASA rated for fire safety, single & double acting, direct & reverse acting, full & split ranges, 0° to 90° & 0° to 180° rotation. Advanced balanced port spool valve for vibration and corrosion resistance, reliability, and low air consumption. Gauge block with 3 gauges, 2 1/2″ conduit entries, supply connection 1/8″ NPT, air consumption 0.25 scfm @ 80 PSI. Weight 2 lbs.

This positioner also offers extensive options such as: Integral position indicator with color lenses; stainless steel gauges, (1) 0-30 PSI & (2) 0-160 PSI; integral position transmitter, 4-20 mA or resistive outputs; integral limit switches, mechanical and proximity.

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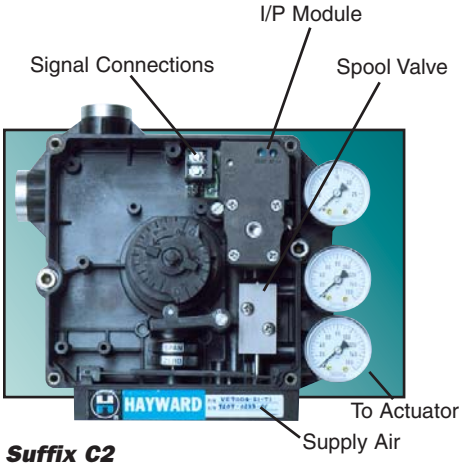
Lexan® is a registered trademark of General Electric
Ryton® is a registered trademark of Chevron Phillips Chemicals

Pneumatic Actuator Accessories

Extended Descriptions



Suffix C2

Suffix R2

Electro/Pneumatic Positioner (Ryton®)

Suffix C2

4-20 mA Input, Air/Air & Air/Spring

(For PCD, PCS, PKD & PKS series actuators)

Conversion of the pneumatic positioner to an electro/pneumatic positioner requires only the simple addition of a single module inside the positioner enclosure using (2) captive mounting screws. Features of this electro/pneumatic positioner include: continuously adjustable split ranging, red LED loop power indication, reversible and de-pluggable current loop connections, selectable speed control, I/P final air supply filtration-30 micron-replaceable, automatic compensation for supply air pressure, atmospheric pressure and ambient temperature changes, radio frequency interference (RFI) and transient protection, vibration resistant construction, linear speed control.

Integral Position Indicator, Beacon with Color

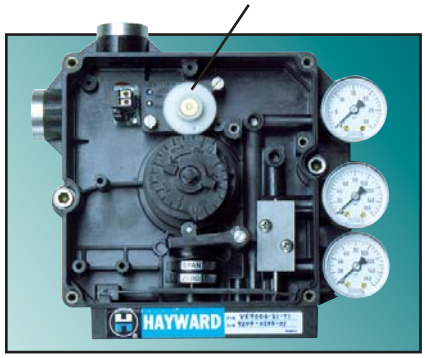
Suffix R2

(For C & C2 positioners only)

The standard flat lens position indicator on top of the positioner can be changed to a beacon type. This, like the flat lens, is color coded and proportionally sectional to improve interpretation over single color indicators. Features include: wide angle visibility, NEMA 4, 4X, 0° to 90° indication, high impact corrosion resistant and UV stabilized, high visibility fluorescent red and green rotor and contrasting black lens, on/off and proportional indication.

Pneumatic Actuator Accessories

Extended Descriptions



Suffix R5

Suffix S2 and S4

Integral Position Transmitter

Suffix R5 to R8

4-20 mA Output

(For C & C2 positioners only)

The integral position transmitter is mounted inside the positioner enclosure with position pickup directly from the positioner shaft. Easily mounted with captive stainless steel screws, direct driven, polarity reversible 2-wire connections, environmentally sealed, potentiometer type zero and span adjustments, red-LED power loop indicator, de-pluggable terminal block and jumper selectable for reverse output. The position transmitter must be specified by the output signal desired.

4-20 mA . . . . . add suffix R5
0-1000 ohms resistor . . . . . add suffix R6
0-5000 ohms resistor . . . . . add suffix R7
0-10,000 ohms resistor . . . . add suffix R8

Top Mounted Limit Switches Zytel® Enclosure

Suffix S2 and S4

NEMA 4X, Flat Cover, 2 SPDT, 15 amps

NEMA 4X, Beacon, 2 SPDT, 15 amps

(For PCD, PCS, PKD, PKS, PMD & PMS series actuators)

This top mounted limit switch is designed to survive corrosive environments. High performance polyamide resin offers a viable alternative to metal enclosures. The ″supertough″ glass-reinforced enclosure combines chemical resistance with high impact strength and immunity to weathering.

Top Mounted Limit Switches Aluminum/ Epoxy Enclosure

Suffix SA2 and SA4

NEMA 4 & 7, Flat Cover, 2 SPDT, 15 amps

NEMA 4 & 7, Beacon, 2 SPDT, 15 amps

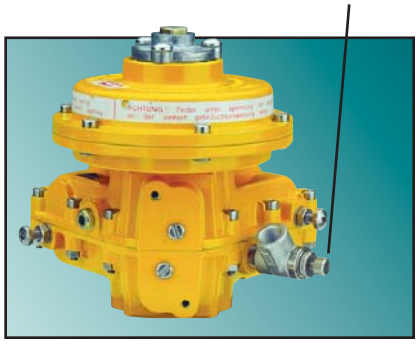
(For PCD, PCS, PKD & PKS series actuators)

Zytel® is a registered trademark of DuPont

Pneumatic Actuator Accessories

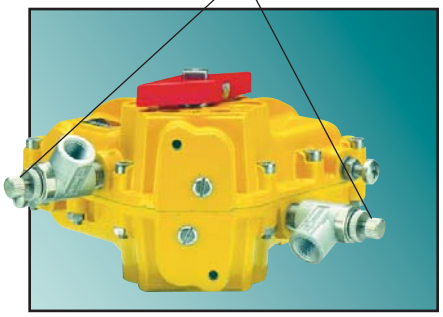
Extended Descriptions

Speed control



Suffix T3

Two speed controls



Suffix T4

Speed Controls Suffix T3 and T4

Discrete Speed Control, Spring Return, Air/Spring, 1 Required

(For PAS, PCS, PKS, PMS series actuators)

Speed control (1) is mounted in the air inlet or exhaust port of the spring return actuator.*
The internal design allows restricted and adjustable flow control of air leaving the actuator while allowing unrestricted flow of air entering the actuator. The restricted adjustment can be set from a few seconds to approximately 60 seconds.

Discrete Speed Control, Double Acting, Air/Air, 2 Required

(For PAD, PCD, PKD, PMD series actuators)

Speed controls (2) are mounted, one in each air inlet or exhaust port of the double acting actuator.* The internal design allows restricted and adjustable flow control of the air leaving the actuator while allowing unrestricted flow of air entering the actuator. The restricted adjustment can be set from a few seconds to approximately 60 seconds.

316 Stainless Steel Labels with Stamped Valve Numbers

Suffix YSS2

(For all actuators, electric & pneumatic)

For applications where permanent valve numbers must be attached to the automated assembly, Hayward will stamp or etch the provided customer supplied designation and affix the tag to the assembly, with a stainless steel chain.

*May be mounted to solenoid valve at discretion of factory.

Pneumatic Actuator Specifications and Accessories

Actuator Features

General Specifications

Actuator Model

		Double Acting				Spring Return			
		PMD	**PAD**	**PCD**	**PKD**	**PMS**	**PAS**	**PCS**	**PKS**
Standard Actuator Features									
Design Type		R & P	Vane	R & P	Vane	R & P	Vane	R & P	Vane
Number of Pistons/Vanes		2	1	4	1	2	1	4	1
Piston Sealing Material		Nitrile	Urethane	Nitrile	Urethane	Nitrile	Urethane	Nitrile	Urethane
Enclosure Materials		Polyarylamide	Ultem	Aluminum	Zinc/T	Polyarylamide	Ultem	Aluminum	Zinc/T
Exterior Finish		N/A	N/A	Epoxy	Epoxy	N/A	N/A	Epoxy	Epoxy
Manual Override		Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard
Position Indication		Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard
End of Travel Stops (Adjustable)		N/A	Standard	Standard	Standard	N/A	Standard	Standard	Standard
External Hardware		SSTL	SSTL	SSTL	SSTL	SSTL	SSTL	SSTL	SSTL
Integral Solenoid Mounting		Standard		Standard	Standard	Standard		Standard	Standard
Uniform Bearing Load Distribution		Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard
Maximum Operating Pressure – PSI		100	100	100	100	100	100	100	100
Shaft Rotation for ˝Fail Closed˝						CW	CW	CW	CW
Spring Configuration – Quantity/Type						1/Clock	Coil	1/Clock	Coil
High Ambient Limit – °F/Low Ambient Limit – °F		176/0	200/0	176/0	176/0	176/0	200/0	176/0	176/0
Mounting Position		Any	Any	Any	Any	Any	Any	Any	Any
Optional Actuator Accessories	**Suffix**								
Solenoid Valves, Nema 4, 4-Way, A/A	A2		Opt	Opt	Opt		Opt	Opt	Opt
Solenoid Valves, Nema 4, 3-Way, A/S	A3		Opt	Opt	Opt		Opt	Opt	Opt
Solenoid Valves – Integral (Namur) 4-Way, A/A, 115 VAC	A8	Opt		Opt	Opt	Opt		Opt	Opt
Solenoid Valves – Integral (Namur) 3-Way, A/S, 115 VAC	A9	Opt		Opt	Opt	Opt		Opt	Opt
Solenoid Valves – Integral (Namur) 4-Way, A/A, 115 VAC	AA8			Opt				Opt	
Solenoid Valves, Integral (Namur) 3-Way, A/S, 115 VAC	AA9			Opt				Opt	
12 VAC	12A	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Opt
24 VAC	24A	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Opt
12 VDC	12D	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Opt
24 VDC	24D	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Opt
220 VAC	220A	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Opt
Speed Controls, Air/Spring	T3	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Opt
Speed Controls, Air/Air	T4	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Opt
Positioners, 3-15 PSI Input, Ryton, A/A & A/S	C			Opt	Opt			Opt	Opt
Positioners, Electro/Pneumatic 4-20 mA Input, Ryton, A/A & A/S	C2			Opt	Opt			Opt	Opt
Positioner Options	**Suffix**								
Positioner Indicator – Beacon w/color	R2		Opt	Opt			Opt	Opt	
Position Transmitter, 4-20 mA Output	R5		Opt	Opt			Opt	Opt	
Integral Position Transmitter, 4-20 mA Output 0-1000 Ohm Resistor	R6			Opt	Opt			Opt	Opt
Integral Limit Switches, Mechanical, 2 SPDT	R9			Opt	Opt			Opt	Opt
Integral Limit Switches, Proximity, 2 SPST	R10			Opt	Opt			Opt	Opt
Top-Mounted Limit Switches, Eastar– Flat Cover, 2 SPDT, 15 Amps	S2	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Opt
Top-Mounted Limit Switches, Eastar– Beacon, 2 SPDT, 15 Amps	S4	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Opt
Top-Mounted Limit Switches, Aluminum	SA2	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Opt
Top-Mounted Limit Switches, Flat Cover	SA4	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Opt

Important Note: The valve and actuator combinations shown in this catalog have been tested and approved compatible by Hayward Flow Control Systems when installed into compatible process systems. Should actuators, accessories or mounting hardware other than those supplied by Hayward be used for the operation of these valves, the installer assumes all responsibility for the performance of those valves.

Pneumatically Actuated Diaphragm Valves

Overview

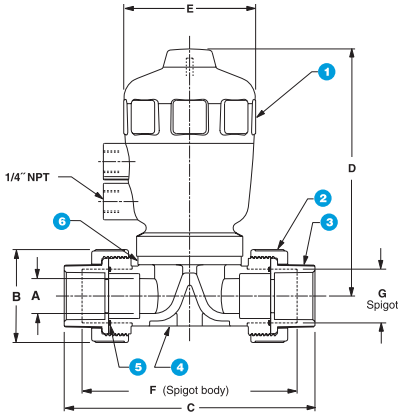
Diaphragm valves are designed for flow control of liquids in pipelines from 1/2″ to 2″ in size. The compact, lightweight actuator provides internal working pressure to 150 PSI, and a position indicator provides a visual open or closed status of the valve. The all-plastic valve and actuator housing will not corrode or contaminate process fluid and require no special maintenance. Available modular design options allow the valve to be configured for application-specific requirements.

Features

- 1/2″ – 2″ PVC, Corzan® CPVC, PPL
- Position Indicator
- Double Stem Seals
- PVC & CPVC are True Union Design
- PPL has Spigot Connections
- Air-to-Spring Fail-safe Operation
- FPM or EPDM Seals
- Rated to 150 PSI

Options

- Solenoid Valve
- Limit Switches
- Stroke Limiters
- Manual Override
- Double Acting–Air to Air Operation



Parts List

Pneumatically Actuated Diaphragm Valves

1. Actuator
2. Assembly Nut
3. End Connector
4. Body
5. O-Ring Seal
6. Diaphragm

Cv Factors

Size	Factor	Size	Factor
1/2″	4	1 1/4″	28
3/4″	7	1 1/2″	32
1″	12	2″	47

Pressure Loss Calculation Formula

$$\Delta P = \left[\frac{Q}{Cv}\right]^2$$

ΔP = Pressure Drop
Q = Flow in GPM
Cv = Flow Coefficient

Dimensions–Inches

Size	A	B	C	D	E	F	G-PPL	G-PVDF	Weight (lb/kg)
1/2 /20*	0.59	2.25	5.79	5.87	3.15	4.88	0.840	20	3.1/1.4
3/4 /25*	0.79	2.25	6.50	5.87	4.00	5.67	1.050	25	3.5/1.6
1/32*	0.98	2.62	7.07	7.01	4.00	6.06	1.314	32	4.9/2.2
1 1/4 /40*	1.58	3.56	9.33	9.36	5.00	N/A	N/A	N/A	13.0/5.9
1 1/2 /50*	1.58	3.56	9.89	9.36	5.00	7.64	1.900	50	13.0/5.9
2/63*	1.97	4.00	11.15	11.15	6.03	8.82	2.375	63	17.5/7.9

* Metric End Connections Available in: BSP – Straight Thread, BSP TR – Tapered Thread and Metric Socket

Pneumatically Actuated Diaphragm Valves

Actuator Specifications

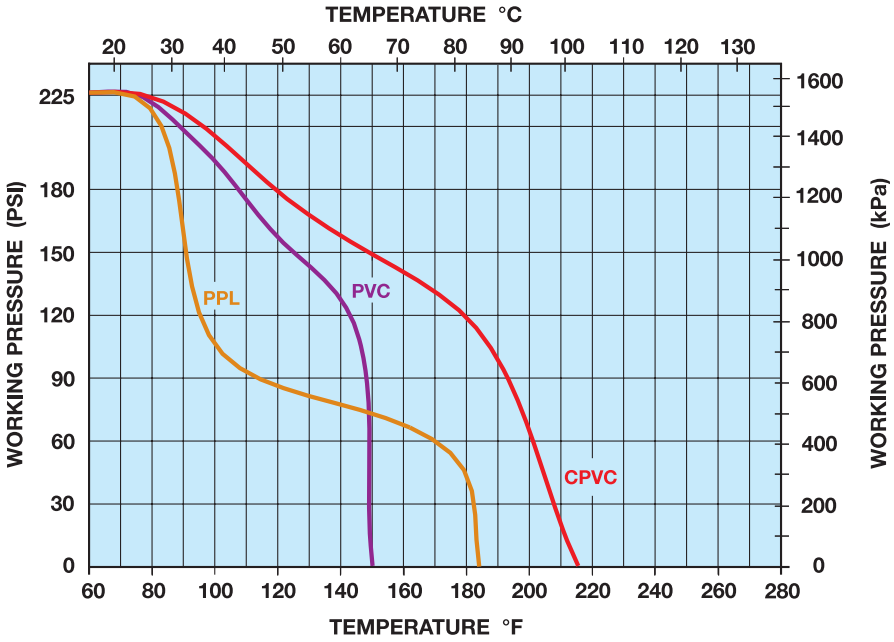
Air Pressure Minimum:	80 PSI
Air Pressure Maximum:	120 PSI
Air Port Connections:	1/4″ NPT
Housing Material:	Polyamide
Seals:	Nitrile
Position Indicator:	Visual

Diaphragm Valve Selection Chart

Size	Material	End Conn.	Diaphragm	Rating
1/4″ – 2″	PVC/CPVC	Socket/Threaded	FPM, EPDM, PFTE	150 PSI @ 70°F Non-shock
1/2″ – 2″	PPL**	Spigot*	FPM, EPDM	

* Not True Union ** No 1 1/4″ in PPL

Operating Temperature/Pressure



Note: Maximum operating pressure with standard pneumatic operator is 150 PSI.

Part Number Matrix

PVC - FPM Diaphragm		
Size	**End Conn.**	**Part Number**
1/2″	Threaded	DA10050TVP50
	Socket	DA10050SVP50
3/4″	Threaded	DA10075TVP63
	Socket	DA10075SVP63
1″	Threaded	DA10100TVP80
	Socket	DA10100SVP80
1 1/4″	Threaded	DA10125TVP100
	Socket	DA10125SVP100
1 1/2″	Threaded	DA10150TVP100
	Socket	DA10150SVP100
2″	Threaded	DA10200TVP125
	Socket	DA10200SVP125

PVC - EPDM Diaphragm		
Size	**End Conn.**	**Part Number**
1/2″	Threaded	DA10050TEP50
	Socket	DA10050SEP50
3/4″	Threaded	DA10075TEP63
	Socket	DA10075SEP63
1″	Threaded	DA10100TEP80
	Socket	DA10100SEP80
1 1/4″	Threaded	DA10125TEP100
	Socket	DA10125SEP100
1 1/2″	Threaded	DA10150TEP100
	Socket	DA10150SEP100
2″	Threaded	DA10200TEP125
	Socket	DA10200SEP125
3″	Flanged	DA10300FEP2
4″	Flanged	DA10400FEP2
6″	Flanged	DA10600FEP2

PPL - FPM Diaphragm		
Size	**End Conn.**	**Part Number**
1/2″	Spigot	DA30050WVP50
3/4″	Spigot	DA10075WVP63
1″	Spigot	DA10100WVP80
1 1/4″	Spigot	DA10125WVP100
1 1/2″	Spigot	DA10150WVP100
2″	Spigot	DA10200WVP125

PPL - EPDM Diaphragm		
Size	**End Conn.**	**Part Number**
1/2″	Spigot	DA30050WEP50
3/4″	Spigot	DA10075WVE63
1″	Spigot	DA10100WEP80
1 1/4″″	Spigot	DA10125WEP100
1 1/2″	Spigot	DA10150WEP100
2″	Spigot	DA10200WEP125

PVC - PTFE - EPDM Diaphragm		
Size	**End Conn.**	**Part Number**
1/2″	Threaded	DA10050TTP50
	Socket	DA10050STP50
3/4″	Threaded	DA10075TTP63
	Socket	DA10075STP63
1″	Threaded	DA10100TTP80
	Socket	DA10100STP80
1 1/4″	Threaded	DA10125TTP100
	Socket	DA10125STP100
1 1/2″	Threaded	DA10150TTP100
	Socket	DA10150STP100
2″	Threaded	DA10200TTP125
	Socket	DA10200STP125
3″	Flanged	DA10300FTP2
4″	Flanged	DA10400FTP2
6″	Flanged	DA10600FTP3

CPVC Corzan - FPM Diaphragm		
Size	**End Conn.**	**Part Number**
1/2″	Threaded	DA20050TVP50
	Socket	DA20050SVP50
3/4″	Threaded	DA20075TVP63
	Socket	DA20075SVP63
1″	Threaded	DA20100TVP80
	Socket	DA20100SVP80
1 1/4″	Threaded	DA20125TVP100
	Socket	DA20125SVP100
1 1/2″	Threaded	DA20150TVP100
	Socket	DA20150SVP100
2″	Threaded	DA20200TVP125
	Socket	DA20200SVP125

CPVC Corzan - EPDM Diaphragm		
Size	**End Conn.**	**Part Number**
1/2″	Threaded	DA20050TEP50
	Socket	DA20050SEP50
3/4″	Threaded	DA20075TEP63
	Socket	DA20075SEP63
1″	Threaded	DA20100TEP80
	Socket	DA20100SEP80
1 1/4″	Threaded	DA20125TEP100
	Socket	DA20125SEP100
1 1/2″	Threaded	DA20150TEP100
	Socket	DA20150SEP100
2″	Threaded	DA20200TEP125
	Socket	DA20200SEP125
3″	Flanged	DA20300FEP2
4″	Flanged	DA20400FEP2
6″	Flanged	DA20600FEP3

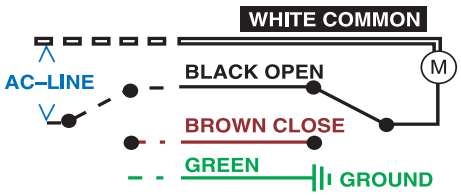
CPVC - Corzan®- PTFE - EPDM Diaphragm		
Size	**End Conn.**	**Part Number**
1/2″	Threaded/Socket	DA20050TTP50/DA20050STP50
3/4″	Threaded/Socket	DA20075TTP63/DA20075STP63
1″	Threaded/Socket	DA20100TTP80/DA20100STP80
1 1/4″	Threaded/Socket	DA20125TTP100/DA20125STP100
1 1/2″	Threaded/Socket	DA20150TTP100/DA20150STP100
2″	Threaded/Socket	DA20200TTP125/DA20200STP125
3″	Flanged	DA20300FTP2
4″	Flanged	DA20400FTP2
6″	Flanged	DA20600FTP2

EATB Series Electric Actuator and True Union Valve

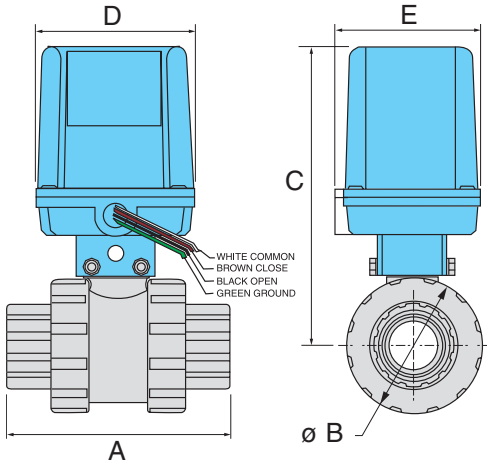
Overview

Moderately priced, full featured, plastic ball valve with unidirectional quarter-turn actuator. Fully serviceable true union ball valve provides reliable, long-term service in a wide range of corrosive applications. All plastic actuator features an integrally molded bracket and provides ample torque for 1/2″ – 2″ valve operation.

Wiring Diagram



Dimensions



Valve Features

- 1/2″ to 2″ Corrosion-Resistant True Union Ball Valve
- Pressure Rating to 250 PSI
- EPDM Seals/FPM Seals
- PTFE Seats
- Full Port Design
- Fully Serviceable
- Double O-ring Stem Seal

Actuator Features

- All Plastic Weather-Resistant Enclosure
- 2.5-second Cycle Time
- Thermal Overload Protection
- Permanently Lubricated Gear Train
- Nema 4/4X Enclosure
- Actuator Brake for Full Open/Close
- No Adjustments Needed

Dimensions–Inches

Size	Part Number	A	B	C	D	E	Weight (lb/kg)
1/2″	EATB1050STE or V	4.63	2.25	8.40			6.8/3.1
3/4″	EATB1075STE or V	4.75	2.63	8.60			
1″	EATB1100STE or V	5.25	3.00	9.10	4.88	4.13	7.1/3.2
1 1/2″	EATB1150STE or V	6.75	4.00	9.50			8.1/3.7
2″	EATB1200STE or V	8.00	4.75	10.10			9.8/4.5

Technical Information

Actuator Specifications

Model	EATB
Torque Output (in-lbs)	140
Standard Voltage	110 VAC
Duty Cycle	25%
Thermal Overload	Standard
Cycle Time (secs @ 90°)	2.5
Conduit Entry	1/2″ NPT
Enclosure	NEMA 4/4X
Enclosure Material	Polypropylene
Max Current Amps @ 115 Vac	2.8

Valve Specifications

Valve Type	True Union
Material of Construction	PVC
Seals	EPDM/FPM
Seats	PTFE
End Connections	Socket or Threaded
Sizes	1/2″, 3/4″, 1″, 1 1/2″ and 2″
Pressure Rating	250 PSI @ 70°F, Non-shock
Design	Full Port

C_V Factors

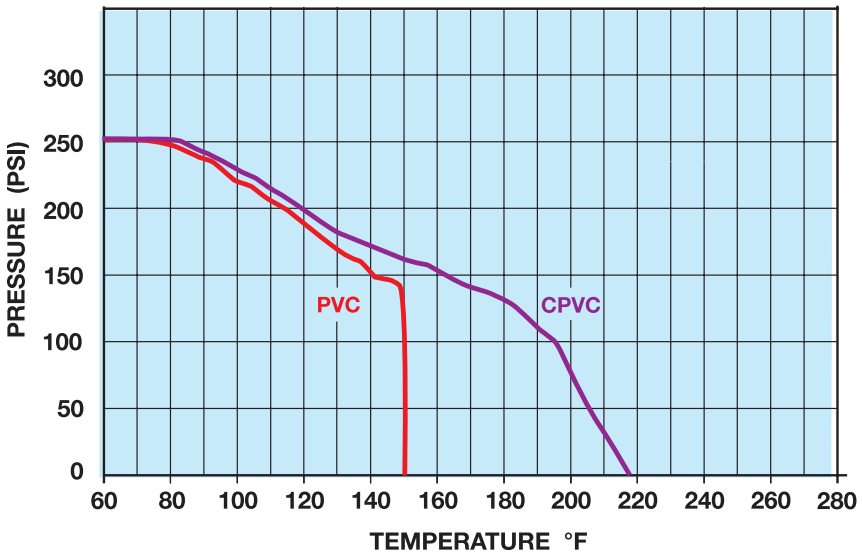
Size	Factor
1/2″	8.0
3/4″	15.0
1″	29.0
1 1/4″	75.0
1 1/2″	90.0
2″	140.0

Pressure Loss Calculation Formula

$$\Delta P = \left[\frac{Q}{Cv}\right]^2$$

ΔP = Pressure Drop
Q = Flow in GPM
Cv = Flow Coefficient

Operating Temperature/Pressure



EAU Series Electric Actuators

Overview

Moderately-priced uni-directional quarter-turn actuator for Hayward ball valve applications only. In addition to providing ample torque for 1/2″ – 2″ valve operation, this all plastic actuator offers a molded-in mounting bracket as well as several basic features.

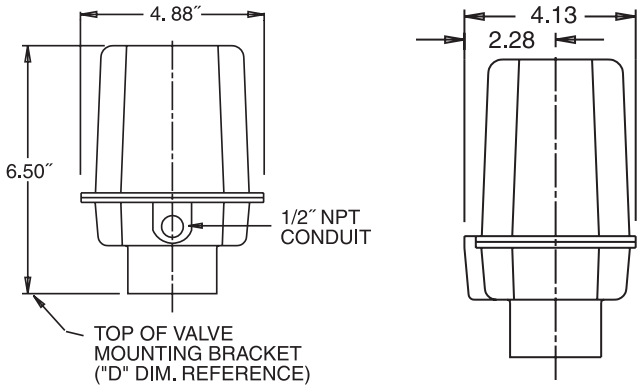
Features

- Plastic Weather Resistant Enclosure
- 90° (EAU29) or 180° (EAU28) Operation
- UL/CSA Listed Motor
- Permanently Lubricated
- Brake Standard
- On/Off Applications
- Nema 4/4X Housing
- 115 VAC Operation
- Auxiliary Limit Switch Standard

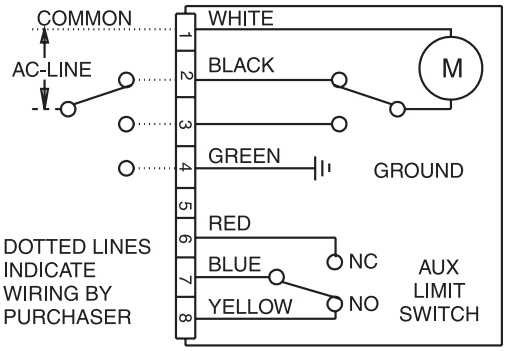
Options

- Voltage Options: 12 VDC, 24 VDC, 12 VAC, 24 VAC, 220 VAC Motors

Dimensions–Inches



Wiring Diagram



Actuator Specifications

Model	EAU
Torque Output (in-lbs)	140
Standard Voltage	115 VAC
Duty Cycle	25%
Thermal Overload	Standard
Cycle Time (secs)*	2.5/5.0
Auxiliary Switch Limit Rating	SPDT 5A Resistive @ 230 VAC
Conduit Entry	1/2″ NPT
Enclosure	NEMA 4/4X
Enclosure Material	Polypropylene
Max Current Amps@ 115 VAC	2.8
Weight (lb/kg)	6.2 /2.7

* EAU29 2.5, EAU28, 5.0

Valve Selection Chart

Size	True Union Ball Valve	Three-Way Ball Valve
1/2″- 2″	EAU29 (90°)	EAU28 (180°)

* Actuator size selections based on clean water at 70°F.

EVR Series Reversing Electric Actuators

Overview

Economical, high performance actuator for use with all true union ball valves, three-way ball valves, and butterfly valves up to 4″ in size. Ideal for on/off applications where there is a need to manually override actuator operation, and use in limited space areas.

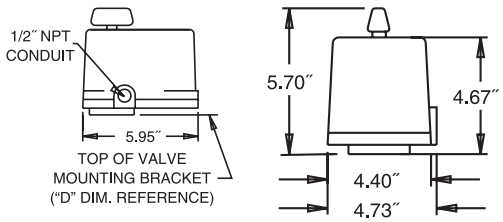
Features

- Low Profile Design
- Manual Override
- Position Indicator
- UL Listed Motor
- Nema 4/4X Enclosure
- Permanent Lubrication
- 115 VAC Operation
- Mechanical Brake

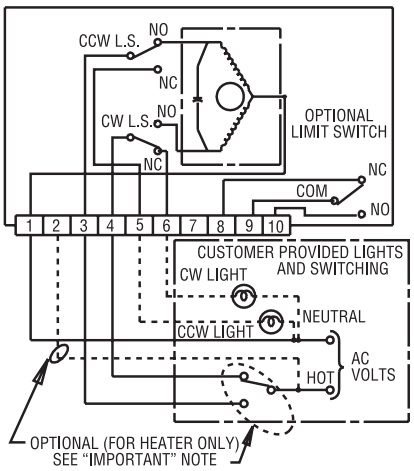
Options

- Voltage Options: 12 VDC, 24 VDC, 24 VAC and 220 VAC
- Heater and Thermostat
- Timer
- Auxiliary Limit Switches

Dimensions–Inches



Wiring Diagram



NOTE:
ACTUATOR SHOWN IN FULL CLOCKWISE EXTREME OF TRAVEL OR ″CLOSED″ POSITION

IMPORTANT NOTE
REVERSING ELECTRIC ACTUATORS WITH CAPACITOR START MOTORS **MUST** BE WIRED TO INDEPENDENT CONTACTS FOR OPEN/CLOSED OPERATION. **DO NOT** WIRE TWO OR MORE ACTUATORS TOGETHER – AS CAPACITOR DAMAGE WILL OCCUR.

Actuator Specifications

Model	EVR2K	EVR3K	EVR6K
Torque Output (in-lbs)	150	300	600
Standard Voltage	115 VAC		
Duty Cycle	25%		
Thermal Overload	Standard		
Cycle Time (secs @ 90°)	4.5	7.5	12.5
Auxiliary Limit Switch Rating	1/3 hp, 10 amps @ 125/230 VAC		
Conduit Entry	1/2″ NPT		
Enclosure	NEMA 4/4X		
Enclosure Material	Plastic Cover/Zinc Alloy Base		
Max Current Amps @ 115 VAC	0.4	0.6	0.5
Weight (lbs/kg)	6/2.7		

Valve Selection Chart*

Size	True Union Ball Valve	Three-Way Ball Valve	Butterfly Valve
1/2″ – 1″	EVR2K	EVR2K	N/A
1 1/2″ – 2″	EVR2K	EVR2K	EVR3K
2 1/2″	EVR3K	EVR6K	N/A
3″	EVR3K	EVR6K	EVR3K
4″	EVR3K	EVR6K	EVR6K
6″	EVR3K	EVR6K	N/A

* Actuator size selections based on clean water at 70°F.

EJM Series Reversing Electric Actuators

Overview

Cost effective, rugged, quarter-turn actuator designed for use with all ball and butterfly valves up to 24″ in size. Ideal for a wide range of applications without costly options. Positioners are available for special throttling or modulating requirements.

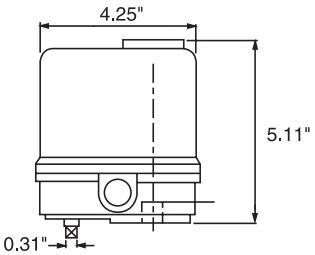
Features

- Two Auxiliary Limit Switches
- Heater with Thermostat
- NEMA 4/4X Enclosure
- Position Indicator
- Manual Override
- Self-Locking Gear Train
- Permanently Lubricated
- Thermal Overload Protection
- CE and CSA Approved
- ISO 5211 Mounting Base

Options

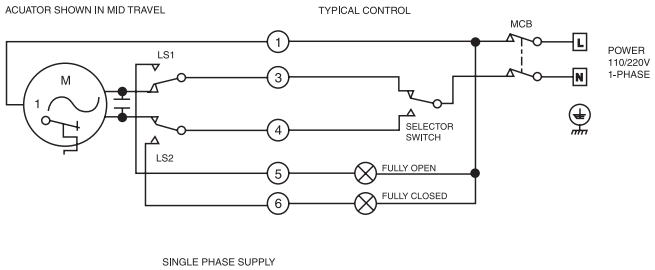
- Positioners
- Voltage Options: 12 VDC, 24 VDC, 12 VAC, 24 VAC and 220 VAC Motors
- Feedback Potentiometer
- Control Stations

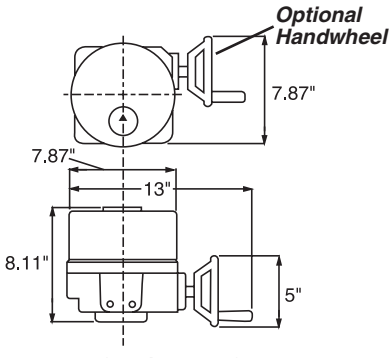
EJM Series Dimensions–Inches



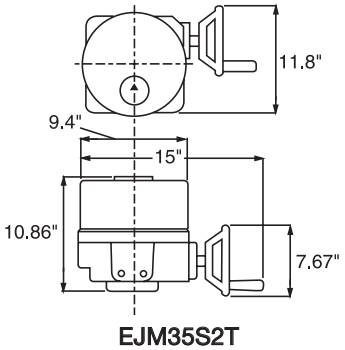
EJM2S2T/EJM3S2T

Wiring Diagram

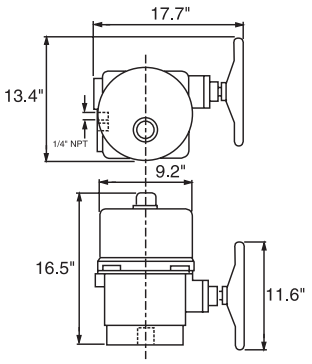




EJM8S2T/EJM13S2T



EJM35S2T



EJM130S2T

Technical Information

Actuator Specifications

Model	EJM2S2T	EJM3S2T	EJM8S2T	EJM13S2T	EJM35S2T	EJM130S2T
Torque Output (in-lbs)	150	300	800	1300	3500	13300
Standard Voltage	50/60 Hz, 115 VAC, 1 Phase, PSC					
Duty Cycle	25%					
Thermal Overload	Standard					
Cycle Time (secs @ 90°)	8	12	15	22	22	46
Auxiliary Limit Switch Rating	5 amps @ 125 V		½ hp, 15 amps @ 125/250 V			
Conduit Entry	½″ NPT					
Enclosure	NEMA 4/4X					
Enclosure Material	Aluminum Alloy, Dry Powder Coated					
Max Current Amps @ 115 VAC	.60	1.8	3.6	10.0		
Weight (lbs/kg)	5/2.3	20/9.1	40/18.2	52/23.6		

Ball Valve Selection Chart*

Size	True Union Ball Valve	Three-Way Ball Valve
½″ – 2″	EJM2S2T	EJM2S2T
2 ½″ – 6″	EJM3S2T	EJM8S2T

*Actuator size selections based on clean water at 70°F.

Butterfly Valve Selection Chart*

Size	Butterfly Valve
1 ½″, 2″, 3″	EJM3S2T
4″, 6″	EJM8S2T
8″	EJM13S2T
10″, 12″	EJM35S2T
14″ – 24″	EJM130S2T

*Actuator size selections based on clean water at 70°F.

EVS/EVT Series Electric Actuators

Overview

Versatile, quarter-turn actuator is designed for on/off and modulating use with all ball and butterfly valves up to 12″ in size. The actuator's specially designed circuit board accepts plug-in connectors, and a wide range of options allows configuration to meet virtually any application requirement.

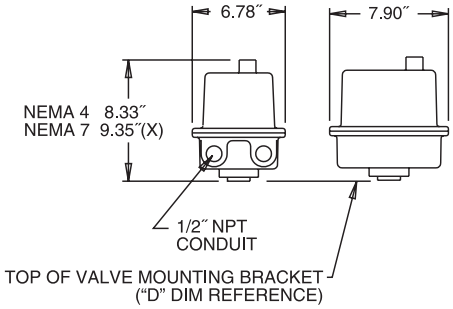
Features

- Extended Duty Motor
- Multi Option Availability
- Gold Plated Connectors
- Modular Internal Construction
- Manual Override
- Position Indicator
- UL Listed Motor
- Nema 4/4X Enclosure
- Permanent Lubrication
- 115 VAC Operation

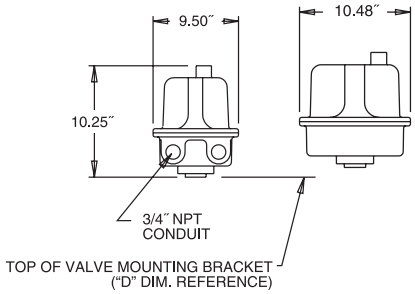
Options

- Limit Switches
- Positioners
- Voltage Options: 12 VDC, 24 VDC, 12 VAC, 24 VAC, and 220 VAC Motors
- Fail Safe Operation
- Feedback Potentiometer
- Heater & Thermostat
- Mechanical Brake
- CSA Certification
- Nema 4/4X/7/9 Enclosure

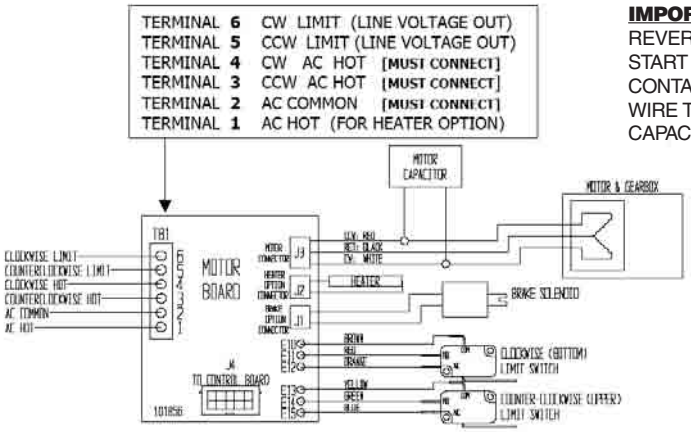
EVS Series Dimensions–Inches



EVT Series Dimensions–Inches



Wiring Diagram



IMPORTANT NOTE

REVERSING ELECTRIC ACTUATORS WITH CAPACITOR START MOTORS **MUST** BE WIRED TO INDEPENDENT CONTACTS FOR OPEN/CLOSED OPERATION. **DO NOT** WIRE TWO OR MORE ACTUATORS TOGETHER – AS CAPACITOR DAMAGE WILL OCCUR.

Technical Information

Actuator Specifications

Model	EVS2	EVS3	EVS6	EVT10K	EVT20K	EVT30K
Torque Output (in-lbs)	150	300	600	1000	2000	3000
Standard Voltage	120 VAC					
Duty Cycle	75%					
Thermal Overload	Standard					
Cycle Time (secs @ 90°)	5.0	10.0	15.0	30.0	30.0	45.0
Auxiliary Limit Switch Rating	1/3 hp, 10 amps @ 125/230 VAC					
Enclosure	NEMA 4/4X					
Conduit Entry	1/2″ NPT					
Enclosure Material	Epoxy-Coated Aluminum					
Max Current Amps @ 115 VAC	.6	.6	.6	.8	.8	.8
Weight - lbs/kg	16.3/7.4	16.3/7.4	16.45/7.5	20.60/9.4	31/14.1	31/14.1

Ball Valve Selection Chart*

Size	True Union Ball Valve	Three-Way Ball Valve
1/2″ – 2″	EVS2	EVS2
2 1/2″ – 3″	EVS3	EVS3
4″ – 6″	EVS3	EVS6

*Actuator size selections based on clean water at 70°F.

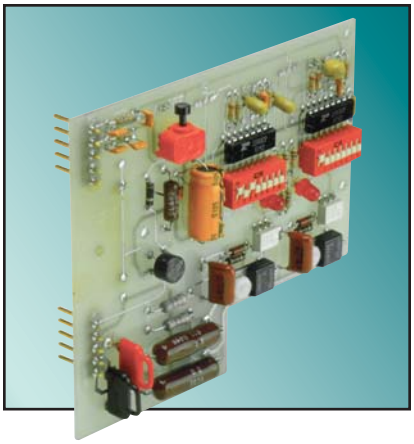
Butterfly Valve Selection Chart*

Size	Butterfly Valve
1 1/2″ – 3″	EVS3K
4″	EVS6K
6″ – 8″	EVT10K
10″	EVT20K
12″	EVT30K

*Actuator size selections based on clean water at 70°F.

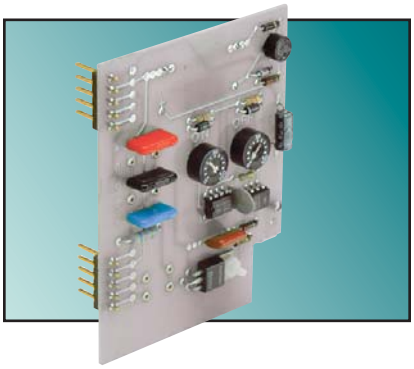
Electric Actuator Accessories

Extended Descriptions



Timer Board–Suffix A

Timer board installs within actuator enclosure. Board shown is for EVR, EVS, and EVT actuators.



Cycle Time Rate Regulator–Suffix B

Cycle time rate regulator installs within actuator enclosure. Board shown is for EVS and EVT actuators.

Timer Board

115 VAC Input–Suffix A

(For EVR, EVS & EVT actuators)

The timer board is a solid state device that allows the user to program actuators to automatically control valves in repetitive on/off functions. The switches for programming the ″on″ time provide 255 options for setting the length of time the valve remains open. This can range from 6 seconds to 25 minutes. The other set of switches, for programming the ″off″ time, provide 255 more options to set the length of time the valve remains closed. This range is from 5.5 minutes to almost 24 hours.

Cycle Time Regulator

115 VAC Input–Suffix B

(For EVS & EVT actuators)

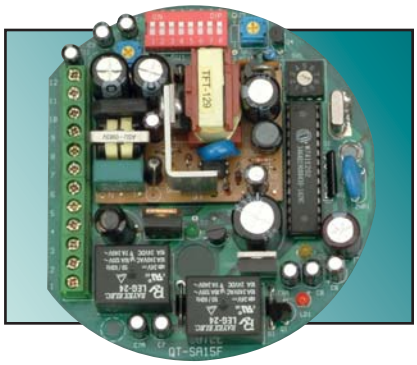
The cycle time regulator board allows speed adjustment for both the ″opening″ and ″closing″ cycles of the actuator. The adjustments are only available for slowing the cycle down to ″pulse″ the motor either open or closed. This feature is used primarily to avoid water hammer or large, abrupt flow variations. Cycle time adjustments range from 3-300 times the standard cycle time (depends on torque of actuator model).

Positioners

Suffix C2E

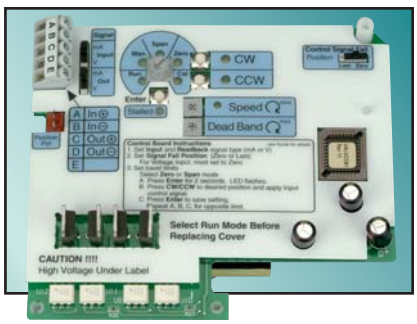
(For EJM, EVS & EVT actuators)

EJM positioners are used for flow-throttling applications in response to an external control signal received from a control panel (or PLC). The signal is usually in the form of current (4-20 mA range), or DC voltage (0-10 VDC range). The positioners have a simple selector switch on the circuit board so that the user can choose either the 4-20 mA or 0-10 VDC control signal, depending on which signal is being transmitted by the control panel (or PLC). The positioners are preset at the factory so at 4 mA (or 0 VDC), the valve will be in the full closed position, and at 20 mA (or 10 VDC), the valve will be in the full open position. If the positioner receives an external signal within the range of 4-20 mA (or 0-10 VDC), the actuator will simply rotate the valve to achieve a specific position within the 0°-90° of rotation, thus achieving a specific downstream flow rate.



EJM Positioner Board–Suffix C2E

EVS & EVT–actuator positioners contain a few more features on the circuit board than just positioning. **Position Retransmit** (4-20 mA or 0-10 VDC) if chosen to send the current position signal to another electrical device in the process flow loop, **Speed Control** for slower rotation and less sudden flow rate changes, **Adjustable Dead Band** to tune-out surrounding ″machine noise″ that may interfere with the control signal, and selectable **Position Response** in case of lost control signal (either the actuator can stay in its current position or travel to the home/close position.)



EVS/EVT Positioner Board–Suffix C2E

Electric Actuator Accessories

Extended Descriptions

180° Center-Off

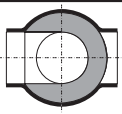
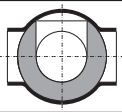
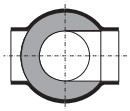
Suffix D

(For EVR, EVS & EVT actuators)

180 degree center off is used with three-way valves. A 2-hole ball (TW) is installed in the valve to provide an OFF position. The actuator moves the ball 180 degrees in 90 degree increments.

This feature is also useful when used with true union blocked end valves for two stage shut-off or dribble control.

Consult factory if this feature is used on actuators with auxiliary limit switches, Suffix S, S2, and S3.

FLOW AT	″TW″ BALL AVAILABLE ″HCTW″ PREFIX
0°	Port A  Port B
90° CENTER-OFF	Port A  Port B
180°	Port A  Port B

Extended Duty Cycle Motors

75 to 100%–Suffix E

(Standard with all EVS and EVT actuators. Standard with EJM actuators with positioner option)

Actuators for on/off servce typically have motors that are rated for a duty cycle of 25%. Actuators used for modulating valves must have motors that are rated at 75 to 100%. Modulating valves are often required to cycle frequently which increases the heat generation of the motor and increases the temperature within the housing. Extended duty motors are used to allow more frequent periods of operation without overheating.

Re-Transmitter

115 VAC Input/ 4-20 mA Output–Suffix G

(For EVS & EVT actuators)

The re-transmit module provides a 4-20 mA output signal directly proportional to the actuator/valve angular output drive movement or position. The module has an accuracy of ±0.5% within its rated voltage/ temperature bands. This module includes its own power supply.

Note: Use a dual potentiometer when using the re-transmit module if a remote resistance signal is required for EWC or EWB actuators.

Mechanical Brake

115 VAC Standard–Suffix K

(For EVS & EVT actuators. Standard on EVR actuators.)

Used when the actuator must be stopped instantaneously and securely. It eliminates actuator ″drifting″ or ″hunting″ due to internal valve pressure of turbulence. Mechanical brake is required on butterfly valves to prevent the fluid force on the valve's disc from causing the disc to rotate.

Electric Actuator Accessories

Extended Descriptions

Electric Fail-safe (Battery)–Suffix L2
For EVS and EVT actuators.

Electric Fail-Safe (Battery)

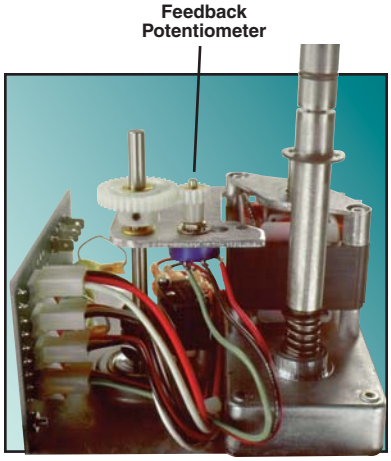
Suffix L2

(For EVS & EVT actuators)

The electric fail-safe board allows the shut down of the process system in the event of an AC power loss. Engineered to supply dependable valve actuation to fail-open or fail-closed. Upon loss of power it can provide up to 15 complete cycles under its own power. The electric actuators are driven by a powerful DC motor that runs on either AC or DC input voltage. The electric fail-safe feature incorporates a rechargeable battery pack on a plug-in modular PC board under the actuator cover. Upon power loss or a signal from an external sensor, the battery pack is automatically activated as the motor power supply. During normal operation, the unit monitors the battery pack to keep it fully charged. After a failure, and once power is restored, the recharging cycle is reactivated. LED indicator shows charge condition. It is recommended that a heater and thermostat be specified if the operational temperature falls below 40°F.

Battery Replacement

- Should be replaced every 18 to 24 months.



Feedback Potentiometer–Suffix P, P2, and P3
For EJM, EVS, and EVT actuators.

Feedback Potentiometer

Suffix P, P2, and P3

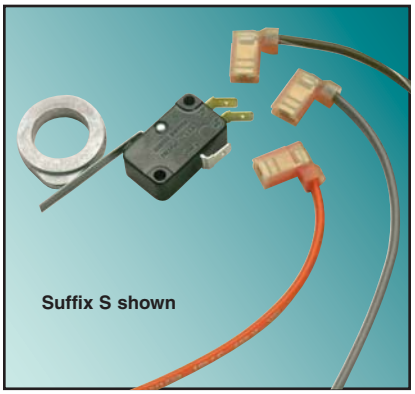
(For EJM, EVS & EVT actuators)

A potentiometer provides continuous, remote status indication of the position of the valve at a control panel or other monitoring equipment. The standard usage is 0 to 1000 ohms, but other resistive values can be supplied.

- Use 90°, 0 to 1000 ohms for two-way valves–Suffix P
- Use no-stop, 0 to 1000 ohms for three-way valves–Suffix P2
- Use dual, 0 to 1000 ohms for applications requiring two distinct feedback signals–Suffix P3

Electric Actuator Accessories

Extended Descriptions



Auxiliary Limit Switches–Suffix S to S3

Auxiliary Limit Switches

Suffix S, S2, and S3

(For EVR, EVS & EVT actuators)

A maximum of three additional limit switches can be installed (see Electric Actuator Specifications and Accessories–page 75). Switches are SPDT, rated at 10A @ 250 VAC, and are pre-wired to the internal terminal strip.

Auxiliary limit switches may be set to open/close at any point during the 90° rotation. These are dry contacts, and may be used to trigger alarms, illuminate indicator lights, and other similar devices.

Heater & Thermostat

Suffix T

(For EVR, EVS & EVT actuators, standard on EJM actuators)

A heater and thermostat are designed to electrically warm the inside of the actuator enclosure to approximately 40°F. Its purpose is to inhibit condensation, facilitate better lubrication, and prolong fail-safe battery life in environments as cold as -40°F.

Special Enclosure NEMA 4/4X/7/9

Suffix X2

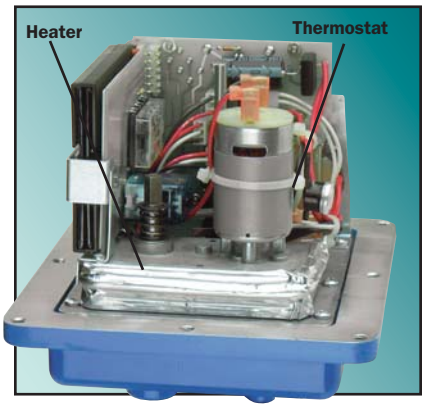
(For EVS & EVT actuators)

In addition to being water and corrosion resistant, these enclosures meet NEMA specifications for Class 1, Division 1 groups A, B, and C Explosion-proof as well as Class 1, Division 1 groups D, E, and F dust-proof.

Optional Motor Voltages–See Below for Respective Suffix

(For all actuators)

12D–12 VDC
24D–24 VDC
24A–24 VAC
220A–220 VAC



Heater and Thermostat–Suffix T
For EVR, EVS, and EVT actuators.

Surge Protector–

Suffix W

(For EVS & EVT actuators)

The surge protector, (also known as “voltage transient suppression board”) is designed for installation in 120/240 VAC actuators, and used to protect against voltage surges that could damage the actuator. This module will also protect the capacitors used within each actuator.

Second Conduit Entry

Suffix Y

(For EVS & EVT actuators)

Some applications and electrical codes require that control wires be run in a separate conduit from the power supply wires. A second 1/2˝ NPT conduit connection can be provided for this purpose.

Electric Actuator Specifications and Accessories

Features/ Accessories/Voltages		General Specifications Actuator Model				
Standard Actuator Features		**EATB**	**EAU**	**EVR**	**EVS/EVT**	**EJM**
Motor Drive Rotation		Uni	Uni	Rev	Rev	Rev
NEMA Rating (Available)		4, 4X	4, 4X	4, 4X	4, 4X	4, 4X
Enclosure Material (Top/Bottom)		GFPPL/GFPPL	GFPPL/GFPPL	PVC/ZA	Al/Al	Al/Al
Manual Override (De-Clutching)				Standard	Standard	Back–Drive
Position Indicator				Standard	Standard	Standard
Position Indication w/LED		POA	POA	POA	POA	POA
Standard Voltage (VAC)		115	115	115	115	115
Prewired to Terminal Strip			Standard	Standard	Standard	Standard
Motor Thermal Protector		Standard	Standard	Standard	Standard	Standard
Automatic Reset		Standard	Standard	Standard	Standard	Standard
Auxiliary Limit Switches (SPDT)			1 STD	Optional	Optional	2 STD
Auxiliary Limit Switch (Amp Rating)		5	5	10	15	EJM 2&3 5, all others 15
Low Ambient Limit without ″T″ (°F)		40°F	40°F	40°F	40°F	N/A
High Ambient Limit (°F)		160°F	160°F	160°F	160°F	150°F
Motor Brake		Standard	Standard	Standard	Optional	Self-Locking Gearing
Conduit Entry Size, NPT		1/2″	1/2″	1/2″	1/2″	1/2″
Permanent Lubrication		Standard	Standard	Standard	Standard	Standard
Mounting Position		Any	Any	Any	Any	Any
Min/Max Wire Size		18/16	18/16	18/14	18/14	20/12
Optional Actuator Accessories	**Suffix**	**EATB**	**EAU**	**EVR**	**EVS/EVT**	**EJM**
Timer Board	A			Optional	Optional	
Cycle Time Rate Regulator	B				Optional	
Positioner (4-20 mA)	C2E				Optional	Optional
180 Degree Center-Off	D			Optional	Optional	
Extended Duty	E				Standard	Optional
Handwheel	H			Optional		Standard
Mechanical Brake	K		Standard	Standard	Optional	Self-Locking Gearing
Electric Fail-safe (Battery Backup)	L2				Optional	
Feedback Potentiometer 90 Degree, 0 to 1000 Ohms No-Stop, 0 to 1000 Ohms Dual, 0 to 1000 Ohms	 P P2 P3				 Optional Optional Optional	Optional
Auxiliary Limit Switches Available* Auxiliary Limit Switch w/cam 1 Auxiliary Limit Switch w/cam 2 Auxiliary Limit Switch w/cam 3	 S S2 S3			 Optional Optional	 Optional Optional Optional	 Standard
Heater & Thermostat	T			Optional	Optional	Standard
Enclosure, NEMA 4,7,9	X2				Optional	
316 SS Tags w/Stamped Valve Numbers	YSS2	Optional	Optional	Optional	Optional	Optional
Optional Voltages	**Suffix**	**EATB**	**EAU**	**EVR**	**EVS/EVT**	**EJM**
12 VAC	12A		Optional			Optional
24 VAC	24A		Optional	Optional	Optional	Optional
220 VAC	220A		Optional	Optional	Optional	Optional
12 VDC	12D		Optional	Optional	Optional	Optional
24 VDC	24D		Optional	Optional	Optional	Optional

*Should additional auxiliary limit switches be required greater than quantity shown, consult factory.

Notes:
1. K Option, Mechanical Brake, is required with Actuators for butterfly valves.
2. E Option, Extended Duty, is included with Positioners.
3. EVS and EVT Actuators can be CSA certified. Price on application.
4. Positioners with 12–24 VDC input are available. Consult factory.
5. EJM Actuators over 800 in-lb torque include handwheel.

Important Note: The valve and actuator combinations shown in this catalog have been tested and approved by Hayward Flow Control Systems when properly installed into compatible process systems. Should actuators, accessories or mounting hardware other than those supplied by Hayward be used for the operation of these valves, the installer assumes all responsibility for the performance of those valves.

NPD Series Solenoid Valves

True Union

Overview

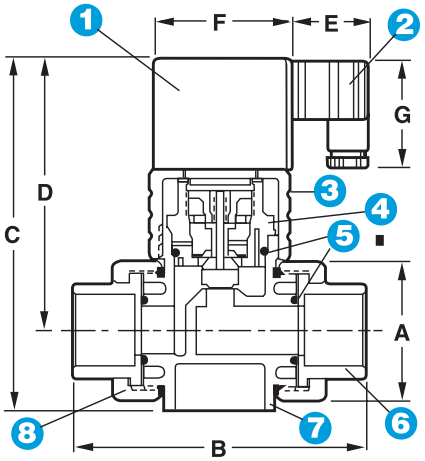
Heavy-duty solenoid valves feature true union end connections and are designed so No Pressure Differential is required for reliable operation. Problems such as sticking and ″chattering″ are eliminated and downstream restrictions caused by nozzles, flowmeters, and other equipment will not affect performance. The valve's unique coil design results in lower coil operating temperatures and a 100% continuous duty rating. A molded polyester housing protects the coil assembly and electronics from harsh corrosive environments, and an easy to replace one-piece seal cartridge and plunger assembly allow the valve to quickly be put back in service.

Features

- Continuous 100% Duty Cycle
- Multi-Position Electric Connections
- Polyester Coil Housing
- 115 VAC Standard
- Corrosion Resistant
- Built-In 1/2″ Conduit or S-J Type Cord Electric Connections
- FPM or EPDM Seals
- NPD Design
- 1/4 - 1″ PVC, Corzan® CPVC

Options

- Voltage Options: 12 VAC/VDC, 24 VAC/VDC, 220 VAC



Parts List

True Union Solenoid Valves

1. Solenoid Coil
2. Electrical Connector
3. Bonnet Nut – CPVC
4. Seal Cartridge – CPVC, PVC
5. O-Rings
6. End Connector – PVC/CPVC
7. Body – PVC/CPVC
8. Union Nut – PVC/CPVC

Operating Parameters

For optimum valve performance, inlet pressure must not exceed 120 PSI. Flow rate should not exceed 5 feet per second.

Pressure Loss Calculation Formula

$$\Delta P = \left[\frac{Q}{Cv}\right]^2$$

ΔP = Pressure Drop
Q = Flow in GPM
Cv = Flow Coefficient

Cv Factors

Size	Factor	Size	Factor
1/4″	1.3	3/4″	3.2
1/2″	2.3	1″	3.8

Dimensions–Inches

Size	A	B	C	D	E	F	G	Weight (lb/kg)
1/4″	2.25	5.30	6.30	4.60	1.60	2.60	2.00	2.79/1.3
1/2″ /20*	2.25	5.30	6.30	4.60	1.60	2.60	2.00	2.81/1.3
3/4″ /25*	2.63	5.50	6.60	5.10	1.60	2.60	2.00	3.01/1.4
1″ /32*	2.63	5.50	6.60	5.10	1.60	2.60	2.00	3.03/1.4

* **Metric End Connections Available in:** BSP – Straight Thread, BSP TR – Tapered Thread and Metric Socket

Technical Information

Part Numbers

PVC/FPM Seals			CPVC/FPM Seals		
Size	**End Conn.**	**Part Number**	**Size**	**End Conn.**	**Part Number**
1/2″	Socket/Threaded	SV10050STV	1/4″	Socket/Threaded	SV20025STV
3/4″	Socket/Threaded	SV10075STV	1/2″	Socket/Threaded	SV20050STV
1″	Socket/Threaded	SV10100STV	3/4″	Socket/Threaded	SV20075STV
			1″	Socket/Threaded	SV20100STV

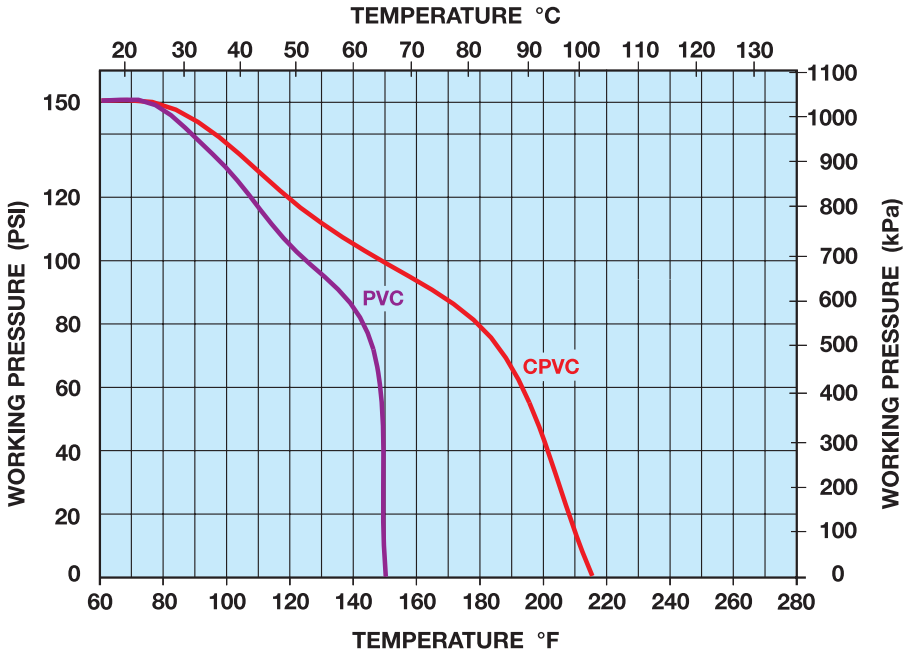
PVC/EPDM Seals			CPVC/EPDM Seals		
Size	**End Conn.**	**Part Number**	**Size**	**End Conn.**	**Part Number**
1/2″	Socket/Threaded	SV10050STE	1/4″	Socket/Threaded	SV20025STE
3/4″	Socket/Threaded	SV10075STE	1/2″	Socket/Threaded	SV20050STE
1″	Socket/Threaded	SV10100STE	3/4″	Socket/Threaded	SV20075STE
			1″	Socket/Threaded	SV20100STE

Solenoid Valve Selection Chart

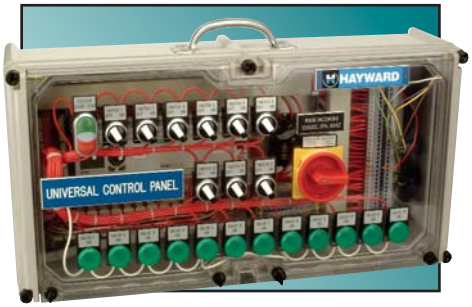
Size	Material	End Conn.	Liner & Seals	Pressure Rating	Coil Rating
1/4″, 1/2″ 3/4″, 1″	PVC*, CPVC	Socket, Threaded, or Flanged	FPM, EPDM	150 PSI @ 70°F Non-Shock 120 PSI Max Inlet Pressure	1.6 Amp @ 120 VAC

*1/4″ not available in PVC

Operating Temperatures/Pressure



Universal Control Panel



For Control, Sequencing, and Monotoring of Automated Valves

Overview

Extremely flexible, low-cost Universal Control Panels are used to control the operation of 5 to 25 electrically or pneumatically actuated valves without the complexity and cost of programmable controllers or the maze of wires associated with hard-wire relays. Compact, electronic relays that serve as multiple timers, counters, clocks, and relays are easily programmed to perform endless combinations of actuated valve control to meet the specific requirements of virtually any application.

Features

- NEMA 4X Enclosure (UL, CSA & CE Listed)
- Transparent Hinged Cover
- Built-In Circuit Breaker
- Control Relay with Expansion Module
- Interposing Relays
- Terminal Wiring Block
- Control Switches
- Indicator and Alarm Lights

Application Flexibility

Universal Control Panels have control relay and expansion modules for numerous control functions including:

- Maximum of 20 Digital Outputs
- Maximum of 2 Analog Inputs
- Maximum of 10 Relay Outputs (Rated to 10 A Resistive [3A Ind.])

Panel Functions Include:

- 8 Timers and 8 Counters
- 4 Real Time Clocks with 4 Channels/Clock
- 8 Display Messages (To accommodate complex applications)

A standard main power disconnect switch provides added safety, a UL 489 circuit breaker allows power to be directly wired to the panel, and clearly marked terminal blocks make wiring connections easy.

An easy-to-read LCD displays circuit diagrams, continuous function updates, and other user-defined display messages. The panel can be customized to include indicating lights, alarms, interloping relays, and selector switches. It is also AS-interface and PROFIBUS compatible.

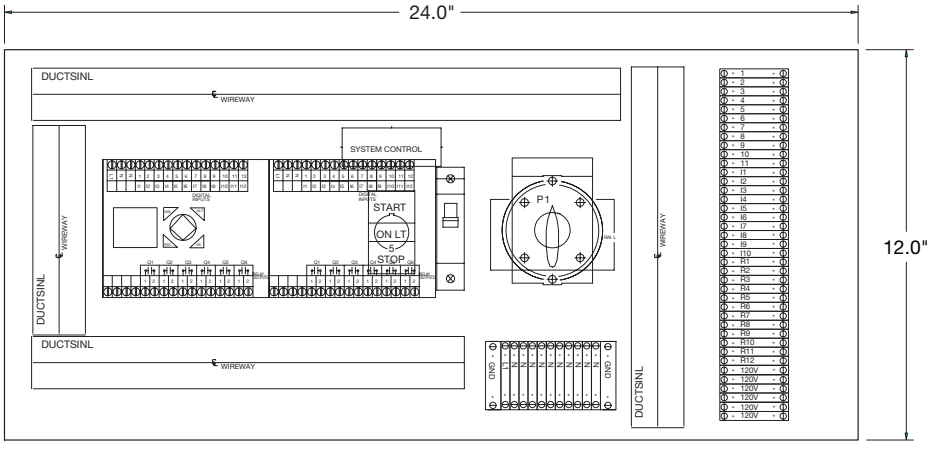
Easily Configured

Universal Control Panels are easily configured with the help of a Hayward Automated Valve Specialist. The panel can be programmed remotely, and a new control chip module can be installed on a panel already in the field. The panel is designed for use with Hayward Automated Valves but will also work with electric and pneumatic actuators from most other manufacturers.

Typical Applications

Universal Control Panels are ideally suited for small, compact systems with 5 to 25 actuated valves such as:

- Multiple Filter Banks with Backwash Systems
- Photo Processing Systems
- Small Waste and Water Treatment Plants
- HVAC Control and Sequencing
- Container Filling Systems
- PC Board Manufacturing Facilities



CONTROL BOX OVERALL HEIGHT = 9.5"

Bus Control Systems

Pneumatic Bus Control System
mounted on a butterfly valve

For Multiple Automated Valve Applications

Overview

Specially equipped Hayward actuated valves, as well as numerous other associated devices, can be linked via standardized communication networks within plants. While conventional communication architecture dictates as many as 8-12 wires run from PLC controls to each automated valve, bus architecture allows all actuated valves in the network to be controlled via a pair of daisy-chained wires – providing a level of enhanced flexibly and utility while dramatically reducing installation and maintenance costs.

Since communication protocols are as varied as the 100 or so manufacturers of programmable logic controllers (PLCs), Hayward actuated valves are equipped with AS-I modules that freely communicate with all PLC brands regardless of protocol. For modulating applications that require communication modules compatible with the specific PLC used, Hayward offers modules compatible with the most popular protocols including Device Net, Profibus, Modbus, Fieldbus, and several others.

Why Bus Is Better

Conventional actuated valve systems, especially modulating systems, often require the running of discrete bundles of wire from the central control station to each actuator in the network. These wiring bundles include power, control and feedback wiring. Use of Hayward's bus control system allows all actuated valves in the network to be linked via a single pair of daisy-chained wires.

Other compatible devices such as flow meters, temperature sensors, and other instrumentation can also be included in the network. Electronic "addresses" assigned to each actuated valve enable the PLC to command any actuator in the network independently of all other actuated valves.

The advantages of bus control over conventional control are numerous:

- Wiring is greatly simplified
- Power from the air solenoid in pneumatic actuation applications can be supplied via the bus connection
- Troubleshooting and future modifications are relatively simple
- Other devices can be included in the network
- Speed, reliability, and flexibility are greatly enhanced
- Net applied cost is often a fraction of conventional control costs

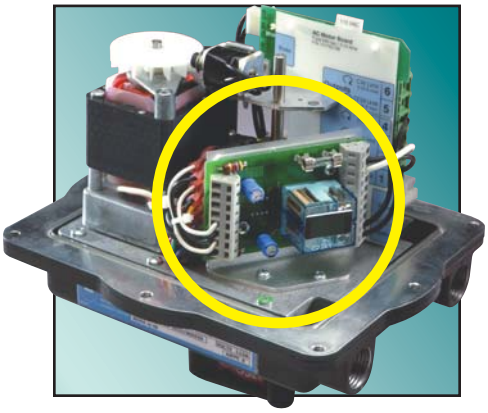
Applied Cost Savings

The industry standard for discreet wiring (design conduit, wire, and installation) is approximately $8 per linear foot vs. a comparable bus system which can be installed for approximately $2 per linear foot.

Using these cost factors, a modulating system requiring 20 actuators installed an average of 200 feet from the PLC would cost approximately $32,000 to connect. An equivalent bus system would cost approximately $8,000 with the resulting savings more than offsetting the cost of bus compatible actuated valves.

In bus control systems, the greatest cost savings are often realized later since troubleshooting is often accomplished through visual review of the system via a PC instead of physically tracing wires. Future modifications and system expansions are also greatly simplified.

Bus Control Systems



Electric Bus Module
(highlighted by yellow circle)

A Choice of Electric or Pneumatic Automation

Hayward bus control systems are designed to work with Hayward's EVS Series Electric and Series PH or PK Pneumatic Actuators. The bus control module for the electric actuator fits inside the actuator housing, and the one for the pneumatic actuator is contained in a small housing that mounts directly to the actuator. The module provides power and signal to the actuator.

Pneumatic Bus Module Features

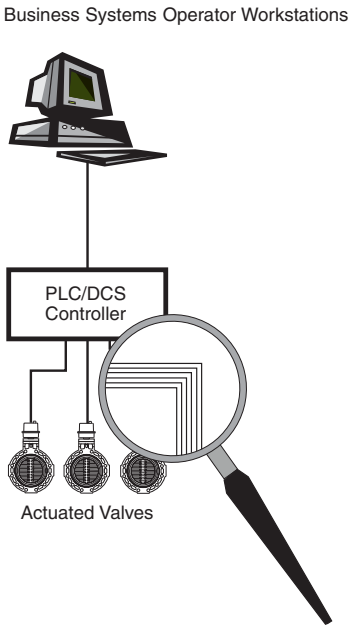
- NEMA 4, 4X, and IP67 Enclosure (UL, CSA, and CE Listed)
- Transparent Screw-On Lexan® Cover
- Large Color-Coded Visual Open/Closed Indicator
- Solid State Inductive Positioning Sensors
- Integral High Flow, Low Power Consumption Solenoid Valve in Brass or Stainless Steel
- Enclosed Protected Pilot Solenoid
- AS-I or Device Net Twisted Pair Solenoid Power*
- Choice of 120 VAC or 24 VDC Operation
- Manual Override

*Auxiliary power must be provided to the solenoid for Foundation Fieldbus applications.

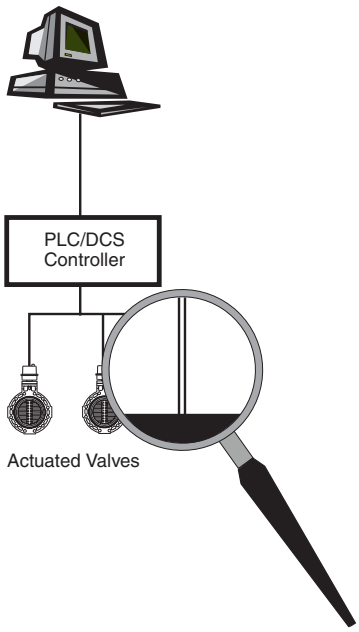
Electric Bus Module Features

- Flexible, Housing-Enclosed Plug-In Type Protocol Module
- Several Different Protocol Modules to Handle Varying Application Requirements

Conventional I/O Architecture



Fieldbus I/O Architecture



Lexan® is a registered trademark of General Electric

LS Series Control Station

For On-Demand Local or Remote Control of Electronically Actuated Valves

Overview

LS Series Control Stations are designed and engineered to provide maximum in-field flexibility for local and/or remote control of electrically actuated valves. A single LS Series Control Station can be used for local actuator control, and addition of a second station permits control from a remote location as well. One of two manual switches on each station allows control to be switched from one station to the other on demand – or both stations can be deactivated simultaneously. The other switch allows manual open, stop or close control of the valve. Two highly visible open or close indicator lights clearly show status of the valve.

Hayward LS Series Control Stations can be factory-mounted directly on the valve/electric actuator as a compact package, or ordered individually for mounting on a nearby wall or control panel. A color-coded wiring harness is available to make field installation easy.

Application Flexibility

The LS Series Control Station's modular design allows it to be easily modified to meet virtually any automated valve requirement. Determination of the number of stations required to meet switching and indication requirements for a new application is simple, and the stations can easily replace "make do" control wiring in existing applications.

Features

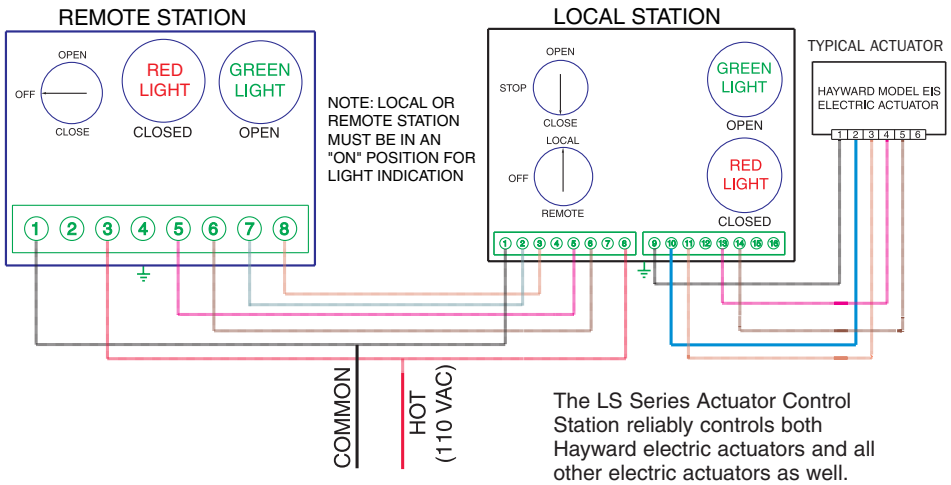
- NEMA 4x Rated Housing
- Rugged, Heavy Duty Construction
- Corrosion Resistant Enclosure
- Local and/or Remote Actuator Control
- Flexible Mounting on Actuator, Wall, or Control Panel
- Interposing Relays
- Eliminates Need for Switch

Options

- Keyed Selector Switches for Secured Access
- 4-20 mA Signal Generation for Modulating Valves
- Color Coded Wiring Harness for Easy Field Installation

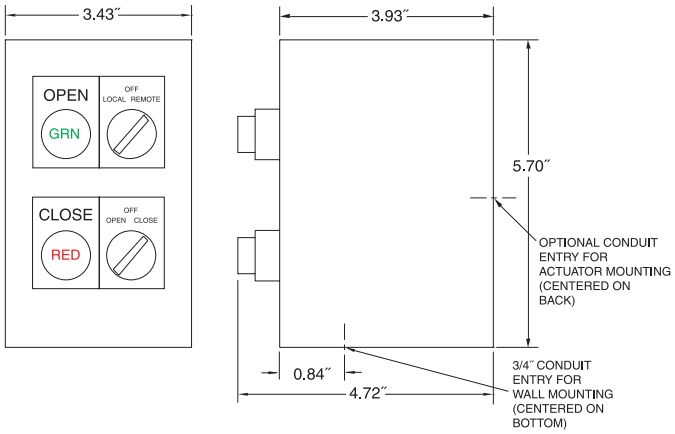
LS Series Control Station

Wiring Diagram Where Two Actuator Control Stations are Used for Both Remote and Local Control

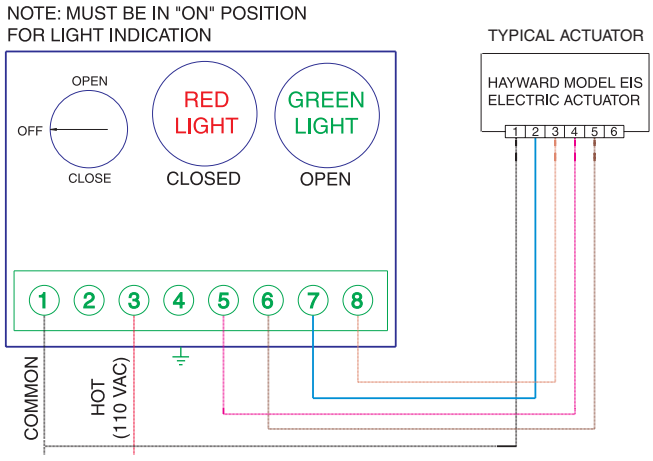


The LS Series Actuator Control Station reliably controls both Hayward electric actuators and all other electric actuators as well.

Dimensions



Wiring Diagram Where Actuator Control Station is Used for Either Remote or Local Control



A Better Way to Control Automated Valves

Why bother to custom fabricate switching controls for your electric actuator? Hayward has a better solution…the Series LS Actuator Control Station. Just connect a power source and you're ready to put your automated valve into service…without loose wires, hanging switches or confusion about whether the actuator has opened or closed the valve. And the LS Control Station can be mounted directly to the actuator, near it or in a convenient remote location. Not just for new installations, the Actuator Control Station can easily replace existing “make do” control wiring. The color-coded wiring harness makes a field retrofit simple to do.

Webster D-Series Vertical Seal-Less Immersible Pumps

All Plastic CPVC, Polypropylene, or PVDF Construction

Features

- Exclusive Two-Year Warranty
- Built for Years of Trouble Free Service
- Integral Mounting Bracket
- No Metal Ever Contacts the Process Fluid
- Pump Cannot Fail Due to Rust or Corrosion
- Dynamically Balanced Impeller
- Can be Run Dry or Against a Closed Valve
- No Seals to Leak or Replace

Options

- Inlet Screens Protect Pump Impellers From Damage

Built To a High Standard

Often, pumps built to handle smaller capacity applications are not built to the standards of larger capacity pumps. This is not the case with Webster D-Series pumps. These pumps have been designed to perform reliably for years with standard features like a Heavy-Duty, TEFC, epoxy painted motor and extra features, such as increased end-bell motor protection, larger motor bearings for tighter control and less vibration, and improved capacitor protection.

Runs Dry, Runs Against a Closed Valve

A dynamically balanced, semi-open impeller with a unique “tandem” design permits the pump to run dry or to operate against a closed valve without damage to ensure years of trouble-free service. The seal-less design eliminates leaking and costly seal replacements.

All Plastic Construction

A D-Series pump can never fail because of rust or corrosion…the pump features all-plastic construction…the process media never comes in contact with metal. And with a choice of three different plastic materials of construction, including all-natural polypropylene, there’s one right for your corrosive application.

Two Year Warranty

Lots of pumps claim to be reliable but only offer a one-year warranty. All Webster D-Series pumps are backed by Hayward’s extended two-year warranty, your assurance of reliability.

Technical Information

D-Series Pump Specifications

Natural Polypropylene, CPVC, or PVDF Construction

Threaded Connections

Stainless Steel Shaft with non-metallic sleeve

PTFE Fume Barrier protects motor and bearings

Viton O-rings

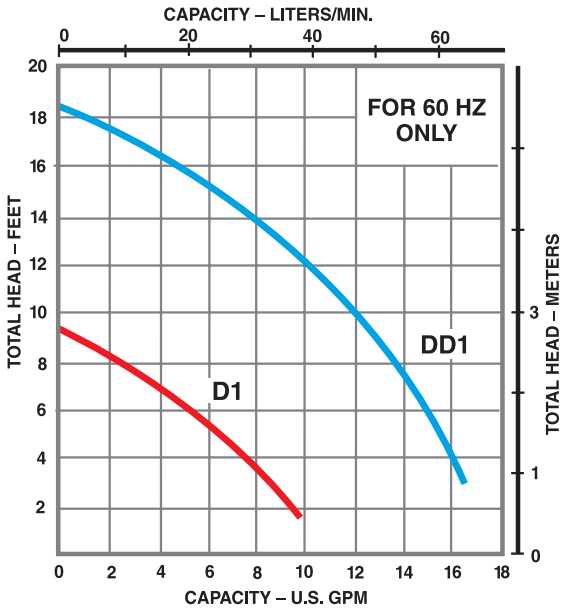
For flow rates from 2 to 17 GPM with TDH's up to 18 feet

Single Phase Motor with 1/8 HP, 115/230 VAC has heavy duty TEFC, epoxy painted construction and is rated for continuous duty service

The motor features a 1/2″ diameter extended stainless steel shaft and sealed ball bearings with "slinger" lip seal

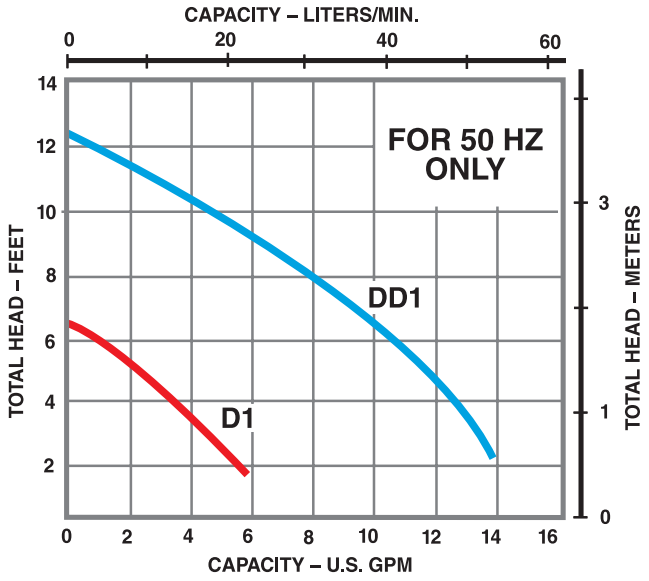
Performance Curves

60Hz



D1, DD1

50Hz



D1, DD1

Webster S-Series Vertical Seal-Less Immersible Pumps

Rugged, Non-metallic Chemical Duty Pumps Against a Closed Valve

SS8 Quick Service Pump's special tear-drop design allows the pump motor and core to be removed for service while the pump body remains connected to the piping system.

Features

- Exclusive Two-Year Warranty
- No Metal Contacts the Process Fluid
- Heavy-Duty Design for Continuous Duty Service
- Dynamically Balanced Enclosed Impeller
- Can be Run Dry or Against a Closed Valve
- No Seals to Leak or Replace
- Virtually Maintenance Free

Options

- Inlet Screens CPVC (Not Available for S1)
- Extended Shafts CPVC, 18″, 24″, 36″ (Currently for S8 Only)
- Wash Down Duty or Explosion Proof Motors

Reduce Unscheduled Downtime

The S-Series vertical pump is the pump to choose when unscheduled down time is just NOT an option. The all-plastic pump construction means that they can never fail due to rust or corrosion – and with a choice of three different thermoplastics, CPVC, PPL and PVDF, there's one that's right for most applications.

Runs Dry

And there is never a worry about damaging the pump if something goes wrong and the pump runs dry or tries to pump against a closed valve. Webster Series S pumps are designed to stand up to this kind of abuse without damage. These pumps can even be used with slightly abrasive process media.

Quick Service Model

The SS8 Quick Service Model features a special tear-drop locking design that allows the operator to quickly remove the pump core for service while the pump body stays connected to the piping system. Just turn the pump motor slightly and lift it out of the body for service. Spillage of the process media is eliminated because the pump body stays connected to the piping system.

Unsurpassed Performance

A Webster S-Series vertical pump is built to perform year in and year out with no unscheduled downtime because of pump or motor failure. A pump this good doesn't come with just a standard 1-year warranty…Hayward backs every one of its S-Series Webster pumps with an extended two-year warranty…your assurance of built-in reliability. And, surprisingly this extra reliability doesn't cost extra…compare price, specs and warranties…you always come out ahead with a Webster pump from Hayward.

Our Exclusive Two Year Warranty

Other pumps claim to be heavy duty but check the warranty behind the claim...is it only for 1 year...only for water service? Compare price, features, specifications and warranty… then move up to Webster.

Consult your Webster distributor for warranty information.

Technical Information

S-Series Pump Specifications

Pump:
Glass reinforced polypropylene, natural polypropylene, CPVC or PVDF, construction. (CPVC & GFPPL for SS8) (CPVC only with 3 and 5 HP motors)

Pipe Connection:
Threaded NPT or socket.

Fume Barrier:
PTFE, protects motor and bearings from corrosion damage.

O-rings:
Viton

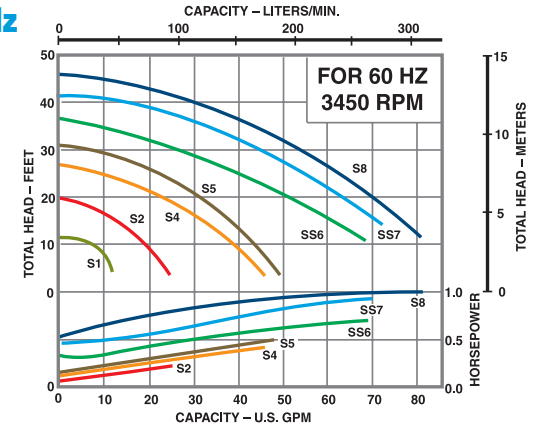
Performance:
Models for flow rates from 5 to 130 GPM with TDH's of up to 115 feet. S-Series motors and pumps are matched for non-overloading, continuous duty performance throughout the entire pump performance range.

Motors:
Single or three phase motors are available with 1/8, 1/3, 1/2, 1, 1-1/2 , 3 and 5 horsepower ratings, 115/230 VAC or 208-230/460 VAC and are heavy duty TEFC, epoxy painted and rated for continuous service. Also available with wash down and explosion proof motors.

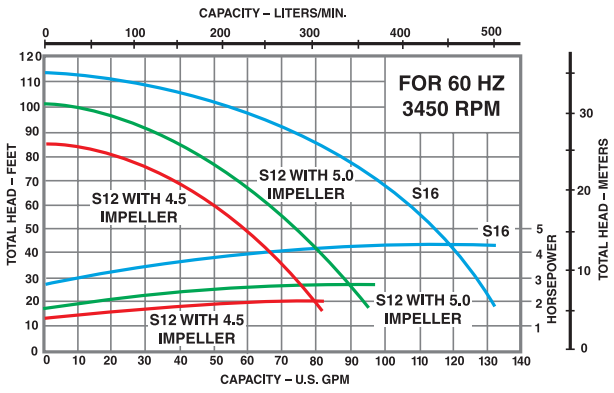
Pump Models:
S1 1/15 HP, S2 1/3 HP, S4 1/2 HP,S5 3/4 HP, SS6 3/4 HP, SS7 1 HP, S8 1-1/2 HP, SS8 1-1/2 HP, S12 3 HP, S16 5 HP

Performance Curves

60Hz

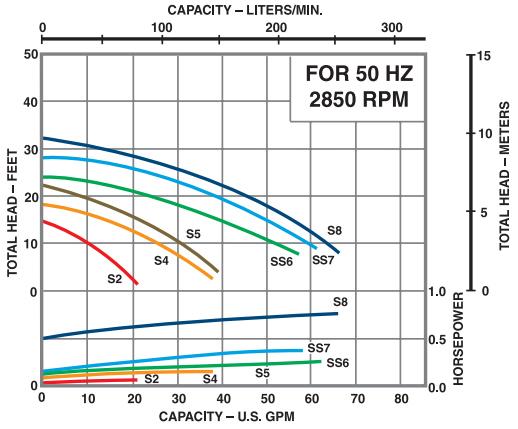


S2, S4, S5, SS6, SS7, S8, SS8

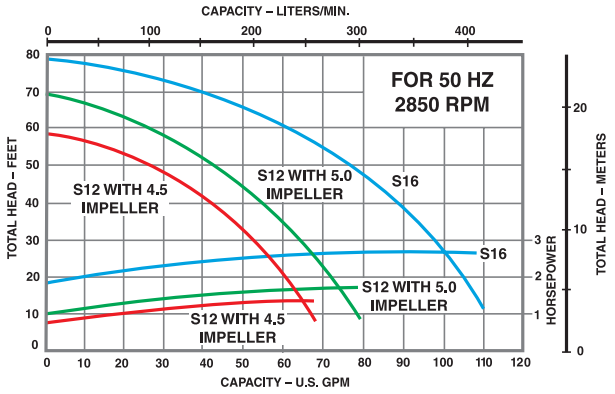


S12, S16

50Hz



S2, S4, S5, SS6, SS7, S8, SS8



S12, S16

Webster R-Series Mag Drive Pumps

All-Plastic, PPL, ETFE Corrosion Resistant Construction • Patented Design

Webster R series Mag Drive pumps shown above. The top pump (RX model) ranges from 1/2 to 5 HP, the bottom pump (RC model) is 1/3 HP.

Features

- Exclusive Two-Year Warranty
- Leak-proof, Seal-less Magnetic Drive
- Friction Free Operation/ Reduced Energy Consumption
- Easy Maintenance Without Special Tools
- Anti-Airlock Mechanism
- Plastic Pump Construction – No Rust or Corrosion
- Double Supported Large Diameter Non-Cantilevered Shaft

Options

- Carbon Bushings
- Ceramic Bushings
- EPDM O-Rings
- Single Phase 1/2 HP to 1 HP Motors
- Three Phase 1 1/2 HP to 5 HP Motors
- Self-Priming Pumps Available

Ensured Reliability

Using the latest, patented pump technology the R-Series corrosion resistant pumps will stand up to the most aggressive, demanding industrial applications year in and year out. From the heavy-duty, thick wall pump body construction to the rugged epoxy painted motors to the patented design that helps guard against premature damage from dry running, there is simply no better mag drive pump available anywhere.

Application Versatility

Applications requiring flow rates from 5 to 140 gpm with maximum total dynamic head discharges up to 141 feet will find an R-Series pump to meet their requirements. And because the process media never contacts metal there is never a danger of pump failure due to rust or corrosion.

Rugged, Energy Efficient

The pump's magnetic drive coupling consists of two heavy-duty magnet assemblies. This frictionless drive is extremely energy efficient and consumes less power than other designs. For superior performance in larger size pumps, 2 HP and greater, rare earth neodymium magnets are used. These special magnets feature an exceptional magnetic force to weight ratio. The magnetic drive of the R-Series pumps require no seals. This means there are no emissions, no leaks and no expensive, time consuming seal replacements.

Two-Year Warranty

Other pumps claim to be heavy-duty but check the warranty behind the claim. Is it only for 1 year…only for water service? Compare price, features, specifications and warranty...then move up to a Webster R-Series Mag Drive Pump from Hayward.

Consult your Webster distributor for warranty information.

Technical Information

Mag Drive Pump Specifications

Pump:
Glass reinforced, thick wall, polypropylene construction. Also in ETPE.

Pipe Connection:
Threaded NPT or flanged ANSI 150#.

Shaft:
Ceramic with PTFE bushing.

O-rings:
FPM

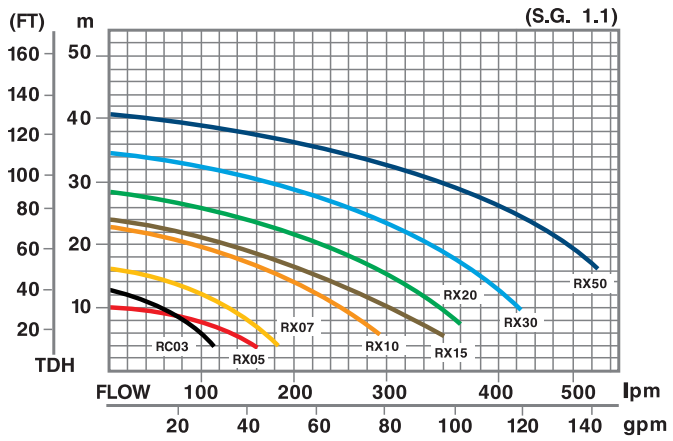
Performance:
Models for flow rates from 5 to 140 GPM with TDH's of up to 141 feet. R-Series pumps and motors are matched for non-overloading, continuous duty performance throughout the entire pump performance range.

Motors:
Single or three phase motors available with horsepower ratings of 1/3 , 1/2 , 3/4 , 1, 1-1/2 , 2, 3, or 5 HP, 115/230 VAC or 208-230/460 VAC. Motors are heavy-duty TEFC and epoxy painted.

Pump Models:
RC03 1/3 HP, RX05 1/2 HP, RX07 3/4 HP, RX10, 1 HP, RX15 1-1/2 HP, RX20 2 HP, RX30 3HP, RX50 5HP.

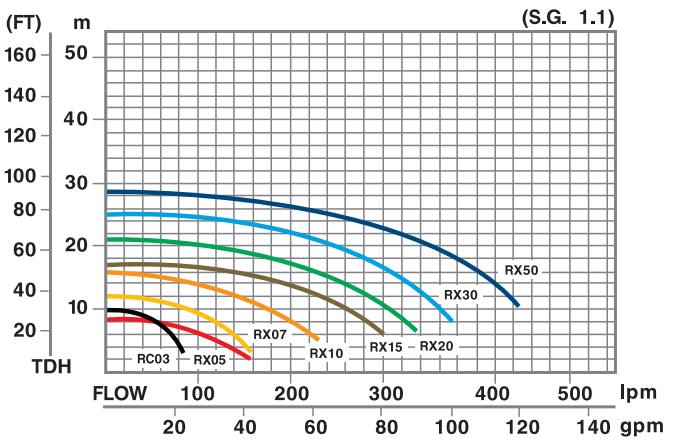
Performance Curves

60Hz



RC03, RX05, RX07, RX10, RX15, RX20, RX30, RX50

50Hz



RC03, RX05, RX07, RX10, RX15, RX20, RX30, RX50

Webster C-Series Centrifugal Pumps

Non-metallic Pumps Designed for Continuous Duty Chemical Service

Top: Webster C10 centrifugal pump, 3 to 5 HP
Bottom: Webster C8 centrifugal pump, 1/3 to 1 1/2 HP

Features

- Exclusive Two-Year Warranty
- Rugged, Heavy-Duty Construction
- No Metal Contacts the Process Fluid
- Pump Cannot Fail Due to Rust or Corrosion
- Dynamically Balanced Enclosed Impeller
- Specifically Designed for Continuous Duty Service
- Heavy-Duty Internal Components

Options

- Bearing Frame for Belt Drive or Direct Coupled Drivers
- Double Water-Flushed Seal
- PTFE Rotary Seal Faces and Carpenter 20 or Pink Ceramic Seal Seats

Horizontal End Suction

Hayward builds its Webster C-Series Horizontal End Suction Centrifugal pumps to stand up to the toughest industrial and commercial applications.

Extra Reliability

Rugged pump bodies and beefed up internal components, along with a heavy-duty motor, means your C-Series Webster pump will perform reliably for years. This pump is built to last…and Hayward backs that claim up with an extended two-year warranty on the pump and motor…not just one year like other manufacturers' warranties.

Corrosion Resistant

The all plastic pump construction means a C-Series pump will never fail due to rust or corrosion. And the plastic construction will not contaminate sensitive process media.

Difficult Applications

The requirements of continuous duty, aggressive, corrosive chemical applications are easily handled by Webster C-Series Pumps. And even if your application could "get by" with a lesser pump, consider moving up to Webster…extra reliability doesn't have to cost extra…compare price, specs and warranties…the choice is Webster.

Two Year Warranty

Other pumps claim to be heavy-duty but check the warranty behind the claim...is it only for 1 year...only for water service? Compare price, features, specifications and warranty…then move up to Webster.

Consult your Webster distributor for warranty information.

Technical Information

C-Series Pump Specifications

Pump:
Glass Reinforced Polypropylene, CPVC, or PVDF Construction (Glass Reinforced PPL only with 3 and 5 HP motors).

Pipe Connection:
Threaded Connections.

Shaft:
Stainless Steel Shaft with non-metallic sleeve.

Seal:
John Crane external Type 21 or equal carbon/ceramic seal faces with stainless steel hardware and Viton elastomers.

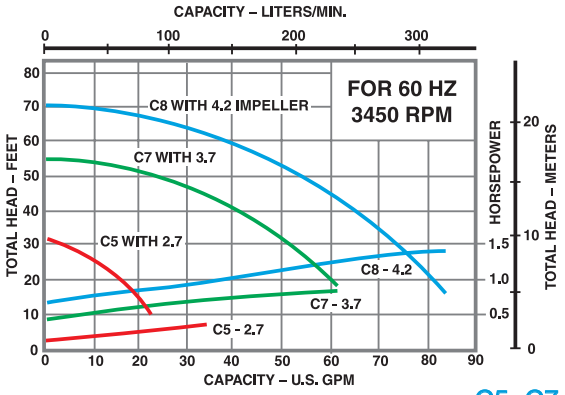
Performance:
Models for flow rates from 5 to 130 GPM with TDH's up to 140 feet. Series C motors and pumps are matched for non-overloading, continuous duty performance throughout the entire pump performance range.

Motors:
Single or Three Phase Motors are available with 1/3 , 1, 1-1/2 , 3, or 5 HP ratings, 115/230 VAC or 208-230/460 VAC, and are heavy-duty TEFC, epoxy painted and rated for continuous duty service. Wash down and explosion proof motors available.

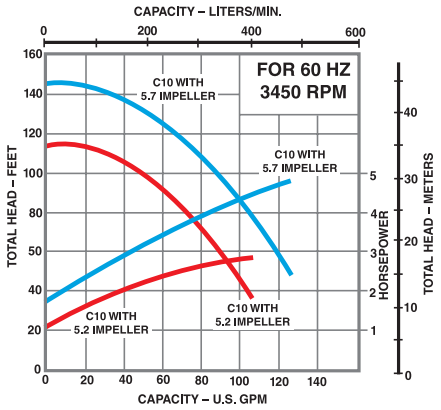
Pump Models:
C5 1/3 HP, C7 1 HP, C8 1-1/2 HP, C10 3 or 5 HP.

Performance Curves

60Hz

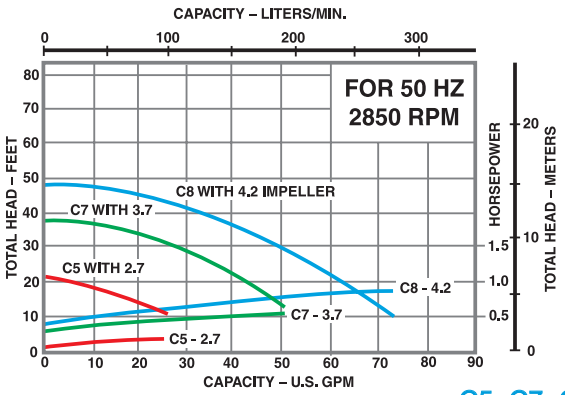


C5, C7, C8

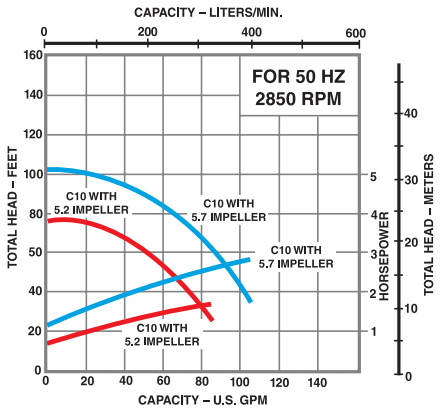


C10

50Hz



C5, C7, C8



C10

FLT Cartridge Filters

All Plastic PVC or CPVC Construction Removes Fine Particulate Matter

Features

- All Plastic CPVC Construction Will Never Rust or Corrode
- Compact, Easy to Install
- No Metal in Contact with the Process Fluid
- Quick and Easy Filter Cartridge Changes
- FPM O-Ring Seal

Simple In-Tank Filtration

Designed to filter process fluid within a tank eliminating the time and expense needed to install a separate, stand alone, filter and pump. The filter features all plastic, CPVC construction with FPM for exceptional chemical resistance and are available with either one or two filter cartridges.

Easy Operation

Changing filter cartridges is quick and easy for both single and double filter units. A simple quick disconnect union is used to connect the filter cartridge to the pump. Just unscrew the union, no tools are required, and remove the filter cartridge and assembly. It takes only seconds and there are no plastic screws that could be cross-threaded, especially at higher temperatures. To make the cartridge change process even faster additional disconnect unions are available to make up preloaded assemblies with clean filter cartridges.

Choice of Filter Media

The In-Tank Filtration unit comes standard with one 50 micron wound, polypropylene filter cartridge. Cartridges are also available in 1, 5, 10, 30, 75 and 100 micron ratings and have a 1″ I.D. and a 2 1/2″ O.D. Single or double cartridge configurations are available in either 10″, 20″, or 30″ lengths. In-Tank Filtration Systems are available with S or D-Series pumps that are seal-less and can be run dry. These heavy duty, reliable pumps come with Hayward's unique two year warranty.

Two Year Warranty

The heavy-duty Webster S or D-Series Pumps that are part of the In-Tank Filtration System are rugged pumps designed to stand up to the most aggressive, and demanding of applications and are backed by the exclusive Hayward two year warranty.

Consult your Webster distributor for warranty information.

In-Tank Filtration Systems

Features

- For use with S and D-Series Pumps
- CPVC Corrosion-Resistant Construction
- Compact and Easy to Install
- Immersible, Seal-Less, Bearing Free Pump
- Can Run Dry
- Quick and Easy Filter Change
- Single or Double Filter
- 1/15 HP Model Features a Built-in Power Cord

Simple In-Tank Filtration

Designed to filter process fluid within a tank eliminating the time and expense needed to install a separate, stand alone, filter and pump. The filter features all plastic, CPVC construction with FPM for exceptional chemical resistance and are available with either one or two filter cartridges.

Easy Operation

Changing filter cartridges is quick and easy for both single and double filter units. A simple quick disconnect union is used to connect the filter cartridge to the pump. Just unscrew the union, no tools are required, and remove the filter cartridge and assembly. It takes only seconds and there are no plastic screws that could be cross-threaded, especially at higher temperatures. To make the cartridge change process even faster additional disconnect unions are available to make up preloaded assemblies with clean filter cartridges.

Choice of Filter Media

The In-Tank Filtration unit comes standard with one 50 micron wound, polypropylene filter cartridge. Cartridges are also available in 1, 5, 10, 30, 75 and 100 micron ratings and have a 1″ I.D. and a 2½″ O.D. Single or double cartridge configurations are available in either 10″, 20″, or 30″ lengths. In-Tank Filtration Systems are available with S or D-Series pumps that are seal-less and can be run dry. These heavy-duty, reliable pumps come with Hayward's unique two year warranty.

Two Year Warranty

The heavy duty Webster S or D-Series Pumps that are part of the In-Tank Filtration System are rugged pumps designed to stand up to the most aggressive, and demanding of applications and are backed by the exclusive Hayward two year warranty.

Simplex Basket Strainers

1/2″ to 8″ - PVC, Corzan® CPVC and Eastar® Clear Polyester

6″ and 8″ Design

Eastar® Clear Polyester

Features

- External Body Threads
- Low Pressure Drop
- Wide Choice of Baskets
- In-line or Loop Piping Design
- True Union Connections
- Ergonomic Hand Removable Cover
- FPM Seals
- Integral, Flat Mounting Base
- Hand Removable Vent On Cover
- Hand Removable Drain On Body
- Liquid Displacing Cover

Options

- Stainless Steel Mesh Strainer Baskets
- EPDM Seals
- Pressure Differential Gauge and Switch

Protect System Components

When pipeline system components require protection from dirt and debris and the line can be shut down for basket cleaning, a Hayward All Plastic Simplex Basket Strainer is the ideal choice. Unwanted particles are removed as the process media passes through a perforated strainer basket contained inside the strainer body. The basket traps the unwanted material while allowing the process media to flow freely.

Easy Basket Cleaning

Changing or cleaning the strainer basket is quick and easy. The hand removable, spin-off cover features two angled handles for easy access to the strainer basket. The housing features external cover threads that do not contact the process media and never need cleaning. Venting and draining are made possible by two hand removable, threaded plugs, one on the top of the cover and the other on the housing side.

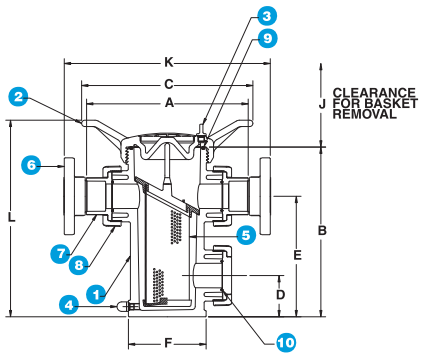
Choice of Piping Connections

Hayward Simplex Basket Strainers can be installed either in-line or with loop piping configurations. This is made possible by a unique design that incorporates three piping connections on the strainer body that are used as inlets and outlets. The unused connection is plugged using a blind fitting (included). True union connections make it possible to remove the strainer from the piping system without disassembling the piping connections.

Wide Range of Strainer Baskets

Plastic baskets in perforation sizes from 1/32″ to 3/16″ are available. Stainless steel perforated baskets are available from 1/2″ to 1/32″. Mesh stainless steel baskets for very fine straining applications are available in sizes from 20 mesh down to 325 mesh.

Technical Information



Parts List
Simplex Basket Strainer

1. Body
2. Cover
3. Vent Plug
4. Drain Plug
5. Basket
6. Flange
7. End Connector
8. Nut
9. Cover O-Ring
10. End Connector O-Ring

Dimensions - Inches / Millimeters

Size	A	B	C	D	E	F	J	K	L	WEIGHT (lb/kg) Skt/Thd	WEIGHT (lb/kg) Flange	VOLUME GAL / LT
1/2″	8.64 / 219	9.63 / 245	11.0 / 279	2.25 / 57	6.75 / 171	4.31 / 109	8.00 / 203	10.77 / 274	11.7 / 297	8.0 / 3.4	9.0 / 4	0.20 / 0.8
3/4″	8.64 / 219	9.63 / 245	11.0 / 279	2.25 / 57	6.75 / 171	4.31 / 109	8.00 / 203	11.02 / 280	11.7 / 297	8.0 / 3.4	9.0 / 4	0.20 / 0.8
1″	8.64 / 219	9.63 / 245	11.0 / 279	2.25 / 57	6.75 / 171	4.31 / 109	8.00 / 203	11.64 / 296	11.7 / 297	8.0 / 3.4	9.0 / 4	0.20 / 0.8
1-1/4″	12.75 / 324	13.38 / 340	13.5 / 343	3.25 / 83	9.5 / 241	6.13 / 156	12.86 / 327	15.63 / 397	15.5 / 394	14.0 / 6.4	16.5 / 7.5	0.70 / 2.7
1-1/2″	12.69 / 322	13.38 / 340	13.5 / 343	3.25 / 83	9.5 / 241	6.13 / 156	12.86 / 327	15.89 / 404	15.5 / 394	14.0 / 6.4	16.5 / 7.5	0.70 / 2.7
2″	12.75 / 324	13.38 / 340	13.5 / 343	3.25 / 83	9.5 / 241	6.13 / 156	12.86 / 327	16.29 / 414	15.5 / 394	14.0 / 6.4	16.5 / 7.5	0.70 / 2.7
2-1/2″	16.52 / 384	19.83 / 504	16.0 / 406	4.83 / 123	14.83 / 377	7.25 / 184	17.25 / 438	21.02 / 534	22.3 / 566	28.0 / 13	33.0 / 15	2.80 / 10.6
3″	16.40 / 384	19.83 / 504	16.0 / 406	4.83 / 123	14.83 / 377	7.25 / 184	17.25 / 438	20.36 / 517	22.3 / 566	28.0 / 13	33.5 / 15	2.80 / 10.6
4″	17.27 / 384	19.83 / 504	16.0 / 406	4.83 / 123	14.83 / 377	7.25 / 184	17.25 / 438	22.13 / 562	22.3 / 566	28.0 / 13	37.0/ 17	2.80 / 10.6
6″	n/a	34.28 / 871	18.0 / 457	12.45 / 317	28.98 / 736	11.75 / 298	21.80 / 554	22.42 / 569	38.90 / 988	n/a	60.0 / 27	6.8 / 25.7
8″	n/a	34.28 / 871	18.0 / 457	12.45 / 317	28.98 / 736	11.75 / 298	28.75 / 730	25.19 / 640	38.90 / 988	n/a	80.0 / 36	9.0 / 34.1

Cv Factors

Size	Factor	Size	Factor
1/2″	15	2-1/2″	290
3/4″	18	3″	300
1″	20	4″	350
1-1/4″	55	6″	1000
1-1/2″	58	8″	750
2″	60		

The above Cv Factors were determined using a 1/16″ perforated plastic basket in 1/2″ through 4″ strainers and a 5/32″ perforated stainless steel basket in 6″ and 8″ strainers. For other size basket perforations, multiply the pressure drop by the correction factor in the above Correction Factor charts.

Pressure Drop Calculations

Basket Perforation Correction Factors

For 1/2″ to 4″ Strainers

Plastic Baskets		Stainless Steel Baskets			
1/32″	1.05	1/32″	.82	3/8″	.45
1/16″	1.00	3/64″	.63	1/2″	.48
1/8″	.58	1/16″	.74	20 Mesh	.79
3/16″	.46	5/64″	.50	40 Mesh	1.01
		7/64″	.51	60 Mesh	1.20
		1/8″	.58	80 Mesh	1.16
		5/32″	.37	100 Mesh	1.20
		3/16″	.46	200 Mesh	1.09
		1/4″	.58	325 Mesh	1.22

For 6″ to 8″ Strainers

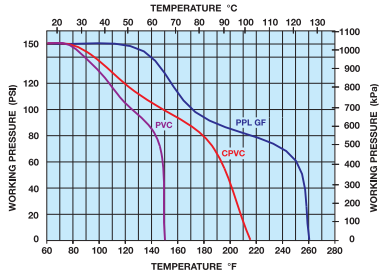
Plastic Baskets		Stainless Steel Baskets			
1/8″	2.00	1/32″	2.25	3/8″	1.24
3/16″	1.50	3/64″	1.73	1/2″	1.31
		1/16″	2.03	20 Mesh	2.16
		5/64″	1.37	40 Mesh	2.79
		7/64″	1.40	60 Mesh	3.28
		1/8″	1.58	80 Mesh	3.18
		5/32″	1.00	100 Mesh	3.30
		3/16″	1.26	200 Mesh	2.98
		1/4″	1.58	325 Mesh	3.33

The pressure drop across the strainer, for water or fluids with a similar viscosity, can be calculated using the formula at the right:

$$\Delta P = \left[\frac{Q}{Cv}\right]^2$$

Where ΔP = Pressure Drop
Q = Flow in GPM
Cv = Flow Coefficient

Operating Temperature/Pressure



Selection Chart

Size	Material	End Connection	Seal*	Rating
1/2″ to 4″	PVC, CPVC	Thd, Skt, Flg	FPM	150 PSI @ 70°F
1/2″ to 2″	EASTAR®	Thd, Skt, Flg	FPM	100 PSI @ 70°F
6″ to 8″	PVC, CPVC	Flg	FPM	150 PSI @ 70°F

*EPDM seals POA.

Basket Selection

- The 1/2″ to 1″ strainers can be ordered with either a 1/32″ or 1/16″ perf plastic basket.
- The 1 1/2″ and 2″ with a 1/32″, 1/16″, 1/8″, or 3/16″ perf plastic basket.
- The 3″ and 4″ with a 1/16″, 1/8″ or 3/16″ perf plastic basket.
- The 6″ and 8″ with a 1/8″ or 3/16″ perf plastic basket.
- Stainless steel baskets for all size strainers are available in these perfs: 1/32″, 3/64″, 1/16″, 5/64″, 7/64″, 1/8″, 5/32″, 3/16″, 1/4″, 3/8″, 1/2″; and in mesh sizes: 20, 40, 60, 80, 100, 200, 325

Duplex Basket Strainers

1/2″ to 4″ - PVC, Corzan® CPVC and Eastar® Clear Polyester

Features

- Uninterrupted Flow
- External Cover Threads
- Low Pressure Drop
- Wide Choice of Baskets
- In-Line or Loop Piping
- True Union Connections
- Ergonomic Hand Removable Cover
- FPM Seals
- Integral Flat Mounting Bases
- Hand Removable Vents On Covers
- Hand Removable Drains On Bodies
- Liquid Displacing Covers

Options

- Stainless Steel Mesh Strainer Baskets
- EPDM Seals

Corzan® is a registered trademark of Noveon, Inc.
Eastar ® is a registered trademark of Eastman

Protect System Components

When pipeline system components require protection from dirt and debris and the line cannot be shut down for basket cleaning, a Hayward All Plastic Duplex Basket Strainer is the ideal choice. Unwanted particles are removed as the process media passes through a perforated strainer basket contained inside the strainer body. The basket traps the unwanted material while allowing the process media to flow freely.

Easy Basket Cleaning

Cleaning or changing the strainer basket is quick and easy. Turning the operating handle on the diverter valve assembly switches the flow from one strainer housing to the other. Then, the out of service housing can be serviced by opening the hand removable, spin-off cover for access to the basket. The cover features two angled handles for easy opening and closing. The housing has external cover threads that do not contact the process media eliminating the need for cleaning. Venting and draining are easily accomplished by using the hand removable, threaded plugs on the cover and the side of the housing.

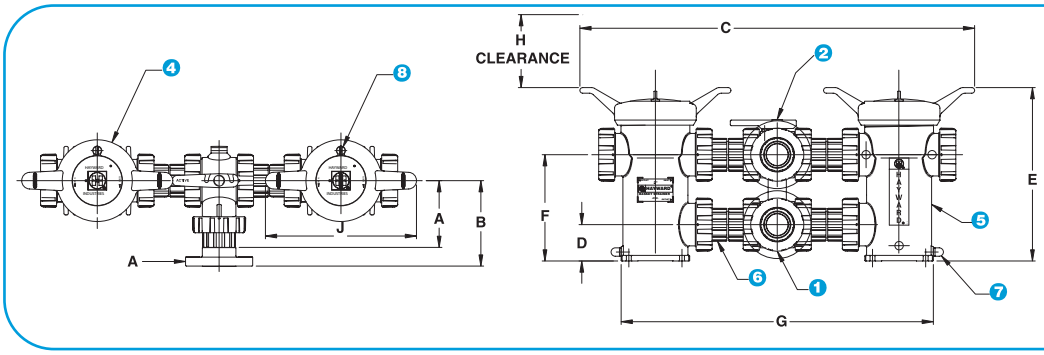
Choice of Piping Connections

The strainer can be installed either in-line or with a loop piping configuration. This is made possible by changing the orientation of the bottom outlet connection. Just loosen the connection assembly nuts on the bottom diverter valve and rotate it 180 degrees to convert from one type of connection to the other. Maintenance is simplified by the strainers true union piping connections which make it possible to remove the strainer from the pipeline without breaking down piping connections.

Wide Range of Strainer Baskets

Plastic baskets in perforation sizes from 1/32″ to 3/16″ and stainless steel baskets from 1/2″ perforation down to 325 mesh are available.

Technical Information



Parts List
Duplex Basket Strainer

1. Single Stem Lateral
2. Double Stem Lateral
3. Inlet Flange
4. Cover
5. Strainer Body
6. Spool
7. Drain Plug
8. Vent Plug

Dimensions - Inches / Millimeters

Size	A	B	C	D	E	F	G	H	J	Weight (lb / kg) Skt / Thd	Weight (lb / kg) Flg
1/2″	4.14 / 105	5.21 / 132	27.2 / 693	2.25 / 57	11.7 / 297	6.75 / 171	20.5 / 521	5.0 / 127	11.0 / 279	20.0 / 9	21.0 / 9.5
3/4″	4.14 / 105	5.33 / 135	27.2 / 693	2.25 / 57	11.7 / 297	6.75 / 171	20.5 / 521	5.0 / 127	11.0 / 279	20.0 / 9	21.0 / 9.5
1″	4.14 / 105	5.64 / 143	27.2 / 693	2.25 / 57	11.7 / 297	6.75 / 171	20.5 / 521	5.0 / 127	11.0 / 279	20.0 / 9	21.0 / 9.5
1 1/4″	6.0 / 152	7.44 / 189	35.3 / 897	3.25 / 83	15.5 / 394	9.5 / 241	28.0 / 711	10.8 / 274	13.5 / 343	39.5 / 18	42.0 / 20
1 1/2″	6.0 / 152	7.6 / 193	35.3 / 897	3.25 / 83	15.5 / 394	9.5 / 241	28.0 / 711	10.8 / 274	13.5 / 343	39.5 / 18	42.0 / 20
2″	6.0 / 152	7.77 / 197	35.3 / 897	3.25 / 83	15.5 / 394	9.5 / 241	28.0 / 711	10.8 / 274	13.5 / 343	39.5 / 18	42.0 / 20
2 1/2″	7.6 / 178	9.85 / 250	44.4 / 1128	4.83 / 123	22.3 / 566	14.83 / 377	35.6 / 904	14.8 / 376	16.0 / 406	83.0 / 38	88.0 / 40
3″	7.6 / 178	9.85 / 243	44.4 / 1128	4.83 / 123	22.3 / 566	14.83 / 377	35.6 / 904	14.8 / 376	16.0 / 406	83.0 / 38	88.5 / 40
4″	9.33 / 237	11.76/ 299	47.5 / 1207	4.83 / 123	22.3 / 566	14.83 / 377	38.7 / 983	14.8 / 376	16.0 / 406	100 / 45	105 / 48

Cv Factors

Size	Factor	Size	Factor
1/2″	12.5	1 1/2″	45
3/4″	13	2″	48
1″	14	3″	200
1 1/4″	40	4″	230

The above Cv Factors were determined using a 1/16″ perforated plastic basket.

Pressure Drop Calculations

Basket Perforation Correction Factors

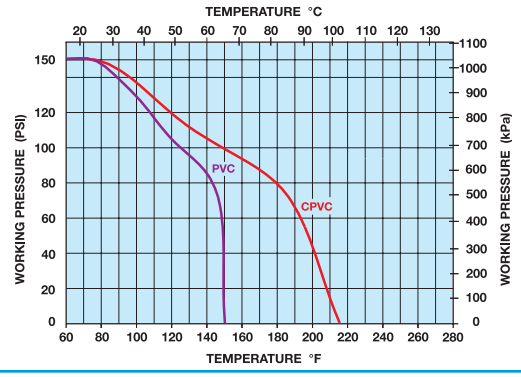
Plastic Baskets		Stainless Steel Baskets			
1/32″	1.05	1/32″	.82	3/8″	.45
1/16″	1.00	3/64″	.63	1/2″	.48
1/8″	.58	1/16″	.74	20 Mesh	.79
3/16″	.46	5/64″	.50	40 Mesh	1.01
		7/64″	.51	60 Mesh	1.20
		1/8″	.58	80 Mesh	1.16
		5/32″	.37	100 Mesh	1.20
		3/16″	.46	200 Mesh	1.09
		1/4″	.58	325 Mesh	1.22

The pressure drop across the strainer, for water or fluids with a similar viscosity, can be calculated using the formula below:

$$\Delta P = \left[\frac{Q}{Cv}\right]^2$$

Where ΔP = Pressure Drop
Q = Flow in GPM
Cv = Flow Coefficient

Operating Temperature/Pressure



Selection Chart

Size	Material	End Connection	Seal*	Rating
1/2″ to 4″	PVC, CPVC	Thd, Skt, Flg	FPM	150 PSI @ 70°F
1/2″ to 2″	EASTAR®*	Thd, Skt, Flg	FPM	100 PSI @ 70°F

*EPDM seals POA.

Basket Selection

- The 1/2″ to 1″ strainers can be ordered with either a 1/32″ or 1/16″ perf plastic basket.
- The 1 1/2″ and 2″ with a 1/32″, 1/16″, 1/8″, or 3/16″ perf plastic basket.
- The 3″ and 4″ with a 1/16″, 1/8″ or 3/16″ perf plastic basket.
- The 6″ and 8″ with a 1/8″ or 3/16″ perf plastic basket.
- Stainless steel baskets for all size strainers are available in these perfs: 1/32″, 3/64″, 1/16″, 5/64″, 7/64″, 1/8″, 5/32″, 3/16″, 1/4″, 3/8″, 1/2″; and in mesh sizes: 20, 40, 60, 80, 100, 200, 325

Large Size Duplex Basket Strainers

6″ and 8″ - PVC and Corzan® CPVC

Features

- Uninterrupted Flow
- External Cover Threads
- Low Pressure Drop
- Wide Choice of Baskets
- In-Line or Loop Piping
- Ergonomic Hand Removable Cover
- FPM Seals
- Integral Flat Mounting Bases
- Hand Removable Vents on Covers
- Hand Removable Drains on Bodies
- Liquid Displacing Covers

Options

- Stainless Steel Mesh Strainer Baskets
- EPDM Seals

Protect System Components

When pipeline system components require protection from dirt and debris and the line cannot be shut down for basket cleaning, a Hayward All Plastic Duplex Basket Strainer is the ideal choice. Unwanted particles are removed as the process media passes through a perforated strainer basket contained inside the strainer body. The basket traps the unwanted material while allowing the process media to flow freely.

Easy Basket Cleaning

Cleaning or changing the strainer basket is quick and easy. Turning the operating hand wheels on the diverter butterfly valve assembly switches the flow from one strainer housing to the other. Then, the out of service housing can be serviced by opening the hand removable, spin-off cover for access to the basket. The cover features two angled handles for easy opening and closing. The housing has external cover threads that do not contact the process media eliminating the need for cleaning. Venting and draining are easily accomplished by using the hand removable, threaded plugs on the cover and the side of the housing.

Choice of Piping Connections

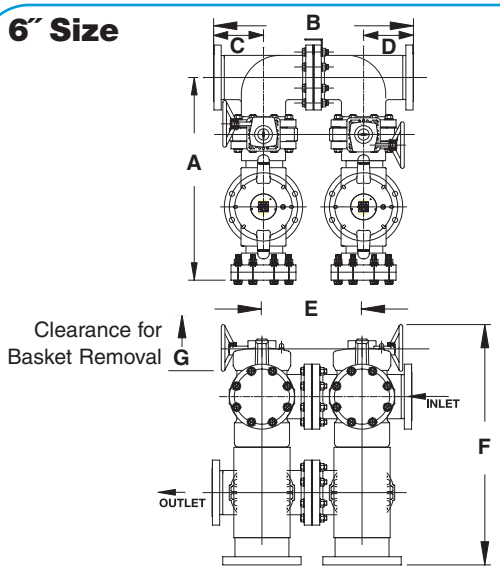
The strainer can be installed either in-line or with a loop piping configuration. This is made possible by changing the orientation of the top or bottom inlet/outlet connection. Just remove the connection assembly, rotate it 180 degrees and reinstall it to convert from one type of connection to the other.

Wide Range of Strainer Baskets

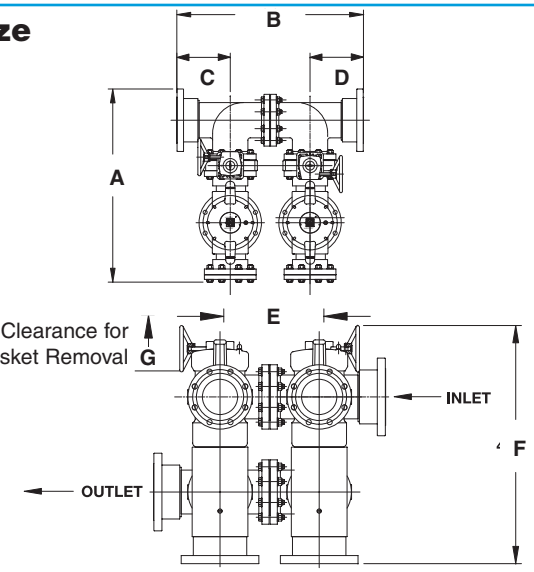
Plastic baskets in perforation sizes from 1/32″ to 3/16″ and stainless steel baskets from 1/2″ perforation down to 325 mesh are available.

Technical Information

6″ Size



8″ Size



Dimensions – Inches/Millimeters

Size	A	B	C	D	E	F	G	Weight (lb / kg)
6″	34.91 / 887	34.42 / 874	8.59 / 218	8.59 / 218	17.24 / 438	41.40 / 1052	21.80 / 554	180 / 81.8
8″	41.74 / 1060	40.34 / 1025	11.55 / 293	11.55 / 293	17.24 / 438	41.40 / 1052	28.75 / 730	250 / 114

Cv Factors

Size	Factor	Size	Factor
6″	900	8″	700

The above Cv Factors were determined using a 1/16″ perforated plastic basket.

Pressure Drop Calculations

Basket Perforation Correction Factors

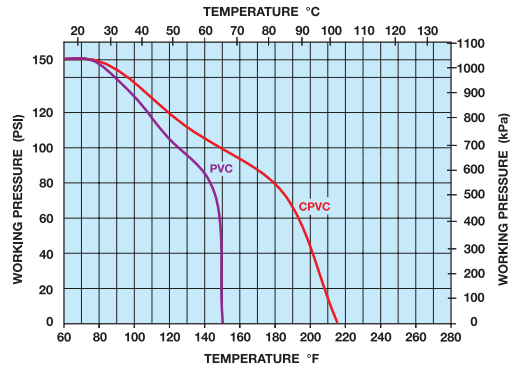
Plastic Baskets		Stainless Steel Baskets			
1/32″	1.05	1/32″	.82	3/8″	.45
1/16″	1.00	3/64″	.63	1/2″	.48
1/8″	.58	1/16″	.74	20 Mesh	.79
3/16″	.46	5/64″	.50	40 Mesh	1.01
		7/64″	.51	60 Mesh	1.20
		1/8″	.58	80 Mesh	1.16
		5/32″	.37	100 Mesh	1.20
		3/16″	.46	200 Mesh	1.09
		1/4″	.58	325 Mesh	1.22

The pressure drop across the strainer, for water or fluids with a similar viscosity, can be calculated using the formula below:

$$\Delta P = \left[\frac{Q}{Cv}\right]^2$$

Where ΔP = Pressure Drop
Q = Flow in GPM
Cv = Flow Coefficient

Operating Temperature/Pressure



Selection Chart

Size	Material	End Connection	Seal	Rating
6″ and 8″	PVC, CPVC	Flanged	FPM*	150 PSI @ 70°F

* EPDM optional

Basket Selection

- Stainless steel baskets are available in these perfs: 1/32″, 3/64″, 1/16″, 5/64″, 7/64″, 1/8″, 5/32″, 3/16″, 1/4″, 3/8″, 1/2″; and in mesh sizes: 20, 40, 60, 80, 100, 200, 325.

Y Strainers

1/2″ to 4″ - PVC and Corzan® CPVC

Features

- Rated to 150 PSI
- FPM Seals
- Standard 1/32″ perf screen
- All-Plastic Construction
- Easy Screen Access
- Can Be Used in Horizontal or Vertical Position

Options

- Stainless Steel Strainer Screens
- True Union Connections Available

Corzan® is a registered trademark of Noveon, Inc.

Economical Protection

Hayward Y Strainers protect piping system components from damage caused by dirt or debris in the process media. They cost less than other types of strainers and are lightweight and very compact. Because they can often be supported by the pipeline alone, they work in applications where other strainers cannot.

Rugged Plastic Screens

Hayward Y Strainers are supplied with a 1/32″ perforated plastic screen. This screen is ultrasonically welded, not glued, for superior strength. Screens fabricated from type 316 stainless steel are also available in openings from 1/2″ down to super fine 325 mesh. All screens have an open area at least twice that of the equivalent pipe size cross-sectional area to minimize pressure drop.

Easy Clean Out

All sizes of Hayward Y Strainers feature a heavy-duty hex cap that permits quick and easy removal of the strainer screen when cleanout becomes necessary.

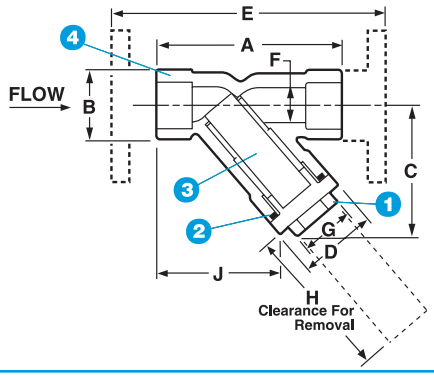
Adaptable Design

Hayward Y Strainers will work equally well in the horizontal or vertical position, simplifying piping system layout.

All Plastic Construction

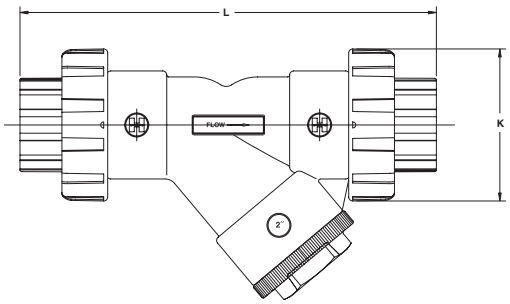
Hayward Plastic Y Strainers will never rust or corrode – and they don't require painting or coating to survive corrosive environmental conditions.

Technical Information



Parts List
Y Strainer

1. Cap
2. O-Ring Seal
3. Screen
4. Body



Dimensions - Inches / Millimeters

Size	A	B	C	D	E	F	G	H	J	K	L	Weight (lb / kg) Skt/Thd	Weight (lb / kg) Flg
1/2″	3.38 / 86	1.38 / 35	2.25 / 57	1.50 / 38	N/A	0.56 / 14	1.00 / 25	2.13 / 54	2.50 / 64	2.25 / 57	6.64 / 169	0.25 / .11	N/A
3/4″	4.18 / 106	1.69 / 43	2.88 / 73	2.00 / 51	N/A	0.81 / 21	1.25 / 32	2.75 / 70	3.00 / 76	2.63 / 67	7.42 / 188	0.63 / .29	N/A
1″	5.19 / 132	2.00 / 51	3.63 / 92	2.16 / 55	N/A	1.00 / 25	1.50 / 38	3.30 / 84	3.32 / 84	3.00 / 76	8.97 / 228	0.88 / .40	N/A
1-1/4″	6.63 / 168	2.63 / 67	4.50 / 114	2.94 / 75	N/A	1.25 / 32	2.00 / 51	4.50 / 114	4.45 / 113	4.75 / 120	13.01 / 330	1.75 / .80	N/A
1-1/2″	6.63 / 168	2.63 / 67	4.50 / 114	2.94 / 75	N/A	1.56 / 40	2.00 / 51	4.50 / 114	4.45 / 113	4.75 / 120	12.07 / 307	1.63 / .74	N/A
2″	7.63 / 194	3.38 / 86	5.38 / 137	3.75 / 95	11.00 / 279	2.00 / 51	2.38 / 60	5.06 / 129	4.88 / 124	4.75 / 120	13.05 / 331	3.00 / 1.4	5.00 / 2.3
2-1/2″	10.31 / 262	4.69 / 119	7.25 / 184	5.25 / 133	N/A	2.90 / 74	3.50 / 89	6.60 / 168	6.54 / 166	6.40 / 163	16.77 / 426	7.75 / 3.5	N/A
3″	10.31 / 262	4.69 / 119	7.25 / 184	5.50 / 140	14.37 / 365	2.90 / 74	3.50 / 89	6.60 / 168	6.54 / 166	6.40 / 163	16.77 / 426	7.50 / 3.4	12.25 / 5.7
4″	12.81 / 325	5.75 / 146	8.88 / 226	6.18 / 157	17.73 / 450	3.78 / 96	4.25 / 108	8.00 / 203	8.58 / 218	8.56 / 217	21.23 / 539	9.50 / 4.3	17.50 / 8.0

Cv Factors*

Size	Factor	Size	Factor
1/2″	4.0	2″	28
3/4″	6.8	2-1/2″	40
1″	9.0	3″	65
1-1/4″	12	4″	100
1-1/2″	28		

* With 1/32″ plastic screen

Pressure Drop Calculations

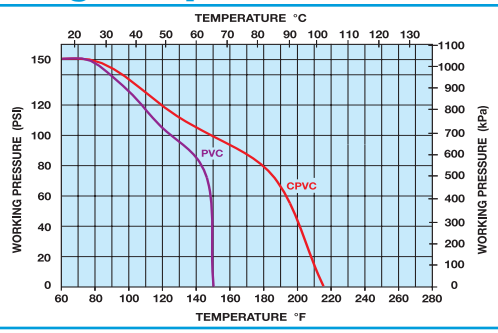
The pressure drop across the strainer, for water or fluids with a similar viscosity, can be calculated using the formula at the right:

$$\Delta P = \left[\frac{Q}{Cv}\right]^2$$

Where ΔP = Pressure Drop
Q = Flow in GPM
Cv = Flow Coefficient

The pressure loss across a valve or filter can be calculated using the system's flow rate and the Cv factor for that valve or filter.
For example, a 1″ strainer with a Cv factor of 8 will have a 4 PSI pressure loss in a system with a 16 gpm flow rate $(16 \div 8)^2 = 4$

Operating Temperature/Pressure



Selection Chart

Size	Material	End Connection	Seal	Rating
1/2″ to 4″	PVC, CPVC	Thd, Skt, Flg*	FPM	150 PSI @ 70°F

* 1/2″ to 1-1/2″ not available with flanged connections

Strainer Screen Selection

- Y Strainers are furnished with a 1/32″ perf plastic screen.
- Stainless steel strainer screens are available in these perfs: 1/32″, 3/64″, 1/16″, 5/64″, 7/64″, 1/8″, 5/32″, 3/16″, 1/4″, 3/8″, 1/2″; and in mesh sizes: 20, 40, 60, 80, 100, 200, 325

Y Strainers - Clear PVC

1/2″ to 2″

Features

- Clear PVC construction
- Rated to 150 PSI
- FPM Seals
- Standard 1/32″ Perf Screen
- All-Plastic Construction
- Easy Screen Access
- Can be Used in Horizontal or Vertical Position

Options

- Stainless Steel Strainer Screens

Clear PVC Construction

See how much dirt and debris have been trapped by the strainer screen in the Hayward Clear PVC Y Strainer. The translucent PVC body shows the strainer screen in operation. This helps determine when it needs cleaning based on a visual check of the amount of debris retained by the screen. These Y strainers are available in pipeline sizes up to 2″ with socket or threaded connections, and are rated at a full 150 PSI.

Economical Protection

Hayward Y Strainers protect piping system components from damage caused by dirt or debris in the process media. They cost less than other types of strainers and are light-weight and very compact. Because they can often be supported by the pipeline alone, they work in applications where other strainers cannot.

Screens for All Applications

Hayward Y Strainers are supplied with a 1/32″ perforated plastic screen. This screen is ultrasonically welded, not glued, for superior strength. Screens fabricated from type 316 stainless steel are also available in openings from 1/2″ down to super fine 325 mesh. All screens have an open area at least twice that of the equivalent pipe size cross-sectional area to minimize pressure drop.

Easy Clean Out

All sizes of Hayward Y Strainers feature a heavy-duty hex cap that permits quick and easy removal of the strainer screen when cleanout becomes necessary.

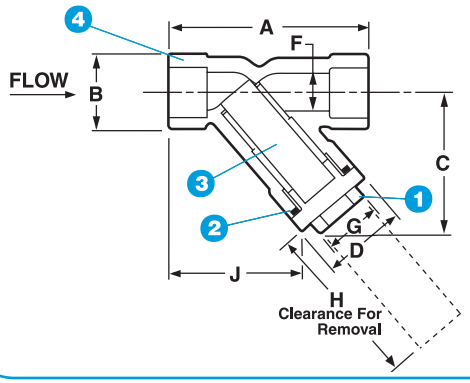
Adaptable Design

Hayward Y Strainers will work equally well in the horizontal or vertical position, simplifying piping system layout.

All Plastic Construction

Hayward Plastic Y Strainers will never rust or corrode – and they will not contaminate sensitive process media.

Technical Information



Parts List
Y Strainer

1. Cap
2. O-Ring Seal
3. Screen
4. Body

Dimensions - Inches / Millimeters

Size	A	B	C	D	F	G	H	J	Weight (lb / kg) Skt / Thd
1/2″	3.38 / 86	1.38 / 35	2.25 / 57	1.50 / 38	0.56 / 14	1.00 / 25	2.13 / 54	2.50 / 64	0.25 / .11
3/4″	4.18 / 106	1.69 / 43	2.88 / 73	2.00 / 51	0.81 / 21	1.25 / 32	2.75 / 70	3.00 / 76	0.63 / .29
1″	5.19 / 132	2.00 / 51	3.63 / 92	2.16 / 55	1.00 / 25	1.50 / 38	3.30 / 84	3.32 / 84	0.88 / .40
1-1/4″	6.63 / 168	2.63 / 67	4.50 / 114	2.94 / 75	1.25 / 32	2.00 / 51	4.50 / 114	4.45 / 113	1.75 / .80
1-1/2″	6.63 / 168	2.63 / 67	4.50 / 114	2.94 / 75	1.56 / 40	2.00 / 51	4.50 / 114	4.45 / 113	1.63 / .74
2″	7.63 / 194	3.38 / 86	5.38 / 137	3.75 / 95	2.00 / 51	2.38 / 60	5.06 / 129	4.88 / 124	3.00 / 1.4

Cv Factors*

Size	Factor	Size	Factor
1/2″	4.0	1-1/4″	12.0
3/4″	6.8	1-1/2″	28.0
1″	9.0	2″	28.0

* With 1/32″ plastic screen

Pressure Drop Calculations

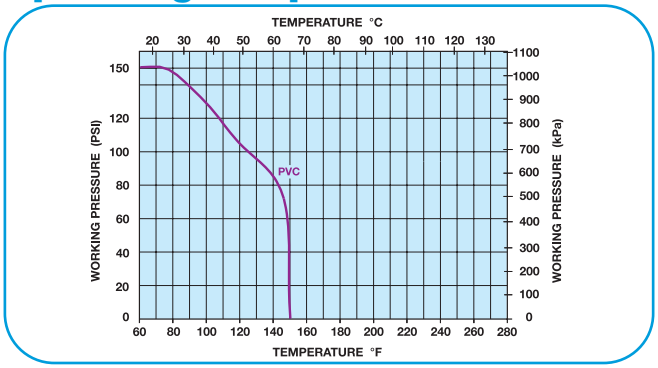
The pressure drop across the strainer, for water or fluids with a similar viscosity, can be calculated using the formula at the right:

$$\Delta P = \left[\frac{Q}{Cv}\right]^2$$

Where ΔP = Pressure Drop
Q = Flow in GPM
Cv = Flow Coefficient

The pressure loss across a valve or filter can be calculated using the system's flow rate and the Cv factor for that valve or filter.
For example, a 1″ strainer with a Cv factor of 8 will have a 4 PSI pressure loss in a system with a 16 gpm flow rate $(16 \div 8)^2 = 4$

Operating Temperature/Pressure



Selection Chart

Size	Material	End Connection	Seal	Rating
1/2″ to 2″	Clear PVC	Thd or Skt	FPM	150 PSI @ 70°F

Strainer Screen Selection

- Y Strainers are furnished with a 1/32″ perf plastic screen.
- Stainless steel strainer screens are available in these perfs: 1/32″, 3/64″, 1/16″, 5/64″, 7/64″, 1/8″, 5/32″, 3/16″, 1/4″, 3/8″, 1/2″; and in mesh sizes: 20, 40, 60, 80, 100, 200, 325.

Simplex Bag Filters

Single or Double Length - PPL, PVDF

Features

- All-Plastic Construction
- PPL Offered in Single & Double Length; PVDF in Double Length
- Hand-Removable Cover
- Integral Mounting Flange
- External Cover Threads
- In-Line or Loop Flow
- FPM Seals

Options

- Flanged Connections
- EPDM Seals
- Pressure Differential Gauge and Switch
- Vent Gauge with Gauge Guard
- Multi-Vessel Manifolded Units
- 1/4″ NPT Differential Pressure Gauge Holes

Corrosion Is Never a Problem

A metal filter housing will ultimately rust or corrode and contaminate the process media. There is no danger of this happening with a Hayward All-Plastic Simplex Bag Filter. It will never rust or corrode and never compromise the quality of the process fluid.

Wide Range of Filter Bags

Non-woven polypropylene filter bags are available in 1, 5, 10, 25, 50, 100 and 200 micron sizes. The retaining basket that holds the bag has a unique, universal seat that works with almost any standard 7″ x 16″ or 7″ x 32″ filter bag.

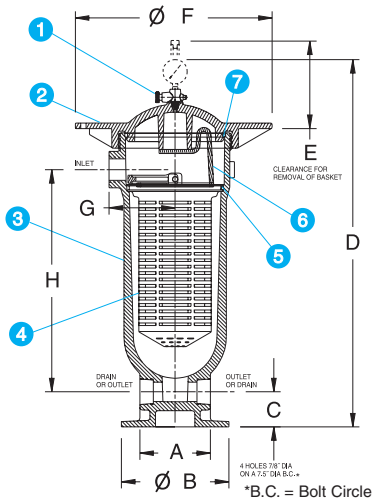
Extra Features, No Extra Cost

Features such as a vent/bleed valve installed on the cover of the polypropylene model and an integral mounting flange are all standard with every Hayward Simplex Bag Filter.

Easy Bag Change-Out

These filters are designed for easy service. A hand-removable cover and built-in basket and bag handles, make bag change-out fast and easy. No tools are needed and the filter is back in service in a matter of minutes. The external cover threads are not in contact with the process media – thus eliminating the need for cleaning each time the bag is changed. For extra strength the cover features specially designed buttress style threads.

Technical Information



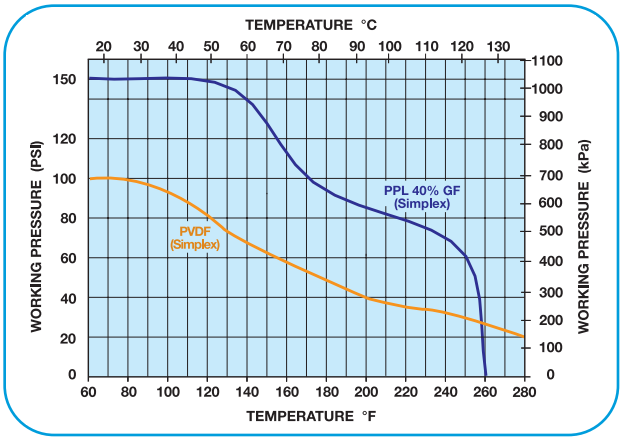
Parts List
Simplex Bag Filter

1. Vent Valve with Optional Gauge (PPL Vessels Only)
2. Cover
3. Body (PPL Double & Single Length, PVDF Double Length Only)
4. Basket
5. Viton O-Ring
6. Bag Retainer
7. Viton O-Ring

Dimensions - Inches / Millimeters

Vessel Size	A	B	C	D	E	F	G	H	J	K	Weight (lb / kg)
Single Length	6.50 / 165	10.00 / 254	3.25 / 83	34.10 / 866	20.00 / 508	18.30 / 465	6.13 / 156	20.75 / 527	11.5 / 292	8.75 / 222	60 / 27
Double Length	6.50 / 165	10.00 / 254	3.25 / 83	50.10 / 1273	36.00 / 914	18.30 / 465	6.13 / 156	36.75 / 933	11.5 / 292	8.75 / 222	80 / 36

Operating Temperature/Pressure



Technical Specifications

Material of Construction:	Glass-reinforced polypropylene – single & double length; PVDF – double length only
Piping Connections:	PPL: 2″ NPT threaded or 150# ANSI flange. PVDF: 2″ flange
Drain Connections:	PPL: 2″ NPT threaded or 150# ANSI flange. PVDF: 2″ flange
Bag Size:	Single length - 7″ x 16″, 2.0 square feet; double length - 7″ x 32″, 4.1 square feet, PPL fabric and ring
Pressure Rating:	PPL 150 PSI, PVDF 100 PSI
Seals:	Viton® (EPDM optional)
Nominal Bag Ratings:	1, 5, 10, 25, 50, 100, 150, 200, 400, 600 and 800 microns. Universal seat accepts most standard 7″ diameter bags
Flow Rate:	Single length, 50 gpm with clean bag double length, 100 gpm with clean bag

Simplex Bag Filters

Single or Double Length - PVC or Corzan® CPVC

Features

- All Plastic, No Metal Contacts the Flow
- Accepts Standard Size Filter Bags
- Choose from PVC or CPVC Construction
- Hand Removable Cover
- True Union Piping Connections
- Integral Mounting Base
- In-Line or Loop Piping Installations
- FPM Seals
- Vent Connection On Cover with Valve

Options

- Flanged Connections
- EPDM Seals
- Pressure Differential Gauge and Switch
- Multi-Vessel Manifolded Units
- 1/4″ NPT Pressure Differential Gauge Taps (Requires Spools)
- Heavy Duty Shrouded Vent Valve Assembly

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Corrosion Is Never a Problem

A metal filter housing will ultimately rust or corrode and contaminate the process media. This can never happen with a Hayward PVC or CPVC all plastic filter bag housing. It will never rust, corrode, or contaminate the process media. The housing weighs much less than a metal one making installation easier.

Accepts Most Standard Filter Bags

For application versatility the housing will accept most standard 7″ diameter filter bags. The single length vessel uses Size 01 bags, 7″ x 16″. While the double length vessel uses Size 02 bags, 7″ x 32″. This permits the vessel to be used with thousands of different types of filter bags to exactly match the application requirements. With a Hayward PVC or CPVC Bag Filter Vessel you are not limited to just a few ″non-standard″ size bags.

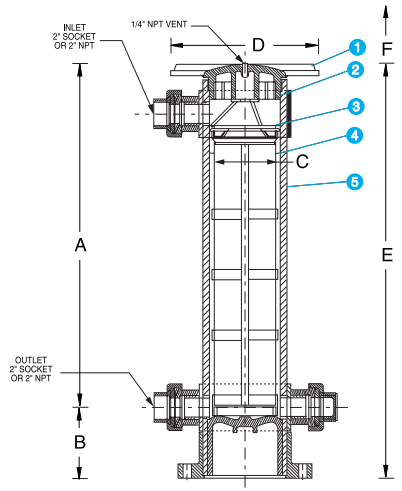
Advanced Design

This all plastic filter housing is designed to stand up to the most demanding industrial and commercial applications around. Rugged, thick wall construction ensures years of trouble free service and the housing is rated at a full 150 PSI. The built in true union piping and drain connections make installation and operation quick and easy. With this feature the filter housing can be removed from the piping system without having to break down the piping system. Just unscrew the assembly nut and remove the connecting pipe. The integral mounting base also makes for an easy installation and eliminates the need for extra cost support legs. The housing has two bottom outlet connections so that either can be used as a drain connection. This makes both in-line or loop piping installations possible. The one-piece, corrosion resistant plastic body has an extremely smooth interior surface that is very easy to clean.

Easy Bag Change

The hand removable, no tools required, spin-off cover makes filter bag changing quick and easy. There are no swing bolts to deal with like on a metal filter housing. Just a few turns of the cover using the built-in 15″ handle opens and closes the housing with little effort.

Technical Information



Parts List
Simplex Bag Filter Housing

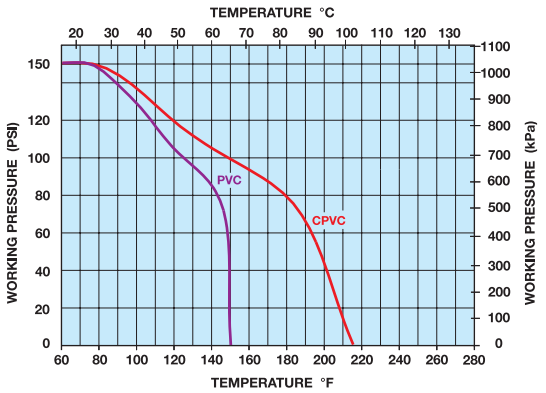
1. Cover - PVC or CPVC
2. O-Ring - Viton® (EPDM Optional)
3. Bag Hold Down - PVC or CPVC
4. Restrainer Basket - PVC or CPVC
5. Body - PVC or CPVC

Dimensions - Inches / Millimeters

Vessel Size	A	B	C	D	E	F *	Weight (lb / kg)
Single Length	13.75 / 349	7.87 / 200	6.13 / 156	15.0 / 381	26.63 / 676	16.0 / 407	50 / 23
Double Length	29.75 / 756	7.87 / 200	6.13 / 156	15.0 / 381	42.63 / 1083	32.0 / 813	75 / 34

Note: * Clearance from top for basket removal

Operating Temperature/Pressure



Technical Specifications

Material of Construction:	PVC or CPVC
Piping Connections:	True Union 2″ Socket, NPT Threaded or Optional 150# ANSI Flanged
Drain Connections:	True Union 2″ Socket, NPT Threaded or Optional 150# ANSI Flanged
Bag Size:	Single Length - Size 01, 7″ x 16″ Double Length - Size 02, 7″ x 32″
Pressure Rating:	150 PSI at 70°F Non-Shock
Seals:	Viton (EPDM optional)
Nominal Bag Ratings:	PPL bags, 1, 5, 10, 25, 100, 150, 200, 400, 600, and 800 microns. Universal seat accepts most standard single and double length bags
Flow Rate:	With clean bag, Double Length 100 gpm, Single Length 50 gpm

Duplex Plastic Bag Filters

Single or Double Length – Polypropylene, PVC, CPVC

Features

- No Line Shutdown for Bag Change-Out
- Available in Both Single and Double Length Bag Sizes
- Can't Rust or Corrode
- Reversible Inlet and Outlet
- Rated to 150 PSI

Options

- Pressure Differential Gauges
- Pressure Differential Switches
- Automated Operation – Electric or Pneumatic

No Downtime for Bag Change-Out

With an all-plastic, corrosion-resistant Hayward Duplex Bag Filter, there is never a need to shut down the line and there is never any downtime necessary when changing filter bags. Just turn the lever handle to divert flow from one filter housing to the other. Then spin off the hand-removable cover, remove the dirty bag and install a new one.

Extra Features... No Extra Cost

Features such as a rugged, lightweight fiberglass mounting platform and a vent/bleed valve installed on both filter housing covers are standard with every Hayward All-Plastic Duplex Bag Filter.

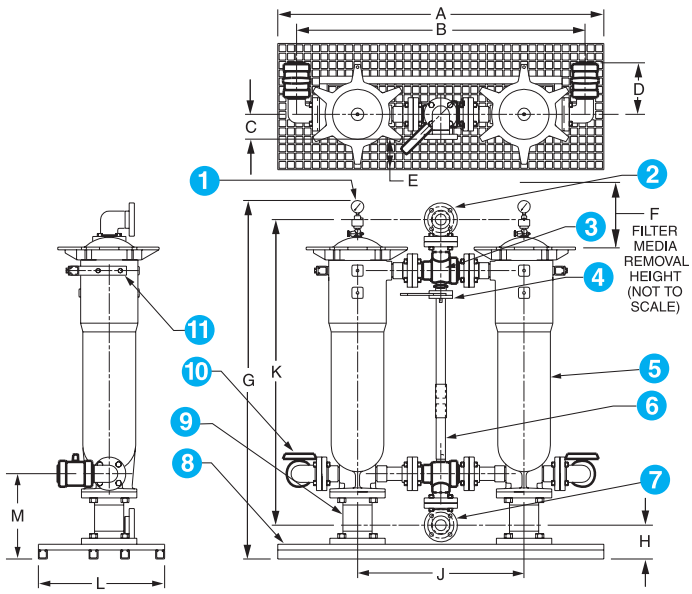
Corrosion Is Never a Problem

A metal filter housing will ultimately rust or corrode and contaminate the process media. There is no danger of this happening with a Hayward All-Plastic Duplex Bag Filter. It will never rust or corrode and never compromise the quality of the process fluid.

Wide Range of Filter Bags

Non-woven polypropylene filter bags are available in 1, 5, 10, 25, 50, 100, 150, 200, 400, 600 and 800 micron sizes. The retaining basket that holds the bag has a unique, universal seat that works with almost any single or double length filter bag.

Technical Information



Parts List
*Duplex Bag Filter - PPL**

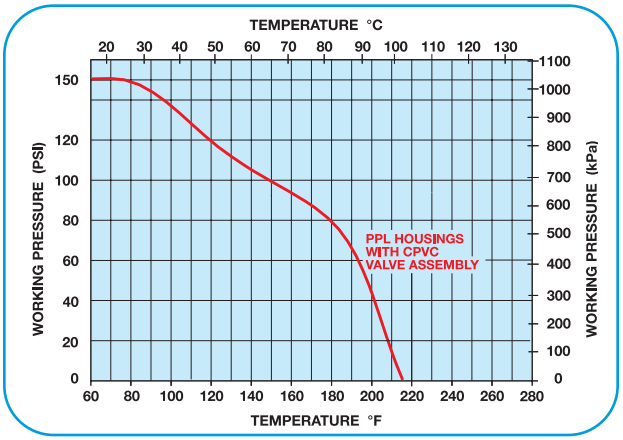
1. Vent Valve with Optional Gauge
2. Inlet Connection
3. Valve Assembly – Corzan® CPVC
4. Lever Handle
5. Filter Housing – Polypropylene
6. Linkage Assembly
7. Outlet Connection
8. Base Assembly
9. Support Stand
10. Drain Valve
11. Differential Gauge Mounting Bracket– Optional

* Consult Hayward for PVC and CPVC dimensions.

Dimensions - Inches / Millimeters

Vessel Size	A	B	C	D	E	F	G	H	J	K	L	M	Weight (lb / kg)
Single Length	59 / 150	52 / 132	4.5 / 11	9.3 / 24	5.5 / 14	20 / 51	49 / 123	6.1 / 16	30 / 76	39 / 99	23 / 58	15.3 / 39	162 / 74
Double Length	59 / 150	52 / 132	4.5 / 11	9.3 / 24	5.5 / 14	36 / 91	65 / 164	6.1 / 16	30 / 76	55 / 140	23 / 58	15.3 / 39	190 / 86

Operating Temperature/Pressure



Technical Specifications

Bag Size:	Single length - 7″ x 16″, 2.0 square feet; double length - 7″ x 32″, 4.1 square feet, PPL fabric and ring
Basket Open Area Ratio:	Single length 28:1; double length 60:1
Piping Connections:	2″ 150# class flange
Drain Connections:	2″ NPT
Material of Construction:	Glass-reinforced polypropylene and Corzan® CPVC
Seals:	FPM
Pressure Rating:	150 PSI @ 70° F
Nominal Bag Ratings:	1, 5, 10, 25, 50, 100, 150, 200, 400, 600 and 800 microns. Universal seat accepts most standard 7″ diameter bags
Maximum Flow Rate:	100 gpm
Mounting Base:	Fiberglass
Hardware:	Stainless steel

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How to Select a Bag Filter

1. Check the Chart on the Right

…to make sure that the temperature/ pressure of the application falls within the OK range.

2. Determine the Flow Rate

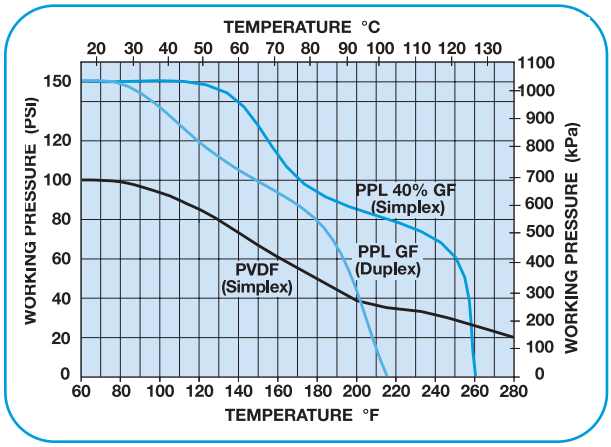
…in gpm, of the system into which the bag filter is to be installed. Hayward single and double-length bag filters work with flows of up to 100 gpm. If the system's flow rate is greater, consider using two or more filters manifolded together. For example, if the system flow rate is 150 gpm, using two manifolded filters would reduce the flow to a manageable 75 gpm through each.

3. Select the Bag

…Hayward bags are available in 5, 10, 25, 50 and 100 micron ratings. The bags are made from non-woven polypropylene felt material. They are double stitched and heat treated to minimize fiber migration. All bags are individually plastic wrapped and sealed to prevent contamination in shipping and handling. A single length bag has a surface area of 2.0 sq ft and a double length 4.1 sq ft.

4. Consider Startup Pressure Loss

…Bag filters are typically sized so that there is a 2 PSI or less pressure loss across them with a clean bag installed. Keep in mind that this is just a guide. Remember that in most applications filtration efficiency falls off at about 8 to 10 PSI loss and bag changeout should take place before a 20 PSI loss is reached. When in doubt select the filter with the lowest pressure loss. The time between bag changeouts for a double length filter is more than twice that of a single length filter in the same application.



5. Calculate Startup Pressure Loss

…To figure the total pressure loss across the filter with a clean bag requires making two pressure loss calculations and adding them together: The loss across the filter vessel without a bag and the bag loss.

First: Use the system flow rate and Chart Number One to determine the loss across the filter without a bag (single and double length filter vessels have virtually the same pressure loss without a bag). Example – A flow rate of 30 gpm results in a 0.4 PSI pressure loss. If the process media is water or has a viscosity less than 200 cps, that's it. If the viscosity is greater, select the correction factor that matches the process media viscosity in CPS units from Table Number One. Multiply the pressure drop by this factor.

Second: Single and double length filter bags have different pressure losses. Use Chart Number Two to determine the pressure loss per square foot of bag surface. Example – With a system flow rate of 30 gpm, a 5 or 10 micron bag would have a 0.2 PSI loss per square foot. This loss is divided by 2.0 for a single length bag or 4.1 for a double length bag. These factors are the respective surface areas of the bags in square feet. The loss for a single bag would be 0.1 PSI (0.2 ÷ 2.0) and 0.05 for a double length bag (0.2 ÷ 4.1). For fluids with viscosities other than water, select the correction factor from Table Two and multiply the pressure drop by it. Example – If the fluid viscosity were 800 cps, the pressure loss for a single length bag would be 5.0 (0.1 x 50.0).

Last: Add the pressure loss of the vessel and the bag together to get the pressure loss across the filter with the bag installed.

Chart Number One
Vessel Pressure Loss

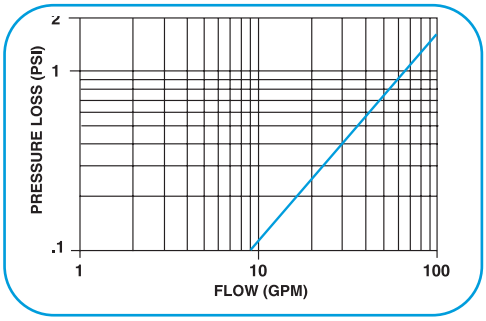


Chart Number Two
Bag Pressure Loss

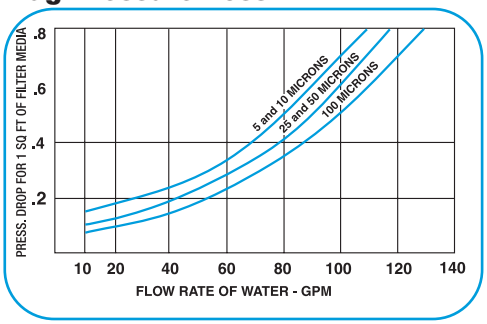


Table Number One
Vessel Viscosity Correction

Viscosity in CPS	200	400	600	800	1000	2000
Correction Factor	1.10	1.20	1.40	1.50	1.60	1.80

Pressure differential data determined by ISA S75.02 test procedure. It is shown only as a guide and may vary by application.

Table Number Two
Bag Viscosity Correction

Viscosity	Factor	Viscosity	Factor	Viscosity	Factor
Water 1	1.0	200	16.6	800	50.0
50	4.5	400	27.7	1000	56.2
100	8.5	600	38.9	2000	113.6

Basket Strainer Technical Information

Selection Criteria

The first consideration when selecting a Hayward basket strainer is the amount of free open area. This is the ratio of the open area through the strainer basket to the cross sectional area of the pipe. A well-designed basket strainer should have an open area ratio of at least 4 to 1. Anything less may cause excessive pressure drop. The area is calculated with a clean basket – and as the basket begins to clog, the ratio will drop. Unless there is a wide safety margin, the area through the basket may quickly become smaller than the pipe area. This will reduce flow through the strainer and necessitate very frequent cleaning. A small open area ratio also means the holding capacity of the basket is small (an important consideration if there is a lot of solid material to be removed.)

Second, is ease of basket removal. Since a basket strainer is used where cleaning may occur often, it stands to reason that the basket should be able to be removed and replaced as simply as possible. Hayward simplex and duplex strainers feature hand removable, precision machined, threaded covers which can be quickly loosened or tightened by hand without the use of tools.

Another item to look for in selecting a strainer is compactness of design. Is the strainer unnecessarily bulky or tall? In many industrial areas, space is at a premium and the less room a strainer takes the better.

Lastly, a wide variety of basket perforation sizes should be available. This is necessary to cope with the great range of particle sizes which the strainer may be called upon to remove.

Selection and Sizing

Selecting the proper size basket strainer for a particular application is extremely important for optimum performance of the strainer. Factors such as viscosity, specific gravity, and mesh lining size all influence pressure drop of flow through the strainer. As a general rule of thumb, a pressure of greater than 2 PSI through a clean strainer usually indicates the strainer selected is too small for the intended application.

In some cases, the strainer size may not always be the same size as the pipe diameter. For example, the pressure drop of highly viscous liquids passing through a mesh basket can cut flow considerably making it necessary to use a strainer several times larger than pipeline to ensure adequate flow.

Likewise, if an unusually large amount of material needs to be taken out of the process flows, a larger strainer or multiple strainer should be specified. By using two strainers in a series, the first with large openings designed to catch larger particles and the second with a fine mesh lining to trap smaller material, the load is spread over two strainers and time between maintenance for cleaning is also extended.

While the initial investment is slightly more for a larger strainer or multiple strainers, there are no added long term operating costs since basket strainers have no parts to wear out and last indefinitely.

Proper Basket Selection

The question of which perforation or mesh lining size to use comes up regularly. Here again, the basic rule is to use the coarsest size which will strain out the product to be removed. Using a finer mesh than needed will only result in premature clogging. When in doubt about which of two basket screens to use, it is best to choose the larger. As a rule of thumb, size the baskets for one half the particle size to be removed.

Basket Sizes Offered for Hayward Simplex and Duplex Plastic Basket Strainers

Pressure Drop Correction Factors for Various Size Basket Screens

PLASTIC		STAINLESS STEEL		STAINLESS STEEL	
Perforation	Correction Factor	Perforation	Correction Factor	Mesh	Correction Factor
1/32″	1.05	1/32″	0.82	20	0.79
1/16″	1.00	3/64″	0.63	40	1.01
1/8″	0.58	1/16″	0.74	60	1.20
3/16″	0.46	5/64″	0.50	80	1.16
		7/64″	0.51	100	1.20
		1/8″	0.58	200	1.09
		5/32″	0.37	325	1.22
		3/16″	0.46		
		1/4″	0.58		
		3/8″	0.45		
		1/2″	0.48		

Note: Pressure Drop Correction Factors for various size basket screens may be applied to data for 1/16″ perforation plastic baskets. Simply multiply the pressure drop shown in the 1/16″ basket chart by the appropriate correction factor.

Comparative Particle Size

Mesh	Inches	Microns	Mesh	Inches	Microns	Mesh	Inches	Microns
3250	0.0002	6	130	0.0043	110	24	0.028	718
1600	0.0005	14	120	0.0046	118	20	0.034	872
750	0.0010	25	110	0.0051	131	18	0.039	1000
325	0.0016	40	100	0.0055	149	16	0.045	1154
250	0.0024	62	90	0.0061	156	14	0.051	1308
200	0.0029	74	80	0.0070	179	12	0.060	1538
180	0.0033	85	70	0.0078	200	10	0.075	1923
170	0.0035	90	60	0.0092	238	8	0.097	2488
160	0.0038	97	50	0.0117	300	6	0.132	3385
150	0.0041	100	40	0.015	385	5	0.159	4077
140	0.0042	108	30	0.020	513	4	0.203	5205

FLT Cartridge Filters

All Plastic PVC or CPVC Construction Removes Fine Particulate Matter

Features

- All Plastic CPVC Construction Will Never Rust or Corrode
- Compact, Easy to Install
- No Metal in Contact with the Process Fluid
- Quick and Easy Filter Cartridge Changes
- FPM O-Ring Seal

Simple In-Tank Filtration

Designed to filter process fluid within a tank eliminating the time and expense needed to install a separate, stand alone, filter and pump. The filter features all plastic, CPVC construction with FPM for exceptional chemical resistance and are available with either one or two filter cartridges.

Easy Operation

Changing filter cartridges is quick and easy for both single and double filter units. A simple quick disconnect union is used to connect the filter cartridge to the pump. Just unscrew the union, no tools are required, and remove the filter cartridge and assembly. It takes only seconds and there are no plastic screws that could be cross-threaded, especially at higher temperatures. To make the cartridge change our process even faster additional disconnect unions are available to make up preloaded assemblies with clean filter cartridges.

Choice of Filter Media

The In Tank Filtration unit comes standard with one 50 micron wound, polypropylene filter cartridge. Cartridges are also available in 1, 5, 10, 30, 75 and 100 micron ratings and have a 1″ I.D. and a 2 1/2″ O.D. Single or double cartridge configurations are available in either 10″, 20″, or 30″ lengths. In Tank Filtration Systems are available with S or D-Series pumps that are seal-less and can be run dry. These heavy duty, reliable pumps come with Hayward's unique two year warranty.

Two Year Warranty

The heavy duty Webster S or D-Series Pumps that are part of the In-Tank Filtration System are rugged pumps designed to stand up to the most aggressive, and demanding of applications and are backed by the exclusive Hayward two year warranty.

Consult your Webster distributor for warranty information.

In-Tank Filtration Systems

Features

- For use with S and D-Series Pumps
- CPVC Corrosion-Resistant Construction
- Compact and Easy to Install
- Immersible, Seal-Less, Bearing Free Pump
- Can Run Dry
- Quick and Easy Filter Change
- Single or Double Filter
- 1/15 HP Model features a Built-in Power Cord

Simple In-Tank Filtration

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All-Plastic High Capacity Cartridge Filters

For Water or Chemical Filtration

Housings Feature

- All-Plastic PPL or PVDF Construction
- FPM or EPDM Seals
- Threaded or Flanged Connections
- Hand-Removable Cover
- High Pressure Ratings
- Inline or Loop Piping Setup
- Simplex or Duplex Models

Cartridges Feature

- Nominal and Absolute Rated Cartridges
- Large Filtration Area
- High Dirt Holding Capacity

An Important Advance in Cartridge Filtration

Now you can have all the benefits of cartridge filtration for industrial and commercial applications – while getting complete corrosion resistance. Hayward's one-piece, seamless, plastic-body cartridge filters will never rust or corrode, nor will they contaminate the process fluid.

Thousands of Applications

Hayward's Series 4200 all-plastic cartridge filters have been designed to work in the most demanding of applications – whether for high purity water or aggressive chemical filtration. These heavy-wall-housing filters will withstand operating pressures of up to 150 PSI with no problem. Series 4200 filters will work in corrosive atmospheres and harsh environments, places where a metal housing would have to be painted or epoxy-coated just to survive. All this, plus light weight and easy installation, make the Hayward Series 4200 cartridge filter right for your application.

The Right Configuration for Your Application

Series 4200 cartridge filter housings are offered in three sizes – making it easier to choose the exact filter for your application requirements. And you can choose between two types of Hayward cartridges. Hayward HC cellulose cartridges are perfect for all types of water filtration up to 165°F. Their special design packs 47 sq ft of filter media into a 16˝ tall cartridge. Hayward PF polypropylene cartridges are silicone-free and feature graded density construction for superior particle retention.

Duplex Models

Choose a Hayward Series 4200 duplex cartridge filter for those applications where the pipeline flow cannot be shut down to change out filter cartridges. Duplex filters allow the pipeline flow to be diverted to one of the two filter housings. This permits the off-line housing to be serviced without flow shutdown.

Series 4200 Plastic Filter Housings for Cartridges

Features

- All-plastic PPL or PVDF construction
- FPM or EPDM seals
- Threaded or flanged connections
- Hand-removable cover
- High pressure ratings
- Inline or loop piping setup
- For water filtration applications, CFLT4201 accepts one 16″ cartridge; CFLT4202 accepts two 16″ cartridges, end to end
- For absolute filtration applications, five-element 20″ and 30″ cartridges are accepted by housings CFLT4203 and CFLT4202, respectively

Will Not Rust or Corrode

A metal filter housing will ultimately rust or corrode and contaminate the process media. There is no danger of this happening with a Hayward Series 4200, all-plastic, seamless body, polypropylene cartridge filter housing. It will never compromise the quality of the filtration system by rusting or corroding. The Model CFLT4202 simplex housing is also available in PVDF for the filtration of extremely corrosive fluids such as bromine, chlorine, toluene and trichloroethylene.

Application Versatility

With three filter housing sizes, the Series 4200 easily adapts to all Hayward filter cartridges. The Hayward HC cartridge, a nominally rated water filter cartridge, fits the Model CFLT4201 and CFLT4202 housings, while the absolute-rated PF cartridge fits the CFLT4203 and CFLT4202 housings for high purity and aggressive chemical applications. Adapter kits custom configure each housing to the specific filter cartridge.

Easy to Service

The Series 4200 filter housings are designed for quick and easy filter cartridge changeout. A hand removable cover simplifies cartridge changing. No tools are needed and the filter is back in service in a matter of minutes. The external cover threads are not in contact with the process media – eliminating the need for cleaning each time the cartridge is changed – a real time saving feature. Extra strength buttress style cover threads are a standard feature on all filter housings.

Easy Installation

Support stands are not needed for the Series 4200 housings. An integrally molded support flange ensures fast, rock solid installation. The 2″ inlet and outlet connections are parallel and easy to pipe into. Two outlet connections are available for either in-line or loop piping arrangements.

Extra Features, No Extra Cost

An all-plastic vent/bleed valve on the cover is standard on every all-plastic Series 4200 cartridge filter housing. Duplex models come ready mounted on a fiberglass mounting skid.

Duplex Model for Continuous Flow

In many applications it is not possible to shut the process line down for cartridge changeout. For these applications a duplex cartridge filter skid assembly is available. Here, two filter housings are linked with a special all-plastic CPVC valve assembly that diverts the flow from one housing to the other without having to shut down the system. Just a quarter turn of a handle diverts the flow from one housing to the other – making it possible to change the cartridge in the out of service housing while the flow continues through the other housing.

Housing/Cartridge Specifier

Housing	Hayward HC Cartridge	Max. Flow Rate	Hayward PF Cartridge	Max. Flow Rate
CFLT4201	One 16″	50 gpm	—	—
CFLT4202	Two 16″	100 gpm	Five 30″	100 gpm
CFLT4203	—	—	Five 20″	50gpm

Hayward HC Cartridges for Water Filtration

Features

- FDA-approved materials
- High particle retention
- Long life
- High holding capacity
- 5-micron size

More Filtration Area

The Hayward HC cartridge is a high capacity cartridge that has over 47 sq ft of filter area. That's more than 10 times the filtration area of a typical standard 10″ cartridge – resulting in a higher dirt loading capacity and less downtime for cartridge changeout. These cartridges measure almost 16″ tall. For flow rates of up to 50 gpm, use one cartridge installed in a CFLT4201 filter housing. Two cartridges can be installed end-to-end in a CFLT4202 housing – creating a total of 94 sq ft of filtration area for applications requiring flow rates up to 100 gpm.

Heavy Duty Construction

HC cartridges are constructed with a polypropylene core, cellulose element and sealed with plastisol end caps. All materials are FDA approved. HC cartridge is offered in 5 nominally rated micron size.

Best Cartridge for Water Filtration Applications

HC cartridges are ideal for all types of water filtration up to 165°F. Whether your application requires the filtering of salt water, cooling water, well water, waste water or drinking water, the Hayward HC cartridge is the right choice for your filtration requirements.

Hayward PF Cartridges for Absolute Filtration

Features

- Large pleat design – more filter for the money
- Silicone free – for high purity applications
- Graded density – for superior particle retention
- Ratings of 1, 5 and 10 microns
- FDA-approved materials

Absolute Filtration to 99.98%

Hayward PF cartridges are the perfect choice when the quality of the process liquid cannot be compromised. They are designed for applications that require absolute filtration to 99.98% and are rated at 1, 5 and 10 microns.

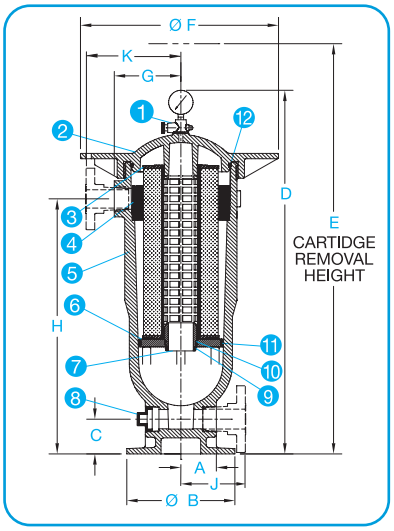
Superior Design for Long Life

PF cartridges are silicone free and constructed from a continuous, graded, polypropylene fiber. A high efficiency pleat configuration results in high flow rates and dirt loading capacity with minimal pressure drop. The media is housed within a polypropylene cage for support under high flow conditions and permits a more even distribution of the process liquid through the filter media for longer cartridge life. Easy, positive installation of the cartridge into the housing is assured by the Type 222 double o-ring seal design. You never have to guess if the cartridge is properly installed. The PF cartridges consist of five filtration elements and are available in two lengths. The 20″ cartridge fits the CFLT4203 filter housing for flow rates up to 50 gpm and a 30″ cartridge in the CFLT4202 filter housing for applications requiring flow rates up to 100 gpm.

Unlimited Applications

The Hayward PF cartridge, combined with the Hayward Series 4200 housing, is the best chemically resistant filtration system available. It is ideal for applications requiring quality filtration of bulk chemicals, oils, photographic chemicals, cosmetics, pharmaceuticals, inks, dyes, paints and water. Hayward PF cartridges also meet FDA requirements for food and beverage contact.

Technical Information

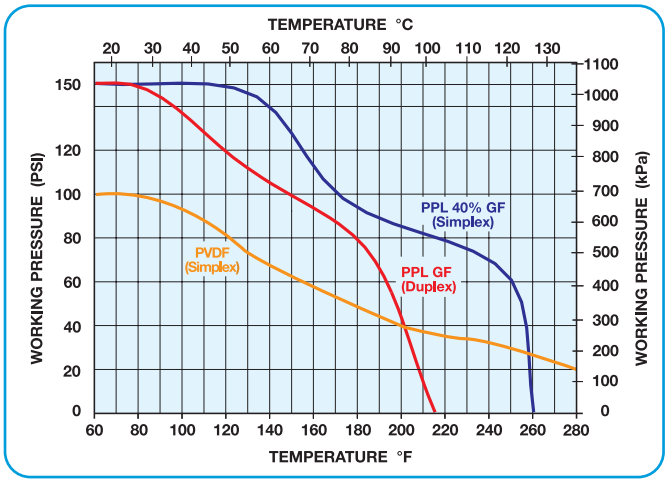


Series CFLT4200 Simplex Parts List

1. PPL vent valve (with optional gauge)
2. Cover
3. HC cartridge
4. Flow diffuser (HC only)
5. Body
6. Support
7. Connector
8. Drain plug

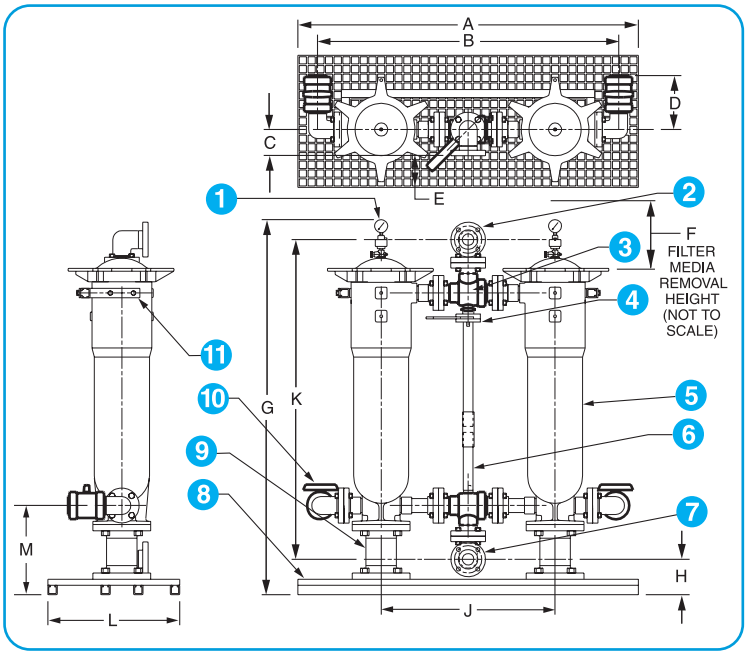
9-12. O-ring

Operating Temperatures/Pressures



Model 4200 Simplex Dimensions – Inches / Millimeters

Model	A	B	C	D	E (HC Cart.)	E (PF Cart.)	F	G	H	J	K	Weight (lb/kg)
CFLT4201	6.5 / 165	10 / 254	3.25 / 83	34.1 / 866	45 / 1143	—	18.38 / 467	6.21 / 156	20.75 / 527	5.75 / 146	8.75 / 222	50 / 22.7
CFLT4202				50.2 / 1275	61 / 1549	75 / 1905			36.75 / 933			65 / 29.5
CFLT4203				38.1 / 967	—	49 / 1245			24.75 / 628			58 / 26.4



Series CFLT4200 Duplex Parts List

1. PPL vent valve with optional gauge
2. Inlet connection
3. Valve assembly, Corzan® CPVC
4. Lever handle
5. Filter housing, polypropylene
6. Linkage assembly
7. Outlet connection
8. Base assembly
9. Support stand
10. Drain valve, optional
11. Differential gauge mounting bracket, optional

Technical Specifications

Material of Construction:	Glass reinforced polypropylene or PVDF (Model CFLT4202 only)
Piping Connections:	PPL – 2″ NPT threaded or optional 150# ANSI flanged. PVDF – 2″ socket fusion or optional flanged
Pressure Rating:	PPL – 150 PSI. PVDF – 100 PSI non-shock at 70°F
Seals:	FPM or optional EPDM

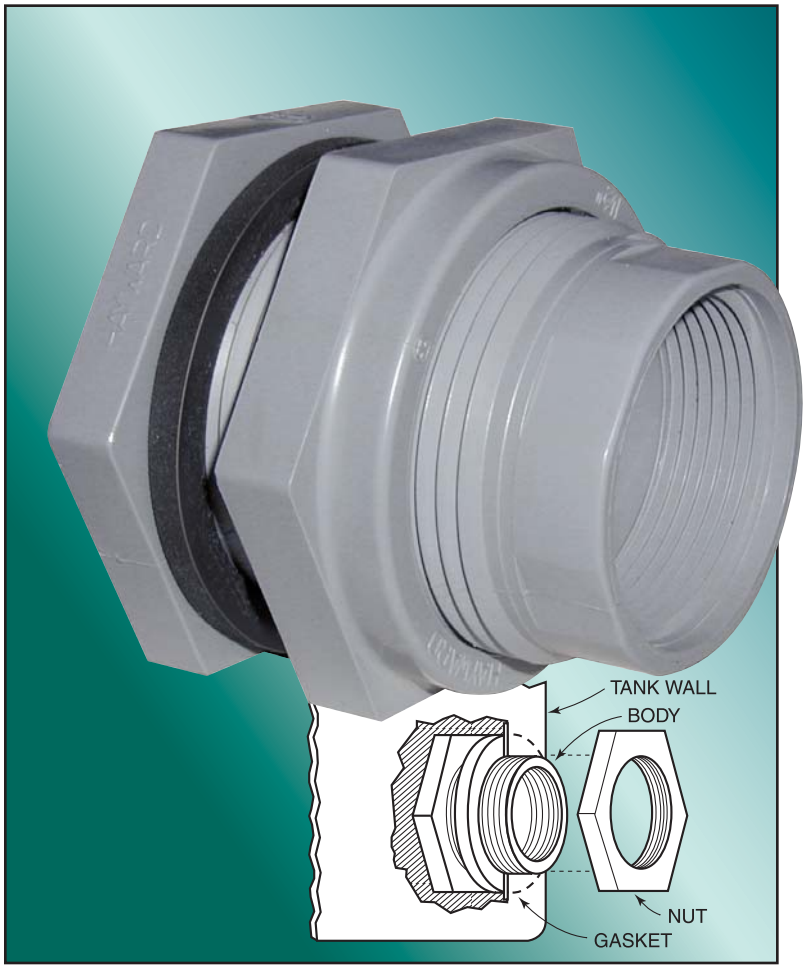
Corzan® is a registered trademark of Noveon, Inc.

Model 4200 Duplex Dimensions – Inches / Centimeters

Model	A	B	C	D	E	F (HC Cart.)	F (PF Cart.)	G	H	J	K	L	M	Weight (lb/kg)
CFLT4201	59 / 150	52 / 132	4.5 / 11	9.3 / 24	5.5 / 14	55 / 1397	—	49 / 123	6.1 / 16	30 / 76	39 / 99	23 / 58	15.3 / 39	162 / 74
CFLT4202						71 / 1803	85 / 2159	65 / 164			55 / 140			190 / 86
CFLT4203						—	59 / 1499	53 / 135			43 / 109			170 / 77

Bulkhead Fittings

1/2″ to 4″ – PVC, Corzan® CPVC and PPL



Features

- Rated to 150 PSI
- EPDM or FPM Gasket Seal
- Hex Body for One Person Installation
- All-Plastic Construction
- Proven, Rugged Design

Options

- Ready Flanges for Making Flanged Connections to Tanks

Corzan® is a trademark of Noveon, Inc.

Easy Tank Connections

Hayward Safe-T-Loc Bulkhead Fittings (Tank Adapters) easily permit safe, quick pipe connections to be made to plastic, metal or plastic tanks. Simply cut the proper size opening in the tank, slide the body of the fitting through it, and then just tighten the nut. The fitting is now ready to accept the piping connection.

Rugged Design

Hayward Bulkhead Fittings have been designed to stand up to the most demanding applications without leaking – year in and year out. These bulkhead fittings are molded with an extremely heavy wall thickness and will withstand most abuse without failure.

Leak Protection

All sizes of Hayward Bulkhead Fittings come standard with heavy duty buttress threads to help prevent leaks under pressure. These buttress threads are substantially stronger than the standard threads on ordinary bulkhead fittings.

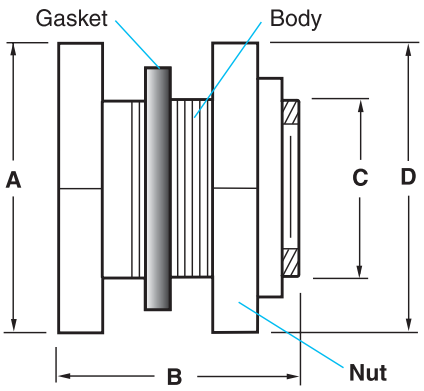
Easy Installation

A Hayward Bulkhead Fitting has been designed so that only one person is needed to install it, not two, unlike other ordinary bulkhead fittings. A special hex shape on the body end of the fitting allows it to be gripped from outside the tank while the nut is tightened.

Can't Rust, Won't Corrode

These all-plastic bulkhead fittings will never fail due to rust or corrosion.

Technical Information



Minimum Inside Diameters of Tanks For Bulkhead Fitting Installation

Bulkhead Size	Min. Rigid Tank ID	Min. Flexible Tank ID	Max. Wall Thickness
1/2″	7.25	5.56	1.08
3/4″	10.00	7.75	1.15
1″	11.75	8.94	1.15
1-1/4″	16.25	12.19	1.02
1-1/2″	16.25	12.19	1.02
2″	25.75	19.38	1.09
3″	42.50	36.25	1.14
4″	90.00	76.81	1.69

Dimensions - Inches / Millimeters

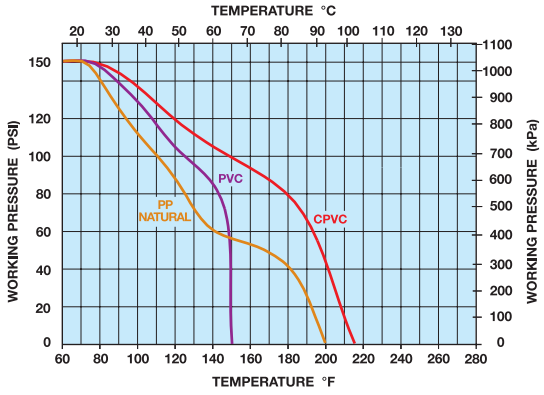
Size	A	B	C Installation Hole Size	D	Weight (lb / kg)
1/2″	2.00 / 51	2.75 / 70	1.38 / 35	2.00 / 51	0.13 / .06
3/4″	2.38 / 60	2.88 / 73	1.63 / 41	2.38 / 60	0.38 / .17
1″	2.56 / 65	2.88 / 73	1.88 / 48	2.56 / 65	0.38 / .17
1-1/4″	3.00 / 76	3.00 / 76	2.38 / 60	3.00 / 76	0.50 / .23
1-1/2″	3.00 / 76	3.00 / 76	2.38 / 60	3.00 / 76	0.50 / .23
2″	4.38 / 111	3.25 / 83	3.25 / 83	4.38 / 111	1.00 / .45
3″	6.00 / 152	3.63 / 92	4.50 / 114	6.00 / 152	2.00 / .90
4″	8.75 / 222	4.75 / 121	5.75 / 146	8.75 / 222	7.00 / 3.2

Dimensions A, C, & D are Across Flats. 1/2″ to 2″ Hexagon Flats, 3″ & 4″ Octagon Flats

Selection Chart

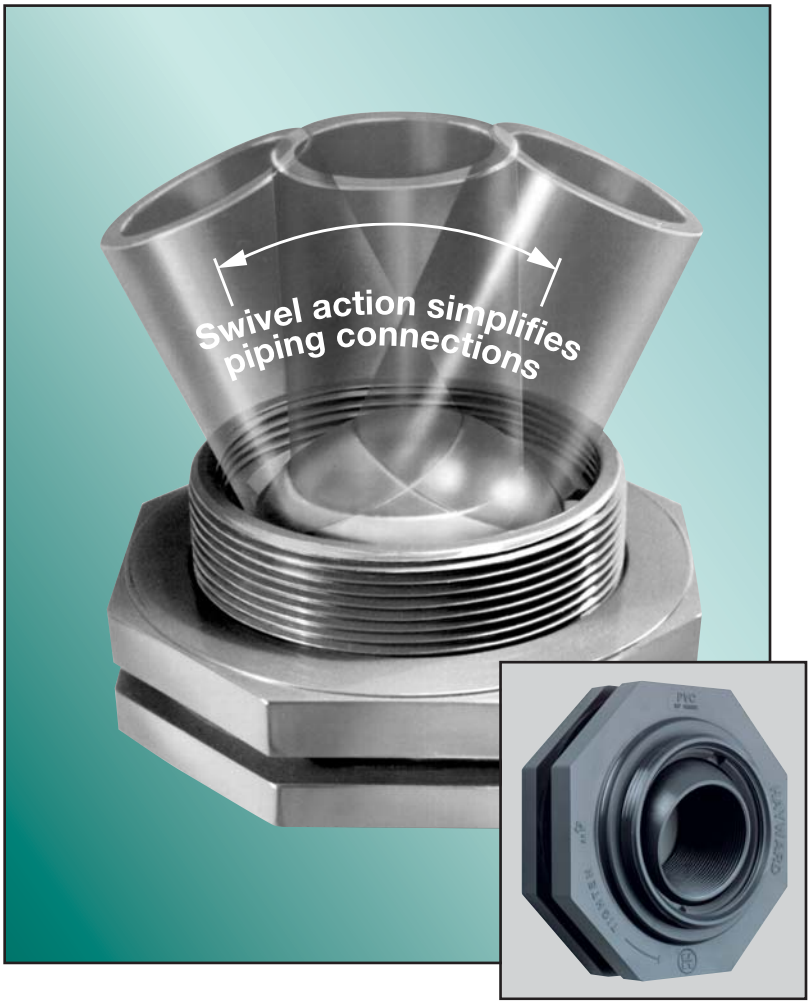
Size	Material	End Conn.	Seals	Rating
1/2″-4″	PVC	Socket X Thread Thread X Thread	EPDM or FPM	150 PSI, Non Shock @ 70°F
1/2″-4″	CPVC	Socket X Thread		
1/2″-4″	Natural PPL	Thread X Thread		

Operating Temperature/Pressure



Self-Aligning Bulkhead Fittings

1″, 2″ and 3″ – PVC



Features

- Rated to 75 PSI
- EPDM or FPM Gasket Seal
- Easy Installation
- All Plastic Construction
- Proven, Rugged Design
- Offset Connections to 27°

Applications

- Straight piping connections to the tops of domed tanks or other curved surface vessels

No Hassle Connections

Hayward Self-Aligning Bulkhead Fittings make it easy to connect pipe to the top of domed tanks. Now it's no longer necessary to fabricate expensive, complex sections of pipe to make this, or any other, type of offset connection. Just install the fitting onto the domed tank, position the swivel connection line up to pipe and you're ready to make the straight line connection. No hassles!

Unique Design

Hayward Self-Aligning Bulkhead Fittings feature a unique swivel ball design. The piping connection to the fitting is made into a threaded ball that swivels on a Teflon® seat. Once the connection is positioned at the desired offset angle, a plastic lock ring firmly holds it in position. Straight to offset connections of up to 27 degrees can easily be made.

Easy Installation

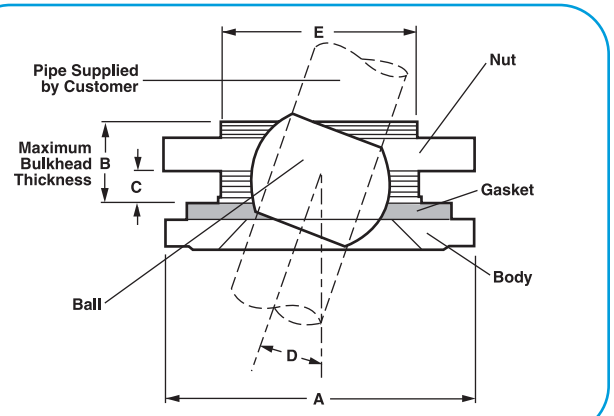
No special tools are needed. Just insert the body of the fitting through the properly sized hole on the tank top and tighten the lock nut. The fitting is now ready for the pipe connection.

All Plastic Construction

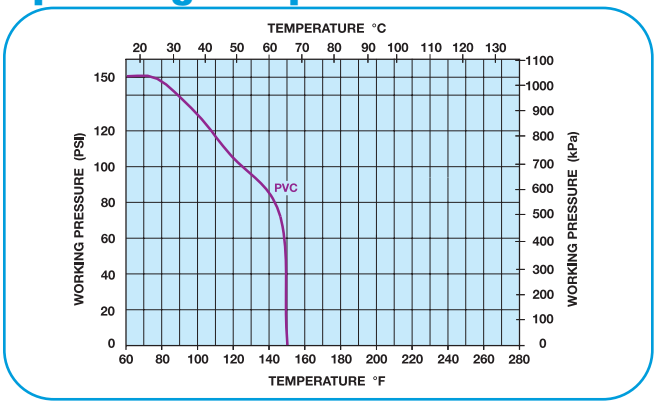
Hayward Self-Aligning Bulkhead Fittings will never rust or corrode like metal fittings. And their PVC material will not contaminate fluids that come in contact with them.

Teflon® is a registered trademark of DuPont

Technical Information



Operating Temperature/Pressure



Dimensions - Inches / Millimeters

Size	A	B	C	D Angle	E	Weight (lb / kg)
1″	4.38 / 111	2.00 / 51	1.25 / 32	27 degrees	3.25 / 83	1.90 / .86
2″	6.00 / 152	2.00 / 51	1.06 / 27	25 degrees	4.50 / 114	4.80 / 2.2
3″	8.75 / 222	2.50 / 64	1.25 / 32	20 degrees	5.75 / 146	11.10 / 2.3

Selection Chart

Size	Material	End Conn.	Seals	Rating
1″, 2″, 3″	PVC	Thread x Thread	EPDM or FPM	75 PSI @ 70°F

Minimum Inside Diameters of Tanks for Bulkhead Fitting Installation

Bulkhead Size	Min. Rigid Tank I.D.	Min. Flexible Tank I.D.
1″	25.75″	19.38″
2″	42.50″	36.25″
3″	90.00″	76.81″

Vacuum Breaker

Features

- All-Plastic Construction
- Easy Installation
- Eliminates Siphoning Problems
- Compact
- No Metal Parts to Stick or Jam

Options

- All-Plastic Bulkhead Fittings for Easy Tank Installation

Reliable Venting of Tanks and Piping Systems

Hayward's all-plastic, corrosion-resistant Vacuum Breaker allows quick and trouble-free draining of tanks and piping systems. The vacuum breaker is normally closed at positive internal pressures. As the tank or piping system is being drained the Vacuum Breaker automatically opens and allows air to enter the tank or system.

Advanced Design for Fast Draining

Hayward Vacuum Breakers allow a tank or piping system to be drained at the rate of up to 300 gpm. For even faster draining requirements, just install additional vacuum breakers. For instance, three installed on a tank would allow a drainage rate of 900 gpm with properly-sized drains.

Easy Installation

Hayward Vacuum Breakers have a $^{3}/_{4}$″ NPT end connection for easy installation into a piping system. Installation onto a tank is also quick and easy. For this use, the Vacuum Breaker was designed to fit perfectly into the socket connection of a $1^{1}/_{2}$″ Hayward Bulkhead Fitting. Just solvent-weld the Vacuum Breaker into the fitting and then install the fitting onto the tank. That's all there is to it.

Never a Problem with Corrosion

Because of its all-plastic construction, a Hayward Vacuum Breaker will never rust or corrode – and it can survive corrosive environments and harsh weather conditions without the need for painting or expensive epoxy coating.

Technical Information

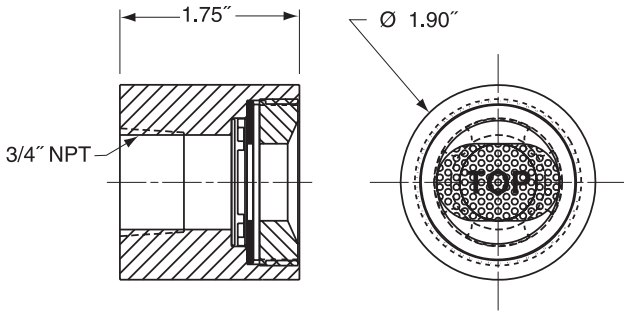
Specifications

Body Material:	PVC
Membrane:	FPM
Piping Connection:	3/4″ NPT
Tank Connection:	Uses Bulkhead Fitting
Maximum Pressure:	150 PSI @ 70°F
Operation:	Normally closed. Automatically opens when subjected to a vacuum and closes at positive pressures.
Maximum Drain Rate:	300 GPM

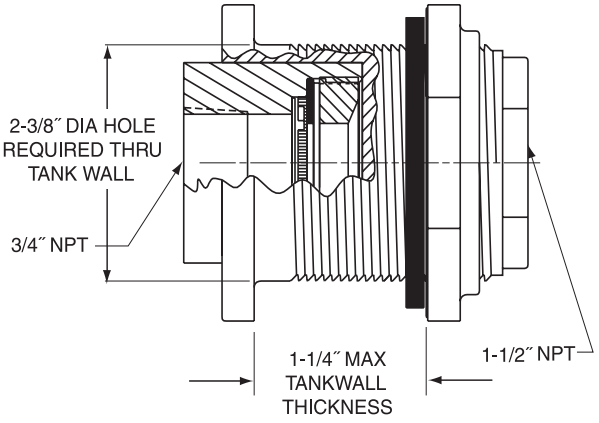
Easy to Install onto Tanks

Just solvent-weld the vacuum breaker into the socket connection of a standard Hayward 1 1/2″ bulkhead fitting. Then install the bulkhead fitting onto the tank. No extra piping is needed.

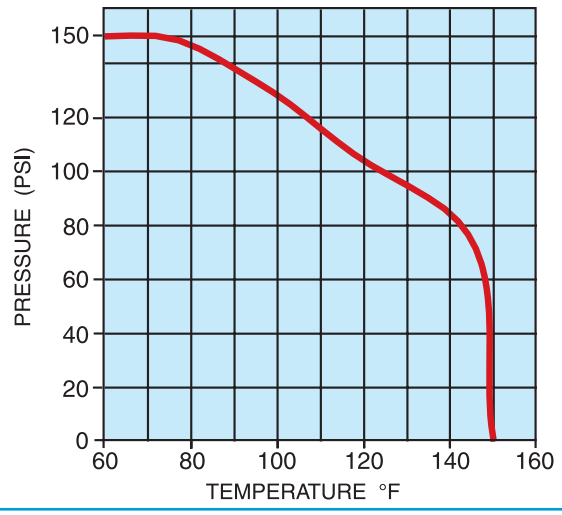
Dimensions



Vacuum Breaker Installed in Bulkhead



Temperature/Pressure Chart



Pipeline Accessories

Gauge Guards - PVC, Corzan® CPVC, PPL and PVDF

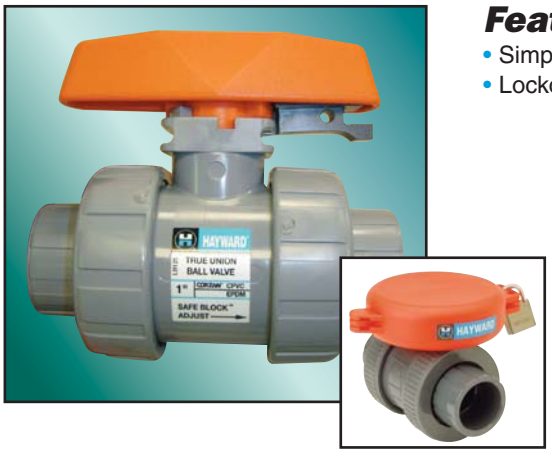
Gauge guards isolate and protect gauges and other instruments from the process media. They work in any position in both vacuum and pressure applications. Hayward gauge guards can be supplied without a gauge or with either a 0 to 30, 0 to 60 or 0 to 160 PSI gauge installed.

Features

- 1/4″ x 1/4″ or 1/4″ x 1/2″ Threaded NPT Connections
- FPM Membrane
- Air Bleed Port for Gauge Installation
- All Plastic, No Rust or Corrosion
- No Metal Fasteners
- Low Profile, Compact Design
- Work in any Position

Valve-Safe Lockouts

Hayward valve lockouts are made from PPL and are used to prevent tampering or other unauthorized valve operation. Lockouts can be used to secure the valve in either the open or closed position.



Features

- Simple Trigger Mechanical Design
- Lockout/Tagout Clasp

Features

- Use With up to Three Padlocks
- Valve Handle is Completely Enclosed
- Impact Resistant

Ready Flanges – PVC, Corzan• CPVC and PPL - 1″ to 4″

Hayward Ready Flanges easily convert socket PVC and CPVC valves or threaded PPL valves to flanged connections. Ready Flanges feature a one-piece body with an integral nipple, eliminating the need for an extra fabricated joint and preventing a possible leak path.

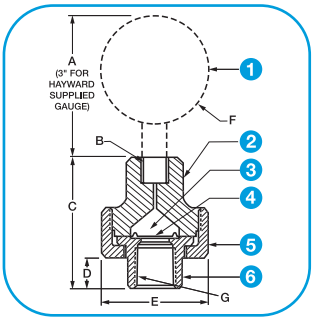
Corzan® is a trademark of Noveon, Inc.

Features

- Integral Molded Nipple
- 150# ANSI Bolt Pattern
- Easy, One-Step Installation

Technical Information

Gauge Guards



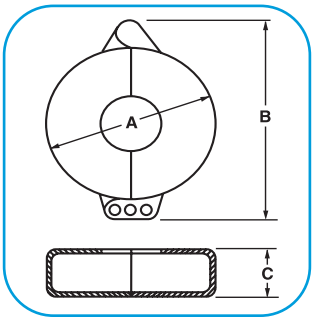
Parts List

1. Gauge/Instrument
2. Body
3. Oil-Filled Upper Chamber with Installed Gauge
4. FPM Membrane
5. Union Nut
6. End Connector

Dimensions - Inches / Millimeters

Size	A	B	C	D	E	F	G
1/4″ x 1/4″	3.0 / 76	1/4″ NPT	2.69 / 68	0.61 / 15	2.25 / 57	2.3 / 58	1/4″
1/4″ x 1/2″	3.0 / 76	1/4″ NPT	2.69 / 68	0.61 / 15	2.25 / 57	2.3 / 58	1/2″

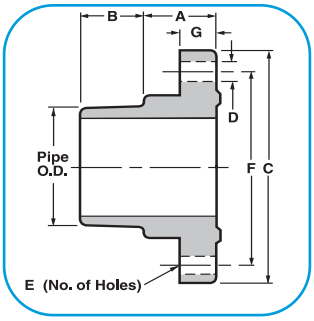
Valve-Safe Lockouts



Dimensions - Inches / Millimeters

Size	A	B	C
1/2″ to 2″ Ball Valves	5.50 / 140	7.00 / 178	1.75 / 44
2-1/2″ to 6″ Ball Valves	14.50 / 368	16.00 / 406	3.00 / 76

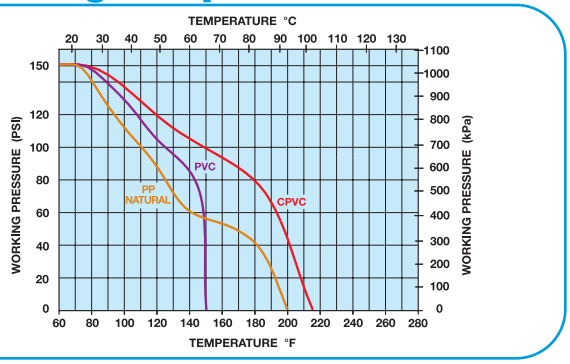
Ready Flanges



Dimensions - Inches / Millimeters

Size	A	B	C	D	E	F	G	Weight (lb / kg)
1″	1.25 / 32	1.19 / 30	4.50 / 114	0.56 / 14	4	3.13 / 80	.56 / 14	0.50 / .23
1-1/2″	1.50 / 38	1.44 / 37	5.00 / 127	0.56 / 14	4	3.88 / 99	0.75 / 19	0.75 / .34
2″	1.65 / 42	1.54 / 39	6.00 / 152	0.75 / 19	4	4.75 / 121	0.75 / 19	1.25 / .57
3″	1.98 / 50	1.84 / 47	7.50 / 191	0.75 / 19	4	6.00 / 152	1.00 / 25	2.75 / 1.25
4″	2.36 / 60	2.31/ 54	9.00 / 229	0.75 / 19	8	7.50 / 191	1.13/ 29	4.50 / 2.04

Operating Temperature/Pressure



Manual Top Works

Lever Handle for Ball Valves

HCTB1200STACTV
LH1SR
LK2

Manual top works are available for two-way and three-way ball valves up to 6″ in size and butterfly valves up to 4″ in size. Typical top works components include a lever handle, fail-safe spring return, and mechanical limit switches. The limit switches are available with a variety of features and in various materials of construction.

Lever Handle Assembly with Mounting Only

LH1–Lever handle assembly is constructed of zinc titanium alloy with a lever of mild steel, baked epoxy coated with plastic hand grip. The shaft is stainless steel. All mounting hardware is stainless steel.

Lever Handle Assembly with Fail-Safe Spring Return Options

LH1SR–Lever handle assembly with spring module on top. Spring module is sized to close or open the valve on release of the lever handle. The spring module is a weatherproof sealed, zinc and titanium alloy housing with baked epoxy coating. Mounting hardware is stainless steel.

Lever Handle Assembly with Fail-Safe Spring Return and Limit Switch Option

LH1SRS2–Lever handle assembly with spring module and manual limit switch on top. Spring is sized to close or open the valve on release of the lever handle and at the same time, cause the cams inside the switch housing to close the switch contacts at each end of the stroke.

Manual Top Works

Options

LH1LS

Lever Handle Assembly with Limit Switch Option

LH1LS–Lever handle assembly with limit switch on top. The limit switch housing is available in three basic types.

Standard Limit Switch, Type #1 Zinc/Titanium Alloy/Epoxy

Unless otherwise specified, the limit switch assembly used with this lever handle will be a top-mounted switch, zinc/titanium-epoxy coated enclosure, NEMA 4, 2 SPDT switches rated at 10 amps. The switch assembly mounts directly on top of the lever handle assembly with stainless steel hardware. Features include: small and compact, NEMA 4, 2 SPDT mechanical switches wired to terminal strip, 2 adjustable cams, exterior epoxy coated, position indicator, $^1/_2$″ conduit connection. Switch options: proximity, hazardous duty.

NEMA 4X Beacon 2 SPDT 15 Amps

Suffix S4

NEMA 4, 4X black and yellow beacon, self-locking cam mechanism eliminates set screws and allows instantaneous manual setting, 2 mechanical switches prewired to terminal strip, “Micro” brand switches with roller-type lever, 8-point terminal strip for SPDT, and two $^1/_2$″ NPT conduit connections. Switches are UL & CSA listed.

Optional Limit Switch, Type #3

Suffix SA2 to SA4

Aluminum, NEMA 4 & 7, 2 SPDT, 15 Amps

Suffix SA2

NEMA 4, 4X, 7 & 9, Class 1, Groups C & D, Class 2, Groups E, F & G, Division 1 & 2, flat cover, self-locking cam mechanism eliminates set screws and allows instantaneous manual setting, two mechanical switches prewired to terminal strip, “Micro” brand switches with roller-type lever, 8-point terminal strip for SPDT, and two $^1/_2$″ NPT conduit connections. Switches are UL & CSA listed.

Aluminum, NEMA 4 & 7, Beacon, 2 SPDT, 15 Amps

Suffix SA4

NEMA 4, 4X, 7 & 9, Class 1, Groups C & D, Class 2, Groups E, F & G, Division 1 & 2, black and yellow beacon, self-locking cam mechanism eliminates set screws and allows instantaneous manual setting, two mechanical switches prewired to terminal strip, “Micro” brand switches with roller-type lever, 8-point terminal strip for SPDT, and two $^1/_2$″ NPT conduit connections. Switches are UL & CSA listed.

Manual Top Works

Spring Return Handle

Manual Valves
Actuator Model

		Lever Handle Assembly with:			
	Use Mounting Kit Listed	Lever Handle Only	Lever w/ Fail-Safe Spring Return Option	Lever w/ Limit Switch Option Type 1	Lever w/Spring Return & Limit Switch
Blocked End Valve Size	**Kit#**	**LH1**	**LH1SR**	**LH1LS**	**LH1SRS**
1/4″, 3/8″, 1/2″	LK1	✓	✓	✓	✓
3/4″	LK1	✓	✓	✓	✓
1″	LK2	✓	✓	✓	✓
1 1/4″	LK2	✓	✓	✓	✓
1 1/2″	LK2	✓	✓	✓	✓
2″	LK2	✓	✓	✓	✓
2 1/2″, 3″	LK3	✓	✓	✓	
4″, 6″	LK3	✓		✓	
Three-Way Valve Size (NT)					
1/2″	LK1	✓	✓	✓	✓
3/4″	LK1	✓	✓	✓	✓
1″	LK2	✓	✓	✓	✓
1 1/2″	LK2	✓	✓	✓	✓
2″	LK2	✓	✓	✓	✓
3″	LK3	✓		✓	
4″, 6″	LK3	✓		✓	
Butterfly Valve Size					
1 1/2″ / 2″, 3″	LK4		✓	✓	✓
4″	LK5			✓	

Top Mounted Limit Switch, Zytel® Enclosure	Add Suffix to Part # Above
NEMA 4X, Flat Cover, 2 SPDT, 15 Amps	S2
NEMA 4X, Beacon, 2 SPDT, 15 Amps	S4
Top Mounted Limit Switch Aluminum / Epoxy Enclosure	
Aluminum, NEMA 4 & 7, 2 SPDT, 15 Amps	SA2
Aluminum, NEMA 4 & 7, Beacon, 2 SPDT, 15 Amps	SA4

* To use Type 2 limit switch in place of Type 1, Select the desired Lever Handle from columns marked LH1 or LH1SR and enter the Type 2 limit switch suffix.

EXAMPLE: L H 1 S R S 4 Lever handle with fail-safe spring return option mounted with a NEMA 4X limit switch, Zytel enclosure, beacon, 2 SPDT (single pole, double throw) switches rated at 15 amps.

Glossary of Actuation Terms

AUTOMATIC RESET: (Electric) A component of the thermal overload device that permits it to automatically engage when the temperature falls to an acceptable level.

AMPERAGE RATING AUXILIARY LIMIT SWITCH: The maximum current carrying capacity of the extra limit switches contained within the actuator housing.

CONDUIT ENTRY, SIZE NPT: The electrical entrance into the housing of the actuator through which the operating wires are connected. The exterior of the entrance hole is usually tapped with an NPT thread (National Pipe Thread).

CONSTANT TORQUE OUTPUT: (Pneumatic) The torque in inch pounds developed by a double acting pneumatic rack and pinion or vane type actuator as measured at the beginning and end of a stroke or at any point in between.

CYCLE TIME: The time required for an actuator to rotate one complete cycle (typically 90° or 180°), expressed in seconds.

DESIGN TYPE: The basic design type of the actuator in terms of the method used to deliver rotational torque to the output shaft.

DIRECT MOUNTING: A method used to attach a valve to an actuator, being coupled without the use of separate bracketry or special mounting hardware.

DISCRETE MOUNTING BRACKET: A method used to attach a valve to an actuator, being a separate part from either the valve, actuator or both.

DPDT: Double Pole, Double Throw

DUTY CYCLE: (Electric) The ratio of actual motor run time as compared to 100%. (Example: an actuator with a 20% duty cycle, having a required run time of 5 seconds to rotate 90° would require an off time of 25 seconds before it can be cycled another 90°.)

EMF: Electro-Magnetic Force

ENCLOSURE MATERIALS, (TOP & BOTTOM): Material of construction of the actuator base, (bottom) and cover, (top).

END OF STROKE TRAVEL STOPS, (ADJUSTABLE): A mechanical component on the actuator that can be adjusted to position the valve either open or closed.

EXTERIOR FINISH: The exterior coating or finish used to protect the actuator housing from corrosion.

EXTERNAL HARDWARE: The materials of construction of the fasteners and/or other hardware used to assemble the actuator components.

FEMALE OUTPUT SHAFT: The output drive of the actuator having a recessed opening into which the valve stem or coupling shaft fits.

HIGH AMBIENT LIMIT: The maximum operating temperature of the actuator, as designated by the actuator manufacturer.

HYSTERESIS: The cumulative rotational twist resulting from the ˝take-up˝ of clearances between the fitting dimensions of the ball, stem, coupling and actuator mechanism.

INTEGRAL MOUNTING BRACKET: A method used to attach a valve to an actuator, being a part of either the valve, actuator or both.

INTERNAL AIR PORTING: The high pressure (100 PSI) air passages contained within the actuator that shuttle the air pressure to either side of the torque producing components.

LOW AMBIENT LIMIT(°F): The minimum operating temperature of the actuator as set by the actuator's manufacturer, expressed in degrees Fahrenheit.

LOW AMBIENT LIMIT W/OUT "T": (HEATER & THERMOSTAT) The minimum operating temperature of the actuator, as designated by the actuator manufacturer without the use of a heater & thermostat.

MALE OUTPUT SHAFT: The output drive of the actuator consisting of an externally protruding shaft.

MANUAL OVERRIDE, (DE-CLUTCHING): (Electric) An actuator component that allows mechanical turning of the valve, while simultaneously disengaging the gear train.

MANUAL OVERRIDE: An actuator component that allows mechanical turning of the valve.

MAXIMUM OPERATING PRESSURE (PSI): (Pneumatic) The pressure limitation established as the maximum safe operating pressure.

MOTOR BRAKE/MECHANICAL BRAKE - (STANDARD ON BUTTERFLY VALVES): (Electric) A mechanical device that is designed to apply a force to a motor shaft to prevent back drive of the actuator geartrain resulting from hydraulic pressure transfer of the process fluid through the valve.

MIN/MAX WIRE SIZE: The minimum and maximum wire size that the actuator requires or that will fit into the actuator's terminal connections.

MODULATING SERVICE: The ability of the actuator to be used in systems that require continuous control, typically with a positioner.

MOTOR DRIVE ROTATION: (Electric) The rotation of the actuator output shaft in either one direction (uni-directional) or two directions (reversing).

MOTOR SWITCHES (SPDT): (Electric) The switches that control the motor's starting and stopping. (SPDT means Single Pole Double Throw).

MOTOR THERMAL PROTECTOR: (Electric) A device that protects the motor against overheating and subsequent burn-out due to (typically a 120 VAC 25% duty cycle motor is protected at 100°C) heat buildup resulting from excessive starting, stopping or continuous running.

MOUNTING POSITION: The ability of the valve/actuator to be physically mounted in the piping system.

NEMA RATING (AVAILABLE): 1, 4, 4X, 7, 9 National Electrical Manufacturers Association Rating.

NUMBER OF PISTONS: (pneumatic) The number of torque producing surfaces within the actuator.

PERMANENT LUBRICATION: A type of lubrication sealed within the actuator to prolong cycle life.

PISTON SEALING MATERIAL: (Pneumatic) The type of elastomer used to maintain an airtight seal between the piston and the cylinder.

POSITION INDICATOR W/LED: Light emitting diodes which, when illuminated, indicate visual confirmation of the valve's position in terms of open or closed.

POSITION INDICATOR: A mechanical or electrical device that allows visual confirmation of the valve's position in terms of open or closed, (e.g., Red = "closed" or Green = "open".)

PREWIRED TO TERMINAL STRIP: Internal component wire leads or printed circuit board connector pins which terminate at a terminal strip to which field wiring can be attached.

REVERSING: The output shaft of the actuator rotates in both CW and CCW directions.

SELF-LOCKING GEAR TRAIN: (Electric) Design of an actuator gear train that locks the actuator output shaft, thus preventing valve rotation.

SPDT: Single Pole, Double Throw.

SPRING CONFIGURATION (QTY/TYPE): (Pneumatic) The quantity and design configuration of the springs used within a pneumatic actuator that affect the spring return, (fail-safe) function.

STANDARD VOLTAGE (AC): Unless otherwise specified, the voltage of all electrical devices in this catalog will be considered to be 115/120 VAC/60 Hz. All ratings, performance or specifications are based on standard voltage.

START/FINISH TORQUE: (Pneumatic) The torque in inch pounds, as measured at the actuator output shaft of a pneumatic actuator containing a spring return feature. The torque developed at the beginning of the stroke when the spring is fully compressed (START) and the torque at the end of the stroke (FINISH) when the spring has dissipated its stored energy.

START/STALL TORQUE: (Electric) The torque in inch pounds, as measured at the actuator output shaft at the instant of the start of rotation, and at maximum stall when the motor is restricted from rotation while energized.

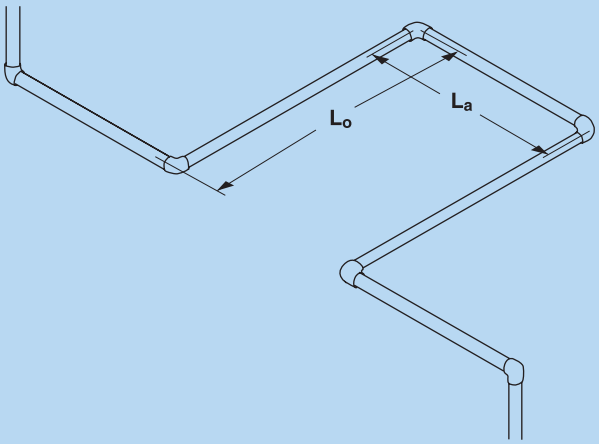
TWO STAGE SHUT-OFF, (DRIBBLE CONTROL): The closing of the valve in two, or more, distinct motions. The first movement, partially closing such that the remaining flow is small. The second movement, fully closing the valve.

UNI-DIRECTIONAL: The output shaft of the actuator rotates in only CW direction, as viewed from the top of the actuator.

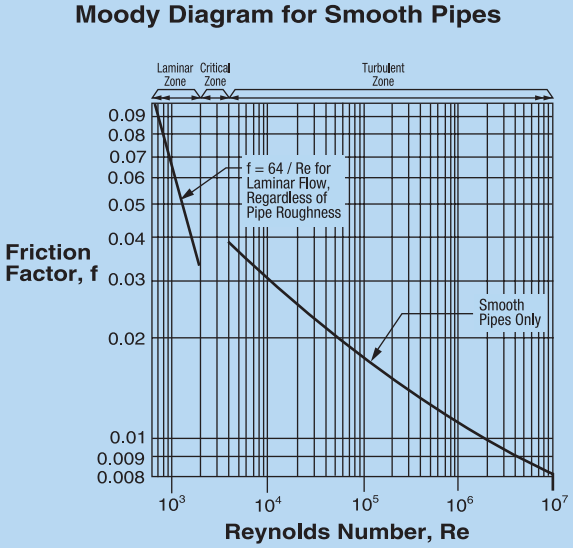
UNIFORM BEARING LOAD DISTRIBUTION: The design of the torque producing components to be supported by bearing surfaces that allow high cycle life.

VOLTAGE VARIATIONS: The variations of optional voltages available for all products offered.

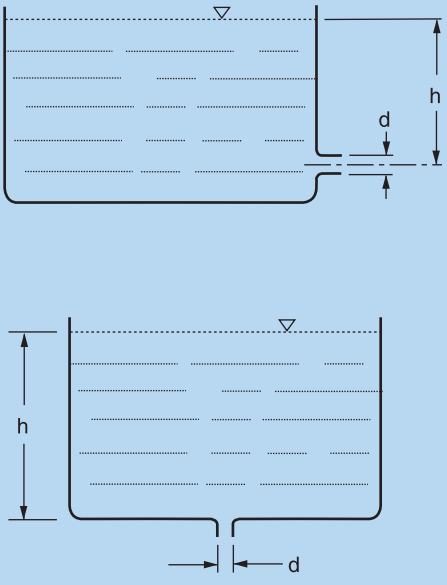
Engineering & Design

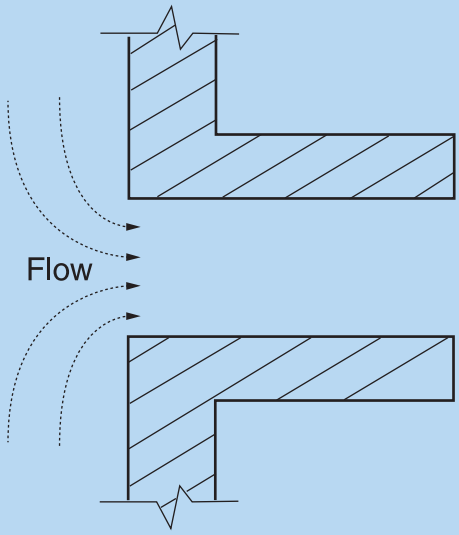


$$L = L(T_2 - T_1) \quad 12$$



$$H = \frac{6fLV^2}{dG}$$





$$C_d = 0.81$$

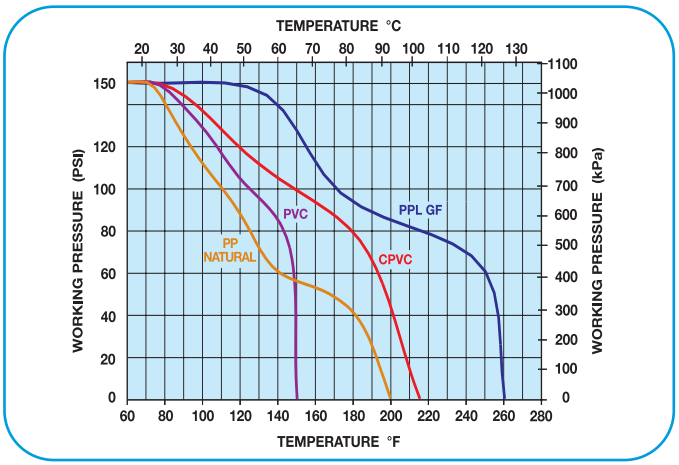
ENGINEERING DATA

Typical Minimum Physical Properties

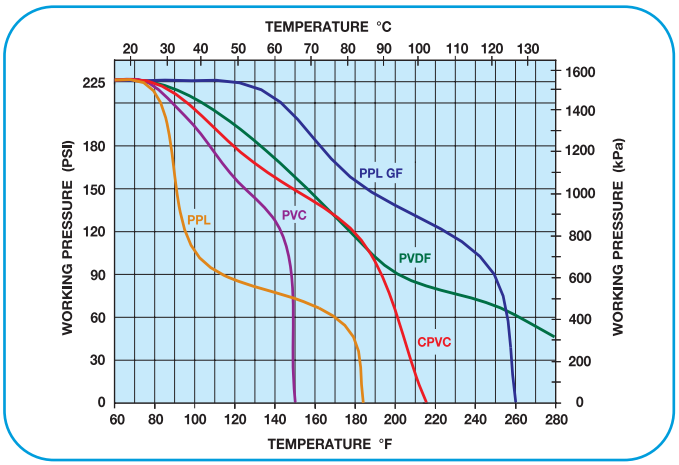
Properties	ASTM Test Method	Polyvinyl Chloride	Chlorinated Polyvinylchloride	Polypropylene Unfilled (Natural)	Polypropylene 30% Glass Filled	PVC 30% Glass Filled	Polyetherimide 40% Glass Filled
Mechanical at 73°F							
Specific Gravity	D792	1.41	1.52	1.33	1.13	1.53	1.61
Tensile Strength, PSI	D638	7000	8230	3650	12500	11500	27000
Modulus Elasticity, PSI	D638	450000	400000	170000	170000	970000	1700000
Compressive Strength, PSI		9000	9000	5500	9500	9500	31800
Flexural Strength, PSI	D790	12930	14990	7000	18200	17900	36000
Izod Notch Impact, ft lb/in	D256	1.5	1.6	1.3	2.0	1.3	2.1
Hardness, Rockwell R	D785	112	117	95	M57	110	M114
Thermal							
Heat Distortion Temperature: 66 PSI 264 PSI		 165 164	 243 214	 225 185	 325 300	 169 167	 420 415
Coefficient of Expansion, in/in/°F		3.1×10^{-5}	3.8×10^{-5}	3.0×10^{-5}	2.1×10^{-5}	1.4×10^{-5}	0.8×10^{-5}
Other Properties							
Water Absorption, % 24 hr	D570	0.05	0.07	0.03	0.02	0.05	0.13
Light Transmission	E308	Opaque	Opaque	Translucent	Opaque	Opaque	Opaque
Light Stability		Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Effect of Sunlight		Slight Darkening	Very Slight	Slight	Slight	Slight	Slight
Color		Dark Gray	Medium Gray	Clear	Black	Light Gray	Black
NSF Approved		Yes	Yes	Yes			

Operating Temperatures/Pressures

For 150 PSI Maximum Rated Products



For 225 PSI Maximum Rated Products



Notes:

1. Working pressure (non-shock) figures are the maximum recommended for the indicated temperatures.
2. It is recommended that the minimum process temperature for Hayward products not fall below 34°F (1°C).

Nomenclature

a	Area (in^2)	G	Gravitational acceleration, 32.2 ft/sec^2	R	Outside radius (in)
A	Area (ft^2)	G_c	Dimension constant, 32.2 lbm ft/(lbf sec^2)	t	Thickness (in)
C	Wave surge constant (PSI sec/ft)	h	Height	T	Temperature (°F)
C_d	Discharge coefficient (dimensionless)	L	Length (ft)	V	Velocity (ft/sec)
C_v	Flow coefficient ($gpm/PSI^{1/2}$)	L_a	Length of expansion loop along run (ft)	$\propto$	Coefficient of thermal expansion (in/in/°F)
d_{orf}	Orifice diameter (in)	L_o	Length of expansion loop offset (ft)	ΔH	Head loss through pipe (ft)
d	Inside diameter (in)	m	Mass density of liquid (lbm/ft^3)	ΔL	Change in length (in)
D	Outside diameter	M	Mass density (lbm/ft^3)	ΔP	Change in pressure (PSI)
e	Poisson's ratio (dimensionless)	P	Pressure (PSI)	Δt	Time duration (sec)
f	Friction factor (dimensionless)	P_{total}	Total line pressure (PSI)	θ	Half angle of conical tank (°)
E	Modulus of elasticity	q	Volume flow rate (in^3/sec)	S_d	Design stress (PSI)
E_w	Modulus of elasticity for liquid (PSI)	Q	Volume flow rate (gpm)	μ	Absolute velocity [lbm/(ft sec)]
E_p	Modulus of elasticity for pipe (PSI)	Re	Reynolds number based on inside diameter of pipe (dimensionless)	*	Used to indicate multiplication
E'	Combined modulus of elasticity of liquid and pipe (PSI)	r	Inside radius (in)		
g	Gravitational acceleration, 386 in/sec^2				

Thermal Effects of Pipe, Valves and Fittings

Temperature effects on plastic piping systems should always be considered when the system is initially designed. As with all piping systems, the pipe changes length with changes in temperature. When a piping system is designed without enough directional changes to compensate for expansion or contraction, the movement can affect the performance of the system valves and, in many cases, generate external loads that can cause damage. Generally the system will have many bends in the pipe, minimizing the effects of temperature changes. Plastic piping should be installed in such a way as to minimize the stress induced by temperature changes by hanging the pipe on rollers or pipe hangers – rather than fixing it in position. With long lengths of straight pipe with expected large temperature changes, either from time of installation or in operating conditions, expansion joints should be considered. When an expansion loop or expansion joint is installed, the pipe should be anchored in such a way as to direct the axial movement into the compensating configuration. The total pipe length change can be calculated from the following:

$$\Delta L = L * (T2 - T1) * \propto * 12$$

Where: ΔL = pipe length change (in)
$\propto$ = coefficient of thermal expansion (in/in/°F), from Table 1
T1 = ambient temperature (°F)
T2 = maximum process temperature
L = length of pipe run (ft)

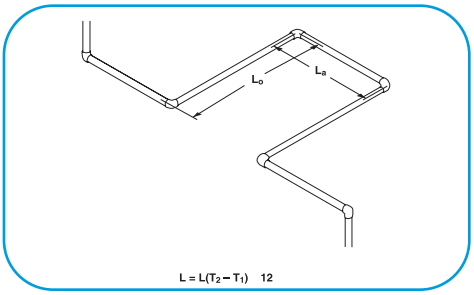


Table 1. Coefficient of Thermal Expansion

Material	PVC	CPVC	PPL
a (in/in/°F)	0.000031	0.000038	0.000021

Example 1

A 200-ft 4-in CPVC straight pipe run is to be constructed. During installation the ambient temperature is 60°F. The anticipated operating temperature for the system is 100°F. The total change in length of the pipe run is:

$$\Delta L = 200 * (100 - 60) * 0.000038 * 12 = 3.6 \text{ in}$$

The length of the offset leg of an expansion loop can be calculated by:

$$L_o = \frac{\sqrt{\frac{3 * E}{S_d}} * D * \Delta L}{12}$$

Where:
L_o = length of offset leg (ft)
D = nominal outside pipe diameter (in)
E = modulus of elasticity at the maximum temperature (PSI)
S_d = design stress of the pipe at design condition (PSI)

Example 2

The design stress for the system is 1,600 PSI and the modulus of elasticity for CPVC is 360,000 PSI. The length of the offset leg required to accommodate expansion during operation is given by:

$$L_o = \frac{\sqrt{\frac{3 * 360{,}000}{1{,}600}} * 4.5 * 3.6}{12} = 8.7 \text{ ft}$$

The length of the expansion loop along the run of the pipe is:

$$L_a = \frac{L_o}{2}$$

Example 3

The length of the expansion loop along the run is:

$$L_a = \frac{8.7}{2} = 4.4 \text{ ft}$$

Water Hammer

A significant, nearly instantaneous pressure shock wave may be generated when a valve opens or closes too quickly, or when a pump starts with an empty discharge line or suddenly shuts down. This phenomenon is the result of the sudden change in velocity of the fluid flow in combination with the characteristics of the piping. This shock wave is manifested by a series of hammerblow-like sounds, called water hammer, which may have sufficient magnitude to cause catastrophic failure within the piping system.

To avoid water hammer conditions, consider the following:

1. Fluid velocities in excess of five feet per second in plastic piping systems increase the hydraulic shock effect resulting from the starting and stopping of pumps and rapid opening and closing of valves. Fluid velocity not exceeding five feet per second is considered safe, and will minimize the effects of water hammer.

2. Install pressure relief valves to dampen the effects of water hammer and relieve excess pressure and flow.

3. Slow-closing actuated valves should be installed to control the speed at which valves open and close. They can be controlled electrically or pneumatically, eliminating the chances of human error.

The pressure rise created by water hammer is added to the nominal actual working pressure of the system.

In order to calculate this pressure rise, it is first necessary to come up with a combined modulus of elasticity for the pipe/liquid system as shown here:

$$E' = \frac{1}{\frac{1}{E_w} + \frac{d}{4\,t\,E_p}\,(5 - 4e)} = 37{,}531 \text{ PSI}$$

Where:
- E' = modulus of elasticity of liquid/pipe combination (PSI)
- d = inside pipe diameter (in)
- e = Poisson's ratio for thermoplastic pipe material, a value within the range from 0.38 to 0.42 may be used
- E_p = modulus of elasticity for pipe (PSI, from Table 2)
- E_w = modulus of elasticity of liquid, water = 300,000 PSI
- t = pipe wall thickness (in)

Table 2 – Modulus of Elasticity at 73°F

Material	PVC	CPVC
Modulus (PSI)	400,000	360,000

Example 1

For a 4″ Schedule 80 PVC pipe (I.D. 3.786″, wall thickness 0.337″), carrying water, the combined modulus of elasticity is calculated at right:

$$E' = \frac{1}{\frac{1}{300{,}000} + \frac{3.786}{4\,(0.337)\,400{,}000}\,[5 - 4\,(.42)]} = 37{,}531 \text{ PSI}$$

The pressure rise due to water hammer is:

$$\Delta P = \frac{V\sqrt{\frac{m}{G_c}E'}}{12}$$

Where:
- ΔP = pressure rise due to water hammer (PSI)
- m = density of liquid, water = 62.4 lbm ft^3)
- G_c = dimensional constant = 32.2 lbm ft/(lbf sec^2)
- E' = modulus of elasticity of liquid/pipe combination (PSI)
- V = velocity reduction causing water hammer (ft/sec)

Example 2

Water is flowing at 250 gpm (6.5 ft/sec) at a line pressure of 40 PSI. If a valve in the line is closed suddenly, the resultant pressure rise is calculated by:

$$\Delta P = \frac{6.5\sqrt{\frac{62.4}{32.2}\,37{,}531}}{12} = 146 \text{ PSI}$$

Total line pressure: $P_{total} = 40 + 146 = 186$ PSI

A 4″ Schedule 80 PVC pipe is rated for 320 PSI at room temperature and is, therefore, acceptable for this application.

Note: Insure that all other system components are rated for this pressure.

For convenience, Table 3 lists "wave surge constants" for common sizes of pipe carrying water at 73°F.

The wave surge constant may be used to quickly calculate pressure rise due to water hammer as illustrated below:

$$\Delta P = VC$$

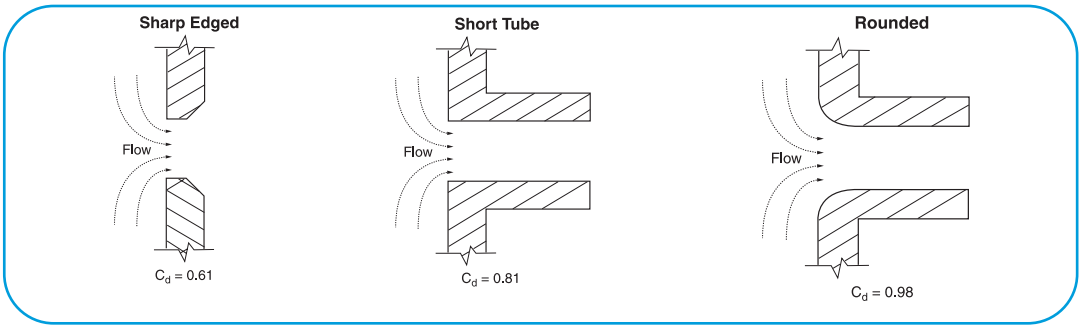
Where:
- P = pressure rise due to water hammer (PSI)
- C = wave surge constant from Table 3
- V = velocity reduction causing water hammer

Table 3 – Wave Surge Constants (for Pipe Carrying Water at 73°F, e = 0.42)

Size	1/2″		3/4″		1″		1-1/2″		2″		3″		4″		6″		8″		10″		12″	
Schedule	40	80	40	80	40	80	40	80	40	80	40	80	40	80	40	80	40	80	40	80	40	80
PVC	30.1	35.4	27.3	32.1	26.8	30.8	22.7	26.9	20.9	25.0	20.3	23.1	18.7	22.5	16.7	20.9	15.7	19.7	15.0	19.2	14.5	19.0
CPVC	28.9	34.1	26.1	30.8	25.2	29.6	21.7	25.7	19.9	23.9	19.4	22.1	17.8	21.4	15.9	19.9	14.9	18.8	14.2	18.3	13.8	18.1

Calculating the Time Required to Empty a Vessel

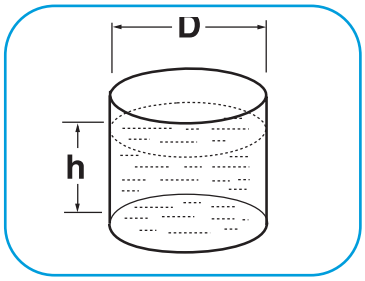
The following formulas are based on turbulent flow of a Newtonian fluid through an outlet (orifice) in a tank. The discharge coefficient C_d depends on the configuration of the outlet. Some typical values for discharge coefficient are shown at right.



Variables:
h elevation of tank
D diameter of tank
A orifice area (ft^2)
G gravitational acceleration = 32.2 ft/sec^2
Δt time required to empty tank (sec)

Vertical Cylindrical Tank

$$\Delta t = \frac{\pi D^2}{C_d A}\sqrt{\frac{h}{8G}}$$



Example 1
A vertical cylindrical tank 12 ft in diameter is fitted with a 2″ Hayward bulkhead fitting (comparable to a short tube outlet). The area of the outlet is:

$$\Delta t = \frac{\pi D^2_{orf}}{4\,(144)} = \frac{\pi\, 2^2}{4\,(144)} = 0.0218\ ft^2$$

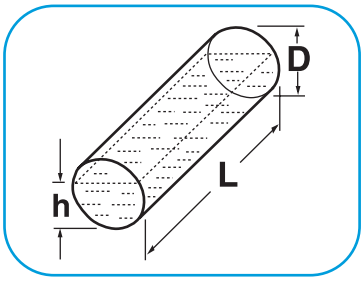
If the tank is filled with water to a height of 20 ft, and we assume turbulent flow, the approximate time to empty the tank is given by:

$$\Delta t = \frac{\pi\, 12^2}{0.81(0.0218)}\sqrt{\frac{20}{8\,(32.2)}} = 7{,}139\ sec$$

The tank should be empty in about 2 hours.

Horizontal Cylindrical Tank

$$\Delta t = \frac{L\{D^{3/2} - (D-h)^{3/2}\}}{3\,C_d A}\sqrt{\frac{8}{G}}$$



Example 2
A 7 ft diameter by 9 ft long horizontal cylindrical tank has a 4″ diameter sharp edged orifice outlet. The area of the outlet is:

$$\Delta t = \frac{\pi D^2_{orf}}{4\,(144)} = \frac{\pi\, 4^2}{4\,(144)} = 0.0873\ ft^2$$

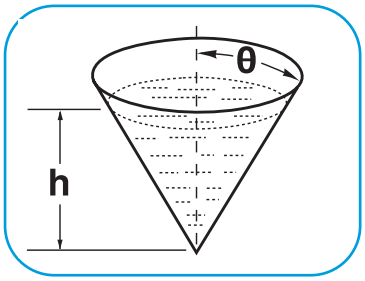
If the tank is filled with water to a height of 5 ft, and we assume turbulent flow, the approximate time to empty the tank is given by:

$$\Delta t = \frac{9\{7^{3/2} - (7-5)^{3/2}\}}{3\,(0.61)\ 0.0873}\sqrt{\frac{8}{(32.2)}} = 440\ sec$$

The tank should be empty in about 7 minutes.

Conical Tank

$$\Delta t = \frac{\pi h^{5/2}\tan^2\theta}{5\,C_d A}\sqrt{\frac{8}{G}}$$



Example 1
A conical tank with a taper angle of 25° is fitted with a 2″ diameter short tube type outlet. The area of the outlet is:

$$\Delta t = \frac{\pi D^2_{orf}}{4\,(144)} = \frac{\pi\, 2^2}{4\,(144)} = 0.0218\ ft^2$$

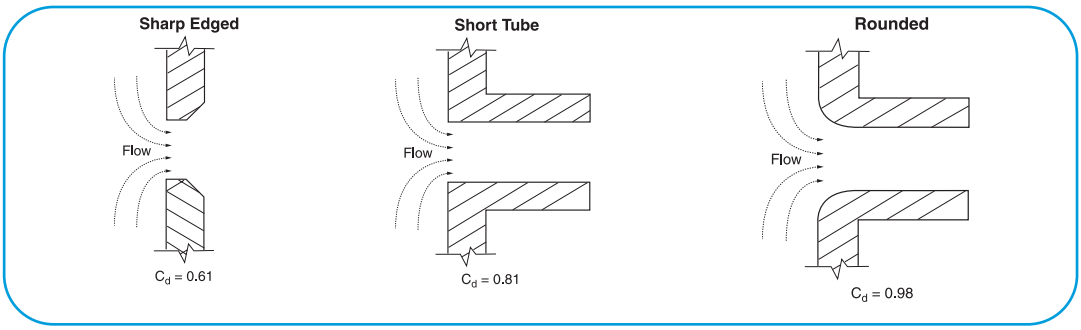
If the tank is filled with water to a height of 28 ft, and we assume turbulent flow, the appriximate time to empty the tank is given by:

$$\Delta t = \frac{\pi\,(28^{5/2})\tan^2 25°}{5\,(0.81)\,0.0128}\sqrt{\frac{2}{32.2}} = 8{,}000\ sec$$

The tank should be empty in about 2-1/4 hours.

Formulas for Calculating Flow Rate from a Vessel

The following formulas are for calculating the rate at which a fluid will flow from a tank when the fluid level is maintained constant (h is constant). The discharge coefficient C_d depends on the configuration of the outlet. Some typical values for discharge coefficient are shown below.

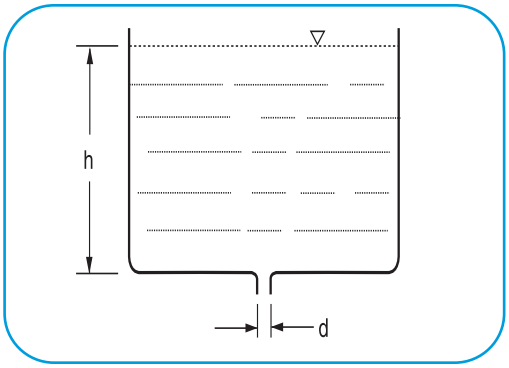


Variables:

h	fluid elevation above outler (in)	g	gravitational acceleration = 386 in/sec^2
d	diameter of orifice (in)	q	volume flow rate of fluid through opening (in^3/sec)
a	orifice area (in^2)	C_d	Discharge coefficient

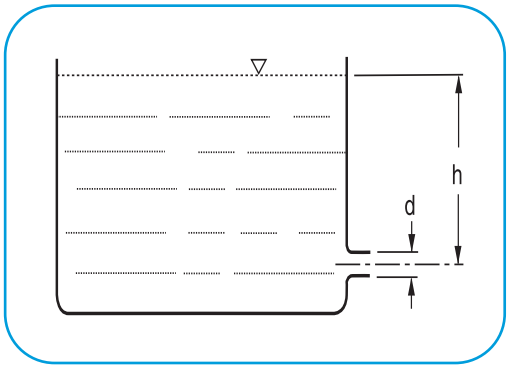
Bottom Opening

$q = C_d (a) \sqrt{2gh}$



Side Opening

$q = C_d (a) \sqrt{2gh}$



Example 1

An open tank is continuously fed with water such that the height from the water surface to the outlet is maintained at 60˝. The outlet has a 1˝ diameter bulkhead fitting (comparable to a short tube outlet). The outlet area is calculated by:

$$a = \frac{\pi d^2}{4} = \frac{\pi (1^2)}{4} = 0.7854 \text{ in}^2$$

The flow of water through the outlet is given by:

$$q = 0.81\ (0.7854) \sqrt{2\ (386)\ 60} = 137 \text{ in}^3/\text{sec}$$

This flow rate is equivalent ot about 36 gpm.

Material Description

PVC (Polyvinyl Chloride)

Type 1, Grade 1 PVC is the most frequently specified of all plastic valve materials. It has been successfully used for over 30 years in such areas as chemical processing, industrial plating, chilled water, deionized water lines, chemical drainage, DWV piping and irrigation systems. PVC is generally inert to most mineral acids, bases, salts and paraffinic hydrocarbon solutions. PVC is not recommended for use with chlorinated or aromatic hydrocarbons, esters, or ketones. PVC possesses excellent fire performance properties. In particular, it will not burn once the source of heat or flame is removed. PVC has excellent weatherability. The PVC used in Hayward products conforms to ASTM D-1784. The maximum recommended working temperature of PVC is 140°F. PVC products can be installed using solvent cement, threaded or flanged end connections.

Corzan® CPVC (Chlorinated Polyvinyl Chloride)

Corzan CPVC is generally inert to most mineral acids, bases, salts and paraffinic hydrocarbon solutions. Corzan CPVC is not recommended for use with chlorinated or aromatic hydrocarbons, esters or ketones. The Corzan CPVC used in Hayward products conforms to ASTM D-1784-23447B. The maximum working temperature for Hayward products made of Corzan CPVC is 190°F at 60 PSI. It has been proven an excellent material for hot corrosive liquids and hot and cold water distribution. Corzan CPVC products can be installed using solvent cement, threaded or flanged end connections.

Glass Fiber-Reinforced PPL (Polypropylene)

Polypropylene (PPL) is a lightweight material with generally high resistance to chemical attack. The glass fiber-reinforced PPL has the highest long-term temperature resistance of any material furnished by Hayward Industrial Products. It has been used successfully for years in such areas as chemical processing, industrial plating, chilled water, deionized water lines, chemical drainage, DWV piping and irrigation systems. PPL is generally inert to most mineral acids, bases, salts and hydrocarbon solutions. The PPL used in Hayward products conforms to ASTM D-4101. The maximum recommended working temperature of PPL is 250°F. PPL products can be installed using threaded or flanged end connections.

EPDM

Ethylene Propylene Diene Monomer rubber is an elastomer prepared from ethylene and propylene compounds. EPDM has been used continuously to a temperature of 300°F. EPDM is recommended for water, steam, dilute acids, dilute alkalis and alcohols. EPDM is not recommended for petroleum oils or di-ester lubricants.

FPM or FKM (Fluorocarbon Rubber)

The fluorocarbon elastomers have a maximum service temperature of 400°F. Fluorocarbon materials are recommended for petroleum oils, di-ester base lubricants, silicate fluids and greases, halogenated hydrocarbons, acids and vacuum environments. Fluorocarbon materials are not recommended for ketones, amines, anhydrous ammonia, hot hydrofluoric or chlorosulfonic acids.

Nitrile or Buna N

Nitrile, chemically, is a copolymer of butadiene and acrylonitrile. Nitrile maximum service temperature is 275°F. Nitrile is recommended for petroleum oils and fluids, cold water, silicone greases and oils, di-ester base lubricants and ethylene glycol base fluids. Nitrile is not recommended for halogenated hydrocarbons, nitro hydrocarbons, phosphate ester hydraulic fluids, ketones, strong acids, ozone and automotive brake fluid.

Teflon®

Polytetrafluoroethylene (PTFE) is chemically stable and virtually unaffected by chemicals, acids, bases and solvents. PTFE has a maximum service temperature of 500°F. PTFE is used as a seat material in several lines of Hayward valves due to its low coefficient of friction and chemical stability.

EASTAR®

Eastar is a clear polyester thermoplastic compound having excellent impact strength, chemical resistance, and high clarity. It is used in a variety of applications such as chemical processing and ultra-pure industries.

PVDF

Polyvinylidene Fluoride is a thermoplastic polymer with excellent corrosion, chemical, and abrasion resistance. It has a good mechanical and thermal stability with a maximum operating temperature of 300°F. PVDF has a high impact resistance and excellent UV resistance. It is used in applications of high purity, and chemical processing.

ETFE

Ethylene Tetrafluoroethylene is a fluorocarbon based polymer. It has a very good resistance to solvents and chemicals as well as outdoor weathering. ETFE has a maximum service temperature of 300°F. It is widely used in the electronics, chemical processing, and laboratory testing equipment industries.

Flow Coefficient Cv

Extensive experimentation has shown that, in general, for a given flow passage and completely turbulent flow the relationship between fluid flow rate and pressure drop follows a power law.

Variable: ΔP = Pressure drop across flow passage (PSI)
Q = Volume flow rate of fluid through passage (gpm)
Cv = Flow coefficient [$gpm/PSI^{1/2}$]

The flow coefficient Cv is the necessary proportionality constant, and it is typically determined experimentally. Usually, flow coefficient is expressed as the flow rate in gpm for a pressure drop of 1 PSI across a flow passage. By definition:

$$Cv = Q\sqrt{\frac{1}{\Delta P}}$$

A standardized test procedure for finding Cv factors is presented in ISA S75.02. A form of the equation is:

$$\Delta P = \left[\frac{Q}{Cv}\right]^2$$

Example 1:
A Hayward 1/2″ True Union Ball Valve has an experimentally-determined Cv rating of 8 for water. It is required to flow 20 gpm of water through this valve. The anticipated pressure drop across this valve may be calculated as follows:

$$\Delta P = \left[\frac{20}{8}\right]^2 = 6.3 \text{ PSI}$$

Example 2:
If a 0.5 PSI pressure drop has been allotted for a Hayward 4″ True Union Ball Valve, the associated flow rate may be calculated by:

$$Q = Cv\sqrt{\Delta P}$$

A Hayward 4″ True Union Ball Valve has an experimentally-determined Cv rating of 600 for water. The approximate flow rate at a 0.5 PSI pressure drop is calculated by:

$$Q = 600\sqrt{0.5} = 420 \text{ gpm}$$

Conversion Factors

Liquid Measure and Weight

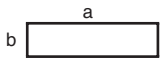
To Obtain Multiply By	U.S. Gallon	Imperial Gallon	U.S. Pound Water	U.S. Cubic Foot	U.S. Cubic Inch	Liter	Cubic Meter
U.S. Gallon	1	0.8327	8.337	0.13368	231.0	3.785	0.003785
Imperial Gallon	1.2009	1	10.0	0.16054	277.78	4.546	0.004546
U.S. Pound Water	0.11995	0.1	1	0.016035	27.708	0.45404	0.000454
U.S. Cubic Foot	7.4805	6.2288	62.365	1	1728.0	28.316	0.028314
U.S. Cubic Inch	0.004329	0.00360	0.3609	0.000578	1	0.016387	0.0000164
Liter	0.26418	0.21997	2.202	0.035315	61.025	1	0.0010
Cubic Meter	264.2	219.99	2202.6	35.3183	61030.0	999.97	1

Pressure and Head

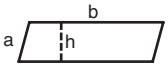
To Obtain Multiply By	lb/sq in	lb/sq ft	atmo-sphere	kg/sq cm	inch water	foot water	inch mercury	mm mercury	bar
lb/sq in	1	144.0	0.068046	0.070307	27.7276	2.3106	2.0360	51.7150	0.06895
lb/sq ft	0.006945	1	0.000473	0.000488	0.1926	0.01605	0.014139	0.35913	0.000479
atmosphere	14.696	2116.22	1	1.0332	407.484	33.9570	29.921	760.0	1.01325
kg/sq cm	14.2233	2048.16	0.96784	1	394.27	32.864	28.959	735.558	0.9807
in water	0.03607	5.194	0.002454	0.00254	1	0.08333	0.0734	1.865	0.00249
ft water	0.43278	62.3205	0.029449	0.03043	12.0	1	0.8811	22.381	0.02984
in mercury	0.49115	70.726	0.033421	0.03453	13.617	1.1349	1	25.40	0.03386
mm mercury	0.019337	2.7845	0.0013158	0.0013595	0.5361	0.04468	0.03937	1	0.001333
bar	14.5038	2088.55	0.98692	1.0197	402.1	33.51	29.53	750.0	1

Area and Volume Formulas

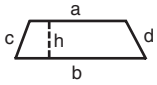
A = Area, S = Surface Area of Solid, V = Volume, C = Circumference, R = Radius of Circumscribed Circle



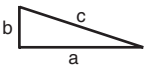
Rectangle
$A = ab$
$C = 2\,(a + b)$



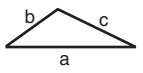
Parallelogram
$A = bh$
$C = 2\,(a + b)$



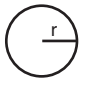
Trapezoid
$A = 0.5\,(a + b)\,h$
$C = a + b + c + d$



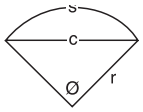
Right Triangle
$A = 0.5\,ab$
$R = 0.5\,c$



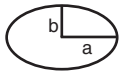
General Triangle
$A = \sqrt{s\,(s-a)\,(s-b)\,(s-c)}$
$R = abc/(0.25A)$



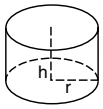
Circle
$A = 3.142\,r^2$
$C = 6.283\,r$



Sector of Circle
$S = r\,Ø$
$C = 2\,r \sin(Ø/2)$
A (sector) $= 0.5\,r\,s$
A (segment) $= 0.5\,r^2(Ø - \sin Ø)$



Ellipse
$A = 3.142ab$
$C = 6.284\sqrt{[a(a+b)b]/2}$



Cylinder
$C = 3.142\,r^2h$
$S = 6.284\,rh$

Cone
$V = 1.047\,r^2h$
$S = 3.142\,r\sqrt{r(r+h)\,h}$

Sphere
$A = 4.189\,r^3$
$S = 12.57\,r^2$

Frustrum of Right Circular Cone
$V = 1.047h\,[a\,(a + b)(b + a)\,b]$
$S = 3.142(a + b)\sqrt{(a - b)}$

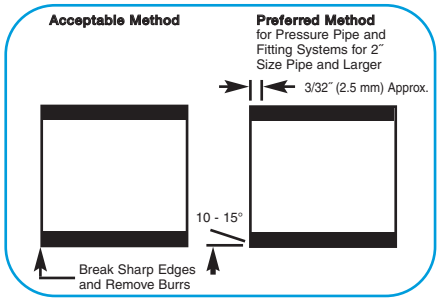
Installation Instructions

Hayward valves can be installed in a piping system by a solvent cement, threaded or flanged connection. All three connections have specific requirements that must be followed in order to maintain joint integrity and a leak-free system. We have detailed the necessary steps for solvent cementing, threading and flanging pipe to a Hayward valve. These procedures are the only way to install Hayward valves in a piping system – and performed properly, will provide years of trouble-free service.

Solvent Cementing (PVC, CPVC)

Preparation:

Begin by cutting the end of the pipe square. Use a hand saw and a miter box, or a circular cut-off saw. Use a fine-toothed blade (16 -18 teeth per inch) and little or no set (maximum 0.0025˝). With a circular saw, a cutting speed of 6,000 rpm is recommended. Plastic cutters may also be used, however, they tend to produce a raised ridge at the end of the pipe. This



must be removed with a file or a chamfering tool, as it will wipe the cement away when the pipe is inserted into the valve socket.

Remove all burrs from both the inside and outside of the pipe with a knife, file or chamfering tool. The pipe ends should be beveled 10°-15°, within 3/32 in from the edge of the pipe.

With a clean cloth, remove all dirt, grease and moisture from the surface of the pipe and valve end connector. Dirt, grease or moisture can prevent adhesion and create a joint failure. (It is not recommended to solvent cement in the rain.)

Priming:

Primer penetrates and softens the surfaces of both pipe and end connector so that the solvent cement can adhere well to both surfaces.

Using a dauber or a clean natural bristle or nylon brush (about 1/2 the size of the pipe diameter), apply with a scrubbing motion a liberal coating of primer to the end connector socket, keeping the surface and applicator wet until the surface has been softened. This will take between 5-15 seconds depending on the weather conditions. Avoid puddles of primer in the end connector. Now apply the primer to the pipe O.D. equal to or slightly greater than the depth of the fitting.

A second application of primer to the end connection and pipe is recommended. Check the penetration of the primer by confirming that the surface has softened. Immediately following the second primer application, apply solvent cement as follows:

Solvent Cementing:

Notes:

1. It is good practice to disassemble the socket end connectors from a true union valve while priming and cementing. Remove assembly nuts and end connectors from valve body. Slide assembly nut, with threads facing valve, onto pipe to which the end connector is to be cemented. Reinstall the valve body only after the joint has cured.

2. When solvent cementing non-true union valves, it is important to place all valves in the open position to evacuate the primer and cement vapor. Solvent cement and primer vapor can attack the valve's sealing area and must be exhausted from the piping system.

3. PVC cement should not be used with CPVC products.

Using a new applicator, apply an even layer of cement on the pipe O.D. for a distance equal to or greater than the depth of the end connector socket.

Next, apply a coat of cement to the inside of the end connector using a straight outward stroke to keep excess cement out of the socket.

A second coating of cement on the pipe is recommended so there is more than a sufficient amount of cement to fill any gap in the joint.

While both surfaces are still wet with solvent cement, insert the pipe into the end connector with a quarter-turn twisting motion. The pipe must be inserted fully to the end connector. Hold the pipe and end connector together for a short time (approximately 30 seconds) to assure that the hydraulic effects of the assembly do not cause the pipe and end connector to separate.

After assembly, the joint should have a bead of cement completely around the juncture. If voids in the bead are present, sufficient cement was not applied and the joint may be defective. Using a cloth, wipe clean all excess cement including the bead. Handle newly assembled joints carefully and allow proper set time before disturbing the joints. Recommended set time is related to the temperature as follows (see Table 1.)

Allow the joint to cure for an adequate time before pressure testing (see Table 2.)

Table 1. Recommended Set Time

Temperature Range	Pipe Sizes			
	1/2˝ to 1-1/4˝	1-1/2˝ to 3˝	4˝ to 8˝	10˝ to 20˝
60° to 100°F (15° to 40°C)	15 min	30 min	1 hr	2 hr
40° to 60°F (5° to 15°C)	1 hr	2 hr	4 hr	8 hr
0° to 40°F (-20° to 5°C)	3 hr	6 hr	12 hr	24 hr

Installation Instructions (Cont'd)

Joint Cure Schedule

The following cure schedules may be used to determine the necessary time required after assembly before testing the system or before line pressure can be applied.

Table 2. Cure Time

Relative Humidity 60% or Less	Pipe Sizes							
	1/2″ to 1-1/4″		1-1/2″ to 3″		3-1/2″ to 8″		10″ to 14″	16″ to 24″
Temperature Range During Assembly and Cure Periods	Up to 180 PSI	Above 180 to 370 PSI	Up to 180 PSI	Above 180 to 315 PSI	Up to 180 PSI	Above 180 to 315 PSI	Up to 180 PSI	Up to 100 PSI
60° to 100°F (15° to 40°C)	1 hr	6 hr	2 hr	12 hr	6 hr	24 hr	24 hr	48 - 72 hr
40° to 60°F (5° to 15°C)	2 hr	12 hr	4 hr	24 hr	12 hr	48 hr	72 hr	5 days
0° to 40°F (20° to 5°C)	8 hr	48 hr	16 hr	96 hr	48 hr	8 days	8 days	10 - 14 days

Threading

Hayward threaded valves have NPT (American standard) tapered pipe threads that are molded or cut to the dimensions and tolerances for tapered pipe threads consistent with ANSI B1.20.1 standards.

When installing threaded plastic pipe into Hayward valves, it is important to use a thread sealant such as Teflon tape. Do not use oil-based joint compound or Teflon paste. They may contain substances that could cause stress cracking of the plastic.

Facing the threaded end of the pipe, begin wrapping the tape in a clockwise direction, starting with the second thread nearest the end of the pipe. Overlap each wrap by one-half the width of the Teflon tape. Pipe sizes 2″ and larger may benefit with two wraps due to the greater depth of the thread.

Carefully screw the end connectors onto the end of the pipe and hand tighten. Using a strap wrench only (never use a Stilson type wrench or “channel lock” type plier), tighten the end connector 1 to 1-1/2 turns beyond hand tight. Avoid distorting or cracking the end connector by over-tightening.

Flange Joints

Hayward valves with flanged end connectors are recommended for applications where frequent dismantling is required, or when the system piping is other than plastic (steel, fiberglass, metal-lined pipe, etc...). All Hayward flanged valves have flanges with a bolt hole pattern that meets ANSI 150 lb dimensions.

Elastomeric gaskets between the flanges must be used and should be a minimum 1/8″ thick full face gasket with a hardness between 50 to 70 durometers. Bolts, nuts and washers should be well lubricated.

Begin making the flanged joint by making sure that the bolt holes of the mating pipe flanges line up. Insert the bolts and make certain that the distance between the flanges is not excessive prior to bolting down the flanges. Using a torque wrench, tighten each bolt in sequence as detailed in the flange bolt tightening sketch.

Tighten the bolts to the recommended torque values as listed in Table 3.

The following tightening pattern is suggested for the flange

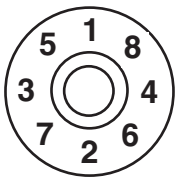


Table 3. Recommended Bolt Torque

Flange Size	Recommended Torque
1/2″ to 1-1/2″	10 - 15 ft-lb
2″ to 4″	15 - 25 ft-lb
6″ to 8″	25 - 45 ft-lb
10″	53 - 75 ft-lb
12″	80 - 110 ft-lb

Engineering Terminology

Abrasion Resistance: Ability to withstand the repeated action of rubbing, scratching, wearing, etc.

Adhesive: A substance capable of holding two or more objects together by attaching to their surfaces.

Aging: The effect of exposing plastic to a specific environment for an extended period of time.

Anneal: A procedure for preventing or removing stresses within a material through the use of controlled heating and subsequent cooling of the material.

Bond: To attach two or more objects by means of an adhesive.

Burst Strength: The hydraulic pressure required to cause a pipe; fitting or vessel to fail. This value is typically dependent on the rate at which the pressure is applied as well as the pressure duration.

Calendaring: A process by which sheet material (esp. rubber or plastic) is passed between sets of rollers to produce a specific thickness or finish. In certain applications this process may be used to combine two or more dissimilar sheet materials (e.g. cloth & rubber) to produce a single multilayered sheet.

Cement: Any of a variety of solutions commonly used in the plastics industry for bonding objects. The solution either dissolves or softens the common surfaces of the objects such that they may be fused together.

Chemical Resistance: The degree to which a given plastic will resist degradation due to contact with certain chemicals. This characteristic will usually vary with chemical concentration and temperature.

Cold Flow: The deformation of a material attributed to forces or pressures acting at ambient temperatures.

Complete Turbulent Flow: Pipe fluid flow characterized by a constant friction factor for increasing Reynolds Number.

Compression Set: Unrecoverable deformation (strain) that remains in a material after compressive loading has been removed.

Creep: The elongation a material undergoes when subjected to a force or pressure loading. This elongation is in addition to the initial elastic elongation and will increase over time provided the loading is maintained.

Critical Flow: Fluid flow characterized by a Reynolds Number typically between 2000 and 4000. Flow in this region is neither laminar nor turbulent.

Deflection Temperature: The temperature at which a plastic structure will deflect a specific distance for a given loading. Standardized conditions for this test may be found in ASTM D-648.

Delamination: Separation in the layers of material.

Degradation: A deleterious change in the chemical composition, appearance, physical or mechanical properties of a Plastic.

Density: The mass per unit volume of a substance. For solids and liquids, typically, temperature would also be provided with density. For gasses, both temperature and pressure should be given with the density.

Dimensional Stability: The ability of a part to retain its size and proportion over time.

Durometer: A numerical scale for measuring the hardness of rubber or plastic based on the depth of penetration of an indenter point on the surface of a test specimen.

Elasticity: The property that describes the tendency of a plastic material to return to its original dimensions after undergoing a deformation.

Elastomer: A material that exhibits almost complete recovery to its original size after undergoing dramatic strain levels (as high as 100% and sometimes more).

Environmental Stress Cracking: The tendency of a material to craze and or crack due to the combination of residual or applied stress in the material, and chemical, thermal, or electromagnetic environments.

Filler: A substance added to plastic to alter its properties.

Friction Factor: A quantity that relates the head loss to the fluid velocity for a fluid flowing through a specific diameter and length of pipe.

Fuse: To join two or more plastic parts by the action of heat or solvents.

Full Port Valve: A valve in which the resistance to flow, in the fully open position, is comparable to the equivalent length of pipe.

Gasket: A device installed within the gap of a joint for the purpose of retaining a fluid.

Head: A unit of measure representing the relative energy of a flowing fluid. Commonly recorded in “feet” of fluid, it provides a convenient means of combining the pressure, velocity and elevation energy portions of a flowing fluid.

Head Loss: Energy loss in a fluid as it passes through a flow passage. The loss is due to friction between fluid particles and can be expressed as a linear change in the height of a column of fluid.

Hoop Stress: The circumferential stress in a cylindrical shell due to internal or external pressure.

Hot Stamp: Process for marking plastic by applying roll leaf to the surface through the use of hot metal dies.

Impact Strength: The degree to which a plastic will withstand the sudden application of a load.

Impermeable: Describes a material that prevents the passage of a substance into or through it.

Laminate: Object composed of two or more sheets or shells of material unitized by means of a bonding agent.

Laminar Flow: Fluid flow characterized by a Reynolds Number typically less than 2000.

Light Stability: Degree to which a plastic will resist degradation due to light exposure (esp. ultraviolet).

Modulus of Elasticity: The ratio of applied stress to the associated strain developed within a material that has been elastically deformed.

Newtonian Fluid: A fluid for which the ratio of the shear stress to the shear rate is equivalent to the absolute viscosity.

Nozzle: A fluid flow passage characterized by a rapid transition from a large cross sectional area to a small cross sectional area.

Operating Pressure Range: The range of pressures for which the component will perform normally.

Plastic Deformation: Unrecoverable deformation due to stresses beyond the yield strength of the material.

Poise: Unit of measure for absolute viscosity with dimensions of gram per centimeter per second. A one poise fluid would require a force of one dyne to move a one square centimeter layer at a velocity of one centimeter per second relative to a second parallel layer one centimeter away.

Porosity: The presence of voids within an object.

Pressure Drop: Energy loss in a fluid as it passes through a flow passage. The loss is due to friction between fluid particles and can be measured as a decrease in pressure in the direction of flow.

Relative Roughness: The ratio between the experimentally determined roughness to the pipe I.D.

Reynolds Number: A dimensionless ratio of inertial to viscous forces for a fluid flowing through a conduit.

Roughness: An experimentally determined length that characterizes the degree to which the surface finish of a pipe tends to resist the motion of a fluid.

Rubber: Polymers that can endure dramatic strain levels and still be able to return to their original form.

Engineering Terminology (Cont'd)

Solvent: A substance that is capable of dissolving another material.

Schedule: A system of pipe sizes that provides for standardized outside diameters and wall thicknesses.

Specific Gravity: The ratio of the weight density of a substance (solid or liquid) at a specific temperature and the weight density of water at 600°F. For solids and liquids the effect of pressure on the weight density of a substance is typically negligible, however, temperature usually has a more significant effect.

Spring Rate: The force per unit deflection for a given object (esp. a spring).

Stress: The internal force per unit area that resists deformation due to applied external forces.

Stress Crack: Cracks that form on the inside or outside of an object and are attributable to tensile stresses below the short term mechanical strength of the material.

Strain: The ratio of the change in dimension of an object, due to external loading and the original undeformed dimension.

Thermoplastic: Material which when heated becomes sufficiently pliable that it can be formed into a variety of shapes and then quickly hardened by cooling.

Transitional Flow: Fluid flow region between critical flow and complete turbulent flow.

Turbulent Flow: Fluid flow region that encompasses transitional flow and complete turbulent flow. Typically it begins at a Reynolds Number greater than 4000.

Venturi: A fluid flow passage characterized by smooth transitions from a large cross sectional area to a small cross sectional area, and back to a large cross sectional area.

Virgin Material: Plastic material that has not undergone any processing other than that required to prepare it for manufacturing parts.

Viscosity: The Property of a fluid that describes its resistance to flow. It is due to shear stresses that result from friction between fluid particles.

Water Hammer: A Phenomenon whereby a pressure shock wave is generated, due to a sudden change in fluid velocity within a piping system. The resulting pressure pulses can be significantly higher than the nominal working pressure of the system.

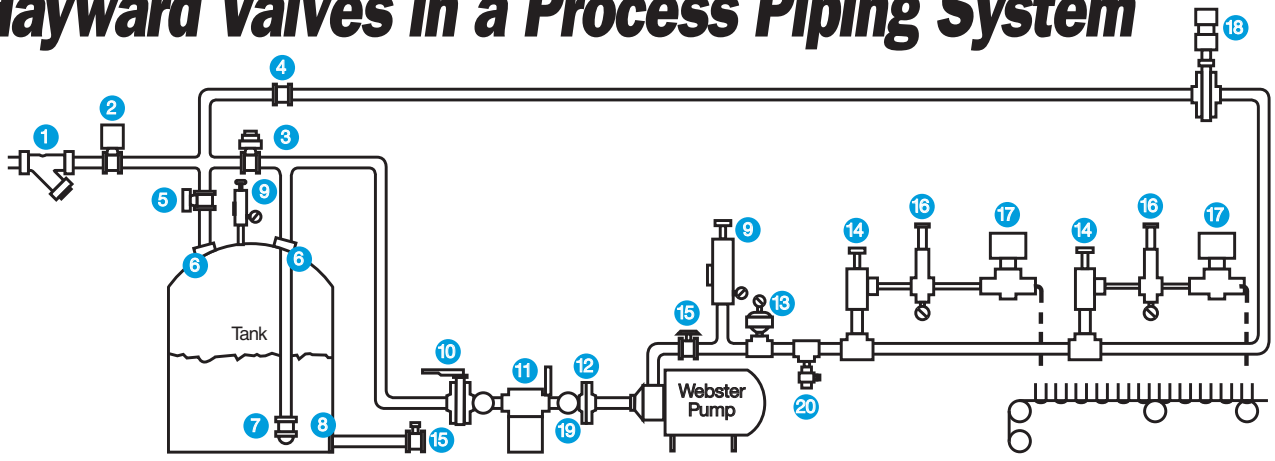
Weeping: A very low leakage rate evidenced by the appearance of fluid at a pipe joint or fitting.

Weight Density: The weight per unit volume of a substance. For solids and liquids, typically, temperature would also be provided with density. For gasses, both temperature and pressure should be given with the density.

Abbreviations

ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
BS	British Standards Institute
CPVC	Chlorinated Polyvinyl Chloride
CRN	Canadian Registration Number
CSA	Canadian Standards Association
DPDT	Double Pole, Double Throw
EPDM	Ethylene propylene diene monomer
ETFE	Ethylene-Tetrafluoroethylene
FM	Factory Mutual
FPM	Fluoro Polymer
GPM	gallons per minute
GFPPL	Glass Filled Polypropylene
IAPMO	International Association of Plumbing & Mechanical Officials
I/P	Instrument signal to pressure
ISO	International Standards Organization
LED	Light Emitting Diode
NEMA	National Electrical Manufacturers Association
NPT	American National Standard Taper Pipe Thread
NSF	National Sanitation Foundation
PPL	Polypropylene
PSI	Pounds per square inch
PSIG	Pounds per square inch gauge pressure
PTFE	Polytetrafluoroethylene
PVC	Polyvinyl chloride
PVDF	Polyvinylidene fluoride
SPDT	Single Pole, Double Throw
SPST	Single Pole Single Throw
UL	Underwriters Laboratories, Inc.

Hayward Valves in a Process Piping System



1. Y-Strainer
2. Electrically Actuated Ball Valve
3. True Union Ball Valve With Pneumatic Actuator, Fail Safe Close Spring and 3-Way Solenoid Valve
4. True Check Valve
5. True Union Ball Valve with Pneumatic Actuator and 4-Way Solenoid Valve
6. Self-Aligning Bulkhead Fitting
7. True Check Foot Valve
8. Safe-T-Loc Bulkhead Fitting
9. Pressure Relief Valve
10. Lever Actuated Butterfly Valve Design
11. Duplex Basket Strainer
12. Ready Flange
13. Gauge Guard with Gauge Installed
14. Angle Valve – Controls Flow
15. True Union Ball Valve
16. Pressure Regulator – Controls Downstream Pressure
17. Solenoid Valve – Instant On/Off Actuated Valve
18. Butterfly Valve with Pneumatic Actuator, Fail Open Spring, Pneumatic Positioner and Limit Switches
19. 3-Way Ball Valve
20. Universal StopCock Sampling Valve

The drawing above shows a chemical process system utilizing Hayward Plastic Valves and Process Control Products. The function of each component of the system is detailed below.

Product 1 is a Hayward Y-Strainer. Very common to piping systems is the problem of unwanted materials. Dirt, foreign matter, or even clumps of product itself can clog pumps, spray nozzles, flow meters and other process equipment. Our plastic piping system is no exception.

Hayward Y-Strainers solve this problem. The Y-Strainer screen's open area is at least twice that of the pipe size. Y-Strainers are ideal for applications where the amount of material to be collected is small and the necessity for cleaning is infrequent.

Valves 2, 3 and 5 are True Union Ball Valves automated by an electric actuator, a fail-safe pneumatic actuator with limit switches, and a double acting pneumatic actuator. As shown, these valves are above the tank and are inaccessible. The actuators allow us to cycle the valves from a remote location and link the sequencing to a PC. This eliminates the risk of human error. The electric actuator, Valve 2 has an all-plastic actuator which is in a Nema 4 enclosure. This ensures water-tight sealing and tough corrosion resistance. It is also pre-wired for auxiliary limit switches or lights.

The fail safe pneumatic actuator with limit switches, **Valve 3**, is made of plastic, too. It opens the valve with 80 PSI air pressure when the solenoid is energized, and the valve is closed by the spring return, when de-energized. The limit switch sends an output signal to operate other electrical devices such as pumps, solenoids, or indicating lights.

Valve 4 is a True Union Ball Check Valve. This valve prevents the reversal of flow in a piping system.

Valve 5 uses a double-acting pneumatic actuator which is also made of plastic. This actuator opens and closes the valve utilizing a four-way solenoid at 80 PSI air pressure.

Product 6 is a Self-Aligning Bulkhead Fitting. It is a unique type of bulkhead fitting that permits straight piping connections to be made to the top of domed tanks or other curved surfaces. The swivel action of the internal ball compensates for the curvature of the tank surface.

Valve 7 is a True Check Foot Valve. It is a specialized type of ball check valve that prevents loss of pump prime. A perforated screen on the end of the valve keeps debris on the tank bottom from entering the piping system.

Product 8 is a Safe-T-Loc Bulkhead Fitting. This allows piping connections to be made to the tank. A hole is cut in the tank into which the fitting body is inserted. A locknut threads over the body to hold it in place.

Valve 9 is a Pressure Relief Valve. This valve protects piping system components from damage due to over-pressurization. The valve works by sensing system pressure. When the system pressure exceeds the set pressure, the force of the excess pressure moves the valve piston off its seat just enough to release only the excess pressure.

Valve 10 is a Lever-Actuated Butterfly Valve (Lug Design). This product is used for on/off or modulating applications. The lug design allows for disconnection of the downstream piping while the upstream side is still pressurized.

Product 11 is a Duplex Basket Strainer. It removes debris from the process media that can damage pumps or other system components. The Duplex Strainer operates continuously; the line never has to be shut down for basket cleaning. Compared to the Y-Strainer, it has a minimum 6:1 ratio open area through the strainer basket to the corresponding cross-sectional pipe area.

Product 12 is a Ready Flange–a one-piece pipe flange with an integrally molded nipple. This makes for one less solvent weld joint connection in the piping system.

Product 13 is a Gauge Guard. This product isolates and protects gauges from the corrosive process media in the piping system.

Product 14 is an Angle Valve. It is used for throttling and changing flow directions. It is compact and able to fit into tight locations.

Valve 15 is a True Union Ball Valve. This is used for on/off operation. The valve is full ported so pressure loss is minimal. The True Union design allows for easy removal.

Product 16 is a Pressure Regulator. It insures that the downstream pressure does not exceed the regulator set pressure. The regulator operates by sensing downstream pressure through a pressure orifice. The valve is fully open when no downstream pressure is sensed. As downstream pressure builds, the regulator spring is compressed, gradually moving the piston up and closing the regulator. When the downstream pressure equals the set pressure, the regulator closes completely–preventing any further pressure increase.

Valve 17 is a Solenoid Valve. It is designed for Process systems that require an instant on/off actuated valve. The valve provides bubble-tight shutoff in the event of electrical failure. Simple and efficient, the unique piston/solenoid module and true union design allow the valve body to be removed for service without disconnecting any piping or electrical connections.

Valve 18 is a Butterfly Valve with Pneumatic Actuator Fail Open Spring, Pneumatic Positioners and Limit Switches. It is used for flow modulation. The positioner unit opens and closes the valve proportionally in response to a 3-15 PSI control air signal. In the event of electrical failure the valve will open completely.

Valve 19 is a Three-Way Ball Valve. It simplifies the design of the piping system. One three-way valve replaces two ball valves and a tee fitting. It allows the flow to go left, right, or be shut off with just a simple 1/4 turn of the handle.

Valve 20 is a Universal StopCock™. It is a specialized, very compact 1/4-turn ball valve used in monitoring small amounts of the process media.

Pump 21 is an energy efficient Mag Drive Pump constructed from corrosion resistant plastic.

Engineering Data

Good Piping Practice

Hayward Flow Control Systems recommends that all piping systems be installed in such a way as to minimize the stress induced by temperature changes, particularly the use of rollers or pipe hangers rather than fixing the pipe in position.

With long lengths of straight pipe and when large temperature changes are to be expected (either from time of installation or in operation), expansion loops or expansion joints should be considered. Additionally, consideration should be given to applying direct support to the actuator when using actuators on pipe sizes below two inches and, when actuators are not mounted vertically to the piping system, independent actuator support is recommended.

NEMA Ratings

Enclosure Classifications and Types

NEMA Type 1: General purpose: intended for indoor use primarily to provide a degree of protection against contact with the enclosed parts in locations without unusual service conditions.

NEMA Type 2: Drip proof: intended for indoor use primarily to provide a degree of protection against limited amounts of falling water or dirt.

NEMA Type 3: Rain-tight, dust-tight, and sleet (ice) resistant: intended for outdoor use primarily to provide a degree of protection against windblown dust, rain, and sleet; undamaged by the formation of ice on the enclosure.

NEMA Type 3S: Rain-tight, dust-tight, and sleet (ice) resistant: intended for outdoor use primarily to provide a degree of protection against windblown dust, rain, and sleet; external mechanism remains operable when ice laden.

NEMA Type 3R: Rain-tight, dust-tight, and sleet (ice) resistant: intended for outdoor use primarily to provide a degree of protection against falling rain and sleet, undamaged by the formation of ice on the enclosure.

NEMA Type 4: Water-tight and dust-tight; intended for indoor or outdoor use to provide a degree of protection against splashing water, water seepage, falling or hose-directed water and severe external condensation, undamaged by the formation of ice on the enclosure.

NEMA Type 4X: Water-tight, dust-tight, and corrosion resistant: same as Type 4 enclosure, but provides additional protection to resist corrosion.

NEMA Type 6: Submersible: intended for indoor or outdoor use to provide a degree of protection against entry of water during submersion at a limited depth.

NEMA Type 6P: Submersible: same as Type 6 enclosure, but provides prolonged submersion protection at a limited depth.

NEMA Type 7 (A, B, C, and D): Explosion proof, Class 1, Division 1, Groups A, B, C, and D hazardous locations: designed to contain an internal explosion without causing an external hazard when installed in the indicated atmospheres and locations. Class 1, Division 1 locations are those in which hazardous atmospheres are, or may be, present under normal operating conditions.

These enclosures are also suitable for Class 1, Division 2 locations in which hazardous atmospheres are present only in case of accidental rupture or breakdown of equipment, or abnormal operation. Type 1 general purpose enclosures may be permitted in a Class 1, Division 2 location subject to the approval authority. (ref: national electrical code 501-3,b3).

Group designations are described in national building code as follows:

Group A–Atmospheres containing acetylene

Group B–atmospheres containing hydrogen

Group C–atmospheres containing ethylether vapors, ethylene or cyclopropane

Group D–Atmospheres containing gasoline, hexane, naphtha, benzene, benzyl, lacquer, solvent vapors or natural gas.

NEMA Type 9 (E, F, and G): Dust ignition proof, Class ii, groups E, F, and G hazardous locations:

Designed to prevent the entrance of dust, and the enclosed devices do not produce sufficient heat to cause external surface temperatures capable of igniting dust on the enclosure or in the surrounding atmosphere. Class ii, Division 1 locations are those in which combustible dust is, or may be, present under normal operating conditions. These enclosures are also suitable for Class ii, Division 2 locations in which hazardous dust is present only under abnormal conditions.

The group designations are described in the national electrical code as follows:

Group E–atmospheres containing metal dust, including aluminum, magnesium, their commercial alloys, and other metals of similarly hazardous characteristics.

Group F–atmospheres containing carbon black, coal or coke dust.

Group G–Atmospheres containing flour, starch or grain dust.

Flow of Water Through Schedule 80 Plastic Pipe

DISCHARGE		VELOCITY IN SCHEDULE 80 PLASTIC PIPE FOR WATER @ 60ºF							
		VELOCITY							
GALLONS PER MINUTE	CUBIC FT. PER SECOND	FEET PER SECOND	FEET PER SECOND 1/4″	FEET PER SECOND 3/8″	FEET PER SECOND 1/2″	FEET PER SECOND 3/4″	FEET PER SECOND 1″	FEET PER SECOND 1 1/4″	FEET PER SECOND 1 1/2″
0.2	0.000446		0.824						
0.3	0.000668		1.237	0.651	0.392				
0.4	0.000891		1.646	0.867	0.529				
0.5	0.00111		2.061	1.083	0.653	0.359			
0.6	0.00134		2.476	1.303	0.782	0.431			
0.8	0.00178		3.295	1.728	1.043	0.574			
1	0.00223		4.122	2.167	1.311	0.718	0.435		
2	0.00446		8.245	4.335	2.609	1.432	0.871	0.525	
3	0.00668		12.381	6.502	3.919	2.161	1.306	0.788	0.538
4	0.00891	2″	16.502	8.671	5.218	2.876	1.747	1.051	0.717
5	0.01114			10.837	6.528	3.592	2.181	1.313	0.896
6	0.01337	0.65	2 1/2″	13.005	7.827	4.308	2.614	1.579	1.076
8	0.01782	0.86			10.448	5.741	3.482	2.105	1.434
10	0.02228	1.08	0.752	3″	13.057	7.185	4.351	2.632	1.798
15	0.03342	1.61	1.134			10.778	6.531	3.941	2.697
20	0.04456	2.15	1.505	0.986			8.712	5.252	3.596
25	0.0557	2.69	1.886	1.238		4″	10.881	6.574	4.484
30	0.06684	3.23	2.256	1.476			13.062	7.884	5.383
35	0.07798	3.78	2.638	1.726		0.973	15.232	9.193	6.282
40	0.08912	4.32	3.009	1.976		1.114	17.413	10.515	7.171
45	0.1003	4.84	3.391	2.215		1.247		11.838	8.069
50	0.1114	5.39	3.761	2.465		1.391		13.147	8.969
60	0.1337	6.47	4.513	2.953		1.665		15.779	10.778
70	0.156	7.55	5.266	3.453		1.942			12.577
80	0.1782	8.62	6.018	3.942		2.228		6″	14.36
90	0.2005	9.69	6.771	4.442		2.504			16.162
100	0.2228	10.77	7.523	4.931		2.781		1.225	17.96
125	0.2785	13.48	9.409	6.168		3.475		1.534	22.445
150	0.3342	16.18	11.284	7.395		4.171		1.893	
175	0.3899	18.87	13.171	8.633		4.865		2.141	8″
200	0.4456	21.56	15.068	9.861		5.561		2.451	
225	0.5013		16.943	11.098		6.255		2.759	1.577
250	0.557			12.325		6.951		3.069	1.752
275	0.6127			13.563		7.645		3.367	1.927
300	0.6684			14.768		8.341		3.675	2.102
325	0.7241			16.041		9.035		3.985	2.277
350	0.7798					9.731		4.294	2.453
375	0.8355					10.425		4.592	2.628
400	0.8912					11.121		4.901	2.803
425	0.9469	10″				11.815		5.211	2.989
450	1.003					12.511		5.519	3.164
475	1.059	2.119				13.205		5.817	3.329
500	1.114	2.229				13.901		6.126	3.515
550	1.225	2.459				15.279		6.744	3.865
600	1.337	2.679	12″			16.681		7.352	4.215
650	1.225	2.899						7.971	4.566
700	1.56	3.129	2.205					8.588	4.916
750	1.671	3.349	2.359					9.195	5.267
800	1.56	3.569	2.513					9.802	5.617
850	1.782	3.799	2.677					10.421	5.968
900	2.005	4.019	2.831					11.028	6.318
950	2.117	4.239	2.984					11.646	6.668
1000	2.228	4.469	3.149					12.253	7.019
1100	2.451	4.919	3.458					13.489	7.719
1200	2.674	5.359	3.775					14.715	8.431
1300	2.896	5.809	4.093					15.929	9.121
1400	3.119	6.259	4.401					17.165	9.833
1500	3.342	6.698	4.718					18.391	10.534
1600	3.565	7.148	5.037					19.611	11.235
1800	4.01	8.038	5.662					22.067	12.636
2000	4.456	8.938	6.288					24.517	14.038
2500	5.57	11.168	7.868						17.552
3000	6.684	13.396	9.437						21.068
3500	7.798	15.637	11.006						24.572
4000	8.912	17.866	12.587						28.08
4500	10.13	20.106	14.156						31.613
5000	11.14	THE FOLLOWING WAVE SURGE CONSTANTS MAY BE USED TO QUICKLY CALCULATE PRESSURE RISE DUE TO WATER HAMMER WHERE: ″C″ = THE WAVE SURGE CONSTANT FROM THE TABLE BELOW MULTIPLIED BY ″V″ THE LINE VELOCITY IN FEET PER SECOND. THE RESULTANT NUMBER IS THEN ADDED TO THE LINE PRESSURE TO DETERMINE THE RESULTING WAVE SURGE (WATER HAMMER EFFECT).								
6000	13.37								
7000	15.6								
8000	17.82								
9000	20.05								
10000	22.28								
12000	26.74								

PIPE SIZE	1/4″	1/2″	3/4″	1″	1 1/2″	2″	3″	4″	6″	8″	10″	12″
CONSTANT	40	35	32	31	27	25	23	23	21	20	19	19

MAXIMUM RECOMMENDED FLUID VELOCITY IS 8 FEET PER SECOND (SOLENOID VALVES 5 FEET PER SECOND).

Chemical Resistance Guide

The data in the following tables was obtained from numerous sources in the industry. The information is based primarily on the immersion of unstressed strips in the chemicals at ambient temperature and, to a lesser degree, on field experience. The end user should be aware of the fact that actual service conditions will affect the chemical resistance. It should be noted in the following charts that the ″A″ rating does not mean or imply that material will perform within original specification. The chemical resistance table should be used for reference only. It is the ultimate responsibility of the end user to determine the compatibility of the chemical being used in his or her particular application. Contact Hayward for information on Eastar® products.

Chemicals	Ultem (GF 40%)	PVC	CPVC	PPL	PVDF	PVCGF (Fiberloc)	Teflon	Viton	EPDM	Nitrile (Buna N)	316 SS	416 SS	Titanium
Acetaldehyde		X	X	B	C	X	A	X	B	X	A	A	A
Acetaldehyde, Aq.	A	X	X	A	X	X	A	B	A				
Acetamide	A			A			A	C	A	A	A		
Acetate Solv., Crude		X	X	X	A	X							
Acetate Solv., Pure		X	X	X	A	X	A	X	C	X	A	A	
Acetic Acid 5%	A						A	A	A	B			
Acetic Acid 10%	A	A	A	A	A	A	A	X	B	B	A	A	B
Acetic Acid 20%	A	A	B	A	A	A	A	C	B	B	A	B	A
Acetic Acid 30%	A					A	A	C	A	B			
Acetic Acid 50%	A	A	A	A	A	A	A	C	B	A	A	C	
Acetic Acid 60%	A	A		B	A	A	A	C	C		A	X	
Acetic Acid 80%	A	B	B	C	A	C	A	C	B	C	A	X	
Acetic Acid, Glacial	C	X	X	B	B	C	A	X	B	X	A	X	B
Acetic Aldehyde							A	X	A	X			
Acetic Anhydride		X	C	B	B	X	A	X	C	C	A	X	B
Acetic Ester							A	X	B	X			
Acetic Ether							A	X	B	X			
Acetol							A						
Acetone	C	X	X	B	X	X	A	X	A	C	A	A	A
Acetonitrile	C	X		B	A	X	A	C	A	C	A		
Acetophenone				A	A		A	X	A	C	A		
Acetyl Acetone		X	X		X	X	A	X	A	X			
Acetal Benzene							A	X	A	X			
Acetyl Bromide					A		A						
Acetyl Chloride		X	X	A	A	X	A	C	X	C	A		
Acetal Oxide							A	X	B	C			
Acetyl Propane							A	X	B	X			
Acetylene		C	C	A	A	C	A	A	A	A	A	A	
Acetylene Dichl.							A	A			X		
Acetylene Tetrachl.							A	A	X	X			
Acid Mine Water		A	A	B	A	A	A	A					

Chemicals	Ultem (GF 40%)	PVC	CPVC	PPL	PVDF	PVCGF (Fiberloc)	Teflon	Viton	EPDM	Nitrile (Buna N)	316 SS	416 SS	Titanium
Acrylic Acid		X	X		A	X	A						
Acrylic Emulsions				X									
Acrylonitrile		X	X	B	A	X	A	X	X	C	C		
Adipic Acid, Aq.		A	A	A	A	A	A	A	A	A			
Air	A	A	A	A	A	A	A	A	A	A			
Alcohol							A	B	A	A			
Alcohol, Allyl		X	X	A	A	C	A	B	A	A		A	
Alcohol, Amyl		C	B	A	A	C	A	A	A	A	A		A
Alcohol, Benzyl		X	X	A	A	X		A	C	X	A		A
Alcohol, Butyl		C	A	A	A	C	A	A	A	A	A	A	A
Alcohol, Diacetone		X		C	B	X	A	X	A	C	A		A
Alcohol, Ether							A	B	A	C			
Alcohol, Ethyl	A	A	A	A	A	A	A	B	A	A	A	B	A
Alcohol, Hexyl		A		A		A	A	A	A	A	A		A
Alcohol, Isobutyl					A		A	A	A	B	A		A
Alcohol, Isopropyl		A	A	A	B	A	A	A	A	B	A		A
Alcohol, Methyl		A	X	A	A	A	A	X	A	A	A		A
Alcohol, Octyl								A		B	A		A
Alcohol, Polyvinyl		A	A	A		A	A	A	A				
Alcohol, Propargyl		A											
Alcohol, Propyl		A	A	A	A	A	A	A	A	A	A		A
Aldehyde							A	X	A	X			
Alkanes							A	A	X	A			
Alkazene							A	B	X	X			
Allyl Aldehyde							A	A		B			
Allyl Bromide							A	B		X			
Allyl Chloride		X			A	X	B	B	X	X	A		A
Allyl Trichloride							A	A		X			
Alum		A	A	A	A	A	A	A	A	A	A		A
Alum, Ammonium		X	X	A	A	C		A	A	A			
Alum, Chrome		A	A	A		A		A		A			

A = Excellent, no effect • B = Good, minor effect • C = Fair, data not conclusive, testing recommended • X = Not recommended. Ratings are based on testing at an ambient temperature of 70°F. Customer should test to determine application suitability.

Chemicals	Ultem (GF 40%)	PVC	CPVC	PPL	PVDF	PVCGF (Fiberloc)	Teflon	Viton	EPDM	Nitrile (Buna N)	316 SS	416 SS	Titanium
Alum, Potassium		A	A	A	A	A	A	A	A	A			
Aluminum, Acetate							A	C	A	B			
Alum., Ammonium				A	A		A	A	A	B			
Aluminum, Bromide							A	A	A	A			
Aluminum, Chloride	A	A	A	A	A	A	A	A	A	A	C	X	C
Alum. Chlorohydr.							A						
Aluminum, Citrate													
Aluminum, Fluoride		A	A		A	C		A	A	A	C	X	C
Aluminum, Formate							A	X		X			
Alum. Hydroxide	A	A	A	A	A	C	A	C	A	A	A	A	A
Alum. Nitrate		A	A	A	A	A	A	B	A	A		A	
Alum. Oxychloride		A	A	A	A	A		X					
Alum. Phosphate							A	A	A	A			
Alum. Potassium		A	A	A	A	A	A	A	A	A		X	
Aluminum, Salts		A		A	A	A	A	A	A	A	X	X	
Aluminum, Sulfate		A	A	A	A	A	A	A	A	A	B	X	A
Amber Acid		A	A	A	A	A	A	A	A				
Amines		C			B	C	A	X		X	A	A	B
Ammonia 10%		A		A		A	A	A		X	A	A	A
Ammonia, Anhydrous		X	X	A	B	X	A	X	A	C	A	A	B
Ammonia, Aq. 25%		A	A	A	A	A						B	
Ammonia, Dry Gas		A	A	A		A	A	X	A	A		A	A
Ammonia, Liquid	C	X		A	A	X	A	X	A	B	A	A	
Ammonia. Nitrate		B	B	A	A	C		A	A	B	A	A	
Ammonium Ph. Mono		A		A		A	A	A	A	A	A	A	A
Ammonium Ph.Tri.		A		A		A	A	A	A	A	A	B	A
Ammonium Acetate		A	A	A		A	A	A	A	A			
Ammonium Alum							A			B			
Ammonium Bichrom.							A		A	A			
Ammonium, Bifluoride		A	A	A	A	A	A	A	A	B	A		
Ammonium Bisulfide		A			A	A							
Ammonium Carbonate		A	A	A	A	A	A	A	A	C	B	B	A
Ammonium Casenite											A		
Ammonium Chloride		A	A	A	A	A	A	A	A	B	B	C	A
Ammonium Dichromate		A				A	A		A	A			
Ammonium, Fluoride							A			B			
Ammonium, Fluoride 10%		A	A	A	A	C	A	A	A				
Ammonium, Fluoride 20%		A		A	A	C	A	A	A				
Ammonium, Fluoride 25%		X	X	A	A	X							
Ammonium, Hydroxide	X	A	X	A	A	A	A	B	A	B	A	A	A
Ammon. Metaphosph.		A	A	A	A	A	A	A	A	A			

Chemicals	Ultem (GF 40%)	PVC	CPVC	PPL	PVDF	PVCGF (Fiberloc)	Teflon	Viton	EPDM	Nitrile (Buna N)	316 SS	416 SS	Titanium
Ammonium, Nitrate		B	B	A	A	A		A	A	A	A	A	
Ammonium, Oxalate										A	A		
Ammonium, Persulfate		A	A	C	A	A	A	C	B	C	A	A	A
Ammonium, Phosphate	A	A	A	A	A	A	A	A	A	A		A	
Ammonium, Ph. Di Basic		A	A	A		A	A	A	A	A	A	A	A
Ammonium, Ph. Mono.			A	A		A		A		A	C	B	A
Ammonium, Ph. Tri.			A	A		A		A		A	A	A	A
Ammonium, Salts		A		A	A	A	A	C	A	A	X		
Ammonium, Sulfate	A	A	A	A	A	A	A	C	A	B	B	B	A
Ammonium, Sulfide		A	A	A	A	A	A	C	A	A			
Ammonium, Thiocyan.		A	A	A		A	A	A	A	A			
Ammonium, Thiosulf.							A	A	A	A	A		A
Amyl Acetate		X	X	X	C	X	A	X	A	C	A		X
Amyl Alcohol		C	B	A		C	A	A	A	A	A		C
Amyl Borate					A		A	A	X	A			
Amyl Bromide							A	B	X	X			
Amyl Chloride		X	X	X	A	X	A	A	X	X	B	C	C
Aniline		X	X	A	C	X	A	B	B	X	A	B	B
Aniline Chlorohydrate		X				X							
Aniline Hydrochloride		X	X	A	A	X	A	B	B	C		X	
Anthraquinone Sulf. Ac.		A	A	A	A	A		A					
Anti-Freeze	C	A		A		A	A	A	A	A	A		
Antichlor							A	A	A	A			
Antimony Chloride				A	A		A	A		X			
Antimony Pentachloride							A			X			
Antimony Trichloride		A		A	A		A	A	A	A		X	
Aqua Regia		X	X	X	A		A	C	C	C	X	X	B
Argon							A	A	A	C			
Arochlor								A		X			
Aromatic Hydrocarbons		X	X			X		A	X	X	A		
Arsenic Acid		A	A	A	A	A	A	A	A	B	B	B	
Arsenous Acid													
Aryl Supfonic Acid		X	X	X	X								
Asphalt		X	X	A	A	X	A	A	X	B	A	B	
Aviation Fuel							A						
Aviation Turbine Fuel							A						
Baking Soda							A	A	A	A		A	
Barium Acetate													
Barium Carbonate		A	A	A	A	A	A	A	A	A	B	B	A
Barium Chloride		A	A	A	A	A	A	A	A	A	B	B	A
Barium Cyanide								A		C	A		

A = Excellent, no effect • B = Good, minor effect • C = Fair, data not conclusive, testing recommended • X = Not recommended.
Ratings are based on testing at an ambient temperature of 70°F. Customer should test to determine application suitability.

Chemicals	Ultem (GF 40%)	PVC	CPVC	PPL	PVDF	PVCGF (Fiberloc)	Teflon	Viton	EPDM	Nitrile (Buna N)	316 SS	416 SS	Titanium
Barium Hydrate							A	A	A	A			
Barium Hydroxide		A	A	A	A	A	A	A	A	A	A	B	B
Barium Nitrate		A	A	A		A	A	A		A	A	A	A
Barium Salts		A		A	A	A	A	A	A	A	A		
Barium Sulfate		A	A	A	A	A	A	A		A	A	B	A
Barium Sulfide		A	A	A	A	A	A	A	A	A	A	B	
Beer		A	A	A	A	A	A	A	A	C	A	A	A
Beet Sugar Liquid		A	A	A		A	A	A	A	A	A	A	
Beet Sugar Liquors		A	A	A	A	A	A	A	A	A		B	
Benzaldehyde		X	X	C	C	X		C	C	X	A		A
Benzalkonium Chl.		A											
Benzene	C	X	X	C	B	X	A	B	X	C	B	B	A
Benzene Sulf Ac .		X	X	X	B	X	A	A	X	C			
Benzene Sulf. Ac. 10%		X	X	X	B	X	A	A					
Benzil Chloride							A	A	X	X			
Benzoic Acid		A	A	A	A	A	A	A	B	X	B	B	A
Benzy] Alcohol	X			A			A	A	B	C			
Benzyl Benzoate							A	A	C	X			
Benzyl Chloride				A	X		A	X	X	X			
Bismuth Carbonate		A	A	A	A	A	A	A	A	A			
Black Liquor		A	A	A	A	A	A	A	B	A			
Bleach		A	A	A	A	A	A	A	A	X			
Borax		A	A	A	A	A	A	A	A	A	A	A	A
Boric Acid		A	A	A	A	A	A	A	A	B	B	B	A
Brake Fluid	C						A	X	A	C			
Brewery Slop								A		A	A		
Brine		A	A	A	A	A	A	A	A	A			
Brine Acid		A	A	A	A	A	A	A	A	A			
Bromic Acid		A	A	X	A	A	A	A	B				
Bromine Dry							A	A	X	X		X	
Bromine Gas		C		X	A	C	A	A	X	X		X	
Bromine Liquid, Br		X	X	X	A	X	A	A	X	X		X	
Bromine Water		X	C	C	A	X	A	A	X	C	X	X	A
Bromobenzene		X				X	A	A	X	C			
Bromotoluene		X		X		X							
Butadiene Gas		B	A	A	A	C	A	A	X	X	A	A	
Butane		A	A	A	A	A	A	A	X	A	A	A	
Butanediol		A	B		A	A		A	X				
Butanol							A				A		
Butter							A	A		A	A	A	
Buttermilk							A	A		A	A	A	

Chemicals	Ultem (GF 40%)	PVC	CPVC	PPL	PVDF	PVCGF (Fiberloc)	Teflon	Viton	EPDM	Nitrile (Buna N)	316 SS	416 SS	Titanium
Butyl Acetate	C	X	X	C	B	X	A	X	B	C	C	B	
Butyl Acrylate Pure		X	X	X	A	X	A	X	A				
Butyl Acrylate Satur.								X	A				
Butyl Amine		X	X	X	B	X	A	X	X	C			
Butylbenzene							A	A		X			
Butyl Benzoate							A	A	A	X			
Butyl Bromide					A		A	B		X			
Butyl Butyrate							A	C	B	X			
Butyl Carbitol							A	A	A	C			
Butyl Cellosolve		A	X		A	A	A	X	B	C			
Bufyl Chloride					A		A	A		X			
Butyl Diol		B	A	A	A	C	A	A	A				
Butyl Ether		X	X	X	A	X	A	X	X	B			
Butyl Formate							A			X			
Butyl Hydrate							A	A	B	A			
Butyl Hydride							A	A	X	A			
Butyl Hydroxide							A	A	B	A			
Bufyl Mercaptan		X			A	X	A						
Butyl Phenol		C	A	A	A	C							
Butyl Phthalate		X	X	A	A	X	A	C	B	X			
Butyl Stearate					A		A	A	B	B			
Butylene		A	A	X	A	A	A	A	X	B	A		
Butyraldehyde							A	X	B	X			
Butyric Acid		X	B	A	A		A	B	B	X	B	C	A
Cadmium Cyanide		A	A			A		A					
Cadmium Salts				A	A		A	A					
Caffeine Citrate		A			A		A						
Calamine							A	A		B			
Calcium Acetate		A	A	A	A	A	A	X	A	B			
Calcium Bisulfide		A	A	A	A	A	A	A	X	A	B		A
Calcium Bisulfite		A	A	A	A	A	A	A	X	A		X	
Calcium Carbonate		A	A	A	A	A	A	A	A	A	A	A	A
Calcium Chlorate		A	A	A	A	A	A	A	A	A	A		
Calcium Chloride		A	A	A	A	A	A	A	A	A	B	B	A
Calcium Cyanide							A		A	A			
Calcium Hydroxide	A	A	A	A	A	A	A	A	A	A	A		A
Calcium Hypochloride							A	A	A	X			
Calcium Hypochlorite	A	A	A	B	A	A	A	A	A	B	X	X	B
Calcium Nitrate		A	A	A	A	A	A	A	A	B			
Calcium Oxide		A			A	A	A		A	A			
Calcium Phosphate							A	A	A	A			

A = Excellent, no effect • B = Good, minor effect • C = Fair, data not conclusive, testing recommended • X = Not recommended.
Ratings are based on testing at an ambient temperature of 70°F. Customer should test to determine application suitability.

Chemicals	Ultem (GF 40%)	PVC	CPVC	PPL	PVDF	PVCGF (Fiberloc)	Teflon	Viton	EPDM	Nitrile (Buna N)	316 SS	416 SS	Titanium
Calcium Sulfate		A	A	A	A	A	A	A	A	A	B		A
Calcium Sulfide		A	A	A	A	A	A	A	A	A			
Calcium Thiosulfate							A	A	A	B			
Calgon				C	A		A	A		A	A		
Cane Sugar Liquors		A	A	A	A	A	A	A	A	A	A		
Caprylic Acid					A		A			C			
Carbinol							A	X	A	A			
Carbolic Acid			A	A						C	A		B
Carbon Bisulfide		X	X	X	A	X	A	A		X	C		
Carbon Dioxide		A	A	A	A	A	A	A	B	A	A	A	A
Carbon Disulfide		X	X	X	A	X	A	A	X	C	A	B	
Carbon Monoxide		A	A	A		A	A	A	A	A	A	A	
Carbon Tetrachloride	A	X	X	X	A	X	A	B	X	C	A	A	A
Carbonic Acid		A	A	A	A	A	A	A	A	B	B	B	
Casein					A		A	A	A	A			
Castor Oil		A	C	A	A	A	A	A	B	A			
Catsup		A	A	A		A		A		A	A		
Caustic Lime							A	B	A	A			
Caustic Potash		A	A	A	A	A	A	X	A	A		B	
Caustic Soda		A	A	A	A	A	A	B	A	C		C	
Cellosolve	C	B		A	A		A	C	B	C			
Chloral Hydrate		A	A	A	A	A		A		C			
Chlorasetic Acid		A		X			A	X	B	X	X	X	A
Chloric Acid		A			A		A			X	X	X	
Chloric Acid 20%		A	A	X	A	A							
Chlorinated Glue								A	B	C	A		
Chlorine Dioxide		A	A	C	A	A	A	A	X				
Chlorine, Dry							A	C	B	X	A		X
Chlorine Gas, Dry	A	X	X	X	A	X	A	B	X	C			
Chlorine Gas, Wet	C	X	X	X	A	X	A	C	X	C			
Chlorine, Liquid		X	X	X	A	X	C			C			
Chlorine Water		A	A	C	A	A	A	A	B	C	X	X	A
Chlorosulfonic,Acid		X	X	X	C	X	A	X	X	X	X	X	A
Chlorox Bleach 5.5%	A	A	A	C	A	A	A	A	B	C	A		
Chocolate Syrup				A				A		A	A	A	
Chresylic Acid 50%		A			B			A		X	A		
Chrome Alum		A	A	A	A	A		A		A			
Chromic Acid 5%	A	A		X		A		A	A	X	A		A
Chromic Acid I0%	A	A	A	B	A	A	A	A	B	X			A
Chromic Acid 20%		B	B	X	A	C	A	B	B	C			A
Chromic Acid 30%		B	B	X	A	C	A	A		X			A

Chemicals	Ultem (GF 40%)	PVC	CPVC	PPL	PVDF	PVCGF (Fiberloc)	Teflon	Viton	EPDM	Nitrile (Buna N)	316 SS	416 SS	Titanium
Chromic Acid 50%	C	X	X	X	A	X	A	A	B	X	X		A
Chromium Alum		A	A	A	A	A	A	A	A				
Citric Acid	A	A	A	A	A	A	A	A	A	B	A		A
Citric Oils				A			A	A	B	A	A		
Cobalt Chloride							A	A	A	A			
Coconut Oil		A	A	A	A	A	A	A	B	A			
Cod Liver Oil							A	A	A	B			
Coffee			A	A				A	A	A	A		
Coke Oven Gas		X	A	A	A	X	A	A	A	X			
Cola Concentrates				A									
Copper Acetate		A	A	A	A	A	A	X	A	B			
Copper Borofluoride		A	A	A	A	A	A	A	A				
Copper Carbonate		A	A	A	A	A	A	A	A	X			
Copper Chloride		A	A	A	A	A	A	A	A	A	B	B	A
Copper Cyanide		A	A	A	A	A	A	A	A	B	A	B	A
Copper Fluoborate		A			A	A	A		B	X			
Copper Fluoride		A	A	A	A	A	A	A	A				
Copper Nitrate		A	A	A	A	A	A	A	A	A	A	B	A
Copper Salts		A	A	A	A	A	A	A	A	A			
Copper Sulfate		A	A	A	A	A	A	B	A	B	A		A
Copper Sulfate 5%		A		A		A	A	A		A	A	B	A
Corn Oil		A	A	A		A	A	A	B	A			
Corn Syrup		A	A	A	A	A	A	A	B	A			
Cottonseed Oil		A	A	A	A	A	A	A	B	B			
Cream			A	A				A		A	A		
Creosol		X	X	C	C	X	A	A	X	X	A		
Creosote		X	X			X	A	A	X	B			
Cresols		X	X	C	A	X	A	A	X	X	A		
Cresylic Acid		C	C	A	A		A	A	X	X	A	A	A
Croton Aldehyde		X	X	A	C	X	A	A	B				
Crude Oil		A	A	A	A	A	A	A	X	X	A	B	
Cryolite		B	B	A	A		A	A	A	B			
Cupric Cyanide													
Cupric Fluoride		A	A	A	A	A	A	A	A				
Cupric Nitrate							A	A	A	A			
Cupric Salts		A		A	A	A	A	A	A		X		
Cupric Sulfate		A	A	A	A	A	A	A	A	A			
Cutting Oil							A	A	X	A			
Cyanic Acid							A		A	A			
Cyclohexane	A	X	X	X	A	X	A	A	X	C			A
Cyclohexanol		X	X	A	C	X	A	A	B	B			

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Ratings are based on testing at an ambient temperature of 70°F. Customer should test to determine application suitability.

Chemicals	Ultem (GF 40%)	PVC	CPVC	PPL	PVDF	PVCGF (Fiberloc)	Teflon	Viton	EPDM	Nitrile (Buna N)	316 SS	416 SS	Titanium
Cyclohexanone		X	X	B	C	X	A	X	C	C			
Decalin		X	X	A	A	X	A	A	X	X			
Decanal							A	X		X			
Decane					A		A	A	X	B			
Detergents		A	A	B	A	A	A	A	A	A	A		
Detergents, Heavy Duty		A	A	A	A	A							
Developers							A			A			A
Dextrin		A	A	A	A	A	A	A	A				
Dextrose		A	A	A	A	A	A	A	A	A			
Diacetone Alcohol		X	X	A	B	X	A	X	A	X			
Diallyl Phthalate													
Diazo Salts		A	A	A	A	A							
Dibenzyl Ether					A		A		C				
Dibutyl Amine					A		A	C	X	C			
Dibutyl Ether					A		A	C	C	C			
Dibutyl Phthalate		X	X	B	A	X	A	B	A	X			
Dibutyl Sebacate		B			A		A	C	B				
Dicalcium Phosphate													
Dichlorethane	X	X				X	A	C			A		
Dichloro Benzene		X				X	A	B	X	X			
Dichlorobenzene	X	X	X		A	X	A	A	X	X			
Dichloroethylene		X		X	A	X	A	A	X	X			
Dichloroisopropyl Ether					A								
Dichloromethane	X					A	B	X	X				
Diemethyl Phthalate													
Diesel Fuel	A	A	A	B	A	A	A	A	X	A	A		
Diethanolamine													
Diethyl Cellosolve					A				X				
Diethyl Ether		X	X	B	A	X	A	C	C	X		A	
Diethyl Ketone							A	X	B	X			
Diethyl Oxide							A	X	X	B			
Diethylamine		X	X	A	C	X	A	X	B	B			
Diethylbenzene							A	A	X	X			
Diethylene Glycol	A		A	A			A	A		A	A		
Diethylenetriamine					A		A			B			
Diglycolic Acid		A	A	A	A	A	A	A	A				
Diisobutyl Ketone					A			X	X				
Diisobutylene					A		A	A	X				
Diisooctyl Phthalate	A						A	B	B				
Diisopropyl Ketone					B		A	X	B				
Dimethyl Amine		X	X	A	B	X	A	X	C	B			

Chemicals	Ultem (GF 40%)	PVC	CPVC	PPL	PVDF	PVCGF (Fiberloc)	Teflon	Viton	EPDM	Nitrile (Buna N)	316 SS	416 SS	Titanium
Dimethyl Benzene							A	A	X	X			
Dimethyl Ether							A	B	B	B			
Dimethyl Formamide	X	X	X	A	A	X	A	C	B	B			
Dimethyl Ketone							A	X	A	X			
Dimethyl Phthalate					B		A	B	B	X			
Dimethylamine		X	X	A	X	X		X	X				
Dioctyl Phthalate		X	X	X	A	X	A	A	B	X			
Dioxane	X	X	X	B	X	X	A	X	B	X			
Dioxolane					X			X	X				
Diphenyl							A	A	X	X			
Diphenyl Ether													
Diphenyl Oxide								A	X	X			
Dipropylene Glycol							A	A		A			
Disod.Methylarsonate													
Disodium Phosphate		A	A	A	A	A	A		A	A			
Distilled Water		A	A	A	A	A							
Divinylbenzene		X	X	X	X	X							
Dolomite							A	A	B	A			
Dowtherm													
Dry Cleaning Solvents						X	A	A	X	A			
Epichlorohydrin		X	X	A	A		A	X	X				
Epsom Salt		A		A	A	A	A	A	A	A	A		A
Esters		X	X	C	A	X	A						
Ethane							A	A	X	A	A		A
Ethanol	A	A	A	A	A	A	A	B	A	A	A	B	A
Ethanolamine		X	X	X	X	X	A	X	A	B	A	A	
Ethers		X	X	C		X	A	C	C	X	A	B	
Ethyl Acetate	C	X	X	C	A	X	A	X	B	X	A	B	
Ethyl Acetoacetate		X	X		A	X	A	X	A	X			
Ethyl Acrylate	C	X	X	X	A	X	A	X	B	X			
Ethyl Alcohol		A	A	A	A	A	A	B	A	A	A	B	A
Ethyl Benzene					A		A	A	X	X			
Ethyl Benzene													
Ethyl Bromide				X									
Ethyl Butyrate													
Ethyl Cellosolve													
Ethyl Chloride		X	X	X	A	X	A	A	A	B	A	A	A
Ethyl Ether	A	X	X	B	A	X	A	C	X	X			
Ethyl Formate							A	B	B	X			
Ethyl Hexanol					A		A	A	A	B			
Ethyl Sulfate							A	X		C	X		

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Ratings are based on testing at an ambient temperature of 70°F. Customer should test to determine application suitability.

Chemicals	Ultem (GF 40%)	PVC	CPVC	PPL	PVDF	PVCGF (Fiberloc)	Teflon	Viton	EPDM	Nitrile (Buna N)	316 SS	416 SS	Titanium
Ethylcellulose													
Ethylene Bromide		X	X	C	A	X	A	B	C	X			
Ethylene Chloride		X	X	C	A	X	A	A	C	X	A	A	B
Ethylene Chlorohydrin		X	X	A	A	X	A	A	A	X			
Ethylene Diamine	X	X	X	A	C	X	A	X	A	A			
Ethylene Dichloride		X	X	C	A	X	A	A	X	X	A	A	A
Ethylene Glycol	A	A	C	A	A	A	A	A	A	A	A	B	
Ethylene Oxide		X	X	X	A	X	A	X	X	X	A		
Extrin		A	A	A	A		A	A	A				
Fatty Acids		A	B	A	A	A	A	A	X	B	A	B	A
Ferric Acetate		B				B	A	X		X			
Ferric Chl. Anhydrous		A	A	A	A	A	A	A	A	B	X	X	A
Ferric Hydroxide		A	A	A		A	A	C	A				
Ferric Nitrate		A	A	A	A	A	A	A	A	A	B	B	A
Ferric Sulfate		A	A	A	A	A		A	A	B	B	B	A
Ferrous Chloride		A	A	A	A	A	A	A	A	B	X	X	A
Ferrous Nitrate		A	A	A	A	A	A	A	B	A			
Ferrous Sulfate		A	A	A	A	A	A	A	A	A	C	B	A
Fish Solubles		A	A	B		A							
Fluoboric Acid	B	A	A	A	A	A		A	A	B	B		X
Fluorine Gas (Wet)		A	A	B	A	C	A	A	A	X			
Fluorine Liquid		C		X	A	X	B	B	C	X	X		X
Fluosilicic Acid 25%		A	A	A	A		A	A	A	A	B	C	X
Formaldehyde	A	X	A	A	A	B	A	B	B	B	A	B	A
Formaldehyde 35%		A	A	A	A	A	A	A	A			B	
Formaldehyde 50%		A	A	A	A	A	A	B	X				
Formic Acid	B	A	A	A	A	A	A	X	A	C	B	B	C
Freon 11		X	A	A	A	X	A	B	X	B	A	A	
Freon 113		A			A	A	A	B	X	A	A	A	
Freon 114		A			A	A	A	A	C	A			
Freon 12		C	A	A	A	C	A	B	A	B	A	A	
Freon 12 (Wet)		B		A		C	A	A	B	A	X	A	
Freon 22		X	X	A	A	X	A	X	B	X	A	A	
Freon TF	A	B	B	X		C	A	B	X	A	A	A	
Fructose		A	A	A	A	A	A	A	A	A	A		
Fruit Juice		A	A	A	A	A	A	A		A	A		
Fruit Pulp		A	A	A	A	A		A					
Fuel Oil		B		B	A	C	A	A	X	A	A		A
Fumaric Acid							A	A		A			
Furan							A	X	X				
Furfural (Ant Oil)		X	X	C	B	X	A	X	B	X	A	A	

Chemicals	Ultem (GF 40%)	PVC	CPVC	PPL	PVDF	PVCGF (Fiberloc)	Teflon	Viton	EPDM	Nitrile (Buna N)	316 SS	416 SS	Titanium
Furfuryl Alcohol					B		A	X	C				
Gallic Acid		A	A	A	A	A	A	A	A	A	A	B	
Gas, Natural		A	A	A	A	A		A	X	A			
Gasoline, Leaded	A	A	X	X	A	A	A	B	X	A	A	A	X
Gasoline, Sour		A	B	X	A	A	A	A	X	A	A	A	X
Gasoline, Unleaded	A	C	X	X	A	C	A	B	X	A	A	A	X
Gelatin		A	A	A	A	A	A	A	A	A	A	A	
Gin		A	A	A	A	A	A	A	A				
Gluconic Acid 50%													
Glucose		A	A	A	A	A	A	A	A	A	A	A	
Glue		A	A	A	A	A	A	A	B	A	A	A	A
Glycerin	A	A	A	A	A	A	A	A	A	A	A	A	A
Glycerol		A	A	A	A	A	A	A	A	A	A		
Glycolic Acid		A	A	A	A	A	A	A	A	A			
Glycols		A	A	A	A	A	A	A	A	A			
Glyoxal								A					
Gold Monocyanide								A		A	A		
Grape Juice		A	A			A		A		A	A		
Grape Sugar		A	A	A	A	A	A	A	A	A			
Grease		A		A	A	A	A	A	X	B	A		
Green Liquor		A	A	A	A	A	A	A	A	B			
Helium							A	A	A	A			
Heptane		A	A	B	A	A	A	A	X	A	A		
Hexane	A	X	A	B	A	X	A	A	X	A	A		
Hexene							A	A	X	A			
Hexyl Alcohol		A	A	A	A	A	A	A	B				
Honey		A		A	A	A	A	A		A	A		
Hydraulic Oil	A						A	A	X	A			
Hydraulic Oil (Synth.)				X		C		A		C	A		
Hydrazine		X	X	X	X	X	A	X	A	C	A		
Hydrobromic Acid		A	A	B	A	A	A	A	A	X	X	X	A
Hydrobromic Acid 20%		A	A	A	A	A	A	A	A	X	X	X	A
Hydrobromic Acid 50%		A	A	B	A	A	A	A	A	X	C	X	X
Hydrochloric Acid	A	A					A		A		A		
Hydrochloric Acid 10%	A	A	A	A	A	A	A	A	A	B		X	C
Hydrochloric Acid 20%	A	A	A	A	A	A	A	A	A	B	X	X	C
Hydrochloric Acid 25%	A	A	A	A	A	A	A	A	A	C		X	
Hydrochloric Acid 37%	A	A		A	A	A	A	A	C	C	X	X	C
Hydrocyanic Acid		A	A	A	A	A	A	A	A	B	A	B	A
Hydrocyanic Acid 10%		A	A	A	A	A	A	A	A	B	X	X	
Hydrofluoric Acid 10%		A	A	A	A	C	A	A	A	B		X	

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Chemicals	Ultem (GF 40%)	PVC	CPVC	PPL	PVDF	PVCGF (Fiberloc)	Teflon	Viton	EPDM	Nitrile (Buna N)	316 SS	416 SS	Titanium
Hydrofluoric Acid 20%		A		A		C	A	A	A	X	X	X	X
Hydrofluoric Acid 30%		A	A	A	A	C	A	A	A			X	
Hydrofluoric Acid 40%		B	X	A	A	C	A	A	A			X	
Hvdrofluoric Acid 50%	A	X	X	A	B	X	A	A	A	C	X	X	X
Hydrofluoric Acid 65%							A	A	B	X		X	
Hydrofluoric Acid 75%		X	C	A	A	X	A	A	X	X	X	X	
Hydrofluosilic Acid		A	A	A	A	A	A	A	A	A	X	X	A
Hydrofluosilicic Acid 20%		A	A	A		A	A	A	A	B	X	X	X
Hydrogen		A	A	A	A	A	A	A	A	A	A	A	
Hydrogen Chl. Gas Dry				A	A							X	
Hydrogen Cyanide		A	A	A	A	A	A	A	A	B		C	
Hydrogen Fluoride		X	X	A	A	X						C	
Hydrogen Peroxide 5%		A	X	A	A	A	A	A	A			B	
Hydrogen Peroxide 10%		A	A	A	A	A	A			A	C	B	C
Hydrogen Peroxide 30%	A	A	X	C		A	A	A	B	X	B	B	B
Hydrogen Peroxide 50%		B	B	A	A	C	A	A	C	X		C	
Hydrogen Peroxide 90%		X	X	X	A	C	A	B	C	X		X	
Hydrogen Peroxide		A		A	A	A	A	A	B	C	B	B	B
Hydrogen Phosphide		X	A	A	A	C				C			
Hydrogen Sulfide		A		A	A	A	A	A	A			C	
Hydrogen Sulf. (Aq. Sol.)		A	A	A		A	A	C	A	C	A	C	A
Hydrogen Sulfide (Dry)		A	A	A	A	A	A	A	A	A	A	C	
Hydroquinone		A	A	A	A	A	A	A	A	X			
Hydroxyacetic Acid			A					A		A			A
Hydroxyacetic Acid 70%		A	A			A		A	A	A			B
Hydroxylamine Sutfate		A	A	A	A	A			A				
Hypochlorous Acid		A	A	A	A	A	A	B	B	X	X		
Ink				A	A					A	A		
Iodine Solution	A	X	A	C	A	X	A	A	A	C	X	X	A
Isobutyl Alcohol	A				A		A	A	A				
Isooctane		A	A	A	A	A	A	A	X	A			
Isophorone		X	X			X		X	X				
Isopropyl Acetate							A	X	B	X	B		
Isopropyl Alcohol		A	A	A	B	A	A	A	A	B	A		A
Isopropyl Ether		X	X	C	A	X	A	X	X	B	A		
Jet Fuel JP-3				A			A	A	X	A	A	A	
Jet Fuel JP-4		A	A	C	A	A	A	A	X	B	A	A	
Jet Fuel JP-5	A	A	A	C	A	A	A	A	X	A	A	A	
Kerosene	A	A	A	A	A	A	A	A	X	A	A	A	A
Ketones		X	X	A	A	X	A	X	C	X	A		A
Kraft Liquor		A	A	A	A	A							

Chemicals	Ultem (GF 40%)	PVC	CPVC	PPL	PVDF	PVCGF (Fiberloc)	Teflon	Viton	EPDM	Nitrile (Buna N)	316 SS	416 SS	Titanium
Lacquer				A			A	X	X	X	A		
Lacquer Thinner		C		B		C	A		A	X	A		A
Lactic Acid	A	A	A	A	A	A	A	B	B	B	A	C	B
Lard	A	A	A	A	A	A	A	A	C	A	A	A	
Lard Oil		A	A	A	A	A	A	A	A				
Latex				A			A	A	B	B	A	A	
Lauric Acid		A	A	A	A	A	A						
Lauryl Chloride		A	A	A	A	A	A						
Lead Acetate		A	A	A	A	A	A	C	A	B	B	B	A
Lead Chloride		A	A	A	A	A	A	A	A				
Lead Nitrate		A	A	A		A	A	A	A	A		B	
Lead Sulfate		A	A	A	A	A	A	A	A	A			
Lemon Oil		A	A	X	A	A	X						
Levulinic Acid													
Ligroin		X	X	C	A	X		A	C	A	A		
Lime (Calcium Oxide)		A		A		A	A	A	C	A	A		A
Lime - Sulfur Solution		A	A	A	A	A				X		B	
Linoleic Acid		B	A	A	A	C	A	B	X	B		A	
Linseed Oil		A	A	A	A	A	A	A	B	A		A	
Lithium Bromide		A			A	A	A	A		A			
Lithium Chloride						A						X	
LPG							A						
Lubricants		A		A		A	A	A		A	A	A	A
Lubricating Oil		A	A	A	A	A	A	A				A	
Lye Solution													
Machine Oil		A	A	A	A	A	A	A					
Magnesium Acetate							A	X		X			
Magnesium Carbonate		A	A	A	A	A	A	A	B	A	A	A	
Magnesium Chloride		A	A	A	A	A	A	A	A	A	B	B	A
Magnesium Citrate		A	A	A	A	A	A	A	A				
Magnesium Hydroxide		A	A	A	A	A	A	A	A				
Magnesium Nitrate		A	A	A	A	A	A	A	B	A	A	A	A
Magnesium Oxide							A	A	A	A	A	B	
Magnesium Sulfate		A	A	A	A	A	A	A	C	A	A	A	A
Maleic Acid		A	A	A	A	A	A	A	C	X	A	A	A
Maleic Anhydride								A		X			
Malic Acid		A	A	A	A	A	A	A	X	A	A	B	A
Manganese Sulfate		A	A	A		A	A	A	A	A			
Mash										A	A		
Mayonnaise				A			A	A		A	A		
Melamine										C	X		

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Chemicals	Ultem (GF 40%)	PVC	CPVC	PPL	PVDF	PVCGF (Fiberloc)	Teflon	Viton	EPDM	Nitrile (Buna N)	316 SS	416 SS	Titanium
Mercuric Chloride		A	A	A	A	A	A	A	A	A	X	X	A
Mercuric Cyanide		A	A	A	A	A	A	A	B	A	A	X	A
Mercuric Nitrate							A	A	A			A	
Mercuric Sulfate		A	A	A	A	A	A	A	A	A			
Mercurous Chloride													
Mercurous Nitrate		A	A	A	A	A	A	A	A				
Mercury		A	A	A	A	A	A	A	A	A	A	A	B
Methacrylic Ac.Glacial		X											
Methane		A	A	A	A	A	A	A	C	A		A	
Methane Sulfonic Ac.					A		A						
Methanol	A	A	X	A	A	A	A	X	A	A	A		A
Methoxyethyl Oleate		A				A							
Methyl "Cellosolve"		X	X	A	A	X		X	B	X			
Methyl Acetate		X	X	B	A	X	A	X	B	X	A		
Methyl Acetone							A	X		X	A		
Methyl Acrylate					A		A	X	B	X	A		
Methyl Alcohol		A	A	A	A	A	A	C	A	A		B	
Methyl Benzene							A	A	X	X			
Methyl Bromide		X	X	X	A	X	A	A	C	X			
Methyl Butanol							A	B		A			
Methyl Butyl Ketone							A	X	B	X	A		
Methyl Chloride		X	X	X	A	X	A	C	C	C	A	B	A
Methyl Chloroform		X	X	C	A	X	A	B	X				
Methyl Ether							A	C	C	B			
Methyl Ethyl Ketone	C	X	X	C	X	X	A	X	A	X	A		A
Methyl Formate								X	A				
Methyl Isobutyl Alcohol										X			
Methyl Isobutyl Carbinol							A	A	A				
Methyl Isobutyl Ketone		X	X	C	A	X	A	X	B	X	A		A
Methyl Isopropyl Ketone		X	X	B	A	X	A	X	C	X	A		
Methyl Methacrylate	C	A					A	X	X	X			
Methyl Propanol							A	A	B	A			
Methyl Salicylate		A	A	A	A	A							
Methyl Sulfate		B	A	A	A	C							
Methylamine		X	X	X	C	X	A		A	B	A		
Methylene Bromide		X			X	X							
Methylene Chloride		X	X	X	C	X	A	B	X	X	A	B	A
Methylene Iodine		X			C	X	A	A					
Methylhexane							A	A	X	A			
Methylisobutyl Carb.		A	A	A	A	A		A	A				
Methylmethacrylate					A		A	X	X				

Chemicals	Ultem (GF 40%)	PVC	CPVC	PPL	PVDF	PVCGF (Fiberloc)	Teflon	Viton	EPDM	Nitrile (Buna N)	316 SS	416 SS	Titanium
Methylsulfuric Acid		A	A	A	A	A	A						
Milk	B	A	A	A	A	A	A	A	A	A	A	A	
Mineral Oil	A	B	A	A	A	A	A	A	X	A		A	
Molasses		A	A	A		A	A	A	C	A	A	A	
Monochlorocetic Acid		A	A	B	A	A	A	B	C			X	
Monochlorobenzene				B	A		A	A	X				
Monoethanolamine		X			X	X	A	A	A	A		A	
Morpholine							A				A		
Motor Oil	A	A	A	C	A	A	A	A	X	A			
Mustard		A	A	A		A		A		B	A		
Naphtha	A	A	A	A	A	A	A	A	X	B	A	A	A
Naphthalene		X	X	B	A	X	A	B	X	X	B	A	A
Natural Gas		A	A	A	A	A		A	X	A			
Neon							A	A	A	A			
Nickel		A	A	A		A	A	A	A	A			
Nickel Acetate		A	A	A	A	A	A	X	A	B			
Nickel Chloride		A	A	A	A	A	A	A	A	B	B	X	A
Nickel Cyanide		A	A			A							
Nickel Nitrate		A	A	A	A	A	A	A	B	A		B	
Nickel Sulfate		A	A	A	A	A	A	A	A	A	C	B	
Nicotine		A	A	X	C	A	A						
Nicotine Acid		A	A	A	A	A	A		A				
Nitric Acid 10%	A	A	A	A	A	A	A	A	B	X	A	B	A
Nitric Acid 20%	A	A		A		A	A	A	X	X		B	
Nitric Acid 30%	A	A	A	A	B	A	A	A	B	X		B	
Nitric Acid 40%	A	A	A	C	B	A		A	X	X		C	
Nitric Acid 50%		A	A	C	B	A	A	A	X	X		X	
Nitric Acid 70%	A	X	X	X	X	X	A	C	X	X		X	
Nitric Acid Concentr.		X	X	X	X	X	A	C	X	X		C	
Nitric Acid Fuming		X	X	X	X	X						C	
Nitrobenzene	C	X	X	C	A	X	A	C	C	C	B	B	A
Nitroethane					A		A	X	A				
Nitrogen							A	A	A	A		A	
Nitrogen Dioxide					A		A						
Nitrogen Solutions													
Nitroglycerine		X							A				
Nitromethane					A		A		B				
Nitrous Oxide		A	A	A	A	A	A	A	A	A			
Ocenol		A	A	X	A	A							
Octane					A		A	A	X				
Octyl Acid					A		A			C			

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Chemicals	Ultem (GF 40%)	PVC	CPVC	PPL	PVDF	PVCGF (Fiberloc)	Teflon	Viton	EPDM	Nitrile (Buna N)	316 SS	416 SS	Titanium
Octylamine							A	X		C			
Oils		A	A	A	A	A							
Oils, Aniline		X		A		X	A	A	B	X	A		A
Oils, Anise											A		
Oils, Bay								A			A		
Oils, Bone								A		A	A		
Oils, Castor		A						A	B	A	A		
Oils, Cinnamon		A						A			A		
Oils, Citric				A				A		A	A		
Oils, Clove				B						A	A		
Oils, Coconut				A				A	A	A	A		
Oils, Cod Liver				A				A	A	A	A		
Oils, Corn			A	A				A	C	A	A		
Oils, Cotton Seed		A	A	A		A	A	A	C	A	A		
Oils, Creosote				X		X		A	X	B	A		
Oils, Crude Sour												C	
Oils, Diesel Fuel			A	A		A		A	X	A	A		
Oils, Fuel		A				A	A	A	X	B	A		A
Oils, Linseed		A	A	A		A		A	X	A	A		
Oils, Mineral		A		A		A		A	X	A	A	A	
Oils, Olive		A	A	A		A	A	A	B	A	A	A	
Oils, Pine		A	A			A	A	A		C	A		
Oils, Silicone				A		A		A		A	A		
Oils, Vegetable		A	A	A	A	A		A		A		A	
Oleic Acid	A	A	B	A	A	A	A	B	C	B	A	B	
Oleum		X	X	X	X	X	A	X	X	X	A		
Orange Extract				A	A		A						
Oxalic Acid		A	A	A	A	A	A	A	A	B	B	C	C
Oxygen Gas		A	A	A	A	A	A	A	A	C			
Ozone		B	B	C	A	B		A	A	X			
Palmitic Acid 10%		A	A	A	A	A	A	A	B	A			
Palmitic Acid 70%		X	A	A			A	A	B	A			
Paraffin		A	A	A	A	A	A	B	X	A	A	A	
Pentane							A	A	X	A	C		
Peracetic Acid 40%		X	X	X	A	X	A	A	B				
Perchlorlc Acid 10%		A	A	A	A	A	A	A	B	X		B	
Perchlorlc Acid 70%	X	X	X	A	A	X	A	A	A	X		X	
Perchloroethylene		X	X	C	A	X	A	A	X	X	A		
Perphosphate		A	A	A		A	A	A	A				
Petrolatum		A	A	A	A	A	A	A	C	A	A		
Petroleum (Sour)		A				A		A	X	A		C	

Chemicals	Ultem (GF 40%)	PVC	CPVC	PPL	PVDF	PVCGF (Fiberloc)	Teflon	Viton	EPDM	Nitrile (Buna N)	316 SS	416 SS	Titanium
Petroleum Oils		A	A	B	A	A	A	A	X	A		A	
Phenols 100%	X	X	A	A	A	X	A	B	C	X	A		C
Phenylacetate							A	X	B	X			
Phenylhydrazine		X	X	X	A	X	A	C	C	X			
Phenylhydrazine Hydrochl		X	A	X	A	X							
Phosgene Gas		X	X	C	A	X		X	A	X			
Phosgene Liquid		X	X	X	C	X		X	A	X			
Phosphoric Acid 10%	A	A	A	A	A	A	A	A	A	C	A		B
Phosphoric Acid 20%	A	A	A	A	A	A	A	A	A	C			
Phosphoric Acid 40%	A	A		A		A	A	A	B	X	A		A
Phosphoric Acid 50%	A	A	A	A	A	A	A	A	A	C	B		B
Phosphoric Acid 80%	A	A	A	A	A	A	A	A	A				
Phosphoric Acid 85%	A	A	A	A	B	A	A	A	A	C	B		C
Phosphoric Acid 100%		A		A		A	A	A	B	X	B		B
Phosphoric Acid Crude							A	A	B	C	C		C
Phosphorous Oxychloride							A						
Phosphorous Red		A	A	A	A	A	A						
Phosphorous Trichloride		X	X	C	A	X	A	C	C	X	A		
Phosphorous Yellow		A	A	A	A	A	A						
Photographic Developer		A	A	A	A	A		A		A	A		A
Photographic Solutions		A	A	A	A	A	A	A		A			
Phthalic Acid		X	X	X	A	X	A	A	A			B	
Phthalic Anhydride		X	X	X		X	A	A	A	C	B	A	
Pickle Brine		A	A	A	A	A							
Pickling Solutions		A	A	A	A	A	A	B	C	X			
Picric Acid		X	C	A	A	X	A	A	C	B	A	B	
Pine Oil						A	A	A	X	B			
Plating Sol. Antimony		A	A	A		A	A	A		A	A		A
Plating Sol. Arsenic		A	A	A		A		A		A	A		A
Plating Solutions, Brass		A	A	A	A	A	A	A	A	A	A		A
Plating Solutions, Bronze		A	A	A		A	A	A		A	A		A
Plating Sol. Cadmium		A	A	C	A	A	A	A	A	A	A		A
Plating Solutions, Chrome		A	A	C	A	A	A	C	B	X	C	A	A
Plating Solutions, Copper		A	A	A	A	A	A	A	A	A	X		A
Plating Solutions, Gold		A	A	C	A	A	A	A	A	A	C		A
Plating Solutions, Indium		A	A	A		A	A	A		A	C		A
Plating Solutions, Iron		X	A	C		X	A	A		A	C		A
Plating Solutions, Lead		A	A	A	A	A	A	A	A	B	C		X
Plating Solutions, Nickel		A	A	A	A	A	A	A	A	A	C		A
Plating Solut. Rhodium		A	A	A	A	A	A	A	A	A	X		X
Plating Solutions, Silver		A	A	A	A	A	A	A	A	A	A		A

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Chemicals	Ultem (GF 40%)	PVC	CPVC	PPL	PVDF	PVCGF (Fiberloc)	Teflon	Viton	EPDM	Nitrile (Buna N)	316 SS	416 SS	Titanium
Plating Solutions, Tin		A	A	A	A	A	A	A	A	B	C		X
Plating Solutions, Zinc		A	A	A	A	A	A	A	A	A	X		A
Polyethylene Glycol		A	A	A	A	A	A	A	A	A			
Polyvinyl Acetate Emul					A		A	A	A				
Polyvinyl Alcohol		A	X	A	A	A	A	A	A				
Potash		A	A	A	A	A	A	C	B	C	A		
Potassium Acetate		A	A	A	A	A	A	X	A	B			
Potassium Alum		A	A	A	A	A	A	A	A	A		B	
Potossium Bicarbonate		A	A	A	A	A	A	A	A	A	B	B	A
Potassium Bichromate		A	A	A	A	A	A	A	A	A		B	
Potassium Bisulfate		A	A	A	A	A	A	A	A	A			
Potassium Bromate		A	A	A	A	A	A	A	A	A			
Potassium Bromide		A	A	A	A	A	A	A	A	A	B	B	A
Potassium Carbonate	A	A	A	A	A	A	A	A	A	B	A	B	A
Potassium Chlorate		A	A	A	A	A	A	A	A	A	A	B	A
Potassium Chloride		A	A	A	A	A	A	A	A	A	A	B	A
Potassium Chromate		A	A	A	A	A	A	A	A	A	B	B	
Potass. Coppercyanide		A	A	A	A	A	A	A	A				
Potassium Cyanide		A	A	A	A	A	A	B	A	A	B	B	A
Potassium Dichromate		A	A	A	A	A	A	A	A	A	A	B	A
Potassium Ferricyanide		A	A	A	A	A	A	A	A	A		A	
Potassium Ferrocyanide		A	A	A	A	A	A	A	A	C		A	
Potassium Fluoride		A	A	A	A	A	A	A	A	A			
Potassium Hydroxide	A	A	A	A	A	A	A	C	B	C	C	A	C
Potassium Hydroxide 25%						A							
Potassium Hydroxide 50%		A	A	A	B	A							
Potassium Hypochlorite		A	A	A	A	A	A	A	A	X		X	
Potassium Iodide		A	A	A	A	A	A	A	A	A		A	
Potassium Nitrate		A	A	A	A	A	A	B	A	A	B	B	A
Potassium Perborate		A	A	A	A	A	A						
Potassium Perchlorate		A	A	A		A	A		A				
Potassium Permangan.		A	A	B	A	A	A	B	A	C	B	B	B
Potassium Persulfate		A	A	A	A	A	A		A				
Potassium Phosphate										A			
Potassium Salts				A	A		A	A	A				
Potassium Sulfate		A	A	A	A	A	A	A	A	A	B	B	A
Potassium Sulfide		A				A	A	A	A	A		B	
Potassium Thiosulfate							A	A		A			
Propane		A	A	B	A	A	A	A	X	A	A	A	
Propanol							A	A	A	A		A	
Propargyl Alcohol		A	A	A	A	A							

Chemicals	Ultem (GF 40%)	PVC	CPVC	PPL	PVDF	PVCGF (Fiberloc)	Teflon	Viton	EPDM	Nitrile (Buna N)	316 SS	416 SS	Titanium
Propyl Acetate					A		A	X	B	X			
Propyl Alcohol		A	A	A	A	A	A	A	A	A		A	
Propylene							A	A	X	X			
Propylene Dichloride		X	X	C	A	X	A	B	X	X			
Propylene Glycol	A		C				A	A	A	A	A		
Pyridine	X	X	X	C	C	X	B	X	C	X	C	B	
Pyrogallic Acid		B			X	C	A	A		A	A	B	
Quaternary Amm. Salts													
Rayon Coagulating Bath		A	A	A	A	A							
Rhodan Salts		A	A	A	A	A	A	A	A				
Rosins				A			A	A		A	A	B	
Rum		A		A		A	A	B	A	A			
Rust Inhibitors				A				A		A	A		
Salad Dressings		A		A		A		A		A	A		
Salicylaldehyde	X	X			C	X	A	A	A				
Salicylic Acid	A	A			A	A	A	A	A	C		B	
Saline Solutions		A	A	A	A	A							
Salt Brine		A	A	A	A	A	A	A	A	A			
Sea Water		A	A	A	A	A	A	A	A	A	C	C	A
Selenic Acid		A	A	A	A	A							
Sewage		A	A	A	A	A	A	A	A	A			
Shellac Bleached				A			A			A	A	A	
Shellac Orange				A			A			A			
Silicic Acid		A	A	A	A	A	A	A	A				
Silicone Oil		A	A	A		A	A	A	A	A	A		
Silver Bromide											C	X	
Silver Cyanide		A	A	A	A	A	A	A	A			A	
Silver Nitrate		A	A	A	A	A	A	A	C	C	B	B	A
Silver Salts		A		A	A	A	A	A	A		A		
Silver Sulfate		A	A	A	A	A	A	A	A	C			A
Soap Solutions		A	A	A	A	A	A	A	A	A	A	A	A
Soda Ash							A	A	A	A			
Sodium		A	A	A	A	A	A	A	A				
Sodium Acetate		A	A	A	A	A	A	C	A	C	B	B	A
Sodium Alum		A	A	A	A	A	A	A	A	A			
Sodium Aluminate							A	A	A	A	A	C	B
Sodium Benzoate		A	A	A	A	A	A						
Sodium Bicarbonate		A	A	A	A	A	A	A	A	A	A	A	A
Sodium Bichromate		A	A	A	A	A	A	A	A			B	
Sodium Bisulfate		A	A	A	A	A	A	A	A	B	A	A	A
Sodium Bisulfite		A	A	A	A	A	A	A	A	A	A	C	A

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Chemicals	Ultem (GF 40%)	PVC	CPVC	PPL	PVDF	PVCGF (Fiberloc)	Teflon	Viton	EPDM	Nitrile (Buna N)	316 SS	416 SS	Titanium
Sodium Borate		C	A	A	A	C	A	A	A	A		A	
Sodium Bromate													
Sodium Bromide		A	A	A	A	A	A	A	A			C	
Sodium Carbonate		A	A	A	A	A	A	A	A	A	A		A
Sodium Chlorate		A	A	A	A	A	A	A	A	C	B	B	A
Sodium Chloride		A	A	A	A	A	A	A	A	A	C	B	A
Sodium Chlorite		X	X	X		X	B	X	X				
Sodium Chromate				A			A	B		A	A	B	
Sodium Cyanide		A	A	A	A	A	A	A	A	A	A	A	A
Sodium Dichromate		A	A	A	A	A	A	A	A				
Sodium Ferricyanide		A	A	A	A	A	A	A	A			B	
Sodium Ferrocyanide		A	A	A	A	A	A	A	A				
Sodium Fluoride		A	A	A	A	A	A	B	A	C		C	A
Sodium Hydrosulfide													
Sodium Hydrosulfite		C					A	A					
Sod. Hydroxide 15%	A	A	A	A	A	A	A	C	A	A	B	B	A
Sodium Hydroxide 20%		A	A	A	A	A	A	C	A	A	B	B	A
Sodium Hydroxide 30%		A	A	A	A	A	A	C	A		B	B	
Sodium Hydroxide 50%		A	A	A	A	A	A	C	A	X	B	C	A
Sodium Hydroxide 70%		A	A	B	B	A	A	X	A	X		X	A
Sod. Hydroxide Conc		A	A	A	A	A	A	B	A	X		C	
Sod. Hypochlorite 20%		A	A	C	A	A	A	A	X	C	C		A
Sodium Hypochlorite	A	A	A	C	A	A	A	X	X	X			
Sodium Hyposulfate							A				A		
Sodium Metaphosphate		A	A	C	A	A	A	A	A	A	A		
Sodium Metasilicate		A	A	A	A	A	A	A	A	A	A	A	
Sodium Nitrate		A	A	A	A	A	A	B	A	C	B	B	A
Sodium Nitrite		A	A	A	A	A	A	A	A		B		
Sodium Palmitrate		A	A	A	A	A	A						
Sodium Perborate		A	A	A	A	A	A	A	A	C	C	B	
Sodium Perchlorate		A	A	A	A	A	A						
Sodium Peroxide		A	A	A	A	A	A	A	B	C	A	A	
Sodium Phosphate Ac.		A	A	A	A	A	A	A	A	A			
Sodium Phosph. Alkal.		A	A	A	A	A	A	A	A	A			
Sodium Phosph. Neutr.		A	A	A	A	A	A	A	A	A			
Sodium Polyphosph.							A	A	A	B	A		A
Sodium Silicate		A	A	A	A	A		A	A	A	B	B	A
Sodium Sulfate		A	A	A	A	A	A	A	A	A	B	B	A
Sodium Sulfide		A	A	A	A	A	A	A	A	C	B	X	A
Sodium Sulfite		A	A	A	A	A	A	A	A	A	C	B	A
Sodium Tetraborate		A						A		A	A	A	

Chemicals	Ultem (GF 40%)	PVC	CPVC	PPL	PVDF	PVCGF (Fiberloc)	Teflon	Viton	EPDM	Nitrile (Buna N)	316 SS	416 SS	Titanium
Sodium Thiocyanate		A	A	A	A	A	A	A	A				
Sodium Thiosulfate		A	A	A	A	A	A	A	A	B	A	A	
Sorghum							A		A	A			
Soy Sauce							A		A	A			
Soybean Oil		A	A	A	A	A	A	A	A				
Stannic Chloride		A	A	A	A	A	A	A	A	A	A	X	A
Stannic Salts		A		A	A	A	A	A	A				
Stannous Chloride		A	A	A	A	A	A	B	B	C	C	C	A
Starch		A	A	A		A	A	A	A	A	A		
Stearic Acid		A	A	B	A	A	A	A	C	B	B	B	A
Stoddard Solvent		X	X	C	A	X	A	A	X	B	A		A
Strontium Carbonate													
Styrene					A		A	C	X	X	A		
Succinic Acid		A	A	A	A	A	A	A	A				
Sugar Solutions				A			A	A		A	A	A	
Sulfamic Acid		X	X	X	X	X							
Sulfate Liquors		A	A	A	A	A		A	A	A	C	A	
Sulfated Detergents		A	A	A	A	A							
Sulfur 10%		A		A		A	A	A	X	C	C		A
Sulfur Dioxide		X		X		C	A	C	A	X	A		A
Sulfite Liquor		A	A	A	A	A	A	A	A	B		X	
Sulfur		A	A	X	A	A	A	A	C	C		A	
Sulfur Chloride		A	A	C	A	A	A	A	X	X	X	C	
Sulfur Dioxide Dry		A	A	A	A	A	A	A	A	X	B	B	
Sulfur Dioxide Wet		X	A	A	A	X	A	A	A	X		B	
Sulfur Slurries		A	A	A	A	A							
Sulfur Trioxide Dry		C	C	X	X	C	B	C	C	C	C	B	
Sulfuric Acid 10%	A	A	A	A	A	A	A	A	B	C	C	X	A
Sulfuric Acid 30%		A	A	A	A	A	A	A	A	C	X	X	C
Sulfuric Acid 50%		A	A	A	A	A	A	A	B	C	X	X	C
Sulfuric Acid 60%		A	A	A	B	A	A	A	B	X	X	X	C
Sulfuric Acid 70%		A	A	C	A	A	A	A	A	C	X	X	C
Sulfuric Acid 80%		X	A	A	A	X	A	A	A	C	X	X	X
Sulfuric Acid 90%		X	A	C	A	X	A	A	A	C	X	X	X
Sulfuric Acid 95%	X	X	B	X	A	X	A	A	X	X	X	X	X
Sulfuric Acid 98%		X	B	X	A	X	B	X	X		X	X	
Sulfuric Acid 100%		X	X	X	C	X	B	C	X	X	C	C	X
Sulfurous Acid		A	A	A	A	A	A	A	C	X	B	C	A
Sulfuryl Chloride		A					A						
Syrup		A		A		A	A	A		A	A		
Tall Oil		A	A	A	A	A	A	A	X	A		X	

A = Excellent, no effect • B = Good, minor effect • C = Fair, data not conclusive, testing recommended • X = Not recommended.
Ratings are based on testing at an ambient temperature of 70°F. Customer should test to determine application suitability.

Chemicals	Ultem (GF 40%)	PVC	CPVC	PPL	PVDF	PVCGF (Fiberloc)	Teflon	Viton	EPDM	Nitrile (Buna N)	316 SS	416 SS	Titanium
Tallow				A	A		A	A	A	A	A		
Tannic Acid		A	A	A	A	A	A	A	B	C	C	B	A
Tanning Liquors		A	A	A	A	A	A	A	B	C	A		A
Tar		X	X	B	A	X	A	A	X	C		B	
Tartaric Acid		A	A	A	A	A	A	A	B	C	B	B	A
Tertiary Butyl Alcohol		A	A	A	A	A	A	A	B				
Tetrachlorethane		X		A		X	A	A	X	X	A		A
Tetrochloroethane					A	X	A	A	X				
Tetraethyl Lead		B	A	A	A	C	A	B	X	C			
Tetrahydrofuron	X	X	X	B	B	X	A	X	X	X	A		
Tetralin		X	X	X	A	X	A	A	X	X			
Thionyl Chloride		X	X	X	X	X	A						
Thread Cutting Oils		A	A	A	A	A			X				
Titanium Tetrachloride		X	X	X	X	X	A	A	X	C			
Titanous Sulfate		A	A	A	A	A	A						
Toluene	C	X	X	C	A	X	A	B	X		A	A	
Toluene Toluol		X	X	C	B	X	A	C	X	X	A	A	A
Tomato Juice		A	A	C	A	A	A		A	A	A	C	
Toxaphene-Xylene		X	X	X	A	X							
Transformer Oil		A	A	A	A	A	A	A	X	A			
Tributyl Phosphate		X	X	C	A	X	A	X	A	X			
Trichloroacetic Acid		A	A	C	A	A	A	X	X	X	X	X	
Trichloroethane	X					X	A	A	X	X	A		A
Trichloroethylene	X	X	X	B	A	X	A	A	X	C	A	A	B
Trichloropropane						X	A	A		A	A	A	
Tricresyl Phosphate		X				X	A	B	A	X	A		B
Triethanolamine		B		C	C	C		X	A				
Triethyl Phosphate	C	A	A	A	A	A	A	A	A		A		
Triethylamine	A	A	A	X	C	A		A		A			
Trimethylpropane		A	A	A	A	A	A						
Trisodiun Phosphate		A	A	A	A	A	A	A	A	A	A	B	
Turbine Oil		A	A	B		A	A	A	X	B			
Turpentine	A	X	A	B	A		A	A	C	C	A	B	
Urea	A	A	A	A	A	A	A	A	A	C			
Urine		A	A	A	A	A	A	A	A	A	A		

Chemicals	Ultem (GF 40%)	PVC	CPVC	PPL	PVDF	PVCGF (Fiberloc)	Teflon	Viton	EPDM	Nitrile (Buna N)	316 SS	416 SS	Titanium
Vanilla Extract				A		A	A						
Varnish				A	A		A	A	X	B	A	A	
Vaseline		X	A	A	A	X	A	A	X	A			
Vegetable Oil		A	C	A	A	A	A	A	A	A	A		
Vinegar	A	A	A	A	A	A	A	A	A	C	A	A	A
Vinyl Acetate	X	X	X		A	X	A	X	B	X			
Vinyl Chloride							A	A	C	X		A	
Vinyl Ether							A	X		B			
Water Acid Mine		A	A	A	A	A	A	A	A	A	A	C	
Water Deionized		A	A	A	A	A	A	B	A	A	A		
Water Demineralized		A	A	A	A	A		A	A	A			
Water Distilled		A	A	A	A	A	A	A	A	A	A	A	
Water Potable		A	A	A	A	A	A	A	A	A	A	A	
Water Salt		A	A	A	A	A	A	A	A	A	A	C	
Water Sewage		A	A	A	A	A	A	A	A	A			
Weed Killers								A		B	A		
Whey								A		A	A		
Whiskey		A	A	A	A	A	A	A	A	A	A		
White Acid					A		A						
White Liquor		A	A	A	A	A	A	A	A	B	A		
Wines		A	A	A	A	A	A	A	A	A	A	C	
Xenon							A	A	A	A			
Xylene	X	X	X	X	A	X	A	B	X	X	A		
Xylol		X	X	X	A	X	A	A	X	C			
Yeast				A	A		A	A	A				
Zeolite							A	A	A	B			
Zinc Acetate		A	A	A	A	A	A	C	A	B			
Zinc Carbonate							A	A		A		B	
Zinc Chloride	A	A	A	A	A	A	A	A	A	A	B	C	A
Zinc Chromate							A						
Zinc Nitrate		A	A	A	A	A	A	A	A				
Zinc Phosphate													
Zinc Salts				A	A	A	A	A	A	A			
Zinc Sulfate		A	A	A	A	A	A	A	A	A	A	A	A
Zirilite							A	C	A	B			

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