

## Section 5



## Type 21 Ball Valve

### Standard Features (Sizes 1/2" – 6")

- Pressure rated up to 230 psi (PVC, CPVC, PVDF)
- Double O-ring seals on stem for an added protection.
- Full bore, sizes 1/2" – 2"
- Full vacuum rated, all sizes
- Blocks in two directions, upstream and downstream, leaving full pressure on the opposite end of the valve
- Integrally molded ISO mounting pad for both manual and actuated operations
- Integrally molded base pad to mount valves securely or panel mounting
- PTFE seats with elastomeric backing cushions ensure bubble-tight shut-off and a low fixed torque, while at the same time compensating for wear
- True Union design for easier installation or repairs without expanding the pipe system
- Built-in spanner wrench on the handle for valve disassembly and assembly
- Two sets of end connectors (socket and threaded) included with all PVC and CPVC valves in sizes 1/2" – 2"
- CPVC threaded end connectors on sizes 1/2" – 1" come with stainless steel reinforcing rings

### Options

- Pneumatic and electric actuators & accessories
- Stem extensions
- 2" square operating nut or "T" nut
- Locking and/or spring return handles
- Limit switches
- Vented Ball

### Specifications

**Sizes:** 1/2" – 6"  
**Models:** PVC & CPVC: Socket Threaded and Flanged (ANSI)  
 PP & PVDF: IPS and Metric (DIN)  
 Socket, Threaded, Butt and Flanged (ANSI)  
**Bodies:** PVC, CPVC, PP and PVDF  
**Seats:** PTFE backed with EPDM or FKM  
**Seals:** EPDM or FKM or AFLAS®†

**Sizes 1/2" - 4" PVC/EPDM/FKM Models available with NSF-61 Certification**

† Trademark of Asahi Glass Co., Ltd.

### Parts List (Sizes 1/2" – 2")

PARTS			
NO.	DESCRIPTION	PCS.	MATERIAL
1	Body	1	PVC, CPVC, PP, PVDF
2	Ball	1	PVC, CPVC, PP, PVDF
3	Carrier	1	PVC, CPVC, PP, PVDF
4	End Connector	2	PVC, CPVC, PP, PVDF
5	Union Nut	2	PVC, CPVC, PP, PVDF
6	Stem	1	PVC, CPVC, PP, PVDF
7	Seat	2	PTFE
8	O-Ring (A)	2	EPDM, FKM, Others
9	O-Ring (B)	1	EPDM, FKM, Others
10	O-Ring (C)	2	EPDM, FKM, Others
11	O-Ring (D)	1	EPDM, FKM, Others
12	O-Ring (E)	1	EPDM, FKM, Others
13	Stop Ring*	2	PVDF
14	Handle	1	ABS
4a	Ring**	2	304 Stainless Steel

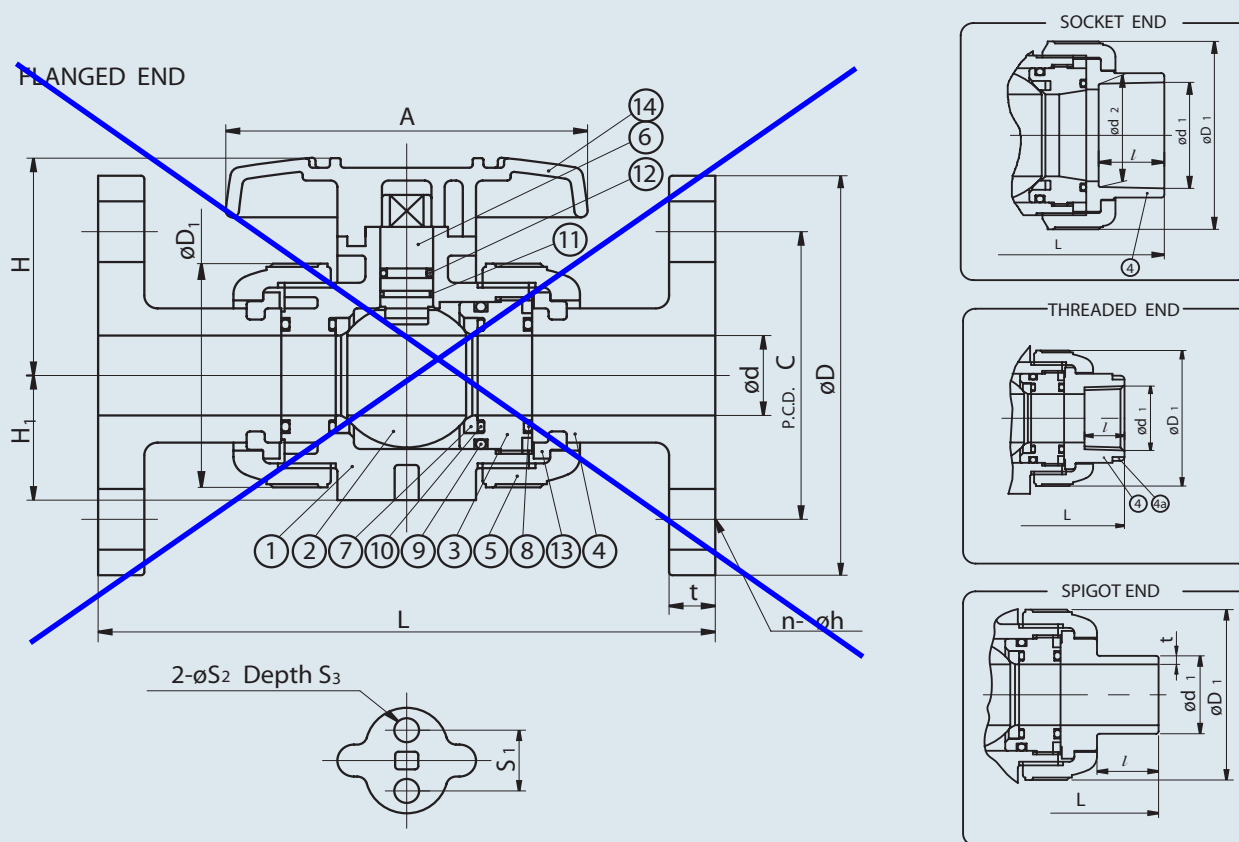
\* Used for flanged end

\*\* Used for CPVC body, threaded end, 1/2" – 1"



**ASAHI/AMERICA**

Rev. C 03-05



## Dimensions (Sizes 1/2" – 2")

NOMINAL SIZE		FLANGED							SOCKET										
		ANSI CLASS 150							PVC, CPVC				PP, PVDF (DIN)				PP, PVDF (IPS)		
									ASTM SCH 80		L	L	DIN 16962				d1	l	L
INCHES	mm	d	D	C	n	h	L	t	d1	d2			d1	d2	l	L			
1/2	15	0.59	3.50	2.38	4	0.62	5.63	0.47	0.848	0.836	0.875	4.45	0.768	0.760	0.57	3.90	0.83	0.87	4.45
3/4	20	0.79	3.88	2.75	4	0.62	6.77	0.55	1.058	1.046	1.000	5.08	0.965	0.957	0.63	4.49	1.03	1.00	5.08
1	25	0.98	4.25	3.12	4	0.62	7.36	0.55	1.325	1.310	1.125	5.75	1.240	1.232	0.71	4.84	1.30	1.13	5.75
1 1/4	32	1.26	4.62	3.50	4	0.62	7.48	0.63	1.670	1.655	1.250	6.46	1.553	1.543	0.81	5.47	1.65	1.25	6.46
1 1/2	40	1.57	5.00	3.88	4	0.62	8.35	0.63	1.912	1.894	1.375	7.24	1.947	1.937	0.93	5.83	1.89	1.37	7.24
2	50	2.01	6.00	4.75	4	0.75	9.21	0.63	2.387	2.369	1.500	8.23	2.461	2.445	1.08	6.93	2.36	1.50	8.23

NOMINAL SIZE		THREADED							SPIGOT (BUTT END)								
									PP, PVDF								
									DIN 3442		PP	PVDF					
INCHES	mm	d1	l	L	D1	H	H1	A	d1	l	t	t	L	S1	S2	S3	
1/2	15	1/2-14 NPT	0.59	4.02	1.89	2.03	1.14	3.62	0.787	0.728	0.098	0.075	4.882	0.75	0.29	0.43	
3/4	20	3/4-14 NPT	0.67	4.72	2.36	2.34	1.38	3.94	0.984	0.866	0.106	0.075	5.670	0.75	0.29	0.43	
1	25	1-11 1/2 NPT	0.79	5.16	2.76	2.68	1.54	4.33	1.260	0.886	0.118	0.094	6.063	0.75	0.29	0.43	
1 1/4	32	1 1/4-11 1/2 NPT	0.87	5.91	3.23	3.17	1.85	4.76	1.575	1.024	0.146	0.094	6.850	1.18	0.35	0.59	
1 1/2	40	1 1/2-11 1/2 NPT	0.98	6.42	3.94	3.50	2.17	5.16	1.969	1.260	0.181	0.118	7.638	1.18	0.35	0.59	
2	50	2-11 1/2 NPT	1.10	7.76	4.96	4.04	2.60	6.26	2.480	1.417	0.228	0.118	8.819	1.18	0.35	0.59	

## Pressure vs. Temperature (PSI, WATER, NON-SHOCK)

NOMINAL SIZE		PVC				CPVC						PP				PVDF				
		30° F 70° F	71° F 105° F	106° F 120° F	121° F 140° F	30° F 70° F	71° F 105° F	106° F 120° F	121° F 140° F	141° F 175° F	176° F 195° F	-5° F 85° F	86° F 120° F	121° F 140° F	141° F 175° F	-5° F 70° F	71° F 105° F	106° F 140° F	141° F 175° F	176° F 210° F
INCHES	mm																			
1/2-2	15-50	230	170	150	30	230	170	150	120	75	55	150	110	90	55	230	185	150	115	85
2 1/2	65	230	170	150	NA	230	170	150	120	75	55	150	95	70	40	230	185	150	115	85
3	80	230	170	150	NA	230	170	150	85	55	40	150	95	70	40	230	185	150	100	70
4-6	100-150	150	150	150	NA	150	150	150	85	55	40	150	95	70	40	150	150	150	100	70

## Sample Specification

All TYPE 21 Ball Valves, sizes 1/2" to 4", shall be of true union design with two-way blocking capability. All O-rings shall be EPDM or FKM with PTFE seats. PTFE seats shall have elastomeric backing cushion of the same material as the valve seals. Stem shall have double O-rings and be of blowout-proof design. The valve handle shall double as carrier removal and/or tightening tool. ISO mounting pad shall be integrally molded to valve body for actuation. PVC conforming to ASTM D1784 Cell Classification 12454-A, CPVC conforming to ASTM D1784 Cell Classification 23567-A, PP Conforming to ASTM D4101 Cell Classification PP0210B67272 and PVDF conforming to ASTM D3222 Cell Classification Type II. The ball valves, except PP, shall have a pressure rating of 230 psi for sizes 1/2" to 3" and 150 psi for 4" (150 psi for PP, all sizes) at 70 ° F. Type 21 Ball Valves must carry a two-year guarantee, as manufactured by Asahi/America, Inc.

## Cv Values

NOMINAL SIZE		Cv
INCHES	mm	
1/2	15	14
3/4	20	29
1	25	47
1 1/4	32	72
1 1/2	40	155
2	50	190
2 1/2	65	365
3	80	410
4	100	680

## Weight (POUNDS)

NOMINAL SIZE		SOCKET THREADED	FLANGED
INCHES	mm		
1/2	15	0.44	1.10
3/4	20	0.66	1.54
1	25	1.10	2.70
1 1/4	32	1.54	3.30
1 1/2	40	2.64	4.40
2	50	4.40	8.15
2 1/2	65	6.17	8.80
3	80	9.70	13.00
4	100	24.00	26.67

## Caution

- Never remove valve from pipeline under pressure.
- Always wear protective gloves and goggles.
- Watch out for trapped fluid in valve. It is safe to close valve before removing it from the pipeline.

## Caution

- Do not use ball valves where media has suspended particles. Use the following valves:  
*Butterfly Valves* – PVDF disc is most abrasion resistant and make sure of chemical compatibility.  
*Diaphragm Valves* – Elastomeric diaphragm is designed for handling suspended particles.
- Volatile fluids such as sodium hypochlorite (NaClO) and hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) could be trapped and gasified within the valve. We can provide you with a Type 21 ball valve with a *vented ball* to relieve pressure build-up inside the valve.

## Troubleshooting

### What if the fluid still flows when valve is closed?

- Carrier is not properly tightened. Tighten it.
- PTFE seat is damaged or worn. Replace seat.
- Foreign material is caught between ball and PTFE seat. Remove material and clean.
- Ball is damaged or worn. Change ball.

### What if fluid leaks outside of valve?

- Union nut not properly tightened. Retighten.
- Carrier is not properly tightened. Thread it in firmly.
- Carrier or face O-ring is damaged, worn, or missing. Replace O-ring.

### What if handle does not rotate smoothly?

- Foreign material has formed on the ball or seat. Clean both.
- Internal part(s) chemically attacked or swollen. Refer to Asahi/America Chemical Resistance Chart for compatibility. Replace part(s) as required.
- Carrier over-tightened. Retighten properly.

### What if handle rotates too freely?

- Stem is damaged. Replace stem.
- Handle is not engaged with stem. Disassemble and reengage. Inspect.
- Engaging part of stem and/or ball is damaged. Change stem and/or ball.



Serial No.	H – V027 E – 4
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**Ball Valve Type 21**

**User’s Manual**



## (1) General operating instructions

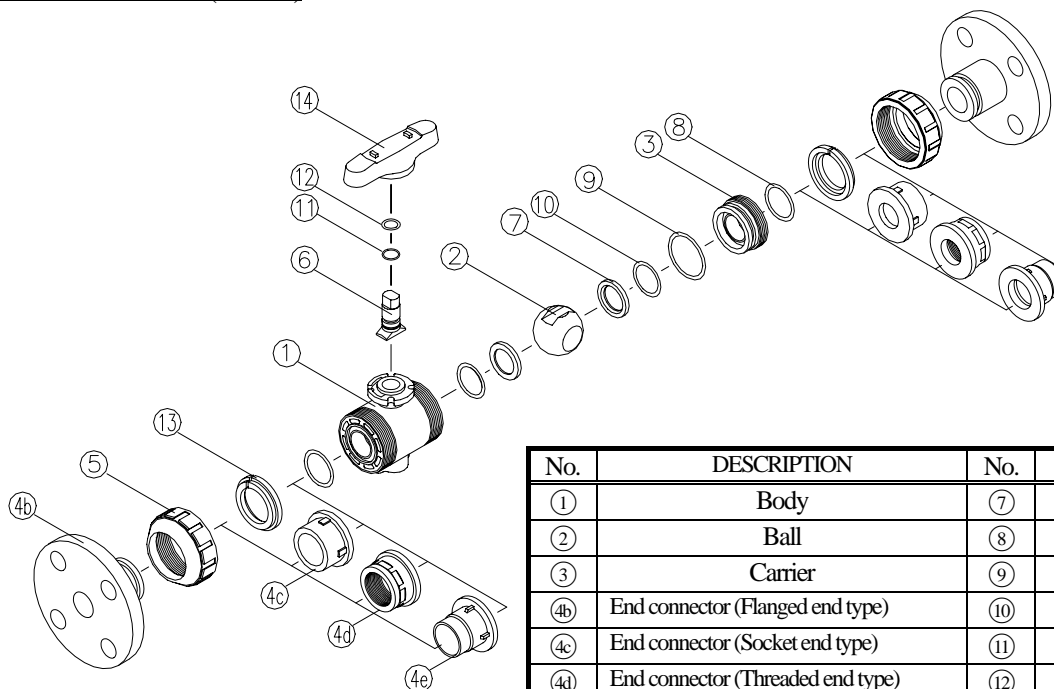
- Operate the valve within the pressure Vs temperature range.  
(The valve can be damaged by operating beyond the allowable range.)
- Select a valve material that is compatible with the media, refer to “CHEMICAL RESISTANCE ON ASAHI AV VALVE”.  
(Some chemicals may damage incompatible valve materials.)
- Do not use the valve to fluid containing slurry. (The valve will not operate properly.)
- Do not use the valve on condition that fluid has crystallized.  
(The valve will not operate properly.)
- Do not step on the valve or apply excessive weight on valve. (It can be damaged.)
- Do not exert excessive force in closing the valve.
- Make sure to consult a waste treatment dealer to dispose of the valves.  
(Poisonous gas is generated when the valve is burned improperly.)
- Allow sufficient space for maintenance and inspection.
- Keep the valve away from excessive heat or fire. (It can be deformed, or destroyed.)
- The valve is not designed to bear any kind of external load. Never stand on or place anything heavy on the valve at anytime.
- Certain liquid such as H<sub>2</sub>O<sub>2</sub>, NaClO, etc may be prone to vaporization which may cause irregular pressure increases, which may destroy the valve.

## (2) General instructions for transportation, unpacking and storage

- Keep the valve packed in the carton or box as delivered until installation.
- Keep the valve away from any coal tar, creosote (antiseptic for wood), termite insecticide, vermicides, and paint.  
(This could cause swelling damage the valve.)
- Do not impact or drop the valve. (It can be damaged.)
- Avoid scratching the valve with any sharp object.

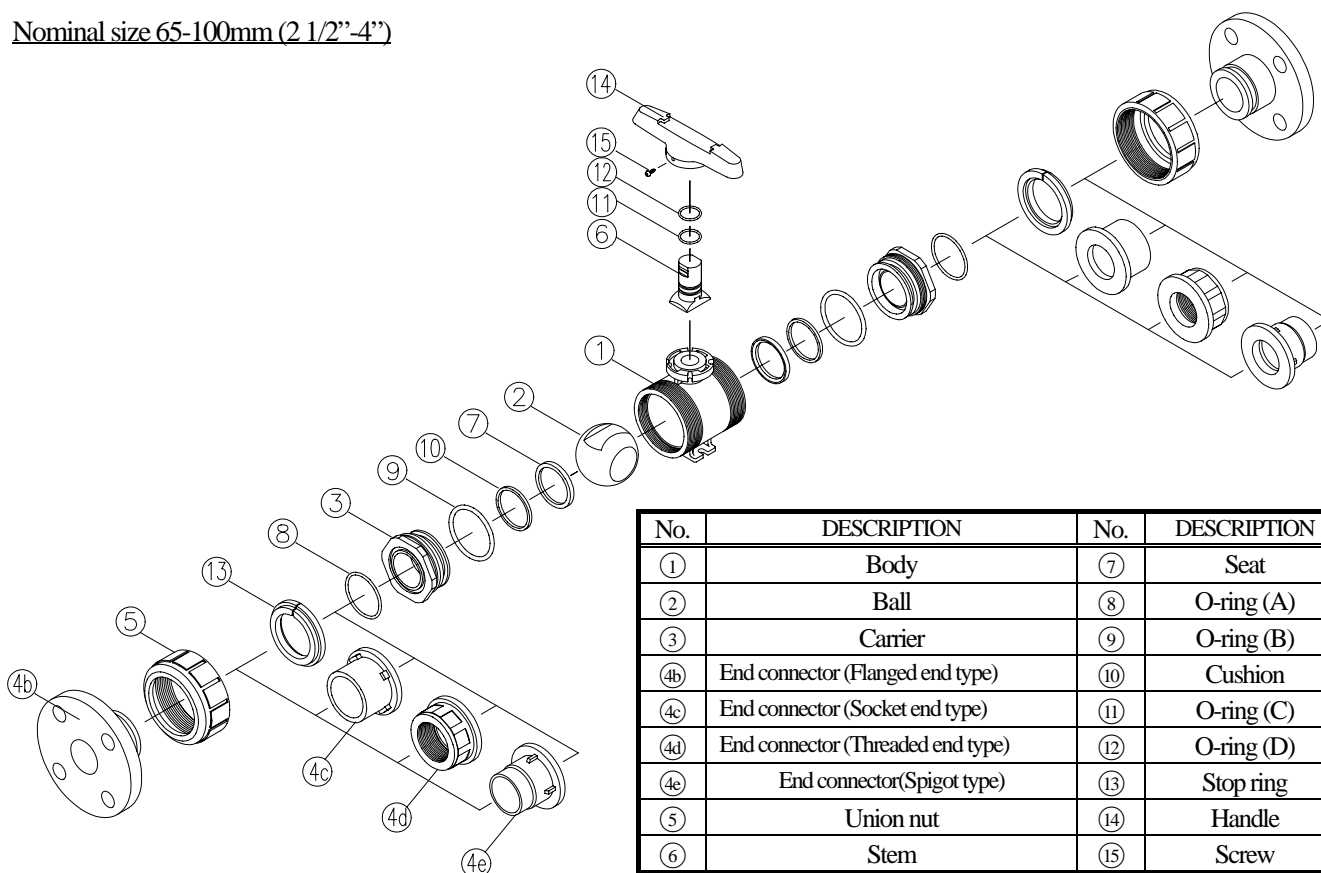
### (3) Name of parts

Nominal size 15-50mm (1/2"-2")



No.	DESCRIPTION	No.	DESCRIPTION
①	Body	⑦	Seat
②	Ball	⑧	O-ring (A)
③	Carrier	⑨	O-ring (B)
④b	End connector (Flanged end type)	⑩	O-ring (C)
④c	End connector (Socket end type)	⑪	O-ring (D)
④d	End connector (Threaded end type)	⑫	O-ring (E)
④e	End connector (Spigot type)	⑬	Stop ring
⑤	Union nut	⑭	Handle
⑥	Stem		

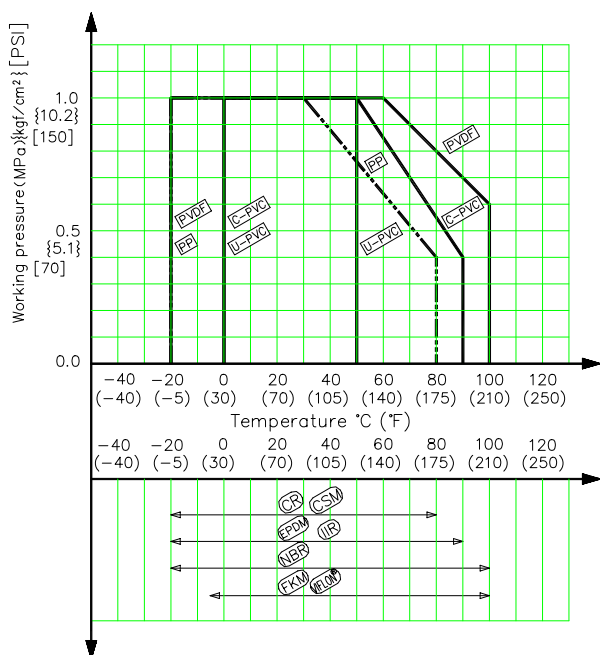
Nominal size 65-100mm (2 1/2"-4")



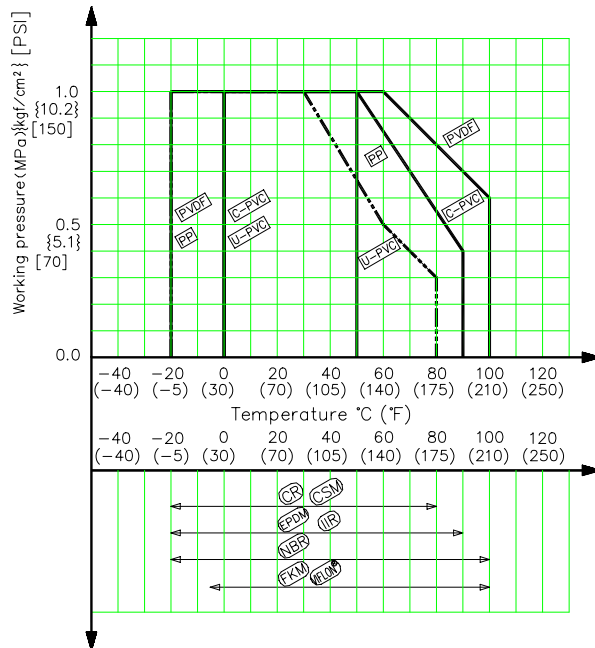
No.	DESCRIPTION	No.	DESCRIPTION
①	Body	⑦	Seat
②	Ball	⑧	O-ring (A)
③	Carrier	⑨	O-ring (B)
④b	End connector (Flanged end type)	⑩	Cushion
④c	End connector (Socket end type)	⑪	O-ring (C)
④d	End connector (Threaded end type)	⑫	O-ring (D)
④e	End connector (Spigot type)	⑬	Stop ring
⑤	Union nut	⑭	Handle
⑥	Stem	⑮	Screw

#### (4) Comparison between working temperature and pressure

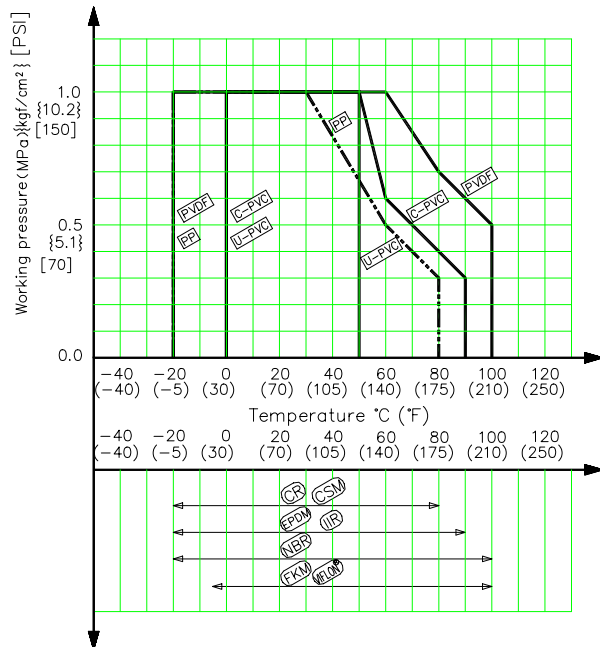
Nominal size: 15mm-50mm (1/2"-2")



Nominal size: 65mm (2 1/2")



Nominal size: 80mm, 100mm (3", 4")



#### Caution

Do not operate the valve beyond the range of working temperature and pressure.  
(The valve can be damaged.)

## (5) Installation procedure

### **Flanged type** (Material: PVC, C-PVC, PP, PVDF)

#### Necessary items

- Torque wrench
- Spanner wrench
- AV gasket
- Bolt, Nut, Washer (For many flanges specification)

(When a non-AV gasket is used, a different tightening torque specification should be followed.)

#### Procedure

- 1) When the union nut ⑤ flange assembly set was removed or loosen from body ①, O-ring (A) ⑧ should be installed into carrier and body groove. (In either horizontal or vertical installation, if necessary apply a small amount of lubricant to O-ring to hold in place.) Align union nut and end connector with the body. Insure end connector mates with body and O-ring. Make certain union nut threads onto body smoothly. Tighten union nuts on each side valve until hand tight. Then using a strap wrench tighten union nuts uniformly on each side approx 90° -180° turns, 1/4 to 1/2 turns.
- 2) Set the AV gasket between the flanges.
- 3) Insert washers and bolts from the pipe side, insert washers and nuts from the valve side, then temporarily tighten them by hand.



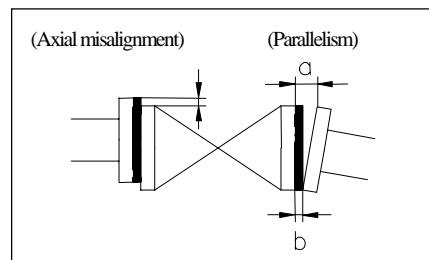
#### Caution

The parallelism and axial misalignment of the flange surface should be under the values shown in the following table to prevent damage the valve.

(A failure to observe them can cause destruction due to stress application to the pipe)

Unit : mm (inch)

Nom. Size	Axial Misalignment	Parallelism (a-b)
15-32mm (1/2"-1 1/4")	1.0mm (0.04")	0.5mm (0.02")
40-80mm (1 1/2"-3")	1.0mm (0.04")	0.8mm (0.03")
100mm (4")	1.0mm (0.04")	1.0mm (0.04")



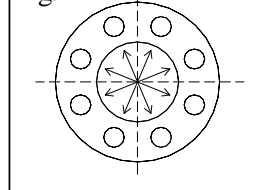
- 4) Tighten the bolts and nuts gradually with a torque wrench to the specified torque level in a diagonal manner. (Refer to fig.1.)

#### Recommended torque value

Unit: N·m [kgf·cm] [lb·inch]

Nom. Size	15-20mm (1/2"-3/4")	25-40mm (1"-1 1/2")	50, 65 mm (2", 2 1/2")	80, 100 mm (3", 4")
Torque value	17.5 { 179 } [155]	20.0 { 204 } [177]	22.5 { 230 } [230]	30.0 { 306 } [266]

Fig. 1



#### Caution

Avoid excessive tightening. (The valve can be damaged.)

**Threaded type** (Material : PVC, C-PVC, PP, PVDF)

## Necessary items

- Sealing tape (A non-sealing tape can cause leakage.)
- Strap wrench (Do not use Pipe wrench.)
- Spanner wrench



## Caution

Make sure that the threaded connections are plastic x plastic.  
(Metallic thread can cause damage.)

Procedure

- 1) Wind a sealing tape around the external thread of joint, leaving the end (about 3mm) free.
- 2) Loosen the union nut (5) with a strap wrench..
- 3) Remove the union nut (5) and the end connector (4d).
- 4) Lead the union nut (5) through the pipe.
- 5) Tighten the external thread of the joint and the end connector (4d) hardly with hand.
- 6) Using a spanner wrench, screw in the end connector (4d) by turning 180° -360° carefully without damaging it.



## Caution

Avoid excessive tightening. (The valve can be damaged.)

- 7) Make sure that the O-ring (A) (8) is mounted.
- 8) Set the end connector (4d) and union nut (5) directly on the body without allowing the O-ring (A) (8) to come off.
- 9) Tighten union nuts (5) on each valve until hand tight.
- 10) Using a strap wrench tighten union nuts uniformly on each on each side approx 90° -180° turns, 1/4 to 1/2 turns.



## Caution

Avoid excessive tightening. (The valve can be damaged.)



Socket type (Material : PVC, C-PVC)

## Necessary items

- Adhesive for hard vinyl chloride pipes
- Strap wrench (Do not use the pipe wrench)



## Caution

Do not install a socket type valve where the atmospheric temperature is 5°C or lower.  
(The valve can be damaged.)

Procedure

- 1) Loosen the union nut ⑤ with a strap wrench.
- 2) Remove the union nut ⑤ and end connector ④c.
- 3) Lead the union nut through the pipe.
- 4) Clean the hub part of the end connector ④c by wiping the waste cloth.
- 5) Apply adhesive evenly to the hub part of the end connector ④c and the pipe spigot.



## Caution

Do not apply more adhesives than necessary.  
(The valve can be damaged due to solvent cracking.)

Adhesive quantity (guideline)

Nom. Size	15mm (1/2")	20mm (3/4")	25mm (1")	32mm (1 1/4")	40mm (1 1/2")	50mm (2")	65mm (2 1/2")	80mm (3")	100mm (4")
Quantity (g)	1.0	1.3	2.0	2.4	3.5	4.8	6.9	9.0	13.0

- 6) After applying adhesive, insert the pipe quickly to the end connector ④c and leave it alone for at least 60 seconds.
- 7) Wipe away overflowing adhesive.
- 8) Make sure that O-ring(A) ⑧ is mounted
- 9) Set the end connector ④c and union nut ⑤ directly on the body without allowing the O-ring (A) ⑧ to come off.
- 10) Tighten union nut ⑤ hardly with hand.
- 11) Using a strap wrench tighten union nuts uniformly on each side approx 90° -180° turns, 1/4 to 1/2 turns.



## Caution

Avoid excessive tightening. (The valve can be damaged.)

**Socket type** (Material : PP, PVDF)

## Necessary items

- Strap wrench (Do not use the pipe wrench.)
- Sleeve welder or automatic welding machine
- User's manual for sleeve welder or automatic welding machine

**Procedure**

- 1) Loosen the union nut with a strap wrench.
- 2) Remove the union nut ⑤ and the end connector.
- 3) Lead the union nut ⑤ through the pipe.
- 4) For the next step, refer to the user's manual for the sleeve welder or the automatic welding machine.
- 5) After welding, make sure that the O-ring (A) ⑧ is mounted.
- 6) Set the end connector ④c and the union nut ⑤ directly without allowing the O-ring (A) ⑧ to come off.
- 7) Tighten union nut ⑤ hardly with hand.
- 8) Using a strap wrench tighten union nuts uniformly on each side approx 90° -180° turns, 1/4 to 1/2 turns.

**Caution**

Avoid excessive tightening. (The valve can be damaged.)

**Spigot type** (Material : PVDF)

## Necessary items

- Strap wrench (Do not use the pipe wrench.)
- Automatic welding machine
- User's manual for automatic welding machine

**Procedure**

- 1) Loosen the union nut with a strap wrench.
- 2) Remove the union nut ⑤ and the end connector.
- 3) Lead the union nut ⑤ through the pipe.
- 4) For the next step, refer to the user's manual for the sleeve welder or the automatic welding machine.
- 5) After welding, make sure that the O-ring (A) ⑧ is mounted.
- 6) Set the end connector ④c and the union nut ⑤ directly without allowing the O-ring (A) ⑧ to come off.
- 7) Tighten union nut ⑤ hardly with hand.
- 8) Using a strap wrench tighten union nuts uniformly on each side approx 90° -180° turns, 1/4 to 1/2 turns.

**Caution**

Avoid excessive tightening. (The valve can be damaged.)

**Caution**

{15mm-50mm(1/2"-2")}

It is recommended to install the valve with the threaded carrier to the upstream side of the system.

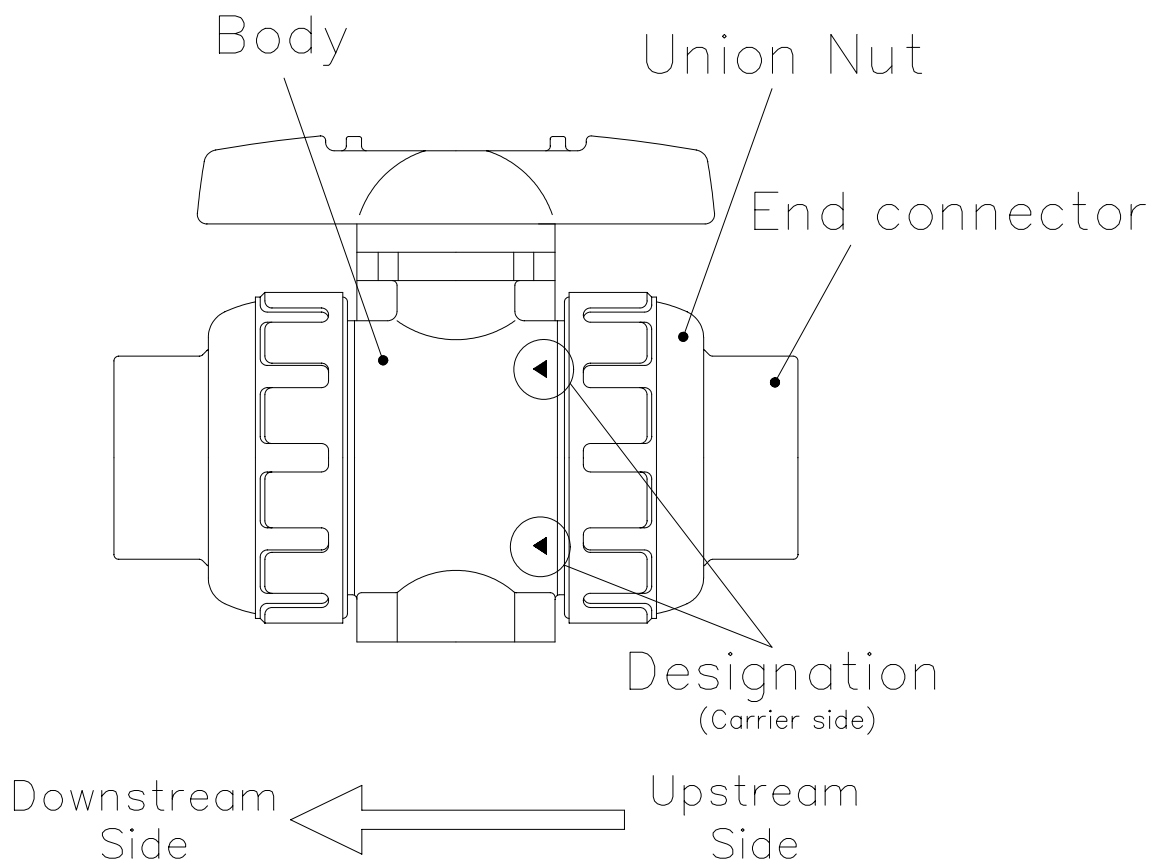
This allows for an increase safety factor and eliminating a threaded connection when used as a blocking valve.

This also allows the down stream union nut and end connector to be removed safely under pressure.

It increases the safety where there is no chance of thread leakage or accidentally removing the carrier.

The designation of the up stream side (non threaded carrier is marked as shown) on the body.

Nominal size 15mm - 50mm (1/2" – 2")



## (6) Operating Procedure



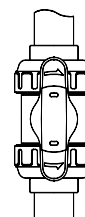
### Caution

Avoid excessive tightening. (The valve can be damaged.)

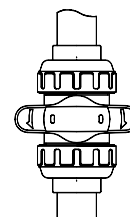
- Turn the handle gently to open or close.  
(Turn the handle clockwise to close and counter clockwise to open.)

Fully closed ..... The position of the handle should be perpendicular to the pipe.

Fully opened ..... The position of the handle should be parallel to the pipe.



Fully opened



Fully closed

## (7) Method of Adjusting Face Pressure between Ball and Seat

### Necessary items

- Strap wrench
- Safety goggles
- Protective gloves
- Screwdriver (+) (only with nominal size 65~100mm)

### Procedure

- 1) Completely discharge fluid from pipes.
- 2) Turn the handle to full close.
- 3) Loosen the right union nut and the left one ⑤ with a strap wrench.
- 4) Remove the body part from piping system.



### Caution

Wear protective gloves and safety goggles as some fluid remains in the valve. (You may be injured.)

- 5) Pull the handle off the body part.



### Caution

As for nominal size 65-100mm (2 1/2"-4"), loosen the screw ⑮ properly with a screwdriver before pulling it off..

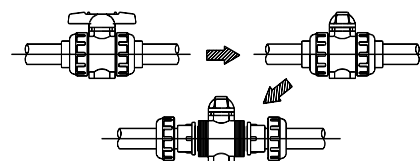
- 6) Engage the upper convex part of the handle with the concave part of the union ③.



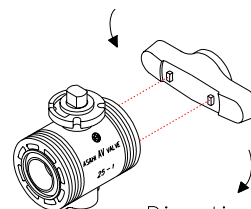
### Caution

As for nominal size 15-50mm  
Only the union ③ on the right side when viewed from the trademark (AV mark) can be adjusted.  
As for nominal size 65-100mm  
adjust the unions on both sides.

- 7) Make an adjustment by turning the union clockwise (to tighten it) or counter clockwise (to loosen it).
- 8) Make sure that the handle can be operated smoothly.
- 9) Assemble the valve by following the above procedure in the reverse order, starting at 6)



Direction where carrier is tightened



Direction where carrier is loosened

## (8) Disassembling Method for Replacing Parts

### Necessary items

- Strap wrench
- Safety goggles
- Protective gloves



### Caution

Wear protective gloves and safety goggles as some fluid remains in the valve.  
(You may be injured.)

### <Disassembly>

#### Procedure

- 1) Completely discharge fluid from pipes.
- 2) Turn the handle to full close.
- 3) Loosen the right union nut and the left one ⑤ with a strap wrench.
- 4) Remove the body part from piping system.
- 5) Pull the handle off the body part.



### Caution

As for nominal size 65-100mm (2 1/2"-4"), loosen the screw ⑮ properly with a screwdriver before pulling it off..

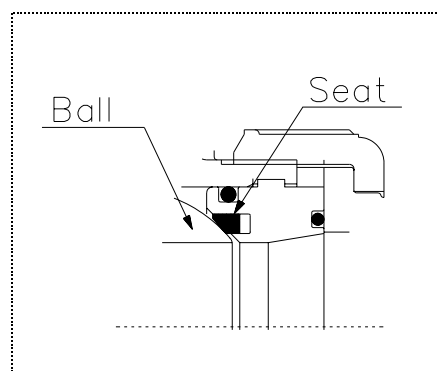
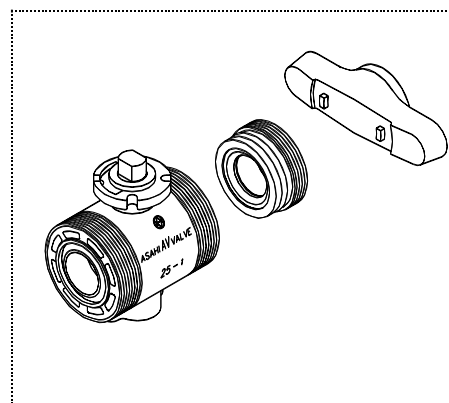
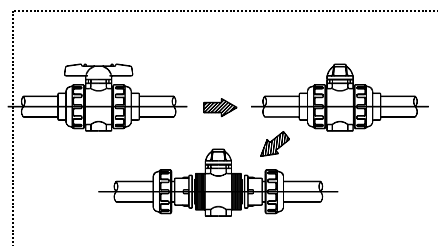
- 6) Engage the upper convex part of the handle with the concave part of the union.



### Caution

As for nominal size 15-50mm  
Only the union ③ on the right side when viewed from the trademark (AV mark) can be adjusted.  
As for nominal size 65-100mm, adjust the unions on both sides.

- 7) In the engaged state, turn the handle ⑭ counter clockwise to loosen it and remove the union ③.
- 8) Remove the seat ⑦ carefully by hand without damaging it.
- 9) Push out the ball ② by hand.
- 10) Push out the stem ⑥ from the top flange side to the body side.



### <Assembly>

#### Procedure

Carry out the assembly work in the reverse procedure from item 10)



### Caution

With regard to item 8), before installing seat ⑦ on the valve, check the seat for its face and back.

## (9) Mounting actuator, Ensaf and base (panel)

### ○ Attach actuator to the top flange

#### Procedure

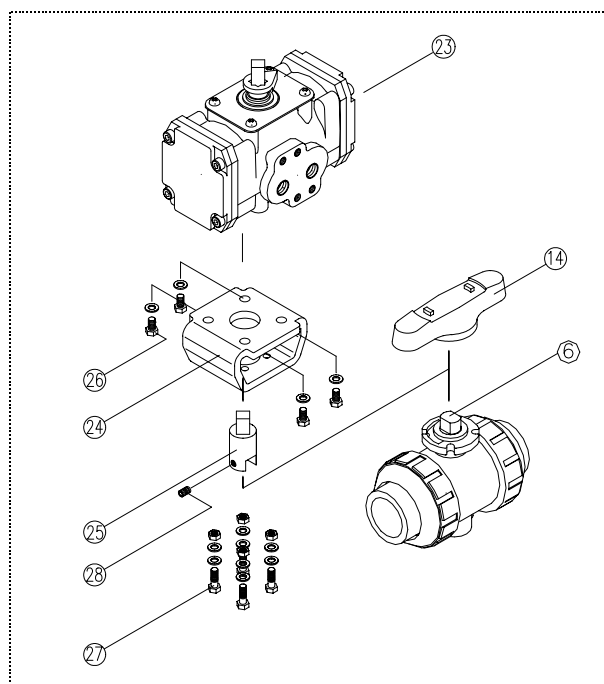
- 1) Remove the handle (14).



#### Caution

As for nominal 65mm-100mm, tighten the screw (15) properly before removing it.

- 2) Fix the stand (24) to actuator (23) with bolt (A).
- 3) Fix the stem (6) to the joint (25) with screw (B) (28).
- 4) Engage the joint (25) with actuator (23).
- 5) Fix the stand (24) to the top flange with bolt-nut (B) (27).
- 6) Make sure that the valve works smoothly, by operating actuator (23) by hand.



### ○ Attach Inserted metal to the bottom stand.

#### Procedure

Refer to the user's manual for the Inserted metal  
(Commercially available.)

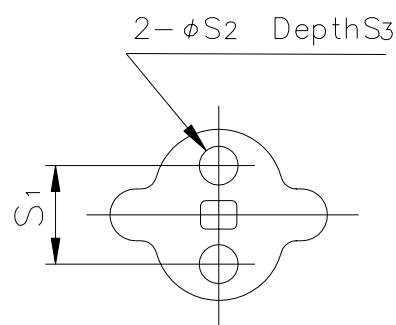
#### Bottom stand dimension

Unit; mm

Nom.Size	S1	S2	S3
15mm (1/2")	19	7.3	11
20mm (3/4")	19	7.3	11
25mm (1")	19	7.3	11
32mm (1 1/4")	30	9	15
40mm (1 1/2")	30	9	15
50mm (2")	30	9	15
65mm (2 1/2")	48	9	6
80mm (3")	55	11	7
100mm (4")	65	11	8

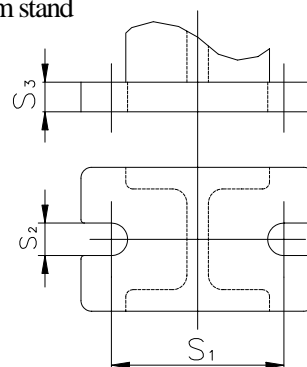
Nominal 15-50mm(1/2"-2")

Bottom stand



Nominal 65-100mm (2 1/2"-4")

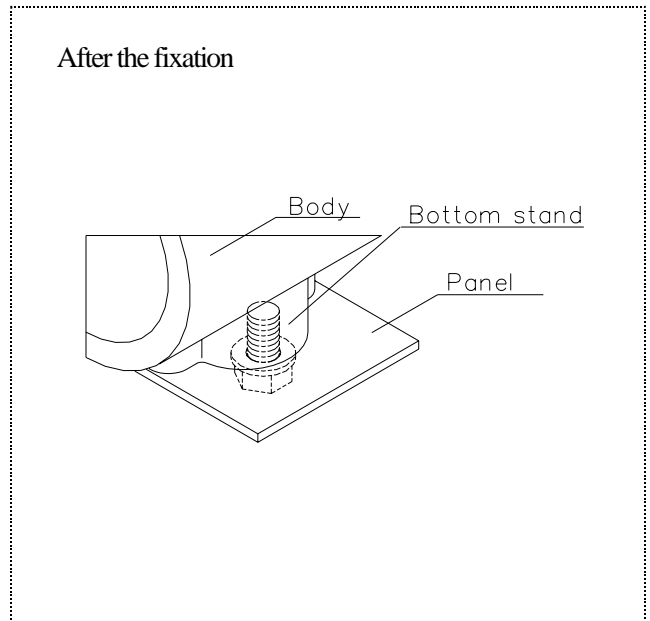
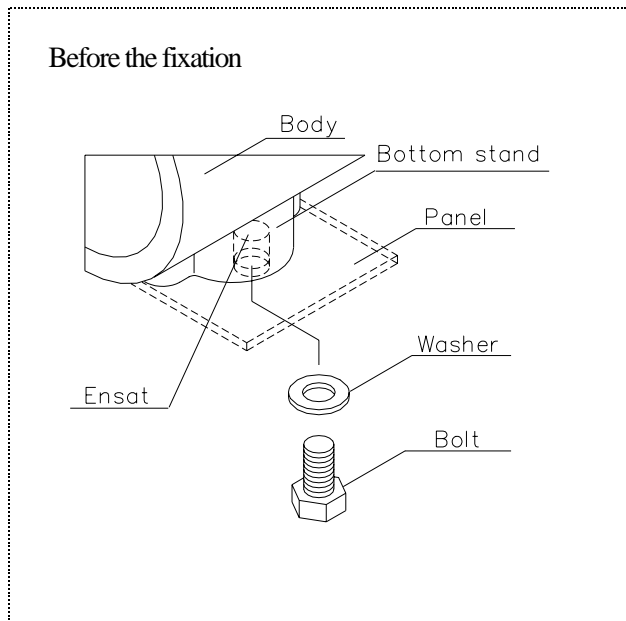
Bottom stand



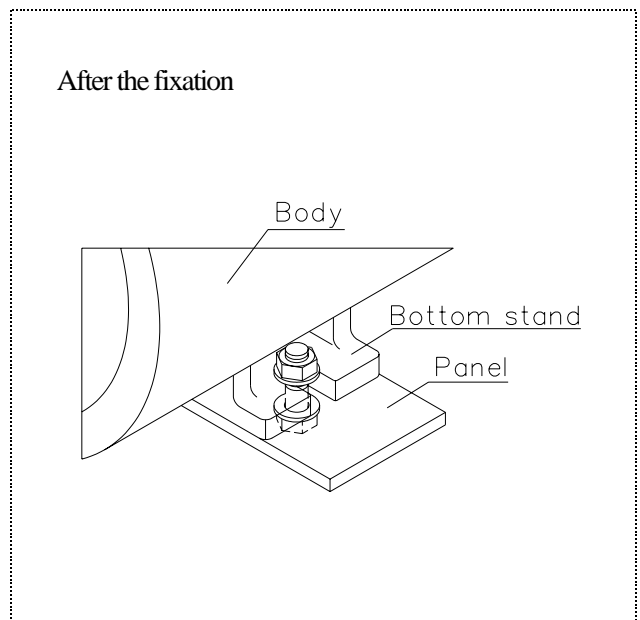
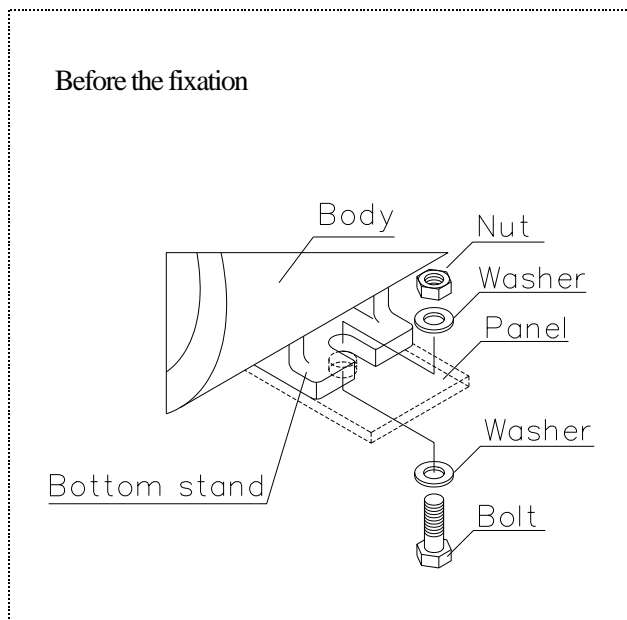


## ○ Fixation of bottom stand with panel

Nominal size: 15mm-50mm (1/2"-2")



Nominal size: 65mm-100mm (2 1/2"-4")



**(10) Inspection items**

○Inspect the following items.

(1)	Existence of scratches, cracks, deformation, and discoloring.
(2)	Existence of leakage from the valve to the outside.
(3)	Existence of leakage when the valve is opened fully at right or left.

**(11) Troubleshooting**

Problem	Cause	Treatment
Fluid leaks from the valve even when the valve is closed fully.	The carrier is loosened.	Adjust the face pressure between the ball and the seat. (Refer to page 9)
	The seat is scratched or worn.	Replace the seat with a new one.
	Foreign matter is in the valve.	Clean up.
	The ball is scratched or worn.	Replace the scratched ball with a new one.
Fluid leaks from the valve.	The union nut is loosened.	Tighten up the union nut.
	The carrier is loosened.	Adjust the face pressure between the ball and the seat. (Refer to page 9)
	The O-ring is scratched or worn.	Replace the O-ring with a new one.
The handle can not be turned smoothly.	Foreign matter is in the valve.	Clean up.
	Deformation. (By heat etc.)	Replace the parts.
The handle fails to engage.	The stem is broken.	Replace the stem with a new one.
	The engagement between the stem and the ball is broken.	Replace the stem and ball with new ones.

**(12) Handling of residual and waste materials**

Caution

In discarding remaining or waste materials, be sure to ask waste service company.  
(Poisonous gas is generated.)

**(13) Inquiries****ASAHI ORGANIC CHEMICALS INDUSTRY CO., LTD.**

**Nobeoka Head Office** : 2-5955, Nakanose-Cho, Nobeoka-City, Miyazaki-Pref., Japan.

Tel : (81) 982-35-0880 Fax : (81) 982-35-9350

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**Singapore Branch Office** : 16 Raffles Quay, #40-03 Hong Leong Building, Singapore 048581.

Tel : (65) 220-4022 Fax : (65) 324-6151

**Europe Representative Office** : Kaiser-Friedrich-Promenade 61 D-61348 Bad Homburg v. d. H. Germany.

Tel : (49) 6172-9175-0 Fax : (49) 6172-9175-25

**Shanghai Branch Office** : Room 1301-P Shanghai Kerry Center, 1515 Nanjing Xi Road, Shanghai China

Tel : (21) 5298-6900 Fax : (21) 5298-6556

**ASAHI /AMERICA Inc.** : 35 Green Street P.O.Box 653, Malden, Massachusetts 02148 U.S.A.

Tel : (1) 781-321-5409 Fax : (1) 781-321-4421

**Distributor**

Ball Valves Type 21

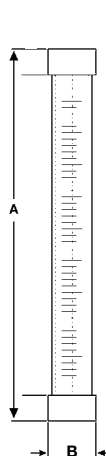


# Pump & Systems Accessories

## Calibration Columns

### Calibration columns

#### Clear PVC calibration columns

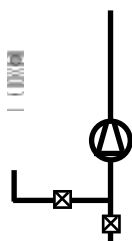


Cylinder size	Fitting size	Dimension (inches)		Threaded base, removable top	Threaded both ends
		A	B		
100 mL	1/2" NPT	10.75	1.39	7500137	7500127
250 mL	1/2" NPT	11.51	1.89	7350138	7500128
500 mL	1/2" NPT	12.75	2.39	7350139	7500129
1000 mL	1/2" NPT	16.75	2.77	7350130	7500135
2000 mL	1" FNPT	20.67	3.52	7500140	7500131
4000 mL	1" FNPT	22.66	4.52	7500141	7500132
10,000 mL	2" FNPT	23.16	6.91	7500134	7500133
20,000 mL	2" FNPT	42.69	6.91	7500142	7500136

#### Typical Application of Calibration Columns

##### Column w/removable top

**Note:** Top must be removed during calibration



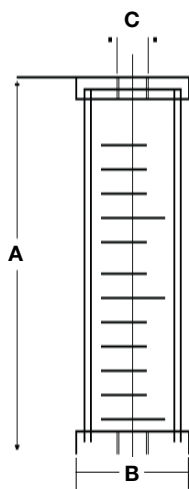
##### Column threaded both ends

**Note:** If plumbed as shown, a vent hole must be drilled into the top of the calibration column



### Borosilicate Glass calibration columns with Viton® o-rings for Sulfuric Acid Applications

Glass cylinder with acrylic outer shield and 1/2" (316 SS) or 3/4" (PVDF, PVC) thick end flanges. All cylinders are bolted together using stainless steel rods with Viton O-rings for the glass seal and Buna N O-rings for the acrylic seal.



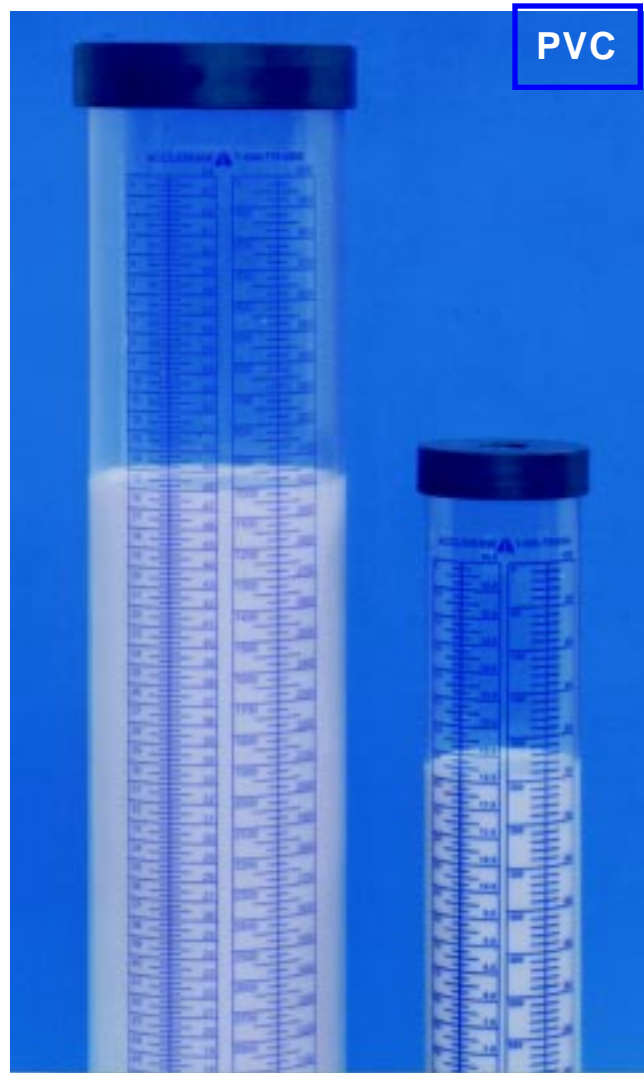
Cylinder size	Fitting size	Dimensions (inches)			Part No.
		A	B	C	
100 mL	1/2" CPVC	10.0	3.0	1/2	7500151
100 mL	1/2" PVDF	10.0	3.0	1/2	7500152
100 mL	1/2" SS	9.5	3.0	1/2	7500153
250 mL	1/2" CPVC	12.5	3.5	1/2	7500154
250 mL	1/2" PVDF	12.5	3.5	1/2	7500155
250 mL	1/2" SS	12.0	3.5	1/2	7500156
500 mL	1/2" CPVC	14.5	4.0	1/2	7500157
500 mL	1/2" PVDF	14.5	4.0	1/2	7500158
500 mL	1/2" SS	14.0	4.0	1/2	7500159
1000 mL	1/2" CPVC	16.75	4.75	1/2	7500160
1000 mL	1/2" PVDF	16.75	4.75	1/2	7500161
1000 mL	1/2" SS	16.25	4.75	1/2	7500162
2000 mL	1" CPVC	18.75	5.5	1	7500163
2000 mL	1" PVDF	18.75	5.5	1	7500164
2000 mL	1" SS	18.25	5.5	1	7500165
4000 mL	1" CPVC	22.5	6.5	1	7500166
4000 mL	1" PVDF	22.5	6.5	1	7500167
4000 mL	1" SS	22.0	6.5	1	7500168



# ACCUDRAW® Calibration Cylinders



**Polypropylene**



**PVC**

**ACCUDRAW®** *has been developed for the accurate calibration of metering pumps. Standard features include:*

- translucent
- chemical resistant
- break resistant
- threaded or socket
- colored graduations and lettering
- PVC has dual scale USGPH & ml
- PVC sizes 100 - 20000 ml
- POLY sizes 100 - 4000 ml
- POLY meets ISO standards
- custom sizes and other materials (acrylic, glass) on request







# ACCUDRAW®

# Calibration Cylinders

## "For Accuracy That Counts"

## Sizing and Ordering Information

**PVC Construction**

### Polypropylene Construction

Size	Conn.	BC	BTC	BDC
100 ml	1/2" NPT	AC#1-100	AC#2-100	AC#3-100
250 ml	1/2" NPT	AC#1-250	AC#2-250	AC#3-250
500 ml	1/2" NPT	AC#1-500	AC#2-500	AC#3-500
1000 ml	1/2" NPT	AC#1-1000	AC#2-1000	AC#3-1000
2000 ml	1.0" NPT	AC#1-2000	AC#2-2000	AC#3-2000
4000 ml	1.0" NPT	AC#1-4000	AC#2-4000	AC#3-4000

Size/Scale	Conn	BC	BTC	BDC
100 ml/ 1.6 GPH	1/2" NPT	PV#1-100	PV#2-100	PV#3-100
250 ml/ 4 GPH	1/2" NPT	PV#1-250	PV#2-250	PV#3-250
500 ml/ 8 GPH	1/2" NPT	PV#1-500	PV#2-500	PV#3-500
1000 ml/ 16 GPH	1/2" NPT	PV#1-1000	PV#2-1000	PV#3-1000
2000 ml/ 32 GPH	1.0" NPT	PV#1-2000	PV#2-2000	PV#3-2000
4000 ml/ 64 GPH	1.0" NPT	PV#1-4000	PV#2-4000	PV#3-4000
10000 ml/ 160 GPH	2.0" NPT	PV#1-10000	PV#2-10000	PV#3-10000
20000 ml/ 320 GPH	2.0" NPT	PV#1-20000	PV#2-20000	PV#3-20000

BC = bottom connection only, open top

BTC= bottom and top connections

BDC= bottom connection and dust cover top

Note: PVC cylinders available with socket weld connections.

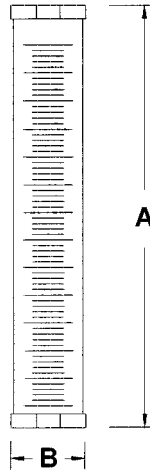
Add suffix "S" to model # e.g. PV#3-100S

For BSP threads, add suffix "B" to model # e.g. PV#3-100B

## Dimensional Information

### Polypropylene Construction

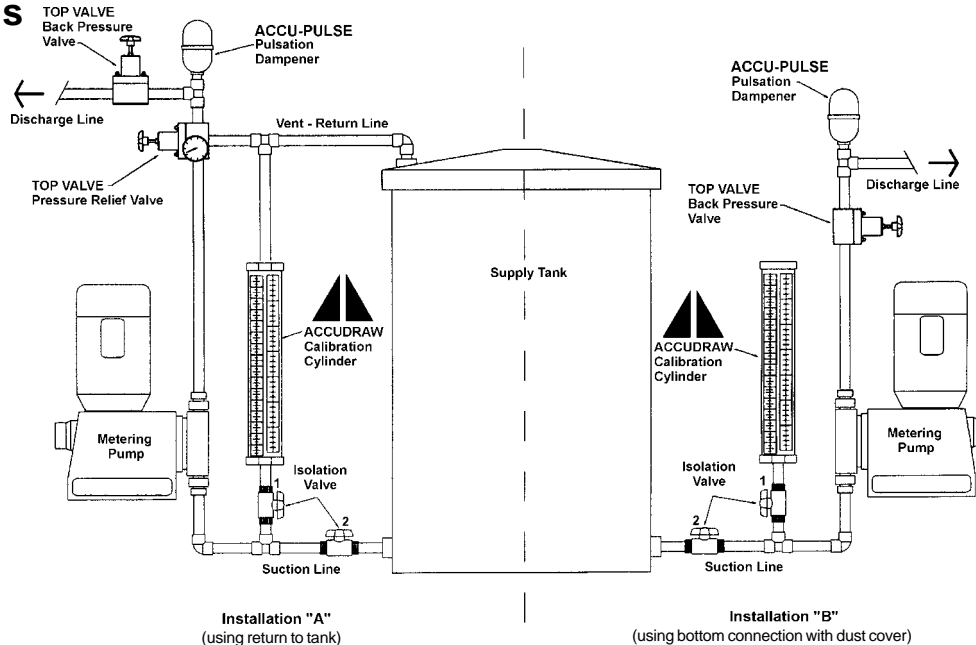
Model	Size (ml)	Dev (ml)	A (inches)	B (inches)
AC#1	100	1	9.88	1.38
AC#1	250	2	12.44	1.75
AC#1	500	5	14.1	2.33
AC#1	1000	10	17.19	2.63
AC#1	2000	20	20.88	3.38
AC#1	4000	50	23.56	4.38
AC#2/AC#3	100	1	9.25	1.38
AC#2/AC#3	250	2	11.63	1.75
AC#2/AC#3	500	5	13	2.32
AC#2/AC#3	1000	10	16.5	2.69
AC#2/AC#3	2000	20	19.5	3.38
AC#2/AC#3	4000	50	22.13	4.38



**PVC Construction**

Model	Size (ml)	Divisions (ml)	Size (GPH)	Divisions (GPH)	A (inches)	B (inches)
PV#1	100	1	1.6	0.02	10.24	1.388
PV#1	250	2	4	0.05	11.04	1.888
PV#1	500	5	8	0.05	12.25	2.388
PV#1	1000	10	16	0.125	16.24	2.765
PV#1	2000	20	32	0.25	20.16	3.517
PV#1	4000	25	64	0.25	22.16	4.521
PV#1	10000	200	160	2	22.64	6.906
PV#1	20000	200	320	2	42.19	6.906
PV#2/PV#3	100	1	1.6	0.02	10.75	1.388
PV#2/PV#3	250	2	4	0.05	11.51	1.888
PV#2/PV#3	500	5	8	0.05	12.75	2.388
PV#2/PV#3	1000	10	16	0.125	16.76	2.765
PV#2/PV#3	2000	20	32	0.25	20.67	3.517
PV#2/PV#3	4000	25	64	0.25	22.66	4.521
PV#2/PV#3	10000	200	160	2	23.16	6.906
PV#2/PV#3	20000	200	320	2	42.69	6.906

## Installations



### Conversion Factors

1 ml = 1 cc  
 1000 ml = 1 liter  
 ml/sec X 60 = ml/min  
 1 US gal/min X 0.063 = liters/sec  
 1 US gal = 3.786 liters

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# ▲ ACCUDRAW® PVC Calibration Instructions

**Note:** Before starting either of the calibration procedures below, ensure that the pump is primed and void of any trapped air.

**Using the USGPH scale:** (scale is based on time, in one (1) minute volume discharge)

1. Fill the calibration to the top "0" mark on the USGPH scale.
2. Close isolation valve (#2) from supply tank, open isolation valve (#1) below cylinder and start the pump.
3. Use a stopwatch to measure the time of one (1) minute (60 seconds) and record the volume dispensed by the metering pump, using the draw down scale.
4. Adjust the pump volume control higher or lower to meet with your desired output.
5. Repeat above steps 1 through 4, until the desired output is met.
6. Divide the measured USGPH number by 60 to determine the **USGPM volume**, if required.

If you wish to shorten the time of dispensing for calibration by one half (1/2) or one quarter (1/4), you must multiply the measured volume by the same number used to divide the time by.

e.g. 10 USGPH in 1 minute equals  
5 USGPH X 2 in 30 seconds or  
2.5 USGPH X 4 in 15 seconds

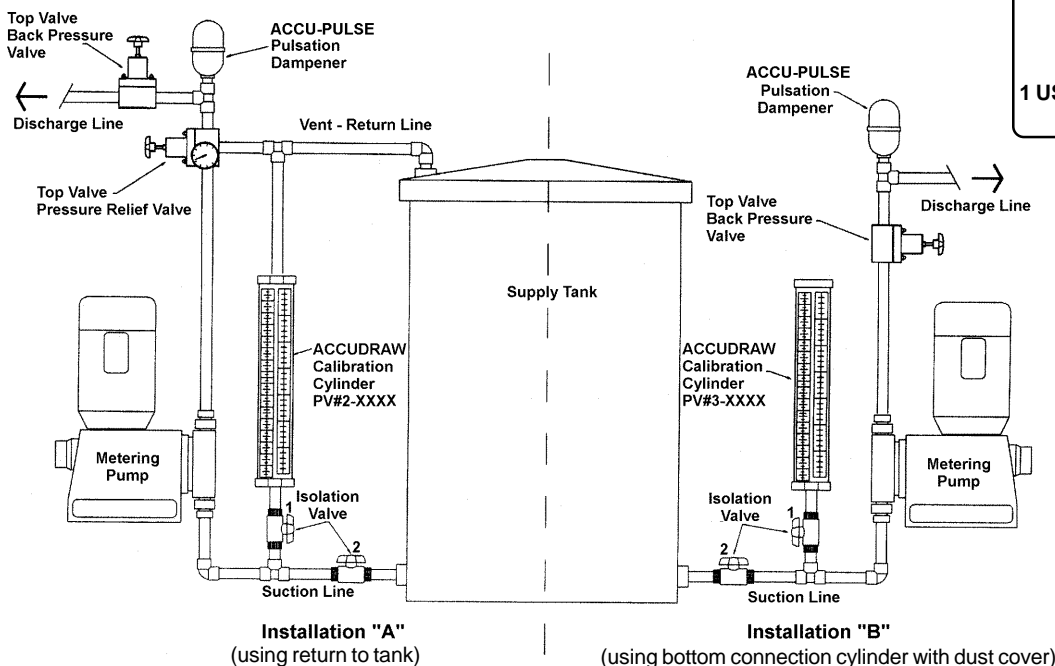
**Using the ml scale:** (scale is based on volume pumped, over any given time)

1. Fill the calibration cylinder to the top "0" mark on the ml scale.
2. Close isolation valve (#2) from supply tank, open isolation valve (#1) below cylinder and start the pump.
3. Use a stopwatch to measure the time it takes to pump down a given volume (ml) in 60 seconds.
4. Multiply the volume by 60 to determine the **ml per hour** volume, if required.
5. Adjust the pump volume control higher or lower to meet with your desired output.
6. Repeat above steps 1 through 5, until the desired output is met.

If you wish to shorten the time of dispensing for calibration by one half (1/2) or one quarter (1/4), you must multiply the volume by the same number used to divide the time by to determine ml per minute or hour.

e.g. 100 ml in 60 seconds equals  
50 ml X 2 in 30 seconds or  
25 ml X 4 in 15 seconds

## Typical Installations ("A" and "B")



# Pump & Systems Accessories

## Pulsation Dampeners

Pulsation dampeners operate on the principle that gas is compressible and fluid is not. The pulsation dampener consists of an air chamber containing compressed air, a fluid chamber connected to the pump's suction or discharge line, and a bladder or bellows which separates the air and fluid.

Some models are flow-through design, with two ports so they can be mounted directly on the pump suction or discharge line. Other models are single port design, to be teed off of the pump suction or discharge line. Flow-through models may also be used in a tee if one port is capped.

All models feature a Schrader (bicycle) valve and pressure gauge for charging the air chamber on-site.

PVDF/Nordel pulsation dampeners are recommended for sodium hydroxide (caustic) applications. Viton® pulsation dampeners are recommended for sodium hypochlorite applications.

### Sizing Pulsation Dampeners

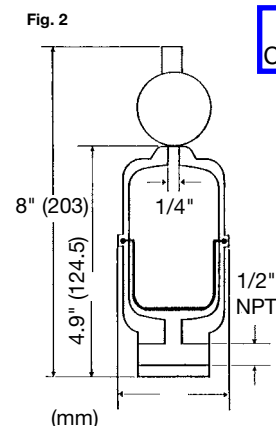
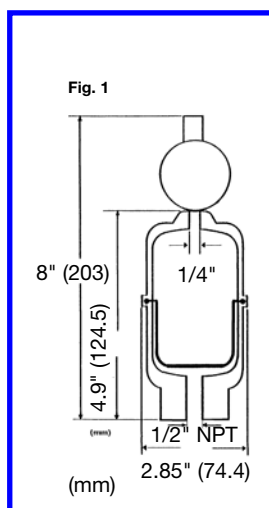
Multiply the pump's displacement per stroke (mL) times 26 to get minimum pulsation dampener volume (mL) to achieve 90% reduction in pulsation.

**Safety Note:** We recommend using pressure relief valves with the pulsation dampeners.

### General Specifications

Maximum pressure:	150 psig (polypro, PVDF and PTFE), 300 psig (SS)
Temperature range:	
Nordel bladder:	-60°F to 280°F (-51°C to 138°C)
Viton® bladder:	30°F to 350°F (-1°C to 177°C)
HYPALON® bladder:	-20°F to 275°F (-29°C to 135°C)
PTFE bellows:	40°F to 220°F (4°C to 104°C)
Polypro housing :	32°F to 175°F (0°C to 79°C)
PVC housing:	32°F to 140°F (0°C to 60°C)
PVDF housing:	10°F to 250°F (-12°C to 121°C)
PTFE housing:	-20°F to 125°F (-29°C to 52°C)
SS housing:	32°F to 200°F (0°C to 93°C)

\*Teflon bellows are smaller in volume



### 131 mL (8 cu. in.) Models

SS housing: 3/8" FNPT, 1 port (not illustrated)				
PTFE bellows	3 (1.4)	CTS1020 T	III	7253205
PVDF housing: 1/2" FNPT, 1 port (Fig. 1)				
PTFE bellows	1 (0.9)	CTK1005 T 5	III	7744101

### 164 mL (10 cu. in.) Models

CPVC housing: 1/2" FNPT, 1 port (Fig. 1)

Nordel bladder (EPDM)	1 (0.9)	RC-10X-E50	III	7744096
Viton® bladder	1 (0.9)	RC-10X-V50	III	7744097
HYPALON® bladder	1 (0.9)	RC-10X-H50	III	7744098
Polypro housing: 1/2" FNPT, 1 port (Fig. 1)				
Nordel bladder (EPDM)	1 (0.9)	CTP1005 ND 5	III	7744102
PVDF housing: 1/2" FNPT, 1 port (Fig. 1)				
Nordel bladder (EPDM)	1 (0.9)	CTK1005 ND 5	III	7744100
Viton® bladder	1 (0.9)	CTK1005 V 5	III	7744099

### 131 mL (8 cu. in.) Models

PVDF housing: 1/2" FNPT, 2 port (Fig. 2)				
PTFE bellows	1 (0.9)	CTK1000 T	III	7253217

### 164 mL (10 cu. in.) Models

PVC housing: 1/2" FNPT, 2 port (Fig. 2)				
Viton® bladder	1 (0.9)	CTP1010 V	III	7253216
HYPALON® bladder	1 (0.9)	CTP1010 H	III	7740945
Polypro housing: 1/2" FNPT, 2 port (Fig. 2)				
Nordel bladder (EPDM)	1 (0.9)	CTP1000 ND	III	7253201
PVDF housing: 1/2" FNPT, 2 port (Fig. 2)				
Nordel bladder (EPDM)	1 (0.9)	CTK1000 ND	III	7253203
Viton® bladder	1 (0.9)	CTK1000 V	III	7253204

Viton® and HYPALON® are registered trademarks of DuPont Dow Elastomers

# SENTRY PULSATION DAMPENERS



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# SENTRY PULSATION DAMPENERS

## BENEFITS & FEATURES

Positive Displacement (PD) pumps create pulsation and hydraulic shock due to the reciprocating nature of their stroking action, potentially damaging the entire pumping system. Blacoh's SENTRY® Pulsation Dampeners remove virtually all hydraulic shock, enhancing all-around performance and reliability of fluid handling equipment in industrial and chemical transfer applications.

### SENTRY BENEFITS:

- Produces a near steady fluid flow up to 99%\* pulsation and vibration free.
- Protects pipes, valves, fittings, meters, and in-line instrumentation from destructive pulsations, vibrations, surges, cavitation, thermal expansion, & water hammer
- Creates steady and continuous flow when dosing, blending or proportioning additives
- Insures accuracy, longevity, and repeatability of in-line meters
- Enables uniform application of material in spraying and coating systems
- Reduces product agitation, foaming, splashing and degradation of product
- Provides liquid energy storage for emergency valve closure and equipment shutdown
- Reduces overall energy cost with continuous linear flow, rather than start/ stop turbulent flow
- Operates as a reservoir for make-up fluid

### SENTRY FEATURES:

- Sizes available for all positive displacement pumps with discharge sizes from 1/8" (3.18mm) to 6" (152.4mm)
- Simple, reliable design and quick installation
- Easy in-line maintenance
- Pressure ranges up to 4000 PSI (276 BAR) available from stock
- Temperature ranges from -60°F to +400°F (-51°C to +205°C) available from stock
- Custom models available up to 100 gallons (378L) and 25,000 PSI (1724 BAR)
- Bodies available in a full range of chemically resistant materials
- Bladders available for even the most corrosive application

***Let SENTRY Stand Guard Over Your System.  
Increase productivity, safety, reliability and efficiency.  
Decrease maintenance and operating costs.***

## PROCESSES

- |                   |                    |                   |                    |                  |
|-------------------|--------------------|-------------------|--------------------|------------------|
| • <b>TRANSFER</b> | • <b>FILTERING</b> | • <b>PRINTING</b> | • <b>DOSING</b>    | • <b>FILLING</b> |
| • <b>METERING</b> | • <b>SPRAYING</b>  | • <b>COATING</b>  | • <b>INJECTING</b> | • <b>MIXING</b>  |

## INDUSTRIES SERVED



**Chemical Process**



**Water Treatment**



**Food & Beverage**



**Pulp, Paper & Textile**



**Paint & Coating**



**Biotech/  
Pharmaceutical**



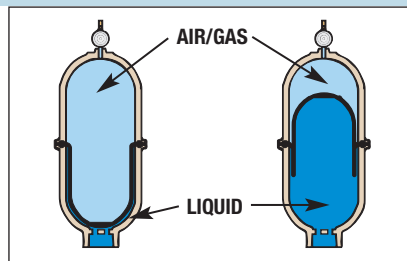
**Gas, Oil, & Petrochemical**



**Consumer Products**

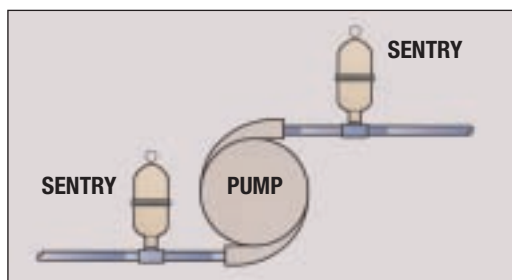
## PRINCIPLES OF OPERATION

SENTRY operates on the principle that volume is inversely proportional to pressure. Compressed air or gas is introduced into the air chamber of the SENTRY Pulsation Dampener to a specified pressure. The gas is entrapped by the elastomeric bladder, which prevents contact between the process fluid and compressed gas. (Without the bladder, the gas would dissolve into the fluid and cause product contamination). During pump discharge, fluid enters the wetted chamber of the SENTRY Pulsation Dampener, displacing the bladder, compressing the gas and absorbing the shock. During pump shift, liquid pressure decreases, the dampener gas expands, pushing fluid back into the process line, eliminating up to 99% of system shock and pulsation.

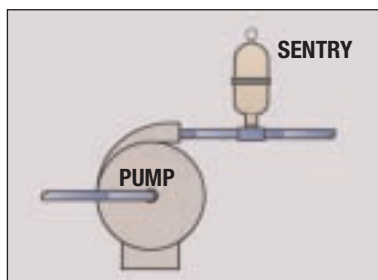


## TYPICAL INSTALLATIONS

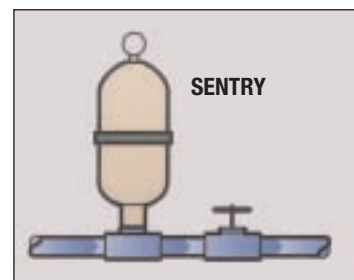
### ADD, METERING, PERISTALTIC, & PISTON PUMPS



### PUMP STARTUP & SHUTDOWN



### QUICK CLOSING VALVES



\*Requires proper sizing.



## SENTRY TECHNICAL SPECIFICATIONS



### SENTRY PLASTIC

Pressure Rating*:	Up to 150 PSI (10 BAR)	Temperature Range**:	-20°F to +250°F (-29°C to +121°C)
Capacities:	4 cubic inches to 5 gallons (.066 – 18L)	Inlet Ports:	Threaded: FNPT and BSP Flanged: ANSI and DIN
Shell Materials:	Polypropylene Conductive Polypropylene PVC and CPVC PVDF Conductive Acetal		



### SENTRY METAL

Pressure Rating*:	Up to 4000 PSI (276 BAR)	Temperature Range**:	-60°F to +400°F (-51°C to +204°C)
Capacities:	4 cubic inches to 100 gallons (.066 - 378L)	Inlet Ports:	Threaded: FNPT and BSP Flanged: ANSI and DIN
Shell Materials:	Aluminum Carbon Steel 316L Stainless Steel Alloy 20 Hastelloy C Epoxy, PVDF and PTFE coated steel		



### SENTRY SANITARY

Pressure Rating*:	Up to 1000 PSI (69 BAR)	Temperature Range**:	-20°F to +350°F (-28°C to +176°C)
Capacities:	4 cubic inches to 10 gallons (.066 - 37L)	Inlet Ports:	Tri-clamp type sanitary fitting
Shell Materials:	30 RA Polished 316L Stainless Steel Bead Blasted 316L Stainless Steel		



### SENTRY PTFE

Pressure Rating*:	Up to 100 PSI (6 BAR)	Temperature Range**:	+40°F to +220°F (+4°C to +104°C)
Capacities:	4 to 370 cubic inches (.066 - 6L)	Inlet Ports:	Threaded: FNPT and BSP Flanged: ANSI and DIN Metric Flare Type
Shell Materials:	Machined PTFE		



### SENTRY XP HIGH PRESSURE

Pressure Rating*:	Up to 4000 PSI (276 BAR)	Temperature Range**:	-60°F to +225°F (-51°C to +107°C)
Capacities:	8 to 24 cubic inches (.13 - .39L)	Inlet Ports:	Threaded: FNPT Flanged: ANSI
Shell Materials:	316L Stainless Steel		



### SENTRY TEF-GUARD HP II

Pressure Rating*:	Up to 2000 PSI (137 BAR)	Temperature Range**:	+40°F to +220°F (+4°C to +104°C)
Capacities:	12 cubic inches (.20L)	Inlet Ports:	Threaded: FNPT Flanged: ANSI
Shell Materials:	316L Stainless Steel Carbon Steel Alloy 20 Hastelloy C		

### BLADDER OPTIONS

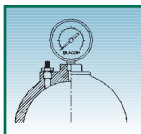
COMPOUND	TEMPERATURE LIMITS	APPLICATIONS
Neoprene	0°F to +200°F (-18°C to +93°C)	Good abrasion resistance and flex; use with moderate chemicals.
Buna	+10°F to +180°F (+12°C to +82°C)	Good flex life; use with petroleum, solvents and oil-based fluids.
EPDM	-60°F to +280°F (-51°C to +137°C)	Use in extreme cold; good chemical resistance with ketones, caustics.
Hypalon	-20°F to +275°F (-29°C to +135°C)	Excellent abrasion resistance; good in aggressive acid applications.
Viton	-10°F to +350°F (-23°C to +176°C)	Use in hot & aggressive fluids; good with aromatics, solvents, acids & oils.
Aflas	0°F to +400°F (-18°C to +204°C)	High temperature, petroleum based chemicals, strong acids and bases.
FDA Silicone	-20°F to +300°F (-29°C to +149°C)	FDA-approved food grade material; for use in food and pharmaceutical processing.
FDA Buna	+10°F to +180°F (-12°C to +82°C)	FDA-approved food grade. Similar characteristics of Silicone.
FDA Fluorel	-10°F to +350°F (-23°C to +176°C)	Fluorel is a fluorelastomer comparable to Viton.
PTFE	+40°F to +220°F (+4°C to +104°C)	Bellows design; excellent flex life; use with highly aggressive fluids.

\* Maximum PSI rated for ambient temperatures.

\*\* Reflects entire temperature range for all available materials. Consult Blacoh on specific materials.

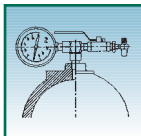


## AIR CONTROL OPTIONS



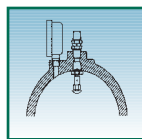
### CHARGEABLE

The chargeable model has a Schrader type charging valve that allows for a predetermined pressure charge to be applied and held in the dampener. No permanent source of compressed gas is required to be attached to the unit. The chargeable models are used primarily with metering, piston and peristaltic pumps for pulsation dampening. Chargeable models are also used for surge suppression to prevent water hammer from quick closing valves, for make-up fluid to prevent pump cycling and for suppression of pump start up or shut down pressure spikes.



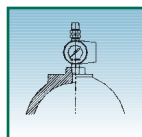
### INLET STABILIZER

The patented inlet stabilizer air control (U.S. Patent No. 6,089,837) consists of a compound pressure gauge, a pressure/vacuum tight ball valve and a venturi valve. When compressed air is passed through the venturi valve at high speed, a low pressure area is created which is used to evacuate the air from the stabilizer, creating a vacuum internally. Conversely, when the flow of air through the venturi valve is diverted into the stabilizer, a pressure charge is obtained. When pump inlet conditions are optimized, pump efficiency is maximized.



### AUTOMATIC

An automatic poppet type valve located in the non-wetted section of the dampener allows for an increase in compressed air pressure to balance an increase in system liquid pressure. As liquid system pressure increases, the bladder is pushed further up into the dampener until it contacts the internal automatic valve. This contact opens the valve and allows an increase of compressed air to enter the dampener. When the air pressure inside the dampener equals the system liquid pressure, the dampener is in balance and pulsations are minimized. If a change in pressure occurs this process is repeated. Automatic units are designed for use on air operated diaphragm pumps in systems with a varying discharge pressure.



### ADJUSTABLE

The adjustable model uses a self-relieving regulator to set dampener pressure. A compressed air line must be permanently attached to the regulator. The regulator allows for an easy, convenient method for readjusting the dampener pressure if the system fluid pressure changes. Adjustable units are designed for use on air operated diaphragm pumps in systems with a constant discharge pressure.

## APPLICATION STORIES

### APPLICATION: PULSATION DAMPENING

**PROBLEM:** A major pulp & paper mill in the Northwest used AODD unloading pumps. The reciprocating action of these air-operated pumps created violent pulsations that caused both pipe stress and mounting fatigue. In fact, these pulsations often caused the pumps to be pulled from their cement foundations. This created significant downtime, costly foundation repair, environmental hazards, and a dangerous working environment.



**SOLUTION:** A Blacoh SENTRY IV Pulsation Dampener was installed in the common discharge of the pumps to dampen these pulsations.

**RESULT:** Pipe stress and mounting fatigue have been eliminated. Not only have the pumps not been ripped from their cement foundations, but the mill has experienced longer life from pump components such as diaphragms and ball valves.

### APPLICATION: WATER HAMMER

**PROBLEM:** A major producer of water treatment chemicals accessed their local water supply through a 3" PVC pipe with quick-closing valves. When the desired quantity had been measured and the valve shut, a water hammer effect with pressure spikes that exceeded the PVC pipe's burst strength was created. The PVC repeatedly broke, causing the entire plant to be shut down for repair. In addition, since pipe failure occurred under a nearby highway, it also had to be closed.



**SOLUTION:** A Blacoh SENTRY 10 gallon Surge Suppressor was installed on the pressure side of each quick closing valve to reduce water hammer pressure spikes.

**RESULT:** The damaging water hammer pressure spikes are now absorbed, no pipes have ruptured, and the plant (and nearby highway) have had no downtime due to water hammer.

### APPLICATION: METERING

**PROBLEM:** A 300 megawatt power plant required a chemical feed system to supply hydrazine to a boiler. The hydrazine acts as an oxygen scavenger, and must be delivered in a precise and consistent quantity. While metering pumps can deliver chemicals in precise amounts, their reciprocating action will not allow delivery in a smooth and consistent flow.



**SOLUTION:** A Blacoh SENTRY III Pulsation Dampener was installed in the common discharge of two metering pumps to create smooth and consistent flow.

**RESULT:** Hydrazine is now delivered to the boiler in a precise and consistent quantity. In addition, pipe vibration has been eliminated, gauge accuracy has been maximized, and pump component stress has been reduced.

### APPLICATION: SPRAYING/ COATING

**PROBLEM:** A decontamination facility pumped acids and water through a series of 15° spray nozzles to rinse radiation from contaminated metals. However, the pulsating action of their reciprocating pumps caused uneven spray into the rinse tanks, and the metals were not rinsed completely.



**SOLUTION:** A Blacoh SENTRY 1 Pulsation Dampener was installed at each pump discharge manifold to eliminate the surging flow of the pumps and ensure complete coverage and thorough cleaning.

**RESULT:** The even flow ensures that the metal product is completely rinsed of radiation. Furthermore, both process time and the amount of acid required have been reduced, which increased productivity and profit.

## UNDERSTANDING PULSATION AND WATER HAMMER CONTROL

### PULSATION DAMPENING

Positive displacement pumps create pulsation and hydraulic shock purely by the reciprocating nature of the pump's stroking action. During the discharge stroke of a pump, fluid pressure takes the line of least resistance, displacing the bladder in the dampener, and compressing the trapped gas. As the pump begins its next cycle, fluid flow stops momentarily allowing the compressed gas to expand, forcing the bladder to push the accumulated

fluid back into the discharge line. This fills the void created in the pipeline by the pump's cycle shift. Whether a piston, plunger, air diaphragm, peristaltic, gear, or diaphragm metering pump, a SENTRY Pulsation Dampener placed at the pump's discharge will produce a steady fluid flow up to 99% pulsation free; protecting the entire pumping system from the damaging effects of shock.

### SURGE SUPPRESSION & WATER HAMMER

When fluid in motion is abruptly stopped, a hydraulic surge is created in the system. Hydraulic surge is often referred to as "water hammer". The kinetic energy, released as pressure, can spike up to six times the system's operating pressure, destroying system instrumentation, pumps, pipes, fittings, and valves. Without a suppression device, the shock wave travels the length of the pipe back to the pump, then reverses again, oscillating back and forth until friction dissipates the pressure spike or a system component fails.

There are several major culprits that produce water hammer; quick closing valves, back surge, pump start up and pump shut down. Quick closing valves can be defined as valves that close within one and one-half seconds. Quick closing valves have the potential of stopping large volumes of energized fluid, producing violent water hammer. The pump start up also stops fluid in motion. During pump start up, fluid in a pipe is static and must be accelerated. The pumped fluid is abruptly stopped when it contacts the static fluid in the pipe, again creating a shock wave. A SENTRY Surge

Suppressor installed at the pump's discharge will provide the accumulation capacity to absorb the rapid fluid acceleration and prevent a pressure spike from occurring. As the surge enters the Suppressor, the gas inside is compressed, the fluid is accumulated and the shock wave is absorbed. When steady system flow rate is achieved, pressure and fluid are slowly released back into the system by the compressed gas.

At pump shut-down, either planned or failure, fluid flow will momentarily continue away from the pump due to momentum. As the flow continues, a void, called column separation can occur at the pump's discharge. When fluid momentum is stopped due to pipe friction, the liquid will usually reverse toward the void area of the pump discharge. The reversing fluid will slam into the check valve usually located at the pump discharge and a water hammer pressure spike will occur. Depending upon the design of the piping system and the fluid involved, the voided area can actually become sub-atmospheric which can significantly increase the pressure spike.

### INLET (SUCTION) STABILIZATION

Without a sufficient supply of fluid a pump will not perform efficiently. Fluid "starvation" is caused by unbalanced hydraulics from friction, acceleration, and head. A reciprocating pump further complicates the issue by emitting high-frequency pressure waves created by the inlet valves opening and closing. In high inlet pressure situations, a pump's inlet valves create water hammer by their opening and closing action; increasing pipe and pump damage, and draining system efficiency.

In suction lift and horizontal suction applications, the pumps' inlet valve action actually decreases inlet fluid pressure. A "starved" or cavitating

pump will be unable to produce specified flow rates due to the incomplete filling of cylinders and liquid chambers. In addition, cavitation will result in the premature failure of pump parts. A SENTRY Suction Stabilizer at the pump's inlet will act as an accumulator, reducing pressure fluctuations and aid in filling the pump head with fluid during each inlet stroke. In high suction lift applications it is also important not to lose the acceleration of the fluid created with each suction stroke of the pump. A Suction Stabilizer will momentarily maintain the flow of the accelerated fluid. The fluid flows into the stabilizer as the pump shifts, and then out as the inlet valve re-opens, maintaining even pressure and steady flow, minimizing cavitation.

### THERMAL EXPANSION

Many fluids change volume due to temperature changes. As the temperature of a fluid rises, the fluid expands. In a closed or loop system a volumetric increase in fluid can create a rise in pressure beyond the limits of safety. The increase in pressure can result in ruptured pipes and fittings,

destroyed in-line instrumentation, burst pressure relief valves and contaminated surroundings. A SENTRY Thermal Expansion Chamber installed in the pipeline will accumulate the expanded fluid, eliminating a dangerous rise in pressure.

### ACCUMULATORS, AUXILIARY ENERGY, FLUID MAKE-UP & TRANSFER BARRIER

Fluids flowing in a system can be accumulated during one part of the process cycle, and then released when needed during another part of the cycle. The release can be based upon the pressure of the system or by the opening/closing of a valve. The SENTRY Accumulator can be used to maintain process line pressure and store fluid for other uses, such as to back flush filters or to draw off sample fluid.

Accumulators can be used as a Transfer Barrier where pressure on one side of a system needs to be transferred to another side without the mixing of the fluids. The accumulator is installed in-line with the two fluids entering at opposite ends, separated by the bladder. As the pressure of one fluid increases, it pushes the bladder against the other fluid, transferring the increase in pressure.

Please call your local distributor:



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# WELCOME TO THE "REVOLUTION"

**NEW**

*CPVC body provides  
higher temperature  
ratings and better  
chemical resistance  
capabilities than  
PVC Dampeners*



## "Revolutionary" Pulsation Dampener features:

1. **NEW CPVC body with temperature ratings up to 180°F & a variety of chemically resistant bladder materials to provide complete chemical compatibility**
2. **Threaded housings instead of metal fasteners to reduce damage common in corrosive environments.**

**PVC Bladders  
- A Blacoh  
Exclusive!**



**NEW CPVC  
Body Construction**

## USE A PULSATION DAMPENER TO:

- Reduce pump pulsation, pipe vibration, and shaking up to 99%
- Protect plastic piping, joints, and fittings from breaking or leaking
- Extend pump component life and improve pump performance
- Minimize pump cavitation
- Limit damaging pressure surges caused by pump start-up and shut-down
- Remove tube motion that abrades and shortens tube life
- Eradicate splashing, foaming, or product degradation
- Ensure accurate reading of flow meters and gauges
- Produce a smooth and even flow for spraying or filling

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[www.Blacoh.com](http://www.Blacoh.com)

**BLACOH**  
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**SENTRY**  
PULSATION DAMPENERS

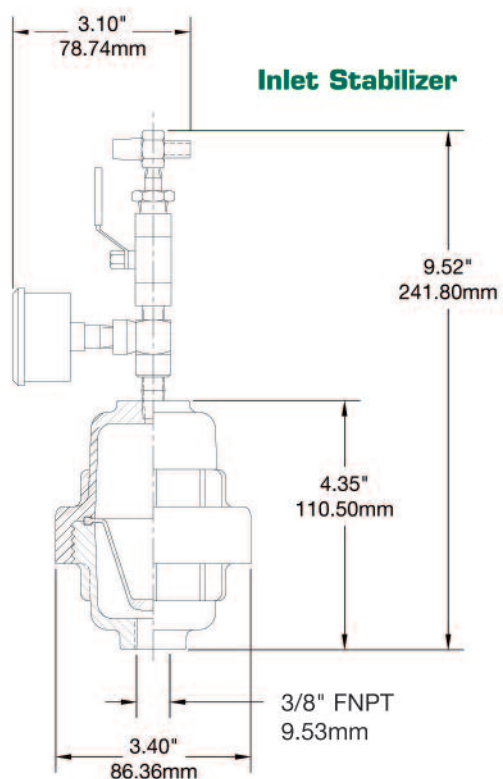
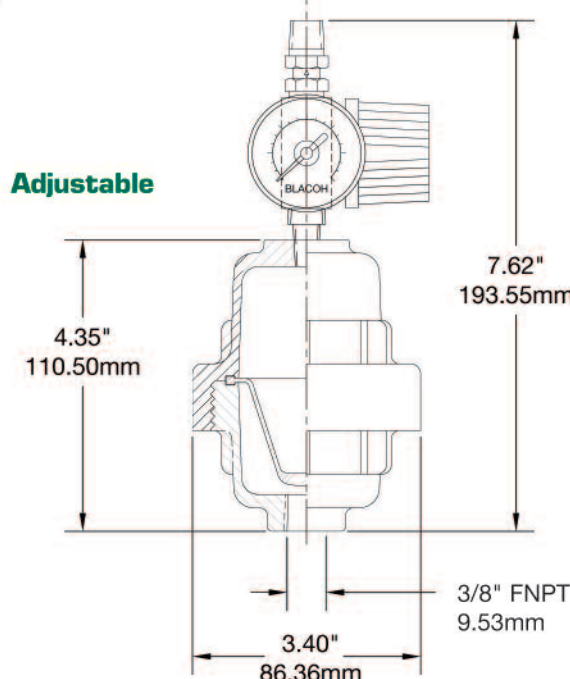
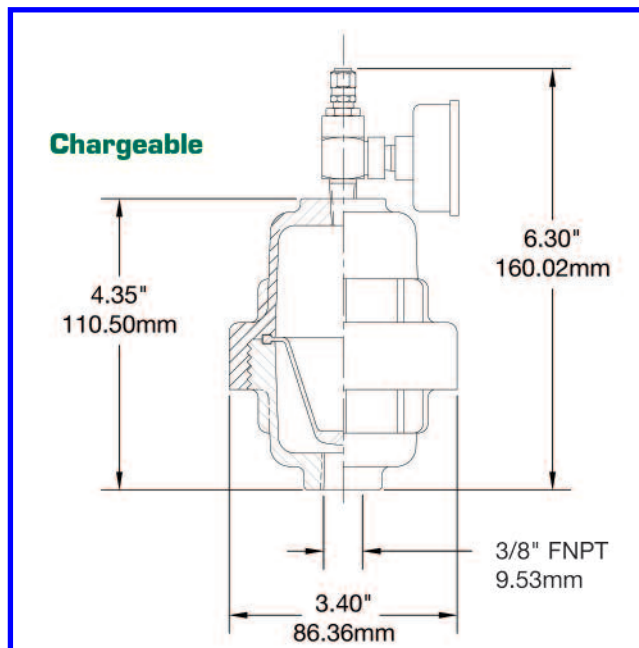
**SENTINEL**  
DIAPHRAGM SEALS

**SPILL STOP**  
LEAK CONTAINMENT





## "REVOLUTION" 10 CUBIC INCH (.16L) CPVC PULSATION DAMPENER



### UNITS WITH 1/2" (12.7MM) FNPT INLET

AIR CONTROL BLADDER	CHARGEABLE MODEL	ADJUSTABLE MODEL	INLET STABILIZER MODEL
PVC	RC-10X-X50	RM-10X-X50	RJ-10X-X50
SANTOPRENE	RC-10X-W50	RM-10X-W50	RJ-10X-W50
NEOPRENE	RC-10X-N50	RM-10X-N50	RJ-10X-N50
BUNA	RC-10X-B50	RM-10X-B50	RJ-10X-B50
EPDM	RC-10X-E50	RM-10X-E50	RJ-10X-E50
HYPALON	RC-10X-H50	RM-10X-H50	RJ-10X-H50
SILICONE- FOOD GRADE	RC-10X-S50	RM-10X-S50	RJ-10X-S50
VITON	RC-10X-V50	RM-10X-V50	RJ-10X-V50
AFLAS	RC-10X-A50	RM-10X-A50	RJ-10X-A50
PTFE	RC-10X-T50	RM-10X-T50	RJ-10X-T50

For 3/8" (9.53mm) FNPT Inlet - Last two digits of model number change to 38.

Please call your local distributor:



Call for your **FREE**  
Demonstration CD

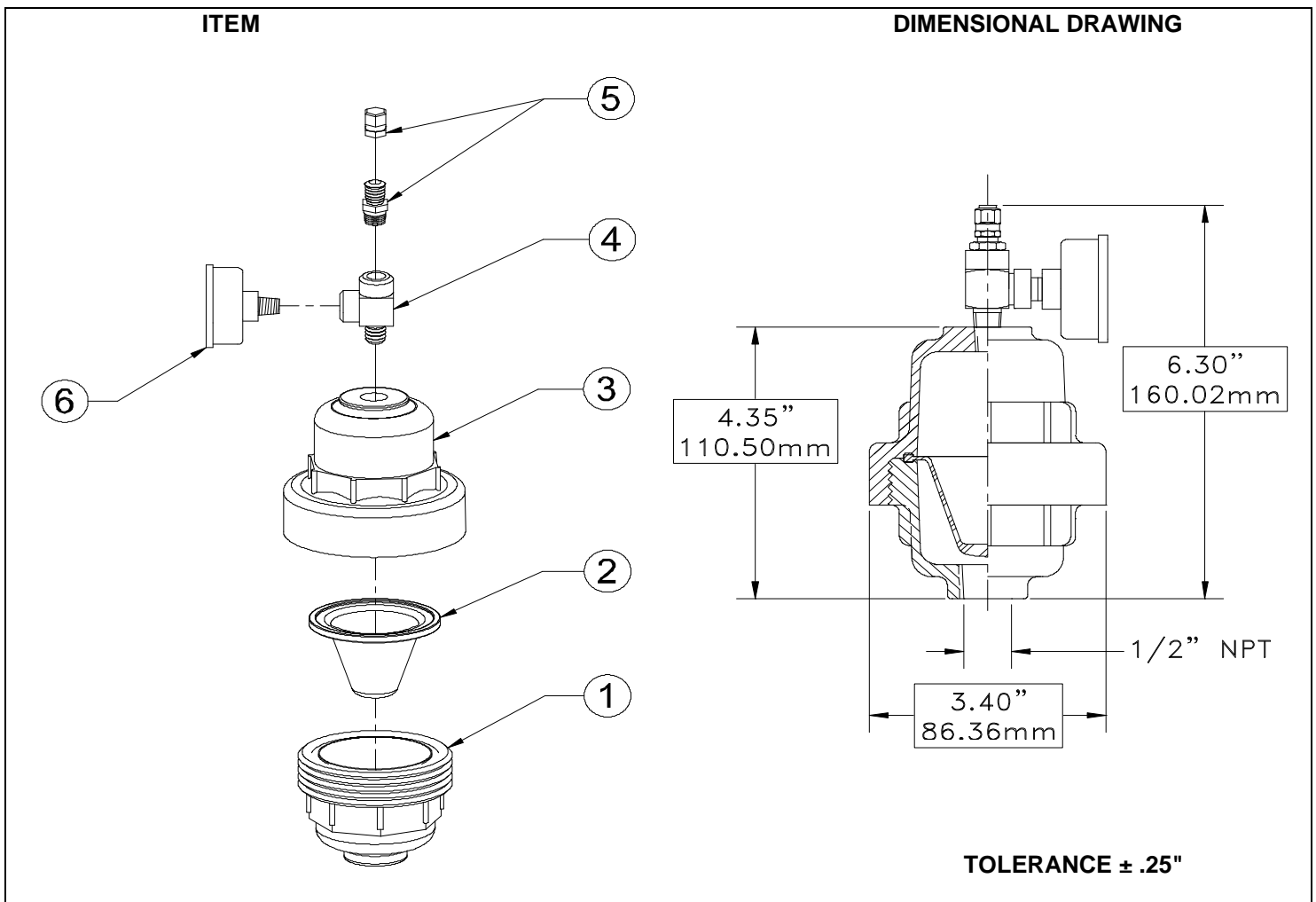
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<b>SENTRY MODEL #:</b>	<b>RC-10X-V50</b>
<b>MAXIMUM PRESSURE:</b>	<b>150 PSI/10 BAR</b>
<b>CAPACITY:</b>	<b>10 CUBIC INCH/.16 LITERS</b>
<b>WETTED HOUSING:</b>	<b>CPVC</b>
<b>NONWETTED HOUSING:</b>	<b>CPVC</b>
<b>BLADDER:</b>	<b>VITON</b>
<b>INLET:</b>	<b>1/2" NPTF</b>
<b>AIR CONTROL:</b>	<b>CHARGEABLE</b>

DESCRIPTION				
ITEM	PART #	QTY	Component	Material
1	10X-050	1	Wetted Housing	CPVC
2	1000-31	1	Bladder	Viton
3	10X-024	1	Nonwetted Housing	CPVC
4	1000-46	1	Tee	Steel
5	1000-70	1	Fill Valve	Brass
6	101-20	1	Gauge	Plastic

11/18/2004



S/N: _____		MODEL #: _____		DATE OF PURCHASE _____	
MATERIALS OF CONSTRUCTION:		BODY _____		BLADDER _____	
PUMP AREA & NUMBER _____					
SUPPLIER:		COMPANY _____		CONTACT _____	
PHONE _____		FAX _____		E-MAIL _____	

### INSTALLATION NOTES

### READ BEFORE INSTALLATION

- To prevent pre-charge loss through the fill valve, **always** replace the cap after charging unit.
- If a **system pressure test is to be performed**, SENTRY must be charged with 80% of the system test pressure prior to test. This will avoid possible bladder damage.
- Blacoh recommends installing a pressure relief valve in all pump systems to ensure compliance with pressure limits on system equipment.
- Mount SENTRY as close to pump discharge, inlet and/or quick closing valve as possible, but within 10 pipe diameters.
- Temperature and pressure affect the strength and chemical resistance of plastic and rubber. Please consult factory for additional information.
- Remove all pressure from SENTRY unit **AND** pumping system before attempting maintenance.
- Do not exceed 150 PSI with plastic models; up to 300 PSI with CT units (all metal models excluding units with plastic non-wetted parts). **Check pressure rating shown on serial tag.**
- Always wear safety glasses when installing, charging or repairing SENTRY units.
- Do not operate a SENTRY that is leaking, damaged, corroded or unable to hold internal fluid, air or gas pressure.
- Pre-charge SENTRY with compressed air or nitrogen only. **DO NOT USE OXYGEN**
- **DANGER OF STATIC SPARK: GROUNDING PRECAUTIONS MUST BE CONSIDERED WHEN USED IN FLAMMABLE OR EXPLOSIVE ENVIRONMENTS.**

### INSTALLATION FOR PUMP DISCHARGE PULSATION

### READ BEFORE INSTALLATION

#### Step 1 – Installation Position

Install the dampener in-line, as close to the pump discharge as possible to absorb the pulse at its source. Install ahead of any downstream equipment such as risers, valves, elbows, meters, or filters. Dampener installation should be no more than ten pipe diameters from pump discharge. If using a flexible connector from pump to system piping, dampener should be installed at the pump discharge manifold. The flexible connector should be attached to the dampener's tee and system piping (see Figure 1). Since pressure is equal in all directions, SENTRY can be installed in a vertical, horizontal, or upside-down position. Blacoh recommends a vertical installation for better draining of the unit. Limitations for horizontal and upside-down mounting include high specific gravity, high viscosity, settling of solid material, or possible air entrapment, which could result in shortened bladder life and/or poor dampening performance.

#### Step 2 – Air Line Connection

Chargeable models do not require an air line connection. Units must be pre-charged with compressed air or Nitrogen, using a hand pump, tank/bottle or compressor. **DO NOT USE OXYGEN.** Charging hose kits are available – part number 701-00.

#### Step 3 – Charging and Start Up – see PRE-CHARGE NOTES on next page.

Prior to starting the pump, pre-charge SENTRY with compressed air or Nitrogen to approximately 80% of expected system pressure and replace fill valve cap. **DO NOT USE OXYGEN.** The gas pre-charge must always be lower than pump discharge pressure. Generally, pulsation is most effectively minimized when the gas charge is 80% of system pressure. Start the pump to generate system pressure.

**NOTE:** Once system pressure is in contact with the bladder, the gas charge will be compressed to the system pressure and the dampener gauge will read the system pressure, not the initial charge pressure. Once working pressure is achieved, adjustment may be necessary. Gradually increase or decrease the gas charge in the dampener by bleeding or filling through the gas valve. Allow the system to respond to each adjustment (this may take a minute or two) before making further adjustments.

## INSTALLATION FOR PUMP INLET

## READ BEFORE INSTALLATION

### Step 1 – Installation Position

Install SENTRY as close to the pump inlet as possible. Install after any upstream equipment such as risers, valves, elbows, meters, or filters. If using a flexible connector from system piping to pump, SENTRY should be installed to the pump inlet manifold. The flexible connector should be attached to the SENTRY tee and system piping (see Figure 1).

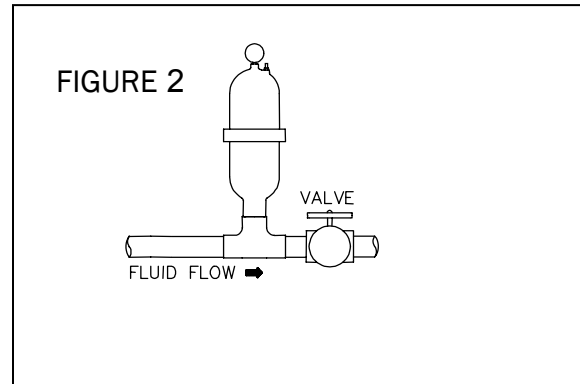
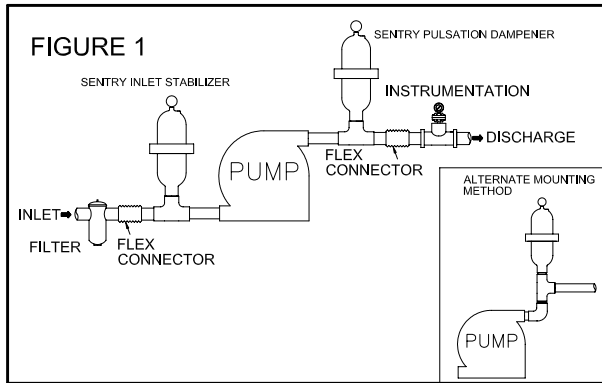
### Step 2 – Air Line Connection

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### Step 3 – Charging and Start Up – see PRE-CHARGE NOTES.

**A. Suctions Lift/Accumulator:** No pre-charge is required in a lift/accumulator installation. Start the pump to generate working pressure. As system pressure and vacuum is created, the acceleration head created with each suction stroke will compress the air trapped in the bladder. For better inlet stabilization, a SENTRY “J” Model is recommended.

**B. Positive Inlet Pressure:** Pre-charge SENTRY with 50% of the static pressure realized at the pump inlet. Start the pump to generate working pressure. Minor pressure adjustments may be required. Allow the system to respond to each adjustment (this may take a minute or two) before making further adjustments.



## INSTALLATION FOR WATER HAMMER / SURGE

## READ BEFORE INSTALLATION

### Step 1 – Installation Position

Install SENTRY up stream from valve, as close as possible but no more than ten pipe diameters from the valve. (See Figure 2)

### Step 2 – Air Line Connection

Chargeable models do not require an air line connection. Units must be pre-charged with compressed air or Nitrogen, using a hand pump, tank/bottle or compressor. **DO NOT USE OXYGEN.** Charging hose kits are available – part number 701-00.

### Step 3 – Charging and Start Up – see PRE-CHARGE NOTES

Prior to operating system, pre-charge SENTRY to 90% of system pressure and replace fill valve cap. Start the system.

## PRE-CHARGE NOTES

## READ BEFORE INSTALLATION

Gas molecules will diffuse through elastomer membranes, the speed of which depends on elastomer material, temperature and pressure. As a rule of thumb, the pre-charge pressure should be checked every month. Checks must occur when no system pressure is present or inaccurate readings will be recorded. If temperature is above ambient and/or pressure is over 300 PSI, checks should be performed more frequently. **Also, to prevent pre-charge loss through the fill valve, always replace the cap after charging.** A proper gas charge is the key to dampener effectiveness and bladder life.

**IMPORTANT: AFTER MAINTENANCE OR RE-ASSEMBLY, TORQUE FASTENERS ACCORDING TO SPECIFICATION ON THE UNIT TAG.**

**Standard Product Warranty:** Blacoh Fluid Control warrants its products to be free of defective material and workmanship under normal use and service for two years from date of shipment. The remedy for any product defect covered under this warranty shall be limited to the replacement or repair of the defective part or parts and Blacoh will not be responsible for damages or injury caused to other products, machinery, buildings, property or person. This warranty shall be null and void if the product has been altered, misapplied, misused, or neglected of maintenance. Damage or loss resulting from over-pressurization of a product, whether from gas or fluid does not constitute a defect covered under this warranty nor will Blacoh be responsible in any way for any such damage or loss. Because Blacoh cannot anticipate or control the many different conditions under which its products may be used, Blacoh does not guarantee the applicability or suitability of its products for any particular use or purpose. Each user of Blacoh products should conduct its own tests to determine the suitability of each product for its intended uses or purposes. Blacoh products are sold with this limited warranty and each buyer assumes all responsibility for loss or damage, including consequential damage, arising from the handling and use of Blacoh products whether used in accordance with Blacoh's directions or otherwise. Statements concerning the possible use of Blacoh products are not intended as recommendations for any specific use of such products. This Standard Product Warranty shall be governed by and construed in accordance with the laws of the State of California.



**BLACOH FLUID CONTROL, INC.**  
601 COLUMBIA AVE. BLDG. D, RIVERSIDE, CA 92507 USA  
TEL: 800.603.7867 or 951.342.3100 Fax: 951.342.3101  
e-mail: sales@blacoh.com web site: www.blacoh.com  
L-180 REV 11/09/04



## Duragauge® Pressure Gauge Type 1279, ASME B 40.1 Grade 2A ( $\pm 0.5\%$ of span)

- 4½" full-size bourdon tube
- Patented Duratube™ with as-welded tube construction controls stress for longer life
- "Round Cap Tip" construction lowers stresses for longer life
- Easily adjustable, self-locking micrometer pointer
- Burn-resistant phenol turret case
- Exclusive Teflon coated 400 series stainless steel rotary movement for longer life
- New PLUS!™ Performance Option:
  - Liquid-filled performance in a dry gauge
  - Fights vibration and pulsations without liquid-filled headaches

- See pages 6-7 for details
- Order as option XLL
- Epoxy-coated system for superior corrosion resistance

Type 1279 Duragauge® pressure gauge is offered in 4½" phenolic case for superior chemical and heat resistance. Solid-front case design with blow-out back for safety. Dry, liquid-filled, hermetically sealed, weatherproof or **PLUS!** options available. Field convertible to liquid-fill with conversion kit (detailed on page 243). All case styles provide full temperature compensation.



### BOURDON SYSTEM SELECTION

Ordering Code	Bourdon Tube & Tip Material <sup>(1)</sup> (all joints TIG welded except "A")	Socket Material	Tube Type	Range Selection Limits (psi)	NPT Conn. <sup>(2)</sup>
A	Phosphor Bronze Tube-Brass Tip, Silver Braze	Brass	C-Tube	12/1000	¼, ½
R	316L stainless steel	1019 steel	C-Tube	12/1500	¼, ½
			Helical	2000/20,000	¼, ½
<b>S</b>	316L stainless steel	316L stainless steel	C-Tube	12/1500	¼, ½
			Helical	2000/20,000	¼, ½
P <sup>(3)</sup>	K Monel	Monel 400	C-Tube	15/1500	¼, ½
			Helical	2000/30,000	¼, ½ <sup>(4)</sup>

(1) For selection of the correct bourdon system material, see the media application table on page 243.

(2) Other connections available on application.

(3) Use for applications where NACE standard MR-01-75 is specified.

(4) 30,000 psi range supplied with ¼ high pressure connection, ½ NPT optional.

### STANDARD RANGES

Pressure psi	Compound psi
0/15	30 in.Hg/15 psi
0/30	30 in.Hg/30 psi
0/60	30 in.Hg/60 psi
<b>0/100</b>	30 in.Hg/100 psi
0/160	30 in.Hg/150 psi
0/200	30 in.Hg/300 psi
0/300	
0/400	<b>Vacuum</b>
0/600	30/0 in.Hg
0/800	34/0 ftH <sub>2</sub> O
0/1000	
0/1500	
0/2000	
0/3000	
0/5000	
0/10,000	
0/20,000	
0/30,000	

**NOTE:**  
Equivalent standard  
kg/cm<sup>2</sup>, and kPa metric  
ranges are available.

### TO ORDER THIS 1279 DURAGAUGE:

#### Select:

1. Dial size—4½" \_\_\_\_\_
2. Case type—1279 \_\_\_\_\_
3. Bourdon system selection ordering code **316ss Tube / Glycerin Filled Gauge**
4. Connection—¼ NPT (02), ½ NPT (04), Lower (L), Back (B) \_\_\_\_\_
5. Optional features—see page 239 \_\_\_\_\_
6. Standard pressure range \_\_\_\_\_
7. Accessories—see pages 233-238 \_\_\_\_\_

(\*) "S" denotes solid front case design

Consult factory for guidance in product selection  
Phone (203) 385-0217, Fax (203) 385-0602 or  
visit our web site at [www.ashcroft.com](http://www.ashcroft.com)

MADE IN U.S.A.

**DRESSER**  
Instruments



## SELECTION

**Pressure Ranges** – Select a gauge with a full scale pressure range of approximately twice the normal operating pressure. The maximum operating pressure should not exceed approximately 75% of the full scale range. Failure to select a gauge range within this criteria may ultimately result in fatigue failure of the Bourdon tube component.

## INSTALLATION

Always use a wrench on the flats of the gauge socket to screw the gauge in place. When a fitting is being screwed to the gauge, hold a wrench on the socket flats instead of twisting against the gauge socket screws which are intended to hold the gauge mechanism in the case.

When gauges are mounted on the wall or panel, make sure they are connected free from piping strains. Also see that the mounting surface is flat, or insert washers under the flange of the gauge case to obtain three-point suspension. Preferably, the last length of piping leading up to the gauge should be flexible tubing. This will ensure that the gauge is free from strain.

Install gauges where they will be free from the effects of mechanical vibrations as this will wear out any gauge quickly. Try to mount the gauge on a wall nearby and connect the gauge to the machine which vibrates badly by means of flexible line assembly.

Protect gauges from frequent pressure pulsations by using liquid-filled or Duragauge Plus® with a throttle screw in the socket of the gauge, needle valves, pulsation dampeners or pressure snubbers.

When any gauge is used for steam pressures, a siphon filled with water must be installed between the gauge and the line. When the system is subject to occasional vacuum, provide a leg of piping which cannot be emptied by the vacuum effect. A drain cock or plug should be installed at the bottom of this leg to enable occasional cleaning out of the sediment. The head effect of this piping leg should be compensated for by resetting the pointer of the gauge.

## OPERATING CONDITIONS

The operating conditions to which a gauge will be subjected must be considered. If the gauge will be subjected to severe vibration or pressure pulsations, liquid filling the gauge may be necessary to obtain normal product life. Other than discoloration of the dial and hardening of the gasketing that will occur as ambient temperatures exceed 150°F, metal case Duragauges (that are not liquid filled) can withstand continuous ambient temperatures as high as 250°F. Liquid filled gauges can withstand 200°F but glycerin fill and acrylic window will tend to yellow. Accuracy will be affected by approximately 1.5% per 100°F. Gauges with welded joints will withstand 750°F (450°F with silver brazed joints) for short times without rupture, although other parts of the gauge will be destroyed and calibration will be lost. For temperature limits on other gauges see the appropriate bulletin.

## PROPER USE

Apply pressure slowly. do not open gauge cock or valve too quickly – this imparts a severe strain on the Bourdon tube which may rupture it, or result in shortened life. When the service itself is subject to sudden pressure applications, use a needle valve or the Ashcroft Gauge Saver.

Avoid overpressure. See that the apparatus is provided with a relief valve and that the range of the gauge is higher than the set pressure of the relief valve.

Sudden pressure release has the same detrimental effect and should be compensated for in the same manner as for the pressure applications mentioned above. On hydraulic presses, Catalog Number 1056 or 1009DH Gauges with slotted link should be specified. See Special Service Bulletin SG-1.

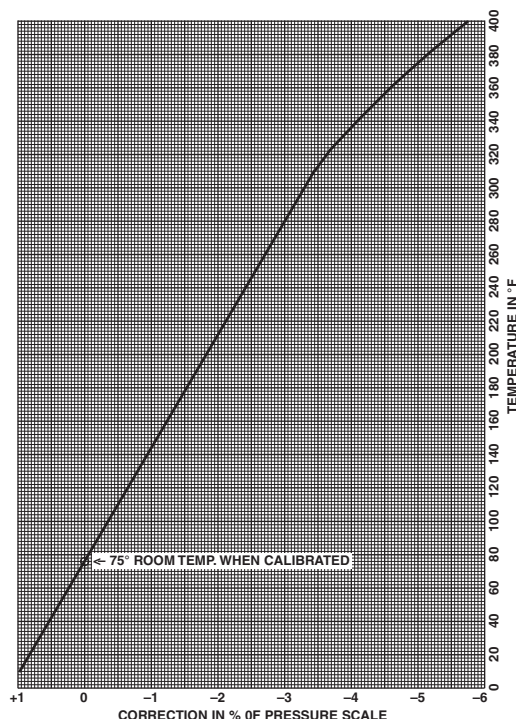
## MAINTENANCE

Replace broken glasses and thus keep dirt out of the working bearings and teeth of the movement mechanism.

Never oil gauge movements or linkages except with high grade instrument oil. Regular oil attracts dirt and becomes gummy, thus causing the gauge to act sluggish and inaccurate.

### HEAT AFFECTS GAUGE ACCURACY

**Approximate error or change in calibration of a Bourdon tube type pressure gauge caused by changes in temperature.**



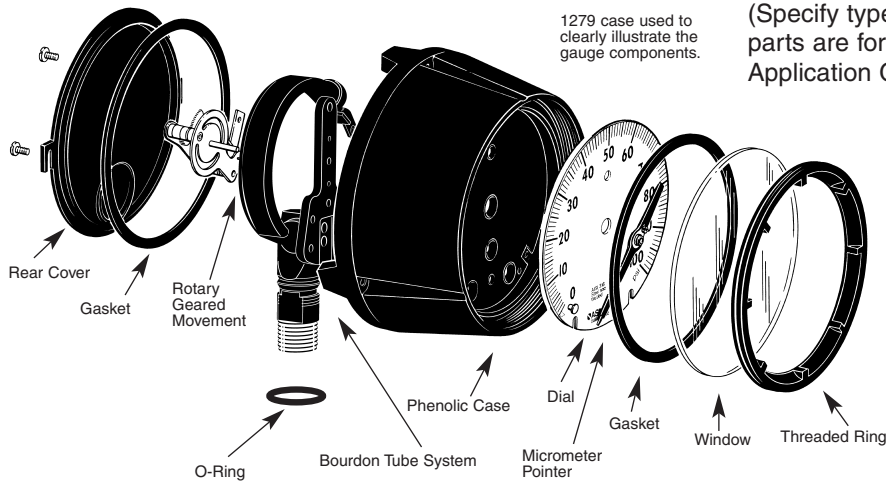
Example: Gauge working at 500 psi pressure at 280°F. temperature would have a -3% correction and would read 3% or 15 psi fast.

# Installation and Maintenance Instructions for ASHCROFT® Pressure Gauges, Gauge Parts and Ring Designs, Engineering Data



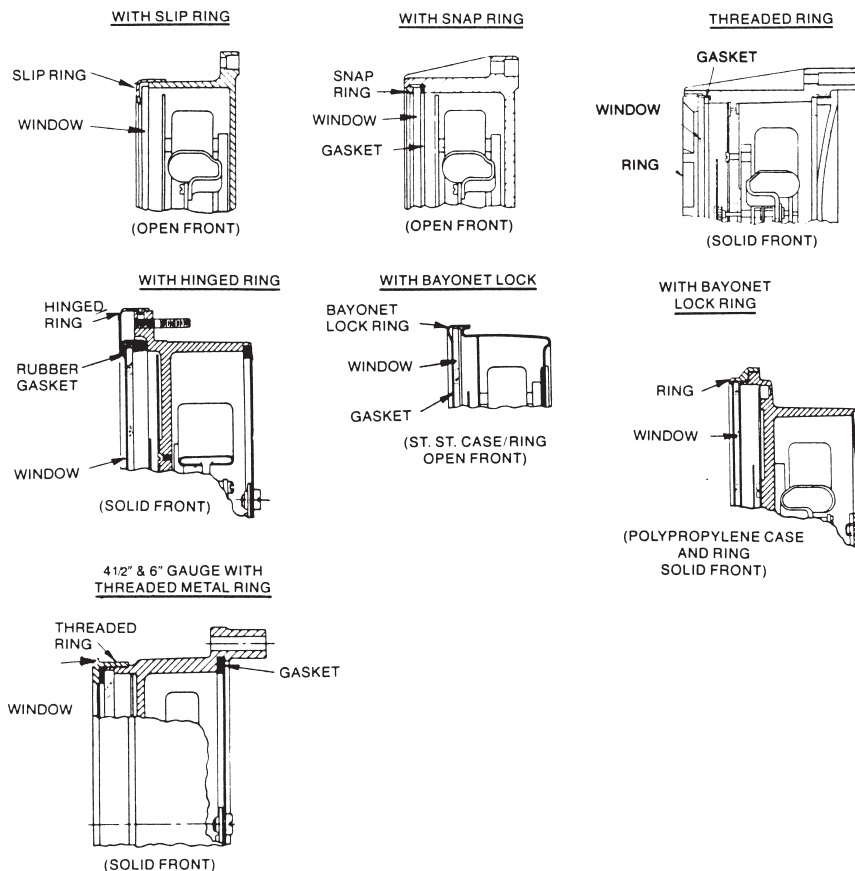
The drawing below shows a typical solid front, lower connection Duragauge with all of the parts designated by their standard names. The use of these names will facilitate the ordering of parts and eliminate any misunderstanding in describing gauge construction.

When ordering parts – specify as much of the following data as possible: *Size* (Dial Diameter); *Case Material* (Stainless Steel, Polypropylene, Aluminum or Phenol); *Case Type* (Open Front or Solid Front); *Ring Design* (Slip, Internal Threaded, External Threaded, Bayonet, Snap or Hinged); *Connection Location* (Lower or Back); *Connection Size* ( $\frac{1}{4}$ " or  $\frac{1}{2}$ ""); *Bourdon Tube/Socket* (Material Indicated on Dial); *Dial Range* (Specify type number if possible; otherwise, mention whether parts are for Duragauge, General Service Gauge, Special Application Gauge, Receiver Gauge or Test Gauge.)



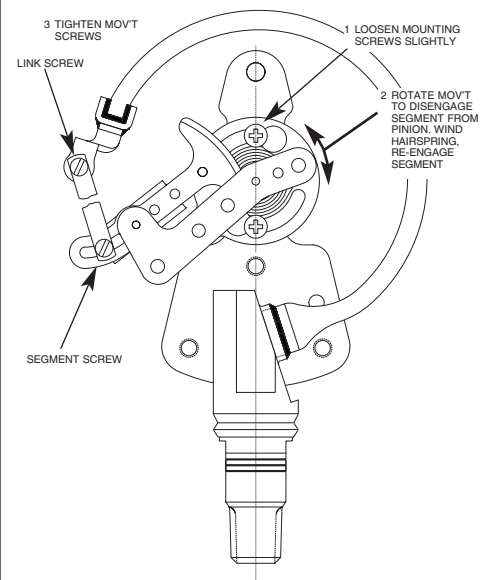
**Note:** The socket, tube and tip assembly is furnished as one integral unit. The movement is supplied complete.

## TYPICAL CONSTRUCTION DETAILS



## CALIBRATION PROCEDURE

### 1. Preliminary Gauge Calibration Setting – (SOLID FRONT GAUGE SHOWN)



### 2. Calibration –

- At zero pressure (or at full vacuum for compound or vacuum gauges), assemble pointer to pinion shaft in the horizontal position.
- Apply pressure equal to full range and adjust the slide in the segment slot until the pointer has rotated 270° (vertical position).
- Reduce pressure to zero and reset pointer, if necessary, to horizontal position. If pointer adjustment was required, repeat step (b) above.
- Apply pressure equal to mid-scale and drive pointer firmly onto pinion.
- Recheck calibration at the lower and upper ends of the scale.

**3. Linearity Adjustment** –Although the procedure outlined above should produce a correctly calibrated gauge, linearity adjustment may be required. If the pointer reads correctly at the bottom of the scale and low at the top of the scale, rotate the movement to increase the angle between the link and the segment. If the pointer reads high, rotate the movement in the opposite direction.

ZEAL ORDERING NUMBER <b>T510-04TW</b>	NON-CLEANOUT TYPE FOR PIPE MOUNTING	CATALOG NUMBER <b>T510-04</b>
--	--	----------------------------------

PART T5004 - INSTRUMENT FLANGE - (1) REQUIRED MATERIAL - STEEL

PART T5411 - DIAPHRAGM GASKET - (1) REQ'D MATERIAL - VITON

PART T5511 - CAP SCREW (4) REQ'D - HEX. HEAD 3/8-18 X 2" LONG MATERIAL - STEEL

PART M5406 - INSTRUMENT FLANGE GASKET - (1) REQ'D MATERIAL - VITON

PART T5407 - PROCESS GASKET - (1) REQ'D MAT'L - TEFLON

PART T5408 PRESSURE PLATE (1) REQUIRED MAT'L - STEEL

PART T5509 - HEX. NUT (4) REQ'D - SIZE 3/8-16 MAT'L - STAINLESS STEEL

PART T5404 - DIAPHRAGM (1) REQUIRED MATERIAL - TEFLON

PART T5528 - BLEED SCREW - (1) REQUIRED MATERIAL - STEEL

PART T5110 - PROCESS FLANGE - (1) REQUIRED MAT'L - CPVC

# T510-04TW-XCG DIAPHRAGM SEAL:  
 CPVC BOTTOM HOUSING  
 TEFLON DIAPHRAGM  
 1/2" FNPT PROCESS CONNECTION  
 GLYCERIN FILL

ZAVODA MFG. CO., INC., HWY. 71 WEST, P.O. BOX 506, LA GRANGE, TX 78945, PH: 979-242-3300 FAX: 979-242-3353

CUSTOMER:		P.O.	
QUAN:	P.O. DATE:	WANTED BY:	W.O. DATE:
WILL SHIP BY:		SHIPPED:	
USER:			
TITLE:		WORK ORDER NUMBER	PAGE
MODEL T510 SMALL ZEAL®		MUST BE GIVEN IN ALL CORRESPONDENCE OR PHONE INQUIRIES	OF

# ZAVODA MANUFACTURING CO., INC.

we make zeals?

Since 1962

Thursday, August 20, 2009

CATALOG 2000

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## Operating Instructions

**LIQUID FILLING** - When a Zeal is attached to a pressure instrument, the two must act as an integral unit. To accomplish this, all the cavities, or space, occupied by air in the instrument flange of the Zeal, in the sensing element of the pressure instrument and in the hole through the capillary tubing (if used) must be filled with a fluid.

- [Liquid Filling](#)
- [Installation](#)
- [Maintenance](#)
- [Diaphragm Replacement](#)

The function of the liquid fill fluid is to transmit the process pressure, which acts on the diaphragm, from the diaphragm to the sensing element of the pressure instrument.

Usually, this fluid is a light instrument oil but other fluids can be used should oil tend to contaminate the process in case of leakage.

The instrument/seal assembly can be filled in either of two methods.

The instrument and seal can be filled separately and then assembled. Back pressure, if present, should be relieved by use of the fill/bleed screw provided in the seal for this purpose.

The liquid filling operation can be done by evacuating all the air from all the cavities in the pressure instrument with the aid of a vacuum pump and then, by the proper arrangement of pipes and valves, allowing the fill fluid to replace the evacuated air in the cavities. The cavity in the instrument flange of the diaphragm seal can be easily filled through the instrument connection from an oil can or other container prior to attaching it to the pressure instrument.

In the second method of filling, the instrument and seal are assembled first, then the entire internal cavities of the instrument and seal can be evacuated and completely filled through the fill/bleed port by the use of a fill adapter that is inserted into the port.

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## LIST OF FEATURES

### ■ TYPE T DIAPHRAGM

- DIAPHRAGM - Made of Teflon for greatest compatibility with practically all chemicals.
- GREATER ACCURACY - The Teflon diaphragm is more sensitive than a metal diaphragm, with increased displacement due to greater flexibility and elasticity. The Type T, Series 6, Zeal is the most sensitive quality Diaphragm Seal available.
- SIMPLIFIED LIQUID FILLING OPERATION - Highly efficient vacuum pump is not necessary; highly skilled technician not required; faster; less costly.
- LESS TEMPERATURE ERROR - More sensitive diaphragm reduces error due to expansion of liquid fill; less back pressure.



### ■ ALL TYPES AND SERIES

- SPECIAL PATENTED FEATURE - A patented feature of the metal diaphragm, used in the Type W and Type M Zeal, is the addition of spoke corrugations to the radial corrugations. The spoke corrugations reduce hoop stress in the metal thus enabling the metal diaphragm to flex more readily and allow more displacement of the liquid fill fluid. This patented feature allows our Diaphragm Seal to have more displacement than other manufacturers and therefore is more sensitive.
- PATENTED SNAP-IN DIAPHRAGM - Eliminates the need for a costly machined diaphragm clamping ring (wetted part) to retain the diaphragm; lowers cost.
- SEALING - Ingenious O-ring gasketing of the diaphragm insures minimal possibility of leakage of the liquid fill fluid when properly installed, operated and maintained.
- SIMPLIFIED ASSEMBLY - Flanges of all Zeals, except the flanged type, are bolted solidly together, face-to-face, by four bolts; no skill or special tools required to tighten bolts.
- IMPOSSIBLE TO CRUSH GASKET - Flange is recessed for gasket; flanges squeeze gasket, do not tighten on gasket.

## DIAPHRAGM SEALS

- FLANGES BOLT UP EASIER - Flanges bolt up metal-to-metal; flanges bolt up directly under bolt heads; no guesswork required to tighten bolts; no "feel" required; quicker, easier, flanges remain parallel.
- SELF-ENERGIZED GASKET - Process pressure is used to pressure load the process gasket surface; the greater the process pressure, the greater the sealing pressure.
- GASKET PRESSURE IS CONSTANT - When flanges separate slightly from stretch of bolts, due to high pressure, the process flange gasket pressure on sealing surfaces remains constant thus preventing leakage.
- EASY TO CLEAN - Except for styles 10 or 11, all Zeals can be disassembled at the flanges and reassembled many times; simple, quick, no loss of liquid fill.



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### **ZAVODA MANUFACTURING CO., INC.**

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Phone: (979) 242-3300 \* Fax (979) 242-3353

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After filling, the bleed screw is inserted into the fill/bleed port to seal it. If you use this method, it is strongly recommended that an equal vacuum be pulled on the process side of the diaphragm, especially on the Type T and Type V Zeals.

It is a fact that the smallest amount of movement, required of the diaphragm, occurs when all the air is removed from the unit.

It is also a fact that the larger the amount of movement required to fully actuate a sensing element of a pressure instrument, the greater the spring rate of a diaphragm. The greater the spring rate - the greater the inaccuracy of the unit. These facts are inherent regardless of make or manufacturer of the diaphragm seal.

The spring rate of the diaphragm can be calibrated into the assembled unit by recalibrating the unit after liquid filling. But, this is possible only if the calibration range of the sensing element in the pressure instrument is great enough to compensate for the added spring rate of the diaphragm. In instruments of low pressure range, the spring rate of the sensing element is too small to allow for the compensation necessary for the high spring rate of some diaphragms. In fact, the spring rate of some diaphragms is so great that it is equal to and sometimes even greater than the spring rate of the sensing element in low pressure instruments.

The more precise and exacting the process requirements, the more important it is to remove all the air from a pressure instrument and to carefully recalibrate the unit after liquid filling.

In the large Type T Zavoda Diaphragm Seal (Zeal), the spring rate of the diaphragm is equal to only two ounces of pressure per square inch, when all the air is evacuated from the unit, and is so small that in most uses this will not require the costly recalibration of the instrument.

**INSTALLATION** - Depending on model used, Zeals can be welded, bolted or threaded into the process system using any good installation procedure. A hole is provided in the instrument flange for the use of a pin spanner wrench when attaching a Zeal onto a threaded process pipe.

**MAINTENANCE** - All Zeals in all series, except styles 10 and 11, are of the cleanout type and, by removing the flange bolts, can be separated at the flanges without loss of the liquid fill fluid to permit periodic cleaning of the diaphragm.

## DIAPHRAGM SEALS

The cavity in the process flange and the process side of the diaphragm must be kept clean and free of any clogging matter, otherwise proper movement of the diaphragm may be impaired.

The retention of the liquid fill is accomplished by the diaphragm being firmly held by a holding groove in the instrument flange.

**CAUTION** - At all times extreme care must be taken not to nick or scratch the gasketing surfaces or leakage may result.

**DIAPHRAGM REPLACEMENT** - When removing a damaged diaphragm from the instrument flange, extreme care must be taken not to dent, nick or otherwise damage the groove are at the instrument flange gasketing surface face.

Install a new diaphragm by inserting one point of the diaphragm into the holding groove with the instrument flange gasket assembled in place on the diaphragm and then press the diaphragm in with the fingers pushing down on the thickened edge of the diaphragm and working around the periphery until the opposite side has been reached.

Lightly oil all parts to aid in installation, if necessary, but hammers or like objects should not be used, as they may dent or nick the gasketing surface and may result in leakage after assembling.

Zeals with the style numbers 10 and 11 do not have the holding groove in the instrument flange, nor the self-holding type of diaphragm. Therefore, to assemble a diaphragm into one of these models, simply assemble an instrument flange gasket in place and insert the diaphragm into the recess provided for it in the instrument flange and bolt the process flange to the instrument flange.

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**Griffco Valve Inc.**  
6010 N. Bailey Ave., Ste 1B  
Amherst, NY 14226  
Phone: 1 716 835-0891  
Fax: 1 716 835-0893

# T-SERIES BACK PRESSURE VALVES

(2-PORT BACKPRESSURE / PRESSURE RELIEF VALVES)

## Features:

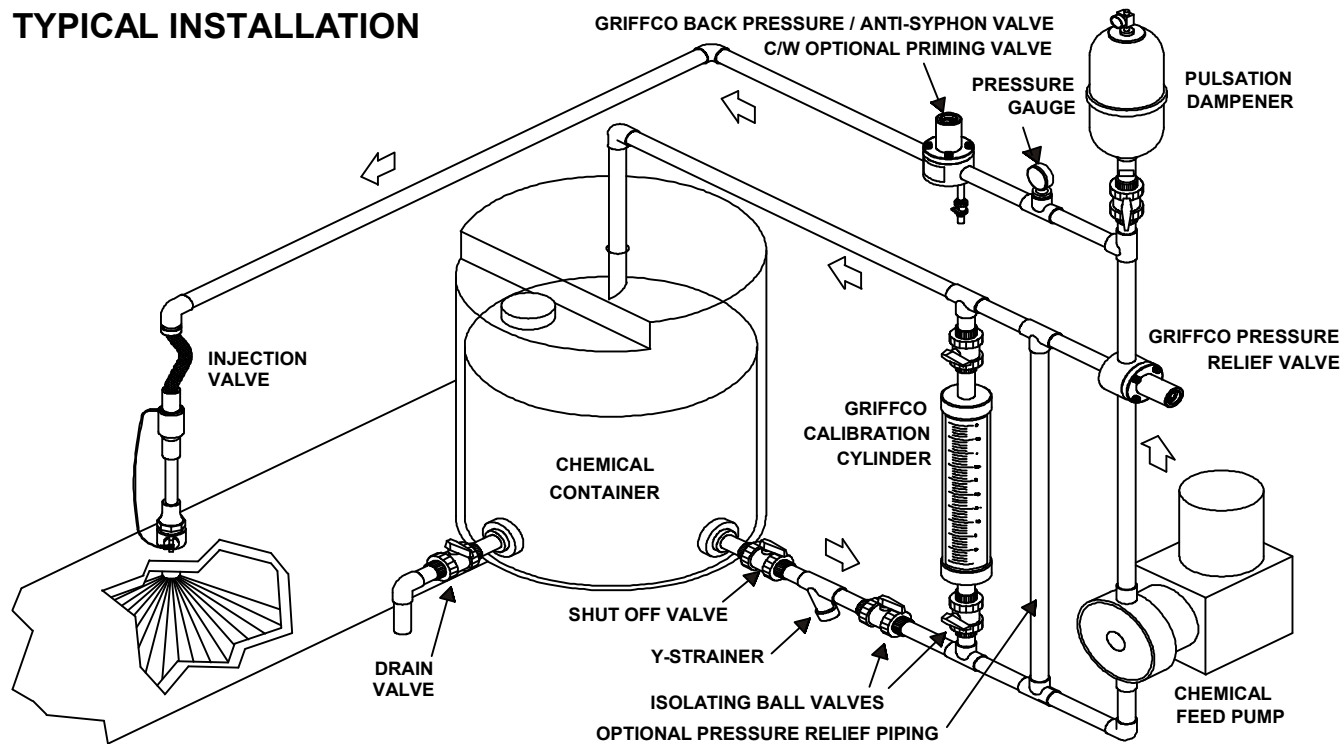
- High Reliability / Low Cost
- No Bolts on Plastic Models
- Compact Size for OEM Applications
- Adjustable 10 - 150 PSI
- Optional 350 PSI Rated Valve
- Anti-Siphon Function
- Robust, Machined Construction
- Vulcanised PTFE/EPDM Diaphragm
- Wide Range of Materials

## Operation:

**Griffco** diaphragm back pressure valves apply positive discharge pressure to a metering pump system to prevent siphoning and eliminate varying dosage rates caused by fluctuating downstream pressure. The diaphragm is held against the valve seat by an internal spring. When the preset pressure is exceeded, the diaphragm is forced up and chemical flows through the valve to the injection point. The valves are preset for 50 psi, however they are field adjustable from 10 - 150 psi via the adjustment screw. Installation should be as close to the injection point as possible to prevent chemical line drainage, and it is most important that all chemical system equipment such as pulsation dampeners and pressure gauges are between the pump and back pressure valve.

**Griffco** diaphragm back pressure valves are designed to enhance the performance of chemical feed systems by applying a continuous back pressure to the chemical feed pump, while also acting as an anti-syphon valve. Robust construction ensures reliability in the rigorous service of municipal and industrial applications. Wetted materials include: **PVC, CPVC, PP, PVDF, PTFE, 316 SS, A 20 and Hast. C.** Available sizes: 1/4"- 1/2"+

## TYPICAL INSTALLATION



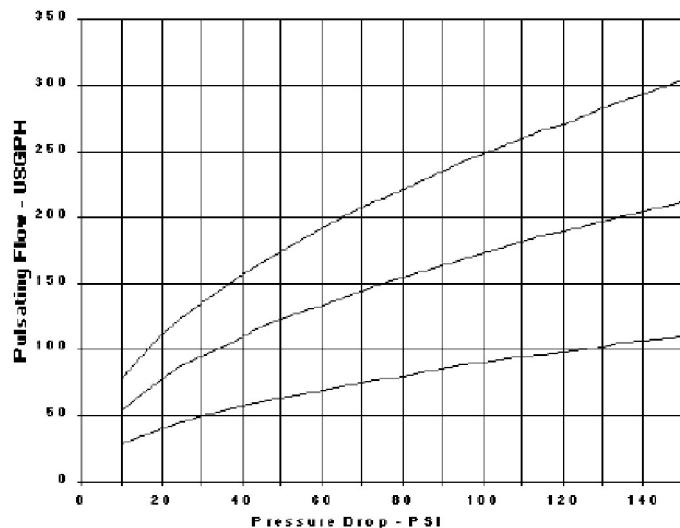
**CALL 1 - 800 - GRIFFCO**

Bulletin # BPV1003-2007

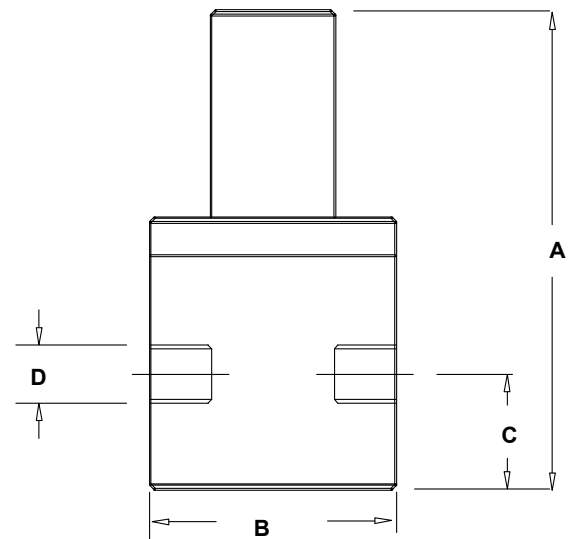
## Technical Data:

Sizes: Model BPT			1/4", 3/8" 1/2"		
Connections:			NPT and Socket		
Pressure Adjustment			10 - 50 psi, 10 - 150 psi, 10 - 250 psi, 50 - 350 psi		
Flow Rates @ 150 psi			Shipping Weight: lbs		
Size	Pulsating	Continuous	Plastic	Metal / Plastic Top	Metal / Metal Top
1/4"	100 USgph	5 USgpm	1.0	2.5	3.0
3/8"	200 USgph	10 USgpm	1.0	2.5	3.0
1/2"	300 USgph	15 USgpm	1.0	3.0	3.5
Max Temperature: (°F)			PVC: 140° CPVC: 190° PTFE & PVDF: 280°; Metal: 300°, (Short Term 390°)		
Max Operating Pressure @ 70°F: (psi)			Plastic/Noryl: 375 psi, Metal /Metal: 2000 psi		
Materials of Construction:					
Diaphragm			PTFE / EPDM, Optional: Viton & PTFE / Viton		
Valve Top			Standard: Noryl (Threaded to Plastic Valves, Bolted to Metal Valves) Optional: 316 SS, (Alloy tops fit alloy valves ONLY)		
Valve Body			PVC, CPVC, PP, PTFE, PVDF, 316 SS, A 20, Hast. C, Others on Request		

## Performance Curves:



## Dimensions:



## Product Codes For Ordering:

BPT -050 -CP -S

1 2 3

### 1 = Size

025 - 1/4+

038 - 3/8+

050 - 1/2+

### 2 = Material

P - PVC

CP - CPVC

PP - Polypro

T - PTFE

K - PVDF

S - 316 SS

A - Alloy 20

C - Hastalloy C

### 3 = Options

V - Viton Diaphragm

S - Socket Connections

OSS - Optional 316 SS Top

MSS - 50 - 350 psi; 316 SS Top

AR - Optional Air Release Port

D	A	B	C
1/4" Plastic	3.90	2.35	0.75
1/4" Metal	3.50	2.35	0.75
3/8" Plastic	3.90	2.35	0.75
3/8" Metal	3.50	2.35	0.75
1/2" Plastic	4.60	2.35	1.25
1/2" Metal	4.25	2.35	1.25

Note: Options OS, OSS, MS, & MSS are only for use on 316SS, A20, & Hast C Valves.

For more detailed information visit us at [www.griffcovalve.com](http://www.griffcovalve.com)



**Griffco Valve Inc.**  
**6010 N. Bailey Ave., Suite 1B**  
**Amherst, NY 14226**  
**Phone: 1 716 835-0891**  
**Fax: 1 716 835-0893**

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# **T-Series Instruction Manual**

## **Back Pressure Valves Pressure Relief Valves**

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**Call: 1 - 800 – GRIFFCO**

**Website: [www.griffcovalve.com](http://www.griffcovalve.com)**

**INST1002-2008**



## INTRODUCTION

**GRIFFCO** diaphragm back pressure valves are used to enhance the performance of chemical feed pumps and systems by providing a constant discharge head pressure. These valves also function as an anti-siphon valve. The diaphragm is held against the seat by the internal spring. Back pressure is adjustable from 0 - 150 psi via the adjustment screw. When the inlet pressure exceeds the preset pressure the diaphragm lifts off the seat and the chemical flows to the injection point. After each discharge stroke of the pump, as the pressure drops, the diaphragm reseats itself.

**GRIFFCO** diaphragm pressure relief valves are designed to protect chemical feed pumps and systems from overpressure caused by defective equipment or blockages in the chemical line.

The 3 port design allows chemical to flow through the valve via an internal chamber. When the pressure in the chemical line exceeds the preset pressure of the valve the diaphragm lifts off the seat and the chemical then flows out the bottom port back to the chemical tank. Relief pressure is adjustable from 0 - 150 psi via the tamper resistant screw in the top of the valve.

## INSTALLATION

### Back Pressure Valve:

Generally, the back pressure valve can be installed anywhere in the discharge line, provided there is some downstream pressure at the dosage point. If there is no downstream pressure the back pressure valve should be installed at the dosage point to prevent siphoning and drainage of the chemical line. All **GRIFFCO** valves are factory set at 50 psi, unless otherwise specified. Field adjustment is possible with the adjustment screw, (appx. 25 psi/revolution with a 150 psi spring).

Back pressure valve performance will be enhanced with the installation of a pulsation dampener to smooth out the discharge / suction cycles of the pump. Thus, the diaphragm is free to float inside the valve chamber, minimizing the wear on the stress points of the diaphragm. Pulsation dampeners will also reduce the pressure drop across the valve by reducing peak flows. Backpressure valves should be installed downstream of the dampener. For most applications diaphragm type dampeners are required. Generally speaking 5 to 10% dampening is sufficient. Consult with your pump manufacturer to get his recommendations.

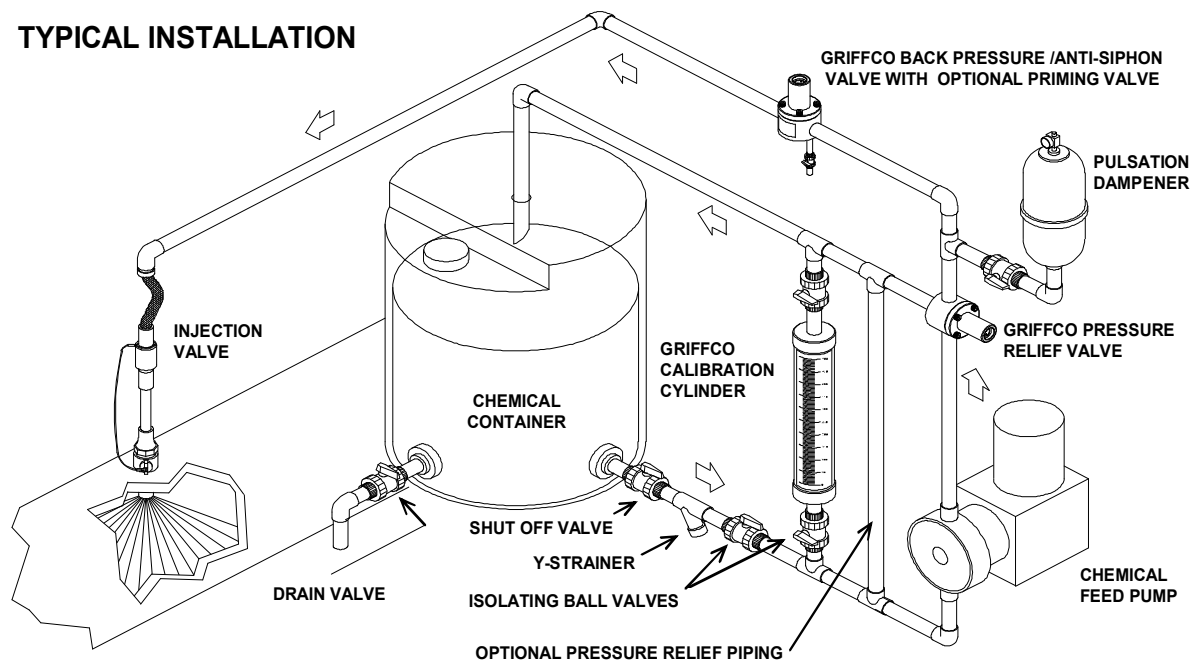
### Pressure Relief Valve:

Installation should be made as close to the chemical pump discharge valve as possible, without any equipment, especially shut-off valves, between the valve and the pump. Direction of flow must be across the valve; however the side of entry is not important. All **GRIFFCO** valves are factory set at 50psi, however field adjustment is possible with the adjustment screw.

The optimum installation for the relief valve is to vent the relief port back to the chemical tank, or directly to a containment area. However if this is not possible, the relief port can be piped back into the suction side of the pump. This will apply the suction head to the relief port. To compensate, divide the NPSH by 4 and add this pressure to the relief valve setting.

Do not install a shut-off valve in the relief line.

## TYPICAL INSTALLATION



## MAINTENANCE:

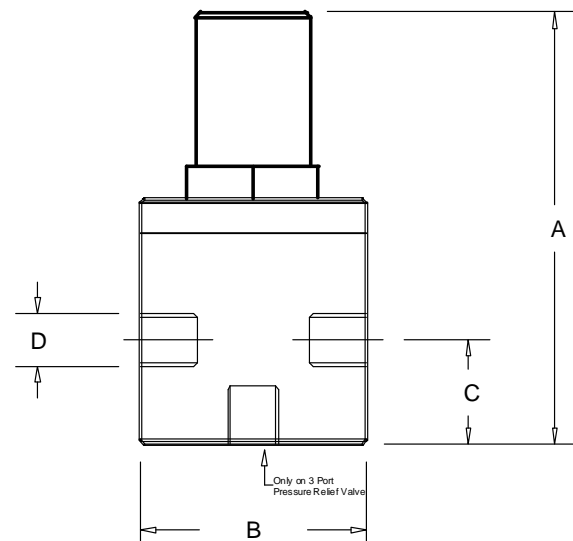
The pressure relief and back pressure valves were designed with minimizing the amount of maintenance required to keep the valves in operation. However, periodic replacement of the diaphragm is required. To facilitate inspection and replacement, the valve layout is such that removal of the diaphragm can be done without taking the valve out of the chemical line.

**Caution: Ensure the system is not under pressure and that the chemical lines are flushed with water before disassembly.**

Unscrew the pressure adjuster to remove the pressure from the diaphragm. Unthread the valve top and lift off. After the diaphragm has been inspected and replaced if necessary check the adjustment spring. Make sure there is no rust or corrosion. Replaced the spring if necessary. Place the spring and support disc onto the valve, then thread the valve top back over the valve body. Hand snug then tighten 1/8 of a turn. (appx. 25 ft/lbs)

Screw in the djustment screw to approximately the same position as it was prior to disassembly. If an exact pressure setting is required or a different pressure is desired a pressure gauge should be used to verify the setting. Turning the adjustment screw clockwise will increase pressure.

## DIMENSIONS:

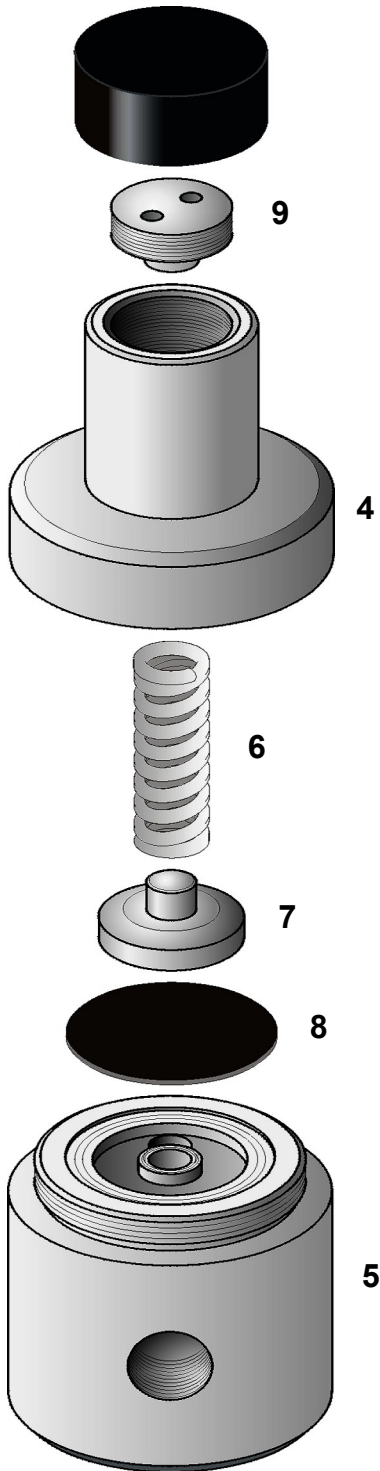


D	A (in)	B (in)	C (in)
1/4" (P)	3.90	2.340	0.750
1/4" (M)	3.50	2.340	0.750
3/8" (P)	3.90	2.340	0.750
3/8" (M)	3.50	2.340	0.750
1/2" (P)	4.60	2.340	0.750
1/2" (M)	4.20	2.340	0.750

**Warranty:** GRIFCO Valve, Inc. warrants its products against defects in workmanship or materials for one year under normal use or 18 months from date of shipment whichever occurs first. All obligations and liabilities under this warranty are limited to repair or replacement (at out option), FOB our plant such allegedly defective units as are returned to our factory transport prepaid. Repairs or replacements are made subject to inspection of returned items.

This warranty does not extend to damage by corrosion or erosion. The materials of construction offered are recommendations subject in all cases to acceptance by the customer. These recommendations, based on previous experience and best available information, do not constitute guarantees against wear or chemical action. Expressly excluded from this warranty are defects caused by misuse, abuse or improper application, installation or operation of the unit. No liability for consequential damages or reinstallation labor is accepted. GRIFCO Valve, Inc. will not assume responsibility for contingent liability for alleged failure of its products.

## PARTS LIST



ITEM	DESCRIPTION	PART #	
1	10/32 x 3/4+- Bolt . SS ( Metal Valves only )	PV-00107	
2	10/32 Cap Nut - SS (Only used on PRTA Valves)	PV-00201	
3	10/32 Flat Washer . SS ( Metal Valves only )	PV-00301	
4	1/4+- 1/2+Valve Top . Noryl. Black (Metal Valves) 1/4+- 1/2+Valve Top . Noryl, Orange (Metal Valves) 1/4+- 1/2+Valve Top . Noryl, Yellow (Metal Valves) 1/4+- 1/2+Valve Top . Noryl, Green (Metal Valves) 1/4+- 1/2+Valve Top . Noryl, Grey (Metal Valves) 1/4+- 1/2+Valve Top . Noryl. Black (Plastic Valves) 1/4+- 1/2+Valve Top . Noryl, Orange (Plastic Valves) 1/4+- 1/2+Valve Top . Noryl, Yellow (Plastic Valves) 1/4+- 1/2+Valve Top . Noryl, Green (Plastic Valves) 1/4+- 1/2+Valve Top . Noryl, Grey (Plastic Valves) 1/4+- 1/2+Valve Top - 316 SS	PV-004011 PV-004012 PV-004013 PV-004014 PV-004015 PV-004024 PV-004026 PV-004027 PV-004028 PV-004029 PV-00403	
		BPV #	PRV #
5	1/4+Valve Body PVC 1/4" Valve Body PP 1/4+Valve Body PTFE 1/4+Valve Body PVDF 1/4+Valve Body 316 SS 1/4+Valve Body Alloy 20 1/4+Valve Body Hast C 1/4" Valve Body CPVC 3/8+Valve Body PVC 3/8+Valve Body PP 3/8+Valve Body PTFE 3/8+Valve Body PVDF 3/8+Valve Body 316 SS 3/8+Valve Body Alloy 20 3/8+Valve Body Hast C 3/8+Valve Body CPVC 1/2+ Valve Body PVC 1/2+ Valve Body PP 1/2+ Valve Body PTFE 1/2+ Valve Body PVDF 1/2+ Valve Body 316 SS 1/2+ Valve Body Alloy 20 1/2+ Valve Body Hast C 1/2+ Valve Body CPVC	BPV-005011 BPV-005021 BPV-005031 BPV-005041 BPV-00505 BPV-00506 BPV-00507 BPV-005081 BPV-005611 BPV-005621 BPV-005631 BPV-005641 BPV-00565 BPV-00566 BPV-00567 BPV-005681 BPV-005111 BPV-005121 BPV-005131 BPV-005141 BPV-005151 BPV-005161 BPV-005171 BPV-005181	PRV-005011 PRV-005021 PRV-005031 PRV-005041 PRV-00505 PRV-00506 PRV-00507 PRV-005081 PRV-005611 PRV-005621 PRV-005631 PRV-005641 PRV-00565 PRV-00566 PRV-00567 PRV-005681 PRV-005111 PRV-005121 PRV-005131 PRV-005141 PRV-005151 PRV-005161 PRV-005171 PRV-005181
6	Pressure Spring - 1/4+- 1/2+Valve; 150 psi Pressure Spring - 1/4+- 1/2+Valve; 50 psi Pressure Spring - 1/4+- 1/2+Valve; 250 psi Pressure Spring - 1/4+- 1/2+Valve; 350 psi Pressure Spring - 1/4+- 1/2+Valve; 100 psi, 316 SS	PV-00601 PV-006011 PV-006013 PV-006012 PV-00601S	
7	Support Disc - 1/4+- 1/2+ Valve, PVC Support Disc - 1/4+- 1/2+ Valve, 316 SS	PV-00701 PV-00702	
8	Diaphragm - 1/4+- 1/2+Valve - PTFE / EPDM Diaphragm - 1/4+- 1/2+Valve . Viton Diaphragm - 1/4+- 1/2+Valve - PTFE / Viton (High Temperature)	PV-00800 PV-00802 PV-00803	
9	Adjustment Screw - 1/4+- 1/2+Valve Noryl Adjustment Screw - 1/4+- 1/2+Valve Coated Steel	PV-00905 PV-00901	
	Protective Vinyl Cap	PV-01001	

# ALL PLASTIC BASKET STRAINER

Best for  
Corrosive Service

Sizes 1/2" to 8" • PVC **Corzan® CPVC** or Eastar • **Socket**, Threaded or Flanged



## Features:

- External Cover Threads
- Low Pressure Drop
- Wide Choice of Baskets
- In-Line or loop Piping Design
- True Union Connections
- Hand Removable Cover
- Integral, Flat mounting Base

## Options:

- Stainless Steel Mesh Baskets
- EPDM Seals
- Clear, See Through Eastar Construction

Hayward's All-Plastic Simplex Strainer is the answer for straining applications in corrosive or ultra pure services. There is no metal used in its construction to leach out and contaminate sensitive fluids. And because it's plastic this simplex strainer will never rust or corrode. Another benefit, often overlooked, is that because it is plastic, the strainer will never need painting or coating. It will stand up and function for years in applications where a metal strainer would have to be coated or painted just to survive.

Perforated plastic baskets, made of the same material as the strainer housing, are standard. For applications that require fine mesh straining, baskets can be fabricated from stainless steel, extending the application flexibility of this all-plastic basket strainer.

Basket changing or cleanout couldn't be easier. The cover spins off by hand, no tools are needed. And because of the light weight of the strainer, installation is simplified.

Plastic simplex strainers can be used in many applications, even

some that you may have thought would require metal strainers. Thinking of replacing a metal strainer with a plastic one to take advantage of lower costs and better corrosion resistance? First take a look at the temperature/non-shock pressure chart to see if your application falls within range of the plastic material you are considering. If it does, and chemical resistance is not a problem, then the other consideration is the actual installation itself. Contact Hayward for specific recommendations for your system. These recommendations may include things such as proper alignment of the strainer in the piping system to eliminate stress, correct support for the strainer and installation of spool pieces of plastic pipe or expansion joints.

Hayward All-Plastic Simplex Basket Strainers are the answer to highly corrosive or ultra pure applications. They are available in PVC and CPVC in sizes up to 8" – with socket, threaded or flanged connections. They are rated at 150 psi at 70F in most applications.

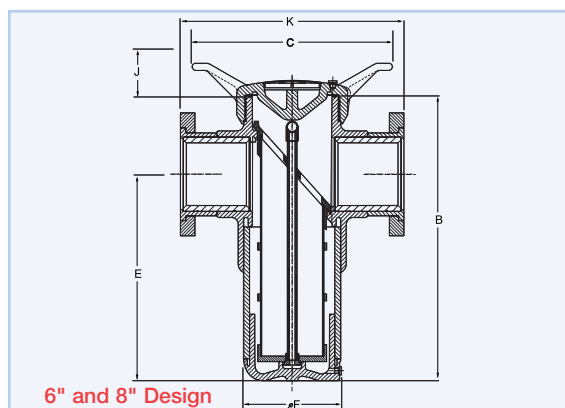
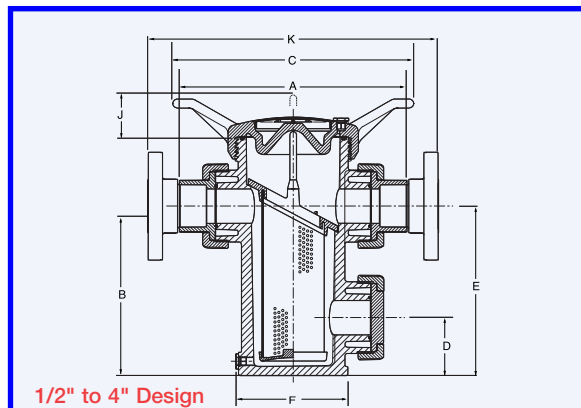
## Selection Chart

Size	Material	End Connection	Seal	Pressure Rating
1/2" - 4"	PVC or <b>CPVC</b>	Threaded, <b>Socket</b> or Flanged*	Viton®	150 psi @70F*
1" to 4"	EASTAR*	Threaded or Flanged		
6" to 8"	PVC or CPVC	Flanged		

\*3" & 4" EASTAR Rated at 100 PSI at 70° F



## Technical Details



### Dimensions (Inches / Millimeters)

	Size	A	B	C	D	E	F	J	K	Weight (lb / kg)		Volume
										Skt / Thd	Flg	(gal / liters)
	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	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	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	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	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	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	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	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	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	28.0 / 13	37.0 / 17	2.80 / 10.6
	6"	n/a	25.8 / 655	18.0 / 457	n/a	18.5 / 470	8.63 / 219	21.80 / 554	20.0 / 508	n/a	50.0 / 23	6.10 / 23
	8"	n/a	32.3 / 820	18.0 / 457	n/a	25.25 / 641	8.63 / 219	28.75 / 730	22.68 / 576	n/a	70.0 / 32	8.60 / 32.5

Dimensions and weights are for reference only. Contact Hayward for certified drawings.

### C<sub>v</sub> Factors\*

Size	Value	Size	Value
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		

\* For water with clean, perforated basket

The above C<sub>v</sub> 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 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

1/32"	1.05
1/16"	1.00
1/8"	.58
3/16"	.46

###### Stainless Steel Baskets

1/32"	.82	3/8"	.45
3/64"	.63	1/2"	.48
1/16"	.74	20 Mesh	.79
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

1/8"	2.00
3/16"	1.50

###### Stainless Steel Baskets

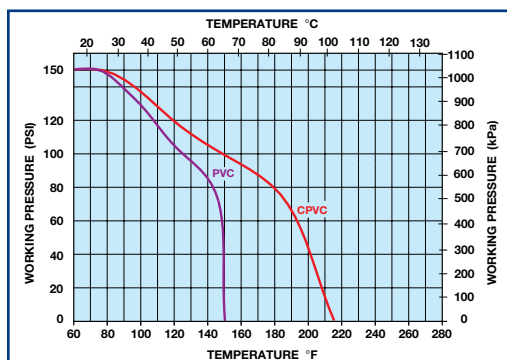
1/32"	2.25	3/8"	1.24
3/64"	1.73	1/2"	1.31
1/16"	2.03	20 Mesh	2.16
5/64"	1.37	40 Mesh	2.79
7/64"	1.40	60 Mesh	3.28
1/8"	1.58	80 Mesh	3.18
5/32"	1.00	100 Mesh	3.30
3/16"	1.26	200 Mesh	2.98
1/4"	1.58	325 Mesh	3.33

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

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

Where  $\Delta P$  = Pressure Drop  
Q = Flow in GPM  
C<sub>v</sub> = Flow Coefficient

### Operating Temperature/Pressure



### Pressure Drop Calculation Example

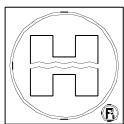
The pressure loss for a 2" simplex strainer in water service, with a clean 100 mesh basket at 40 gpm, would be:

$$(40 / 55)^2 = 0.5 \times \text{correction factor of 1.20} = 0.6 \text{ psi}$$

### 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 perms: 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





# HAYWARD INDUSTRIAL PRODUCTS

## INSTALLATION, OPERATION & MAINTENANCE

### OF SIMPLEX BASKET STRAINER

**PLEASE READ THE FOLLOWING INFORMATION PRIOR TO INSTALLING AND USING HAYWARD VALVES, STRAINERS, FILTERS, AND OTHER ASSOCIATED PRODUCTS. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN SERIOUS INJURY.**

1. Hayward guarantees its products against defective material and workmanship only. Hayward assumes no responsibility for damage or injuries resulting from improper installation, misapplication, or abuse of any product.
2. Hayward assumes no responsibility for damage or injury resulting from chemical incompatibility between its products and the process fluids to which they are subjected. Compatibility charts provided in Hayward literature are based on ambient temperatures of 70 °F and are for reference only. Customer should always test to determine application suitability.
3. Consult Hayward literature to determine operating pressure and temperature limitations before installing any Hayward product. Note that the maximum recommended fluid velocity through any Hayward product is five feet per second. Higher flow rates can result in possible damage due to the water hammer effect. Also note that maximum operating pressure is dependent upon material selection as well as operating temperature.
4. Hayward products are designed primarily for use with non-compressible liquids. They should NEVER be used or tested with compressible fluids such as compressed air or nitrogen.
5. Systems should always be depressurized and drained prior to installing or maintaining Hayward products.
6. Temperature effect on piping systems should always be considered when the systems are initially designed. Piping systems must be designed and supported to prevent excess mechanical loading on Hayward equipment due to system misalignment, weight, shock, vibration, and the effects of thermal expansion and contraction.
7. Because PVC and CPVC plastic products become brittle below 40 °F, Hayward recommends caution in their installation and use below this temperature.
8. Published operating torque requirements are based upon testing of new valves using clean water at 70 °F. Valve torque is affected by many factors including fluid chemistry, viscosity, flow rate, and temperature. These should be considered when sizing electric or pneumatic actuators.
9. Due to differential thermal expansion rates between metal and plastic, transmittal of pipe vibration, and pipe loading forces **DIRECT INSTALLATION OF METAL PIPE INTO PLASTIC CONNECTIONS IS NOT RECOMMENDED**. Wherever installation of plastic valves into metal piping systems is necessary, it is recommended that at least 10 pipe diameter in length of plastic pipe be installed upstream and downstream of the plastic valve to compensate for the factors mentioned above.

#### SOCKET CONNECTION INSTALLATION:

**THE COVER OF THE BASKET STRAINER MUST BE REMOVED TO ALLOW THE CEMENT FUMES TO VENT.**

Socket end connections are manufactured to ASTM D2467-94. Solvent cementing of socket end connections to pipe should be performed per ASTM specifications D2855-87. Cut pipe square. Chamfer and deburr pipe. Surfaces must be cleaned and free of dirt, moisture, oil and other foreign material. Apply primer to inside socket surface of the strainer. Use a scrubbing motion. Repeat applications may be necessary to soften the surface of the socket. Next, liberally apply primer to the male end of the pipe to the length of the socket depth. Again apply to the socket, without delay apply cement to the pipe while the surface is still wet with primer. Next apply cement lightly, but uniformly to the inside of the socket. Apply a second coat of cement to the pipe, and assemble the pipe to the end socket of the strainer, rotating the pipe 1/4 turn in one direction as it is slipped to full depth into the socket. The connection should be held in position for approx. 30 seconds to allow the connection to "set". After assembly wipe off excess cement. Full set time is a minimum of 30 minutes at 60 to 100 °F. Full cure time should be based on the chart below.

#### JOINT CURE SCHEDULE:

The cure schedules are suggested as guides. They are based on laboratory test data, and should not be taken to be the recommendations of all cement manufacturers. Individual manufacturer's recommendations for their particular cement should be followed.

Temperature Range During Cure Period(B) °F(°C)	Test Pressures for Pipe Sizes 1/2" to 1-1/4"		Test Pressures for Pipe Sizes 1-1/2" to 3"		Test Pressures for Pipe Sizes 4" & 5"		Test Pressures for Pipe Sizes 6" to 8"	
	Up to 180 PSI (1240 kPa)	Above 180 to 370 PSI (1240 to 2550 kPa)	Up to 180 PSI (1240 kPa)	Above 180 to 315 PSI (1240 to 2172 kPa)	Up to 180 PSI (1240 kPa)	Above 180 to 315 PSI (1240 to 2172 kPa)	Up to 180 PSI (1240 kPa)	Above 180 to 315 PSI (1240 to 2172 kPa)
60 to 100 (15 to 40)	1 hour	6 hours	2 hours	12 hours	6 hours	18 hours	8 hours	1 day
40 to 60 (5 to 15)	2 hours	12 hours	4 hours	1 day	12 hours	36 hours	16 hours	4 days
20 to 40 (-7 to 5)	6 hours	36 hours	12 hours	3 days	36 hours (A)	4 days (A)	3 days (A)	9 days (A)
10 to 20 (-15 to 7)	8 hours	2 days	16 hours	4 days	3 days (A)	8 days (A)	4 days (A)	12 days (A)

Colder than 10 (-15)

Extreme care should be exercised on all joints made where pipe, fittings or cement is below 10 °F.

A: It is important to note that at temperatures colder than 20°F on sizes that exceed 3 in., test results indicate that many variables exist in the actual cure rate of the joint. The data expressed in these categories represent only estimated averages. In some cases, cure will be achieved in less time, but isolated test results indicate that even longer periods of cure may be required.

B: These cure schedules are based on laboratory test data obtained on Net Fit Joints (NET FIT=in a dry fit the pipe bottoms snugly in the fitting socket without meeting interference)

#### THREADED CONNECTION INSTALLATION:

Threaded end connections are manufactured to ASTM specifications D2464-88. F437-88 and ANSI B2.1. Wrap threads of pipe with Teflon tape of 3 to 3-1/2 mil thickness. The tape should be wrapped in a clockwise direction starting at the first or second full thread. Overlap each wrap by, 1/2 the width of the tape. The wrap should be applied with sufficient tension to allow the threads of a single wrapped area to show through without cutting the tape. The wrap should continue for the full effective length of the thread. Pipe sizes 2" and greater will not benefit with more than a second wrap, due to the greater thread depth. To provide a leak proof joint, the pipe should be threaded into the end connection "hand tight". Using a strap wrench only. (Never use a stillson type wrench) tighten the joint an additional 1/2 to 1-1/2 turns past hand tight. Tightening beyond this point may induce excessive stress that could cause failure.

## FLANGED CONNECTION INSTALLATION:

Flange bolts should be tight enough to slightly compress the gasket and make a good seal, without distorting or putting excessive stress on the flanges. Suitable washers should be used between the bolt head and flange and the nut and flange. Bolts should be tightened in alternating sequence.

### RECOMMENDED FLANGE BOLT TORQUE

FLANGE SIZE	BOLT DIA.	TORQUE FT. LBS.	FLANGE SIZE	BOLT DIA.	TORQUE FT. LBS.
1/2	1/2	10-15	2	5/8	15-25
3/4	1/2	10-15	2-1/2	5/8	20-25
1	1/2	10-15	3	5/8	20-25
1-1/4	1/2	10-15	4	5/8	20-25
1-1/2	1/2	10-15	6	3/4	30-40

**NOTE: USE WELL LUBRICATED METAL BOLTS AND NUTS. USE SOFT RUBBER GASKETS.**

## METAL PIPING INSTALLATION:

Due to different thermal expansion rates between metal and plastic, transmittal of pipe vibration, and pipe loading forces, direct installation of plastic simplex strainer into metal piping systems can potentially damage the simplex strainer.

**IT IS RECOMMENDED THAT AT LEAST 10 PIPE DIAMETERS IN LENGTH OF PLASTIC PIPING BE INSTALLED UPSTREAM AND DOWNSTREAM OF THE SIMPLEX STRAINER.**

## OPERATION and BASKET CLEANING:

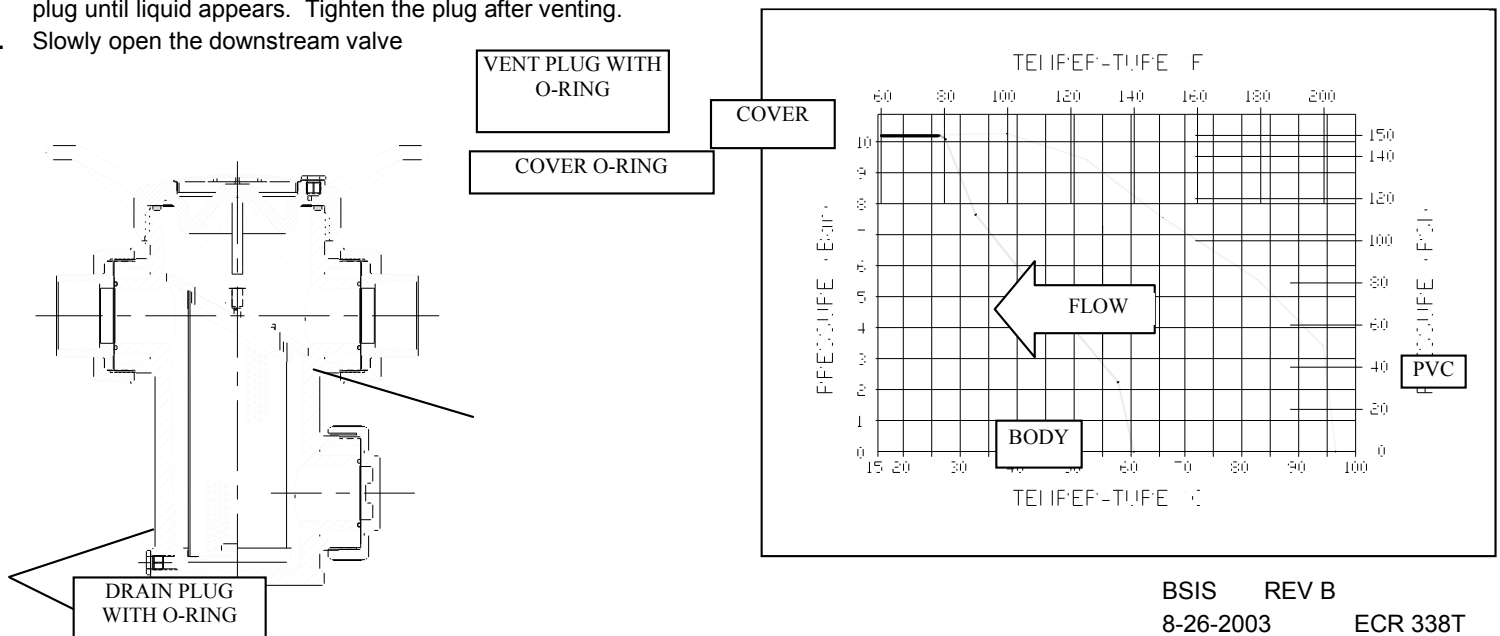
**CAUTION: The Simplex basket strainer must be depressurized before proceeding further.**

*The cover must be installed per Step 5 below on the strainer before the system is pressurized.*

The maximum recommended fluid velocity is 5 feet per second. This velocity minimizes the effects of valve closure and pump start up or shut down.

Pressure gauges may be installed on the inlet and the outlet piping to indicate by pressure loss, in excess of 5 psi, when the basket should be cleaned.

- Valves should be installed just upstream and downstream of the Simplex. Basket strainer. **These valves must be closed and/or the system depressurized before proceeding.**
- The drain plug, from the strainer, should carefully be removed to partially drain the strainer. The vent plug can be loosened to allow the liquid to drain more rapidly.
- The strainer cover is removed by turning in a counter-clockwise direction. No tools are required. *Do not use wrenches or hammers.*
- When the process fluid has been completely drained, remove the basket. Clean the basket by using a brush or soaking in an appropriate cleaning solution. **DO NOT USE SOLVENTS ON PLASTIC BASKETS.** Baskets should be cleaned as soon as possible after removal from the strainer, otherwise the contents may harden and become more difficult to remove. *Avoid striking baskets to loosen their contents as this may damage the basket.* To clean the basket strainer body wash the inside of the body with an appropriate cleaning solution. (NOT A SOLVENT)
- Place a clean basket into the basket strainer body. The basket flange should rest squarely on the basket seat inside the body. Before replacing the cover, make sure that the "o"-ring for the cover is undamaged, clean, and lubricated with a lubricant such as KRYTOX GPL203. It is good practice to clean the body threads with a soft brush to remove all foreign material. **TIGHTEN THE COVER USING LIGHT HAND PRESSURE ONLY.** The cover holds the basket in place ensuring no material passes the basket. The cover is forced against the top surface of the body when tightening, the seal is performed with a surface sealing action.
- Reinstall the drain plug, DO NOT FORGET THE O-RING.**
- Slowly open the upstream valve to pressurize the strainer. It is good practice to vent the air vented from the strainer by loosening the vent plug until liquid appears. Tighten the plug after venting.
- Slowly open the downstream valve



BSIS REV B

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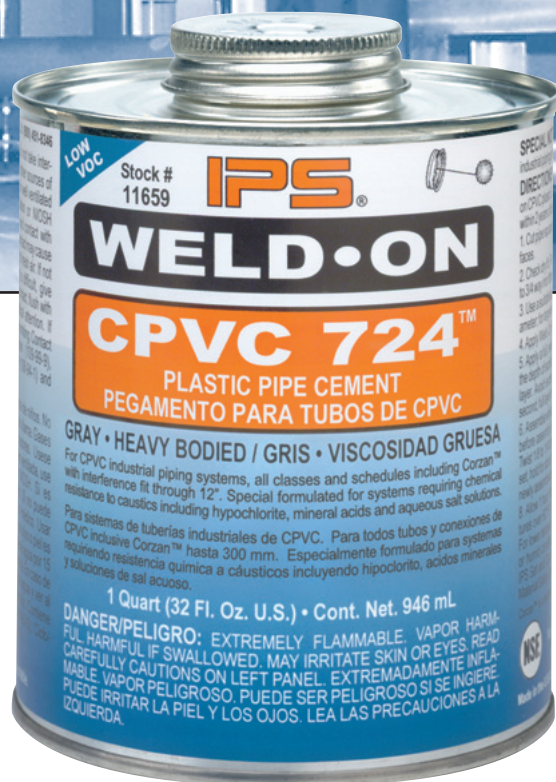
ECR 338T

# *The Industry Leader in Plastic Pipe Solvent Cements*



## ***Introducing Weld-On CPVC 724™***

***For CPVC and PVC Industrial Piping and  
Chemical Processing Applications***



**IPS®**  
**WELD-ON**



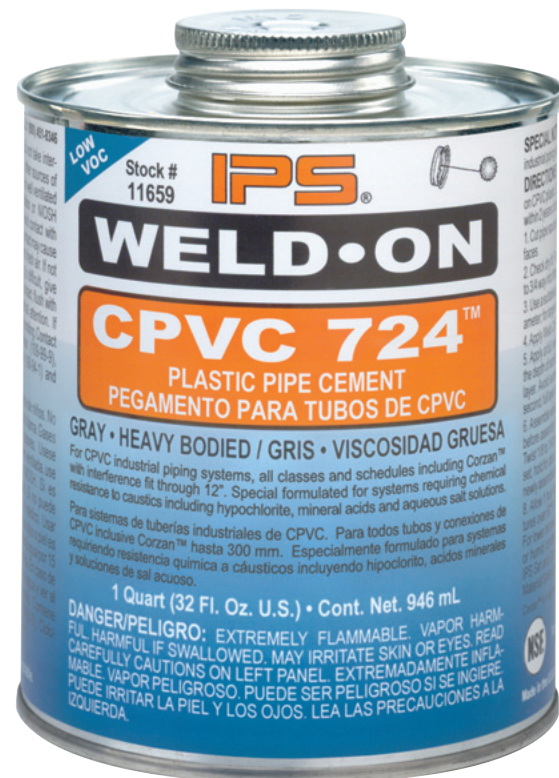
# IPS WELD-ON® 724 a High Strength Solvent Cement for Chemical Resistant Joints

From the beginning of the plastic piping industry, there was an awareness that well-made solvent cement joints were as strong or stronger than pipe, valves, or fittings alone. As plastic piping gained popularity and reliability for water distribution, so did its use in the chemical process industry. Engineers came to appreciate the superior chemical resistance and cost efficiencies of CPVC and PVC piping when compared to metallic systems. A major advantage of thermoplastic solvent cemented joints is the elimination of secondary joint treatment techniques such as oxide passivation to reduce joint corrosion in welded stainless steel applications, and the use of special barrier coatings to eliminate electrolysis problems in buried metal piping systems.

In early 1996, IPS Weld-On began developing a CPVC / PVC solvent cement with improved chemical resistance. Later that year three test sites were chosen for field-testing. Two were pulp and paper plants; the other was a chemical treatment plant. These installations were monitored for a year. The new cement showed improved chemical resistance to caustics, including hypochlorites, mineral acids, and other corrosive chemicals.

Based on the success of these installations, Weld-On 724 became commercially available in 1997. Since that time it has been used in a variety of harsh chemical applications with no reported failures; as a result of this success, we have received many inquiries for empirical data based on actual laboratory testing. This brochure presents chemical resistance data taken from a set of tests that were performed on CPVC and PVC joints under controlled pressure and temperature conditions that were similar to those normally found in the process industry. Test specimens were each filled with chemicals that are commonly used in a wide variety of industries. For each category of chemical, and for each condition, the independent third party laboratory conducting the evaluation observed no failure of the solvent cemented joints. We would encourage you to review these results and contact us with any questions that you might have concerning Weld-On 724, or any of our other fine products.

Weld-On 724 is NSF approved for potable water applications and meets the requirements of ASTM standard specification F-493.



For use on all classes and schedules of CPVC and PVC pipe and fittings with interference fit through 12" diameter.



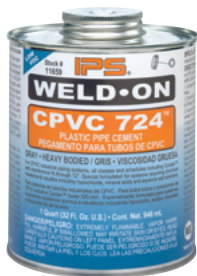




Above photos courtesy of Noveon, Inc.

IPS WELD-ON 724 Solvent Cement					
Hydrostatic Pressure - 100 PSI			Test Duration - 2,500 Hours		
35% NITRIC ACID		20% ACETIC ACID		85% PHOSPHORIC ACID	
CPVC 180°F	PVC 140°F	CPVC 180°F	PVC 140°F	CPVC 180°F	PVC 140°F

IPS WELD-ON 724 Solvent Cement					
Hydrostatic Pressure - 100 PSI			Test Duration - 2,500 Hours		
12% SODIUM HYPOCHLORITE		50% SODIUM HYDROXIDE		37% HYDROCHLORIC ACID	
CPVC 180°F	PVC 140°F	CPVC 180°F	PVC 140°F	CPVC 180°F	PVC 140°F



IPS Corporation, the industry leader, has been producing high quality solvent cements for use in chemical piping systems for many years. As a result of our long-term relationship with the industrial piping market, we were able to gain a valuable understanding of the unique pipe joint problems associated with corrosive chemical transport. Our goal has always been to strive to continuously improve on our products and to remain once again, the preferred choice for industrial CPVC and PVC piping applications.

### IPS WELD-ON 724 Solvent Cement CPVC Chart

CPVC @ 180°F • Hydrostatic Pressure - 100 PSI • Test Duration - 2,500 Hours				
Chemical / Concentration		Temperature °F (°C)	Pressure psi (Bars)	Hydrostatic Testing Results
ACETIC ACID / 20%	CH <sub>3</sub> COOH	180 (82)	100 (7)	No Failure
CHROMIC ACID / 40%	H <sub>2</sub> CrO <sub>4</sub>	180 (82)	100 (7)	No Failure
ETHYLENE GLYCOL / 50%	HOCH <sub>2</sub> CH <sub>2</sub> OH	180 (82)	100 (7)	No Failure
HYDROCHLORIC ACID / 37%	HCl	180 (82)	100 (7)	No Failure
NITRIC ACID / 35%	HNO <sub>3</sub>	180 (82)	100 (7)	No Failure
PHOSPHORIC ACID / 85%	H <sub>3</sub> PO <sub>4</sub>	180 (82)	100 (7)	No Failure
PROPYLENE GLYCOL / 25%	CH <sub>3</sub> CHOHCH <sub>2</sub> OH	180 (82)	100 (7)	No Failure
SODIUM HYDROXIDE / 50%	NaOH	180 (82)	100 (7)	No Failure
SODIUM HYPOCHLORITE **	NaOCl*	180 (82)	100 (7)	No Failure
SULFURIC ACID / 80%	H <sub>2</sub> SO <sub>4</sub>	180 (82)	100 (7)	No Failure
WATER, DISTILLED	H <sub>2</sub> O	180 (82)	100 (7)	No Failure

\* Bleach \*\* Fresh Chemical added twice weekly

### IPS WELD-ON 724 Solvent Cement PVC Chart

PVC @ 140°F • Hydrostatic Pressure - 100 PSI • Test Duration - 2,500 Hours				
Chemical / Concentration		Temperature °F (°C)	Pressure psi (Bars)	Hydrostatic Testing Results
ACETIC ACID / 20%	CH <sub>3</sub> COOH	140 (60)	100 (7)	No Failure
CHROMIC ACID / 40%	H <sub>2</sub> CrO <sub>4</sub>	140 (60)	100 (7)	No Failure
ETHYLENE GLYCOL / 100%	HOCH <sub>2</sub> CH <sub>2</sub> OH	140 (60)	100 (7)	No Failure
HYDROCHLORIC ACID / 37%	HCl	140 (60)	100 (7)	No Failure
NITRIC ACID / 35%	HNO <sub>3</sub>	140 (60)	100 (7)	No Failure
PHOSPHORIC ACID / 85%	H <sub>3</sub> PO <sub>4</sub>	140 (60)	100 (7)	No Failure
PROPYLENE GLYCOL / 100%	CH <sub>3</sub> CHOHCH <sub>2</sub> OH	140 (60)	100 (7)	No Failure
SODIUM HYDROXIDE / 50%	NaOH	140 (60)	100 (7)	No Failure
SODIUM HYPOCHLORITE **	NaOCl*	140 (60)	100 (7)	No Failure
SULFURIC ACID / 90%	H <sub>2</sub> SO <sub>4</sub>	140 (60)	100 (7)	No Failure
WATER, DISTILLED	H <sub>2</sub> O	140 (60)	100 (7)	No Failure
AMMONIUM HYDROXIDE / 10%	NH <sub>4</sub> OH	140 (60)	100 (7)	No Failure

\* Bleach \*\* Fresh Chemical added twice weekly

For additional information contact IPS® Weld-On's Technical Department.



The use of P-70 Purple Primer is recommended when installing CPVC & PVC piping systems for chemical applications.



**GENERAL DESCRIPTION:**

WELD-ON® 724™ is an orange or gray, low VOC emissions, heavy bodied, medium setting, high strength CPVC solvent cement for all classes and schedules of pipe and fittings with interference fit, including Schedule 80 through 12 inch diameter. Also recommended for PVC industrial piping systems for chemical applications.

**APPLICATION:**

WELD-ON 724 is especially formulated for use on industrial piping systems (CPVC or PVC) requiring chemical resistance to caustics, including hypochlorite solutions, mineral acids, aggressive water and aqueous salt solutions. Approved for use with Corzan™ Industrial Piping Systems.

Detailed directions on making solvent cemented joints are printed on the container label. An installation DVD/CD covering solvent cementing is available. It not only describes the basic principles of solvent cementing, but also covers the handling, storage and use of our products. It is highly recommended that the installer review the instructions supplied by the pipe and fitting manufacturer.

**NOTE:** WELD-ON solvent cements must never be used in CPVC and PVC systems using or being tested by compressed air or gases; including air-over-water booster.

**AVAILABILITY:**

WELD-ON 724 orange is available in quart (946 ml) and gallon (3.785 l) metal cans. WELD-ON 724 gray is available in pint (473 ml), quart (946 ml) and gallon (3.785 l) metal cans. For detailed information on containers and applicators, see our current Price List.

**STANDARDS AND CERTIFICATION LISTINGS:**

- Meets ASTM F 493 Standard
- Meets SCAQMD Rule 1168/316A
- Compliant with LEED® (Leadership in Energy and Environmental Design). When using this WELD-ON low VOC product, credit can be claimed for LEED Green Building Rating System – Indoor Environmental Quality.
- Listed by NSF International for compliance with ASTM F 493, NSF/ANSI Standard 14, and NSF/ANSI Standard 61 for use on potable water, drain, waste, vent and sewer applications.
- Listed by IAPMO for compliance with ASTM F 493 and applicable sections of the latest edition of the Uniform Plumbing Code®.

**SPECIFICATIONS:**

COLOR:	Orange or Gray
RESIN:	CPVC
SPECIFIC GRAVITY:	0.984 ± 0.040
BROOKFIELD VISCOSITY:	Minimum 1600 cP @ 73° ± 2°F (23° ± 1°C)

**SHELF LIFE:**

2 years in tightly sealed containers. The date code of manufacture is stamped on the bottom of the container. Stability of the product is limited by the evaporation of the solvent when the container is opened. Evaporation of solvent will cause the cement to thicken and reduce its effectiveness. Adding of thinners to change viscosity is not recommended and may significantly change the properties of the cement.

**QUALITY ASSURANCE:**

WELD-ON 724 is carefully evaluated to assure that consistent high quality is maintained. Fourier transform infrared spectroscopy, gas chromatography, and additional in depth testing ensures each batch is manufactured to exacting standards. A batch identification code is stamped on each can and assures traceability of all materials and processes used in manufacturing this solvent cement.

**SHIPPING:****For One Liter and Above**

Proper Shipping Name: Adhesive  
Hazard Class: 3  
Identification Number: UN 1133  
Packing Group: II  
Label Required: Flammable Liquid

**For Less than One Liter**

Proper Shipping Name: Consumer Commodity  
Hazard Class: ORM-D

**SAFETY AND ENVIRONMENTAL PRECAUTIONS:**

This product is flammable and considered a hazardous material. In conformance with the Federal Hazardous Substances Labeling Act, the following hazards and precautions are given. Purchasers who repackage this product must also conform to all local, state and federal labeling, safety and other regulations. VOC emissions do not exceed 490 grams per liter.

**DANGER: EXTREMELY FLAMMABLE. VAPOR HARMFUL.  
MAY BE HARMFUL IF SWALLOWED. MAY IRRITATE SKIN OR EYES.**

Keep out of reach of children. Do not take internally. Keep away from heat, spark, open flame and other sources of ignition. Vapors may ignite explosively. Solvent cement vapors are heavier than air and may travel to source(s) of ignition at or near ground or lower level(s) and flash back. Keep container closed when not in use. Store between 40°F (5°C) and 90°F (33°C). Avoid breathing of vapors. Use only in well-ventilated area. If confined or partially enclosed, use forced ventilation. When necessary, use local exhaust ventilation to remove harmful airborne contaminants from employee breathing zone and to keep contaminants below 25 ppm TWA. Atmospheric levels must be maintained below established exposure limits contained in Section II of the Material Safety Data Sheet (MSDS). If airborne concentrations exceed those limits, use of a NIOSH approved organic vapor cartridge respirator with full face-piece is recommended. The effectiveness of an air-purifying respirator is limited. Use it only for a single short-term exposure. For emergency and other conditions where short-term exposure guidelines may be exceeded, use an approved positive pressure self-contained breathing apparatus. Do not smoke, eat or drink while working with this product. Avoid contact with skin, eyes and clothing. May cause eye injury. Protective equipment such as gloves, goggles and impervious apron should be used. Carefully read Material Safety Data Sheet and follow all precautions. Do not use this product for other than intended use.

"SARA Title III Section 313 Supplier Notification": This product contains toxic chemicals subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 and of 40CFR372. This information must be included in all MSDS that are copied and distributed for this material.

**FIRST AID:**

Inhalation: If overcome with vapors, remove to fresh air. If not breathing, give artificial respiration.  
If breathing is difficult, give oxygen. Call physician.

Eye Contact: Flush with plenty of water for 15 minutes and call a physician.

Skin Contact: Wash skin with plenty of soap and water for at least 15 minutes.  
If irritation develops, get medical attention.

Ingestion: If swallowed, give 1 or 2 glasses of water or milk. Do not induce vomiting.  
Contact physician or poison control center immediately.

**SPECIAL PRECAUTION:**

Do not use a dry granular calcium hypochlorite as a disinfecting material for water purification in potable water piping systems. The introduction of granules or pellets of calcium hypochlorite with PVC and CPVC solvent cements and primers (including their vapors) may result in a violent chemical reaction if a water solution is not used. It is advisable to purify lines by pumping chlorinated water into the piping system – this solution will be nonvolatile. Furthermore, dry granular calcium hypochlorite should not be stored or used near solvent cements and primers.

**IMPORTANT NOTE:**

This product is intended for use by skilled individuals at their own risk. These suggestions and data are based on information we believe to be reliable. Installers should verify for themselves that they can make satisfactory joints under varying conditions. Toward this end, it is highly desirable that they receive personal instruction from trained instructors or competent, experienced installers. Contact IPS® Corporation or your supplier for additional information or instructions.

**WARRANTY:**

IPS® Corporation ("IPS Corp.") warrants that all new IPS Corp. products shall be of good quality and free from defects in material and workmanship for the shelf life as indicated on the product. If any IPS Corp. product becomes defective, or fails to conform to our written limited warranty under normal use and storage conditions, then IPS Corp. will, without charge, replace the nonconforming product. However, this limited warranty shall not extend to, nor shall IPS Corp. be responsible for, damages or loss resulting from accident, misuse, negligent use, improper application, or incorporation of IPS Corp. products into other products. In addition, any repackaging of IPS Corp. products also shall void the limited warranty. IPS Corp. shall not be responsible for, nor does this limited warranty extend to, consequential damage, or incidental damage or expense, including without limitation, injury to persons or property or loss of use. Please refer to our standard IPS Corp. Limited Warranty for additional provisions.



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Fax: 901.853.5008

Customer Service: 800.888.8312  
[www.ipscorp.com](http://www.ipscorp.com)





**GENERAL DESCRIPTION:**

WELD-ON® P-70™ is a low VOC emission, non-bodied, fast acting, primer. The strong, aggressive action of P-70 primer rapidly softens and dissolves the joining surfaces of PVC and CPVC pipe and fittings. The benefit of this priming action is especially noticeable on parts being joined together in cold weather. Available in clear and purple; the latter allows easy identification when used on the joining surfaces.

**APPLICATION:**

WELD-ON P-70 primer, when used in conjunction with appropriate WELD-ON solvent cements, will make consistently strong, well-fused joints. It is essential that the joining surfaces of pipe and fittings be softened and remains softened prior to assembly. The main function of the primer is to expedite the penetration and softening of the surfaces. Its rate of penetration into the joining surfaces is more rapid than that of solvent cement alone. P-70 primer is suitable for use with all types, classes and schedules of PVC and CPVC pipe and fittings.

Detailed directions on making solvent cemented joints are printed on the container label. An installation DVD/CD covering solvent cementing is available. It not only describes the basic principles of solvent cementing, but also covers the handling, storage and use of our products. It is highly recommended that the installer review the instructions supplied by the pipe and fitting manufacturer.

**NOTE:** WELD-ON solvent cements must never be used in a CPVC system using or being tested by compressed air or gases; including air-over-water booster.

**AVAILABILITY:**

Both WELD-ON P-70 clear and purple primers are available in ¼ pint (118 ml), ½ pint (237 ml), pint (473 ml), quart (946 ml) and gallon (3.785 l) metal cans. For detailed information on containers and applicators, see our current Price List.

**STANDARDS AND CERTIFICATION LISTINGS:**

- Meets ASTM F 656 Standard
- Meets SCAQMD Rule 1168/316A
- Compliant with LEED® (Leadership in Energy and Environmental Design). When using this WELD-ON low VOC product, credit can be claimed for LEED Green Building Rating System – Indoor Environmental Quality.
- Listed by NSF International for compliance with ASTM F 656, NSF/ANSI Standard 14, and NSF/ANSI Standard 61 for use on potable water, drain, waste, vent and sewer applications.
- **WELD-ON P-70 Purple Only** - Listed by IAPMO for compliance with ASTM F 656 and applicable sections of the latest edition of the Uniform Plumbing Code®.

**SPECIFICATIONS:**

COLOR: Clear or Purple  
SPECIFIC GRAVITY: 0.858 ± 0.040  
BROOKFIELD VISCOSITY: Water Thin

**SHELF LIFE:**

3 years in tightly sealed containers. The date code of manufacture is stamped on the bottom of the container. Stability of the product is limited by the evaporation of the solvent when the container is opened. Adding of solvents is not recommended and may significantly change the properties of the primer.

**QUALITY ASSURANCE:**

WELD-ON P-70 primer is carefully evaluated to assure that consistent high quality is maintained. Fourier transform infrared spectroscopy, gas chromatography, and additional in depth testing ensures each batch is manufactured to exacting standards. A batch identification code is stamped on each can and assures traceability of all materials and processes used in manufacturing this product.

**SHIPPING:****For One Liter and Above**

Proper Shipping Name: Flammable Liquid  
n.o.s. (Methyl Ethyl Ketone, Tetrahydrofuran)  
Hazard Class: 3  
Identification Number: UN 1993  
Packing Group: II  
Label Required: Flammable Liquid

**For Less than One Liter**

Proper Shipping Name: Consumer Commodity  
Hazard Class: ORM-D

**SAFETY AND ENVIRONMENTAL PRECAUTIONS:**

This product is flammable and considered a hazardous material. In conformance with the Federal Hazardous Substances Labeling Act, the following hazards and precautions are given. Purchasers who repackage this product must also conform to all local, state and federal labeling, safety and other regulations. VOC emissions do not exceed 550 grams per liter.

**DANGER: EXTREMELY FLAMMABLE. VAPOR HARMFUL.  
MAY BE HARMFUL IF SWALLOWED. MAY IRRITATE SKIN OR EYES.**

Keep out of reach of children. Do not take internally. Keep away from heat, spark, open flame and other sources of ignition. Vapors may ignite explosively. Solvent cement vapors are heavier than air and may travel to source(s) of ignition at or near ground or lower level(s) and flash back. Keep container closed when not in use. Store between 40°F (5°C) and 110°F (44°C). Avoid breathing of vapors. Use only in well-ventilated area. If confined or partially enclosed, use forced ventilation. When necessary, use local exhaust ventilation to remove harmful airborne contaminants from employee breathing zone and to keep contaminants below 25 ppm TWA. Atmospheric levels must be maintained below established exposure limits contained in Section II of the Material Safety Data Sheet (MSDS). If airborne concentrations exceed those limits, use of a NIOSH approved organic vapor cartridge respirator with full face-piece is recommended. The effectiveness of an air-purifying respirator is limited. Use it only for a single short-term exposure. For emergency and other conditions where short-term exposure guidelines may be exceeded, use an approved positive pressure self-contained breathing apparatus. Do not smoke, eat or drink while working with this product. Avoid contact with skin, eyes and clothing. May cause eye injury. Protective equipment such as gloves, goggles and impervious apron should be used. Carefully read Material Safety Data Sheet and follow all precautions. Do not use this product for other than intended use.

"SARA Title III Section 313 Supplier Notification": This product contains toxic chemicals subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 and of 40CFR372. This information must be included in all MSDS that are copied and distributed for this material.

**FIRST AID:**

Inhalation: If overcome with vapors, remove to fresh air. If not breathing, give artificial respiration.  
If breathing is difficult, give oxygen. Call physician.

Eye Contact: Flush with plenty of water for 15 minutes and call a physician.

Skin Contact: Wash skin with plenty of soap and water for at least 15 minutes.  
If irritation develops, get medical attention.

Ingestion: If swallowed, give 1 or 2 glasses of water or milk. Do not induce vomiting.  
Contact physician or poison control center immediately.

**SPECIAL PRECAUTION:**

Do not use a dry granular calcium hypochlorite as a disinfecting material for water purification in potable water piping systems. The introduction of granules or pellets of calcium hypochlorite with PVC and CPVC solvent cements and primers (including their vapors) may result in a violent chemical reaction if a water solution is not used. It is advisable to purify lines by pumping chlorinated water into the piping system – this solution will be nonvolatile. Furthermore, dry granular calcium hypochlorite should not be stored or used near solvent cements and primers.

**IMPORTANT NOTE:**

This product is intended for use by skilled individuals at their own risk. These suggestions and data are based on information we believe to be reliable. Installers should verify for themselves that they can make satisfactory joints under varying conditions. Toward this end, it is highly desirable that they receive personal instruction from trained instructors or competent, experienced installers. Contact IPS® Corporation or your supplier for additional information or instructions.

**WARRANTY:**

IPS® Corporation ("IPS Corp.") warrants that all new IPS Corp. products shall be of good quality and free from defects in material and workmanship for the shelf life as indicated on the product. If any IPS Corp. product becomes defective, or fails to conform to our written limited warranty under normal use and storage conditions, then IPS Corp. will, without charge, replace the nonconforming product. However, this limited warranty shall not extend to, nor shall IPS Corp. be responsible for, damages or loss resulting from accident, misuse, negligent use, improper application, or incorporation of IPS Corp. products into other products. In addition, any repackaging of IPS Corp. products also shall void the limited warranty. IPS Corp. shall not be responsible for, nor does this limited warranty extend to, consequential damage, or incidental damage or expense, including without limitation, injury to persons or property or loss of use. Please refer to our standard IPS Corp. Limited Warranty for additional provisions.



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# CPVC SCHEDULE 80 FITTINGS

80C-2-1199

## Performance Engineered and Tested



### Full 1/4" Through 12" Availability

Spears comprehensive line of CPVC fittings offers a variety of configurations in Schedule 80 sizes 1/4" through 12".

### Exceptional Chemical & Corrosion Resistance

Unlike metal, CPVC fittings never rust, scale or pit, and will provide many years of maintenance-free service and extended system life.

### Higher Temperature Ratings

High Temperature CPVC Thermoplastics can handle fluids at service temperatures up to 200° F, allowing a wide range of process applications, including hot corrosive liquids.

### Higher Flow Capacity

Smooth interior walls result in lower pressure loss and higher volume than conventional metal fittings.

### Lower Installation Costs

Substantially lower material costs than steel alloys or lined steel, combined with lighter weight and ease of installation, can reduce installation costs by as much as 60% over conventional metal systems.

### CPVC Valves

SPEARS CPVC Valve products are available for total system compatibility and uniformity; see SPEARS' THERMOPLASTIC VALVES PRODUCT GUIDE AND ENGINEERING SPECIFICATIONS (V-4).

SPEARS Schedule 80 CPVC fitting designs combine years of proven experience with computer generated stress analysis to yield the optimum physical structure and performance for each fitting. Material reinforcement is uniformly placed in stress concentration areas for substantially improved pressure handling capability. Resulting products are subjected to numerous verification tests to assure obtaining the very best CPVC fittings available.

### SPEARS Injection Molded Schedule 80 10" & 12" Large Diameter Fittings

CPVC Schedule 80 Large Diameter fittings are a special engineered product by Spears Manufacturing Company, where no applicable ASTM specification exists. Available in a variety of configurations, including Tees, 90° Elbows, 45° Elbows, Bushings and Flanges. Plus additional fabricated Schedule 80 CPVC configurations.

### Sample Engineering Specifications

All CPVC Schedule 80 injection molded fittings shall be produced by Spears Manufacturing Company from CPVC, cell classification 23447, conforming to ASTM Standard D 1784. All CPVC Schedule 80 fittings shall be listed for potable water service by the National Sanitation Foundation (NSF) and manufactured in strict compliance to ASTM F 437 for threaded fittings and ASTM F 439 for socket type fittings and Spears specifications for 10" and 12" fittings.

All CPVC flanges shall be designed and manufactured to meet CL150 bolt pattern specifications per ANSI Standard B16.5 and rated for a maximum internal pressure of 150 psi, non-shock at 73°F.



**PROGRESSIVE PRODUCTS FROM SPEARS INNOVATION & TECHNOLOGY**

Visit our web site: [www.spearsmfg.com](http://www.spearsmfg.com)

## CPVC Thermoplastic Material Temperature Pressure De-rating

Elevated temperature fluid mediums require a de-rating of thermoplastic pipe maximum internal pressure ratings at 73°F. To determine the maximum internal pressure rating at an elevated temperature, simply multiply the product pressure rating at 73°F by the percentage specified for the desired temperature.

System Operating Temperature °F (°C)	73-80 (23-27)	90 (32)	100 (38)	110 (43)	120 (49)	130 (54)	140 (60)	150 (66)	160 (71)	170 (77)	180 (82)	190 (88)	200 (93)	210 (99)
CPVC	100%	92%	82%	77%	65%	62%	50%	47%	40%	32%	25%	22%	20%	-0-

### CPVC Basic Physical Properties

Properties	ASTM Test Method	CPVC
<b>Mechanical Properties, 73°F</b>		
Specific Gravity, g/cm <sup>3</sup>	D 792	1.55
Tensile Strength, psi	D 638	8,000
Modulus of Elasticity, psi	D 638	360,000
Compressive Strength, psi	D 695	10,100
Flexural Strength, psi	D 790	15,100
Izod Impact, notched, ft-lb/in	D 256	1.5
<b>Thermal Properties</b>		
Heat Deflection Temperature, °F at 66 psi	D 648	217
Thermal Conductivity, BTU/hr/sq ft/°F/in	C 177	.95
Coefficient of Linear Expansion, in/in/°F	D 696	3.4 x 10 <sup>-5</sup>
<b>Flammability</b>		
Limiting Oxygen Index, %	D 2863	60
UL 94 Rating		V-0, 5VB, 5VA
<b>Other Properties</b>		
Water Absorption, % 24 hr.	D 570	.03
Industry Standard Color		Medium Gray
ASTM Cell Classification	D 1784	23447
NSF Potable Water Approved		Yes

### CPVC Chemical Resistance

Weak acids	Excellent
Strong acids	Excellent
Weak bases	Excellent
Strong bases	Excellent
Salts	Excellent
Aliphatic Solutions	Good
Halogens	Good-Fair
Strong Oxidants	Good-Fair

CPVC is not recommended for use with chlorinated or aromatic hydrocarbons, esters, or polar solvents such as ketones.

### NOT FOR USE WITH COMPRESSED AIR OR GASES

Spears Manufacturing Company DOES NOT RECOMMEND the use of thermoplastic piping products for systems to transport or store compressed air or gases, or the testing of thermoplastic piping systems with compressed air or gases in above and below ground locations. The use of our product in compressed air or gas systems automatically voids any warranty for such products, and its use against our recommendation is entirely the responsibility and liability of the installer.

**WARNING:** DO NOT USE COMPRESSED AIR OR GAS TO TEST ANY PVC OR CPVC THERMOPLASTIC PIPING PRODUCT OR SYSTEM, AND DO NOT USE DEVICES PROPELLED BY COMPRESSED AIR OR GAS TO CLEAR SYSTEMS. THESE PRACTICES MAY RESULT IN EXPLOSIVE FRAGMENTATION OF SYSTEM PIPING COMPONENTS CAUSING SERIOUS OR FATAL BODILY INJURY.



## SPEARS® MANUFACTURING COMPANY

### CORPORATE OFFICES

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Auburn (Seattle), WA  
98002  
(253) 939-4433  
(800) 347-7327  
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### ROCKY MOUNTAIN

4880 Florence Street  
Denver, CO  
80238  
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### INTERNATIONAL SALES

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