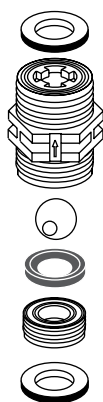
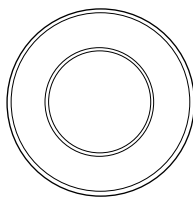


Motor Pump Spare Parts

Sigma 1, 2, & 3



Valve Complete



Complete liquid ends include pump head, valves, mounting screws, diaphragm and backplate. Clamping nuts and inserts are not included with complete liquid ends, complete valves or spare parts kits. Spare parts kits include:

PVT Liquid ends

- 1 Diaphragm
- 1 Suction valve
- 1 Discharge valve
- 2 Valve balls
- 1 Set of o-rings

SST Liquid ends

- 1 Diaphragm
- 2 Valve balls
- 1 Set of o-rings, complete (sleeve rings, ball seat rings)

Material Code	Liquid End Complete	Spare Parts Kit	Valve Complete	Diaphragm
12017, 12035, 10050 with Liquid end FM 50				
PVT	1010560	1010541	QTY = 2	1010279
SST	1010561	1010555		1010279
SST*		1010554		1010279
10022, 10044, 07065 with Liquid end FM 65				
PVT	1010562	1010542	1002267	1010282
SST	1010563	1010557	809459	1010282
SST*		1010556		1010282
07042, 04084, 04120 with Liquid end FM 120				
PVT	1010565	1010543	792517	1010285
SST	1010566	1010559	809404	1010285
SST*		1010558		1010285
12050 with Liquid end FM 130				
PVT	792755	740324	792517	792495
SST	792761	740328	809404	792495
SST*		740326		
12090, 12130 with Liquid end FM 130				
PVT	7792755	740324	792517	792495
SST	792761	740328	809404	792495
SST*		740326		
07120, 07220 with Liquid end FM 350				
PVT	792756	740325	740615	792496
SST	792762	740329	803708	792496
SST*		740327		
04350 with Liquid end FM 350				
PVT	7792756	740325	740615	792496
SST	792762	740329	803708	792496
SST*		740327		
120145, 120190, 120270, with Liquid end FM 330 - DN 25				
PVT	1005298	1005308	740615	1004604
SST	1005300	1005312	803708	1004604
SST*		1005310		1004604
070410, 070580, 040830, with Liquid end FM 1000 - DN 32				
PVT	1005297	1005309	1002806	1002835
SST	1005299	1005313	1002811	1002835
SST*		1005311		1002835

Liquid End Version	Material Code	Complete Liquid End	Spare Parts Kit	Valve Complete Suction (Spare valves only)	Valve Complete Discharge	Packing set
Sigma HK						
08 (For pump versions 32002, 23004, & 10006)	S	1000584	1001572	803792	803793	1000565
12.5 (For pump versions 14006, 10011, & 05016)	S	910420	910470	803792	803793	485401
25 (For pump versions 07012, 04522, & 02534)	S	910421	910471	803792	803793	485402
50 (For pump versions 04022, 02541, & 01264)	S	910422	910472	803794	803795	485403

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 ⁽¹⁾ (all joints TIG welded except "A")	Socket Material	Tube Type	Range Selection Limits (psi)	NPT Conn. ⁽²⁾
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
S	316L stainless steel	316L stainless steel	C-Tube	12/1500	¼, ½
			Helical	2000/20,000	¼, ½
P ⁽³⁾	K Monel	Monel 400	C-Tube	15/1500	¼, ½
			Helical	2000/30,000	¼, ½ ⁽⁴⁾

(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
0/100	30 in.Hg/100 psi
0/160	30 in.Hg/150 psi
0/200	30 in.Hg/300 psi
0/300	
0/400	Vacuum
0/600	30/0 in.Hg
0/800	34/0 ftH ₂ O
0/1000	
0/1500	
0/2000	
0/3000	
0/5000	
0/10,000	
0/20,000	
0/30,000	

NOTE:
Equivalent standard
kg/cm², 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

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.

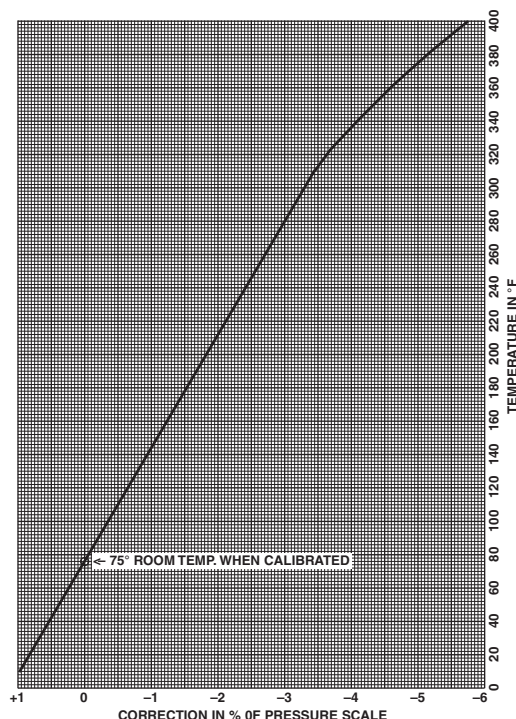
MAINTENANCE

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.



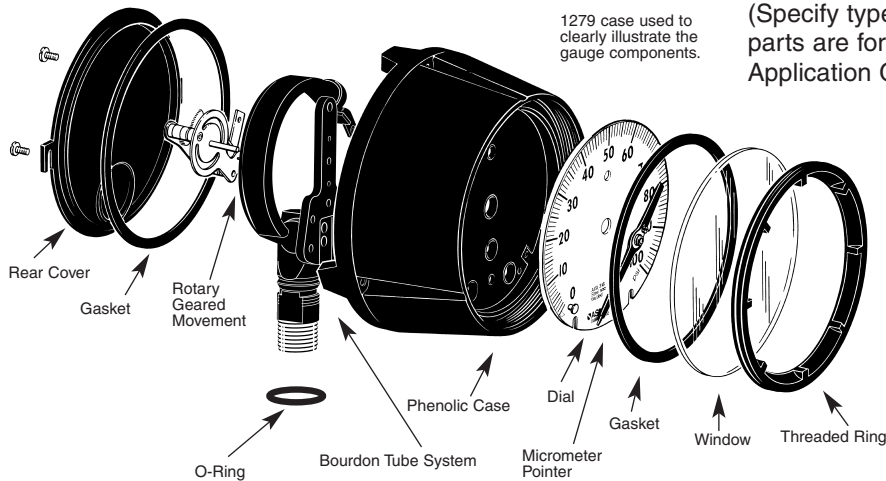
Example: Gauge working at 500 psi pressure at 280°F. temperature would have a -3% correction and would read 3% or 15 psi fast.

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



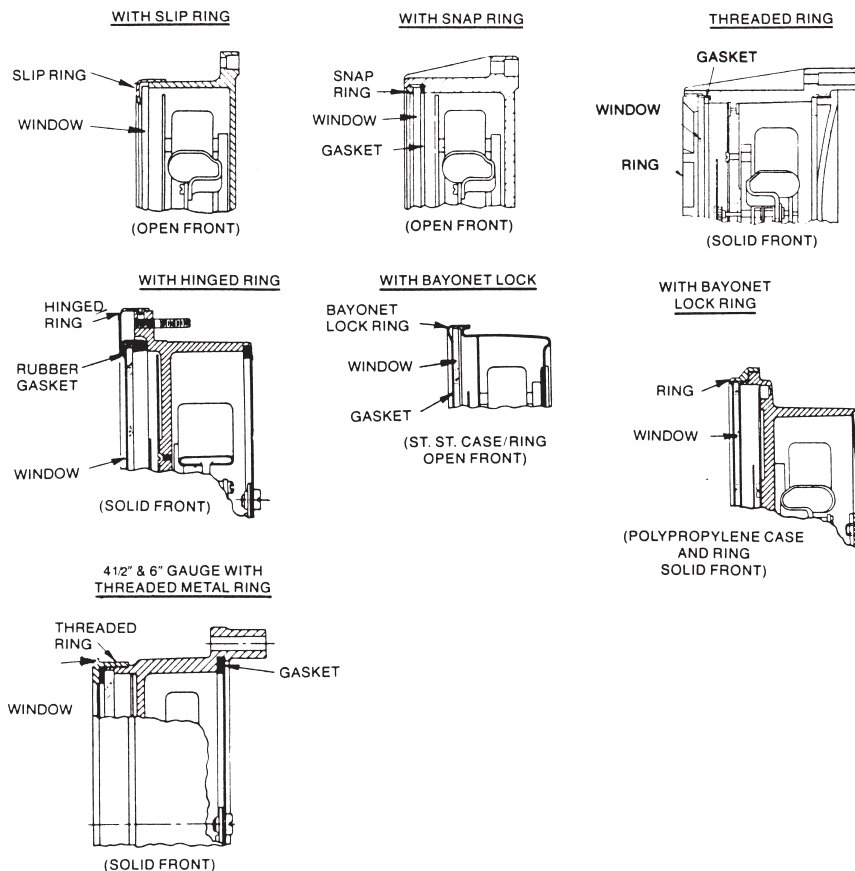
The drawing below shows a typical solid front, lower connection Duragauge with all of the parts designated by their standard names. The use of these names will facilitate the ordering of parts and eliminate any misunderstanding in describing gauge construction.

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.)



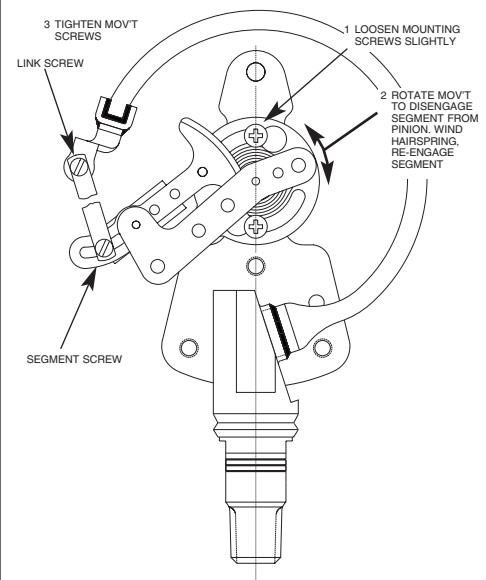
Note: The socket, tube and tip assembly is furnished as one integral unit. The movement is supplied complete.

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 T510-04TW	NON-CLEANOUT TYPE FOR PIPE MOUNTING	CATALOG NUMBER T510-04
------------------------------------------	----------------------------------------	----------------------------------

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

ZAYODA 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:
BY:	WILL SHIP BY:		
SHIPPED:		USER:	
TITLE: MODEL T510 SMALL ZEAL®	WORK ORDER NUMBER MUST BE GIVEN IN ALL CORRESPONDENCE OR PHONE INQUIRIES	WORK ORDER NUMBER	PAGE OF

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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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[Blondie's Web Designs](#)

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



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:

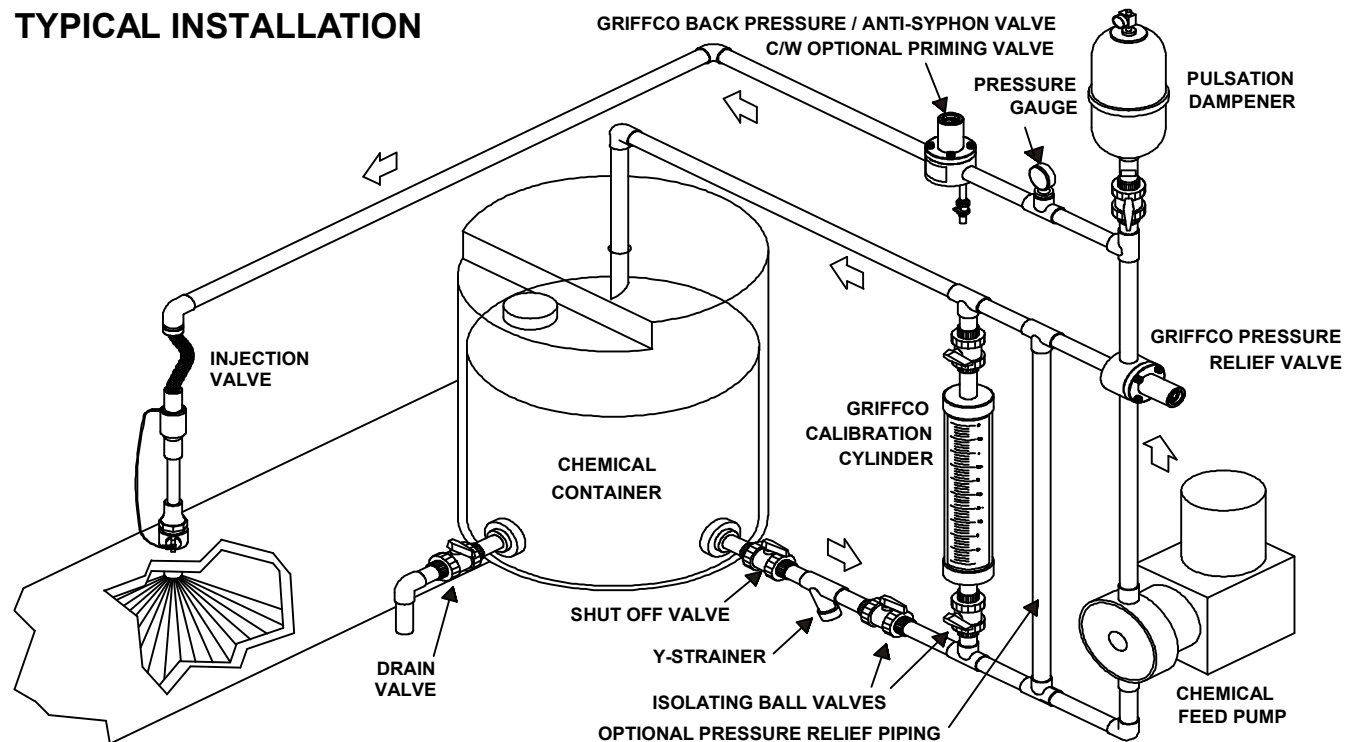
- High Reliability / Low Cost
- No Bolts on Plastic Models
- Compact Size for OEM Applications
- Adjustable 10 - 150 PSI
- Optional 350 PSI Rated Valve
- Anti-Siphon Function
- Robust, Machined Construction
- Vulcanised PTFE/EPDM Diaphragm
- Wide Range of Materials

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



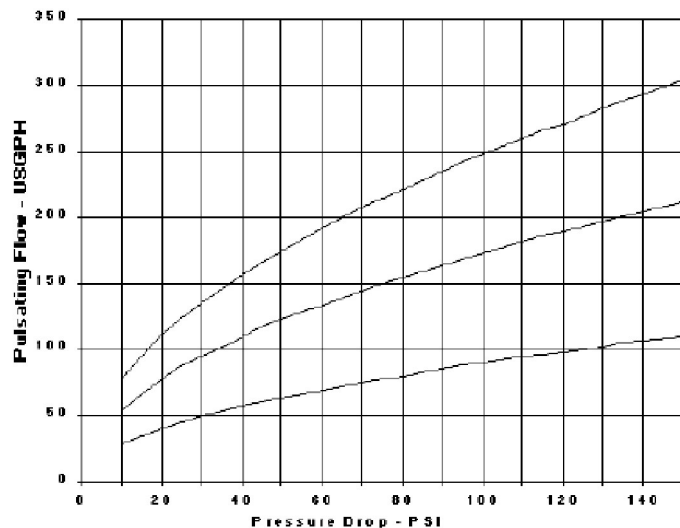
CALL 1 - 800 - GRIFFCO

Bulletin # BPV1003-2007

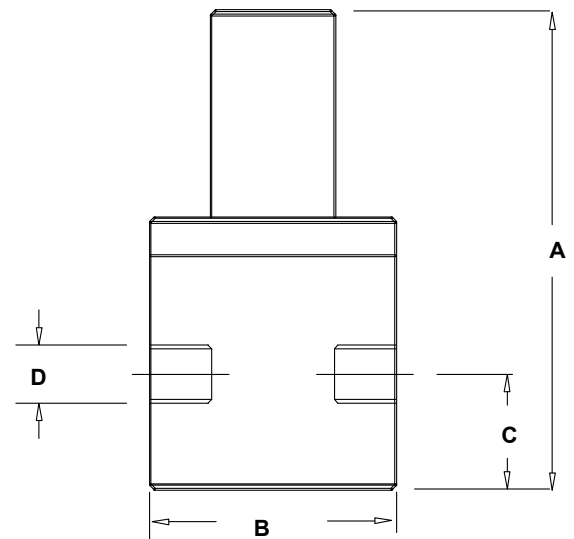
Technical Data:

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



Griffco Valve Inc.
6010 N. Bailey Ave., Suite 1B
Amherst, NY 14226
Phone: 1 716 835-0891
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T-Series Instruction Manual

**Back Pressure Valves
Pressure Relief Valves**

Call: 1 - 800 – GRIFFCO

Website: 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.

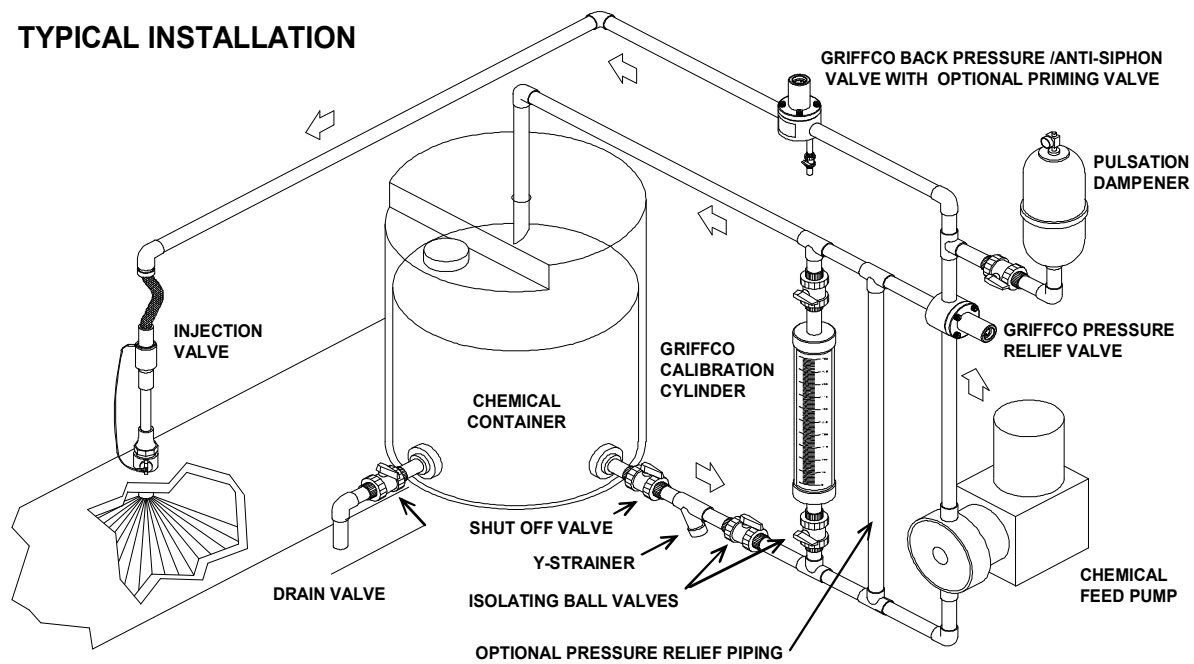
Pressure Relief Valve:

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:

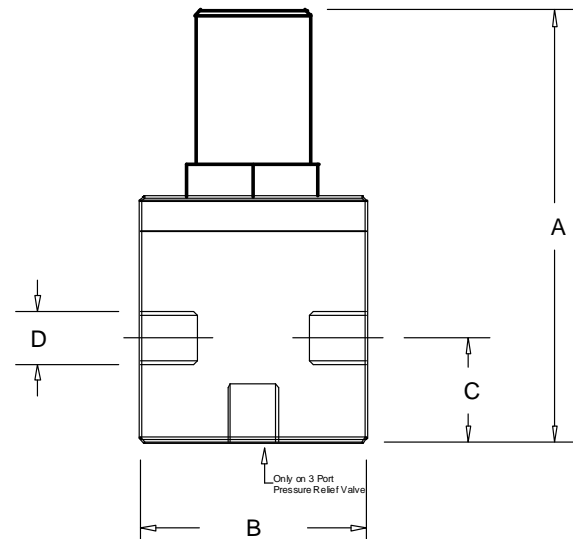
The pressure relief and back pressure valves were designed with minimizing the amount of maintenance required to keep the valves in operation. However, periodic replacement of the diaphragm is required. To facilitate inspection and replacement, the valve layout is such that removal of the diaphragm can 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:

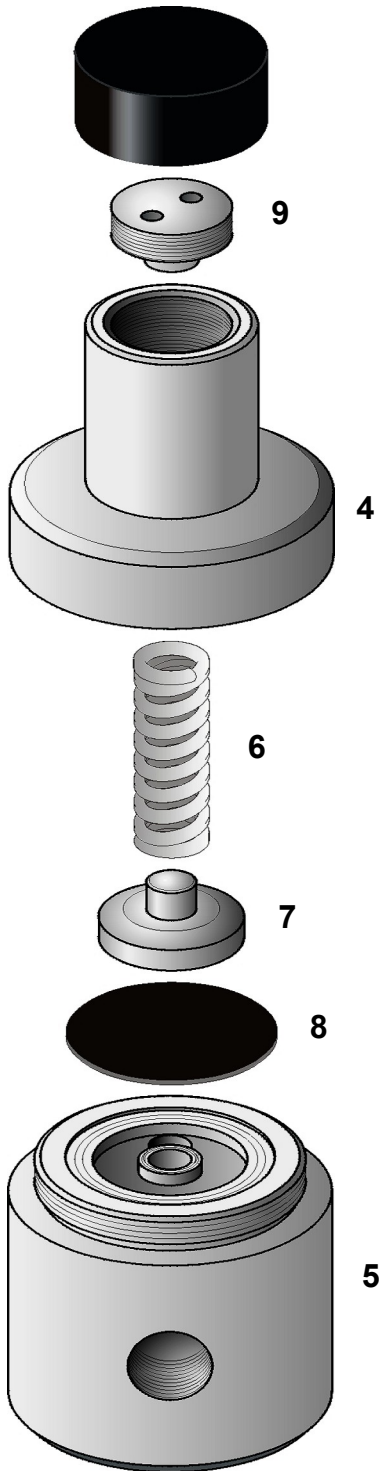


D	A (in)	B (in)	C (in)
1/4" (P)	3.90	2.340	0.750
1/4" (M)	3.50	2.340	0.750
3/8" (P)	3.90	2.340	0.750
3/8" (M)	3.50	2.340	0.750
1/2" (P)	4.60	2.340	0.750
1/2" (M)	4.20	2.340	0.750

Warranty: GRIFFCO 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. GRIFFCO 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	

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

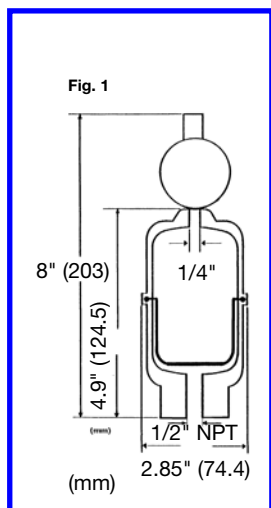
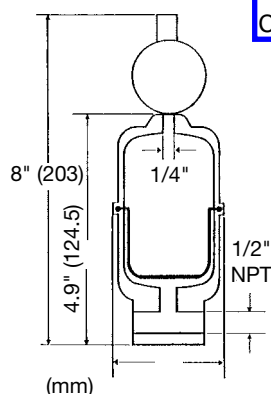


Fig. 2



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



DON'T
PUMP
WITHOUT
US

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FLUID CONTROL

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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

- | | | | | |
|-------------------|--------------------|-------------------|--------------------|------------------|
| • TRANSFER | • FILTERING | • PRINTING | • DOSING | • FILLING |
| • METERING | • SPRAYING | • COATING | • INJECTING | • MIXING |

INDUSTRIES SERVED



Chemical Process



Water Treatment



Food & Beverage



Pulp, Paper & Textile



Paint & Coating



**Biotech/
Pharmaceutical**



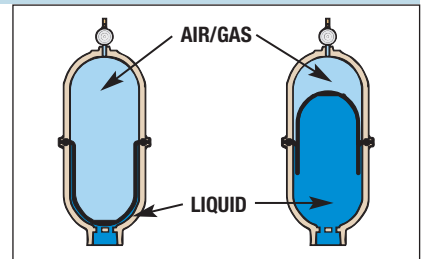
Gas, Oil, & Petrochemical



Consumer Products

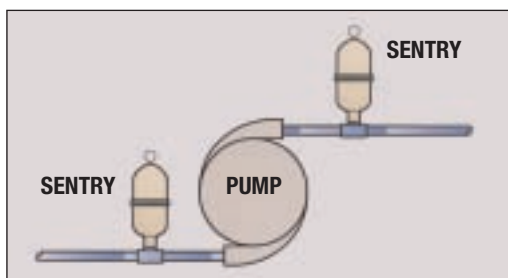
PRINCIPLES OF OPERATION

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.

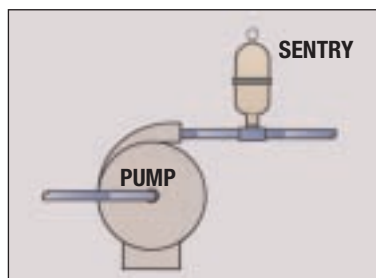


TYPICAL INSTALLATIONS

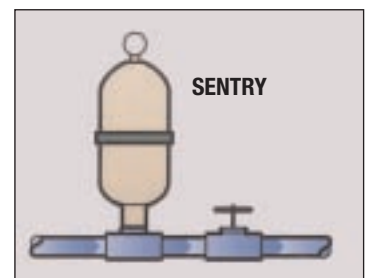
ADD, METERING, PERISTALTIC, & PISTON PUMPS



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		

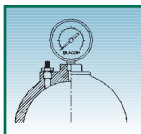
BLADDER OPTIONS

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.

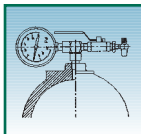
** Reflects entire temperature range for all available materials. Consult Blacoh on specific materials.

AIR CONTROL OPTIONS



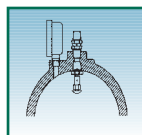
CHARGEABLE

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.



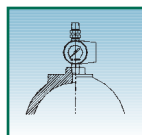
INLET STABILIZER

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"

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*CPVC body provides
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capabilities than
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"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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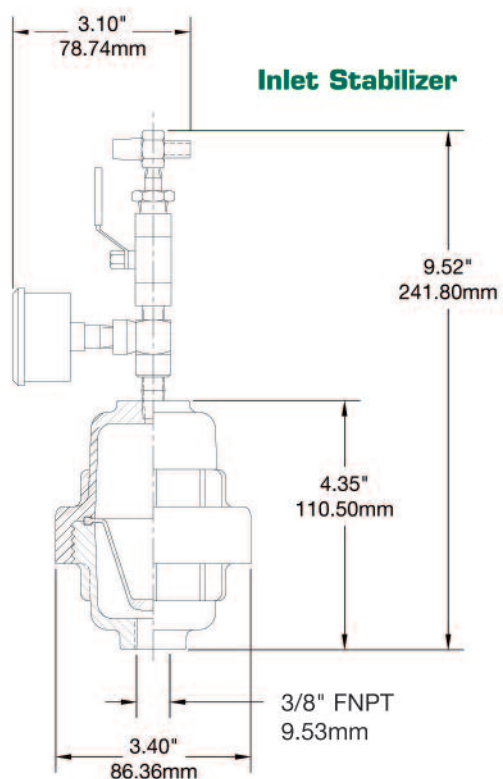
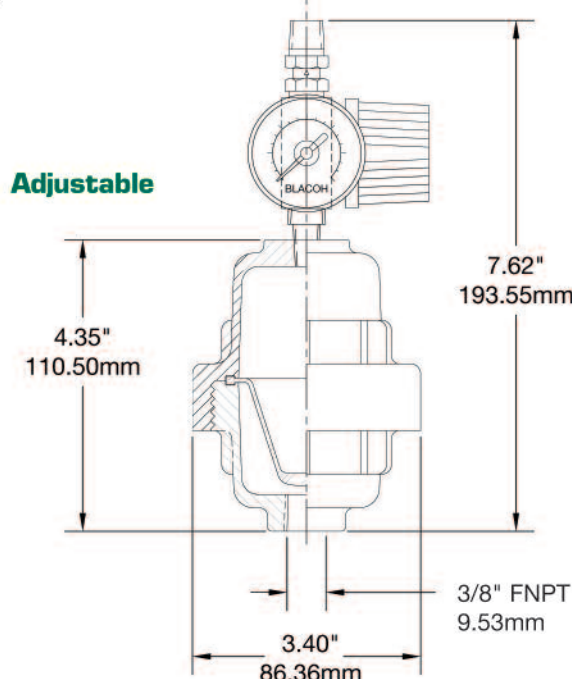
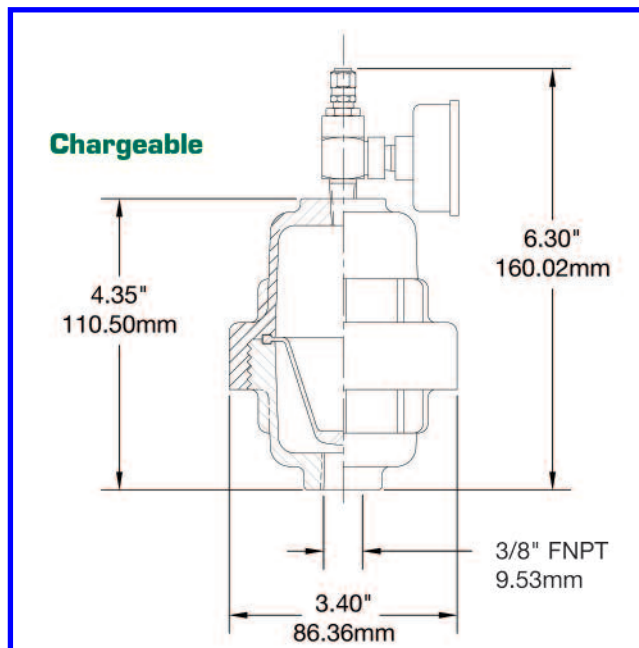
SENTRY
PULSATION DAMPENERS

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	CHARGEABLE	ADJUSTABLE	INLET STABILIZER
BLADDER	MODEL	MODEL	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

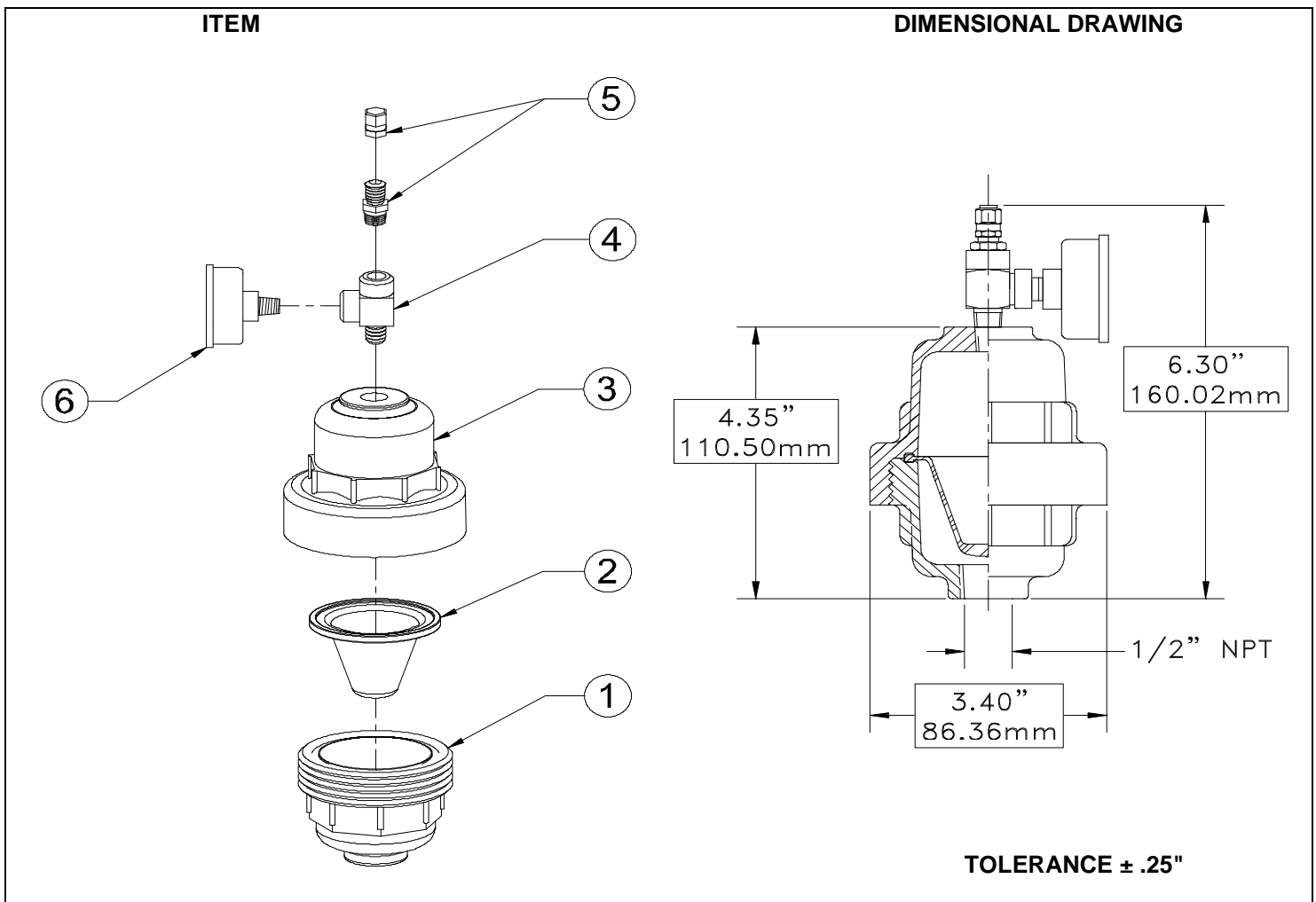
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FLUID CONTROL

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Tel: (800) 603-7867 or (951) 342-3100 • Fax: (951) 342-3101
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SENTRY MODEL #:	RC-10X-V50
MAXIMUM PRESSURE:	150 PSI/10 BAR
CAPACITY:	10 CUBIC INCH/.16 LITERS
WETTED HOUSING:	CPVC
NONWETTED HOUSING:	CPVC
BLADDER:	VITON
INLET:	1/2" NPTF
AIR CONTROL:	CHARGEABLE

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



REV 3-13-03

BLACOH FLUID CONTROL, INC

RIVERSIDE, CALIFORNIA USA

TEL: 800.603.7867 or 951.342.3100 Fax: 951.342.3101

E-mail: sales@blacoh.com web site: www.blacoh.com

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).

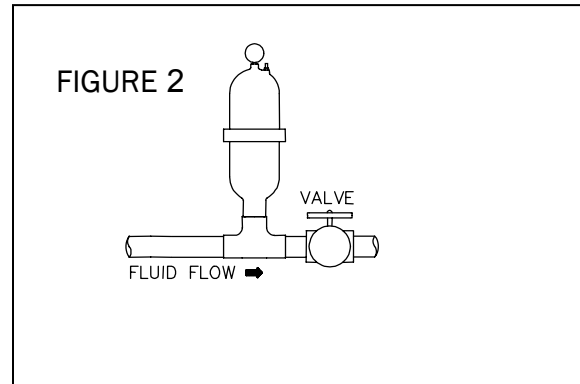
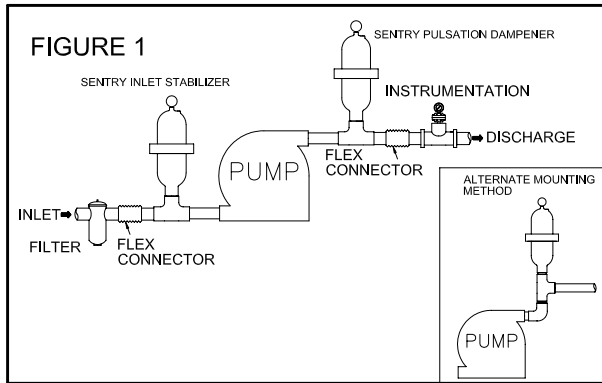
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Step 3 – Charging and Start Up – see PRE-CHARGE NOTES.

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.



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