

# TOP VALVE

Pat. #5,857,486 & 5,944,050

## Back Pressure and Pressure Relief Valves

### Instruction Manual

**PLEASE NOTE:**

This instruction manual provides detailed information and instructions that must be read, understood and followed to ensure that the equipment is installed, operated and serviced in an appropriate manner. Failure to do so before using may result in hazardous consequences and/or improper operation.

05/2023

**TEMPERATURE LIMIT NOTATION:**

If the application in which this valve is to be installed has a temperature greater than 73°F (23°C) including radiant heat, refer to page 11 for temperature correction vs. pressure limits.

Rev. 10

**NOTE:**

See Gauge Installation Instructions before removal of gauge plug to avoid thread damage. (Gauge port is optional)

Manufactured by:



**PRIMARY FLUID SYSTEMS INC.**

1050 COOKE BLVD., BURLINGTON, ON. CANADA L7T 4A8

TEL: (905) 333-8743

FAX: (905) 333-8746

1-800-776-6580

primary@primaryfluid.com

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## INTRODUCTION

The following instructions are to provide information on the Installation, operation and maintenance of TOP VALVE, 150# rated diaphragm style Back Pressure and Pressure Relief Valves, manufactured by Primary Fluid Systems Inc. The valves are designed to improve the performance and safe operation of most pumps used for metering applications.

Various materials of construction are available dependent on the requirements of the application and the type of fluids being transferred.

The valve(s) are factory set at 50 PSIG with a field adjustment range of 15-150 PSIG\*. Other factory set pressure ranges (within the range of the valve) are available upon request.

### Special Features of TOP VALVE

- PVC, PP, TFE, CPVC, PVDF, Hastelloy C, Alloy 20 or 316 S/S wetted construction
- PTFE laminated to EPDM backer diaphragm
- Turn down handle limits pressure to 150 PSIG
- Handle shaped for ease of adjustment
- Color-coded handles indicate size at a glance
- (Optional) Built-in matching material gauge port plug is easily removed for gauge option
- Rectangular shape for ease of installation
- Specially designed spring provides consistent pressure adjustments through the range (15-150 PSIG\*)
- Valve top specially designed for mounting clamp to help reduce pipeline stress when required
- Built-in downstream manual air release, for ease of pump priming
- Built-in anti-siphon

**\*Pressures under 15 PSIG require rubber elastomeric diaphragm.**

### Back Pressure Valve

Diaphragm Back Pressure Valves serve two primary functions. The first is to provide a constant discharge pressure on the pump, which improves the performance, efficiency and consistency of the delivered volume. Secondly, the valve performs as an anti-siphon mechanism against positive or negative pressures in the downstream line. The valve is designed to allow for the venting of air into the downstream pipeline. This provides for easier priming of metering pumps that function under a suction lift. This is accomplished by a simple adjustment of the handle.

The valve is available with an optional gauge port, pre-plugged at the factory or can be ordered complete with gauge to suit application. This eliminates the need to install extra fittings in the line to accommodate the addition of a gauge for the purpose of reading and setting of pressure.

#### **CAUTION:**

**The gauge port is solely for the installation of the gauge and must not be used for the bleeding or venting of the system. Improper operation of the valve and/or hazardous consequences could result. (see *gauge installation instructions*)**

## Back Pressure Valves: Reason for Selection and Use

Metering pumps having an atmospheric discharge system pressure of less than 20 psi and will benefit from the installation of a back pressure control valve. Metering pumps in general require downstream back pressure to ensure smoother function of the discharge check assemblies, which enhances the accuracy of the discharge flow.

## Pressure Relief Valves

Diaphragm Pressure Relief Valves are designed to relieve excess line pressure that exceeds the set pressure of the valve. This protects the system piping from overpressure that could result in hazardous leakage and/or damage to the pump and other system components.

The Pressure Relief Valves are normally recommended to be set between 5 and 10 PSIG above the system operating pressure.

The valve is of an in-line flow through design with bottom NPT relief port for piping back to supply tank or feed side of pump.

The valve is available with an optional gauge port, pre-plugged at the factory or can be ordered complete with gauge to suit application. This eliminates the need to install extra fittings in the line to accommodate the addition of a gauge for the purpose of reading and setting of pressure.

### **CAUTION:**

The gauge port is solely for the installation of the gauge and cannot be used for the bleeding or venting of the system. Improper operation and/or hazardous consequences could result. (see *gauge installation instructions*)

## Pressure Relief Valves: Reason for Selection and Use

When using motor driven metering pumps, a pressure relief valve should always be installed on the downstream side of the pump to protect the system from over pressure which can cause pipe leakage and/or rupture.

## Installation and Maintenance of Back Pressure Valves

Back pressure control valves are installed on the discharge line of the pump. The valve should be located within a 2 (two)-foot distance of the pump discharge to ensure check valve seating. When pumping to a process line without an injection valve, the back pressure valve should be installed as close as possible to the injection point to prevent siphoning.

When used in conjunction with a pressure relief valve, always locate the back pressure valve on the downstream side of the relief valve.

The valve is supplied from the factory pre-set at 50 psig. To increase the pressure setting, back off the lock nut located beneath the colour coded handle. Turn the handle clockwise to increase pressure setting or counterclockwise to reduce pressure setting. Approximately one (1) full turn of the handle is equal to 10 psig.

*If maintenance is required on the valve:*

1. Ensure that the valve is properly isolated from the line, not under pressure and properly flushed of chemical before proceeding to disassembly.
2. Turn knob on the top of valve, counterclockwise until all spring pressure is released **before** proceeding to undo retaining nuts, to remove top of valve for diaphragm replacement.
3. All working components i.e. diaphragm, spring can be accessed by removing the four retaining nuts located on the top of the valve (item # 9 of parts breakdown). For ¼" and ¼" x ½" Top Valves, use 5/32" Allen Key / #4 Hex Key. For ½" sizes and up, use a 3/16" Allen Key / #5 Hex key.
4. When replacing the diaphragm, ensure the PTFE coated side of the diaphragm is facing down when viewed from the top of the valve. The installed diaphragm also functions as the body seal. (For 25 & 45 series with polycarbonate tops, torque the nuts to 40-inch pounds when reassembling, for all other sizes, torque to 55 inch pounds.)

#### **Set Pressure Safety Feature**

The valve adjustment handle/bolt length is designed to prevent operators from engaging the spring to a coil binding situation that would cause serious function and safety concerns.

In order to achieve max pressures within the top 10% of the valve range, the lock nut on the adjustment handle/bolt must be removed prior to setting the pressure. Ensure that all system pressure has been released before removing the lock nut and re-installing the approved valve handle/bolt.

The valve handle/bolt is the only approved adjustment component to be used on our valves. Deviation from this will void manufacturer warranty and liability.

#### **Installation and Maintenance of Pressure Relief Valves**

Pressure relief valves are installed on the discharge line of a pump and should be located as close as possible to the metering pump. The valve is of an in-line flow through design with a bottom NPT relief port for piping back to the supply tank or feed side of the pump.

Never install shut-off/isolation valves between pump discharge and in-line pressure relief valves. When using in conjunction with a back pressure control valve, always install back pressure valve downstream of pressure relief valve. The relief port on the pressure relief valve should be piped back to the feed tank or suction side of the pump (see typical installation schematics).

#### **CAUTION:**

The plastic valve bodies have standard NPT threads, which are tapered. When installing pipe into the body, hand tighten only to avoid cracking.

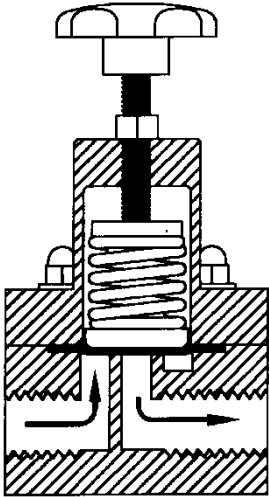
#### **Gauge Installation Instructions: (When ordered with valve only)**

For the convenience of pressure setting and reading, there is an optional plugged gauge port provided, if the valve has not been ordered complete with gauge. **Important:** use a **TORX style # T-45** wrench or screwdriver **only** to remove plug from plastic valves. Any other tool will strip the body of the plug and require an extractor to remove the threaded plug.

#### **CAUTION:**

Before removing the gauge port plug to install a gauge, ensure that the discharge line is not under pressure and lines are flushed with water prior to proceeding. Ensure that the gauge you are using is chemical resistant to the fluid before installing.

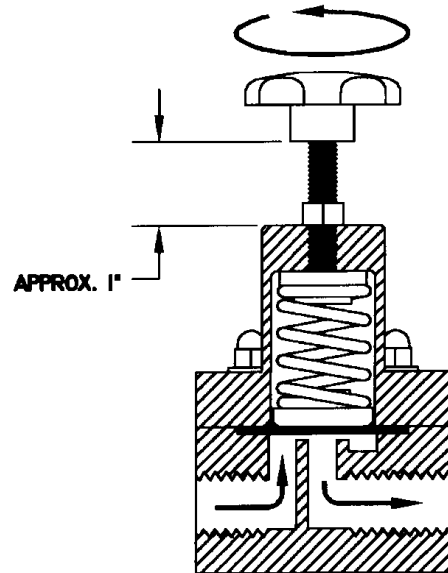
## Manual Air Release for Back Pressure Valve Only



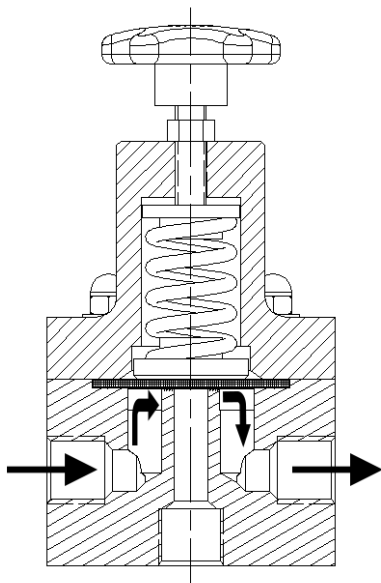
DIAPHRAGM POSITION AT  
50 PSI BACK PRESSURE

To adjust the valve to relieve air or gas downstream:

1. Back off lock nut located beneath the colour coded handle.
2. Turn handle counter clockwise until approximately 1 inch of thread is exposed.
3. At this adjustment, the spring has relieved all tension from the diaphragm allowing air or gas to be vented downstream.



AIR RELEASE POSITION WITH  
HANDLE BACKED OFF



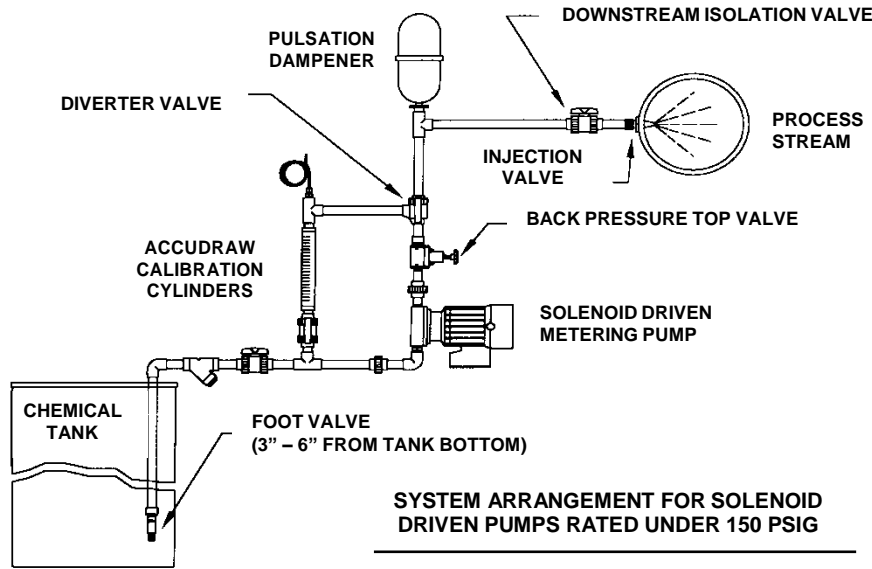
Flow through design Pressure Relief Valve

The bottom port relieves over pressure.

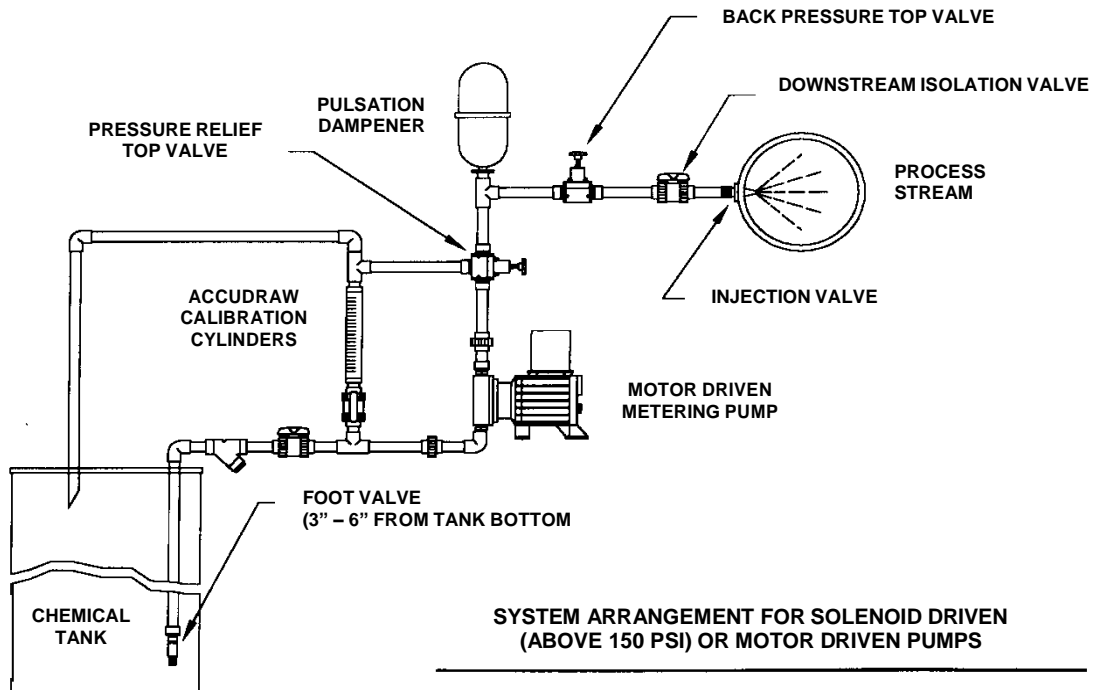
## Typical Installations

The installations below are typical installation examples only. Consult your Engineering Department for the appropriate installation for your application or call the factory for advice.

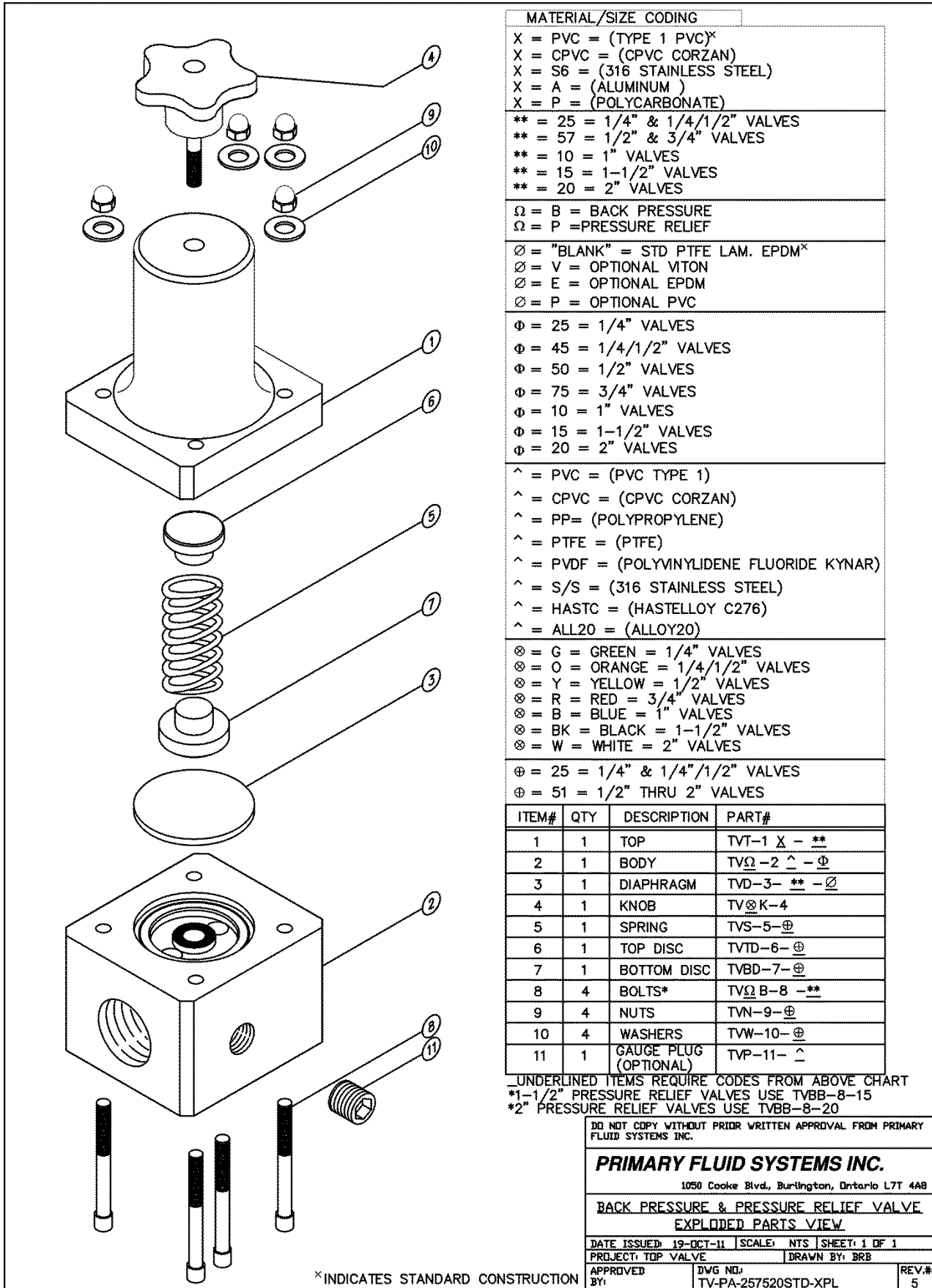
### EXAMPLE A: SOLENOID DRIVEN PUMPS RATED UNDER 150 PSIG



### EXAMPLE B: SYSTEM ARRANGEMENT FOR SOLENOID DRIVEN (ABOVE 150 PSIG) OR MOTOR DRIVEN PUMPS.



## Exploded Parts View-Back Pressure & Pressure Relief Valve



MATERIAL/SIZE CODING			
X =	PVC =	(TYPE 1 PVC)*	
X =	CPVC =	(CPVC CORZAN)	
X =	S6 =	(316 STAINLESS STEEL)	
X =	A =	(ALUMINUM)	
X =	P =	(POLYCARBONATE)	
** =	25 =	1/4" & 1/4"/1/2" VALVES	
** =	57 =	1/2" & 3/4" VALVES	
** =	10 =	1" VALVES	
** =	15 =	1-1/2" VALVES	
** =	20 =	2" VALVES	
Ω =	B =	BACK PRESSURE	
Ω =	P =	PRESSURE RELIEF	
∅ =	"BLANK" =	STD PTFE LAM. EPDM*	
∅ =	V =	OPTIONAL VITON	
∅ =	E =	OPTIONAL EPDM	
∅ =	P =	OPTIONAL PVC	
Φ =	25 =	1/4" VALVES	
Φ =	45 =	1/4"/1/2" VALVES	
Φ =	50 =	1/2" VALVES	
Φ =	75 =	3/4" VALVES	
Φ =	10 =	1" VALVES	
Φ =	15 =	1-1/2" VALVES	
Φ =	20 =	2" VALVES	
^ =	PVC =	(PVC TYPE 1)	
^ =	CPVC =	(CPVC CORZAN)	
^ =	PP =	(POLYPROPYLENE)	
^ =	PTFE =	(PTFE)	
^ =	PVDF =	(POLYVINYLIDENE FLUORIDE KYNAR)	
^ =	S/S =	(316 STAINLESS STEEL)	
^ =	HASTC =	(HASTELLOY C276)	
^ =	ALL20 =	(ALLOY20)	
⊗ =	G =	GREEN = 1/4" VALVES	
⊗ =	O =	ORANGE = 1/4"/1/2" VALVES	
⊗ =	Y =	YELLOW = 1/2" VALVES	
⊗ =	R =	RED = 3/4" VALVES	
⊗ =	B =	BLUE = 1" VALVES	
⊗ =	BK =	BLACK = 1-1/2" VALVES	
⊗ =	W =	WHITE = 2" VALVES	
⊕ =	25 =	1/4" & 1/4"/1/2" VALVES	
⊕ =	51 =	1/2" THRU 2" VALVES	
ITEM#	QTY	DESCRIPTION	PART#
1	1	TOP	TVT-1 <u>X</u> - **
2	1	BODY	TV <u>Ω</u> -2 <u>^</u> - <u>Φ</u>
3	1	DIAPHRAGM	TVD-3- ** - <u>∅</u>
4	1	KNOB	TV <u>∅</u> K-4
5	1	SPRING	TVS-5- <u>⊕</u>
6	1	TOP DISC	TVTD-6- <u>⊕</u>
7	1	BOTTOM DISC	TVBD-7- <u>⊕</u>
8	4	BOLTS*	TV <u>Ω</u> B-8 -**
9	4	NUTS	TVN-9- <u>⊕</u>
10	4	WASHERS	TVW-10- <u>⊕</u>
11	1	GAUGE PLUG (OPTIONAL)	TVP-11- <u>^</u>

\*UNDERLINED ITEMS REQUIRE CODES FROM ABOVE CHART  
 \*1-1/2" PRESSURE RELIEF VALVES USE TVBB-8-15  
 \*2" PRESSURE RELIEF VALVES USE TVBB-8-20

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**PRIMARY FLUID SYSTEMS INC.**

1050 Cooke Blvd., Burlington, Ontario L7T 4A8

**BACK PRESSURE & PRESSURE RELIEF VALVE**  
**EXPLODED PARTS VIEW**

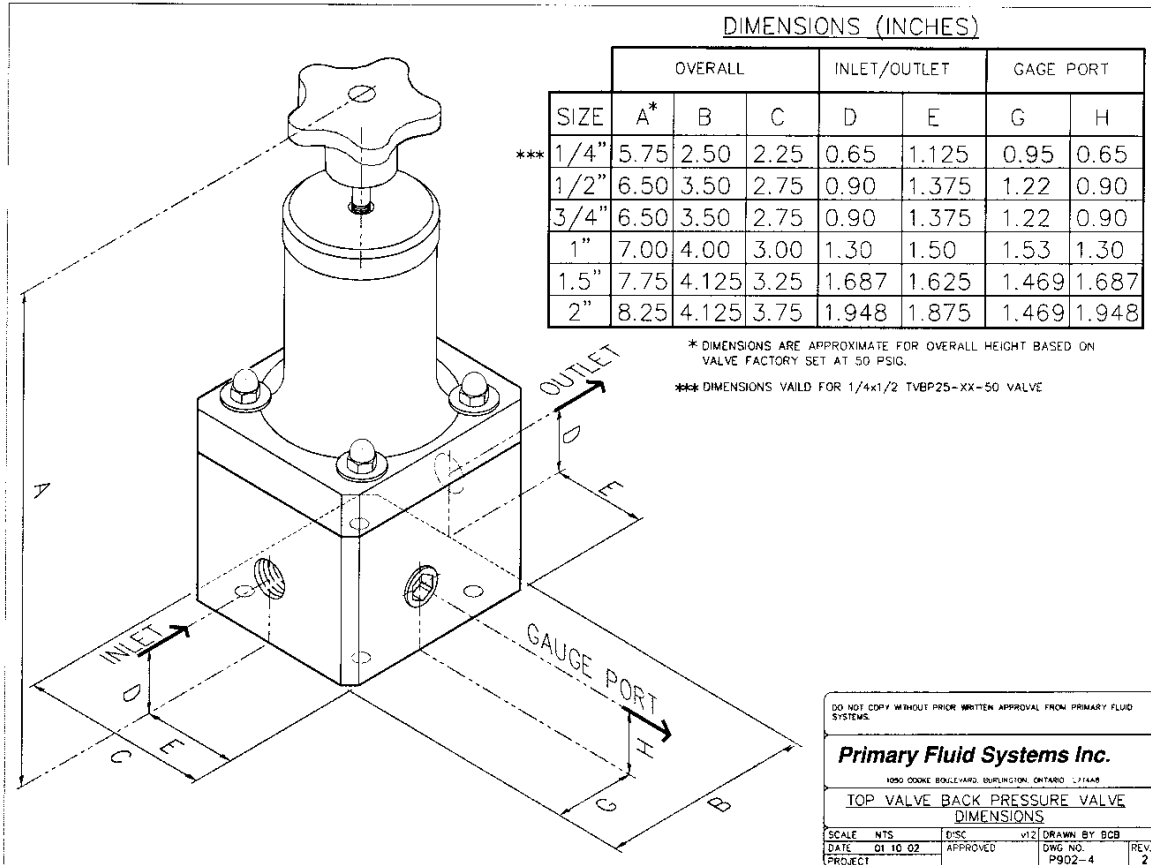
DATE ISSUED: 19-OCT-11 | SCALE: NTS | SHEET: 1 OF 1  
 PROJECT: TOP VALVE | DRAWN BY: BRB

APPROVED BY: | DWG NO: TV-PA-257520STD-XPL | REV.# 5

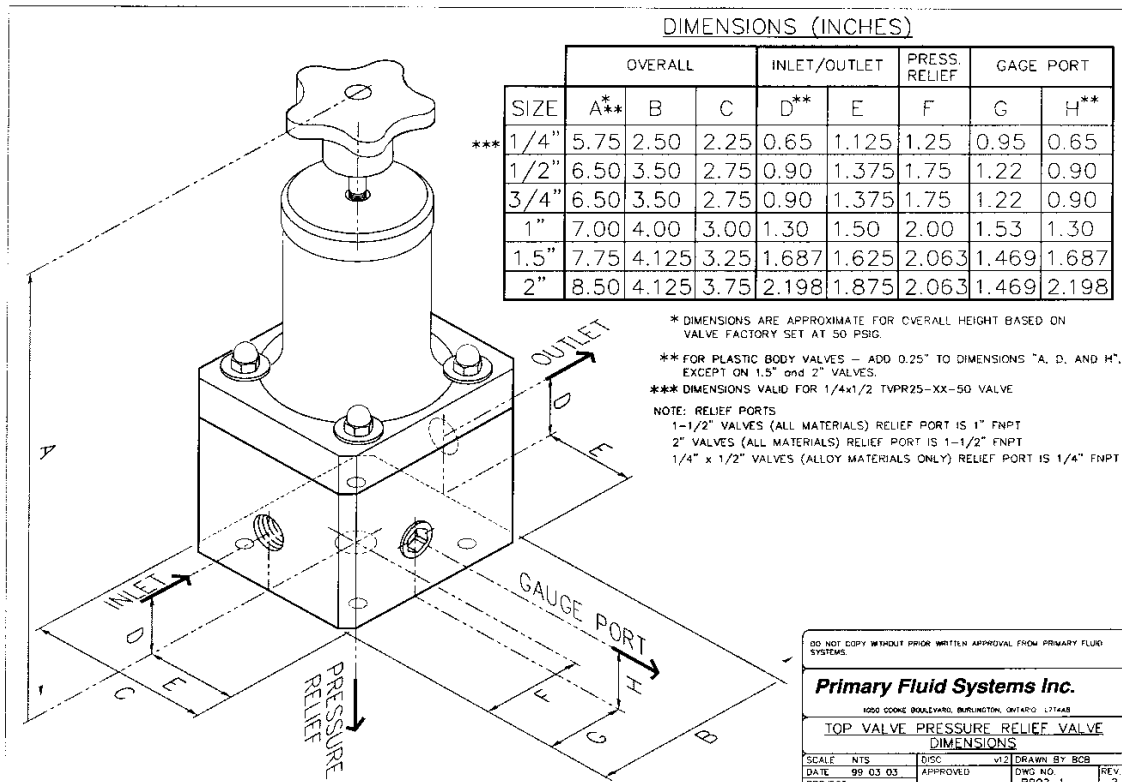
\*INDICATES STANDARD CONSTRUCTION



## Dimensions – Top Valve – Back Pressure



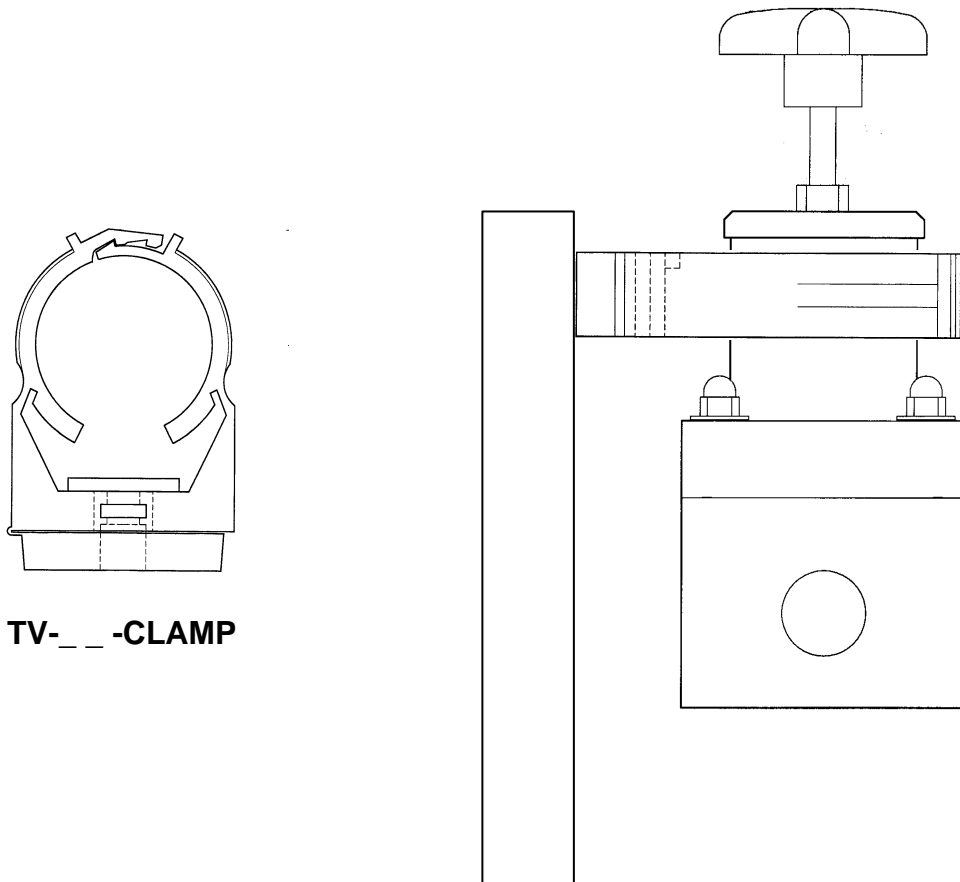
## Dimensions – Top Valve – Pressure Relief



## ALL New Clamping Device for TOP VALVE, Back Pressure and Pressure Relief Valves

This new polypropylene-clamping device now makes it even easier than ever to support TOP VALVE, back pressure or pressure relief valves in service, to help eliminate pipe strain and the need for expensive mounting brackets.

It's simple to install, economical to purchase and we've reworked the top of the valve body now available on all new valves, to assist with the support.



TV-\_\_-CLAMP

Sample Installation

### Part #

TV-25-CLAMP to fit ¼" Valves and ¼ - ½" Valves

TV-51-CLAMP to fit ½" through 2" Valves

## Flow Rates

Subject: Flow capacity through TOP VALVE, back pressure and pressure relief valves. Under continuous flow conditions: @ **50 PSI** with ambient temperature water

¼" valve	4	USGPM
¼"/½" valve	4	USGPM
½" valve	6	USGPM
¾" valve	8	USGPM
1" valve	14	USGPM
1½" valve	25	USGPM
2" valve	40	USGPM

Note: Capacities will increase with pressure. (If pressure is doubled, flow rate will approximately double.) For capacities of valves with pulsating flow use approximately ⅓ of the above given flow values.

### Temperature Correction Factors: Thermoplastics

**Temperature Effects:** Thermoplastics and thermosets will decrease in tensile strength as the temperature increases: therefore, the working pressure must be reduced accordingly. The following factors will apply:

Operating Temperatures		{Factors}			
F	C	PVC	CPVC	PP	PVDF
70	21	1.00	1.00	1.00	1.00
80	27	1.00	1.00	1.00	1.00
90	32	1.00	1.00	1.00	1.00
100	38	.90	1.00	1.00	1.00
110	43	.83	1.00	.91	1.00
115	46	.75	1.00	.87	1.00
120	49	.66	1.00	.83	1.00
125	52	.58	.97	.79	1.00
130	54	.50	.95	.75	1.00
140	60	.33	.90	.66	1.00
150	66	NR	.80	.60	.97
160	71	NR	.70	.53	.93
170	77	NR	.60	.43	.86
180	82	NR	.50	.33	.80
200	93	NR	.33	NR	.66
210	99	NR	NR	NR	.60
240	116	NR	NR	NR	.40
280	138	NR	NR	NR	.16

**Example:**

Maximum Pressure for PVDF valve at 280°F (138°C)  
 Factor = 0.16 x 150psig = 24psig max. pressure  
 Factor = 0.16 x 1034kPa = 165.44kPa max. pressure

The maximum pressure rating for valves regardless of size is 150 PSIG (1034 kPa) at 73° F (22°C)

**NR** = not recommended

Primary Fluid Systems, Inc. takes no responsibility for the enclosed data.

**NOTE:** If the material of the valve you have chosen is rated below the working pressure of your system than you must reconsider your choice. The standard valve top material of construction is Polycarbonate and should be taken into temperature consideration. (Other materials of construction are available, consult price list or factory)

**NOTE:** When considering working temperature, include ambient and potential collective surface temperature (Radiant Heat).

## LIMITED WARRANTY

Primary Fluid Systems Inc. (Primary) warrants its products against defects in workmanship or materials for one (1) year under normal use. Three-(3) year available when application card is completed and returned to factory. Application card can be obtained by emailing request to sales@primaryfluid.com

Primary's obligations and liabilities under this warranty shall be limited to replacement of the product, or a refund of an amount not to exceed the purchase price of the product(s) to which such warranty claim is made. Repairs or replacements are made subject to our inspection of the returned product(s). Primary's decision of one of these alternatives shall be the buyer's exclusive remedy.

This warranty does not extend to damage by corrosion or other decomposition by chemical action. Primary does not warrant damages caused by (a) improper use of the product, (b) unauthorized modification or attachment to product, (c) misuse, abuse, accident or negligent handling or installation of product, or (d) alterations or repairs made by purchaser.

The materials of construction offered are recommendations only, subject in all cases to acceptance by purchaser. These recommendations do not constitute any guarantee against corrosion or decomposition, but are based on previous experience and best available information of the industry.

Statements and instructions set forth herein are based on the best information and practices known to Primary, but it should not be assumed that every acceptable safety procedure is contained herein. Of necessity Primary cannot guarantee that actions in accordance with such statements and instructions will result in the complete elimination of hazards and it assumes no liability for accidents that may occur.

Except as specifically provided herein, Primary makes no warranty, representations, promise or guarantee, either express or implied, statutory or otherwise, with respect to the product and technical information provided, including the products' quality, performance, merchantability, or fitness for a particular purpose.

In no event will Primary be liable for indirect, special, incidental, economic, covert or consequential damages arising out of the use or inability to use the product, including without limitation, damages or costs relating to the loss of profits, business and good will even if advised of the possibility of such damages. In no event shall Primary's liability exceed the amount paid by you for the product.

The warranty and remedies set forth herein are exclusive and in lieu of all others, oral or written, express or implied. No Primary dealer, distributor, agent or employee is authorized to make any modification or addition to this warranty. This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

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