

# TOP VALVE

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

**Mid-Range Pressure  
50 - 232 PSIG  
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.

10/2020  
REV. 1

Manufactured by:



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## Introduction

The following instructions are to provide information on the Installation, operation and maintenance of Top Valve, 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 100 PSIG with a field adjustment range of 50-232 PSIG. Other factory set pressure ranges (within the range of the valve) is available upon request.

## Special Features of TOP VALVE:

- CPVC top standard; Optional tops include aluminum, 316 S/S
- PVC, CPVC Corzan, PVDF, 316L S/S, Alloy 20, and Hastelloy C276 wetted body construction available
- Viton diaphragm standard; optional EPDM available
- Turn down pressure adjustment limits pressure to 232 PSIG
- Rectangular shape designed for ease of installation
- Specially designed spring provides consistent pressure adjustments through the range (50-232 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

## 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.

## **Back Pressure Valves: Reason for Selection and Use**

Metering pumps having an atmospheric discharge system pressure of less than 20 psi 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.

### **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 100 psig. To increase the pressure setting, back off the lock nut located beneath the color coded handle. Turn the handle clockwise to increase pressure setting or counter clockwise to reduce pressure setting. Approximately one (1) full turn of the handle is equal to 50 psig.

If maintenance is required on the valve:

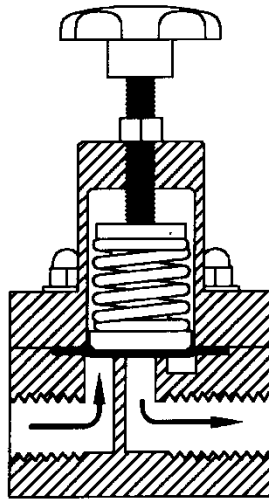
1. Ensure that the valve is properly isolated from the line, not under pressure and properly flushed of chemical before proceeding to disassembly.
2. Turn knob on the top of valve, counterclockwise until all spring pressure is released **before** proceeding to undo retaining nuts, to remove top of valve for diaphragm replacement.
3. All working components ie. diaphragm, spring can be accessed by removing the four retaining nuts located on the top of the valve (item # 9 of parts breakdown). For 1/4" and 1/4" x 1/2" Top Valves, use 5/32" Allen Key / #4 Hex Key. For 1/2" sizes and up, use a 3/16" Allen Key / #5 Hex key.
4. When replacing the diaphragm, ensure the diaphragm is fitted in the center of the body diaphragm cavity. The installed diaphragm also functions as the body seal. Torque nuts to 55 inch pounds when reassembling.

### **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.

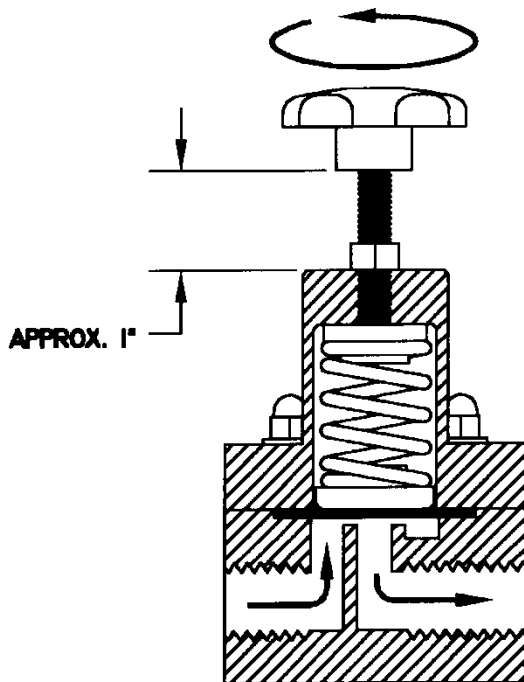
Never install shut-off/isolation valves between pump discharge and in-line pressure relief valves. When using in conjunction with a back pressure control valve, always install back pressure valve downstream of pressure relief valve. The relief port on the pressure relief valve should be piped back to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

# Manual Air Release



**DIAPHRAGM POSITION AT  
50 PSI BACK PRESSURE**

The valve is shipped with a factory set pressure of 100 psig. The diagram to the left shows a cut away view of the position of the diaphragm on the seat.



**AIR RELEASE POSITION WITH  
HANDLE BACKED OFF**

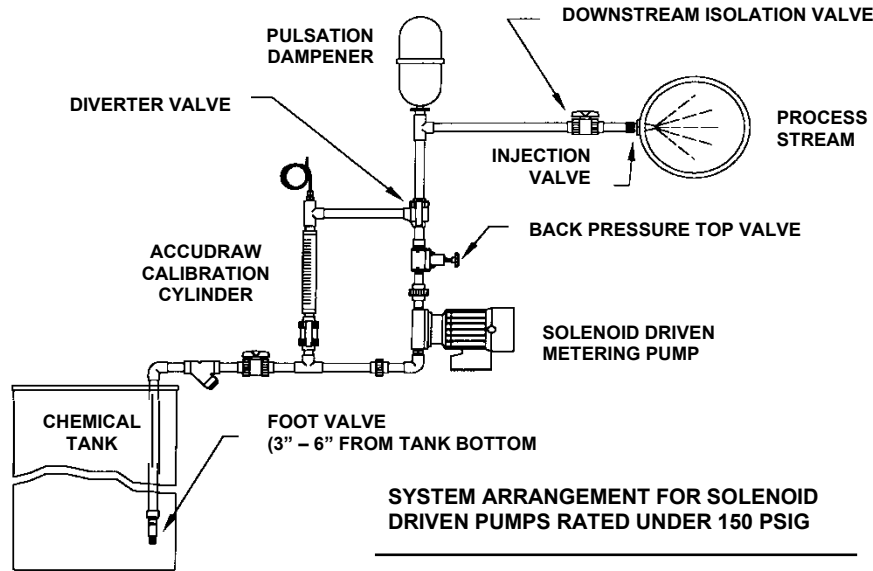
To adjust the valve to relieve air or gas downstream:

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.

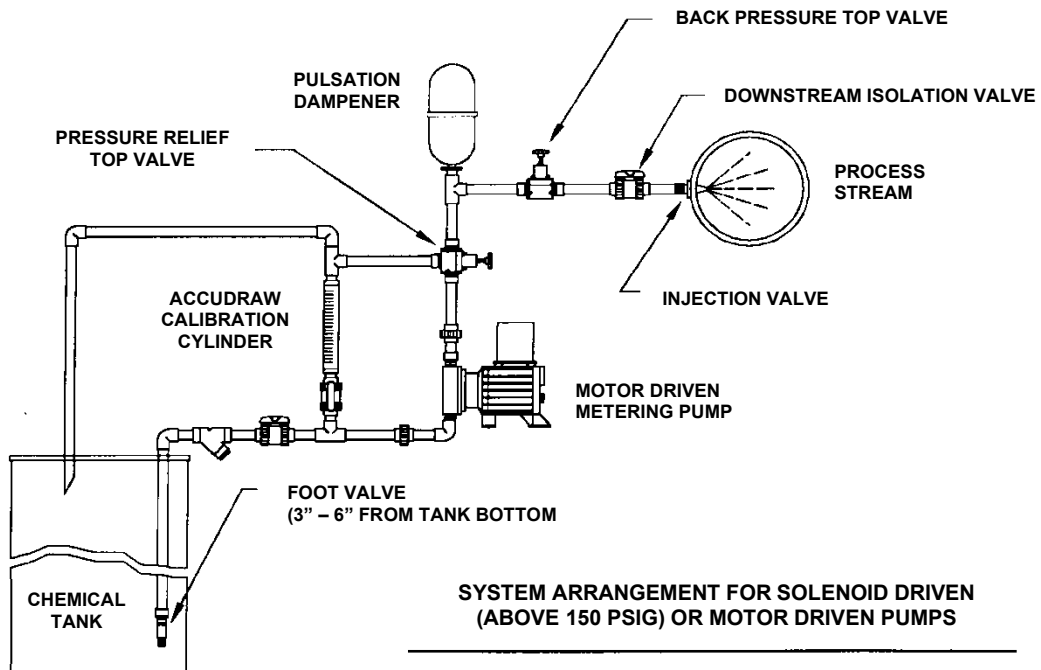
## Typical Installations

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.

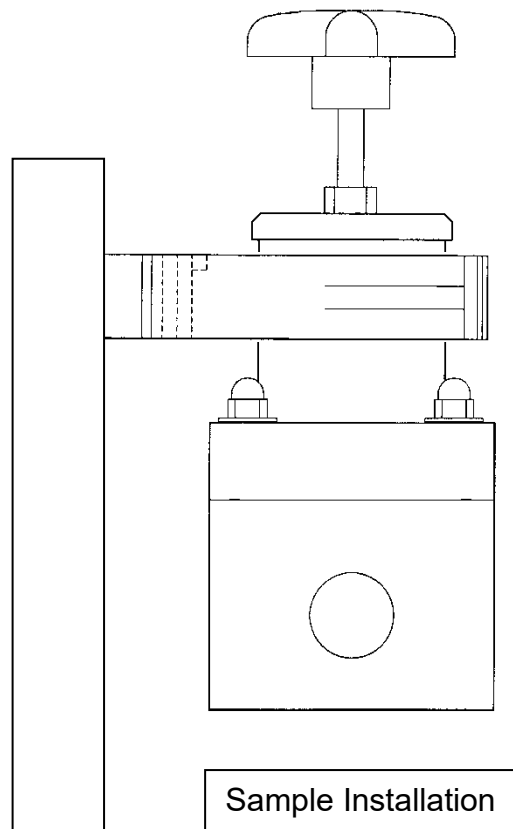
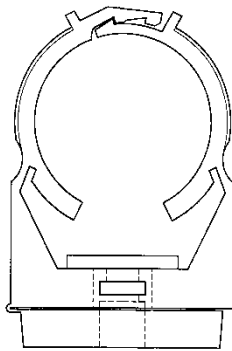


***ALL New Clamping Device for TOP VALVE, back pressure and pressure relief valves.***

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



**Part #**

TV-25-CLAMP to fit 1/4" Valves and 1/4-1/2 Valves

TV-51-CLAMP to fit 1/2" through 1-1/2" Valves



# Back Pressure & Pressure Relief Valve – Mid-Range Pressure – Exploded Parts View

MATERIAL/SIZE CODING	
X	= CPVC = (CPVC Corzan) <sup>x</sup>
X	= A = (ALUMINUM )
X	= S6 = (316 STAINLESS STEEL)
**	= 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/2 PORT PRESSURE RELIEF
Ω	= P =PRESSURE RELIEF
∅	= V = VITON <sup>x</sup>
∅	= E = OPTIONAL EPDM
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)
^	= PVDF = (POLYVINYLIDENE FLUORIDE KYNAR)
^	= S/S = (316 STAINLESS STEEL)
^	= HASTC = (HASTELLOY C276)
^	= ALL20 = (ALLOY20)
⊗	= 5/16 = 1/4" & 1/4"/1/2" VALVES
⊗	= 3/8 = 1/2" THRU 2" VALVES
⊕	= 2H = 1/4" & 1/4"/1/2" VALVES
⊕	= 5H = 1/2" THRU 2" VALVES
◆	= 25 = 1/4" & 1/4"/1/2" VALVES
◆	= 51 = 1/2" THRU 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	TVΩ-2 <u>^</u> -Φ
3	1	DIAPHRAGM	TVD-3- ** -∅
4	1	KNOB	⊗ x 1-1/2CAP
5	1	SPRING	TVS-5-⊕ -PLA
6	1	TOP DISC	TVTD-6-⊕
7	1	BOTTOM DISC	TVBD-7-⊕
8	4	BOLTS*	TVΩ B-8 -**
9	4	NUTS	TVN-9-◆
10	4	WASHERS	TVW-10-∇

- UNDERLINED ITEMS REQUIRE CODES FROM ABOVE CHART

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**Primary Fluid Systems Inc.**

1050 Cooke Boulevard, Burlington, Ontario L7T 4A8

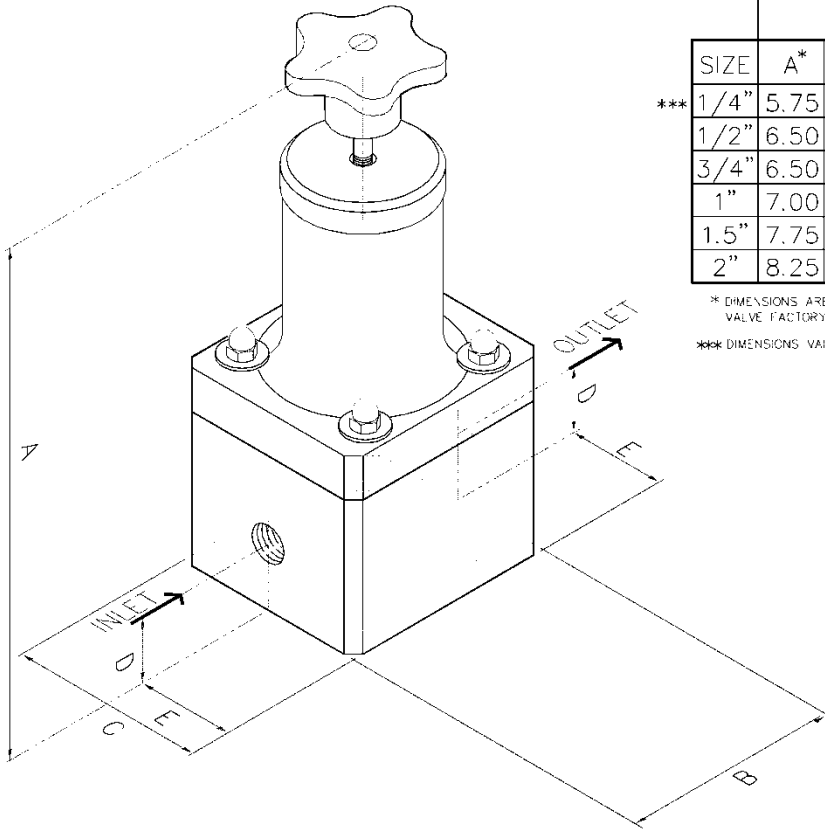
**BACK PRESSURE & PORT PRESSURE RELIEF VALVE**

**50-230 PSIG EXPLoded PARTS VIEW**

SCALE	NTS	DISC	v12	DRAWN BY	BRB
DATE	APR 19, 2016	APPROVED		DWG NO.	EXTOPVALVE230HP
PROJECT				REV.#	1

\*INDICATES STANDARD CONSTRUCTION

DIMENSIONS (INCHES)



SIZE	OVERALL			INLET/OUTLET	
	A*	B	C	D	E
*** 1/4"	5.75	2.50	2.25	0.65	1.125
1/2"	6.50	3.50	2.75	0.90	1.375
3/4"	6.50	3.50	2.75	0.90	1.375
1"	7.00	4.00	3.00	1.30	1.50
1.5"	7.75	4.125	3.25	1.687	1.625
2"	8.25	4.125	3.75	1.948	1.875

\* DIMENSIONS ARE APPROXIMATE FOR OVERALL HEIGHT BASED ON VALVE FACTORY SET AT 50 PSIG

\*\*\* DIMENSIONS VALID FOR 1/4x1/2 TVBP45-XX VALVE

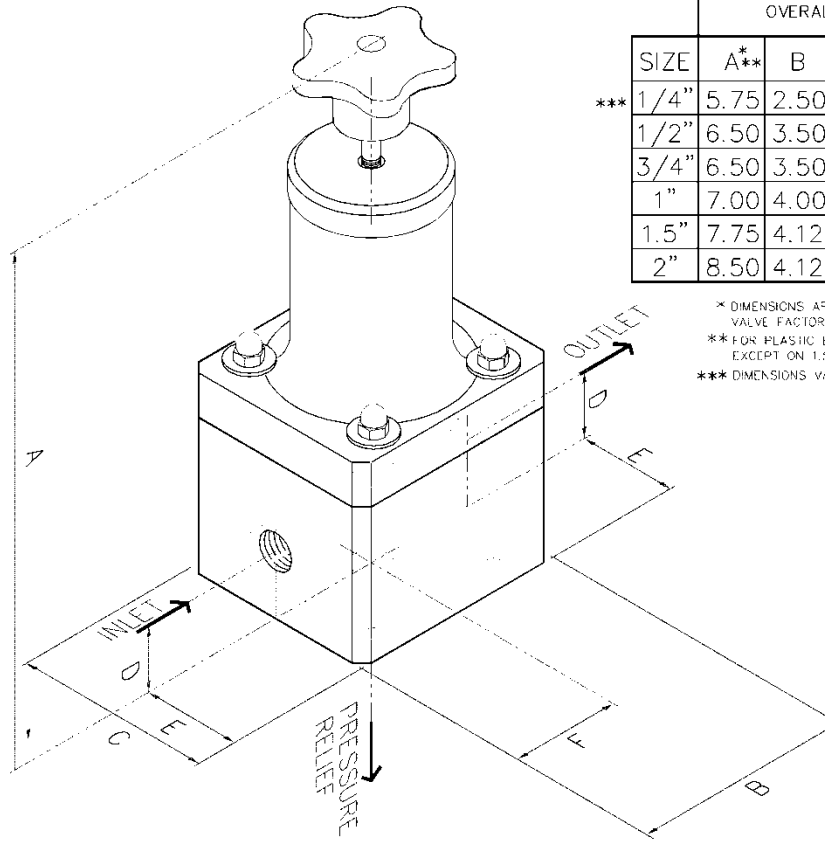
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**TOP VALVE BACK PRESSURE VALVE DIMENSIONS**

SCALE	NTS	DWG NO.	v2	DRAWN BY	BRB
DATE	01 01 09	APPROVED		PTVBPxx-xx	REV # 0
PROJECT					

DIMENSIONS (INCHES)



SIZE	OVERALL			INLET/OUTLET		PRESS. RELIEF
	A**	B	C	D**	E	F
*** 1/4"	5.75	2.50	2.25	0.65	1.125	1.25
1/2"	6.50	3.50	2.75	0.90	1.375	1.75
3/4"	6.50	3.50	2.75	0.90	1.375	1.75
1"	7.00	4.00	3.00	1.30	1.50	2.00
1.5"	7.75	4.125	3.25	1.687	1.625	2.063
2"	8.50	4.125	3.75	2.198	1.875	2.063

\* DIMENSIONS ARE APPROXIMATE FOR OVERALL HEIGHT BASED ON VALVE FACTORY SET AT 50 PSIG.

\*\* FOR PLASTIC BODY VALVES - ADD 0.25" TO DIMENSIONS "A, D, AND H", EXCEPT ON 1.5" AND 2" VALVES.

\*\*\* DIMENSIONS VALID FOR 1/4x1/2 TVPR25-XX-50 VALVE

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**TOP VALVE PRESSURE RELIEF VALVE DIMENSIONS**

SCALE	NTS	DWG NO.	v2	DRAWN BY	BRB
DATE	01 01 09	APPROVED		APTVPxx-xx	REV # 0
PROJECT					

## Flow Rates

Subject: Flow capacity through TOP VALVE, back pressure and pressure relief valves.  
Under continuous flow conditions: @ **100 PSI** with ambient temperature water

1/4" valve	8 USGPM
1/4"/1/2" valve	8 USGPM
1/2" valve	12 USGPM
3/4" valve	16 USGPM
1" valve	28 USGPM
1-1/2" valve	50 USGPM
2" valve	80 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 1/3 of the above given flow rates.

## 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.

## **LIMITED WARRANTY**

Primary Fluid Systems Inc. (Primary) warrants its products against defects in workmanship or materials for one (1) year under normal use.

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.

