Model 762

GAS LOADED RELIEF/BACK PRESSURE VALVES

DESCRIPTION

The Model 762 gas loaded relief/back pressure control valves are specifically designed to regulate and control maximum pipeline pressures or to maintain a minimum back pressure in a system. It was pioneered along with extensive testing by a major pipeline. It has proven to be reliable, rugged and very responsive in controlling pipeline surges and pressures. The Model 762 Valve is not pilot operated. It incorporates an integral oil reservoir mounted on the external surface of the valve cylinder head, which upon installation, is partially filled with a light oil. Gas under pressure is applied to the reservoir. The oil is a moveable barrier between the gas and the valve piston.

⚠ WARNING

Do not operate this instrument in excess of the specifications listed. Failure to heed this warning could result in serious injury and/or damage to the equipment.

DESIGN FEATURES

- Modular construction
- No diaphragm or stuffing boxes
- Linear control characteristics
- Exceptionally fast response speed
- Positive shut-off
- High flow capacity
- Balanced piston design
- No pilot controls
- Can pass dirty or viscous products
- Screwed seat rings on all sizes

PRINCIPLE OF OPERATION

The Model 762 is normally closed and opens on increasing inlet pressure. The basic valve is of the balanced piston operated design. Refer to Typical Installation Schematic (Figure 1). Pressure applied to the nose of the piston is equally transmitted to the spring side of the piston. When the line pressure on the nose of the piston exceeds the gas pressure, the moveable barrier of oil compresses the gas, and the valve opens. As line pressure falls below set point, the gas pressure, added to the spring pressure closes the valve and it remains closed as long as gas pressure is greater than line pressure. Opening and closing speed are controlled by a check valve mounted to the internal surface of the cylinder head. Opening speed is relatively unrestricted which results in very fast opening response. Closing speed is controlled by a fixed orifice in the check valve.

VALVE CAPACITY DATA

Valve Size	2"	3"	4"	6"	8"	10"	12"
*Cv - gpm	86	186	309	688	1296	2040	2,920

For capacities and pressure drops, please consult Bulletin DSVALVEC_v "Capacity Charts for Valve Sizing."
*C_v based on wide open valve utilizing water at 60°F (15.6°C).

FLANGE CONNECTIONS / RATINGS (DIN)

Valve Size	DIN PN16 MAX. WORKING PRESSURE @ 120°C	DIN PN25 MAX. WORKING PRESSURE @ 120°C	DIN PN40 MAX. WORKING PRESSURE @ 120°C	DIN PN64 (300 lbs.) MAX. WORKING PRESSURE @ 38°C	DIN PN64 (600 lbs.) MAX. WORKING PRESSURE @ 120°C	DIN PN100 MAX. WORKING PRESSURE @ 38°C
DN50 - DN300	16 bar	25 bar	40 bar	51 bar	64 bar	100 bar

Temperature Range: -20°F to 150°F (-29°C to 66°C) Optional 250°F (121°C)

FLANGE CONNECTIONS / RATINGS (ANSI)

Valve Size	MAXIMUM WORKING PRESSURE @ 100° F		
	150 lbs. ANSI	300 lbs. ANSI	600 lbs. ANSI
2" - 12"	285 psi	740 psi	1480 psi

EMERSON. Process Management

MATERIALS OF CONSTRUCTION

Main Valve Body
Steel - ASTM-A216- GR-WCB
Main Valve Cylinder
2"-4" Stainless Steel on 150lb. and 300lb. valves.
6"-12" Steel, Nickel Coated on 150# and 300# valves.
Main Valve Piston
2"-6" Stainless Steel on 150lb. and 300 lb. valves.
8"-12" Bronze on 150lb. and 300lb. valves.
Optional Stainless Steel
Seat Ring
2-6" Stainless Steel on 150lb. and 300lb. valves.
8-12" Steel nickel coated on 150lb. and 300lb. valves.
Stainless Steel on 600lb. valves
O-Rings
Viton† Dynamic, Buna-N† Static are standard.
Other O-rings available are Neoprene†, EPR, all Viton, all Buna-N
Other internal parts
Stainless Steel
Reservoir - Carbon Steel

PRESSURE DROP

Refer to Bulletin DSVALVEC$_v$

RECOMMENDED SPARE PARTS

O-Rings

TYPICAL APPLICATIONS

A) Pipeline Pressure and Surge Relief

Product movement by pipeline requires over-pressure protection. Response time to pressure rise is very critical. Many times a pilot operated or a conventional direct operated spring biased relief valve cannot react fast enough to limit surge pressure to a desirable level. The Model 762 will respond very fast and only relieve the necessary volume of product to decrease pipeline pressure to or below set-point. The typical application schematic shown, (Figure 1), is very common for pipeline use. Surges and excess pressure are normally caused by: (1) Inadvertently closing a main line valve, (2) Closing a main line valve too fast, (3) Pump startup, (4) Stopping a pump with potential reverse flow, (5) Failure of a pipeline booster pump.

In addition, the following factors can become very important with pipeline aging which reduces the maximum surge pressure it can withstand. A) Wear from product movement, B) Internal and external corrosion, C) Frequency and amplitude of surge and shock pressures.

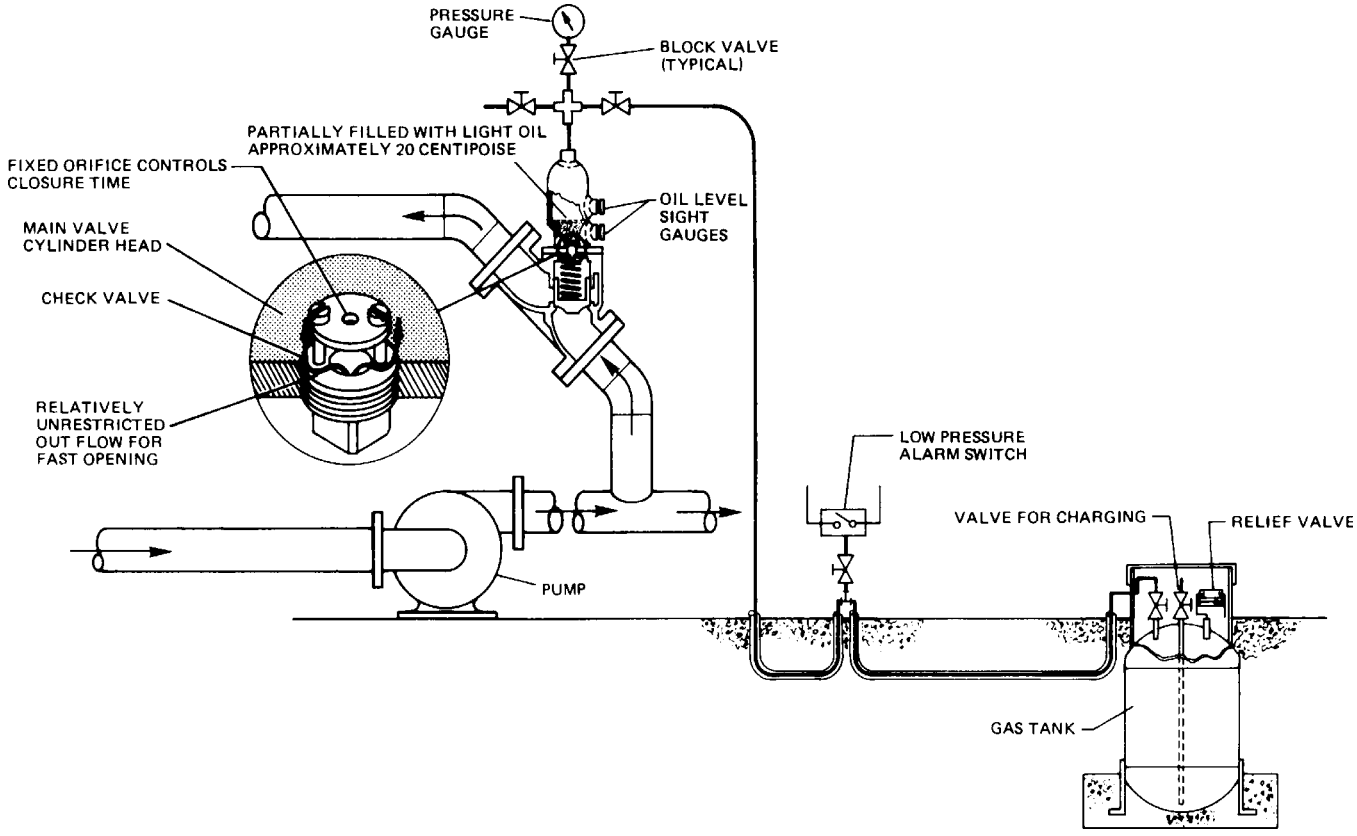


Figure 1 Excess Pressure and Surge Relief or Pump By-Pass Control

B) Back Pressure Control

The Model 762 is ideally suited for back pressure control and minimum pressure drop. When line pressure exceeds the gas pressure, the valve will open and follow the CV curve for pressure loss.

Typical applications for minimum back pressure control requirements are (Reference Figure 2):

A) Turbine Meters (Reference API Chapter 5) minimum back pressure requirements.

B) On the end of a pipeline or any point along the pipeline where the upstream pressure is subject to drop below minimum requirements.

C) Discharge of centrifugal pumps to maintain maximum efficiency and to start against a closed valve.

C) By-Pass Pressure Control

The Model 762 is ideally suited for constant pump by-pass control to regulate pump discharge pressure. Also, in this application, the valve will control surges. (Reference Figure 1).

D) Pipeline Pump Station By-Pass

Most pipeline have booster pumps at intervals along the pipeline. If a pump station is shut-down, it must be by-passed or the entire pipeline is subject to being shut-down. The Model 762 valve, when installed as shown in Figure 3 will automatically open and by-pass the pump station when line pressure exceeds set point.

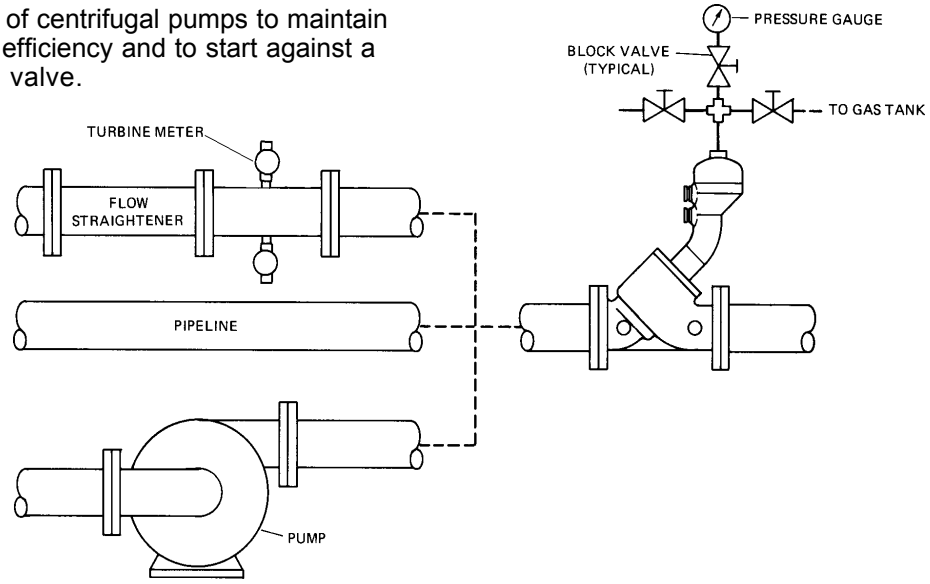


Figure 2 Back Pressure Control

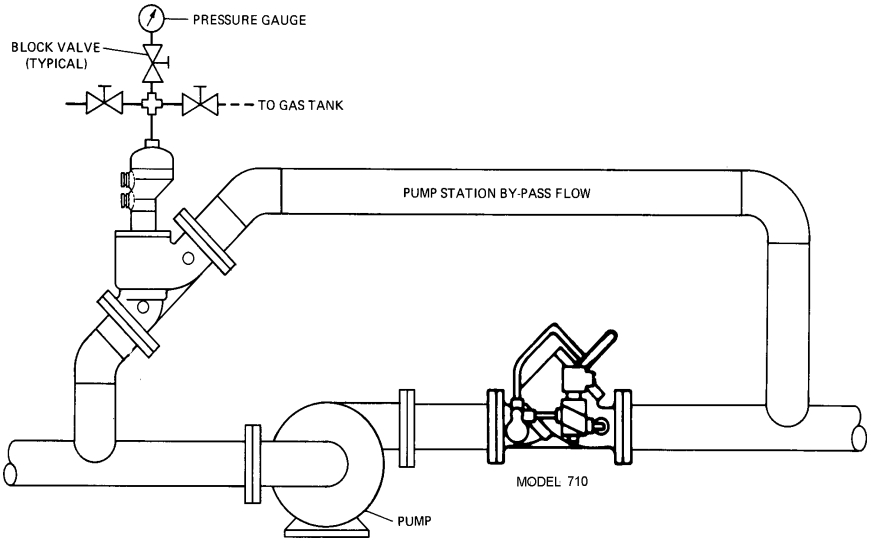
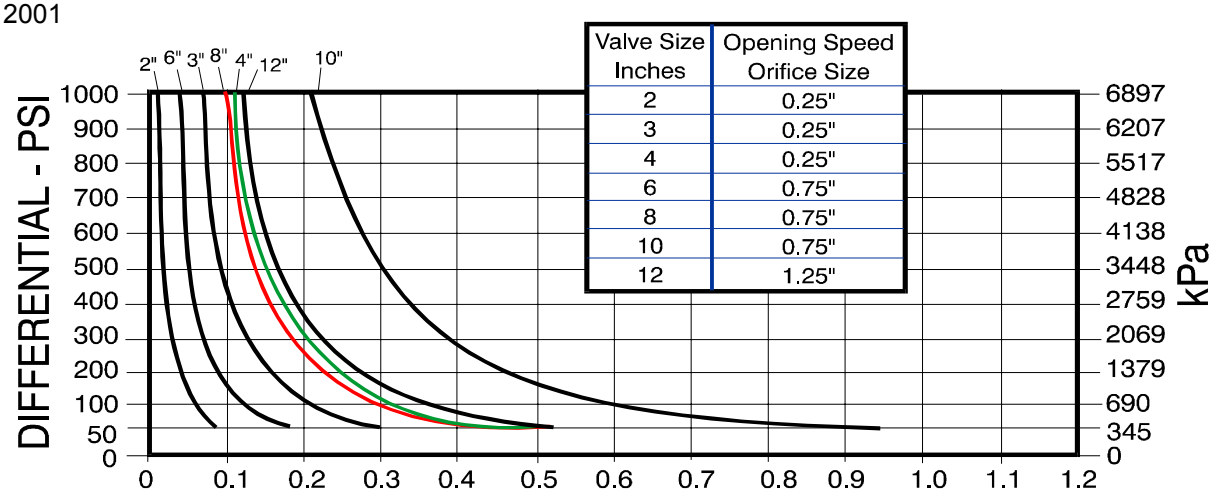


Figure 3 Pipeline Pump Station By-Pass



Valve Size Inches	Opening Speed Orifice Size
2	0.25"
3	0.25"
4	0.25"
6	0.75"
8	0.75"
10	0.75"
12	1.25"

Figure 4 Typical Valve Opening Time

INSTALLATIONS

The schematic, (Figure 1), shows the valve mounted at a 45^0 angle position. This is the preferred orientation, so that the piston is vertical. This distributes the weight of the piston equally and gives equal resistance to piston O-Ring movement. Standard horizontal mounting is available. Whether mounted at 45^0 or horizontal, the oil reservoir is in a vertical position. The type of mounting must be specified.

OIL RESERVOIR

The Oil Reservoir is supplied with two (2) sight gauges. In a closed position the oil is visible only at the lower sight gauge. Should oil be visible in the upper sight gauge, this indicates line product is leaking into the reservoir or that valve is open. If no oil is visible in the lower sight gauge, this indicates the reservoir oil is leaking into the product stream.

OIL SPECIFICATIONS

Use a light weight non-detergent oil between 5-30 Centipoise based on climate conditions of user.

The oil to fill the reservoir, gas tank, pressure switch and other interconnecting pieces are to be supplied by the user.

OPENING/CLOSING SPEED

The opening speed of the valve is virtually unrestricted. Closing speed is standard at three (3) seconds from a full-open position, based on gas pressure being 25 psi (1724 kPa) above line pressure. The fastest closure is limited to 0.5 seconds at 1500 psi (10,342 kPa) differential pressure to protect the piston and seat ring. For closure speeds longer than three (3) seconds, we can change the orifice size to match the customers requirements. It should be noted that the calculated closing speeds are a function of the viscosity of the oil in the reservoir. See Oil Specifications for recommended oil. Typical valve opening times are illustrated in Figure 4.

GAS TANK INSTALLATION AND SIZING

The Gas Tank should be buried underground to keep the gas at a constant temperature. Thermal expansion, caused by the increases in temperature of the gas, will change the relief set point.

The effective volume of the gas tank decreases as the valve opens by an amount equal to the piston displacement. The size of the gas tank determines the percentage that the pressure relief set point will change as the valve opens. For example, a 12" valve piston displacement is 554 cubic inches from a closed to an open position. Thus, when fully opened, an equal amount of gas is contained in a volume that is decreased by 554 inches. From Boyles Law, we can see the proportional increase in pressure as: $P_1V_1=P_2V_2$. For example, a 12" valve piston displacement is 554 inches from a closed to an open position.

Before the gas tank is sized, determine:

1. Set point (psi)
2. Valve size
3. Acceptable over-pressure (psi)

VOLUME DISPLACEMENT OF MAIN VALVE PISTON

Valve Size	Cubic Inches	Valve Size	Cubic Inches
2"	3.7	8"	165
3"	12.6	10"	347
4"	20	12"	554
6"	66		

Example of tank sizing assuming adiabatic compression:

$$V_1 = \frac{\left[PD\left(\frac{P_2}{P_1}\right)^{.709} \right]}{\left[\left(\frac{P_2}{P_1}\right)^{.709} \right] - 1}$$

P_1 = Valve required set pressure, valve closed.
P_2 = Maximum allowable overpressure, valve open.
V_1 = Total Gas Volume (gas chamber and volume behind main valve piston)
PD = Volume displacement of main valve piston
Exponent = .709 derived from K factor of Nitrogen (1.41).

No consideration is given to volume of gas contained in tubing, fittings and the top portion of the valve itself.

Example (12" Valve)
P_1 = 640 psi set point required, minus 4 psi spring load plus 14.7 psi (adjustment to absolute) = 650.7 psi.
P_2 = 680 psi maximum allowable over-pres sure, minus 6 psi spring load plus 14.7 psi (Adjustment to absolute) = 688.7 psi.
V_1 = Unknown
PD = 554 cubic inches.

$$V_1 = \frac{576.74779}{.041061} = 14046.121 \text{ Cubic Inches}$$

$$V_1 = \frac{14046.121}{231 \text{ Cubic Inches per U.S. Gallon}} = 60.80 \text{ U.S. Gallon Tank Volume}$$

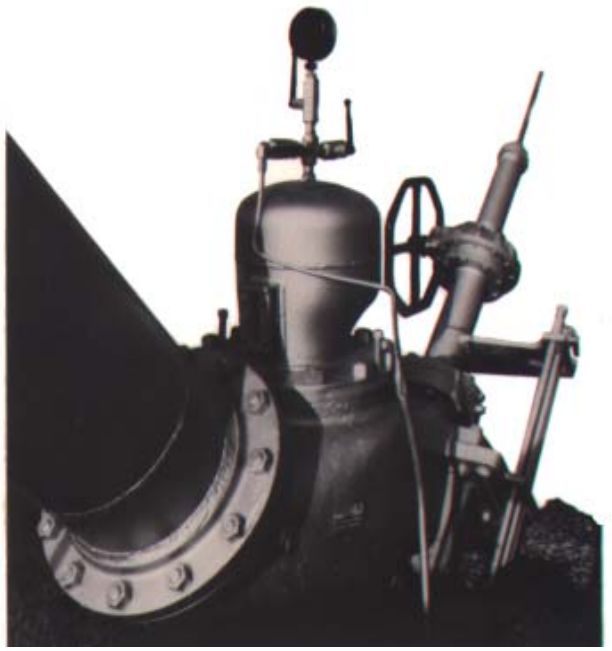
NOTE: Valve is fitted with light piston spring which provides:

4 psi Preload with valve closed
6 psi Preload with valve open

This 4 & 6 psi Preload must be subtracted from P1 & P2, respectively, to arrive at actual gas pressure.

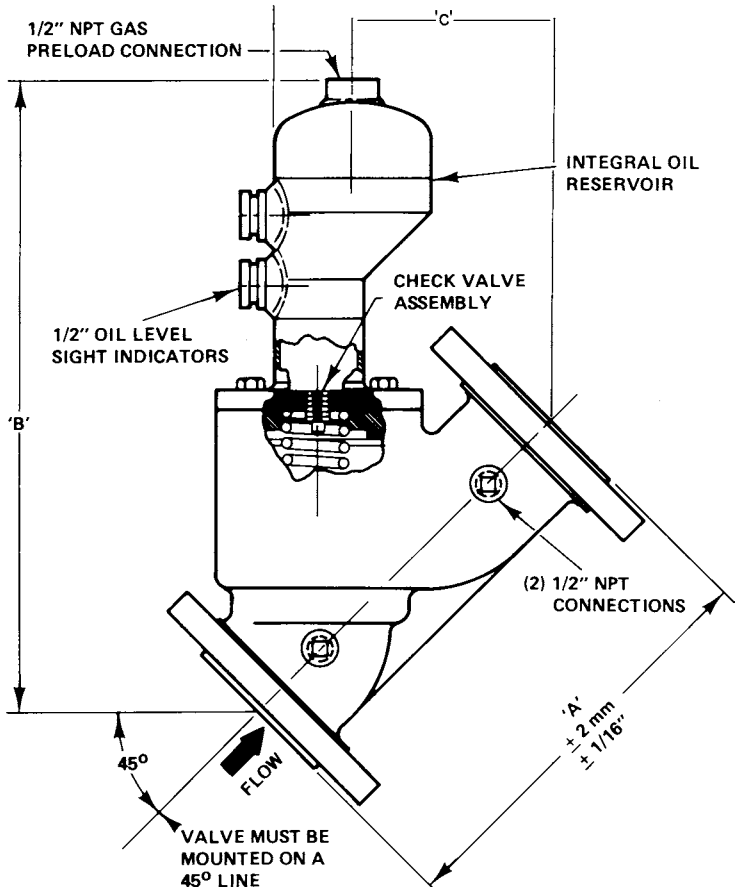
PRESSURE SWITCH

The valve will open any time gas pressure is less than line pressure. A pressure switch is recommended in the gas supply line to the valve for alarm actuation an alarm should gas pressure decrease below an acceptable operating level.



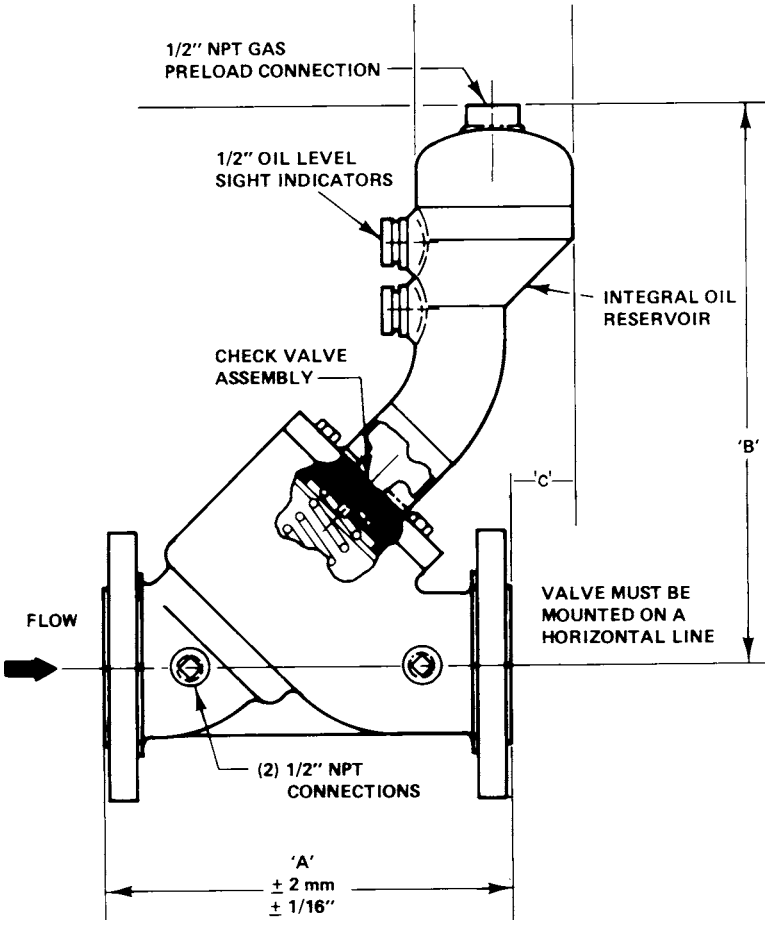
Typical Pipeline (45⁰) Installation

DIMENSIONS - 45⁰ IN-LINE INSTALLATION (For certified dimension - prints consult factory)



Valve Size	DIMENSION A (ANSI Flanges)						DIMENSION B (ANSI Flanges)						DIMENSION C (ANSI Flanges)					
	150 lbs.		300 lbs.		600 lbs.		150 lbs.		300 lbs.		600 lbs.		150 lbs.		300 lbs.		600 lbs.	
	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm
2"	10 1/4	260	10 1/2	267	11 1/2	292	15 1/2	394	15 1/2	394	16 1/8	410	5 1/2	140	5 3/8	137	5 3/4	146
3"	11	279	13 1/8	333	14	356	18 5/8	473	20 1/4	514	20 1/4	514	5 3/8	137	6 1/4	159	7 1/8	181
4"	13	330	14 1/2	368	17	432	19 1/4	487	19 1/4	502	27 1/2	699	6 3/4	171	7 1/4	184	8 5/8	219
6"	17	432	17 7/8	454	22	559	25 5/8	151	25 7/8	657	27 3/4	705	8 5/8	219	8 3/4	222	10 1/2	267
8"	22 1/4	565	23 1/4	591	26	660	29 7/8	759	30 1/4	768	32 3/4	832	10	254	11 1/4	286	12 5/8	321
10"	26 1/2	673	27 7/8	708	31	787	35 1/4	895	36 1/4	921	39	991	12	305	13 3/8	340	17 1/2	445
12"	30 7/8	784	33 5/8	854	36 1/2	927	42 3/4	1086	43 5/8	1108	45 1/2	1156	15 1/2	394	16 3/4	425	18	457

DIMENSIONS - HORIZONTAL INSTALLATION (For certified dimension prints - consult factory)



Valve Size	DIMENSION A (ANSI Flanges)						DIMENSION B (ANSI Flanges)						DIMENSION C (ANSI Flanges)					
	150 lbs.		300 lbs.		600 lbs.		150 lbs.		300 lbs.		600 lbs.		150 lbs.		300 lbs.		600 lbs.	
	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm
2"	10 1/4	260	10 1/2	267	11 1/2	292	14 1/8	359	14 1/8	359	5/8	16	5/8	16	3/4	19	1/4	6
3"	11	279	13 1/8	333	14	356	16 3/4	425	18 1/8	460	2 3/8	60	2 3/8	60	1 1/2	38	1 1/4	32
4"	13	330	14 1/2	368	17	432	17 5/8	448	18 1/2	470	1 1/4	32	1 1/4	32	1/2	13	--	--
6"	17	432	17 7/8	454	22	559	23 3/8	594	23 7/8	606	2 3/8	60	2 3/8	60	2	51	1/8	3
8"	22 1/4	565	23 1/4	591	26	660	27	686	28 1/8	714	3 3/8	86	3 3/8	86	1 5/8	41	3/4	19
10"	26 1/2	673	27 7/8	708	31	787	32 1/2	806	33 1/2	851	4	102	4	102	1 1/2	38	1	25
12"	30 7/8	784	33 5/8	854	36 1/2	927	38 3/4	984	39 3/8	1000	3 5/8	92	3 5/8	92	2 1/8	54	1 1/8	29

SHIPPING WEIGHT AND VOLUME (Approximate)

	150-300 lb. ANSI		600 lb. ANSI		150-300 lb. ANSI		600 lb. ANSI	
Size	lbs.	Kg.	lbs.	Kg.	Cubic Feet	Cubic Meters	Cubic Feet	Cubic Meters
2"	63	29	103	47	1.26	0.036	1.43	0.04
3"	113	51	158	72	2.11	0.06	2.25	0.063
4"	148	67	213	97	2.66	0.075	4.23	0.12
6"	268	122	423	192	5.12	0.145	7.19	0.204
8"	493	224	363	165	9.84	0.279	11.84	0.335
10"	743	337	1225	556	16.32	0.462	20.45	0.579
12"	1278	580	1883	854	26.83	0.76	33.29	0.943

PURCHASE SPECIFICATIONS

These valves shall be normally closed and only open when line pressure exceeds the gas loaded bias pressure applied to the integral reservoir of the valve. The gas loaded bias pressure must be equal to the desired set point. There shall be no unbalanced forces. The integral oil reservoir shall include two (2) sight gauges for visual indication of the oil level. Opening and closing speeds shall be factory set with no external adjustments. The basic valve shall be of the balanced piston design with linear control characteristics. It shall be single seated with 45^0 body construction. All internal parts, including cylinder, piston and seat ring shall be removed as a cartridge assembly without disturbing line connections. These valves shall, in all respects, be similar or equal to Model 762 Gas Loaded Relief/Back Pressure Valve.

ORDERING INFORMATION

When ordering, the following information must be supplied:

1. Size
2. Product, product viscosity, product specific gravity
3. Minimum and maximum operating temperature
4. Minimum and maximum flow rate
5. Minimum, normal and maximum operating pressure
6. Control functions to be performed
7. Flange connections (150, 300, 600 lbs. ANSI)
8. O-Ring Material
9. Type of Mounting (45^0 or horizontal)
10. Main valve piston material
11. Optional Equipment

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