Valve Concepts, Inc.

TECHNICAL BULLETIN

1088 - TB
06-05

Model 1088

Vacu-Gard® Tank Blanketing Valve
1/2" (DN15)

1/2" Model 1088

The Model 1088 is a valve specifically designed for tank blanketing. It opens and closes automatically as required, to maintain a closely controlled blanket pressure. The simple design, increases reliability and lowers maintenance cost.

TYPICAL APPLICATIONS

- Blanketing of small tanks

FEATURES

- Single valve system
- Compact & light weight
- Pressure-balanced trim
- Supply pressure fluctuations do not affect set point
- Uses standard o-rings
- Bottom entry design for easy maintenance
- Set points from vacuum to 14 psig
- Self cleaning flow design
- Temperature changes have no appreciable effect on set point

BENEFITS

- Lower maintenance costs due to fewer parts
- Inexpensive replacement parts
- Standard valve material provides added corrosion protection at no additional cost
- Valve design ensures integrity and protects against injury to personnel
- Bubble tight at set point prevents waste of blanketing gases

ISO 9001 Registered

GENERAL SPECIFICATIONS

Sizes

1/2" (DN15)

Connections

1/2" FNPT (screwed)
1/2" 150# & 300# RF threaded flanges with nipples
1/2" 150# & 300# RF welded flanges
DN15 (PN40) welded flanges
Any combination of above

Larger size reducing flanges are available on request.

Outlet Configurations

Horizontal or Vertical

Valves with FNPT or nipple and threaded flange connections can be configured in the field. Valves with welded flange connections, configuration must be specified at time of order.

Sensing Options

Remote sensing
Integral dip tube sensing
Internal sensing

Supply Pressures

Minimum: 10 psig (1.83 Bar)
Maximum: 200 psig (13.83 Bar)

Capacities

See Table 6

Outlet Pressure Ranges

See Table 3

Maximum Back Pressures

25 psig (1.7 Bar) – standard
Higher pressures on request

Materials of Construction

Body Material:
316 SST
Diaphragm Case Material:
Carbon Steel (Powder Coated)
316 SST
Trim Material:
316 SST
Diaphragm Material:
Teflon®
Soft Seat & Seals:
Fluorocarbon Elastomer – standard, Buna-N, Chemraz®, EPDM or Kalrez®
On request elastomers to FDA requirements

Temperature Limits

Fluorocarbon Elastomer – (FKM)
0° to 212° F (-17° to 100° C)
Buna-N (Nitrile-NBR):
-40° F to 180° F (-40° C to 82° C)
EPDM (Ethylenepropylene):
-50° F to 212° F (-45° C to 100° C)
Chemraz® (Perfluoroelastomer-FFKM):
0° F to 212° F (-18° C to 100° C)
Kalrez® (Perfluoroelastomer-FFKM):
0° to 212° F (-18° to 100° C)

Approximate Weights

1/2" Model 1088 FNPT:
12 lbs (5.4 kg)
1/2" Model 1088 Flanged:
17 lbs (7.7 kg)

CAPACITY REQUIREMENTS

The capacity requirement of the tank blanketing valve is the sum of two components. The first being inbreathing due to liquid or product movement out of the tank and the second being inbreathing due to contraction of the vapors/product because of weather changes.

Inbreathing due to maximum liquid or product movement out of the tank equals 8.0 SCFH of air for each US gallon per minute of maximum emptying rate or 0.94 Nm^3/h of air for each m^3/h of maximum emptying rate.

Q displacement (SCFH) = Max. Pumpout Rate (gpm) x 8.0

or

Q displacement (Nm^3/h) = Max. Pumpout Rate (m^3/h) x .94

The second component, inbreathing due to weather changes, is selected from Table 5 (Table 5A). The tank capacity is found in column 1 and the corresponding inbreathing requirement is selected from column 2.

The two components are added together to give the total inbreathing requirement and the capacity requirement of the tank blanketing valve.

Q total = Q displacement + Q thermal

VALVE SELECTION

If the tank blanketing supply pressure varies, use the minimum supply pressure in selecting the tank blanketing valve and the maximum supply pressure to determine blanketing valve failure capacity. Go to Table 6 to determine the capacity at the minimum supply pressure. This capacity must be equal to or greater than the Total Inbreathing Requirement (Q total).Next determine if a reducing "flow plug" can be used to make the capacity of the tank blanketing valve more closely match the inbreathing requirements. This will also reduce the fail open capacity of the blanketing valve. This is done by dividing the required inbreathing (Q total) by the full capacity of the size valve selected and multiplying by 100. Now from Table 2 choose the flow plug that is greater than the calculated percentage.

Example:

Total inbreathing requirement (Q total) = 1,000 SCFH
Maximum supply pressure = 100 psig
Minimum supply pressure = 80 psig
The 1088 flows 1,318 SCFH at 80 psig.

At the maximum supply pressure of 100 psig, use Cv of 1.1 or fail open flow, which is needed when sizing the pressure relieving device.

NORMAL INSTALLATION

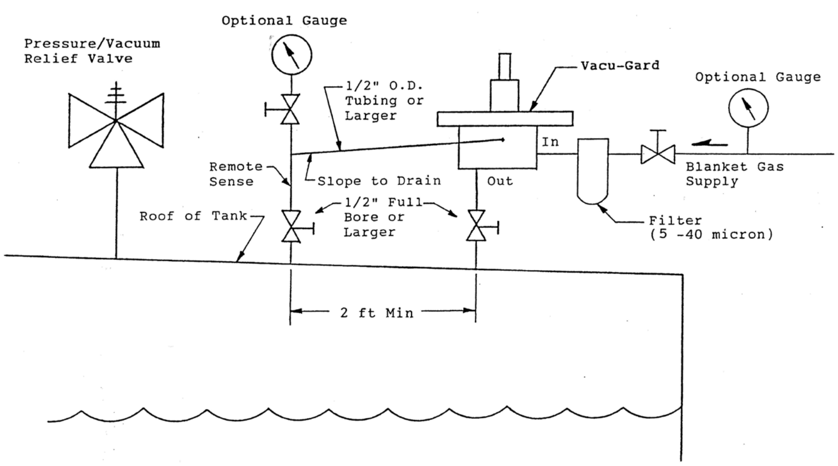


TABLE 1						
STANDARD MATERIALS OF CONSTRUCTION						
VALVE SIZE	**MAIN BODY**	**DIAPHRAGM CASE**	**SPRING BONNET**	**VALVE TRIM**	**SENSE DIAPHRAGM**	**SPRING (2 places)**
1/2" Std Valve	316 SST	CS	CS	316 SST	Teflon®	316 SST
1/2" SST Valve	316 SST	316 SST	316 SST	316 SST	Teflon®	316 SST
Other material combinations are available upon request.						

TABLE 2	
Cv Values	
Normal Flow	**Fail Open Flow**
0.4	1.1

TABLE 3	
OUTLET PRESSURE RANGES	
OUTLET PRESSURE RANGES	**SPRING COLOR**
0" to 5" WC	Yellow
5" to 14" WC	White
14" to 30" WC	Black
1.0 to 1.5 psig	Red
1.5 to 3.0 psig	Red
3.0 to 14.0 psig	Red
0" to 1-1/2" WC (vac)	Yellow
1-1/2" to 6" WC (vac)	Yellow
* Other spring ranges available upon request.	

VALVE OPERATION

The Vacu-Gard Model 1088 is a direct spring-operated pressure reducing valve. Below demonstates the three sensing options available.

Set pressure is defined as the pressure at which the valve will be fully closed on increaseing tank pressure during a normal operating cycle to inject needed blanket gas. Whenever the pressure in the sense chamber falls below the set pressure, the set pressure spring located above the sense diaphragm will push downward to unseat the spindle. This will allow inlet pressure to flow across the spindle seat and out through the outlet port. When the pressure in the sense chamber is sufficient to overcome the force of the set pressure spring the spindle will move upward to close the seat and stop the flow.

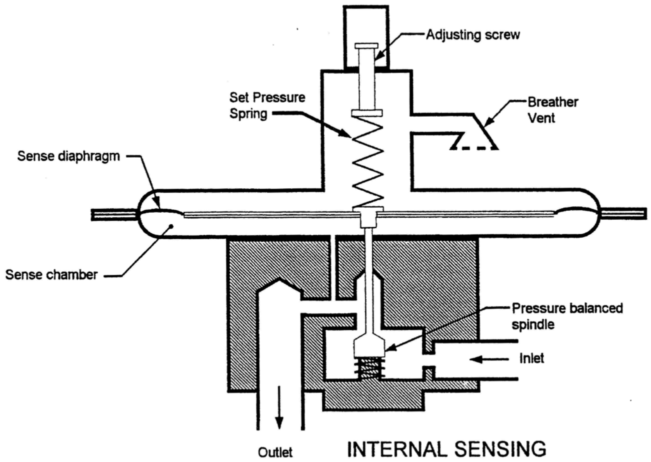
The internal sensing valve senses the outlet pressure just downstream of the seat. The flow here is very turbulent. This results in a pressure reading higher than actual tank pressure resulting in reduced flow capacity. This is most noticable at low setpoints.

The integral dip-tube sensing valve senses the tank pressure through the use of a dip-tube that protudes below the tank roof.

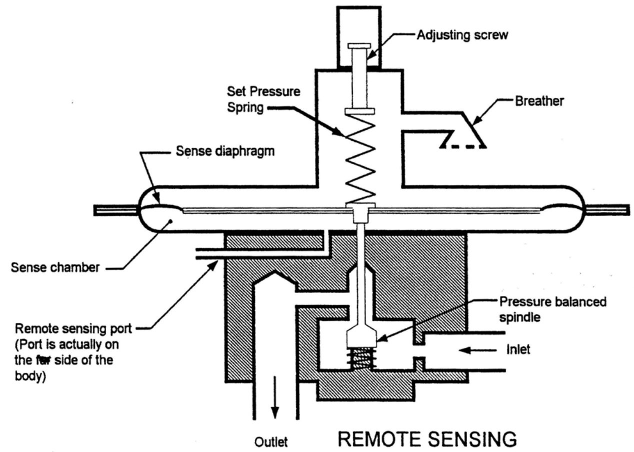
The remote sensing valve senses the tank pressure remotely through the remote sense port.

The sense chamber is not a dead ended chamber. therefore, whenever the valve is open, there is a very small flow from the seat up into the sense chamber. Any pressure that gets into the sense chamber from this path must be able to get out rapidly through the sense port, otherwise, a build up of pressure in the sense chamber will occur, causing the valve to close prematurely. For this reason, remote sense lines and valve discharge piping must be large enough to carry away this pressure.

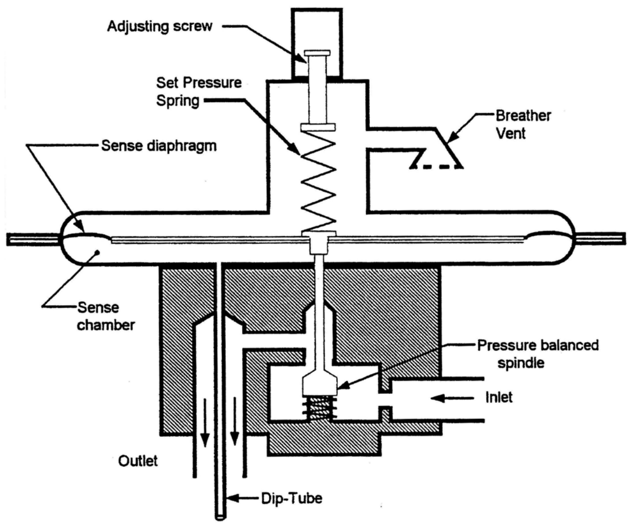
Model 1088 Vacu-Gard Tank Blanketing Valve Sensing Options



INTERNAL SENSING
(capacity limitations)



REMOTE SENSING



INTEGRAL DIP-TUBE
SENSING

STANDARD INFORMATION

The tank blanketing valve is not a substitute for the vacuum relief device.

API Standard 2000 states, "The design of a gas-repressuring system to eliminate the requirement for vacuum relief valves is beyond the scope of this standard and should be considered only when the induction of air represents a hazard equal to or greater than failure of the tank".

The tank blanketing valve failure must be taken into account when considering possible causes of overpressure in a tank.

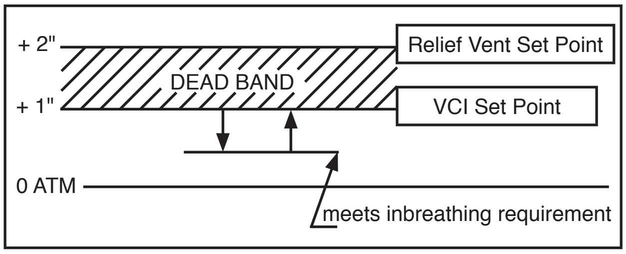
API Standard 2000 states, "When the possible causes of overpressure or vacuum in a tank are being determined, other circumstances resulting from equipment failures and operating errors must be considered and evaluated by the designer." Failure of the tank blanketing valve can result in unrestricted gas flow into the tank, reduced gas flow or complete loss of the gas flow.

Tank blanketing valve set point definition is not the same for all manufacturers.

Valve Concepts defines set point as the point where the tank blanketing valve is closed bubble tight!

Some manufacturers define the set point as where the blanketing valve opens and the valve requires a pressure above the set point in order to close completely. Others define set point somewhere in between opening and closing but still the pressure must go above the defined set point in order to close completely.

The following example illustrates Valve Concepts definition of set point:



As can be seen from the illustration, the Vacu-Gard gives the greatest dead band between the blanketing valve set point and the relief vent set point.

ADDITIONAL FEATURES

Maintenance View Point:

The Vacu-Gard® Tank Blanketing Valve was designed for years of maintenance free operation and has years of proven field experience. In fact the first valve ever manufactured is still in service! But if service should be required the Vacu-Gard® makes it easy. Here are just a few points:

• Every bolt on the Vacu-Gard® is identical; in fact, every nut, flat washer and lock washer is identical.

• All seats and seals are standard o-rings. This makes repair kits inexpensive and readily available.

• The Vacu-Gard® has a bottom entry design. This allows complete access to the valve without being removed from the tank.

• The only time the diaphragm case needs to be disassembled is when replacing the diaphragm.

• The valve set point and performance can be verified 100% on the tank, without removal and without flowing supply gas into the tank.

Application View Point:

The Vacu-Gard® Tank Blanketing Valve was designed to reduce blanketing gas losses on low-pressure storage tanks, provide flexibility to fit the application and simplify the selection process.

• On many low-pressure storage tanks the operating range is very low, which makes blanketing and venting system selection/design a challenge for the engineer. The Vacu-Gard® makes the job much easier. First, the Vacu-Gard® set point definition is where the blanketing valve closes bubble tight. This gives the largest dead band between the blanketing valve set point and the set point of the relieving device, and therefore will reduce losses. Second, the Vacu-Gard® has a wide range of available settings, from vacuum to 14 psig, that make proper selection easier.

• Because the Vacu-Gard® uses standard o-rings, selection of the proper elastomers for the application is easy and inexpensive.

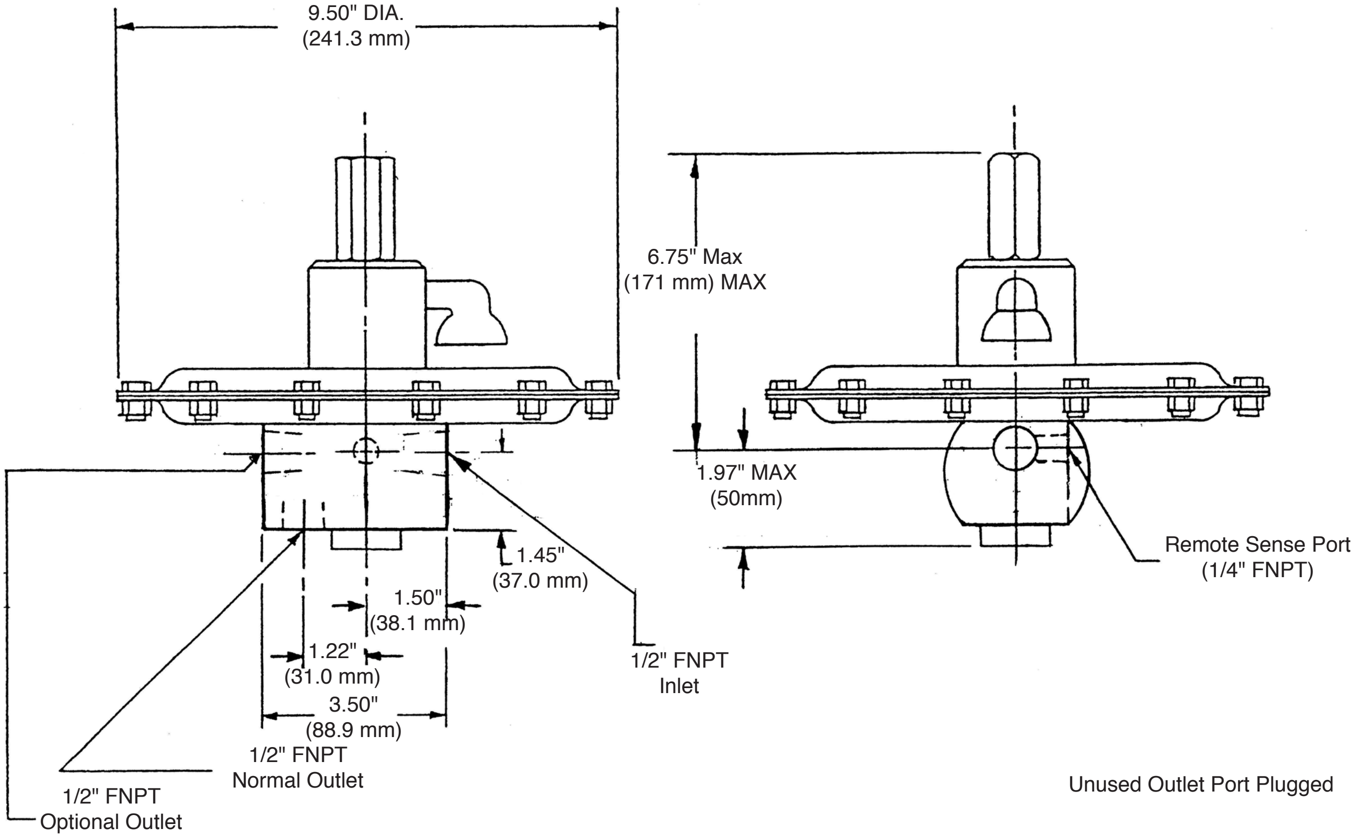
• The Vacu-Gard® offers a wide variety of configurations to meet every blanketing application.

TABLE 5					
REQUIREMENTS FOR THERMAL INBREATHING - ENGLISH UNITS					
(Column 1)		(Column 2)	(Column 1)		(Column 2)
TANK CAPACITY		INBREATHING	TANK CAPACITY		INBREATHING
Barrels	Gallons	SCFH Air	Barrels	Gallons	SCFH Air
60	2,500	60	35,000	1,470,000	31,000
100	4,200	100	40,000	1,680,000	34,000
500	21,000	500	45,000	1,890,000	37,000
1,000	42,000	1,000	50,000	2,100,000	40,000
2,000	84,000	2,000	60,000	2,520,000	44,000
3,000	126,000	3,000	70,000	2,940,000	48,000
4,000	168,000	4,000	80,000	3,360,000	52,000
5,000	210,000	5,000	90,000	3,780,000	56,000
10,000	420,000	10,000	100,000	4,200,000	60,000
15,000	630,000	15,000	120,000	5,040,000	68,000
20,000	840,000	20,000	140,000	5,880,000	75,000
25,000	1,050,000	24,000	160,000	6,720,000	82,000
30,000	1,260,000	28,000	180,000	7,560,000	90,000
NOTE: Table and sizing from API 2000 fifth edition, April 1998.					

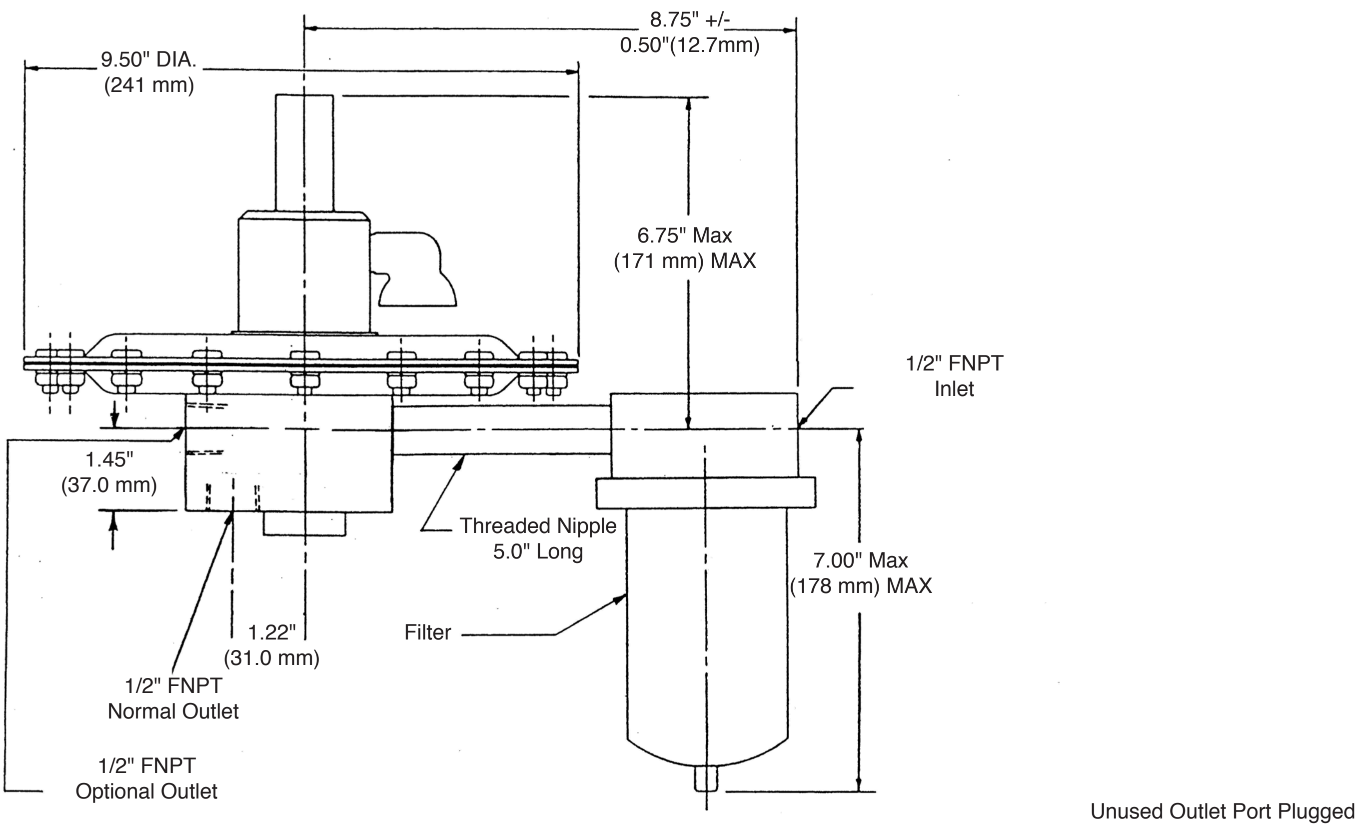
TABLE 5A			
REQUIREMENTS FOR THERMAL INBREATHING - METRIC UNITS			
(Column 1)	(Column 2)	(Column 1)	(Column 2)
TANK CAPACITY	INBREATHING	TANK CAPACITY	INBREATHING
CUBIC METERS	Nm3/H	CUBIC METERS	Nm3/H
10	1.69	5000	787
20	3.37	6000	896
100	16.9	7000	1003
200	33.7	8000	1077
300	50.6	9000	1136
500	84.3	10000	1210
700	118	12000	1345
1000	169	14000	1480
1500	253	16000	1615
2000	337	18000	1745
3000	506	20000	1877
3180	536	25000	2179
4000	647	30000	2495
NOTE: Table and sizing from API 2000 fifth edition, April 1998.			

TABLE 6	
TANK BLANKETING VALVE CAPACITIES	
INLET PRESSURE psig (Bar)	**CAPACITIES IN SCFH (Nm^3/h) OF AIR**
	1/2" MODEL 1088
10 (.7)	280 (7.5)
20 (1.4)	452 (12.1)
30 (2.1)	602 (16.1)
40 (2.8)	747 (20.0)
50 (3.4)	891 (23.9)
60 (4.1)	1,035 (27.7)
70 (4.8)	1,177 (31.5)
80 (5.5)	1,318 (35.3)
90 (6.2)	1,460 (39.1)
100 (6.9)	1,599 (42.9)
110 (7.6)	1,742 (46.7)
120 (8.3)	1,882 (50.4)
130 (9.0)	2,023 (54.2)
140 (9.6)	2,164 (58.0)
150 (10.3)	2,303 (61.7)
160 (11.0)	2,445 (65.5)
170 (11.7)	2,585 (69.3)
180 (12.4)	2,726 (73.1)
190 (13.1)	2,867 (76.8)
200 (13.8) MAX	3,005 (80.5)
Note: For internal sensing use 1/4 of values shown.	

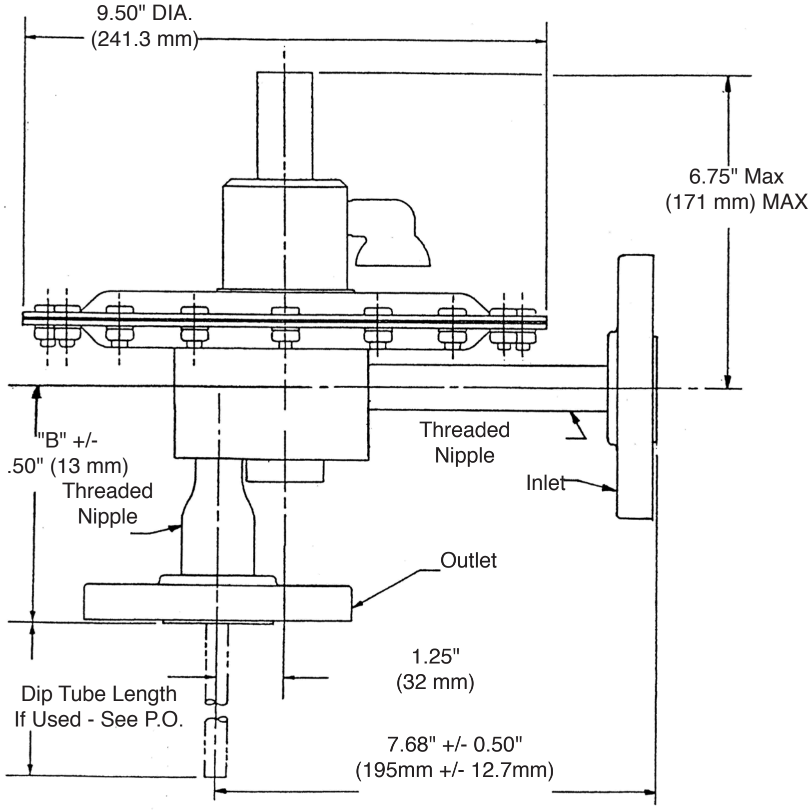
Model 1088 NPT Connection without Filter



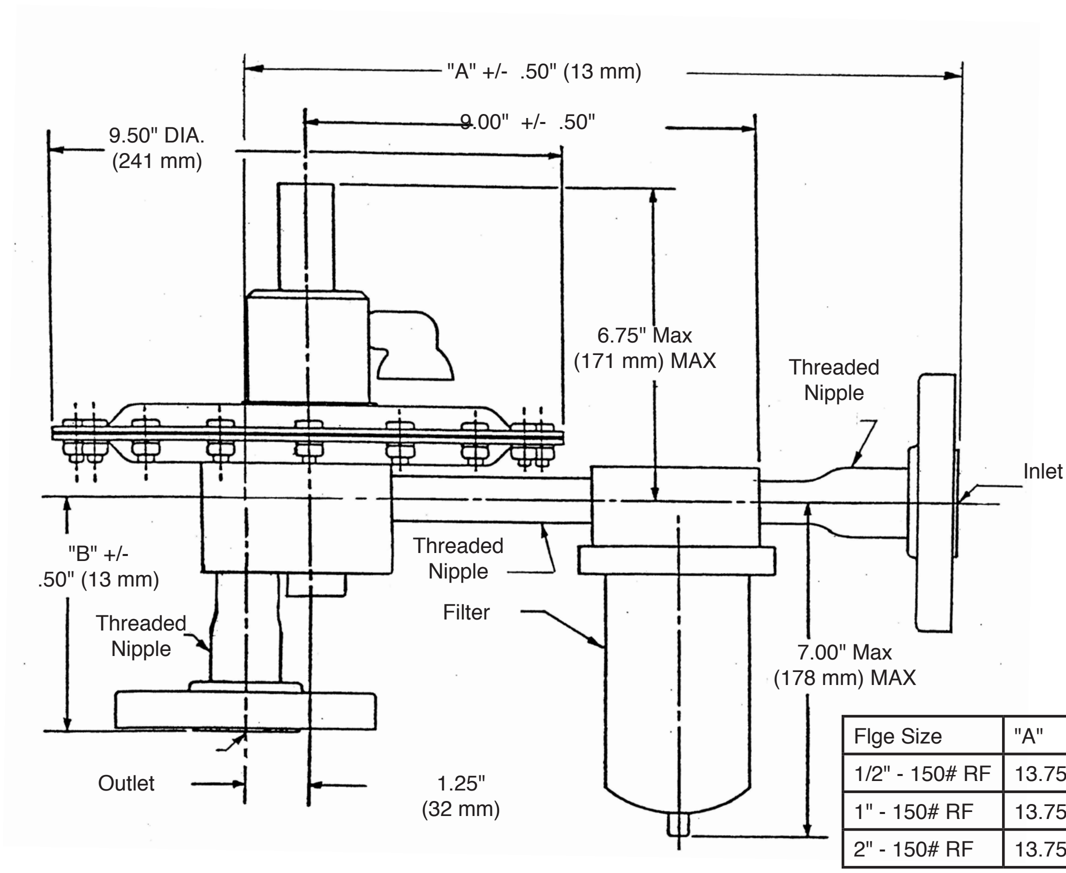
Model 1088 NPT Connection withFilter



Model 1088 Flanged Connection without Filter



Model 1088 Flanged Connection withFilter



Flge Size	"A"	"B"
1/2" - 150# RF	13.75" (349.3 MM)	4.75" (121 MM)
1" - 150# RF	13.75" (349.3 MM)	4.75" (121 MM)
2" - 150# RF	13.75" (349.3 MM)	4.75" (121 MM)

OPTIONAL FEATURES & ACCESSORIES

Supply Pressure Gauge

To provide local indication of supply pressure.

- Standard ABS gauge with carbon steel fitting.
- Stainless gauge with 316 SST fitting.

Control Pressure Gauge

To provide local indication of actual tank pressure.

- Standard Magnehelic® gauge with carbon steel fitting.
- Stainless gauge with 316 SST fitting.

Purge

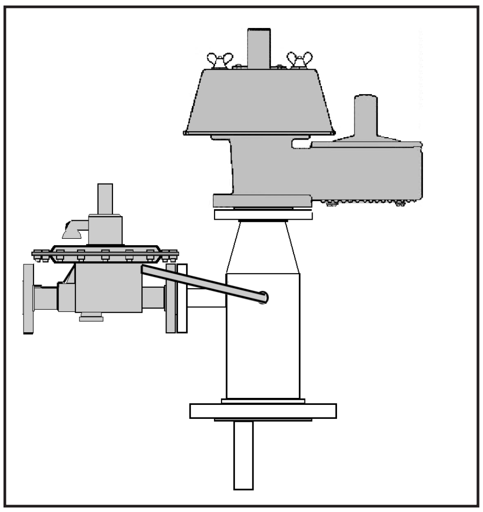
A purge is used to prevent tank vapors from entering into the valve. One Variable Area Flow meter (Rotameter) is used to purge both the sense line and the outlet. The combined flow is 1 - 1.5 SCFH. VCI advises the use of a purge when tank vapors may solidify or crystallize when cooled to ambient temperature.

A purge will also extend the service life of the valve if 316 SST is not compatible with the tank vapors.

- Standard Rotameter used has a 316 SST body with glass tube.

PV-Gard Manifold

The PV-Manifold allows for a very compact installation of a blanketing valve and vent valve on one single tank nozzle. Normally, an installation of this type requires at least three different nozzles; one for the blanketing valve, one for the vent valve, and one for the remote sensing for the blanketing valve. Using the PV-Manifold, only one tank nozzle is required.

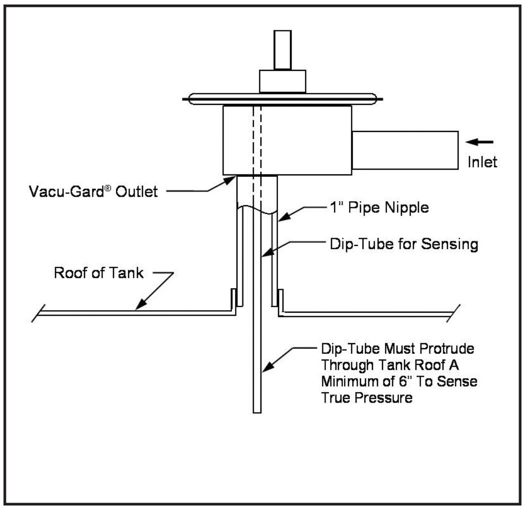


Sense with Dip Tube (patented)

This option provides a sense connection into the tank through the vertical outlet of the valve. This can be useful when no tank connection is available for the standard external sense.

The dip tube length should be sized so that it protrudes 6" to 8" below the tank roof into the tank.

- Standard material is 316 SST.



Inline Filter

The use of an inline filter is not required for regular blanketing gases. An inline strainer or filter can be provided in case the blanketing gas used is not sufficiently clean.

Model 1088 PRODUCT CODE 06/02/05
SPRING OPERATED VACU-GARD®

S	0	Table 1	Table 2	Table 3	X	Table 4	X	Table 5	Table 6	Table 7

TABLE 1 - OUTLET

Outlet	CODE
Horizontal	H
Vertical	V

TABLE 2 - SENSING

Sensing Options	CODE
Internal Sensing	2
Remote Sensing	3
Integral Dip-Tube Sensing	8

TABLE 3 - MATERIALS

Body Material	CODE
316 SST Body & CS Diaphragm Case	C
316 SST Body, Trim & Diaphragm Case	S
316 SST Body, CS Upper Diaphragm Case, All Wetted Surface 316 SST	W

TABLE 4 - END CONNECTIONS

End Connection	CODE
1" - 150# RF Flanges w/nipples	3
1/2" - 150# RF Flanges w/nipples	A
1/2 " FNPT	T

TABLE 5 - SEATS & SEALS

Material	CODE
Buna-N	B
Chemraz®	C
EPDM	E
Kalrez®	K
Viton®	V

TABLE 6 - RANGE SPRINGS

Spring Range	CODE
0.75" - 5.0" wc (1.9-12.4 mbar)	3
5" - 14" wc (12.4-34.8 mbar)	6
14" - 30" wc (34.8-74.7 mbar)	7
1 - 1.5 psig (69-103 mbar)	8
1.5 - 3 psig (103-207 mbar)	9
3 - 14 psig (0.2-0.96 bar)	H
1" - 1.5" wc vac (2.5-3.7 mbar)	A
1.5" - 6" wc vac (3.7-14.8 mbar)	C

TABLE 7 - EXTERNAL PILOT FILTER

Description	CODE
SST External Pilot Filter with Purge Meter	A
Alum/Zinc Filter w/ backflow preventer check valve	C
SST Filter w/ backflow preventer check valve	D
No Filter, with Purge Meter	N
Alum/Zinc Filter with Purge Meter	P
SST Filter	S
Alum/Zinc 1/2" FNPT Inlet Filter	W
No Filter (Standard)	X

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