PV Vent Valve Tester

TP-201.1E – NTE PV Tester

Leak Rate and Cracking Pressure of Pressure/Vacuum Vent Valves

PURPORA ENGINEERING

PROTANIC

A DIVISION OF STENSTROM

OPERATION MANUAL

PV Vent Valve Test - Thresholds

- The pressure specifications for PV vent valves
- a positive pressure setting of **2.5 to 6.0** inches of water and
- a negative pressure setting of **6.0 to 10.0** inches of water.

- The total leak rate of all PV vent valves at an affected facility including connections, shall not exceed
- **0.17 cubic foot per hour at a pressure of 2.0 inches of water** and
- **O.63 cubic foot per hour at a vacuum of 4 inches** of water.

- **40 CFR** Part 63, Subpart CCCCCC, Table 2 to Subpart CCCCCC of Part 63 - Applicability Criteria and Management Practices for Gasoline Cargo Tanks...Dispensing Facilities With Monthly Throughput of 100,000 Gallons of Gasoline or More

Four Test are required for each PV Vent Cap

Pressure Test

1. **Positive Leak Rate Test at 2.0” w.c.**

   Measures how much air (vapor) can leak past the valve when there’s a very low amount of pressure

2. **Positive Cracking Pressure at 120 ml/min**

   Measures the amount of pressure it takes to cause the valve to “open” up. After the valve “cracks” it won’t hold quite as much pressure.

Vacuum Test

3. **Negative Leak Rate Test at -4.0” w.c.**

   Measures how much air (vapor) can leak past the valve when there’s a very low amount of vacuum.

4. **Negative cracking pressure at 200 ml/min**

   Measures the amount of vacuum it takes to cause the valve to “open” up when the vacuum is building up. After the valve “cracks” it won’t hold as much vacuum.

EPA Thresholds for "Individual" Test

(unless other manufacture specifications apply)

Pressure Test

1. **Positive Leak Rate Test at 2.0" w.c.**
   Must be ≤ 23.6 ml/min (0.05 CFH)
2. **Positive Cracking Pressure at 120 ml/min**
   Must be between 2.5" – 6.0" w.c

Vacuum Test

3. **Negative Leak Rate Test at -4.0" w.c.**
   Must be ≤ 99.1 ml/min (0.21 CFH)
4. **Negative cracking Pressure at 200 ml/min**
   Must be between 6.0" and 10.0" w.c.

Caps must meet total leak rate requirements for entire site as well. See next page for details.

Threshold for "multi valves" at one site

In addition to passing individual test. The leak rates for all valves at each site must be added together. The total leak rate of all valves must meet the following:

1. **Positive Leak Rate Test at 2.0" w.c.**
   Must be ≤ 80.2 ml/min (0.17 CFH)

3. **Negative Leak Rate Test at -4.0" w.c.**
   Must be ≤ 297.3 ml/min (0.63 CFH)

Caps must meet individual specifications as well. See prior page for details.

Conversion Factors:
1 CFH = 471.95 ml/min
1 ml/min = 0.00212 CFH

Pre-Test Procedures

- **All pressure measuring device(s) shall be bench calibrated using reference gauge, incline manometer or NIST traceable standard at least once every six (6) months.**
  Calibration shall be performed at 20, 50 and 80 percent of full scale. Accuracy shall be within (5) percent at each of these calibration points.

- **Electronic pressure measuring devices shall be warmed up for a period of fifteen minutes and zeroed immediately prior to testing using the zero gauge pressure knob located on the instrument.**

- **The flow metering device(s) shall be calibrated using a reference meter or NIST traceable standard. Calibrations shall be performed at 20, 50 and 80 percent of full scale range and shall take place at a minimum of once every six (6) months.**

Pre-test: Leak Check

- **Leak Check the test stand or test assembly prior to installing the PV Valve.**

  - **Install a 2- inch cap onto the NPT threads in place of the P/V Valve using pipe sealant or Teflon tape. (or use test plug)**
  - **Check all fittings for tightness and proper assembly.**
  - **Slowly establish a stable gauge pressure in the test stand between 18.00 and 20.00 in water column and allow pressure to stabilize. (flow should stop if no leaks)**
  - **Check for leaks (if necessary) by applying a leak detection solution around all fittings and joints and observing the pressure for changes that may indentify a leak. If no bubbles form, the test assembly is leak tight. (do NOT get meters wet)**
  - **If soap bubbles form or the test assembly pressure will not stabilize (repeat the procedures above) ; it may also be necessary to place the test apparatus in an environment that is free from the effects of wind and sunlight. (or temperature)**

Equipment needed

- **PV Valve Tester uses a diffuser to operate the pressure and vacuum portion of the test putting it in a class by itself. It also uses a secondary regulator making it easier to control the flow of the pressure and vacuum.** (see test procedure for detail)

- **PV Valve Tester is built to work with the use of commercial grade gaseous nitrogen in a high pressure cylinder with a regulator valve.**

- **PV Valve Tester will need a 110 volt power outlet or 12 volt car adapter plug in.** (cigarette lighter port) **The unit is supplied with both adapters.**

- **Perform test in the shade and controlled atmosphere as much as possible. Direct sunlight and wind may impact results.**

Test Assembly Set-Up

1. **Remove unit from the case and set-up in a stabile atmosphere. (out of direct sunlight and wind)**
2. **Connect Digital flow meter to power source and allow 15 minutes to prior to test. (it is ready when unit is at zero) keep in an upright position at all times during test.**
3. **Place digital manometer next to test stand and connect tubing to the (high pressure) barb on the manometer and also to test stand. Make sure manometer units are set at INWC. (inches of water column)**
4. **Remove PV Vent Cap from the vent pipe and screw it onto the tester with teflon tape or pipe sealant, grease to get a good seal.**
5. **Unplug tubing to disconnect manometer from test stand to relieve any pressure or vacuum.**
6. **Zero out digital meters and then connect tubing to test stand.**
7. **Use nitrogen from cylinder and set regulator at 25-50 psi. (make sure secondary regulator or valve is closed)**
8. **Connect to test assembly for test procedures. (it may be necessary to increase pressure with regulator during the vacuum portion of the test)**

Positive Leak Rate Test

1. **Connect manometer to test column. Open valves to pressure position test then slowly adjust regulator until pressure stabilizes at 2” w.c. on digital manometer.**

2. **Stabilize for 10 seconds (+/- 0.05” w.c.)**

Positive Leak Rate Test

3. **Record flow rate in ml/min from digital flow meter**

4. **Multiply this number by 0.00212 to get flow rate in CFH**

7 X 0.00212=0.01484

Threshold is 0.05, therefore cap passes at 0.01

Must be < 23.6 ml/min or 0.05 CFH to pass
(unless other manufacture requirements apply)
AND total of all caps must be < 80.2 ml/min (0.17 CFH)

Positive Cracking Pressure

1. **Unplug the tubing on the manometer from the test stand assembly.**

2. **Open Valves on the pressure position. Increase pressure till flow meter reading is stabilized at 120 ml/min.**

3. **Attach manometer and tubing to test stand.**

Must measure between 2.5” and 6.0” w.c. to pass

Positive Cracking Pressure

4. **Observe Manometer while performing the above step 3.**

5. **Record highest pressure achieved before PV valve “cracks”. Repeat steps if necessary to record the average number on the form that is used to record results.**

In this case the “cracking pressure” is 3.10, which is between the threshold of 2.5 and 6.0” of WC to pass

Must measure between 2.5” and 6.0” w.c. to pass

Negative Leak Rate

1. **Connect manometer to test column. Open valves to vacuum position. Slowly adjust regulator until pressure stabilizes at -4” w.c. on digital manometer.** **(It may be necessary to increase nitrogen pressure)**

2. **Stabilize for 10 seconds** **(+/- 0.05” w.c.)**

Negative Leak Rate

3. **Record flow rate in ml/min from digital flow meter.**

4. **Multiply by 0.00212 to get flow rate in CFH.**

12 X 0.00212=0.02544

Threshold is 0.21, therefore cap passes at 0.03

Must be ≤ 99.1 ml/min or 0.21 CFH to pass
(unless other manufacture requirements apply)
AND total of all caps must be ≤ 297.3 ml/min (0.63 CFH)

Negative Cracking Pressure

1. **Unplug the tubing on the manometer from the test stand assembly.**

2. **Open Valves to the vacuum position. Increase pressure till flow meter reading is stabilized at 200 ml/min.**

3. **Attach manometer and tubing to test stand assembly.**

Must measure between -6.0” and -10.0” w.c. to pass

Negative Cracking Pressure

4. **Observe Manometer while performing the above step 3.**

5. **Record highest vacuum achieved before PV valve “cracks”. Repeat steps if necessary to record the average number on the form that is used to record results.**

In this case the “cracking pressure is -7.46, which is between the threshold of -6.0 and -10.0” of WC to pass

Must measure between -6.0” and -10.0” w.c. to pass

Pressure-Vacuum (PV) Vent Valve Data Sheet	
Facility Name:	**Test Date:**
Address:	**Time of Test:**
City:	**Facility ID #:**

PV Valve Manufacture:	**Model Number:**	**Pass or Fail**
Manufactures Specified 2.00 inch Leak Rate (CFH):	**Manufactures Specified -4.00 inch Leak Rate (CFH):**	
Measured 2.00 inch Leak Rate (CFH):	**Measured -4.00 inch Leak Rate (CFH):**	
Positive Cracking Pressure (W/C):	**Negative Cracking Pressure (W/C):**	

PV Valve Manufacture:	**Model Number:**	**Pass or Fail**
Manufactures Specified 2.00 inch Leak Rate (CFH):	**Manufactures Specified -4.00 inch Leak Rate (CFH):**	
Measured 2.00 inch Leak Rate (CFH):	**Measured -4.00 inch Leak Rate (CFH):**	
Positive Cracking Pressure (W/C):	**Negative Cracking Pressure (W/C):**	