BULLETIN 613
JULY 2011

DeZURIK
APCO | WILLAMETTE

# APCO SLOW CLOSING AIR/VACUUM VALVES

Series 1900

# APCO Slow Closing Air/Vacuum Valves

## Maximum Air Flow Velocity in Good Pipeline Design

The Air/Vacuum Valve operates in the normal fashion allowing air to escape freely at any velocity (maximum discharge velocity is approximately 300 fps (91.44 m/s) at 6.7 psi (46.19 kpa); however, good pipeline design restricts velocity flows of air to 100 fps (30.48 m/s) which occurs at approximately 1 psi (6.89 kpa).

The APCO Slow Closing Air/Vacuum Valve actually consists of a standard Air/Vacuum Valve mounted on top of a Surge Check Unit.

The Surge Check Unit operates on the interphase between the kinetic energy in the relative velocity flows of air and water. The Surge Check is a normally open valve, spring loaded, so that air passes through unrestricted. Then when water rushes into the Surge Check Unit, the disc begins to close against the spring tension and reduces the rate of flow of water into the air valve by means of throttling holes in the disc.

This ensures normal gentle closing of the Air/Vacuum Valve regardless of the initial velocity flows involved and minimizes pressure surges when the valve closes.

As soon as the Air/Vacuum Valve is closed, the pressure on both sides of the Surge Check Valve disc equalizes and the disc automatically returns to its open position. This means the Air/Vacuum Valve does not need an incipient vacuum to open, but can open at any time the water level drops and line pressure approaches atmospheric and immediately have full re-entry flow of air into the pipeline before a vacuum can form.

## What It Does

The APCO Slow Closing Air/Vacuum Valve is designed expressly to eliminate critical shock conditions occurring in those installations where the operating conditions cause a regular air valve to slam open and/or closed.

This slow closing feature protects the Air/Vacuum Valve.

This type Slow Closing Air/Vacuum Valve should not be considered as relief for shock conditions* which develop elsewhere in the system. However, actual field tests prove the Surge Check Unit may protect the Air/Vacuum Valve in cases where the Air/Vacuum Valve can be destroyed by severe shut-off shock.

This protection far outweighs the small cost of the Surge Check Unit when you consider the tremendous field damage that can result from an Air/Vacuum Valve failure.

*** For pipeline shock protection see Bulletin 7000 for details of Hydraulically Controlled Air/Vacuum Valves, or Bulletin 3000 for Surge Relief Valves.**

## Where to Use It

1. High points in pipelines where the hydraulic gradient and flow conditions are such that a negative pressure can possibly form.
2. High points on sections of pipeline having water velocities in excess of 10 fps (3.048 m/s).
3. Adjacent to any quick closing valve in a pipeline such as a check or gate valve where a vacuum can be formed upon closure.
4. On the discharge of larger deep well turbine pumps between the pump and the check valve.

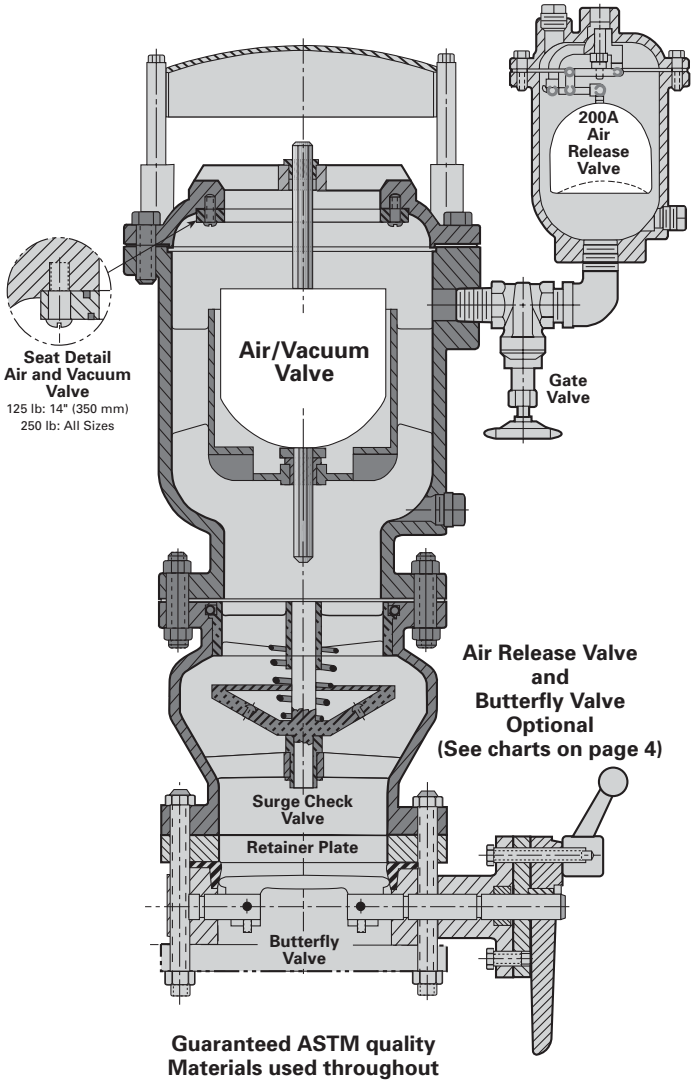
## Note to Engineer

If an Air/Vacuum Valve is to be installed inside the pump house, use a threaded or flanged outlet connection and pipe back into the well or to outside. This will greatly muffle the high noise level caused by the air being discharged and provide for drainage of any small amount of water or water vapor that may discharge.

Manufactured to AWWA C-512

ISO flange connections available

# How To Select Slow Closing Air/Vacuum Valves




**Guaranteed ASTM quality Materials used throughout**

**Step one:** Check pump curve for GPM capacity at **no head** condition.

**Step two:** Enter chart with GPM to determine size.

**Step three:** If valve is to be installed inside pump house specify discharge connection. Sizes 4" (100 mm) and 6" (150 mm) available with screwed or flanged connections. Size 8" (200 mm) and larger flanged only.

***Step four:** If the pump is scheduled to run for prolonged periods (6 - 8 hours) without stopping, Automatic Air Release Valves should be added.

**The following method of selection will satisfy normal installations. For further information, check with our engineering department.**

| Pump Capacity GPM/LPM | Size | Model | (Optional) Air Release Valve No.* |
|---|---|---|---|
| Below 6300<br>Below 23848 | See Bulletin No. 586 | | |
| 6301 - 13500<br>23852 - 51103 | 4"<br>100 | 1904 | 200A |
| 13501 - 32000<br>51107 - 121133 | 6"<br>150 | 1906 | 200A |
| 32001 - 60000<br>121137 - 227125 | 8"<br>200 | 1908 | 200A |
| 60001 - 90000<br>227128 - 340687 | 10"<br>250 | 1910 | 200 |
| 90001 - 140000<br>340691 - 529958 | 12"<br>300 | 1912 | 200 |
| 140001 - 180000<br>529961 - 681374 | 14"<br>350 | 1914 | 200 |
| 180001 - 250000<br>681378 - 946353 | 16"<br>400 | 1916 | 200 |

Inch
Millimeter

## APCO Exclusive Features

Because the Air/Vacuum Valve and Surge Check Unit are each self-contained items, the Surge Check Unit can be added to any Air/Vacuum Valve already in service making it into a Slow Closing Air/Vacuum Valve.

## APCO Air/Vacuum Valve

Stainless Steel float and trim, synthetic, non-destructible seat. Positively will not blow shut even at maximum discharge velocities. Regular 125 lb. or 250 lb. flange mates with similar flange on Surge Check Unit.

## APCO Surge Check Valve

Bronze or stainless trim and stainless steel spring for ultimate in protection.

## APCO Air Release Valve

It will open while line is in operation against pressures up to 300 psi to exhaust small pockets of entrained air. Stainless steel concave float. (Higher pressure valves available.)

Simplicity of design – no delicate needle valves to fail or need adjustment. Positively will not blow shut.

## Replace Shut-Off Valve With DeZURIK Butterfly Valve

Costs to excavate pipeline trenches can be greatly reduced by using DeZURIK Butterfly Valves for isolation instead of gate valves. DeZURIK Butterfly Valves are economical, reliable and much shorter, permitting a reduction in depth of the trench.

## Series 1900

Air/Vacuum Valve & Surge Check Valve

| Size | Model | Max. Dia. | Height | |
|---|---|---|---|---|
| | | | 125# | 250# |
| 4"<br>100 | 1904 | 11.125"<br>283 | 25.75"<br>654 | 25.75"<br>654 |
| 6"<br>150 | 1906 | 13.625"<br>346 | 30.25"<br>768 | 30.5"<br>775 |
| 8"<br>200 | 1908 | 17.25"<br>438 | 34.875"<br>886 | 35.375"<br>899 |
| 10"<br>250 | 1910 | 20"<br>508 | 38.875"<br>987 | 39.5"<br>1003 |
| 12"<br>300 | 1912 | 29"<br>737 | 45.125"<br>1146 | 45.125"<br>1146 |
| 14"<br>350 | 1914 | 29"<br>737 | 46.875"<br>1191 | 46.875"<br>1191 |
| 16"<br>400 | 1916 | 32"<br>813 | 49.25"<br>1251 | 49.25"<br>1251 |

Inch
Millimeter

## Series 1700

Air/Vacuum Valve, Surge Check Valve & Air Release Valve

| Model | Width | Height | |
|---|---|---|---|
| | | 125# | 250# |
| 1704 | 19.5"<br>495 | 27.5"<br>699 | 28"<br>711 |
| 1706 | 22.75"<br>578 | 31.875"<br>810 | 32.25"<br>819 |
| 1708 | 25.5"<br>648 | 34.625"<br>879 | 35.5"<br>902 |
| 1710 | 27.875"<br>708 | 38.875"<br>987 | 39.5"<br>1003 |
| 1712 | 32.875"<br>835 | 45.875"<br>1165 | 45.875"<br>1165 |
| 1714 | 41.875"<br>1064 | 45.875"<br>1165 | 45.625"<br>1159 |
| 1716 | 45.5"<br>1156 | 49.75"<br>1264 | 49.75"<br>1264 |

Inch
Millimeter

## Series 1300

Air/Vacuum Valve, Surge Check Valve & Butterfly Valve

| Model | Width | Height | |
|---|---|---|---|
| | | 125# | 250# |
| 1304 | 15.5"<br>394 | 28.625"<br>727 | 29.875"<br>759 |
| 1306 | 18.75"<br>476 | 34.375"<br>873 | 34.5"<br>876 |
| 1308 | 23.25"<br>591 | 40.875"<br>1038 | 41.375"<br>1051 |
| 1310 | 25.5"<br>648 | 45.25"<br>1149 | 45.875"<br>1165 |
| 1312 | 28.5"<br>724 | 54.375"<br>1381 | 54.375"<br>1381 |
| 1314 | 31.25"<br>794 | 55.125"<br>1400 | 55.125"<br>1400 |
| 1316 | 33.75"<br>857 | 60.75"<br>1543 | 60.75"<br>1543 |

Inch
Millimeter

## Series 1200

Air/Vacuum Valve, Surge Check Valve, Air Release Valve & Butterfly Valve

| Model | Width | Height | |
|---|---|---|---|
| | | 125# | 250# |
| 1204 | 19.438"<br>494 | 30.5"<br>775 | 30.875"<br>784 |
| 1206 | 22.688"<br>576 | 35.375"<br>899 | 36"<br>914 |
| 1208 | 25.5"<br>648 | 41.875"<br>1064 | 42.375"<br>1076 |
| 1210 | 27.875"<br>708 | 45.75"<br>1162 | 46.5"<br>1181 |
| 1212 | 32.875"<br>835 | 50.875"<br>1292 | 50.875"<br>1292 |
| 1214 | 41.875"<br>1064 | 52.25"<br>1327 | 52.25"<br>1327 |
| 1216 | 45.5"<br>1156 | 55.375"<br>1407 | 55.375"<br>1407 |

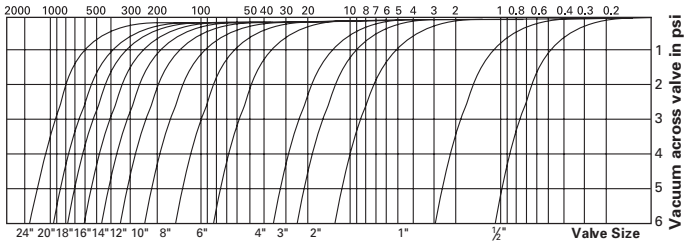
Inch
Millimeter

**Sizes 3" (80mm) & smaller, see Bulletin 586**
**Larger sizes readily available – contact factory.**

# Performance Graph For Air/Vacuum Valve

Air inflow/outflow through valve in standard cubic feet of free air per second, (scfs).

### Inflow




**Curves shown are actual flow capacities at 14.7 psi barometric pressure at 70 °F temperature based on actual test.**

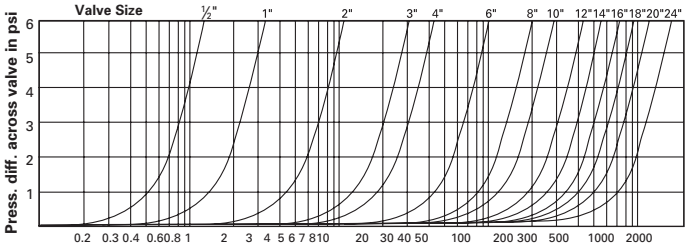
**These figures are not merely flow capacities across the orifice, but flow capacities across the entire valve.**

**In the test set-up air approach velocity is negligible, therefore, actual flow capacity exceeds the values shown on chart.**

**Tests Conducted By:**
**Phillips Petroleum Company**
**Engineering Department – Test Division**
**Edmond Plant Plant Feb. 2, 1961**

**Southern Research Research Institute**
**Birmingham, Alabama May 8, 1959**

### Outflow

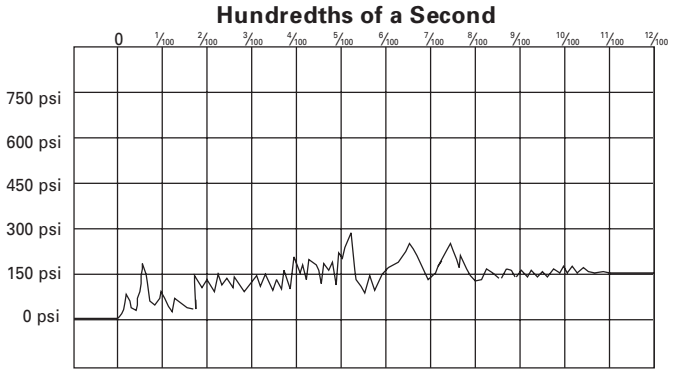



## Surge Pressure Comparison

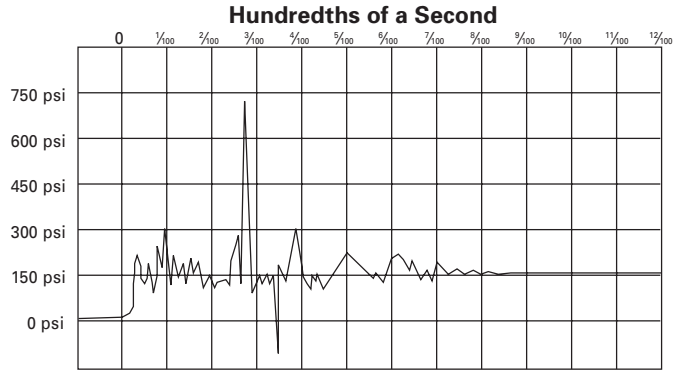
The graph shows actual surge pressures experienced closing a standard Air/Vacuum Valve under identical conditions with and without the APCO Surge Check Unit when filling a 150 psi line. Note that without the Surge Check Unit the maximum surge pressure exceeds line pressure by 550 psi, or approximately five times line pressure, whereas with the Surge Check Unit the maximum surge pressure only exceeded the line pressure by 150 psi, or twice line pressure.

On especially critical installations further surge dampening can be effected by using two Surge Check Units under the Air/Vacuum Valve.

These pressure recordings were taken on a Minneapolis Honeywell No. 906 visicorder high speed oscillograph with a maximum frequency response of 5000 cps and a linograph travel of 10 inches per sec.




**With Surge Check Units**




**Without Surge Check Units**

# Specifications

The Slow Closing Air/Vacuum Valve shall be four valves furnished assembled and tested as a single unit. The Air/Vacuum Valve must have a stainless steel float guided at each end with stainless stems. The stems shall be guided through stainless steel bushings inside the body and cover. The seat* must be Buna-N fastened to the cover with stainless shoulder screws without distortion to allow drop tight closure.

The cover shall have a male lip to fit the female body register for positive float guide direction into the seat. Cover outlets may be threaded, flanged, or hooded. (Engineer to specify.)

The Surge Check Valve shall be a normally open spring loaded valve consisting of a body, seat and plug bolted to the inlet of the Air/Vacuum Valve. The surge check shall operate on the interphase between the kinetic energy and relative velocity flows of air and water. It will allow air to pass through but water shall actually close the surge check, reducing the rate of water flow by means of throttling orifices in the plug to prevent shock closure of the Air/Vacuum Valve. The surge check orifices must be adjustable type to suite operating conditions in the field.

The inlet Isolation Butterfly Valve shall be wafer (compact) style constructed to AWWA Standards with hand lever and variable position locking device. The seat to be freely interchangeable from the body without the need for special tools or skill. The seat must be Buna-N, molded with a steel flanged insert for high strength and tight seating. The disc must pivot eccentrically from closed position to clear center valve area.

The Air Release Valve shall be side connected to the upper valve, but separated with an Isolation Shut-Off Valve. The internal mechanism shall be the compound lever type to permit the valve to open under pressure to vent pockets of entrapped air as they accumulate. The compound mechanism shall be activated by a stainless steel concave float to lift the Buna-N needle to shut-off the Air Release orifice.

The Slow Closing Air/Vacuum Valve shall have been flow tested in the field, substantiated by test data to show reduction of surge pressure in the valve.

Materials shall be certified to ASTM specifications:

| | | |
|---|---|---|
| Air/Vacuum Valve/Air Release Valve Covers, Bodies Surge Check Body and Butterfly Valve Body | Cast Iron | ASTM A126 GR.B |
| Floats & Spring | Stainless Steel | ASTM A240 |
| Surge Check Seat & Disc | Bronze* | ASTM B584 |
| Air Release Valve Needle | Buna-N | |
| Air/Vacuum Valve Seat* | Buna-N (4"-12", 100-300 mm) | |
| 14" (350mm) and Larger 250# Class | Stainless Steel with Buna-N Molded Seal | ASTM A240 |
| ARV Leverage Assembly | Delrin | ASTM D2133 |
| Butterfly Valve Shaft | Stainless Steel | ASTM A270 |
| Exterior Paint | Universal Metal Primer | FDA Approved for Potable Water Contact |

*Bronze components meet current lead-free requirements.

Valve to be APCO Series 1200 Slow Closing Air & Vacuum Valves.

Other materials available.

## Sales and Service

For information about our worldwide locations, approvals, certifications and local representative:
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