APCO AIR VALVES
FOR VERTICAL TURBINE PUMPS

Series 140DAT
Air must be vented from the pump discharge column to the atmosphere and not forced into the water system. Without air venting, problems are certain to develop. Air entrapped in the water system will restrict water flow. This results in consumer complaints about air in the water and can cause pressure surges and water hammer with each pump start-up and shutdown. Surges and water hammer are the main cause for costly damage to piping and water system components.

Field Tested
After years of laboratory and field testing, under actual operating conditions and in co-operation with leading vertical turbine pump manufacturers, we determined that no vertical turbine pump installations are identical. Instead, each has its own characteristics, pump capacity, efficiency, well depths and head conditions – all too many variables for a standard air/vacuum valve to satisfy. So, APCO developed an Air Valve for Vertical Turbine Pumps using a water diffuser, throttling device or surge check to compensate for the variables.

Water Diffuser or Surge Check
Sizes ½” (15mm) through 3” (80mm) are fitted with (1) water diffusers in larger sizes with (2) surge checks. APCO water diffusers perform much like water faucet strainers, breaking down the solid water column force into a smooth non-destructive flow. Similarly, surge checks absorb solid water column shock and break it down to smooth non-shock flow into the air valve. In this manner, the water diffuser and surge check facilitate positive water closure of the Vertical Turbine Air Valve without water hammer, shock, or damage to the pump, valves or other system components.

Old Style (One Way) Throttling Device
Throttling devices have been used on Vertical Turbine Air Valves for more than sixty years. All have the same operational design weakness of one way flow regulation to restrict air out. Restricting air out is an excellent pump start procedure and helps to minimize risk of damage to pump, valves and piping, from shock with each pump start. It establishes back pressure on the rising column of water, thereby greatly reducing shock, pressure surge and hammer when the water column hits the closed pump discharge check valve.

However, what about pump stop procedure? Herein lies the design weakness. On pump stop, the pump discharge check valve closes and the Vertical Turbine Air Valve opens allowing air to re-enter the pump column to prevent vacuum and/or water column separation. As the old style throttling device was adjusted to restrict air out, air re-entry also has the same restriction. As a result vacuum and water column separation can occur damaging pump seals, packings, and gasketed joints. Additionally, the pump may be called to start while the column is still full putting a severe strain on the pump shaft, motors and electrical controls.
**APCO’s Double Acting Throttling Device with Exclusive Throttling Air-Out/Full Flow Air-In Design Feature**

Now, regardless of the amount of air throttling out, there is assured full line capacity air inflow on pump stop to positively prevent vacuum and water column separation in the pump. The Double Acting Throttling Device is highly recommended.

**Operation:**

The Teflon tapered plug is pushed ahead into the throttle position by a very light weight stainless steel spring and it stays in this position due to the force of air being discharged from the pump suction on pump start. On pump stop, the tapered plug moves from its throttle air-out position to the full air-in position, due to negative pressure inside and atmospheric forces of air rushing in.

The desired tapered plug position for throttling air-out is regulated by turning the stainless steel adjusting screw. When satisfactory throttling of air is achieved, lock the adjusting screw in place with the stainless steel lock nut to prevent tampering.

Double Acting Throttling Devices are available for larger sizes as well.

### Slow Closing Air Valves – How They Work

These air/vacuum valves have large orifices for exhausting air from deep well pump columns on pump start. They close when water enters the valve and remain closed until the water drains and the pressure drops to atmospheric. Then the valve immediately opens to allow air to re-enter the column to prevent vacuum or water column separation.

A Slow Closing Air Valve is a standard air/vacuum valve (3) mounted on top of surge check (2).

The Surge Check Unit operates on the differential between the kinetic energy in the relative velocity flows of air and water. The air passes through unrestricted, but when the water rushes into the Surge Check, the disc closes and slows the rate of water flow into the air valve by means of throttling holes in the disc. This insures gentle closing of the Air/Vacuum Valve and as soon as the valve is closed the Surge Check disc automatically returns to its normal open position ready for the next cycle.

See Bulletin 613 for more information on Surge Check Valves.

### DeZURIK Butterfly Valves for Isolation

It is good engineering practice to install isolation valves below the air valve (as shown below). Use DeZURIK Butterfly Valves instead of gate valves for this purpose. DeZURIK Butterfly Valves are reliable, economical and much shorter than gate valves, permitting a savings of height in the pump house.
## Dimensions - Series 1200

<table>
<thead>
<tr>
<th>Size</th>
<th>Model</th>
<th>A</th>
<th>B (125 lb)</th>
<th>B (250 lb)</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot;</td>
<td>1204</td>
<td>19.438&quot;</td>
<td>30.5&quot;</td>
<td>30.875&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>4&quot;</td>
<td>1206</td>
<td>22.688&quot;</td>
<td>36&quot;</td>
<td>36&quot;</td>
<td>12&quot;</td>
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<tr>
<td>8&quot;</td>
<td>1208</td>
<td>25.5&quot;</td>
<td>41.875&quot;</td>
<td>42.375&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>10&quot;</td>
<td>1210</td>
<td>27.875&quot;</td>
<td>45.5&quot;</td>
<td>45.5&quot;</td>
<td>12&quot;</td>
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<tr>
<td>12&quot;</td>
<td>1212</td>
<td>32.875&quot;</td>
<td>50.875&quot;</td>
<td>50.875&quot;</td>
<td>12&quot;</td>
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<td>14&quot;</td>
<td>1214</td>
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</tr>
<tr>
<td>16&quot;</td>
<td>1216</td>
<td>45.5&quot;</td>
<td>55.375&quot;</td>
<td>55.375&quot;</td>
<td>15&quot;</td>
</tr>
</tbody>
</table>

Larger sizes available:
- 125 lb: 14" (350mm) & Larger
- 250 lb: All Sizes

**Series 1200**

- Air/Vacuum Valve
- Gate Valve or Ball Valve
- Surge Check Valve
- Retainer plate
- Butterfly Valve
- APCO Check Valve
- Vertical Pump Intake

**Symbols:**
- Inch
- Millimeter

**Diagram Notes:**
- Seat Detail
- Air Release Valve
- 200A Air Release Valve
- Gate Valve or Ball Valve
How to Select
Air/Vacuum Valves for Vertical Turbine Pump Installation

A. Check the pump curve for GPM capacity at no head condition.

B. Enter chart with GPM to determine the size of the valve.

C. If valves are to be installed inside the pump house, specify the discharge connection. Sizes 3" (80mm), 4" (100mm) and 6" (150mm) are available with screwed or flanged discharge connections. Size 8" (200mm) and larger are available with flanged connection only.

D. Determine if automatic air release is required.

The selection table shown at left will satisfy typical Deep Well Turbine pump installations which use a Silent Check or Conventional Swing Check valve, as shown above. For High Service Vertical Turbine pump installations which utilize positive shut-off type discharge Control Valves, contact our Engineering Department and a specific size will be recommended.

Note to Engineer:
If the air valve is to be installed inside the pump house, use threaded or flanged discharge connections and pipe back to the well or 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 exist.

<table>
<thead>
<tr>
<th>No Head Pump Capacity GPM/LPM</th>
<th>Valve Size</th>
<th>APCO Model</th>
<th>(Optional) Air Release Valve*</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 250</td>
<td>5&quot;</td>
<td>141DAT</td>
<td>50</td>
</tr>
<tr>
<td>up to 948</td>
<td>1&quot;</td>
<td>142DAT</td>
<td>50</td>
</tr>
<tr>
<td>251-700</td>
<td>2&quot;</td>
<td>144DAT</td>
<td>50</td>
</tr>
<tr>
<td>950-2650</td>
<td>3&quot;</td>
<td>146DAT</td>
<td>50</td>
</tr>
<tr>
<td>701-1450</td>
<td>4&quot;</td>
<td>1904</td>
<td>200A</td>
</tr>
<tr>
<td>1250-2654</td>
<td>5&quot;</td>
<td>1906</td>
<td>200A</td>
</tr>
<tr>
<td>7001-18500</td>
<td>6&quot;</td>
<td>1908</td>
<td>200A</td>
</tr>
<tr>
<td>2654-5489</td>
<td>8&quot;</td>
<td>1910</td>
<td>200</td>
</tr>
<tr>
<td>13253-38330</td>
<td>10&quot;</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>3501-7500</td>
<td>125</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>18501-40000</td>
<td>150</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>70034-151416</td>
<td>200</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>40001-58000</td>
<td>250</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>151420-211983</td>
<td>300</td>
<td>200</td>
<td></td>
</tr>
</tbody>
</table>

* If the turbine is scheduled to run for prolonged periods (6-8 hours) without stopping, automatic air release valves should be added.
Specifications

Air Valves for Vertical Turbine Pumps shall vent large quantities of air through the discharge orifice when the pump starts, close tight when liquid enters and permit large quantities of air to re-enter through the orifice when the pump stops to prevent vacuum forming in the pump suction column.

The main valve parts shall be a body, cover, baffle, float and seat. The baffle shall shield the float from direct impact of air and water to prevent premature float closure. The seat shall slip fit into the baffle or cover and lock in place without any distortion.

Sizes 1/2" (15mm) through 3" (80mm): the entire float and baffle assembly must be shrouded with a water diffuser to prevent water from slamming the float shut. Outlets to be threaded. Flanged connections available.

The float shall be stainless steel, center guided (not free floating) for positive seating.

The discharge orifice shall be fitted with a Double-Acting Throttling Device (patented), to regulate and restrict air venting. This device will establish a pressure loading on the rising column of water to eliminate damaging shock to the pump, controls and check valve on pump start. On pump stop, the Double-Acting Throttling Device shall automatically open allowing full line unrestricted air re-entry to prevent vacuum from forming in the suction column.

Valve exterior to be painted with universal metal primer paint as accepted by the FDA for use with potable water.

Materials of construction shall be certified conforming to following ASTM specifications:

- **Body and cover**: Cast Iron or Ductile Iron, ASTM A126 Gr. B or ASTM A536 Gr. 65-45-12
- **Baffle, sizes 1/2" (15mm), 1" (25mm) & 2" (50mm)**: Delrin, ASTM D2133
- **Baffle, size 3" (80mm)**: Cast Iron, ASTM A48 CL 30
- **Float**: Stainless Steel, ASTM A240
- **Seat**: Buna-N
- **Water diffuser**: Brass or Stainless Steel, ASTM B16
- **Double Acting Throttling Device Patented**: Malleable Iron, ASTM A47
- **Housing**: Stainless Steel, ASTM A276 T304
- **Adj. screw & nut**: Stainless Steel, ASTM A313 T316
- **Spring**: Teflon, AMS 3651
- **Plug**: Teflon, AMS 3651

*Bronze components meet current lead-free requirements.

Valve to be APCO Series 140DAT Air/Vacuum Valve with Double Acting Throttling Device & Water Diffuser.

**Note: See Bulletin 613 for Slow Closing Air Valve Specifications.**

Manufactured to AWWA C-512

ISO flange connections available