



## White Paper

# Air Valves for Fire Protection

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# Air Valves for Fire Protection

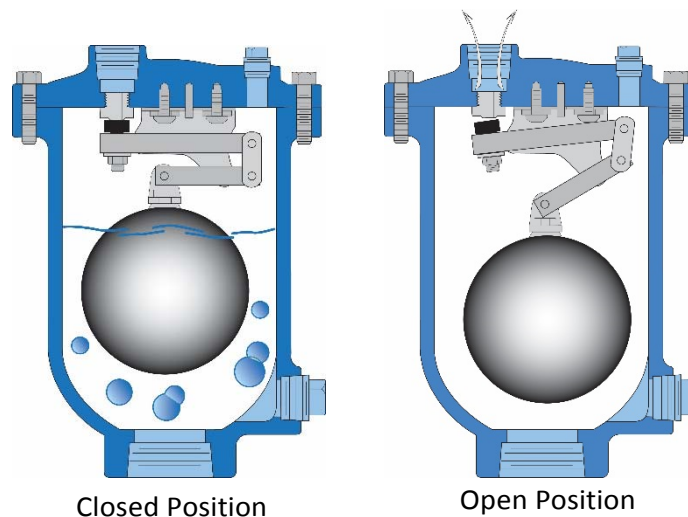
## Introduction

Water systems used for fire protection in commercial buildings require release and admission of air for proper operation. Before their use, pumps, pipes, and sprinkler systems are filled with air, which must be automatically released during filling and operation. Conversely, when fire protection systems are drained, air must be admitted to allow proper drainage.

Air valves are automatic, float-operated, and in the installed condition, “normally open” to allow air in and out of the piping system. When water enters the air valve, the float rises, which closes the outlet orifice of the valve and prevents the discharge of water. Air valves for fire protection are typically constructed of cast iron with stainless steel trim and resilient seals. There are three basic types of automatic air valves used to control the flow of air in and out of fire protection systems: air release, air/vacuum, and combination. The proper selection, sizing, and installation of automatic air valves are essential in safeguarding life and property from fire.

## Air Release Valves

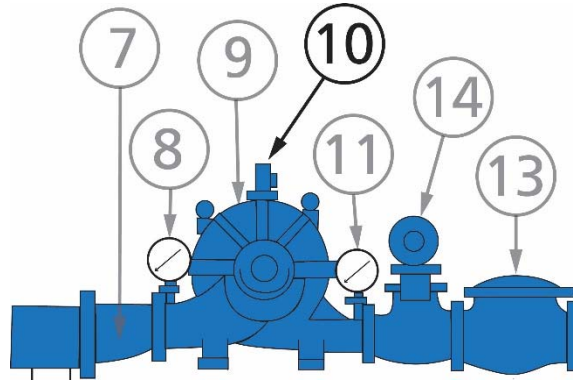
Air release valves are probably the most widely used type of air valve and are characterized by their small orifices, weighted floats, and leverage mechanisms. The combination of these three features allow air release valves to expel air or gas at full operating pressure of the system. Air release valves automatically vent small pockets of accumulated air during startup and as they accumulate in fire protection systems.



**FIGURE 1. Operation of Air Release Air Valve**

Air Release Valves with a ½” NPT pipe connection and a 1/16” minimum orifice size are installed on the top of centrifugal pumps to release air from the top of the casing thereby improving efficiency and preventing pump cavitation, See Figure 2. Air release valves are also installed on wet pipe sprinkler system branch lines to allow filling of the lines with water.

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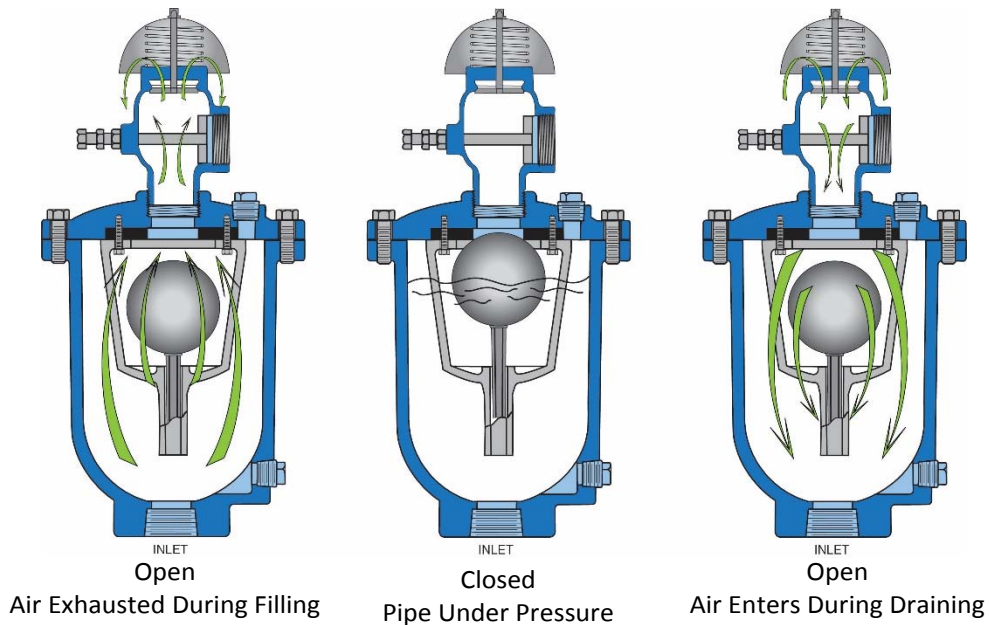


**FIGURE 2. Installation of an Air Release Valve (10) on a split-case fire pump (9) (NFPA 20)**

## Air/Vacuum Valves

The second type of air valve is the air/vacuum valve, which has a large, full-size orifice ranging from 1/2 in. to 20 in. and as a result, can exhaust large volumes of air during filling. The valve will also admit large volumes of air to prevent a vacuum condition from occurring in the piping system during draining or after pump shut down. As shown in Figure 3, air/vacuum valves are normally open and a float in the valve automatically rises with the water level to seal the large orifice after the air has been exhausted. While the pipe is under pressure, the valve remains closed. Conversely, upon the loss of system pressure due to pump shut off or draining, the float will drop and allow air to re-enter the pipeline.

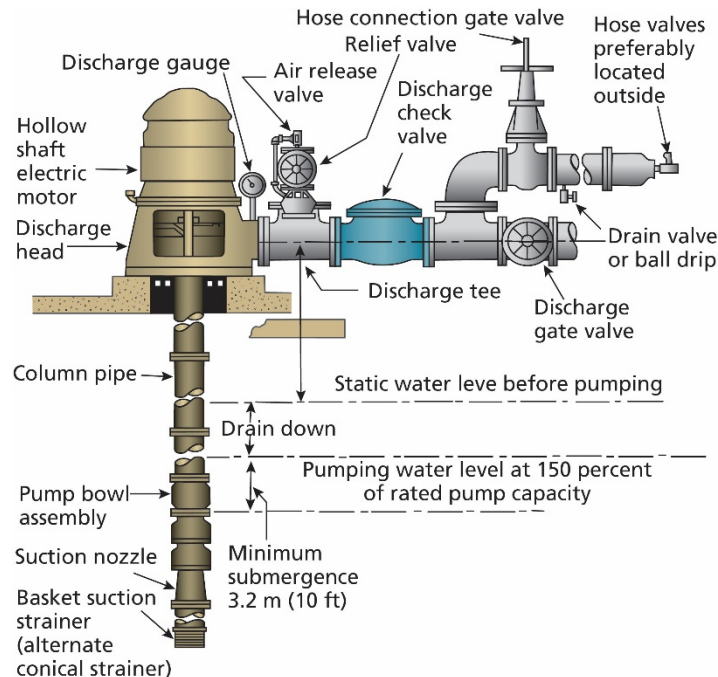
The rate of exhaust is controlled with an adjustable throttling device mounted on the top of the air valve. Since the pump can reach full speed in a few seconds, the throttling device is used to slow down the exhaust of air to prevent the water from rising too fast and slamming into the downstream check valve and causing a water hammer in the pump column.



**FIGURE 3. Operation of an Air/Vacuum Valve**

# Air Valves for Fire Protection

1-1/2" NPT or larger air/vacuum valves are installed on the discharge of vertical turbine pumps before the check valve to vent the air from the pump column during the starting of the pump and to admit air into the column to dissipate the vacuum upon stopping the pump, see Figure 4.

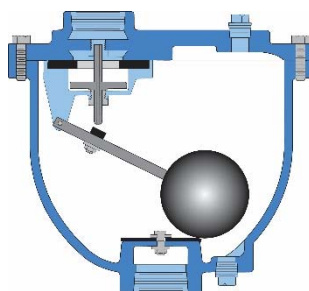


**FIGURE 4. Installation of an Air/Vacuum Valve on a vertical turbine pump (NFPA 20).**

## **Combination Air Valves**

It is important to note that under normal operation, the air/vacuum valve float is held closed by the line pressure and will not relieve accumulated air. Air/vacuum valves do not have mechanical linkage and because of the large diameter orifice, have no ability to open while the system is pressurized. Therefore, an air release valve is also needed to relieve air and gas during system operation. A combination air valve combines the functions of the air release and air/vacuum valves in one body.

Combination air valves equipped with throttling devices are intended for use in dry standpipe and similar applications where the (1) release of large volumes of air in a controlled manner is needed, (2) continuous release of air within the system is needed while the system is pressurized and (3) admission of air into the system is needed to minimize the development of vacuum conditions when the system is shutdown.



**FIGURE 5. Construction of a Combination Air Valve**

# Air Valves for Fire Protection

## **Safety Requirements for Air Valves**

Air valves for fire protection service are independently, tested and certified by Underwriters Laboratories (UL) in accordance with UL Subject 2573 and by Factory Mutual (FM) in accordance with Approval Standard FM 1344. These standards provide the testing and qualification requirements for fire protection air valves.

Requirements for installation of air valves in sprinkler systems are included in the Standard for the Installation of Sprinkler Systems, NFPA 13. Requirements for installation of air valves on fire pumps are included in the Standard for the Installation of Stationary Pumps for Fire Protection, NFPA 20.

Requirements for the installation of dry standpipe systems are included in standards such as the Standards for the Installation of Standpipe and Hose Systems, NFPA 14.

## **Why Val-Matic® Air Valves**

There are few valve applications as critical as fire protection. Quality and dependability must be at the forefront when choosing components for a fire protection system. All Val-Matic® Air Valves are supplied standard with Type 316 Stainless Steel Trim. All Val-Matic® Air/Vacuum Valve floats are center guided to assure drop tight shut-off. All Val-Matic® Air Release and Air/Vacuum Valves are Underwriters Laboratories (U.L.) Listed. In fact, Val-Matic® is the only approved valve for vertical turbine pump applications. In addition to U.L. approval, Val-Matic® Air Release Valves are also Factory Mutual (F.M.) approved. Contact U.L. or F.M. for current listing information.

In addition to U.L. and F.M., Val-Matic® Air Valves fully comply with AWWA Standard C512 for Air Release and Air/Vacuum Valves.

## **Air Release Air Valves for Split Case Fire Pumps**

| <b>Air Release Air Valves for use with split case fire pumps</b> |                                |                                |                             |                                 |                                 |
|--|--------------------------------|--------------------------------|-----------------------------|---------------------------------|---------------------------------|
| <b>Rated Capacity<br/>GPM</b>                                    | <b>Rated Pressure<br/>PSIG</b> | <b>Inlet Size<br/>NPT, In.</b> | <b>Orifice Size<br/>In.</b> | <b>Outlet Size<br/>NPT, In.</b> | <b>Val-Matic®<br/>Model No.</b> |
| 800  | 175                            | ½                              | 1/16                        | ½                               | 15A                             |
| 800  | 175                            | ¾                              | 1/16                        | ½                               | 15A.2                           |
| 800  | 175                            | 1                              | 1/16                        | ½                               | 15A.3                           |
| 2200   | 175                            | ½, ¾                           | 3/32                        | ½                               | 22.4                            |
| 2200   | 175                            | 1                              | 3/32                        | ½                               | 22.3                            |
| 2200   | 300                            | ½                              | 1/16                        | ½                               | 22.7                            |
| 2200   | 300                            | ½, ¾, 1                        | 1/16                        | ½                               | 22.9                            |

## Air Valves for Fire Protection

| Well Service Air Valves for use with vertical shaft turbine fire pumps. |                        |                        |                     |                         |                         |
|---|------------------------|------------------------|---------------------|-------------------------|-------------------------|
| Rated Capacity<br>GPM   | Rated Pressure<br>PSIG | Inlet Size<br>NPT, In. | Orifice Size<br>In. | Outlet Size<br>NPT, In. | Val-Matic®<br>Model No. |
| 1350  | 300                    | 1                      | 1                   | 1                       | 101ST                   |
| 4000  | 300                    | 2                      | 2                   | 2                       | 102ST                   |
| 7000  | 300                    | 3                      | 3                   | 3                       | 103ST                   |

Also available from Val-Matic® for Fire Protection Systems: Dual Disc and Silent Check Valves

### *Disclaimer*

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