

# Ammonia Service Valves

**FLO·TITE™**  
valves & controls

## VALVES FOR AMMONIA SERVICE REQUIRE:

1. Viton Free Valves . EPDM or Kalrez could be used to substitute the steam/seats o-ring subject to the temperature of operation, but Viton (FKM) is a NO-NO for ammonia.
2. Vented ball valves are required for liquid ammonia.
3. Degreasing of the Valve is required.

## 1. INTRODUCTION:

Ammonia (also referred to as Azane) is a widely used gas. It greatly assists in the nutritional needs of many agricultural related organisms and is a key component to many fertilizers and therefore important to our food supply. It is also a common ingredient in many cleaning agents, and used extensively for refrigeration, the manufacture of commercial chemicals, and laboratory reagents in pharmaceutical plants.

## 2. CHARACTERISTICS:

Ammonia is a colorless, very pungent, suffocating, highly water-soluble, gaseous compound that is both caustic and dangerous. Anhydrous (Dry) Ammonia has to be stored under high pressure or at low temperatures in order to remain in liquid form. It is most commonly used for commercial purposes in the anhydrous state as it is less expensive this way.

### MATERIALS:

Past experience shows Stainless Steel to be the most common material utilized for metallic components like valve bodies, bonnets, retainers, and trim materials (ball and stem). Sealing components like seats, stem packing and body seals are generally TFM & PTFE based materials. It is always good to check compatibility/acceptability of selected materials based off specific application data like concentrations, temperatures and pressures.

GENERAL NOTE: Be aware that when ammonia is being handled in a liquid state and where the media can potentially become trapped. Any thermal changes can require that valves and other retaining vessels be vented or have means/method and a path for media expansion.

## Common Flo-Tite and Max-Seal valves used in Ammonia and other Services.

Several of these valves come viton free as standard. Always ask for viton free for Ammonia services.



S23/T23  
FusionSeries



Tri-Pro, Series



F150 Series



High Performance  
Butterfly Valve

### 3. MATERIAL SELECTION:

**Ball and Seats:** Ammonia can be corrosive to many metals and elastomers, so it's important to select materials that can withstand exposure to ammonia. Common materials used for ammonia service include:

- **Stainless Steel (316 or 304):**  
Stainless steels are often used for ammonia service, but the exact grade should be carefully selected to resist corrosion.
- **Nickel Alloys (Inconel, Monel):**  
These materials are highly resistant to ammonia, especially under extreme temperatures and pressures.
- **PTFE (Polytetrafluoroethylene), PEEK (Polyether Ether Ketone), Super-Tek (TFM-1600) and S-Tek (50/50) Seats:**  
These materials are compatible with ammonia and provide excellent sealing capabilities.
- **Epoxy or Other Suitable Coatings:**  
For added protection against corrosion, coating like epoxy can be applied to the valve body or the actuator.

### 4. SEAL MATERIAL COMPATIBILITY:

The valve seals must be constructed from materials compatible with ammonia. Common materials for seats include PTFE, Super-Tek (TFM-1600), S-Tek (50/50) and PEEK. For stem seals, TFM-1600, PTFE, and flexible graphite are often used. Body gaskets are typically made from spiral-wound SST/Graphite, flexible graphite, or TFM-1600.

### 5. PRESSURE AND TEMPERATURE RATING:

Ammonia is typically used in refrigeration and chemical processes where temperatures can be very low down to (-28°C/18.4° F) or high. Therefore, ensure the valve is rated for these temperature ranges.

Ammonia may also be handled at high pressures, so ensure the ball valve has an appropriate pressure rating to prevent leaks or failures.

### 6. VALVE ACTUATION AND OPERATION:

Ammonia valves are typically operated manually or via actuators, but it's crucial that the actuation mechanism is robust and resistant to corrosion or freezing (especially in low-temperature applications).

### 7. CLEANLINESS AND PURITY REQUIREMENTS:

In some applications, the ammonia service demands a very clean system (e.g., in refrigeration). The valve and all components should be cleaned and prepared to avoid contamination in the ammonia system. This is particularly important for valves used in systems like food processing or pharmaceutical refrigeration.

### 8. LEAK TESTING AND INSPECTION:

The valve should undergo rigorous leak testing (such as pressure testing or helium leak detection) to ensure there are no leaks, especially since ammonia is toxic and hazardous.

Periodic inspections should be scheduled to check for signs of degradation, such as corrosion, wear, or cracks.

## 9. COMPLIANCE WITH REGULATIONS:

Ensure that the valve complies with any industry-specific standards and regulations, such as ASME, API, or ANSI, that apply to ammonia service.

By ensuring these considerations are met, you can modify a ball valve for safe and effective use in ammonia service.

## 10. ACCESSORIES:

**Fugitive emission (MC) Bonnet** - An impressive safety device that Flo-Tite offers for ammonia service is the Fugitive Emission (MC) bonnet. A stainless steel pressure chamber bolted on and sealed against the valve ISO 5211 top platform. The MC bonnet will collect any ammonia that may have leaked and contain it within the MC bonnet until a maintenance operation is scheduled. The purge ports located at the top of the Media containment unit allow the safety technician to connect a pressure gauge, pressure transducer, or ammonia sniffer to alert for ammonia leakage through the valve stem seal. Although the MC unit is a simple design, it offers stem seal reinforcement, greatly improving site safety by preventing ammonia leakage through the plant atmosphere.

Our extensive range of Media containment ISO 15848-1 certified valves help ensure long-term containment of ammonia and other hazardous chemicals, even under the most demanding conditions.

## SPECIAL SERVICES - AMMONIA

### Valves for Ammonia Services

Flo-Tite's ammonia service ball valves are ideally suited to provide optimal protection and functionality for use in severe ammonia service applications. All valves designated for ammonia service are expertly prepared and cleaned to standards required for the safe operation of ammonia service equipment and product purity.

### Ammonia

Ammonia is a compound of nitrogen and hydrogen with the formula  $\text{NH}_3$ , at atmospheric conditions, ammonia is a colorless gas, lighter than air with a pungent, suffocating odor. It is a highly caustic irritant that is both toxic and flammable. Ammonia is soluble in water to provide an alkaline solution.

- Ammonia boiling point  $-33\text{ }^\circ\text{C}$  ( $-28\text{ }^\circ\text{F}$ ) at a pressure of 1 atmosphere, the liquid must be stored under high pressure or at low temperature.
- Ammonia melting point  $-78\text{ }^\circ\text{C}$  ( $-108\text{ }^\circ\text{F}$ ).

### Ammonia Uses

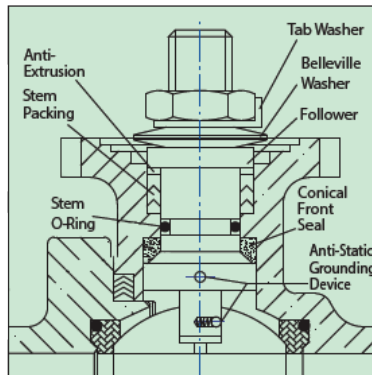
Manufactured by synthesis from nitrogen and hydrogen, ammonia has many uses in the production of fertilizers, plastics, explosives, pharmaceuticals, metal treating operations, refrigerant, cleaning agent and more.

### Ammonia Hazards

Never permit oil, grease or other combustible substances to come in contact with ammonia service valves or components. Ammonia combined with these substances can result in explosions.

## Design

Flo-Tite ammonia service valves are available with screwed, socket weld, butt-weld, ANSI Class 150 and ANSI Class 300, EN 1092, PN16, and PN40 flanged ends. Flanged valves range from 1/2" to 8", and three piece valves from 1/4" to 8". Body materials include 316 stainless steel or carbon steel. Standard ball and stem material is 316/316L stainless steel.



Flo-Tite's vented balls are machined with an upstream pressure relief hole in the ball and are ideal for ammonia applications, especially liquid ammonia. The relief hole avoids trapped cavities in the valve while in the closed position and pressure buildup due to thermal expansion during liquid ammonia boil off. A valve with a vented relief hole is uni-directional, and the relief hole must be positioned for upstream or otherwise an in-line leak will be evident.

If a bi-directional Flo-Tite valve is necessary for ammonia use, then self relief seats (SRS) should be used. The best seat material to use in this case would be TFM or CF PTFE. These seats would allow the release of cavity pressure buildup and return to the shut off position once the over pressure is relieved.

Cavity pressure relief



## Preparation

All valve components used for ammonia applications are de-burred to a high standard and specifically cleaned to remove any traces of oil, grease or hydrocarbon materials prior to assembly. Ammonia service Valve assembly is carried out in a high quality 'clean room' by technicians using lint free gloves, to assure no ingress of grease or dust. Only lubricants compatible with ammonia are used. Valve seat and external leakage pressure tests are conducted in a 'clean room' environment, using pure Nitrogen. Only special 'clean tools' are used in the valve assembly.

## Packing

After successful testing, valves are once again restored to the "open" position. Each valve is packed with a 'Silica-gel pack'. The valve is clearly labeled 'Prepared for Ammonia Service', and sealed in a polyethylene bag.