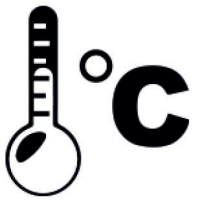


INDUSTRIAL REFRIGERATION SOLUTIONS



AMMONIA GAS INFORMATION AND USER MANUAL

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1. CHEMICAL PRODUCT AND COMPANY DEFINITION

Product Name : ANHYDROUS AMMONIA

Chemical Formula : NH₃



Area of usage:

It is mostly used in the manufacture of nitric acid and ammonium salts and in the manufacture of organic materials such as urea, paint, medicine and plastics.

Ammonia, a colorless gas with a distinctive pungent odor, is mostly used in the industry as a starting material in the production of nitrogenous fertilizers and nitric acid, and as a weak base in obtaining many chemicals in laboratories. In addition, ammonia is also used as a refrigerant gas because it is a gas that easily liquefies when pressure is applied at normal temperature and the excess heat of vaporization (327 kcal / g) formed.

2. COMPOUND / INFORMATION ON THE COMPOUND

Name	% Volume	CAS Number	Legislation Risk and Safety Information
Ammonia	99,8	7664-41-7	R10,R23,R34,R50 S7/9,S16,S18,S26, S33,S36/37/39,S45,S61

Note : For explanation of regulatory risk and safety phrases, see Article 15.

It is classified as a hazardous substance according to the Dangerous Chemicals Regulation published in the Official Gazette No. 21634 dated 11.07.1993.

3. HAZARDS IDENTIFICATION

- Ammonia is corrosive to human tissue and is a toxic and flammable gas.
- It has the feature of flammability at low temperatures.
- It is a colorless, unpleasant-smelling gas that has a destructive effect on the soft membranes of the eyes, throat and lungs.
- High amounts of ammonia gas can cause breathing difficulties, larynx and bronchial spasm, and edema.
- Depending on the intensity of breathing, it causes a burning sensation, shortness of breath, headache, fainting and death.
- If liquid ammonia comes into contact with the skin, it will cause severe burns.

4. FIRST AID TREATMENT

Inhale:

- Immediate medical attention is required in all cases of excessive exposure to ammonia gas. Rescue personnel should have breathing apparatus.
- People who are conscious and affected by ammonia gas should be taken to an area that is not contaminated with gas, and fresh air should be inhaled. If there is a breathing problem, oxygen should be given.
- It is very important to quickly move away from the ammonia-contaminated area. If breathing stops, artificial respiration and oxygen supplements should be applied.
- The patient should be kept warm and calm.

Skin Contact:

In case of skin contact or cold burns;

- Clothing contaminated with ammonia liquid should be removed and affected areas should be washed with lukewarm water for at least 15 minutes.
- Hot water should not be used.**
- The burned area should not be rubbed or massaged.
- In case of intense tissue freezing, cold burns or swelling of the skin surface, the patient should be taken to a health institution immediately.

Eye Contact:

When ammonia comes into contact with the eyes;

- The evaporation of the liquid ammonia should be accelerated by opening the eyelids as much as possible.
- Eyes should be washed with lukewarm water for at least 15 minutes.
- If the patient cannot look at the light, the eyes should be covered with a light band and taken to a health institution immediately.

5. FIRE FIGHTING METHODS

Suitable Fire Extinguishing Appliances / Methods:

Ammonia can be flammable at low temperatures. Low concentrations of gas in the air ignite. Gas release in closed environment creates danger of explosion. During a fire, the tubes may explode violently due to the increased pressure.

If possible, gas flow should be stopped. Emergency responders should wear positive-pressure breathing apparatus and protective clothing made of butyl rubber and boots.

Water is the best extinguisher as ammonia dissolves in water. As the water extinguishes the fire, it also absorbs the ammonia gas emitted. The surrounding tubes must be cooled with water. As running water is corrosive, it should be prevented from entering drains and waste water pipes. The tubes exposed to fire should continue to be cooled for a while after the flames are extinguished.

Non - Suitable Fire Extinguishing Appliances / Methods:

The combination of water and ammonia forms a strong base, it is necessary to pay attention to environmental compatibility.

Harmful Substances That May Occur As A Result Of Fire: None.

Protective Equipment in Fire Fighting:

Firefighters should wear respiratory protection and flameproof clothing.

6. PRECAUTIONS TO BE TAKEN AGAINST ACCIDENTAL GAS RELEASE

Personal Precautions:

- The area where ammonia gas is emitted should be abandoned immediately.
- Appropriate protective equipment should be used when entering the area.
- No smoking, no flames, fire or sparks in the danger zone.
- Proper ventilation should be provided.
- Suitable protective equipment should be used.

Precautions to be Taken in The Environment:

The gas leaking cylinder should be taken carefully to a safe area and no repairs should be made on it. In such cases, **FRIGO MEKANİK INC.** Technical support team should be called.

Cleaning Methods:

- The area affected by ammonia gas should be ventilated.
- If the leak is in the user's equipment, the gas pipes should definitely be swept with inert gas before starting the repair.

7. USE AND STORAGE

Use:

- Strong gloves should be worn.
- Unless the seller specifies, a gas cylinder should never be picked up from its cap and removed.
- A wheeled transport vehicle must be used to transport heavy tubes, even over short distances.
- The protection cover of the valve should not be removed until the gas cylinder to be used is fixed somewhere, and it should be kept for use in an upright position.
- If necessary, appropriate eye and face protective equipment should be worn.
- Gas leaks should be checked using an appropriate method.
- In case of gas leak; Sufficient water should be available for first aid, fire fighting or dilution of corrosive materials.
- Appropriate pressure reducers (regulators) should be used to reduce the pressure during gas usage.
- Before putting the ammonia gas cylinder into use, care should be taken that there is no feedback in the system.
- All electrical systems in the area of use must be suitable for ammonia gas.
- Direct flames or electrical heating devices should never be used to increase the pressure of a gas cylinder.
- The tube should never be exposed to a pressure of 45 °C.
- A gas cylinder should not be used as a slider or support other than to contain purchased gas.
- Oil, petroleum and other highly combustible substances, cylinders containing oxygen or other oxidizers should never be allowed to come into contact with valves.
- Tube outlet valves should be kept clean and free from contaminants, especially oil and water.
- Tubes should be kept away from abnormal mechanical shocks that could damage their valves or safety devices.
- Cylinder valves or safety devices should never be repaired or modified.
- Damaged valves should be reported to the dealer immediately.
- Even if the cylinder is connected to equipment, if no gas use is required, the cylinder valve should be kept closed.
- Tube caps should be placed as soon as the tube is separated from the equipment.

Storage:

- Personnel working with ammonia must know the safety rules for working with this substance which is corrosive to human tissue.
- Welding should not be done in or on the ammonia vessel before the ammonia and its residue have been completely cleaned.
- Ammonia leakage is evident by odor. Ammonia vapor that is lighter than air can be discharged with good ventilation. If ventilation is not possible, the ammonia concentration in the air is reduced by spraying water.
- If it is desired to drain ammonia from a leakage tank, it can be taken into a container with sufficient water (10 water, 1 ammonia). Ammonia should be drained towards the bottom of the container filled with water. If there is a leak at the bottom of the valve, try to tighten the valve. If the valve is not tight, the valve is taken out with closed condition.
- If the ammonia tank is caught in the fire, it is cooled by water from a safe distance. Firefighters should wear protective clothing and breathing equipment.
- Ammonia tubes should be stored in a well ventilated area. During storage, precautions should be taken in a way that the tube temperature will not fall below -40°C or exceed 45°C.
- Tubes should be stored in a place free from fire risk and away from heat / ignition sources.
- A "NO SMOKING" warning sign must be hung in the storage area.
- The storage area should be kept clean and only authorized personnel should enter.
- The storage area should be marked with appropriate hazard warning signs.
- Stored tubes must be kept in such a way that they cannot tip over or roll over.
- The tube valves must be tightly closed and valve outlets must also be closed if necessary.
- The protective cover must be in place and fitted properly.
- Tubes stored in open areas should be protected against rusting and harsh weather conditions.
- Tubes should not be stored under conditions that may cause corrosion.
- Full and empty tubes should be stored separately and full tubes should be arranged first to use old stock.
- Ammonia gas cylinders should be separated in the storage area according to various categories.
- Flammable and toxic gases should be kept to a minimum in the storage area.
- Flammable gases should be kept away from flammable materials.
- Tubes kept in storage should be inspected periodically.
- Tubes should not be stored to complete the electrical circuit.

Special Uses:

For specific uses other than those specified above, users are required to adhere to the information obtained from the literature, applicable methods and procedures.

8. EXPOSURE CONTROL / PERSONAL PROTECTION

Occupational Exposure Limit : 25 ppm TWA (TLV-ACGIH)
50 ppm TWA (PEL_OSHA)
7338 ppm LC₅₀ (LD50 or LC₅₀)

Occupational Exposure Controls :

Forced ventilation should be provided with a hood.

Local ventilation should be provided to prevent accumulation above the exposure level.

Protection of Respiratory System :

A full-face respirator or self-contained breathing apparatus must be ready for emergency use. Operate this equipment in the "plus pressure use" position.

Hand Protection :

Protective gloves should be worn.

Eye Protection :

Face shield or eye mask should be used.

Skin Protection :

Protective clothing and boots made of butyl rubber material should be worn.

Environmental Exposure Controls:

Discharges should be avoided.

9. PHYSICAL AND CHEMICAL FEATURES

Physical State	: Gas (15 °C 'de 1 atm'de)
Smell / Color	: Bad Smell, Colorless
Molecular Weight	: 17,031 gr/mol-gr
Boiling Point	: -33 °C (1 atm)
Melting Point	: -77,7 °C
Critical Temperature	: 132 °C
Critical Pressure	: 114,25 bar
Ignition Temperature	: 630 °C
Explosion Limit	: % 15-28
Specific Gravity of Gas	: 0,6 (Air = 1)
Gas Density	: 0,7714 g /lt (0 °C, 1 bar)
Solubility (H ₂ O)	: 530 g/l (20 °C).
Other Informations	: It is colorless, pungent, flammable, toxic, mutagenic.

10. STABILITY AND REACTIVITY

Stability : Stable.

Conditions to Avoid : The combination of water and ammonia forms a strong base

Materials to Avoid :

- Reacts with acids and oxidizing materials (fluorine, chlorine, etc.).
- Corrosive to copper, zinc, tin, brass and many metal surfaces.
- Reacts with hypochlorite or other halogen sources to form explosive compounds sensitive to pressure and temperature.
- It should not come into contact with silver and mercury as it will create explosive mixture.

Hazardous Decomposition Products : High temperatures, 840 °C, hydrogen

11. TOXICOLOGICAL INFORMATION

Ammonia is a toxic, mutagenic, irritating gas.

It may cause damage to the respiratory system, severe burns to the skin and eyes, and its physiological effects are as follows.

Minimum odor level (unnoticeable odor)	: 5 ppm
Noticeable odor	: 20-50 ppm
A Level that does not disturb and does not harm health when exposed for a long time	: 50-100 ppm
General discomfort and tearing;	: 150-200 ppm
No effect on short-term exposure	
Cough, bronchial spasm	: 1700 ppm
Dangerous, 1.5 hour exposure may result in death	: 2000-3000 ppm
Severe edema, trouble breathing, death quickly	: 5000-10000 ppm
Sudden death	: 10000 ppm

In general, in concentrations not exceeding 35 ppm, it can be settled in ammonia environment in not more than 15 minutes.

If liquid ammonia comes into contact with skin, it will cause severe burns.

12. ECOLOGICAL INFORMATION

Ecotoxicity : Toxic to aquatic organisms.

Mobility : No data available.

Persistence and Degradability : No data available.

Bioaccumulative Potential : No data available.

Other Perverse Effects : May cause pH changes in the ecological system

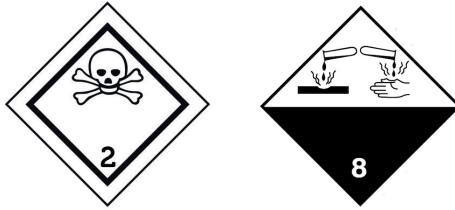
13. DISPOSAL INFORMATION

It should not be discharged into any environment where dangerous amounts of accumulation may occur. For the disposal of gases remaining in the tubes, should be contacted with **FRIGO MEKANİK INC.**

14. TRANSPORT INFORMATION

Parameter	Identification Number	Convenient Shipping Type	Hazard Class	Hazard Class Code	Tag Information	Shipping Label
ADR	UN 1005	Ammonia Anhydrous, Liquefied	2	2 TC	2.3 + 8	Toxic, Corrosive Gas

ADR Tag:



15. REGULATORY INFORMATION

Symbol : T,N

Legislation Risk Definitions : R10, May be flammable..
R23, Toxic if inhaled.
R34, Causes burns.
R50, Toxic to aquatic organisms.

Legislation Security Definitions : S7/9, Keep container tightly closed and in a well-ventilated place
S16, Keep away from sources of ignition. no smoking
S18, The container should be carefully moved and opened.
S26, In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S33, Take precautionary measures against static electricity discharges.
S36/37/39, Wear suitable protective clothing, protective gloves, protective glasses / mask while working.
S45, In case of accident or if you feel unwell, consult a doctor immediately.
S61, Avoid giving the environment uncontrolled See special instructions / Safety Data sheet.

16. OTHER INFORMATION

The information has been prepared for the purpose of information from the available sources in good faith and without creating any assurance regarding its accuracy, validity and effectiveness, regardless of the basis

PEL-OSHA : The Exposure Limit Allowed by the U.S. Occupational Safety Occupational Health Administration.

TLV-ACGIH : American Association of State Industrial Hygienists, Threshold Limit Value.

TWA : The average amount that can be exposed during the 8-hour workday.

LD : Lethal amount in mice.

LC : Lethal concentration in mice.