



Ammonia – a new energy source with particular hazards

Ammonia is increasingly seen as a promising hydrogen carrier in the energy transition debate. Its low boiling point allows it to be transported in liquid form, giving it an advantage over hydrogen. In addition, its higher density allows more ammonia to be stored in the same tank volume, and liquid ammonia has a much higher energy density than hydrogen. However, ammonia's corrosive and toxic properties pose particular hazards. These require special precautions, especially when handling and transporting ammonia. Advanced safety technology minimises these risks, protecting human health and the environment.

Ammonia production, storage and transport

Producing ammonia, usually using the Haber-Bosch process, requires extensive safety precautions due to the high reactivity of the raw materials and the high temperatures and pressures required. When storing ammonia, it is crucial to prevent leaks, as ammonia is highly toxic in the air. Special containers and monitoring systems must be in place to safely handle and manage hazards like corrosion and pressure build-up. Ammonia transport, whether by tanker, ship or pipeline, also highly demands safety technology. In particular, the release risks and associated environmental and health hazards must be managed. Fixed and portable gas detection technology used as monitoring and control systems and personal protective equipment is decisive in keeping people and the environment safe.

Safety challenges

Compared to highly flammable hydrogen, ammonia's ignition temperature and required ignition energy are significantly higher. However, due to its toxic and corrosive properties, it presents a number of other safety challenges. Choosing the right equipment, materials, and protective measures is essential.

Toxic

Exposure to ammonia vapours can cause irritation and damage to the eyes, nose, throat, and lungs. In higher concentrations, ammonia can be fatal. To ensure the safety of workers, appropriate protective measures must be taken, such as gas detectors, personal protective equipment, or ventilation systems.

Corrosive

Ammonia is corrosive as it extracts water from its surroundings, creating alkalinity at the points of contact. This can cause skin and eye irritation, chemical burns and damage to the respiratory tract.

Flammable

Ammonia is a flammable gas that can be ignited between 14% by volume (lower explosion limit) and 32.5% by volume (upper explosion limit). Spontaneous ignition occurs at 630°C in the presence of sufficient oxygen.

Water solubility

Ammonia is highly soluble in water, depending on temperature and partial pressure. Ammonia water poses a long-term danger to aquatic organisms and their environment. Therefore, leaking or spilling ammonia must be avoided at all costs, especially during maritime transport.

Dispersal behaviour

Ammonia is lighter than air and rises typically. However, when used as a refrigerant, cryogenic NH₃ tends to sink when it escapes. Humid conditions can also lead to the formation of ammonia vapour, which is heavier than air. The optimal location of gas detection equipment must be considered case-by-case.

Frostbite

Liquid ammonia is often stored in a cold or cryogenic state. Therefore, when handling ammonia, leaks or cold surfaces can lead to frostbite or cold burns. Therefore, when selecting protective equipment, particular attention must be paid to the resistance of materials such as protective clothing. →

Detection technologies and solutions for safe ammonia handling

The right equipment, materials, and protective measures can meet these special safety challenges. Dräger provides comprehensive safety solutions, from portable gas detection devices to fixed fire and gas detection systems, from consulting and project planning to maintenance services. For any questions regarding ammonia measurement, please contact your local Dräger sales organisation.

Fixed gas detection:



Dräger Polytron® 7000
Detector for
toxic gases and oxygen



Dräger Polytron® 8900
Ultrasonic Gas Detector



Dräger Polytron® 8200 CAT
Flammable Gas Detector



Dräger Flame 1750 H₂ (IR3)
Flame Detector

Portable gas detection:



Dräger Pac® 8500
Single Gas Detector



Dräger X-am® 5600
Multi Gas Detector



Dräger X-am® 8000
Multi Gas Detector

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Further information on ammonia safety can be found here:
www.draeger.com/ammoniasafety

Personal protective equipment:



Dräger X-plore® 3300/3500
Half Mask



Dräger X-plore® 8000
Powered Air Purifying
Respirator



PARAT® 7500
Escape Hood



CPS 7800
Chemical Protection
Suit