

Ammonia leak detection in industrial refrigeration

Low temperatures must be generated wherever food and beverages are produced, processed or stored. Ammonia is primarily used in industrial refrigeration, particularly in the food industry, for several reasons: energy efficiency, lower cost and environmental friendliness. Refrigeration systems based on Ammonia (NH₃, R717) are common in such applications as:

- Food processing facilities (slaughterhouses, fish plants, dairy factories, canneries, etc.)
- Breweries
- Bottling plants
- Cold storage warehouses



AMMONIA LEAKS

Any refrigeration system based on NH_3 poses a risk of leakage, the main causes of which can be: corrosion, leaking valves or operating errors. Since Ammonia is toxic at low concentrations and flammable at higher ppm levels (classified as B2L by hazard level), all Ammonia systems must be designed with safety in mind. This is necessary for fast and accurate detection of leaks and, as a result, for:

- Employee safety and protection from exposure to high concentrations;
- Damage prevent of system and food stored in the refrigerator;
- Minimizing the cost of stopping production, whether it is a real alarm due to dangerous concentrations or just a false alarm;
- Reducing the cost of refrigerant topping up.

REGULATIONS

Industrial refrigeration facilities have to follow the guidelines laid out in EN 378, which implies Ammonia gas detection. According to this standard, the low NH_3 hazard level is not more than 500 ppm by volume, and the high hazard level is 30 000 ppm or more. For people safety it is also necessary to comply with the following standards:

- **EU-OSHA:** maximum permissible short- term exposure limit for NH_3 – 50 ppm;
- **WEL:** 8hr exposure limit – 25 ppm (TWA); exposure limit for 15min – 35 ppm (STEL)

Depending on the place type in a plant, certain codes and regulations will apply in each of them.

MACHINERY ROOMS

Requirements for refrigerant leaks detection in machinery rooms are clearly defined in the EN 378 standard. Section 9.1 of EN 378 – 3 : 2016 states that “When the concentration of the refrigerant can exceed the practical limit in accordance with EN 378 – 1 : 2016, Annex C, detectors shall at least actuate an alarm and in the case of a machinery room the emergency mechanical ventilation.” Practical limit (or pre-alarm level) for R717 refrigerant is 500 ppm, and main-alarm concentration is 30 000 ppm.

In Section 9.2, also stating

“At least one detector shall be installed in each machinery room or the occupied space being considered.”

Regarding the requirements for gas detectors in a machinery room, EN 378 – 3 : 2016, Section 8.3 highlights that they must activate audible and visual alarms both inside and outside the given place (alarms outside the machinery room may be installed in a monitored location).





REFRIGERATED ROOMS

In addition to complying with all of the above EN 378 requirements, people safety standards must also be taken into account in refrigerated rooms such as walk-in freezers and cold storages. For personnel protection and early leaks detection inside these places, it is necessary to measure not only high but also low Ammonia concentrations (25 and 35 ppm).

By the standard, audible and visual alarms must be present inside the refrigerated room, however, alarm installation outside walk-in freezers and cold rooms is also widespread. This is important to alert employees who may be entering potentially hazardous areas.

Important requirement for gas detectors in refrigerated rooms is the reliable control of a highly toxic hazardous substance in unfavorable climatic conditions, such as temperature fluctuations or high humidity. Installing Evikon MCI gas detectors is an effective method for threshold violations detection and staff alerting as quickly as possible. A built-in heating element not only allows the detectors to operate at temperatures down to -40°C , but also prevents condensation forming and freezing on the sensor, which ensures accurate readings.





E2608

- Electrochemical (smaller ranges up to 1 000 ppm) or catalytic (bigger ranges up to 100 000 ppm) sensors choice depending on detector location.
- Two analog outputs 4-20 mA or 0-10 V and RS485 Modbus RTU digital interface for connecting the detectors to safety or building automation systems.
- Operation at low temperatures (down to -40°C) by using built-in heating element.
- Two SPST relays with closing contact for remote signalling or ventilation control (two alarm set-points are user settable).

OPTIONS

- Remote probe for installation in any places (including hard-to-reach ones), depending on the wishes / requirements of the client, and subsequently, for more convenient instrument access / maintenance
- Duct mount version
- 230 VAC or 24 VAC power supply

E2638

Electrochemical (small ranges up to 1 000 ppm) or catalytic (bigger ranges up to 100 000 ppm) sensor choice depending on detector location.

Two analog outputs 4-20 mA or 0-10 V and RS485 Modbus RTU digital interface for connecting the detectors to safety or building automation systems.

Operation at low temperatures (down to -40°C) by using built-in heating element.

OPTIONS

Two SPST relays with closing contact for remote signalling or concentration control (two alarm set-points are user settable).

Remote probe for installation in any places (including hard-to-reach ones), depending on the wishes / requirements of the client, and subsequently, for more convenient instrument access / maintenance.

LEDs and a buzzer for visible and audible alarms to alert workers to dangerous refrigerant concentrations.

LCD allows customers to see the measured gas concentration in real time.

Detectors relay functionality button check (self-test button for relays) makes the instrument testing process easy and convenient.

230 VAC or 24 VAC power supply





Wider selection of gas detectors for refrigeration applications is presented on the Evikon MCI website.

Jointly with a sister company Evikontroll Systems it is possible to offer full solutions as well.

For more technical information / inquiries, please contact us via sales@evikon.eu

