Ammonia

Where is it found?

Ammonia (NH_3) is a colourless gas with a pungent odour that can be detected by humans at 0.4-1 ppm, being the exposure limit 50 ppm. NH_3 is originated from both natural and anthropogenic sources, the main ones being agriculture (fertiliser application and fabrication) and livestock (manure management), followed by waste and water management (slurries, composting and landfills). Other sources are household and industrial cleaners, which can directly affect humans exposed to them.

Why is it harmful?

NH_3 is a volatile gas poisonous if inhaled at high concentrations, causing respiratory tract and eye irritation, while causing throat and skin irritation in lesser amounts. It is highly soluble in water, so it is associated with acid deposition and eutrophication, affecting land and water ecosystems by reducing biodiversity.

Besides, it is explosive when mixed with air or oxygen at very high concentrations. NH_3 also contributes to the formation of particulate aerosols in the atmosphere as a secondary particulate precursor.

NH_3 cartridge

The NH_3 cartridges contain electrochemical sensors capable of accurately measuring NH_3 in different ranges. There are 3 types of NH_3 cartridges for different applications:

- **Type A:** is used to detect from low concentrations up to 50 ppm with a typical noise of less than 0.3 ppm when the ambient temperature is less than 25 ºC. This sensor is responsive to H_2S when present at high concentrations (ppm level), which is relevant since the two substances can coexist in the same environment. Therefore, to accurately measure NH_3, it is necessary to have the H_2S cartridge installed in the same device (in case of high H_2S concentrations, ppm level). Thus, thanks to Kunak's algorithm which considers both concentrations, it is possible to correct the interference of H_2S and obtain precise measurements of NH_3.
- **Type B:** a higher range version that is used to carry out continuous measurements of concentrations up to 1,500 ppm, not so precise at low concentrations. Both Type A and Type B sensors are specially conceived for industrial leak detection, and not for environments with continuous background NH_3 concentrations (i.e. livestock).
- **Type C:** cartridge is able to measure continuous (background) concentrations of NH_3, with a range up to 50 ppm. It is responsive to H_2S, which is why it is recommended to install an H_2S cartridge in the same device to correct this interference when H_2S is present at high concentrations (ppm level). This cartridge is recommended for continuous NH_3 monitoring applications such as farms and livestock.

Type	Electrochemical
Unit of measurement	mg/m³, ppm
Measurement range (1)	0 - 50 ppm (A-C) 0 - 1,500 ppm (B)
Resolution (2)	0.01 ppm
Operating temp. range (3)	-10 to 50ºC (A) -20 to 43ºC (B) -20 to 40ºC (C)
Operating RH range (4)	0 to 99 %RH
Recommended RH range (4)	15 to 90 %RH
Operating life (5)	> 24 months
Guarantee range (6)	100 ppm (A) 5,000 ppm (B) 200 ppm (C)

Limit of Detection (LOD) (7)	0.02 ppm (A-C) 0.15 ppm (B)
Repeatability (8)	0.03 ppm (A) 0.5 ppm (B) 0.1 ppm (C)
Response time (9)	< 45 sec (A) < 90 sec (B-C)
Typical accuracy (11) (12)	± 0.3 ppm (A) ± 1.5 ppm (B) ± 0.5 ppm (C)
Typical precision R^2 (10)	-
Typical slope (10)	-
Typical intercept (a) (10)	-
DQO - Typical U(exp) (13)	-
Typical Intra-model variability (14)	< 0.1 ppm (A-C) < 0.2 ppm (B)

* See notes on page 24