



Options for Measurement of Ammonia

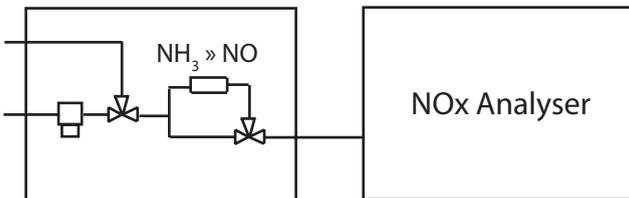
- Model 410 Ammonia Converter
- Parallel NH₃ Analyser/NO_x Analyser
 - Real time NH₃ and NO_x
- Parallel NH₃/NO_x/NO Analysers
 - Real time NH₃, NO_x, NO₂ and NO

Ammonia Measurement Overview

It is possible to measure ammonia, NH₃, using a variety of detection techniques. As NH₃ is highly soluble in water, cold techniques such as infra-red measurement are generally unsuitable for hot applications. In cooling and drying a heated sample, the NH₃ will readily be lost during the sample conditioning process. For this reason Signal would recommend the use of a high efficiency converter of NH₃ to NO in conjunction with a heated chemiluminescent detector. The stainless steel design utilised in Signal ammonia converters has an efficiency of at least 90%

1. Model 410 Ammonia Converter Overview

The Signal Model 410 Converter uses stainless steel to convert NH₃ and NO₂ to NO. This can be used with an NO analyser to measure NH₃+NO₂+NO. If this converter is then bypassed the analyser can be used to measure NO, or ideally with a NO₂ converter to measure NO_x (NO+NO₂), and from this values for NH₃, NO₂ and NO can all be derived. In this arrangement the selection of converter and bypass is operated via a switch on the front panel and the NH₃ value calculated manually.

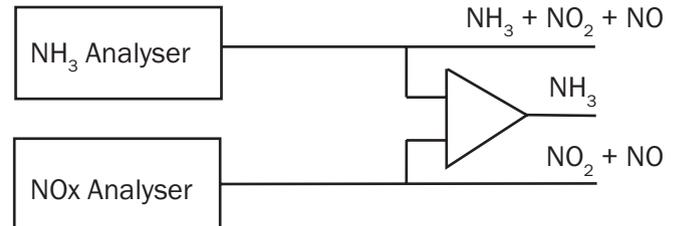


Flow schematic option 1.

This setup is mainly used in laboratory type applications where levels of the gases being measured are fairly stable. As it can take up to several minutes to get an accurate reading for each measurement, to then derive the individual values for NH₃, NO₂ and NO, this method is not very suitable for fast changing concentrations. It does not provide true real-time measurement, however, it is the simplest and most cost effective solution for hot measurement of NH₃.

2. Parallel NH₃ Analyser/NO_x Analyser Overview

In this method two analysers, one containing a stainless steel NH₃ to NO converter and the other a carbon based NO₂ to NO converter, are arranged in parallel. The outputs are then linked to a differential amplifier connected to a PC so that continuous readings for NH₃+NO₂+NO, NO+NO₂ and the differential NH₃ can be obtained.

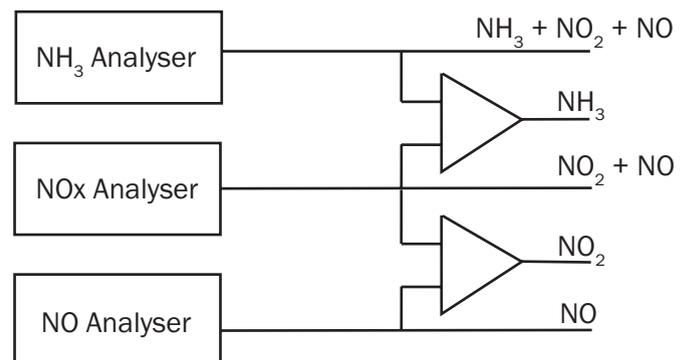


Flow schematic option 2.

This arrangement is used to provide true real-time measurement of ammonia. As the measurement is a differential, once the analysers have been calibrated using the same gas it will not be necessary to calibrate the NH₃ differential again apart from a 6 monthly check of the converter efficiency. This method is not ideal, however, for high levels of NO_x with low levels of ammonia. For optimum operation the ratio should ideally be no more than 1:3 NH₃ to NO_x. The NO₂ converter designed by Signal has an efficiency of better than 95%

3. Parallel NH₃/NO_x/NO Analyser Overview

Using the same principle as Option 2, this arrangement provides a real time continuous measurement of NH₃, NO₂ and NO using two differential measurements. These subtractions are carried out in a PC rather than within the analysers themselves providing readings for total nitrogen, NH₃, NO_x, NO₂ and NO.



Flow schematic option 3.

This is the most complete and technologically advanced solution and the only method currently available to measure hot NH₃, NO₂ and NO in real time.