

GC-IMS: DEVICE SET-UP

A GC-IMS was calibrated to detect NO/NO₂. In order to separate the NO_x species from other permanent gases a GC column for permanent gas analysis was used. Certified test gases (Linde AG Germany, DIN EN ISO 6141) were used to calibrate the device in the concentration range of 0-150 ppb.



Figure 1: GC-IMS made by G.A.S. for online at-site monitoring of permanent gases and VOCs.

DEVICE CALIBRATION

Calibration measurements of NO (Figure 2) in the range of 0-150 ppb. Standard deviation was calculated to 1.6 % @ 50 ppb (n=10). The limit of detection for NO lies in the one-digit ppb-range.

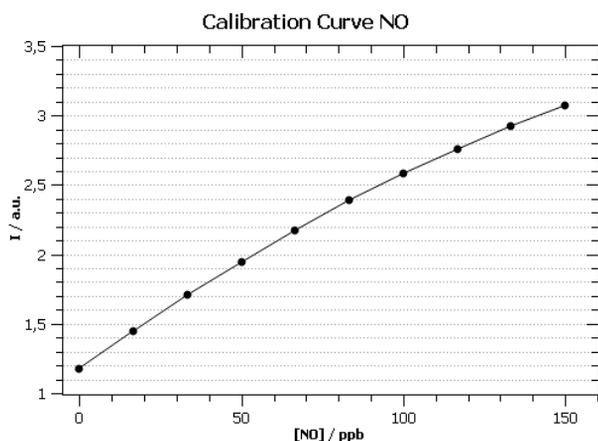


Figure 2: Calibration of NO in the range of 0-150 ppb.

Representative calibration measurements of NO₂ in the range of 0-150 ppb are shown in figure 3. The standard deviation was calculated to 2.1 % @ 50 ppb (n=10). Depending on the device setup the limit of detection for NO₂ is below 10 ppb.

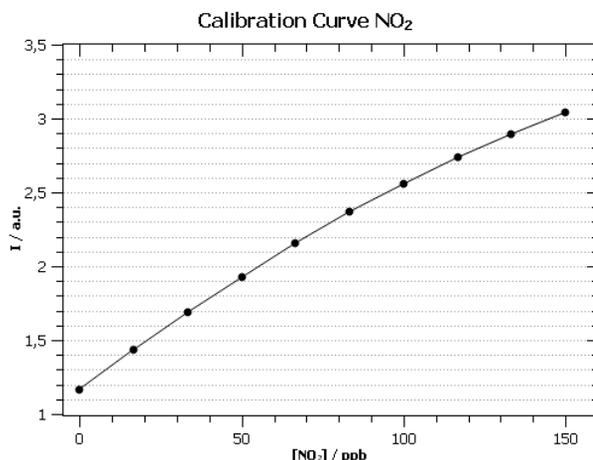


Figure 3: Calibration of NO₂ in the range of 0-150 ppb

The application-specific (matrix, GC column) calibration measurements resulted in detection limits below 10 ppb for both oxides of nitrogen (s. table below).

Analyte	LOD *1	σ *2
NO	< 10 ppb	1.6 %
NO ₂	< 10 ppb	2.1 %

*1 Limit of detection was determined in a customized/application related setup.

*2 Standard deviation, σ, of signal intensity at a concentration of 50 ppb (n = 10).

FURTHER INFORMATION

As is known both nitrogen oxides, NO and NO₂, are part of several reactions and equilibria making the quantification process complex.

Due to the fact that NO/NO₂ were not separable by GC-IMS technology a quantification of each species is only possible, if it is ensured, that only one of them is introduced into the device (NO converter, e.g.) at the same time. Otherwise, based on the very similar detector response for both nitrogen oxides, the result can be displayed as a generic parameter displayed as NO_x (concentration of NO, NO₂ or accumulation of both oxides). Of course co-elution of other matrix compounds should be avoided in order to quantify the analytes.

For further information about online/at-site monitoring of permanent gases and VOCs visit gas-dortmund.de.