### Technical note TNE-05

# **Calibration gas**

Nippon Gases Norge AS (former «Yara Praxair» and «Hydro Gas and Chemicals») has over 60 years of experience in production and development of specialty gas mixtures. Today's production covers almost all types of gas mixtures, provided that the individual components do not react chemically, or that physical causes limit the possibilities.

Why calibration gas is needed: Most methods of analysis are not absolute, but only give a relative response. Therefore, it is necessary to calibrate with a standard of known composition and concentration, so that the content of a sample can be determined accurately. A calibration gas must be an accurate, stable and homogeneous mixture. The concentration is stated for each component, together with a guarantee for the accuracy of the certified value within a certain guarantee period.

About mixing tolerance and certified uncertainty: Mixing tolerance indicates how close to the ordered concentration we guarantee that the produced concentration will be. Mixing tolerance varies with concentration and quality class, but can also be adapted to special needs of the customer. Standard mixing tolerances are given in the table below. The certified uncertainty indicates our guarantee for the maximum deviation from the certified value the true value can have. The size of the certified accuracy depends mainly on the production method, the purity and content of contaminants in the raw materials, the stability of the components, and the accuracy of the analysis.

Class	Concentration- range	Mixing tolerance % relative	Certified uncer- tainty % relative
Class 0 (*)	Agreed in particular	Agreed in particular	Agreed in particular
Class 1 «Calibration gas»	≤1 ppm 1 – 5 ppm 5 – 250 ppm 0,025 – 50 % 50 – 100 %	± 20 ± 10 ± 10 ± 5 ± 3	±5 ±3 ±2 ±1 ±0,5
Class 2 «Calibration gas»	≤ 10 ppm 10 – 250 ppm 0,025 – 50 % 50 – 100 %	± 20 ± 20 ± 10 ± 5	±5 ±3 ±2 ±1
Class 2a «Calibration gas»	≤ 10 ppm 10 - 250 ppm 250 - 1000 ppm 0,01 - 50 % 50 - 100 %	± 20 ± 20 ±10 ±10 ±5	±10 og ±5 (**) ±5 ±3 ±2 ±1
Class 3 «Gas mix» / «Liquid Mixture»	≤ 1000 ppm 0,1 - 10 % > 10 %	± 20 ± 10 ± 5	Not certified

\*): If the standardized specifications above do not meet the customers need, many specifications can be customized in Class 0 - within the framework of Nippon Gases Norge AS' expertise. Specifications and delivery time are in these cases agreed between the customer, supply and development.

\*\*): Components that can be produced in class 1, are certified with uncertainty ± 5 % relative with concentrations below 10 ppm. Other components are certified with uncertainty ± 10 % relative.

 $\mathsf{Except}$  for class 3, all mixtures are delivered with a certificate.



## Factors that will influence the uncertainty in the production process:

#### 1. Choice of raw materials

Total purity and specified impurities in raw materials are important in calculation of parameters. If the raw materials contain impurities, this will influence the uncertainty for each and every component.

#### 2. Weigh-in

When calibration gases are produced gravimetrically, that is all components are weighed in according to calculated values, the resolution of the balances and scales are of great importance. The same applies to the traceability of the weights used in the control of these.

## 3. Choice of materials and pretreatment of cylinders

To achieve the best quality of calibration gases, it is essential that the surface in contact with the gas is pretreated in a way that no reaction between the components, cylinder and valve will take place. Nippon Gases Norge AS has developed methods for pre-treatment of the inner surface of the cylinders and valves to eliminate this effect.