
**Ambient air — Determination of mass
concentration of nitrogen dioxide —
Modified Griess-Saltzman method**

*Air ambiant — Détermination de la concentration en masse de dioxyde
d'azote — Méthode de Griess-Saltzman modifiée*



Foreword

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International Standard ISO 6768 was prepared by Technical Committee ISO/TC 146, *Air quality*, Subcommittee SC 3, *Ambient atmospheres*.

This second edition cancels and replaces the first edition (ISO 6768:1985), which has been technically revised.

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Ambient air — Determination of mass concentration of nitrogen dioxide — Modified Griess-Saltzman method

1 Scope

This International Standard specifies a modified Griess-Saltzman method for the determination of the mass concentration of nitrogen dioxide present in ambient air.

The method is applicable to the determination of the mass concentration of nitrogen dioxide present in ambient and confined air within the range 0,003 mg/m³ to 2 mg/m³ and for sampling times between 10 min and 2 h.

Substances present in the air mass under investigation, and thus in the air sample, and known to have an effect on the instrument reading, are given in 7.4. Information on the performance characteristics is given in 8.2.

The method is not suitable for personal breathing-zone sampling.

The Griess-Saltzman method is suitable for the analytical check of calibration gas mixtures which are used to calibrate chemiluminescence analysers (see ISO 7996).

2 Normative reference

The following standard contains provisions which, through reference to this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 6349:1979, *Gas analysis — Preparation of calibration gas mixtures — Permeation method*.

3 Principle

The nitrogen dioxide present in an air sample is absorbed by passage through an azo-dye-forming reagent within a specified period, resulting in the formation of a pink colour within 15 min.

The absorbance of the sample solution is then determined at a wavelength between 540 nm and 550 nm using an appropriate spectrophotometer. The corresponding mass concentration of nitrogen dioxide is determined from a calibration graph of absorbance vs. concentration prepared using sodium nitrite solutions of known concentrations.

4 Reagents

During the analysis, use only reagents of recognized analytical grade and only nitrite-free water (4.1).

4.1 Nitrite-free water.

If the water used to prepare the absorption and calibration solutions results in a pink coloration due to the presence of nitrite in the water, prepare nitrite-free water as follows. Add one crystal each of potassium permanganate (KMnO_4) and barium hydroxide [$\text{Ba}(\text{OH})_2$] to the water and redistill using an all-glass still.

4.2 *N*-(1-naphthyl)ethylenediamine dihydrochloride, 0,5 g/l stock solution.

Dissolve 0,5 g of *N*-(1-naphthyl)ethylenediamine dihydrochloride [$\text{C}_{10}\text{H}_7\text{NH}(\text{CH}_2)_2\text{NH}_2 \cdot 2\text{HCl}$] in 1000 ml of nitrite-free water (4.1).

Store in a stoppered brown glass bottle at a temperature below 5 °C. The solution is stable for several months.

NOTE It is also possible to store small weighed amounts of the solid reagent.

4.3 Absorption solution.

Dissolve 5,0 g of sulfanilic acid ($\text{C}_6\text{H}_4\text{SO}_3\text{H}\text{NH}_2$) in approx. 600 ml of nitrite-free water (4.1) and 50 ml of acetic acid by heating, if necessary, in a 1000 ml one-mark volumetric flask. Cool the solution to room temperature, add 100 ml of *N*-(1-naphthyl)ethylenediamine dihydrochloride solution (4.2), mix and make up to the mark with nitrite-free water (4.1).

Store in a well-stoppered brown glass bottle at a temperature below 5 °C. The solution is stable for 2 weeks.

4.4 Gas mixtures.

Prepare gas mixtures, which are used to test the absorption efficiency (7.1.1), following the permeation technique specified in ISO 6349 or by an equivalent method.

4.5 Reagents for preparation of the calibration graph

4.5.1 Nitrite solution, $\rho_{\text{NO}_2} = 250 \text{ mg/l}$.

Dissolve 375 mg of sodium nitrite (NaNO_2) in nitrite-free water (4.1) in a 1000 ml one-mark volumetric flask. Make up to the mark with nitrite-free water and mix well.

Store in a well-stoppered bottle. The solution is stable for at least 3 months.

1 ml of this solution contains 250 μg of NO_2^- .

4.5.2 Nitrite solution, $\rho_{\text{NO}_2} = 2,5 \text{ mg/l}$.

Transfer 10,0 ml of nitrite solution (4.5.1) to a 1000 ml one-mark volumetric flask. Make up to the mark with nitrite-free water (4.1) and mix well.

Prepare this solution immediately before use.

1 ml of this solution contains 2,5 μg of NO_2^- .

5 Apparatus

5.1 Ordinary laboratory apparatus and sampling equipment, as specified in 5.1.1 to 5.1.7.

5.1.1 Sampling probe.

Borosilicate glass, stainless steel or polytetrafluoroethylene tube whose internal diameter is approximately 6 mm and which is as short as possible, but in any case not longer than 2 m, provided with a downward-facing air intake.

If the use of such short sampling probes is not possible, an auxiliary sampling pipe consisting of a sampling probe of internal diameter about 50 mm, provided with a joint for attachment to the sampling train, and a pump drawing air at a volume flowrate of about 2 m³/h shall be used [see figure 1 c)].

5.1.2 Cotton wool filter.

Borosilicate glass tube, of internal diameter at least 15 mm and length approximately 80 mm, loosely packed with bleached, not optically brightened, and non-finished cotton wool. It shall be a component of the sampling train only if it is considered necessary to remove ozone from the air before it enters the fritted bubbler (see also 7.4).

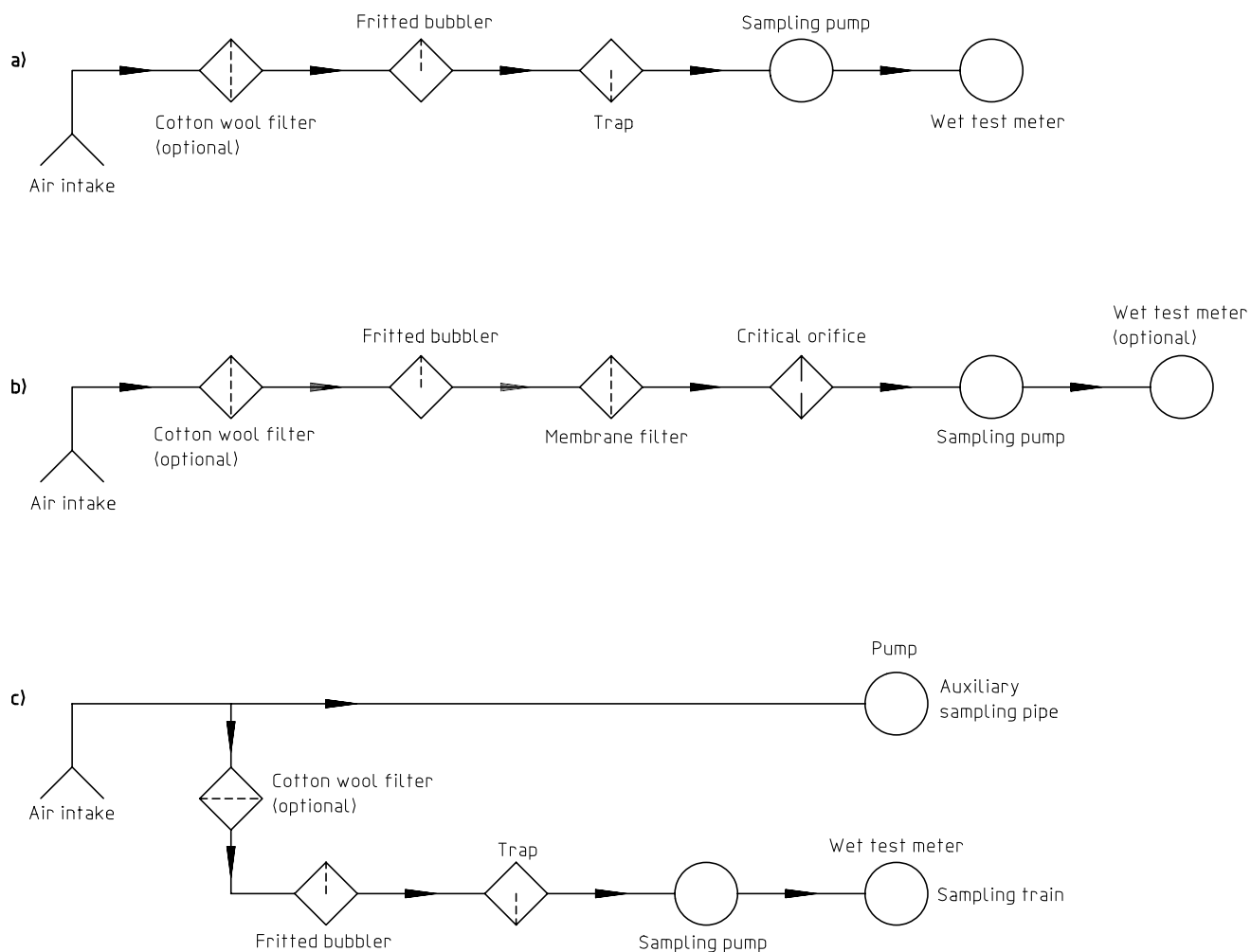


Figure 1 — Examples of sampling trains capable of the determination of the mass concentration of nitrogen dioxide in ambient air

5.1.3 Fritted bubbler.

Borosilicate all-glass bubblers equipped with a frit whose porosity shall be fine enough to enable an absorption efficiency of at least 0,95 to be attained without providing too great a pressure drop in use. Frits having pore diameters between 40 µm and 60 µm are suitable. Four examples of fritted bubblers (types A to D) that have been found to be suitable are shown in figure 2.

The absorption efficiency of each individual fritted bubbler shall be tested at least once a year using calibration gas mixtures prepared following the permeation technique specified in ISO 6349 or by an equivalent method.