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Ambient air - Method for the determination of the concentration of nitrogen dioxide by diffusive sampling

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

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English Version

Ambient air - Method for the determination of the concentration of nitrogen dioxide by diffusive sampling

Air ambiant - Méthode de détermination de la concentration en dioxyde d'azote au moyen d'échantillonneurs par diffusion

Außenluft - Bestimmung der Konzentration von Stickstoffdioxid mittels Passivsammler

This European Standard was approved by CEN on 24 February 2025.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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European foreword

This document (EN 16339:2025) has been prepared by Technical Committee CEN/TC 264 “Air quality”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2025, and conflicting national standards shall be withdrawn at the latest by October 2025.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document will supersede EN 16339:2013.

A list of the significant technical changes compared to EN 16339:2013 can be found in Annex G.

EN 16339:2025 includes the following significant technical changes with respect to EN 16339:2013:

— 4.2 and Annex A: examples of demonstration of equivalence with respect to the reference method are provided;

— 4.3 and Annex F: protective devices have been described including the advantages over the conventional design of samplers;

— Annex D: More contemporary data included for the equivalence method determination of the measurement uncertainty;

— Annex D: Sampling rates have been updated.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Introduction

EU Directive 2008/50/EC [1] stipulates that European Union Member States apply measurement methods for air quality pollutants (fixed measurement, modelling, indicative measurement, objective estimation) and associated Data Quality Objectives (DQO), depending on concentrations observed in different situations. Diffusive sampling is most often used as "indicative measurement". The methodology described in this document has been developed to ensure the possibility for diffusive sampling to partially substitute and supplement fixed monitoring (where the reference method being that described in EN 14211 [2] is used) as a tool for the assessment of nitrogen dioxide (NO_2) with corresponding DQO.

Instead of the reference method, users may employ any other method which has been demonstrated to be equivalent according to the Guide for the Demonstration of Equivalence (GDE) [3]

Diffusive sampling is an attractive alternative to fixed monitoring by reference methodology (described in EN 14211) for the measurement of NO_2. This is due to:

— small size of diffusive samplers;

— no requirement for electric power;

— potential for covering areas with a high spatial density;

— cost effectiveness.

Consequently, diffusive samplers can partially substitute and supplement fixed monitoring as a means for the assessment of air quality, provided that they fulfil the specific DQO given in [1].

Passive samplers can be used for indicative measurements to complement air quality networks, improve modelling techniques and other air quality assessments, such as NO_2 concentrations for comparing with UNECE Critical Levels (annual mean of 30 μg NO_x/m^3, expressed as a NO_2 equivalent) for the protection of vegetation and natural ecosystems [4] [5] [6].

A demonstration of equivalence according to [3] has been performed by the North Rhein-Westphalia state agency for nature, environment and consumer protection (LANUV) [7]. Some studies have compared NO_2 annual average concentrations measured by chemiluminescence and by diffusive samplers [8], [9], [10] and [11]. These have shown the potential of diffusive sampling to meet the data quality objective of 15 % expanded uncertainty for fixed measurements [1].

The methodology described in this document can be applied to obtain air quality information with a relatively high spatial density that can be used to complement the appropriate siting of fixed monitoring stations, or in the validation of dispersion models.

This document has been prepared based on the findings of reviews of implemented diffusive samplers in the European Union [12].

The methodology described in this document may also be used to determine NO_2 in indoor air. Appropriate strategies for NO_2 measurement in indoor air are described in EN ISO 16000-15 [13].

1 Scope

This document specifies a method for the sampling of NO_2 in ambient air using diffusive sampling followed by extraction and analysis by colourimetry or ion chromatography (IC). It can be used for the NO_2 measurement in a concentration range of approximately 3 µg/m³ to 130 µg/m^3 [12]. A sample is typically collected for a period of 1 to 4 weeks [14], with exposure periods depending on the design of the samplers and the concentration levels of NO_2.

Several sorbents can be used for trapping NO_2 in ambient air using a diffusive sampler [15]. This document specifies the application of triethanolamine as the reagent.

This document describes the application of a tube-type sampler (with either a cylindrical or a slightly conical tube), a badge-type sampler and a radial-type sampler.

The relative expanded uncertainty of NO_2 measurements performed using these tube-type diffusive samplers can potentially be lower than 25 % for individual measurements. When aggregating results to form annual average values, the relative expanded uncertainty can be further reduced to levels below 15 % due to the reduction of random effects on uncertainty [9].

NOTE NO_2 passive samplers are also employed to measure NO_x with the addition of an oxidant to convert ambient NO into NO_2. A second NO_2 sampler is also deployed without the oxidant and the concentration of NO is determined from the difference of the two samplers [16].

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 13528-2, *Ambient air quality - Diffusive samplers for the determination of concentrations of gases and vapours - Requirements and test methods - Part 2: Specific requirements and test methods*