Irish Standard
I.S. EN 16339:2013

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

I.S. EN 16339:2013

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English Version

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

Air ambiant - Méthode pour la détermination de la concentration du 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 15 June 2013.

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Foreword

This document (EN 16339:2013) 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of an identical text or by endorsement, at the latest by January 2014, and conflicting national standards shall be withdrawn at the latest by January 2014.

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

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Introduction

Experience gained across the European Union (EU) in implementing EU ambient air quality legislation [1] has shown that, generally, for nitrogen dioxide (NO_2), meeting the annual average limit value of 40 µg/m^3 is more problematic than meeting the 1-h limit value of 200 µg/m³ [2].

EU Directive 2008/50/EC [1] stipulates that European Union Member States shall apply the reference measurement methods and criteria specified in the Directive. For NO_2 monitoring in ambient air, the reference method being that described in EN 14211:2012 [3]. However, a Member State may use any other method that provides results equivalent to that of the reference method, to be demonstrated in accordance with the Guide for the demonstration of equivalence of ambient air monitoring methods [4]. The GDE devotes specific paragraphs to methods based on diffusive sampling.

For the measurement of longer-term average concentrations of nitrogen dioxide for comparison with the annual average limit value diffusive sampling is an attractive alternative to fixed monitoring using the reference methodology described in EN 14211 because of

— 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 an instrument for the assessment of air quality, provided that they fulfil the specific Data Quality Objectives given in [1].

At the time of publication of this standard, no full demonstration of equivalence according to [4] has been performed. However, some studies have compared NO_2 annual average concentrations measured by chemiluminescence and by diffusive samplers [5], [6], [7] and [8]. 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 standard 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.

Further, the methodology described can be used for simultaneously measuring sulphur dioxide (SO_2) when using ion chromatography as the method of analysis. The analytical method is described in [9], [10] and [11].

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

The methodology described in this standard 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.

1 Scope

This European Standard specifies a method for the sampling and analysis of NO_2 in ambient air using diffusive sampling followed by extraction and analysis by colorimetry 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. A sample is typically collected for a period of 1 to 4 weeks [13], 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. This standard specifies the application of triethanolamine as the reagent.

Nitrous acid and peroxyacetyl nitrate are the major chemical interferences of sorption by triethanolamine. However, in ambient air monitoring over long sampling times, both contaminants are generally present at low concentrations relative to NO_2. Moreover, these species can also interfere with the measurement of NO_2 when applying the EU reference method for NO_2 monitoring based on chemiluminescence (see [2]).

This standard describes the application of a tube-type sampler with either a cylindrical or a slightly conical tube. Its typical uptake rate is about 1 cm^3/min. Only for this sampler type sufficient evidence of validation has been found in a literature survey [12].

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 [6].

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for the application 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 ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025)*

3 Terms and definitions

For the purpose of this document, the following terms and definitions apply.

3.1
certified reference material
reference material [3.8], characterized by a metrologically valid procedure for one or more specified properties, accompanied by a certificate that provides the value of the specified property, its associated uncertainty, and a statement of metrological traceability

[SOURCE: ISO Guide 35:2006]

3.2
combined standard uncertainty
standard measurement uncertainty [3.10] that is obtained using the individual standard measurement uncertainties associated with the input quantities in a measurement model

[SOURCE: JGCM 200:2012]

3.3
desorption efficiency
ratio of the mass of analyte desorbed from a sampling device to that applied