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ISO 16000-15

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Indoor air —

Part 15: Sampling strategy for nitrogen dioxide (NO_2)

Air intérieur —

Partie 15: Stratégie d'échantillonnage du dioxyde d'azote (NO_2)

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 16000-15 was prepared by Technical Committee ISO/TC 146, *Air quality*, Subcommittee SC 6, *Indoor air*.

ISO 16000 consists of the following parts, under the general title *Indoor air* :

— *Part 1: General aspects of sampling strategy*

— *Part 2: Sampling strategy for formaldehyde*

— *Part 3: Determination of formaldehyde and other carbonyl compounds — Active sampling method*

— *Part 4: Determination of formaldehyde — Diffusive sampling method*

— *Part 5: Sampling strategy for volatile organic compounds (VOCs)*

— *Part 6: Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA® sorbent, thermal desorption and gas chromatography using MS/FID*

— *Part 7: Sampling strategy for determination of airborne asbestos fibre concentrations*

— *Part 8: Determination of local mean ages of air in buildings for characterizing ventilation conditions*

— *Part 9: Determination of the emission of volatile organic compounds from building products and furnishing — Emission test chamber method*

— *Part 10: Determination of the emission of volatile organic compounds from building products and furnishing — Emission test cell method*

— *Part 11: Determination of the emission of volatile organic compounds from building products and furnishing — Sampling, storage of samples and preparation of test specimens*

— *Part 12: Sampling strategy for polychlorinated biphenyls (PCBs), polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs) and polycyclic aromatic hydrocarbons (PAHs)*

— *Part 13: Determination of total (gas and particle-phase) polychlorinated dioxin-like biphenyls (PCBs) and polychlorinated dibenzo-p-dioxins/dibenzofurans (PCDDs/PCDFs) — Collection on sorbent-backed filters*

— *Part 14: Determination of total (gas and particle-phase) polychlorinated dioxin-like biphenyls (PCBs) and polychlorinated dibenzo-p-dioxins/dibenzofurans (PCDDs/PCDFs) — Extraction, clean-up and analysis by high-resolution gas chromatography/mass spectrometry*

— *Part 15: Sampling strategy for nitrogen dioxide (NO_2)*

— *Part 16: Detection and enumeration of moulds — Sampling by filtration*

— *Part 17: Detection and enumeration of moulds — Culture-based method*

— *Part 23: Performance test for evaluating the reduction of formaldehyde concentrations by sorptive building materials*

The following parts are under preparation:

— *Part 18: Detection and enumeration of moulds — Sampling by impaction*

— *Part 19: Sampling strategy for moulds*

— *Part 24: Performance test for evaluating the reduction of the concentrations of volatile organic compounds and carbonyl compounds without formaldehyde concentrations by sorptive building materials*

— *Part 25: Determination of the emission of semi-volatile organic compounds by building products — Micro-chamber method*

— *Part 28: Sensory evaluation of emissions from building materials and products*

The following parts are planned:

— *Part 20: Detection and enumeration of moulds — Sampling from house dust*

— *Part 21: Detection and enumeration of moulds — Sampling from materials*

— *Part 22: Detection and enumeration of moulds — Molecular methods*

— *Part 27: Standard method for the quantitative analysis of asbestos fibres in settled dust*

Furthermore,

— ISO 12219-1[1)], *Indoor air — Road vehicles — Part 1: Whole vehicle test chamber — Specification and method for the determination of volatile organic compounds in car interiors,* and

— the two International Standards for indoor air, ambient air and workplace atmosphere, ISO 16017-1[44] on pumped sampling and ISO 16017-2[45] on diffusive sampling

focus on volatile organic compound (VOC) measurements.

1) Under preparation.

Introduction

In ISO 16000-1, general requirements relating to the measurement of indoor air pollutants and the important conditions to be observed before or during the sampling of individual pollutants or groups of pollutants are described.

This part of ISO 16000 describes basic aspects to be considered when working out a sampling strategy for the measurements of nitrogen dioxide in indoor air. It is intended to be a link between ISO 16000-1, *Indoor air — Part 1: General aspects of sampling strategy*, and the analytical procedures.

This part of ISO 16000 presupposes knowledge of ISO 16000-1.

This part of ISO 16000 uses the definition for indoor environment defined in ISO 16000-1 and Reference [1] as dwellings having living rooms, bedrooms, DIY (do-it-yourself) rooms, recreation rooms and cellars, kitchens and bathrooms, workrooms or work places in buildings which are not subject to health and safety inspections with regard to air pollutants (for example, offices, sales premises), public buildings (for example hospitals, schools, kindergartens, sports halls, libraries, restaurants and bars, theatres, cinemas and other function rooms), and also cabins of vehicles and public transport.

The sampling strategy procedure described in this part of ISO 16000 is based on VDI 4300-5 [2].

Indoor air —

Part 15: Sampling strategy for nitrogen dioxide (NO_2)

1 Scope

This part of ISO 16000 specifies the planning of nitrogen dioxide indoor pollution measurements. In the case of indoor air measurements, the careful planning of sampling and the entire measurement strategy are of particular significance since the result of the measurement may have far-reaching consequences, for example, with regard to ascertaining the need for remedial action or the success of such an action.

An inappropriate measurement strategy may lead to misrepresentation of the true conditions or, worse, to erroneous results.

2 Normative references

The following referenced documents 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.

ISO 16000-1:2004, *Indoor air — Part 1: General aspects of sampling strategy*

3 Properties, origin and occurrence of nitrogen dioxide

Nitrogen dioxide (NO_2, CAS No. 10102-44-0) is one of the important substances of the class of nitrous gases or nitrogen oxides. NO_2 is a reddish-brown gas with a sweet to pungent odour, which is also present to a minor extent as dimeric colourless N_2O_4. Information on properties of NO_2 and its effects on humans is summarized elsewhere (see References [3], [4], [5], [6] and [7]).

In all combustion processes, nitrogen oxides (NO_x) are formed by reaction of nitrogen and oxygen. The main combustion product is nitrogen monoxide (NO), a certain fraction of which reacts further with oxygen to form nitrogen dioxide. This reaction is exothermic so that cooling combustion exhaust gases promotes this secondary NO_2 formation.

In ambient air, heating power stations, motor vehicles, industrial heating systems and building heating systems are the most important emission sources of NO_2. Indoor NO_2 emissions are formed from combustion sources such as heating and cooking with solid fuel (wood, coal), liquid fuel (oil, kerosene) or gaseous fuel [town gas, natural gas, bottled gas (propane, butane)], especially in the initial heating phase. An unflued appliance that releases combustion gases directly into the indoor air can be a particularly strong source. In the literature, there are many reports on the results of NO_2 determinations in indoor air (see References [4], [8], and [9]). On the basis of these results, the average concentrations may range from under 10 µg/m^3 to 800 µg/m^3 under different conditions [2].

2) In the literature, some concentrations are also reported in ppm (1 mg/m^3 corresponds to 0,53 ppm at 293 K and 1,013 bar).