
Indoor air —

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

Air intérieur —

*Partie 4: Dosage du formaldéhyde — Méthode par échantillonnage
diffusif*



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Contents

Page

1	Scope	1
2	Normative references	1
3	Principle	1
4	Reagents	2
5	Apparatus	3
6	Sampling	4
7	Procedure	4
7.1	Desorption and sample preparation	4
7.2	Calibration	4
7.3	HPLC analysis	4
7.4	Determination of sample concentration	5
7.5	Storage	6
7.6	Determination of desorption efficiency	6
8	Calculations	6
8.1	Amount of DNPH-formaldehyde on the filter	6
8.2	Concentration of formaldehyde in air	6
9	Report	7
10	Precision and uncertainty of the method	7
11	Quality control	7
	Annex A (informative) Typical design of the diffusive sampler	8
	Bibliography	9

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 16000-4 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 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 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*

The following parts are in preparation

- *Part 1: General aspects of sampling strategy*
- *Part 5: Measurement strategy for volatile organic compounds (VOCs) (in preparation)*
- *Part 7: Sampling strategy for determination of airborne asbestos fibre concentrations (in preparation)*
- *Part 8: Ventilation rate measurement*
- *Part 9: Determination of the emission of volatile organic compounds — Emission test chamber method*
- *Part 10: Determination of the emission of volatile organic compounds — Emission test cell method*
- *Part 11: Determination of the emission of volatile organic compounds — Sampling, storage of samples and preparation of test specimens*

Introduction

Formaldehyde has a high potential toxicity, and therefore its determination is of interest as an indoor air pollutant.

ISO 16000-1 gives 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. Aspects of the determination (sampling and analysis) and the sampling strategy of specific pollutants or groups of pollutants are described in the other parts of ISO 16000.

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Indoor air —

Part 4:

Determination of formaldehyde — Diffusive sampling method

1 Scope

This part of ISO 16000 specifies a diffusive sampler/solvent desorption/high performance liquid chromatography (HPLC) method for the determination of formaldehyde in indoor air.

The test method is applicable to the measurement of formaldehyde¹⁾ in indoor air over the range from 0,001 mg/m³ to 1,0 mg/m³ for a sampling period of between 24 h and 72 h. For sampling periods of 24 h, the applicable concentration range is 0,003 mg/m³ to 1 mg/m³, and for 72 h it is 0,001 mg/m³ to 0,33 mg/m³.

The method is suitable for measurements in atmospheres of up to 80 % relative humidity and for monitoring at air velocities as low as 0,02 m/s. Potential interferences, including those due to the presence of other carbonyl compounds, should be eliminated by the chromatographic step in the method. The sampling method gives a time-weighted average result.

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 16000-2, *Indoor air — Part 2: Sampling strategy for formaldehyde*

ISO 16000-3:2001, *Indoor air — Part 3: Determination of formaldehyde and other carbonyl compounds — Active sampling method*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

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*

3 Principle

The diffusive sampler is exposed to air for a defined time period. The rate of sampling depends on the diffusion coefficient of formaldehyde, and is proportional to the cross-sectional area of the opening of the monitor and inversely proportional to the length of the diffusion zone of the monitor. This rate is known as the diffusive uptake rate of the sampler, and has been determined by prior calibration in a standard atmosphere. The formaldehyde vapour migrates into the sampler by diffusion and is collected on a strip of cellulose paper loaded with silica gel, which has been coated with 2,4-dinitrophenylhydrazine (DNPH) and phosphoric acid. A stable hydrazone is formed which can be desorbed by acetonitrile and the solution analysed by means of a high performance liquid chromatograph (HPLC) equipped with an ultraviolet (UV) detector. The diffusive sampler may also be used for personal sampling, for which purpose it is attached to the clothing of the person being monitored.

1) Instead of the nomenclature according to IUPAC regulations (e.g. methanal), the more common names (e.g. formaldehyde) are used in this part of ISO 16000.