
Indoor air —

**Part 3:
Determination of formaldehyde
and other carbonyl compounds in
indoor and test chamber air — Active
sampling method**

Air intérieur —

*Partie 3: Dosage du formaldéhyde et d'autres composés carbonylés
dans l'air intérieur et dans l'air des chambres d'essai — Méthode par
échantillonnage actif*



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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 146, *Air quality*, Subcommittee SC 6, *Indoor air*.

This third edition cancels and replaces the second edition (ISO 16000-3:2011), which has been technically revised.

The main changes are as follows:

- clarification of the suitability of the method for acrolein measurements.

A list of all parts in the ISO 16000 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document is intended to be used for characterizing indoor air following the sampling strategy specified in ISO 16000-2. It is applicable to formaldehyde and other carbonyl compounds. It has been tested for 14 aldehydes and ketones. Formaldehyde is the simplest carbonyl compound, with one carbon, one oxygen and two hydrogen atoms. In its monomolecular state, it is a colourless, pungent, reactive gas. It has been used in the production of urea-formaldehyde resins, adhesives, and insulating foams. Emissions from particle (chip) board and wall insulation are the major sources of formaldehyde in indoor air.

Formaldehyde is collected by passing air through a reactive medium that converts the compound to a derivative of lower vapour pressure that is more efficiently retained by the sampler and can be easily analysed. This document determines formaldehyde and other carbonyl compounds by reaction with 2,4 dinitrophenylhydrazine coated on to a sorbent to convert them to their corresponding hydrazones, which can be recovered and measured with high sensitivity, precision, and accuracy. Other carbonyl compounds that may be emitted into air from solvents, adhesives, cosmetics, and other sources can also be determined using this document.

The sampling procedure is based on US EPA method TO-11A^[12].

Formaldehyde and certain other carbonyl compounds have a high toxic potential^[15].

ISO 16017^{[7][8]} and ISO 12219^{[2][6]} also focus on volatile organic compound (VOC) measurements.

Instead of systematic IUPAC nomenclature, traditional names are used in this document. Some equivalent names are:

- acetaldehyde: ethanal;
- acetone: 2-propanone;
- butyraldehyde: butanal;
- capronaldehyde: hexanal;
- formaldehyde: methanal;
- isovaleraldehyde: 3-methylbutanal;
- propionaldehyde: propanal;
- m-tolualdehyde: 3-methylbenzaldehyde;
- o-tolualdehyde: 2-methylbenzaldehyde;
- p-tolualdehyde: 4-methylbenzaldehyde;
- valeraldehyde: pentanal.

Indoor air —

Part 3:

Determination of formaldehyde and other carbonyl compounds in indoor and test chamber air — Active sampling method

WARNING — Persons using this document should be familiar with normal laboratory practice. This document does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.

1 Scope

This document specifies a determination of formaldehyde (HCHO) and other carbonyl compounds (aldehydes and ketones) in air. The method is specific to formaldehyde but, with modification, at least 12 other aromatic as well as saturated and unsaturated aliphatic carbonyl compounds can be detected and quantified. It is suitable for determination of formaldehyde and other carbonyl compounds in the approximate concentration range $1 \mu\text{g}/\text{m}^3$ to $1 \text{ mg}/\text{m}^3$. The sampling method gives a time-weighted average (TWA) sample. It can be used for long-term (1 h to 24 h) or short-term (5 min to 60 min) sampling of air for formaldehyde.

This document specifies a sampling and analysis procedure for formaldehyde and other carbonyl compounds that involves collection from air on to adsorbent cartridges coated with 2,4-dinitrophenylhydrazine (DNPH) and subsequent analysis of the hydrazones formed by high performance liquid chromatography (HPLC) with detection by ultraviolet absorption^{[12],[16]}. The method is not suitable for longer chained or unsaturated carbonyl compounds.

This document applies to the determination of:

acetaldehyde	2,5-dimethylbenzaldehyde	<i>m</i> -tolualdehyde
acetone	formaldehyde	<i>o</i> -tolualdehyde
benzaldehyde	isovaleraldehyde	<i>p</i> -tolualdehyde
butyraldehyde	propionaldehyde	valeraldehyde
capronaldehyde		

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.

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

3 Terms and definitions

No terms and definitions are listed in this document.