

---

---

**Indoor air —**

**Part 33:**

**Determination of phthalates with gas chromatography/mass spectrometry (GC/MS)**

*Air intérieur —*

*Partie 33: Détermination des phthalates par chromatographie en phase gazeuse/spectrométrie de masse (CPG/SM)*



This document is a preview generated by EMS



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2017, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Ch. de Blandonnet 8 • CP 401  
CH-1214 Vernier, Geneva, Switzerland  
Tel. +41 22 749 01 11  
Fax +41 22 749 09 47  
copyright@iso.org  
www.iso.org

# Contents

	Page
<b>Foreword</b> .....	<b>v</b>
<b>Introduction</b> .....	<b>vi</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 Sampling methods and analytical apparatus</b> .....	<b>2</b>
4.1 General.....	2
4.2 Sampling by adsorption with subsequent thermal desorption.....	2
4.2.1 Apparatus, operating materials and chemicals.....	2
4.2.2 Preparation of the thermal desorption tube.....	3
4.2.3 Sampling.....	3
4.3 Sampling by adsorption and subsequent solvent extraction.....	4
4.3.1 Apparatus, operating materials and chemicals.....	4
4.3.2 Preparation of Florisil® <sup>2)</sup> and the adsorption tubes.....	5
4.3.3 Hints to the application of Florisil® <sup>2)</sup> .....	6
4.3.4 Sampling.....	6
4.3.5 Sample conditioning.....	7
<b>5 Calibration</b> .....	<b>7</b>
5.1 General.....	7
5.2 Calibration of the thermal desorption method.....	8
5.3 Calibration of the solvent extraction method.....	8
<b>6 Identification and quantification</b> .....	<b>8</b>
6.1 Mass spectrometric analysis.....	8
<b>7 Establishment of calibration curves and calculation of the analyte mass</b> .....	<b>14</b>
7.1 Establishment of calibration curves.....	14
7.2 Calculation of the analyte mass.....	14
<b>8 Calculation of indoor air concentrations</b> .....	<b>15</b>
<b>9 Performance characteristics</b> .....	<b>16</b>
9.1 Detection limit.....	16
9.2 Quantification limit and problems related to the blank values.....	16
9.3 Reproducibility standard deviation and repeatability standard deviation.....	17
<b>10 Quality assurance</b> .....	<b>19</b>
10.1 Method verification and determination of blanks.....	19
10.1.1 Field blank value of the indoor air.....	19
10.1.2 Analytical laboratory blank value.....	19
10.2 Measures for blank value minimization.....	19
10.3 Documents.....	20
<b>11 Interferences</b> .....	<b>20</b>
<b>Annex A (informative) General information on phthalates</b> .....	<b>21</b>
<b>Annex B (informative) Screening phthalates in solvent wipe tests</b> .....	<b>24</b>
<b>Annex C (informative) Screening phthalates in house dust</b> .....	<b>27</b>
<b>Annex D (informative) Practical example for the calibration of the thermal desorption method</b> .....	<b>31</b>
<b>Annex E (informative) Practical example for the calibration of the solvent extraction method using Florisil®<sup>2)</sup></b> .....	<b>33</b>
<b>Annex F (informative) Practical example for the gas chromatography with thermal desorption</b> .....	<b>35</b>

<b>Annex G (informative) Practical example for the gas chromatography following solvent extraction</b> .....	<b>36</b>
<b>Annex H (informative) Problems related to the blank values</b> .....	<b>37</b>
<b>Annex I (informative) Example of a sampling protocol</b> .....	<b>38</b>
<b>Bibliography</b> .....	<b>39</b>

This document is a preview generated by EVS

## 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](http://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](http://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 on 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 the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

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

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

## Introduction

The different parts of ISO 16000 describe 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, as well as the measurement procedures themselves (see Foreword).

The definition of indoor environment is given by ISO 16000-1. Dwellings [living rooms, bedrooms, do-it-yourself (DIY) rooms, sports rooms and cellars, kitchens and bathrooms], workrooms or workplaces in buildings which are not subject to health and safety inspections with respect to air pollutants (e.g. offices, salesrooms), public buildings (e.g. restaurants, theatres, cinemas and other meeting rooms) and passenger cabins of motor vehicles and public transport are among the most important types of indoor environment.

Phthalates, the diesters of the ortho-phthalic acid (1,2-benzene dicarbon acid), are emitted into the indoor air primarily from articles of daily use made of soft polyvinyl chloride (PVC). Typically, phthalates are used as plasticizers in soft PVC. The five most frequently used phthalates are diisodecylphthalate (DiDP), diisononylphthalate (DiNP), di(2-ethylhexyl)-phthalate (DEHP), di-*n*-butyl-phthalate (DBP), and benzyl-*n*-butyl-phthalate (BBP). An overview of the most important phthalates, their acronyms and several relevant substance properties can be found in [Table A.1](#). These phthalates can be determined in indoor environments by means of the analytical methods incorporating gas chromatography/mass spectrometry specified in this document.

## Indoor air —

### Part 33:

## Determination of phthalates with gas chromatography/ mass spectrometry (GC/MS)

### 1 Scope

This document specifies the sampling and analysis of phthalates in indoor air and describes the sampling and analysis of phthalates in house dust and in solvent wipe samples of surfaces by means of gas chromatography/mass spectrometry.

Two alternative sampling and processing methods, whose comparability has been proven in a round robin test, are specified for indoor air<sup>[4]</sup>. Sampling can take place using sorbent tubes with subsequent thermal desorption and GC-MS analysis. Alternatively, sampling can take on other types of sorbent tubes that are subsequently analysed by solvent extraction with GC-MS.

Depending on the sampling method, the compounds dimethyl phthalate to diisoundecylphthalate can be analysed in house dust as described in [Annex C](#)<sup>[8]</sup>. The investigation of house dust samples is only appropriate as a screening method. This investigation only results in indicative values and is not acceptable for a final assessment of a potential need for action.

Dimethyl phthalate to diisoundecylphthalate can be analysed in solvent wipe samples as described in [Annex B](#). Solvent wipe samples are suitable for non-quantitative source identification.

**NOTE** In principle, the method is also suitable for the analysis of other phthalates, adipates and cyclohexane dicarboxylic acid esters, but this is confirmed by determination of the performance characteristics in each case.

General information on phthalates are given in [Annex A](#).

### 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 16000-6:2011, *Indoor air — 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 or MS-FID*

### 3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>