



**NSAI**  
Standards

Irish Standard  
I.S. EN ISO 17943:2016

Water quality - Determination of volatile organic compounds in water - Method using headspace solid-phase micro-extraction (HS-SPME) followed by gas chromatography-mass spectrometry (GC-MS) (ISO 17943:2016)

## I.S. EN ISO 17943:2016

*Incorporating amendments/corrigenda/National Annexes issued since publication:*

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard — national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation — recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

*This document replaces/revises/consolidates the NSAI adoption of the document(s) indicated on the CEN/CENELEC cover/Foreword and the following National document(s):*

*NOTE: The date of any NSAI previous adoption may not match the date of its original CEN/CENELEC document.*

*This document is based on:*

EN ISO 17943:2016

*Published:*

2016-04-20

*This document was published under the authority of the NSAI and comes into effect on:*

2016-05-08

ICS number:

13.060.50

NOTE: If blank see CEN/CENELEC cover page

NSAI  
1 Swift Square,  
Northwood, Santry  
Dublin 9

T +353 1 807 3800  
F +353 1 807 3838  
E standards@nsai.ie  
W NSAI.ie

Sales:  
T +353 1 857 6730  
F +353 1 857 6729  
W standards.ie

Údarás um Chaighdeáin Náisiúnta na hÉireann

## National Foreword

I.S. EN ISO 17943:2016 is the adopted Irish version of the European Document EN ISO 17943:2016, Water quality - Determination of volatile organic compounds in water - Method using headspace solid-phase micro-extraction (HS-SPME) followed by gas chromatography-mass spectrometry (GC-MS) (ISO 17943:2016)

This document does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

**Compliance with this document does not of itself confer immunity from legal obligations.**

*In line with international standards practice the decimal point is shown as a comma (,) throughout this document.*

This page is intentionally left blank

EUROPEAN STANDARD

EN ISO 17943

NORME EUROPÉENNE

EUROPÄISCHE NORM

April 2016

ICS 13.060.50

English Version

Water quality - Determination of volatile organic compounds in water - Method using headspace solid-phase micro-extraction (HS-SPME) followed by gas chromatography-mass spectrometry (GC-MS) (ISO 17943:2016)

Qualité de l'eau - Détermination de composés organiques volatils dans l'eau - Méthode utilisant une micro-extraction en phase solide (MEPS) de l'espace de tête suivie d'une chromatographie en phase gazeuse-spectrométrie de masse (CG-SM) (ISO 17943:2016)

Wasserbeschaffenheit - Bestimmung flüchtiger organischer Verbindungen in Wasser - Verfahren mittels Headspace-Festphasenmikroextraktion (HS-SPME) gefolgt von der Gaschromatographie und Massenspektrometrie (GC-MS) (ISO 17943:2016)

This European Standard was approved by CEN on 13 February 2016.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

**EN ISO 17943:2016 (E)**

<b>Contents</b>	<b>Page</b>
<b>European foreword.....</b>	<b>3</b>

## **European foreword**

This document (EN ISO 17943:2016) has been prepared by Technical Committee ISO/TC 147 “Water quality” in collaboration with Technical Committee CEN/TC 230 “Water analysis” 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 October 2016, and conflicting national standards shall be withdrawn at the latest by October 2016.

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.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

## **Endorsement notice**

The text of ISO 17943:2016 has been approved by CEN as EN ISO 17943:2016 without any modification.

This page is intentionally left blank



# INTERNATIONAL STANDARD

**ISO**  
**17943**

First edition  
2016-04-01

---

---

## **Water quality — Determination of volatile organic compounds in water — Method using headspace solid- phase micro-extraction (HS-SPME) followed by gas chromatography-mass spectrometry (GC-MS)**

*Qualité de l'eau — Détermination de composés organiques volatils  
dans l'eau — Méthode utilisant une micro-extraction en phase solide  
(MEPS) de l'espace de tête suivie d'une chromatographie en phase  
gazeuse-spectrométrie de masse (CG-SM)*



Reference number  
ISO 17943:2016(E)

© ISO 2016

**ISO 17943:2016(E)**



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2016, 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>iv</b>
<b>Introduction</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>3</b>
<b>3 Principle</b> .....	<b>3</b>
<b>4 Interferences</b> .....	<b>4</b>
4.1 Sampling.....	4
4.2 Extraction.....	4
4.3 Gas chromatography and mass spectrometry.....	5
<b>5 Reagents</b> .....	<b>5</b>
<b>6 Apparatus</b> .....	<b>7</b>
<b>7 Sampling and sample pretreatment</b> .....	<b>8</b>
<b>8 Procedure</b> .....	<b>8</b>
8.1 Sample preparation and extraction.....	8
8.2 Gas chromatography.....	9
8.3 Identification of individual compounds by means of mass spectrometry (GC-MS).....	9
8.4 Blank value measurements.....	11
<b>9 Calibration</b> .....	<b>11</b>
9.1 General.....	11
9.2 Calibration of the total procedure using the internal standard.....	12
<b>10 Calculation of the results</b> .....	<b>13</b>
<b>11 Expression of results</b> .....	<b>13</b>
<b>12 Test report</b> .....	<b>14</b>
<b>Annex A (informative) Examples of suitable SPME fibres</b> .....	<b>15</b>
<b>Annex B (informative) Examples of GC columns</b> .....	<b>16</b>
<b>Annex C (informative) Examples of internal standards</b> .....	<b>17</b>
<b>Annex D (informative) Suitable gas chromatographic conditions and example chromatograms for compounds of <a href="#">Table 1</a></b> .....	<b>19</b>
<b>Annex E (informative) General information on SPME</b> .....	<b>33</b>
<b>Annex F (informative) Performance data</b> .....	<b>34</b>
<b>Bibliography</b> .....	<b>43</b>

## ISO 17943:2016(E)

### 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 meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 147, *Water quality*, Subcommittee SC 2, *Physical, chemical and biochemical methods*.

## Introduction

Volatile organic compounds (VOCs) are often found in the manufacturing processes of paints, adhesives, petroleum products, pharmaceuticals, and refrigerants. Some are used as gasoline additives, solvents, hydraulic fluids, and dry-cleaning agents. This group of compounds belongs to the group of anthropogenic chemicals. VOC contamination of water resources is a human-health concern because many are toxic and are known or suspected human carcinogens.

For the determination of VOCs, several published procedures are available (see References [\[4\]](#), [\[5\]](#), [\[6\]](#), [\[7\]](#), [\[9\]](#), [\[12\]](#), [\[13\]](#), and [\[14\]](#)).



# Water quality — Determination of volatile organic compounds in water — Method using headspace solid-phase micro-extraction (HS-SPME) followed by gas chromatography-mass spectrometry (GC-MS)

**WARNING** — Persons using this International Standard should be familiar with normal laboratory practice. This International Standard 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.

**IMPORTANT** — It is absolutely essential that tests conducted in accordance with this International Standard be carried out by suitably qualified staff.

## 1 Scope

This International Standard specifies a method for the determination of volatile organic compounds (see [Table 1](#)). This comprises, for example, halogenated hydrocarbons, trihalogenated methanes, gasoline components (such as BTEX, MTBE, and ETBE), naphthalene, 2-ethyl-4-methyl-1,3-dioxolane, and highly odorous substances like geosmin and 2-methylisoborneol in drinking water, ground water, surface water, and treated waste water, by means of headspace solid-phase micro-extraction (HS-SPME) followed by gas chromatography-mass spectrometry (GC-MS). The limit of determination depends on the matrix, on the specific compound to be analysed, and on the sensitivity of the mass spectrometer. For most compounds to which this International Standard applies, it is at least 0,01 µg/l. Validation data related to a concentration range between 0,02 µg/l and 2,6 µg/l have been demonstrated in an interlaboratory trial. Additional validation data derived from standardization work show applicability of the method within a concentration range from 0,01 µg/l to 100 µg/l of individual substances. All determinations are performed on small sample amounts (e.g. sample volumes of 10 ml).

This method may be applicable to other compounds not explicitly covered by this International Standard or to other types of water. However, it is necessary to demonstrate the applicability for each case.

**Table 1 — Volatile organic compounds determinable by this method**

Name	Molecular formula	CAS registry no. <sup>d</sup>	Molar mass g/mol	Density kg/l
<i>tert</i> -amyl methyl ether (TAME)	C <sub>6</sub> H <sub>14</sub> O	994-05-8	102,17	0,76
benzene	C <sub>6</sub> H <sub>6</sub>	71-43-2	78,12	0,88
bromobenzene	C <sub>6</sub> H <sub>5</sub> Br	108-86-1	157,01	1,50
bromochloromethane	CH <sub>2</sub> BrCl	74-97-5	129,38	1,99
bromodichloromethane	CHBrCl <sub>2</sub>	75-27-4	163,83	1,98
<i>n</i> -butylbenzene	C <sub>10</sub> H <sub>14</sub>	104-51-8	134,22	0,86
<i>sec</i> -butylbenzene	C <sub>10</sub> H <sub>14</sub>	135-98-8	134,22	0,86
<i>tert</i> -butylbenzene	C <sub>10</sub> H <sub>14</sub>	98-06-6	134,22	0,87
chlorobenzene	C <sub>6</sub> H <sub>5</sub> Cl	108-90-7	112,56	1,11

<sup>a</sup> Signals of substances may overlap in chromatograms as they might co-elute.

<sup>b</sup> Density of liquid at boiling point (-13,4 °C)

<sup>c</sup> Refer to [Tables F.1](#) and [F.2](#) for validation data and additional information.

<sup>d</sup> CAS: Chemical Abstracts Service.

This is a free preview. Purchase the entire publication at the link below:

[Product Page](#)

- 
- [Looking for additional Standards? Visit Intertek Inform Infostore](#)
  - [Learn about LexConnect, All Jurisdictions, Standards referenced in Australian legislation](#)
-