



BSI Standards Publication

**Water quality — Determination of arsenic(III) and arsenic(V) species — Method using high performance liquid chromatography (HPLC) with detection by inductively coupled plasma mass spectrometry (ICP-MS) or hydride generation atomic fluorescence spectrometry (HG-AFS)**

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## National foreword

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A list of organizations represented on this committee can be obtained on request to its secretary.

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**Water quality — Determination of arsenic(III) and arsenic(V) species — Method using high performance liquid chromatography (HPLC) with detection by inductively coupled plasma mass spectrometry (ICP-MS) or hydride generation atomic fluorescence spectrometry (HG-AFS)**

*Qualité de l'eau — Détermination des formes chimiques (III) et (V) d'arsenic — Méthode par chromatographie en phase liquide à haute performance (HPLC) avec détection par spectrométrie de masse par torche à plasma (ICP-MS) ou génération d'hydrure fluorescence atomique (HG-AFS)*



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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](http://www.iso.org/directives)).

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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 147, *Water quality*, Subcommittee SC 2, *Physical, chemical and biochemical methods*.

## Introduction

In the environment, metals and metalloids are found in the form of various chemical species. Chemical speciation makes it possible to identify and quantify these different species. For the same metal or metalloid, given that the toxicity of each compound may vary significantly, it can be useful to quantify each of the species present in a given sample. For arsenic, the toxicity of the various species varies considerably; inorganic species are recognized as being more toxic than organic species and, for example, the toxicity of As(III) is greater than that of As(V). This method is primarily applicable to the determination of arsenite (As(III)) and arsenate (As(V)) as these are the main species of interest and are the predominant species found in potable water samples from the underlying geological strata in many parts of the world. Arsenic speciation measurements are important to establish and select the best water treatment technology for arsenic removal from raw waters containing significant levels of arsenic.



# Water quality — Determination of arsenic(III) and arsenic(V) species — Method using high performance liquid chromatography (HPLC) with detection by inductively coupled plasma mass spectrometry (ICP-MS) or hydride generation atomic fluorescence spectrometry (HG-AFS)

**WARNING** — Persons using this document should be familiar with normal laboratory practice. This document is not intended to cover any safety problems associated with its use, if applicable. It is the responsibility of the user to establish appropriate safety and health practices.

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

## 1 Scope

This document specifies a method primarily developed for the determination of inorganic arsenic species (arsenite (As(III)) and arsenate (As(V)) dissolved in a sample after a preservation process in waters with a low total organic carbon content such as potable water, tap water, surface waters, ground waters and rain waters. Information is provided on the determination of potentially relevant organo-arsenic species such as methylarsonic acid (MMA) and dimethylarsinic acid (DMA) which may be encountered at very low levels in natural surface waters.

The linear working dynamic range depends on the operating conditions and the method of detection used; under standard conditions, it typically ranges from 0,5 µg/l to 50 µg/l for each species. Samples containing arsenic at concentrations higher than the linear dynamic range can be analysed after suitable dilution.

This method is based on high performance liquid chromatography separation of arsenic species with either inductively coupled mass spectrometry (ICP-MS) or hydride generation atomic fluorescence spectrometry (HG-AFS) as a method of detection.

The sensitivity of this method depends on the method of detection and the instrumental operating conditions selected. The limit of quantification (LOQ) of the method also depends on the operating conditions of the analytical system used and the extent of the calibration range used. LOQ examples for As(III) and As(V) are provided; LOQs are generally less than 1 µg/l.

This document does not apply to arsenobetaine and other organic arsenic species which are not present in natural water samples.

## 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 3696, *Water for analytical laboratory use — Specification and test methods*

ISO 5667-1, *Water quality — Sampling — Part 1: Guidance on the design of sampling programmes and sampling techniques*

ISO 5667-3, *Water quality — Sampling — Part 3: Preservation and handling of water samples*