



International
Standard

ISO 17294-2

**Water quality — Application of
inductively coupled plasma mass
spectrometry (ICP-MS) —**

Part 2:

**Determination of selected elements
including uranium isotopes**

*Qualité de l'eau — Application de la spectrométrie de masse avec
plasma à couplage inductif (ICP-MS) —*

*Partie 2: Dosage des éléments sélectionnés y compris les isotopes
d'uranium*

**Third edition
2023-10**

**Corrected version
2024-02**



COPYRIGHT PROTECTED DOCUMENT

© ISO 2023

All rights reserved. Unless otherwise specified, or required in the context of its implementation, 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
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword	iv
1 Scope	1
2 Normative references	2
3 Terms, definitions and symbols	3
3.1 Terms and definitions	3
3.2 Symbols	6
4 Principle	6
5 Interferences	7
5.1 General	7
5.2 Spectral interferences	8
5.2.1 General	8
5.2.2 Isobaric elemental	9
5.2.3 Polyatomic interferences	9
5.3 Non-spectral interferences	9
6 Reagents	10
7 Apparatus	14
8 Sampling	15
9 Sample pre-treatment	15
9.1 Determination of the mass concentration of dissolved elements without digestion	15
9.2 Determination of the total mass concentration after digestion	16
10 Procedure	16
10.1 General	16
10.2 Calibration of the ICP-MS system	17
10.3 Measurement of the matrix solution for evaluation of the correction factors	17
10.4 Measurement of the samples	17
11 Calculation	17
12 Test report	18
Annex A (normative) Determination of the mass concentration of uranium isotopes	19
Annex B (informative) Description of the matrices of the samples used for the interlaboratory trial	28
Annex C (informative) Performance data	31
Bibliography	34

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 document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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 147, *Water quality*, Subcommittee SC 2, *Physical, chemical and biochemical methods*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 230, *Water analysis*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 17294-2:2016), which has been technically revised.

The main changes are as follows:

- with the incorporation of mercury in the previous edition, mercury has now been excluded as a hydrolysable and has now become a non-hydrolysable element because it was not in line with the other existing standards for the determination of mercury;
- the addition of a modifier has been clarified;
- titanium has been added to the scope.

A list of all parts in the ISO 17294 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.

This corrected version of ISO 17294-2:2023 incorporates the following corrections:

- Note 1 to entry has been moved from the terminological entry [3.1.26](#) to [3.1.16](#);
- the symbols "*k*", "*α*" and "*β*" have been revised in [3.2](#) and the symbols "*η*" and "*o*" have been revised in [Tables C.3](#) and [C.5](#), respectively;
- [Clause 12 b\)](#) has been editorially revised;
- "²⁰⁴Tl" has been changed to "²⁰⁵Tl or ¹⁹³Ir" in [Clause A.2](#);

- [Formula \(A.3\)](#) has been revised from " $R = r \left(\frac{m_A}{m_B} \right)^\beta$ " to " $R = r \left(\frac{m_A}{m_B} \right)^\beta$ ";
- the descriptions of symbols " l ", " n " and " $\bar{\bar{x}}$ " have been revised in Table C.5.

Water quality — Application of inductively coupled plasma mass spectrometry (ICP-MS) —

Part 2: Determination of selected elements including uranium isotopes

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.

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 for the determination of the elements aluminium, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, caesium, calcium, cerium, chromium, cobalt, copper, dysprosium, erbium, gadolinium, gallium, germanium, gold, hafnium, holmium, indium, iridium, iron, lanthanum, lead, lithium, lutetium, magnesium, manganese, mercury, molybdenum, neodymium, nickel, palladium, phosphorus, platinum, potassium, praseodymium, rubidium, rhenium, rhodium, ruthenium, samarium, scandium, selenium, silver, sodium, strontium, terbium, tellurium, thorium, thallium, thulium, tin, titanium, tungsten, uranium and its isotopes, vanadium, yttrium, ytterbium, zinc and zirconium in water (e.g. drinking water, surface water, ground water, waste water and eluates).

Taking into account the specific and additionally occurring interferences, these elements can be determined in water and digests of water and sludge (e.g. digests of water as described in ISO 15587-1 or ISO 15587-2).

The working range depends on the matrix and the interferences encountered. In drinking water and relatively unpolluted waters, the limit of quantification (L_{0Q}) lies between 0,002 µg/l and 1,0 µg/l for most elements (see [Table 1](#)). The working range typically covers concentrations between several ng/l and mg/l depending on the element and specified requirements.

The quantification limits of most elements are affected by blank contamination and depend predominantly on the laboratory air-handling facilities available on the purity of reagents and the cleanliness of glassware.

The lower limit of quantification is higher in cases where the determination suffers from interferences (see [Clause 5](#)) or memory effects (see ISO 17294-1).

Elements other than those mentioned in the scope can also be determined according to this document provided that the user of the document is able to validate the method appropriately (e.g. interferences, sensitivity, repeatability, recovery).