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**Water quality — Determination of  
selected elements by inductively coupled  
plasma optical emission spectrometry  
(ICP-OES)**

*Qualité de l'eau — Dosage d'éléments choisis par spectroscopie  
d'émission optique avec plasma induit par haute fréquence (ICP-OES)*



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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 11885 was prepared by Technical Committee ISO/TC 147, *Water quality*, Subcommittee SC 2, *Physical, chemical and biochemical methods*.

This second edition cancels and replaces the first edition (ISO 11885:1996), which has been technically revised.

## Introduction

When applying this International Standard, it is necessary in each case, depending on the range to be tested, to determine if and to what extent additional conditions should be established.

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# Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES)

**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 according to this International Standard be carried out by suitably trained staff.

## 1 Scope

This International Standard specifies a method for the determination of dissolved elements, elements bound to particles ("particulate") and total content of elements in different types of water (e.g. ground, surface, raw, potable and waste water) for the following elements: aluminium, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, calcium, chromium, cobalt, copper, gallium, indium, iron, lead, lithium, magnesium, manganese, molybdenum, nickel, phosphorus, potassium, selenium, silicon, silver, sodium, strontium, sulfur, tin, titanium, tungsten, vanadium, zinc and zirconium.

Taking into account the specific and additionally occurring interferences, these elements can also be determined in digests of water, sludges and sediments (for example, digests of water as specified in ISO 15587-1 or ISO 15587-2). The method is suitable for mass concentrations of particulate matter in waste water below 2 g/l. The scope of this method may be extended to other matrices or to higher amounts of particulate matter if it can be shown that additionally occurring interferences are considered and corrected for carefully. It is up to the user to demonstrate the fitness for purpose.

Recommended wavelengths, limits of quantification and important spectral interferences for the selected elements are given in Table 1.

## 2 Normative references

The following referenced documents are indispensable for the application 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 Guide 30, *Terms and definitions used in connection with reference materials*

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: Guidance on the preservation and handling of water samples*

ISO 7027, *Water quality — Determination of turbidity*

ISO 15587-1, *Water quality — Digestion for the determination of selected elements in water — Part 1: Aqua regia digestion*

ISO 15587-2, *Water quality — Digestion for the determination of selected elements in water — Part 2: Nitric acid digestion*

### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

- 3.1**  
**accuracy**  
closeness of agreement between test result and the accepted reference value
- NOTE The term accuracy, when applied to a set of observed values, describes a combination of random error components and common systematic error components. Accuracy includes precision and trueness.
- 3.2**  
**analyte**  
element(s) to be determined
- 3.3**  
**background equivalent concentration**  
**BEC**  
elemental concentration required to produce an analyte signal with the same intensity as a background signal
- 3.4**  
**calibration blank solution**  
prepared in the same way as the calibration solution but leaving out the analyte
- 3.5**  
**calibration solution**  
solution used to calibrate the instrument, prepared from (a) stock solution(s) or from a certified standard
- 3.6**  
**calibration check solution**  
solution of known composition within the range of the calibration solutions, but prepared independently
- 3.7**  
**determination**  
entire process from preparing the test sample solution up to and including measurement and calculation of the final result
- 3.8**  
**instrument performance check solution**  
solution used to determine and control the instrument drift for relevant analytes
- 3.9**  
**linearity**  
straight line relationship between the (mean) result of measurement (signal) and the quantity (concentration) of the component to be determined