
**Water quality — Determination of dissolved
anions by liquid chromatography of ions —**

Part 4:

Determination of chlorate, chloride and chlorite
in water with low contamination

*Qualité de l'eau — Dosage des anions dissous par chromatographie des
ions en phase liquide —*

*Partie 4: Dosage des ions chlorate, chlorure et chlorite dans des eaux
faiblement contaminées*



Foreword

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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.

International Standard ISO 10304-4 was prepared by Technical Committee ISO/TC 147, *Water quality*, Subcommittee SC 2, *Physical, chemical and biochemical methods*.

ISO 10304 consists of the following parts, under the general title *Water quality — Determination of dissolved anions by liquid chromatography of ions*:

- *Part 1: Determination of fluoride, chloride, bromide, nitrate, nitrite, orthophosphate and sulfate in water with low contamination*
- *Part 2: Determination of bromide, chloride, nitrate, nitrite, orthophosphate and sulfate in waste water*
- *Part 3: Determination of chromate, iodide, sulfite, thiocyanate and thiosulfate*
- *Part 4: Determination of chlorate, chloride and chlorite in water with low contamination.*

Annexes A and B of this part of ISO 10304 are for information only.

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Introduction

The essential minimum requirements of an ion chromatographic system applied within the scope of this part of ISO 10304 are the following:

- Resolution power of the column: For the anion to be determined it is essential that the peak resolution does not fall below $R = 1,3$ (clause 7, figure 3)
- Method of detection:
 - a) Measurement of the electrical conductivity with or without suppressor device
 - b) Spectrometric measurement (UV/VIS), directly or indirectly
 - c) Amperometric direct detection
- Applicability of the method: Working ranges according to table 1
- Calibration (9.1): Calibration and determination of the linear working range (see ISO 8466-1). Use of the method of standard addition to special cases of application (9.2).
- Guaranteeing the analytical quality (9.3): Validity check of the calibration function. Replicate determinations, if necessary.

The diversity of the appropriate and suitable assemblies and the procedural steps depending on them permit a general description only.

For further information on the analytical technique see reference [2].

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1 Scope

This part of ISO 10304 specifies a method for the determination of the dissolved anions chlorate, chloride, and chlorite in water with low contamination (e.g. drinking water, raw water or swimming pool water).

An appropriate pretreatment of the sample (e.g. dilution) and the use of a conductivity detector (CD), UV detector (UV) or amperometric detector (AD) make the working ranges given in table 1 feasible.

Table 1 — Working ranges of the analytical method

Anion	Working range mg/l*	Detection
Chlorate	0,03 to 10	CD
Chloride	0,1 to 50	CD
Chlorite**	0,05 to 1	CD
	0,1 to 1	UV; $\lambda=207$ nm to 220 nm
	0,01 to 1	AD; 0,4 to 1,0 V

* The working range is restricted by the ion-exchange capacity of the columns. Dilute the sample in to the working range, if necessary.

** The minimum working range for chlorite of 0,05 mg/l was obtained using calibration checks, but the round robin trials (annex A, table A.4) showed that it is difficult to obtain this with sufficient accuracy. Thus great care shall be taken when working in the lower range of this method.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 10304. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 10304 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 5667-1:1980 *Water quality - Sampling - Part 1: Guidance on the design of sampling programmes.*

ISO 5667-2:1991 *Water quality - Sampling - Part 2: Guidance on sampling techniques.*

ISO 5667-3:1994	<i>Water quality - Sampling - Part 3: Guidance on the preservation and handling of samples.</i>
ISO 8466-1:1990	<i>Water quality - Calibration and evaluation of analytical methods and estimation of performance characteristics - Part 1: Statistical evaluation of the linear calibration function.</i>
ISO 10304-1:1992	<i>Water quality - Determination of dissolved anions by liquid chromatography of ions - Part 1: Determination of fluoride, chloride, bromide, nitrate, nitrite, orthophosphate and sulfate in water with low contamination</i>
ISO 10304-2:1995	<i>Water quality - Determination of dissolved anions by liquid chromatography of ions - Part 2: Determination of bromide, chloride, nitrate, nitrite, orthophosphate and sulfate in waste water</i>
ISO 10304-3:1997	<i>Water quality - Determination of dissolved anions by liquid chromatography of ions - Part 3: Determination of chromate, iodide, sulfite, thiocyanate and thiosulfate</i>
ISO 10530: 1992	<i>Water quality - Determination of dissolved sulfide - Photometric method using methylene blue</i>

3 Interferences

3.1 Organic acids such as mono- and dicarboxylic acids and disinfection byproducts (e.g. chloroacetic acid) can interfere.

3.2 Dissolved organics can react with the working electrode of the amperometric detector, causing a decrease in sensitivity.

3.3 The presence of fluoride, carbonate, nitrite and nitrate can cause interference with the determination of chlorate, chloride and chlorite. The respective concentrations given in table 2 are typical for conductivity, UV and amperometric detectors.

3.4 Elevated loads of chloride and bromide can cause interference with the determination of chlorite and chlorate. Remove chloride and bromide with the aid of special exchangers (8.2).

3.5 Solid particles and organic compounds (such as mineral oils, detergents, and humic acids) shorten the life-time of the separator column. They are therefore eliminated from the sample prior to analysis (clause 8).