

**VEE KVALITEET**

**Kloriidi määramine**

**Tiitrimine hõbenitraadiga kromaatindikaatori  
juuresolekul (Mohri meetod)**

**Water quality**

**Determination of chloride**

**Silver nitrate titration with chromate indicator (Mohr's  
method)**

**(ISO 9297:1989, identical)**

**EESTI STANDARDI EESSÕNA****NATIONAL FOREWORD**

See Eesti standard EVS-ISO 9297:2023 sisaldab rahvusvahelise standardi ISO 9297:1989 „Water quality. Determination of chloride. Silver nitrate titration with chromate indicator (Mohr's method)“ identset ingliskeelset teksti.	This Estonian Standard EVS-ISO 9297:2023 consists of the identical English text of the International Standard ISO 9297:1989 „Water quality. Determination of chloride. Silver nitrate titration with chromate indicator (Mohr's method)“.
Ettepaneku rahvusvahelise standardi ümbertrüki meetodil ülevõtuks on esitanud EVS/TK 47, standardi avaldamist on korraldanud Eesti Standardimis- ja Akrediteerimiskeskus.	Proposal to adopt the International Standard by reprint method has been presented by EVS/TK 47, the Estonian Standard has been published by the Estonian Centre for Standardisation and Accreditation.
Standard EVS-ISO 9297:2023 on jõustunud sellekohase teate avaldamisega EVS Teatajas.	Standard EVS-ISO 9297:2023 has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.
Standard on kättesaadav Eesti Standardimis- ja Akrediteerimiskeskusest.	This standard is available from the Estonian Centre for Standardisation and Accreditation.

**Käsitlusala**

See rahvusvaheline standard kirjeldab titrimetrilist meetodit lahustunud kloriidi määramiseks vees. Meetod on rakendatav lahustunud kloriidi otsemääramiseks kontsentratsioonides vahemikus 5 mg/l kuni 150 mg/l. Töövahemikku võib suurendada kuni 400 mg/l, kasutades suurema mahutavusega büretti või proovi lahjendamist. Paljude segavate mõjude tõttu ei ole meetod rakendatav tugevalt saastunud madala kloriidisisaldusega vee korral.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile [standardiosakond@evs.ee](mailto:standardiosakond@evs.ee).

ICS 13.060.50

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Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardimis- ja Akrediteerimiskeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autoriõiguse kaitse kohta, võtke palun ühendust Eesti Standardimis- ja Akrediteerimiskeskusega: Koduleht [www.evs.ee](http://www.evs.ee); telefon 605 5050; e-post [info@evs.ee](mailto:info@evs.ee)

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 9297 was prepared by Technical Committee ISO/TC 147, *Water quality*.

## Introduction

Nearly all natural waters, as well as rain water and many waste waters, contain chloride ions. Concentrations can vary widely from a few milligrams per litre in some natural waters to very high concentrations in polluted waste water, marine water and saline ground water.

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# Water quality - Determination of chloride - Silver nitrate titration with chromate indicator (Mohr's method)

## 1 Scope

### 1.1 Application range

This International Standard specifies a titration method for the determination of dissolved chloride in water. The method is applicable to the direct determination of dissolved chloride in concentrations between 5 mg/l and 150 mg/l. The working range may be extended to 400 mg/l by using a burette of larger capacity or by sample dilution. Due to many interferences the method is not applicable to heavily polluted waters of low chloride content.

### 1.2 Interferences

Normal concentrations of common constituents of ground water, surface water and potable water do not interfere with the determination.

The following substances interfere with the method

- Substances forming insoluble silver compounds, such as bromides, iodides, sulfides, cyanides, hexacyanoferrates(II) and hexacyanoferrates(III). If necessary, bromide and iodide ions shall be determined separately, and the result of the chloride determination corrected accordingly.
- Compounds forming complexes with silver ions, such as ammonium and thiosulfate ions.
- Compounds which will reduce chromate ions, including iron(II) and sulfite ions.

The interferences mentioned above will lead to high chloride values.

Highly coloured or turbid solutions may obscure the end point, for example hydrated iron oxide.

**Table 1 - Interferences**

Substance	Amount interfering mg/l
Br <sup>-</sup>	3
I <sup>-</sup>	5
S <sup>2-</sup>	0,8
CN <sup>-</sup>	1
Fe(CN) <sub>6</sub> <sup>4-</sup>	2
Fe(CN) <sub>6</sub> <sup>3-</sup>	2
NH <sub>4</sub> <sup>+</sup>	100
S <sub>2</sub> O <sub>3</sub> <sup>2-</sup>	200
SO <sub>3</sub> <sup>2-</sup>	70
SCN <sup>-</sup>	3
CrO <sub>4</sub> <sup>2-</sup>	1 000
PO <sub>4</sub> <sup>3-</sup>	25

Table 1 gives a summary of the concentrations of interfering compounds, in milligrams per litre, that give an increase of approximately 2 % in the result when in the presence of 70 mg/l of chloride.

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard 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 385-1:1984, *Laboratory glassware - Burettes - Part 1: General requirements*.

ISO 5567-1:1980, *Water quality – Sampling - Part 1: Guidance on the design of sampling programmes*.

ISO 5667-2:1982, *Water quality - Sampling Part 2: Guidance on sampling techniques*.

ISO 5667-3:1985, *Water quality - Sampling Part 3: Guidance on the preservation and handling of samples*.

ISO 5725:1986, *Precision of test methods - Determination of repeatability and reproducibility for a standard test method by inter-laboratory tests*.

## 3 Principle

Reaction of chloride with added silver ions to form insoluble silver chloride which precipitates quantitatively. Addition of a small excess of silver ions to form a red brown silver chromate with chromate ions that have been added as an indicator. This reaction is used for indicating the end-point. The pH is maintained in the range of 5 to 9.5 throughout the titration in order to allow precipitation.

## 4 Reagents

NOTE 1 All silver compounds and solutions are sensitive to light. Silver salts temporarily stain the skin brown.

Use only reagents of recognized analytical grade and only distilled water or water of equivalent purity.

**4.1 Silver nitrate**, standard volumetric solution,  $c(\text{AgNO}_3) \approx 0,02 \text{ mol/l}$ .

Dissolve 3,3974 g of silver nitrate ( $\text{AgNO}_3$ ), previously dried at 105 °C in water and dilute to 1000 ml in a one-mark volumetric flask.

If stored in the dark in a brown glass bottle with glass stoppers, the solution is stable for several months. The solution is standardized against 10 ml sodium chloride standard reference solution (diluted to 100 ml) using the procedure given in 6.1, however, there is no need for pH adjustment.

**4.2 Potassium chromate**, indicator, 100 g/l solution. Dissolve 10 g of potassium chromate ( $\text{K}_2\text{CrO}_4$ ) in water and dilute to 100 ml.

**4.3 Sodium chloride**, standard reference solution,  $c(\text{NaCl}) = 0,02 \text{ mol/l}$ . Dissolve 1,1688 g of sodium chloride ( $\text{NaCl}$ ), previously dried at 105 °C, in water and dilute to 1000 ml in a one-mark volumetric flask.

**4.4 Nitric acid**,  $c(\text{HNO}_3) \approx 0, 1 \text{ mol/l}$ .

Stored in a glass bottle, the solution is stable indefinitely.

**4.5 Sodium hydroxide**, solution,  $c(\text{NaOH}) \approx 0,1 \text{ mol/l}$ .

**4.6 Reagent**, for improvement of the buffer capacity.