

Water quality - Determination of free chlorine and total chlorine - Part 2: Colorimetric method using N,N-dialkyl-1,4-phenylenediamine, for routine control purposes (ISO 7393-2:2017)

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

See Eesti standard EVS-EN ISO 7393-2:2018 sisaldab Euroopa standardi EN ISO 7393-2:2017 ingliskeelset teksti.	This Estonian standard EVS-EN ISO 7393-2:2018 consists of the English text of the European standard EN ISO 7393-2:2017.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
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Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

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English Version

Water quality - Determination of free chlorine and total chlorine - Part 2: Colorimetric method using N,N-dialkyl-1,4-phenylenediamine, for routine control purposes (ISO 7393-2:2017)

Qualité de l'eau - Dosage du chlore libre et du chlore total - Partie 2: Méthode colorimétrique à la N,N-diéthylphénylène-1,4 diamine destinée aux contrôles de routine (ISO 7393-2:2017)

Wasserbeschaffenheit - Bestimmung von freiem Chlor und Gesamtchlor - Teil 2: Kolorimetrisches Verfahren mit N,N-Diethyl-1,4-Phenylendiamin für Routinekontrollen (ISO 7393-2:2017)

This European Standard was approved by CEN on 9 December 2017.

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## European foreword

This document (EN ISO 7393-2:2018) has been prepared by Technical Committee ISO/TC 147 "Water quality" in collaboration with Technical Committee CEN/TC 230 "Water analysis", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2018, and conflicting national standards shall be withdrawn at the latest by July 2018.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN ISO 7393-2:2000.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

## Endorsement notice

The text of ISO 7393-2:2017 has been approved by CEN as EN ISO 7393-2:2018 without any modification.

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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)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

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*.

This second edition cancels and replaces the first edition (ISO 7393-2:1985), which has been technically revised.

The main changes compared to the previous edition are as follows:

- a new [Annex C](#) has been included with the title: Disposable planar reagent-filled cuvettes using a mesofluidic channel pump/colorimeter.

A list of all parts in the ISO 7393 series can be found on the ISO website.

# Water quality — Determination of free chlorine and total chlorine —

## Part 2:

## Colorimetric method using *N,N*-dialkyl-1,4-phenylenediamine, for routine control purposes

**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 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 free chlorine and total chlorine in water, readily applicable to lab- and field-testing. It is based on measurement of the absorption, the red DPD colour complex in a photometer or the colour intensity by visual comparison of the colour with a scale of standards that is regularly calibrated.

This method is appropriate for drinking water and other waters, where additional halogens like bromine, iodine and other oxidizing agents are present in almost negligible amounts. Seawater and waters containing bromides and iodides comprise a group for which special procedures are to be carried out.

This method is in practice applicable to concentrations, in terms of chlorine ( $\text{Cl}_2$ ), from, for example, 0,000 4 mmol/l to 0,07 mmol/l (e.g. 0,03 mg/l to 5 mg/l) total chlorine. For higher concentrations, the test portion is diluted.

Commonly, the method is applied as a field method with mobile photometers and commercially available ready-for-use reagents (liquid reagents, powders and tablets). It is essential that those reagents comply with minimum requirements and contain the essential reagents and a buffer system suitable to adjust the measurement solution to a pH range of typically 6,2 to 6,5. If there is doubt that water samples have uncommon pH values and/or buffer capacities, the user has to check and, if necessary, to adjust the sample pH to the required range. The pH of the sample is within the range of pH 4 and 8. Adjust, if necessary, with sodium hydroxide solution or sulfuric acid before the test.

A procedure for the differentiation of combined chlorine of the monochloramine type, combined chlorine of the dichloramine type and combined chlorine in the form of nitrogen trichloride is presented in [Annex A](#). In [Annex C](#), a procedure is presented for the determination of free and total chlorine in drinking and other low polluted waters, for disposable planar reagent-filled cuvettes using a mesofluidic channel pump/colorimeter.

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

ISO 8466-1, *Water quality — Calibration and evaluation of analytical methods and estimation of performance characteristics — Part 1: Statistical evaluation of the linear calibration function*

### 3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

#### 3.1

##### **free chlorine**

chlorine present in the form of hypochlorous acid, hypochlorite ion or dissolved elemental chlorine

Note 1 to entry: See [Table 1](#).

#### 3.2

##### **combined chlorine**

##### **bound chlorine**

fraction of *total chlorine* ([3.3](#)) present in the form of *chloramines* ([3.4](#)) and organic chloramines

Note 1 to entry: See [Table 1](#).

#### 3.3

##### **total chlorine**

chlorine present in the form of *free chlorine* ([3.1](#)) and *combined chlorine* ([3.2](#))

Note 1 to entry: See [Table 1](#).

#### 3.4

##### **chloramines**

derivatives of ammonia by substitution of one, two or three hydrogen atoms with chlorine atoms

Note 1 to entry: Derivatives are monochloramine  $\text{NH}_2\text{Cl}$ , dichloramine  $\text{NHCl}_2$ , nitrogen trichloride  $\text{NCl}_3$  and all chlorinated derivatives of organic nitrogen compounds as determined by the method specified in this document.

**Table 1 — Terms and synonyms in relation to actual compounds in the solution**

Term	Synonym		Compounds
Free chlorine	Free chlorine	Active free chlorine	Elemental chlorine, hypochlorous acid
		Potential free chlorine	Hypochlorite
Total chlorine	Total residual chlorine		Elemental chlorine, hypochlorous acid, hypochlorite, and chloramines
Bound chlorine	Combined chlorine		Difference of total and free chlorine

## 4 Principle

### 4.1 Determination of free chlorine

Free chlorine is determined by a direct reaction with *N,N*-dialkyl-1,4-phenylenediamine (DPD) in a pH range of 6,2 to 6,5. This leads to the formation of a red colour complex. Measure the colour intensity by photometry, or alternatively, by visual comparison of the colour with a scale of permanent glass, plastics standards or colour card comparators.