SLOVENSKI STANDARD
SIST ISO 8245:2000

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Kakovost vode - Smernice za doloļ evanje celotnega organskega ogljika (TOC) in raztopljenega organskega ogljika (DOC)

Water quality -- Guidelines for the determination of total organic carbon (TOC) and dissolved organic carbon (DOC)

Qualité de l'eau -- Lignes directrices pour le dosage du carbone organique total (COT) et du carbone organique dissous (COD)

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INTERNATIONAL STANDARD

ISO 8245

Second edition
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Water quality — Guidelines for the determination of total organic carbon (TOC) and dissolved organic carbon (DOC)

Qualité de l'eau — Lignes directrices pour le dosage du carbone organique total (COT) et carbone organique dissous (COD)

Reference number
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Contents

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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 3.

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 8245 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 8245:1987) which has been technically revised.

Annexes A and B of this International Standard are for information only.

Introduction

It is absolutely essential that tests conducted in accordance with this International Standard be carried out by suitably qualified staff.

Total organic carbon (TOC) is a measure of the carbon content of dissolved and undissolved organic matter present in water. It does not give information on the nature of the organic substance.

Water quality — Guidelines for the determination of total organic carbon (TOC) and dissolved organic carbon (DOC)

1 Scope

This International Standard gives guidance for the determination of total carbon (TC), total inorganic carbon (TIC) and total organic carbon (TOC) in drinking water, ground water, surface water, sea water and waste water. It also defines terms and specifies interferences, reagents, and sample pretreatment for water samples.

The method described in this International Standard applies to water samples containing organic carbon content ranging from 0,3 mg/l to 1000 mg/l. The lower limit concentration is only applicable in special cases, for example drinking water, measured by highly sensitive instruments. Higher concentrations may be determined after appropriate dilution.

This International Standard does not deal with the instrument-dependent specifications.

Purgeable organic substances, such as benzene, toluene, cyclohexane and chloroform, can also be determined using this method.

Cyanide, cyanate and particles of elemental carbon (soot), when present in the sample, can be determined together with the organic carbon.

2 Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, this publication do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

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

3 Terms and definitions

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

3.1
total carbon
TC
sum of organically bound and inorganically bound carbon present in water, including elemental carbon

3.2
total inorganic carbon
TIC
sum of inorganic carbon present in water in the form of elemental carbon, total carbon dioxide, carbon monoxide, cyanide, cyanate and thiocyanate

NOTE TOC instruments most often measure TIC as CO_2 originating only from hydrogencarbonates and carbonates.

3.3
total organic carbon
TOC
sum of organically bound carbon present in water, bonded to dissolved or suspended matter, including cyanate, elemental carbon and thiocyanate

3.4
dissolved organic carbon
DOC
sum of organically bound carbon present in water originating from compounds passing through a membrane filter of 0,45 µm pore size, including cyanate and thiocyanate

3.5
volatile organic carbon
VOC
purgeable organic carbon
POC
organic carbon present in water which can be purged under the conditions of this method

3.6
non-volatile organic carbon
NVOC
non-purgeable organic carbon
NPOC
organic carbon present in water which cannot be purged under the conditions of this method

4 Principle

Organic carbon (org. C) in water is oxidized to carbon dioxide by combustion, by the addition of an appropriate oxidant, by UV radiation or any other high-energy radiation.

The application of the ultraviolet method with only oxygen as an oxidant is restricted to low polluted waters, containing low concentrations of TOC.

NOTE In the presence of humic material, low TOC values may be obtained when UV radiation is used.

The carbon dioxide formed by oxidation is determined either directly or after reduction, for example to methane (CH_4).

The final determination of CO_2 is carried out by a number of different procedures, for example infrared spectrometry, titration (preferably in non-aqueous solution), thermal conductivity, conductimetry, coulometry, CO_2-sensitive sensors and flame ionization detection (used after reduction of CO_2 to methane, among others).

In addition to organic carbon, the water sample may contain carbon dioxide or ions of carbonic acid. Prior to the TOC determination, it is essential that this inorganic carbon be removed by purging the acidified sample with a gas which is free from CO_2 and organic compounds. Alternatively, both total carbon (TC) and total inorganic carbon (TIC) may be determined and the organic carbon content (TOC) may be calculated by subtracting the total inorganic carbon from the TC. This method is particularly suitable for samples in which the total inorganic carbon is less than the TOC.

Purgeable organic substances, such as benzene, toluene, cyclohexane and chloroform, may partly escape upon stripping. In the presence of these substances, the TOC concentration is determined separately or the differential method (TC – TIC = TOC) may be applied. By using the differential method, the value of the TOC should be higher than the TIC, or at least of similar size.

Inorganic carbon is removed by acidification and purging or is determined separately.

5 Reagents

Use only reagents of recognized analytical grade.

In this International Standard only those chemicals and gases which are used with the majority of TOC methods are listed. Reagents shall be used according to the manufacturer's instructions, and shall, if necessary, be pretreated.

5.1 Dilution water

The TOC of the water used for dilution and for preparation of the calibration standards shall be sufficiently low to be negligible in comparison with the lowest TOC concentration to be determined (see Table 1).

The choice of the method to pretreat water intended for dilution purposes depends on the concentration range of the sample under investigation as shown in Table 1.

NOTE For measurements of a TOC concentration < 0,5 mg/l, it is preferable to prepare water for blanks and calibration solutions immediately prior to analysis (see Table 1).

Table 1 — Dilution water specifications

TOC of sample mg/l	Maximum acceptable TOC of dilution water mg/l	Dilution water: treatment method
< 10	0,1* 0,3	UV treatment condensation
10 to 100	0,5	double distillation with $KMnO_4/K_2Cr_2O_7$
> 100	1	distillation
* Only for ultrapure water.		

5.2 Potassium hydrogenphthalate stock solution, ρ(org. C) = 1 000 mg/l.

Dissolve 2,125 g of potassium hydrogenphthalate ($C_8H_5KO_4$) (dried for 1 h at a temperature between 105 °C and 120 °C) in a 1 000 ml one-mark volumetric flask filled with 700 ml of water (5.1), then dilute to volume with water.

The solution is stable for about 2 months if stored in a tightly stoppered bottle in a refrigerator.

5.3 Potassium hydrogenphthalate standard solution, ρ(org. C) = 100 mg/l.

Pipette 100 ml of the potassium hydrogenphthalate stock solution (5.2) into a 1 000 ml one-mark volumetric flask, and dilute to volume with water (5.1).

The solution is stable for about 1 week if stored in a tightly stoppered bottle in a refrigerator.

5.4 Standard solution for the determination of inorganic carbon, ρ(inorg. C) = 1 000 mg/l.

Dissolve 4,415 g of sodium carbonate (Na_2CO_3) [dried for 1 h at (285 ± 5)°C] in a 1 000 ml one-mark volumetric flask in approximately 500 ml of water (5.1).

Add 3,500 g of sodium hydrogencarbonate ($NaHCO_3$) (dried for 2 h over silica gel), and dilute to volume with water (5.1).

This solution is stable at room temperature for about 2 weeks.