



SLOVENSKI STANDARD

SIST EN ISO 14593:2005

01-december-2005

Kakovost vode – Vrednotenje aerobne biorazgradljivosti organskih spojin v vodnem mediju – Metoda z analizo anorganskega ogljika v zaprtih posodah (CO₂ headspace test) (ISO 14593:1999)

Water quality - Evaluation of ultimate aerobic biodegradability of organic compounds in aqueous medium - Method by analysis of inorganic carbon in sealed vessels (CO₂ headspace test) (ISO 14593:1999)

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Wasserbeschaffenheit - Bestimmung der vollständigen biologischen Abbaubarkeit organischer Substanzen im wässrigen Medium - Verfahren mittels Bestimmung des anorganischen Kohlenstoffs in geschlossenen Flaschen (CO₂-Headspace-Test) (ISO 14593:1999)

Qualité de l'eau - Evaluation en milieu aqueux de la biodégradabilité aérobie ultime des composés organiques - Méthode par analyse du carbone inorganique dans des récipients hermétiquement clos (Essai au CO₂ dans l'espace de tete) (ISO 14593:1999)

Ta slovenski standard je istoveten z: EN ISO 14593:2005

ICS:

13.060.70	Preiskava bioloških lastnosti vode	Examination of biological properties of water
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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN ISO 14593

June 2005

ICS 13.060.70

English version

Water quality - Evaluation of ultimate aerobic biodegradability of organic compounds in aqueous medium - Method by analysis of inorganic carbon in sealed vessels (CO₂ headspace test) (ISO 14593:1999)

Qualité de l'eau - Evaluation en milieu aqueux de la biodégradabilité aérobie ultime des composés organiques - Méthode par analyse du carbone inorganique dans des récipients hermétiquement clos (Essai au CO₂ dans l'espace de tête) (ISO 14593:1999)

Wasserbeschaffenheit - Bestimmung der vollständigen biologischen Abbaubarkeit organischer Substanzen im wässrigen Medium - Verfahren mittels Bestimmung des anorganischen Kohlenstoffs in geschlossenen Flaschen (CO₂-Headspace-Test) (ISO 14593:1999)

This European Standard was approved by CEN on 25 May 2005.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

EN ISO 14593:2005 (E)**Foreword**

The text of ISO 14593:1999 has been prepared by Technical Committee ISO/TC 147 "Water quality" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 14593:2005 by 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 December 2005, and conflicting national standards shall be withdrawn at the latest by December 2005.

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

Endorsement notice
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The text of ISO 14593:1999 has been approved by CEN as EN ISO 14593:2005 without any modifications.

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INTERNATIONAL STANDARD

ISO 14593

First edition
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Water quality — Evaluation of ultimate aerobic biodegradability of organic compounds in aqueous medium — Method by analysis of inorganic carbon in sealed vessels (CO₂ headspace test)

iTeh STANDARD PREVIEW
Qualité de l'eau — Évaluation en milieu aqueux de la biodégradabilité aérobie ultime des composés organiques — Méthode par analyse du carbone inorganique dans des récipients hermétiquement clos (Essai au CO₂ dans l'espace de tête)

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ISO 14593:1999(E)

Contents

1 Scope	1
2 Normative reference	1
3 Terms and definitions	2
4 Principle	3
5 Test environment	4
6 Reagents	4
7 Apparatus	5
8 Procedure	5
9 Calculation and expression of results	9
10 Expression of results	10
11 Validity of results	10
12 Precision of the method	11
13 Test report	11
Annex A (informative) Example of a biodegradation curve	12
Annex B (informative) Statistical treatment of results	13
Annex C (informative) Interlaboratory ring test	14
Bibliography	15

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International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet iso@iso.ch

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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 14593 was prepared by Technical Committee ISO/TC 147, *Water quality*, Subcommittee SC 5, *Biological methods*.

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

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Water quality — Evaluation of ultimate aerobic biodegradability of organic compounds in aqueous medium — Method by analysis of inorganic carbon in sealed vessels (CO₂ headspace test)

WARNING — Activated sludge and sewage may contain potentially pathogenic organisms and should be handled with appropriate precautions. Hazardous test compounds and those whose properties are unknown should be handled with care.

1 Scope

This International Standard specifies a method, by analysis of inorganic carbon, for the evaluation in an aqueous medium of the ultimate aerobic biodegradability of organic substances at a given concentration of microorganisms.

This International Standard is applicable to organic compounds which are:

- a) water-soluble under the test conditions;
- b) poorly water-soluble under the test conditions, in which case special measures may be necessary to achieve a good dispersion of the compound (see ISO 10634);
- c) volatile;
- d) not inhibitory to the test microorganisms at the concentration chosen for the test.

In this test, biogenically produced inorganic carbon is measured *in situ* in the test vessels in such a manner that the rate measured nearly equals the rate of microbial production.

NOTE 1 The conditions described in this International Standard do not always correspond to the optimal conditions for allowing the maximum degree of biodegradation to occur. For alternative biodegradation methods see ISO 15462.

NOTE 2 With highly volatile substances, losses to the gaseous phase can be minimized by reducing the volume of the headspace. However, there should be sufficient oxygen in the test system to prevent biodegradation being oxygen-limited.

NOTE 3 The presence of an inhibitory effect can be determined as specified in 8.3, or by using any other method for determining the inhibitory effect of a substance on bacteria (see, for example, ISO 8192).

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, any of these publications 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 reference, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 10634:1995, *Water quality — Guidance for the preparation and treatment of poorly water-soluble organic compounds for the subsequent evaluation of their biodegradability in aqueous medium.*

3 Terms and definitions

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

3.1

ultimate aerobic biodegradation

breakdown of a chemical compound or organic matter by microorganisms in the presence of oxygen to carbon dioxide, water and mineral salts of any other elements present (mineralization) and the production of new biomass

3.2

primary biodegradation

structural change (transformation) of a chemical compound by microorganisms resulting in the loss of a specific property

3.3

activated sludge

biomass produced in the aerobic treatment of wastewater by the growth of bacteria and other microorganisms in the presence of dissolved oxygen

3.4

concentration of suspended solids

<activated sludge> amount of solids obtained by filtration or centrifugation of a known volume of activated sludge and drying at about 105 °C to constant mass

3.5

total organic carbon

TOC

all that carbon present in organic matter which is dissolved and suspended in the water sample

3.6

dissolved organic carbon

DOC

that part of the organic carbon in the water sample which cannot be removed by specified phase separation

NOTE For example, by centrifugation at 40 000 m · s⁻² for 15 min or by membrane-filtration using membranes with pores of diameter 0,2 µm to 0,45 µm.

3.7

total inorganic carbon

TIC

all that inorganic carbon in the water deriving from carbon dioxide and carbonate

3.8

dissolved inorganic carbon

DIC

that part of the inorganic carbon in water which cannot be removed by specified phase separation

NOTE For example, by centrifugation at 40 000 m · s⁻² for 15 min or by membrane-filtration using membranes with pores of diameter 0,2 µm to 0,45 µm.

3.9

theoretical amount of inorganic carbon

ThIC

theoretical maximum amount of inorganic carbon formed after oxidizing a chemical compound completely

NOTE It is calculated from the molecular formula and expressed in this case as milligrams carbon per milligram (or gram) test compound.

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3.10 lag phase

time from the start of a test until adaptation and/or selection of the degrading microorganisms are achieved and the biodegradation degree of a chemical compound or organic matter has increased to about 10 % of the maximum level of biodegradation

NOTE It is normally recorded in days.

3.11 maximum level of biodegradation

maximum biodegradation degree of a chemical compound or organic matter in a test, above which no further biodegradation takes place during the test

NOTE It is normally recorded in percent.

3.12 biodegradation phase

time from the end of the lag phase of a test until about 90 % of the maximum level of biodegradation has been reached

NOTE It is normally recorded in days.

3.13 plateau phase

time from the end of the biodegradation phase until the end of the test

NOTE It is normally recorded in days.

3.14 pre-exposure

pre-incubation of an inoculum in the presence of the test chemical compound or organic matter, with the aim of enhancing the ability of this inoculum to biodegrade the test material by adaptation and/or selection of the microorganisms

3.15 preconditioning

pre-incubation of an inoculum under the conditions of the subsequent test in the absence of the test chemical compound or organic matter, with the aim of improving the performance of the test by acclimatization of the microorganisms to the test conditions

4 Principle

The test compound, as the sole source of carbon and energy, is added to a mineral salts medium inoculated with a mixed population of microorganisms and incubated in sealed vessels with a headspace of air. The concentration of the compound used normally yields an initial organic carbon concentration in the medium of 2 mg/l to 40 mg/l, usually 20 mg/l. Biodegradation (mineralization to carbon dioxide) is determined by measuring the net increase in total inorganic carbon (TIC) levels over time compared with unamended blanks. The test generally runs for 28 d. The extent of biodegradation is expressed as a percentage of the theoretical amount of inorganic carbon (ThIC) based on the amount of test compound added initially.

For sufficiently water-soluble substances, dissolved organic carbon (DOC) removal during the test may also be determined (see for example ISO 7827).

If a suitable analytical method is available, the primary biodegradation of the test compound during the test may also be determined.