



**SLOVENSKI STANDARD**  
**oSIST prEN ISO 14239:2020**  
**01-januar-2020**

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**Kakovost tal - Laboratorijski inkubacijski sistemi za merjenje mineralizacije organskih spojin v tleh pri aerobnih pogojih (ISO 14239:2017)**

Soil quality - Laboratory incubation systems for measuring the mineralization of organic chemicals in soil under aerobic conditions (ISO 14239:2017)

iTeh STANDARD PREVIEW  
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Qualité du sol - Systèmes d'incubation de laboratoire destinés à la mesure de la minéralisation de produits chimiques organiques dans le sol en conditions aérobies (ISO 14239:2017)

**Ta slovenski standard je istoveten z: prEN ISO 14239**

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**ICS:**

13.080.30      Biološke lastnosti tal      Biological properties of soils

**oSIST prEN ISO 14239:2020**      **en,fr,de**



INTERNATIONAL  
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14239

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2017-07

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**Soil quality — Laboratory incubation  
systems for measuring the  
mineralization of organic chemicals in  
soil under aerobic conditions**

*Qualité du sol — Systèmes d'incubation de laboratoire destinés à la  
mesure de la minéralisation de produits chimiques organiques dans le  
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## ISO 14239:2017(E)

### 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, on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

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This document was prepared by Technical Committee ISO/TC 190, *Soil quality*, Subcommittee SC 4, *Biological methods*.

SIST EN ISO 14239:2020

This second edition cancels and replaces the first edition (ISO 14239:1997), which has been technically revised. The main changes are the inclusion of two additional incubation systems.

## Introduction

This document describes incubation systems for determining the mineralization of organic compounds in soil under aerobic conditions.

Mineralization is only one of the parameters which can be used to assess the biodegradation of organic compounds in soil. If mineralization is not extensive, this does not necessarily mean that the test material is not biodegradable. Material balance studies to assess the production of metabolites, in addition to mineralization studies, provide a comprehensive assessment of biodegradation.

It is essential that this document be used in conjunction with ISO 11266, which gives general guidance on the information needed to assess the potential of an organic compound to be degraded in soil.

Depending on the aim of the study, it is feasible to use a range of incubation conditions, described below, and different methods of analysis.

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# Soil quality — Laboratory incubation systems for measuring the mineralization of organic chemicals in soil under aerobic conditions

**WARNING** — The methods in this document use several materials of a hazardous nature. Due care is necessary in their handling and disposal. In particular, all pertinent national regulations should be complied with.

## 1 Scope

This document specifies six suitable incubation systems for measuring the rates and extent of mineralization of organic compounds in soil by measurement of carbon dioxide (CO<sub>2</sub>) evolution. All incubation systems are applicable to soluble or insoluble compounds but choice of system depends on the overall purposes of the study.

This document does not apply to the use of such systems for material balance studies, which are often test-substance specific.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 11266, *Soil quality — Guidance on laboratory testing for biodegradation of organic chemicals in soil under aerobic conditions*

ISO 11269-2:2012, *Soil quality — Determination of the effects of pollutants on soil flora — Part 2: Effects of contaminated soil on the emergence and early growth of higher plants*

ISO 11274, *Soil quality — Determination of the water-retention characteristic — Laboratory methods*

ISO 18400-206,<sup>1)</sup> *Soil quality — Sampling — Part 206: Guidance on the collection, handling and storage of soil for the assessment of biological functional and structural endpoints in the laboratory*

## 3 Terms and definitions

No terms and definitions are listed in this document.

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

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

## 4 Methods

### 4.1 General requirements

The following procedures shall be followed, whichever incubation system is selected.

1) Under preparation. Stage at the time of publication: ISO/DIS 18400-206:2017.

## ISO 14239:2017(E)

### 4.1.1 Soil collection and characterization

Soil shall be collected and handled in accordance with ISO 18400-206<sup>1)</sup>. The soil shall be characterized in accordance with ISO 11266.

### 4.1.2 Test material

The test material shall be characterized in accordance with ISO 11266.

### 4.1.3 Incubation conditions

The following conditions shall be used unless there is a specific reason for using different conditions:—

Temperature:  $(20 \pm 2)$  °C

— Pore water pressure of soil:  $-0,01$  MPa to  $-0,03$  MPa (measured to  $\pm 5$  %) as determined in accordance with ISO 11274 (or between 40 % and 60 % max. water holding capacity (WHC measured to  $\pm 5$  %) in accordance with ISO 11269-2:2012, Annex A)

— Incubation: in the dark

The incubation conditions should be reported in the test report. If they differ from those above, the reasons for changing them should also be reported in the test report.

A temperature of  $(20 \pm 2)$  °C has been chosen as a standard for comparative purposes and because it gives relatively rapid results. Temperatures outside this range can be used if they are more appropriate (for example, because of local conditions, lack of cooling equipment).

## 4.2 Choice of incubation systems

One of the six systems described in this document shall be used:

- the flow-through system (4.3);
- the soda-lime column system (4.4);
- the biometer system (4.5);
- the radiorespirometer (4.6);
- the microradiorespirometer (4.7);
- the miniaturized respirometer (4.8).

Data on the mineralization of organic chemicals can most reliably be obtained from experiments with radiolabelled compounds.

Recoveries of CO<sub>2</sub> in the six systems can be measured using known quantities of unlabelled or <sup>14</sup>C-labelled calcium carbonate and adding sufficient hydrochloric acid to dissolve fully the calcium carbonate.

The main advantages and disadvantages of the systems are described in [Table 1](#) below.

Table 1 — Advantages and disadvantages of the incubation systems

Device	Advantages	Disadvantages
<b>flow-through system</b>	<ul style="list-style-type: none"> <li>— sufficient oxygen for long-term, aerobic degradation studies;</li> <li>— uses standard laboratory glassware;</li> <li>— allows measurement of unlabelled CO<sub>2</sub> (titration), <sup>14</sup>CO<sub>2</sub> (scintillation counting), and/or <sup>14</sup>C-labelled volatile products (scintillation counting).</li> </ul>	<ul style="list-style-type: none"> <li>— difficulties with complete recoveries when volatile <sup>14</sup>C-compounds are under investigation;</li> <li>— sensitivity to leaks in the system.</li> </ul>
<b>soda-lime column system</b>	<ul style="list-style-type: none"> <li>— free access of oxygen for long-term degradation studies;</li> <li>— uses standard laboratory glassware; requires little space;</li> <li>— adaptable without changes for use with standing or shaken aerobic sediments, pure cultures of microorganisms, algae or plant cell cultures;</li> <li>— problem-free incubation under various environmental conditions;</li> <li>— full recoveries of applied radioactivity in short- or long-term material balance studies.</li> </ul>	<ul style="list-style-type: none"> <li>— <sup>14</sup>CO<sub>2</sub> trapped in soda lime has to be released and re-adsorbed in liquid for scintillation counting;</li> <li>— water content of soils has to be adjusted at least once per month.</li> </ul>
<b>biometer system</b>	<ul style="list-style-type: none"> <li>— requires little space;</li> <li>— adaptable without changes for use with standing cultures of aerobic sediments;</li> <li>— pure cultures of microorganisms or algae;</li> <li>— problem-free incubation under various environmental conditions; ease of measurement of non-radioactive CO<sub>2</sub> (titration), <sup>14</sup>CO<sub>2</sub> (scintillation counting or <sup>14</sup>C-labelled volatile products (scintillation counting).</li> </ul>	<ul style="list-style-type: none"> <li>— not ideal for long-term incubations due to lack of free access of air and reduction of partial pressure of oxygen in chamber during incubation;</li> <li>— requires special glassware.</li> </ul>