

SLOVENSKI STANDARD
oSIST prEN ISO 21268-3:2018
01-april-2018

Kakovost tal - Postopki izluževanja za nadaljnje kemijsko in ekotoksikološko preskušanje tal in talnih (zemeljskih) materialov - 3. del: Preskus v koloni s tokom navzgor (ISO/DIS 21268-3:2018)

Soil quality - Leaching procedures for subsequent chemical and ecotoxicological testing of soil and soil materials - Part 3: Up-flow percolation test (ISO/DIS 21268-3:2018)

Bodenbeschaffenheit - Elutionsverfahren für die anschließende chemische und ökotoxikologische Untersuchung von Boden und von Bodenmaterialien - Teil 3: Perkolationstest im Aufwärtsstrom (ISO/DIS 21268-3:2018)

Qualité du sol - Modes opératoires de lixiviation en vue d'essais chimiques et écotoxicologiques ultérieurs des sols et matériaux du sol - Partie 3: Essai de percolation à écoulement ascendant (ISO/DIS 21268-3:2018)

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13.080.05	Preiskava tal na splošno	Examination of soils in general
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Soil quality — Leaching procedures for subsequent chemical and ecotoxicological testing of soil and soil materials —

Part 3: Up-flow percolation test

Qualité du sol — Modes opératoires de lixiviation en vue d'essais chimiques et écotoxicologiques ultérieurs des sols et matériaux du sol —

Partie 3: Essai de percolation à écoulement ascendant

ICS: 13.080.05

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Contents

Page

Foreword.....	v
Introduction.....	vii
1 Scope	1
2 Normative references	1
3 Terms and definitions.....	2
4 Principle.....	3
5 Reagents and materials	4
6 Apparatus	4
7 Sample pre-treatment.....	6
7.1 Particle size.....	6
7.2 Sample preparation	7
7.3 Test portion	7
7.4 Determination of dry matter content.....	8
8 Procedure.....	8
8.1 Temperature	8
8.2 Preparation.....	8
8.3 Packing of the column.....	9
8.4 Start of the test.....	10
8.5 Collection of additional eluate fractions	11
8.6 Further preparation of the eluates for analysis	12
8.7 Blank test.....	13
9 Calculations.....	13
10 Test report	14
11 Performance characteristics	14
11.1 General	14
11.2 Validation trials performed in Japan.....	15
11.2.1 Round robin tests performed in accordance with ISO/TS 21268-3:2004	15
11.2.2 Robustness testing and validation results considering equilibration period and flow rate.....	16
11.3 Validation results obtained in Germany (DIN 19528)	16
11.3.1 General	16
11.3.2 Results for validation trial 1	18
11.3.3 Results for validation trial 2	21
Annex A (informative) Suggestions for packing the column, water saturation and establishment of equilibrium conditions	24
A.1 General	24
A.2 Column filling and packing.....	24
A.3 Water saturation.....	24
Annex B (informative) Justification of the choices made in developing the test procedure	26
B.1 Introduction.....	26
B.2 Column dimensions	26

ISO/DIS 21268-3:2018(E)

B.3	Leachant flow direction	27
B.4	Leachant flow rate	27
B.5	Nature of the leachant	28
B.6	L/S ratio	28
B.7	Temperature.....	29
B.8	Beneficial use of the test results	29
Annex C (informative)	Calculation of centrifugation duration depending on centrifugation speed and rotor dimensions	30
C.1	Introduction	30
C.2	Calculations.....	30
Bibliography		32

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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).

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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.

This document was prepared by Technical Committee ISO/TC 190, *Soil quality*, Subcommittee SC 7, *Soil and site assessment*.

This first edition of ISO 21268-3 cancels and replaces ISO/TS 21268-3:2007, Clauses 1, 2, 4, 5, 6, 7.1, 7.2, 8, 11, A.3 and Annex B of which have been technically revised.

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

- maximum grain size changed to < 2 mm as usual for soil;
- demineralized water added as possible leachant;
- column diameter changed from "5 or 10 cm" to "5 to 10 cm";
- flow rate of 30 cm/d added as option based on robustness testing;
- Clauses 7.1 and 7.2 exchanged to read 7.1 "Particle size" and 7.2 "Sample preparation";
- Clauses 11.1 "General", 11.2 "Validation trials performed in Japan" and 11.3 "Validation results obtained in Germany (DIN 19528)" added;
- B.2 "Particle size distribution" deleted;

ISO/DIS 21268-3:2018(E)

- informative Annex C "Calculation of centrifugation duration depending on centrifugation speed and rotor dimensions" added;
- references in Clause 2 and Bibliography updated.

A list of all parts in the ISO 21268 series can be found on the ISO website.

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Introduction

In various countries, tests have been developed to characterise and assess the constituents which can be released from materials. The release of soluble constituents upon contact with water is regarded as a main mechanism of release, which results in a potential risk to the environment during the use or disposal of materials. The intent of these tests is to identify the leaching properties of materials. The complexity of the leaching process makes simplifications necessary.

Not all of the relevant aspects of leaching behaviour can be addressed in one standard.

Tests to characterise the behaviour of materials can generally be divided into three categories (EN 12920; EN/TS 14405) and are addressed in ISO 18772^[13]. The relationships between these tests are summarised below:

- a) “Basic characterisation” tests are used to obtain information on the short- and long-term leaching behaviour and characteristic properties of materials. Liquid/solid (L/S) ratios, leachant composition, factors controlling leachability, such as pH, redox potential, complexing capacity, role of dissolved organic carbon (DOC), ageing of material and physical parameters, are addressed in these tests.
- b) “Compliance” tests are used to determine whether the material complies with a specific behaviour or with specific reference values. The tests focus on key variables and leaching behaviour previously identified by basic characterisation tests.
- c) “On-site verification” tests are used as a rapid check to confirm that the material is the same as that which has been subjected to the compliance test(s). On-site verification tests are not necessarily leaching tests.

The test procedure described in this method belongs to category a): basic characterisation tests.

This standard was originally elaborated on the basis of CEN/TS 14405:2004. Especially modifications considering requirements on subsequent ecotoxicological testing and analysis of organic substances have been included. Validation results have been adopted from DIN 19528.

Soil quality — Leaching procedures for subsequent chemical and ecotoxicological testing of soil and soil materials — Part 3: Up-flow percolation test

1 Scope

This part of ISO 21268 specifies a test, which is aimed at determining the leaching behaviour of inorganic and organic constituents from a soil and soil material. The method is a once-through percolation test with water ($0,001 \text{ mol/l CaCl}_2$) under standardized conditions of flow rate. The material is leached under dynamic hydraulic conditions. The eluates obtained can be used to determine the ecological properties of the soil with respect to micro-organisms, flora and fauna. The test results enable the distinction between different release patterns, for instance wash-out and release under the influence of interaction with the matrix, when approaching local equilibrium between material and leachant.

This test method produces eluates, which can subsequently be characterised by physical, chemical and ecotoxicological methods in accordance with existing standard methods. The results of eluate analysis are presented as a function of the liquid/solid (L/S) ratio. The test is not suitable for species that are volatile under ambient conditions.

NOTE 1 Volatile organic constituents include the low-molecular-weight components in mixtures such as mineral oil.

NOTE 2 It is not always possible to optimise test conditions simultaneously for inorganic and organic constituents and optimum test conditions can also vary between different groups of organic constituents. Test requirements for organic constituents are generally more stringent than those for inorganic constituents. The test conditions suitable for measuring the release of organic constituents will generally also be applicable to inorganic constituents.

NOTE 3 For ecotoxicological testing, eluates representing the release of both inorganic and organic contaminants are needed. In this document, ecotoxicological testing is also meant to include genotoxicological testing.

NOTE 4 The test is generally not suitable for soils with hydraulic conductivities below 10^{-8} m/s (see also Annex B). It might be difficult to maintain the designated flow rate already in the range of saturated hydraulic conductivity between 10^{-7} m/s and 10^{-8} m/s .

The application of this test method alone is not sufficient for the determination of the leaching behaviour of a material under specified conditions different to those from the test procedure, since this generally requires the application of several test methods, behavioural modelling and model validation. This part of ISO 21268 does not address issues related to health and safety. It only determines the leaching properties as outlined in Clause 4.

2 Normative references

The following referenced documents are indispensable for the application 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/DIS 21268-3:2018(E)

ISO 3696, *Water for analytical laboratory use — Specification and test methods*

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

ISO 7027:1999, *Water quality — Determination of turbidity*

ISO 10523, *Water quality — Determination of pH*

ISO 11464, *Soil quality — Pretreatment of samples for physico-chemical analysis*

ISO 11465, *Soil quality — Determination of dry matter and water content on a mass basis — Gravimetric method*

ISO 18400-101, *Soil quality - Sampling - Framework for the preparation and application of a sampling plan*

ISO 18400-104, *Soil quality - Sampling – Strategies*

ISO 18400-202, *Soil quality - Sampling Preliminary investigations*

ISO 18512, *Soil quality - Guidance on long and short term storage of soil samples*

ISO 23909, *Soil quality - Preparation of laboratory samples from large samples*

3 Terms and definitions

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

3.1
leaching test
test during which a material is put into contact with a leachant under strictly defined conditions and some constituents of the material are extracted

3.2
leachant
liquid used in a leaching test

Note 1 to entry: For the purposes of this part of ISO 21268, the leachant is water as specified in 5.1.

3.3
eluate
solution recovered from a leaching test

3.4
liquid to solid ratio
L/S
the ratio between the total volume of liquid (L in litres), which in this extraction is in contact with the soil sample, and the dry mass of the sample (S in kg of dry matter).

Note 1 to entry: L/S is expressed in l/kg.

3.5**laboratory sample**

sample or subsample(s) sent to or received by the laboratory

3.6**test sample**

sample, prepared from the laboratory sample, from which test portions are removed for testing or analysis

3.7**test portion**

quantity of material of appropriate size for measurement of the concentration or other properties of interest, taken from the test sample

Note 1 to entry: The test portion can be taken from the laboratory sample directly if no pre-treatment of sample is required, but usually it is taken from the test sample.

Note 2 to entry: A unit or increment of proper homogeneity, size and fineness, needing no further preparation, can be a test portion.

3.8**granular material**

solid material, not being monolithic

Note 1 to entry: It is not a gas, a liquid or a sludge.

3.9**dry matter content**

w_{dm}

ratio expressed in percent between the mass of the dry residue and the corresponding raw mass

Note 1 to entry: It is determined in accordance with ISO 11465.

3.10**soil materials****soil-like materials**

excavated soil, dredged materials, manufactured soils, treated soils and fill materials

[SOURCE: ISO 15176:2002, 3.1.4]

4 Principle

This part of ISO 21268 describes a method to determine the release of constituents from soil and soil material, packed in a column with leachant percolating through it. A continuous vertical up-flow is used, which allows a column test under water-saturated conditions. The test conditions, including the flow rate of the leachant, are chosen such that the components that are rapidly washed out and the components that are released under the influence of interaction with the matrix can be deduced from the results. It is intended and assumed that conditions approach local equilibrium between the material and the leachant throughout the test.

The test portion of the material with a specified particle size is packed in a column in a standardised manner. Pre-equilibration is applied to reach local equilibrium at the start. The column size is related to the amount of eluate needed for subsequent analysis and testing. The leachant is demineralised water