SLOVENSKI STANDARD
oSIST prEN 12457-4:2026

01-julij-2026

Granulirani odpadki, blato, tla, tlom podobni materiali in sedimenti - Izluževanje - Preskus skladnosti za izluževanje - 4. del: Enostopenjski šaržni preskus pri razmerju tekoče/trdno 10 l/kg za materiale z velikostjo delcev pod 10 mm (brez drobljenja ali z njim)

Granular waste materials, sludges, soil, soil-like materials and sediments - Leaching - Compliance test for leaching - Part 4: One-stage batch test a liquid-to-solid ratio of 10L/kg for materials with particle size below 10 mm (with or without size reduction)

Charakterisierung von Abfällen - Auslaugung - Übereinstimmungsuntersuchung für die Auslaugung von körnigen Abfällen und Schlämmen - Teil 4: Einstufiges Schüttelverfahren mit einem Flüssigkeits-/Feststoffverhältnis von 10 l/kg für Materialen mit einer Korngröße unter 10 mm (ohne oder mit Korngrößereduzierung)

Caractérisation des déchets - Lixiviation - Essai de conformté pour la lixiviation des déchets fragmentés et des boues - Partie 4: Essai en bâchée unique avec un rapport liquide/solide de 10 l/kg et une granularité inférieure à 10 mm (sans ou avec réduction de la granularité)

Ta slovenski standard je istoveten z: **prEN 12457-4**

ICS:

13.030.10	Trdni odpadki	Solid wastes
13.030.20	Tekoči odpadki. Blato	Liquid wastes. Sludge

oSIST prEN 12457-4:2026 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
prEN 12457-4

July 2026

ICS 13.030.10; 13.030.20

Will supersede EN 12457-4:2002

English Version

Granular waste materials, sludges, soil, soil-like materials and sediments - Leaching - Compliance test for leaching - Part 4: One-stage batch test a liquid-to-solid ratio of 10L/kg for materials with particle size below 10 mm (with or without size reduction)

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 444.

If this draft becomes a European Standard, 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.

This draft European Standard was established by CEN 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 CEN-CENELEC Management Centre has the same status as the official versions.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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European foreword

This document (prEN 12457-4:2026) has been prepared by CEN/TC 444, “Environmental characterization of solid matrices”, the secretariat of which is held by NEN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 12457-4:2002.

In comparison with the previous edition, the following technical modifications have been made:

prEN 12457-4:2026 includes the following significant technical changes with respect to EN 12457-4:2002:

— This document has been updated and elaborated on the basis of EN 12457-2:2002 and extended to address the leaching of non-volatile organic substances. Validation data are derived from the original validation results for EN 12457-2:2002, validation data for corresponding fractions of EPA 1316 and validation results for inorganic and organic substances originating from DIN 19529. This document has been developed primarily to support the requirements for compliance testing within the EU and EFTA countries.

Introduction

In the different European countries, tests have been developed to characterize and assess the substances which can be leached from granular waste materials, sludges, soil, soil-like materials and sediments. The release of soluble substances upon contact with water is regarded as a main mechanism of release which results in a potential risk to the environment during the reuse or disposal of soil, soil-like materials, sediments, granular waste materials and sludges. The intent of these tests is to identify the leaching properties of these materials. The complexity of the leaching process makes simplifications necessary.

Not all of the relevant aspects of leaching behaviour can be addressed in one document. Tests to characterize waste materials and their behaviour can generally be divided into three categories:

a) "Basic Characterisation" tests are used to obtain information on the short and long term leaching behaviour and characteristics properties of waste materials, sludges, soil, soil-like materials and sediments. Liquid/solid (L/S) ratios, leachant composition, factors controlling leachability such as pH, redox potential, complexing capacity and physical parameters are addressed in these tests;

b) "Compliance" tests are used to determine whether the granular waste materials, sludges, soil, soil-like materials and sediments comply with specific reference values. The tests focus on key variables and leaching behaviour identified by basic characterization tests;

c) "On-site verification" tests are used as a rapid check to confirm that the granular waste materials, sludges, soil, soil-like materials and sediments are the same as that which has been subjected to the compliance test(s).

The procedure described in this document falls in category 2: compliance tests.

This document constitutes one of the four compliance leaching test procedures described below. The four European Standards are based on different liquid to solid (L/S) ratios and different particle sizes because these parameters, among others, play an important role in the leaching process:

— EN 12457-1, One stage batch test at a liquid to solid ratio of 2 l/kg for materials with high solid content and with particle size below 4 mm (without or with size reduction).

— EN 12457-2, One stage batch test at a liquid to solid ratio of 10 l/kg for materials with particle size below 4 mm (without or with size reduction).

— EN 12457-3, Two stage batch test at a liquid to solid ratio of 2 l/kg and 8 l/kg for materials with high solid content and with particle size below 4 mm (without or with size reduction).

— EN 12457-4, One stage batch test at a liquid to solid ratio of 10 l/kg for materials with particle size below 10 mm (without or with size reduction).

Each part specifies a distinct procedure. The specific features of each part are described in the scope and principle of each part. For given granular waste materials, sludges, soil, soil-like materials and sediments the results might be different for the different procedures. The choice of the procedure depends on the degree and type of information required for compliance testing. This choice is made by the organization establishing the compliance requirements.

Annexes A to F give background information on leaching, intercomparison validation results, guidance on materials suitable for inorganic substances, organic substances and PFAS, an example of reporting, and guidance on specific procedures and their limitations.

This document specifies a compliance test. For basic characterization, a methodology for the determination of the leaching behaviour of waste has been developed within CEN/TC 292 (now CEN/TC 444) and formulated in EN 12920, *Methodology for the determination of the leaching behaviour of waste under specified conditions.*

1 Scope

This document in the series specifies a compliance test providing information on leaching of granular waste materials, sludges, soil, soil-like materials and sediments under the experimental conditions specified hereafter, and particularly a liquid to solid ratio of 10 L/kg dry matter. It applies to materials which have a particle size below 10 mm without or with size reduction.

This document has been developed to investigate the leaching of inorganic and non-volatile organic substances from granular waste materials, sludges, soil, soil-like materials and sediments. It does not take into account the consequences of microbiological processes in organic degradable materials.

The test procedure specified in this document produces an eluate which is subsequently characterized physically and chemically according to appropriate standard methods. This document includes two different procedures for eluate preparation prior to analysis, one procedure for non-volatile organic substances, inorganic substances and DOC and one for inorganic substances and DOC. When assessing only the leaching of inorganic substances and DOC, certain precautions needed when assessing the leaching of organic substances can in some cases be omitted.

This procedure cannot be applied to materials with a water content or such a water affinity that a good mixing of the solid with the predetermined quantity of liquid is not achievable.

This procedure does not apply to materials reacting with the leachant, leading, for example, to excessive gas emission, a solidifying effect or an excessive heat release. In that case, the material can be wetted prior to carrying out the leaching test.

This test cannot be used alone to determine the leaching behaviour of granular waste materials, sludges, soil, soil-like materials and sediments, as specified in EN 12920.

This document does not address issues related to health and safety.

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.

EN ISO 11465:2025, *Sludge and solid environmental matrices - Determination of dry residue or water content and calculation of the dry matter fraction on a mass basis (ISO 11465:2025)*

3 Terms and definitions

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

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

— ISO Online browsing platform: available at https://www.iso.org/obp/

— IEC Electropedia: available at https://www.electropedia.org/

3.1
leaching test
test during which a material is put into contact with a leachant and some substances of the material are extracted

3.2
leachant
liquid used in a leaching test

Note 1 to entry For the purpose of this document, the leachant is water as specified in 5.2.15

3.3
eluate
solution recovered from a leaching test

3.4
single batch leaching test
leaching test in which a fixed amount of material is leached in one step with a fixed amount of leachant

3.5
serial batch leaching test
leaching test for two or more subsequent extractions of the same portion of material with a fresh amount of leachant in each extraction

3.6
liquid to solid ratio
(L/S)
ratio between the total amount of liquid (L in litres), which in a leaching test is in contact with the waste, and the dry mass of the sample (S in kg of dry matter) abbreviated L/S and expressed in L/kg

3.7
liquid waste
waste that completely flows out of a calibrated opening, down to the upper level of the opening within a limited period of time less than 8 hours (See Annex E, informative)

3.8
sludge
mixture of liquid and solids separated from various types of liquids as a result of natural or artificial processes

Note 1 to entry In the field of water treatment, the prevailing standards (EN 1085 and EN 12880) use the word water instead of the word liquid.

3.9
monolithic waste
material which has certain minimum dimensions and physical and mechanical properties that ensure its integrity over a certain period of time

3.10
granular waste
waste that is neither monolithic, liquid, gas nor sludge

3.11
dry matter content ratio
DR
ratio expressed in percent between the mass of the dry residue, determined according to EN ISO 11465:2025 for sludge, treated biowaste, soil and waste, and the corresponding raw mass

3.12
moisture content ratio
MC
ratio expressed in percent between the mass of water contained in the material and the mass of the dry residue

Note 1 to entry The basis for the calculation of the moisture content is the mass of the dry residue in this document. It is to be noted that in the context of environmental assessment, the water content is generally calculated on the basis of the raw mass.

3.13
laboratory sample
sample or sub-sample(s) sent to or received by the laboratory

Note 1 to entry When the laboratory sample is further prepared (reduced) by subdividing, mixing, grinding or by combinations of these operations, the result is the *test sample*. When no preparation of the laboratory sample is required, the laboratory sample is the *test sample*. A *test portion* is removed from the *test sample* for the performance of the test or for analysis. The laboratory sample is the final sample from the point of view of sample collection, but it is the initial sample from the point of view of the laboratory. See EN 15002: 2015.

Note 2 to entry Several laboratory samples can be prepared and sent to different laboratories or to the same laboratory for different purposes. When sent to the same laboratory, the set is generally considered as a single laboratory sample and is documented as a single sample.

[SOURCE: IUPAC]

3.14
test sample
sample, prepared from the *laboratory sample,* from which *test portions* are removed for testing or for analysis

[SOURCE: IUPAC]

3.15
test portion
amount or volume of the *test sample* taken for analysis, usually of known weight or volume

[SOURCE: IUPAC]

4 Abbreviations

DOC	dissolved organic carbon
FEP	fluorinated ethylene propylene
PA	polyamide
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PE	polyethylene
PFAS	per- and polyfluoroalkyl substances
PFA	perfluoroalkoxy alkanes
PP	polypropylene
PTFE	polytetrafluorethylene
PCTFE	polychlorotrifluoroethylene
HDPE	high density polyethylene

5 Compliance leaching test

5.1 Principle

The sample material, which originally or after pre-treatment has a particle size at least below 4 mm as defined in Clause 4.3.2, is brought into contact with water (Clause 5.2.15) under defined conditions. The test equipment material is selected to ensure that it does not interfere with the leaching of the substances to be assessed. This document is based on the assumption that equilibrium or near-equilibrium is achieved between the liquid and solid phases during the test duration (see Clause 6.2.1). The eluate is separated from the solid residue either by centrifugation (Procedure A for measurement of non-volatile organic substances or both organic substances and inorganic substances) or by filtration (Procedure B for inorganic substances and DOC). The properties of the eluate are measured using methods developed for water analysis adapted to meet criteria for analysis of eluates (see CEN/TR 16192:2020).

After the test the leaching conditions in terms of pH, conductivity, turbidity and optionally redox potential dictated by the waste are recorded.

NOTE These parameters often control the leaching behaviour of wastes and are therefore important for checking the leaching test.

5.2 Equipment and reagents

5.2.1 Containers of inert material that does not interfere with the substances to be measured in accordance with EN ISO 5667-3. Rinsing is compulsory. Further information for materials suitable for organics and/or inorganics can be found in Annex C [Table C.1].

The volume of 1 l is selected in combination with the mass M_D of 90 g as specified in Clause 4.3.4 in order to minimize head space. In case of material with low density, deviation from this requirement is necessary while still attempting to minimize headspace. This deviation shall be documented in the test report.

5.2.2 An end-over-end tumbler (5 rpm - 10 rpm) or roller-table inducing eccentric rotation of the bottle at about 10 rpm.

NOTE An eccentric roller-table ensures movement of solid through the leachant in two directions providing the same type of contact as an end-over-end tumbler. Roller tables without additional eccentric movement and horizontal shakers are not considered to provide equivalent agitation modus compared to the end-over-end tumbler.

5.2.3 Filtering apparatus, either a vacuum filtration device (between 30 kPa and 70 kPa) (300 – 700 mbar) or a high-pressure filtration apparatus (<0,5 MPa) (5 bar). Rinsing is compulsory.

NOTE A water ejection pump generally operates in the vicinity of 50 kPa.

When volatile components (e.g. mercury) are to be analysed, vacuum filtration shall not be used.

5.2.4 Pre-rinsed or similarly clean 0,45 µm membrane filters for filtration (e.g. rinsed with 0,1 mol/l HNO_3 as described in 4.2.16 and water as described in 5.2.15).

Depending on the test requirements, PTFE filter material can be required. Filter made of PTFE are hydrophobic. Before filtration of eluate, they should be wetted using ethanol or methanol provided it doesn't influence the results of analysis.

5.2.5 Crushing equipment: jaw crusher or cutting device.

NOTE Due to crushing, contamination of the sample can occur to an extent which affects the leaching of some substances of concern e.g. cobalt and tungsten from tungsten carbide equipment or chromium, nickel and molybdenum from stainless steel equipment.

5.2.6 Sieving equipment with sieves of 10 mm nominal screen size.

NOTE Due to sieving, contamination of the sample can occur to an extent which affects the leaching of some substances of concern, e.g. cobalt and tungsten from tungsten carbide equipment or chromium, nickel and molybdenum from stainless steel equipment.

5.2.7 A centrifuge, operating at 20 000 g to 30 000 g using centrifuge tubes of PFA (perfluoroalkoxy alkane), fluorinated ethylene propylene (FEP) or tubes of an alternative material which is inert with regard to the substances to be assessed (see Annex C) and suitable for high-speed centrifugation.

NOTE Potential sorption of hydrophobic organic substances to the centrifuge tubes can be tested in preliminary experiments.

Alternatively, if a high-speed centrifuge is not available, a centrifuge operating at 2 000 g to 3 000 g may be used in combination with increased centrifugation time.

Cooling shall be applied if needed to maintain a temperature of 19 °C – 25 °C.

5.2.8 A device for measuring electrical conductivity.

5.2.9 A pH-meter according to EN 16192.

5.2.10 Two thermometers for air and leachant temperature measurement.

5.2.11 A redox potential meter (optional).

5.2.12 A balance with accuracy of at least 0,1 g.

5.2.13 Measuring cylinders for volume determination with 1 % accuracy.

5.2.14 A sample splitter or utensils for cone and quartering for sub-sampling of test samples (optional).

5.2.15 Distilled water, demineralized water, de-ionized water or water of equivalent purity (5 < pH < 7,5) with a conductivity < 0,5 mS/m.

5.2.16 Nitric acid (HNO_3) 0,1 mol/l (analytical grade).

5.3 Sampling strategy and sample preparation

5.3.1 Sampling strategy

Obtain a laboratory sample of at least 2 kg of the material. Use a sample splitter (5.2.14) or apply coning and quartering to split the sample into representative sub-samples according to EN 15002).

Depending on the maximum grain size, the splitting can require size reduction of coarser particles to comply with the rules of sampling.

In some cases, especially for soil and sediments, a laboratory sample of less than 2 kg may be received by the laboratory e.g. due to limited availability of the material to be tested, provided the material is not too heterogeneous. For other types of solids, a larger sample size shall be required if necessary to take the relationship between maximum particle size and minimum sample volume into account.

5.3.2 Sampling strategy

The tests shall be made on material with a grain size of at least 95 % (mass) less than 10 mm. Therefore, the laboratory sample shall be sieved (Clause 5.2.6). If oversized material exceeds 5 % (mass) the entire oversized fraction shall be crushed with a crushing equipment (Clause 5.2.5). On no account shall the