



SLOVENSKI STANDARD
oSIST prEN 17925:2022
01-december-2022

Izboljševalci tal in rastni substrati - Določanje temperaturnega in časovnega profila med kompostiranjem in razkrojem odpadkov

Soil improvers and growing media - Determination of temperature and time profile during composting and digestion

Bodenverbesserungsmittel und Kultursubstrate - Bestimmung des Temperatur- und Zeitprofils bei der Kompostierung und Vergärung von Abfällen

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Ta slovenski standard je istoveten z: prEN 17925

ICS:

65.080 Gnojila Fertilizers

oSIST prEN 17925:2022 **en,fr,de**

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 17925

November 2022

ICS 65.080

English Version

Soil improvers and growing media - Determination of temperature and time profile during composting and digestion

Bodenverbesserungsmittel und Kultursubstrate -
Bestimmung des Temperatur- und Zeitprofils bei der
Kompostierung und Vergärung von Abfällen

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 223.

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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 17925:2022) has been prepared by Technical Committee CEN/TC 223 “Soil improvers and growing media”, the secretariat of which is held by NEN.

This document is currently submitted to the CEN enquiry.

This document has been prepared under a Standardization Request given to CEN by the European Commission and the European Free Trade Association.

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Introduction

This document is applicable for the measurement of temperature during the composting and anaerobic digestion process.

In composting plants, a high biological activity with corresponding self-heating of the biodegradable material is achieved by a suitable process control under favourable oxygen and humidity conditions. The temperature measurements are used to check the sanitation that takes place in the process.

In anaerobic digestion plants, the sanitation is achieved by a thermophilic anaerobic digestion process or a pasteurization step. The temperature measurement serves as proof of the adherence to the given time-temperature specifications.

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1 Scope

This document specifies methods for determining temperature and time profiles during composting and anaerobic digestion for the production of compost and digestate.

The process monitoring is an organized check and recording of the temperature during a specific time of the composting and anaerobic digestion process.

This document only applies to composting and anaerobic digestion.

This document is intended to be used by manufacturers and enforcement agencies for the purpose of manufacturing control.

The requirements of this document can differ from national legal requirements for the production process of compost and digestate.

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.

CEN/TS 17732, *Soil improvers and growing media - Terminology*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in CEN/TS 17732 and the following 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://standards.iteh.ai/catalog/standards/sist/b7f3072b-d48b-4aeb-878f-22> <https://www.electropedia.org>

3.1

additives

materials or substances which are used to improve the process performance and environmental performance of the composting and/or anaerobic digestion process

3.2

anaerobic digestion

controlled decomposition of biodegradable materials which is predominately anaerobic and at temperatures suitable for mesophilic or thermophilic bacteria

3.3

batch

quantity of goods manufactured by the same process under the same conditions, at the same time, and labelled in the same manner and which are assumed to have the same characteristics to be sampled using a particular sampling plan

3.4

compost

solid particulate material that is the result of a thermophilic aerobic composting of biodegradable matter by microorganisms, which has been sanitized and stabilized

prEN 17925:2022**3.5****composting**

controlled decomposition of biodegradable materials, which is predominantly aerobic and which allows the development of temperatures suitable for thermophilic bacteria as a result of biologically produced heat

3.6**digestate**

solid or liquid product that is the result of anaerobic digestion of biodegradable materials by micro-organisms

3.7**hydraulic retention time****HRT**

average residence time of the material in the digester vessel, determined by the loading rate and operational digester capacity

Note 1 to entry: The hydraulic retention time can be calculated by dividing the digester working volume by the rate of flow of input materials into the digester: $HRT \text{ [days]} = \text{digester volume [m}^3\text{]} / \text{influent flow rate [m}^3\text{ per day]}$.

3.8**sanitation**

reduction of human, animal and plant pathogens to acceptable levels as a result of the treatment process

4 Requirements**4.1 General**

During composting or anaerobic digestion, optimum conditions shall be ensured to support the processes.

Depending on the input material, the treatment of biodegradable materials requires sanitation in order to provide the necessary reduction of human, animal and plant pathogens.

4.2 Process requirements in composting plants

Composting may take place in closed or open systems and with or without forced aeration. Each composting batch shall undergo a thermophilic decomposition phase. For an optimal process the following process conditions are recommended:

- The optimum moisture content should be $\geq 40\%$ to 50% .
- During the composting, operational measures (dates of turning, watering, control of forced aeration) should ensure optimum decomposition conditions at minimized odour emissions.

The following measures and data of process control should be recorded, if applicable:

- Type and quantity of input materials and additives;
- Temperature measurements during sanitisation;
- Watering;
- Turning;
- Aeration;
- Any other measures, such as covering with fleece, screening.

4.3 Process requirements in anaerobic digestion plants

The following measures and data of process control should be recorded, if applicable:

- Type and quantity of input materials and additives;
- Sanitation protocol (time, temperature);
- pH (if recorded) in the digester;
- Time between digestion chamber loadings;
- Hydraulic retention time;
- Delivery of digestate.

5 Apparatus

A thermometer with a resolution of at least 1 °C and an accuracy of ± 1 °C shall be used to measure temperatures. The thermometer shall be calibrated annually, as a minimum every three years by an external calibration company.

In case of inserting of thermometers in piles, the length of the lance should be appropriate to reach points which are critical for temperature measurements.

NOTE The calibration of a thermometer can be done by the manufacturer of the thermometers, by external calibration companies (both with calibration certificate) or by self-calibration. As an example for self-calibration a comparison measurement between the thermometer and another already calibrated thermometer at two different points of temperature in the expected temperature range can be done.

6 Procedure

6.1 General

The operator shall have a documented procedure which ensures that the temperature is adequately measured over the requested time period. This procedure shall describe in detail:

- a) the type of temperature measurement (manually or automatically recorded);
- b) the locations where temperature is measured (type of air stream, locations in a pile);
- c) the time-temperature profile as requested;
- d) the frequency of measurement.

In composting plants, the temperature is generally measured and recorded automatically. In the case of manual measurement, it should be noted that the insertion lance should be carefully pierced into the material. A strong bending of the lance shall be avoided, as the measuring cables inside the lance could be affected and incorrect measurements can occur. The temperature value shall be recorded when the temperature display indicates a stable value.

NOTE 1 In closed composting plants, the temperature can be measured in the exhausted air with appropriate corrections (see 6.3).

NOTE 2 In open windrow composting plants, where the temperature is not recorded automatically, the measurement of the temperature once a day over the required treatment time is sufficient.

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In anaerobic digestion plants, there are usually permanently installed temperature sensors. The values of each sensor are recorded electronically. Manual measurement of temperature is not feasible.

6.2 Measurement of the temperature directly in the material of the composting system

The temperature shall be measured directly in the material of the composting process. In the case of reactors with more than one probe inserted in the material, the average temperature can be taken as a reference.

NOTE 1 In practice, the measurement of the “core”, “edge” and “base” areas has proven to be successful in open composting systems. These measurements can be used, for example, to determine the thickness of the edge and base layers, which can have temperatures deviating from those of the core area. By turning the heap/windrow and mixing the material, areas which can have not yet been exposed to the required temperatures to a sufficient extent are moved into the inner zones/core of the heap/windrow. The following measuring points are suggested:

- Core: Temperature in the core area of the heap/windrow (reference value).
- Edge: Temperature measured 10 cm below the surface at approx. middle height of the heap/windrow (orientative value).
- Base: Temperature measured approx. 10 cm above the bottom of the heap/windrow below the core area (orientative value).

NOTE 2 The reference value is the indicative value for measuring manually the temperature in open composting systems.

NOTE 3 The orientative value is measured in the edge and in the base of the composting heap.

6.3 Measurement of the temperature indirectly in the air of composting systems

Measuring the temperature indirectly assumes a uniform temperature throughout the entire composting body. The temperature is measured in representative zones. In systems with forced aeration by blowing and air circulation also a plant-specific correction factor can be documented and used.

In systems provided with suction aeration, temperature measurements of the sucked air can also be carried out. For these systems, a plant-specific comparison calibration of the measuring method shall then be prepared and documented. The temperature of the material is to be determined by means of a plant-specific correction factor compared to the direct temperature measurement in the composting material. The plant-specific correction factor is to be checked annually by parallel direct temperature measurements in the material to be composted.

For the assessment of the compliance to the time-temperature profiles the following should be supplied:

- In the case of reactors with more than one probe inserted in the material, the average temperature can be taken as a reference.
- In the case of exhaust air temperature monitoring, the corrected temperature is the reference.

6.4 Measurement of the temperature in anaerobic digestion plants

The temperature is directly measured in the material via permanently installed temperature sensors. Temperature measurement units shall be recorded over the required treatment time.

If several sensors are available, all values shall be documented and not undercut the minimum temperature requirements. In pasteurization units (70 °C for 1 h), material which did not undergo the described temperature/time profile should technically not leave the unit until the requirements are fulfilled.