



SLOVENSKI STANDARD

SIST EN 14984:2006

01-september-2006

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Liming materials - Determination of product effect on soil pH - Soil incubation method

Calcium-/Magnesium-Bodenverbesserungsmittel - Bestimmung des Produkteinflusses auf den Boden-pH-Wert - Bodeninkubationsverfahren

Amendements minéraux basiques - Détermination de l'effet d'un produit sur le pH d'un sol - Méthode par incubation du sol

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ICS 65.080

English Version

Liming materials - Determination of product effect on soil pH -
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Amendements minéraux basiques - Détermination de l'effet
d'un produit sur le pH d'un sol - Méthode par incubation du
sol

Calcium-/Magnesium-Bodenverbesserungsmittel -
Bestimmung des Produkteinflusses auf den Boden-pH-
Wert - Bodeninkubationsverfahren

This European Standard was approved by CEN on 2 March 2006.

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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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents	Page
Foreword	3
Introduction	4
1 Scope	5
2 Normative references	5
3 Terms and definitions	6
4 Principle	7
5 Method A	8
6 Method B	15
7 Test report	24
Annex A (informative) Variations to the test methods	25
Annex B (normative) Determination of moisture at full soil water holding capacity	27
Bibliography	28

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<https://standards.iteh.ai/catalog/standards/sist/f063a474-a4b9-4c78-8010-f2036b39a416/sist-en-14984-2006>

Foreword

This document (EN 14984:2006) has been prepared by Technical Committee CEN/TC 260 “Fertilizers and liming materials”, 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 October 2006, and conflicting national standards shall be withdrawn at the latest by October 2006.

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, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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Introduction

The chemical methods for determining the neutralizing value (NV) (see EN 12945) and the reactivity (see EN 13971) of liming materials are not always appropriate indicators for any material claimed to have a liming effect in the soil, particularly materials with a high organic matter content.

The biological mineralization of organic matter contained in some products can, in the field, have an effect on pH, which cannot be quantified by the chemical methods.

The two methods described in this document overcome these problems.

Method A characterizes products through their effect on the pH of a soil under controlled, standard conditions, which are close to those in the field.

Method B establishes the efficiency of products when applied to a standard soil.

However, attention is drawn to the limitations of these methods. They are laboratory methods carried out in controlled conditions and care should be taken when applying the results to field conditions. The quality of incorporation of the liming material into the soil and the eventual need to break down the product agglomerates, together with the soil and climate conditions, can affect the results. Nevertheless, these methods allow a comparison of the potential neutralizing effect of liming products under optimum and reproducible conditions.

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1 Scope

This document specifies two methods (method A and method B) of measuring the effect of the addition of any material claimed to have a liming effect on the soil, using the same basic principles.

Method A measures the changes to the soil pH resulting from the addition of any material claimed to have a liming effect on a standard soil, measured over a period of one month.

Method B assesses the efficiency of any material claimed to have a liming effect, using a range of defined soils and measured over a period of up to 2,5 years.

NOTE These methods allow comparison of products under controlled climatic conditions but do not replace field experiments. The methods are not applicable to mineral products coarser than 6,3 mm for method A or 20 mm for method B.

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.

prEN 1482-1, *Fertilizers and liming materials — Sampling and sample preparation — Part 1: Sampling*

EN 12048, *Solid fertilizers and liming materials — Determination of moisture content — Gravimetric method by drying at (105±2) °C (ISO 8190:1992 modified)*

EN 12049, *Solid fertilizers and liming materials — Determination of moisture content — Gravimetric method by drying under reduced pressure (ISO 8189:1992 modified)*

EN 12945, *Liming materials — Determination of neutralizing value — Titrimetric methods*

EN 12948, *Liming materials - Determination of size distribution by dry and wet sieving*

EN 13040, *Soil improvers and growing media — Sample preparation for chemical and physical tests, determination of dry matter content, moisture content and laboratory compacted bulk density*

EN ISO 3696, *Water for analytical laboratory use — Specification and test methods (ISO 3696:1987)*

ISO 3310-1, *Test sieves — Technical requirements and testing — Part 1: Test sieves of metal wire cloth*

ISO 3310-2, *Test sieves — Technical requirements and testing — Part 2: Test sieves of perforated metal plate*

ISO 10390:2005, *Soil quality — Determination of pH*

ISO 11272, *Soil quality — Determination of dry bulk density*

ISO 11277, *Soil quality — Determination of particle size distribution in mineral soil material — Method by sieving and sedimentation*

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

ISO 14235, *Soil quality — Determination of organic carbon by sulfochromic oxidation*

NF X31-130, *Soil quality — Chemical methods — Determination of the cationic exchange capacity (CEC) and extractible cations (buffered at pH = 7, Metson method)¹⁾*

3 Terms and definitions

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

3.1 efficiency

ability of a liming material to react in soil or solution within a specified time

NOTE In this document, efficiency is calculated as mentioned in 6.5.2.

3.2 internal peak values approach

crediting fine fractions of a product or other highly reactive materials for 100 % efficiency in soil when reaching maximum pH value

NOTE 1 This efficiency is maintained even if pH later drops due to soil microbial counteraction (acidification).

NOTE 2 For further clarification see Figure 1 and Figure 2.

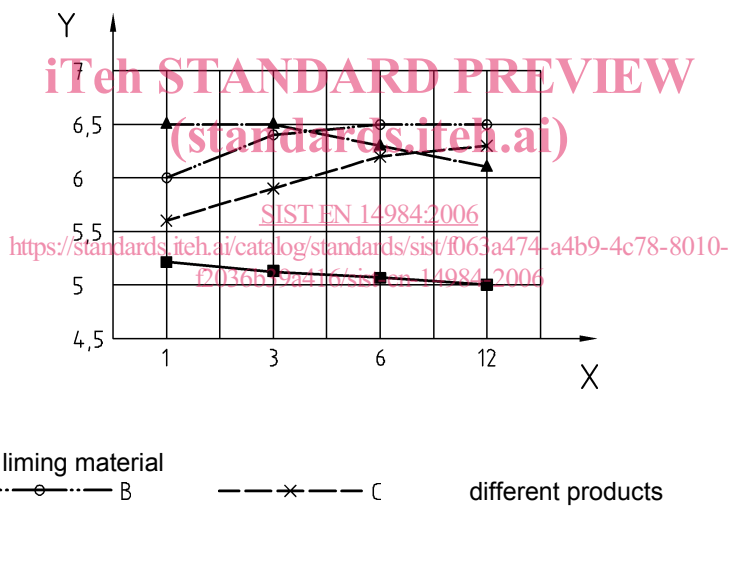
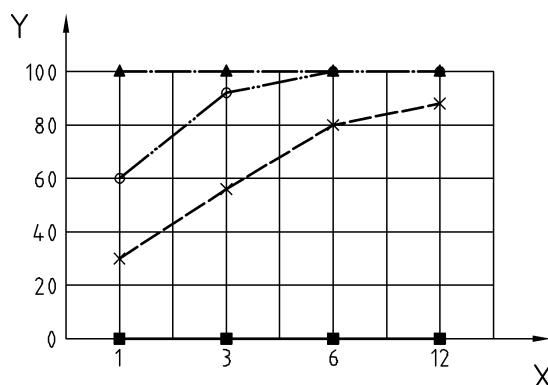


Figure 1 — Soil pH versus weeks of soil incubation

1) No international buffered method is available at pH = 7. As soon as an International Standard is available for cation exchange capacity buffered at pH = 7, it will replace the NF X 31-130.



Key

Z no liming material
 A different products
X weeks of incubation
Y efficiency in percent

Figure 2 — Efficiency versus weeks of soil incubation

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3.3

liming index

ratio of the improvement in soil pH due to the product under test to that achieved using the reference liming material

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NOTE The liming index, LI_x is an indicator given by the following formula: $LI_x = \frac{(pH1 - pH2)}{(pH3 - pH4)}$

where

LI is the liming index

$pH1$ is the pH of the soil with tested product after time x

$pH2$ is the pH of the soil alone after time x

$pH3$ is the pH of the soil with the reference liming material after time x

$pH4$ is the pH of the soil alone after time x

time x is the length of time of the incubation test

4 Principle

4.1 General

Incorporation of a standardized amount of liming material or material claimed to have a liming effect into a reference soil or range of defined soils. Incubation of these soils under controlled climatic conditions for a defined period. Checking the buffer capacity of the soil with a reference liming material and measuring the changes in soil pH.

4.2 Method A

Monitoring after 24 h, 2 week and 4 week the changes in soil pH under controlled temperature and moisture conditions.

4.3 Method B

Monitoring after 24 h, 1 week, 3 week, 6 week, 12 week, 24 week and 48 week, and 1 year, 1,5 year, 2 year and 2,5 year of the changes in soil pH under controlled temperature and moisture conditions. When testing calcined products (burnt products and slaked products), add monitoring at 1 h, 3 h and 6 h and 3 day. The test may be stopped at any time after 3 week, according to information required.

The tests should be performed within the pH range of 4,6 to 7,0, subject to there being a linearity response.

5 Method A

5.1 Reagents and materials

5.1.1 Reference soil with the following characteristics:

- a) pH 5,6 to pH 6,4 in water, when determined in settling suspension after 16 h in accordance with ISO 10390:2005, 7.1.3, 7.2 and 7.3;
- b) cation exchange capacity of 9 cmol+/kg to 11 cmol+/kg, when determined in accordance with NF X 31-130 (see Note in Clause 2);
- c) mass fraction of organic carbon of 0,50 % to 2,00 % on a dry basis, when determined in accordance with ISO 14235 (this is equivalent to 0,86 % to 3,44 % expressed as organic matter, ($O.M. = O.C. \times 1,72$);
<https://standards.iteh.ai/catalog/standards/sist/f063a474-a4b9-4c78-8010-239011111111>);
- d) mass fraction of particles of equivalent spherical diameter less than 0,002 mm (clay) shall be less than 20 %, when determined in accordance with ISO 11277.

5.1.2 Reference liming material (RLM), calcium hydroxide of recognized analytical grade

5.1.3 Water, conforming to EN ISO 3696, grade 3

5.2 Apparatus

5.2.1 Temperature-controlled room, capable of being maintained at (20 ± 2) °C

5.2.2 pH meter, capable of being read to the nearest 0,01 unit

5.2.3 Beakers, capacity 200 ml

5.2.4 Pots, of inert material with respect to soil, 50 mm to 200 mm diameter, capacity according to Table 1

5.2.5 Volumetric spoons, 20 ml

5.2.6 Magnetic stirrer**5.2.7 Balance**, capable of weighing to the nearest 1 g**5.2.8 Precision balance**, capable of weighing to the nearest 1 mg**5.2.9 Test sieves**, wire sieves (ISO 3310-1), 1 mm, 2 mm, 4 mm and 6,3 mm nominal aperture size**5.3 Sampling of products and sample preparation**

Take a sample in accordance with prEN 1482-1.

Determine the dry matter content of the sample in accordance with EN 12048 or EN 12049.

Determine the dry matter content of the soil in accordance with ISO 11465. It shall be used to adjust the mass fraction of soil in Table 1 to determine field water capacity in 5.4.3.

Determine the smallest aperture size sieve from the range 1 mm, 2 mm, 4 mm and 6,3 mm that all the sample will pass.

For mineral products use the sample as received.

For organic products use the sample as received, but after homogenization, unless it contains coarse particles (equivalent spherical diameter greater than 1 mm). If the sample contains coarse particles, prepare it in accordance with EN 13040 so that all the particles will pass a 1-mm aperture size sieve. Determine in that case the fineness of the product.

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5.4 Procedure

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5.4.1 Preparation of the standard soil

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Dry the soil to constant mass at a temperature below 40°C, sieve on a 2 mm aperture size sieve (5.2.9) and use the soil that passes the sieve.

Measure the initial pH of the standard soil in a settling suspension of water after 16 h in accordance with ISO 10390:2005, 7.1.3, 7.2 and 7.3 and record it.

5.4.2 Test portions

Weigh, to the nearest 0,001 g, two test portions each of the mass specified in Table 1. At the same time, weigh, to the nearest 0,001 g, two portions of reference liming material (4.1.2) of the same mass as the test portions.

NOTE The portion of reference liming material is equivalent to 2 250 units of neutralizing value per hectare, on the basis of 3 000 t of dried soil per hectare, and in the standard soil it will raise the pH by approximately one unit.

Table 1 — Mass of test portion and mass of standard soil

Sieve size that test portion passes after preparation mm	Mass of test portion, on a dry basis g	Mass of standard soil per pot, on a dry basis (105 °C) g
1	0,5 ± 0,001	500 ± 1
2	1 ± 0,001	1 000 ± 1
4	2 ± 0,001	2 000 ± 1
6,3	3 ± 0,001	3 000 ± 1

5.4.3 Preparation of pots

Into each of six or more pots, weigh, to the nearest 1 g, the mass of standard soil (5.1.1) specified in 5.4.2 and Table 1. To avoid lack or excess of air, height of soil in the pots shall be between 50 mm and 150 mm. Add a test portion to each of two pots (pots A₁ and A₂). Add a portion of reference liming material (5.1.2) to each of two further pots (pots B₁ and B₂), and possibly more pots and leave the remaining two pots (pots C₁ and C₂) with just the standard soil. Thoroughly mix the contents within each pot. Onto the soil in each pot, slowly add, by means of a drip, a mass of water (5.1.3) corresponding to 70 % of the water field capacity (see Annex B) considered at free drainage. Weigh each pot and its contents and record the masses.

5.4.4 Incubation

Maintain the open pots at a constant temperature of (20 ± 2) °C in the temperature-controlled room (5.2.1).

Regularly check the water losses in the pots by weighing and adjust using a drip as often as necessary. The water contents shall not fall below to 60 % of the water field capacity. Thoroughly mix the contents of each pot before watering to avoid soil compaction.

5.4.5 pH measurements

Measure the pH after incubations of 24 h, 2 weeks and 4 weeks.

Thoroughly mix the contents of each pot. Take three portions, each of 20 ml, from each pot, thoroughly mixing the contents after taking each portion. Place each of these portions in a separate beaker (5.2.3). Continue the incubation process until the next measurement.

Add 100 ml water (5.1.3) to the contents of each beaker, measure the pH of each settling suspension after 16 h in accordance with ISO 10390:2005, 7.1.3, 7.2 and 7.3 and record each result (see Table 2).

5.5 Expression of results

For each set of six results from a pair of pots (i.e. pot A₁ and pot A₂, pot B₁ and pot B₂ and pot C₁ and pot C₂), after each time interval, calculate the mean values of the pH and the deviation and report them in Table 2.