CEN/TC 223/WG 4 "Analytical methods"
WG Secretariat: **ASI**
Convenor: **Baumgarten Andreas Mr**

1stWD_WI00223102_EN13038rev

Document type	Related content	Document date	Expected action
Project / Other		2021-07-26	**INFO**

Description

Please find enclosed the 1st working draft on the revision of EN 13038. As agreed during the last meeting of CEN/TC 223/WG 4, this version is circulated to CEN/TC 223 as first working draft.

CEN/TC 223

Date: 2021-06

prEN 13038:2021

Secretariat: NEN

Soil improvers and growing media — Determination of electrical conductivity

Bodenverbesserungsmittel und Kultursubstrate — Bestimmung der elektrischen Leitfähigkeit

Amendements du sol et supports de culture — Détermination de la conductivité Électrique

ICS:

CCMC will prepare and attach the official title page.

Contents

Page

European foreword 3
1 Scope 4
2 Normative references 4
3 Terms and definitions 4
4 Principle 4
5 Reagents 4
6 Apparatus 5
7 Preparation 5
8 Procedure 5
8.1 Extraction of materials in solid form 5
8.1.1 Test samples passing through a 20 mm sieve 5
8.1.2 Test samples passing through a 40 mm sieve 5
8.1.3 Test samples > 40 mm 5
8.2 Extraction of material in pre-shaped form 5
8.3 Filtration 6
8.4 Measuring conductivity of the potassium chloride solutions 6
8.5 Measurement of the specific electrical conductivity of the filtrates 6
9 Precision 6
10 Test report 7
Annex A (informative) Results of an interlaboratory trial to determine specific electrical conductivity 8
Bibliography 9

European foreword

This document (prEN 13038:2021) 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 a working document.

This document will supersede EN 13038:2011.

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

- Adaption of scope and applicability with respect to the EU-Fertilizer Product Regulation

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

1 Scope

This European Standard specifies an instrumental method for the routine determination of electrical conductivity in a water extract of a soil improver or growing medium. The determination is carried out to obtain an indication of the content of water soluble electrolytes in either soil improvers or growing media.

NOTE The requirements of the standard may differ from the national legal requirements for the declaration of the products concerned.

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 13040:—[1], *Soil improvers and growing media — Sample preparation for chemical and physical tests, determination of dry matter content, moisture content and laboratory bulk density*

ISO 1770, *Solid-stem general purposes thermometers*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in CEN/TS 00223137:—[2] and the following apply.

3.1
electrical conductivity
ability of an aqueous extract of the sample to conduct electricity as a function of the ion concentration

4 Principle

A sample is extracted with water at (22 ± 3,0) °C in an extraction ratio of 1 : 5 (1 V sample + 5 V water) to dissolve the electrolytes. The specific electrical conductivity of the extract is measured and the result is adjusted to a measurement temperature of 25 °C.

5 Reagents

5.1 Water having an electrical conductivity not higher than 0,2 mS/m at 25 °C.

5.2 Potassium chloride solution, c(KCl) = 0,100 mol/l

Dissolve 7,456 g potassium chloride, (KCl), previously dried for 2 h at 105 °C, in water (see 5.1) and dilute to 1000 ml. The specific electrical conductivity of this solution at 25 °C is 1290 mS/m.

5.3 Potassium chloride solution, c(KCl) = 0,0100 mol/l

Add 100,0 ml of potassium chloride solution (see 5.2) into a 1000 ml volumetric flask and dilute to the mark with water (see 5.1) at 20 °C. The specific electrical conductivity of this solution at 25 °C is 141 mS/m.

Commercially available solutions may also be used.

[1] Under preparation. Stage at the time of publication: EN 13040:20**.

[2] Under preparation. Stage at the time of publication: prCEN/TS 00223137:20**.

NOTE All potassium chloride solutions used for calibration should be stored in tightly sealed glass bottles which do not release alkali metal or alkali earth cations.

6 Apparatus

6.1 Conductivity meter fitted with a conductivity cell and equipped with adjustable measuring range setting and (automatic) temperature correction and having a resolution not greater than 1 mS/m at 25 °C. Preferably, the conductivity meter should also be equipped with a cell constant control.

6.2 Analytical balance with an accuracy of 0,001 g.

6.3 Thermometer capable of measuring to the nearest 0,1 °C complying with type C according to ISO 1770.

6.4 Plastic or glass containers of sufficient capacity to accommodate the volume of the sample, extractant and 10 % air volume.

6.5 Shaking or mixing machine, capable of holding container (6.4) and maintaining the sample in suspension without damaging the structure of the sample.

6.6 Filter paper, with low ash content and high retentive properties.

7 Preparation

Prepare the sample in accordance with clause 9 of EN 13040:— and determine the laboratory bulk density of the sample in accordance with annex A of EN 13040:—.

8 Procedure

8.1 Extraction of materials in solid form

8.1.1 Test samples passing through a 20 mm sieve

Take a weight equivalent 60 ml of the sample volume to the nearest 1 g and transfer to the container (6.4). Add 300 ml of water (5.1) secure the cap and shake for 1 h on the shaking machine (6.5) at (22 ± 3) °C.

8.1.2 Test samples passing through a 40 mm sieve

Take a weight equivalent 250 ml of the sample volume to the nearest 1 g and transfer to the container (see 6.4). Add 1250 ml of water (see 5.1), secure the cap, and shake for 1 h on the shaking machine (see 6.5) at (22 ± 3) °C.

8.1.3 Test samples > 40 mm

Take a weight equivalent to 250 ml of the sample volume to the nearest 1 g and transfer to a 2000 ml container (6.4). Add 1250 ml of water (5.1), secure the cap and shake for 1 h on the shaking machine (6.5) at (22 ± 3) °C.

8.2 Extraction of material in pre-shaped form

Take a weight equivalent to 150 ml of the sample volume to the nearest 1 g and transfer to a 1000 ml container (6.5). Add 750 ml of water (5.1), secure the cap and shake for 1 h on the shaking machine (6.6) at (22 ± 3) °C.

Before filtration pour out the fluid and the pre-shaped sample in a beaker. Squeeze the pre-shaped sample in the beaker as much as possible by applying a pressure to the sample with help of a plastic masher or pestle.

8.3 Filtration

Filter through filter paper (see 6.6) discarding the first 10 ml. In some cases, paper filtration is too slow or even impossible. In such cases alternative procedures, (e.g. centrifugation, glass fibre filter papers) may be used to obtain a clear supernatant.

8.4 Measuring conductivity of the potassium chloride solutions

Measure the conductivity (G) of the potassium chloride solutions (5.2 and 5.3) according to the instruction manual of the instrument.

Calculate the cell constant using the potassium chloride solution (5.3) according to:

$$k = \frac{K_s}{G} \tag{1}$$

where

k is the cell constant, in reciprocal metres;

K_s is the specific electrical conductivity of one of the potassium chloride solutions, in millisiemens per metre;

G is the measured electrical conductivity of the same potassium chloride solution, in millisiemens per metre.

The calculated cell constant shall not differ by more than 5 % from the value given by the manufacturer.

Adjust the cell constant on the conductivity meter.

8.5 Measurement of the specific electrical conductivity of the filtrates

Measure within one hour of extraction the specific electrical conductivity of the filtrates in millisiemens per metre (mS/m) according to the instructions given by the manufacturer of the conductivity meter (see 6.1). Carry out the measurements with the temperature correction set at 25 °C. Note the results to one decimal place.

All the apparatus and equipment used in the extraction shall be checked and cleaned as required.

NOTE 1 The measured values of the electrical conductivity can be influenced by contamination of the electrodes.

NOTE 2 Air bubbles on the electrodes, developed during warming up of solutions disturb the measurements.

9 Precision

The repeatability and reproducibility of the specific electrical conductivity in separately prepared samples should be in accordance with Table A.1.

A summary of the results of an interlaboratory trial to determine the precision of the method in accordance with ISO 5725 are given in Annex A.

The values derived from the interlaboratory trial may not be applicable to concentrations and matrices other than those given.

10 Test report

The test report shall contain the following information:

a) a reference to this European Standard;

b) all information necessary for complete identification of the sample;

c) the results of the determination as whole numbers, expressed in millisiemens per metre;

d) details of any operations not specified in the European Standard or regarded as optional, as well as any factor which may have affected the results;

e) laboratory bulk density.

Annex A
(informative)

Results of an interlaboratory trial to determine specific electrical conductivity

An interlaboratory trial was organized in 1995 under the auspices of the European Committee for Standardization, to test the procedures specified in this European Standard.

In this trial the number of laboratories given in Table A.1 determined the specific electrical conductivity in three types of samples.

Table A.1 — Summary of the results of an interlaboratory trial for the determination of the specific electrical conductivity

Sample	**Unfertilized peat perlite**	**Composted coarse bark**	**Sewage sludge composted with straw**
Number of laboratories retained after eliminating outliers	16	16	16
Number of outliers (laboratories)	0	0	0
Mean Value (mS/m)	10,18	31,70	126,93
Repeatability standard deviation, s_r (mS/m)	0,40	0,98	3,18
Repeatability relative standard deviation (%)	3,93	3,09	2,50
Repeatability limit, $r = 2{,}8\ s_r$ (mS/m)	1,12	2,73	8,90
Reproducibility standard deviation, s_R (mS/m)	2,02	5,39	11,96
Reproducibility relative standard deviation (%)	19,84	17,00	9,42
Reproducibility limit, $r = 2{,}8\ s_R$ (mS/m)	5,71	15,11	33,50

The number of matrices has to be enlarged for the future ring test, including additionally

Material	**Particle size**
1: Green compost	unsieved
2: Perlite, peat	<40 mm
3: Green compost, digestate, peat	< 20 mm
5: Bark	> 40mm
6: Pre-shaped	

Bibliography

[1] EN 27888, Water quality — Determination of electrical conductivity (ISO 7888:1985)

[2] ISO 5725 (all parts), Accuracy (trueness and precision) of measurement methods and results

[3] CEN/TS 00223137:—, Soil improvers and growing media — Terminology