SLOVENSKI STANDARD
SIST EN 15414-3:2011

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SIST-TS CEN/TS 15414-3:2007

Trdna alternativna goriva - Določevanje vlage z metodo sušenja v sušilni komori - 3. del: Vlaga v preskusnem vzorcu

Solid recovered fuels - Determination of moisture content using the oven dry method - Part 3: Moisture in general analysis sample

Feste Sekundärbrennstoffe - Bestimmung des Wassergehaltes unter Verwendung des Verfahrens der Ofentrocknung - Teil 3: Wassergehalt in gewöhnlichen Analysenproben

Combustibles solides de récupération - Détermination de l'humidité par la méthode de séchage à l'étuve - Humidité de l'échantillon pour analyse générale

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English Version

Solid recovered fuels - Determination of moisture content using the oven dry method - Part 3: Moisture in general analysis sample

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Foreword

This document (EN 15414-3:2011) has been prepared by Technical Committee CEN/TC 343 “Solid recovered fuels”, the secretariat of which is held by SFS.

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of an identical text or by endorsement, at the latest by September 2011, and conflicting national standards shall be withdrawn at the latest by September 2011.

This document supersedes CEN/TS 15414-3:2006.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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

CEN/TS 15414/EN 15414 *Solid recovered fuels — Determination of moisture content using the oven dry method* consists of the following parts:

— *Part 1: Determination of total moisture by a reference method*

— *Part 2: Determination of total moisture content by a simplified method*

— *Part 3: Moisture in general analysis sample*

This document differs from CEN/TS 15414-3:2006 mainly as follows:

a) use of automatic equipments under specific conditions permitted;

b) specification to observe a defined repeatability limit deleted;

c) results of interlaboratory tests supplemented as an informative Annex A;

d) whole document editorially revised.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, 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.

1 Scope

This European Standard specifies a method for the determination of moisture in an analysis sample by drying the sample in an oven. This method is suitable for use for general analysis samples in accordance with CEN/TS 15414-1. It is applicable to all solid recovered fuels.

NOTE 1 The term moisture content when used with recovered materials can be misleading since solid recovered materials e.g. biomass frequently contain varying amounts of volatile compounds (extractives) which can evaporate when determining the moisture content of the general analyses sample by oven drying.

NOTE 2 This European Standard is based on EN 14774-3.

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.

EN 15357:2011, *Solid recovered fuels — Terminology, definitions and descriptions*

EN 15443, *Solid recovered fuels — Methods for the preparation of the laboratory sample*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 15357:2011 apply.

4 Principle

The analysis sample of recovered fuel is dried at a temperature of 105 °C under air atmosphere, nitrogen atmosphere or vacuum conditions. The percentage of moisture is calculated from the loss in mass of the test sample. If the sample material is susceptible to oxidation (at 105 °C), drying in nitrogen atmosphere or vacuum conditions is performed.

5 Apparatus

5.1 Drying oven, capable of being controlled at (105 ± 2) °C (see declaration of the manufacturer) and in which the air atmosphere changes between three and five times per hour. The air velocity shall be such that the sample particles are not dislodged from their weighing dish (5.2).

NOTE For the use of vacuum drying oven, see EN 14774-3.

5.2 Weighing dish, of glass or corrosion resistant and temperature resistant material, with a well-fitting lid and of such a size that the sample layer does not exceed 0,2 g/cm^2.

5.3 Balance, with a sufficient accuracy to weigh the sample to the nearest 0,1 mg.

5.4 Dessicator, to avoid absorption of moisture from the atmosphere to the sample.

6 Sample preparation

The sample used for the determination shall be the general analysis test sample with a particle size ≤ 1 mm prepared in accordance with EN 15443.

Before commencing the determination, mix the analysis sample preferably by mechanical means.

7 Procedure

A minimum of two determinations shall be carried out on the test sample.

Dry an empty weighing dish (5.2) with its lid at (105 ± 2) °C until constant mass is reached and allow it to cool to room temperature in the dessicator (5.4).

NOTE 1 Several weighing dishes can be handled at the same time.

Weigh the weighing dish (5.2) with its lid to the nearest 0,1 mg.

Add minimum 1 g of the analysis sample into the weighing dish (5.2) in an even layer and weigh the weighing dish with its lid plus sample to the nearest 0,1 mg.

Heat the uncovered weighing dish (5.2) and its lid together with the sample at (105 ± 2) °C until constant mass is reached. Constancy in mass is defined as a change not exceeding 1 mg in mass during a further period of heating at (105 ± 2) °C over a period of 60 min. If the sample material is susceptible to oxidation at the given temperature, dry in nitrogen atmosphere or under vacuum conditions (see EN 14774-3 for vacuum conditions). Report the drying atmosphere.

NOTE 2 The drying time required is usually between 2 h to 3 h.

WARNING — For some materials present in solid recovered fuels there can be a risk of self-ignition when drying at 105 °C.

Replace the lid while the weighing dish (5.2) is still in the drying oven (5.1). Transfer the weighing dish and its contents to the dessicator (5.4). Allow it to cool to room temperature.

Weigh the weighing dish (5.2) and its lid with the sample to the nearest 0,1 mg. Since small particle size recovered fuels are very hygroscopic, weigh rapidly once the sample is cooled.

NOTE 3 Since recovered fuels in small particle size are very hygroscopic, their moisture content will vary with change of humidity of the atmosphere and therefore, the moisture of the analyses sample should always be determined simultaneously when portions are weighed out for other analytical determinations, for example, calorific value, carbon, nitrogen.

Automatic equipments may be used if the method is validated by parallel measurements. These automatic equipments shall fulfil all the requirements regarding sample size, heating procedure, temperature, atmosphere and weighing accuracy. Deviations from this paragraph shall be reported and justified.

8 Calculation

For each determination, the moisture content, M_{ad}, in the analysis sample, as analysed, expressed as mass fraction in percent, shall be calculated using Equation (1):

$$M_{ad} = \frac{(m_2 - m_3)}{(m_2 - m_1)} \times 100 \quad (1)$$

where

m_1 is the mass of the empty weighing dish (5.2) plus lid, in grams;

m_2 is the mass of the weighing dish (5.2) plus lid plus sample before drying, in grams;

m_3 is the mass of the weighing dish (5.2) plus lid plus sample after drying, in grams.

The test result for each individual determination shall be calculated on analysed basis to two decimal places and for reporting purposes, the mean value of the individual test results shall be calculated and rounded to the nearest 0,1 %.

9 Precision

9.1 Repeatability

The maximum difference to be expected between two independent single test results of one laboratory at a confidence level of 95 % will not exceed the repeatability limit in more than 5 % of cases when measuring the same measurand in the same medium, using the same facilities and fulfilling all requirements of the test method (interlaboratory testing).

Precision data derived from the interlaboratory test are given in Annex A.

9.2 Reproducibility

The maximum difference to be expected between two independent single test results of different laboratories at a confidence level of 95 % will not exceed the reproducibility limit in more than 5 % of cases when measuring the same measurand in the same medium, each laboratory using their own facilities and fulfilling all requirements of the test method (interlaboratory testing).

Precision data derived from the interlaboratory test are given in Annex A.

10 Test report

The test report shall include at least the following information:

a) identification of the laboratory and the testing date;

b) identification of the product or sample tested;

c) a reference to this document, i.e. EN 15414-3;

d) any deviation from this document;

e) drying atmosphere used;

f) test results on wet basis as specified in Clause 8;

g) any unusual features observed during the test procedure which may have affected the test result.

Annex A
(informative)

Interlaboratory test results

The statistic evaluation of the interlaboratory test results was carried out in accordance with ISO 5725-5. The precision data obtained are shown in Table A.1.

Table A.1 — Precision data

Designation	Shredded tyre	Demolition wood	Dried sludge	Municipal waste	Plastic/ paper fluff
Number of laboratories participated	14	14	14	14	14
Total number of values (without outliers)	50	50	50	52	50
Mean value, in % mass fraction	2,48	11,79	2,13	5,96	6,49
Laboratory effect, in % mass fraction	0,11	—	0,43	0,45	0,18
Sample effect, in % mass fraction	0,47	—	0,14	0,16	0,25
Repeatability standard deviation, s_r, in % mass fraction	0,19	0,29	0,08	0,14	0,14
Repeatability limit, r: ($r = 2{,}8 \times s_r$) in % mass fraction	0,53	0,81	0,22	0,39	0,39
Reproducibility standard deviation, s_R in % mass fraction	0,22	0,29	0,44	0,47	0,23
Reproducibility limit, R: ($R = 2{,}8 \times s_R$) in % mass fraction	0,62	0,81	1,23	1,32	0,64

The deviations of the test results between the individual laboratories for each sample type are shown in Figures A.1 a) to A.1 e).