



SLOVENSKI STANDARD SIST EN 14774-1:2010

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SIST-TS CEN/TS 14774-1:2004

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Solid biofuels - Methods for determination of moisture content - Oven dry method - Part 1: Total moisture - Reference method

Feste Biobrennstoffe - Verfahren zur Bestimmung des Wassergehaltes - Verfahren der Ofentrocknung - Teil 1: Gehalt an Gesamtwasser - Referenzverfahren

Biocombustibles solides - Méthode de détermination du taux d'humidité - Méthode par séchage à l'étuve - Partie 1: humidité totale - Méthode de référence

Ta slovenski standard je istoveten z: EN 14774-1:2009

ICS:

75.160.10 Trda goriva Solid fuels

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EUROPEAN STANDARD
NORME EUROPÉENNE
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EN 14774-1

October 2009

ICS 75.160.10

Supersedes CEN/TS 14774-1:2004

English Version

Solid biofuels - Determination of moisture content - Oven dry method - Part 1: Total moisture - Reference method

Biocombustibles solides - Détermination de la teneur en humidité - Méthode par séchage à l'étuve - Partie 1: Humidité totale - Méthode de référence

Feste Biobrennstoffe - Bestimmung des Wassergehaltes - Ofentrocknung - Teil 1: Gesamtgehalt an Wasser - Referenzverfahren

This European Standard was approved by CEN on 20 September 2009.

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 CEN Management Centre 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 CEN Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, 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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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 14774-1:2009) has been prepared by Technical Committee CEN/TC 335 “Solid biofuels”, the secretariat of which is held by SIS.

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 April 2010, and conflicting national standards shall be withdrawn at the latest by April 2010.

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 supersedes CEN/TS 14774-1:2004.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

EN 14774 consists of the following parts:

- EN 14774-1, *Solid biofuels – Determination of moisture content – Oven dry method – Part 1: Total moisture – Reference method*;
- EN 14774-2, *Solid biofuels – Determination of moisture content – Oven dry method – Part 2: Total moisture – Simplified method*;
- EN 14774-3, *Solid biofuels – Determination of moisture content – Oven dry method – Part 3: Moisture in general analysis sample*.

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, 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.

EN 14774-1:2009 (E)**1 Scope**

This European Standard describes the method of determining the total moisture content of a sample of solid biofuels by drying in an oven and should be used when high precision of the determination of moisture content is necessary. The method described in this document is applicable to all solid biofuels.

The total moisture content of biofuels is not an absolute value and conditions for its determination have to be standardised to enable comparative determinations to be made.

NOTE The term moisture content when used with biomass materials can be misleading since untreated biomass frequently contains varying amounts of volatile compounds (extractives) which may evaporate when determining moisture content by oven drying (see Bibliography).

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.

CEN/TS 14588:2003, *Solid biofuels – Terminology, definitions and descriptions*

CEN/TS 14778-1, *Solid biofuels – Sampling – Part 1: Methods for sampling*

CEN/TS 14778-2, *Solid biofuels – Sampling – Part 2: Methods for sampling particulate material transported in lorries*

CEN/TS 14780, *Solid biofuels – Methods for sample preparation*

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3 Terms and definitions

For the purpose of this document, the terms and definitions given in CEN/TS 14588:2003 shall apply.

NOTE In this method the moisture content should be reported on wet basis. The moisture content can also be expressed on dry basis; ratio of the mass of water in the material to the mass of dry matter in the material (see subclause 8.3).

4 Principle

The sample of biofuel is dried at a temperature of 105 °C in air atmosphere until constant mass is achieved and percentage moisture calculated from the loss in mass of the sample and includes a procedure for the correction of buoyancy effects.

5 Apparatus

5.1 Drying oven, capable of being controlled (manufacturers specifications) at a temperature within the range of (105 ± 2) °C and in which the air atmosphere changes between three and five times per h.

The air velocity should be such that the sample particles are not dislodged from their tray.

5.2 Trays, of non-corrodible and heat-resistant material and of such dimension that they will hold the test portion in the proportion of approximately 1 g of sample per cm².

The surface of the trays shall be such, that the possibility to adsorption/absorption is minimised (very clean and even surface).

5.3 Balance, having sufficient accuracy to enable the sample as received and tray, to be weighed to the nearest 0,1 g.

6 Sample preparation

6.1 WARNING Precautions shall be carried out to ensure that moisture is not lost during the preparation of the sample. Significant losses of moisture from the sample will occur after a few minutes in room atmosphere.

Samples for the determination of total moisture content shall be sampled in accordance with CEN/TS 14778-1 and CEN/TS 14778-2 and shall be received in the laboratory in sealed air-tight containers or packings. The test portion shall be sample material with a nominal top size of max. 30 mm and prepared in accordance with CEN/TS 14780.

6.2 The mass of the test portion shall be in accordance with CEN/TS 14780 and minimum 300 g.

NOTE For fine particulate solid biofuels e.g. sawdust, shavings, fuel powder the sample size can be reduced to 200 g, or with a balance having resolution 0,01 g to 100 g.

6.3 During the course of its preparation the sample may have been pre-dried (see CEN/TS 14780), in which case Equation (2) detailed in 8.2 shall be used to calculate the total moisture content.

7 Procedure

7.1 Weigh an empty clean tray to the nearest 0,1 g, transfer the sample from the container or packing to the tray and spread the sample evenly allowing about 1 cm² of surface area to 1 g of sample. Weigh an identical empty clean tray (reference tray) to the nearest 0,1 g. In case of moisture left on the inner surfaces of the packing or container, this amount of moisture shall be included in the calculation of the moisture content. Dry the sample packing (container, bag, etc.) in the oven and weigh the packing before and after the drying. If the packing material cannot stand for the 105 °C, dry it at room temperature by placing it open in the laboratory.

NOTE A reference tray is included in the procedure for a correction of buoyancy. To avoid absorption of moisture from the atmosphere, the tray with the dried sample is reweighed when still hot. The weight of a tray when still hot is, due to buoyancy, less than the weight of the cold tray. The magnitude of the buoyancy depends on the size and the weight of the tray.

7.2 Weigh the tray with the sample. Place the loaded tray together with the reference tray in the oven controlled at (105 ± 2) °C. Heat the trays until constant in mass as detailed in 7.3.

NOTE Do not overload the drying cabinet. There should be enough empty room over the sample layer and also between the trays.

7.3 Dried solid biofuels are hygroscopic and the loaded tray together with the reference tray shall be reweighed to the nearest 0,1 g when still hot within 10 s to 15 s to avoid absorption of moisture. Use heat-insulating material on the balance pan to protect it from direct contact with the hot tray. Constancy in mass is defined as a change not exceeding 0,2 % of the total loss in mass during a further period of heating at (105 ± 2) °C over a period of 60 min. The drying time required will depend on the particle size of the sample, the rate of atmosphere change in oven, the thickness of the sample layer, etc.

NOTE 1 To prevent unnecessary losses of volatile compounds, generally the drying time should not exceed 24 h.

NOTE 2 The required drying time can be determined in pre-tests on similar fuel types with comparable particle size.

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8 Calculation

8.1 General

The total moisture content shall be calculated on a wet basis in accordance with Equation (1) detailed in 8.2. The relationship between total moisture on a wet basis to that on a dry basis is given in Equations (3) and (4) as detailed in 8.3. The result shall be reported on a wet or dry basis in accordance with Clause 10.

8.2 Moisture content on wet basis

The moisture content, M_{ar} , in the biofuel, as *received*, expressed as a percentage by mass, shall be calculated using the following Equation (1):

$$M_{ar} = \frac{(m_2 - m_3) - (m_4 - m_5) + m_6}{(m_2 - m_1) + m_6} \times 100 \quad (1)$$

where

m_1 is the mass in g of the empty tray;

m_2 is the mass in g of the tray and sample before drying;

m_3 is the mass in g of the tray and sample after drying;

m_4 is the mass in g of the reference tray before drying (Weight at room temp.);

m_5 is the mass in g of the reference tray after drying (Weight when still hot);

m_6 is the mass in g of moisture associated with the packing.

The result shall be calculated to 2 decimal places and rounded to the nearest 0,1 % for reporting.

If the sample has been pre-dried before this moisture determination (according to subclause 6.3), the total moisture, M_T , expressed as a percentage by mass is given by the following Equation (2):

$$M_T = M_p + M_r \times (1 - M_p / 100) \quad (2)$$

where

M_p is the moisture loss of pre-drying, expressed as a percentage by mass of the original sample.

M_r is the residual moisture, expressed as a percentage by mass, determined in the pre-dried sample by this procedure.

8.3 Moisture content on dry basis

The relation between moisture on dry basis, U_d , and wet basis, M_{ar} , expressed as a percentage by mass shall be calculated using the following formulas:

$$U_d = \frac{M_{ar}}{100 - M_{ar}} \times 100 \quad (3)$$

$$M_{ar} = \frac{U_d}{100 + U_d} \times 100 \quad (4)$$

9 Precision

Because of the varying nature of the solid biofuels covered by this document, it is not possible at this time to give a precision statement (repeatability or reproducibility) for this test method.

10 Test report

The test report shall include at least the following information:

- identification of the laboratory and the testing date;
- identification of the product or sample tested (see CEN/TS 14778-1 and CEN/TS 14778-2);
- reference to this document;
- any deviation from the European Standard;
- test result shall be expressed with the relevant symbols and basis e.g. wet basis or dry basis;
- conditions and observations i.e. unusual features, during the test procedure, which may affect the result.

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