BS EN ISO 18134-1:2015

BSI Standards Publication

Solid biofuels — Determination of moisture content — Oven dry method

Part 1: Total moisture — Reference method

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National foreword

This British Standard is the UK implementation of EN ISO 18134-1:2015. It supersedes BS EN 14774-1:2009 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PTI/17, Solid biofuels.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Solid biofuels - Determination of moisture content - Oven dry method - Part 1: Total moisture - Reference method (ISO 18134-1:2015)

Biocarburants solides - Dosage de la teneur en humidité - Méthode de séchage à l'étuve - Partie 1: Humidité totale - Méthode de référence (ISO 18134-1:2015)

Biogene Festbrennstoffe - Bestimmung des Wassergehaltes - Ofentrocknung - Teil 1: Gesamtgehalt an Wasser - Referenzverfahren (ISO 18134-1:2015)

This European Standard was approved by CEN on 8 August 2015.

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

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European foreword

This document (EN ISO 18134-1:2015) has been prepared by Technical Committee ISO/TC 238 "Solid biofuels" in collaboration with 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of an identical text or by endorsement, at the latest by March 2016, and conflicting national standards shall be withdrawn at the latest by March 2016.

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Endorsement notice

The text of ISO 18134-1:2015 has been approved by CEN as EN ISO 18134-1:2015 without any modification.

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information.

The committee responsible for this document is ISO/TC 238, *Solid biofuels*.

ISO 18134 consists of the following parts under the general title *Solid biofuels — Methods for the determination of moisture content — Oven dry method*:

— *Part 1: Total moisture — Reference method*

— *Part 2: Total moisture — Simplified method*

— *Part 3: Moisture in general analysis sample*

INTERNATIONAL STANDARD ISO 18134-1:2015(E)

Solid biofuels — Determination of moisture content — Oven dry method —

Part 1: Total moisture — Reference method

1 Scope

This part of ISO 18134 describes the method of determining the total moisture content of a test sample of solid biofuels by drying in an oven and may be used when high precision of the determination of moisture content is necessary. The method described in this International Standard is applicable to all solid biofuels. The moisture content of solid biofuels (as received) is always reported based on the total mass of the test sample (wet basis).

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 might evaporate when determining moisture content by oven drying (see References [2] and [3]).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 16559, *Solid biofuels — Terminology, definitions and descriptions*

EN 14780[1)], *Solid biofuels — Sample preparation*

EN 14778[2)], *Solid biofuels — Sampling*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 16559 and the following apply.

3.1
nominal top size
aperture size of the sieve where at least 95 % by mass of the material passes

[SOURCE: ISO 16559:2014, definition 4.137, modified]

3.2
test sample
original sample sent to the laboratory for analysis

3.3
test portion
sample extracted from the test sample and used during the analysis

1) To be replaced by ISO 14780.

2) To be replaced by ISO 18135.

4 Principle

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

5 Apparatus

5.1 Drying oven, capable of being controlled at a temperature within the range of (105 ± 2) °C and in which the air atmosphere changes between three to five times per hour. The air velocity shall be such that the test portion particles are not dislodged from their tray.

5.2 Dishes and trays, of non-corrodible and heat-resistant material and of such dimension that they will hold the total test portion in a layer not exceeding 1 g of material per cm^2. The surface of the trays shall be such that the possibility to adsorption/absorption is minimised (very clean and even surface).

5.3 Balance, capable of reading to the nearest 0,1 g.

6 Sample preparation

6.1 Sample reduction

Test samples for the determination of total moisture content shall be obtained in accordance with ISO 18135 and shall be received in the laboratory in sealed air-tight containers or bags. A test portion shall be prepared in accordance with ISO 14780 and the nominal top size reduced to below 31,5 mm.

6.2 Pre-dried test sample

During the course of its preparation, the test sample might have been pre-dried (see ISO 14780) in which case, Formula (2) detailed in 8.3 shall be used to calculate the total moisture content.

WARNING — Dried solid biofuels are hygroscopic. Precautions shall be taken to ensure that moisture is not lost during preparation of the test portion. Significant losses of moisture from test portion will occur after a few minutes in room atmosphere.

6.3 Size of test portion

The mass of the test portion shall have a minimum mass of 300 g.

NOTE For fine particulate solid biofuels (e.g. sawdust and fuel powder), the test portion can be reduced to 200 g or 100 g, respectively, if using a balance capable of reading to the nearest 0,01 g.

7 Procedure

7.1 Handling of test portion

Weigh an empty and clean drying tray to the nearest 0,1 g.

Transfer the test portion from the package (container or bag) in which it is delivered to the empty and clean drying tray and spread the material evenly, not to exceed 1 cm^2 of surface area per 1 g of material. In case moisture remains on the inside surfaces of the package, shake the package to allow the material to re-absorb the moisture prior to emptying the package.

7.2 Weighing of test portion and correction for buoyancy of trays

Weigh the tray with the test portion to the nearest 0,1 g before heating.

Weigh an identical empty and clean tray (reference tray) to the nearest 0,1 g before heating.

NOTE 1 A reference tray is included in the procedure for the purpose of correction of buoyancy. The weight of a tray when still hot is less than the weight of the cold tray due to buoyancy. The magnitude of the buoyancy effect depends on the size and the weight of the tray.

Thereafter, place the tray with the test portion together with the reference tray in the temperature controlled oven at (105 ± 2) °C. Heat the trays until constant mass has been achieved. Constant mass is defined as a change not exceeding 0,2 % absolute of the initial mass of the test portion during a heating period of 60 min. The drying time required will depend on particle size of the material, rate of atmospheric change in the oven, and thickness of the layer of material.

Remove the two trays from the oven and weigh each when they are still hot to the nearest 0,1 g within 10 s to 15 s in order to avoid absorption of moisture. Use heat-insulating material on the balance pan to avoid direct contact with the hot tray.

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

Do not overload the drying oven. The space above the trays and between the trays shall allow free flow of air and moisture.

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

The moisture content determination shall be conducted in duplicate.

8 Calculation

8.1 General

The total moisture content shall be calculated on a wet basis in accordance with Formula (1) detailed in 8.2. The determination of moisture content for pre-died test sample is detailed in 8.3. The result shall be reported on a wet basis and reported in accordance with Clause 10.

8.2 Moisture content on a wet basis

The moisture content, M_{ar}, of the test portion, as received, expressed as a percentage by mass, shall be calculated in accordance with Formula (1):

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

where

m_1 is the mass of the empty tray used for the test portion, in g;

m_2 is the mass of the tray and test portion before drying (weight in room temp), in g;

m_3 is the mass of the tray and test portion after drying (weight when still hot), in g;

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

m_5 is the mass of the reference tray after drying (weight when still hot), in g.

The result shall be calculated to two decimal places and the mean value of both determinations shall be rounded to the nearest 0,1 % for reporting.

8.3 Moisture content for pre-dried material

If the test sample has been pre-dried before this moisture determination (according to 6.2), the total moisture, M_T, expressed as a percentage by mass is given by Formula (2):

$$M_T = M_p + M_r x\left(1 - M_p/100\right) \quad (2)$$

where

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

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

9 Performance characteristics

Because of the varying nature of the solid biofuels covered by this part of ISO 18134, it is not possible 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:

a) identification of the laboratory performing the test and the date of the test;

b) identification of product (or sample) tested;

c) reference to this part of ISO 18134, i.e. ISO 18134-1;

d) results of the test on wet basis;

e) any unusual features noted during the determination which might affect the result;

f) any deviation from this part of ISO 18134 or operations regarded as optional.

Bibliography

[1] ISO 16993, *Solid biofuels — Conversion of analytical results from one basis to another*

[2] Samuelsson R., Burvall J., Jirjis R. Comparison of different methods for the determination of moisture content in biomass. Biomass Bioenergy. 2006, **30** pp. 929–934

[3] Samuelsson R., Nilsson C., Burvall J. Sampling and GC-MS as a method for analysis of volatile organic compounds (VOC) emitted during oven drying of biomass materials. Biomass Bioenergy. 2006, **30** pp. 923–928

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