BS EN ISO 18134-3:2015

BSI Standards Publication

Solid biofuels — Determination of moisture content — Oven dry method

Part 3: Moisture in general analysis sample

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National foreword

This British Standard is the UK implementation of EN ISO 18134-3:2015. It supersedes BS EN 14774-3:2009, which is withdrawn.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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Published by BSI Standards Limited 2015

ISBN 978 0 580 81432 7

ICS 75.160.10

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 October 2015.

Amendments issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 18134-3

September 2015

ICS 75.160.10

Supersedes EN 14774-3:2009

English Version

Solid biofuels - Determination of moisture content - Oven dry method - Part 3: Moisture in general analysis sample (ISO 18134-3:2015)

Biocombustibles solides - Méthode de détermination de la teneur en humidité - Méthode de séchage à l'étuve - Partie 3: Humidité de l'échantillon pour analyse générale (ISO 18134-3:2015)

Biogene Festbrennstoffe - Bestimmung des Wassergehaltes - Ofentrocknung - Teil 3: Wassergehalt in allgemeinen Analysenproben (ISO 18134-3:2015)

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European foreword

This document (EN ISO 18134-3:2015) 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of an identical text or by endorsement, at the latest by March 2016, and conflicting national standards shall be withdrawn at the latest by March 2016.

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.

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Endorsement notice

The text of ISO 18134-3:2015 has been approved by CEN as EN ISO 18134-3:2015 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 — 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 18134-3:2015(E)

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

Part 3: Moisture in general analysis sample

1 Scope

This part of ISO 18134 describes the method of determining the moisture in the analysis test sample by drying in an oven. It is intended to be used for general analysis samples in accordance with EN 14780. The method described in this part of ISO 18134 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).

Since biofuels in small particle size are very hygroscopic, their moisture content will change with humidity in the atmosphere and therefore, the moisture of the test portion is determined simultaneously with determination of for example calorific value, carbon content, and nitrogen content.

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 can evaporate when determining the moisture content by oven drying (see References [1] and [2]).

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 14778,[1)] *Solid Biofuels — Sampling*

EN 14780,[2)] *Solid Biofuels — Sample preparation*

ISO 11722, *Solid mineral fuels — Hard coal — Determination of moisture in the general analysis test sample by drying in nitrogen*

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]

1) To be replaced by ISO 18135.

2) To be replaced by ISO 14780.

3.2
test sample
original sample sent to the laboratory for analysis

[SOURCE: ISO 16559]

3.3
test portion
sample extracted from the *test sample* (3.2) and used during the analysis

[SOURCE: ISO 16559]

4 Principle

The test portion of solid biofuel is dried at a temperature of 105 °C in air atmosphere until constant mass is achieved and the percentage moisture is calculated from the loss in mass of the test portion.

Automatic equipment such as gravimetric analyzers can be used when the method is validated with biomass reference test samples of selected biomass type. Analysis with such equipment shall fulfil all the requirements given in Clause 7 regarding sample size, temperature, atmosphere, and weighing accuracy.

The analysis sample can be dried in air atmosphere or in nitrogen atmosphere. If the sample material is susceptible to oxidation (at 105 °C), drying in nitrogen atmosphere is preferred in accordance with ISO 11722. The used drying atmosphere should be reported in accordance with Clause 10.

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 and five times per hour.

The air velocity shall be such that the test portion particles are not dislodged from their tray.

The use of nitrogen atmosphere is detailed in ISO 11722.

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 0,2 g of material per cm^2 and covered by a well fitted lid. The surface of the trays shall be such that the possibility to adsorption/absorption is minimized (very clean and even surface).

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

5.4 Desiccator with desiccant to minimize absorption by the test portion of moisture from the atmosphere.

6 Sample preparation

6.1 General

Test samples for the determination of total moisture content shall be obtained in accordance with EN 14778 and shall be received in the laboratory in sealed air-tight containers or bags. A test portion shall be prepared in accordance with EN 14780 and the nominal top size reduced to below 1 mm.

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.

Before commencing the determination, mix the analysis sample in its container, preferably by mechanical means, to ensure a well-mixed sample.

6.2 Size of test portion

The mass of the test portion shall have a minimum mass of 1 g.

7 Procedure

Dry an empty weighing dish with its lid at (105 ± 2) °C until constant in mass and cool it to room temperature in a desiccator (5.4).

NOTE Several dishes can be handled at the same time.

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

Add minimum 1 g of the test portion into the weighing dish in an even layer and weigh the weighing dish with its lid plus the test portion to the nearest 0,1 mg.

Heat the uncovered dish and its lid with the test portion at (105 ± 2) °C in the temperature controlled oven until constant mass has been achieved. Constant mass is defined as a change not exceeding 1 mg in mass during a heating period of 60 min. The drying time required will depend on the particle size of the material, the rate of atmospheric change in the oven, and the thickness of the layer of material. Allow for up to 3 h.

Replace the lid immediately upon removal from the oven. Transfer the dish and its contents to a desiccator. Let it cool in the desiccator to room temperature.

Remove the dish and its lid with the test portion from the desiccator and weigh to the nearest 0,1 mg. Since small particle size biofuels are very hygroscopic, it is important to weigh rapidly once the test portion taken out of the desiccator.

The moisture content determination shall be conducted in duplicate.

8 Calculation

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

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

where

m_1 is the mass in grams of the empty dish plus lid;

m_2 is the mass in grams of the dish plus lid plus test portion before drying;

m_3 is the mass in grams of the dish plus lid plus test portion after drying.

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.

9 Performance characteristics

9.1 Repeatability

The result of duplicate determinations, carried out in the same laboratory, by the same operator, with the same apparatus on representative portions weighed out at the same time from the analysis sample, shall not differ more than 0,2 % absolute.

9.2 Reproducibility

Since the humidity of the atmosphere and other factors in different laboratories may vary, it is not practical to quote a value regarding reproducibility.

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) a reference to this part of ISO 18134, i.e. ISO 18134-3;

d) results of the test *on wet basis* (alternatively for all standards: results of the test including the basis in which they are expressed, as indicated in Clause 8);

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

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

Bibliography

[1] 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

[2] 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

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

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