

Solid biofuels - Determination of total content of sulfur  
and chlorine (ISO 16994:2016)

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

See Eesti standard EVS-EN ISO 16994:2016 sisaldab Euroopa standardi EN ISO 16994:2016 ingliskeelset teksti.	This Estonian standard EVS-EN ISO 16994:2016 consists of the English text of the European standard EN ISO 16994:2016.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 03.08.2016.	Date of Availability of the European standard is 03.08.2016.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

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English Version

**Solid biofuels - Determination of total content of sulfur and  
chlorine (ISO 16994:2016)**

Biocombustibles solides - Détermination de la teneur  
totale en soufre et en chlore (ISO 16994:2016)

Biogene Festbrennstoffe - Bestimmung des  
Gesamtgehaltes an Schwefel und Chlor (ISO  
16994:2016)

This European Standard was approved by CEN on 27 July 2016.

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

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## European foreword

This document (EN ISO 16994:2016) 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of an identical text or by endorsement, at the latest by February 2017, and conflicting national standards shall be withdrawn at the latest by February 2017.

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 EN ISO 16994:2015.

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

### Endorsement notice

The text of ISO 16994:2016 has been approved by CEN as EN ISO 16994:2016 without any modification.

# Contents

Page

<b>Foreword</b>	<b>iv</b>
<b>Introduction</b>	<b>v</b>
<b>1 Scope</b>	<b>1</b>
<b>2 Normative references</b>	<b>1</b>
<b>3 Terms and definitions</b>	<b>1</b>
<b>4 Principle</b>	<b>2</b>
4.1 General	2
4.2 Decomposition of the biofuel	2
4.3 Determination of sulfate and chloride in the decomposition solution	2
4.4 Automatic equipment	2
<b>5 Reagents</b>	<b>3</b>
<b>6 Apparatus</b>	<b>3</b>
6.1 General	3
6.2 Method A	3
6.3 Method B	4
<b>7 Preparation of the test sample</b>	<b>4</b>
<b>8 Procedure</b>	<b>4</b>
8.1 Decomposition	4
8.1.1 Method A: Combustion in a closed combustion vessel	4
8.1.2 Method B: Digestion in a closed vessel	5
8.1.3 Blank test	6
8.2 Detection methods	6
8.2.1 Ion chromatography	6
8.2.2 Other detection methods	6
8.3 Calibration of the apparatus	6
8.4 Analyses of the decomposition solutions	6
<b>9 Expression of results</b>	<b>7</b>
9.1 General	7
9.2 Total chlorine	7
9.3 Total sulfur	7
<b>10 Performance characteristics</b>	<b>7</b>
<b>11 Test report</b>	<b>8</b>
<b>Annex A (informative) Performance data</b>	<b>9</b>
<b>Bibliography</b>	<b>11</b>

## 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](http://www.iso.org/directives)).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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*.

This second edition cancels and replaces the first edition (ISO 16994:2015), of which it constitutes a minor revision.

## Introduction

Sulfur and chlorine are present in solid biofuels in varying concentrations. During the combustion process, they are usually converted to sulfur-oxides and chlorides. The presence of these elements and their reaction products can contribute significantly to corrosion and to environmentally harmful emissions.

Chlorine can be present in different organic and inorganic compounds and is to exceed or equal the water soluble amount that can be determined by ISO 16995.

Combustion in an oxygen atmosphere in a closed combustion vessel is the preferred method to digest biomass samples for a determination of the total content of sulfur and chlorine. An advantage of the method is that the digestion can be carried out in connection with the determination of the calorific value according to ISO 18125<sup>1)</sup>. Decomposition in closed vessels is an appropriate alternative method. Other analytical techniques (e.g. high-temperature combustion in a tube furnace and Eschka method) may also be used. The determination of the resultant chlorine and sulfur compounds can be done by different techniques, e.g. ion chromatography, ICP, titrimetry.

Automatic equipment and alternative methods may be used when these methods are validated with biomass reference samples of an adequate type and also meet the requirements of [Clause 10](#).

A list with typical sulfur and chlorine contents of solid biofuels can be found in ISO 17225-1:2014, Annex B.

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1) To be published.

# Solid biofuels — Determination of total content of sulfur and chlorine

## 1 Scope

This International Standard describes methods for the determination of the total sulfur and total chlorine content in solid biofuels. This International Standard specifies two methods for decomposition of the fuel and different analytical techniques for the quantification of the elements in the decomposition solutions. The use of automatic equipment is also included in this International Standard, provided that a validation is carried out as specified and that the performance characteristics are similar to those of the method described in this International Standard.

## 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 10304-1, *Water quality — Determination of dissolved anions by liquid chromatography of ions — Part 1: Determination of bromide, chloride, fluoride, nitrate, nitrite, phosphate and sulfate*

ISO 11885, *Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES)*

ISO 14780<sup>2)</sup>, *Solid biofuels — Sample preparation*

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

ISO 16967:2015, *Solid biofuels — Determination of major elements — Al, Ca, Fe, Mg, P, K, Si, Na and Ti*

ISO 18125<sup>2)</sup>, *Solid biofuels — Determination of calorific value*

ISO 18134-3, *Solid biofuels — Determination of moisture content — Oven dry method — Part 3: Moisture in general analysis sample*

CEN Guide 13:2008, *Validation of environmental test methods*

## 3 Terms and definitions

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

### 3.1

#### reference material

#### RM

material or substance one or more of whose property values are sufficiently homogeneous and well-established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials

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2) To be published.