

---

**Trdna alternativna goriva - Določevanje vlage z metodo sušenja v sušilni komori -  
3. del: Vlaga v preskusnem vzorcu (ISO/DIS 21660-3:2019)**

Solid recovered fuels - Determination of moisture content using the oven dry method -  
Part 3: Moisture in general analysis sample (ISO/DIS 21660-3:2019)

Feste Sekundärbrennstoffe - Bestimmung des Wassergehaltes unter Verwendung des  
Verfahrens der Ofentrocknung - Teil 3: Wassergehalt in gewöhnlichen Analysenproben  
(ISO/DIS 21660-3:2019)

Combustibles solides de récupération - Détermination de l'humidité par la méthode de  
séchage à l'étuve - Partie 3: Humidité de l'échantillon pour analyse générale (ISO/DIS  
21660-3:2019)

**Ta slovenski standard je istoveten z: prEN ISO 21660-3**

**ICS:**

75.160.10 Trda goriva Solid fuels

**oSIST prEN ISO 21660-3:2020 en,fr,de**



# DRAFT INTERNATIONAL STANDARD

## ISO/DIS 21660-3

ISO/TC 300

Secretariat: SFS

Voting begins on:  
2019-12-19Voting terminates on:  
2020-03-12

---

---

## Solid recovered fuels — Determination of moisture content using the oven dry method —

### Part 3: Moisture in general analysis sample

*Combustibles solides de récupération — Détermination de l'humidité par la méthode de séchage à l'étuve —*

*Partie 3: Humidité de l'échantillon pour analyse générale*

ICS: 75.160.10

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

[SIST EN ISO 21660-3:2021](https://standards.iteh.ai/catalog/standards/sist/b456cd02-5eb7-4dda-b8bc-c0dd45f282b4/sist-en-iso-21660-3-2021)

<https://standards.iteh.ai/catalog/standards/sist/b456cd02-5eb7-4dda-b8bc-c0dd45f282b4/sist-en-iso-21660-3-2021>

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENT AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

This document is circulated as received from the committee secretariat.

**ISO/CEN PARALLEL PROCESSING**



Reference number  
ISO/DIS 21660-3:2019(E)

© ISO 2019

# iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN ISO 21660-3:2021

<https://standards.iteh.ai/catalog/standards/sist/b456cd02-5eb7-4dda-b8bc-c0dd45f282b4/sist-en-iso-21660-3-2021>



## **COPYRIGHT PROTECTED DOCUMENT**

© ISO 2019

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Fax: +41 22 749 09 47  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

	Page
Foreword.....	iv
<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>1</b>
<b>5 Apparatus</b> .....	<b>2</b>
<b>6 Sample preparation</b> .....	<b>2</b>
<b>7 Procedure</b> .....	<b>2</b>
<b>8 Calculation</b> .....	<b>3</b>
<b>9 Precision</b> .....	<b>3</b>
9.1 Repeatability.....	3
9.2 Reproducibility.....	3
<b>10 Test report</b> .....	<b>3</b>
<b>Annex A (informative) Interlaboratory test results</b> .....	<b>5</b>
<b>Annex B (informative) Environmental aspects</b> .....	<b>8</b>
<b>Bibliography</b> .....	<b>10</b>

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

SIST EN ISO 21660-3:2021

<https://standards.iteh.ai/catalog/standards/sist/b456cd02-5eb7-4dda-b8bc-c0dd45f282b4/sist-en-iso-21660-3-2021>

## ISO/DIS 21660-3:2019(E)

### 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)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

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

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 300, *Solid recovered fuels*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

# Solid recovered fuels — Determination of moisture content using the oven dry method —

## Part 3: Moisture in general analysis sample

### 1 Scope

This document specifies a method for the determination of moisture in a general 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<sup>1)</sup>. It is applicable to all solid recovered fuels.

If solid recovered fuels contain large amounts of oil-fractions the Karl-Fischer-Method (for example ISO 760) is advisable. Otherwise, a lower temperature is recommended (e. g. 50 °C ± 10°C) and a longer drying time until constant mass is achieved.

NOTE 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.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO/DIS 21637, *Solid recovered fuels — Terminology, definitions and descriptions*

EN 15443,<sup>2)</sup> *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 ISO/DIS 21637 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

### 4 Principle

The analysis sample of recovered fuel is dried at a temperature of 105 °C under air atmosphere or nitrogen atmosphere. The percentage of moisture is calculated from the loss in mass of the test

1) The adoption of the standard series EN 15414, *Solid recovered fuels — Determination of moisture content using the oven dry method* as standard series EN ISO 21660 is planned. The draft standard of EN ISO 21660-3, *Solid recovered fuels — Determination of moisture content using the oven dry method — Part 3: Moisture in general analysis sample* is published in parallel.

2) ISO/CD 21646:2019 "Solid recovered fuels — Sample preparation" is currently being processed for the preparation of the "DIS"-enquiry.

## ISO/DIS 21660-3:2019(E)

sample. If the sample material is susceptible to oxidation (at 105 °C), drying in nitrogen atmosphere is performed.

Automatic equipment (such as gravimetric analysers) may be used as long as the equipment is validated by parallel measurements to the reference method. The automatic equipment shall fulfil all the requirements regarding sample size, heating procedure, temperature, atmosphere and weighing accuracy. Deviations from this paragraph shall be reported and justified.

For information about environmental aspect see [Annex B](#).

## 5 Apparatus

**5.1 Drying oven**, capable of being controlled at  $(105 \pm 2)$  °C (refer to the manufacturer's manual) 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](#)).

**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<sup>2</sup>.

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

**5.4 Desiccator**, with desiccant (e.g. silica gel) 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  $\leq 1$  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  $(105 \pm 2)$  °C until constant mass is reached and allow it to cool to room temperature in the desiccator ([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  $(105 \pm 2)$  °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 60 min of heating at  $(105 \pm 2)$  °C. If the sample material is susceptible to oxidation at the given temperature use nitrogen atmosphere for drying. The drying atmosphere used has to be mentioned in the test report.

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 desiccator ([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 solid 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 analysis sample is always determined simultaneously when portions are weighed out for other analytical determinations, for example, calorific value, carbon, nitrogen.

## 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 (intralaboratory testing).

Precision data derived from an interlaboratory test in Europe from 2008 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 an interlaboratory test in Europe from 2008 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. ISO 21660-3;

**ISO/DIS 21660-3:2019(E)**

- 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.

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[SIST EN ISO 21660-3:2021](#)

<https://standards.iteh.ai/catalog/standards/sist/b456cd02-5eb7-4dda-b8bc-c0dd45f282b4/sist-en-iso-21660-3-2021>