SLOVENSKI STANDARD
oSIST prEN ISO 22167:2020

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Trdna alternativna goriva - Določevanje hlapnih snovi (ISO/DIS 22167:2019)

Solid recovered fuels - Determination of the content of volatile matter (ISO/DIS 22167:2019)

Feste Sekundärbrennstoffe - Bestimmung des Gehaltes an flüchtigen Substanzen (ISO/DIS 22167:2019)

Combustibles solides de récupération - Détermination de la teneur en composés volatils (ISO/DIS 22167:2019)

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ICS:

75.160.10	Trda goriva	Solid fuels

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Solid recovered fuels — Determination of content of volatile matter

Combustibles solides de récupération — Détermination de la teneur en composés volatils

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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
Website: www.iso.org

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Contents

Page

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).

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).

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.

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.

Introduction

The volatile matter is determined as the loss in mass of the analysed sample, after moisture removal, when material is heated up under specific conditions of temperature, time and in a reduced atmosphere (anoxic conditions). The test is empirical and, in order to ensure reproducible results, it is essential that the rate of heating, the final temperature and the overall duration of the test are carefully controlled. It is also essential to exclude air from the solid recovered fuel during heating to prevent oxidation.

The moisture content of the sample is determined at the same time as the volatile matter so that the appropriate correction can be made. Mineral matter associated with the sample can also lose mass under the conditions of the test, the magnitude of the loss being dependent on both the nature and the quantity of the minerals present.

This document is primarily geared toward laboratories, producers, suppliers and purchasers of solid recovered fuels, but is also useful for the authorities and inspection organizations.

The method specified in this document is based on EN 15402 as well as ISO 562.

For information about environmental aspect see Annex B.

Solid recovered fuels — Determination of content of volatile matter

1 Scope

This document specifies the requirements and a method for the determination of volatile matter of solid recovered fuels.

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.

EN 15442,[1] *Solid recovered fuels — Methods for sampling*

EN 15443,[2] *Solid recovered fuels — Methods for the preparation of the laboratory sample*

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

ISO/DIS 21660-3, *Solid recovered fuels — Determination of moisture content using the oven dry method — Part 3: Moisture in general analysis 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/

3.1
ash content on dry basis
mass of inorganic residue remaining after ignition of a fuel under specified conditions, expressed as mass fraction in percent of the dry matter in the fuel

Note 1 to entry: For the characterisation of solid recovered fuels (SRF) it is necessary to analyse the content of the volatile alkaline and therefore the temperature of 550°C is used for biomass SRF.

3.2
removed ash contributors (*rac*)
rac: coarse inert material (i.e. metals, glass, stones, tiles etc.) removed from the pre-dried sample before preparation, in order to avoid damage to the preparation equipment

Note 1 to entry: Removed ash contributors are included in the ash content calculations

1) ISO/CD 21645:2019 "Solid recovered fuels — Method for sampling" is currently being processed for the preparation of the "DIS"-enquiry.

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

3.3
total organic matter
combustible part of solid recovered fuels, which consists of the sum of volatile matter and fixed carbon

Note 1 to entry: It is calculated as: 100 - moisture content - ash content.

Note 2 to entry: It is the mass fraction of the matter lost by ignition, also known as “Loss Of Ignition” (LOI).

3.4
volatile matter
relative part of the analysed sample, after moisture removal, that is lost when material is heated up under specific conditions of temperature, time and in a reduced atmosphere (anoxic conditions)

3.5
fixed carbon
relative part of carbon contained in a material that can only be degraded in oxic conditions and high temperature

Note 1 to entry: It is calculated as: 100 - moisture content - volatile matter content - ash content.

3.6
pre-drying
drying process to minimise moisture loss in the subsequent sample-division processes, to facilitate the sample preparation processes, and to minimise biological activity

4 Principle

A test portion of the general analysis sample is heated out of contact with ambient air at (900 ± 10) °C for 7 min. The percentage of volatile matter is calculated from the loss in mass of the test portion after deducting the loss in mass due to moisture. The test is empirical and, in order to ensure reproducible results, it is essential that the rate of heating, the final temperature and the overall duration of the test are carefully controlled.

Automatic equipment (such as thermogravimetric 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.

5 Apparatus

5.1 Furnace

The furnace shall be heated electrically and capable of maintaining a zone with uniform temperature of (900 ± 10) °C. It may be of the stop-ended type or fitted at the back with a flue with a diameter of about 25 mm and a length of about 150 mm (see Figure 1).

It is important for furnaces with flues that the furnace door seals well. The flue should not reach far out of the oven and should be fitted with a butterfly valve to restrict airflow through the furnace.

The heat capacity of the furnace shall be such that, with an initial temperature of (900 ± 10) °C, the temperature is regained within about 4 min after insertion of a cold stand and its crucibles. The temperature shall be measured with a thermocouple, as specified in 5.2.

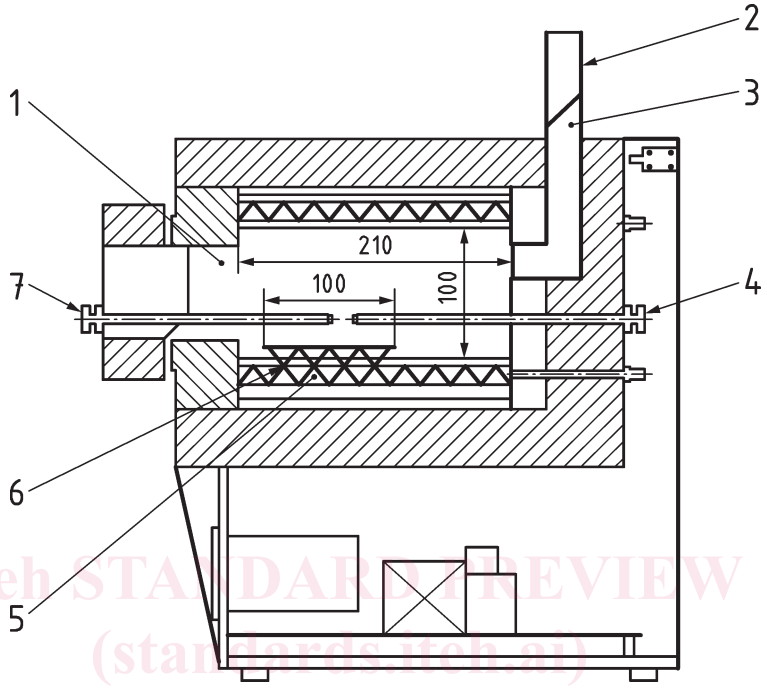
NOTE 1 Observing the temperature is very important in order to compensate for inherent deviations of the temperature measurement and lack of uniformity regarding the temperature distribution.

Usually the furnace will be designed specifically either for multiple determinations using a number of crucibles in one stand or for receiving one crucible and its stand. In the first case, the zone of uniform

temperature shall be at least 160 mm × 100 mm; in the latter case, a zone of diameter about 40 mm is sufficient.

A position for the crucible stand shall be chosen within the zone of uniform temperature and this position shall be used for all determinations.

Dimensions in millimetres



Key

1	chamber, 200 mm width	5	heating system
2	flue	6	zone of uniform temperature
3	valve	7	check thermocouple
4	thermocouple		

Figure 1 — Example of suitable furnace

5.2 Thermocouple

The thermocouple shall be an unsheathed wire with a thickness ≤ 1 mm. It shall be long enough to reach the centre of the underside of each crucible when placed into the zone of uniform temperature on being inserted through the front or rear of the furnace. The thermo junction shall be placed midway between the base of the crucible in its stand and the floor of the furnace. If the stand holds more than one crucible, the temperature under each crucible shall be checked in the same manner.

If desired, a sheathed thermocouple may be permanently installed in the furnace (5.1) (see Figure 1) with its thermo junction as close as possible to the centre of the zone of uniform temperature; in this case furnace temperature readings shall be correlated at frequent intervals with those of the unsheathed thermocouple which is thus inserted only if necessary.

NOTE The temperature/electromotive force relationship of a thermo junction maintained at elevated temperatures gradually changes with time.

5.3 Crucible

The crucible shall be cylindrical, with a well-fitting lid, both of fused silica, porcelain or other suitable material. The crucible with lid shall have a mass from 10 g to 14 g and dimensions approximating