

---

---

**Brown coals and lignites —  
Determination of the volatile matter  
in the analysis sample —**

**Part 1:  
Two-furnace method**

*Charbons bruns et lignites — Détermination des matières volatiles  
dans l'échantillon pour analyse —*

*Partie 1: Méthode avec utilisation de deux fours*



This document is a preview generated by EBS



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2013

All rights reserved. Unless otherwise specified, 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  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Published in Switzerland

# 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>1</b>
<b>5 Reagents</b> .....	<b>1</b>
<b>6 Apparatus</b> .....	<b>2</b>
<b>7 Sample</b> .....	<b>6</b>
<b>8 Procedure</b> .....	<b>6</b>
8.1 Preliminary procedure.....	6
8.2 Predetermination procedure.....	6
8.3 Method using oven-dried coal.....	6
8.4 Method using air-dried coal.....	6
<b>9 Calculation of results</b> .....	<b>6</b>
9.1 For oven-dried coal.....	7
9.2 For air-dried coal.....	7
<b>10 Precision of the method</b> .....	<b>7</b>
10.1 Repeatability limit.....	7
10.2 Reproducibility limit.....	7
<b>11 Test report</b> .....	<b>8</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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 5071-1 was prepared by Technical Committee ISO/TC 27, *Solid mineral fuels*, Subcommittee SC 5, *Methods of analysis*.

This second edition cancels and replaces the first edition (ISO 5071-1:1997), of which this constitutes a minor revision.

ISO 5071 consists of the following parts, under the general title *Brown coals and lignites — Determination of volatile matter in the analysis sample*:

*Part 1: Two-furnace method*

## Introduction

The volatile matter is determined as the loss in mass, corrected for moisture, when an analysis sample of brown coal or lignite is heated out of contact with air under specified conditions. The test is empirical and, in order to obtain reproducible results, it is essential that the rate of heating, the final temperature and the overall duration of the test be carefully controlled. Due to the nature of brown coals and lignites, initial heating of the sample at 400 °C is necessary to minimize the possibility of ejection of sample from the test crucible.

Mineral matter associated with the sample may 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.



# Brown coals and lignites — Determination of the volatile matter in the analysis sample —

## Part 1: Two-furnace method

### 1 Scope

This part of ISO 5071 specifies a method of determining the volatile matter of brown coals and lignites.

### 2 Normative references

The following referenced documents are indispensable for the application 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 1170, *Coal and coke — Calculation of analyses to different bases*

ISO 1213-2, *Solid mineral fuels — Vocabulary — Part 2: Terms relating to sampling, testing and analysis*

ISO 5068-2, *Brown coals and lignites — Determination of moisture content — Part 2: Indirect gravimetric method for moisture in the analysis sample*

ISO 5069-2, *Brown coals and lignites — Principles of sampling — Part 2: Sample preparation for determination of moisture content and for general analysis*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1213-2 apply.

### 4 Principle

The coal is heated out of contact with air for 7 min at 400 °C, then immediately transferred to another furnace and heated at 900 °C for a further 7 min. The percentage of volatile matter is calculated from the loss in mass of the oven-dried sample or from the loss in mass of the analysis sample corrected for moisture.

### 5 Reagents

**5.1 Desiccants**, fresh or freshly regenerated and preferably self-indicating. Suitable desiccants are magnesium perchlorate, silica gel, activated alumina and anhydrous calcium sulfate.

**WARNING — Magnesium perchlorate is a strong oxidizing agent. Do not attempt to regenerate the absorbent. Do not permit contact with organic materials or reducing agent.**

**5.2 Nitrogen**, dry, with a maximum oxygen content of 30 µl per litre.

## 6 Apparatus

**6.1 Furnace** (Figure 1), heated by electricity. Two such furnaces are required. One furnace shall have a zone of 160 mm × 100 mm maintained at a uniform temperature of 400 °C ± 10 °C. The second shall have a zone of 160 mm × 100 mm maintained at a uniform temperature of 900 °C ± 5 °C. The furnaces may be the stop-ended type or fitted at the back with a flue approximately 25 mm in diameter by 150 mm long.

The heat capacity of the 900 °C and/or 400 °C furnace shall be such that, with an initial temperature of 900 °C and/or 400 °C, a temperature of 900 °C ± 10 °C and/or 400 °C ± 10 °C is regained within 4 min after insertion of a cold stand and its crucibles. The temperature shall be measured with a thermocouple as described in 6.3. The furnace can be designed specifically either for multiple determinations using a number of crucibles in one stand or for receiving one crucible and its stand. A position for the crucible stand shall be chosen within the zone of uniform temperature and this position used for all determinations.

**6.2 Oven**, capable of being controlled at a temperature within the range 105 °C to 110 °C and with provision for passing a current of dry, oxygen-free nitrogen through it at a rate sufficient to change the atmosphere 15 times per hour. The size of the chamber is suitable for containing the crucible (6.4).

**6.3 Thermocouple**, unsheathed, of wire not thicker than 1 mm, used to check the temperature characteristics of the furnace. The thermo-junction shall be inserted 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 with its thermo-junction as close as possible to the centre of the zone of uniform temperature; in this case, its temperature readings shall be correlated at frequent intervals with those of the unsheathed thermocouple, which is then inserted only when necessary.

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

**6.4 Crucible and lid**, a cylindrical crucible with a well fitting lid, both made of fused silica. The crucible and lid shall weigh between 10 g and 14 g and have dimensions approximating those shown in Figure 2. The fit of the lid on the crucible is critical to the determination and a lid shall be selected to match the crucible so that the horizontal clearance between them is not greater than 0,5 mm. After selection, the crucible and the lid shall be ground together to give smooth surfaces and then be given a common distinguishing mark. Crucibles of other refractory materials, or of platinum, can be used, provided that they give results which agree with the recommended silica crucible, within the stated precision of the method (Clause 10).

**6.5 Stand**, on which the crucible is placed in the muffle furnace, so that the appropriate specified rate of heating can be achieved. For example, it may consist of the following:

a) for a single determination, a ring of heat-resistant steel wire as shown in Figure 3 a), 27 mm in diameter and 1,5 mm thick, resting on the inner projection of its legs,

or

b) for multiple determinations, a tray of heat-resistant steel wire as shown in Figure 3 b), of appropriate size, with ceramic plates 2 mm thick supporting the crucibles.

**6.6 Balance**, sensitive to 0,1 mg.

**6.7 Desiccator.**