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Hard coal — Determination of caking index

Houille — Détermination de l'indice d'agglutination

Reference number
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Foreword

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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 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 27, *Solid mineral fuels,* Subcommittee SC 5, *Methods of analysis*.

This second edition cancels and replaces the first edition (ISO 15585:2006), which has been technically revised. The main changes compared to the previous edition are as follows:

— Change to test precision (both for repeatability, *r*, and reproducibility, *R*) resulting from ILS conducted in 2016 and 2017.

— Additional information provided on anthracite sample packing and homogeneity test in Annex A and standard deviation formula and flowchart for standard anthracite sample taking in Annex B.

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

Caking index is a key parameter to identify the caking power of hard coal, which is a measurement of the agglutinating strength between the coal particles and inert constituents after heating without the contact of air. Coal caking characteristic is important and widely used in coking, gasification, liquefaction and combustion industries.

Hard coal — Determination of caking index

1 Scope

This document specifies a method of determination of caking index of hard coal. It is applicable to the evaluation of caking power of bituminous coal with random reflectance of vitrinite, R_r, greater than 0,6 % and less than or equal to 1,8 % (>0,6 % and ≤1,8 %).

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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
caking index
measure of the magnitude of the binding strength between coal particles or between coal particles and inert particles after coal is heated at 850 °C

4 Principle

A portion of prepared sample of coal of limited size range and the standard anthracite are mixed under defined conditions, and the mixture is carbonized rapidly. The crucible coke thus obtained is tested for strength in a drum conforming to certain specifications. The caking power of the test sample is expressed by the abrasive strength, i.e. resistance to breakage of the crucible coke.

5 Reagent and materials

5.1 Standard anthracite, having a moisture of less than 2,5 % in mass fraction, air-dried basis, an ash of less than 4 % in mass fraction, dry basis and a volatile matter of less than 8 % in mass fraction, dry, ash free basis. The size limits are 0,1 mm to 0,2 mm. The undersize content of 0,1 mm should not be more than 6 % in mass fraction, and the oversize content of 0,2 mm should not be more than 4 % in mass fraction.

NOTE Annexes A and B provide information on the extraction, preparation and testing of standard anthracite.

6 Apparatus

6.1 Balance, analytical balance with a resolution of at least 0,1 % relative of the test portion mass.

6.2 Crucible, porcelain, having the following dimensions (see Figure 1):

a) external diameter at the top: 40 mm ± 1,5 mm;

b) internal diameter at the base: 20 mm ± 1,5 mm;

c) external height: 40 mm ± 1,5 mm;

d) wall thickness: less than 2 mm.

Dimensions in millimetres

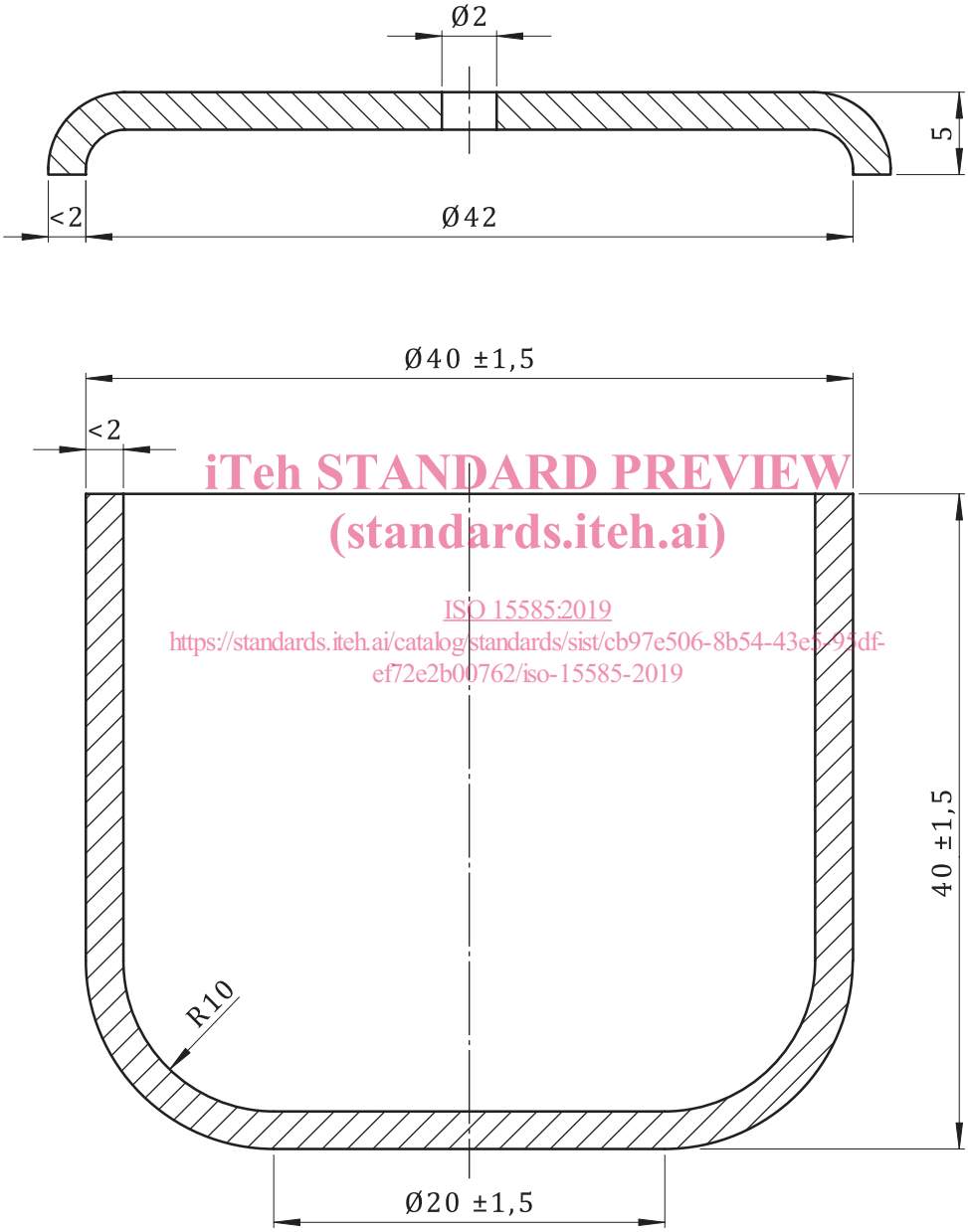


Figure 1 — Crucible and lid

6.3 Lid, porcelain, 1,5 mm to 2,0 mm thick, with a hole 2 mm in diameter in the centre (see Figure 1).

6.4 Stirrer, made of 1,0 mm to 1,5 mm diameter metal wire, having an 8 mm loop at one end (see Figure 2).

Dimensions in millimetres

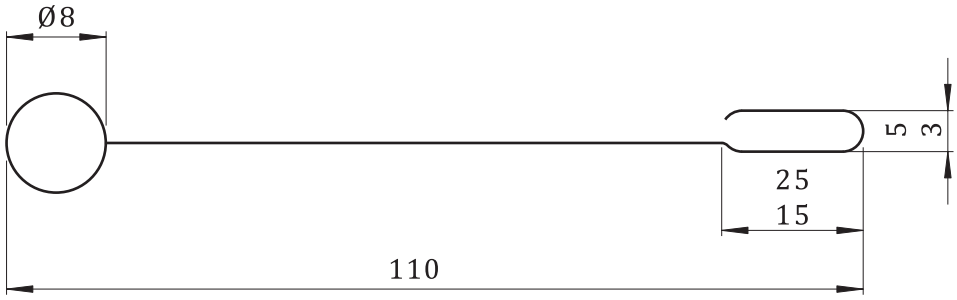


Figure 2 — Stirrer

6.5 Heat resistant weight, composed for example of Nichrome steel[1)], with a mass of 110 g to 115 g (see Figure 3).

Dimensions in millimetres

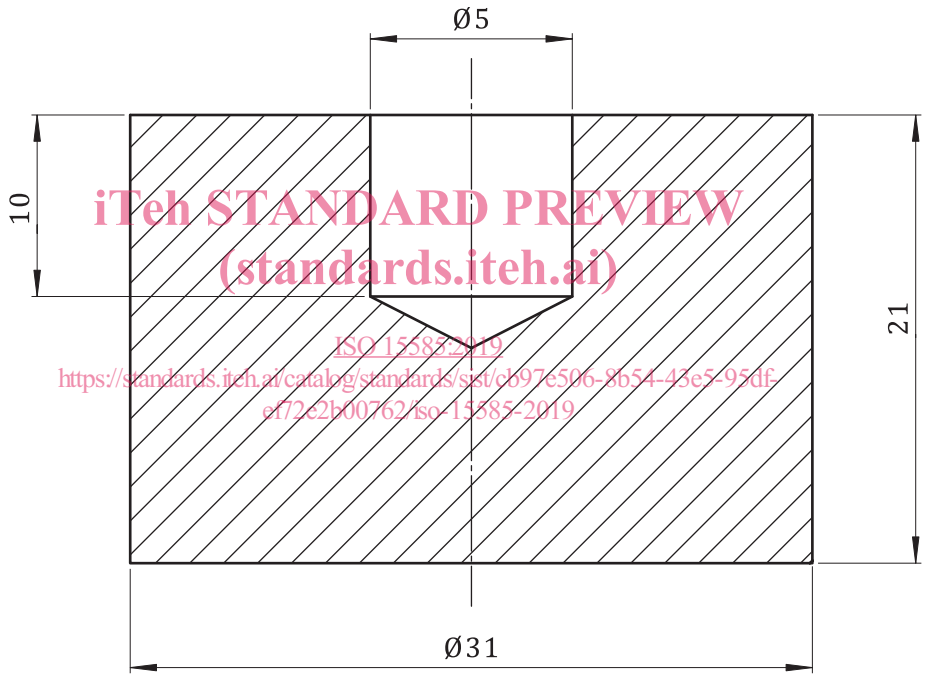
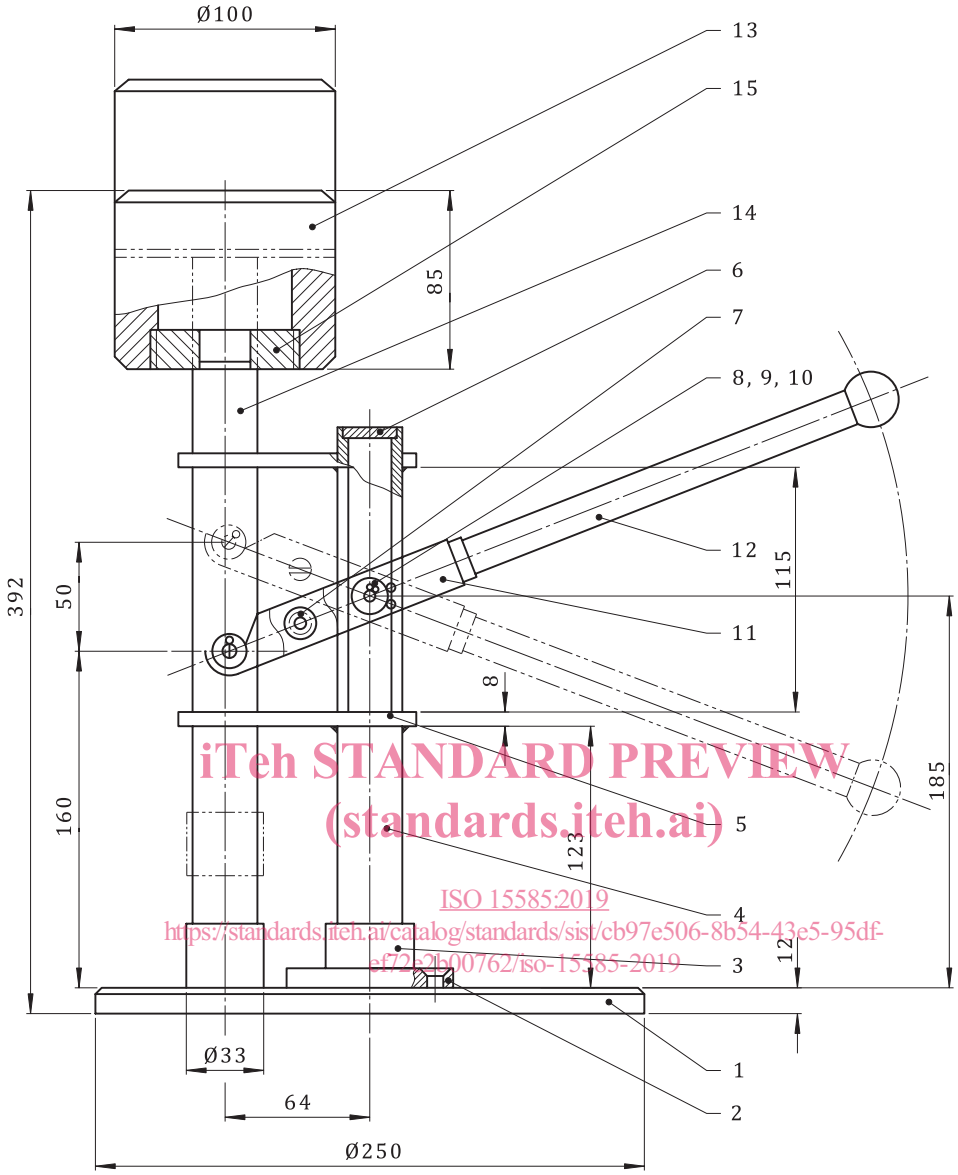


Figure 3 — Heat resistant weight

6.6 Press, for compressing the mixture of coal and standard anthracite under a weight having a 6 kg mass (see Figure 4).

1) Nichrome is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this product.

Dimensions in millimetres



Key

1	bottom plate	6	dead plate	11	carriage
2	screw	7	back-up shaft	12	hand knob
3	round base	8	small shaft	13	press
4	steel tube	9	dump	14	lighting vertical shaft
5	connecting board	10	forelock	15	plug

Figure 4 — Press used for compressing the mixture of anthracite and test coal

6.7 Electric furnace, with a zone of uniform temperature and a temperature control device capable of maintaining that zone at 850 °C ± 10 °C.

6.8 Drum, with a cover, driving shaft, transmission gear and electric motor for carrying out the abrasion test on coke.

The drum (see Figure 5) has a 200 mm internal diameter, is 70 mm deep and is made of 3 mm thick sheet iron. To the inside walls are welded two symmetrical sheet iron strips 70 mm long, 30 mm wide

and 2 mm thick. To close the drum, the cover is seated on a felt or rubber gasket and is secured by two wing-nuts. The drum is rotated with the stub axle horizontal at (50 ± 0,5) r/min.

Dimensions in millimetres

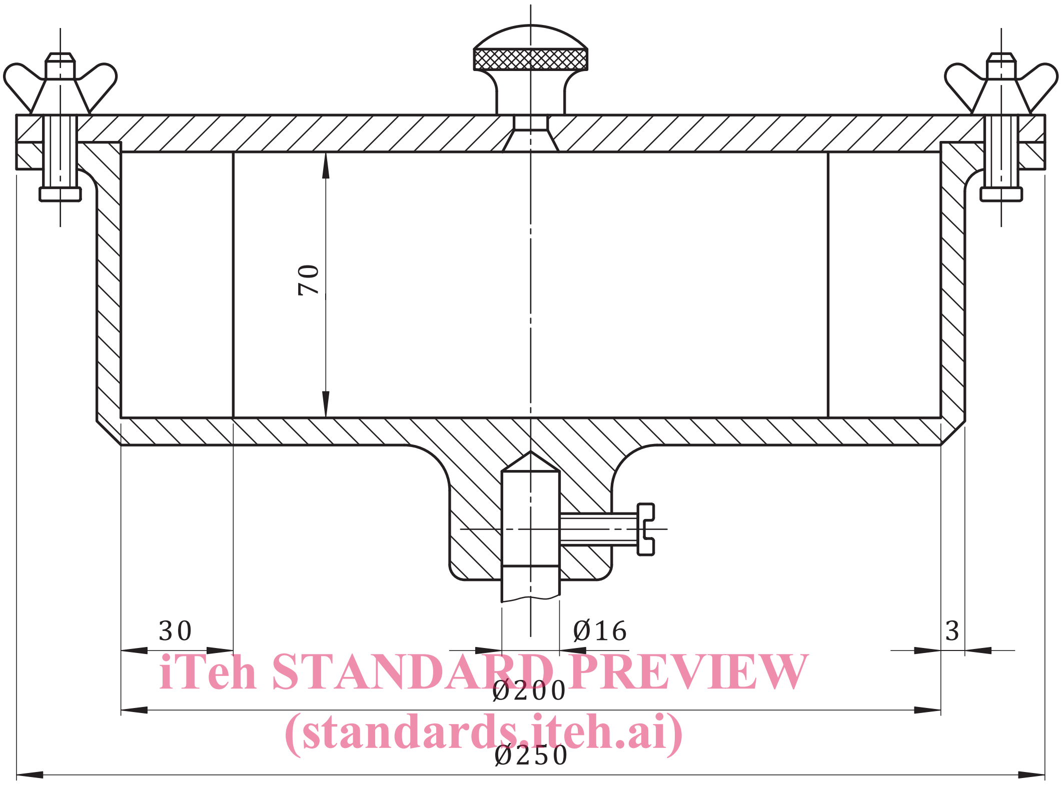


Figure 5 — Drum used for test

6.9 Laboratory sieve, made of thin brass sheet or stainless steel sheet, with 1 mm round holes.

6.10 Stopwatch.

6.11 Brush.

6.12 Long handled tongs or rod, suitable for moving the weight.

7 Preparation of test sample

7.1 Crush the sample of air-dried coal to pass a 0,2 mm test sieve. Take care to avoid an excessive production of particles below 0,1 mm. It is essential that 20 % to 40 % mass fraction of the total sample consists of particles between 0,1 mm and 0,2 mm.

7.2 The test sample shall be kept in a tightly closed container. Determine caking index of the sample on the same day after its preparation. Otherwise, refrigeration of prepared sample or maintaining it under inert gases or other anti- oxidation method should be used to minimize oxidation, and the time between preparation of the sample and carrying out the test shall not exceed 5 days.

7.3 Before commencing the determination, mix the analysis sample for at least 1 min.