SLOVENSKI STANDARD
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Hard coal -- Determination of the crucible swelling number

Houille -- Détermination de l'indice de gonflement au creuset

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Hard coal — Determination of the crucible swelling number

Houille — Détermination de l'indice de gonflement au creuset

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Foreword

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

This third edition cancels and replaces the second edition (ISO 501:1981), which has been technically revised.

Hard coal — Determination of the crucible swelling number

1 Scope

This International Standard specifies a method for determining the swelling properties of hard coal when heated in a covered crucible. The terminology of “Crucible Swelling Number” or CSN is also known as “Free Swelling Index” or FSI.

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 13909-4:2001, *Hard coal and coke — Mechanical sampling — Part 4: Coal — Preparation of test samples*

3 Principle

A sample of coal is heated in a covered crucible under standard conditions of time and temperature. The shape of the coke button obtained is classified by comparison with the outlines of a set of standard profiles.

4 Preparation of the test sample

The test sample is the general analysis sample prepared in accordance with ISO 13909-4. Ensure that the moisture content of the sample is in equilibrium with the laboratory atmosphere, exposing it, if necessary, in a thin layer for the minimum time required to achieve equilibrium.

Avoid both very fine grinding and undue exposure of the ground coal to the atmosphere as oxidation of the coal provides misleading results.

For coals that can be proven to be stable, analysis should be carried out as soon as possible after sample preparation. With coals especially liable to oxidation, carry out the test as soon as possible, but not more than 2 h after grinding, unless the sample can be stored in an inert atmosphere.

Before commencing the determination, thoroughly mix the test sample for at least 1 min.

5 Apparatus

5.1 Crucible and lid (see Figure 1)

Silica crucible, squat form, and silica lid with ring handle. The crucible shall conform to the following specifications:

External height: 26 ± 1,0 mm

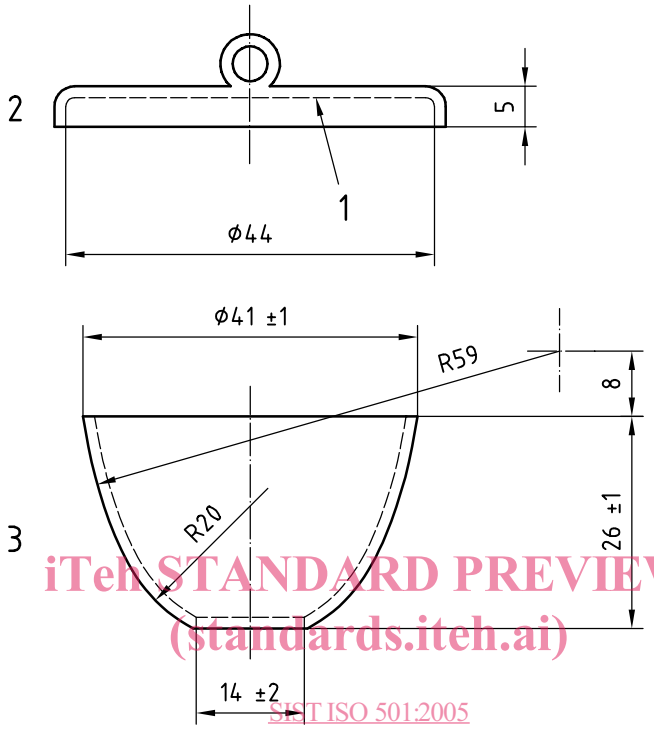
External diameter at top: 41 ± 1,0 mm

Internal diameter at base: 14 ± 2,0 mm

Mass: 12 ± 1,0 g

Capacity: 16 to 17,5 ml

Dimensions in millimetres



Key

1 Flat surface required
2 Lid
3 Crucible

Figure 1 — Crucible with lid for swelling test

5.2 Pierced silica lid (see Figure 2)

Similar to that described in 5.1 but with a 6 mm hole through which the thermocouple (5.7) can pass.

Dimensions in millimetres

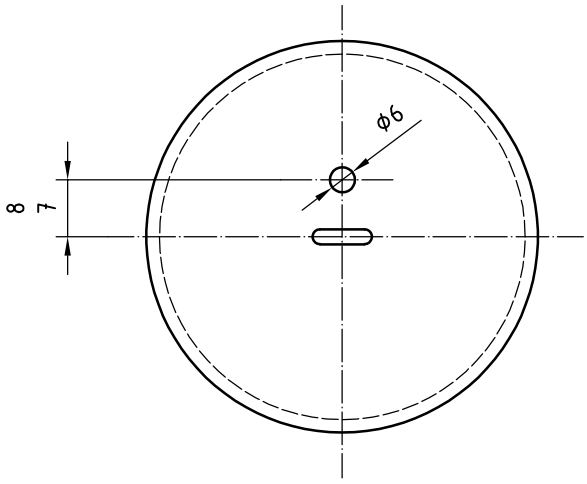


Figure 2 — Pierced crucible lid

5.3 Triangle, consisting of silica tubing of 6 to 6,5 mm external diameter, mounted on nickel/chromium wire or a triangle formed of solid silica, the length of each side being approximately 55 mm to 60 mm.

5.4 Burner, capable of giving the required standard heating conditions.

For coal gas of calorific value of about 20 MJ/m^3, a Teclu-type burner with an internal diameter of the burner tube of approximately 12,5 mm has been found satisfactory. For gases with higher calorific value, such as natural gas or LPG, a Teclu- or Meker-type burner could be used, but the diameter of the burner tube or burner grid should be substantially greater than that for the coal gas; approximately 30 mm has been found satisfactory.

NOTE Alternatively, an electrical heating system may be used, provided that it has been shown to give results within ½ unit of that obtained with the gas heating method over the whole range of swelling numbers.

5.5 Gauge, for measuring gas pressure.

5.6 Draught shield, made from refractory piping approximately 150 mm in length, of 100 mm internal diameter and 110 mm external diameter. At one end, the piping shall have three slots 25 mm deep in which the wire portions of the silica triangle rest (5.3) (see Figure 3).

5.7 Thermocouple, of fine wire of diameter not greater than 0,5 mm if made of noble metals, or 0,8 mm if made of base metal.

5.8 Weight, of mass 500 ± 10 g.

6 Preparation of apparatus

Assemble the apparatus as shown in Figure 3. Place an empty crucible (5.1) on the silica triangle (5.3) and support it in the draught shield (5.6). Adjust the gas and air supplies to the burner (5.4), so that the temperature of the inner surface of the base of the crucible reaches 800 ± 10 °C in 1,5 min and 820 ± 5 °C in 2,5 min from first igniting the gas. Finally, heat a crucible in the apparatus for at least 5 min. Replace the crucible and check the temperatures again. Make any minor adjustments which are necessary to meet the standard conditions.

If a Teclu-type burner is used, it will generally be found that a flame approximately 300 mm long, with the crucible positioned just above the tip of the blue cone, will give the standard temperature conditions.

If a Meker-type burner is used, place the crucible approximately 10 mm above the burner grid and adjust the flame so that the standard temperature conditions are attained.

Measure the temperature by means of the thermocouple (5.7) inserted through the pierced lid (5.2) and having its unprotected junction and a portion of each wire in contact with the centre of the base of the empty crucible.

Check the apparatus at frequent intervals to ensure that the standard conditions apply.