INTERNATIONAL STANDARD

ISO 728

Third edition
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Coke (nominal top size greater than 20 mm) — Size analysis by sieving

Coke (dimension supérieure nominale supérieure à 20 mm) — Analyse granulométrique par tamisage

Reference number
ISO 728:1995(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.

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.

International Standard ISO 728 was prepared by Technical Committee ISO/TC 27, *Solid mineral fuels*, Subcommittee SC 3, *Coke*.

This third edition cancels and replaces the second edition (ISO 728:1981), which has been technically revised.

Annex A of this International Standard is for information only.

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Coke (nominal top size greater than 20 mm) — Size analysis by sieving

1 Scope

This International Standard specifies a method for the size analysis of coke, of nominal top size greater than 20 mm, by manual sieving.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 579:1981, *Coke — Determination of total moisture content.*

ISO 1213-2:1992, *Solid mineral fuels — Vocabulary — Part 2: Terms relating to sampling, testing and analysis.*

ISO 2309:1980, *Coke — Sampling.*

ISO 3310-2:1990, *Test sieves — Technical requirements and testing — Part 2: Test sieves of perforated metal plate.*

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 1213-2 apply.

4 Apparatus

4.1 Test sieves, complying with ISO 3310-2. The set of sieves used shall have exclusively round holes or exclusively square holes.

NOTE 1 The test sieves should be selected according to the requirements of the test and the characteristics of the sample. If possible, the series of sieves should be selected so that the mass of coke in any size fraction does not exceed 25 % of the total mass of sample being sieved. For ungraded coke, a series of test sieves of nominal hole sizes 125 mm; 100 mm; 80 mm; 71 mm; 63 mm; 50 mm; 40 mm; 31,5 mm; 20 mm and 10 mm may be suitable. For samples containing pieces with a particle size greater than 125 mm, single-hole gauges may be used instead of test sieves. For graded coke, a series of test sieves of nominal hole sizes 50 mm; 45 mm; 40 mm; 35,5 mm; 31,5 mm; 25 mm; 20 mm; 16 mm; 10 mm; 5,6 mm and 2,8 mm may be suitable.

It is important to check the sieves from time to time, using the methods described in ISO 3310-2, to ensure that the hole dimensions are within the specified tolerances. Worn or damaged sieves can give rise to serious errors in size analysis and should be discarded.

4.2 Weighing machine, capable of measuring the mass of the sample to be sieved to the nearest 0,1 %.

5 Sampling and preparation of test sample

Take two gross samples for physical testing in accordance with ISO 2309[1]. Prepare one of these samples for the determination of moisture content in

1) In due course, ISO 2309 will be replaced by ISO 13909-6, *Hard coal and coke — Sampling — Part 6: Coke — Preparation of test samples.*

accordance with ISO 2309 and carry out the determination in accordance with ISO 579.

If the moisture content is higher than 5 % (m/m), dry the other sample sufficiently to reduce the moisture content to lower than 5 % (m/m). Use this second sample for the remainder of the test.

6 Procedure

6.1 Arrange the set of sieves (4.1) in a stack in order of nominal hole sizes, with the smallest size at the bottom.

Weigh the test sample, in several portions if necessary, using the weighing machine (4.2).

6.2 Place on the top sieve a portion of the test sample small enough that not more than 75 % of the sieve area is covered, and shake to allow most of the undersize to pass. Manually place the remaining coke on the sieve and transfer the oversize to a suitable container. Remove the top sieve and repeat these operations for sieves of nominal hole sizes down to and including 40 mm.

6.3 Continue the process described in 6.2 for sieves of nominal hole sizes less than 40 mm, but using manual shaking. Carry out manual shaking by holding the sieve in the hands, or suspending it freely, and moving it horizontally to and fro with a displacement of about 75 mm. Complete fifty such oscillations (each consisting of one movement to and fro) in a period of about 30 s. If the amount of coke remaining on the sieve is then such that it covers more than 75 % of the sieve area, divide it into two or more portions and manually shake each portion separately. Otherwise, transfer the oversize to a suitable container.

NOTE 2 Mechanical sieving may be carried out if it can be demonstrated that the method is free from bias when compared to the manual sieving method described in this International Standard.

6.4 If necessary, re-stack the sieves and repeat the steps described in 6.2 and 6.3 for successive portions until the entire test sample has been sized and each size fraction has been collected in a separate container.

6.5 Either weigh each container separately with its size fraction and subtract the respective tare mass, or, after weighing the first fraction, successively add the other fractions and note the cumulative mass after each addition.

NOTE 3 Cumulative weighing is preferable because it reduces the weighing error for the cumulative fractions. Depending on how the results are to be expressed (see clause 7), cumulative weighing should be in descending order of size fractions (cumulative oversize) or in ascending order of size fractions (cumulative undersize).

7 Expression of results

If necessary, calculate the cumulative mass on each sieve starting with the sieve with the largest size of holes, or the cumulative mass passing through each sieve starting with the sieve with the smallest size of holes, from the masses of the individual size fractions.

Calculate the apparent loss, i.e. the difference between the total mass of the test sample before sieving and the total mass of coke collected afterwards. If the loss is greater than 0,4 % of the original mass of the test sample, reject the results and carry out a further test. Otherwise, add the apparent loss to the mass of the smallest size fraction.

Convert each cumulative mass to a percentage of the total mass of the test sample. Report the cumulative masses to the nearest 0,1 kg and the cumulative percentages to the nearest 0,1 %.

NOTES

4 An example of the calculation of the results of a size analysis of coke, in terms of the cumulative oversize, is given in table 1.

5 If the mean size is required, it may be determined in accordance with annex A.

Table 1 — Example of size analysis of coke

Nominal size of hole (round hole) mm	Mass of fraction kg	Cumulative mass kg	Cumulative percentage oversize %
140	4,9	4,9	1,1
125	9,4	14,3	3,2
100	41,3	55,6	12,4
80	113,4	169,0	37,7
71	78,5	247,5	55,2
63	67,7	315,2	70,3
50	51,5	366,7	81,8
40	37,2	403,9	90,1
31,5	17,9	421,8	94,1
20	9,9	431,7	96,3
10	8,1	439,8	98,1
passing 10	7,4 + 1,1 = 8,5	448,3	100,0
Sum	447,2		
Original mass	448,3		
Loss in mass	1,1		
0,4 % of original mass	1,8		
The loss in mass, being less than 0,4 % of the original mass, is added to the fraction of smallest size (< 10 mm).			

8 Test report

The test report shall include the following:

a) the method used by reference to this International Standard;

b) a complete identification of the sample;

c) whether the sieves used had round or square holes;

d) the date of the test;

e) the results expressed in accordance with clause 7;

f) any unusual features noted during the determination;

g) any operation not included in this International Standard, or regarded as optional.

Annex A
(informative)

Determination of mean size

The mean size of the coke may be calculated from the following formula:

$$\frac{B(a-c)+C(b-d)+\ldots+J(h-k)+100\,j}{200}$$

where

a, b, c, d ... h, j, k are the hole sizes, in millimetres, of successive sieves;

A, B, C, D ... H, J, K are the cumulative percentage oversizes for each of the sieves.

NOTE 6 The sieve with hole size a is the smallest size through which all the coke passes (i.e. $A = 0$ %). The sieve with hole size k is a hypothetical sieve through which no coke will pass (i.e. $k = 0$ mm, $K = 100$ %).

Alternative methods of calculation or graphical methods of determination may lead to slightly different results and the same method should, therefore, be used for comparative tests.

The precision of a determination of mean size can be expressed in terms of the repeatability limit, as follows.

The results of duplicate determinations of mean size, carried out at different times in the same laboratory, by the same operator with the same apparatus, on representative test samples taken from the same lot of coke, should not differ by more than 2,5 mm.

No value for reproducibility can be quoted for determinations carried out in different laboratories, since the transport of coke samples involves the risk of breakage and thus alteration of the size distribution.