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Coke – Size analysis by sieving

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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, *Coal and coke,* Subcommittee SC 3, *Coke*.

This fourth edition cancels and replaces the third editions (ISO 728:1995 and ISO 2325:1986), which has been technically revised.

The main changes compared to the previous edition are as follows:

a) The coke size analysis of the minus 20 mm fractions has been moved to this document;

b) Mechanical sieving was added to the scope;

c) Hand placing of coke was increased from 40 mm down to 22,4 mm;

d) ISO 728 now incorporates ISO 2325;

e) The coke mean size calculation was modified, moved from an annex to the main document and a worked example added.

Annex A of this International Standard is for information only.

Coke – Size analysis by sieving

1 Scope

This International Standard specifies procedures for the size analysis of coke by manual and/or mechanical sieving, using square or round holed sieves of aperture sizes between 125 mm and 0,5 mm. Some guidance on handling the sampling and sizing of coke products greater than 125 mm is given in Annex A.

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. The latest edition of the referenced document (including any amendments) applies.

ISO 579, *Coke — Determination of total moisture*

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

ISO 3310-1, *Test sieves — Technical requirements and testing — Part 1: Test sieves of metal wire cloth*

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

ISO 13909-5, *Hard coal and coke — Mechanical sampling — Part 5: Coke — Sampling from moving streams*

ISO 13909-6, *Hard coal and coke — Mechanical sampling — Part 6: Coke — Preparation of test samples*

ISO 18283, *Hard coal and coke — Manual sampling*

3 Terms and definitions

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

4 Principle

A sample of coke with less than 5 % moisture is subjected to a process of size analysis by a specified manual and or mechanical sieving, and the results are expressed in terms of the cumulative percentage by mass of the coke remaining on sieves of different sized openings.

5 Apparatus

a) **Test sieves,** complying with ISO 3310-1 and ISO 3310-2. The set of sieves used shall have exclusively round holes or exclusively square holes. It is important to check the sieves from time to time, using the methods specified in ISO 1310, 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 shall be discarded. 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 cokes, an example of a series of test sieves of nominal hole sizes 125 mm; 100 mm; 75 mm; 63 mm; 50 mm; 45 mm; 35,5 mm; 31,5 mm; 25; 22,4 mm; 16 mm; 10 mm; 8 mm; 5,6 mm; 4,0 mm and 2,8 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;

b) **Weighing scale or weighing machine,** capable of measuring the mass of each size fraction to the nearest 0,1 %;

c) **Receivers or bins**, for collecting material passing through the sieves;

d) **Trays**, smooth, of non-corrodible material, of at least 400 mm × 400 mm, depending on the mass of sample and number of analysis required;

e) **Lids**, to fit the test sieves;

f) **Flat brush**, for cleaning the sieves and for brushing dust from the trays;

g) **Hardwood block**, about 150 mm long with a 10 mm × 10 mm cross-section, for tapping the sieves;

h) **Shovel or scoop**;

i) **Vibratory sieve shaker for mechanical sieving**. (see example Figure 2).

6 Sampling and preparation of sizing sample

The sieving shall be carried out on samples having less than 5,0 % moisture as per the following procedures:

a) For unknown cokes two gross samples shall be sampled in accordance with ISO 13909-5 or ISO 18283. Each gross sample shall be prepared in accordance with ISO 13909-6 or ISO 18283 and meet the minimum masses as quoted in Table 1 below. Prepare one of these samples for total moisture determination in accordance with ISO 579. If the total moisture is higher than 5,0 % (as sampled), dry the other sample sufficiently to reduce the total moisture content to lower than 5,0 % (as sampled). After the initial drying if the total moisture is still above 5,0 % further drying will be necessary until the sample moisture is less than 5,0 %. The final dried sample less than 5,0 % moisture is used for the test;

b) For known cokes with less than 5,0 % moisture from the same plant or same supplier no further pretreatment is required. If the moisture is above the 5,0 % level the drying time to reach less than 5,0 % (as sampled) may be determined by taking the average drying time over 10 lots. Alternatively, drying most coke samples for 12 h or more at 100 to 200 °C should render the sample suitable for sizing only. If only size analysis is required it is permissible to take one gross sample for sizing and use the determined period or the longer 12 h drying time at 100-200 °C to prepare the gross sample for sizing. Table 2 is used to determine the minimum mass needed at different levels of precision.

Table 1 — Minimum mass of sample for total moisture

Nominal top size mm	Minimum mass kg
> 125	2 000
125	1 000
90	500
63	250
45	125
31,5	60
22,4	30
16,0	15

Table 1 *(continued)*

Nominal top size mm	Minimum mass kg
11,2	8
10,0	6
8,0	4
5,6	2
4	1

Reference: ISO 13909-6

Table 2 — Minimum mass of sample for size analysis

Nominal top size of coal or coke mm	Minimum mass for a precision of 1 % kg	Minimum mass for a precision of 2 % kg
125	4 000	1 000
90	1 500	400
75	950	250
63	500	125
50	280	70
45	200	50
38	130	30
31,5	65	15
22,4	25	6
16,0	8	2
11,2	3	0,70
10,0	2	0,50
8,0	1	0,25
5,6	0,50	0,25
4,0	0,25	0,25
2,8	0,25	0,25

Reference: ISO 18283

7 Procedures

7.1 Sizing sample of particle size greater than 22,4 mm but less than 125 mm

a) Weigh the coke sample to be sized to the nearest 0,1 % of the mass of the sample;

b) Position the 22,4 mm aperture size sieve over an empty receiver or bin made from plastic to minimize breakage;

c) Place the coke on the sieve and move the coke by hand. Hand place each piece of coke in turn and if in any position and without forcing, it passes through the sieve opening, it is designated as passing 22,4 mm. See Figure 1. Alternatively, a mechanical sieve shaker (Figure 2) can be used to assist this process on a stop start basis;

d) Re-sieve the oversize by hand placing from the 22,4 mm aperture size sieve, on the larger aperture size sieves in the set, starting with the largest aperture size and working down to the smallest. (e.g.

start from the 125 mm sieve and hand place through subsequent smaller sieves down to 22,4 mm). Alternatively, a mechanical sieve shaker (Figure 2) can be used to assist this process on a stop start basis also. Collect each size fraction in a weighed (tared) empty bin (Figure 1) and reweigh to obtain the mass of each individual fraction;

e) Sieve the undersize from the 22,4 mm aperture size sieve as described in 7.3 or 7.4 or 7.5;

f) The 22,4 mm size has historically been used to size coke by hand placing above this size. However, it is permissible to use a similar screen in the 19 to 25 mm range for this function.

NOTE 1 Hand placing" refers to the operation defined in ISO 1213-2.

Figure 1 — Example of Standard sieves and tared bins for “Hand Placing” coke sizing

