
Coke — Determination of bulk density in a small container

*Coke — Détermination de la masse volumique en vrac dans un
récipient de petites dimensions*

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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.

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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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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 third edition cancels and replaces the second edition (ISO 567:1995), which has been technically revised.

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

- General and technical revision.
- The container to be used for determination of coke bulk density can either be cubical or cylindrical in shape with a capacity 0,2 m³.

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

The bulk density of coke depends on its physical characteristics, e.g. apparent relative density, shape and size of the coke particles, and on the dimensions of the container. The container specified in this International Standard has a capacity of 0,2 m³. The determination of bulk density of coke in a large container is described in ISO 1013.

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Coke — Determination of bulk density in a small container

1 Scope

This document specifies a method for the determination of the bulk density of coke in a cubical or cylindrical container of small capacity (0,2 m³). It is applicable to coke with a nominal top size not greater than 125 mm.

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. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 579, *Coke — Determination of total moisture*

ISO 728, *Coke — Size analysis by sieving*

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 following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

coke bulk density

mass of a portion of coke divided by the volume of the container, which is filled by that portion under specified conditions outlined in the procedure

4 Principle

A container of known mass and volume is filled with coke and the increase in mass is determined.

5 Apparatus

5.1 Cubical or cylindrical container, of small capacity (0,2 m³), with a smooth inner surface, and rigidly constructed. The exact volume of the small container shall be known. The container shall be waterproof and be resistant to deformation. A 200 l container (44 gallon drum) or a 100 l container is suitable for this purpose. A 44 gallon drum sliced to a height of 50 % is also suitable for this purpose.

5.2 Mass determination scale/machine, preferably of the platform type, of minimum capacity 200 kg and sufficiently accurate that the mass determination error does not exceed 0,1 % of the maximum load or 250 g, whichever is the smaller.

6 Test sample

Take a representative sample in accordance with ISO 13909-5 or ISO 18283. It is recommended that enough sample is taken to allow duplicate determinations and a reserve. Test samples of 3×200 kg for cokes ≤ 100 mm and for cokes $125 \text{ mm} \times 100 \text{ mm}$ sample masses of 1 000 kg are recommended.

7 Procedure

Determine the mass of the empty container by weighing the empty container, clean and dry on the scale or weighing machine (5.2) and record its mass, m_1 . Fill the container with water of known density until maximum capacity then determine the mass again. Determine the mass of water in the container and calculate the exact volume of the container in cubic metres, V .

NOTE The initial determination of m_1 and the volume of the container need only to be done in duplicate once during the first test. Thereafter these results are recorded and can be used for subsequent tests.

The container is emptied, cleaned and dried before proceeding with the test. It is recommended that the strip-mixing and splitting technique outlined in ISO 13909-6 and ISO 18283 be used to form the increments from the test sample that are charged to the container. Charge the coke slowly into the container until pieces of coke project above the top of the container across the whole surface. The height of drop of the coke shall not exceed 250 mm from the mouth of the implement being used to transfer the coke to the container, to the bottom of the container.

Slide a straight bar across the top of the container and remove any pieces of coke, which obstruct its passage. Determine the mass of the container plus the coke sample on the scale or weighing machine (5.2) and record its mass, m_2 .

Carry out a duplicate determination by repeating the procedure using a second portion of the test sample.

When the duplicate determinations are completed combine the test samples and prepare this sample for total moisture in accordance with ISO 13909-6 or ISO 18283. The resultant total moisture test sample, M , shall be analysed in duplicate in accordance with ISO 579.

8 Expression of results

The bulk density in a small container, ρ_s , of the coke, in kilograms per cubic metre, on a dry basis, is given by the following [Formula \(1\)](#):

$$\rho_s = \frac{m_2 - m_1}{V} \times \frac{100 - M}{100} \quad (1)$$

where

m_1 is the mass, in kilograms, of the empty container;

m_2 is the mass, in kilograms, of the container plus coke;

V is the capacity, in cubic metres, of the container;

M is the total moisture content of the coke, expressed as a percentage by mass, determined in accordance with ISO 579.

Calculate the mean of the two determinations and report the result to three significant figures.

For calculation of the result on an "as sampled" basis, omit the correction factor for moisture, i.e. " $(100 - M)/100$ ", in [Formula \(1\)](#).

9 Precision

9.1 Repeatability

The results of duplicate determinations, carried out in the same laboratory by the same operator with the same apparatus on representative portions of coke taken from the same test sample, should not differ by more than 30 kg/m³.

9.2 Reproducibility

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

10 Test report

The test report shall include the following information:

- The method used by reference to this document, i.e. ISO 567:2021.
- For unknown cokes it is recommended that a complete identification of the sample including recording the sample mass received and the total moisture determined be recorded.
- A full-coke sample size analysis in accordance with ISO 728 from +125 mm to -10,0 mm is also recommended. [Table 1](#) shows a typical example of a coke size analysis. However, the number and screen aperture sizes used may be varied. For known sized cokes that are sampled regularly from the same source the need for size analysis on every sample for bulk density would not be necessary.
- The date the test was completed.
- The results expressed in accordance with [Clause 8](#).

Table 1 — Coke sample size analysis

Sample identification:

Coke sample mass (kg):

Size fraction mm	Fractional mass %
>125	
125 × 100	
100 × 90	
90 × 75	
75 × 63	
63 × 50	
50 × 45	
45 × 31,5	
31,5 × 22,4	
22,4 × 16,0	
16,0 × 11,2	
11,2 × 10,0	
<10,0	