International Standard 728

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

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

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

Second edition — 1981-11-01

UDC 662.749.2 : 620.168.32 **Ref. No. ISO 728-1981 (E)**

Descriptors : coke, size determination, grain size analysis.

Price based on 3 pages

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 728 was developed by Technical Committee ISO/TC 27, *Solid mineral fuels*.

This second edition was submitted directly to the ISO Council, in accordance with clause 5.10.1 of part 1 of the Directives for the technical work of ISO. It cancels and replaces the first edition (i.e. ISO 728-1974), which had been approved by the member bodies of the following countries :

Australia	Egypt, Arab Rep. of	Romania
Austria	Germany, F.R.	South Africa, Rep. of
Belgium	India	Switzerland
Canada	Italy	Turkey
Chile	Korea, Rep. of	United Kingdom
Colombia	Netherlands	USA
Czechoslovakia	New Zealand	USSR
Denmark	Poland	

The member body of the following country had expressed disapproval of the document on technical grounds :

France

Printed in Switzerland

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

1 Scope and field of application

This International Standard specifies a method of determining the particle size distribution of a sample of coke of nominal top size greater than 20 mm.

2 References

ISO 565, *Test sieves — Woven metal wire cloth and perforated plate — Nominal sizes of aperture.*

ISO 2309, *Coke — Sampling.*

3 Principle

The sample is subjected to a process of size analysis by a specified procedure and the result expressed in terms of the cumulative percentages by mass of coke remaining on sieves of different sized apertures.

4 Apparatus

4.1 Suitable series of sieves, of suitable woven metal wire cloth, or perforated plate with round or square apertures, conforming to the requirements of ISO 565.

4.2 Weighing machine, preferably of the platform type, of suitable capacity and such that the weighing error does not exceed 0,1 % of the maximum mass of sample taken, or 100 g, whichever is the smaller.

5 Sample

The sample shall be representative of the coke under consideration. Its minimum mass will depend on its nominal upper size and on the place from which it is sampled (see ISO 2309, tables 2 and 3). The mass of the sample shall never be less than 40 kg and may be as much as 500 kg.

If the coke is excessively wet, the different size fractions will have different moisture contents; this will lead to variable errors in the determined masses of the various size fractions and hence in the calculated size analysis. Errors may also be caused by adhesion of small particles to larger ones. Accordingly, if the coke has a mean moisture content of more than 5 % (m/m), or is visibly wet, it shall be dried to a mean moisture content not exceeding 5 % (m/m) before sieving.

6 Procedure

Select a set of sieves suitable for the purpose (see 9.1 and 9.2) and, if possible, such that no size fraction will exceed about 25 % of the mass of the sample; arrange the sieves in a stack in order of size aperture with the smallest at the bottom.

Weigh the sample of coke, in several batches if necessary.

Place on the top sieve a quantity of the sample small enough to prevent choking and shake to allow most of the undersize to pass. Hand-place the coke remaining on the sieve (see 9.3) and transfer the oversize to a suitable container. Remove the top sieve and repeat these operations for sieves of aperture down to 40 mm.

Continue this procedure for sieves of aperture less than 40 mm, but using hand-shaking only (see 9.4), until the oversize on each sieve has been placed in a separate container. Mechanical sieving equipment may be used if it is proved to be free from bias (see 9.5).

If necessary, re-stack the sieves and repeat the procedure for successive quantities until the entire sample has been sized. At the end of each sieving operation, the oversize remaining on the sieve shall not cover more than 75 % of the sieving area.

Either weigh separately each container with its size fraction and subtract the tare masses, or, after weighing the fraction of largest size, add successively the other fractions and note the cumulative mass after each addition. The second method is preferable since it reduces the weighing error for the cumulative fractions.

7 Expression of results

Record the mass of each size fraction. Calculate the cumulative mass on each sieve starting with the sieve of largest aperture.

Record the apparent loss, i.e. the difference between the total mass of the sample before and after the size analysis. Loss in mass means loss of sample and should not occur. If the loss is not more than 1 % of the original sample mass, add it to the mass of the fraction of smallest size. If the loss is greater than 1 % of the original mass, reject the results of the size analysis.

Convert each cumulative mass to a percentage of the total mass. An example is given in the table below.

Also record the type of sieve used (round or square hole).

Report the results to the nearest 0,1 kg and 0,1 %.

Table — Example of size analysis of coke

Sieve size (diameter of round aperture)	Mass of fraction	Cumulative mass	Cumulative percentage oversize
mm	kg	kg	%
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 mm	7,4 + 1,1 = 8,5	448,3	100,0

Sum	447,2	
Original mass	448,3	
Loss in mass	1,1	The loss in mass, being less than 1 % of the original mass, is added to the fraction of smallest size (< 10 mm).
1 % of original mass	4,5	

8 Precision of determination

Mean size	Maximum permissible differences between results obtained	
	In the same laboratory (Repeatability)	In different laboratories (Reproducibility)
	2,5 mm	(see 8.2)

8.1 Repeatability

The results of duplicate determinations of mean size (see 9.6), carried out at different times in the same laboratory, by the same operator with the same apparatus, on samples obtained by taking alternate increments from the same consignment of coke, shall not differ by more than the above value.

8.2 Reproducibility

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

9 Notes on procedure

9.1 For each test, the sieves required shall be selected from those the apertures of which are specified in ISO 565, according to the requirements of the test and the characteristics of the sample.

For ungraded coke, suitable sieves would have nominal apertures of 125 — 100 — 80 — 71 — 63 — 50 — 40 — 31,5 — 20 and 10 mm. For coke of very large size, it may be necessary to use apertures of 200 — 180 — 160 and 140 mm, but these can conveniently be plates with single apertures.

For graded coke or nuts, the suitable sieves would have nominal apertures of 50 — 45 — 40 — 35 — 31,5 — 25 — 20 — 16 — 10 — 5,6 and 2,8 mm.

9.2 When, because of wear, any aperture in a sieve plate exceeds the nominal aperture by more than 1 % of the dimension of the aperture, blank off that aperture or change the sieve plate.

9.3 Hand-placing is the operation in which the sieve remains stationary and each particle of coke is handled; if a particle will, in any position and without forcing, pass through the sieve aperture, it is considered as undersize. Hand-placing, after a preliminary period of hand-shaking, is applied to sieves of all aperture sizes down to and including 40 mm.

9.4 Hand-shaking is the operation in which a sieve is held in the hands, or is freely suspended, and is given a horizontal oscillatory motion with a throw of about 75 mm. The coke which passes the sieve after fifty horizontal oscillations (each consisting of one movement to and fro) in a period of about 30 s is considered as undersize. Hand-shaking only is applied to sieves of aperture size less than 40 mm round.

9.5 Mechanical sieving is permissible, provided that it gives the same results as hand-sieving to within 3 % in terms of mean size (see 9.6).

9.6 For all methods of sieving, the mean size is calculated from the size analysis of coke. The mean size may be calculated in the following way :

Sieve apertures (in millimetres) $a\ b\ c\ d\ \ldots\ h\ j\ k$

Cumulative percentages $A\ B\ C\ D\ \ldots\ H\ J\ K$

the symbols being allocated so that $A = 0$ % and $K = 100$ % (i.e. $k = 0$ mm), then mean size is given by the formula

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

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

10 Test report

The test report shall include the following particulars :

a) an identification of the product tested;

b) the reference of the method used;

c) the results and the method of expression used;

d) any unusual features during the determination;

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