INTERNATIONAL STANDARD

ISO 13909-1

Second edition
2016-07-01

Hard coal and coke — Mechanical sampling —

Part 1: General introduction

Houille et coke — Échantillonnage mécanique —

Partie 1: Introduction générale

Reference number
ISO 13909-1:2016(E)

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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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword - Supplementary information.

The committee responsible for this document is ISO/TC 27, *Solid mineral fuels*, Subcommittee SC 4, *Sampling*.

This second edition cancels and replaces the first edition (ISO 13909-1:2001), which has been technically revised.

ISO 13909 consists of the following parts, under the general title *Hard coal and coke — Mechanical sampling*:

— *Part 1: General introduction*

— *Part 2: Coal — Sampling from moving streams*

— *Part 3: Coal — Sampling from stationary lots*

— *Part 4: Coal — Preparation of test samples*

— *Part 5: Coke — Sampling from moving streams*

— *Part 6: Coke — Preparation of test samples*

— *Part 7: Methods for determining the precision of sampling, sample preparation and testing*

— *Part 8: Methods of testing for bias*

Hard coal and coke — Mechanical sampling —

Part 1: General introduction

1 Scope

This part of ISO 13909 defines the basic terms used in the sampling of solid mineral fuels, describes the general principles of sampling and details the information to be provided in the documentation and the sampling report. It also lists the other parts and gives guidance on the selection of the appropriate part.

ISO 13909 does not include sampling of brown coals and lignites, or sampling from coal seams, for which guidance is given in ISO 14180. Manual sampling of coal and coke is covered in ISO 18283.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 565, *Test sieves — Metal wire cloth, perforated metal plate and electroformed sheet — Nominal sizes of openings*

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

ISO 5725-1:1994, *Accuracy (trueness and precision) of measurement methods and results — Part 1: General principles and definitions*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
air-drying
process of bringing the moisture content of the *sample* (3.31) near to equilibrium with the atmosphere in the area in which further reduction and division of the sample are to take place

Note 1 to entry: Air-drying to equilibrium with the atmosphere applies to coal. Drying of coke is generally to facilitate *sample preparation* (3.34).

3.2
bias
systematic *error* (3.10) which leads to the average value of a series of results being persistently higher or persistently lower than those which are obtained using a reference sampling method

3.3
coefficient of variation
standard deviation (3.37) expressed as a percentage of the absolute value of the arithmetic mean

3.4
common sample
sample (3.31) collected for more than one intended use

3.5
continuous sampling
taking of a *sample* (3.31) from each consecutive *sub-lot* (3.39) so that increments are taken at uniform intervals whenever the fuel is handled at the point of sampling

3.6
cut
see *increment* (3.15)

3.7
cutter
mechanical sampling device which extracts increment(s)

3.8
divided increment
part obtained from the division of the increment in order to decrease its mass

Note 1 to entry: Such division may be done with or without prior size reduction.

3.9
duplicate sampling
particular case of *replicate sampling* (3.30) with only two replicate *samples* (3.31)

3.10
error
difference between the observation and the accepted reference value as defined in ISO 5725-1:1994, 3.5

Note 1 to entry: This can be designated as systematic error [*bias* (3.2)] or *random error* (3.29).

3.11
fixed mass division
method of *sample division* (3.33) in which the mass retained is predetermined and independent of the mass of the feed

3.12
fixed ratio division
method of *sample division* (3.33) in which the division ratio is predetermined

Note 1 to entry: In fixed ratio division, the mass of *sample* (3.31) retained is a fixed proportion of the mass of the feed.

3.13
fuel
hard coal or coke

3.14
general-analysis test sample
sample (3.31), prepared to pass a sieve of nominal size of openings 212 µm complying with ISO 3310-1, used for the determination of most chemical and some physical characteristics

3.15
increment
portion of *fuel* (3.13) extracted in a single operation of the sampling device

3.16
lot
defined quantity of *fuel* (3.13) for which the quality is to be determined

Note 1 to entry: A lot may be divided into *sub-lots* (3.39).

3.17
manual sampling
collection of *increments* (3.15) by human effort

3.18
mass-basis sampling
taking of *increments* (3.15) whereby the position of each increment to be collected from the stream of *fuel* (3.13) is measured by a mass interval of stream flow and the increment mass is fixed

3.19
mechanical sampling
collection of *increments* (3.15) by mechanical means

3.20
mechanical sampling system
combination of sampling and *sample preparation* (3.34) performed mechanically

3.21
moisture sample
sample (3.31) taken specifically for the purpose of determining total moisture

Note 1 to entry: For coke, this sample may also be used for general analysis.

3.22
nominal top size
aperture size of the smallest sieve in the range included in the R 20 Series (as defined in ISO 565, square hole) on which not more than 5 % of the *sample* (3.31) is retained

3.23
off-line sample preparation
sample preparation (3.34) performed manually or mechanically on the *samples* (3.31) produced by the *mechanical sampling system* (3.20), using equipment not integral to the mechanical sampling system itself

3.24
on-line sample processing
processing of the primary *sample* (3.31) material using equipment integral with the sampling system

3.25
outlier
result which meets statistical criteria identifying an outlier, esp. exceeding Cochran's maximum variance test, and for which there is direct physical evidence of causation by gross deviation from the prescribed experimental procedure

3.26
physical sample
sample (3.31) taken specifically for the determination of physical characteristics, such as physical strength indices or size distribution

3.27
precision
closeness of agreement between independent test results obtained under stipulated conditions

Note 1 to entry: This is often defined using an index of precision, such as two *standard deviations* (3.37).

3.28
primary increment
increment (3.15) taken at the first stage of sampling, prior to any *sample division* (3.33) and/or *sample reduction* (3.35)

3.29
random error
error (3.10) that is statistically independent of previous errors

Note 1 to entry: This implies that any two errors in a series of random errors are uncorrelated and that individual errors are unpredictable. In consequence of the partitioning of error into systematic [*bias* (3.2)] and random components, the theoretical mean of the random errors is zero. Whereas individual errors are unpredictable, the mean of the random errors in a series of observations tends towards zero as the number of observations increases.

3.30
replicate sampling
taking at intervals of *increments* (3.15) which are combined in rotation into different containers to give two or more *samples* (3.31) of approximately equal mass

3.31
sample
quantity of *fuel* (3.13), representative of a larger mass for which the quality is to be determined

3.32
sampler
device physically collecting a sample *increment* (3.15)

Note 1 to entry: Not to be confused with personnel physically collecting an increment or operating a sampling system.

3.33
sample division
process in *sample* (3.31) preparation whereby the sample is divided into representative, separate portions

3.34
sample preparation
process of bringing *samples* (3.31) to the condition required for analysis or testing

Note 1 to entry: Sample preparation covers mixing, particle size reduction, *sample division* (3.33) and sometimes *air-drying* (3.1) of the sample and may be performed in several stages.

3.35
sample reduction
process in *sample preparation* (3.34) whereby the particle size of the *sample* (3.31) is reduced by crushing or grinding

3.36
size analysis sample
sample (3.31) taken specifically for particle size analysis

3.37
standard deviation
square root of the *variance* (3.43)

3.38
stratified random sampling
taking of an *increment* (3.15) at random within the mass interval or time interval determined for *mass-basis sampling* (3.18) or *time-basis sampling* (3.42), respectively

3.39
sub-lot
part of a *lot* (3.16) for which a test result is required

3.40
systematic sampling
taking of *increments* (3.15) at uniform mass or time intervals according to a predetermined plan

3.41
test sample
sample (3.31) which is prepared to meet the requirements of a specific test

3.42
time-basis sampling
taking of *increments* (3.15) whereby the position of each increment to be collected from the stream of *fuel* (3.13) is measured by a time interval and the increment mass is proportional to the flow rate at the time the increment is taken

3.43
variance
measure of dispersion, which is the sum of the squared deviations of observations from their average divided by one less than the number of observations

4 Structure

ISO 13909 is divided into eight parts. ISO 13909–2, ISO 13909–3 and ISO 13909–4 relate to coal only; ISO 13909–5 and ISO 13909–6 to coke only.

Basic statistical procedures and formulae which apply equally to the sampling of hard coal or coke and which underlie the decisions concerning numbers of sub-lots, increments and masses taken and information concerning the precision and bias of the sampling operation are, for the most part, found in ISO 13909–7 and ISO 13909–8.

The parts are as follows:

ISO 13909, *Hard coal and coke — Mechanical sampling*

Part 1: General introduction

Part 2: Coal — Mechanical sampling from moving streams

Part 3: Coal — Mechanical sampling from stationary lots

Part 4: Coal — Preparation of test samples

Part 5: Coke — Mechanical sampling from moving streams

Part 6: Coke — Preparation of test samples

Part 7: Methods for determining the precision of sampling, sample preparation and testing

Part 8: Methods of testing for bias

5 General principles of sampling

The purpose of taking and preparing a sample of fuel is to provide a test sample which, when analyzed, will provide test results representative of the lot sampled.

The first stage of sampling, known as primary sampling, is the taking of an adequate number of fuel portions known as primary increments from positions distributed over the entire lot. The primary increments are then combined into a sample, either as taken or after having been divided in order to reduce the mass of the sample to a manageable size. From this sample, the required number and types of test samples are prepared by a series of processes jointly known as sample preparation.