

SLOVENSKI STANDARD

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

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Combustibles minéraux solides -- Vocabulaire -- Partie 2: Termes relatifs à l'échantillonnage, l'essai et l'analyse du charbon

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INTERNATIONAL STANDARD

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Reference number
ISO 1213-2:1992(E)

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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.

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 1213-2 was prepared by Technical Committee ISO/TC 27, *Solid mineral fuels*.

It cancels and replaces ISO Recommendations R 1213-2:1971 and R 1213-3:1971, of which it constitutes a technical revision.

ISO 1213 consists of the following parts, under the general title *Solid mineral fuels* — *Vocabulary*:

- *Part 1: Terms relating to coal preparation*
- *Part 2: Terms relating to sampling, testing and analysis*

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Solid mineral fuels — Vocabulary —

Part 2:

Terms relating to sampling, testing and analysis

1 Scope

This part of ISO 1213 defines terms commonly employed in the sampling, testing and analysis of solid mineral fuels.

Alternative names are given for several terms; in some cases, however, the use of the alternative name is deprecated (as indicated).

An alphabetical index, with numerical cross-reference is provided.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 1213. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 1213 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 565:1990, *Test sieves — Metal wire cloth, perforated metal plate and electroformed sheet — Nominal sizes of openings*.

ISO 3310-1:1990, *Test sieves — Technical requirements and testing — Part 1: Test sieves of metal wire cloth*.

3 Terms and definitions

3.1 abrasion: Loss of material from particle surfaces of a solid mineral fuel, or from other surfaces in contact with the particles, caused by friction between contacting surfaces.

3.2 abrasion index: The total mass lost by the *abrasion* of four carbon steel blades when rotated in a specified mass of a solid mineral fuel under specified conditions, expressed in milligrams of metal lost per kilogram of solid mineral fuel.

3.3 accuracy: The closeness of agreement between an observation and the “true” value.

NOTE 1 The accuracy of a result should not be confused with its *precision*.

3.4 adventitious ash; extraneous ash (deprecated): Ash arising from *mineral matter* associated with, but not inherent in, a solid mineral fuel.

3.5 air-dried basis: A means of expressing an analytical result based on the condition in which a solid mineral fuel is in equilibrium with atmospheric humidity.

NOTE 2 The solid mineral fuel in this state is composed of residual moisture, *mineral matter* and organic matter.

3.6 anthracite: Coal of high *rank*, with a low *volatile matter* content and a semi-metallic lustre, and which does not soften or swell when heated.

3.7 apparent relative density: The ratio of the mass of a dry solid mineral fuel to the mass of a volume of water equal to the apparent volume of the solid mineral fuel at a specified temperature.

NOTE 3 The apparent relative density should not be confused with the *bulk density* (see 3.21).

3.8 ash: The residue obtained by incineration of a solid mineral fuel under specified conditions.

3.9 ash analysis: The analysis of *ash* for its elemental composition.

ISO 1213-2:1992(E)

NOTE 4 The elements usually determined are silicon, aluminium, iron, magnesium, titanium, calcium, sodium, potassium, phosphorus and sulfur, and these are usually expressed as oxides.

3.10 ash fusibility: Characteristic physical state of the *ash* obtained by heating under specified conditions.

NOTES

5 Ash fusibility is determined under either oxidizing or reducing conditions.

6 See also *deformation interval* (3.43), *deformation temperature* (3.44), *flow temperature* (3.58), *hemisphere temperature* (3.76) and *melting interval* (3.100).

3.11 ash viscosity: A measure of the resistance to flow of *ash* in the fused state.

3.12 base/acid ratio: The ratio of the mass of basic oxides [iron(III) oxide, calcium oxide, magnesium oxide, disodium oxide and dipotassium oxide] to the mass of acidic oxides [silica, aluminium oxide and titanium (IV) oxide] in *ash*.

NOTE 7 This ratio can be used in the determination of the *fouling factor* and the *slagging factor*.

3.13 batch: A quantity of a solid mineral fuel produced at one time under relatively uniform conditions.

3.14 bias: A systematic error which leads to results which are persistently higher or persistently lower than the "true" value.

3.15 bituminous coal: A general descriptive term for *coal* of *rank* between *anthracite* and *brown coal/lignite*.

NOTES

8 The vitrinites in all coals in the bituminous range melt and form a *coke* when the coal is heated above 400 °C in the absence of air.

9 In some countries coals of *rank* immediately below that of *bituminous coal* are referred to as sub-bituminous coals.

3.16 blast furnace coke: Strong, large *coke* for use in blast furnaces.

NOTES

10 Blast furnace coke is generally produced from blends of *bituminous coals*, which may incorporate additives.

11 Blast furnace coke usually has a low *reactivity* to carbon dioxide.

3.17 bottom size; lower size: The size corresponding to the 95 percentile on the cumulative *size distribution* curve of a material, i.e. the largest sieve size on which 95 % of the material is retained.

tribution curve of a material, i.e. the largest sieve size on which 95 % of the material is retained.

3.18 breakage: *Particle size reduction* resulting from impact and/or compression.

3.19 breeze: The undersize after separating the smallest size of *graded coke*.

NOTE 12 Breeze is usually less than 10 mm in size.

3.20 brown coal and lignite: Coals of low *rank* characterized by high inherent moisture, high *volatile matter* and low calorific value.

NOTE 13 In some countries the terms are used to describe all low *rank* coals up to *bituminous coals*. In other countries the coals at the higher end of the range are referred to as sub-bituminous coals.

3.21 bulk density: The mass of a portion of a solid mineral fuel divided by the volume of the container which is filled by that portion under specified conditions.

3.22 carbominerite: Collective term for intergrowths of minerals and *macerals*.

NOTE 14 The various types of carbominerite with their compositions are given in table 1.

SIST ISO 1213-2:1998

Table 1 — Types and compositions of carbominerite

Type	Volume percentage of minerals
Carbargillite	20 to 60, clay minerals
Carbopyrite	5 to 20, sulfides
Carbankerite	20 to 60, carbonates
Carbosilicite	20 to 60, quartz
Carbopolyminerite ¹⁾	20 to 60, various minerals
1) The term is used also for carbopolyminerite containing a maximum of 5 % of mineral matter, provided that sulfides form a substantial part of the mineral matter.	

3.23 carbon in mineral matter: The carbon in the *mineral matter* carbonates of a solid mineral fuel.

3.24 carboxyreactivity: The rate of reaction of a solid mineral fuel with carbon dioxide under specified conditions.

3.25 char: The solid, partially or non-agglomerated carbonaceous material produced by the pyrolysis of solid mineral fuels.

3.26 chute: An inclined trough for conveying solid mineral fuel to a lower level.

3.27 clinkering: The aggregation of particles of *ash* after it has melted during the course of combustion of a solid mineral fuel or during gasification.

NOTE 15 The aggregated particles may include small amounts of unburnt solid mineral fuel.

3.28 coal: Combustible sedimentary rock formed from altered plant remains consolidated under superimposed strata.

NOTE 16 The characteristics of different coals are due to differences in source plant material, in the conditions and the degree of change that the material has undergone in its geological history, and in the range of impurities present. Coals can be characterized macroscopically by their lithotype composition and microscopically by their *maceral* and *microlithotype* compositions.

3.29 coalification: Process by which sedimented compacted plant remains are transformed into *coal*.

NOTE 17 This process is characterized by an increase in the carbon content in the plant remains and a decrease in the *volatile matter* yield from the plant remains. As coalification proceeds, the *reflectances* of the *macerals* tend to increase. Vitrinite is used as a reference material for the determination of the *rank* of *coal* because its *reflectance* increases uniformly with the extent of coalification.

3.30 coefficient of variation: The *standard deviation*, s , expressed as a percentage of the absolute value of the arithmetic mean, $|\bar{x}|$

$$v = \frac{s}{|\bar{x}|} \times 100$$

NOTE 18 This term is usually designated as v .

3.31 coke: The solid, agglomerated carbonaceous residue produced by the pyrolysis of *coal* in the absence of air.

3.32 combustible matter: Theoretical state of a solid mineral fuel without moisture and *mineral matter* other than *pyritic sulfur* and sulfidic sulfur.

3.33 combustible sulfur: The sulfur which reacts with oxygen when a solid mineral fuel is burnt under specified controlled conditions.

3.34 common sample: A *sample* collected for more than one intended use.

3.35 complete seam profile sample for each bench: Collective designation of the coal samples taken separately from each coal bench and band of the tested seam or a part of it which is a section of a thick seam.

3.36 coning and quartering: An operation in which the thoroughly mixed material is piled into a conical heap on a clean, dry, non-absorbent surface, then

flattened into a uniform circular layer and divided into four equal portions by cuts at right angles, one pair of opposite quarters being retained while the other pair is rejected.

3.37 constant mass division: The method of increment or *sample division* in which the portions retained from individual *increments*, *partial samples* or *gross samples* are of uniform mass.

3.38 continuous sampling: The taking of a *sample* from every unit of the solid mineral fuel being handled.

3.39 correlation coefficient: A measure of the degree of correlation between the members of paired sets.

3.40 crucible swelling number: The number which defines, by reference to a series of standard profiles, the size and shape of the residue obtained when a specified mass of *coal* is heated in a covered crucible under specified conditions.

3.41 crush (to): To reduce the *particle size* of a *sample* to produce mainly coarse particles.

NOTE 19 See also to *grind* (3.70).

3.42 cut coke: Screened *coke* from which the over-size has been reduced by mechanical means and rescreened.

3.43 deformation interval; softening interval: The interval between the *deformation temperature* and the *hemisphere temperature*.

3.44 deformation temperature: The temperature at which deformation of a test piece prepared from ash, by a specified procedure, occurs.

NOTE 20 The deformation observed takes the following forms:

- when using cylindrical (or cubical) test pieces, a change of the surface and the rounding of the edges at the rim or corner;
- when using pyramidal test pieces, the rounding of the tip of the test piece.

3.45 dilatation: A measure of the volume change produced by heating a *coal* through its plastic range under specified conditions.

3.46 dirt band; shale band (deprecated): A layer of *mineral matter* lying parallel to the bedding plane in a seam of *coal*.

3.47 divided increment: The part obtained from the division of the *increment* in order to decrease its mass.

ISO 1213-2:1992(E)

NOTE 21 Such division may be done with or without prior size reduction.

3.48 dry ash-free basis: A means of expressing an analytical result based on a hypothetical condition in which the solid mineral fuel is considered to be free from both moisture and ash.

3.49 dry basis: A means of expressing an analytical result based on the condition in which the solid mineral fuel is free from moisture.

3.50 dry mineral-matter-free basis: A means of expressing an analytical result based on a hypothetical condition in which the solid mineral fuel is considered to be free from both moisture and *mineral matter*.

3.51 duplicate determination: The determination of a characteristic on two portions of the same *test sample* carried out by the same operator using the same apparatus but at different times.

3.52 duplicate sampling: A particular case of *replicate sampling* with only two replicate samples.

3.53 error: The difference between the observation and the "true" value, which can be designated systematic (*bias*) or random.

3.54 falling stream: A stream of solid mineral fuel in free fall, for example from the end of a conveyor.

3.55 fixed carbon: The remainder after the percentages of the moisture, *ash* and *volatile matter* are subtracted from 100.

3.56 fixed rate division: The method of increment or *sample division* in which the portions retained from individual *increments*, *partial samples* or *gross samples* have a mass proportional to the mass of the *increment*, *partial sample* or *gross sample*.

3.57 fixed sulfur: The sulfur which is present in the solid residue (non-volatile), after the pyrolysis of a solid mineral fuel at a particular temperature.

3.58 flow temperature: The temperature at which a test piece, prepared from *ash* by a specified procedure, loses its profile and flows to the extent that its height is one third of its height at the *hemisphere temperature*.

3.59 fluidity: A measure of the viscosity of a *coal* in its plastic state determined under specified conditions.

3.60 formed coke: Coke specially prepared from *coal* by processes involving the compaction of particles into a regularly shaped artifact.

3.61 forms of sulfur: A collective term for the *pyritic sulfur*, *sulfate sulfur* and *organic sulfur* in a solid mineral fuel.

NOTE 22 For the purposes of this definition, elemental sulfur and monosulfides, which may be present in certain solid mineral fuels, are disregarded.

3.62 fouling factor: A measure of the tendency of *ash* to form sintered deposits in the convective zone of a furnace.

3.63 foundry coke: Very strong, very large, dense *coke* for use in foundry cupola furnaces.

NOTE 23 It is prepared in coke ovens from selected coking coal blends, and may incorporate additives.

3.64 free moisture: The moisture which is lost by the solid mineral fuel *sample* in attaining approximate equilibrium with the atmosphere to which it is exposed.

3.65 gas coke: *Coke* usually made from high volatile *bituminous coal* at high temperature in gas-making carbonization plants.

3.66 general analysis: The determination of the chemical and physical characteristics of a solid mineral fuel, other than the determination of *total moisture*.

3.67 general analysis test sample: A *sample*, crushed to pass a sieve, of nominal size of openings 212 µm, complying with ISO 3310-1, used for the determination of most physical and chemical characteristics of a solid mineral fuel.

3.68 graded coke: *Coke* which has been screened between two specified sizes.

3.69 Gray-King coke type: The type, denoted by a letter, with a subscript in certain cases, which defines, by reference to a series of standard profiles, the size, strength and texture of the coke residue obtained when a specified mass of *coal* is heated in a retort tube under specified conditions.

3.70 grind (to); mill (to) (deprecated): To reduce the *particle size* of a *sample* to produce fine particles.

NOTE 24 See also *to crush* (3.41).

3.71 gross calorific value at constant volume: The amount of heat liberated per unit mass of a solid mineral fuel when it is burned in oxygen saturated with water vapour in a bomb calorimeter under specified conditions.

NOTE 25 The gross calorific value at *constant volume* is the negative value of the gross specific energy of combustion.

3.72 gross sample: The quantity of a solid mineral fuel consisting of all the *increments* or *partial samples* taken from a *sampling unit*, either in the condition as taken or after the *increments* have been individually reduced and/or divided.

3.73 hand placing: The operation by which an attempt is made to pass each particle of solid mineral fuel through a stationary sieve by presenting it to the sieve in all possible orientations but without the use of force.

3.74 hand shaking; manual shaking: The operation in which a sieve is held in the hands and is given a gentle horizontal oscillatory motion.

3.75 Hardgrove grindability index: A measure of the grindability of a *coal* determined by testing a specially prepared sample in standard apparatus.

3.76 hemisphere temperature: The temperature at which the height of a test piece, prepared from *ash* by a specified procedure, is equal to half the width of the base, and its shape becomes approximately hemispherical.

3.77 high temperature coke: The solid, agglomerated carbonaceous residue of the pyrolysis of *coal* at temperatures above 850 °C.

3.78 humic acids: A group of complex organic, amorphous compounds of high relative molecular mass which occur as free acids and as metal salts (humates).

3.79 hydrogen in mineral matter: The hydrogen in the *water of constitution* in the *mineral matter* of a solid mineral fuel.

3.80 hydoreactivity: The rate of reaction of a solid mineral fuel with water vapour under specified conditions.

3.81 hygroscopic moisture of brown coals and lignites: The part of *total moisture* which is retained by a *brown coal* or *lignite* after exposing it to the atmosphere and allowing it to attain a constant mass, at $20\text{ °C} \pm 2\text{ °C}$ and $(70 \pm 5)\%$ relative humidity.

3.82 ignition temperature: The minimum temperature at which a solid mineral fuel liberates enough *volatile matter* to form, together with the surrounding atmosphere, a flammable mixture.

3.83 increment: A portion of a solid mineral fuel collected in a single operation of the sampling instrument.

NOTE 26 For some types of sampling instrument, a single operation consists of a double pass (back and forth) through the stream.

3.84 inerts (inorganic): Constituents of a solid mineral fuel which decrease its efficiency in a specific use.

3.85 inerts (organic): The *maceral* components of a *coal* which do not soften or swell during the process of carbonization.

3.86 inherent ash: *Ash* arising from *mineral matter* present in the original plant material from which the solid mineral fuel was formed and from *mineral matter* incorporated intimately in the solid mineral fuel during the *coalification* process.

3.87 intermittent sampling: The taking of a *sample* from only certain units of the solid mineral fuel being handled.

3.88 Irsid indices: The percentages of a specially prepared sample of *coke* remaining on a test sieve of 40 mm nominal size of openings (round hole) and passing a test sieve of 10 mm nominal size of openings (round hole), denoted by I_{40} and I_{10} respectively, after the sample has been subjected to 500 revolutions by a specified procedure in a rotating drum.

NOTE 27 Other indices, for example I_{20} , may be reported in addition to, or in place of, I_{40} if required.

3.89 laboratory sample: A *sample* prepared from the *gross* or *partial sample* as delivered to the laboratory and from which further samples are prepared for test purposes.

3.90 large coal: *Coal* above a specified lower limiting size, without any upper size limit.

3.91 large coke: *Coke* with lower size of 20 mm and above, with or without upper size limit.

3.92 lot: A discrete quantity of a solid mineral fuel for which the overall quality needs to be determined.

3.93 low temperature coke: The solid, agglomerated carbonaceous residue of the pyrolysis of *coal* at a temperature between 500 °C and 850 °C.

3.94 lump section: A piece of solid mineral fuel of size suitable for polishing and examination under the microscope.

NOTE 28 One face of the lump section, usually that perpendicular to the bedding plane, is ground and polished.

3.95 maceral: Microscopically recognizable organic constituent of *coal* analogous to the minerals of inorganic rocks, but differing from them in that a maceral has no characteristic crystal form and is not constant in chemical composition.