INTERNATIONAL STANDARD

ISO 17225-9

First edition
2021-07

Solid biofuels — Fuel specifications and classes —

Part 9: Graded hog fuel and wood chips for industrial use

Biocombustibles solides — Classes et spécifications des combustibles —

Partie 9: Plaquettes et broyat de bois à usage industriel

Reference number
ISO 17225-9:2021(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 238, *Solid biofuels*.

This document replaces ISO/TS 17225-9:2020, which has been technically revised. The main changes are:

— general definitions;

— updated particle size distribution.

A list of all parts in the ISO 17225 series can be found on the ISO website.

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 objective of the ISO 17225 series is to provide unambiguous and clear classification principles for solid biofuels; to serve as a tool to enable efficient trading of biofuels; to enable good understanding between seller and buyer as well as a tool for communication with equipment manufacturers. It also facilitates authority permission procedures and reporting.

This document supports the use of graded hog fuel and wood chips for industrial heat and power generation applications, which require graded hog fuel and/or wood chips.

NOTE For individual contracts, ISO 17225-1 can be used.

Although this document may be obtained separately, it requires a general understanding of the standards based on and supporting ISO 17225-1. It is recommended to obtain and use ISO 17225-1 in conjunction with this document.

Solid biofuels — Fuel specifications and classes —

Part 9: Graded hog fuel and wood chips for industrial use

1 Scope

This document determines the fuel quality classes and specifications of graded hog fuel and wood chips for industrial use. It covers only hog fuel and wood chips produced from the following raw materials (see ISO 17225-1, Table 1):

— 1.1 Forest, plantation and other virgin wood;

— 1.2 By-products and residues from wood processing industry;

— 1.3 Used wood;

— 1.4 Blends and mixtures.

This document covers *hog fuel* that has pieces of varying size and shape, produced by crushing with blunt tools such as rollers, hammers, or flails, and *wood chips* which are defined as chipped woody biomass with a sub-rectangular shape and a typical length of 5 mm to 50 mm typically in the form of pieces with a defined particle size produced by mechanical treatment with sharp tools such as knives.

See 1.1.2 in ISO 17225-1, Table 1 for by-products and residues from wood processing industry, which can include chemically treated material (e.g. glued, painted, laminated), are not allowed to contain halogenated organic compounds or heavy metals at levels higher than those in typical virgin material values or higher than typical values of the country of origin (see Annex B in ISO 17225-1).

NOTE If 1.4 Blends and mixtures includes 1.3.2 Chemically treated used wood, it can be only used in the installations permitted to use 1.3.2.

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 14780, *Solid biofuels — Sample preparation*

ISO 16559, *Solid biofuels — Terminology, definitions and descriptions*

ISO 16948, *Solid biofuels — Determination of total content of carbon, hydrogen and nitrogen*

ISO 16968, *Solid biofuels — Determination of minor elements*

ISO 16994, *Solid biofuels — Determination of total content of sulfur and chlorine*

ISO 17225-1, *Solid biofuels — Fuel specifications and classes — Part 1: General requirements*

ISO 17827-1, *Solid biofuels — Determination of particle size distribution for uncompressed fuels — Part 1: Oscillating screen method using sieves with apertures of 3,15 mm and above*

ISO 18122, *Solid biofuels — Determination of ash content*

ISO 18125, *Solid biofuels — Determination of calorific value*

ISO 18134-1, *Solid biofuels — Determination of moisture content — Oven dry method — Part 1: Total moisture — Reference method*

ISO 18134-2, *Solid biofuels — Determination of moisture content — Oven dry method — Part 2: Total moisture — Simplified method*

ISO 18135, *Solid Biofuels — Sampling*

ISO 19743, *Solid biofuels — Determination of content of heavy extraneous materials larger than 3,15 mm*

ISO 21945, *Solid biofuels — Simplified sampling method for small scale applications*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 16559 and the following terms and definitions 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 https://www.electropedia.org/

3.1
chemical treatment
any treatment with chemicals other than air, water or heat

EXAMPLE Glue, paint, laminate.

Note 1 to entry: Examples of chemical treatments are listed in ISO 17225-1:2021, Annex C.

[SOURCE: ISO 17225-1:2021, 3.1]

3.2
contamination
occurrence of any undesirable matter such as chemical, physical and/or microbiological matter in the product

[SOURCE: ISO 16559:—[1)], 4.54]

3.3
heavy extraneous materials
EM_d
extraneous substances ≥ 3,15 mm with a specific density > 1 g/cm^3 of the dry matter in the fuel.

Note 1 to entry: Most of the particles are inorganic material, e.g. stones, glass or metal, but it also can include particles of non-biogenic origin e.g. plastic or rubber.

3.4
inorganic matter
non-combustible fraction of a fuel

[SOURCE: ISO 16559:—, 4.120]

4 Symbols and abbreviated terms

The symbols and abbreviated terms used in document comply with the SI system of units as far as possible.

1) Under preparation. Stage at the time of publication: ISO/FDIS 16559:2021.

A Designation for ash content on dry basis, A_d [% in mass]

ar as received

BD Designation for bulk density as received, BD_{ar} [kg/m^3 (loose volume)]

d dry (dry basis)

EM Designation for amount of heavy extraneous material on dry basis, EM_d [% in mass]

F Designation for amount of fines (<3,15 mm) on analysis moisture basis [% in mass]

L Designation for length as received, *L* [mm]

M Designation for moisture content as received on wet basis, M_{ar} [% in mass]

P Designation for particle size distribution on analysis moisture basis

Q Designation for net calorific value as received at constant pressure, $q_{p,net,ar}$ [MJ/kg or kWh/kg]

NOTE 1 1 MJ/kg equals 1 GJ/t or 0,277 8 kWh/kg (1 kWh/kg equals 1 MWh/t and 1 MWh/t is 3,6 MJ/kg). 1 g/cm^3 equals 1 kg/dm^3. 1 mg/kg equals 0,000 1 %.

NOTE 2 Designation symbols are used in combination with a number to specify property levels in Table 1 and Table 2. For designation of chemical properties, chemical symbols like S (sulfur), Cl (chlorine), N (nitrogen) are used and the property class is added at the end of the symbol.

5 Specification of graded hog fuel and wood chips for industrial use

Specification of the graded hog fuel and wood chips is stated in accordance with property levels in Tables 1 and 2. The sampling shall be carried out in accordance with ISO 18135 or ISO 21945, and sample preparation with ISO 14780. Analysis of the properties shall be carried out in accordance with the methods mentioned in Clause 2.

Property class I1 represents virgin woods and chemically untreated by-products and wood residues with or without bark. I2 has slightly higher ash content and/or moisture content.

Property classes I3 and I4 extend the origin and source of class I1 to include other materials, such as 1.2.2 Chemically treated industrial by-products and residues and 1.3.1 Chemically untreated used wood. Class I4 includes 1.1 Forest, plantation and other virgin wood, 1.2. By-products and residues from wood processing industry, 1.3 Used wood and 1.4 Blends and mixtures. If it contains 1.3.2 Chemically treated used wood, it may only be used in the installations permitted to use 1.3.2.

Raw materials belonging to the following classes shall not contain heavy metals or halogenated organic compounds exceeding virgin wood levels:

— 1.2.2 Chemically treated wood by-products, residues, fibres and wood constituents;

— 1.3.1 Chemically untreated used wood; or

— 1.3.2 Chemically treated used wood.

Heavy metals and halogenated organic compounds can be found in treatment with wood preservatives or coating. In case of raw materials belonging to property class 1.2.2 Chemically treated wood by-products, residues, fibres and wood constituents the actual origin or manufacturing process from which the raw material is sourced shall be clearly stated, e.g. 1.2.2 residues from laminated wood production.

EXAMPLE Hog fuel of class I3 or I4 produced from 99 % in mass of 1.1.1 stemwood from spruce and 1 % in mass of 1.2.2 glued wood from wood beam production (amount of glue < 0,1 % in mass of wood beam).

In general, chemical treatment of biomass before harvesting shall not be stated. Where any operator in the fuel supply chain has reason to suspect serious contamination of biomass or from soil (e.g. coal slag

heaps) or if planting has been used specifically for the sequestration of chemicals or growing woody biomass is fertilized with sewage sludge (issued from waste water treatment or chemical process), then fuel analysis shall be carried out to identify chemical impurities such as halogenated organic compounds or heavy metals.

Declaration of the ash content cannot provide sufficient information to describe the impacts of a hog fuel or wood chip batch on feeding and conversion processes.

For the production of hog fuel or wood chips with a raw material that often contains stones or other heavy extraneous materials e.g. stumps/roots or wood from gardens/parks it is recommended:

— To determine content of these stones or other heavy extraneous materials in accordance with ISO 19743.

— To declare maximum content (% in mass) contamination of heavy extraneous materials (e.g. stones).

If data for chemical or physical properties are available, further analysis may not be required.

To ensure resources are used appropriately and the declaration is accurate, use the most appropriate measure below:

a) using previously measured values or values obtained by experience with the same raw material;

b) calculation of properties, e.g. by using typical values and considering generally accepted and documented specific values;

c) carrying out of analysis:

   1) with simplified methods if available;

   2) with reference methods.

The responsibility of the producer or supplier to provide correct and accurate information is the same whether laboratory analysis is performed or not. Typical values do not release the producer or supplier from providing accurate and reliable information.

In Table 1 particle size classes are shown.

Table 2 specifies property classes for hog fuel and wood chips.

The average value of a delivery lot shall not exceed limits specified in this document.

The quality shall be given in the product declaration.

Table 1 — Particle size of graded hog fuel and wood chips for industrial use

Dimensions for P16 – P63 (mm) ISO 17827-1 [a, b, c]				
Particle size class	Main fraction (minimum 60 % in mass), mm	Coarse fraction, % in mass (sieve aperture size or length of particle, mm)	Fines fraction (F) (< 3,15 mm), % in mass	Maximum length (L) of particles [c], mm
P16	3,15 mm ≤ m < 16 mm	≤ 6 %, ≥ 31,5 mm	to be stated from F-classes below	value to be stated
P31	3,15 mm ≤ m < 31,5 mm	≤ 6 %, ≥ 45 mm		
P45	3,15 mm ≤ m < 45 mm	≤ 10 %, ≥ 63 mm		
P63	3,15 mm ≤ m < 63 mm	≤ 10 %, ≥ 100 mm		
Dimensions for PL10 – PL30+ (mm) ISO 17827-1 [a, c, d]				
Particle size class	Particle size fractions (% in mass)	Mass of long particles (100 mm ≤ m ≤ maximum length of particle), % in mass	Fines fraction (F) (< 3,15 mm), % in mass	Maximum length (L) of particle [c], mm
PL 10	all screening results to be stated	0 % ≤ m ≤ 10 %	to be stated from F-classes below	value to be stated
PL 20		10 % < m ≤ 20 %		
PL 30		20 % < m ≤ 30 %		
PL 30+		m > 30 % (value to be stated)		
Fines fraction, F (< 3,15 mm % in mass) ISO 17827-1				
F02	≤ 2 %			
F05	≤ 5 %			
F10	≤ 10 %			
F15	≤ 15 %			
F20	≤ 20 %			
F25	≤ 25 %			
F30	≤ 30 %			
F30+	> 30 % (maximum value to be stated)			

[a] For the production of hog fuel raw materials often contain stones or other heavy extraneous materials e.g. stumps/roots, wood from garden/parks or used wood. It is recommended to determine and specify the content of these stones or other heavy extraneous materials (EM_d) in % in mass according to ISO 19743. Heavy extraneous material shall be sorted out before sieving. This material shall not be reported as part of the fuel fractions (see Table 2, EM). The declaration of the ash content alone cannot provide sufficient information to describe the impacts of a hog fuel batch on feeding and conversion processes. Small stones, sand and soil which pass the 3,15 mm sieve contribute to the ash content but not to the content of heavy extraneous material.

[b] The numerical values (P-class) for dimensions up to P63 refer to the mass of particle sizes (at least 60 % in mass) passing through the mentioned round hole sieve size (ISO 17827-1) and staying on the mentioned lower sieve size. Sieves with sieve aperture sizes to be used for size classification are: 3,15 mm, 16 mm, 31,5 mm, 45 mm, 63 mm. Any sample can only belong to one size class, which always is the lowest possible class based on the main fraction. (ISO 17827-1).

[c] Maximum length only has to be determined for those particles, which are found in the coarse fraction.

[d] The fuel in the PL classes is typically made of logging residues, garden and park wood or used wood. These fuels can contain many long particles or lot of fines and therefore there is no clear main fraction. For PL classes all screening results shall be reported. Sieves with sieve aperture sizes to be used for size classification are: 3,15 mm, 16 mm, 31,5 mm, 45 mm, 63 mm. Any sample can only belong to one size class, which is lowest possible class (ISO 17827-1). It is recommended to use these fuels in medium and large scale appliances.

Table 2 — Specification of graded hog fuel and wood chips for industrial use

	Property class, Analysis method	**Unit**	**I1**	**I2**	**I3**	**I4**
Normative	Origin and source, ISO 17225-1		1.1. Forest, plantation and other virgin wood [a] 1.2.1 Chemically untreated by-products and residues	1.1. Forest, plantation and other virgin wood [a] 1.2.1 Chemically untreated by-products and residues	1.1 Forest, plantation and other virgin wood 1.2. By-products and residues from wood processing industry 1.3.1 Chemically untreated used wood	1.1 Forest, plantation and other virgin wood 1.2. By-products and residues from wood processing industry 1.3 Used wood [b] 1.4 Blends and mixtures [b]
	Particle size, P ISO 17827-1	mm	to be selected from Table 1			
	Moisture, M [c], ISO 18134-1, ISO 18134-2	% in mass	M45 ≤ 45	M50 ≤ 50	M55 ≤ 55	M60 ≤ 60
	Ash, A, ISO 18122	% in dry mass	A3.0 ≤ 3,0	A5.0 ≤ 5,0	A6.0 ≤ 6,0	A7.0 ≤ 7,0
	Nitrogen, N, ISO 16948	% in dry mass	N0.5 ≤ 0,5	N1.0 ≤ 1.0	N1.0 ≤ 1,0	N1.5 ≤ 1,5
	Sulfur, S, ISO 16994	% in dry mass	S0.05 ≤ 0,05	S0.1 ≤ 0,1	S0.1 ≤ 0,1	S0.1 ≤ 0,1
	Chlorine, Cl, ISO 16994	% in dry mass	Cl0.05 ≤ 0,05	Cl0.05 ≤ 0,05	Cl0.1 ≤ 0,1	Cl0.1 ≤ 0,1
	Arsenic, As, ISO 16968	mg/kg dry	≤ 1	≤ 1	≤4	≤ 4
	Cadmium, Cd, ISO 16968	mg/kg dry	≤ 2,0	≤ 2,0	≤ 2,0	≤ 2,0
	Chromium, Cr, ISO 16968	mg/kg dry	≤ 20	≤ 20	≤ 20	≤ 30
	Copper, Cu, ISO 16968	mg/kg dry	≤ 30	≤ 30	≤ 30	≤ 50
	Lead, Pb, ISO 16968	mg/kg dry	≤ 10	≤ 20	≤ 20	≤ 30
	Mercury, Hg, ISO 16968	mg/kg dry	≤ 0,1	≤ 0,1	≤ 0,1	≤ 0,1
	Nickel, Ni, ISO 16968	mg/kg dry	≤10	≤ 10	≤10	≤ 10
	Zinc, Zn, ISO 16968	mg/kg dry	≤ 100	≤ 100	≤100	≤ 100
	Net calorific value, Q [d], ISO 18125	MJ/kg or kWh/kg as received	Minimum value shall be stated.			