INTERNATIONAL STANDARD

ISO 17225-4

Second edition
2021-02

Solid biofuels — Fuel specifications and classes —

Part 4: Graded wood chips

Biocombustibles solides — Classes et spécifications des combustibles —

Partie 4: Classes de plaquettes de bois

Reference number
ISO 17225-4:2021(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 TC238, *Solid biofuels*.

This second edition cancels and replaces the first edition (ISO 17225-4:2014), which has been technically revised. The main changes compared to the previous edition are as follows:

— particle size distribution classification updated;

— moisture and ash content classes updated;

— Annex A updated.

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 solid 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 [2].

This document supports the use of graded wood chips for small and medium residential, commercial and public building applications.

Depending on the type of energy conversion technology used (boilers, heaters, gasifiers, etc., the tolerances for a particular quality of wood chips will be different.

Scales of applications and their typical operation range:

- below 100 kW (Residential);
- from 75 to 500 kW (Small; e.g. residential, public and commercial buildings);
- from 500 kW to 1,5 MW (Medium; public and commercial buildings);
- 1,5 MW to 5 MW (Large; small industrial facilities and district heating);
- over 5 MW (Industrial; recommended to use 'ISO 17225-1 or ISO/DIS 17225-9[1)])

The scale used for grouping the applications utilizing wood chips is for illustration only and in practice, some overlaps between the applications and the scales are expected.

The residential, small and medium commercial and public building applications require high quality fuel for the following reasons:

- Small-scale equipment usually does not have advanced controls and flue gas cleaning.
- Appliances are not generally managed by professional heating engineers.
- Appliances are often located in residential and populated districts.

NOTE 1 Wood chips produced according to this document can be used in boilers tested according to EN 303–5[1].

NOTE 2 For individual contracts and industrial use, ISO 17225-1 or ISO/DIS 17225-9 can be used.

Although this document can 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.

1) Under preparation. Stage at the time of publication: ISO/DIS 17225-9:2021.

Solid biofuels — Fuel specifications and classes —

Part 4: Graded wood chips

1 Scope

This document determines the fuel quality classes and specifications of graded wood chips. This document covers only wood chips produced from the following raw materials (see ISO 17225-1:2021, Table 1):

- 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.

This document covers only wood chips, which are produced with sharp tools, and does not cover hog fuel, which is produced with blunt tools.

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

ISO 18135, *Solid Biofuels — Sampling*

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 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 http://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 treatment are listed in ISO 17225-1.

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

3.3
commercial application
facility that utilizes solid biofuel burning appliances or equipment that have similar fuel requirements as residential appliances

Note 1 to entry: Commercial applications should not be confused with industrial applications, which can utilize a much wider array of materials and have vastly different fuel requirements.

[SOURCE: ISO 17225-1 2021, 3.2]

4 Symbols and abbreviated terms

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

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

ar as received

BD Designation for bulk density as received [kg/m^3 (loose volume)]

d dry (dry basis)

F Designation for amount of fines (< 3,15 mm) as determined [% in mass]

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

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

P Designation for particle size distribution as determined

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

NOTE 1 1 MJ/kg equals 1 GJ/t or 0,2 778 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. 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 wood chips

Specification of the graded wood chips is stated in accordance with Table 1 and 2. The sampling (ISO 18135 or ISO 21945), sample preparation (ISO 14780) and analysis of the properties shall be carried out in accordance with the methods mentioned in the normative references in Clause 2.

Property classes A1 and A2 represent virgin woods and chemically untreated wood residues. A1 represents fuels with lower moisture content, while class A2 has slightly higher moisture content. B1 extends the origin and source of class A to include other material, such as short rotation coppice from contaminated soil, wood from gardens and plantation etc. Property class B2 also includes 1.2.2 chemically treated industrial by-products and residues and 1.3.1 chemically untreated used wood according to Table 1 in ISO 17225-1:2021.

1.2.2 Chemically treated wood by-products, residues, fibres and wood constituents according to Table 1 in ISO 17225-1:2021 and 1.3.1 chemically untreated used wood according to Table 1 in ISO 17225-1:2021 are included in property class B2. In these cases, raw material shall not contain heavy metals exceeding virgin wood levels or halogenated organic compounds. 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 according to Table 1 in ISO 17225-1:2021.

EXAMPLE Wood chips of class B2 produced from 99 % in mass stemwood from spruce 1.1.3, and 1 % in mass glued wood from wood beam production (amount of glue < 0,1 % in mass of beam mass).

In general, it is not necessary to state chemical treatment of biomass before harvesting. Where any operator in the fuel supply chain has reason to suspect serious contamination from biomass to 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.

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:

1) using previous measured values or obtained by experience of same raw material;

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

3) carrying out of analysis:

   3a) with simplified methods if available;

   3b) with reference methods.

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

The threshold values (N, S, Cl and minor elements) for grade A1 and A2 are not required as these classes of fuels are chemically untreated wood residues or from virgin material, which has been grown in uncontaminated land and therefore the likelihood of contamination is very low.

In Table 1 particle size classes are shown and in Annex A bulk densities for different moisture content ranges are given.

The quality shall be given in the product declaration.

Table 1 — Particle size of graded wood chips

Dimensions (mm) ISO 17827-1 [a, b, c]				
Particle class	Main fraction [a] (minimum 60 % in mass), mm	Coarse fraction, % in mass [a] (sieve aperture size or length of particle, mm)	Fines fraction (F) (< 3,15 mm), % in mass	Max. length (L) of particles [c], mm
P16s	3,15 mm ≤ m < 16 mm	≤ 6 %, ≥ 31,5 mm	≤ 15 %	45 mm
P31s	3,15 mm ≤ m < 31,5 mm	≤ 6 %, ≥ 45 mm	≤ 10 %	120 mm
P45s	3,15 mm ≤ m < 45 mm	≤ 10 %, ≥ 63 mm	≤ 10 %	200 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		
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] Use Ps-classes for wood chips for residential and small-scale commercial applications. The numerical values for dimensions up to P45s refer to the mass of particle sizes (at least 60 % in mass) passing through the mentioned round hole sieve sizes (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 and 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).

[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 sizes (ISO 17827-1) and staying on the mentioned lower sieve size. Sieve sizes to be used for size classification are: 3,15 mm, 16 mm, 31,5 mm, 45 mm and 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 to be determined for those particles, which are to be found in the coarse fraction. Maximum 2 pieces of about 10 l sample may exceed the maximum length, if the cross sectional area (ISO 17827-1) is < 0,5 cm^2.

Table 2 — Specification of graded wood chips

	Property class, Analysis method	**Unit**	**A**		**B**	
			1	**2**	**1**	**2**
Normative	Origin and source, ISO 17225-1		1.1.1 Whole trees without roots [a] 1.1.3 Stemwood 1.1.4 Logging residues 1.2.1 Chemically untreated wood residues	1.1.1 Whole trees without roots [a] 1.1.3 Stemwood 1.1.4 Logging residues 1.2.1 Chemically untreated wood residues	1.1 Forest, plantation and other virgin wood [b] 1.2.1 Chemically untreated wood residues	1.2. By-products and residues from wood processing industry 1.3.1 Chemically untreated used wood
	Particle size, P, ISO 17827-1	mm	to be selected from Table 1		to be selected from Table 1	
	Moisture, M [c, d], ISO 18134-2	% in mass	≤ 25 Values below 10 % in mass to be stated	> 25 and ≤ 55 Value range to be stated	≤ 35 Values below 10 % in mass to be stated	> 15 and ≤ 55 Value range to be stated
	Ash, A, ISO 18122	% in mass, dry	A1.5 ≤ 1,5	A1.5 ≤ 1,5	A3.0 ≤ 3,0	A3.0 ≤ 3,0
	Nitrogen, N, ISO 16948	% in mass, dry	Not applicable	Not applicable	N1.0 ≤ 1,0	
	Sulfur, S, ISO 16994	% in mass, dry	Not applicable	Not applicable	S0.1 ≤ 0,1	
	Chlorine, Cl, ISO 16994	% in mass, dry	Not applicable	Not applicable	C l0.05 ≤ 0,05	
	Arsenic, As, ISO 16968	mg/kg, dry	Not applicable	Not applicable	≤ 1	
	Cadmium, Cd, ISO 16968	mg/kg, dry	Not applicable	Not applicable	≤ 1	
	Chromium, Cr, ISO 16968	mg/kg, dry	Not applicable	Not applicable	≤ 10	
	Copper, Cu, ISO 16968	mg/kg, dry	Not applicable	Not applicable	≤ 10	
	Lead, Pb, ISO 16968	mg/kg, dry	Not applicable	Not applicable	≤ 10	
	Mercury, Hg, ISO 16968	mg/kg, dry	Not applicable	Not applicable	≤ 0,1	
	Nickel, Ni, ISO 16968	mg/kg, dry	Not applicable	Not applicable	≤ 10	
	Zinc, Zn, ISO 16968	mg/kg, dry	Not applicable	Not applicable	≤ 100	

	Property class, Analysis method	Unit	A1	A2	B1 and B2
Informative	**Bulk density, BD** [e], ISO 17828 [3]	kg/m^3 as received	BD150 ≥ 150 BD200 ≥ 200 BD250 ≥ 250	BD150 ≥ 150 BD200 ≥ 200 BD250 ≥ 250 BD300 ≥ 300	Minimum value to be stated
	Net calorific value, Q [f], ISO 18125 [4]	MJ/kg or kWh/kg as received	Minimum value to be stated		Minimum value to be stated

[a] Excluding class 1.1.1.3 Short rotation coppice, if reason to suspect contamination of land or if planting has been used for the sequestration of chemicals or growing trees have been fertilized by sewage sludge (issued from waste water treatment or chemical process).

[b] Excluding classes 1.1.5 Stumps/roots and 1.1.6 Bark.

[c] In any particular batch of delivered wood chips, the moisture content of each of five randomly selected samples (increments) shall not exceed ± 5 percentage points of the average percent moisture of the selected samples. For example, if the average percent moisture is 37 % in mass, the percent moisture of any of the five samples shall be between 32 and 42 % in mass. It is recommended to specify the range of moisture content(s) in the fuel supply contract.

[d] Gasification systems often require a moisture level below 20 % in mass.

[e] The bulk density is lower for coniferous than for broadleaf wood, see informative Annex A.

[f] See Annex D from ISO 17225-1:2021 for calculation of net calorific value as received.