



DZS 1272 – 2: 2023
ICS: 75.160.40
First Edition

Draft Zambian Standard

BIOMASS PELLETS – Specification

Part 2: Wood and Non-Woody Pellets

DRAFT STANDARD FOR PUBLIC COMMENTS

ZAMBIA BUREAU OF STANDARD

Amendments issued since publication

Amdt No.	Date	Text affected

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DATE OF PUBLICATION

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FOREWORD

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This Draft Zambian Standards has been prepared with assistance drawn from: revision of this standard was necessary to ensure that the technological advancements in the sector are taken into consideration.

In the preparation of this standard, the following publication was consulted:

ISO 17225 – 2(2021) Solid biofuels — Fuel specifications and classes — Part 2: Graded wood pellets

ACKNOWLEDGEMENT

The Zambia Bureau of Standards would like to acknowledge the invaluable material and financial support of the Energy Regulation Board (ERB) and United States Agency for International Development (USAID) – Alternatives to Charcoal Project (A2C) and all the institutions and stakeholders that contributed in the promulgation of this standard.

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Draft Zambian Standard

BIOMASS PELLETS – Specification

Part 2: Wood and Non–Woody Pellets

1.0 SCOPE

This Zambian Standard determines the fuel quality classes and specifications of graded wood pellets for non-industrial and industrial use, as well as graded non-woody pellets for commercial and residential use. This document covers biofuel pellets produced from source materials listed in Part 1.

2.0 NORMATIVE REFERENCES

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. All standards are subject to revision and, since any reference to a standard is deemed to be a reference to the latest edition of that standard, parties to agreements based on this standard are encouraged to take steps to ensure the use of the most recent editions of the standards indicated below. Information on currently valid National and International standards can be obtained from Zambia Bureau of Standards.

DZS 1272 – 1	Biomass Pellets – Specification, Part 1: General Requirements
ZS ISO 14780	Solid biofuels – Sample preparation
ZS ISO 18135	Solid biofuels - Sampling
ZS ISO 21945	Solid biofuels – Simplified sampling method for small scale applications

3.0 DEFINITIONS

For the purposes of this standard, the following definitions shall apply:

- 3.1. **Additives:** material which has been intentionally introduced into the fuel feed stock to improve quality of fuel (e.g. combustion or durability properties), to reduce emissions or to make production more efficient

NOTE: Trace amounts of e.g. grease or other lubricants that are introduced into the fuel processing stream as part of normal mill operations are not considered as additives

- 3.2. **Ash:** residue remaining after combustion of a fuel under specified conditions, typically expressed as a percentage of the mass of dry matter in fuel

- 3.3. **As received:** condition of a biofuel pellet as it is received at distribution location and at end user point

- 3.4. **Biofuel pellet:** densified biofuel made with or without additives usually with a cylindrical form, random length typically 5 mm to 40 mm and diameter up to 25 mm and broken ends, produced by compressing biomass

NOTE 1: Usually the biomass has been milled before densification.

NOTE 2: See also non-woody pellet, wood pellet and pellet from thermally treated biomass.

- 3.5. **Chemical treatment:** any treatment with chemicals other than treatment with air, water or heat

NOTE 1: Examples of chemical treatments are listed in Annex C of DZS 1272 – 1.

- 3.6. **Coarse pellet fines (CPF):** particles with a size ranging from ≥ 3.15 mm to < 5.6 mm resulting from breakage of pellets during production or handling.

- 3.7. Commercial application:** facility that utilizes solid biofuel burning appliances or equipment that have similar fuel requirements as residential appliances.

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

- 3.8. Fines (F):** fraction of small sized particles as defined by a specification or end-user.

NOTE 1: In the solid biofuels standards fines are always defined as particles passing through a 3.15 mm round hole sieve.

- 3.9. Non-woody biomass:** biomass originating from herbaceous, fruit or aquatic biomass as well as blends or mixtures of woody and non-woody biomass

- 3.10. Non-woody biofuel pellets:** biofuel pellets produced from non-woody biomass.

- 3.11. Woody biomass:** biomass originating from trees, bushes and shrubs together with their fruit, leaves and needles inherent to the biomass.

Note 1 to entry: This definition includes forest, plantation and other virgin wood, wood processing industry by-products and residues, and used wood.

- 3.12. Wood pellet:** biofuel pellet (3.4) made from woody biomass (3.11).

4.0 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_{ad} [% in mass]
ar	as received
BD	Designation for bulk density as received [kg/m ³ (loose volume)]
CPF	Designation for amount of coarse pellet fines as received [% in mass, particles ≥ 3.15 mm and < 5.6 mm]
D	Designation for diameter as received, D [mm]
d	dry (dry basis)
DE	Designation for particle density as received [g/m ³]
DT	Designation for deformation temperature of the fuel ash [°C]
DU	Designation for mechanical durability as received [% in mass]
F	Designation for amount of fines (< 3.15 mm) as determined [% in mass]
FT	Designation for flow temperature of the fuel ash [°C]
HT	Designation for hemisphere temperature of the fuel ash [°C]
L	Designation for length as received, L [mm]
M	Designation for moisture content as received, M_{ar} [% in mass]

- Q Designation for net calorific value at constant pressure as received, $Q_{p,net,ar}$ [MJ/kg or kWh/kg]
- SST Designation for shrinkage starting temperature of the fuel ash [°C]

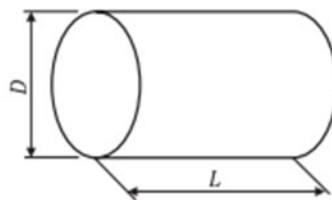
Note 1: 1MJ/kg equals 1GJ/t or 0.2778 kWh/kg equals 1 MWh/t and 1 MWh/t is 3.6 MJ/kg. 1g/cm³ equals 1 kg/dm³. 1 mg/kg equals 0.0001%.

Note 2: Designation symbols are used in combination with a number to specify property levels in Table 3 to 15. For designation of chemical properties, chemical symbols such as S (sulfur), Cl (chlorine), and N (nitrogen) are used and the property class is added at the end of the symbol.

5.0 SPECIFICATION OF BIOFUEL PELLETS

5.1 Specification of graded non-woody pellets

- 5.1.1 Specifications of the non-woody pellets are stated in accordance with Table 1 and Figure 1. Sampling, sample preparation and analysis of the properties of solid biofuels shall be carried out in accordance with the methods mentioned in the normative references in Clause 2.



Key

D diameter

L length

Figure 1 — Dimension of pellets

- 5.1.2 In general, chemical treatment before harvesting of biomass does not need to be stated. Where any operator in the fuel supply chain has reason to suspect serious contamination of the biomass or the soil (e.g coal slag heaps) or if planting has been used specifically for the sequestration of chemicals or growing biomass is fertilized by sewage sludge (originating from waste treatment of chemical process), then fuel analysis should be carried out to identify chemical impurities such as halogenated organic compounds or heavy metals. In case of raw materials belonging to chemically treated herbaceous and fruit biomass according to DZS 1272 – 1 the actual origin of the raw material shall be clearly described.
- 5.1.3 To ensure the end-user receives pellets with low level of fines, the amount of fines shall be stated when leaving the final point of loading for delivery to the end-user (see Table 1). Between factory gates and the end-user, distributors should take appropriate measures to maintain this low level of fines.
- 5.1.4 To ensure that pellets maintain their quality, the handling and storage (including the equipment) shall be appropriate at different stages of supply or delivery chain ending to the end-user storage.

NOTE 1: The fines requirement has been included to ensure small-scale users are protected from handling and combustion issues while operating their combustion plant/appliance.

- 5.1.5 The quality shall be given either in the product declaration or by a corresponding label on the package.

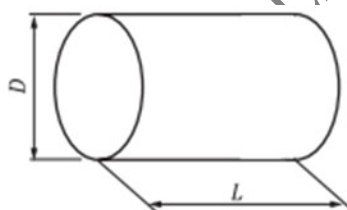
Table 1 – Specification of pellets produced from herbaceous biomass, fruit biomass, aquatic biomass and blends and mixtures

	Property class, Analysis method	Units	A	B
Normative	Origin and source ¹ , ISO 17225-1:2021, Table 1		2 Herbaceous biomass 3 Fruit biomass 4 Aquatic biomass 5 Blends and mixtures	2 Herbaceous biomass 3 Fruit biomass 4 Aquatic biomass 5 Blends and mixtures
	Diameter, D^b and Length L^c , ISO 17829 According to Figure 1	mm	D06 to D25, $D \pm 1$; $3,15 \leq L \leq 40$ (from D06 to D10) $3,15 \leq L \leq 50$ (from D12 to D25)	D06 to D25, $D \pm 1$; $3,15 \leq L \leq 40$ (from D06 to D10) $3,15 \leq L \leq 50$ (from D12 to D25)
	Moisture, M, ISO 18134-1, ISO 18134-2	% in mass as received, wet basis	M12 \leq 12	M15 \leq 15
	Ash, A, ISO 18122	% in mass dry	A6,0 \geq 6	A10 \leq 10
	Mechanical durability ² , DU, ISO 17831-1	% in mass as received	DU97,5 \geq 97,5	DU96,0 \geq 96,0
	Fines, F ⁴ , ISO 18846	% in mass as received	F2,0 \leq 2,0	F3,0 \leq 3,0
	Additives ³	% in mass as received	\leq 5 Type and amount to be stated	\leq 5 Type and amount to be stated
	Net calorific value, Q _n , ISO 18125	MJ/kg or kWh/kg as received	Q14,5 \geq 14,5 or Q4,0 \geq 4,0	Q14,5 \geq 14,5 or Q4,0 \geq 4,0
	Bulk density, BD, ISO 17828	kg/m ³ as received	BD600 \geq 600	BD550 \geq 550
	Nitrogen, N, ISO 16948	% in mass, dry	N1,5 \leq 1,5	N2,0 \leq 2,0
	Sulfur, S, ISO 16994	% in mass, dry	S0,20 \leq 0,20	S0,30 \leq 0,30
	Chlorine, Cl, ISO 16994	% in mass, dry	Cl0,10 \leq 0,10	Cl0,40 \leq 0,40
	Arsenic, As, ISO 16968	mg/kg dry	\leq 1	\leq 1,5
	Cadmium, Cd, ISO 16968	mg/kg dry	\leq 0,5	\leq 0,5
	Chromium, Cr, ISO 16968	mg/kg dry	\leq 50	\leq 50
	Copper, Cu, ISO 16968	mg/kg dry	\leq 20	\leq 20
Lead, Pb, ISO 16968	mg/kg dry	\leq 10	\leq 10	
Mercury, Hg, ISO 16968	mg/kg dry	\leq 0,1	\leq 0,1	
Nickel, Ni, ISO 16968	mg/kg dry	\leq 10	\leq 10	
Zinc, Zn, ISO 16968	mg/kg dry	\leq 100	\leq 100	
Informative	Ash melting behaviour ¹ , ISO 21404 ^{1B}	°C	SST, DT, HT and FT should be stated	

	Property class, Analysis method	Units	A	B
<p>^a To be stated the 4-digit classification (ISO 17225-1:2021, Table 1). Blends and mixtures can include also woody biomass. If composition of blend is known, the % in mass can be used to specify blends. Example 1: 80 % in mass 2.1.1.2 Straw, 20 % in mass 2.1.2.2 Grasses, straw parts. In the case of mixture, the main component should be stated first. Example 2: 2.1.1.2 Straw, 2.1.2.2 Grasses, straw parts.</p> <p>^b Selected size (e.g. D06, D08, D10, D12 or D25) of pellets to be stated.</p> <p>^c Maximum length for classes D06, D08 and D10 shall be 45 mm. Pellets are longer than 3,15 mm, if they stay on a round hole-sieve of aperture size of 3,15 mm.</p> <p>^d At final point of loading in bulk transport (at the time of loading) and in small (up to 20 kg) and big bags (at time of packing).</p> <p>^e Type and amount of additive(s) to aid production, delivery or combustion (e.g. pressing aids, slagging inhibitors or any other additives like starch, corn flour, potato flour, vegetable oil, lignin) shall be stated.</p> <p>^f It is recommended that all characteristic temperatures (shrinkage starting temperature (SST), deformation temperature (DT), hemisphere temperature (HT) and flow temperature (FT)) in oxidizing conditions should be stated. Pre-ashing temperature is 550 °C.</p>				

5.2 Specification of graded wood pellets

5.2.1 The specification of the wood pellets is stated in accordance with Table 1, Table 2 and Figure 2. Sampling (ZS ISO 18135 or ZS ISO 21945), sample preparation (ZS ISO 14780) and analysis of the properties shall be carried out in accordance with the methods mentioned in the normative references in Clause 2.



Key
D diameter
L length

Figure 1 — Dimension of pellets

5.2.2 Property classes A1, A2, I1 and I2 represents virgin wood and chemically untreated wood residues. A1 and A2 pellets are high quality pellets, suitable for small scale use like stoves and fireplaces. In Table 1 A1 represents fuels which are low in ash and nitrogen content, while class A2 has slightly higher ash and nitrogen content. Property classes I1 and I2 have similar ash and nitrogen content as A2. Property classes B and I3 allow chemically treated industrial wood by-products and residues and chemically untreated used wood.

5.2.3 1.2.2 Chemically treated wood by-products and residues from wood processing industry and 1.3.1 Chemically untreated used wood according to DZS 1272 – 1, Table 1 are included in class B and I3 as long as they do not contain heavy metals or halogenated organic compounds more than typical virgin material values or typical values of country of origin. In case of raw materials belonging to 1.2.2 chemically treated wood according to DZS 1272 – 1, Table 1 the actual origin of the raw material shall be clearly described, e.g. 1.2.2 Residues from laminated wood production.

5.2.4 For pellets of class B/I3 produced from 99 % in mass sawdust from spruce 1.2.1.2, and 1 % in mass can contain glued wood from wood beam production (amount of glue < 0,1 % in mass).

5.2.5 To ensure the end-user receives pellets with a low level of fines, the amount of fines shall be ≤ 1 % in mass leaving the final point of loading for delivery to the end-user (see Table 1). Between factory gates

and the end-user, distributors shall take appropriate measures to maintain this low level of fines. The quality shall be given either in the product declaration or by a corresponding label on the package.

Table 2.1 — Specification of graded wood pellets for commercial and residential applications

	Property class Analysis method	Unit	A1	A2	B
Normative	Origin and source ISO 17225-1		1.1.3 Stemwood 1.2.1 Chemically untreated wood residues ^a	1.1.1 Whole trees without roots 1.1.3 Stemwood 1.1.4 Logging residues 1.2.1 Chemically untreated wood residues ^a	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
	Diameter, D^b and Length L^c ISO 17829 According to Figure 1	mm	D06, 6 ± 1 ; $3,15 \leq L \leq 40$ D08, 8 ± 1 ; $3,15 \leq L \leq 40$	D06, 6 ± 1 ; $3,15 \leq L \leq 40$ D08, 8 ± 1 ; $3,15 \leq L \leq 40$	D06, 6 ± 1 ; $3,15 \leq L \leq 40$ D08, 8 ± 1 ; $3,15 \leq L \leq 40$
	Moisture, M ISO 18134-1, ISO 18134-2	% in mass as received, wet basis	$M10 \leq 10$	$M10 \leq 10$	$M10 \leq 10$
	Ash, A^d ISO 18122	% in mass dry	$A0,7 \leq 0,7$	$A1,2 \leq 1,2$	$A2,0 \leq 2,0$
	Mechanical durability, DU^e ISO 17831-1	% in mass as received	$DU98,0 \geq 98,0$ for D06 $DU97,5 \geq 97,5$ for D08	$DU97,5 \geq 97,5$	$DU96,5 \geq 96,5$

^a Negligible levels of glue, grease and other timber production additives used in sawmills during production of timber and timber product from virgin wood are acceptable, if all chemical parameters of the pellets are clearly within the limits and/or concentrations are too small to be concerned with.

^b Selected size D06 or D08 of pellets to be stated.

^c Amount of pellets longer than 40 mm may be up to 1 % in mass. Maximum length shall be 45 mm for class A1 and 50 mm for class A2 and class B. Pellets are longer than 3,15 mm, if they stay on a round hole-sieve of 3,15 mm. Amount of pellets shorter than 10 mm, % in mass recommended to be stated.

^d For household burners and stoves an ash content < 0.5 % in mass is recommended.

^e At final point of loading in bulk transport (at the time of loading) and in small (up to 20 kg) and big bags (at time of packing).

^f Type and amount of additives to aid production, delivery or combustion (e.g. pressing aids, slagging inhibitors or any other additives like starch, corn flour, potato flour, vegetable oil, lignin) shall be stated.

^g It is recommended to state the actual value of bulk density. This is especially important for household burners and stoves with no automatic control of air supply and thus are sensitive to variations in bulk density.

^h It is recommended to state all characteristic temperatures (shrinkage starting temperature (SST), deformation temperature (DT), hemisphere temperature (HT) and flow temperature (FT)) in oxidizing conditions. Pre-ashing temperature shall be 815 °C.

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	Property class Analysis method	Unit	A1	A2	B
	Fines, F ^e	% in mass as received	F1,0 ≤ 1,0	F1,0 ≤ 1,0	F1,0 ≤ 1,0
	Additives ^f	% in mass as received	≤ 2 Type and amount to be stated	≤ 2 Type and amount to be stated	≤ 2 Type and amount to be stated
	Net calorific value, Q ISO 18125	MJ/kg or kWh/kg as received	Q ≥ 16,5 or ≥ 4,6	Q ≥ 16,5 or ≥ 4,6	Q ≥ 16,5 or ≥ 4,6
	Bulk density, BD ^g , ISO 17828	kg/m ³ as received	600 ≤ BD ≤ 750	600 ≤ BD ≤ 750	600 ≤ BD ≤ 750
	Nitrogen, N ISO 16948	% in mass dry	N0,3 ≤ 0,3	N0,5 ≤ 0,5	N1,0 ≤ 1,0
	Sulfur, S ISO 16994	% in mass dry	S0,04 ≤ 0,04	S0,04 ≤ 0,04	S0,05 ≤ 0,05
	Chlorine, Cl ISO 16994	% in mass dry	Cl0,02 ≤ 0,02	Cl0,02 ≤ 0,02	Cl0,03 ≤ 0,03
	Arsenic, As ISO 16968	mg/kg dry	≤ 1	≤ 1	≤ 1
	Cadmium, Cd ISO 16968	mg/kg dry	≤ 0,5	≤ 0,5	≤ 0,5
	Chromium, Cr ISO 16968	mg/kg dry	≤ 10	≤ 10	≤ 10
	Copper, Cu ISO 16968	mg/kg dry	≤ 10	≤ 10	≤ 10
	Lead, Pb, ISO 16968	mg/kg dry	≤ 10	≤ 10	≤ 10
	Mercury, Hg ISO 16968	mg/kg dry	≤ 0,1	≤ 0,1	≤ 0,1
	Nickel, Ni ISO 16968	mg/kg dry	≤ 10	≤ 10	≤ 10
	Zinc, Zn ISO 16968	mg/kg dry	≤ 100	≤ 100	≤ 100
	Ash melting behaviour ^h ISO 21404	°C	DT ≥ 1 200	DT ≥ 1 100	DT ≥ 1 100
Informative	Coarse pellet fines, CPF (3,15 mm ≤ CPF < 5,6 mm) ISO 18846	% in mass	Should be stated	Should be stated	Should be stated
	Particle density, DE ISO 18847 ^[d] ,	g/cm ³	Should be stated	Should be stated	Should be stated

^a Negligible levels of glue, grease and other timber production additives used in sawmills during production of timber and timber product from virgin wood are acceptable, if all chemical parameters of the pellets are clearly within the limits and/or concentrations are too small to be concerned with.

- ^b Selected size D06 or D08 of pellets to be stated.
- ^c Amount of pellets longer than 40 mm may be up to 1 % in mass. Maximum length shall be 45 mm for class A1 and 50 mm for class A2 and class B. Pellets are longer than 3,15 mm, if they stay on a round hole-sieve of 3,15 mm. Amount of pellets shorter than 10 mm, % in mass recommended to be stated.
- ^d For household burners and stoves an ash content < 0.5 % in mass is recommended.
- ^e At final point of loading in bulk transport (at the time of loading) and in small (up to 20 kg) and big bags (at time of packing).
- ^f Type and amount of additives to aid production, delivery or combustion (e.g. pressing aids, slagging inhibitors or any other additives like starch, corn flour, potato flour, vegetable oil, lignin) shall be stated.
- ^g It is recommended to state the actual value of bulk density. This is especially important for household burners and stoves with no automatic control of air supply and thus are sensitive to variations in bulk density.
- ^h It is recommended to state all characteristic temperatures (shrinkage starting temperature (SST), deformation temperature (DT), hemisphere temperature (HT) and flow temperature (FT)) in oxidizing conditions. Pre-ashing temperature shall be 815 °C.

Table 2.2 — Specification of graded wood pellets for industrial use

	Property class, Analysis method	Unit	I1	I2	I3
Normative	Origin and source, ISO 17225-1		1.1 Forest, plantation and other virgin wood 1.2.1 Chemically untreated wood residues ^a	1.1 Forest, plantation and other virgin wood 1.2.1 Chemically untreated wood residues ^a	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
	Diameter, D ^b and Length L ^c ISO 17829 According Figure 1	mm	D06, 6 ± 1; 3,15 ≤ L ≤ 40 D08, 8 ± 1; 3,15 ≤ L ≤ 40	D06, 6 ± 1; 3,15 ≤ L ≤ 40 D08, 8 ± 1; 3,15 ≤ L ≤ 40 D10, 10 ± 1; 3,15 ≤ L ≤ 40	D06, 6 ± 1; 3,15 ≤ L ≤ 40 D08, 8 ± 1; 3,15 ≤ L ≤ 40 D10, 10 ± 1; 3,15 ≤ L ≤ 40 D12, 12 ± 1; 3,15 ≤ L ≤ 40
	Moisture, M ISO 18134-1, ISO 18134-2	% in mass as received, wet basis	M10 ≤ 10	M10 ≤ 10	M10 ≤ 10
	Ash, A ISO 18122	% in mass dry	A1,0 ≤ 1,0	A1,5 ≤ 1,5	A3,0 ≤ 3,0
	Mechanical durability, DU ISO 17831-1	% in mass as received	97,5 ≤ DU ≤ 99,0	97,0 ≤ DU ≤ 99,0	96,5 ≤ DU ≤ 99,0
	Fines, F ^d	% in mass as received	F4,0 ≤ 4,0	F5,0 ≤ 5,0	F6,0 ≤ 6,0
	Additives ^e	% in mass as received	< 3 Type and amount to be stated	< 3 Type and amount to be stated	< 3 Type and amount to be stated
	Net calorific value, Q ISO 18125	MJ/kg as received	Q16,5 ≥ 16,5	Q16,5 ≥ 16,5	Q16,5 ≥ 16,5
^a Negligible levels of glue, grease and other timber production additives used in sawmills during production of timber and timber product from virgin wood are acceptable if all chemical parameters of the pellets are clearly within the limits and/or concentrations are too small to be concerned with. ^b Selected size D06, D08, D10 or D12 of pellets to be stated.					
^c Amount of pellets longer than 40 mm may be 1 % in mass. Maximum length shall be 50 mm for class I1, I2 and I3. Pellets are longer than 3,15 mm, if they stay on a round hole-sieve of 3,15 mm. Amount of pellets shorter than 10 mm, % in mass recommended to be stated. ^d Final point of loading in bulk transport (at the time of loading) and in large sacks (at time of packing or when delivering to end-user). ^e Type and amount of additives to aid production, delivery or combustion (e.g. pressing aids, slagging inhibitors or any other additives like starch, corn flour, potato flour, vegetable oil, lignin) shall be stated. ^f Maximum bulk density is 750 kg/m ³ . ^g It is recommended to state all characteristic temperatures (shrinkage starting temperature (SST), deformation temperature (DT), hemisphere temperature (HT) and flow temperature (FT)) in oxidizing conditions. The default ashing temperature according to ISO 21404 is 550 °C ± 10 °C. If alternative ashing temperature is used, it shall be specified.					

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	Property class, Analysis method	Unit	I1	I2	I3
	Bulk density, BD ^f ISO 17828	kg/m ³ as received	BD600 ≥ 600	BD600 ≥ 600	BD600 ≥ 600
	Particle size distribution of disintegrated pellets ISO 17830	% in mass equilibrated basis	≥ 99 % (< 3,15 mm) ≥ 95 % (< 2,0 mm) ≥ 60 % (< 1,0 mm)	≥ 98 % (< 3,15 mm) ≥ 90 % (< 2,0 mm) ≥ 50 % (< 1,0 mm)	≥ 97 % (< 3,15 mm) ≥ 85 % (< 2,0 mm) ≥ 40 % (< 1,0 mm)
	Nitrogen, N ISO 16948	% in mass dry	N0,3 ≤ 0,3	N0,3 ≤ 0,3	N0,6 ≤ 0,6
	Sulfur, S ISO 16994	% in mass dry	S0,05 ≤ 0,05	S0,05 ≤ 0,05	S0,05 ≤ 0,05
	Chlorine, Cl ISO 16994	% in mass dry	Cl0,03 ≤ 0,03	Cl0,05 ≤ 0,05	Cl0,1 ≤ 0,1
	Arsenic, As ISO 16968	mg/kg dry	≤ 2	≤ 2	≤ 2
	Cadmium, Cd ISO 16968	mg/kg dry	≤ 1,0	≤ 1,0	≤ 1,0
	Chromium, Cr ISO 16968	mg/kg dry	≤ 15	≤ 15	≤ 15
	Copper, Cu ISO 16968	mg/kg dry	≤ 20	≤ 20	≤ 20
	Lead, Pb ISO 16968	mg/kg dry	≤ 10	≤ 10	≤ 10
	Mercury, Hg ISO 16968	mg/kg dry	≤ 0,1	≤ 0,1	≤ 0,1
	Nickel, Ni ISO 16968	mg/kg dry	≤ 10	≤ 10	≤ 10
	Zinc, Zn ISO 16968	mg/kg dry	≤ 100	≤ 100	≤ 100
Informative	Ash melting behaviour ^g ISO 21404	°C	Should be stated	Should be stated	Should be stated

^a Negligible levels of glue, grease and other timber production additives used in sawmills during production of timber and timber product from virgin wood are acceptable if all chemical parameters of the pellets are clearly within the limits and/or concentrations are too small to be concerned with.

^b Selected size D06, D08, D10 or D12 of pellets to be stated.

^c Amount of pellets longer than 40 mm may be 1 % in mass. Maximum length shall be 50 mm for class I1, I2 and I3. Pellets are longer than 3,15 mm, if they stay on a round hole-sieve of 3,15 mm. Amount of pellets shorter than 10 mm, % in mass recommended to be stated.

^d Final point of loading in bulk transport (at the time of loading) and in large sacks (at time of packing or when delivering to end-user).

^e Type and amount of additives to aid production, delivery or combustion (e.g. pressing aids, slugging inhibitors or any other additives like starch, corn flour, potato flour, vegetable oil, lignin) shall be stated.

^f Maximum bulk density is 750 kg/m³.

^g It is recommended to state all characteristic temperatures (shrinkage starting temperature (SST), deformation temperature (DT), hemisphere temperature (HT) and flow temperature (FT)) in oxidizing conditions. The default ashing temperature according to ISO 21404 is 550 °C ± 10 °C. If alternative ashing temperature is used, it shall be specified.

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