



## New European Pellets Standard – EN 14961-1

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### Fuel specification and classes and quality assurance - multipart standards

The European Committee for Standardization, CEN under committee TC335 has published 27 technical specifications (pre-standards) for solid biofuels during 2003 – 2006. Now these technical specifications are upgraded to full European standards (EN). When EN-standards are in force the national standards has to be withdrawn or adapted to these EN-standards. The two most important technical specifications being developed deal with classification and specification (EN 14961) and quality assurance for solid biofuels (EN 15234). Both these standards will be published as multipart standards. The Part 1 – General requirements of EN 14961-1 includes all solid biofuels and is targeted for all user groups, but will be probably used mainly in industry.

Working group 2 of CEN/TC 335 is developing the following pellet standards

- EN 14961-1 for general use (includes pellets from different biomass raw materials), published
- EN14961-2 for wood pellets for non-industrial use (under preparation)
- EN14961-6 for non-woody pellets for non-industrial use (under preparation).

EN14961-2 and EN14961-6 is so-called product standards for non-industrial use, which means fuel intended to be used in smaller appliances, such as, in households and small commercial and public sector buildings. In the product standards all properties are normative and they are bind together to form a class (see Annexes 2 – 4).

### Biomass pellets in EN 14961-1

General part 1 of EN14961 includes Table 5 (see Annex 1) for all kind of biomass pellets. These pellets can produced from different of biomass raw materials. This part also includes the classification of solid biofuels, which is

based on their origin and source. The fuel production chain of fuels shall be unambiguously traceable back over the whole chain. The solid biofuels are divided to the following sub-categories for classification in EN 14961-1:

- 1) Woody biomass (Table 1, Fig. 1)
- 2) Herbaceous biomass,
- 3) Fruit biomass and 4) Blends and mixtures

Woody biomass is biomass from trees, bushes and shrubs. Herbaceous biomass is from plants that have a non-woody stem and which die back at the end of the growing season. It includes grains and their by-products such as cereals. Fruit biomass is the biomass from the parts of a plant which are from or hold seeds.

If appropriate, also the actual species (e.g. spruce, wheat) of biomass should be stated. The actual wood species (e.g. spruce) can be stated according to EN 13556 "Round and sawn timber Nomenclature".

The term "Blends and mixtures" in Tables 1 refers to material of various origin within the given box in the classification table and appears on four levels. Blends are intentionally mixed biofuels, whereas mixtures are unintentionally mixed biofuels. The origin of the blend and mixture shall be described using Tables 1 of EN 14961-1.

The purpose of classification is to allow the possibility to differentiate and specify raw material based on origin with as much detail as needed. The quality classification in a table form was prepared only for major traded solid biofuels.

The classification in EN14961-1 is flexible, and hence the producer or the consumer may select from each property class the classification that corresponds to the produced or desired fuel quality. This so-called "free classification" in Part 1 does not bind different characteristics with each other. An advantage

of this classification is that the producer and the consumer may agree upon characteristics case-by-case. Demolition wood is not included in the scope of the EN 14961-1.

The most significant characteristics are mandatory, normative, and shall be given in the fuel specification EN 14961-1. These characteristics vary for different traded form, while the most significant characteristics for all

solid biofuels are moisture content (M), particle size/dimensions (P or D/L) and ash content (A). For example, the average moisture content of fuels is given as a value after the symbol (e.g. M10), which means that the average moisture content of the fuel shall be  $\leq 10$  w-%. Some characteristics, e.g., bulk density (BD), are voluntary, informative (see Annex 1). Example of wood pellets according EN 14961-1 is shown in Fig.2.

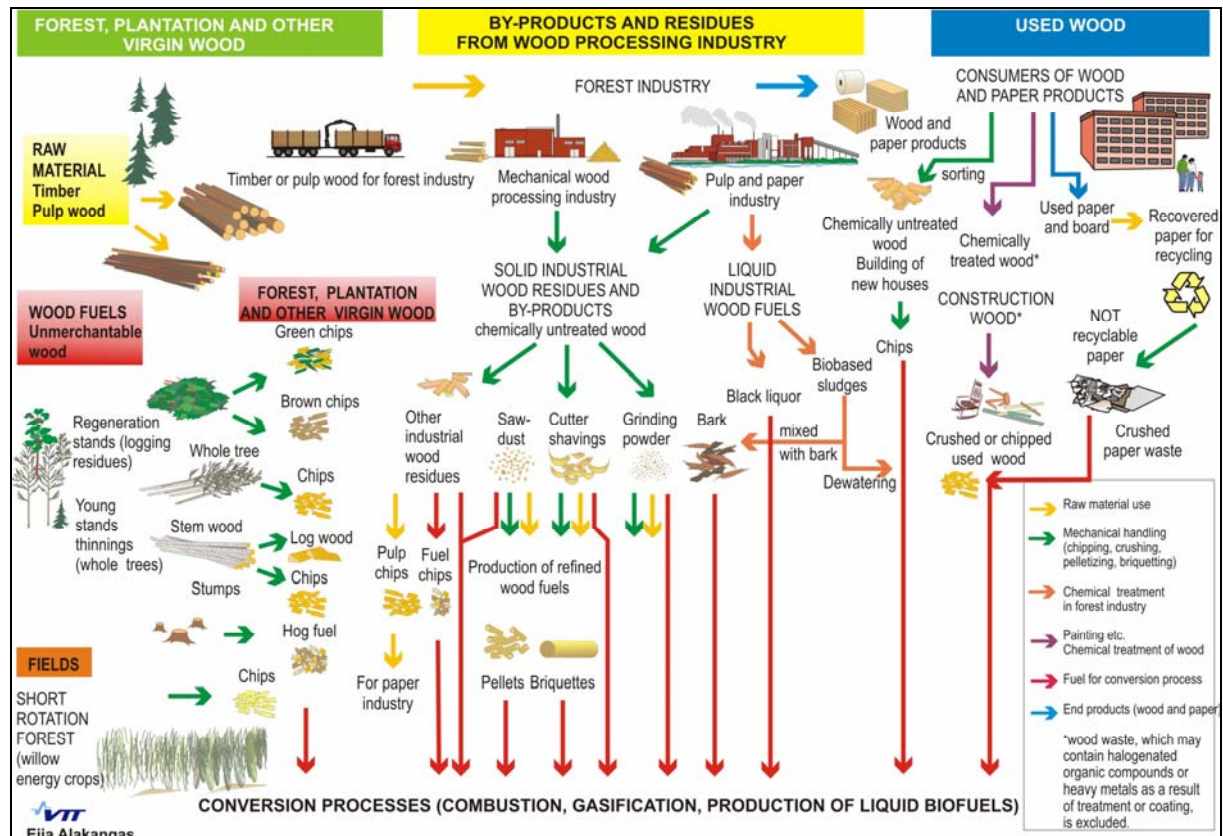


Fig. 1. Classification of woody biomass.

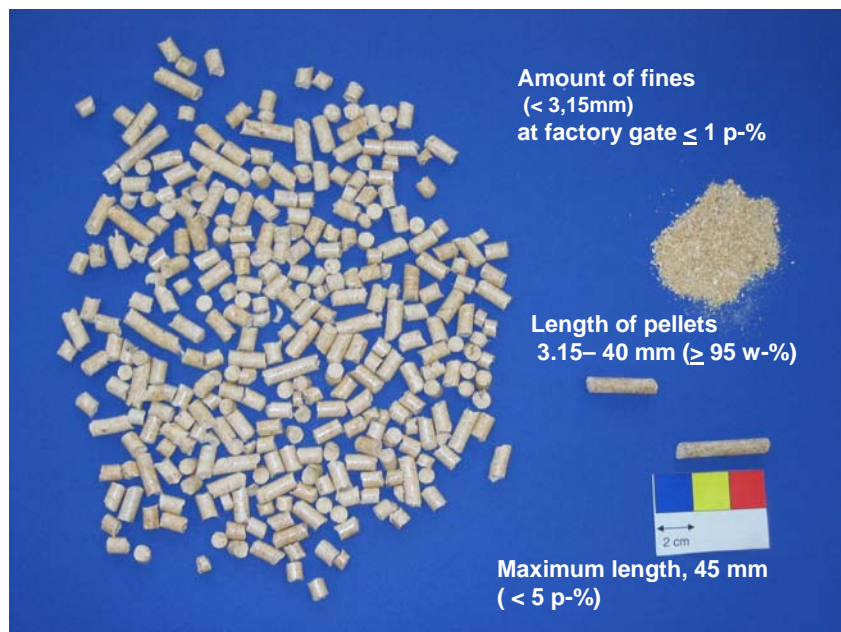


Fig 2. Dimensions of 8 mm wood pellets according to EN 14961-1.

**Table 1.** Classification of 1 Woody biomass (EN 14961-1)

1.1 Forest, plantation and other virgin wood	1.1.1 Whole trees without roots	1.1.1.1 Broadleaf
		1.1.1.2 Coniferous
		1.1.1.3 Short rotation coppice
		1.1.1.4 Bushes
		1.1.1.5 Blends and mixtures
	1.1.2 Whole trees with roots	1.1.2.1 Broadleaf
		1.1.2.2 Coniferous
		1.1.2.3 Short rotation coppice
		1.1.2.4 Bushes
		1.1.2.5 Blends and mixtures
	1.1.3 Stemwood	1.1.3.1 Broadleaf
		1.1.3.2 Coniferous
		1.1.3.3 Blends and mixtures
	1.1.4 Logging residues	1.1.4.1 Fresh/Green, Broadleaf (including leaves)
		1.1.4.2 Fresh/Green, Coniferous (including needles)
		1.1.4.3 Stored, Broadleaf
		1.1.4.4 Stored, Coniferous
		1.1.4.5 Blends and mixtures
1.1.5 Stumps/roots	1.1.5.1 Broadleaf	
	1.1.5.2 Coniferous	
	1.1.5.3 Short rotation coppice	
	1.1.5.4 Bushes	
	1.1.5.5 Blends and mixtures	
1.1.6 Bark (from forestry operations) <sup>a</sup>		
1.1.7 Segregated wood from gardens, parks, roadside maintenance, vineyards and fruit orchards		
1.1.8 Blends and mixtures		
1.2 By-products and residues from wood processing industry	1.2.1 Chemically untreated wood residues	1.2.1.1 Without bark, Broadleaf
		1.2.1.2 Without bark, Coniferous
		1.2.1.3 With bark, Broadleaf
		1.2.1.4 With bark, Coniferous
		1.2.1.5 Bark (from industry operations) <sup>a</sup>
	1.2.2 Chemically treated wood residues, fibres and wood constituents	1.2.2.1 Without bark
		1.2.2.2 With bark
		1.2.2.3 Bark (from industry operations) <sup>a</sup>
		1.2.2.4 Fibres and wood constituents
1.2.3 Blends and mixtures		
1.3 Used wood	1.3.1 Chemically untreated wood	1.3.1.1 Without bark
		1.3.1.2 With bark
		1.3.1.3 Bark <sup>a</sup>
	1.3.2 Chemically treated wood	1.3.2.1 Without bark
		1.3.2.2 With bark
		1.3.2.3 Bark <sup>a</sup>
1.3.3 Blends and mixtures		
1.4 Blends and mixtures		

<sup>a</sup> Cord is included in bark.

## prEN 15234- Multipart standard for fuel quality assurance

The overall aim of prEN 15234 multipart standard is to guarantee the solid biofuel quality through the whole supply chain, from the origin to the delivery of the solid biofuel and provide adequate confidence that specified quality requirements are fulfilled.

The objective of prEN15234-1 is to serve as a tool to enable the efficient trading of biofuels. Thereby:

1. the end-user can find a biofuel that corresponds to its needs;
2. the producer/supplier can produce a biofuel with defined and consistent properties and describe the biofuel to the customers.

Quality assurance measures shall establish confidence in the biofuel through systems that are simple to operate and do not cause undue bureaucracy.

Solid biofuels are specified according to EN 14961 series — Solid Biofuels, Fuel Specification and Classes.

According to the terminology of ISO 9001 Quality Management system generally consists of quality planning, quality control, quality assurance and quality improvement. prEN 15234-1 covers fuel quality assurance (part of quality management, focused on providing confidence that the quality requirements will be fulfilled) and quality control (part of quality management, focused on fulfilling the quality requirements).

The users of this European Standard may integrate the prEN 15234-1 in their general quality assurance scheme, e.g. the ISO 9000 series. If the company does not have a quality management system, prEN 15234-1 can be

used on its own to help the supplier in documenting fuel quality and creating adequate confidence between the supplier and the end-user.

Fuel product declaration (prEN 15234-1) for the solid biofuel shall be issued by the supplier to the end-user or retailer. The fuel product declaration shall be issued for each defined lot. The quantity of the lot shall be defined in the delivery agreement. The supplier shall date the declaration and keep the records for a minimum of one year after the delivery. The fuel product declaration shall state the quality in accordance to the appropriate part of EN 14961.

The fuel product declaration shall as a minimum include:

- Supplier (body or enterprise) including contact information
- A reference to appropriate part of prEN 15234-Fuel quality assurance standard
- Origin and source (according EN 14961-1)
- Country/countries (locations) of origin
- Traded form (e.g. pellet)
- Specification of properties according to appropriate part of EN 14961
  - Normative properties
  - Informative properties
- Chemical treatment if chemically treated biomass is traded (yes/no)
- Signature (by operational title or responsibility), name, date and place

The fuel product declaration can be approved electronically. Signature and date can be approved by signing of the waybill or stamping of the packages in accordance with the appropriate part of EN 14961. Example of product declaration is shown in Fig.4.

<b>PRODUCT DECLARATION</b>		
<b>Supplier:</b>	Solid Biofuels Ltd. 123 Main Street Any town, 12345 Any country	
<b>Traded form:</b>	Pellets	
<b>Origin and source:</b>	1.2.1.2 Chemically untreated residues	
<b>Country/countries (locations) of origin:</b>	Any location, Any country	
<b>Chemically treated material:</b>	<input checked="" type="checkbox"/> No	
<b>Normative properties according to EN 14961-1:</b>		
Diameter, D and Length, L:	D06 $6 \pm 1$ ; $3,15 \leq L \leq 40$	[mm]
Moisture, M:	M10 $\leq 10$	[w-% as received]
Ash, A:	A1.0 $\leq 1,0$	[w-% dry]
Mechanical durability, DU:	DU 96.5 $\geq 96,5$	[w-% as received]
Fines, F:	F1.0 $\leq 1,0$	[w-%], at factory gate
Additives:	1 % (starch)	[w-%]
Bulk density, BD:	BD600 $\geq 600$	[kg/m <sup>3</sup> ]
Net calorific value, Q:	Q16.5 $\geq 16,5$	[MJ/kg as received]
<b>Informative properties according to EN 14961-1</b>		
Nitrogen, N:	N0.5 $\leq 0,5$	[w-% dry]
Sulphur, S:	S0.05 $\leq 0,05$	[w-% dry]
Chlorine, Cl:	Cl0.03 $\leq 0,03$	[w-% dry]
Ash melting behaviour, DT:	DT1200 $\geq 1200$	[°C]
<b>Date:</b>	August 12th, 2009	
<b>Name and position of signatory:</b>	Mr. John Q. Public, General Manager	
<b>Signature:</b>		

Fig.4: Example of a product declaration referring to EN 14961-1

## References

Alakangas, E. Fuel specification and classes – introduction to Task IV and feedback from industry and classification of used wood in fuel specification and classes (EN 14961) multipart standard, Final conference – BioNormII, Pre-Normative research on solid biofuels for improved European standards, 4 November 2009, Leipzig, Germany, p. 71 – 80 ([www.bionorm2.eu](http://www.bionorm2.eu))

Alakangas, E. European standards for fuel specification and classes of solid biofuels, Manuscript to Springer publication, Energy production from solid biofuels towards global warming abatement, June 2009, 25 p.

Alakangas, E. (VTT), Kilgus, D. (USTUTT) & Rautbauer J. (FJ-BLT). Comparison of different pellet standards and proposals for upgrading CEN/TS 14961, BioNormII. November 2007. 16 p.

Alakangas, E. European standards for solid biofuels – case wood pellets and wood chips, Riga 6 – 7 May 2009, Wood combustion and standards, Proc. Environmental and climate technologies, Serija 13, sejums 2, p. 7 – 20.

Alakangas, E. & Gushcha, J. (eds.) Summary report of combustion test, BioNormII- Pre-normative research on solid biofuels for improved European standards, Project no. 038644, DIV7-Part 7. 86 p. (www.bionorm2.eu).

Alakangas, E., Rathbauer, J., Sulzbacher, L., Kilgus, D., Baumbach, G., Grammelis, P. & Malliopoulou, A., Blumberga, D. & Gushcha, J. Feedback on prEN 14961 standards from industry and workshops. BioNormII- Pre-normative research on solid biofuels for improved European standards, Project no. 038644, DIV6-Part 1. 51 p. (www.bionorm2.eu).

Alakangas, E., Wiik, C. & Lensu, T. CEN 335 – Solid biofuels, Feedback from market actors, EUBIONET report – VTT Report VTT-R-00430-07, Jyväskylä 2007. 58 p. + app. 13 p. (www.eubionet.net)

## List of standards related to pellets

EN 14961:2010. Solid biofuels – Fuel Specification and classes, Part 1 – General requirements. CEN (European Committee for Standardization). January 2010.

prEN 14961.2009. Solid biofuels – Fuel Specification and classes, Part 2 – Wood pellets for non-industrial use (draft document N192). December 2009.

prEN 14961.2009. Solid biofuels – Fuel Specification and classes, Part 6 – Non-woody pellets for non-industrial use (draft document N200). May 2009.

prEN 14588:2009, Solid biofuels – Terminology, definitions and descriptions,

EN 14774-1, Solid biofuels – Methods for the determination of moisture content – Oven dry method – Part 1: Total moisture – Reference method

EN 14774-2, Solid biofuels – Methods for the determination of moisture content – Oven dry method – Part 2: Total moisture – Simplified procedure

EN 14775, Solid biofuels – Methods for the determination of ash content

prEN 14778, Solid Biofuels – Sampling

prEN 14780, Solid Biofuels – Methods for sample preparation

EN 14918, Solid Biofuels – Method for the determination of calorific value

EN 15103, Solid Biofuels – Methods for the determination of bulk density

prEN 15104, Solid Biofuels – Determination of carbon, hydrogen and nitrogen – Instrumental method

prEN 15149-1, Solid biofuels – Determination of particle size distribution - Part 1: Oscillating screen method using sieve apertures of 1 mm and above

prEN 15150, Solid Biofuels – Methods for the determination of particle density

prEN 15210-1, Solid Biofuels – Methods for the determination of mechanical durability of pellets and briquettes – Part 1: Pellets

prEN 15234-1, Solid Biofuels – Fuel quality assurance, Part 1: General requirements

prEN 15234-1, Solid Biofuels – Fuel quality assurance, Part 2. Wood pellets for non-industrial use. December 2009 (draft document N224), 17 p.

prEN 15289, Solid Biofuels – Determination of total content of sulphur and chlorine

prEN 15290, Solid Biofuels – Determination of major elements

prEN 15296, Solid Biofuels – Conversion of analytical results from one basis to another

prEN 15297, Solid Biofuels – Determination of content of minor elements

prEN 15370, Solid Biofuels – Methods for the determination of ash melting behaviour

Standards marked by pr are not published.

## Terms related to pellets (prEN 14588)

### additive

material which improves the quality of the fuel (e.g. combustion properties), reduces emissions or makes production more efficient.

### bioenergy

energy from biomass

### biofuel

fuel produced directly or indirectly from biomass

### biofuel blend

biofuel resulting from intentionally mixing of different biofuels. EXAMPLE Straw or energy grass with wood, dried biosludge with bark.

### biofuel mixture

biofuel resulting from natural or unintentional mixing of different biofuels and/or different types of biomass

### biofuel pellet

densified biofuel made from pulverised biomass with or without additives usually with a cylindrical form, random length typically 5 to 40 mm, and broken ends. The raw material for biofuel pellets can be woody biomass, herbaceous biomass, fruit biomass, or biomass blends and mixtures. They are usually manufactured in a die. The total moisture of biofuel pellets is usually less than 10 % of mass.

### biomass

is defined from a scientific and technical point of view as material of biological origin excluding material embedded in geological formations and/or transformed to fossil (See also herbaceous biomass, fruit biomass, and woody biomass)

Biomass is defined in legal documents in many different ways according to the scope and goal of the respective documents (e.g.: Directive 2001/77/EC of the European

Parliament and the Council; Commission Decision (2007/589/EC) of 18 July 2007). This definition does not contradict legal definitions.

**chemical treatment**

chemical treatment is defined as any treatment with chemicals other than air, water or heat.

**cutter chips**

wood chips made as a by-product of the wood processing industry, with or without bark

**demolition wood**

used wood arising from demolition of buildings or civil engineering installation

**densified biofuel, compressed biofuel**

solid biofuel made by mechanically compressing biomass to increase its density and to mould the solid biofuel into a specific size and shape such as cubes, pressed logs, biofuel pellets or biofuel briquettes. See also biofuel briquette and biofuel pellets.

**energy grass; fuel grass**

endogenous plants having simple leaves grown specifically for their fuel value. NOTE: Belong to the group of herbaceous biomass. EXAMPLE Sugarcane, Miscanthus, Reed canary grass. NOTE. Fuel grass is a not recommended synonym

**fruit biomass**

biomass from the parts of a plant which hold seeds. EXAMPLE. Nuts, olives

**fuel**

energy carrier intended for energy conversion. NOTE 1. Fuels are solid, liquid or gaseous. NOTE2 Fuels can originate from biomass, waste and/or fossil material

**fuel dust**

pulverised fuel with a typical particle size of 1 to 5 mm. EXAMPLE Saw dust, straw dust

**fuel powder; fuel flour**

pulverised fuel with a typical particle size less than 1 mm. EXAMPLE. Wood powder, wood flour, straw powder

**grinding dust**

dust-like wood residue formed in grinding timber and wood boards

**herbaceous biomass**

biomass from plants that has a non-woody stem and which dies back at the end of the growing season. See also energy grass.

**herbaceous fuels**

all types of biofuels originating from herbaceous biomass

**non-woody pellet**

densified non-woody biofuel made from pulverised biomass with or without additives usually with a cylindrical form diameter < 25 mm, random length and typically 3,15 to 40 mm with broken ends, obtain by mechanical compression. NOTE The raw material for non-woody pellets can be herbaceous biomass, fruit biomass, or biomass blends and mixtures. They are usually manufactured in a die with a total moisture content usually less than 15 % of their mass.

**particleboard residues**

woody biomass residues from the particleboard industry

**plywood residues**

woody biomass residues formed in plywood industry

**pulverised fuel**

solid fuel in the form of dust and powder, produced by milling or grinding. See also fuel dust and fuel powder.

**sawdust**

fine particles created when sawing wood. NOTE: Most of the material has a typical particle length of 1 to 5 mm.

**solid biofuel**

solid fuels produced directly or indirectly from biomass

**used wood**

wood substances or objects which have performed their intended purpose.

**wood fuels, wood based fuels, wood-derived biofuels**

all types of biofuels originating directly or indirectly from woody biomass. See also fuelwood, forest fuels, and black liquor.

**wood processing industry by-products and residues**

woody biomass residues originating from the wood processing as well as the pulp and paper industry. See also bark, cork residues, cross-cut ends, edgings, fibreboard residues, fibre sludge, grinding dust, particleboard residues, plywood residues, saw dust, slabs, and wood shavings

**wood shavings cutter shavings**

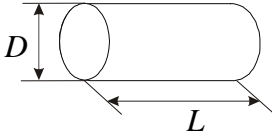
shavings from woody biomass created when planing wood

**woody biomass**

biomass from trees, bushes and shrubs. This definition includes forest and plantation wood, wood processing industry by-products and residues, and used wood.



## Annex 1 — Specification of properties for pellets (EN 14961-1)

<b>Master table</b>	
<b>Origin:</b> According to Tables 1,2 or 3	Woody biomass (1); Herbaceous biomass (2); Fruit biomass (3); Blends and mixtures (4).
<b>Traded Form</b>	Pellets
<p style="text-align: center;"> <math>L</math> Length                      <math>D</math> Diameter  <b>Dimensions (mm)</b> </p> 	
<b>Dimensions (mm)</b>	
<b>Diameter (D) and Length (L) <sup>a</sup></b>	
D 06	6 mm ± 1,0 mm and 3,15 ≤ L ≤ 40 mm
D 08	8 mm ± 1,0 mm, and 3,15 ≤ L ≤ 40 mm
D 10	10 mm ± 1,0 mm, and 3,15 ≤ L ≤ 40 mm
D 12	12 mm ± 1,0 mm, and 3,15 ≤ L ≤ 50 mm
D 25	25 mm ± 1,0 mm, and 10 ≤ L ≤ 50 mm
<b>Moisture, M (w-% as received) prEN 14774-1, prEN14774-2</b>	
M10	≤ 10 %
M15	≤ 15 %
<b>Ash, A (w-% of dry basis) EN 14775</b>	
A0.5	≤ 0,5%
A0.7	≤ 0,7%
A1.0	≤ 1,0%
A1.5	≤ 1,5 %
A2.0	≤ 2,0 %
A3.0	≤ 3,0 %
A5.0	≤ 5,0 %
A7.0	≤ 7,0 %
A10.0	≤ 10,0 %
A10.0+	> 10,0 %
<b>Mechanical durability, DU (w-% of pellets after testing) prEN15210-1</b>	
DU97.5	≥ 97,5 %
DU96.5	≥ 96,5 %
DU95.0	≥ 95,0 %
DU95.0-	< 95,0 % (minimum value to be stated)
<b>Amount of fines, F (w-%, &lt; 3,15 mm <sup>b</sup>) after production when loaded or packed, prEN 15149-1</b>	
F1.0	≤ 1,0 %
F2.0	≤ 2,0 %
F3.0	≤ 3,0 %
F5.0	≤ 5,0 %
F5.0+	> 5,0 % (maximum value to be stated)
<b>Additives (w-% of pressing mass) <sup>c</sup></b>	Type and content of pressing aids, slagging inhibitors or any other additives have to be stated
<b>Bulk density (BD) as received (kg/m<sup>3</sup>) EN 15103</b>	
BD550	≥ 550 kg/m <sup>3</sup>
BD600	≥ 600 kg/m <sup>3</sup>
BD650	≥ 650 kg/m <sup>3</sup>
BD700	≥ 700 kg/m <sup>3</sup>
BD700+	> 700 kg/m <sup>3</sup> (minimum value to be stated)
<b>Net calorific value as received, Q (MJ/kg or kWh/kg) EN 14918</b>	Minimum value to be stated

Normative



<b>Normative / informative</b>	<b>Sulphur, S</b> (w-% of dry basis) prEN 15289		
	S0.02	≤ 0,02 %	Normative: Chemically treated biomass (1.2.2; 1.3.2; 2.2.2; 3.2.2) or if sulphur containing additives have been used.
	S0.05	≤ 0,05 %	
	S0.08	≤ 0,08 %	Informative: All fuels that are not chemically treated (see the exceptions above)
	S0.10	≤ 0,10 %	
	S0.20	≤ 0,20 %	
	S0.20+	> 0,20 % (maximum value to be stated)	
	<b>Nitrogen, N</b> (w-% of dry basis) prEN 15104		
	N0.3	≤ 0,3 %	Normative: Chemically treated biomass (1.2.2; 1.3.2; 2.2.2; 3.2.2)
	N0.5	≤ 0,5 %	
N1.0	≤ 1,0 %	Informative: All fuels that are not chemically treated (see the exceptions above)	
N2.0	≤ 2,0 %		
N3.0	≤ 3,0 %		
N3.0+	> 3,0 % (maximum value to be stated)		
<b>Chlorine, Cl</b> (w-% of dry basis) prEN 15289			
Cl0.02	≤ 0,02 %	Normative: Chemically treated biomass (1.2.2; 1.3.2; 2.2.2; 3.2.2)	
Cl0.03	≤ 0,03 %		
Cl0.07	≤ 0,07 %	Informative: All fuels that are not chemically treated (see the exceptions above)	
Cl0.10	≤ 0,10 %		
Cl0.10+	> 0,10 % (maximum value to be stated)		
<b>Informative: Ash melting behaviour</b> (°C) prEN 15370-1		Deformation temperature, DT should be stated	
<p><sup>a</sup> Amount of pellets longer than 40 mm (or 50 mm) can be 5 w-%. Maximum length for classes D06, D08 and D10 shall be &lt; 45 mm.</p> <p><sup>b</sup> Fines shall be determinate by using method prEN 15149-1.</p> <p><sup>c</sup> The maximum amount of additive is 20 w-% of pressing mass. Type stated (e.g. starch). If amount is greater, then raw material for pellet is blend.</p>			

NOTE 5 Special attention should be paid to the ash melting behaviour for some biomass fuels, for example eucalyptus, poplar, short rotation coppice, straw, miscanthus and olive stone.