European new pellets standards

Case non-woody pellets, 4 May 2010, Lyon

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http://www.eubionet.net

Multipart standard EN14961 – Pellets

- **Part - General requirements –** (EN 14961-1, January 2010)
  - For industrial use
  - pellets from woody, herbaceous and fruit biomass and blends and mixtures)
- **Separate product standards (under preparation)**
  - Part 2 - wood pellets for non-industrial use (voting phase)
  - **Part 6 – non-woody pellets for non-industrial use**

Product standards targeted for non-industrial use in small-scale appliances, such as,

- households and
- small commercial and public sector buildings

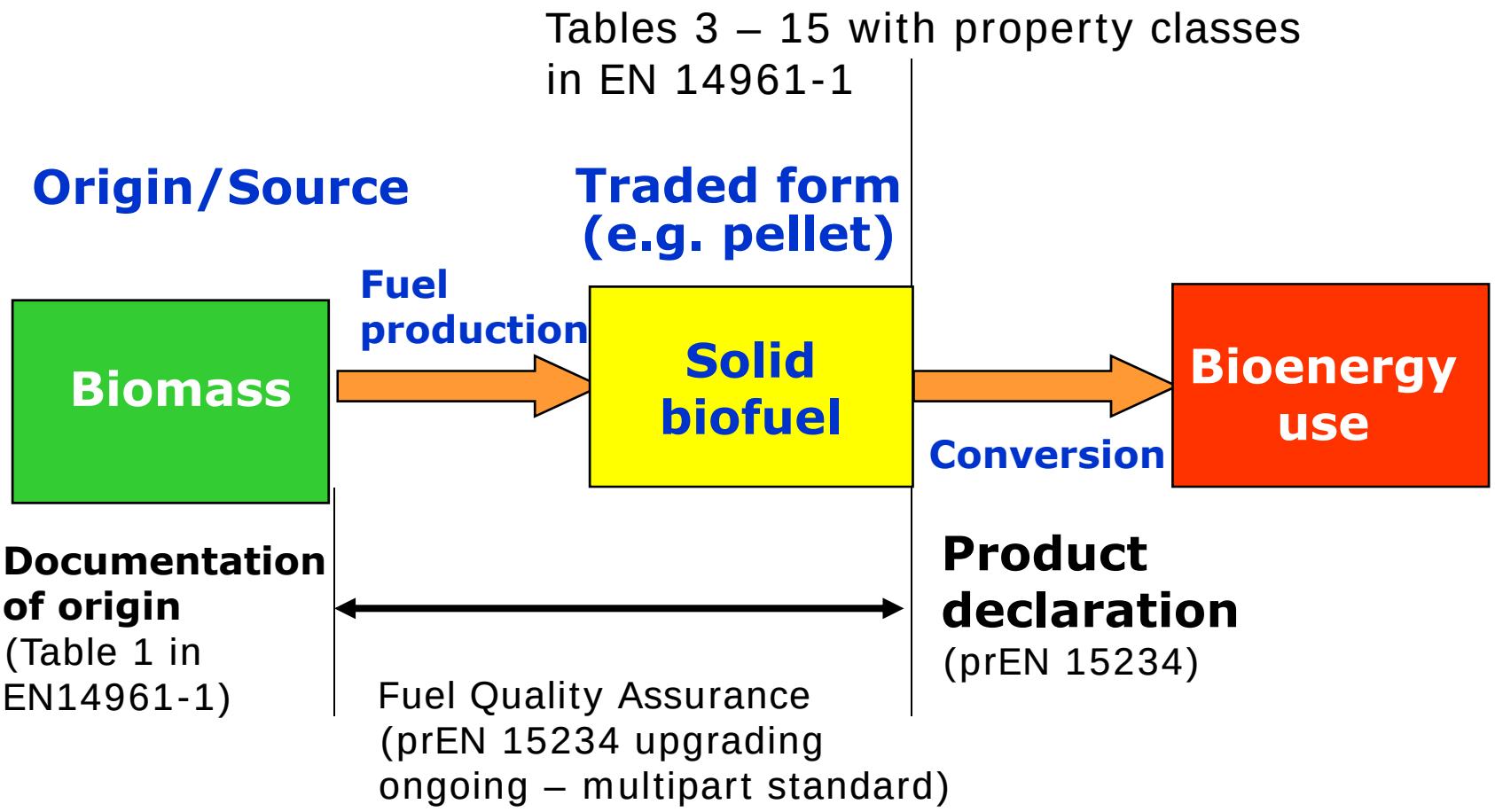
EN 14961-1, Solid biofuels – General requirements

- Classification of raw material
- Property tables for 14 traded forms

Specification and classes (EN 14961-1)

- Classification is based on origin and source, major traded forms and properties
- Hierarchical classification system in table format:
  1 Woody biomass
  2 Herbaceous biomass
  3 Fruit biomass
  4 Biomass blends and mixtures
    - blends = intentional, mixtures = unintentional
- Special requirements for chemically treated biomass
- Chemical treatment defined as any treatment with chemicals other than air, heat or water
  - Chemically treated wood (e.g. glued, painted, coated, lacqued or otherwise treated), without halogeneted compounds and heavy metals

Solid biofuel utilisation chain



2.1 Herbaceous biomass from agriculture and horticulture (Table 1, EN 14961-1)

2.1.1 Cereal crops	2.1.1.1 Whole plant
	2.1.1.2 Straw parts
	2.1.1.3 Grains or seeds
	2.1.1.4 Husks or shells
	2.1.1.5 Blends and mixtures
2.1.2 Grasses	2.1.2.1 Whole plant
	2.1.2.2 Straw parts
	2.1.2.3 Seeds
	2.1.2.4 Shells
	2.1.2.5 Blends and mixtures
2.1.3 Oil seed crops	2.1.3.1 Whole plant
	2.1.3.2 Stalks and leaves
	2.1.3.3 Seeds
	2.1.3.4 Husks or shells
	2.1.3.5 Blends and mixtures
2.1.4 Root crops	2.1.4.1 Whole plant
	2.1.4.2 Stalks and leaves
	2.1.4.3 Root
	2.1.4.4 Blends and mixtures
2.1.5 Legume crops	2.1.5.1 Whole plant
	2.1.5.2 Stalks and leaves
	2.1.5.3 Fruit
	2.1.5.4 Pods
	2.1.5.5 Blends and mixtures
2.1.6 Flowers	2.1.6.1 Whole plant
	2.1.6.2 Stalks and leaves
	2.1.6.3 Seeds
	2.1.6.4 Blends and mixtures
2.1.7 Segregated herbaceous biomass from gardens, parks, roadside maintenance, vineyards, and fruit orchards	
2.1.8 Blends and mixtures	

2.2 By-products and residues from herbaceous processing industry by-products and residues (EN 14961-1)

2.2.1 Chemically untreated herbaceous residues	2.2.1.1 Cereal crops and grasses
	2.2.1.2 Oil seed crops
	2.2.1.3 Root crops
	2.2.1.4 Legume crops
	2.2.1.5 Flowers
	2.2.1.6 Blends and mixtures
2.2.2 Chemically treated herbaceous residues	2.2.2.1 Cereal crops and grasses
	2.2.2.2 Oil seed crops
	2.2.2.3 Root crops
	2.2.2.4 Legume crops
	2.2.2.5 Flowers
	2.2.2.6 Blends and mixtures
2.2.3 Blends and mixtures	

Flexible classification – EN 14961-1

- Classification is ”flexible”, and hence the producer or the consumer may select property from each property class
- This classification does not bind different characteristics with each other
- The fuel supply chain shall be unambiguosly traceble back over the whole chain
- For most commonly traded forms (e.g. pellets), a table including property classes
  - Example **M10**, means that moisture content has to be less than ≤10% on average

Flexible classification – EN14961-1

- Some of the properties are normative (mandatory)
  - origin and source always to be stated
  - normative properties vary depending on both origin and traded form
  - moisture content (M), and ash content (A) for all fuels
- Some properties are informative (voluntary), but they are recommended to be stated

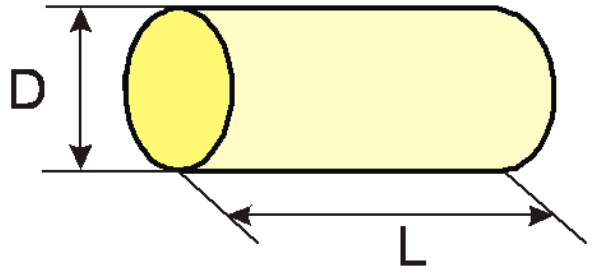
Specification for traded forms – EN14961-1

- Briquettes (Table 3)
- **Pellets (Table 4)** (all raw material)
- Wood chips (Table 5)
- Hog fuel (Table 6)
- Wood logs (Table 7)
- Sawdust (Table 8)
- Shavings (Table 9)
- Bark (Table 10)
- Straw bales, reed canary grass bales and Miscanthus bales (Table 11)
- Energy grain (Table 12)
- Olive residues (Table 13)
- Fruit seed (Table 14)
- General master table for others (Table 15)

Pellets – Normative properties (EN 14961-1)

Origin (Table 1 - Part 1)

- Woody biomass 1
- Herbaceous biomass 2
- Fruit biomass 3
- Blends and mixtures 4



Dimensions

Class	**Diameter (D)**	**Length (L)**
D06	≤ 6 ± 1,0 mm	3,15 ≤ L ≤ 40 mm (95 w-%)
D08	≤ 8 ± 1,0 mm	3,15 ≤ L ≤ 40 mm (95 w-%)
D10	≤ 10 ± 1,0 mm	3,15 ≤ L ≤ 40 mm (95 w-%)
D12	≤ 12 ± 1,0 mm	3,15 ≤ L ≤ 50 mm (95 w-%)
D25	≤ 25 ± 1,0 mm	10 ≤ L ≤ 50 mm (95 w-%)

- Maximum length of pellets: 45 mm in classes D06, D08 and D10 (≤ 5 w-%)

Pellets – Normative (EN 14961-1)

Moisture (M)

- M10 ≤ 10 % as received
- M15 ≤ 15 % as received

Ash content (A)

- A0.5 ≤ 0.5 % dry basis
- A0.7 ≤ 0.7 % dry basis
- A1.0 ≤ 1.0 % dry basis
- A1.5 ≤ 1.5 % dry basis
- A3.0 ≤ 3.0 % dry basis
- A5.0 ≤ 5.0 % dry basis
- A7.0 ≤ 7.0 % dry basis
- A10.0 ≤ 10.0 % dry basis
- A10.0+ > 10.0 % dry basis, minimum value to be stated

Bulk density (BD) (kg/m³)

- To be stated in the following classes BD550, BD600, BD650, BD700 and BD700+ (minimum value to be stated)

Drying oven, moisture content prEN 14774-1 – 3

High temperature laboratory furnace Ash content EN 14775

Pellet - Normative (EN 14961-1)

Amount of fines (F)

When loaded or packaged

Fines < 3,15 mm

- F1.0 ≤ 1,0 w-%
- F2.0 ≤ 2,0 w-%
- F3.0 ≤ 3,0 w-%
- F5.0 ≤ 5,0 w-%
- F5.0+ > 5,0 w-%, maximum value to be stated

3,15 mm sieve according to ISO 3310
Particle size distribution prEN 15149

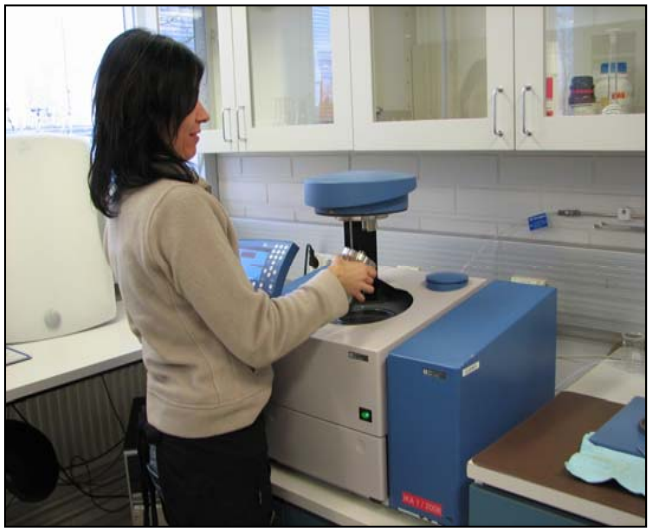
Additives

- Type and amount of pressing aids, slagging inhibitors or any other additives to be stated
- The amount of additives should not be more than 20 w-% of pressing mass. If the amount of additive is more than 20 w-% of the pressing mass then these are blended pellets

Pellets – Normative (EN 14961-1)

Net calorific value as received (Q)

- **Minimum value to be stated** (calculation by the selected moisture category and the typical variation of the net calorific value of dry matter at constant pressure)



Calorimetric bomb EN 14918
Photo: ENAS Oy

$$q_{p,net,ar} = q_{p,net,d} \times \left(\frac{100 - M_{ar}}{100}\right) - 0{,}02443 \times M_{ar}$$

- $q_{p,net,ar}$ net calorific value as received, (MJ/kg)
- $q_{p,net,d}$ net calorific value (constant pressure) dry basis (MJ/kg)
- M_{ar} total moisture (w-%)
- 0,02443 is the correction factor of the enthalpy of vaporization (constant pressure) for water (moisture) at 25 °C [MJ/kg per 1 w-% of moisture]

Calculation formula is available in EN 14961-1 in Annex C

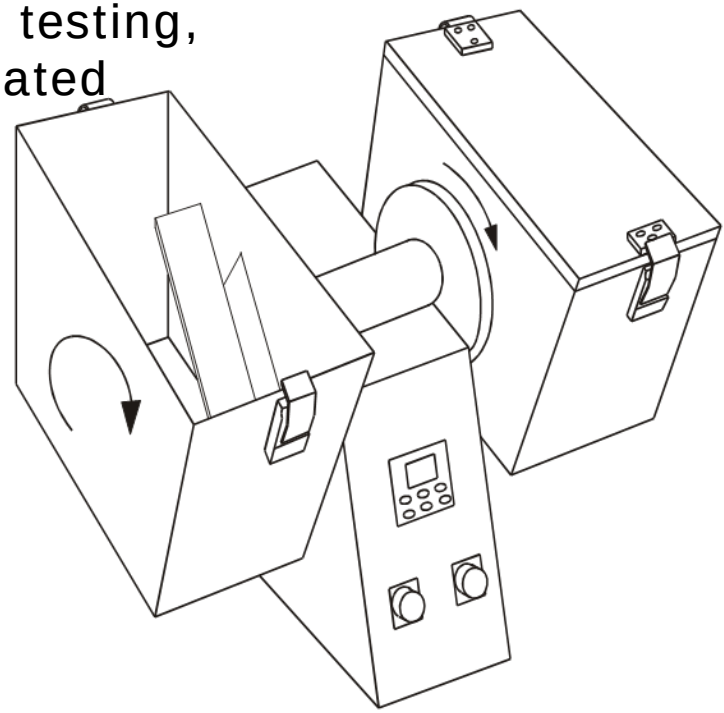
Pellets – Normative (EN 14961-1)

Mechanical durability (DU)

- DU97.5 ≥ 97.5 % pellets after testing
- DU96.5 ≥ 96.5 % pellets after testing
- DU95.0 ≥ 95.0 % pellets after testing
- DU95.0- < 95.0 % pellets after testing, minimum value to be stated

Test portion 500 ± 10 g

50 ± 2 rpm for 500 rotations



Testing apparatus for mechanical durability according EN 15210-1

Normative/informative for pellets (EN 14961-1)

Sulphur (S)

- Sulphur is normative only for chemically treated biomass (1.2.2, 1.3.2, 2.2.2,3.2.2) or if sulphur containing additives have been used

• S0.02	≤ 0.02 w-% dry basis
• S0.05	≤ 0.05 w-% dry basis
• S0.08	≤ 0.08 w-% dry basis
• S0.10	≤ 0.10 w-% dry basis
• S0.20	≤ 0.20 w-% dry basis
• S0.20+	> 0.20 w-% dry basis, and maximum value to be stated

Analyzer for S, C According to method prEN 15289

Normative/informative for pellets (EN 14961-1)

Nitrogen (N)

- Nitrogen is normative only for chemically treated biomass (1.2.2, 1.3.2, 2.2.2,3.2.2)

- N0.3 ≤ 0.3 w-% dry basis
- N0.5 ≤ 0.5 w-% dry basis
- N1.0 ≤ 1.0 w-% dry basis
- N2.0 ≤ 2.0 w-% dry basis
- N3.0 ≤ 3.0 w-% dry basis
- N3.0+ >3.0 % w-% dry basis and maximum value to be stated

CHN-analyzer
According to method prEN 15104

Normative/informative for pellets (EN 14961-1)

Chlorine (Cl)

- Chlorine is normative only for chemically treated biomass (1.2.2, 1.3.2, 2.2.2,3.2.2)

• Cl 0.02	≤ 0.02 w-% dry basis
• Cl 0.03	≤ 0.03 w-% dry basis
• Cl 0.07	≤ 0.07 w-% dry basis
• Cl 0.10	≤ 0.10 w-% dry basis
• Cl 0.10+	> 0.10 w-% dry basis the maximum value to be stated

Analysis according to method prEN 15289 (total S, Cl)

Photos: ofi & ENAS Oy

prEN 14961-6 Non-woody pellets for non-industrial use

- **Classes for straw, miscanthus and reed canary grass pellets**
- **Classes for blends and mixtures of herbaceous and fruit biomass**

Non-woody pellets (prEN 14961-6)
Normative (proposal April 2010)

Property	Cereal straw	Miscanthus	Reed canary grass
Origin	2.1.1.2 Straw parts	2.1.2.1 Grasses whole plant	
Dimensions	D06, D08, D10 (± 1 mm) 3,15 ≤ L ≤40 mm, Max. 45 mm (1 w-%)		
Moisture, M	≤ 10 w-%	≤ 10 w-%	≤ 12 w-%
Ash content, A dry basis	≤ 6.0 w-% > 6.0 w-%	≤ 4.0 w-% ≤ 6.0 w-%	≤ 8.0 w-% >8.0 w-%
Bulk density, BD	≥ 600 kg/m³	≥ 580 kg/m³	≥ 550 kg/m³
Mechanical durability, DU	≥ 97.5 w-%	≥ 97.5 w-%	≥ 96.5 w-%
Net calorific value as received, Q	Value to be stated	Value to be stated	≥14.5 MJ/kg
Fines, F (< 3,15 mm)	The amount of fines shall be ≤ 1% or 2% leaving the final point of loading for delivery to the end-user.		
Additives	Type (e.g. starch, corn flour, vegetable oil) and amount to be stated.		

Non-woody pellets (prEN 14961-6)

Normative (proposal April 2010)

Property	Cereal straw	Miscanthus	Reed canary grass
Sulphur, S dry basis	S0.1	S0.05	S0.2
Nitrogen, N dry basis	N0.7	N0.5	N1.0
Chlorine, Cl, dry basis	Cl0.1	Cl0.07	Cl0.1
Arsenic, As mg/kg dry	≤ 1	≤ 1	≤ 1
Cadmium, Cd, mg/kg dry**	≤ 0.5	≤ 0.5	≤ 0.5
Chromium, Cr mg/kg dry**	≤ 50	≤ 50	≤ 50
Copper, Cu, mg/kg dry**	≤ 20	≤ 20	≤ 20
Lead, Pb, mg/kg dry**	≤ 10	≤ 10	≤ 10
Mercury, Hg, mg/kg dry**	≤ 0.1	≤ 0.1	≤ 0.1
Nickel, Ni, mg/kg dry**	≤ 10	≤ 10	≤ 10
Zinc, Zn, mg/kg dry**	≤ 100	≤ 100	≤ 100

Ash melting behaviour is informative

** 100 mg/kg = 100 ppm = 0,01%, *Analysis prEN 15297 – Minor elements*

Non-woody pellets (EN 14961-6)
Normative (proposal April 2010)

Property	A	B
Origin	2 Herbaceous, 3 Fruit biomass and 4 Blends and mixtures	
Dimensions	D06, D08 3,15≤ L ≤40 mm (99%), Max. 45 mm (1 w-%)	D06, D08, D10 3,15≤ L ≤40 mm (99%), Max. 45 mm (1 w-%)
Moisture, M	≤ 10 w-%	≤ 12 w-%
Ash content, A dry basis	≤ 6.0 w-%	≤ 6.0 w-%
Bulk density, BD	≥ 600 kg/m^3	≥ 600 kg/m^3
Mechanical durability, DU	≥ 97.5 w-%	≥ 96.0 w-%
Fines, F (< 3,15 mm)	≤ 2%	≤ 3%
Net calorific value as received, Q	≥14.1 MJ/kg	≥13.2 MJ/kg
Additives	Type (e.g. starch, corn flour, vegetable oil) and amount to be stated.	

Non-woody pellets (prEN 14961-6)

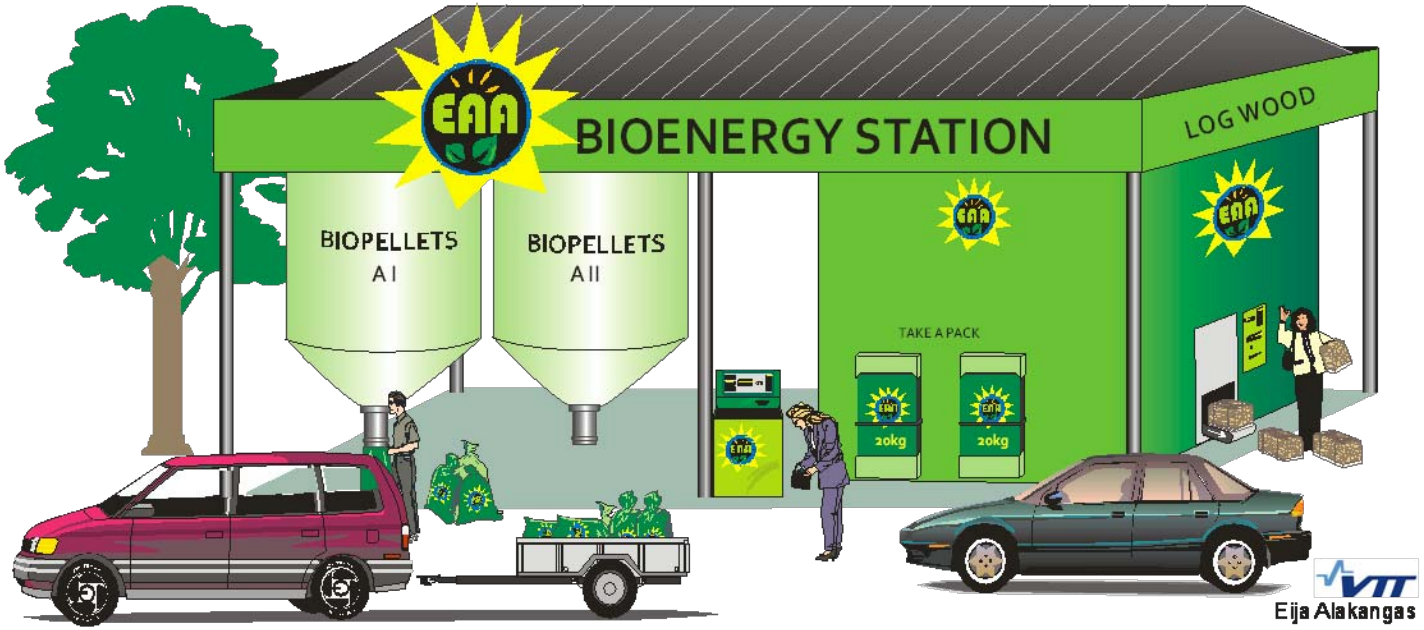
Normative (proposal April 2010)

Property	A	B
Sulphur, S dry basis	S0.2	S0.2
Nitrogen, N dry basis	N1.5	N2.0
Chlorine, Cl, dry basis	Cl0.2	Cl0.3
Arsenic, As mg/kg dry	≤ 1	≤ 1
Cadmium, Cd, mg/kg dry**	≤ 0.5	≤ 0.5
Chromium, Cr mg/kg dry**	≤ 50	≤ 50
Copper, Cu, mg/kg dry**	≤ 40	≤ 40
Lead, Pb, mg/kg dry**	≤ 10	≤ 10
Mercury, Hg, mg/kg dry**	≤ 0.1	≤ 0.1
Nickel, Ni, mg/kg dry**	≤ 15	≤ 15
Zinc, Zn, mg/kg dry**	≤ 60	≤ 60

Ash melting behaviour is informative

** 100 mg/kg = 100 ppm = 0,01%, *Analysis prEN 15297 – Minor elements*

More information



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