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TECHNICAL SPECIFICATION  
SPÉCIFICATION TECHNIQUE  
TECHNISCHE SPEZIFIKATION

**CEN/TS 14961**

March 2005

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ICS 75.160.10

English version

**Solid biofuels - Fuel specifications and classes**

Biocombustibles solides - Classes et spécifications des combustibles

Feste Biobrennstoffe - Brennstoffspezifikationen und -klassen

This Technical Specification (CEN/TS) was approved by CEN on 9 November 2004 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

CEN members are required to announce the existence of this CEN/TS in the same way as for an EN and to make the CEN/TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the CEN/TS) until the final decision about the possible conversion of the CEN/TS into an EN is reached.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
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## Foreword

This document (CEN/TS 14961:2005) has been prepared by Technical Committee CEN/TC 335 “Solid Biofuels”, the secretariat of which is held by SIS.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this CEN Technical Specification: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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## CEN/TS 14961:2005 (E)

## Introduction

This is a Technical Specification of "Fuel Specifications and Classes" of the TC335 Solid Biofuels Working group "Fuel Specifications, Classes and Quality Assurance".

The objective of this Technical Specification is to provide unambiguous and clear classification principles for solid biofuels and to serve as a tool to enable efficient trading of biofuels and to enable good understanding between seller and buyer as well as a tool for communication with equipment manufacturers. It will also facilitate authority permission procedures and reporting.

This Technical Specification is made for all user groups.

Figure 1 describes the bioenergy utilisation chain from sources of biomass, to biofuel production to final use of bioenergy. Although biomass can be used for energy generation it has many other primary uses (non-fuels) as a raw material for construction, furniture, packaging, paper products etc. The classifications given in this Technical Specification are provided with the objective of using biomass as a biofuel, and therefore do not deal with all other uses.

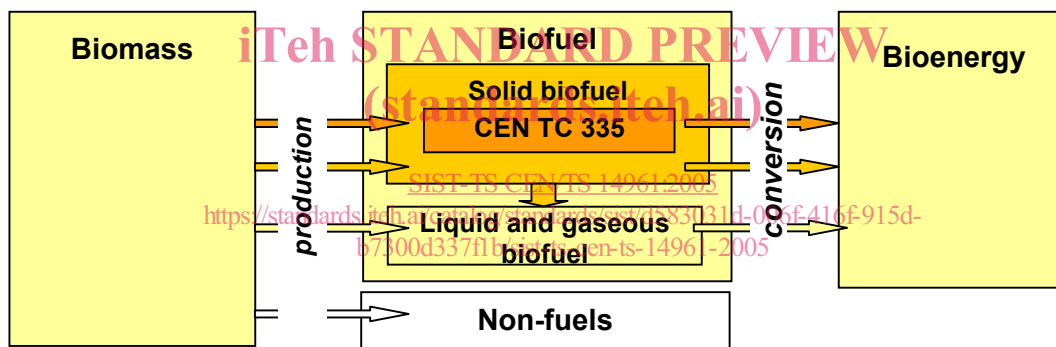


Figure 1 — CEN TC 335 within the biomass – biofuel – bioenergy field

## 1 Scope

This Technical Specification determines the fuel quality classes and specifications for solid biofuels. According to the mandate given for the standardisation work, the scope of the Technical Specification (TC335) only includes solid biofuels originating from the following sources:

- products from agriculture and forestry;
- vegetable waste from agriculture and forestry;
- vegetable waste from the food processing industry;
- wood waste, with the exception of wood waste which may contain halogenated organic compounds or heavy metals as a result of treatment with wood preservatives or coating, and which includes in particular such wood waste originated from construction and demolition waste;
- fibrous vegetable waste from virgin pulp production and from production of paper from pulp, if it is co-incinerated at the place of production and heat generated is recovered;
- cork waste.

NOTE For the avoidance of doubt, demolition wood is not included in the scope of this Technical Specification. Demolition wood is "used wood arising from demolition of buildings or civil engineering installations" (CEN/TS 14588).

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## 2 Normative references (standards.iteh.ai)

Not applicable.

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## 3 Terms and definitions [b7300d337fb/sist-ts-cen-ts-14961-2005](https://standards.iteh.ai/catalog/standards/sist/d583031d-006f-416f-915d-b7300d337fb/sist-ts-cen-ts-14961-2005)

For the purposes of this Technical Specification, the terms and definitions given in CEN/TS 14588 and the following apply.

### 3.1

#### chemical treatment

chemical treatment is in this Technical Specification defined as any treatment with chemicals other than air or water (e.g. glue and paint). Examples of chemical treatment are listed in informative annex D.

## 4 Symbols and abbreviations

The symbols and abbreviations used in this Technical Specification comply with the SI system of units as far as possible.

d dry (dry basis)

daf dry, ash-free, see informative annex C

ar as received

A Designation for ash content (w-%, dry basis) \*

$\rho$  Density [ $\text{kg/m}^3$ ]

BD Designation for bulk density \*

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DE Designation for particle density as received [ $\text{kg/dm}^3$ ]

D Designation for diameter \*

DU Designation for mechanical durability \*

$E_{\text{ar}}$  Energy density as received [ $\text{MWh/m}^3$  loose, solid or stacked volume (amount of energy/volume unit)]

E Designation for energy density as received [ $\text{kWh/m}^3$  or  $\text{kWh/kg}$ , unit is to be stated in brackets]\*

F Designation for amount of fines (< 3,15 mm, w-%)

L Designation for length \*

$M_{\text{ar}}$  Total moisture content as received [w-%] on wet basis

M Designation for moisture content as received\*

P Designation for particle size distribution\*

$q_{\text{V,gr}}$  Gross calorific value [ $\text{MJ/kg}$ ] at constant volume

$q_{\text{p,net}}$  Net calorific value [ $\text{MJ/kg}$ ] at constant pressure

\*Designation symbols are used in combination with a number to specify property levels in the Tables 4 to 13 and in informative annex A. For designation of chemical properties chemical symbols like S (sulphur), Cl (chlorine), N (nitrogen) are used and the value is added at the end of the symbol.

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**5 Principle**

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Solid biofuels are specified by: <https://standards.iteh.ai/catalog/standards/sist/d583031d-006f-416f-915d-b7300d337fb/sist-ts-cen-ts-14961-2005>

- origin and source, clause 6;
- major traded forms and properties, clause 7.

For specification of origin and source, see Table 1. For major traded forms, see Table 2.

For specification of properties see Tables 4 to 13. The major traded forms of solid biofuels are covered by Tables 4 to 12. Table 13 is a general master table to be used for solid biofuels not covered by Tables 4 to 12.

Tables 4 to 13 list the normative properties, which have to be specified and informative properties, which are voluntary. Normative properties vary depending on both origin and traded form.

**Example of specification:**

Origin: Logging residues (1.1.3)

Traded form: Wood chips

Properties: Particle size distribution P45, Moisture M40, Ash A1.5

In the case of wood chips (Table 7) the properties of dimensions, moisture and ash are normative in the specification. Other properties are informative.

Specifications for special high quality classes for solid biofuels recommended for household usage in each of the traded forms of wood pellets, wood briquettes, wood chips and log woods, are given in annex A.



## 6 Classification of origin and sources of solid biofuels

### 6.1 General

The classification is based on the biofuel origin and source. In the hierarchical classification system (Table 1) the main origin-based solid biofuel groups are:

- woody biomass;
- herbaceous biomass;
- fruit biomass; and
- 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.

*Fruit biomass* is the biomass from the parts of a plant which hold seeds.

The term “*Blends and mixtures*” in Table 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 mixture or blend has to be described using Table 1. If solid biofuel blend or mixture may contain chemically treated material it has to be stated. A blend or a mixture of e.g. chemically treated wood and chemically untreated wood has to be classified as chemically treated wood.

The second level of classification in Table 1 describes fuels from different sources within the main groups, primarily stating whether the biomass is a by-product or a residue from the industry or if it is virgin material.

Groups in Table 1 are further divided into third and fourth level sub-groups.

The purpose of Table 1 is to allow the possibility to differentiate and specify biofuel material based on origin with as much detail as needed. With the help of typical values from informative annex C information on physical and chemical properties can be deducted.

Example: Logging residues - 1.1.3.

Table 1 — Classification of origin and sources of solid biofuels

1. Woody biomass	1.1 Forest and plantation wood	1.1.1 Whole trees	1.1.1.1 Deciduous
			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 Stemwood	1.1.2.1 Deciduous
			1.1.2.2 Coniferous
			1.1.2.3 Blends and mixtures
		1.1.3 Logging residues	1.1.3.1 Fresh/Green (including leaves/needles)
			1.1.3.2 Stored
			1.1.3.3 Blends and mixtures
		1.1.4 Stumps	1.1.4.1 Deciduous
			1.1.4.2 Coniferous
			1.1.4.3 Short rotation coppice
			1.1.4.4 Bushes
			1.1.4.5 Blends and mixtures
	1.1.5 Bark (from forestry operations)*		
	1.1.6 Landscape management woody biomass		
	1.2 Wood processing industry, by-products and residues	1.2.1 Chemically untreated wood residues	1.2.1.1 Without bark
			1.2.1.2 With bark *
			1.2.1.3 Bark (from industry operations)*
			1.2.1.4 Blends and mixtures
		1.2.2 Chemically treated wood residues	1.2.2.1 Without bark
			1.2.2.2 With bark *
		1.2.3 Fibrous waste from the pulp and paper industry	1.2.2.3 Bark (from industry operations) *
			1.2.2.4 Blends and mixtures
1.2.3.1 Chemically untreated fibrous waste			
1.2.3.2 Chemically treated fibrous waste			
1.3 Used wood	1.3.1 Chemically untreated wood	1.3.1.1 Without bark	
		1.3.1.2 Bark*	
		1.3.1.3 Blends and mixtures	
	1.3.2 Chemically treated wood	1.3.2.1 Without bark	
		1.3.2.2 Bark*	
		1.3.2.3 Blends and mixtures	
1.4 Blends and mixtures			

NOTE 1 Cork waste is included in bark sub-groups.

NOTE 2 For the avoidance of doubt, demolition wood is not included in the scope of this Technical Specification. Demolition wood is "used wood arising from demolition of buildings or civil engineering installations" (see CEN/TS 14588).

Table 1 (continued)

2 Herbaceous biomass	2.1 Agriculture and Horticulture herb	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		
2.2 Herb processing industry, by-products and residues	2.2.1 Chemically untreated herb 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 and flowers	
		2.2.1.5 Blends and mixtures	
	2.2.2 Chemically treated herb 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 and flowers	
		2.2.2.5 Blends and mixtures	
2.3 Blends and mixtures			

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Table 1 (concluded)

3 Fruit biomass	3.1 Orchard and horticulture fruit	3.1.1 Berries	3.1.1.1 Whole berries
			3.1.1.2 Flesh
			3.1.1.3 Seeds
			3.1.1.4 Blends and mixtures
		3.1.2 Stone/kernel fruits	3.1.2.1 Whole fruit
			3.1.2.2 Flesh
			3.1.2.3 Stone/kernel
			3.1.2.4 Blends and mixtures
		3.1.3 Nuts and acorns	3.1.3.1 Whole nuts
	3.1.3.2 Shells/husks		
	3.1.3.3 Kernels		
	3.2 Fruit processing industry, by-products and residues	3.2.1 Chemically untreated fruit residues	3.2.1.1 Berries
			3.2.1.2 Stone/kernel fruits
			3.2.1.3 Nuts and acorns
			3.2.1.4 Crude olive cake
3.2.1.5 Blends and mixtures			
3.2.2 Chemically treated fruit residue		3.2.2.1 Berries	
	3.2.2.2 Stone/kernel fruits		
	3.2.2.3 Nuts and acorns		
	3.2.2.4 Exhausted olive cake		
	3.2.2.5 Blends and mixtures		
	3.3 Blends and mixtures		
4 Blends and mixtures	4.1 Blends		
	4.2 Mixtures		

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## 6.2 Woody biomass

### 6.2.1 Forest and plantation wood

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Forest wood and plantation wood in this category may only have been subjected to size reduction, debarking, drying or wetting. Forest wood and plantation wood includes wood from forests, parks and plantations and from short rotation forests.

### 6.2.2 Wood processing industry by-products and residues

Wood by-products and wood residues from industrial production are classified in this group. These biofuels can be chemically untreated (for example residues from debarking, sawing or size reduction, shaping, pressing) or chemically treated wood residues as long as they do not contain heavy metals or halogenated organic compounds as a result of treatment with wood preservatives or coating.

### 6.2.3 Used wood

This group includes post consumer/post society wood waste. With respect to treatment the same criteria apply as with respect to "wood processing industry by-products and residues": i.e. the used wood shall not contain heavy metals or halogenated organic compounds as a result of treatment with wood preservatives or coating.

### 6.2.4 Blends and mixtures

This refers to blends and mixtures of woody biomass in the categories 1.1 to 1.3 in Table 1. The mixing can be either intentional (blends) or unintentional (mixtures).

## 6.3 Herbaceous biomass

### 6.3.1 Agriculture and horticulture herb

Material, which comes directly from the field, perhaps after a storage period, and may only have been subject to size reduction and drying is included here. It covers herbaceous material from agricultural and horticultural fields and from gardens and parks.

### 6.3.2 Herb processing industry, by-products and residues

This refers to an herbaceous biomass material that is left over after industrial handling and treatment.

Examples are residues from the production of sugar from sugar beets and barley malt residues from beer production.

### 6.3.3 Blends and mixtures

This refers to blends and mixtures of herbaceous biomasses in the categories 2.1 to 2.2 in Table 1. The mixing can be either intentional (blends) or unintentional (mixtures).

## 6.4 Fruit biomass

### 6.4.1 Orchard and horticulture fruit

Fruit from trees and bushes and also fruit from herbs (e.g. tomatoes) are classified in this class.

### 6.4.2 Fruit processing industry, by-products and residues

This refers to a fruit biomass material that is left over after industrial handling and treatment. Examples are pressing residues from olive oil or apple juice production.

### 6.4.3 Blends and mixtures

This refers to blends and mixtures of fruit biomass in the categories 3.1 to 3.2 in Table 1. The mixing can be either intentional (blends) or unintentional (mixtures).

## 6.5 Biomass blends and mixtures

These include blends and mixtures of different biomasses mentioned above under 6.2 to 6.4. The mixing can be either intentionally (blends) or unintentionally (mixtures).

## 7 Specification of solid biofuels based on traded forms and properties

### 7.1 Traded forms of solid biofuels

Solid biofuels are traded in many different sizes and shapes. The size and shape influence the handling of the fuel as well as its combustion properties. Biofuels may be delivered for example in the forms shown in Table 2.