# SolidStandards

## Enhancing the implementation of quality and sustainability standards and certification schemes for solid biofuels (EIE/11/218)

## D2.1a: General information module

Co-funded by the Intelligent Energy Europe Programme of the European Union

# The SolidStandards project

The SolidStandards project addresses ongoing and recent developments related to solid biofuel quality and sustainability issues, in particular the development of related standards and certification systems. In the SolidStandards project, solid biofuel industry players will be informed and trained in the field of standards and certification and their feedback will be collected and provided to the related standardization committees and policy makers.

SolidStandards is coordinated by:

WIP Renewable Energies
Sylvensteinstrasse 2
81369 Munich, Germany
Cosette Khawaja & Rainer Janssen
cosette.khawaja@wip-munich.de
rainer.janssen@wip-munich.de
Tel. +49 (0)89 72012 740

# About this document

This document is part of **Deliverable 2.1** of the SolidStandards project. It is the training guidebook for the general information module and provides background information to the corresponding presentation slides. This document was prepared in **December 2011** by:

VTT
Koivurannantie 1,
40400 Jyväskylä, Finland
Eija Alakangas
eija.alakangas@vtt.fi
Tel. +358 20 722 2550

NEN
Vlinderweg 6
2623 Delft, the Netherlands
Margret Groot
margret.groot@nen.nl
Tel. +31 15 2690 423

This training material was updated by Eija Alakangas, VTT in November 2013.

# Intelligent Energy Europe

The SolidStandards project is co-funded by the European Union under the Intelligent Energy Europe Programme (Contract No. EIE/11/218).

Co-funded by the Intelligent Energy Europe Programme of the European Union

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# 1. The process of European standardization

## 1.1. The Committee for European Standardization (CEN)

To understand the process of standardization well, it is good to realize what precisely a standard is.

**What is standard?**

A standard is a document, designed for common and repeated use, to be used as a rule, guideline or definition. It is both consensus-built and approved by a recognized body. NOTE Standards should be based on the consolidated results of science, technology and experience.

**What is certification?**

A certification is third-party attestation (i.e., issue of a statement) that specified requirements related to products, processes, systems or persons have been fulfilled (adapted from ISO/IEC 17000, 2005, Definitions 5.2 and 5.5).

Standards are created by bringing together all interested parties such as manufacturers, consumers, and regulators of a particular material, product, process or service. All parties benefit from standardization through increased product safety and quality as well as lower transactions costs and prices. An important objective of standardization is to remove barriers in the European market for goods and services.

The standards related to solid biomass are provided by the Committee for European Standardization (CEN). This organization works in a decentralized way. Its 32 members – the National Standardization Bodies (NSBs, see App.1) of the 27 EU and 3 EFTA countries and of Croatia and Turkey – operate the technical groups that draw up the standards. The CEN-CENELEC Management Centre (CCMC) in Brussels manages and coordinates this system. More than 60,000 technical experts from industry, associations, public administrations, academia, and societal organizations are involved in the CEN network that reaches over 590 million people. The European Commission and the EFTA (European Free Trade Association) Secretariat act as CEN's Counsellors in terms of regulatory or public interest.

## 1.2. Developing standards

CEN produces European Standards (EN), which are also national standards in our member countries. In addition, CEN produces some other technical documents such as a CEN Workshop Agreement (CWA) which are often used in fast-evolving technologies and the creation of new markets. CEN can also start preparing technical specifications (CEN/TS), which are so-called pre-standards. The different products of CEN are more precisely described in the textbox on next page.

## CEN products

**European Standard (EN)**

A standard is a technical publication that is used as a rule, guideline or definition. Essentially, it is a repeatable way of doing something, developed through consensus. Standards are created by bringing together all interested parties. National Standards Bodies have to adopt a European Standard as a national standard. The process of standardization officially consists of three stages (see text after this box).

**CEN Workshop Agreement (CWA)**

A CEN Workshop agreement (CWA) is a standardization document, developed in a CEN Workshop. The latter is open to the direct participation of anyone with an interest in the development of the agreement. There is no geographical limit on participation and hence participants may be from outside Europe. The development of a CWA is fast and flexible, and takes on average between 10-12 months to produce it. A CWA does not have the status of a European Standard and there is no obligation for the National Standards Bodies to adopt it as national standards.

**Technical Specifications (CEN/TS)**

A Technical Specification (TS) is a normative document produced and approved by a Technical Committee. A CEN/TS can be developed by CEN Technical Committees as a pre-standard which contains technical requirements for innovative technology, or when various alternatives need to coexist in anticipation of future harmonization that would not gather enough as to allow agreement on a European Standard (EN). A CEN/TS does not have the status of an EN but may be adopted as national standard. Moreover there is no standstill, no public enquiry and no weighted vote.

**Technical Report (CEN/TR)**

A Technical Report (TR) is a document that provides information on the technical content of standardization work. Technical Reports may be prepared when it is considered urgent or advisable to provide additional information to the CEN national members, the European Commission, the EFTA Secretariat or other governmental agencies or outside bodies. The information contained in a TR is different from that which is normally published as a European Standard (EN). A CEN/TR is approved by the Technical Board or by a Technical Committee by simple majority.

Most standards are prepared at the request of industry. The European Commission can also request the relevant standards bodies to prepare standards in order to implement European legislation. This type of standardization activity is 'mandated' by the European Commission. In most cases, such initiatives are supported by the EFTA Secretariat.

All CEN activities are undertaken by a collective of stakeholders, manufacturers, users, research organizations, government departments and consumers. In these so called CEN Technical Committees (CEN/TC), experts are mandated by national member bodies, with formal decisions by national delegations. The CEN/TC can be divided in different working groups (WG). Representatives of the CEN Members (mostly an employee of an NSB) act as secretaries to the various technical groups and manage the projects and the production of standards and other documents.

The process to set up an EN standard is bounded on rules (which are described in the CEN/CENELEC Internal Regulations) and officially consists of three stages:

1. Proposal stage (drafting standards in working groups, standards marked by pr)
2. Enquiry stage (final technical and editorial comments collected from national standardization bodies, standards marked by Fpr)
3. Approval stage (voting by national standardization bodies for approval and standards published as EN)

In each phase there are votes about the delivered products by the relevant WG or TC (like a New Work Item proposal (NWIP) in the first stage, or the prEN in the second stage). After the last phase the EN is going to be published.

In the following paragraphs information is given about the three CEN/TCs, which are related to biomass.

## 1.3. Relation between regulation, standardization and certification

Figure 1 schematically shows the relation between regulation, standardization and certification. The pyramid symbolizes the hierarchy in this figure. European standards can support EU policies and legislation. They can help the business to comply with requirements established by EU legislation. For example the European Commission defines essential requirements in Directives, and indicates desired outcome without specifying how this should be achieved. In this case standardization organizations develop or approve (harmonized) standards, which set out specifications to meet Directives' essential requirements. It is important to realize that the use of standards is always voluntary. Manufacturers or other stakeholders do not have to follow the standards.

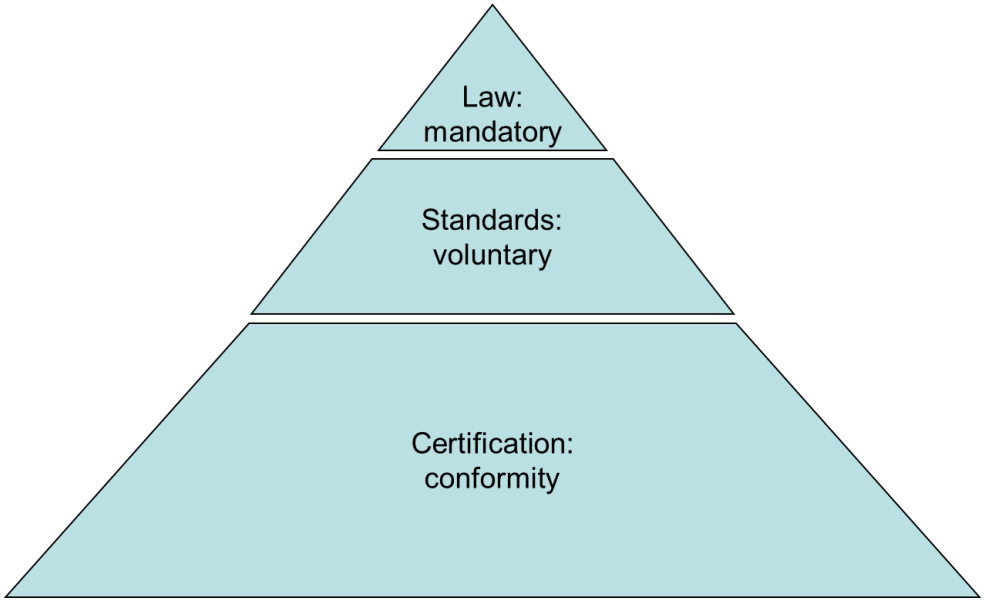



**Figure 1: Hierarchy of regulation, standardization and certification. Figure NEN.**

Frequently the European Commission gives CEN a mandate to develop standards, to support or complement European policy and law. This is also the matter for biomass as can be read in the paragraph "Standards for Solid Biomass" (1.5). Certification is based on the justified confidence that a product, service, process, system or person complies with an (internationally) agreed standard. Certification marks are earned by businesses whose products and practices consistently prove conformity to relevant standards. These marks are easily recognizable and act as labels of quality, safety and performance. Most of the times the certification process is carried out by a third party conformity assessment body, because they have an independent point of view.

## 1.4. Benefits of standardization

Like mentioned before, all parties benefit from standardization. In this section some important benefits for the stakeholders in the market and the public sector are described and illustrated via examples.

**Market:**

Compliance with widely recognized European standards is an effective means of differentiation in a competitive marketplace; using standards leads to lower production costs for instance. Besides that consumers become better informed about their choices, so conformity to recognized standards becomes increasingly important. Two examples are the European standards for toys (EN 71 series) and the European standards for lifts (EN 81 series), which are used internationally. Standards can also be used by producers to show the market that their products meet some legal (environmental) requirements. Furthermore it is important for a transparent market to have quality indicators for the buyers of the products, measured in a standardized way. This is for example important for biomass, because the different quality characteristics determine the amount of electricity that can be produced with the biomass and whether the biomass is suitable for the power plant. The better the quality of the biomass, the higher the price could be.

**Public sector:**

Although standards are voluntary and separate from legal and regulatory systems, they can be used to support or complement legislation as mentioned before, for instance to protect the environment or to improve consumer safety. This benefit becomes more important now the government is committed to reducing the burden of regulation for the private and public sectors. An important example on the area of biomass is the one of sustainability. The European Commission laid down minimum requirements for the sustainability of liquid biofuels in the Renewable Energy Directive (RED), but it is the markets own responsibility to demonstrate that the biomass used meets the requirements via voluntary schemes. Another advantage is that the use of carefully developed standards is providing the environment and setting the best possible conditions in which innovation can thrive. Furthermore international and European standards provide a common technical language for trade partners throughout the world and support in this way the international trading.

## 1.5. Standards for solid biofuels

In the late nineties the European Commission gave CEN the mandate to develop standards for solid biofuels to support the energy policy of Europe. With its policy the European Commission aimed at stimulating the renewable energy production, because of climate change and energy security. The ambition is to reduce greenhouse gas emission and to become less dependent on countries that produce oil and gas. As a result of this, the Renewable Energy Directive requires the renewable energy consumption to be 20% in Europe's total energy consumption by 2020. The mandate of the European Commission to CEN was to develop quality standards for solid biofuels. Because the import of biomass in Europe was increasing, it became more important to develop not only European, but also global standards. In the following section information is given about the European CEN/TCs, and the global ISO/TC that are related to biomass. It describes the scope of the TCs, some contact data and in more detail the need of such kind of standards.

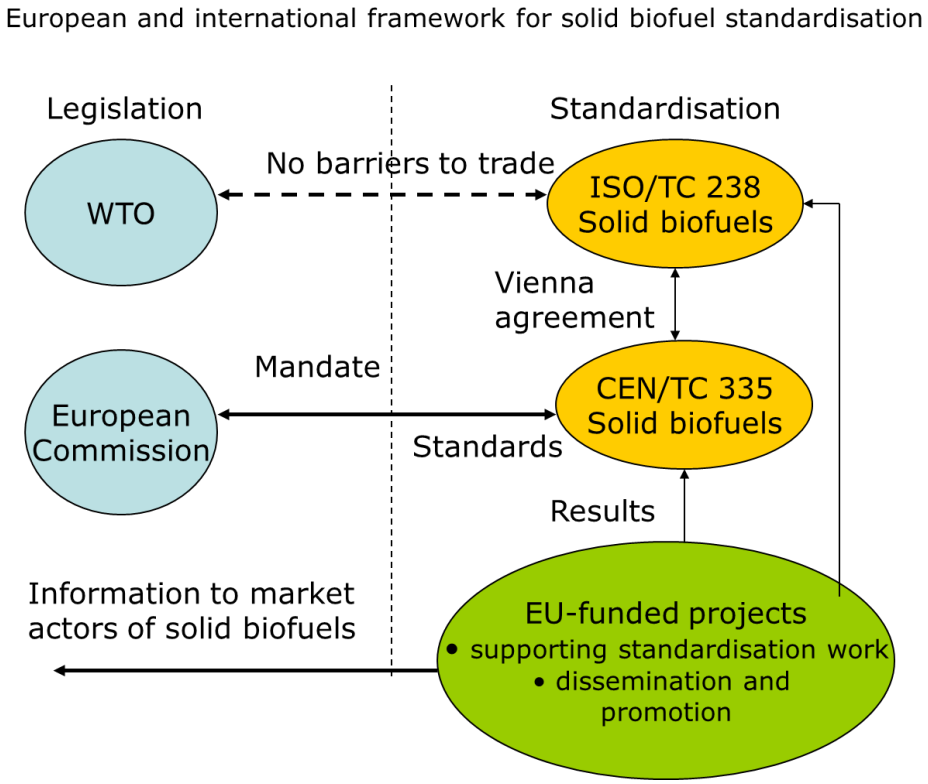



**Figure 2: European and international framework for solid biofuels standardisation (VTT)**

This report includes also EN ISO standards numbers, which are superseding current EN-standards for solid biofuels. Figure 3 describles the solid biofuel standardization process.

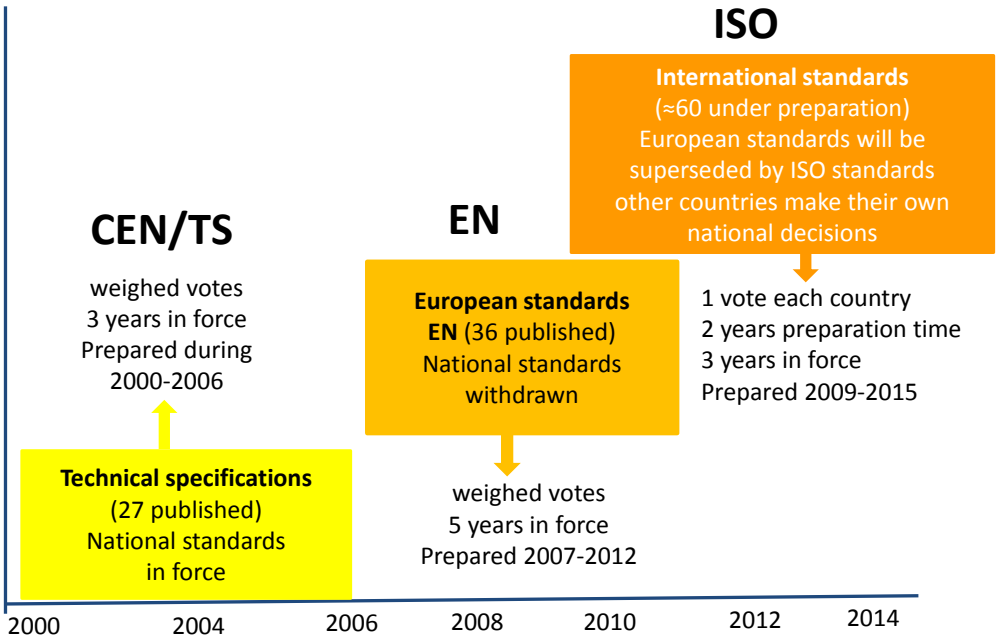



**Figure 3. Solid biofuel standardization process (VTT)**

## 1.6. CEN/TC 335 Solid biofuels

Standards for solid biofuels are seen as a key for unlocking the fuel markets as well as the trans-European fuel trade. The development of standards for sampling and testing of solid biofuels as well as on fuel quality assurance assist in the development of the markets for solid biofuels. This helps reaching the environmental and climatic as well as social goals of the European Commission. Furthermore competition due to the increasing trade supports in keeping the prices for solid biofuels at a low level. Finally the development of an overall quality assurance system is seen as a key element, because guaranteeing a certain fuel quality is becoming more and more important against the background of increasing regulation of air quality and the goal to use solid biofuels in an environmentally sound way. CEN/TC 335 is established to develop the relevant European Standards for the market for solid biofuels and the work has been mandated by the European Commission.

More precisely the objective of CEN/TC 335 is elaboration of standards on:

- Terminology, definitions and description (CEN/TC 335/WG 1) (Germany, Martin Kaltschmitt) (see chapter 3.1)
- Fuel specifications, classes and quality assurance (CEN/TC 335/WG 2) (Finland, Eija Alakangas, VTT) (see chapter 3.2 and 3.3)
- Sampling and sample reduction (CEN/TC 335/WG 3) (the Netherlands, Ludwin Daal) (see chapter 3.4)
- Physical and mechanical test methods (CEN/TC 335/WG 4) (Sweden, Jan Burvall, Skellefteå Kraft) (see chapter 3.5)
- Chemical test methods (CEN/TC 335/WG 5) (the Netherlands, Frits Bakker, ECN)(see chapter 3.6

For solid biofuels, technical specifications (CEN/TS) were prepared during 2000 – 2006 and after that these documents have been upgraded to full standards. Most of these EN-standards have been published in the period 2009 -2012.

In the table below page, you find some contact information. Further details can be found at www.solidstandards.eu.

| Technical Committee | **TC 335 Solid biofuels** |
|---|---|
| Chairman | Jonas Wilde (Vattenfall) |
| Secretary | Lars Sjöberg, Swedish Standards Institute (SIS) |
| Address | SE-118 80 Stockholm, Sweden |
| Telephone | +46 8-555 520 00 |
| E-mail | lars.sjoberg@sis.se |
| Website | www.sis.se |

## 1.7. CEN/TC 383 Sustainably produced biomass for energy applications

The objective of CEN/TC 383 is to develop standards with sustainability criteria for biomass. The first aim of CEN/TC 383 is to develop standards that help companies implementing the European Renewable Energy Directive (RED) and that are supported by the European Commission. The RED lays down sustainability criteria for biofuels (for transport) and bioliquids (for other energy purposes) that shall be applied by all organizations in this sector in order to be eligible for counting in renewable energy targets. The standards apply to biofuels and bioliquids and include the following topics:

- Terminology (CEN/TC 383/WG 1, convenor A. Heitzer (CH)
- Calculation methods of the greenhouse gas emission balance using a life cycle approach (CEN/TC 383/WG 2, convenor J.F. Larivé (BE))
- Biodiversity and environmental aspects related to nature protection purposes (CEN/TC 383/WG 3, under German convenorship)
- Conformity assessment including chain of custody and mass balance (CEN/TC 383/WG 5, convenor A. De Plaen (BE))

CEN/TC 383 is considering starting developing standards with sustainability criteria for solid biomass and biogas (status September 2011).

In the table below, you find some contact information. Further details can be found at www.solidstandards.eu.

| Technical Committee | **CEN/TC 383 Sustainably produced biomass for energy applications** |
|---|---|
| Chairman | Helias Udo de Haes |
| Secretary | Ortwin Costenoble, Netherlands Standardization Institute (NEN) |
| Address | Vlinderweg 6, 2623 AX Delft, the Netherlands |
| Telephone | +31 15 269 0 326 |
| E-mail | energy@nen.nl |
| Website | www.nen.nl |

## 1.8. ISO/TC 238 Solid biofuels

The committee ISO/TC 238 was created in 2007 to facilitate the market of solid biomass and to support legislation for air quality. ISO/TC 238 was established to develop the relevant global standards for the market for solid biofuels, just like CEN/TC 335 did for Europe. The structure of this committee is also very similar to the one of CEN/TC 335. More precisely the objective of CEN/TC 335 is elaboration of standards on:

- Terminology (ISO/TC 238/WG 1) (Germany)
- Fuel specifications and classes (ISO/TC 238/WG 2) (Finland)
- Quality assurance (ISO/TC 238/WG 3) (UK)
- Physical and mechanical test methods (ISO/TC 238/WG 4) (Sweden)

- Chemical test methods (ISO/TC 238/WG 5) (The Netherlands)
- Sampling and sample preparation (ISO/TC 238/WG 6) (USA)

For ISO/TC 238 many published European Standards are now being used as draft standards. Furthermore there are some new subjects for standardization. In the table next page, you find some contact information. Further details can be found at www.solidstandards.eu.

| Technical Committee | **ISO/TC 238** |
|---|---|
| Chairman | New chairperson to be nominated |
| Secretary | Lars Sjöberg, Swedish Standards Institute (SIS) |
| Address | 118 80 Stockholm, Sweden |
| Telephone | +46 8-555 520 00 |
| E-mail | lars.sjoberg@sis.se |
| Website | www.sis.se |

## 1.9. ISO/PC 248 Sustainability criteria for bioenergy

The objective of ISO/PC 248 is to elaborate one standard in the field of sustainability criteria for production, supply chain and application of bioenergy. This includes terminology and aspects related to the sustainability (e.g. environmental, social and economic) of bioenergy. The project committee develops a single standard, but divided the work in the following working groups:

- Cross cutting issues (ISO/PC 248/WG 1) (The Netherlands)
- Greenhouse gases (ISO/PC 248/WG 2) (USA)
- Environmental, economic and social aspects (ISO/PC 248/WG 3) (Sweden & Brazil)
- Indirect effects (ISO/PC 248/WG 4) (Canada, Argentina & USA)

In the table below, you find some contact information. Further details can be found at www.solidstandards.eu.

| Project Committee | ISO/PC 248 Sustainably criteria for bioenergy |
|---|---|
| Chairman | Humberto Siqueira Brandi (Brazil) |
| Secretary | Reiner Hager, Deutsches Institut für Normung (DIN) |
| Address | Burggrafenstraße 6, 10787 Berlin, Germany |
| Telephone | +49 30 26012187 |
| E-mail | reiner.hager@din.de |
| Website | www.din.de |

# 2. Possibilities to get involved as a stakeholder

## 2.1. General

Being involved in the standardization process is an opportunity to influence the content of standards so that it reflects the business needs. It is also a chance for your company or organization to receive information on issues that matters your company and to establish contacts with interested parties like your customers, trade federations, consumers, users, government and regulators. In general anyone – industry, SMEs, individuals – who is interested in developing a standard can do so, provided the correct channels are used. Interested parties can get involved in the standardization process at either national or international level. In the following paragraphs you can read how to realize this.

## 2.2. Through National Standardization Bodies (NSBs)

All European countries have a National Standardization Body that is either a Member or an Affiliate of CEN. Each NSB seeks to bring together all national stakeholders with significant interest in particular projects. Representations are from multiple spheres: industry, SMEs, consumer organizations, professional institutions, certification, testing and inspection bodies, environmentalists, public authorities, enforcement bodies, national notified bodies, trade associations, trade unions, educational establishments, research organizations, etc. Their primary task is to represent the national position in the European standardization process. The NSB ensures real consensus building at national level and thus enables a wide measure of consultation and support in standards work. For each standardization topic, an NSB can establish a national mirror committee for the different stakeholders, so that they are able to follow and influence the standardization process. National standardisation bodies are listed in Appendix 1.

NSBs are responsible for appointing experts to participate in standardization work done at European and international levels. With specialist knowledge in a particular area, you may be appointed to become part of the national delegation sent by your NSB to sit on a Technical Committee (TC) or in a TC Working Group (WG), tasked with preparing CEN deliverables. It is the role of the NSB to participate in European standardization work and it is their obligation to implement European Standards at national level and withdraw any conflicting national standards. Further details can be found at www.solidstandards.eu.

**Figure 4: The best way to influence the content of the standards is to participate in the working groups. WG2 meeting of CEN/TC 335 in Athens in September 2008 (ENEA).**

## 2.3. Through national trade federations or associations

Another way to participate in the standardization process as a stakeholder is to become a member of a national trade federation or association. National trade federations or associations provide a number of services to their members, advancing and protecting their member's interests and supporting their members in various areas of their business. These national trade federations, which in general are a member of NSBs, will echo your views at national level and then take them back to the European and international standardization process.

## 2.4. Through European trade federations

Stakeholders can also join a European trade federation or association. Some European trade federations are an Associate Member of CEN. These organizations are important stakeholders in the European standardization process. Within their pan-European scope, many such European federations have been instrumental in programming and drafting standards work. Their members contribute to the drafting of European Standards and other documents, either through experts participating directly in European working groups, or through national delegations. Federations granted liaison status has the right to send participants to specific Technical Committees of interest to them. These participants can participate fully, including through technical contributions but without voting rights given to the national delegations.

# 3. Introduction to solid biofuels standards

This guidebook gives general information of solid biofuel standards developed under CEN/TC 335. The scope of standardisation of terminology, specifications and classes, quality assurance, sampling and sample reduction, and test methods include raw and processed materials originating from agriculture and forestry to be used as a source of solid biofuels.

One of the most important tools for a strong common solid biofuel market in Europe is the standards for solid biofuels currently under development in CEN/TC 335. The standards can be used as tools to enable both efficient trading of solid biofuels and good understanding between seller and buyer, as well as in communication with equipment manufacturers.

The scope has been defined by the Commission and the solid biofuels covered by the TC 335 are identical to the fuels exempted from the Directive 2000/76/EC [Article 2.2 a) from i) to v)] on incineration of waste. For the avoidance of doubt, demolition wood is not included in the scope of the CEN/TC 335. Demolition wood is “used wood arising from demolition of buildings or civil engineering installations” (EN 14588).

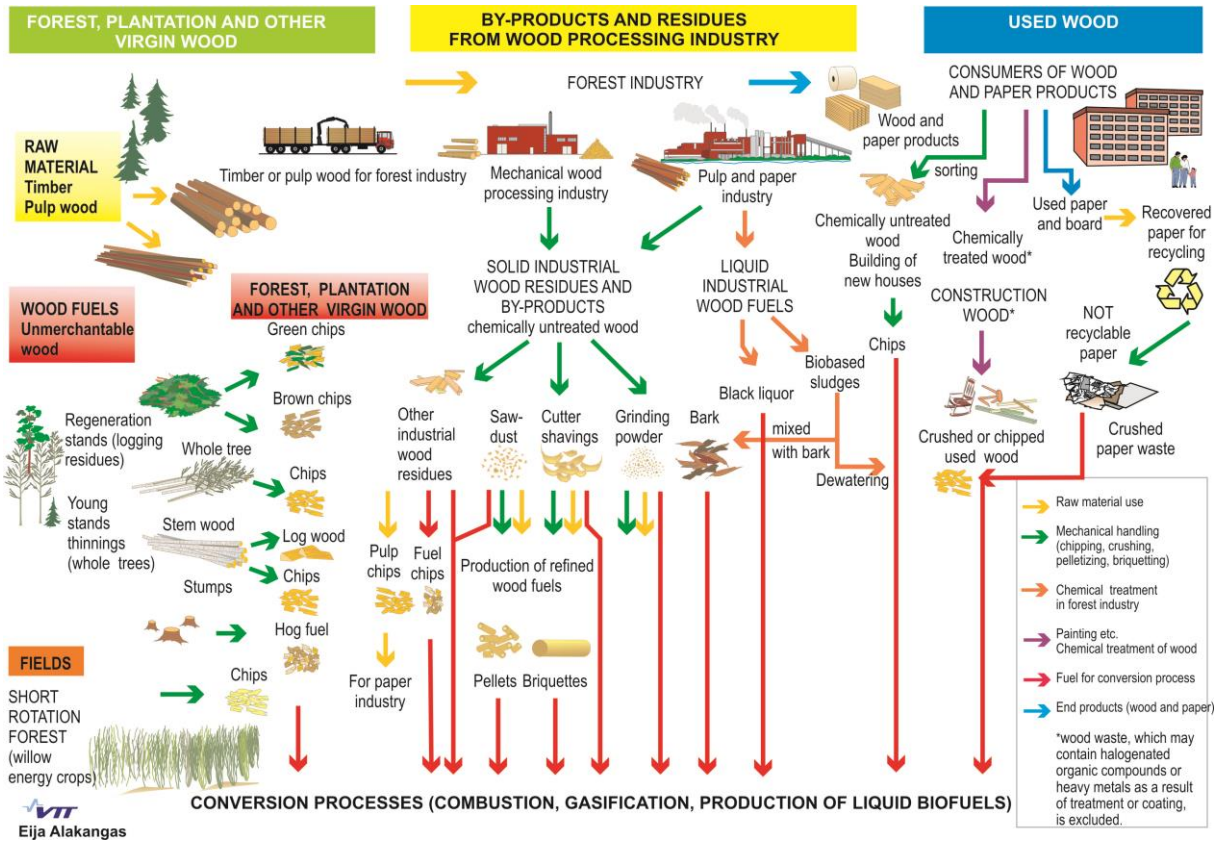



**Figure 5: Example of classification of 1 Woody biomass according to EN 14961-1:2010 standard (VTT).**

The CEN/TC 335 started in year 2000 and decided to start by making Technical Specifications, CEN/TSs, in order to serve the market as fast as possible. This work was finished in 2006 and most technical specifications are upgraded to full EN-standards during 2007 to 2011.

# 4. Short description of solid biofuel standards

## 4.1. Terminology

**EN 14588:2011 Solid Biofuels – Terminology, definitions and description**

This standard defines the terms within the scope of CEN/TC 335 “Solid Biofuels”. Beside the international standards, also national standards and manuals have provided the basis of the standard. Some terms important within specific nations have been added to the terminology: e.g. “black liquor” and “animal husbandry residues” are out of the scope of the mandate, yet included in the standard for information only. Numerically 187 terms and definitions are categorised in a logical structure based on the assumptions that there are different types of solid biofuels, which are produced from different sources and the purpose of which is the conversion into bioenergy. This standard also includes all terms needed in other TC 335 standards; fuel classification and quality, physical, mechanical and chemical properties, sampling and sample reduction.

This standard will be superseded by EN ISO 16559 in 2014. This standard will include also terms for thermally treated biomass.

## 4.2. Fuel specification and classes – multipart standard EN 14961

**EN 14961-1:2010: Solid Biofuels, Fuel specifications and classes - Part 1: General requirements**

This EN determines the fuel quality classes and specifications for solid biofuels for general use. The classification principle of the solid biofuels is based on origin and source, major traded forms (briquettes, pellets, wood chips, hog fuel, sawdust, firewood/logs, straw, miscanthus and reed canary bales, grains, olive residues) and properties of solid biofuels. In this standard there are several property classes, which can be selected separately. Classification system is flexible. Hierarchical classification system includes four subgroups: woody biomass, herbaceous biomass, fruit biomass and biomass blends and mixtures. This EN involves special requirements for chemically treated biomass (other than heat, air or water). The European standard series EN 14961 are provided as a general requirements and additional product standards. EN 14961 consists of the following parts: Part 1: General requirements, Part 2: Non industrial wood pellets, Part 3: Non industrial wood briquettes, Part 4: Non industrial wood chips, Part 5: Firewood Part 6: Non woody pellets.

This standard will be superseded by EN ISO 17225-1 in 2014. Standard includes also classification of aquatic biomass. New quality tables are produced for thermally treated biomass. Wood chip and hog fuel table is combined and particle size distribution is changed. Chemically treated material shall not include halogenated organic compounds or heavy metals at levels higher than those in typical virgin material values (see Annex B) or higher than typical values of the country of origin.

**EN 14961-2:2011: Solid biofuels, Fuel specification and classes – Part 2: Wood pellets for non-industrial use**

This product standard specifies the quality of wood pellets for non-industrial use. Non-industrial use means that wood pellets are targeted to households, and small public or industrial buildings. Classification includes three classes: A1, A2 and B. Most of the properties are normative only ash melting behaviour is informative. Property class A1 for wood pellets represents virgin woods and chemically untreated wood residues low in ash and nitrogen content. Fuels with slightly higher ash content and nitrogen content fall within grade A2. In Class A1 and A2 only chemically untreated wood is allowed. In property class B is also allowed chemically treated industrial wood by-products and residues and used wood, but

there are very strict threshold values for heavy metals. Class B can include also chemically treated industrial by-products or residues and used wood, but heavy metal threshold values are same for all classes.

This standard will be superseded by EN ISO 17225-2 in 2014. Standard includes also a classification table for industrial wood pellets (classes I1, I2 and I3). Some changes for sulphur and ash content has been made for A1 and A2 classes.

**EN 14961-3: Solid biofuels, Fuel specification and classes – Part 3: Wood briquettes for non-industrial use**

This standard is similar to wood pellets (see EN 14961-2) and specifies the quality of wood briquettes for non-industrial use. Also classification includes three classes: A1, A2 and B as wood pellets. Stating ash melting behaviour is not required. Requirements for heavy metals and raw material are the same as for wood pellets.

This standard will be superseded by EN ISO 17225-3 in 2014. Also EN ISO 17225-7 for non-woody briquettes is drafted.

**EN 14961-4: Solid biofuels, Fuel specification and classes – Part 4: Wood chips for non-industrial use**

This product standard specifies the quality of wood chips for non-industrial use. Classification includes four classes: A1, A2, B1 and B2. Requirements of heavy metals are stated only for class B1 and B2, because A1 and A2 include only virgin wood and chemically untreated wood. Property classes A1 and A2 represent virgin woods and chemically untreated wood residues. A1 represents fuels with lower ash content indicating no or little bark, and lower moisture content, while class A2 has slightly higher ash content and/or moisture content. B1 extended the origin and source of class A to include other material, such as, short rotation coppice, wood from gardens and plantation, etc. and chemically untreated industrial by-products and residues. Property class B2 also includes chemically treated industrial by-products and residues and used wood. Chemically treated wood residues, fibres and wood constituents from wood processing (1.2.2) and used wood (1.3) are included in property class B2 as long as they do not contain heavy metals or halogenated organic compounds as a result of treatment with wood preservatives or coating. Quality requirements are set in two tables: Table 1 for particle size and Table 2 for other properties. All properties are normative.

This standard will be superseded by EN ISO 17225-4 in 2014. Particle size classification is changed.

**EN 14961-5: Solid biofuels, Fuel specification and classes - Part 5: Firewood for non-industrial use**

This product standard specifies the quality of oven-ready firewood for non-industrial use. Classification includes three classes: A1, A2 and B. Firewood specified according to classes A1 and A2 are suitable to be used in stoves and fireplaces and class B in log wood boilers. No chemically treated wood is allowed. All properties are normative. Both moisture content on dry basis (U) and moisture content on wet basis (M) have to be stated. The threshold values for ash, N, S, Cl and minor elements are not required as firewood is produced from virgin material which has been grown on uncontaminated land and therefore the likely hood of contamination is very low. Firewood amounts are given in cubic metres or in kilograms. A cubic metre of stacked wood means a stack of wood that occupies a space of one cubic metre. A cubic metre of loose wood is equal to a box one cubic metre in size into which the split logs are “thrown”. For firewood amount of split volume, decay and quality of cut-off surface has to be informed.

This standard will be superseded by EN ISO 17225-5 in 2014.

**EN 14961-6:2012: Solid biofuels, Fuel specification and classes – Part 6: Non-woody pellets for non-industrial use**

This product standard specifies the quality of non-woody pellets for non-industrial use. This standard covers only non-woody pellets produced from the following raw material: 2 Herbaceous biomass, 3 Fruit biomass and 4 Biomass blends and mixtures. Standard will include Table 1 for specification of straw, miscanthus and reed canary grass pellets and Table 2 for blends and mixtures. Both tables include normative and informative properties. Group 4 Blends and mixtures include blends and mixtures from the main origin-based solid biofuel groups woody, herbaceous biomass and fruit biomass.

This standard will be superseded by EN ISO 17225-6 in 2014. Some changes for values for A and B class pellets has been made.

## 4.3. Fuel quality assurance – Multipart standard EN 15234

**EN 15234-1:2011 Fuel quality assurance - Part 1: General requirement**

This standard defines the procedures to guarantee solid biofuel quality through the whole supply chain from the biofuel origin to the delivery to the end-user, and describes measures to provide adequate confidence that specified quality requirements are fulfilled. It covers the fuel quality assurance of the supply chain and the information to be used in the quality control of the product, which ensures traceability and gives confidence by demonstrating that all processes along the supply chain up to the point of the delivery to the end-user are under control. The methodology described in this standard facilitates the design of a fuel quality control and assurance system. There are six consecutive steps that have to be followed by every stakeholder in the supply chain. Step 1: Define fuel requirements for the final product, Step 2: Document the steps in the production and distribution processes, Step 3: Identify quality influencing factors including company performance, Step 4: Define Critical Control Points for compliance with the fuel specification, Step 5: Select appropriate measures to assure the quality of the product and Step 6: Establish routines of separate handling of nonconforming raw materials and solid biofuels. Fuel quality assurance needs to be applied to the entire supply chain. As the supply chains for solid biofuels in the most cases need to be kept very simple, the same documents are often used for documentation of quality assurance and quality control measures. This standard gives also templates for product declarations.

**EN 15234-2:2012 Fuel quality assurance – Part 2: Wood pellets for non-industrial use**

This standard defines the procedures to fulfil the quality requirements (quality control) and describes measures to ensure adequate confidence that the wood pellet specification described in EN 14961-2 is fulfilled (quality assurance). This standard covers the production and delivery chain, from purchasing of raw materials to point of delivery to the end-user and quality assurance for wood pellets produced from the woody biomasses stated in EN 14961-1:2010, Table 1 and EN 14961-2. Examples of the process description with the corresponding quality influencing factors and critical control points are given in standard and also templates for a product declaration.

**EN 15234-3:2012 Fuel quality assurance – Part 3: Wood briquettes for non-industrial use**

This standard defines the procedures to fulfil the quality requirements (quality control) and describes measures to ensure adequate confidence that the wood briquette specification described in EN 14961-3 is fulfilled (quality assurance). This standard covers the production and delivery chain, from purchasing of raw materials to point of delivery to the end-user. This

standard covers only quality assurance for wood briquettes produced from the woody biomasses stated in EN 14961-1:2010, Table 1 and EN 14961-3. Examples of the process description with the corresponding quality influencing factors and critical control points are given in standard and also templates for a product declaration. See six steps from EN 15234-1.

**EN 15234-4:2012 Fuel quality assurance – Part 4: Wood chips for non-industrial use (approved, under publishing)**

This standard defines the procedures to fulfill the quality requirements (quality control) and describes measures to ensure adequate confidence that the wood chips specification for non-industrial use as described in EN 14961-4 is fulfilled (quality assurance). This standard covers the raw material supply, production and delivery chain, from purchasing of raw materials to point of delivery to the end-user. This standard covers only quality assurance for wood chips produced from the woody biomasses stated in EN 14961-1:2010, Table 1 and EN 14961-4. Examples of the process description with the corresponding quality influencing factors and critical control points are given in standard and also templates for a product declaration. See six steps from EN 15234-1.

**EN 15234-5:2012 Fuel quality assurance – Part 5: Firewood for non-industrial use (approved, under publishing)**

This standard defines the procedures to fulfil the quality requirements (quality control) and describes measures to ensure adequate confidence that specification of firewood described in EN 14961-5 is fulfilled (quality assurance). This standard covers the raw material supply, production and delivery chain, from purchasing of raw materials to point of delivery to the end-user. This standard covers only quality assurance for firewood produced from the woody biomasses stated in EN 14961-1:2010, Table 1 and EN 14961-5. Examples of the process description with the corresponding quality influencing factors and critical control points are given in standard and also templates for a product declaration. See six steps from EN 15234-1.

**EN 15234-6:2012 Fuel quality assurance – Part 6: Non-woody pellets for non-industrial use**

This standard defines the procedures to fulfil the quality requirements (quality control) and describes measures to ensure adequate confidence that the non-woody pellet specification described in EN 14961-6 is fulfilled (quality assurance). This standard covers production and delivery chain, from purchasing of raw materials to point of delivery to the end-user. This standard covers only quality assurance for non-woody pellets produced from the non-woody biomasses stated in EN 14961-1:2010, Table 1 and EN 14961-6. Examples of the process description with the corresponding quality influencing factors and critical control points are given in standard and also templates for a product declaration. See six steps from EN 15234-1.

**CEN/TR 15569:2009 Solid Biofuels – A guide for a Fuel Quality Assurance System**

This technical report is a guide to assist all operators within the solid biofuel supply chains to compose a quality assurance manual according to EN 15234 “Solid Biofuels - Fuel quality assurance”. This document can be considered as a bridging element over the gap between the ISO 9001:2008 quality management principles and the specific needs of operators in the solid biofuel market. Methodology of this guideline can be applied without having a full quality management system already in place. Guide has been prepared in co-operation with BioNorm project (www.bionorm2.eu).

## 4.4. Sampling and sample preparation

### EN 14778: 2011 Solid Biofuels – Sampling

This standard describes methods for preparing sampling plans and certificates and taking samples of solid biofuels, for example, from the place where the raw materials grow, from production plant, from deliveries e.g. lorry loads, or from stock. It includes both manual and mechanical methods, and is applicable to solid biofuels that are either: fine (particle size up to about 10 mm) and regularly-shaped particulate materials that can be sampled using a scoop or pipe, for example: sawdust, olive stones and wood pellets; coarse or irregularly-shaped particulate materials, particle sizes up to about 200 mm that can be sampled using a fork or shovel, for example: wood chips and nut shells, forest residue chips, and straw; baled materials for example: baled straw or grass; large pieces (particles sizes above 200 mm) which are either picked manually or automatically; vegetable waste, fibrous waste from virgin pulp production and from production of paper from pulp that has been dewatered; and round wood. The methods described in this standard may be used, for example, when the samples are to be tested for moisture content, ash content, calorific value, bulk density, durability, particle size distribution, ash melting behaviour and chemical composition. The main principle of correct sampling is to obtain a representative sample (samples) from the whole lot concerned. Every particle in the lot or sub-lot to be represented by the sample should have an equal probability of being included in the sample. In order to do so a sampling plan is needed. Standard also gives instructions of sampling equipment and how to calculate number of samples needed.

This standard will be superseded by EN ISO 18135 in 2015.

### EN 14780:2011 Solid Biofuels - Methods for sample preparation

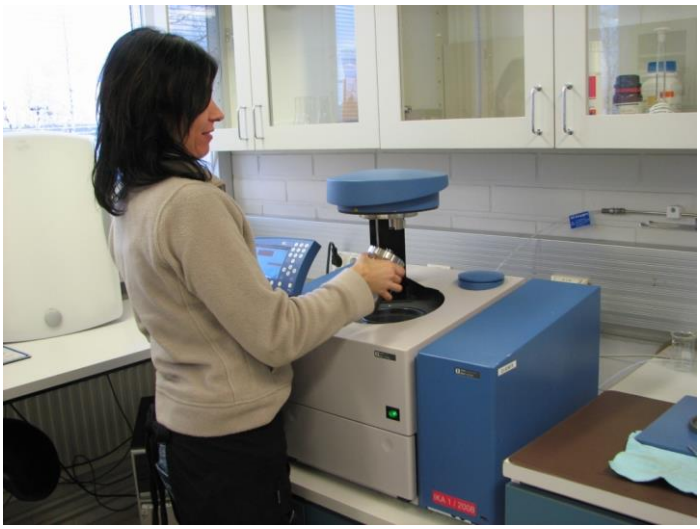
This standard describes methods for reducing combined samples (or increments) to laboratory samples and laboratory samples to sub-samples and general analysis samples and is applicable to solid biofuels. The methods described in this standard may be used for sample preparation, for example, when the samples are to be tested for calorific value, moisture content, ash content, bulk density, durability, particle size distribution, ash melting behaviour, chemical composition, and impurities. The methods are not intended to be applied to the very large samples required for the testing of bridging properties. The main purpose of sample preparation is that a sample is reduced to one or more test portions that are in general smaller than the original sample. The main principle for sample reduction is that the composition of the sample as taken on site shall not be changed during each stage of the sample preparation. Each sub sample shall be representative of the original sample. To reach this goal every particle in the sample before sample division shall have an equal probability of being included in the sub-sample following sample division. Two basic methods are used during the sample preparation. These methods are: sample division and particle size-reduction of the sample. Standard also gives information on suitable apparatus for sample division. A guideline for minimum masses to be retained after each sample division stage, depending on the nominal top size of the material are given in the standard.

## 4.5. Physical and mechanical properties

**EN 14918:2009 Solid Biofuels - Methods for the determination of calorific value**

This EN standard defines a method for the determination of the gross calorific value of a solid biofuel at constant volume and at reference temperature of 25°C in a bomb calorimeter calibrated by combusting certified benzoic acid. The result obtained is the gross calorific value of the analysis sample at constant volume with all the water of the combustion products as liquid water. In practice, biofuels are burned at constant (atmospheric) pressure and the water is either not condensed (removed as vapour with the flue gases) or condensed. Under both conditions, the operative heat of combustion to be used is the net calorific value of the fuel at constant pressure. The net calorific value at constant volume may also be used; formulae are given for calculating both values. General principles and procedures for the calibrations and the biofuel experiments are presented. It is applicable to all solid biofuels. In the EN standard, the reagents, apparatus, test sample preparation, calorimetric procedure and calibration related to the determination process, and the calculation of net calorific value are presented. Note in EN 14961-serie net calorific value at constant (as received) pressure is requested. Formulae to calculate net calorific value as received is presented in EN 14961-1.

This standard will be superseded by EN ISO 18125 in 2014 or 2015.



**EN 15103:2009 Solid biofuels - Methods for the determination of bulk density**

This EN standard describes a method for determining bulk density of solid biofuels by using a standard measuring container (5 litre and 50 litre). The container shall be cylindrically shaped and manufactured of a shock resistant, smooth-surfaced material. The container shall be resistant to deformation in order to prevent any variation in shape and volume. The container has to be waterproof. For easier handling grips may be fixed externally. The height-diameter-ratio shall be within 1.25 and 1.50. Before use, the mass and filling volume of the container shall be determined. Fill the container by pouring the sample material from a height of 200 mm to 300 mm above the upper rim until a cone of maximum possible height is formed. The filled container is then shock exposed to allow settling. This is done by dropping it freely from 15 cm height onto a wooden board. Remove surplus material by using a small scantling. Weigh the container. Bulk density is calculated from the net weight per standard volume and reported for the measured moisture content. The apparatus, sample preparation, procedure and calculation are described.

This standard will be superseded by EN ISO 17828 in 2014 or 2015.

**EN 14774-1:2009 Solid biofuels - Methods for the determination of moisture content – Oven dry method – Part 1: Total moisture – Reference method**

This EN standard is applicable to all solid biofuels and describes the reference method for determining the total moisture content of a sample by drying in an oven. It should be used when high precision of the determination of moisture content is necessary. A sample with the minimum mass of 300 g is dried at a temperature of (105 ± 2°C) and in which the air atmosphere changes between 3 and 5 times per hour, until constant mass is achieved. Moisture percentage is calculated from the loss in sample mass. Procedure for the correction of buoyancy effects is included in the method. The dried sample has to be weighed while still hot, which gives a buoyancy effect which has to be compensated for when the highest precision is required. The apparatus, sample preparation, procedure and calculation are described.

This standard will be superseded by EN ISO 18134-1 in 2014 or 2015.

**EN 14774-2:2009 Solid biofuels – Methods for the determination of moisture content – Oven dry method – Part 2: Total moisture – Simplified method**

The principle of this EN standard is similar to EN 14774-1, and it may be used when the highest precision is not needed e.g. for routine production control on site i.e.most analysis. The only difference compared to Part 1 is that there is no buoyancy compensation in Part 2. The sample with the minimum mass of 300 g is dried at a temperature of (105 ± 2°C) in air atmosphere until constant mass is achieved and moisture percentage is calculated from the loss in sample mass. The apparatus, sample preparation, procedure and calculation are described.

This standard will be superseded by EN ISO 18134-2 in 2014 or 2015.

**EN 14774-3:2009 Solid biofuels – Methods for the determination of moisture content – Oven dry method – Part 3: Moisture in general analysis sample**

This EN standard is applicable to all solid biofuels and it describes the method for determining the moisture in the analysis sample by drying the sample in an oven. It is to be used for general analysis samples described in EN 14780. General analysis sample is defined as sub-sample of a laboratory sample having a nominal top size of 1 mm or less and used for a number of chemical and physical analyses. The analysis sample is dried either in air atmosphere or in nitrogen atmosphere at a temperature of (105 ± 2 °C) and the moisture percentage is calculated from the loss in the test sample mass. The apparatus, sample preparation, procedure and calculation are described. A minimum of two determinations shall be carried out on the test sample.

This standard will be superseded by EN ISO 18157-1 in 2014 or 2015.

**EN 15148:2009 Solid biofuels - Methods for the determination of the content of volatile matter**

This EN standard is applicable to all solid biofuels and defines the method used for the determination of volatile matters of solid biofuels. This means determination of the loss in mass, less that due to moisture, when solid biofuel is heated out of contact with air under standardised conditions. A test portion of the general analysis sample is heated out of contact with air at (900 ± 10) °C for 7 min, and the percentage of volatile matter is calculated from the loss in mass of the test portion after deducting the loss in mass due to moisture. The apparatus, sample preparation, procedure and calculation are described.

This standard will be superseded by EN ISO 18123 in 2014 or 2015.

**EN 14775:2009 Solid biofuels - Method for the determination of ash content**

This EN standard specifies the method for the determination of ash content of all solid biofuels. Ash content is defined as the mass of inorganic residue remaining after ignition of a fuel under specified conditions, expressed as a percentage of the mass of the dry matter in the fuel. The ash content of the sample is calculated from the mass of the residue remaining after the sample is heated in air under rigidly controlled conditions of time, sample weight and equipment specifications to a controlled temperature of (550 ± 10) °C. The apparatus, sample preparation, procedure and calculation are described.

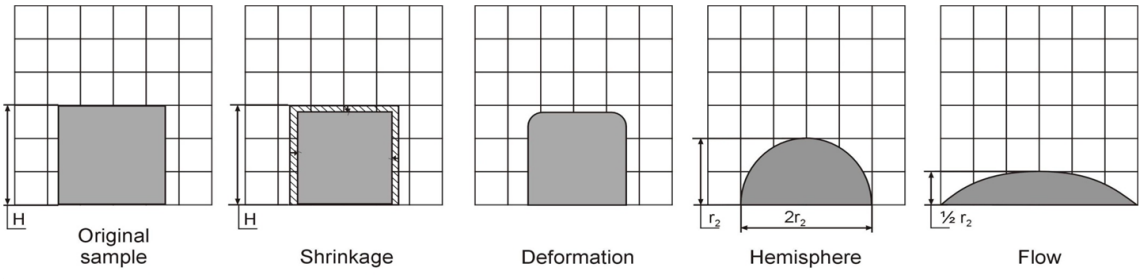
This standard will be superseded by EN ISO 18122 in 2014 or 2015.

**CEN/TS 15370-1:2006 Solid Biofuels - Method for the determination of ash melting behaviour**

This standard specifies a method for the determination of the ash melting behaviour of all solid biofuels. Ash from the solid biofuel sample is prepared according to the method specified in EN 14775 Solid biofuels- Method for the determination of ash content. A test piece made from the ash is heated and continuously observed. The temperatures at which characteristic changes of shape occur are recorded. The temperatures to be recorded are the “shrinkage starting temperature”, the “deformation temperature”, the “hemisphere temperature” and the “flow temperature”. The apparatus, sample preparation, procedure and calculation are described.

The ash melting behaviour is the only standardized method currently available to assess the ash melting behaviour of solid biomass, but the significance of this test is frequently criticised, in particular the applicability for low-quality wood or non-wooden biomass.

A number of alternative test methods have been developed to predict the ash melting properties of biomass fuels, but predictions and test results have scarcely been evaluated regarding their significance with regard to the practical performance of the fuels during combustion. The objectives of the AshMelT project (www.ashmelt.eu) are to develop a test method for the assessment of the ash melting characteristics of solid biofuels, specify ash melting classes for solid biofuels and work out a proposal for a European standard for the developed test method




**EN15149-1:2010 Solid biofuels - Methods for the determination of particle size distribution. Part 1: Oscillating screen method using screen apertures of 1 mm and above**

This standard specifies a method for the determination of the size distribution of particulate biofuels by the oscillating screen method. The method is intended for particulate biofuels only, i.e. materials having been reduced in size (such as most wood fuels) or materials

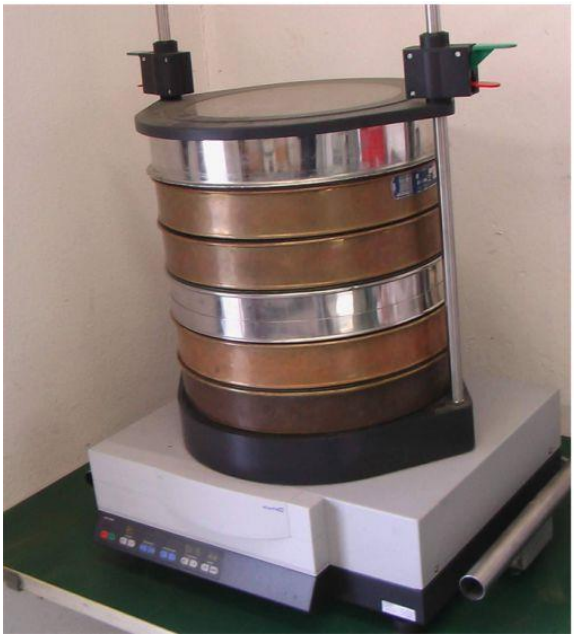
already in a particulate form (such as grains and nut shells). It is applicable also to particular uncompressed fuels. To determine the particle size distribution a sample is subjected to sieving through horizontally oscillating sieves, sorting the particles in decreasing size classes by mechanical means. The apparatus, sample preparation, procedure and calculation are described. The geometry of the apparatuses, the thickness of sieves, the hole distances and the diameter of holes is specified according to ISO 3310–1 (1 mm) and ISO 3310–2 (above 1 mm).

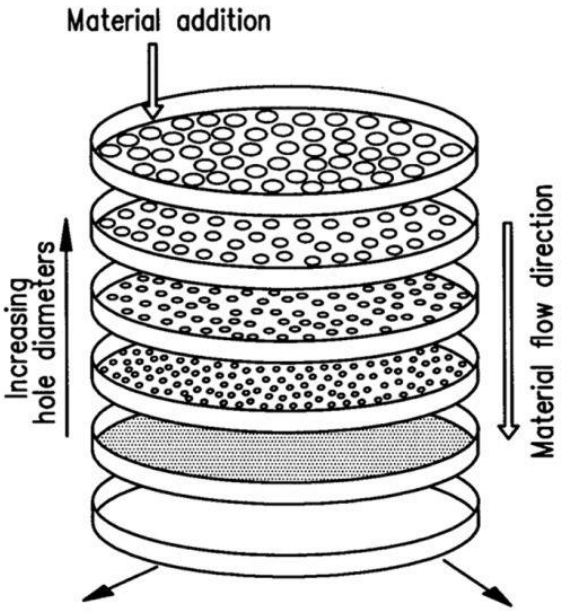
This standard will be superseded by EN ISO 17827-1 in 2014 or 2015.

**EN 15149-2:2010 Solid biofuels - Methods for the determination of particle size distribution. Part 2: Vibrating screen method for small particles using screen apertures of 3,15 mm and below**

This standard specifies a method for the determination of the size distribution of particulate biofuels by the vibrating screen method. It is applicable to particulate fuels with a nominal top size less than 3,15 mm or below (e.g. sawdust). A sample is subjected to sieving through horizontal vibrating sieves, sorting the particles in decreasing size classes by mechanical means. Manual sieving is excluded due to the risk of clogging of the sieve holes. The apparatus, sample preparation, procedure and calculation are described. The geometry of the apparatuses, the thickness of sieves, the hole distances and the diameter of holes is specified according to ISO 3310-1 and ISO 3310– 2.

This standard will be superseded by EN ISO 17827-2 in 2014 or 2015.






**CEN/TR 15149-3: Solid biofuels - Methods for the determination of particle size distribution. Part 3: Rotary screen method**

This technical report specifies a method for the determination of the size distribution of particulate biofuels by the rotary screen method. It is applicable to all particulate uncompressed fuels with a nominal top size of 3,15 mm and over, e.g. wood chips, hog fuel and olive stones. A sample is subjected to sieving through sieves in a rotary sieving machine sorting the particles by increasing size. The apparatus, sample preparation, procedure and calculation are described.

### EN 15150:2011 Solid biofuels – Methods for the determination of the particle density

This EN standard describes the method for determining the particle density of irregularly shaped pieces of compressed fuels such as pellets or briquettes. Both mass and volume of an individual particle or a group of particles are determined. The volume is determined by measuring the buoyancy in a liquid. Buoyancy of a body is equal to the weight of the displaced volume of a liquid. The apparent loss in weight between a measurement in air and a subsequent measurement in liquid marks its buoyancy. The volume of the sample is calculated via the density of the applied liquid. For regularly shaped briquettes the volume could also be estimated by stereometric means. This is described in an informative Appendix in the standard. The apparatus, sample preparation, procedure and calculation are described.

This standard will be superseded by EN ISO 18847 in 2014 or 2015.

### EN 16126:2012 Solid biofuels – Method for the determination of particle size distribution of disintegrated pellets

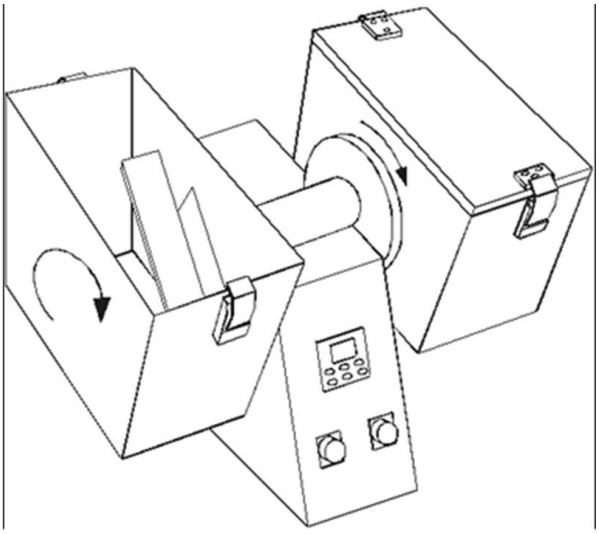
This standard aims to define the requirements and method used to determine the particle size distribution of disintegrated pellets for pulverized combustion. It is applicable for pellets, which disintegrate in hot water temperature below 100 oC. For e.g. pellets made from torrefied material, this method is not applicable. The particle size distribution is determined after the pellets sample (300 + 25 g) is disintegrated in hot deionised water (about 2 000 ml is heated to the boiling point and poured over the pellets), stirred carefully from the bottom and up until a smooth mush is obtained. Slurry left it for 24 hours and dried in drying containers. The determination is performed by sieving according to EN15149-2.

This standard will be superseded by EN ISO 17830 in 2014 or 2015.

### EN 15210-1:2009 Solid biofuels – Methods for the determination of the mechanical durability for pellets – Part 1: Pellets

This EN standard defines the requirements and methods for testing the mechanical durability of pellets. The durability is the measure of the resistance of densified fuels towards shocks and/or abrasion in consequence of transport and handling processes. The test sample is subjected to controlled shocks by collision of fuel particles against each other's and against the walls of a defined rotating test chamber. The durability is then calculated from the mass of sample remaining after separation of abraded and fine broken particles. The test chamber according to the EN standard is a box made of rigid material. Take a test portion of (500 ± 10) g. For pellets above 12 mm diameter (500 ± 50) g is allowed. Place the test portion of the sieved pellets, weighed to the nearest 0.1 g, in the tumbling box device. Tumble the sample at (50 ± 2) rpm for 500 rotations. After this number of rotations the sample is removed and passed manually through a sieve. The apparatus, sample preparation, procedure and calculation are described. Method also includes manual sieving (3,15 mm according ISO 3310-2).

This standard will be superseded by EN ISO 17831-1 in 2014 or 2015.



**EN 15210-2:2010 Solid biofuels. Methods for the determination of the mechanical durability of briquettes – Part 2: Briquettes**

This EN standard defines the requirements and methods for testing the mechanical durability of briquettes. The durability is the measure of the resistance of densified fuels towards shocks and/or abrasion in consequence of transport and handling processes. The test sample is subjected to controlled shocks by collision of fuel particles against each other's and against the walls of a defined rotating test chamber. The durability drum is a cylindrical steel drum with nominal volume of 160 litres having with specific dimensions. A prepared test portion, of minimum (2 ± 0.1) kg, is placed in the durability drum. Rotate the sample at (21 ± 0.1) rpm for 5 min or for (105 ± 0.5) rotations. Afterwards, the sample is passed through a sieve, with dimensions approximately equivalent to 2/3 of the diameter of the briquettes but not exceeding 45 mm. This sieve is selected from the series between 16 mm and 45 mm according to ISO 3310-1. The sieving is carried out by mechanical or manual oscillation during a period that allows a complete separation of the particles. The durability is then calculated from the mass of sample remaining after separation of abraded and fine broken particles. The test chamber according to the EN standard is a cylindrical steel drum. The apparatus, sample preparation, procedure and calculation are described.

This standard will be superseded by EN ISO 17831-2 in 2014 or 2015.

**CEN/TR Solid biofuels – Methods for the determination of bridging properties of particulate biofuels (not published)**

This technical report describes a method of determining the bridging properties of particulate biofuels. The method is applicable to all particulate biofuels that either have been reduced in size (such as most wood fuels or cut straw) or which are physically in a particulate form (such as olive stones, nut shells, grain etc.). A sample is subjected to bridging by placing it over an expandable slot opening facilitating the building of a bridge. The opening width of the slot is taken as a measure for the bridge building properties of the sample. The standard gives dimensions for bottom area for the test a box and a minimum height. The sides of the box are made of oriented strand board (OSB); the bottom shall be made of two flexible mats with rubber surfaces. An expandable slot divides the middle of the box's bottom. The slot is formed by round edges. These round edges form a quarter of a circular arc with an effective radius of 125 mm. When the bottom is fully closed, the two mats meet in the centre of the box' length without forming any slot. The mats are fully even and horizontal to the ground, except at the round edges. The slot shall be capable of being gradually expanded while the edges are parallel and the bottom is prevented from becoming inclined during any phase of

the opening procedure. The expansion shall be executed in a way, which ensures, that the mats remain in place, except at the rounded edges, where they are sliding over a plate which forms the rounded edges. Alternatively they could also be rolled onto a pair of rollers.

**EN 16127:2012 Solid biofuels - Determination of diameter and length of pellets**

This document aims to define the requirements and method used to measure the length and diameter of fuel pellets. It is intended for persons and organisations that manufacture, plan, sell, erect or use machinery, equipment, tools and entire plants related to fuel pellets, and to all persons and organisations involved in producing, purchasing, selling and utilising fuel pellets. The length and diameter of pellets are measured from a test portion of fuel pellets based on diameter of pellets (D<6mm pellets 60–80 g, for D6–8 mm pellet 80–100 g, for D8–10 mm 100–150 g, for D10–12 mm 150–200 g and for D12-25 mm 200-600 g (minimum 50 pellets)). By the means of a caliper, each pellet from the test portion is measured and the results are recorded. Sampling is carried out according to EN 14780. Standard include two procedures: A Determination of share of oversized pellets and B Determination of the average length of pellets. For determination of the diameter select a minimum number of 10 pellets randomly from the test portion.

This standard will be superseded by EN ISO 17829 in 2014 or 2015.

## 4.6. Chemical analysis

**EN 15104: 2010 Solid biofuels – Determination of total content of carbon (C), hydrogen (H) and nitrogen (N) content – Instrumental methods**

This standard describes following method for the determination of total carbon, hydrogen and nitrogen contents in solid biofuels: a known mass of the sample is burned under such conditions that sample is converted into ash and gaseous combustion products, i.e. carbon dioxide, water vapour, elemental nitrogen and/or oxides of nitrogen, oxides and oxyacids of sulphur and hydrogen halides, which are treated to ensure that any hydrogen associated with sulphur or halides is liberated as water vapour. Oxides of nitrogen are reduced to elemental nitrogen or nitrous oxide, and combustion products likely to interfere with the subsequent gas-analysis procedures are removed. The carbon dioxide, water vapour and nitrogen or nitrous oxide mass fractions of the gas stream are then determined quantitatively by appropriate instrumental gas-analysis procedures. It is recognized that the Kjeldahl method is most reliable for determining nitrogen contents with a concentration lower than 0,1 % (EN 13342, Characterization of sludges - Determination of Kjeldahl nitrogen).

This standard will be superseded by EN ISO 16948 in 2014 or 2015.


**EN 15289:2010 Solid biofuels - Determination of total content of sulphur (S) and chlorine (Cl)**

This standard describes a method for simultaneous determination of the total sulphur and total chlorine content in solid biofuels: procedures for the digestion and different analytical techniques for the quantification of the elements in the digestion solution are described. The method is applicable for all biofuel samples containing more than 50 mg/kg of chlorine and/or sulphur.

This standard will be superseded by EN ISO 16994 in 2014 or 2015.


**EN 15105:2010 Solid biofuels – Determination of water soluble chloride (Cl) content, sodium (Na) and potassium (K)**

This standard describes a method for defining the water soluble content of chloride, sodium and potassium in solid biofuels by extraction with water in a closed container and their following quantification by different analysis techniques. The method is applicable for all solid biofuels with water soluble contents more than 50 mg/kg for chloride and more than 10 mg/kg for sodium and potassium. The principle of the method is the following: the sample is heated with water in a closed container at temperature of 120°C for one hour. The concentrations of chloride, sodium and potassium in the obtained water extract are determined by one of the following techniques:

- Chloride: Ion-Chromatography (IC) or potentiometric titration with silver nitrate;
- Sodium and potassium: Flame Emission Spectroscopy (FES) or Flame Atomic Absorption Spectroscopy (FAAS) or Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES).

This standard will be superseded by EN ISO 16995 in 2014 or 2015.

**EN 15290:2010 Solid biofuels – Determination of major elements (Al, Si, K, Na, Ca, Mg, Fe, P and Ti)**

This standard describes methods for the determination of the content of major elements of solid biofuels, i.e. Al, Si, K, Na, Ca, Mg, Fe, P and Ti. Ba and Mn can also be determined through these methods. Part A of this standard describes the direct determination on the fuel, and part B presents the determination on a prepared 550 °C ash. The principle of the procedure is following: the digestion of the sample is carried out in a closed vessel using the method presented either in part A or part B. The detection of the elements is done by Inductively Coupled Plasma Optical Emission Spectrometry (ICP/OES), Inductively Coupled Plasma Mass Spectrometry (ICP/MS) or Flame Atomic Absorption Spectrometry (FAAS) or Flame Emission Spectroscopy (FES).

This standard will be superseded by EN ISO 16967 in 2014 or 2015.

**EN 15297:2010 Solid biofuels – Determination of minor elements (As, Ba, Be, Cd, Co, Cr, Cu, Hg, Mo, Mn, Ni, Pb, Se, Te, V and Zn)**

This standard defines the methods for determination the content of the minor elements in all solid biofuels, i.e. As, Cd, Co, Cr, Cu, Hg, Mn, Mo, Ni, Pb, Sb, Se, Sn, V and Zn. The principle of the procedure is following: the analysis sample is prepared according to EN 14780. Weigh, in the decomposition vessel, 400 – 500 mg homogenised sample. Add 2.5 ml hydrogen peroxide (30%) and wait 1-5 minutes. Add 5 ml nitric acid (65%) and 0.4 ml hydrofluoric acid (40%) and close the sample decomposition vessel. Heat sample by a resistant heating or a microwave heating. After cooling transfer the digest to a volumetric flask, rinse the digestion vessel carefully with high purity water and transfer the rinse solution to the volumetric flask. Add high water to the digest to and appropriate volume, depending on the detection methods to be used. Determination methods are listed in the standard.

This standard will be superseded by EN ISO 16968 in 2014 or 2015.

**EN 15296: 2010 Solid biofuels – Calculation of different bases**

This standard gives formulae, which allow analytical data relating to solid biofuels to be expressed on the various different bases in common use. The bases in common use for solid biofuels are “air-dried” (sometimes stated as “as determined”), “as received” (ar) (sometimes stated “as sampled” or “as delivered”), “dry” (d) and dry, “ash free” (daf). Consideration is given to corrections that may be applied to certain determined values for solid biofuels prior

to their calculation to other bases. The principle of the calculation is that in order to convert an analytical result expressed on one basis to another basis, it is multiplied by the appropriate formula after insertion of the requisite numerical values.

There is also new ISO standard under development to determination of the chemical composition by XRF (X-ray fluorescence).

# 5. Short description to sustainably produced biomass for energy applications

**EN 16214-1, Sustainability criteria for the production of biofuels and bioliquids for energy applications - Principles, criteria, indicators and verifiers- Part 1: Terminology**

This standard defines the terminology to be used in the field of sustainably produced biomass for energy applications. It covers biofuels and bioliquids. This European Standard specifically considers some relevant terms and definitions used in the European Commission Directive 2009/28/EC, referred to as Renewable Energy Directive (RED), and in the European Commission Directive 2009/30/EC referred to as Fuel Quality Directive (FQD), or in other European regulations.

**prEN 16214-2, Sustainability criteria for the production of biofuels and bioliquids for energy applications - Principles, criteria, indicators and verifiers - Part 2: Conformity assessment including chain of custody and mass balance (under preparation)**

The RED contains binding sustainability criteria to greenhouse gas savings, land with high biodiversity value, land with high carbon stock and agro-environmental practices. Several articles in the RED present requirements to European Member States and to economic operators in Europe.

This standard defines requirements for provision by economic operators of the required evidence that biofuels and bioliquids fulfil the sustainability criteria as defined in the Renewable Energy Directive. This standard is applicable to the initial biomass production or to the point of collection for waste and residue and to each stage within the chain of custody. It also defines requirements on conformity assessment bodies when checking compliance with the present standard.

**prEN 16214-3, Sustainability criteria for the production of biofuels and bioliquids for energy applications - Principles, criteria, indicators and verifiers - Part 3: Biodiversity and environmental aspects related to nature protection purposes (under preparation)**

This standard only defines procedures, criteria and indicators to provide the required evidence for: production of raw material in areas for nature protection purposes; harvesting of raw material from highly biodiverse non-natural grassland; and cultivation and harvesting on peatland. This standard specifies requirements relevant for the provision of evidence by economic operators that the production, cultivation and harvesting of raw materials is in accordance with legal or other requirements concerning the areas mentioned above. This standard is applicable to production, cultivation and harvesting of biomass for biofuels and bioliquids production.

**prEN 16214-4, Sustainability criteria for the production of biofuels and bioliquids for energy applications - Principles, criteria, indicators and verifiers - Part 4: Calculation methods of the greenhouse gas emission balance using a life cycle approach (under preparation)**

This part 4 of prEN 16214 provides a detailed methodology that will allow any economic operator in a biofuel or bioliquid chain to calculate the actual GHG emissions associated with

its operations in a standardized and transparent manner, taking all materially relevant aspects into account. It includes all steps of the chain from biomass production to the end transport and distribution operations. The methodology strictly follows the principles and rules stipulated in the RED and particularly its Annex V, as well as any additional interpretation of the legislative text published by the EU Commission. Where appropriate these rules are clarified, explained and further elaborated. In the context of accounting for heat and electricity consumption and surpluses reference is also made to Directive 2004/8/EC[ 3] on “the promotion of cogeneration based on a useful heat demand in the internal energy market” and the associated EU Commission decision of 21/12/2006 “establishing harmonised efficiency reference values for separate production of electricity and heat”.

# Annex 1: List of national standardization institutes

## Austria

ASI - Austrian Standards Institute
Heinestraße 38
1020 Wien

Tel.: +43 1 213 00 0
Fax: +43 1 213 00 650
office [at] as-institute.at
www.as-institute.at

## Belgium

NBN - Bureau de Normalisation/Bureau voor Normalisatie
Rue de Birminghamstraat, 131
B-1070 Brussels

Tel.: + 32 2 738 01 11
Fax: + 32 2 733 42 64
info [at] nbn.be

www.nbn.be

## Bulgaria

BDS - Bulgarian Institute for Standardisation
13, Lachezar Stanchev str., Izgrev Complex
BG-1797 Sofia

Tel.: + 359 2 817 45 04
Fax: + 359 2 873 55 97
standards [at] bds-bg.org

www.bds-bg.org/

## Croatia

HZN - Croatian Standards Institute
Ulica grada Vukovara 78, p.p. 167
HR-10000 Zagreb

Tel.: + 385 1 610 60 95
Fax: + 385 1 610 93 21
hzn [at] hzn.hr

www.hzn.hr

## Cyprus

CYS - Cyprus Organisation for Standardisation
Limassol Avenue and Kosta Anaxagora 30, 3rd Floor
P.O. Box 16197
CY-2086 Nicosia

Tel.: + 357 22 411 411
Fax: + 357 22 411 511
cystandards [at] cys.org.cy

www.cys.org.cy

## Czech Republic

UNMZ - Czech Office for Standards, Metrology and Testing Standards Department
Gorazdova 24, P.O. Box 49
CZ-128 01 Praha 2

Tel.: + 420 221 802 802
Fax: + 420 221 802 301
extrel [at] unmz.cz

www.unmz.cz

## Denmark

DS - Danish Standards
Kollegievej 6
DK-2920 Charlottenlund

Tel.: + 45 39 96 61 01
Fax: + 45 39 96 61 02
dansk.standard [at] ds.dk

www.ds.dk

## Estonia

EVS - Estonian Centre for Standardisation
Aru Street 10
EE-10317 Tallinn

Tel.: + 372 605 50 50
Fax: + 372 605 50 70
info [at] evs.ee

www.evs.ee

## Finland

SFS - Suomen Standardisoimisliitto r.y.
Malminkatu 34, P.O. Box 130
FI-00101 Helsinki

Tel.: + 358 9 149 93 31
Fax: + 358 9 146 49 25
sfs [at] sfs.fi

www.sfs.fi

## France

AFNOR - Association Française de Normalisation
11, rue Francis de Pressensé
FR-93571 La Plaine Saint-Denis Cedex

Tel.: + 33 1 41 62 80 00
Fax: + 33 1 49 17 90 00
norminfo [at] afnor.org

www.afnor.org

## Germany

DIN - Deutsches Institut für Normung e.V.
Burggrafenstraße 6
D-10787 Berlin

Tel.: + 49 30 26 01 0
Fax: + 49 30 26 01 12 31
postmaster [at] din.de

www.din.de

## Greece

ELOT - Hellenic Organization for Standardization
313, Acharnon Street
GR-111 45 Athens

Tel.: + 30 210 21 20 100
Fax: + 30 210 22 83 034
info [at] elot.gr

www.elot.gr

## Hungary

MSZT - Hungarian Standards Institution
Horváth Mihály tér 1.
HU-1082 Budapest

Tel.: + 36 1 456 68 00
Fax: + 36 1 456 68 84
isoline [at] mszt.hu

www.mszt.hu

## Iceland

IST - Icelandic Standards
Skúlatún 2
IS-105 Reykjavik

Tel.: + 354 52 07 150
Fax: + 354 52 07 171
stadlar [at] stadlar.is

www.stadlar.is

## Ireland

NSAI - National Standards Authority of Ireland
1 Swift Square, Northwood, Santry
IE-Dublin 9

Tel.: + 353 1 807 38 00
Fax: + 353 1 807 38 38
nsai [at] nsai.ie

www.nsai.ie

## Italy

UNI - Ente Nazionale Italiano di Unificazione
Via Sannio, 2
IT-20137 Milano

Tel.: + 39 02 70 02 41
Fax: + 39 02 70 10 61 06
uni [at] uni.com

www.uni.com

## Latvia

LVS - Latvian Standards Ltd
K. Valdemãra Street 157
LV-1013 Riga

Tel.: + 371 7 371 308
Fax: + 371 7 371 324
lvs [at] lvs.lv

www.lvs.lv

## Lithuania

LST - Lithuanian Standards Board
T. Kosciuškos g. 30
LT-01100 Vilnius

Tel.: + 370 5 212 62 52
Fax: + 370 5 212 62 52
lstboard [at] lsd.lt

www.lsd.lt

## Luxembourg

ILNAS - Institut Luxembourgeois de la normalisation, de l'accreditation, de la sécurité et qualité des produits et services
34 avenue de la Porte-Neuve (3ème etage), B.P. 10
LU-2010 Luxembourg

Tel.: + 352 46 97 46 62
Fax: + 352 46 97 46 39
normalisation [at] ilnas.etat.lu

www.ilnas.lu

## Malta

MCCAA - Malta Competition and Consumer Affairs Authority
Second Floor, Evans Building, Merchants Street
MT-Valletta VLT 1179

Tel.: + 356 21 24 24 20
Fax: + 356 21 24 24 06
francis.e.farrugia [at] msa.org.mt

www.msa.org.mt

## The Netherlands

NEN - Nederlands Normalisatie-instituut
Vlinderweg 6, P.O. Box 5059
NL-2600 GB Delft

Tel.: + 31 15 2 690 390
Fax: + 31 15 2 690 190
info [at] nen.nl

www.nen.nl

## Norway

SN - Standards Norway
Strandveien 18, P.O. Box 242
NO-1326 Lysaker

Tel.: + 47 67 83 86 00
Fax: + 47 67 83 86 01
info [at] standard.no

www.standard.no

## Poland

PKN - Polish Committee for Standardization
Swietokrzyska 14, skr. poczt. 411
PL-00-950 Warszawa

Tel.: + 48 22 55 67 591
Fax: + 48 22 55 67 786
intdoc [at] pkn.pl

www.pkn.pl

## Portugal

IPQ - Instituto Português da Qualidade
Rua António Gião, 2
PT-2829-513 Caparica

Tel.: + 351 21 294 81 00
Fax: + 351 21 294 81 01
info [at] mail.ipq.pt

www.ipq.pt

## Romania

ASRO - Romanian Standards Association
Str. Mendeleev 21-25
RO-010362 Bucharest 1

Tel.: + 40 21 316 32 96
Fax: + 40 21 316 08 70
international [at] asro.ro

www.asro.ro

## Slovakia

SUTN - Slovak Standards Institute
Karloveská 63, PO Box 246
SK-840 00 Bratislava

Tel.: + 421 2 60 29 44 74
Fax: + 421 2 65 41 18 88
int [at] sutn.gov.sk

www.sutn.sk

## Slovenia

SIST - Slovenian Institute for Standardization
Šmartinska cesta 152
SI-1000 Ljubljana

Tel.: + 386 1 478 30 13
Fax: + 386 1 478 30 94
sist [at] sist.si

www.sist.si

## Switzerland

SNV - Schweizerische Normen-Vereinigung
Bürglistraße 29
CH-8400 Winterthur

Tel.: + 41 52 224 54 54
Fax: + 41 52 224 54 74
info [at] snv.ch

www.snv.ch

## Spain

AENOR - Asociación Española de Normalización y Certificación
Génova, 6
ES-28004 Madrid

Tel.: + 34 91 432 60 00
Fax: + 34 91 310 31 72
info [at] aenor.es

www.aenor.es

## Turkey

TSE - Türk Standardlari Enstitüsü
Necatibey Cad. 112
Bakanliklar
TR-06100 Ankara

Tel.: + 90 312 416 62 58
Fax: + 90 312 417 25 51
usm [at] tse.org.tr

www.tse.org.tr

## Sweden

SIS - Swedish Standards Institute
Sankt Paulsgatan 6
SE-118 80 Stockholm

Tel.: + 46 8 555 520 00
Fax: + 46 8 555 520 01
info [at] sis.se

www.sis.se

## United Kingdom

BSI - British Standards Institution
389 Chiswick High Road
GB-London W4 4AL

Tel.: + 44 208 996 90 00
Fax: + 44 208 996 74 00
info [at] bsigroup.com

www.bsigroup.com

# Annex 2: Sending samples to analysis laboratory (source:Labtium Oy, Finland)

The sampling is carried out according to the sampling standard EN 14778. The sampler and the sender of the sample are responsible for the representativeness, sufficient amount and adequate packaging of the sample. When the sample is sent for the analysis, it must be packed carefully and in air proof packaging. The sample information is marked on the container/bag. An attached covering note includes the name of the customer, required specifications, and contact information. It is also important to specify the biomass (e.g. wood chips, hog fuel, pellets) and raw material (whole tree – wood species, logging residues – wood species, dry/fresh, stump – wood species, stemwood – wood species) in question. Table 1 of the standard EN 14961-1 can be used in declaring the raw material.

Examples of required sample amounts:

| Analyses | Amount |
|---|---|
| Basic analyses (calorific value; Q, ash; A, sulphur S, carbon; C, hydrogen; H and nitrogen; N) | About 2 litres |
| Moisture; M | 500 g about 2 litres |
| Bulk density; BD | 7 – 10 litres (with a 5 litre container) and 70 litres (with a 50 litre container |
| Mechanical durability; DU | 2,5 kg i.e. about 4 litres |
| Particle size; P | 8 – 10 litres |