TECHNICAL SPECIFICATION

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Solid biofuels — Fuel specifications and classes —

Part 8: Graded thermally treated and densified biomass fuels

Biocombustibles solides — Classes et spécifications des combustibles —

Partie 8: Combustibles de biomasses traitées thermiquement et densifiées

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 238, *Solid biofuels*.

A list of all parts in the ISO 17225 series can be found on the ISO website.

Introduction

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

This document supports the use of thermally treated and densified biomass for household, small commercial and public building as well as industrial energy generation applications, which require classified quality.

Thermal treatment includes processes such as torrefaction, steam treatment (explosion pulping), hydrothermal carbonization and charring, all of which represent different exposure to heat, oxygen, steam or water. Thermally treated and densified biomass fuels should only be used in appliances with manufacturer approval.

The household, small commercial and public building applications require specified quality fuel for the following reasons:

— small-scale equipment does not usually have advanced controls and flue gas cleaning;

— appliances are not generally managed by professional heating engineers or trained plant operators;

— appliances are often located in living and populated districts.

Pellets produced according to this document may be used in pellet stoves, which are tested according to European Standard EN 14785[6], pellet burners tested according to EN 15270[7] and pellet boilers or integrated-pellet burner systems tested according to EN 303-5[5]. It is recommended that stove manufacturers test these products prior to authorizing their use.

For individual contracts, ISO 17225-1 should be used. ISO 17225-1 can be used for specification of undensified thermally treated material and charcoal.

Solid biofuels — Fuel specifications and classes —

Part 8:
Graded thermally treated and densified biomass fuels

1 Scope

This document determines the fuel quality classes and specifications of graded densified solid biofuels produced from thermally treated biomass for non-industrial and industrial use. This document covers pellets and briquettes produced from the following raw materials (see ISO 17225-1:2014, Table 1):

— 1.1 Forest, plantation and other virgin wood;

— 1.2 By-products and residues from wood processing industry;

— 1.3.1 Chemically untreated used wood;

— 2. Herbaceous biomass;

— 3. Fruit biomass;

— 4. Aquatic biomass.

Subcategories of the above stated raw materials are included.

This document does not consider products, which are marketed as charcoal or as charcoal products. For these products, ISO 17225-1:2014, Table 14 shall apply.

NOTE 1 For thermally treated powder, ISO 17225-1:2014, Table 15 or Table 16 may be used for specification.

NOTE 2 Health, safety and environmental issues for solid biofuels are important and need special attention; however, they are outside the scope of this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 16948, *Solid biofuels — Determination of total content of carbon, hydrogen and nitrogen*

ISO 16968, *Solid biofuels — Determination of minor elements*

ISO 16994, *Solid biofuels — Determination of total content of sulfur and chlorine*

ISO 17225-1:2014, *Solid biofuels — Fuel specifications and classes — Part 1: General requirements*

ISO 17828, *Solid biofuels — Determination of bulk density*

ISO 17829, *Solid Biofuels — Determination of length and diameter of pellets*

ISO 17831-1, *Solid biofuels — Determination of mechanical durability of pellets and briquettes — Part 1: Pellets*

ISO 18122, *Solid biofuels — Determination of ash content*

ISO 18123, *Solid biofuels — Determination of the content of volatile matter*

ISO 18125[1)], *Solid biofuels — Determination of calorific value*

ISO 18134-1, *Solid biofuels — Determination of moisture content — Oven dry method — Part 1: Total moisture — Reference method*

ISO 18134-2, *Solid biofuels — Determination of moisture content — Oven dry method — Part 2: Total moisture — Simplified method*

ISO 18846, *Solid biofuels — Determination of fines content in quantities of pellets*

ISO 18847, *Solid biofuels — Determination of particle density of pellets and briquettes*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 16559 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
pellets made by thermal processing
densified biofuel made from thermally treated solid biomass with or without additives usually with a cylindrical form, random length typically 5 mm to 40 mm, diameter up to 25 mm and broken ends

EXAMPLE Torrefied biomass, steam exploded biomass, hydrothermally carbonized biomass, charred biomass.

Note 1 to entry: Drying is not considered thermal treatment in this definition.

Note 2 to entry: Fuel pellets which are produced by applying the thermal treatment after compaction are also included in this definition.

3.2
briquettes made by thermal processing
densified biofuel made with or without additives in form of cubiform, polyhedral, polyhydric or cylindrical units with diameter of more than 25 mm produced by compressing thermally treated solid biomass

EXAMPLE Torrefied biomass, steam exploded biomass, hydrothermally carbonized biomass, charred biomass.

Note 1 to entry: Drying is not considered thermal treatment in this definition.

Note 2 to entry: Fuel briquettes which are produced by applying the thermal treatment after compaction are also included in this definition.

3.3
commercial application
facility that utilizes solid biofuel burning appliances or equipment that have similar fuel requirements as residential appliances

Note 1 to entry: Commercial applications should not be confused with industrial applications, which can utilize a much wider array of materials and may have somewhat different fuel requirements.

[SOURCE: ISO 17225-1:2014, 3.2, modified]

1) To be published.

4 Symbols and abbreviated terms

The symbols and abbreviated terms used in this document comply with the SI system of units as far as possible.

d	dry (dry basis)
ar	as received
mass fraction in %	mass fraction in percentage
A	designation for ash content on dry basis, A_d (mass fraction in %)
BD	designation for bulk density as received (kg/m^3)
D	designation for diameter as received, *D* (mm)
DE	designation for particle density as received, DE (g/cm^3)
DU	designation for mechanical durability as received (mass fraction in %)
F	designation for amount of fines as received (mass fraction in %, particles less than 3,15 mm)
L	designation for length as received, *L* (mm)
M	designation for moisture content as received on wet basis, M_{ar} (mass fraction in %)
Q_d	designation for net calorific value on dry basis, $q_{p,net,d}$ (MJ/kg or kWh/kg or MWh/t) at constant pressure
VM	designation for content of volatile matter on dry basis (mass fraction in %)

NOTE 1 1 MJ/kg equals 0,2778 kWh/kg (1 kWh/kg equals 1 MWh/t and 1 MWh/t is 3,6 MJ/kg). 1 g/cm^3 equals 1 kg/dm^3. 1 mg/kg equals 0,000 1 % or 1 ppm.

NOTE 2 Designation symbols are used in combination with a number to specify property levels in Table 1 to Table 4. For designation of chemical properties, chemical symbols like S (sulfur), Cl (chlorine), N (nitrogen) are used and the property class is added at the end of the symbol.

5 Specification of graded pellets produced by thermal processing

The specification of thermally treated pellets is stated in accordance with Tables 1 and 2 and Figure 1. The sampling and analysis of the properties shall be carried out in accordance with the methods mentioned in the normative references.

Property classes TW1H, TW1L, TW2H, TW2L, TW3H and TW3L[2)] represent virgin woods and chemically untreated wood residues. In Table 1, TW1H and TW1L represent fuels which are low in ash and nitrogen content, while classes TW2H and TW2L have slightly higher ash and TW3H and TW3L have higher ash and nitrogen content. Property classes TA1, TA2 and TA3[3)] represent non-woody, chemically untreated herbaceous, fruit and aquatic biomass. TA1, TA2 and TA3 differ in regard to ash, nitrogen and chlorine content.

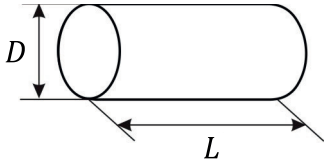
The TW1H and TW1L property classes may be used as fuel in residential and other small-scale combustion equipment, if approved by the manufacturer of the equipment. TA property classes are mainly to be used in industrial applications.

2) TW = property class for thermally treated woody biomass, H = $Q_d \geq 21{,}0$ MJ/kg and *L* = $Q_d < 21{,}0$ MJ/kg.

3) TA = property class for thermally treated non-woody biomass (e.g. agrobiomass).

Chemically treated by-products and residues from wood processing industry (class 1.2.2 in ISO 17225-1:2014, Table 1) and chemically untreated used wood (class 1.3.1 in ISO 17225-1:2014, Table 1) are included in classes TW2H, TW2L, TW3H and TW3L as long as they do not contain heavy metals or halogenated organic compounds more than the typical virgin material values or typical values of country of origin, unless specified in ISO 17225-1:2014, Annex B. Chemically treated used wood (class 1.3.2 in ISO 17225-1:2014, Table 1) is not included. In case of raw materials belonging to 1.2.2 (chemically treated wood according to ISO 17225-1:2014, Table 1), the actual origin of the raw material shall be closely described, e.g. 1.2.2 in ISO 17225-1:2014, Table 1, Residues from laminated wood production.

EXAMPLE Pellets of classes TW2H, TW2L, TW3H and TW3L may be made of a mass fraction of 99 % of sawdust from spruce (class 1.2.1.4 in ISO 17225-1:2014, Table 1) and may contain up to 1 % in mass fraction in glued wood from wood beam production (amount of glue < 0,1 % of mass fraction in glued wood).



Key

D diameter

L length

Figure 1 — Dimension of pellets

If data for chemical or physical properties are available, further analysis may not be required.

To ensure resources are used appropriately and the declaration is accurate, use the most appropriate measure as follows:

a) using previous measured values or obtained by experience of same raw material;

b) calculation of properties, e.g. by using typical values and considering generally accepted and documented specific values;

c) carrying out of analysis

   1) with simplified methods if available;

   2) with reference methods.

The responsibility of the producer or supplier to provide correct and accurate information is exactly the same whether laboratory analysis is performed or not. Typical values do not release the producer or supplier from providing accurate and reliable information.

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

Specifications of other properties such as grindability, water absorptivity and self-heating may be added into the future version of this document, when methods are developed.