

BS EN 15234-3:2012



BSI Standards Publication

Solid biofuels — Fuel quality assurance

Part 3: Wood briquettes for non-industrial use

bsi.

...making excellence a habit.™

National foreword

This British Standard is the UK implementation of EN 15234-3:2012.

The UK participation in its preparation was entrusted to Technical Committee PTI/17, Solid biofuels.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2012

ISBN 978 0 580 75035 9

ICS 75.160.10

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 January 2012.

Amendments issued since publication

| Date | Text affected |
|------|---------------|
|------|---------------|

ICS 75.160.10

English Version

**Solid biofuels - Fuel quality assurance - Part 3: Wood briquettes
for non-industrial use**Biocombustibles solides - Assurance qualité du
combustible - Partie 3 : Briquettes de bois à usage non
industrielFeste Biobrennstoffe - Qualitätssicherung von Brennstoffen
- Teil 3: Holzbriketts für nichtindustrielle Verwendung

This European Standard was approved by CEN on 27 November 2011.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG**Management Centre: Avenue Marnix 17, B-1000 Brussels**

Contents

Page

| | |
|--|----|
| Foreword..... | 3 |
| Introduction | 4 |
| 1 Scope | 5 |
| 2 Normative references | 5 |
| 3 Terms and definitions | 5 |
| 4 Symbols and abbreviations | 6 |
| 5 Quality assurance and quality control measures..... | 6 |
| 5.1 General..... | 6 |
| 5.2 Traceability | 7 |
| 5.3 Production requirements | 7 |
| 5.4 Fuel requirements for the final product (Step 1) | 8 |
| 5.5 Process description (Steps 2, 3 and 4)..... | 8 |
| 5.6 Measures to assure the quality of the product (Step 5)..... | 10 |
| 5.6.1 Inspection of incoming raw material and other goods | 10 |
| 5.6.2 Wood briquette production..... | 10 |
| 5.6.3 Distribution..... | 11 |
| 5.7 Routines for separate handling of nonconforming materials and solid biofuels (Step 6)..... | 11 |
| 6 Product declaration of fuel quality and labelling | 12 |
| Annex A (informative) Examples of product declarations | 13 |
| Annex B (informative) A-deviations..... | 15 |
| Bibliography | 16 |

Foreword

This document (EN 15234-3:2012) has been prepared by Technical Committee CEN/TC 335 “Solid biofuels”, the secretariat of which is held by SIS.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2012, and conflicting national standards shall be withdrawn at the latest by July 2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

The European standard series EN 15234, *Solid biofuels — Fuel quality assurance* are provided as a general requirements and additional product standards. Additional product standards may extend this series over time.

EN 15234 consists of the following parts, under the general title *Solid biofuels — Fuel quality assurance*:

- *Part 1: General requirements;*
- *Part 2: Wood pellets for non-industrial use;*
- *Part 3: Wood briquettes for non-industrial use;*
- *Part 4: Wood chips for non-industrial use;*
- *Part 5: Firewood for non-industrial use;*
- *Part 6: Non-woody pellets for non-industrial use.*

Although these product standards may be obtained separately, it should be recognized that they require an understanding of the standards based on and supporting EN 15234-1. It is recommended to obtain and use EN 15234-1 in conjunction with these standards.

NOTE In these product standards, non-industrial use means - use in smaller scale appliances, such as in households, in small commercial and public sector buildings.

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

Introduction

The overall aim of this European Standard is to guarantee the wood briquette quality through the whole supply chain, from the origin to the delivery of the solid biofuel and provide adequate confidence that specified quality requirements are fulfilled.

The objective of this European Standard is to serve as a tool to enable the efficient trading of wood briquettes. Thereby:

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

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

Wood briquettes are specified according to EN 14961-3, *Solid biofuels — Fuel specifications and classes — Part 3: Wood briquettes for non-industrial use*.

1 Scope

This European 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 European Standard covers the production and delivery chain, from purchasing of raw materials to point of delivery to the end-user.

This European 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.

2 Normative references

The following referenced documents are indispensable for the application 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.

EN 14588:2010, *Solid biofuels — Terminology, definitions and descriptions*

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

EN 14961-3:2011, *Solid biofuels — Fuel specifications and classes — Part 3: Wood briquettes for non-industrial use*

EN 15234-1, *Solid biofuels — Fuel quality assurance — Part 1: General requirements*

NOTE In EN 14961-1:2010 there are listed Normative references of the European Standards for sampling and sample reduction and in EN 14961-3:2011 for determination of solid biofuel properties.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 14588:2010 and the following apply.

3.1

wood briquette

densified biofuel made with or without additives in the form of cubiform, polyedric or cylindrical units, produced by compressing pulverised biomass

NOTE The raw material for wood briquettes is woody biomass in accordance with Table 1 of EN 14961-1:2010. Briquettes are usually manufactured in a die/mould, with total moisture content usually less than 15 % of their mass on wet basis.

3.2

additive

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

3.3

chemical treatment

treatment with chemicals other than air, water or heat

NOTE Examples of chemical treatment are listed in informative Annex C of EN 14961-1:2010.

3.4

impurities

material other than the raw material or fuel itself such as soil, stones, metal, plastic, glass

3.5

weather condition

temperature, humidity and precipitation, e.g. rain, snow

4 Symbols and abbreviations

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

d dry (dry basis)

ar as received

w-% weight-percentage

A designation for ash content, A_d [w-%, dry basis]¹⁾

DE designation for particle density as received [g/cm³]¹⁾

D designation for diameter as received, D [mm]¹⁾

L designation for length as received, L [mm]¹⁾

M designation for moisture content as received on wet basis, M_{ar} [w-%]¹⁾

Q designation for net calorific value as received, $q_{p,net,ar}$ [MJ/kg or kWh/kg or MWh/t] at constant pressure¹⁾

NOTE 1 MJ/kg equals 0,277 8 kWh/kg (1 kWh/kg equals 1 MWh/t and 1 MWh/t is 3,6 MJ/kg). 1 g/cm³ equals 1 kg/dm³.

5 Quality assurance and quality control measures

5.1 General

Quality assurance and control aim to provide confidence that a stable quality is continually achieved in accordance with the customer requirements. It means that specified requirements are fulfilled, but it does not necessarily mean a high quality but a steady and continually achieved quality in accordance with the customer's requirements. The customer is the next operator in the supply chain. Customer requirements include not only the fuel quality, but also the quality of the company's performance, such as documentation (product declaration, labelling of packaging, etc.), timing and logistics (to provide biofuels in time and to agreed performances criteria).

Fuel quality assurance needs to be applied to the entire supply chain. As the supply chains for solid biofuels in the most cases needs to be kept very simple, the same documents are often used for documentation of quality assurance and quality control measures.

NOTE When the customer is a supplier, a retailer or end user, the customer requirements are usually written in sales contracts.

Quality control is fundamentally about controlling the quality of a product or process to enable the delivery of the product or service within agreed parameters in the most efficient and cost effective way. The consequences of having good quality control will be a cost effective product and process.

1) Designation symbols are used in combination with a number to specify property levels (see for example Table 1, EN 14961-4:2011). For designation of chemical properties chemical symbols like S (sulphur), Cl (chlorine), N (nitrogen) are used and the value is added at the end of the symbol.

Quality assurance on the other hand, is about reviewing the products and processes, primarily through data provided from the quality control records and using this data.

- a) to provide confidence that products are produced within the required specification and processes are operated as they should be, and
- b) to assure that over a longer term either consistency is being maintained (stability in process results) or that quality improvements are making the intended impact.

5.2 Traceability

Wood briquettes for non-industrial use shall be specified with EN 14961-3. The origin and source of solid biofuel is specified by Table 1 in EN 14961-1:2010.

There are three parts in the supply chain, illustrated in Figure 1.

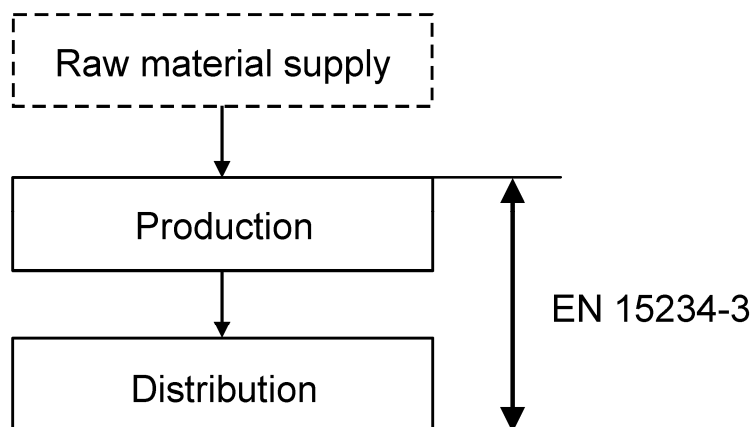


Figure 1 — Simplified example of a wood briquette supply chain

All operators in the supply chain are responsible for the traceability of the origin and source of the material delivered by them. The first operator is responsible for the documents being prepared the first time. The documents shall be available and provided on justified request throughout the entire supply chain according to EN 15234-1.

5.3 Production requirements

The methodology described below for quality assurance and quality control of the production shall be used, but shall be adjusted for the production requirements of the specific wood briquettes production chain in question.

There are six consecutive steps that have to be followed by every stakeholder in the supply chain. The steps are described below. For examples of documentation, see informative Annex A.

Step 1: Define fuel requirements for the final product (see 5.4)

Step 2: Document the steps in the production and distribution processes (see 5.5, Figures 2 and 3)

Step 3: Identify quality influencing factors including company performance (see 5.5, Figures 2 and 3)

Step 4: Define Critical Control Points for compliance with the fuel specification (see 5.5 Figures 2 and 3)

Step 5: Select appropriate measures to assure the quality of the product (see 5.6)

Step 6: Establish routines of separate handling of nonconforming raw materials and solid biofuels (see 5.7)

The following information will give a general overview about documenting the requirements for the production in a wood briquettes supply chain.

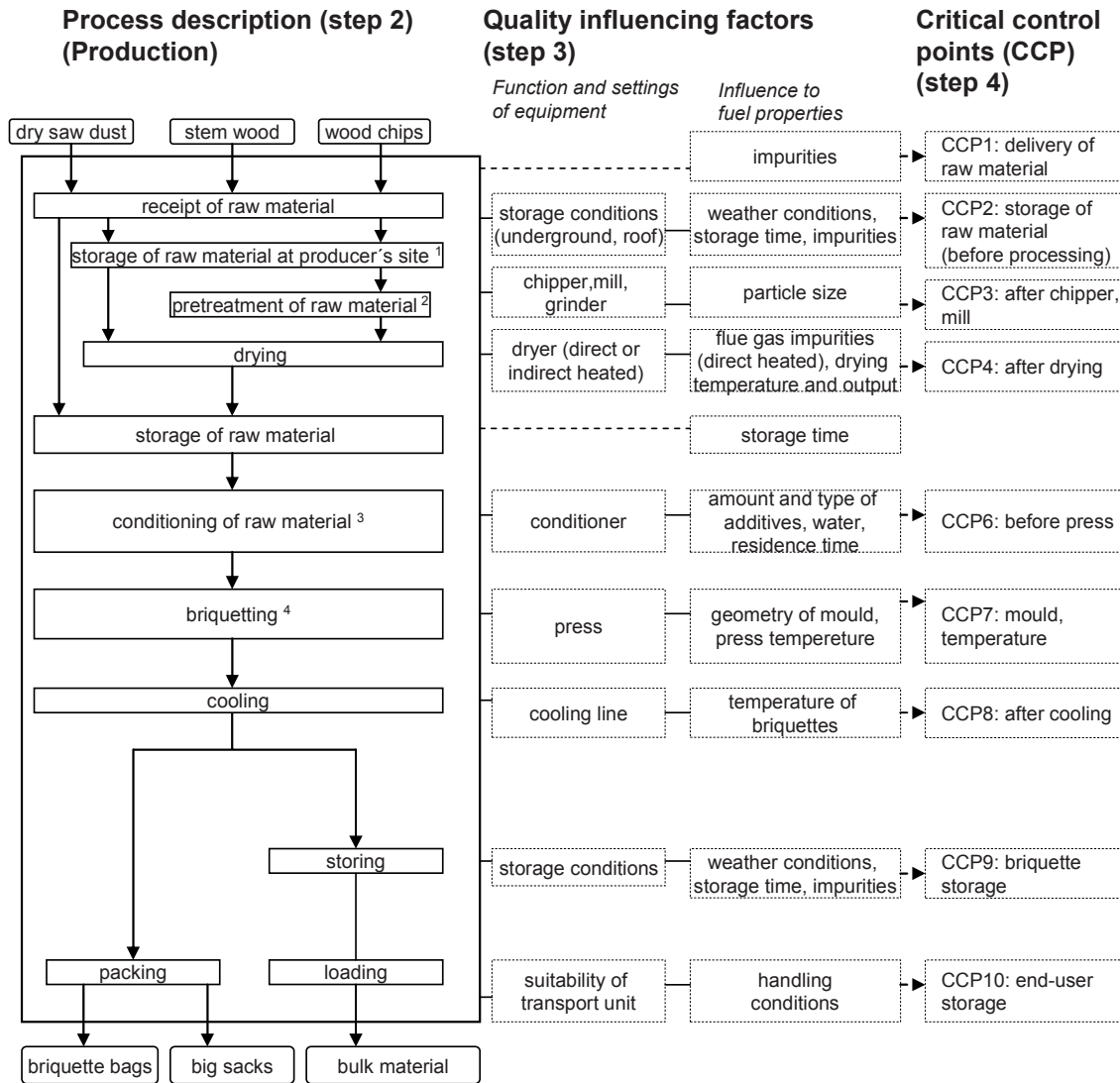
5.4 Fuel requirements for the final product (Step 1)

Wood briquettes for non-industrial use are produced according to EN 14961-3.

NOTE The fuel specification is based on EN 14961-1:2010 general part, Table 3 in the case of individually made agreements.

5.5 Process description (Steps 2, 3 and 4)

Examples of the process description with the corresponding quality influencing factors and critical control points are given in Figure 2 and Figure 3.



¹ separate raw material storages (e.g. woody residues, freshwood with or without bark)
² debarking, chipping, milling or grinding (if necessary),
³ and separation of impurities (stones, metals)
⁴ adding of pressing aid and water or steam (if necessary), maturation bunker

Figure 2 — Example for the description of the production process with quality influencing factors and Critical Control Points

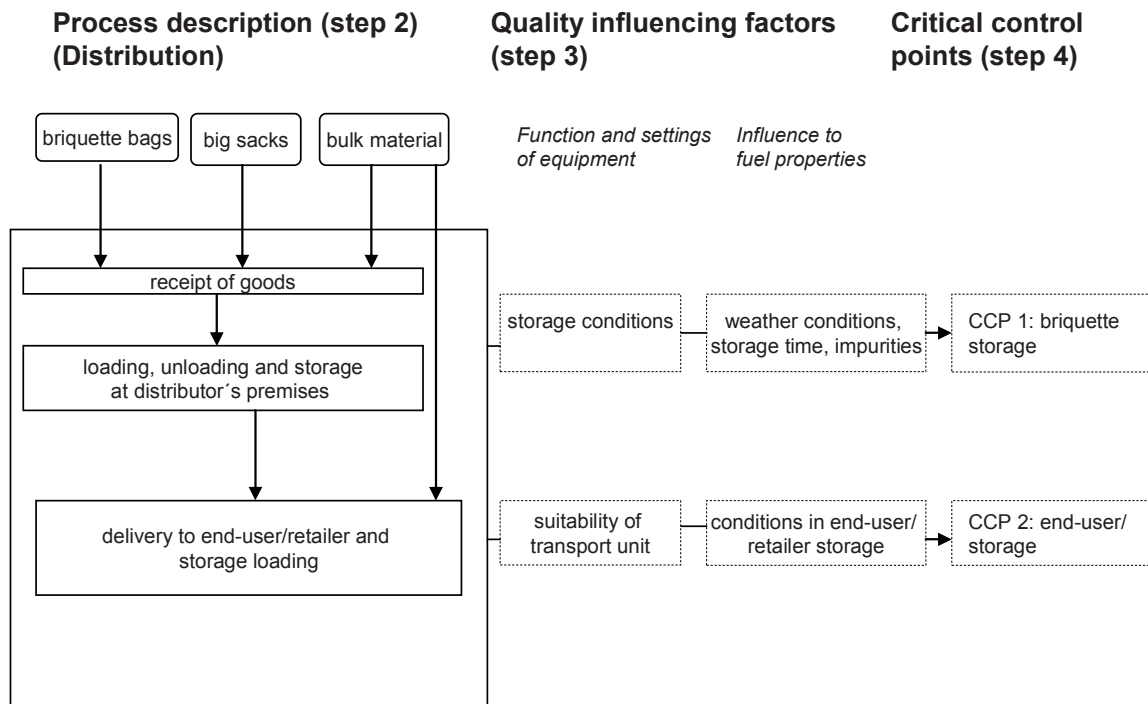


Figure 3 — Example for the description of the delivery chain with quality influencing factors and Critical Control Points

5.6 Measures to assure the quality of the product (Step 5)

5.6.1 Inspection of incoming raw material and other goods

- carry out visual or other sensory inspections of the delivered raw material,
- make a contract between supplier and producer with “terms of delivery” including fuel specifications and biofuel handling,
- document delivery declaration of the supplier e.g. with sustainability certification (PEFC, FSC, etc.²).

5.6.2 Wood briquette production

- control of key properties after the raw material basis has changed,
- control settings, function and condition of the equipment regularly,
- repair and change equipment when necessary; some parts will require changing regularly according to their technical lifetime or the production control system,
- protect wood briquettes from moisture from e.g. snow or rain or damp walls; also from condensation moisture through suitable storage,
- protect and control wood briquettes from contamination with impurities (e.g. stones, soil and grain),
- store separately wood briquettes of different quality (e.g. different classes described in EN 14961-3),

²) PEFC: Programme for the Endorsement of Forest Certification, FSC: Forest Stewardship Council.

- control and document production conditions and adjustment of the equipment (e.g. power demand of presses, temperature of the die) regularly,
- determine the quality of the produced briquettes regularly, in Table 1 the tests required, the place of sampling and the frequency are listed; the frequency of these checks is calculated by the following formula:

$$N = \frac{10}{days} * \sqrt{\frac{tonne}{10}}$$

where

N number of sample in 24h
days annual working days
tonne annual quantity of briquettes in tonnes

EXAMPLE $N=10/220*\sqrt{5\ 000/10} = 1$ times per 24h

Table 1 — Regular analyses of wood briquettes quality

| Property | Place of control | Frequency |
|----------------------------------|------------------|-------------------------|
| Dimensions (D, L), if adjustable | Production line | See formula above |
| Moisture Content (M) | Production line | See formula above |
| Particle density (DE) | Production line | At least once per shift |

- document all measures to assure the quality,
- install a system for complaint management.

5.6.3 Distribution

- control settings, function and condition of the equipment regularly,
- protect wood briquettes from moisture from e.g. snow or rain or damp walls; also from condensation moisture through suitable storage;
- protect wood briquettes from contamination with impurities (e.g. stones, soil and grain),
- store wood briquettes of different quality (e.g. different classes described in EN 14961-3) separately,
- check visually the quality of the briquettes regularly,
- document all measures to assure the quality,
- install a system for complaint management.

5.7 Routines for separate handling of nonconforming materials and solid biofuels (Step 6)

If raw materials or the produced wood briquettes do not fulfil the requirements, these batches must be stored separately from those that do.

All necessary information has to be documented.

If nonconformity of the product is discovered at the premises of the consumer in connection with a delivery, a nonconformity report is generated and handling of the nonconforming lot is agreed with the consumer.

6 Product declaration of fuel quality and labelling

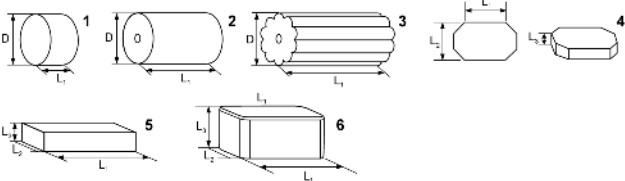
With the product declaration of fuel quality the producer or supplier confirms that the properties of the end-product are in accordance with the requirements of EN 14961-3 according to EN 15234-1. Product declarations shall be issued for both wood briquettes handled as bulk material and for packaged briquettes, in any case for each delivery lot. For packaged wood briquettes, the quality information given in the product declaration shall be labelled on the packaging. The supplier shall date the declaration and keep all relevant records for a minimum of one year after the delivery.

Examples for product declarations are given in informative Annex A.

Annex A (informative)

Examples of product declarations

Table A.1 — Example of a template for the product declaration for wood briquettes

| PRODUCT DECLARATION BASED ON EN 14961-3 | | | |
|--|--|---|--------------------|
| | Supplier | Name, contact information and number of contract | |
| | Amount of delivery | Agreed mass, volume or number of bags of the delivery. (The supplier and end-user shall also agree upon the methods of weighing or volume determination). | |
| | Origin: | According to Table 1 from EN 14961-1:2010 (select the level which is needed) | |
| | Country | Country/countries (or more detailed location if agreed) | |
| | Chemically treated material | raw No <input type="checkbox"/> Yes, class B <input type="checkbox"/> | |
| | Traded Form | Briquettes | |
| | Class | A1 or A2 or B | |
| Normative | Specifications of properties according to EN 14961-3:2011 | Unit | Value ^a |
| | Dimensions, diameter (D) or length (L ₁), width (L ₂) and height (L ₃) | mm | |
| | Shape | A or B, etc. | |
| |  | | |
| | Moisture, M EN 14774-1, EN 14774-2 | as received, w-% | |
| | Ash, A EN 14775 | w-% dry | |
| | Additives | w-% dry | |
| | Net calorific value, Q EN 14918 | as received, MJ/kg or kWh/kg | |
| | Particle density, DE, EN 15150 | g/cm ³ | |
| | Nitrogen, N, EN 15104 | w-% dry | |
| | Sulphur, S, EN 15289 | w-% dry | |
| | Chlorine, Cl, EN 15289 | w-% dry | |
| | Arsenic, As, EN 15297 | mg/kg dry | |
| | Cadmium, Cd, EN 15297 | mg/kg dry | |
| | Chromium, Cr, EN 15297 | mg/kg dry | |
| Copper, Cu, EN 15297 | mg/kg dry | | |
| Lead, Pb, EN 15297 | mg/kg dry | | |
| Mercury, Hg, EN 15297 | mg/kg dry | | |
| Nickel, Ni, EN 15297 | mg/kg dry | | |
| Zinc, Zn, EN 15297 | mg/kg dry | | |
| | Signature of assigned person | | Place and date |

^a The value column can be used for stating the average (mean) value or minimum and maximum values.

Table A.2 — Example of template for a simplified product declaration

| PRODUCT DECLARATION BASED ON EN 14961-3 | |
|---|---|
| Supplier | Name, contact information Number of contract |
| Amount of delivery | Agreed mass, volume or number of bags of the delivery. (The supplier and end-user shall also agree upon the methods of weighing or volume determination.) |
| Origin | According to Table 1 from EN 14961-1:2010 (select the level which is needed) |
| Country | Country/countries (or more detailed location if agreed) |
| Chemically treated raw material | No <input type="checkbox"/> Yes, class B <input type="checkbox"/> |
| Traded Form | Briquettes |
| Class | A1 or A2 or B |

Table A.3 — Example of product declaration for A1 class briquettes

| PRODUCT DECLARATION BASED ON EN 14961-3 | |
|---|--|
| Supplier | Holz Energie GmbH Number of contract: 12345 |
| Amount of delivery | 4 tons |
| Origin | 1.2.1.2 Sawdust according EN 14961-1 spruce (PCAB according to EN 13556) |
| Country | Germany, Hessen |
| Chemically treated raw material | No <input checked="" type="checkbox"/> Yes, class B <input type="checkbox"/> |
| Traded Form | Briquettes in 10 kg bags |
| Class | A1 |

Annex B (informative)

A-deviations

A-deviation: National deviation due to regulations, the alteration of which is for the time being outside the competence of the CEN/CENELEC member.

This European Standard does not fall under any Directive of the EC.

In the relevant CEN/CENELEC countries these A-deviations are valid instead of the provisions of the European Standard until they have been removed.

| Deviation | |
|--|--|
| Country France | National Regulation Rubrique 2910 de la nomenclature ICPE (Installations classées pour la protection de l'environnement) – Décret n° 2010-419 du 28 avril 2010 modifiant la nomenclature des installations classées The use of solid biofuels as mentioned in this standard is possible only for heating boilers up to a nominal heat output of 100 kWth, which are thus potentially subject to ICPE Regulation (Classified installation for the protection of the environment regulation). In any cases, heating boilers categories remains subject to the criteria set out in ICPE Regulation, in particular according to the source of biofuels and its composition. |
| Introduction Last Paragraph Clause 1 Clause 2 Clause 4 Footnote Clause 5.2 1st paragraph Clause 5.4 Clause 6 | All references to EN 14961-3 involve taking into account its A-Deviation, which is authorized only class 1.1.1, 1.1.3, 1.1.4, 1.1.6, 1.2.1 et 1.3.1 in Table 1 of EN 14961-1 and class A1 and A2 of EN 14961-3. |
| Annex A Tables A.1, A.2 and A.3 | In accordance with “rubrique 2910” of ICPE Regulation, there is no mention on Class B products in declaration. |

Bibliography

- [1] EN 13556, *Round and sawn timber — Nomenclature of timbers used in Europe*
- [2] EN 14774-1, *Solid biofuels — Determination of moisture content — Oven dry method — Part 1: Total moisture — Reference method*
- [3] EN 14774-2, *Solid biofuels — Determination of moisture content — Oven dry method — Part 2: Total moisture — Simplified method*
- [4] EN 14775, *Solid biofuels — Determination of ash content*
- [5] EN 14918, *Solid biofuels — Determination of calorific value*
- [6] EN 15104, *Solid biofuels — Determination of total content of carbon, hydrogen and nitrogen — Instrumental methods*
- [7] EN 15150, *Solid biofuels — Determination of particle density*
- [8] EN 15289, *Solid biofuels — Determination of total content of sulfur and chlorine*
- [9] EN 15297, *Solid biofuels — Determination of minor elements — As, Cd, Co, Cr, Cu, Hg, Mn, Mo, Ni, Pb, Sb, V and Zn*

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards-based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

All the data, software and documentation set out in all British Standards and other BSI publications are the property of and copyrighted by BSI, or some person or entity that owns copyright in the information used (such as the international standardization bodies) and has formally licensed such information to BSI for commercial publication and use. Except as permitted under the Copyright, Designs and Patents Act 1988 no extract may be reproduced, stored in a retrieval system or transmitted in any form or by any means – electronic, photocopying, recording or otherwise – without prior written permission from BSI. Details and advice can be obtained from the Copyright & Licensing Department.

Useful Contacts:

Customer Services

Tel: +44 845 086 9001

Email (orders): orders@bsigroup.com

Email (enquiries): cservices@bsigroup.com

Subscriptions

Tel: +44 845 086 9001

Email: subscriptions@bsigroup.com

Knowledge Centre

Tel: +44 20 8996 7004

Email: knowledgecentre@bsigroup.com

Copyright & Licensing

Tel: +44 20 8996 7070

Email: copyright@bsigroup.com



...making excellence a habit.™