

BS EN 15210-2:2010



BSI Standards Publication

Solid biofuels — Determination of mechanical durability of pellets and briquettes

Part 2: Briquettes

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National foreword

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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.

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ISBN 978 0 580 70587 8

ICS 75.160.10

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 January 2011.

Amendments issued since publication

Date	Text affected
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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 15210-2

November 2010

ICS 75.160.10

Supersedes CEN/TS 15210-2:2005

English Version

**Solid biofuels - Determination of mechanical durability of pellets
and briquettes - Part 2: Briquettes**

Biocombustibles solides - Méthodes de détermination de la
durabilité mécanique des granulés et des briquettes - Partie
2: Briquettes

Feste Biobrennstoffe - Bestimmung der mechanischen
Festigkeit von Pellets und Briketts - Teil 2: Briketts

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Foreword

This document (EN 15210-2:2010) 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of an identical text or by endorsement, at the latest by May 2011, and conflicting national standards shall be withdrawn at the latest by May 2011.

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1 Scope

This European Standard defines the requirements and method used for testing the mechanical durability of briquettes. It is applicable to persons and organisations that manufacture, plan, sell, erect or use machinery, equipment, tools and entire plants related to such briquettes, and to all persons and organisations involved in producing, purchasing, selling and utilising briquettes.

The durability is the measure of the resistance of densified fuels towards shocks and/or abrasion as a consequence of handling and transportation processes.

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 14774-1:2009, *Solid biofuels — Determination of moisture content — Oven dry method — Part 1: Total moisture — Reference method*

EN 14774-2:2009, *Solid biofuels — Determination of moisture content — Oven dry method — Part 2: Total moisture — Simplified method*

CEN/TS 14778-1, *Solid biofuels — Sampling — Part 1: Methods for sampling*

CEN/TS 14780, *Solid biofuels — Methods for sample preparation*

ISO 3310-1, *Test sieves — Technical requirements and testing — Part 1: Test sieves of metal wire cloth*

3 Terms and definitions

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

4 Principle

The test sample is subjected to controlled shocks by collision of briquettes against each other and against the walls of a specified rotating test chamber. The durability is calculated from the mass of the sample remaining after separation of abraded and fine broken particles.

5 Apparatus

5.1 Briquette tester

The durability drum is a cylindrical steel drum with a nominal volume of 160 l having the following dimensions (see Figure 1):

- a) Internal length, or depth: (598 ± 8) mm;
- b) Internal diameter: (598 ± 8) mm.

The drum shall be made of minimum 1 mm steel plate. The internal surface area of the drum shall be smooth and any disturbances of the surface such as ridges or furrows shall be avoided.

The durability drum is equipped with a rectangular steel baffle having the following dimensions:

- c) Length: (598 ± 8) mm;
- d) Height: (200 ± 2) mm;
- e) Thickness: 1 mm.

The baffle shall be welded on its length to the full height of the internal curved surface of the drum, parallel to the axis of the drum and perpendicular to the tangent of the curve. The baffle tip is sagged in a smooth curve to obtain a rim perpendicular to the baffle.

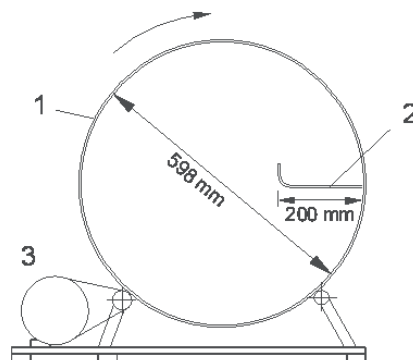
The drum may be opened on one of the ends. This opening shall be fitted with a dustproof lid of the same diameter as the internal diameter of the drum (598 ± 8) mm. When the lid is in position, it shall be approximately flush with the side of the cylinder. This lid shall be made of minimum 1 mm steel plate.

It shall be possible to fasten the lid securely by four rotating bolts (or any other suitable mechanism) fixed on the external part of the drum.

The drum shall be capable of being constantly driven at $(21 \pm 0,1)$ rpm by an electric motor, by suitable pulleys or gearings, in order to avoid vibrations. A rotation counter should be connected to the drum.

The rotation counter may also be connected to the motor so that the latter is automatically switched off after a defined number of rotations.

Dimensions in millimetres



Key

- 1 Drum
- 2 Baffle
- 3 Motor

Figure 1 — Principle of the durability drum

5.2 Sieve

Depending on the briquette diameter, a metal wire cloth conforming to ISO 3310-1 is chosen so that the aperture size is approximately equivalent to $2/3$ of the briquettes diameter or diagonal but not exceeding 45 mm.

5.3 Balance

A balance capable of measuring the mass of the sample to the nearest 0,1 g.

6 Sample preparation

The sample used for the determination of mechanical durability shall be taken and if necessary divided in mass according to CEN/TS 14778-1 and CEN/TS 14780. The size of the sample shall conform to the requirements of this document (depending on the nominal top size) but shall be at least 25 kg.

Divide the sample to obtain two parts: one to be used for moisture content determination (5 kg), the other for the mechanical durability test ($5 \times 4 \text{ kg} = 20 \text{ kg}$). The moisture content as received shall be determined on a non-sieved sample simultaneously with the durability test according to EN 14774-1:2009 or EN 14774-2:2009.

The sample shall be tested at the moisture content as received. It shall be stored in airtight containers to avoid moisture changes. While the test is being conducted the sample shall be at room temperature.

Cylindrical briquettes with a length over twice their diameter shall be cut to a length equivalent to twice their diameter. Oversize briquettes shall be cut down to size using a blade or a band saw. Cuts shall be at right angles to the axis of the briquette. Other shaped briquettes shall be tested as received.

The minimum test portion shall be 2 kg, as many full briquette portions are added to exceed this limit.

NOTE 1 The use of a single briquette portion with a minimum of 2 kg mass is acceptable.

The sample shall not contain any small, broken particles. Small particles shall be separated from the sample by the use of the sieve mentioned in 5.2 or by sorting out briquettes manually.

NOTE 2 The length of the briquette has an influence on the briquettes behaviour in the durability drum, and therefore on the mechanical durability.

NOTE 3 The saw and type of teeth should be chosen to produce as smooth cut surface, consistent with the composition of the briquette under test.

7 Procedure

A prepared test portion, of minimum ($2 \pm 0,1$) kg, is placed in the durability drum. Rotate the sample at ($21 \pm 0,1$) min^{-1} for 5 min or for ($105 \pm 0,5$) 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.

NOTE Attention is drawn to the fact that rough treatment during screening might influence the result.

The sample remaining on the sieve shall be weighed and then the percentage of whole briquettes (particles remaining on the selected sieve) shall be calculated. Briquettes durability will be defined according to Clause 8.

8 Calculation

The mechanical durability of briquettes shall be calculated using the following equation:

$$DU = \frac{m_A}{m_E} \times 100$$

where

DU is the mechanical durability in percent (%);

m_E is the mass of pre-sieved briquettes before the drum treatment in grams (g);

m_A is the mass of sieved briquettes after the drum treatment in grams (g).

Calculate the mean value from the results of the five replications and report to the nearest 0,1 %.

9 Test report

The test report shall include at least the following information:

- identification of laboratory performing test and the date when the test was undertaken;
- identification of product (or sample) tested and the number of duplicates tested;
- a reference to this document;
- the result of the mechanical durability (as received) as mean value and the moisture content (as received);
- any unusual features noted during the determination;
- any operation not included in this document, or regarded as optional;
- shape and dimensions of the briquettes.

Additional reporting (informative):

- the result of the mechanical durability (as received) for all individual replications.

10 Precision and bias

Because of the varying nature of solid biofuels covered by this document it is not possible at this time to give a precision statement (repeatability or reproducibility) for these test methods.

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