BRITISH STANDARD

BS EN
15210-1:2009

Solid biofuels — Determination of mechanical durability of pellets and briquettes

Part 1: Pellets

ICS 75.160.10

BSI
British Standards

National foreword

This British Standard is the UK implementation of EN 15210-1:2009. It supersedes DD CEN/TS 15210-1:2005 which is withdrawn.

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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Foreword

This document (EN 15210-1:2009) 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of an identical text or by endorsement, at the latest by June 2010, and conflicting national standards shall be withdrawn at the latest by June 2010.

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1 Scope

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

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.

CEN/TS 14588:2003, *Solid biofuels — Terminology, definitions and descriptions*

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

EN 14774-2, *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 3310-2, *Test sieves — Technical requirements and testing — Part 2: Test sieves of perforated metal plate*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in CEN/TS 14588:2003 apply.

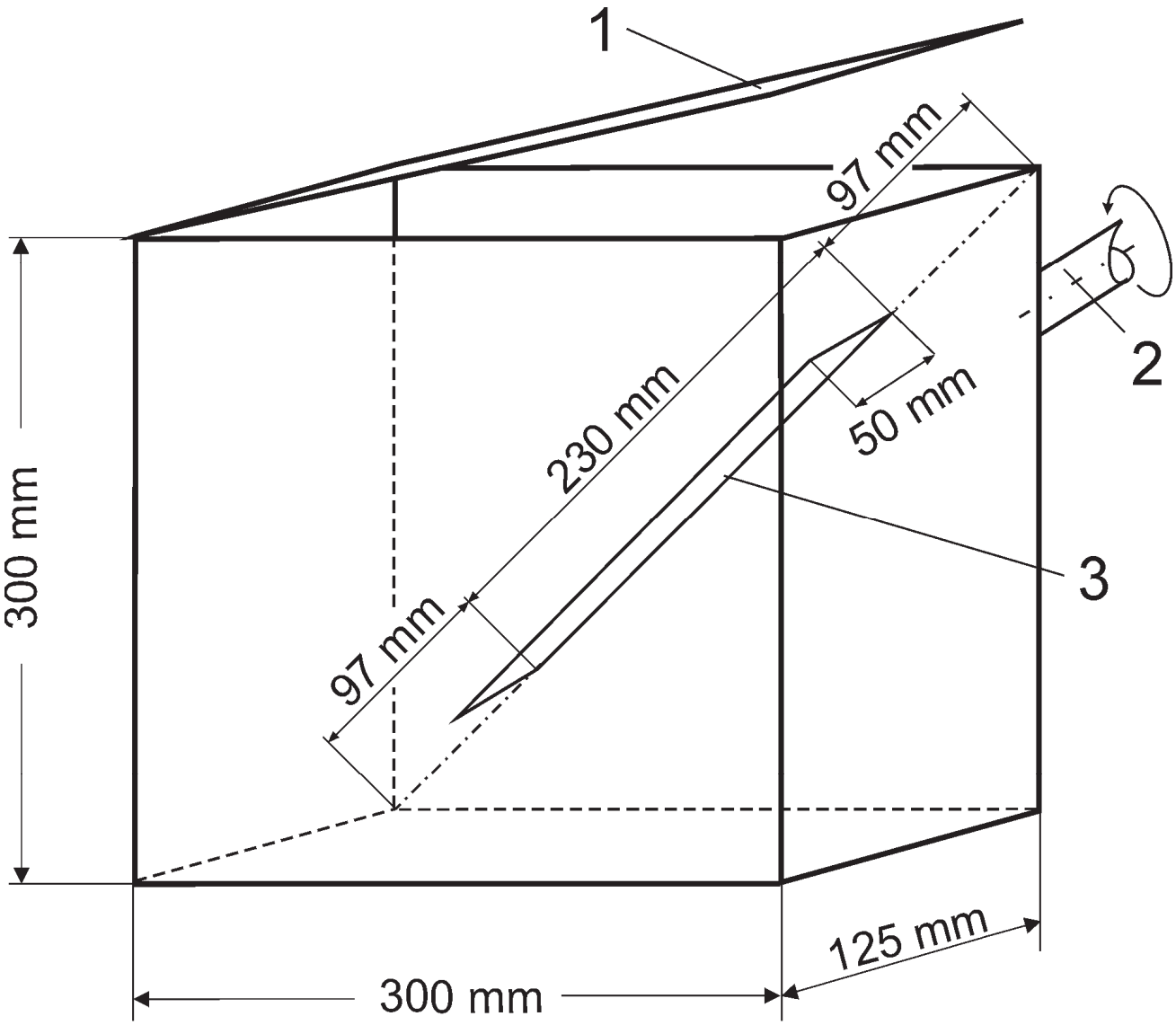
4 Principle

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

5 Apparatus

5.1 Pellet tester

The structure and dimensions of the pellets tester are shown in Figure 1 (see also informative Annex A).



Key

1 Filling door
2 Drive shaft
3 Baffle

Figure 1 — Structure of the main parts of the pellet tester

The pellet tester shall consist of a dust tight box. This box shall be made of rigid material with smooth and flat surfaces (e.g. stainless steel plate). The inner dimensions of the box shall be of (300 ± 3) mm × (300 ± 3) mm × (125 ± 1,3) mm; it shall rotate at 50 rpm about an axis, which is perpendicular to and centred in the 300 mm sides. A (230 ± 2,3) mm long baffle is affixed symmetrically to a diagonal of one 300 mm × 300 mm side of the box. The baffle extends (50 ± 1,0) mm into the box (see Figure 1) and is securely fastened to the back of the box. The edges of the baffle shall not be sharp but rounded to avoid any cutting effect. A door may be placed in any side. Projections, such as rivets and screws, shall be kept to a minimum and well rounded (alternatively flathead screws may be used).

5.2 Sieve

A sieve with round screen holes of 3,15 mm diameter and suitable for manual screening in accordance with ISO 3310-2.

5.3 Balance

A balance with weighing capacity of 2 kg and capable of measuring the mass to the nearest 0,1 g.

6 Sample preparation

The sample used for the determination of mechanical durability shall be taken according to CEN/TS 14778. If it is necessary divide the mass of the sample use coning and quartering method according to CEN/TS 14780. The minimum size of the sample shall be 2,5 kg. Divide the sample into four equal portions according to CEN/TS 14780. Take one portion for the determination of the total moisture content according to EN 14774 Part 1 or Part 2. Weigh two of the remaining sample portions and then separate particles passing 3,15 mm sieve by hand sieving, using a sieve as described in 5.2. The sieving shall be done in a way that the fine particles are separated but the creation of new fine particles is avoided. This is usually achieved when a sample portion of 1 kg to 1,5 kg is shaken in about five to ten circular movements on a sieve of 40 cm diameter. If other equipment is used, the procedure and the test portion size can be adjusted to achieve the same effect.

Weigh the amount of pellets retained on the sieve and calculate the initial amount of particles passing through the 3,15 mm sieve in the sample portion in weight %.

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

7 Procedure

7.1 General

A minimum of two determinations shall be carried out on the test sample.

7.2 Tumbling procedure

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 according to 5.2.

7.3 Sieving procedure

The sieving shall be done in a way that the fine particles are separated but the creation of new fine particles is avoided. This is usually achieved when the sample portion of 0,5 kg is shaken in about five to ten circular movements on a sieve of 40 cm diameter. If other equipment is used, the procedure and the test portion size can be adjusted to achieve the same effect.

The sieving has to be done completely. The sample remaining on the sieve shall be weighed. The percent of whole pellets (particles remaining on the sieve) shall be calculated. Pellet durability is defined according to Clause 8.

8 Calculation of the mechanical durability

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

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$$D_U = \frac{m_A}{m_E} \times 100 \quad (1)$$

where

D_U is the mechanical durability, in %;

m_E is the mass of pre-sieved pellets before the tumbling treatment, in g;

m_A is the mass of sieved pellets after the tumbling treatment, in g.

The result shall be calculated to two decimal places and the mean result shall be rounded to the nearest 0,1 % for reporting.

9 Precision and bias

9.1 General

Table 1 — Repeatability and reproducibility

Durability	**Maximum acceptable differences between results obtained**	
	Repeatability limit % absolute	**Reproducibility critical difference** % absolute
Durability above or equal to 97,5 %	0,4	0,8
Durability under 97,5 %	2	3

9.2 Repeatability

The results of the duplicate determinations (performed within a short period of time, but not simultaneously) in the same laboratory by the same operator using the same apparatus on two representative test portions taken from the same sample, shall not differ by more than the values given in Table 1.

9.3 Reproducibility

The means of the results of duplicate determinations, performed in each of two different laboratories on representative test portions taken from the same sample shall not differ by more than the values given in Table 1.

10 Test report

The test report shall include at least the following information:

a) identification of laboratory performing test and the date when the test was undertaken;

b) identification of product or sample tested and the number of duplicates tested;

c) reference to this European Standard;

d) result of the mechanical durability (as received) as mean value and the moisture content (as received);

e) any unusual features noted during the determination;

f) any operation not included in this European Standard, or regarded as optional;

g) amount of particles passing through the 3,15 mm sieve, in weight % separated from the sample before the determination;

Additional reporting (informative):

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

Annex A
(informative)

Example of pellet tester with two boxes

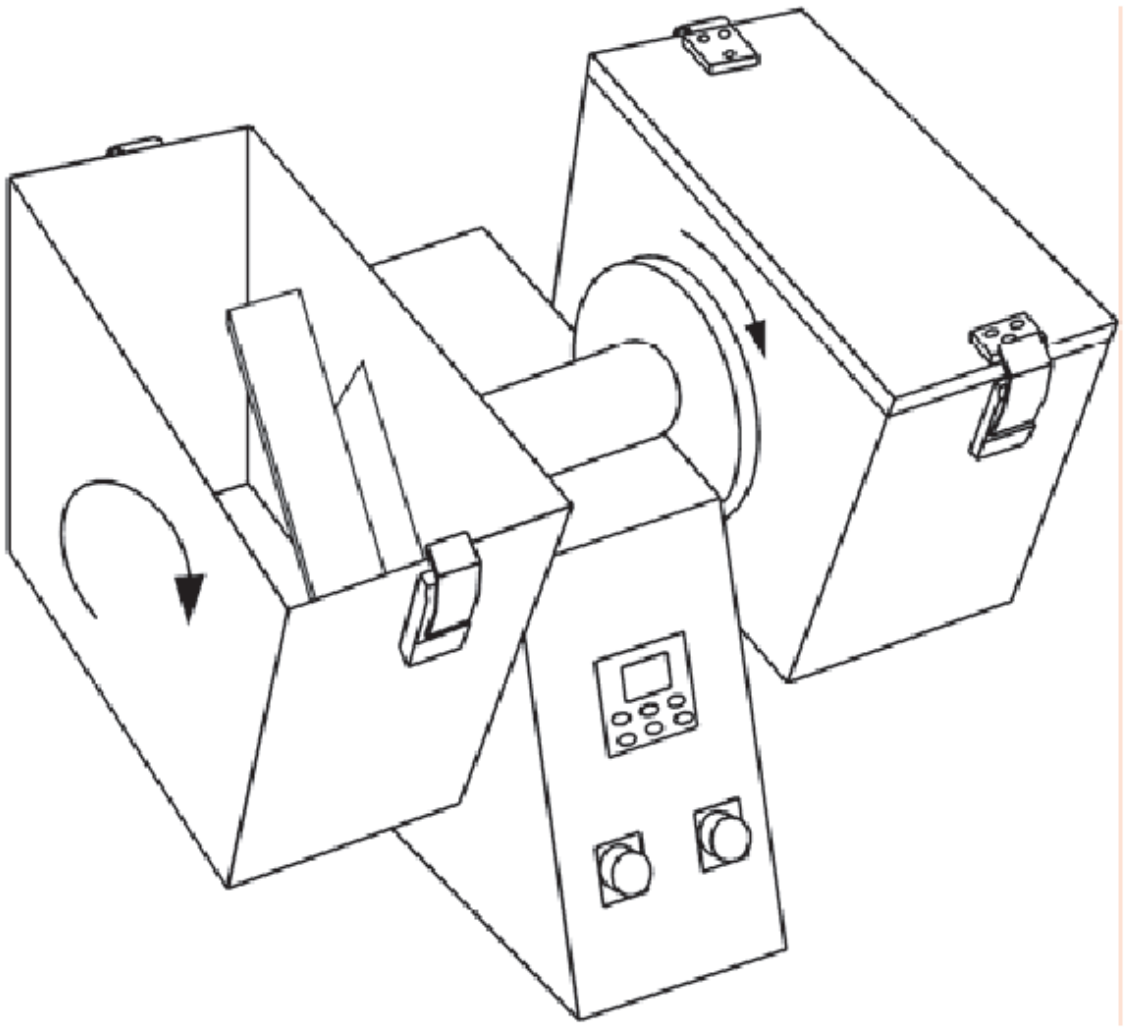

Figure A.1 — Pellet tester with two boxes

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