BS EN ISO 17831-1:2015

BSI Standards Publication

Solid biofuels — Determination of mechanical durability of pellets and briquettes

Part 1: Pellets

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National foreword

This British Standard is the UK implementation of EN ISO 17831-1:2015. It supersedes BS EN 15210-1:2009 which is withdrawn.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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English Version

Solid biofuels - Determination of mechanical durability of pellets and briquettes - Part 1: Pellets (ISO 17831-1:2015)

Biocombustibles solides - Détermination de la résistance mécanique des granulés et des briquettes - Partie 1: Granulés (ISO 17831-1:2015)

Biogene Festbrennstoffe - Bestimmung der mechanischen Festigkeit von Pellets und Briketts - Teil 1: Pellets (ISO 17831-1:2015)

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European foreword

This document (EN ISO 17831-1:2015) has been prepared by Technical Committee ISO/TC 238 "Solid biofuels" in collaboration with 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of an identical text or by endorsement, at the latest by June 2016, and conflicting national standards shall be withdrawn at the latest by June 2016.

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The text of ISO 17831-1:2015 has been approved by CEN as EN ISO 17831-1:2015 without any modification.

Contents

Page

Foreword

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The committee responsible for this document is ISO/TC 238, *Solid biofuels*.

ISO 17831 consists of the following parts under the general title *Solid Biofuels — Determination of mechanical durability of pellets and briquettes*:

— *Part 1: Pellets*

— *Part 2: Briquettes*

Introduction

Compressed solid biomass fuel is usually classified either as pellets or briquettes, of which pellets usually have a diameter below 25 mm while for briquettes the diameter is higher (see ISO 17225-1). To account for the different particle dimensions, it was necessary to define different test apparatuses for determination of durability for pellets and briquettes.

INTERNATIONAL STANDARD ISO 17831-1:2015(E)

Solid biofuels — Determination of mechanical durability of pellets and briquettes —

Part 1: Pellets

1 Scope

This part of ISO 17831 defines a determination method for testing the mechanical durability of pellets. The mechanical durability is a measure of the resistance of compressed fuels towards shocks and/or abrasion as a consequence of handling and transportation.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 14780, *Solid biofuels — Sample preparation*[1)]

ISO 16559, *Solid biofuels — Terminology, definitions and descriptions*

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 18135, *Solid Biofuels — Sampling*[1)]

3 Terms and definitions

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

4 Principle

A test portion 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 test portion, after separation by sieving of particles less than 3,15 mm, and the mass of the test portion after tumbling.

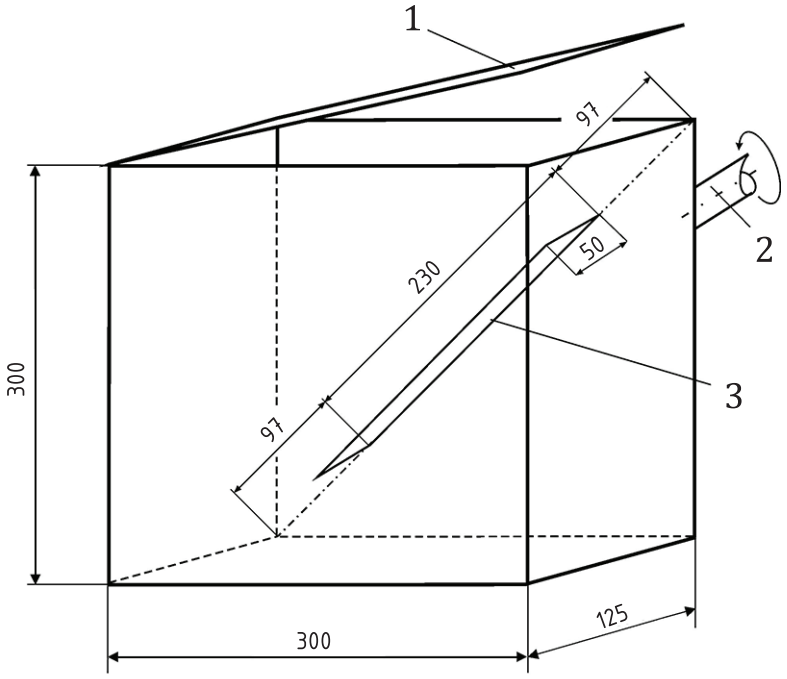
5 Apparatus

5.1 Pellets tester

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

1) In preparation.

Dimensions in millimetres



Key

1 filling door
2 drive shaft
3 baffle

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

The pellets tester shall consist of a dust tight box with an internal baffle for mixing of the pellets and a driving mechanism.

The box shall have an internal smooth surface and projections such as rivets and screws shall be kept to a minimum and well rounded (alternatively flathead screws can be used). A door can be placed at any side.

Specification of box and inner dimensions:

Material: stainless steel (1,5 ± 0,1) mm thick

Width (300 ± 3) mm

Height (300 ± 3) mm

Breadth (125 ± 1,3) mm

Specification of baffle and dimensions:

Material: stainless steel (1,5 ± 0,1) mm thick

Length: (230 ± 2,3) mm

Width: (50 ± 1,0) mm

The baffle is affixed on a diagonal of one of the 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.

The box shall be capable of rotating at a constant speed of (50 ± 2) r/min by means of an electric motor with suitable pulleys or gear in order to avoid vibrations. A rotation counter shall be connected to the drum.

The rotation counter can also be connected to the motor for automatic shut-off after a defined number of rotations.

5.2 Sieve

The sieve shall have a screen with 3,15 mm diameter round holes and suitable for manual screening (see ISO 3310-2). The recommended diameter of sieve is 400 mm or above.

5.3 Balance

The balance shall be capable of reading to the nearest 0,1 g and a weighing capacity of 2 kg.

6 Sample preparation

A laboratory sample of minimum 2 kg material for the determination of mechanical durability shall be obtained in accordance with ISO 18135 and prepared in accordance with ISO 14780. The test sample shall be divided into four equal test samples.

One test sample shall be used for determination of the total moisture content in accordance with ISO 18134-1 or ISO 18134-2.

Simultaneously for the determination of the durability each of the remaining three test samples shall be sieved separately in order to remove the fines (particles less than 3,15 mm) using a sieve as described in 5.2.

The sieving shall be performed by manually shaking each of the test portions in about 5-10 circular movements. The recommended amount of material in the sieve shall be less than 0,8 g/cm^2 of sieve area. This requirement will be achieved for example by using a sample of 1,0 kg on a sieve 400 mm diameter. If a sieve with a different diameter is used, the amount of the material shall be adjusted to achieve the same degree of filling.

The three test samples may be unified and divided into two portions in preparation for the tumbling (7.1).

7 Procedure

7.1 Tumbling procedure

Select one of the test portion of (500 ± 10) g from the unified sample (see Clause 6). For pellets above 12 mm diameter a test portion of (500 ± 50) g is allowed. Weigh the test portion to the nearest 0,1 g and place it in the tumbling box of the pellet tester (see 5.1). Tumble the test portion at (50 ± 2) r/min for 500 rotations. After this, the test portion is removed and manually sieved (7.2) for separation of the fines.

The same procedure shall be performed for the second test portion from the unified sample (see Clause 6).

7.2 Sieving procedure

For sieving using a sieve described in 5.2. Sieving of the test portions after the tumbling procedure shall be done in such a way as to avoid generation of new fines. The sieving shall be performed by shaking each of the previously tumbled test portions one after the other with about 5-10 circular movements. The recommended sieve diameter shall be chosen in order to achieve a load of less than 0,8 g/cm^2 of sieve area (see also Clause 6).

The sieving has to be done completely. Weigh the material remaining on the sieve for each of the tumbled test portions. The pellets durability shall be calculated in accordance with Clause 8.

8 Calculation of the mechanical durability

The mechanical durability of pellets shall be calculated using Formula (1):

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

where

DU is the mechanical durability, in %;

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

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

The result for each of the two test portions shall be calculated to two decimal places and the mean value result from the two test portions shall be rounded to the nearest 0,1 percent for reporting.

9 Performance characteristics

9.1 General

Table 1

Durability	Maximum acceptable differences between results	
	Repeatability limit	Reproducibility limits
Durability above or equal to 97,5 %	0,3 % absolute	0,6 % absolute
Durability under 97,5 %	2 % absolute	3 % absolute

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 laboratory sample, shall not differ by more than the values given in Table 1 (see References [3], [4], [5], [6], and [7]).

9.3 Reproducibility

The mean value of the results of duplicate determinations, performed in each of two different laboratories on representative test portions taken from the same laborytory sample shall not differ by more than the values given in Table 1 (see References [3], [4], [5], [6], and [7]).

10 Test report

The test report shall include at least the following information:

a) identification of the laboratory performing the test and the date of the test;

b) identification of product (or sample) tested;

c) a reference to this part of ISO 17831, i.e. ISO 17831-1;

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

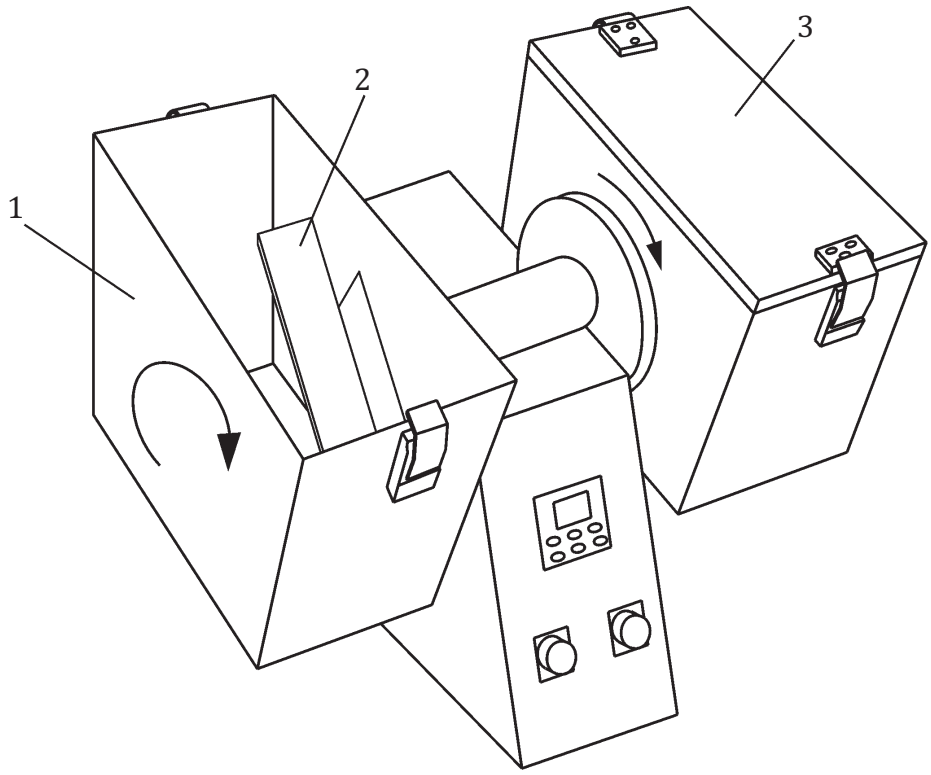
e) result of the mechanical durability (as received) for all individual replications (optional);

f) any unusual features noted during the determination which can affect the result;

g) any operation not included in this part of ISO 17831, or regarded as optional.

Annex A
(informative)

Example of pellets tester with two boxes



Key

1 tumbling box (with lid removed)
2 baffle
3 lid closing a tumbling box

Figure A.1

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