INTERNATIONAL STANDARD

ISO 17225-8

First edition
2023-03

Solid biofuels — Fuel specifications and classes —

Part 8: Graded thermally treated and densified biomass fuels for commercial and industrial use

Biocombustibles solides — Classes et spécifications des combustibles —

Partie 8: Combustibles de biomasses traitées thermiquement et densifiées en vue d'une utilisation commerciale et industrielle

Reference number
ISO 17225-8:2023(E)

© ISO 2023



COPYRIGHT PROTECTED DOCUMENT

© ISO 2023

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

© ISO 2023 – All rights reserved

Contents

Page

Foreword ..... **iv**
Introduction ..... **v**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **2**
4 Symbols and abbreviated terms **3**
5 Specification of graded pellets and briquettes produced by thermal processing **4**
Annex A (normative) **Template for specification of densified and non-densified biomass fuels produced by thermal processing** **13**
Annex B (informative) **Reference values for the calculation of the limit values in terms of energy** **15**
Bibliography **17**

© ISO 2023 – All rights reserved

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 of the voluntary nature of standards, 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 238, *Solid biofuels*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 335, *Solid biofuels*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This first edition cancels and replaces the first edition (ISO/TS 17225-8:2016), which has been technically revised.

The main changes are as follows:

— raw material basis enlarged;

— Tables 1 to 6 merged into Tables 1 to 3, to be used for pellets and briquettes;

— table for thermally treated woody biomass split in two tables (Table 1 and Table 2);

— threshold values for Tables 1 to 3 stated in terms of energy;

— Annex A has been introduced to support product specification;

— Annex B has been introduced to support the calculation of the limit values in terms of energy given in Tables 1 to 3.

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

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

© ISO 2023 – All rights reserved

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 legal permission procedures and reporting.

This document supports the use of thermally treated and densified biomass in commercial and industrial energy generation applications and in industrial processes, which require classified quality.

Thermal treatment includes processes such as torrefaction, steam explosion, 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 plants with manufacturer approval.

For individual contracts, ISO 17225-1 can be used. ISO 17225-1 can also be used for specification of charcoal.

Although this document may be used separately, a general understanding of the standards based on and supporting ISO 17225-1 is required. It is recommended that ISO 17225-1 is used in conjunction with this document.

© ISO 2023 – All rights reserved

Solid biofuels — Fuel specifications and classes —

Part 8: Graded thermally treated and densified biomass fuels for commercial and industrial use

1 Scope

This document determines the fuel quality classes and specifications of graded densified solid biofuels produced from thermally treated biomass for commercial applications and industrial use. This document covers pellets and briquettes produced from the following raw materials (see ISO 17225-1:2021, Table 1):

— woody biomass;

— herbaceous biomass;

— fruit biomass;

— aquatic biomass;

— blends and mixtures.

Subcategories of these raw materials are included.

This document does not consider products which are marketed as charcoal or as charcoal products. For these products, see ISO 17225-1:2021, Table 14.

NOTE 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 5370, *Solid biofuels — Determination of fines content in pellets*

ISO 14780, *Solid biofuels — Sample preparation*

ISO 16559, *Solid biofuels — Vocabulary*

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 17225-1:2021, *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 2023 – All rights reserved

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

ISO 17831-2, *Solid biofuels — Determination of mechanical durability of pellets and briquettes — Part 2: Briquettes*

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

ISO 18125, *Solid biofuels — Determination of calorific value*

ISO 18134-1, *Solid biofuels — Determination of moisture content — Part 1: 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*

ISO 21945, *Solid biofuels — Simplified sampling method for small scale applications*

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 terminology databases for use in standardization at the following addresses:

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

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

3.1
pellet made from thermally treated biomass
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 as thermal treatment in this definition.

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

3.2
briquette made from thermally treated biomass
densified biofuel made with or without additives in pre-determined geometric form with at least two dimensions (height width, and length) 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 as thermal treatment in this definition.

Note 2 to entry: Fuel briquettes which are produced by applying the thermal treatment after densification 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 have vastly different fuel requirements.

© ISO 2023 – All rights reserved

[SOURCE: ISO 17225-1:2021, 3.2]

3.4
post-immersion durability reduction
DUR_{pi}
measure of the drop in the durability of thermally treated biomass fuel pellets after immersion in water

Note 1 to entry: A post-immersion durability reduction value of 0 means there was no change to the durability of the thermally treated pelletized fuel as a result of wetting, whereas, for example, a post-immersion durability reduction value of 3 indicates that the durability dropped by three percentage points as a result of wetting.

Note 2 to entry: The test procedure is given in ISO 23343-1.

[SOURCE: ISO 23343-1:2021, 3.2, modified — Definition revised and Note 2 to entry added.]

3.5
thermally treated biomass
biomass whose chemical composition has been changed by heat (usually by temperatures of 200 °C to 300 °C and above)

3.6
thermally treated biomass grindability index
TTBGI
measure for the tendency of a fixed volume of thermally treated biomass material to produce fine particles after grinding under defined settings and conditions

[SOURCE: ISO/TS 21596:2021, 3.3]

3.7
water sorption
W_{SORP}
gain or loss of water or moisture by solid biofuels through absorption and/or adsorption when exposed to water or varying levels of humidity

[SOURCE: ISO 16559:2022, 3.216]

4 Symbols and abbreviated terms

A_{MJ}	designation for ash content on a dry basis [g/MJ dry]
ar	as received
BD	designation for bulk density as received [kg/m^3, (loose volume)]
C_f	fixed carbon [% in mass dry]
D	designation for diameter as received [mm]
d	dry (dry basis)
DT	designation for deformation temperature of the fuel ash [°C]
DU	designation for mechanical durability as received [% in mass]
DUR_{pi}	designation for post-immersion durability reduction [% in mass]
F	designation for amount of fines (<3,15 mm) as received [% in mass]
F0.5	designation for amount of fines below 0,5 mm as received [% in mass]

© ISO 2023 – All rights reserved