

TEST REPORT

BEA2023435

Date of report: 2024-01-16

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Client: Lespak d.o.o. (attn. Mrs. Tanja Wondra)

Address: Verd 107; 1360 Vrhnika, SLOVENIA

Order: Fuel testing according ENplus® certification program of wood pellets ENplus® ST.1001:2022

Order date: 2023-11-08

Receipt of samples: 2023-12-01; 2024-01-11

Sample(s): Wood pellets




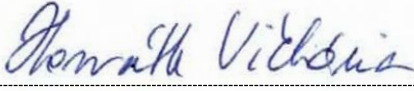
Testing period: 2023-12-01 – 2024-01-16

Sample details: 15kg pellets in plastic bag class A1 marked with internal sample no.: BEA2023435, 15kg pellets in plastic bag class A1 marked with internal sample no.: BEA2023435-NP1

| BEA2023435 parameter ENplus® | limit values A1 | limit values A2 | result pellets | unit |
|--|-----------------|-----------------|-------------------|------------------------|
| diameter | 6 ± 1, 8 ± 1 | 6 ± 1, 8 ± 1 | 6,0 | mm (ar) |
| length (3,15 ≤ L ≤ 40 mm) | (3,15 ≤ L ≤ 40) | (3,15 ≤ L ≤ 40) | 16,8 ± 6,3 | mm (ar) |
| length (40 ≤ L ≤ 45 mm)* | ≤ 1 | ≤ 1 | 0,8 | % in mass (ar) |
| length (> 45 mm)* | 0 | 0 | 0 | piece(s) |
| share of pellets with a length < 10mm | - | - | 5,6 | % in mass (ar) |
| category L < 20%, 20% ≤ M ≤ 30%, S > 30% | - | - | L | - |
| amount of pellets for length determination | ≥ 100 | ≥ 100 | 1 120 | piece(s) |
| moisture content | ≤ 10,0 | ≤ 10,0 | 7,7 | % in mass (ar) |
| ash content | ≤ 0,70 | ≤ 1,20 | 0,54 | % in mass (db) |
| mechanical durability* | ≥ 98,0 | ≥ 97,5 | 98,3 | % in mass (ar) |
| bulk density | 600 ≤ BD ≤ 750 | 600 ≤ BD ≤ 750 | 650 | kg/m ³ (ar) |
| particle density | - | - | 1,27 | g/cm ³ (ar) |
| coarse fines (3,15 ≤ CPF < 5,6 mm) | - | - | 0,5 | % in mass |
| fines content (< 3,15 mm), bulk | ≤ 1 | ≤ 1 | - | % in mass (ar) |
| fines content (< 3,15 mm), bags | ≤ 0,5 | ≤ 0,5 | 0,3 | % in mass (ar) |
| net calorific value q _{P,net} | ≥ 16,5 | ≥ 16,5 | 17,1 | MJ/kg (ar) |
| net calorific value q _{P,net} | ≥ 4,6 | ≥ 4,6 | 4,75 | kWh/kg (ar) |
| net calorific value q _{P,net} | - | - | 18,7 | MJ/kg (db) |
| net calorific value q _{P,net} | - | - | 5,21 | kWh/kg (db) |
| gross calorific value q _{V,gr} | - | - | 18,6 | MJ/kg (ar) |
| gross calorific value q _{V,gr} | - | - | 5,17 | kWh/kg (ar) |
| nitrogen content | ≤ 0,3 | ≤ 0,5 | <0,05 | % in mass (db) |
| sulphur content | ≤ 0,04 | ≤ 0,04 | 0,007 | % in mass (db) |
| chlorine content | ≤ 0,02 | ≤ 0,02 | 0,006 | % in mass (db) |
| arsenic | ≤ 1 | ≤ 1 | <0,5 | mg/kg (db) |
| cadmium | ≤ 0,5 | ≤ 0,5 | 0,13 | mg/kg (db) |
| chromium | ≤ 10 | ≤ 10 | <1 | mg/kg (db) |
| copper | ≤ 10 | ≤ 10 | <1 | mg/kg (db) |
| lead | ≤ 10 | ≤ 10 | <0,5 | mg/kg (db) |
| mercury | ≤ 0,1 | ≤ 0,1 | <0,075 | mg/kg (db) |
| nickel | ≤ 10 | ≤ 10 | <1 | mg/kg (db) |
| zinc | ≤ 100 | ≤ 100 | 13 | mg/kg (db) |
| shrinking temperature SST | - | - | 1100 | °C |
| deformation temperature DT | ≥ 1200 | ≥ 1100 | 1510 | °C |
| hemisphere temperature HT | - | - | >1550 | °C |
| flow temperature FT | - | - | >1550 | °C |

db... dry basis, ar... as received, * tested on resample BEA2023435-NP1 received 2024-01-11

The test results apply only to the samples investigated. As a rule, they are not the only criteria for assessing the raw material or product in question and its suitability for a specific purpose of application. Test Reports may only be made available to third parties, either free of charge or against payment, if the full wording is given and if the author is expressly named. Unless otherwise indicated, at client's request neither the measurement uncertainty was stated, nor were decision rules agreed. The General Terms and Conditions of BEA Institut für Bioenergie GmbH shall apply as amended.

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|   | director in charge |  |
| |  Dr. Viktoria Horvath | |

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testing methods



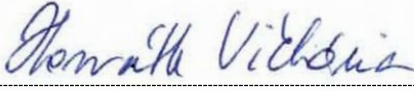

standard

| | |
|--|--|
| sample preparation | ISO 14780:2020 |
| diameter and length | ISO 17829:2015 |
| moisture content | ISO 18134-2:2017 |
| ash content | ISO 18122:2023, performed with proximate analyzer |
| mechanical durability | ISO 17831-1:2015 |
| finer content < 3,15 mm | ISO 18846:2016 |
| net calorific value /gross calorific value | ISO 18125:2017 |
| bulk density | ISO 17828:2015 |
| carbon, hydrogen, nitrogen content | ISO 16948:2015 |
| chlorine, sulphur content | ISO 16994:2016, quantification according to ISO 10304-1:2007 |
| minor elements | ISO 16968:2015, quantification according to ISO 17294-2:2016 |
| ash melting behaviour | ISO 21404:2020, ash preparation at 815°C, oxidizing atmosphere |
| coarse pellets fines 3,15 < CPF < 5,6 mm | ISO 18846:2016: / ISO 5370:2023 non accredited method |
| particle density | ISO 18847:2017 |

remarks

none

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