

# TEST REPORT

## BEA2024044-2

Date of report: 2024-10-04

page 1 of 2

Client: WARMESTON OÜ

Address: Magasini 3-4, 51006 Tartu, ESTONIA

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

Order date: 2024-04-17

Receipt of samples: 2024-10-01

Sample(s): Wood pellets, plant Järvere



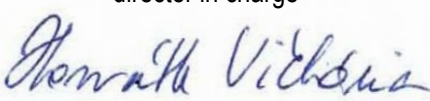

Testing period: 2024-10-01 – 2024-10-03

Sample details: 15 kg pellets in plastic bag class A1, internal sample no.: BEA2024044-3

parameter ENplus®	limit values A1	limit values A2	-3 result class A1	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)	12,2 ± 4,1	mm (ar)
length (40 ≤ L ≤ 45 mm)	≤ 1	≤ 1	0	% in mass (ar)
length (> 45 mm)	0	0	0	piece(s)
share of pellets with a length < 10mm	-	-	21,5	% in mass (ar)
category L < 20%, 20% ≤ M ≤ 30%, S > 30%	-	-	M	-
amount of pellets for length determination	≥ 100	≥ 100	1 648	piece(s)
moisture content	≤ 10,0	≤ 10,0	6,1	% in mass (ar)
ash content	≤ 0,70	≤ 1,20	0,32	% in mass (db)
mechanical durability	≥ 98,0	≥ 97,5	98,9	% in mass (ar)
bulk density	600 ≤ BD ≤ 750	600 ≤ BD ≤ 750	660	kg/m <sup>3</sup> (ar)
particle density	-	-	1,32	g/cm <sup>3</sup> (ar)
coarse fines (3,15 ≤ CPF < 5,6 mm)	-	-	0,6	% in mass (ar)
fines content (< 3,15 mm), bulk	≤ 1	≤ 1	-	% in mass (ar)
fines content (< 3,15 mm), bags	≤ 0,5	≤ 0,5	0,1	% in mass (ar)
net calorific value q <sub>P,net</sub>	≥ 16,5	≥ 16,5	17,7	MJ/kg (ar)
net calorific value q <sub>P,net</sub>	≥ 4,6	≥ 4,6	4,91	kWh/kg (ar)
net calorific value q <sub>P,net</sub>	-	-	19,0	MJ/kg (db)
net calorific value q <sub>P,net</sub>	-	-	5,28	kWh/kg (db)
gross calorific value q <sub>V,gr</sub>	-	-	19,2	MJ/kg (ar)
gross calorific value q <sub>V,gr</sub>	-	-	5,33	kWh/kg (ar)
nitrogen content	≤ 0,3	≤ 0,5	0,06	% in mass (db)
sulphur content	≤ 0,04	≤ 0,04	0,006	% in mass (db)
chlorine content	≤ 0,02	≤ 0,02	<0,005	% in mass (db)
arsenic	≤ 1	≤ 1	<0,5	mg/kg (db)
cadmium	≤ 0,5	≤ 0,5	<0,1	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	9,4	mg/kg (db)
shrinking temperature SST	-	-	1070	°C
deformation temperature DT	≥ 1200	≥ 1100	1470	°C
hemisphere temperature HT	-	-	>1550	°C
flow temperature FT	-	-	>1550	°C

db... dry basis, ar... as received

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.

 	<p>director in charge</p> 	
	<p>Dr. Viktoria Horvath</p>	



BEA Institut für Bioenergie GMBH - Accr. inspection body acc. to EN ISO/IEC 17020 | Accr. testing laboratory acc. to EN ISO/IEC 17025

1150 Vienna | Avedikstrasse 21 | AUSTRIA | P: +43 1 89093 91 | F: +43 1 89093 92 | www.bioenergy.institute | Email: office@bioenergy.co.at  
 Legal form: GmbH | Headquarter: Vienna | Comm.reg.No.: FN 331066m | Jurisdiction: Vienna | UID/VAT: ATU 65124117  
 IBAN: AT47 1200 0529 4901 1803 | SWIFT: BKAUATWW | Bank: Bank Austria AG | EORI: ATEOS1000004531 | CEO: DI Dr. Martin Englisch

# TEST REPORT

## BEA2024044-2

Date of report: 2024-10-04

page 2 of 2

Client: WARMESTON OÜ

Address: Magasini 3-4, 51006 Tartu, ESTONIA

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

Order date: 2024-04-17

Receipt of samples: 2024-10-01

Sample(s): Wood pellets, plant Järvere

Testing period: 2024-10-01 – 2024-10-03

Sample details: 15 kg pellets in plastic bag class A1, internal sample no.: BEA2024044-3

### testing methods



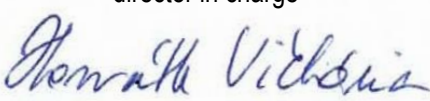

### standard

sample preparation	ISO 14780:2020
diameter and length	ISO 17829:2015
moisture content	ISO 18134-2:2017
ash content	ISO 18122:2022, performed with proximate analyzer
mechanical durability	ISO 17831-1:2015
finer content < 3,15 mm	ISO 5370:2023 (method submitted for accreditation)
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 17294-2:2023
ash melting behaviour	ISO 21404:2020, ash preparation at 815°C, oxidizing atmosphere
coarse pellets fines 3,15 < CPF < 5,6 mm	ISO 5370:2023 (method submitted for accreditation)
particle density	ISO 18847:2017

### remarks

none

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.

 	director in charge  Dr. Viktoria Horvath	
---	--	---



BEA Institut für Bioenergie GMBH - Accr. inspection body acc. to EN ISO/IEC 17020 | Accr. testing laboratory acc. to EN ISO/IEC 17025

1150 Vienna | Avedikstrasse 21 | AUSTRIA | P: +43 1 89093 91 | F: +43 1 89093 92 | www.bioenergy.institute | Email: office@bioenergy.co.at  
Legal form: GmbH | Headquarter: Vienna | Comm.reg.No.: FN 331066m | Jurisdiction: Vienna | UID/VAT: ATU 65124117  
IBAN: AT47 1200 0529 4901 1803 | SWIFT: BKAUATWW | Bank: Bank Austria AG | EORI: ATEOS1000004531 | CEO: DI Dr. Martin Englisch