TEST REPORT
BEA2024044-2

Institut für Bioenergie

Date of report: 2024-10-04

Client: WARMESTON OÜ

Address: Magasini 3-4, 51006 Tartu, ESTONIA

Order: Fuel testing according EN*plus*® certification program of wood pellets EN*plus*® 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

BEA2024044 parameter EN*plus* ®	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/m³ (ar)
particle density	-	-	**1,32**	g/cm³ (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 $q_{P,net}$	≥ 16,5	≥ 16,5	**17,7**	MJ/kg (ar)
net calorific value $q_{P,net}$	≥ 4,6	≥ 4,6	**4,91**	kWh/kg (ar)
net calorific value $q_{P,net}$	-	-	**19,0**	MJ/kg (db)
net calorific value $q_{P,net}$	-	-	**5,28**	kWh/kg (db)
gross calorific value $q_{V,gr}$	-	-	**19,2**	MJ/kg (ar)
gross calorific value $q_{V,gr}$	-	-	**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

Akkreditierung Austria A 0388 ISO/IEC 17025 T

ilac

director in charge

Dr. Viktoria Horvath

Institut für Bioenergie GmbH Ingenieurbüro für technische Chemie

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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 18122:2022, performed with proximate analyzer
mechanical durability	ISO 17831-1:2015
fines 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

director in charge

Dr. Viktoria Horvath