



AB 088

**TESTING LABORATORY OF WOOD, WOOD-BASED MATERIALS,
PACKAGING, FURNITURE AND CONSTRUCTIONS**

SOLID BIOFUELS TESTING SECTION

Poznań, 14.07.2021



TEST REPORT
No. 2242/2021/S.M

Subject of the order Quality testing of wood pellets – Graf Sp. z o.o.

Order No A-2242-BBI/2021

Name and address of the customer Control Union Poland Sp. z o.o.
Al. Wojska Polskiego 45, 65-764 Zielona Góra

Name and address of the producer Graf Sp. z o.o.
ul. Połaniecka 19, 22-100 Chełm

ENplus® ID / Sample No. A1-GRAF-1, 22.06.2021

Performance date 25.06 – 14.07.2021

Operators Monika Kubińska, M.Sc.
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Małgorzata Walkowiak, M.Sc.Eng.

Compiled by

Authorized by

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Małgorzata Walkowiak, M.Sc.Eng.

Wojciech Cichy, PhD.Eng.

A qualified electronic signature has been affixed to this document, which according to the law is equivalent to written form.

1. IDENTIFICATION (DESCRIPTION OF TEST SAMPLE)

The object of the assessment was the sample of solid biofuels in the form of pellets with diameter of 6 mm, described by the customer as pellets produced from chemically untreated by-products and residues from the wood processing industry.

Sample number: A1-GRAF-1, 22.06.2021

Identification number: A-2242-BBI/2021

2. DELIVERY DATE OF TESTED SUBJECTS

The sample was taken by the customer and delivered to the laboratory on 25th June 2021.

3. TEST METHODS

- EN ISO 14780:2017-07 Solid biofuels – Sample preparation (Method 16M)
- EN ISO 18134-2:2015-11 Solid biofuels – Determination of moisture content – Oven dry method – Part 2: Total moisture – Simplified method (Method 1M)
- EN ISO 18134-3:2015-11 Solid biofuels – Determination of moisture content – Oven dry method – Part 3: Moisture in general analysis sample (Method 1M)
- EN ISO 18122:2016-01 Solid biofuels – Determination of ash content (Method 2M)
- EN ISO 17828:2016-02 Solid biofuels – Determination of bulk density (Method 4M)
- EN ISO 18125:2017-07 Solid biofuels – Determination of calorific value (Method 6M)
- EN ISO 16948:2015-07 Solid biofuels – Determination of total content of carbon, hydrogen and nitrogen (Method 7M)
- EN ISO 16994:2015-06 Solid biofuels – Determination of total content of sulfur and chlorine (Method 8M)
- EN ISO 18846:2016 Solid biofuels – Determination of fines content in quantities of pellets (Method 9M)
- EN ISO 17831-1:2016-02 Solid biofuels – Determination of mechanical durability of pellets and briquettes – Part 1: Pellets (Method 10M)
- EN ISO 17829:2016-02 Solid biofuels – Determination of length and diameter of pellets (Method 11M)
- EN ISO 16968:2015-07 Solid biofuels – Determination of minor elements (Method 13M)
- CEN/TS 15370-1:2006 Solid biofuels – Determination of ash melting behaviour – Part 1: Characteristic temperatures method (14M Method)

4. EQUIPMENT OF THE TEST STANDS (elementary)

No.	Name	Type	Producer	Lab.No.
1.	Analytical balance	LE26P-OCE	SARTORIUS	M7/2
2.	Analytical balance	CPA225D-OCE	SARTORIUS	M8/57
3.	Laboratory drier	Redline RF115	BINDER	M1/47
4.	Calorimeter	C6000	IKA	M6/83
5.	Elemental analyzer	Flash EA 1112	THERMO ELECTRON CORPORATION	M7/8
6.	Furnace	FCF 7SM/pl	CZYLOK	M2/4
7.	Ionic chromatograph	ICS-1100	THERMO SCIENTIFIC	M8/54
8.	Laboratory balance	PS 6000/C/2	RADWAG	M3/50
9.	Pellets durability tester	TUMBLER 3000	BIOENERGY ANLAGENPLANUNG	M10/42
10.	Sieve 3.15 mm	-	RETSCH	M9/34
11.	Caliper	SD-10	BAKER	M3/14
12.	Microwave oven	MARS 6	CEM CORPORATION	M13/80
13.	Atomic Absorption Spectrometer	280FS AA	AGILENT TECHNOLOGIES	M13/66
14.	Atomic Absorption Spectrometer	280Ze AA	AGILENT TECHNOLOGIES	M13/67
15.	System for determination of characteristic temperatures of ash melting behaviour	PR-37/1600	Radio Research Institute	M14/88
16.	Sieve 0.075 mm	-	ATEST	M14/91

5. TESTS RESULTS

Tests results are presented in record No 1/2242/2021.

6. DECLARATION

The test results refer only to the sample and do not necessarily mean that similar products or seemingly identical have the same properties.

The Test Report cannot be copied in parts, only in its entirety.

Record No. 1/2242/2021

Sample name: Wood pellets
Name of Producer: Graf Sp. z o.o.
 ul. Połaniecka 19, 22-100 Chełm
ENplus® ID/sample No.: A1-GRAF-1, 22.06.2021

Origin:		1. Woody biomass				
Traded form:		Wood pellets				
Classification of origin according to EN ISO 17225-1:2014		1.2.1 Chemically untreated by-products and residues from the wood processing industry				
Parameter	Unit	Value	Uncertainty [±] ¹	Threshold value acc. to ENplus® Handbook, Part 3 version 3.0		
				A1	A2	B
Diameter	mm	6.1	0.1	6 ± 1 or 8 ± 1		
Length	mm	20.6	5.3	3.15 < L ≤ 40		
Moisture	w-% _{ar}	2.60	0.11	≤ 10		
Ash	w-% _d	0.32	0.03	≤ 0.7	≤ 1.2	≤ 2.0
Mechanical durability	w-% _{ar}	98.51	0.05	≥ 98.0	≥ 97.5	
Fines (< 3.15 mm)	w-% _{ar}	0.05	0.01	≤ 1.0 (< 0.5%) ⁴		
Gross calorific value	MJ/kg _d	20.63	0.06	-		
Net calorific value	MJ/kg _{ar}	18.60	0.07	≥ 16.5		
	kWh/kg _{ar}	5.17	0.02	≥ 4.6		
Bulk density	kg/m ³ _{ar}	737	12	600 ≤ BD ≤ 750		
Carbon	w-% _d	50.82	0.85	-		
Hydrogen	w-% _d	6.80	0.15	-		
Nitrogen	w-% _d	< 0.08	-	≤ 0.3	≤ 0.5	≤ 1.0
Sulfur	w-% _d	0.0088	0.0004	≤ 0.04	≤ 0.05	
Chlorine	w-% _d	0.018	0.002	≤ 0.02		≤ 0.03

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				A1	A2	B
Ash shrinkage temperature SST ^{2. 3}	°C	1330	38	Should be stated		
Ash deformation temperature DT ^{2. 3}	°C	1470	51	≥ 1200	≥ 1100	
Ash hemisphere temperature HT ^{2. 3}	°C	1470	20	Should be stated		
Ash flow temperature FT ^{2. 3}	°C	1480	13	Should be stated		
Arsenic	mg/kg _d	< 0.1	-	≤ 1		
Cadmium	mg/kg _d	0.34	0.01	≤ 0.5		
Chromium	mg/kg _d	< 0.5	-	≤ 10		
Copper	mg/kg _d	0.69	0.01	≤ 10		
Lead	mg/kg _d	< 0.5	-	≤ 10		
Mercury	mg/kg _d	< 0.05	-	≤ 0.1		
Nickel	mg/kg _d	< 0.5	-	≤ 10		
Zinc	mg/kg _d	19.51	0.16	≤ 100		

_d dry _{ar} as received

1. the expanded uncertainty was determined for coverage factor $k = 2$ and 95% confidence level

2. characteristic ash melting temperature determined in an oxidizing atmosphere

3. ash received at 815°C

4. at factory gate, at the end of production or when loading truck for deliveries to end-users (< 0.5% when filling pellet bags or sealed big bags)

End of report