PROFTECH
SPÓŁKA Z O.O.

PCA
POLSKIE CENTRUM AKREDYTACJI
BADANIA
AB 994

Research laboratory accredited by PCA, Nr AB 994

Scopes of accreditation:

- *concentration and mass measurements of flow of fine particles*
- *measurements of concentration and mass flow of SO_2, NO_x, CO*
- *concentration measurements of CO_2, O_2*
- *concentration and mass flow measurements of OWO*
- *sampling for mass concentration determination of PCDD/PDF and dioxin type PCB*
- *sampling for concentration determination of (As; Cd; Cr; Co; Cu; Mn; Ni; Pb; Sb; Tl; V)*
- *sampling for concentration determination of Hg*
- *sampling and determination of concentration and mass flow of HCl*
- *sampling and determination of concentration and mass flow of HF*
- *sampling for determining the concentration of individual gaseous organic compounds*
- *calibration of Automated Monitoring systems,*
- *QAL2 procedure*
- *annual performance test of Automated Monitoring Systems, AST procedure*
- *noise measurement from machinery, installations and industrial plants*

Chorzów, November 27th 2025
Our ref. No.: PW/66/11/25

Report No PW/66/11/25

on concentration measurements of heavy metals (As; Cd; Cr; Co; Cu; Mn; Ni; Pb; Sb; Tl; V) emitted into environment from flue gas channel located at UAB KAUNO KOGENERACINĖ JĖGAINĖ, Jėgainės g. 6, Biruliškių k., LT-54469 Kauno raj., Lithuania.

Client name and address: **UAB KAUNO KOGENERACINĖ JĖGAINĖ,**
Jėgainės g. 6, Biruliškių k.,
LT-54469 Kauno raj

Developed by: mgr Grzegorz Bortel

Calculation and data transfer checked by: inż. Dariusz Guja

Verified by: Company manager - inż. Dariusz Guja
Prezes Z...
Dariusz ...

Copy number: 1/2

ul. Kurta Aldera 44
41-506 Chorzów
tel/fax: 0 32 247 37 24
www.proftech.com.pl
e-mail: proftech@proftech.com.pl
NIP: 627 252 46 31
KRS: 0000773369
bank account : PKO BANK POLSKI S.A. O/Katowice : IBAN PL62 1440 1172 0000 0000 0353 4332

List of contents:

1. PURPOSE AND SCOPE OF THE REPORT

Purpose of executed measurements was to determine the concentration of heavy metals (As; Cd; Cr; Co; Cu; Mn; Ni; Pb; Sb; Tl; V) emitted to environment from flue gas channel located at UAB KAUNO KOGENERACINĖ JĖGAINĖ, Jėgainės g. 6, Biruliškių k., LT-54469 Kauno raj., Lithuania

Measurements range:

- Heavy metals (As; Cd; Cr; Co; Cu; Mn; Ni; Pb; Sb; Tl; V) concentration,

The measurements were carried out in accordance with the sampling plan and the described sampling methods.
Operating parameters of the technological installation was obtained from the customer's representative.

2. BASIS OF MEASUREMENTS EXECUTION

The measurements were taken according to the contract No 2025-KKJ-63 dated April 25th 2025.

3. MEASUREMENT TEAM

The measurements taken on October 17th 2025 were executed by the following team:

- Grzegorz Bortel — specialist - measurement team leader,
- Karol Sodo — specialist,
- Przemysław Zubel — specialist.

4. MEASUREMENT RESULTS SUMMARY

Below are presented measurement results summary, full measurement results are presented in chapter No 6, at page 8 and 9

Stationary emission source	Concentration of the substance in the gas in the reference conditions O2 ref. 11%	Cd*+Tl*	mg/m3 ref.	**0,007**
		Sb*+As*+Cr*+Co*+Mn*+Cu*+Ni*+Pb*+V*	mg/m3 ref.	**0,037**
	Emission limits	Cd+Tl	mg/m3 ref.	**0,02**
		Sb+As+Cr+Co+Mn+Cu+Ni+Pb+V	mg/m3 ref.	**0,3**
	Transgerssion	Cd+Tl	mg/m3 ref.	-
		Hg	mg/m3 ref.	-
		Sb+As+Cr+Co+Mn+Cu+Ni+Pb+V	mg/m3 ref.	-

*- the results obtained from the subcontractor (accredited)

5. DESCRIPTION OF THE MEASUREMENT METHOD

Measurement of the gas volumetric flow

The flow rate and density of flue gases were determined according to Polish Standard PN-Z-04030-7:1994 „Testing of particulate content. The gravimetric method measurement of concentration and particulate mass flow in flue gases" / ISO Standard PN-EN ISO 16911-1:2013 „Stationary source emissions - Manual and automatic determination of velocity and volume flow rate in ducts - Part 1: Manual reference method". Gravimetric dust monitor type MEGASYSTEM X-1 APIS and type "S" Pitot tube were used for the measurements. Measurement is accredited.

Accreditation range: differential pressure: > 10 Pa

Measurement O_2 content

The concentration of O_2 was determined using gas analyzer HORIBA PG-350E-EU equipped with testing probe 1500 mm long. The measurements were taken according to the procedure described in measurement unit as well as to EN Standard PN-EN 14789:2017 "Stationary source emissions - Determination of volume concentration of oxygen O_2 - Reference method - Paramagnetism". Measurement is accredited.

Accreditation range: O_2 content: 1,5-21%

Measurement CO_2 content

The concentration of CO_2 was determined using gas analyzer HORIBA PG-350E-EU equipped with testing probe 1500 mm long. The measurements were taken according to the procedure described in measurement unit as well as to ISO Standard ISO 10396:2007 "Stationary Source Emissions - Sampling For The Automated Determination Of Gas Concentrations ". Measurement is accredited.

Accreditation range: CO_2 content: 0,1-20%

Measurement of heavy metals content

Sampling for the determination of concentrations and emissions of heavy metals (Cd, Tl, Sb , As, Cr, Co, Cu , Mn , Ni , Pb, V) was performed according to PN -EN 14385 : 2005. Analysis of metals (Cd , Tl , Sb , As, Cr, Co, Cu , Mn , Ni , Pb, V) was performed in the laboratory of ŚCOP Sp. z o.o. in Czeladź , accredited in this regard by the Polish Centre of Accreditation No. AB 719

6. MEASUREMENT RESULTS

Test Report No PW/66/11/25

1) Plant or unit name[1)]: **Combined Heat and Power Plant**
2) Flue gases cleaning unit[1)]: **Bag filters, activate carbon, hydrated lime, scrubber**
3) Emission source load during measurements[1)]: **Boiler load ~87,4 MW – 104,8%**
4) Fuel type or material mass flow in process[1)]: **57% municipal waste, 43% industrial waste**
5) Location of sampling and measurements: **In duct, after flue gases cleaning unit**

Measurement reference number			17-10-01					
Date of measurement			17.10.2025					
Measurement time range			11:15-12:16	12:22-13:24	13:28-14:30			
Scope of test		Unit	Results			Average	Uncertainty +/-	Method
Meteorological conditions	Atmospheric pressure	hPa	1002,2	1002,6	1002,6	**1002,5**	0,9	PN-Z-04030-7:1994 PN-EN ISO 16911-1:2013
	Air temperature	oC	10	10	9	**10**		
Measurement plane	Diameter	m	2,33					
	Area	m2	4,2617					
Stack gas parameters	Temperature	oC	53,9	53,0	53,0	**53,3**	1,1	
	Static pressure	Pa	161,4	163,0	151,6	**158,7**	2,2	
	Dynamic pressure	Pa	129,2	121,3	125,1	**125,2**	1,5	
	Gas moistness grade X	kg/kg	0,127	0,126	0,125	**0,126**	0,0032	PN-EN 14790:2017
	Average velocity	m/s	12,8	12,4	12,6	**12,6**	0,4	PN-Z-04030-7:1994 PN-EN ISO 16911-1:2013
	Chemical composition O2	%	9,00	9,10	9,00	**9,03**	0,24	PN-EN 14789:2017
	Chemical composition CO2	%	10,10	10,10	10,20	**10,13**	0,41	ISO 10396:2007
	Wet gas density during testing	kg/m3	1,030	1,034	1,035	**1,033**		PN-Z-04030-7:1994 PN-EN ISO 16911-1:2013
	Gas density in normal conditions	kg/m3 N	1,245	1,246	1,247	**1,246**		
	Gas density in standard conditions	kg/m3 U	1,338	1,339	1,339	**1,339**		
Concentration of the substance in the gas in reference conditions O2 ref. 11%	As gaseus*	mg/m^3_{ref}	< 0,005225	< 0,005310	< 0,005679	< **0,005405**	0,001155	PN-EN 14385:2005
	As dust*	mg/m^3_{ref}	< 0,000488	< 0,000559	< 0,000544	< **0,000530**	0,000113	PN-EN 14385:2005
	As*	mg/m^3_{ref}	< 0,005713	< 0,005869	< 0,006223	< **0,005935**	0,001161	PN-EN 14385:2005
	Sb gaseus*	mg/m^3_{ref}	< 0,005225	< 0,005310	< 0,005679	< **0,005405**	0,001155	PN-EN 14385:2005
	Sb dust*	mg/m^3_{ref}	< 0,000488	< 0,000559	< 0,000544	< **0,000530**	0,000113	PN-EN 14385:2005
	Sb*	mg/m^3_{ref}	< 0,005713	< 0,005869	< 0,006223	< **0,005935**	0,001161	PN-EN 14385:2005
	Cd gaseus*	mg/m^3_{ref}	< 0,001045	< 0,001062	< 0,001136	< **0,001081**	0,000135	PN-EN 14385:2005
	Cd dust*	mg/m^3_{ref}	< 0,000098	< 0,000112	< 0,000109	< **0,000106**	0,000013	PN-EN 14385:2005
	Cd*	mg/m^3_{ref}	< 0,001143	< 0,001174	< 0,001245	< **0,001187**	0,000136	PN-EN 14385:2005
	Co gaseus*	mg/m^3_{ref}	< 0,002612	< 0,002655	< 0,002839	< **0,002702**	0,000383	PN-EN 14385:2005
	Co dust*	mg/m^3_{ref}	< 0,000244	< 0,000280	< 0,000272	< **0,000265**	0,000037	PN-EN 14385:2005
	Co*	mg/m^3_{ref}	< 0,002856	< 0,002935	< 0,003111	< **0,002967**	0,000385	PN-EN 14385:2005
	Mn gaseus*	mg/m^3_{ref}	0,002665	0,001274	< 0,000795	**0,001578**	0,000226	PN-EN 14385:2005
	Mn dust*	mg/m^3_{ref}	0,000112	0,000062	0,000093	**0,000089**	0,000011	PN-EN 14385:2005
	Mn*	mg/m^3_{ref}	0,002777	0,001336	0,000888	**0,001667**	0,000226	PN-EN 14385:2005
	Cu gaseus*	mg/m^3_{ref}	< 0,003187	< 0,003027	< 0,002839	< **0,003018**	0,000411	PN-EN 14385:2005
	Cu dust*	mg/m^3_{ref}	< 0,000244	0,000280	< 0,000272	**0,000265**	0,000037	PN-EN 14385:2005
	Cu*	mg/m^3_{ref}	< 0,003431	0,003307	< 0,003111	**0,003283**	0,000413	PN-EN 14385:2005
	Ni gaseus*	mg/m^3_{ref}	< 0,002612	< 0,002655	< 0,002839	< **0,002702**	0,000383	PN-EN 14385:2005
	Ni dust*	mg/m^3_{ref}	< 0,000244	< 0,000280	< 0,000272	< **0,000265**	0,000037	PN-EN 14385:2005
	Ni*	mg/m^3_{ref}	< 0,002856	< 0,002935	< 0,003111	< **0,002967**	0,000385	PN-EN 14385:2005
	Pb gaseus*	mg/m^3_{ref}	< 0,002612	< 0,002655	< 0,002839	< **0,002702**	0,000628	PN-EN 14385:2005
	Pb dust*	mg/m^3_{ref}	0,000244	0,000280	< 0,000974	**0,000499**	0,000116	PN-EN 14385:2005
	Pb*	mg/m^3_{ref}	0,002856	0,002935	< 0,003813	**0,003201**	0,000639	PN-EN 14385:2005

Test Report No PW/66/11/25

	V gaseus*	mg/m^3_{ref}	< 0,005225	< 0,005310	< 0,005679	< **0,005405**	0,001155	PN-EN 14385:2005
	V dust*	mg/m^3_{ref}	< 0,000488	< 0,000559	< 0,000544	< **0,000530**	0,000113	PN-EN 14385:2005
	V*	mg/m^3_{ref}	< 0,005713	< 0,005869	< 0,006223	< **0,005935**	0,001161	PN-EN 14385:2005
	Cr gaseus*	mg/m^3_{ref}	< 0,004180	< 0,004248	< 0,004543	< **0,004324**	0,000874	PN-EN 14385:2005
	Cr dust*	mg/m^3_{ref}	< 0,000390	< 0,000447	< 0,000435	< **0,000424**	0,000085	PN-EN 14385:2005
	Cr*	mg/m^3_{ref}	< 0,004570	< 0,004695	< 0,004978	< **0,004748**	0,000878	PN-EN 14385:2005
	Tl gaseus*	mg/m^3_{ref}	< 0,005225	< 0,005310	< 0,005679	< **0,005405**	0,001672	PN-EN 14385:2005
	Tl dust*	mg/m^3_{ref}	< 0,000488	< 0,000559	< 0,000544	< **0,000530**	0,000164	PN-EN 14385:2005
	Tl*	mg/m^3_{ref}	< 0,005713	< 0,005869	< 0,006223	< **0,005935**	0,001680	PN-EN 14385:2005
Gas volume flow	measurement conditions	m^3/h	196839	190396	193157	**193464**	5458	PN-Z-04030-7:1994 PN-EN ISO 16911-1:2013
	normal conditions	m^3_n/h	162897	158059	160347	**160435**	4527	
	standard conditions	m^3_u/h	134469	130671	132735	**132625**	3742	
	reference conditions O2 ref. 11%	m^3_{ref}/h	161362	155499	159282	**158714**	5709	
Emission limits	Cd*+Tl*	mg/m^3_{ref}	0,02					
	Sb*+As*+Cr*+Co*+Mn*+Cu*+Ni*+Pb*+V*	mg/m^3_{ref}	0,3					
Concentration of the substance in the gas in reference conditions O2 ref. 11%	Cd*+Tl*	mg/m^3_{ref}	0,007					
	Sb*+As*+Cr*+Co*+Mn*+Cu*+Ni*+Pb*+V*	mg/m^3_{ref}	0,037					

*- the results obtained from the subcontractor (accredited)
[1)]-information obtained from the client

The notation "< or > y" where y=the value of the mesurand corresponding to the lower/upper limit of the measurement range of the method) means - a test result/result below or above the measurement range of the method. The lower/upper limit of the method's measurement range is assumed for the calculation, respectively. The expanded uncertainty shown is the measurement uncertainty for the value of the lower/upper limit of the measurement range of the method. In the case of converted test results/results obtained from a third-party provider of laboratory services, the measurement range limit of that provider's method is assumed for the calculation.

The measurement range limit for: Cr<0,80 ug/próbkę / As<1,00 ug/próbkę / Cd<0,20 ug/próbkę / Co<0,50 ug/próbkę / Mn<0,10 ug/próbkę / Cu<0,50 ug/próbkę / Ni<0,50 ug/próbkę / Pb<0,50 ug/próbkę / Tl<1,00 ug/próbkę / V<0,10 ug/próbkę / Sb<1,00 ug/próbkę

Notes:

Normal conditions designate the temperature of 273 K and pressure of 101,3kPa, defining normal cubic meter m^3N. The standard conditions designate the temperature of 273K, pressure of 101,3 kPa and dry gases (steam contents less than 5 g/kg of flue gas), defining standard cubic meter, m3U

The specified expanded uncertainty comes from standard uncertainty multiplied by expansion coefficient k = 2, which provides 95% level of confidence for normal distribution. Uncertainty takes into account the sampling and analysis.

Registry of samples delivered to the laboratory: P/117/10/25 - P/126/10/25

Date of delivery to the laboratory: 17.10.2025

Date of analysis: 17.10.2025 - 18.11.2025

Field blanks:

ID/ number of sample	Type of substance	The criterion of the blank [mg/m^3] 11%O_2	The value of the blank [mg/m^3] 11% O_2	Result [+/-]
P/123/10/25	Cd+Tl	0,002	p.o.	+
P/123/10/25	Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V	0,03	p.o.	+

p.o. – below the limit of quantification.

Test Report No PW/66/11/25

Work parameters of measurement system:

Heavy metals (PN-EN 14385:2005)

Sampling plane:	2 measurement axis
Sampling:	isokinetic [x]
	nonisokinetic [ ]
Isokinetic ratio:	107,0 % / 96,9 % / 97,3 %
Sampling time:	60,1 min / 60,1 min / 60,1 min
Sampled volume:	0,137 / 0,136 / 0,127 m^3
Filter parameters:	FT-50: Ø 0,50 mm, efficiency: 99,990 %, quartz (QMA)
Impingers:	impingers set No. 1 (absorption efficiency 98,5 %)
Absorption solution:	HNO_3/H_2O_2

H_2O (PN-EN 14790:2017)

Sampling plane:	2 measurement axis
Sampling equipment:	titanium sampling line
	heated probe 1,5 m
	sampling pump: PT-O1
Cartridge No:	H_2O content set No 2
Sampling No:	1
Sampling time:	~60 min
Sampling speed:	~2,3 l/min
H_2O maas:	~18,3 g
absrobtion efficiency:	98,5 %

Test Report No PW/66/11/25

O_2 paramagnetic (PN-EN 14789:2017):

Range :	0 – 5 %	[ ]	
	0 – 10 %	[ ]	
	0 – 25 %	[X]	
Calibration gas:	O_2 – 8,001%	[ ]	R/07/W
	O_2 – 18,85%	[X]	R/12/W
	N_2 – 99,99%	[X]	R/17/
Sampling train:	2 measurement axis		
Sampling time/ average time:	180 min / 1 min		

O_2 concentration measurement (paramagnetic):		HORIBA PG-350E-EU			
check operation		unit	result	criterion	result +/-
„0" after adjustment, without sampling train		%	0,03	± 0,1 [%]*	+
„0" after adjustment, with sampling train	before measurement	%	0,05	± 0,2 [%]**	+
	after measurement	%	0,06	± 0,2 [%]**	+
„Span" after adjustment with sampling train /standard 18,85% **R/12/W** analyzer range 25%/	before measurement	%	18,80	± 0,2 [%]**	+
	after measurement	%	18,86	± 0,2 [%]**	+
	before measurement time T90	%	18,1	> 18,02 [%]	-----
		sec.	17	< 200 sec.	+

*2 x repeatability „0"; **2% measurement range

Test Report No PW/66/11/25

7. MEASUREMENT DEVICES

Name of measuring device		X1- Apis
Type of measuring device		Isokinetic sampler S/N 0185
Certificate	Calibration No	94/54/LA/P/2023 G-73/23-46/23 65/1/T/23
Issued by		ZAP BESTWINKA LABOSERWIS SP. Z O.O. KATOWICE PLUM SP. Z O.O. KLEOSIN
Date of issue the certificate of calibration		27.02.2023 23.02.2023 02.03.2023
Expiration date of the certificate of calibration		-

Name of measuring device		HORIBA
Type of measuring device		PG-350E-EU
Certificate	Calibration No	106/1/AW/25
Issued by		LABOSERWIS SP. Z O.O. KATOWICE
Date of issue the certificate of calibration		10.04.2025
Expiration date of the certificate of calibration		-

Name of measuring device		Sampler
Type of measuring device		PT-01
Certificate	Calibration No	G-354/22-208/22 1189/436/LA/T/2022 786/281/LA/P/2022
Issued by		ZAP BESTWINKA PLUM SP. Z O.O. KLEOSIN
Date of issue the certificate of calibration		30.08.2022 06.09.2022 09.09.2022
Expiration date of the certificate of calibration		-

Test Report No PW/66/11/25

8. CERTIFICATE OF ACCREDITATION

POLSKIE CENTRUM AKREDYTACJI
POLISH CENTRE FOR ACCREDITATION

Sygnatariusz EA MLA
EA MLA Signatory

CERTYFIKAT AKREDYTACJI
LABORATORIUM BADAWCZEGO
ACCREDITATION CERTIFICATE OF TESTING LABORATORY
Nr AB 994

Potwierdza się, że: / This is to confirm that:

„PROFTECH" Sp. z o.o.
ul. Kurta Aldera 44, 41-506 Chorzów

spełnia wymagania normy PN-EN ISO/IEC 17025:2018-02
meets requirements of the PN-EN ISO/IEC 17025:2018-02 standard

Akredytowana działalność jest określona w Zakresie Akredytacji Nr AB 994
Accredited activity is defined in the Scope of Accreditation No AB 994

Akredytacja pozostaje w mocy pod warunkiem przestrzegania wymagań jednostki akredytującej określonych w kontrakcie Nr AB 994
This accreditation remains in force provided the Laboratory observes the requirements of Accreditation Body defined in the Contract No AB 994

Akredytacji udzielono dnia 30.01.2009 r.
Accreditation was granted on 30.01.2009

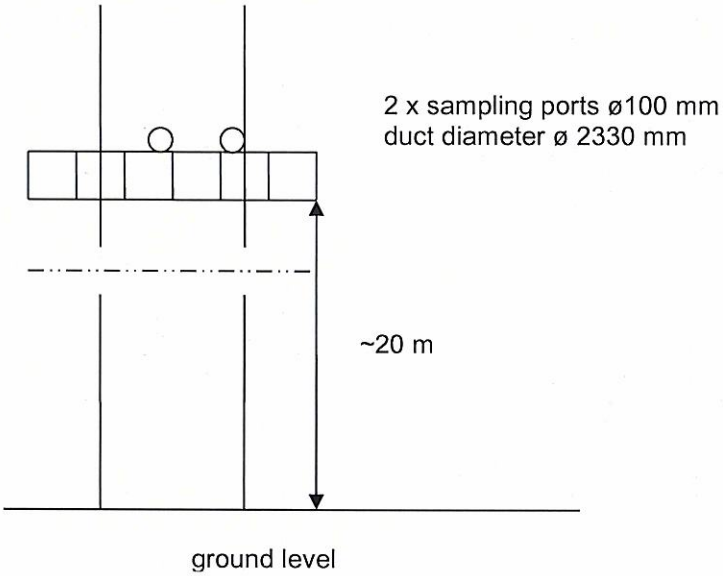
DYREKTOR
POLSKIEGO CENTRUM AKREDYTACJI
LUCYNA OLBORSKA

Warszawa, dnia 9 grudnia 2019 roku

Scope of accreditation issued 08.01.2025, No 24

Test Report No PW/66/11/25

9. MEASUREMENT PLANE SCHEME



Approved by

DYREKTOR

.....

Name and Signature

Inż. Dariusz Gluja

END OF REPORT