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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 SO₂, NO_x, CO
- concentration measurements of CO₂, O₂
- 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, July 14th 2026
Our ref. No.: PW/42/07/26

Report No PW/42/07/26

on concentration measurements of heavy metals (As; Cd; Cr; Co; Cu; Mn; Ni; Pb; Sb; Tl; V) emitted into environment from stationary emission source No. 001 (waste incineration boiler stack), located at UAB Vilniaus Kogeneracinė Jėgainė, Jočionių g. 13, 02300 Vilnius

Client name and address:

UAB Vilniaus Kogeneracinė Jėgainė

Paneriškių g. 25,

LT-02300 Vilnius

Developed by:

mgr Grzegorz Bortel

Calculation and data transfer checked by:

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Verified by:

Company manager - inż. Dariusz Guja

Copy number: 1./2

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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 stationary emission source No. 001 (waste incineration boiler stack), located at UAB Vilniaus Kogeneracinė Jėgainė, Jočionių g. 13, 02300 Vilnius

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 2023-VKJ-328 dated March 27th 2024.

3. MEASUREMENT TEAM

The measurements taken on June 10th 2026 were executed by the following team:

- Grzegorz Bortel specialist - measurement team leader,
- Karol Sodo specialist,

Test Report No PW/42/07/26**4. MEASUREMENT RESULTS SUMMARY**

Below are presented measurement results summary, full measurement results are presented in chapter No 6, at page 7 and 8

Stationary emission source No. 001 (waste incineration boiler stack)	Concentration of the substance in the gas in the reference conditions O ₂ ref. 11%	Cd*+Tl*	mg/m ³ ref.	0,006
		Sb*+As*+Cr*+Co*+Mn*+Cu*+Ni*+Pb*+V*	mg/m ³ ref.	0,068
	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
	Transgression	Cd+Tl	mg/m ³ ref.	-
		Sb+As+Cr+Co+Mn+Cu+Ni+Pb+V	mg/m ³ ref.	-

*- the results obtained from the subcontractor (accredited)

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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” and/or PN-EN 13284-1:2018 “Stationary source emissions – Determination of low range mass concentration of dust – Part 1: Manual gravimetric 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: > 5 Pa

Measurement O₂ content

The concentration of O₂ was determined using gas analyzer HORIBA PG-350E-EU equipped with testing probes 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 O₂ - Reference method - Paramagnetism". Measurement is accredited.

Accreditation range: O₂ content: 1,5-21%

Measurement CO₂ content

The concentration of CO₂ was determined using gas analyzer HORIBA PG-350E-EU equipped with testing probes 1500 mm long. The measurements were taken according to the procedure described in measurement unit as well as ISO Standard ISO 12039:2019 “Stationary source emissions — Determination of the mass concentration of carbon monoxide, carbon dioxide and oxygen in flue gas — Performance characteristics of automated measuring systems”.

Accreditation range: CO₂ 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 : 2025. Analysis of metals (Cd, Tl, Sb, As, Cr, Co, Cu, Mn, Ni, Pb, V) was performed in the laboratory of ALS Czech Republic s.r.o., specifically accredited for the test by the Český Institut Pro Akreditaci, o.p.s. , Nr L 1163.

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6. MEASUREMENT RESULTS

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- 1) Plant or unit name¹⁾: **Stationary emission source No. 001 (waste incineration boiler stack)**
 2) Flue gases cleaning unit¹⁾: **Evaporative cooler, hydrated lime and active carbon reactor, bag filters unit (2x4)**
 3) Emission source load during measurements¹⁾: **Boiler load ~90,0 MW**
 4) Fuel type or material mass flow in process¹⁾: **Waste ~27,8 t/h**
 5) Location of sampling and measurements: **in duct, after flue gases cleaning unit**

Measurement reference number			10-06-01						
Date of measurement			10.06.2026						
Measurement time range			10:24-11:13	11:17-12:06	12:10-12:59				
Scope of test		Unit	Results			Average	Uncertainty +/-	Method	
Meteorological conditions	Atmospheric pressure	hPa	1000,2	1000,5	1000,7	1000,5	0,9	PN-Z-04030-7:1994	
	Air temperature	oC	22	22	22	22			
Measurement plane	Diameter	m	2,10						
	Area	m2	3,4619						
Stack gas parameters	Temperature	oC	64,3	54,5	53,2	57,3	1,2		
	Static pressure	Pa	-162,1	-122,4	-112,8	-132,4	-1,8		
	Dynamic pressure	Pa	195,3	161,7	166,0	174,3	2,0		
	Gas moistness grade X	kg/kg	0,158	0,132	0,111	0,134	0,0035		PN-EN 14790:2017
	Average velocity	m/s	15,8	14,0	14,1	14,6	0,4		PN-Z-04030-7:1994
	Chemical composition	O2	%	7,50	7,30	7,30	7,37		0,41
		CO2	%	11,30	11,50	11,50	11,43	0,47	ISO 12039:2019
	Wet gas density during testing	kg/m3	0,982	1,026	1,041	1,016		PN-Z-04030-7:1994	
	Gas density in normal conditions	kg/m3 N	1,231	1,247	1,260	1,246		PN-Z-04030-7:1994	
	Gas density in standard conditions	kg/m3 U	1,344	1,345	1,345	1,345		PN-Z-04030-7:1994	
Concentration of the substance in the gas in reference conditions O2 ref. 11%	As gaseus*	mg/m ³ _{ref}	< 0,005454	< 0,005452	< 0,005506	< 0,005471	0,000710	PN-EN 14385:2025	
	As dust*	mg/m ³ _{ref}	< 0,000224	< 0,000240	< 0,000238	< 0,000234	0,000051	PN-EN 14385:2025	
	As*	mg/m ³ _{ref}	< 0,005677	< 0,005692	< 0,005744	< 0,005705	0,000712	PN-EN 14385:2025	
	Sb gaseus*	mg/m ³ _{ref}	< 0,005454	< 0,005452	< 0,005506	< 0,005471	0,000710	PN-EN 14385:2025	
	Sb dust*	mg/m ³ _{ref}	< 0,000224	< 0,000240	< 0,000238	< 0,000234	0,000051	PN-EN 14385:2025	
	Sb*	mg/m ³ _{ref}	< 0,005677	< 0,005692	< 0,005744	< 0,005705	0,000712	PN-EN 14385:2025	
	Cd gaseus*	mg/m ³ _{ref}	< 0,000545	< 0,000545	< 0,000551	< 0,000547	0,000071	PN-EN 14385:2025	
	Cd dust*	mg/m ³ _{ref}	< 0,000022	< 0,000024	< 0,000024	< 0,000023	0,000005	PN-EN 14385:2025	
	Cd*	mg/m ³ _{ref}	< 0,000568	< 0,000569	< 0,000574	< 0,000570	0,000071	PN-EN 14385:2025	
	Co gaseus*	mg/m ³ _{ref}	< 0,001098	< 0,001105	< 0,001073	< 0,001092	0,000142	PN-EN 14385:2025	
	Co dust*	mg/m ³ _{ref}	< 0,000045	< 0,000048	< 0,000048	< 0,000047	0,000010	PN-EN 14385:2025	
	Co*	mg/m ³ _{ref}	< 0,001142	< 0,001153	< 0,001120	< 0,001138	0,000142	PN-EN 14385:2025	
	Mn gaseus*	mg/m ³ _{ref}	0,033888	0,033245	0,034217	0,033783	0,004389	PN-EN 14385:2025	
	Mn dust*	mg/m ³ _{ref}	< 0,000045	< 0,000048	< 0,000048	< 0,000047	0,000010	PN-EN 14385:2025	
	Mn*	mg/m ³ _{ref}	0,033933	0,033293	0,034265	0,033830	0,004389	PN-EN 14385:2025	
	Cu gaseus*	mg/m ³ _{ref}	0,001475	0,001568	0,001645	0,001562	0,000191	PN-EN 14385:2025	
	Cu dust*	mg/m ³ _{ref}	0,000054	< 0,000048	< 0,000048	0,000050	0,000011	PN-EN 14385:2025	
	Cu*	mg/m ³ _{ref}	0,001529	0,001616	0,001692	0,001612	0,000191	PN-EN 14385:2025	
	Ni gaseus*	mg/m ³ _{ref}	< 0,005454	< 0,005452	< 0,005506	< 0,005471	0,000710	PN-EN 14385:2025	
	Ni dust*	mg/m ³ _{ref}	< 0,000224	< 0,000240	< 0,000238	< 0,000234	0,000051	PN-EN 14385:2025	
	Ni*	mg/m ³ _{ref}	< 0,005677	< 0,005692	< 0,005744	< 0,005705	0,000712	PN-EN 14385:2025	
	Pb gaseus*	mg/m ³ _{ref}	< 0,005454	< 0,005452	< 0,005506	< 0,005471	0,000710	PN-EN 14385:2025	
	Pb dust*	mg/m ³ _{ref}	< 0,000224	< 0,000240	< 0,000238	< 0,000234	0,000051	PN-EN 14385:2025	
	Pb*	mg/m ³ _{ref}	< 0,005677	< 0,005692	< 0,005744	< 0,005705	0,000712	PN-EN 14385:2025	

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	V gaseus*	mg/m ³ _{ref}	< 0,005454	< 0,005452	< 0,005506	< 0,005471	0,000710	PN-EN 14385:2025
	V dust*	mg/m ³ _{ref}	< 0,000224	< 0,000240	< 0,000238	< 0,000234	0,000051	PN-EN 14385:2025
	V*	mg/m ³ _{ref}	< 0,005677	< 0,005692	< 0,005744	< 0,005705	0,000712	PN-EN 14385:2025
	Cr gaseus*	mg/m ³ _{ref}	< 0,002710	< 0,002744	< 0,002753	< 0,002735	0,000355	PN-EN 14385:2025
	Cr dust*	mg/m ³ _{ref}	< 0,000112	< 0,000120	< 0,000119	< 0,000117	0,000026	PN-EN 14385:2025
	Cr*	mg/m ³ _{ref}	< 0,002822	< 0,002864	< 0,002872	< 0,002852	0,000356	PN-EN 14385:2025
	Ti gaseus*	mg/m ³ _{ref}	< 0,005454	< 0,005452	< 0,005506	< 0,005471	0,000710	PN-EN 14385:2025
	Ti dust*	mg/m ³ _{ref}	< 0,000224	< 0,000240	< 0,000238	< 0,000234	0,000051	PN-EN 14385:2025
	Ti*	mg/m ³ _{ref}	< 0,005677	< 0,005692	< 0,005744	< 0,005705	0,000712	PN-EN 14385:2025
Gas volume flow	measurement conditions	m ³ /h	196290	174854	175851	182331	5253	PN-Z-04030-7:1994
	normal conditions	m ³ _n /h	156608	143774	145212	148531	4279	
	standard conditions	m ³ _u /h	123832	117732	122414	121326	3496	
	reference conditions O2 ref. 11%	m ³ _{ref} /h	167173	161292	167708	165391	8219	
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}	0,006					
	Sb*+As*+Cr*+Co*+Mn*+Cu*+Ni*+Pb*+V*	mg/m ³ _{ref}	0,068					

*- 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<0,25 ug / As<0,50 ug / Cd<0,050 ug / Co<0,10 ug / Mn<0,10 ug / Cu<0,10 ug / Ni<0,50 ug / Pb<0,50 ug / Tl<0,50 ug / V<0,50 ug / Sb<0,50 ug / in sample

Notes:

Normal conditions designate the temperature of 273 K and pressure of 101,3kPa, defining normal cubic meter m³N. 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/62/06/26 - P/71/06/26

Date of delivery to the laboratory: 12.06.2026

Date of analysis: 12.06.2026 - 29.06.2026

Test Report No PW/42/07/26**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/68/06/26	Cd+Tl	0,002	p.o.	+
P/68/06/26	Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V	0,03	p.o.	+

p.o. – below the limit of quantification.

Work parameters of measurement system:**Heavy metals (PN-EN 14385:2025)**

Sampling plane: 2 measurement axis
Sampling: isokinetic [x]
nonisokinetic []
Isokinetic ratio: 114,3 % / 110,3 % / 107,3 %
Sampling time: 48,1 min / 48,1 min / 48,1 min
Sampled volume: 0,146 / 0,144 / 0,143 m³
Filter parameters: FT-50: Ø 0,50 mm, efficiency: 99,990 %, quartz (QMA)
Impingers: impingers set No. 2 (absorption efficiency 98,1 %)
Absorption solution: HNO₃/H₂O₂

H₂O (PN-EN 14790:2017)

Sampling plane: 2 measurement axis
Sampling equipment: titanium sampling line
heated probe 1,5 m
sampling pump: PT-01
Cartridge No: H₂O content set No 1
Sampling No: 1
Sampling time: ~48,1 min
Sampled volume: 0,146 / 0,144 / 0,143 m³
H₂O maas: 21,0 g / 18,0 g / 15,0 g
absrobtion efficiency: 98,1 %

Test Report No PW/42/07/26**O₂ paramagnetic (PN-EN 14789:2017):**

Range : 0 – 5 % []
 0 – 10 % [X]
 0 – 25 % []

Calibration gas: O₂ – 8,001% [X] R/07/W
 O₂ – 18,85% [] R/12/W
 N₂ – 99,99% [X] R/17/

Sampling train: 2 measurement axis

Sampling time/ average time: 144 min / 1 min

O ₂ concentration measurement (paramagnetic):		HORIBA PG-350E-EU			
check operation		unit	result	criterion	result +/-
„0” after adjustment, without sampling train		%	0,02	± 0,1 [%]*	+
„0” after adjustment, with sampling train	before measurement	%	0,04	± 0,2 [%]**	+
	after measurement	%	0,05	± 0,2 [%]**	+
„Span” after adjustment with sampling train /standard 8,001 % R/07/W analyser range 10%/	before measurement	%	7,95	± 0,2 [%]**	+
	after measurement	%	8,0	± 0,2 [%]**	+
	before measurement time T90	%	8,15	> 8,12 [%]	----
		sec.	21	< 200 sec.	+

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

Test Report No PW/42/07/26**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		-

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8. CERTIFICATE OF ACCREDITATION

POLSKIE CENTRUM AKREDYTACJI
POLISH CENTRE FOR ACCREDITATIONSygnatariusz EA MLA
EA MLA SignatoryCERTYFIKAT AKREDYTACJI
LABORATORIUM BADAWCZEGO
ACCREDITATION CERTIFICATE OF TESTING LABORATORY
Nr AB 994

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

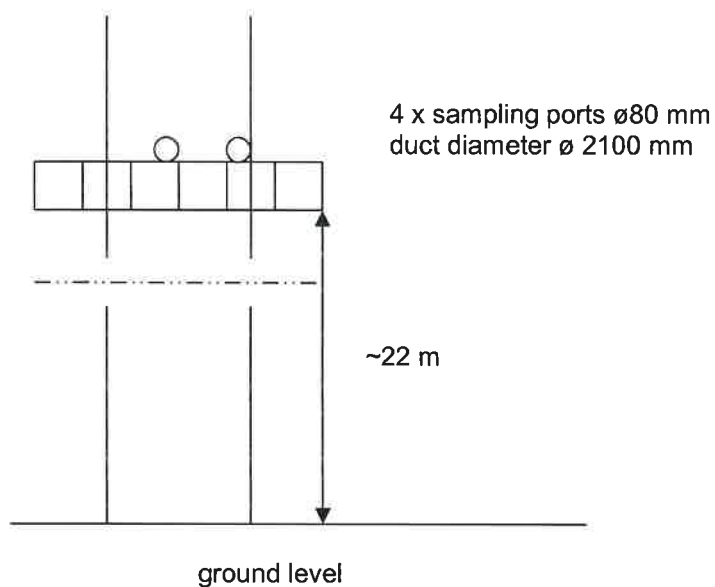
„PROFTECH” Sp. z o.o.
ul. Kurta Aldera 44, 41-506 Chorzówspełnia wymagania normy PN-EN ISO/IEC 17025:2018-02
meets requirements of the PN-EN ISO/IEC 17025:2018-02 standardAkredytowana działalność jest określona w Zakresie Akredytacji Nr AB 994
Accredited activity is defined in the Scope of Accreditation No AB 994Akredytacja 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 994Akredytacji udzielono dnia 30.01.2009 r.
Accreditation was granted on 30.01.2009DYREKTOR
POLSKIEGO CENTRUM AKREDYTACJI
LUCYNA OLSZOWSKA

Warszawa, dnia 9 grudnia 2019 roku

Scope of accreditation issued 11.12.2025, No 25

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9. MEASUREMENT PLANE SCHEME



Approved by

.....
Name and Signature

END OF REPORT

