



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, June 16th 2021
Our ref. No.: PW/20/06/21

Report No PW/20/06/21

on concentration measurements of dioxins, furans, heavy metals (As; Cd; Cr; Co; Cu; Mn; Ni; Pb; Sb; Tl; V and Hg) 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:

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Test Report No PW/20/06/21

List of contents:

- 1. PURPOSE AND SCOPE OF THE REPORT**
- 2. BASIS OF MEASUREMENTS EXECUTION**
- 3. MEASUREMENT TEAM**
- 4. MEASUREMENT RESULTS SUMMARY**
- 5. DESCRIPTION OF THE MEASUREMENT METHOD**
- 6. MEASUREMENT RESULTS**
- 7. MEASUREMENT DEVICES**
- 8. CERTIFICATE OF ACCREDITATION**
- 9. DIOXINS AND FURANS ANALYSIS RESULTS**
- 10. MEASUREMENT PLANE SCHEME**

Test Report No PW/20/06/21

1. PURPOSE AND SCOPE OF THE REPORT

Purpose of executed measurements was to determine the concentration and emission of dioxins, furans, heavy metals (As; Cd; Cr; Co; Cu; Mn; Ni; Pb; Sb; Tl; V and Hg) 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:

- PCDD/DF emission and concentration,
- Heavy metals (As; Cd; Cr; Co; Cu; Mn; Ni; Pb; Sb; Tl; V and Hg) emission and 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 VKJ_S_2020-263 dated December 16th 2020.

3. MEASUREMENT TEAM

The measurements taken on May 26th 2021 were executed by the following team:

- Grzegorz Bortel specialist - measurement team leader,
- Grzegorz Kurzeja specialist,
- Karol Sodo technician.

Test Report No PW/20/06/21**4. MEASUREMENT RESULTS SUMMARY**

Below are presented measurement results summary, full measurement results are presented in chapter no 6, at page 10 and 12.

Stationary emission source No. 001 (waste incineration boiler stack)	Concentration of the substance in the gas in the reference conditions O ₂ ref. 11%	PCDDF*	ng/m ³ U	0,002
	Emission limits	PCDDF	ng/m ³ U	0,1
	Transgression	PCDDF	ng/m ³ U	-
	Concentration of the substance in the gas in the reference conditions O ₂ ref. 11%	Cd*+Tl*	mg/m ³ U	0,008
		Hg*	mg/m ³ U	0,001
		Sb*+As*+Cr*+Co*+Mn*+Cu*+Ni*+Pb*+V*	mg/m ³ U	0,115
	Emission limits	Cd+Tl	mg/m ³ U	0,05
		Hg	mg/m ³ U	0,05
		Sb+As+Cr+Co+Mn+Cu+Ni+Pb+V	mg/m ³ U	0,50
	Transgression	Cd+Tl	mg/m ³ U	-
		Hg	mg/m ³ U	-
		Sb+As+Cr+Co+Mn+Cu+Ni+Pb+V	mg/m ³ U	-

*- the results obtained from the subcontractor (accredited)

Test Report No PW/20/06/21

5. DESCRIPTION OF THE MEASUREMENT METHOD**Measurement of the gas volumetric flow**

The flow rate was determined according to 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 APIS X-1 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-350 EHR equipped with testing probe 2000 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: 3-21%

Measurement CO₂ content

The concentration of CO₂ was determined using gas analyzer HORIBA PG-350 EHR equipped with testing probe 2000 mm long. The measurements were taken according to the procedure described in measurement unit as well as to ISO Standard PN-ISO 10396:2001 "Stationary Source Emissions - Sampling For The Automated Determination Of Gas Concentrations ". Measurement is accredited.

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 : 2005. Analysis of metals (Cd , Tl , Sb , As, Cr, Co, Cu , Mn , Ni , Pb, V) was performed in the laboratory of OBiKŚ Sp. z o.o. in Katowice , accredited in this regard by the Polish Centre of Accreditation No. AB 213

Test Report No PW/20/06/21

Measurement of mercury (Hg) content

Sampling for the determination of concentrations and emissions of mercury (Hg) was made according to PN -EN 13211 + AC : 2006. Analysis of mercury (Hg) was made in a laboratory OBiKŚ Sp. z o.o. in Katowice , accredited in this regard by the Polish Centre of Accreditation No. AB 213

PCDD+PCDF sampling and determination

PCDD/DF samples were taken according to the requirements of Polish Standard PN-EN 1948-1:2006 „ Stationary source emissions - Determination of mass concentration of PCDDs/PCDFs and dioxin-type PCBs - Part 1: Sampling of PCDDs/PCDFs”.

The three stages of PCDD/DF concentration and emission determination:

Stage I - sampling

For the determination of mass concentration of PCDD/DF proper sampling plays important role that affects following stages of the testing. The sampling were performed by means of the filtration and condensation method using PCDD/DF sampling conformed to European Standard PN-EN 1948-1:2006.

The following page shows the schematic diagram of the sampling system.

Stage II - laboratory analysis

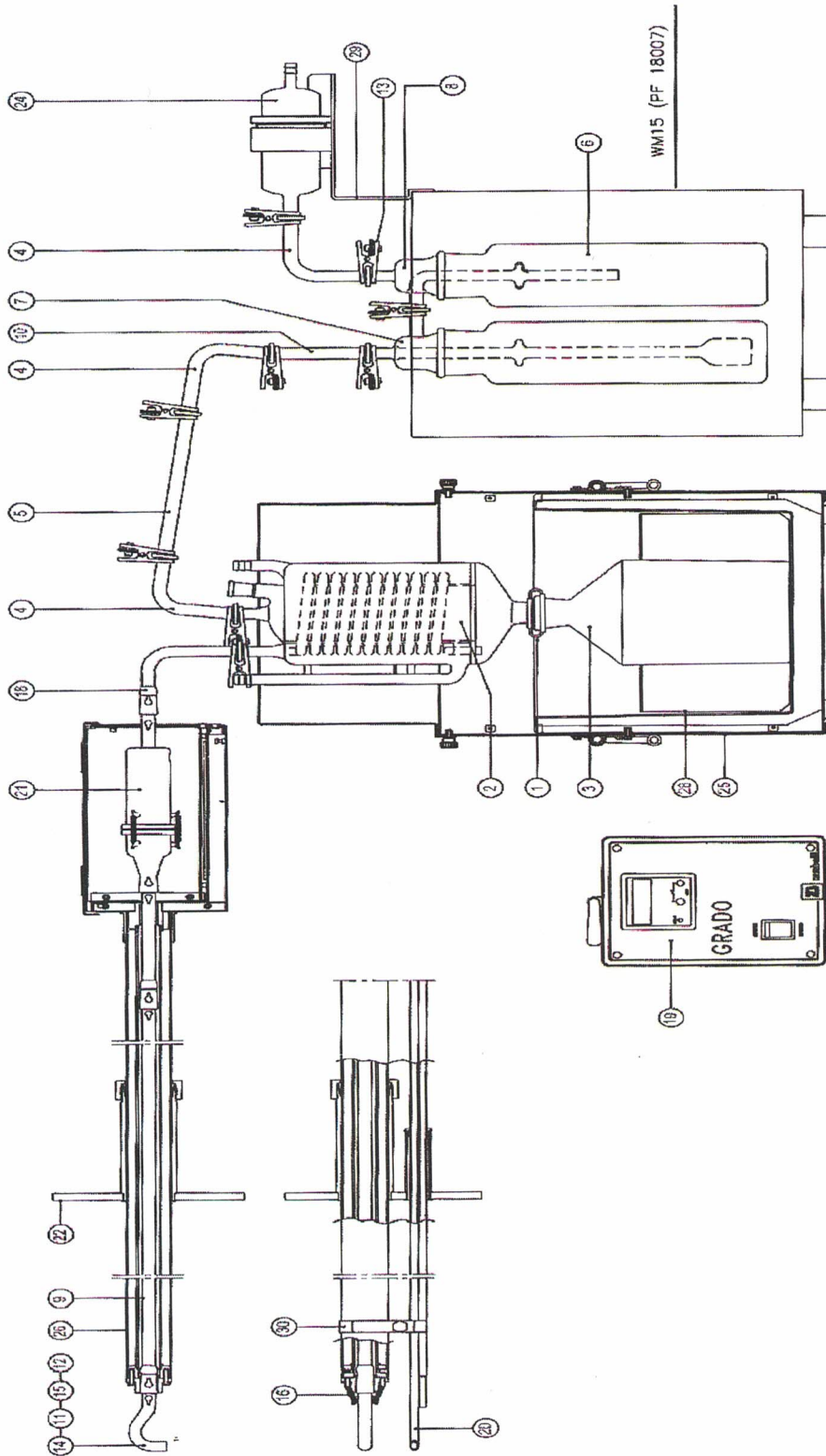
The samples were analysed at the ALS Czech Republic, s.r.o accredited laboratory following the CSN EN 1948-2,3 methodology: The determination of polychlorinated dibenzo-p-dioxine, dibenzofurans in emission samples with the method of isotop dillution using HRGC/HRMS.

The dioxin and furans analyses were conducted at the ALS Czech Republic, s.r.o. Laboratory, specifically accredited for the test by the Český Institut Pro Akreditaci, o.p.s. , No L1163.

Stage III - development and the results and discussion

The last stage includes results collection from the previous stages, emission calculation and PCDD/DF concentration as well as comparison to the standards in force.

Test Report No PW/20/06/21



- Opis:
- 1. ferrule
 - 2. cooler
 - 5,10. aspiration path - tubes
 - 13. clamp
 - 20. Pitot tube „S” - type
 - 25. cooler casing
 - 3. condensation pot
 - 6-8. scrubbers
 - 16. holding springs
 - 21. filter casing
 - 26. heated probe
 - 4,18. aspiration path - elbows
 - 9. aspiration path - probe tube
 - 17. aspiration controller
 - 22. yoke
 - 28. cooler coil
 - 11,12,14,15. - aspiration endings
 - 19. temperature controller
 - 24. gas dryer
 - 29,30. support

Test Report No PW/20/06/21

6. MEASUREMENT RESULTS

Test Report No PW/20/06/21

- 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 ~64,5 MW,**
 4) Fuel type or material mass flow in process¹⁾: **Waste ~26,2 t/h**
 5) Location of sampling and measurements: **in duct, after flue gases cleaning unit**

Measurement reference number		26-05-01		X	X	X		
Date of measurement		26.05.2021						
Measurement time range		11:52-12:31	12:38-13:17					
Scope of test	Unit	Results		Average	Uncertainty +/-	Method		
Meteorological conditions	Atmospheric pressure	hPa	999,0	999,5	999,3	1,7	PN-Z-04030-7:1994	
	Air temperature	oC	12	12	12			
Cross-section	Diameter	m	2,10					
	Area	m ²	3,4619					
The parameters of gas in line	Temperature	oC	41,0	40,0	40,5	0,8		
	Static pressure	Pa	-68,2	-72,5	-70,4	-1,1		
	Differential pressure	Pa	142,1	145,3	143,7	1,2		
	Gas moistness grade X	kg/kg	0,045	0,045	0,045	0,0015		PN-EN 14790:2017
	Average velocity	m/s	13,6	13,8	13,7	1,6		PN-EN ISO 16911-1:2013
	Chemical composition	O ₂	%	7,30	7,10	7,20		0,59
		CO ₂	%	11,40	11,60	11,50	0,53	PN-ISO 10396:2001
	Wet gas density during testing	kg/m ³	1,120	1,125	1,122		PN-Z-04030-7:1994	
	Gas density in normal conditions	kg/m ³ N	1,307	1,308	1,307		PN-Z-04030-7:1994	
	Gas density in conventional conditions	kg/m ³ U	1,345	1,346	1,345		PN-Z-04030-7:1994	
Concentration in the gas at measurement conditions	As*	mg/m ³	<0,008729				PN-EN 14385:2005	
	Sb*	mg/m ³	<0,017458				PN-EN 14385:2005	
	Cd*	mg/m ³	<0,000209				PN-EN 13211:2006	
	Co*	mg/m ³	<0,000698				PN-EN 14385:2005	
	Mn*	mg/m ³	0,021313			0,007951	PN-EN 14385:2005	
	Cu*	mg/m ³	0,037635			0,014078	PN-EN 14385:2005	
	Ni*	mg/m ³	0,022226			0,008330	PN-EN 14385:2005	
	Pb*	mg/m ³	<0,004399				PN-EN 14385:2005	
	V*	mg/m ³	<0,000873				PN-EN 14385:2005	
	Cr*	mg/m ³	0,017647			0,006565	PN-EN 14385:2005	
	Tl*	mg/m ³	<0,008729				PN-EN 14385:2005	
	Hg*	mg/m ³	<0,001321				PN-EN 13211+AC:2006	
	Concentration in the gas at normal conditions	As*	mg/m ³ N	<0,009749				PN-EN 14385:2005
		Sb*	mg/m ³ N	<0,019498				PN-EN 14385:2005
Cd*		mg/m ³ N	<0,000234				PN-EN 13211:2006	
Co*		mg/m ³ N	<0,000780				PN-EN 14385:2005	
Mn*		mg/m ³ N	<0,023804			0,008881	PN-EN 14385:2005	
Cu*		mg/m ³ N	<0,042035			0,015724	PN-EN 14385:2005	
Ni*		mg/m ³ N	<0,024824			0,009303	PN-EN 14385:2005	
Pb*		mg/m ³ N	<0,004914				PN-EN 14385:2005	
V*		mg/m ³ N	<0,000975				PN-EN 14385:2005	
Cr*		mg/m ³ N	<0,019709			0,007333	PN-EN 14385:2005	
Tl*		mg/m ³ N	<0,009749				PN-EN 14385:2005	
Hg*		mg/m ³ N	<0,001475				PN-EN 13211+AC:2006	

Test Report No PW/20/06/21

Concentration of the substance in the gas in standard conditions	As*	mg/m3 U	<0,010481			PN-EN 14385:2005	
	Sb*	mg/m3 U	<0,020962			PN-EN 14385:2005	
	Cd*	mg/m3 U	<0,000252			PN-EN 13211:2006	
	Co*	mg/m3 U	<0,000838			PN-EN 14385:2005	
	Mn*	mg/m3 U	0,025592	0,009548		PN-EN 14385:2005	
	Cu*	mg/m3 U	0,045190	0,016904		PN-EN 14385:2005	
	Ni*	mg/m3 U	0,026687	0,010002		PN-EN 14385:2005	
	Pb*	mg/m3 U	<0,005283			PN-EN 14385:2005	
	V*	mg/m3 U	<0,001048			PN-EN 14385:2005	
	Cr*	mg/m3 U	0,021190	0,007883		PN-EN 14385:2005	
	Tl*	mg/m3 U	<0,010481			PN-EN 14385:2005	
	Hg*	mg/m3 U	<0,001585			PN-EN 13211+AC:2006	
Concentration of the substance in the gas in reference conditions O2 ref. 11%	As*	mg/m3 U	<0,007650			PN-EN 14385:2005	
	Sb*	mg/m3 U	<0,015301			PN-EN 14385:2005	
	Cd*	mg/m3 U	<0,000184			PN-EN 13211:2006	
	Co*	mg/m3 U	<0,000612			PN-EN 14385:2005	
	Mn*	mg/m3 U	0,018680	0,007085		PN-EN 14385:2005	
	Cu*	mg/m3 U	0,032986	0,012544		PN-EN 14385:2005	
	Ni*	mg/m3 U	0,019480	0,007421		PN-EN 14385:2005	
	Pb*	mg/m3 U	<0,003856			PN-EN 14385:2005	
	V*	mg/m3 U	<0,000765			PN-EN 14385:2005	
	Cr*	mg/m3 U	0,015467	0,005851		PN-EN 14385:2005	
	Tl*	mg/m3 U	<0,007650			PN-EN 14385:2005	
	Hg*	mg/m3 U	<0,001141			PN-EN 13211+AC:2006	
Gas volume flow	measurement conditions	m3/h	23405	22186	22796	2674	PN-EN ISO 16911-1:2013
	normal conditions	m3N/h	19004	18050	18527	2175	
	standard conditions	m3U/h	16166	15357	15761	1950	
	reference conditions O2 ref. 11%	m3U/h	13418	12746	13082	1721	
The emission obtained by measuring	As*	kg/h	<0,001420	<0,001438	<0,001429		PN-EN 14385:2005
	Sb*	kg/h	<0,002840	<0,002876	<0,002858		PN-EN 14385:2005
	Cd*	kg/h	<0,000034	<0,000035	<0,000034		PN-EN 13211:2006
	Co*	kg/h	<0,000114	<0,000115	<0,000114		PN-EN 14385:2005
	Mn*	kg/h	0,003467	0,003511	0,003489	0,001385	PN-EN 14385:2005
	Cu*	kg/h	0,006122	0,006200	0,006161	0,002451	PN-EN 14385:2005
	Ni*	kg/h	0,003616	0,003662	0,003639	0,001450	PN-EN 14385:2005
	Pb*	kg/h	<0,000716	<0,000725	<0,000720		PN-EN 14385:2005
	V*	kg/h	<0,000142	<0,000144	<0,000143		PN-EN 14385:2005
	Cr*	kg/h	0,002871	0,002907	0,002889	0,001144	PN-EN 14385:2005
	Tl*	kg/h	<0,001420	<0,001438	<0,001429		PN-EN 14385:2005
	Hg*	kg/h	<0,000215	<0,000217	<0,000216		PN-EN 13211+AC:2006
Emission limits	Cd+Tl	mg/m3 U	0,05				
	Hg	mg/m3 U	0,05				
	Sb+As+Cr+Co+Mn+Cu+Ni+Pb+V	mg/m3 U	0,50				
Transgerssion	Cd+Tl	mg/m3 U	-				
	Hg	mg/m3 U	-				
	Sb+As+Cr+Co+Mn+Cu+Ni+Pb+V	mg/m3 U	-				

*- the results obtained from the subcontractor (accredited)

1)-information obtained from the client

Test Report No PW/20/06/21**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/99/05/21, P/100/05/21, P/101/05/21, P/102/05/21, P/103/05/21, P/104/05/21, P/105/05/21

Date of delivery to the laboratory: 28.05.2021

Date of analysis: 28.05.2021 - 14.06.2021

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/101/05/21	Cd+Tl	0,005	p.o.	+
P/104/02/21	Hg	0,005	p.o.	+
P/101/05/21	Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V	0,05	p.o.	+

p.o. – below the limit of quantification.

Test Report No PW/20/06/21

- 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 ~64,5 MW,**
- 4) Fuel type or material mass flow in process¹⁾: **Waste ~26,2 t/h**
- 5) Location of sampling and measurements: **in duct, after flue gases cleaning unit**

Measurement reference number		26-05-01		X	X	
Date of measurement		26.05.2021				
Measurement time range		13:22-19:23				
Scope of test		Unit	Results	Uncertainty +/-	Method	
Meteorological conditions	Atmospheric pressure	hPa	1000,5	1,6	X	
	Ambient temperature	oC	13			
Cross-section	Diameter	m	2,10			
	Area	m ²	3,4619			
The parameters of gas in line	Temperature	oC	40	1,190		
	Static pressure	Pa	-70	0,750		
	Differential pressure	Pa	129	1,190		
	Gas moistness grade X	kg/kg	0,047	0,002		PN-EN 14790:2017
	Average velocity	m/s	13,0	0,8		PN-EN ISO 16911-1:2013
	Chemical composition	O ₂	%	7,5		0,6
		CO ₂	%	11,3	0,5	PN-ISO 10396:2001
	Wet gas density during testing	kg/m ³	1,123		PN-EN 14790:2006	
	Gas density in normal conditions	kg/m ³ N	1,305		PN-EN 14790:2006	
Gas density in conventional conditions	kg/m ³ U	1,344		PN-EN 14790:2006		
Concentration in the gas at measurement conditions	PCDDF*	ng/m ³	0,003	0,001	PN-EN 1948:2006	
Concentration in the gas at normal conditions	PCDDF*	ng/m ³ N	0,003	0,001	PN-EN 1948:2006	
Concentration of the substance in the gas in standard conditions	PCDDF*	ng/m ³ U	0,003	0,001	PN-EN 1948:2006	
Concentration of the substance in the gas in reference conditions O ₂ ref. 11%	PCDDF*	ng/m ³ U	0,002	0,001	PN-EN 1948:2006	
Gas volume flow	measurement conditions	m ³ /h	161892	18995	X	
	normal conditions	m ³ N/h	139362	16368		
	standard conditions	m ³ U/h	129692	17575		
	reference conditions O ₂ ref. 11%	m ³ U/h	175084	25900		
The emission obtained by measuring	PCDDF*	ng/h	415,01	140,97	PN-EN 1948:2006	
Emission limits	PCDDF*	ng/m ³ U	0,10		X	
Transgerssion	PCDDF*	ng/m ³ U	-		X	

*- the results obtained from the subcontractor (accredited)

¹⁾-information obtained from the client

Test Report No PW/20/06/21Notes:

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/112/05/21, P/113/05/21

Date of delivery to the laboratory: 28.05.2021

Date of analysis: 28.05.2021 - 15.06.2021

Field blanks:

ID/ number of sample	Type of substance	The criterion of the blank [ng/m ³] 11%O ₂	The value of the blank [ng/m ³] 11% O ₂	Result [+/-]
P/113/05/21	PCDD/DF	0,01	0,001	+

Work parameters of measurement system:**PCDD/DF (PN-EN 1948:2006):**

sampling method:	condensation - adsorption method		
filter parameters:	19 x 90 mm, filter efficiency: 99,998 %		
sampling train:	2 measurement axis		
oxygen reference :	11 %		
time of dioxins and furans measurement:	13:22 – 19:23 (360,3 min)		
nozzle diameter:	6	mm	
probe temperature:	119	°C	
scrubbers temperature	4	°C	
aspired gas volume	6,87	m ³	
average sampling flow	19,1	l/min	
izokinetic ratio:	98,1	%	
leak test:	+ / +		
gas meter temperature	21,5	°C	
gas meter pressure	0	bar	
spiking pattern:	filter surface		
absorption solution:	100 ml H ₂ O dest. + 50 ml 2-etoksyetanol		
recovery:	74 %	¹³ C ₁₂ -2,3,4,7,8-PECDF,	/>50%/
	92 %	¹³ C ₁₂ -1,2,3,6,7,8-HxCDF,	/>50%/
	76 %	¹³ C ₁₂ -1,2,3,4,6,7,8 HpCDF.	/>50%/
TEQ sample mass:	0,02	ng	

H₂O (PN-EN 14790:2017)

Sampling train:	2 measurement axis
Sampling equipment:	titanium sampling line heated probe 2,0 m sampling pump: PT-02
Cartridge No:	H ₂ O content set No 1
Sampling No:	1
Sampling time:	30 min
Sampling speed:	~2,0 l/min
H ₂ O maas:	3,10 g
absorption efficiency:	97,8 %

Test Report No PW/20/06/21**O₂ paramagnetic (PN-EN 14789:2017):**

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

Calibration gas: O₂ – 9,012% [X] R/07/W
 O₂ – 20,018% [] R/12/W
 N₂ – 99,99% [X] R/17/

Sampling train: 2 measurement axis
 Sampling time/ average time: 360 min / 1 min

O ₂ concentration measurement (paramagnetic):		HORIBA PG-350E-HR (63/1/AW/18)			
		unit	result	criterion	result +/-
check operation					
„0” after adjustment, without sampling train		%	0,1	± 0,1 [%]*	+
„0” after adjustment, with sampling train	before measurement	%	0,1	± 0,2 [%]**	+
	after measurement	%	0,0	± 0,2 [%]**	+
„Span” after adjustment with sampling train /standard 20,018 % R/12/W analyzer range 25%/	before measurement	%	9,1	± 0,2 [%]**	+
	after measurement	%	9,0	± 0,2 [%]**	+
	before measurement time T90	% sec.	8,2 40	> 8,12 [%] < 200 sec.	----- +

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

Hg (PN-EN 13211 + AC:2006)

Sampling train: 2 measurement axis
 Sampling: isokinetic [x]
 nonisokinetic []

Isokinetic ratio: 102,5 %
 Sampling time: 39,4 min
 Sampled volume: 0,141 m³
 Impingers: impingers set No. 1 (absorption efficiency 97,5 %)
 Absorption solution: No. I (manganese (VII) potassium / sulfuric acid (VI))

Heavy metals (PN-EN 14385:2005)

Sampling train: 2 measurement axis
 Sampling: isokinetic [x]
 nonisokinetic []

Isokinetic ratio: 100,7 %
 Sampling time: 39,3 min
 Sampled volume: 0,110 m³
 Filter parameters: FT-50: Ø 0,50 mm, efficiency: 99,990 %, quartz (QMA)
 Impingers: impingers set No. 2 (absorption efficiency 98,5 %)
 Absorption solution: HNO₃/H₂O₂

Test Report No PW/20/06/21Statement of compliance with the specification/requirement:

The average value of the measurement series in the scope of dioxins and furans, mercury, heavy metals was assessed for compliance with the value of the emission standard for certain types of installations, fuel combustion sources and waste incineration or co-incineration devices. The laboratory has adopted the simple acceptance principle in accordance with ILAC-G8: 09/2019. The risk of incorrect acceptance / incorrect rejection for a result equal to the requirement / specification is 50%. Decision-making bodies may adopt a different decision-making principle, which may have an impact on the outcome.

7. MEASUREMENT DEVICES

Name of measuring device		X1- Apis
Type of measuring device		Isokinetic sampler S/N 0142
Certificate	Calibration No	824-2373/19 824-2374/19 824-2372/19 824-2375/19 G-106/20-66/20
Issued by		INTROL Sp. z o.o. KATOWICE ZAP BESTWINKA
Date of issue the certificate of calibration		27.08.2019 28.08.2019 11.03.2020
Expiration date of the certificate of calibration		-

Name of measuring device		HORIBA
Type of measuring device		PG-350E-HR
Certificate	Calibration No	69/1/AW/21
Issued by		Laboserwis Sp. z o.o. Katowice
Date of issue the certificate of calibration		22.03.2021
Expiration date of the certificate of calibration		-

Name of measuring device		Sampler
Type of measuring device		PT-02
Certificate	Calibration No	851-2464/19 786-2246/19 R-287/16-186/16 G-373/19-227/19
Issued by		INTROL Sp. z o.o. KATOWICE ZAP BESTWINKA
Date of issue the certificate of calibration		29.08.2019 12.08.2019 08.08.2019
Expiration date of the certificate of calibration		-

Test Report No PW/20/06/21**8. CERTIFICATE OF ACCREDITATION****POLSKIE CENTRUM AKREDYTACJI**
POLISH CENTRE FOR ACCREDITATIONSygnatariusz EA MLA
EA MLA Signatory**CERTYFIKAT AKREDYTACJI**
LABORATORIUM BADAWCZEGO
ACCREDITATION CERTIFICATE OF TESTING LABORATORY**Nr AB 994**

Powierza 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 OLBORSKA

Warszawa, dnia 9 grudnia 2019 roku

Test Report No PW/20/06/21

9. DIOXINS AND FURANS ANALYSIS RESULTS



Attachment no. 1 to the Certificate of Analysis for work order PR2150655

Sample: P/112/05/21

Measurement results PCDD/Fs:

Sample: P/112/05/21			Final extract [µl]: 60		
			Injection volume [µl]: 4		
			Acquisition date [d.m.y h.m]: 9.6.21 0:59		
2,3,7,8-PCDD/Fs	Result [ng/sample]	Limit of Detection [ng/sample]	Limit of Quantification [ng/sample]	¹ I-TEFs	I-TEQ Upperbound [ng/sample]
2,3,7,8-TCDD	< 0.0064	0.0064	0.013	1	0.0064
1,2,3,7,8-PeCDD	< 0.0075	0.0075	0.015	0.5	0.0038
1,2,3,4,7,8-HxCDD	< 0.0082	0.0082	0.016	0.1	0.00082
1,2,3,6,7,8-HxCDD	< 0.0082	0.0082	0.016	0.1	0.00082
1,2,3,7,8,9-HxCDD	< 0.0082	0.0082	0.016	0.1	0.00082
1,2,3,4,6,7,8-HpCDD	< 0.009	0.009	0.018	0.01	0.00009
OCDD	< 0.018	0.018	0.035	0.001	0.000018
2,3,7,8-TCDF	< 0.0063	0.0063	0.013	0.1	0.00063
1,2,3,7,8-PeCDF	< 0.0054	0.0054	0.011	0.05	0.00027
2,3,4,7,8-PeCDF	< 0.0054	0.0054	0.011	0.5	0.0027
1,2,3,4,7,8-HxCDF	< 0.0085	0.0085	0.017	0.1	0.00085
1,2,3,6,7,8-HxCDF	< 0.0085	0.0085	0.017	0.1	0.00085
1,2,3,7,8,9-HxCDF	< 0.0085	0.0085	0.017	0.1	0.00085
2,3,4,6,7,8-HxCDF	< 0.0085	0.0085	0.017	0.1	0.00085
1,2,3,4,6,7,8-HpCDF	< 0.011	0.011	0.022	0.01	0.00011
1,2,3,4,7,8,9-HpCDF	< 0.011	0.011	0.022	0.01	0.00011
OCDF	< 0.013	0.013	0.026	0.001	0.000013
I-TEQ from quantified 2,3,7,8-PCDD/Fs - "Lowerbound"					0
I-TEQ from 2,3,7,8-PCDD/Fs - "Mediumbound"					0.01
Maximum possible I-TEQ - "Upperbound"					0.02
PCDDs	Result [ng/sample]	PCDFs	Result [ng/sample]		
Tetra-CDDs	0.29	Tetra-CDFs	2.4		
Penta-CDDs	< 0.11	Penta-CDFs	< 0.15		
Hexa-CDDs	< 0.082	Hexa-CDFs	< 0.14		
Hepta-CDDs	< 0.018	Hepta-CDFs	< 0.044		
OCDD	< 0.018	OCDF	< 0.013		

¹I-TEF according to NATO.

Limits of quantification are defined as double of the detection limits.

The limit of detection is defined as the amount of analyte producing a signal with S/N>3.

The value of the detection limit is mentioned as the actual value at the acquisition date.

Measurement uncertainty is expressed as a double (k=2) relative standard deviation (RSD%), and corresponds to 95% confidence interval.

Estimation of uncertainty of each 2,3,7,8-PCDD/F congener is 30% and total I-TEQ is 20%.

These values were ensured by analyses of certified reference material under conditions of internal reproducibility.

Results marked with "<" are below limit of detection or quantification.

"Lowerbound" and "Upperbound" are levels defined in Regulation 2017/644 and EN 1948-4.

"Mediumbound" is levels defined in Regulation 2017/644.

Test Report No PW/20/06/21



Attachment no. 1 to the Certificate of Analysis for work order PR2150655

Sample:

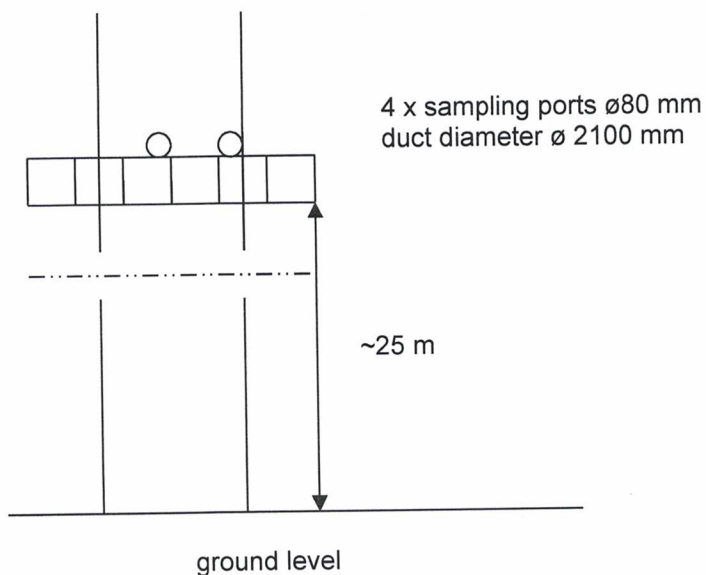
P/112/05/21

Standards recovery:

Sample:		P/112/05/21			
		Final extract [µl]:		60	
		Injection volume [µl]:		4	
		Acquisition date [d.m.y h:m]:		9.6.21 0:59	
Extraction standard	Recovery [%]	Acceptable range [%]		Accept. rec. with respect to	
		Basic	Extended	basic range	extended range
PCDDs					
13C12 - 2,3,7,8-TCDD	79	50 - 130	30 - 150	YES	-
13C12 - 1,2,3,7,8-PeCDD	62	50 - 130	30 - 150	YES	-
13C12 - 1,2,3,4,7,8-HxCDD	74	50 - 130	30 - 150	YES	-
13C12 - 1,2,3,6,7,8-HxCDD	83	50 - 130	30 - 150	YES	-
13C12 - 1,2,3,4,6,7,8-HpCDD	70	40 - 130	20 - 150	YES	-
13C12 - OCDD	72	40 - 130	20 - 150	YES	-
PCDFs					
13C12 - 2,3,7,8-TCDF	60	50 - 130	30 - 150	YES	-
13C12 - 2,3,4,7,8-PeCDF	99	50 - 130	30 - 150	YES	-
13C12 - 1,2,3,4,7,8-HxCDF	90	50 - 130	30 - 150	YES	-
13C12 - 1,2,3,6,7,8-HxCDF	86	50 - 130	30 - 150	YES	-
13C12 - 2,3,4,6,7,8-HxCDF	69	50 - 130	30 - 150	YES	-
13C12 - 1,2,3,4,6,7,8-HpCDF	91	40 - 130	20 - 150	YES	-
13C12 - OCDF	71	40 - 130	20 - 150	YES	-
Sampling standard	Recovery [%]	Acceptable range [%]		Rec. in range?	
13C12-1,2,3,7,8-PeCDF	74	> 50		YES	
13C12-1,2,3,7,8,9-HxCDF	92	> 50		YES	
13C12-1,2,3,4,7,8,9-HpCDF	76	> 50		YES	

Test Report No PW/20/06/21

10. MEASUREMENT PLANE SCHEME



Approved by **DYREKTOR**

[Handwritten Signature]

..... inż. Dariusz Guja
Name and Signature

END OF REPORT