

Stack Emissions Monitoring Report

Job Reference: JOB-2836

Commissioned by Mr Edward Vaughan

Operator Name

Mr Edward Vaughan | Sychtyn

Operator Address

Llanerfyl
Welshpool, Powys
SY21 0JF
EPR Permit EPR/AB3091ZZ

Release Point

AD Plant Engine Exhaust

Dates of the Monitoring Campaign

02/06/2026

Report Date | Version Number

10/06/2026 | Version 1

Cura Terra Primary Contact

Alastair Wolff | m: 07506 729 226
e: alastair.wolff@cura-terrae.com



Monitoring organisation name & address	Report written by	Report approved by	Report approved by signature
Cura Terra OH and Emissions Testing Limited North West Office Unit 2, Asher Court, Lyncastle Way Appleton, Warrington, Cheshire, WA4 4ST	Andrew Shipley Senior Team Leader MCERTS Level 2 Endorsements: TE1 TE2 TE3 TE4 MM 13 1243 expires on 30/11/2026	Brian Jacob Operations Manager MCERTS Level 2 Endorsements: TE1 TE2 TE3 TE4 MM 06 693 expires on 30/09/2027	

Report Contents and Monitoring Objectives

Report Contents

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Monitoring Objective

The monitoring objective was to conduct stack emissions monitoring to demonstrate compliance against a set of emission limit values (ELVs) as specified in the Site's Environmental Permit.

Special Requirements

There were no special requirements for this monitoring campaign.

Opinions and Interpretations

Any opinions or interpretations contained within this test report are outside the scope of Cura Terra's MCERTS / ISO 17025 accreditation.

Part 1: Executive Summary - Monitoring Results Summary

Monitoring Results - Summary

test parameter	EXPRESSED AS A CONCENTRATION				EXPRESSED AS A MASS EMISSION				reference conditions	accreditation status
	result	uncertainty in result +/-	limit (ELV)	units	result	uncertainty in result +/-	limit (ELV)	units		
Sulphur Dioxide	5.5	0.47	350	mg/m ³	4.3	0.39		g/hr	STP, dry, 5% O ₂	MCERTS
Total VOCs (as Carbon) †	1259	189	1000	mg/m ³	973	146		g/hr	STP, dry, 5% O ₂	MCERTS
Oxides of Nitrogen (as NO ₂) †	446	44.6	500	mg/m ³	344	34.4		g/hr	STP, dry, 5% O ₂	MCERTS
Carbon Monoxide †	837	50.2	1400	mg/m ³	647	38.8		g/hr	STP, dry, 5% O ₂	MCERTS
Oxygen	6.8	0.19		% v/v					dry	MCERTS
Stack Gas Water Vapour	14.1	0.34		% v/v					actual	MCERTS
Stack Gas Temperature	403			°C					actual	MCERTS
Stack Gas Velocity	34.2	0.56		m/s					actual	MCERTS
Stack Gas Flow Rate (ACTUAL)	2473	119		m ³ /hr					actual	MCERTS
Stack Gas Flow Rate (REF)	774	37.3		m ³ /hr					STP, dry, 5% O ₂	MCERTS

The stack gas water vapour, temperature, velocity and flow rates in the above table are calculated as an average of all of the results recorded during this monitoring campaign

The uncertainty in the result is reported at a 95% Confidence Interval in the same units as the monitoring result. In practice, this means that 95 times out of 100, the true result will lie within the stated range.

† The uncertainties referenced above are those defined in the UK Government (gov.uk) guidance and represent the maximum expanded uncertainties used to determine whether periodic monitoring results comply with the emission limit values (ELVs) specified in environmental permits. In accordance with Standard Rules Permit SR2021 No. 9, the applicable uncertainty allowance is that set out in the Environment Agency guidance “Monitoring stack emissions: maximum uncertainty values for periodic monitoring.”

See - <https://www.gov.uk/guidance/monitoring-stack-emissions-maximum-uncertainty-values-for-periodic-monitoring#maximum-measurement-uncertainties-for-periodic-monitoring>

Part 1: Executive Summary - Monitoring Results Further Details

Monitoring Results - Further Details

		EXPRESSED AS A CONCENTRATION				EXPRESSED AS A MASS EMISSION				sampling date times	run time (mins)	H ₂ O (% v/v)	reference conditions
test parameter	run	result	uncertainty in result +/-	limit (ELV)	units	result	uncertainty in result +/-	limit (ELV)	units				
Sulphur Dioxide	R1	5.5	0.47	350	mg/m ³	4.3	0.39		g/hr	02/06/2026 11:48 - 12:48	60	14.1	STP, dry, 5% O ₂
Total VOCs (as Carbon) †	R1	1259	189	1000	mg/m ³	973	146		g/hr	02/06/2026 11:48 - 12:48	60		STP, dry, 5% O ₂
Oxides of Nitrogen (as NO ₂) †	R1	446	44.6	500	mg/m ³	344	34.4		g/hr	02/06/2026 11:48 - 12:48	60		STP, dry, 5% O ₂
Carbon Monoxide †	R1	837	50.2	1400	mg/m ³	647	38.8		g/hr	02/06/2026 11:48 - 12:48	60		STP, dry, 5% O ₂
Oxygen		6.8	0.19		% v/v					N/A - Concurrent Testing			dry
Velocity & Flow Rate Traverse	R1	34.2	0.56		m/s	2473	119		m ³ /hr	02/06/2026 11:01 - 11:04			actual
Stack Gas Water Vapour		14.1	0.34		% v/v								actual
Stack Gas Temperature		403			°C								actual
Stack Gas Velocity		34.2	0.56		m/s								actual
Stack Gas Flow Rate (ACTUAL)		2473	119		m ³ /hr								actual
Stack Gas Flow Rate (REF)		774	37.3		m ³ /hr								STP, dry, 5% O ₂

The stack gas water vapour, temperature, velocity and flow rates in the above table are calculated as an average of all of the results recorded during this monitoring campaign

The uncertainty in the result is reported at a 95% Confidence Interval in the same units as the monitoring result. In practice, this means that 95 times out of 100, the true result will lie within the stated range.

† The uncertainties referenced above are those defined in the UK Government (gov.uk) guidance and represent the maximum expanded uncertainties used to determine whether periodic monitoring results comply with the emission limit values (ELVs) specified in environmental permits. In accordance with Standard Rules Permit SR2021 No. 9, the applicable uncertainty allowance is that set out in the Environment Agency guidance “Monitoring stack emissions: maximum uncertainty values for periodic monitoring.”

See - <https://www.gov.uk/guidance/monitoring-stack-emissions-maximum-uncertainty-values-for-periodic-monitoring#maximum-measurement-uncertainties-for-periodic-monitoring>

Part 1: Executive Summary - Monitoring and Analytical Methods

Monitoring and Analytical Methods

where analysis required	MONITORING					ANALYSIS					
test parameter	laboratory	accreditation number	technical procedure	reference method	monitoring status	laboratory	accreditation number	analytical procedure	analytical technique	analysis status	accreditation status
Sulphur Dioxide	CTA	2522	TP-10	EN 14791	MCERTS	TET	0605	C27	IC	MCERTS	MCERTS
Water Vapour	CTA	2522	TP-03	EN 14790	MCERTS	CTA	2522	TP-03	Gravimetric	MCERTS	MCERTS

where analysis not required	MONITORING										
test parameter	laboratory	accreditation number	technical procedure	reference method	monitoring status	measurement technique & equipment					accreditation status
Total VOCs (as Carbon)	CTA	2522	TP-21b	EN 12619	MCERTS	FID using iFID Mobile					MCERTS
Oxides of Nitrogen (as NO ₂)	CTA	2522	TP-22a	EN 14792	MCERTS	Chemiluminescence using Horiba PG-350E					MCERTS
Carbon Monoxide	CTA	2522	TP-22b	EN 15058	MCERTS	NDIR using Horiba PG-350E					MCERTS
Oxygen	CTA	2522	TP-22d	EN 14789	MCERTS	Paramagnetism using Horiba PG-350E					MCERTS
Velocity & Flow Rate Traverse	CTA	2522	TP-04a	EN 16911-1 TR 17078	MCERTS	Pitot Tube, Thermocouple & Thermomanometer					MCERTS

Summary of Monitoring Deviations (from Appendix 2)

test parameter	run	details of monitoring deviation
All	1	There were no deviations associated with the monitoring employed.

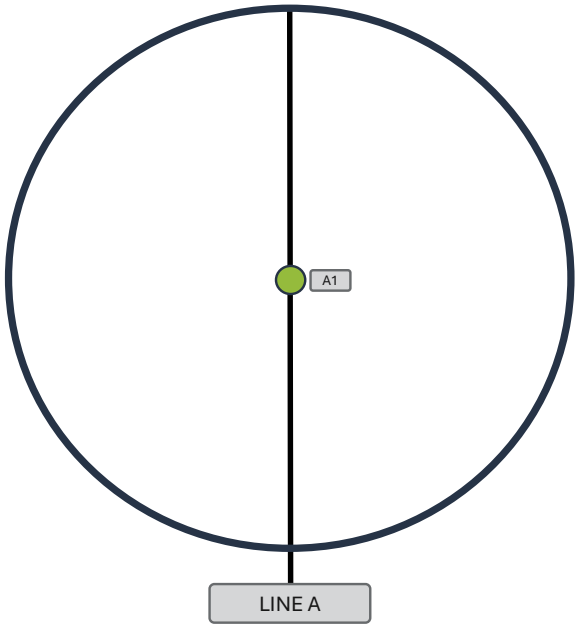
Part 1: Executive Summary - Monitoring Location

Monitoring Location Photos



Identification of Sampling Points on a Duct Diagram

refer to Appendix 2 - Raw Data to see how the points on this diagram relate to the points used for each test



Part 1: Executive Summary - Duct and Sampling Platform Information

Duct Characteristics | Sampling Ports

parameter	units	value	parameter	value	summary of all sample ports available
shape	-	Circular	primary sample port size	1" BSP	1" BSP
dimensions	-	Diameter = 0.16 m	primary sample port depth cm	10	
area	m ²	0.02	primary sample ports number of sampling lines available	1	
orientation	-	Horizontal			

Sampling Location General Information

general information	details
type location access	On the Ground Inside On Ground Level

CEMS | Abatement Systems

parameter	details
abatement system/s	N/A
CEMS installed on the stack	N/A

Sampling Plane Validation Criteria Summary (EN 15259) from Stack Traverse/s

criteria in EN 15259	units	value	allowed	compliant
lowest differential pressure	Pa	450.8	> 5 Pa	Yes
lowest traverse velocity	m/s	34.2	-	-
highest traverse velocity	m/s	34.2	-	-
mean traverse velocity	m/s	34.2	-	-
ratio traverse velocities	: 1	1.00	< 3 : 1	Yes
angle of swirl compliance	°	< 15	< 15°	Yes
no local negative flow	-	Yes	-	Yes

Part 1: Executive Summary - Sampling Location and Operating Information

Process Details

process detail	details
plume appearance on day of monitoring	No Visible Plume
type of process	Anaerobic Digester Engine
batch or continuous process	Continuous
fuel type	Biogas
feedstock	N/A
typical load / throughput of plant	250 mWh
details of any unusual process occurrences	None

Part 2: Supporting Information - Appendix 1: Monitoring Personnel, Analysis Laboratories and Test Equipment Used

Monitoring Personnel

name	position	MCERTS level number expiry	MCERTS technical endorsements
Andrew Shipley	Senior Team Leader	MCERTS Level 2 MM 13 1243 30/11/2026	TE1 TE2 TE3 TE4
Mark Banner	Trainee	MCERTS Trainee MM 25 1909 14/10/2030	-

Analysis Laboratories

laboratory	ISO 17025 accreditation number	laboratory short name	laboratory phone number
Cura Terra OH and Emissions Testing Limited North West	2522	CTA	0800 970 8945
Tetra Tech Salford	0605	TET	0161 872 2443

Test Equipment Used

equipment type	A-EQ ID
Source sampling console	
Low flow sampling console	424
Low flow sampling MFCs	427
ThermoFID / iFID mobile	287
Horiba PG-250	
Horiba PG-350E	69
Gasmet DX4000 FTIR	
Gasmet PSS	
Protea AtmosFIR	
Protea PIB 9ump	
Gasmet syringe calibrator	
M&C PSS5-C	61
Digital thermomanometer	116
Top pan balance kit	465

equipment type	A-EQ ID
S-Type pitot	
S-Type pitot tip	
Mini S-Type pitot	373
L-Type pitot	
Calipers	
Heated head filter	63
Heated tee	
1.5m heated line	55
10m heated line	30
20m heated line	
Odour barrel	
Vacuum chamber	
Dilution probe	
Tape measure	480

equipment type	A-EQ ID
Barometer	21
Timer	19
10m umbilical	
30m umbilical	
Heated probe	
Filter oven	
Ambient thermocouple	164
Stack thermocouple	273
Exit thermocouple	
Condenser thermocouple	
Tubes kit thermocouple	
2-way heater controller	
Air sampling pump	
Analytical balance	1 492

Part 2: Supporting Information - Appendix 2: Sulphur Dioxide | Run 1

Results reference conditions are: STP, dry, 5% O₂

parameter	units	result ± MU (95% CI)	units	result ± MU (95% CI)
Sulphur Dioxide	mg/m ³	5.5 ± 0.47	g/hr	4.3 ± 0.39

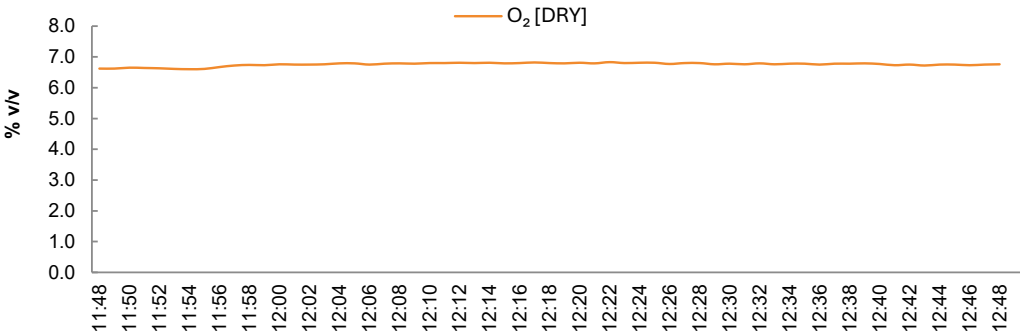
Analytical Laboratory Information

parameter	details
name of analytical lab	TET
lab analytical procedure	C27
lab analytical technique	IC Analysis Accreditation: MCERTS
date analysis completed	09/06/2026

General Information

parameter	details
sampling date	02/06/2026
sampling times	11:48 - 12:48
sampling duration testing team	60 minutes tested by: AS MBA
standard technical procedure	EN 14791 TP-10
probe filter housing material	Stainless Steel Stainless Steel Heated Head
impinger material capture media	Borosilicate Glass 0.3% H ₂ O ₂
set flow rate	3 l/min

Oxygen Data



parameter	details
filter size, material & location	Heated Head Filter Element PTFE Within Heated Head heated to 180°C
number sampling lines available	1
number sampling lines used	1
number sampling points ideal per line	1
number sampling points used per line	1
sampling point IDs	A1
volume metering device	Mass Flow Controller

Quality Assurance

QA parameter	units	sample run			blank (taken on 02/06/2026)		
		value	allowable	result	value	allowable	result
maximum allowable blank	mg/m ³	-	-	-	0.13	35	Pass
leak test	%	0.67	2.00	Pass	1.00	2.00	Pass
absorption efficiency	%	96.7	95	Pass	-	-	-
silica trap <50% faded	-	Yes	-	Pass	-	-	-
are water droplets present	-	No	-	-	-	-	-
water vapour MU	%	2.4	20.0	Pass	-	-	-

Breakdown of Results

reference conditions are: STP, dry, 5% O₂

parameter	sample volume [m ³]	LOD [mg]	impingers [front back] [mg/l]	impinger volume [front back] [ml]	mass total [mg]	LOD result [mg/m ³]	result [mg/m ³]	result reported [mg/m ³]	mass emission [g/hr]
sample run	0.1608	0.019	3.45 0.23	250 128	0.89	0.12	5.5	5.5	4.3
blank	0.1608	0.021	< 0.05	421	< 0.021	0.13	< 0.13	< 0.13	

Part 2: Supporting Information - Appendix 2: Sulphur Dioxide | Run 1

Raw Data | Calculations

data	units	value
P _{bar}	mmHg	767.3
P _g	Pa	222.0
P _s	mmHg	769.0
V _m (metered)	m ³	0.1806
C _{stp}	-	0.3592

data	units	value
m _{wts}	g	24.0
M _w	g/mol	18.0
V _{mol}	m ³ /mol	0.0222
T _s	°C	403.7
R _{wv} (H ₂ O)	% v/v	14.1

data	units	value
%CO _{2d}	% v/v (est)	12.00
%O _{2d}	% v/v	6.75
%O _{2w}	% v/v	5.80
%N _{2d}	% v/v	81.25
%O _{2ref}	% v/v	5.0
O _{2facd}	-	1.12
O _{2facw}	-	1.05

data	units	value
M _d	g/mol	30.19
M _s	g/mol	28.48
A _s	m ²	0.02
θ (sample time)	mins	60

where (est) refers to an estimated value

metered volume calculations	units	value
allow favourable O ₂ correction	-	Yes
vol actual stack conditions, V _{ma} = (V _{mstw})(T _s + 273) / (P _s) / (C _{stp})	m ³	0.5150
vol dry, V _{mstd} = V _m	m ³	0.1806
vol wet, V _{mstw} = (V _{mstd})(100 / (100 - R _{wv}))	m ³	0.2102
vol dry O ₂ , V _{mstdO₂} = (V _{mstd}) / (O _{2facd})	m ³	0.1608
vol wet O ₂ , V _{mstwO₂} = (V _{mstw}) / (O _{2facw})	m ³	0.1996

velocity volume flow rate calculations	units	value
velocity of stack gas, v _s = average of all velocity measurements	m/s	34.2
stack gas flow actual stack conditions, Q _a = average of all flow rate measurements	m ³ /hr	2473.2

Measurement Uncertainty (MU) Calculations

parameter	units	value	standard MU	MU as %age	required standard	value	sens coeff.	MU mg/m ³	MU factor O ₂ correction
MFC meter volume, V _m	m ³	0.1806	0.0009	0.50	≤2%	-	-	-	0.04
MFC volume STP, V _{mstd}	m ³	-	-	-	-	0.2	30.7	0.028	
leak, L	% ¹ mg/m ^{3.2}	0.67 ¹	-	0.67	≤2%	0.021 ²	1.00	0.021	overall MU for O ₂ correction
laboratory result, L _r	% ¹ mg/m ^{3.2}	3.9 ¹	-	3.9	-	0.21 ²	1.00	0.21	3.5%
combined MU with O ₂ correction									0.24
expanded MU 95% CI with O ₂ correction (k = 1.96) including method deviations									0.47
expanded MU 95% CI with O ₂ correction (k = 1.96) as percentage of measured value									8.4%
expanded MU 95% CI (k = 1.96) as percentage of measured value for mass emission									9%
expanded MU 95% CI with O ₂ correction (k = 1.96) as percentage of ELV [allowable 20.3%]									0.13%
									result
									Pass

method and sampling deviations
Sampling was performed in full compliance with the Standard, technical procedure and regulatory requirements.

Part 2: Supporting Information - Appendix 2: Total VOCs (as Carbon) | Run 1

Results reference conditions are: STP, dry, 5% O₂

parameter	units	result ± MU (95% CI)	units	result ± MU (95% CI)
Total VOCs (as Carbon) †	mg/m³	1259 ± 189	g/hr	973 ± 146

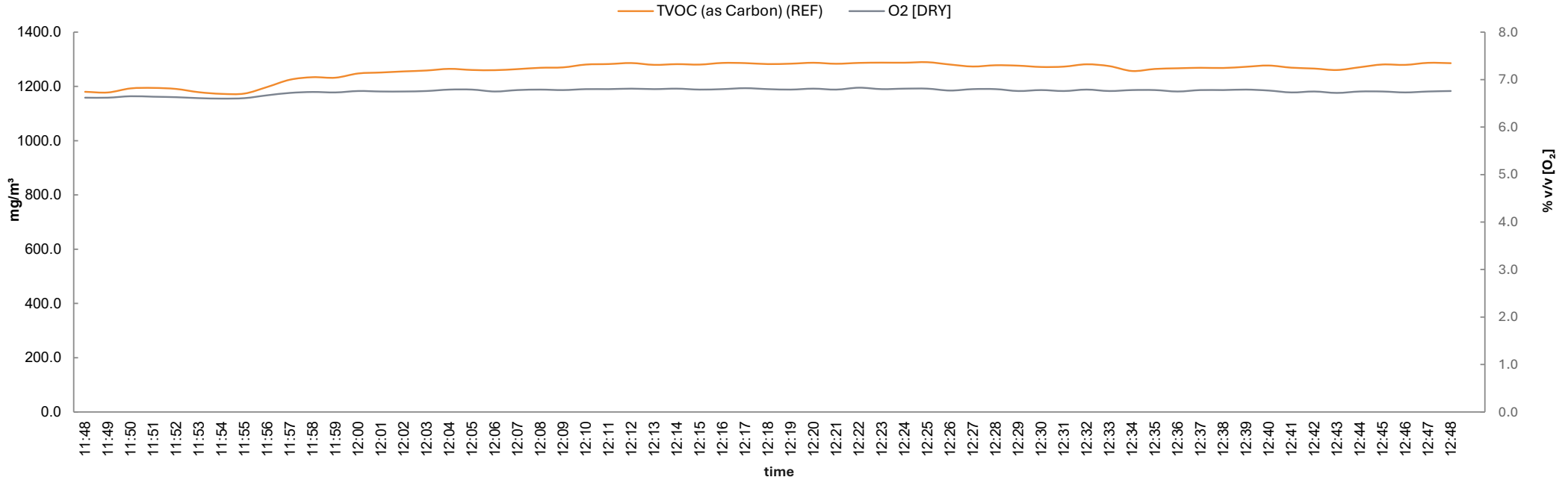
† Maximum value for total uncertainty (15% of measured value) applied to the results

General Information

parameter	details
sampling start date & time	02/06/2026 11:48
sampling end date & time	02/06/2026 12:48
test time mins	60
testing team	AS MBA
standard technical procedure	EN 12619 TP-21b
analyser type	iFID Mobile
heated head & line temperature	180°C

parameter	details
probe material	Stainless Steel
filter size, material & location	Heated Head Filter Element PTFE Within Heated Head
number sampling lines available	1
number sampling lines used	1
number sampling points ideal per line	1
number sampling points used per line	1
sampling point IDs	A1

Plot of Emissions Over Time



Part 2: Supporting Information - Appendix 2: Total VOCs (as Carbon) | Run 1

Analyser Calibration Information with QA checks

where [A] = at analyser, [L] = down sampling line

CAL ID	pre-test calibration events								post-test calibration events			quality assurance					
	date & time	zero [A] [ppm]	span [A] [ppm]	zero [L] [ppm]	span [L] [ppm]	T ₉₀ [s]	leak [%]		date & time	zero [L] [ppm]	span [L] [ppm]	zero drift [%]		span drift [%]		allowable [%]	temp [°C]
1	02/06/26 10:35	0.00	789.23	-0.37	780.11	21	1.2	P	02/06/26 12:57	-0.80	748.32	-0.1	P	-4.0	P	±5	19.5

Analyser Calibration Extended Information

CAL ID	performed by	drift corr. applied	log period [s]	CYL ID	CYL conc. [ppm]	CYL expiry	CYL MU [%]	zero gas type	span [CYL] gas type	span target [ppm]	range [ppm]	LOD [ppm]
1	AS	Yes	60	A-CYL-316	789.23	30/04/2031	0.9	Synthetic Air	10l 8000ppm Propane in Air	789.23	AUTO	0.03

Part 2: Supporting Information - Appendix 2: Total VOCs (as Carbon) | Run 1

Measurement Uncertainty (MU) Calculations

general information	units	value
emission limit value (ELV) (REF)	mg/m ³	1000
measured concentration (REF)	mg/m ³	1259

MU budget			
parameter	units	min	max
ambient temp	°C	19.0	20.0
voltage	V	90.0	130.0

overall MU for O ₂ correction
3.5%

MU factor O ₂ correction
0.04

MU budget input parameters					MU budget		
performance characteristics	symbol	units	value	source	symbol	units	value
repeatability at zero	rz	% of value	0.05	MCERTS certificate MC050062	U _{rz}	mg/m ³	0.63
repeatability at span	rs	% of value	0.08	MCERTS certificate MC050062	U _{rs}	mg/m ³	1
lack of fit	lof	% of value	2	maximum allowable	U _{lof}	mg/m ³	14.5
maximum short term zero drift (ABS) [after drift correction]	dz	% of value	0	day of testing	U _{dz}	mg/m ³	0
maximum short term span drift (ABS) [after drift correction]	ds	% of value	0	day of testing	U _{ds}	mg/m ³	0
influence of sample gas flow	f	% of value	-0.42	MCERTS certificate MC050062	U _f	mg/m ³	-3.1
influence of sample gas pressure	p	% of value	0	MCERTS certificate MC050062	U _p	mg/m ³	0
influence of ambient temperature zero point (/ 35k)	tz	% of value	-2.4	MCERTS certificate MC050062	U _{tz}	mg/m ³	-0.29
influence of ambient temperature span point (/ 35k)	ts	% of value	-2.7	MCERTS certificate MC050062	U _{ts}	mg/m ³	-0.32
influence of supply voltage (/ 60V)	v	% of value	-0.46	MCERTS certificate MC050062	U _v	mg/m ³	-2.2
cross sensitivity at zero	iz	% of value	3.8	MCERTS certificate MC050062	U _{iz}	mg/m ³	27.6
cross sensitivity at span	is	% of value	3.9	MCERTS certificate MC050062	U _{is}	mg/m ³	28.3
maximum leak	L	% of value	1.2	day of testing	U _L	mg/m ³	8.4
uncertainty associated with calibration gas	adj	% of value	0.9	span gas calibration certificate	U _{adj}	mg/m ³	5.7
combined MU with O ₂ correction						mg/m ³	49
expanded MU with O ₂ correction (k = 1.96)						mg/m ³	96.1
expanded MU 95% CI with O ₂ correction (k = 1.96) as percentage of measured value						%	7.6
expanded MU 95% CI (k = 1.96) as percentage of measured value for mass emission						%	8.3
expanded MU with O ₂ correction (k = 1.96) as percentage of ELV [allowable 15.4%]						%	9.6
							result
							N/A [>ELV]

† This MU budget calculates the measurement uncertainty (MU) based upon the equipment used and the Standard followed. The reported MU is that specified in the GOV UK Guidance 'Monitoring stack emissions: maximum uncertainty values for periodic monitoring' which is 15% for Total VOCs.

method and sampling deviations
Sampling was performed in full compliance with the Standard, technical procedure and regulatory requirements.

Part 2: Supporting Information - Appendix 2: Oxides of Nitrogen (as NO₂) | Run 1

Results reference conditions are: STP, dry, 5% O₂

parameter	units	result ± MU (95% CI)	units	result ± MU (95% CI)
Oxides of Nitrogen (as NO ₂) †	mg/m ³	446 ± 44.6	g/hr	344 ± 34.4

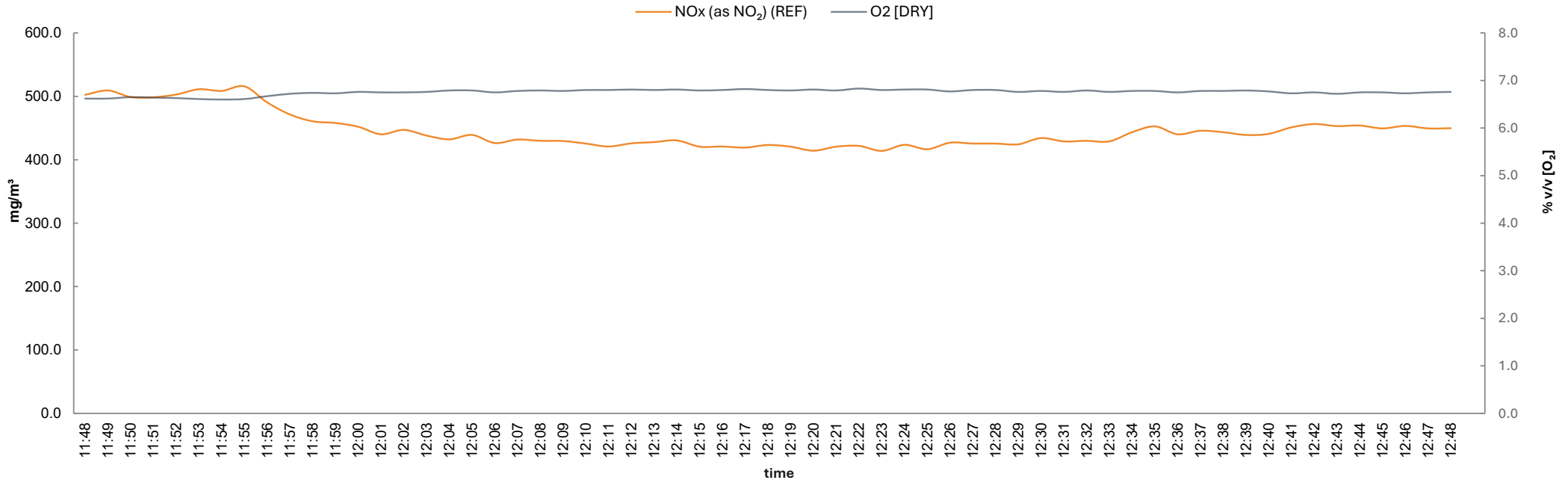
† Maximum value for total uncertainty (10% of measured value) applied to the results

General Information

parameter	details
sampling start date & time	02/06/2026 11:48
sampling end date & time	02/06/2026 12:48
test time mins	60
testing team	AS MBA
standard technical procedure	EN 14792 TP-22a
analyser type	Horiba PG-350E
heated head & line temperature	180°C

parameter	details
probe material	Stainless Steel
filter size, material & location	Heated Head Filter Element PTFE Within Heated Head
number sampling lines available	1
number sampling lines used	1
number sampling points ideal per line	1
number sampling points used per line	1
sampling point IDs	A1

Plot of Emissions Over Time



Part 2: Supporting Information - Appendix 2: Oxides of Nitrogen (as NO₂) | Run 1

Analyser Calibration Information with QA checks

where [A] = at analyser, [L] = down sampling line

CAL ID	pre-test calibration events								post-test calibration events			quality assurance					
	date & time	zero [A] [ppm]	span [A] [ppm]	zero [L] [ppm]	span [L] [ppm]	T ₉₀ [s]	leak [%]		date & time	zero [A] [ppm]	span [A] [ppm]	zero drift [%]		span drift [%]		allowable [%]	temp [°C]
1	02/06/26 10:35	0.00	413.84	0.20	418.60	18	0.0	P	02/06/26 12:55	1.20	416.90	0.2	P	0.5	P	±5	19.5

Analyser Calibration Extended Information

CAL ID	performed by	drift corr. applied	log period [s]	CYL ID	CYL conc. [ppm]	CYL expiry	CYL MU [%]	zero gas type	span [CYL] gas type	span target [ppm]	range [ppm]	LOD [ppm]
1	AS	No	60	A-CYL-252	413.84	14/08/2028	1.2	Nitrogen 5.2	10l 400ppm NO 1600ppm CO 16% CO2 in Nitrogen	413.84	500	0.09

Part 2: Supporting Information - Appendix 2: Oxides of Nitrogen (as NO₂) | Run 1

Measurement Uncertainty (MU) Calculations

general information	units	value
emission limit value (ELV) (REF)	mg/m ³	500
measured concentration (REF)	mg/m ³	446

MU budget			
parameter	units	min	max
ambient temp	°C	19.0	20.0
voltage	V	90.0	130.0

overall MU for O ₂ correction
3.5%

MU factor O ₂ correction
0.04

MU budget input parameters					MU budget		
performance characteristics	symbol	units	value	source	symbol	units	value
repeatability at zero	rz	% of value	0	MCERTS certificate MC130223	U _{rz}	mg/m ³	0
repeatability at span	rs	% of value	0.1	MCERTS certificate MC130223	U _{rs}	mg/m ³	0.45
lack of fit	lof	% of value	2	maximum allowable	U _{lof}	mg/m ³	5.1
maximum short term zero drift (ABS) [after drift correction]	dz	% of value	0.24	day of testing	U _{dz}	mg/m ³	0.62
maximum short term span drift (ABS) [after drift correction]	ds	% of value	0.5	day of testing	U _{ds}	mg/m ³	1.3
influence of sample gas flow	f	% of value	0.1	MCERTS certificate MC130223	U _f	mg/m ³	0.26
influence of sample gas pressure	p	% of value	0	MCERTS certificate MC130223	U _p	mg/m ³	0
influence of ambient temperature zero point (/ 35k)	tz	% of value	0	MCERTS certificate MC130223	U _{tz}	mg/m ³	0
influence of ambient temperature span point (/ 35k)	ts	% of value	1.8	MCERTS certificate MC130223	U _{ts}	mg/m ³	0.076
influence of supply voltage (/ 60V)	v	% of value	0.4	MCERTS certificate MC130223	U _v	mg/m ³	0.69
cross sensitivity at zero	iz	% of value	0.63	MCERTS certificate MC130223	U _{iz}	mg/m ³	1.6
cross sensitivity at span	is	% of value	-0.52	MCERTS certificate MC130223	U _{is}	mg/m ³	-1.3
maximum leak	L	% of value	0	day of testing	U _L	mg/m ³	0
uncertainty associated with calibration gas	adj	% of value	1.2	span gas calibration certificate	U _{adj}	mg/m ³	2.7
combined MU with O ₂ correction						mg/m ³	10.2
expanded MU with O ₂ correction (k = 1.96)						mg/m ³	20
expanded MU 95% CI with O ₂ correction (k = 1.96) as percentage of measured value						%	4.5
expanded MU 95% CI (k = 1.96) as percentage of measured value for mass emission						%	5.6
expanded MU with O ₂ correction (k = 1.96) as percentage of ELV [allowable 10.6%]						%	4
							result
							Pass

† This MU budget calculates the measurement uncertainty (MU) based upon the equipment used and the Standard followed. The reported MU is that specified in the GOV UK Guidance 'Monitoring stack emissions: maximum uncertainty values for periodic monitoring' which is 10% for Oxides of Nitrogen (as NO₂).

method and sampling deviations
Sampling was performed in full compliance with the Standard, technical procedure and regulatory requirements.

Part 2: Supporting Information - Appendix 2: Carbon Monoxide | Run 1

Results reference conditions are: STP, dry, 5% O₂

parameter	units	result ± MU (95% CI)	units	result ± MU (95% CI)
Carbon Monoxide †	mg/m ³	837 ± 50.2	g/hr	647 ± 38.8

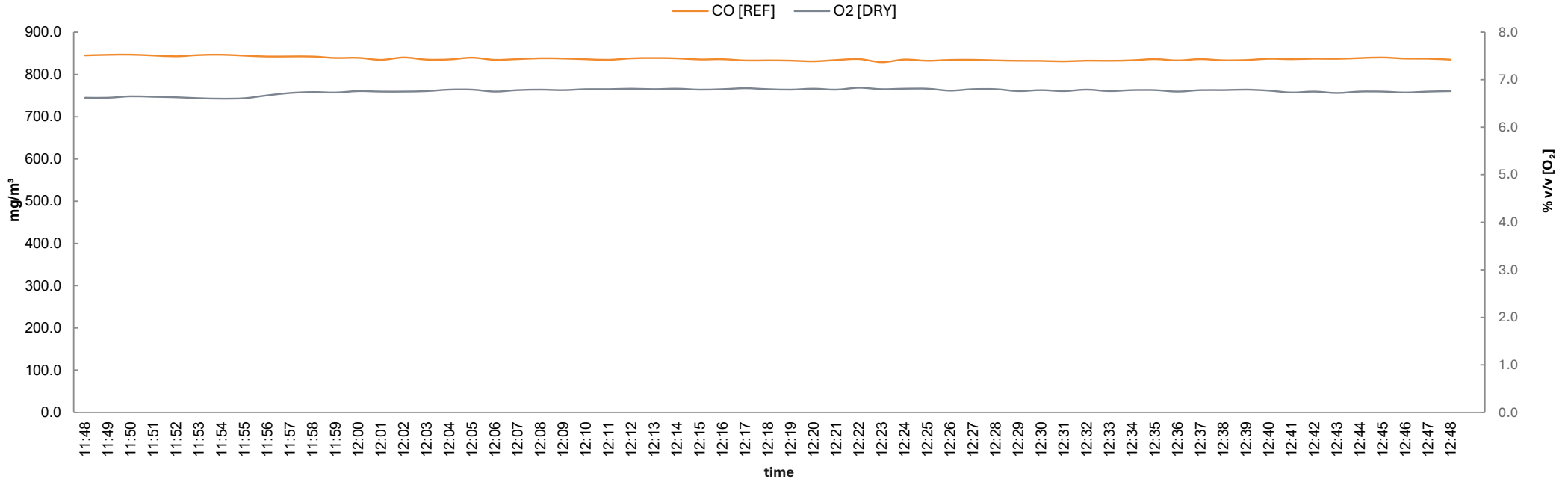
† Maximum value for total uncertainty (6% of measured value) applied to the results

General Information

parameter	details
sampling start date & time	02/06/2026 11:48
sampling end date & time	02/06/2026 12:48
test time mins	60
testing team	AS MBA
standard technical procedure	EN 15058 TP-22b
analyser type	Horiba PG-350E
heated head & line temperature	180°C

parameter	details
probe material	Stainless Steel
filter size, material & location	Heated Head Filter Element PTFE Within Heated Head
number sampling lines available	1
number sampling lines used	1
number sampling points ideal per line	1
number sampling points used per line	1
sampling point IDs	A1

Plot of Emissions Over Time



Part 2: Supporting Information - Appendix 2: Carbon Monoxide | Run 1

Analyser Calibration Information with QA checks

where [A] = at analyser, [L] = down sampling line

CAL ID	pre-test calibration events								post-test calibration events			quality assurance					
	date & time	zero [A] [ppm]	span [A] [ppm]	zero [L] [ppm]	span [L] [ppm]	T ₉₀ [s]	leak [%]		date & time	zero [A] [ppm]	span [A] [ppm]	zero drift [%]		span drift [%]		allowable [%]	temp [°C]
1	02/06/26 10:35	0.00	1688.07	0.00	1664.00	17	1.4	P	02/06/26 12:55	1.00	1658.00	0.0	P	-1.8	P	±5	19.5

Analyser Calibration Extended Information

CAL ID	performed by	drift corr. applied	log period [s]	CYL ID	CYL conc. [ppm]	CYL expiry	CYL MU [%]	zero gas type	span [CYL] gas type	span target [ppm]	range [ppm]	LOD [ppm]
1	AS	No	60	A-CYL-252	1688.07	14/08/2028	1.3	Nitrogen 5.2	10l 400ppm NO 1600ppm CO 16% CO2 in Nitrogen	1688.07	2000	0.32

Part 2: Supporting Information - Appendix 2: Carbon Monoxide | Run 1

Measurement Uncertainty (MU) Calculations

general information	units	value
emission limit value (ELV) (REF)	mg/m ³	1400
measured concentration (REF)	mg/m ³	837

MU budget			
parameter	units	min	max
ambient temp	°C	19.0	20.0
voltage	V	90.0	130.0

overall MU for O ₂ correction
3.5%

MU factor O ₂ correction
0.04

MU budget input parameters					MU budget		
performance characteristics	symbol	units	value	source	symbol	units	value
repeatability at zero	rz	% of value	0.1	MCERTS certificate MC130223	U _{rz}	mg/m ³	0.84
repeatability at span	rs	% of value	0.2	MCERTS certificate MC130223	U _{rs}	mg/m ³	1.7
lack of fit	lof	% of value	2	maximum allowable	U _{lof}	mg/m ³	9.7
maximum short term zero drift (ABS) [after drift correction]	dz	% of value	0.0011	day of testing	U _{dz}	mg/m ³	0.0052
maximum short term span drift (ABS) [after drift correction]	ds	% of value	1.8	day of testing	U _{ds}	mg/m ³	8.6
influence of sample gas flow	f	% of value	0.1	MCERTS certificate MC130223	U _f	mg/m ³	0.48
influence of sample gas pressure	p	% of value	0	MCERTS certificate MC130223	U _p	mg/m ³	0
influence of ambient temperature zero point (/ 35k)	tz	% of value	-0.2	MCERTS certificate MC130223	U _{tz}	mg/m ³	-0.016
influence of ambient temperature span point (/ 35k)	ts	% of value	2	MCERTS certificate MC130223	U _{ts}	mg/m ³	0.16
influence of supply voltage (/ 60V)	v	% of value	0.5	MCERTS certificate MC130223	U _v	mg/m ³	1.6
cross sensitivity at zero	iz	% of value	-0.48	MCERTS certificate MC130223	U _{iz}	mg/m ³	-2.3
cross sensitivity at span	is	% of value	-0.87	MCERTS certificate MC130223	U _{is}	mg/m ³	-4.2
maximum leak	L	% of value	1.4	day of testing	U _L	mg/m ³	6.9
uncertainty associated with calibration gas	adj	% of value	1.3	span gas calibration certificate	U _{adj}	mg/m ³	5.3
combined MU with O ₂ correction						mg/m ³	22.3
expanded MU with O ₂ correction (k = 1.96)						mg/m ³	43.7
expanded MU 95% CI with O ₂ correction (k = 1.96) as percentage of measured value						%	5.2
expanded MU 95% CI (k = 1.96) as percentage of measured value for mass emission						%	6.2
expanded MU with O ₂ correction (k = 1.96) as percentage of ELV [allowable 7%]						%	3.1
							result
							Pass

† This MU budget calculates the measurement uncertainty (MU) based upon the equipment used and the Standard followed. The reported MU is that specified in the GOV UK Guidance 'Monitoring stack emissions: maximum uncertainty values for periodic monitoring' which is 6% for Carbon Monoxide.

method and sampling deviations
Sampling was performed in full compliance with the Standard, technical procedure and regulatory requirements.

Part 2: Supporting Information - Appendix 2: Oxygen | QA Concurrent Testing

Results

parameter	units	result ± MU (95% CI)
Oxygen	% v/v	6.8 ± 0.19

General Information

parameter	details
sampling start date & time	N/A - Concurrent Testing
sampling end date & time	N/A - Concurrent Testing
testing team	AS MBA

parameter	details
standard technical procedure	EN 14789 TP-22d
analyser type	Horiba PG-350E

Analyser Calibration Information with QA checks

where [A] = at analyser, [L] = down sampling line

	pre-test calibration events							post-test calibration events			quality assurance						
CAL ID	date & time	zero [A] [% v/v]	span [A] [% v/v]	zero [L] [% v/v]	span [L] [% v/v]	T ₉₀ [s]	leak [%]		date & time	zero [A] [% v/v]	span [A] [% v/v]	zero drift [%]		span drift [%]	allowable [%]	temp [°C]	
1	02/06/26 10:35	0.00	21.19	0.07	20.96	18	1.1	P	02/06/26 12:55	0.03	21.12	-0.1	P	-0.2	P	±5	19.5

Analyser Calibration Extended Information

CAL ID	performed by	drift corr. applied	log period [s]	CYL ID	CYL conc. [% v/v]	CYL expiry	CYL MU [%]	zero gas type	span [CYL] gas type	span target [% v/v]	range [% v/v]	LOD [% v/v]
1	AS	No	60	A-CYL-273	21.19	27/01/2031	1.2	Nitrogen 5.2	5l Synthetic Air	21.19	25	0.03

Part 2: Supporting Information - Appendix 2: Oxygen | QA Concurrent Testing

Measurement Uncertainty (MU) Calculations

general information	units	value
measured concentration (dry)	% v/v	6.8

MU budget			
parameter	units	min	max
ambient temp	°C	19.0	20.0
voltage	V	90.0	130.0

performance characteristics	MU budget input parameters				MU budget		
	symbol	units	value	source	symbol	units	value
repeatability at zero	rz	% of value	0.02	MCERTS certificate MC130223	U _{rz}	% v/v	0.0014
repeatability at span	rs	% of value	0.02	MCERTS certificate MC130223	U _{rs}	% v/v	0.0014
lack of fit	lof	% of value	2	maximum allowable	U _{lof}	% v/v	0.078
maximum short term zero drift (ABS) [after drift correction]	dz	% of value	0.14	day of testing	U _{dz}	% v/v	0.0055
maximum short term span drift (ABS) [after drift correction]	ds	% of value	0.19	day of testing	U _{ds}	% v/v	0.0074
influence of sample gas flow	f	% of value	-0.01	MCERTS certificate MC130223	U _f	% v/v	-0.00039
influence of sample gas pressure	p	% of value	0	MCERTS certificate MC130223	U _p	% v/v	0
influence of ambient temperature zero point (/ 35k)	tz	% of value	-0.4	MCERTS certificate MC130223	U _{tz}	% v/v	-0.00026
influence of ambient temperature span point (/ 35k)	ts	% of value	-0.15	MCERTS certificate MC130223	U _{ts}	% v/v	-0.000096
influence of supply voltage (/ 60V)	v	% of value	0.02	MCERTS certificate MC130223	U _v	% v/v	0.00052
cross sensitivity at zero	iz	% of value	0	MCERTS certificate MC130223	U _{iz}	% v/v	0
cross sensitivity at span	is	% of value	0	MCERTS certificate MC130223	U _{is}	% v/v	0
maximum leak	L	% of value	1.1	day of testing	U _L	% v/v	0.042
uncertainty associated with calibration gas	adj	% of value	1.2	span gas calibration certificate	U _{adj}	% v/v	0.041
combined MU						% v/v	0.098
expanded MU 95% CI (k = 1.96)						% v/v	0.19
expanded MU 95% CI (k = 1.96) as percentage of measured value						%	2.8

method and sampling deviations
Sampling was performed in full compliance with the Standard, technical procedure and regulatory requirements.

Part 2: Supporting Information - Appendix 2: Velocity & Flow Rate Traverse | Run 1

Supporting Information

parameter	units	value
barometric pressure	kPa	102.3
average wet density	kg/m ³	0.520
average stack static pressure	Pa	222.2
pitot tube coefficient, C _p	-	0.825

ND = Not Detected

NM = Not Measured

Line A

static pressure = 222.2 Pa

Pt	Depth m	ΔP Pa	Temp °C	Vel m/s	Swirl °
1	0.08	450.8	401.8	34.2	

General Information

parameter	details
traverse date	02/06/2026
traverse times performed by	11:01 - 11:04 performed by: AS MBA
standard technical procedure	EN 16911-1 TR 17078 TP-04a
device used	S-type Pitot with KIMO MP 210 (500Pa module)

Limit of Detection (LOD) is 1 m/s for this device combination

Quality Assurance

parameter	details
result of pitot stagnation test	Pass
result of pitot leak check (pre)	Pass
result of pitot leak check (post)	Pass
water droplets present	No

Part 2: Supporting Information - Appendix 2: Velocity & Flow Rate Traverse | Run 1

Measurement Uncertainty (MU) Calculations

ND = Not Detected		
parameter	units	value
standard uncertainty on the coefficient of the pitot tube	-	0.0015
standard uncertainty associated with the mean local dynamic pressures	Pa	7
standard uncertainty associated with the molar mass of the gas	-	0.000066
standard uncertainty associated with the temperature	K	3.4
standard uncertainty associated with the absolute pressure in the duct	Pa	176
standard uncertainty associated with the density of the gas effluent	kg/m ³	0.003
standard uncertainty associated with the local velocities	m/s	0.29
standard uncertainty associated with the mean velocity	m/s	0.29

ND = Not Detected		
parameter	units	value
standard uncertainty associated with the mean velocity (95% CI)	m/s	0.56
standard uncertainty associated with the mean velocity (95% CI), relative	%	1.6
standard uncertainty associated with the volume flow rate @ actual (95% CI)	m ³ /hr	119
standard uncertainty associated with the volume flow rate @ actual (95% CI), relative	%	4.8
standard uncertainty associated with the volume flow rate @ ref 1 (95% CI)	m ³ /hr	37.3
standard uncertainty associated with the volume flow rate @ ref 1 (95% CI), relative	%	4.8

method and sampling deviations
Sampling was performed in full compliance with the Standard, technical procedure and regulatory requirements.