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Stack Emissions Testing Report Commissioned by
Duynie Ingredients

Installation Name & Address
Duynie Ingredients
Coed Abden Road
Wrexham Industrial Estate
Wrexham
LL13 9UH

Stack Reference
Horizontal Reactor

Dates of the Monitoring Campaign
25th - 26th September 2025

Job Reference Number
EMT14377

Report Written by
Stephen Taylor Team Leader MCERTS Level 2 MM 23 1803 TE1 TE3 & TE4

Report Approved by
Donal O Faogain Technical Report Writer MCERTS Level 2 MM13 1259 TE1 TE2 TE3 TE4

Report Date
8th October 2025

Version
Version 1

Signature of Report Approver


CONTENTS

Opinions and interpretations expressed herein are outside the scope of Element's ISO 17025 accreditation.

MONITORING OBJECTIVES

Duynie Ingredients , Wrexham
Horizontal Reactor
25th - 26th September 2025

Overall Aim of the Monitoring Campaign

Element were commissioned by Duynie Ingredients to carry out stack emissions testing on the Horizontal Reactor at Wrexham.

The aim of the monitoring campaign was to perform testing, as requested by the customer, for a number of prescribed pollutants. There are no emission limits set for any of the pollutants at this time.

Special Requirements

There were no special requirements.

Target Parameters

Total Particulate Matter, Hydrogen Chloride, Total VOCs (as Carbon)

MONITORING RESULTS

Duynie Ingredients , Wrexham
Horizontal Reactor
25th - 26th September 2025

where MU = Measurement Uncertainty associated with the Result

	Concentration				Mass Emission			
Parameter	**Units**	**Result**	**MU +/-**	**Limit**	**Units**	**Result**	**MU +/-**	**Limit**
Total Particulate Matter [1]	mg/m³	0.67	0.51	-	g/hr	0.15	0.14	-
Hydrogen Chloride [1]	mg/m³	0.02	0.0012	-	g/hr	0.0049	0.0025	-
Total VOCs (as Carbon) [1]	mg/m³	4.7	0.55	-	g/hr	1.1	0.6	-
Water Vapour	% v/v	6.6	0.40					
Stack Gas Temperature	°C	42.8						
Stack Gas Velocity	m/s	2.3	1.2					
Volumetric Flow Rate (ACTUAL)	m³/hr	258	133					
Volumetric Flow Rate (REF) [1]	m³/hr	225	116					

NOTE: VOLUMETRIC FLOW RATE & VELOCITY DATA TAKEN FROM AN AVERAGE OF ALL OF THE ISOKINETIC RUNS.

[1] Reference Conditions (REF) are: 273K, 101.3kPa, without correction for water vapour content.

MONITORING DATE(S) & TIMES

Duynie Ingredients , Wrexham
Horizontal Reactor
25th - 26th September 2025

Parameter		Units	Concentration	Units	Mass Emission	Sampling Date(s)	Sampling Times	Duration mins
Total Particulate Matter	R1	mg/m³	0.67	g/hr	0.15	26/09/2025	09:56 - 10:41	45
Hydrogen Chloride	R1	mg/m³	0.02	g/hr	0.0049	26/09/2025	09:56 - 10:41	45
Total VOCs (as Carbon)	R1	mg/m³	4.7	g/hr	1.1	26/09/2025	09:56 - 10:41	45
Velocity Traverse	R1					26/09/2025	09:40 - 09:45	

All results are expressed at the respective reference conditions.

PROCESS DETAILS

Duynie Ingredients , Wrexham
Horizontal Reactor
25th - 26th September 2025

Standard Operating Conditions

Parameter	Value
Process Status	Normal Operating Capacity
Capacity (of 100%) and Tonnes / Hour	Standard Capacity
Continuous or Batch Process	Batch
Feedstock (if applicable)	0
Abatement System	N/A
Abatement System Running Status	N/A
Fuel	N/A
Plume Appearance	None visable

MONITORING & ANALYTICAL METHODS

Duynie Ingredients , Wrexham
Horizontal Reactor
25th - 26th September 2025

	Monitoring				Analysis					
Parameter	**Standard**	**Technical Procedure**	**Sampling Status**	**Testing Lab**	**Analytical Procedure**	**Analytical Technique**	**Analysis Status**	**Analysis Lab**	**Overall Status**	**LOD (Average)**
Total Particulate Matter	EN 13284-1	MD 001	MCERTS	EET	MD 103	Gravimetric	MCERTS	EET	MCERTS	0.21 mg/m³
Hydrogen Chloride	EN 1911	MD 011	MCERTS	EET	MD 101	IC	MCERTS	EET	MCERTS	0.019 mg/m³
Water Vapour	EN 14790	MD 005	MCERTS	EET	MD 005	Gravimetric	MCERTS	EET	MCERTS	0.10 % v/v
Total VOCs (as Carbon)	EN 12619:2013	MD 020	MCERTS	EET	Flame Ionisation Detection by Sick 3006				MCERTS	0.32 mg/m³
Velocity & Vol. Flow Rate	EN 16911-1 (MID)	MD 041	MCERTS	EET	Pitot Tube and Thermocouple				MCERTS	1.2 m/s

ANALYSIS LABORATORIES

(with short name reference as appears in the table above)

Element (Stockport Lab - EET)	ISO 17025 Accreditation Number: UKAS 4279

SUMMARY OF SAMPLING DEVIATIONS

Parameter	Run	Deviation
Velocity & Vol. Flow Rate, TPM	1	Lowest differential pressure < 5 Pa.

SUITABILITY OF SAMPLING LOCATION

Duct Characteristics

Parameter	Units	Value
Type	-	Circular
Depth	m	0.20
Width	m	-
Area	m²	0.03
Port Depth	cm	8
Orientation of Duct	-	Horizontal
Number of Ports	-	1
Sample Port Size	-	4" BSP

Location of Sampling Platform

General Platform Information	Value
Permanent / Temporary Platform	Permanent
Inside / Outside	Inside

Platform Details

EA Technical Guidance Note M1 / EN 15259 Platform Requirements	Value
Sufficient working area to manipulate probe and operate the measuring instruments	Yes
Platform has 2 levels of handrails (approx. 0.5m & 1.0m high)	Yes
Platform has vertical base boards (approx. 0.25m high)	Yes
Platform has chains / self closing gates at top of ladders	N/A
There are no obstructions present which hamper insertion of sampling equipment	Yes
Safe Access Available	Yes
Easy Access Available	Yes

Sampling Location / Platform Improvement Recommendations

Correct size port to be installed.

EN 15259 Homogeneity Test Requirements

There is no requirement to perform a EN 15259 Homogeneity Test on this Stack.

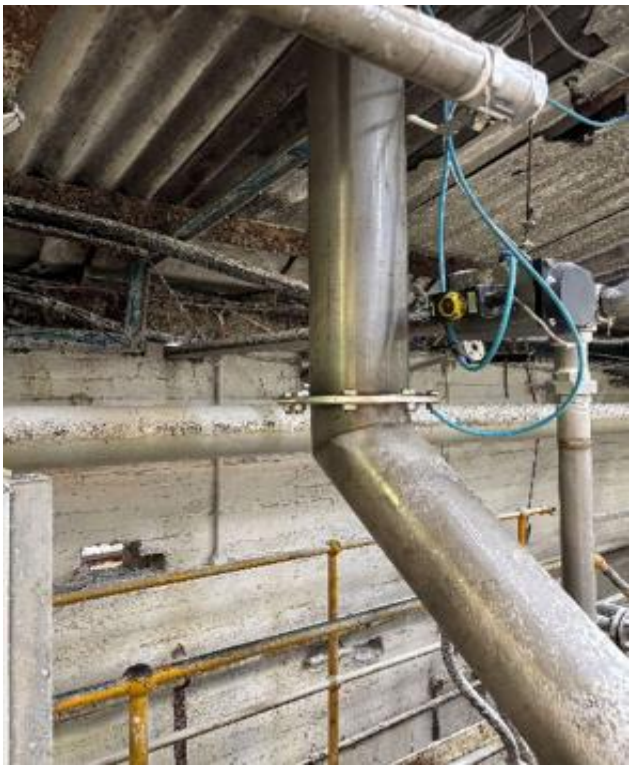
Sampling Plane Validation Criteria (from EN 15259)

Criteria in EN 15259	Units	Traverse 1	Required	Compliant
Lowest Differential Pressure	Pa	2.0	> 5 Pa	No
Mean Velocity	m/s	1.63	-	-
Lowest Gas Velocity	m/s	1.63	-	-
Highest Gas Velocity	m/s	1.63	-	-
Ratio of Above	: 1	1.00	< 3 : 1	Yes
Maximum Angle of Swirl	°	0.00	< 15°	Yes
No Local Negative Flow	-	Yes	-	Yes

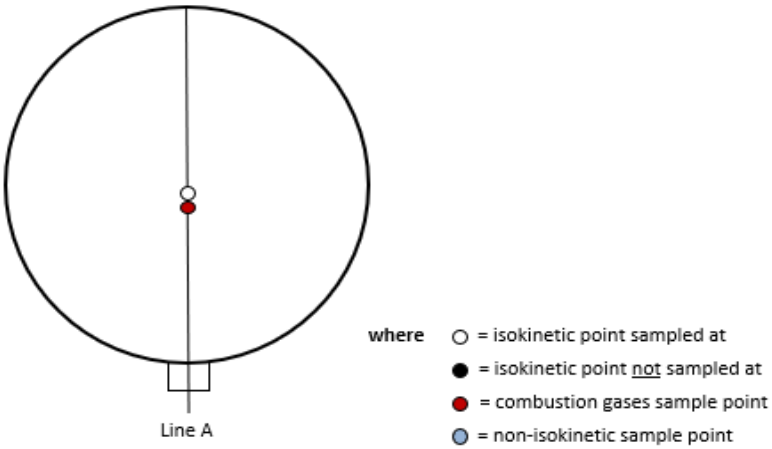
PLANT PHOTOS

Photo 1

Photo 2



SAMPLE POINTS



APPENDIX CONTENTS

STACK EMISSIONS MONITORING PERSONNEL

Position	Name	MCERTS Accreditation	MCERTS Number	Technical Endorsements
Team Leader	Stephen Taylor	MCERTS Level 2	MM 23 1803	TE1 TE3 & TE4
Technician	Tom Dixon	MCERTS Level 1	MM 23 1802	TE1

LIST OF EQUIPMENT

Extractive Sampling	
Equipment Type	**Equipment I.D.**
Control Box DGM (1)	CAT 7.95
Control Box DGM (2)	-
Box Thermocouples (1)	-
Box Thermocouples (2)	-
Umbilical (1)	-
Umbilical (2)	-
Oven Box (1)	-
Oven Box (2)	-
Heated Probe (1)	-
Heated Probe (2)	-
Heated Probe (3)	-
S-Pitot (1)	CAT 21P.134
S-Pitot (2)	CAT 21S.71
L-Pitot	-
Site Balance	CAT 17.108
500g / 1Kg Check Weights	CAT 17.108
Last Impinger Arm	-
Callipers	CAT 23.53
Tubes Kit Thermocouple	-

Instrumental Analysers	
Equipment Type	**Equipment I.D.**
Horiba PG-250	-
Horiba PG-250	-
Servomex 4900	-
Eco Physics CLD 822Mh	-
ABB AO2020-URAS26	-
Testo 350 XL	-
JCT JCC P1 Cooler	-
Gasmet DX4000	-
Gasmet Sampling System	-
Sick 3006	CAT 8.33
M&C PSS	CAT 12.174
Mass Flow Controller (1)	CAT 6.23
Mass Flow Controller (2)	CAT 6.24
Mass View (1)	CAT 25.94
Mass View (2)	CAT 25.121
Hioki 5043 (V)	CAT 11.103
Easylogger EN-EL-12 Bit	-
Bioaerosols Temperature Logger	-
Electronic Refrigerator	-

Miscellaneous Items	
Equipment Type	**Equipment I.D.**
Digital Manometer 500	CAT 3.265
Digital Manometer 10000	-
Digital Temperature Meter	-
Stopwatch	CAT 14.98
Barometer	CAT 13.62
Stack Thermocouple 0.5m	-
Stack Thermocouple 1.0m	-
Stack Thermocouple 1.5m	-
1m Heated Line (1)	-
1m Heated Line (2)	-
1m Heated Line (3)	-
5m Heated Line (1)	-
15m Heated Line (1)	-
20m Heated Line (1)	CAT 20.277
20m Heated Line (2)	-
Dual Channel Heater Controller	-
Single Channel Heater Controller	-
Laboratory Balance	CAT 1.18, 1.18a, 1.18b
Tape Measure	CAT 16.58

METHODS & TECHNICAL PROCEDURES USED

Parameter	Standard	Technical Procedure
Total Particulate Matter	EN 13284-1	MD 001
Hydrogen Chloride	EN 1911	MD 011
Water Vapour	EN 14790	MD 005
Total VOCs (as Carbon)	EN 12619:2013	MD 020
Velocity & Vol. Flow Rate	EN 16911-1 (MID)	MD 041

PRELIMINARY STACK SURVEY: CALCULATIONS

General Stack Details

Stack Details (from Traverse)	Units	Value
Stack Diameter / Depth, D	m	0.20
Stack Width, W	m	-
Stack Area, A	m^2	0.03
Average Stack Gas Temperature, T_a	°C	44.0
Average Stack Gas Pressure	Pa	2.0
Average Stack Static Pressure, P_{static}	kPa	0.000
Average Barometric Pressure, P_b	kPa	102.3
Average Pitot Tube Calibration Coefficient, C_p	-	0.85

Stack Gas Composition & Molecular Weights

Component	Conc ppm	Conc Dry % v/v	Conc Wet % v/v	Volume Fraction r	Molar Mass M	Density kg/m^3 p	Conc kg/m^3 p_i
CO_2 (Estimated)	-	0.06	0.06	0.0006	44.01	1.9635	0.00118
O_2 (Estimated)	-	20.80	19.42	0.2080	32.00	1.4277	0.29696
N_2	-	79.14	73.90	0.7914	28.01	1.2498	0.98913
Moisture (H_2O)	-	-	6.62	0.0662	18.02	0.8037	0.05321

Where: $p = M / 22.41$

$p_i = r \times p$

Calculation of Stack Gas Densities

Determinand	Units	Result
Dry Density (STP), P_{STD}	kg/m^3	1.287
Wet Density (STP), P_{STW}	kg/m^3	1.255
Dry Density (Actual), P_{Actual}	kg/m^3	1.120
Average Wet Density (Actual), $P_{ActualW}$	kg/m^3	1.092

Where: P_{STD} = sum of component concentrations, kg/m^3 (not including water vapour)

P_{STW} = sum of all wet concentrations / 100 x density, kg/m^3 (including water vapour)

$P_{Actual} = P_{STD} \times (T_{STP} / (P_{STP})) \times ((P_{static} + P_b) / T_a)$

$P_{ActualW}$ (at each sampling point) $= P_{STW} \times (T_s / P_s) \times (P_a / T_a)$

Calculation of Stack Gas Volumetric Flowrate, Q

Duct gas flow conditions	Units	Actual	REF [1]
Temperature	°C	44.0	0.0
Total Pressure	kPa	102.3	101.3
Moisture	%	6.62	6.62

Gas Volumetric Flowrate (from Traverse)	Units	Result
Gas Volumetric Flowrate (Actual)	m^3/hr	184
Gas Volumetric Flowrate (STP, Wet)	m^3/hr	160
Gas Volumetric Flowrate (STP, Dry)	m^3/hr	149
Gas Volumetric Flowrate REF [1]	m^3/hr	160

PRELIMINARY STACK SURVEY: VELOCITY TRAVERSE TO EN 16911-1 (MID)

(1 of 1)

Parameter	Units	Value
Date of Survey	-	26/09/2025
Time of Survey	-	09:40 - 09:45
Atmospheric Pressure	kPa	102.3
Average Stack Static Pressure	Pa	0
Result of Pitot Stagnation Test	-	Pass
Are Water Droplets Present?	-	Yes
Device Used	S-Type Pitot with KIMO MP 210 (500Pa)	

Parameter	Units	Value
Initial Pitot Leak Check	-	Pass
Final Pitot Leak Check	-	Pass
Orientation of Duct	-	Horizontal
Pitot Tube, C_p	-	0.85
Number of Lines Available	-	1
Number of Lines Used	-	1

Sampling Line A

Traverse Point	Depth m	ΔP Pa	Temp °C	Wet Density kg/m³	Velocity m/s	Swirl °
STATIC (Units: Pa)		*-0.2*				
Mean		**2.0**	**44.0**	**1.092**	**1.63**	
1	0.10	2.0	44.0	1.092	1.63	0.0

PRELIMINARY STACK SURVEY: VELOCITY TRAVERSE TO EN 16911-1 (MID) - MEASUREMENT UNCERTAINTY

(1 of 1)

Performance characteristics (Uncertainty Components)	Uncertainty	Value	Units
Standard Uncertainty on the coefficient of the Pitot Tube	u(k)	0.005	-
Standard Uncertainty associated with the mean local dynamic pressures	u(Δpi)	1.045	Pa
- Resolution	u(res)	0.00087	
- Calibration	u(cal)	0.000	
- Drift	u(drift)	0.083	
- Lack of Fit	u(fit)	0.008	
- Overall corrections to dynamic measurements	u(Cf)	0.092	
Standard uncertainty associated with the molar mass of the gas	u(M)	0.00004	-
- $\varphi O_2,w$	-	19.423	
- $\varphi CO_2,w$	-	0.056	
- Oxygen, dry	u(ϕO_2,d)	0.637	
- Carbon Dioxide, dry	u(ϕCO_2,d)	0.002	
- Water Vapour	u(ϕH_2O)	0.338	
- Oxygen, wet	u(ϕO_2,w)	0.599	
- Carbon Dioxide, wet	u(ϕCO_2,w)	0.002	
Standard uncertainty associated with the stack temperature	u(Tc)	1.617	K
Standard uncertainty associated with the absolute pressure in the duct	u(pc)	175.695	Pa
- Atmospheric Pressure	u(patm)	175.692	
- Static Pressure	u(pstat)	1.045	
Standard uncertainty associated with the density in the duct	u(ρ)	0.00609	-
Standard uncertainty associated with the local velocities	u(vi)	0.427	Pa
Standard uncertainty associated with the mean velocity	u(v)	0.427	m/s
Standard uncertainty associated with the mean velocity (95% Confidence)	Uc(v)	0.838	m/s
Standard uncertainty associated with the mean velocity (95% Confidence), relative	Uc,rel(v)	51.46	%
Standard uncertainty associated with the volume flow rate (95% Confidence)	Uc(qV,w)	95.1	m^3/hr
- $u^2(a)/a^2$	-	0.00053	
- $u^2(qV,w)/q^2V,w$	-	0.06947	
- $u^2(qV,w)$	-	2354	
- $u(qV,w)$	-	48.5	
Standard uncertainty associated with the volume flow rate (95% Confidence), relative	Uc,rel(qV,w)	51.66	%

TOTAL PARTICULATE MATTER: RESULTS SUMMARY

Duynie Ingredients , Wrexham
Horizontal Reactor

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	0.67		0.67
Uncertainty	±mg/m³	0.51		0.51
Mass Emission	g/hr	0.15		0.15
Uncertainty	±g/hr	0.14		0.14

Parameter	Units	Run 1		Mean
Water Vapour	% v/v	6.62		6.62
Uncertainty	±% v/v	0.40		0.40

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	0.21		0.21

NOTE: Where the Balance Uncertainty / Limit of Detection is higher than the Blank concentration, the Balance Uncertainty / Limit of Detection concentration has been reported.

General Sampling Information

Parameter	Value	
Standard	EN 13284-1	
Technical Procedure	MD 001	
Probe Material	Titanium	
Filter Housing Material	Titanium	
Positioning of Filter	Out Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

TOTAL PARTICULATE MATTER: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	767.3
Stack static pressure, P_{static}	mmH_2O	0.0
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	767.3
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	52.3
Total mass collected in impingers (silica trap)	g	5.4
Total mass of liquid collected, V_{lc}	g	57.7
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0719
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	1.0208
Gas meter correction factor, Y_d	-	1.0500
Average dry gas meter temperature, T_m	°C	19.9
Average pressure drop across orifice, ΔH	mmH_2O	55.7
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.0142
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0662
B_{wo} as a percentage	% v/v	6.62
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	6.62
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.0861
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$		
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A
% oxygen reference condition, $REF\%O_2$	% v/v	N/A
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A
Molecular weight of dry gas stream, M_d		
CO_2 (Estimated)	% v/v	0.06
O_2 (Estimated)	% v/v	20.80
Total	% v/v	20.86
N_2	% v/v	79.14
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84
Molecular weight of stack gas (wet), M_s		
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.12
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.85
Average of velocity heads, ΔP_{avg}	mmH_2O	0.40
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	0.63
Average stack gas temperature, T_s	°C	42.8
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	2.28
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})		
Area of stack, A_s	m^2	0.03
$Q_a = (60)(A_s)(V_s)$	m^3/min	4.3
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	3.8
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	3.5
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	N/A
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	16.01
Nozzle area, A_n	mm^2	201.40
Total sampling time, q	min	45
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	100.4

TOTAL PARTICULATE MATTER: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	09:56 - 10:41
Sampling Dates	-	26/09/2025
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	1.0861
Filter I.D. Number	-	47-109695
Start Filter Mass	g	0.14764
End Filter Mass	g	0.14811
Total Mass on Filter	g	0.00047
Probe Rinse I.D. Number	-	PR-47-109695
Start Probe Rinse Mass	g	2.91689
End Probe Rinse Mass	g	2.91714
Total Mass in Probe Rinse	g	0.00025
Total Mass Collected	mg	0.72
Calculated Concentration	mg/m^3	0.67
Balance Uncertainty / LOD	mg/m^3	0.21

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	26/09/2025
Average Volume Sampled (REF)	m^3	1.0861
Filter I.D. Number	-	47-109684
Start Filter Mass	g	0.14615
End Filter Mass	g	0.14618
Total Mass on Filter	g	0.00003
Probe Rinse I.D. Number	-	PR-47-109684
Start Probe Rinse Mass	g	2.88706
End Probe Rinse Mass	g	2.88695
Total Mass in Probe Rinse	g	-0.00011
Total Mass Collected	mg	-0.08
Calculated Concentration	mg/m^3	-0.08
Balance Uncertainty / LOD	mg/m^3	0.21

TOTAL PARTICULATE MATTER: QUALITY ASSURANCE

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	23.8
Pre-Sampling Leak Rate	l/min	0.34
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	6.1
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1
Less than 50% Faded	%	Yes

Isokinetic Criterion Compliance	Units	Run 1
Isokinetic Variation	%	100.4
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Weighing Uncertainty Criteria	Units	Run 1
Overall Weighing Uncertainty	± mg	0.33
Overall Weighing Uncertainty	± mg/m³	0.30
ELV [Daily ELV for IED]	mg/m³	N/A
Allowable Weighing Uncertainty	mg/m³	N/A
Weighing Uncertainty Acceptable	-	N/A

Filter Temperatures	Units	Run 1
Pre-Conditioning Temperature	°C	180
Post-Conditioning Temperature	°C	160
Maximum Filter Temperature	°C	120

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

TOTAL PARTICULATE MATTER: QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.24
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m³	N/A
Blank Acceptable	-	N/A

Acetone / Water Rinse Blank	Units	Blank
Acetone / Water Rinse Value	mg/l	2.7
Allowable Blank	mg/l	10
Blank Acceptable	-	Yes

Method Deviations

Nature of Deviation (x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	Run Number 1	
Lowest differential pressure < 5 Pa.	wx	
Only one out of two required sampling lines was available.		

TOTAL PARTICULATE MATTER: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	1.0208	uV_m	m³	0.0204
Sampled Gas Temperature	T_m	292.9	uT_m	K	2.00
Sampled Gas Pressure	ρ_m	102.3	$u\rho_m$	kPa	0.50
Sampled Gas Humidity	H_m	0.00	uH_m	% v/v	1.00
Leak	L	1.43	uL	%	-
Mass of Particulate	m	0.72	um	mg	0.23
Uncollected Mass	UCM	-0.08	uUCM	mg	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.68	≤1%
Sampled Gas Pressure	%	0.49	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	1.43	≤2%
Mass of Particulate	%	-	-
Uncollected Mass	%	-	-

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m³	1.0142	0.66
Leak	L	mg/m³	0.005	1.00
Mass of Particulate	L_r	mg	0.723	0.92
Uncollected Mass	UCM	mg	-0.05	0.92

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m³	0.016
Leak	mg/m³	0.0055
Mass of Particulate	mg/m³	0.2118
Uncollected Mass	mg/m³	-0.0443

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	-	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m³	0.22
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m³	0.43
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m³	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m³	0.51
Reported Uncertainty	mg/m³	0.51
Expanded uncertainty (95% confidence), without Oxygen Correction	%	63.9
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	76.6
Reported Uncertainty	%	76.6
Reported Uncertainty as % of ELV	%	N/A

HYDROGEN CHLORIDE: RESULTS SUMMARY

Duynie Ingredients , Wrexham
Horizontal Reactor

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	0.02		0.02
Uncertainty	±mg/m³	0.0012		0.0012
Mass Emission	g/hr	0.0049		0.0049
Uncertainty	±g/hr	0.0025		0.0025

Parameter	Units	Run 1		Mean
Water Vapour	% v/v	6.6		6.6
Uncertainty	±% v/v	0.40		0.40

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	< 0.01		< 0.01

General Sampling Information

Parameter	Value	
Standard	EN 1911	
Technical Procedure	MD 011	
Name of Analytical Laboratory	EET	
Analytical Laboratory's Procedure	MD 101	
ISO 17025 Accredited Analysis?	MCERTS	
Date of Sample Analysis	01/10/2025	
Probe Material	Titanium	
Filter Housing Material	Titanium	
Impinger Material	Polyethylene	
Absorption Solution	HPLC Grade Water	
Positioning of Filter	Out Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

HYDROGEN CHLORIDE: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	767.3
Stack static pressure, P_{static}	mmH_2O	0.0
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	767.3
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	52.3
Total mass collected in impingers (silica trap)	g	5.4
Total mass of liquid collected, V_{lc}	g	57.7
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0719
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	1.0208
Gas meter correction factor, Y_d	-	1.0500
Average dry gas meter temperature, T_m	°C	19.9
Average pressure drop across orifice, ΔH	mmH_2O	55.7
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.0142
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0662
B_{wo} as a percentage	% v/v	6.62
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	6.62
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.0861
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$		
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A
% oxygen reference condition, $REF\%O_2$	% v/v	N/A
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A
Molecular weight of dry gas stream, M_d		
CO_2 (Estimated)	% v/v	0.06
O_2 (Estimated)	% v/v	20.80
Total	% v/v	20.86
N_2	% v/v	79.14
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84
Molecular weight of stack gas (wet), M_s		
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.12
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.85
Average of velocity heads, ΔP_{avg}	mmH_2O	0.40
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	0.63
Average stack gas temperature, T_s	°C	42.8
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	2.28
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})		
Area of stack, A_s	m^2	0.03
$Q_a = (60)(A_s)(V_s)$	m^3/min	4.3
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	3.8
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	3.5
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	N/A
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	16.01
Nozzle area, A_n	mm^2	201.40
Total sampling time, q	min	45
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	100.4

HYDROGEN CHLORIDE: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	09:56 - 10:41
Sampling Dates	-	26/09/2025
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	1.0861
Laboratory Result for Front Impingers	µg/ml	0.06
Laboratory Result for Back Impinger	µg/ml	< 0.05
Volume in Front Impingers	ml	286.8
Volume in Back Impinger	ml	128.2
Mass in Front Impingers	µg	17.2
Mass in Back Impinger	µg	< 6.4
Total Mass Collected	µg	23.6
Calculated Concentration	mg/m^3	0.02

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	26/09/2025
Average Volume Sampled (REF)	m^3	1.0861
Laboratory Result for Impingers	µg/ml	< 0.05
Volume in Impingers	ml	313.5
Total Mass Collected	µg	< 15.7
Calculated Concentration	mg/m^3	< 0.01

HYDROGEN CHLORIDE: QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	23.8
Pre-Sampling Leak Rate	l/min	0.34
Post-Sampling Leak Rate	l/min	N/A
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Absorption Efficiency	Units	Run 1
Absorption Efficiency	%	100.0
Allowable Absorption Efficiency	%	N/A [1]
Absorption Efficiency Acceptable	-	Yes [1]

[1] The concentration in the last absorber was less than 5 times the analytical detection limit.

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	6.1
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1
Less than 50% Faded	%	Yes

Isokinetic Criterion Compliance	Units	Run 1
Isokinetic Variation	%	100.4
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Filter Temperatures	Units	Run 1
Maximum Filter Temperature	°C	120

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

HYDROGEN CHLORIDE: QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.24
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m^3	N/A
Blank Acceptable	-	N/A

Method Deviations

Nature of Deviation	Run Number	
(x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	1	

HYDROGEN CHLORIDE: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	1.0208	uV_m	m³	0.0204
Sampled Gas Temperature	T_m	292.9	uT_m	K	2.00
Sampled Gas Pressure	ρ_m	102.3	$u\rho_m$	kPa	0.50
Sampled Gas Humidity	H_m	0.00	uH_m	% v/v	1.00
Leak	L	1.43	uL	%	-
Laboratory Result	L_r	1.05	uL_r	%	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.68	≤1%
Sampled Gas Pressure	%	0.49	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	1.43	≤2%
Laboratory Result	%	1.05	No Requirement

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m³	1.0142	0.02
Leak	L	mg/m³	0.000	1.00
Laboratory Result	L_r	mg/m³	0.000	1.00

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m³	0.001
Leak	mg/m³	0.0002
Laboratory Result	mg/m³	0.0002

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	-	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m³	0.00
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m³	0.00
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m³	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m³	0.00
Reported Uncertainty	mg/m³	0.00
Expanded uncertainty (95% confidence), without Oxygen Correction	%	5.4
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	5.4
Reported Uncertainty	%	5.4
Reported Uncertainty as % of ELV	%	N/A

TOTAL VOCs (as CARBON): RESULTS SUMMARY

Duynie Ingredients , Wrexham
Horizontal Reactor

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	4.7		4.7
Uncertainty	±mg/m³	0.55		0.55
Mass Emission	g/hr	1.1		1.1
Uncertainty	±g/hr	0.563		0.563

General Sampling Information

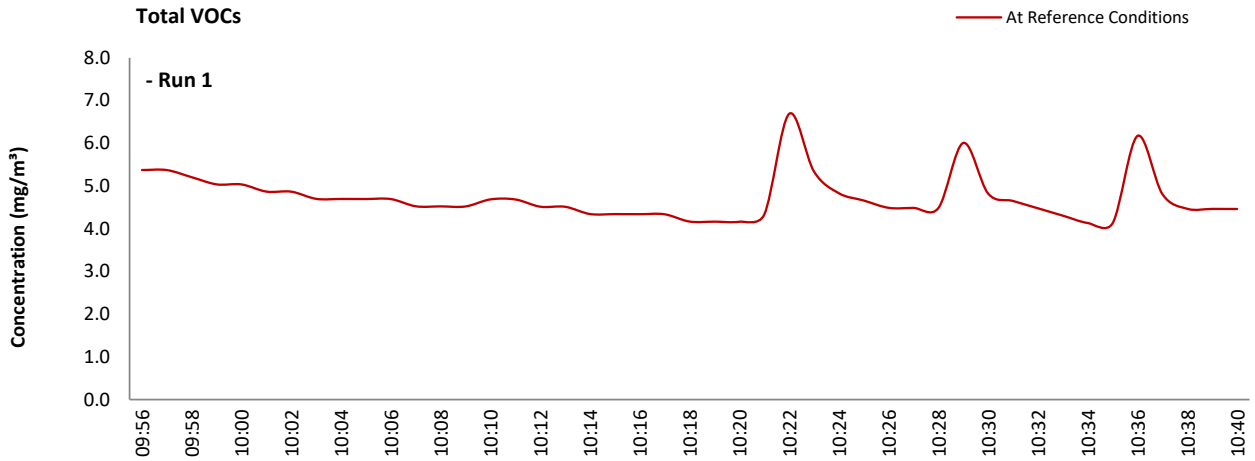
Parameter	Value	
Standard	EN 12619:2013	
Technical Procedure	MD 020	
Probe Material	Stainless Steel	
Filtration Type / Size	0.1µm Glass Fibre	
Heated Head Filter Used	Yes	
Heated Line Temperature	180°C	
Span Gas Type	Propane In Synthetic Air (5 Grade)	
Span Gas Reference Number	1.0625	
Span Gas Expiry Date	07/10/2029	
Span Gas Start Pressure (bar)	110	
Gas Cylinder Concentration (ppm)	80.4	
Span Gas Set Point (ppm)	80.40	
Span Gas Uncertainty (%)	2	
Zero Gas Type	Synthetic Air (5 Grade)	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

TOTAL VOCs (as CARBON): DATA TREND

Graphical Trend of Data



TOTAL VOCs (as CARBON): SAMPLING DETAILS & QUALITY ASSURANCE

Sampling Details

Parameter	Units	Run 1
Sampling Times	-	09:56 - 10:41
Sampling Dates	-	26/09/2025
Instrument Range	ppm	100
Span Gas Value	ppm	80.4

Quality Assurance

	Zero Drift	Units	Run 1
CAL 1	Zero Down Sampling Line (Pre)	ppm	0.10
CAL 1	Zero Down Sampling Line (Post)	ppm	0.30
CAL 1	Zero Drift	ppm	0.20
CAL 1	Zero Drift	%	0.25
CAL 1	Drift Correction Applied	2-5%	No
	Allowable Zero Drift	± ppm	4.02
	Zero Drift Acceptable	-	Yes

	Span Drift	Units	Run 1
CAL 1	Span Down Sampling Line (Pre)	ppm	79.10
CAL 1	Span Down Sampling Line (Post)	ppm	75.70
CAL 1	Span Drift	ppm	-3.40
CAL 1	Span Drift	%	-4.30
CAL 1	Drift Correction Applied	2-5%	Yes
	Allowable Span Drift	± ppm	4.02
	Span Drift Acceptable	-	Yes

Test Conditions	Units	Run 1
Run Ambient Temperature Range	°C	16 - 17

Method Deviations

Nature of Deviation (x = deviation applies to the associated run)	Run Number 1	
Lowest differential pressure < 5 Pa.	x	

TOTAL VOCs (as CARBON): MEASUREMENT UNCERTAINTY CALCULATIONS

Performance characteristics	RUN 1		Units
Limit value	-		mg/m³ (REF)
Allowable MU	15.0		%
Measured concentration	5.06		mg/m³ (STP, dry)
Range Used	100.0		ppm
Range Used [A]	160.6		mg/m³
Cal gas conc.	80.4		ppm
Conversion	1.61		ppm to mg/m³
MCERTS Range [B]	15.0		mg/m³
Lower of [A] or [B]	15.0		mg/m³
Cal gas conc.	129.1		mg/m³

Performance characteristics	RUN 1		Units
Response time	45		seconds
Number of readings in measurement	45		-
Repeatability at zero	2.00		% full scale
Repeatability at span level	0.00		% full scale
Deviation from linearity	0.51		% of value
Zero drift	0.25		% full scale
Span drift	0.00		% full scale
Volume or pressure flow dependence	1.60		% of full scale
Atmospheric pressure dependence	0.30		% of value/kPa
Ambient temperature dependence	1.40		% full scale/10K
Combined interference	0.45		% range
Dependence on voltage	0.50		% full scale/10V
Losses in the line (leak)	1.62		% of value
Uncertainty of calibration gas	2.00		% of value

Performance characteristic	RUN 1		Units
Standard deviation of repeatability at zero	use rep at span		mg/m³
Standard deviation of repeatability at span level	0.00		mg/m³
Lack of fit	0.04		mg/m³
Drift	0.19		mg/m³
Volume or pressure flow dependence	0.00		mg/m³
Atmospheric pressure dependence	0.01		mg/m³
Ambient temperature dependence	0.20		mg/m³
Combined interference (from MCERTS Certificate)	0.04		mg/m³
Dependence on voltage	0.06		mg/m³
Losses in the line (leak)	0.05		mg/m³
Uncertainty of calibration gas	0.06		mg/m³

			RUN 1		Units
Measurement uncertainty		**Result**	5.06		mg/m³
Combined uncertainty			0.30		mg/m³
Expanded uncertainty	k =	1.96	0.58		mg/m³
Uncertainty corrected to std conds. (O_2)			0.58		mg/m³ (REF)

	RUN 1		Units
Expanded uncertainty (no O_2) - at 95% Confidence	11.56		% of Value
Expanded uncertainty (no O_2) - at 95% Confidence	N/A		% at ELV
Overall Allowable uncertainty (no O_2) - at 95% Confidence	N/A		% at ELV
Result of Compliance with Uncertainty Requirement	**N/A**		-

	RUN 1		Units
Expanded uncertainty (with O_2) - at 95% Confidence	N/A		% of Value
Expanded uncertainty (with O_2) - at 95% Confidence	N/A		% at ELV
Overall Allowable uncertainty (with O_2) - at 95% Confidence	N/A		% at ELV
Result of Compliance with Uncertainty Requirement	**N/A**		-

Requirement for SRM is that Uncertainty should be <15% of the value at the ELV, on a dry gas basis, or if O_2 correction is applied less than 15% + the uncertainty associated with the O_2 correction (using sqrt of sum squares to add uncertainty components).

VERSION HISTORY

Version Number	Record of changes made within this version of the document
V1	The original document issued to the client