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Your Element Contact: David Guy (+44 (0)7827 156 007)
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Stack Emissions Testing Report Commissioned by
Avon Metals Ltd

Installation Name & Address
Avon Metals Ltd
Ashville Road
Gloucester
GL2 5DA

PPC Permit: PPC Permit: EP/A2/001, VARIATION GC/16/00001/A2/V4

Stack Reference
A1 New GT

Dates of the Monitoring Campaign
13th - 14th April 2026

Job Reference Number
EMT15917

Report Written by
Jonathon Guy Team Leader MCERTS Level 2 MM 16 1388 TE1 TE2 TE3 TE4

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

Report Date
29th April 2026

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

Avon Metals Ltd, Gloucester
A1 New GT
13th - 14th April 2026

Overall Aim of the Monitoring Campaign

Element were commissioned by Avon Metals Ltd to carry out stack emissions testing on the A1 New GT at Gloucester.

The aim of the monitoring campaign was to demonstrate compliance with a set of emission limit values (ELVs) as specified in the Site's Permit.

Special Requirements

There were no special requirements.

Target Parameters

Total Particulate Matter, Hydrogen Chloride, Dioxins & Furans, Hydrogen Fluoride, Total VOCs (as Carbon)

MONITORING RESULTS

Avon Metals Ltd, Gloucester
A1 New GT
13th - 14th April 2026

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	0.49	0.45	5		g/hr	19.7	18.2	-
Hydrogen Chloride [1]	mg/m³	0.048	0.0040	5		g/hr	1.9	0.25	-
Dioxins & Furans Upper Limit (worst case where <LOD = LOD)									
Dioxins & Furans (NATO I-TEQ) [1]	ng/m³	0.0094	0.0019	0.10		µg/hr	0.38	0.085	-
Dioxins & Furans (WHO TEQ Humans / Mammals) [1]	ng/m³	0.0084	0.0017	-		µg/hr	0.34	0.076	-
Dioxins & Furans (WHO TEQ Fish) [1]	ng/m³	0.0092	0.0019	-		µg/hr	0.37	0.083	-
Dioxins & Furans (WHO TEQ Birds) [1]	ng/m³	0.014	0.0028	-		µg/hr	0.56	0.13	-
Dioxins & Furans Lower Limit (best case where <LOD = 0)									
Dioxins & Furans (NATO I-TEQ) [1]	ng/m³	0.0088	0.0018	-		µg/hr	0.35	0.079	-
Dioxins & Furans (WHO TEQ Humans / Mammals) [1]	ng/m³	0.0075	0.0015	-		µg/hr	0.30	0.068	-
Dioxins & Furans (WHO TEQ Fish) [1]	ng/m³	0.0083	0.0017	-		µg/hr	0.33	0.075	-
Dioxins & Furans (WHO TEQ Birds) [1]	ng/m³	0.013	0.0026	-		µg/hr	0.52	0.12	-
Hydrogen Fluoride [1]	mg/m³	0.025	0.0017	1		g/hr	1.0	0.12	-
Total VOCs (as Carbon) [1]	mg/m³	7.2	0.44	10		g/hr	288	33.0	-
Water Vapour	% v/v	0.59	0.037						
Stack Gas Temperature	°C	52.0							
Stack Gas Velocity	m/s	10.8	0.92						
Volumetric Flow Rate (ACTUAL)	m³/hr	47781	4605						
Volumetric Flow Rate (REF) [1]	m³/hr	40185	3873						

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

[1] Reference Conditions (REF) are: 273K, 101.3kPa, dry gas.

MONITORING DATE(S) & TIMES

Avon Metals Ltd, Gloucester
A1 New GT
13th - 14th April 2026

Parameter		Units	Concentration	Units	Mass Emission	Sampling Date(s)	Sampling Times	Duration mins
Total Particulate Matter	R1	mg/m³	0.71	g/hr	28.7	13/04/2026	10:14 - 11:18	64
Total Particulate Matter	R2	mg/m³	0.49	g/hr	19.8	13/04/2026	11:24 - 12:28	64
Total Particulate Matter	R3	mg/m³	0.26	g/hr	10.6	13/04/2026	12:32 - 13:36	64
Hydrogen Chloride	R1	mg/m³	0.029	g/hr	1.2	13/04/2026	10:14 - 11:18	64
Hydrogen Chloride	R2	mg/m³	0.079	g/hr	3.2	13/04/2026	11:24 - 12:28	64
Hydrogen Chloride	R3	mg/m³	0.036	g/hr	1.5	13/04/2026	12:32 - 13:36	64
Dioxins & Furans (NATO)	R1	ng/m³	0.0094	µg/hr	0.38	14/04/2026	07:55 - 13:55	360
Hydrogen Fluoride	R1	mg/m³	< 0.015	g/hr	< 0.61	13/04/2026	10:14 - 11:18	64
Hydrogen Fluoride	R2	mg/m³	< 0.016	g/hr	< 0.66	13/04/2026	11:24 - 12:28	64
Hydrogen Fluoride	R3	mg/m³	0.042	g/hr	1.7	13/04/2026	12:32 - 13:36	64
Total VOCs (as Carbon)	R1	mg/m³	7.2	g/hr	288	13/04/2026	11:24 - 12:24	60
Velocity Traverse	R1					13/04/2026	09:50 - 10:00	

All results are expressed at the respective reference conditions.

PROCESS DETAILS

Avon Metals Ltd, Gloucester
A1 New GT
13th - 14th April 2026

Standard Operating Conditions

Parameter	Value
Process Status	Metal Casting
Capacity (of 100%) and Tonnes / Hour	N/A
Continuous or Batch Process	Continuous
Feedstock (if applicable)	Alluminium Alloy
Abatement System	Bag Filter
Abatement System Running Status	Running
Fuel	Alluminium Alloy
Plume Appearance	No plume visible

MONITORING & ANALYTICAL METHODS

Avon Metals Ltd, Gloucester
A1 New GT
13th - 14th April 2026

	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	0.23 mg/m³
Hydrogen Chloride	EN 1911	MD 011	MCERTS	EET	MD 101	IC	MCERTS	EET	MCERTS	0.015 mg/m³
Dioxins & Furans	EN 1948	MD 007	MCERTS	EET	PM137, TM201	GC-HRMS	MCERTS	ELD	MCERTS	0.0018 ng/m³
Hydrogen Fluoride	CEN/TS 17340	MD 010	MCERTS	EET	MD 101	IC	MCERTS	EET	MCERTS	0.015 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	1.8 m/s

ANALYSIS LABORATORIES

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

Element (Stockport Lab - EET)	ISO 17025 Accreditation Number: UKAS 4279
Element (Deeside Lab - ELD)	ISO 17025 Accreditation Number: UKAS 4225

SUMMARY OF SAMPLING DEVIATIONS

Parameter	Run	Deviation
Total Particulate Matter, Dioxins & Furans, Velocity & Vol. Flow Rate	All	One out of two sampling lines was used due to sampling location restrictions, however the number of sample points used on the available line were increased to the minimum required by the Standard

SUITABILITY OF SAMPLING LOCATION

Duct Characteristics

Parameter	Units	Value
Type	-	Circular
Depth	m	1.25
Width	m	-
Area	m^2	1.23
Port Depth	cm	10
Orientation of Duct	-	Vertical
Number of Ports	-	2
Sample Port Size	-	4" BSP

Location of Sampling Platform

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

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	Yes
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

The sampling location meets all the requirements specified in EA Guidance Note M1 and EN 15259, and therefore there are no improvement recommendations.

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)

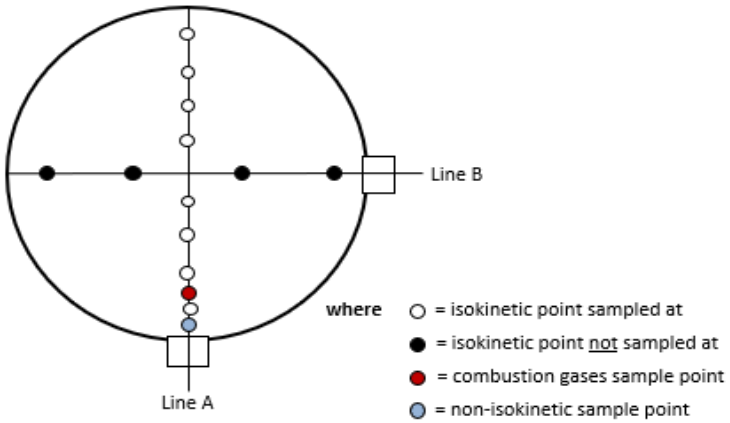
Criteria in EN 15259	Units	Traverse 1	Required	Compliant
Lowest Differential Pressure	Pa	78.5	> 5 Pa	Yes
Mean Velocity	m/s	10.94	-	-
Lowest Gas Velocity	m/s	10.74	-	-
Highest Gas Velocity	m/s	11.07	-	-
Ratio of Above	: 1	1.03	< 3 : 1	Yes
Maximum Angle of Swirl	°	8.00	< 15°	Yes
No Local Negative Flow	-	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	Jonathon Guy	MCERTS Level 2	MM 16 1388	TE1 TE2 TE3 TE4
Technician	Simon Dwyer	MCERTS Level 1	MM 23 1768	None

LIST OF EQUIPMENT

Extractive Sampling	
Equipment Type	**Equipment I.D.**
Control Box DGM (1)	CAT 7.998
Control Box DGM (2)	-
Box Thermocouples (1)	CAT 3.103
Box Thermocouples (2)	-
Umbilical (1)	CAT 3.103
Umbilical (2)	-
Oven Box (1)	CAT 12.41
Oven Box (2)	-
Heated Probe (1)	-
Heated Probe (2)	-
Heated Probe (3)	CAT 5.84
S-Pitot (1)	-
S-Pitot (2)	CAT 21P.76, 21S.17
L-Pitot	-
Site Balance	CAT 17.51
500g / 1Kg Check Weights	CAT 17.51
Last Impinger Arm	CAT 4.895, 4.896, 4.8
Callipers	CAT 23.78
Tubes Kit Thermocouple	-

Instrumental Analysers	
Equipment Type	**Equipment I.D.**
SELECT Horiba Model (1)	-
SELECT Horiba Model (2)	-
SELECT Servomex Model	-
SELECT NOX Analyser/Convertor	-
ABB AO2020-URAS26	-
Testo 350 XL	-
SELECT Gas Conditioning	-
SELECT FTIR	-
Gasmet Sampling System	-
Sick 3006	CAT 8.28
M&C PSS	CAT 12.172
Mass Flow Controller (1)	CAT 6.32
Mass Flow Controller (2)	CAT 6.33
Mass View (1)	-
Mass View (2)	-
SELECT Logger 1	CAT 11.107
SELECT Logger 2	-
Bioaerosols Temperature Logger	-
Electronic Refrigerator	-

Miscellaneous Items	
Equipment Type	**Equipment I.D.**
Digital Manometer (1)	CAT 3.271
Digital Manometer (2)	CAT 3.116
Digital Temperature Meter	CAT 3.317
Stopwatch	CAT 14.444
Barometer	CAT 13.93
Stack Thermocouple (1)	-
Stack Thermocouple (2)	-
Stack Thermocouple (3)	CAT 4.9941
1m Heated Line (1)	-
1m Heated Line (2)	-
1m Heated Line (3)	-
5m Heated Line (1)	-
15m Heated Line (1)	CAT 20.230
20m Heated Line (1)	-
20m Heated Line (2)	-
Dual Channel Heater Controller	-
Single Channel Heater Controller	-
Laboratory Balance	CAT 1.18, 1.18a, 1.18b
Tape Measure	CAT 16.99

METHODS & TECHNICAL PROCEDURES USED

Parameter	Standard	Technical Procedure
Total Particulate Matter	EN 13284-1	MD 001
Hydrogen Chloride	EN 1911	MD 011
Dioxins & Furans	EN 1948	MD 007
Hydrogen Fluoride	CEN/TS 17340	MD 010
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	1.25
Stack Width, W	m	-
Stack Area, A	m^2	1.23
Average Stack Gas Temperature, T_a	°C	47.5
Average Stack Gas Pressure	mmH_2O	8.3
Average Stack Static Pressure, P_{static}	kPa	0.092
Average Barometric Pressure, P_b	kPa	101.1
Average Pitot Tube Calibration Coefficient, C_p	-	0.898

Stack Gas Composition & Molecular Weights

Component	Conc ppm	Conc Dry % v/v	Conc Wet % v/v	Volume Fraction r	Molar Mass M	Density kg/m³ p	Conc kg/m³ p_i
CO_2 (Estimated)	-	0.06	0.06	0.0006	44.01	1.9635	0.00118
O_2 (Estimated)	-	20.80	20.68	0.2080	32.00	1.4277	0.29696
N_2	-	79.14	78.67	0.7914	28.01	1.2498	0.98913
Moisture (H_2O)	-	-	0.59	0.0059	18.02	0.8037	0.00476

Where: $p = M / 22.41$

$p_i = r \times p$

Calculation of Stack Gas Densities

Determinand	Units	Result
Dry Density (STP), P_{STD}	kg/m³	1.287
Wet Density (STP), P_{STW}	kg/m³	1.284
Dry Density (Actual), P_{Actual}	kg/m³	1.095
Average Wet Density (Actual), $P_{ActualW}$	kg/m³	1.093

Where: P_{STD} = sum of component concentrations, kg/m³ (not including water vapour)

P_{STW} = sum of all wet concentrations / 100 x density, kg/m³ (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	47.5	0.0
Total Pressure	kPa	101.2	101.3
Moisture	%	0.59	0.00

Gas Volumetric Flowrate (from Traverse)	Units	Result
Gas Volumetric Flowrate (Actual)	m³/hr	48353
Gas Volumetric Flowrate (STP, Wet)	m³/hr	41149
Gas Volumetric Flowrate (STP, Dry)	m³/hr	40905
Gas Volumetric Flowrate REF [1]	m³/hr	40905

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

(1 of 1)

Parameter	Units	Value
Date of Survey	-	13/04/2026
Time of Survey	-	09:50 - 10:00
Atmospheric Pressure	kPa	101.1
Average Stack Static Pressure	Pa	92
Result of Pitot Stagnation Test	-	Pass
Are Water Droplets Present?	-	No
Device Used	S-Type Pitot with Liquid Incline Manometer	

Parameter	Units	Value
Initial Pitot Leak Check	-	Pass
Final Pitot Leak Check	-	Pass
Orientation of Duct	-	Vertical
Pitot Tube, C_p	-	0.898
Number of Lines Available	-	2
Number of Lines Used	-	1

		Sampling Line A					Sampling Line B - Restricted Access				
Traverse Point	Depth m	ΔP mmH_2O	Temp °C	Wet Density kg/m^3	Velocity m/s	Swirl °	ΔP	Temp °C	Wet Density kg/m^3	Velocity m/s	Swirl °
STATIC (Units: Pa)		*92.0*									
Mean		**8.3**	**47.5**	**1.093**	**10.94**						
1	0.04	8.0	47.4	1.093	10.74	3.0					
2	0.13	8.3	47.5	1.093	10.90	3.0					
3	0.24	8.3	47.5	1.093	10.90	4.0					
4	0.40	8.5	47.4	1.093	11.07	6.0					
5	0.85	8.5	47.5	1.093	11.07	4.0					
6	1.01	8.3	47.4	1.093	10.90	7.0					
7	1.12	8.3	47.4	1.093	10.90	8.0					
8	1.21	8.5	47.5	1.093	11.07	4.0					

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)	2.027	Pa
- Resolution	u(res)	0.52154	
- Calibration	u(cal)	0.692	
- Drift	u(drift)	1.096	
- Lack of Fit	u(fit)	0.801	
- Overall corrections to dynamic measurements	u(Cf)	3.111	
Standard uncertainty associated with the molar mass of the gas	u(M)	0.00003	-
- $\varphi O_2,w$	-	20.677	
- $\varphi CO_2,w$	-	0.060	
- Oxygen, dry	u(ϕO_2,d)	0.637	
- Carbon Dioxide, dry	u(ϕCO_2,d)	0.002	
- Water Vapour	u(ϕH_2O)	0.030	
- Oxygen, wet	u(ϕO_2,w)	0.633	
- Carbon Dioxide, wet	u(ϕCO_2,w)	0.002	
Standard uncertainty associated with the stack temperature	u(Tc)	1.635	K
Standard uncertainty associated with the absolute pressure in the duct	u(pc)	175.704	Pa
- Atmospheric Pressure	u(patm)	175.692	
- Static Pressure	u(pstat)	2.027	
Standard uncertainty associated with the density in the duct	u(ρ)	0.00597	-
Standard uncertainty associated with the local velocities	u(vi)	1.336	Pa
Standard uncertainty associated with the mean velocity	u(v)	0.475	m/s
Standard uncertainty associated with the mean velocity (95% Confidence)	Uc(v)	0.931	m/s
Standard uncertainty associated with the mean velocity (95% Confidence), relative	Uc,rel(v)	8.51	%
Standard uncertainty associated with the volume flow rate (95% Confidence)	Uc(qV,w)	4659.6	m^3/hr
- $u^2(a)/a^2$	-	0.00053	
- $u^2(qV,w)/q^2V,w$	-	0.00242	
- $u^2(qV,w)$	-	5651784	
- $u(qV,w)$	-	2377.3	
Standard uncertainty associated with the volume flow rate (95% Confidence), relative	Uc,rel(qV,w)	9.64	%

TOTAL PARTICULATE MATTER: RESULTS SUMMARY

Avon Metals Ltd, Gloucester
A1 New GT

Sample Runs

Parameter	Units	Run 1	Run 2	Run 3		Mean
Concentration	mg/m³	0.71	0.49	0.26		0.49
Uncertainty	±mg/m³	0.45	0.46	0.44		0.45
Mass Emission	g/hr	28.7	19.8	10.6		19.7
Uncertainty	±g/hr	18.2	18.8	17.7		18.2

Parameter	Units	Run 1	Run 2	Run 3		Mean
Water Vapour	% v/v	0.073	0.13	0.46		0.22
Uncertainty	±% v/v	0.015	0.016	0.028		0.020

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	0.23		0.23

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	In Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 2	FORMAT: Number Used / Number Required
Number of Sampling Points Used	8 / 8	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1, A2, A3, A4, A5, A6, A7, A8	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, dry gas.

TOTAL PARTICULATE MATTER: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1	Run 2	Run 3	
Absolute pressure of stack gas, P_s					
Barometric pressure, P_b	mmHg	762.8	762.8	762.8	
Stack static pressure, P_{static}	mmH_2O	9.4	9.4	9.4	
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	763.5	763.5	763.5	
Volume of water vapour collected, V_{wstd}					
Total mass collected in impingers (liquid trap)	g	-4.0	-2.1	-2.5	
Total mass collected in impingers (silica trap)	g	4.6	3.1	6.3	
Total mass of liquid collected, V_{lc}	g	0.6	1.0	3.8	
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0007	0.0012	0.0047	
Volume of gas metered dry, V_{mstd}					
Volume of gas sample through gas meter, V_m	m^3	1.1670	1.1360	1.2140	
Gas meter correction factor, Y_d	-	0.9310	0.9310	0.9310	
Average dry gas meter temperature, T_m	°C	19.5	23.1	27.6	
Average pressure drop across orifice, ΔH	mmH_2O	33.5	31.2	35.2	
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.0211	0.9817	1.0339	
Moisture content, B_{wo} & R_{wv}					
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0007	0.0013	0.0046	
B_{wo} as a percentage	% v/v	0.07	0.13	0.46	
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	0.07	0.13	0.46	
Volume of gas metered wet, V_{mstw}					
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.0218	0.9829	1.0386	
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	No	No	
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A	N/A	N/A	
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A	N/A	N/A	
% oxygen reference condition, $REF\%O_2$	% v/v	N/A	N/A	N/A	
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A	N/A	N/A	
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A	N/A	N/A	
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A	N/A	N/A	
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A	N/A	N/A	
Molecular weight of dry gas stream, M_d					
CO_2 (Estimated)	% v/v	0.06	0.06	0.06	
O_2 (Estimated)	% v/v	20.80	20.80	20.80	
Total	% v/v	20.86	20.86	20.86	
N_2	% v/v	79.14	79.14	79.14	
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84	28.84	28.84	
Molecular weight of stack gas (wet), M_s					
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.83	28.83	28.79	
Velocity of stack gas, V_s					
Pitot tube velocity constant, K_p	-	34.97	34.97	34.97	
Velocity pressure coefficient, C_p	-	0.90	0.90	0.90	
Average of velocity heads, ΔP_{avg}	mmH_2O	8.06	7.61	8.39	
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	2.84	2.76	2.90	
Average stack gas temperature, T_s	°C	46.4	54.2	52.0	
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	10.74	10.56	11.06	
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	1.23	1.23	1.23	
$Q_a = (60)(A_s)(V_s)$	m^3/min	790.9	777.7	814.4	
Conversion factor (K/mm.Hg), C_f	-	0.3592	0.3592	0.3592	
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	679.0	651.8	687.2	
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	678.5	651.0	684.1	
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A	N/A	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	N/A	N/A	
Percent isokinetic, %I					
Nozzle diameter, D_n	mm	5.98	5.98	5.98	
Nozzle area, A_n	mm^2	28.09	28.09	28.09	
Total sampling time, q	min	64	64	64	
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	102.7	102.9	103.2	

TOTAL PARTICULATE MATTER: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1	Run 2	Run 3
Sampling Times	-	10:14 - 11:18	11:24 - 12:28	12:32 - 13:36
Sampling Dates	-	13/04/2026	13/04/2026	13/04/2026
Sampling Device	-	ISO	ISO	ISO
Volume Sampled (REF)	m^3	1.0211	0.9817	1.0339
Filter I.D. Number	-	47-128182	47-128183	47-128184
Start Filter Mass	g	0.15191	0.15137	0.15167
End Filter Mass	g	0.15202	0.15146	0.15177
Total Mass on Filter	g	0.00011	0.00009	0.00010
Probe Rinse I.D. Number	-	PR-47-128182	PR-47-128183	PR-47-128184
Start Probe Rinse Mass	g	2.91724	2.81580	2.86503
End Probe Rinse Mass	g	2.91786	2.81620	2.86520
Total Mass in Probe Rinse	g	0.00062	0.00039	0.00017
Total Mass Collected	mg	0.73	0.48	0.27
Calculated Concentration	mg/m^3	0.71	0.49	0.26
Balance Uncertainty / LOD	mg/m^3	0.23	0.23	0.22

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	13/04/2026
Average Volume Sampled (REF)	m^3	1.0122
Filter I.D. Number	-	47-128196
Start Filter Mass	g	0.15275
End Filter Mass	g	0.15271
Total Mass on Filter	g	-0.00004
Probe Rinse I.D. Number	-	PR-47-128196
Start Probe Rinse Mass	g	2.91080
End Probe Rinse Mass	g	2.91078
Total Mass in Probe Rinse	g	-0.00002
Total Mass Collected	mg	-0.06
Calculated Concentration	mg/m^3	-0.06
Balance Uncertainty / LOD	mg/m^3	0.23

TOTAL PARTICULATE MATTER: QUALITY ASSURANCE

Sample Runs

Leak Test Results	Units	Run 1	Run 2	Run 3
Mean Sampling Rate	l/min	17.0	16.5	17.7
Pre-Sampling Leak Rate	l/min	0.12	0.12	0.12
Post-Sampling Leak Rate	l/min			
Allowable Leak Rate	l/min	0.36	0.36	0.36
Leak Test Acceptable	-	Yes	Yes	Yes

Water Droplets	Units	Run 1	Run 2	Run 3
Are Water Droplets Present	-	No	No	No

MU (Concurrent Water Vapour)	Units	Run 1	Run 2	Run 3
Measurement Uncertainty (MU)	%	20.3	12.9	6.2
Allowable MU	%	20.0	20.0	20.0
MU Acceptable	%	No	Yes	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1	Run 2	Run 3
Less than 50% Faded	%	Yes	Yes	Yes

Isokinetic Criterion Compliance	Units	Run 1	Run 2	Run 3
Isokinetic Variation	%	102.7	102.9	103.2
Allowable Isokinetic Range	%	95 - 115	95 - 115	95 - 115
Isokineticity Acceptable	-	Yes	Yes	Yes

Weighing Uncertainty Criteria	Units	Run 1	Run 2	Run 3
Overall Weighing Uncertainty	± mg	0.33	0.33	0.33
Overall Weighing Uncertainty	± mg/m³	0.32	0.33	0.31
ELV [Daily ELV for IED]	mg/m³	5.00	5.00	5.00
Allowable Weighing Uncertainty	mg/m³	0.25	0.25	0.25
Weighing Uncertainty Acceptable	-	No	No	No

Filter Temperatures	Units	Run 1	Run 2	Run 3
Pre-Conditioning Temperature	°C	180	180	180
Post-Conditioning Temperature	°C	160	160	160
Maximum Filter Temperature	°C	52	55	54

Test Conditions	Units	Run 1	Run 2	Run 3
Ambient Temperature Recorded?	-	Yes	Yes	Yes

TOTAL PARTICULATE MATTER: QUALITY ASSURANCE

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	18.0
Pre-Sampling Leak Rate	l/min	0.13
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.36
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m³	0.5
Blank Acceptable	-	Yes

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	2	3	
One out of two sampling lines was used due to sampling location restrictions, however the number of sample points used on the available line were increased to the minimum required by the Standard	x	x	x	

TOTAL PARTICULATE MATTER: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value				Standard uncertainty				
Measured Quantities	**Symbol**	**Run 1**	**Run 2**	**Run 3**	**Symbol**	**Units**	**Run 1**	**Run 2**	**Run 3**
Sampled Volume (Actual)	V_m	1.1670	1.1360	1.2140	uV_m	m^3	0.0233	0.0227	0.0243
Sampled Gas Temperature	T_m	292.5	296.1	300.6	uT_m	K	2.00	2.00	2.00
Sampled Gas Pressure	ρ_m	101.8	101.8	101.8	$u\rho_m$	kPa	0.50	0.50	0.50
Sampled Gas Humidity	H_m	0.00	0.00	0.00	uH_m	% v/v	1.00	1.00	1.00
Leak	L	0.71	0.73	0.68	uL	%	-	-	-
Mass of Particulate	m	0.73	0.48	0.27	um	mg	0.23	0.23	0.23
Uncollected Mass	UCM	-0.06	-0.06	-0.06	uUCM	mg	-	-	-

	Uncertainty as a Percentage				
Measured Quantities	**Units**	**Run 1**	**Run 2**	**Run 3**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	2.00	2.00	≤2%
Sampled Gas Temperature	%	0.68	0.68	0.67	≤1%
Sampled Gas Pressure	%	0.49	0.49	0.49	≤1%
Sampled Gas Humidity	%	1.00	1.00	1.00	≤1%
Leak	%	0.71	0.73	0.68	≤2%
Mass of Particulate	%	4.51	4.69	4.45	-
Uncollected Mass	%	-	-	-	-

	Uncertainty in Measurement Units					Sensitivity Coefficient		
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 2**	**Run 3**	**Run 1**	**Run 2**	**Run 3**
Sampled Volume (STP)	V_m	m^3	1.0211	0.9817	1.0339	0.70	0.50	0.26
Leak	L	mg/m^3	0.003	0.002	0.001	1.00	1.00	1.00
Mass of Particulate	L_r	mg	0.730	0.483	0.273	0.98	1.02	0.97
Uncollected Mass	UCM	mg	-0.03	-0.03	-0.03	0.98	1.02	0.97

	Uncertainty in Result			
Measured Quantities	**Units**	**Run 1**	**Run 2**	**Run 3**
Sampled Volume (STP)	mg/m^3	0.019	0.013	0.007
Leak	mg/m^3	0.0029	0.0021	0.0010
Mass of Particulate	mg/m^3	0.2253	0.2343	0.2225
Uncollected Mass	mg/m^3	-0.0320	-0.0333	-0.0316

	Oxygen Correction Part of MU Budget			
Measured Quantities	**Units**	**Run 1**	**Run 2**	**Run 3**
O_2 Correction Factor	-	N/A	N/A	N/A
Stack Gas O_2 Content	% v/v	N/A	N/A	N/A
MU for O_2 Correction	-	N/A	N/A	N/A
Overall MU For O_2 Measurement	%	N/A	N/A	N/A

Parameter	**Units**	**Run 1**	**Run 2**	**Run 3**
Combined uncertainty	mg/m^3	0.23	0.24	0.22
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	0.45	0.46	0.44
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A	N/A	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.45	0.46	0.44
Reported Uncertainty	mg/m^3	0.45	0.46	0.44
Expanded uncertainty (95% confidence), without Oxygen Correction	%	62.6	94.4	166.7
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A	N/A	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	62.6	94.4	166.7
Reported Uncertainty	%	62.6	94.4	166.7
Reported Uncertainty as % of ELV	%	9.0	9.3	8.8

HYDROGEN CHLORIDE: RESULTS SUMMARY

Avon Metals Ltd, Gloucester
A1 New GT

Sample Runs

Parameter	Units	Run 1	Run 2	Run 3		Mean
Concentration	mg/m³	0.029	0.079	0.036		0.048
Uncertainty	±mg/m³	0.0024	0.0065	0.0030		0.0040
Mass Emission	g/hr	1.2	3.2	1.5		1.9
Uncertainty	±g/hr	0.15	0.40	0.19		0.25

Parameter	Units	Run 1	Run 2	Run 3		Mean
Water Vapour	% v/v	0.07	0.13	0.46		0.22
Uncertainty	±% v/v	0.015	0.016	0.028		0.020

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	< 0.015		< 0.015

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	16/04/2026	
Probe Material	Titanium	
Filter Housing Material	Titanium	
Impinger Material	Polyethylene	
Absorption Solution	HPLC Grade Water	
Positioning of Filter	In Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 2	FORMAT: Number Used / Number Required
Number of Sampling Points Used	8 / 8	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1, A2, A3, A4, A5, A6, A7, A8	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, dry gas.

HYDROGEN CHLORIDE: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1	Run 2	Run 3	
Absolute pressure of stack gas, P_s					
Barometric pressure, P_b	mmHg	762.8	762.8	762.8	
Stack static pressure, P_{static}	mmH_2O	9.4	9.4	9.4	
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	763.5	763.5	763.5	
Volume of water vapour collected, V_{wstd}					
Total mass collected in impingers (liquid trap)	g	-4.0	-2.1	-2.5	
Total mass collected in impingers (silica trap)	g	4.6	3.1	6.3	
Total mass of liquid collected, V_{lc}	g	0.6	1.0	3.8	
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0007	0.0012	0.0047	
Volume of gas metered dry, V_{mstd}					
Volume of gas sample through gas meter, V_m	m^3	1.1670	1.1360	1.2140	
Gas meter correction factor, Y_d	-	0.9310	0.9310	0.9310	
Average dry gas meter temperature, T_m	°C	19.5	23.1	27.6	
Average pressure drop across orifice, ΔH	mmH_2O	33.5	31.2	35.2	
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.0211	0.9817	1.0339	
Moisture content, B_{wo} & R_{wv}					
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0007	0.0013	0.0046	
B_{wo} as a percentage	% v/v	0.07	0.13	0.46	
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	0.07	0.13	0.46	
Volume of gas metered wet, V_{mstw}					
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.0218	0.9829	1.0386	
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	No	No	
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A	N/A	N/A	
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A	N/A	N/A	
% oxygen reference condition, $REF\%O_2$	% v/v	N/A	N/A	N/A	
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A	N/A	N/A	
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A	N/A	N/A	
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A	N/A	N/A	
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A	N/A	N/A	
Molecular weight of dry gas stream, M_d					
CO_2 (Estimated)	% v/v	0.06	0.06	0.06	
O_2 (Estimated)	% v/v	20.80	20.80	20.80	
Total	% v/v	20.86	20.86	20.86	
N_2	% v/v	79.14	79.14	79.14	
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84	28.84	28.84	
Molecular weight of stack gas (wet), M_s					
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.83	28.83	28.79	
Velocity of stack gas, V_s					
Pitot tube velocity constant, K_p	-	34.97	34.97	34.97	
Velocity pressure coefficient, C_p	-	0.90	0.90	0.90	
Average of velocity heads, ΔP_{avg}	mmH_2O	8.06	7.61	8.39	
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	2.84	2.76	2.90	
Average stack gas temperature, T_s	°C	46.4	54.2	52.0	
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	10.74	10.56	11.06	
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	1.23	1.23	1.23	
$Q_a = (60)(A_s)(V_s)$	m^3/min	790.9	777.7	814.4	
Conversion factor (K/mm.Hg), C_f	-	0.3592	0.3592	0.3592	
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	679.0	651.8	687.2	
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	678.5	651.0	684.1	
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A	N/A	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	N/A	N/A	
Percent isokinetic, %I					
Nozzle diameter, D_n	mm	5.98	5.98	5.98	
Nozzle area, A_n	mm^2	28.09	28.09	28.09	
Total sampling time, q	min	64	64	64	
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	102.7	102.9	103.2	

HYDROGEN CHLORIDE: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1	Run 2	Run 3
Sampling Times	-	10:14 - 11:18	11:24 - 12:28	12:32 - 13:36
Sampling Dates	-	13/04/2026	13/04/2026	13/04/2026
Sampling Device	-	ISO	ISO	ISO
Volume Sampled (REF)	m^3	1.0211	0.9817	1.0339
Laboratory Result for Front Impingers	µg/ml	0.12	0.24	0.12
Laboratory Result for Back Impinger	µg/ml	0.05		
Volume in Front Impingers	ml	201.4	323.2	313.6
Volume in Back Impinger	ml	101.3		
Mass in Front Impingers	µg	24.2	77.6	37.6
Mass in Back Impinger	µg	5.1		
Total Mass Collected	µg	29.2	77.6	37.6
Calculated Concentration	mg/m^3	0.029	0.079	0.036

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	13/04/2026
Average Volume Sampled (REF)	m^3	1.0122
Laboratory Result for Impingers	µg/ml	< 0.05
Volume in Impingers	ml	306.2
Total Mass Collected	µg	< 15.3
Calculated Concentration	mg/m^3	< 0.015

HYDROGEN CHLORIDE: QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1	Run 2	Run 3
Mean Sampling Rate	l/min	17.0	16.5	17.7
Pre-Sampling Leak Rate	l/min	0.12	0.12	0.12
Post-Sampling Leak Rate	l/min	N/A	N/A	N/A
Allowable Leak Rate	l/min	0.36	0.36	0.36
Leak Test Acceptable	-	Yes	Yes	Yes

Absorption Efficiency	Units	Run 1
Absorption Efficiency	%	82.7
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	Run 2	Run 3
Are Water Droplets Present	-	No	No	No

MU (Concurrent Water Vapour)	Units	Run 1	Run 2	Run 3
Measurement Uncertainty (MU)	%	20.3	12.9	6.2
Allowable MU	%	20.0	20.0	20.0
MU Acceptable	%	No	Yes	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1	Run 2	Run 3
Less than 50% Faded	%	Yes	Yes	Yes

Isokinetic Criterion Compliance	Units	Run 1	Run 2	Run 3
Isokinetic Variation	%	102.7	102.9	103.2
Allowable Isokinetic Range	%	95 - 115	95 - 115	95 - 115
Isokineticity Acceptable	-	Yes	Yes	Yes

Filter Temperatures	Units	Run 1	Run 2	Run 3
Maximum Filter Temperature	°C	52	55	54

Test Conditions	Units	Run 1	Run 2	Run 3
Ambient Temperature Recorded?	-	Yes	Yes	Yes

HYDROGEN CHLORIDE: QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	18.0
Pre-Sampling Leak Rate	l/min	0.13
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.36
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m³	0.5
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	2	3	

HYDROGEN CHLORIDE: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value				Standard uncertainty				
Measured Quantities	**Symbol**	**Run 1**	**Run 2**	**Run 3**	**Symbol**	**Units**	**Run 1**	**Run 2**	**Run 3**
Sampled Volume (Actual)	V_m	1.1670	1.1360	1.2140	uV_m	m³	0.0233	0.0227	0.0243
Sampled Gas Temperature	T_m	292.5	296.1	300.6	uT_m	K	2.00	2.00	2.00
Sampled Gas Pressure	ρ_m	101.8	101.8	101.8	$u\rho_m$	kPa	0.50	0.50	0.50
Sampled Gas Humidity	H_m	0.00	0.00	0.00	uH_m	% v/v	1.00	1.00	1.00
Leak	L	0.71	0.73	0.68	uL	%	-	-	-
Laboratory Result	L_r	3.25	3.25	3.25	uL_r	%	-	-	-

	Uncertainty as a Percentage				
Measured Quantities	**Units**	**Run 1**	**Run 2**	**Run 3**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	2.00	2.00	≤2%
Sampled Gas Temperature	%	0.68	0.68	0.67	≤1%
Sampled Gas Pressure	%	0.49	0.49	0.49	≤1%
Sampled Gas Humidity	%	1.00	1.00	1.00	≤1%
Leak	%	0.71	0.73	0.68	≤2%
Laboratory Result	%	3.25	3.25	3.25	No Requirement

	Uncertainty in Measurement Units					Sensitivity Coefficient		
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 2**	**Run 3**	**Run 1**	**Run 2**	**Run 3**
Sampled Volume (STP)	V_m	m³	1.0211	0.9817	1.0339	0.028	0.080	0.035
Leak	L	mg/m³	0.00012	0.00033	0.00014	1.00	1.00	1.00
Laboratory Result	L_r	mg/m³	0.001	0.003	0.001	1.00	1.00	1.00

	Uncertainty in Result			
Measured Quantities	**Units**	**Run 1**	**Run 2**	**Run 3**
Sampled Volume (STP)	mg/m³	0.0008	0.0021	0.0010
Leak	mg/m³	0.0001	0.0003	0.0001
Laboratory Result	mg/m³	0.0009	0.0026	0.0012

	Oxygen Correction Part of MU Budget			
Measured Quantities	**Units**	**Run 1**	**Run 2**	**Run 3**
O_2 Correction Factor	-	N/A	N/A	N/A
Stack Gas O_2 Content	% v/v	N/A	N/A	N/A
MU for O_2 Correction	-	N/A	N/A	N/A
Overall MU For O_2 Measurement	%	N/A	N/A	N/A

Parameter	**Units**	**Run 1**	**Run 2**	**Run 3**
Combined uncertainty	mg/m³	0.0012	0.0033	0.0015
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m³	0.0024	0.0065	0.0030
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m³	N/A	N/A	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m³	0.0024	0.0065	0.0030
Reported Uncertainty	mg/m³	0.0024	0.0065	0.0030
Expanded uncertainty (95% confidence), without Oxygen Correction	%	8.2	8.3	8.3
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A	N/A	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	8.2	8.3	8.3
Reported Uncertainty	%	8.2	8.3	8.3
Reported Uncertainty as % of ELV	%	0.0	0.1	0.1

DIOXINS & FURANS: RESULTS SUMMARY

(PAGE 1 OF 4)

Avon Metals Ltd, Gloucester
A1 New GT

TEQ1 - UPPER LIMITS (worst case where <LOD = LOD)

Sample Runs (UPPER NATO I-TEQ)

Parameter	Units	Run 1	Mean
Concentration	ng/m³	0.0094	0.0094
Uncertainty	±ng/m³	0.0019	0.0019
Mass Emission	µg/hr	0.38	0.38
Uncertainty	±µg/hr	0.085	0.085

Sample Runs (UPPER WHO TEQ Humans / Mammals)

Parameter	Units	Run 1	Mean
Concentration	ng/m³	0.0084	0.0084
Uncertainty	±ng/m³	0.0017	0.0017
Mass Emission	µg/hr	0.34	0.34
Uncertainty	±µg/hr	0.076	0.076

Sample Runs (UPPER WHO TEQ Fish)

Parameter	Units	Run 1	Mean
Concentration	ng/m³	0.0092	0.0092
Uncertainty	±ng/m³	0.0019	0.0019
Mass Emission	µg/hr	0.37	0.37
Uncertainty	±µg/hr	0.083	0.083

Sample Runs (UPPER WHO TEQ Birds)

Parameter	Units	Run 1	Mean
Concentration	ng/m³	0.0140	0.0140
Uncertainty	±ng/m³	0.0028	0.0028
Mass Emission	µg/hr	0.56	0.56
Uncertainty	±µg/hr	0.13	0.13

DIOXINS & FURANS: RESULTS SUMMARY

(PAGE 2 OF 4)

Avon Metals Ltd, Gloucester
A1 New GT

TEQ2 - LOWER LIMITS (best case where <LOD = 0)

Sample Runs (LOWER NATO I-TEQ)

Parameter	Units	Run 1		Mean
Concentration	ng/m³	0.0088		0.0088
Uncertainty	±ng/m³	0.0018		0.0018
Mass Emission	µg/hr	0.35		0.35
Uncertainty	±µg/hr	0.079		0.079

Sample Runs (LOWER WHO TEQ Humans / Mammals)

Parameter	Units	Run 1		Mean
Concentration	ng/m³	0.0075		0.0075
Uncertainty	±ng/m³	0.0015		0.0015
Mass Emission	µg/hr	0.30		0.30
Uncertainty	±µg/hr	0.068		0.068

Sample Runs (LOWER WHO TEQ Fish)

Parameter	Units	Run 1		Mean
Concentration	ng/m³	0.0083		0.0083
Uncertainty	±ng/m³	0.0017		0.0017
Mass Emission	µg/hr	0.33		0.33
Uncertainty	±µg/hr	0.075		0.075

Sample Runs (LOWER WHO TEQ Birds)

Parameter	Units	Run 1		Mean
Concentration	ng/m³	0.0130		0.0130
Uncertainty	±ng/m³	0.0026		0.0026
Mass Emission	µg/hr	0.52		0.52
Uncertainty	±µg/hr	0.12		0.12

DIOXINS & FURANS: RESULTS SUMMARY

(PAGE 3 OF 4)

Avon Metals Ltd, Gloucester
A1 New GT

TEQ1 - UPPER LIMITS (worst case where <LOD = LOD)

Blank Runs (UPPER NATO I-TEQ)

Parameter	Units	Blank 1		Maximum
Concentration	ng/m³	0.00043		0.00043

Blank Runs (UPPER WHO TEQ Humans / Mammals)

Parameter	Units	Blank 1		Maximum
Concentration	ng/m³	0.00050		0.00050

Blank Runs (UPPER WHO TEQ Fish)

Parameter	Units	Blank 1		Maximum
Concentration	ng/m³	0.00055		0.00055

Blank Runs (UPPER WHO TEQ Birds)

Parameter	Units	Blank 1		Maximum
Concentration	ng/m³	0.00070		0.00070

TEQ2 - LOWER LIMITS (best case where <LOD = 0)

Blank Runs (LOWER NATO I-TEQ)

Parameter	Units	Blank 1		Maximum
Concentration	ng/m³	0.000026		0.000026

Blank Runs (LOWER WHO TEQ Humans / Mammals)

Parameter	Units	Blank 1		Maximum
Concentration	ng/m³	0.000023		0.000023

Blank Runs (LOWER WHO TEQ Fish)

Parameter	Units	Blank 1		Maximum
Concentration	ng/m³	0.000016		0.000016

Blank Runs (LOWER WHO TEQ Birds)

Parameter	Units	Blank 1		Maximum
Concentration	ng/m³	0.000016		0.000016

DIOXINS & FURANS: RESULTS SUMMARY

(PAGE 4 OF 4)

Avon Metals Ltd, Gloucester

A1 New GT

Parameter	Units	Run 1		Mean
Water Vapour	% v/v	1.3		1.3
Uncertainty	±% v/v	0.072		0.072

General Sampling Information

Parameter	Value	
Standard	EN 1948	
Technical Procedure	MD 007	
Name of Analytical Laboratory	ELD	
Analytical Laboratory's Procedure	PM137, TM201	
ISO 17025 Accredited Analysis?	MCERTS	
Date of Sample Analysis	20/04/2026	
Probe Material	Titanium	
Filter Housing Material	Borosilicate Glass	
Glassware Material	Borosilicate Glass	
Absorption Material	XAD-2	
Positioning of Filter	Out Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 2	FORMAT: Number Used / Number Required
Number of Sampling Points Used	8 / 8	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1, A2, A3, A4, A5, A6, A7, A8	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, dry gas.

DIOXINS & FURANS: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	760.6
Stack static pressure, P_{static}	mmH_2O	9.4
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	761.3
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	23.7
Total mass collected in impingers (silica trap)	g	38.9
Total mass of liquid collected, V_{lc}	g	62.6
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0780
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	6.5730
Gas meter correction factor, Y_d	-	0.9310
Average dry gas meter temperature, T_m	°C	19.0
Average pressure drop across orifice, ΔH	mmH_2O	32.1
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	5.7440
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0134
B_{wo} as a percentage	% v/v	1.34
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	1.34
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	5.8220
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	28.70
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.90
Average of velocity heads, ΔP_{avg}	mmH_2O	8.10
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	2.85
Average stack gas temperature, T_s	°C	61.7
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	11.07
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	1.23
$Q_a = (60)(A_s)(V_s)$	m^3/min	814.7
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	665.7
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	656.8
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	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	5.98
Nozzle area, A_n	mm^2	28.09
Total sampling time, q	min	360
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	106.1

DIOXINS & FURANS: SAMPLING DETAILS

RUN 1

Parameter	Units	Value
Sampling Times	-	07:55 - 13:55
Sampling Dates	-	14/04/2026
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	5.7440

Where: ISO stands for Manual Isokinetic Sampling Train

				NATO I-TEQ		WHO Humans / Mammals		WHO Fish		WHO Birds		
Parameter	**Units**	**Result**	**DL**	**TEQ1**	**TEQ2**	**TEQ1**	**TEQ2**	**TEQ1**	**TEQ2**	**TEQ1**	**TEQ2**	**% Rec**
2378-TCDD	ng	ND	0.0018	0.0018	0.0000	0.0018	0.0000	0.0018	0.0000	0.0018	0.0000	84
12378-PeCDD	ng	ND	0.0036	0.0018	0.0000	0.0036	0.0000	0.0036	0.0000	0.0036	0.0000	80
123478-HxCDD	ng	0.0118	0.0056	0.0012	0.0012	0.0012	0.0012	0.0059	0.0059	0.0006	0.0006	88
123678-HxCDD	ng	0.0265	0.0057	0.0026	0.0026	0.0026	0.0026	0.0003	0.0003	0.0003	0.0003	87
123789-HxCDD	ng	0.0216	0.0058	0.0022	0.0022	0.0022	0.0022	0.0002	0.0002	0.0022	0.0022	-
1234678-HPeCDD	ng	0.2366	0.0020	0.0024	0.0024	0.0024	0.0024	0.0002	0.0002	0.0002	0.0002	83
OCDD	ng	0.3004	0.0037	0.0003	0.0003	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	80
Total Dioxins	ng	0.5969	-	0.0123	0.0087	0.0139	0.0084	0.0120	0.0066	0.0087	0.0033	-
2378-TCDF	ng	0.0137	0.0031	0.0014	0.0014	0.0014	0.0014	0.0007	0.0007	0.0137	0.0137	70
12378-PeCDF	ng	0.0145	0.0047	0.0007	0.0007	0.0004	0.0004	0.0007	0.0007	0.0014	0.0014	104
23478-PeCDF	ng	0.0336	0.0046	0.0168	0.0168	0.0101	0.0101	0.0168	0.0168	0.0336	0.0336	76
123478-HxCDF	ng	0.0362	0.0049	0.0036	0.0036	0.0036	0.0036	0.0036	0.0036	0.0036	0.0036	83
123678-HxCDF	ng	0.0398	0.0049	0.0040	0.0040	0.0040	0.0040	0.0040	0.0040	0.0040	0.0040	80
234678-HxCDF	ng	0.0803	0.0055	0.0080	0.0080	0.0080	0.0080	0.0080	0.0080	0.0080	0.0080	74
123789-HxCDF	ng	0.0373	0.0072	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	101
1234678-HPeCDF	ng	0.2746	0.0019	0.0027	0.0027	0.0027	0.0027	0.0027	0.0027	0.0027	0.0027	70
1234789-HPeCDF	ng	0.0607	0.0024	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	88
OCDF	ng	0.2515	0.0030	0.0003	0.0003	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	70
Total Furans	ng	0.8422	-	0.0419	0.0419	0.0347	0.0347	0.0410	0.0410	0.0715	0.0715	-
Totals	ng	1.4391	-	0.0541	0.0505	0.0485	0.0431	0.0530	0.0476	0.0802	0.0748	-
Total Concentration	ng/m^3	-	-	0.0094	0.0088	0.0084	0.0075	0.0092	0.0083	0.0140	0.0130	-
Limit of Detection	ng/m^3	-	-	0.0018	-	0.0020	-	0.0023	-	0.0029	-	-

Where: ND stands for Non Detected

DL stands for Analytical Detection Limit

TEQ1 refers to Non Detected Congeners at the Detection Limit

TEQ2 refers to Non Detected Congeners at Zero

% Rec stands for the Recovery Percentage of the Sample

DIOXINS & FURANS: SAMPLING DETAILS

(Continued)

BLANK 1

Parameter	Units	Value
Sampling Dates	-	14/04/2026
Sampling Device	-	ISO
Average Volume Sampled (REF)	m^3	5.7440

Where: ISO stands for Manual Isokinetic Sampling Train

				NATO I-TEQ		WHO Humans / Mammals		WHO Fish		WHO Birds		
Parameter	**Units**	**Result**	**DL**	**TEQ1**	**TEQ2**	**TEQ1**	**TEQ2**	**TEQ1**	**TEQ2**	**TEQ1**	**TEQ2**	**% Rec**
2378-TCDD	ng	ND	0.0006	0.0006	0.0000	0.0006	0.0000	0.0006	0.0000	0.0006	0.0000	95
12378-PeCDD	ng	ND	0.0012	0.0006	0.0000	0.0012	0.0000	0.0012	0.0000	0.0012	0.0000	88
123478-HxCDD	ng	ND	0.0010	0.0001	0.0000	0.0001	0.0000	0.0005	0.0000	0.0001	0.0000	92
123678-HxCDD	ng	ND	0.0010	0.0001	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	95
123789-HxCDD	ng	ND	0.0010	0.0001	0.0000	0.0001	0.0000	0.0000	0.0000	0.0001	0.0000	-
1234678-HPeCDD	ng	0.0040	0.0007	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	90
OCDD	ng	0.0122	0.0013	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	82
Total Dioxins	ng	0.0162	-	0.0015	0.0001	0.0020	0.0000	0.0022	0.0000	0.0019	0.0000	-
2378-TCDF	ng	ND	0.0009	0.0001	0.0000	0.0001	0.0000	0.0000	0.0000	0.0009	0.0000	80
12378-PeCDF	ng	ND	0.0008	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	92
23478-PeCDF	ng	ND	0.0008	0.0004	0.0000	0.0002	0.0000	0.0004	0.0000	0.0008	0.0000	86
123478-HxCDF	ng	ND	0.0008	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	88
123678-HxCDF	ng	ND	0.0009	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	88
234678-HxCDF	ng	ND	0.0009	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	80
123789-HxCDF	ng	ND	0.0012	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	93
1234678-HPeCDF	ng	0.0064	0.0009	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	76
1234789-HPeCDF	ng	0.0019	0.0011	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	81
OCDF	ng	0.0150	0.0019	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	75
Total Furans	ng	0.0233	-	0.0010	0.0001	0.0008	0.0001	0.0009	0.0001	0.0022	0.0001	-
Totals	ng	0.0395	-	0.0025	0.0001	0.0028	0.0001	0.0032	0.0001	0.0040	0.0001	-
Total Concentration	ng/m^3	-	-	0.0004	0.0000	0.0005	0.0000	0.0005	0.0000	0.0007	0.0000	-

Where: ND stands for Non Detected

DL stands for Analytical Detection Limit

TEQ1 refers to Non Detected Congeners at the Detection Limit

TEQ2 refers to Non Detected Congeners at Zero

% Rec stands for the Recovery Percentage of the Sample

DIOXINS & FURANS: QUALITY ASSURANCE

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	17.0
Pre-Sampling Leak Rate	l/min	0.14
Post-Sampling Leak Rate	l/min	0.14
Allowable Leak Rate	l/min	0.85
Leak Test Acceptable	-	Yes

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	5.3
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	%	106.1
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Filter Temperatures	Units	Run 1
Maximum Filter Temperature	°C	120
Maximum Allowable Temperature	°C	125
Temperature Acceptable	-	Yes

Condenser Exit Temperature	Units	Run 1
Maximum Temperature Recorded	°C	16
Maximum Allowable Temperature	°C	20
Exit Temperature Acceptable	-	Yes

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

DIOXINS & FURANS: QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	18.0
Sampling Leak Rate	l/min	0.15
Allowable Leak Rate	l/min	0.90
Leak Test Acceptable	-	Yes

Validity of NATO I-TEQ Blank vs ELV	Units	Blank 1
Allowable Blank	ng/m³	0.010
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	
One out of two sampling lines was used due to sampling location restrictions, however the number of sample points used on the available line were increased to the minimum required by the Standard	x	

DIOXINS & FURANS (NATO I-TEQ): MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	6.5730	uV_m	m^3	0.1315
Sampled Gas Temperature	T_m	292.0	uT_m	K	2.00
Sampled Gas Pressure	ρ_m	101.5	$u\rho_m$	kPa	0.50
Sampled Gas Humidity	H_m	0.00	uH_m	% v/v	1.00
Leak	L	0.82	uL	%	-
Laboratory Result	L_r	10.0	uL_r	%	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.69	≤1%
Sampled Gas Pressure	%	0.49	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	0.82	≤5%
Laboratory Result	%	10.0	No Requirement

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	5.7440	0.002
Leak	L	ng/m^3	0.0000	1.00
Laboratory Result	L_r	ng/m^3	0.0009	1.00

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	ng/m^3	0.0002
Leak	ng/m^3	0.0000
Laboratory Result	ng/m^3	0.0009

	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	ng/m^3	0.0010
Expanded uncertainty (95% confidence), without Oxygen Correction	ng/m^3	0.0019
Expanded uncertainty (95% confidence), with Oxygen Correction	ng/m^3	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	ng/m^3	0.0019
Reported Uncertainty	ng/m^3	0.0019
Expanded uncertainty (95% confidence), without Oxygen Correction	%	20.3
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	20.3
Reported Uncertainty	%	20.3
Reported Uncertainty as % of ELV	%	1.9

HYDROGEN FLUORIDE: RESULTS SUMMARY

Avon Metals Ltd, Gloucester
A1 New GT

Sample Runs

Parameter	Units	Run 1	Run 2	Run 3		Mean
Concentration	mg/m³	< 0.015	< 0.016	0.042		0.025
Uncertainty	±mg/m³	0.0011	0.0012	0.0030		0.0017
Mass Emission	g/hr	< 0.61	< 0.66	1.7		1.0
Uncertainty	±g/hr	0.07	0.08	0.20		0.12

NOTE: Where the maximum Blank concentration is higher than the Sample concentration, the Blank concentration has been reported.

Parameter	Units	Run 1	Run 2	Run 3		Mean
Water Vapour	% v/v	0.073	0.13	0.46		0.22
Uncertainty	±% v/v	0.015	0.016	0.028		0.020

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	< 0.015		< 0.015

General Sampling Information

Parameter	Value	
Standard	CEN/TS 17340	
Technical Procedure	MD 010	
Name of Analytical Laboratory	EET	
Analytical Laboratory's Procedure	MD 101	
ISO 17025 Accredited Analysis?	MCERTS	
Date of Sample Analysis	16/04/2026	
Probe Material	Titanium	
Filter Housing Material	Titanium	
Impinger Material	Polyethylene	
Absorption Solution	HPLC Grade Water	
Positioning of Filter	In Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 2	FORMAT: Number Used / Number Required
Number of Sampling Points Used	8 / 8	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1, A2, A3, A4, A5, A6, A7, A8	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, dry gas.

HYDROGEN FLUORIDE: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1	Run 2	Run 3	
Absolute pressure of stack gas, P_s					
Barometric pressure, P_b	mmHg	762.8	762.8	762.8	
Stack static pressure, P_{static}	mmH_2O	9.4	9.4	9.4	
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	763.5	763.5	763.5	
Volume of water vapour collected, V_{wstd}					
Total mass collected in impingers (liquid trap)	g	-4.0	-2.1	-2.5	
Total mass collected in impingers (silica trap)	g	4.6	3.1	6.3	
Total mass of liquid collected, V_{lc}	g	0.6	1.0	3.8	
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0007	0.0012	0.0047	
Volume of gas metered dry, V_{mstd}					
Volume of gas sample through gas meter, V_m	m^3	1.1670	1.1360	1.2140	
Gas meter correction factor, Y_d	-	0.9310	0.9310	0.9310	
Average dry gas meter temperature, T_m	°C	19.5	23.1	27.6	
Average pressure drop across orifice, ΔH	mmH_2O	33.5	31.2	35.2	
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.0211	0.9817	1.0339	
Moisture content, B_{wo} & R_{wv}					
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0007	0.0013	0.0046	
B_{wo} as a percentage	% v/v	0.07	0.13	0.46	
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	0.07	0.13	0.46	
Volume of gas metered wet, V_{mstw}					
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.0218	0.9829	1.0386	
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	No	No	
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A	N/A	N/A	
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A	N/A	N/A	
% oxygen reference condition, $REF\%O_2$	% v/v	N/A	N/A	N/A	
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A	N/A	N/A	
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A	N/A	N/A	
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A	N/A	N/A	
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A	N/A	N/A	
Molecular weight of dry gas stream, M_d					
CO_2 (Estimated)	% v/v	0.06	0.06	0.06	
O_2 (Estimated)	% v/v	20.80	20.80	20.80	
Total	% v/v	20.86	20.86	20.86	
N_2	% v/v	79.14	79.14	79.14	
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84	28.84	28.84	
Molecular weight of stack gas (wet), M_s					
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.83	28.83	28.79	
Velocity of stack gas, V_s					
Pitot tube velocity constant, K_p	-	34.97	34.97	34.97	
Velocity pressure coefficient, C_p	-	0.90	0.90	0.90	
Average of velocity heads, ΔP_{avg}	mmH_2O	8.06	7.61	8.39	
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	2.84	2.76	2.90	
Average stack gas temperature, T_s	°C	46.4	54.2	52.0	
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	10.74	10.56	11.06	
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	1.23	1.23	1.23	
$Q_a = (60)(A_s)(V_s)$	m^3/min	790.9	777.7	814.4	
Conversion factor (K/mm.Hg), C_f	-	0.3592	0.3592	0.3592	
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	679.0	651.8	687.2	
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	678.5	651.0	684.1	
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A	N/A	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	N/A	N/A	
Percent isokinetic, %I					
Nozzle diameter, D_n	mm	5.98	5.98	5.98	
Nozzle area, A_n	mm^2	28.09	28.09	28.09	
Total sampling time, q	min	64	64	64	
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	102.7	102.9	103.2	

HYDROGEN FLUORIDE: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1	Run 2	Run 3
Sampling Times	-	10:14 - 11:18	11:24 - 12:28	12:32 - 13:36
Sampling Dates	-	13/04/2026	13/04/2026	13/04/2026
Sampling Device	-	ISO	ISO	ISO
Volume Sampled (REF)	m^3	1.0211	0.9817	1.0339
Laboratory Result for Front Impingers	µg/ml	< 0.05	< 0.05	0.14
Laboratory Result for Back Impinger	µg/ml	< 0.05		
Volume in Front Impingers	ml	201.4	323.2	313.6
Volume in Back Impinger	ml	101.3		
Mass in Front Impingers	µg	< 10.1	< 16.2	43.9
Mass in Back Impinger	µg	< 5.1		
Total Mass Collected	µg	< 15.1	< 16.2	43.9
Calculated Concentration	mg/m^3	< 0.015	< 0.016	0.042

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	13/04/2026
Average Volume Sampled (REF)	m^3	1.0122
Laboratory Result for Impingers	µg/ml	< 0.05
Volume in Impingers	ml	306.2
Total Mass Collected	µg	< 15.3
Calculated Concentration	mg/m^3	< 0.015

HYDROGEN FLUORIDE: QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1	Run 2	Run 3
Mean Sampling Rate	l/min	17.0	16.5	17.7
Pre-Sampling Leak Rate	l/min	0.12	0.12	0.12
Post-Sampling Leak Rate	l/min	0.12	0.12	0.12
Allowable Leak Rate	l/min	0.34	0.33	0.35
Leak Test Acceptable	-	Yes	Yes	Yes

Absorption Efficiency	Units	Run 1
Absorption Efficiency	%	100.0
Allowable Absorption Efficiency	%	N/A [2]
Absorption Efficiency Acceptable	-	Yes [2]

[2] The concentration is less than 30% of the ELV, therefore no assessment against an allowable efficiency is required.

Water Droplets	Units	Run 1	Run 2	Run 3
Are Water Droplets Present	-	No	No	No

MU (Concurrent Water Vapour)	Units	Run 1	Run 2	Run 3
Measurement Uncertainty (MU)	%	20.3	12.9	6.2
Allowable MU	%	20.0	20.0	20.0
MU Acceptable	%	No	Yes	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1	Run 2	Run 3
Less than 50% Faded	%	Yes	Yes	Yes

Isokinetic Criterion Compliance	Units	Run 1	Run 2	Run 3
Isokinetic Variation	%	102.7	102.9	103.2
Allowable Isokinetic Range	%	95 - 115	95 - 115	95 - 115
Isokineticity Acceptable	-	Yes	Yes	Yes

Filter Temperatures	Units	Run 1	Run 2	Run 3
Maximum Filter Temperature	°C	46	54	52

Test Conditions	Units	Run 1	Run 2	Run 3
Ambient Temperature Recorded?	-	Yes	Yes	Yes

HYDROGEN FLUORIDE: QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	18.0
Pre-Sampling Leak Rate	l/min	0.13
Post-Sampling Leak Rate	l/min	0.13
Allowable Leak Rate	l/min	0.36
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m^3	0.1
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	2	3	

HYDROGEN FLUORIDE: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value				Standard uncertainty				
Measured Quantities	**Symbol**	**Run 1**	**Run 2**	**Run 3**	**Symbol**	**Units**	**Run 1**	**Run 2**	**Run 3**
Sampled Volume (Actual)	V_m	1.1670	1.1360	1.2140	uV_m	m^3	0.0233	0.0227	0.0243
Sampled Gas Temperature	T_m	292.5	296.1	300.6	uT_m	K	2.00	2.00	2.00
Sampled Gas Pressure	ρ_m	101.8	101.8	101.8	$u\rho_m$	kPa	0.50	0.50	0.50
Sampled Gas Humidity	H_m	0.00	0.00	0.00	uH_m	% v/v	1.00	1.00	1.00
Leak	L	0.71	0.73	0.68	uL	%	-	-	-
Laboratory Result	L_r	2.40	2.40	2.40	uL_r	%	-	-	-

	Uncertainty as a Percentage				
Measured Quantities	**Units**	**Run 1**	**Run 2**	**Run 3**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	2.00	2.00	≤2%
Sampled Gas Temperature	%	0.68	0.68	0.67	≤1%
Sampled Gas Pressure	%	0.49	0.49	0.49	≤1%
Sampled Gas Humidity	%	1.00	1.00	1.00	≤1%
Leak	%	0.71	0.73	0.68	≤2%
Laboratory Result	%	2.40	2.40	2.40	No Requirement

	Uncertainty in Measurement Units					Sensitivity Coefficient		
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 2**	**Run 3**	**Run 1**	**Run 2**	**Run 3**
Sampled Volume (STP)	V_m	m^3	1.0211	0.9817	1.0339	0.01	0.02	0.04
Leak	L	mg/m^3	0.0001	0.0001	0.0002	1.00	1.00	1.00
Laboratory Result	L_r	mg/m^3	0.0004	0.0004	0.0010	1.00	1.00	1.00

	Uncertainty in Result			
Measured Quantities	**Units**	**Run 1**	**Run 2**	**Run 3**
Sampled Volume (STP)	mg/m^3	0.0004	0.0004	0.0011
Leak	mg/m^3	0.0001	0.0001	0.0002
Laboratory Result	mg/m^3	0.0004	0.0004	0.0010

	Oxygen Correction Part of MU Budget			
Measured Quantities	**Units**	**Run 1**	**Run 2**	**Run 3**
O_2 Correction Factor	-	N/A	N/A	N/A
Stack Gas O_2 Content	% v/v	N/A	N/A	N/A
MU for O_2 Correction	-	N/A	N/A	N/A
Overall MU For O_2 Measurement	%	N/A	N/A	N/A

Parameter	**Units**	**Run 1**	**Run 2**	**Run 3**
Combined uncertainty	mg/m^3	0.001	0.001	0.002
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	0.001	0.001	0.003
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A	N/A	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.001	0.001	0.003
Reported Uncertainty	mg/m^3	0.001	0.001	0.003
Expanded uncertainty (95% confidence), without Oxygen Correction	%	7.0	7.1	7.1
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A	N/A	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	7.0	7.1	7.1
Reported Uncertainty	%	7.0	7.1	7.1
Reported Uncertainty as % of ELV	%	0.1	0.1	0.3

TOTAL VOCs (as CARBON): RESULTS SUMMARY

Avon Metals Ltd, Gloucester
A1 New GT

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	7.2		7.2
Uncertainty	±mg/m³	0.44		0.44
Mass Emission	g/hr	288		288
Uncertainty	±g/hr	33.0		33.0

General Sampling Information

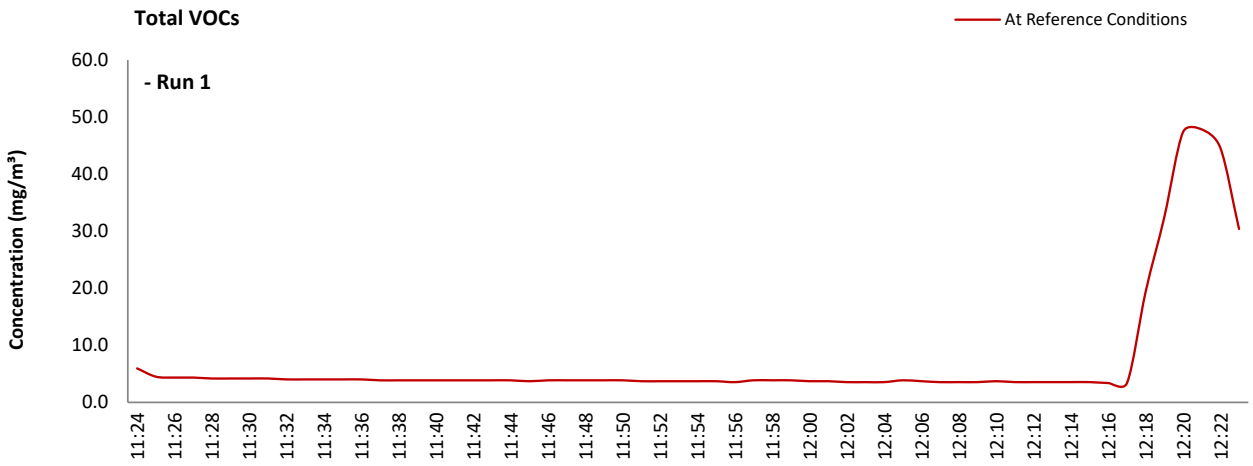
Parameter	Value	
Standard	EN 12619:2013	
Technical Procedure	MD 020	
Probe Material	Stainless Steel	
Filtration Type / Size	2µm Stainless Steel and 0.1µm Glass Fibre	
Heated Head Filter Used	Yes	
Heated Line Temperature	180°C	
Span Gas Type	Propane In Synthetic Air (5 Grade)	
Span Gas Reference Number	A0096760	
Span Gas Expiry Date	05/03/2031	
Span Gas Start Pressure (bar)	180	
Gas Cylinder Concentration (ppm)	81.6	
Span Gas Set Point (ppm)	81.60	
Span Gas Uncertainty (%)	1.77	
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, dry gas.

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	-	11:24 - 12:24
Sampling Dates	-	13/04/2026
Instrument Range	ppm	100
Span Gas Value	ppm	81.6

Quality Assurance

	Zero Drift	Units	Run 1
CAL 1	Zero Down Sampling Line (Pre)	ppm	0.00
	Zero Down Sampling Line (Post)	ppm	0.00
	Zero Drift	ppm	0.00
	Zero Drift	%	0.00
	Drift Correction Applied	2-5%	No
	Allowable Zero Drift	± ppm	4.08
	Zero Drift Acceptable	-	Yes

	Span Drift	Units	Run 1
CAL 1	Span Down Sampling Line (Pre)	ppm	81.50
	Span Down Sampling Line (Post)	ppm	81.20
	Span Drift	ppm	-0.30
	Span Drift	%	-0.37
	Drift Correction Applied	2-5%	No
	Allowable Span Drift	± ppm	4.08
	Span Drift Acceptable	-	Yes

Test Conditions	Units	Run 1
Run Ambient Temperature Range	°C	12 - 13

Method Deviations

Nature of Deviation (x = deviation applies to the associated run)	Run Number 1	
There are no deviations associated with the sampling employed.	x	

TOTAL VOCs (as CARBON): MEASUREMENT UNCERTAINTY CALCULATIONS

Performance characteristics	RUN 1		Units
Limit value	10.0		mg/m³ (REF)
Allowable MU	15.0		%
Measured concentration	7.18		mg/m³ (STP, dry)
Range Used	100.0		ppm
Range Used [A]	160.6		mg/m³
Cal gas conc.	81.6		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.	131.1		mg/m³

Performance characteristics	RUN 1		Units
Response time	45		seconds
Number of readings in measurement	60		-
Repeatability at zero	2.00		% full scale
Repeatability at span level	0.00		% full scale
Deviation from linearity	0.05		% of value
Zero drift	0.00		% full scale
Span drift	-0.37		% 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)	0.12		% of value
Uncertainty of calibration gas	1.77		% 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	0.00		mg/m³
Drift	-0.02		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)	0.01		mg/m³
Uncertainty of calibration gas	0.07		mg/m³

			RUN 1		Units
Measurement uncertainty		**Result**	7.18		mg/m³
Combined uncertainty			0.23		mg/m³
Expanded uncertainty	k =	1.96	0.44		mg/m³
Uncertainty corrected to std conds. (O_2)			0.44		mg/m³ (REF)

	RUN 1		Units
Expanded uncertainty (no O_2) - at 95% Confidence	6.20		% of Value
Expanded uncertainty (no O_2) - at 95% Confidence	4.45		% at ELV
Overall Allowable uncertainty (no O_2) - at 95% Confidence	15.0		% at ELV
Result of Compliance with Uncertainty Requirement	**COMPLIANT**		-

	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