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Stack Emissions Testing Report Commissioned by
Intel Ireland Ltd

Installation Name & Address
Intel Ireland Ltd
Collinstown Industrial Park
Leixlip
County Kildare
Ireland

Industrial Emissions Licence: P0207-04

Stack Reference
FAB 14 A159 Ammonia Exhaust No 23

Dates of the Monitoring Campaign
January

Job Reference Number
EMT04905

Report Written by
Neil Kelly Team Leader MCERTS Level 2 MM 16 1390 TE1 TE2 TE3 TE4

Report Approved by
Donal O Faogain Senior Team Leader MCERTS Level 2 MM 13 1259 TE1 TE2 TE3 TE4

Report Date
4th June 2024

Version
Version 2 - Lab Analysis Report CAT-AP-01

Signature of Report Approver

CONTENTS

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

The testing performed fully meets the technical requirements in Irish EPA Guidance Note, AG2.

Executive Summary

MONITORING OBJECTIVES

Intel Ireland Ltd, Leixlip
FAB 14 A159 Ammonia Exhaust No 23
January

Overall Aim of the Monitoring Campaign

Element Ireland were commissioned by Intel Ireland Ltd to carry out stack emissions testing on the FAB 14 A159 Ammonia Exhaust No 23 at Leixlip.

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

Ammonia

Executive Summary

MONITORING RESULTS

Intel Ireland Ltd, Leixlip
FAB 14 A159 Ammonia Exhaust No 23
January

where MU = Measurement Uncertainty associated with the Result

	Concentration				Mass Emission			
Parameter	**Units**	**Result**	**MU +/-**	**Limit**	**Units**	**Result**	**MU +/-**	**Limit**
Ammonia [1]	mg/m³	### #VALUE!	######	10	g/hr			-
Water Vapour	% v/v	0.86	0.05					
Stack Gas Temperature	°C	12.00						
Stack Gas Velocity	m/s	9.00	0.14					
Volumetric Flow Rate (ACTUAL)	m³/hr	20613.6	984.9					
Volumetric Flow Rate (REF) [1]	m³/hr	19508.3	932.0	41000				

NOTE: VOLUMETRIC FLOW RATE & VELOCITY DATA TAKEN FROM THE PRELIMINARY VELOCITY TRAVERSE.

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

Executive Summary

MONITORING DATE(S) & TIMES

Intel Ireland Ltd, Leixlip
FAB 14 A159 Ammonia Exhaust No 23
January

Parameter		Units	Concentration	Units	Mass Emission	Sampling Date(s)	Sampling Times	Duration mins
Ammonia	R1	mg/m³	### #VALUE!	g/hr		10/01/2023	12:25 - 13:42	92
Velocity Traverse	R1					10/01/2023	11:40 - 11:50	

All results are expressed at the respective reference conditions.

PROCESS DETAILS

Intel Ireland Ltd, Leixlip
FAB 14 A159 Ammonia Exhaust No 23
January

Standard Operating Conditions

Parameter	Value
Process Status	Ammonia Scrubber
Capacity (of 100%) and Tonnes / Hour	100%
Continuous or Batch Process	Continuous
Feedstock (if applicable)	Integrated Circuits
Abatement System	Wet Scrubber
Abatement System Running Status	On
Fuel	N/A
Plume Appearance	No Plume Visible

MONITORING & ANALYTICAL METHODS

Intel Ireland Ltd, Leixlip
FAB 14 A159 Ammonia Exhaust No 23
January

	Monitoring				Analysis					
Parameter	**Standard**	**Technical Procedure**	**Sampling Status**	**Testing Lab**	**Analytical Procedure**	**Analytical Technique**	**Analysis Status**	**Analysis Lab**	**Overall Status**	**LOD (Average)**
Ammonia	ISO 21877	CAT-TP-14	MCERTS	EET	A6	IC	Yes	RPS	Yes	0.025 mg/m³
Water Vapour	EN 14790	CAT-TP-05	MCERTS	EET	CAT-TP-05	Gravimetric	MCERTS	EET	MCERTS	0.10 % v/v
Velocity & Vol. Flow Rate	EN 16911-1 (MID)	CAT-TP-41	MCERTS	EET	Pitot Tube and Thermocouple				MCERTS	1.2 m/s

ANALYSIS LABORATORIES

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

EDU

Element (Stockport Lab - EET)	ISO 17025 Accreditation Number: 4279
RPS Laboratories Ltd (RPS)	ISO 17025 Accreditation Number: 0605

SUMMARY OF SAMPLING DEVIATIONS

Parameter	Run	Deviation
All	All	There are no deviations associated with the sampling employed.

SUITABILITY OF SAMPLING LOCATION

Duct Characteristics

Parameter	Units	Value
Type	-	Circular
Depth	m	0.90
Width	m	-
Area	m²	0.64
Port Depth	cm	28
Orientation of Duct	-	Vertical
Number of Ports	-	2
Sample Port Size	-	3" BSP

Location of Sampling Platform

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

Platform Details

Irish EPA Technical Guidance Note AG1 / 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 Irish EPA Guidance Note AG1 and EN 15259, and therefore there are no improvement recommendations.

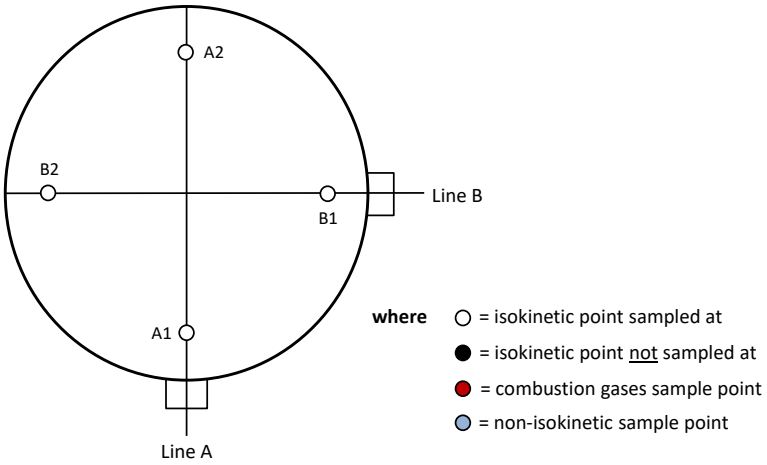
EN 15259 Homogeneity Test Requirements

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	69.0	> 5 Pa	Yes
Mean Velocity	m/s	9.00	-	-
Lowest Gas Velocity	m/s	8.87	-	-
Highest Gas Velocity	m/s	9.13	-	-
Ratio of Above	: 1	1.03	< 3 : 1	Yes
Maximum Angle of Swirl	°	2.00	< 15°	Yes
No Local Negative Flow	-	Yes	-	Yes

SAMPLE POINTS



APPENDIX CONTENTS

STACK EMISSIONS MONITORING PERSONNEL

Position	Name	MCERTS Accreditation	MCERTS Number	Technical Endorsements
Team Leader	Neil Kelly	MCERTS Level 2	MM 16 1390	TE1 TE2 TE3 TE4
Trainee	Keith Mannion	MCERTS Trainee	MM 22 1719	None

LIST OF EQUIPMENT

Extractive Sampling	
Equipment Type	**Equipment I.D.**
Control Box DGM (1)	CAT 7.74
Control Box DGM (2)	-
Box Thermocouples (1)	CAT 3.103
Box Thermocouples (2)	-
Umbilical (1)	CAT 3.103
Umbilical (2)	-
Oven Box (1)	CAT 12.101
Oven Box (2)	-
Heated Probe (1)	CAT 5.54
Heated Probe (2)	-
Heated Probe (3)	-
S-Pitot (1)	CAT 21S.73
S-Pitot (2)	-
L-Pitot	-
Site Balance	CAT 17.68
500g / 1Kg Check Weights	CAT 17.68
Last Impinger Arm	-
Callipers	CAT 23.30
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	-
SELECT FID Model	-
SELECT Heated Head	-
Mass Flow Controller (1)	-
Mass Flow Controller (2)	-
Mass View (1)	-
Mass View (2)	-
SELECT Logger 1	-
SELECT Logger 2	-
Bioaerosols Temperature Logger	-
Electronic Refrigerator	-

Miscellaneous Items	
Equipment Type	**Equipment I.D.**
Digital Manometer (1)	CAT 3.275
Digital Manometer (2)	-
Digital Temperature Meter	CAT 3.275
Stopwatch	CAT 14.97
Barometer	CAT 13.39
Stack Thermocouple (1)	CAT 4.0045
Stack Thermocouple (2)	CAT 4.1118
Stack Thermocouple (3)	-
1m Heated Line (1)	-
1m Heated Line (2)	-
1m Heated Line (3)	-
5m Heated Line (1)	-
15m Heated Line (1)	-
20m Heated Line (1)	-
20m Heated Line (2)	-
Dual Channel Heater Controller	-
Single Channel Heater Controller	-
Laboratory Balance	
Tape Measure	CAT 16.94

METHODS & TECHNICAL PROCEDURES USED

Parameter	Standard	Technical Procedure
Ammonia	ISO 21877	CAT-TP-14
Water Vapour	EN 14790	CAT-TP-05
Velocity & Vol. Flow Rate	EN 16911-1 (MID)	CAT-TP-41

PRELIMINARY STACK SURVEY: CALCULATIONS

General Stack Details

Stack Details (from Traverse)	Units	Value
Stack Diameter / Depth, D	m	0.90
Stack Width, W	m	-
Stack Area, A	m^2	0.64
Average Stack Gas Temperature, T_a	°C	12.0
Average Stack Gas Pressure	Pa	71.0
Average Stack Static Pressure, P_{static}	kPa	-0.018
Average Barometric Pressure, P_b	kPa	100.1
Average Pitot Tube Calibration Coefficient, C_p	-	0.83

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)	-	20.90	20.72	0.2090	32.00	1.4277	0.29838
N_2	-	79.04	78.36	0.7904	28.01	1.2498	0.98788
Moisture (H_2O)	-	-	0.86	0.0086	18.02	0.8037	0.00690

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	1.283
Dry Density (Actual), P_{Actual}	kg/m^3	1.218
Average Wet Density (Actual), $P_{ActualW}$	kg/m^3	1.214

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	12.0	0.0
Total Pressure	kPa	100.1	101.3
Moisture	%	0.86	0.86

Gas Volumetric Flowrate (from Traverse)	Units	Result
Gas Volumetric Flowrate (Actual)	m^3/hr	20613.6
Gas Volumetric Flowrate (STP, Wet)	m^3/hr	19508.3
Gas Volumetric Flowrate (STP, Dry)	m^3/hr	19340.7
Gas Volumetric Flowrate REF [1]	m^3/hr	19508.3

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

(1 of 1)

Parameter	Units	Value
Date of Survey	-	10/01/2023
Time of Survey	-	11:40 - 11:50
Atmospheric Pressure	kPa	100.1
Average Stack Static Pressure	Pa	-18
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	-	Vertical
Pitot Tube, C_p	-	0.834
Number of Lines Available	-	2
Number of Lines Used	-	2

		Sampling Line A					Sampling Line B				
Traverse Point	**Depth m**	**ΔP Pa**	**Temp °C**	**Wet Density kg/m³**	**Velocity m/s**	**Swirl °**	**ΔP Pa**	**Temp °C**	**Wet Density kg/m³**	**Velocity m/s**	**Swirl °**
STATIC (Units: Pa)		*-17.0*					*-18.0*				
Mean		**69.5**	**12.0**	**1.214**	**8.90**		**72.5**	**12.0**	**1.214**	**9.09**	
1	0.13	70.0	12.0	1.214	8.94	2.0	73.0	12.0	1.214	9.13	1.0
2	0.77	69.0	12.0	1.214	8.87	1.0	72.0	12.0	1.214	9.06	2.0

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)	1.315	Pa
- Resolution	u(res)	0.00087	
- Calibration	u(cal)	0.525	
- Drift	u(drift)	0.083	
- Lack of Fit	u(fit)	0.119	
- Overall corrections to dynamic measurements	u(Cf)	0.728	
Standard uncertainty associated with the molar mass of the gas	u(M)	0.00003	-
- $\varphi O_2,w$	-	20.720	
- $\varphi CO_2,w$	-	0.059	
- Oxygen, dry	u(ϕO_2,d)	0.640	
- Carbon Dioxide, dry	u(ϕCO_2,d)	0.002	
- Water Vapour	u(ϕH_2O)	0.044	
- Oxygen, wet	u(ϕO_2,w)	0.634	
- Carbon Dioxide, wet	u(ϕCO_2,w)	0.002	
Standard uncertainty associated with the stack temperature	u(Tc)	1.454	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)	0.930	
Standard uncertainty associated with the density in the duct	u(ρ)	0.00655	-
Standard uncertainty associated with the local velocities	u(vi)	0.101	Pa
Standard uncertainty associated with the mean velocity	u(v)	0.070	m/s
Standard uncertainty associated with the mean velocity (95% Confidence)	Uc(v)	0.138	m/s
Standard uncertainty associated with the mean velocity (95% Confidence), relative	Uc,rel(v)	1.53	%
Standard uncertainty associated with the volume flow rate (95% Confidence)	Uc(qV,w)	984.9	m^3/hr
- $u^2(a)/a^2$	-	0.00053	
- $u^2(qV,w)/q^2V,w$	-	0.00059	
- $u^2(qV,w)$	-	252481	
- $u(qV,w)$	-	502.5	
Standard uncertainty associated with the volume flow rate (95% Confidence), relative	Uc,rel(qV,w)	4.78	%

AMMONIA: RESULTS SUMMARY

Intel Ireland Ltd, Leixlip
FAB 14 A159 Ammonia Exhaust No 23

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	#VALUE!		### #VALUE!
Uncertainty	±mg/m³	#VALUE!		#VALUE!
Mass Emission	g/hr	#VALUE!		#VALUE!
Uncertainty	±g/hr	#VALUE!		#VALUE!

#VALUE!

Parameter	Units	Run 1		Mean
Water Vapour	% v/v	0.86		0.86
Uncertainty	±% v/v	0.05		0.05

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	< #VALUE!		< #VALUE!

General Sampling Information

Parameter	Value	
Standard	ISO 21877	
Technical Procedure	CAT-TP-14	
Name of Analytical Laboratory	RPS	
Analytical Laboratory's Procedure	A6	
ISO 17025 Accredited Analysis?	Yes	
Date of Sample Analysis	INPUT	
Probe Material	Titanium	
Filter Housing Material	Borosilicate Glass	
Impinger Material	Polyethylene	
Absorption Solution	0.05 mol/l Sulphuric Acid	
Positioning of Filter	Out Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	2 / 2	FORMAT: Number Used / Number Required
Number of Sampling Points Used	4 / 4	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1, A2, B1, B2	

Reference Conditions

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

AMMONIA: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	750.8
Stack static pressure, P_{static}	mmH_2O	-1.7
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	750.7
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	6.6
Total mass collected in impingers (silica trap)	g	3.3
Total mass of liquid collected, V_{lc}	g	9.9
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0123
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	1.5680
Gas meter correction factor, Y_d	-	0.9620
Average dry gas meter temperature, T_m	°C	13.6
Average pressure drop across orifice, ΔH	mmH_2O	29.7
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.4236
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0086
B_{wo} as a percentage	% v/v	0.86
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	0.86
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.4359
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	28.75
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.88
Average of velocity heads, ΔP_{avg}	mmH_2O	7.00
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	2.65
Average stack gas temperature, T_s	°C	14.0
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	9.34
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	0.64
$Q_a = (60)(A_s)(V_s)$	m^3/min	356.4
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_{sj})(C_f)) / ((T_s) + 273)$	m^3/min	334.9
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	332.0
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	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	6.10
Nozzle area, A_n	mm^2	29.27
Total sampling time, q	min	92
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	101.3

AMMONIA: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	12:25 - 13:42
Sampling Dates	-	10/01/2023
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	1.4359
Laboratory Result for Front Impingers	µg/ml	< INPUT
Laboratory Result for Back Impinger	µg/ml	INPUT
Volume in Front Impingers	ml	228.6
Volume in Back Impinger	ml	124.3
Mass in Front Impingers	µg	< #VALUE!
Mass in Back Impinger	µg	< #VALUE!
Total Mass Collected	µg	< #VALUE!
Calculated Concentration	mg/m^3	< #VALUE!

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	10/01/2023
Average Volume Sampled (REF)	m^3	1.4359
Laboratory Result for Impingers	µg/ml	< INPUT
Volume in Impingers	ml	303.0
Total Mass Collected	µg	< #VALUE!
Calculated Concentration	mg/m^3	< #VALUE!

AMMONIA: QUALITY ASSURANCE

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	16.4
Pre-Sampling Leak Rate	l/min	0.20
Post-Sampling Leak Rate	l/min	0.20
Allowable Leak Rate	l/min	0.33
Leak Test Acceptable	-	Yes

Absorption Efficiency	Units	Run 1
Absorption Efficiency	%	100.0
Allowable Absorption Efficiency	%	#VALUE!
Absorption Efficiency Acceptable	-	#VALUE!

###

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	5.8
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	%	101.3
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Filter Temperatures	Units	Run 1
Maximum Filter Temperature	°C	160

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

AMMONIA: QUALITY ASSURANCE

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.20
Post-Sampling Leak Rate	l/min	0.20
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m³	1.0
Blank Acceptable	-	#VALUE!

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	
There are no deviations associated with the sampling employed.	x	

AMMONIA: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	1.5680	uV_m	m^3	0.0314
Sampled Gas Temperature	T_m	286.6	uT_m	K	2.00
Sampled Gas Pressure	ρ_m	100.1	$u\rho_m$	kPa	0.50
Sampled Gas Humidity	H_m	0.00	uH_m	% v/v	1.00
Leak	L	1.22	uL	%	-
Laboratory Result	L_r	8.90	uL_r	%	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.70	≤1%
Sampled Gas Pressure	%	0.50	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	1.22	≤2%
Laboratory Result	%	8.90	No Requirement

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	1.4236	######
Leak	L	mg/m^3	######	1.00
Laboratory Result	L_r	mg/m^3	######	1.00

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m^3	######
Leak	mg/m^3	######
Laboratory Result	mg/m^3	######

	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/m^3	######
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	######
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	######
Reported Uncertainty	mg/m^3	######
Expanded uncertainty (95% confidence), without Oxygen Correction	%	######
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	######
Reported Uncertainty	%	######

VERSION HISTORY

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