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Stack Emissions Testing Report Commissioned by
Blackmore Vale Farm Cream Ltd

Installation Name & Address
Blackmore Vale Farm Cream Ltd
Wincombe Lane
Shaftesbury
SP7 8QD

EPR Permit: HP3492EZ

Stack Reference
A1 - Engine 1

Dates of the Monitoring Campaign
13th October 2022


Job Reference Number
ERE-22401

Report Written by
Darren Price Team Leader MCERTS Level 2 MM 03 176 TE1 TE2 TE3 TE4

Report Approved by
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Report Date
31st October 2022

Version
Version 1

Signature of Report Approver


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Executive Summary

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MONITORING OBJECTIVES

Blackmore Vale Farm Cream Ltd, Shaftesbury

A1 - Engine 1

13th October 2022

Overall Aim of the Monitoring Campaign

Element were commissioned by Blackmore Vale Farm Cream Ltd to carry out stack emissions testing on the A1 - Engine 1 at Shaftesbury.

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

Sulphur Dioxide, Total VOCs (as Carbon), Oxides of Nitrogen (as NO₂), Carbon Monoxide

Executive Summary
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MONITORING RESULTS

Blackmore Vale Farm Cream Ltd, Shaftesbury
A1 - Engine 1
13th October 2022

where MU = Measurement Uncertainty associated with the Result

Concentration				
Parameter	Units	Result	MU +/-	Limit
Sulphur Dioxide	¹ mg/m ³	41.5	2.7	350
Total VOCs (as Carbon)	¹ mg/m ³	738	29	1000
Oxides of Nitrogen (as NO ₂)	¹ mg/m ³	330	16	500
Carbon Monoxide	¹ mg/m ³	523	25	1400
Oxygen	% v/v	Dry 6.1	0.24	
Water Vapour	% v/v	14.5	0.8	

¹ Reference Conditions (REF) are: 273K, 101.3kPa, dry gas, 5% oxygen.

Executive Summary
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MONITORING DATE(S) & TIMES

Blackmore Vale Farm Cream Ltd, Shaftesbury
A1 - Engine 1
13th October 2022

Parameter	Units	Concentration		Sampling Date(s)	Sampling Times	Duration mins
Sulphur Dioxide	R1	mg/m ³	41.5	13/10/2022	10:44 - 11:44	60
Total VOCs (as Carbon)	R1	mg/m ³	738	13/10/2022	10:44 - 11:44	60
Oxides of Nitrogen (as NO ₂)	R1	mg/m ³	330	13/10/2022	10:44 - 11:44	60
Carbon Monoxide	R1	mg/m ³	523	13/10/2022	10:44 - 11:44	60
Oxygen	R1	% v/v	6.1	13/10/2022	10:44 - 11:44	60

All results are expressed at the respective reference conditions.

Executive Summary

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PROCESS DETAILS

Blackmore Vale Farm Cream Ltd, Shaftesbury

A1 - Engine 1

13th October 2022

Standard Operating Conditions

Parameter	Value
Process Status	Operating - Exhaust Temp 508°C (Pre Heat Exchanger)
Capacity (of 100%) and Tonnes / Hour	Rated at 190kWe (Operating at 55% MCR)
Continuous or Batch Process	Continuous
Feedstock (if applicable)	N/A
Abatement System	None
Abatement System Running Status	N/A
Fuel	Biogas
Plume Appearance	No Visible Plume

Executive Summary

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MONITORING & ANALYTICAL METHODS

Blackmore Vale Farm Cream Ltd, Shaftesbury

A1 - Engine 1

13th October 2022

Parameter	Monitoring				Analysis				Overall Status	LOD (Average)
	Standard	Technical Procedure	Sampling Status	Testing Lab	Analytical Procedure	Analytical Technique	Analysis Status	Analysis Lab		
Sulphur Dioxide	EN 14791	CAT-TP-09	17025	EET	CAT-AP-01	IC	MCERTS	EET	MCERTS	0.088 mg/m ³
Water Vapour	EN 14790	CAT-TP-05	MCERTS	EET	CAT-TP-05	Gravimetric	MCERTS	EET	MCERTS	0.10 % v/v
Total VOCs (as Carbon)	EN 12619:2013	CAT-TP-20	MCERTS	EET	Flame Ionisation Detection by Signal 3010HM				MCERTS	0.32 mg/m ³
Oxides of Nitrogen (as NO ₂)	EN 14792	CAT-TP-21	MCERTS	EET	Chemiluminescence by Horiba PG-250				MCERTS	0.41 mg/m ³
Carbon Monoxide	EN 15058	CAT-TP-21	MCERTS	EET	NDIR by Horiba PG-250				MCERTS	0.25 mg/m ³
Oxygen	EN 14789	CAT-TP-21	MCERTS	EET	Dry Zirconia Cell by Horiba PG-250				MCERTS	0.1 %

ANALYSIS LABORATORIES

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

Element (Stockport Lab - EET)	ISO 17025 Accreditation Number: 4279
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SUMMARY OF SAMPLING DEVIATIONS

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

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SUITABILITY OF SAMPLING LOCATION

Duct Characteristics

Parameter	Units	Value
Type	-	Circular
Depth	m	0.22
Width	m	-
Area	m ²	0.04
Port Depth	cm	2
Orientation of Duct	-	Horizontal
Number of Ports	-	1
Sample Port Size	-	1" BSP

Location of Sampling Platform

General Platform Information	Value
Permanent / Temporary Platform	On Ground
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)	N/A
Platform has vertical base boards (approx. 0.25m high)	N/A
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

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.

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PLANT PHOTOS

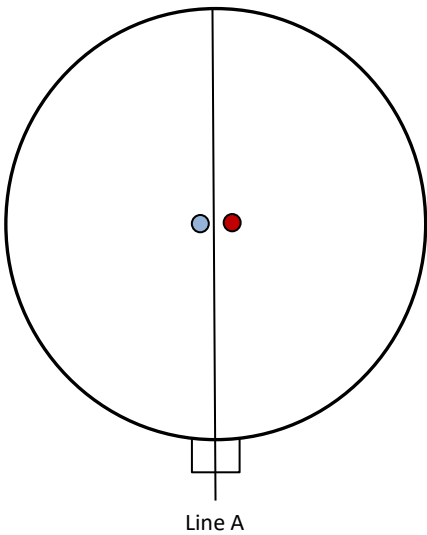
Photo 1



Photo 2



SAMPLE POINTS



- where
- = isokinetic point sampled at
 - = isokinetic point not sampled at
 - = combustion gases sample point
 - = non-isokinetic sample point

APPENDICES

APPENDIX CONTENTS

APPENDIX 1 - Stack Emissions Monitoring Personnel, List of Equipment & Methods and Technical Procedures Used

APPENDIX 2 - Summaries, Calculations, Raw Data and Charts

APPENDIX 1

STACK EMISSIONS MONITORING PERSONNEL

Position	Name	MCERTS Accreditation	MCERTS Number	Technical Endorsements
Team Leader	Darren Price	MCERTS Level 2	MM 03 176	TE1 TE2 TE3 TE4
Trainee	Naill Kester	MCERTS Trainee	MM 19 1573	None

LIST OF EQUIPMENT

Extractive Sampling		Instrumental Analysers		Miscellaneous Items	
Equipment Type	Equipment I.D.	Equipment Type	Equipment I.D.	Equipment Type	Equipment I.D.
Control Box DGM (1)	CAT 7.126	Horiba PG-250	CAT 39.21	Digital Manometer (1)	-
Control Box DGM (2)	-	Horiba PG-250 SRM	-	Digital Manometer (2)	-
Box Thermocouples (1)	CAT 3.276	Servomex 4900	-	Digital Temperature Meter	CAT TP#10
Box Thermocouples (2)	-	Ankersmid AOX210	-	Stopwatch	CAT TP#10
Umbilical (1)	CAT 7.126	ABB AO2020-URAS26	-	Barometer	CAT DB#28
Umbilical (2)	-	Testo 350 XL	-	Stack Thermocouple (1)	-
Oven Box (1)	-	Signal 200SM	-	Stack Thermocouple (2)	-
Oven Box (2)	-	Gasmet DX4000	-	Stack Thermocouple (3)	-
Heated Probe (1)	-	Gasmet Sampling System	-	1m Heated Line (1)	-
Heated Probe (2)	-	Signal 3010HM	CAT 8.51	1m Heated Line (2)	-
Heated Probe (3)	-	M&C PSS	-	1m Heated Line (3)	-
S-Pitot (1)	-	Mass Flow Controller (1)	-	5m Heated Line (1)	-
S-Pitot (2)	-	Mass Flow Controller (2)	-	15m Heated Line (1)	-
L-Pitot	-	Mass View (1)	-	20m Heated Line (1)	CAT HL#11
Site Balance	CAT BAL#02	Mass View (2)	-	20m Heated Line (2)	-
500g / 1Kg Check Weights	CAT BAL#02	Squirrel 2020	CAT DL#04	Dual Channel Heater Controller	-
Last Impinger Arm	-	Easylogger EN-EL-12 Bit	-	Single Channel Heater Controller	CAT HLC#11
Callipers	-	Bioaerosols Temperature Logger	-	Laboratory Balance	-
Tubes Kit Thermocouple	-	Electronic Refrigerator	-	Tape Measure	CAT 16.122

METHODS & TECHNICAL PROCEDURES USED

Parameter	Standard	Technical Procedure
Sulphur Dioxide	EN 14791	CAT-TP-09
Water Vapour	EN 14790	CAT-TP-05
Total VOCs (as Carbon)	EN 12619:2013	CAT-TP-20
Oxides of Nitrogen (as NO ₂)	EN 14792	CAT-TP-21
Carbon Monoxide	EN 15058	CAT-TP-21
Oxygen	EN 14789	CAT-TP-21

APPENDIX 2

SULPHUR DIOXIDE: RESULTS SUMMARY

Blackmore Vale Farm Cream Ltd, Shaftesbury
A1 - Engine 1

Sample Runs

Parameter	Units	Run 1	Mean
Concentration	mg/m ³	41.5	41.5
Uncertainty	±mg/m ³	2.7	2.7

Parameter	Units	Run 1	Mean
Water Vapour	% v/v	14.5	14.5
Uncertainty	±% v/v	0.77	0.77

Blank Runs

Parameter	Units	Blank 1	Maximum
Concentration	mg/m ³	0.078	0.078

General Sampling Information

Parameter	Value	
Standard	EN 14791	
Technical Procedure	CAT-TP-09	
Name of Analytical Laboratory	EET	
Analytical Laboratory's Procedure	CAT-AP-01	
ISO 17025 Accredited Analysis?	MCERTS	
Date of Sample Analysis	24/10/2022	
Probe Material	Monel	
Filter Housing Material	Titanium	
Impinger Material	Polyethylene	
Absorption Solution	0.3% Hydrogen Peroxide	
Positioning of Filter	Out Stack Heated Head	
Filter Size and Material	0.1µm Glass 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, dry gas, 5% oxygen.

SULPHUR DIOXIDE: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	10:44 - 11:44
Sampling Dates	-	13/10/2022
Sampling Device	-	DGM
Duration	mins	60
DGM Start Volume	m ³	857.1490
DGM End Volume	m ³	857.4490
DGM Start Temperature	°C	12.0
DGM End Temperature	°C	14.0
Start ΔH	mmH ₂ O	8.00
End ΔH	mmH ₂ O	8.00
DGM Y _d	-	0.9830
Barometric Pressure	kPa	101.6
Volume Sampled (STP, Dry)	m ³	0.2824
Volume Sampled (STP, Wet)	m ³	0.3304
Volume Sampled (REF)	m ³	0.2628
Sample Flow Rate	l/min	4.91
Laboratory Result for Front Impingers	µg/ml	33.78
Laboratory Result for Back Impinger	µg/ml	0.32
Volume in Front Impingers	ml	321.2
Volume in Back Impinger	ml	139.1
Mass in Front Impingers	µg	10850.1
Mass in Back Impinger	µg	44.5
Total Mass Collected	µg	10894.6
Calculated Concentration	mg/m ³	41.45
Liquid Trap Start Mass	g	2941.7
Liquid Trap End Mass	g	2976.2
Silica Trap Start Mass	g	946.4
Silica Trap End Mass	g	950.4
Total Mass Of Water Vapour	g	38.5
Calculated Water Vapour	% v/v	14.52

Where: DGM stands for Dry Gas Meter

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	13/08/2022
Average Volume Sampled (REF)	m ³	0.2628
Laboratory Result for Impingers	µg/ml	0.10
Volume in Impingers	ml	203.7
Total Mass Collected	µg	20.4
Calculated Concentration	mg/m ³	0.08

SULPHUR DIOXIDE: QUALITY ASSURANCE

Sample Runs

Leak Test Results	Units	Run 1	
Mean Sampling Rate	l/min	4.9	
Pre-Sampling Leak Rate	l/min	0.07	
Post-Sampling Leak Rate	l/min	0.08	
Allowable Leak Rate	l/min	0.10	
Leak Test Acceptable	-	Yes	

Absorption Efficiency	Units	Run 1	
Absorption Efficiency	%	99.6	
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	
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	

Test Conditions	Units	Run 1	
Ambient Temperature Recorded?	-	Yes	

Blank Runs

Leak Test Results	Units	Blank 1	
Expected Sampling Rate	l/min	5.0	
Pre-Sampling Leak Rate	l/min	0.08	
Post-Sampling Leak Rate	l/min	0.08	
Allowable Leak Rate	l/min	0.10	
Leak Test Acceptable	-	Yes	

Validity of Blank vs ELV	Units	Blank 1	
Allowable Blank	mg/m ³	35.0	
Blank Acceptable	-	Yes	

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
There are no deviations associated with the sampling employed.	wx

SULPHUR DIOXIDE: MEASUREMENT UNCERTAINTY CALCULATIONS

Measured Quantities	Value		Standard uncertainty		
	Symbol	Run 1	Symbol	Units	Run 1
Sampled Volume (Actual)	V _m	0.3000	uV _m	m ³	0.0060
Sampled Gas Temperature	T _m	286.0	uT _m	K	2.00
Sampled Gas Pressure	p _m	101.6	up _m	kPa	0.50
Sampled Gas Humidity	H _m	0.00	uH _m	% v/v	1.00
Leak	L	1.63	uL	%	-
Laboratory Result	L _r	1.00	uL _r	%	-

Measured Quantities	Uncertainty as a Percentage		Requirement of Standard
	Units	Run 1	
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.70	≤1%
Sampled Gas Pressure	%	0.49	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	1.63	≤2%
Laboratory Result	%	1.00	No Requirement

Measured Quantities	Uncertainty in Measurement Units			Sensitivity Coefficient
	Symbol	Units	Run 1	
Sampled Volume (STP)	V _m	m ³	0.2824	146.76
Leak	L	mg/m ³	0.390	1.00
Laboratory Result	L _r	mg/m ³	0.415	1.00

Measured Quantities	Uncertainty in Result	
	Units	Run 1
Sampled Volume (STP)	mg/m ³	1.036
Leak	mg/m ³	0.3895
Laboratory Result	mg/m ³	0.4145

Measured Quantities	Oxygen Correction Part of MU Budget	
	Units	Run 1
O ₂ Correction Factor	-	1.07
Stack Gas O ₂ Content	% v/v	6.11
MU for O ₂ Correction	-	0.04
Overall MU For O ₂ Measurement	%	3.36

Parameter	Units	Run 1
Combined uncertainty	mg/m ³	1.18
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m ³	2.32
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m ³	2.70
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m ³	2.70
Reported Uncertainty	mg/m ³	2.70
Expanded uncertainty (95% confidence), without Oxygen Correction	%	5.6
Expanded uncertainty (95% confidence), with Oxygen Correction	%	6.5
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	6.5
Reported Uncertainty	%	6.5

APPENDIX 2

TOTAL VOCs (as CARBON): RESULTS SUMMARY

Blackmore Vale Farm Cream Ltd, Shaftesbury
A1 - Engine 1

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m ³	738		738
Uncertainty	±mg/m ³	28.6		28.6

General Sampling Information

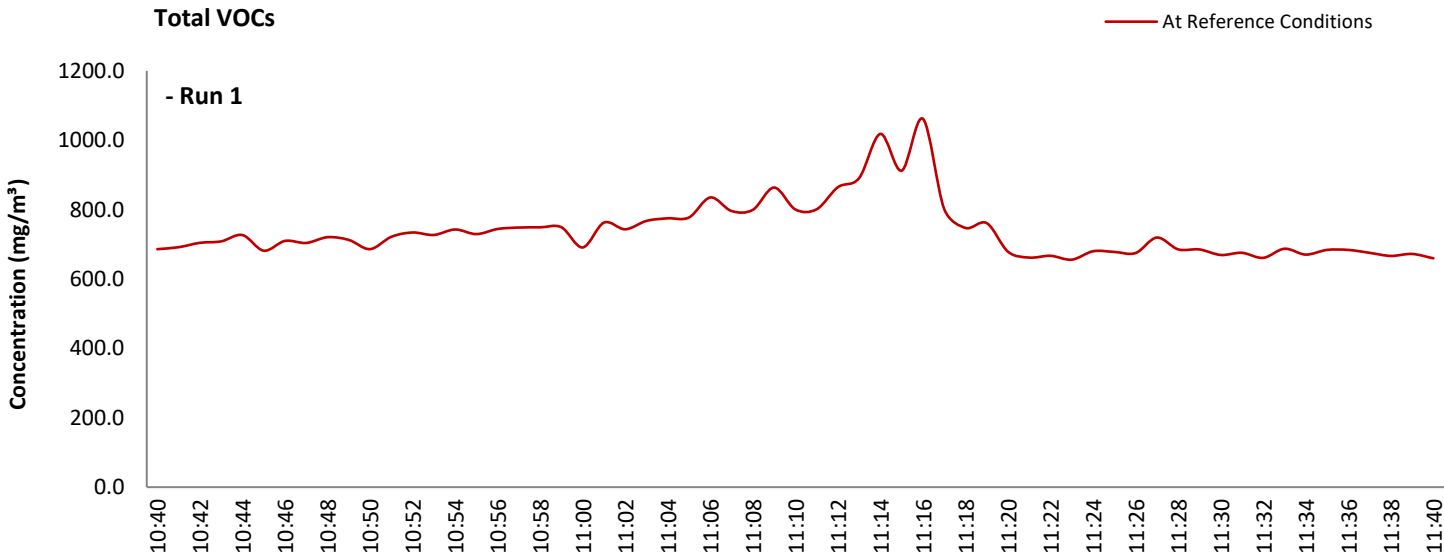
Parameter	Value	
Standard	EN 12619:2013	
Technical Procedure	CAT-TP-20	
Probe Material	Stainless Steel	
Filtration Type / Size	0.1µm Glass Fibre	
Heated Head Filter Used	Yes	
Heated Line Temperature	180°C	
Span Gas Type	Propane In Synthetic Air (5 Grade)	
Span Gas Reference Number	12.0443	
Span Gas Expiry Date	13/04/2024	
Span Gas Start Pressure (bar)	100	
Gas Cylinder Concentration (ppm)	618.5	
Span Gas Set Point (ppm)	618.50	
Span Gas Uncertainty (%)	0.2	
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, dry gas, 5% oxygen.

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	-	10:44 - 11:44
Sampling Dates	-	13/10/2022
Instrument Range	ppm	1000
Span Gas Value	ppm	618.5

Quality Assurance

Zero Drift		Units	Run 1
CAL 1	Zero Down Sampling Line (Pre)	ppm	1.00
	Zero Down Sampling Line (Post)	ppm	0.00
	Zero Drift	ppm	-1.00
	Zero Drift	%	-0.16
	Drift Correction Applied	2-5%	No
	Allowable Zero Drift	± ppm	30.93
	Zero Drift Acceptable	-	Yes
Span Drift		Units	Run 1
CAL 1	Span Down Sampling Line (Pre)	ppm	617.00
	Span Down Sampling Line (Post)	ppm	608.00
	Span Drift	ppm	-9.00
	Span Drift	%	-1.46
	Drift Correction Applied	2-5%	No
	Allowable Span Drift	± ppm	30.93
	Span Drift Acceptable	-	Yes
Test Conditions		Units	Run 1
Run Ambient Temperature Range		°C	17 - 20

Method Deviations

Nature of Deviation	Run Number	
(x = deviation applies to the associated run)	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	1000.0	mg/m ³ (REF)
Allowable MU	15.0	%
Measured concentration	686.97	mg/m ³ (STP, dry)
Range Used	1000.0	ppm
Range Used [A]	1606.1	mg/m ³
Cal gas conc.	618.5	ppm
Conversion	1.61	ppm to mg/m ³
MCERTS Range [B]	15.0	mg/m ³
Lower of [A] or [B]	15.0	mg/m ³
Cal gas conc.	993.4	mg/m ³

Performance characteristics	RUN 1	Units
Response time	15	seconds
Number of readings in measurement	60	-
Repeatability at zero	0.15	% full scale
Repeatability at span level	0.80	% full scale
Deviation from linearity	0.15	% of value
Zero drift	-0.16	% full scale
Span drift	-1.46	% full scale
Volume or pressure flow dependence	2.00	% of full scale
Atmospheric pressure dependence	0.80	% of value/kPa
Ambient temperature dependence	1.00	% full scale/10K
Combined interference	1.20	% range
Dependence on voltage	0.10	% full scale/10V
Losses in the line (leak)	0.32	% of value
Uncertainty of calibration gas	0.20	% of value

Performance characteristic	RUN 1	Units
Standard deviation of repeatability at zero	use rep at span	mg/m ³
Standard deviation of repeatability at span level	0.10	mg/m ³
Lack of fit	0.01	mg/m ³
Drift	0.00	mg/m ³
Volume or pressure flow dependence	0.00	mg/m ³
Atmospheric pressure dependence	0.03	mg/m ³
Ambient temperature dependence	0.14	mg/m ³
Combined interference (from MCERTS Certificate)	0.10	mg/m ³
Dependence on voltage	0.01	mg/m ³
Losses in the line (leak)	1.28	mg/m ³
Uncertainty of calibration gas	0.79	mg/m ³

Measurement uncertainty	Result	RUN 1	Units
Combined uncertainty		686.97	mg/m ³
Expanded uncertainty		1.53	mg/m ³
Expanded uncertainty	k = 1.96	2.99	mg/m ³
Uncertainty corrected to std conds. (O ₂)		3.21	mg/m ³ (REF)

	RUN 1	Units
Expanded uncertainty (no O ₂) - at 95% Confidence	0.44	% of Value
Expanded uncertainty (no O ₂) - at 95% Confidence	0.30	% at ELV
Overall Allowable uncertainty (no O ₂) - at 95% Confidence	15.0	% at ELV
Result of Compliance with Uncertainty Requirement	N/A	-

	RUN 1	Units
Expanded uncertainty (with O ₂) - at 95% Confidence	3.87	% of Value
Expanded uncertainty (with O ₂) - at 95% Confidence	3.86	% at ELV
Overall Allowable uncertainty (with O ₂) - at 95% Confidence	15.5	% at ELV
Result of Compliance with Uncertainty Requirement	COMPLIANT	-

Requirement for SRM is that Uncertainty should be <15% of the value at the ELV, on a dry gas basis, or if O₂ correction is applied less than 15% + the uncertainty associated with the O₂ correction (using sqrt of sum squares to add uncertainty components).

APPENDIX 2

OXIDES OF NITROGEN (as NO₂): RESULTS SUMMARY

Blackmore Vale Farm Cream Ltd, Shaftesbury
A1 - Engine 1

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m ³	330		330
Uncertainty	±mg/m ³	15.7		15.7

General Sampling Information

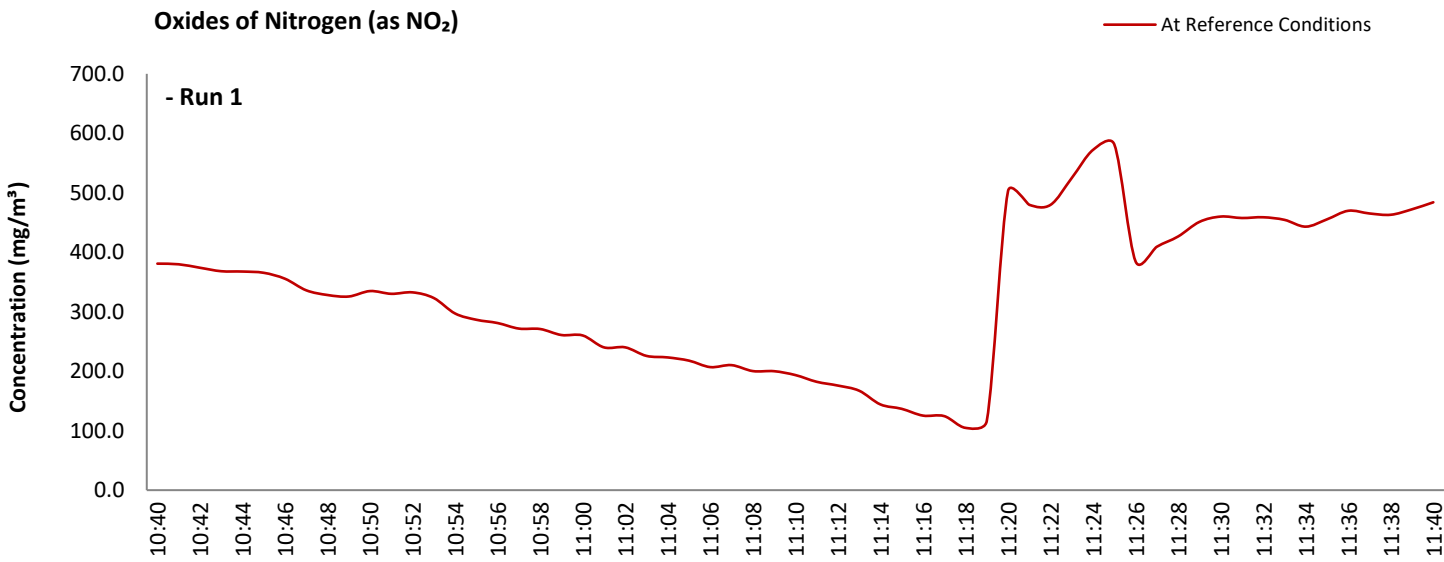
Parameter	Value	
Standard	EN 14792	
Technical Procedure	CAT-TP-21	
Probe Material	Stainless Steel	
Filtration Type / Size	0.1µm Glass Fibre	
Heated Head Filter Used	Yes	
Heated Line Temperature	180°C	
Date & Result of Last Converter Check	18/11/2021 - 96.7%	
Span Gas Type	Nitrogen Monoxide	
Span Gas Reference Number	12.0441	
Span Gas Expiry Date	13/04/2024	
Span Gas Start Pressure (bar)	20	
Gas Cylinder Concentration (ppm)	228.7	
Span Gas Uncertainty (%)	2	
Zero Gas Type	Nitrogen (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, 5% oxygen.

OXIDES OF NITROGEN (as NO₂): DATA TREND

Graphical Trend of Data



APPENDIX 2

OXIDES OF NITROGEN (as NO₂): SAMPLING DETAILS & QUALITY ASSURANCE

Sampling Details

Parameter	Units	Run 1
Sampling Times	-	10:44 - 11:44
Sampling Dates	-	13/10/2022
Instrument Range	ppm	500
Span Gas Value	ppm	228.7

Quality Assurance

Conditioning Unit Temperature	Units	Run 1
Average Temperature	°C	2.7
Allowable Temperature	< °C	4.0
Temperature Acceptable	-	Yes

Zero Drift		Units	Run 1
CAL 1	Zero at Analyser (Pre)	ppm	0.00
	Zero at Analyser (Post)	ppm	1.00
	Zero Drift	ppm	1.00
	Zero Drift	%	0.44
	Drift Correction Applied	2-5%	No
	Allowable Zero Drift	± %	5.00
	Zero Drift Acceptable	-	Yes

Span Drift		Units	Run 1
CAL 1	Span at Analyser (Pre)	ppm	228.90
	Span at Analyser (Post)	ppm	234.00
	Span Drift	ppm	5.10
	Zero Adj. Span Drift	%	1.79
	Drift Correction Applied	2-5%	No
	Allowable Span Drift	± %	5.00
	Span Drift Acceptable	-	Yes

Test Conditions	Units	Run 1
Run Ambient Temperature Range	°C	17 - 20

Method Deviations

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

OXIDES OF NITROGEN (as NO₂): MEASUREMENT UNCERTAINTY CALCULATIONS

Performance characteristics	RUN 1	Units
Limit value	500.0	mg/m ³ (REF)
Allowable MU	10.0	%
Measured concentration	307.51	mg/m ³ (STP, dry)
Ratio NO / NO ₂	5	%
Range Used	500.0	ppm
Range Used [A]	1026.1	mg/m ³
Cal gas conc.	228.7	ppm
Conversion	2.05	ppm to mg/m ³
MCERTS Range [B]	125.0	mg/m ³
Lower of [A] or [B]	125.0	mg/m ³
Cal gas conc.	469.4	mg/m ³

Performance characteristics	RUN 1	Units
Response time	60	seconds
Number of readings in measurement	60	-
Repeatability at zero	0.40	% full scale
Repeatability at span level	0.40	% full scale
Deviation from linearity	0.36	% of value
Zero drift	0.44	% full scale
Span drift	1.79	% full scale
Volume or pressure flow dependence	0.40	% of full scale
Atmospheric pressure dependence	0.30	% of value/kPa
Ambient temperature dependence	0.18	% full scale/10K
Combined interference	0.60	% range
Dependence on voltage	0.40	% full scale/10V
Converter efficiency	96.7	%
Losses in the line (leak)	0.00	% of value
Uncertainty of calibration gas blending	1.40	% 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/m ³
Standard deviation of repeatability at span level	0.05	mg/m ³
Lack of fit	0.26	mg/m ³
Drift	0.00	mg/m ³
Volume or pressure flow dependence	0.00	mg/m ³
Atmospheric pressure dependence	0.11	mg/m ³
Ambient temperature dependence	0.03	mg/m ³
Combined interference (from MCERTS Certificate)	0.43	mg/m ³
Dependence on voltage	0.05	mg/m ³
Converter efficiency	0.29	mg/m ³
Losses in the line (leak)	0.00	mg/m ³
Uncertainty of calibration gas blending	2.49	mg/m ³
Uncertainty of calibration gas	3.55	mg/m ³

Measurement uncertainty	Result	RUN 1	Units
Combined uncertainty		307.51	mg/m ³
Expanded uncertainty		4.40	mg/m ³
Expanded uncertainty	k = 1.96	8.62	mg/m ³
Uncertainty corrected to std conds. (O ₂)		9.26	mg/m ³ (REF)

	RUN 1	Units
Expanded uncertainty (no O ₂) - at 95% Confidence	2.80	% of Value
Expanded uncertainty (no O ₂) - at 95% Confidence	1.72	% at ELV
Overall Allowable uncertainty (no O ₂) - at 95% Confidence	10.0	% at ELV
Result of Compliance with Uncertainty Requirement	N/A	-

	RUN 1	Units
Expanded uncertainty (with O ₂) - at 95% Confidence	4.76	% of Value
Expanded uncertainty (with O ₂) - at 95% Confidence	4.27	% at ELV
Overall Allowable uncertainty (with O ₂) - at 95% Confidence	10.7	% at ELV
Result of Compliance with Uncertainty Requirement	COMPLIANT	-

Requirement for SRM is that Uncertainty should be <10% of the value at the ELV, on a dry gas basis, or if O₂ correction is applied less than 10% + the uncertainty associated with the O₂ correction (using sqrt of sum squares to add uncertainty components).

APPENDIX 2

CARBON MONOXIDE: RESULTS SUMMARY

Blackmore Vale Farm Cream Ltd, Shaftesbury
A1 - Engine 1

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m ³	523		523
Uncertainty	±mg/m ³	24.8		24.8

General Sampling Information

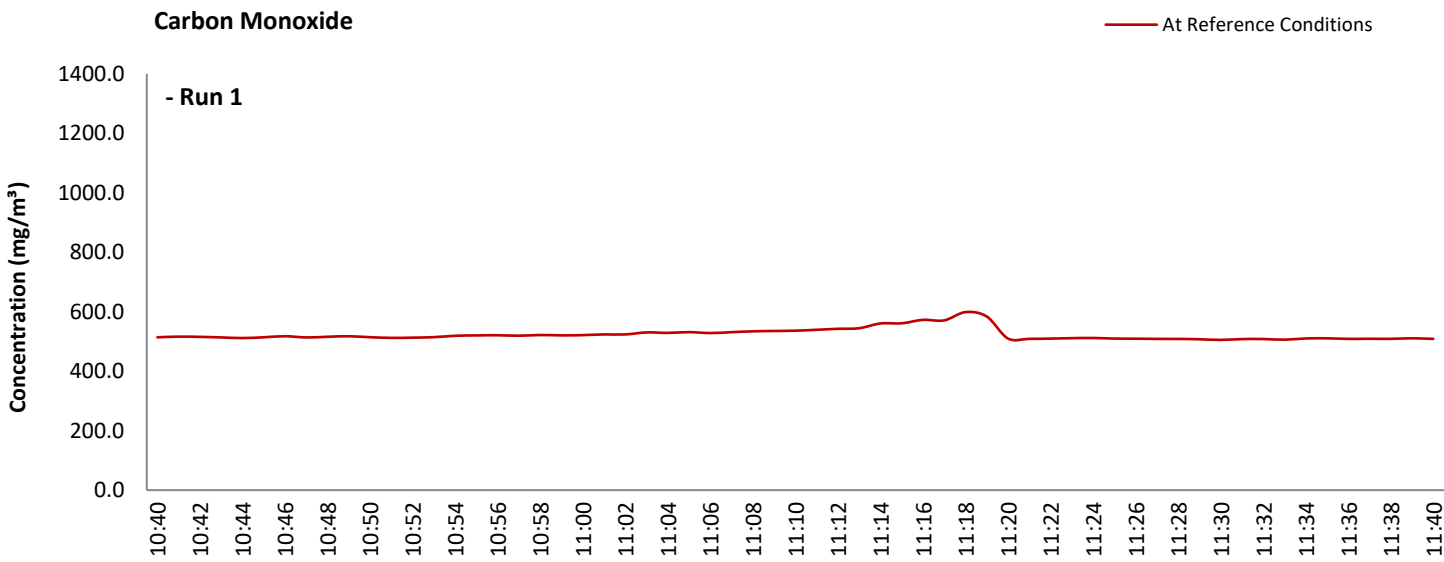
Parameter	Value	
Standard	EN 15058	
Technical Procedure	CAT-TP-21	
Probe Material	Stainless Steel	
Filtration Type / Size	0.1µm Glass Fibre	
Heated Head Filter Used	Yes	
Heated Line Temperature	180°C	
Span Gas Type	Carbon Monoxide	
Span Gas Reference Number	12.0441	
Span Gas Expiry Date	13/04/2024	
Span Gas Start Pressure (bar)	20	
Gas Cylinder Concentration (ppm)	1210.3	
Span Gas Uncertainty (%)	2	
Zero Gas Type	Nitrogen (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, 5% oxygen.

CARBON MONOXIDE: DATA TREND

Graphical Trend of Data



APPENDIX 2

CARBON MONOXIDE: SAMPLING DETAILS & QUALITY ASSURANCE

Sampling Details

Parameter	Units	Run 1
Sampling Times	-	10:44 - 11:44
Sampling Dates	-	13/10/2022
Instrument Range	ppm	2000
Span Gas Value	ppm	1210.3

Quality Assurance

Conditioning Unit Temperature	Units	Run 1
Average Temperature	°C	2.7
Allowable Temperature	< °C	4.0
Temperature Acceptable	-	Yes

Zero Drift	Units	Run 1
Zero at Analyser (Pre)	ppm	0.00
Zero at Analyser (Post)	ppm	0.00
Zero Drift	ppm	0.00
Zero Drift	%	0.00
Drift Correction Applied	2-5%	No
Allowable Zero Drift	± %	5.00
Zero Drift Acceptable	-	Yes

Span Drift	Units	Run 1
Span at Analyser (Pre)	ppm	1210.00
Span at Analyser (Post)	ppm	1205.00
Span Drift	ppm	-5.00
Zero Adj. Span Drift	%	0.41
Drift Correction Applied	2-5%	No
Allowable Span Drift	± %	5.00
Span Drift Acceptable	-	Yes

Test Conditions	Units	Run 1
Run Ambient Temperature Range	°C	17 - 20

Method Deviations

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

CARBON MONOXIDE: MEASUREMENT UNCERTAINTY CALCULATIONS

Performance characteristics	RUN 1	Units
Limit value	1400.0	mg/m ³ (REF)
Allowable MU	6.0	%
Measured concentration	486.80	mg/m ³ (STP, dry)
Range Used	2000.0	ppm
Range Used [A]	2498.4	mg/m ³
Cal gas conc.	1210.3	ppm
Conversion	1.25	ppm to mg/m ³
MCERTS Range [B]	95.0	mg/m ³
Lower of [A] or [B]	95.0	mg/m ³
Cal gas conc.	1511.9	mg/m ³

Performance characteristics	RUN 1	Units
Response time	60	seconds
Number of readings in measurement	60	-
Repeatability at zero	0.40	% full scale
Repeatability at span level	0.40	% full scale
Deviation from linearity	0.24	% of value
Zero drift	0.00	% full scale
Span drift	-0.41	% full scale
Volume or pressure flow dependence	0.40	% of full scale
Atmospheric pressure dependence	0.30	% of value/kPa
Ambient temperature dependence	0.05	% full scale/10K
Combined interference	0.73	% range
Dependence on voltage	0.40	% full scale/10V
Losses in the line (leak)	0.08	% of value
Uncertainty of calibration gas blending	1.40	% 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/m ³
Standard deviation of repeatability at span level	0.05	mg/m ³
Lack of fit	0.13	mg/m ³
Drift	0.00	mg/m ³
Volume or pressure flow dependence	0.00	mg/m ³
Atmospheric pressure dependence	0.08	mg/m ³
Ambient temperature dependence	0.01	mg/m ³
Combined interference (from MCERTS Certificate)	0.40	mg/m ³
Dependence on voltage	0.05	mg/m ³
Losses in the line (leak)	0.23	mg/m ³
Uncertainty of calibration gas blending	3.93	mg/m ³
Uncertainty of calibration gas	5.62	mg/m ³

Measurement uncertainty	Result	RUN 1	Units
Combined uncertainty		486.80	mg/m ³
Expanded uncertainty		6.89	mg/m ³
Expanded uncertainty	k = 1.96	13.51	mg/m ³
Uncertainty corrected to std conds. (O ₂)		14.51	mg/m ³ (REF)

	RUN 1	Units
Expanded uncertainty (no O ₂) - at 95% Confidence	2.77	% of Value
Expanded uncertainty (no O ₂) - at 95% Confidence	0.96	% at ELV
Overall Allowable uncertainty (no O ₂) - at 95% Confidence	6.0	% at ELV
Result of Compliance with Uncertainty Requirement	N/A	-

	RUN 1	Units
Expanded uncertainty (with O ₂) - at 95% Confidence	4.74	% of Value
Expanded uncertainty (with O ₂) - at 95% Confidence	3.98	% at ELV
Overall Allowable uncertainty (with O ₂) - at 95% Confidence	7.1	% at ELV
Result of Compliance with Uncertainty Requirement	COMPLIANT	-

Requirement for SRM is that Uncertainty should be <6% of the value at the ELV, on a dry gas basis, or if O₂ correction is applied less than 6% + the uncertainty associated with the O₂ correction (using sqrt of sum squares to add uncertainty components).

APPENDIX 2

OXYGEN: RESULTS SUMMARY

Blackmore Vale Farm Cream Ltd, Shaftesbury
A1 - Engine 1

Sample Runs

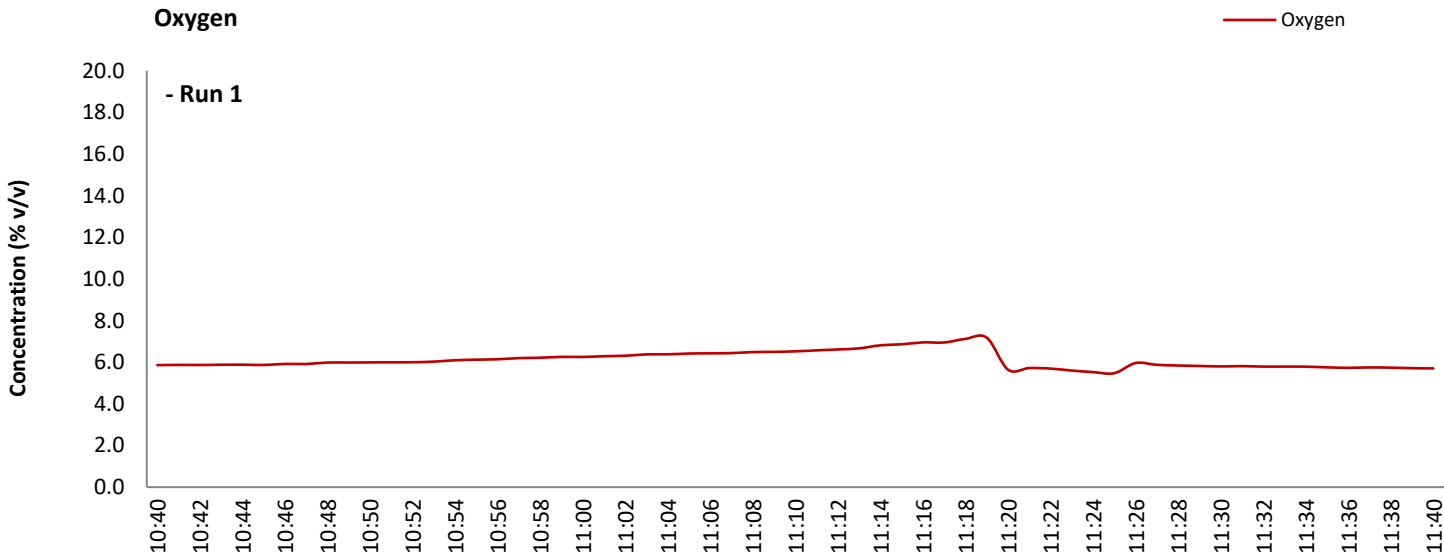
Parameter	Units	Run 1		Mean
Concentration	% v/v	6.1		6.1
Uncertainty	±% v/v	0.24		0.24

General Sampling Information

Parameter	Value	
Standard	EN 14789	
Technical Procedure	CAT-TP-21	
Probe Material	Stainless Steel	
Filtration Type / Size	0.1µm Glass Fibre	
Heated Head Filter Used	Yes	
Heated Line Temperature	180°C	
Span Gas Type	Synthetic Air (5 Grade)	
Span Gas Reference Number	12.0443	
Span Gas Expiry Date	13/04/2024	
Span Gas Start Pressure (bar)	20	
Gas Cylinder Concentration (% v/v)	8.2	
Span Gas Uncertainty (%)	0.2	
Zero Gas Type	Nitrogen (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	

OXYGEN: DATA TREND

Graphical Trend of Data



APPENDIX 2

OXYGEN: SAMPLING DETAILS & QUALITY ASSURANCE

Sampling Details

Parameter	Units	Run 1
Sampling Times	-	10:44 - 11:44
Sampling Dates	-	13/10/2022
Instrument Range	% v/v	25.0
Span Gas Value	% v/v	8.2

Quality Assurance

Conditioning Unit Temperature	Units	Run 1
Average Temperature	°C	2.7
Allowable Temperature	< °C	4.0
Temperature Acceptable	-	Yes

Zero Drift	Units	Run 1
CAL 1	Zero at Analyser (Pre)	% v/v 0.00
	Zero at Analyser (Post)	% v/v 0.10
	Zero Drift	% v/v 0.10
	Zero Drift	% 1.24
	Drift Correction Applied	2-5% No
	Allowable Zero Drift	± % 5.00
	Zero Drift Acceptable	- Yes

Span Drift	Units	Run 1
CAL 1	Span at Analyser (Pre)	% v/v 8.05
	Span at Analyser (Post)	% v/v 8.15
	Span Drift	% v/v 0.10
	Zero Adj. Span Drift	% 0.00
	Drift Correction Applied	2-5% No
	Allowable Span Drift	± % 5.00
	Span Drift Acceptable	- Yes

Test Conditions	Units	Run 1
Run Ambient Temperature Range	°C	17 - 20

Method Deviations

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

OXYGEN: MEASUREMENT UNCERTAINTY CALCULATIONS

Performance characteristics	RUN 1	Units
Limit value	N/A	%vol
Allowable MU	6.0	%
Measured concentration	6.11	%vol
Range Used	25.0	%vol
Cal gas conc.	8.2	%vol

Performance characteristics	RUN 1	Units
Response time	60	seconds
Number of readings in measurement	60	-
Repeatability at zero	0.04	% full scale
Repeatability at span level	0.04	% full scale
Deviation from linearity	0.10	% of value
Zero drift	1.24	% full scale
Span drift	0.00	% full scale
Volume or pressure flow dependence	0.20	% of full scale
Atmospheric pressure dependence	0.30	% of value/kPa
Ambient temperature dependence	-0.07	% full scale/10K
Combined interference	0.56	% range
Dependence on voltage	0.02	% full scale/10V
Losses in the line (leak)	0.61	% of value
Uncertainty of calibration gas	0.20	% of value

Performance characteristic	RUN 1	Units
Standard deviation of repeatability at zero	use rep at span	%vol
Standard deviation of repeatability at span level	0.01	%vol
Lack of fit	0.01	%vol
Drift	0.00	%vol
Volume or pressure flow dependence	0.00	%vol
Atmospheric pressure dependence	0.02	%vol
Ambient temperature dependence	-0.01	%vol
Combined interference (from MCERTS Certificate)	0.08	%vol
Dependence on voltage	0.00	%vol
Losses in the line (leak)	0.02	%vol
Uncertainty of calibration gas	0.01	%vol

Measurement uncertainty	Result	RUN 1	Units
Combined uncertainty		6.11	%vol
Expanded uncertainty		0.12	%vol
Expanded uncertainty	k = 1.96	0.24	%vol

	RUN 1	Units
Expanded uncertainty (no O ₂) - at 95% Confidence	3.85	% of Value
Result of Compliance with Uncertainty Requirement	COMPLIANT	-

Requirement for SRM is that Uncertainty should be 0.3% vol absolute or 6% relative whichever is the lower, on a dry gas basis. Source, EN 14789.

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