



Element, Unit C6, Emery Court, The Embankment Business Park, Heaton Mersey, Stockport, SK4 3GL

Your Element Contact: [REDACTED]
E: [REDACTED]

EN 14181 QAL2 Report Commissioned by
Thalia Waste Management

Installation Name & Address
Thalia Waste Management
Allerton Park Quarry
Moor Lane
Knaresborough
HG5 0SD

Primary Site Contact: [REDACTED]

EPR Permit: EPR/KP3808PN/V003

Stack Reference
A3- Line 2 - Duty

Dates of the Monitoring Campaign
8th - 12th December 2025

Job Reference Number
EMT15003

Report Written by
[REDACTED] Technical Advisor MCERTS Level 2 MM 03 216 TE1 TE2 TE3 TE4

Report Approved by
[REDACTED] Senior Technical Advisor MCERTS Level 2 MM 05 641 TE1 TE2 TE3 TE4

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[REDACTED]

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

This test report shall not be reproduced, except in full, without the written approval of Element Materials Technology.

This test report has been written to fully comply with the requirements in EN 14181:2014 and the Environment Agency's Guidance 'Monitoring stack emissions: quality assurance of continuous monitors' which was published in March 2025.

SECTION 1B

Executive Summary (Page 1 of 3)

Thalia Waste Management, Knaresborough
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Overall Aim of the Monitoring Campaign

Element were commissioned by Thalia Waste Management to carry out stack emissions testing on the A3- Line 2 - Duty Stack at Knaresborough.

The aim of the monitoring campaign was to perform a QAL2 Calibration Exercise on the Continuous Emissions Monitor (CEM), which is installed on the Plant, following the requirements of EN 14181.

Special Requirements

There were no special requirements.

QAL2 CALIBRATION SUMMARY

Parameter	Calibration Function derived from QAL2?	EN 14181 Procedure used to Derive the Calibration Function	Calibration Function Derived	Result of Variability Test	Valid Calibration Range @ REF Conditions	Range after Surrogate Extension @ REF Conditions	Calibration Function to Apply to the Data Acquisition Handling Software (See Conclusions)
Total Particulate Matter (Duty)	No	Not Derived	N/A	N/A	N/A	N/A	$y = x$
Total Particulate Matter (Standby)	No	Not Derived	N/A	N/A	N/A	N/A	$y = x$
Total VOCs	Yes	Procedure C	$y = 0.9041x + 0.2479$	Pass	0 to 2.0 mg/m ³	N/A	$y = 0.9041x + 0.2479$
Oxides of Nitrogen (as NO ₂)	Yes	Procedure A	$y = 0.8853x + 1.2352$	Pass	0 to 190.6 mg/m ³	N/A	$y = 0.8853x + 1.2352$
Sulphur Dioxide	Yes	Procedure A	$y = 1.0973x + 2.2215$	Pass	0 to 52.5 mg/m ³	N/A	$y = 1.0973x + 2.2215$
Nitrous Oxide	Yes	Procedure A	$y = 0.9621x + 1.1428$	Pass	0 to 22.1 mg/m ³	N/A	$y = 0.9621x + 1.1428$
Carbon Monoxide	Yes	Procedure A	$y = 1.0072x - 3.8478$	Pass	0 to 58.2 mg/m ³	N/A	$y = 1.0072x - 3.8478$
Hydrogen Chloride	Yes	Procedure B	$y = 0.5644x - 0.2472$	Pass	0 to 2.8 mg/m ³	N/A	$y = 0.5644x - 0.2472$
Ammonia	Yes	Procedure B	$y = 1.1375x - 0.3583$	Pass	0 to 6.6 mg/m ³	N/A	$y = 1.1375x - 0.3583$
Water Vapour (% v/v)	Yes	Procedure B	$y = 0.9009x - 0.3423$	Pass	0 to 19.4 % v/v	N/A	$y = 0.9009x - 0.3423$
Oxygen (% v/v)	Yes	Procedure B	$y = 1.2303x - 0.3236$	Pass	0 to 10.5 % v/v	N/A	$y = 1.2303x - 0.3236$
Carbon Dioxide (% v/v)	Yes	Procedure B	$y = 1.1296x - 0.2560$	Pass	0 to 10.1 % v/v	N/A	$y = 1.1296x - 0.2560$

The calibration functions, once applied, only remain valid as long as the QAL3 data remains within control limits, and that there are no manual adjustments made to the CEMs other than those allowed to bring the settings back within the QAL3 control limit.

All calibration functions throughout this report are given in the form $y = bx + a$, where b is the gradient and a is the intercept.

All calibration functions relate to mg/m³, unless otherwise stated.

1. The Valid Calibration Range for Nitrogen Monoxide is expressed in units of mg/m³ as NO₂.

QAL2 CALIBRATION FUNCTION COMPARISON ASSESSMENT

Parameter	Previous QAL 2 function	New QAL 2 function derived above	Variation from previous function (%)	Is the variation from previous function greater than 10% ?
Total Particulate Matter (Duty)	$y = 1.0000x + 0.0000$	$y = x$	N/A	N/A
Total Particulate Matter (Standby)	$y = 1.0000x + 0.0000$	$y = x$	N/A	N/A
Total VOCs	$y = 1.0101x + 0.3233$	$y = 0.9041x + 0.2479$	-11%	Yes
Oxides of Nitrogen (as NO ₂)	$y = 0.9623x - 4.2502$	$y = 0.8853x + 1.2352$	-5%	No
Sulphur Dioxide	$y = 0.8474x - 0.7885$	$y = 1.0973x + 2.2215$	39%	Yes
Nitrous Oxide	$y = 1.0548x + 0.0405$	$y = 0.9621x + 1.1428$	-4%	No
Carbon Monoxide	$y = 1.0600x - 0.0142$	$y = 1.0072x - 3.8478$	-12%	Yes
Hydrogen Chloride	$y = 0.5653x - 0.8663$	$y = 0.5644x - 0.2472$	17%	Yes
Ammonia	$y = 0.9695x + 0.5922$	$y = 1.1375x - 0.3583$	10%	Yes
Water Vapour (% v/v)	$y = 0.8604x + 0.0000$	$y = 0.9009x - 0.3423$	3%	No
Oxygen (% v/v)	$y = 1.1878x + 0.0000$	$y = 1.2303x - 0.3236$	2%	No
Carbon Dioxide (% v/v)	$y = 1.1266x - 0.0957$	$y = 1.1296x - 0.2560$	-1%	No

This table indicates whether the new function has an impact of greater than $\pm 10\%$ at the ELV, and although this does not necessarily indicate that there is an error in the calibration function, can be used as a screening mechanism to prompt further investigation.

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CONCLUSIONS, DISCUSSIONS & ACTIONS FROM THE SAMPLING EXERCISE

QAL2 CALIBRATION - All parameters except - Total Particulate Matter

A valid calibration function has been derived from the parallel tests which passes the variability test. This calibration function should be used and entered into the Data Acquisition Handling Software (DAHS).

QAL2 CALIBRATION - Total Particulate Matter

The Total Particulate Matter emissions are of a low order which means a greater degree of relative scatter of data points (plotting of CEMS against SRM points), which gives a low R2 value. The use of surrogate data may not be representative of actual concentrations, (and may not be available), within the gas stream so that Procedure C cannot be used. In this instance, it may be possible to use the average dust value to calibrate the CEMS if the average SRM dust value is greater than the uncertainty of the SRM (20% of ELV or 1 mg/m3 for ELVs below 5mg/m3). The SRM reported actual data sets (and average of the data sets at ELV conditions) are close to the reported LOD for testing, and taking the uncertainty of measurement into account, means that the data may not be reliable to derive a calibration function (using the average value to derive a QAL2 function). However, the offset between the SRM and the CEM is consistent, giving confidence in the repeatability and accuracy of the SRM. Keeping the function set as $y=x$ may be a sensible approach as it could be considered "best case approach" and may provide the operator a quicker response to genuine rising emissions. If the particulate monitor is left as " $y = x$ ", it should be set to its most sensitive range to alert the operator that the control devices for particulate may need attention if an increase in emissions is observed. Taking this approach, the CEM is effectively being used as a qualitative indicator of rising emissions rather than a quantitative monitor. The Environment Agency should be informed if this approach has been taken.

Although a QAL2 calibration function could be derived it is based on low level raw data points. Using this derived function may give rise to biased higher or lower readings (this is dependent on the function) as the concentration of low levels increase or for high data spikes.

If the indicated dust emission increases during normal operation, such that seven consecutive daily average concentrations are higher than 2.5 mg/m3, then a QAL2 must be done within 6 months. When configured in this way, the CEMS will generally over-estimate mass emissions during normal operation

SECTION 1C

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Thalia Waste Management, Knaresborough
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CONCLUSIONS, DISCUSSIONS & ACTIONS FROM THE SAMPLING EXERCISE

Functional Tests

Report not seen by Element

Linearity

The CEM was found to give a linear response to the test gases supplied to the analyser.

Procedure C - Surrogates - Calibration Gas Used

The service report does not detail the standard of the gases used on site.

Test laboratories must use traceable gas standards for QAL2 and AST testing. Traceable gas standards are prepared under EN ISO/IEC 17025 accreditation to better than plus or minus 2% uncertainty at a 95% confidence interval. These gases are EN ISO/IEC 17025 accredited gas standards (AGS) and are referred to as certified reference gas mixtures.

Operators usually use multi-component working gas mixture standards (WGMS) for QAL3 drift checking, with a concentration tolerance of plus or minus 2%. Certificates of analysis are prepared in accordance with ISO 6141 – Gas analysis – Contents of certificates for gas analysis. These gases may also be used for occasional adjustment of the instrument provided that the CEMS manufacturer accepts the gas mixture as being suitable for adjustment purposes. Adjustment may be required following a QAL3 failure or when the instruments are serviced.

AGS gases must be used for Procedure C linearity tests and site gas quality checks.

SUMMARY OF STANDARD REFERENCE METHOD & EN 14181 DEVIATIONS, ACTIONS & NOTES

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

Section 2: Information about the Regulated Installation

REGULATORY INFORMATION

Thalia Waste Management, Knaresborough

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Parameter	Value
Name of the Installation	Knaresborough
Address of the Installation	See Title Page
Sector of the Installation	Combustion Activities
Permit Number	EPR/KP3808PN/V003
Date of the Last QAL2 / AST Campaign	17th - 25th July 2025
Date CEMs Data Obtained by Element	3rd Febraury 2026

Regulated Determinands and Emission Limit Values (ELVs)

Determinand	Short-Term ELV (mg/m ³)	Daily or 48hr Average ELV (mg/m ³)	Uncertainty Requirement (%)
Total Particulate Matter (Duty)	30	5	30 / 50 ¹
Total Particulate Matter (Standby)	30	5	30 / 50 ¹
Total VOCs	20	10	30
Oxides of Nitrogen (as NO ₂)	400	180	20
Sulphur Dioxide	200	40	20
Nitrous Oxide	-	20	20
Carbon Monoxide	100	50	10 ²
Hydrogen Chloride	60	8	40
Ammonia	-	15	40
Water Vapour	-	-	30
Carbon Dioxide	-	-	10
Oxygen	-	-	10

1 - For installations that have a low ELV of 5mg/m³ or less for dust, a confidence interval of 50% may be used for the variability and acceptance tests

2 - Environment Agency's Guidance 'Monitoring stack emissions: quality assurance of continuous monitors' section 3.7.17 notes that, "Legislation specifies an uncertainty of 10% for CO. In practice, this is difficult to achieve, whilst the risks of applying a higher uncertainty of 20% are low. So, test laboratories may use 20% for the CO variability test."

Results tables in the report refer to Reference Conditions (REF) which are: STP, dry gas, 11% oxygen.

Section 2: Information about the Regulated Installation

OPERATIONAL INFORMATION AND SITE MONITORING PROVISIONS

Thalia Waste Management, Knaresborough

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Process Type and Variations in Emissions

Parameter	Value
Continuous or batch process	Continuous
Were there any variations in emissions during the EN 14181 test (e.g. Load changes)	Yes - Load changes
Will these variations affect the representative nature of the collected data?	No - Load changes are part of normal operation
Are there any factors that may affect the collected data (e.g. auto-calibrations, plant start up and shut down)	Yes - Periods of auto-calibration removed from paired data sets.
Reviewing historical Plant data, were low emissions expected for any determinands?	Yes - Total VOCs and Total Particulate Matter
Was the CEM reading zero for any determinands, if so, was this investigated to ensure it was working?	N/A - full linearity assessment conducted.
What product was being processed during the tests?	Incineration of Municipal Waste

Type of Fuel

Parameter	Value
Fuel type used during the EN 14181 test (include proportions for co-incineration)	Municipal Waste
Are multiple calibration functions required if the emissions vary due to different fuel types being used?	N/A

Abatement

Parameter	Value
Type of Abatement System	Bag Filter with Carbon and Lime Dosing
Running Status	On

Section 2: Information about the Regulated Installation

MONITORING PROVISIONS AT THE INSTALLATION - PERIODIC MONITORING

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Duct Characteristics

Parameter	Units	Value
Type	-	Circular
Depth	m	1.80
Width	m	-
Area	m ²	2.55
Port Depth	cm	25
Orientation of Duct	-	Vertical
Number of Ports	-	2
Sample Port Size	-	5" Flange

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	N/A
Access to sample ports unhindered by obstructions	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

A valid EN 15259 Homogeneity test was performed by Exova Catalyst on this Stack on 9th October 2017, Report ID: CAT-3709, and the stack gas profile was found to be homogenous.

Sampling Plane Validation Criteria (EN 15259)

Criteria in M1	Units	Traverse 1	Required	Compliant
Lowest Differential Pressure	Pa	190.0	> 5 Pa	Yes
Mean Velocity	m/s	20.7		
Lowest Gas Velocity	m/s	20.2		
Highest Gas Velocity	m/s	21		
Ratio of Above	: 1	1.04	< 3 : 1	Yes
Maximum Angle of Swirl	°	6	< 15°	Yes
No Local Negative Flow	-	Yes		Yes

MONITORING PROVISIONS AT THE INSTALLATION - PERIODIC MONITORING
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Pro-forma for Site Provisions for Monitoring

Requirement	Compliant	Notes
A safe and clean working environment with sufficient space and weather protection.	Yes	Platform is of sufficient size to allow representative sampling
Easy and safe access to the CEM.	Yes	Located in a locked and air conditioned room
Adequate supplies of reference materials, tools and spare parts.	Yes	ENVEA service contract in place.
Facilities to introduce the reference materials for gaseous-monitoring systems, both at the inlet of the sampling line (where present), and at the inlet of the CEM.	Yes	
Compliance with EN 15259	Yes	See the Sampling Plane Validation Criteria table on the previous page.

Plant Photos

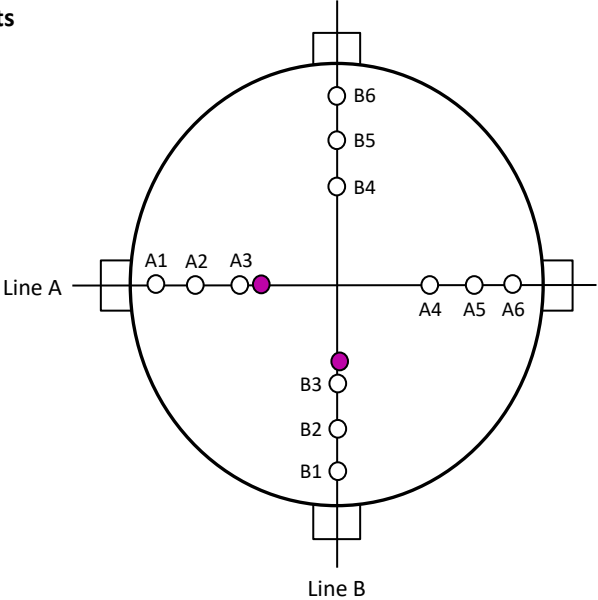
Photo 1



Photo 2



Sample Points



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

Section 2: Information about the Regulated Installation

CONTINUOUS EMISSION MONITORs (CEMs) AT THE INSTALLATION

Thalia Waste Management, Knaresborough
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Main Determinand	Type	Instrument Name	Instrument Serial Number	Measurement Principle	Certified Range (mg/m³)	QAL1 Compliant	MCERTS Number
Total Particulate Matter (Duty)	In-Situ	QAL 181	52993	Light Scatter	0 - 15	Yes	MC 090152
Total Particulate Matter (Standby)	In-Situ	QAL 181	49397	Light Scatter	0 - 15	Yes	MC 090152
Total VOCs	Extractive	Graphite 52M	880	FID	0 - 15	Yes	MC 090152
Oxides of Nitrogen (as NO ₂)	Extractive	MIR FT	153264	FTIR	0 - 200	Yes	MC 040031
Sulphur Dioxide	Extractive	MIR FT	153264	FTIR	0 - 75	Yes	MC 040031
Nitrous Oxide	Extractive	MIR FT	153264	FTIR	0 - 100	Yes	MC 040031
Carbon Monoxide	Extractive	MIR FT	153264	FTIR	0 - 75	Yes	MC 040031
Hydrogen Chloride	Extractive	MIR FT	153264	FTIR	0 - 15	Yes	MC 040031
Ammonia	Extractive	MIR FT	153264	FTIR	0 - 15	Yes	MC 040031
Water Vapour	Extractive	MIR FT	153264	FTIR	0 - 30%	Yes	MC 040031
Oxygen (Wet)	Extractive	JOKAir	-	Zirconia	0 - 25%	No	-
Carbon Dioxide	Extractive	MIR FT	153264	FTIR	0 - 25%	Yes	MC 040031

Peripheral Determinand	Recorded	Instrument Name
Temperature	Yes	StackFlow 400
Pressure	Yes	StackFlow 400

Record of NO _x Converter Check	Date of Last Check	Result of Check (Allowable is ≥ 95%)
CEM	N/A	N/A
SRM	07/08/2025	103.3

Pass

The following table indicates the format the CEMS data was received and treat by Element.

Parameter	Value
CEMS Units (excluding % values such as Oxygen and Moisture)	mg/m3
Data received wet or dry	Wet
VOC calibration gas if reported in ppm	Propane
NOx data reporting and handling	NOx as NO2 (calculated NO + NO2)
Is NOx already reported as NO2	Yes

Section 3 - Information about the Monitoring Campaign

TEST LABORATORY STAFF

Position	Name	MCERTS Accreditation	MCERTS Number & Expiry Date	Technical Endorsements
Team Leader	Robbie Cunningham	MCERTS Level 2	MM 21 1632	TE1 TE2 TE3 TE4
Team Leader	Warren Taplett	MCERTS Level 2	MM 17 1435	TE1 & TE2
Technician	Joshua Shaw	MCERTS Level 1	MM 24 1857	None
Technician	Steven Irvine	MCERTS Level 1	MM 22 1742	TE1

STANDARD REFERENCE METHODS (SRMs)

Element hold UKAS and MCERTS Accreditation for performing QAL2 and ASTs, to EN 14181.

Determinand	Instrument Name	Measurement Principle	Instrumental Ranges		MCERTS Number	Reference Method	MU ² (%)
			Certified (mg/m ³)	Operational (mg/m ³)			
Total Particulate Matter (Duty)	MST	Gravimetric	N/A - SRM	N/A - SRM	N/A	EN 13284-1	15
Total Particulate Matter (Standby)	MST	Gravimetric	N/A - SRM	N/A - SRM	N/A	EN 13284-1	15
Total VOCs	Sick Maihak 3006	FID	0 - 15	0 - 160	MC 040036	EN 12619	4
Oxides of Nitrogen (as NO ₂)	Horiba PG-350E	Chemiluminescence	0 - 205	0 - 200	MC 130223	EN 14792	5
Sulphur Dioxide	Gasmet DX4000	FTIR	0 - 75	0 - 75	MC 030014	CEN/TS 17337	10
Nitrous Oxide	Gasmet DX4000	FTIR	0 - 75	0 - 75	MC 030014	CEN/TS 17337	22
Carbon Monoxide	Gasmet DX4000	FTIR	0 - 75	0 - 75	MC 030014	CEN/TS 17337	6
Hydrogen Chloride	Gasmet DX4000	FTIR	0 - 15	0 - 15	MC 030014	CEN/TS 17337	11
Ammonia	Gasmet DX4000	FTIR	N/A	0 - 15	MC 030014	CEN/TS 17337	6
Water Vapour	Gasmet DX4000	FTIR	0 -30%	0 - 30%	MC 030014	CEN/TS 17337	5
Oxygen (Dry)	Horiba PG-350E	Paramagnetic Cell	0 - 25%	0 - 25%	MC 130223	EN 14789	3
Carbon Dioxide	Gasmet DX4000	FTIR	0 - 25%	0 - 25%	MC 030014	CEN/TS 17337	12

NOTE 1: Element hold UKAS and MCERTS Accreditation for all Standard Reference Method Tests performed.

NOTE 2: The MU specified in this column is reported as the MU at the Daily ELV (not the MU percentage of concentration measured.)

where: **MST stands for Manual Sampling Train**

LIST OF EQUIPMENT

Extractive Sampling	
Equipment Type	Equipment I.D.
Control Box DGM (1)	CAT 7.36
Control Box DGM (2)	-
Box Thermocouples (1)	CAT 3.7
Box Thermocouples (2)	-
Umbilical (1)	CAT 3.371
Umbilical (2)	-
Oven Box (1)	-
Oven Box (2)	-
Heated Probe - 0.5m	-
Heated Probe - 1.0m	-
Heated Probe - 2.5m	CAT 5.77
S-Pitot (1) - 1.5m	-
S-Pitot (2)	CAT 21P.178(0.84)
L-Pitot	-
Site Balance	CAT 17.114
500g / 1Kg Check Weights	CAT 17.63
Last Impinger Arm	-
Callipers	CAT 23.59
Tubes Kit Thermocouple	-

Instrumental Analysers	
Equipment Type	Equipment I.D.
Horiba PG-250	-
Horiba PG-350E	CAT 39.22
Servomex 5200 MP	-
Eco Physics CLD 822Mh	-
ABB AO2020-URAS26	-
Testo 350 XL	-
JCT JCC P1 Cooler	CAT 4.0106
Gasmet DX4000	CAT 19.13
Gasmet Sampling System	CAT 10.10
Sick 3006	CAT 8.29
M&C PSS	CAT 12.149
Mass Flow Controller (2L)	CAT 6.83
Mass Flow Controller (10L)	CAT 6.84
Mass View (2L)	-
Mass View (10L)	-
Hioki 5043 (V)	CAT 11.111
Hioki 5043 (V)	-

Miscellaneous Items	
Equipment Type	Equipment I.D.
Digital Manometer (1)	CAT 3.241
Digital Manometer (2)	-
Digital Temperature Meter	-
Stopwatch	CAT 14.53
Barometer	CAT 13.61
Stack Thermocouple - 0.5m	-
Stack Thermocouple - 1.0m	-
Stack Thermocouple - 2.5m	CAT 4.1710
S-Pitot Thermocouple - 1.5m	-
1m Heated Line (1)	CAT 20.203
1m Heated Line (2) FTIR	CAT 20.40
1m Heated Line (3) FTIR	CAT 20.226
10m Heated Line (1)	-
10m Heated Line (1)	-
20m Heated Line (2)	CAT 20.232
Dual Channel Heater Controller	-
Single Channel Heater Controller	-
Laboratory Balance	CAT AUTO
Tape Measure	CAT 16.88

Section 4A - Data and Calculations - QAL2

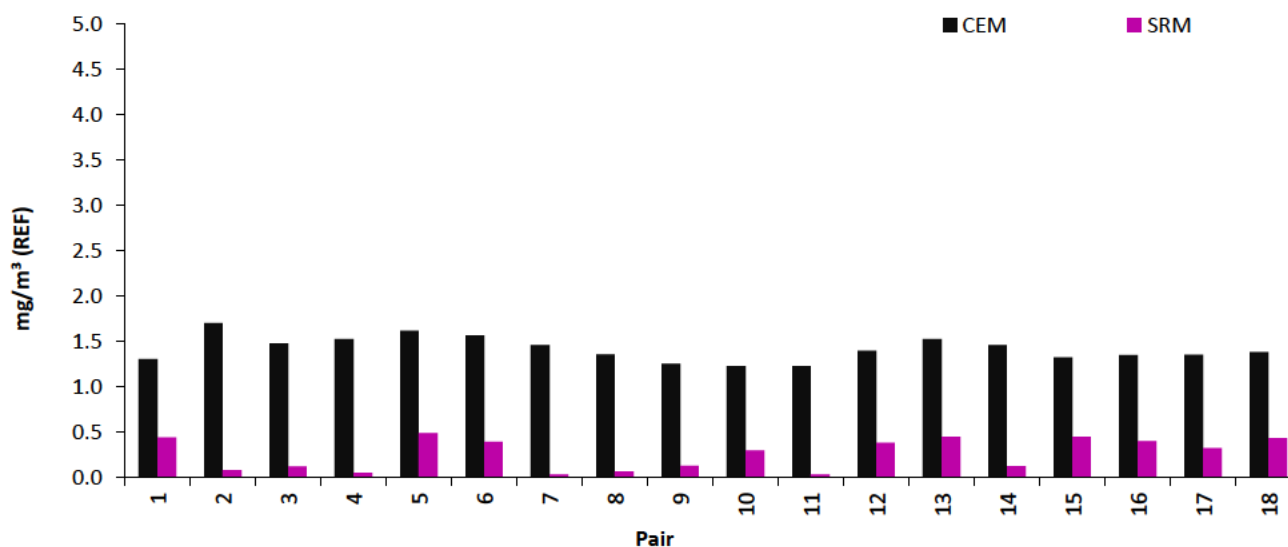
TOTAL PARTICULATE MATTER: QAL2 CALCULATIONS (Duty)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Pair	Date	Times	x, CEM (ACTUAL) mg/m ³	y, SRM (ACTUAL) mg/m ³	UNCAL CEM (STP, Dry, 11% O ₂) mg/m ³	SRM (STP, Dry, 11% O ₂) mg/m ³	Filter ID Number (47-XXXX)
1	09/12/2025	09:19 - 10:19	0.95	0.30	1.30	0.44	47-117686
2	09/12/2025	10:26 - 11:26	1.25	0.05	1.70	0.08	47-120711
3	09/12/2025	11:32 - 12:32	1.05	0.09	1.48	0.12	47-120716
4	09/12/2025	12:36 - 13:36	1.08	0.04	1.52	0.05	47-121140
5	09/12/2025	13:40 - 14:28	1.10	0.31	1.61	0.49	47-117687
6	09/12/2025	14:40 - 15:28	1.06	0.26	1.56	0.39	47-117462
7	09/12/2025	15:40 - 16:28	1.03	0.02	1.46	0.03	47-120748
8	10/12/2025	08:58 - 09:46	0.96	0.04	1.35	0.06	47-120739
9	10/12/2025	09:58 - 10:46	0.89	0.08	1.25	0.13	47-117680
10	10/12/2025	10:58 - 11:46	0.86	0.20	1.23	0.30	47-117434
11	10/12/2025	11:58 - 12:46	0.87	0.02	1.23	0.03	47-120741
12	10/12/2025	12:58 - 13:46	1.00	0.26	1.40	0.38	47-125446
13	10/12/2025	13:58 - 14:46	1.09	0.30	1.52	0.45	47-125445
14	11/12/2025	08:48 - 09:36	1.03	0.08	1.46	0.13	47-125319
15	11/12/2025	09:48 - 10:36	0.95	0.31	1.32	0.45	47-119018
16	11/12/2025	10:48 - 11:36	0.96	0.28	1.35	0.40	47-125435
17	11/12/2025	11:48 - 12:36	0.95	0.21	1.35	0.32	47-125434
18	11/12/2025	12:48 - 13:36	0.95	0.28	1.38	0.43	47-125428
DAILY ELV	-	-	-	-	-	5	

PLOT 1: BAR CHART FOR REFERENCE SRM vs REFERENCE CEM (STANDARDISED)



The Total Particulate Matter emissions are of a low order which means a greater degree of relative scatter of data points (plotting of CEMS against SRM points), which gives a low R2 value. The use of surrogate data may not be representative of actual concentrations, (and may not be available), within the gas stream so that Procedure C cannot be used. In this instance, it may be possible to use the average dust value to calibrate the CEMS if the average SRM dust value is greater than the uncertainty of the SRM (20% of ELV or 1 mg/m³ for ELVs below 5mg/m³). The SRM reported actual data sets (and average of the data sets at ELV conditions) are close to the reported LOD for testing, and taking the uncertainty of measurement into account, means that the data may not be reliable to derive a calibration function (using the average value to derive a QAL2 function). However, the offset between the SRM and the CEM is consistent, giving confidence in the repeatability and accuracy of the SRM. Keeping the function set as y=x may be a sensible approach as it could be considered "best case approach" and may provide the operator a quicker response to genuine rising emissions. If the particulate monitor is left as "y = x", it should be set to its most sensitive range to alert the operator that the control devices for particulate may need attention if an increase in emissions is observed. Taking this approach, the CEM is effectively being used as a qualitative indicator of rising emissions rather than a quantitative monitor. The Environment Agency should be informed if this approach has been taken.

Although a QAL2 calibration function could be derived it is based on low level raw data points. Using this derived function may give rise to biased higher or lower readings (this is dependent on the function) as the concentration of low levels increase or for high data spikes.

If the indicated dust emission increases during normal operation, such that seven consecutive daily average concentrations are higher than 2.5 mg/m³, then a QAL2 must be done within 6 months. When configured in this way, the CEMS will generally over-estimate mass emissions during normal operation

Section 4A - Data and Calculations - QAL2

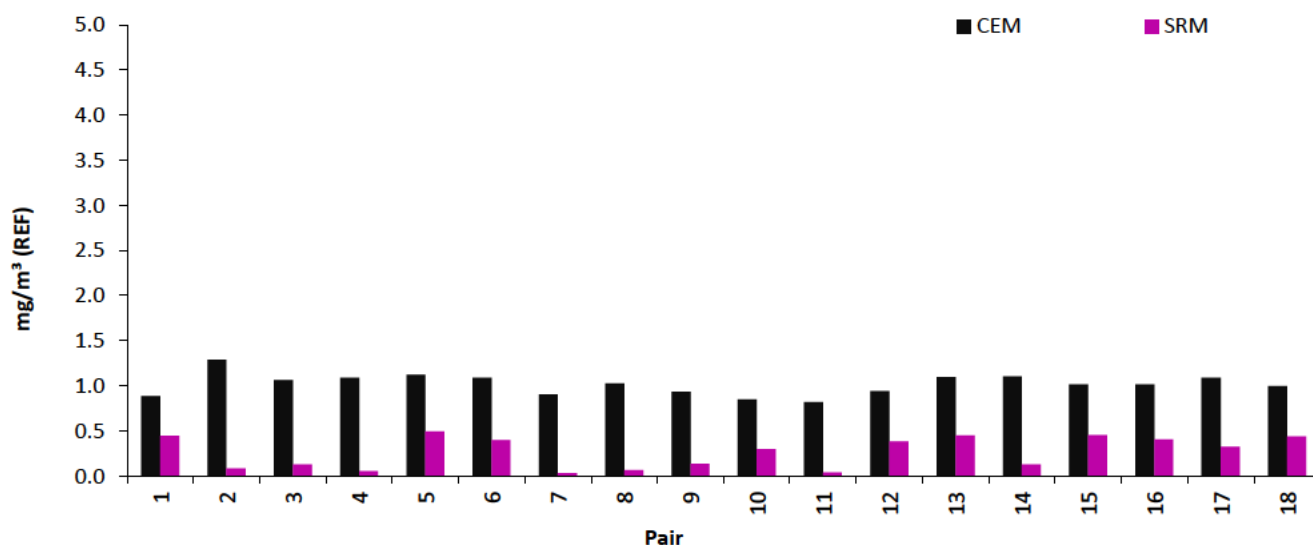
TOTAL PARTICULATE MATTER: QAL2 CALCULATIONS Standby

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Pair	Date	Times	x, CEM (ACTUAL) mg/m ³	y, SRM (ACTUAL) mg/m ³	UNCAL CEM (STP, Dry, 11% O ₂) mg/m ³	SRM (STP, Dry, 11% O ₂) mg/m ³	Filter ID Number (47-XXXX)
1	09/12/2025	09:19 - 10:19	0.64	0.30	0.88	0.44	47-117686
2	09/12/2025	10:26 - 11:26	0.94	0.05	1.28	0.08	47-120711
3	09/12/2025	11:32 - 12:32	0.75	0.09	1.06	0.12	47-120716
4	09/12/2025	12:36 - 13:36	0.77	0.04	1.09	0.05	47-121140
5	09/12/2025	13:40 - 14:28	0.76	0.31	1.12	0.49	47-117687
6	09/12/2025	14:40 - 15:28	0.74	0.26	1.09	0.39	47-117462
7	09/12/2025	15:40 - 16:28	0.63	0.02	0.90	0.03	47-120748
8	10/12/2025	08:58 - 09:46	0.73	0.04	1.02	0.06	47-120739
9	10/12/2025	09:58 - 10:46	0.66	0.08	0.93	0.13	47-117680
10	10/12/2025	10:58 - 11:46	0.59	0.20	0.84	0.30	47-117434
11	10/12/2025	11:58 - 12:46	0.58	0.02	0.82	0.03	47-120741
12	10/12/2025	12:58 - 13:46	0.68	0.26	0.94	0.38	47-125446
13	10/12/2025	13:58 - 14:46	0.78	0.30	1.10	0.45	47-125445
14	11/12/2025	08:48 - 09:36	0.78	0.08	1.10	0.13	47-125319
15	11/12/2025	09:48 - 10:36	0.73	0.31	1.01	0.45	47-119018
16	11/12/2025	10:48 - 11:36	0.72	0.28	1.01	0.40	47-125435
17	11/12/2025	11:48 - 12:36	0.76	0.21	1.09	0.32	47-125434
18	11/12/2025	12:48 - 13:36	0.68	0.28	1.00	0.43	47-125428
DAILY ELV	-	-	-	-	-	5	

PLOT 1: BAR CHART FOR REFERENCE SRM vs REFERENCE CEM (STANDARDISED)



The Total Particulate Matter emissions are of a low order which means a greater degree of relative scatter of data points (plotting of CEMS against SRM points), which gives a low R² value. The use of surrogate data may not be representative of actual concentrations, (and may not be available), within the gas stream so that Procedure C cannot be used. In this instance, it may be possible to use the average dust value to calibrate the CEMS if the average SRM dust value is greater than the uncertainty of the SRM (20% of ELV or 1 mg/m³ for ELVs below 5mg/m³). The SRM reported actual data sets (and average of the data sets at ELV conditions) are close to the reported LOD for testing, and taking the uncertainty of measurement into account, means that the data may not be reliable to derive a calibration function (using the average value to derive a QAL2 function). However, the offset between the SRM and the CEM is consistent, giving confidence in the repeatability and accuracy of the SRM. Keeping the function set as y=x may be a sensible approach as it could be considered “best case approach” and may provide the operator a quicker response to genuine rising emissions. If the particulate monitor is left as “y = x”, it should be set to its most sensitive range to alert the operator that the control devices for particulate may need attention if an increase in emissions is observed. Taking this approach, the CEM is effectively being used as a qualitative indicator of rising emissions rather than a quantitative monitor. The Environment Agency should be informed if this approach has been taken.

Although a QAL2 calibration function could be derived it is based on low level raw data points. Using this derived function may give rise to biased higher or lower readings (this is dependent on the function) as the concentration of low levels increase or for high data spikes.

If the indicated dust emission increases during normal operation, such that seven consecutive daily average concentrations are higher than 2.5 mg/m³, then a QAL2 must be done within 6 months. When configured in this way, the CEMS will generally over-estimate mass emissions during normal operation

Section 4A - Data and Calculations - QAL2

TOTAL VOCs: QAL2 CALCULATIONS
(Page 1 of 6)

Thalia Waste Management, Knaresborough
A3- Line 2 - Duty

Calibration Data

Pair	Date	Time (30-minute Average)	x, CEM (STP, WET) mg/m³	y, SRM (STP, WET) mg/m³	SRM (STP, Dry, 11% O₂) mg/m³	x - x _{av} (A)	y - y _{av} (B)	(A) x (B)	(x - x _{av})²	CAL CEM (STP, WET) mg/m³
H1	Surrogate	High	17.41	16.00	16.00	16.90	15.29	258.45	285.64	15.99
L1	Surrogate	Near Zero	0.30	0.00	0.00	-0.21	-0.71	0.15	0.05	0.52
1	09/12/2025	15:32 - 16:02	0.16	0.44	0.42	-0.35	-0.27	0.09	0.12	0.39
2	09/12/2025	16:32 - 17:02	0.15	0.32	0.31	-0.36	-0.39	0.14	0.13	0.38
3	09/12/2025	17:32 - 18:02	0.13	0.32	0.33	-0.38	-0.39	0.15	0.14	0.36
4	09/12/2025	18:32 - 19:02	0.10	0.32	0.33	-0.41	-0.39	0.16	0.16	0.34
5	09/12/2025	19:32 - 20:02	0.07	0.32	0.31	-0.44	-0.39	0.17	0.20	0.31
6	09/12/2025	22:32 - 23:02	0.00	0.32	0.31	-0.51	-0.39	0.20	0.26	0.25
7	10/12/2025	23:32 - 00:02	0.03	0.32	0.32	-0.48	-0.39	0.19	0.23	0.28
8	10/12/2025	00:32 - 01:02	0.03	0.32	0.31	-0.48	-0.39	0.19	0.23	0.27
9	10/12/2025	01:32 - 02:02	0.04	0.32	0.31	-0.47	-0.39	0.18	0.22	0.28
10	10/12/2025	02:32 - 03:02	0.08	0.32	0.32	-0.43	-0.38	0.16	0.18	0.32
11	10/12/2025	03:32 - 04:02	0.09	0.35	0.32	-0.42	-0.36	0.15	0.17	0.33
12	10/12/2025	05:32 - 06:02	0.10	0.36	0.34	-0.41	-0.35	0.14	0.17	0.34
13	10/12/2025	06:32 - 07:02	0.10	0.33	0.31	-0.41	-0.38	0.16	0.17	0.34
14	10/12/2025	08:32 - 09:02	0.13	0.46	0.43	-0.38	-0.25	0.10	0.15	0.36
15	10/12/2025	09:32 - 10:02	0.09	0.46	0.44	-0.42	-0.25	0.10	0.17	0.33
16	10/12/2025	11:32 - 12:02	0.16	0.32	0.30	-0.35	-0.39	0.14	0.12	0.39
17	10/12/2025	12:32 - 13:02	-0.01	0.33	0.31	-0.52	-0.38	0.20	0.27	0.24
18	10/12/2025	13:32 - 14:02	0.04	0.34	0.33	-0.47	-0.37	0.17	0.22	0.28
19	10/12/2025	15:32 - 16:02	-0.01	0.32	0.31	-0.52	-0.39	0.20	0.27	0.24
20	10/12/2025	16:32 - 17:02	0.00	0.32	0.31	-0.51	-0.39	0.20	0.26	0.24
21	10/12/2025	17:32 - 18:02	-0.02	0.32	0.31	-0.53	-0.39	0.20	0.28	0.23
22	10/12/2025	18:32 - 19:02	-0.01	0.32	0.30	-0.52	-0.39	0.20	0.27	0.24
23	10/12/2025	19:32 - 20:02	-0.08	0.32	0.31	-0.59	-0.39	0.23	0.35	0.18
24	10/12/2025	20:32 - 21:02	0.12	0.32	0.31	-0.39	-0.39	0.15	0.15	0.36
25	10/12/2025	21:32 - 22:02	0.13	0.32	0.30	-0.38	-0.39	0.15	0.15	0.36
26	10/12/2025	22:32 - 23:02	0.10	0.32	0.31	-0.41	-0.39	0.16	0.17	0.33
27	11/12/2025	23:32 - 00:02	0.14	0.32	0.30	-0.37	-0.39	0.14	0.14	0.37
28	11/12/2025	00:32 - 01:02	0.10	0.32	0.30	-0.40	-0.39	0.16	0.16	0.34
29	11/12/2025	01:32 - 02:02	0.09	0.32	0.30	-0.42	-0.39	0.16	0.18	0.33
30	11/12/2025	02:32 - 03:02	0.13	0.32	0.30	-0.38	-0.39	0.15	0.14	0.36
31	11/12/2025	03:32 - 04:02	0.11	0.32	0.31	-0.39	-0.39	0.15	0.16	0.35
32	11/12/2025	04:32 - 05:02	0.11	0.33	0.31	-0.40	-0.38	0.15	0.16	0.35
33	11/12/2025	05:32 - 06:02	0.10	0.32	0.30	-0.41	-0.39	0.16	0.17	0.34
34	11/12/2025	06:32 - 07:02	0.12	0.32	0.30	-0.39	-0.39	0.15	0.16	0.35
35	11/12/2025	08:32 - 09:02	0.12	0.32	0.30	-0.39	-0.39	0.15	0.15	0.36
36	11/12/2025	09:32 - 10:02	0.11	0.32	0.30	-0.40	-0.39	0.16	0.16	0.34
37	11/12/2025	10:32 - 11:02	0.14	0.32	0.30	-0.37	-0.39	0.14	0.13	0.38
38	11/12/2025	11:32 - 12:02	0.12	0.32	0.30	-0.39	-0.39	0.15	0.15	0.36
39	11/12/2025	12:32 - 13:02	0.08	0.32	0.31	-0.43	-0.39	0.16	0.18	0.32
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Section 4A - Data and Calculations - QAL2

TOTAL VOCs: QAL2 CALCULATIONS

(Page 2 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Calibration Data (continued)

Pair	Date	Time (30-minute Average)	x, CEM (STP, WET) mg/m ³	y, SRM (STP, WET) mg/m ³	SRM (STP, Dry, 11% O ₂) mg/m ³	x - x _{av} (A)	y - y _{av} (B)	(A) x (B)	(x - x _{av}) ²	CAL CEM (STP, WET) mg/m ³
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66										
67										
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90										
			MAX SRM - MIN SRM		0.14			SUM	264.86	292.96
			(DAILY) DELV (mg/m ³)		10					
			95% CI MU (%)		30					
			95% CI at DELV (mg/m ³)		3.0					
			15% of ELV		1.5					
			PROCEDURE (A, B, C)		C					
								PROCEDURE A	If (MAX SRM - MIN SRM) > 95% CI at Daily ELV	
								PROCEDURE B	If (MAX SRM - MIN SRM) < 95% CI at Daily ELV and MIN SRM ≥ 15% of Daily ELV	
								PROCEDURE C	If (MAX SRM - MIN SRM) < 95% CI at Daily ELV and MIN SRM < 15% of Daily ELV	

Outliers Data

Pair	Date	Time (30-minute Average)	x, CEM (STP, WET) mg/m ³	y, SRM (STP, WET) mg/m ³	Reason for Data Pair Removal
					(Statistical Outliers removed following outlier test, other data removed prior to this test)
1	09/12/2025	20:32 - 21:02	0.03	0.32	Water - Statistical outlier
2	09/12/2025	21:32 - 22:02	0.03	0.32	Oxygen - Statistical outlier
3	10/12/2025	04:32 - 05:02	0.15	0.35	Water - Statistical outlier
4	10/12/2025	07:32 - 08:02	0.00	0.39	Instrument performing an auto-zero
5	10/12/2025	14:32 - 15:02	-0.02	0.00	SRM offline/calibrating
6	11/12/2025	07:32 - 08:02	0.00	0.32	Instrument performing an auto-zero
7	10/12/2025	10:32 - 11:02	1.70	1.02	Statistical outlier
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Section 4A - Data and Calculations - QAL2

TOTAL VOCs: QAL2 CALCULATIONS

(Page 3 of 6)

Thalia Waste Management, Knaresborough
 A3- Line 2 - Duty

Derivation of Calibration Function

b =	0.9041	a =	0.2479
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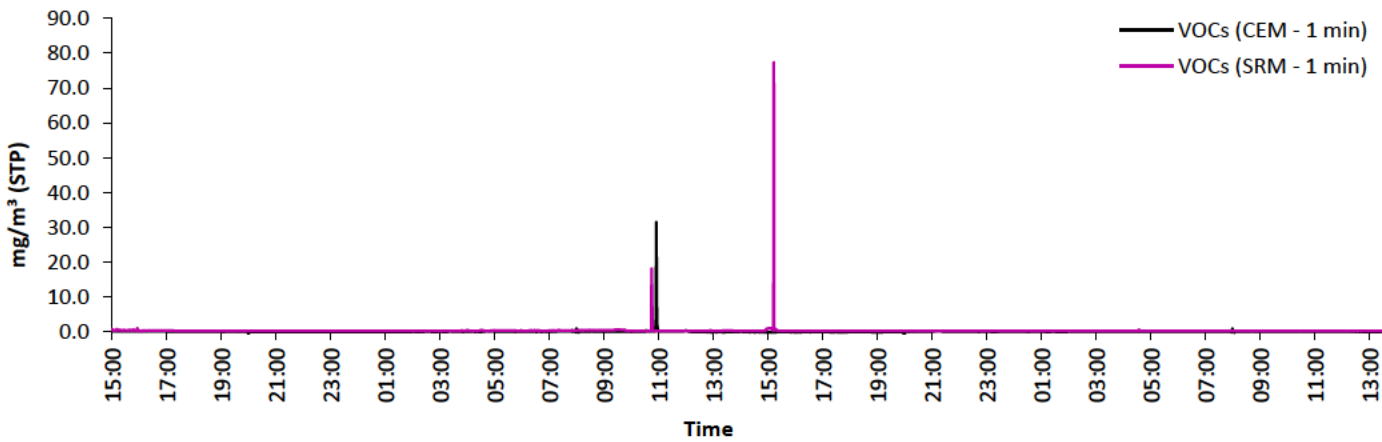
CALIBRATION FUNCTION =	$y = 0.9041x + 0.2479$
------------------------	------------------------

where

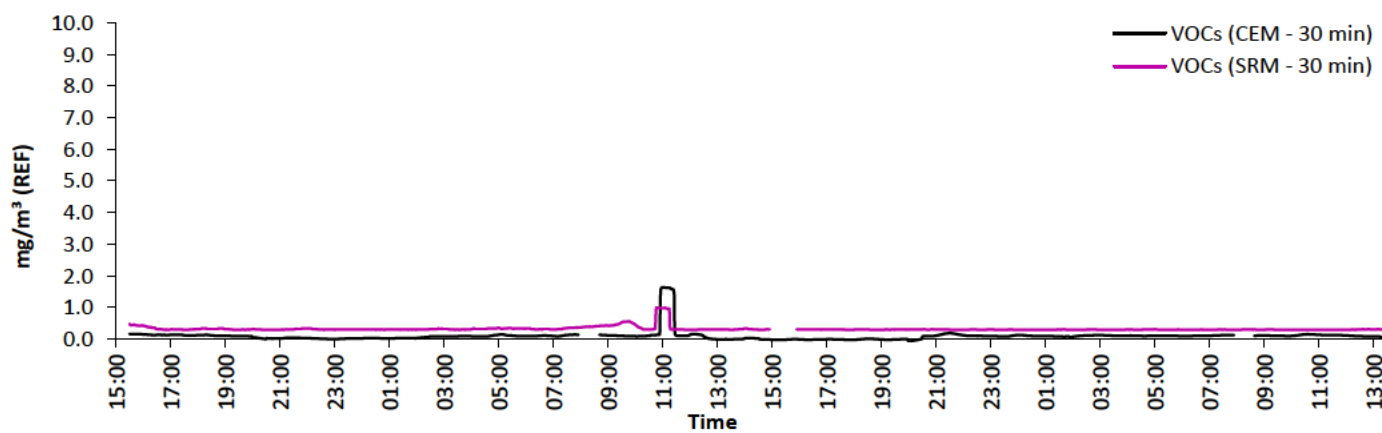
For Procedure A / C $b = [(x - x_{av}) \times (y - y_{av})] / (x - x_{av})^2$ and $a = \text{MEAN}(y) - [\text{MEAN}(x) \times b]$

Procedure B $b = \text{MEAN}(y) / [\text{MEAN}(x) - \text{OFFSET}]$ and $a = -b \times \text{OFFSET}$

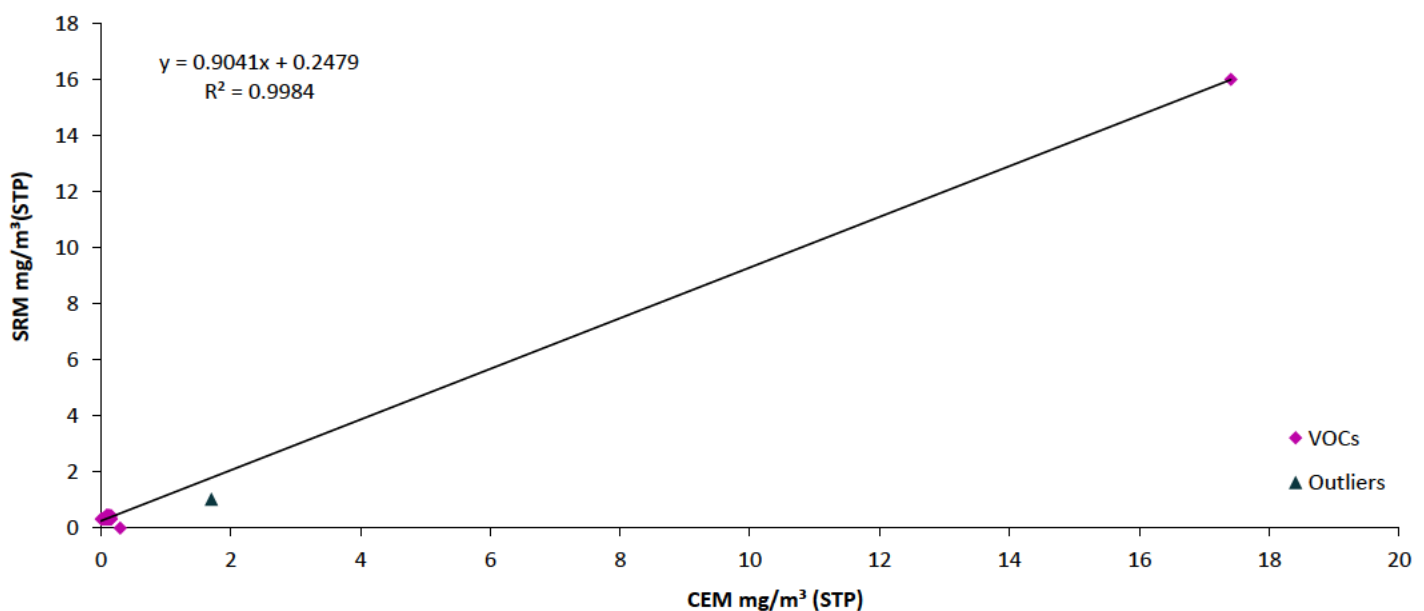
PLOT 1a: GRAPH FOR STP SRM vs STP CEMS (NON-STANDARDISED) (1 minute readings)



PLOT 1: GRAPH FOR REFERENCE SRM vs REFERENCE CEM (STANDARDISED) (30 minute rolling averages)



PLOT 2: Calibration Graph for Procedure C



Section 4A - Data and Calculations - QAL2

TOTAL VOCs: QAL2 CALCULATIONS
(Page 4 of 6)

Thalia Waste Management, Knaresborough
A3- Line 2 - Duty

Variability Test Data

Pair	Date	Time (30-minute Average)	CAL CEM (STP, WET) mg/m ³	CEM Water Vapour % v/v	CAL	SRM Water Vapour % v/v	CAL		SRM Oxygen (DRY) % v/v	CAL CEM (STP, Dry, 11% O ₂) mg/m ³	SRM (STP, Dry, 11% O ₂) mg/m ³	UNCAL CEM (STP, Dry, 11% O ₂) mg/m ³	ys, SRM - CAL CEM
					CEM Water Vapour % v/v		CEM Oxygen (DRY) % v/v						
H1	Surrogate	High	15.99	N/A	N/A	N/A	N/A	N/A	N/A	15.99	16.00	17.41	0.01
L1	Surrogate	Near Zero	0.52	N/A	N/A	N/A	N/A	N/A	N/A	0.52	0.00	0.30	-0.52
1	09/12/2025	15:32 - 16:02	0.39	19.34	17.08	16.78	8.50	N/A	8.37	0.38	0.42	0.15	0.05
2	09/12/2025	16:32 - 17:02	0.38	17.37	15.30	14.86	8.34	N/A	8.71	0.36	0.31	0.14	-0.05
3	09/12/2025	17:32 - 18:02	0.36	16.88	14.86	15.59	8.98	N/A	9.30	0.36	0.33	0.13	-0.03
4	09/12/2025	18:32 - 19:02	0.34	17.97	15.85	16.13	9.51	N/A	9.25	0.35	0.33	0.11	-0.03
5	09/12/2025	19:32 - 20:02	0.31	17.58	15.50	15.57	8.48	N/A	8.56	0.29	0.31	0.06	0.02
6	09/12/2025	22:32 - 23:02	0.25	18.34	16.18	16.49	8.54	N/A	8.43	0.24	0.31	0.00	0.07
7	10/12/2025	23:32 - 00:02	0.28	18.12	15.98	15.82	8.71	N/A	8.92	0.27	0.32	0.03	0.05
8	10/12/2025	00:32 - 01:02	0.27	16.95	14.93	14.76	8.82	N/A	8.86	0.26	0.31	0.03	0.05
9	10/12/2025	01:32 - 02:02	0.28	17.74	15.64	16.24	8.71	N/A	8.56	0.27	0.31	0.04	0.03
10	10/12/2025	02:32 - 03:02	0.32	19.10	16.87	16.70	9.14	N/A	9.02	0.33	0.32	0.08	0.00
11	10/12/2025	03:32 - 04:02	0.33	17.97	15.85	15.89	8.26	N/A	8.26	0.31	0.32	0.09	0.02
12	10/12/2025	05:32 - 06:02	0.34	15.61	13.72	13.30	8.66	N/A	8.79	0.31	0.34	0.09	0.02
13	10/12/2025	06:32 - 07:02	0.34	15.79	13.88	13.57	8.71	N/A	8.71	0.32	0.31	0.09	-0.01
14	10/12/2025	08:32 - 09:02	0.36	15.96	14.03	14.22	8.80	N/A	8.62	0.35	0.43	0.12	0.08
15	10/12/2025	09:32 - 10:02	0.33	19.93	17.62	17.07	8.02	N/A	8.29	0.31	0.44	0.09	0.13
16	10/12/2025	11:32 - 12:02	0.39	18.31	16.15	16.45	8.25	N/A	8.01	0.37	0.30	0.15	-0.07
17	10/12/2025	12:32 - 13:02	0.24	16.70	14.70	14.50	8.65	N/A	8.70	0.23	0.31	-0.01	0.08
18	10/12/2025	13:32 - 14:02	0.28	17.85	15.74	15.43	8.48	N/A	8.90	0.27	0.33	0.03	0.07
19	10/12/2025	15:32 - 16:02	0.24	17.12	15.08	15.39	8.82	N/A	8.67	0.23	0.31	-0.01	0.08
20	10/12/2025	16:32 - 17:02	0.24	16.64	14.65	14.57	8.79	N/A	9.00	0.23	0.31	0.00	0.08
21	10/12/2025	17:32 - 18:02	0.23	18.11	15.97	15.41	8.42	N/A	8.67	0.22	0.31	-0.02	0.09
22	10/12/2025	18:32 - 19:02	0.24	16.99	14.96	15.49	8.42	N/A	8.35	0.22	0.30	-0.01	0.08
23	10/12/2025	19:32 - 20:02	0.18	17.27	15.21	15.11	8.63	N/A	8.61	0.17	0.31	-0.08	0.14
24	10/12/2025	20:32 - 21:02	0.36	18.18	16.04	16.12	8.53	N/A	8.72	0.34	0.31	0.11	-0.03
25	10/12/2025	21:32 - 22:02	0.36	16.40	14.43	14.15	8.51	N/A	8.63	0.34	0.30	0.12	-0.04
26	10/12/2025	22:32 - 23:02	0.33	16.57	14.58	14.72	8.75	N/A	8.86	0.32	0.31	0.09	-0.01
27	11/12/2025	23:32 - 00:02	0.37	16.80	14.79	15.10	8.71	N/A	8.43	0.35	0.30	0.13	-0.05
28	11/12/2025	00:32 - 01:02	0.34	16.72	14.72	14.70	8.47	N/A	8.38	0.32	0.30	0.10	-0.02
29	11/12/2025	01:32 - 02:02	0.33	18.15	16.01	16.03	8.39	N/A	8.21	0.31	0.30	0.08	-0.01
30	11/12/2025	02:32 - 03:02	0.36	17.28	15.22	14.98	8.56	N/A	8.52	0.35	0.30	0.12	-0.04
31	11/12/2025	03:32 - 04:02	0.35	16.22	14.27	14.31	8.62	N/A	8.82	0.33	0.31	0.11	-0.02
32	11/12/2025	04:32 - 05:02	0.35	16.81	14.80	14.95	8.77	N/A	8.52	0.33	0.31	0.11	-0.02
33	11/12/2025	05:32 - 06:02	0.34	17.75	15.65	15.73	8.57	N/A	8.39	0.32	0.30	0.10	-0.02
34	11/12/2025	06:32 - 07:02	0.35	17.64	15.55	15.25	8.38	N/A	8.27	0.33	0.30	0.11	-0.03
35	11/12/2025	08:32 - 09:02	0.36	18.16	16.02	15.66	8.43	N/A	8.36	0.34	0.30	0.11	-0.04
36	11/12/2025	09:32 - 10:02	0.34	16.65	14.66	14.78	8.56	N/A	8.42	0.32	0.30	0.10	-0.02
37	11/12/2025	10:32 - 11:02	0.38	17.26	15.21	14.84	8.48	N/A	8.43	0.35	0.30	0.13	-0.05
38	11/12/2025	11:32 - 12:02	0.36	16.97	14.95	14.94	8.58	N/A	8.52	0.34	0.30	0.11	-0.03
39	11/12/2025	12:32 - 13:02	0.32	19.91	17.60	18.14	8.63	N/A	8.49	0.32	0.31	0.08	0.00
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TOTAL VOCs: QAL2 CALCULATIONS

(Page 5 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Variability Test Data (continued)

Pair	Date	Time (30-minute Average)	CAL CEM (STP, WET) mg/m ³	CEM Water Vapour % v/v	CAL	SRM Water Vapour % v/v	CAL	where CAL = Calibrated using QAL2 calibration functions					
					CEM Water Vapour % v/v		CEM Oxygen (DRY) % v/v		SRM Oxygen (DRY) % v/v	CAL CEM (STP, Dry, 11% O ₂) mg/m ³	SRM (STP, Dry, 11% O ₂) mg/m ³	UNCAL CEM (STP, Dry, 11% O ₂) mg/m ³	ys, SRM - CAL CEM
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										MAX	AVERAGE	AVERAGE	Sd
										0.38	0.32	0.08	0.05

Test of Variability

Q _o = ELV x (MU / 100) / 1.96	1.53
Kv for 39 Pairs of Data	0.9885
The variability is accepted if Sd ≤ Q _o x Kv.	

Parameter	Value
Standard Deviation (Sd)	0.05
Q _o x Kv	1.51
Outcome of Variability Test	Pass

Valid Calibration Range

Maximum CAL CEM Value (mg/m ³)	0.4
The Calibration Range can be extended by the greater of a) 10% of the Maximum CAL CEM Value or b) Up to 20% of the Daily ELV.	

a) Calibrated Range (10% extension) (mg/m ³)	0 to 0.4
b) Calibrated Range (20% of Daily ELV) (mg/m ³)	0 to 2.0

Greater of (a) or (b)	0 to 2.0
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Surrogate Extension Applied?	NOT PERMISSIBLE
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Valid Calibration Range (at REF conditions)	0 to 2.0 mg/m ³
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Section 4A - Data and Calculations - QAL2

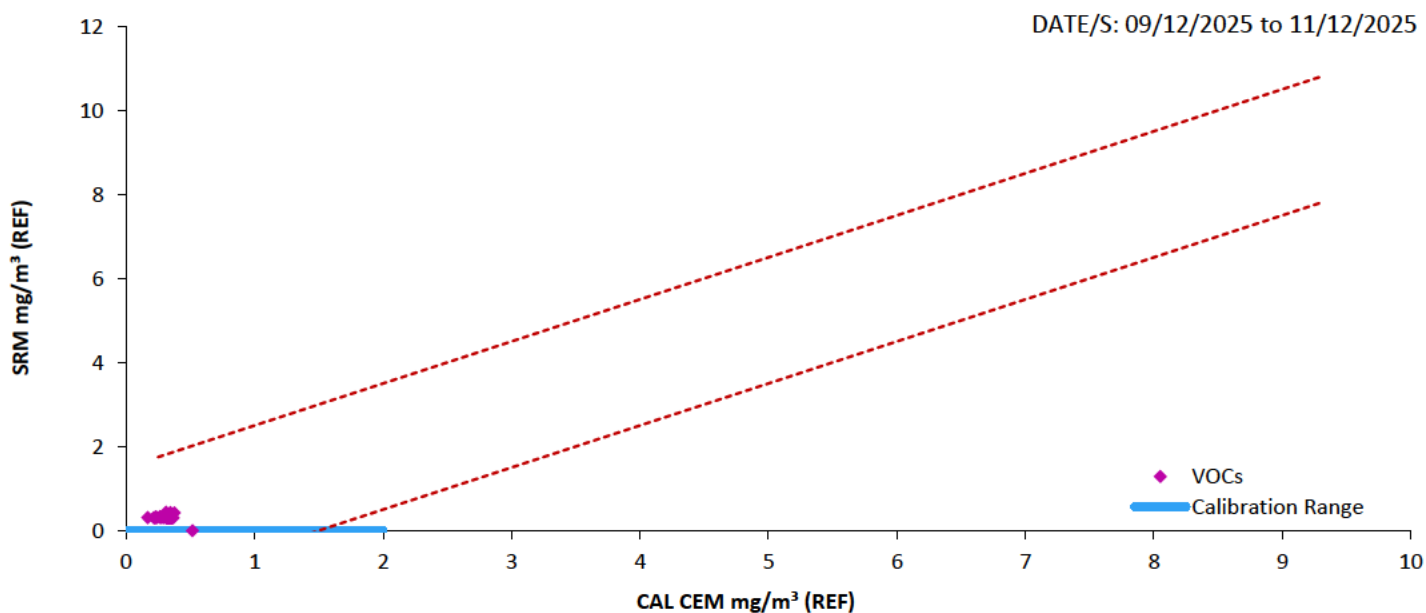
TOTAL VOCs: QAL2 CALCULATIONS

(Page 6 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

PLOT 3: X-Y Plot - REF CAL CEM vs REF SRM Values



Section 4A - Data and Calculations - QAL2

OXIDES OF NITROGEN (as NO₂): QAL2 CALCULATIONS

(Page 1 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Calibration Data

Pair	Date	Time (30-minute Average)	x, CEM (STP, WET) mg/m ³	y, SRM (STP, WET) mg/m ³	SRM (STP, Dry, 11% O ₂) mg/m ³	x - x _{av} (A)	y - y _{av} (B)	(A) x (B)	(x - x _{av}) ²	CAL CEM (STP, WET) mg/m ³
L1	Surrogate	Near Zero	0.05	0.00	0.00	-176.99	-157.98	27960.76	31326.18	1.28
1	09/12/2025	15:32 - 16:02	177.42	163.56	155.57	0.38	5.59	2.13	0.15	158.32
2	09/12/2025	16:32 - 17:02	184.06	161.12	154.04	7.02	3.15	22.08	49.27	164.19
3	09/12/2025	17:32 - 18:02	186.85	154.89	156.81	9.80	-3.09	-30.26	96.11	166.66
4	09/12/2025	18:32 - 19:02	168.62	161.23	163.64	-8.42	3.25	-27.39	70.97	150.52
5	09/12/2025	19:32 - 20:02	179.57	160.00	152.32	2.53	2.02	5.10	6.38	160.21
6	09/12/2025	22:32 - 23:02	175.73	156.19	148.80	-1.32	-1.78	2.35	1.73	156.81
7	10/12/2025	23:32 - 00:02	167.66	146.38	143.91	-9.38	-11.59	108.80	88.06	149.67
8	10/12/2025	00:32 - 01:02	180.19	166.58	160.94	3.14	8.61	27.06	9.89	160.76
9	10/12/2025	01:32 - 02:02	168.83	151.18	145.05	-8.22	-6.80	55.87	67.50	150.70
10	10/12/2025	02:32 - 03:02	188.75	163.04	163.40	11.71	5.06	59.25	137.13	168.35
11	10/12/2025	03:32 - 04:02	182.52	165.87	154.74	5.48	7.89	43.22	29.98	162.82
12	10/12/2025	05:32 - 06:02	184.54	153.20	144.73	7.50	-4.77	-35.78	56.18	164.61
13	10/12/2025	06:32 - 07:02	188.59	182.13	171.49	11.55	24.15	279.00	133.44	168.20
14	10/12/2025	08:32 - 09:02	202.52	193.32	182.05	25.48	35.35	900.67	649.34	180.54
15	10/12/2025	10:32 - 11:02	181.78	155.67	149.78	4.74	-2.30	-10.91	22.43	162.17
16	10/12/2025	11:32 - 12:02	178.78	162.37	149.62	1.74	4.39	7.64	3.03	159.52
17	10/12/2025	12:32 - 13:02	196.00	165.79	157.72	18.95	7.81	148.12	359.22	174.76
18	10/12/2025	13:32 - 14:02	185.16	151.72	148.20	8.12	-6.26	-50.82	65.97	165.17
19	10/12/2025	15:32 - 16:02	179.28	158.89	152.24	2.24	0.91	2.03	5.01	159.96
20	10/12/2025	16:32 - 17:02	202.68	182.73	178.30	25.64	24.75	634.50	657.20	180.67
21	10/12/2025	17:32 - 18:02	192.35	171.36	164.32	15.31	13.38	204.91	234.41	171.53
22	10/12/2025	18:32 - 19:02	180.74	159.72	149.41	3.70	1.74	6.44	13.67	161.25
23	10/12/2025	19:32 - 20:02	171.92	167.40	159.11	-5.12	9.42	-48.20	26.19	153.45
24	10/12/2025	20:32 - 21:02	178.33	155.45	150.85	1.28	-2.53	-3.25	1.65	159.11
25	10/12/2025	21:32 - 22:02	191.85	167.27	157.48	14.80	9.29	137.50	219.16	171.08
26	10/12/2025	22:32 - 23:02	172.32	141.85	136.98	-4.72	-16.13	76.16	22.29	153.80
27	11/12/2025	23:32 - 00:02	175.53	166.45	155.97	-1.51	8.47	-12.77	2.27	156.64
28	11/12/2025	00:32 - 01:02	192.44	171.49	159.28	15.40	13.51	208.08	237.21	171.61
29	11/12/2025	01:32 - 02:02	171.67	157.62	146.76	-5.37	-0.35	1.90	28.84	153.22
30	11/12/2025	02:32 - 03:02	188.56	161.54	152.20	11.52	3.56	40.99	132.71	168.18
31	11/12/2025	03:32 - 04:02	182.05	154.71	148.28	5.01	-3.27	-16.36	25.08	162.41
32	11/12/2025	04:32 - 05:02	172.52	165.09	155.57	-4.52	7.11	-32.14	20.42	153.98
33	11/12/2025	05:32 - 06:02	166.52	148.38	139.63	-10.52	-9.60	101.03	110.76	148.66
34	11/12/2025	06:32 - 07:02	179.88	164.31	152.29	2.84	6.33	17.99	8.08	160.49
35	11/12/2025	08:32 - 09:02	183.44	169.25	158.70	6.40	11.27	72.09	40.91	163.64
36	11/12/2025	09:32 - 10:02	184.94	163.55	152.57	7.89	5.57	43.99	62.31	164.97
37	11/12/2025	10:32 - 11:02	190.61	175.51	163.93	13.57	17.53	237.97	184.22	169.99
38	11/12/2025	11:32 - 12:02	170.70	148.41	139.80	-6.34	-9.57	60.73	40.25	152.36
39	11/12/2025	12:32 - 13:02	175.73	153.90	150.23	-1.31	-4.08	5.34	1.71	156.82
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Section 4A - Data and Calculations - QAL2

OXIDES OF NITROGEN (as NO₂): QAL2 CALCULATIONS

(Page 2 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Calibration Data (continued)

Pair	Date	Time (30-minute Average)	x, CEM (STP, WET) mg/m ³	y, SRM (STP, WET) mg/m ³	SRM (STP, Dry, 11% O ₂) mg/m ³	x - x _{av} (A)	y - y _{av} (B)	(A) x (B)	(x - x _{av}) ²	CAL CEM (STP, WET) mg/m ³
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			MAX SRM - MIN SRM		45.07			SUM	31205.81	35247.27
			(DAILY) DELV (mg/m ³)		180					
			95% CI MU (%)		20					
			95% CI at DELV (mg/m ³)		36.0					
			15% of ELV		27.0					
			PROCEDURE (A, B, C)		A					
			PROCEDURE A If (MAX SRM - MIN SRM) > 95% CI at Daily ELV							
			PROCEDURE B If (MAX SRM - MIN SRM) < 95% CI at Daily ELV and MIN SRM ≥ 15% of Daily ELV							
			PROCEDURE C If (MAX SRM - MIN SRM) < 95% CI at Daily ELV and MIN SRM < 15% of Daily ELV							

Outliers Data

Pair	Date	Time (30-minute Average)	x, CEM (STP, WET) mg/m ³	y, SRM (STP, WET) mg/m ³	Reason for Data Pair Removal
					(Statistical Outliers removed following outlier test, other data removed prior to this test)
1	09/12/2025	20:32 - 21:02	185.59	157.95	Water - Statistical outlier
2	09/12/2025	21:32 - 22:02	147.19	122.36	Oxygen - Statistical outlier
3	10/12/2025	04:32 - 05:02	191.20	164.03	Water - Statistical outlier
4	10/12/2025	07:32 - 08:02	0.00	174.70	Instrument performing an auto-zero
5	10/12/2025	14:32 - 15:02	169.81	0.00	SRM offline/calibrating
6	11/12/2025	07:32 - 08:02	0.00	160.91	Instrument performing an auto-zero
7	10/12/2025	09:32 - 10:02	207.67	170.89	Statistical outlier
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Section 4A - Data and Calculations - QAL2

OXIDES OF NITROGEN (as NO₂): QAL2 CALCULATIONS

(Page 3 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Derivation of Calibration Function

b =	0.8853	a =	1.2352
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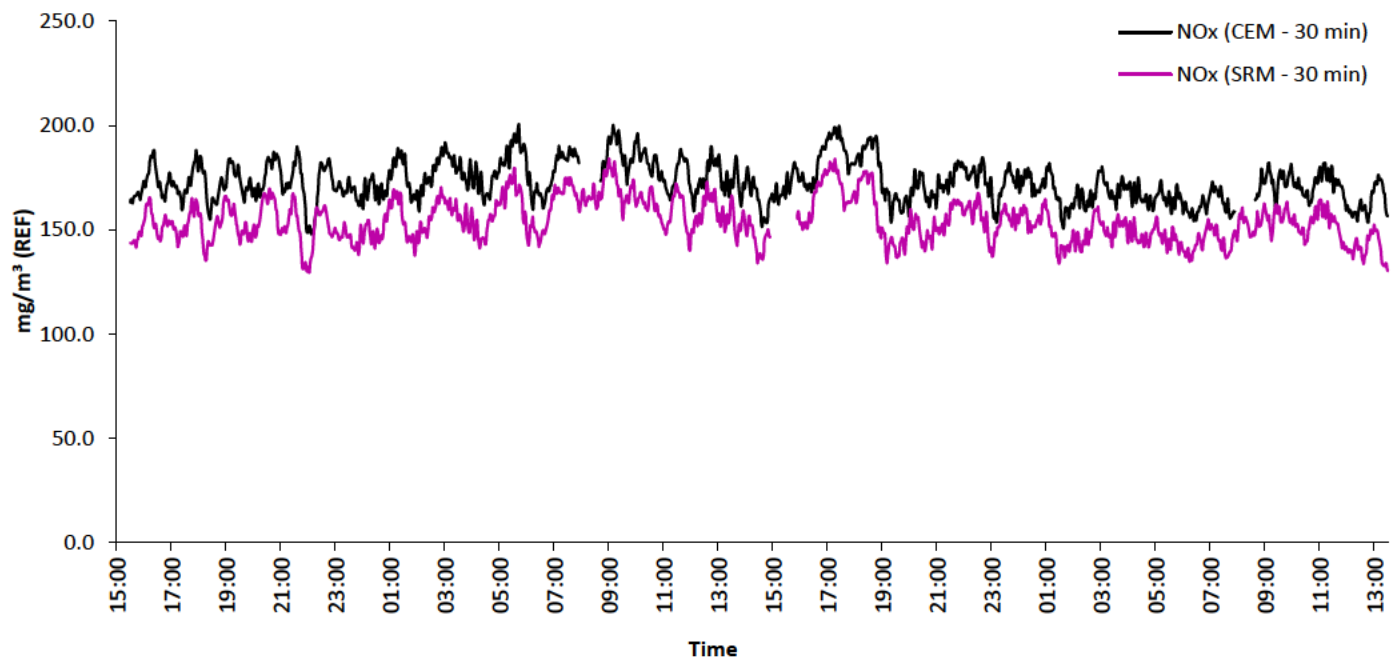
CALIBRATION FUNCTION =	$y = 0.8853x + 1.2352$
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where

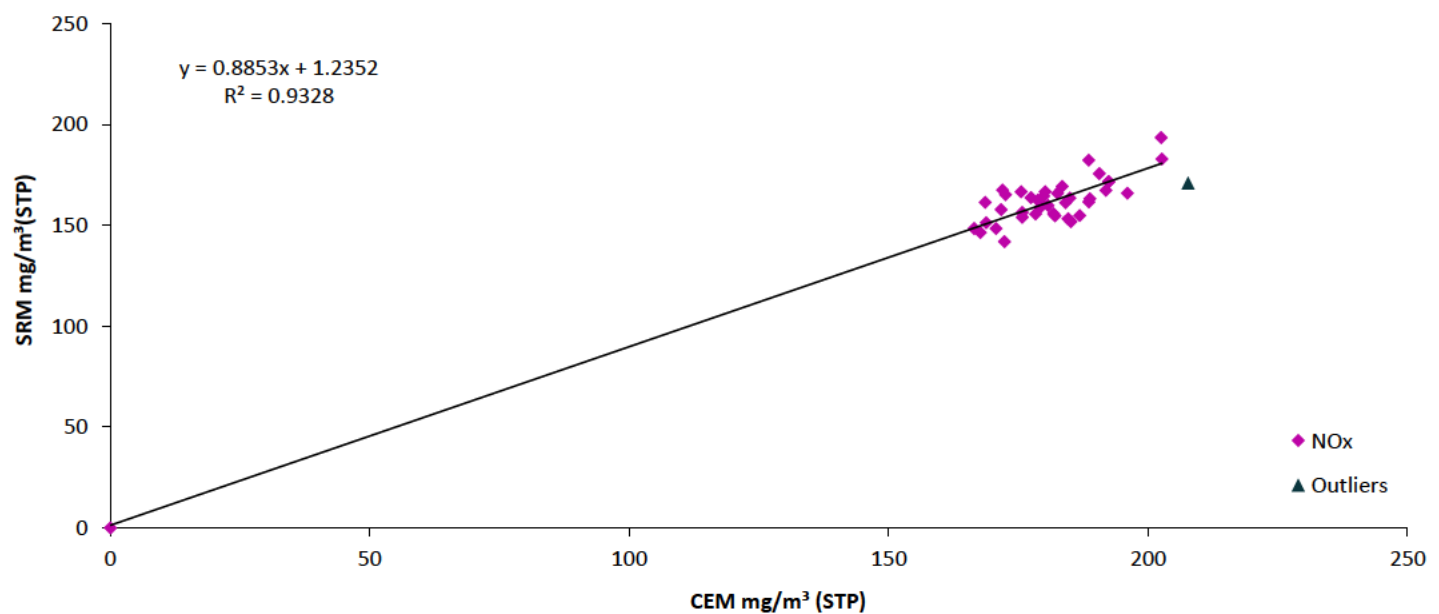
For Procedure A / C $b = [(x - x_{av}) \times (y - y_{av})] / (x - x_{av})^2$ and $a = \text{MEAN}(y) - [\text{MEAN}(x) \times b]$

Procedure B $b = \text{MEAN}(y) / [\text{MEAN}(x) - \text{OFFSET}]$ and $a = -b \times \text{OFFSET}$

PLOT 1: GRAPH FOR REFERENCE SRM vs REFERENCE CEM (STANDARDISED) (30 minute rolling averages)



PLOT 2: Calibration Graph for Procedure A



Section 4A - Data and Calculations - QAL2

OXIDES OF NITROGEN (as NO₂): QAL2 CALCULATIONS
(Page 4 of 6)

Thalia Waste Management, Knaresborough
A3- Line 2 - Duty

Variability Test Data

					CAL		CAL	where CAL = Calibrated using QAL2 calibration functions					
Pair	Date	Time (30-minute Average)	CAL CEM (STP, WET) mg/m³	CEM Water Vapour % v/v	CEM Water Vapour % v/v	SRM Water Vapour % v/v	CEM Oxygen (DRY) % v/v		SRM Oxygen (DRY) % v/v	CAL CEM (STP, Dry, 11% O₂) mg/m³	SRM (STP, Dry, 11% O₂) mg/m³	UNCAL CEM (STP, Dry, 11% O₂) mg/m³	ys, SRM - CAL CEM
					N/A			N/A					
L1	Surrogate	Near Zero	1.28	N/A	N/A	N/A	N/A	N/A	N/A	1.28	0.00	0.05	-1.28
1	09/12/2025	15:32 - 16:02	158.32	19.34	17.08	16.78	8.50	N/A	8.37	152.70	155.57	171.13	2.86
2	09/12/2025	16:32 - 17:02	164.19	17.37	15.30	14.86	8.34	N/A	8.71	153.10	154.04	171.62	0.94
3	09/12/2025	17:32 - 18:02	166.66	16.88	14.86	15.59	8.98	N/A	9.30	162.85	156.81	182.58	-6.05
4	09/12/2025	18:32 - 19:02	150.52	17.97	15.85	16.13	9.51	N/A	9.25	155.61	163.64	174.32	8.03
5	09/12/2025	19:32 - 20:02	160.21	17.58	15.50	15.57	8.48	N/A	8.56	151.48	152.32	169.77	0.84
6	09/12/2025	22:32 - 23:02	156.81	18.34	16.18	16.49	8.54	N/A	8.43	150.17	148.80	168.28	-1.37
7	10/12/2025	23:32 - 00:02	149.67	18.12	15.98	15.82	8.71	N/A	8.92	144.91	143.91	162.33	-1.01
8	10/12/2025	00:32 - 01:02	160.76	16.95	14.93	14.76	8.82	N/A	8.86	155.10	160.94	173.85	5.84
9	10/12/2025	01:32 - 02:02	150.70	17.74	15.64	16.24	8.71	N/A	8.56	145.39	145.05	162.88	-0.34
10	10/12/2025	02:32 - 03:02	168.35	19.10	16.87	16.70	9.14	N/A	9.02	170.75	163.40	191.45	-7.36
11	10/12/2025	03:32 - 04:02	162.82	17.97	15.85	15.89	8.26	N/A	8.26	151.90	154.74	170.28	2.84
12	10/12/2025	05:32 - 06:02	164.61	15.61	13.72	13.30	8.66	N/A	8.79	154.58	144.73	173.29	-9.85
13	10/12/2025	06:32 - 07:02	168.20	15.79	13.88	13.57	8.71	N/A	8.71	158.93	171.49	178.20	12.56
14	10/12/2025	08:32 - 09:02	180.54	15.96	14.03	14.22	8.80	N/A	8.62	172.17	182.05	193.14	9.88
15	10/12/2025	10:32 - 11:02	162.17	16.63	14.64	14.79	8.76	N/A	8.80	155.16	149.78	173.92	-5.38
16	10/12/2025	11:32 - 12:02	159.52	18.31	16.15	16.45	8.25	N/A	8.01	149.25	149.62	167.27	0.37
17	10/12/2025	12:32 - 13:02	174.76	16.70	14.70	14.50	8.65	N/A	8.70	165.89	157.72	186.05	-8.17
18	10/12/2025	13:32 - 14:02	165.17	17.85	15.74	15.43	8.48	N/A	8.90	156.52	148.20	175.47	-8.32
19	10/12/2025	15:32 - 16:02	159.96	17.12	15.08	15.39	8.82	N/A	8.67	154.60	152.24	173.27	-2.36
20	10/12/2025	16:32 - 17:02	180.67	16.64	14.65	14.57	8.79	N/A	9.00	173.32	178.30	194.42	4.99
21	10/12/2025	17:32 - 18:02	171.53	18.11	15.97	15.41	8.42	N/A	8.67	162.34	164.32	182.04	1.98
22	10/12/2025	18:32 - 19:02	161.25	16.99	14.96	15.49	8.42	N/A	8.35	150.79	149.41	169.02	-1.39
23	10/12/2025	19:32 - 20:02	153.45	17.27	15.21	15.11	8.63	N/A	8.61	146.35	159.11	163.97	12.76
24	10/12/2025	20:32 - 21:02	159.11	18.18	16.04	16.12	8.53	N/A	8.72	151.99	150.85	170.34	-1.14
25	10/12/2025	21:32 - 22:02	171.08	16.40	14.43	14.15	8.51	N/A	8.63	160.08	157.48	179.51	-2.60
26	10/12/2025	22:32 - 23:02	153.80	16.57	14.58	14.72	8.75	N/A	8.86	146.98	136.98	164.68	-10.00
27	11/12/2025	23:32 - 00:02	156.64	16.80	14.79	15.10	8.71	N/A	8.43	149.52	155.97	167.55	6.45
28	11/12/2025	00:32 - 01:02	171.61	16.72	14.72	14.70	8.47	N/A	8.38	160.64	159.28	180.14	-1.37
29	11/12/2025	01:32 - 02:02	153.22	18.15	16.01	16.03	8.39	N/A	8.21	144.67	146.76	162.09	2.09
30	11/12/2025	02:32 - 03:02	168.18	17.28	15.22	14.98	8.56	N/A	8.52	159.52	152.20	178.85	-7.32
31	11/12/2025	03:32 - 04:02	162.41	16.22	14.27	14.31	8.62	N/A	8.82	153.07	148.28	171.58	-4.79
32	11/12/2025	04:32 - 05:02	153.98	16.81	14.80	14.95	8.77	N/A	8.52	147.73	155.57	165.52	7.84
33	11/12/2025	05:32 - 06:02	148.66	17.75	15.65	15.73	8.57	N/A	8.39	141.78	139.63	158.82	-2.15
34	11/12/2025	06:32 - 07:02	160.49	17.64	15.55	15.25	8.38	N/A	8.27	150.55	152.29	168.73	1.74
35	11/12/2025	08:32 - 09:02	163.64	18.16	16.02	15.66	8.43	N/A	8.36	155.07	158.70	173.83	3.63
36	11/12/2025	09:32 - 10:02	164.97	16.65	14.66	14.78	8.56	N/A	8.42	155.40	152.57	174.21	-2.83
37	11/12/2025	10:32 - 11:02	169.99	17.26	15.21	14.84	8.48	N/A	8.43	160.12	163.93	179.54	3.81
38	11/12/2025	11:32 - 12:02	152.36	16.97	14.95	14.94	8.58	N/A	8.52	144.27	139.80	161.64	-4.47
39	11/12/2025	12:32 - 13:02	156.82	19.91	17.60	18.14	8.63	N/A	8.49	153.91	150.23	172.47	-3.68
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OXIDES OF NITROGEN (as NO₂): QAL2 CALCULATIONS

(Page 5 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Variability Test Data (continued)

Pair	Date	Time (30-minute Average)	CAL CEM (STP, WET) mg/m ³	CEM Water Vapour % v/v	CAL	SRM Water Vapour % v/v	CAL		SRM Oxygen (DRY) % v/v	where CAL = Calibrated using QAL2 calibration functions			
					CEM Water Vapour % v/v		CEM Oxygen (DRY) % v/v			CAL CEM (STP, Dry, 11% O ₂) mg/m ³	SRM (STP, Dry, 11% O ₂) mg/m ³	UNCAL CEM (STP, Dry, 11% O ₂) mg/m ³	ys, SRM - CAL CEM
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										MAX	AVERAGE	AVERAGE	Sd
										173.32	154.53	173.28	5.84

Test of Variability

Q ₀ = ELV x (MU / 100) / 1.96	18.37
Kv for 39 Pairs of Data	0.9885
The variability is accepted if Sd ≤ Q ₀ x Kv.	

Parameter	Value
Standard Deviation (Sd)	5.84
Q ₀ x Kv	18.16
Outcome of Variability Test	Pass

Valid Calibration Range

Maximum CAL CEM Value (mg/m ³)	173.3
The Calibration Range can be extended by the greater of a) 10% of the Maximum CAL CEM Value or b) Up to 20% of the Daily ELV.	
a) Calibrated Range (10% extension) (mg/m ³)	0 to 190.6
b) Calibrated Range (20% of Daily ELV) (mg/m ³)	0 to 36.0
Greater of (a) or (b)	0 to 190.6
Surrogate Extension Applied?	No

Valid Calibration Range (at REF conditions)	0 to 190.6 mg/m ³
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Section 4A - Data and Calculations - QAL2

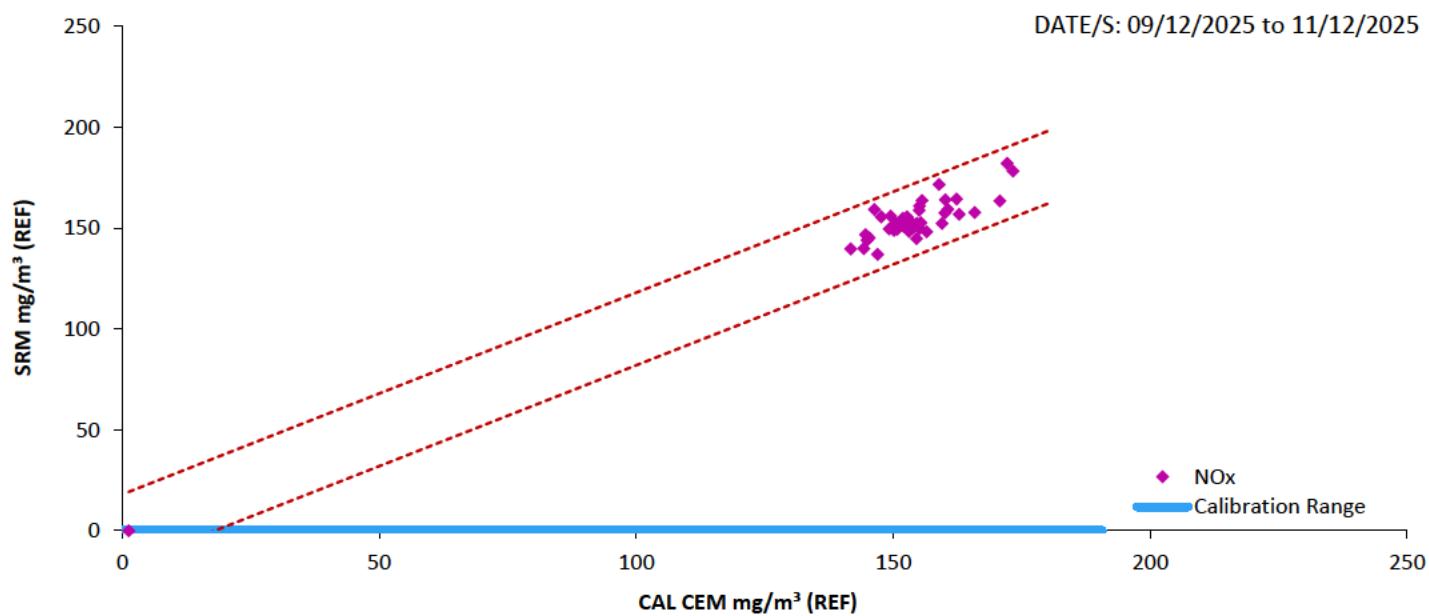
OXIDES OF NITROGEN (as NO₂): QAL2 CALCULATIONS

(Page 6 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

PLOT 3: X-Y Plot - REF CAL CEM vs REF SRM Values



Section 4A - Data and Calculations - QAL2

SULPHUR DIOXIDE: QAL2 CALCULATIONS

(Page 1 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Calibration Data

Pair	Date	Time (30-minute Average)	x, CEM (STP, WET) mg/m³	y, SRM (STP, WET) mg/m³	SRM (STP, Dry, 11% O₂) mg/m³	x - x _{av} (A)	y - y _{av} (B)	(A) x (B)	(x - x _{av})²	CAL CEM (STP, WET) mg/m³
L1	Surrogate	Near Zero	0.74	0.00	0.00	-36.65	-43.24	1584.81	1343.14	3.03
1	09/12/2025	15:32 - 16:02	28.86	37.66	35.82	-8.53	-5.58	47.61	72.72	33.89
2	09/12/2025	16:32 - 17:02	41.60	46.59	44.54	4.21	3.35	14.10	17.76	47.87
3	09/12/2025	18:32 - 19:02	23.46	27.96	28.38	-13.93	-15.28	212.83	193.91	27.96
4	09/12/2025	19:32 - 20:02	40.95	44.81	42.66	3.57	1.57	5.59	12.73	47.16
5	09/12/2025	22:32 - 23:02	36.49	39.35	37.48	-0.89	-3.89	3.48	0.80	42.26
6	10/12/2025	23:32 - 00:02	35.43	36.99	36.36	-1.96	-6.25	12.25	3.84	41.09
7	10/12/2025	00:32 - 01:02	41.99	47.23	45.63	4.60	3.98	18.32	21.16	48.29
8	10/12/2025	01:32 - 02:02	34.67	34.84	33.43	-2.72	-8.40	22.82	7.38	40.26
9	10/12/2025	02:32 - 03:02	36.46	36.51	36.59	-0.93	-6.73	6.25	0.86	42.22
10	10/12/2025	03:32 - 04:02	37.78	43.14	40.25	0.40	-0.10	-0.04	0.16	43.68
11	10/12/2025	05:32 - 06:02	43.02	49.97	47.21	5.63	6.73	37.88	31.70	49.42
12	10/12/2025	06:32 - 07:02	43.51	53.34	50.23	6.12	10.10	61.81	37.46	49.96
13	10/12/2025	08:32 - 09:02	34.14	40.27	37.92	-3.24	-2.98	9.65	10.52	39.68
14	10/12/2025	09:32 - 10:02	24.01	32.14	30.50	-13.37	-11.11	148.52	178.82	28.57
15	10/12/2025	10:32 - 11:02	36.79	42.26	40.66	-0.59	-0.98	0.58	0.35	42.59
16	10/12/2025	11:32 - 12:02	31.50	37.26	34.33	-5.89	-5.98	35.24	34.68	36.78
17	10/12/2025	12:32 - 13:02	43.38	50.41	47.96	6.00	7.17	42.99	35.96	49.82
18	10/12/2025	13:32 - 14:02	38.38	42.08	41.11	1.00	-1.16	-1.16	1.00	44.34
19	10/12/2025	15:32 - 16:02	40.39	46.33	44.39	3.01	3.09	9.28	9.04	46.54
20	10/12/2025	16:32 - 17:02	40.85	46.72	45.59	3.46	3.48	12.05	11.98	47.04
21	10/12/2025	17:32 - 18:02	38.85	48.94	46.93	1.47	5.69	8.35	2.15	44.85
22	10/12/2025	18:32 - 19:02	40.71	46.66	43.64	3.32	3.41	11.34	11.05	46.89
23	10/12/2025	19:32 - 20:02	41.27	46.22	43.93	3.88	2.98	11.57	15.07	47.50
24	10/12/2025	20:32 - 21:02	41.88	44.01	42.71	4.49	0.77	3.47	20.18	48.17
25	10/12/2025	21:32 - 22:02	40.79	50.19	47.25	3.40	6.95	23.63	11.57	46.98
26	10/12/2025	22:32 - 23:02	42.21	41.40	39.98	4.83	-1.84	-8.89	23.28	48.54
27	11/12/2025	23:32 - 00:02	40.21	46.22	43.31	2.83	2.98	8.41	7.99	46.34
28	11/12/2025	00:32 - 01:02	44.47	52.24	48.52	7.08	9.00	63.76	50.18	51.02
29	11/12/2025	01:32 - 02:02	34.15	45.60	42.46	-3.24	2.36	-7.63	10.47	39.69
30	11/12/2025	02:32 - 03:02	40.60	46.27	43.60	3.22	3.03	9.75	10.34	46.77
31	11/12/2025	03:32 - 04:02	42.53	44.44	42.60	5.14	1.20	6.17	26.45	48.89
32	11/12/2025	04:32 - 05:02	38.45	46.30	43.63	1.07	3.05	3.26	1.14	44.41
33	11/12/2025	05:32 - 06:02	40.59	45.79	43.10	3.20	2.55	8.18	10.27	46.76
34	11/12/2025	06:32 - 07:02	40.62	50.29	46.61	3.24	7.05	22.80	10.47	46.79
35	11/12/2025	08:32 - 09:02	33.52	46.12	43.25	-3.86	2.88	-11.11	14.92	39.00
36	11/12/2025	09:32 - 10:02	41.59	51.68	48.21	4.20	8.44	35.43	17.64	47.85
37	11/12/2025	10:32 - 11:02	41.46	50.88	47.52	4.08	7.63	31.14	16.63	47.72
38	11/12/2025	11:32 - 12:02	39.74	47.36	44.62	2.36	4.12	9.71	5.55	45.83
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Section 4A - Data and Calculations - QAL2

SULPHUR DIOXIDE: QAL2 CALCULATIONS

(Page 2 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Calibration Data (continued)

Pair	Date	Time (30-minute Average)	x, CEM (STP, WET) mg/m ³	y, SRM (STP, WET) mg/m ³	SRM (STP, Dry, 11% O ₂) mg/m ³	x - x _{av} (A)	y - y _{av} (B)	(A) x (B)	(x - x _{av}) ²	CAL CEM (STP, WET) mg/m ³
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			MAX SRM - MIN SRM		21.85			SUM	2514.18	2291.34
			(DAILY) DELV (mg/m ³)		40					
			95% CI MU (%)		20					
			95% CI at DELV (mg/m ³)		8.0					
			15% of ELV		6.0					
			PROCEDURE (A, B, C)		A					
								PROCEDURE A	If (MAX SRM - MIN SRM) > 95% CI at Daily ELV	
								PROCEDURE B	If (MAX SRM - MIN SRM) < 95% CI at Daily ELV and MIN SRM ≥ 15% of Daily ELV	
								PROCEDURE C	If (MAX SRM - MIN SRM) < 95% CI at Daily ELV and MIN SRM < 15% of Daily ELV	

Outliers Data

Pair	Date	Time (30-minute Average)	x, CEM (STP, WET) mg/m ³	y, SRM (STP, WET) mg/m ³	Reason for Data Pair Removal
					(Statistical Outliers removed following outlier test, other data removed prior to this test)
1	09/12/2025	20:32 - 21:02	39.97	39.99	Water - Statistical outlier
2	09/12/2025	21:32 - 22:02	29.69	26.04	Oxygen - Statistical outlier
3	10/12/2025	04:32 - 05:02	43.79	46.96	Water - Statistical outlier
4	10/12/2025	07:32 - 08:02	0.00	39.20	Instrument performing an auto-zero
5	10/12/2025	14:32 - 15:02	41.07	0.00	SRM offline/calibrating
6	11/12/2025	07:32 - 08:02	0.00	51.31	Instrument performing an auto-zero
7	09/12/2025	17:32 - 18:02	40.26	36.64	Statistical outlier
8	11/12/2025	12:32 - 13:02	25.95	22.53	Statistical outlier
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Section 4A - Data and Calculations - QAL2

SULPHUR DIOXIDE: QAL2 CALCULATIONS

(Page 3 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Derivation of Calibration Function

b =	1.0973	a =	2.2215
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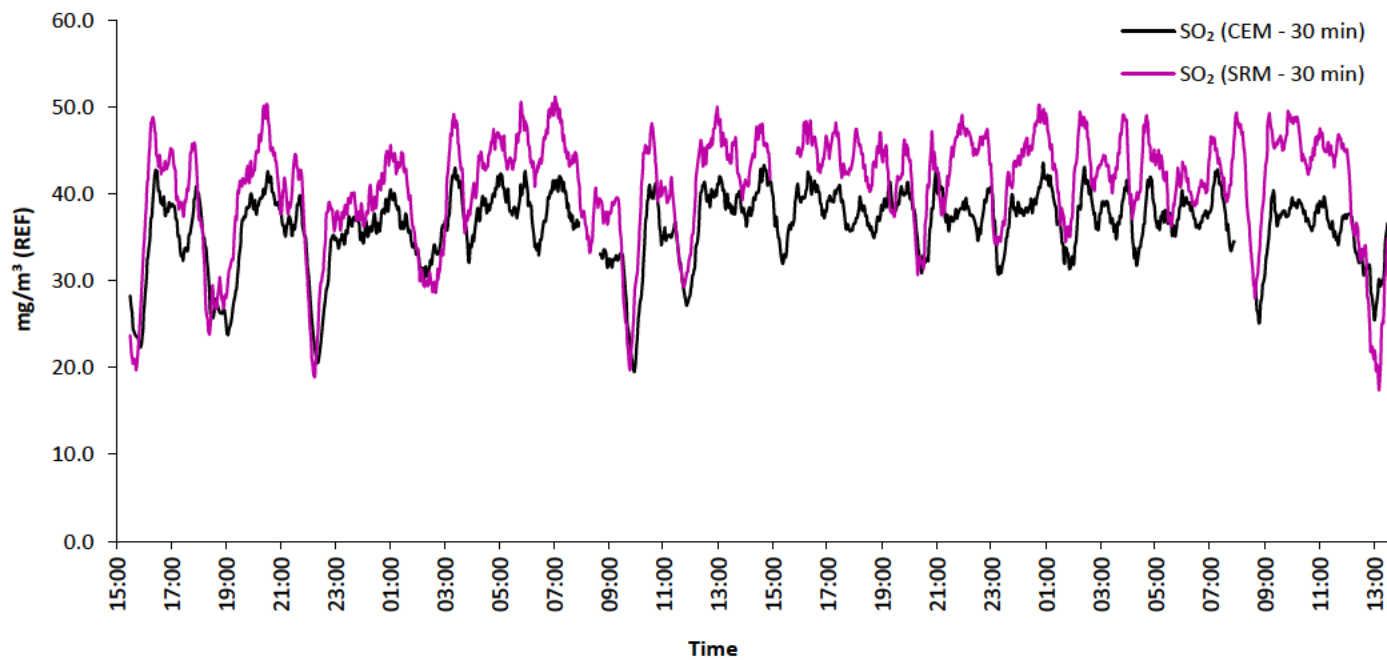
CALIBRATION FUNCTION =	$y = 1.0973x + 2.2215$
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where

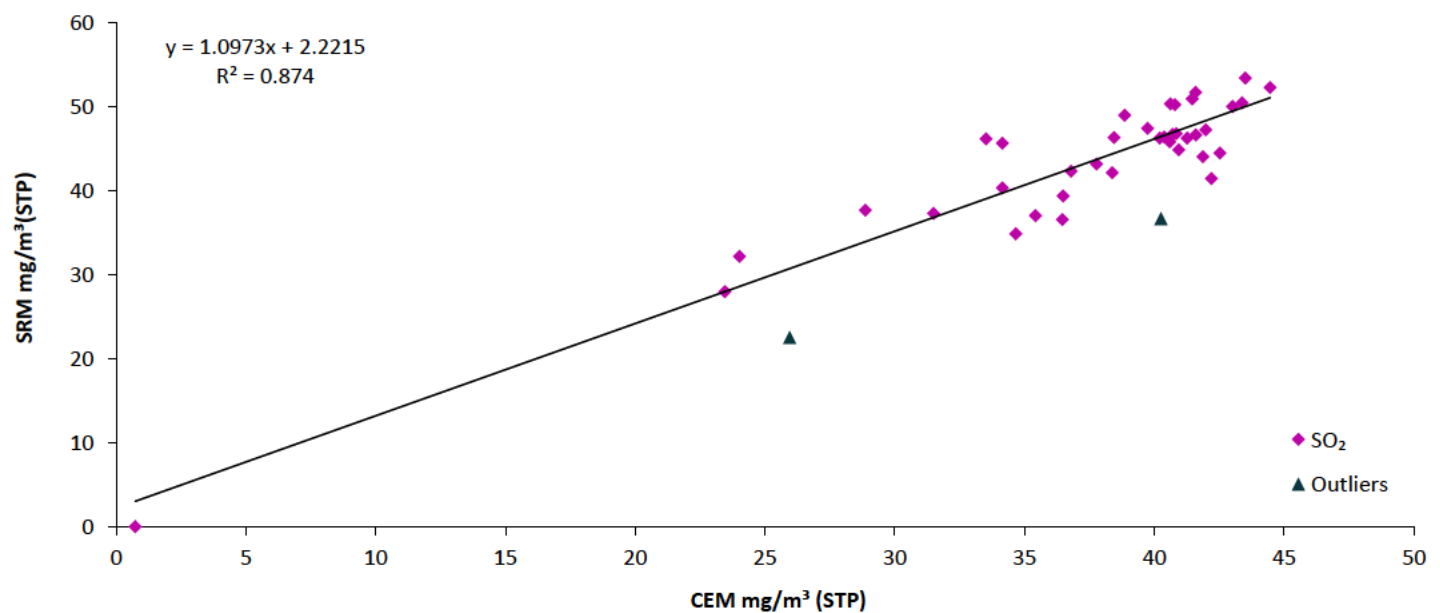
For Procedure A / C $b = [(x - x_{av}) \times (y - y_{av})] / (x - x_{av})^2$ and $a = \text{MEAN}(y) - [\text{MEAN}(x) \times b]$

Procedure B $b = \text{MEAN}(y) / [\text{MEAN}(x) - \text{OFFSET}]$ and $a = -b \times \text{OFFSET}$

PLOT 1: GRAPH FOR REFERENCE SRM vs REFERENCE CEM (STANDARDISED) (30 minute rolling averages)



PLOT 2: Calibration Graph for Procedure A



Section 4A - Data and Calculations - QAL2

SULPHUR DIOXIDE: QAL2 CALCULATIONS
(Page 4 of 6)

Thalia Waste Management, Knaresborough
A3- Line 2 - Duty

Variability Test Data

					CAL		CAL	where CAL = Calibrated using QAL2 calibration functions					
Pair	Date	Time (30-minute Average)	CAL CEM (STP, WET) mg/m³	CEM Water Vapour % v/v	CEM Water Vapour % v/v	SRM Water Vapour % v/v	CEM Oxygen (DRY) % v/v		SRM Oxygen (DRY) % v/v	CAL CEM (STP, Dry, 11% O₂) mg/m³	SRM (STP, Dry, 11% O₂) mg/m³	UNCAL CEM (STP, Dry, 11% O₂) mg/m³	ys, SRM - CAL CEM
					N/A			N/A					
L1	Surrogate	Near Zero	3.03	N/A	N/A	N/A	N/A	N/A	N/A	3.03	0.00	0.74	-3.03
1	09/12/2025	15:32 - 16:02	33.89	19.34	17.08	16.78	8.50	N/A	8.37	32.68	35.82	27.83	3.13
2	09/12/2025	16:32 - 17:02	47.87	17.37	15.30	14.86	8.34	N/A	8.71	44.63	44.54	38.79	-0.09
3	09/12/2025	18:32 - 19:02	27.96	17.97	15.85	16.13	9.51	N/A	9.25	28.91	28.38	24.25	-0.53
4	09/12/2025	19:32 - 20:02	47.16	17.58	15.50	15.57	8.48	N/A	8.56	44.59	42.66	38.72	-1.93
5	09/12/2025	22:32 - 23:02	42.26	18.34	16.18	16.49	8.54	N/A	8.43	40.47	37.48	34.95	-2.99
6	10/12/2025	23:32 - 00:02	41.09	18.12	15.98	15.82	8.71	N/A	8.92	39.79	36.36	34.30	-3.42
7	10/12/2025	00:32 - 01:02	48.29	16.95	14.93	14.76	8.82	N/A	8.86	46.59	45.63	40.51	-0.96
8	10/12/2025	01:32 - 02:02	40.26	17.74	15.64	16.24	8.71	N/A	8.56	38.84	33.43	33.45	-5.41
9	10/12/2025	02:32 - 03:02	42.22	19.10	16.87	16.70	9.14	N/A	9.02	42.83	36.59	36.98	-6.24
10	10/12/2025	03:32 - 04:02	43.68	17.97	15.85	15.89	8.26	N/A	8.26	40.75	40.25	35.25	-0.50
11	10/12/2025	05:32 - 06:02	49.42	15.61	13.72	13.30	8.66	N/A	8.79	46.41	47.21	40.39	0.80
12	10/12/2025	06:32 - 07:02	49.96	15.79	13.88	13.57	8.71	N/A	8.71	47.21	50.23	41.11	3.02
13	10/12/2025	08:32 - 09:02	39.68	15.96	14.03	14.22	8.80	N/A	8.62	37.85	37.92	32.56	0.07
14	10/12/2025	09:32 - 10:02	28.57	19.93	17.62	17.07	8.02	N/A	8.29	26.71	30.50	22.45	3.79
15	10/12/2025	10:32 - 11:02	42.59	16.63	14.64	14.79	8.76	N/A	8.80	40.75	40.66	35.20	-0.09
16	10/12/2025	11:32 - 12:02	36.78	18.31	16.15	16.45	8.25	N/A	8.01	34.41	34.33	29.47	-0.08
17	10/12/2025	12:32 - 13:02	49.82	16.70	14.70	14.50	8.65	N/A	8.70	47.29	47.96	41.18	0.66
18	10/12/2025	13:32 - 14:02	44.34	17.85	15.74	15.43	8.48	N/A	8.90	42.02	41.11	36.38	-0.91
19	10/12/2025	15:32 - 16:02	46.54	17.12	15.08	15.39	8.82	N/A	8.67	44.98	44.39	39.04	-0.59
20	10/12/2025	16:32 - 17:02	47.04	16.64	14.65	14.57	8.79	N/A	9.00	45.12	45.59	39.18	0.47
21	10/12/2025	17:32 - 18:02	44.85	18.11	15.97	15.41	8.42	N/A	8.67	42.45	46.93	36.77	4.48
22	10/12/2025	18:32 - 19:02	46.89	16.99	14.96	15.49	8.42	N/A	8.35	43.85	43.64	38.07	-0.21
23	10/12/2025	19:32 - 20:02	47.50	17.27	15.21	15.11	8.63	N/A	8.61	45.31	43.93	39.36	-1.37
24	10/12/2025	20:32 - 21:02	48.17	18.18	16.04	16.12	8.53	N/A	8.72	46.02	42.71	40.00	-3.30
25	10/12/2025	21:32 - 22:02	46.98	16.40	14.43	14.15	8.51	N/A	8.63	43.95	47.25	38.16	3.30
26	10/12/2025	22:32 - 23:02	48.54	16.57	14.58	14.72	8.75	N/A	8.86	46.39	39.98	40.34	-6.41
27	11/12/2025	23:32 - 00:02	46.34	16.80	14.79	15.10	8.71	N/A	8.43	44.24	43.31	38.38	-0.93
28	11/12/2025	00:32 - 01:02	51.02	16.72	14.72	14.70	8.47	N/A	8.38	47.75	48.52	41.63	0.77
29	11/12/2025	01:32 - 02:02	39.69	18.15	16.01	16.03	8.39	N/A	8.21	37.48	42.46	32.24	4.98
30	11/12/2025	02:32 - 03:02	46.77	17.28	15.22	14.98	8.56	N/A	8.52	44.36	43.60	38.51	-0.76
31	11/12/2025	03:32 - 04:02	48.89	16.22	14.27	14.31	8.62	N/A	8.82	46.08	42.60	40.08	-3.48
32	11/12/2025	04:32 - 05:02	44.41	16.81	14.80	14.95	8.77	N/A	8.52	42.61	43.63	36.89	1.02
33	11/12/2025	05:32 - 06:02	46.76	17.75	15.65	15.73	8.57	N/A	8.39	44.60	43.10	38.71	-1.50
34	11/12/2025	06:32 - 07:02	46.79	17.64	15.55	15.25	8.38	N/A	8.27	43.89	46.61	38.10	2.71
35	11/12/2025	08:32 - 09:02	39.00	18.16	16.02	15.66	8.43	N/A	8.36	36.96	43.25	31.77	6.28
36	11/12/2025	09:32 - 10:02	47.85	16.65	14.66	14.78	8.56	N/A	8.42	45.08	48.21	39.17	3.13
37	11/12/2025	10:32 - 11:02	47.72	17.26	15.21	14.84	8.48	N/A	8.43	44.95	47.52	39.06	2.57
38	11/12/2025	11:32 - 12:02	45.83	16.97	14.95	14.94	8.58	N/A	8.52	43.40	44.62	37.63	1.22
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SULPHUR DIOXIDE: QAL2 CALCULATIONS

(Page 5 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Variability Test Data (continued)

Pair	Date	Time (30-minute Average)	CAL CEM (STP, WET) mg/m ³	CEM Water Vapour % v/v	CAL	SRM Water Vapour % v/v	CAL	where CAL = Calibrated using QAL2 calibration functions					
					CEM Water Vapour % v/v		CEM Oxygen (DRY) % v/v		SRM Oxygen (DRY) % v/v	CAL CEM (STP, Dry, 11% O ₂) mg/m ³	SRM (STP, Dry, 11% O ₂) mg/m ³	UNCAL CEM (STP, Dry, 11% O ₂) mg/m ³	ys, SRM - CAL CEM
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										MAX	AVERAGE	AVERAGE	Sd
										47.75	42.18	36.50	2.95

Test of Variability

Q _o = ELV x (MU / 100) / 1.96	4.08
Kv for 38 Pairs of Data	0.9885
The variability is accepted if Sd ≤ Q _o x Kv.	

Parameter	Value
Standard Deviation (Sd)	2.95
Q _o x Kv	4.03
Outcome of Variability Test	Pass

Valid Calibration Range

Maximum CAL CEM Value (mg/m ³)	47.8
The Calibration Range can be extended by the greater of a) 10% of the Maximum CAL CEM Value or b) Up to 20% of the Daily ELV.	

a) Calibrated Range (10% extension) (mg/m ³)	0 to 52.5
b) Calibrated Range (20% of Daily ELV) (mg/m ³)	0 to 8.0

Greater of (a) or (b)	0 to 52.5
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Surrogate Extension Applied?	No
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Valid Calibration Range (at REF conditions)	0 to 52.5 mg/m ³
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Section 4A - Data and Calculations - QAL2

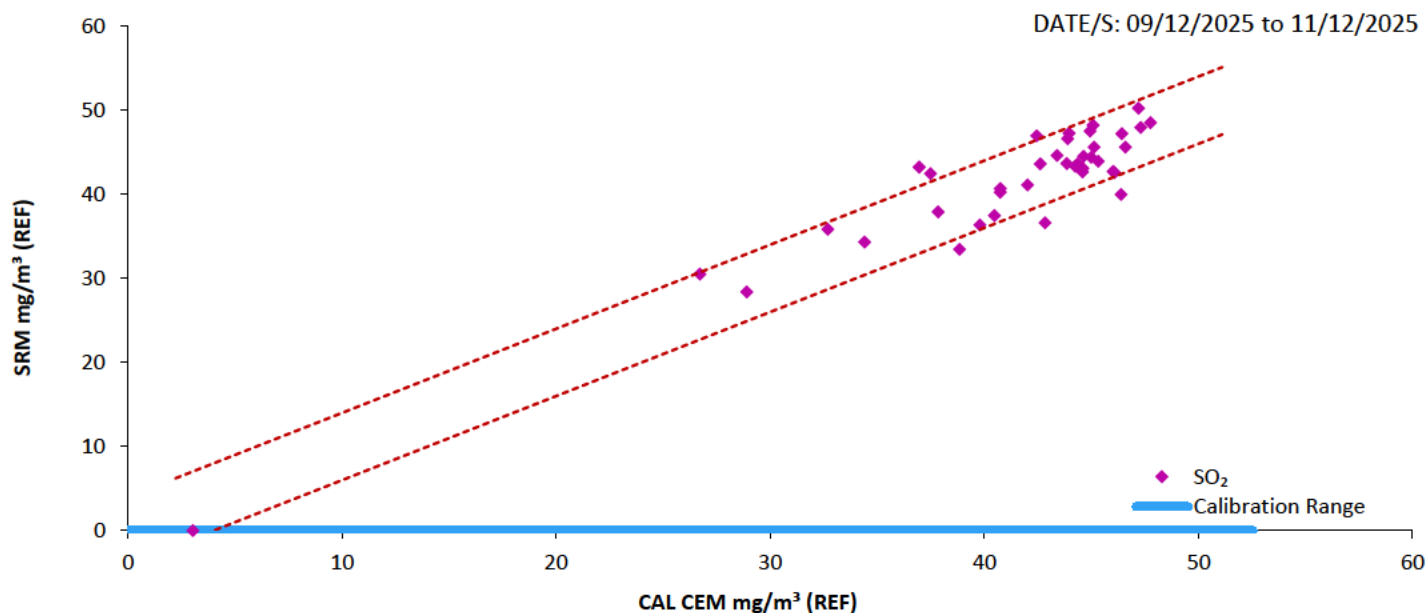
SULPHUR DIOXIDE: QAL2 CALCULATIONS

(Page 6 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

PLOT 3: X-Y Plot - REF CAL CEM vs REF SRM Values



Section 4A - Data and Calculations - QAL2

NITROUS OXIDE: QAL2 CALCULATIONS

(Page 1 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Calibration Data

Pair	Date	Time (30-minute Average)	x, CEM (STP, WET) mg/m ³	y, SRM (STP, WET) mg/m ³	SRM (STP, Dry, 11% O ₂) mg/m ³	x - x _{av} (A)	y - y _{av} (B)	(A) x (B)	(x - x _{av}) ²	CAL CEM (STP, WET) mg/m ³
L1	Surrogate	Near Zero	0.20	0.00	0.00	-7.54	-8.59	64.73	56.81	1.34
1	09/12/2025	16:32 - 17:02	9.88	11.95	11.42	2.14	3.36	7.19	4.57	10.64
2	09/12/2025	17:32 - 18:02	9.71	12.09	12.24	1.97	3.50	6.90	3.89	10.48
3	09/12/2025	18:32 - 19:02	19.04	18.71	18.99	11.30	10.12	114.42	127.75	19.46
4	09/12/2025	19:32 - 20:02	9.91	10.94	10.42	2.17	2.36	5.12	4.72	10.68
5	09/12/2025	22:32 - 23:02	4.70	5.53	5.26	-3.04	-3.06	9.30	9.22	5.67
6	10/12/2025	23:32 - 00:02	8.99	10.12	9.94	1.25	1.53	1.91	1.56	9.79
7	10/12/2025	00:32 - 01:02	7.68	9.72	9.39	-0.06	1.13	-0.06	0.00	8.53
8	10/12/2025	01:32 - 02:02	7.03	7.32	7.03	-0.71	-1.26	0.89	0.50	7.91
9	10/12/2025	02:32 - 03:02	10.24	12.61	12.64	2.50	4.02	10.07	6.27	11.00
10	10/12/2025	03:32 - 04:02	8.71	9.31	8.69	0.97	0.72	0.70	0.94	9.52
11	10/12/2025	05:32 - 06:02	8.82	9.56	9.03	1.08	0.97	1.05	1.17	9.63
12	10/12/2025	06:32 - 07:02	7.14	8.35	7.86	-0.59	-0.24	0.14	0.35	8.01
13	10/12/2025	08:32 - 09:02	12.96	12.38	11.66	5.22	3.79	19.79	27.23	13.61
14	10/12/2025	10:32 - 11:02	13.74	14.09	13.56	6.00	5.50	33.01	35.98	14.36
15	10/12/2025	11:32 - 12:02	9.36	9.09	8.38	1.62	0.50	0.82	2.63	10.15
16	10/12/2025	12:32 - 13:02	9.48	10.76	10.24	1.74	2.17	3.78	3.03	10.26
17	10/12/2025	13:32 - 14:02	5.99	8.35	8.16	-1.75	-0.23	0.41	3.05	6.91
18	10/12/2025	15:32 - 16:02	9.70	9.53	9.13	1.97	0.94	1.85	3.87	10.48
19	10/12/2025	16:32 - 17:02	9.80	12.21	11.91	2.06	3.62	7.47	4.26	10.57
20	10/12/2025	17:32 - 18:02	7.36	9.14	8.76	-0.38	0.55	-0.21	0.14	8.22
21	10/12/2025	18:32 - 19:02	7.41	7.54	7.05	-0.33	-1.05	0.34	0.11	8.27
22	10/12/2025	19:32 - 20:02	7.52	7.55	7.18	-0.22	-1.04	0.23	0.05	8.38
23	10/12/2025	20:32 - 21:02	6.91	9.62	9.34	-0.82	1.04	-0.85	0.68	7.80
24	10/12/2025	21:32 - 22:02	3.74	5.34	5.03	-4.00	-3.25	12.99	15.97	4.74
25	10/12/2025	22:32 - 23:02	9.28	9.75	9.41	1.55	1.16	1.80	2.39	10.08
26	11/12/2025	23:32 - 00:02	7.44	6.70	6.28	-0.29	-1.89	0.56	0.09	8.30
27	11/12/2025	00:32 - 01:02	3.71	5.65	5.25	-4.03	-2.93	11.82	16.23	4.71
28	11/12/2025	01:32 - 02:02	7.75	7.03	6.54	0.02	-1.56	-0.03	0.00	8.60
29	11/12/2025	02:32 - 03:02	5.61	7.56	7.13	-2.12	-1.02	2.17	4.51	6.54
30	11/12/2025	03:32 - 04:02	8.80	9.80	9.39	1.06	1.21	1.29	1.13	9.61
31	11/12/2025	04:32 - 05:02	5.60	5.67	5.34	-2.14	-2.92	6.24	4.57	6.53
32	11/12/2025	05:32 - 06:02	5.81	5.54	5.21	-1.92	-3.05	5.87	3.70	6.74
33	11/12/2025	06:32 - 07:02	4.03	5.29	4.91	-3.71	-3.29	12.22	13.76	5.02
34	11/12/2025	08:32 - 09:02	7.66	7.39	6.93	-0.07	-1.19	0.09	0.01	8.52
35	11/12/2025	09:32 - 10:02	4.67	4.34	4.05	-3.07	-4.24	13.02	9.40	5.64
36	11/12/2025	10:32 - 11:02	5.66	6.67	6.23	-2.08	-1.92	3.99	4.33	6.58
37	11/12/2025	11:32 - 12:02	4.80	6.00	5.65	-2.94	-2.59	7.60	8.63	5.76
38	11/12/2025	12:32 - 13:02	4.91	5.73	5.59	-2.83	-2.86	8.09	8.02	5.86
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Section 4A - Data and Calculations - QAL2
NITROUS OXIDE: QAL2 CALCULATIONS
(Page 2 of 6)

Thalia Waste Management, Knaresborough
A3- Line 2 - Duty

Calibration Data (continued)

Pair	Date	Time (30-minute Average)	x, CEM (STP, WET) mg/m ³	y, SRM (STP, WET) mg/m ³	SRM (STP, Dry, 11% O ₂) mg/m ³	x - x _{av} (A)	y - y _{av} (B)	(A) x (B)	(x - x _{av}) ²	CAL CEM (STP, WET) mg/m ³
64										
65										
66										
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			MAX SRM - MIN SRM		14.94			SUM	376.70	391.54
			(DAILY) DELV (mg/m ³)		20					
			95% CI MU (%)		20					
			95% CI at DELV (mg/m ³)		4.0					
			15% of ELV		3.0					
			PROCEDURE (A, B, C)		A					
								PROCEDURE A	If (MAX SRM - MIN SRM) > 95% CI at Daily ELV	
								PROCEDURE B	If (MAX SRM - MIN SRM) < 95% CI at Daily ELV and MIN SRM ≥ 15% of Daily ELV	
								PROCEDURE C	If (MAX SRM - MIN SRM) < 95% CI at Daily ELV and MIN SRM < 15% of Daily ELV	

Outliers Data

Pair	Date	Time (30-minute Average)	x, CEM (STP, WET) mg/m ³	y, SRM (STP, WET) mg/m ³	Reason for Data Pair Removal
					(Statistical Outliers removed following outlier test, other data removed prior to this test)
1	09/12/2025	20:32 - 21:02	6.87	7.04	Water - Statistical outlier
2	09/12/2025	21:32 - 22:02	16.12	21.64	Oxygen - Statistical outlier
3	10/12/2025	04:32 - 05:02	8.02	12.76	Water - Statistical outlier
4	10/12/2025	07:32 - 08:02	0.00	15.47	Instrument performing an auto-zero
5	10/12/2025	14:32 - 15:02	8.59	0.00	SRM offline/calibrating
6	11/12/2025	07:32 - 08:02	0.00	5.17	Instrument performing an auto-zero
7	09/12/2025	15:32 - 16:02	18.07	16.38	Statistical outlier
8	10/12/2025	09:32 - 10:02	3.72	7.20	Statistical outlier
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10					
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NITROUS OXIDE: QAL2 CALCULATIONS
(Page 3 of 6)

Thalia Waste Management, Knaresborough
A3- Line 2 - Duty

Derivation of Calibration Function

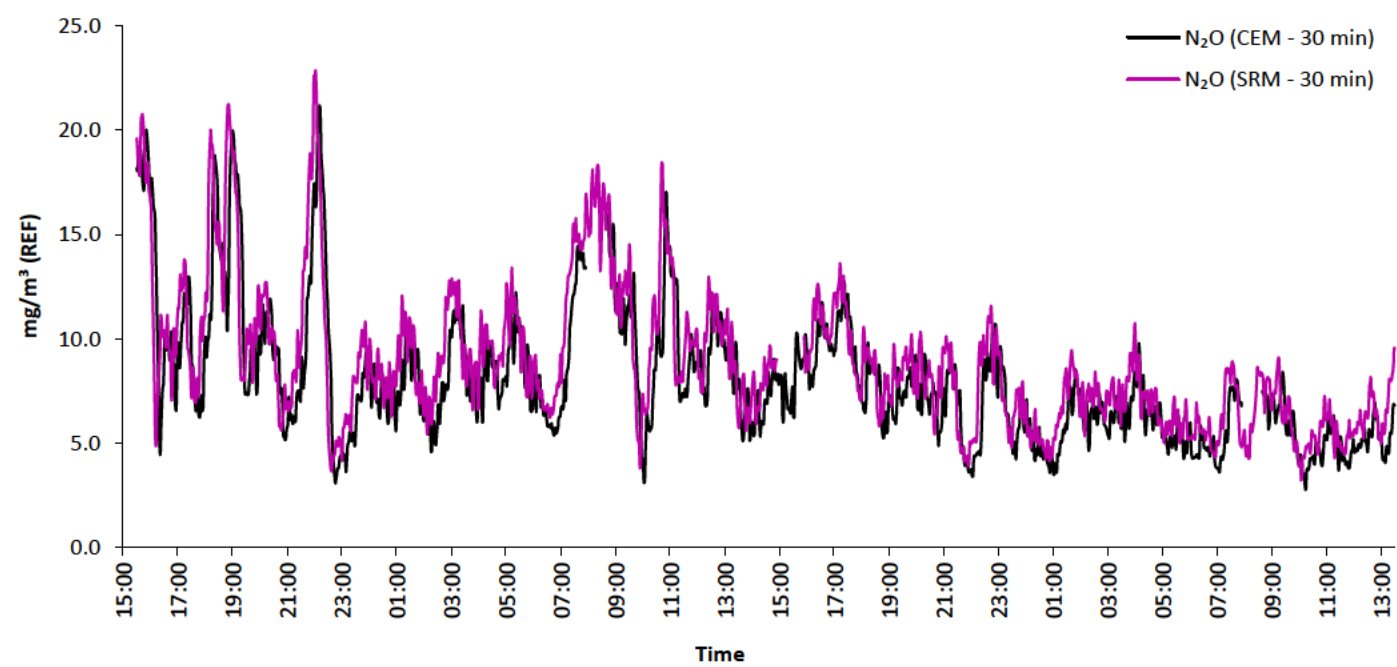
b =	0.9621	a =	1.1428	CALIBRATION FUNCTION =	y = 0.9621x + 1.1428
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where

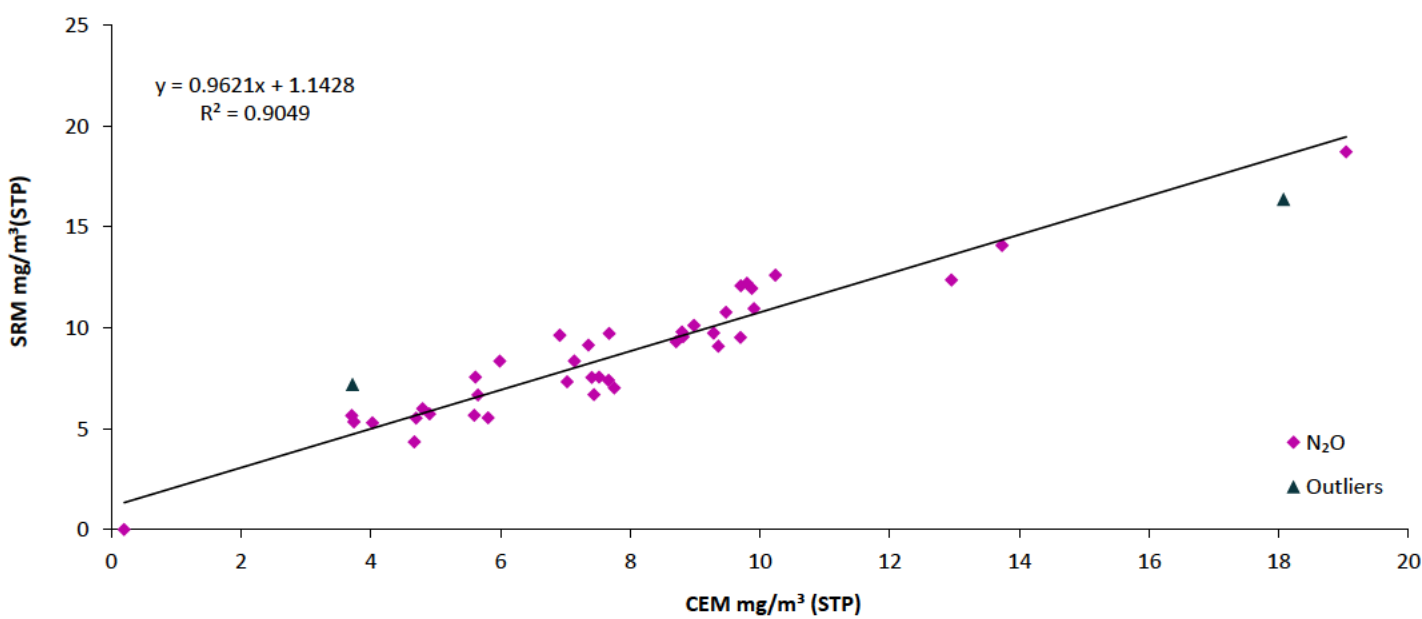
For Procedure A / C $b = [(x - x_{av}) \times (y - y_{av})] / (x - x_{av})^2$ and $a = \text{MEAN}(y) - [\text{MEAN}(x) \times b]$

Procedure B $b = \text{MEAN}(y) / [\text{MEAN}(x) - \text{OFFSET}]$ and $a = -b \times \text{OFFSET}$

PLOT 1: GRAPH FOR REFERENCE SRM vs REFERENCE CEM (STANDARDISED) (30 minute rolling averages)



PLOT 2: Calibration Graph for Procedure A



Section 4A - Data and Calculations - QAL2

NITROUS OXIDE: QAL2 CALCULATIONS
(Page 4 of 6)

Thalia Waste Management, Knaresborough
A3- Line 2 - Duty

Variability Test Data

					CAL		CAL	where CAL = Calibrated using QAL2 calibration functions					
Pair	Date	Time (30-minute Average)	CAL CEM (STP, WET) mg/m³	CEM Water Vapour % v/v	CEM Water Vapour % v/v	SRM Water Vapour % v/v	CEM Oxygen (DRY) % v/v		SRM Oxygen (DRY) % v/v	CAL CEM (STP, Dry, 11% O₂) mg/m³	SRM (STP, Dry, 11% O₂) mg/m³	UNCAL CEM (STP, Dry, 11% O₂) mg/m³	ys, SRM - CAL CEM
					N/A			N/A					
L1	Surrogate	Near Zero	1.34	N/A	N/A	N/A	N/A	N/A	N/A	1.34	0.00	0.20	-1.34
1	09/12/2025	16:32 - 17:02	10.64	17.37	15.30	14.86	8.34	N/A	8.71	9.92	11.42	9.21	1.50
2	09/12/2025	17:32 - 18:02	10.48	16.88	14.86	15.59	8.98	N/A	9.30	10.25	12.24	9.49	1.99
3	09/12/2025	18:32 - 19:02	19.46	17.97	15.85	16.13	9.51	N/A	9.25	20.12	18.99	19.68	-1.13
4	09/12/2025	19:32 - 20:02	10.68	17.58	15.50	15.57	8.48	N/A	8.56	10.10	10.42	9.37	0.32
5	09/12/2025	22:32 - 23:02	5.67	18.34	16.18	16.49	8.54	N/A	8.43	5.43	5.26	4.50	-0.16
6	10/12/2025	23:32 - 00:02	9.79	18.12	15.98	15.82	8.71	N/A	8.92	9.48	9.94	8.70	0.47
7	10/12/2025	00:32 - 01:02	8.53	16.95	14.93	14.76	8.82	N/A	8.86	8.23	9.39	7.41	1.16
8	10/12/2025	01:32 - 02:02	7.91	17.74	15.64	16.24	8.71	N/A	8.56	7.63	7.03	6.78	-0.60
9	10/12/2025	02:32 - 03:02	11.00	19.10	16.87	16.70	9.14	N/A	9.02	11.15	12.64	10.39	1.48
10	10/12/2025	03:32 - 04:02	9.52	17.97	15.85	15.89	8.26	N/A	8.26	8.88	8.69	8.13	-0.20
11	10/12/2025	05:32 - 06:02	9.63	15.61	13.72	13.30	8.66	N/A	8.79	9.04	9.03	8.28	-0.01
12	10/12/2025	06:32 - 07:02	8.01	15.79	13.88	13.57	8.71	N/A	8.71	7.57	7.86	6.75	0.29
13	10/12/2025	08:32 - 09:02	13.61	15.96	14.03	14.22	8.80	N/A	8.62	12.98	11.66	12.36	-1.32
14	10/12/2025	10:32 - 11:02	14.36	16.63	14.64	14.79	8.76	N/A	8.80	13.74	13.56	13.14	-0.18
15	10/12/2025	11:32 - 12:02	10.15	18.31	16.15	16.45	8.25	N/A	8.01	9.49	8.38	8.76	-1.12
16	10/12/2025	12:32 - 13:02	10.26	16.70	14.70	14.50	8.65	N/A	8.70	9.74	10.24	9.00	0.49
17	10/12/2025	13:32 - 14:02	6.91	17.85	15.74	15.43	8.48	N/A	8.90	6.55	8.16	5.68	1.61
18	10/12/2025	15:32 - 16:02	10.48	17.12	15.08	15.39	8.82	N/A	8.67	10.13	9.13	9.38	-1.00
19	10/12/2025	16:32 - 17:02	10.57	16.64	14.65	14.57	8.79	N/A	9.00	10.14	11.91	9.40	1.77
20	10/12/2025	17:32 - 18:02	8.22	18.11	15.97	15.41	8.42	N/A	8.67	7.78	8.76	6.97	0.98
21	10/12/2025	18:32 - 19:02	8.27	16.99	14.96	15.49	8.42	N/A	8.35	7.74	7.05	6.93	-0.69
22	10/12/2025	19:32 - 20:02	8.38	17.27	15.21	15.11	8.63	N/A	8.61	7.99	7.18	7.17	-0.81
23	10/12/2025	20:32 - 21:02	7.80	18.18	16.04	16.12	8.53	N/A	8.72	7.45	9.34	6.60	1.89
24	10/12/2025	21:32 - 22:02	4.74	16.40	14.43	14.15	8.51	N/A	8.63	4.44	5.03	3.50	0.59
25	10/12/2025	22:32 - 23:02	10.08	16.57	14.58	14.72	8.75	N/A	8.86	9.63	9.41	8.87	-0.22
26	11/12/2025	23:32 - 00:02	8.30	16.80	14.79	15.10	8.71	N/A	8.43	7.93	6.28	7.11	-1.65
27	11/12/2025	00:32 - 01:02	4.71	16.72	14.72	14.70	8.47	N/A	8.38	4.41	5.25	3.47	0.84
28	11/12/2025	01:32 - 02:02	8.60	18.15	16.01	16.03	8.39	N/A	8.21	8.12	6.54	7.32	-1.58
29	11/12/2025	02:32 - 03:02	6.54	17.28	15.22	14.98	8.56	N/A	8.52	6.21	7.13	5.33	0.92
30	11/12/2025	03:32 - 04:02	9.61	16.22	14.27	14.31	8.62	N/A	8.82	9.06	9.39	8.30	0.33
31	11/12/2025	04:32 - 05:02	6.53	16.81	14.80	14.95	8.77	N/A	8.52	6.26	5.34	5.37	-0.92
32	11/12/2025	05:32 - 06:02	6.74	17.75	15.65	15.73	8.57	N/A	8.39	6.42	5.21	5.54	-1.21
33	11/12/2025	06:32 - 07:02	5.02	17.64	15.55	15.25	8.38	N/A	8.27	4.71	4.91	3.78	0.20
34	11/12/2025	08:32 - 09:02	8.52	18.16	16.02	15.66	8.43	N/A	8.36	8.07	6.93	7.26	-1.14
35	11/12/2025	09:32 - 10:02	5.64	16.65	14.66	14.78	8.56	N/A	8.42	5.31	4.05	4.40	-1.26
36	11/12/2025	10:32 - 11:02	6.58	17.26	15.21	14.84	8.48	N/A	8.43	6.20	6.23	5.33	0.03
37	11/12/2025	11:32 - 12:02	5.76	16.97	14.95	14.94	8.58	N/A	8.52	5.46	5.65	4.55	0.19
38	11/12/2025	12:32 - 13:02	5.86	19.91	17.60	18.14	8.63	N/A	8.49	5.75	5.59	4.81	-0.16
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NITROUS OXIDE: QAL2 CALCULATIONS

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Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Variability Test Data (continued)

Pair	Date	Time (30-minute Average)	CAL CEM (STP, WET) mg/m ³	CEM Water Vapour % v/v	CAL	SRM Water Vapour % v/v	CAL	where CAL = Calibrated using QAL2 calibration functions					
					CEM Water Vapour % v/v		CEM Oxygen (DRY) % v/v		SRM Oxygen (DRY) % v/v	CAL CEM (STP, Dry, 11% O ₂) mg/m ³	SRM (STP, Dry, 11% O ₂) mg/m ³	UNCAL CEM (STP, Dry, 11% O ₂) mg/m ³	ys, SRM - CAL CEM
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89													
90													
										MAX	AVERAGE	AVERAGE	Sd
										20.12	8.45	7.61	1.04

Test of Variability

Q _o = ELV x (MU / 100) / 1.96	2.04
Kv for 38 Pairs of Data	0.9885
The variability is accepted if Sd ≤ Q _o x Kv.	

Parameter	Value
Standard Deviation (Sd)	1.04
Q _o x Kv	2.02
Outcome of Variability Test	Pass

Valid Calibration Range

Maximum CAL CEM Value (mg/m ³)	20.1
The Calibration Range can be extended by the greater of a) 10% of the Maximum CAL CEM Value or b) Up to 20% of the Daily ELV.	

a) Calibrated Range (10% extension) (mg/m ³)	0 to 22.1
b) Calibrated Range (20% of Daily ELV) (mg/m ³)	0 to 4.0

Greater of (a) or (b)	0 to 22.1
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Surrogate Extension Applied?	No
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Valid Calibration Range (at REF conditions)	0 to 22.1 mg/m ³
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Section 4A - Data and Calculations - QAL2

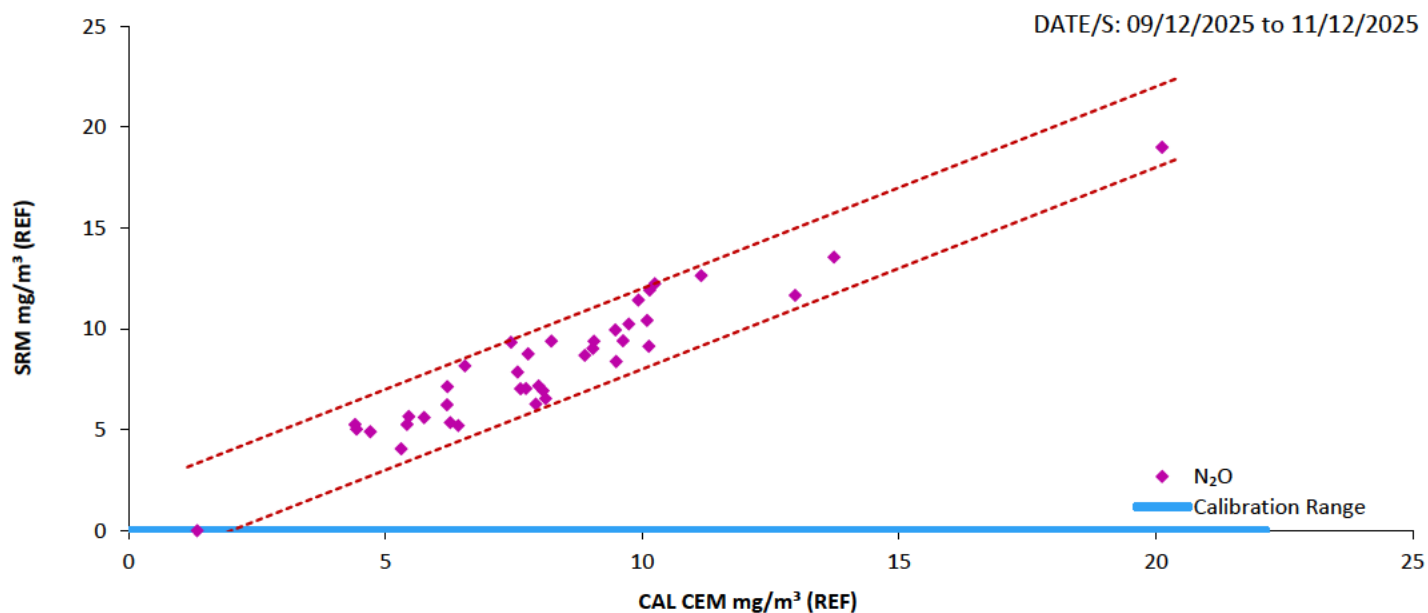
NITROUS OXIDE: QAL2 CALCULATIONS

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Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

PLOT 3: X-Y Plot - REF CAL CEM vs REF SRM Values



Section 4A - Data and Calculations - QAL2

CARBON MONOXIDE: QAL2 CALCULATIONS

(Page 1 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Calibration Data

Pair	Date	Time (30-minute Average)	x, CEM (STP, WET) mg/m ³	y, SRM (STP, WET) mg/m ³	SRM (STP, Dry, 11% O ₂) mg/m ³	x - x _{av} (A)	y - y _{av} (B)	(A) x (B)	(x - x _{av}) ²	CAL CEM (STP, WET) mg/m ³
L1	Surrogate	Near Zero	0.30	0.00	0.00	-7.05	-3.55	25.05	49.70	-3.55
1	09/12/2025	15:32 - 16:02	8.80	4.20	3.99	1.45	0.65	0.94	2.11	5.02
2	09/12/2025	16:32 - 17:02	6.58	2.29	2.18	-0.77	-1.27	0.98	0.59	2.78
3	09/12/2025	17:32 - 18:02	5.68	1.31	1.32	-1.67	-2.25	3.74	2.77	1.88
4	09/12/2025	18:32 - 19:02	9.15	4.72	4.79	1.80	1.17	2.10	3.24	5.37
5	09/12/2025	19:32 - 20:02	6.61	1.95	1.86	-0.74	-1.60	1.19	0.55	2.81
6	09/12/2025	22:32 - 23:02	6.66	2.30	2.19	-0.69	-1.25	0.87	0.48	2.86
7	10/12/2025	23:32 - 00:02	6.08	2.04	2.00	-1.27	-1.52	1.92	1.61	2.28
8	10/12/2025	00:32 - 01:02	5.65	1.14	1.10	-1.70	-2.41	4.09	2.88	1.84
9	10/12/2025	02:32 - 03:02	4.60	0.80	0.80	-2.74	-2.75	7.55	7.53	0.79
10	10/12/2025	03:32 - 04:02	5.04	1.92	1.79	-2.31	-1.64	3.78	5.32	1.23
11	10/12/2025	05:32 - 06:02	5.61	2.20	2.08	-1.74	-1.35	2.35	3.03	1.80
12	10/12/2025	08:32 - 09:02	6.48	2.15	2.02	-0.87	-1.41	1.22	0.75	2.68
13	10/12/2025	09:32 - 10:02	5.10	1.81	1.71	-2.25	-1.75	3.93	5.07	1.29
14	10/12/2025	10:32 - 11:02	58.70	55.79	53.68	51.36	52.24	2682.69	2637.56	55.28
15	10/12/2025	11:32 - 12:02	6.08	2.04	1.88	-1.27	-1.51	1.91	1.60	2.28
16	10/12/2025	12:32 - 13:02	5.98	3.01	2.86	-1.36	-0.55	0.74	1.86	2.18
17	10/12/2025	13:32 - 14:02	6.46	2.42	2.36	-0.89	-1.14	1.01	0.79	2.66
18	10/12/2025	15:32 - 16:02	5.86	1.78	1.70	-1.49	-1.78	2.65	2.22	2.05
19	10/12/2025	16:32 - 17:02	5.66	2.09	2.04	-1.69	-1.46	2.47	2.84	1.86
20	10/12/2025	17:32 - 18:02	5.15	1.17	1.12	-2.20	-2.38	5.24	4.84	1.34
21	10/12/2025	18:32 - 19:02	5.70	1.59	1.49	-1.65	-1.96	3.23	2.71	1.89
22	10/12/2025	19:32 - 20:02	6.34	2.07	1.96	-1.01	-1.49	1.50	1.02	2.54
23	10/12/2025	20:32 - 21:02	5.51	1.79	1.74	-1.83	-1.76	3.23	3.36	1.71
24	10/12/2025	21:32 - 22:02	4.83	0.99	0.93	-2.52	-2.56	6.45	6.34	1.02
25	10/12/2025	22:32 - 23:02	6.56	2.71	2.62	-0.79	-0.84	0.67	0.63	2.76
26	11/12/2025	23:32 - 00:02	6.09	2.34	2.19	-1.26	-1.22	1.53	1.59	2.28
27	11/12/2025	00:32 - 01:02	5.35	1.69	1.57	-2.00	-1.86	3.72	4.00	1.54
28	11/12/2025	01:32 - 02:02	6.90	3.17	2.95	-0.45	-0.39	0.17	0.20	3.10
29	11/12/2025	02:32 - 03:02	5.84	2.38	2.25	-1.51	-1.17	1.76	2.28	2.03
30	11/12/2025	03:32 - 04:02	7.56	4.19	4.02	0.22	0.64	0.14	0.05	3.77
31	11/12/2025	04:32 - 05:02	6.98	3.30	3.11	-0.37	-0.25	0.09	0.14	3.18
32	11/12/2025	05:32 - 06:02	5.52	2.07	1.94	-1.82	-1.49	2.71	3.33	1.72
33	11/12/2025	06:32 - 07:02	6.30	2.91	2.70	-1.05	-0.64	0.67	1.11	2.49
34	11/12/2025	08:32 - 09:02	6.72	2.92	2.74	-0.62	-0.63	0.39	0.39	2.93
35	11/12/2025	09:32 - 10:02	6.17	1.59	1.49	-1.18	-1.96	2.30	1.38	2.37
36	11/12/2025	10:32 - 11:02	6.58	2.50	2.34	-0.77	-1.05	0.80	0.59	2.78
37	11/12/2025	11:32 - 12:02	6.10	1.80	1.69	-1.24	-1.75	2.18	1.55	2.30
38	11/12/2025	12:32 - 13:02	5.27	1.44	1.40	-2.08	-2.11	4.39	4.32	1.46
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Section 4A - Data and Calculations - QAL2

CARBON MONOXIDE: QAL2 CALCULATIONS

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Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Calibration Data (continued)

Pair	Date	Time (30-minute Average)	x, CEM (STP, WET) mg/m ³	y, SRM (STP, WET) mg/m ³	SRM (STP, Dry, 11% O ₂) mg/m ³	x - x _{av} (A)	y - y _{av} (B)	(A) x (B)	(x - x _{av}) ²	CAL CEM (STP, WET) mg/m ³
64										
65										
66										
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90										
			MAX SRM - MIN SRM		52.87			SUM	2792.37	2772.30
			(DAILY) DELV (mg/m ³)		50					
			95% CI MU (%)		20					
			95% CI at DELV (mg/m ³)		10.0					
			15% of ELV		7.5					
			PROCEDURE (A, B, C)		A					
								PROCEDURE A	If (MAX SRM - MIN SRM) > 95% CI at Daily ELV	
								PROCEDURE B	If (MAX SRM - MIN SRM) < 95% CI at Daily ELV and MIN SRM ≥ 15% of Daily ELV	
								PROCEDURE C	If (MAX SRM - MIN SRM) < 95% CI at Daily ELV and MIN SRM < 15% of Daily ELV	

Outliers Data

Pair	Date	Time (30-minute Average)	x, CEM (STP, WET) mg/m ³	y, SRM (STP, WET) mg/m ³	Reason for Data Pair Removal
					(Statistical Outliers removed following outlier test, other data removed prior to this test)
1	09/12/2025	20:32 - 21:02	5.52	1.33	Water - Statistical outlier
2	09/12/2025	21:32 - 22:02	7.74	5.32	Oxygen - Statistical outlier
3	10/12/2025	04:32 - 05:02	5.40	2.56	Water - Statistical outlier
4	10/12/2025	07:32 - 08:02	0.00	6.35	Instrument performing an auto-zero
5	10/12/2025	14:32 - 15:02	7.94	0.00	SRM offline/calibrating
6	11/12/2025	07:32 - 08:02	0.00	1.85	Instrument performing an auto-zero
7	10/12/2025	01:32 - 02:02	6.81	1.75	Statistical outlier
8	10/12/2025	06:32 - 07:02	7.06	1.50	Statistical outlier
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Section 4A - Data and Calculations - QAL2

CARBON MONOXIDE: QAL2 CALCULATIONS

(Page 3 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Derivation of Calibration Function

b =	1.0072	a =	-3.8478
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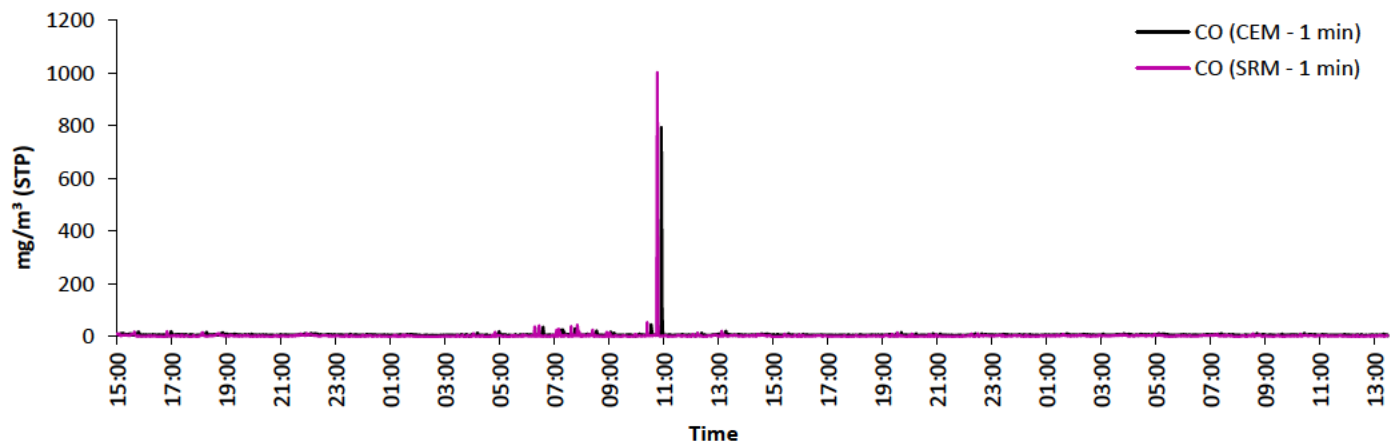
CALIBRATION FUNCTION =	$y = 1.0072x - 3.8478$
------------------------	------------------------

where

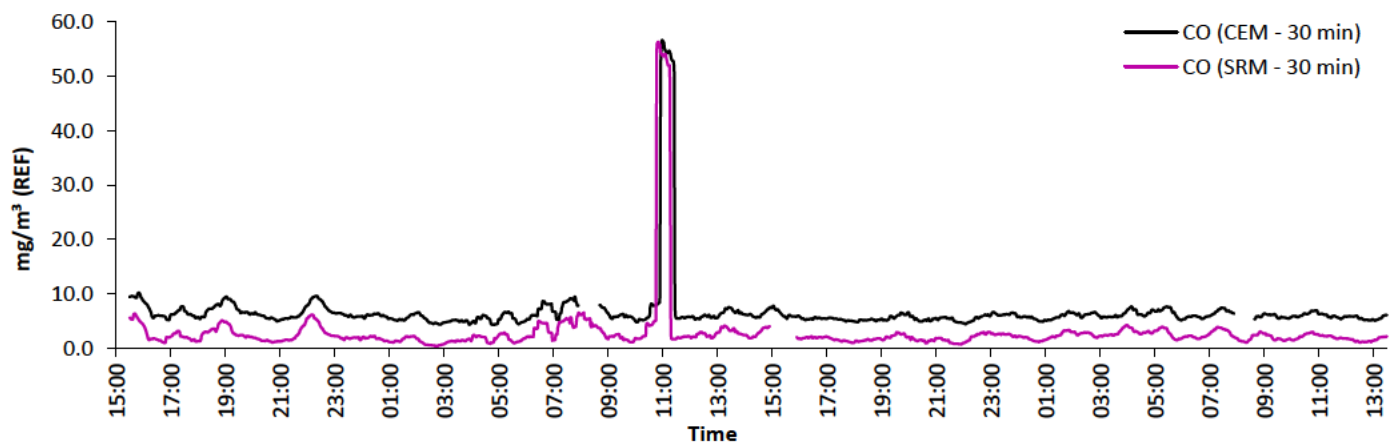
For Procedure A / C $b = [(x - x_{av}) \times (y - y_{av})] / (x - x_{av})^2$ and $a = \text{MEAN}(y) - [\text{MEAN}(x) \times b]$

Procedure B $b = \text{MEAN}(y) / [\text{MEAN}(x) - \text{OFFSET}]$ and $a = -b \times \text{OFFSET}$

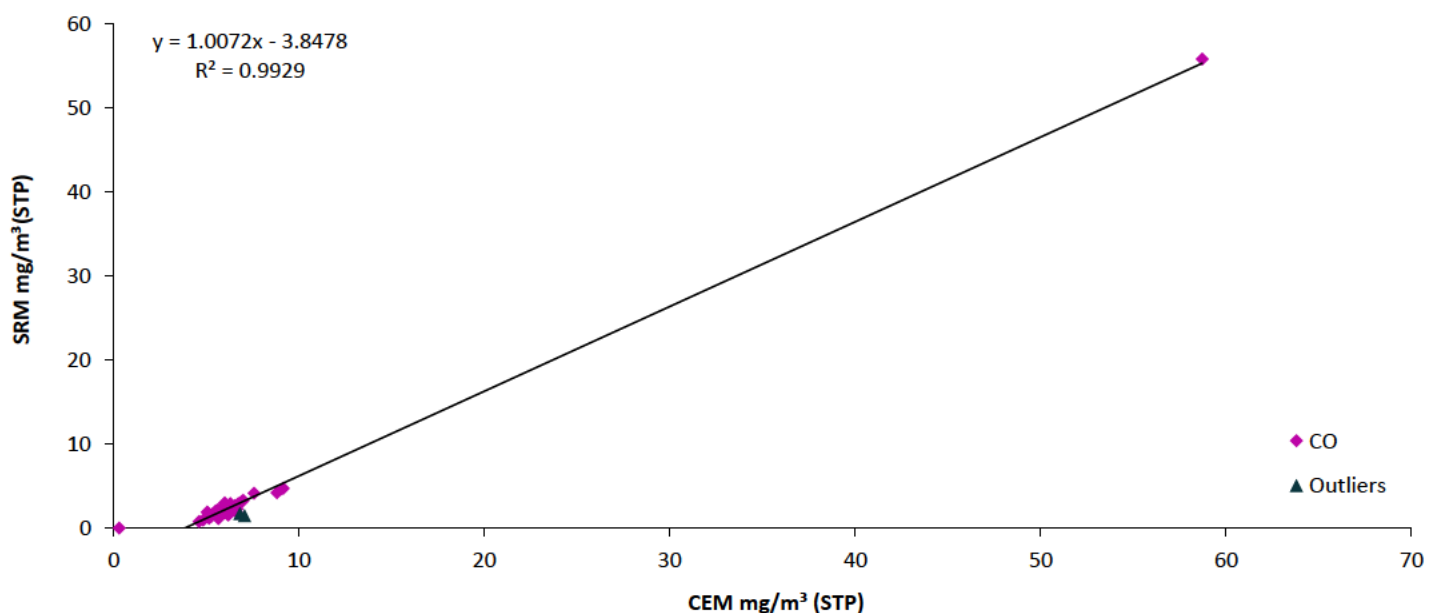
PLOT 1a: GRAPH FOR STP SRM vs STP CEMS (NON-STANDARDISED) (1 minute readings)



PLOT 1: GRAPH FOR REFERENCE SRM vs REFERENCE CEM (STANDARDISED) (30 minute rolling averages)



PLOT 2: Calibration Graph for Procedure A



Section 4A - Data and Calculations - QAL2

CARBON MONOXIDE: QAL2 CALCULATIONS
(Page 4 of 6)

Thalia Waste Management, Knaresborough
A3- Line 2 - Duty

Variability Test Data

Pair	Date	Time (30-minute Average)	CAL CEM (STP, WET) mg/m ³	CEM Water Vapour % v/v	CAL	SRM Water Vapour % v/v	CAL		where CAL = Calibrated using QAL2 calibration functions				
					CEM Water Vapour % v/v		CEM Oxygen (DRY) % v/v		SRM Oxygen (DRY) % v/v	CAL CEM (STP, Dry, 11% O ₂) mg/m ³	SRM (STP, Dry, 11% O ₂) mg/m ³	UNCAL CEM (STP, Dry, 11% O ₂) mg/m ³	ys, SRM - CAL CEM
					N/A			N/A					
L1	Surrogate	Near Zero	-3.55	N/A	N/A	N/A	N/A	N/A	N/A	-3.55	0.00	0.30	3.55
1	09/12/2025	15:32 - 16:02	5.02	19.34	17.08	16.78	8.50	N/A	8.37	4.84	3.99	8.49	-0.84
2	09/12/2025	16:32 - 17:02	2.78	17.37	15.30	14.86	8.34	N/A	8.71	2.59	2.18	6.13	-0.40
3	09/12/2025	17:32 - 18:02	1.88	16.88	14.86	15.59	8.98	N/A	9.30	1.83	1.32	5.55	-0.51
4	09/12/2025	18:32 - 19:02	5.37	17.97	15.85	16.13	9.51	N/A	9.25	5.55	4.79	9.46	-0.76
5	09/12/2025	19:32 - 20:02	2.81	17.58	15.50	15.57	8.48	N/A	8.56	2.65	1.86	6.25	-0.80
6	09/12/2025	22:32 - 23:02	2.86	18.34	16.18	16.49	8.54	N/A	8.43	2.73	2.19	6.37	-0.54
7	10/12/2025	23:32 - 00:02	2.28	18.12	15.98	15.82	8.71	N/A	8.92	2.20	2.00	5.89	-0.20
8	10/12/2025	00:32 - 01:02	1.84	16.95	14.93	14.76	8.82	N/A	8.86	1.78	1.10	5.45	-0.67
9	10/12/2025	02:32 - 03:02	0.79	19.10	16.87	16.70	9.14	N/A	9.02	0.80	0.80	4.67	0.00
10	10/12/2025	03:32 - 04:02	1.23	17.97	15.85	15.89	8.26	N/A	8.26	1.15	1.79	4.70	0.64
11	10/12/2025	05:32 - 06:02	1.80	15.61	13.72	13.30	8.66	N/A	8.79	1.69	2.08	5.26	0.39
12	10/12/2025	08:32 - 09:02	2.68	15.96	14.03	14.22	8.80	N/A	8.62	2.56	2.02	6.18	-0.54
13	10/12/2025	09:32 - 10:02	1.29	19.93	17.62	17.07	8.02	N/A	8.29	1.20	1.71	4.76	0.51
14	10/12/2025	10:32 - 11:02	55.28	16.63	14.64	14.79	8.76	N/A	8.80	52.89	53.68	56.17	0.79
15	10/12/2025	11:32 - 12:02	2.28	18.31	16.15	16.45	8.25	N/A	8.01	2.13	1.88	5.69	-0.25
16	10/12/2025	12:32 - 13:02	2.18	16.70	14.70	14.50	8.65	N/A	8.70	2.07	2.86	5.68	0.79
17	10/12/2025	13:32 - 14:02	2.66	17.85	15.74	15.43	8.48	N/A	8.90	2.52	2.36	6.12	-0.16
18	10/12/2025	15:32 - 16:02	2.05	17.12	15.08	15.39	8.82	N/A	8.67	1.98	1.70	5.66	-0.28
19	10/12/2025	16:32 - 17:02	1.86	16.64	14.65	14.57	8.79	N/A	9.00	1.78	2.04	5.43	0.26
20	10/12/2025	17:32 - 18:02	1.34	18.11	15.97	15.41	8.42	N/A	8.67	1.27	1.12	4.87	-0.14
21	10/12/2025	18:32 - 19:02	1.89	16.99	14.96	15.49	8.42	N/A	8.35	1.77	1.49	5.33	-0.28
22	10/12/2025	19:32 - 20:02	2.54	17.27	15.21	15.11	8.63	N/A	8.61	2.42	1.96	6.05	-0.46
23	10/12/2025	20:32 - 21:02	1.71	18.18	16.04	16.12	8.53	N/A	8.72	1.63	1.74	5.27	0.11
24	10/12/2025	21:32 - 22:02	1.02	16.40	14.43	14.15	8.51	N/A	8.63	0.95	0.93	4.52	-0.02
25	10/12/2025	22:32 - 23:02	2.76	16.57	14.58	14.72	8.75	N/A	8.86	2.63	2.62	6.27	-0.02
26	11/12/2025	23:32 - 00:02	2.28	16.80	14.79	15.10	8.71	N/A	8.43	2.18	2.19	5.81	0.01
27	11/12/2025	00:32 - 01:02	1.54	16.72	14.72	14.70	8.47	N/A	8.38	1.44	1.57	5.01	0.13
28	11/12/2025	01:32 - 02:02	3.10	18.15	16.01	16.03	8.39	N/A	8.21	2.93	2.95	6.52	0.02
29	11/12/2025	02:32 - 03:02	2.03	17.28	15.22	14.98	8.56	N/A	8.52	1.93	2.25	5.54	0.32
30	11/12/2025	03:32 - 04:02	3.77	16.22	14.27	14.31	8.62	N/A	8.82	3.55	4.02	7.13	0.46
31	11/12/2025	04:32 - 05:02	3.18	16.81	14.80	14.95	8.77	N/A	8.52	3.05	3.11	6.70	0.06
32	11/12/2025	05:32 - 06:02	1.72	17.75	15.65	15.73	8.57	N/A	8.39	1.64	1.94	5.27	0.31
33	11/12/2025	06:32 - 07:02	2.49	17.64	15.55	15.25	8.38	N/A	8.27	2.34	2.70	5.91	0.36
34	11/12/2025	08:32 - 09:02	2.93	18.16	16.02	15.66	8.43	N/A	8.36	2.77	2.74	6.37	-0.03
35	11/12/2025	09:32 - 10:02	2.37	16.65	14.66	14.78	8.56	N/A	8.42	2.23	1.49	5.81	-0.75
36	11/12/2025	10:32 - 11:02	2.78	17.26	15.21	14.84	8.48	N/A	8.43	2.62	2.34	6.20	-0.28
37	11/12/2025	11:32 - 12:02	2.30	16.97	14.95	14.94	8.58	N/A	8.52	2.18	1.69	5.78	-0.48
38	11/12/2025	12:32 - 13:02	1.46	19.91	17.60	18.14	8.63	N/A	8.49	1.43	1.40	5.17	-0.03
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CARBON MONOXIDE: QAL2 CALCULATIONS

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Thalia Waste Management, Knaresborough
A3- Line 2 - Duty

Variability Test Data (continued)

Pair	Date	Time (30-minute Average)	CAL CEM (STP, WET) mg/m ³	CEM Water Vapour % v/v	CAL	SRM Water Vapour % v/v	CAL		SRM Oxygen (DRY) % v/v	where CAL = Calibrated using QAL2 calibration functions			
					CEM Water Vapour % v/v		CEM Oxygen (DRY) % v/v			CAL CEM (STP, Dry, 11% O ₂) mg/m ³	SRM (STP, Dry, 11% O ₂) mg/m ³	UNCAL CEM (STP, Dry, 11% O ₂) mg/m ³	ys, SRM - CAL CEM
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										MAX	AVERAGE	AVERAGE	Sd
										52.89	3.49	7.20	0.44

Test of Variability

Q _o = ELV x (MU / 100) / 1.96	5.10
Kv for 38 Pairs of Data	0.9885
The variability is accepted if Sd ≤ Q _o x Kv.	

Parameter	Value
Standard Deviation (Sd)	0.44
Q _o x Kv	5.04
Outcome of Variability Test	Pass

Valid Calibration Range

Maximum CAL CEM Value (mg/m ³)	52.9
The Calibration Range can be extended by the greater of a) 10% of the Maximum CAL CEM Value or b) Up to 20% of the Daily ELV.	

a) Calibrated Range (10% extension) (mg/m ³)	0 to 58.2
b) Calibrated Range (20% of Daily ELV) (mg/m ³)	0 to 10.0

Greater of (a) or (b)	0 to 58.2
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Surrogate Extension Applied?	No
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Valid Calibration Range (at REF conditions)	0 to 58.2 mg/m ³
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Section 4A - Data and Calculations - QAL2

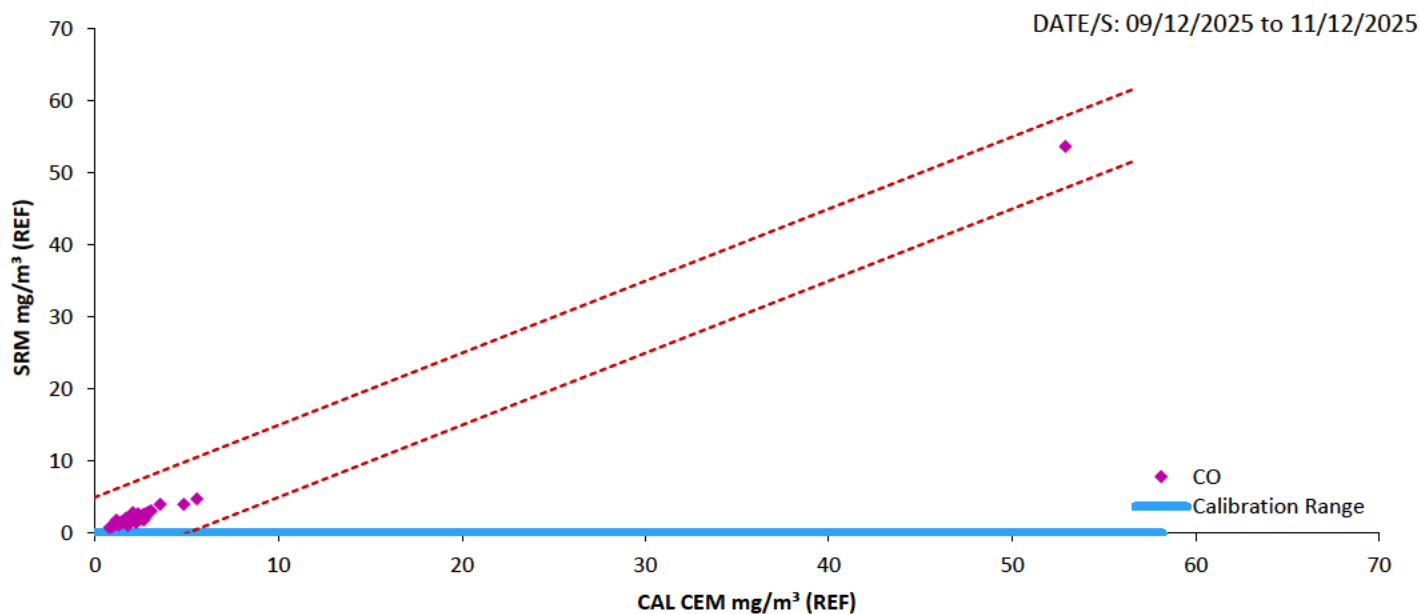
CARBON MONOXIDE: QAL2 CALCULATIONS

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Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

PLOT 3: X-Y Plot - REF CAL CEM vs REF SRM Values



Section 4A - Data and Calculations - QAL2

HYDROGEN CHLORIDE: QAL2 CALCULATIONS

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Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Calibration Data

Pair	Date	Time (30-minute Average)	x, CEM (STP, WET) mg/m ³	y, SRM (STP, WET) mg/m ³	SRM (STP, Dry, 11% O ₂) mg/m ³	x - x _{av} (A)	y - y _{av} (B)	(A) x (B)	(x - x _{av}) ²	CAL CEM (STP, WET) mg/m ³
L1	Surrogate	Near Zero	0.44	0.00	0.00	-3.31	-1.87	6.19	10.97	0.00
1	09/12/2025	15:32 - 16:02	3.89	1.28	1.21	0.14	-0.59	-0.08	0.02	1.95
2	09/12/2025	17:32 - 18:02	4.20	1.48	1.50	0.45	-0.38	-0.17	0.21	2.13
3	09/12/2025	18:32 - 19:02	4.19	1.42	1.44	0.44	-0.45	-0.20	0.20	2.12
4	09/12/2025	19:32 - 20:02	4.31	1.75	1.67	0.56	-0.12	-0.07	0.31	2.18
5	09/12/2025	22:32 - 23:02	4.35	2.21	2.10	0.60	0.34	0.20	0.36	2.21
6	10/12/2025	23:32 - 00:02	4.46	1.93	1.90	0.71	0.06	0.04	0.51	2.27
7	10/12/2025	00:32 - 01:02	4.73	1.72	1.66	0.98	-0.15	-0.14	0.95	2.42
8	10/12/2025	01:32 - 02:02	4.37	2.21	2.12	0.62	0.34	0.21	0.39	2.22
9	10/12/2025	02:32 - 03:02	4.87	2.20	2.21	1.12	0.33	0.37	1.26	2.50
10	10/12/2025	03:32 - 04:02	3.68	1.90	1.77	-0.07	0.03	0.00	0.00	1.83
11	10/12/2025	05:32 - 06:02	3.95	1.67	1.57	0.20	-0.20	-0.04	0.04	1.98
12	10/12/2025	06:32 - 07:02	3.73	1.62	1.53	-0.02	-0.25	0.00	0.00	1.86
13	10/12/2025	08:32 - 09:02	3.08	1.71	1.61	-0.67	-0.16	0.11	0.45	1.49
14	10/12/2025	09:32 - 10:02	3.38	2.16	2.05	-0.37	0.29	-0.11	0.14	1.66
15	10/12/2025	10:32 - 11:02	3.40	1.66	1.60	-0.35	-0.21	0.07	0.12	1.67
16	10/12/2025	11:32 - 12:02	3.20	1.99	1.84	-0.55	0.12	-0.07	0.30	1.56
17	10/12/2025	12:32 - 13:02	3.62	1.79	1.70	-0.13	-0.08	0.01	0.02	1.79
18	10/12/2025	13:32 - 14:02	3.63	1.76	1.72	-0.12	-0.11	0.01	0.01	1.80
19	10/12/2025	15:32 - 16:02	4.08	1.85	1.77	0.33	-0.02	-0.01	0.11	2.05
20	10/12/2025	16:32 - 17:02	4.13	1.96	1.91	0.38	0.09	0.03	0.14	2.08
21	10/12/2025	17:32 - 18:02	4.20	2.85	2.74	0.45	0.98	0.44	0.20	2.12
22	10/12/2025	18:32 - 19:02	4.07	2.32	2.17	0.32	0.45	0.14	0.10	2.05
23	10/12/2025	19:32 - 20:02	4.24	2.26	2.15	0.49	0.39	0.19	0.24	2.15
24	10/12/2025	20:32 - 21:02	3.85	2.18	2.12	0.10	0.31	0.03	0.01	1.93
25	10/12/2025	21:32 - 22:02	3.17	1.78	1.68	-0.58	-0.09	0.05	0.34	1.54
26	10/12/2025	22:32 - 23:02	3.10	1.75	1.69	-0.65	-0.12	0.08	0.42	1.50
27	11/12/2025	23:32 - 00:02	3.20	1.96	1.84	-0.55	0.09	-0.05	0.30	1.56
28	11/12/2025	00:32 - 01:02	3.46	2.02	1.88	-0.29	0.15	-0.04	0.08	1.71
29	11/12/2025	02:32 - 03:02	3.65	2.05	1.93	-0.10	0.18	-0.02	0.01	1.81
30	11/12/2025	03:32 - 04:02	3.38	1.98	1.90	-0.37	0.11	-0.04	0.14	1.66
31	11/12/2025	04:32 - 05:02	3.61	1.92	1.81	-0.14	0.05	-0.01	0.02	1.79
32	11/12/2025	05:32 - 06:02	3.69	2.19	2.06	-0.06	0.32	-0.02	0.00	1.84
33	11/12/2025	06:32 - 07:02	3.75	2.18	2.02	0.00	0.31	0.00	0.00	1.87
34	11/12/2025	08:32 - 09:02	3.75	1.89	1.78	0.00	0.03	0.00	0.00	1.87
35	11/12/2025	09:32 - 10:02	3.75	1.90	1.77	0.00	0.03	0.00	0.00	1.87
36	11/12/2025	10:32 - 11:02	3.81	1.73	1.61	0.06	-0.14	-0.01	0.00	1.91
37	11/12/2025	11:32 - 12:02	3.84	1.77	1.67	0.09	-0.10	-0.01	0.01	1.92
38	11/12/2025	12:32 - 13:02	4.04	1.88	1.83	0.29	0.01	0.00	0.08	2.03
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Section 4A - Data and Calculations - QAL2

HYDROGEN CHLORIDE: QAL2 CALCULATIONS
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Thalia Waste Management, Knaresborough
A3- Line 2 - Duty

Calibration Data (continued)

Pair	Date	Time (30-minute Average)	x, CEM (STP, WET) mg/m³	y, SRM (STP, WET) mg/m³	SRM (STP, Dry, 11% O₂) mg/m³	$x - x_{av}$ (A)	$y - y_{av}$ (B)	(A) x (B)	$(x - x_{av})^2$	CAL CEM (STP, WET) mg/m³
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69										
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71										
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90										
			MAX SRM - MIN SRM		1.52			SUM	7.12	18.47
			(DAILY) DELV (mg/m³)		8					
			95% CI MU (%)		40					
			95% CI at DELV (mg/m³)		3.2					
			15% of ELV		1.2					
			PROCEDURE (A, B, C)		B					
						WHERE OFFSET = 0.438				
						PROCEDURE A		If (MAX SRM - MIN SRM) > 95% CI at Daily ELV		
						PROCEDURE B		If (MAX SRM - MIN SRM) < 95% CI at Daily ELV and MIN SRM ≥ 15% of Daily ELV		
						PROCEDURE C		If (MAX SRM - MIN SRM) < 95% CI at Daily ELV and MIN SRM < 15% of Daily ELV		

Outliers Data

Pair	Date	Time (30-minute Average)	x, CEM (STP, WET) mg/m ³	y, SRM (STP, WET) mg/m ³	Reason for Data Pair Removal
					(Statistical Outliers removed following outlier test, other data removed prior to this test)
1	09/12/2025	20:32 - 21:02	4.26	2.22	Water - Statistical outlier
2	09/12/2025	21:32 - 22:02	3.94	1.47	Oxygen - Statistical outlier
3	10/12/2025	04:32 - 05:02	4.15	1.57	Water - Statistical outlier
4	10/12/2025	07:32 - 08:02	0.00	2.04	Instrument performing an auto-zero
5	10/12/2025	14:32 - 15:02	3.87	0.00	SRM offline/calibrating
6	11/12/2025	07:32 - 08:02	0.00	1.97	Instrument performing an auto-zero
7	09/12/2025	16:32 - 17:02	4.48	1.46	Statistical outlier
8	11/12/2025	01:32 - 02:02	3.03	2.42	Statistical outlier
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HYDROGEN CHLORIDE: QAL2 CALCULATIONS

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Thalia Waste Management, Knaresborough
A3- Line 2 - Duty

Derivation of Calibration Function

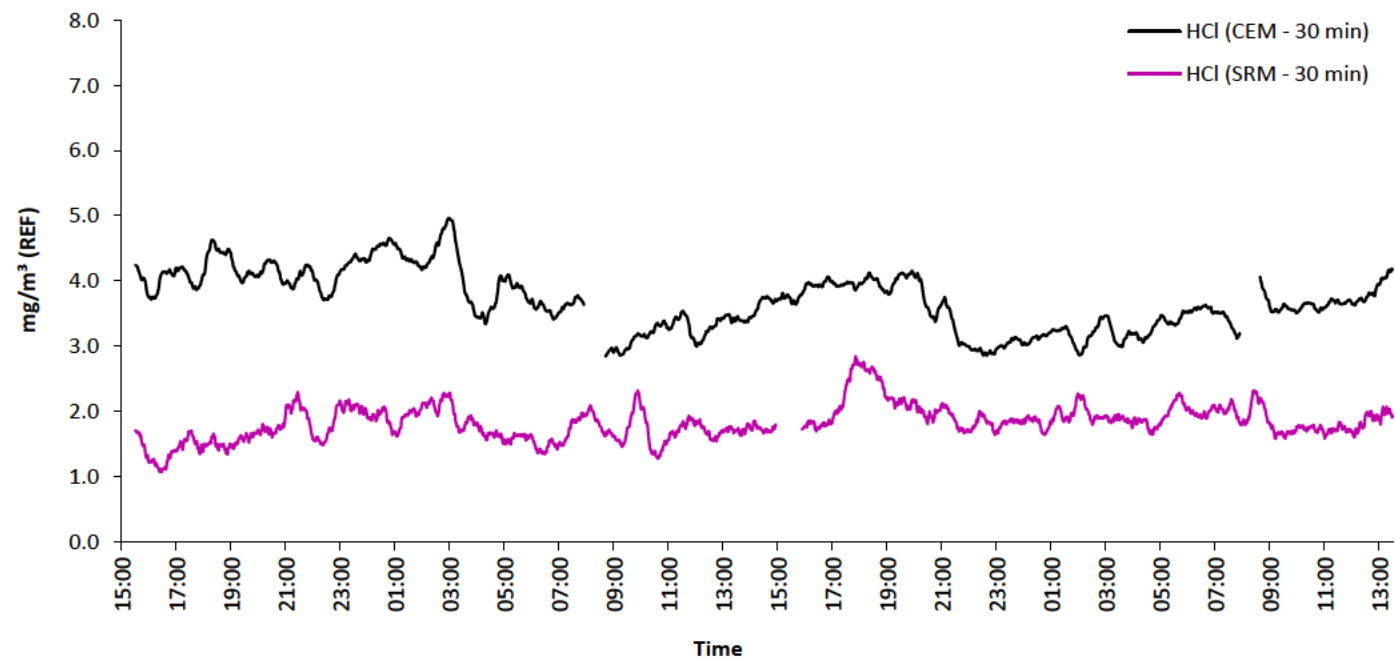
b =	0.5644	a =	-0.2472	CALIBRATION FUNCTION =	y = 0.5644x - 0.2472
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where

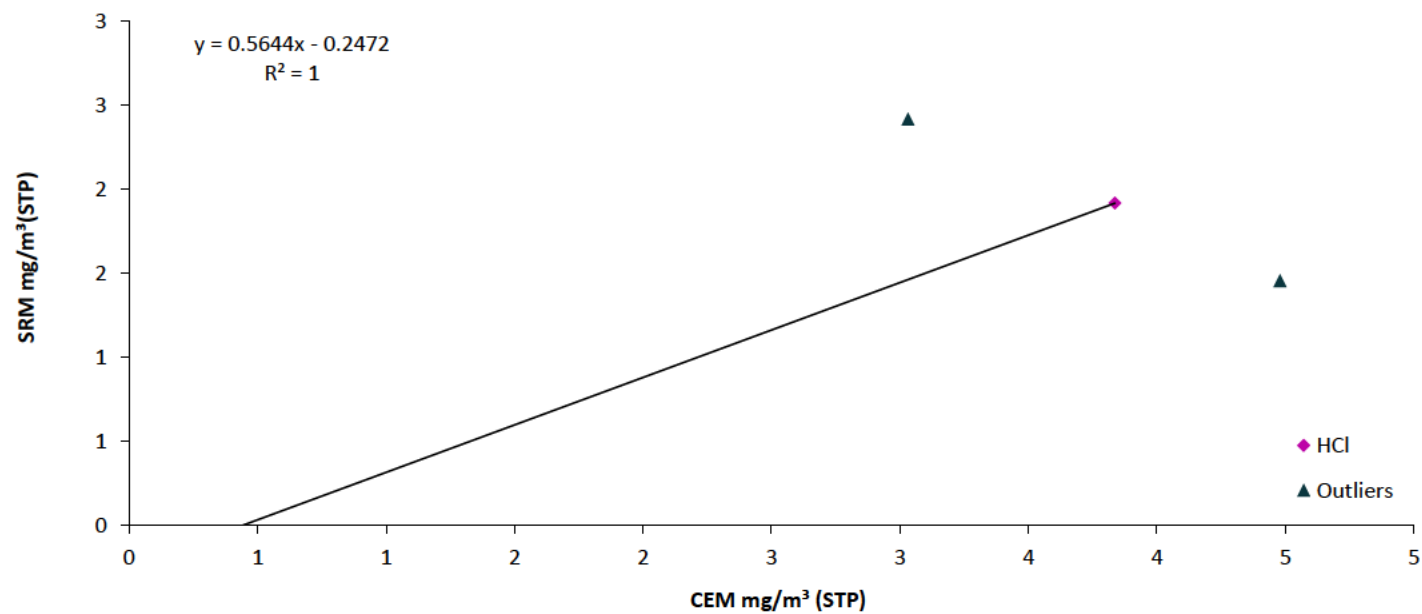
For Procedure A / C $b = [(x - x_{av}) \times (y - y_{av})] / (x - x_{av})^2$ and $a = \text{MEAN}(y) - [\text{MEAN}(x) \times b]$

Procedure B $b = \text{MEAN}(y) / [\text{MEAN}(x) - \text{OFFSET}]$ and $a = -b \times \text{OFFSET}$

PLOT 1: GRAPH FOR REFERENCE SRM vs REFERENCE CEM (STANDARDISED) (30 minute rolling averages)



PLOT 2: Calibration Graph for Procedure B



Section 4A - Data and Calculations - QAL2

HYDROGEN CHLORIDE: QAL2 CALCULATIONS

(Page 4 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Variability Test Data

Pair	Date	Time (30-minute Average)	CAL CEM (STP, WET) mg/m ³	CEM Water Vapour % v/v	CAL	SRM Water Vapour % v/v	CAL		where CAL = Calibrated using QAL2 calibration functions				
					CEM Water Vapour % v/v		CEM Oxygen (DRY) % v/v		SRM Oxygen (DRY) % v/v	CAL CEM (STP, Dry, 11% O ₂) mg/m ³	SRM (STP, Dry, 11% O ₂) mg/m ³	UNCAL CEM (STP, Dry, 11% O ₂) mg/m ³	ys, SRM - CAL CEM
					N/A			N/A					
L1	Surrogate	Near Zero	0.00	N/A	N/A	N/A	N/A	N/A	N/A	0.00	0.00	0.44	0.00
1	09/12/2025	15:32 - 16:02	1.95	19.34	17.08	16.78	8.50	N/A	8.37	1.88	1.21	3.75	-0.66
2	09/12/2025	17:32 - 18:02	2.13	16.88	14.86	15.59	8.98	N/A	9.30	2.08	1.50	4.11	-0.57
3	09/12/2025	18:32 - 19:02	2.12	17.97	15.85	16.13	9.51	N/A	9.25	2.19	1.44	4.33	-0.75
4	09/12/2025	19:32 - 20:02	2.18	17.58	15.50	15.57	8.48	N/A	8.56	2.06	1.67	4.07	-0.40
5	09/12/2025	22:32 - 23:02	2.21	18.34	16.18	16.49	8.54	N/A	8.43	2.12	2.10	4.17	-0.01
6	10/12/2025	23:32 - 00:02	2.27	18.12	15.98	15.82	8.71	N/A	8.92	2.20	1.90	4.32	-0.30
7	10/12/2025	00:32 - 01:02	2.42	16.95	14.93	14.76	8.82	N/A	8.86	2.34	1.66	4.56	-0.67
8	10/12/2025	01:32 - 02:02	2.22	17.74	15.64	16.24	8.71	N/A	8.56	2.14	2.12	4.22	-0.02
9	10/12/2025	02:32 - 03:02	2.50	19.10	16.87	16.70	9.14	N/A	9.02	2.54	2.21	4.94	-0.33
10	10/12/2025	03:32 - 04:02	1.83	17.97	15.85	15.89	8.26	N/A	8.26	1.71	1.77	3.44	0.06
11	10/12/2025	05:32 - 06:02	1.98	15.61	13.72	13.30	8.66	N/A	8.79	1.86	1.57	3.71	-0.29
12	10/12/2025	06:32 - 07:02	1.86	15.79	13.88	13.57	8.71	N/A	8.71	1.76	1.53	3.52	-0.23
13	10/12/2025	08:32 - 09:02	1.49	15.96	14.03	14.22	8.80	N/A	8.62	1.42	1.61	2.94	0.18
14	10/12/2025	09:32 - 10:02	1.66	19.93	17.62	17.07	8.02	N/A	8.29	1.55	2.05	3.16	0.49
15	10/12/2025	10:32 - 11:02	1.67	16.63	14.64	14.79	8.76	N/A	8.80	1.60	1.60	3.25	0.00
16	10/12/2025	11:32 - 12:02	1.56	18.31	16.15	16.45	8.25	N/A	8.01	1.46	1.84	2.99	0.38
17	10/12/2025	12:32 - 13:02	1.79	16.70	14.70	14.50	8.65	N/A	8.70	1.70	1.70	3.43	0.00
18	10/12/2025	13:32 - 14:02	1.80	17.85	15.74	15.43	8.48	N/A	8.90	1.71	1.72	3.44	0.01
19	10/12/2025	15:32 - 16:02	2.05	17.12	15.08	15.39	8.82	N/A	8.67	1.99	1.77	3.94	-0.21
20	10/12/2025	16:32 - 17:02	2.08	16.64	14.65	14.57	8.79	N/A	9.00	2.00	1.91	3.96	-0.09
21	10/12/2025	17:32 - 18:02	2.12	18.11	15.97	15.41	8.42	N/A	8.67	2.01	2.74	3.97	0.73
22	10/12/2025	18:32 - 19:02	2.05	16.99	14.96	15.49	8.42	N/A	8.35	1.92	2.17	3.81	0.25
23	10/12/2025	19:32 - 20:02	2.15	17.27	15.21	15.11	8.63	N/A	8.61	2.05	2.15	4.05	0.10
24	10/12/2025	20:32 - 21:02	1.93	18.18	16.04	16.12	8.53	N/A	8.72	1.84	2.12	3.68	0.28
25	10/12/2025	21:32 - 22:02	1.54	16.40	14.43	14.15	8.51	N/A	8.63	1.44	1.68	2.97	0.24
26	10/12/2025	22:32 - 23:02	1.50	16.57	14.58	14.72	8.75	N/A	8.86	1.44	1.69	2.96	0.25
27	11/12/2025	23:32 - 00:02	1.56	16.80	14.79	15.10	8.71	N/A	8.43	1.49	1.84	3.05	0.35
28	11/12/2025	00:32 - 01:02	1.71	16.72	14.72	14.70	8.47	N/A	8.38	1.60	1.88	3.24	0.28
29	11/12/2025	02:32 - 03:02	1.81	17.28	15.22	14.98	8.56	N/A	8.52	1.72	1.93	3.46	0.21
30	11/12/2025	03:32 - 04:02	1.66	16.22	14.27	14.31	8.62	N/A	8.82	1.56	1.90	3.18	0.34
31	11/12/2025	04:32 - 05:02	1.79	16.81	14.80	14.95	8.77	N/A	8.52	1.72	1.81	3.46	0.09
32	11/12/2025	05:32 - 06:02	1.84	17.75	15.65	15.73	8.57	N/A	8.39	1.75	2.06	3.52	0.31
33	11/12/2025	06:32 - 07:02	1.87	17.64	15.55	15.25	8.38	N/A	8.27	1.75	2.02	3.52	0.27
34	11/12/2025	08:32 - 09:02	1.87	18.16	16.02	15.66	8.43	N/A	8.36	1.77	1.78	3.55	0.01
35	11/12/2025	09:32 - 10:02	1.87	16.65	14.66	14.78	8.56	N/A	8.42	1.76	1.77	3.53	0.02
36	11/12/2025	10:32 - 11:02	1.91	17.26	15.21	14.84	8.48	N/A	8.43	1.79	1.61	3.59	-0.18
37	11/12/2025	11:32 - 12:02	1.92	16.97	14.95	14.94	8.58	N/A	8.52	1.82	1.67	3.64	-0.15
38	11/12/2025	12:32 - 13:02	2.03	19.91	17.60	18.14	8.63	N/A	8.49	1.99	1.83	3.96	-0.16
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HYDROGEN CHLORIDE: QAL2 CALCULATIONS

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Thalia Waste Management, Knaresborough
A3- Line 2 - Duty

Variability Test Data (continued)

Pair	Date	Time (30-minute Average)	CAL CEM (STP, WET) mg/m ³	CEM Water Vapour % v/v	CAL	SRM Water Vapour % v/v	CAL	where CAL = Calibrated using QAL2 calibration functions					
					CEM Water Vapour % v/v		CEM Oxygen (DRY) % v/v		SRM Oxygen (DRY) % v/v	CAL CEM (STP, Dry, 11% O ₂) mg/m ³	SRM (STP, Dry, 11% O ₂) mg/m ³	UNCAL CEM (STP, Dry, 11% O ₂) mg/m ³	ys, SRM - CAL CEM
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										MAX	AVERAGE	AVERAGE	Sd
										2.54	1.83	3.67	0.34

Test of Variability

Q _o = ELV x (MU / 100) / 1.96	1.63
Kv for 38 Pairs of Data	0.9885
The variability is accepted if Sd ≤ Q _o x Kv.	

Parameter	Value
Standard Deviation (Sd)	0.34
Q _o x Kv	1.61
Outcome of Variability Test	Pass

Valid Calibration Range

Maximum CAL CEM Value (mg/m ³)	2.5
The Calibration Range can be extended by the greater of a) 10% of the Maximum CAL CEM Value or b) Up to 20% of the Daily ELV.	

a) Calibrated Range (10% extension) (mg/m ³)	0 to 2.8
b) Calibrated Range (20% of Daily ELV) (mg/m ³)	0 to 1.6

Greater of (a) or (b)	0 to 2.8
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Surrogate Extension Applied?	No
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Valid Calibration Range (at REF conditions)	0 to 2.8 mg/m ³
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Section 4A - Data and Calculations - QAL2

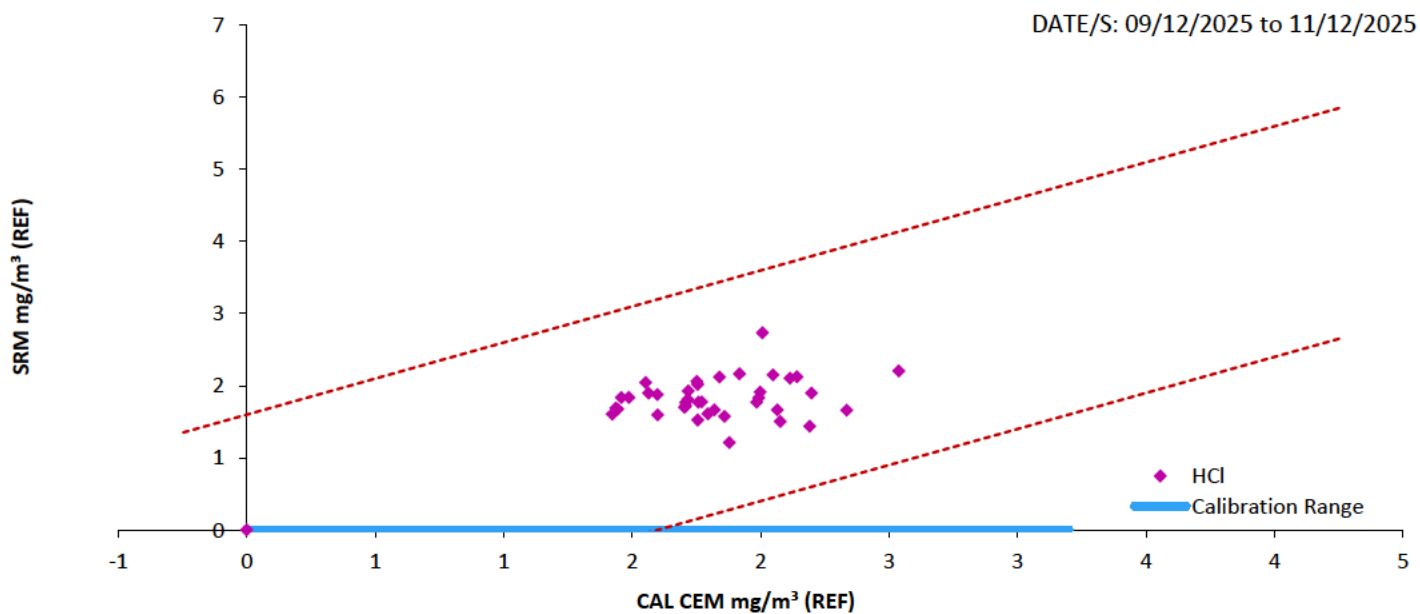
HYDROGEN CHLORIDE: QAL2 CALCULATIONS

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Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

PLOT 3: X-Y Plot - REF CAL CEM vs REF SRM Values



Section 4A - Data and Calculations - QAL2

AMMONIA: QAL2 CALCULATIONS

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Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Calibration Data

Pair	Date	Time (30-minute Average)	x, CEM (STP, WET) mg/m ³	y, SRM (STP, WET) mg/m ³	SRM (STP, Dry, 11% O ₂) mg/m ³	x - x _{av} (A)	y - y _{av} (B)	(A) x (B)	(x - x _{av}) ²	CAL CEM (STP, WET) mg/m ³
L1	Surrogate	Near Zero	0.32	0.00	0.00	-3.53	-4.01	14.15	12.44	0.00
1	09/12/2025	16:32 - 17:02	3.77	4.04	3.86	-0.07	0.03	0.00	0.00	3.93
2	09/12/2025	17:32 - 18:02	5.00	4.56	4.62	1.16	0.55	0.63	1.34	5.33
3	09/12/2025	18:32 - 19:02	4.80	4.76	4.83	0.96	0.75	0.72	0.92	5.10
4	09/12/2025	19:32 - 20:02	4.05	4.15	3.95	0.21	0.14	0.03	0.04	4.25
5	09/12/2025	22:32 - 23:02	3.12	3.77	3.60	-0.73	-0.24	0.17	0.53	3.19
6	10/12/2025	23:32 - 00:02	4.30	3.74	3.68	0.46	-0.27	-0.12	0.21	4.54
7	10/12/2025	00:32 - 01:02	3.00	3.23	3.12	-0.85	-0.78	0.66	0.71	3.05
8	10/12/2025	01:32 - 02:02	3.69	3.26	3.13	-0.15	-0.75	0.12	0.02	3.84
9	10/12/2025	02:32 - 03:02	2.85	2.94	2.95	-0.99	-1.07	1.07	0.99	2.88
10	10/12/2025	03:32 - 04:02	3.48	3.17	2.96	-0.37	-0.84	0.31	0.13	3.60
11	10/12/2025	05:32 - 06:02	3.96	3.97	3.75	0.12	-0.05	-0.01	0.01	4.15
12	10/12/2025	06:32 - 07:02	3.88	3.88	3.65	0.04	-0.13	0.00	0.00	4.05
13	10/12/2025	08:32 - 09:02	2.44	2.73	2.57	-1.40	-1.29	1.80	1.96	2.42
14	10/12/2025	09:32 - 10:02	3.26	3.23	3.06	-0.58	-0.78	0.46	0.34	3.35
15	10/12/2025	10:32 - 11:02	3.23	3.52	3.39	-0.61	-0.49	0.30	0.38	3.31
16	10/12/2025	11:32 - 12:02	3.53	3.45	3.18	-0.31	-0.56	0.18	0.10	3.65
17	10/12/2025	12:32 - 13:02	4.41	4.42	4.20	0.57	0.40	0.23	0.32	4.66
18	10/12/2025	13:32 - 14:02	4.60	4.48	4.38	0.76	0.47	0.36	0.57	4.87
19	10/12/2025	15:32 - 16:02	4.76	4.36	4.18	0.92	0.35	0.32	0.85	5.06
20	10/12/2025	16:32 - 17:02	3.28	4.00	3.90	-0.56	-0.01	0.01	0.31	3.37
21	10/12/2025	17:32 - 18:02	2.51	3.21	3.07	-1.33	-0.81	1.07	1.77	2.50
22	10/12/2025	18:32 - 19:02	2.91	3.29	3.08	-0.93	-0.72	0.67	0.86	2.96
23	10/12/2025	20:32 - 21:02	4.62	5.19	5.03	0.78	1.17	0.92	0.61	4.90
24	10/12/2025	21:32 - 22:02	3.35	4.20	3.95	-0.49	0.19	-0.09	0.24	3.45
25	10/12/2025	22:32 - 23:02	5.07	5.21	5.03	1.23	1.20	1.47	1.50	5.41
26	11/12/2025	23:32 - 00:02	4.87	5.14	4.82	1.03	1.13	1.16	1.06	5.18
27	11/12/2025	00:32 - 01:02	3.49	4.06	3.77	-0.35	0.05	-0.02	0.12	3.61
28	11/12/2025	01:32 - 02:02	4.79	4.86	4.53	0.95	0.85	0.80	0.90	5.09
29	11/12/2025	02:32 - 03:02	4.57	4.95	4.66	0.73	0.94	0.69	0.53	4.84
30	11/12/2025	03:32 - 04:02	4.05	4.55	4.36	0.21	0.54	0.11	0.04	4.25
31	11/12/2025	04:32 - 05:02	4.33	4.52	4.25	0.49	0.50	0.25	0.24	4.57
32	11/12/2025	05:32 - 06:02	4.64	4.79	4.51	0.80	0.78	0.62	0.64	4.92
33	11/12/2025	06:32 - 07:02	4.25	4.48	4.15	0.41	0.47	0.19	0.17	4.48
34	11/12/2025	08:32 - 09:02	4.04	4.58	4.30	0.20	0.57	0.12	0.04	4.24
35	11/12/2025	09:32 - 10:02	3.42	4.08	3.80	-0.42	0.07	-0.03	0.18	3.53
36	11/12/2025	10:32 - 11:02	3.76	3.98	3.72	-0.08	-0.03	0.00	0.01	3.92
37	11/12/2025	11:32 - 12:02	3.78	4.07	3.83	-0.06	0.05	0.00	0.00	3.94
38	11/12/2025	12:32 - 13:02	5.66	5.66	5.52	1.81	1.65	2.99	3.29	6.07
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Section 4A - Data and Calculations - QAL2

AMMONIA: QAL2 CALCULATIONS

(Page 2 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Calibration Data (continued)

Pair	Date	Time (30-minute Average)	x, CEM (STP, WET) mg/m³	y, SRM (STP, WET) mg/m³	SRM (STP, Dry, 11% O₂) mg/m³	x - x _{av} (A)	y - y _{av} (B)	(A) x (B)	(x - x _{av})²	CAL CEM (STP, WET) mg/m³	
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90											
			MAX SRM - MIN SRM		2.96			SUM	32.29	34.40	
			(DAILY) DELV (mg/m³)		15						
			95% CI MU (%)		40						
Daily			95% CI at ELV (mg/m³)		6.0						
			15% of ELV		2.3						
			PROCEDURE (A, B, C)		B						
WHERE OFFSET = 0.315											
						PROCEDURE A	If (MAX SRM - MIN SRM) > 95% CI at Daily ELV				
						PROCEDURE B	If (MAX SRM - MIN SRM) < 95% CI at Daily ELV and MIN SRM ≥ 15% of Daily ELV				
						PROCEDURE C	If (MAX SRM - MIN SRM) < 95% CI at Daily ELV and MIN SRM < 15% of Daily ELV				

Outliers Data

Pair	Date	Time (30-minute Average)	x, CEM (STP, WET) mg/m ³	y, SRM (STP, WET) mg/m ³	Reason for Data Pair Removal
					(Statistical Outliers removed following outlier test, other data removed prior to this test)
1	09/12/2025	20:32 - 21:02	3.14	3.61	Water - Statistical outlier
2	09/12/2025	21:32 - 22:02	4.66	4.21	Oxygen - Statistical outlier
3	10/12/2025	04:32 - 05:02	5.21	4.73	Water - Statistical outlier
4	10/12/2025	07:32 - 08:02	0.00	3.05	Instrument performing an auto-zero
5	10/12/2025	14:32 - 15:02	5.02	0.00	SRM offline/calibrating
6	11/12/2025	07:32 - 08:02	0.00	5.49	Instrument performing an auto-zero
7	09/12/2025	15:32 - 16:02	7.71	6.61	Statistical outlier
8	10/12/2025	19:32 - 20:02	6.09	5.30	Statistical outlier
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Section 4A - Data and Calculations - QAL2

AMMONIA: QAL2 CALCULATIONS

(Page 3 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Derivation of Calibration Function

b =	1.1375	a =	-0.3583
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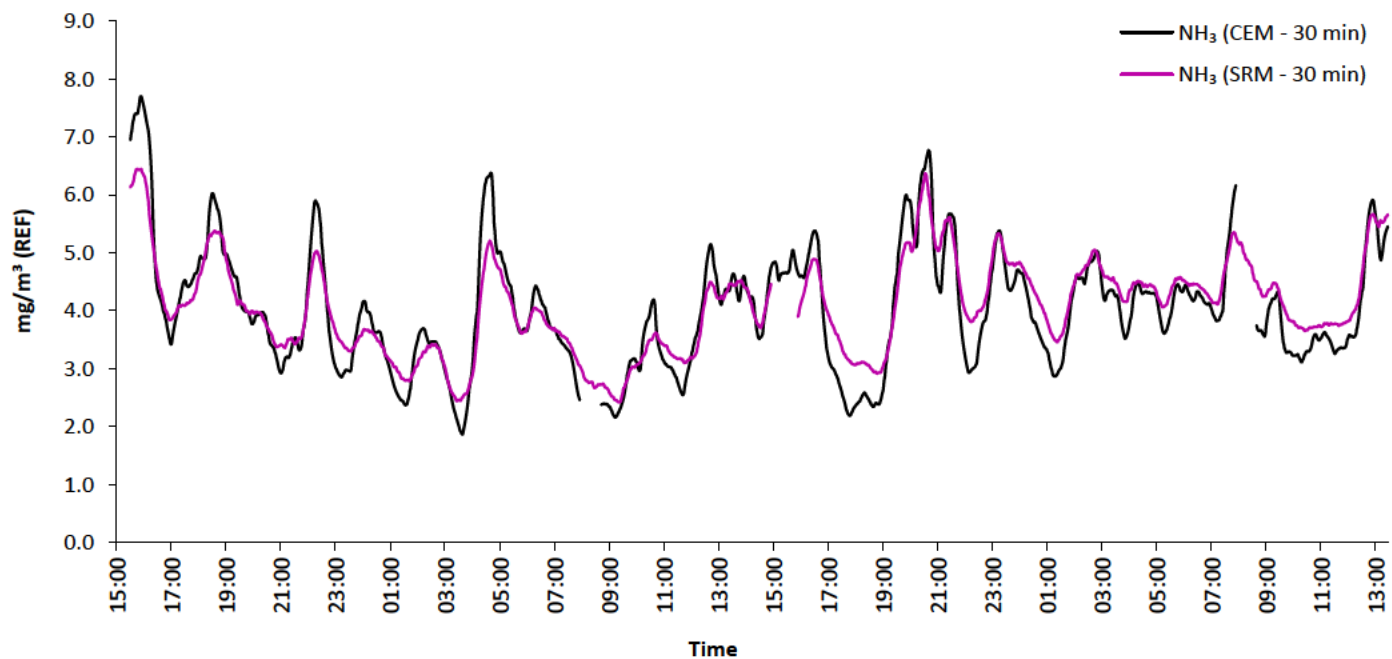
CALIBRATION FUNCTION =	$y = 1.1375x - 0.3583$
------------------------	------------------------

where

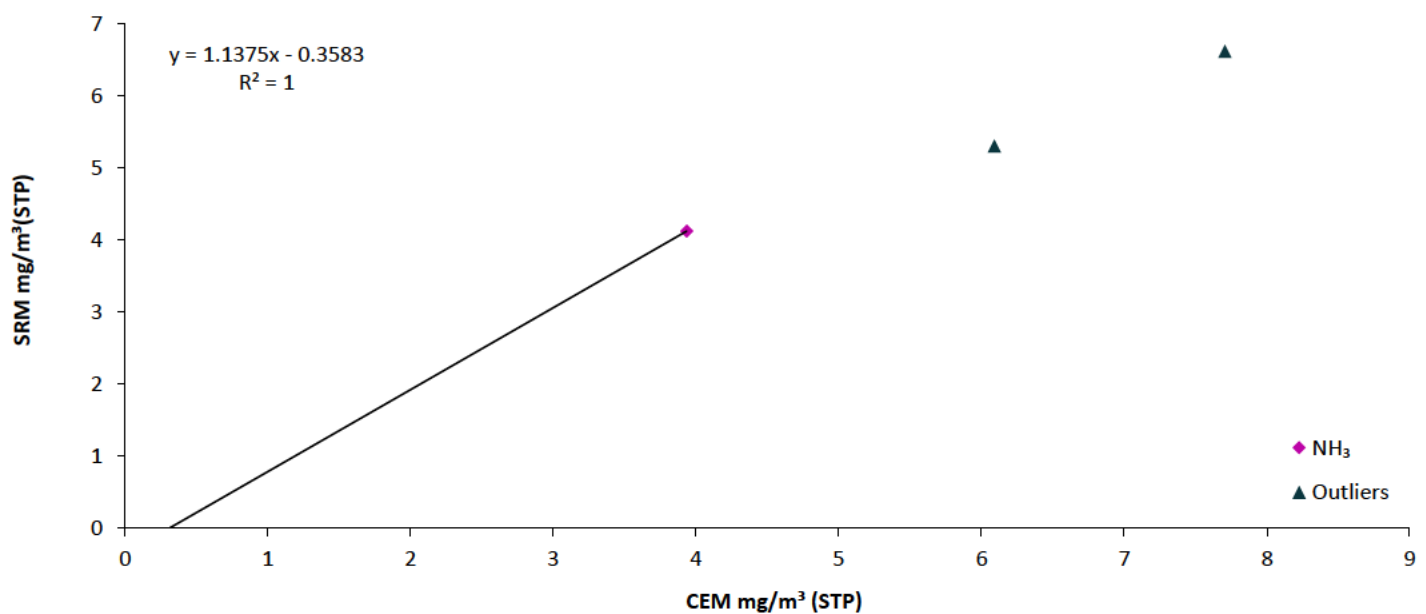
For Procedure A / C $b = [(x - x_{av}) \times (y - y_{av})] / (x - x_{av})^2$ and $a = \text{MEAN}(y) - [\text{MEAN}(x) \times b]$

Procedure B $b = \text{MEAN}(y) / [\text{MEAN}(x) - \text{OFFSET}]$ and $a = -b \times \text{OFFSET}$

PLOT 1: GRAPH FOR REFERENCE SRM vs REFERENCE CEM (STANDARDISED) (30 minute rolling averages)



PLOT 2: Calibration Graph for Procedure B



Section 4A - Data and Calculations - QAL2

AMMONIA: QAL2 CALCULATIONS

(Page 4 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Variability Test Data

Pair	Date	Time (30-minute Average)	CAL CEM (STP, WET) mg/m ³	CEM Water Vapour % v/v	CAL	SRM Water Vapour % v/v	CAL		where CAL = Calibrated using QAL2 calibration functions				
					CEM Water Vapour % v/v		CEM Oxygen (DRY) % v/v		SRM Oxygen (DRY) % v/v	CAL CEM (STP, Dry, 11% O ₂) mg/m ³	SRM (STP, Dry, 11% O ₂) mg/m ³	UNCAL CEM (STP, Dry, 11% O ₂) mg/m ³	ys, SRM - CAL CEM
					N/A			N/A					
L1	Surrogate	Near Zero	0.00	N/A	N/A	N/A	N/A	N/A	N/A	0.00	0.00	0.32	0.00
1	09/12/2025	16:32 - 17:02	3.93	17.37	15.30	14.86	8.34	N/A	8.71	3.67	3.86	3.52	0.19
2	09/12/2025	17:32 - 18:02	5.33	16.88	14.86	15.59	8.98	N/A	9.30	5.21	4.62	4.88	-0.59
3	09/12/2025	18:32 - 19:02	5.10	17.97	15.85	16.13	9.51	N/A	9.25	5.28	4.83	4.96	-0.44
4	09/12/2025	19:32 - 20:02	4.25	17.58	15.50	15.57	8.48	N/A	8.56	4.02	3.95	3.83	-0.07
5	09/12/2025	22:32 - 23:02	3.19	18.34	16.18	16.49	8.54	N/A	8.43	3.05	3.60	2.98	0.54
6	10/12/2025	23:32 - 00:02	4.54	18.12	15.98	15.82	8.71	N/A	8.92	4.39	3.68	4.17	-0.71
7	10/12/2025	00:32 - 01:02	3.05	16.95	14.93	14.76	8.82	N/A	8.86	2.94	3.12	2.89	0.18
8	10/12/2025	01:32 - 02:02	3.84	17.74	15.64	16.24	8.71	N/A	8.56	3.70	3.13	3.56	-0.57
9	10/12/2025	02:32 - 03:02	2.88	19.10	16.87	16.70	9.14	N/A	9.02	2.92	2.95	2.89	0.02
10	10/12/2025	03:32 - 04:02	3.60	17.97	15.85	15.89	8.26	N/A	8.26	3.35	2.96	3.24	-0.40
11	10/12/2025	05:32 - 06:02	4.15	15.61	13.72	13.30	8.66	N/A	8.79	3.89	3.75	3.72	-0.15
12	10/12/2025	06:32 - 07:02	4.05	15.79	13.88	13.57	8.71	N/A	8.71	3.83	3.65	3.66	-0.18
13	10/12/2025	08:32 - 09:02	2.42	15.96	14.03	14.22	8.80	N/A	8.62	2.31	2.57	2.33	0.26
14	10/12/2025	09:32 - 10:02	3.35	19.93	17.62	17.07	8.02	N/A	8.29	3.13	3.06	3.05	-0.07
15	10/12/2025	10:32 - 11:02	3.31	16.63	14.64	14.79	8.76	N/A	8.80	3.17	3.39	3.09	0.22
16	10/12/2025	11:32 - 12:02	3.65	18.31	16.15	16.45	8.25	N/A	8.01	3.42	3.18	3.30	-0.24
17	10/12/2025	12:32 - 13:02	4.66	16.70	14.70	14.50	8.65	N/A	8.70	4.42	4.20	4.18	-0.22
18	10/12/2025	13:32 - 14:02	4.87	17.85	15.74	15.43	8.48	N/A	8.90	4.62	4.38	4.36	-0.24
19	10/12/2025	15:32 - 16:02	5.06	17.12	15.08	15.39	8.82	N/A	8.67	4.89	4.18	4.60	-0.71
20	10/12/2025	16:32 - 17:02	3.37	16.64	14.65	14.57	8.79	N/A	9.00	3.24	3.90	3.15	0.66
21	10/12/2025	17:32 - 18:02	2.50	18.11	15.97	15.41	8.42	N/A	8.67	2.36	3.07	2.38	0.71
22	10/12/2025	18:32 - 19:02	2.96	16.99	14.96	15.49	8.42	N/A	8.35	2.76	3.08	2.72	0.31
23	10/12/2025	20:32 - 21:02	4.90	18.18	16.04	16.12	8.53	N/A	8.72	4.68	5.03	4.42	0.35
24	10/12/2025	21:32 - 22:02	3.45	16.40	14.43	14.15	8.51	N/A	8.63	3.23	3.95	3.13	0.72
25	10/12/2025	22:32 - 23:02	5.41	16.57	14.58	14.72	8.75	N/A	8.86	5.17	5.03	4.84	-0.14
26	11/12/2025	23:32 - 00:02	5.18	16.80	14.79	15.10	8.71	N/A	8.43	4.95	4.82	4.65	-0.13
27	11/12/2025	00:32 - 01:02	3.61	16.72	14.72	14.70	8.47	N/A	8.38	3.38	3.77	3.27	0.39
28	11/12/2025	01:32 - 02:02	5.09	18.15	16.01	16.03	8.39	N/A	8.21	4.80	4.53	4.52	-0.28
29	11/12/2025	02:32 - 03:02	4.84	17.28	15.22	14.98	8.56	N/A	8.52	4.59	4.66	4.34	0.07
30	11/12/2025	03:32 - 04:02	4.25	16.22	14.27	14.31	8.62	N/A	8.82	4.01	4.36	3.82	0.35
31	11/12/2025	04:32 - 05:02	4.57	16.81	14.80	14.95	8.77	N/A	8.52	4.38	4.25	4.16	-0.13
32	11/12/2025	05:32 - 06:02	4.92	17.75	15.65	15.73	8.57	N/A	8.39	4.69	4.51	4.42	-0.18
33	11/12/2025	06:32 - 07:02	4.48	17.64	15.55	15.25	8.38	N/A	8.27	4.20	4.15	3.99	-0.05
34	11/12/2025	08:32 - 09:02	4.24	18.16	16.02	15.66	8.43	N/A	8.36	4.02	4.30	3.83	0.28
35	11/12/2025	09:32 - 10:02	3.53	16.65	14.66	14.78	8.56	N/A	8.42	3.33	3.80	3.22	0.48
36	11/12/2025	10:32 - 11:02	3.92	17.26	15.21	14.84	8.48	N/A	8.43	3.69	3.72	3.54	0.03
37	11/12/2025	11:32 - 12:02	3.94	16.97	14.95	14.94	8.58	N/A	8.52	3.73	3.83	3.58	0.10
38	11/12/2025	12:32 - 13:02	6.07	19.91	17.60	18.14	8.63	N/A	8.49	5.96	5.52	5.55	-0.44
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AMMONIA: QAL2 CALCULATIONS

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Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Variability Test Data (continued)

Pair	Date	Time (30-minute Average)	CAL CEM (STP, WET) mg/m ³	CEM Water Vapour % v/v	CAL	SRM Water Vapour % v/v	CAL		SRM Oxygen (DRY) % v/v	where CAL = Calibrated using QAL2 calibration functions			
					CEM Water Vapour % v/v		CEM Oxygen (DRY) % v/v			CAL CEM (STP, Dry, 11% O ₂) mg/m ³	SRM (STP, Dry, 11% O ₂) mg/m ³	UNCAL CEM (STP, Dry, 11% O ₂) mg/m ³	ys, SRM - CAL CEM
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										MAX	AVERAGE	AVERAGE	Sd
										5.96	3.93	3.76	0.38

Test of Variability

Q _o = ELV x (MU / 100) / 1.96	3.06
Kv for 38 Pairs of Data	0.9885
The variability is accepted if Sd ≤ Q _o x Kv.	

Parameter	Value
Standard Deviation (Sd)	0.38
Q _o x Kv	3.03
Outcome of Variability Test	Pass

Valid Calibration Range

Maximum CAL CEM Value (mg/m ³)	6.0
The Calibration Range can be extended by the greater of a) 10% of the Maximum CAL CEM Value or b) Up to 20% of the Daily ELV.	

a) Calibrated Range (10% extension) (mg/m ³)	0 to 6.6
b) Calibrated Range (20% of Daily ELV) (mg/m ³)	0 to 3.0

Greater of (a) or (b)	0 to 6.6
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Surrogate Extension Applied?	No
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Valid Calibration Range (at REF conditions)	0 to 6.6 mg/m ³
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Section 4A - Data and Calculations - QAL2

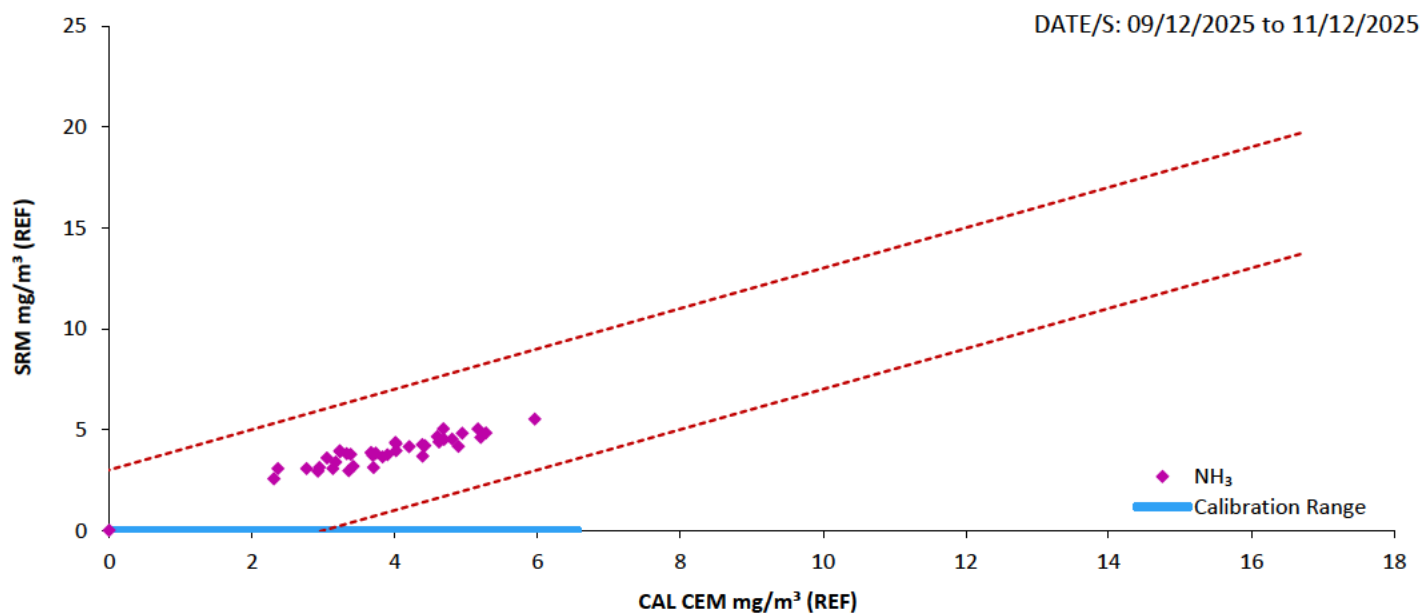
AMMONIA: QAL2 CALCULATIONS

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Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

PLOT 3: X-Y Plot - REF CAL CEM vs REF SRM Values



Section 4A - Data and Calculations - QAL2

WATER VAPOUR: QAL2 CALCULATIONS

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Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Calibration Data

Pair	Date	Time (30-minute Average)	x, CEM (ACTUAL) % v/v	y, SRM (ACTUAL) % v/v	x - x _{av} (A)	y - y _{av} (B)	(A) x (B)	(x - x _{av}) ²	CAL CEM (ACTUAL) % v/v
L1	Surrogate	Near Zero	0.38	0.00	-16.64	-14.99	249.48	276.92	0.00
1	09/12/2025	15:32 - 16:02	19.34	16.78	2.32	1.79	4.16	5.39	17.08
2	09/12/2025	16:32 - 17:02	17.37	14.86	0.35	-0.14	-0.05	0.12	15.30
3	09/12/2025	17:32 - 18:02	16.88	15.59	-0.15	0.59	-0.09	0.02	14.86
4	09/12/2025	18:32 - 19:02	17.97	16.13	0.95	1.14	1.08	0.90	15.85
5	09/12/2025	19:32 - 20:02	17.58	15.57	0.56	0.58	0.33	0.32	15.50
6	09/12/2025	21:32 - 22:02	16.74	15.10	-0.28	0.11	-0.03	0.08	14.74
7	09/12/2025	22:32 - 23:02	18.34	16.49	1.32	1.50	1.98	1.74	16.18
8	10/12/2025	23:32 - 00:02	18.12	15.82	1.10	0.83	0.91	1.21	15.98
9	10/12/2025	00:32 - 01:02	16.95	14.76	-0.07	-0.23	0.02	0.00	14.93
10	10/12/2025	01:32 - 02:02	17.74	16.24	0.72	1.25	0.90	0.52	15.64
11	10/12/2025	02:32 - 03:02	19.10	16.70	2.08	1.71	3.56	4.34	16.87
12	10/12/2025	03:32 - 04:02	17.97	15.89	0.95	0.90	0.86	0.90	15.85
13	10/12/2025	05:32 - 06:02	15.61	13.30	-1.41	-1.69	2.38	1.99	13.72
14	10/12/2025	06:32 - 07:02	15.79	13.57	-1.23	-1.42	1.74	1.51	13.88
15	10/12/2025	08:32 - 09:02	15.96	14.22	-1.06	-0.77	0.82	1.13	14.03
16	10/12/2025	09:32 - 10:02	19.93	17.07	2.91	2.08	6.06	8.48	17.62
17	10/12/2025	10:32 - 11:02	16.63	14.79	-0.39	-0.20	0.08	0.15	14.64
18	10/12/2025	11:32 - 12:02	18.31	16.45	1.29	1.46	1.88	1.65	16.15
19	10/12/2025	12:32 - 13:02	16.70	14.50	-0.32	-0.49	0.16	0.10	14.70
20	10/12/2025	13:32 - 14:02	17.85	15.43	0.83	0.44	0.36	0.69	15.74
21	10/12/2025	15:32 - 16:02	17.12	15.39	0.10	0.39	0.04	0.01	15.08
22	10/12/2025	16:32 - 17:02	16.64	14.57	-0.38	-0.42	0.16	0.14	14.65
23	10/12/2025	17:32 - 18:02	18.11	15.41	1.09	0.42	0.46	1.19	15.97
24	10/12/2025	18:32 - 19:02	16.99	15.49	-0.03	0.50	-0.02	0.00	14.96
25	10/12/2025	19:32 - 20:02	17.27	15.11	0.25	0.12	0.03	0.06	15.21
26	10/12/2025	20:32 - 21:02	18.18	16.12	1.16	1.12	1.31	1.35	16.04
27	10/12/2025	21:32 - 22:02	16.40	14.15	-0.62	-0.84	0.52	0.39	14.43
28	10/12/2025	22:32 - 23:02	16.57	14.72	-0.45	-0.28	0.12	0.20	14.58
29	11/12/2025	23:32 - 00:02	16.80	15.10	-0.22	0.11	-0.02	0.05	14.79
30	11/12/2025	00:32 - 01:02	16.72	14.70	-0.30	-0.29	0.09	0.09	14.72
31	11/12/2025	01:32 - 02:02	18.15	16.03	1.13	1.04	1.17	1.27	16.01
32	11/12/2025	02:32 - 03:02	17.28	14.98	0.26	-0.01	0.00	0.07	15.22
33	11/12/2025	03:32 - 04:02	16.22	14.31	-0.80	-0.68	0.54	0.64	14.27
34	11/12/2025	04:32 - 05:02	16.81	14.95	-0.22	-0.04	0.01	0.05	14.80
35	11/12/2025	05:32 - 06:02	17.75	15.73	0.73	0.74	0.54	0.53	15.65
36	11/12/2025	06:32 - 07:02	17.64	15.25	0.62	0.25	0.16	0.39	15.55
37	11/12/2025	08:32 - 09:02	18.16	15.66	1.14	0.67	0.76	1.31	16.02
38	11/12/2025	09:32 - 10:02	16.65	14.78	-0.37	-0.22	0.08	0.14	14.66
39	11/12/2025	10:32 - 11:02	17.26	14.84	0.24	-0.15	-0.04	0.06	15.21
40	11/12/2025	11:32 - 12:02	16.97	14.94	-0.05	-0.05	0.00	0.00	14.95
41	11/12/2025	12:32 - 13:02	19.91	18.14	2.89	3.15	9.11	8.37	17.60
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63									
64									
65									

WATER VAPOUR: QAL2 CALCULATIONS

(Page 2 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Calibration Data (continued)

Pair	Date	Time (30-minute Average)	x, CEM (ACTUAL) % v/v	y, SRM (ACTUAL) % v/v	x - x _{av} (A)	y - y _{av} (B)	(A) x (B)	(x - x _{av}) ²	CAL CEM (ACTUAL) % v/v
66									
67									
68									
69									
70									
71									
72									
73									
74									
75									
76									
77									
78									
79									
80									
81									
82									
83									
84									
85									
86									
87									
88									
89									
90									
MAX SRM - MIN SRM				4.84					
(DAILY) DELV (% v/v)				30					
95% CI MU (%)				30					
95% CI at DELV (% v/v)				9.0					
PROCEDURE (A OR B)				B					
						SUM	291.62	324.47	

PROCEDURE A If (MAX SRM - MIN SRM) > 95% CI at Daily ELV

PROCEDURE B If (MAX SRM - MIN SRM) < 95% CI at Daily ELV and MIN SRM ≥ 15% of Daily ELV

WHERE OFFSET = 0.38

Outliers Data

Pair	Date	Time (30-minute Average)	x, CEM (ACTUAL) % v/v	y, SRM (ACTUAL) % v/v	Reason for Data Pair Removal
(Statistical Outliers removed following outlier test, other data removed prior to this test)					
1	10/12/2025	07:32 - 08:02	0.00	12.62	Instrument performing an auto-zero
2	10/12/2025	14:32 - 15:02	17.34	0.00	SRM offline/calibrating
3	11/12/2025	07:32 - 08:02	0.00	14.95	Instrument performing an auto-zero
4	09/12/2025	20:32 - 21:02	16.83	15.96	Water - Statistical outlier
5	10/12/2025	04:32 - 05:02	17.39	14.48	Water - Statistical outlier
6					
7					
8					
9					
10					
11					
12					
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14					
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20					
21					
22					
23					
24					
25					

Section 4A - Data and Calculations - QAL2

WATER VAPOUR: QAL2 CALCULATIONS

(Page 3 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Derivation of Calibration Function

b =	0.9009	a =	-0.3423
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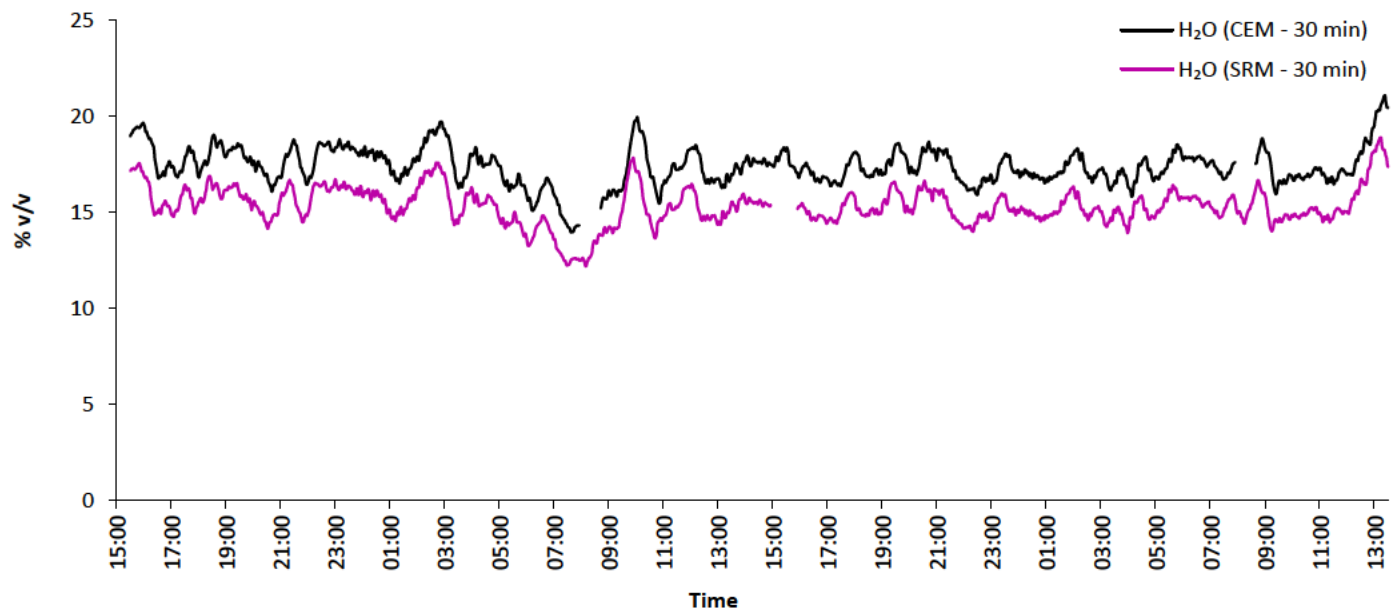
CALIBRATION FUNCTION =	$y = 0.9009x - 0.3423$
------------------------	------------------------

where

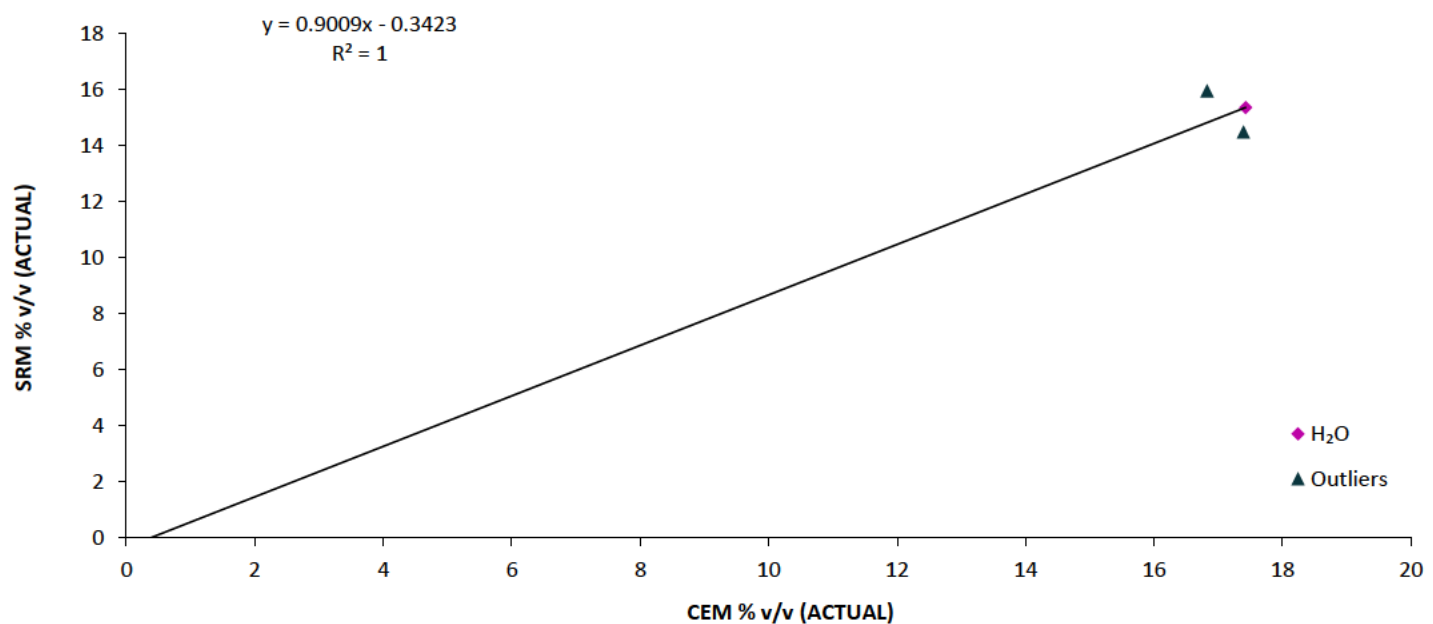
For Method A $b = [(x - x_{av}) \times (y - y_{av})] / (x - x_{av})^2$ and $a = \text{MEAN}(y) - [\text{MEAN}(x) \times b]$

Method B $b = \text{MEAN}(y) / [\text{MEAN}(x) - \text{OFFSET}]$ and $a = -b \times \text{OFFSET}$

PLOT 1: GRAPH FOR STP SRM vs STP CEM (30 minute rolling averages)



PLOT 2: Calibration Graph for Method B



Section 4A - Data and Calculations - QAL2

WATER VAPOUR: QAL2 CALCULATIONS

(Page 4 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Variability Test Data

Pair	Date	Time (30-minute Average)	CAL CEM (ACTUAL) % v/v	ys, SRM (ACTUAL) % v/v	UNCAL CEM (ACTUAL) % v/v	ys, SRM - CAL CEM
L1	Surrogate	Near Zero	0.00	0.00	0.38	0.00
1	09/12/2025	15:32 - 16:02	17.08	16.78	19.34	-0.30
2	09/12/2025	16:32 - 17:02	15.30	14.86	17.37	-0.45
3	09/12/2025	17:32 - 18:02	14.86	15.59	16.88	0.73
4	09/12/2025	18:32 - 19:02	15.85	16.13	17.97	0.28
5	09/12/2025	19:32 - 20:02	15.50	15.57	17.58	0.07
6	09/12/2025	21:32 - 22:02	14.74	15.10	16.74	0.36
7	09/12/2025	22:32 - 23:02	16.18	16.49	18.34	0.32
8	10/12/2025	23:32 - 00:02	15.98	15.82	18.12	-0.16
9	10/12/2025	00:32 - 01:02	14.93	14.76	16.95	-0.17
10	10/12/2025	01:32 - 02:02	15.64	16.24	17.74	0.60
11	10/12/2025	02:32 - 03:02	16.87	16.70	19.10	-0.17
12	10/12/2025	03:32 - 04:02	15.85	15.89	17.97	0.05
13	10/12/2025	05:32 - 06:02	13.72	13.30	15.61	-0.42
14	10/12/2025	06:32 - 07:02	13.88	13.57	15.79	-0.31
15	10/12/2025	08:32 - 09:02	14.03	14.22	15.96	0.19
16	10/12/2025	09:32 - 10:02	17.62	17.07	19.93	-0.54
17	10/12/2025	10:32 - 11:02	14.64	14.79	16.63	0.15
18	10/12/2025	11:32 - 12:02	16.15	16.45	18.31	0.30
19	10/12/2025	12:32 - 13:02	14.70	14.50	16.70	-0.20
20	10/12/2025	13:32 - 14:02	15.74	15.43	17.85	-0.31
21	10/12/2025	15:32 - 16:02	15.08	15.39	17.12	0.30
22	10/12/2025	16:32 - 17:02	14.65	14.57	16.64	-0.08
23	10/12/2025	17:32 - 18:02	15.97	15.41	18.11	-0.56
24	10/12/2025	18:32 - 19:02	14.96	15.49	16.99	0.53
25	10/12/2025	19:32 - 20:02	15.21	15.11	17.27	-0.10
26	10/12/2025	20:32 - 21:02	16.04	16.12	18.18	0.08
27	10/12/2025	21:32 - 22:02	14.43	14.15	16.40	-0.28
28	10/12/2025	22:32 - 23:02	14.58	14.72	16.57	0.13
29	11/12/2025	23:32 - 00:02	14.79	15.10	16.80	0.31
30	11/12/2025	00:32 - 01:02	14.72	14.70	16.72	-0.02
31	11/12/2025	01:32 - 02:02	16.01	16.03	18.15	0.02
32	11/12/2025	02:32 - 03:02	15.22	14.98	17.28	-0.24
33	11/12/2025	03:32 - 04:02	14.27	14.31	16.22	0.04
34	11/12/2025	04:32 - 05:02	14.80	14.95	16.81	0.15
35	11/12/2025	05:32 - 06:02	15.65	15.73	17.75	0.08
36	11/12/2025	06:32 - 07:02	15.55	15.25	17.64	-0.31
37	11/12/2025	08:32 - 09:02	16.02	15.66	18.16	-0.36
38	11/12/2025	09:32 - 10:02	14.66	14.78	16.65	0.12
39	11/12/2025	10:32 - 11:02	15.21	14.84	17.26	-0.37
40	11/12/2025	11:32 - 12:02	14.95	14.94	16.97	-0.01
41	11/12/2025	12:32 - 13:02	17.60	18.14	19.91	0.54
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WATER VAPOUR: QAL2 CALCULATIONS
(Page 5 of 6)

Thalia Waste Management, Knaresborough
A3- Line 2 - Duty

Variability Test Data (continued)

Pair	Date	Time (30-minute Average)	CAL CEM (ACTUAL) % v/v	ys, SRM (ACTUAL) % v/v	UNCAL CEM (ACTUAL) % v/v	ys, SRM - CAL CEM
66						
67						
68						
69						
70						
71						
72						
73						
74						
75						
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86						
87						
88						
89						
90						
			MAX	AVERAGE	AVERAGE	Sd
			17.62	15.36	17.43	0.32

Test of Variability

$Q_0 = ELV \times (MU / 100) / 1.96$	4.59
Kv for 41 Pairs of Data	0.9885

The variability is accepted if $Sd \leq Q_0 \times Kv$

Parameter	Value
Standard Deviation (Sd)	0.32
$Q_0 \times Kv$	4.54
Outcome of Variability Test	Pass

Valid Calibration Range

Maximum CAL CEM Value (% v/v)	17.6
Allowable Extension (%)	10

Valid Calibration Range	0 to 19.4 % v/v
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Section 4A - Data and Calculations - QAL2

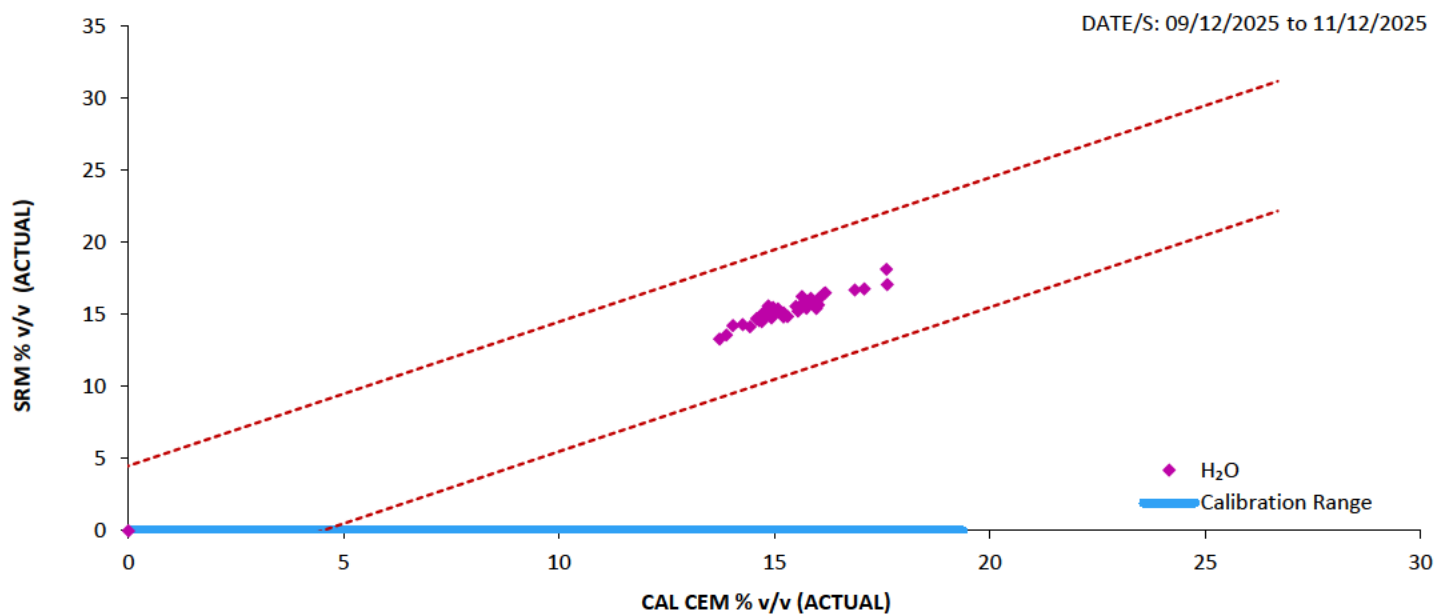
WATER VAPOUR: QAL2 CALCULATIONS

(Page 6 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

PLOT 3: X-Y Plot - ACTUAL CAL CEM vs ACTUAL SRM Values



Section 4A - Data and Calculations - QAL2

OXYGEN: QAL2 CALCULATIONS
(Page 1 of 6)

Thalia Waste Management, Knaresborough
A3- Line 2 - Duty

Calibration Data

Pair	Date	Time (30-minute Average)	x, CEM (WET) % v/v	y, SRM (WET) % v/v	SRM (DRY) % v/v	x - x _{av} (A)	y - y _{av} (B)	(A) x (B)	(x - x _{av}) ²	CAL CEM (WET) % v/v
L1	Surrogate	Near Zero	0.26	0.00	0.00	-5.78	-7.11	41.07	33.38	0.00
1	09/12/2025	15:32 - 16:02	5.99	6.96	8.37	-0.05	-0.15	0.01	0.00	7.04
2	09/12/2025	16:32 - 17:02	6.00	7.42	8.71	-0.04	0.31	-0.01	0.00	7.06
3	09/12/2025	17:32 - 18:02	6.48	7.85	9.30	0.44	0.74	0.32	0.19	7.65
4	09/12/2025	18:32 - 19:02	6.77	7.76	9.25	0.72	0.65	0.47	0.53	8.00
5	09/12/2025	19:32 - 20:02	6.09	7.23	8.56	0.05	0.12	0.01	0.00	7.17
6	09/12/2025	22:32 - 23:02	6.08	7.04	8.43	0.04	-0.07	0.00	0.00	7.16
7	10/12/2025	23:32 - 00:02	6.21	7.51	8.92	0.17	0.40	0.07	0.03	7.32
8	10/12/2025	00:32 - 01:02	6.36	7.55	8.86	0.32	0.44	0.14	0.10	7.50
9	10/12/2025	01:32 - 02:02	6.24	7.17	8.56	0.20	0.06	0.01	0.04	7.35
10	10/12/2025	02:32 - 03:02	6.44	7.51	9.02	0.40	0.41	0.16	0.16	7.60
11	10/12/2025	03:32 - 04:02	5.91	6.94	8.26	-0.13	-0.16	0.02	0.02	6.95
12	10/12/2025	05:32 - 06:02	6.33	7.62	8.79	0.29	0.51	0.15	0.09	7.47
13	10/12/2025	06:32 - 07:02	6.36	7.53	8.71	0.32	0.42	0.13	0.10	7.50
14	10/12/2025	08:32 - 09:02	6.41	7.39	8.62	0.37	0.29	0.11	0.14	7.57
15	10/12/2025	09:32 - 10:02	5.63	6.88	8.29	-0.41	-0.23	0.09	0.17	6.60
16	10/12/2025	10:32 - 11:02	6.34	7.50	8.80	0.30	0.39	0.12	0.09	7.47
17	10/12/2025	11:32 - 12:02	5.89	6.69	8.01	-0.15	-0.42	0.06	0.02	6.92
18	10/12/2025	12:32 - 13:02	6.26	7.44	8.70	0.22	0.33	0.07	0.05	7.38
19	10/12/2025	13:32 - 14:02	6.07	7.52	8.90	0.03	0.41	0.01	0.00	7.14
20	10/12/2025	15:32 - 16:02	6.35	7.33	8.67	0.31	0.22	0.07	0.09	7.49
21	10/12/2025	16:32 - 17:02	6.36	7.69	9.00	0.32	0.58	0.19	0.10	7.50
22	10/12/2025	17:32 - 18:02	6.02	7.33	8.67	-0.02	0.23	-0.01	0.00	7.08
23	10/12/2025	18:32 - 19:02	6.09	7.06	8.35	0.05	-0.05	0.00	0.00	7.16
24	10/12/2025	19:32 - 20:02	6.21	7.31	8.61	0.17	0.20	0.03	0.03	7.32
25	10/12/2025	20:32 - 21:02	6.09	7.31	8.72	0.04	0.20	0.01	0.00	7.16
26	10/12/2025	21:32 - 22:02	6.18	7.41	8.63	0.14	0.30	0.04	0.02	7.28
27	10/12/2025	22:32 - 23:02	6.34	7.55	8.86	0.30	0.45	0.13	0.09	7.47
28	11/12/2025	23:32 - 00:02	6.29	7.16	8.43	0.25	0.05	0.01	0.06	7.42
29	11/12/2025	00:32 - 01:02	6.14	7.15	8.38	0.10	0.04	0.00	0.01	7.23
30	11/12/2025	01:32 - 02:02	5.99	6.89	8.21	-0.05	-0.21	0.01	0.00	7.05
31	11/12/2025	02:32 - 03:02	6.16	7.24	8.52	0.12	0.13	0.02	0.02	7.26
32	11/12/2025	03:32 - 04:02	6.27	7.56	8.82	0.23	0.45	0.11	0.05	7.39
33	11/12/2025	04:32 - 05:02	6.33	7.25	8.52	0.29	0.14	0.04	0.09	7.47
34	11/12/2025	05:32 - 06:02	6.14	7.07	8.39	0.10	-0.04	0.00	0.01	7.23
35	11/12/2025	06:32 - 07:02	6.01	7.01	8.27	-0.03	-0.10	0.00	0.00	7.07
36	11/12/2025	08:32 - 09:02	6.02	7.05	8.36	-0.02	-0.06	0.00	0.00	7.08
37	11/12/2025	09:32 - 10:02	6.20	7.18	8.42	0.16	0.07	0.01	0.03	7.31
38	11/12/2025	10:32 - 11:02	6.11	7.18	8.43	0.07	0.07	0.00	0.00	7.19
39	11/12/2025	11:32 - 12:02	6.20	7.25	8.52	0.16	0.14	0.02	0.02	7.30
40	11/12/2025	12:32 - 13:02	6.05	6.95	8.49	0.01	-0.16	0.00	0.00	7.12
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Section 4A - Data and Calculations - QAL2

OXYGEN: QAL2 CALCULATIONS
(Page 2 of 6)

Thalia Waste Management, Knaresborough
A3- Line 2 - Duty

Calibration Data (continued)

Pair	Date	Time (30-minute Average)	x, CEM (WET) % v/v	y, SRM (WET) % v/v	SRM (DRY) % v/v	x - x _{av} (A)	y - y _{av} (B)	(A) x (B)	(x - x _{av}) ²	CAL CEM (WET) % v/v
66										
67										
68										
69										
70										
71										
72										
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75										
76										
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88										
89										
90										
			MAX SRM - MIN SRM		1.29			SUM	43.71	35.73
			(DAILY) DELV (% v/v)		21					
			95% CI MU (%)		10					
			95% CI at DELV (% v/v)		2.1					
			PROCEDURE (A OR B)		B					

PROCEDURE A If (MAX SRM - MIN SRM) > 95% CI at Daily ELV

PROCEDURE B If (MAX SRM - MIN SRM) < 95% CI at Daily ELV and
MIN SRM ≥ 15% of Daily ELV

WHERE OFFSET = 0.263

Outliers Data

Pair	Date	Time (30-minute Average)	x, CEM (WET) % v/v	y, SRM (WET) % v/v	Reason for Data Pair Removal
					(Statistical Outliers removed following outlier test, other data removed prior to this test)
1	10/12/2025	07:32 - 08:02	0.00	7.96	Instrument performing an auto-zero SRM offline/calibrating Instrument performing an auto-zero Water - Statistical outlier Water - Statistical outlier Oxygen - Statistical outlier
2	10/12/2025	14:32 - 15:02	6.28	0.00	
3	11/12/2025	07:32 - 08:02	0.00	7.18	
4	09/12/2025	20:32 - 21:02	6.12	7.08	
5	10/12/2025	04:32 - 05:02	6.26	7.85	
6	09/12/2025	21:32 - 22:02	6.89	8.37	
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OXYGEN: QAL2 CALCULATIONS

(Page 3 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Derivation of Calibration Function

b =	1.2303	a =	-0.3236	CALIBRATION FUNCTION =	y = 1.2303x - 0.3236
-----	--------	-----	---------	------------------------	----------------------

where

For Method A

$$b = \frac{[(x - x_{av}) \times (y - y_{av})]}{(x - x_{av})^2}$$

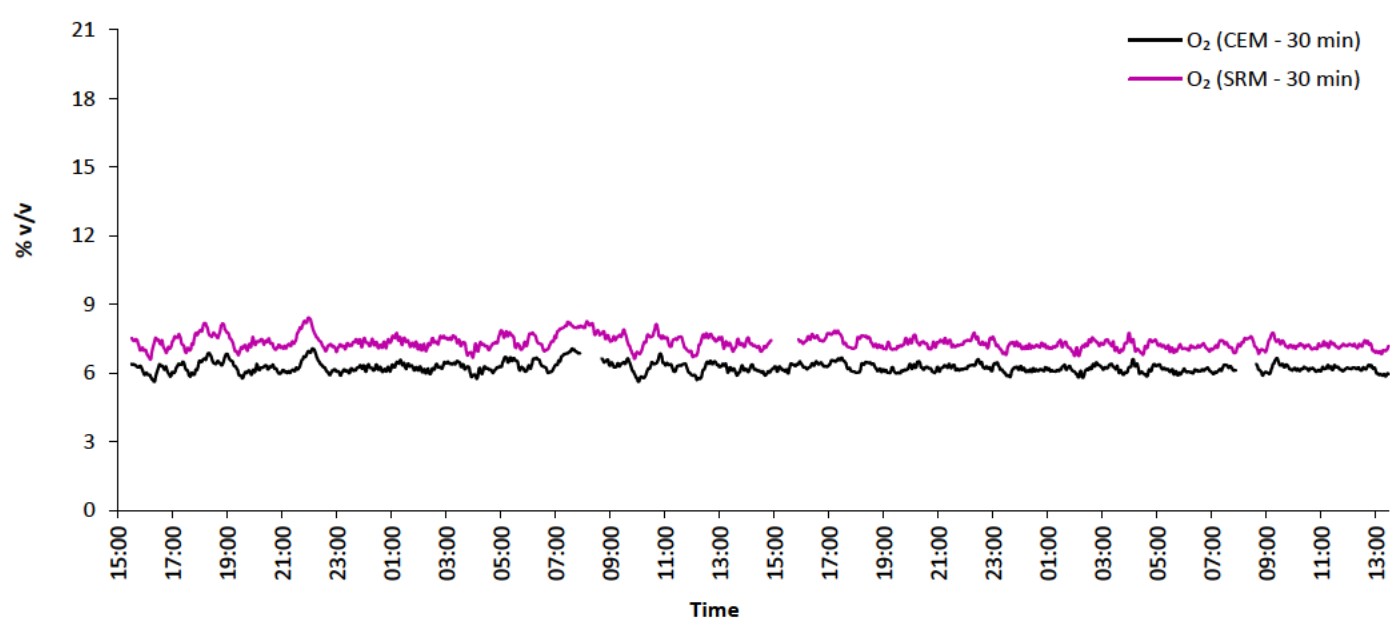
$$\text{and } a = \text{MEAN}(y) - [\text{MEAN}(x) \times b]$$

Method B

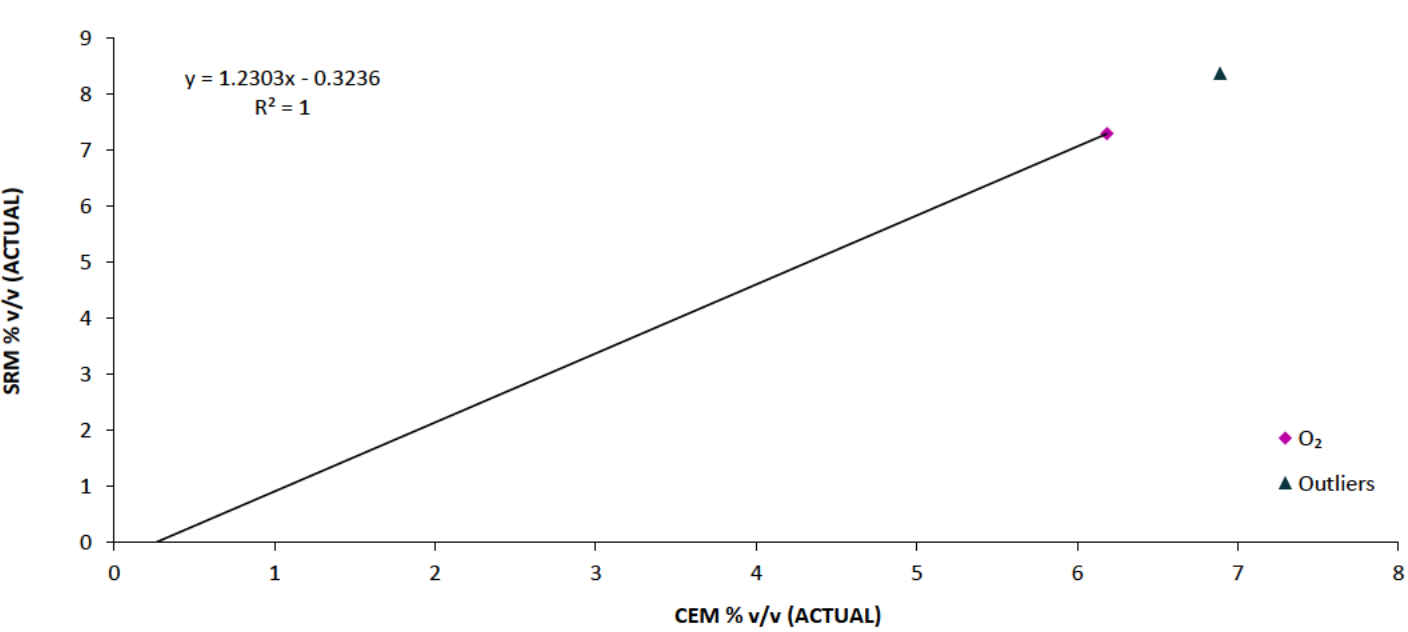
$$b = \text{MEAN}(y) / [\text{MEAN}(x) - \text{OFFSET}]$$

$$\text{and } a = -b \times \text{OFFSET}$$

PLOT 1: GRAPH FOR STP SRM (WET) vs STP CEMS (WET) (30 minute rolling averages)



PLOT 2: Calibration Graph for Method B



Section 4A - Data and Calculations - QAL2

OXYGEN: QAL2 CALCULATIONS

(Page 4 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Variability Test Data

Pair	Date	Time (30-minute Average)	CAL CEM (DRY) % v/v	ys, SRM (DRY) % v/v	UNCAL CEM (WET) % v/v	ys, SRM - CAL CEM
L1	Surrogate	Near Zero	0.00	0.00	0.26	0.00
1	09/12/2025	15:32 - 16:02	8.50	8.37	5.99	-0.13
2	09/12/2025	16:32 - 17:02	8.34	8.71	6.00	0.38
3	09/12/2025	17:32 - 18:02	8.98	9.30	6.48	0.32
4	09/12/2025	18:32 - 19:02	9.51	9.25	6.77	-0.25
5	09/12/2025	19:32 - 20:02	8.48	8.56	6.09	0.08
6	09/12/2025	22:32 - 23:02	8.54	8.43	6.08	-0.11
7	10/12/2025	23:32 - 00:02	8.71	8.92	6.21	0.21
8	10/12/2025	00:32 - 01:02	8.82	8.86	6.36	0.04
9	10/12/2025	01:32 - 02:02	8.71	8.56	6.24	-0.16
10	10/12/2025	02:32 - 03:02	9.14	9.02	6.44	-0.12
11	10/12/2025	03:32 - 04:02	8.26	8.26	5.91	-0.01
12	10/12/2025	05:32 - 06:02	8.66	8.79	6.33	0.13
13	10/12/2025	06:32 - 07:02	8.71	8.71	6.36	0.00
14	10/12/2025	08:32 - 09:02	8.80	8.62	6.41	-0.18
15	10/12/2025	09:32 - 10:02	8.02	8.29	5.63	0.28
16	10/12/2025	10:32 - 11:02	8.76	8.80	6.34	0.05
17	10/12/2025	11:32 - 12:02	8.25	8.01	5.89	-0.24
18	10/12/2025	12:32 - 13:02	8.65	8.70	6.26	0.06
19	10/12/2025	13:32 - 14:02	8.48	8.90	6.07	0.42
20	10/12/2025	15:32 - 16:02	8.82	8.67	6.35	-0.15
21	10/12/2025	16:32 - 17:02	8.79	9.00	6.36	0.22
22	10/12/2025	17:32 - 18:02	8.42	8.67	6.02	0.25
23	10/12/2025	18:32 - 19:02	8.42	8.35	6.09	-0.07
24	10/12/2025	19:32 - 20:02	8.63	8.61	6.21	-0.03
25	10/12/2025	20:32 - 21:02	8.53	8.72	6.09	0.18
26	10/12/2025	21:32 - 22:02	8.51	8.63	6.18	0.12
27	10/12/2025	22:32 - 23:02	8.75	8.86	6.34	0.11
28	11/12/2025	23:32 - 00:02	8.71	8.43	6.29	-0.28
29	11/12/2025	00:32 - 01:02	8.47	8.38	6.14	-0.10
30	11/12/2025	01:32 - 02:02	8.39	8.21	5.99	-0.18
31	11/12/2025	02:32 - 03:02	8.56	8.52	6.16	-0.05
32	11/12/2025	03:32 - 04:02	8.62	8.82	6.27	0.20
33	11/12/2025	04:32 - 05:02	8.77	8.52	6.33	-0.24
34	11/12/2025	05:32 - 06:02	8.57	8.39	6.14	-0.18
35	11/12/2025	06:32 - 07:02	8.38	8.27	6.01	-0.11
36	11/12/2025	08:32 - 09:02	8.43	8.36	6.02	-0.08
37	11/12/2025	09:32 - 10:02	8.56	8.42	6.20	-0.14
38	11/12/2025	10:32 - 11:02	8.48	8.43	6.11	-0.05
39	11/12/2025	11:32 - 12:02	8.58	8.52	6.20	-0.06
40	11/12/2025	12:32 - 13:02	8.63	8.49	6.05	-0.15
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Section 4A - Data and Calculations - QAL2

OXYGEN: QAL2 CALCULATIONS
(Page 5 of 6)

Thalia Waste Management, Knaresborough
A3- Line 2 - Duty

Variability Test Data (continued)

Pair	Date	Time (30-minute Average)	CAL CEM (DRY) % v/v	ys, SRM (DRY) % v/v	UNCAL CEM (WET) % v/v	ys, SRM - CAL CEM
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90						
			MAX	AVERAGE	AVERAGE	Sd
			9.51	8.61	6.18	0.18

Test of Variability

$Q_0 = ELV \times (MU / 100) / 1.96$	1.07
Kv for 40 Pairs of Data	0.9885

The variability is accepted if $Sd \leq Q_0 \times Kv$

Parameter	Value
Standard Deviation (Sd)	0.18
$Q_0 \times Kv$	1.06
Outcome of Variability Test	Pass

Valid Calibration Range

Maximum CAL CEM Value (% v/v)	9.5
Allowable Extension (%)	10

Valid Calibration Range	0 to 10.5 % v/v
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Section 4A - Data and Calculations - QAL2

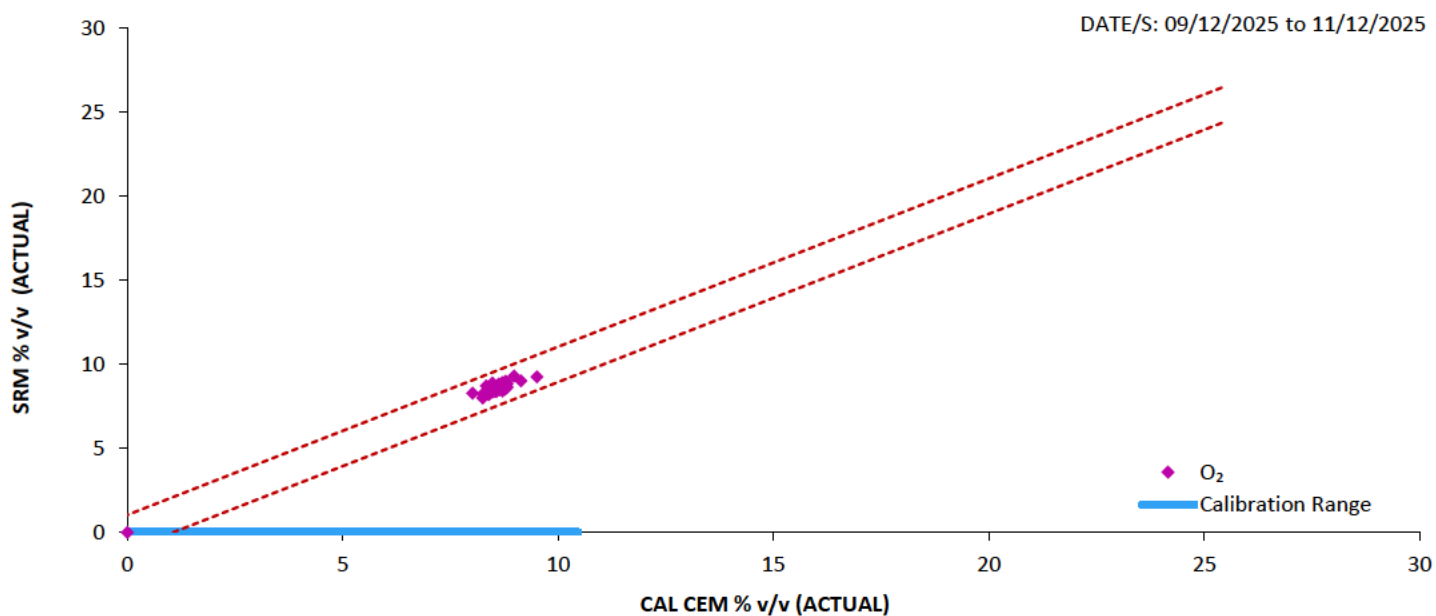
OXYGEN: QAL2 CALCULATIONS

(Page 6 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

PLOT 3: X-Y Plot - ACTUAL CAL CEM vs ACTUAL SRM Values



Section 4A - Data and Calculations - QAL2

CARBON DIOXIDE: QAL2 CALCULATIONS

(Page 1 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Calibration Data

Pair	Date	Time (30-minute Average)	x, CEM (WET) % v/v	y, SRM (WET) % v/v	x - x _{av} (A)	y - y _{av} (B)	(A) x (B)	(x - x _{av}) ²	CAL CEM (WET) % v/v
L1	Surrogate	Near Zero	0.23	0.00	-7.72	-8.72	67.26	59.54	0.00
1	09/12/2025	15:32 - 16:02	8.01	8.92	0.06	0.20	0.01	0.00	8.79
2	09/12/2025	16:32 - 17:02	8.17	8.78	0.23	0.06	0.01	0.05	8.98
3	09/12/2025	18:32 - 19:02	7.52	8.30	-0.43	-0.41	0.18	0.18	8.23
4	09/12/2025	19:32 - 20:02	8.18	8.89	0.24	0.18	0.04	0.06	8.98
5	09/12/2025	20:32 - 21:02	8.19	8.92	0.25	0.21	0.05	0.06	9.00
6	09/12/2025	22:32 - 23:02	8.11	9.01	0.16	0.29	0.05	0.03	8.90
7	10/12/2025	23:32 - 00:02	8.01	8.66	0.06	-0.06	0.00	0.00	8.79
8	10/12/2025	00:32 - 01:02	8.05	8.77	0.11	0.05	0.01	0.01	8.84
9	10/12/2025	01:32 - 02:02	8.06	8.84	0.12	0.13	0.01	0.01	8.85
10	10/12/2025	02:32 - 03:02	7.64	8.36	-0.31	-0.36	0.11	0.09	8.37
11	10/12/2025	03:32 - 04:02	8.30	9.10	0.35	0.38	0.13	0.13	9.12
12	10/12/2025	05:32 - 06:02	8.21	8.85	0.27	0.14	0.04	0.07	9.02
13	10/12/2025	06:32 - 07:02	8.19	8.92	0.24	0.20	0.05	0.06	8.99
14	10/12/2025	08:32 - 09:02	8.14	9.04	0.20	0.33	0.07	0.04	8.94
15	10/12/2025	09:32 - 10:02	8.20	8.96	0.26	0.24	0.06	0.07	9.01
16	10/12/2025	10:32 - 11:02	8.09	8.82	0.15	0.11	0.02	0.02	8.88
17	10/12/2025	11:32 - 12:02	8.25	9.24	0.31	0.53	0.16	0.10	9.07
18	10/12/2025	12:32 - 13:02	8.09	8.90	0.15	0.19	0.03	0.02	8.89
19	10/12/2025	13:32 - 14:02	8.05	8.62	0.11	-0.10	-0.01	0.01	8.84
20	10/12/2025	15:32 - 16:02	8.04	8.93	0.09	0.22	0.02	0.01	8.82
21	10/12/2025	16:32 - 17:02	8.11	8.72	0.16	0.00	0.00	0.03	8.90
22	10/12/2025	17:32 - 18:02	8.20	8.94	0.26	0.23	0.06	0.07	9.01
23	10/12/2025	18:32 - 19:02	8.24	9.09	0.30	0.37	0.11	0.09	9.06
24	10/12/2025	19:32 - 20:02	8.07	8.93	0.12	0.22	0.03	0.02	8.86
25	10/12/2025	20:32 - 21:02	8.06	8.68	0.11	-0.03	0.00	0.01	8.84
26	10/12/2025	21:32 - 22:02	8.30	9.06	0.35	0.34	0.12	0.12	9.11
27	10/12/2025	22:32 - 23:02	8.22	8.82	0.28	0.10	0.03	0.08	9.03
28	11/12/2025	23:32 - 00:02	8.15	9.08	0.20	0.36	0.07	0.04	8.95
29	11/12/2025	00:32 - 01:02	8.30	9.22	0.36	0.51	0.18	0.13	9.12
30	11/12/2025	01:32 - 02:02	8.23	9.19	0.28	0.47	0.13	0.08	9.04
31	11/12/2025	02:32 - 03:02	8.20	9.11	0.26	0.39	0.10	0.07	9.01
32	11/12/2025	03:32 - 04:02	8.37	8.94	0.43	0.22	0.10	0.19	9.20
33	11/12/2025	04:32 - 05:02	8.11	9.08	0.17	0.36	0.06	0.03	8.90
34	11/12/2025	05:32 - 06:02	8.16	9.12	0.21	0.40	0.09	0.05	8.96
35	11/12/2025	06:32 - 07:02	8.34	9.30	0.39	0.58	0.23	0.15	9.16
36	11/12/2025	08:32 - 09:02	8.30	9.19	0.35	0.47	0.17	0.13	9.12
37	11/12/2025	09:32 - 10:02	8.28	9.20	0.34	0.49	0.17	0.11	9.10
38	11/12/2025	10:32 - 11:02	8.29	9.16	0.35	0.45	0.16	0.12	9.11
39	11/12/2025	11:32 - 12:02	8.18	9.04	0.24	0.32	0.08	0.06	8.98
40	11/12/2025	12:32 - 13:02	7.86	8.68	-0.09	-0.04	0.00	0.01	8.62
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43									
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Section 4A - Data and Calculations - QAL2

CARBON DIOXIDE: QAL2 CALCULATIONS

(Page 2 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Calibration Data (continued)

Pair	Date	Time (30-minute Average)	x, CEM (WET) % v/v	y, SRM (WET) % v/v	x - x _{av} (A)	y - y _{av} (B)	(A) x (B)	(x - x _{av}) ²	CAL CEM (WET) % v/v
66									
67									
68									
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90									
MAX SRM - MIN SRM				0.99					
(DAILY) DELV (% v/v)				10					
95% CI MU (%)				10					
95% CI at DELV (% v/v)				1.0					
PROCEDURE (A OR B)				B					
						SUM	70.17	62.14	

PROCEDURE A If (MAX SRM - MIN SRM) > 95% CI at Daily ELV

PROCEDURE B If (MAX SRM - MIN SRM) < 95% CI at Daily ELV and MIN SRM ≥ 15% of Daily ELV

WHERE OFFSET = 0.2266

Outliers Data

Pair	Date	Time (30-minute Average)	x, CEM (WET) % v/v	y, SRM (WET) % v/v	Reason for Data Pair Removal
(Statistical Outliers removed following outlier test, other data removed prior to this test)					
1	10/12/2025	07:32 - 08:02	0.00	8.88	Instrument performing an auto-zero
2	10/12/2025	14:32 - 15:02	8.02	0.00	SRM offline/calibrating
3	11/12/2025	07:32 - 08:02	0.00	9.15	Instrument performing an auto-zero
4	09/12/2025	17:32 - 18:02	7.89	8.28	Statistical outlier
5	09/12/2025	21:32 - 22:02	7.57	7.93	Statistical outlier
6	10/12/2025	04:32 - 05:02	8.07	8.50	Statistical outlier
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9					
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24					
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Section 4A - Data and Calculations - QAL2

CARBON DIOXIDE: QAL2 CALCULATIONS

(Page 3 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Derivation of Calibration Function

b =	1.1296	a =	-0.2560
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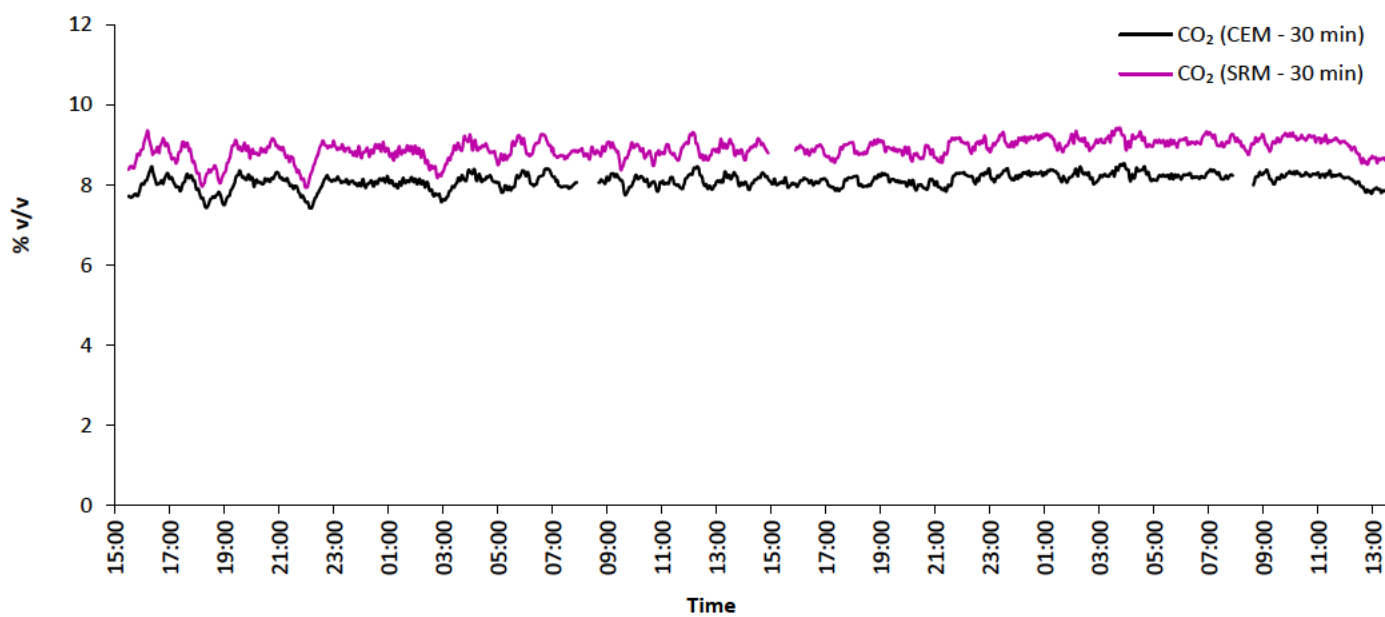
CALIBRATION FUNCTION =	$y = 1.1296x - 0.2560$
------------------------	------------------------

where

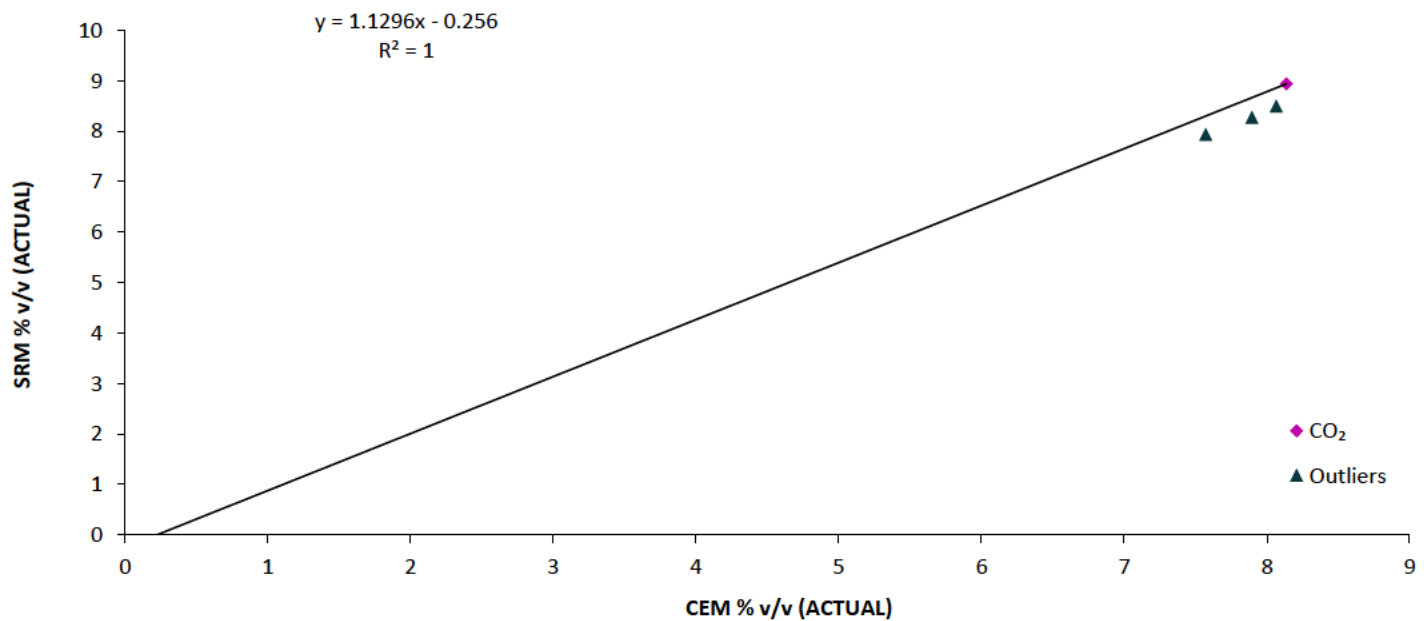
For Method A $b = [(x - x_{av}) \times (y - y_{av})] / (x - x_{av})^2$ and $a = \text{MEAN}(y) - [\text{MEAN}(x) \times b]$

Method B $b = \text{MEAN}(y) / [\text{MEAN}(x) - \text{OFFSET}]$ and $a = -b \times \text{OFFSET}$

PLOT 1: GRAPH FOR STP SRM (WET) vs STP CEMS (WET) (30 minute rolling averages)



PLOT 2: Calibration Graph for Method B



Section 4A - Data and Calculations - QAL2

CARBON DIOXIDE: QAL2 CALCULATIONS

(Page 4 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Variability Test Data

Pair	Date	Time (30-minute Average)	CAL CEM (WET) % v/v	ys, SRM (WET) % v/v	UNCAL CEM (WET) % v/v	ys, SRM - CAL CEM
L1	Surrogate	Near Zero	0.00	0.00	0.23	0.00
1	09/12/2025	15:32 - 16:02	8.79	8.92	8.01	0.13
2	09/12/2025	16:32 - 17:02	8.98	8.78	8.17	-0.20
3	09/12/2025	18:32 - 19:02	8.23	8.30	7.52	0.07
4	09/12/2025	19:32 - 20:02	8.98	8.89	8.18	-0.09
5	09/12/2025	20:32 - 21:02	9.00	8.92	8.19	-0.08
6	09/12/2025	22:32 - 23:02	8.90	9.01	8.11	0.11
7	10/12/2025	23:32 - 00:02	8.79	8.66	8.01	-0.13
8	10/12/2025	00:32 - 01:02	8.84	8.77	8.05	-0.07
9	10/12/2025	01:32 - 02:02	8.85	8.84	8.06	-0.01
10	10/12/2025	02:32 - 03:02	8.37	8.36	7.64	-0.01
11	10/12/2025	03:32 - 04:02	9.12	9.10	8.30	-0.02
12	10/12/2025	05:32 - 06:02	9.02	8.85	8.21	-0.17
13	10/12/2025	06:32 - 07:02	8.99	8.92	8.19	-0.07
14	10/12/2025	08:32 - 09:02	8.94	9.04	8.14	0.10
15	10/12/2025	09:32 - 10:02	9.01	8.96	8.20	-0.05
16	10/12/2025	10:32 - 11:02	8.88	8.82	8.09	-0.06
17	10/12/2025	11:32 - 12:02	9.07	9.24	8.25	0.17
18	10/12/2025	12:32 - 13:02	8.89	8.90	8.09	0.01
19	10/12/2025	13:32 - 14:02	8.84	8.62	8.05	-0.22
20	10/12/2025	15:32 - 16:02	8.82	8.93	8.04	0.11
21	10/12/2025	16:32 - 17:02	8.90	8.72	8.11	-0.18
22	10/12/2025	17:32 - 18:02	9.01	8.94	8.20	-0.06
23	10/12/2025	18:32 - 19:02	9.06	9.09	8.24	0.03
24	10/12/2025	19:32 - 20:02	8.86	8.93	8.07	0.08
25	10/12/2025	20:32 - 21:02	8.84	8.68	8.06	-0.16
26	10/12/2025	21:32 - 22:02	9.11	9.06	8.30	-0.06
27	10/12/2025	22:32 - 23:02	9.03	8.82	8.22	-0.21
28	11/12/2025	23:32 - 00:02	8.95	9.08	8.15	0.13
29	11/12/2025	00:32 - 01:02	9.12	9.22	8.30	0.10
30	11/12/2025	01:32 - 02:02	9.04	9.19	8.23	0.15
31	11/12/2025	02:32 - 03:02	9.01	9.11	8.20	0.10
32	11/12/2025	03:32 - 04:02	9.20	8.94	8.37	-0.26
33	11/12/2025	04:32 - 05:02	8.90	9.08	8.11	0.18
34	11/12/2025	05:32 - 06:02	8.96	9.12	8.16	0.16
35	11/12/2025	06:32 - 07:02	9.16	9.30	8.34	0.14
36	11/12/2025	08:32 - 09:02	9.12	9.19	8.30	0.07
37	11/12/2025	09:32 - 10:02	9.10	9.20	8.28	0.11
38	11/12/2025	10:32 - 11:02	9.11	9.16	8.29	0.06
39	11/12/2025	11:32 - 12:02	8.98	9.04	8.18	0.05
40	11/12/2025	12:32 - 13:02	8.62	8.68	7.86	0.06
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CARBON DIOXIDE: QAL2 CALCULATIONS

(Page 5 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

Variability Test Data (continued)

Pair	Date	Time (30-minute Average)	CAL CEM (WET) % v/v	ys, SRM (WET) % v/v	UNCAL CEM (WET) % v/v	ys, SRM - CAL CEM
66						
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87						
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89						
90						
			MAX	AVERAGE	AVERAGE	Sd
			9.20	8.93	8.14	0.12

Test of Variability

$Q_0 = ELV \times (MU / 100) / 1.96$	0.51
Kv for 40 Pairs of Data	0.9885

The variability is accepted if $Sd \leq Q_0 \times Kv$

Parameter	Value
Standard Deviation (Sd)	0.12
$Q_0 \times Kv$	0.50
Outcome of Variability Test	Pass

Valid Calibration Range

Maximum CAL CEM Value (% v/v)	9.2
Allowable Extension (%)	10

Valid Calibration Range	0 to 10.1 % v/v
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Section 4A - Data and Calculations - QAL2

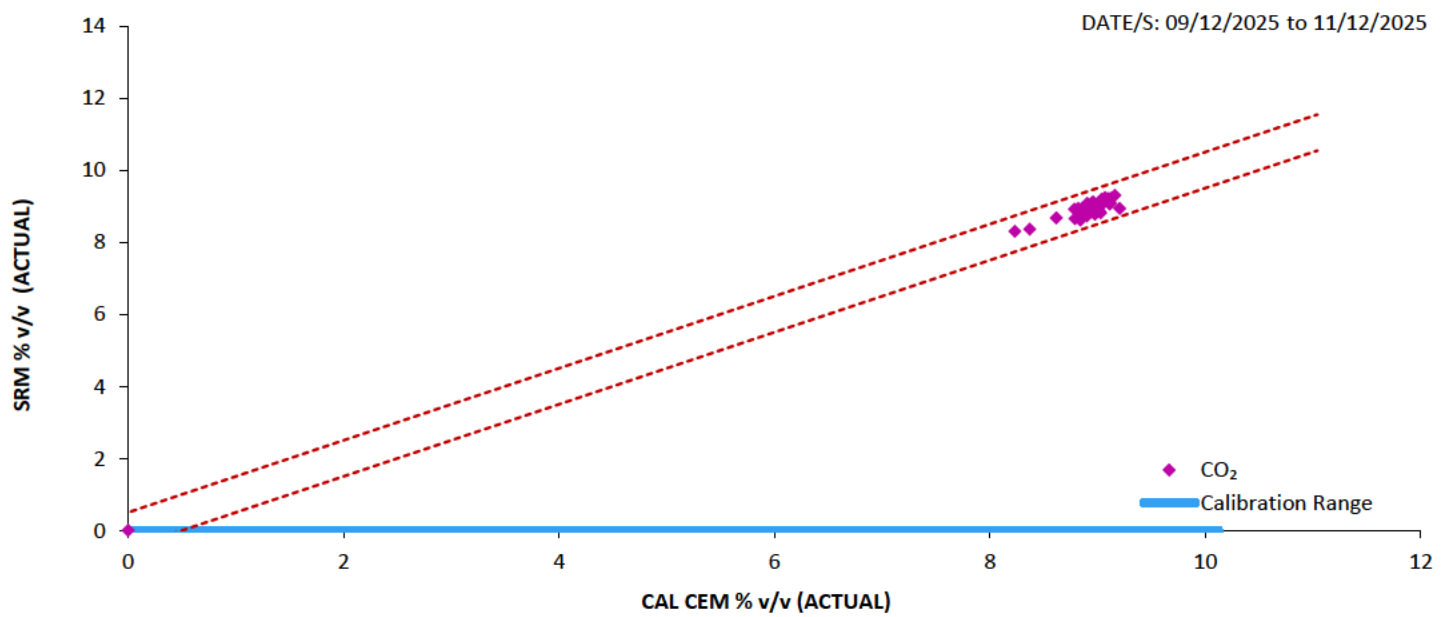
CARBON DIOXIDE: QAL2 CALCULATIONS

(Page 6 of 6)

Thalia Waste Management, Knaresborough

A3- Line 2 - Duty

PLOT 3: X-Y Plot - ACTUAL CAL CEM vs ACTUAL SRM Values



Section 5 - Results of the Functional Checks

FUNCTIONAL CHECKS OF CEM

Thalia Waste Management, Knaresborough
A3- Line 2 - Duty

Reference Materials Available on Site

Parameter	QAL3 Check Gas	Concentration (mg/m³ / %)	QAL3 Check Gas Supplier	Cylinder Number	Cylinder Expiry Date	Certified Accuracy
Total VOCs	C ₃ H ₈	Report not seen by Element				
Nitrogen Monoxide	NO					
Nitrogen Dioxide	NO ₂					
Sulphur Dioxide	SO ₂					
Nitrous Oxide	N ₂ O					
Carbon Monoxide	CO					
Hydrogen Chloride	HCl					
Ammonia	NH ₃					
Water Vapour	H ₂ O					
Oxygen	O ₂					
Carbon Dioxide	CO ₂					

CEM Checks

Parameter	Analyser System Check				Sampling Line System Check			
	Gas Conc. (mg/m³ / %)	Zero (mg/m³ / %)	Span (mg/m³ / %)	Response (T ₉₀ - secs)	Gas Conc. (mg/m³ / %)	Zero (mg/m³ / %)	Span (mg/m³ / %)	Response (T ₉₀ - secs)
Total VOCs	See appended report for linearity							
Nitrogen Monoxide								
Nitrogen Dioxide								
Sulphur Dioxide								
Nitrous Oxide								
Carbon Monoxide								
Hydrogen Chloride								
Ammonia								
Water Vapour								
Oxygen								
Carbon Dioxide								

Section 5 - Results of the Functional Checks

PRO-FORMA FOR ASSESSING AND REPORTING THE RESULTS OF THE FUNCTIONAL TESTS

(Page 1 of 4)

Functional Checks Performed By	C & I
Date/s Functional Checks Performed	17th - 19th November 2025 / 15th January 2026

1. Alignment and Cleanliness (Non-Extractive CEMs Only)

Requirement	Performed	Notes
A visual inspection, with reference to the CEMs manuals, shall be carried out on the following when applicable:		
Internal check of the CEM.	No	Report not seen by Element
Cleanliness of the optical components.	No	Report not seen by Element
Flushing air supply.	No	Report not seen by Element
Optical path free from obstructions.	No	Report not seen by Element
After re-assembly at the measurement location, at least the following shall be checked:		
Alignment of the measuring system.	No	Report not seen by Element
Contamination control (internal check of optical surfaces).	No	Report not seen by Element

2. Sampling System (Extractive CEMs Only)

Requirement	Performed	Notes
A visual inspection of the sampling system shall be performed, noting the condition of the following components, when fitted:		
Sampling probe.	No	Report not seen by Element
Gas conditioning systems.	No	Report not seen by Element
Pumps.	No	Report not seen by Element
All connections.	No	Report not seen by Element
Sample lines.	No	Report not seen by Element
Power supplies.	No	Report not seen by Element
Filters.	No	Report not seen by Element
NOx converters – if the sampling system contains a NOx converter, then the test laboratory shall record when the last efficiency-test was performed, and the result of this test.	No	Report not seen by Element
The sampling system shall be in good condition and free of any visible faults, which may decrease the quality of the data.	No	Report not seen by Element

3. Leak testing

Requirement	Performed	Notes
Leak Testing shall be performed according to the CEMs manuals. The test shall cover the entire sampling system.	No	See Section 5 of the Test Report - "CEMs Checks" for the results of the leak check.

4. Zero and Span Check

Requirement	Performed	Notes
Reference zero and span materials shall be used to verify the corresponding readings of the CEMs. Ensure the reading on the DAHS Computer reflects the reading on the screen of the CEMs Analyser/s.	No	See Section 5 of the Test Report - "CEMs Checks" for the results of the zero and span checks. The reading on the DAHS was cross-referenced with the CEMs screen to ensure the logged reading was correct.

PRO-FORMA FOR ASSESSING AND REPORTING THE RESULTS OF THE FUNCTIONAL TESTS

(Page 2 of 4)

4. Zero and Span Check (continued)		
Requirement	Performed	Notes
For non-extractive CEMs, zero and span checks shall be performed using a reference-path free of flue gas before and after readjustment and after re-assembly of the CEM at the measurement location.	No	See Section 5 of the Test Report - "CEMs Checks" for the results of the zero and span checks. The reading on the DAHS was cross-referenced with the CEMs screen to ensure the logged reading was correct.

5. Linearity		
Requirement	Performed	Notes
During the calibration / linearity tests the applied concentrations should be logged onto the DAHS to prove the complete system. i.e. Concentration applied to the instrument is represented by the instrument output and identical to the value logged on the DAHS. DAHS logged values should be included in the instrument service report.	Yes	See appended report
The linearity of the CEM response shall be checked using five different reference materials, including a zero concentration.	Yes	See appended report
The reference material with zero concentration, as well as the reference materials with four different concentrations, shall have a verifiable quantity and quality.	Yes	See Section 5 of the Test Report - "Reference Materials Used for CEMs Linearity Checks".
In case of gaseous reference materials, these four reference materials can be obtained from different gas cylinders or can be prepared by means of a calibrated dilution system from one single gas concentration. The uncertainty must be $\leq 2\%$ and where they	Yes	See appended report
The reference material concentrations shall be selected such that the measured values are at approximately 20%, 40%, 60% and 80% of the range that is at least the short-term ELV. It is necessary to know the values of the ratios of their concentrations precisely enough so that an incorrect failure of the linearity test does not occur. The dry test reference material shall be applied to the inlet of the CEM. (i.e. not down the line)	Yes	See appended report
The individual CEMs are tested using the following concentrations applied in a randomised sequence:		
Reference material with zero concentration	Yes	See appended report
Reference material concentration approximately 20% of the range (i.e. the short-term ELV)	Yes	See appended report
Reference material concentration approximately 40% of the range (i.e. the short-term ELV)	Yes	See appended report
Reference material concentration approximately 60% of the range (i.e. the short-term ELV)	Yes	See appended report
Reference material concentration approximately 80% of the range (i.e. the short-term ELV)	Yes	See appended report
Reference material with zero concentration	Yes	See appended report

6. Interferences		
Requirement	Performed	Notes
A test shall be undertaken if the process gases to be monitored contain components that are known interferences, as identified during QAL1 and there is a failure of the QAL2 or AST which could be due to interferences.	No	

PRO-FORMA FOR ASSESSING AND REPORTING THE RESULTS OF THE FUNCTIONAL TESTS

(Page 3 of 4)

7. Zero and Span Drift Audit		
Requirement	Performed	Notes
The test laboratory shall assess whether the operator has a QAL3 procedure in place, and whether the operator has applied this procedure. The evidence would comprise (i) a documented procedure, (ii) zero and span data, (iii) control charts.	No	Not seen by Element

8. Response Time		
Requirement	Performed	Notes
The response time of the CEM shall be checked. This can be performed, if appropriate, by feeding of the reference material at the end of the sampling probe. The response time shall not exceed the performance requirement applied during the QAL1 tests. (i.e. 200 seconds)	No	Parameter specific response times can be found in the Zero and Span Gas Functional Test Table (above).

9. Service Report (THIS IS AN AUDIT OF THE SERVICE REPORT, STATE IF THE REQUIRED INFO IS PRESENT OR NOT IN THE SERVICE REPORT)		
Requirement	Performed	Notes
As a minimum requirement the service report should include the following:		
Document reference for work instruction for the type of work being undertaken.	No	Not seen by Element
Instrument manufacturer.	No	Not seen by Element
Instrument type.	No	Not seen by Element
Instrument model.	No	Not seen by Element
Instrument serial no.	No	Not seen by Element
Operating principle.	No	Not seen by Element
Operating range.	No	Not seen by Element
Certification details.	No	Not seen by Element
Compliance with MCERTS. (including certificate no.)	No	Not seen by Element
Location.	No	Not seen by Element
Date and time work was undertaken.	No	Not seen by Element
Equipment used - type, serial no's, calibration dates.	No	Not seen by Element
Gases used - certificate no's, expiry dates, binary or mixture.	No	Not seen by Element
Calibration and linearity data as required by EN14181.	No	Not seen by Element
Logged data for the period of calibration and linearity. NOTE: There may be gaps in the data, for example, if the CEMs are removed from the stack for the linearity test. In such cases, the test laboratory shall state why there are gaps in the data.	No	Not seen by Element
Name and signature of the service engineer present on the service report?	No	Not seen by Element

PRO-FORMA FOR ASSESSING AND REPORTING THE RESULTS OF THE FUNCTIONAL TESTS

(Page 4 of 4)

10. Documentation and Records		
Requirement	Available	Notes
A plan of the CEM.	No	Not seen by Element
All manuals (maintenance, users, etc).	No	Not seen by Element
Log books to document possible malfunctions and action taken.	No	Not seen by Element
Service reports.	No	Not seen by Element
QAL3 documentation including actions taken as a result of out of control situations.	No	Not seen by Element
Management system procedures for maintenance, calibration and training.	No	Not seen by Element
Training records.	No	Not seen by Element
Maintenance schedules.	No	Not seen by Element
Auditing plans and records - evidence that the operator includes the procedures for the management of the CEMs within the auditing cycle of the management system.	No	Not seen by Element
Existing instrument calibration functions / gain factors.	No	Not seen by Element
Documentation and records audit completed and validated prior to commencing SRM testing.	No	Not seen by Element

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



CEMS SERVICE RECORD

Date	Customer	Site	System	Engineer	Service Type		
15/01/2026	Thalia	Allerton	Line 1 Duty	G.Stone	Intermediate		
Multigas type	Serial No	FID Type	Serial No	Oxygen Type	Serial No	Particulate Type 1	Serial No
MIRFT	153621	GR52M	888	MIR ZR O2	N/A	QAL181	52995
Extract Probe	Serial No	Flow Type	Serial No	Pressure Type	Serial No		
HoFi	2362	SF400	98851	E+H Cerabar M	KC038901128		

MIRFT Checks

Review sampling system from probe to analyser. Note any issues.
 Check temperature set points & current temperature reading at probe & heated line.
 Check Calcmeter for residual alarms. Note any issues.
 Check Calcmeter for any other alarms. Note any issues.
 Check background graph shape. Take screenshot for reference. Note any issues.
 Check IFG Height on N2 - ideally around 5V (+/- 0.3V)
 Check IFG Centre - Ideally 2400 (+/- 50)
 Check Sample Cell Pressure - Ideally between 995-900mbar
 Check Cell Temperature - Should be 180C & stable
 Check interferometer Temperature - less than 45C
 Check Detector Temperature = -37C and stable
 Check all residual alarms set correctly (0.01 warning, 0.02 alarm)
 Record date of last H2O calibration

Result

Good no issues
180c/180c - 200c/200c
No Residual alarms
No Alarms
Background Good
5.02
2460
917
177
44
37
All Correct
28/11/2025
7.2
Yes
Smooth
9.16
57889

Service Menu Checks

Check laser peak to peak is between 8-20V, if not adjust
 Check velocity is smooth, if not adjust
 Check IGR signal and adjust focusing mirrors
 Check IR voltage is between 9.15 - 9.25V
 Check background max is around 60,000

Zero Check

H2O	CO2	CO	N2O	NO	CH4
0.02	0.06	0.02	0	0.59	0.06
SO2	NH3	HCl			
0.19	0.05	0.05			

	Within 2% FS?
<Gas	
<Zero Reading	
<Gas	
<Zero Reading	
	Within 2% FS?

Span Check

CO2	CO	NO2	NO	
10	100.875	20.229	267	40
9.98	101.788	22.06	269	41.03
SO2	NH3	HCl		
199.914	20.74	57.921		
199.33	20.87	56.304		

<Gas	
<Expected Reading	
<Actual Reading	
<Gas	
<Expected Reading	
<Actual Reading	

GR52M Checks

Check heated line temperature - 180C
 Check Sample flow rate - 200mbar (+/- 20mbar)
 Check Fuel Gas Pressure - 700mbar (+/- 20mbar)
 Check Air Pressure - 400mbar (+/- 20mbar)
 Check Air Catalyst Temp - 400C (+/- 5C)

180
112
694
402
397

Check FID temp 191C
 Check PCB temp - less than 45C
 Check Range is set to 2 (0-100mg/m3)

Zero Check

<u>0.2</u>
0

Span Check

20.891
22

191
39
Range Correct
Within 2% FS?
<Expected Reading
<Actual Reading

MIR ZR 02 Checks

Check O2 reading at probe matches on DAHS (Raw Data)

Zero Check

<u>0</u>
0

Span Check

11
11.01

Within 2% FS?
<Expected Reading
<Actual Reading

QAL181 Checks

Check reading on controller matches on DAHS (Raw Data)
 Check Zero & Span Checks are within tolerance

Yes
Yes

General

Check previous QAL3 results - discuss any regular issues

All passed from 5/01/26

Notes

Line1 lazer slightly lower and will not improve with adjustment. Line 1 GR52M needed a new calibration factor to correct and also a new Diaphragm for pump.



CEMS SERVICE RECORD

Date	Customer	Site		System	Engineer	Service Type	
15/01/2026	Thalia	Allerton		Line 2 Duty	G.Stone	Intermediate	
Multigas type	Serial No	FID Type	Serial No	Oxygen Type	Serial No	Particulate Type	Serial No
MIRFT	153264	GR52M	880	MIR ZR O2	N/A	QAL181	52994
Extract Probe	Serial No	Flow Type	Serial No	Pressure Type	Serial No		
HoFi	2364	SF400	52715	E+H Cerabar M	KC038801128		

MIRFT Checks

Review sampling system from probe to analyser. Note any issues.
 Check temperature set points & current temperature reading at probe & heated line.
 Check Calcmeter for residual alarms. Note any issues.
 Check Calcmeter for any other alarms. Note any issues.
 Check background graph shape. Take screenshot for reference. Note any issues.
 Check IFG Height on N2 - ideally around 5V (+/- 0.3V)
 Check IFG Centre - Ideally 2400 (+/- 50)
 Check Sample Cell Pressure - Ideally between 995-900mbar
 Check Cell Temperature - Should be 180C & stable
 Check interferometer Temperature - less than 45C
 Check Detector Temperature = -37C and stable
 Check all residual alarms set correctly (0.01 warning, 0.02 alarm)
 Record date of last H2O calibration

Service Menu Checks

Check laser peak to peak is between 8-20V, if not adjust
 Check velocity is smooth, if not adjust
 Check IGR signal and adjust focusing mirrors
 Check IR voltage is between 9.15 - 9.25V
 Check background max is around 60,000

Zero Check

H2O	CO2	CO	N2O	NO	NO2
0.02	0.14	0.03	0	0.15	0
SO2	NH3	HCl			
0	0	0.07			

Span Check

	CO2	CO	NO2	NO	
	10	100.875	20.229	267	40
	9.77	97.99	20.201	265.49	40.2
SO2	NH3	HCl			
199.914	20.74	57.921			
198.667	21.01	57.68			

Result

Good No Issues
180c/180c - 200c/200c
No Residual Alarms
No Alarms
Good Background
4.8
2350
900
180
41
37
All Correct
04/11/2025
10
Yes
08-Jan
09/01/1900
57000
Adjusted
Within 2% FS?
<Gas
<Zero Reading
<Gas
<Zero Reading
Within 2% FS?
<Gas
<Expected Reading
<Actual Reading
<Gas
<Expected Reading
<Actual Reading

GR52M Checks

Check heated line temperature - 180C
 Check Sample flow rate - 200mbar (+/- 20mbar)
 Check Fuel Gas Pressure - 700mbar (+/- 20mbar)
 Check Air Pressure - 400mbar (+/- 20mbar)

180
189
701
409

Check Air Catalyst Temp - 400C (+/- 5C)
 Check FID temp 191C
 Check PCB temp - less than 45C
 Check Range is set to 2 (0-100mg/m3)

Zero Check

<u>0.2</u>
0.14

Span Check

20.891
20.87

405
186
35
Range Correct
Within 2% FS?
<Expected Reading
<Actual Reading

MIR ZR O2 Checks

Check O2 reading at probe matches on DAHS (Raw Data)

Zero Check

<u>0</u>
0

Span Check

8.92
8.96

Within 2% FS?
<Expected Reading
<Actual Reading

QAL181 Checks

Check reading on controller matches on DAHS (Raw Data)
 Check Zero & Span Checks are within tolerance

Yes
Yes

General

Check previous QAL3 results - discuss any regular issues

All passed from 5/01/26

Notes

No issues.



CEMS SERVICE RECORD

Date	Customer	Site	System	Engineer	Service Type		
15/01/2026	Thalia	Allerton	Dual Standby	G.Stone	Intermediate		
Multigas type	Serial No	FID Type	Serial No	Oxygen Type	Serial No	Particulate Type 1	Serial No
MIRFT	153262	GR52M	887	MIRZR O2	N/A	QAL181	52992
Extract Probe	Serial No	Flow Type	Serial No	Pressure Type	Serial No	Particulate Type 2	Serial No
HoFi	2366/2365	SF400	52996/52997	E+H Cerabar M	KC038901128/ KC038A01128	QAL181	52993

MIRFT Checks

Review sampling system from probe to analyser. Note any issues.
 Check temperature set points & current temperature reading at probe & heated line.
 Check Calcmeter for residual alarms. Note any issues.
 Check Calcmeter for any other alarms. Note any issues.
 Check background graph shape. Take screenshot for reference. Note any issues.
 Check IFG Height on N2 - ideally around 5V (+/- 0.3V)
 Check IFG Centre - Ideally 2400 (+/- 50)
 Check Sample Cell Pressure - Ideally between 995-900mbar
 Check Cell Temperature - Should be 180C & stable
 Check interferometer Temperature - less than 45C
 Check Detector Temperature = -37C and stable
 Check all residual alarms set correctly (0.01 warning, 0.02 alarm)
 Record date of last H2O calibration

Service Menu Checks

Check laser peak to peak is between 8-20V, if not adjust
 Check velocity is smooth, if not adjust
 Check IGR signal and adjust focusing mirrors
 Check IR voltage is between 9.15 - 9.25V
 Check background max is around 60,000

9.16
64612

Result

Good / No Issue

180c/180c - 200c/200c

No Residual Alarms

No issues

Background Ok

5.1v

2420

870

180c

46c

37.05

All Correct

04/11/2025

12V

Yes

Yes

Zero Check

H2O	CO2	CO	N2O	NO	NO2
0.02	0.03	0.02	0.04	0.05	0
SO2	NH3	HCl			
0.15	0	0.1			

Within 2% FS?

<Gas

<Zero Reading

<Gas

<Zero Reading

Span Check

CO2	CO	NO2	NO	
10	100.875	20.229	267	40
9.99	102.65	20.66	272	40.89
SO2	NH3	HCl		
199.914	20.74	57.921		
199.914	20.65	55.992		

Within 2% FS?

<Gas

<Expected Reading

<Actual Reading

<Gas

<Expected Reading

<Actual Reading

GR52M Checks

Check heated line temperature - 180C
 Check Sample flow rate - 200mbar (+/- 20mbar)
 Check Fuel Gas Pressure - 700mbar (+/- 20mbar)
 Check Air Pressure - 400mbar (+/- 20mbar)

179c

115mb

695

399

400

Check Air Catalyst Temp - 400C (+/- 5C)

Check FID temp 191C

Check PCB temp - less than 45C

Check Range is set to 2 (0-100mg/m3)

Zero Check

<u>0.2</u>
0.24

Span Check

20.891
21.77

191
39c
Range Correct
Within 2% FS?
<Expected Reading
<Actual Reading

MIRZR O2 Checks

Check O2 reading at probe matches on DAHS (Raw Data)

Zero Check

<u>0</u>
0

Span Check

9.51
8.98

Within 2% FS?
<Expected Reading
<Actual Reading

QAL181 Checks

Check reading on controller matches on DAHS (Raw Data)

Check Zero & Span Checks are within tolerance

Yes
Yes

General

Check previous QAL3 results - discuss any regular issues

All passed from 5/01/26

Notes

GR52M needs the pump diaphragm replacing.



EN14181 Linearity and Variability Check

Customer: Thalia
Ticket Number: N/A
Equipment location: Allerton
Date: 04/11/2025
Order Number: N/A
Contract Number: N/A
Gas Divider: Protea PRO155i

☐ *Short Term ELV
☒ *Daily ELV

System details

Present	Equipment Type	S/N	Certification	Test	Gas	ELV*	95% Ci
☒	Envea MIR FT	153264	Sira MC 040031/11	☒	CO	75	10
☒	Jok Air	153264	Sira MC 040031/11	☒	NO	300	20
☒	Envea GR52M	880	Sira MC 060082/11	☒	SO2	75	20
☐	Other			☒	HCl	15	40
☒	QAL181	52994	Sira 090152/04	☒	O2	20.90	10
☐				☒	C3H8	15	30
				☒	Particulat	15	30
				☒	NH3	20	40
					N2O	50	20

Linearity Gas Details

Gas / Gases Mix	Balance	Concentration	Conversion factor	Converted Concentration	Tolerance [%]	Identifying number	Expiry date
CO	N2	80.7 ppm	1.25	100.875 mg/m3	2	VCB6223	17/03/28
NO	N2	199.3 ppm	1.34	267.062 mg/m3	2	VCB6223	17/03/28
SO2	N2	69.9 ppm	2.86	199.914 mg/m3	2	VCB6223	17/03/28
HCl	N2	35.6 ppm	1.627	57.9212 mg/m3	2	VC107047	12/01/26
O2	N2	20.9 %	1	20.9 %	n/a	Air	n/a
C3H8	N2	13 ppm	1.607	20.891 mg/m3	2	VC8401	06/09/25
Particulates	N/A	45 mg/m3	1	45 mg/m3	-	37535	-
NH3	N2	27.3 ppm	0.76	20.748 mg/m3	2	VCB1454	04/02/26
N2O	N2	10.3 ppm	1.964	20.2292 mg/m3	2	VC8401	06/09/2025
H2O	N2	30 %	1	%	2	-	-
CO2	N2	10 %	1	10 %	2	8735441	20/12/2024

*-If other target I used select Short Term ELV

Comments:

Print Name : Gary Stone

DATE : 17/11/2025



Envea MIR FT H2O EN14181 Linearity and Variability Check

Customer: Thalia Date: 17/11/2025
Ticket Number: N/A Order Number: N/A
Equipment location: Allerton Contract Number: N/A
Serial Number: 153264 Gas Divider: Protea PRO1557
Instrument Model: Envea MIR FT Certification: Sira MC 040031/11
Gas: H2O 25.00 % 100% Target: 25 2 x Daily ELV

Data Entry

% of target	0	20	40	60	80	0
Start Time	11:54	12:00	11:48	12:06	11:42	12:12
End Time	12:00	12:06	11:54	12:12	11:48	12:18
Target Conc y _i %	0	5	10	15	20	0
Analyser Response 1 x _i	0.20	5.33	10.98	15.88	20.20	0.58
Analyser Response 2 x _i	0.21	5.40	10.97	15.75	20.16	0.55
Analyser Response 3 x _i	0.30	5.28	10.89	15.33	20.15	0.46

T 90	Response time	Analyser Span	Probe Span
Concentration Target	Start Time	10:38:00	n/a
H2O 22.50 %	End Time	10:40:00	n/a
	T 90 Time	00:02:00	

Test the residuals

Method Used Standard +/- 5 %

Comments:

Authorised Signatory :

Print Name :

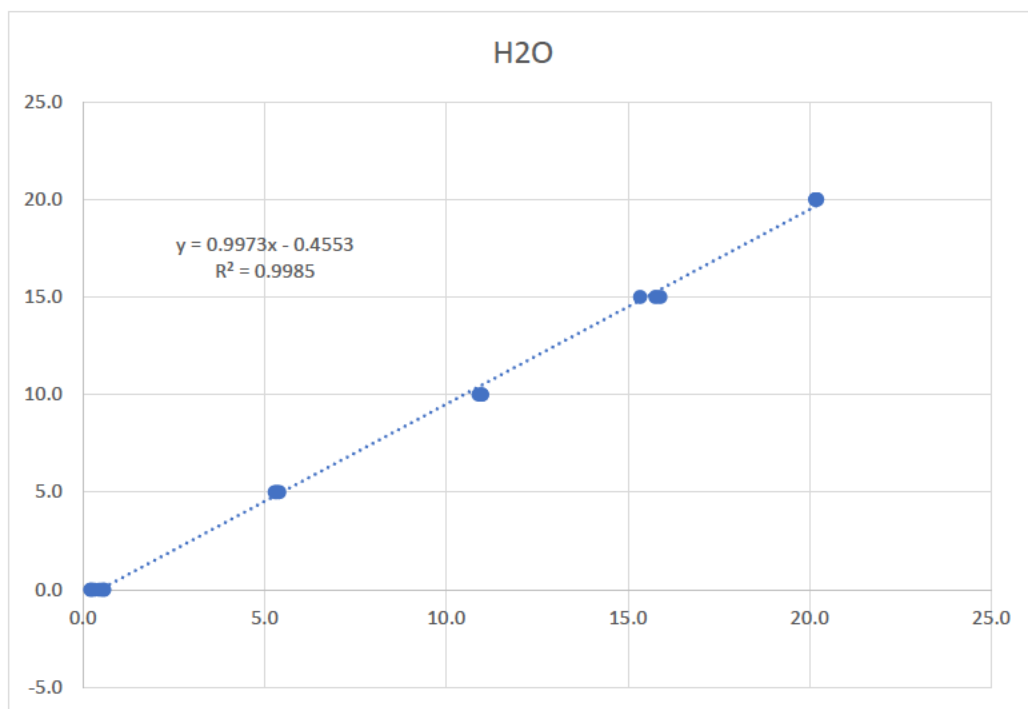
Gary Stone

Date: 17/11/2025



Envea MIR FT H2O EN14181 Linearity and Variability Check

Customer: Thalia Date: 17/11/2025
Ticket Number: N/A
Equipment location: Allerton
Serial Number: 153264
Instrument Model: Envea MIR FT



The AMS has **Pass** linearity test
The AMS has **Pass** variability test

Comments:

Authorised Signatory :

Print Name : Gary Stone

Date: 17/11/2025



Envea MIR FT H2O EN14181 Linearity and Variability Check

Customer:	Thalia	Date:	17/11/2025
Ticket Number:	N/A	Order Number:	N/A
Equipment location:	Allerton	Contract Number:	N/A
Serial Number:	153264	Gas Divider:	Protea PRO1557
Instrument Model:	Envea MIR FT	Certification:	Sira MC 040031/11

Gas:	H2O	25.00 %	100% Target:	25
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Calculation of calibration function						Sum	
SRM y_i	0.00	5.00	10.00	15.00	20.00		$(y_i, s)_{ave} = 10$
x_i (AMS Readings)	0.24	5.34	10.95	15.65	20.17		$x_{ave} = 10.47$
$x_i - x_{ave}$	-10.23	-5.13	0.48	5.18	9.70		
$y_i - y_{ave}$	-10.00	-5.00	0.00	5.00	10.00		
$(x_i - x_{ave}) * (y_i - y_{ave})$	102.32	25.66	0.00	25.92	97.01	250.92	
$(x_i - x_{ave})^2$	104.69	26.34	0.23	26.88	94.12	252.26	

Calibration function:	Y=	-0.41	+	0.9947	x	(xj)
------------------------------	----	-------	---	--------	---	------

Test of variability						Sum	No of Tests	5
AMS value * ($\bar{y}$) mg/m ³	-0.18	4.90	10.48	15.16	19.65		ELV	25
D ($y_i - \bar{y}$) mg/m ³	0.18	0.10	-0.48	-0.16	0.35		95% Ci	20
D ² ($y_i - \bar{y}$) ²	0.03	0.01	0.23	0.02	0.12	0.42		

$$\sigma_D = \sqrt{((1/(N-2)) \sum D^2)} \quad \sigma_D = 0.3723$$

$$\sigma_o = p \times ELV / 1.96 \quad \sigma_o = 2.5510$$

$$\sigma_D \leq \sigma_o \times kv$$

For this number of measurements kv is 0.9161 $\sigma_o \times kv : 2.3370$

The AMS passes the variability test when, $\sigma_D < \sigma_o \times kv$, therefore:

The AMS has **Pass** variability check

Valid range for calibrated AMS -0.160 mg/m³ to 21.61 mg/m³

Authorised Signatory :

Print Name :

Gary Stone

Date: 17/11/2025



Envea MIR FT CO2 EN14181 Linearity and Variability Check

Customer: Thalia
Ticket Number: N/A
Equipment location: Allerton
Serial Number: 153264
Instrument Model: Envea MIR FT
Date: 17/11/2025
Order Number: N/A
Contract Number: N/A
Gas Divider: Protea PRO1557
Certification: Sira MC 040031/11

Gas: CO2 10.00 % 100% Target: 10 2 x Daily ELV

	N2	7.5	6	4.5	3	1.5	7.5
Data Entry	GAS	0	1.5	3	4.5	6	0
% of target		0	20	40	60	80	0
Start Time		12:32	12:38	12:26	12:44	12:20	12:50
End Time		12:38	12:44	12:32	12:50	12:26	12:56
Target Conc y_i	%	0	2	4	6	8	0
Analyser Response 1 x_i		0.43	1.98	3.97	5.96	7.89	0.00
Analyser Response 2 x_i		0.21	1.98	3.98	5.99	7.85	0.40
Analyser Response 3 x_i		0.22	1.96	3.96	5.97	7.87	0.10

T 90	Response time	Analyser Span	Probe Span
Concentration Target	Start Time	10:38:00	n/a
CO2 9.00 %	End Time	10:40:00	n/a
	T 90 Time	00:02:00	

Test the residuals

Method Used Standard +/- 5 %

Comments:

Authorised Signatory :

Print Name :

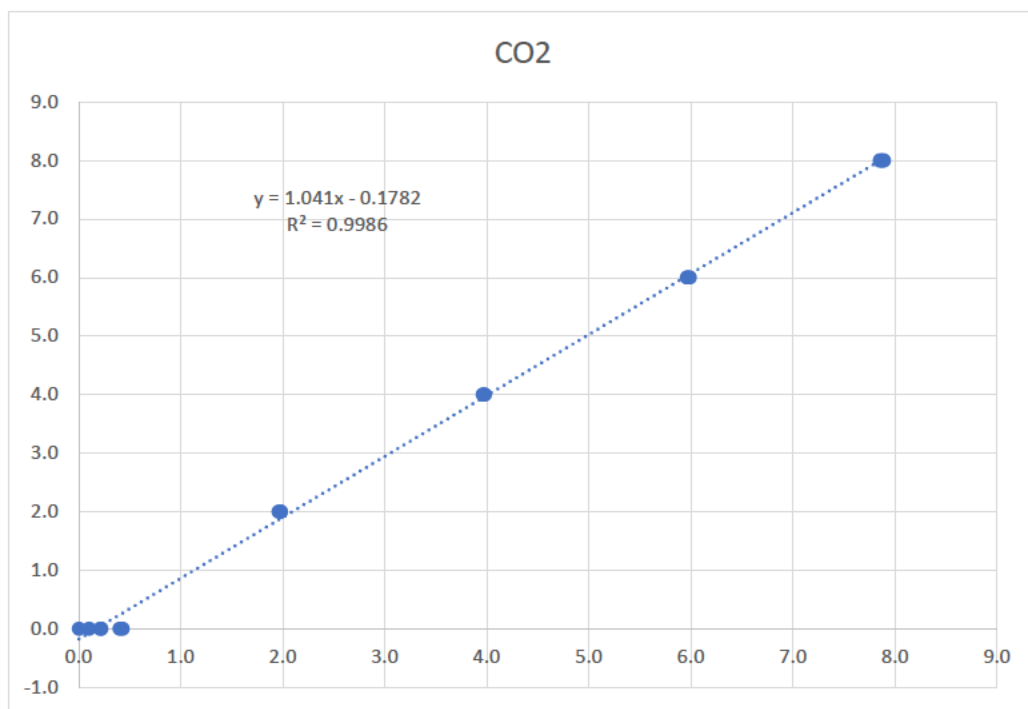
Gary Stone

Date: 17/11/2025



Envea MIR FT CO2 EN14181 Linearity and Variability Check

Customer: Thalia Date: 17/11/2025
Ticket Number: N/A
Equipment location: Allerton
Serial Number: 153264
Instrument Model: Envea MIR FT



The AMS has **Pass** linearity test
The AMS has **Pass** variability test

Comments:

Authorised Signatory :

Print Name :

Gary Stone

Date:

17/11/2025



Envea MIR FT CO2 EN14181 Linearity and Variability Check

Customer:	Thalia	Date:	17/11/2025
Ticket Number:	N/A	Order Number:	N/A
Equipment location:	Allerton	Contract Number:	N/A
Serial Number:	153264	Gas Divider:	Protea PRO1557
Instrument Model:	Envea MIR FT	Certification:	Sira MC 040031/11

Gas:	CO2	10.00	%	100% Target:	10
------	-----	-------	---	--------------	----

Calculation of calibration function						Sum	
SRM y_i	0.00	2.00	4.00	6.00	8.00		$(y_i, s)_{ave} = 4$
x_i (AMS Readings)	0.29	1.97	3.97	5.97	7.87		$x_{ave} = 4.01$
$x_i - x_{ave}$	-3.73	-2.04	-0.04	1.96	3.86		
$y_i - y_{ave}$	-4.00	-2.00	0.00	2.00	4.00		
$(x_i - x_{ave}) * (y_i - y_{ave})$	14.91	4.08	0.00	3.92	15.42	38.33	
$(x_i - x_{ave})^2$	13.90	4.17	0.00	3.84	14.86	36.77	

Calibration function:	Y=	-0.19	+	1.0426	x	(x_j)
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Test of variability						Sum	No of Tests	
AMS value * ($\bar{y}$) mg/m ³	0.11	1.87	3.95	6.04	8.02		ELV	10
D ($y_i - \bar{y}$) mg/m ³	-0.11	0.13	0.05	-0.04	-0.02		95% Ci	20
D ² ($y_i - \bar{y}$) ²	0.01	0.02	0.00	0.00	0.00	0.03		

$$\sigma_D = \sqrt{((1/(N-2)) \sum D^2)} \quad \sigma_D = 0.1058$$

$$\sigma_o = p \times ELV / 1.96 \quad \sigma_o = 1.0204$$

$$\sigma_D \leq \sigma_o \times kv$$

For this number of measurements kv is 0.9161 $\sigma_o \times kv : 0.9348$

The AMS passes the variability test when, $\sigma_D < \sigma_o \times kv$, therefore:

The AMS has **Pass** variability check

Valid range for calibrated AMS 0.102 mg/m³ to 8.82 mg/m³

Authorised Signatory :

Print Name :

Gary Stone

Date: 17/11/2025



Envea MIR FT HCl EN14181 Linearity and Variability Check

Customer: Thalia
Ticket Number: N/A
Equipment location: Allerton
Serial Number: 153264
Instrument Model: Envea MIR FT
Date: 17/11/2025
Order Number: N/A
Contract Number: N/A
Gas Divider: Protea PRO1557
Certification: Sira MC 040031/11
Gas: HCl 57.92 mg/m3 100% Target: 60 2 x Daily ELV

	N2	7.500	5.946	4.392	2.838	1.285	7.500
Data Entry	GAS	0.000	1.554	3.108	4.662	6.215	0.000
% of target		0	20	40	60	80	0
Start Time		13:17	13:38	12:56	13:59	12:35	14:20
End Time		13:38	13:59	13:17	14:20	12:56	14:41
Target Conc y_i	mg/m3	0	12	24	36	48	0
Analyser Response 1 x_i		0.6	11.89	21.46	34.24	44.11	0.13
Analyser Response 2 x_i		0.5	11.88	21.33	34.2	43.45	0.6
Analyser Response 3 x_i		0.5	11.88	21.29	34.2	43.46	0.3

T 90	Response time	Analyser Span	Probe Span
Concentration Target	Start Time	15:46:00	n/a
HCl 52.13 mg/m3	End Time	15:53:00	n/a
	T 90 Time	00:07:00	n/a

Test the residuals

Method Used Standard +/- 5 %

Comments:

Authorised Signatory :

Print Name :

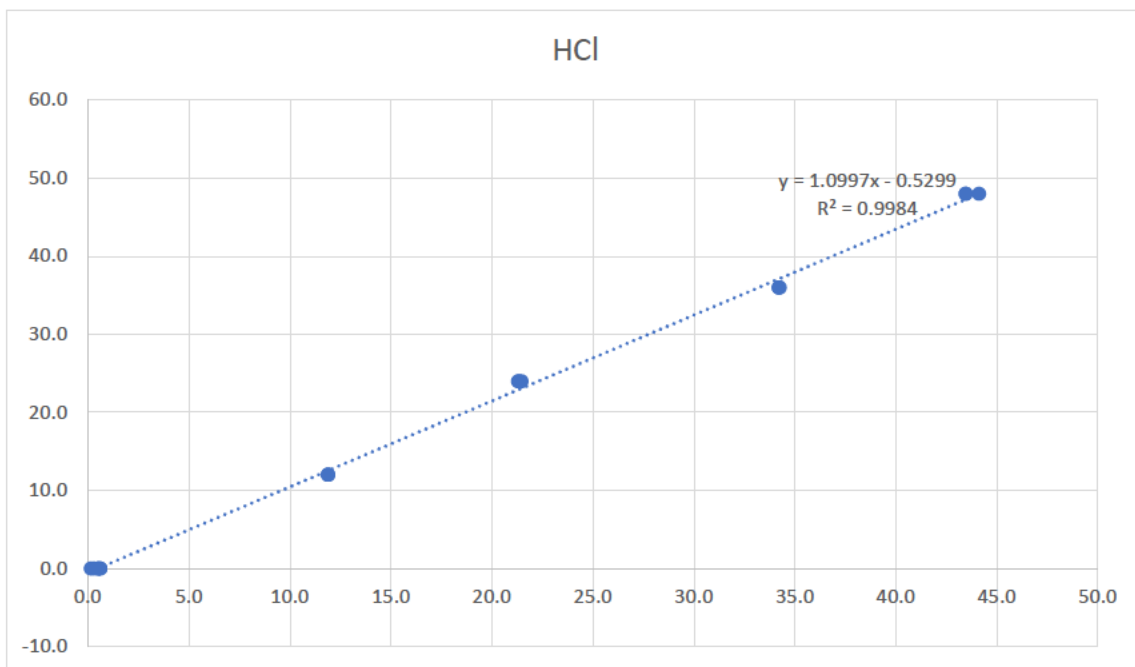
Gary Stone

Date: 17/11/2025



Envea MIR FT HCI EN14181 Linearity and Variability Check

Customer: Thalia Date: 17/11/2025
Ticket Number: N/A
Equipment location: Allerton
Serial Number: 153264
Instrument Model: Envea MIR FT



The AMS has **Pass** linearity test
The AMS has **Pass** variability test

Comments:

Authorised Signatory :

Print Name : Gary Stone

Date: 17/11/2025



Envea MIR FT HCl EN14181 Linearity and Variability Check

Customer:	Thalia	Date:	17/11/2025
Ticket Number:	N/A	Order Number:	N/A
Equipment location:	Allerton	Contract Number:	N/A
Serial Number:	153264	Gas Divider:	Protea PRO1557
Instrument Model:	Envea MIR FT	Certification:	Sira MC 040031/11

Gas:	HCl	57.92 mg/m ³	100% Target:	60
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Calculation of calibration function						Sum		
SRM y _i	0.00	12.00	24.00	36.00	48.00		(y _{i,s}) _{ave} =	24
x _i (AMS Readings)	0.53	11.88	21.36	34.21	43.67		x _{ave} =	22.33
x _i - x _{ave}	-21.80	-10.45	-0.97	11.88	21.34			
y _i - y _{ave}	-24.00	-12.00	0.00	12.00	24.00			
(x _i - x _{ave}) * (y _i - y _{ave})	523.18	125.39	0.00	142.57	512.18	1303.32		
(x _i - x _{ave}) ²	475.21	109.19	0.95	141.15	455.42	1181.92		

Calibration function:	Y=	-0.63	+	1.1027	x	(x _j)
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Test of variability						Sum	No of Tests	5
AMS value * (ŷ) mg/m ³	-0.04	12.48	22.93	37.10	47.53		ELV	60
D (y _i - ŷ) mg/m ³	0.04	-0.48	1.07	-1.10	0.47		95% Ci	40
D ² (y _i - ŷ) ²	0.00	0.23	1.15	1.21	0.22	2.81		

$$\sigma_D = \sqrt{((1/(N-2)) \sum D^2)} \quad \sigma_D = 0.9679$$

$$\sigma_o = p \times \text{ELV} / 1.96 \quad \sigma_o = 12.2449$$

$$\sigma_D \leq \sigma_o \times kv$$

$$\text{For this number of measurements kv is } 0.9161 \quad \sigma_o \times kv = 11.2176$$

The AMS passes the variability test when, $\sigma_D < \sigma_o \times kv$, therefore:

The AMS has **Pass** variability check

Valid range for calibrated AMS -0.035 mg/m³ to 52.29 mg/m³

Authorised Signatory :

Print Name :

Gary Stone

Date: 17/11/2025



Envea MIR FT N2O EN14181 Linearity and Variability Check

Customer: Thalia
Ticket Number: N/A
Equipment location: Allerton
Serial Number: 153264
Instrument Model: Envea MIR FT
Date: 17/11/2025
Order Number: N/A
Contract Number: N/A
Gas Divider: Protea PRO1557
Certification: Sira MC 040031/11

Gas:	N2O	20.23	mg/m3	100% Target:				20	2 x Daily ELV
	N2	7.500	6.017	4.534	3.051	1.568	7.500		
Data Entry	GAS	0.000	1.483	2.966	4.449	5.932	0.000		
% of target		0	20	40	60	80	0		
Start Time		09:57	10:03	09:51	10:09	09:45	10:15		
End Time		10:03	10:09	09:57	10:15	09:51	10:21		
Target Conc y_i	mg/m3	0	4	8	12	16	0		
Analyser Response 1 x_i		0.30	4.88	8.22	12.55	16.78	0.10		
Analyser Response 2 x_i		0.30	4.89	8.26	12.66	16.78	0.10		
Analyser Response 3 x_i		0.30	4.89	8.29	12.77	16.80	0.10		

T 90	Response time	Analyser Span	Probe Span
Concentration Target	Start Time	10:38:00	n/a
N2O 18.21 mg/m3	End Time	10:40:00	n/a
	T 90 Time	00:02:00	

Test the residuals

Method Used Standard +/- 5 %

Comments:

Authorised Signatory :

Print Name :

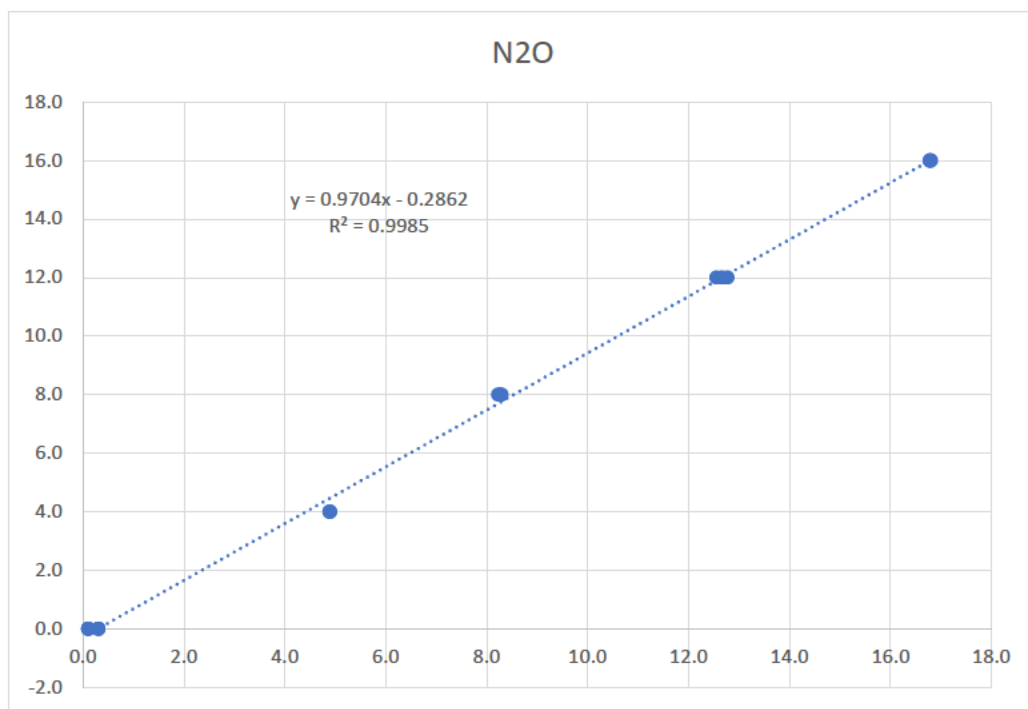
Gary Stone

Date: 17/11/2025



Envea MIR FT N2O EN14181 Linearity and Variability Check

Customer: Thalia Date: 17/11/2025
Ticket Number: N/A
Equipment location: Allerton
Serial Number: 153264
Instrument Model: Envea MIR FT



The AMS has **Pass** linearity test
The AMS has **Pass** variability test

Comments:

Authorised Signatory :

Print Name : Gary Stone Date: 17/11/2025



Envea MIR FT N2O EN14181 Linearity and Variability Check

Customer: Thalia	Date: 17/11/2025
Ticket Number: N/A	Order Number: N/A
Equipment location: Allerton	Contract Number: N/A
Serial Number: 153264	Gas Divider: Protea PRO1557
Instrument Model: Envea MIR FT	Certification: Sira MC 040031/11

Gas: N2O 20.23 mg/m3 **100% Target:** 20

Calculation of calibration function						Sum	
SRM y_i	0.00	4.00	8.00	12.00	16.00		$(y_i, s)_{ave} = 8$
x_i (AMS Readings)	0.30	4.89	8.26	12.66	16.79		$x_{ave} = 8.58$
$x_i - x_{ave}$	-8.28	-3.69	-0.32	4.08	8.21		
$y_i - y_{ave}$	-8.00	-4.00	0.00	4.00	8.00		
$(x_i - x_{ave}) * (y_i - y_{ave})$	66.22	14.77	0.00	16.33	65.67	162.99	
$(x_i - x_{ave})^2$	68.53	13.63	0.10	16.66	67.38	166.30	

Calibration function: $Y = -0.41 + 0.9801 x$ (xj)

Test of variability						Sum	No of Tests	5
AMS value * ($\bar{y}$) mg/m ³	-0.11	4.38	7.69	12.00	16.05		ELV	20
D ($y_i - \bar{y}$) mg/m ³	0.11	-0.38	0.31	0.00	-0.05		95% Ci	20
D ² ($y_i - \bar{y}$) ²	0.01	0.15	0.10	0.00	0.00	0.26		

$$\sigma_D = \sqrt{((1/(N-2)) \sum D^2)} \quad \sigma_D = 0.2944$$

$$\sigma_o = p \times ELV / 1.96 \quad \sigma_o = 2.0408$$

$$\sigma_D \leq \sigma_o \times kv$$

For this number of measurements kv is 0.9161 $\sigma_o \times kv : 1.8696$

The AMS passes the variability test when, $\sigma_D < \sigma_o \times kv$, therefore:

The AMS has Pass variability check

Valid range for calibrated AMS -0.102 mg/m³ to 17.65 mg/m³

Authorised Signatory :

Print Name :

Gary Stone

Date: 17/11/2025



Envea GR52M C3H8 EN14181 Linearity and Variability Check

Customer: Thalia
Ticket Number: N/A
Equipment location: Allerton
Serial Number: 880
Instrument Model: Envea GR52M
Date: 17/11/2025
Order Number: N/A
Contract Number: N/A
Gas Divider: Protea PRO1557
Certification: Sira MC 060082/11

Gas: C3H8 20.89 mg/m3 100% Target: 21 2 x Daily ELV

	N2	7.500	5.992	4.484	2.977	1.469	7.500
Data Entry	GAS	0.000	1.508	3.016	4.523	6.031	0.000
% of target		0	20	40	60	80	0
Start Time		15:29	15:41	15:17	15:53	15:05	16:05
End Time		15:41	15:53	15:29	16:05	15:17	16:17
Target Conc y_i	mg/m3	0	4.2	8.4	12.6	16.8	0
Analyser Response 1 x_i		0.68	4.22	9.77	13.98	17.39	0.23
Analyser Response 2 x_i		0.23	4.28	9.77	13.98	17.42	0.22
Analyser Response 3 x_i		0.2	4.66	9.77	13.74	17.43	0.22

T 90	Response time	Analyser Span	Probe Span
Concentration Target	Start Time	16:55:00	n/a
C3H8 18.80 mg/m3	End Time	16:59:00	n/a
	T 90 Time	00:04:00	

Test the residuals

Method Used Standard +/- 5 %

Comments:

Authorised Signatory :

Print Name :

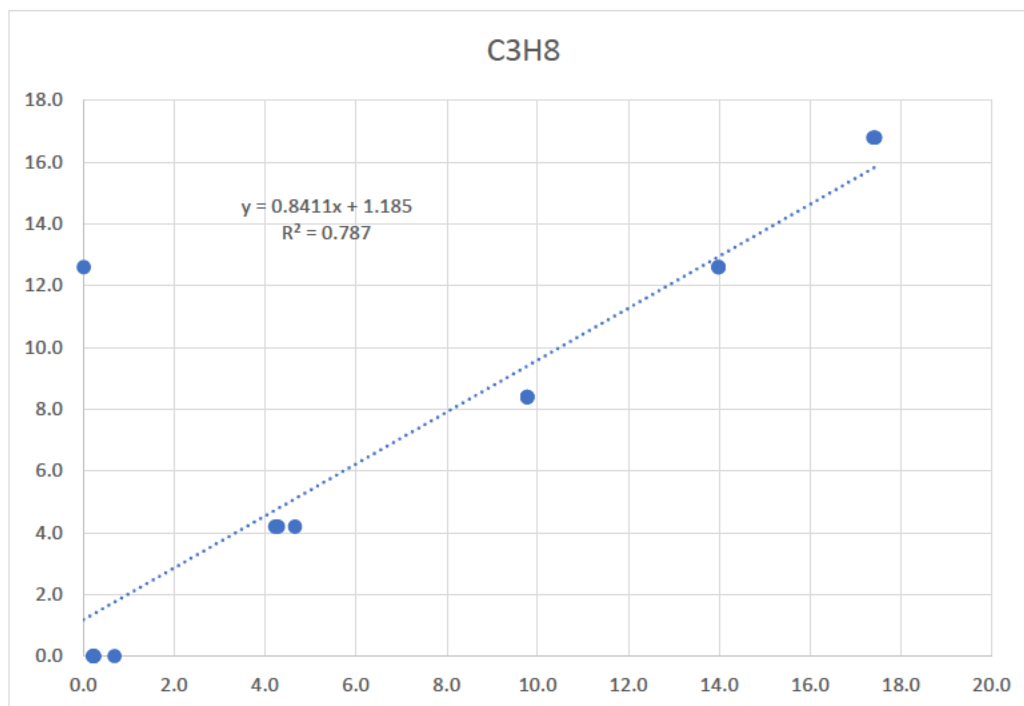
Gary Stone

Date: 17/11/2025



Envea GR52M C3H8 EN14181 Linearity and Variability Check

Customer: Thalia Date: 17/11/2025
Ticket Number: N/A
Equipment location: Allerton
Serial Number: 880
Instrument Model: Envea GR52M



The AMS has **Pass** linearity test
The AMS has **Pass** variability test

Comments:

Authorised Signatory :

Print Name : Gary Stone

Date: 17/11/2025



Envea GR52M C3H8 EN14181 Linearity and Variability Check

Customer:	Thalia	Date:	17/11/2025
Ticket Number:	N/A	Order Number:	N/A
Equipment location:	Allerton	Contract Number:	N/A
Serial Number:	880	Gas Divider:	Protea PRO1557
Instrument Model:	Envea GR52M	Certification:	Sira MC 060082/11

Gas:	C3H8	20.89	mg/m3	100% Target:	21
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Calculation of calibration function						Sum		
SRM y_i	0.00	4.20	8.40	12.60	16.80		$(y_i, s)_{ave} =$	8.4
x_i (AMS Readings)	0.37	4.39	9.77	13.98	17.41		$x_{ave} =$	9.18
$x_i - x_{ave}$	-8.81	-4.80	0.59	4.80	8.23			
$y_i - y_{ave}$	-8.40	-4.20	0.00	4.20	8.40			
$(x_i - x_{ave}) * (y_i - y_{ave})$	74.04	20.15	0.00	20.14	69.13	183.46		
$(x_i - x_{ave})^2$	77.69	23.01	0.34	23.00	67.72	191.77		

Calibration function:	Y=	-0.39	+	0.9567	x	(xj)
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Test of variability						Sum	No of Tests	5
AMS value * ($\bar{y}$) mg/m ³	-0.03	3.81	8.96	12.99	16.27		ELV	21
D ($y_i - \bar{y}$) mg/m ³	0.03	0.39	-0.56	-0.39	0.53		95% Ci	30
D ² ($y_i - \bar{y}$) ²	0.00	0.15	0.31	0.15	0.28	0.90		

$$\sigma_D = \sqrt{((1/(N-2)) \sum D^2)} \quad \sigma_D = 0.5464$$

$$\sigma_o = p \times ELV / 1.96 \quad \sigma_o = 3.2143$$

$$\sigma_D \leq \sigma_o \times kv$$

For this number of measurements kv is 0.9161 $\sigma_o \times kv : 2.9446$

The AMS passes the variability test when, $\sigma_D < \sigma_o \times kv$, therefore:

The AMS has **Pass** variability check

Valid range for calibrated AMS -0.029 mg/m3 to 17.90 mg/m3

Authorised Signatory :

Print Name :

Gary Stone

Date: 17/11/2025



Envea MIR FT CO EN14181 Linearity and Variability Check

Customer:	Thalia	Date:	20/11/2025
Ticket Number:	N/A	Order Number:	N/A
Equipment location:		Contract Number	N/A
Serial Number:	153264	Gas Divider:	Protea PRO1557
Instrument Model:	Envea MIR FT	Certification:	Sira MC 040031/11

Gas: CO 100.88 mg/m3 100% Target: 100.00 2 x Daily ELV

	N2	7.500	6.013	4.526	3.039	1.552	7.500
Data Entry	GAS	0.000	1.487	2.974	4.461	5.948	0.000
% of target		0	20	40	60	80	0
Start Time		10:57	11:03	10:51	11:09	10:45	11:15
End Time		11:03	11:09	10:57	11:15	10:51	11:21
Target Conc y_i	mg/m3	0	20	40	60	80	0
Analyser Response 1 x_i		0.01	18.89	42.01	61.98	81.77	0.66
Analyser Response 2 x_i		0.01	18.99	41.88	61.98	81.67	0.58
Analyser Response 3 x_i		0	19.01	41.87	61.97	81.66	0.53

T 90	Response time	Analyser Span	Probe Span
Concentration Target	Start Time	10:38:00	n/a
CO 90.79 mg/m3	End Time	10:40:00	n/a
	T 90 Time	00:02:00	n/a

Test the residuals

Method Used	Standard	+/-	5	%
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Comments:

Authorised Signatory :

Print Name :

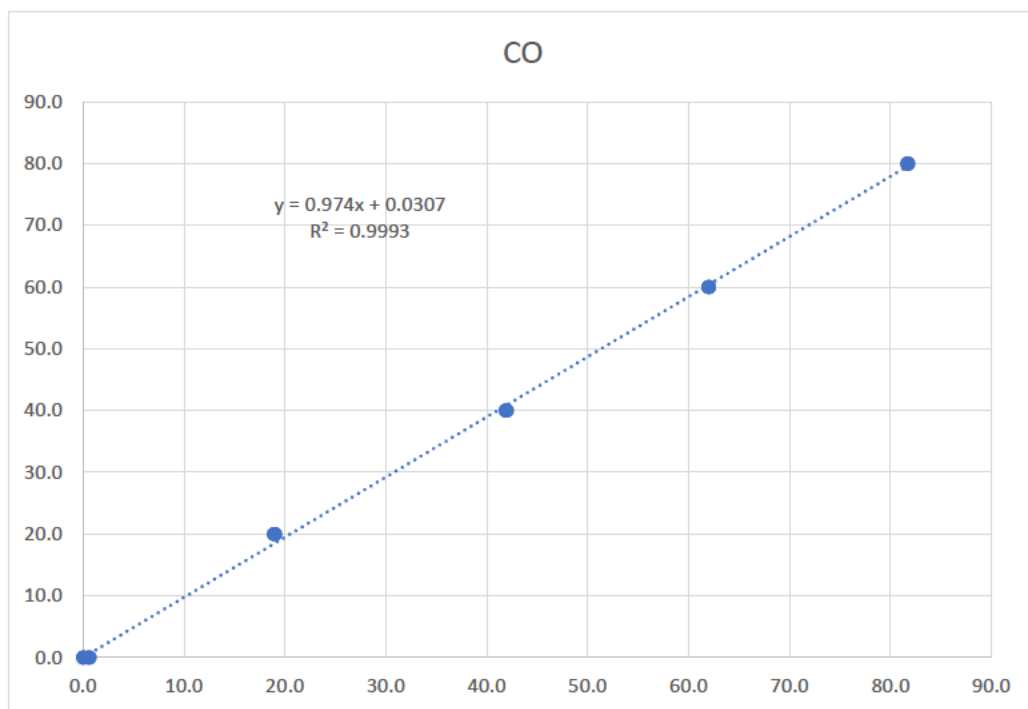
Gary Stone

Date: 20/11/2025



Envea MIR FT CO EN14181 Linearity and Variability Check

Customer: Date: 20/11/2025
Ticket Number: N/A
Equipment location: 0
Serial Number: 153264
Instrument Model: Envea MIR FT



The AMS has **Pass** linearity test
The AMS has **Pass** variability test

Comments:

Authorised Signatory :

Print Name : Gary Stone Date: 20/11/2025



Envea MIR FT CO EN14181 Linearity and Variability Check

Customer:	Thalia	Date:	20/11/2025
Ticket Number:	N/A	Order Number:	N/A
Equipment location:	0	Contract Number:	N/A
Serial Number:	153264	Gas Divider:	Protea PRO1557
Instrument Model:	Envea MIR FT	Certification:	Sira MC 040031/11

Gas: **CO** 100.88 mg/m³ 100% Target: 100

Calculation of calibration function						Sum
SRM y_i	0.00	20.00	40.00	60.00	80.00	
x_i (AMS Readings)	0.01	18.96	41.92	61.98	81.70	
$x_i - x_{ave}$	-40.91	-21.95	1.01	21.06	40.79	
$y_i - y_{ave}$	-40.00	-20.00	0.00	20.00	40.00	
$(x_i - x_{ave}) * (y_i - y_{ave})$	1636.27	439.00	0.00	421.27	1631.47	4128.00
$(x_i - x_{ave})^2$	1673.36	481.80	1.01	443.66	1663.55	4263.39

$(y_i, s)_{ave} = 40$
 $x_{ave} = 40.91$

Calibration function: $Y = 0.39 + 0.9682 x$ (xj)

Test of variability						Sum	No of Tests	5
AMS value * ($\bar{y}$) mg/m ³	0.39	18.75	40.97	60.39	79.49		ELV	100
D ($y_i - \bar{y}$) mg/m ³	-0.39	1.25	-0.97	-0.39	0.51		95% Ci	10
D ² ($y_i - \bar{y}$) ²	0.15	1.57	0.95	0.16	0.26	3.09		

$$\sigma_D = \sqrt{((1/(N-2)) \sum D^2)} \quad \sigma_D = 1.0146$$

$$\sigma_o = p \times ELV / 1.96 \quad \sigma_o = 5.1020$$

$$\sigma_D \leq \sigma_o \times kv$$

For this number of measurements kv is 0.9161 $\sigma_o \times kv : 4.6740$

The AMS passes the variability test when, $\sigma_D < \sigma_o \times kv$, therefore:

The AMS has **Pass** variability check

Valid range for calibrated AMS 0.353 mg/m³ to 87.44 mg/m³

Authorised Signatory :

Print Name :

Gary Stone

Date: 20/11/2025



Envea MIR FT NO EN14181 Linearity and Variability Check

Customer:	Thalia	Date:	17/11/2025
Ticket Number:	N/A	Order Number:	N/A
Equipment location:	Allerton	Contract Number	N/A
Serial Number:	153264	Gas Divider:	Protea PRO1557
Instrument Model:	Envea MIR FT	Certification:	Sira MC 040031/11

Gas: NO 267.06 mg/m3 100% Target: 267 2 x Daily ELV

Data Entry	N2	7.500	6.000	4.501	3.001	1.501	7.500
	GAS	0.000	1.500	2.999	4.499	5.999	0.000

% of target	0	20	40	60	80	0
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Start Time	10:57	11:03	10:51	11:09	10:45	11:15
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End Time	11:03	11:09	10:57	11:15	10:51	11:21
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Target Conc y_i	mg/m3	0	53.4	106.8	160.2	213.6	0
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Analyser Response 1 x_i	0	49.8	107	161.03	214.66	0.13
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Analyser Response 2 x_i	0	50.14	106.98	161.34	214.64	0.1
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Analyser Response 3 x_i	0	50.33	106.97	161.08	214.63	0
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T 90	Response time	Analyser Span	Probe Span
Concentration Target	Start Time	10:38:00	n/a
NO 240.36 mg/m3	End Time	10:40:00	n/a
	T 90 Time	00:02:00	

Test the residuals

Method Used	Standard	+/-	5	%
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Comments:

Authorised Signatory :

Print Name :

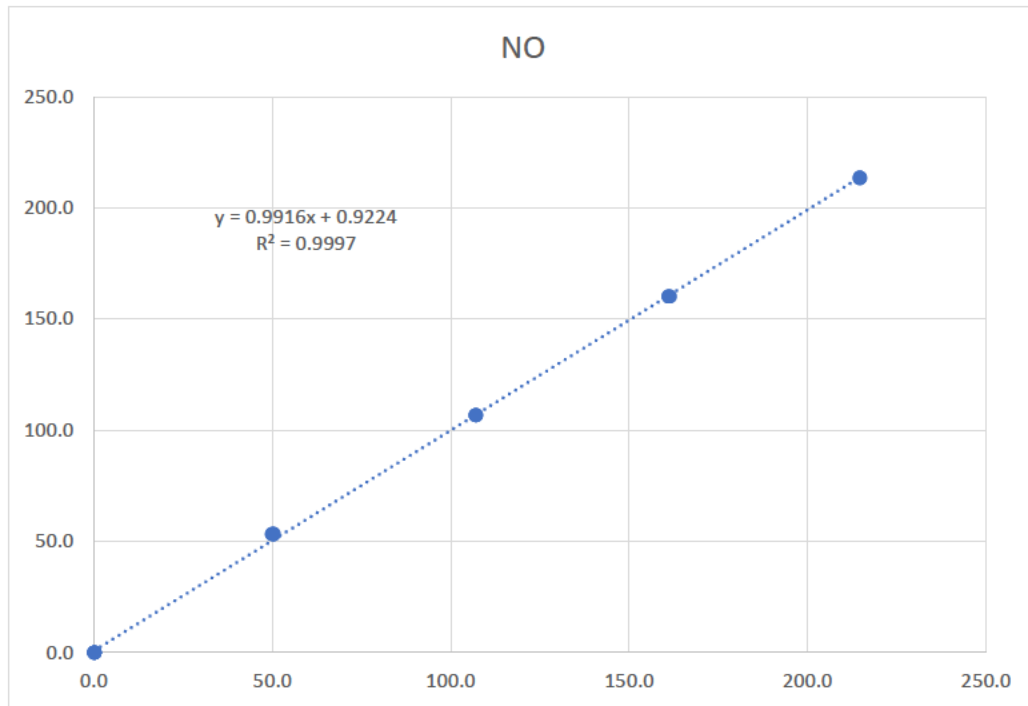
Gary Stone

Date: 17/11/2025



Envea MIR FT NO EN14181 Linearity and Variability Check

Customer: Thalía Date: 17/11/2025
Ticket Number: N/A
Equipment location: Allerton
Serial Number: 153264
Instrument Model: Envea MIR FT



The AMS has **Pass** linearity test
The AMS has **Pass** variability test

Comments:

Authorised Signatory :

Print Name : Gary Stone Date: 17/11/2025



Envea MIR FT NO EN14181 Linearity and Variability Check

Customer:	Thalia	Date:	17/11/2025
Ticket Number:	N/A	Order Number:	N/A
Equipment location:	Allerton	Contract Number:	N/A
Serial Number:	153264	Gas Divider:	Protea PRO1557
Instrument Model:	Envea MIR FT	Certification:	Sira MC 040031/11

Gas: **NO** 267.06 mg/m³ 100% Target: 267

Calculation of calibration function						Sum	
SRM y_i	0.00	53.40	106.80	160.20	213.60		$(y_i, s)_{ave} = 106.8$
x_i (AMS Readings)	0.00	50.09	106.98	161.15	214.64		$x_{ave} = 106.57$
$x_i - x_{ave}$	-106.57	-56.48	0.41	54.58	108.07		
$y_i - y_{ave}$	-106.80	-53.40	0.00	53.40	106.80		
$(x_i - x_{ave}) * (y_i - y_{ave})$	11382.03	3016.21	0.00	2914.39	11541.88	28854.51	
$(x_i - x_{ave})^2$	11357.88	3190.37	0.17	2978.61	11679.12	29206.15	

Calibration function: $Y = 1.51 + 0.9880 x$ (xj)

Test of variability						Sum	No of Tests	5
AMS value * ($\bar{y}$) mg/m ³	1.51	51.00	107.21	160.72	213.57		ELV	267
D ($y_i - \bar{y}$) mg/m ³	-1.51	2.40	-0.41	-0.52	0.03		95% Ci	20
D ² ($y_i - \bar{y}$) ²	2.28	5.78	0.16	0.27	0.00	8.49		

$$\sigma_D = \sqrt{(1/(N-2) \sum D^2)} \quad \sigma_D = 1.6823$$

$$\sigma_o = p \times ELV / 1.96 \quad \sigma_o = 27.2449$$

$$\sigma_D \leq \sigma_o \times kv$$

For this number of measurements kv is 0.9161 $\sigma_o \times kv : 24.9591$

The AMS passes the variability test when, $\sigma_D < \sigma_o \times kv$, therefore:

The AMS has **Pass** variability check

Valid range for calibrated AMS 1.359 mg/m³ to 234.93 mg/m³

Authorised Signatory :

Print Name :

Gary Stone

Date: 17/11/2025



Envea MIR FT SO2 EN14181 Linearity and Variability Check

Customer:	Thalia	Date:	17/11/2025
Ticket Number:	N/A	Order Number:	N/A
Equipment location:	Allerton	Contract Number:	N/A
Serial Number:	153264	Gas Divider:	Protea PRO1557
Instrument Model:	Envea MIR FT	Certification:	Sira MC 040031/11

Gas: SO2 199.91 mg/m3 100% Target: 200.00 2 x Daily ELV

	N2	7.500	5.999	4.499	2.998	1.497	7.500
Data Entry	GAS	0.000	1.501	3.001	4.502	6.003	0.000

% of target	0	20	40	60	80	0
Start Time	11:21	11:39	11:03	11:57	10:45	12:15
End Time	11:39	11:57	11:21	12:15	11:03	12:33
Target Conc y_i	mg/m3	0	40	80	120	160
Analyser Response 1 x _i		0	38.89	78.66	123.78	159.99
Analyser Response 2 x _i		0	38.88	78.65	122.88	158.06
Analyser Response 3 x _i		0	39.01	78.6	122.86	156.13

T 90	Response time	Analyser Span	Probe Span
Concentration Target	Start Time	10:38:00	n/a
SO2 179.92 mg/m3	End Time	10:44:00	n/a
	T 90 Time	00:06:00	

Test the residuals

Method Used	Standard	+/-	5	%
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Comments:

Authorised Signatory :

Print Name :

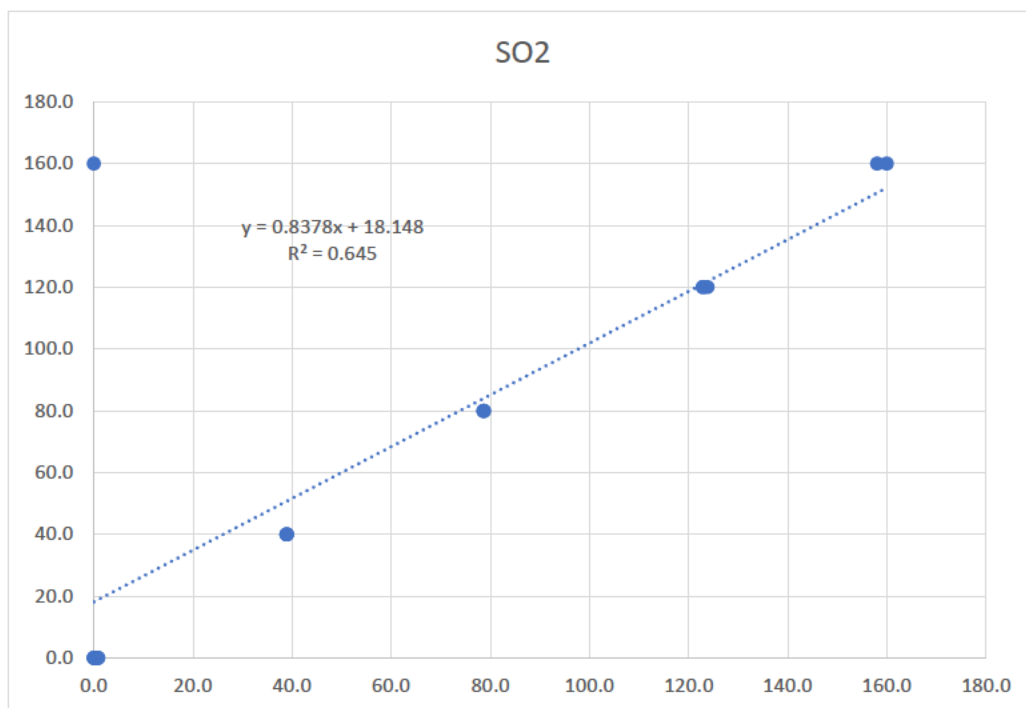
Gary Stone

Date: 04/11/2025



Envea MIR FT SO2 EN14181 Linearity and Variability Check

Customer: Thalia Date: 17/11/2025
Ticket Number: N/A
Equipment location: Allerton
Serial Number: 153264
Instrument Model: Envea MIR FT



The AMS has **Pass** linearity test
The AMS has **Pass** variability test

Comments:

Authorised Signatory :

Print Name :

Gary Stone

Date:

17/11/2025



Envea MIR FT SO2 EN14181 Linearity and Variability Check

Customer:	Thalia	Date:	17/11/2025
Ticket Number:	N/A	Order Number:	N/A
Equipment location:	Allerton	Contract Number:	N/A
Serial Number:	153264	Gas Divider:	Protea PRO1557
Instrument Model:	Envea MIR FT	Certification:	Sira MC 040031/11

Gas:	SO2	199.91 mg/m3	100% Target:	200
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Calculation of calibration function						Sum	
SRM y_i	0.00	40.00	80.00	120.00	160.00		$(y_i, s)_{ave} = 80$
x_i (AMS Readings)	0.00	38.93	78.64	123.17	158.06		$x_{ave} = 79.76$
$x_i - x_{ave}$	-79.76	-40.83	-1.12	43.41	78.30		
$y_i - y_{ave}$	-80.00	-40.00	0.00	40.00	80.00		
$(x_i - x_{ave}) * (y_i - y_{ave})$	6380.75	1633.31	0.00	1736.56	6264.05	16014.67	
$(x_i - x_{ave})^2$	6361.55	1667.31	1.26	1884.78	6130.99	16045.89	

Calibration function:	Y=	0.40	+	0.9981	x	(xj)
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Test of variability						Sum	No of Tests	
AMS value * ($\bar{y}$) mg/m ³	0.40	39.25	78.88	123.33	158.15		ELV	200
D ($y_i - \bar{y}$) mg/m ³	-0.40	0.75	1.12	-3.33	1.85		95% Ci	20
D ² ($y_i - \bar{y}$) ²	0.16	0.57	1.26	11.09	3.43	16.49		

$$\sigma_D = \sqrt{((1/(N-2)) \sum D^2)} \quad \sigma_D = 2.3448$$

$$\sigma_o = p \times ELV / 1.96 \quad \sigma_o = 20.4082$$

$$\sigma_D \leq \sigma_o \times kv$$

For this number of measurements kv is 0.9161 $\sigma_o \times kv : 18.6959$

The AMS passes the variability test when, $\sigma_D < \sigma_o \times kv$, therefore:

The AMS has **Pass** variability check

Valid range for calibrated AMS 0.356 mg/m³ to 173.96 mg/m³

Authorised Signatory :

Print Name :

Gary Stone

Date: 17/11/2025



Envea MIR FT NH3 EN14181 Linearity and Variability Check

Customer: Thalia
Ticket Number: N/A
Equipment location: Allerton
Serial Number: 153264
Instrument Model: Envea MIR FT
Date: 17/11/2025
Order Number: N/A
Contract Number: N/A
Gas Divider: Protea PRO1557
Certification: Sira MC 040031/11

Gas: NH3 20.75 mg/m3 100% Target: 20 2 x Daily ELV

	N2	7.500	6.054	4.608	3.162	1.716	7.500
Data Entry	GAS	0.000	1.446	2.892	4.338	5.784	0.000

% of target	0	20	40	60	80	0
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Start Time	16:44	16:56	16:32	17:08	16:20	17:20
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End Time	16:56	17:08	16:44	17:20	16:32	17:32
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Target Conc y _i	mg/m3	0	4	8	12	16	0
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Analyser Response 1 x _i	0.33	4.22	9.02	12.23	16.97	0.44
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Analyser Response 2 x _i	0.27	4.22	8.86	12.24	16.88	0.37
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Analyser Response 3 x _i	0.11	4.36	8.88	12.23	16.9	0.37
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T 90	Response time	Analyser Span	Probe Span
Concentration Target	Start Time	17:20:00	n/a
NH3 18.67 mg/m3	End Time	17:24:00	n/a
	T 90 Time	00:04:00	

Test the residuals

Method Used	Standard	+/-	5	%
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Comments:

Authorised Signatory :

Print Name :

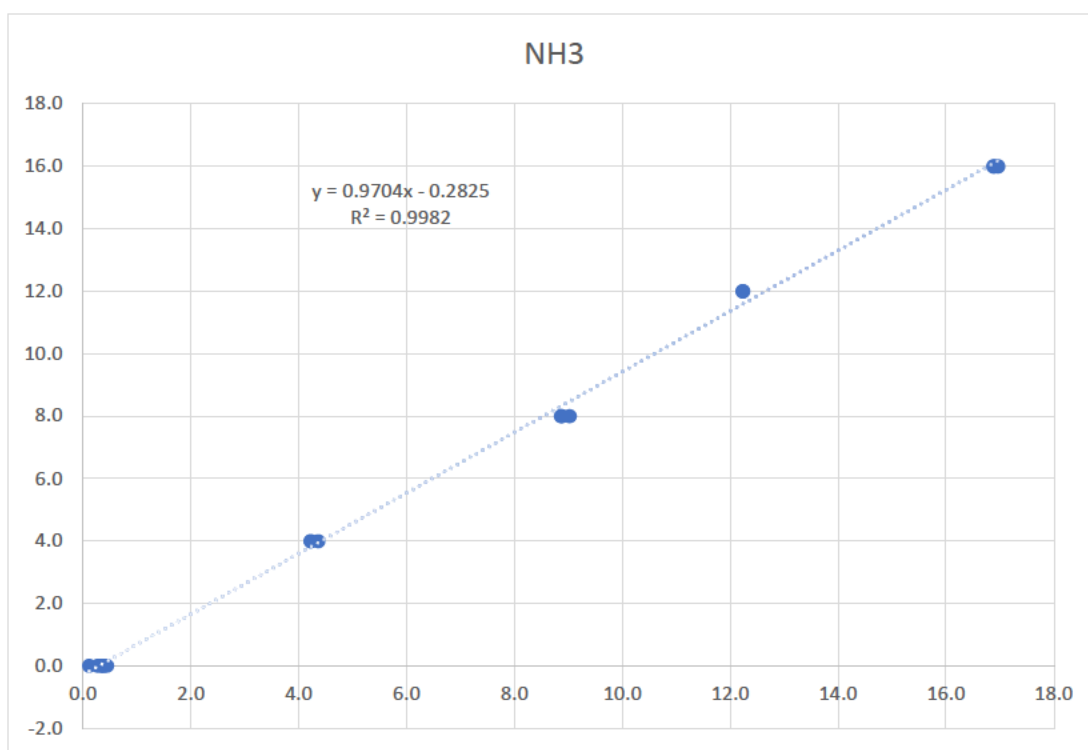
Gary Stone

Date: 17/11/2025



Envea MIR FT NH3 EN14181 Linearity and Variability Check

Customer: Thalia Date: 17/11/2025
Ticket Number: N/A
Equipment location: Allerton
Serial Number: 153264
Instrument Model: Envea MIR FT



The AMS has **Pass** linearity test

The AMS has **Pass** variability test

Comments:

Authorised Signatory :

Print Name :

Gary Stone

Date:

17/11/2025



Envea MIR FT NH3 EN14181 Linearity and Variability Check

Customer:	Thalia	Date:	17/11/2025
Ticket Number:	N/A	Order Number:	N/A
Equipment location:	Allerton	Contract Number:	N/A
Serial Number:	153264	Gas Divider:	Protea PRO1557
Instrument Model:	Envea MIR FT	Certification:	Sira MC 040031/11

Gas: NH3 20.75 mg/m3 **100% Target:** 20

Calculation of calibration function						Sum	
SRM y_i	0.00	4.00	8.00	12.00	16.00		$(y_i, s)_{ave} = 8$
x_i (AMS Readings)	0.24	4.27	8.92	12.23	16.92		$x_{ave} = 8.51$
$x_i - x_{ave}$	-8.28	-4.25	0.41	3.72	8.40		
$y_i - y_{ave}$	-8.00	-4.00	0.00	4.00	8.00		
$(x_i - x_{ave}) * (y_i - y_{ave})$	66.22	16.99	0.00	14.87	67.22	165.31	
$(x_i - x_{ave})^2$	68.53	18.05	0.16	13.83	70.59	171.16	

Calibration function: $Y = -0.22 + 0.9658 x$ (xj)

Test of variability						Sum	No of Tests	5
AMS value * ($\bar{y}$) mg/m ³	0.00	3.90	8.39	11.59	16.11		ELV	20
D ($y_i - \bar{y}$) mg/m ³	0.00	0.10	-0.39	0.41	-0.11		95% Ci	40
D ² ($y_i - \bar{y}$) ²	0.00	0.01	0.15	0.17	0.01	0.34		

$$\sigma_D = \sqrt{((1/(N-2)) \sum D^2)} \quad \sigma_D = 0.3386$$

$$\sigma_o = p \times ELV / 1.96 \quad \sigma_o = 4.0816$$

$$\sigma_D \leq \sigma_o \times kv$$

For this number of measurements kv is 0.9161 $\sigma_o \times kv : 3.7392$

The AMS passes the variability test when, $\sigma_D < \sigma_o \times kv$, therefore:

The AMS has **Pass** variability check

Valid range for calibrated AMS 0.004 mg/m³ to 17.73 mg/m³

Authorised Signatory :

Print Name :

Gary Stone

Date: 17/11/2025



Jok Air O2 EN14181 Linearity and Variability Check

Customer:	Thalia	Date:	17/11/2025
Ticket Number:	N/A	Order Number:	N/A
Equipment location:	Allerton	Contract Number:	N/A
Serial Number:	153264	Gas Divider:	Protea PRO1557
Instrument Model:	Jok Air	Certification:	Sira MC 040031/11

Gas:	O2	20.90	%	100% Target:				21
	N2	7.500	5.993	4.486	2.978	1.471	7.500	
Data Entry	GAS	0.000	1.507	3.014	4.522	6.029	0.000	
% of target		0	20	40	60	80	0	
Start Time		14:51	14:54	14:48	14:57	14:45	15:00	
End Time		14:54	14:57	14:51	15:00	14:48	15:03	
Target Conc y_i	%	0	4.2	8.4	12.6	16.8	0	
Analyser Response 1 x_i		0.33	4.44	8.5	12.88	16.87	0.24	
Analyser Response 2 x_i		0.3	4.4	8.41	12.86	16.87	0.24	
Analyser Response 3 x_i		0.22	4.44	8.41	12.86	16.88	0.25	

T 90			Response time	Analyser Span	Probe Span
Concentration Target			Start Time	12:40:00	n/a
O2	18.81	%	End Time	12:41:00	n/a
			T 90 Time	00:01:00	

Test the residuals

Method Used	Standard	+/-	5	%
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Comments:

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Authorised Signatory :

Print Name :

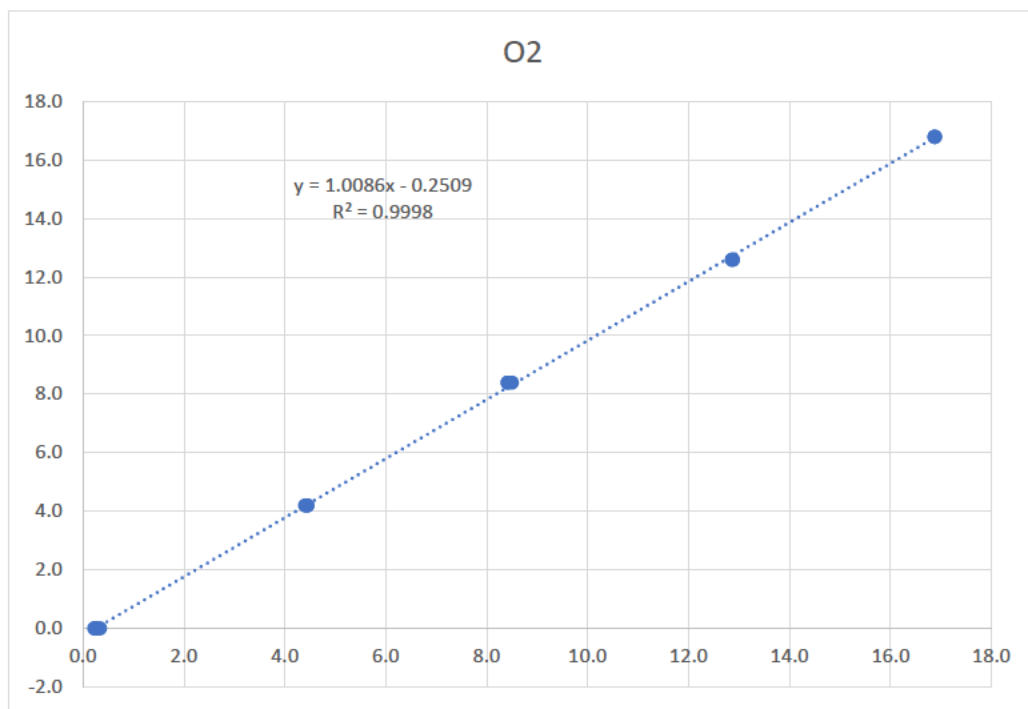
Gary Stone

Date: 17/11/2025



Jok Air O2 EN14181 Linearity and Variability Check

Customer: Thalia Date: 17/11/2025
Ticket Number: N/A
Equipment location: Allerton
Serial Number: 153264
Instrument Model: Jok Air



The AMS has **Pass** linearity test
The AMS has **Pass** variability test

Comments:

Authorised Signatory :

Print Name :

Gary Stone

Date:

17/11/2025



Jok Air 02 EN14181 Linearity and Variability Check

Customer: Thalia	Date: 17/11/2025
Ticket Number: N/A	Order Number: N/A
Equipment location: Allerton	Contract Number: N/A
Serial Number: 153264	Gas Divider: Protea PRO1557
Instrument Model: Jok Air	Certification: Sira MC 040031/11

Gas: O2 20.90 %	100% Target: 21
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Calculation of calibration function						Sum	
SRM y_i	0.00	4.20	8.40	12.60	16.80		$(y_i, s)_{ave} =$ 8.4
x_i (AMS Readings)	0.28	4.43	8.44	12.87	16.87		$x_{ave} =$ 8.58
$x_i - x_{ave}$	-8.29	-4.15	-0.14	4.29	8.30		
$y_i - y_{ave}$	-8.40	-4.20	0.00	4.20	8.40		
$(x_i - x_{ave}) * (y_i - y_{ave})$	69.68	17.44	0.00	18.01	69.68	174.80	
$(x_i - x_{ave})^2$	68.80	17.23	0.02	18.39	68.81	173.26	

Calibration function:	Y=	-0.25	+	1.0089	x	(xj)
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Test of variability						Sum	No of Tests	
AMS value * ($\hat{y}$) mg/m ³	0.03	4.21	8.26	12.73	16.77		ELV	21
D ($y_i - \hat{y}$) mg/m ³	-0.03	-0.01	0.14	-0.13	0.03		95% Ci	10
D ² ($y_i - \hat{y}$) ²	0.00	0.00	0.02	0.02	0.00	0.04		

$$\sigma_D = \sqrt{((1/(N-2)) \sum D^2)} \quad \sigma_D = 0.1119$$

$$\sigma_o = p \times ELV / 1.96 \quad \sigma_o = 1.0714$$

$$\sigma_D \leq \sigma_o \times kv$$

$$\text{For this number of measurements kv is } 0.9161 \quad \sigma_o \times kv = 0.9815$$

The AMS passes the variability test when, $\sigma_D < \sigma_o \times kv$, therefore:

The AMS has Pass variability check

Valid range for calibrated AMS 0.028 % to 18.45 %

Authorised Signatory :

Print Name :

Gary Stone

Date: 17/11/2025

Envea QAL181 Particulates EN14181 Linearity and Variability Check

Customer:	Thalia	Date:	17/11/2025
Ticket Number:	N/A	Order Number:	N/A
Equipment location:	Allerton	Contract Number:	N/A
Serial Number:	76940	Gas Divider:	N/A
Instrument Model:	Envea QAL181	Certification:	Sira MC 040031/11
Gas:	Particulates 45.00 mg/m3	100% Target:	45 2 x Daily ELV

Data Entry

% of target	0.02	20	40	60	80	0
Start Time	09:06	09:09	09:03	09:12	09:00	09:15
End Time	09:09	09:12	09:06	09:15	09:03	09:18
Target Conc y _i mg/m3	0.009	10.89	22.71	35.08	45.18	0
Analyser Response 1 x _i	-0.08	10.8	22.75	35.49	44.99	-0.07
Analyser Response 2 x _i	-0.08	10.8	22.75	35.49	44.99	-0.07
Analyser Response 3 x _i	-0.08	10.8	22.75	35.49	44.99	-0.07

T 90	Response time	Analyser Span	Probe Span
Concentration Target	Start Time	17:12:00	n/a
Particulates 45.00 mg/m3	End Time	17:13:00	n/a
	T 90 Time	00:01:00	

Test the residuals

Method Used	Standard	+/-	5	%
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Comments:

Authorised Signatory :

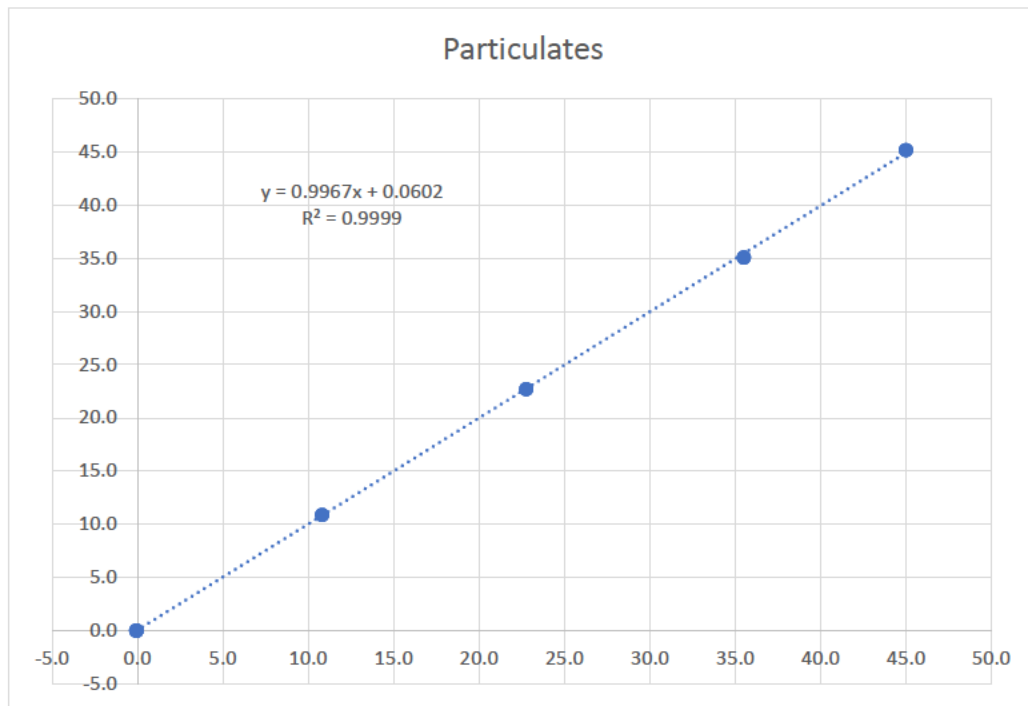
Print Name :

Gary Stone

Date: 17/11/2025

Envea QAL181 Particulates EN14181 Linearity and Variability Check

Customer: Thalia Date: 17/11/2025
Ticket Number: N/A
Equipment location: Allerton
Serial Number: 76940
Instrument Model: Envea QAL181



The AMS has **Pass** linearity test
The AMS has **Pass** variability test

Comments:

Authorised Signatory :

Print Name : Gary Stone Date: 17/11/2025

Envea QAL181 rticula EN14181 Linearity and Variability Check

Customer:	Thalia	Date:	17/11/2025
Ticket Number:	N/A	Order Number:	N/A
Equipment location:	Allerton	Contract Number:	N/A
Serial Number:	76940	Gas Divider:	N/A
Instrument Model:	Envea QAL181	Certification:	Sira MC 040031/11

Gas:	Particulates	45.00	mg/m3
		100% Target:	45

Calculation of calibration function	Sum	
SRM y_i	0.01 10.89 22.71 35.08 45.18	$(y_i, s)_{ave} = 22.7738$
x_i (AMS Readings)	-0.08 10.80 22.75 35.49 44.99	$x_{ave} = 22.79$
$x_i - x_{ave}$	-22.87 -11.99 -0.04 12.70 22.20	
$y_i - y_{ave}$	-22.76 -11.88 -0.06 12.31 22.41	
$(x_i - x_{ave}) * (y_i - y_{ave})$	520.63 142.49 0.00 156.29 497.42	
$(x_i - x_{ave})^2$	523.04 143.76 0.00 161.29 492.84	
	1316.83 1320.93	

Calibration function:	Y=	0.05	+	0.9969	x	(xj)
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Test of variability	Sum		No of Tests
AMS value * $(\hat{y})$ mg/m ³	-0.03 10.82 22.73 35.43 44.90		5
$D (y_i - \hat{y})$ mg/m ³	0.03 0.07 -0.02 -0.35 0.28		ELV 45
$D^2 (y_i - \hat{y})^2$	0.00 0.00 0.00 0.13 0.08		95% Ci 30
	0.21		

$$\sigma_D = \sqrt{((1/(N-2)) \sum D^2)} \quad \sigma_D = 0.2632$$

$$\sigma_o = p \times ELV / 1.96 \quad \sigma_o = 6.8878$$

$$\sigma_D \leq \sigma_o \times kv$$

$$\text{For this number of measurements kv is } 0.9161 \quad \sigma_o \times kv = 6.3099$$

The AMS passes the variability test when, $\sigma_D < \sigma_o \times kv$, therefore:

The AMS has Pass variability check

Valid range for calibrated AMS -0.023 mg/m³ to 49.40 mg/m³

Authorised Signatory :

Print Name :

Gary Stone

Date: 17/11/2025