CERTIFICATE OF CALIBRATION

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Date of issue: 11 January 2022

Certificate Number: 5698

Customer Name and Address:

Perth and Kinross Council
Pullar House
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Description: Calibration factors for the air monitoring station(s) at Perth and Kinross Council

Ricardo Energy & Environment ID: ED11194 / 5698

The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95% The uncertainty evaluation has been carried out in accordance with UKAS requirements.

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory

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Perth and Kinross Council
NOx analysers

Station	Date of Audit	Species	Analyser Serial no	Zero Response[1]	Zero uncertainty nmol/mol	Calibration Factor[2]	Factor uncertainty %	Converter eff. (%)[3]
Perth Atholl Street	21 December 2021	NOx	1202238668	-0.6	2.5	0.9858	3.50	100.0
		NO		-0.7	2.5	0.9920	3.50	
Perth Bridgend	21 December 2021	NOx	CM07460074	-1.4	2.7	1.3574	3.50	98.3
		NO		-0.4	2.7	1.3574	3.50	
Perth Crieff	21 December 2021	NOx	1202238666	-1.2	2.6	1.1004	3.50	97.4
		NO		-1.1	2.6	1.1060	3.50	

FIDAS analysers

Station	Date of audit	Analyser Serial no	Calculated ko[5]	Uncertainty %	Total flow[4]	Uncertainty %	Main flow	Uncertainty %
Perth Atholl Street	21 December 2021	8654			4.62	2.2		2.2
Perth Bridgend	21 December 2021	12147			4.47	2.2		2.2
Perth Crieff	21 December 2021	8655			4.54	2.2		2.2
Perth Muirton	21 December 2021	10603			4.53	2.2		2.2

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The gaseous ambient analysers listed above have been tested for zero response, calibration factor, linearity and converter efficiency (NOx analysers) by documented methods. The factors have been calculated using certified gas standards. The particulate analysers listed above have been tested for sample flow rates and k_0(where appropriate) by documented methods. Note that the test results are valid on the day of test only, as analyser drift over time cannot be quantified. All results for gaseous species are reported in concentration units of nmol/mol or µmol/mol.

[1] The zero response is the zero reading on the data logging system of the analyser when audit zero gas was introduced to the analysers under test.

[2] The calibration factor is the multiplying factor required to scale the reading on the data logging system of the analyser into reported concentration units (nmol/mol for NO, NOx, SO_2, O_3 and µmol/mol for CO). It should be used in conjunction with the zero response. A corrected concentration is calculated using the following equation:

Concentration = F(Output - Zero Response)

Where F = Calibration Factor provided on this certificate

Output = Reading on the data logging system of the analyser

Zero Response = Zero Response provided on this certificate

[3] Converter eff. is the measured efficiency of the NO_2 to NO converter within the oxides of nitrogen analyser under test.

[4] The measured main flow rate (where this is applicable) is the flow rate through the sensor unit of the TEOM particulate analyser under test. The measured total flow rate is the total flow rate through the particulate analyser under test. Units of flow are $l.min^{-1}$, reported at prevailing ambient conditions unless otherwise specified. Where flow rates are highlighted in bold, it indicates that measurements were not made at the analyser sample inlet. These measurements therefore may not accurately reflect analyser performance in normal operation.

[5] The calculated k_0 value (specifically for TEOM analysers) is the calculated k_0 spring constant based on tests undertaken with filters of known weight. The % deviation indicates the closeness of the calculated result to the manufacturer's specified value of k_0.

The calibration results shaded are those that fall within our scope of accreditation, all other results on this certificate are not UKAS accredited, but have been included for completeness.