CERTIFICATE OF CALIBRATION

Ricardo Energy and Environment, Gemini Building, Fermi Avenue Harwell,
Didcot, Oxfordshire OX11 0QR. Telephone 01235 753692

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Approved Signatories:

☐	S. Eaton	☐	B Stacey
☐	D Hector	☐	S Stratton
☐	N Rand	☐	S Telfer
☐	E Marshall-Padkin	☑	S Gray
☐	B Davies		

Signed:

Date of issue: 25 Apr 18

Certificate Number: 3925

Customer Name and Address:

Scottish Government
Water, Air, Soils and Flooding Division
Environmental Quality Directorate
Scottish Government
Victoria Quay
Edinburgh
EH6 6QQ

Description: Calibration factors for the air monitoring stations at City of Edinburgh Council

Ricardo Energy & Environment ID: ED61598/3925

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.

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Ricardo Energy & Environment
Head Office
Gemini Building,
Fermi Avenue,
Harwell,
Oxon
OX11 0QR

Tel: +44 (0)1235 753 000

Registered office
Shoreham Technical Centre
Shoreham-by-Sea
West Sussex
BN43 5FG

Registered in England No.
08229264

VAT Registration No.
GB 212 8365 24

ee.ricardo.com

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City of Edinburgh Council

NOx analysers

Station	Date of Audit	Species	Analyser Serial no	Zero Response[1]	Zero uncertainty ppb	Calibration Factor[2]	Factor uncertainty %	Converter eff. (%)[3]
Edinburgh Currie	31-Jul-17	NOx	1877	1.8	2.6	1.1071	3.50	99.6
		NO		2.7	2.6	1.1098	3.50	
Edinburgh Glasgow Road	31-Jul-17	NOx	M1780-M722	4.0	2.7	0.9830	3.50	99.6
		NO		0.0	2.7	0.9706	3.50	
Edinburgh Gorgie Road	01-Aug-17	NOx	O601915008	-0.2	2.8	1.4974	3.50	100.0
		NO		-0.4	2.7	1.4836	3.50	
Edinburgh Salamander Street	01-Aug-17	NOx	660B-292	1.0	12.5	1.0718	4.17	99.6
		NO		0.0	10.1	1.0719	3.91	
Edinburgh St Johns Road	05-Sep-17	NOx	M2722-M1043	1.0	2.8	1.1856	3.50	98.1
		NO		0.0	2.6	1.1744	3.50	

PM10 analysers

Station	Date of audit	Analyser Serial no	Calculated ko	Uncertainty %	Total flow	Uncertainty %	Main flow	Uncertainty %
Edinburgh Currie	31-Jul-17	140AB252660407	11930	1.0	15.74	2.2	2.25	2.2
Edinburgh Glasgow Road	31-Jul-17	24376	14282	1.0	16.22	2.2	2.95	2.2
Edinburgh Queensferry Road	05-Sep-17	27492	14645	1.0	16.54	2.2	3.21	2.2
Edinburgh Salamander Street	01-Aug-17	22301	18382	1.0	16.17	2.2	2.97	2.2
Edinburgh St Johns Road	05-Sep-17	7749			4.63	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 given in ppb (parts per billion) mole fractions or ppm (parts per million) mole fractions.

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 (ppb for NO, NOx, SO_2, O_3 and ppm for CO. Where 1ppm = 1000ppb). 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.