CERTIFICATE OF CALIBRATION

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Signed:

Date of issue: 20 September 2024

Certificate Number: 6998

Customer Name and Address:

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

Description: Calibration factors for the air monitoring station(s) at Falkirk Council

Ricardo Energy & Environment ID: ED19050 / 6998

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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Falkirk 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]	Converter uncertainty (%)
Falkirk Bainsford	25 June 2024	NOx	7576	2.7	2.6	1.0876	3.55	98.6 (248nmol/mol)	0.8
		NO		0.6	2.5	1.0792	3.60	98.7 (124nmol/mol)	0.8
Falkirk Grangemouth MC	26 June 2024	NOx	7568	-3.0	2.6	1.0672	3.53	98.9 (266nmol/mol)	0.6
		NO		-0.8	2.6	1.0856	3.59	98.9 (128nmol/mol)	0.6
Falkirk Haggs	24 June 2024	NOx	4793	7.6	2.6	1.0591	3.64	98.5 (251nmol/mol)	1.5
		NO		4.4	2.5	1.0543	3.70	98.4 (120nmol/mol)	1.5
Falkirk Hope Street	25 June 2024	NOx	7564	-0.4	2.5	1.0690	3.54	99 (259nmol/mol)	0.4
		NO		0.7	2.5	1.0740	3.58	100 (123nmol/mol)	0.4
Falkirk West Bridge Street	25 June 2024	NOx	1228	-1.6	2.6	1.1215	3.52	95.2 (249nmol/mol)	0.9
		NO		0.8	2.6	1.1521	3.60	93.5 (121nmol/mol)	0.9

Fidas analysers

Station	Date of audit	Analyser Serial no	Zero (µg/m³)	Caldust channel deviation	Total flow[4]	Uncertainty %	Deviation %
Falkirk Bainsford	25 June 2024	13696	0	1.02	4.62	2.25	-3.75
Falkirk Grangemouth MC	26 June 2024	11616	0	0.43	4.81	2.25	0.29
Falkirk Haggs	24 June 2024	6179	0	1.26	4.70	2.25	-2.06
Falkirk Hope Street	25 June 2024	13555	0	1.44	4.52	2.25	-5.87
Falkirk West Bridge Street	25 June 2024	7661	0	0.43	4.69	2.25	-2.36

SO2 analysers

Station	Date of Audit	Analyser Serial no	Zero Response[1]	Zero uncertainty nmol/mol	Calibration Factor[2]	Factor uncertainty %
Falkirk Bo'ness	24 June 2024	6853	-1.0	2.5	1.0185	2.7573
Falkirk Grangemouth MC	26 June 2024	6854	0.9	2.5	0.9780	2.6728
Falkirk Hope Street	25 June 2024	6226	-1.0	2.5	0.9523	2.7223
Falkirk Grangemouth Zetland Park	26 June 2024	6227	1.7	2.5	0.9718	3.5828
Grangemouth Moray Scot Gov	05 July 2024	6855	3.8	2.5	1.0159	2.7440

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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 k0 (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 composition 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 composition units (nmol/mol for NO, NO_x, SO_2, O_3 and µmol/mol for CO). It should be used in conjunction with the zero response. A corrected composition is calculated using the following equation:

composition = 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 NO2 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 aux flow rate (where this is applicable) is the flow rate through the bypass tubing 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 k0 value (specifically for TEOM analysers) is the calculated k0 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 k0.

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.

******END OF CERTIFICATE******