



Approved Signatories:

- |                          |          |                                     |            |
|--------------------------|----------|-------------------------------------|------------|
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Signed:

Date of issue: 04 August 2022

Certificate Number: 5942

Customer Name and Address: Perth and Kinross Council  
Pullar House  
Kinnoull Street  
Perth  
PH1 5GD

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

Ricardo Energy & Environment ID: ED12110/5942

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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**CERTIFICATE OF CALIBRATION**



Date of issue: 04 August 2022  
 Certificate Number: 5942  
 Ricardo Energy & Environment ID: ED11194/5942

Perth and Kinross Council  
 NOx analysers

Station	Date of Audit	Species	Analyser Serial no	Zero Response <sup>1</sup>	Zero uncertainty nmol/mol	Calibration Factor <sup>2</sup>	Factor uncertainty %	Converter eff. (%) <sup>3</sup>
Perth Atholl Street	28 June 2022	NOx	1202238668	0.5	2.5	0.9257	3.50	100.4
		NO		0.0	2.5	0.9303	3.50	
Perth Bridgend	28 June 2022	NOx	CM07460074	0.1	2.6	1.1293	3.55	100.5
		NO		0.2	2.6	1.1271	3.50	
Perth Crieff	28 June 2022	NOx	1202238666	-0.8	2.5	1.0322	3.50	100.4
		NO		-0.5	2.5	1.0330	3.50	

Fidas analysers

Station	Date of audit	Analyser Serial no	Calculated ko <sup>5</sup>	Uncertainty %	Total flow <sup>4</sup>	Uncertainty %	Main flow	Uncertainty %
Perth Atholl Street	28 June 2022	8654			4.65	2.2		2.2
Perth Bridgend	28 June 2022	12147			4.78	2.2		2.2
Perth Crieff	28 June 2022	8655			4.75	2.2		2.2
Perth Muirton	28 June 2022	10603			4.80	2.2		2.2





## CERTIFICATE OF CALIBRATION



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The gaseous ambient analysers listed above have been tested for zero response, calibration factor, linearity and converter efficiency (NO<sub>x</sub> 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<sub>0</sub> (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.

<sup>1</sup> 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.

<sup>2</sup> 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, NO<sub>x</sub>, SO<sub>2</sub>, O<sub>3</sub> 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

<sup>3</sup> Converter eff. is the measured efficiency of the NO<sub>2</sub> to NO converter within the oxides of nitrogen analyser under test.

<sup>4</sup> 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<sup>-1</sup>, 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.

<sup>5</sup> The calculated k<sub>0</sub> value (specifically for TEOM analysers) is the calculated k<sub>0</sub> 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<sub>0</sub>.

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.