CERTIFICATION OF CALIBRATION

Date Of Calibration: 24-Jun-2016 **Certificate Number:** GA10350_2/16678

4533

ISSUED BY: GEOTECHNICAL INSTRUMENTS (UK) LTD

Customer: **Leyden Kirby Associates Limited**

Eton Business Park Eton Hill Road Radcliffe
MANCHESTER M26 2ZS UNITED KINGDOM

Description: Gas Analyser

Model: GA2000

Serial Number: GA10350

UKAS Accredited results:

Results after adjustment :

Methane (CH_4)		
Certified Gas (%)	**Instrument Reading (%)**	**Uncertainty (%)**
5.1	5.2	0.41
15.0	15.2	0.64
50.0	49.6	0.94

Carbon Dioxide (CO_2)		
Certified Gas (%)	**Instrument Reading (%)**	**Uncertainty (%)**
5.1	4.9	0.43
15.1	14.9	0.70
50.0	50.0	1.1

Oxygen (O_2)		
Certified Gas (%)	**Instrument Reading (%)**	**Uncertainty (%)**
21.4	21.5	0.31

The inwards assessment was carried out 20-Jun-2016.
The maximum adjustment was less than the inwards assessment uncertainty.
Inwards assessment data is available if requested.

All concentrations are molar.

CH_4, CO_2 readings recorded at : 33.5 °C ± 1.5 °C

O2 reading recorded at : 22.7 °C ± 1.5 °C

Barometric Pressure : 1010 mbar ± 3 mbar

Method of Test : The analyser is calibrated in a temperature controlled chamber using a series of reference gases, in compliance with procedure LP004.

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

Calibrations marked 'Non-UKAS Accredited results' on this certificate have been included for completeness.

Non-UKAS Accredited results:

Barometer (mbar)	
Reference	**Instrument Reading**
1010	1010

Additional Gas Cells		
Gas	**Certified Gas (ppm)**	**Instrument Reading (ppm)**
CO	477	477.2
H_2S	254	254.2

Internal Flow	
Applied (l/hr)	**Instrument Reading (l/hr)**
5.00	5.10
10.00	10.20

Approved by Signatory

Jeremy Dunn

Laboratory Inspection

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Instrument Service Report

Unit Type: GA2000	Part Number:	Date:	Next Service Due:	Customer Name:
Serial Number: GA10350	GA2K1-E100	27-Jun-2016	24-Dec-2016	Leyden Kirby Associates Limited

Actions/Investigation Description	Result	Comments
Serial Number Check	Yes	
Serial Comms Test	Pass	
Full Automatic Calibration	Pass	
Inward Gas Check Performed?	Yes	
Service history of instrument reviewed	Yes	
Inwards gas check data reviewed	Yes	
Instrument turns on	Pass	
Customer specific requirements observed and reported fault(s) acknowledged	Yes	
Backlight operates correctly	Yes	
External visual inspection performed	Pass	
Microfibre (inlet port) filter replaced	Yes	
Instrument has latest software	Yes	
Memory cleared (cold start)	Yes	
Internal visual inspection performed	Retest Passed	Case replaced due to damaged battery mounting pillars
PTFE filter replaced	Yes	
Chemical sensor(s) replaced	Yes	H2S cell replaced

Instrument Service Report

Unit Type: GA2000	Part Number:	Date:	Next Service Due:	Customer Name:
Serial Number: GA10350	GA2K1-E100	27-Jun-2016	24-Dec-2016	Leyden Kirby Associates Limited

Actions/Investigation Description	Result	Comments
Battery over 6 years old and replaced	No	
O2 sensor replaced	No	
All screws tightened to correct torque	Yes	
All connectors are secure	Pass	
Check diagnostic channels	Pass	
Case compression test	Pass	
Impact and stability test	Pass	
Pump flow test	Pass	
Automated instrument pressure system test (leak test)	Pass	
Pump vacuum test and flow fails in main read screen	Pass	
Pressure transducer test(s) as per user operation	Pass	
Final visual inspection on instrument	Pass	
Blanking plugs in place	Yes	
Carry strap pins in place	Yes	
Case assembly closed and screws tightened to correct torque	Yes	
Response to customer's reported comments	Yes	Our investigation shows pump faulty. This has been resolved by replacing pump and carried out full service and calibration.

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Instrument Service Report

Unit Type: GA2000	Part Number:	Date:	Next Service Due:	Customer Name:
Serial Number: GA10350	GA2K1-E100	27-Jun-2016	24-Dec-2016	Leyden Kirby Associates Limited

Actions/Investigation Description	Result	Comments
GPS function test	NA	
Internal flow calibrated - refer to results on Calibration Certificate	Pass	
Temperature probe tested	Pass	
Anemometer tested	Pass	
Chemical cells calibrated - refer to results on Calibration Certificate	Retest Passed	

Customer Comments

Just to confirm our GA2000 will be returned today by courier for calibration. Please note we've observed that the readings appear to be getting stuck on the previous borehole's readings and not changing. I'm not sure whether this is a result of incorrect useage and not purging the instrument in between boreholes or there is a fault somewhere. I've noted it on the returns form, but could you take a look at it please while it's with you.
Many thanks,
Helen
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Accessory Test	Result	Comments
Charger	Pass	Charger output is in spec.
Water Trap	Pass	Replaced PTFE filter. Replaced tubing, Replaced hose barb, Tested ok.
Download Lead	Pass	Data transfer successful.

Service Details:		Service Engineer:	Calibration Engineer:	Approved By:	Signature:
Service Scheme	☐	Abdul Tantoush	Graham Ingles	Jeremy Dunn	
Standard Service	✓				