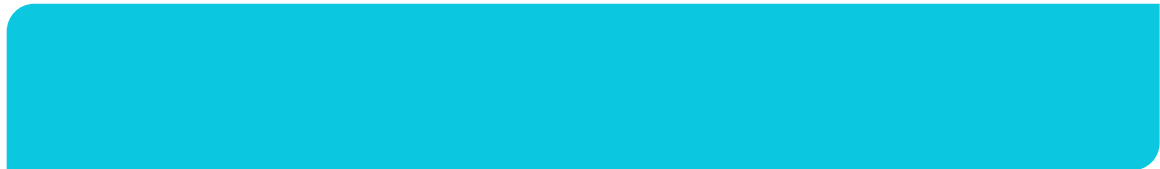


ANEXO 4



Organismo
de Evaluación
y Fiscalización
Ambiental

Certificados de calibración



Organismo
de Evaluación
y Fiscalización
Ambiental

CA-RZC-01



CERTIFICADO DE CALIBRACIÓN

Certificate of calibration

N°: **LG-325-2021**

Página (Page) 1 de 3

Green Group PE S.A.C

Av. Aviación 4210 Surquillo Lima - Perú

www.greengroup.com.pe

Central: 560-6134 / 273-3550



Los resultados marcados con (*) no están amparados por la acreditación de ENAC

INSTRUMENTO <i>Equipment</i>	Analizador continuo de Dióxido de Azufre
FABRICANTE <i>Manufacturer</i>	Thermo Scientific
MODELO <i>Model</i>	43iQ
IDENTIFICACIÓN <i>Identification</i>	12123713084
SOLICITANTE <i>Customer</i>	ORGANISMO DE EVALUACIÓN Y FISCALIZACIÓN AMBIENTAL - OEFA Av. Faustino Sánchez Carrión Nro. 603 - Jesús María - Lima
FECHA/S DE CALIBRACIÓN <i>Date/s of calibration</i>	2021-10-23

Signatario/s autorizado/s
Authorized signatory/ies

Fecha de emisión
Date of issue

2021-10-25

- . Este certificado se expide de acuerdo con las condiciones de la acreditación concedida por ENAC que ha comprobado las capacidades de medida del laboratorio y su trazabilidad a patrones nacionales e internacionales.
- . ENAC es firmante del Acuerdo de Reconocimiento Mutuo (MLA) de calibración de European Cooperation for Accreditation (EA) y de International Laboratory Accreditation Cooperation (ILAC).
- . Este certificado no podrá ser reproducido parcialmente sin la aprobación por escrito del laboratorio que lo emite
- . *This certificate is issued in accordance with the conditions of accreditation granted by ENAC which has assessed the measurement capability of the laboratory and its traceability to national or international standards.*
- . ENAC is one of the signatories of the Multilateral Agreement of the European Cooperation for Accreditation (EA) and the international Laboratories Accreditation Cooperation (ILAC).
- . *This certificate may not be partially reproduced, except with the prior written permission of the issuing laboratory.*

Certificado de Calibración

LG-325-2021

1. DATOS TÉCNICOS DEL INSTRUMENTO

Página 2 de 3

Linealidad: 1 % de Escala.
Deriva: 1 % de Escala.
Resolución: 0,1ppb - 1 ppb

Esta información proviene del manual de fabricante.

2. MÉTODO DE CALIBRACIÓN

La calibración se realizó por lecturas del equipo con gases patrón según "Procedimiento PCG-01 para la calibración de analizadores de Gases" Green Group PE SAC.

3. LUGAR DE CALIBRACIÓN.

Laboratorio de Gases - Green Group PE

4. CONDICIONES AMBIENTALES

	Temperatura °C	Humedad relativa %hr
Inicial	21,3	62,3
Final	21,0	61,2

5. TRAZABILIDAD

Patrón usado	Código Interno	N° de lote o N° de certificado	F. Vencimiento
GAS PATRÓN SO2	GGP-CG-26.7	EB0137989	2023-12-14
CAUDALÍMETRO	GGP-41.2	MM111020S001	2021-11-10
CAUDALÍMETRO	GGP-41.3	MM111820S001	2021-11-17

6. PARÁMETROS DE MEDICIÓN

Parámetros	Inicial	Final	Rango
Rango (ppb)	500	500	(0 - 20) ppm
Average Time (sec)	60	60	(0 a 300) s
SO2 BKG	17,6	12,8	-
SO2 Coef	1,012	0,947	-
Internal Temp (°C)	27,6	27	(8 a 47) °C
Chamb Temp (°C)	45	45	(44 a 46) °C
Press (mmHg)	741,2	738,7	(300 a 800) mmHg
Flow (L/min)	0,044	0,446	(0,3 a 1) L/min
Lamp Intens (Hz)	96,8	96,8	(60 a 120) Hz
Lamp Voltage (v)	780	781,6	(600 a 1200) Volt.
PMT Supply (v)	-634,2	-634,2	(-400 a -900) Volt.

Certificado de Calibración

LG-325-2021

7. LECTURAS DE AJUSTE DEL INSTRUMENTO

Página 3 de 3

Lectura de SO₂

	Patrón	Lectura inicial	Lectura Final	Unidades
Zero	1,2	-2,7	1,1	ppb
Span	400	427	399	ppb
Zero	1,2	1,3	1,3	ppb

8. RESULTADO DE MEDICIÓN

Lectura de SO₂

Lectura del instrumento	Concentración del patrón	Corrección	Incertidumbre
ppb	ppb	ppb	ppb
400	401	1	9
300	301	1	7
199	201	2	6
98,8	100,0	1,2	5,2
1,1	1,2	0,1	2,3

9. OBSERVACIONES

- El instrumento se ajustó antes de la calibración.
- El tiempo de estabilización de la lectura es de 13 minutos.
- Considerar que 1 ppb equivale a 1.10^{-9} mol/mol.
- De los resultados de la curva de calibración de SO₂, la pendiente es: 1,002 y el coeficiente de correlación es: 0,999. (*)

-
- La incertidumbre expandida declarada se ha obtenido multiplicando la incertidumbre típica de medida por un factor de cobertura $k=2$ tal que la probabilidad de cobertura sea de aproximadamente el 95%.
 - La incertidumbre declarada en el presente certificado ha sido estimado siguiendo las directrices de: EA-4/02 M:2013 "Evaluación de la Incertidumbre de las Medidas de las Calibraciones" Rev01 Setiembre 2013
 - Los resultados emitidos son válidos solo para el instrumento y sensores calibrados, en el momento de la calibración.
 - Se recomienda al usuario recalibrar a intervalos adecuados, los cuales deben ser elegidos con base a las características del instrumento.
-

Campbell Scientific Limited

80 Hathern Road,
Shepshed,
Leicestershire,
LE12 9GX, United Kingdom.



Telephone: +44 (0) 1509 601141

HygroVUE™10 Calibration Check

Serial Number	Reference RH (%)	Probe RH (%)	Reference Temperature (°C)	Probe Temperature (°C)
E2967	50.46	50.77	23.30	23.26

The Test Standards used have full traceability to UK Standards. All standards have been calibrated by Campbell Scientific or a UKAS accredited calibration service.

Check performed by: *Keri*

Date: *21st September 2021*

Campbell Scientific Limited operates a Quality Assurance System approved to BS EN ISO 9001:2015



CERTIFICATE OF CALIBRATION AND TESTING

SERIAL NUMBER:	BPA0011712
CUSTOMER:	GREEN GROUP PE SAC
P.O. NUMBER:	001-6426
INV NUMBER:	161845
MODEL:	61402L BAROMETRIC PRESSURE SENSOR (4-20 MA)

We hereby certify that the sensor serial number specified above has been inspected, tested, and found to comply with all process and material specifications established for the purpose of quality assurance of R. M. Young Company products. Engineering drawings, procedures, and specifications are maintained on file at our premises.

Standards established by R. M. Young Company for calibrating the measuring and test equipment used in controlling product quality are traceable to the National Institute of Standards and Technology (NIST).

Date of Certification: 15 Sep 2021

R. M. Young Company

Ed Chemosky
Quality Assurance

Product Test Report

Product Tested: MaxiMet GMX200-2B

Part Number: 1957-0200-60-000

Serial Number: 21340002

Test Date: 17/08/2021

Location: Gill Instruments Ltd

GILL ensures that quality is inherent in all aspects of their activities and ensures that compliance with BS EN ISO9001: 2015 is maintained.

This report certifies that the above instrument has been tested in accordance with Gill internal procedures

Results

<u>Test</u>	<u>Limits</u>	<u>Result</u>
Wind Still Air Test (Zero Wind Speed)	Pass/Fail	Pass
Compass Calibration (Routine Successful)	Pass/Fail	Pass
Firmware Test (Current Version Loaded)	Pass/Fail	Pass
Data Formats Test (Functional Test)	Pass/Fail	Pass

Other tests done to ISO 9001:2015 standards or (where applicable) more highly regarded international standards.

Wind sensor generic calibration is traceable to the University of Southampton wind tunnel and Gill instrumentation is maintained in accordance with UKAS.

Comparisons for Temperature, Humidity and Pressure are done against reference UKAS traceable instruments. The reference system numbers of these instruments are listed above.

All tests have been successfully completed

On behalf of Gill Instruments Ltd



Les Rann - Quality Control



Gill Instruments Limited

Certificate of Conformance

This is to certify that:

Product: 1957-0200-60-000 MAXIMET GMX200



Serial Number: 21340002



Has been manufactured within Gill Instruments Limited Quality Management System, approved to the requirements of BS EN ISO 9001.

The instrument has been tested and calibrated with equipment having full traceability to national standards where applicable and meets the requirements of the Operating Manual Specification and Electrical Conformity, both CE and FCC.

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference and
(2) This device must accept any interference received, including interference that may cause undesired operation.

The instrument comes with a 24 Month warranty against defective materials or workmanship from the date of purchase, providing it has not been tampered with and has been returned through an authorised route to Gill Instruments Limited.

Date created: 17 Aug 2021

Signed by: [Signature]

Les Rann
Quality Engineer

Gill Instruments Limited
Saltmarsh Park
67 Gosport Street
Lymington
Hampshire
SO41 9EG, UK

Tel: +44 (0)1590 613500
Fax: +44 (0)1590 613501
E-mail: gill@gillinstruments.com
Web: gillinstruments.com



View our current Anemometer range here



CERTIFICATE OF CALIBRATION AND TESTING

SERIAL NUMBER:	TB00016965
CUSTOMER:	GREEN GROUP PE SAC
P.O. NUMBER:	001-6426
INV NUMBER:	161845
MODEL:	52203 TIPPING BUCKET RAIN GAUGE (UNHEATED)

We hereby certify that the sensor serial number specified above has been inspected, tested, and found to comply with all process and material specifications established for the purpose of quality assurance of R. M. Young Company products. Engineering drawings, procedures, and specifications are maintained on file at our premises.

Standards established by R. M. Young Company for calibrating the measuring and test equipment used in controlling product quality are traceable to the National Institute of Standards and Technology (NIST).

Date of Certification: 15 Sep 2021

R. M. Young Company

Ed Chemosky
Quality Assurance



Organismo
de Evaluación
y Fiscalización
Ambiental

CA-RZC-02

CERTIFICADO DE CALIBRACIÓN

Certificate of calibration

N°: **LG-328-2021**

Página (Page) 1 de 3

Green Group PE S.A.C

Av. Aviación 4210 Surquillo Lima - Perú

www.greengroup.com.pe

Central: 560-6134 / 273-3550



Los resultados marcados con (*) no están amparados por la acreditación de ENAC

INSTRUMENTO <i>Equipment</i>	Analizador continuo de Dióxido de Azufre
FABRICANTE <i>Manufacturer</i>	Thermo Scientific
MODELO <i>Model</i>	43iQ
IDENTIFICACIÓN <i>Identification</i>	12123713083
SOLICITANTE <i>Customer</i>	ORGANISMO DE EVALUACIÓN Y FISCALIZACIÓN AMBIENTAL - OEFA Av. Faustino Sánchez Carrión Nro. 603 - Jesús María - Lima
FECHA/S DE CALIBRACIÓN <i>Date/s of calibration</i>	2021-10-23

Signatario/s autorizado/s
Authorized signatory/ies

Fecha de emisión
Date of issue



ISAÍAS CURI MELGAREJO
Jefe de Laboratorio de Calibración
GREEN GROUP PE S.A.C

2021-10-25

- . Este certificado se expide de acuerdo con las condiciones de la acreditación concedida por ENAC que ha comprobado las capacidades de medida del laboratorio y su trazabilidad a patrones nacionales e internacionales.
- . ENAC es firmante del Acuerdo de Reconocimiento Mutuo (MLA) de calibración de European Cooperation for Accreditation (EA) y de International Laboratory Accreditation Cooperation (ILAC).
- . Este certificado no podrá ser reproducido parcialmente sin la aprobación por escrito del laboratorio que lo emite
- . *This certificate is issued in accordance with the conditions of accreditation granted by ENAC which has assessed the measurement capability of the laboratory and its traceability to national or international standards.*
- . *ENAC is one of the signatories of the Multilateral Agreement of the European Cooperation for Accreditation (EA) and the international Laboratories Accreditation Cooperation (ILAC).*
- . *This certificate may not be partially reproduced, except with the prior written permission of the issuing laboratory.*

Certificado de Calibración

LG-328-2021

1. DATOS TÉCNICOS DEL INSTRUMENTO

Página 2 de 3

Linealidad: 1 % de Escala.
Deriva: 1 % de Escala.
Resolución: 0,1ppb - 1 ppb

Esta información proviene del manual de fabricante.

2. MÉTODO DE CALIBRACIÓN

La calibración se realizó por lecturas del equipo con gases patrón según "Procedimiento PCG-01 para la calibración de analizadores de Gases" Green Group PE SAC.

3. LUGAR DE CALIBRACIÓN.

Laboratorio de Gases - Green Group PE

4. CONDICIONES AMBIENTALES

	Temperatura °C	Humedad relativa %hr
Inicial	21,3	62,3
Final	21,0	61,2

5. TRAZABILIDAD

Patrón usado	Código Interno	N° de lote o N° de certificado	F. Vencimiento
GAS PATRÓN SO2	GGP-CG-26.7	EB0137989	2023-12-14
CAUDALÍMETRO	GGP-41.2	MM111020S001	2021-11-10
CAUDALÍMETRO	GGP-41.3	MM111820S001	2021-11-17

6. PARÁMETROS DE MEDICIÓN

Parámetros	Inicial	Final	Rango
Rango (ppb)	500	500	(0 - 20) ppm
Average Time (sec)	60	60	(0 a 300) s
SO2 BKG	9,5	9,3	-
SO2 Coef	1,011	1,092	-
Internal Temp (°C)	27,2	27,7	(8 a 47) °C
Chamb Temp (°C)	45	45	(44 a 46) °C
Press (mmHg)	737,2	738,2	(300 a 800) mmHg
Flow (L/min)	0,439	0,438	(0,3 a 1) L/min
Lamp Intens (Hz)	100,7	100,8	(60 a 120) Hz
Lamp Voltage (v)	739	738,2	(600 a 1200) Volt.
PMT Supply (v)	-663,9	-663,4	(-400 a -900) Volt.

Certificado de Calibración

LG-328-2021

7. LECTURAS DE AJUSTE DEL INSTRUMENTO

Página 3 de 3

Lectura de SO₂

	Patrón	Lectura inicial	Lectura Final	Unidades
Zero	1,2	0,2	1	ppb
Span	400	373	400	ppb
Zero	1,2	2,2	1,1	ppb

8. RESULTADO DE MEDICIÓN

Lectura de SO₂

Lectura del instrumento	Concentración del patrón	Corrección	Incertidumbre
ppb	ppb	ppb	ppb
401	401	0	9
301	301	0	7
200	201	1	6
100,3	100,0	-0,3	5,2
1,2	1,2	0,0	2,3

9. OBSERVACIONES

- El instrumento se ajustó antes de la calibración.
- El tiempo de estabilización de la lectura es de 12 minutos.
- Considerar que 1 ppb equivale a 1.10^{-9} mol/mol.
- De los resultados de la curva de calibración de SO₂, la pendiente es: 1,003 y el coeficiente de correlación es: 0,999. (*)

-
- La incertidumbre expandida declarada se ha obtenido multiplicando la incertidumbre típica de medida por un factor de cobertura $k=2$ tal que la probabilidad de cobertura sea de aproximadamente el 95%.
 - La incertidumbre declarada en el presente certificado ha sido estimado siguiendo las directrices de: EA-4/02 M:2013 "Evaluación de la Incertidumbre de las Medidas de las Calibraciones" Rev01 Setiembre 2013
 - Los resultados emitidos son válidos solo para el instrumento y sensores calibrados, en el momento de la calibración.
 - Se recomienda al usuario recalibrar a intervalos adecuados, los cuales deben ser elegidos con base a las características del instrumento.
-

Campbell Scientific Limited

80 Hathern Road,
Shepshed,
Leicestershire,
LE12 9GX, United Kingdom.



Telephone: +44 (0) 1509 601141

HygroVUE™10 Calibration Check

Serial Number	Reference RH (%)	Probe RH (%)	Reference Temperature (°C)	Probe Temperature (°C)
E2966	50.46	50.48	23.30	23.31

The Test Standards used have full traceability to UK Standards. All standards have been calibrated by Campbell Scientific or a UKAS accredited calibration service.

Check performed by: Keri

Date: 21st September 2021

Campbell Scientific Limited operates a Quality Assurance System approved to BS EN ISO 9001:2015



CERTIFICATE OF CALIBRATION AND TESTING

SERIAL NUMBER:	BPA0011713
CUSTOMER:	GREEN GROUP PE SAC
P.O. NUMBER:	001-6426
INV NUMBER:	161845
MODEL:	61402L BAROMETRIC PRESSURE SENSOR (4-20 MA)

We hereby certify that the sensor serial number specified above has been inspected, tested, and found to comply with all process and material specifications established for the purpose of quality assurance of R. M. Young Company products. Engineering drawings, procedures, and specifications are maintained on file at our premises.

Standards established by R. M. Young Company for calibrating the measuring and test equipment used in controlling product quality are traceable to the National Institute of Standards and Technology (NIST).

Date of Certification: 15 Sep 2021

R. M. Young Company

Ed Chemosky
Quality Assurance

Product Test Report

Product Tested: MaxiMet GMX200-2B

Part Number: 1957-0200-60-000

Serial Number: 21340003

Test Date: 17/08/2021

Location: Gill Instruments Ltd

GILL ensures that quality is inherent in all aspects of their activities and ensures that compliance with BS EN ISO9001: 2015 is maintained.

This report certifies that the above instrument has been tested in accordance with Gill internal procedures

Results

<u>Test</u>	<u>Limits</u>	<u>Result</u>
Wind Still Air Test (Zero Wind Speed)	Pass/Fail	Pass
Compass Calibration (Routine Successful)	Pass/Fail	Pass
Firmware Test (Current Version Loaded)	Pass/Fail	Pass
Data Formats Test (Functional Test)	Pass/Fail	Pass

Other tests done to ISO 9001:2015 standards or (where applicable) more highly regarded international standards.

Wind sensor generic calibration is traceable to the University of Southampton wind tunnel and Gill instrumentation is maintained in accordance with UKAS.

Comparisons for Temperature, Humidity and Pressure are done against reference UKAS traceable instruments. The reference system numbers of these instruments are listed above.

All tests have been successfully completed

On behalf of Gill Instruments Ltd



Les Rann - Quality Control



Gill Instruments Limited

Certificate of Conformance

This is to certify that:

Product: **1957-0200-60-000** **MAXIMET GMX200**



Serial Number: **21340003**



Has been manufactured within Gill Instruments Limited Quality Management System, approved to the requirements of BS EN ISO 9001.

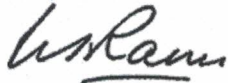
The instrument has been tested and calibrated with equipment having full traceability to national standards where applicable and meets the requirements of the Operating Manual Specification and Electrical Conformity, both CE and FCC.

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

The instrument comes with a **24 Month** warranty against defective materials or workmanship from the date of purchase, providing it has not been tampered with and has been returned through an authorised route to Gill Instruments Limited.

Date created: 17 Aug 2021

Signed by: 

Les Rann
Quality Engineer

Gill Instruments Limited
Saltmarsh Park
67 Gosport Street
Lymington
Hampshire
SO41 9EG, UK

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Fax: +44 (0)1590 613501
E-mail: gill@gillinstruments.com
Web: gillinstruments.com



View our current Anemometer range here



CERTIFICATE OF CALIBRATION AND TESTING

SERIAL NUMBER: TB00016964

CUSTOMER: GREEN GROUP PE SAC
P.O. NUMBER: 001-6426
INV NUMBER: 161845
MODEL: 52203 TIPPING BUCKET RAIN GAUGE (UNHEATED)

We hereby certify that the sensor serial number specified above has been inspected, tested, and found to comply with all process and material specifications established for the purpose of quality assurance of R. M. Young Company products. Engineering drawings, procedures, and specifications are maintained on file at our premises.

Standards established by R. M. Young Company for calibrating the measuring and test equipment used in controlling product quality are traceable to the National Institute of Standards and Technology (NIST).

Date of Certification: 15 Sep 2021

R. M. Young Company

Ed Chemosky
Quality Assurance