



บริษัท ปตท.สผ. สยาม จำกัด

รายงานผลการปฏิบัติตามมาตรการป้องกันและแก้ไขผลกระทบสิ่งแวดล้อม และมาตรการติดตามตรวจสอบผลกระทบสิ่งแวดล้อม
โครงการผลิตปิโตรเลียมแหล่งประดู่เฒ่าและแหล่งเสาเดียวร่อนขยาย แปลงเอส 1 จังหวัดพิษณุโลก และสุโขทัย
ฉบับเดือนมกราคม – ธันวาคม พ.ศ.2565

ภาคผนวกที่ 38
เอกสารสอบเทียบเครื่องมือ

ฐานหลุมผลิตประตู่เฒ่า-เอฟ (PTO-F)

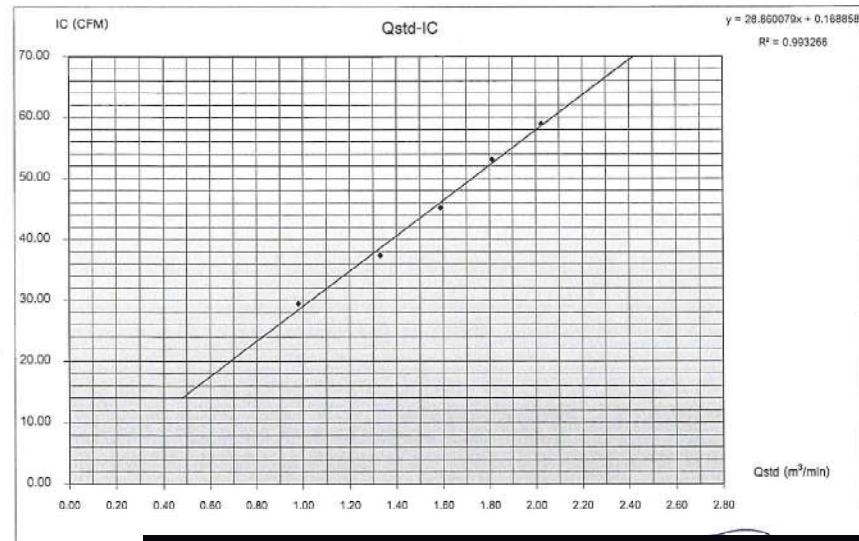
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

| | | | | | |
|-------------------------|-------------|--------------------------|----------|---------------|---------------------------|
| Sampler Location | | | | Date | March 9, 2022 |
| ชื่อสถานที่เก็บตัวอย่าง | | | | Start Time | 11:00 AM |
| Sampler Number | TSP No. A11 | Transfer Standard Type | Orifice | Stop Time | 11:15 AM |
| Instrument Model | HIVOL-8ACBE | Calibrator Model | TE-5025A | | |
| Motor Serial Number | 610-650 | Calibrator Serial Number | 2718 | Calibrated By | Mr. Warakorn Ngampankasew |
| Recorder Serial Number | 102930701 | | | | |

| Plate No. | (Delta H) Pressure Drop Across Orifice (in H ₂ O) | (A) [ΔH ₂ O(Pa/P _{atm})(T _{atm} /T _s) ^{1.5}] (m ³ /min) | (X) Orifice = (1/100)(A-B) (mm/min) | (I) Sample Flow Rate Indication (L/min) | (Y) IC = [(Pa/P _{atm})(T _{atm} /T _s) ^{1.5}] (m ³ /min) | Temperature (°K = °C+273) | Barometric Pressure (mmHg) | Start Meter | Stop Meter |
|--------------------------------------|---|--|---|---|--|--|----------------------------------|------------------|---------------|
| | Positive Negative ΔH ₂ O | | | | | | | | |
| 5 | 1.7 1.7 3.4 | 1.81245 | 0.98034 | 30.0 | 29.49 | 306.0 | 754.0 | | |
| 7 | 3.1 3.1 6.2 | 2.44750 | 1.33078 | 38.0 | 37.35 | 306.0 | 754.0 | | |
| 10 | 4.4 4.4 8.8 | 2.91287 | 1.58925 | 46.0 | 45.22 | 306.0 | 754.0 | | |
| 13 | 5.7 5.7 11.4 | 3.31878 | 1.81160 | 54.0 | 53.08 | 306.0 | 754.0 | | |
| 18 | 7.1 7.1 14.2 | 3.70400 | 2.02417 | 60.0 | 58.98 | 306.0 | 754.0 | | |
| Linear Regression Y ON X: Y = mX + b | | | | | | Average | 306.0 | 754.0 | |
| 1 | Slope (m) | 1.81211 | Linear Equation | | | r ² | 0.993266 | Pa(Pa/mmHg) | 760.0 |
| 2 | Intercept (b) | 0.03597 | Set Point Flow Rate (X) (m ³ /min) | | 1.133 | r | 0.996273 | T _{atm} | 298.0 |
| 3 | Correlation Coefficient (r) | 0.99999 | Final Set Flow Rate = (I) | | 0 | (Pa/P _{atm})(T _{atm} /T _s) | 0.066167871 | | |
| Result | | | | | | C = (Pa/P _{atm})(T _{atm} /T _s) ^{1.5} 0.982938366 | | | |

COMMENT

Andersen Instruments, Inc.



Checked By (Mr. Prayun Detida)
Technician

(Mr. Panupon Podang)
Environmental Scientist

F-AB-028, Rev. 02, June 3, 2019

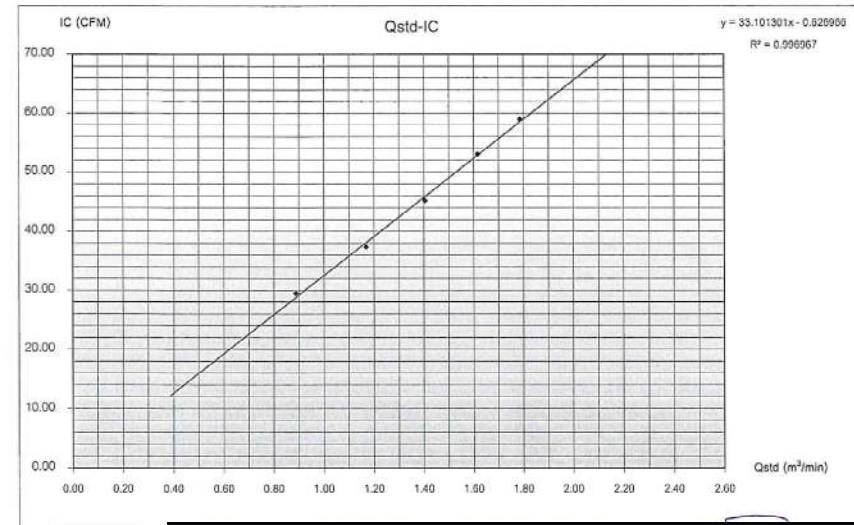
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

| | | | | | |
|-------------------------|-------------|--------------------------|----------|---------------|---------------------------|
| Sampler Location | | | | Date | March 9, 2022 |
| ชื่อสถานที่เก็บตัวอย่าง | | | | Start Time | 11:15 PM |
| Sampler Number | PM-10 No.10 | Transfer Standard Type | Orifice | Stop Time | 11:25 PM |
| Instrument Model | HIVOL-8MBBE | Calibrator Model | TE-5025A | | |
| Motor Serial Number | 510-647 | Calibrator Serial Number | 2718 | Calibrated By | Mr. Warakorn Ngampankasew |
| Recorder Serial Number | 1313 | | | | |

| Plate No. | (Delta H) Pressure Drop Across Orifice (in H ₂ O) | (A) [ΔH ₂ O(Pa/P _{atm})(T _{atm} /T _s) ^{1.5}] (m ³ /min) | (X) Orifice = (1/100)(A-B) (mm/min) | (I) Sample Flow Rate Indication (L/min) | (Y) IC = [(Pa/P _{atm})(T _{atm} /T _s) ^{1.5}] (m ³ /min) | Temperature (°K = °C+273) | Barometric Pressure (mmHg) | Start Meter | Stop Meter |
|--------------------------------------|---|--|---|---|--|--|----------------------------------|------------------|---------------|
| | Positive Negative ΔH ₂ O | | | | | | | | |
| 5 | 1.4 1.4 2.8 | 1.84477 | 0.88781 | 30.0 | 29.49 | 306.0 | 754.0 | | |
| 7 | 2.4 2.4 4.8 | 2.19351 | 1.16855 | 38.0 | 37.35 | 306.0 | 754.0 | | |
| 10 | 3.4 3.4 6.8 | 2.58197 | 1.40499 | 46.0 | 45.22 | 306.0 | 754.0 | | |
| 13 | 4.5 4.5 9.1 | 2.96515 | 1.61645 | 54.0 | 53.08 | 306.0 | 754.0 | | |
| 18 | 5.5 5.5 11.1 | 3.27482 | 1.78734 | 60.0 | 58.98 | 306.0 | 754.0 | | |
| Linear Regression Y ON X: Y = mX + b | | | | | | Average | 306.0 | 754.0 | |
| 1 | Slope (m) | 1.81211 | Linear Equation | | | r ² | 0.996967 | Pa(Pa/mmHg) | 760.0 |
| 2 | Intercept (b) | 0.03597 | Set Point Flow Rate (X) (m ³ /min) | | 1.133 | r | 0.99846235 | T _{atm} | 298.0 |
| 3 | Correlation Coefficient (r) | 0.99999 | Final Set Flow Rate = (I) | | 0 | (Pa/P _{atm})(T _{atm} /T _s) | 0.066167871 | | |
| Result | | | | | | C = (Pa/P _{atm})(T _{atm} /T _s) ^{1.5} 0.982938366 | | | |

COMMENT

Andersen Instruments, Inc.



Checked By (Mr. Prayun Detida)
Technician

(Mr. Panupon Podang)
Environmental Scientist

F-AB-028, Rev. 02, June 3, 2019

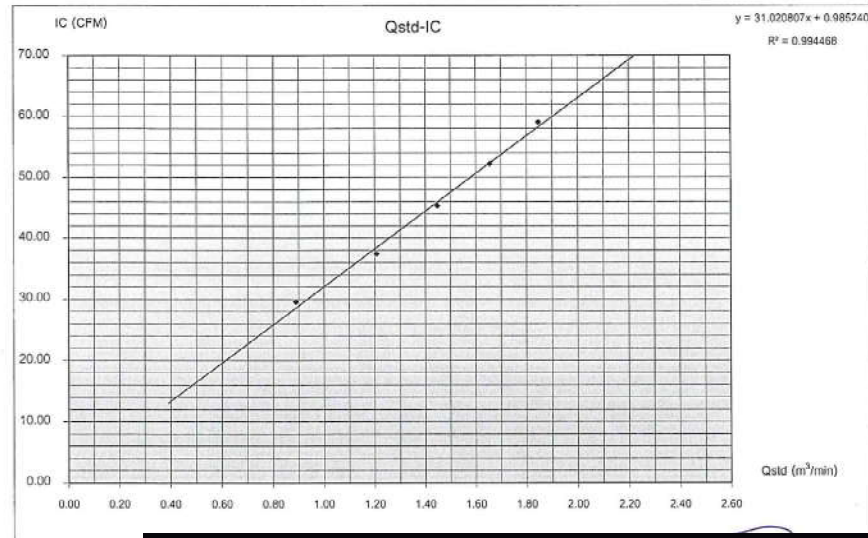
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

| | | | | | |
|------------------------|-------------|--------------------------|----------|---|---------------|
| Sampler Location | | | | Date | March 9, 2022 |
| Site: บ้านสวน | | | | Start Time | 9:55 AM |
| Sampler Number | TSP No. A19 | Transfer Standard Type | Orifice | Stop Time | 10:05 AM |
| Instrument Model | HIVOL-8BCBE | Calibrator Model | TE-5025A | Calibrated By: Mr. Warakorn Ngampankaew | |
| Motor Serial Number | 2914-04 | Calibrator Serial Number | 2716 | | |
| Recorder Serial Number | 7372 | | | | |

| Plate No. | { Delta P } | | | { A } | { X } | { I } | { Y } | Temperature | Barometric Pressure | Start Meter | Stop Meter |
|-------------------------------------|--|----------|-------------------|--|---|-----------------------------|---|---|---------------------|------------------|------------|
| | Pressure Drop Across Orifice (mH ₂ O) | | | $[\Delta P_{H_2O} (Pa) \cdot (T_{ref}/T_a)^{1.2}]^{1/2}$ | Qstd = (1/m) [(A-b)] | Sample Flow Rate Indication | IC = [(Pa/Pstd) * (Tstd/Ta)] ^{1/2} | (°K = °C + 273) | (mmHg) | | |
| | Positive | Negative | ΔH ₂ O | | (m ³ /min) | (l/min) | | | | | |
| 5 | 1.4 | 1.4 | 2.8 | 1.64746 | 0.88929 | 30.0 | 29.54 | 305.0 | 754.0 | | |
| 7 | 2.5 | 2.6 | 5.1 | 2.22342 | 1.20713 | 35.0 | 37.41 | 305.0 | 754.0 | | |
| 10 | 3.8 | 3.7 | 7.5 | 2.69010 | 1.44811 | 46.0 | 45.29 | 305.0 | 754.0 | | |
| 13 | 4.7 | 4.8 | 9.5 | 3.03458 | 1.65476 | 53.0 | 52.18 | 305.0 | 754.0 | | |
| 18 | 5.9 | 5.9 | 11.8 | 3.38203 | 1.84690 | 60.0 | 59.07 | 305.0 | 754.0 | | |
| Linear Regression Y ON X: Y= mX + b | | | | | | | | Average | 305.0 | 754.0 | |
| 1 | Slope (m) | | | 1.81211 | Linear Equation | | | r ² | 0.994468 | Pstd(mmtg) | 750.0 |
| 2 | Intercept (b) | | | 0.03597 | Set Point Flow Rate (X) (m ³ /min) | | 1.133 | r | 0.9972302 | T _{avg} | 298.0 |
| 3 | Correlation Coefficient (r) | | | 0.99999 | Final Set Flow Rate = (I) | | 0 | (Pa/Pstd) * (Tstd/Ta) | | 0.960335634 | |
| Result | | | | | | | | C= (Pa/Pstd) * (Tstd/Ta) ^{0.5} | | 0.984548442 | |

COMMENT

Andersen Instruments, Inc.



Checked By: [Signature]
(Mr. Prayun Detkla)
Technician

Approved By: [Signature]
(Mr. Panupon Podang)
Environmental Scientist

FAB-028, Rev. 02, June 3, 2019

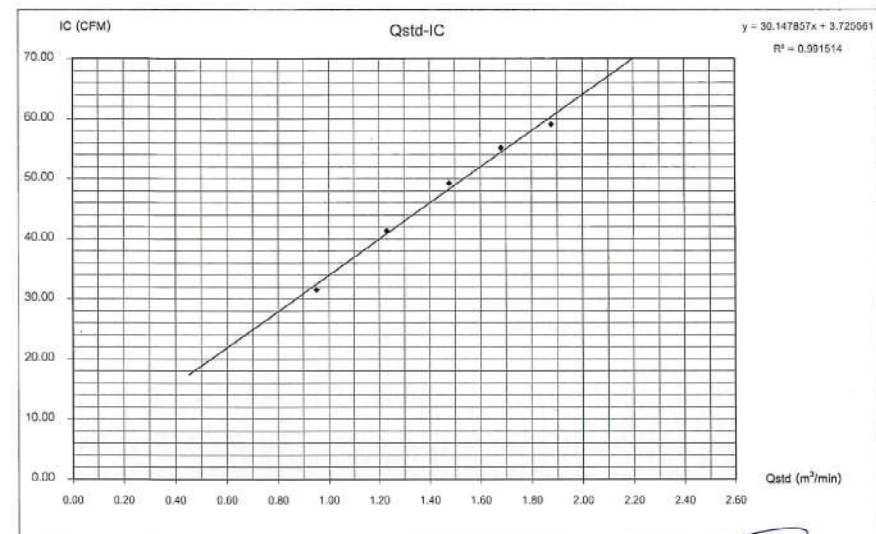
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

| | | | | | |
|------------------------|--------------|--------------------------|----------|---|---------------|
| Sampler Location | | | | Date | March 9, 2022 |
| Site: บ้านสวน | | | | Start Time | 10:05 AM |
| Sampler Number | PM-10 No. 23 | Transfer Standard Type | Orifice | Stop Time | 10:15 AM |
| Instrument Model | HIVOL-8MBBE | Calibrator Model | TE-5025A | Calibrated By: Mr. Warakorn Ngampankaew | |
| Motor Serial Number | 2135 | Calibrator Serial Number | 2716 | | |
| Recorder Serial Number | 2391 | | | | |

| Plate No. | (Delta P) | | | (A) | (X) | (I) | (Y) | Temperature | Barometric | Start | Stop |
|--------------------------------------|--|----------|------------------------------|--|---|-----------------------------|--|---------------------|------------|------------------|-------|
| | Pressure Drop Across Orifice (mH ₂ O) | | | $[\Delta P_{H_2O} (Pa) \cdot (T_{ref}/T_a)^{1.2}]^{1/2}$ | Qstd = (1/m) [(A-b)] | Sample Flow Rate Indication | IC = [(Pa/P _{std}) · (T _{std} /T _a)] ^{0.5} | (°K = °C + 273) | Pressure | Meter | Meter |
| | Positive | Negative | ΔP _{H₂O} | | (m ³ /min) | (l/min) | | | (mmHg) | | |
| 5 | 1.5 | 1.5 | 3.2 | 1.76121 | 0.95206 | 32.0 | 31.51 | 305.0 | 754.0 | | |
| 7 | 2.7 | 2.6 | 5.3 | 2.26660 | 1.23099 | 42.0 | 41.35 | 305.0 | 754.0 | | |
| 10 | 3.8 | 3.8 | 7.6 | 2.71421 | 1.47797 | 50.0 | 49.23 | 305.0 | 754.0 | | |
| 13 | 4.9 | 4.9 | 9.8 | 3.08212 | 1.68100 | 56.0 | 55.13 | 305.0 | 754.0 | | |
| 18 | 6.1 | 6.1 | 12.2 | 3.43888 | 1.87787 | 60.0 | 59.07 | 305.0 | 754.0 | | |
| Linear Regression Y ON X: Y = mX + b | | | | | | | | Average | 305.0 | 754.0 | |
| 1 | Slope (m) | | | 1.81211 | Linear Equation | | | r ² | 0.991514 | Pstd(mmtHg) | 750.0 |
| 2 | Intercept (b) | | | 0.03597 | Set Point Flow Rate (X) (m ³ /min) | | 1.133 | r | 0.995748 | T _{avg} | 298.0 |
| 3 | Correlation Coefficient (r) | | | 0.99999 | Final Set Flow Rate = (I) | | 0 | (Pa/Pstd)*(Tstd/Ta) | | 0.960335634 | |
| Result | | | | C = (Pa/Pstd)*(Tstd/Ta)^0.5 | | | 0.984548442 | | | | |

COMMENT

Andersen Instruments, Inc.



Checked By: [Signature]
(Mr. Prayun Detkla)
Technician

Approved By: [Signature]
(Mr. Panupon Podang)
Environmental Scientist

FAB-028, Rev. 02, June 3, 2019

RECALIBRATION
DUE DATE:
February 8, 2023

Certificate of Calibration

Calibration Certification Information

Cal. Date: February 8, 2022 Rootmeter S/N: 438320 Ta: 294 °K
Operator: Jim Tisch Pa: 750.1 mm Hg
Calibration Model #: TE-5025A Calibrator S/N: 2716

| Run | Vol. Init (m3) | Vol. Final (m3) | ΔVol. (m3) | ΔTime (min) | ΔP (mm Hg) | ΔH (in H2O) |
|-----|----------------|-----------------|------------|-------------|------------|-------------|
| 1 | 1 | 2 | 1 | 1.3090 | 3.2 | 2.00 |
| 2 | 3 | 4 | 1 | 0.9160 | 6.4 | 4.00 |
| 3 | 5 | 6 | 1 | 0.8140 | 7.9 | 5.00 |
| 4 | 7 | 8 | 1 | 0.7760 | 8.8 | 5.50 |
| 5 | 9 | 10 | 1 | 0.6380 | 12.8 | 8.00 |

Data Tabulation

| Vstd (m3) | Qstd (x-axis) | $\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)}$ (y-axis) | Va | Qa (x-axis) | $\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)}$ (y-axis) |
|-----------|---------------|--|--------|-------------|---|
| 0.9961 | 0.7609 | 1.4145 | 0.9957 | 0.7607 | 0.8854 |
| 0.9918 | 1.0828 | 2.0004 | 0.9915 | 1.0824 | 1.2521 |
| 0.9898 | 1.2160 | 2.2365 | 0.9895 | 1.2156 | 1.3999 |
| 0.9886 | 1.2740 | 2.3456 | 0.9883 | 1.2735 | 1.4683 |
| 0.9833 | 1.5412 | 2.8289 | 0.9829 | 1.5407 | 1.7708 |
| QSTD | m= | 1.81211 | QA | m= | 1.13472 |
| | b= | 0.03597 | | b= | 0.02252 |
| | r= | 0.99999 | | r= | 0.99999 |

Calculations

$$Vstd = \Delta Vol \left(\frac{Pa - \Delta P}{Pstd} \right) \left(\frac{Tstd}{Ta} \right) \quad Va = \Delta Vol \left(\frac{Pa - \Delta P}{Pa} \right)$$

$$Qstd = Vstd / \Delta Time \quad Qa = Va / \Delta Time$$

For subsequent flow rate calculations:

$$Qstd = 1/m \left(\left(\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)} \right) - b \right) \quad Qa = 1/m \left(\left(\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)} \right) - b \right)$$

Standard Conditions

Tstd: 298.15 °K
Pstd: 760 mm Hg

Key

ΔH: calibrator manometer reading (in H2O)
ΔP: rootmeter manometer reading (mm Hg)
Ta: actual absolute temperature (°K)
Pa: actual barometric pressure (mm Hg)
b: intercept
m: slope

RECALIBRATION

US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30

Tisch Environmental, Inc.
145 South Miami Avenue
Village of Cleves, OH 45002

www.tisch-env.co
TOLL FREE: (877)263-761
FAX: (513)467-90C



PLAY SOLUTION

PLAY SOLUTION TECHNOLOGY COMPANY LIMITED
179/75 Nawong Pracha Pattana Road, Sikan, Donmuang, Bangkok 10210
Tel.: +66 2 011 0505, Fax: +66 2 010 7700
www.playsotec.com



CERTIFICATE OF CALIBRATION

Customer

Certificate no. PST-0001-22

Page no. 1 of 3

Company : ENVIRONMENT RESEARCH & TECHNOLOGY CO.,LTD.
Address : 25/114 Moo 6 Soi Chinaket 1, Ngamwongwan Road, Toongsonghong,
City / Province : Laksi, Bangkok
Zip/Postal : 10210

Device

Equipment : Electronic Balance Capacity : 220 g
Manufacturer : METTLER TOLEDO Readability : 0.0001 g
Model : AB204-S ID No. : ERTC-L-In-0048
Serial No. : 1123103723

Environment Conditions

Location of Calibration : Calibration Laboratory at Play Solution Technology Co.,Ltd
Ambient Temperature : 25.9 (°C)
Relative Humidity : 53.1 (%RH)
Barometric Pressure : 1011.5 (mba)
Calibration Procedure : This Calibration was conducted by using In-House calibration procedure number CP-M-001 base on "UKAS LAB 14"
Comment :

Date of Receipt : January 4, 2022

Date of Calibration : January 4, 2022

Issue Date : January 4, 2022

Calibrated by

Calibrator

Approved Signature

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%

This Certificate is issued in accordance with the conditions of accreditation granted by Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and is traceability to recognize national standards and to the unit of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval prior written approval of the calibration center, Play Solution Technology Co.,Ltd

CERTIFICATE OF CALIBRATION

Result of Calibration : Without Adjustment

Certificate no. PST-0001-22

Page no. 2 of 3

1. Repeatability

| Weighing Rang 1 (g) | Norminal Value (g) | Standard Deviation (g) |
|---------------------|--------------------|------------------------|
| Max.capacity 220 | 200 | 0.00005 |
| Weighing Rang 2 (g) | Norminal Value (g) | Standard Deviation (g) |
| Max.capacity | | |

2. Linearity, Departure of Indication from nominal value

Weighing Range 1

| Normal Value (g) | Standard Value (g) | Indication (g) | Error of Indication (g) | Expanded Uncertainty (g) | Factor k |
|------------------|--------------------|----------------|-------------------------|--------------------------|----------|
| 0.001 | 0.00100 | 0.0010 | 0.0000 | 0.00011 | 2.07 |
| 0.01 | 0.01000 | 0.0100 | 0.0000 | 0.00011 | 2.07 |
| 0.1 | 0.10001 | 0.1000 | 0.0000 | 0.00011 | 2.07 |
| 1 | 1.00001 | 1.0000 | 0.0000 | 0.00011 | 2.06 |
| 5 | 5.00002 | 5.0000 | 0.0000 | 0.00011 | 2.06 |
| 10 | 10.00001 | 10.0000 | 0.0000 | 0.00011 | 2.05 |
| 50 | 50.00003 | 50.0000 | 0.0000 | 0.00013 | 2.03 |
| 100 | 100.00004 | 100.0001 | 0.0001 | 0.00018 | 2.00 |
| 150 | 150.00007 | 150.0001 | 0.0000 | 0.00024 | 2.00 |
| 200 | 200.00006 | 200.0002 | 0.0001 | 0.00031 | 2.00 |
| | | | | | |
| | | | | | |

Weighing Range 2

| Normal Value (g) | Standard Value (g) | Indication (g) | Error of Indication (g) | Expanded Uncertainty (g) | Factor k |
|------------------|--------------------|----------------|-------------------------|--------------------------|----------|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

The given extended measurement uncertainty is the standard uncertainty of the measurement multiplied by cover factor k as per listed in table above, which corresponds to a confidence level of about 95%

CERTIFICATE OF CALIBRATION

Result of Calibration

Certificate no. PST-0001-22

Page no. 3 of 3

3. Eccentricity

Test load at least 1/3 of the maximum capacity, typically placed between 1/2 and 1/3 of the distance from the centre of the load receptor to the edge.



Weighing Range 1

Test Load : 100 (g)

| Position | Indication (g) |
|---------------|----------------|
| 1 | 100.0001 |
| 2 | 100.0001 |
| 3 | 100.0002 |
| 4 | 100.0001 |
| 5 | 100.0002 |
| Max.Deviation | 0.0001 |

Weighing Range 2

Test Load : (g)

| Position | Indication (g) |
|---------------|----------------|
| | |
| | |
| | |
| | |
| | |
| Max.Deviation | |

Standard methode

The calibration was performed by using calibration laboratory's in-house calibration methode : CP-M-001 based on "UKAS LAB 14 : Calibration of weighing machine" : edition 6 | October 2019

Reference standards instrument

| Instrument | OIML Class | S/N | Certificate No. | Due Date |
|---------------------|------------|------------|-----------------|------------------|
| Standard Weight Set | E2 | 4000021952 | MM-0183-20 | December 8, 2022 |
| Standard Weight Set | - | - | - | - |
| Standard Weight Set | - | - | - | - |
| Standard Weight Set | - | - | - | - |

Measurement Uncertainty

The given measurement uncertainty is the standard of the measurement multiplied by an extension factor k which corresponds to a confidence level of about 95% for a normal distribution. The standard uncertainty was calculated according to M3003

Traceability : The measurement is traceable to national standard, which realize the physical unit of measurement (SI)

- National Institute of Metrology (Thailand) through Calibration Laboratory

END OF REPORT

Calibration Data of NOx Analyzer

Analyzer Performance Test

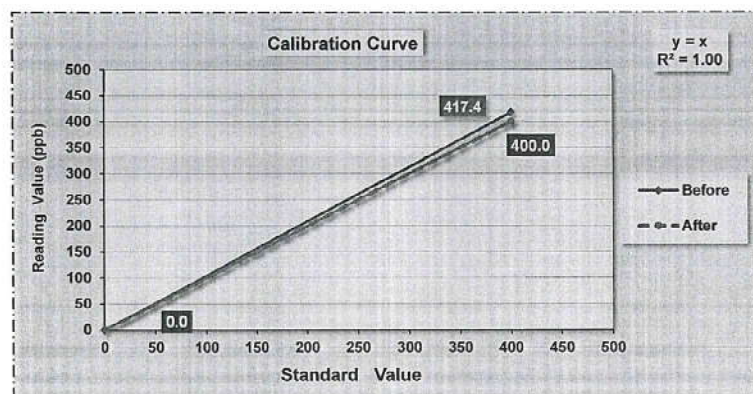
| Equipment | Gas Analyzer (NOx) | Customer Name | Vision E. Consultants |
|---------------|---------------------|------------------|-----------------------|
| Manufacture | API | Location | Envi Research |
| Model | 200A | Scientist | Panupon |
| Serial No. | 56 | Calibration Date | February 9, 2022 |
| Analyzer Unit | ppb | Time | 10:43 AM |

Instruments for Calibration

| Instruments | Manufacture | Model | Serial Number |
|-----------------------------|----------------------------|---------|---------------|
| Zero Air Supply | Thermo Env. | 111 | 0700419829 |
| Dynamic Dilution Calibrator | Tanabyte | 3011-GD | 0165 |
| Standard Gas Components | CO = 4,516 ppm | | |
| Cylinder No : EB0123013 | NO = 55.3 ppm | | |
| Expire Date : Oct 22, 2027 | SO ₂ = 54.9 ppm | | |

Single Point Calibration

| Standard Gas | Standard Gas Value | Analyzer Value | | | | | | | | % Abs Error |
|--------------|--------------------|-------------------------|-------|------------|-------|-------------------------|-------|-----------|-------|-------------|
| | | NO _x (ppb) | | NO (ppb) | | NO ₂ (ppb) | | Stability | | |
| | | Before | After | Before | After | Before | After | Before | After | |
| Zero | 0 | 0.1 | 0.0 | -0.2 | 0.0 | 0.3 | 0.0 | - | - | - |
| Span | 400 | 427.3 | 405.0 | 417.4 | 400.0 | 9.9 | 5.0 | - | - | 4.3 |



STATUS TEST AND VALIDATION OF NOx ANALYZER MODEL 200A

| Parameter | Display As | Unit | Observed Value | | Nominal Range |
|---------------------------|------------------------|-------------|----------------|--------------|--------------------------|
| | | | Before Adjust | After Adjust | |
| Range | RANGE | ppb | 500 | 500 | 0 - 500 standard |
| Stability | STABIL | ppb | 1 | 0 | < 2 with zero air |
| Sample Flow | SAMP FL | cc / min | 481 | 480 | 500 +/- 50 |
| Ozone Flow | OZONE FL | cc / min | 82 | 81 | 80 +/- 10 |
| PMT signal | PMT | mV | 18 | 27 | 0 to 5,000 |
| Auto - Zero | AZERO | mV | 11 | 11 | -20 to 150 |
| High Voltage Power Supply | HVPS | V | 758 | 758 | 450 to 900 |
| Reaction Cell Temperature | RCELL TEMP | °C | 50 | 50 | 50 +/- 1 |
| Box Temperature | BOX TEMP | °C | 31 | 32 | Ambient temp. +3 / -7 |
| PMT Temperature | PMT TEMP | °C | 7 | 7 | 7 +/- 1 |
| Converter Temperature | MOLY TEMP | °C | 315 | 315 | 315 +/- 5 |
| Reaction Cell Pressure | RCEL | In - Hg - A | 10 | 10 | 2 to 10 (Constant) |
| Sample Pressure | SAMP | In - Hg - A | 31 | 31 | Ambient - 1 (Constant) |
| NO _x Slope | NO _x SLOPE | - | 1.075 | 0.953 | 1.000 +/- 0.300 |
| NO _x Offset | NO _x OFFSET | mV | 0 | 0 | 0 +/- 20 |
| NO Slope | NO SLOPE | - | 1.054 | 0.943 | 1.000 +/- 0.300 |
| NO Offset | NO OFFSET | mV | -1 | -1 | 0 +/- 20 |

Calibrate By :

(MR.PANUPON PODANG)
February 9, 2022

Checked By :

(MS.SUTATIP IM-NOI)
February 9, 2022

Calibration Data of NOx Analyzer

Analyzer Performance Test

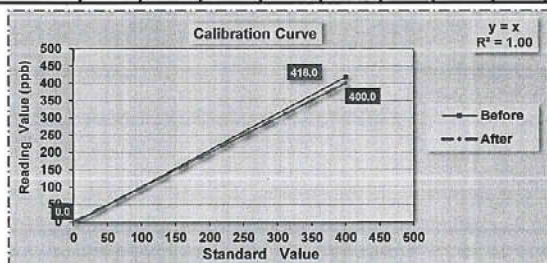
| Equipment | Gas Analyzer (NOx) | Customer Name | Vision E. Consultants |
|---------------|----------------------|------------------|-----------------------|
| Manufacture | HORIBA | Location | Envi Research |
| Model | APNA-360 | Scientist | Panupon |
| Serial No. | 8517870102 | Calibration Date | February 9, 2022 |
| Analyzer Unit | ppm | Time | 11:15 AM |

Instruments for Calibration

| Instruments | Manufacture | Model | Serial Number |
|-----------------------------|----------------------------|---------|---------------|
| Zero Air Supply | Thermo Env. | 111 | 0700419829 |
| Dynamic Dilution Calibrator | Tanabyte | 3011-GD | 0165 |
| Standard Gas Components | CO = 4,516 ppm | | |
| Cylinder No : EB0123013 | NO = 55.3 ppm | | |
| Expire Date : Oct 22, 2027 | SO ₂ = 54.9 ppm | | |

Single Point Calibration

| Standard Gas | Standard Gas Value | Analyzer Value | | | | | | | | % Abs Error |
|--------------|--------------------|-------------------------|-------|------------|-------|-------------------------|-------|-----------|-------|-------------|
| | | NO _x (ppb) | | NO (ppb) | | NO ₂ (ppb) | | Stability | | |
| | | Before | After | Before | After | Before | After | Before | After | |
| Zero | 0 | -0.4 | 0.0 | -3.1 | 0.0 | 2.7 | 0.0 | - | - | - |
| Span | 400 | 416.7 | 400.0 | 418.0 | 400.0 | -1.3 | 0.0 | - | - | 4.5 |



STATUS TEST AND VALIDATION OF NOx ANALYZER MODEL APNA-360

| Parameter | Unit | Observed Value | | Nominal Range |
|--------------------|------|----------------|--------------|--|
| | | Before Adjust | After Adjust | |
| Range | ppm | 0.5 | 0.5 | 0.1 - 1.0 Standard |
| Signal NO | mV | 1.4 | 2.6 | Voltage of the measured NO value |
| Signal NOx | mV | 31.0 | 37.3 | Voltage of the measured NOx value |
| Detector | kPa | 60.3 | 60.3 | (Present Air Pressure/101.3 x100 - 20) ± 4 |
| Sample Flow | LPM | 0.9 | 0.9 | 1.1 ± 0.3 |
| NO Slope | - | 1.48490 | 1.14540 | 0.50000 - 2.0000 |
| NOx Slope | - | 1.66420 | 1.28780 | 0.50000 - 2.0000 |
| Motherboard Status | - | OK | OK | OK |
| Alarm Detected | - | None | None | None |

Calibrate By :

(MR.PANUPON PODANG)
February 9, 2022

(MS.SUTATIP IM-NOI)
February 9, 2022

Calibration Data of SO₂ Analyzer

Analyzer Performance Test

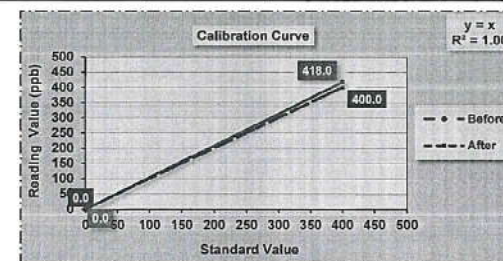
| Equipment | Gas Analyzer (SO ₂) | Customer Name | Vision E. Consultants |
|---------------|----------------------------------|------------------|-----------------------|
| Manufacture | Thermo | Location | Envi Research |
| Model | 43C | Scientist | Panupon |
| Serial No. | 0811116460 | Calibration Date | February 3, 2022 |
| Analyzer Unit | ppb | Time | 6:55 AM |

Instruments for Calibration

| Instruments | Manufacture | Model | Serial Number |
|-----------------------------|----------------------------|---------|---------------|
| Zero Air Supply | Thermo Env. | 111 | 0700419829 |
| Dynamic Dilution Calibrator | Tanabyte | 3011-GD | 0165 |
| Standard Gas Components | CO = 4,516 ppm | | |
| Cylinder No : EB0123013 | NO = 55.3 ppm | | |
| Expire Date : Oct 22, 2027 | SO ₂ = 54.9 ppm | | |

Single Point Calibration

| Standard Gas | Standard Gas Value | Analyzer Value (ppb) | | Stability | | % Abs Error |
|--------------|--------------------|------------------------|-------|-----------|-------|-------------|
| | | Before | After | Before | After | |
| Zero | 0 | 0.0 | 0.0 | - | - | - |
| Span | 400 | 418.0 | 400.0 | - | - | 4.5 |



STATUS TEST AND VALIDATION OF SO₂ ANALYZER MODEL 43C

| Parameter | Display As | Unit | Observed Value | | Nominal Range |
|----------------------|--------------------|------|----------------|--------------|--------------------|
| | | | Before Adjust | After Adjust | |
| Range | RANGE | ppb | 500 | 500 | 0 - 500 standard |
| Internal Temperature | INTERNAL | °C | 34.0 | 34.3 | 6.0 °C to 47.0 °C |
| Chamber Temp | CHAMBER | °C | 44.5 | 44.4 | 43.0 °C to 47.0 °C |
| Pressure | PRESSURE | mmHg | 738.7 | 738.6 | 400.0 to 1,000 |
| Sample Flow | SAMP FLOW | LPM | 1.374 | 1.373 | 0.350 to 1,000 |
| Lamp Intensity | INTENSITY | Hz | 24,006 | 23,654 | 20,000 to 50,000 |
| Lamp Voltage | LAMP VOLTAGE | V | 837 | 8347 | 750 to 1,200 |
| SO2 Concentration | SO2 CONCENTRATION | ppb | 0.7 | 2.3 | 0 to 10,000 |
| Motherboard Status | MOTHERBOARD STATUS | - | OK | OK | OK |
| Interface Status | INTERFACE STATUS | - | OK | OK | OK |

Calibrate By :

(MR.PANUPON PODANG)
February 3, 2022

(MS.SUTATIP IM-NOI)
February 3, 2022

Calibration Data of SO₂ Analyzer

Analyzer Performance Test

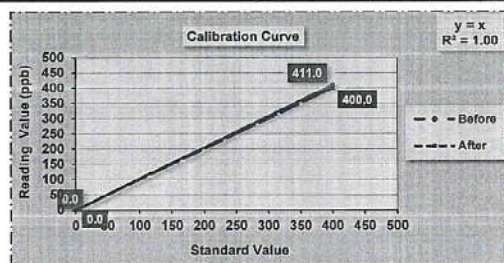
| Equipment | Gas Analyzer (SO ₂) | Customer Name | Vision E. Consultants |
|---------------|---------------------------------|------------------|-----------------------|
| Manufacture | Thermo | Location | Envi Research |
| Model | 43C | Scientist | Panupon |
| Serial No. | 64390-343/2 | Calibration Date | February 3, 2022 |
| Analyzer Unit | ppb | Time | 9:51 AM |

Instruments for Calibration

| Instruments | Manufacture | Model | Serial Number |
|-----------------------------|---|---------|---------------|
| Zero Air Supply | Thermo Env. | 111 | 0700419829 |
| Dynamic Dilution Calibrator | Tanabyte | 3011-GD | 0165 |
| Standard Gas Components | CO = 4.516 ppm NO = 55.3 ppm SO ₂ = 54.9 ppm | | |
| Cylinder No : | EB0123013 | | |
| Expire Date : | Oct 22, 2027 | | |

Single Point Calibration

| Standard Gas | Standard Gas Value | Analyzer Value (ppb) | | Stability | | % Abs Error |
|--------------|--------------------|----------------------|-------|-----------|-------|-------------|
| | | Before | After | Before | After | |
| Zero | 0 | 0.0 | 0.0 | - | - | - |
| Span | 400 | 411.0 | 400.0 | - | - | 2.8 |



STATUS TEST AND VALIDATION OF SO₂ ANALYZER MODEL 43C

| Parameter | Display As | Unit | Observed Value | | Nominal Range |
|-------------------------------|-------------------------------|------|----------------|--------------|--------------------|
| | | | Before Adjust | After Adjust | |
| Range | RANGE | ppb | 500 | 500 | 0 - 500 standard |
| Internal Temperature | INTERNAL | °C | 35.0 | 36.0 | 6.0 °C to 47.0 °C |
| Chamber Temp | CHAMBER | °C | 45.7 | 45.7 | 43.0 °C to 47.0 °C |
| Pressure | PRESSURE | mmHg | 742.5 | 743.0 | 400.0 to 1,000 |
| Sample Flow | SAMP FLOW | LPM | 0.407 | 0.406 | 0.350 to 1.000 |
| Lamp Intensity | INTENSITY | Hz | 22,651 | 22,746 | 20,000 to 50,000 |
| Lamp Voltage | LAMP VOLTAGE | V | 808 | 817 | 750 to 1,200 |
| SO ₂ Concentration | SO ₂ CONCENTRATION | ppb | 0.4 | 2.1 | 0 to 10,000 |
| Motherboard Status | MOTHERBOARD STATUS | - | OK | OK | OK |
| Interface Status | INTERFACE STATUS | - | OK | OK | OK |

Calibrate By :

(MR.PANUPON PODANG)
February 3, 2022

(MS.SUTATIP IM-NOI)
February 3, 2022

Calibration Data of CO Analyzer

Analyzer Performance Test

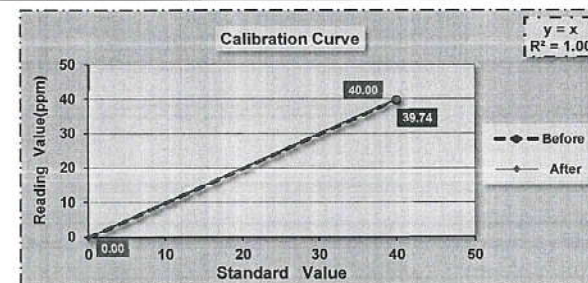
| Equipment | Gas Analyzer (CO) | Customer Name | Vision E. Consultants |
|---------------|-------------------|------------------|-----------------------|
| Manufacture | HORIBA | Location | Envi Research |
| Model | APMA-370 | Scientist | Panupon |
| Serial No. | WNTLD9N8 | Calibration Date | February 3, 2022 |
| Analyzer Unit | ppm | Time | 1:33 PM |

Instruments for Calibration

| Instruments | Manufacture | Model | Serial Number |
|-----------------------------|---|---------|---------------|
| Zero Air Supply | Thermo Env. | 111 | 0700419829 |
| Dynamic Dilution Calibrator | Tanabyte | 3011-GD | 0165 |
| Standard Gas Components | CO = 4.487 ppm NO = 46.1 ppm SO ₂ = 46.0 ppm | | |
| Cylinder No : | CC507080 | | |
| Expire Date : | Sep 19, 2020 | | |

Single Point Calibration

| Standard Gas | Standard Gas Value | Analyzer Value (ppm) | | Stability | | % Abs Error |
|--------------|--------------------|----------------------|-------|-----------|-------|-------------|
| | | Before | After | Before | After | |
| Zero | 0 | -0.12 | 0.00 | - | - | - |
| Span | 40 | 39.74 | 40.00 | - | - | 0.65 |



STATUS TEST AND VALIDATION OF CO ANALYZER MODEL APMA-370

| Parameter | Unit | Observed Value | | Nominal Range |
|---------------|------|----------------|--------------|---|
| | | Before Adjust | After Adjust | |
| SIGNAL(MAIN) | mV | 6 | 7 | Voltage of the measured CO Value |
| SIGNAL (COMP) | mV | 4 | 4 | Voltage of the interference component Value |
| CELL | °C | 35 | 34 | Ambient + (5 to 10 °C) |
| PUMP | kpa | 56 | 56 | less than 65 |
| AMBIENT | kpa | 101 | 101 | Atmospheric pressure |
| DC 24V | mV | 23.9 | 23.9 | 24 +/- 0.5 V |
| DC 5V | mV | 4.9 | 4.9 | 5 +/- 0.5 V |

Calibrate By :

(MR.PANUPON PODANG)
February 3, 2022

(MS.SUTATIP IM-NOI)
February 3, 2022

Calibration Data of CO Analyzer

Analyzer Performance Test

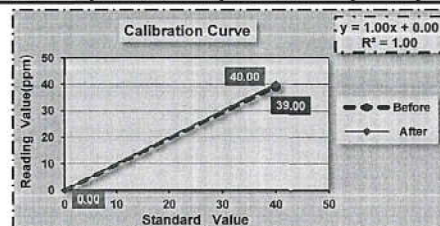
| Equipment | Gas Analyzer (CO) | Customer Name | Vision E. Consultants |
|---------------|---------------------|------------------|-----------------------|
| Manufacture | Thermo | Location | Envi Research |
| Model | 48C | Scientist | Panupon |
| Serial No. | 73426-373 | Calibration Date | February 3, 2022 |
| Analyzer Unit | ppm | Time | 10:00 AM |

Instruments for Calibration

| Instruments | Manufacture | Model | Serial Number |
|-----------------------------|------------------------|---------|---------------|
| Zero Air Supply | Thermo Env. | 111 | 0700419829 |
| Dynamic Dilution Calibrator | Tanabyte | 3011-GD | 0165 |
| Standard Gas Components | CO = 4.516 | ppm | |
| Cylinder No : EB0123013 | NO = 55.3 | ppm | |
| Expire Date : Oct 22, 2027 | SO ₂ = 54.9 | ppm | |

Single Point Calibration

| Standard Gas | Standard Gas Value | Analyzer Value (ppm) | | Stability | | % Abs Error |
|--------------|--------------------|------------------------|-------|-----------|-------|-------------|
| | | Before | After | Before | After | |
| Zero | 0 | -0.06 | 0.00 | - | - | - |
| Span | 40 | 39.00 | 40.00 | - | - | 2.50 |



STATUS TEST AND VALIDATION OF CO ANALYZER MODEL 48C

| Parameter | Display As | Unit | Observed Value | | Nominal Range |
|--------------------|---------------|------|----------------|--------------|--------------------|
| | | | Before Adjust | After Adjust | |
| Range | RANGE | ppm | 50 | 50 | 0 - 100 standard |
| Internal Temp | INTERNAL TEMP | °C | 35.6 | 35.2 | 8.0 to 47.0 |
| Chamber Temp | CHAMBER TEMP | °C | 45.0 | 46.1 | 40.0 to 59.0 |
| Pressure | PRESSURE | mmHg | 735 | 734 | 250 to 1,000 |
| Sample Flow | FLOW | LPM | 1.041 | 1.041 | 0.350 to 1.500 |
| Bias Voltage | BIAS VOLT | V | -117.0 | -117 | -130 to -100 |
| AGC Intensity | AGC | Hz | 154,509 | 154,630 | 150,000 to 300,000 |
| Motor Speed | SPEED | % | 100 | 100 | 100 |
| Concentration | Conc. | ppm | 0.402 | 0.301 | 0 to 10,000 |
| Motherboard Status | MOTHERBOARD | - | OK | OK | OK |
| Interface Status | INTERFACE | - | OK | OK | OK |

Calibrate By :

(MR.PANUPON PODANG)
February 3, 2022

(MS.SUTATIP IM-NOI)
February 3, 2022

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04NI99E15A0292
Cylinder Number: EB0123013
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12019
Gas Code: CO,NO,NOX,SO2,BALN

Reference Number: 160-401604495-1
Cylinder Volume: 144.4 Cubic Feet
Cylinder Pressure: 2015 PSIG
Valve Outlet: 660
Certification Date: Oct 22, 2019

Expiration Date: Oct 22, 2027

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

| Component | Requested Concentration | Actual Concentration | Protocol Method | Total Relative Uncertainty | Assay Dates |
|-----------------|-------------------------|----------------------|-----------------|----------------------------|------------------------|
| NOX | 55.00 PPM | 55.27 PPM | G1 | +/- 0.8% NIST Traceable | 10/14/2019, 10/22/2019 |
| NITRIC OXIDE | 55.00 PPM | 55.27 PPM | G1 | +/- 0.8% NIST Traceable | 10/14/2019, 10/22/2019 |
| SULFUR DIOXIDE | 55.00 PPM | 54.93 PPM | G1 | +/- 0.9% NIST Traceable | 10/14/2019, 10/22/2019 |
| CARBON MONOXIDE | 4500 PPM | 4516 PPM | G1 | +/- 0.6% NIST Traceable | 10/14/2019 |
| NITROGEN | Balance | | | | |

| Type | Lot ID | Cylinder No | Concentration | Uncertainty | Expiration Date |
|------|----------|-------------|-----------------------------------|-------------|-----------------|
| NTRM | 13010429 | KAL004123 | 97.6 PPM NITRIC OXIDE/NITROGEN | +/- 0.8% | Jul 23, 2025 |
| NTRM | 13010429 | KAL004123 | 97.6 PPM NOX/NITROGEN | +/- 0.8% | Jul 23, 2025 |
| NTRM | 16010235 | KAL004419 | 97.69 PPM SULFUR DIOXIDE/NITROGEN | +/- 0.8% | Dec 23, 2021 |
| NTRM | 08012318 | KAL004620 | 4857 PPM CARBON MONOXIDE/NITROGEN | +/- 0.6% | Jun 07, 2024 |

| Instrument/Make/Model | Analytical Principle | Last Multipoint Calibration |
|----------------------------|----------------------|-----------------------------|
| MKS FTIR - CO - 000928781 | FTIR | Sep 26, 2019 |
| MKS FTIR - NO - 000928781 | FTIR | Oct 18, 2019 |
| MKS FTIR - NOx - 000928781 | FTIR | Oct 18, 2019 |
| MKS FTIR - SO2 - 000928781 | FTIR | Oct 03, 2019 |

Triad Data Available Upon Request

NOTES: Gross Weight: 28.0 Kg, Net Weight: 4.6 Kg.



Approved for Release



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 16 August, 2021

Certification No. 382/21

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : Davis Instruments Inc.

Type : Weather Wizard III Product No. 7425

Serial No. : WC20318B07 ID No. : No.2

Customer : Environment Research & Technology Company Limited.
25/113-114 Moo 6 Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi, Bangkok 10210.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1011.9 hPa

NATIONAL STANDARD WIND TUNNEL :

: Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023

N.I.S.T. Test Reference Number 731/241460

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

Calibrated by :

Mr. Watcharapol Subwat

Mechanical Engineer



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

Certification No. 382/21

16 August, 2021

Page : 2 of 2

| Standard Ultrasonic Anemometer m/sec | HOOK GAGE NO. 1425 | | | TESTED ANEMOMETER | |
|--|--------------------|------------------|-----------------|-------------------|---------------------|
| | Pressure inches | Vacuum inches | Pressure hPa | Velocity m/sec | Correction m/sec |
| 1.00 | - | - | - | 0.9 | 0.10 |
| 3.02 | - | - | - | 2.7 | 0.32 |
| 5.00 | - | - | - | 4.9 | 0.10 |
| 7.04 | - | - | - | 6.7 | 0.34 |
| 9.02 | - | - | - | 8.9 | 0.12 |
| 11.01 | - | - | - | 10.7 | 0.31 |
| 13.01 | - | - | - | 12.1 | 0.91 |
| 15.01 | - | - | - | 14.3 | 0.71 |
| 17.02 | - | - | - | 16.1 | 0.92 |
| 20.02 | - | - | - | 19.3 | 0.72 |

| Wind Aloft Plotting Board. | |
|--|-----------------------|
| US.DEPARTMENT OF COMMERCE WEATHER BUREAU | |
| WIND DIRECTION | TESTED WIND DIRECTION |
| 0 | 0 |
| 90 | 90 |
| 180 | 180 |
| 270 | 270 |

Calibrated by :

Mr. Watcharapol Subwat

Mechanical Engineer





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804,0-2399-0469

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 16 August, 2021

Certification No. 384/21

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : Davis Instruments Inc.

Type : Weather Wizard III Product No. 7425

Serial No. : WC80813A59 ID No. : No.12

Customer : Environment Research & Technology Company Limited.
25/113-114 Moo 6 Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi, Bangkok 10210.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1010.3 hPa

NATIONAL STANDARD WIND TUNNEL :

: Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023

N.I.S.T. Test Reference Number 731/241460

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

Calibrated by :

Mr. Watcharapol Subwat

Mechanical Engineer

Mr. Pisood Promsut



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804,0-2399-0469

The Result of Calibration

Certification No. 384/21

16 August, 2021

Page : 2 of 2

| Standard Ultrasonic Anemometer m/sec | HOOK GAGE NO. 1425 | | | TESTED ANEMOMETER | |
|--|--------------------|------------------|-----------------|-------------------|---------------------|
| | Pressure inches | Vacuum inches | Pressure hPa | Velocity m/sec | Correction m/sec |
| 1.00 | - | - | - | 0.9 | 0.10 |
| 3.02 | - | - | - | 2.7 | 0.32 |
| 5.00 | - | - | - | 4.5 | 0.50 |
| 7.04 | - | - | - | 6.7 | 0.34 |
| 9.02 | - | - | - | 8.5 | 0.52 |
| 11.01 | - | - | - | 10.7 | 0.31 |
| 13.01 | - | - | - | 12.5 | 0.51 |
| 15.01 | - | - | - | 14.7 | 0.31 |
| 17.02 | - | - | - | 16.5 | 0.52 |
| 20.02 | - | - | - | 19.3 | 0.72 |

| Wind Aloft Plotting Board. | |
|--|-----------------------|
| US.DEPARTMENT OF COMMERCE WEATHER BUREAU | |
| WIND DIRECTION | TESTED WIND DIRECTION |
| 0 | 0 |
| 90 | 90 |
| 180 | 180 |
| 270 | 270 |

Calibrated by :

Mr. Watcharapol Subwat

Mechanical Engineer





Sound Level Meter Calibration Report

| | |
|-------------------------------|--|
| Support Equipment Type | : Sound Level Calibrator |
| Manufacture | : Larson Davis |
| Model | : CAL200 |
| Serial No. | : 3605 |
| Range of Calibrator | |
| - Sound Pressure Level | : 93.6 dB |
| - Frequency | : 1,000 Hz. |
| Calibrated By | : Mr.Romsea Kateh |
| Calibration Date | : March 9, 2022 |
| Customer Name | : Vision E. Consultants Co., Ltd. : โครงการผลิตบิโครบลิยมแหล่งประตุ้เผ่าและแหล่งเสาเถียรส่วนหยาบ แปลงเอส 1 จ้งหวัดพิษนโลก และสขทัย (จาเหมมยลิตประตุ้เผ่า-เอพ (PTO-F)) |

[illegible]

Checked By

Mr. Prayun Detkla
Technician

Approved By _____

Ms.Sutatip Im-noi
Environmental Scientist

Page 1 / 1

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0141

MTC No. EEL, BP. 109/1164

CALIBRATION CERTIFICATE

Submitted by : Environment Research & Technology Co.,Ltd.
Address : 25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Road, Toongsonghong, Laksi, Bangkok, 10210.
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

| Instrument Calibrated : | | Ambient Environment | |
|-------------------------|---------------------------------|---------------------|-------------------------|
| Description | : Precision Acoustic Calibrator | Temperature | : (23 ± 3) °C |
| Manufacturer | : Larson Davis | Relative Humidity | : (50 ± 15) % |
| Model | : CAL200 | Ambient Pressure | : (101.325 ± 1.500) kPa |
| Serial No. | : 3605 | | |

Standards used :

1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
4. Digital Multimeter Agilent 34401A S/N MY44005560.
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
6. Audio Analyzer Keithley 2015-P S/N 4106495.
7. Condenser Microphone Bruel&Kjaer 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 26 Nov. 2021

Date of Calibration : 7 Dec. 2021

1 / 3

The results relate only to the items tested/calibrated or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM,BL,MTC,002 Rev.4

Head Office
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand
Tel. (66) 0 2577 9000
Fax. (66) 0 2577 9009
E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

Office/Laboratory
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
Fax. (66) 0 2323 9165
E-mail : mtc@tistr.or.th

Office
196 Phahonyothin Road, Chatuchak, Bangkok 10900,
Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0141

MTC No. EEL. BP. 109/1164

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.

Nominal Output of Unit Under Test = 94 dB re 20 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ Pa, Corrected to Reference Conditions : 101.325 kPa, 23.0 °C and 50 %RH

1. Sound Pressure Level

| Standard Microphone Type | Measured Sound Pressure Level (dB) | Deviated value (dB) | Uncertainty (dB) | Tolerance limit IEC60942:2003 Class 1 |
|--------------------------|------------------------------------|---------------------|------------------|---------------------------------------|
| 1/2 inch Bruel&Kjaer4180 | 93.63 | -0.37 | ± 0.10 | ± 0.40 dB |

2. Frequency

| Standard Microphone Type | Measured Frequency (Hz) | Deviated value (Hz) | Uncertainty (Hz) | Tolerance limit IEC60942:2003 Class 1 |
|--------------------------|-------------------------|---------------------|------------------|---------------------------------------|
| 1/2 inch Bruel&Kjaer4180 | 1000.0 | 0.0 | ± 1.5 | $\pm 1.0\%$ |

3. Total distortion

| Standard Microphone Type | Measured Total distortion (%) | Uncertainty (%) | Tolerance limit IEC60942:2003 Class 1 |
|--------------------------|-------------------------------|-----------------|---------------------------------------|
| 1/2 inch Bruel&Kjaer4180 | 2.15 | ± 0.50 | $\pm 3.0\%$ |

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was included at level of 0.26 dB from manual.

Date of Calibration : 7 Dec. 2021

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

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Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0141

MTC No. EEL. BP. 109/1164

Nominal Output of Unit Under Test = 114 dB re 20 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ Pa, Corrected to Reference Conditions : 101.325 kPa, 23.0 °C and 50 %RH

1. Sound Pressure Level

| Standard Microphone Type | Measured Sound Pressure Level (dB) | Deviated value (dB) | Uncertainty (dB) | Tolerance limit IEC60942:2003 Class 1 |
|---------------------------|------------------------------------|---------------------|------------------|---------------------------------------|
| 1/2 inch Bruel&Kjaer 4180 | 113.62 | -0.38 | ± 0.10 | ± 0.40 dB |

2. Frequency

| Standard Microphone Type | Measured Frequency (Hz) | Deviated value (Hz) | Uncertainty (Hz) | Tolerance limit IEC60942:2003 Class 1 |
|---------------------------|-------------------------|---------------------|------------------|---------------------------------------|
| 1/2 inch Bruel&Kjaer 4180 | 1000.0 | 0.0 | ± 1.5 | $\pm 1.0\%$ |

3. Total Distortion

| Standard Microphone Type | Measured Total Distortion (%) | Uncertainty (%) | Tolerance limit IEC60942:2003 Class 1 |
|---------------------------|-------------------------------|-----------------|---------------------------------------|
| 1/2 inch Bruel&Kjaer 4180 | 0.37 | ± 0.50 | $\pm 3.0\%$ |

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was included at level of 0.26 dB from manual.

Calibrated by :

(Mr. Weerachai Deechaiyae)

Approved by :

(Mr. Prawate Kluaypa)

Acting Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 7 Dec. 2021

Date of Issue : 8 Dec. 2021

Ref : 2011264112604951001

End of Certificate

3 / 3

The results relate only to the items tested/calibrated or value assigned.

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TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert.No.: 22CH9
Page.: 1 of 2

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Eutech
Model : pHTestr 30
Serial No. : 2561366
ID No. : NO.14
Condition As-Received: Used Item
Received Date : 29 December 2021
Calibration Date : 04 January 2022
Reference : 2112-0752WN-6
Submitted by : Environment Research & Technology Company Limited,
25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi, Bangkok 10210
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with standard
voltage calibrator and direct measurement
with certified reference material (CRM)

Calibrated by :



Approved by :

Approved Signatory

(✓) Malee Butkruea
() Salthip Meangmai
() Warakorn Lernagtrakul

Issue Date : 7 January 2022

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.



Cert.No.: 22CH9
Page.: 2 of 2

Condition of this calibration result

1. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AIR-1835

| Buffer Solution | Manufacturer | Lot No. | Exp. date |
|-----------------|--------------|---------|-------------|
| pH 4.008 | CPA chem | 761016 | 02 Aug 2023 |
| pH 6.982 | CPA chem | 761017 | 02 Aug 2022 |
| pH 10.015 | CPA chem | 761018 | 02 Aug 2022 |

2. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7,10)

| Unit Under Calibration | Standard pH Buffer Solution | Actual pH Reading | Actual mV Reading (mV) | Uncertainty of pH Measurement (±) | Coverage factor k |
|------------------------|-----------------------------|-------------------|------------------------|-----------------------------------|-------------------|
| pH Electrode | 4.008 | 4.02 | N/A | 0.0079 | 2.00 |
| S/N.: 2561366 | 6.982 | 6.97 | N/A | 0.011 | 2.00 |
| | 10.015 | 10.00 | N/A | 0.0095 | 2.00 |

Remark - pH meter does not have voltage mode.
- Can not connect the BNC because the plug does not match with the socket.
- N/A = Not Available

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %

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Salathammassop, Thawewatthana, Bangkok 10170 Thailand

Tel : 0-2408-8474-5 Fax : 0-2408-8477 Email : info@crystalcal.com www.crystalcal.com



CERTIFICATE OF CALIBRATION

Issue Date : 28 December 2021
Certificate No. : 21-1224-004
Work Order No. : 21/1224

Customer Name : Environment research & Technogy Co., Ltd.
25/114 Moo6 Soi Chinaket1, Ngamwongwan Road,
Toongsonghong, Laksi, Bangkok 10210

Date of Received : 15 December 2021

Date of Calibration : 15 December 2021

Instrument Details : Description : Temperature Controlled Enclosures [Incubator]
Manufacturer : Accuplus
Model : Smart i250
Serial No. : 2059-0218-0002
ID No. : ERTC-L-IN-143
Resolution : 0.1 °C
Location : Laboratory

Calibration Method : This instrument was calibrated by insert standard thermometer into the chamber according to calibration procedure no. CWI-T-10 follow up to TLAS G-20-1/02-08
(E) : Guidelines for Calibration and Checks of Temperature Controlled Enclosures.

Environmental Conditions :

Temperature : Area Monitoring between 15°C to 40°C
Humidity : Area Monitoring between 30%RH to 85%RH
Line Voltage : Area Monitoring 220 VAC \pm 10%

Traceability of Measurement :

This certificate of calibration documents the traceability to national standard, which realize the unit of measurement according to the International system of Units (SI) and The temperature scale in use at this laboratory is The International Temperature scale of 1990.

Calibrated by : Mr. Sitthisak Tonglim
Calibration Engineer

Approved by :
(Mr. Anuwat Yaktornjit)
Laboratory Manager

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Crystal Calibration Sales and Service Co., Ltd.

45/48 Salathammassop 31, Salathammassop Rd., Salathammassop, Thawewatthana, Bangkok 10170

Phone : 0-2408-8474 Fax : 0-2408-8477 http://www.crystalcal.com Email : info@crystalcal.com



CRYSTAL CALIBRATION SALES AND SERVICE CO., LTD.

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Salathammassop, Thawewatthana, Bangkok 10170 Thailand

Tel : 0-2408-8474-5 Fax : 0-2408-8477 Email : info@crystalcal.com www.crystalcal.com



CERTIFICATE OF CALIBRATION

Issue Date : 28 December 2021
Certificate No. : 21-1224-004
Work Order No. : 21/1224

Details of Calibration

1. Reference Standards Instrument

| Instrument | Model | Serial No./Ins No. | Certificate No. | Due Date |
|-----------------------|--------|--------------------|-----------------|-------------------|
| Data Acquisition unit | 34972A | MY57006241 | 21-719-014 | 03 September 2022 |
| Sensor type | RTD | RTD# 101-109 | 21-719-014 | 03 September 2022 |

2. Certificate traceable

: This certificate traceable to The International System of Unit refer to
Crystal Calibration Sales and Service Co., Ltd. , NAC Calibration No. 0260

3. Condition of item

: Used

4. Calibration site

: On - Site

5. Result of Calibration

: Without adjustment

6. Evaluate Condition

: Time Constant : - Hour 50 Minute At cal. point 20 °C
Air vent : Off
Fan speed status : Fixed Fan Speed

7. Calibration note

: The results reported in this certificate refer to the condition of instrument on the process into the steady state of chamber

8. Sensors Installation Diagram

: When : Sensor installation location in Chamber @ Working Space
A = Distance between sensor and wall of chamber is 5 cm

9. Dimensions of chamber

: W = 0.5 m ; D = 0.5 m ; H = 0.9 m

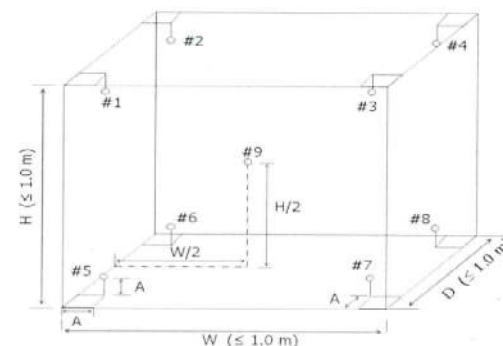


Diagram of Chamber



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CERTIFICATE OF CALIBRATION

Issue Date : 28 December 2021

Certificate No. : 21-1224-004

Work Order No. : 21/1224

Result of Temperature Distribution and Performance Check

Table1 : Reporting of Temperature Distribution

| Calibration point (°C) | Average Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF) | | | | | | | | | Uncertainty ± (°C) |
|------------------------|--|-------|-------|-------|-------|-------|-------|-------|-------|-----------------------|
| | #1 | #2 | #3 | #4 | #5 | #6 | #7 | #8 | #9 | |
| 20.0 | 20.26 | 20.08 | 20.22 | 20.11 | 20.18 | 20.12 | 20.09 | 20.16 | 19.91 | 0.60 |

Table 2 : Reporting of Performance check

| Indicator Set Point (°C) | Indicator Reading (°C) | | | Stability ± (°C) | Uniformity (°C) | Overall variation (°C) |
|-----------------------------|------------------------|------|---------|---------------------|--------------------|---------------------------|
| | MAX | MIN | Average | | | |
| 20.0 | 20.0 | 19.6 | 19.9 | 0.39 | 0.58 | 1.03 |

Note

Customer would like to find internal temperature in chamber and this report customer request and accepted in certificate

The reference sensor is preferably located of the geometric center of chamber

The measured temperature data readout by software "Benchlink Datalogger 3"

The quoted uncertainty include " Stability " and " Loading effect (20% of Temp Uniformity) "

Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.

Uniformity - the maximum difference of measured temperatures at any sensors and the measured temperature

at the reference location which are observed at the same time or at as close an observation time as possible

to determine the temperature pattern or homogeneity within the chamber under steady state conditions.

Overall Variation - The difference of the maximum and minimum measured temperatures throughout observation time.

Indicating Temperature - the average reading of indicating device that forms the integral part of the enclosure.

This result of calibration was found accurate as shown on date and place of calibration only.

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor of 2, giving a level of confidence of approximately 95%.

-END-

E 3/3



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Cert.No.: 22TW15

Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
 Manufacturer : YSI
 Model : 5000-115V
 Serial No. : 03C1280 AC
 ID No. : ERTC-L-In-021
 Received Date : 19 January 2022
 Test Date : 21 January 2022
 Reference : 2201-0594WN-1
 Submitted by : Environment Research & Technology Company Limited.
 25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Road,
 Toongsonghong, Laksi, Bangkok 10210
 Laboratory Condition : Temperature (25 ± 5) °C
 Humidity (50 ± 20) %
 Test Procedure : In - house method : CP-CH9
 by Comparison Technique with Azide Modification Method

Tested by :

W. J. J. J. J.

Approved by :

Approved Signatory

(/) Malee Butkruea
 () Saithip Meangmai
 () Warakorn Lerngagtrakul

Issue Date :

1 February 2022

B 0279633



Cert.No.: 22TW15
Page.: 2 of 2

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 07H100306

| Titration Method (Azide Modification Method) (mg/L) | DO Meter Reading (mg/L) | Standard Deviation (mg/L) |
|---|-------------------------------|------------------------------|
| 8.16 | 8.15 | 0.0071 |

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency, The environmental impact control and present to organization it may concerned. Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory.

-o0o-

a 1091839



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Cert. No.: 22TM154
Page.: 1 of 3

Certificate of Calibration

Equipment : Incubator
Manufacturer : Ehret
Model : BK 4106
Serial No. : 22162
ID No. : ERTC-L-In.-022
Submitted by : Environment Research & Technology Company Limited
25/114 Moo 6 Soi Chinaket 1,
Ngamwongwan Road, Toongsonghong, Laksi,
Bangkok 10210
Location : 408/2 ห้องปฏิบัติการนมอาหารเลี้ยงเชื้อ
Received Order : 5 January 2022
Calibration Date : 6 January 2022
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Man Pattanapongpaiboon
Approved by : 
Approved Signatory
() Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai
Issue Date : 19 January 2022

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services

A 0036712



Equipment : Incubator
 Condition As-Received : Used Item
 Reference : 2201-0006ON-6

Cert. No.: 22TM154
 Page.: 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

| Instrument | Model | Serial No. | Cert. No. | Due Date |
|----------------------|--------|------------|-----------|-------------|
| 1) Data Acquisition | 34970A | MY44031769 | 21LM12 | 02 Sep 2022 |

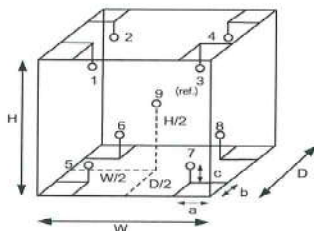
2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Probe Installation Details :

a = 5.0 cm
 b = 5.0 cm
 c = 5.0 cm

Dimension of Chamber :

D = 0.50 m
 W = 0.60 m
 H = 0.50 m
 Capacity = 0.15 m³

| Environment during calibration | | |
|--------------------------------|-----------|----------|
| | Beginning | Finished |
| Temp. (°C) | 25 | 25 |
| REL.Humid. (%) | 56 | 58 |
| AC Supply (Volt) | 221 | 222 |

| Position : | Ref. Std. ID No.: |
|------------|-------------------|
| 1 | 9RTD-2/1 |
| 2 | 9RTD-2/2 |
| 3 | 9RTD-2/3 |
| 4 | 9RTD-2/4 |
| 5 | 9RTD-2/5 |
| 6 | 9RTD-2/6 |
| 7 | 9RTD-2/7 |
| 8 | 9RTD-2/8 |
| 9 (ref.) | 9RTD-2/9 |



Equipment : Incubator
 Condition As-Received : Used Item
 Reference : 2201-0006ON-6
Result of Calibration :- (*) Without Adjustment

Cert. No.: 22TM154
 Page.: 3 of 3

Function of UUC* : Temperature Source

Fresh air setting : Close

| Calibration Point (°C) | UUC* Setting (°C) | UUC* Reading (°C) | Temperature stability (± °C) | Temperature uniformity (°C) | Overall Variation (°C) | Uncertainty (± °C) | Coverage Factor k |
|--------------------------|---------------------|---------------------|--------------------------------|-------------------------------|--------------------------|----------------------|-------------------|
| 44.5 | 44.5 | 45.0 | 0.20 | 0.98 | 1.7 | 0.7 | 2 |

| Calibration Point (°C) | Measured Temperature (°C) | | | | | | | | |
|--------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|----------|
| | Position | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 (ref.) |
| 44.5 | 44.990 | 45.152 | 45.203 | 45.279 | 43.789 | 44.155 | 44.530 | 45.142 | 44.745 |

Average* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity .

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor *k*, providing a level of confidence of approximately 95 %.

-o0o-



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Bangkok 10500 Thailand

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Fax: +662 632 4334
Email: ccc-smt@agilent.com
Website: www.agilent.com/chem

Service Confirmation Number: 6903908836

Service Confirmation Date: 18.11.2021

Customer Contact:

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Co Ltd
Head Office
Ngamwongwan Rd
25/114 Moo 6 Soi Chinnakhet 1
TAX ID : 0105542064981

Raiwin@enviresearch.co.th
0895030467

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World Siam Group Co Ltd Head
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126/8 3D Floor Thai Sri Bldg.,
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Klong San
BANGKOK 10600

Delivery Site:

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Ngamwongwan Rd
25/114 Moo 6 Soi Chinnakhet 1

Location:

Room
Bldg
Lab
Dept

SERVICE REPORT

| | |
|---------------------------------|----------------------------------|
| Customer Purchase Order Number: | Customer Number: 70472666 |
| Service Request: | Service Request Date: |
| Service Order: 6004983683 | Service Confirmation: 6903908836 |

Direct Inquiries to:

Contact Name: Customer Contact Center
Contact E-mail: ccc-smt@agilent.com
Contact Telephone: +662 637 6363
Contact Fax: +662 632 4334

Service Instrument:

| Model Number | Model Description | Serial Number | System Handle | Parent Asset |
|--------------|---------------------------------------|---------------|---------------|--------------|
| SYS-IO-5100 | ICP-OES 5100/5110 System | | | |
| G8481A | Water chiller | 1A1560387 | | SYS-IO-5100 |
| G8011A | Agilent 5100 VDV ICP-OES Spectrometer | MY15330001 | | SYS-IO-5100 |
| G8410A | SPS 4 Autosampler | AU15220240 | | SYS-IO-5100 |

Service Items:

| Item | Service/Part # | Description | Qty | Entitlement | Service Start | Service End |
|------|----------------|--|------|---------------------------------------|---------------|-------------|
| 2000 | PM | Preventive Maintenance | 1.00 | Agreement Entitlement - 100 % covered | 18.11.2021 | 18.11.2021 |
| 2040 | G8010-68015 | Spare pre-optic window rad,5100 ICP 1/pk | 1.00 | Agreement Entitlement - 100 % covered | | |
| 2030 | G8010-68014 | Spare pre-optic window ax,5100 ICP 1/pk | 1.00 | Agreement Entitlement - 100 % covered | | |
| 2020 | G8010-60136 | Filter Argon ICP-OES 5100 Series | 1.00 | Agreement Entitlement - 100 % covered | | |
| 2010 | G8000-68002 | Inlet cooling air filter for MP-AES | 1.00 | Agreement Entitlement - 100 % covered | | |

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Sub-district, Wattana District, Bangkok 10110 Thailand
Acc. No: 012-4452-007
THB:Krug Thai Bank PCL
Siam Square Br.,416/1-2 Rama 1 Rd.,Pathumwan, BKK 10330
Thailand

ORIGINAL

Service Confirmation Number: 6903908836

Service Confirmation Date: 18.11.2021

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Agilent CrossLab Compliance Services

Service Information:

Problem Description:

T-WM-S-PMOQ-105100-5000961745

Service Provided:

Discuss any issues with the customer prior to starting/ perform to preventive maintenance checklist and replace parts

Service Overview Code:

Reason Code: Scheduled Service

Diagnosis Code: Scheduled Service

Resolution Code: Scheduled Service

Reported Hours:

4.0

Travel Hours:

2.0

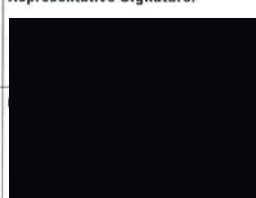
Customer Field Service

Representative Name:

Piyawit Sompanithan

Customer Field Service

Representative Signature:



Date:

18 Nov 2021

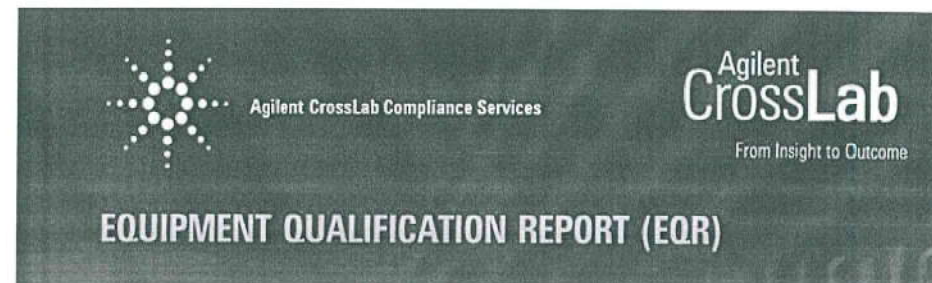
Customer Name:

RAIWIN POSIT

Date:

18 Nov 2021

Additional Comments:



Agilent CrossLab Compliance

Qualification Type: ES-OQ

System ID: MY15330001

EQP Name: AgilentRecommended

EQP Revision: ES.02.50

EQP Publish Date: March 2020

Date: November 29, 2021 3:20:41 PM

Report Type: Report

Org. Name: Environment Research & Technology Co., Ltd

Org. Location: 25/114 Moo 6 Soi Chinaket, Ngamwongwan Rd., Bangkok 10210

Table of Contents

| Section | Page |
|--|------|
| Cover page | 1 |
| Table of Contents | 2 |
| Test Summary | 3 |
| Service Details | 4 |
| Instrument Details | 5 |
| Protocol Details | 6 |
| Tests | 7 |
| Preparation : 5100 VDV | 7 |
| Instrument Tests : 5100 VDV | 10 |
| Autosampler Operation : Autosampler 1 - SPS4 | 11 |
| Declaration of Change Control | 12 |
| Attachments | 13 |
| Signature | 29 |
| Transaction Logs | 30 |

Test Summary

Purpose

This section includes a status for each scheduled test and the overall qualification. For each test that is run, (1) the status is automatically determined based on pre-defined limits, and (2) the total number of times the test was run is displayed. For detailed results and specifications for a test, refer to the test results in this EQR.

Details

| Test | Status | Runs |
|--|--------|------|
| Preparation : 5100 VDV | Pass | 1 |
| Instrument Tests : 5100 VDV | Pass | 1 |
| Autosampler Operation : Autosampler 1 - SPS4 | Pass | 1 |

Overall Qualification Status

Pass

Service Details

Purpose

This section includes local contact and delivery details for this service.

General Details

| | |
|----------------------------|--------------------|
| Service Order No./Request: | 6004983683 |
| EQP Name: | AgilentRecommended |
| EQP Revision: | ES.02.50 |
| Report Type: | Report |

Organization Details

| | |
|-----------|---|
| Name: | Environment Research & Technology Co., Ltd |
| Location: | 25/114 Moo 6 Soi Chinaket, Ngamwongwan Rd., Bangkok 10210 |

Local Contact Details

| | |
|-------------------------|----------------------|
| Name: | Khun Raiwin Posit |
| Job Title: | Supervisor Scientist |
| Qualification Location: | ICPOES Room |

Operator Details

| | |
|------------|----------------------------|
| Name: | Kanyakorn Sukpathrajarearn |
| Job Title: | Field Service Engineer |

Data Acquisition Details

| | |
|--------------------------------|------------|
| Acquisition Software Name: | ICP Expert |
| Acquisition Software Revision: | 7.1.0.6821 |

| | |
|-----------------------------|----------------|
| Customer Data System (CDS): | Es: ICP Expert |
|-----------------------------|----------------|

Instrument Details

Purpose

This section describes the as found system configuration.

Details

Spectrometer 1

| | |
|---------------------|--|
| Manufacturer | Agilent Technologies |
| Name | 5100 VDV |
| Model Number | G8011A |
| Sample Introduction | Double pass glass cyclonic spraychamber and seaspray nebulizer |
| Serial Number | MY15330001 |
| Firmware Revision | 2994 |

Chiller 1

| | |
|---------------|----------------------|
| Manufacturer | Agilent Technologies |
| Name | Chiller |
| Model Number | G8481A |
| Serial Number | 1A1560387 |

Autosampler 1

| | |
|---------------|----------------------|
| Manufacturer | Agilent Technologies |
| Name | SPS4 |
| Model Number | G8410A |
| Serial Number | AU15220240 |

Protocol Details

Purpose

This section lists the revisions for all test units used in this report. For complete test-specific and high-level change details, refer to the Revision History document.

| Test Revision | Test |
|---------------|-----------------------|
| ES.02.50 | Autosampler Operation |
| ES.02.50 | Instrument Tests |
| ES.02.50 | Preparation |

Preparation

Purpose

This test records a status for each preparation task for the Agilent ICP-OES.

Configuration Details

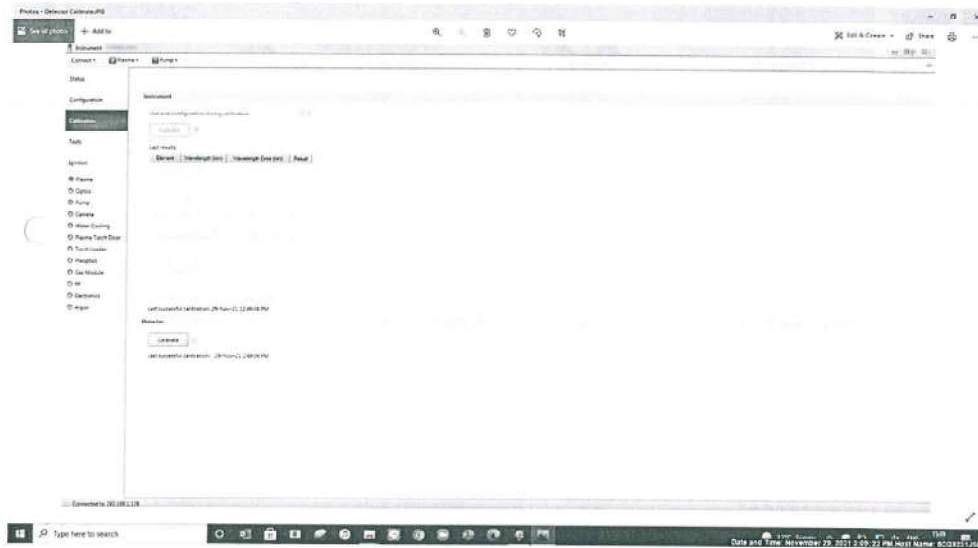
| | | |
|-------------------|--------|------------|
| Model/Serial No.: | G8011A | MY15330001 |
|-------------------|--------|------------|

Results

| Criteria | Observed Result | Expected Result | Status |
|--|-----------------|-----------------|--------|
| Does the plasma ignite successfully in the first three attempts? | Yes | Yes | Pass |
| Was the detector calibration performed and completed successfully? | Yes | Yes | Pass |
| Was the instrument calibration performed and completed successfully? | Yes | Yes | Pass |

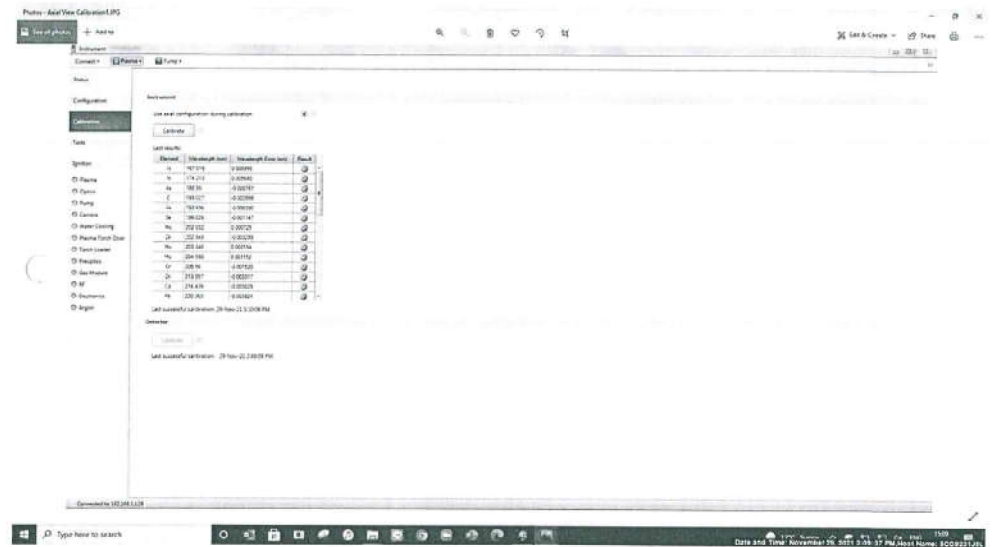
Test Evidence

| | |
|----------------|--|
| Image Details: | Was the detector calibration performed and completed successfully? |
| Date and Time: | November 29, 2021 3:09:22 PM |
| Host Name: | 5CG9231J5L |



Date: November 29, 2021 3:20:41 PM
System ID: MY15330001

| | |
|----------------|--|
| Image Details: | Was the instrument calibration performed and completed successfully? |
| Date and Time: | November 29, 2021 3:09:37 PM |
| Host Name: | 5CG9231J5L |



Overall Test Status

Pass

Runs: 1

Date: November 29, 2021 3:20:41 PM
System ID: MY15330001

Instrument Tests

Purpose

This test records a status for each of the automated tests within the Agilent ICP-OES CDS. For detailed test criteria, refer to the attached report.

Configuration Details

Model/Serial No.:

| Results | Observed Result | Expected Result | Status |
|---------|-----------------|-----------------|--------|
|---------|-----------------|-----------------|--------|

Are the Functional Tests results within acceptance criteria?

| | | | |
|--------------------------|----------------------------------|----------------------------------|-----------------------------------|
| Subsystem Communications | <input type="text" value="Yes"/> | <input type="text" value="Yes"/> | <input type="text" value="Pass"/> |
| Air Flow | <input type="text" value="Yes"/> | <input type="text" value="Yes"/> | <input type="text" value="Pass"/> |
| Water Flow | <input type="text" value="Yes"/> | <input type="text" value="Yes"/> | <input type="text" value="Pass"/> |
| Gas Flows | <input type="text" value="Yes"/> | <input type="text" value="Yes"/> | <input type="text" value="Pass"/> |
| RF Generator | <input type="text" value="Yes"/> | <input type="text" value="Yes"/> | <input type="text" value="Pass"/> |
| Camera | <input type="text" value="Yes"/> | <input type="text" value="Yes"/> | <input type="text" value="Pass"/> |
| Optics | <input type="text" value="Yes"/> | <input type="text" value="Yes"/> | <input type="text" value="Pass"/> |

Are the Instrument Performance Tests results within acceptance criteria?

| | | | |
|-------------|----------------------------------|----------------------------------|-----------------------------------|
| Resolution | <input type="text" value="Yes"/> | <input type="text" value="Yes"/> | <input type="text" value="Pass"/> |
| Sensitivity | <input type="text" value="Yes"/> | <input type="text" value="Yes"/> | <input type="text" value="Pass"/> |
| Precision | <input type="text" value="Yes"/> | <input type="text" value="Yes"/> | <input type="text" value="Pass"/> |

Overall Test Status

Runs:

Autosampler Operation

Purpose

This test verifies that the autosampler operates properly.

Configuration Details

Model/Serial No.:

Results

| Criteria | Observed Result | Expected Result | Status |
|----------|-----------------|-----------------|--------|
|----------|-----------------|-----------------|--------|

Does the autosampler successfully move to the specified location(s)?

| | | |
|----------------------------------|----------------------------------|-----------------------------------|
| <input type="text" value="Yes"/> | <input type="text" value="Yes"/> | <input type="text" value="Pass"/> |
|----------------------------------|----------------------------------|-----------------------------------|

Overall Test Status

Runs:

Declaration of Change Control

This document is under change control. Revision history is maintained and printed on each document. Access to the master documents is limited to process owners. Documents receive periodic review and cannot be assigned an evergreen status. The qualification performed according to this document refers only to the hardware/software configuration in place at the time of the qualification. Agilent Technologies recommends that instrument configuration change management procedures be in place in order to maintain the validation process. Any changes to the analytical or computer hardware or software must be clearly specified. A change management system provides a means for determining the degree of requalification required according to the extent of the changes made. All details of the changes must be thoroughly recorded and documented, together with details of completed tests and their results. Note: Hardware/software configuration management is the customer's responsibility.

Attachments

Training requirements note: The delivery engineer attaches an ACE technique-specific training certificate to the Equipment Qualification Report (EQR). Obtaining ACE technique-specific certification includes pre-requisite trainings for Data Integrity, General Compliance topics (GMP, GLP, ALCOA, etc.), instrument hardware and software components, and the ACE technique itself. The one certificate encompasses all pre-requisite trainings as documented in the Agilent Learning Management System called Success Factors.

| Location | Category | Document Name | Page |
|----------|----------|---|------|
| EQR | General | Certificate of Qualification for ACE | 14 |
| EQR | General | Certificate of Qualification for ACE | 15 |
| EQR | General | Operator's training certificate and qualifications | 16 |
| EQR | General | Certificate of Qualification for ACE | 17 |
| EQR | Material | Certificate of Analysis Wavelength calibration solution | 18 |
| EQR | General | Instrument's Test Report | 22 |
| EQR | General | Instrument's Test Report | 25 |
| EQR | General | Instrument's Test Report | 26 |
| EQR | General | Instrument's Test Report | 27 |
| EQR | General | Instrument's Test Report | 28 |

General

Document Name: Certificate of Qualification for ACE

**Agilent Compliance Engine Self Qualification**

Date: November 29, 2021 3:10:26 PM

Drive Serial #: EAF04572

Platform Revision: ACE 3.11

Individual self-qualification reports for each specific technique installed are also available upon request. They provide additional details on the general report from the concise summary and are structured by the actual algorithms challenged during the process. There is not a one-to-one relationship between algorithms and OQ program tests because some algorithms are used by several tests and across multiple similar hardware components of the qualified systems.

| Technique Type | Tests Completed | Result |
|-----------------------|-----------------|----------|
| Emission Spectroscopy | 3 | Conforms |
| Software | 6 | Conforms |

Overall Qualification Status

Conforms

Date: November 29, 2021 3:20:41 PM
System ID: MY15330001

General

Document Name: Certificate of Qualification for ACE

**Certificate of Completion**

Learner Name: Kanyakorn Sukpathrajarn

Title Of Course: AN-CE-SS-II-030-A: ACE 3.X User Update Training

Completion Date: June 25, 2020

Certified By Company: Learning at Agilent

All Service and Support training certificates have the following specific limitations.

A certificate for Service and Support training is only valid while employed by Agilent Technologies or while working as an Agilent-authorized service provider, through which the service employee has ongoing access to Agilent's: Safety Alerts, Service Notes, internal technical updates, update training, current documentation, technical support, current parts, and parts updates. Completion of training alone, without being employed by Agilent Technologies, does not qualify an individual to safely install, service or maintain Agilent products.

Date: November 29, 2021 3:20:41 PM
System ID: MY15330001

General

Document Name: Operator's training certificate and qualifications



Certificate of Completion

Learner Name: Kanyakorn Sukpathrajareon

Title Of Course: ANV-CE-ICPOES-2-008-A: Agilent 5100 ICP-OES Support Neophyte Training

Completion Date: November 2, 2017

Certified By Company: Learning at Agilent

All Service and Support training certificates have the following specific limitations.

A certificate for Service and Support training is only valid while employed by Agilent Technologies or while working as an Agilent-authorized service provider, through which the service employee has ongoing access to Agilent's Safety Alerts, Service Notes, internal technical updates, update training, current documentation, technical support, current parts, and parts updates. Completion of training alone, without being employed by Agilent Technologies, does not qualify an individual to safely install, service or maintain Agilent products.

General

Document Name: Certificate of Qualification for ACE



Certificate of Completion

Learner Name: Kanyakorn Sukpathrajareon

Title Of Course: ANV-CE-ICPOES-2-007-C: CrossLab Compliance Hardware Specific Delivery for Agilent ICP-OES Systems

Completion Date: October 30, 2020

Certified By Company: Learning at Agilent

All Service and Support training certificates have the following specific limitations.

A certificate for Service and Support training is only valid while employed by Agilent Technologies or while working as an Agilent-authorized service provider, through which the service employee has ongoing access to Agilent's Safety Alerts, Service Notes, internal technical updates, update training, current documentation, technical support, current parts, and parts updates. Completion of training alone, without being employed by Agilent Technologies, does not qualify an individual to safely install, service or maintain Agilent products.

Materials

Document Name: Certificate of Analysis Wavelength calibration solution



CERTIFICATE OF ANALYSIS

Agilent Product Name: Wavelength Calibration Solution for ICP-OES & MP-AES, 5 mg/L, 500mL
Agilent Part No: 8610030100
Lot No: 0010888002

Product Specifications

| Analyte | Starting Material | CAS # | Certified Conc. | Analyte | Starting Material | CAS # | Certified Conc. |
|---------|-----------------------------------|------------|--------------------|---------|--|------------|--------------------|
| Al | Al(NO ₃) ₃ | 7784-21-2 | 5.000 ± 0.025 mg/L | Mn | Mn | 7439-95-5 | 5.003 ± 0.025 mg/L |
| As | As | 7440-38-2 | 5.002 ± 0.025 mg/L | Mo | (NH ₄) ₂ MoO ₄ | 13106-76-8 | 5.001 ± 0.025 mg/L |
| Ba | Ba(NO ₃) ₂ | 10025-31-8 | 4.999 ± 0.025 mg/L | Ni | Ni | 7440-02-0 | 5.001 ± 0.025 mg/L |
| Cd | Cd | 7440-43-9 | 5.002 ± 0.025 mg/L | Pb | Pb | 7439-92-1 | 4.998 ± 0.025 mg/L |
| Co | Co | 7440-48-4 | 5.000 ± 0.025 mg/L | Se | Se | 7782-49-2 | 5.003 ± 0.025 mg/L |
| Cr | Cr(NO ₃) ₃ | 13548-38-4 | 5.001 ± 0.025 mg/L | Sr | Sr(NO ₃) ₂ | 10042-76-9 | 5.001 ± 0.025 mg/L |
| Cu | Cu | 7440-50-8 | 5.003 ± 0.025 mg/L | Zn | Zn | 7440-66-6 | 5.002 ± 0.025 mg/L |
| K | KNO ₃ | 7757-79-1 | 90.00 ± 0.25 mg/L | | | | |

Matrix: 5% HNO₃

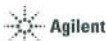
Intended Use: This solution is intended for use as a certified reference material or calibration standard for inductively coupled plasma optical emission spectroscopy (ICP-OES), inductively coupled plasma mass spectrometry (ICP-MS), atomic absorption spectroscopy (flame AAS or GFAAS), microwave plasma atomic emission spectroscopy (MP-AES), x-ray fluorescence spectroscopy (XRF), and other techniques for elemental analysis.

Certification & Traceability: This CRM was manufactured under a quality management system that is registered to ISO 9001, ISO 17034 and ISO/IEC 17025. This CRM was prepared to the certified concentrations shown above by gravimetric methods using single element concentrates that were certified using the "High Performance ICP-OES" protocol developed by NIST and are directly traceable to the NIST SRMs listed below. The solution was stabilized using high purity nitric acid (HNO₃) and diluted with filtered (0.22µm), 18 M-ohm deionized water. The balances used in the preparation of this CRM are calibrated regularly with traceability to NIST. All volumetric dilutions are performed in Class A calibrated glassware. The certified concentrations were determined based upon gravimetric procedures. Secondary verification of the certified concentrations was performed using ICP-OES that was calibrated and/or referenced against NIST SRMs: 3181a, 3103a, 3184a, 3100, 3113, 3112a, 3114, 3141a, 3132, 3134, 3136, 3128, 3148, 3153a, and 3158a. The uncertainty associated with each certified concentration represents the expanded uncertainty at the 95% confidence level using a coverage factor of k=2.

Instructions for Use: Agilent recommends that the solution be thoroughly mixed by repeated shaking or swirling of the bottle immediately prior to use. To achieve the highest accuracy the analyst should: (1) use only pre-cleaned containers and transferware, (2) avoid pipetting directly from the CRM's original container, (3) use a minimum sub-sample size of 500µL, (4) make dilutions using calibrated balances or certified volumetric class A flasks and pipettes, (5) dilute to volume using the same matrix as the original CRM, and (6) never pour used product back into the original container. The solution should be kept tightly capped and stored under normal laboratory conditions. Do not freeze, heat, or expose to direct sunlight. Minimize exposure to moisture or high humidity.

Page 1 of 3

Document Name: Certificate of Analysis Wavelength calibration solution



Period of Validity: Agilent ensures the accuracy of this solution until the expiration date shown below, provided the instructions for use are followed. During the period of validity, the purchaser will be notified if this product is recalled due to any significant changes in the stability of the solution.

Sample lot approval:

Date of release: 17 October 2020
Date of expiration: 17 April 2022

Chuck Goudreau
Chuck Goudreau, Certifying Officer

Page 2 of 3

Document Name: Certificate of Analysis Wavelength calibration solution



Hazard Information: Refer to the Safety Data Sheet (SDS), which can be obtained at www.agilent.com/chem/sds.

Homogeneity: This solution was determined to be homogeneous by procedures consistent with the requirements of ISO 17034 and ISO Guide 35. Replicate samples of the finished solution were analyzed to confirm its homogeneity. In accordance with OSP 6-13 Assessment of Homogeneity and Stability, to ensure homogeneity, users should not take a smaller sub-sample than specified in the Instructions for Use, as doing so will invalidate the certified values and uncertainties.

Further Information: Please contact Agilent for further information about this CRM.

Quality Certification: This CRM was prepared under a quality management system that is:

- Registered to ISO 9001 – Quality Management Systems – Requirements (TUV NORD Cert. Reg. No. 44 100 16560231)
- Accredited to ISO 17034 – General Requirements for the Competence of Reference Material Producers (A2LA Cert. No. 2848.02)
 - ISO 17034 references additional requirements specified in ISO Guide 31 and ISO Guide 35.
- Accredited to ISO/IEC 17025 – General Requirements for the Competence of Testing and Calibration Laboratories (A2LA Cert. No. 2848.01)
- 165 Sturdevant, 270 Abby Road, Manchester, NH 03103

Page 3 of 3

Date: November 29, 2021 3:20:41 PM
System ID: MY15330001

Document Name: Certificate of Analysis Wavelength calibration solution

Date: November 29, 2021 3:20:41 PM
System ID: MY15330001

General

Document Name: Instrument's Test Report

Report Summary

Instrument Model Agilent 5100 VDV ICP-OES
 Instrument ID G8011A
 Instrument Serial Number MY15330001
 Software Version 7.1.0.6821
 Firmware Version 2994
 Tested By Kanyakorn S.
 Test Completed On 29-Nov-21 3:18:24 PM

Result Summary

Resolution Test Pass
 Sensitivity Test Pass
 Precision Test Pass

Resolution Test

Pass

| Element Wavelength | Specification | Width |
|--------------------|---------------|-------|
| N (174.213 nm) | ≤ 9.40 | 7.54 |
| As (188.980 nm) | ≤ 8.20 | 6.72 |
| C (193.027 nm) | ≤ 11.50 | 8.01 |
| Mo (202.032 nm) | ≤ 0.20 | 0.80 |
| Cr (206.158 nm) | ≤ 13.40 | 10.24 |
| Zn (213.857 nm) | ≤ 8.70 | 7.54 |
| Pb (220.353 nm) | ≤ 9.50 | 7.71 |
| Co (228.615 nm) | ≤ 17.20 | 11.30 |
| Ba (230.424 nm) | ≤ 9.40 | 8.19 |
| Mn (257.610 nm) | ≤ 13.30 | 9.60 |
| Mn (260.568 nm) | ≤ 20.30 | 16.52 |
| Cr (267.716 nm) | ≤ 11.00 | 9.08 |
| Cu (324.754 nm) | ≤ 25.00 | 18.23 |
| Cu (327.395 nm) | ≤ 14.20 | 12.53 |
| Sr (338.071 nm) | ≤ 33.50 | 27.38 |
| Ba (455.403 nm) | ≤ 44.00 | 34.14 |
| Sr (460.733 nm) | ≤ 36.00 | 21.93 |
| Ba (493.408 nm) | ≤ 36.00 | 29.13 |
| Ba (614.171 nm) | ≤ 42.00 | 27.47 |
| Ar (675.283 nm) | ≤ 74.00 | 67.94 |
| K (766.491 nm) | ≤ 80.00 | 63.70 |

Page 1 of 3

Date: November 29, 2021 3:20:41 PM
 System ID: MY15330001

Document Name: Instrument's Test Report

Sensitivity Test

Pass

Radial

| Element Wavelength | Specification | Method | Ratio | Standard | Blank |
|--------------------|---------------|--------|---------|-----------|---------|
| As (188.980 nm) | ≥ 45.0 | SRBR | 122.4 | 1199.1 | 83.2 |
| Se (196.026 nm) | ≥ 41.0 | SRBR | 79.1 | 935.2 | 109.1 |
| Zn (213.857 nm) | ≥ 1421.0 | SRBR | 3206.2 | 52338.5 | 263.8 |
| Pb (220.353 nm) | ≥ 46.0 | SRBR | 170.7 | 2838.4 | 233.0 |
| Mn (257.610 nm) | ≥ 3518.0 | SRBR | 10484.0 | 285474.0 | 737.6 |
| Al (396.152 nm) | ≥ 3.4 | SBR | 5.7 | 37125.2 | 5560.4 |
| Ba (493.408 nm) | ≥ 34.0 | SBR | 84.3 | 1024562.6 | 12016.8 |
| K (766.491 nm) | ≥ 1.8 | SBR | 3.9 | 104539.1 | 21328.3 |

Axial

| Element Wavelength | Specification | Method | Ratio | Standard | Blank |
|--------------------|---------------|--------|---------|-----------|---------|
| As (188.980 nm) | ≥ 208.0 | SRBR | 276.1 | 4320.0 | 220.4 |
| Se (196.026 nm) | ≥ 159.0 | SRBR | 179.5 | 3290.1 | 281.0 |
| Zn (206.200 nm) | ≥ 234.0 | SRBR | 1432.3 | 22017.4 | 231.4 |
| Zn (213.857 nm) | ≥ 1743.0 | SRBR | 6972.3 | 204965.9 | 857.0 |
| Cd (214.439 nm) | ≥ 4227.0 | SRBR | 7810.0 | 163528.6 | 436.1 |
| Pb (220.353 nm) | ≥ 320.0 | SRBR | 600.5 | 16920.2 | 727.3 |
| Mn (257.610 nm) | ≥ 10625.0 | SRBR | 31358.8 | 1574284.8 | 2512.2 |
| Cr (267.716 nm) | ≥ 1048.0 | SRBR | 4587.3 | 186346.2 | 1621.6 |
| Cu (324.754 nm) | ≥ 19.0 | SBR | 51.8 | 253941.6 | 4813.6 |
| Al (396.152 nm) | ≥ 6.0 | SBR | 12.4 | 263070.7 | 19021.4 |
| Ba (493.408 nm) | ≥ 00.0 | SBR | 190.6 | 6858283.6 | 35799.9 |
| K (766.491 nm) | ≥ 24.0 | SBR | 63.4 | 3363913.7 | 52206.8 |

Page 2 of 3

Date: November 29, 2021 3:20:41 PM
 System ID: MY15330001

Document Name:

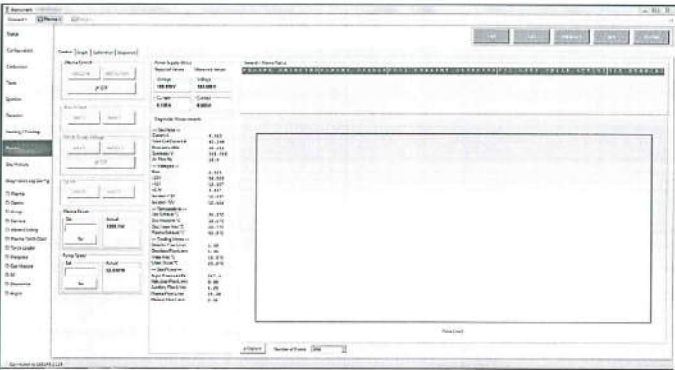
Instrument's Test Report

| Precision Test | | | Pass |
|--------------------|---------------|----------------------|------|
| Radial | | | |
| Element Wavelength | Specification | Measured Value % RSD | |
| As (188.980 nm) | ≤ 2.60 | 1.19 | |
| Se (196.026 nm) | ≤ 2.60 | 1.14 | |
| Zn (213.857 nm) | ≤ 1.50 | 0.47 | |
| Pb (220.353 nm) | ≤ 2.60 | 0.84 | |
| Mn (257.610 nm) | ≤ 1.50 | 0.42 | |
| Al (396.152 nm) | ≤ 1.50 | 0.37 | |
| Ba (493.408 nm) | ≤ 1.50 | 0.77 | |
| K (766.491 nm) | ≤ 1.50 | 0.29 | |
| Axial | | | |
| Element Wavelength | Specification | Measured Value % RSD | |
| As (188.980 nm) | ≤ 1.50 | 0.68 | |
| Se (196.026 nm) | ≤ 1.50 | 0.64 | |
| Zn (206.200 nm) | ≤ 1.50 | 0.29 | |
| Zn (213.857 nm) | ≤ 1.50 | 0.37 | |
| Cd (214.439 nm) | ≤ 1.50 | 0.34 | |
| Pb (220.353 nm) | ≤ 1.50 | 0.33 | |
| Mn (257.610 nm) | ≤ 1.50 | 0.74 | |
| Cr (267.716 nm) | ≤ 1.50 | 0.29 | |
| Cu (324.754 nm) | ≤ 1.50 | 0.37 | |
| Al (396.152 nm) | ≤ 1.50 | 0.35 | |
| Ba (493.408 nm) | ≤ 1.50 | 0.55 | |
| K (766.491 nm) | ≤ 1.50 | 0.60 | |

General

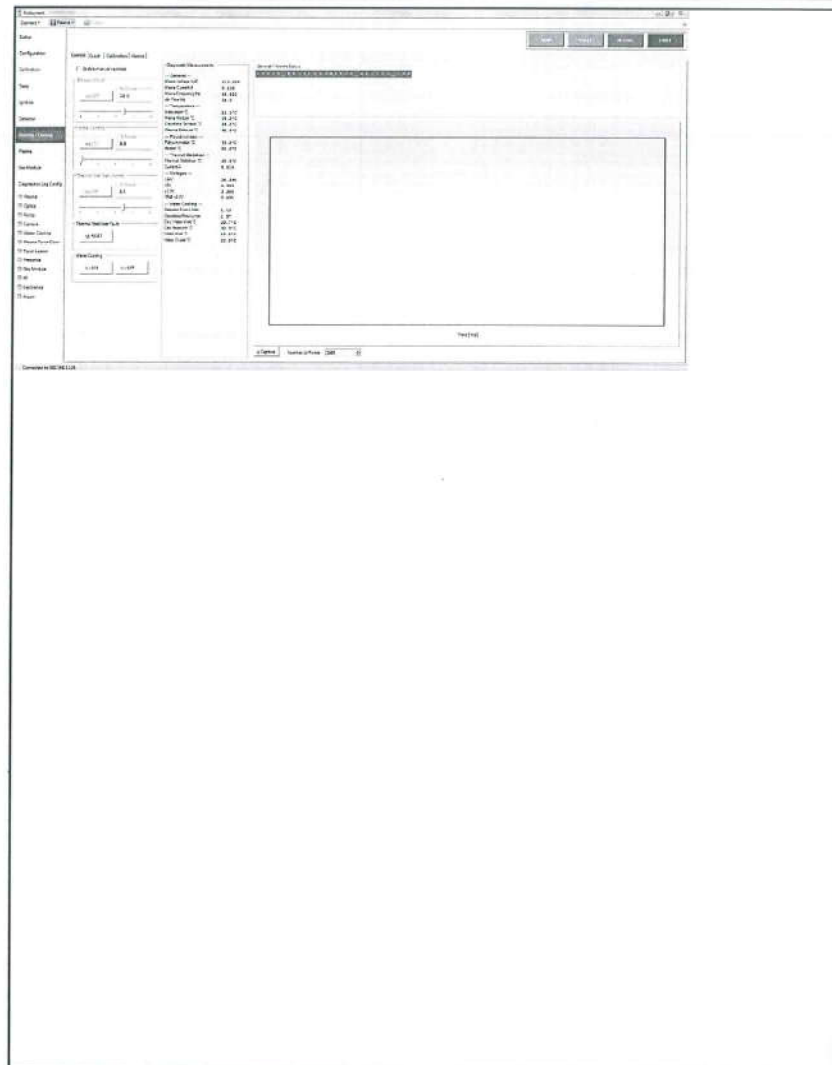
Document Name:

Instrument's Test Report



General

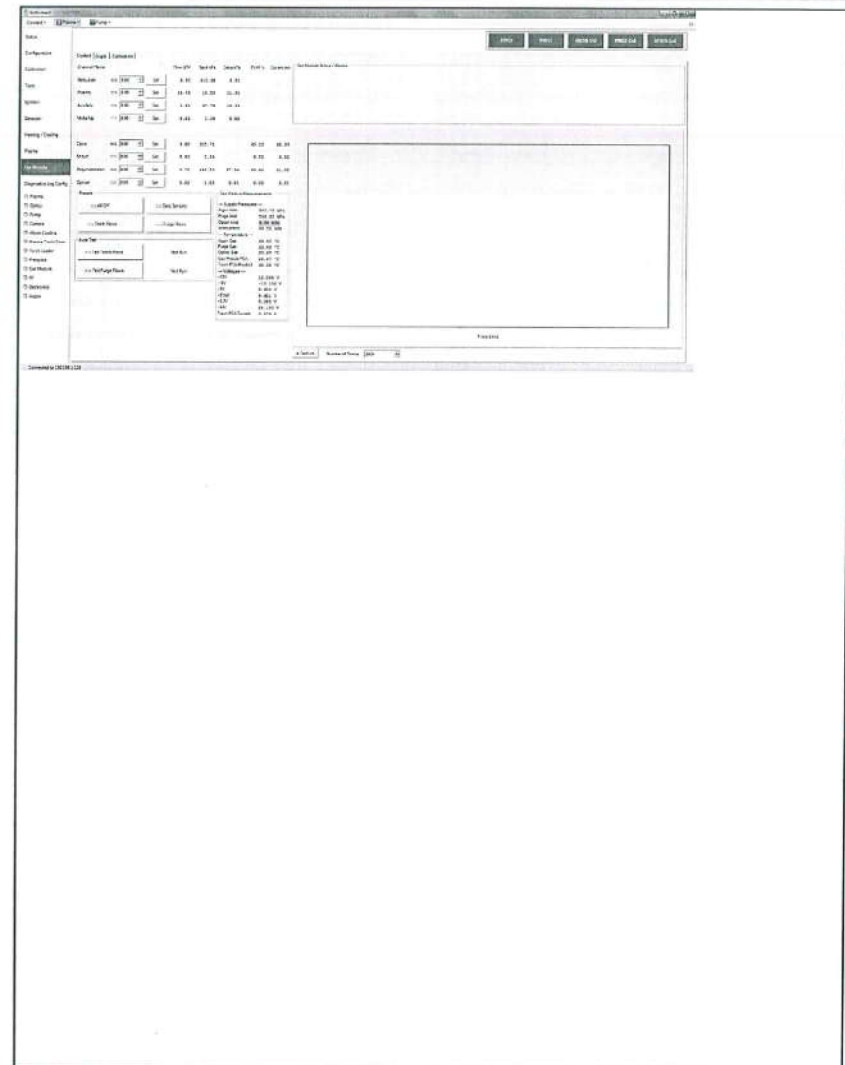
Document Name: Instrument's Test Report



Date: November 29, 2021 3:20:41 PM
System ID: MY15330001

General

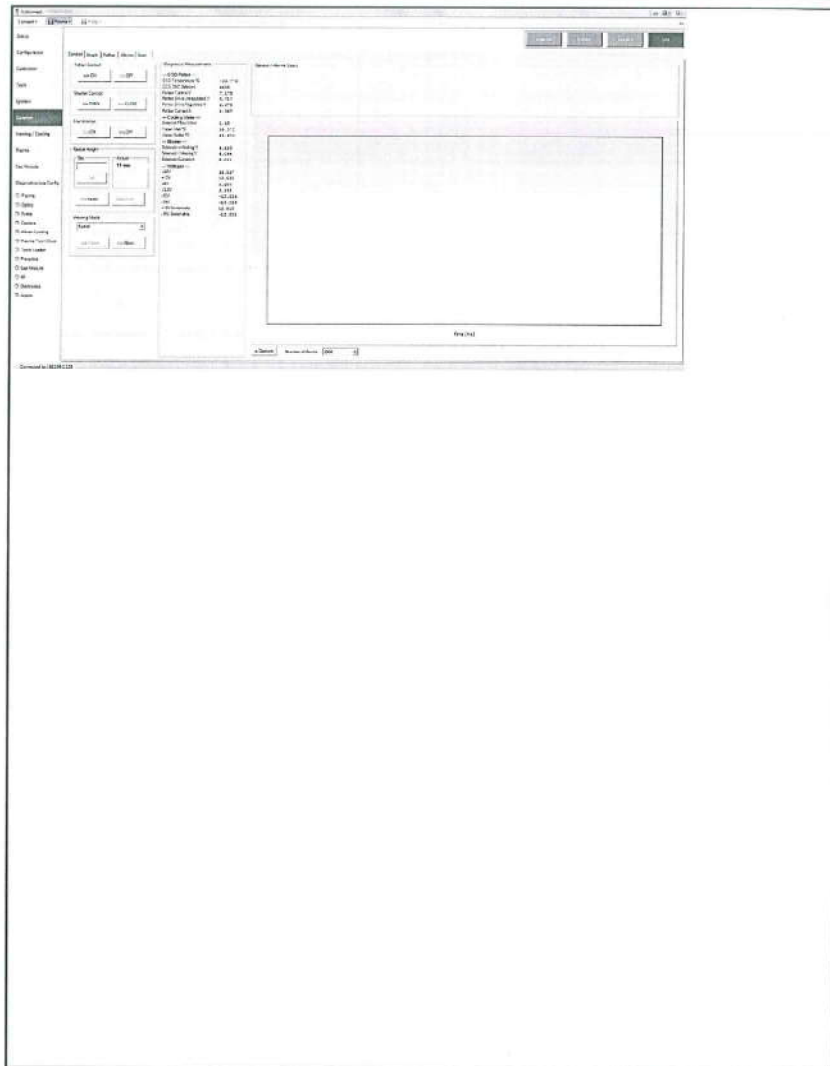
Document Name: Instrument's Test Report



Date: November 29, 2021 3:20:41 PM
System ID: MY15330001

General

Document Name: Instrument's Test Report



PinAAcle 900Z Preventive Maintenance Report

Company Name: ENVIRONMENT RESEARCH


Instrument Location: 25/114 M.6 ,THANON NGAM WONG WAN
THUNG SONG HONG, LAK SI, BANGKOK, 10210

Instrument Serial No.: PZAS19031401

Date: 14-Jun-2021

PinAAcle 900Z Preventive Maintenance (PM)

| | | | |
|--|--|--|--------------|
| Company Name: | ENVIRONMENT RESEARCH | | |
| Address (Instrument Location): | 25/114 M.6 ,THANON NGAM WONG WAN, LAK SI, BANGKOK, 10210 | | |
| Serial Number: | PZAS19031401 | PM Number: | 1/2 |
| Customer Name (if applicable): | K. RAIWIN | Telephone Number: | 099-182-9241 |
| Customer Support Engineer Name: | K.DUANG | Service Order Number: | WO-01301953 |
| Date PM Performed: (DD-MMM-YYYY) | 14-Jun-2021 | Next PM Due Date: (DD-MMM-YYYY) | 14-Dec-2021 |
| Standard Labor Hours to Complete PM : | | 5 hours | |

| Part Number | Release | Publication Date |  |
|----------------|---------|------------------|---|
| 09370144 Rev.9 | A | January 2018 | |

Scope

The purpose of this PM is to ensure the continued functionality of the PinAAcle 900Z by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer.

The customer should save their method before the PM begins.

General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.

Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files.

The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.

Update the PM sticker and instrument logbook as required.

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Component List

| Component / Specific Model | Serial # | Configuration Notes |
|----------------------------|----------|---------------------|
| | | |
| | | |
| | | |
| | | |

Parts Lists

| Parts Included with the PM | | |
|--------------------------------|---------------------------|----------|
| Part Number (if applicable) | Description | Quantity |
| B0501696 | Fan Filters | 2 |
| B3002013 | THGA Contact Cylinders | 1 |
| B3141064 | Glycerol for THGA Cooling | N/A |

Additional Reagents and Standards Required for PM

| Part Number (if applicable) | Description | Quality | Batch/Lot # | Expired Date (MM/YY) |
|--------------------------------|----------------------|---------|-------------|-------------------------|
| N9300244 | GFAAS Mixed Standard | AR | 53-255CRY1 | 30-Sep-2021 |

Additional Reagents and Standards Required for PM (Customer Support Solution)

| Part Number (if applicable) | Description | Quantity | Batch/Lot # | Expiration Date (MM/YY) |
|--------------------------------|-----------------------|----------|-------------|----------------------------|
| N/A | DI Water | 250 ml. | AR | AR |
| N/A | 0.5% HNO ₃ | 250 ml. | AR | AR |

| Additional Tools Required for PM | | | |
|----------------------------------|-----------------------|----------|---------------|
| Part Number (if applicable) | Description | Quantity | Serial # |
| B3100652 Or N9307029 | Electronic Flow Meter | 1 | PE200767 |
| B0505495 | Test Jig | 1 | NA |
| 03030997 | System 2 EDL Driver | 1 | 03030997 |
| N3050605 | As System 2 EDL | 1 | 16148 |
| N3050121 | Cu Lumina HCL | 1 | 092216-010130 |
| N3050109 | Ba Lumina HCL | 1 | 102416-040160 |
| N3050139 | K Lumina HCL | 1 | 110716-010060 |
| N3050152 | Ni Lumina HCL | 1 | 100516-030190 |
| N3050119 | Cr Lumina HCL | 1 | 091911-020150 |

Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.
- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Perform general inspection of system for cleanliness.

2. PC Instrument Software:

- ☒ Instrument Software user files/databases archived, packed, and/or deleted as needed.

3. Mechanical:

- ☒ Inspect and clean all fans and filters. Replace filters if necessary
- ☒ Inspect all gas and water lines for leaks and/or wear. Replace if needed. Thoroughly inspect all quick connects. Replace the Y connector, P/N 09921079, if needed.
- ☒ Clean exterior of the instrument.
- ☒ Check the drain system for signs of wear. Replace worn or damaged parts.
- ☒ Inspect the pole pieces and clean where the pole pieces contact the furnace. Replace the pole piece p-rings as needed, P/N's B0501018 & B0501250. Grease the O-rings as needed with Apiezon L grease, P/N 09905148
- ☒ Inspect the four insulation pads on the front contact housing of the THGA in furnace. If the pads are missing replace the THGA furnace or replace the insulator pads on the furnace.
- ☒ Inspect the graphite tube and clean the contact cylinders. Replace if necessary.
- ☒ Check internal and external gas flows with the Electronic Gas Flow Meter and the Gas Flow Test Probe as described in the Service Manual. Correct if necessary.
- ☒ Check furnace open/close function.
- ☒ Verify the operation of the GFTV Camera for proper operation and viewing alignment in the furnace camera Tube View window. Align if needed.
- ☒ Check the operation of the Halogen Light ASSY for the GFTV Camera. Replace if needed.
- ☒ Check the water level/quality in the recirculation (if applicable). Add distilled water if necessary.
- ☒ Check the cooling system fluid flow rate with the FCS In-Line Flow Meter for proper levels if needed. Refer to SDB# COSY008.STN
- ☒ Perform Cooling System maintenance if needed per SDB# COSY005.STN.
- ☒ Check auto sampler operation.
- ☒ Perform an auto sampler check valve test as described in the Service Manual.
- ☒ Lubricate the spindles of the auto sampler pumps and all moving parts of the tray mechanics as described in the Service Manual.
- ☒ Inspect the auto sampler sampling capillary as described in the Service Manual. Replace if necessary.
- ☒ Inspect the four insulation pads on the front contact housing of the THGA in furnace. If the pads are missing replace the THGA furnace or replace the insulator pads on the furnace.
- ☒ Inspect the graphite tube and clean the contact cylinders. Replace if necessary.
- ☒ Check internal and external gas flows with the Electronic Gas Flow Meter and the Gas Flow Test Probe as described in the Service Manual. Correct if necessary.
- ☒ Check furnace open/close function

4. Electrical:

- ☒ Inspect PC boards. Clean if necessary.
- ☒ Check instrument firmware revisions upgrade to current levels (if necessary)
- ☒ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.

5. Optics:

- ☒ Inspect and clean the sample compartment windows, if needed.
- ☒ Inspect and clean the furnace windows, if needed.
- ☒ Inspect and clean the GFTV camera lens, if needed.
- ☒ Inspect optics. Clean or replace if necessary,

6. Gasses:

- ☒ Verify that the Gasses supplied to the instrument are within the pressure and purity specifications found in the PinAAcle 900 Series Pre-installation Checklist SDB.
- ☒ Verify that the air filter element is dry. Replace if necessary.

7. After PM Performance tests [THGA]:

7.1 Furnace Gas Flows

Description: Ensures the flow rates are within specification.

| Parameter | Specification | Test Results | Pass/Fail |
|--------------------|----------------------------|--------------|-----------|
| Internal Flow Rate | 250 mL/min \pm 25 mL/min | 255 | Passed |
| External Flow Rate | 100 mL/min \pm 10 mL/min | 100 | Passed |

7.2 Chromium Baseline Noise

Description: Signal to noise check.

| Parameter | Specification | Results | Pass/Fail |
|--------------------|-------------------|---------|-----------|
| Baseline Noise | \leq 0.005 Abs. | 0.0010 | Passed |
| Standard Deviation | \leq 0.005 | 0.0003 | Passed |

7.3 Chromium Characteristic Mass and Precision

Description: Calculate the characteristic mass using the characteristic mass tool and precision from the integrated absorbance values.

| Parameter | Specification | Results | Pass/Fail |
|------------------|--------------------------|---------|-----------|
| Cr m_0 Results | \leq 7.0 pg/0.0044 A-s | 3.8 | Passed |
| Precision | \leq 2.0 % | 1.02 | Passed |

7.4 Copper Characteristic Mass and Zeeman Ratio

Description: Calculate the characteristic mass using the characteristic mass tool and check the Zeeman Ratio.

| Parameter | Specification | Results | Pass/Fail |
|-----------------|---------------------------|---------|-----------|
| Cu m_0 Result | \leq 16.5 pg/0.0044 A-s | 11.8 | Passed |
| Zeeman Ratio | 0.52 \pm 0.04 | 0.56 | Passed |

8. Review:

- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer supplied materials to have on hand.
- ☒ Attach PM sticker.

Additional Comments

Additional Comments Regarding the PM

$$\begin{aligned} \text{Zeeman Ratio} &= \frac{\text{Atomic Signal (Peak area)}}{\text{Atomic Signal (Peak area)} + \text{Background Signal (Peak area)}} \\ &= \frac{0.1934}{0.1934 + 0.1481} \\ &= 0.56 \end{aligned}$$

Review

The preventive maintenance checks and if applicable performance tests for PinAAcle 900Z have been completed.

This PinAAcle 900Z Passes ☒ Fails ☐ the preventive maintenance.

Review of Preventive Maintenance:

| | | |
|--|--|---------------------------------------|
| Authorized PerkinElmer Representative: | | Date: 14-Jun-2021 (DD-MMM-YYYY) |
| Authorized Customer Representative: | | Date: 14-Jun-2021 (DD-MMM-YYYY) |

Calibration Certificate ID
TH2065-083-011922-ACC-TH

Mettler-Toledo (Thailand) Ltd.
846/4 - 846/5 Lasalle Rd., Bangna Tai Sub-District
Bangna District, Bangkok 10260
+66 2723 0382
MT-TH.ServiceSupport@mt.com

METTLER TOLEDO



Accuracy Calibration Certificate

Customer

Company: ENVIRONMENT RESEARCH&TECHNOLOGY CO., LTD.
Address: 25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Rd., Toongsongho
City: Laksl Contact: Ramita Taengthai
Zip / Postal: 10210
State / Province: Bangkok
Order Number: 

Weighing Device

Manufacturer: Mettler Toledo Instrument Type: Weighing Instrument
Model: MS204S/01 Asset Number: ERTC-L-IN-088
Serial No.: B334691537 Terminal Model: N/A
Building: N/A Terminal Serial No.: N/A
Floor: 5 Terminal Asset No.: N/A
Room: 504

| Range | Max. Capacity | Readability (d) |
|-------|---------------|-----------------|
| 1 | 220 g | 0.0001 g |

Procedure

Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)
METTLER TOLEDO Work Instruction: CP/W002/20

This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.

The sensitivity/span of the weighing instrument was adjusted before calibration with a built-in weight.

In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

| | Temperature | | Humidity | |
|----------|----------------|--------------|---------------|-------------|
| As Found | Start: 23.9 °C | End: 24.2 °C | Start: 45.8 % | End: 54.8 % |

As Found Calibration Date: 19-Jan-2022
As Left Calibration Date: N/A
Issue Date: 20-Jan-2022
Calibrator:
Approved Signatory:

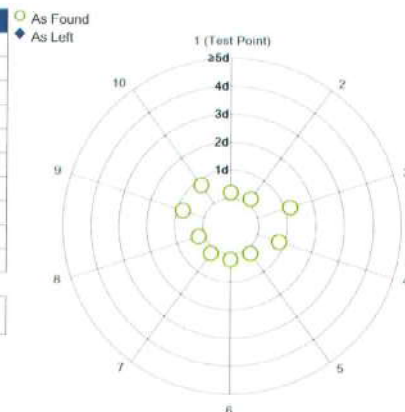
Measurement Results

Repeatability

Test Load: 100 g

| | As Found | As Left |
|----|-----------|---------|
| 1 | 99.9998 g | N/A |
| 2 | 99.9998 g | N/A |
| 3 | 99.9997 g | N/A |
| 4 | 99.9999 g | N/A |
| 5 | 99.9998 g | N/A |
| 6 | 99.9998 g | N/A |
| 7 | 99.9998 g | N/A |
| 8 | 99.9998 g | N/A |
| 9 | 99.9999 g | N/A |
| 10 | 99.9999 g | N/A |

| | | |
|--------------------|-----------|-----|
| Standard Deviation | 0.00006 g | N/A |
|--------------------|-----------|-----|



The "d" in the graph represents the readability of the range/interval in which the test was performed.

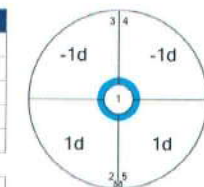
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g

| Position | As Found | As Left |
|----------|-----------|---------|
| 1 | 99.9998 g | N/A |
| 2 | 99.9999 g | N/A |
| 3 | 99.9997 g | N/A |
| 4 | 99.9997 g | N/A |
| 5 | 99.9999 g | N/A |

| | | |
|-------------------|----------|-----|
| Maximum Deviation | 0.0001 g | N/A |
|-------------------|----------|-----|



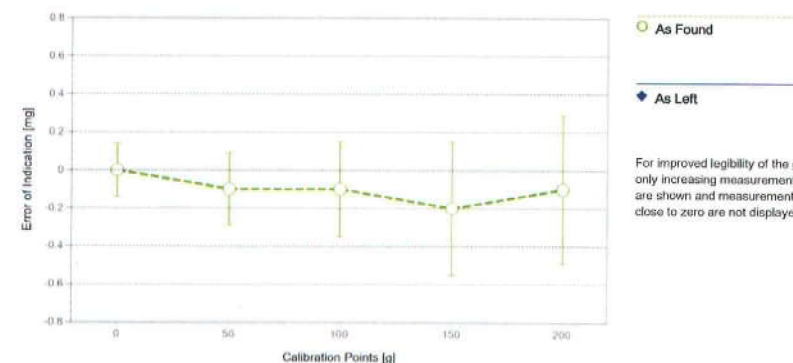
As Found

The "d" in the graph represents the readability of the range/interval in which the test was performed.

Error of Indication

As Found

| | Reference Value | Indication | Error of Indication | Expanded Uncertainty | k |
|----|-----------------|------------|---------------------|----------------------|---|
| 1 | 0.0000 g | 0.0000 g | 0.0000 g | 0.14 mg | 2 |
| 2 | 0.0500 g | 0.0500 g | 0.0000 g | 0.15 mg | 2 |
| 3 | 0.1000 g | 0.1000 g | 0.0000 g | 0.15 mg | 2 |
| 4 | 0.5000 g | 0.5000 g | 0.0000 g | 0.15 mg | 2 |
| 5 | 1.0000 g | 1.0000 g | 0.0000 g | 0.15 mg | 2 |
| 6 | 5.0000 g | 5.0000 g | 0.0000 g | 0.16 mg | 2 |
| 7 | 10.0000 g | 10.0000 g | 0.0000 g | 0.16 mg | 2 |
| 8 | 50.0000 g | 49.9999 g | -0.0001 g | 0.19 mg | 2 |
| 9 | 99.9999 g | 99.9998 g | -0.0001 g | 0.25 mg | 2 |
| 10 | 149.9999 g | 149.9997 g | -0.0002 g | 0.35 mg | 2 |
| 11 | 199.9999 g | 199.9998 g | -0.0001 g | 0.39 mg | 2 |



For improved legibility of the graphics, only increasing measurement points are shown and measurement points close to zero are not displayed.

The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k – which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2

| | | | |
|---------------------|--------|-----------------------|-------------|
| Weight Set No.: | WS03 | Date of Issue: | 21-Sep-2021 |
| Certificate Number: | 175498 | Calibration Due Date: | 14-Mar-2023 |

Thermo Hygrometer

| | | | |
|---------------------|---------|-----------------------|-------------|
| Equipment No.: | IN281 | Date of Issue: | 25-May-2021 |
| Certificate Number: | 21H1100 | Calibration Due Date: | 10-May-2022 |

Remarks

FACT adjustment functionality activated
Equipment condition: Good
Next calibration according to customer's procedure

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with $k=2$ in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: $1.5 \cdot 10^{-6} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use: 4 K

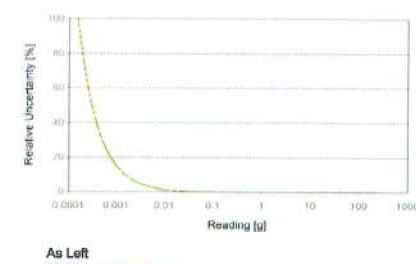
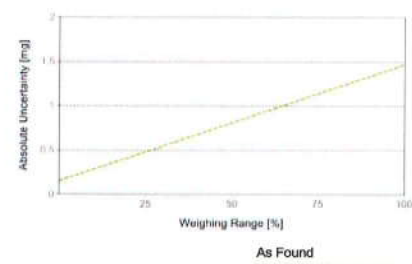
Linearization of Uncertainty Equation

| 1 | Range | | As Found | As Left |
|---|----------|-------|--|---------|
| | d | Max | | |
| 1 | 0.0001 g | 220 g | $U_1 = 0.15 \text{ mg} + 0.00599 \text{ mg/g} \cdot R$ | N/A |

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

| Net Indication | As Found | | As Left | |
|----------------|----------|----------|---------|-----|
| 0.0220 g | 0.15 mg | 0.68% | N/A | N/A |
| 0.2200 g | 0.15 mg | 0.069% | N/A | N/A |
| 2.2000 g | 0.16 mg | 0.0074% | N/A | N/A |
| 22.0000 g | 0.28 mg | 0.0013% | N/A | N/A |
| 220.0000 g | 1.5 mg | 0.00067% | N/A | N/A |



GWP® Certificate



As
Found



As
Left



The weighing device meets the given
process requirements.

The weighing device meets the given
process requirements.

Tests Performed: ☒ As Found ☐ As Left ☒ No adjustments/modifications made. As Left results correspond to As Found.

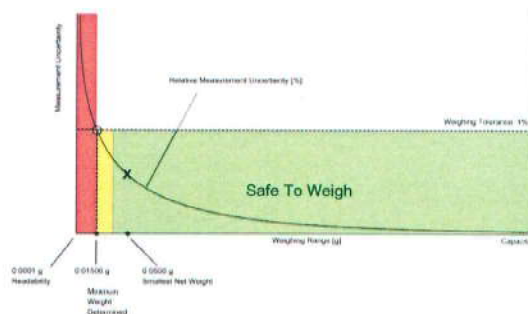
Process Requirements

Weighing Tolerance: 1%

Smallest Net Weight: 0.0500 g

Safety Factor: 2

Safe Weighing Range



While the values in this graph reflect the actual calibration results, the measurement uncertainty curves are simply a visual representation. This graph reflects As Left testing, unless only As Found was performed.

Minimum Weight

As Found Minimum Weight Table

| Minimum weights for different weighing tolerances and safety factors | | | | | |
|--|---------------|-----------|-----------|-----------|-----------|
| Tolerance | Safety Factor | | | | |
| | 1 | 2 | 3 | 5 | 10 |
| 0.1% | 0.15146 g | 0.30476 g | 0.45993 g | 0.77601 g | 1.60147 g |
| 0.2% | 0.07550 g | 0.15146 g | 0.22788 g | 0.38211 g | 0.77601 g |
| 0.5% | 0.03015 g | 0.06037 g | 0.09066 g | 0.15146 g | 0.30476 g |
| 1% | 0.01506 g | 0.03015 g | 0.04525 g | 0.07550 g | 0.15146 g |
| 2% | 0.00753 g | 0.01506 g | 0.02260 g | 0.03770 g | 0.07550 g |
| 5% | 0.00301 g | 0.00602 g | 0.00904 g | 0.01506 g | 0.03015 g |



Pass: The determined minimum weight meets the requirement for the smallest net weight.

As Left Minimum Weight Table

| Minimum weights for different weighing tolerances and safety factors | | | | | |
|--|---------------|-----------|-----------|-----------|-----------|
| Tolerance | Safety Factor | | | | |
| | 1 | 2 | 3 | 5 | 10 |
| 0.1% | 0.15146 g | 0.30476 g | 0.45993 g | 0.77601 g | 1.60147 g |
| 0.2% | 0.07550 g | 0.15146 g | 0.22788 g | 0.38211 g | 0.77601 g |
| 0.5% | 0.03015 g | 0.06037 g | 0.09066 g | 0.15146 g | 0.30476 g |
| 1% | 0.01506 g | 0.03015 g | 0.04525 g | 0.07550 g | 0.15146 g |
| 2% | 0.00753 g | 0.01506 g | 0.02260 g | 0.03770 g | 0.07550 g |
| 5% | 0.00301 g | 0.00602 g | 0.00904 g | 0.01506 g | 0.03015 g |



Pass: The determined minimum weight meets the requirement for the smallest net weight.

At these net minimum weight values, the measurement uncertainty of the weighing device is equal to or less than 1/1 (no safety factor), 1/2, 1/3, 1/5, or 1/10 of the required tolerance. The values are calculated with $k = 2$ and based on the linear formula of the measurement uncertainty of the weighing device in use.

The safety factor for As Found is always 1. This implies no safety factor. As Found testing looks at the behavior of the instrument from the past until test occurred. For the past, it is necessary to know that the tolerance was met, but not the safety factor. The safety factor is a proactive measure to apply for future measurements.

Notes on minimum weight values in above table:

- If "N/A" is shown above, no appropriate value could be calculated.
- METTLER TOLEDO is not responsible for the definition of the process requirements.

Measurement Results

Results Summary

| | Repeatability | Eccentricity | Error of Indication |
|----------|---------------|--------------|---------------------|
| As Found | ✓ | ✓ | ✓ |
| As Left | ✓ | ✓ | ✓ |

✓ = Passed

✗ = Failed

⚠ = Safety Factor not met

Repeatability

Test Load: 100 g

| Tolerance | Control Limit | As Found | | As Left | |
|-----------|---------------|----------------|--------|----------------|--------|
| | | Std. Deviation | Result | Std. Deviation | Result |
| 0.1% | N/A | 0.00006 g* | N/A | 0.00006 g* | N/A |
| 0.2% | 0.00005 g | | ✗ | | ✗ |
| 0.5% | 0.00013 g | | ✓ | | ✓ |
| 1% | 0.00025 g | | ✓ | | ✓ |
| 2% | 0.00050 g | | ✓ | | ✓ |
| 5% | 0.00125 g | | ✓ | | ✓ |

*The calculated standard deviation value is below the rounding error of the balance. The 0.41*d rule is used for the assessment of this repeatability test and the calculation of the minimum weight.

The weighing tolerance is met if the standard deviation is less than or equal to the corresponding control limit.

Eccentricity

Test Load: 100 g

| Tolerance | Control Limit | As Found | | As Left | |
|-----------|---------------|-----------|--------|-----------|--------|
| | | Deviation | Result | Deviation | Result |
| 0.1% | 0.0500 g | 0.0001 g | ✓ | 0.0001 g | ✓ |
| 0.2% | 0.1000 g | | ✓ | | ✓ |
| 0.5% | 0.2500 g | | ✓ | | ✓ |
| 1% | 0.5000 g | | ✓ | | ✓ |
| 2% | 1.0000 g | | ✓ | | ✓ |
| 5% | 2.5000 g | | ✓ | | ✓ |

The weighing tolerance is met if the deviation is less than or equal to the corresponding control limit.

Error of Indication

As Found

| Reference Value | Error | Control limits for various weighing tolerances | | | | | |
|-----------------|-----------|--|----------|----------|----------|----------|----------|
| | | 0.1% | 0.2% | 0.5% | 1% | 2% | 5% |
| 0.0000 g | 0.0000 g | N/A | N/A | N/A | N/A | N/A | N/A |
| 50.0000 g | -0.0001 g | 0.0250 g | 0.0500 g | 0.1250 g | 0.2500 g | 0.5000 g | 1.2500 g |
| 99.9999 g | -0.0001 g | 0.0500 g | 0.1000 g | 0.2500 g | 0.5000 g | 1.0000 g | 2.5000 g |
| 149.9999 g | -0.0002 g | 0.0750 g | 0.1500 g | 0.3750 g | 0.7500 g | 1.5000 g | 3.7500 g |
| 199.9999 g | -0.0001 g | 0.1000 g | 0.2000 g | 0.5000 g | 1.0000 g | 2.0000 g | 5.0000 g |
| Result | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

As Left

| Reference Value | Error | Control limits for various weighing tolerances | | | | | |
|-----------------|-----------|--|----------|----------|----------|----------|----------|
| | | 0.1% | 0.2% | 0.5% | 1% | 2% | 5% |
| 0.0000 g | 0.0000 g | N/A | N/A | N/A | N/A | N/A | N/A |
| 50.0000 g | -0.0001 g | 0.0250 g | 0.0500 g | 0.1250 g | 0.2500 g | 0.5000 g | 1.2500 g |
| 99.9999 g | -0.0001 g | 0.0500 g | 0.1000 g | 0.2500 g | 0.5000 g | 1.0000 g | 2.5000 g |
| 149.9999 g | -0.0002 g | 0.0750 g | 0.1500 g | 0.3750 g | 0.7500 g | 1.5000 g | 3.7500 g |
| 199.9999 g | -0.0001 g | 0.1000 g | 0.2000 g | 0.5000 g | 1.0000 g | 2.0000 g | 5.0000 g |
| Result | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

The weighing tolerance is met if the error (of indication) for each test point is less than or equal to the corresponding control limit for that particular weighing tolerance. Results at or close to the zero point cannot be assessed.

Service Date: 2022-01-19
 Document Number: TH2065-165-011922-LABBalanceHR
 ENVIRONMENT RESEARCH&TECHNOLOGY CO., LTD
 25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Rd., Toongsongho n. บางบัวทอง, Laksi, Bangkok 10210
 Ramita Taengthai

METTLER TOLEDO

Balance Health Report

Device Details

| System Details | | | |
|----------------|----------------|---------------------------------|-------|
| Manufacturer: | Mettler Toledo | Accessory 1: | |
| Model: | MS204S | Accessory 2: | |
| Serial number: | B334691537 | Weight set for routine testing: | Yes / |
| Firmware: | 1.74 | | |

History

| Device History | | Service History | |
|-----------------------------|------------|------------------------------------|----------|
| Instrument in use: | Yes | Last preventive maintenance: | < 1 year |
| Instrument age: | > 10 years | Last instrument calibration: | < 1 year |
| Spare parts available: | Yes | Last minimum weight determination: | |
| Regulations: | ISO | Routine testing performed: | Yes |
| Process tolerance in %: | 1% | | |
| Smallest sample net weight: | 0.05g | | |

Check List

| Environmental Conditions | | General & Functional Checks | |
|--|---|---|---|
| Room temperature fluctuation | ✓ | Levelling | ✓ |
| Exposure to direct sun | ✓ | Cleanliness | ✓ |
| Vibrations | ✓ | Completeness - missing parts see additional remarks | ✓ |
| Draft | ✓ | Settings optimized for operating environment | ✓ |
| Dirt or dust | ✓ | Other - objections noted as additional remarks | — |
| Static | ✓ | | |
| Mechanical Component Checks | | Electrical Component Checks | |
| Draft shield | ✓ | Power supply | ✓ |
| Weighing pan position | ✓ | Sliding door drive | — |
| Housing | ✓ | Internal weight drive | ✓ |
| Other - objections noted as additional remarks | — | Display | ✓ |
| | | Other - objections noted as additional remarks | — |

Recommendations

| Measurement Result Quality | | Process Efficiency | |
|---|------------------------|--|----------------------------------|
| Instrument calibration | | Uninstall instrument | |
| Identify safe weighing range | | Replace instrument | |
| GWP verification / risk assessment | | Replace / add parts (see additional remarks) | |
| Preventive maintenance | | Onsite repair | |
| Perform routine testing with test weights | | Depot repair | |
| User training | | Use of accessories (see additional remarks) | |
| Contact | Name: Ramita Taengthai | Position: N/A | Phone: 0868334490 |
| | | | Email: ramita@enviresearch.co.th |
| Additional Remarks & Recommendations | | Engineer Details | |
| | | Date: | 19-Jan-2022 |
| | | Name: | Suwicha Choykamchu |
| | | Signature: | |

This is not a certificate.

It should not be used to interpret final results for the testing of these devices.

Legend: ✓ Good/Pass ⚠ Needs Attention ✗ Bad/Fail — Not Applicable

846/4 - 846/5 Laxali Rd., Bangna Tai Sub-District, Bangna District, Bangkok 10260, +66 2723 0382
 MT-TL.ServiceSupport@mt.com
 www.mt.com

METTLER TOLEDO Service

Report Version: 1.13, Software Version 4.26.2.19, Page 1/1, © METTLER TOLEDO



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
 CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
 534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
 TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 22TM152

Page.: 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven

Manufacturer : Memmert

Model : UF 110

Serial No. : B414.0652

ID No. : ERTC-L-In.-098

Submitted by : Environment Research & Technology Company Limited
 25/114 Moo 6 Soi Chinaket 1,
 Ngamwongwan Road, Toongsonghong, Laksi,
 Bangkok 10210

Location : Laboratory (ERTC)

Received Order : 5 January 2022

Calibration Date : 5 January 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Man Pattanapongpaiboon

Approved by :

() Pornthippa Tameyakul
 () Malee Butkruea
 () Suwit Imjai

Issue Date : 21 January 2022

The Uncertainties are for a confidence probability of approximately 95%

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 Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0036819



Equipment : Hot Air Oven
 Condition As-Received : Used Item
 Reference : 2201-0006ON-3

Cert. No.: 22TM152
 Page.: 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

| Instrument | Model | Serial No. | Cert. No. | Due Date |
|----------------------|--------|------------|-----------|-------------|
| 1) Data Acquisition | 34970A | MY44031769 | 21LM12 | 02 Sep 2022 |

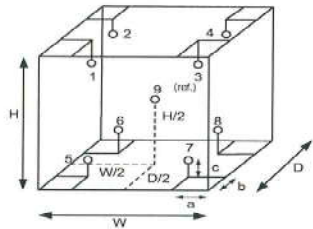
2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



| Environment during calibration | | |
|--------------------------------|-----------|----------|
| | Beginning | Finished |
| Temp. (°C) | 27 | 27 |
| REL.Humid. (%) | 54 | 58 |
| AC Supply (Volt) | 219 | 222 |

| Ref. Std. ID No.: @ Calibration Point | | |
|---------------------------------------|------------|------------|
| Position : | (180) °C | (104) °C |
| 1 | 20-09TC-01 | 9RTD-2/1 |
| 2 | 20-09TC-02 | 9RTD-2/2 |
| 3 | 20-09TC-03 | 9RTD-2/3 |
| 4 | 20-09TC-04 | 9RTD-2/4 |
| 5 | 20-09TC-05 | 9RTD-2/5 |
| 6 | 20-09TC-06 | 9RTD-2/6 |
| 7 | 20-09TC-07 | 9RTD-2/7 |
| 8 | 20-09TC-08 | 9RTD-2/8 |
| 9 (ref.) | 20-09TC-09 | 9RTD-2/9 |

| Probe Installation Details : | | Dimension of Chamber : | |
|------------------------------|--------|------------------------|--------|
| a = | 5.0 cm | D = | 0.40 m |
| b = | 5.0 cm | W = | 0.56 m |
| c = | 5.0 cm | H = | 0.48 m |
| Capacity = | | 0.11 m ³ | |



Equipment : Hot Air Oven
 Condition As-Received : Used Item
 Reference : 2201-0006ON-3
Result of Calibration :- (*) Without Adjustment

Cert. No.: 22TM152
 Page.: 3 of 3

Function of UUC* : Temperature Source

Fresh air setting : Close

| Calibration Point (°C) | UUC* Setting (°C) | UUC* Reading (°C) | Temperature stability (± °C) | Temperature uniformity (°C) | Overall Variation (°C) | Uncertainty (± °C) | Coverage Factor k |
|--------------------------|---------------------|---------------------|--------------------------------|-------------------------------|--------------------------|----------------------|-------------------|
| 104.0 | 104.0 | 104.0 | 0.11 | 1.0 | 1.9 | 0.42 | 2 |
| 180.0 | 180.0 | 180.0 | 0.51 | 2.3 | 4.2 | 1.2 | 2 |

| Calibration Point (°C) | Measured Temperature (°C) | | | | | | | | |
|--------------------------|-----------------------------|---------|---------|---------|---------|---------|---------|---------|------------|
| | Position | | | | | | | | |
| 104.0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 (ref.) |
| 104.0 | 105.219 | 103.394 | 103.908 | 104.133 | 104.348 | 104.096 | 103.878 | 104.103 | 104.360 |
| 180.0 | 182.291 | 178.691 | 178.879 | 180.031 | 180.761 | 180.026 | 180.572 | 180.044 | 180.253 |

Average* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity .

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor *k*, providing a level of confidence of approximately 95 %.

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
334/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 22TM151

Page.: 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven
Manufacturer : Binder
Model : FED 115 E2
Serial No. : 11-22823
ID No. : ERTC-L-In.-076
Submitted by : Environment Research & Technology Company Limited
25/114 Moo 6 Soi Chinaket 1,
Ngamwongwan Road, Toongsonghong, Laksi,
Bangkok 10210
Location : Laboratory (ERTC)
Received Order : 5 January 2022
Calibration Date : 5 January 2022
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Man Pattanapongpaiboon

Approved by :

Approved Signatory

() Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai

Issue Date : 21 January 2022

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2201-0006ON-2

Cert. No.: 22TM151

Page.: 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

| Instrument | Model | Serial No. | Cert. No. | Due Date |
|----------------------|--------|------------|-----------|-------------|
| 1) Data Acquisition | 34970A | MY44031769 | 21LM12 | 02 Sep 2022 |

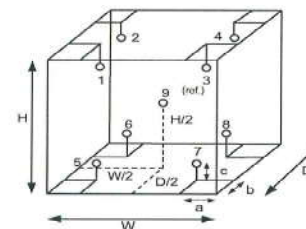
2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Probe Installation Details : **Dimension of Chamber :**

| | | | | | |
|-----|-----|----|------------|------|----------------|
| a = | 5.0 | cm | D = | 0.40 | m |
| b = | 5.0 | cm | W = | 0.60 | m |
| c = | 5.0 | cm | H = | 0.48 | m |
| | | | Capacity = | 0.12 | m ³ |

| Environment during calibration | | |
|--------------------------------|-----------|----------|
| | Beginning | Finished |
| Temp. (°C) | 27 | 27 |
| REL.Humid. (%) | 54 | 58 |
| AC Supply (Volt) | 219 | 222 |

| Ref. Std. ID No.: @ Calibration Point | | |
|---------------------------------------|------------|------------|
| Position : | (180) °C | (104) °C |
| 1 | 20-09TC-01 | 9RTD-2/1 |
| 2 | 20-09TC-02 | 9RTD-2/2 |
| 3 | 20-09TC-03 | 9RTD-2/3 |
| 4 | 20-09TC-04 | 9RTD-2/4 |
| 5 | 20-09TC-05 | 9RTD-2/5 |
| 6 | 20-09TC-06 | 9RTD-2/6 |
| 7 | 20-09TC-07 | 9RTD-2/7 |
| 8 | 20-09TC-08 | 9RTD-2/8 |
| 9 (ref.) | 20-09TC-09 | 9RTD-2/9 |

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Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2201-0006ON-2
Result of Calibration :- (*) Without Adjustment

Cert. No.: 22TM151

Page.: 3 of 3

Function of UUC* : Temperature Source

Fresh air setting : Close

| Calibration Point (°C) | UUC* Setting (°C) | UUC* Reading (°C) | Temperature stability (± °C) | Temperature uniformity (°C) | Overall Variation (°C) | Uncertainty (± °C) | Coverage Factor k |
|--------------------------|---------------------|---------------------|--------------------------------|-------------------------------|--------------------------|----------------------|-------------------|
| 104 | 104 | 104 | 0.11 | 1.1 | 1.4 | 0.69 | 2 |
| 180 | 180 | 180 | 0.43 | 3.3 | 5.6 | 1.5 | 2 |

| Calibration Point (°C) | Measured Temperature (°C) | | | | | | | | |
|--------------------------|-----------------------------|---------|---------|---------|---------|---------|---------|---------|----------|
| | Position | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 (ref.) |
| 104 | 103.167 | 102.948 | 104.098 | 104.155 | 104.013 | 103.198 | 103.619 | 103.294 | 103.159 |
| 180 | 177.080 | 177.342 | 181.816 | 181.065 | 179.474 | 177.914 | 181.064 | 179.354 | 178.751 |

Average* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity .

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

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Agilent 8890 Gas Chromatograph –Installation Checklist

Thank you for purchasing an Agilent instrument. This checklist is used by the installing engineer to ensure that the instrument and associated systems are correctly installed, upgraded, and functioning as designed in your facility. This checklist will be completed at the end of the service and provided to you as a record of the installation.

Customer Information

- Customers should leave the instrument shipment for the engineer to unpack.
- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the installation.
- Some installation tasks will be beneficial to you if you are present – refer to sections in this checklist

Important Customer Web Links

- The **Agilent Community** is an excellent place to get answers, collaborate with others about applications and Agilent products, and find in-depth documents and videos relevant to Agilent technologies. Go to <https://community.agilent.com/welcome>
- Further training, advice, and consultation can be obtained upon request.
To access **Agilent University**, visit <http://www.agilent.com/crosslab/university/> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- A useful **Agilent Resource Center** web page is available, which includes short videos on maintenance, quick lists of consumables for new instruments, and other valuable information. Check out the Resource Page here: <https://www.agilent.com/en-us/agilentresources>
- Need technical support, FAQs, supplies? – visit our **Support Home page** <http://www.agilent.com/search/support>

Service Engineer's Responsibilities

- Only complete/printout pages that relate to the system being installed.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using a "X" or tick mark "✓".
- Check "Section not applicable" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Service Review section together with the customer.
- Complete the fields for page numbers at the foot of each selected page
- Complete the total number of pages field in the Service Completion section
- Ask the customer to sign the Service Completion section including the customer's and your signature.

Additional Instruction Notes

- There are separate checklists like this one for each major system component installed with the GC. Make sure that all checklists for the system are available prior to beginning the installation.
- User information is available from the touchscreen interface and the manual are available via the web server built into the 8890 GC.
- GC, ALS, MSD and accessory user manuals, the GC Firmware/PID Update Tool, Parts Finder and other tools are included on the "GC and GC/MS User Manuals and Tools" DVD set. These will be installed as part of this GC Installation Procedure.
- Refer to the following 8890 User Manuals as you go through this checklist procedure.
Installation and First Startup
Operation Manual
Maintaining Your GC

System Information

- ☐ Check this box if an instrument configuration report is attached instead of completing the table.

| | | |
|---------------------------------------|--------|---|
| Instrument system name and ID | | CN 2122A142 |
| Instrument system site and location | | Environment Research |
| List system component product numbers | | List the serial numbers of each component |
| 1. | G3540A | 1. CN 2122A142 |
| 2. | G4513A | 2. CN 21195115 |
| 3. | G4513A | 3. CN 21195114 |
| 4. | G4514A | 4. CN 2207014 |
| 5. | | 5. |
| 6. | | 6. |
| 7. | | 7. |
| 8. | | 8. |
| 9. | | 9. |
| 10. | | 10. |

Preparation

- ☒ Unpack/verify the condition and completeness of shipment. For discrepancies, use the following table.

| Product or part description | Observation | Action |
|-----------------------------|-------------|--------|
| | | |
| | | |

- ☒ Discuss any specific questions or issues with the customer before starting.
- ☒ Discuss with the customer the location in the lab and near the instrument where consumables, accessories and tools will be stored.
- ☒ Discuss any configuration options with the customer before starting.
- ☒ Check for required service note applicability and firmware update requirements.
- ☐ Upgrades only – check with customer that instrument control settings, data, methods, etc. have been properly saved or archived before starting any installation procedures.

Installation Procedure

Connect cables and Plumb Gasses

- ☒ Place the GC on the bench.
- ☒ Verify line voltage, GC Line power configuration, and power cord match.
- ☒ Compare GC Configuration voltage range from label on the unit with actual voltage at customer site.
- Voltage Range from Label 220
 - Customer Line Voltage 220.4
- ☒ Plug in power cable and power ON the GC. Confirm Power ON successful.
- ☒ Run the 8890 GC feature tour from the front panel of the GC.
- ☒ Use the 8890 GC Setup Wizard to setup the GC:
- ☒ Remove shipping caps and tape.
 - ☒ Set the date and time.
 - ☒ Set the pressure units.
 - ☒ Configure gas types
 - ☒ Configure the network settings.
 - ☒ Connect the gasses.
 - ☒ Install Tank Regulators and purge out the air as required
 - ☒ Connect tubing to the tank regulators or house gas supply
 - ☒ Install gas traps - purge each with carrier before connecting the next trap or the fitting to the GC
 - ☒ Connect supply gases to the GC and Leak check/Pressure Test all gas connections.
- ☒ Install and configure the ALS.
- ☐ If an 8890 GC is being installed with a 5977 MSD, configure the MS. Refer to the GC-MS Features section in the 8890 GC Operation Manual for instruction.
- ☒ Connect the external cables, including LAN, signal output, and/or remote cables.
- ☐ If the GC includes an Electron Capture Detector, connect the exhaust tubing to a proper vent or fume hood.
- ☐ If the GC includes cryogenic cooling, connect cryogenic coolant.
For LN2 use 1/4" Swagelok and insulated copper tubing @ 25-40 PSI
For CO2 use 1/8" Swagelok and Stainless Steel tubing @ 800-1000 PSI.
- ☐ If GC includes valves, connect valve actuator air using 1/4" plastic/PTFE - 50 PSI clean/dry Air.
- ☐ If a headspace or other sampler is included install per the specific Installation Checklist.

Install User Manuals and Update Instrument Firmware

- ☑ From the "GC and GCMS User Manuals and Tools" DVD set, install the following:
 - "Instrument Manuals" for all modules installed on the GC system - i.e. 8890 GC, 7693 ALS, 7697 Headspace Sampler etc.
 - "GC Firmware Update Tool" - Update the Firmware on all instrument modules as required - Before performing the updates, check with the customer and check that firmware is compatible with all components in the system
 - "Parts Finder" - Demonstrate how to find and order parts for maintaining the customer's system
 - Install the "Method Developer Tools" as applicable to the System configuration.

Column Connection, Conditioning and Bakeout (Customer present)

- ☑ Install HP-5 or other Agilent checkout column to the GC, and confirm column flow, and purge with carrier at ambient temperature for 5 minutes.
- ☑ Perform the Leak and Restriction Test from the GC Touchscreen User Interface.
- ☑ Set the gas flows to the Detector and Set to Operating Temperature. Light the Flame or Turn on the TCD Filament etc.
- ☑ Bake out inlet, column, and detector.
- ☑ Repeat for all inlets and detectors installed.

Install Agilent Data System Software (if Included)

- ☑ Section not applicable
- ☑ Install any Agilent Data System PC and Software if included with the GC system.
- ☑ Create links to the GC Browser Interface and GC Help and Information on the PC OS Desktop.
- ☑ Launch and Configure the Agilent Data System Software to the GC system.

Installation Checkout (Customer present)

- ☑ Locate the inlet/detector checkout method. (8890 Operation Manual).
- ☑ Install the syringe in the Auto-sampler and configure as required. (ALS User Manual)
- ☑ Transfer the Agilent checkout sample for the detector being tested into a screw cap vial or other sampler vial.
- ☑ Load solvent and waste vials into the Auto-sampler turret. (ALS User Manual)
- ☑ Use the Agilent Data System to enter the checkout conditions.

- ☑ Save the "Checkout Method"
- ☑ Create and Save a System "Bakeout Method" - Bakeout the entire system for 15 minutes
 - Split Vent flow > 100 ml/min
 - Inlet/Detector 20-50 degrees above the Checkout Method Temps,
 - Oven 20-50 degrees hotter than Method Final Temp
- ☑ Reload the "Checkout Method"
- ☑ When the temperatures and detector output is stable, perform one injection of checkout sample.
- ☑ Compare the resulting chromatogram with the typical results documented in the 8890 GC "Operation Manual".
- ☑ Repeat for other Detectors if installed.
- ☑ Review the results with the customer.

Service Review

- ☐ Attach available reports/printouts to this documentation.
- ☒ Record the time/date of installation or upgrade completion in the customer's records/logbook.
- ☒ Complete the following Service Engineer comments section if there are additional comments.
- ☒ Review the installation/upgrade with the customer.
- ☒ Explain Agilent warranty for instruments.
- ☒ Explain how to use manuals, guides, and online help.
- ☒ Explain how to get self-help, and FAQs online.
- ☒ Explain how to log an instrument service call and support services that are available.
- ☒ Advise customer of additional instrument training options.
- ☒ If the instrument firmware was updated, record the details of the change in the service engineer's comments box or if necessary, in the customer's IQ records.
- ☒ Supply the customer with a copy of the Smart Alerts flyer.
- ☒ Describe Smart Alerts to the customer.
- ☒ Install Smart Alerts if requested.

Service Engineer Comments (optional)

If there are any specific points you wish to note as part of performing the installation or other items of interest for the customer, please write include them in this box.

Service Completion

Service request number _____ Date service completed 1 Aug 2011

Agilent signature _____ Customer signature _____

Total number of pages in this document 7