

ภาคผนวกที่ 4

ใบรับรองการสอบเทียบเครื่องมือ

METHOD 5 PRE-TEST CONSOLE CALIBRATION
USING REFERENCE METER # WET TEST METER W-NK5A No. 546321
5-POINT METRIC UNIT SMILE LABORATORY Co.,Ltd.

☒ Preventive maintenance and check

| Meter Console Information | |
|---------------------------|---------|
| Console Model Number | XC572 |
| Console Serial Number | 0509047 |
| DGM Model Number | SK25 |
| DGM Serial Number | 8001032 |

| Calibration Conditions | | | |
|---------------------------|------|-------------|----------|
| Date | Time | 13-Jan-2023 | 11:00 AM |
| Calibration Reference No. | | 3APE660015 | |
| Barometric Pressure | | 758 | mm Hg |
| Calibration Meter Gamma | | 1.0010 | unitless |

| Factors/Conversions | | |
|---------------------|-------|---------|
| Std Temp | 293 | K |
| Std Press | 760 | mm Hg |
| K ₁ | 0.386 | K/mm Hg |
| Console Leak Check | | PASS |

| Calibration Data | | | | | | | | | |
|------------------|---------------------|--------------------|--------------------|------------------------|----------------------|--------------------|--------------------|------------------------|----------------------|
| Run Time | Metering Console | | | | | Calibration Meter | | | |
| Elapsed | DGM Orifice ΔH | Volume Initial | Volume Final | Outlet Temp Initial | Outlet Temp Final | Volume Initial | Volume Final | Outlet Temp Initial | Outlet Temp Final |
| (Θ) | (P _m) | (V _{mi}) | (V _{mf}) | (t _{mi}) | (t _{mf}) | (V _{wi}) | (V _{wf}) | (t _{wi}) | (t _{wf}) |
| min | mm H ₂ O | m ³ | m ³ | °C | °C | m ³ | m ³ | °C | °C |
| 15.00 | 13.0 | 4058.4148 | 4058.5657 | 24 | 24 | 333.84384 | 334.01994 | 24.8 | 24.9 |
| 10.00 | 25.0 | 4058.5657 | 4058.7124 | 24 | 24 | 334.01994 | 334.17503 | 24.9 | 25.0 |
| 8.00 | 50.0 | 4058.7124 | 4058.8827 | 24 | 24 | 334.17503 | 334.34383 | 25.0 | 25.1 |
| 7.00 | 80.0 | 4058.8827 | 4059.0772 | 24 | 24 | 334.34383 | 334.52497 | 25.1 | 25.2 |
| 5.00 | 120.0 | 4059.0772 | 4059.2498 | 24 | 24 | 334.52497 | 334.68887 | 25.2 | 25.3 |

| Results | | | | | | | | |
|------------------------|------------------------|------------------------|------------------------|--------------------|-----------|------------------------------|--|-------------|
| Standardized Data | | | | Dry Gas Meter | | | | |
| Dry Gas Meter | | Calibration Meter | | Calibration Factor | | Flowrate | ΔH @ | |
| (V _{m(std)}) | (Q _{m(std)}) | (V _{w(std)}) | (Q _{w(std)}) | Value | Variation | Std & Corr | .0212 m ³ _{std} /min | Variation |
| m ³ | m ³ /min | m ³ | m ³ /min | (Y) | (ΔY) | (Q _{m(std)(corr)}) | (ΔH@) | (ΔΔH@) |
| | | | | | | m ³ /min | mm H ₂ O | |
| 0.149 | 0.010 | 0.173 | 0.012 | 1.16341 | 0.152 | 0.012 | 43.5 | -7.0 |
| 0.145 | 0.014 | 0.152 | 0.015 | 1.05231 | 0.041 | 0.015 | 48.1 | -2.4 |
| 0.168 | 0.021 | 0.166 | 0.021 | 0.98391 | -0.027 | 0.021 | 52.3 | 1.7 |
| 0.193 | 0.028 | 0.178 | 0.025 | 0.92149 | -0.090 | 0.025 | 56.0 | 5.4 |
| 0.172 | 0.034 | 0.161 | 0.032 | 0.93569 | -0.076 | 0.032 | 52.7 | 2.2 |
| | | | | 1.01136 | Y Average | | 50.5 | ΔH@ Average |

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +0.02.

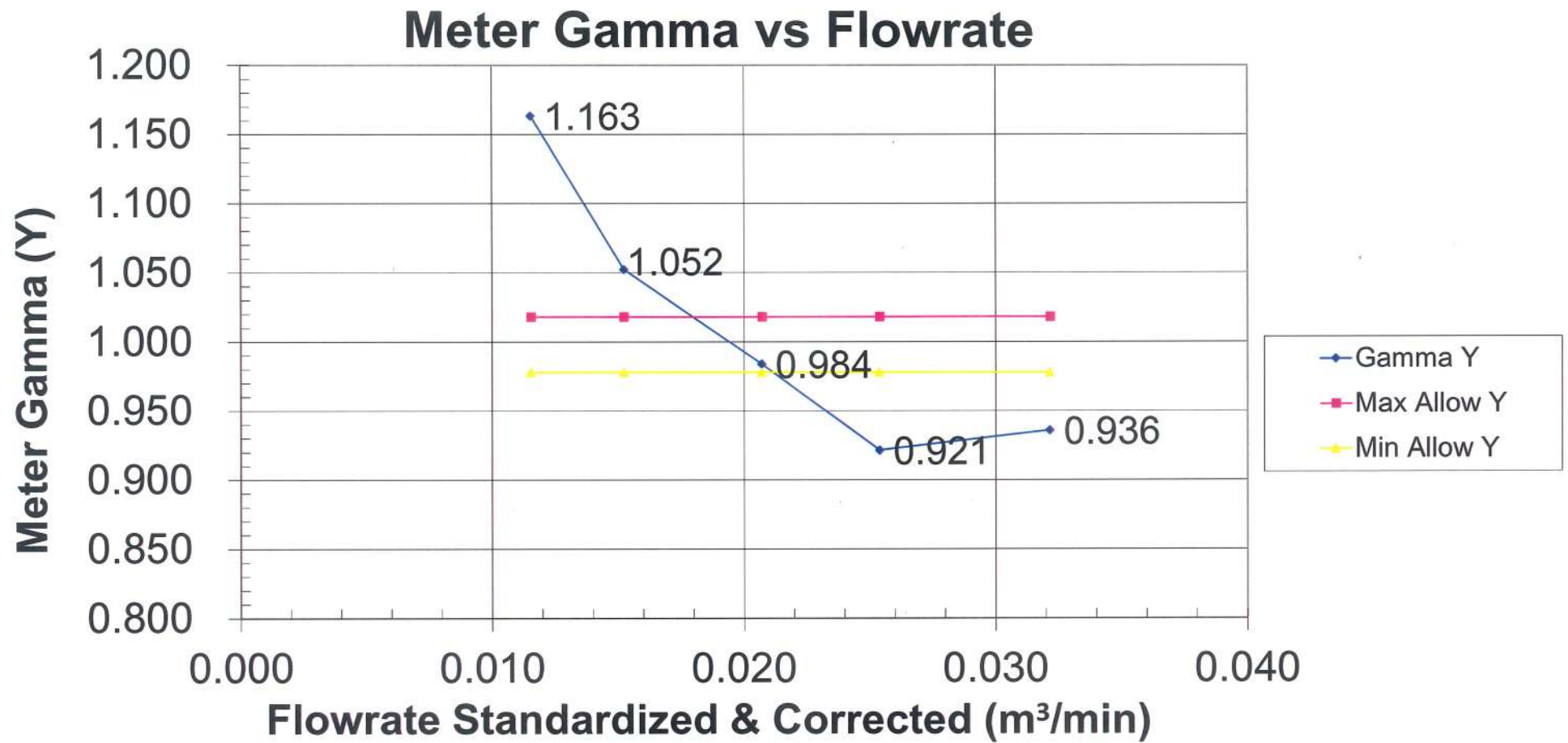
Note: For ΔH_@, orifice pressure differential that equates to 0.75cfm (0.0212m³/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is +0.2inches (5.1mm) H₂O.

Signature _____
Service Engineer

Date 13 / 1 / 66

Calibration Date: 13-1-2023

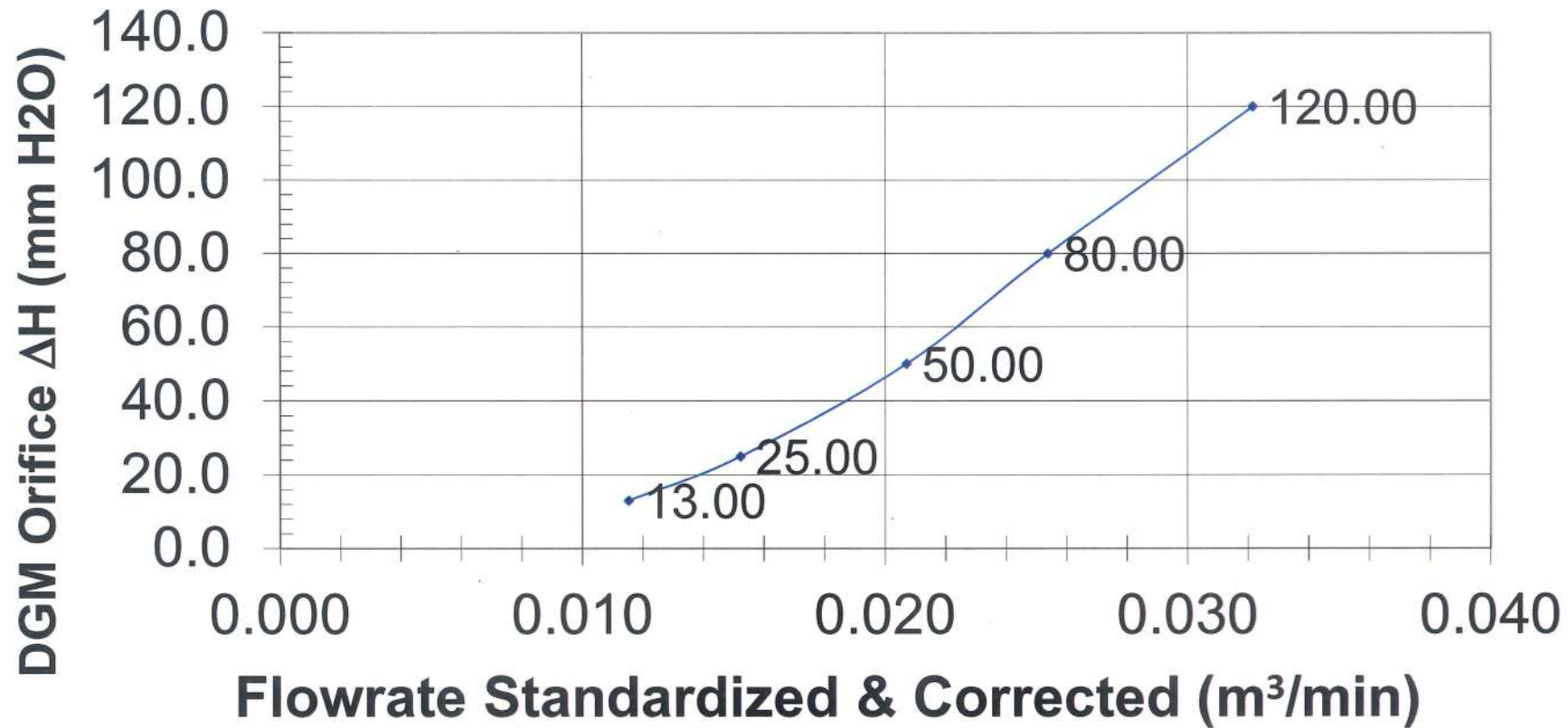
Calibration Reference No: 3APE660015



Console Serial: 0509047

Console Model: XC572

Meter Pressure vs Flowrate



THERMOCOUPLES SYSTEM CALIBRATION

| Sampling System Equipment Information | |
|---------------------------------------|---------|
| Console Model Number | XC572 |
| Console Serial Number | 0509047 |
| DGM Model Number | SK25 |
| DGM Serial Number | 8001032 |
| Meter Box Model Number | JENCO |
| Meter Box Serial Number | |

| Calibration Conditions | | | |
|---------------------------|------|------------|----------|
| Date | Time | 13-Jan-23 | 11:00 AM |
| Calibration Reference No. | | 3APE660015 | |
| Barometric Pressure | | 758 | mm Hg |
| Reference Thermometer | | FLUKE 714 | |
| Serial Number | | 9038005 | |

| Results | | | | | | | | | | | | |
|--------------------------------|--|-----|------|------|------|-------|-------|-------|-------|-------|-------|--------|
| Console Thermocouple Simulator | | | | | | | | | | | | |
| Channel and test point | Meter Box Channel Temperature Reading (°C) | | | | | | | | | | | |
| | -18.0 | 0.0 | 25.0 | 38.0 | 93.0 | 149.0 | 260.0 | 371.0 | 482.0 | 593.0 | 816.0 | 1038.0 |
| Stack | -17 | 0.0 | 25 | 37 | 92 | 148 | 258 | 372 | 483 | 595 | 817 | 1038 |
| Probe | -17 | 0.0 | 25 | 37 | 92 | | | | | | | |
| Filter | -17 | 0.0 | 25 | 37 | 92 | | | | | | | |
| Aux | -17 | 0.0 | 25 | 37 | 92 | | | | | | | |
| Exit | -17 | 0.0 | 25 | 37 | 92 | | | | | | | |

Tolerance Range

Stack ± 1.50% Absolute
 Probe ± 3.0 °C
 Filter ± 3.0 °C
 DGM Outlet ± 2.0 °C

Aux ± 3.0 °C
 Imp. Outlet ± 2.0 °C
 DGM Inlet ± 2.0 °C

Signature _____



Service Engineer

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Environmental / Hygiene Products Department (ENV)

Web site : www.sithiphorn.com # E-mail: service2-env@sithiphorn.com

HEATER SYSTEM CALIBRATION

| Sampling System Equipment Information | |
|---------------------------------------|------------------------------|
| Console Model Number | XC572V |
| Console Serial Number | 0509047 |
| DGM Model Number | SK25 |
| DGM Serial Number | 8001032 |
| Probe Heater | Standard Method 5 Assemblies |
| Heated Filter Box Model | - |

| Calibration Conditions | | | |
|---------------------------|------|------------|----------|
| Date | Time | 13-Jan-23 | 11:00 AM |
| Calibration Reference No. | | 3APE660015 | |
| Barometric Pressure | | 758 | mm Hg |

| Results | | | | |
|------------------------------------|--------------------|-----------------------------------|--|------------------------|
| System Heat | Control Acceptance | Reference thermometer temperature | Thermocouple potentiometer temperature | Temperature difference |
| | °C | °C | °C | % |
| Probe Heater System for 6ft. Probe | 120 °C \pm 14 °C | 117 | 120 | -0.77 |
| Filter Holder | 121 °C \pm 14 °C | 113 | 120 | -1.81 |

Note: Check Acceptance Limits, capable of maintaining 120 °C \pm 14 °C at 20-lpm flow rate

Signature _____



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PITOT TUBE CALIBRATION

| Sampling System Equipment Information | |
|---------------------------------------|---------|
| Console Model Number | XC572 |
| Console Serial Number | 0509047 |
| DGM Model Number | SK25 |
| DGM Serial Number | 8001032 |
| Pitot tube Number | |

| Calibration Conditions | | | |
|-------------------------------|------------|-----------|----------|
| Date | Time | 13-Jan-23 | 11:00 AM |
| Calibration Reference No. | 3APE660015 | | |
| Barometric Pressure | 758 | mm Hg | |
| Pitot Tube Type | S | | |
| size (OD) | 3/8 | inch | |
| Standard Pitot Tube ID Number | 160-12 | | |
| C _p (std) | 0.84 | | |

| Results | | | | |
|----------------------|----------------|-------------------------|--------------------|---------------------------------------|
| "A" SIDE CALIBRATION | | | | |
| RUN No. | | | | DEVIATION |
| | Δp std | Δp (s) | C _p (s) | C _p (s)-C _p (A) |
| | mm | mm | | |
| 1 | 7.4 | 7.37 | 0.842 | -0.002 |
| 2 | 11.2 | 11.04 | 0.846 | 0.003 |
| 3 | 15.5 | 15.43 | 0.842 | -0.001 |
| | AVERAGE | C _p (SIDE A) | 0.843 | 0.001 |

| Results | | | | |
|----------------------|----------------|-------------------------|--------------------|---------------------------------------|
| "B" SIDE CALIBRATION | | | | |
| RUN No. | | | | DEVIATION |
| | Δp std | Δp (s) | C _p (s) | C _p (s)-C _p (B) |
| | mm | mm | | |
| 1 | 7.4 | 7.13 | 0.856 | 0.021 |
| 2 | 11.2 | 11.88 | 0.816 | -0.019 |
| 3 | 15.5 | 15.76 | 0.833 | -0.002 |
| | AVERAGE | C _p (SIDE B) | 0.835 | 0.001 |

$$[C_p(A \text{ (SIDE A)}) - C_p(\text{SIDE B})] = 0.008 \quad (\text{must be } \leq 0.01)$$

Note: Average deviation must be < 0.01

Signature _____

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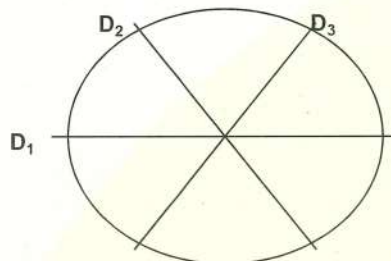
Web site : www.sithiphorn.com # E-mail: service2-env@sithiphorn.com

NOZZLE CALIBRATION

| Sampling System Equipment Information | | Calibration Conditions | | | |
|--|---------|---------------------------|------|--------------------|----------|
| Console Model Number | XC572V | Date | Time | 13-Jan-23 | 11:00 AM |
| Console Serial Number | 0509047 | Calibration Reference No. | | 3APE660015 | |
| DGM Model Number | SK25 | Barometric Pressure | | 758 mm Hg | |
| DGM Serial Number | 8001032 | Calibration | | Vernier ,0-150mm | |
| | | Method Reference | | US.EPA Method | |
| | | | | 0.01 mm increments | |

| Calibration Data | | | | | Results | |
|------------------|-----------------|----------------|----------------|----------------|-----------|-------------------------|
| Nozzle ID | Nozzle Diameter | | | | Different | $(D_1 + D_2 + D_3) / 3$ |
| Sizes | | D ₁ | D ₂ | D ₃ | ΔD | Davg |
| | mm | mm | mm | mm | mm | mm |
| 4 | 3.2 | 2.98 | 2.97 | 2.99 | 0.020 | 2.980 |
| 6 | 4.8 | 3.96 | 3.99 | 3.97 | 0.030 | 3.973 |
| 8 | 6.4 | 5.98 | 5.95 | 5.98 | 0.030 | 5.970 |
| 10 | 8.0 | 7.07 | 7.27 | 7.18 | 0.200 | 7.173 |
| 12 | 9.5 | 8.99 | 9.20 | 9.46 | 0.470 | 9.217 |
| 14 | 11.1 | 10.40 | 10.90 | 10.52 | 0.500 | 10.607 |
| 16 | 12.7 | 12.31 | 12.34 | 12.49 | 0.180 | 12.380 |

- D1, D2, = There difference nozzle diameters at 60 degrees to each other,
each measured to the nearest 0.025 mm
- ΔD = Maximum difference between any two diameters, must be ≤ 0.100 mm
- Davg = $(D_1 + D_2 + D_3) / 3$



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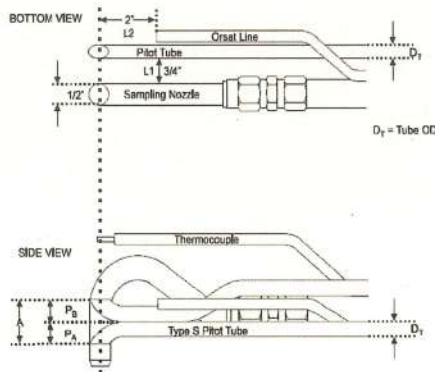
Sampling Probe and Pitot validation

| Sampling System Equipment Information | |
|---------------------------------------|---|
| Probe Sheat | Apex 1 in. , 3 ft. |
| Probe Number | N/A |
| Pitot tube Number | N/A |
| Pitot tube Type | S Type 3/8 Inc. |
| Validation method | Standard Probe validation. with pitot tubs (S) |

| Calibration Conditions and Equipment | |
|--------------------------------------|---------------------------|
| Reference No. | |
| Digital Calipers | 0-150 mm. |
| Digital Inclinator | Laserline s/n. ADJ21L0270 |
| Temperature | 25.0 °C |
| Relative Humidity | 60.0 % RH |
| Validation Date | 15 Sep. 2023 |

Sampling Probe Validation with Tune up

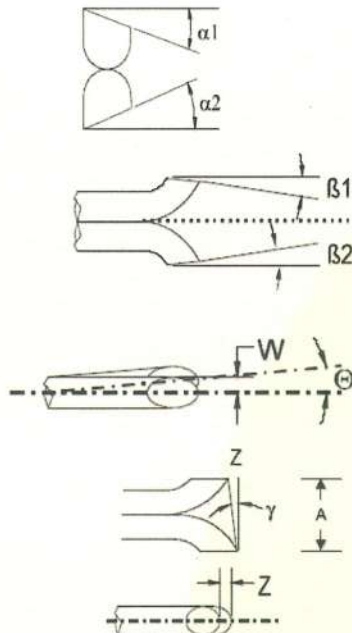
☒ : Measure and Alinment with 1/2" Sampling Nozzle(12.7 mm)



| Measured | Standard Range | |
|----------|----------------|----------------------------|
| L1 = | 19.24 mm. | (19.05 mm. or 3/4 in.) |
| L2 = | 53.74 mm. | (50.8 mcm. or 2.0 in.) |
| DT = | 9.6 mm. | (9.525 mm., 3/8 in.) |
| A = | 21.64 mm | (2.1 DT ≤ A ≤ 3DT) |
| A/2DT = | 1.127 mm. | (1.05 PA / DT ≤ A ≤ 1.5) |

Pitot Tube Validations and Engles measurement Result

☒ : Measure Result after Maintanance and Adjustable



| | PB Size | Standard Range | |
|------|--------------------|-------------------|---------------------------|
| α1 = | 0.5 ° | ≤ 10° | |
| β1 = | 0.7 ° | ≤ 5° | |
| | PA Size | | |
| α2 = | 0.3 ° | ≤ 10° | |
| β2 = | 0.1 ° | ≤ 5° | |
| | Engles measurement | Calculated Result | Standard Range |
| W = | 0.9 ° | 0.354 mm | W < 0.794 mm (1/32 in.) |
| Z = | 0.4 ° | 0.151 mm | Z < 3.175 mm (1/8 in.) |

Can be use 0.84 for Cp(s) if the type of face-opening misafgnment show above with not affect the base line value of Cp(s)
Solong as standard range.

Signature _____

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EMAIL:center@sithiphorn.com www.sithiphorn.com



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : EMEX ASSOCIATION COMPANY LIMITED

วันที่ : 26 กันยายน 2565

รายชื่ออุปกรณ์ / เครื่องมือ : CO Analyzer

บริษัทผู้ผลิต : Teledyne API

รุ่นของอุปกรณ์ / เครื่องมือ : T300

หมายเลขอุปกรณ์ / เครื่องมือ : 92

| TEST VALUES | | | |
|----------------|--|-------------------------------|-------------------------------|
| API MODEL T300 | | BEFORE | AFTER |
| 1 | RANGE 1 - 1000 PPM | 50.0 | 50.0 |
| 2 | STABILITY ≤ 1 PPM | 0.1 | 0.0 |
| 3 | CO MEASURE 2500 - 4800 mV | 3444.4 | 3485.2 |
| 4 | CO REFERENCE 2000 - 4800 mV | 2850.4 | 2875.6 |
| 5 | MR RATION 1.1 ± 1.3 | 1.218 | 1.222 |
| 6 | PRESEURE 25 - 35 in - Hg-A | 30.0 | 29.7 |
| 7 | SAMPLE FLOW $800 \pm 10\%$ cc/min | 874 | 824 |
| 8 | SAMPLE TEMP $48 \pm 4^{\circ}\text{C}$ | 47.2 | 46.5 |
| 9 | BENCH TEMP $48 \pm 2^{\circ}\text{C}$ | 48.0 | 48.0 |
| 10 | WHEEL TEMP $68 \pm 2^{\circ}\text{C}$ | 68.1 | 68.0 |
| 11 | BOX TEMP AMBIENT $\pm 5^{\circ}\text{C}$ | 31.2 | 31.0 |
| 12 | PHT DRIVE 250-4750 Mv | 2916.8 | 2914.7 |
| 13 | CO SLOPE 1.0 ± 0.3 | 0.923 | 0.943 |
| 14 | CO OFFSET 0.0 ± 0.3 | 0.012 | 0.012 |
| 15 | CO READING (AMBIENT) PPM | 2.2 | 0.6 |
| 16 | ELECTRICAL TEST 40 ± 2 PPM | 40.3 | 40.3 |
| 17 | VOLTAGE TEST +5V +12V +15V -15V | 5.18 / 12.13 / 16.53 / -15.10 | 5.18 / 12.13 / 16.53 / -15.10 |
| 18 | ZERO GAS 0.00 PPM | 0.8 | 0.0 |
| 19 | SPAN GAS 40.0 PPM | 42.0 | 39.9 |

หมายเหตุ

- เปลี่ยน O-ring 2 ชิ้น , Spring 1 ชิ้น , Sintered Filter 1 ชิ้น



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด



ลงนามเจ้าหน้าที่ (Signature)

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ : คุณพรชัย ผาติวนารักษ์

โทรศัพท์ : 0-2515-8987

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : EMEX ASSOCIATION COMPANY LIMITED

EQUIPMENT NAME : CO Analyzer

MANUFACTURER : Teledyne - API

MODEL : T300

SERIAL NO : 92

STANDARD GAS CONCENTRATION (PPM) : 4512

CYLINDER NO : CC745169

CYLINDER PRESSURE (psig) : 1700

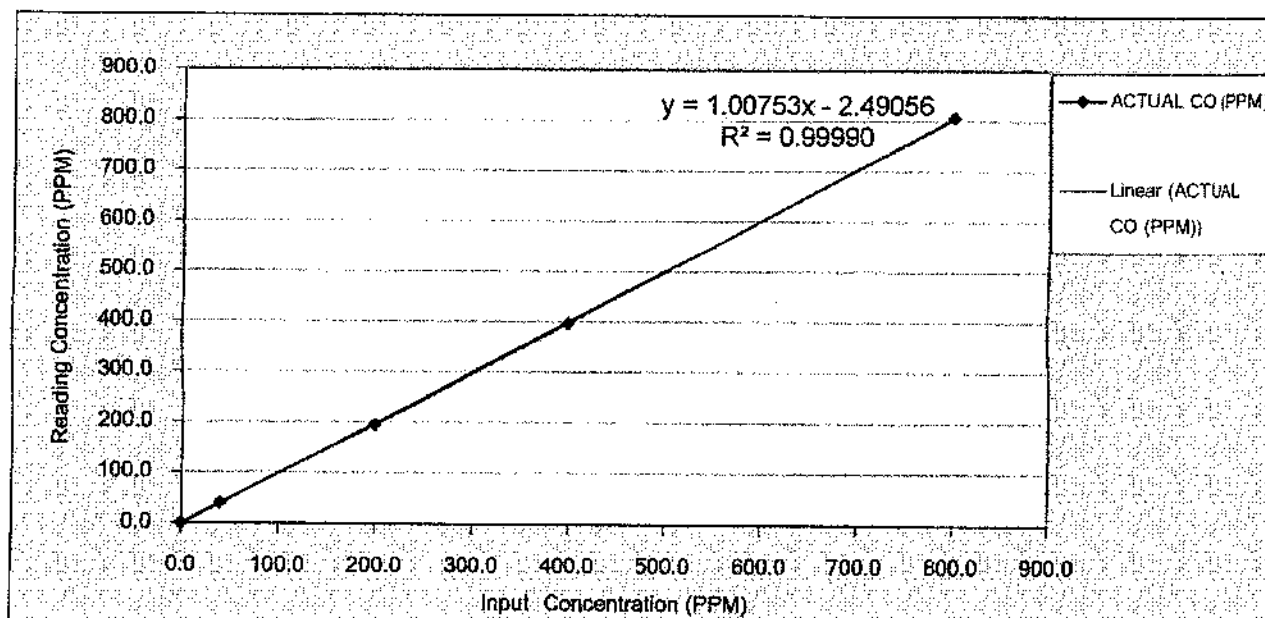
CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10, 2029

CALIBRATION RESULTS

| POINT NO | CALIBRATION RESULTS | | | |
|-------------|---------------------|-----------------|----------------|------------|
| | IDEAL (PPM) | ACTUAL CO (PPM) | ERROR CO (PPM) | % ERROR CO |
| ZERO | 0.00 | 0.00 | 0.00 | - |
| 1 | 40.00 | 39.90 | -0.10 | -0.25 |
| 2 | 199.20 | 195.00 | -4.20 | -2.11 |
| 3 | 400.30 | 396.70 | -3.60 | -0.90 |
| 4 | 800.90 | 807.20 | 6.30 | 0.79 |
| AVERAGE (%) | | | | 1.01 |



EMEX Environmental and Medical Expert
 EMEX ASSOCIATION CO., LTD.

KINETICS
 บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

CALIBRATED BY : คุณพรชัย มาติตนาคักษ์

DATE

ต้องการข้อมูลเพิ่มเติมทางเทคนิคเพิ่มเติม : คุณพรชัย มาติตนาคักษ์ โทรศัพท์ : 02-515-8987

ห้องปฏิบัติการวิเคราะห์เอกชน

เลขทะเบียน ว-244

เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทระเกษม เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : Info@kinetics.co.th

Certificate of Calibration

Certificate No. : 66-200067-1

Page : 1 of 2

Submitted by : M E T Company Limited
36/659 Moo 6, T. Bangrakpattana, A. Bangbuatong, Nonthaburi 11110

Equipment : Electronic Balance
Manufacturer : METTLER TOLEDO Model : AG285
Serial No. : 1122140126 ID No. : MET-EB01/46
Capacity : 210 g Resolution : 0.00001g/81g, 0.0001g/210g

Environment : On site calibration was carried out at the Laboratory, M E T Company Limited
Ambient Temperature : (26.4 to 26.8) °C
Relative Humidity : (54.9 to 58.8) %
Air Pressure : 1013.0 mbar

Date of Received : 02 March 2023

Date of Calibration : 02 March 2023

Date of Issue : 13 March 2023

Calibrated by :

Calibration Method : In-house method CAL-M2001 based on UKAS Publication ref : LAB 14
Edition 7 - November 2022

Reference Standard Instruments : This certification is traceable to the International System of Units

Standard Weights

| ID No. | Cert. No. | Due Date | Traceability |
|------------|-----------|-------------|--|
| E261-E2624 | C02222345 | 10 Nov 2023 | National Institute of Metrology (Thailand), (NIMT) |

Approved by :

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 66-200067-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Departure of indication from nominal value

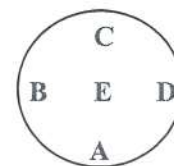
| Nominal Value (g) | Correction (g) | Uncertainty \pm (g) |
|----------------------|-------------------|--------------------------|
| 0.01 | 0.00001 | 0.000020 |
| 0.1 | 0.00000 | 0.000019 |
| 1 | -0.00002 | 0.000031 |
| 5 | -0.00004 | 0.000043 |
| 10 | -0.00008 | 0.000054 |
| 20 | -0.00027 | 0.000071 |
| 50 | -0.00059 | 0.00011 |
| 100 | -0.0009 | 0.00023 |
| 150 | -0.0012 | 0.00038 |
| 200 | -0.0019 | 0.00040 |

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

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2.43$, providing a level of confidence of approximately 95%

Eccentric error Load test : 50 g

| | | | | | |
|---------|---------|----------|----------|---------|---|
| A | B | C | D | E | |
| 0.00055 | 0.00027 | -0.00015 | -0.00018 | 0.00000 | g |



Repeatability Load test : 200 g

Stdev. : 0.000053 g

- o0o -



Certificate of Calibration

Certificate No. : 66-400476-2

Page : 1 of 2

Submitted by : M E T Company Limited

36/659 Moo 6, T.Bangrakpattana, A.Bangbuatong, Nonthaburi 11110

Equipment : Air Chamber (Oven)

Manufacturer : Binder

Model : ED53

Range : N/A °C

Resolution : 1 °C

Serial No. : 13-07419

ID No. : MET-OV02/57

Environment : On site calibration was carried out at the Laboratory, M E T Company Limited

Ambient Temperature : (31.0 to 32.0) °C

Relative Humidity : (55 to 60) %

Line Voltage : (210.0 to 210.8) V

Date of Received : 23 August 2023

Date of Calibration : 23 August 2023

Date of Issue : 23 August 2023

Calibrated by :

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units
Standard Digital Thermometer with Thermocouple probe

ID No.

Cert. No.

Due Date

Traceability

400029 & 400030 66-400227-1

24 Oct 2023

National Institute of Metrology Thailand (NIMT)

Approved by :

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 66-400476-2

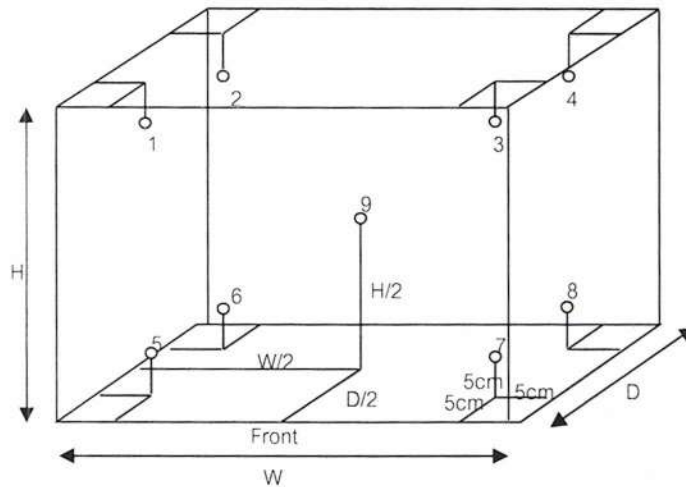
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

This instrument was setting air ventilation at position 0 (close)



Inside of Chamber

W = 0.40 m

D = 0.33 m

H = 0.40 m

Capacity = 0.05 m³

| Test Point (° C) | Setting Temperature (° C) | Indicating Temperature (° C) | Measured Temperature (° C) @ Sensor No. | | | | | | | | | Uncertainty (± ° C) |
|-----------------------|--------------------------------|-----------------------------------|---|-------|-------|-------|-------|-------|-------|-------|-------|--------------------------|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| 104 | 110 | 110 | 105.0 | 105.0 | 105.0 | 104.9 | 103.9 | 103.9 | 104.2 | 104.2 | 104.2 | 0.94 |
| 180 | 184 | 184 | 180.1 | 181.9 | 180.8 | 179.7 | 180.2 | 180.8 | 180.7 | 180.8 | 180.2 | 1.2 |

| Test Point (° C) | Setting Temperature (° C) | Indicating Temperature (° C) | Measured Uniformity (° C) | Measured Stability (° C) | Overall Variation (° C) |
|-----------------------|--------------------------------|-----------------------------------|--------------------------------|-------------------------------|------------------------------|
| 104 | 110 | 110 | 1.0 | 0.2 | 1.3 |
| 180 | 184 | 184 | 1.9 | 0.3 | 2.7 |

Remark The uncertainty is not combine uniformity of the air chamber

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

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%

- o0o -



Certificate of Calibration

Certificate No. : 66-400476-1

Page : 1 of 2

Submitted by : M E T Company Limited

36/659 Moo 6, T.Bangrakpattana, A.Bangbuatong, Nonthaburi 11110

Equipment : Air Chamber (Oven)

Manufacturer : Memmert

Model : UM 100

Range : N/A °C

Resolution : 0.1 °C

Serial No. : b197.0985

ID No. : MET-OV01/46

Environment : On site calibration was carried out at the Laboratory, M E T Company Limited

Ambient Temperature : (31.0 to 32.0) °C

Relative Humidity : (55 to 60) %

Line Voltage : (210.0 to 210.8) V

Date of Received : 23 August 2023

Date of Calibration : 23 August 2023

Date of Issue : 23 August 2023

Calibrated by :

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units

Standard Digital Thermometer with Thermocouple probe

| <u>ID No.</u> | <u>Cert. No.</u> | <u>Due Date</u> | <u>Traceability</u> |
|-----------------|------------------|-----------------|---|
| 400029 & 400032 | 66-400228-1 | 25 Oct 2023 | National Institute of Metrology Thailand (NIMT) |

Approved by

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 66-400476-1

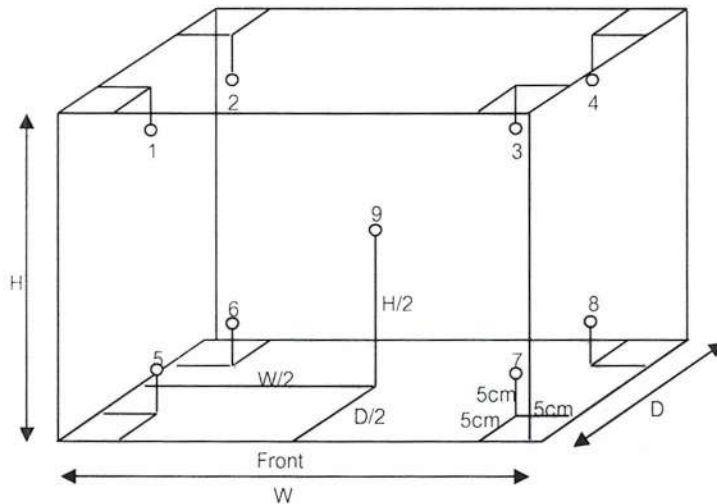
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

This instrument was setting air ventilation at position 0 (close)



Inside of Chamber

W = 0.32 m

D = 0.18 m

H = 0.24 m

Capacity = 0.01 m³

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ Sensor No. | | | | | | | | | Uncertainty (± °C) |
|--------------------|-----------------------------|--------------------------------|--|-------|-------|-------|-------|-------|-------|-------|-------|-----------------------|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| 180.0 | 180.0 | 180.0 | 181.7 | 180.1 | 180.5 | 180.7 | 181.5 | 181.7 | 181.3 | 181.4 | 180.1 | 0.95 |

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Uniformity (°C) | Measured Stability (°C) | Overall Variation (°C) |
|--------------------|-----------------------------|--------------------------------|-----------------------------|----------------------------|---------------------------|
| 180.0 | 180.0 | 180.0 | 1.7 | 0.2 | 2.0 |

Remark The uncertainty is not combine uniformity of the air chamber

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

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

- o0o -



GC-00

System ID: ON2136A118_MET
Organization Name: MET Company Limited
Organization Location: 36/659 Moo 3 Tambol Bangrakpatana Nonthaburi 11110 Thailand

Date: March 28, 2023 1:45:04 PM
EQP Name: AgilentRecommended
EQP Revision: GC.02.52
Overall Qualification Status: Pass

Logon: Sasnouthai Tarak
Overall ODS Logon Verification - GC Test Status
Pass

Name: 8890
Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status
Pass

Name: 8890
From: GSI

Setpoint Status: Pass
Pressure: 25.0 psi
Pressure Change: ± 0.1 psi /5 minutes
Agilent Recommended: ≥ -2.0 and ≤ 0.5

Date: March 28, 2023 1:45:04 PM
System ID: ON2136A118_MET

Overall Inlet Pressure Decay Test Status

Pass

Name: 8890
Front GDL

Setpoint Status: Pass

| | Setpoint | | Actual | |
|-----------------|----------|-----|--------|-----|
| Inlet Pressure: | 25.0 | psi | 25.0 | psi |

Accuracy: 0.0 psi

Agilent Recommended: ≤ 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Name: 8890
Front FID

Setpoint Status: Pass

Flow Type: Fuel

| | | | | | |
|-----------|------|--------|----------------|------|--------|
| Setpoint: | 30.0 | mL/min | Measured Flow: | 30.1 | mL/min |
|-----------|------|--------|----------------|------|--------|

Accuracy: 0.1 mL/min

Agilent Recommended: ≤ 10.0 % setpoint (3.0 mL/min)

Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Setpoint Status: Pass

Flow Type: Oxidizer

| | | | | | |
|-----------|-------|--------|----------------|-------|--------|
| Setpoint: | 400.0 | mL/min | Measured Flow: | 399.2 | mL/min |
|-----------|-------|--------|----------------|-------|--------|

Accuracy: 10.8 mL/min

Agilent Recommended: ≤ 10.0 % setpoint (40.0 mL/min)

Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Date: March 28, 2023 14:51:04 PIA
System ID: CN2136A116_MET

Setpoint Status: Pass

Flow Type: Makeup

Setpoint: 25.0 mL/min Measured Flow: 25.1 mL/min

Accuracy: 0.1 mL/min

Agilent Recommended: ≤ 10.0 % setpoint (2.5 mL/min)

Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Overall Detector Flow Accuracy Test Status

Pass

Name: 8890

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual

Temperature: 230.0 230.3 °C

Accuracy: 0.3 °C

Agilent Recommended: ≥ -1.0 % setpoint in K (-5.0 °C)

≤ 1.0 % setpoint in K (5.0 °C)

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual

Temperature: 100.0 100.3 °C

Accuracy: 0.3 °C

Agilent Recommended: ≥ -1.0 % setpoint in K (-3.7 °C)

≤ 1.0 % setpoint in K (3.7 °C)

Overall GC Oven Temperature Accuracy Test Status

Pass

Name: 8890

Date: March 28, 2023 1:45:04 PM

System ID: CN2189A148_MBT

Temperature: 100.0 100.2167 °C

Stability: 0.1 °C

Agilent Recommended: ≤ 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Tested Combination1 Front SSL / Front FID

Injection Tower

Name: 7633A

Setpoint Status: Completed

Injection Volume on Column: 1.0 µL

Overall Scouting Run Status

Completed

Tested Combination1 Front SSL / Front FID

Name: 8890

Setpoint Status: Pass

Base Signal: 8.9 pA

ASTM Noise

Drift

pA

pA/Hr

0.05

0.34

Agilent Recommended: ≤ 0.10 ≤ 2.50

Status: Pass

Pass

Overall Noise and Drift Test Status

Pass

Date: March 28, 2020 1:45:04 PM

System ID: CN2136A118_MET

| | | | | |
|-----------------------------|-------|------|---------------------|--------|
| Tested Combination1 | Front | SSL | / Front | FID |
| Name: | 7693A | | | |
| Setpoint Status: | Pass | | | |
| Injection Volume on Column: | 1.0 | µL | | |
| Area RSD: | 0.44 | % | Retention Time RSD: | 0.17 % |
| Agilent Recommended: | <= | 3.00 | <= | 1.00 |

Overall Injection Precision Test Status

Pass

| | | | | |
|----------------------|-----------------|--------|---------|-----|
| Tested Combination1 | Front | SSL | / Front | FID |
| | Injection Tower | | | |
| Name: | 8890 | | | |
| Setpoint Status: | Pass | | | |
| Signal to Noise: | 2198451 | | | |
| Agilent Recommended: | >= | 300000 | | |

Overall Signal to Noise Test Status

Pass

This section describes the as found system configuration.

System

| | |
|------------------------|-----------------------------------|
| System ID | CN2138A118_MET |
| Manufacturer | Agilent Technologies |
| Name | 8890 |
| Flow Data Input | Manual Data |
| Temperature Data Input | Manual Data or Other Data Logging |

Tested Combination1

| | |
|---------------------|-----------------|
| Injection Technique | Injection Tower |
| Inlet | Front |
| Detector | Front |
| LTM Included? | No |

Sampler 1

| | |
|---------------------|----------------------|
| Manufacturer | Agilent Technologies |
| Type | Injection Tower |
| Name | 7693A |
| Model Number | G4514A |
| Serial Number | CN22047056 |
| Firmware Revision | A.11.03 |
| Usage | Sample Injection |
| Location | Front |
| Syringe Volume (µL) | 10 |

Sampler 2

| | |
|-------------------|----------------------|
| Manufacturer | Agilent Technologies |
| Type | Tray |
| Name | 7893A |
| Model Number | G1514A |
| Serial Number | CN22047055 |
| Firmware Revision | A.11.03 |
| Vial Heater | Not installed |

Mainframe 3

| | |
|-------------------|----------------------|
| Manufacturer | Agilent Technologies |
| Name | 8890 |
| Model Number | G3540A |
| Serial Number | CN2138A118 |
| Firmware Revision | 2.5.1.9 |
| Oven Type | Standard |


Inlet 1

| | |
|--------------|-----------------------------------|
| Manufacturer | Agilent Technologies |
| Name | 8890 |
| Type | SSL |
| Location | Front |
| Carrier Gas | Helium |
| Control Type | Electronic Pressure Control (EPC) |
| Purged Inlet | Yes |

Detector 1

| | |
|--------------|-----------------------------------|
| Manufacturer | Agilent Technologies |
| Name | 8890 |
| Type | FID |
| Adapter | Capillary |
| Control Type | Electronic Pressure Control (EPC) |
| Location | Front |
| Makeup Gas | Nitrogen |

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CN2128A118 Transaction log :

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|----------------------------|-------------------|--------------------|---|---|
| March 28, 2023 12:26:50 PM | Auth | SessionCreated | Session | None |
| March 28, 2023 12:26:58 PM | Auth | Enrollment | Licensing | Session identifier generated: 0000-0002-0000-0000-0005-G |
| March 28, 2023 12:26:58 PM | Start | Configuration | Session | None |
| March 28, 2023 12:32:02 PM | Auth | Enrollment | Licensing | Successfully enrolled session identified by 0000-0002-0000-0000-0005-G with protocol code 0010-0000-0000-0000-0004g |
| March 28, 2023 12:38:35 PM | Auth | ExpLoaded | Session | EQP details for primary technique [Or] - File path: {Protocol\Fracks\Go\Configuration\02.52\Go.02.52.eqp}, EQP File Name: {Go.02.52.eqp}, EQP Name: {AgilentRecommended}.Protocol Revision {Go.02.52} |
| March 28, 2023 12:40:04 PM | End | Configuration | Session | None |
| March 28, 2023 12:40:11 PM | Start | Qualification | Session | OQ |
| March 28, 2023 12:40:12 PM | Start | Execution | QDS Logon Verification - QC - - Qualitative test | None |
| March 28, 2023 12:43:12 PM | End | Execution | QDS Logon Verification - QC - - Qualitative test | Run Count : 1 |
| March 28, 2023 12:43:15 PM | Start | Execution | System Inspection and Basic Safety and Operation - 3890 - Qualitative Test - no solutions associated | None |

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Date: March 28, 2023 1:45:04 PM
System ID: CN2128A118_MET

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CN2136A118 Transaction Log 1

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|----------------------------|-------------------|--------------------|--|----------------------|
| March 28, 2023 12:43:34 PM | End | Execution | System Inspection and Basic Safety and Operation - SS900 - Qualitative Test - No setpoints associated | Run Count : 1 |
| March 28, 2023 12:43:34 PM | Start | Execution | Inlet Pressure Decay - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.3 psi | None |
| March 28, 2023 12:43:44 PM | End | Execution | Inlet Pressure Decay - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.3 psi | Run Count : 1 |
| March 28, 2023 12:43:44 PM | Start | Execution | Inlet Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi | None |
| March 28, 2023 12:43:48 PM | End | Execution | Inlet Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi | Run Count : 1 |
| March 28, 2023 12:43:50 PM | Start | Execution | Detector Flow Accuracy - Front FID - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint | None |
| March 28, 2023 12:44:12 PM | Audit | Data | Detector Flow Accuracy - Front FID - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint | Manual Data Entry |
| March 28, 2023 12:44:20 PM | End | Execution | Detector Flow Accuracy - Front FID - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint | Run Count : 1 |
| March 28, 2023 12:44:22 PM | Start | Execution | Detector Flow Accuracy - Front FID - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint | None |
| March 28, 2023 12:44:42 PM | Audit | Data | Detector Flow Accuracy - Front FID - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint | Manual Data Entry |

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Date: March 28, 2023 1:46:04 PM
System ID: CN2136A118_114ET

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CN2138A118 Transaction log :

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|----------------------------|-------------------|--------------------|--|----------------------|
| March 28, 2023 12:44:47 PM | End | Execution | Detector Flow Accuracy - Front FID; - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint | Run Count : 1 |
| March 28, 2023 12:44:52 PM | Start | Execution | Detector Flow Accuracy - Front FID; - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint | None |
| March 28, 2023 12:45:03 PM | Audit | Data | Detector Flow Accuracy - Front FID; - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint | Manual Data Entry |
| March 28, 2023 12:45:07 PM | End | Execution | Detector Flow Accuracy - Front FID; - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint | Run Count : 1 |
| March 28, 2023 12:45:09 PM | Start | Execution | GC Oven Temperature Accuracy - 8890; - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K | None |
| March 28, 2023 12:45:28 PM | Audit | Data | GC Oven Temperature Accuracy - 8890; - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K | Manual Data Entry |
| March 28, 2023 12:45:33 PM | End | Execution | GC Oven Temperature Accuracy - 8890; - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K | Run Count : 1 |
| March 28, 2023 12:45:35 PM | Start | Execution | GC Oven Temperature Accuracy - 8890; - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K | None |
| March 28, 2023 12:45:48 PM | Audit | Data | GC Oven Temperature Accuracy - 8890; - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K | Manual Data Entry |

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ON2136A118 Transaction log :

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|----------------------------|-------------------|--------------------|---|---|
| March 28, 2023 12:45:51 PM | End | Execution | GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 160.0°C - L: >= -1.0 AND <= 1.0 is accurate in K | Run Count : 1 |
| March 28, 2023 12:46:52 PM | Start | Execution | GC Oven Temperature Stability - 8890: - Temperature : Oven - S: 160.0°C - L: <= 0.5°C | None |
| March 28, 2023 12:46:53 PM | Audit | Data | GC Oven Temperature Stability - 8890: - Temperature : Oven - S: 160.0°C - L: <= 0.5°C | Manual Data Entry |
| March 28, 2023 12:46:57 PM | End | Execution | GC Oven Temperature Stability - 8890: - Temperature : Oven - S: 160.0°C - L: <= 0.5°C | Run Count : 1 |
| March 28, 2023 12:47:01 PM | Start | Execution | GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated | None |
| March 28, 2023 12:50:06 PM | Start | Execution | GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated | None |
| March 28, 2023 12:51:05 PM | Audit | Data | GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated | Data File Path : F:\Data\SC041.D\FID1A.ch |
| March 28, 2023 12:51:52 PM | End | Execution | GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated | Run Count : 1 |
| March 28, 2023 12:51:57 PM | Start | Execution | Noise and Drift - Front FID: - Detector FID - L (Noise) <= 0.10 pA - L (Drift) <= 0.00 pA/Hours | None |

CN2138A118 Transaction log :

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---------------------------------|-------------------|--------------------|---|---|
| March 28, 2023 12:52:25 PM | Audit | Data | Noise and Drift - Front FID: - Detector FID: - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour | Data files Path : F:\Data\ND012.D\FID1A.ch |
| March 28, 2023 12:53:21 PM | End | Execution | Noise and Drift - Front FID: - Detector FID: - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour | Run Count: 1 |
| March 28, 2023 12:53:23 PM | Start | Execution | Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00% | None |
| March 28, 2023 1:12:20 PM Audit | | Data | Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00% | Data files Path : F:\Data\Pre0107.D\FID1A.ch |
| March 28, 2023 1:12:20 PM Audit | | Data | Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00% | Data files Path : F:\Data\Pre0108.D\FID1A.ch |
| March 28, 2023 1:12:20 PM Audit | | Data | Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00% | Data files Path : F:\Data\Pre0109.D\FID1A.ch |
| March 28, 2023 1:12:20 PM Audit | | Data | Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00% | Data files Path : F:\Data\Pre0110.D\FID1A.ch |
| March 28, 2023 1:12:24 PM Audit | | Data | Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00% | Data files Path : F:\Data\Pre0111.D\FID1A.ch |

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QN2138A118 Transaction log :

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---------------------------------|-------------------|--------------------|---|---|
| March 28, 2023 1:12:25 PM Audit | | Data | Injection Precision - Injection Tower, Front SSL, Front FID; - GC - L (Area) <= 0.00% - L (Ret. Time) <= 1.00% | Data files Path : F:\Data\Pre3112.D\FID%Auto |
| March 28, 2023 1:15:35 PM End | | Execution | Injection Precision - Injection Tower, Front SSL, Front FID; - GC - L (Area) <= 0.00% - L (Ret. Time) <= 1.00% | Run Count : 1 |
| March 28, 2023 1:16:40 PM Start | | Execution | Signal to Noise - Injection Tower, Front SSL, Front FID; - Detector FID - L <= 300000 | None |
| March 28, 2023 1:16:08 PM Audit | | Data | Signal to Noise - Injection Tower, Front SSL, Front FID; - Detector FID - L <= 300000 | Data files Path : F:\Data\Pre3112.D\FID%Auto |
| March 28, 2023 1:17:06 PM End | | Execution | Signal to Noise - Injection Tower, Front SSL, Front FID; - Detector FID - L <= 300000 | Run Count : 1 |
| March 28, 2023 1:17:14 PM End | | Qualification | Session | QC |
| March 28, 2023 1:17:14 PM Start | | Reporting | Session | None |
| March 28, 2023 1:18:49 PM Audit | | Reporting | Session | Report Generated : Certificate |

Certificate of Calibration

Certificate No. : 66-400476-4 **Page : 1 of 2**

Submitted by : M E T Company Limited
36/659 Moo 6, T.Bangrakpattana, A.Bangbuatong, Nonthaburi 11110

Equipment : Air Chamber (Refrigerator)
Manufacturer : Sanden Intercool Model : YPR-068S
Range : N/A °C Resolution : 1 °C
Serial No. : YPR0682S-140100003R ID No. : MET-RE02/57

Environment : On site calibration was carried out at the Laboratory, M E T Company Limited
Ambient Temperature : (29.5 to 30.5) °C
Relative Humidity : (54 to 57) %
Line Voltage : (220.5 to 221.8) V

Date of Received : 23 August 2023

Date of Calibration : 23 August 2023

Date of Issue : 23 August 2023

Calibrated by :

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units
Standard Digital Thermometer with Thermocouple probe

| ID No. | Cert. No. | Due Date | Traceability |
|-----------------|-------------|-------------|---|
| 400046 & 400023 | 66-400184-1 | 03 Oct 2023 | National Institute of Metrology Thailand (NIMT) |

Approved by

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full except with the prior written approval of the Calibratech Co.,Ltd.



Certificate of Calibration

Certificate No. : 66-400476-4

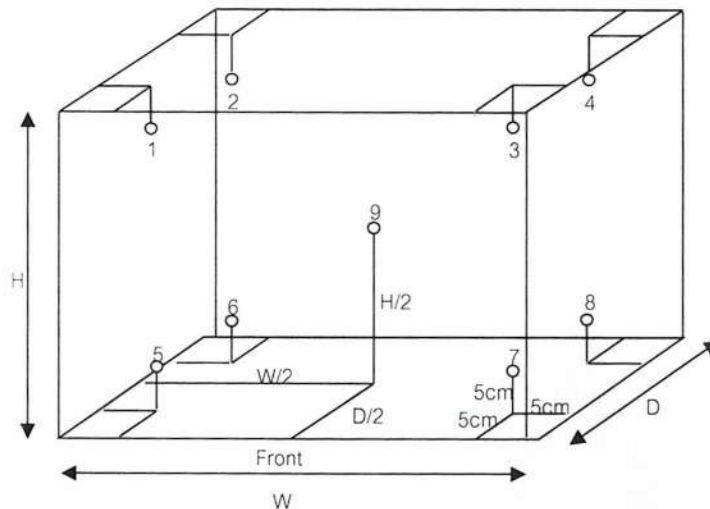
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

This instrument was setting air ventilation at position 0 (close)



Inside of Chamber
 $W = 0.58 \text{ m}$
 $D = 0.60 \text{ m}$
 $H = 1.45 \text{ m}$
 $\text{Capacity} = 0.50 \text{ m}^3$

| Test Point ($^{\circ}\text{C}$) | Setting Temperature ($^{\circ}\text{C}$) | Indicating Temperature ($^{\circ}\text{C}$) | Measured Temperature ($^{\circ}\text{C}$) @ Sensor No. | | | | | | | | | Uncertainty ($\pm ^{\circ}\text{C}$) |
|--------------------------------------|---|--|--|-----|-----|-----|-----|-----|-----|-----|-----|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| 3 | 2 | 2 | 4.4 | 3.7 | 4.3 | 3.9 | 4.1 | 4.3 | 3.9 | 4.2 | 3.2 | 0.89 |

| Test Point ($^{\circ}\text{C}$) | Setting Temperature ($^{\circ}\text{C}$) | Indicating Temperature ($^{\circ}\text{C}$) | Measured Uniformity ($^{\circ}\text{C}$) | Measured Stability ($^{\circ}\text{C}$) | Overall Variation ($^{\circ}\text{C}$) |
|--------------------------------------|---|--|---|--|---|
| 3 | 2 | 2 | 1.5 | 0.3 | 1.7 |

Remark The uncertainty is not combine uniformity of the air chamber

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

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%

- o0o -



Certificate of Calibration

Certificate No. : 66-400476-5

Page : 1 of 2

Submitted by : M E T Company Limited
36/659 Moo 6, T.Bangrakpattana, A.Bangbuatong, Nonthaburi 11110

Equipment : Air Chamber (Incubator)
Manufacturer : M-LAB Model : BIC-140
Range : N/A °C Resolution : 0.1 °C
Serial No. : 240412 ID No. : MET-BI01/55

Environment : On site calibration was carried out at the Laboratory, M E T Company Limited
Ambient Temperature : (31.0 to 32.0) °C
Relative Humidity : (55 to 60) %
Line Voltage : (210.0 to 210.8) V

Date of Received : 23 August 2023

Date of Calibration : 23 August 2023

Date of Issue : 23 August 2023

Calibrated by :

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units
Standard Digital Thermometer with RTD Probe

| ID No. | Cert. No. | Due Date | Traceability |
|-----------------|-------------|-------------|---|
| 400029 & 400043 | 66-400226-1 | 27 Oct 2023 | National Institute of Metrology Thailand (NIMT) |

Approved by :

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full except with the prior written approval of the Calibratech Co.,Ltd.



Certificate of Calibration

Certificate No. : 66-400476-5

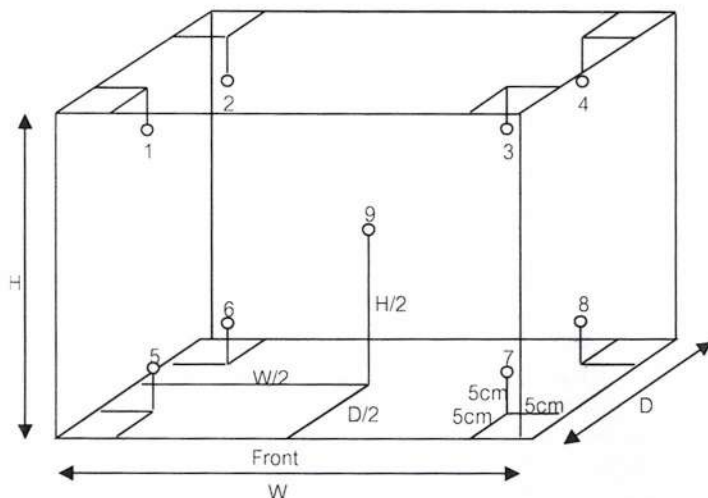
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

This instrument was setting air ventilation at position 0 (close)



Inside of Chamber

W = 0.37 m

D = 0.33 m

H = 1.14 m

Capacity = 0.14 m³

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ Sensor No. | | | | | | | | | Uncertainty (± °C) |
|--------------------|-----------------------------|--------------------------------|--|-------|-------|-------|-------|-------|-------|-------|-------|-----------------------|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| 20.0 | 20.0 | 20.0 | 19.94 | 19.63 | 19.66 | 19.60 | 20.31 | 20.38 | 20.27 | 20.01 | 20.22 | 0.34 |

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Uniformity (°C) | Measured Stability (°C) | Overall Variation (°C) |
|--------------------|-----------------------------|--------------------------------|-----------------------------|----------------------------|---------------------------|
| 20.0 | 20.0 | 20.0 | 0.68 | 0.05 | 0.9 |

Remark The uncertainty is not combine uniformity of the air chamber

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

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%

- o0o -



Calibration Certificate

Cert. No. : CT-23-05-23470

Page : 1 of 4

Issued date : 08 May 2023

Equipment : COD Reader , Manufacturer : MLAB , Model : DB1602

S/N = 0169 , Customer ID = -

Client : M E T COMPANY LIMITED.

36/659 M.6 Bang Rak Phatthana, Bang Bua Thong, Nonthaburi 11110

Received Date : 03 May 2023

Ref. Job No. : SO6605-00001

Calibrate by :

Cert. prepare by :

Calibrated Date : 03 May 2023

Approved by :

Calibration Place : Laboratory room

Environment Condition : Temperature 28.6 ± 0.4 (°c) , Humidity 59.5 ± 3.5 (%RH)


Calibration Method : Measure temperature distribution by 9 channel in flat level. , (MTEC WI No. # WICAL-02-005-R01)

Reference Standard Instrument :

| No | Instrument | code | Model | Due date |
|----|------------------------|--------------|--------|----------|
| 1 | Temperature Datalogger | MTEC-CE-0180 | MLAB | 10/2023 |
| 2 | Thermo Hygrometer | MTEC-CE-0181 | TH-03A | 06/2023 |
| | | | | |
| | | | | |

Condition of certificate :

(1) This certificate is traceable to International System of units (SI Units). , (2) This certificate was certified only for the instrument we calibrated. , (3) This result of calibration was found accurate as show on date and place of calibration only. , (4) The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k =$ (see result table) , providing a level of confidence of approximately 95%. , (5) This certificate may not be reproduced other than in full, except with the prior written approval of the head of Calibration Division, Metrology Technical Co.,Ltd.


Approved Signatory

Certificate No. : CT-23-05-23470

Calibration Result :

Page : 2 of 4

Condition of UUC :

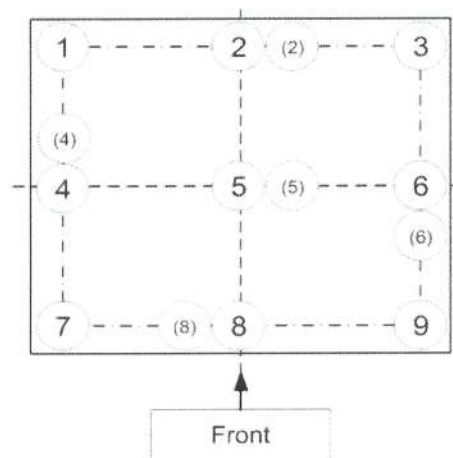
- 1) Without Adjustment
- 2) Immersion : 1/2 of the depth of the hole

(1) The quoted uncertainty include with " Stability".

(2) Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors , for at least half an hour after reaching sted state.

(3) 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.

(4) Overall variation = The difference of the maximum and the minimum measured temperature throughout observation time.



Pic 1 : Position of each sensor No.

Section 1 : Report of Temperature distribution

Unit : (°c)

| Calibration Point | UUC Setting (*) | UUC Reading (*) | Measured Temperature @ Sensor No. | | | | | | | | | Uncertainty (±) | k (**) |
|-------------------|-----------------|-----------------|-----------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|-------------------|--------|
| | | | #1 | #2 | #3 | #4 | #5 | #6 | #7 | #8 | #9 | | |
| 150 | 150 | 150 | 150.51 | 149.89 | 150.16 | 149.93 | 150.56 | 150.67 | 149.80 | 150.25 | 149.76 | 0.627 | 2 |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

(*) = The average of 30 values in each point , (**) = Coverage factor (k) value

Section 2 : Report of Chamber Performance

Unit : (°c)

| Calibration Point | UUC Setting | UUC Reading (*) | Temperature Uniformity | Temperature Stability (± °c) | Temperature Overall Variation |
|-------------------|-------------|-----------------|------------------------|--------------------------------|-------------------------------|
| 150 | 150 | 150 | 1 | 0.05 | 1 |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

(*) = The average of 30 values in each point

Approved Signatory :

Certificate No. : CT-23-05-23470

Page : 3 of 4

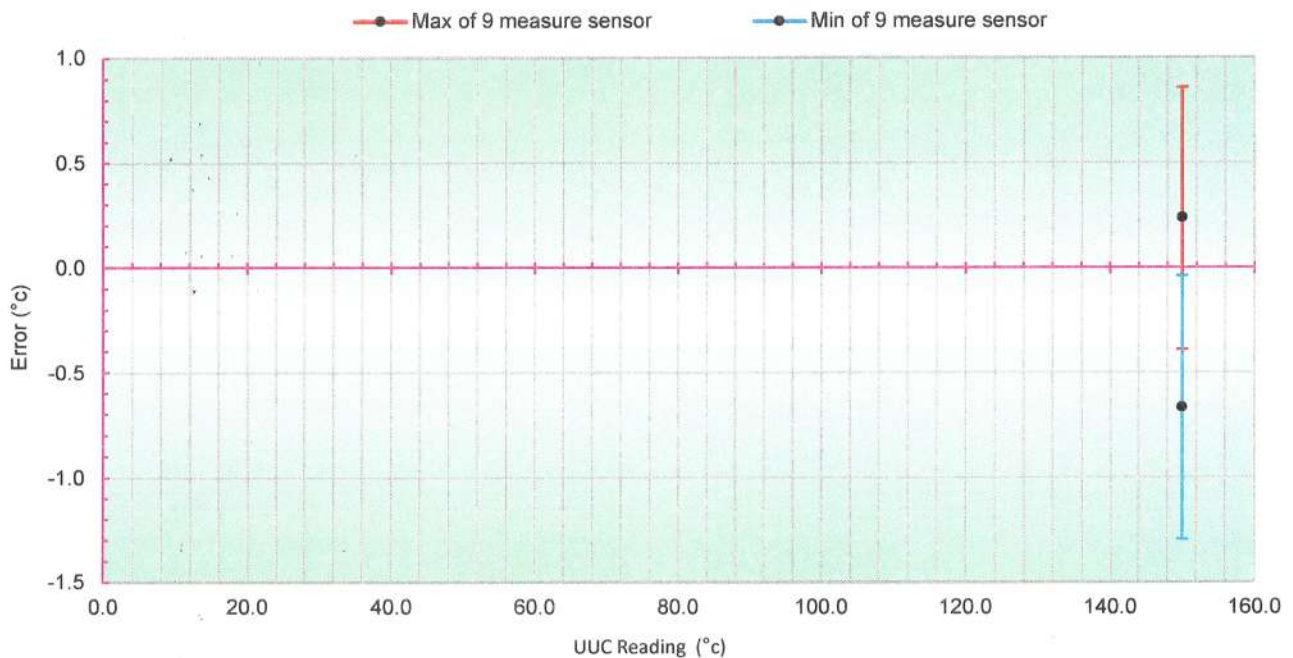
Section 3 : Possible of temperature. Show minimum and maximum of the average values and Include with uncertainty of measurement. The average values is average of each position standard sensor throughout observation time.

Unit : (°c)

| Calibration Point | UUC Setting ^(*) | UUC Reading ^(*) | Possible of Minimum temperature | Possible of Maximum temperature |
|-------------------|----------------------------|----------------------------|---------------------------------|---------------------------------|
| 150 | 150 | 150 | 149.14 | 151.30 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

(*) = The average of 30 values in each point

Section 4 : Trend of accuracy



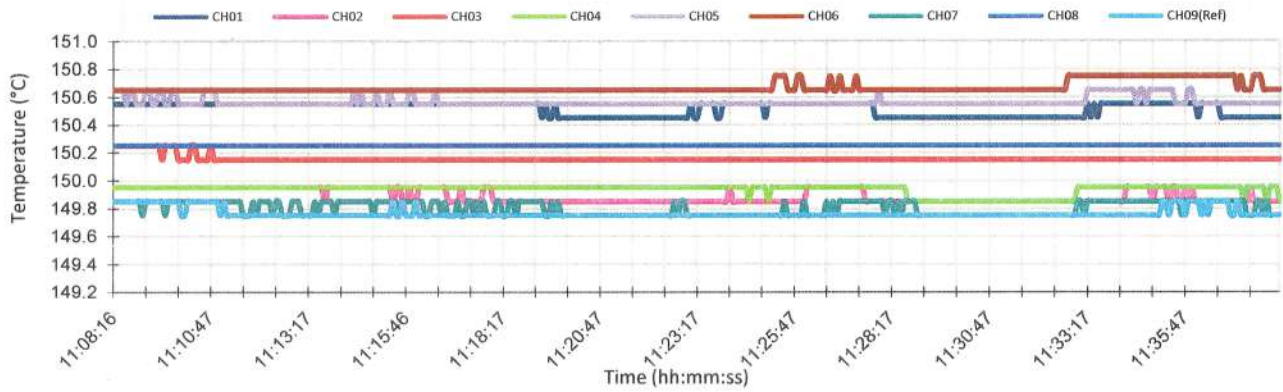
Approved Signatory : _____

Certificate No. : CT-23-05-23470

Page : 4 of 4

Section 5 : Graph report for Temperature distribution , not include uncertainty of measurement

(5.1) Temperature Distribution at UUC Reading 150 °C



Approved Signatory :



Certificate of Calibration

Certificate No. : 66-400012-1

Page : 1 of 2

Submitted by : M E T Company Limited
6/659 Moo 6, T. Bangrakpattana, A. Bangbuatong, Nonthaburi 11110

Equipment : Digital Thermometer with Thermistor Probe
Temperature Indicator

| | | | |
|------------------|-------------------|-------------------|-------------|
| Manufacturer : | Thermo Scientific | Model : | pH 150 |
| Range : | N/A | Resolution : | 0.1 °C |
| Serial No. : | 2657036 | ID No. : | MET-PH04/60 |
| Thermistor Probe | | | |
| Model : | PHWPTEM01W | Sheath Material : | Stainless |
| Diameter : | 3 mm. | Length : | 85 mm. |
| Serial No. : | 237 | ID No. : | MET-PH04/60 |

Environment : Ambient Temperature : (23 ± 2) °C
Relative Humidity : (50 ± 15) %
Line Voltage : (220 ± 22) VAC

Date of Received : 05 January 2023

Date of Calibration : 11 January 2023

Date of Issue : 11 January 2023

Calibrated by : [Redacted]

Calibration Method : This instrument was calibrated by In-house method comparison technique CAL-M4003 by compared with PRT in the liquid bath at the constant controlled temperature.

The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units

1. Platinum Resistance Thermometer (PRT)

| ID No. | Cert. No. | Due Date | Traceability |
|--------|------------|-------------|---|
| 400001 | TT-0016-20 | 04 Mar 2022 | National Institute of Metrology Thailand (NIMT) |

2. Standard Digital Thermometer

| ID No. | Cert. No. | Due Date | Traceability |
|--------|-----------|-------------|---|
| 400003 | 21E1850 | 14 Jun 2023 | National Institute of Metrology Thailand (NIMT) |
| 400004 | 21E1850 | 14 Jun 2023 | National Institute of Metrology Thailand (NIMT) |

Approved by :

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full except with the prior written approval of the Calibratech Co.,Ltd.



Certificate of Calibration

Certificate No. : 66-400012-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

| Immersion Depth (mm.) | Standard Reading (°C) | UUC Reading (°C) | Correction (°C) | Uncertainty (± °C) |
|----------------------------|----------------------------|-----------------------|----------------------|-------------------------|
| 85 | 10.0035 | 9.8 | 0.2 | 0.11 |
| 85 | 50.0025 | 50.0 | 0.0 | 0.11 |

Remark

UUC : Unit Under Calibration

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

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%

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National Institute of Metrology (Thailand)

Certificate of Calibration



Certificate No. : AA-2022-23
Issued by : Acoustics Laboratory
Acoustics and Vibration Group

Page 1 of 5 pages

MEASUREMENT ITEM : Sound Calibrator
MANUFACTURER : RION
MODEL/TYPE : NC-75
SERIAL NUMBER : 34480442
CUSTOMER : MET Co., Ltd.
36/659 Moo 6, T. Bangrakphatthana,
A. Bangbuathong, Nonthaburi 11110
MEASUREMENT DATE : 25 August 2023

The reported measurement result relates only to the measurand and applies only at the time of measurement.

*The calibration results only marked with an asterisk * in this certificate are not included in the scope of accreditation.*

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 calibration certificate may not be reproduced other than in full except with the permission of the Director of National Institute of Metrology (Thailand).

| Reference | Date | Authorized Signatory | Person in charge |
|---------------|----------------|----------------------|------------------|
| AUVC132-01/23 | 25 August 2023 | | |

This certificate is consistent with the capabilities that are included in Appendix C of the MRA drawn up by the CIPM. Under the MRA, all participating institutes recognize the validity of each other's calibration and measurement certificates for the quantities, ranges and measurement uncertainties specified in Appendix C (for details see <http://www.bipm.org>).

National Institute of Metrology (Thailand)

Ministry of Higher Education, Science, Research and Innovation

3/4-5 Moo 3, Klong 5, Klong Luang, Pathumthani 12120, Thailand. Tel: (66) 2577 5100, Fax: (66) 2577 3659

75/7 Rama VI Road, Rachathewi, Bangkok 10400, Thailand. Tel: (66) 2354 3700, Fax: (66) 2354 3692



UNCERTAINTY OF MEASUREMENT

The stated uncertainty is the expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor $k=2$. It has been determined in accordance with EA publication EA-4/02 M:2013 "Evaluation of the Uncertainty of Measurement in Calibration" and JCGM 100:2008 "Evaluation of measurement data --Guide to the Expression of Uncertainty in Measurement (GUM 1995 with minor corrections)". The value of the measured lies within the assigned range of value with a probability of 95 %.

| Parameter | Uncertainty at SPL94 dB | Maximum-permitted uncertainty of measurement for a coverage probability of 95% | Unit |
|------------------------|----------------------------|--|------|
| 1.Sound Pressure level | 0.08 | 0.15 | dB |
| 2. Frequency | 0.1 | 0.2 | % |
| 3. THD+N | 0.1 | 0.5 | % |

TRACEABILITY

This certificate provides traceability of measurement to recognized national standards, and to the realization of the International System of Units (SI).



ENVIRONMENTAL CONDITIONS

Ambient condition in the laboratory are as follows :

| | | | |
|-------------------|---|-----------------------|-----|
| Temperature | : | (23.0 ± 1.0) | °C |
| Pressure | : | (101.325 ± 1.500) | kPa |
| Relative Humidity | : | (50.0 ± 15.0) | % |

Reference Condition : 101.325 kPa , 23.0 °C and 50.0 %RH.

Calibration Condition

Preconditionings : 16 hours at ambient conditions.

Measurement Conditions : The average values during measurement are
 (100.343 ± 0.036) kPa, (22.0 ± 0.3) °C and (53.0 ± 2.0) %RH

MEASUREMENT METHOD

The sound pressure level, frequency and total distortion of the sound calibrator was measured using the reference microphone. The insert voltage technique was employed and the measurement procedure was based on IEC 60942: 2017.

Reference Microphone

4180 serial no.1395446

TABULATION OF RESULTS

The following tables give the calibration results and associated measurement uncertainties at 95% of confidence level. The calibration results of sound pressure level which quoted in dB with reference to 20 µPa are corrected to the values under the reference environmental conditions.

The calibration results exclude the calibrator pressure correction but include the microphone volume correction, which was obtained from the manufacturer instruction manual of the sound calibrator, at the level of 0 dB.

MEASUREMENT RESULTS

1. Sound pressure level

| Specified sound pressure level (dB) | Measured value (dB) | Deviated value ^[1] (dB) | Acceptance Limit ^[2] (dB) |
|--|---------------------|------------------------------------|--------------------------------------|
| Microphone 4180 Serial No.1395446 | | | |
| 94 | 94.15 | 0.15 | ± 0.25 |

Note ^[1] : The deviated value is the absolute value of the difference between the measured value and the corresponding specified sound pressure level.

Note ^[2] : The acceptance limit is obtained from IEC 60942: 2017.

2. Frequency*

| Specified Frequency (Hz) | Measured value (Hz) | Deviated value ^[3] (%) | Acceptance Limit ^[4] (%) |
|---|---------------------|-----------------------------------|-------------------------------------|
| At the sound pressure level of 94 dB | | | |
| 1000 | 1000.0 | 0.0 | ± 0.7 |

Note ^[3] : The deviated value is the absolute value of the difference in percent between the measured value and the corresponding specified frequency.

Note ^[4] : The acceptance limit is obtained from IEC 60942: 2017.



3. Total distortion + Noise*

Microphone 4180 Serial No.1395446

| Measured value ^[5] (%) | Maximum total distortion + Noise ^[6] (%) |
|---|--|
| At the sound pressure level of 94 dB | |
| 0.2 | 2.5 |

Note ^[5] : The measured value is the total distortion, measured over the frequency range from 20 Hz to 20 kHz.

Note ^[6] : The maximum total distortion + noise is obtained from IEC 60942: 2017.

End of Certificate of Calibration

NIMT



Certificate of Calibration

Certificate Number : SPR23010010-1

Page : 1 of 3

Customer : MET CO.,LTD.

36/659 Moo. 6 Tambol Bangragpattana, Amphur Bangbuatong,
Nonthaburi 11110

Equipment Name : Sound Level Meter

Manufacturer : Rion

Model : NL-21

Serial Number : 00722042

ID. Number : SLM-46

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Received Date : 04 Jan 2023

Relative Humidity : $50\% \pm 15\%$

Calibration Date : 06 Jan 2023

Location of Calibration : In-Lab

Recommend Due Date : 06 Jan 2024

Calibration Procedure : SP-CPE-04-01

Date of Issue : 07 Jan 2023

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by :

Calibration Officer

Approved by :

Authorized Signatory



Calibration Report

Certificate Number : SPR23010010-1

Page : 2 of 3

Reference Standards

| Equipment Name | Model | Serial No. | Certificate No. | Due. Date |
|------------------------|--------|------------|-----------------|-------------|
| Sound Level Calibrator | SC-942 | B014059 | EEL.BP. 34/1264 | 22 Dec 2023 |

Traceability

This certification is traceable to the International System of Unit maintained at :

TISTR - Thailand Institute of Scientific and Technological Research



Result of Calibration

Certificate No. : SPR23010010-1

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

| Standard Setting | UUC Reading | | Error | | Uncertainty (±) |
|------------------|-------------|-------|-------|------|-------------------|
| | Fast | Slow | Fast | Slow | |
| 94 | 93.9 | 93.9 | -0.1 | -0.1 | 0.15 |
| 114 | 113.9 | 113.9 | -0.1 | -0.1 | 0.15 |

Select C

Unit : dB

| Standard Setting | UUC Reading | | Error | | Uncertainty (±) |
|------------------|-------------|-------|-------|------|-------------------|
| | Fast | Slow | Fast | Slow | |
| 94 | 94.1 | 94.1 | 0.1 | 0.1 | 0.15 |
| 114 | 114.0 | 114.0 | 0.0 | 0.0 | 0.15 |

Note:

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -



Certificate of Calibration

Certificate Number : SPR23010249-10

Page : 1 of 3

Customer : MET CO.,LTD.

36/659 Moo. 6 Tambol Bangragpattana, Amphur Bangbuatong,
Nonthaburi 11110

Equipment Name : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial Number : 222069

ID. Number : SLM-36

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Received Date : 19 Jan 2023

Relative Humidity : $50\% \pm 15\%$

Calibration Date : 23 Jan 2023

Location of Calibration : In-Lab

Recommend Due Date : 23 Jan 2024

Calibration Procedure : SP-CPE-04-01

Date of Issue : 24 Jan 2023

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by :



Calibration Officer

Approved by :



Authorized Signatory



Calibration Report

Certificate Number : SPR23010249-10

Page : 2 of 3

Reference Standards

| Equipment Name | Model | Serial No. | Certificate No. | Due. Date |
|------------------------|--------|------------|-----------------|-------------|
| Sound Level Calibrator | SC-942 | B014059 | EEL.BP. 34/1264 | 22 Dec 2023 |

Traceability

This certification is traceable to the International System of Unit maintained at :

TISTR - Thailand Institute of Scientific and Technological Research



Result of Calibration

Certificate No. : SPR23010249-10

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

| Standard Setting | UUC Reading | | Error | | Uncertainty (±) |
|------------------|-------------|-------|-------|------|-------------------|
| | Fast | Slow | Fast | Slow | |
| 94 | 94.0 | 94.0 | 0.0 | 0.0 | 0.15 |
| 114 | 114.0 | 114.0 | 0.0 | 0.0 | 0.15 |

Select C

Unit : dB

| Standard Setting | UUC Reading | | Error | | Uncertainty (±) |
|------------------|-------------|-------|-------|------|-------------------|
| | Fast | Slow | Fast | Slow | |
| 94 | 94.0 | 94.0 | 0.0 | 0.0 | 0.15 |
| 114 | 114.0 | 114.0 | 0.0 | 0.0 | 0.15 |

Note:

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

– End of Certificate –



Certificate of Calibration

Certificate Number : SPR23010249-3

Page : 1 of 3

Customer : MET CO.,LTD.

36/659 Moo. 6 Tambol Bangragpattana, Amphur Bangbuatong,
Nonthaburi 11110

Equipment Name : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial Number : 222070

ID. Number : SLM-37

Environmental Conditions

Ambient Temperature : $23\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$

Relative Humidity : $50\% \pm 15\%$

Location of Calibration : In-Lab

Calibration Procedure : SP-CPE-04-01

Received Date : 19 Jan 2023

Calibration Date : 23 Jan 2023

Recommend Due Date : 23 Jan 2024

Date of Issue : 24 Jan 2023

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by :



Calibration Officer

Approved by :



Authorized Signatory



Calibration Report

Certificate Number : SPR23010249-3

Page : 2 of 3

Reference Standards

| Equipment Name | Model | Serial No. | Certificate No. | Due. Date |
|------------------------|--------|------------|-----------------|-------------|
| Sound Level Calibrator | SC-942 | B014059 | EEL.BP. 34/1264 | 22 Dec 2023 |

Traceability

This certification is traceable to the International System of Unit maintained at :

TISTR - Thailand Institute of Scientific and Technological Research



Result of Calibration

Certificate No. : SPR23010249-3

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

| Standard Setting | UUC Reading | | Error | | Uncertainty (±) |
|------------------|-------------|-------|-------|------|-------------------|
| | Fast | Slow | Fast | Slow | |
| 94 | 94.0 | 94.0 | 0.0 | 0.0 | 0.15 |
| 114 | 114.0 | 114.0 | 0.0 | 0.0 | 0.15 |

Select C

Unit : dB

| Standard Setting | UUC Reading | | Error | | Uncertainty (±) |
|------------------|-------------|-------|-------|------|-------------------|
| | Fast | Slow | Fast | Slow | |
| 94 | 94.2 | 94.2 | 0.2 | 0.2 | 0.15 |
| 114 | 114.2 | 114.2 | 0.2 | 0.2 | 0.15 |

Note:

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -



Certificate of Calibration

Certificate Number : SPR23010249-1

Page : 1 of 3

Customer : MET CO.,LTD.

36/659 Moo. 6 Tambol Bangragpattana, Amphur Bangbuatong,
Nonthaburi 11110

Equipment Name : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial Number : 222071

ID. Number : SLM-38

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Relative Humidity : $50\% \pm 15\%$

Location of Calibration : In-Lab

Calibration Procedure : SP-CPE-04-01

Received Date : 19 Jan 2023

Calibration Date : 23 Jan 2023

Recommend Due Date : 23 Jan 2024

Date of Issue : 24 Jan 2023

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : [Signature]

Calibration Officer

Approved by : [Signature]

Authorized Signatory



Calibration Report

Certificate Number : SPR23010249-1

Page : 2 of 3

Reference Standards

| Equipment Name | Model | Serial No. | Certificate No. | Due. Date |
|------------------------|--------|------------|-----------------|-------------|
| Sound Level Calibrator | SC-942 | B014059 | EEL.BP. 34/1264 | 22 Dec 2023 |

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR - Thailand Institute of Scientific and Technological Research



Result of Calibration

Certificate No. : SPR23010249-1

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

| Standard Setting | UUC Reading | | Error | | Uncertainty (±) |
|------------------|-------------|-------|-------|------|-------------------|
| | Fast | Slow | Fast | Slow | |
| 94 | 94.0 | 94.0 | 0.0 | 0.0 | 0.15 |
| 114 | 114.0 | 114.0 | 0.0 | 0.0 | 0.15 |

Select C

Unit : dB

| Standard Setting | UUC Reading | | Error | | Uncertainty (±) |
|------------------|-------------|-------|-------|------|-------------------|
| | Fast | Slow | Fast | Slow | |
| 94 | 94.5 | 94.5 | 0.5 | 0.5 | 0.15 |
| 114 | 114.4 | 114.4 | 0.4 | 0.4 | 0.15 |

Note:

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

– End of Certificate –



Certificate of Calibration

Certificate Number : SPR23010249-7

Page : 1 of 3

Customer : MET CO.,LTD.

36/659 Moo. 6 Tambol Bangragpattana, Amphur Bangbuatong,
Nonthaburi 11110

Equipment Name : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial Number : 222072

ID. Number : SLM-39

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Received Date : 19 Jan 2023

Relative Humidity : $50\% \pm 15\%$

Calibration Date : 23 Jan 2023

Location of Calibration : In-Lab

Recommend Due Date : 23 Jan 2024

Calibration Procedure : SP-CPE-04-01

Date of Issue : 24 Jan 2023

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by :



Calibration Officer

Approved by :



Authorized Signatory



Calibration Report

Certificate Number : SPR23010249-7

Page : 2 of 3

Reference Standards

| Equipment Name | Model | Serial No. | Certificate No. | Due. Date |
|------------------------|--------|------------|-----------------|-------------|
| Sound Level Calibrator | SC-942 | B014059 | EEL.BP. 34/1264 | 22 Dec 2023 |

Traceability

This certification is traceable to the International System of Unit maintained at :

TISTR - Thailand Institute of Scientific and Technological Research



Result of Calibration

Certificate No. : SPR23010249-7

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

| Standard Setting | UUC Reading | | Error | | Uncertainty (±) |
|------------------|-------------|-------|-------|------|-------------------|
| | Fast | Slow | Fast | Slow | |
| 94 | 94.0 | 94.0 | 0.0 | 0.0 | 0.15 |
| 114 | 114.0 | 114.0 | 0.0 | 0.0 | 0.15 |

Select C

Unit : dB

| Standard Setting | UUC Reading | | Error | | Uncertainty (±) |
|------------------|-------------|-------|-------|------|-------------------|
| | Fast | Slow | Fast | Slow | |
| 94 | 94.0 | 94.0 | 0.0 | 0.0 | 0.15 |
| 114 | 114.1 | 114.1 | 0.1 | 0.1 | 0.15 |

Note:

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -



Certificate of Calibration

Certificate Number : SPR23010249-8

Page : 1 of 3

Customer : MET CO.,LTD.

36/659 Moo. 6 Tambol Bangragpattana, Amphur Bangbuatong,
Nonthaburi 11110

Equipment Name : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial Number : 222073

ID. Number : SLM-40

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Relative Humidity : $50\% \pm 15\%$

Location of Calibration : In-Lab

Calibration Procedure : SP-CPE-04-01

Received Date : 19 Jan 2023

Calibration Date : 23 Jan 2023

Recommend Due Date : 23 Jan 2024

Date of Issue : 24 Jan 2023

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by :



Calibration Officer

Approved by :



Authorized Signatory



Calibration Report

Certificate Number : SPR23010249-8

Page : 2 of 3

Reference Standards

| Equipment Name | Model | Serial No. | Certificate No. | Due. Date |
|------------------------|--------|------------|-----------------|-------------|
| Sound Level Calibrator | SC-942 | B014059 | EEL.BP. 34/1264 | 22 Dec 2023 |

Traceability

This certification is traceable to the International System of Unit maintained at :

TISTR - Thailand Institute of Scientific and Technological Research



Result of Calibration

Certificate No. : SPR23010249-8

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A Unit : dB

| Standard Setting | UUC Reading | | Error | | Uncertainty (±) |
|------------------|-------------|-------|-------|------|-------------------|
| | Fast | Slow | Fast | Slow | |
| 94 | 94.0 | 94.0 | 0.0 | 0.0 | 0.15 |
| 114 | 114.0 | 114.0 | 0.0 | 0.0 | 0.15 |

Select C Unit : dB

| Standard Setting | UUC Reading | | Error | | Uncertainty (±) |
|------------------|-------------|-------|-------|------|-------------------|
| | Fast | Slow | Fast | Slow | |
| 94 | 94.2 | 94.2 | 0.2 | 0.2 | 0.15 |
| 114 | 114.1 | 114.1 | 0.1 | 0.1 | 0.15 |

Note:

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -



Certificate of Calibration

Certificate Number : SPR23020546-8

Page : 1 of 3

Customer : MET CO.,LTD.

36/659 Moo. 6 Tambol Bangragpattana, Amphur Bangbuatong,
Nonthaburi 11110

Equipment Name : Noise Dose Meter

Manufacturer : Tenmars

Model : ST-130

Serial Number : 220100187

ID. Number : ND-12

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Received Date : 28 Feb 2023

Relative Humidity : $50\% \pm 15\%$

Calibration Date : 14 Mar 2023

Location of Calibration : In-Lab

Recommend Due Date : 14 Mar 2024

Calibration Procedure : SP-CPE-04-01

Date of Issue : 15 Mar 2023

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by :



Calibration Officer

Approved by :



Authorized Signatory



Calibration Report

Certificate Number : SPR23020546-8

Page : 2 of 3

Reference Standards

| Equipment Name | Model | Serial No. | Certificate No. | Due. Date |
|------------------------|--------|------------|------------------|-------------|
| Sound Level Calibrator | ST-120 | 211203773 | EEL.BP. 114/0166 | 17 Jan 2024 |

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR - Thailand Institute of Scientific and Technological Research



Result of Calibration

Certificate No. : SPR23020546-8

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

| Standard Setting | UUC Reading | | Error | | Uncertainty (±) |
|------------------|-------------|-------|-------|------|-------------------|
| | Fast | Slow | Fast | Slow | |
| 94 | 94.0 | 94.0 | 0.0 | 0.0 | 0.15 |
| 114 | 114.0 | 114.0 | 0.0 | 0.0 | 0.15 |

Select C

Unit : dB

| Standard Setting | UUC Reading | | Error | | Uncertainty (±) |
|------------------|-------------|-------|-------|------|-------------------|
| | Fast | Slow | Fast | Slow | |
| 94 | 94.0 | 94.0 | 0.0 | 0.0 | 0.15 |
| 114 | 114.0 | 114.0 | 0.0 | 0.0 | 0.15 |

Select Z

Unit : dB

| Standard Setting | UUC Reading | | Error | | Uncertainty (±) |
|------------------|-------------|-------|-------|------|-------------------|
| | Fast | Slow | Fast | Slow | |
| 94 | 94.0 | 94.0 | 0.0 | 0.0 | 0.15 |
| 114 | 113.9 | 113.9 | -0.1 | -0.1 | 0.15 |

Note:

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -



Certificate of Calibration

Certificate Number : SPR23020546-9

Page : 1 of 3

Customer : MET CO.,LTD.

36/659 Moo. 6 Tambol Bangragpattana, Amphur Bangbuatong,
Nonthaburi 11110

Equipment Name : Noise Dose Meter

Manufacturer : Tenmars

Model : ST-130

Serial Number : 220100188

ID. Number : ND-13

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Received Date : 28 Feb 2023

Relative Humidity : $50\% \pm 15\%$

Calibration Date : 14 Mar 2023

Location of Calibration : In-Lab

Recommend Due Date : 14 Mar 2024

Calibration Procedure : SP-CPE-04-01

Date of Issue : 15 Mar 2023

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by :



Calibration Officer

Approved by :



Authorized Signatory



Calibration Report

Certificate Number : SPR23020546-9

Page : 2 of 3

Reference Standards

| Equipment Name | Model | Serial No. | Certificate No. | Due. Date |
|------------------------|--------|------------|------------------|-------------|
| Sound Level Calibrator | ST-120 | 211203773 | EEL.BP. 114/0166 | 17 Jan 2024 |

Traceability

This certification is traceable to the International System of Unit maintained at :

TISTR - Thailand Institute of Scientific and Technological Research



Result of Calibration

Certificate No. : SPR23020546-9

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

| Standard Setting | UUC Reading | | Error | | Uncertainty (±) |
|------------------|-------------|-------|-------|------|-------------------|
| | Fast | Slow | Fast | Slow | |
| 94 | 94.0 | 94.0 | 0.0 | 0.0 | 0.15 |
| 114 | 114.1 | 114.1 | 0.1 | 0.1 | 0.15 |

Select C

Unit : dB

| Standard Setting | UUC Reading | | Error | | Uncertainty (±) |
|------------------|-------------|-------|-------|------|-------------------|
| | Fast | Slow | Fast | Slow | |
| 94 | 94.0 | 94.0 | 0.0 | 0.0 | 0.15 |
| 114 | 114.1 | 114.1 | 0.1 | 0.1 | 0.15 |

Select Z

Unit : dB

| Standard Setting | UUC Reading | | Error | | Uncertainty (±) |
|------------------|-------------|-------|-------|------|-------------------|
| | Fast | Slow | Fast | Slow | |
| 94 | 94.0 | 94.0 | 0.0 | 0.0 | 0.15 |
| 114 | 114.1 | 114.1 | 0.1 | 0.1 | 0.15 |

Note:

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -



GIIC Calibration Laboratory

700/20-21 Phaholyothin Rd., Samsennai, Phayathai,
Bangkok 10400 Thailand

Tel : +66 (02) 615 4999

Fax : +66 (02) 615 4644

E-mail : cal@giic.co.th



CERTIFICATE No.: CAL00007-23

PAGE : 1

OF : 3

Certificate of Calibration

Equipment : DIGITAL LIGHT METER

Manufacturer : DIGICON

Model / Type : LX-73

Serial No. : T.017761

ID No. : -

Customer : M E T CO., LTD.
36/659 Moo 6 T.Bangrakpattana A.Bangbuathong Nonthaburi
11110.

C.S.R. No. : L0000010-23

Received Date : 04 January 2023

Calibration Date : 04 January 2023

Calibrated By : 

Approved By : 

Issue Date : 04 January 2023

The uncertainties are for a level of confidence of approximately 95%.

This certificate may not be reproduced except in full unless permission for the reproduction has been obtained in writing from the laboratory.

CERTIFICATE No.: CAL00007-23

PAGE: 2

OF: 3

CALIBRATION REPORT

Condition of this calibration result :

1. Environment : Temperature : $(23 \pm 3) ^\circ\text{C}$
 Relative Humidity : $(50 \pm 15) \%$

2. Reference / Procedure Used :

- This Instrument was calibrated by substitution with reference illuminance meter; the Instrument and reference illuminance meter were mounted with the plane of its diffuser vertical and normal to the direction of measurement. Calibration was illuminated by the luminous standard lamp (operated at colour temperature 2856K) according to GIIC Calibration Laboratory calibration procedure No.GIICLAB-CP-L01.

3. Reference Standard Instrument :

| Instrument | Model | Serial No | Certificate No | Due Dated |
|-------------------|-------------------|----------------|----------------|-----------|
| Illuminance meter | PMA2200 / PMA2130 | 25531 / 025000 | TP-1018-22 | 21-Jul-23 |

4. This Certification is traceable to the SI unit through :

- The National Institute of Metrology (Thailand) .

5. Uncertainty :

- The reported uncertainty of measurement was estimated and based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.

CERTIFICATE No.: CAL00007-23

PAGE: 3

OF: 3

CALIBRATION REPORT

All data shown below were as received value : Without adjustment

Calibration result :

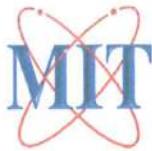
Function: Illuminance Measurement

| U.U.C. Range (lux) | Standard Setting (lux) | U.U.C. Reading (lux) | Error (lux) | Uncertainty of measurement \pm (lux) |
|-----------------------|---------------------------|-------------------------|----------------|---|
| 400 | 0 | 0.0 | 0.0 | 0.60 |
| | 50 | 50.5 | 0.5 | 1.6 |
| | 250 | 253.1 | 3.1 | 6.5 |
| 4000 | 500 | 502 | 2 | 13 |
| | 1000 | 1011 | 11 | 26 |
| | 1500 | 1513 | 13 | 36 |
| | 2000 | 2028 | 28 | 48 |
| | 3000 | 3038 | 38 | 72 |
| 40000 | 4000 | 4030 | 30 | 96 |
| | 5000 | 5030 | 30 | 0.12 klux |

- U.U.C. = Unit Under Calibration

This result of calibration was found accurate as show on data and place of calibration only.

- END -



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

214 Bangwack Rd. Bangpai Bangkac Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>



CALIBRATION CERTIFICATE

Certificate No. : L202301038-001

Date Issued : 16-Jan-23

Customer : MET CO.,LTD.
36/659 Moo 6 T. Bangrakpattana A.Bangbuatong Nonthaburi 11110

Equipment : Heat Stress Meter

Manufacturer : Metrosonic

Model : hs-32

Serial No. : MCE010018

ID No./Tag No. : HT-02

Date Received : 13-Jan-23

Date Calibrated : 13-Jan-23

Calibrated by : N [REDACTED]

Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor $k = 2$, providing a level confidence approximately 95 percent.

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.

Approved by:



Page 1 of 2

Certificate No. : L202301038-001

Environment : Ambient Temperature : $(25 \pm 2) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15)\%\text{RH}$

| STD Reading ($^\circ\text{C}$) | UUC Reading ($^\circ\text{C}$) | | UUC Error ($^\circ\text{C}$) | Measurement Uncertainty ($\pm ^\circ\text{C}$) |
|-------------------------------------|----------------------------------|----------------|-----------------------------------|---|
| | Before Adjusted | After Adjusted | | |
| 24.00 | WET 23.9 | - | -0.10 | 0.35 |
| 28.01 | DRY 27.7 | - | -0.31 | 0.40 |
| 30.00 | GLOBE 30.1 | - | 0.10 | 0.35 |
| 27.02 | WET 26.9 | - | -0.12 | 0.35 |
| 32.00 | DRY 31.9 | - | -0.10 | 0.40 |
| 35.00 | GLOBE 35.1 | - | 0.10 | 0.35 |
| 30.00 | WET 29.8 | - | -0.20 | 0.35 |
| 36.01 | DRY 35.6 | - | -0.41 | 0.40 |
| 40.01 | GLOBE 40.0 | - | -0.01 | 0.35 |

STD = Standard

UUC = Unit Under Calibration

Description of UUC : Range 0 to 100 $^\circ\text{C}$
Resolution 0.1 $^\circ\text{C}$

Condition As-Received : Used Item

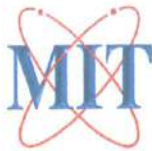
The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. I.202210258-006 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 10-Nov-23

End of Certificate



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

214 Bangwack Rd. Bangpai Bangkae Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>



CALIBRATION CERTIFICATE

Certificate No. : L202301038-002

Date Issued : 16-Jan-23

Customer : MET CO.,LTD.
36/659 Moo 6 T. Bangrakpattana A.Bangbuatong Nonthaburi 11110

Equipment : Heat Stress Meter

Manufacturer : Quest

Model : Questtemp 34

Serial No. : TFB060016

ID No./Tag No. : HT-11

Date Received : 13-Jan-23

Date Calibrated : 13-Jan-23

Calibrated by :

Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor $k = 2$, providing a level confidence approximately 95 percent.

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.

Approved by:



Certificate No. : L202301038-002

Environment : Ambient Temperature : $(25 \pm 2) ^\circ\text{C}$
Relative Humidity : $(50 \pm 1.5)\%\text{RH}$

| STD Reading ($^\circ\text{C}$) | UUC Reading ($^\circ\text{C}$) | | | UUC Error ($^\circ\text{C}$) | Measurement Uncertainty ($\pm^\circ\text{C}$) |
|-------------------------------------|----------------------------------|-----------------|----------------|-----------------------------------|--|
| | | Before Adjusted | After Adjusted | | |
| 24.00 | WET | 24.1 | - | 0.10 | 0.35 |
| 28.01 | DRY | 28.2 | - | 0.19 | 0.35 |
| 30.00 | GLOBE | 30.3 | - | 0.30 | 0.35 |
| 27.02 | WET | 27.2 | - | 0.18 | 0.35 |
| 32.00 | DRY | 32.3 | - | 0.30 | 0.35 |
| 35.00 | GLOBE | 35.3 | - | 0.30 | 0.35 |
| 30.00 | WET | 30.2 | - | 0.20 | 0.35 |
| 36.01 | DRY | 36.4 | - | 0.39 | 0.35 |
| 40.01 | GLOBE | 40.4 | - | 0.39 | 0.35 |

STD = Standard

UUC = Unit Under Calibration

Description of UUC : Range 0 to 100 $^\circ\text{C}$
Resolution 0.1 $^\circ\text{C}$

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. L202210258-006 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 10-Nov-23

End of Certificate

Factory Calibration Certificate

Instrument information

| | |
|-----------|---|
| Name | WET BULB GLOBE TEMPERATURE (WBGT) METER |
| Series No | 3522210130 |
| Type | JT2011-E2A |

Integrity check of instrument

| | |
|---|---|
| Appearance | ✓ |
| Parts integrity | ✓ |
| Screen display or touch | ✓ |
| Instrument button | ✓ |
| Power supply | ✓ |
| battery | ✓ |
| Data storage and export | ✓ |
| Deviation degree of comparison test with standard instrument | ✓ |

Calibration Results

| UUC Sensor | Standard Temperature (°C) | UUC Reading (°C) | Correction (°C) | Uncertainty (± °C) |
|------------|--------------------------------|-----------------------|----------------------|-------------------------|
| WET | 25.0 | 25.2 | -0.2 | 0.2 |
| | 30.0 | 29.9 | 0.1 | 0.2 |
| | 35.0 | 35.1 | -0.1 | 0.2 |
| | 40.0 | 39.8 | 0.2 | 0.2 |
| | 45.0 | 44.9 | 0.1 | 0.2 |
| DRY | 25.0 | 24.8 | 0.2 | 0.2 |
| | 30.0 | 30.2 | -0.2 | 0.2 |
| | 35.0 | 35.2 | -0.2 | 0.2 |
| | 40.0 | 39.8 | 0.2 | 0.2 |
| | 45.0 | 44.9 | 0.1 | 0.2 |
| GLOBE | 25.0 | 24.8 | 0.2 | 0.2 |
| | 30.0 | 29.9 | 0.1 | 0.2 |
| | 35.0 | 34.8 | 0.2 | 0.2 |
| | 40.0 | 39.8 | 0.2 | 0.2 |
| | 45.0 | 44.9 | 0.1 | 0.2 |

Environmental conditions: temperature: 26 °C±2°C, relative humidity: 30% RH±10RH%

Reference Standard : Standard Mercury Thermometers , Manufacturer: BGRI, Model: STA, SN : 2-56,

Calibrated Date : 30 March 2022, Calibration Certificate No.: RA21H-AB1000009

This Certificate is traceable to NCMT North China, Certificate No.: RA20J-AK000073

Calibration Engineer

Date : February 23, 2023



Factory Calibration Certificate



Instrument information

| | |
|-----------|---|
| Name | WET BULB GLOBE TEMPERATURE (WBGT) METER |
| Series No | 3522210131 |
| Type | JT2011-E2A |

Integrity check of instrument

| | |
|---|---|
| Appearance | ✓ |
| Parts integrity | ✓ |
| Screen display or touch | ✓ |
| Instrument button | ✓ |
| Power supply | ✓ |
| battery | ✓ |
| Data storage and export | ✓ |
| Deviation degree of comparison test with standard instrument | ✓ |

Calibration Results

| UUC Sensor | Standard Temperature (°C) | UUC Reading (°C) | Correction (°C) | Uncertainty (± °C) |
|------------|--------------------------------|-----------------------|----------------------|-------------------------|
| WET | 25.0 | 25.2 | -0.2 | 0.2 |
| | 30.0 | 30.2 | -0.2 | 0.2 |
| | 35.0 | 34.8 | 0.2 | 0.2 |
| | 40.0 | 40.1 | -0.1 | 0.2 |
| | 45.0 | 44.9 | 0.1 | 0.2 |
| DRY | 25.0 | 24.8 | 0.2 | 0.2 |
| | 30.0 | 30.2 | -0.2 | 0.2 |
| | 35.0 | 35.2 | -0.2 | 0.2 |
| | 40.0 | 40.2 | -0.2 | 0.2 |
| | 45.0 | 45.2 | -0.2 | 0.2 |
| GLOBE | 25.0 | 24.8 | 0.2 | 0.2 |
| | 30.0 | 29.9 | 0.1 | 0.2 |
| | 35.0 | 35.1 | -0.1 | 0.2 |
| | 40.0 | 39.9 | 0.1 | 0.2 |
| | 45.0 | 44.9 | 0.1 | 0.2 |

Environmental conditions: temperature: 26 °C±2°C, relative humidity: 30% RH±10RH%

Reference Standard : Standard Mercury Thermometers , Manufacturer: BGRI, Model: STA, SN : 2-56,

Calibrated Date : 30 March 2022, Calibration Certificate No.: RA21H-AB1000009

This Certificate is traceable to NCMT North China, Certificate No.: RA20J-AK000073

Calibration Engineer : Date : 
February 23, 2023

质检专用章

JANTYTECH
建通科技

Factory Calibration Certificate

Instrument information

| | |
|-----------|---|
| Name | WET BULB GLOBE TEMPERATURE (WBGT) METER |
| Series No | 3522210132 |
| Type | JT2011-E2A |

Integrity check of instrument

| | |
|---|---|
| Appearance | ✓ |
| Parts integrity | ✓ |
| Screen display or touch | ✓ |
| Instrument button | ✓ |
| Power supply | ✓ |
| battery | ✓ |
| Data storage and export | ✓ |
| Deviation degree of comparison test with standard instrument | ✓ |

Calibration Results

| UUC Sensor | Standard Temperature (°C) | UUC Reading (°C) | Correction (°C) | Uncertainty (± °C) |
|------------|--------------------------------|-----------------------|----------------------|-------------------------|
| WET | 25.0 | 24.9 | 0.1 | 0.2 |
| | 30.0 | 29.9 | 0.1 | 0.2 |
| | 35.0 | 35.1 | -0.1 | 0.2 |
| | 40.0 | 40.1 | -0.1 | 0.2 |
| | 45.0 | 45.2 | -0.2 | 0.2 |
| DRY | 25.0 | 25.1 | -0.1 | 0.2 |
| | 30.0 | 30.1 | -0.1 | 0.2 |
| | 35.0 | 34.8 | 0.2 | 0.2 |
| | 40.0 | 40.1 | -0.1 | 0.2 |
| | 45.0 | 44.9 | 0.1 | 0.2 |
| GLOBE | 25.0 | 24.9 | 0.2 | 0.2 |
| | 30.0 | 29.9 | 0.1 | 0.2 |
| | 35.0 | 34.8 | 0.2 | 0.2 |
| | 40.0 | 40.1 | -0.1 | 0.2 |
| | 45.0 | 45.2 | -0.2 | 0.2 |

Environmental conditions: temperature: 26 °C±2°C, relative humidity: 30% RH±10RH%

Reference Standard : Standard Mercury Thermometers , Manufacturer: BGRI, Model: STA, SN : 2-56,

Calibrated Date : 30 March 2022, Calibration Certificate No.: RA21H-AB1000009

This Certificate is traceable to NCMT North China, Certificate No.: RA20J-AK000073

Calibration Engineer

Date : February 23, 2023

质检专用章

JANTYTECH
建通科技

Factory Calibration Certificate

Instrument information

| | |
|-----------|---|
| Name | WET BULB GLOBE TEMPERATURE (WBGT) METER |
| Series No | 3522210133 |
| Type | JT2011-E2A |

Integrity check of instrument

| | |
|---|---|
| Appearance | ✓ |
| Parts integrity | ✓ |
| Screen display or touch | ✓ |
| Instrument button | ✓ |
| Power supply | ✓ |
| battery | ✓ |
| Data storage and export | ✓ |
| Deviation degree of comparison test with standard instrument | ✓ |

Calibration Results

| UUC Sensor | Standard Temperature (°C) | UUC Reading (°C) | Correction (°C) | Uncertainty (± °C) |
|------------|--------------------------------|-----------------------|----------------------|-------------------------|
| WET | 25.0 | 25.1 | -0.1 | 0.2 |
| | 30.0 | 30.2 | -0.2 | 0.2 |
| | 35.0 | 34.9 | 0.1 | 0.2 |
| | 40.0 | 39.8 | 0.2 | 0.2 |
| | 45.0 | 45.2 | -0.2 | 0.2 |
| DRY | 25.0 | 24.9 | 0.1 | 0.2 |
| | 30.0 | 29.8 | 0.2 | 0.2 |
| | 35.0 | 34.9 | 0.1 | 0.2 |
| | 40.0 | 40.2 | -0.2 | 0.2 |
| | 45.0 | 45.1 | -0.1 | 0.2 |
| GLOBE | 25.0 | 25.2 | -0.2 | 0.2 |
| | 30.0 | 29.9 | 0.1 | 0.2 |
| | 35.0 | 34.8 | 0.2 | 0.2 |
| | 40.0 | 39.8 | 0.2 | 0.2 |
| | 45.0 | 44.9 | 0.1 | 0.2 |

Environmental conditions: temperature: 26 °C±2°C, relative humidity: 30% RH±10RH%

Reference Standard : Standard Mercury Thermometers , Manufacturer: BGRI, Model: STA, SN : 2-56,

Calibrated Date : 30 March 2022, Calibration Certificate No.: RA21H-AB1000009

This Certificate is traceable to NCMT North China, Certificate No.: RA20J-AK000073

Calibration Engineer : 

Date : 
February 23, 2023

质检专用章