

ภาคผนวกที่ 4

ใบรับรองการสอบเทียบเครื่องมือ

METHOD 5 PRE-TEST CONSOLE CALIBRATION
USING REFERENCE METER # WET TEST METER W-NK5A No. 540961
5-POINT METRIC UNIT

Meter Console Information	
Console Model Number	XC572V
Console Serial Number	0509047
DGM Model Number	SK25
DGM Serial Number	8001032

Calibration Conditions			
Date	Time	24-Feb-22	8:30 AM
Calibration Reference No.	HC65APE0023		
Barometric Pressure	758	mm Hg	
Calibration Meter Gamma	0.9980	unitless	

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

Calibration Data									
Run Time		Metering Console				Calibration Meter			
Elapsed	DGM Orifice	Volume	Volume	Outlet Temp	Outlet Temp	Volume	Volume	Outlet Temp	Outlet Temp
(t ₀)	(P ₀)	Initial	Final	Initial	Final	Initial	Final	Initial	Final
min	mm H ₂ O	m ³	m ³	°C	°C	m ³	m ³	°C	°C
15.00	13.0	3826.4749	3826.6201	26	26	268.44500	268.59380	26	26
10.00	25.0	3826.6500	3826.7934	26	26	268.61426	268.76088	26	26
8.00	50.0	3826.8148	3826.9870	26	26	268.77850	268.95544	26	26
7.00	80.0	3827.0198	3827.2147	26	26	268.96871	269.19091	26	26
5.00	120.0	3827.5000	3827.6865	26	26	269.19122	269.38615	26	26

Standardized Data				Results				
Dry Gas Meter		Calibration Meter		Calibration Factor		Dry Gas Meter		
(V _{ref})	(Q _{ref})	(V _{ref})	(Q _{ref})	Value	Variation	Flowrate	ΔH @	
m ³	m ³ /min	m ³	m ³ /min	(Y)	(ΔY)	Std & Corr	.0212 m ³ /min	Variation
(V _{ref})	(Q _{ref})	(V _{ref})	(Q _{ref})	(Y)	(ΔY)	(Q _{ref})	(ΔH@)	(ΔH@)
m ³	m ³ /min	m ³	m ³ /min			m ³ /min	mm H ₂ O	
0.142	0.009	0.145	0.010	1.021	-0.002	0.010	61.378	12.190
0.140	0.014	0.143	0.014	1.018	-0.006	0.014	54.157	4.969
0.169	0.021	0.173	0.022	1.021	-0.003	0.022	47.830	-1.358
0.192	0.027	0.197	0.028	1.027	0.004	0.028	45.127	-4.061
0.184	0.037	0.190	0.038	1.031	0.007	0.038	37.447	-11.741
				1.024	Y Average		49.188	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 ΔH₀, orifice pressure differential that equates to 0.75cm (0.0212m³/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ± 0.2 inches (5.1mm) H₂O.

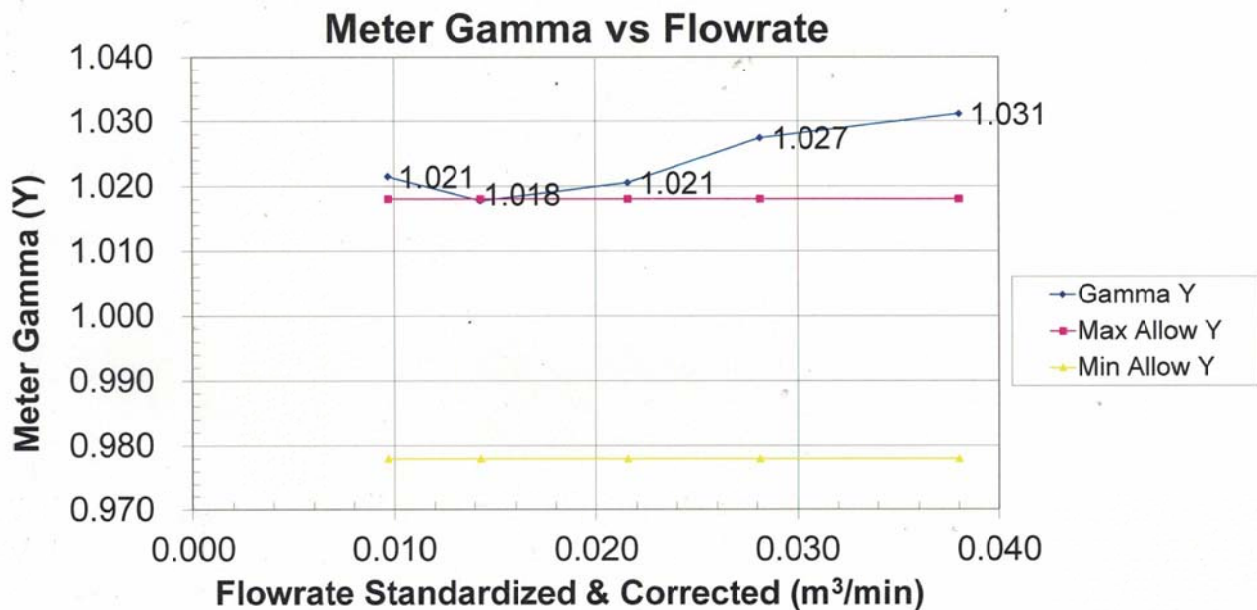
Signature _____
(Surachai Chaisana)
Service Engineer

SITHIPORN ASSOCIATES COMPANY LIMITED

Date 24 / 02 / 2022

Calibration Date: 24-2-2022

Calibration Reference No: HC65APE0023



Console Serial: 0509047

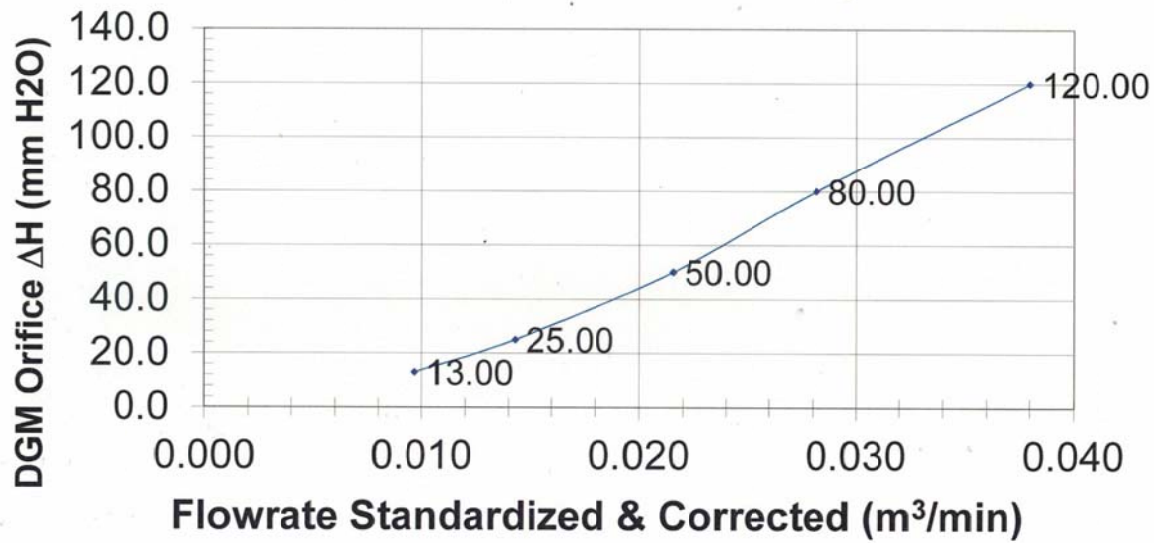
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SITHIPORN ASSOCIATES COMPANY LIMITED

Console Model: XC572V

Calibration Date: 24-2-2022

Calibration Reference No: HC65APE0023

Meter Pressure vs Flowrate



Console Serial: 0509047

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SIMPORN ASSOCIATES COMPANY

Console Model: XC572V

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	SB-2-V

Calibration Conditions			
Date	Time	24-Feb-22	8:30 AM
Calibration Reference No.	HC65APE0023		
Barometric Pressure	758	mm Hg	

Results				
System Heat	Control Acceptance	Reference thermometer temperature	Thermocouple potentiometer temperature	Temperature difference
	°C	°C	°C	°C
Probe Heater System for 5ft. Probe	120 °C±14 °C	121	120.5	0.13
Heated Filter Box	120 °C±14 °C	121	120	0.25

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

Signature _____

(Surachai Chaisana)
Service Engineer

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SITHIPORN ASSOCIATES COMPANY LIMITED

บริษัท สกทิพ แอสโซซิเอต จำกัด

Sithiporn Associates Co., Ltd.

451-451/1 ถนนสีรินธร แขวงบางนาพรุ เขตบางพลี กรุงเทพฯ 10700 โทร. 0-2433-8331, 0-2435-8800, 0-2434-9191 แฟกซ์: 0-2433-1679, 0-2434-9510

451-451/1 Sirinthorn Road, Bangbunru, Bangplud, Bangkok 10700 Thailand Tel. (662) 433-8331, 435-8800, 434-9191 Fax: (662) 433-1679, 434-9510

EMAIL:center@sithiporn.com www.sithiporn.com

THERMOCOUPLES SYSTEM CALIBRATION

Sampling System Equipment Information	
Console Model Number	XC572V
Console Serial Number	0509047
DGM Model Number	SK25
DGM Serial Number	8001032
Meter Box Model Number	JENCO 765
Meter Box Model Number	REX-C100

Calibration Conditions			
Date	Time	24-Feb-22	8:30 AM
Calibration Reference No.		HC65APE0023	
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)										
	0.0	25.0	38.0	93.0	149.0	260.0	371.0	482.0	593.0	816.0	1038.0
Stack	0	25	38	94	152	260	371	485	596	818	1041
Probe	0	25	38	94	151						
Filter	0	25	38	94	151						
Aux	0	25	38	94	152						
Exit	0	25	38								
Meter	0	25	38								

Stack ± 1.50% Absolute
Probe ± 3.0 °C
Filter ± 3.0 °C

Tolerance Range

Aux ± 3.0 °C
Exit ± 2.0 °C
Meter ± 2.0 °C

Note. Cabel socket temp probe wrong + -

Signature _____

(Surachai Chaisana)
Service Engineer

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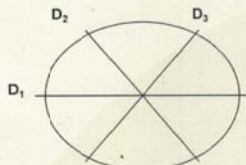
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NOZZLE CALIBRATION

Sampling System Equipment Information		Inspection Conditions		
Console Model Number	XC572V	Date	24-Feb-22	8:30 AM
Console Serial Number	0509047	Calibration Reference No.	HC65APE0023	
DGM Model Number	SK25	Barometric Pressure	758	mm Hg
DGM Serial Number	8001032	Calibration	Vernier, 0-150mm	0.01 mm increments
		Method Reference	US EPA Method	

Inspection 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	3.04	3.04	3.03	0.006	3.037
5	4.0	4.01	4.01	4.00	0.006	4.007
8	6.4	5.99	5.89	6.04	0.076	5.973
10	8.0	7.58	7.53	7.50	0.040	7.537
12	9.5	9.38	9.37	9.46	0.049	9.403
14	11.1	11.01	11.02	11.12	0.061	11.050
16	12.7	12.43	12.49	12.52	0.046	12.480

D₁, D₂, D₃ = Three 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 = (D₁ + D₂ + D₃) / 3



Signature _____

(Surachai Chaisana)
Service Engineer

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Certificate of Calibration
Method 5 Pre-Test Console Calibration - Cubic Meters (m³)

Meter Console Information

Model #: TMC-572-V
Serial #: A2202103
DGM Model #: SK25EX
DGM Serial #: 6345

Calibration Conditions

Bar. Pressure (in Hg): 30.11
Ambient Temp (°F): 71.0
Relative Humidity (%): 51
Altitude (ft): 414.0
Corr. Bar. Pressure (in Hg): 29.70

Factors/Conversions

Std. Temp. (°K): 293.15
Std. Press. (mm Hg): 760
K₁ (K/mm Hg): 0.3857

Reference Equipment

WTM Model: W-NKoDa-5B
WTM Serial: 546258
WTM Cal. Due Date: Feb. 2022
Gamma: 1.0000
WTM Thermometer: Internal

UUT Meter (DGM)						Reference Meter (WTM)						
Run Time (minutes)	Orifice, ΔH (mm H ₂ O)	Volume (m ³)			Outlet Temperature (°C)		Meter Pressure (mm H ₂ O)	Volume (L)			Outlet Temperature (°C)	
		Initial	Final	Total	Initial	Final		Initial	Final	Total	Initial	Final
Θ	P _{orif}	V _{in}	V _{ref}	V _{in}	t _{in}	t _{ref}	P _w	V _{in}	V _{ref}	V _w	t _{in}	t _{ref}
5.00	120.0	1.0654	1.2400	0.1746	22	22	-5.5	541.870	719.320	177.450	21.5	21.5
6.00	80.0	1.2400	1.4133	0.1733	22	22	-4.0	719.320	894.581	175.261	21.5	21.6
7.00	50.0	1.4133	1.5732	0.1599	22	22	-3.0	894.581	1055.229	160.648	21.6	21.6
10.00	25.0	1.5732	1.7354	0.1622	22	22	-2.0	1055.229	1217.199	161.970	21.6	21.6
15.00	13.0	1.7354	1.9115	0.1761	22	23	-1.0	1217.199	1392.341	175.142	21.6	21.7

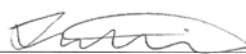
Standardized Data				Calibration Results				ΔH @ (mm H ₂ O)	
Test Meter	Reference Meter	Correction Factor	Flow Rate	Std. Volume	Std. Flow Rate	Std. Volume	Std. Flow	ΔH _{orif}	ΔH _{std}
Std. Volume	Std. Flow Rate	Std. Volume	Std. Flow	"Gamma"	Variance	Std. & Corr.	ΔH _{orif}	ΔH _{std}	Variance
V _{mstd} (m ³)	Q _{mstd} m ³ /min	V _{wstd} (m ³)	Q _{wstd} m ³ /min	(Y)	(ΔY)	Q _{mstd} or Q _{wstd}	ΔH _{orif}	ΔH _{std}	
0.174	0.035	0.175	0.035	1.0057	0.005	0.035	44.0	0.4	
0.172	0.029	0.173	0.029	1.0046	0.004	0.029	43.1	-0.4	
0.158	0.023	0.159	0.023	1.0009	0.000	0.023	43.5	0.0	
0.160	0.016	0.160	0.016	0.9973	-0.004	0.016	43.6	0.1	
0.174	0.012	0.173	0.012	0.9961	-0.005	0.012	43.5	0.0	
				1.0009	= Y Avg.		43.5	= ΔH@ Avg.	

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_{orif}, 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 ±0.3inches (5.1mm) H₂O.

Pass/Fail Result: **Pass**

Technician: Tracy Wilson

Signature: 

Date: February 8, 2022

The instruments listed and described on this certificate have been calibrated against standards traceable to the National Institute of Standards and Technology (NIST) and in reference to EPA Method 5, Section 10.3.1.

Apex Instruments - Address: 204 Technology Park Ln., Fuquay-Varina, NC 27526 USA | Tel: (919) 557-7300 Web: www.apexinst.com

Certificate of Calibration - Supplemental
Method 5 Pre-Test Console Calibration - Cubic Meters (m³)

Nomenclature
ΔH_{orif} - Orifice press. Diff. that equates to 0.75 CFM (0.0212 CMM) at STP
DGM - Dry Gas Meter
K₁ - Constant based on standard temperature and pressure
Θ - Run time, in minutes
P_{orif} - ΔH (Meter Pressure, gauge)
V_{mstd} - Volume collected by test meter, corrected for STP
Q_{mstd} - Calculated flow rate of test meter
K - Critical orifice coefficient
P_{orif} - Measured pressure of reference meter
T_{orif} - Temperature measured in reference meter
T_{std} - Temperature measured in test meter
Y - Ratio of volume collected from test meter and orifice
V_{wstd} - Volume collected by reference meter, corrected for STP
Q_{wstd} - Calculated flow rate of reference meter/standard
corr - Volume or flow rate for a meter corrected by the scaling factor

Equations

$$V_{w(std)} = K_1 + \frac{V_{m(std)} \left(P_{orif} + \frac{\Delta H}{13.6} \right)}{T_{orif}}$$

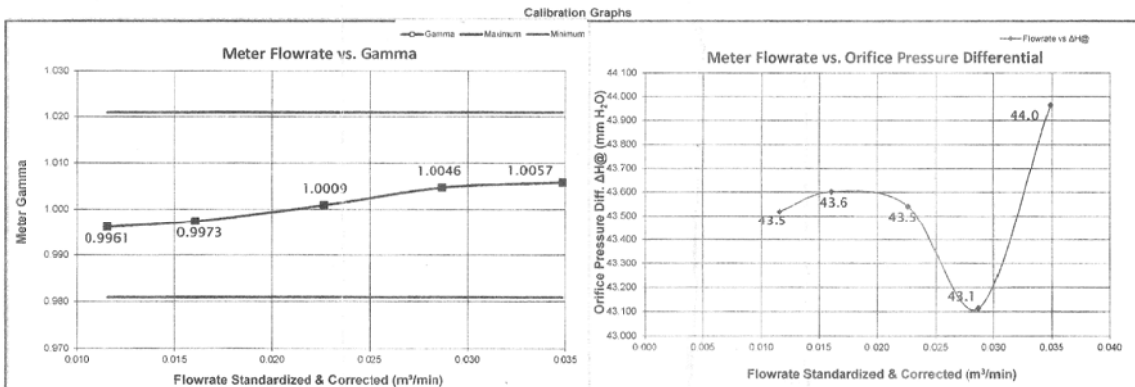
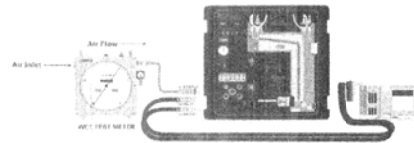
$$V_{w(std)} = \frac{Y + K_1 + V_{m(std)} \left(P_{orif} + \frac{\Delta H}{13.6} \right)}{T_{orif}}$$

$$Q_{w(std)} = \frac{V_{w(std)}}{\Theta} \quad Q_{m(std)} = \frac{V_{m(std)}}{\Theta}$$

$$K_1 = \frac{T_{std}}{P_{std}} \quad Y = \frac{V_{w(std)}}{V_{m(std)}}$$

$$\Delta H_{orif} = \frac{P_{orif} + 0.001609 \left(P_{std} + \frac{P_{std}}{13.6} \right) \left(\frac{T_{std}}{T_{orif} + \Theta} \right)^2}{V_{m(std)}} \quad \left(\frac{T_{std}}{V_{m(std)}} \right)^2$$

Calibration Train



Temperature Display Calibration Data Sheet

Meter Console Information

Model #: TMC-572-V
Serial #: A2202103
Units: Metric
English or Metric

Calibration Conditions

Pbar (mm. Hg): 30.11
Humidity (%): 51
Amb. Temp. (°F): 70.1

Reference Device Information

TC Simulator Model: PIE 520-K
Reference #: 105795
Technician: SA

Temperature Sensors Calibration

Reference Point	Ref. Thermometer Temperature	Thermocouple Display Temperature	Temperature Difference
#	°C	°C	°C
1	-18.0	-17.0	1.0
2	38.0	37.0	1.0
3	93.0	93.0	0.0
4	149.0	149.0	0.0
5	260.0	259.0	1.0
6	371.0	371.0	0.0
7	482.0	482.0	0.0
8	593.0	593.0	0.0
9	816.0	815.0	1.0
10	1038.0	1038.0	0.0

Maximum¹: 1.0
PASS

NIST Reference Thermocouple ID: 210496952

Ice Bath Temperature	Thermocouple Sensor Reading	Abs. Temperature Difference
°C	°C	°C
0.1	0.0	0.04%

Maximum²: 0.04%
PASS

Notes

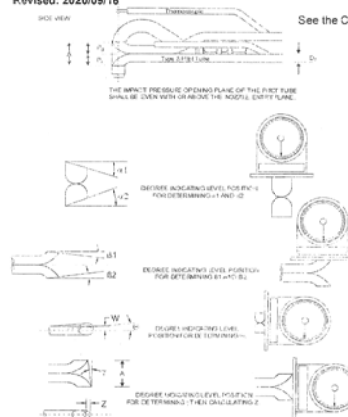
- ¹ For valid test results, the maximum difference between temperature readings should be ≤ 1.0 °C (EPA Method 5, Section 6.1.1.8)
² For valid test results, the maximum % difference between temperature readings should be less than 1.5% (EPA Method 2, Section 6.3)

Reviewed By: Tracy Wilson Date: February 8, 2022
I certify that the above Thermocouple Display was calibrated in accordance with US EPA Methods, CFR 40 Part 60.

Certificate of Calibration

S-Type Geometric Pitot Tube Calibration

See the Code of Federal Regulations, Title 40, Part 60, Appendix A, Method 2, Item 4.



PITOT TUBE/PROBE

A10664

Parameter	Value	Allowable Range	Check
Assembly Level?	y	Yes, Y	PASS
Ports Damaged?	n	No, N	PASS
α_1	0	$-10^\circ < \alpha_1 < +10^\circ$	PASS
α_2	1	$-10^\circ < \alpha_2 < +10^\circ$	PASS
β_1	1	$-5^\circ < \beta_1 < +5^\circ$	PASS
β_2	1	$-5^\circ < \beta_2 < +5^\circ$	PASS
γ	1	N/A	-
ϵ	0	N/A	-
Dt	0.375	.188" to .375"	PASS
A	0.646	$2.1D_t \leq A \leq 3D_t$	PASS
A/2Dt	1.128	$1.05 \leq P_1/D_t \leq 1.5$	PASS
$Z = A \tan \gamma$	0.015	$Z \leq .125"$	PASS
$W = A \tan \theta$	0.000	$W \leq .031"$	PASS

Certified by: KP

Technician

Karl Perkins

Signature

6/6/2022

Calibration Date

I certify that pitot tube/probe number A10664 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification factor of 0.64. See 40 CFR Pt. 60, App. A, EPA Method 2.

The factory, geometric calibration performed by Apex Instruments is valid until initial field use by the end user; this is under the assumption that the pitot tube is in the same physical condition as it was when calibrated. The end user may use the purchase date (or placed into service date) as a way to track initial and ensuing annual calibrations. A geometric calibration should be performed following each subsequent field use.

Purchase Date

Calibration Certificate

Cert. No. : CT-22-04-22785

Page : 1 of 4

Issued date : 01 April 2022

Equipment : COD Reactor , 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 : 30 March 2022

Ref. Job No. : SO6503-00042

Calibrate by : Mr.Pramot Srisukum

Cert. prepare by : Ms.Pimlada Ittiprawet

Calibrated Date : 30 March 2022

Approved by : Mr.Montree Ruschasetkul

Calibration Place : Laboratory of Metrology Technical Co.,Ltd.

Environment Condition : Temperature $27.1 \pm 0.1 (^{\circ}\text{C})$, Humidity $35.5 \pm 4.5 (\% \text{RH})$

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	Thermo Hygrometer	MTEC-CE-0181	TH-03A	06-2022
2	Temperature Datalogger	MTEC-CE-0180	MLAB	10-2022

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

CER04-R01-DF01

44 Soi ChokChai 4 Soi 40 ,LadPrae ,Bangkok ,Tel.: 0-2538-9205 ,0-2935-7096 ,Fax.: 0-2931-4015 ,Email : contact@mtec.co.th , www.mtec.co.th

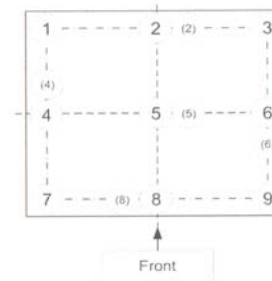
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Calibration Result :

Condition of UUC :

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



Pic 1 : Position of each sensor No.

- (1) The quoted uncertainty include with "Stability".
 (2) Stability = One-half of the greatest maximum difference of measured temperatures at any one sensor , for at least half an hour after reaching std 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.

Section 1 : Report of Temperature distribution

Unit : ($^{\circ}\text{C}$)

Calibration Point	UUC Setting ⁽¹⁾	UUC Reading ⁽¹⁾	Measured Temperature @ Sensor No.									Uncertainty (\pm)	k ^(**)
			#1	#2	#3	#4	#5	#6	#7	#8	#9		
150	150	150	150.55	149.75	150.33	149.86	150.75	150.83	150.00	150.33	150.03	0.424	2

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

Section 2 : Report of Chamber Performance

Unit : ($^{\circ}\text{C}$)

Calibration Point	UUC Setting	UUC Reading ^(*)	Temperature Uniformity	Temperature Stability ($\pm ^{\circ}\text{C}$)	Temperature Overall Variation
150	150	150	0.9	0.1	1.2

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

Approved Signatory : 

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Certificate No. : CT-22-04-22785

Page : 3 of 4

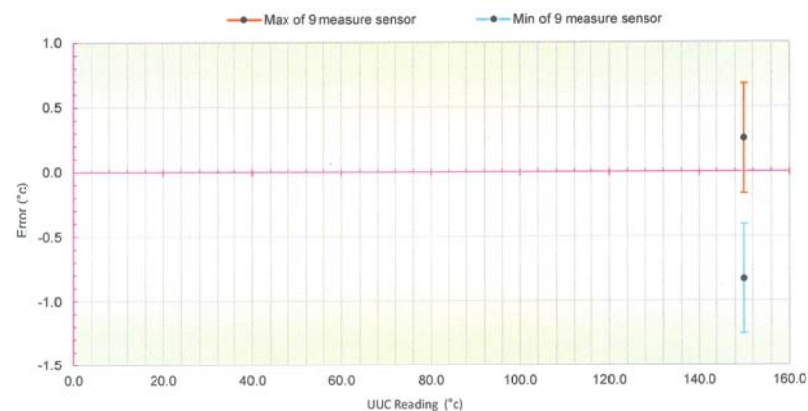
Section 3 : Possible of temperature. Show minimum and maximum of the average values and include with uncertainty of measurement. The average values is average of each position standard sensor throughout observation time.

Unit : (°C)

Calibration Point	UUC Setting (*)	UUC Reading (*)	Possible of Minimum temperature	Possible of Maximum temperature
150	150	150	149.32	151.26

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

Section 4 : Trend of accuracy



Approved Signatory :

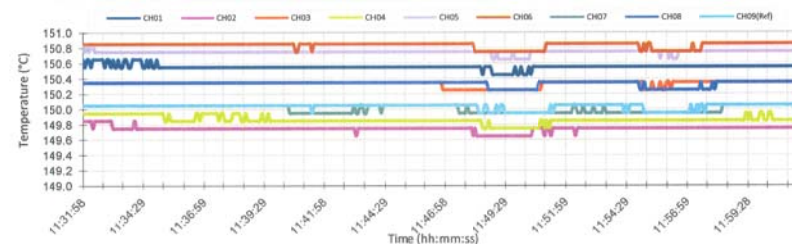
[Signature]

Certificate No. : CT-22-04-22785

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 :

[Signature]

CAL

Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukhaprachasan 3 Rd., Bangpood, Pakkred, Nonthaburi 11120

Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.cal@yahoo.com, calibratech.cal@hotmail.com



NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-400425-5

Page : 1 of 2

Submitted by : M E T Company Limited

35/659 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 : (27.0 to 28.0) °C

Relative Humidity : (50 to 55) %

Line Voltage : (210.0 to 210.8) V

Date of Received : 10 August 2022

Date of Calibration : 10 August 2022

Date of Issue : 13 August 2022

Calibrated by : Permpon Chanpu

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 & 400032 65-400274-1 25 Nov 2022 National Institute of Metrology Thailand (NIMT)

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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CAL-F0031-03

CAL

Calibratech Co.,Ltd.

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Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.cal@yahoo.com, calibratech.cal@hotmail.com

Certificate of Calibration

Certificate No. : 64-400425-5

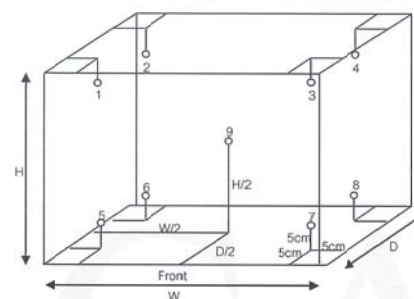
Page : 2 of 2

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	19.8	19.7	19.6	19.6	20.4	20.2	20.3	19.8	19.9	0.54

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
20.0	20.0	20.0	0.6	0.1	1.0

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 -



CAL-F0031-03

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Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.cal@yahoo.com, calibratech.cal@hotmail.com



Certificate of Calibration

Certificate No. : 65-200253-1

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 : Sartorius Model : BSA224S-CW
Serial No. : 35090472 ID No. : MET-EB 02/60
Capacity : 220 g Resolution : 0.0001 g

Environment : On site calibration was carried out at the Laboratory, M E T Company Limited
Ambient Temperature : (25.6 to 25.8) °C
Relative Humidity : (57.3 to 57.8) %
Air Pressure : 1005.0 mbar

Date of Received : 10 August 2022

Date of Calibration : 10 August 2022

Date of Issue : 11 August 2022


Calibrated by : Akaradath Thippichai

Calibration Method : In-house method CAL-M2001 based on UKAS Publication ref : LAB 14
Edition 5, July 2015

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

Standard Weights

ID No.	Cert. No.	Due Date	Traceability
E261-E2624	C02213103	18 Nov 2022	National Institute of Metrology (Thailand), (NIMT)

Approved by : 
(Surachai Promthong)
Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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CAL-F0031-03

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Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.cal@yahoo.com, calibratech.cal@hotmail.com

Certificate of Calibration

Certificate No. : 65-200253-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

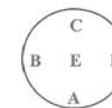
Departure of indication from nominal value

Nominal Value (g)	Correction (g)	Uncertainty ± (g)
0.05	0.0000	0.00011
0.1	0.0000	0.00013
0.5	0.0000	0.00013
1	0.0000	0.00011
5	0.0000	0.00011
10	0.0001	0.00011
50	0.0001	0.00013
100	0.0000	0.00020
150	0.0000	0.00038
200	0.0000	0.00038

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 $k = 2.11$, providing a level of confidence of approximately 95%

Eccentric error Load test : 50 g
A B C D E
0.0001 0.0001 0.0001 0.0000 0.0000 g



Repeatability Load test : 200 g
Stdev. : 0.00005 g

- o0o -





CAL-F0031-03



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

Customer Contact:
Tax ID: 0125546002271

laboratorymet@gmail.com
292014589

Invoice To:

INSTALLATION REPORT

Sales Order Number: 0310740420	Customer Number:
Service Order: 6005072113	Service Confirmation: 6904154189
Software license #: 	

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

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Acc. No: 012-4452-007,
THB Krung Thai Bank PCL
Siam Square Br.,416/1-2 Rama I Rd.,Pathumwan, BKK 10330 Thailand
Acc. No: 052-132-125-5

ORIGINAL

Order Confirmation Number: 6904154189

Service Instrument:

Model Number	Model Description	Serial Number	System Handle	System	Warranty Start	Warranty End
G3540A		CN2138A118	GC8890	SYS-GC-8890	09.03.2022	09.03.2023
G4514A		CN22047055	GC8890	SYS-GC-8890	09.03.2022	09.03.2023
M8301AA		DCA6FA0B4F		M E T COMPANY LIMITED	09.03.2022	09.03.2023
G4513A		CN22035277	GC8890	SYS-GC-8890	09.03.2022	09.03.2023
M8400AA		DF08D0F56E		M E T COMPANY LIMITED	09.03.2022	09.03.2023
G4600AA		DEW0822456		M E T COMPANY LIMITED	09.03.2022	09.03.2023
G4600AA		DEW0822464		M E T COMPANY LIMITED	09.03.2022	09.03.2023
G4600AA		DEW0831956		M E T COMPANY LIMITED	09.03.2022	09.03.2023
G4600AA		DEW0821978		M E T COMPANY LIMITED	09.03.2022	09.03.2023

Service Items:

Item	Service/Part #	Description	Qty	Entitlement	Installation Service Start	Installation Service End
3000	EIQ	Enterprise Installation Qualification	1.00	Site Services	05.04.2022	05.04.2022

Additional Information:

Service Information:

Order Confirmation Number: 6904154189

Service Provided:

Perform EIQ follow by EQP GC2.53 and run ACE version 3.x.

Reported Hours:
4.0

Travel Hours:
2.0

**Customer Field Service
Representative Name:**
Phuwanai Yoktragul

**Customer Field Service
Representative Signature:**

Y. Phuwanai

Date:
5 Apr 2022

Customer Name:
Piyanut Phutphong

Customer Signature:

Piyanut

Date:
5 Apr 2022

Additional Comments:



Tel: +662 637 6363
Fax: +662 632 4334
Email: ccc-smt@agilent.com
Website: www.agilent.com/chem

Customer Contact:

Tax ID: 0125546002271

laboratorymet@gmail.com
292014589

Invoice To:

Delivery Site:

Location:
Room
Bldg
Lab
Dept

INSTALLATION REPORT

Sales Order Number:
0310740420

Customer Number:

Service Order:
6005072113

Service Confirmation:
6904154252

Software license #:

Direct Inquiries to:

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

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Sub-district, Wattana District, Bangkok 10110 Thailand
Acc. No: 012-4452-007,
THB:Krung Thai Bank PCL
Siam Square Br.416/1-2 Rama 1 Rd.,Pathumwan, BKK 10330 Thailand
Acc. No: 052-132-125-5

ORIGINAL

Order Confirmation Number: 6904154252

Service Instrument:

Model Number	Model Description	Serial Number	System Handle	System	Warranty Start	Warranty End
G3540A		CN2138A118	GC8890	SYS-GC-8890	09.03.2022	09.03.2023
G4514A		CN22047055	GC8890	SYS-GC-8890	09.03.2022	09.03.2023
G4513A		CN22035277	GC8890	SYS-GC-8890	09.03.2022	09.03.2023

Service Items:

Item	Service/Part #	Description	Qty	Entitlement	Installation Service Start	Installation Service End
1000	INSTALLATION	Installation	1.00	Site Services	04.04.2022	04.04.2022

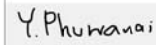

Additional Information:

Service Information:

Order Confirmation Number: 6904154252

Service Provided:

Perform Installation GC8890 with G4514A,G4513A,FID detector , SW openLab Chemstation C.01.10 update 03.

Reported Hours: 6.0	Travel Hours: 2.0	
Customer Field Service Representative Name: Phuwana Yoktragul	Customer Field Service Representative Signature: 	Date: 5 Apr 2022
Customer Name: Piyanut Phutphong	Customer Signature: 	Date: 5 Apr 2022
Additional Comments:		



PerkinElmer Ltd.
Soi 17 Rama 9 Road
Khwang Bangkapi, Khet Huay Kwang
Bangkok 10310
Thailand
Tel: 66 2719 6420 ; Fax: +66 2 319 7900
http://www.perkinelmer.com

Service Report

Work Order Number	Activity Code	Billing Type	Requested Start Date	Model	Serial Number
WO-01550998	Planned Maintenance	Contract	19/12/2564 20:50 น.	ICPN0780011	078S1407053C
Service Representative Name	Contract Number	Expiry Date	Equipment ID	System ID	
Kanan, Chayanana	SC-0035483289	31/07/2022	N/A	N/A	
UDI Number					
N/A					
Equipment Location			Bill To Name		
บริษัท เอ็มอีที จำกัด(สำนักงานใหญ่) สำนักงานวิจัย จังหวัดนนทบุรี 36 11110 TH			บริษัท เอ็มอีที จำกัด(สำนักงานใหญ่) สำนักงานวิจัย จังหวัดนนทบุรี 36 11110 TH		
Customer Contact	Phone Number	Fax Number	Email	Purchase Order	
K. ศิริธรรมากร 087-799-1303	(02) 920-1458-9 #102	02-920-1460	met_ji@yahoo.com	PO62-093	

Work Description		
<ul style="list-style-type: none"> - PM 2 of 2 , ทำอะไหล่และทำความสะอาด Torch Pneumatic Board ระหว่งการสั้เชื้อ. - Cleaning Torch, Injector, Chamber - Detector calibration. - Torch view alignment. - Wavelength Calibration ; Pass 		
Start Date	End Date	Work Description
23/06/2022	23/06/2022	
23/06/2022	23/06/2022	
29/06/2022	29/06/2022	
29/06/2022	29/06/2022	

Tools Used					
Quantity	Calibrated Tool	Description	Serial Number	Last Calibration Date	Next Calibration Date
*** No Calibrated Tools Used ***					

Material Used				
Part Number	Part Description	Note	Lot/Serial Number	Quantity
*** No Parts Used ***				

Labour Details				
Part Number	Part Description	Start Date	Quantity	
SV000013	Preventative maintenance	23/06/2022	6	
SV000002	Service Travel	23/06/2022	1	
SV000013	Preventative maintenance	29/06/2022	4	
SV000002	Service Travel	29/06/2022	2	

Work Complete		Customer Signature	Technician Signature
Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>
PM/OQ/IPV Left with Customer		S. Suwanwike	Chayamank
Yes	<input type="checkbox"/>		

	Please Date and Sign	29/6/2565 Kanan, Chayanana
--	----------------------	----------------------------

Terms & Conditions
Customer Acknowledgment of receipt of the above repair / replacement.
Special Terms and Conditions: This is not an invoice.
Taxes will be applied to your invoice if applicable.



Certificate of Calibration



Equipment: SPECTROPHOTOMETER
Model: SP-2100
Serial No. (or ID.): KJOG05083001 (MET-SP 01/46)
Manufacturer: Spectrum
Condition: In Condition

Certificate No.: C06220514
Issued Date: 17 October 2022
Job No.: KSPR2212976
Page: 1 of 2

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

Environment Condition: Temperature 23.9 °C ± 0.2 °C
Humidity 60.5 %RH ± 1.8 %RH

Calibration Place: M E T CO.,LTD. (Laboratory Room)
36/659 Moo 6, Tambol Bangrakpattana,
Amphur Bangbuathong, Nonthaburi 11110 Thailand

Calibration By: Mr. Atachai Ngamchanat
Calibration Date: 17 October 2022
The Method used: In house method, CAL-WI-24, base on ASTM E 275-08 and ASTM E 387-04
Traceability: This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Sarna Scientific Limited.

The standard for Wavelength Certificate No. 103124 and 103123
The standard for Photometric Certificate No. 9112739

(Mr. Atachai Ngamchanat)
Person in charge

(Mr. Thalerngkeat Pongngam)
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ($k=2$) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

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Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C06-15: 12 Sep 2022



Certificate No.: C06220514

Page 2 of 2

Calibration Results:

Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 4 nm and UUC at 4 nm

Standard Wavelength	Unit Under Calibration	Correction	Uncertainty
334.22	334	0.22	0.59
418.48	419	-0.52	0.59
536.90	537	-0.10	0.59
637.94	638	-0.06	0.59
748.28	748	0.28	0.59
879.70	879	0.70	0.59

Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.2899	0.287	0.0029	0.0045
	0.5170	0.514	0.0030	0.0045
	1.0286	1.026	0.0026	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.2837	0.280	0.0037	0.0045
	0.5074	0.505	0.0024	0.0045
	1.0071	1.005	0.0021	0.0045
465 nm	0.0000	0.000	0.0000	0.0045
	0.2487	0.246	0.0027	0.0045
	0.4593	0.457	0.0023	0.0045
	0.9322	0.929	0.0032	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.2434	0.241	0.0024	0.0045
	0.4649	0.462	0.0029	0.0045
	0.9457	0.941	0.0047	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.2570	0.256	0.0010	0.0045
	0.5035	0.502	0.0015	0.0045
	1.0022	0.999	0.0032	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.2560	0.255	0.0010	0.0045
	0.4968	0.495	0.0018	0.0045
	0.9713	0.969	0.0023	0.0045

The End of Certificate

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CAL-FM-C06-15: 12 Sep 2022



ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: KSPR2212976

ชนิดเครื่องมือ: SPECTROPHOTOMETER

รุ่น: SP-2100

หมายเลขเครื่อง: KJ0G05083001

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
17 Oct 2022			17 Oct 2022		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ซ่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตช์ ปิด – เปิด เครื่อง (On-Off Switch)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		Spectrophotometer			
<input type="checkbox"/>	<input type="checkbox"/>	6. แรงดันไฟฟ้า (Battery Backup) >= 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. ช้องวัดหลายตัวอย่าง (Carousel Module)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		pH Meter and Conductivity Meter			
<input type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด (Electrode and Connection Cable)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาจับอิเล็กโทรด (Stand)	<input type="checkbox"/>	<input type="checkbox"/>	
		Turbidimeter			
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่น้อย 3.0)	<input type="checkbox"/>	<input type="checkbox"/>	
		Automatic titrator			
<input type="checkbox"/>	<input type="checkbox"/>	18. สภาพ Piston Burettes	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	<input type="checkbox"/>	<input type="checkbox"/>	

เพิ่มเติม/ขอแนะนำ :

Mr. Atachai Ngamchanat

Service Engineer

CAL

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NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 65-400424-3

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. : YPR0659S-141200060R

ID No. : MET-RE03/59

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

Ambient Temperature : (29.8 to 31.5) °C

Relative Humidity : (55 to 58) %

Line Voltage : (220.8 to 222.8) V

Date of Received : 10 August 2022

Date of Calibration : 10 August 2022

Date of Issue : 13 August 2022

Calibrated by : Bunjerd Masri

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 65-400157-1 02 Oct 2022 National Institute of Metrology Thailand (NIMT)

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 65-400424-3

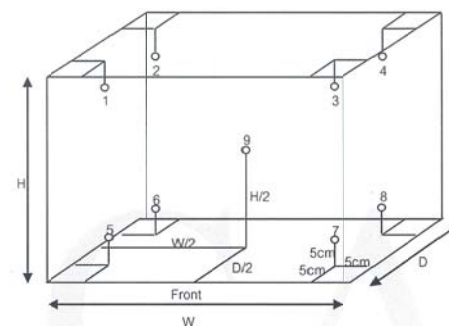
Page : 2 of 2

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 m

D = 0.60 m

H = 1.45 m

Capacity = 0.50 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	
3	2	2	3.7	3.7	4.0	3.7	3.0	3.5	2.8	3.4	2.9	0.84

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
3	2	2	1.2	0.2	1.5

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%

- oOo -

B



CAL-F0031-03

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Certificate of Calibration

Certificate No. : 65-420102-1

Page : 1 of 2

Submitted by : M E T Company Limited

36/559 Moo 6, T.Bangrakpattana, A.Bangbuatong, Nonthaburi 11110

Equipment : pH Meter with electrode

pH meter

Manufacturer : Horiba

Model : LAQUA-PH210

Range : -2.00 to 16.00 pH

Resolution : 0.01 pH

Serial No. : HA0E0012

ID No. : MET-PH07/64

Electrode

Model : 9652

Serial No. : 992G0181

Environment : Ambient Temperature : (25 ± 2) °C

Relative Humidity : (50 ± 15) %

Date of Received : 26 November 2022

Date of Calibration : 30 November 2022

Date of Issue : 30 November 2022

Calibrated by : Pempon Chanpu

Calibration Method : In-house method CAL-M4201 direct measurement by using standard voltage calibrator and using certified reference material (CRM)

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

1. Multiproduct Calibrator

ID No. Cert. No. Due Date Traceability

440001 21E997 17 Mar 2023 National Institute of Metrology Thailand (NIMT)

2. Standard Buffer Solution

pH Cert. No. Lot No. Exp. Date Traceability

4.008 61235182 833447 19 Aug 2024 CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

6.985 61255708 833449 19 Aug 2023 CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

10.008 61244986 833448 19 Aug 2023 CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

Approved by :

(Bunjerd Masri)

Supervisor

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Certificate of Calibration

Certificate No. : 65-420102-1

Page : 2 of 2

Result of Calibration :

UUC Condition As-Received : Good

Function : Electrical measurement

pH meter

Performing standard curve by Multiproduct Calibrator at pH (4,7,10)

Adjustment Curve at nominal pH	Applied Voltage (mV)	Nominal Value (pH)	UUC Reading		Correction (mV)	Uncertainty (± mV)
			(pH)	(mV)		
4, 7, 10	177.4800	4	4.00	177.4	0.1	0.060
	0.0000	7	7.00	-0.1	0.1	0.060
	-177.4800	10	10.00	-177.5	0.0	0.060

Function : pH meter with electrode

Performing a three - buffer standard curve using buffer nominal pH (4,7,10)

Adjustment Curve at nominal pH	Standard Buffer (pH)	UUC Reading (pH)	Correction (pH)	Uncertainty (± pH)
4, 7, 10	4.008	4.01	0.00	0.0097
	6.985	7.00	-0.01	0.011
	10.008	10.01	0.00	0.014

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%

- o0o -

(Signature)



CAL-F0031-03

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Certificate of Calibration

Certificate No. : 65-400424-1 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 : (27.0 to 28.0) °C
Relative Humidity : (50 to 55) %
Line Voltage : (210.0 to 210.8) V

Date of Received : 10 August 2022

Date of Calibration : 10 August 2022

Date of Issue : 13 August 2022

Calibrated by : Permpoon Chanpu

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 & 400032	65-400274-1	25 Nov 2022	National Institute of Metrology Thailand (NIMT)

Approved by :
(Bunjerd Masri)
Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 65-400424-1

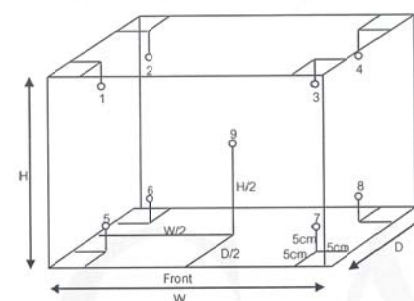
Page : 2 of 2

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	181.2	181.3	180.6	180.4	179.9	181.0	179.5	179.1	180.0	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	1.4	0.3	2.5

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 -



CAL-F0031-03

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Certificate of Calibration

Certificate No. : 65-400424-2

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 : (27.0 to 28.0) °C

Relative Humidity : (50 to 55) %

Line Voltage : (210.0 to 210.8) V

Date of Received : 10 August 2022

Date of Calibration : 10 August 2022

Date of Issue : 13 August 2022

Calibrated by : Permon Chanpu

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 65-400272-1

24 Nov 2022

National Institute of Metrology Thailand (NIMT)

Approved by :

(Bunjerd Masri)

Supervisor

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Certificate of Calibration

Certificate No. : 65-400424-2

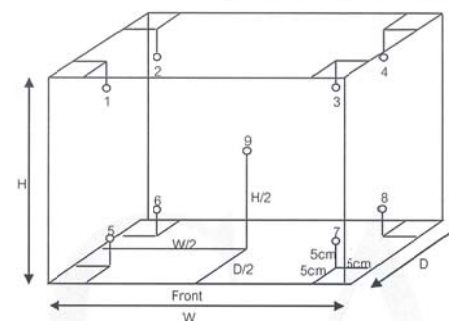
Page : 2 of 2

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	104.7	105.0	104.4	104.5	104.0	103.7	104.2	0.95
180	184	184	180.8	182.0	179.4	180.8	180.8	180.8	180.3	180.0	180.0	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	1.7
180	184	184	2.3	0.3	3.0

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%

- oOo -



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Certificate of Calibration

Certificate No. : 65-300143-1

Page : 1 of 2

Submitted by : M E T Company Limited

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

Equipment : Volumetric Flask

Manufacturer : PYREX

Class : A

Capacity : 100 ml

ID No. : MET-VF100-01/64

Environment : Ambient Temperature : (23 ± 2) °C

Relative Humidity : (50 ± 15) %

Air Pressure : 1001.5 mbar.

Date of Received : 09 March 2022

Date of Calibration : 15 March 2022

Date of Issue : 15 March 2022

Calibrated by : Wipa Tovadee


Calibration Method : In-house method CAL-M3001 based on ASTM E 542-01

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

Electronic Balance

ID No.	Cert. No.	Due Date	Traceability
241003	64-200354-2	02 Jun 2022	National Institute of Metrology (Thailand) (NIMT)

Approved by :


(Wipa Tovadee)
Supervisor

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Certificate of Calibration

Certificate No. : 65-300143-1

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

Nominal Volume (ml)	Measuring Volume (ml)
100	100.043

Uncertainty of measurement with in \pm 0.018 ml

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 $k = 2.00$, providing a level of confidence of approximately 95%

- oOo -





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Certificate of Calibration

Certificate No. : 65-300143-2

Page : 1 of 2

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

Equipment : Volumetric Pipette
Manufacturer : HBG Class : A
Capacity : 10 ml
ID No. : MET-VP10:02/61

Environment : Ambient Temperature : (23 ± 2) °C
Relative Humidity : (50 ± 15) %
Air Pressure : 1004.1 mbar.

Date of Received : 09 March 2022

Date of Calibration : 15 March 2022

Date of Issue : 15 March 2022

Calibrated by : Wipa Tovadee

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-01

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

Electronic Balance

ID No.	Cert. No.	Due Date	Traceability
241003	64-200354-2	02 Jun 2022	National Institute of Metrology (Thailand) (NIMT)

Approved by :

(Wipa Tovadee)

Supervisor

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Certificate of Calibration

Certificate No. : 65-300143-2

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

Delivery Time : 10.70 sec.

Nominal Volume (ml)	Measuring Volume (ml)
10	9.9960

Uncertainty of measurement with in \pm 0.0038 ml

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 $k = 2.00$, providing a level of confidence of approximately 95%

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Certificate of Calibration

Certificate No. : 65-300143-3

Page : 1 of 2

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

Equipment : Volumetric Pipette
Manufacturer : HBG Class : A
Capacity : 20 ml
ID No. : MET-VP20:05/61

Environment : Ambient Temperature : (23 ± 2) °C
Relative Humidity : (50 ± 15) %
Air Pressure : 1003.8 mbar.

Date of Received : 09 March 2022

Date of Calibration : 15 March 2022

Date of Issue : 15 March 2022


Calibrated by : Wipa Tovadee

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-01

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

Electronic Balance

ID No.	Cert. No.	Due Date	Traceability
241003	64-200354-2	02 Jun 2022	National Institute of Metrology (Thailand) (NIMT)

Approved by : 
(Wipa Tovadee)
Supervisor

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Certificate of Calibration

Certificate No. : 65-300143-3

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

Delivery Time : 11.52 sec.

Nominal Volume (ml)	Measuring Volume (ml)
20	20.0797

Uncertainty of measurement with in \pm 0.0064 ml

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 $k = 2.00$,
providing a level of confidence of approximately 95%

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Certificate of Calibration

Certificate No. : 65-300143-4

Page : 1 of 2

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

Equipment : Volumetric Pipette
Manufacturer : HBG **Class :** A
Capacity : 25 ml
ID No. : MET-VP25:04/61

Environment : Ambient Temperature : $(23 \pm 2) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$
Air Pressure : 1003.6 mbar.

Date of Received : 09 March 2022

Date of Calibration : 15 March 2022

Date of Issue : 15 March 2022

Calibrated by : Wipa Tovadee


Calibration Method : In-house method CAL-M3001 based on ASTM E 542-01

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

Electronic Balance

ID No.	Cert. No.	Due Date	Traceability
241003	64-200354-2	02 Jun 2022	National Institute of Metrology (Thailand) (NIMT)

Approved by :


(Wipa Tovadee)
Supervisor

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Certificate of Calibration

Certificate No. : 65-300143-4

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at $20 ^\circ\text{C}$

UUC Condition As-Received : Good

Delivery Time : 15.08 sec.

Nominal Volume (ml)	Measuring Volume (ml)
25	24.8956

Uncertainty of measurement with in ± 0.0066 ml

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 $k = 2.00$, providing a level of confidence of approximately 95%

- o0o -





CAL-F0031-03

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Calibratech Co.,Ltd.

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Certificate of Calibration

Certificate No. : 65-300143-5

Page : 1 of 2

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

Equipment : Measuring Pipette
Manufacturer : KIMAX
Capacity : 10 ml Graduation : 0.1 ml
ID No. : MET-MP10:01-61

Environment : Ambient Temperature : $(23 \pm 2) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$
Air Pressure : 1003.5 mbar.

Date of Received : 09 March 2022

Date of Calibration : 15 March 2022

Date of Issue : 15 March 2022

Calibrated by : Wipa Tovadee


Calibration Method : In-house method CAL-M3001 based on ASTM E 542-01

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

Electronic Balance

ID No.	Cert. No.	Due Date	Traceability
241003	64-200354-2	02 Jun 2022	National Institute of Metrology (Thailand) (NIMT)

Approved by :


(Wipa Tovadee)
Supervisor

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Certificate of Calibration

Certificate No. : 65-300143-5

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at $20 ^\circ\text{C}$

UUC Condition As-Received : Good

Delivery Time : 1.64 sec.

Nominal Volume (ml)	Measuring Volume (ml)
2	2.0335
5	5.1133
10	10.1418

Uncertainty of measurement with in ± 0.0039 ml

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 $k = 2.00$,
providing a level of confidence of approximately 95%

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CAL-F0031-03

CAL

Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukhaprachasan 3 Rd., Bangpood, Pakkred, Nonthaburi 11120

Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.cal@yahoo.com, calibratech.cal@hotmail.com



Certificate of Calibration

Certificate No. : 65-300143-6

Page : 1 of 2

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

Equipment : Measuring Pipette
Manufacturer : KIMAX
Capacity : 10 ml Graduation : 0.1 ml
ID No. : MET-MP10:01-64

Environment : Ambient Temperature : (23 ± 2) °C
Relative Humidity : (50 ± 15) %
Air Pressure : 1002.6 mbar.

Date of Received : 09 March 2022

Date of Calibration : 15 March 2022

Date of Issue : 15 March 2022

Calibrated by : Wipa Tovadee


Calibration Method : In-house method CAL-M3001 based on ASTM E 542-01

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

Electronic Balance

ID No.	Cert. No.	Due Date	Traceability
241003	64-200354-2	02 Jun 2022	National Institute of Metrology (Thailand) (NIMT)

Approved by :


(Wipa Tovadee)
Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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CAL-F0031-03

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Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukhaprachasan 3 Rd., Bangpood, Pakkred, Nonthaburi 11120

Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.cal@yahoo.com, calibratech.cal@hotmail.com

Certificate of Calibration

Certificate No. : 65-300143-6

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

Delivery Time : 1.51 sec.

Nominal Volume (ml)	Measuring Volume (ml)
2	5.0785
5	2.0338
10	10.0125

Uncertainty of measurement with in ± 0.0039 ml

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 $k = 2.00$,
providing a level of confidence of approximately 95%

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CAL-F0031-03

CAL

Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukhaphrachasan 3 Rd., Bangpood, Pakkred, Nonthaburi 11120

Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.cal@yahoo.com, calibratech.cal@hotmail.com



NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 65-400566-1

Page : 1 of 2

Submitted by :

M E T Company Limited

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

Equipment :

Digital Thermometer with Thermistor probe

Temperature Indicator

Manufacturer : Hanna

Model : HI8424

Range : N/A °C

Resolution : 0.1 °C

Serial No. : 06160185101

ID No. : MET-pH08/64

Thermistor probe

Model : HI7662

Sheath Material : Stainless

Diameter : 3 mm.

Length : 115 mm.

Serial No. : 08150D5N

ID No. : MET-pH08/64

Environment :

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

Ambient Temperature : (25.5 to 26.4) °C

Relative Humidity : (54 to 58) %

Line Voltage : (224.5 to 225.0) VAC

Date of Received :

09 November 2022

Date of Calibration :

09 November 2022

Date of Issue :

12 November 2022

Calibrated by :

Bunjerd Masri

Calibration Method : This instrument was calibrated by In-house method comparison technique CAL-M4003

by compared with PRT in the dry-well calibrator 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

400002 TT-0074-22 20 Jun 2024 National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID No. Cert. No. Due Date Traceability

400033 22E569 22 Feb 2024 National Institute of Metrology Thailand (NIMT)

Approved by :

(Bunjerd Masri)
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.



CAL-F0031-03

CAL

Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukhaphrachasan 3 Rd., Bangpood, Pakkred, Nonthaburi 11120

Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.cal@yahoo.com, calibratech.cal@hotmail.com

Certificate of Calibration

Certificate No. : 65-400566-1

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)
115	10.006	9.9	0.1	0.19
115	30.005	30.0	0.0	0.19
115	50.007	50.0	0.0	0.19

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%

- 000 -

(Bunjerd Masri)



CAL-F0031-03



National Institute of Metrology (Thailand)

Certificate of Calibration

Certificate No. : AA-2018-22
Issued by : Acoustics Laboratory
Acoustics and Vibration Group



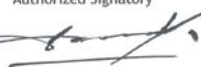

Page 1 of 5 pages

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 : 28 September 2022

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
AUVC844-01/22	29 September 2022	 (Dr. Charun Yafa)	 (Sawitri Srisatjarak)

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



National Institute of Metrology (Thailand)

NIMT
Continuation of Certificate of Calibration Number AA-2018-22

Page 2 of 5 pages

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%
1.Sound Pressure level	0.08	0.15
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
 (100.313 ± 0.014) kPa, (22.0 ± 0.3) °C and (57.0 ± 2.1) %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 94 dB.



MEASUREMENT RESULTS

1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)*	Deviated value ^[1] (dB)	Acceptance Limit (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.

2. Frequency*

Specified Frequency (Hz)	Measured value (Hz)	Deviated value ^[2] (%)	Acceptance Limit (%)
At the sound pressure level of 94 dB			
1000	1000.0	0.0	0.7

Note ^[2] : The deviated value is the absolute value of the difference in percent between the measured value and the corresponding specified frequency.



3. Total distortion + Noise*

Microphone 4180 Serial No.1395446

Measured value ^[3] (%)	Maximum total distortion + Noise (%)
At the sound pressure level of 94 dB	
0.2	2.5

Note ^[3]: The measured value is the total distortion, measured over the frequency range from 20 Hz to 20 kHz. The measured value must not exceed the maximum total distortion + noise appeared in the table.

End of Certificate of Calibration

NIMT





69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 คู่มือสาย www.สอบเทียบเครื่องมือวัด.com

Page : 3 of 3

Function : @1kHz

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (\pm)
	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

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (\pm)
	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

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (\pm)
	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

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.

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 : SPR22020311-7

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 : N/A

Environmental Conditions

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

Received Date : 18 Feb 2022

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

Calibration Date : 21 Feb 2022

Location of Calibration : In-Lab

Recommend Due Date : 21 Feb 2023

Calibration Procedure : SP-CPE-04-01

Date of Issue : 22 Feb 2022

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 : Mr.Chumpon Dckpikul

Calibration Officer

Approved by :

(Mr.Worapong Sinthusopa)

Authorized Signatory

SP-FM-04-15 rev.0



Calibration Report

Certificate Number : SPR22020311-7

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 2022

Traceability

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

TISTR - Thailand Institute of Scientific and Technological Research

SP-FM-04-15 rev.0



SP-FM-04-15 rev.0



SP-FM-04-15 rev.0



Result of Calibration

Certificate No. : SPR22020311-1

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	93.9	93.9	-0.1	-0.1	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select Z

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

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 Number : SPR22020311-3 Page : 1 of 3

Customer : MET CO.,LTD.
36/659 Moo.6 Tambol Bangregpattana, Amphur Bangbuatong,
Nonthaburi 11110

Equipment Name : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial Number : 222070

ID. Number : N/A

Environmental Conditions

Ambient Temperature	: 23 °C ± 3 °C	Received Date	: 18 Feb 2022
Relative Humidity	: 50 % ± 15 %	Calibration Date	: 21 Feb 2022
Location of Calibration	: In-Lab	Recommend Due Date	: 21 Feb 2023
Calibration Procedure	: SP-CPE-04-01	Date of Issue	: 22 Feb 2022

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 : Mr. Surasak Vakjan

Calibration Officer

Approved by :

(Mr.Worapong Sinthusopa)

Authorized Signatory

SP-FM-04-15 rev.0



Certificate Number : SPR22020311-3 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 2022

Traceability

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

SP-FM-04-15 rev.0



Result of Calibration

Certificate No. : SPR2020311-3

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	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	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-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	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 Number : SPR22020311-10 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	: N/A

Environmental Conditions

Ambient Temperature	: 23 °C ± 3 °C	Received Date	: 18 Feb 2022
Relative Humidity	: 50 % ± 15 %	Calibration Date	: 21 Feb 2022
Location of Calibration	: In-Lab	Recommend Due Date	: 21 Feb 2023
Calibration Procedure	: SP-CPE-04-01	Date of Issue	: 22 Feb 2022

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 : Mr.Chumpon Dokpikul

Calibration Officer

Approved by :

(Mr.Worapong Sinthusopa)

Authorized Signatory

SP-FM-04-15 rev.0



Certificate Number : SPR22020311-10 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 2022

Traceability

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

SP-FM-04-15 rev.0

