

ใบสอบเทียบเครื่องมือวิเคราะห์
เครื่องมือตรวจวัดคุณภาพสิ่งแวดล้อม (ภาคสนาม)
การตรวจวัดคุณภาพอากาศจากปล่องระบาย

Envi Equipment Service Co., Ltd.

110/254 Moo 3, Tumbon Bang Rak Phatthana, Amphur Bang Bua Thong, Nonthaburi 11110

Tel. 098 362 9152, 089 478 7885

E-mail: sales@envi-ees.com

Certificate No. : E21-0813

Page : 1 of 6

CERTIFICATE OF CALIBRATION

Customer : United Analyst and Engineering Consultant Co., Ltd.

Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

Description of Equipment : Console meter

Manufacturer : Apex Instrument

Model Number : XC-572-V

Serial Number : 0807047

ID./Control No. : -

Environment Conditions : Temperature (25 ± 2) °C
: Humidity (50 ± 15) % RH

Cal. Date : 19/08/2021

Issue Date : 19/08/2021

Calibration Method or Calibration Procedure Used

US EPA Method (United State Environmental Protection Agency)


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

Result of Calibration

This certificate may not be reproduced other than in full except with prior Written approval of the Technical Manager, Envi Equipment Service Company Limited.

These reported uncertainties of measurement are expanded by a coverage factor of k=2, providing a 95% confidence level

Calibrated by : Mr. Sanya Sangnil

Approved by : 
(Mr. Mana Fuekhud)
Technical Manger



เอกสารไม่ควบคุม

**METHOD 5 CONSOLE CALIBRATION
USING REFERENCE WET GAS METER W-NK-2.5-B-Z No.547425
5-POINT METRIC UNIT**

Meter Console Information	
Console Model Number	XC-572-V
Console Serial Number	0807047
DGM Model Number	SK25EX
DGM Serial Number	00003580

Calibration Conditions			
Date	Time	19/8/2021	01:00 PM
Calibration Reference No.	-		
Barometric Pressure	761.00	mm Hg	
Calibration Meter Gamma	0.999		

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 DH	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final
(Q)	(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
12.17	13.0	3.3600	3.5000	23	23	23.01236	23.15126	26	26
12.30	13.0	3.5000	3.6400	23	23	23.15126	23.28948	26	26
8.72	26.0	3.6490	3.7890	24	24	23.29826	23.43644	26	26
8.88	26.0	3.7890	3.9290	24	24	23.43644	23.57434	26	26
14.83	40.0	3.9350	4.2150	25	25	23.58012	23.85818	26	26
14.67	40.0	4.2150	4.4950	25	25	23.85818	24.13456	26	26
10.37	70.0	4.5080	4.7880	25	25	24.14158	24.41250	26	26
10.13	70.0	4.7880	5.0680	26	26	24.41250	24.68290	26	26
8.90	90.0	5.0750	5.3550	27	27	24.68856	24.96012	26	26
8.88	90.0	5.3550	5.6350	27	27	24.96012	25.23050	26	26

**METHOD 5 CONSOLE CALIBRATION
USING REFERENCE WET GAS METER W-NK-2.5-B-Z No.547425
5-POINT METRIC UNIT**

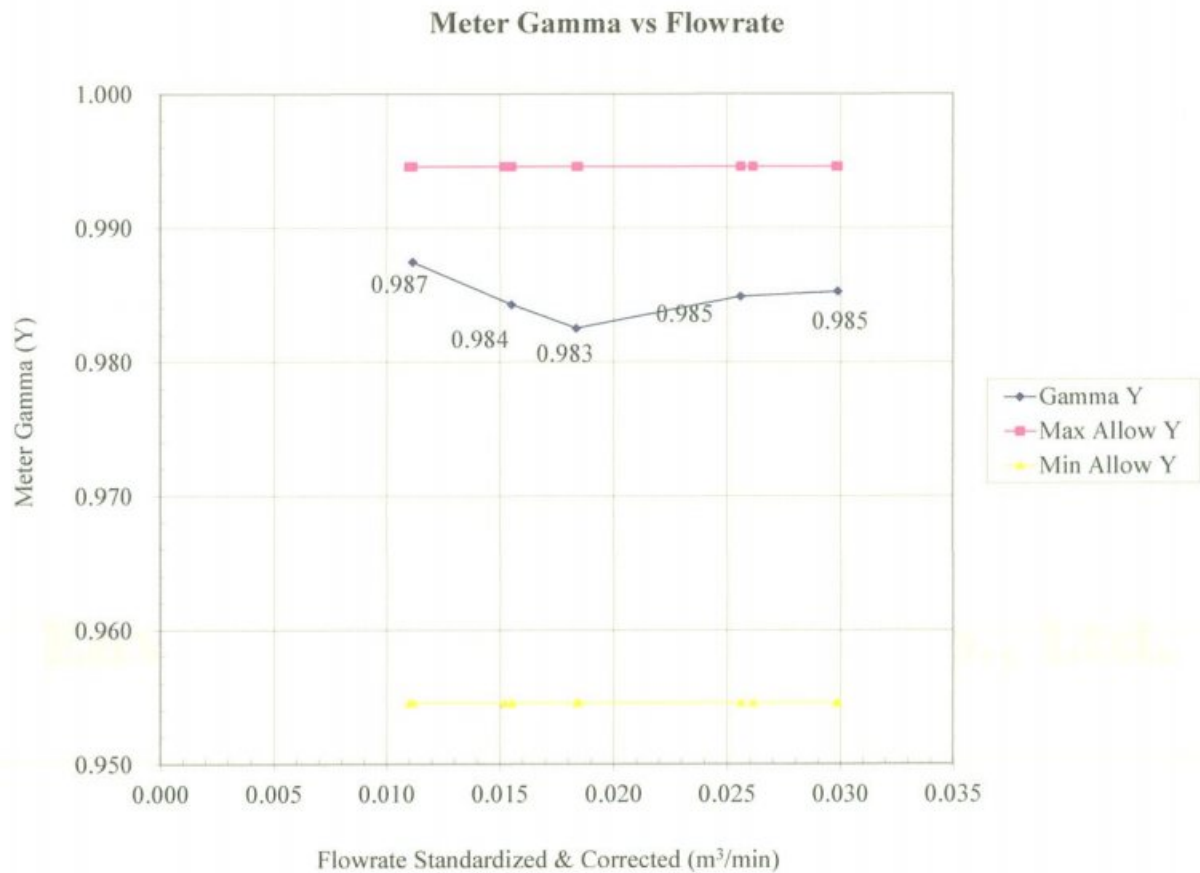
Calibration Data								
Results								
Standardized Data				Dry Gas Meter				
Dry Gas Meter		Calibration Meter		Calibration Factor		Flowrate	.0212 m ³ _{std} /min	Variation
(V _{m(std)})	(Q _{m(std)})	(V _{w(std)})	(Q _{w(std)})	Value	Variation	Std & Corr		
m ³	m ³ /min	m ³	m ³ /min	(Y)	(ΔY)	(Q _{m(std)(corr)})	(ΔH _@)	(ΔH _@)
						m ³ /min	mm H ₂ O	
0.138	0.011	0.136	0.011	0.990	0.015	0.011	46.043	-2.056
0.138	0.011	0.135	0.011	0.985	0.010	0.011	47.522	-0.577
0.138	0.016	0.135	0.016	0.984	0.009	0.016	47.880	-0.219
0.138	0.016	0.135	0.015	0.982	0.007	0.015	49.931	1.832
0.276	0.019	0.273	0.018	0.988	0.014	0.018	52.821	4.722
0.276	0.019	0.271	0.018	0.982	0.008	0.018	52.270	4.171
0.277	0.027	0.266	0.026	0.960	-0.014	0.026	47.835	-0.264
0.277	0.027	0.265	0.026	0.958	-0.016	0.026	45.881	-2.217
0.277	0.031	0.266	0.030	0.961	-0.014	0.030	45.290	-2.809
0.277	0.031	0.265	0.030	0.956	-0.018	0.030	45.515	-2.583
				0.975	Y Average		48.099	DH@ 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 .

For $\Delta H_{@}$, orifice pressure differential that equates to 0.75 cfm (0.0212 m³/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ± 0.2 inches (5.1mm) H₂O.

Calibration Date: 19-8-2021

Calibration Reference No: Ser21-0813



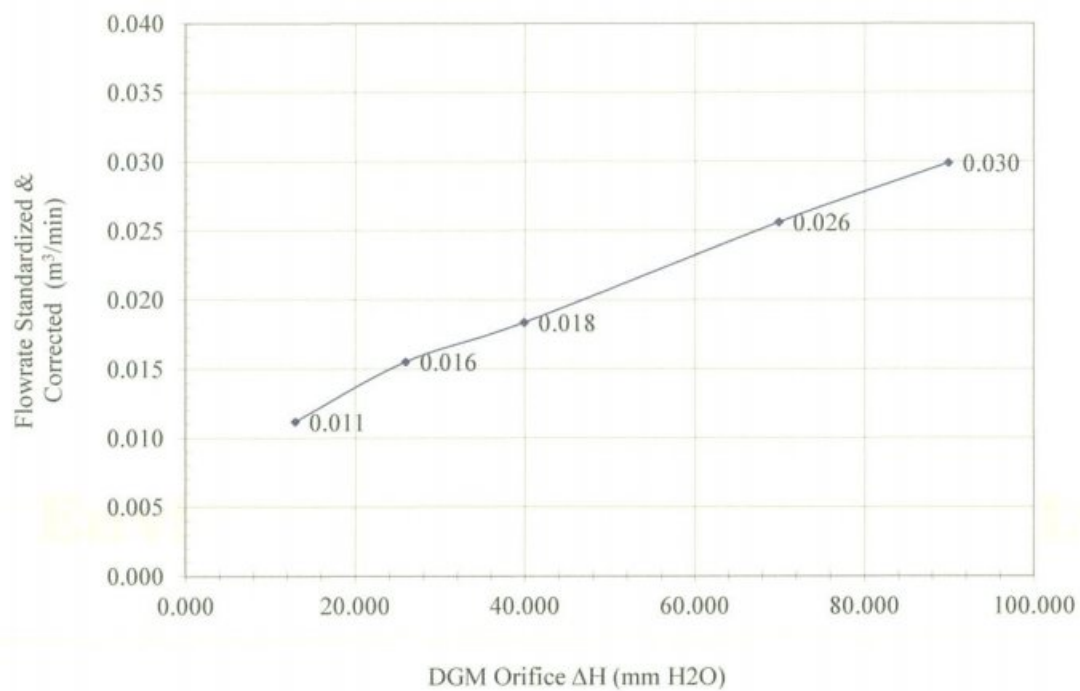
Console Serial: 0807047

Console Model: XC-572-V

Calibration Date: 19-8-2021

Calibration Reference No: Ser21-0813

Meter Pressure vs Flowrate



Console Serial: 0807047

Console Model: XC-572-V

THERMOCOUPLES SYSTEM CALIBRATION

Sampling System Equipment Information	
Console Model Number	XC-572-V
Console Serial Number	0807047
DGM Model Number	SK25EX
DGM Serial Number	00003580
Meter Box Model Number	JENCO 765 KF
Meter Box Serial Number	JC 17073

Calibration Conditions			
Date	Time	19/8/2021	03:00 PM
Calibration Reference No.			
Reference Thermometer		DIGICON	
Serial Number		183169105	

Results											
Console Thermocouple Simulator											
Channel and test point	Meter Box Channel Temperature Reading (°C)										
	-18.0	25.0	38.0	93.0	149.0	260.0	371.0	482.0	593.0	816.0	1038.0
Stack	-17.0	24.0	37.0	93.0	149.0	259.0	371.0	482.0	594.0	817.0	1040.0
Aux	-17.0	24.0	37.0	93.0	149.0						
Probe	-18.0	24.0	37.0	93.0	149.0						
Filter	-18.0	24.0	37.0	93.0	149.0						
Oven	-	-	-	-	-						
Exit	-18.0	24.0	37.0								

Tolerance Range

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

Meter ± 3.0 °C
 Exit ± 2.0 °C

Certificate No: G 640118

Date of issue : 04-Mar-21

Instrument description : Flue gas Analyzer
Instrument model : Testo 350 New
Instrument serial no. : 60899617
ID no. or control no. : UAE.EFM. 007/2560
Manufacturer : testo AG
Probe description : -
Probe model : -
Probe serial : -
Customer name : United Analyst and Engineering Consultant Co., Ltd.
Customer address : 81 Soi Udomsuk 41, Sukhumvit Rd., Bangchak, Phrakhanong, Bangkok 10260

Total pages of certificate : 3 Pages
Receiving no. : L-210518
Receiving date. : 22-Feb-21
Parameter of calibration : Gas Calibration(Oxygen 2.501,10.00,21.00 %vol, Carbon Monoxide 80.23,301.4,1002 ppm, Nitric Oxide 10.04,150.2,320.9 ppm, Sulphur Dioxide 50.28,100.5,600.0 ppm, Nitrogen Dioxide 10.20,80.37,200.8 ppm)
Condition of UUC. : Used
Ambient condition : All of the Measurment ware caried out the stabilized labotary
 Temperature : 23 ±5 °C
 Humidity : 55 ± 15 %RH
Calibration place : 17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Laksi, Bangkok 10210
Calibration procedure no. : WI-CL-28-C

The calibration certificate expanded uncertainty of measurement is stated as the standard uncertainty of measurent Multiplied by coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

This certificate is applied only to item under test Environmental condition.

This Calibration Certificate may not be reporduced other than in full except with the permission of the issuing laboratory. Calibration certificates without signature and seal not valid.

This calibration certificate documents are tracebility to national standards, which realize measurement according to the International System of Units (SI).

Date of calibration : 01-Mar-21



Mr. Kwanchai Khamdoug

Calibration Technician



Mrs. Nongluck Wongsettee

Technical Manager

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O ₂) 2.501 % Vol	2431/19	Linde	16-Jul-23
Oxygen (O ₂) 10.00 % Vol	2453/19	Linde	18-Jul-23
Oxygen (O ₂) 21.00 % Vol	2426/19	Linde	16-Jul-23
Carbon monoxide (CO) 80.23 ppm	2396/19	Linde	15-Jul-21
Carbon monoxide (CO) 301.4 ppm	2397/19	Linde	16-Jul-21
Carbon monoxide (CO) 1002 ppm	2424/19	Linde	17-Jul-21
Nitric Oxide (NO) 10.04 ppm	2448/19	Linde	17-Jul-21
Nitric Oxide (NO) 150.2 ppm	2309/19	Linde	07-Jul-21
Nitric Oxide (NO) 320.9 ppm	2433/19	Linde	16-Jul-21
Sulphur Dioxide (SO ₂) 50.28 ppm	2410/19	Linde	21-Jul-21
Sulphur Dioxide (SO ₂) 100.5 ppm	2400/19	Linde	18-Jul-21
Sulphur Dioxide (SO ₂) 600.0 ppm	2398/19	Linde	16 Jul 21
Nitrogen Dioxide (NO ₂) 10.20 ppm	2929/19	Linde	27-Aug-21
Nitrogen Dioxide (NO ₂) 80.37 ppm	2379/19	Linde	14-Jul-21
Nitrogen Dioxide (NO ₂) 200.8 ppm	2347/19	Linde	10-Jul-21

Measured room conditions

Temperature : 23 °C Humidity : 46.5 %RH Pressure : 1015.1 mbar

Calibration conditions

Gas Temperature : 23 °C Flow rate : 1,100 ml/min Gas pressure : 1021.6 mbar

Calibration Results Before Adjustment (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O ₂ (%Vol)	2.501	2.46	-0.041	0.20
O ₂ (%Vol)	10.00	9.92	-0.08	0.40
O ₂ (%Vol)	21.00	21.17	0.17	0.80
CO (ppm)	80.23	66	-14.23	2.8
CO (ppm)	301.4	247	-54.4	11
CO (ppm)	1002	836	-166	34
NO (ppm)	10.04	7	-3.04	3.0
NO (ppm)	150.2	150	-0.2	5.0
NO (ppm)	320.9	312	-8.9	10
SO ₂ (ppm)	50.28	51	0.72	5.0
SO ₂ (ppm)	100.5	101	0.5	5.0
SO ₂ (ppm)	600.0	606	6.0	14
NO ₂ (ppm)	10.20	9.1	-1.10	1.5
NO ₂ (ppm)	80.37	72.4	-7.97	5.0
NO ₂ (ppm)	200.8	189.2	-11.6	5.0

Calibration Results After Adjustment (Table 3)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O2 (%Vol)	2.501	2.46	-0.041	0.20
O2 (%Vol)	10.00	9.92	-0.08	0.40
O2 (%Vol)	21.00	21.17	0.17	0.80
CO (ppm)	80.23	79	-1.23	2.8
CO (ppm)	301.4	299	-2.4	11
CO (ppm)	1002	1004	2	34
NO (ppm)	10.04	7	-3.04	3.0
NO (ppm)	150.2	150	-0.2	5.0
NO (ppm)	320.9	312	-8.9	10
SO2 (ppm)	50.28	51	0.72	5.0
SO2 (ppm)	100.5	101	0.5	5.0
SO2 (ppm)	600.0	606	6.0	14
NO2 (ppm)	10.20	11.2	1.00	1.5
NO2 (ppm)	80.37	81.2	0.83	5.0
NO2 (ppm)	200.8	201.9	1.1	5.0

Remark : 1 cmol/mol = 1 %vol. , 1 μmol/mol = 1 ppm.

ใบสอบเทียบเครื่องมือวิเคราะห์

เครื่องมือทางห้องปฏิบัติการวิเคราะห์

(เครื่องมือสำหรับวิเคราะห์คุณภาพอากาศ)



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES

534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

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

Cert.No.: 21TW170

Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : Pro 20i
Serial No. : 18K104053
ID No. : UAE.EFM.066/2562 (ENV.DO.01/62)
Received Date : 04 August 2021
Test Date : 18 August 2021
Reference : 2108-0109WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260
Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method
Tested by : Walalak Sirithean

Approved by :

Approved Signatory

- (☒) Malee Butkruea
(☐) Saithip Meangmai
(☐) Warakorn Lerngagtrakul

Issue Date :

23 August 2021



Cert.No.: 21TW170

Page.: 2 of 2

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: 18K100663

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.26	8.26	0.0055

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-07 FAX. 0-2719-9484



Cert. No.: 21TM1443

Page.: 1 of 2

Certificate of Calibration

Equipment : DO Meter with Sensor

Manufacturer : YSI

Model : Pro 20i

Serial No. : 18K104053

ID No. : UAE.EFM.066/2562 (ENV.DO.01/62)

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location : TPA On Site Calibration Laboratory

Received Order : 4 August 2021

Calibrated Date : 20 August 2021

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

AC Line Voltage : (220 ± 22) V

Calibrated by : Khit Rutanaprapachai

Approved by :


Approved Signatory

- () Pornthippa Tameyakul
(☒) Ma ee Butkruea
() Suwit Imjai

Issue Date : 25 August 2021

The Uncertainties are for a confidence probability of approximately 95%

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

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A 005444



Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2108-0109WSC-2

Cert. No.: 21TM1443

Page.: 2 of 2

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Digital Thermometer	1502A	A52847	2011246	14 Oct 2021

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

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

Result of Calibration :- (°) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 18K100663

<u>Calibration Point</u> (°C)	<u>Immersion Depth</u> (mm)	<u>Standard Temperature</u> (°C)	<u>UUC* Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> (± °C)	<u>Coverage Factor</u> <i>k</i>
25.0	100	25.006	24.9	-0.106	0.16	2.00
30.0	100	30.004	29.9	-0.104	0.16	2.00
35.0	100	35.006	34.9	-0.106	0.16	2.00

UUC* : Unit Under Calibration

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

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Malu

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a 1008165



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



Cert.No.: 21CH528

Page.: 1 of 3

Certificate of Calibration

Equipment :	pH Meter
Manufacturer :	Horiba
Model :	LAQUA-PH210
Serial No. :	HA9M0047
ID No. :	UAE.EFM.005/2563(EFM.pH.05/63)
Condition As-Received:	Used Item
Received Date :	19 April 2021
Calibration Date :	21 April 2021
Reference :	2104-0380WSC-5
Submitted by :	United Analyst and Engineering Consultant Co.,Ltd. 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Ambient Temperature :	(25 ± 2.5) °C
Relative Humidity :	(50 ± 15) %
Calibration Procedure :	In - house method : - CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM) - CP-CH8 by comparison with standard thermometer

Calibrated by : Warakorn Lerngagtrakul

Approved by :

Malee

Approved Signatory

- ☒ Malee Butkruea
☐ Saithip Meangmai
☐ Warakorn Lerngagtrakul

Issue Date : 26 April 2021

The Uncertainties are for a confidence probability of approximately 95%

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

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Cert.No.: 21CH528

Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument : -

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Document Process Calibrator	1385032	130RC022	20E4213	24 Nov 2021
2) Ref. Standard Thermometer	2188080	130RC044	20I1389	19 Nov 2021

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

- Traceable to National Institute of Metrology (Thailand), NIMT

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

<u>Buffer Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
pH 4.008	CPA chem	706694	06 Sep 2022
pH 6.985	CPA chem	722285	19 Dec 2021
pH 10.012	CPA chem	722287	19 Dec 2021

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

Calibration Results

Function : mV Measurement

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

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor k
			mV	pH		
pH Meter S/N.: HA9M0047	4.00	177.48	177.4	4.01	0.058	2.00
	7.00	0.00	0.0	7.02	0.058	2.00
	7.00	0.00	0.0	7.02	0.058	2.00
	10.00	-177.48	-177.4	10.01	0.058	2.00

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Cert.No.: 21CH528

Page.: 3 of 3

Calibration Results**Function : pH Measurement**

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (±)	Coverage factor <i>k</i>
pH Electrode S/N.: 999M0135	4.008	4.01	154.4	0.0085	2.05
	6.985	7.01	-18.0	0.011	2.00
	6.985	7.00	-17.8	0.0093	2.00
	10.012	10.01	-190.4	0.013	2.00

Function : Temperature Measurement**(*) Without adjustment**

This equipment was connected with Temperature Probe;

- Model : 9652
- Serial No. : 999M0135

Dimension of probe;

- Length : 90 mm.
- Diameter : 15 mm.
- Immersion Depth : 90 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor <i>k</i>
25.0	25.001	25.0	-0.001	0.20	2.00
30.0	30.006	30.0	-0.006	0.20	2.00
35.0	35.001	35.0	-0.001	0.20	2.00

Remark : - UUC* = Unit Under Calibration

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

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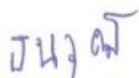
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CERTIFICATE OF CALIBRATION

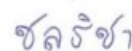
Certificate No. : SP21-015

Page 1 of 5

Customer : United Analyst and Engineering Consultant Co.,Ltd. (Head Office)**Address :** 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260**Location of calibration** Laboratory 315**Equipment :** Spectrophotometer**Manufacturer :** Agilent Technologies**Model :** Cary 60**Serial No. :** MY15410009**ID No. :** N/A**Received Date :** 29 May 2021**Calibration Date :** 29 May 2021**Issue Date :** 30 May 2021**Condition of Instrument :** Used**Calibrated by :**

(Mr.Tanawut Rittidach)

Technical Manager

Approved by :

(Miss Chonthicha Sangngern)

Quality Manager

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the DQE Services Co., Ltd.

REPORT OF CALIBRATION

Certificate No. : SP21-015

Page 2 of 5

Environment Condition : Ambient Temperature 25 ± 5 °CRelative humidity 50 ± 15 %RH**Calibration method :** In-house method CP-01 Calibration of UV-Vis Spectrophotometer Based on ASTM E275-08**Certified Reference Materials :**

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	80102	11/7/2021
Absorbance Standard set	25757	80105	11/7/2021
Wavelength Standard set	25806	80103	11/7/2021
Wavelength Standard set	25758	80104	11/7/2021

Traceability : This certification is traceable to the International System of Unit maintained at National Institute -
of Standards and Technology (NIST) through Sarna Scientific Limited

Spectral Band Width of UUC : 1.5 nm.**Scan Speed of UUC :** 90 nm./min**Scan Interval of UUC :** 0.15 nm.**Resolution of UUC :** Photometric 0.0001 Abs.

Wavelength 0.1 nm.

REPORT OF CALIBRATION

Certificate No. : SP21-015

Page 3 of 5

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor <i>k</i>
241.72	242.0	-0.28	0.19	2.00
279.45	279.5	-0.05	0.19	2.00
287.81	287.9	-0.09	0.19	2.00
334.06	333.8	0.26	0.19	2.00
360.93	360.5	0.43	0.19	2.00
418.59	418.2	0.39	0.19	2.00
445.94	445.6	0.34	0.19	2.00
453.66	453.3	0.36	0.19	2.00
460.02	459.8	0.22	0.19	2.00
536.59	536.7	-0.11	0.19	2.00
637.98	638.4	-0.42	0.19	2.00
431.38	430.9	0.48	0.19	2.00
472.50	472.5	0.00	0.19	2.00
513.47	513.4	0.07	0.19	2.00
528.88	529.2	-0.32	0.19	2.00
573.17	573.5	-0.33	0.19	2.00
585.35	584.8	0.55	0.20	2.00
684.40	684.9	-0.50	0.19	2.00
740.72	740.4	0.32	0.19	2.00
748.55	749.0	-0.45	0.19	2.00
807.03	807.1	-0.07	0.19	2.00
879.28	879.4	-0.12	0.19	2.00

REPORT OF CALIBRATION

Certificate No. : SP21-015

Page 4 of 5

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor <i>k</i>
420	0.0000	0.0000	0.0000	0.0042	2.00
	0.5791	0.5767	0.0024	0.0042	2.00
	1.0488	1.0444	0.0044	0.0042	2.00
	2.1914	2.1841	0.0073	0.0092	2.00
440	0.0000	0.0001	-0.0001	0.0042	2.00
	0.5618	0.5609	0.0009	0.0042	2.00
	1.0260	1.0244	0.0016	0.0042	2.00
	2.1259	2.1192	0.0067	0.0091	2.00
465	0.0000	0.0000	0.0000	0.0042	2.00
	0.5240	0.5212	0.0028	0.0042	2.00
	0.9639	0.9632	0.0007	0.0042	2.00
	1.9788	1.9717	0.0071	0.0091	2.00
546.1	0.0000	-0.0001	0.0001	0.0042	2.00
	0.5194	0.5184	0.0010	0.0042	2.00
	0.9991	0.9991	0.0000	0.0042	2.00
	1.9970	1.9911	0.0059	0.0093	2.00
590	0.0000	0.0000	0.0000	0.0042	2.00
	0.5523	0.5517	0.0006	0.0042	2.00
	1.0810	1.0802	0.0008	0.0042	2.00
	2.0369	2.0293	0.0076	0.0092	2.00
635	0.0000	-0.0001	0.0001	0.0042	2.00
	0.5596	0.5593	0.0003	0.0042	2.00
	1.0513	1.0505	0.0008	0.0042	2.00
	1.9268	1.9217	0.0051	0.0092	2.00

REPORT OF CALIBRATION

Certificate No. : SP21-015

Page 5 of 5

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor <i>k</i>
235	0.0000	0.0001	-0.0001	0.0075	2.00
	0.7498	0.7438	0.0060	0.0075	2.00
257	0.0000	0.0000	0.0000	0.0075	2.00
	0.8712	0.8647	0.0065	0.0075	2.00
313	0.0000	0.0000	0.0000	0.0075	2.00
	0.2920	0.2900	0.0020	0.0075	2.00
350	0.0000	0.0000	0.0000	0.0075	2.00
	0.6459	0.6428	0.0031	0.0075	2.00

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k ,

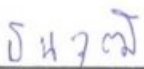
which for a normal distribution corresponds to a coverage probability of approximately 95%

- End of Certificate -

CERTIFICATE OF CALIBRATION

Certificate No. : SP21-008

Page 1 of 5

Customer : United Analyst and Engineering Consultant Co.,Ltd. (Head Office)**Address :** 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260**Location of calibration :** Laboratory 315**Equipment :** Spectrophotometer**Manufacturer :** Hitachi**Model :** U-1900**Serial No. :** 2021-064**ID No. :** UAE.WAS.006/2552**Received Date :** 25 January 2564**Calibration Date :** 25 January 2564**Issue Date :** 26 January 2564**Condition of Instrument :** Used**Calibrated by :**
(Mr.Tanawut Rittidach)

Technical Manager

Approved by :
(Miss Chonthicha Sangngern)

Quality Manager

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the DQE Services Co., Ltd.

REPORT OF CALIBRATION

Certificate No. : SP21-008

Page 2 of 5

Environment Condition : Ambient Temperature 25 ± 5 °CRelative humidity 50 ± 15 %RH**Calibration method :** In-house method CP-01 Calibration of UV-Vis Spectrophotometer Based on ASTM E275-08**Certified Reference Materials :**

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	80102	7/11/2021
Absorbance Standard set	25757	80105	7/11/2021
Wavelength Standard set	25806	80103	7/11/2021
Wavelength Standard set	25758	80104	7/11/2021

Traceability : This certification is traceable to the International System of Unit maintained at National Institute -
of Standards and Technology (NIST) through Sarna Scientific Limited

Spectral Band Width of UUC : 4.0 nm.**Scan Speed of UUC :** 200 nm./min**Scan Interval of UUC :** 0.1 nm.**Resolution of UUC :** Photometric 0.001 Abs.

Wavelength 0.1 nm.

REPORT OF CALIBRATION

Certificate No. : SP21-008

Page 3 of 5

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor <i>k</i>
241.54	240.8	0.74	0.19	2.00
279.40	278.6	0.80	0.19	2.00
288.70	287.6	1.10	0.19	2.00
334.22	333.6	0.62	0.19	2.00
361.26	360.6	0.66	0.19	2.00
418.48	418.0	0.48	0.19	2.00
446.70	445.8	0.90	0.19	2.00
453.20	452.8	0.40	0.19	2.00
460.06	459.6	0.46	0.19	2.00
536.90	536.2	0.70	0.19	2.00
637.94	637.4	0.54	0.19	2.00
440.74	440.2	0.54	0.19	2.00
472.22	471.8	0.42	0.19	2.00
513.70	513.0	0.70	0.19	2.00
528.72	528.2	0.52	0.19	2.00
574.60	574.0	0.60	0.19	2.00
585.48	584.8	0.68	0.19	2.00
684.63	684.0	0.63	0.19	2.00
740.27	739.8	0.47	0.19	2.00
748.28	747.8	0.48	0.19	2.00
807.16	806.6	0.56	0.19	2.00
879.70	879.0	0.70	0.19	2.00

REPORT OF CALIBRATION

Certificate No. : SP21-008

Page 4 of 5

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor <i>k</i>
420	0.0000	0.000	0.0000	0.0042	2.00
	0.5791	0.577	0.0021	0.0042	2.00
	1.0488	1.045	0.0038	0.0042	2.00
	2.1914	2.183	0.0084	0.0092	2.00
440	0.0000	0.000	0.0000	0.0042	2.00
	0.5618	0.560	0.0018	0.0042	2.00
	1.0260	1.025	0.0010	0.0042	2.00
	2.1259	2.122	0.0039	0.0091	2.00
465	0.0000	0.000	0.0000	0.0042	2.00
	0.5240	0.522	0.0020	0.0042	2.00
	0.9639	0.965	-0.0011	0.0042	2.00
	1.9788	1.978	0.0008	0.0092	2.00
546.1	0.0000	0.000	0.0000	0.0042	2.00
	0.5194	0.519	0.0004	0.0042	2.00
	0.9991	1.001	-0.0019	0.0042	2.00
	1.9970	1.998	-0.0010	0.0092	2.00
590	0.0000	0.000	0.0000	0.0042	2.00
	0.5523	0.553	-0.0007	0.0042	2.00
	1.0810	1.082	-0.0010	0.0042	2.00
	2.0369	2.035	0.0019	0.0092	2.00
635	0.0000	0.000	0.0000	0.0042	2.00
	0.5596	0.561	-0.0014	0.0042	2.00
	1.0513	1.052	-0.0007	0.0042	2.00
	1.9268	1.925	0.0018	0.0092	2.00

REPORT OF CALIBRATION

Certificate No. : SP21-008

Page 5 of 5

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor <i>k</i>
235	0.0000	0.000	0.0000	0.0076	2.00
	0.7498	0.745	0.0048	0.0076	2.00
257	0.0000	0.000	0.0000	0.0076	2.00
	0.8712	0.864	0.0072	0.0076	2.00
313	0.0000	0.000	0.0000	0.0076	2.00
	0.2920	0.290	0.0020	0.0076	2.00
350	0.0000	0.000	0.0000	0.0076	2.00
	0.6459	0.632	0.0139	0.0076	2.00

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k ,

which for a normal distribution corresponds to a coverage probability of approximately 95%

- End of Certificate -



Certificate of Calibration

DX-120 : (Anion System ID#042)

This certificate is to verify that instrument below are calibrated

by Archemica Lab Co.,Ltd.

DX-120 S/N : 03010223

for

UAE Consultant Co.,Ltd.



Operator Signature : K. CHANNARONG

Date : Jun 10, 2021

(Mr.Channarong Khiao-un)

Test Engineer

เอกสารไม่ควบคุม

 <input checked="" type="radio"/> PASS <input type="radio"/> NOT PASS	
Remarks	
With in specification	
 Verify	 Approve

21 June 2021 June 21, 2021

E. Guil
21 June 2021

Qualification Report

IC

Model : DX-120

S/N : 03010223

WAE.AIR.005/2546

Qualification Report

**PM Check List,CM_OQ and PQ
DX-120 (ID#042)**

**For
UAE Consultant Co.,Ltd.
(1st Contract)**

Preventive Maintenance Check List

Dionex Ion Chromatography Preventive Maintenance Report

Customer Organization	Name/ Department
UAE Consultant Co.,Ltd.	K.Suwan
Engineer Name	Date
Mr.Channarong Khiao-Un	10-Jun-2021

Instrument Detail

Instrument Model	Application
DX-120	Anion
Instrument components	Serial Number
DX-120	03010223

Consumable Detail

Columns	Guard Columns	Suppressors	Concentrators	Etc.
AS22	AG22	ASRS-300 4-mm	-	-

Remark: Suppressor รั่วซึม Port จาก Eluent out ไป Reagen In และเป็น Noise แต่ยังไม่ใช้งานได้
แนะนำให้เปลี่ยน (Injection Valve เสีย ตอนนี้ใช้ External Valve)

Perform By
Archemica Lab Co.,Ltd.

K.CHANNARONG

Archemica Lab Co.,Ltd.

10/Jan/21

Date



บริษัท อาร์เคมีกา แล็บ จำกัด
ARCHEMICA LAB CO.,LTD.

Suwan

Customer

10-Jan-2021

Date

เอกสารไม่ควบคุม

General Inspection Checklist

Item	Description	Result		Action Taken	N.A.
		Pass	Fail		
1	Power line 220 Vac	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
2	Pneumatic Line	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
3	Pressure outlet 80-100 psi	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
4	Barbed fitting and tee fitting	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
5	Crimped and blocked tubing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
6	Rheodyne Valve for Leak	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
7	Slider valve for leak	<input type="checkbox"/>	<input type="checkbox"/>	-	<input checked="" type="checkbox"/>
8	Inspect slider	<input type="checkbox"/>	<input type="checkbox"/>	-	<input checked="" type="checkbox"/>
9	Inspect port face	<input type="checkbox"/>	<input type="checkbox"/>	-	<input checked="" type="checkbox"/>
10	Inspect pressure bolt	<input type="checkbox"/>	<input type="checkbox"/>	-	<input checked="" type="checkbox"/>
11	Inspect fitting and ferrule	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
12	Suppressor for leak	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
13	Cell for leak	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
14	Electronic cable connected	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
15	Column selection valve for leak	<input type="checkbox"/>	<input type="checkbox"/>	-	<input checked="" type="checkbox"/>
16	Inspect all fitting and line	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
17	Eluent reservoir	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
18	Inspect cap o-ring	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
19	Inspect air for leak	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
20	Piston seal has been replaced	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
21	Back up seal has been replaced	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
22	Pump Lubricate	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
23	Front panel test	<input type="checkbox"/>	<input type="checkbox"/>	-	<input checked="" type="checkbox"/>
24	Low limit alarm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
25	Hi limit alarm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
26	Conductivity electronic test 160+/-1 uS	<input type="checkbox"/>	<input type="checkbox"/>	Checked	<input checked="" type="checkbox"/>
27	Check noise for suppressor (pk to pk <0.005uS)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
28	Check column	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
29	Check suppressor	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
30	Check pump	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
31	Check cell	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
32	Check leak sensor	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
33	Flow rate	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
34	System pressure	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>
35	Detector background	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Checked	<input type="checkbox"/>

Chromeleon Operational Qualification (CM_OQ)

ThermoFisher SCIENTIFIC

Chromeleon Operational Qualification

General Information

Computer Name (Server): LAB-IC
Computer Name (Client): LAB-IC
Version Number: 6.80 SR12 Build 3578 (207169)
Operator: Mr.Channarong Khiao-Un

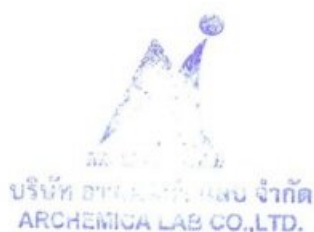
General System Suitability Test: *Test passed*

Comparison Formats:

All Parameters: (Exceptions see below)	Significant Digits: (They must match exactly)	10
Time Related Frac. Coll. Parameters: [The parameters are marked with *].]	Max. Deviation:	0.02 s

Serran 10-Jun-2021

Reviewer's Signature // Date



K.CHANNARONG 10/Jun/21

Operator's Signature // Date

ThermoFisher

SCIENTIFIC

Chromeleon Operational Qualification, Part 1

Verification of Selected Results

Calibration Type: LOff
 Integration Type: Area
 Standard Method: External
 Calibration Mode: Total
 Auto Recalibrate: ON

Report Variable	Peak Name	Status
Offset (c0)	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Slope (c1)	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Correlation Coeffi.	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Variance	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Std. Deviation	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Rel. Std. Dev.	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Variance Coeff.	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok

ThermoFisher

SCIENTIFIC

Chromeleon Operational Qualification, Part 1

Verification of Selected Results

<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
Calibration Point X	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Calibration Point Y	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Amount [ng]	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Resolution (EP)	Methylparabene	ok
	Ethylparabene	ok
Resolution (USP)	Methylparabene	ok
	Ethylparabene	ok
Peak Asymmetry (EP/USP)	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Peak Asymmetry (AIA)	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok

ThermoFisher

SCIENTIFIC

Chromeleon Operational Qualification, Part 1

Verification of Selected Results

<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
Theoretical Plates (EP)	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Theoretical Plates (USP)	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Theoretical Plates (JP)	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok

Test Result: **Passed**



Senan 10-Jun-2021

Reviewer's Signature // Date

K. KHAMKARANG 10/5Jun/21

Operator's Signature // Date

ThermoFisher

SCIENTIFIC

Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Calibration Type: LOff
 Integration Type: Area
 Standard Method: External
 Calibration Mode: Total
 Auto Recalibrate: ON

Variable Category	Report Variable	Peak Name	Status
Sample	No.		ok
	Name		ok
	Sample Type		ok
	Position		ok
	Status		ok
	Inj.Vol.		ok
	Dil.Fac.		ok
	Weight		ok
	Amount		ok
	Program		ok
	Quantification Method		ok
Chromatogram	Channel		ok
	No. of Peaks		ok
	Start Time		ok
	Signal Min.		ok
	Signal Max.		ok
	Signal Dimension		ok
	Noise 2.1-2.3		ok
Peak Results	No.	Methylparabene	ok
	No.	Ethylparabene	ok
	No.	Propylparabene	ok
	Peak Name	Methylparabene	ok
	Peak Name	Ethylparabene	ok
	Peak Name	Propylparabene	ok
	Ret.Time	Methylparabene	ok
	Ret.Time	Ethylparabene	ok
	Ret.Time	Propylparabene	ok



Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

<i>Variable Category</i>	<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
Peak Results	Ret.Dev.(abs)	Methylparabene	ok
	Ret.Dev.(abs)	Ethylparabene	ok
	Ret.Dev.(abs)	Propylparabene	ok
	Ret.Dev.(rel)	Methylparabene	ok
	Ret.Dev.(rel)	Ethylparabene	ok
	Ret.Dev.(rel)	Propylparabene	ok
	Area	Methylparabene	ok
	Area	Ethylparabene	ok
	Area	Propylparabene	ok
	Rel.Area (Total)	Methylparabene	ok
	Rel.Area (Total)	Ethylparabene	ok
	Rel.Area (Total)	Propylparabene	ok
	Height	Methylparabene	ok
	Height	Ethylparabene	ok
	Height	Propylparabene	ok
	Rel.Height (Total)	Methylparabene	ok
	Rel.Height (Total)	Ethylparabene	ok
	Rel.Height (Total)	Propylparabene	ok
	Amount	Methylparabene	ok
	Amount	Ethylparabene	ok
	Amount	Propylparabene	ok
	Concentration	Methylparabene	ok
	Concentration	Ethylparabene	ok
	Concentration	Propylparabene	ok
	Rel.Amount	Methylparabene	ok
	Rel.Amount	Ethylparabene	ok
	Rel.Amount	Propylparabene	ok
	Peak Width (0%)	Methylparabene	ok
	Peak Width (0%)	Ethylparabene	ok
	Peak Width (0%)	Propylparabene	ok
	Peak Width (5%)	Methylparabene	ok
	Peak Width (5%)	Ethylparabene	ok
	Peak Width (5%)	Propylparabene	ok
	Peak Width (10%)	Methylparabene	ok
	Peak Width (10%)	Ethylparabene	ok
	Peak Width (10%)	Propylparabene	ok

ThermoFisher

SCIENTIFIC

Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

<i>Variable Category</i>	<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
Peak Results	Peak Width (50%)	Methylparabene	ok
	Peak Width (50%)	Ethylparabene	ok
	Peak Width (50%)	Propylparabene	ok
	Left Width (0%)	Methylparabene	ok
	Left Width (0%)	Ethylparabene	ok
	Left Width (0%)	Propylparabene	ok
	Right Width (0%)	Methylparabene	ok
	Right Width (0%)	Ethylparabene	ok
	Right Width (0%)	Propylparabene	ok
	Peak Start	Methylparabene	ok
	Peak Start	Ethylparabene	ok
	Peak Start	Propylparabene	ok
	Peak Stop	Methylparabene	ok
	Peak Stop	Ethylparabene	ok
	Peak Stop	Propylparabene	ok
	Peak Start Value	Methylparabene	ok
	Peak Start Value	Ethylparabene	ok
	Peak Start Value	Propylparabene	ok
	Peak Stop Value	Methylparabene	ok
	Peak Stop Value	Ethylparabene	ok
	Peak Stop Value	Propylparabene	ok
	BL-Value Peak Start	Methylparabene	ok
	BL-Value Peak Start	Ethylparabene	ok
	BL-Value Peak Start	Propylparabene	ok
	BL-Value Peak Stop	Methylparabene	ok
	BL-Value Peak Stop	Ethylparabene	ok
	BL-Value Peak Stop	Propylparabene	ok
	Type	Methylparabene	ok
	Type	Ethylparabene	ok
	Type	Propylparabene	ok
	Resolution(EP)	Methylparabene	ok
	Resolution(EP)	Ethylparabene	ok
	Resolution(USP)	Methylparabene	ok
	Resolution(USP)	Ethylparabene	ok
	Asymmetry(EP)	Methylparabene	ok
	Asymmetry(EP)	Ethylparabene	ok
	Asymmetry(EP)	Propylparabene	ok



Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

<i>Variable Category</i>	<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
Peak Results	Asymmetry(AIA)	Methylparabene	ok
	Asymmetry(AIA)	Ethylparabene	ok
	Asymmetry(AIA)	Propylparabene	ok
	Theoretical Plates(EP)	Methylparabene	ok
	Theoretical Plates(EP)	Ethylparabene	ok
	Theoretical Plates(EP)	Propylparabene	ok
	Theoretical Plates(USP)	Methylparabene	ok
	Theoretical Plates(USP)	Ethylparabene	ok
	Theoretical Plates(USP)	Propylparabene	ok
	Theoretical Plates(JP)	Methylparabene	ok
	Theoretical Plates(JP)	Ethylparabene	ok
	Theoretical Plates(JP)	Propylparabene	ok
Peak Calibration	Cal.Mode	Methylparabene	ok
	Cal.Mode	Ethylparabene	ok
	Cal.Mode	Propylparabene	ok
	Auto.Recal.	Methylparabene	ok
	Auto.Recal.	Ethylparabene	ok
	Auto.Recal.	Propylparabene	ok
	Cal.Type	Methylparabene	ok
	Cal.Type	Ethylparabene	ok
	Cal.Type	Propylparabene	ok
	Weights	Methylparabene	ok
	Weights	Ethylparabene	ok
	Weights	Propylparabene	ok
	Offset	Methylparabene	ok
	Offset	Ethylparabene	ok
	Offset	Propylparabene	ok
	Slope	Methylparabene	ok
	Slope	Ethylparabene	ok
	Slope	Propylparabene	ok
	RF-Value	Methylparabene	ok
	RF-Value	Ethylparabene	ok
	RF-Value	Propylparabene	ok
	No. of Points	Methylparabene	ok
	No. of Points	Ethylparabene	ok



Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

<i>Variable Category</i>	<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
Peak Calibration	No. of Points	Propylparabene	ok
	No. of Points(disabled)	Methylparabene	ok
	No. of Points(disabled)	Ethylparabene	ok
	No. of Points(disabled)	Propylparabene	ok
	Variance	Methylparabene	ok
	Variance	Ethylparabene	ok
	Variance	Propylparabene	ok
	Var.Coeff	Methylparabene	ok
	Var.Coeff	Ethylparabene	ok
	Var.Coeff	Propylparabene	ok
	Std.Dev.	Methylparabene	ok
	Std.Dev.	Ethylparabene	ok
	Std.Dev.	Propylparabene	ok
	Rel.Std.Dev.	Methylparabene	ok
	Rel.Std.Dev.	Ethylparabene	ok
	Rel.Std.Dev.	Propylparabene	ok
	Corr.Coeff.	Methylparabene	ok
	Corr.Coeff.	Ethylparabene	ok
	Corr.Coeff.	Propylparabene	ok
	Coeff.Det.	Methylparabene	ok
	Coeff.Det.	Ethylparabene	ok
	Coeff.Det.	Propylparabene	ok
	Adj. Coeff.Det.	Methylparabene	ok
	Adj. Coeff.Det.	Ethylparabene	ok
	Adj. Coeff.Det.	Propylparabene	ok
	X	Methylparabene	ok
	X	Ethylparabene	ok
	X	Propylparabene	ok
	Y	Methylparabene	ok
	Y	Ethylparabene	ok
	Y	Propylparabene	ok
	W	Methylparabene	ok
	W	Ethylparabene	ok
	W	Propylparabene	ok
	F(X)	Methylparabene	ok
	F(X)	Ethylparabene	ok
	F(X)	Propylparabene	ok

ThermoFisher

SCIENTIFIC

Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

<i>Variable Category</i>	<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
Peak Calibration	Residual for Cal.Point X	Methylparabene	ok
	Residual for Cal.Point X	Ethylparabene	ok
	Residual for Cal.Point X	Propylparabene	ok
	Calibration Point Status	Methylparabene	ok
	Calibration Point Status	Ethylparabene	ok
	Calibration Point Status	Propylparabene	ok
	Amount	Methylparabene	ok
	Amount	Ethylparabene	ok
	Amount	Propylparabene	ok
Peak Table	Peak Tab. Cal.Type	Methylparabene	ok
	Peak Tab. Peak Type	Methylparabene	ok
	Peak Tab. Left Limit	Methylparabene	ok
	Peak Tab. Right Limit	Methylparabene	ok
	Peak Tab. Group	Methylparabene	ok
	Peak Tab. Resp.Factor	Methylparabene	ok
	Peak Tab. Amount	Methylparabene	ok
	Peak Tab. Amnt.Dim	Methylparabene	ok

ThermoFisher

SCIENTIFIC

Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Purity	PPI	Methylparabene	ok
	PPI	Ethylparabene	ok
	PPI	Propylparabene	ok
	RSD PPI	Methylparabene	ok
	RSD PPI	Ethylparabene	ok
	RSD PPI	Propylparabene	ok
	Match	Methylparabene	ok
	Match	Ethylparabene	ok
	Match	Propylparabene	ok
	RSD Match	Methylparabene	ok
	RSD Match	Ethylparabene	ok
	RSD Match	Propylparabene	ok
	Rel.Max at	Methylparabene	ok
	Rel.Max at	Ethylparabene	ok
	Rel.Max at	Propylparabene	ok

Test Result: Passed

Simon. 10-Jun-2021

Reviewer's Signature // Date

ARCHER CHEMICALS CO., LTD.
บริษัท อาร์เคเค เคมิคอล จำกัด

K.CHANNAROO 10/5un/21

Operator's Signature // Date



Chromeleon Operational Qualification, Part 3

Post-Acquisition Steps: Comparison with Expected Results

Calibration Type: LOff
 Integration Type: Area
 Standard Method: External
 Calibration Mode: Total
 Auto Recalibrate: ON


Channel Name	Report Variable	Peak Name	Status
Extract UV Channel:			
EXT230NM	Area	Methylparabene	ok
	Area	Ethylparabene	ok
	Area	Propylparabene	ok
	Height	Methylparabene	ok
	Height	Ethylparabene	ok
	Height	Propylparabene	ok
	Base Peak Width	Methylparabene	ok
	Base Peak Width	Ethylparabene	ok
	Base Peak Width	Propylparabene	ok
EXT290NM	Area	Methylparabene	ok
	Area	Ethylparabene	ok
	Area	Propylparabene	ok
	Height	Methylparabene	ok
	Height	Ethylparabene	ok
	Height	Propylparabene	ok
	Base Peak Width	Methylparabene	ok
	Base Peak Width	Ethylparabene	ok
	Base Peak Width	Propylparabene	ok
Smooth Data:			
UV_VIS_1_MA_005_001	Noise (1.9-2.4 min)		ok
UV_VIS_1_OL_051_001	Noise (1.9-2.4 min)		ok
EXT290NM_SG_005_010	Noise (1.9-2.4 min)		ok



Chromeleon Operational Qualification, Part 3

Post-Acquisition Steps: Comparison with Expected Results

Channel Name	Report Variable	Peak Name	Status
Arith. Comb. of Channels:			
ADD_UV_VIS_1_UV_VIS_1	Area	Methylparabene	ok
ADD_UV_VIS_1_UV_VIS_1	Area	Ethylparabene	ok
ADD_UV_VIS_1_UV_VIS_1	Area	Propylparabene	ok
MUL_UV_VIS_1_UV_VIS_1	Area	Methylparabene	ok
MUL_UV_VIS_1_UV_VIS_1	Area	Ethylparabene	ok
MUL_UV_VIS_1_UV_VIS_1	Area	Propylparabene	ok

Test Result:**Passed** Surran 10-Jun-2021

Reviewer's Signature // Date

 KCHANMARONG 10/Jun/21

Operator's Signature // Date

ThermoFisher

SCIENTIFIC

Chromeleon Operational Qualification, Part 4

System Suitability Test: Comparison with Expected Results

Calibration Type: LOff
 Integration Type: Area
 Standard Method: External
 Calibration Mode: Total
 Auto Recalibrate: ON

Variable Category	Report Variable	Status
SST	Test No.	ok
	Test Name	ok
	Sample Condition	ok
	Sample Condition Result	ok
	Test Condition	ok
	Peak Condition	ok
	Aggregate Condition	ok
	Compare Operator	ok
	Compare Value	ok
	Result of Compare Value	ok
	Channel	ok
	Aggregated Samples	ok
	List of Aggr. Smp.	ok
	Result List for Aggr. Smp.	ok
	Result of Test Condition or Aggregate	ok
	N.A.	ok
	Test Result	ok
	Fail-Action	ok

Test Result: Passed

Scman 10-Jun-2021

Reviewer's Signature // Date

บริษัท อีซีเอส จำกัด
 ARCHIVE 2021/06/10

K. S. HANONKORAT 10/June/21

Operator's Signature // Date

ThermoFisher

SCIENTIFIC

Chromeleon Operational Qualification, Part 5

Fraction Collection: Comparison with Expected Results

Calibration Type: LOff
Integration Type: Area
Standard Method: External
Calibration Mode: Total
Auto Recalibrate: ON

Variable Category	Report Variable	Status
Fraction Report	Fract. No.	ok
	Fract. Starttime *)	ok
	Fract. Endtime *)	ok
	No. of Tubes	ok
	Position	ok
	Peak Name	ok
	No. of Peaks	ok
Tube Report	Position	ok
	Tube Starttime *)	ok
	Tube Endtime *)	ok
	Max. Tube Volume	ok
	Peak Name	ok
	No. of Peaks	ok
	Fract. No.	ok
	Fract. Starttime *)	ok
	Fract. Endtime *)	ok
	No. of Tubes	ok
	No. of Peaks	ok

Test Result: **Passed**

Suran 10-Jun-2021

Reviewer's Signature // Date


บริษัท อาร์เคมีคัล แล็บ จำกัด
ARCHEMICAL LAB CO., LTD.

K. Chantaporn 10/Jun/21

Operator's Signature // Date

Performance Qualification (PQ)

(Anion)



Performance Qualification

Instruments:

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	DX120	Dionex	03010223	3.03
Detector	DX120	Dionex	03010223	3.03
Autosampler	AS40 or man. inj.	Dionex	n.a.	0.00
Eluent Generator	n.a.	Dionex	n.a.	0.00
Chromeleon	6.80 SR12 Build 3578 (207169)	Dionex	33308	n.a.

Accessories:

Name	Description	Lot / Serial Number	Expire Date
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")	n.a.	n.a.
Blank	Water	n.a.	n.a.
Sample 1	Nitrate, 5 ppm	200923	Sep-2021
Sample 2	Nitrate, 10 ppm	200923	Sep-2021
Sample 3	Nitrate, 25 ppm	200923	Sep-2021
Sample 4	Nitrate, 50 ppm	200923	Sep-2021
Sample 5	Nitrate, 100 ppm	200923	Sep-2021
Sample 6	Nitrate, 1000 ppm	200923	Sep-2021
Eluent	Water	n.a.	n.a.
Autosampler Reservoir A	Water	n.a.	n.a.

Customer Signature

Customer signature indicates that all information in the following reports has been reviewed and accepted.

บริษัท ดิโอนิกซ์ จำกัด
ARCHEN

K. CHANARAT

Qualification Executor

10/June/21

Date

Limits:

Test	Customized Limit	Dionex Recommended Limits
DX120 Conductivity Noise (nS)	2	2
DX120 Conductivity Drift (nS/hr)	20	20
Injector Precision (Area %RSD)	1.0	1.0
Injector Carry Over (Area %)	0.1	0.1
DX120 Detector Linearity (Corr.)	0.999	0.999
DX120 Detector Linearity (%RSD)	5	5

Additional Information:

Customer/Company:	UAE Consultant Co.,Ltd.	Date:	10-Jun-2021
Qualification Executor:	Mr.Channarong / Archemica	Period between Qualifications:	6 months
		Next Qualification:	Dec-2021



Customer Signature



บริษัท อรเคมีคา จำกัด
ARCHEMICA CO., LTD.



Qualification Executor



Date



Performance Qualification

Detector Noise and Drift

Instruments:

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	DX120	Dionex	03010223	3.03
Detector	DX120	Dionex	03010223	3.03
Autosampler	AS40 or man. inj.	Dionex	n.a.	0.00
Eluent Generator	n.a.	Dionex	n.a.	0.00

Accessories

Name	Description
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")
Eluent	Water

Additional Information

Customer/Company:	UAE Consultant Co.,Ltd.	Date:	10-Jun-2021
Qualification Executor:	Mr.Channarong / Archemica	Next Qualification:	Dec-2021

Test Results Summary

Test	Result
DX120 Conductivity Noise (nS)	PASS
DX120 Conductivity Drift (nS/hr)	PASS

Customer Signature

K. Channarong
Qualification Executor

10/5un/21
Date

Data for detector noise

Segment number	Noise, nS
1	1.981
2	1.367
3	1.884
4	1.846
5	1.620
6	0.906
7	1.654
8	1.309
9	1.877
10	1.901
11	0.607
12	1.871
13	1.172
14	1.765
15	1.418
16	1.414
17	1.583
18	1.830
19	1.458
20	2.096
Average, nS	1.578
Limit, nS	2
Result	PASS

Data for detector drift

20 Minute drift, nS	Drift, nS/hr	Limit, nS/hr	Result
0.524	1.573	20.000	PASS



Customer Signature

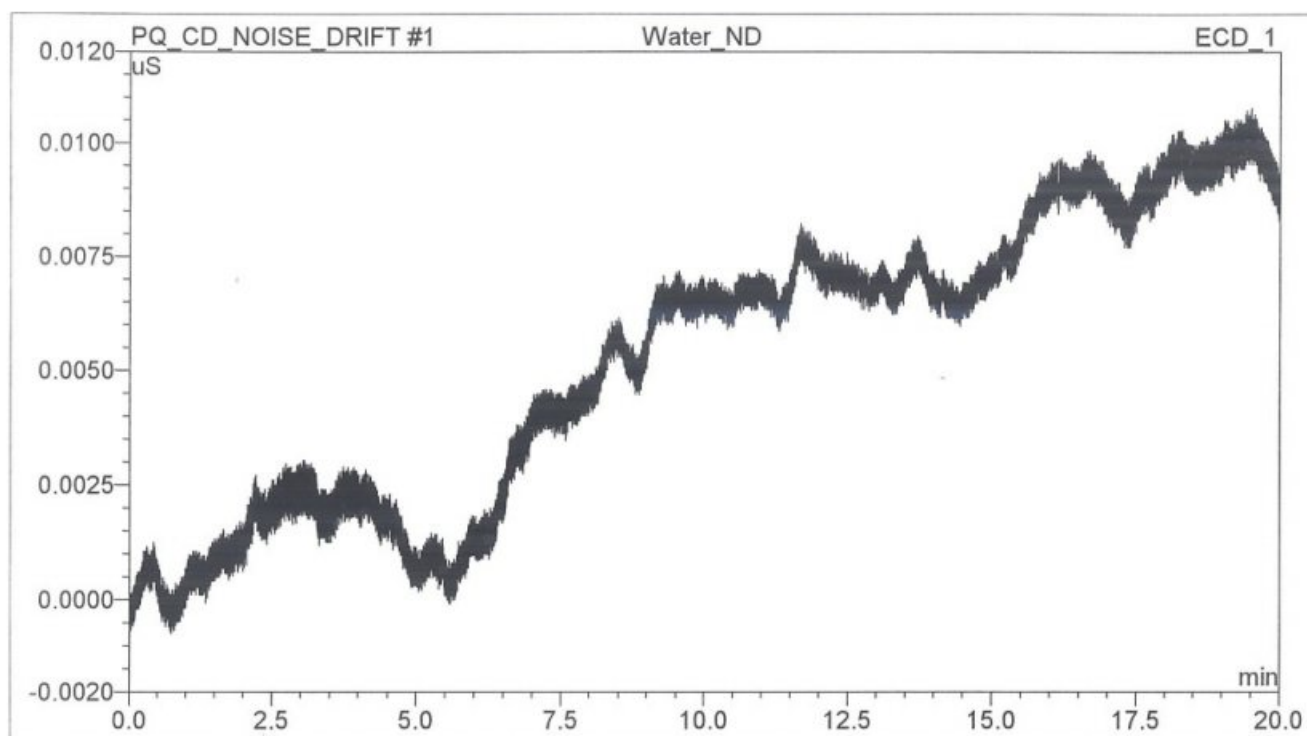



Qualification Executor



Date

Chromatogram of Detector Noise and Drift



Customer Signature



Qualification Executor

Date



Performance Qualification

Injector Precision

Instruments:

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	DX120	Dionex	03010223	3.03
Detector	DX120	Dionex	03010223	3.03
Autosampler	AS40 or man. inj.	Dionex	n.a.	0.00
Eluent Generator	n.a.	Dionex	n.a.	0.00

Accessories

Name	Description
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")
Sample 5	Nitrate, 100 ppm
Eluent	Water


Additional Information

Customer/Company:	UAE Consultant Co.,Ltd.	Date:	10-Jun-2021
Qualification Executor:	Mr.Channarong / Archemica	Next Qualification:	Dec-2021

Test Results Summary

Test	Result
Injector Precision (Area %RSD)	PASS


Customer Signature


Qualification Executor


10/Jun/21
Date

Data for Injector Precision test

Name	Area uS*min Nitrate ECD_1
Inj Precision_1	1.669
Inj Precision_2	1.652
Inj Precision_3	1.654
Inj Precision_4	1.663
Inj Precision_5	1.664
Inj Precision_6	1.657
Inj Precision_7	1.663
Inj Precision_8	1.650
Inj Precision_9	1.649
Inj Precision_10	1.647
Average:	1.657
Std. Dev:	0.008
% RSD:	0.462 %
Limit:	1.0 %
Result:	PASS



Customer Signature



บริษัท คุมการ จำกัด
KHAMNARONG CO., LTD.



Qualification Executor



Date



Performance Qualification

Injector Carry Over

Instruments:

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	DX120	Dionex	03010223	3.03
Detector	DX120	Dionex	03010223	3.03
Autosampler	AS40 or man. inj.	Dionex	n.a.	0.00
Eluent Generator	n.a.	Dionex	n.a.	0.00

Accessories

Name	Description
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")
Sample 6	Nitrate, 1000 ppm
Blank	Water
Eluent	Water

Additional Information

Customer/Company:	UAE Consultant Co.,Ltd.	Date:	10-Jun-2021
Qualification Executor:	Mr.Channarong / Archemica	Next Qualification:	Dec-2021

Test Results Summary

Test	Result
Injector Carry Over (Area %)	PASS

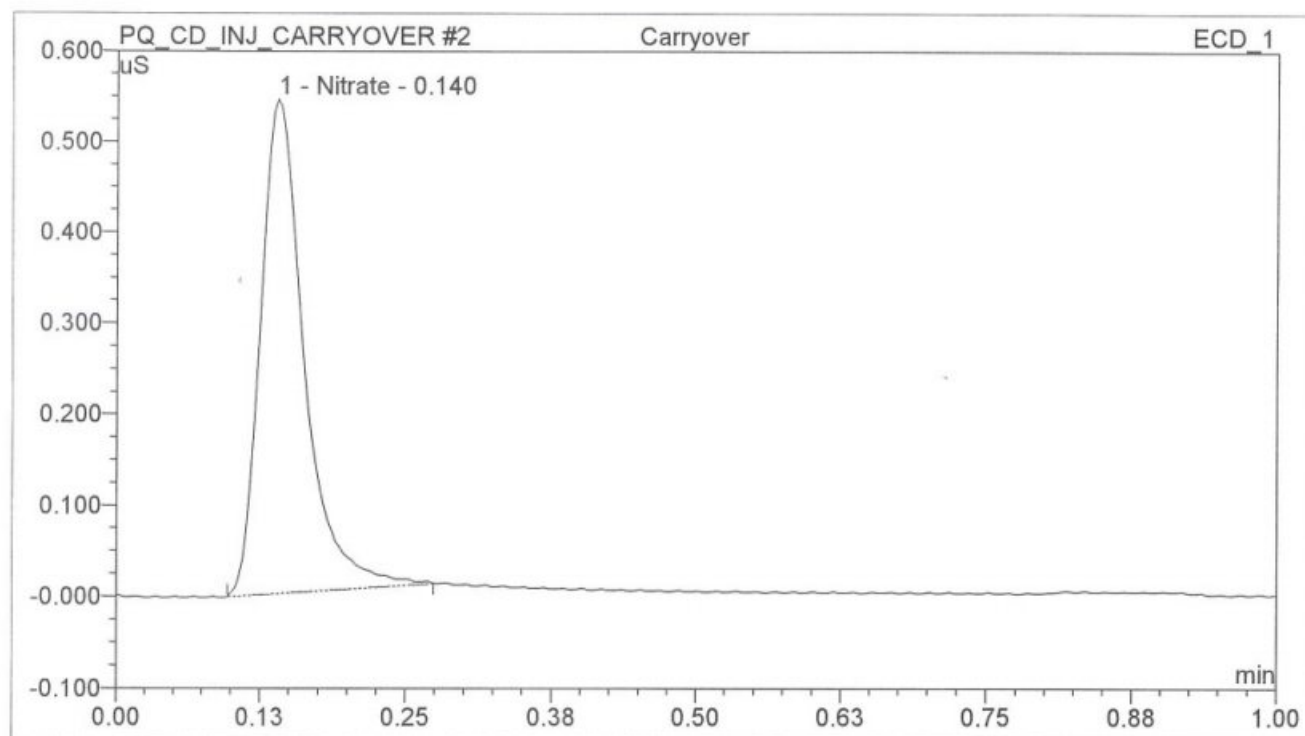


K. Channarong
Qualification Executor

10/Jun/21
Date

Signature
Customer Signature


Chromatogram for Carry Over test



Data for Carry Over test

Name	Ret.Time (detected) min Nitrate ECD_1	Area uS*min Nitrate ECD_1
High Level	0.14	32.560
Carryover	0.14	0.024
Water	0.14	0.017
Carry over:		0.052 %
Limit:		0.1 %
Result:		PASS


Customer Signature


Qualification Executor


10/540/21
Date



Performance Qualification

Detector Linearity

Instruments:

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	DX120	Dionex	03010223	3.03
Detector	DX120	Dionex	03010223	3.03
Autosampler	AS40 or man. inj.	Dionex	n.a.	0.00
Eluent Generator	n.a.	Dionex	n.a.	0.00

Accessories

Name	Description
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")
Sample 1	Nitrate, 5 ppm
Sample 2	Nitrate, 10 ppm
Sample 3	Nitrate, 25 ppm
Sample 4	Nitrate, 50 ppm
Sample 5	Nitrate, 100 ppm
Eluent	Water

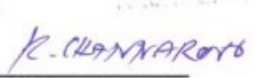
Additional Information

Customer/Company:	UAE Consultant Co.,Ltd.	Date:	10-Jun-2021
Qualification Executor:	Mr.Channarong / Archemica	Next Qualification:	Dec-2021

Test Results Summary

Test	Result
DX120 Detector Linearity (Corr.)	PASS
DX120 Detector Linearity (%RSD)	PASS


Customer Signature

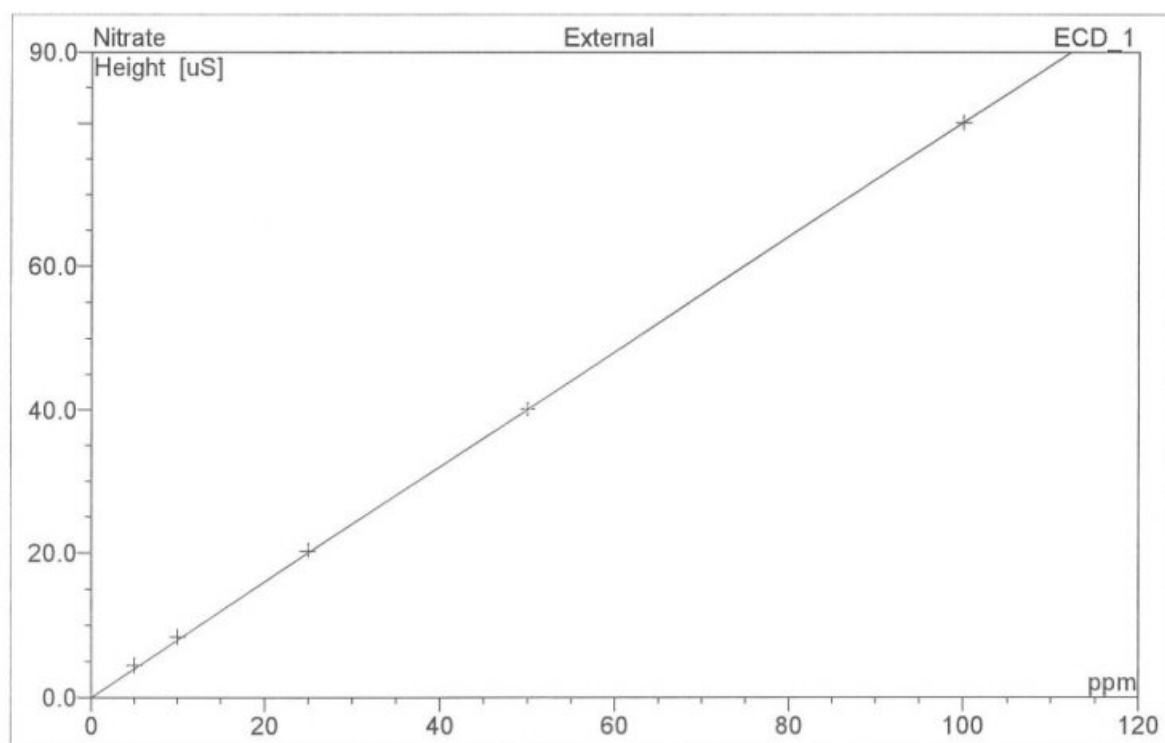

Qualification Executor


10/Jun/21
Date

Data for Detector Linearity

Name	Amount ppm Nitrate ECD_1	Height uS Nitrate ECD_1
Detector linearity_1	5.000	4.488
Detector linearity_2	10.000	8.417
Detector linearity_3	25.000	20.299
Detector linearity_4	50.000	40.154
Detector linearity_5	100.000	80.109


Linearity Plot




Calibration Type	Number of Points	Offset	Slope
Lin	5	0.000	0.802

	Correlation Coefficient	% RSD
Linearity:	1.000	1.101
Limit:	0.999	5
Result:	PASS	PASS

บริษัท ดิโอนิกซ์ จำกัด
DIONEX CO., LTD.


Customer Signature


Qualification Executor


Date

CERTIFICATE

Dionex Nitrate OQ/PQ IC Standards Kit (Set of 6)

Product Number 060254
Certificate of Analysis

Lot Number 200923

Expiration of Certification
September 2021

The Dionex Nitrate Standard was developed to aid the analysis of anions by Ion Chromatography (IC). The single-ion standard was prepared by the dissolution of high-purity salt in ≥ 18.2 megohm deionized water, which was tested by IC for ionic contaminants. The bottle label states the nominal concentration value of the ionic component for informational purposes only. The actual ion concentration value was determined by Ion Chromatography. The IC system was standardized using the National Institute of Standards & Technology (NIST), Standard Reference Material, SRM 3185 (Nitrate Standard Solution). Actual concentration values determined for the single-ion is listed below.

Dionex Nitrate Standard

Vial #	Concentration (mg/L)
1	4.93 \pm 0.03
2	9.85 \pm 0.06
3	24.58 \pm 0.09
4	48.98 \pm 0.35
5	98.5 \pm 1
6	985 \pm 7

บริษัท อีเคมิกส์ จำกัด
ARCHEMICA LAB CO., LTD.
K. CHANARONG
10/June/21

The concentration value is based a proven reliable method of analysis. The estimated uncertainties are two standard deviations of the concentration value. The concentration value is warranted to be stable for one year from the date of manufacture.

The preparation and analyses of the Dionex Nitrate Standard was performed with extreme care by Thermo Scientific Corporation Consumables Manufacturing Department in Sunnyvale California.

Document No. 078690-01

20-Dec-2011

thermoscientific.com/dionex

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Sunnyvale, CA 94088-3603
(408) 737-0700



Thermo Fisher Scientific,
Sunnyvale, CA USA is
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เอกสารไม่ควบคุม

Channarong Khiao-Un

Archemica
Thailand

has successfully completed the course

IC Systems Qualification Service Training

Description:

- Software Installation Qualification
- Software Operation Qualification
- Hardware Installation Qualification
- Hardware Operation Qualification
- Hardware Performance Qualification
- GLP /GMP/ GDP Compliance



KCHANNARONG

10/Jan/21

Training date(s): 15-Oct-2018 ——— 26-Oct-2018

Location: Bangkok, Thailand

Issued on: 26-Oct-2018 **Expires on:** 25-Oct-2021

Certificate issued by:

A handwritten signature in blue ink, appearing to read 'W. Worawirunwong'.

Weerapong Worawirunwong
Manager, ICSP Technical Support

The certificate is only valid during employment with the Thermo Fisher Scientific including its subsidiaries and certified contractors. The original certificate is filed and stored at the company site.

Calibration Certificate

Certificate No.: 2200704-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakanong, Bangkok 10260

Page 1 of 5

Equipment: Electronic Balance

Manufacturer: Mettler Toledo

Model: AB204-S

Serial No.: 1128312528

ID No.: UAE.AIR.019/2550


Order No.: 2200704

Operation No.: 2200704-001

Date of Receipt: 24 November 2021

Date of Calibration: 24 November 2021

Calibrated by Mr.Worapob Sooktong
Scientist

Approved by 
(Mr.Pheraphat Tuanjit)

Manager, Division of Calibration Laboratory

Date of Issue: 30 November 2021

Responsible for the Technical Management Team

The uncertainties are for a confidence probability of approximately 95%

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

Calibration Report

Certificate No.: 2200704-001-01

Equipment: Electronic Balance

Manufacturer: Mettler Toledo

Model: AB204-S

Resolution: 0.0001 g

Serial No.: 1128312528

ID No.: UAE.AIR.019/2550

Capacity: 200 g

Date of Calibration: 24 November 2021

Page 2 of 5

Environment Condition: Ambient Temperature: 21.5 ± 0.5 °C Relative Humidity: 43 ± 2.5 %

Place of Calibration: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method based on UKAS Lab 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1-500mg	B308068554	TCS	M2101097S	12 January 2022
Standard Weight Class E2	1-500g	B308068128	TCS	M2101098S	13 January 2022

Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	11A1	สทท.ฟป. BTH 003/55	Quality Reborn	QR21-0297	15 February 2022

3. This certification is traceable to SI UNIT

4. This certificate was certified only for the instrument we calibrated.

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

Calibration Results:

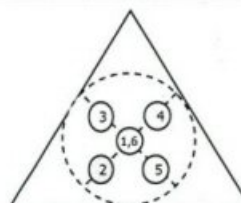
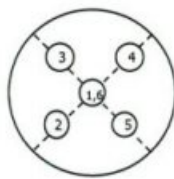
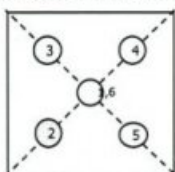
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
10	0.00000
20	0.00000

2. Off-Center Error:

A mass of 50 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
49.9999	49.9999	49.9999	49.9999	49.9999	49.9999	0.0000

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2200704-001-01

Equipment: Electronic Balance

Manufacturer: Mettler Toledo

Model: AB204-S

Resolution: 0.0001 g

Serial No.: 1128312528

ID No.: UAE.AIR.019/2550

Capacity: 200 g

Date of Calibration: 24 November 2021

Page 3 of 5

Calibration Results: (Continued)

Calibration Range: 0-20 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Test Weight by filter pan)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor k
Unload	0.00000	0.0000	0.0000	0.000082	2.00
0.01	0.01000	0.0100	0.0000	0.000082	2.00
0.05	0.05000	0.0500	0.0000	0.000082	2.00
0.1	0.10000	0.1000	0.0000	0.000082	2.00
0.5	0.50000	0.5000	0.0000	0.000083	2.00
1	1.00001	1.0000	0.0000	0.000083	2.00
2	2.00001	2.0000	0.0000	0.000083	2.00
3	3.00001	3.0000	0.0000	0.000084	2.00
4	4.00001	4.0000	0.0000	0.000085	2.00
5	5.00000	4.9999	0.0001	0.000084	2.00
10	9.99998	9.9999	0.0001	0.000087	2.00
15	14.99998	14.9999	0.0001	0.000089	2.00
20	19.99999	19.9999	0.0001	0.000089	2.00

Calibration Report

Certificate No.: 2200704-001-01

Equipment: Electronic Balance

Manufacturer: Mettler Toledo

Model: AB204-S

Resolution: 0.0001 g

Serial No.: 1128312528

ID No.: UAE.AIR.019/2550

Capacity: 200 g

Date of Calibration: 24 November 2021

Page 4 of 5

Environment Condition: Ambient Temperature: 21.5 ± 0.5 °C Relative Humidity: 43 ± 2.5 %

Place of Calibration: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method based on UKAS Lab 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1-500mg	B308068554	TCS	M2101097S	12 January 2022
Standard Weight Class E2	1-500g	B308068128	TCS	M2101098S	13 January 2022

Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	11A1	สทท.ฟป. BTH 003/55	Quality Reborn	QR21-0297	15 February 2022

3. This certification is traceable to SI UNIT

4. This certificate was certified only for the instrument we calibrated.

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

Calibration Results:

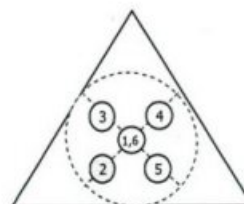
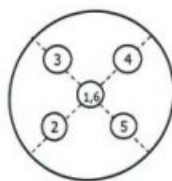
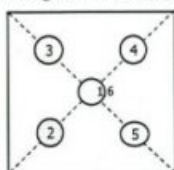
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
100	0.00000
200	0.00000

2. Off-Center Error:

A mass of 50 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1 (g)	2 (g)	3 (g)	4 (g)	5 (g)	6 (g)	(Maximum Difference) (g)
49.9999	49.9999	49.9999	49.9999	49.9999	49.9999	0.0000

Calibration Report

Certificate No.: 2200704-001-01

Equipment: Electronic Balance

Manufacturer: Mettler Toledo

Model: AB204-S

Resolution: 0.0001 g

Serial No.: 1128312528

ID No.: UAE.AIR.019/2550

Capacity: 200 g

Date of Calibration: 24 November 2021

Page 5 of 5

Calibration Results: (Continued)

Calibration Range: 0-200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor <i>k</i>
Unload	0.00000	0.0000	0.0000	0.000082	2.00
0.1	0.10000	0.1000	0.0000	0.000082	2.00
0.5	0.50000	0.5000	0.0000	0.000083	2.00
1	1.00001	1.0000	0.0000	0.000083	2.00
5	5.00000	4.9999	0.0001	0.000084	2.00
10	9.99998	9.9999	0.0001	0.000087	2.00
20	19.99999	19.9999	0.0001	0.000089	2.00
50	49.99990	49.9999	0.0000	0.00012	2.00
70	69.99989	69.9999	0.0000	0.00014	2.00
100	100.00000	99.9999	0.0001	0.00017	2.00
120	119.99999	119.9999	0.0001	0.00019	2.00
150	149.99990	149.9999	0.0000	0.00022	2.00
200	200.00009	199.9999	0.0002	0.00029	2.00

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

----- End -----

เอกสารไม่ควบคุม

Calibration Certificate

Certificate No.: 2102572-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 5

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: AB204-S/FACT

Serial No.: B108115858

ID No.: UAE.AIR.016/2555


Order No.: 2102572

Operation No.: 2102572 -001

Date of Receipt: 26 April 2021

Date of Calibration: 26 April 2021

Calibrated by Mr.Manas Somsak
Expert

Approved by 
(Mr.Pheraphat Tuanjit)

Manager, Division of Calibration Laboratory

Date of Issue: 29 April 2021

Responsible for the Technical Management Team

The uncertainties are for a confidence probability of approximately 95%

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2102572-001-01

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: AB204-S/FACT

Resolution: 0.0001 g

Serial No.: B108115858

ID No.: UAE.AIR.016/2555

Capacity: 220 g

Date of Calibration: 26 April 2021

Page 2 of 5

Environment Condition: Ambient Temperature: 22.0 ± 0.2 °C Relative Humidity: 48 ± 2 %

Place of Calibration: Balance Room (306), UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method Based on UKAS LAB 14 Calibration of Weighing Machines : 2006
2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1-500mg	15880	TCS	M2011195S	28 November 2021
Standard Weight Class E2	1-500g	15882	TCS	M2011196S	28 November 2021

Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	PONPE 490	NFI.BTH 004/18	Quality Reborn	QR21-0300	15 February 2022

3. This certification is traceable to SI UNIT
4. This certificate was certified only for the instrument we calibrated.
5. This result of calibration was found accurate as shown on date and place of calibration only.

Calibration Results:

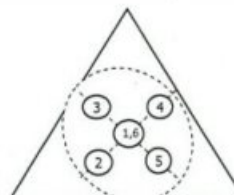
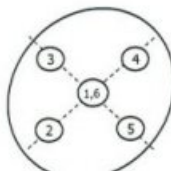
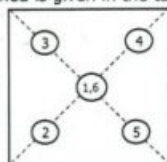
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
100	0.000000
200	0.000042

2. Off-Center Error:

A mass of 50 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
50.0001	50.0001	50.0001	50.0002	50.0002	50.0001	0.0001

Calibration Report

Certificate No.: 2102572-001-01

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: AB204-S/FACT

Resolution: 0.0001 g

Serial No.: B108115858

ID No.: UAE.AIR.016/2555

Capacity: 220 g

Date of Calibration: 26 April 2021

Page 3 of 5

Calibration Results: (Continued)

Calibration Range: 0 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor <i>k</i>
Unload	0.00000	0.0000	0.0000	0.000082	2.00
0.1	0.10000	0.1000	0.0000	0.000082	2.00
0.5	0.49999	0.5000	0.0000	0.000083	2.00
1	0.99999	1.0000	0.0000	0.000086	2.00
2	1.99999	2.0000	0.0000	0.000084	2.00
5	4.99998	5.0000	0.0000	0.000084	2.00
10	10.00003	10.0000	0.0000	0.00011	2.00
15	15.00001	15.0000	0.0000	0.00012	2.00
20	20.00004	20.0000	0.0000	0.00013	2.00
30	30.00006	30.0001	0.0000	0.00015	2.00
40	40.00000	40.0001	-0.0001	0.00014	2.00
50	49.99999	50.0002	-0.0002	0.00015	2.00
70	70.00003	70.0002	-0.0002	0.00019	2.00
100	99.99997	100.0003	-0.0003	0.00020	2.00
150	149.99997	150.0004	-0.0004	0.00027	2.00
200	199.99999	200.0005	-0.0005	0.00043	2.00

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

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2102572-001-01

Equipment:

Electronic Balance

Manufacturer: METTLER TOLEDO

Model: AB204-S/FACT

Resolution: 0.0001 g

Serial No.: B108115858

ID No.: UAE.AIR.016/2555

Capacity: 220 g

Date of Calibration: 26 April 2021

Page 4 of 5

Environment Condition: Ambient Temperature: 22.0 ± 0.2 °C Relative Humidity: 48 ± 2 %

Place of Calibration: Balance Room (306), UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method Based on UKAS LAB 14 Calibration of Weighing Machines : 2006

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1-500mg	15880	TCS	M2011195S	28 November 2021
Standard Weight Class E2	1-500g	15882	TCS	M2011196S	28 November 2021

Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	PONPE 490	NFI.BTH 004/18	Quality Reborn	QR21-0300	15 February 2022

3. This certification is traceable to SI UNIT

4. This certificate was certified only for the instrument we calibrated.

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

Calibration Results: (Calibration with filter pan)

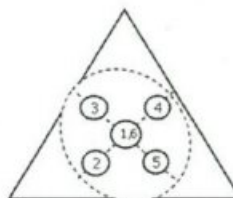
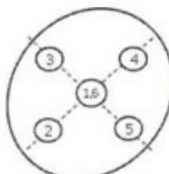
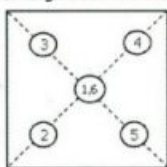
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
10	0.0000
20	0.0000

2. Off-Center Error:

A mass of 5 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1 (g)	2 (g)	3 (g)	4 (g)	5 (g)	6 (g)	(Maximum Difference) (g)
5.0000	5.0002	5.0001	5.0001	5.0000	5.0000	0.0002

Calibration Report

Certificate No.: 2102572-001-01

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: AB204-S/FACT

Resolution: 0.0001 g

Serial No.: B108115858

ID No.: UAE.AIR.016/2555

Capacity: 220 g

Date of Calibration: 26 April 2021

Page 5 of 5

Calibration Results: (Continued)

Calibration Range: 0 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Calibration with filter pan)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor <i>k</i>
Unload	0.00000	0.0000	0.0000	0.000082	2.00
0.01	0.01000	0.0100	0.0000	0.000082	2.00
0.05	0.05000	0.0500	0.0000	0.000082	2.00
0.1	0.10000	0.1000	0.0000	0.000082	2.00
0.5	0.49999	0.5000	0.0000	0.000083	2.00
1	0.99999	1.0000	0.0000	0.000086	2.00
2	1.99999	2.0000	0.0000	0.000084	2.00
3	2.99998	3.0000	0.0000	0.000087	2.00
4	3.99999	4.0000	0.0000	0.000085	2.00
5	4.99998	5.0000	0.0000	0.000084	2.00
10	10.00003	10.0000	0.0000	0.00011	2.00
15	15.00001	15.0000	0.0000	0.00012	2.00
20	20.00004	20.0000	0.0000	0.00013	2.00

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

----- End -----

เอกสารไม่ควบคุม


Calibration Certificate

Certificate No.: 2102572-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhnong, Bangkok 10260

Page 1 of 3

Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XP6
Serial No.: B322373893
ID No.: UAE.AIR.019/2556
Order No.: 2102572
Operation No.: 2102572 -002
Date of Receipt: 26 April 2021
Date of Calibration: 26 April 2021

Calibrated by Mr.Manas Somsak
Expert

Approved by 
(Mr.Pheraphat Tuanjit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 29 April 2021

The uncertainties are for a confidence probability of approximately 95%

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced in any form other than in full except with the prior written approval of the National Food Institute.

Calibration Report

Certificate No.: 2102572-002-01

Equipment:

Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XP6

Resolution: 0.000001 g

Serial No.: B322373893

ID No.: UAE.AIR.019/2556

Capacity: 6.1 g

Date of Calibration: 26 April 2021

Page 2 of 3

Environment Condition: Ambient Temperature: 22.0 ± 0.2 °C Relative Humidity: 48 ± 2 %

Place of Calibration: Balance Room (306), UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method Based on UKAS LAB 14 Calibration of Weighing Machines : 2006

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1-500mg	B308068554	TCS	M2101097S	12 January 2022
Standard Weight Class E2	1-500g	B308068128	TCS	M2101098S	13 January 2022

Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	PONPE 490	NFI.BTH 004/18	Quality Reborn	QR21-0300	15 February 2022

3. This certification is traceable to SI UNIT

4. This certificate was certified only for the instrument we calibrated.

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

Calibration Results:

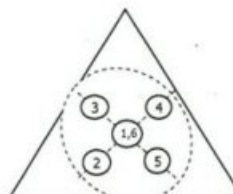
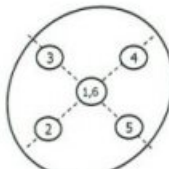
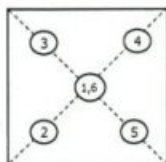
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
3	0.00000042
6	0.00000032

2. Off-Center Error:

A mass of 2 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
1.999997	1.999996	1.999997	1.999996	1.999996	1.999998	0.000002

Calibration Report

Certificate No.: 2102572-002-01

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XP6

Resolution: 0.000001 g

Serial No.: B322373893

ID No.: UAE.AIR.019/2556

Capacity: 6.1 g

Date of Calibration: 26 April 2021

Page 3 of 3

Calibration Results: (Continued)

Calibration Range: 0 - 6 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor <i>k</i>
Unload	0.000000	0.000000	0.000000	0.00000087	2.00
0.01	0.010002	0.010000	0.000002	0.0000032	2.00
0.05	0.050004	0.050000	0.000004	0.0000047	2.00
0.10	0.100000	0.099998	0.000002	0.0000056	2.00
0.15	0.150004	0.150000	0.000004	0.0000072	2.00
0.17	0.170007	0.170004	0.000003	0.0000079	2.00
0.20	0.200002	0.200000	0.000002	0.0000065	2.00
0.50	0.499999	0.499998	0.000001	0.000011	2.00
1.00	1.000005	1.000004	0.000001	0.000014	2.00
1.50	1.500004	1.500004	0.000000	0.000016	2.00
2.00	2.000006	2.000005	0.000001	0.000014	2.00
3.00	3.000011	3.000007	0.000004	0.000018	2.00
4.00	4.000014	4.000009	0.000005	0.000021	2.00
4.50	4.500013	4.500008	0.000005	0.000024	2.00
5.00	5.000002	5.000000	0.000002	0.000018	2.00
6.00	6.000007	5.999988	0.000019	0.000029	2.00

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

----- End -----

เอกสารไม่ควบคุม

Calibration Certificate

Certificate No.: 2103189-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakanong, Bangkok 10260

Page 1 of 5

Equipment: pH Meter
Manufacturer: METTLER TOLEDO
Model: SevenEasy pH
Serial No.: 1231155210
ID No.: UAE.WAT.010/2553
Order No.: 2103189
Operation No.: 2103189-002
Date of Receipt: 9 June 2021
Date of Calibration: 14 June 2021

Calibrated by Mr.Manas Somsak
Expert

Approved by 
(Mr.Pheraphat Tuanjit)

Manager, Division of Calibration Laboratory

Date of Issue: 15 June 2021

Responsible for the Technical Management Team

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

Calibration Report

Certificate No.: 2103189-002-01

Equipment: pH Meter **Resolution:** 0.01 pH ; 1 mV
Manufacturer: METTLER TOLEDO **Model:** SevenEasy pH
Serial No.: 1231155210 **Type:** Bench top
ID No.: UAE.WAT.010/2553

Date of Calibration: 14 June 2021

Page 2 of 5

Location: Chemical Calibration Laboratory, National Food Institute

Environment Condition: **Ambient Temperature:** (23.7 ± 1.5) °C **Relative Humidity:** (53.5 ± 5) %

Condition of Equipment: Good Condition

Condition of this Results of Calibration

1. Calibration Method In house method : W-CC-002 based on direct measurement by using standard voltage calibrator and certified reference material (CRM)

2. Reference Standards / Certified Reference Material

<u>Instruments</u>	<u>Serial / ID No.</u>	<u>Manufacturer</u>	<u>Certificate No.</u>	<u>Due Date</u>
2.1 DC Voltage Calibrator	2709007	Fluke	SCL-20F-0682	17 June 2021
2.2 Digital Thermometer	2709007	Fluke	CC 630609-01	30 October 2021
2.3 Thermo-Hygro Meter	NFI.BTH003/17	PONPE	QR20-1578	21 September 2021

<u>Certified Reference Material</u>	<u>Lot. No.</u>	<u>Manufacturer</u>	<u>Ref N</u>	<u>Expire Date</u>
2.4 pH buffer 4.008 (Primary pH buffer Solution)	710048	CPAchem	PH216.L5	2 October 2022
2.5 pH buffer 6.865 (Primary pH buffer Solution)	710049	CPAchem	PH217.L5	2 October 2022
2.6 pH buffer 10.01 (Primary pH buffer Solution)	710050	CPAchem	PH220.L5	2 October 2021
2.7 pH buffer 7.00 (Standard pH buffer Solution)	710051	CPAchem	PH107.L5	2 October 2021

3. This certification is traceable to The International System of Unit (SI Unit)

3.1 Instruments No.2.1	through	NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0075
3.2 Instruments No.2.2	through	NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0061
3.3 Instruments No.2.3	through	NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0292
3.4 Certified Reference Material No. 2.4 to 2.6	traceable to	Primary measurement method- Hamed cell using calibrated thermometer, barometer, and nanovoltmeter. The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025
3.5 Certified Reference Material No. 2.7	traceable to	BIM RefN HI-7 LotN 30.04.2020; BIM RefN HI-9 LotN 28.05.2020; BIM RefN HI-8 LotN 30.04.2020; BIM RefN HI-10 LotN 28.05.2020. The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025

4. This certificate was certified only for the instrument we calibrated.

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

Calibration Report

Certificate No.: 2103189-002-01

Equipment: pH Meter **Resolution:** 0.01 pH ; 1 mV

Manufacturer: METTLER TOLEDO **Model:** SevenEasy pH

Serial No.: 1231155210 **Type:** Bench top

ID No.: UAE.WAT.010/2553

Date of Calibration: 14 June 2021

Page 3 of 5

Calibration Results:

1. Calibration of pH Meter (Manual Temperature Compensation at 25 °C)

Nominal pH	DC Voltage Standard (mV)	Average Indicator Reading		Uncertainty (±mV)	Coverage Factor (k)
		mV	pH		
0.00	414.118	414	0.00	0.58	2.00
2.00	295.811	296	2.00	0.58	2.00
4.00	177.461	178	4.00	0.58	2.00
6.00	59.160	59	6.00	0.58	2.00
7.00	0.000	0	7.00	0.58	2.00
8.00	-59.158	-59	8.00	0.58	2.00
10.00	-177.461	-177	10.00	0.58	2.00
12.00	-295.812	-296	12.00	0.58	2.00
14.00	-414.118	-414	14.00	0.58	2.00

2. Calibration of pH Meter with Electrode (Manual Temperature Compensation at 25 °C)

Equipment: pH Electrode **Type:** Combined Electrode

Manufacturer: METTLER TOLEDO **Model:** InLab Solids

Serial No.: 115882 **ID.No.:** N/A

Performance of Electrode system (Three-Point Calibration at pH4, pH7 and pH10)

Certified Value @25 °C (pH)	Average Indicator Reading		Relative Slope (%)	Uncertainty (± pH)	Coverage Factor (k)
	pH	mV			
4.008	4.01	185	99.9	0.0071	2.00
6.866	6.87	16		0.0075	2.00
6.866	6.87	16	98.0	0.0075	2.00
10.008	10.01	-166		0.0093	2.00
6.985	6.99	9	-	0.0093	2.00

Calibration Report

Certificate No.: 2103189-002-01

Equipment: Digital Thermometer with RTD (pH Meter)

Resolution: 0.1 °C Model: SevenEasy pH

Serial No.: 1231155210 ID No.: UAE.WAT.010/2553

Manufacturer: METTLER TOLEDO

Date of Calibration: 14 June 2021

Page 4 of 5

Location: Chemical Calibration Laboratory, National Food Institute

Environment Condition: Ambient Temperature 24 °C ± 1 °C

Relative Humidity 54 % ± 2 %

Condition of this results of Calibration:

1. Calibration Method :
 - In house method: W-TE-025 by comparison with standard thermometer.
 - The Calibration is determined by comparing with a known temperature from a standard resistance thermometer.
 - The temperature scale in use at this laboratory is the International Temperature scale of 1990 (ITS-90).

2. Reference Standard Instrument :

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
HANDHELD THERMOMETER	1521	A85997	TE 640028-01	12-Dec-21	NATIONAL FOOD INSTITUTE
Platinum Resistance Thermometer (PRT)	385	509201			

Support Equipment : - Low Temperature Bath (ISOCAL-6), Model: Europa-6 Plus Basic, S/N: 341592/2

3. This certificate is traceable to International System of Units (SI Units).
4. This certificate was certified only for the instrument we calibrated.
5. This result of calibration was found accurate as shown on date and place of calibration only.

6. Condition of Calibrated item : Good

7. Result of Calibration : ☒ Without adjustment ☐ After adjustment



Calibration Report

Certificate No.: 2103189-002-01

Equipment: Digital Thermometer with RTD (pH Meter)

Resolution: 0.1 °C Model: SevenEasy pH

Serial No.: 1231155210 ID No.: UAE.WAT.010/2553

Manufacturer: METTLER TOLEDO

Date of Calibration: 14 June 2021

Page 5 of 5

Calibration point: 15.0, 25.0 and 35.0 °C

Calibration result:

- The probe was immersed in liquid bath or dry bath to a minimum depth of 25 mm.

- Description of probe, model : InLab Solids S/N : 115882

Dimension of probe : Diameter 6 mm., Length 25 mm.,

Sheath material : Glass

UUC* Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.1	15.001	-0.1	0.13
25.1	24.999	-0.1	0.13
35.1	34.999	-0.1	0.13

Note

- UUC* : Unit Under Calibration

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

----- End -----



Calibration Certificate

Certificate No.: 2101930-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhnong, Bangkok 10260

Page 1 of 5

Equipment: pH Meter
Manufacturer: METTLER TOLEDO
Model: SevenEasy pH
Serial No.: 1230525212
ID No.: UAE.WAS.003/2553
Order No.: 2101930
Operation No.: 2101930-001
Date of Receipt: 10 March 2021
Date of Calibration: 17 March 2021

Calibrated by Mr.Manas Somsak
Expert

Approved by 
(Mr.Pheraphat Tuanjit)

Manager, Division of Calibration Laboratory

Date of Issue: 19 March 2021

Responsible for the Technical Management Team

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

Calibration Report

Certificate No.: 2101930-001-01

Equipment: pH Meter **Resolution:** 0.01 pH ; 1 mV
Manufacturer: METTLER TOLEDO **Model:** SevenEasy pH
Serial No.: 1230525212 **Type:** Bench top
ID No.: UAE.WAS.003/2553

Date of Calibration: 17 March 2021

Page 2 of 5

Location: Chemical Calibration Laboratory, National Food Institute

Environment Condition: **Ambient Temperature:** (23.3 ± 1.5) °C **Relative Humidity:** (53.5 ± 5) %

Condition of Equipment: Good Condition

Condition of this Results of Calibration

1. Calibration Method In house method : W-CC-002 based on direct measurement by using standard voltage calibrator and certified reference material (CRM)

2. Reference Standards / Certified Reference Material

Instruments	Serial / ID No.	Manufacturer	Certificate No.	Due Date
2.1 DC Voltage Calibrator	2709007	Fluke	SCL-20F-0682	17 June 2021
2.2 Digital Thermometer	2709007	Fluke	CC 630609-01	30 October 2021
2.3 Thermo-Hygro Meter	NFI.BTH003/17	PONPE	QR20-1578	21 September 2021

Certified Reference Material	Lot. No.	Manufacturer	Ref N	Expire Date
2.4 pH buffer 4.008 (Primary pH buffer Solution)	710048	CPAchem	PH216.L5	2 October 2022
2.5 pH buffer 6.865 (Primary pH buffer Solution)	710049	CPAchem	PH217.L5	2 October 2022
2.6 pH buffer 10.01 (Primary pH buffer Solution)	710050	CPAchem	PH220.L5	2 October 2021
2.7 pH buffer 7.00 (Standard pH buffer Solution)	710051	CPAchem	PH107.L5	2 October 2021

3. This certification is traceable to The International System of Unit (SI Unit)

3.1 Instruments No.2.1	through	NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0075
3.2 Instruments No.2.2	through	NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0061
3.3 Instruments No.2.3	through	NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0292
3.4 Certified Reference Material No. 2.4 to 2.6	traceable to	Primary measurement method- Harned cell using calibrated thermometer, barometer, and nanovoltmeter. The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025
3.5 Certified Reference Material No. 2.7	traceable to	BIM RefN HI-7 LotN 30.04.2020; BIM RefN HI-9 LotN 28.05.2020; BIM RefN HI-8 LotN 30.04.2020; BIM RefN HI-10 LotN 28.05.2020. The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025

4. This certificate was certified only for the instrument we calibrated.

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

Calibration Report

Certificate No.: 2101930-001-01

Equipment: pH Meter Resolution: 0.01 pH ; 1 mV
Manufacturer: METTLER TOLEDO Model: SevenEasy pH
Serial No.: 1230525212 Type: Bench top
ID No.: UAE.WAS.003/2553

Date of Calibration: 17 March 2021

Page 3 of 5

Calibration Results:

1. Calibration of pH Meter (Manual Temperature Compensation at 25 °C)

Nominal pH	DC Voltage Standard (mV)	Average Indicator Reading		Uncertainty (±mV)	Coverage Factor (k)
		mV	pH		
0.00	414.118	414	0.00	0.58	2.00
2.00	295.811	296	2.00	0.58	2.00
4.00	177.461	178	4.00	0.58	2.00
6.00	59.160	59	6.00	0.58	2.00
7.00	0.000	0	7.00	0.58	2.00
8.00	-59.158	-59	8.00	0.58	2.00
10.00	-177.461	-177	10.00	0.58	2.00
12.00	-295.812	-296	12.00	0.58	2.00
14.00	-414.118	-414	14.00	0.58	2.00

2. Calibration of pH Meter with Electrode (Manual Temperature Compensation at 25 °C)

Equipment: pH Electrode Type: Combined Electrode
Manufacturer: METTLER TOLEDO Model: InLab Solids
Serial No.: 9453943 ID.No. N/A

Performance of Electrode system (Three-Point Calibration at pH4, pH7 and pH10)

Certified Value @25 °C (pH)	Average Indicator Reading		Relative Slope (%)	Uncertainty (± pH)	Coverage Factor (k)
	pH	mV			
4.008	4.01	186	97.5	0.0071	2.00
6.866	6.87	21		0.0075	2.00
6.866	6.87	21	98.0	0.0075	2.00
10.008	10.01	-161		0.0093	2.00
6.985	6.99	14		0.0093	2.00

Calibration Report

Certificate No.: 2101930-001-01

Equipment: Digital Thermometer with RTD (pH Meter)

Resolution: 0.1 °C **Model:** SevenEasy pH

Serial No.: 1230525212 **ID No.:** UAE.WAS.003/2553

Manufacturer: METTLER TOLEDO

Date of Calibration: 17 March 2021

Page 4 of 5

Location: Chemical Calibration Laboratory, National Food Institute

Environment Condition:

Ambient Temperature 23 °C ± 1 °C

Relative Humidity 54 % ± 2 %

Condition of this results of Calibration:

- Calibration Method :
 - In house method: W-TE-025 by comparison with standard thermometer.
 - The Calibration is determined by comparing with a known temperature from a standard resistance thermometer.
 - The temperature scale in use at this laboratory is the International Temperature scale of 1990 (ITS-90).

2. Reference Standard Instrument :

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
HANDHELD THERMOMETER	1523	2118154	PSL-T 767/63	04-Jun-21	TISTR
Platinum Resistance Thermometer (PRT)	5627A	877332			

Support Equipment : - Low Temperature Bath (ISOCAL-6), Model: Europa-6 Plus Basic, S/N: 341592/2

- This certificate is traceable to International System of Units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.

6. Condition of Calibrated item :

Good

7. Result of Calibration :

☒

Without adjustment

☐

After adjustment

Calibration Report

Certificate No.: 2101930-001-01

Equipment: Digital Thermometer with RTD (pH Meter)

Resolution: 0.1 °C

Model: SevenEasy pH

Serial No.: 1230525212

ID No.: UAE.WAS.003/2553

Manufacturer: METTLER TOLEDO

Date of Calibration: 17 March 2021

Page 5 of 5

Calibration point: 15.0, 25.0 and 35.0 °C

Calibration result:

- The probe was immersed in liquid bath or dry bath to a minimum depth of 100 mm.

- Description of probe, model : - S/N : -

Dimension of probe : Diameter 3.5 mm., Length 120 mm.,

Sheath material : Stainless Steel

UUC* Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.2	15.003	-0.2	0.099
25.2	25.003	-0.2	0.099
35.2	35.007	-0.2	0.099

Note

- UUC* : Unit Under Calibration

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

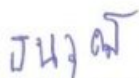
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CERTIFICATE OF CALIBRATION

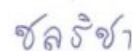
Certificate No. : SP21-015

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Customer : United Analyst and Engineering Consultant Co.,Ltd. (Head Office)**Address :** 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260**Location of calibration** Laboratory 315**Equipment :** Spectrophotometer**Manufacturer :** Agilent Technologies**Model :** Cary 60**Serial No. :** MY15410009**ID No. :** N/A**Received Date :** 29 May 2021**Calibration Date :** 29 May 2021**Issue Date :** 30 May 2021**Condition of Instrument :** Used**Calibrated by :**

(Mr.Tanawut Rittidach)

Technical Manager

Approved by :

(Miss Chonthicha Sangngern)

Quality Manager

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the DQE Services Co., Ltd.

REPORT OF CALIBRATION

Certificate No. : SP21-015

Page 2 of 5

Environment Condition : Ambient Temperature 25 ± 5 °CRelative humidity 50 ± 15 %RH**Calibration method :** In-house method CP-01 Calibration of UV-Vis Spectrophotometer Based on ASTM E275-08**Certified Reference Materials :**

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	80102	11/7/2021
Absorbance Standard set	25757	80105	11/7/2021
Wavelength Standard set	25806	80103	11/7/2021
Wavelength Standard set	25758	80104	11/7/2021

Traceability : This certification is traceable to the International System of Unit maintained at National Institute -
of Standards and Technology (NIST) through Sarna Scientific Limited

Spectral Band Width of UUC : 1.5 nm.**Scan Speed of UUC :** 90 nm./min**Scan Interval of UUC :** 0.15 nm.**Resolution of UUC :** Photometric 0.0001 Abs.

Wavelength 0.1 nm.

REPORT OF CALIBRATION

Certificate No. : SP21-015

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Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor <i>k</i>
241.72	242.0	-0.28	0.19	2.00
279.45	279.5	-0.05	0.19	2.00
287.81	287.9	-0.09	0.19	2.00
334.06	333.8	0.26	0.19	2.00
360.93	360.5	0.43	0.19	2.00
418.59	418.2	0.39	0.19	2.00
445.94	445.6	0.34	0.19	2.00
453.66	453.3	0.36	0.19	2.00
460.02	459.8	0.22	0.19	2.00
536.59	536.7	-0.11	0.19	2.00
637.98	638.4	-0.42	0.19	2.00
431.38	430.9	0.48	0.19	2.00
472.50	472.5	0.00	0.19	2.00
513.47	513.4	0.07	0.19	2.00
528.88	529.2	-0.32	0.19	2.00
573.17	573.5	-0.33	0.19	2.00
585.35	584.8	0.55	0.20	2.00
684.40	684.9	-0.50	0.19	2.00
740.72	740.4	0.32	0.19	2.00
748.55	749.0	-0.45	0.19	2.00
807.03	807.1	-0.07	0.19	2.00
879.28	879.4	-0.12	0.19	2.00

REPORT OF CALIBRATION

Certificate No. : SP21-015

Page 4 of 5

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor <i>k</i>
420	0.0000	0.0000	0.0000	0.0042	2.00
	0.5791	0.5767	0.0024	0.0042	2.00
	1.0488	1.0444	0.0044	0.0042	2.00
	2.1914	2.1841	0.0073	0.0092	2.00
440	0.0000	0.0001	-0.0001	0.0042	2.00
	0.5618	0.5609	0.0009	0.0042	2.00
	1.0260	1.0244	0.0016	0.0042	2.00
	2.1259	2.1192	0.0067	0.0091	2.00
465	0.0000	0.0000	0.0000	0.0042	2.00
	0.5240	0.5212	0.0028	0.0042	2.00
	0.9639	0.9632	0.0007	0.0042	2.00
	1.9788	1.9717	0.0071	0.0091	2.00
546.1	0.0000	-0.0001	0.0001	0.0042	2.00
	0.5194	0.5184	0.0010	0.0042	2.00
	0.9991	0.9991	0.0000	0.0042	2.00
	1.9970	1.9911	0.0059	0.0093	2.00
590	0.0000	0.0000	0.0000	0.0042	2.00
	0.5523	0.5517	0.0006	0.0042	2.00
	1.0810	1.0802	0.0008	0.0042	2.00
	2.0369	2.0293	0.0076	0.0092	2.00
635	0.0000	-0.0001	0.0001	0.0042	2.00
	0.5596	0.5593	0.0003	0.0042	2.00
	1.0513	1.0505	0.0008	0.0042	2.00
	1.9268	1.9217	0.0051	0.0092	2.00

REPORT OF CALIBRATION

Certificate No. : SP21-015

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Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor <i>k</i>
235	0.0000	0.0001	-0.0001	0.0075	2.00
	0.7498	0.7438	0.0060	0.0075	2.00
257	0.0000	0.0000	0.0000	0.0075	2.00
	0.8712	0.8647	0.0065	0.0075	2.00
313	0.0000	0.0000	0.0000	0.0075	2.00
	0.2920	0.2900	0.0020	0.0075	2.00
350	0.0000	0.0000	0.0000	0.0075	2.00
	0.6459	0.6428	0.0031	0.0075	2.00

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k ,

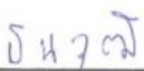
which for a normal distribution corresponds to a coverage probability of approximately 95%

- End of Certificate -

CERTIFICATE OF CALIBRATION

Certificate No. : SP21-008

Page 1 of 5

Customer : United Analyst and Engineering Consultant Co.,Ltd. (Head Office)**Address :** 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260**Location of calibration :** Laboratory 315**Equipment :** Spectrophotometer**Manufacturer :** Hitachi**Model :** U-1900**Serial No. :** 2021-064**ID No. :** UAE.WAS.006/2552**Received Date :** 25 January 2564**Calibration Date :** 25 January 2564**Issue Date :** 26 January 2564**Condition of Instrument :** Used**Calibrated by :**
(Mr.Tanawut Rittidach)

Technical Manager

Approved by :
(Miss Chonthicha Sangngern)

Quality Manager

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the DQE Services Co., Ltd.

REPORT OF CALIBRATION

Certificate No. : SP21-008

Page 2 of 5

Environment Condition : Ambient Temperature 25 ± 5 °CRelative humidity 50 ± 15 %RH**Calibration method :** In-house method CP-01 Calibration of UV-Vis Spectrophotometer Based on ASTM E275-08**Certified Reference Materials :**

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	80102	7/11/2021
Absorbance Standard set	25757	80105	7/11/2021
Wavelength Standard set	25806	80103	7/11/2021
Wavelength Standard set	25758	80104	7/11/2021

Traceability : This certification is traceable to the International System of Unit maintained at National Institute -
of Standards and Technology (NIST) through Sarna Scientific Limited

Spectral Band Width of UUC : 4.0 nm.**Scan Speed of UUC :** 200 nm./min**Scan Interval of UUC :** 0.1 nm.**Resolution of UUC :** Photometric 0.001 Abs.

Wavelength 0.1 nm.

REPORT OF CALIBRATION

Certificate No. : SP21-008

Page 3 of 5

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor <i>k</i>
241.54	240.8	0.74	0.19	2.00
279.40	278.6	0.80	0.19	2.00
288.70	287.6	1.10	0.19	2.00
334.22	333.6	0.62	0.19	2.00
361.26	360.6	0.66	0.19	2.00
418.48	418.0	0.48	0.19	2.00
446.70	445.8	0.90	0.19	2.00
453.20	452.8	0.40	0.19	2.00
460.06	459.6	0.46	0.19	2.00
536.90	536.2	0.70	0.19	2.00
637.94	637.4	0.54	0.19	2.00
440.74	440.2	0.54	0.19	2.00
472.22	471.8	0.42	0.19	2.00
513.70	513.0	0.70	0.19	2.00
528.72	528.2	0.52	0.19	2.00
574.60	574.0	0.60	0.19	2.00
585.48	584.8	0.68	0.19	2.00
684.63	684.0	0.63	0.19	2.00
740.27	739.8	0.47	0.19	2.00
748.28	747.8	0.48	0.19	2.00
807.16	806.6	0.56	0.19	2.00
879.70	879.0	0.70	0.19	2.00

REPORT OF CALIBRATION

Certificate No. : SP21-008

Page 4 of 5

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor <i>k</i>
420	0.0000	0.000	0.0000	0.0042	2.00
	0.5791	0.577	0.0021	0.0042	2.00
	1.0488	1.045	0.0038	0.0042	2.00
	2.1914	2.183	0.0084	0.0092	2.00
440	0.0000	0.000	0.0000	0.0042	2.00
	0.5618	0.560	0.0018	0.0042	2.00
	1.0260	1.025	0.0010	0.0042	2.00
	2.1259	2.122	0.0039	0.0091	2.00
465	0.0000	0.000	0.0000	0.0042	2.00
	0.5240	0.522	0.0020	0.0042	2.00
	0.9639	0.965	-0.0011	0.0042	2.00
	1.9788	1.978	0.0008	0.0092	2.00
546.1	0.0000	0.000	0.0000	0.0042	2.00
	0.5194	0.519	0.0004	0.0042	2.00
	0.9991	1.001	-0.0019	0.0042	2.00
	1.9970	1.998	-0.0010	0.0092	2.00
590	0.0000	0.000	0.0000	0.0042	2.00
	0.5523	0.553	-0.0007	0.0042	2.00
	1.0810	1.082	-0.0010	0.0042	2.00
	2.0369	2.035	0.0019	0.0092	2.00
635	0.0000	0.000	0.0000	0.0042	2.00
	0.5596	0.561	-0.0014	0.0042	2.00
	1.0513	1.052	-0.0007	0.0042	2.00
	1.9268	1.925	0.0018	0.0092	2.00

REPORT OF CALIBRATION

Certificate No. : SP21-008

Page 5 of 5

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor <i>k</i>
235	0.0000	0.000	0.0000	0.0076	2.00
	0.7498	0.745	0.0048	0.0076	2.00
257	0.0000	0.000	0.0000	0.0076	2.00
	0.8712	0.864	0.0072	0.0076	2.00
313	0.0000	0.000	0.0000	0.0076	2.00
	0.2920	0.290	0.0020	0.0076	2.00
350	0.0000	0.000	0.0000	0.0076	2.00
	0.6459	0.632	0.0139	0.0076	2.00

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k ,

which for a normal distribution corresponds to a coverage probability of approximately 95%

- End of Certificate -

CERTIFICATE OF CALIBRATION

Certificate No. : SP21-009

Page 1 of 5

Customer : United Analyst and Engineering Consultant Co.,Ltd. (Head Office)**Address :** 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260**Location of calibration :** Laboratory 213**Equipment :** Spéctrophotometer**Manufacturer :** Merck**Model :** Pharo 100**Serial No. :** 12390016**ID No. :** UAE.WAT.009/2556**Received Date** 25 January 2021**Calibration Date** 25 January 2021**Issue Date :** 26 January 2021**Condition of Instrument** Used**Calibrated by :**
(Mr.Tanawut Rittidach)

Technical Manager

Approved by :
(Miss Chonthicha Sangngern)

Quality Manager

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.
The measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the DQE Services Co., Ltd.

REPORT OF CALIBRATION

Certificate No. : SP21-009

Page 2 of 5

Environment Condition: Ambient Temperature 25 ± 5 °CRelative humidity 50 ± 15 %RH**Calibration method** In-house method CP-01 Calibration of UV-Vis Spectrophotometer Based on ASTM E275-08**Certified Reference Materials :**

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	80102	7/11/2021
Absorbance Standard set	25757	80105	7/11/2021
Wavelength Standard set	25806	80103	7/11/2021
Wavelength Standard set	25758	80104	7/11/2021

Traceability : This certification is traceable to the International System of Unit maintained at National Institute -
of Standards and Technology (NIST) through Sarna Scientific Limited

Spectral Band Width of UUC : 4.0 nm.**Scan Speed of UUC :** N/A**Scan Interval of UUC :** N/A nm.**Resolution of UUC:** Photometric 0.001 Abs.

Wavelength 1.0 nm.

REPORT OF CALIBRATION

Certificate No. SP21-009

Page 3 of 5

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor <i>k</i>
241.54	N/A	N/A	N/A	2.00
279.40	N/A	N/A	N/A	2.00
288.70	N/A	N/A	N/A	2.00
334.22	332	2.22	0.61	2.00
361.26	360	1.26	0.61	2.00
418.48	418	0.48	0.61	2.00
446.70	447	-0.30	0.61	2.00
453.20	453	0.20	0.61	2.00
460.06	459	1.06	0.61	2.00
536.90	537	-0.10	0.61	2.00
637.94	638	-0.06	0.61	2.00
440.74	441	-0.26	0.61	2.00
472.22	471	1.22	0.61	2.00
513.70	514	-0.30	0.61	2.00
528.72	529	-0.28	0.61	2.00
574.60	575	-0.40	0.61	2.00
585.48	586	-0.52	0.61	2.00
684.63	685	-0.37	0.61	2.00
740.27	739	1.27	0.61	2.00
748.28	747	1.28	0.61	2.00
807.16	805	2.16	0.61	2.00
879.70	878	1.70	0.61	2.00

REPORT OF CALIBRATION

Certificate No. SP21-009

Page 4 of 5

Calibration Results Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor <i>k</i>
420	0.0000	0.000	0.0000	0.0042	2.00
	0.5791	0.576	0.0031	0.0042	2.00
	1.0488	1.045	0.0038	0.0042	2.00
	2.1914	2.192	-0.0006	0.0092	2.00
440	0.0000	0.000	0.0000	0.0042	2.00
	0.5618	0.559	0.0028	0.0042	2.00
	1.0260	1.024	0.0020	0.0042	2.00
	2.1259	2.125	0.0009	0.0092	2.00
465	0.0000	0.000	0.0000	0.0042	2.00
	0.5240	0.520	0.0040	0.0042	2.00
	0.9639	0.965	-0.0011	0.0042	2.00
	1.9788	1.982	-0.0032	0.0092	2.00
546.1	0.0000	0.000	0.0000	0.0042	2.00
	0.5194	0.518	0.0014	0.0042	2.00
	0.9991	0.999	0.0001	0.0042	2.00
	1.9970	1.995	0.0020	0.0092	2.00
590	0.0000	0.000	0.0000	0.0042	2.00
	0.5523	0.551	0.0013	0.0042	2.00
	1.0810	1.080	0.0010	0.0042	2.00
	2.0369	2.033	0.0039	0.0092	2.00
635	0.0000	0.000	0.0000	0.0042	2.00
	0.5596	0.558	0.0016	0.0042	2.00
	1.0513	1.050	0.0013	0.0042	2.00
	1.9268	1.925	0.0018	0.0092	2.00

REPORT OF CALIBRATION

Certificate No. SP21-009

Page 5 of 5

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor <i>k</i>
235	0.0000	N/A	N/A	N/A	2.00
	0.7498	N/A	N/A	N/A	2.00
257	0.0000	N/A	N/A	N/A	2.00
	0.8712	N/A	N/A	N/A	2.00
313	0.0000	N/A	N/A	N/A	2.00
	0.2920	N/A	N/A	N/A	2.00
350	0.0000	N/A	N/A	N/A	2.00
	0.6459	N/A	N/A	N/A	2.00

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k ,

which for a normal distribution corresponds to a coverage probability of approximately 95%

- End of Certificate -



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



Cert. No.: 21TM366

Page.: 1 of 3

Certificate of Calibration

Equipment : BOD Incubator

Manufacturer : Arco

Model : UC4-1320

Serial No. : 13URC4S013201

ID No. : UAE.WAO. 015/2561

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location : Lab Floor 2

Received Order : 22 February 2021
Calibration Date : 23 February 2021
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Preecha Hlahib

Approved by :

Approved Signatory

- (☒) Pornthippa Tameyakul
(☒) Malee Butkruea
(☐) Suwit Imjai

Issue Date : 3 March 2021

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

เอกสารไม่ควบคุม



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2102-0757OC-1

Cert. No.: 21TM366

Page.: 2 of 3

Procedure Used :-

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY49023932	20LM6	NIST, NIMT	20 Apr 2021

2. This certification is traceable to the SI unit.

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

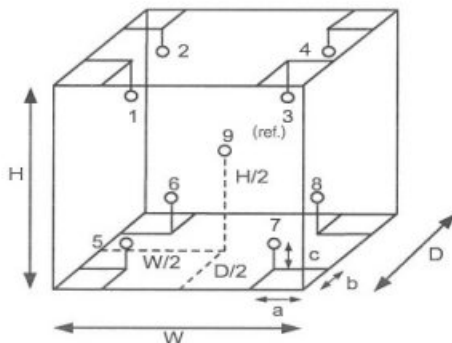
Remark : NIST : National Institute of Standards and Technology, The United State of America.

NIMT : National Institute of Metrology Thailand.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



Probe Installation Details :

a = 10 cm
b = 10 cm
c = 10 cm

Dimension of Chamber :

D = 0.62 m
W = 1.2 m
H = 1.2 m
Capacity = 0.89 m³

Environment during calibration

	Beginning	Finished
Temp. (°C)	27	28
REL.Humid. (%)	66	69
AC Supply (Volt)	220	220

Position :	Ref. Std./ID No.:
1	20-16RTD-01
2	20-16RTD-02
3	20-16RTD-03
4	20-16RTD-04
5	20-16RTD-05
6	20-16RTD-06
7	20-16RTD-07
8	20-16RTD-08
9 (ref.)	20-16RTD-09

เอกสารไม่ควบคุม



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2102-0757OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 21TM366

Page.: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
20.0	20.0	19.4	0.38	0.64	1.1	0.61	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
20.0	20.049	20.023	20.336	19.948	19.847	19.845	19.773	19.746	19.790

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

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

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

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

UUC* : Unit Under Calibration

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

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

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



Cert. No.: 21TM811

Page.: 1 of 3

Certificate of Calibration

Equipment : BOD Incubator

Manufacturer : ARCO

Model : UR-1320

Serial No. : -

ID No. : UAE.WAO.018/2551

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location : Lab Floor 2

Received Order : 21 April 2021
Calibration Date : 21 April 2021
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Khit Ruttanaprapachai

Approved by :


Approved Signatory

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

Issue Date : 5 May 2021

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม

A 0027600



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2104-0024OC-3

Cert. No.: 21TM811

Page.: 2 of 3

Procedure Used :-

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
1) Data Acquisition	MY57013711	20LM7	NIST, NIMT	18 May 2021

2. This certification is traceable to the SI unit.

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

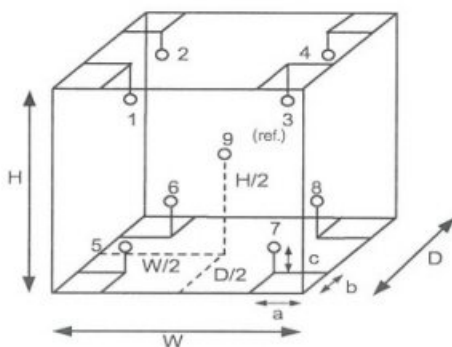
Remark : NIST : National Institute of Standards and Technology, The United State of America.

NIMT : National Institute of Metrology Thailand.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	28
REL.Humid. (%)	47	51
AC Supply (Volt)	221	222

Position :	Ref. Std./ID No.:
1	18RTD-2/1
2	18RTD-2/2
3	18RTD-2/3
4	18RTD-2/4
5	18RTD-2/5
6	18RTD-2/6
7	18RTD-2/7
8	18RTD-2/8
9 (ref.)	18RTD-2/9

Probe Installation Details :

a = 10 cm
b = 10 cm
c = 10 cm

Dimension of Chamber :

D = 0.62 m
W = 1.2 m
H = 1.2 m
Capacity = 0.89 m³

เอกสารไม่ควบคุม

a 1052721



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2104-0024OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 21TM811

Page.: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
20.0	20.0	20.0	0.15	0.47	0.86	0.31	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
20.0	20.368	20.509	20.115	20.023	19.826	19.955	20.135	20.269	20.101

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

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

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

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

UUC* : Unit Under Calibration

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

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

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เอกสารไม่ควบคุม

a 1052720

Calibration Certificate

Certificate No.: 2102573-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhnong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C009071872
ID No.: UAE.WAO.012/2563
Order No.: 2102573
Operation No.: 2102573 -001
Date of Receipt: 26 April 2021
Date of Calibration: 26 April 2021

Calibrated by Mr.Manas Somsak
Expert

Approved by 
(Mr.Pheraphat Tuanjit)

Manager, Division of Calibration Laboratory

Date of Issue: 29 April 2021

Responsible for the Technical Management Team

The uncertainties are for a confidence probability of approximately 95%

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2102573-001-01

Equipment:

Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Resolution: 0.00001 g / 0.0001 g

Serial No.: C009071872

ID No.: UAE.WAO.012/2563

Capacity: 81 g / 220 g

Date of Calibration: 26 April 2021

Page 2 of 4

Environment Condition: Ambient Temperature: 23.2 ± 0.1 °C Relative Humidity: 48 ± 2 %

Place of Calibration: Balance Room (208), UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method Based on UKAS LAB 14 Calibration of Weighing Machines : 2006

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1-500mg	B308068554	TCS	M2101097S	12 January 2022
Standard Weight Class E2	1-500g	B308068128	TCS	M2101098S	13 January 2022

Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	PONPE 490	NFI.BTH 004/18	Quality Reborn	QR21-0300	15 February 2022

3. This certification is traceable to SI UNIT

4. This certificate was certified only for the instrument we calibrated.

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

Calibration Results:

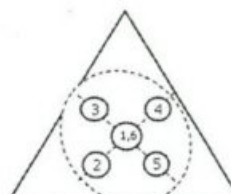
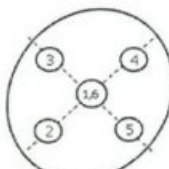
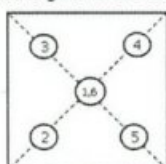
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.0000048
80	0.0000032
100	0.0000000
200	0.0000000

2. Off-Center Error:

A mass of 50 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1 (g)	2 (g)	3 (g)	4 (g)	5 (g)	6 (g)	(Maximum Difference) (g)
50.00000	49.99999	50.00001	50.00001	49.99999	50.00000	0.00001

Calibration Report

Certificate No.: 2102573-001-01

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Resolution: 0.00001 g / 0.0001 g

Serial No.: C009071872

ID No.: UAE.WAO.012/2563

Capacity: 81 g / 220 g

Date of Calibration: 26 April 2021

Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range 0 - 81 g : Resolution 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor <i>k</i>
0.01	0.010002	0.01003	-0.00003	0.0000091	2.00
0.05	0.050004	0.05004	-0.00003	0.0000099	2.00
0.1	0.100000	0.10003	-0.00003	0.000011	2.00
0.2	0.200002	0.20004	-0.00004	0.000011	2.00
0.5	0.499999	0.50003	-0.00003	0.000014	2.00
1	1.000005	1.00001	0.00000	0.000014	2.00
2	2.000006	2.00001	-0.00001	0.000017	2.00
3	3.000011	3.00001	0.00000	0.000020	2.00
4	4.000014	4.00002	-0.00001	0.000023	2.00
5	5.000002	5.00002	-0.00002	0.000020	2.00
10	9.999980	10.00002	-0.00004	0.000029	2.00
20	19.999988	20.00004	-0.00005	0.000037	2.00
50	49.999903	49.99997	-0.00006	0.000083	2.00
70	69.999891	69.99995	-0.00006	0.00011	2.00
80	79.999871	79.99994	-0.00007	0.00015	2.00

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

Calibration Report

Certificate No.: 2102573-001-01

Equipment:

Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Resolution: 0.00001 g / 0.0001 g

Serial No.: C009071872

ID No.: UAE.WAO.012/2563

Capacity: 81 g / 220 g

Date of Calibration: 26 April 2021

Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range >81 g to 200 g, : Resolution 0.0001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor <i>k</i>
82	81.99988	82.0000	-0.0001	0.00012	2.00
85	84.99987	85.0000	-0.0001	0.00013	2.00
90	89.99988	90.0000	-0.0001	0.00013	2.00
95	94.99988	95.0000	-0.0001	0.00014	2.00
100	100.00000	100.0000	0.0000	0.00015	2.00
110	109.99998	110.0000	0.0000	0.00016	2.00
120	119.99999	120.0000	0.0000	0.00017	2.00
150	149.99990	150.0000	-0.0001	0.00020	2.00
170	169.99989	170.0000	-0.0001	0.00023	2.00
200	200.00009	200.0001	0.0000	0.00028	2.00

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

----- End -----



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



Cert. No.: 21TM1876

Page.: 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven

Manufacturer : Memmert

Model : UF 55

Serial No. : B216.1666

ID No. : UAE.WAO.027/2559

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location : Lab Floor 2

Received Order : 29 October 2021

Calibration Date : 29 October 2021

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Kunchit Promprat

Approved by :

Approved Signatory

- (☒) Pornthippa Tameyakul
(☒) Malee Butkruea
(☐) Suwit Imjai

Issue Date : 4 November 2021

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

เอกสารไม่ควบคุม



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2110-0701OC-1

Cert. No.: 21TM1876

Page.: 2 of 3

Procedure Used :-

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY44067817	21LM10	20 Jul 2022

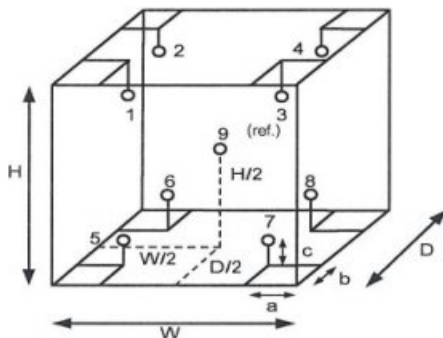
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Environment during calibration		
	Beginning	Finished
Temp. (°C)	28	28
REL.Humid. (%)	56	55
AC Supply (Volt)	230	230

Probe Installation Details :			Dimension of Chamber :		
a =	5.0	cm	D =	0.33	m
b =	5.0	cm	W =	0.40	m
c =	5.0	cm	H =	0.40	m
			Capacity =	0.053	m ³

Ref. Std. ID No.: @ Calibration Point		
Position :	(140, 180) °C	(104) °C
1	21-15TC-01	15RTD2/11
2	21-15TC-02	15RTD2/12
3	21-15TC-03	15RTD2/13
4	21-15TC-04	15RTD2/14
5	21-15TC-05	15RTD2/15
6	21-15TC-06	15RTD2/20
7	21-15TC-07	15RTD2/17
8	21-15TC-08	15RTD2/18
9 (ref.)	21-15TC-09	15RTD2/19

Malu.

เอกสารไม่ควบคุม



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2110-0701OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 21TM1876
Page.: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
104.0	104.0	104.0	0.11	0.52	0.72	0.42	2
140.0	140.0	140.0	0.25	1.1	1.4	1.1	2
180.0	180.0	180.0	0.18	0.87	1.2	1.1	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
104.0	103.852	103.978	104.382	104.323	103.776	104.015	104.312	104.196	103.907
140.0	140.309	140.730	140.426	140.270	139.531	139.666	140.067	139.895	139.750
180.0	180.598	180.339	180.755	180.619	179.716	179.829	180.204	180.365	179.975

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

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

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

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

UUC* : Unit Under Calibration

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

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

-o0o-

Malu

เอกสารไม่ควบคุม

CERTIFICATE OF CALIBRATION

Equipment : COD Test Tube Heater

Meter Model : HI839800-02 **Serial No. :** 4500052101

Manufacturer : Hanna Instruments

Made in : Romania

Condition As-Received : Used Product

Reference : RE210675

Customer name : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Rd., Bangchak
Phrakhanong, Bangkok 10260

Received date : 13 May 2021

Calibrate date : 17 May 2021


Issue date : 17 May 2021

Ambient Temperature : (25 ± 2) °C


Relative Humidity : (50 ± 15) % RH

Calibrated Location : Hanna Instruments (Thailand) Ltd.

Calibrated by :


Mr. Pichit Petthong
Calibration Engineer

Approved by :


Mr. Anan Suwanchaisakul

Authorized Signatory


This certificate was certified only for the instrument we calibrated.

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

** This certificate may not be reproduced other than in full, except with the prior written **
approval of the head of Hanna Instrument (Thailand)

เอกสารไม่ควบคุม

Condition of this result of calibration
Reference Standard Instruments :

Instruments	Model	Serial No.	Certificate No.	Traceable
Thermometer With Sensor	HI935005	03250060101	21T167	Technology Promotion Association (Thailand-Japan)

Reference / Procedure :

This equipment was calibration by comparison to the reference standard (Standard platinum resistance thermometer) whose accuracy is traceable to the national standard. The calibration was performed by generating the specified working point of temperature then recorded the temperature reading values against the reference standard according to Hanna Calibration Laboratory work Instruction No. 141.

This temperature scale used was based on ITS-90

All data shown below were as-received values without adjustment.

SITE CALIBRATION

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25

เอกสารไม่ควบคุม

Result of Calibration :

Calibration Point	Unit Under Calibration Setting	Unit Under Calibration Reading	Temperature Stability	Uncertainty of Measurement
150.0 (°C)	150.6 (°C)	150.3 (°C)	2.0 (°C)	± 0.62 (°C)

Calibration Point (°C)	Average Standard Reading (°C)				
	Position				
150.0	1	2	3	4	5
	149.4	150.6	150.8	150.6	150.0
	6	7	8	9	10
	149.5	150.8	151.0	151.0	150.2
	11	12	13	14	15
	149.7	150.7	151.0	151.0	150.2
	16	17	18	19	20
	149.4	150.7	150.9	150.8	150.0
	21	22	23	24	25
	149.0	149.8	150.2	150.3	149.1

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

** End of certificate **

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CALIBRATION AND TESTING EQUIPMENT SERVICES

534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

TEL. 0-2717-3000-24 FAX. 0-2719-9484

Cert. No.: 21TM364

Page.: 1 of 3

Certificate of Calibration

Equipment : Heating Block

Manufacturer : Hanna

Model : HI839800-02

Serial No. : H018500I

ID No. : UAE.WAS.004/2551

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location : Dry Laboratory

Received Order : 22 February 2021

Calibration Date : 22 February 2021

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Preecha Hlahib

Approved by :

Approved Signatory

() Pornthippa Tameyakul

(✓) Malee Butkruea

() Suwit Imjai

Issue Date : 3 March 2021

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 head of Calibration and Testing Equipment Services.

เอกสารไม่ควบคุม

A 0006391



Equipment : Heating Block
 Condition As-Received : Used Item
 Reference : 2102-0755OC-1

Cert. No.: 21TM364

Page.: 2 of 3

Procedure Used :-

As agreed with customer the calibration was performed using in-house calibration method according to directed measurement method with Data Acquisition which connected with Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY49023932	20LM6	NIST, NIMT	20 Apr 2021

2. This certification is traceable to the SI unit.

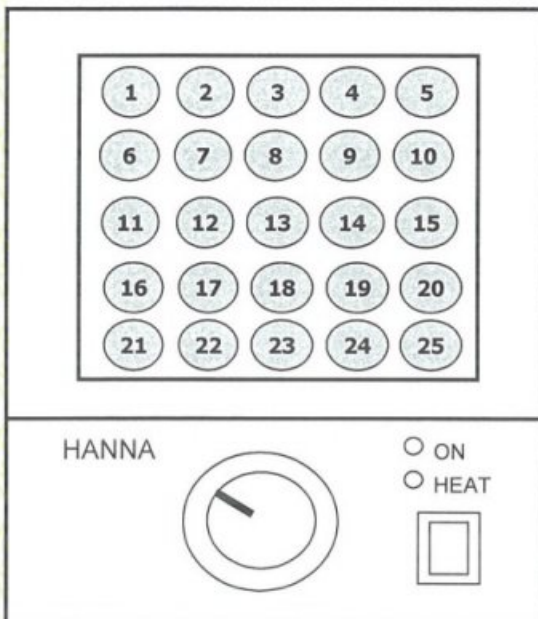
3. This result of calibration was found accurate as shown on date and place of calibration only.

Remark : NIST : National Institute of Standards and Technology, The United State of America.

NIMT : National Institute of Metrology Thailand.

Function of UUC* : Temperature Source

Heat transfer medium used : Silicon oil No. 50



Top View

Environment during calibration		
	Beginning	End
Temp.(°C)	30	32
REL.Humi.(%)	49	55
AC Supply (Volt)	220	220

Position :	1	2	3	4	5
Ref. Std./ID No.:	19-16TC-01	19-16TC-02	19-16TC-03	19-16TC-04	19-16TC-05
Position :	6	7	8	9	10
Ref. Std./ID No.:	19-16TC-06	19-16TC-07	19-16TC-08	19-16TC-09	19-16TC-10
Position :	11	12	13	14	15
Ref. Std./ID No.:	19-16TC-11	19-16TC-12	19-16TC-13	19-16TC-14	19-16TC-15
Position :	16	17	18	19	20
Ref. Std./ID No.:	19-16TC-16	19-16TC-17	19-16TC-18	19-16TC-19	19-16TC-20
Position :	21	22	23	24	25
Ref. Std./ID No.:	19-16TC-01	19-16TC-02	19-16TC-03	19-16TC-04	19-16TC-05

เอกสารไม่ควบคุม



Equipment : Heating Block
Condition As-Received : Used Item
Reference : 2102-0755OC-1
Result of Calibration :- (*) Before Adjustment
Function of UUC* : Temperature Source

Cert. No.: 21TM364

Page.: 3 of 3

Calibration Point 150 °C

UUC* Setting (°C)	UUC* Reading (°C)	Measured Temperature (°C)					Stability (± °C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
		Position							
150	-	1	2	3	4	5	0.37	0.94	2
		151.336	151.415	151.658	151.846	150.966			
		6	7	8	9	10			
		150.561	151.780	152.098	151.423	151.317			
		11	12	13	14	15			
		150.822	151.432	151.965	152.153	151.444			
		16	17	18	19	20			
		150.745	150.854	152.022	151.121	150.626			
		21	22	23	24	25			
		150.368	150.214	151.408	151.739	151.103			

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

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

UUC* : Unit Under Calibration

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

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

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เอกสารไม่ควบคุม

a 1044086

กำหนดจุดห้ามใช้งาน

References Certificate Number. : 21TM364

Equipment : Heating Block

Model : HI839800-02

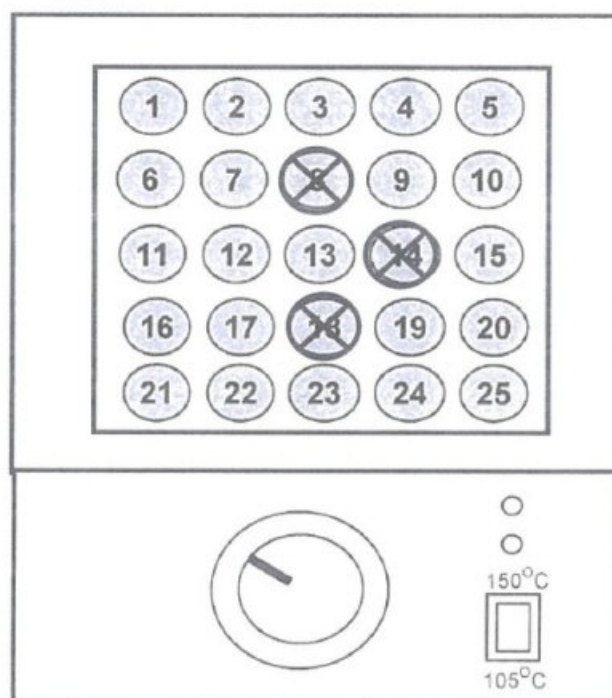
Serial No. : H018500I

ID No. : UAE.WAS.004/2551

Manufacturer : Hanna

Calibration Point : 150 °C

Unit Under Calibration Setting : 150 °C



รูปภาพเครื่องมือ แสดงจุดที่ได้รับการสอบเทียบ และสัญลักษณ์ ⊗ แสดงจุดห้ามใช้งาน

กำหนดจุดห้ามใช้งานตำแหน่งที่....8, 14, 18.....

หมายเหตุ เก็บใบแฟ้ม.....

...../.....

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



Accuracy Calibration Certificate

Customer

Company: United Analyst and Engineering Consultant Co., Ltd.
Address: 3 Soi Udom Suk 41, Sukhumvit Rd., Bang Chak
City: Phra Khanong Contact: Suwit Chotnok
Zip / Postal: 10260
State / Province: Bangkok
Order Number:  * 0 3 7 0 1 5 6 5 1 3 *

Weighing Device

Manufacturer: Mettler Toledo Instrument Type: Weighing Instrument
Model: XSR204 Asset Number: N/A
Serial No.: C117635043 Terminal Model: N/A
Building: N/A Terminal Serial No.: N/A
Floor: 1 Terminal Asset No.: N/A
Room: Balance

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

Procedure

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

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

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

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

	Temperature		Humidity	
As Found	Start: 25.1 °C	End: 24.9 °C	Start: 50.9 %	End: 59.0 %

As Found Calibration Date: 27-May-2021
As Left Calibration Date: N/A
Issue Date: 31-May-2021

Calibrator: 
Phithawat Kunavuti
Approved Signatory: 

- ☒ Kassakorn Tassanachaisakul
☐ Santi Jitniyom
☐ Surachet Sukkate

Measurement Results

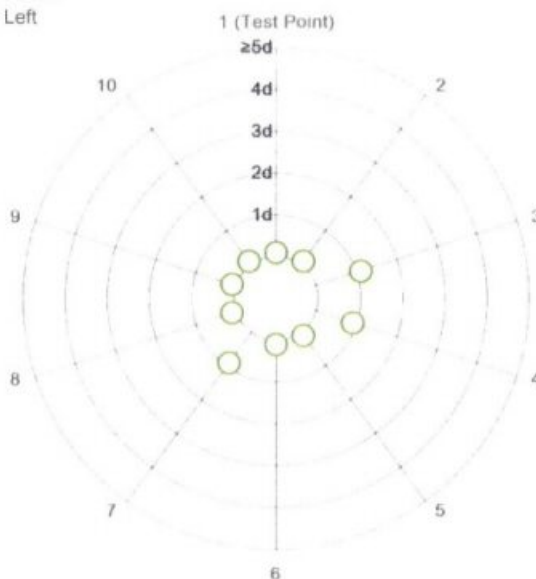
Repeatability

Test Load: 100 g

	As Found	As Left
1	100.0001 g	N/A
2	100.0001 g	N/A
3	100.0002 g	N/A
4	100.0000 g	N/A
5	100.0001 g	N/A
6	100.0001 g	N/A
7	100.0000 g	N/A
8	100.0001 g	N/A
9	100.0001 g	N/A
10	100.0001 g	N/A

Standard Deviation	0.00006 g	N/A
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○ As Found
◆ As Left



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

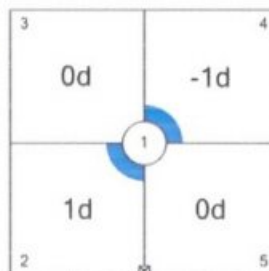
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	100.0001 g	N/A
2	100.0002 g	N/A
3	100.0001 g	N/A
4	100.0000 g	N/A
5	100.0001 g	N/A

Maximum Deviation	0.0001 g	N/A
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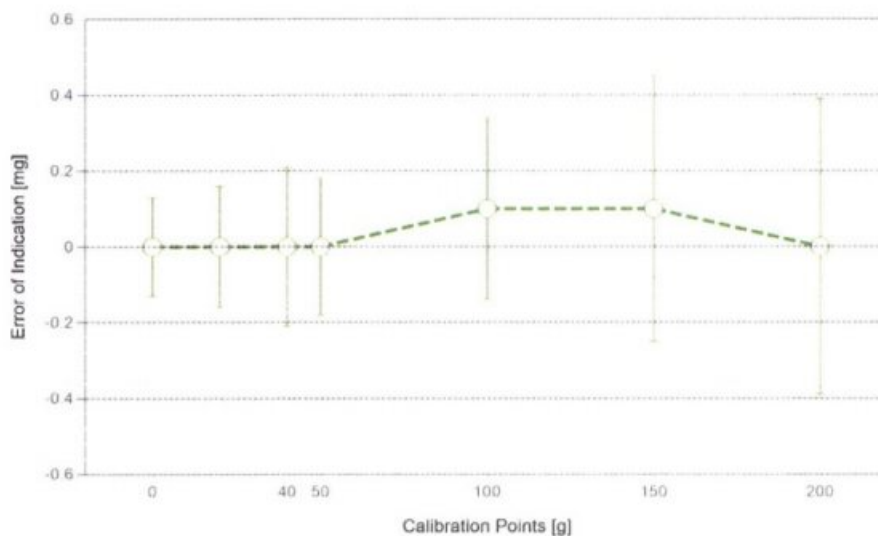
As Found

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

Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.13 mg	2
2	0.5000 g	0.5000 g	0.0000 g	0.14 mg	2
3	1.0000 g	1.0000 g	0.0000 g	0.14 mg	2
4	5.0000 g	5.0000 g	0.0000 g	0.15 mg	2
5	10.0000 g	10.0000 g	0.0000 g	0.15 mg	2
6	20.0000 g	20.0000 g	0.0000 g	0.16 mg	2
7	39.9999 g	39.9999 g	0.0000 g	0.21 mg	2
8	50.0000 g	50.0000 g	0.0000 g	0.18 mg	2
9	100.0000 g	100.0001 g	0.0001 g	0.24 mg	2
10	150.0000 g	150.0001 g	0.0001 g	0.35 mg	2
11	200.0000 g	200.0000 g	0.0000 g	0.39 mg	2



○ As Found

◆ As Left

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

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

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

Test Equipment

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

Weight Set 1: OIML E2

Weight Set No.:	WS38	Date of Issue:	17-Mar-2020
Certificate Number:	166237	Calibration Due Date:	09-Sep-2021

Thermo Hygrometer

Equipment No.:	IN256	Date of Issue:	06-Aug-2020
Certificate Number:	20H1812	Calibration Due Date:	03-Aug-2021

Remarks

FACT adjustment functionality activated

Equipment condition: Good

Next calibration according to customer's procedure

End of Accredited Section

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

Measurement Uncertainty of the Weighing Instrument in Use

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

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

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

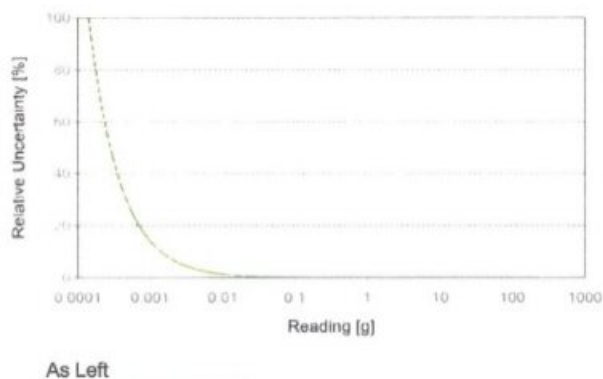
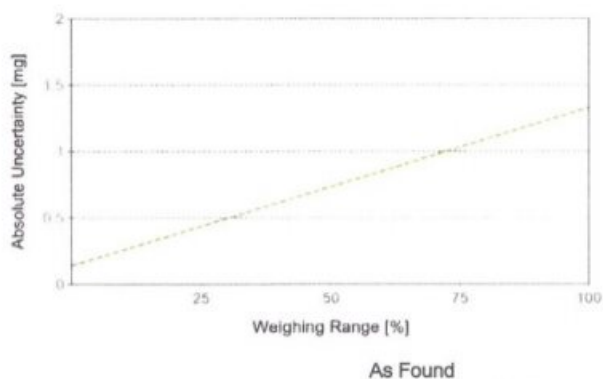
Linearization of Uncertainty Equation

	Range		As Found	As Left
	d	Max		
1	0.0001 g	220 g	$U_1 = 0.14 \text{ mg} + 0.00541 \text{ mg/g} \cdot R$	N/A

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

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

Net Indication	As Found		As Left	
0.0220 g	0.14 mg	0.64%	N/A	N/A
0.2200 g	0.14 mg	0.064%	N/A	N/A
2.2000 g	0.15 mg	0.0069%	N/A	N/A
22.0000 g	0.26 mg	0.0012%	N/A	N/A
220.0000 g	1.3 mg	0.00060%	N/A	N/A





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



Cert. No.: 21TM1357

Page.: 1 of 3

Certificate of Calibration

Equipment : Incubator
Manufacturer : Memmert
Model : INB 400
Serial No. : E411.1325
ID No. : UAE.MIC.003/2555
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory
Received Order : 14 July 2021
Calibration Date : 14 July 2021
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Preecha Hlahib

Approved by :

Approved Signatory

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

Issue Date :

20 July 2021

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม

A 0030500



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2107-0318OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 21TM1357

Page.: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
36.0	35.0	35.0	0.052	0.49	0.90	0.30	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
36.0	36.328	36.158	36.107	36.151	35.718	35.876	35.494	35.852	35.882

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

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

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

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

UUC* : Unit Under Calibration

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

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

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Malu .

เอกสารไม่ควบคุม
a 1064477



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2107-0318OC-3
Procedure Used :-

Cert. No.: 21TM1357
Page.: 2 of 3

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY57013823	21LM3	26 Feb 2022

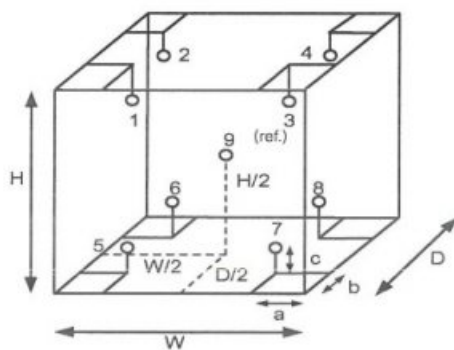
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	25
REL.Humid. (%)	54	60
AC Supply (Volt)	220	221

Position :	Ref. Std. ID No.:
1	21-17RTD-01
2	21-17RTD-02
3	17RTD-03
4	17RTD-04
5	17RTD-05
6	17RTD-06
7	17RTD-07
8	17RTD-08
9 (ref.)	17RTD-09

Probe Installation Details :

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

Dimension of Chamber :

D = 0.40 m
W = 0.33 m
H = 0.40 m
Capacity = 0.053 m³

Male

เอกสารไม่ควบคุม

a 1064478



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 21TM1358

Page.: 1 of 3

Certificate of Calibration

Equipment : Incubator

Manufacturer : Memmert

Model : BE 400

Serial No. : e402.1032

ID No. : UAE.MIC.001/2546

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location : Microbiology Laboratory

Received Order : 14 July 2021

Calibration Date : 15 July 2021

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Preecha Hlahib

Approved by :

Approved Signatory

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

Issue Date : 20 July 2021

The Uncertainties are for a confidence probability of approximately 95%

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

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Equipment : Incubator
 Condition As-Received : Used Item
 Reference : 2107-0318OC-2

Cert. No.: 21TM1358
 Page.: 2 of 3

Procedure Used :-

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY57013823	21LM3	26 Feb 2022

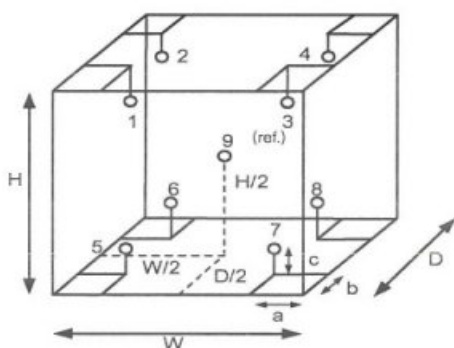
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	25
REL.Humid. (%)	54	60
AC Supply (Volt)	220	221

Position :	Ref. Std. ID No.:
1	21-17RTD-01
2	21-17RTD-02
3	17RTD-03
4	17RTD-04
5	17RTD-05
6	17RTD-06
7	17RTD-07
8	17RTD-08
9 (ref.)	17RTD-09

Probe Installation Details :

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

Dimension of Chamber :

D = 0.40 m
 W = 0.33 m
 H = 0.40 m
 Capacity = 0.053 m³

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2107-0318OC-2
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 21TM1358

Page.: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
56.0	57.1	57.1	0.23	0.88	1.4	0.42	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
56.0	56.743	56.530	56.340	56.453	55.653	56.192	55.439	55.878	56.243

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

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

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

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

UUC* : Unit Under Calibration

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

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

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Cert. No.: 21TM422

Page.: 1 of 3

Certificate of Calibration

Equipment : Water Bath

Manufacturer : Memmert

Model : WNE 14

Serial No. : L416.0606

ID No. : UAE.MIC.002/2560

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location : Microbiology Laboratory

Received Order : 22 February 2021

Calibration Date : 22 February 2021

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Man Pattanapongpaiboon

Approved by :

Approved Signatory

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

Issue Date : 3 March 2021

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2102-0751OC-3

Cert. No.: 21TM422

Page.: 2 of 3

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT04 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPRT).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
1) Data Acquisition	MY44036292	20LM5	NIST, NIMT	10 Apr 2021

2. This certification is traceable to the SI unit.

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

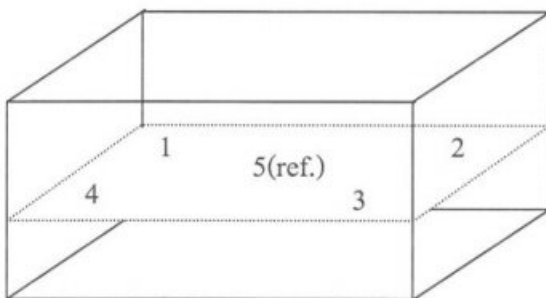
Remark : NIST : National Institute of Standards and Technology, The United State of America.

NIMT : National Institute of Metrology Thailand.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	24	54	219
Finished of Calibration	24	58	221



Front

Position :	Ref. Std. ID No.
1	70RC148
2	70RC149
3	70RC150
4	70RC151
5(ref.)	70RC152

เอกสารไม่ควบคุม



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2102-0751OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 21TM422

Page.: 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)				
			Position				
			1	2	3	4	5 (ref.)
44.5	44.5	44.5	44.462	44.465	44.510	44.496	44.460

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
44.5	0.097	0.046	0.15	2

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

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

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

UUC* : Unit Under Calibration

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

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

-o0o-

เอกสารไม่ควบคุม *Malu*



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Cert. No.: 21TM423

Page.: 1 of 3

Certificate of Calibration

Equipment : Water Bath

Manufacturer : Memmert

Model : WNE 14

Serial No. : L416.0612

ID No. : UAE.MIC.003/2560

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location : Microbiology Laboratory

Received Order : 22 February 2021

Calibration Date : 23 February 2021

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Man Pattanapongpaiboon

Approved by :

Approved Signatory

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

Issue Date :

3 March 2021

The Uncertainties are for a confidence probability of approximately 95%

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A 0025138



Equipment : Water Bath
 Condition As-Received : Used Item
 Reference : 2102-0751OC-4

Cert. No.: 21TM423

Page.: 2 of 3

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT04 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPRT).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
1) Data Acquisition	MY44036292	20LM5	NIST, NIMT	10 Apr 2021

2. This certification is traceable to the SI unit.

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

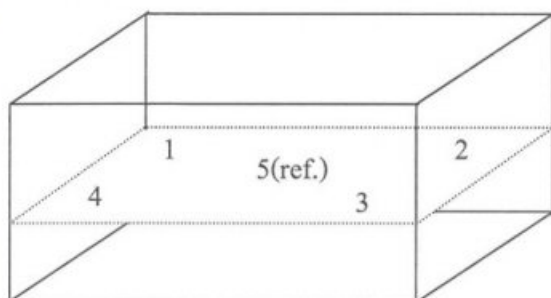
Remark : NIST : National Institute of Standards and Technology, The United State of America.

NIMT : National Institute of Metrology Thailand.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

	<u>Environmental</u>		<u>AC Voltage Supply</u>
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	24	56	220
Finished of Calibration	24	59	221



Front

<u>Position :</u>	<u>Ref. Std. ID No.</u>
1	70RC148
2	70RC149
3	70RC150
4	70RC151
5(ref.)	70RC152

Malu

เอกสารไม่ควบคุม

a 1043929



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2102-0751OC-4
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 21TM423

Page.: 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)				
			Position				
			1	2	3	4	5 (ref.)
44.5	44.5	44.5	44.531	44.474	44.492	44.514	44.537

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
44.5	0.12	0.044	0.15	2

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

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

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

UUC* : Unit Under Calibration

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

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

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Malu .

เอกสารไม่ควบคุม

a 1043928


Calibration Certificate

Certificate No.: 2200705-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhnong, Bangkok 10260

Page 1 of 3

Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: MS603S/01
Serial No.: B007010311
ID No.: UAE.MIC.008/2553
Order No.: 2200705
Operation No.: 2200705-001
Date of Receipt: 24 November 2021
Date of Calibration: 24 November 2021

Calibrated by Mr.Jumpon Pimsri
Scientist

Approved by 
(Mr.Pheraphat Tuanjit)

Manager, Division of Calibration Laboratory

Date of Issue: 30 November 2021

Responsible for the Technical Management Team

The uncertainties are for a confidence probability of approximately 95%

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

Calibration Report

Certificate No.: 2200705-001-01

Equipment:

Electronic Balance

Manufacturer: METTLER TOLEDO

Model: MS603S/01

Resolution: 0.001 g

Serial No.: B007010311

ID No.: UAE.MIC.008/2553

Capacity: 620 g g

Date of Calibration: 24 November 2021

Page 2 of 3

Environment Condition: Ambient Temperature: 24.1 ± 0.6 °C Relative Humidity: 48 ± 2.5 %

Place of Calibration: 306 Balance Room, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method based on UKAS Lab 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1-500mg	B308068554	TCS	M2101097S	12 January 2022
Standard Weight Class E2	1-500g	B308068128	TCS	M2101098S	13 January 2022
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	PONPE 490	NFI.BTH 001/17	Quality Reborn	QR21-0299	15 February 2022

3. This certification is traceable to SI UNIT

4. This certificate was certified only for the instrument we calibrated.

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

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
300	0.00052
600	0.00063

2. Off-Center Error:

A mass of 200 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.

200 g was placed and moved to various position on pan. Reading obtained is given in the table.

☒

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1 (g)	2 (g)	3 (g)	4 (g)	5 (g)	6 (g)	(Maximum Difference) (g)
200.001	200.000	200.002	200.001	200.000	200.002	0.002

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Calibration Report

Certificate No.: 2200705-001-01

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: MS603S/01

Resolution: 0.001 g

Serial No.: B007010311

ID No.: UAE.MIC.008/2553

Capacity: 620 g g

Date of Calibration: 24 November 2021

Page 3 of 3

Calibration Results: (Continued)

Calibration Range: 0-600 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor <i>k</i>
Unload	0.0000	0.000	0.000	0.00088	2.00
0.1	0.1000	0.099	0.001	0.00088	2.00
0.5	0.5000	0.500	0.000	0.00088	2.00
1	1.0000	1.000	0.000	0.00088	2.00
5	5.0000	5.000	0.000	0.00088	2.00
10	10.0000	10.000	0.000	0.00088	2.00
20	20.0000	20.000	0.000	0.00089	2.00
50	49.9999	50.001	-0.001	0.00089	2.00
70	69.9999	70.000	0.000	0.00089	2.00
100	100.0000	100.000	0.000	0.00090	2.00
150	149.9999	150.000	0.000	0.00091	2.00
200	200.0001	199.999	0.001	0.00093	2.00
300	300.0001	300.000	0.000	0.00097	2.00
400	400.0000	400.001	-0.001	0.0011	2.00
500	499.9999	500.001	-0.001	0.0012	2.00
600	599.9999	600.000	0.000	0.0013	2.00

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

----- End -----



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Cert. No.: 20TM853

Page.: 1 of 3

Certificate of Calibration

Equipment : Autoclave

Manufacturer : ALP

Model : CL-40L

Serial No. : 807298

ID No. : UAE.LAB.019/2560

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location : 301 Room

Received Order : 8 May 2020

Calibration Date : 8 May 2020

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Preecha Hlahib

Approved by :

Malee

Approved Signatory

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

Issue Date : 12 May 2020

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2005-0107OC-1

Cert. No.: 20TM853
Page.: 2 of 3

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT03 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
1) Data Acquisition	MY44060450	20LM3	NIMT	07 Mar 2021

2. This certification is traceable to the SI unit.

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

4. This result of calibration covers laboratory autoclaves for the sterilization of goods and material which could be infected with organisms categorized as Hazard Group 1, 2 and 3**

(** = Categorization of pathogens according to hazard and categories of containment, second edition, 1990)

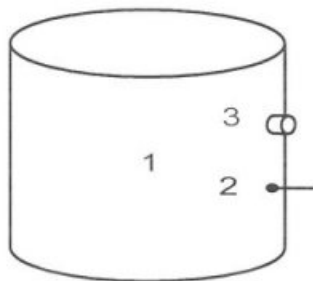
It does not cover autoclaves for use with material infect with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.

This result of calibration does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical or veterinary purposes which are directly concerned with patient care, or those used for fabrics subjected to sterilization which are required to be dry at the end of cycle.

Remark : NIMT : National Institute of Metrology Thailand.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source



	Environmental		
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	26	60	220
Finished of Calibration	26	63	221

<u>Position</u>	<u>Description</u>	<u>Ref. Std.</u> <u>Thermocouple</u>
1 =	Center of chamber	19-14TC-04
2 =	Temperature sensor	19-14TC-05
3 =	Exhaust port	19-14TC-06



Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2005-0107OC-1

Cert. No.: 20TM853

Page.: 3 of 3

Result of Calibration :- (*) Without Adjustment

Operating parameter Set : Temperature = 116 °C

Sterilization period = 15 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor <i>k</i>
115	116	1	116.900	0.13	0.08	0.89	2
		2	116.642				
		3	116.552				

Operating parameter Set : Temperature = 122 °C

Sterilization period = 30 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor <i>k</i>
122	122	1	122.762	0.12	0.12	1.1	2
		2	122.610				
		3	122.597				

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

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

UUC* : Unit Under Calibration

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

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

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Cert. No.: 21TM425

Page.: 1 of 3

Certificate of Calibration

Equipment : Autoclave

Manufacturer : ALP

Model : CL-40L

Serial No. : 802664

ID No. : UAE.MIC.014/2550

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location : Air Analysis Unit

Received Order : 22 February 2021
Calibration Date : 23 February 2021
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Man Pattanapongpaiboon

Approved by :

Approved Signatory

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

Issue Date :

3 March 2021

The Uncertainties are for a confidence probability of approximately 95%

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A 0025135



Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2102-0751OC-1
Procedure Used :-

Cert. No.: 21TM425
Page.: 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT03 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
1) Data Acquisition	MY49023932	20LM6	NIST, NIMT	20 Apr 2021

2. This certification is traceable to the SI unit.

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

4. This result of calibration covers laboratory autoclaves for the sterilization of goods and material which could be infected with organisms categorized as Hazard Group 1, 2 and 3**

(** = Categorization of pathogens according to hazard and categories of containment, second edition, 1990)

It does not cover autoclaves for use with material infect with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.

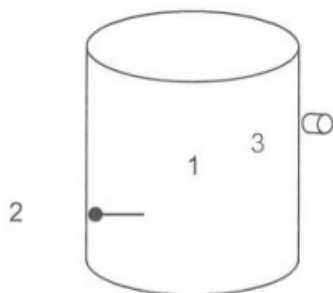
This result of calibration does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical or veterinary purposes which are directly concerned with patient care, or those used for fabrics subjected to sterilization which are required to be dry at the end of cycle.

Remark : NIST : National Institute of Standards and Technology, The United State of America.

NIMT : National Institute of Metrology Thailand.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source



	<u>Environmental</u>		
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	26	61	222
Finished of Calibration	26	63	223

<u>Position</u>	<u>Description</u>	<u>Ref. Std.</u> <u>Thermocouple</u>
1 =	Center of chamber	19-16TC-08
2 =	Temperature sensor	19-16TC-09
3 =	Exhaust port	19-16TC-10

Male

เอกสารไม่ควบคุม

a 1043935



Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2102-0751OC-1

Cert. No.: 21TM425
Page.: 3 of 3

Result of Calibration :- (*) Without Adjustment

Operating parameter Set : Temperature = 116 °C
Sterilization period = 15 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor <i>k</i>
116	116	1	117.021	0.23	0.08	0.92	2
		2	117.111				
		3	117.212				

Operating parameter Set : Temperature = 122 °C
Sterilization period = 15 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor <i>k</i>
122	122	1	122.817	0.15	0.12	1.10	2
		2	122.914				
		3	122.978				

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

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

UUC* : Unit Under Calibration

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

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

-o0o-

Malu .

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a 1043934



Request No.: 22-64/0445

MTC No.: PSL-T 614/64

TEST REPORT

Nomenclature : HEATING BLOCK DIGESTION

Serial No.: 91794469

Maker : FOSS

Model : 2520

Id.No.: UAE.LAB.011/2560

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Address : 3 Soi Udomsuk 41, Sukhumvit Rd., Bangchak, Phrakhanong, Bangkok 10260.

Date of request : 12 March 2021

Date of test : 12 March 2021

Place of test : Photometry and Temperature Standards Laboratory, MTC. Bangpoo.

Point of test : Calibrated at 380 °C.

Conditions of test : - Ambient temperature: (25 ± 5) °C , Relative humidity : (50 ± 20) %.

- AC Power supply : (220 ± 5) % VAC.

Reference Standard : Data Acquisition / Switch Unit Equipped , Model : 34972A , S/N : MY49004645 ,

Maker : Agilent with Sensor TC-S, S/N : TC-S 01 ~ 02 , through Calibration

certificate No.: 22-63/0516, PSL-T 678/63, Date of Calibrated 20 April 2020

Traceability : This certificate is traceable to SI unit through Photometry and Temperature Standards Laboratory, Industrial Metrology and Testing Service Centre, Thailand Institute of Scientific and Technological Research (TISTR), NSC-ONSC accredited no. Calibration 0015.

Test Procedure : Indicate temperature of Unit Under Test (UUT) was compared to temperature

Obtained from reference standards at calibration point.

The temperature scale in use of this laboratory is the International Temperature Scale of 1990 (ITS-90).

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

page 1 of 4

The results relate only to the items tested or calibrated.

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

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E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

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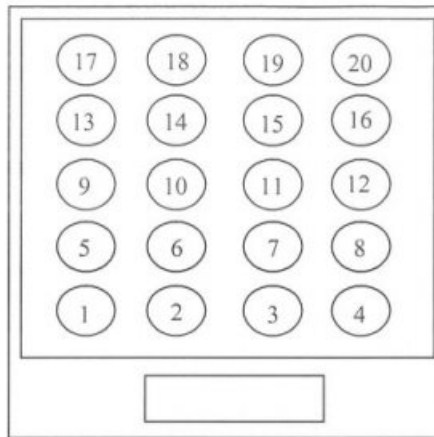
เอกสารไม่ควบคุม 5225, 5217

Request No.: 22-64/0445

MTC No.: PSL-T 614/64

Serial No.: 91794469

Results :



Top View

Tested at 380 °C	Temperature of UUT at each position (°C)				
UUT Setting 380 °C	1	2	3	4	5
Maximum	378.5	377.7	378.5	377.8	379.2
Minimum	378.2	377.4	378.2	377.5	378.9
Mid-Range	378.3	377.6	378.3	377.6	379.0
Difference	0.3	0.3	0.3	0.3	0.3
Uncertainty of measurement (\pm °C)	1.5	1.5	1.5	1.5	1.5

Note : - Reference Standards are measurement in tube sand at 240 value record after temperature stability.
- Level high of sand is equal heater plate of UUT.

page 2 of 4

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Request No.: 22-64/0445

MTC No.: PSL-T 614/64

Serial No.: 91794469

Results :

Tested at 380 °C	Temperature of UUT at each position (°C)				
UUC Setting 380 °C	6	7	8	9	10
Maximum	377.6	379.8	378.1	379.5	377.7
Minimum	377.4	379.4	377.9	379.3	377.6
Mid-Range	377.5	379.6	378.0	379.4	377.6
Difference	0.2	0.5	0.2	0.2	0.2
Uncertainty of measurement (\pm °C)	1.5	1.5	1.5	1.5	1.5

Tested at 380 °C	Temperature of UUT at each position (°C)				
UUC Setting 380 °C	11	12	13	14	15
Maximum	379.1	377.5	378.0	377.9	377.7
Minimum	378.8	377.2	377.6	377.7	377.4
Mid-Range	379.0	377.4	377.8	377.8	377.5
Difference	0.2	0.4	0.3	0.2	0.3
Uncertainty of measurement (\pm °C)	1.5	1.5	1.5	1.5	1.5

Note : - Reference Standards are measurement in tube sand at 240 value record after temperature stability.
 - Level high of sand is equal heater plate of UUT.

page 3 of 4



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Request No.: 22-64/0445

MTC No.: PSL-T 614/64

Serial No.: 91794469

Results :

Tested at 380 °C	Temperature of UUT at each position (°C)				
UUC Setting 380 °C	16	17	18	19	20
Maximum	376.9	379.4	378.7	379.7	378.3
Minimum	376.6	379.1	378.4	379.5	378.1
Mid-Range	376.7	379.2	378.5	379.6	378.2
Difference	0.3	0.3	0.3	0.2	0.2
Uncertainty of measurement (\pm °C)	1.5	1.5	1.5	1.5	1.5

Note : - Reference Standards are measurement in tube sand at 240 value record after temperature stability.
- Level high of sand is equal heater plate of UUT.

...end of certificate...

Tested by :


(Mr. Phatthanapong Chanthamart)

Approved by :


(Mr. Kamchai Singhapiwat)
Director

Photometry and Temperature Standards Laboratory

Ref. : 2012264031201170001

Issued date : 16 March 2021

page 4 of 4

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เอกสารไม่ควบคุม

Verification Certificate

Substitute for Certificate No.: 2103014-001-01
Certificate No.: 2103014-001-02
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PRAKHANONG, BANGKOK, 10260

Page 1 of 4

Equipment: HEATING BLOCK DIGESTION

Manufacturer: VELP SCIENTIFICA

Model: DKL20

Serial No.: 213517

ID No.: UAE.WAS.005/2555

Order No.: 2103014

Operation No.: 2103014-001

Date of Receipt: 30 May 2021

Date of Calibration: 2,7 June 2021

Calibrated by Mr.Nuttapol Niyomchat
Expert

Approved by 
(Mr.Pheraphat Tuanjit)

Manager, Division of Calibration Laboratory

Date of Issue: 25 June 2021

Responsible for the Technical Management Team

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

Verification Report

Certificate No.: 2103014-001-02
Equipment: HEATING BLOCK DIGESTION
 Model: DKL20 Serial No.: 213517
 Resolution: 1 °C ID No.: UAE.WAS.005/2555
 Manufacturer: VELP SCIENTIFICA
Date of Calibration: 2,7 June 2021

Page 2 of 4

Location: Calibration Laboratory, NATIONAL FOOD INSTITUTE
Environment Condition: Ambient Temperature (25 ± 3) °C
 Relative Humidity (55 ± 15) %
 Line Voltage (220 ± 10) Volt

Condition of this results of Calibration:

- This instrument was calibrated by insert standard thermocouples type R into its heating block digestion and compared to temperature obtained from reference standards thermometer at calibrated point.
 - The temperature scale used was based on ITS - 90 .
 - All data show below were final values and the initial data may be obtained upon request.

2. Reference Standard Instrument :

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
Digital Thermometer with Thermocouple	34970A/34901A	MY44045576/MY41194453	TC21/0041	24-Apr-2022	N.M. Technical Center Laboratory
	Type R	TC#101-103 / CH#101-103			

- This certificate is traceable to international system of units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of Calibrated item : Good

UUC* Description

Time of Record - Hour 30 Minute At 380 °C

7. Result of Calibration : ☒ Without adjustment ☐ After adjustment

เอกสารไม่ควบคุม

Verification Report

Certificate No.: 2103014-001-02
Equipment: HEATING BLOCK DIGESTION
Model: DKL20 Serial No.: 213517
Resolution: 1 °C ID No.: UAE.WAS.005/2555
Manufacturer: VELP SCIENTIFICA

Date of Calibration: 2,7 June 2021

Page 3 of 4

Calibration point: 380 °C

Calibration result:

Reporting of Temperature

Block No.	UUC* Setting (°C)	UUC* Reading (°C)	Stability (±°C)	Standard Thermometer (°C)	Uncertainty (±°C)
1	380	379 - 380	0.53	383.17	1.8
2	380	379 - 380	0.32	383.16	1.8
3	380	379 - 380	0.39	382.96	1.8
4	380	379 - 380	0.18	381.23	1.8
5	380	379 - 380	0.49	382.97	1.8
6	380	379 - 380	0.49	382.85	1.8
7	380	379 - 380	0.54	382.97	1.8
8	380	379 - 380	0.24	382.95	1.8
9	380	379 - 380	0.61	383.17	1.8
10	380	379 - 380	0.73	381.14	1.9
11	380	379 - 380	0.73	382.53	1.9
12	380	379 - 380	0.76	381.56	1.9
13	380	379 - 380	0.38	382.25	1.7
14	380	379 - 380	0.43	383.00	1.7
15	380	379 - 380	0.31	383.08	1.7
16	380	379 - 380	0.22	381.78	1.7
17	380	379 - 380	0.31	382.99	1.7
18	380	379 - 380	0.37	383.24	1.7
19	380	379 - 380	0.32	380.98	1.7
20	380	379 - 380	0.31	382.63	1.7

Note:

- UUC* = Unit Under Calibration
- Immersion depth of standard thermometer in tube level high of sand is equal heater plate of UUC.
- Stability = One-half of the greatest maximum difference of measured temperatures at one sensors, for at least half an hour after reaching steady state.

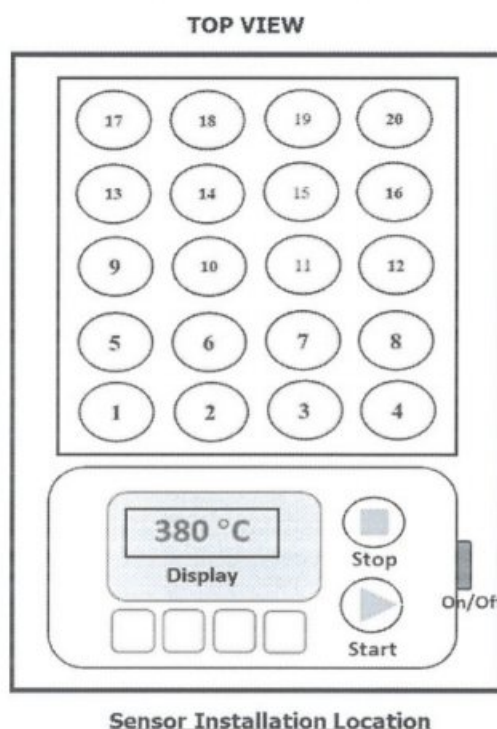
เอกสารไม่ควบคุม

Verification Report

Certificate No.: 2103014-001-02
Equipment: HEATING BLOCK DIGESTION
 Model: DKL20 Serial No.: 213517
 Resolution: 1 °C ID No.: UAE.WAS.005/2555
 Manufacturer: VELP SCIENTIFICA
Date of Calibration: 2,7 June 2021
Calibration point: 380 °C
Calibration result: Continued

Page 4 of 4

Figure 1. Location of Reference Standard and Block Diagram of Digestion Unit



Remark: Edited ID.No. from UAE.WAB.005/2555 to UAE.WAS.005/2555.

Note:

- UUC* = Unit Under Calibration
- Immersion depth of standard thermometer in tube level high of sand is equal heater plate of UUC.
- Stability = One-half of the greatest maximum difference of measured temperatures at one sensors, for at least half an hour after reaching steady state.

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

----- End -----

เอกสารไม่ควบคุม

Preventive Maintenance Protocol

Instrument: Kjeltetec™ 2100	Model ^{KT200} XXXX S/N: 91790524
Customer บริษัท ยูไนเต็ด .เอนเนลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด	Job No. MS62EOT0077B
Certified performed PM interval (whaichever occurs first between interval and no. of samples analysed)	12 Months No. of samples analysed (if applicable):

Introduction

A maintenance protocol provides a systematic and functional means of maintaining a specific instrument type. the certified performed PM interval depends on the operational conditions, and is based on our extensive experience and knowledge of manufacturing and maintaining analytical instruments.

Apart from sample throughput, the environmental conditions also need to be taken into account. Demanding environments, such as high ambient temperature, humidity, dirtiness etc can measurably shorten component lifetime and also the maintenance and component replacement intervals.

The content of this protocol is subject to change over time. In order to ensure you the correct parts, please make sure to indicate serial number and date of installation when contacting you FOSS representative.

Maintenance Procedure

Parts to be Exchanged

Step	Action	Part	P/N	OK
1	Replace	Adapter for dig. tube 250 ml	10000056	<input checked="" type="checkbox"/>
2	Replace	Non return valve	10003538	<input type="checkbox"/>
3	Replace valves in alkali pump	Valve kit reagent/water pump	15750093	<input type="checkbox"/>
4	Replace steam tubing	Silicone tubing 8/12 mm	15820006	<input type="checkbox"/>
5	Replace alkali tubing	Tubing reinforced for alkali	15820011	<input type="checkbox"/>
6	Replace water tubing	Tubing PVC 8/11 mm	15820004	<input type="checkbox"/>
7	Cleaning	Steam generator		<input checked="" type="checkbox"/>
8	Cleaning	Splash head		<input type="checkbox"/>

Check and Adjustment

Step	Action	Module	Measured	Limits	OK
1	Check alkali volume, 10 ml/stroke	Alkali pump		At 50 ml -0/+3 ml	<input checked="" type="checkbox"/>
2	Check distillation volume			100 - 150 ml/4min	<input checked="" type="checkbox"/>
3	Check front panel switches				<input checked="" type="checkbox"/>
4	Check cable,electrical connection and main power supply AC 220 Volts				<input checked="" type="checkbox"/>
5	Check level pins in steam generator				<input checked="" type="checkbox"/>
6	Check safety door switch				<input checked="" type="checkbox"/>

Remark _____

Signature

Customer's Signature

Signature

Engineer's Signature

Date 24/02/2020

Preventive Maintenance Protocol

Instrument: Kjeltex™ 2100	Model 2100 S/N: 52001424
Customer บริษัท ยูโนลิค แอแนลิสต์ แอนด์ เอ็นจิเนียริง คอน.ซัลเลนท์ จำกัด	Job No. MS62FOT007/13
Certified performed PM interval (whichever occurs first between interval and no. of samples analysed)	12 Months
	No. of samples analysed (if applicable):

Introduction

A maintenance protocol provides a systematic and functional means of maintaining a specific instrument type. the certified performed PM interval depends on the operational conditions, and is based on our extensive experience and knowledge of manufacturing and maintaining analytical instruments.

Apart from sample throughput, the environmental conditions also need to be taken into account. Demanding environments, such as high ambient temperature, humidity, dirtiness etc can measurably shorten component lifetime and also the maintenance and component replacement intervals.

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Maintenance Procedure

Parts to be Exchanged

Step	Action	Part	P/N	OK
1	Replace	Adapter for dig. tube 250 ml	10000056	<input checked="" type="checkbox"/>
2	Replace	Non return valve	10003538	<input type="checkbox"/>
3	Replace valves in alkali pump	Valve kit reagent/water pump	15750093	<input type="checkbox"/>
4	Replace steam tubing	Silicone tubing 8/12 mm	15820006	<input type="checkbox"/>
5	Replace alkali tubing	tubing reinforced for alkali	15820011	<input type="checkbox"/>
6	Replace water tubing	Tubing PVC 8/11 mm	15820004	<input type="checkbox"/>
7	Cleaning	Steam generator		<input checked="" type="checkbox"/>
8	Cleaning	Splash head		<input type="checkbox"/>

Check and Adjustment

Step	Action	Module	Measured	Limits	OK
1	Check alkali volume, 10 ml/stroke	Alkali pump		At 50 ml -0/+3 ml	<input checked="" type="checkbox"/>
2	Check distillation volume			100 - 150 ml/4min	<input checked="" type="checkbox"/>
3	Check front panel switches				<input checked="" type="checkbox"/>
4	Check cable,electrical connection and main power supply AC 220 Volts				<input checked="" type="checkbox"/>
5	Check level pins in steam generator				<input checked="" type="checkbox"/>
6	Check safety door switch				<input checked="" type="checkbox"/>

Remark _____

หิ/ออสกร

Customer's Signature

อภิชัย

Engineer's Signature

Date 21/02/2020