

ภาคผนวก จ

เอกสารสอบเทียบ



รายการใบรับรองสอบเทียบ/ทวนสอบ เครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์ สำหรับตรวจวัดคุณภาพสิ่งแวดล้อม

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
เครื่องมือหลักสำหรับตรวจสอบคุณภาพน้ำ									
1	BOD Incubator	BOD	Arco	UC4-1320 / (UAE.LAB.015/2561)	Technology Promotion Association (Thailand-Japan)	21TM366	23 Feb 21	22 Feb 22	-
2	BOD Incubator		Arco	UR-1320 / (UAE.LAB.018/2551)	Technology Promotion Association (Thailand-Japan)	21TM811	21 Apr 21	20 Apr 22	-
3	Analytical Balance (Readability 0.01 mg)	Total Dissolved Solids Suspended solids	Mettler-Toledo	XSR205DU / C009071872	Calibration Laboratory Mettler-Toledo (Thailand) Limited	2102573-001-01	26 Apr 21	25 Apr 22	-
4	Hot Air Oven		Memmert	UF55 / B216.1666	Technology Promotion Association (Thailand-Japan)	20TM2141	4 Nov 20	3 Nov 21	-
5	Digester Unit	TKN	FOSS TECATOR	2520auto / 91794469	Thailand Institute Of Science And Technological Research (TISTR)	PSL-T 614/64	12 Mar 21	11 Mar 22	-
6	Distillation Unit (Kjeldahl Method)		FOSS TECATOR	KT200 / 91790524	Sithiporn Associates Co.,Ltd.	MS63FOT0084B	25 Feb 21	24 Feb 22	-
7	Analytical Balance (Readability 0.1 mg)	Fat, Oil & Grease	Mettler-Toledo	XSR204 / C117635043	National Food Institute, Ministry of Industry, Thailand	TH2060-065-052721-ACC-TH	27 May 21	26 May 22	-
8	UV-VIS Spectrophotometer	Ammonia, Cyanuric Acid Nitrate, Total Nitrogen	Agilent Technologies	Cary60 G6860A / MY15410009	DQE Services Co.,Ltd.	SP21-015	29 May 21	28 May 22	-
9	UV-VIS Spectrophotometer		Hitachi	U-1900 / 2021-064	DQE Services Co.,Ltd.	SP21-008	25 Jan 21	24 Jan 22	-
10	Incubator	Total Coliform Bacteria Fecal Coliform Bacteria	Memmert	IPP 260 / V616.0066	Technology Promotion Association (Thailand-Japan)	20TM2140	3 Nov 20	2 Nov 21	-
11	Incubator		Memmert	IPP 260 / V615.0187	Technology Promotion Association (Thailand-Japan)	21TM706	21 Apr 21	20 Apr 22	-
12	Incubator	Pseudomonas aeruginosa Clodtridium perfringens	Memmert	IN 75 / D317.0307	Technology Promotion Association (Thailand-Japan)	21TM833	7 May 21	6 May 22	-

รายการใบรับรองสอบเทียบ/ทวนสอบ เครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์ สำหรับตรวจวัดคุณภาพสิ่งแวดล้อม

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
เครื่องมือหลักสำหรับตรวจสอบคุณภาพน้ำ									
13	Incubator	Total Coliform Bacteria	Memmert	IF 75 /	Technology Promotion Association	21TM832	7 May 21	6 May 22	-
		Fecal Coliform Bacteria		D317.0305	(Thailand-Japan)				
14	Water Bath	Escherichia coli	Memmert	WNE 14 /	Technology Promotion Association	21TM423	23 Feb 21	22 Feb 22	-
		Staphylococcus aureus		L416.0612	(Thailand-Japan)				
15	Water Bath	Pseudomonas aeruginosa	Memmert	WNE 14 /	Technology Promotion Association	21TM708	21 Apr 21	20 Apr 22	-
		Clodtridium perfringens		L414.1407	(Thailand-Japan)				
16	Analytical Balance		Mettler-Toledo	MS603S /	National Food Institute,	2100858-001-001	8 Dec 20	7 Dec 21	-
				B0070110311	Ministry of Industry, Thailand				
17	Auto Clave		ALP	CL-40L /	Technology Promotion Association	21TM425	23 Feb 21	22 Feb 22	-
				802664	(Thailand-Japan)				
18	Auto Clave		ALP	CL-40L /	Technology Promotion Association	21TM831	7 May 21	6 May 22	-
				807298	(Thailand-Japan)				

Due Date of Calibration* : Based on the annual calibration plan. At least 1 time per year.



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

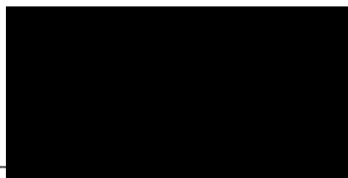
ID No. : UAE.WAO. 015/2561

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

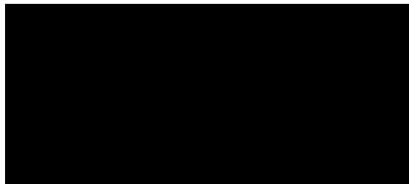
Location : Lab Floor 2

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

Calibrated by :



Approved by :



Approved Signatory

Issue Date :

3 March 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



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:-

<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.

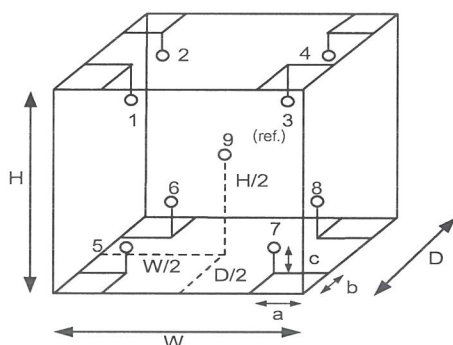
Remark : NIST : National Institute of Standards and Technology, The United State of America.

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. (%)	66	69
AC Supply (Volt)	220	220

Probe Installation Details :

Dimension of Chamber :

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

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

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

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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)
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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 :

Approved by :

Approved Signatory

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:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
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.

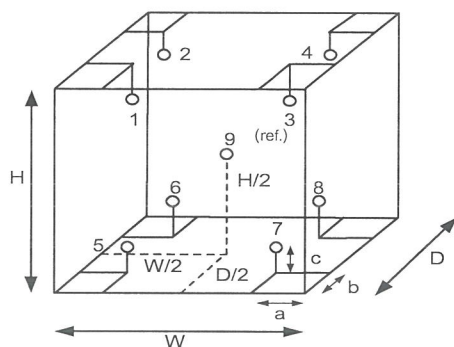
Remark : NIST : National Institute of Standards and Technology, The United State of America.

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 :

Dimension of Chamber :

a =	10	cm	D =	0.62	m
b =	10	cm	W =	1.2	m
c =	10	cm	H =	1.2	m
			Capacity =	0.89	m ³

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

Manag

Date of Issue: 29 April 2021

Responsi

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 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:

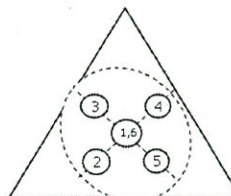
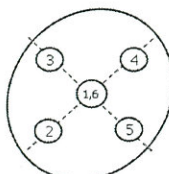
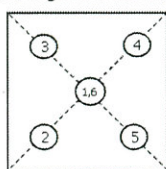
1. Repeatability of Reading:

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.: 20TM2141

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 : 3 November 2020
Calibration Date : 4 November 2020
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by :

Approved by :

Approved Signatory

Issue Date :

10 November 2020

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.

เอกสารควบคุม

A 0020997



Equipment : Hot Air Oven
 Condition As-Received : Used Item
 Reference : 2011-0008OC-1

Cert. No.: 20TM2141

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	Serial No.	Cert. No.	Traceable	Due Date
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.

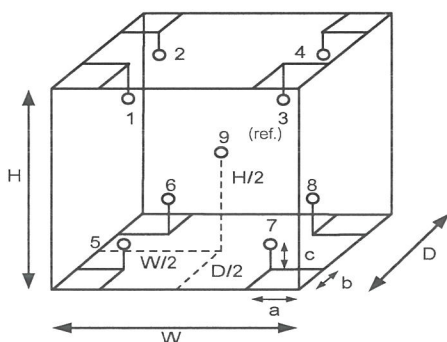
Remark : NIST : National Institute of Standards and Technology, The United State of America.

NIMT : National Institute of Metrology Thailand.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	28
REL.Humid. (%)	47	49
AC Supply (Volt)	220	222

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 :	(104) °C	(140, 180) °C
1	18RTD-2/1	18-18TC-01
2	18RTD-2/2	18-18TC-02
3	18RTD-2/3	18-18TC-03
4	18RTD-2/4	18-18TC-04
5	18RTD-2/5	18-18TC-05
6	18RTD-2/6	18-18TC-06
7	18RTD-2/7	18-18TC-07
8	18RTD-2/8	18-18TC-08
9 (ref.)	18RTD-2/9	18-18TC-09

เอกสารฉบับนี้

a 1025546



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2011-0008OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 20TM2141

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	0.23	0.70	1.3	0.42	2
140.0	140.0	140.0	0.30	1.1	1.8	1.1	2
180.0	180.0	180.0	0.29	0.88	1.7	1.1	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
104.0	103.862	104.114	104.443	104.388	104.120	104.028	103.525	103.789	103.993
140.0	139.718	140.038	140.668	140.503	140.150	139.967	139.232	139.608	139.974
180.0	179.748	179.989	180.669	180.526	180.206	179.944	179.533	179.249	179.878

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-

เอกไมสารควบคุม
a 1028268



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.

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FM.BL.MTC.002 Rev.3

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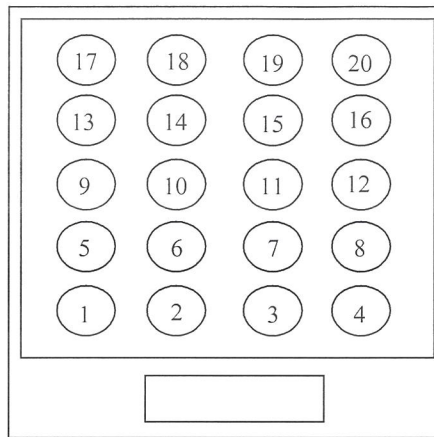
เอกสารไม่ควบคุม

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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เอกสารไม่ควบคุม 5225, 5217

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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เอกสารไม่ควบคุม

Request No.: 22-64/0445

MTC No.: PSL-T 614/64

Serial No.: 91794469

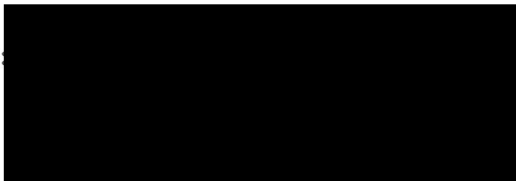
Results :

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 :



Approved by :



Photometry and Temperature Standards Laboratory

Ref. : 2012264031201170001

Issued date : 16 March 2021

page 4 of 4

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เอกสารไม่ควบคุม

Preventive Maintenance Protocol

Instrument: Digester unit	Model <u>2520auto</u> S/N: <u>91794469</u>
Customer <u>บริษัท ยูโนเด็ค แอนนาไลซิส แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด</u>	Job No. <u>MS63FOT0084B</u>

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 your FOSS representative.

Maintenance Procedure

Check and Cleaning

Step	Action	OK
1	Check cables, electrical connections and power supply AC 220 volts	<input checked="" type="checkbox"/>
2	Check the function of power switch	<input checked="" type="checkbox"/>
3	Check the function of temperature controller	<input checked="" type="checkbox"/>
4	Check the display and keypad function	<input checked="" type="checkbox"/>
5	General cleaning	<input checked="" type="checkbox"/>
6	Check the time of heating up to 420°C (DS 6 and 8 ~ 30 mins, DS20 and 40 ~ 40 mins)	<input checked="" type="checkbox"/>
7	Check the digestion time with external watch	<input checked="" type="checkbox"/>
8	Check the temperature in seasand of test tube	<input checked="" type="checkbox"/>

Temp. setting	T1	T2	T3	T4	T5	Mean value
420°C <u>380°C</u>	<u>376.0</u>	<u>372.7</u>	<u>374.8</u>	<u>370.6</u>	<u>371.1</u>	<u>373.04</u>

Remark _____



Date

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: [REDACTED] Contact: [REDACTED]
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 Calibrator:
As Left Calibration Date: N/A
Issue Date: 31-May-2021
Approved Signatory:

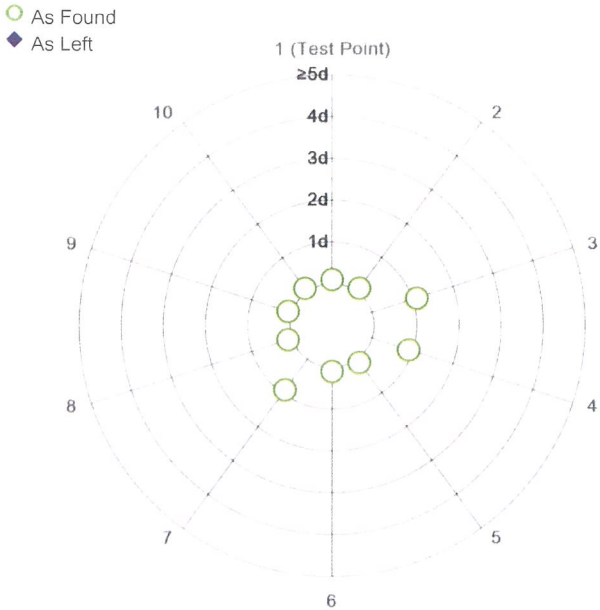
Measurement Results

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

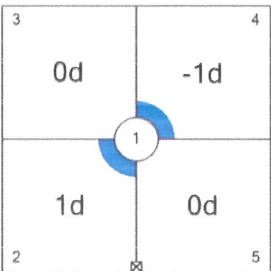
The results of this graph are based upon the absolute values of the differences from the mean value.

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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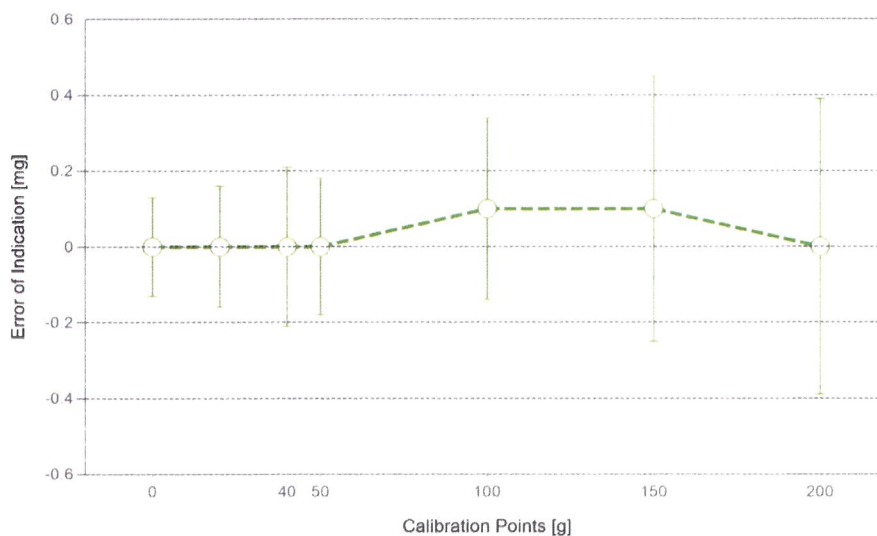
As Found

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

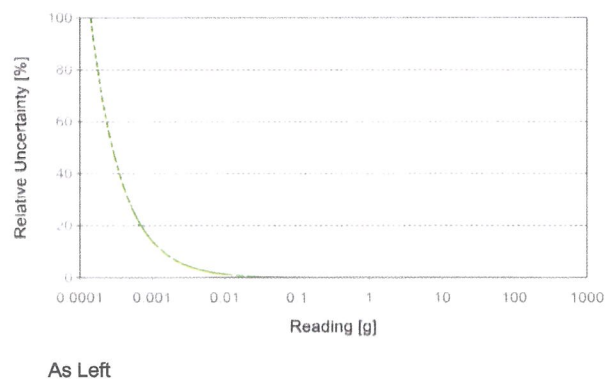
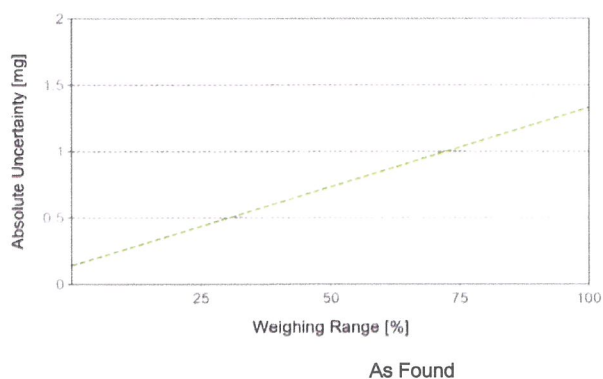
Linearization of Uncertainty Equation

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)

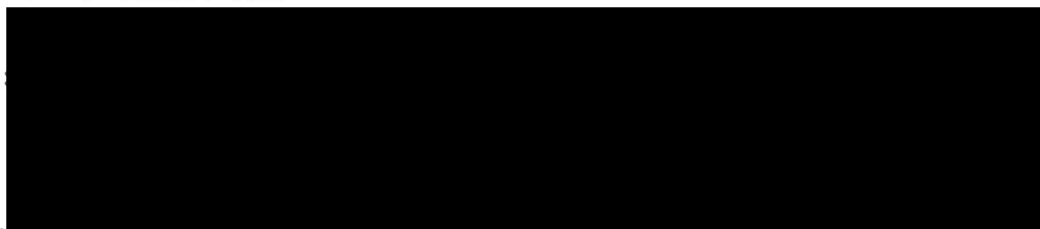
Net Indication	As Found		As Left	
0.0220 g	0.14 mg	0.64%	N/A	N/A
0.2200 g	0.14 mg	0.064%	N/A	N/A
2.2000 g	0.15 mg	0.0069%	N/A	N/A
22.0000 g	0.26 mg	0.0012%	N/A	N/A
220.0000 g	1.3 mg	0.00060%	N/A	N/A



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 :**

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 Starna 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 ,

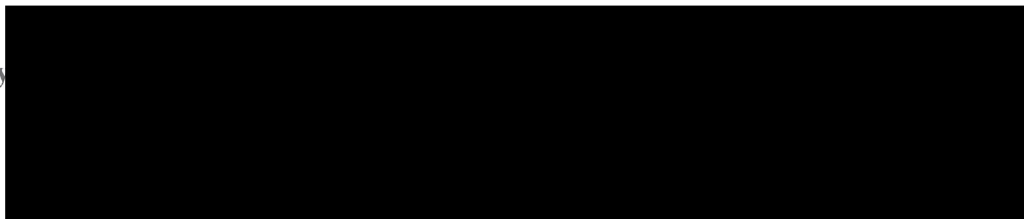
which for a normal distribution corresponds to a coverage probability of approximately 95%

- 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**

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 -



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



Cert. No.: 20TM2140

Page.: 1 of 3

Certificate of Calibration

Equipment : Incubator

Manufacturer : Memmert

Model : IPP 260

Serial No. : V616.0066

ID No. : UAE.MIC.032/2559

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

Location : Microbiology Laboratory (302)

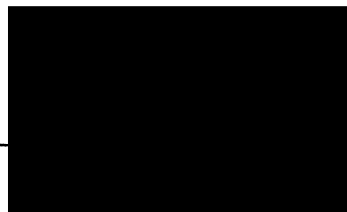
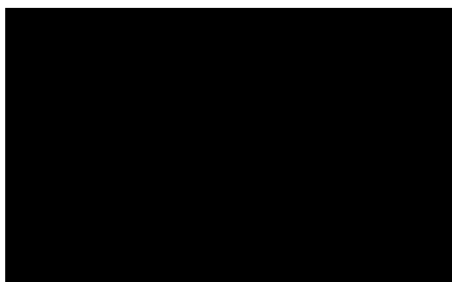
Received Order : 3 November 2020

Calibration Date : 3 November 2020

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by :



10 November 2020

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
10/2020



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2011-0009OC-1
Procedure Used :-

Cert. No.: 20TM2140

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:-

<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.

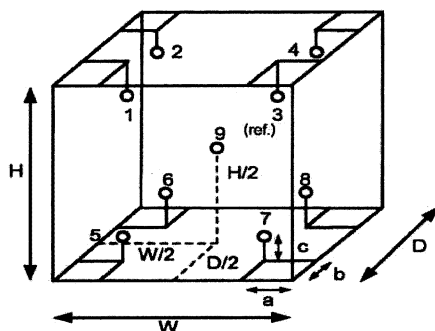
Remark : NIST : National Institute of Standards and Technology, The United State of America.

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)	22	22
REL.Humid. (%)	46	47
AC Supply (Volt)	221	220

Probe Installation Details :

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

Dimension of Chamber :

D = 0.50 m
W = 0.64 m
H = 0.80 m
Capacity = 0.26 m³

Position :	Ref. Std./ID No.:
1	18-18RTD-01
2	18-18RTD-02
3	18-18RTD-03
4	18-18RTD-04
5	18-18RTD-05
6	18-18RTD-06
7	18-18RTD-07
8	18-18RTD-08
9 (ref.)	18-18RTD-09



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2011-0009OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 20TM2140

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>
35.0	35.0	35.0	0.048	0.45	0.54	0.30	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
35.0	35.152	35.142	35.034	35.091	35.019	34.849	34.666	34.990	35.057

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 10221



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Cert. No.: 21TM706

Page.: 1 of 3

Certificate of Calibration

Equipment : Incubator

Manufacturer : Memmert

Model : IPP260

Serial No. : V615.0187

ID No. : UAE.MIC.003/2559

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

Location : Microbiology Laboratory

Received Order : 21 April 2021

Calibration Date : 21 April 2021

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by :

Approved by :

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.

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A 0027609



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2104-0019OC-1

Cert. No.: 21TM706

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	MY44060450	21LM4	NIMT	06 Mar 2022

2. This certification is traceable to the SI unit.

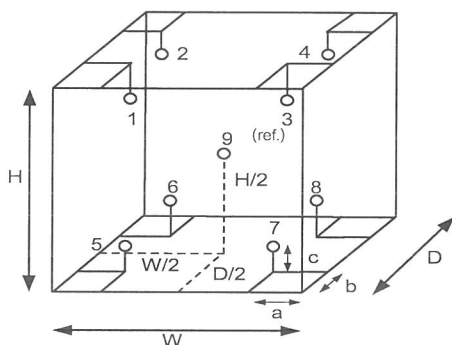
3. This certificate is valid only to the item calibrated on date and place of calibration.

Remark : NIMT : National Institute of Metrology Thailand.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	23
REL.Humid. (%)	60	63
AC Supply (Volt)	223	224

Position :	Ref. Std. ID No.:
1	19-14RTD-01
2	19-14RTD-02
3	19-14RTD-03
4	19-14RTD-04
5	19-14RTD-05
6	19-14RTD-06
7	21-14RTD-07
8	19-14RTD-08
9 (ref.)	19-14RTD-09

Probe Installation Details :

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

Dimension of Chamber :

D = 0.50 m
W = 0.64 m
H = 0.80 m
Capacity = 0.26 m³

เอกสารไม่



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2104-0019OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 21TM706

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>
35.0	35.0	35.0	0.11	0.36	0.55	0.30	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
35.0	34.946	35.035	35.120	35.087	34.989	35.121	34.745	35.004	34.994

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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a 1052707



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



Cert. No.: 21TM833

Page.: 1 of 3

Certificate of Calibration

Equipment : Incubator

Manufacturer : Memmert

Model : IN 75

Serial No. : D317.0307

ID No. : UAE.MIC.023/2561

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

Location : Microbiology Laboratory

Received Order : 7 May 2021

Calibration Date : 7 May 2021

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by :

Approved by :

18 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.

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Equipment : Incubator
Condition As-Received : Used Item
Reference : 2105-0012OC-3

Cert. No.: 21TM833
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	MY57013711	20LM7	18 May 2021

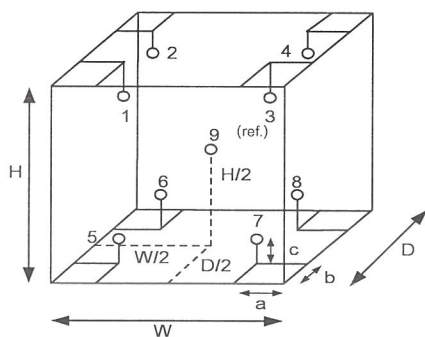
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	24
REL.Humid. (%)	59	62
AC Supply (Volt)	220	221

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 = 5.0 cm
b = 5.0 cm
c = 5.0 cm

Dimension of Chamber :

D = 0.32 m
W = 0.42 m
H = 0.56 m
Capacity = 0.075 m³



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2105-0012OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 21TM833

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	36.0	36.0	0.068	0.33	0.60	0.30	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
36.0	36.281	36.162	36.312	36.247	35.764	35.780	35.851	35.861	36.007

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.: 21TM832

Page.: 1 of 3

Certificate of Calibration

Equipment : Incubator

Manufacturer : Memmert

Model : IF 75

Serial No. : D317.0305

ID No. : UAE.MIC.022/2561

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

Location : Microbiology Laboratory

Received Order : 7 May 2021

Calibration Date : 7 May 2021

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by :

Approved by :

Issue Date :

18 May 2021

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Incubator
 Condition As-Received : Used Item
 Reference : 2105-0012OC-2

Cert. No.: 21TM832
 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	MY57013711	20LM7	18 May 2021

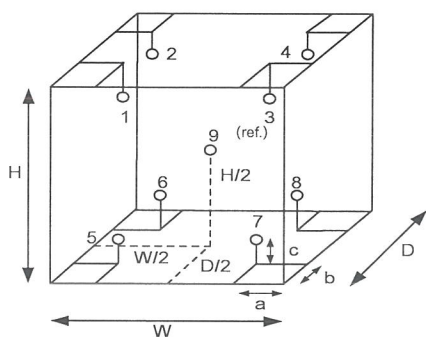
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	24
REL.Humid. (%)	59	62
AC Supply (Volt)	220	221

Position :	Ref. Std. ID No.:
1	18-18RTD-01
2	18-18RTD-02
3	18-18RTD-03
4	18-18RTD-04
5	18-18RTD-05
6	18-18RTD-06
7	18-18RTD-07
8	18-18RTD-08
9 (ref.)	18-18RTD-09

Probe Installation Details :

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

Dimension of Chamber :

D = 0.32 m
 W = 0.42 m
 H = 0.56 m
 Capacity = 0.075 m³



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2105-0012OC-2
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 21TM832

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>
44.0	44.0	44.0	0.041	0.31	0.37	0.30	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
44.0	43.921	44.045	44.053	43.982	43.968	43.856	43.798	43.993	44.093

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.: 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

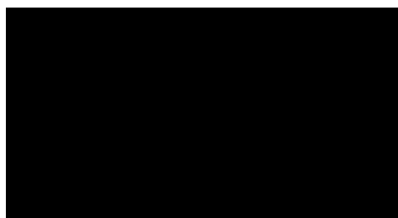
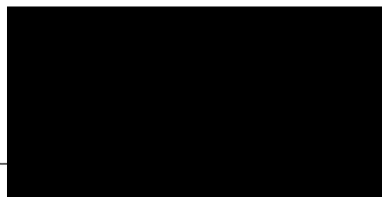
Calibration Date : 23 February 2021

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by :

Approved by :



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

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.

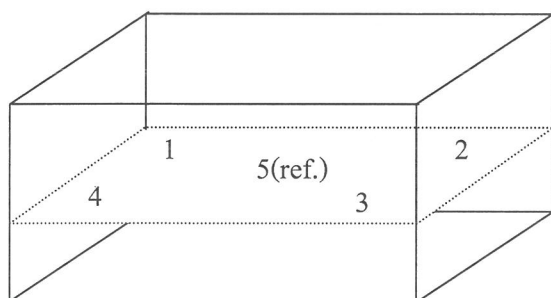
Remark : NIST : National Institute of Standards and Technology, The United State of America.

NIMT : National Institute of Metrology Thailand.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

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



Front

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

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 %.

-o0o-



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.: 21TM708

Page.: 1 of 3

Certificate of Calibration

Equipment : Water Bath

Manufacturer : Memmert

Model : WNE 14

Serial No. : L414.1407

ID No. : UAE.MIC.006/2558

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

Location : Microbiology Laboratory

Received Order : 21 April 2021

Calibration Date : 21 April 2021

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by :

Approved by :

Issue Date :

5 May 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

A 0027612



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2104-0019OC-4

Cert. No.: 21TM708

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	MY44060450	21LM4	NIMT	06 Mar 2022

2. This certification is traceable to the SI unit.

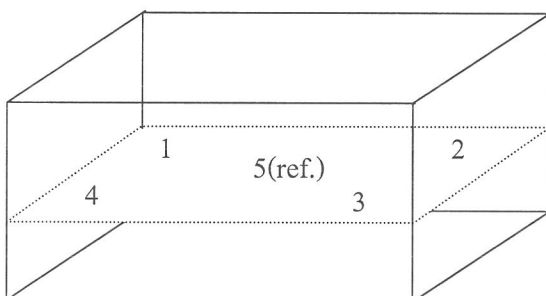
3. This certificate is valid only to the item calibrated on date and place of calibration.

Remark : 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	60	223
Finished of Calibration	23	65	224



Position :	Ref. Std. S/N.:
1	4803988-001
2	4803988-002
3	4803988-003
4	4803988-004
5(ref.)	4803988-005

Front



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2104-0019OC-4
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 21TM708

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	44.524	44.507	44.501	44.518	44.518

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
44.5	0.052	0.035	0.16	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-

Calibration Certificate

Certificate No.: 2100858-001-01
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

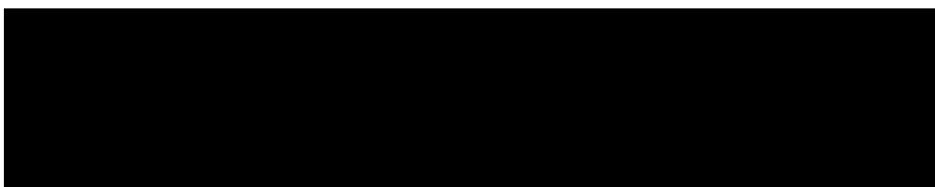
Order No.: 2100858

Operation No.: 2100858-001

Date of Receipt: 8 December 2020

Date of Calibration: 8 December 2020

Calibrated by



Date of Issue: 14 December 2020

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.: 2100858-001-01

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

Date of Calibration: 8 December 2020

Page 2 of 3

Environment Condition: Ambient Temperature: 21.1 ± 0.5 °C Relative Humidity: 49 ± 3.5 %

Place of Calibration: 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 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	M2001161S	24 January 2021
Standard Weight Class E2	1-500g	B308068128	TCS	M2001161S	23 January 2021

Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	PONPE 490	NFI.BTH 004/58	Quality Reborn	QR20-0194	7 February 2021

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:

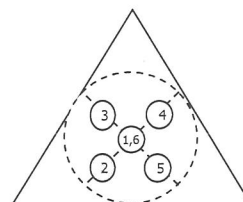
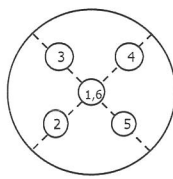
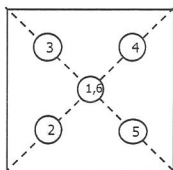
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
300	0.00042
600	0.00042

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.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
200.000	199.999	199.998	199.999	200.001	200.000	0.002

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2100858-001-01

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

Date of Calibration: 8 December 2020

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	0.00086	2.00
0.1	0.1000	0.100	0.000	0.00086	2.00
0.5	0.5000	0.500	0.000	0.00086	2.00
1	1.0000	1.000	0.000	0.00086	2.00
5	5.0000	5.000	0.000	0.00086	2.00
10	10.0000	10.001	-0.001	0.00086	2.00
20	20.0000	20.000	0.000	0.00086	2.00
50	50.0000	50.000	0.000	0.00086	2.00
70	70.0000	70.000	0.000	0.00086	2.00
100	100.0000	100.001	-0.001	0.00087	2.00
150	150.0000	150.000	0.000	0.00088	2.00
200	200.0000	200.000	0.000	0.00091	2.00
300	300.0000	300.000	0.000	0.00095	2.00
400	400.0000	400.000	0.000	0.00100	2.00
500	500.0000	500.000	0.000	0.0011	2.00
600	600.0000	600.000	0.000	0.0012	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 -----

เอกสาร



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.: 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 :

Approved by :

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

A 0025135



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

Cert. No.: 21TM425
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	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.

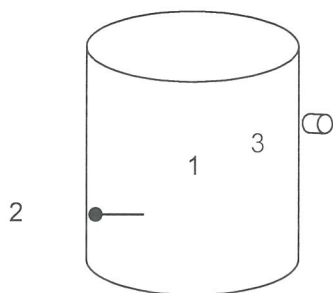
This result of calibration does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical or veterinary purposes which are directly concerned with patient care, or those used for fabrics subjected to sterilization which are required to be dry at the end of cycle.

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

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 %.

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เอกสารไม่ควบคุม

a 1043934



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.: 21TM831

Page.: 1 of 3

Certificate of Calibration

Equipment : Autoclave
Manufacturer : ALP
Model : CL-40L
Serial No. : 807298
ID No. : UAE.MIC.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 : 7 May 2021
Calibration Date : 7 May 2021
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by :

Approved by :

Approved Signatory

Issue Date :

18 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



Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2105-0012OC-1

Cert. No.: 21TM831

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	116.744	0.12	0.08	0.90	2
		2	116.549				
		3	116.515				

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	122.672	0.076	0.12	1.1	2
		2	122.469				
		3	122.414				

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-

เอกสารไม่ควบคุม



Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2105-0012OC-1

Cert. No.: 21TM831
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>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Data Acquisition	34972A	MY57013711	20LM7	18 May 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.

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**

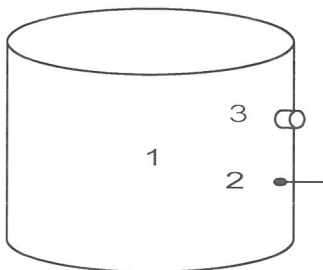
(** = Categorization of pathogens according to hazard and categories of containment, second edition, 1990)

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.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source



	Environmental		
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	24	62	222
Finished of Calibration	25	63	221

<u>Position</u>	<u>Description</u>	<u>Ref. Std. ID No.:</u>
1 =	Center of chamber	18-18TC-04
2 =	Temperature sensor	18-18TC-05
3 =	Exhaust port	18-18TC-06